GROUP 13A

MULTIPORT FUEL INJECTION (MFI) <2.4L ENGINE>

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GENERAL DESCRIPTION

M1131000102581

The Multiport Fuel Injection System consists of sensors, actuators and the powertrain control module (PCM). The sensors detect the engine condition. The PCM controls the system based on signals from these sensors. The actuators work under the control of the PCM. The PCM carries out activities such as fuel injection control, throttle valve opening control, idle air control, and ignition timing control. In addition, the PCM has several diagnostic test modes which simplify troubleshooting when a problem develops.

FUEL INJECTION CONTROL

The PCM controls injector drive times and injection timing to supply the optimum air/fuel mixture to the engine according to the continually-changing engine operation conditions. A single injector is mounted at the intake port of each cylinder. The fuel pump supplies pressurized fuel from the fuel tank to the fuel injectors. The fuel pressure regulator controls the fuel pressure. Thus, the regulated fuel is distributed to each injector. Fuel is normally injected for each cylinder every two rotations of the crankshaft. The firing order is 1-3-4-2. Each cylinder has a dedicated fuel injector. This is called "multiport". The PCM provides a richer air/fuel mixture by carrying out "open-loop" control when the engine is cold or running under high load conditions. Thus, engine performance is maintained. In addition, when the engine is under normal operating temperature after warming-up, the PCM controls the air/fuel mixture according to the heated oxygen sensor signal. This control is a "closed-loop" control. The closed-loop control achieves the theoretical air/fuel mixture ratio where the catalytic converter can obtain the maximum cleaning performance.

THROTTLE VALVE OPENING CONTROL

This system electrically controls the opening of the throttle valve. The PCM detects the amount of travel of the accelerator pedal via the accelerator pedal position sensor, and controls the actuation of the throttle actuator control motor, which is mounted on the throttle body, in order to attain the target throttle valve opening that has been predetermined in accordance with driving conditions.

IDLE AIR CONTROL

The idle speed is kept at the optimum speed by controlling the amount of air that passes through the throttle valve in accordance with changes in idling conditions and engine load during idling.

The PCM drives the throttle actuator control motor to keep the engine running at the pre-set idle target speed in accordance with the engine coolant temperature and A/C and other electrical load. In addition, when the air conditioning switch is turned off and on while the engine is idling, the throttle actuator control motor adjusts the throttle valve pass-through air amount according to the engine load conditions to avoid fluctuations in the engine speed.

IGNITION TIMING CONTROL

The ignition power transistor located in the ignition primary circuit turns on and off to control primary current flow to the ignition coil. This maintains ignition timing at an optimum level regardless of various engine operating conditions. The PCM determines the ignition timing according to engine speed, intake air volume, engine coolant temperature, and atmospheric pressure.

DIAGNOSTIC TEST MODE

- When a fault is detected in any of the sensors or actuators related to emission control, the Malfunction Indicator Lamp (SERVICE ENGINE SOON or Check Engine Lamp) illuminates to warn the driver.
- When a fault is detected in one of the sensors or actuators, a diagnostic trouble code corresponding to the fault is stored in the PCM.
- The RAM data inside the PCM that is related to the sensors and actuators can be read with the scan tool. In addition, the actuators can be controlled by the scan tool MB991958 (M.U.T.-III sub assembly) under certain circumstances.

OTHER CONTROL FUNCTIONS

Fuel Pump Control

- Turns on the fuel pump relay so that current is supplied to the fuel pump while the engine is cranking or running.

A/C Compressor Clutch Relay Control

- Turns on and off the A/C compressor clutch.

Engine Oil Control Valve Control

- The PCM effects duty cycle control on the engine oil control valve, in accordance with the engine speed. This regulates the supply of engine oil to the intake rocker shaft, which switches the cams.

Fan Relay Control

- The radiator fan and condenser fan speeds are controlled in response to the engine coolant temperature and vehicle speed.

Generator Output Current Control

- Prevents generator output current from increasing suddenly and idle speed from dropping at times such as when the headlights are turned on.

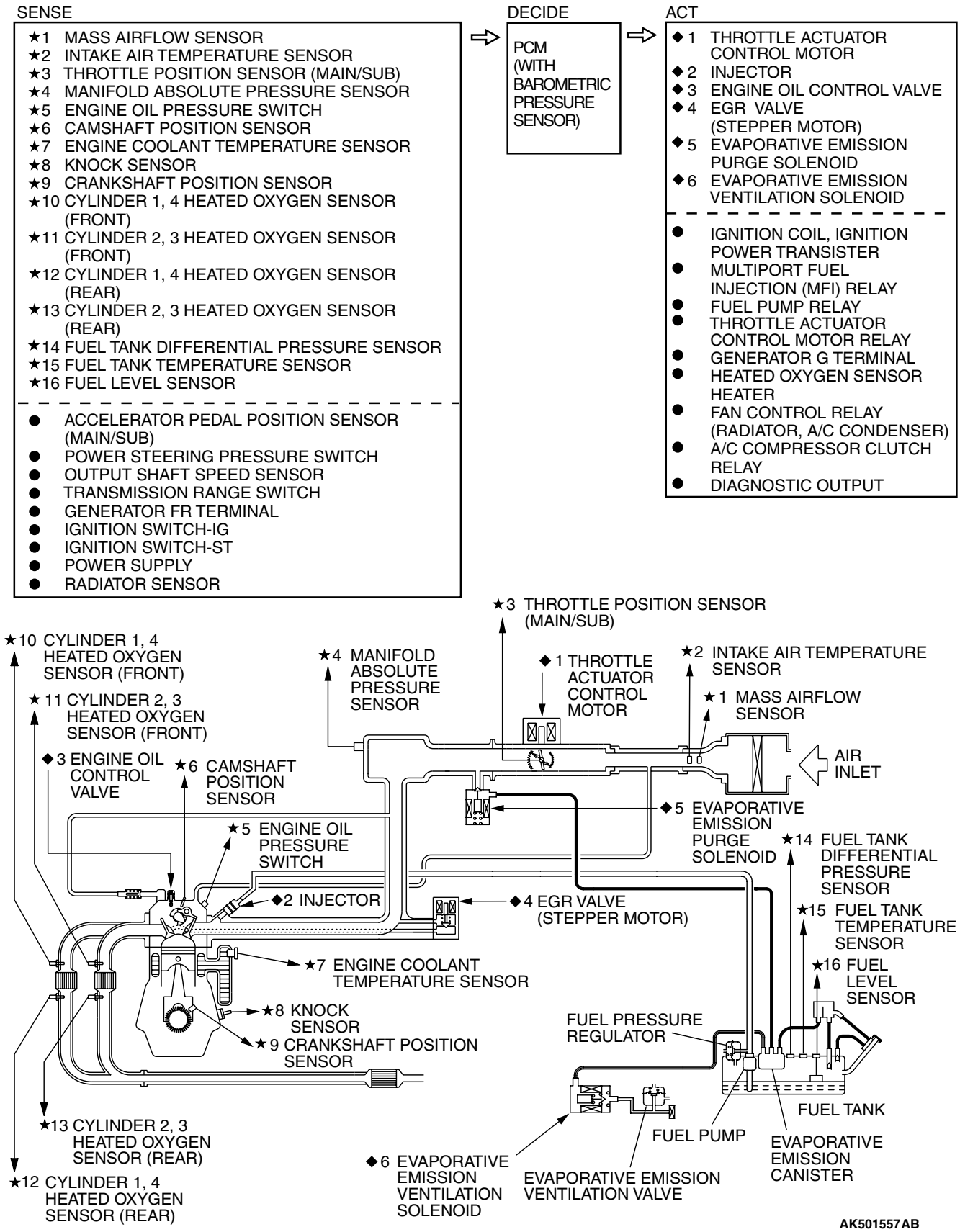
Evaporative Emission Purge Control

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

EGR Control

- (Refer to GROUP 17, Emission Control System – Exhaust Gas Recirculation (EGR) System – General Information. P.17-95)

MULTIPORT FUEL INJECTION (MFI) SYSTEM DIAGRAM



NOTE: For the vacuum hose routing, refer to GROUP 17, Vacuum Hoses P.17-81.

TSB Revision

MULTIPORT FUEL INJECTION (MFI) DIAGNOSIS

TROUBLESHOOTING STRATEGY

M1131150001549

NOTE: If a DTC is erased, its "freeze frame" data will be also erased and the system readiness test status will be reset. Store the "freeze frame" data before erasing the DTC.

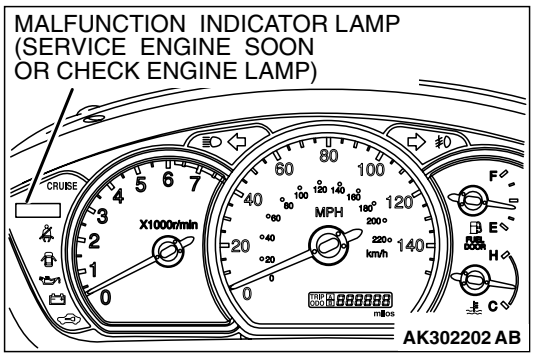
Use these steps to plan your diagnostic strategy. If you follow them carefully, you will be sure to have exhausted most of the possible ways to find an MFI fault.

1. Gather as much information as possible about the complaint from the customer.
2. Verify that the condition described by the customer exists.
3. Check the vehicle for any MFI Diagnostic Trouble Code (DTC).
4. If you cannot verify the condition and there are no DTCs, the malfunction is intermittent. For information on how to cope with intermittent malfunctions, refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-14.
5. If you can verify the condition but there are no DTCs, or the system cannot communicate with the scan tool, refer to the trouble symptom classification table.
6. If there is a DTC, record the number of the code, then erase the code from the memory using the scan tool.
7. Reconfirm the malfunction symptom and carry out a test drive with the drive cycle pattern.
8. If DTC is set again, carry out an inspection with appropriate diagnostic trouble code procedures.
9. If DTC is not set again, the malfunction is intermittent. For information on how to cope with intermittent malfunctions, refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-14.
10. After repairs are completed, conduct a road test duplicating the complaint set conditions to confirm the malfunction has been corrected.

NOTE: If the powertrain control module (PCM) is replaced, Immobilizer Encrypted Code Registration should be carried out, Refer to GROUP 54A, Ignition Switch – On-vehicle Service – Immobilizer Encrypted Code Registration P.54A-40.

DIAGNOSTIC FUNCTION

M1131155501787



MALFUNCTION INDICATOR LAMP (SERVICE ENGINE SOON OR CHECK ENGINE LAMP)

Among the on-board diagnostic items, Malfunction Indicator Lamp (SERVICE ENGINE SOON or Check Engine Lamp) illuminates to notify the driver of an emission control malfunction. However, when an irregular signal returns to normal and the powertrain control module judges that it has returned to normal, the Malfunction Indicator Lamp (SERVICE ENGINE SOON or Check Engine Lamp) will switch off.

Immediately after the ignition switch is turned on, the Malfunction Indicator Lamp (SERVICE ENGINE SOON or Check Engine Lamp) is lit for 20 seconds to indicate that the Malfunction Indicator Lamp (SERVICE ENGINE SOON or Check Engine Lamp) operates normally.

Items Indicated by the Malfunction Indicator Lamp (SERVICE ENGINE SOON or Check Engine Lamp)

DTC	ITEM
–	Powertrain control module (PCM) malfunction
P0031	Cylinder 1, 4 heated oxygen sensor heater (front) control circuit low
P0032	Cylinder 1, 4 heated oxygen sensor heater (front) control circuit high
P0037	Cylinder 1, 4 heated oxygen sensor heater (rear) control circuit low

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DTC	ITEM
P0038	Cylinder 1, 4 heated oxygen sensor heater (rear) control circuit high
P0051	Cylinder 2, 3 heated oxygen sensor heater (front) control circuit low
P0052	Cylinder 2, 3 heated oxygen sensor heater (front) control circuit high
P0057	Cylinder 2, 3 heated oxygen sensor heater (rear) control circuit low
P0058	Cylinder 2, 3 heated oxygen sensor heater (rear) control circuit high
P0069	Abnormal correlation between manifold absolute pressure sensor and barometric pressure sensor
P0101*	Mass airflow circuit range/performance problem
P0102*	Mass airflow circuit low input
P0103*	Mass airflow circuit high input
P0106	Manifold absolute pressure circuit range/performance problem
P0107	Manifold absolute pressure circuit low input
P0108	Manifold absolute pressure circuit high input
P0111*	Intake air temperature circuit range/performance problem
P0112*	Intake air temperature circuit low input
P0113*	Intake air temperature circuit high input
P0116*	Engine coolant temperature circuit range/performance problem
P0117*	Engine coolant temperature circuit low input
P0118*	Engine coolant temperature circuit high input
P0122*	Throttle position sensor (main) circuit low input
P0123*	Throttle position sensor (main) circuit high input
P0125*	Insufficient coolant temperature for closed loop fuel control
P0128	Coolant thermostat (Coolant temperature below thermostat regulating temperature)
P0131	Cylinder 1, 4 heated oxygen sensor (front) circuit low voltage
P0132	Cylinder 1, 4 heated oxygen sensor (front) circuit high voltage
P0133	Cylinder 1, 4 heated oxygen sensor (front) circuit slow response
P0134*	Cylinder 1, 4 heated oxygen sensor (front) circuit no activity detected
P0137	Cylinder 1, 4 heated oxygen sensor (rear) circuit low voltage
P0138	Cylinder 1, 4 heated oxygen sensor (rear) circuit high voltage
P0139	Cylinder 1, 4 heated oxygen sensor (rear) circuit slow response
P0140	Cylinder 1, 4 heated oxygen sensor (rear) circuit no activity detected
P0151	Cylinder 2, 3 heated oxygen sensor (front) circuit low voltage
P0152	Cylinder 2, 3 heated oxygen sensor (front) circuit high voltage
P0153	Cylinder 2, 3 heated oxygen sensor (front) circuit slow response
P0154*	Cylinder 2, 3 heated oxygen sensor (front) circuit no activity detected
P0157	Cylinder 2, 3 heated oxygen sensor (rear) circuit low voltage
P0158	Cylinder 2, 3 heated oxygen sensor (rear) circuit high voltage
P0159	Cylinder 2, 3 heated oxygen sensor (rear) circuit slow response
P0160	Cylinder 2, 3 heated oxygen sensor (rear) circuit no activity detected
P0171	System too lean (cylinder 1, 4)

TSB Revision

DTC	ITEM
P0172	System too rich (cylinder 1, 4)
P0174	System too lean (cylinder 2, 3)
P0175	System too rich (cylinder 2, 3)
P0181	Fuel tank temperature sensor circuit range/performance
P0182	Fuel tank temperature sensor circuit low input
P0183	Fuel tank temperature sensor circuit high input
P0201	Injector circuit-cylinder 1
P0202	Injector circuit-cylinder 2
P0203	Injector circuit-cylinder 3
P0204	Injector circuit-cylinder 4
P0222*	Throttle position sensor (sub) circuit low input
P0223*	Throttle position sensor (sub) circuit high input
P0300	Random/multiple cylinder misfire detected
P0301	Cylinder 1 misfire detected
P0302	Cylinder 2 misfire detected
P0303	Cylinder 3 misfire detected
P0304	Cylinder 4 misfire detected
P0335*	Crankshaft position sensor circuit
P0340*	Camshaft position sensor circuit
P0401	Exhaust gas recirculation flow insufficient detected
P0403	Exhaust gas recirculation control circuit
P0421	Warm up catalyst efficiency below threshold (cylinder 1, 4)
P0431	Warm up catalyst efficiency below threshold (cylinder 2, 3)
P0441	Evaporative emission control system incorrect purge flow
P0442	Evaporative emission control system leak detected (small leak)
P0443	Evaporative emission control system purge control valve circuit
P0446	Evaporative emission control system vent control circuit
P0450	Evaporative emission control system pressure sensor malfunction
P0451	Evaporative emission control system pressure sensor range/performance
P0452	Evaporative emission control system pressure sensor low input
P0453	Evaporative emission control system pressure sensor high input
P0455	Evaporative emission control system leak detected (gross leak)
P0456	Evaporative emission control system leak detected (very small leak)
P0461	Fuel level sensor (main) circuit range/performance
P0462	Fuel level sensor circuit low input
P0463	Fuel level sensor circuit high input
P0506	Idle control system RPM lower than expected
P0507	Idle control system RPM higher than expected
P0551	Power steering pressure switch circuit range/performance
P0554	Power steering pressure switch circuit intermittent

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DTC	ITEM
P0603*	EEPROM malfunction
P0606*	Powertrain control module main processor malfunction
P0630*	VIN malfunction
P0638*	Throttle actuator control motor circuit range/performance
P0642*	Throttle position sensor power supply
P0657*	Throttle actuator control motor relay circuit malfunction
P0705	Transmission range switch circuit malfunction (RPNDL input)
P0712*	Transmission fluid temperature sensor circuit low input
P0713*	Transmission fluid temperature sensor circuit high input
P0715*	Input/Turbine speed sensor circuit
P0720*	Output speed sensor circuit
P0731*	Gear 1 incorrect ratio
P0732*	Gear 2 incorrect ratio
P0733*	Gear 3 incorrect ratio
P0734*	Gear 4 incorrect ratio
P0736*	Gear R incorrect ratio
P0741	Torque converter clutch circuit performance or stuck off
P0742	Torque converter clutch circuit stuck on
P0743*	Torque converter clutch circuit electrical
P0753*	Shift solenoid "A" electrical
P0758*	Shift solenoid "B" electrical
P0763*	Shift solenoid "C" electrical
P0768*	Shift solenoid "D" electrical
P1020	Mitsubishi innovative valve timing electronic control system (MIVEC) performance problem
P1021	Engine oil control valve circuit
P1540	LIN communication (California)
P1541	LIN communication (California)
P1543	DOR tampering monitor (California)
P1544	DOR tampering monitor (California)
P1545	DOR tampering monitor (California)
P1546	DOR tampering monitor (California)
P1547	DOR tampering monitor (California)
P1580	DOR radiator tampering monitor (California)
P1602*	Communication malfunction (between PCM main processor and system LSI)
P1603*	Battery backup line malfunction
P1751*	A/T control relay malfunction
P2066	Fuel level sensor (sub) circuit range/performance
P2100*	Throttle actuator control motor circuit (open)
P2101*	Throttle actuator control motor magneto malfunction

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DTC	ITEM
P2122*	Accelerator pedal position sensor (main) circuit low input
P2123*	Accelerator pedal position sensor (main) circuit high input
P2127*	Accelerator pedal position sensor (sub) circuit low input
P2128*	Accelerator pedal position sensor (sub) circuit high input
P2135*	Throttle position sensor (main and sub) range/performance problem
P2138*	Accelerator pedal position sensor (main and sub) range/performance problem
P2195	Cylinder 1, 4 heated oxygen sensor (front) inactive
P2197	Cylinder 2, 3 heated oxygen sensor (front) inactive
P2228*	Barometric pressure circuit low input
P2229*	Barometric pressure circuit high input
P2252	Heated oxygen sensor offset circuit low voltage
P2253	Heated oxygen sensor offset circuit high voltage
P2567	LIN communication (California)
U1108*	Combination meter time-out

NOTE: If the Malfunction Indicator Lamp (SERVICE ENGINE SOON or Check Engine Lamp) illuminates because of a malfunction of the powertrain control module (PCM), communication between the scan tool MB991958 (M.U.T.-III sub assembly) and the PCM is impossible. In this case, the diagnostic trouble code cannot be read.

NOTE: After the PCM has detected a malfunction, the Malfunction Indicator Lamp (SERVICE ENGINE SOON or Check Engine Lamp) illuminates when the engine is next turned on and the same malfunction is re-detected. However, for items marked with a "" in the DTC NO. column, the Malfunction Indicator Lamp (SERVICE ENGINE SOON or Check Engine Lamp) illuminates only on the first detection of the malfunction.*

NOTE: After the Malfunction Indicator Lamp (SERVICE ENGINE SOON or Check Engine Lamp) illuminates, it will be switched off under the following conditions.

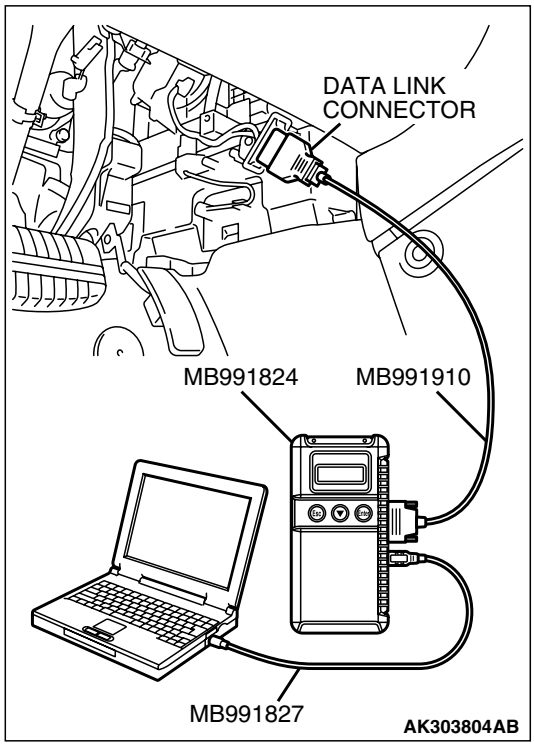
- *When the PCM monitored the powertrain malfunction three times* and met set condition requirements, it detected no malfunction. *: In this case, "one time" indicates from engine start to next engine start.*
- *For misfiring or a fuel trim malfunction, when driving conditions (engine speed, engine coolant temperature, etc.) are similar to those when the malfunction was first recorded.*

NOTE: Sensor 1 indicates the sensor mounted at a position closest to the engine, and sensor 2 indicates the sensor mounted at the position second closest to the engine.

HOW TO CONNECT THE SCAN TOOL (M.U.T.-III)

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: 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. Ensure that the ignition switch is at the "LOCK" (OFF) position.
2. Start up the personal computer.
3. Connect special tool MB991827 to special tool MB991824 and the personal computer.
4. Connect special tool MB991910 to special tool MB991824.
5. Connect special tool MB991910 to the data link connector.
6. Turn the power switch of special tool MB991824 to the "ON" position.

   NOTE: When the special tool MB991824 is energized, special tool MB991824 indicator light will be illuminated in a green color.
7. Start the M.U.T.-III system on the personal computer.

   NOTE: Disconnecting the scan tool MB991958 is the reverse of the connecting sequence, making sure that the ignition switch is at the "LOCK" (OFF) position.

HOW TO READ AND ERASE DIAGNOSTIC TROUBLE CODES.

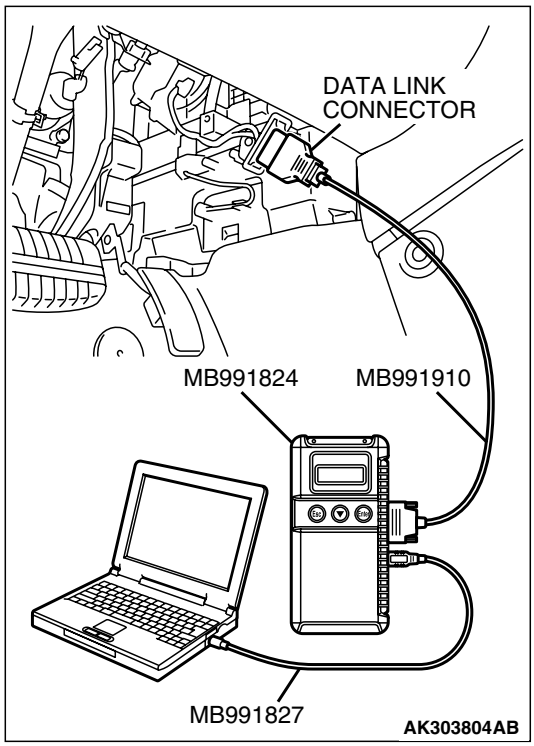
Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: 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.

NOTE: If the battery voltage is low, diagnostic trouble codes will not be set. Check the battery if scan tool MB991958 does not display.

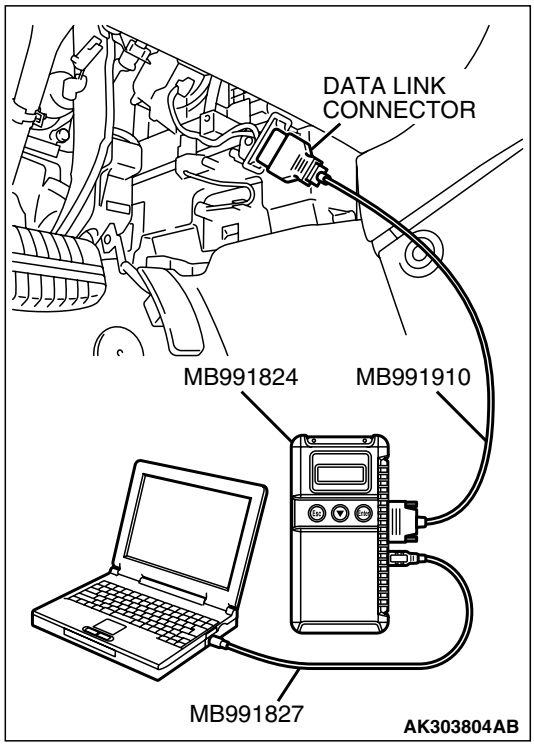


1. Connect scan tool MB991958 to the data link connector.
2. Turn the ignition switch to the "ON" position.
3. Select "Interactive Diagnosis" from the start-up screen.
4. Select "System select."
5. Choose "MFI" from the "POWERTRAIN" tab.
6. Select "MITSUBISHI."
7. Select "Diagnostic Trouble Code"
8. If a DTC is set, it is shown.
9. Choose "Erase DTCs" to erase the DTC.

HOW TO READ DATA LIST

Required Special Tools:

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



⚠ CAUTION

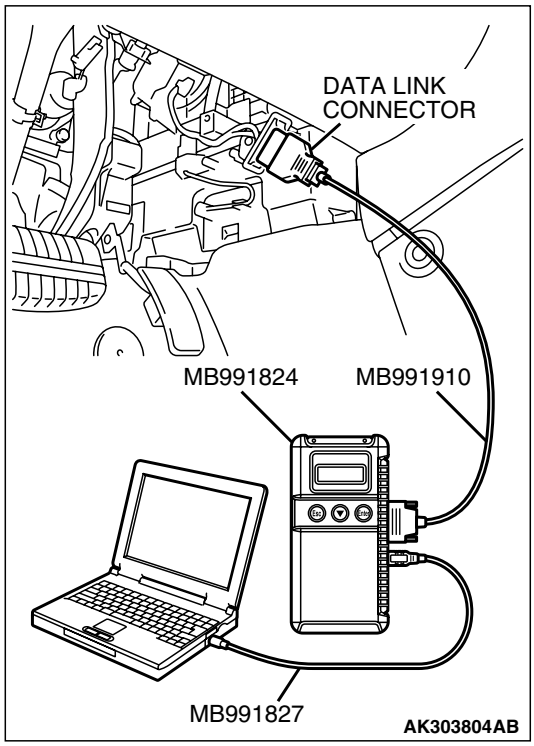
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

1. Connect scan tool MB991958 to the data link connector.
2. Turn the ignition switch to the "ON" position.
3. Select "Interactive Diagnosis" from the start-up screen.
4. Select "System select."
5. Choose "MFI" from the "POWERTRAIN" tab.
6. Select "MITSUBISHI."
7. Select "Data List."
8. Choose an appropriate item and select the "OK" button.

HOW TO PERFORM ACTUATOR TEST

Required Special Tools:

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



⚠ CAUTION

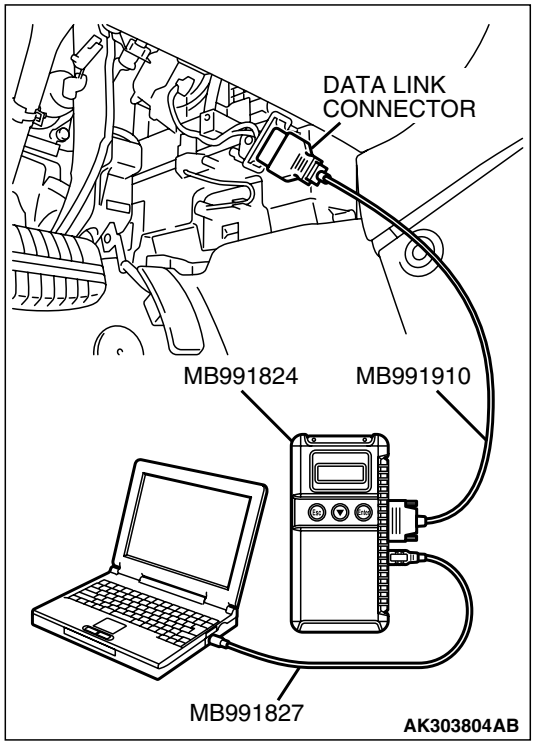
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

1. Connect scan tool MB991958 to the data link connector.
2. Turn the ignition switch to the "ON" position.
3. Select "Interactive Diagnosis" from the start-up screen.
4. Select "System select."
5. Choose "MFI" from the "POWERTRAIN" tab.
6. Select "MITSUBISHI."
7. Select "Actuator Test."
8. Choose an appropriate item and select the "OK" button.

HOW TO DIAGNOSE THE CAN BUS LINES

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: 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. Connect scan tool MB991958 to the data link connector.
2. Turn the ignition switch to the "ON" position.
3. Select "CAN bus diagnosis" from the start-up screen.
4. When the vehicle information is displayed, confirm that it matches the vehicle whose CAN bus lines will be diagnosed.
   - If they matches, go to step 8.
   - If not, go to step 5.
5. Select the "view vehicle information" button.
6. Enter the vehicle information and select the "OK" button.
7. When the vehicle information is displayed, confirm again that it matches the vehicle whose CAN bus lines will be diagnosed.
   - If they matches, go to step 8.
   - If not, go to step 5.
8. Select the "OK" button.
9. When the optional equipment screen is displayed, choose the one which the vehicle is fitted with, and then select the "OK" button.

PROVISIONAL DTCs [OBD-II Test Mode - Results (Mode 7)]

The general scan tool will display the Provisional DTCs reported by PCM if the PCM detects some malfunction for "Misfire", "Fuel System" and "Comprehensive" monitoring during a SINGLE Driving Cycle. The intended use of this data is to assist the technician after a vehicle repair, and after clearing diagnostic information, by reporting test result after a SINGLE Driving Cycle. Note that the test results reported by this mode do not necessarily indicate a faulty component/system. If test results indicate a failure after ADDITIONAL (consecutive) driving, then the Malfunction Indicator Lamp (SERVICE ENGINE SOON or Check Engine Lamp) will be illuminated and a DTC will set.

MODE 6 REFERENCE TABLE

The powertrain control module (PCM) monitors the condition of emission control system.

By selecting MODE 6 using scan tool, Test Result and Limit Value (minimum) *1 or (maximum) *2 about the main items of emission control system which PCM monitors can be confirmed. The value at the last monitoring is output by PCM as a test result.

ON-BOARD DIAGNOSTIC MONITOR ID	STANDARDIZED/ MANUFACTURER DEFINED TEST ID	MONITORING ITEM	SIMPLE TECHNICAL DESCRIPTION	CONVERSION COEFFICIENT IN USING GENERAL SCAN TOOL
01	81	Oxygen Sensor Monitor Bank 1 – Sensor 1 Rich/Lean Switching frequency	PCM monitors the deteriorated condition of the cylinder 1, 4 heated oxygen sensor (front) by checking the rich/lean switching frequency of the cylinder 1, 4 heated oxygen sensor (front).	× 1count
02	82	Oxygen Sensor Monitor Bank 1 – Sensor 2 Output Voltage change	PCM checks the output voltage of the cylinder 1, 4 heated oxygen sensor (rear) in order to monitor whether the cylinder 1, 4 heated oxygen sensor (rear) output is stuck.	× 0.122 mV
	05	Oxygen Sensor Monitor Bank 1 – Sensor 2 Rich To Lean Sensor Switch Time	PCM checks the rich to lean switching time of the cylinder 1, 4 heated oxygen sensor (rear) in order to monitor the response of the cylinder 1, 4 heated oxygen sensor (rear).	× 1 msec
	88	Oxygen Sensor Monitor Bank 1 – Sensor 2 Output Voltage drop slope	PCM checks the output voltage drop slope of the cylinder 1, 4 heated oxygen sensor (rear) in order to monitor the response of the cylinder 1, 4 heated oxygen sensor (rear).	× 1 msec
05	81	Oxygen Sensor Monitor Bank 2 – Sensor 1 Rich/Lean Switching frequency	PCM monitors the deteriorated condition of the cylinder 2, 3 heated oxygen sensor (front) by checking the rich/lean switching frequency of the cylinder 2, 3 heated oxygen sensor (front).	× 1count

ON-BOARD DIAGNOSTIC MONITOR ID	STANDARDIZED/ MANUFACTURER DEFINED TEST ID	MONITORING ITEM	SIMPLE TECHNICAL DESCRIPTION	CONVERSION COEFFICIENT IN USING GENERAL SCAN TOOL
06	82	Oxygen Sensor Monitor Bank 2 – Sensor 2 Output Voltage change	PCM checks the output voltage of the cylinder 2, 3 heated oxygen sensor (rear) in order to monitor whether the cylinder 2, 3 heated oxygen sensor (rear) output is stuck.	× 0.122 mV
	05	Oxygen Sensor Monitor Bank 2 – Sensor 2 Rich To Lean Sensor Switch Time	PCM checks the rich to lean switching time of the cylinder 2, 3 heated oxygen sensor (rear) in order to monitor the response of the cylinder 2, 3 heated oxygen sensor (rear).	× 1 msec
	88	Oxygen Sensor Monitor Bank 2 – Sensor 2 Output Voltage drop slope	PCM checks the output voltage drop slope of the cylinder 2, 3 heated oxygen sensor (rear) in order to monitor the response of the cylinder 2, 3 heated oxygen sensor (rear).	× 1 msec
21	83	Catalyst Monitor Bank 1 Frequency ratio between Front- and Rear-Oxygen Sensors	PCM monitors the deterioration of catalyst at cylinder 1, 4 side by the output frequency ratio between cylinder 1, 4 heated oxygen sensor (front) and cylinder 1, 4 heated oxygen sensor (rear).	× 0.039
22	83	Catalyst Monitor Bank 2 Frequency ratio between Front- and Rear-Oxygen Sensors	PCM monitors the deterioration of catalyst at cylinder 2, 3 side by the output frequency ratio between cylinder 2, 3 heated oxygen sensor (front) and cylinder 2, 3 heated oxygen sensor (rear).	× 0.039

ON-BOARD DIAGNOSTIC MONITOR ID	STANDARDIZED/ MANUFACTURER DEFINED TEST ID	MONITORING ITEM	SIMPLE TECHNICAL DESCRIPTION	CONVERSION COEFFICIENT IN USING GENERAL SCAN TOOL
31	84	EGR Monitor Difference of manifold pressure before and after EGR activation	PCM monitors the operation of EGR system by the pressure difference of intake manifold between before and after introduction of EGR using the manifold absolute pressure sensor.	× 0.0117 kPa
39	85	EVAP Monitor (Cap off) Pressure drop during de-pressurizing	PCM monitors the leak of fuel evaporation gas by checking whether the pressure can be reduced (the amount of pressure reduction) using the fuel tank differential pressure sensor after sealing the fuel tank and the fuel line.	× 0.0117 kPa
3B	85	EVAP Monitor (0.040") Pressure rise during airtight condition	After PCM vacuumizes the fuel tank and the fuel line and then the specified time is passed, PCM monitors the leak of fuel evaporation gas through the fuel tank differential pressure sensor to check the reduction of vacuum in the fuel tank.	× 0.0117 kPa
3C	85	EVAP Monitor (0.020") Pressure rise during airtight condition	After PCM vacuumizes the fuel tank and the fuel line and then the specified time is passed, PCM monitors the leak of fuel evaporation gas through the fuel tank differential pressure sensor to check the reduction of vacuum in the fuel tank.	× 0.0117 kPa

ON-BOARD DIAGNOSTIC MONITOR ID	STANDARDIZED/ MANUFACTURER DEFINED TEST ID	MONITORING ITEM	SIMPLE TECHNICAL DESCRIPTION	CONVERSION COEFFICIENT IN USING GENERAL SCAN TOOL
A1	0B	Mis-Fire General Data EWMA Misfire Counts For Last 10 Driving Cycles	PCM monitors angular acceleration of crankshaft and detect misfire. EWMA (Exponential Weighted Moving Average) misfire counts for last 10 driving cycles.	× 1count
	0C	Mis-Fire General Data Misfire Counts For Last/Current Driving Cycle	PCM monitors angular acceleration of crankshaft and detect misfire. Misfire counts for last/current driving cycle.	× 1count
A2	0B	Mis-Fire Cylinder 1 Data EWMA Misfire Counts For Last 10 Driving Cycles	PCM monitors angular acceleration of crankshaft and detect misfire. EWMA (Exponential Weighted Moving Average) misfire counts for last 10 driving cycles.	× 1count
	0C	Mis-Fire Cylinder 1 Data Misfire Counts For Last/Current Driving Cycle	PCM monitors angular acceleration of crankshaft and detect misfire. Misfire counts for last/current driving cycle.	× 1count
A3	0B	Mis-Fire Cylinder 2 Data EWMA Misfire Counts For Last 10 Driving Cycles	PCM monitors angular acceleration of crankshaft and detect misfire. EWMA (Exponential Weighted Moving Average) misfire counts for last 10 driving cycles.	× 1count
	0C	Mis-Fire Cylinder 2 Data Misfire Counts For Last/Current Driving Cycle	PCM monitors angular acceleration of crankshaft and detect misfire. Misfire counts for last/current driving cycle.	× 1count

ON-BOARD DIAGNOSTIC MONITOR ID	STANDARDIZED/ MANUFACTURER DEFINED TEST ID	MONITORING ITEM	SIMPLE TECHNICAL DESCRIPTION	CONVERSION COEFFICIENT IN USING GENERAL SCAN TOOL
A4	0B	Mis-Fire Cylinder 3 Data EWMA Misfire Counts For Last 10 Driving Cycles.	PCM monitors angular acceleration of crankshaft and detect misfire. EWMA (Exponential Weighted Moving Average) misfire counts for last 10 driving cycles.	× 1count
	0C	Mis-Fire Cylinder 3 Data Misfire Counts For Last/Current Driving Cycle	PCM monitors angular acceleration of crankshaft and detect misfire. Misfire counts for last/current driving cycle.	× 1count
A5	0B	Mis-Fire Cylinder 4 Data EWMA Misfire Counts For Last 10 Driving Cycles	PCM monitors angular acceleration of crankshaft and detect misfire. EWMA (Exponential Weighted Moving Average) misfire counts for last 10 driving cycles.	× 1count
	0C	Mis-Fire Cylinder 4 Data Misfire Counts For Last/Current Driving Cycle	PCM monitors angular acceleration of crankshaft and detect misfire. Misfire counts for last/current driving cycle.	× 1count

*NOTE: *1: Minimum value: The test fails if test value is less than this value.*

*NOTE: *2: Maximum value: The test fails if test value is greater than this value.*

NOTE: When not finishing the monitor of the driving cycle for the request of On-Board Monitoring Test Request, the PCM outputs the stored latest monitor test result.

NOTE: When the monitored test results are erased by the battery disconnection and so on, the PCM outputs the values in hexadecimal of "0000" or "FFFF", otherwise it outputs abnormal values and so on. In case of this, the PCM outputs are handled as invalid-values. When the first monitor (Readiness Status) is completed after this, the PCM outputs the valid-values.

NOTE: "Test Limit Type & Component ID byte" output from the PCM is given in hexadecimal of "00" or "80". "00" means the maximum value and "80" means the minimum value.

DIAGNOSTIC BY DIAGNOSTIC TEST MODE II (INCREASED SENSITIVITY)

Required Special Tools:

- MB991958: Scan tool (M.U.T.-III Sub Assembly)

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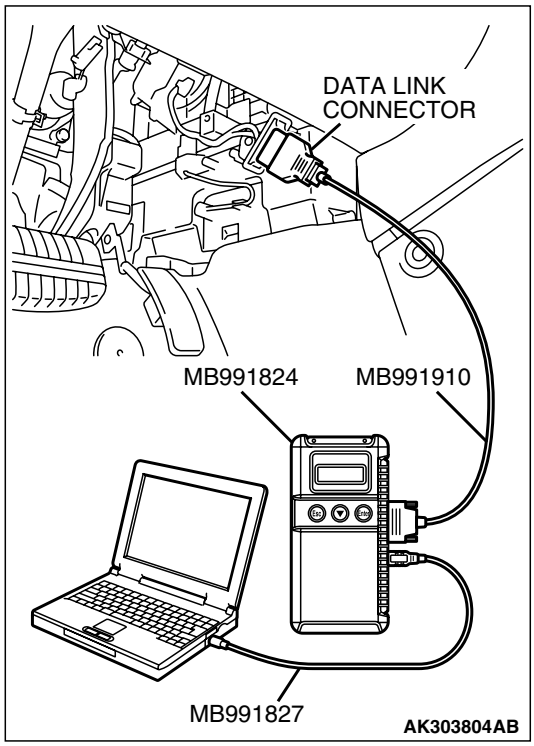

- MB991824: V.C.I.
- MB991827: USB Cable
- MB991910: Main Harness A

⚠ 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.

NOTE: When mode II is selected with MB991958, the Malfunction Indicator Lamp (SERVICE ENGINE SOON or Check Engine Lamp) will light when the powertrain control module (PCM) first detects the trouble (Note that this is only for emission-related trouble). At the same time, the relevant diagnostic trouble codes will be registered. In respect to the comprehensive component electrical faults (opens/shorts), the time for the diagnostic trouble code to be registered after the fault occurrence is four seconds → one second. Therefore, the confirmation of the trouble symptom and the confirmation after completing repairs can be reduced. To return to the normal mode I after mode II has been selected once, the ignition switch must be turned "OFF" once or mode I must be reselected with the scan tool MB991958. The diagnostic trouble code, system readiness test status and freeze frame data, etc., will be erased when mode I is returned to, so record these before returning to mode I.

1. Connect scan tool MB991958 to the data link connector.
2. Turn the ignition switch to the "ON" position.
3. Change the diagnostic test mode of the powertrain control module to DIAGNOSTIC TEST MODE II (INCREASED SENSITIVITY).
4. Road test the vehicle.
5. Read the diagnostic trouble code and repair the malfunctioning part.
6. Turn the ignition switch to the "LOCK" (OFF) position.
7. Disconnect scan tool MB991958 from the data link connector.

ON-BOARD DIAGNOSTICS

The powertrain control module (PCM) monitors the input/output signals (some signals all the time and others under specified conditions) of the PCM. When a malfunction continues for a specified time or longer after the irregular signal is initially monitored, the PCM judges that a malfunction has occurred. After the PCM first detects a malfunction, a diagnostic trouble code is recorded when the engine is restarted and the same malfunction is re-detected. However, for items marked with a "*", a diagnostic trouble code is recorded on the first detection of the malfunction. There are 143 diagnostic items. The diagnostic results can be read out with a scan tool. Since memorization of the diagnostic trouble codes is backed up directly by the battery, the diagnostic results are memorized even if the ignition key is turned off. The diagnostic trouble codes will, however, be erased when the battery terminal or the PCM connector is disconnected. In addition, the diagnostic trouble code can also be erased by turning the ignition switch to ON and sending the diagnostic trouble code erase signal from scan tool MB991958 to the PCM.

NOTE: If the sensor connector is disconnected with the ignition switch turned on, the diagnostic trouble code is memorized. In this case, send the diagnostic trouble code erase signal to the PCM in order to erase the diagnostic memory. The 143 diagnostic items are all indicated sequentially from the smallest code number. The PCM records the engine operating condition when the diagnostic trouble code is set. This data is called "Freeze-frame" data. This data can be read by using the scan tool, and can then be used in simulation tests for troubleshooting. Data items are as follows:

NOTE: If the PCM detects multiple malfunctions, the PCM stores the "Freeze-frame" data for only the first item that was detected. However, if the PCM detects a misfire or a fuel system malfunction, the PCM stores the data by giving priority to the misfire or fuel system malfunction, regardless of the order in which the malfunction was detected.

NOTE: As for Diagnostic trouble code P1603, "Freeze frame" data is not memorized.

Freeze Frame Data for M.U.T.-III

ITEM NO.	M.U.T.-III SCAN TOOL DISPLAY	DATA ITEM	UNIT or STATE
AA	Airflow sensor	Airflow sensor	g/s
AB	TP sensor (main)	Throttle position sensor (main)	%
BA	Target EGR	Target EGR steppper motor	%
BB	Barometric pressure sensor	Barometric pressure sensor	kPa or inHg
C0	Fuel system status (bank1)	Fuel system status (bank1)	• Open loop
			• Closed loop
			• Open loop-drive condition
			• Open loop-DTC set
			• Closed loop-O2 (rear) failed
C1	Fuel system status (bank2)	Fuel system status (bank2)	• Open loop
			• Closed loop
			• Open loop-drive condition
			• Open loop-DTC set
			• Closed loop-O2 (rear) failed
C2	Calculated load value	Calculated load value	%
C3	ECT sensor	Engine coolant temperature sensor	°C or °F
C4	Short term fuel trim (bank1)	Short term fuel trim (bank1)	%
C6	Long term fuel trim (bank1)	Long term fuel trim (bank1)	%
C8	Short term fuel trim (bank2)	Short term fuel trim (bank2)	%
CA	Long term fuel trim (bank2)	Long term fuel trim (bank2)	%
CC	MAP sensor	Manifold absolute pressure sensor	kPa or inHg
CD	Crankshaft position sensor	Crankshaft position sensor	r/m

ITEM NO.	M.U.T.-III SCAN TOOL DISPLAY	DATA ITEM	UNIT or STATE
CE	Vehicle speed	Vehicle speed	km/h or mph
CF	Spark advance	Spark advance	deg
D0	Intake air temperature sensor	Intake air temperature sensor	°C or °F
D1	Time since engine running	Time since engine running	sec
D6	EVAP. emission purge SOL. duty	Evaporative emission purge control solenoid duty	%
D7	Fuel level gauge	Fuel level gauge	%

Freeze Frame Data for General Scan Tool

COMMON EXAMPLE of GENERAL SCAN TOOL DISPLAY	PRAMETER IDENTIFICATION (PID)	DESCRIPTION	UNIT or STATE
DTCFRZF	02	DTC that caused required freeze frame data storage	Pxxxx, Uxxxx
FUELSYS 1	03	See M.U.T.-III Item No. C0	
FUELSYS 2		See M.U.T.-III Item No. C1	
LOAD_PCT	04	See M.U.T.-III Item No. C2	
ECT	05	See M.U.T.-III Item No. C3	
SHRTFT 1	06	See M.U.T.-III Item No. C4	
LONGFT 1	07	See M.U.T.-III Item No. C6	
SHRTFT 2	08	See M.U.T.-III Item No. C8	
LONGFT 2	09	See M.U.T.-III Item No. CA	
MAP	0B	See M.U.T.-III Item No. CC	
RPM	0C	See M.U.T.-III Item No. CD	
VSS	0D	See M.U.T.-III Item No. CE	
SPARKADV	0E	See M.U.T.-III Item No. CF	
IAT	0F	See M.U.T.-III Item No. D0	
MAF	10	See M.U.T.-III Item No. AA	
TP	11	See M.U.T.-III Item No. AB	
RUNTM	1F	See M.U.T.-III Item No. D1	
EGR_PCT	2C	See M.U.T.-III Item No. BA	
EVAP_PCT	2E	See M.U.T.-III Item No. D6	
FLI	2F	See M.U.T.-III Item No. D7	
BARO	33	See M.U.T.-III Item No. BB	
VPWR	42	Control module voltage	V
LOAD_ABS	43	Absolute Load Value	%
EQ_RAT	44	Commanded Equivalence Ratio	%
TP_R	45	Relative Throttle Position	%
AAT	46	Ambient air temperature	°C (°F)

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COMMON EXAMPLE of GENERAL SCAN TOOL DISPLAY	PRAMETER IDENTIFICATION (PID)	DESCRIPTION	UNIT or STATE
TP_B	47	Absolute Throttle Position B	%
APP_D	49	Accelerator pedal position D	%
APP_E	4A	Accelerator pedal position E	%
TAC_PCT	4C	Command Throttle Actuator Control	%

OBD- II DRIVE CYCLE

All kinds of diagnostic trouble codes (DTCs) can be monitored by carrying out a short drive according to the following 24 drive cycle patterns. In other words, doing such a drive regenerates any kind of trouble which involves illuminating the Malfunction Indicator Lamp (SERVICE ENGINE SOON or Check Engine Lamp) and verifies the repair procedure has eliminated [the trouble the Malfunction Indicator Lamp (SERVICE ENGINE SOON or Check Engine Lamp) is no longer illuminated].

⚠ CAUTION

Two technicians should always be in the vehicle when carrying out a test.

NOTE: Check that the diagnosis trouble code (DTC) is not output before driving the OBD-II drive cycle. Erase the DTC if it has been output.

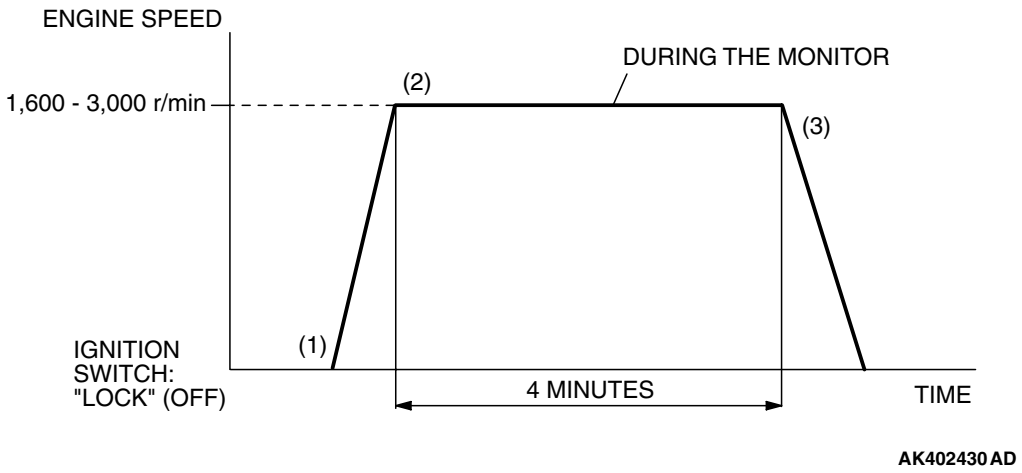
NOTE: Drive cycle patterns are not established for Power steering pressure switch monitor (P0551), and Fuel level sensor monitor (DTC P0461, P2066). Please reference the M.U.T. data list to judge whether these monitor items are normal.

DRIVE CYCLE PATTERN LIST

MONITOR ITEM	DIAGNOSTIC TROUBLE CODE (DTC)	PATTERN
Heated oxygen sensor (front) monitor <Readiness test item>	P0133, P0153	1
Heated oxygen sensor heater monitor <Readiness test item>	P0031, P0032, P0037, P0038, P0051, P0052, P0057, P0058	2
Exhaust gas recirculation (EGR) system monitor <Readiness test item>	P0401	3
Catalytic converter monitor <Readiness test item>	P0421, P0431	4
Evaporative emission system leak monitor (small leak and gross leak) <Readiness test item>	P0442, P0455	5
Evaporative purge system monitor	P0441	
Fuel tank pressure sensor monitor	P0450	
Evaporative emission system leak monitor (very small leak) <Readiness test item>	P0456	6
Airflow sensor monitor	P0101	7
Manifold absolute pressure (MAP) sensor monitor	P0106, P0107	
Intake air temperature sensor monitor	P0111	8
Engine coolant temperature sensor monitor	P0116, P0125	9
Thermostat monitor	P0128	10
Heated oxygen sensor (rear) monitor <Readiness test item>	P0139, P0159	11

MONITOR ITEM	DIAGNOSTIC TROUBLE CODE (DTC)	PATTERN
Air fuel ratio feedback monitor	P0134, P0154	12
Heated oxygen sensor (rear) monitor	P0140, P0160	13
Fuel tank temperature sensor monitor	P0181	14
Misfire monitor	P0300, P0301, P0302, P0303, P0304	15
Fuel tank pressure sensor monitor	P0451	16
Power steering pressure switch monitor	P0554	17
DOR radiator tampering monitor	P1543, P1547	18
DOR radiator tampering monitor	P1544, P1545, P1546	19
Idle speed control system monitor	P0506, P0507	20
MIVEC system monitor	P1020	21
Fuel trim monitor	P0171, P0172, P0174, P0175	22
Heated oxygen sensor monitor	P0131, P0137, P0151, P0157, P2195, P2197	23
Airflow sensor monitor	P0102, P0103	24
Manifold absolute pressure (MAP) sensor monitor	P0108	
Intake air temperature sensor monitor	P0112, P0113	
Engine coolant temperature sensor monitor	P0117, P0118	
Heated oxygen sensor monitor	P0132, P0138, P0152, P0158, P2252, P2253	
Fuel tank temperature sensor monitor	P0182, P0183	
Injector monitor	P0201, P0202, P0203, P0204	
Crankshaft position sensor monitor	P0335	
Camshaft position sensor monitor	P0340	
Exhaust gas recirculation (EGR) valve (stepper motor) monitor	P0403	
Evaporative emission purge solenoid monitor	P0443	
Evaporative emission ventilation solenoid monitor	P0446	
Fuel level sensor monitor	P0462, P0463	
Engine oil control valve monitor	P1021	
Barometric pressure sensor monitor	P2228, P2229	

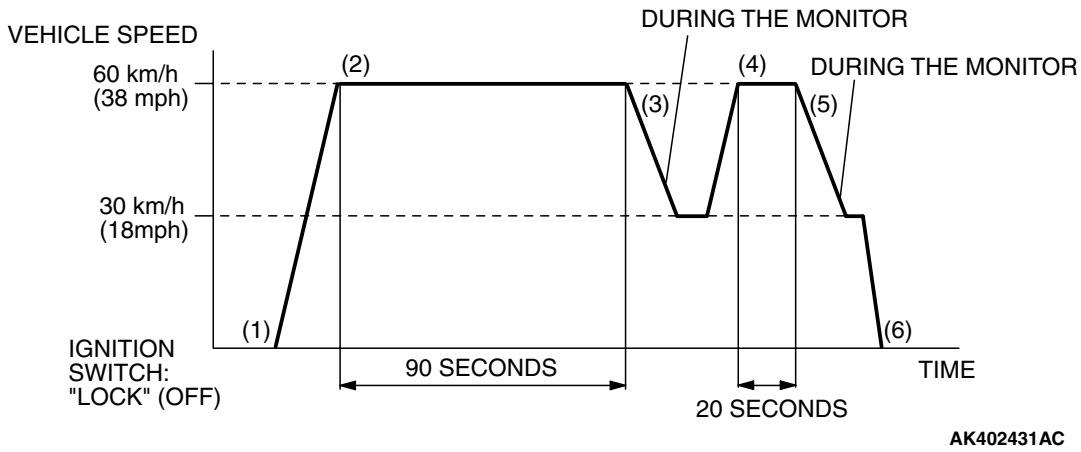
PATTERN 1

Drive cycle pattern	
Inspection conditions	• Engine coolant temperature: More than 82°C (180°F) • Intake air temperature: More than –10°C (14°F) • Barometric pressure: More than 76 kPa (22.5 inHg) • Condition of A/T: Selector lever "D" range
Test procedure	1. Start the engine with all the accessories switched OFF. 2. Drive the vehicle for 4 minutes at the following conditions. (During the monitor) *NOTE: When the system is normal, the monitor is completed earlier.* • Vehicle speed: More than 30 km/h (19 mph) • Engine speed: More than 1,600 r/min, less than 3,000 r/min • Engine load: More than 30%, less than 60% • Without rapid accelerator pedal movement 3. Stop the vehicle at the safe place and turn the ignition switch to "LOCK" (OFF) position. 4. Start the engine and do Steps 1 to 3 again. *NOTE: When the vehicle is operating normally and the OBD-II Drive Cycle is carried out, the Readiness Codes will be set as "Complete" on the first drive cycle. The second drive cycle is required to set the Readiness Codes as "Complete" if a fault is detected during the first drive cycle.* 5. Confirm that the diagnostic trouble code (DTC) is not output.

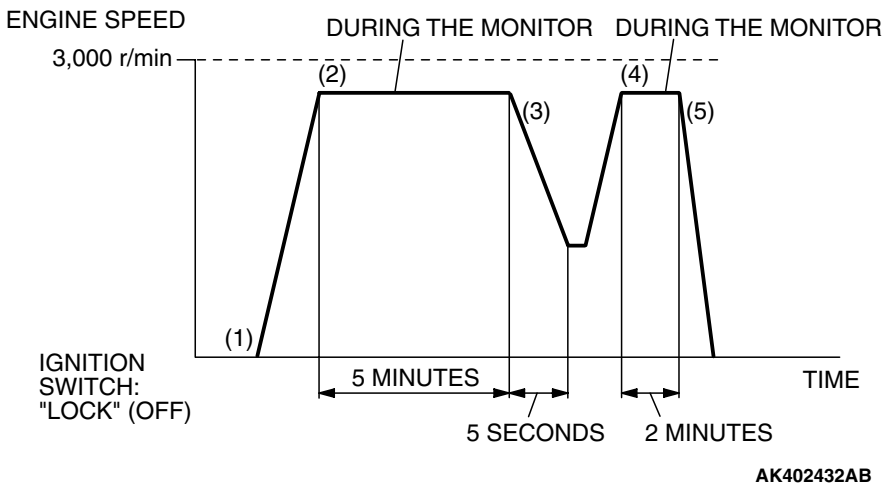
PATTERN 2

Test procedure	1. Start the engine with all the accessories switched OFF. 2. Let the engine idle for 10 seconds. (During the monitor) 3. Turn the ignition switch to the "LOCK" (OFF) position. 4. Start the engine and do Steps 1 to 3 again. *NOTE: When the vehicle is operating normally and the OBD-II Drive Cycle is carried out, the Readiness Codes will be set as "Complete" on the first drive cycle. The second drive cycle is required to set the Readiness Codes as "Complete" if a fault is detected during the first drive cycle.* 5. Confirm that the diagnostic trouble code (DTC) is not output.

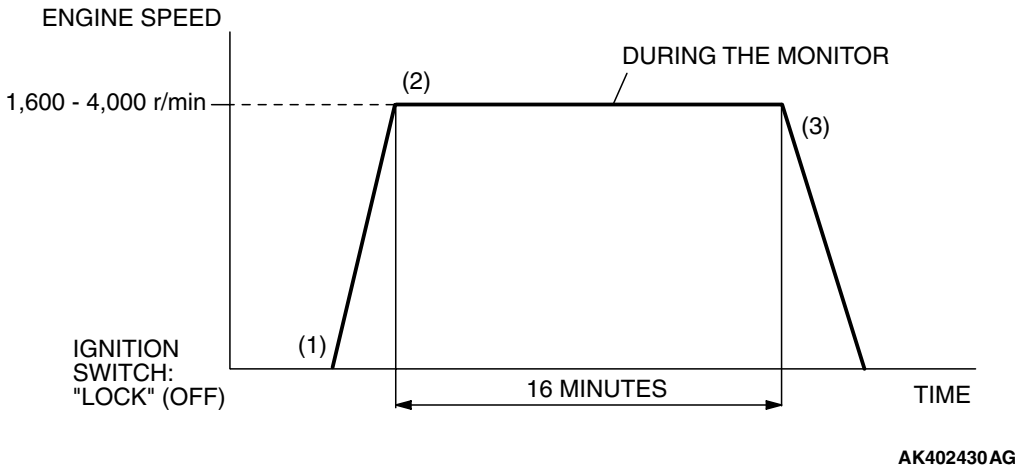
PATTERN 3

Drive cycle pattern	
Inspection conditions	• Engine coolant temperature: More than 82°C (180°F) • Intake air temperature: More than 5°C (41°F) • Barometric pressure: More than 76 kPa (22.5 inHg) • Condition of A/T: Selector lever "D" range
Test procedure	1. Start the engine with all the accessories switched OFF. 2. Accelerate until the vehicle speed is 60 km/h (38 mph) and then drive the vehicle for 90 seconds. 3. Release the accelerator pedal and reduce vehicle speed to 30 km/h (18 mph). (During the monitor) 4. Accelerate until the vehicle speed is 60 km/h (38 mph) and then drive the vehicle for 20 seconds. 5. Release the accelerator pedal and reduce vehicle speed to 30 km/h (18 mph). (During the monitor) 6. Stop the safe place and turn the ignition switch to "LOCK" (OFF) position. 7. Start the engine and do Steps 1 to 6 again. *NOTE: When the vehicle is operating normally and the OBD-II Drive Cycle is carried out, the Readiness Codes will be set as "Complete" on the first drive cycle. The second drive cycle is required to set the Readiness Codes as "Complete" if a fault is detected during the first drive cycle.* 8. Confirm that the diagnostic trouble code (DTC) is not output.

PATTERN 4

Drive cycle pattern	
Inspection conditions	• Engine coolant temperature: More than 30°C (86°F) • Intake air temperature: More than –10°C (14°F) • Barometric pressure: More than 76 kPa (22.5 inHg) • Condition of A/T: Selector lever "D" range
Test procedure	1. Start the engine with all accessories switched OFF. 2. Drive the vehicle for 5 minutes at the following conditions. (During the monitor) • Engine speed: Less than 3,000 r/min • Airflow rate: More than 15 g/sec, less than 29 g/sec • Accelerator pedal: Except full close • Without rapid accelerator pedal movement 3. Release the accelerator pedal for 5 seconds. 4. Drive the vehicle for 2 minutes at the following conditions. (During the monitor) • Engine speed: Less than 3,000 r/min • Airflow rate: More than 15 g/sec, less than 29 g/sec • Accelerator pedal: Except full close • Without rapid accelerator pedal movement *NOTE: When the system is normal, the monitor is completed earlier.* 5. Stop the safe place and turn the ignition switch to "LOCK" (OFF) position. 6. Start the engine and do Steps 1 to 5 again. *NOTE: When the vehicle is operating normally and the OBD-II Drive Cycle is carried out, the Readiness Codes will be set as "Complete" on the first drive cycle. The second drive cycle is required to set the Readiness Codes as "Complete" if a fault is detected during the first drive cycle.* 7. Confirm that the diagnostic trouble code (DTC) is not output.

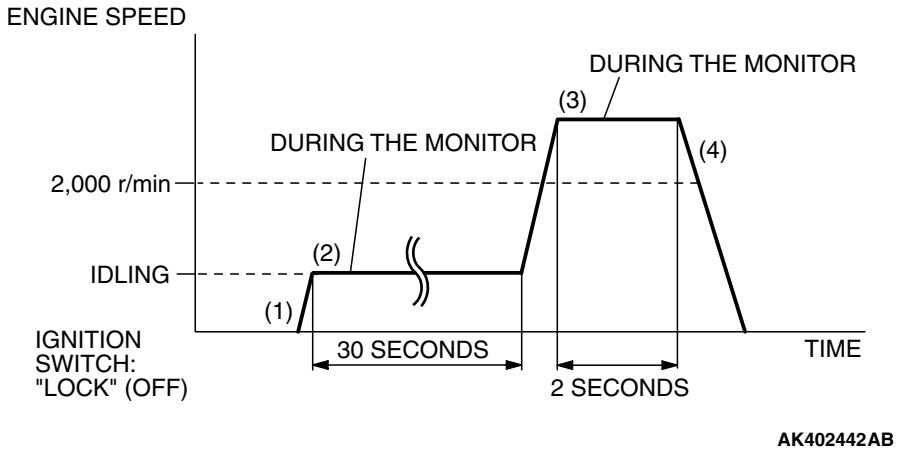
PATTERN 5

Drive cycle pattern	
Inspection conditions	• Engine coolant temperature at engine start: Less than 36°C (96°F) • Intake air temperature at engine start: Less than 36°C (96°F) • Fuel amount at engine start: More than 15%, less than 40% • Engine coolant temperature: More than 60°C (41°F) • Intake air temperature: More than 5°C (41°F) • Barometric pressure: More than 76 kPa (22.5 inHg) • Fuel temperature: Less than 36°C (96°F) • Condition of A/T: Selector lever "D" range
Test procedure	1. Start the engine with all the accessories switched OFF. 2. Drive the vehicle for 16 minutes at the following conditions. (During the monitor) • Engine speed: More than 1,600 r/min, less than 4,000 r/min • Vehicle speed: More than 30 km/h (18.7 mph) • Engine load: More than 26%, less than 50% • Without rapid accelerator pedal movement *NOTE: Keep running as long as possible with the power steering pressure switch in the OFF position.* *NOTE: When the system is normal, the monitor is completed earlier.* 3. Stop the safe place and turn the ignition switch to "LOCK" (OFF) position. 4. Start the engine and do Steps 1 to 3 again. *NOTE: When the vehicle is operating normally and the OBD-II Drive Cycle is carried out, the Readiness Codes will be set as "Complete" on the first drive cycle. The second drive cycle is required to set the Readiness Codes as "Complete" if a fault is detected during the first drive cycle.* 5. Confirm that the diagnostic trouble code (DTC) is not output.

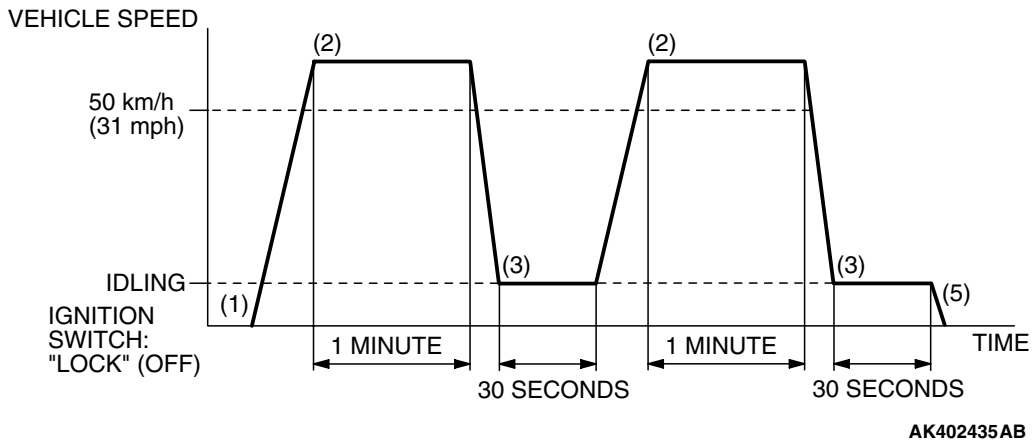
PATTERN 6

Inspection conditions	• Engine coolant temperature at engine start: Less than 36°C (96°F) • Intake air temperature at engine start: Less than 36°C (96°F) • Fuel amount at engine start: More than 40%, less than 85% • Engine coolant temperature: More than 20°C (68°F) • Intake air temperature: More than 5°C (41°F) • Barometric pressure: More than 76 kPa (22.5 inHg) • Fuel temperature: Less than 32°C (90°F)
Test procedure	1. Start the engine with all the accessories switched OFF. 2. Let the engine idle for 16 minutes. (During the monitor) *NOTE: When the system is normal, the monitor is completed earlier.* 3. Turn the ignition switch to "LOCK" (OFF) position. 4. Start the engine and do Steps 1 to 3 again. *NOTE: When the vehicle is operating normally and the OBD-II Drive Cycle is carried out, the Readiness Codes will be set as "Complete" on the first drive cycle. The second drive cycle is required to set the Readiness Codes as "Complete" if a fault is detected during the first drive cycle.* 5. Confirm that the diagnostic trouble code (DTC) is not output.

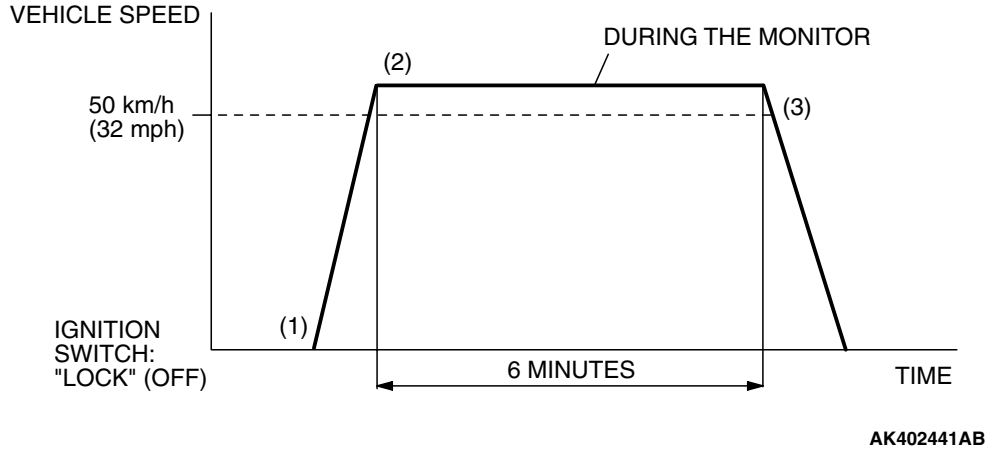
PATTERN 7

Drive cycle pattern	
Inspection condition	• Engine coolant temperature at engine start: More than 0°C (32°F) • Condition of A/T: Selector lever "D" range
Test procedure	1. Start the engine with all the accessories switched OFF. 2. Let the engine idle for 30 seconds. (During the monitor) 3. Accelerate the vehicle for 2 seconds at the following conditions. (During the monitor) • Engine speed: More than 2,000 r/min • Engine load: More than 60% • Throttle position sensor output voltage: More than 3.5 volts 4. Stop the safe place and turn the ignition switch to "LOCK" (OFF) position. 5. Start the engine and do Steps 1 to 4 again. 6. Confirm that the diagnostic trouble code (DTC) is not output.

PATTERN 8

Drive cycle pattern	
Inspection conditions	• Engine coolant temperature: More than 76°C (169°F) • Condition of A/T: Selector lever "D" range
Test procedure	1. Start the engine with all the accessories switched OFF. 2. Drive the vehicle at more than 50 km/h (31 mph) for 1 minute. 3. Stop at safe place and let the engine idle for 30 seconds. 4. Repeat Steps 2 and 3 again. 5. Stop the safe place and turn the ignition switch to "LOCK" (OFF) position. 6. Confirm that the diagnostic trouble code (DTC) is not output.

PATTERN 9

Drive cycle pattern	
Inspection conditions	• Engine coolant temperature at engine start: More than 7°C (47°F) • Intake air temperature: Less than 60°C (140°F) • Engine coolant temperature: More than 40°C (104°F) • Condition of A/T: Selector lever "D" range
Test procedure	1. Start the engine with all the accessories switched OFF. 2. Drive the vehicle for 6 minutes at the following condition. (During the monitor) • Vehicle speed: More than 50 km/h (32 mph) • Except fuel cut 3. Stop at safe place and turn the ignition switch to "LOCK" (OFF) position. 4. Confirm that the diagnostic trouble code (DTC) is not output.

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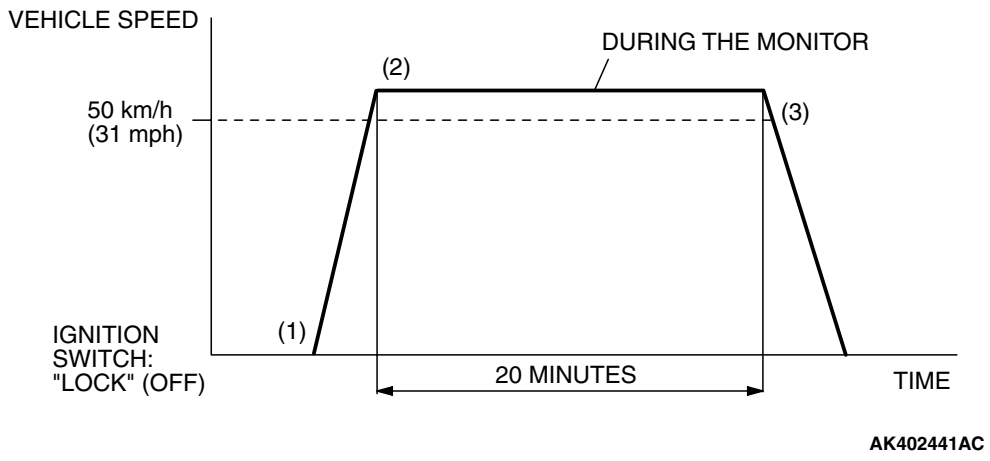
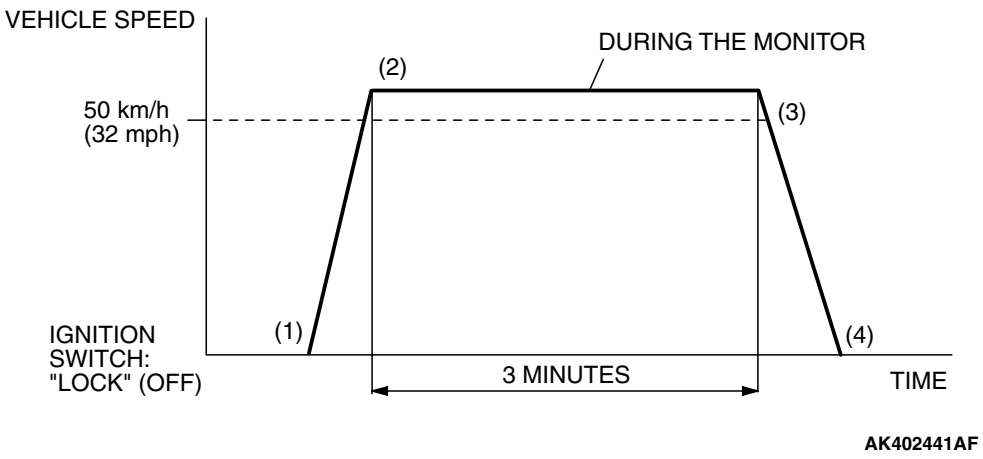
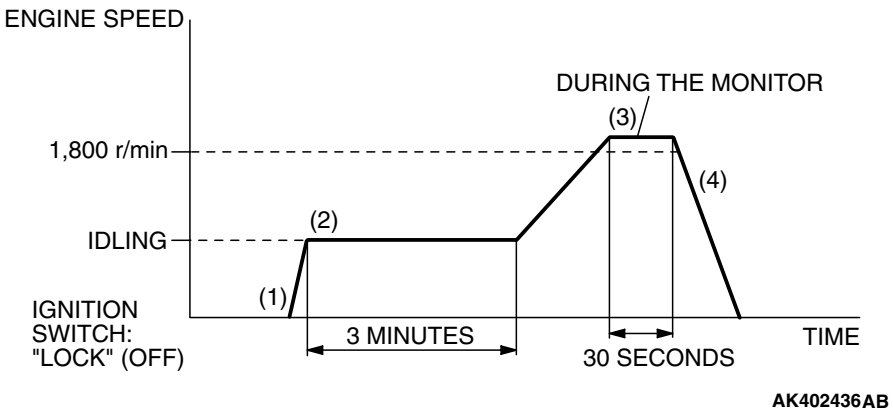
PATTERN 10

Drive cycle pattern	
Inspection conditions	• Engine coolant temperature at engine start: More than 10°C (50°F), less than 76°C (168°F) • Difference between engine coolant temperature and intake air temperature at engine start: Less than 5°C (9°F) • Dropping of intake air temperature since engine start: Less than 2°C (3.6°F) • Condition of A/T: Selector lever "D" range
Test procedure	1. Start the engine with all the accessories switched OFF. 2. Drive the vehicle for 20 minutes at the following conditions. (During the monitor) • Vehicle speed: More than 50 km/h (31 mph) • Except fuel cut *NOTE: The system is normal if engine coolant temperature will rise more than 82°C (180°F) within 20 minutes.* 3. Stop at safe place and turn the ignition switch to "LOCK" (OFF) position. 4. Start the engine and do Steps 1 to 3 again. 5. Confirm that the diagnostic trouble code (DTC) is not output.

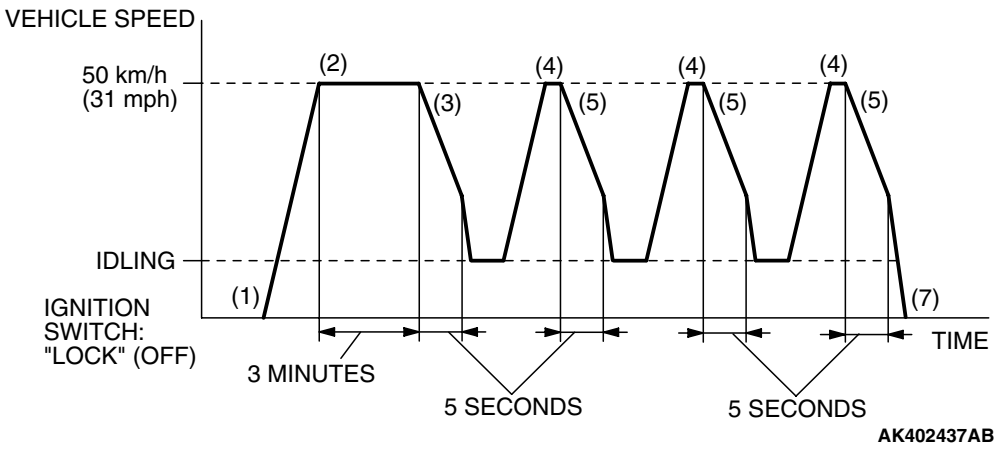
PATTERN 11

Drive cycle pattern	
Inspection conditions	• Engine coolant temperature: More than 76°C (169°F) • Condition of A/T: Selector lever "D" range
Test procedure	1. Start the engine with all the accessories switched OFF. 2. Drive the vehicle at 50 km/h (31 mph) for 3 minutes. 3. Release the accelerator pedal for 10 seconds then stop the safe place. (During the monitor) 4. Turn the ignition switch to "LOCK" (OFF) position. 5. Start the engine and do Steps 1 to 4 again. 6. Confirm that the diagnostic trouble code (DTC) is not output.

PATTERN 12

Drive cycle pattern	
Inspection conditions	• Engine coolant temperature: More than 82°C (180°F) • Condition of A/T: Selector lever "D" range
Test procedure	1. Start the engine with all the accessories switched OFF. 2. Let the engine idle for 3 minutes. 3. Drive the vehicle for 30 seconds at the following conditions. (During the monitor) • Engine speed: More than 1,800 r/m • Engine load: More than 30%, less than 80% • Throttle position sensor output: Less than 3.0 volts • Except fuel cut 4. Stop the safe place and turn the ignition switch to "LOCK" (OFF) position. 5. Confirm that the diagnostic trouble code (DTC) is not output.

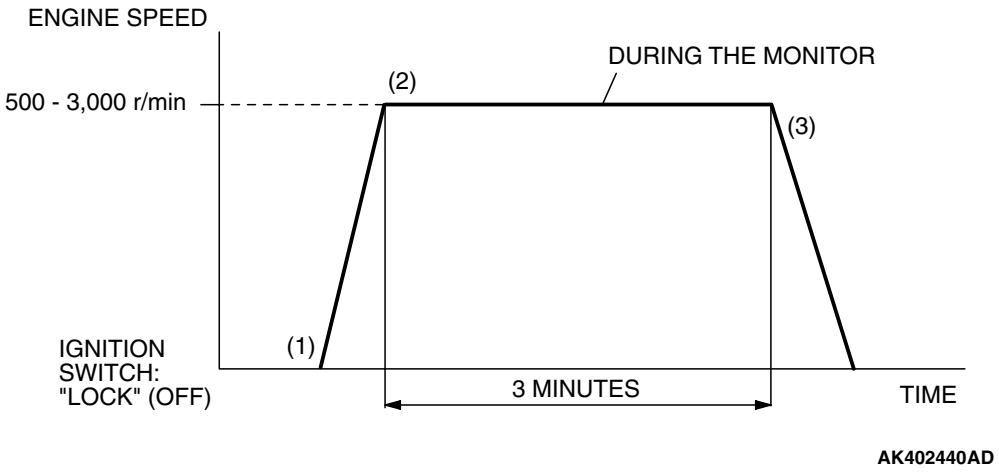
PATTERN 13

Drive cycle pattern	
Inspection conditions	• Engine coolant temperature: More than 76°C (169°F) • Condition of A/T: Selector lever "D" range
Test procedure	1. Start the engine with all the accessories switched OFF. 2. Drive the vehicle at 50 km/h (31 mph) for 3 minutes. 3. Release the accelerator pedal for 5 seconds then stop the safe place. 4. Accelerate until the vehicle speed is at 50 km/h (31 mph) at the following conditions. • Engine speed: More than 1,500 r/min • Engine load: More than 40% 5. Release the accelerator pedal for 5 seconds then stop the safe place. 6. Repeat Steps 4 and 5 for 2 times. 7. Stop the safe place and turn the ignition switch to "LOCK" (OFF) position. 8. Start the engine and do Steps 1 to 7 again. 9. Confirm that the diagnostic trouble code (DTC) is not output.

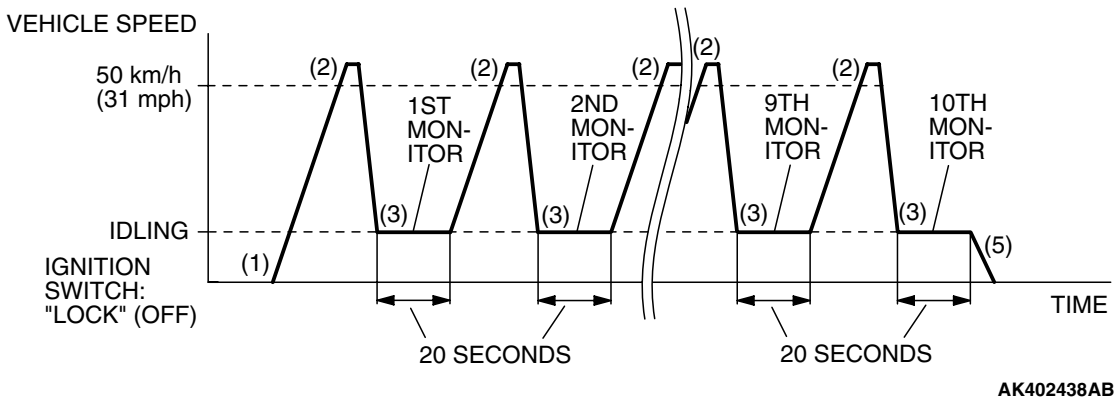
PATTERN 14

Inspection conditions	• Engine coolant temperature at engine start: More than –10°C (14°F), less than 33°C (91°F) • Difference between engine coolant temperature and intake air temperature at engine start: Less than 5°C (9°F) • Condition of A/T: Selector lever "D" range
Test procedure	1. Start the engine with all the accessories switched OFF. 2. Drive the vehicle at more than 30 km/h (19 mph) until engine coolant temperature rises more than 60°C (140°F). (During the monitor) 3. Stop at safe place and turn the ignition switch to "LOCK" (OFF) position. 4. Start the engine and do Steps 1 to 3 again. 5. Confirm that the diagnostic trouble code (DTC) is not output.

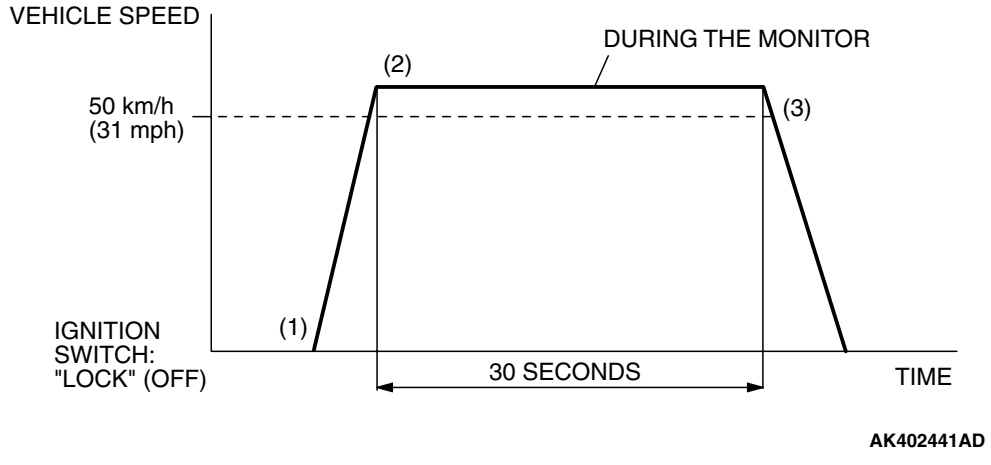
PATTERN 15

Drive cycle pattern	
Inspection conditions	• Engine coolant temperature: More than –10°C (14°F) • Intake air temperature: More than –10°C (14°F) • Barometric pressure: More than 76 kPa (22.5 inHg) • Condition of A/T: Selector lever "D" range
Test procedure	1. Start the engine with all the accessories switched OFF. 2. Drive the vehicle for 3 minutes at the following conditions. (During the monitor) • Engine speed: More than 500 r/min, less than 3,000 r/min • Engine load: More than 25% • Without rapid accelerator pedal change • Except fuel cut 3. Stop the vehicle at the safe place and turn the ignition switch to "LOCK" (OFF) position. 4. Start the engine and do Steps 1 to 3 again. 5. Confirm that the diagnostic trouble code (DTC) is not output.

PATTERN 16

Drive cycle pattern	
Inspection condition	Condition of A/T: Selector lever "D" range
Test procedure	1. Start the engine with all the accessories switched OFF. 2. Accelerate until the vehicle speed is more than 50 km/h (31 mph). • Engine speed: More than 2,500 r/min • Engine load: More than 55% 3. Stop at safe place and let the engine idle for 20 seconds. (During the monitor) 4. Repeat Steps 2 and 3 for 10 times. 5. Stop the vehicle at the safe place and turn the ignition switch to "LOCK" (OFF) position. 6. Start the engine and do Steps 1 to 5 again. 7. Confirm that the diagnostic trouble code (DTC) is not output.

PATTERN 17

Drive cycle pattern	
Inspection conditions	• Engine coolant temperature: More than 30°C (86°F) • Condition of A/T: Selector lever "D" range
Test procedure	1. Start the engine with all the accessories switched OFF. 2. Drive the vehicle at more than 50 km/h (31 mph) for 30 seconds. (During the monitor) 3. Stop the vehicle at the safe place and turn the ignition switch to "LOCK" (OFF) position. 4. Start the engine and do Steps 1 to 3 again. 5. Confirm that the diagnostic trouble code (DTC) is not output.

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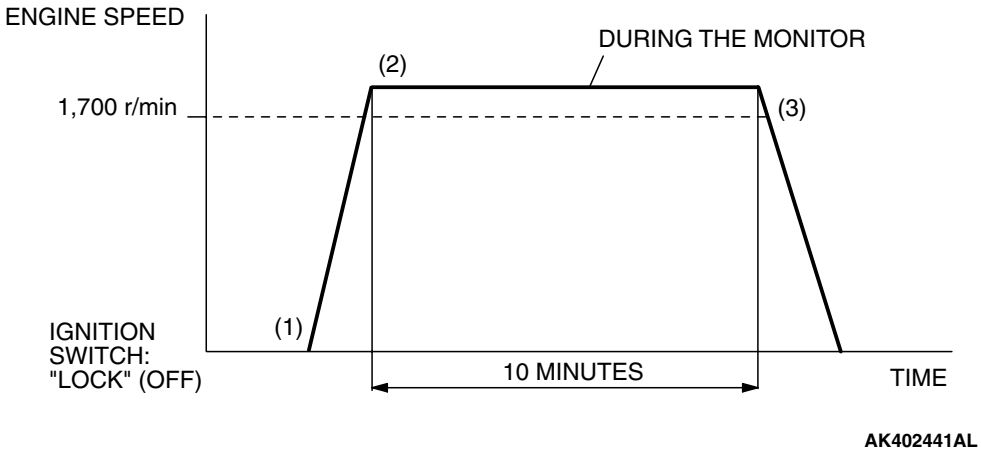
PATTERN 18

Drive cycle pattern	
Inspection conditions	• Engine coolant temperature at the engine started: Less than 40°C (104°F) • Intake air temperature: More than 0°C (32°F), less than 40°C (140°F) • Difference between engine coolant temperature and intake air temperature at the engine started: Less than 5°C (9°F) • Engine coolant temperature: More than 77°C (171°F) • Condition of A/T: Selector lever "D" range
Test procedure	1. Start the engine with all the accessories switched OFF. 2. Drive the vehicle for 10 minutes at the following condition. (During the monitor) • Engine speed: More than 1,700 r/min • Engine load: More than 30% 3. Stop at safe place and turn the ignition switch to "LOCK" (OFF) position. 4. Start the engine and do Steps 1 to 3 again. 5. Confirm that the diagnostic trouble code (DTC) is not output.

PATTERN 19

Inspection conditions	• Engine coolant temperature at the engine started: More than 40°C (104°F) • Intake air temperature: More than 0°C (32°F, less than 40°C (104°F) • Difference between engine coolant temperature and intake air temperature at the engine started: Less than 5°C (9°F) • Engine coolant temperature: 77°C (171°F)
Test procedure	1. Start the engine with all the accessories switched OFF. 2. Lets the engine idle for 10 minutes. (During the monitor) 3. Turn the ignition switch to "LOCK" (OFF) position. 4. Start the engine and do Steps 1 to 3 again. 5. Confirm that the diagnostic trouble code (DTC) is not output.

PATTERN 20

Inspection conditions	• Engine coolant temperature: More than 82°C (180°F) • Intake air temperature: More than –10°C (14°F) • Barometric pressure: More than 76 kPa (22.5 inHg) • Condition of A/T: Selector lever "D" range
Test procedure	1. Start the engine with all the accessories switched OFF. 2. Accelerate until the vehicle speed is more than 1.5 km/h (1 mph). 3. Stop at safe place and let the engine idle for 1 minute. (During the monitor) 4. Turn the ignition switch to "LOCK" (OFF) position. 5. Start the engine and do Steps 1 to 4 again. 6. Confirm that the diagnostic trouble code (DTC) is not output.

PATTERN 21

Inspection condition	Engine coolant temperature: More than 77°C (171°F)
Test procedure	1. Start the engine with all the accessories switched OFF. 2. Let the engine idle for 30 seconds. 3. Drive the engine at more than 4,813 r/min for 5 seconds. (During the monitor) 4. Turn the ignition switch to "LOCK" (OFF) position. 5. Start the engine and do Steps 1 to 4 again. 6. Confirm that the diagnostic trouble code (DTC) is not output.

PATTERN 22

Inspection conditions	Engine coolant temperature: More than 82°C (180°F)
Test procedure	1. Start the engine with all the accessories switched OFF. 2. Let the engine idle for 15 minutes. (During the monitor) 3. Turn the ignition switch to "LOCK" (OFF) position. 4. Start the engine and do Steps 1 to 3 again. 5. Confirm that the diagnostic trouble code (DTC) is not output.

PATTERN 23

Inspection conditions	• Intake air temperature: More than –10°C (14°F) • Engine coolant temperature sensor: More than 7°C (45°F)
Test procedure	1. Start the engine with all the accessories switched OFF. 2. Let the engine idle for 4 minutes. (During the monitor) 3. Turn the ignition switch to "LOCK" (OFF) position. 4. Start the engine and do Steps 1 to 3 again. 5. Confirm that the diagnostic trouble code (DTC) is not output.

PATTERN 24

Inspection conditions	• Fuel temperature sensor: Less than 36°C (96°F) <Fuel tank pressure sensor monitor> • Fuel amount at engine start: Less than 85% <Fuel tank pressure sensor monitor>
Test procedure	1. Start the engine with all the accessories switched OFF. 2. Let the engine idle at the engine speed less than 1,000 r/min for 15 seconds. (During the monitor) 3. Turn the ignition switch to "LOCK" (OFF) position. 4. Confirm that the diagnostic trouble code (DTC) is not output.

SYSTEM READINESS TEST STATUS

PURPOSE

The Readiness function (also referred to as I/M Readiness or I/M Flags) indicates if a full diagnostic check has been "Completed" (is "Ready") for each non-continuous monitor. Enhanced I/M State Emission Programs will use the Readiness status (Codes) to see if the vehicle is ready for OBD-II testing. "Incomplete" (Not Ready) codes will be one of the triggers for I/M failure.

OVERVIEW

The PCM monitors the following main diagnosis items and records whether the evaluation was completed or is incomplete. The Readiness Codes are established for the I/M programs, thereby confirming that the vehicles have not been tampered with by erasing the diagnostic trouble code(s) (DTCs) before I/M testing. The Readiness Codes and DTCs can be reset by disconnecting the battery or by erasing the codes with a scan tool MB991958 (M.U.T.-III sub assembly). For this reason, all the Readiness Codes must be displayed "Complete" before I/ M testing. When the monitors run and complete, the scan tool MB991958 (M.U.T.-III sub assembly) will display the Readiness Codes as "Complete" (General Scan Tools display as "Ready"). When the vehicle is operating normally and the OBD-II Drive Cycle is carried out, the Readiness Codes will be set as "Complete" on the first drive cycle. For DTCs requiring two drive cycles to detect a fault, the second drive cycle is required to set the Readiness Codes as "Complete" if a fault is detected during the first drive cycle. If the fault is still there after the second drive cycle, a DTC will be set.

- Catalyst: P0421, P0431
- Evaporative system: P0442, P0455, P0456
- Heated oxygen sensor: P0133, P0139, P0153, P0159
- Heated oxygen sensor heater: P0031, P0032, P0037, P0038, P0051, P0052, P0057, P0058
- EGR system: P0401

After all the Readiness Codes are displayed as "Complete", the technician is assured that any DTCs related to the monitor will be displayed if the system has a problem. That is why some State's I/M programs require the Readiness Code as "Complete" before they check for DTCs.

NOTE: After a repair is made for a DTC, the technician should drive the OBD-II Drive Cycle checking that the scan tool MB991958 (M.U.T.-III Sub Assembly) displays all the Readiness Codes as "Complete"

FAIL-SAFE FUNCTION REFERENCE TABLE

M1131153000749

When the main sensor malfunctions are detected by the diagnostic test mode, the vehicle is controlled by means of the following defaults.

MALFUNCTION ITEM	CONTROL CONTENTS DURING MALFUNCTION
Mass airflow sensor	• Uses the throttle position sensor signal and engine speed signal (crankshaft position sensor signal) for basic injector drive time and basic ignition timing from the pre-set mapping.
Intake air temperature sensor	Controls as if the intake air temperature is 25°C (77°F).
Engine coolant temperature sensor	Controls as if the engine coolant temperature is 80°C (176°F). (This control will be continued until the ignition switch is turned to " LOCK " (OFF) position even though the sensor signal returns to normal.)

MALFUNCTION ITEM	CONTROL CONTENTS DURING MALFUNCTION
Camshaft position sensor	Injects fuel into the cylinders in the order 1-3-4-2 with irregular timing. (After the ignition switch is turned to the "ON" position, the No. 1 cylinder top dead center is not detected at all.)
Barometric pressure sensor	Controls as if the barometric pressure is 101 kPa (30 in.Hg).
Knock sensor	Switches the ignition timing from ignition timing for high octane to ignition timing for standard octane fuel.
Heated oxygen sensor <front>	Air/fuel ratio closed loop control is not performed.
Heated oxygen sensor <rear>	Performs the closed loop control of the air/fuel ratio by using only the signal of the heated oxygen sensor (front) installed on the front side of the catalytic converter.
Generator FR terminal	No generator output suppression control is performed for the electrical load (to be operated as an ordinary generator).
Misfire detection	The PCM stops supplying fuel to the cylinder with the highest misfire rate if a misfire that could damage the catalytic converter is detected.
Accelerator pedal position sensor (main)	• Detects the amount of the accelerator pedal travel through the use of the accelerator pedal position sensor (sub) signal, but rendering it only as being approximately one-half the normal opening angle. • Prohibits the operation of the auto-cruise control. • Cuts off fuel when the engine speed exceeds 3,000 r/min. • Suppresses the engine output by stopping the electronically controlled throttle valve system if the accelerator pedal position sensor (sub) is also malfunctioning.
Accelerator pedal position sensor (sub)	• Detects the amount of the accelerator pedal travel through the use of the accelerator pedal position sensor (main) signal, but rendering it only as being approximately one-half the normal opening angle. • Prohibits the operation of the auto-cruise control. • Cuts off fuel when the engine speed exceeds 3,000 r/min. • Suppresses the engine output by stopping the electronically controlled throttle valve system if the accelerator pedal position sensor (main) is also malfunctioning.
Throttle position sensor (main)	• Controls the throttle valve position through the use of the throttle position sensor (sub) signal. • Renders the amount of accelerator pedal travel as being approximately one-half the normal opening angle. • Prohibits the operation of the engine speed feedback control. • Prohibits the operation of the auto-cruise control. • Cuts off fuel when the engine speed exceeds 3,000 r/min. • Suppresses the engine output by stopping the electronically controlled throttle valve system if the throttle position sensor (sub) is also malfunctioning.

MALFUNCTION ITEM	CONTROL CONTENTS DURING MALFUNCTION
Throttle position sensor (sub)	• Controls the throttle valve position through the use of the throttle position sensor (main) signal. • Renders the amount of accelerator pedal travel as being approximately one-half the normal opening angle. • Prohibits the operation of the auto-cruise control. • Cuts off fuel when the engine speed exceeds 3,000 r/min. • Prohibits the idle speed control from learning. • Suppresses the engine output by stopping the electronically controlled throttle valve system if the throttle position sensor (main) is also malfunctioning.
Throttle valve position feedback	• Suppresses the engine output by stopping the electronically controlled throttle valve system. • Prohibits the operation of the auto-cruise control. • Prohibits the operation of the engine speed feedback control.
Throttle actuator control motor	• Suppresses the engine output by stopping the electronically controlled throttle valve system. • Prohibits the operation of the auto-cruise control. • Prohibits the operation of the engine speed feedback control.
Throttle actuator control computer	• Suppresses the engine output by stopping the electronically controlled throttle valve system. • Prohibits the operation of the auto-cruise control. • Prohibits the operation of the engine speed feedback control.
Communication between throttle actuator control computer and engine control computer	• Renders the amount of accelerator pedal travel as being approximately one-half the normal opening angle. • Prohibits the operation of the auto-cruise control. • Prohibits the operation of the engine speed feedback control. • Cuts off fuel when the engine speed exceeds 3,000 r/min.
Switching to high-speed cam in Mitsubishi Innovative Valve timing Electronic Control <MIVEC>	• Does not switch to high-speed cam. • Cut off fuel when the engine speed exceeds 5,000 r/min.

DIAGNOSTIC TROUBLE CODE CHART

M1131151002330

⚠ CAUTION

During diagnosis, a DTC associated with other system may be set when the ignition switch is turned on with connector(s) disconnected. On completion, confirm all systems for DTCs. If DTCs are set, erase them all.

DTC	DIAGNOSTIC ITEM	REFERENCE PAGE
P0031	Cylinder 1, 4 heated oxygen sensor heater (front) control circuit low	P.13A-54
P0032	Cylinder 1, 4 heated oxygen sensor heater (front) control circuit high	P.13A-67
P0037	Cylinder 1, 4 heated oxygen sensor heater (rear) control circuit low	P.13A-72
P0038	Cylinder 1, 4 heated oxygen sensor heater (rear) control circuit high	P.13A-85
P0051	Cylinder 2, 3 heated oxygen sensor heater (front) control circuit low	P.13A-90

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DTC	DIAGNOSTIC ITEM	REFERENCE PAGE
P0052	Cylinder 2, 3 heated oxygen sensor heater (front) control circuit high	P.13A-103
P0057	Cylinder 2, 3 heated oxygen sensor heater (rear) control circuit low	P.13A-108
P0058	Cylinder 2, 3 heated oxygen sensor heater (rear) control circuit high	P.13A-121
P0069	Abnormal correlation between manifold absolute pressure sensor and barometric pressure sensor	P.13A-125
P0101*	Mass airflow circuit range/performance problem	P.13A-130
P0102*	Mass airflow circuit low input	P.13A-139
P0103*	Mass airflow circuit high input	P.13A-149
P0106	Manifold absolute pressure circuit range/performance problem	P.13A-156
P0107	Manifold absolute pressure circuit low input	P.13A-170
P0108	Manifold absolute pressure circuit high input	P.13A-182
P0111*	Intake air temperature circuit range/performance problem	P.13A-191
P0112*	Intake air temperature circuit low input	P.13A-200
P0113*	Intake air temperature circuit high input	P.13A-207
P0116*	Engine coolant temperature circuit range/performance problem	P.13A-217
P0117*	Engine coolant temperature circuit low input	P.13A-226
P0118*	Engine coolant temperature circuit high input	P.13A-233
P0122*	Throttle position sensor (main) circuit low input	P.13A-244
P0123*	Throttle position sensor (main) circuit high input	P.13A-255
P0125*	Insufficient coolant temperature for closed loop fuel control	P.13A-263
P0128	Coolant thermostat (coolant temperature below thermostat regulating temperature)	P.13A-275
P0131	Cylinder 1, 4 heated oxygen sensor (front) circuit low voltage	P.13A-278
P0132	Cylinder 1, 4 heated oxygen sensor (front) circuit high voltage	P.13A-295
P0133	Cylinder 1, 4 heated oxygen sensor (front) circuit slow response	P.13A-300
P0134*	Cylinder 1, 4 heated oxygen sensor (front) circuit no activity detected	P.13A-306
P0137	Cylinder 1, 4 heated oxygen sensor (rear) circuit low voltage	P.13A-315
P0138	Cylinder 1, 4 heated oxygen sensor (rear) circuit high voltage	P.13A-332
P0139	Cylinder 1, 4 heated oxygen sensor (rear) circuit slow response	P.13A-337
P0140	Cylinder 1, 4 heated oxygen sensor (rear) circuit no activity detected	P.13A-341
P0151	Cylinder 2, 3 heated oxygen sensor (front) circuit low voltage	P.13A-345
P0152	Cylinder 2, 3 heated oxygen sensor (front) circuit high voltage	P.13A-362
P0153	Cylinder 2, 3 heated oxygen sensor (front) circuit slow response	P.13A-367
P0154*	Cylinder 2, 3 heated oxygen sensor (front) circuit no activity detected	P.13A-373
P0157	Cylinder 2, 3 heated oxygen sensor (rear) circuit low voltage	P.13A-382
P0158	Cylinder 2, 3 heated oxygen sensor (rear) circuit high voltage	P.13A-399
P0159	Cylinder 2, 3 heated oxygen sensor (rear) circuit slow response	P.13A-404

DTC	DIAGNOSTIC ITEM	REFERENCE PAGE
P0160	Cylinder 2, 3 heated oxygen sensor (rear) circuit no activity detected	P.13A-408
P0171	System too lean (cylinder 1, 4)	P.13A-412
P0172	System too rich (cylinder 1, 4)	P.13A-420
P0174	System too lean (cylinder 2, 3)	P.13A-425
P0175	System too rich (cylinder 2, 3)	P.13A-433
P0181	Fuel tank temperature sensor circuit range/performance	P.13A-439
P0182	Fuel tank temperature sensor circuit low input	P.13A-451
P0183	Fuel tank temperature sensor circuit high input	P.13A-457
P0201	Injector circuit-cylinder 1	P.13A-468
P0202	Injector circuit-cylinder 2	P.13A-478
P0203	Injector circuit-cylinder 3	P.13A-488
P0204	Injector circuit-cylinder 4	P.13A-498
P0222*	Throttle position sensor (sub) circuit low input	P.13A-508
P0223*	Throttle position sensor (sub) circuit high input	P.13A-519
P0300	Random/multiple cylinder misfire detected	P.13A-526
P0301	Cylinder 1 misfire detected	P.13A-532
P0302	Cylinder 2 misfire detected	P.13A-535
P0303	Cylinder 3 misfire detected	P.13A-538
P0304	Cylinder 4 misfire detected	P.13A-541
P0325	Knock sensor circuit	P.13A-545
P0335*	Crankshaft position sensor circuit	P.13A-553
P0340*	Camshaft position sensor circuit	P.13A-571
P0401	Exhaust gas recirculation flow insufficient detected	P.13A-586
P0403	Exhaust gas recirculation control circuit	P.13A-590
P0421	Warm up catalyst efficiency below threshold (cylinder 1, 4)	P.13A-601
P0431	Warm up catalyst efficiency below threshold (cylinder 2, 3)	P.13A-603
P0441	Evaporative emission control system incorrect purge flow	P.13A-605
P0442	Evaporative emission control system leak detected (small leak)	P.13A-609
P0443	Evaporative emission control system purge control valve circuit	P.13A-624
P0446	Evaporative emission control system vent control circuit	P.13A-635
P0450	Evaporative emission control system pressure sensor malfunction	P.13A-646
P0451	Evaporative emission control system pressure sensor range/performance	P.13A-667
P0452	Evaporative emission control system pressure sensor low input	P.13A-688
P0453	Evaporative emission control system pressure sensor high input	P.13A-709
P0455	Evaporative emission control system leak detected (gross leak)	P.13A-730
P0456	Evaporative emission control system leak detected (very small leak)	P.13A-747

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DTC	DIAGNOSTIC ITEM		REFERENCE PAGE
P0461	Fuel level sensor (main) circuit range/performance		P.13A-762
P0462	Fuel level sensor circuit low input		P.13A-769
P0463	Fuel level sensor circuit high input		P.13A-776
P0506	Idle control system RPM lower than expected		P.13A-782
P0507	Idle control system RPM higher than expected		P.13A-785
P0513	Immobilizer malfunction		P.13A-788
P0551	Power steering pressure switch circuit range/performance		P.13A-790
P0554	Power steering pressure switch circuit intermittent		P.13A-803
P0603*	EEPROM malfunction		P.13A-807
P0606*	Powertrain control module main processor malfunction		P.13A-809
P0622	Generator FR terminal circuit malfunction		P.13A-811
P0630*	VIN malfunction		P.13A-818
P0638*	Throttle actuator control motor circuit range/performance		P.13A-821
P0642*	Throttle position sensor power supply		P.13A-827
P0657*	Throttle actuator control motor relay circuit malfunction		P.13A-829
P0705	Transmission range switch circuit malfunction (PRNDL input)	• A/T DTC No. P1770 (Transmission range switch system: Open circuit) • A/T DTC No. P1771 (Transmission range switch system: Short circuit)	P.23A-47
P0712*	Transmission fluid temperature sensor low input	• A/T DTC No. P1764 (Transmission fluid temperature sensor system: Short circuit)	P.23A-47
P0713*	Transmission fluid temperature sensor high input	• A/T DTC No. P1763 (Transmission fluid temperature sensor system: Open circuit)	P.23A-47
P0715*	Input/turbine speed sensor circuit	• A/T DTC No. P1766 (Input shaft speed sensor system: Short circuit/Open circuit)	P.23A-47
P0720*	Output speed sensor circuit	• A/T DTC No. P1767 (Output shaft speed sensor system: Short circuit/Open circuit)	P.23A-47
P0731*	Gear 1 incorrect ratio	• A/T DTC No. P1779 (1st gear incorrect ratio)	P.23A-47
P0732*	Gear 2 incorrect ratio	• A/T DTC No. P1780 (2nd gear incorrect ratio)	P.23A-47
P0733*	Gear 3 incorrect ratio	• A/T DTC No. P1781 (3rd gear incorrect ratio)	P.23A-47
P0734*	Gear 4 incorrect ratio	• A/T DTC No. P1782 (4th gear incorrect ratio)	P.23A-47
P0736*	Gear R incorrect ratio	• A/T DTC No. P1784 (Reverse gear incorrect ratio)	P.23A-47
P0741	Torque converter clutch circuit performance or stuck off	• A/T DTC No. P1786 (Torque converter clutch solenoid system: Defective system)	P.23A-47

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DTC	DIAGNOSTIC ITEM		REFERENCE PAGE
P0742	Torque converter clutch circuit stuck on	• A/T DTC No. P1787 (Torque converter clutch solenoid system: Lock-up stuck on)	P.23A-47
P0743*	Torque converter clutch circuit electrical	• A/T DTC No. P1778 (Torque converter clutch solenoid system: Short circuit/Open circuit)	P.23A-47
P0753*	Shift solenoid "A" electrical	• A/T DTC No. P1773 (Low and reverse solenoid valve system: Short circuit/Open circuit)	P.23A-47
P0758*	Shift solenoid "B" electrical	• A/T DTC No. P1774 (Underdrive solenoid valve system: Short circuit/Open circuit)	P.23A-47
P0763*	Shift solenoid "C" electrical	• A/T DTC No. P1775 (Second solenoid valve system: Short circuit/Open circuit)	P.23A-47
P0768*	Shift solenoid "D" electrical	• A/T DTC No. P1776 (Overdrive solenoid valve system: Short circuit/Open circuit)	P.23A-47
P1020	Mitsubishi innovative valve timing electronic control system (MIVEC) performance problem		P.13A-841
P1021	Engine oil control valve circuit		P.13A-852
P1540	LIN communication (California)		P.13A-862
P1541	LIN communication (California)		P.13A-862
P1543	DOR tampering monitor (California)		P.13A-868
P1544	DOR tampering monitor (California)		P.13A-870
P1545	DOR tampering monitor (California)		P.13A-872
P1546	DOR tampering monitor (California)		P.13A-874
P1547	DOR tampering monitor (California)		P.13A-876
P1580	DOR radiator tampering monitor (California)		P.13A-878
P1602*	Communication malfunction (between PCM main processor and system LSI)		P.13A-880
P1603*	Battery backup line malfunction		P.13A-882
P1751*	A/T control relay malfunction <A/T>	• A/T DTC No. P1788 (A/T control relay system: Short circuit to ground /open circuit)	P.23A-47
P2066	Fuel level sensor (sub) circuit range/performance		P.13A-889
P2100*	Throttle actuator control motor circuit (open)		P.13A-894
P2101*	Throttle actuator control motor magneto malfunction		P.13A-902
P2122*	Accelerator pedal position sensor (main) circuit low input		P.13A-908
P2123*	Accelerator pedal position sensor (main) circuit high input		P.13A-918
P2127*	Accelerator pedal position sensor (sub) circuit low input		P.13A-925
P2128*	Accelerator pedal position sensor (sub) circuit high input		P.13A-935
P2135*	Throttle position sensor (main and sub) range/performance problem		P.13A-941
P2138*	Accelerator pedal position sensor (main and sub) range/performance problem		P.13A-947
P2195	Cylinder 1, 4 heated oxygen sensor (front) inactive		P.13A-961

DTC	DIAGNOSTIC ITEM	REFERENCE PAGE
P2197	Cylinder 2, 3 heated oxygen sensor (front) inactive	P.13A-964
P2228*	Barometric pressure circuit low input	P.13A-967
P2229*	Barometric pressure circuit high input	P.13A-969
P2252	Heated oxygen sensor offset circuit low voltage	P.13A-971
P2253	Heated oxygen sensor offset circuit high voltage	P.13A-973
P2567	LIN communication (California)	P.13A-975
U1073	Bus off	P.13A-977
U1102	ABS-ECU time–out	P.13A-979
U1108*	Combination meter time-out	P.13A-984
U1109	ETACS-ECU time-out	P.13A-988
U1110	A/C-ECU time-out	P.13A-993
U1117	Immobilizer-ECU time-out	P.13A-997

NOTE: Do not replace the powertrain control module (PCM) until a through terminal check reveals there are no short/open circuits.

NOTE: Check that the PCM ground circuit is normal before checking for the cause of the problem.

NOTE: After the PCM detects a malfunction, a diagnostic trouble code is recorded the next time the engine is started and the same malfunction is re-detected. However, for items marked with a "", the diagnostic trouble code is recorded on the first detection of the malfunction.*

SYMPTOM CHART

M1131151501581

⚠ CAUTION

During diagnosis, a DTC associated with other systems may be set when the ignition switch is turned on with connector(s) disconnected. On completion, confirm all systems for DTCs. If DTCs are set, erase them all.

⚠ CAUTION

Disconnecting the battery cables or removing the combination meter will erase the learned value of the fuel gauge. To recover the learned value, input a vehicle speed (by actually driving the vehicle or inputting a simulated vehicle speed), and stop the vehicle. This will complete the learning process.

NOTE: Check that the PCM ground circuit is normal before checking for the cause of the problem.

TROUBLE SYMPTOMS		INSPECTION PROCEDURE	REFERENCE PAGE
Communication with scan tool is impossible	Communication with all systems is not possible	1	P.13A-1000
	Communication with PCM only is not possible	2	P.13A-1003

TROUBLE SYMPTOMS		INSPECTION PROCEDURE	REFERENCE PAGE
Malfunction Indicator Lamp (SERVICE ENGINE SOON or Check Engine Lamp) and related parts	The Malfunction Indicator Lamp (SERVICE ENGINE SOON or Check Engine Lamp) does not illuminate right after the ignition switch is turned to the "ON" position	3	P.13A-1006
	The Malfunction Indicator Lamp (SERVICE ENGINE SOON or Check Engine Lamp) remains illuminated and never goes out	4	P.13A-1007
Starting	Cranks, won't start	5	P.13A-1008
	Starts up and dies	6	P.13A-1014
	Hard starting	7	P.13A-1019
Idling stability (improper idling)	Unstable idle (rough idle, hunting)	8	P.13A-1024
	Idle speed is high (improper idle speed)	9	P.13A-1029
	Idle speed is low (improper idle speed)	10	P.13A-1031
Idling stability (engine stalls)	When the engine is cold, it stalls at idle (die out)	11	P.13A-1033
	When the engine is hot, it stalls at idle (die out)	12	P.13A-1036
	The engine stalls when accelerating (pass out)	13	P.13A-1039
	The engine stalls when decelerating	14	P.13A-1041
Driving	Hesitation, sag or stumble	15	P.13A-1042
	Acceleration shock	16	P.13A-1046
	Deceleration shock	17	P.13A-1047
	Poor acceleration	18	P.13A-1048
	Surge	19	P.13A-1052
	Knocking	20	P.13A-1056
Dieseling (Run-on)		21	P.13A-1057
Too high CO and HC concentration when idling		22	P.13A-1057
IM240 test failure	Transient, mass emission tailpipe test failure	23	P.13A-1060
	Purge flow test of the evaporative emission canister failure	24	P.13A-1065
	Pressure test of the evaporative system failure	25	P.13A-1066
Generator output voltage is low (approximately 12.3 volts)		26	P.13A-1067
Fans (radiator fan, A/C condenser fan) are inoperative		27	P.13A-1072
Power supply system and ignition switch-IG system		28	P.13A-1075
Fuel pump system		29	P.13A-1086
Ignition switch-ST system and transmission range switch system		30	P.13A-1100
Ignition circuit system		31	P.13A-1105
A/C system		32	P.13A-1113

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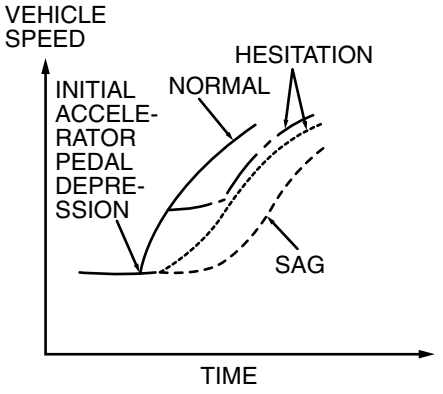
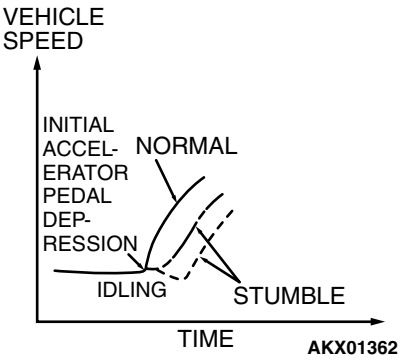
PROBLEM SYMPTOMS TABLE (FOR YOUR INFORMATION)

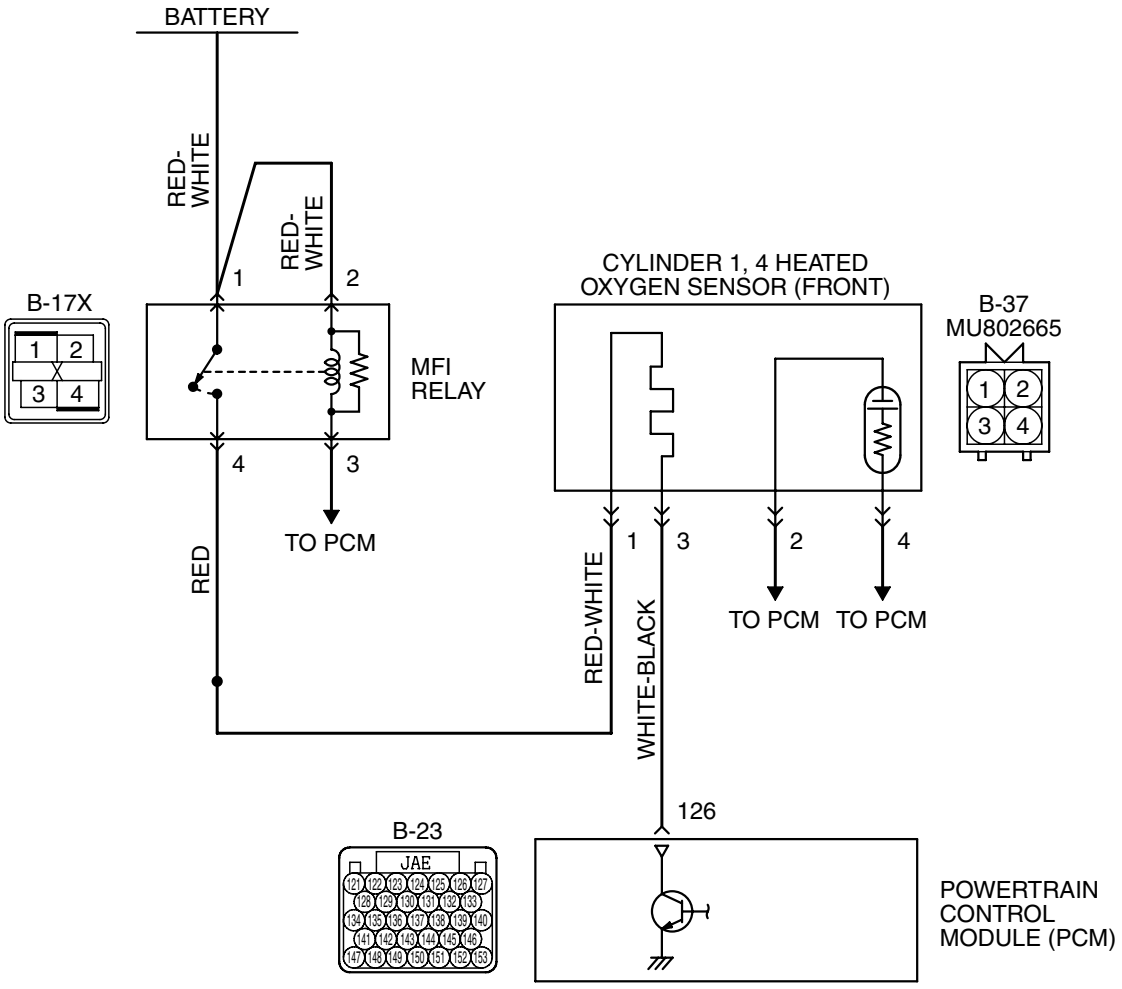
ITEMS		SYMPTOM
At starting	Won't start	The starter cranks the engine, but there is no combustion within the cylinders, and the engine won't start.
	Starts up and dies	The engine starts, but then engine soon stalls.
	Hard starting	Engine starts after cranking a while.
Idling stability	Hunting	Engine speed doesn't remain constant; changes at idle.
	Rough idle	Usually, a judgement can be based upon the movement of the tachometer pointer, and the vibration transmitted to the steering wheel, shift lever, body, etc.
	Incorrect idle speed	The engine doesn't idle at the correct speed.
	Engine stall (die out)	The engine stalls when the foot is taken from the accelerator pedal, regardless of whether the vehicle is moving or not.
	Engine stall (pass out)	The engine stalls when the accelerator pedal is depressed.

ITEMS		SYMPTOM
At driving	Hesitation Sag	"Hesitation" is the delay in response of the vehicle speed (engine speed). This occurs when the accelerator is depressed in order to accelerate from the speed at which the vehicle is now traveling, or a temporary drop in vehicle speed (engine speed) during such acceleration. Serious hesitation is called "sag".  AKX01361AB
	Poor acceleration	Poor acceleration is inability to obtain an acceleration corresponding to the degree of throttle opening, even though acceleration is smooth. Also the inability to reach maximum speed.
	Stumble	Engine speed increase is delayed when the accelerator pedal is initially depressed for acceleration.  AKX01362
	Shock	The feeling of a comparatively large impact or vibration when the engine is accelerated or decelerated.
	Surge	This is slight acceleration and deceleration feel usually felt during steady, light throttle cruise. Most notable under light loads.
	Knocking	A sharp sound during driving, which sounds like a hammer striking the cylinder walls. It makes poor driveability.
At stopped	Run on ("Dieseling")	The condition in which the engine continues to run after the ignition switch is turned to the "LOCK" (OFF) position. Also called "dieseling".

DIAGNOSTIC TROUBLE CODE PROCEDURES

DTC P0031: Cylinder 1, 4 Heated Oxygen Sensor Heater (front) Control Circuit Low

Cylinder 1, 4 Heated Oxygen Sensor (front) Heater Circuit



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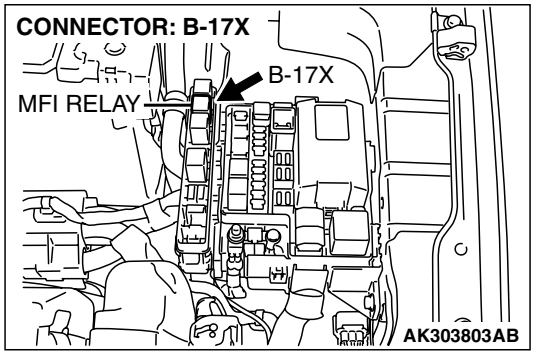
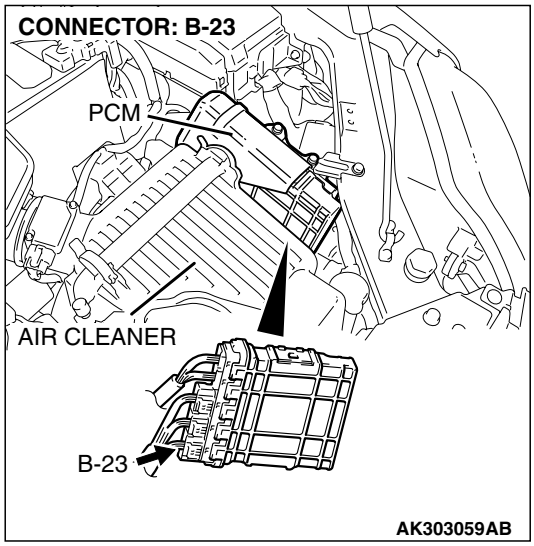
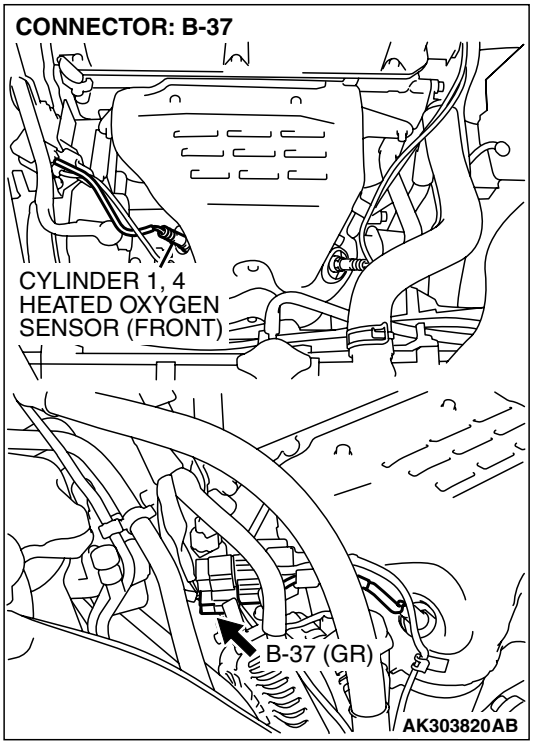


TSB Revision





CIRCUIT OPERATION

- Power is supplied from the MFI relay (terminal No. 4) to the cylinder 1, 4 heated oxygen sensor (front) heater.
- The PCM (terminal No. 126) controls continuity to the cylinder 1, 4 heated oxygen sensor (front) heater by turning the power transistor in the PCM "ON" and "OFF".

TECHNICAL DESCRIPTION

- The PCM checks whether the heater current is within a specified range when the heater is energized.
- The PCM checks whether the heater voltage is within a specified range when the heater is not energized.

DESCRIPTIONS OF MONITOR METHODS

Cylinder 1, 4 heated oxygen sensor heater (front) current or voltage is out of specified range.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

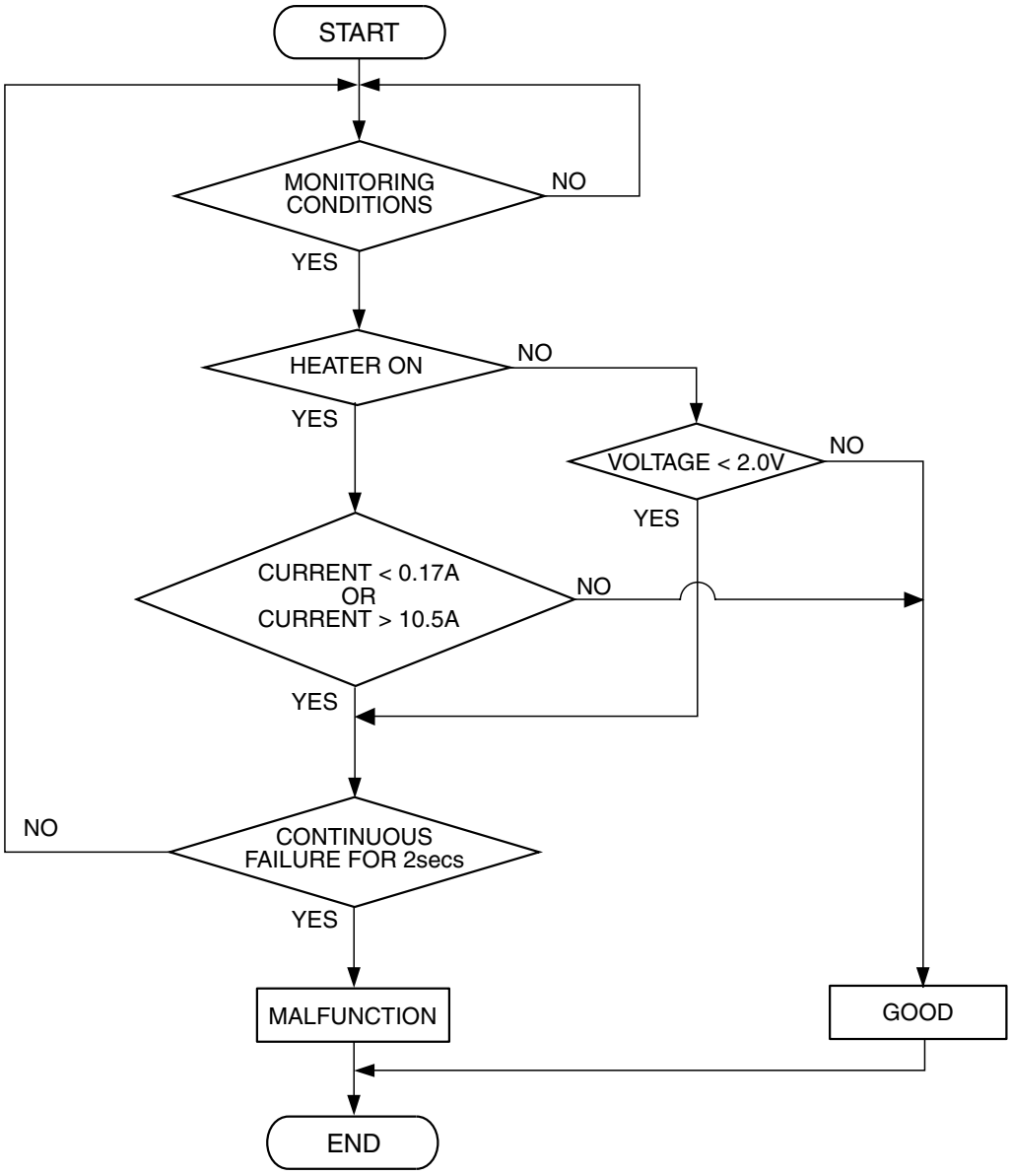
- Not applicable

Sensor (The sensor below is determined to be normal)

- Engine coolant temperature sensor

DTC SET CONDITIONS

Logic Flow Chart



Check Conditions

- More than 2 seconds have passed since the engine starting sequence was completed.
- While the cylinder 1, 4 heated oxygen sensor (front) heater is on.
- Battery positive voltage is between 11 and 16.5 volts.

Judgement Criterion

- The cylinder 1, 4 heated oxygen sensor (front) heater current has continued to be lower than 0.17 ampere for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 2 P.13A-9.

Check Conditions

- More than 2 seconds have passed since the engine starting sequence was completed.
- While the cylinder 1, 4 heated oxygen sensor (front) heater is off.
- Battery positive voltage is between 11 and 16.5 volts.

Judgement Criterion

- The cylinder 1, 4 heated oxygen sensor (front) heater voltage has continued to be lower than 2.0 volts for 2 seconds.

TSB Revision

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

- Open or shorted cylinder 1, 4 heated oxygen sensor (front) heater circuit, harness damage or connector damage.
- Cylinder 1, 4 heated oxygen sensor (front) heater failed.
- PCM failed.

DIAGNOSIS

Required Special Tools:

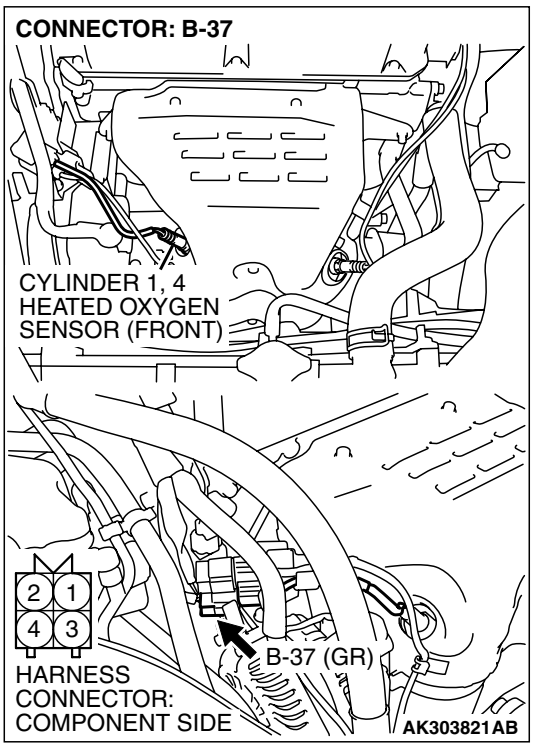
- MB991316: Test Harness
- MB991923: Power Plant ECU Check Harness

STEP 1. Check harness connector B-37 at the cylinder 1, 4 heated oxygen sensor (front) for damage.

Q: Is the harness connector in good condition?

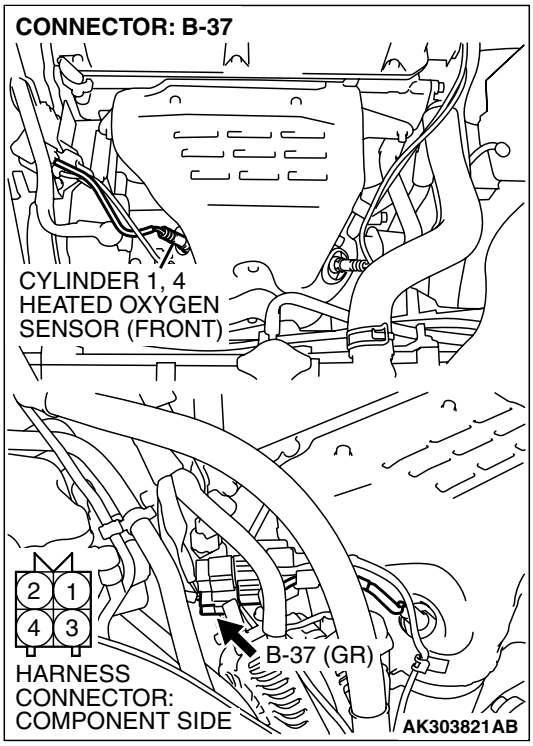
YES : Go to Step 2.

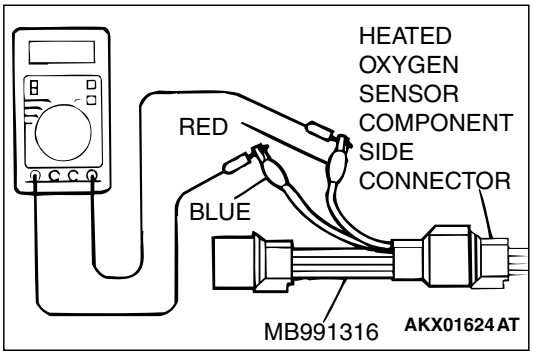
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.



STEP 2. Check the cylinder 1, 4 heated oxygen sensor (front).

(1) Disconnect cylinder 1, 4 heated oxygen sensor (front) connector B-37 and connect test harness special tool, MB991316, to the connector on the cylinder 1, 4 heated oxygen (front) sensor side.





(2) Measure the resistance between heated oxygen sensor connector terminal No. 1 (red clip) and terminal No. 3 (blue clip).

Standard value: 4.5 – 8.0 Ω [at 20°C (68°F)]

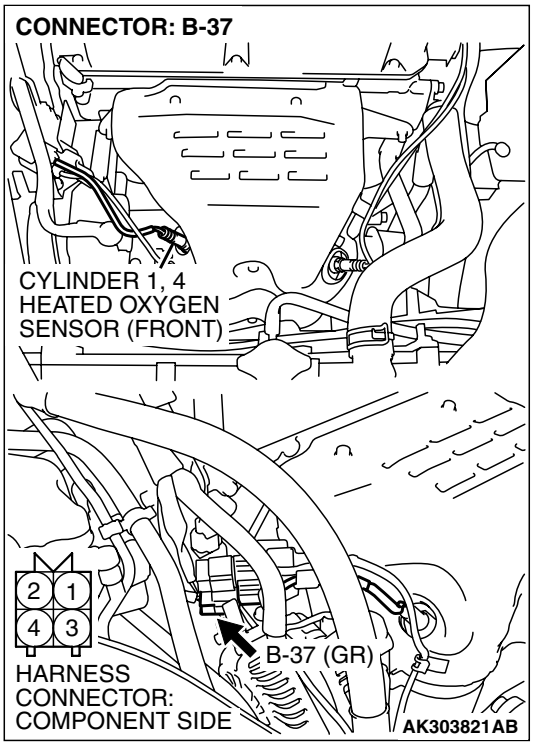
Q: Is the measured resistance between 4.5 and 8.0 ohms [at 20°C (68°F)]?

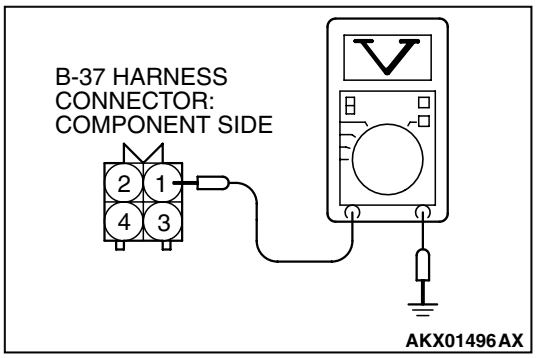
YES : Go to Step 3.

NO : Replace the cylinder 1, 4 heated oxygen sensor (front). Then go to Step 12.

STEP 3. Measure the power supply voltage at cylinder 1, 4 heated oxygen sensor (front) harness side connector B-37.

(1) Disconnect the connector B-37 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.

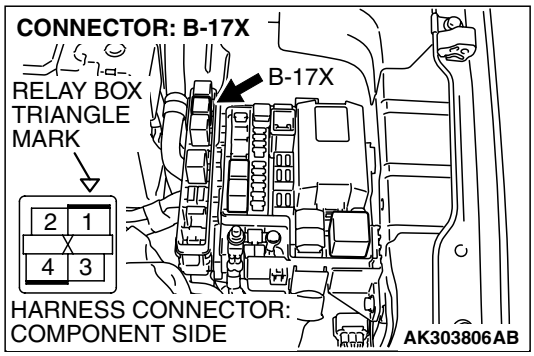
Q: Is battery positive voltage (approximately 12 volts) present?

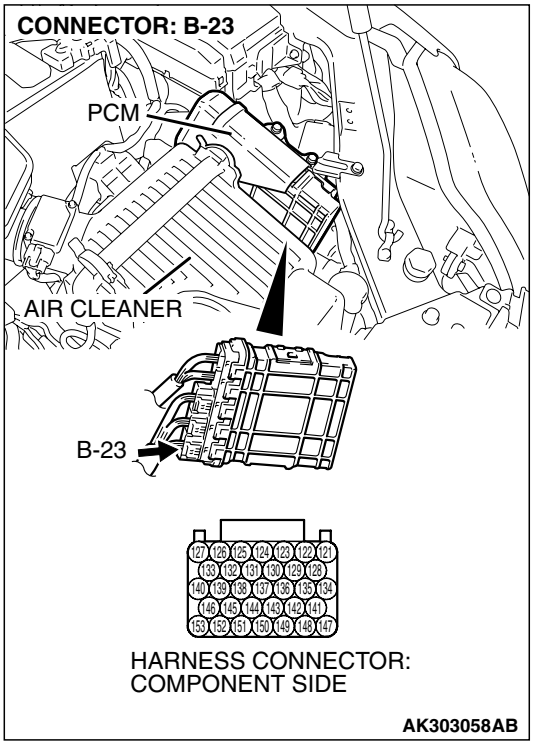
YES : Go to Step 5.
NO : Go to Step 4.

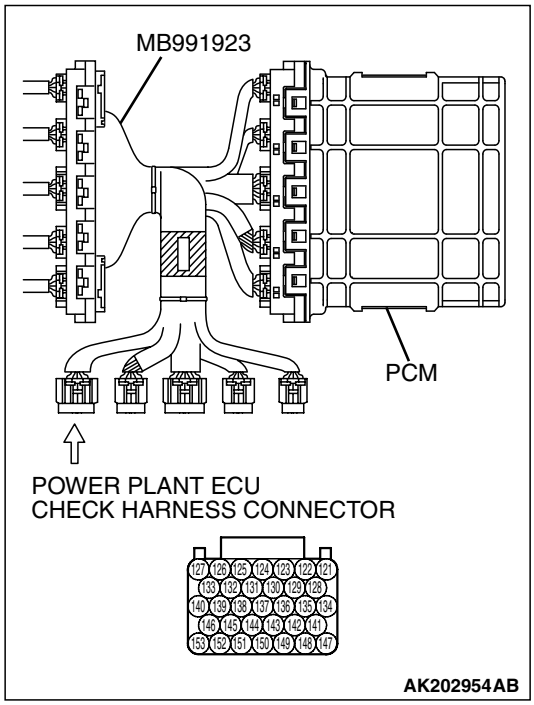
STEP 4. Check harness connector B-17X at the MFI relay for damage.

Q: Is the harness connector in good condition?

YES : Repair harness wire between MFI relay connector B-17X (terminal No. 4) and cylinder 1, 4 heated oxygen sensor (front) connector B-37 (terminal No. 1) because of open circuit or short circuit to ground. Then go to Step 12.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

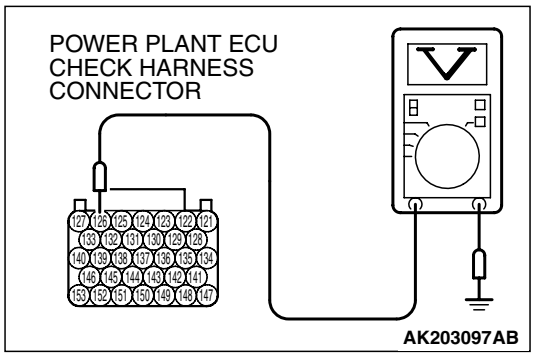






STEP 5. Measure the power supply voltage at PCM connector B-23 by using power plant ECU check harness special tool MB991923.

(1) Disconnect all PCM connectors. Connect the power plant ECU check harness special tool MB991923 between the separated connectors.
(2) Turn the ignition switch to the "ON" position.



(3) Measure the voltage between terminal No. 126 and ground.
- Voltage should be battery positive voltage.

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

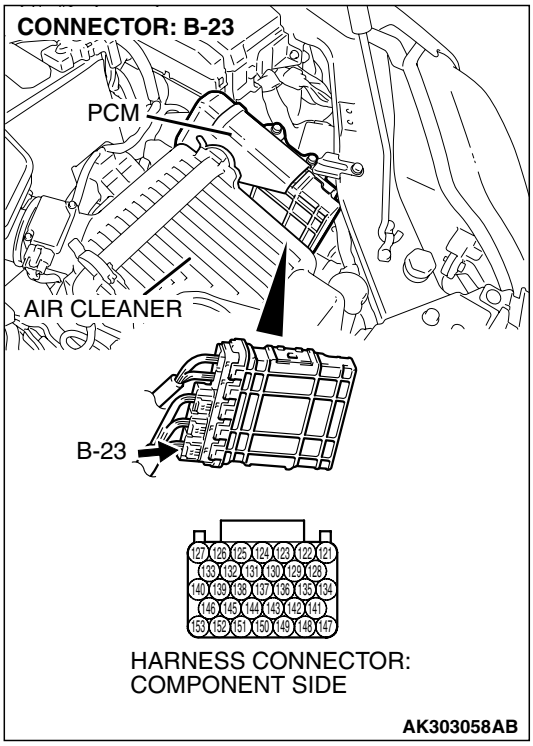
Q: Is battery positive voltage (approximately 12 volts) present?

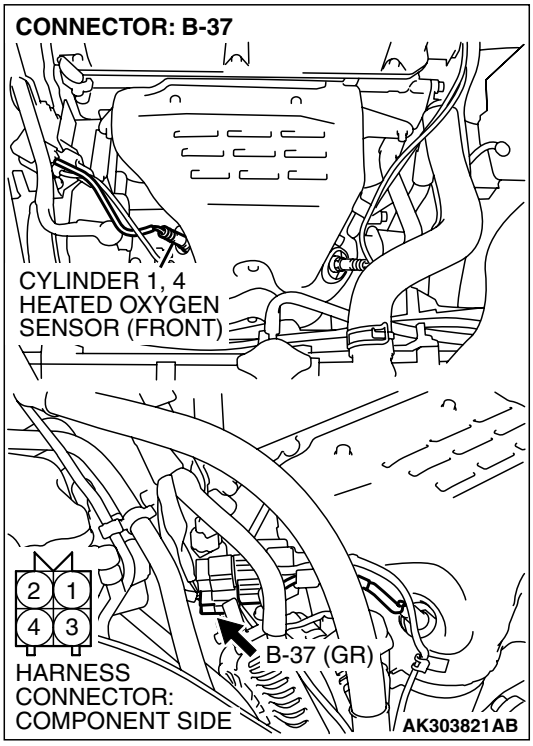
YES : Go to Step 8.
NO : Go to Step 6.

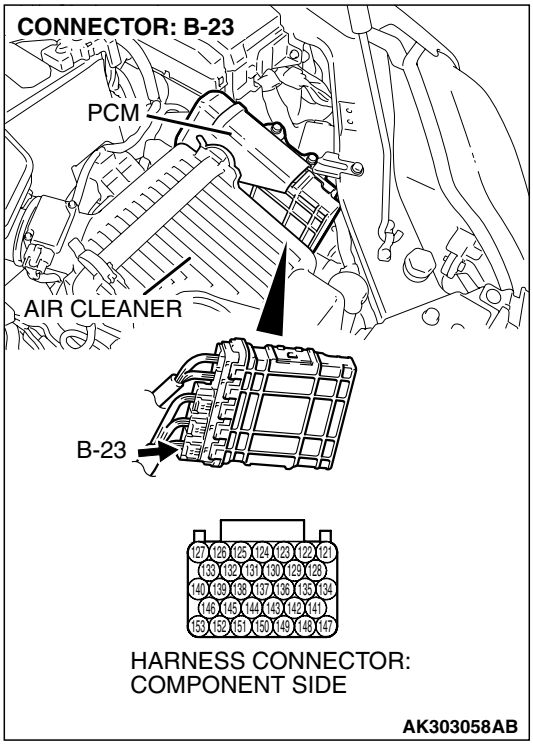
STEP 6. Check harness connector B-23 at PCM for damage.

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 go to Step 12.





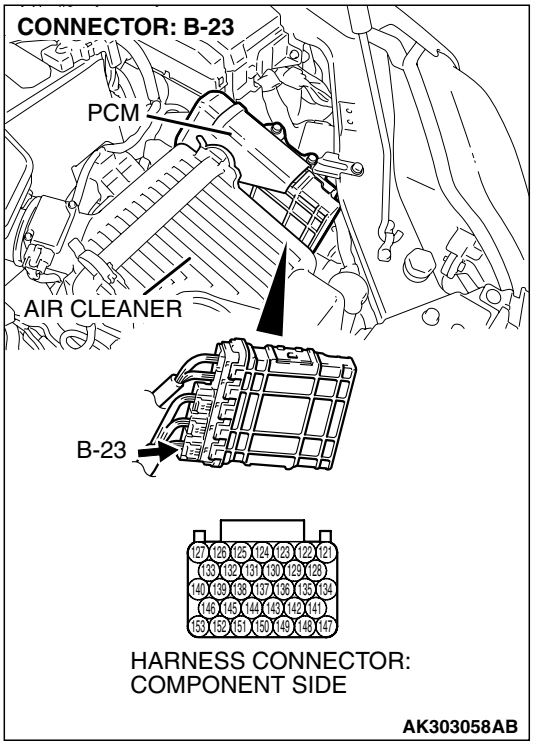


STEP 7. Check for open circuit or short circuit to ground between cylinder 1, 4 heated oxygen sensor (front) connector B-37 (terminal No. 3) and PCM connector B-23 (terminal No. 126).

Q: Is the harness wire in good condition?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 12.

NO : Repair it. Then go to Step 12.

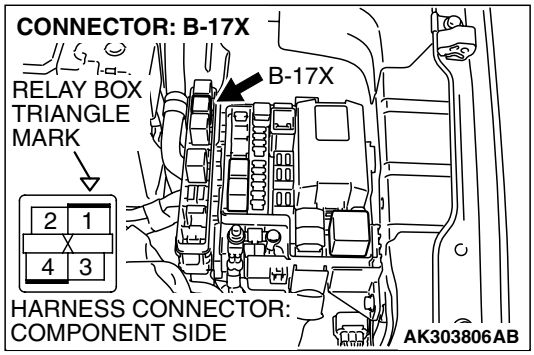


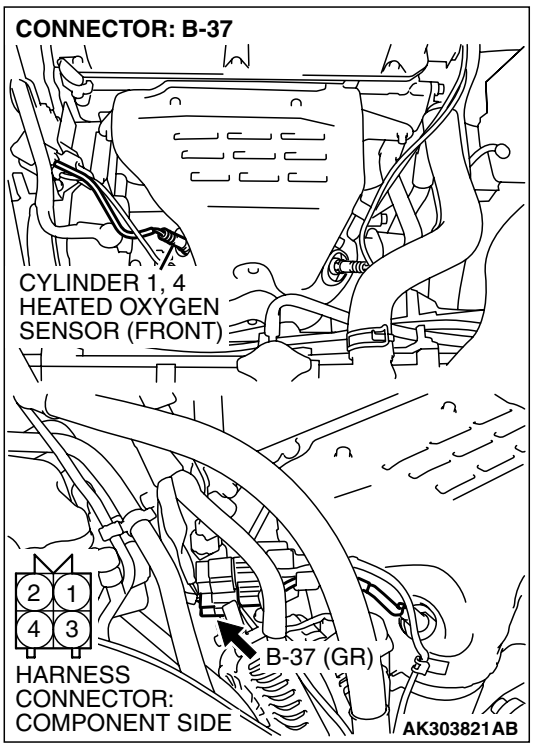
STEP 8. Check harness connector B-23 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 9.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.





STEP 9. Check for harness damage between MFI relay connector B-17X (terminal No. 4) and cylinder 1, 4 heated oxygen sensor (front) connector B-37 (terminal No. 1).
Q: Is the harness wire in good condition?

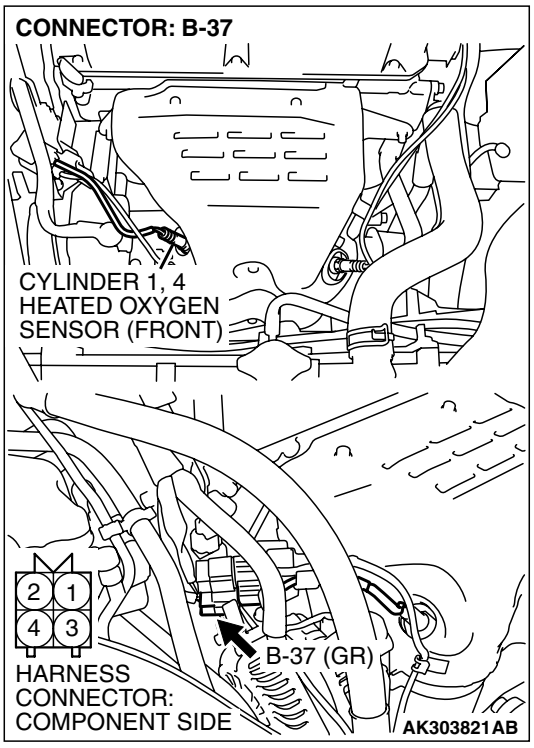
YES : Go to Step 10.
NO : Repair it. Then go to Step 12.

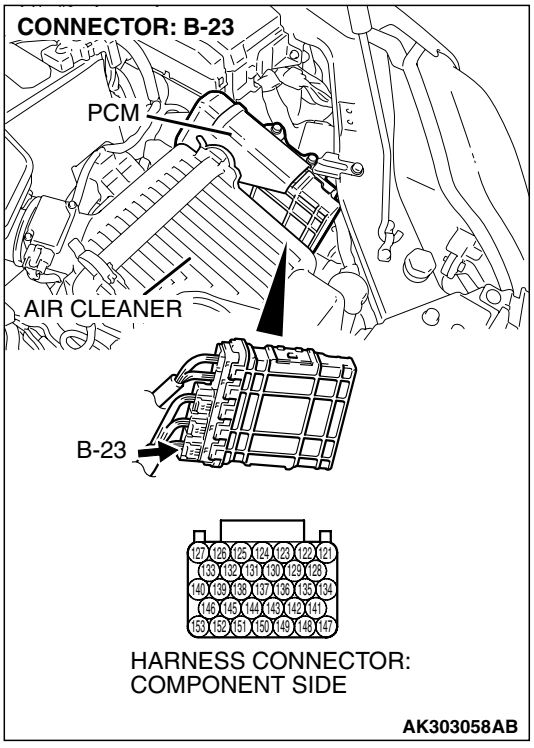
STEP 10. Check for harness damage between cylinder 1, 4 heated oxygen sensor (front) connector B-37 (terminal No. 3) and PCM connector B-23 (terminal No. 126).

Q: Is the harness wire in good condition?

YES : Go to Step 11.

NO : Repair it. Then go to Step 12.





STEP 11. Check the trouble symptoms.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 2 P.13A-9.

(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0031 set?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 12.

NO : It can be assumed 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.

STEP 12. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 2 P.13A-9.

(2) Check the diagnostic trouble code (DTC).

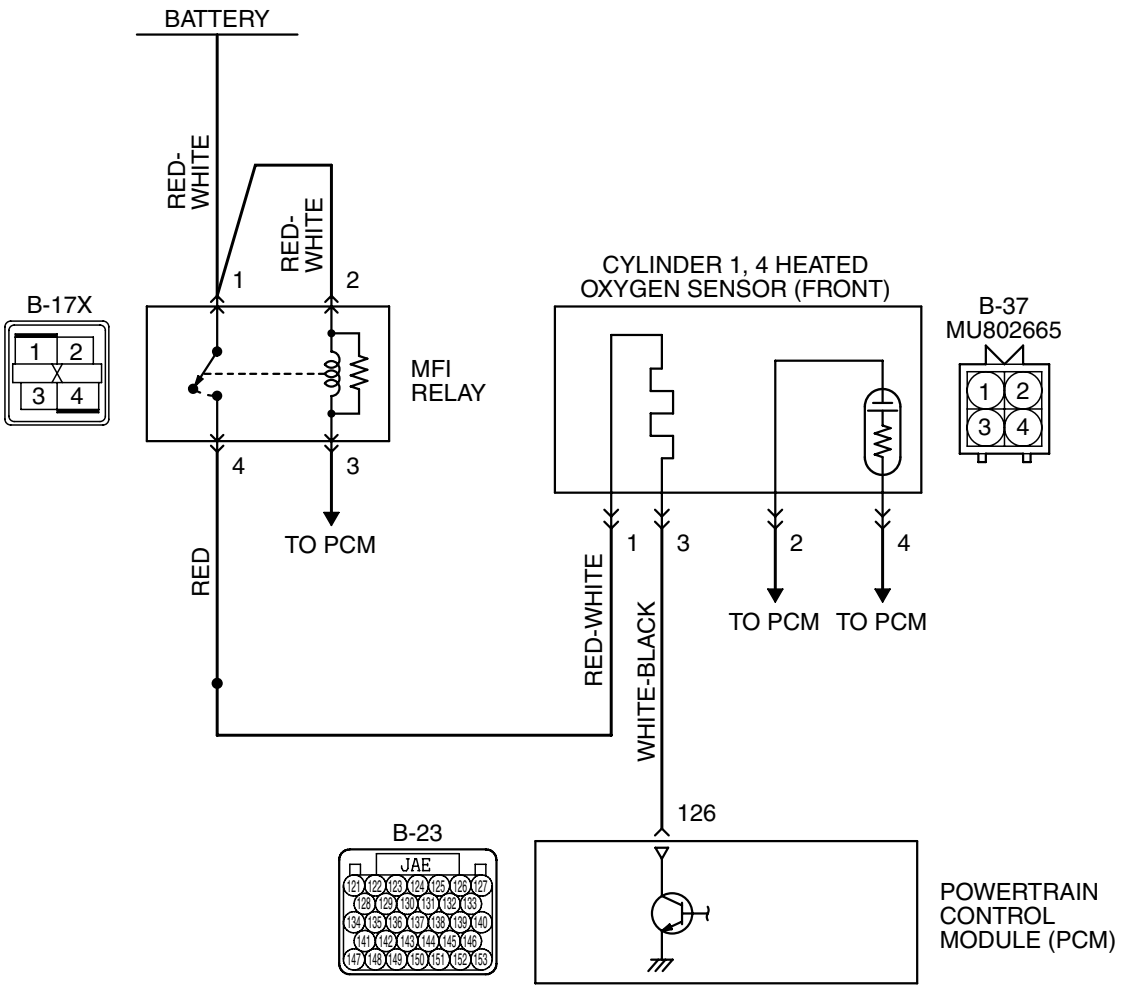
Q: Is DTC P0031 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0032: Cylinder 1, 4 Heated Oxygen Sensor Heater (front) Control Circuit High

Cylinder 1, 4 Heated Oxygen Sensor (front) Heater Circuit



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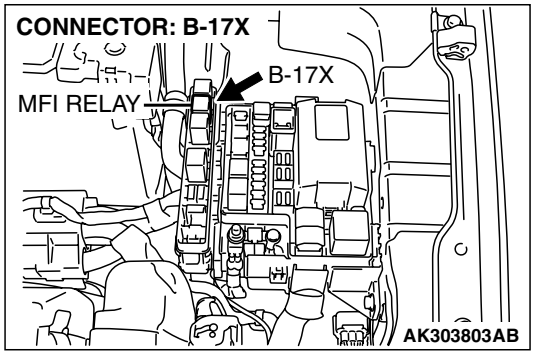
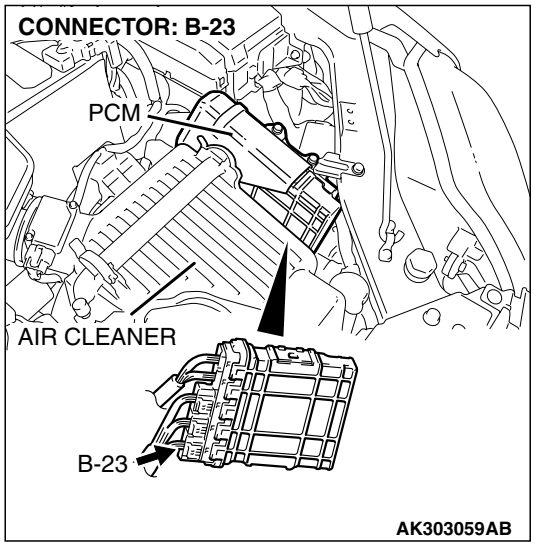
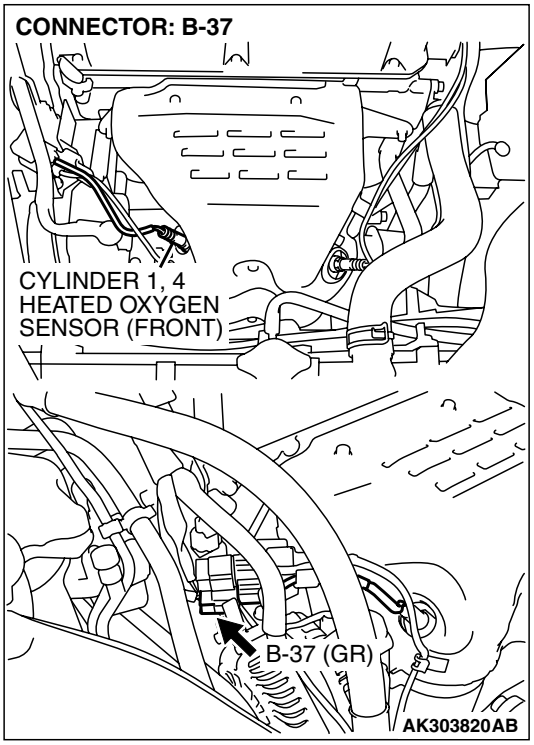


TSB Revision





CIRCUIT OPERATION

- Power is supplied from the MFI relay (terminal No. 4) to the cylinder 1, 4 heated oxygen sensor (front) heater.
- The PCM (terminal No. 126) controls continuity to the cylinder 1, 4 heated oxygen sensor (front) heater by turning the power transistor in the PCM "ON" and "OFF".

TECHNICAL DESCRIPTION

- The PCM checks whether the heater current is within a specified range when the heater is energized.

DESCRIPTIONS OF MONITOR METHODS

Cylinder 1, 4 heated oxygen sensor heater (front) current is out of specified range.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

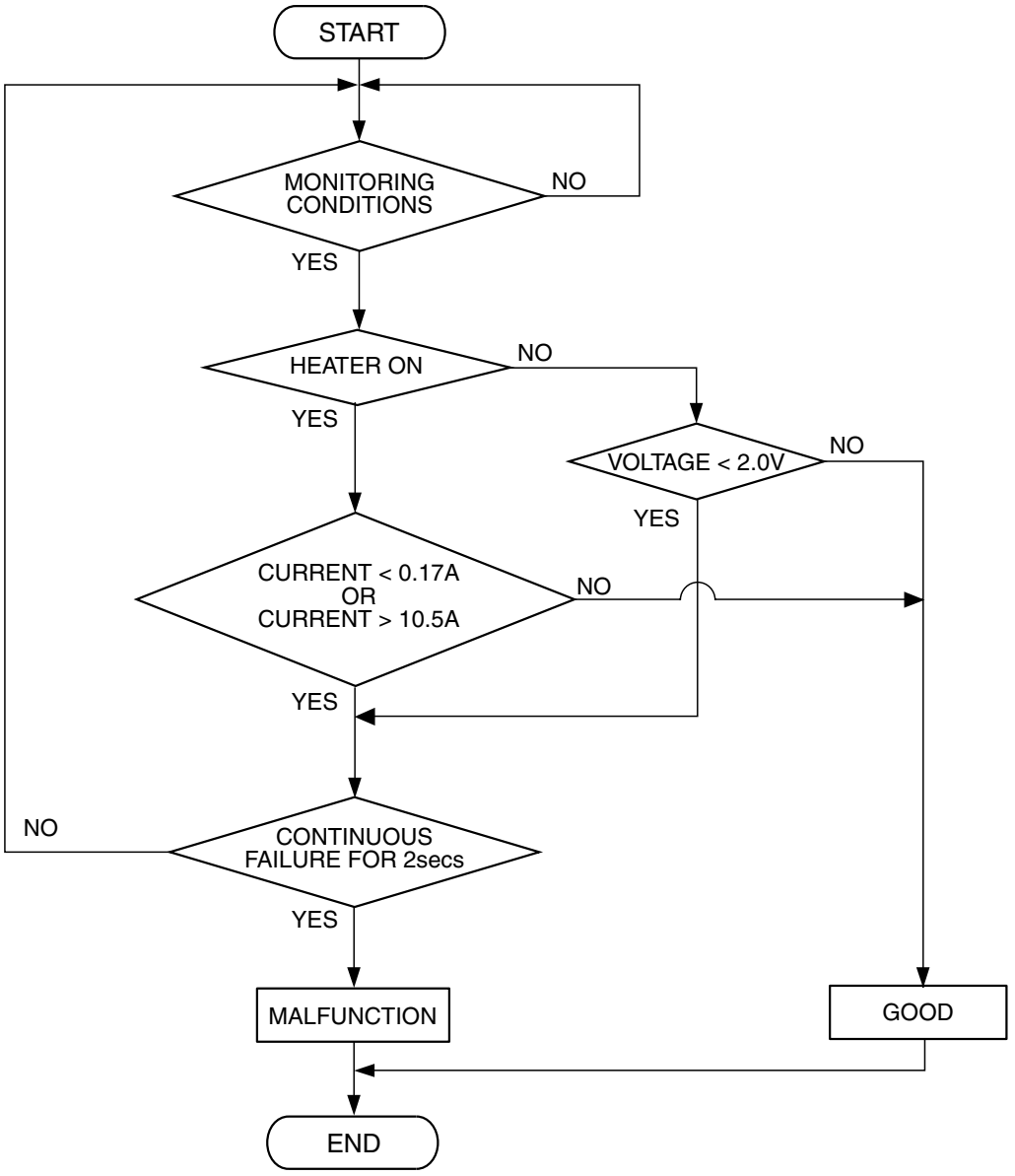
- Not applicable

Sensor (The sensor below is determined to be normal)

- Engine coolant temperature sensor

DTC SET CONDITIONS

Logic Flow Chart



Check Conditions

- More than 2 seconds have passed since the engine starting sequence was completed.
- While the cylinder 1, 4 heated oxygen sensor (front) heater is on.
- Battery positive voltage is between 11 and 16.5 volts.

Judgement Criterion

- The cylinder 1, 4 heated oxygen sensor (front) heater current has continued to be higher than 10.5 ampere for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 2 P.13A-9.

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

- Cylinder 1, 4 heated oxygen sensor (front) heater failed.
- PCM failed.

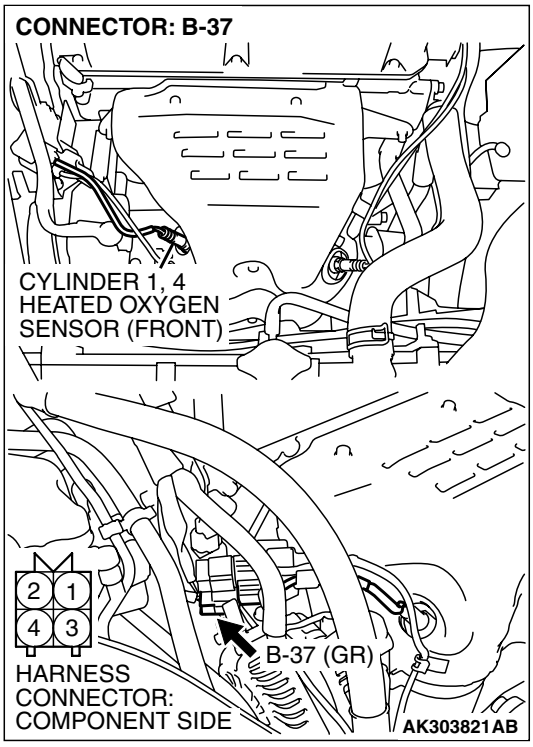
TSB Revision

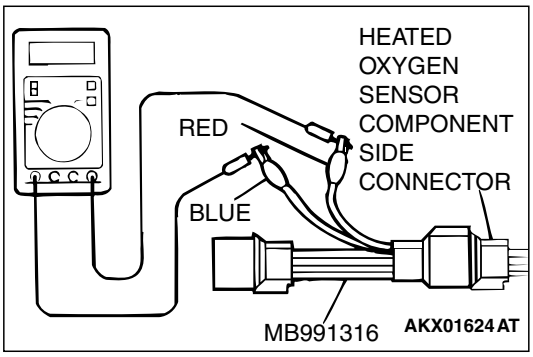
DIAGNOSIS

Required Special Tool:
- MB991316: Test Harness

STEP 1. Check the cylinder 1, 4 heated oxygen sensor (front).

(1) Disconnect cylinder 1, 4 heated oxygen sensor (front) connector B-37 and connect test harness special tool, MB991316, to the connector on the cylinder 1, 4 heated oxygen (front) sensor side.





(2) Measure the resistance between heated oxygen sensor connector terminal No. 1 (red clip) and terminal No. 3 (blue clip).

Standard value: 4.5 – 8.0 Ω [at 20°C (68°F)]

Q: Is the measured resistance between 4.5 and 8.0 ohms [at 20°C (68°F)]?

YES : Go to Step 2.

NO : Replace the cylinder 1, 4 heated oxygen sensor (front). Then go to Step 3.

STEP 2. Check the trouble symptoms.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 2 P.13A-9.

(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0032 set?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 3.

NO : It can be assumed 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.

STEP 3. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 2 P.13A-9.

(2) Check the diagnostic trouble code (DTC).

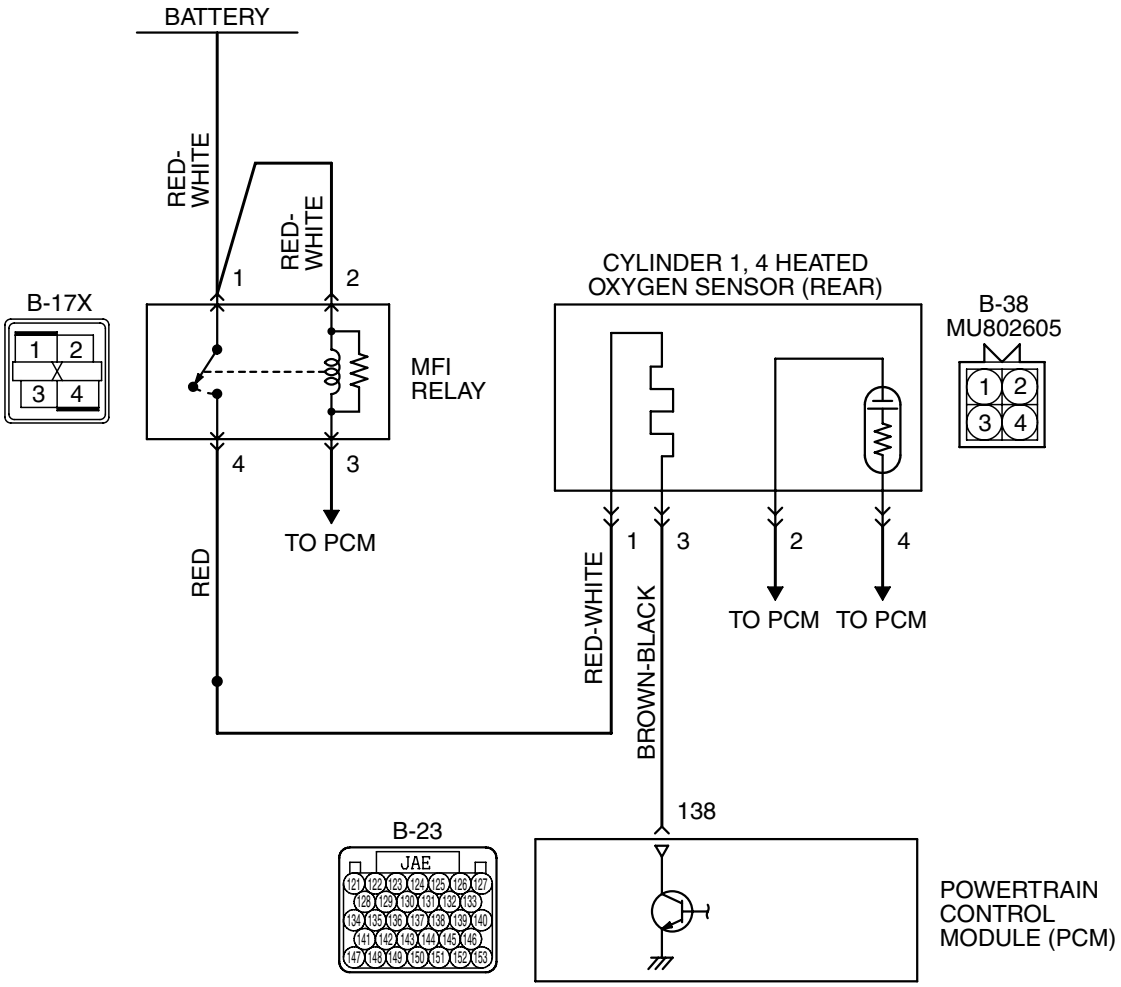
Q: Is DTC P0032 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0037: Cylinder 1, 4 Heated Oxygen Sensor Heater (rear) Control Circuit Low

Cylinder 1, 4 Heated Oxygen Sensor (rear) Heater Circuit



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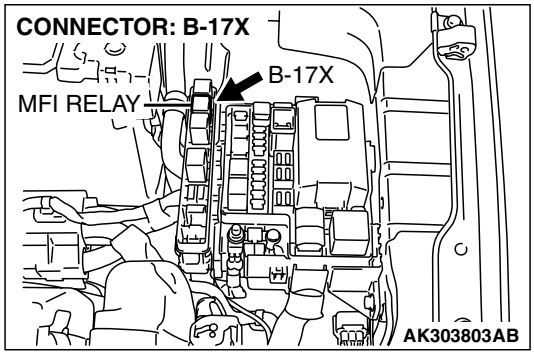
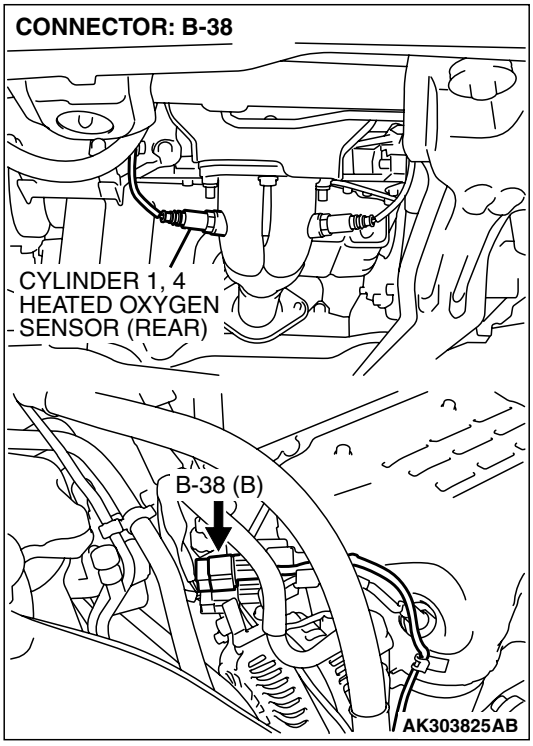
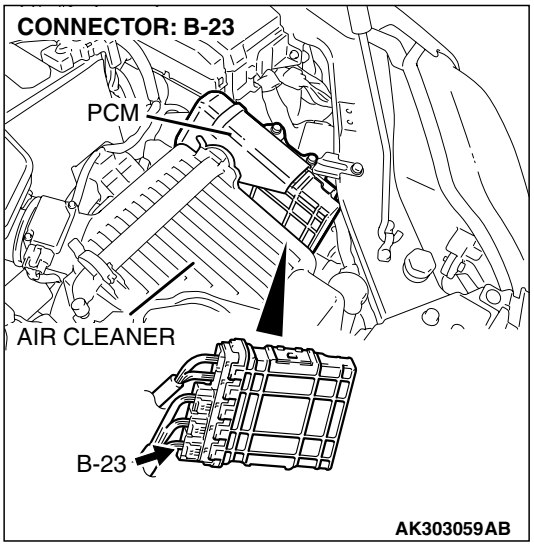


TSB Revision





CIRCUIT OPERATION

- Power is supplied from the MFI relay (terminal No. 4) to the cylinder 1, 4 heated oxygen sensor (rear) heater.
- The PCM (terminal No. 138) controls continuity to the cylinder 1, 4 heated oxygen sensor (rear) heater by turning the power transistor in the PCM "ON" and "OFF".

TECHNICAL DESCRIPTION

- The PCM checks whether the heater current is within a specified range when the heater is energized.
- The PCM checks whether the heater voltage is within a specified range when the heater is not energized.

DESCRIPTIONS OF MONITOR METHODS

Cylinder 1, 4 heated oxygen sensor heater (rear) current or voltage is out of specified range.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

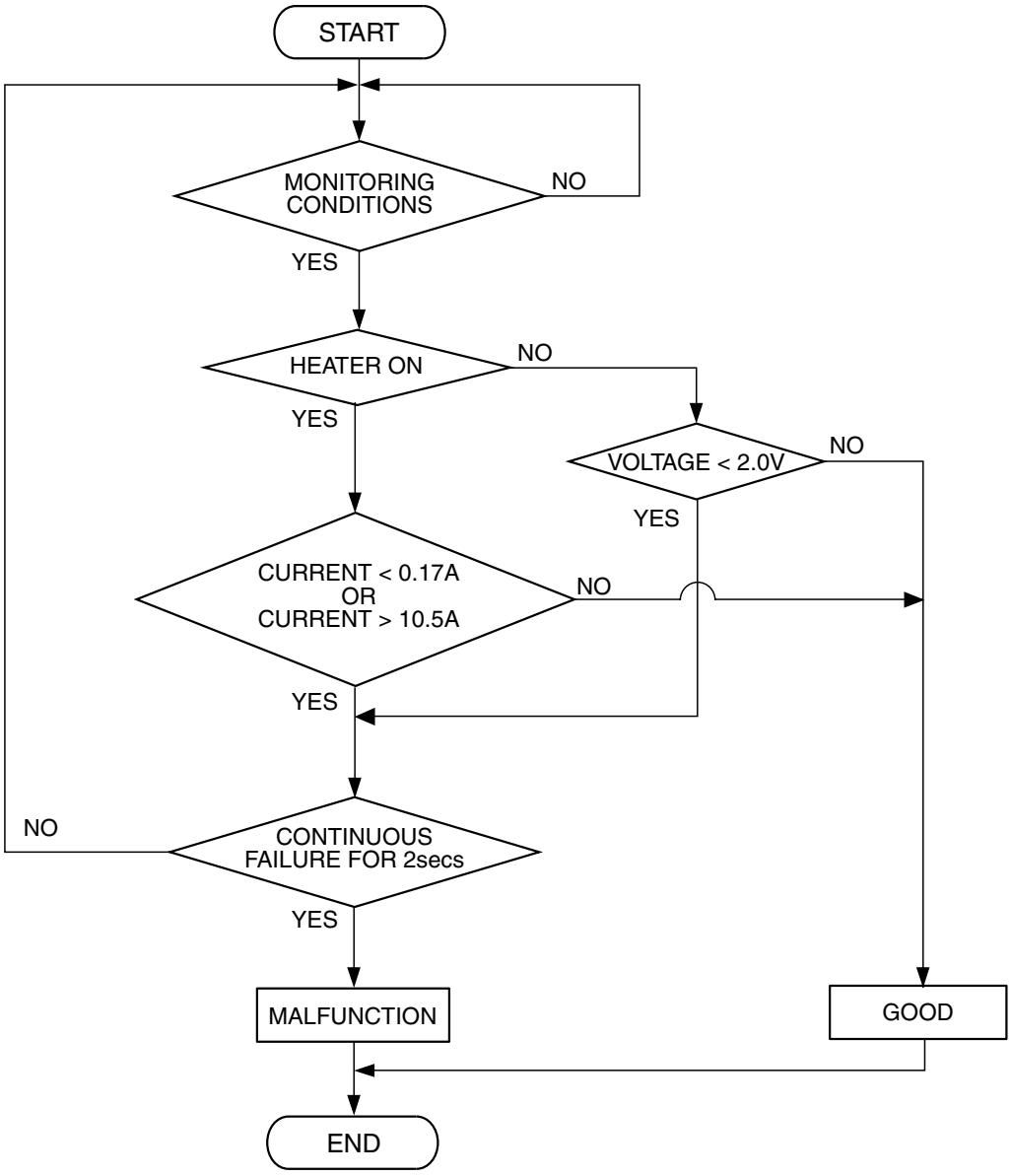
- Not applicable

Sensor (The sensor below is determined to be normal)

- Engine coolant temperature sensor

DTC SET CONDITIONS

Logic Flow Chart



Check Conditions

- More than 2 seconds have passed since the engine starting sequence was completed.
- While the cylinder 1, 4 heated oxygen sensor (rear) heater is on.
- Battery positive voltage is between 11 and 16.5 volts.

Judgement Criterion

- The cylinder 1, 4 heated oxygen sensor (rear) heater current has continued to be lower than 0.17 ampere for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 2 P.13A-9.

Check Conditions

- More than 2 seconds have passed since the engine starting sequence was completed.
- While the cylinder 1, 4 heated oxygen sensor (rear) heater is off.
- Battery positive voltage is between 11 and 16.5 volts.

Judgement Criterion

- The cylinder 1, 4 heated oxygen sensor (rear) heater voltage has continued to be lower than 2.0 volts for 2 seconds.

TSB Revision

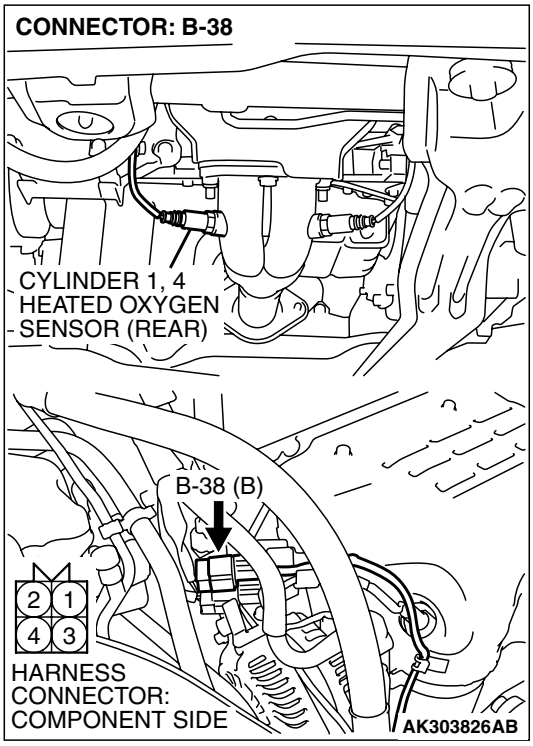
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Open or shorted cylinder 1, 4 heated oxygen sensor (rear) heater circuit, or harness damage.
- Cylinder 1, 4 heated oxygen sensor (rear) heater failed.
- Connector damage.
- PCM failed.

DIAGNOSIS

Required Special Tools:

- MD998464: Test Harness
- MB991923: Power Plant ECU Check Harness



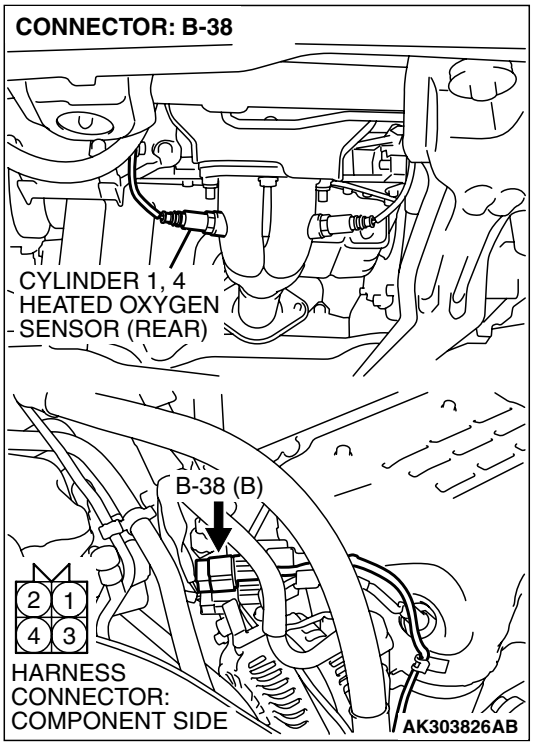
STEP 1. Check harness connector B-38 at the cylinder 1, 4 heated oxygen sensor (rear) for damage.

Q: Is the harness connector in good condition?

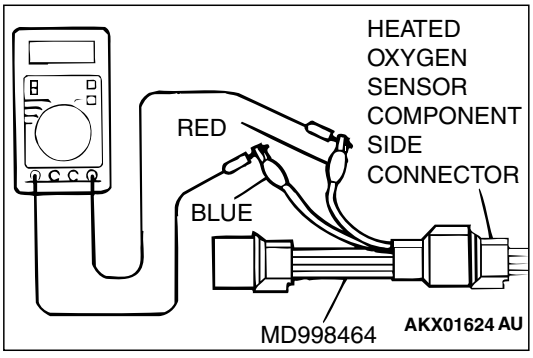
YES : Go to Step 2.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

STEP 2. Check the cylinder 1, 4 heated oxygen sensor (rear).



(1) Disconnect cylinder 1, 4 heated oxygen sensor (rear) connector B-38 and connect test harness special tool, MD998464, to the connector on the cylinder 1, 4 heated oxygen (rear) sensor side.



(2) Measure the resistance between heated oxygen sensor connector terminal No. 1 (red clip) and terminal No. 3 (blue clip).

Standard value: 11 – 18 Ω [at 20°C (68°F)]

Q: Is the measured resistance between 11 and 18 ohms [at 20°C (68°F)]?

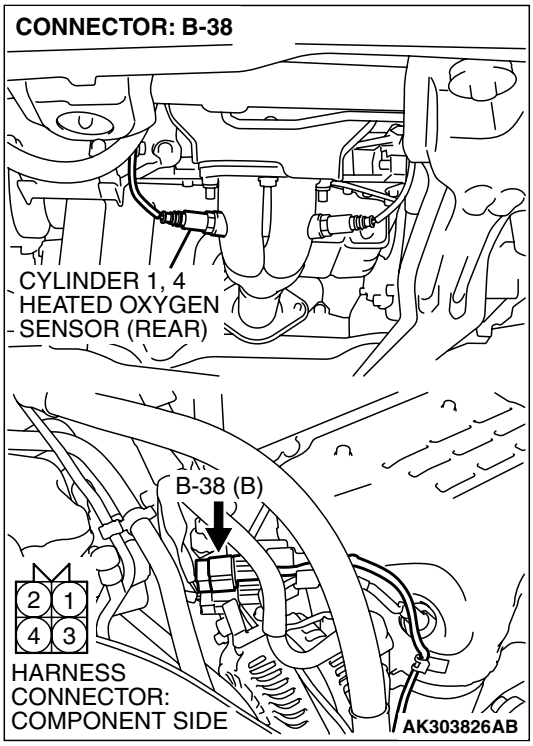
YES : Go to Step 3.

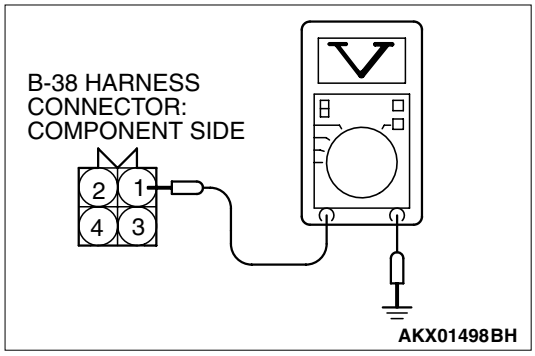
NO : Replace the cylinder 1, 4 heated oxygen sensor (rear). Then go to Step 12.

STEP 3. Measure the power supply voltage at cylinder 1, 4 heated oxygen sensor (rear) harness side connector B-38.

(1) Disconnect the connector B-38 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.

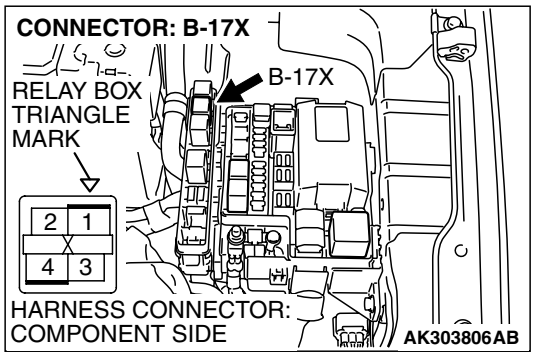
NO : Go to Step 4.

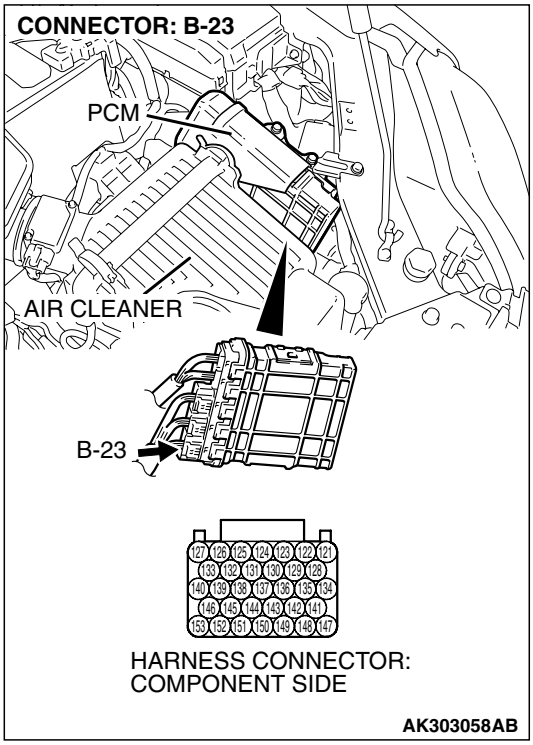
STEP 4. Check harness connector B-17X at the MFI relay for damage.

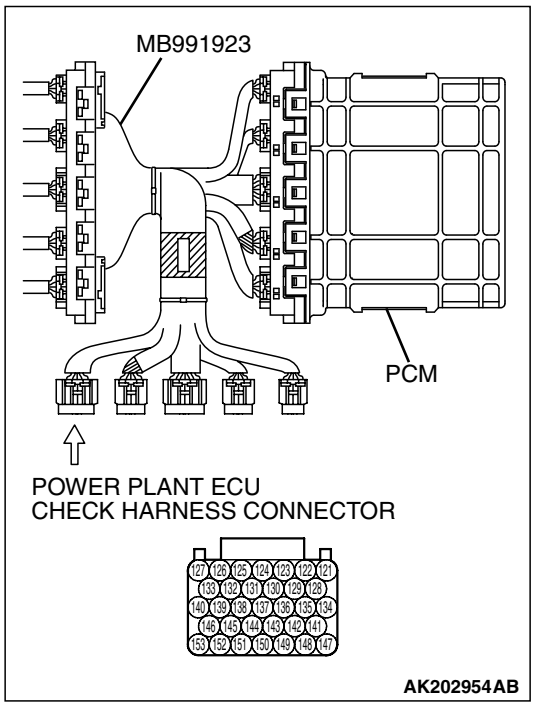
Q: Is the harness connector in good condition?

YES : Repair harness wire between MFI relay connector B-17X (terminal No. 4) and cylinder 1, 4 heated oxygen sensor (rear) connector B-38 (terminal No. 1) because of open circuit or short circuit to ground. Then go to Step 12.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

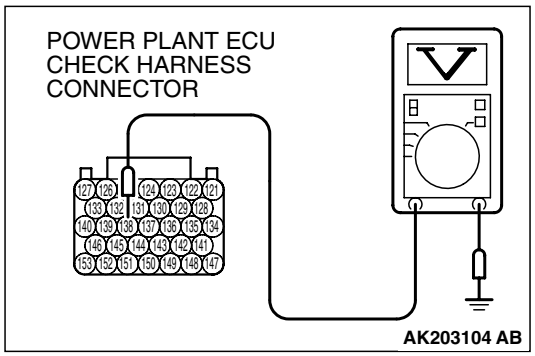






STEP 5. Measure the power supply voltage at PCM connector B-23 by using power plant ECU check harness special tool MB991923.

(1) Disconnect all PCM connectors. Connect the power plant ECU check harness special tool MB991923 between the separated connectors.
(2) Turn the ignition switch to the "ON" position.



(3) Measure the voltage between terminal No. 138 and ground.
- Voltage should be battery positive voltage.

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

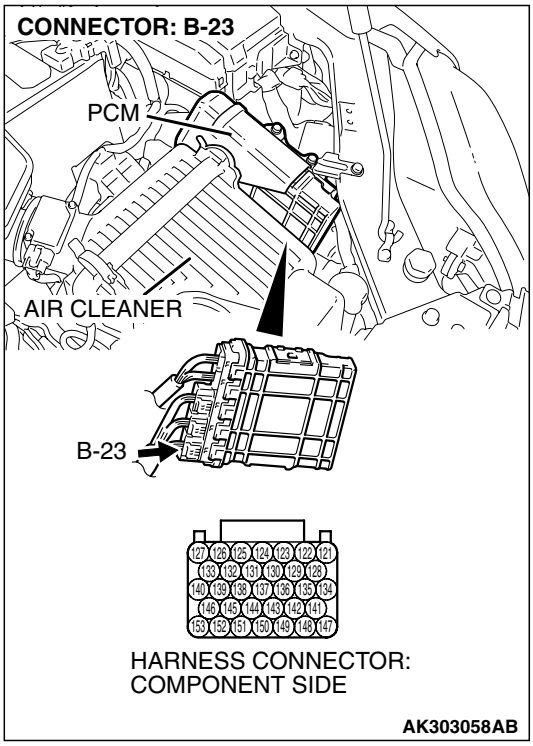
Q: Is battery positive voltage (approximately 12 volts) present?

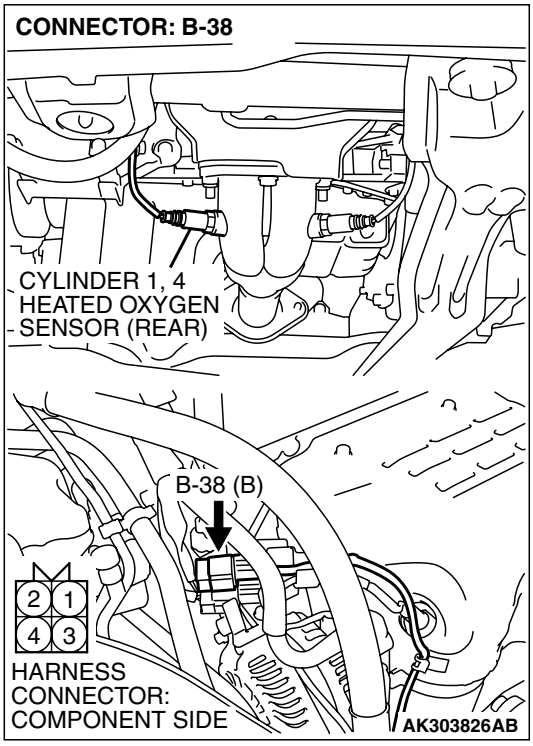
YES : Go to Step 8.
NO : Go to Step 6.

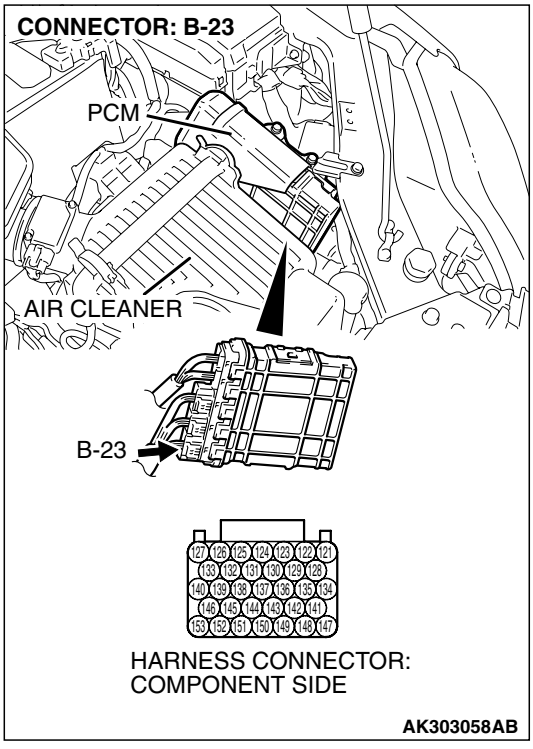
STEP 6. Check harness connector B-23 at PCM for damage.

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 go to Step 12.





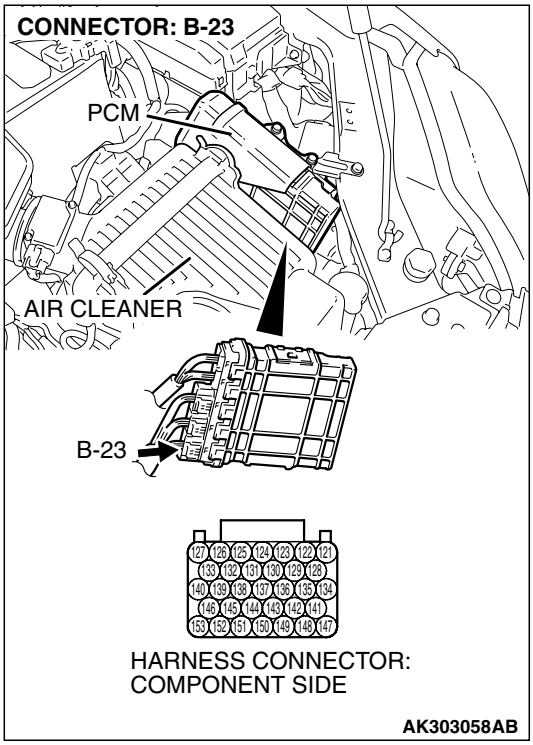


STEP 7. Check for open circuit or short circuit to ground between cylinder 1, 4 heated oxygen sensor (rear) connector B-38 (terminal No. 3) and PCM connector B-23 (terminal No. 138).

Q: Is the harness wire in good condition?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 12.

NO : Repair it. Then go to Step 12.

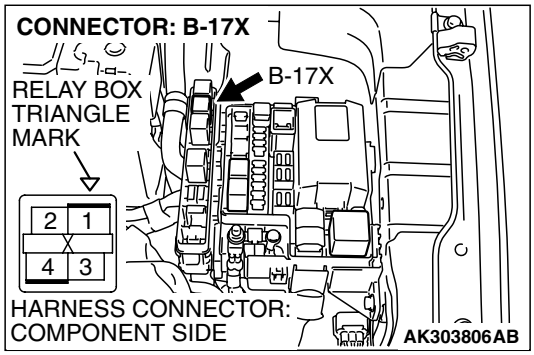


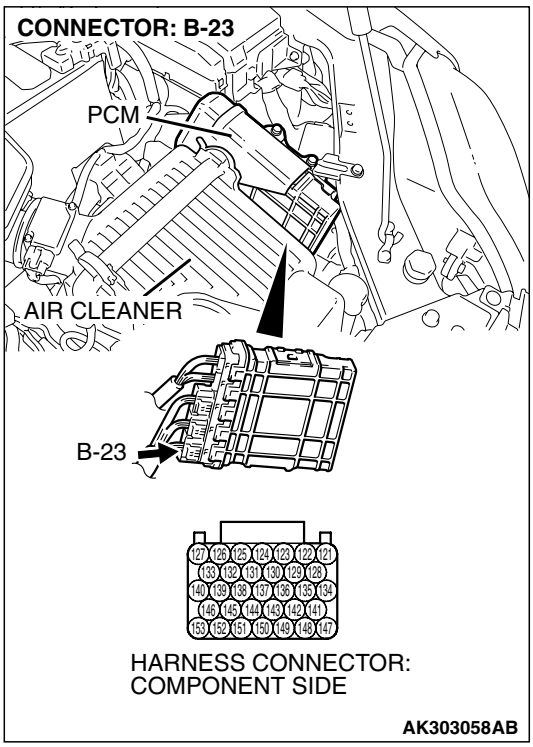
STEP 8. Check harness connector B-23 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 9.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.





STEP 9. Check for harness damage between MFI relay connector B-17X (terminal No. 4) and cylinder 1, 4 heated oxygen sensor (rear) connector B-38 (terminal No. 1).
Q: Is the harness wire in good condition?

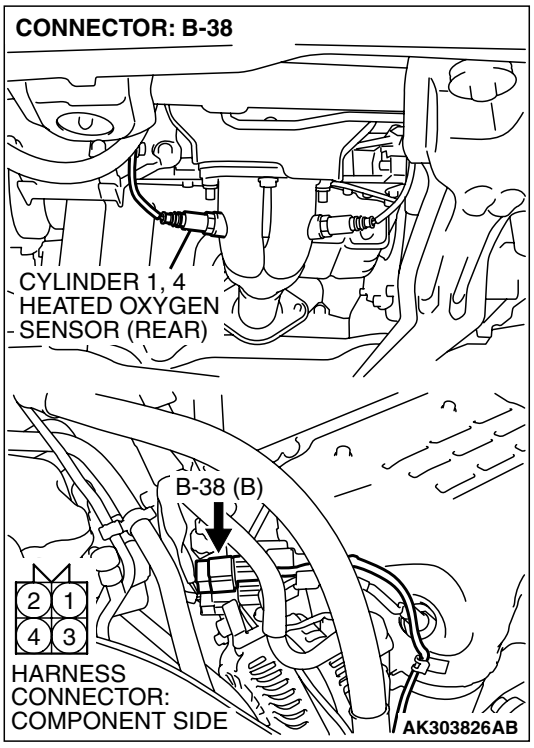
YES : Go to Step 10.
NO : Repair it. Then go to Step 12.

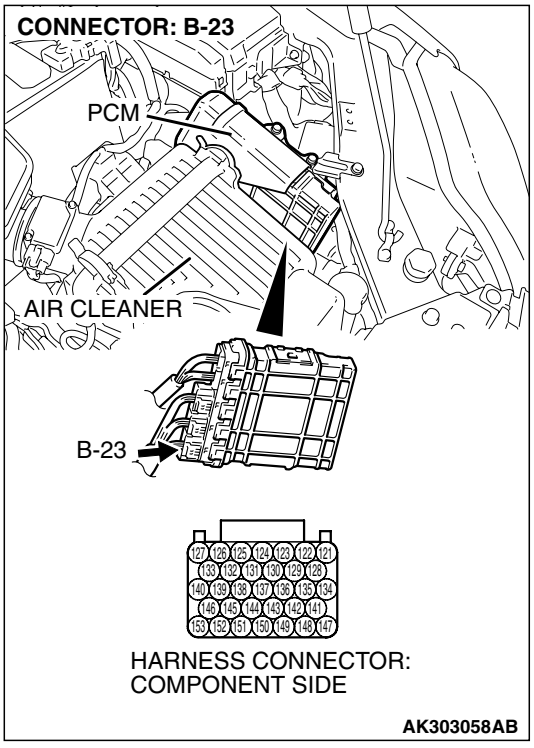
STEP 10. Check for harness damage between cylinder 1, 4 heated oxygen sensor (rear) connector B-38 (terminal No. 3) and PCM connector B-23 (terminal No. 138).

Q: Is the harness wire in good condition?

YES : Go to Step 11.

NO : Repair it. Then go to Step 12.





STEP 11. Check the trouble symptoms.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 2 P.13A-9.

(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0037 set?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 12.

NO : It can be assumed 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.

STEP 12. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 2 P.13A-9.

(2) Check the diagnostic trouble code (DTC).

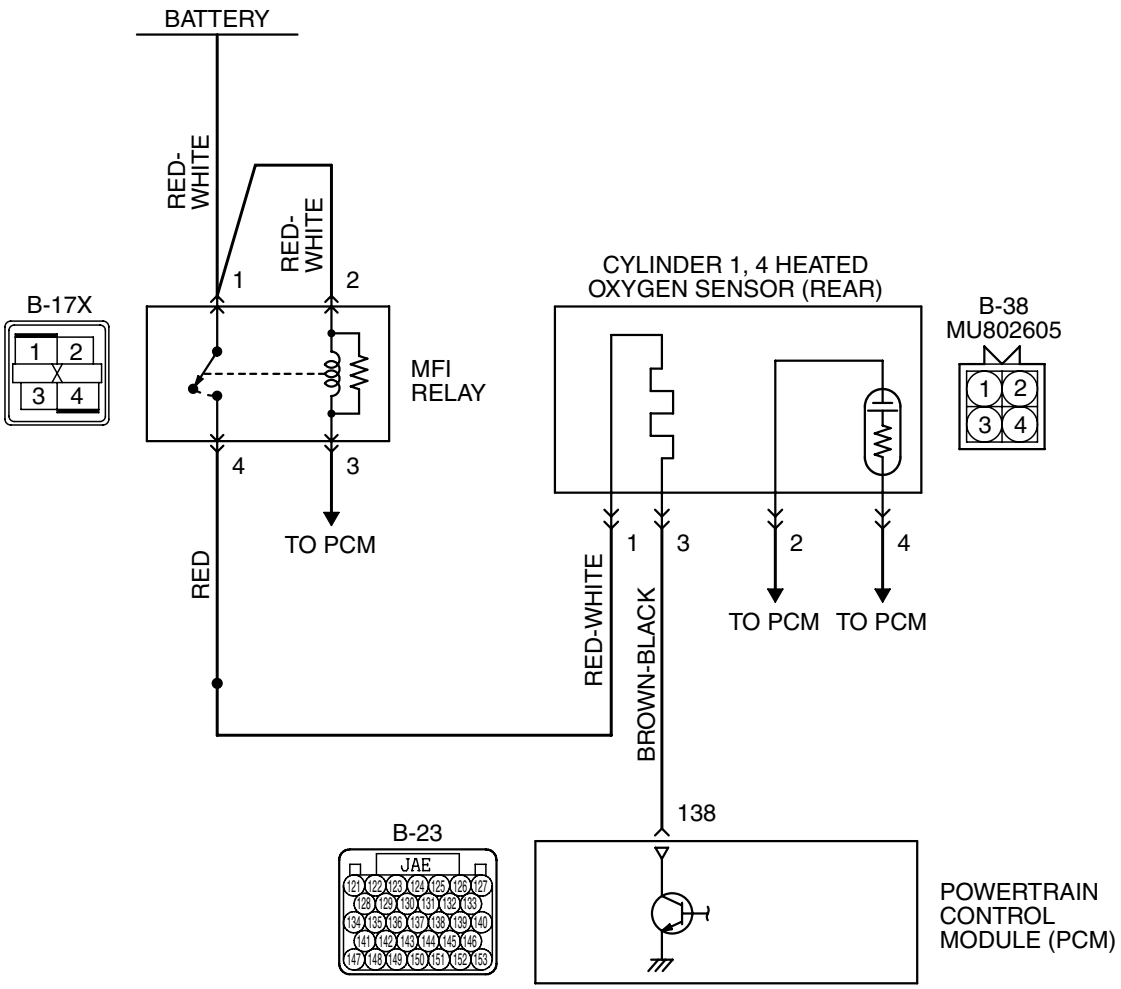
Q: Is DTC P0037 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0038: Cylinder 1, 4 Heated Oxygen Sensor Heater (rear) Control Circuit High

Cylinder 1, 4 Heated Oxygen Sensor (rear) Heater Circuit



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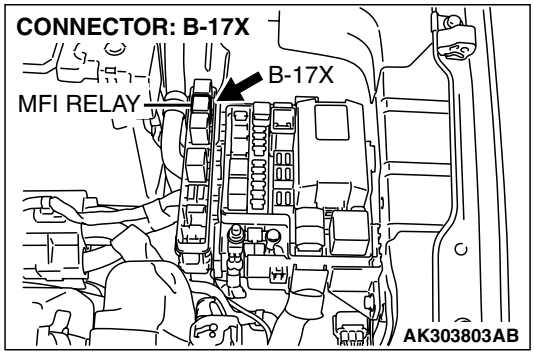
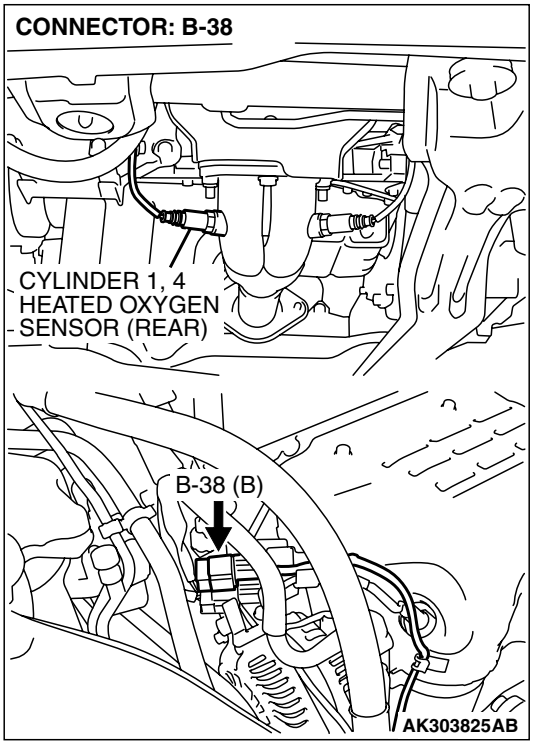
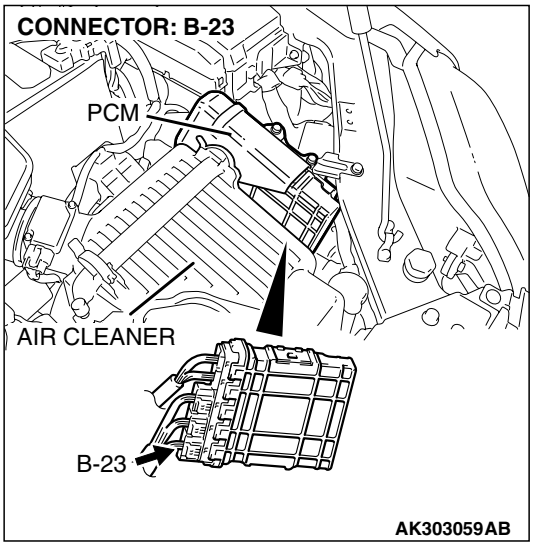


TSB Revision





CIRCUIT OPERATION

- Power is supplied from the MFI relay (terminal No. 4) to the cylinder 1, 4 heated oxygen sensor (rear) heater.
- The PCM (terminal No. 138) controls continuity to the cylinder 1, 4 heated oxygen sensor (rear) heater by turning the power transistor in the PCM "ON" and "OFF".

TECHNICAL DESCRIPTION

- The PCM checks whether the heater current is within a specified range when the heater is energized.

DESCRIPTIONS OF MONITOR METHODS

Cylinder 1, 4 heated oxygen sensor heater (rear) current is out of specified range.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

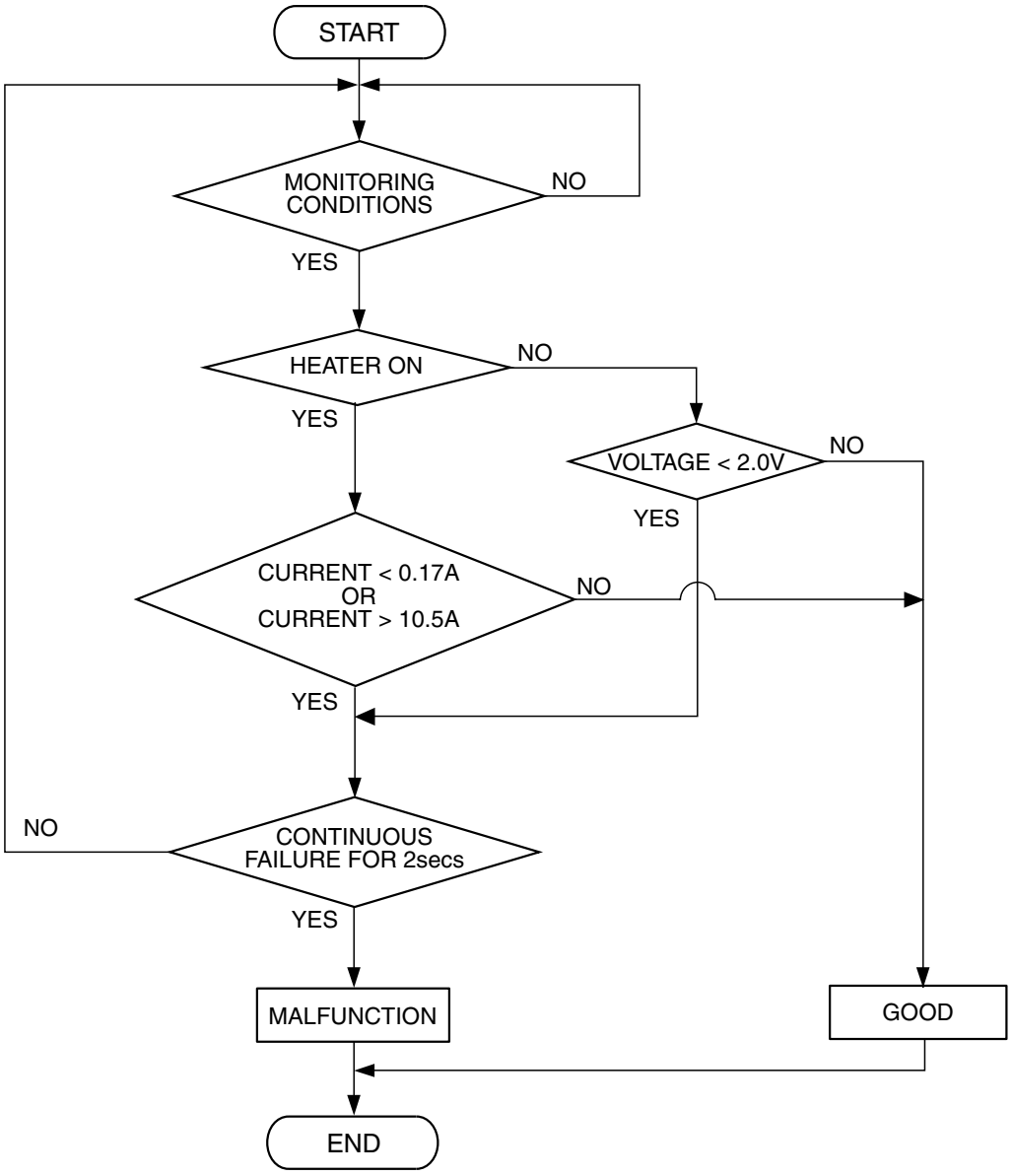
- Not applicable

Sensor (The sensor below is determined to be normal)

- Engine coolant temperature sensor

DTC SET CONDITIONS

Logic Flow Chart



Check Conditions

- More than 2 seconds have passed since the engine starting sequence was completed.
- While the cylinder 1, 4 heated oxygen sensor (rear) heater is on.
- Battery positive voltage is between 11 and 16.5 volts.

Judgement Criterion

- The cylinder 1, 4 heated oxygen sensor (rear) heater current has continued to be higher than 10.5 ampere for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 2 P.13A-9.

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

- Cylinder 1, 4 heated oxygen sensor (rear) failed.
- Connector damage.
- PCM failed.

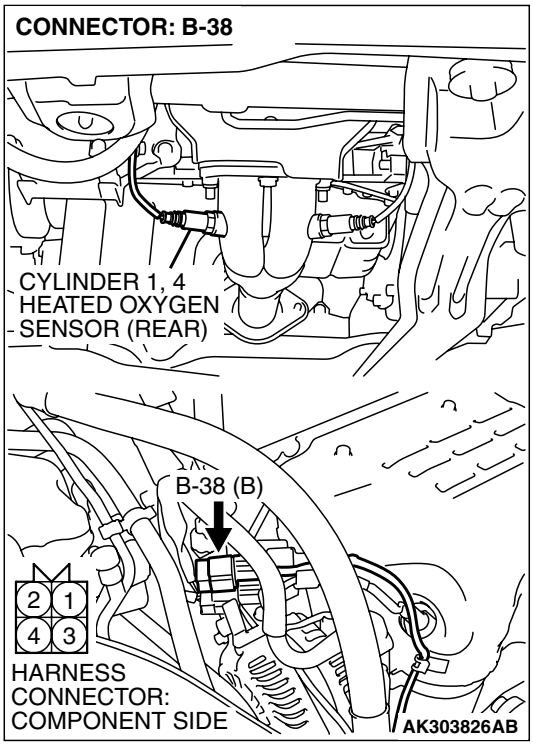
TSB Revision

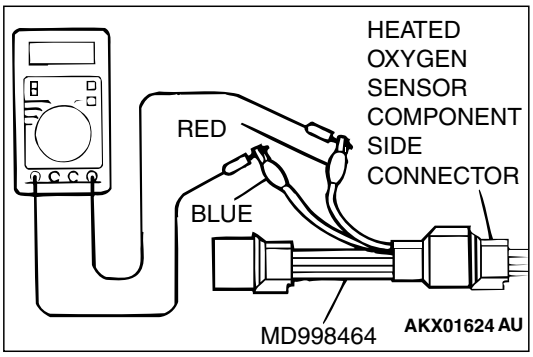
DIAGNOSIS

Required Special Tool:
- MD998464: Test Harness

STEP 1. Check the cylinder 1, 4 heated oxygen sensor (rear).

(1) Disconnect cylinder 1, 4 heated oxygen sensor (rear) connector B-38 and connect test harness special tool, MD998464, to the connector on the cylinder 1, 4 heated oxygen (rear) sensor side.





(2) Measure the resistance between heated oxygen sensor connector terminal No. 1 (red clip) and terminal No. 3 (blue clip).

Standard value: 11 – 18 Ω [at 20°C (68°F)]

Q: Is the measured resistance between 11 and 18 ohms [at 20°C (68°F)]?

YES : Go to Step 2.

NO : Replace the cylinder 1, 4 heated oxygen sensor (rear). Then go to Step 3.

STEP 2. Check the trouble symptoms.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 2 P.13A-9.

(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0038 set?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 3.

NO : It can be assumed 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.

STEP 3. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 2 P.13A-9.

(2) Check the diagnostic trouble code (DTC).

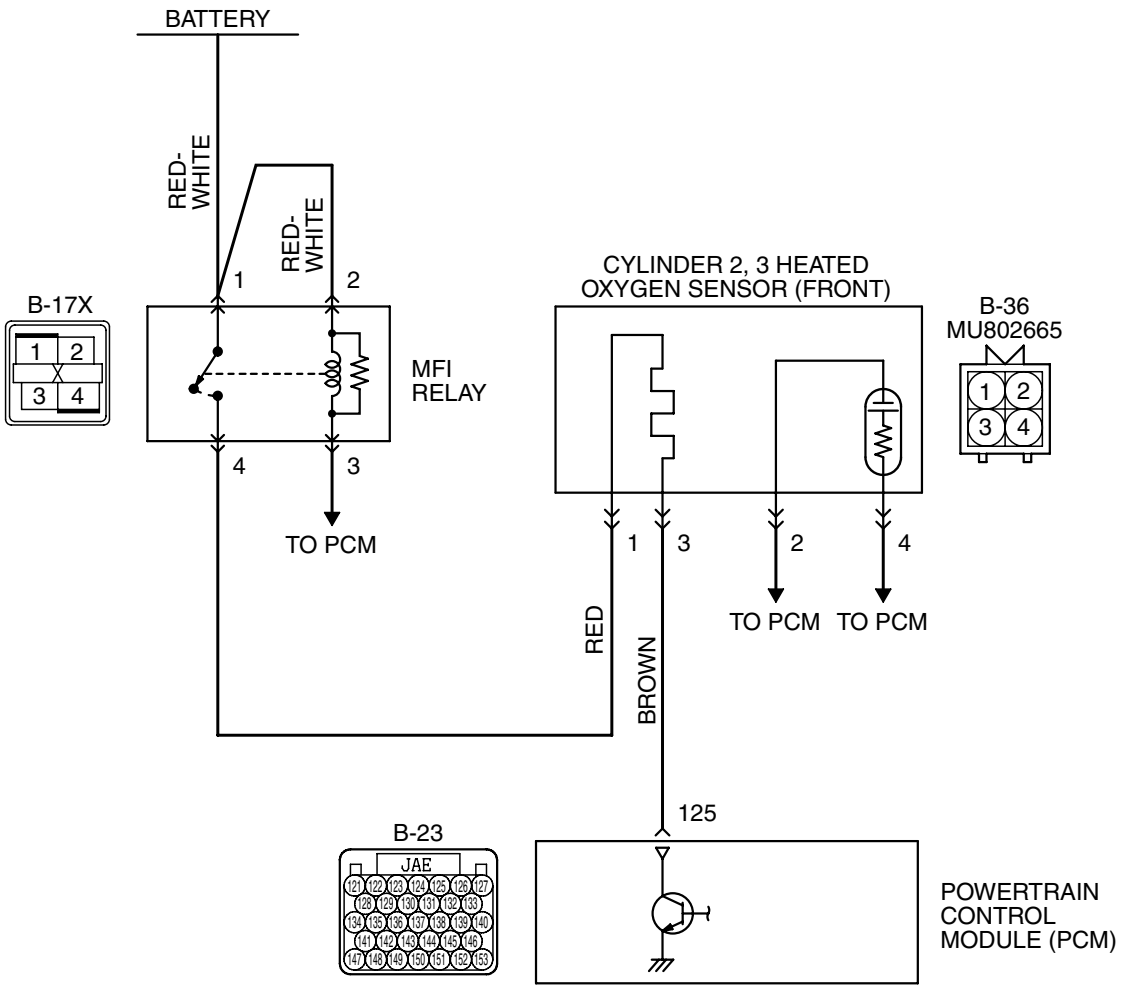
Q: Is DTC P0038 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0051: Cylinder 2, 3 Heated Oxygen Sensor Heater (front) Control Circuit Low

Cylinder 2, 3 Heated Oxygen Sensor (front) Heater Circuit



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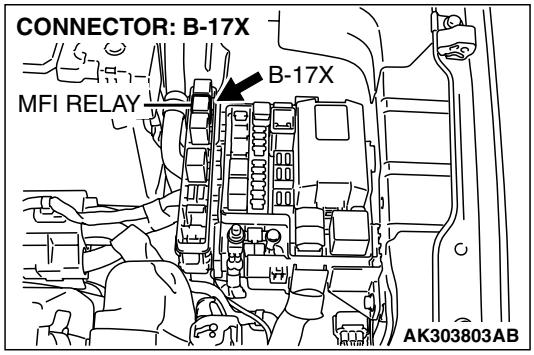
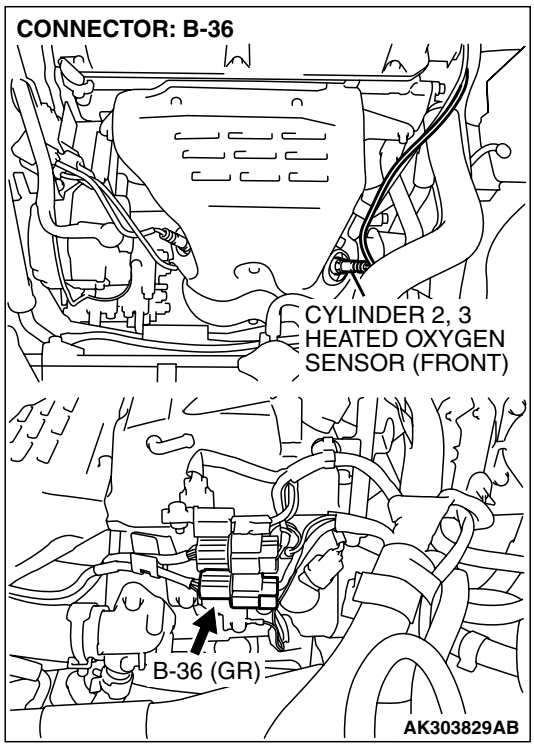
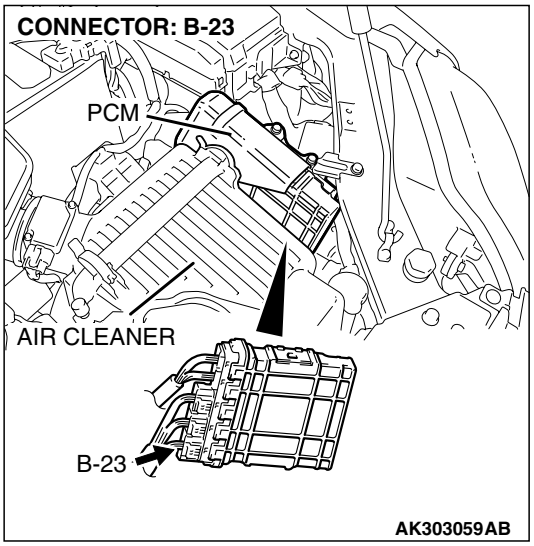


TSB Revision





CIRCUIT OPERATION

- Power is supplied from the MFI relay (terminal No. 4) to the cylinder 2, 3 heated oxygen sensor (front) heater.
- The PCM (terminal No. 125) controls continuity to the cylinder 2, 3 heated oxygen sensor (front) heater by turning the power transistor in the PCM "ON" and "OFF".

TECHNICAL DESCRIPTION

- The PCM checks whether the heater current is within a specified range when the heater is energized.
- The PCM checks whether the heater voltage is within a specified range when the heater is not energized.

DESCRIPTIONS OF MONITOR METHODS

Cylinder 2, 3 heated oxygen sensor heater (front) current or voltage is out of specified range.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

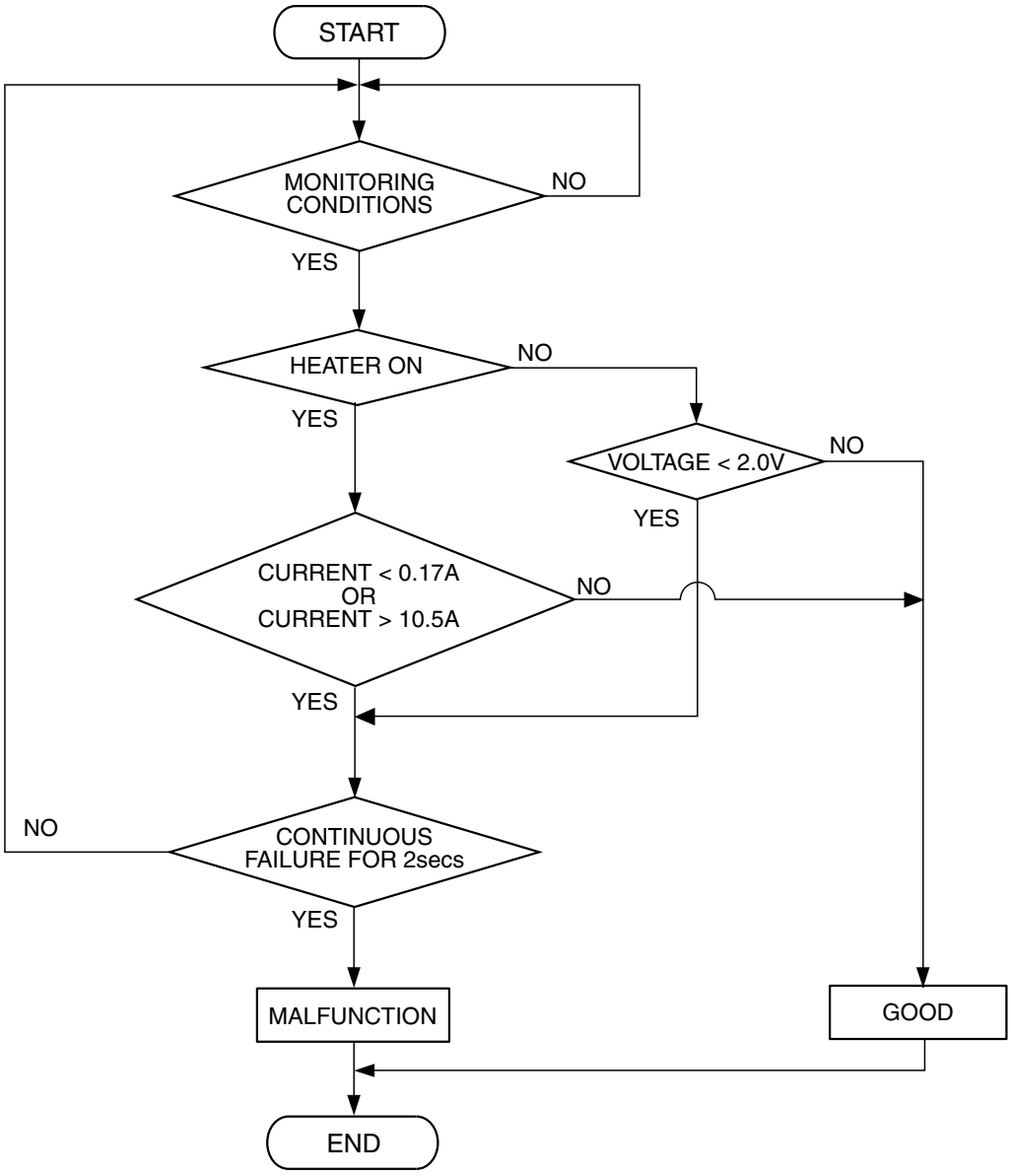
- Not applicable

Sensor (The sensor below is determined to be normal)

- Engine coolant temperature sensor

DTC SET CONDITIONS

Logic Flow Chart



Check Conditions

- More than 2 seconds have passed since the engine starting sequence was completed.
- While the cylinder 2, 3 heated oxygen sensor (front) heater is on.
- Battery positive voltage is between 11 and 16.5 volts.

Judgement Criterion

- The cylinder 2, 3 heated oxygen sensor (front) heater current has continued to be lower than 0.17 ampere for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 2 P.13A-9.

Check Conditions

- More than 2 seconds have passed since the engine starting sequence was completed.
- While the cylinder 2, 3 heated oxygen sensor (front) heater is off.
- Battery positive voltage is between 11 and 16.5 volts.

Judgement Criterion

- The cylinder 2, 3 heated oxygen sensor (front) heater voltage has continued to be lower than 2.0 volts for 2 seconds.

TSB Revision

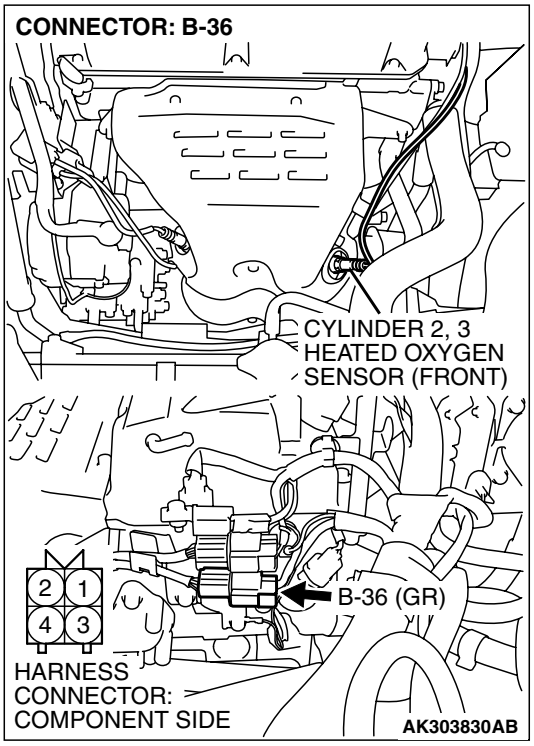
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Open or shorted cylinder 2, 3 heated oxygen sensor (front) heater circuit, or harness damage.
- Cylinder 2, 3 heated oxygen sensor (front) heater failed.
- Connector damage.
- PCM failed.

DIAGNOSIS

Required Special Tools:

- MB991316: Test Harness
- MB991923: Check Harness



STEP 1. Check harness connector B-36 at the cylinder 2, 3 heated oxygen sensor (front) for damage.

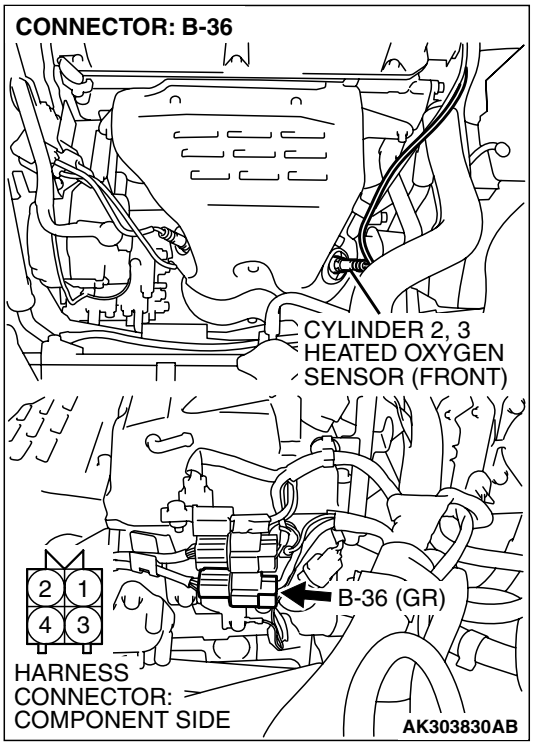
Q: Is the harness connector in good condition?

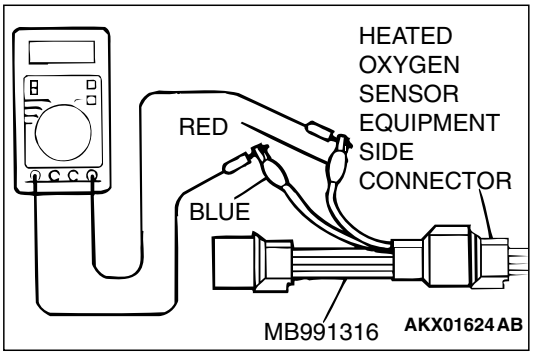
YES : Go to Step 2.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

STEP 2. Check the cylinder 2, 3 heated oxygen sensor (front).

(1) Disconnect cylinder 2, 3 heated oxygen sensor (front) connector B-36 and connect test harness special tool, MB991316, to the connector on the cylinder 2, 3 heated oxygen (front) sensor side.





(2) Measure the resistance between heated oxygen sensor connector terminal No. 1 (red clip) and terminal No. 3 (blue clip).

Standard value: 4.5 – 8.0 Ω [at 20°C (68°F)]

Q: Is the measured resistance between 4.5 and 8.0 ohms [at 20°C (68°F)]?

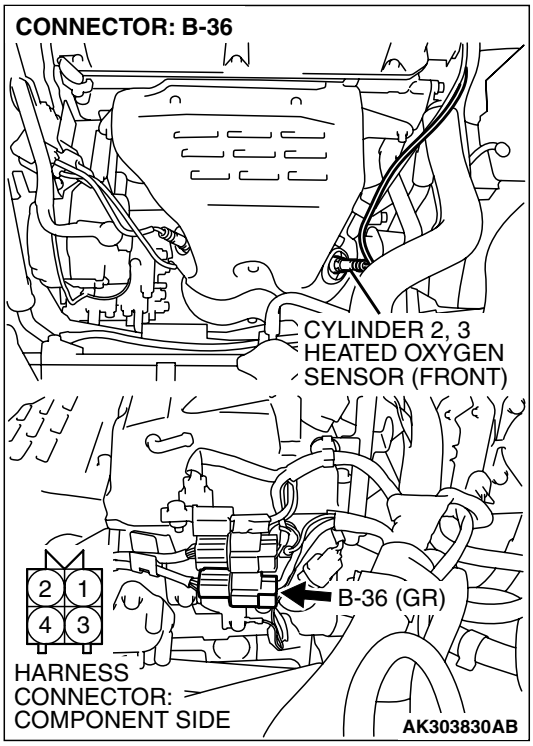
YES : Go to Step 3.

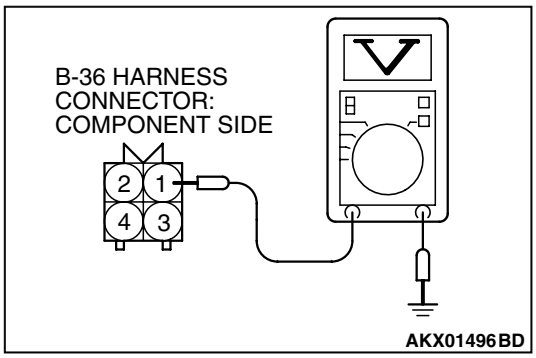
NO : Replace the cylinder 2, 3 heated oxygen sensor (front). Then go to Step 12.

STEP 3. Measure the power supply voltage at cylinder 2, 3 heated oxygen sensor (front) harness side connector B-36.

(1) Disconnect the connector B-36 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.

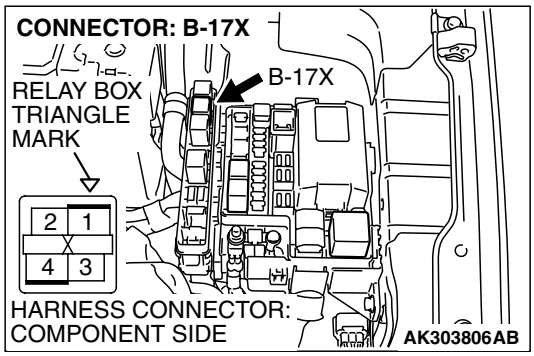
NO : Go to Step 4.

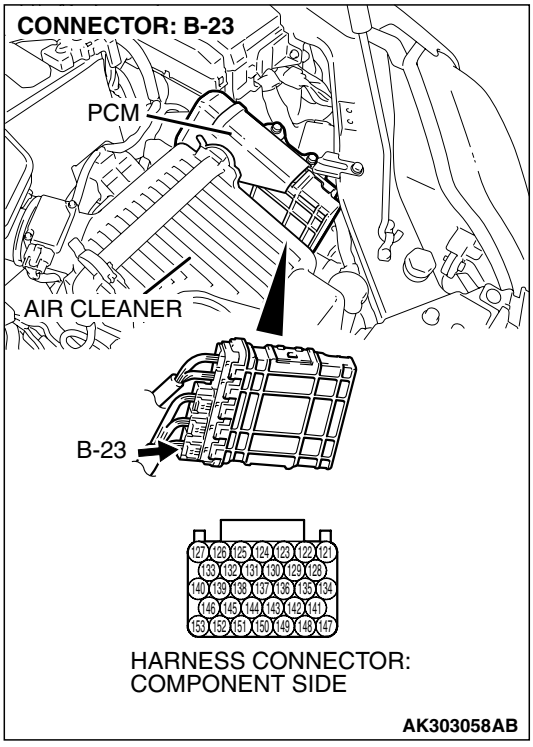
STEP 4. Check harness connector B-17X at the MFI relay for damage.

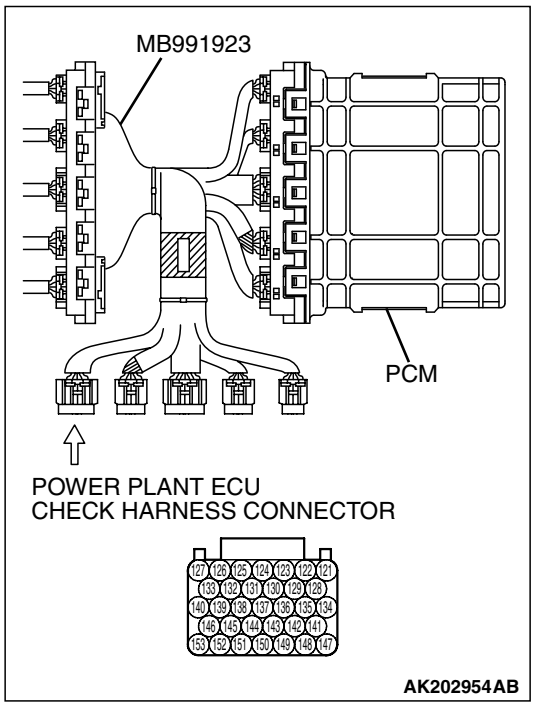
Q: Is the harness connector in good condition?

YES : Repair harness wire between MFI relay connector B-17X (terminal No. 4) and cylinder 2, 3 heated oxygen sensor (front) connector B-36 (terminal No. 1) because of open circuit or short circuit to ground. Then go to Step 12.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.



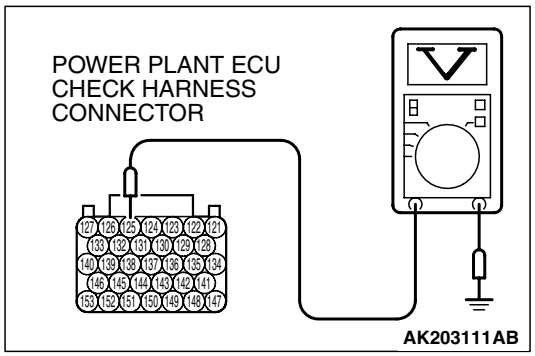




STEP 5. Measure the power supply voltage at PCM connector B-23 by using power plant ECU check harness special tool MB991923.

(1) Disconnect all PCM connectors. Connect the power plant ECU check harness special tool MB991923 between the separated connectors.

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



(3) Measure the voltage between terminal No. 125 and ground.
- Voltage should be battery positive voltage.

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

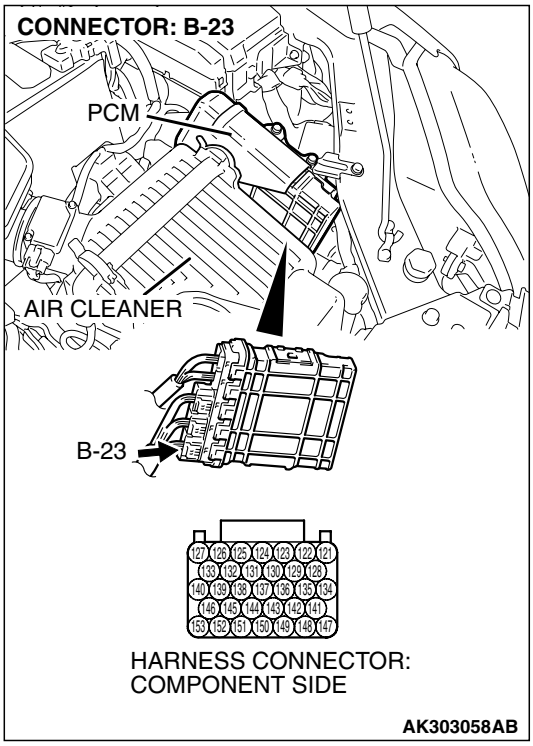
Q: Is battery positive voltage (approximately 12 volts) present?

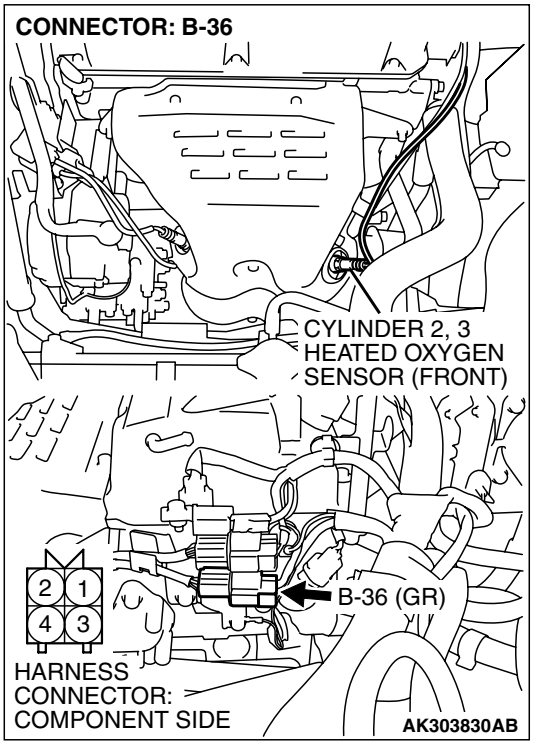
YES : Go to Step 8.
NO : Go to Step 6.

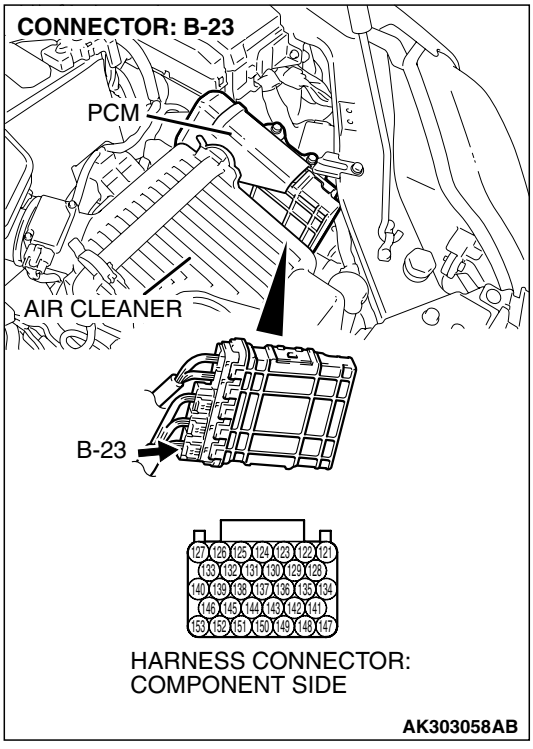
STEP 6. Check harness connector B-23 at PCM for damage.

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 go to Step 12.





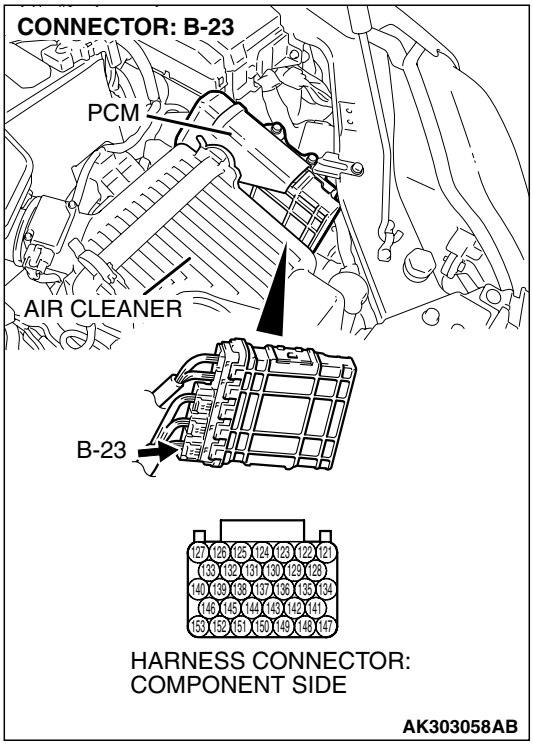


STEP 7. Check for open circuit or short circuit to ground between cylinder 2, 3 heated oxygen sensor (front) connector B-36 (terminal No. 3) and PCM connector B-23 (terminal No. 125).

Q: Is the harness wire in good condition?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 12.

NO : Repair it. Then go to Step 12.

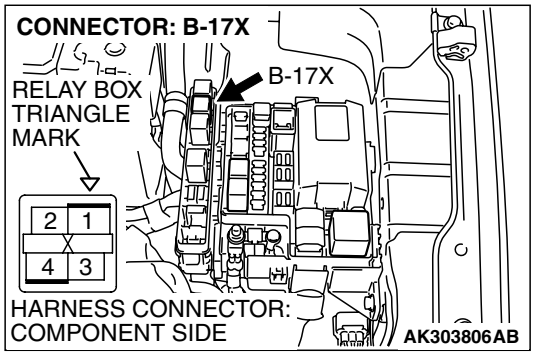


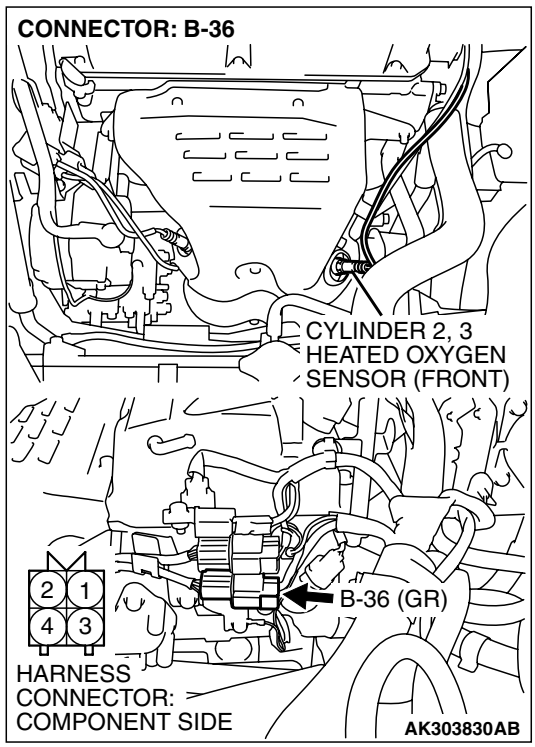
STEP 8. Check harness connector B-23 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 9.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.





STEP 9. Check for harness damage between MFI relay connector B-17X (terminal No. 4) and cylinder 2, 3 heated oxygen sensor (front) connector B-36 (terminal No. 1).

Q: Is the harness wire in good condition?

YES : Go to Step 10.

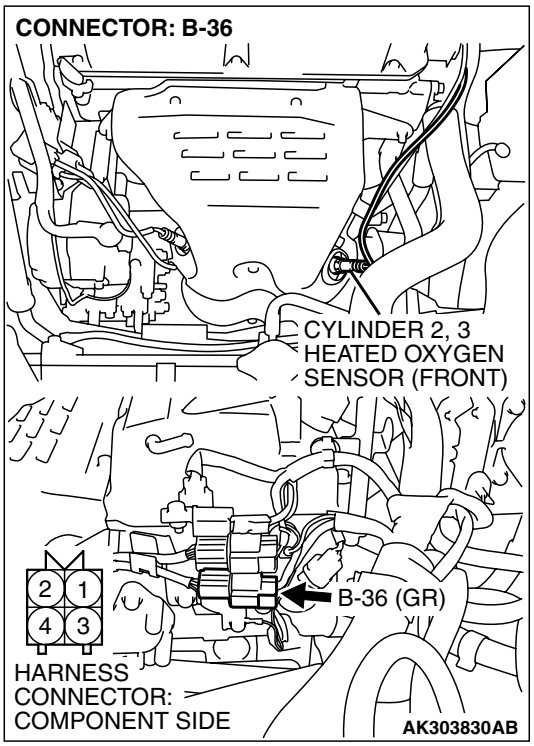
NO : Repair it. Then go to Step 12.

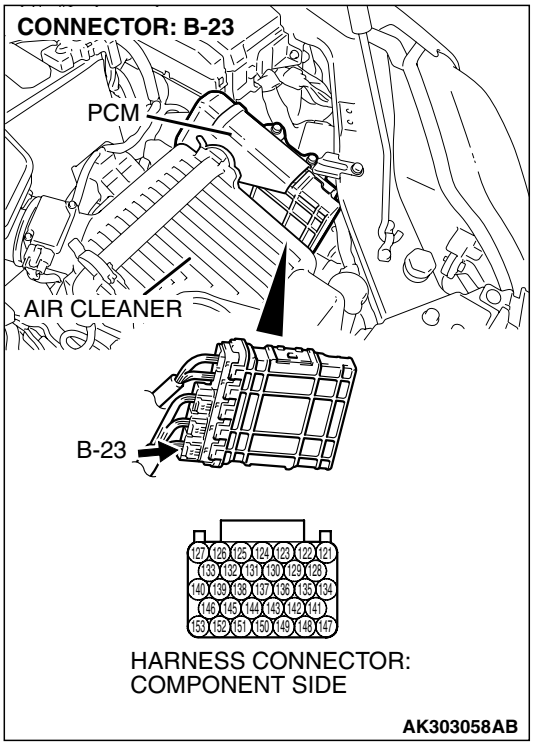
STEP 10. Check for harness damage between cylinder 2, 3 heated oxygen sensor (front) connector B-36 (terminal No. 3) and PCM connector B-23 (terminal No. 125).

Q: Is the harness wire in good condition?

YES : Go to Step 11.

NO : Repair it. Then go to Step 12.





STEP 11. Check the trouble symptoms.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 2 P.13A-9.

(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0051 set?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 12.

NO : It can be assumed 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.

STEP 12. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 2 P.13A-9.

(2) Check the diagnostic trouble code (DTC).

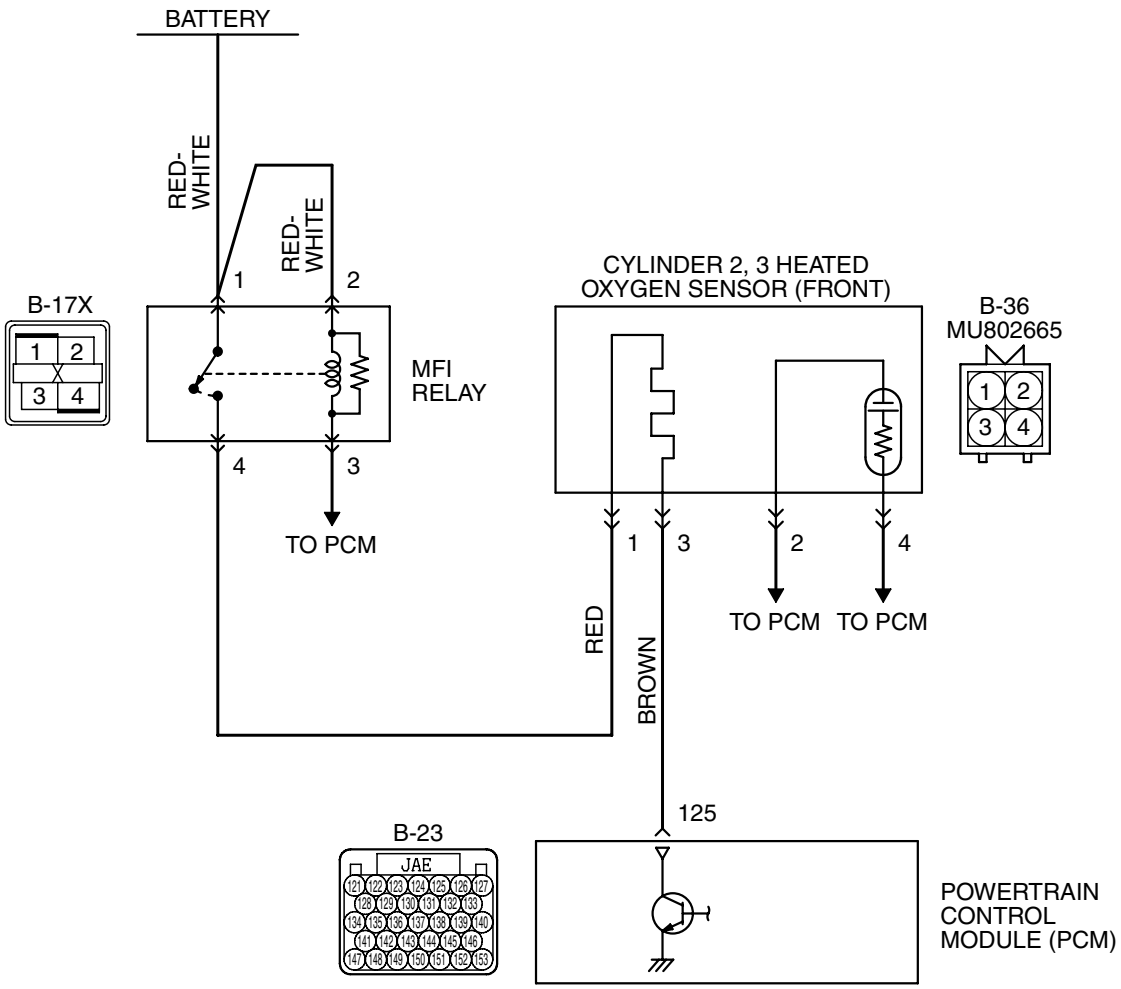
Q: Is DTC P0051 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0052: Cylinder 2, 3 Heated Oxygen Sensor Heater (front) Control Circuit High

Cylinder 2, 3 Heated Oxygen Sensor (front) Heater Circuit



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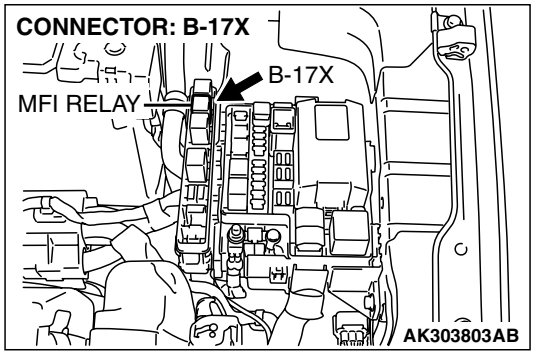
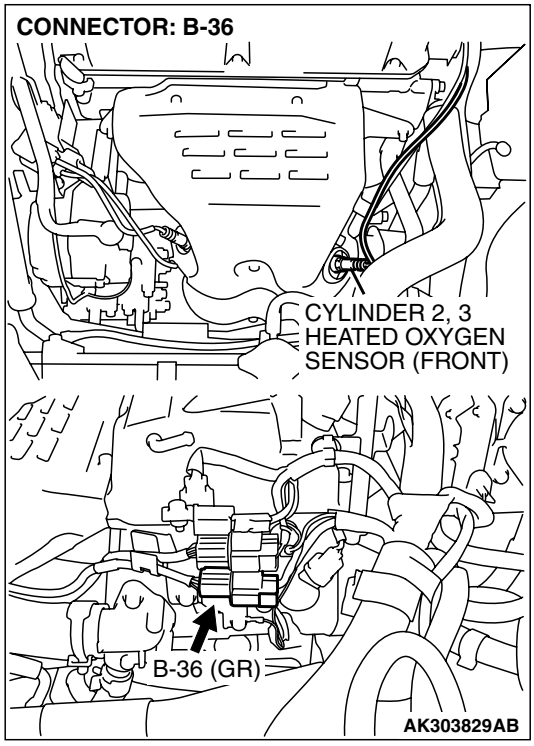
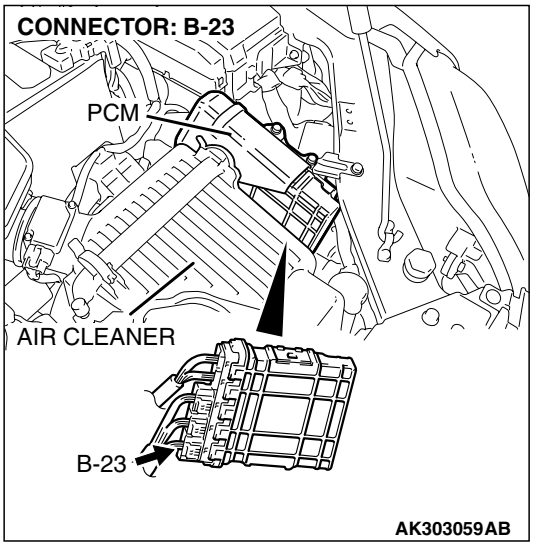


TSB Revision





CIRCUIT OPERATION

- Power is supplied from the MFI relay (terminal No. 4) to the cylinder 2, 3 heated oxygen sensor (front) heater.
- The PCM (terminal No. 125) controls continuity to the cylinder 2, 3 heated oxygen sensor (front) heater by turning the power transistor in the PCM "ON" and "OFF".

TECHNICAL DESCRIPTION

- The PCM checks whether the heater current is within a specified range when the heater is energized.

DESCRIPTIONS OF MONITOR METHODS

Cylinder 2, 3 heated oxygen sensor heater (front) current is out of specified range.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

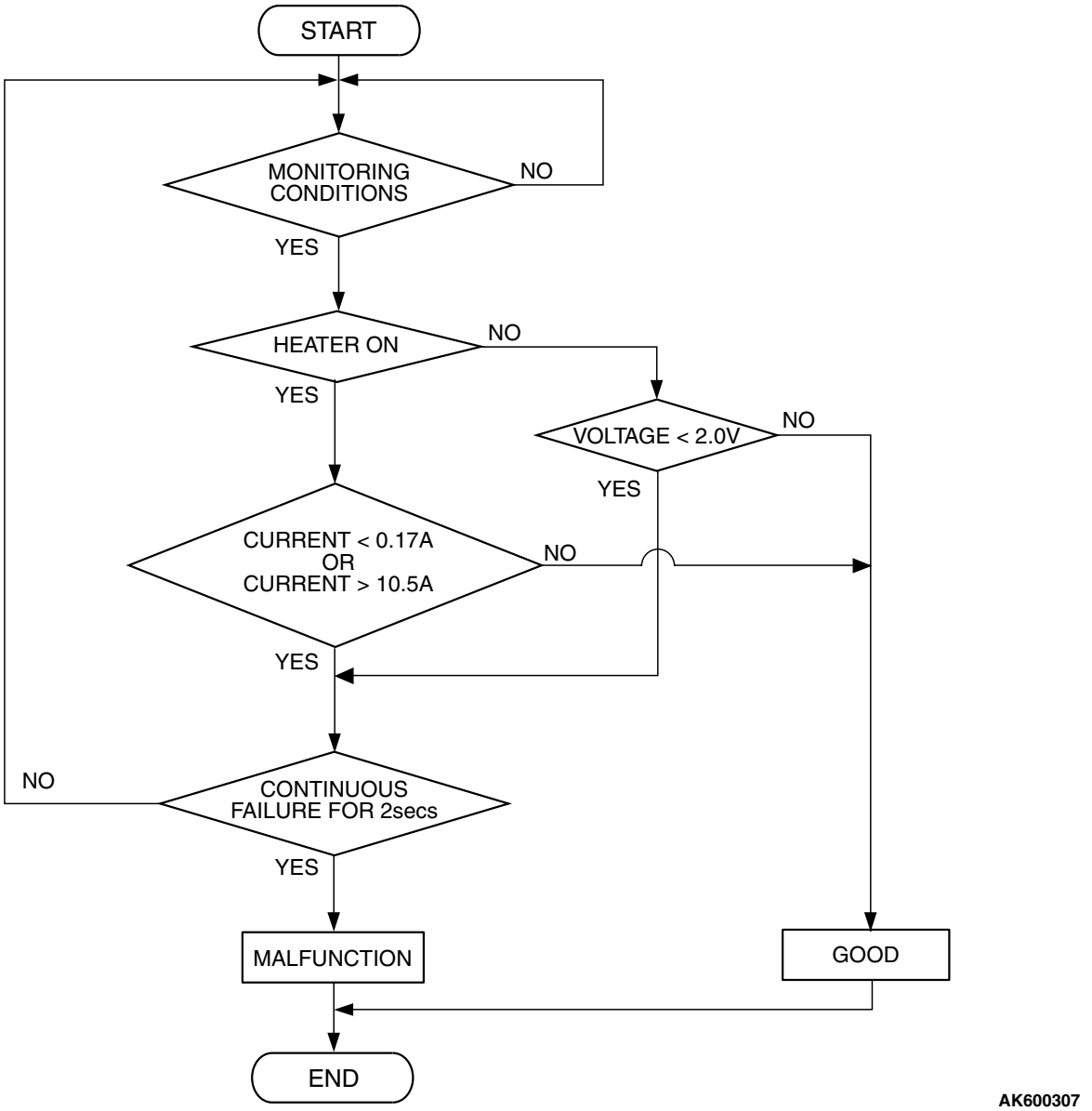
- Not applicable

Sensor (The sensor below is determined to be normal)

- Engine coolant temperature sensor

DTC SET CONDITIONS

Logic Flow Chart



Check Conditions

- More than 2 seconds have passed since the engine starting sequence was completed.
- While the cylinder 2, 3 heated oxygen sensor (front) heater is on.
- Battery positive voltage is between 11 and 16.5 volts.

Judgement Criterion

- The cylinder 2, 3 heated oxygen sensor (front) heater current has continued to be higher than 10.5 ampere for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 2 P.13A-9.

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

- Cylinder 2, 3 heated oxygen sensor (front) heater failed.
- PCM failed.

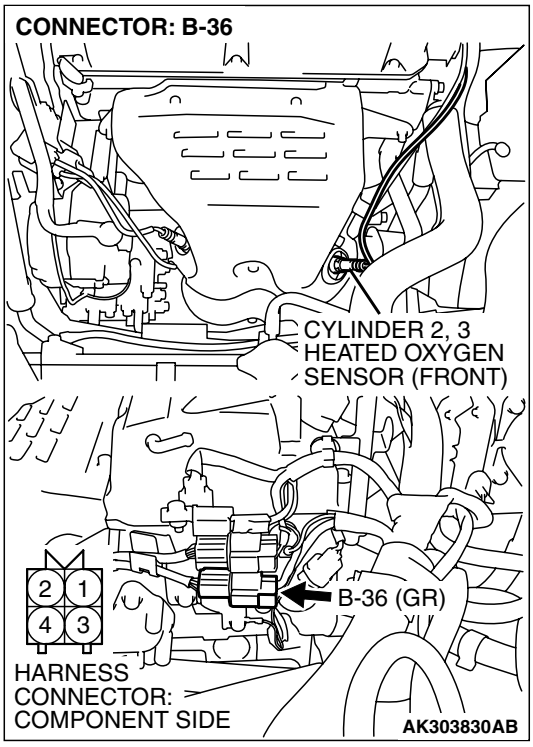
TSB Revision

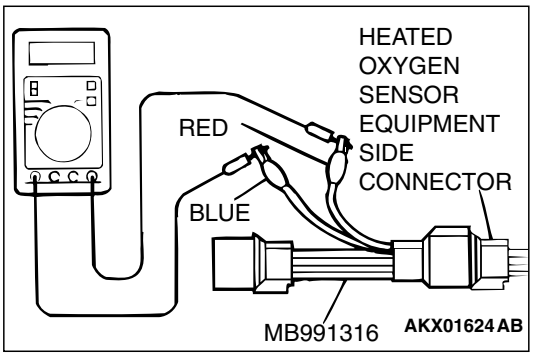
DIAGNOSIS

Required Special Tool:
- MB991316: Test Harness

STEP 1. Check the cylinder 2, 3 heated oxygen sensor (front).

(1) Disconnect cylinder 2, 3 heated oxygen sensor (front) connector B-36 and connect test harness special tool, MB991316, to the connector on the cylinder 2, 3 heated oxygen (front) sensor side.





(2) Measure the resistance between heated oxygen sensor connector terminal No. 1 (red clip) and terminal No. 3 (blue clip).

Standard value: 4.5 – 8.0 Ω [at 20°C (68°F)]

Q: Is the measured resistance between 4.5 and 8.0 ohms [at 20°C (68°F)]?

YES : Go to Step 2.

NO : Replace the cylinder 2, 3 heated oxygen sensor (front). Then go to Step 3.

STEP 2. Check the trouble symptoms.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 2 P.13A-9.

(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0052 set?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 3.

NO : It can be assumed 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.

STEP 3. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 2 P.13A-9.

(2) Check the diagnostic trouble code (DTC).

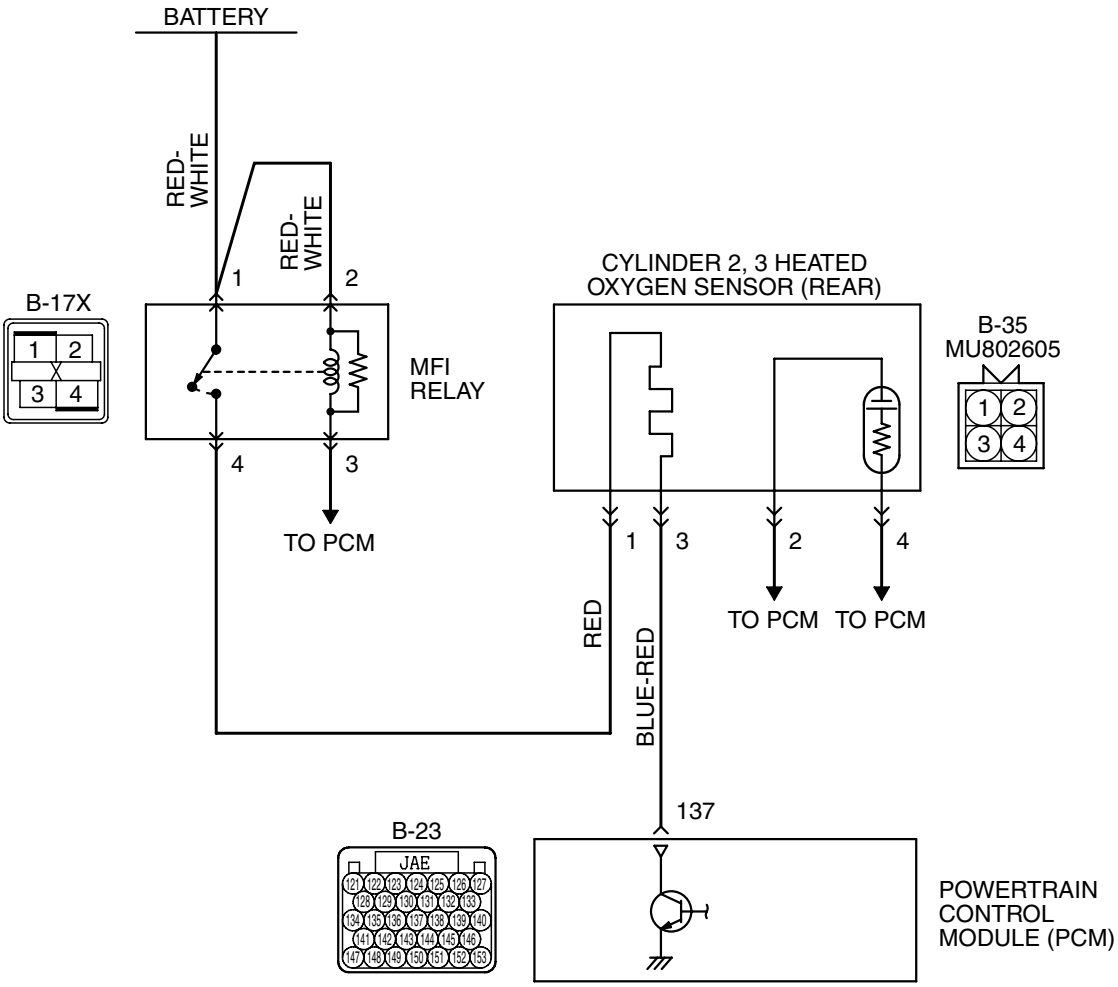
Q: Is DTC P0052 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0057: Cylinder 2, 3 Heated Oxygen Sensor Heater (rear) Control Circuit Low

Cylinder 2, 3 Heated Oxygen Sensor (rear) Heater Circuit



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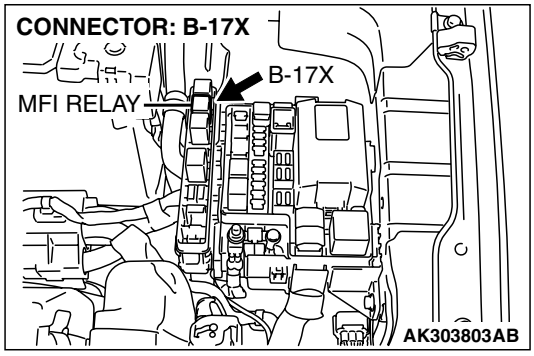
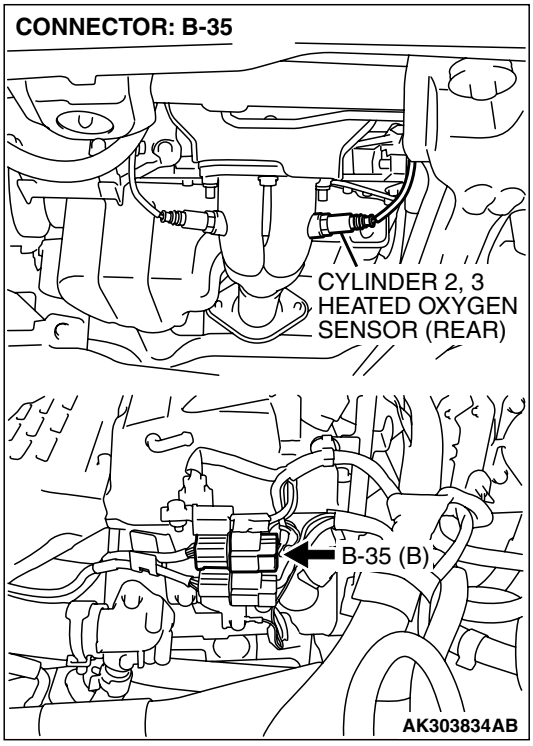
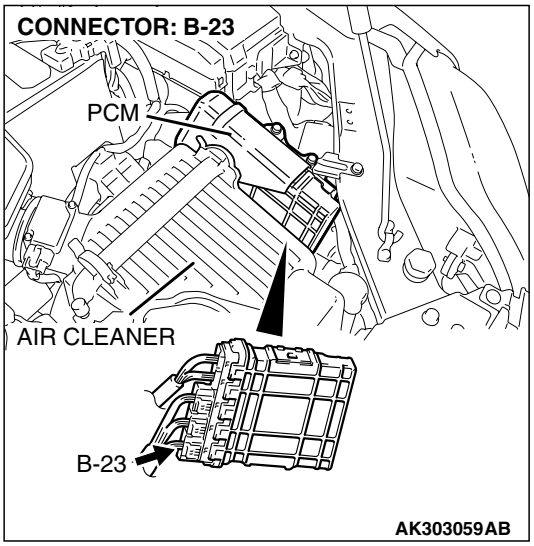


TSB Revision





CIRCUIT OPERATION

- Power is supplied from the MFI relay (terminal No. 4) to the cylinder 2, 3 heated oxygen sensor (rear) heater.
- The PCM (terminal No. 137) controls continuity to the cylinder 2, 3 heated oxygen sensor (rear) heater by turning the power transistor in the PCM "ON" and "OFF".

TECHNICAL DESCRIPTION

- The PCM checks whether the heater current is within a specified range when the heater is energized.
- The PCM checks whether the heater voltage is within a specified range when the heater is not energized.

DESCRIPTIONS OF MONITOR METHODS

Cylinder 2, 3 heated oxygen sensor heater (rear) current or voltage is out of specified range.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

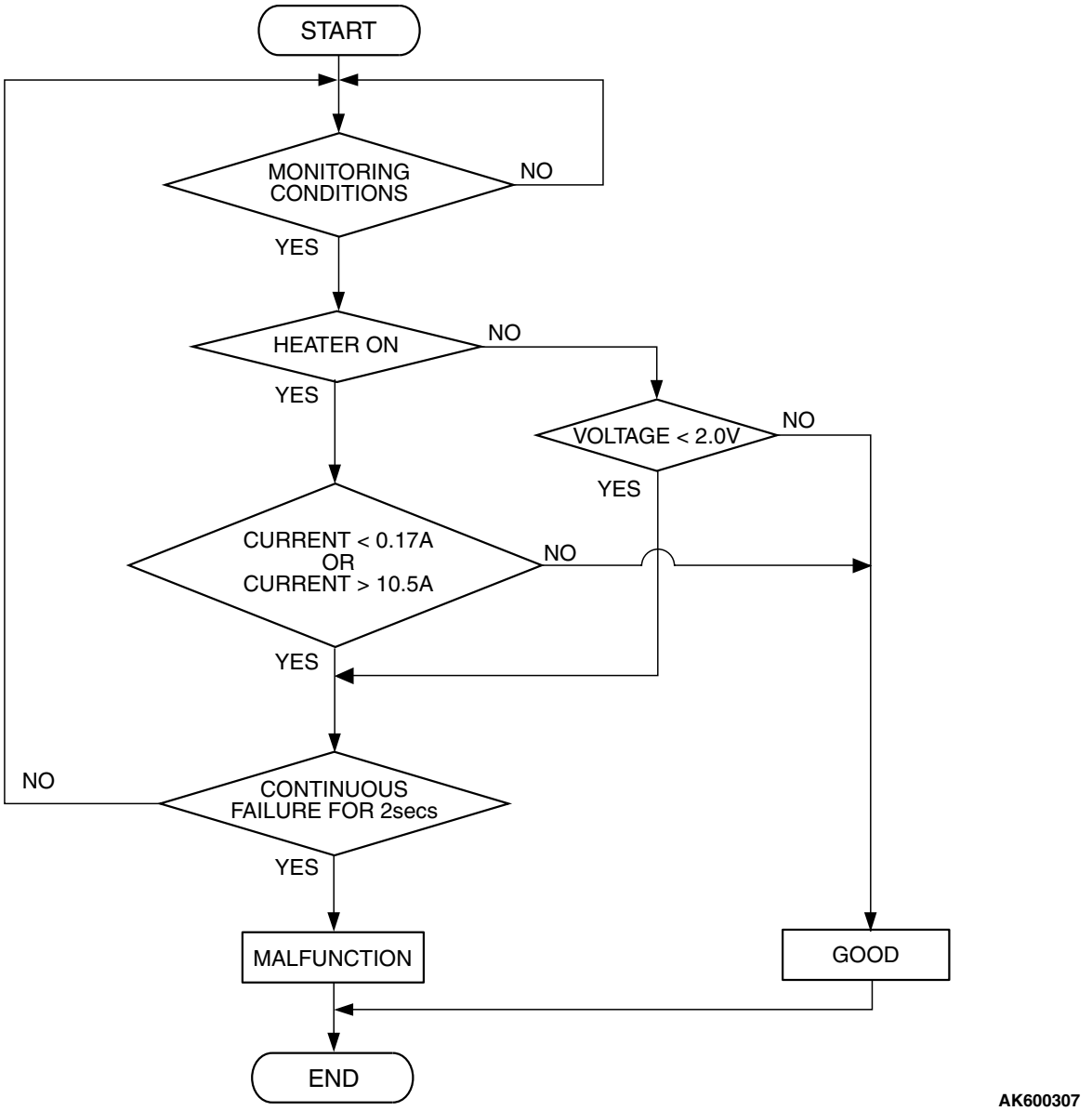
- Not applicable

Sensor (The sensor below is determined to be normal)

- Engine coolant temperature sensor

DTC SET CONDITIONS

Logic Flow Chart



Check Conditions

- More than 2 seconds have passed since the engine starting sequence was completed.
- While the cylinder 2, 3 heated oxygen sensor (rear) heater is on.
- Battery positive voltage is between 11 and 16.5 volts.

Judgement Criterion

- The cylinder 2, 3 heated oxygen sensor (rear) heater current has continued to be lower than 0.17 ampere for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 2 P.13A-9.

Check Conditions

- More than 2 seconds have passed since the engine starting sequence was completed.
- While the cylinder 2, 3 heated oxygen sensor (rear) heater is off.
- Battery positive voltage is between 11 and 16.5 volts.

Judgement Criterion

- The cylinder 2, 3 heated oxygen sensor (rear) heater voltage has continued to be lower than 2.0 volts for 2 seconds.

TSB Revision

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

- Open or shorted cylinder 2, 3 heated oxygen sensor (rear) heater circuit, or harness damage.
- Cylinder 2, 3 heated oxygen sensor (rear) heater failed.
- Connector damage failed.
- PCM failed.

DIAGNOSIS

Required Special Tools:

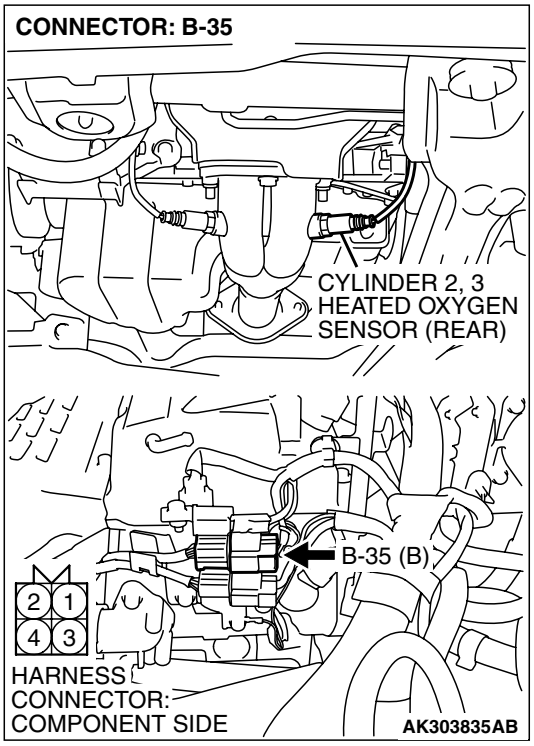
- MD998464: Test Harness
- MB991923: Power Plant ECU Check Harness

STEP 1. Check harness connector B-35 at the cylinder 2, 3 heated oxygen sensor (rear) for damage.

Q: Is the harness connector in good condition?

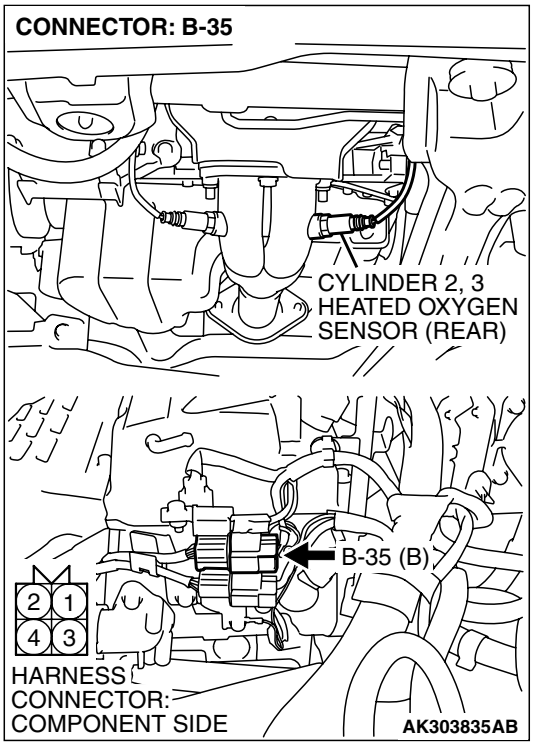
YES : Go to Step 2.

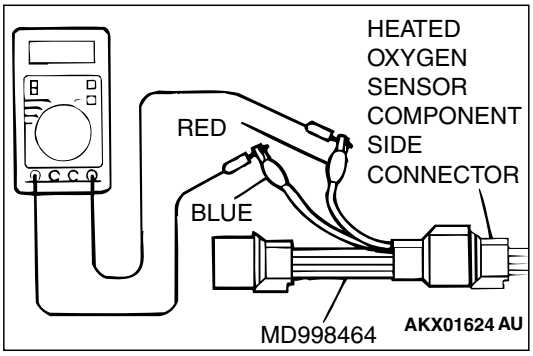
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.



STEP 2. Check the cylinder 2, 3 heated oxygen sensor (rear).

(1) Disconnect cylinder 2, 3 heated oxygen sensor (rear) connector B-35 and connect test harness special tool, MD998464, to the connector on the cylinder 2, 3 heated oxygen (rear) sensor side.





(2) Measure the resistance between heated oxygen sensor connector terminal No. 1 (red clip) and terminal No. 3 (blue clip).

Standard value: 11 – 18 Ω [at 20°C (68°F)]

Q: Is the measured resistance between 11 and 18 ohms [at 20°C (68°F)]?

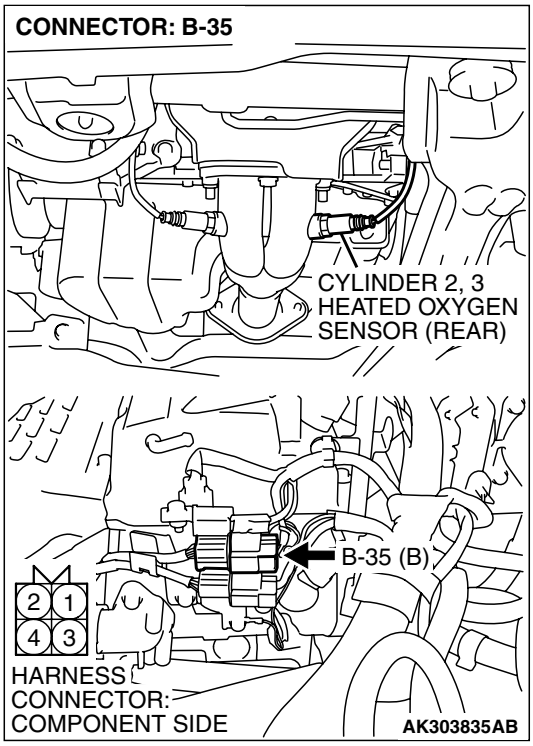
YES : Go to Step 3.

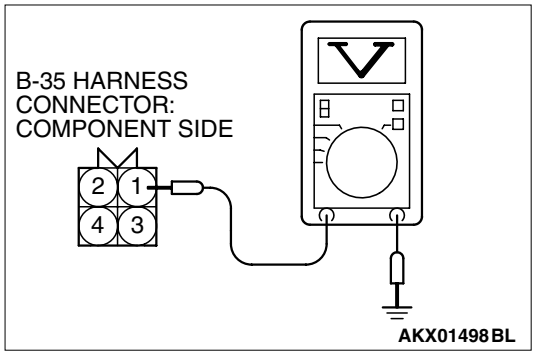
NO : Replace the cylinder 2, 3 heated oxygen sensor (rear). Then go to Step 12.

STEP 3. Measure the power supply voltage at cylinder 2, 3 heated oxygen sensor (rear) harness side connector B-35.

(1) Disconnect the connector B-35 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.

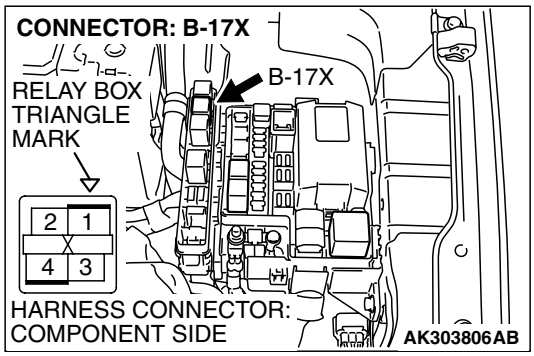
NO : Go to Step 4.

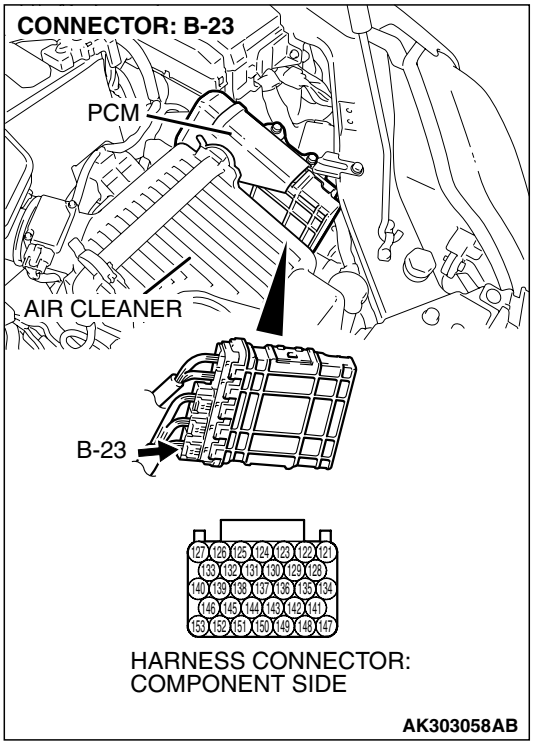
STEP 4. Check harness connector B-17X at the MFI relay for damage.

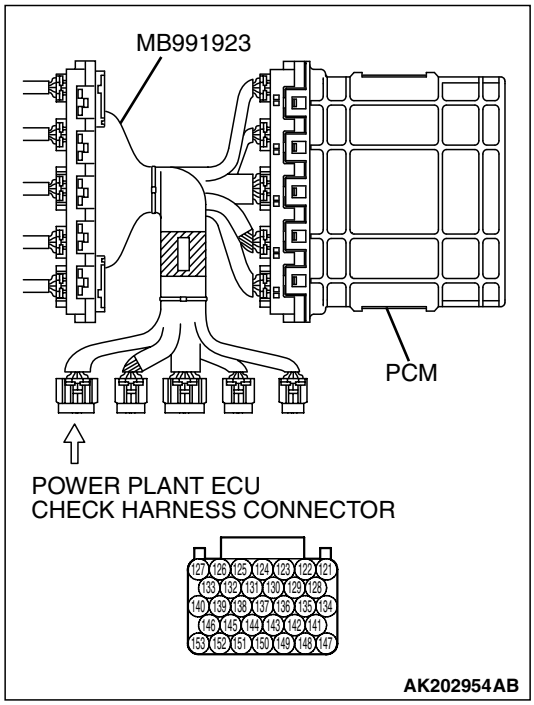
Q: Is the harness connector in good condition?

YES : Repair harness wire between MFI relay connector B-17X (terminal No. 4) and cylinder 2, 3 heated oxygen sensor (rear) connector B-35 (terminal No. 1) because of open circuit or short circuit to ground. Then go to Step 12.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.



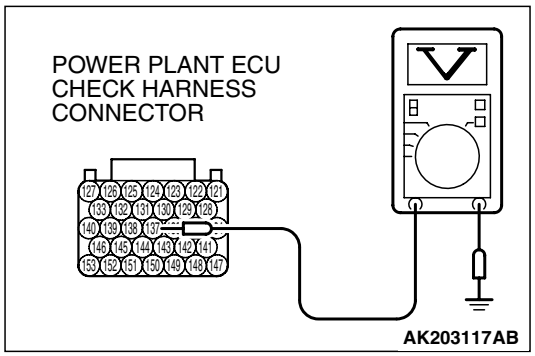




STEP 5. Measure the power supply voltage at PCM connector B-23 by using power plant ECU check harness special tool MB991923.

(1) Disconnect all PCM connectors. Connect the power plant ECU check harness special tool MB991923 between the separated connectors.

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



(3) Measure the voltage between terminal No. 137 and ground.
- Voltage should be battery positive voltage.

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

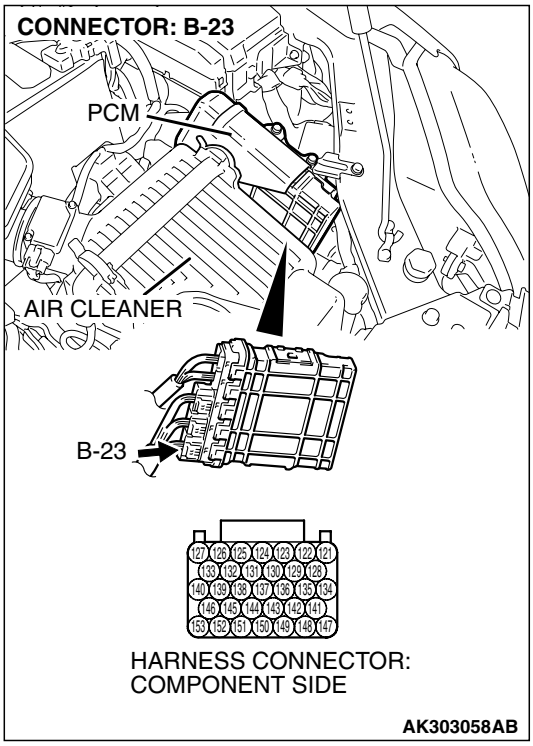
Q: Is battery positive voltage (approximately 12 volts) present?

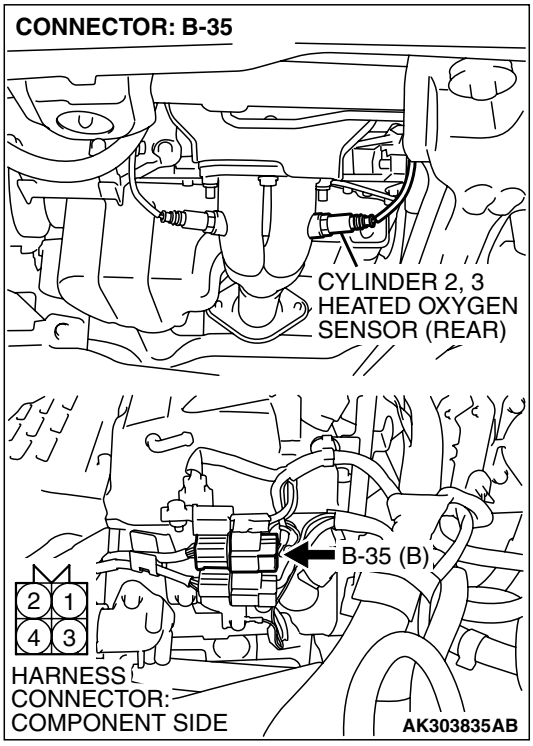
YES : Go to Step 8.
NO : Go to Step 6.

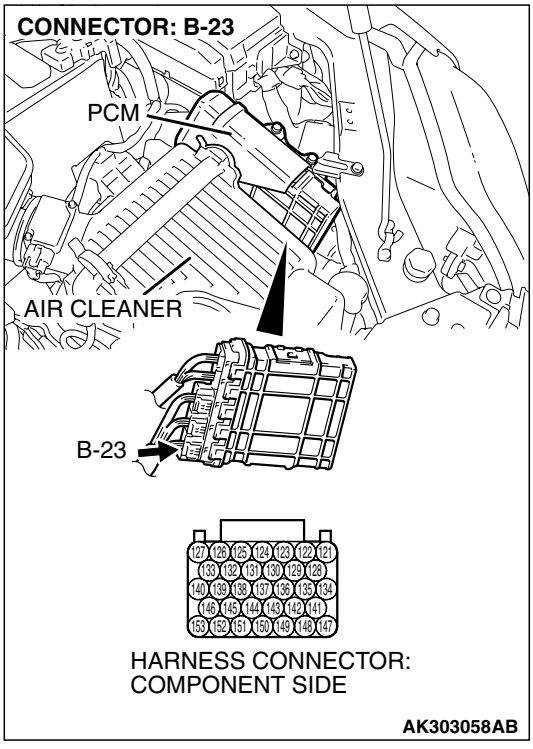
STEP 6. Check harness connector B-23 at PCM for damage.

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 go to Step 12.





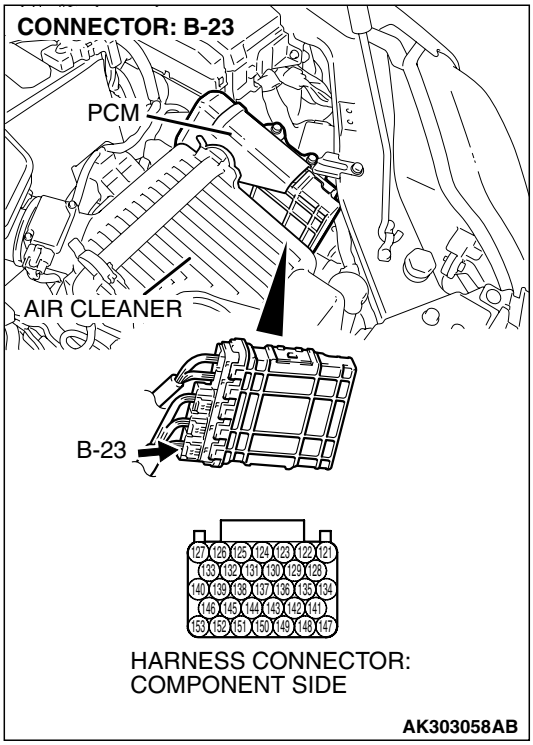


STEP 7. Check for open circuit or short circuit to ground between cylinder 2, 3 heated oxygen sensor (rear) connector B-35 (terminal No. 3) and PCM connector B-23 (terminal No. 137).

Q: Is the harness wire in good condition?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 12.

NO : Repair it. Then go to Step 12.

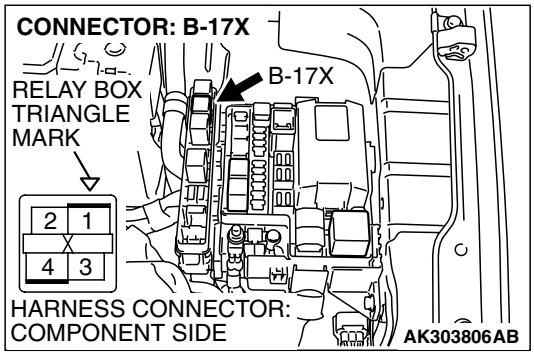


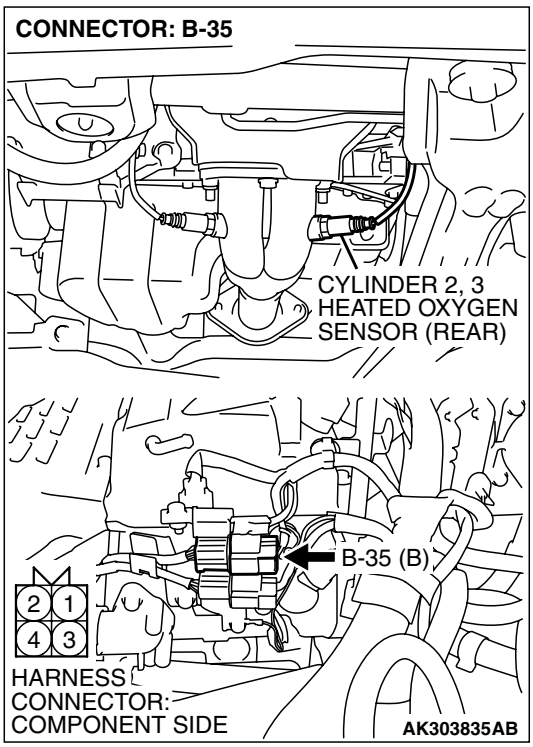
STEP 8. Check harness connector B-23 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 9.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.





STEP 9. Check for harness damage between MFI relay connector B-17X (terminal No. 4) and cylinder 2, 3 heated oxygen sensor (rear) connector B-35 (terminal No. 1).

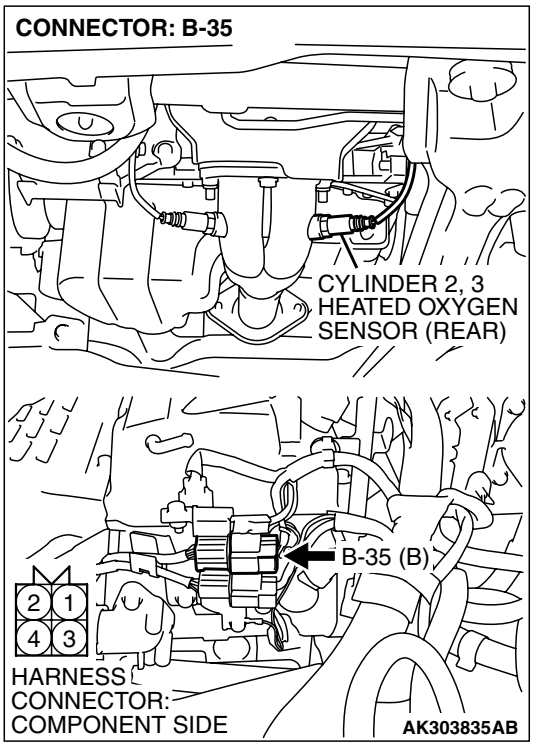
Q: Is the harness wire in good condition?

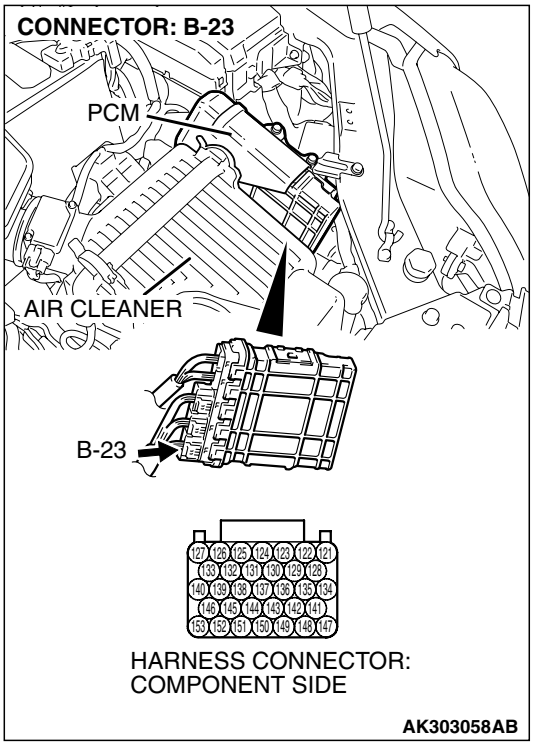
YES : Go to Step 10.

NO : Repair it. Then go to Step 12.

STEP 10. Check for harness damage between cylinder 2, 3 heated oxygen sensor (rear) connector B-35 (terminal No. 3) and PCM connector B-23 (terminal No. 137).
Q: Is the harness wire in good condition?

YES : Go to Step 11.
NO : Repair it. Then go to Step 12.





STEP 11. Check the trouble symptoms.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 2 P.13A-9.

(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0057 set?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 12.

NO : It can be assumed 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.

STEP 12. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 2 P.13A-9.

(2) Check the diagnostic trouble code (DTC).

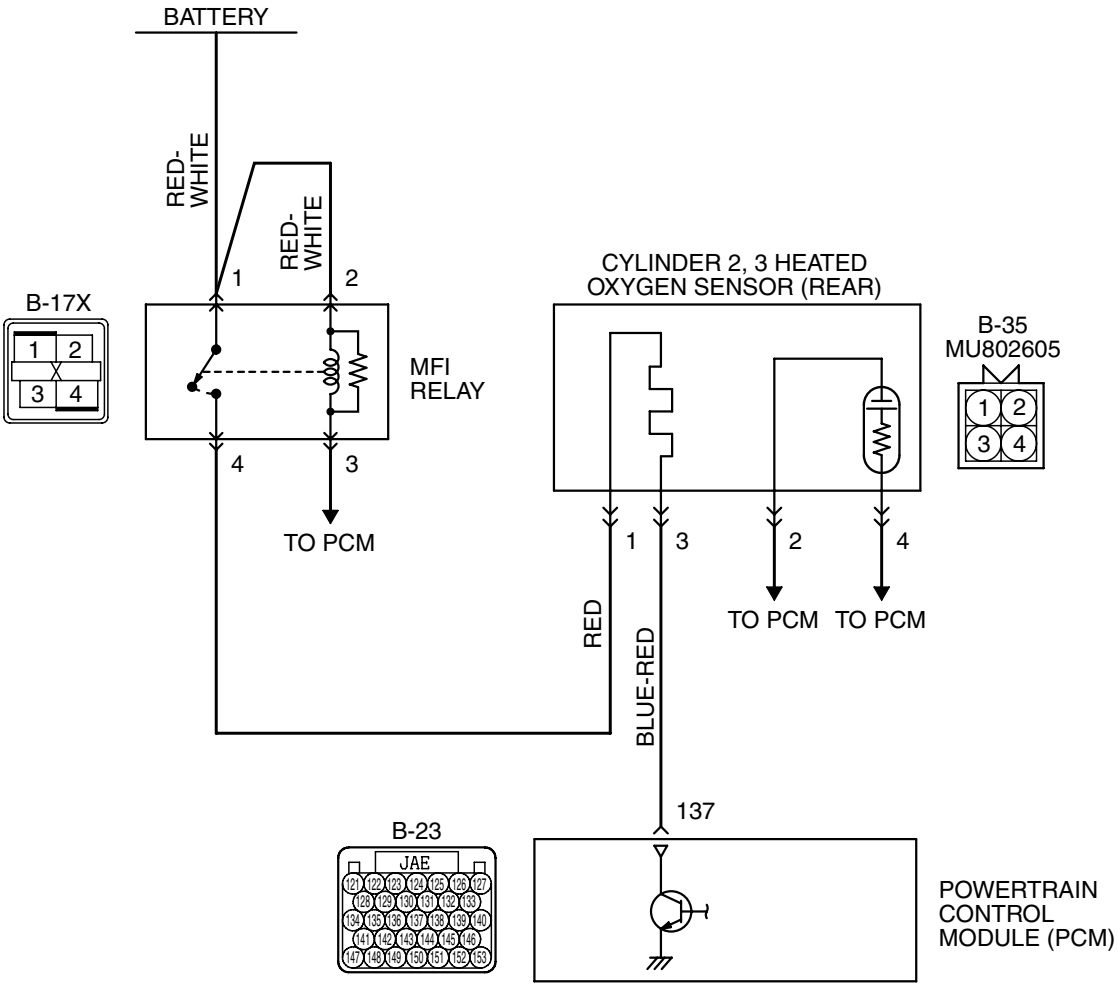
Q: Is DTC P0057 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0058: Cylinder 2, 3 Heated Oxygen Sensor Heater (rear) Control Circuit High

Cylinder 2, 3 Heated Oxygen Sensor (rear) Heater Circuit



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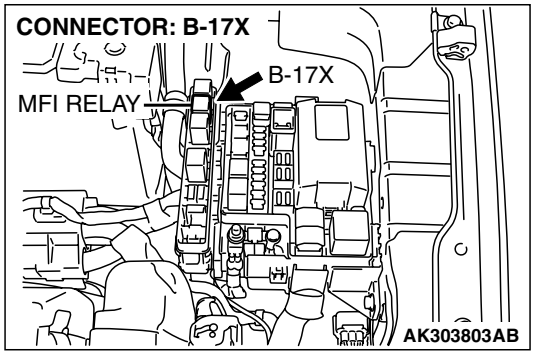

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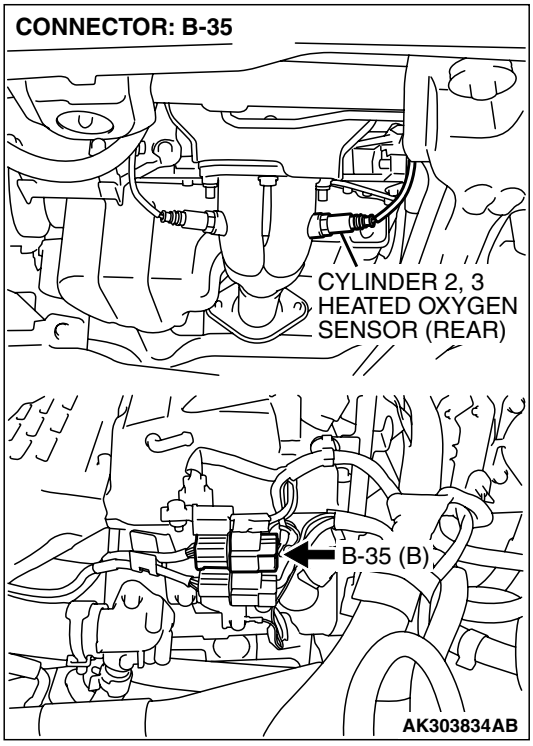

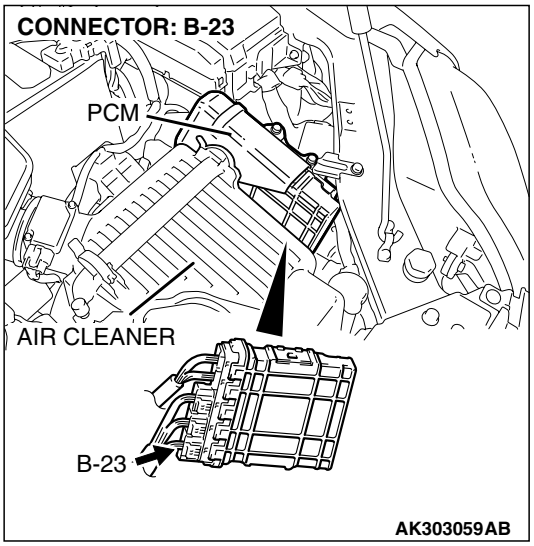

CIRCUIT OPERATION

- Power is supplied from the MFI relay (terminal No. 4) to the cylinder 2, 3 heated oxygen sensor (rear) heater.
- The PCM (terminal No. 137) controls continuity to the cylinder 2, 3 heated oxygen sensor (rear) heater by turning the power transistor in the PCM "ON" and "OFF".

TECHNICAL DESCRIPTION

- The PCM checks whether the heater current is within a specified range when the heater is energized.

DESCRIPTIONS OF MONITOR METHODS

Cylinder 2, 3 heated oxygen sensor heater (rear) current is out of specified range.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

- Not applicable

Sensor (The sensor below is determined to be normal)

- Engine coolant temperature sensor

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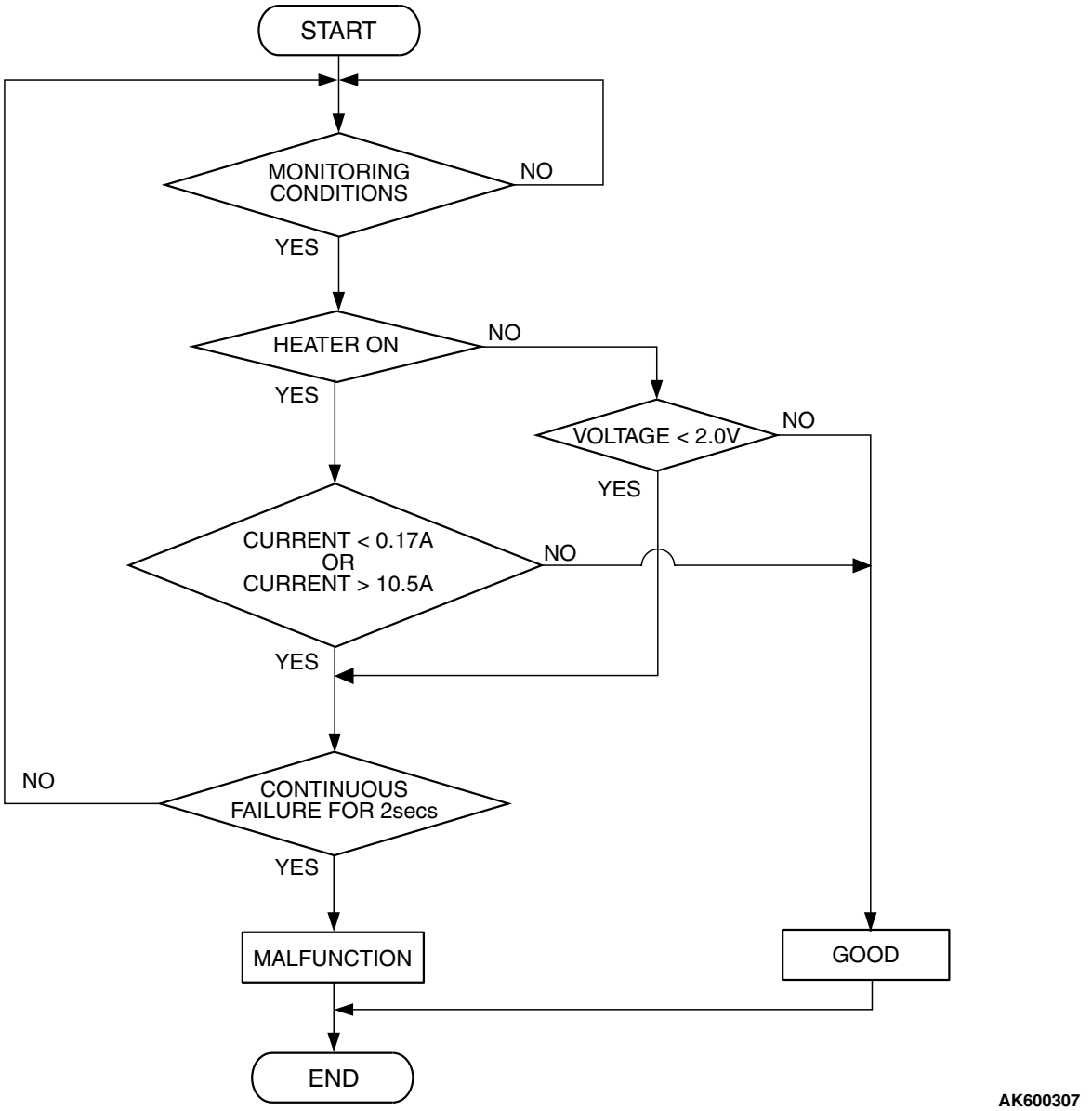
DTC SET CONDITIONS

Logic Flow Chart



Check Conditions

- More than 2 seconds have passed since the engine starting sequence was completed.
- While the cylinder 2, 3 heated oxygen sensor (rear) heater is on.
- Battery positive voltage is between 11 and 16.5 volts.

Judgement Criterion

- The cylinder 2, 3 heated oxygen sensor (rear) heater current has continued to be higher than 10.5 ampere for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 2 P.13A-9.

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

- Connector damage.
- Cylinder 2, 3 heated oxygen sensor (rear) failed.
- PCM failed.

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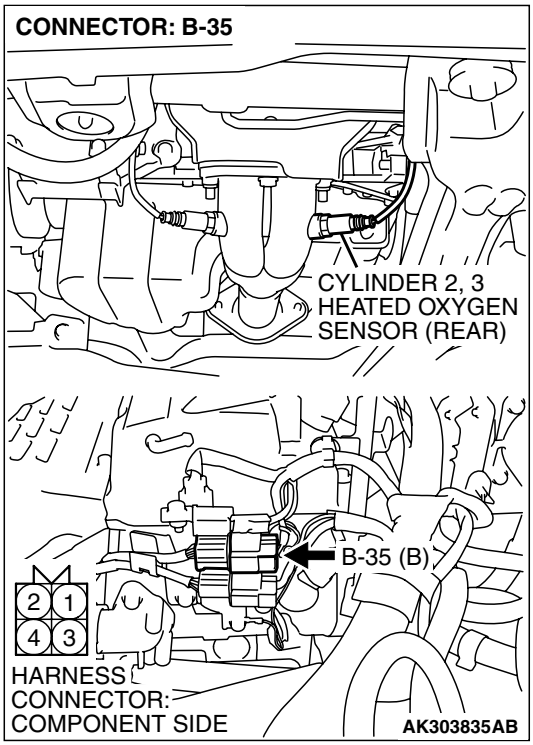
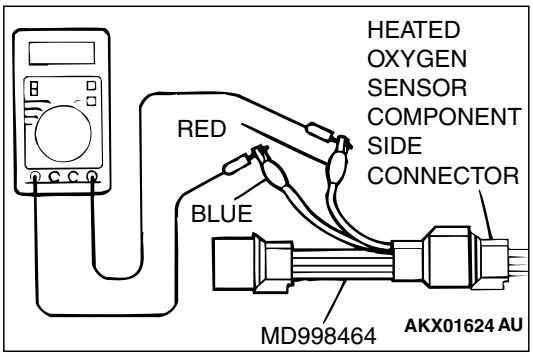
DIAGNOSIS

Required Special Tool:
- MD998464: Test Harness

STEP 1. Check the cylinder 2, 3 heated oxygen sensor (rear).

(1) Disconnect cylinder 2, 3 heated oxygen sensor (rear) connector B-35 and connect test harness special tool, MD998464, to the connector on the cylinder 2, 3 heated oxygen (rear) sensor side.





(2) Measure the resistance between heated oxygen sensor connector terminal No. 1 (red clip) and terminal No. 3 (blue clip).

Standard value: 11 – 18 Ω [at 20°C (68°F)]

Q: Is the measured resistance between 11 and 18 ohms [at 20°C (68°F)]?

YES : Go to Step 2.

NO : Replace the cylinder 2, 3 heated oxygen sensor (rear). Then go to Step 3.

STEP 2. Check the trouble symptoms.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 2 P.13A-9.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0058 set?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 3.
NO : It can be assumed 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.

STEP 3. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 2 P.13A-9.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0058 set?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0069: Abnormal Correlation Between Manifold Absolute Pressure Sensor And Barometric Pressure Sensor

TECHNICAL DESCRIPTION

- The PCM detects abnormality in the sensor by comparing the manifold absolute pressure sensor output with the barometric pressure sensor output.

DESCRIPTIONS OF MONITOR METHODS

The PCM compares the manifold absolute pressure sensor output with the barometric pressure sensor output while the engine control relay is in "ON" position after the ignition switch is in "LOCK" (OFF) position. When the difference exceeds the specified value between them, the PCM determines whether the manifold absolute pressure sensor / the barometric pressure sensor has malfunction or not.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

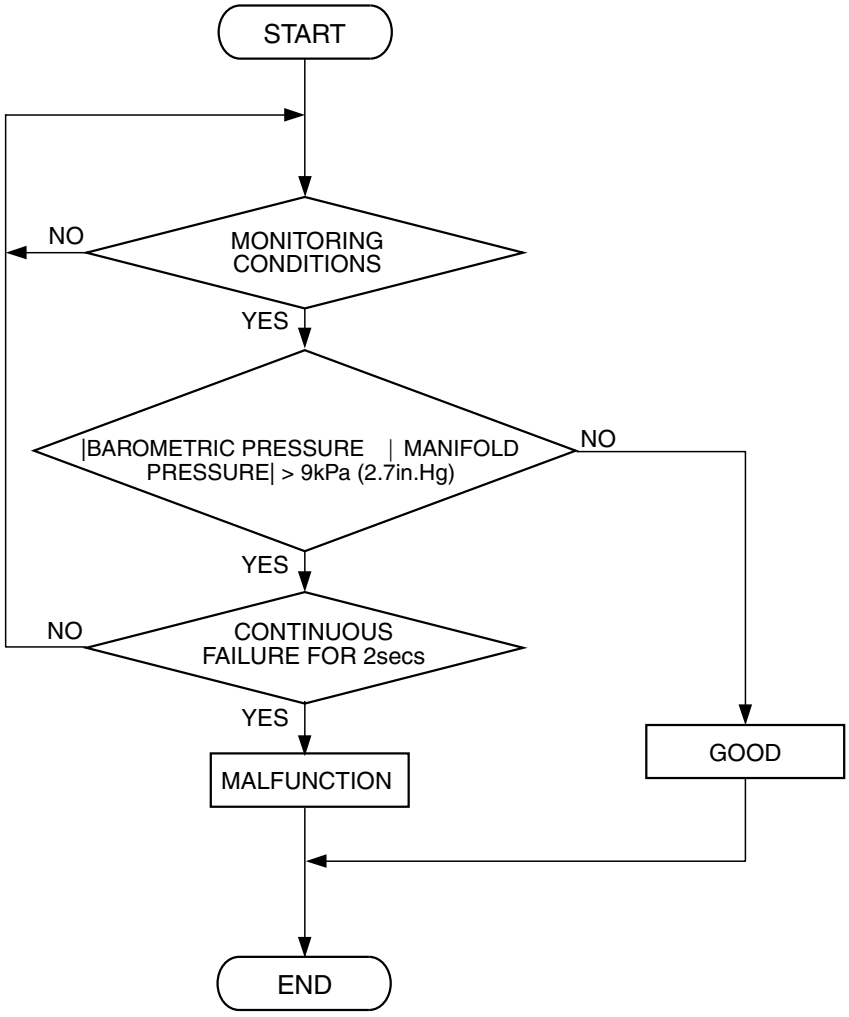
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



Check Conditions

- Ignition switch is in "LOCK" (OFF) position.
- After 2 seconds pass from the time when the engine is stopped.
- Engine coolant temperature is higher than 0°C (32°F).

Judgement Criterion

- Difference between manifold absolute pressure sensor output and barometric pressure sensor output is more than 9 kPa (2.7 in.Hg) for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

None.

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

- Manifold absolute pressure sensor failed.
- Barometric pressure sensor failed.
- PCM failed.

TSB Revision

DIAGNOSIS

Required Special Tools

- MB991958: Scan tool (M.U.T.-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).

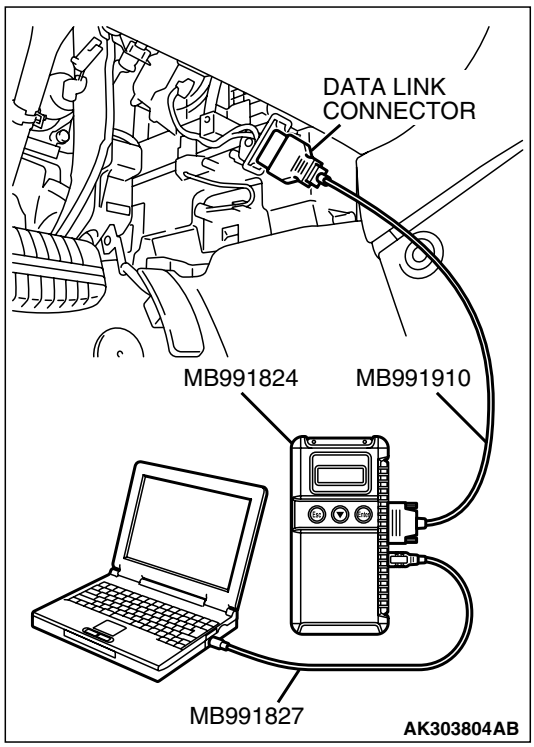
⚠ CAUTION

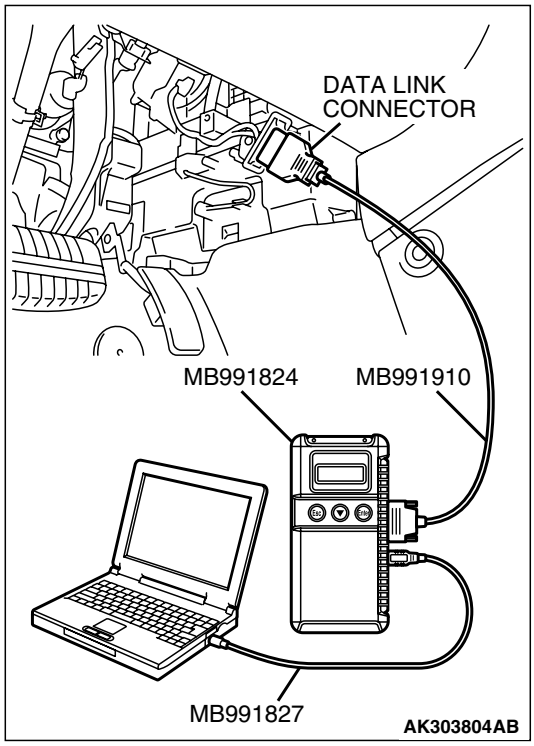
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

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

Q: Is the diagnostic trouble code other than P0069 set?

YES : Refer to, Diagnostic Trouble Code Chart P.13A-45.
NO : Go to Step 2.





STEP 2. Using scan tool MB991958, check data list item 8: Manifold Absolute Pressure Sensor.

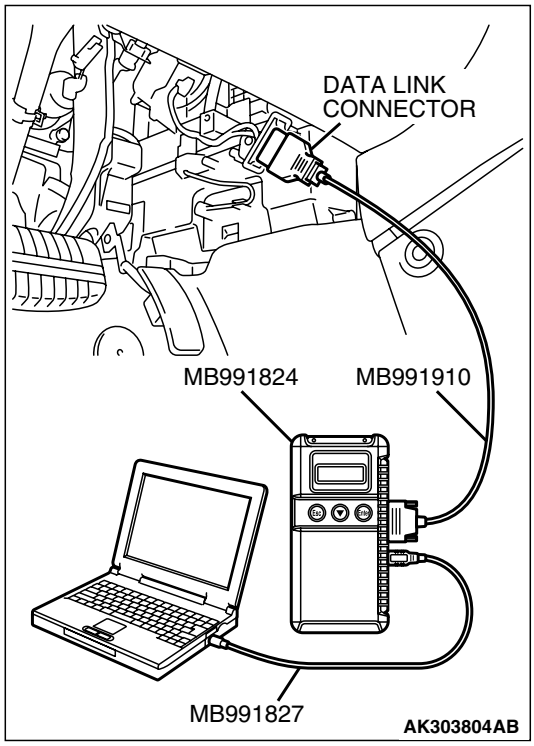
(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool MB991958 to the data reading mode for item 8, Manifold Absolute Pressure Sensor.
- When altitude is 0 m (0 foot), 101 kPa (29.8 in.Hg).
- When altitude is 600 m (1,969 feet), 95 kPa (28.1 in.Hg).
- When altitude is 1,200 m (3,937 feet), 88 kPa (26.0 in.Hg).
- When altitude is 1,800 m (5,906 feet), 81 kPa (23.9 in.Hg).

(3) Start the engine.
- When the engine is idling, 16 – 36 kPa (4.7 – 10.6 in.Hg).
- When the engine is suddenly revved, manifold absolute pressure varies.

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

Q: Is the sensor operating properly?

YES : Go to Step 3.
NO : Refer to, DTC P0106 – Manifold Absolute Pressure Circuit Range/Performance Problem P.13A-130, DTC P0107 – Manifold Absolute Pressure Circuit Low Input P.13A-139, DTC P0108 – Manifold Absolute Pressure Circuit High Input P.13A-149.

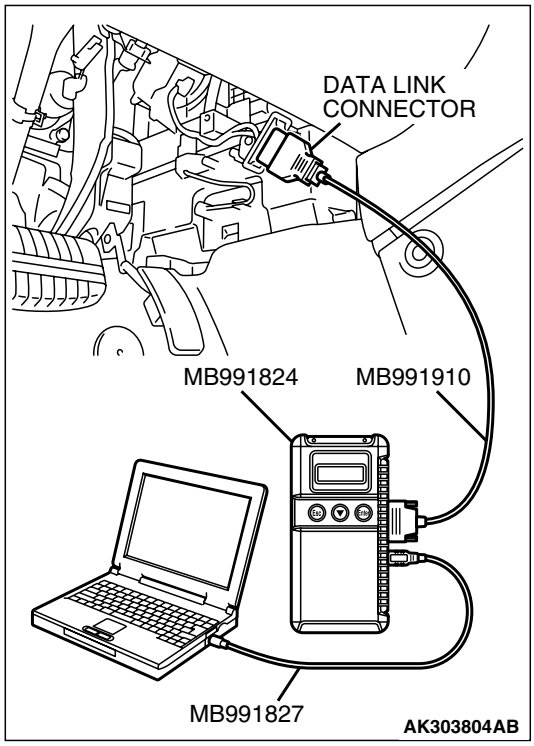


STEP 3. Using scan tool MB991958, read the diagnostic trouble code (DTC).

(1) Turn the ignition switch to the "ON" position.
(2) Erase the DTC.
(3) Start the engine.
(4) Turn the ignition switch to "LOCK" (OFF) position and then wait 2 seconds.
(5) Turn the ignition switch to the "ON" position.
(6) Set scan tool MB991958, read the DTC.
(7) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC P0069 set?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 4.
NO : It can be assumed 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.



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

(1) Turn the ignition switch to the "ON" position.
(2) Erase the DTC.
(3) Start the engine.
(4) Turn the ignition switch to "LOCK" (OFF) position and then wait 2 seconds.
(5) Turn the ignition switch to the "ON" position.
(6) Set scan tool MB991958, read the DTC.
(7) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC P0069 set?

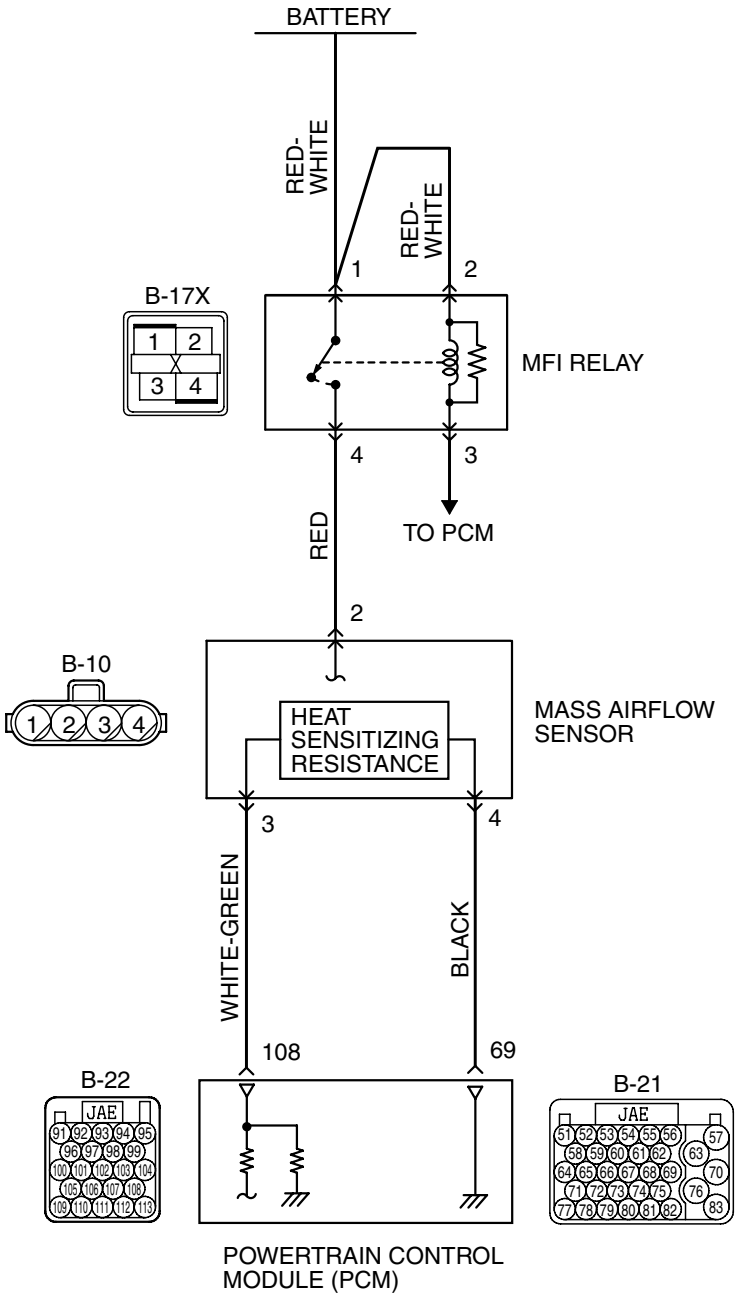
YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0101: Mass Airflow Circuit Range/Performance Problem

⚠ CAUTION

If DTC P0101 has been set, TCL related DTC U1120 is also set. After P0101 has been diagnosed, don't forget to erase DTC U1120.

Mass Airflow Sensor Circuit



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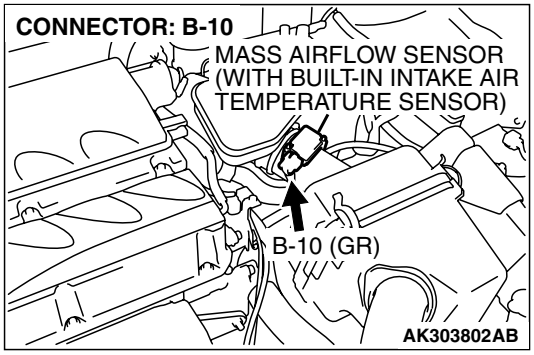
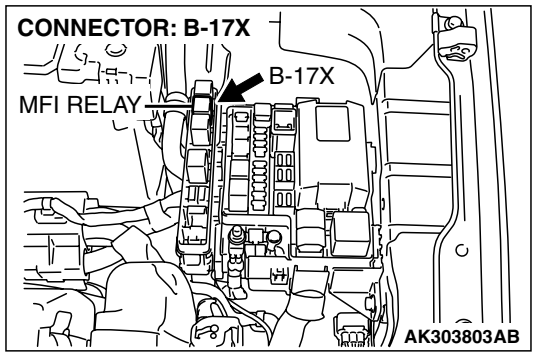
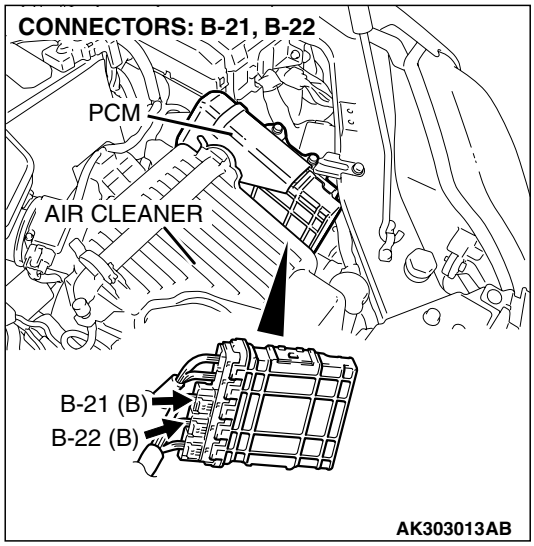






CIRCUIT OPERATION

- The mass airflow sensor power is supplied from the MFI relay (terminal No. 4), and the ground is provided on the PCM (terminal No. 69).
- A voltage that is according to the mass airflow rate is sent to the PCM (terminal No. 108) from the mass airflow sensor output terminal (terminal No. 3).

TECHNICAL DESCRIPTION

- While the engine is running, the mass airflow sensor outputs voltage which corresponds to the mass airflow rate.
- The PCM checks whether the voltage output by the mass airflow sensor while the engine is running is within a specified range.

DESCRIPTIONS OF MONITOR METHODS

Compare load value with mass airflow sensor output voltage.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

- Not applicable

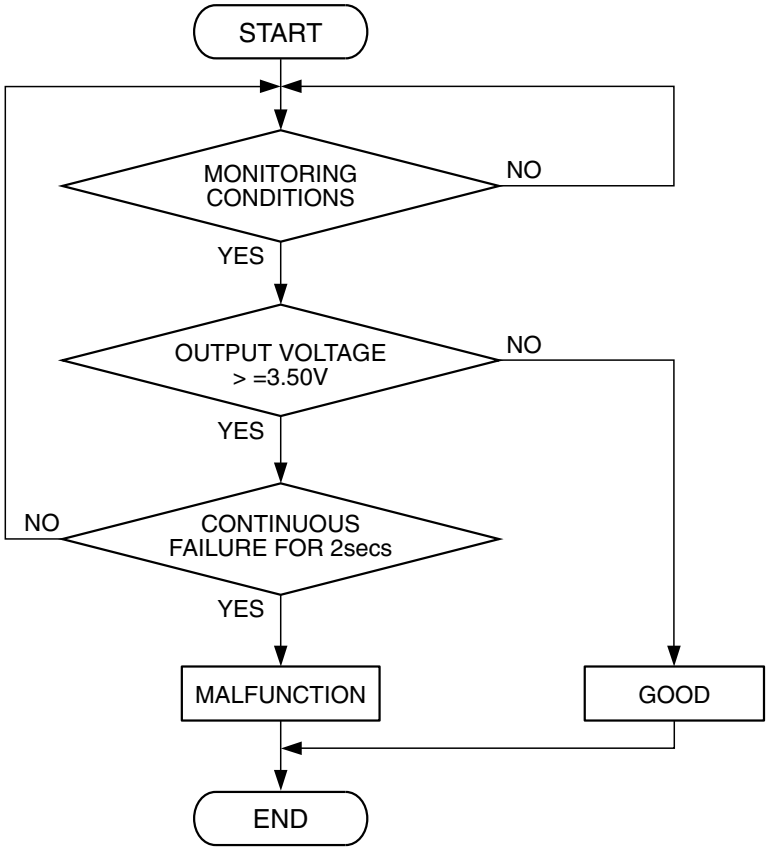
Sensor (The sensor below is determined to be normal)

- Throttle position sensor

TSB Revision

DTC SET CONDITIONS <Range/Performance problem – high>

Logic Flow Chart



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Check Conditions

- Throttle position sensor output voltage is 1.0 volt or lower.
- Mass airflow sensor output voltage is 4.9 volts or lower.

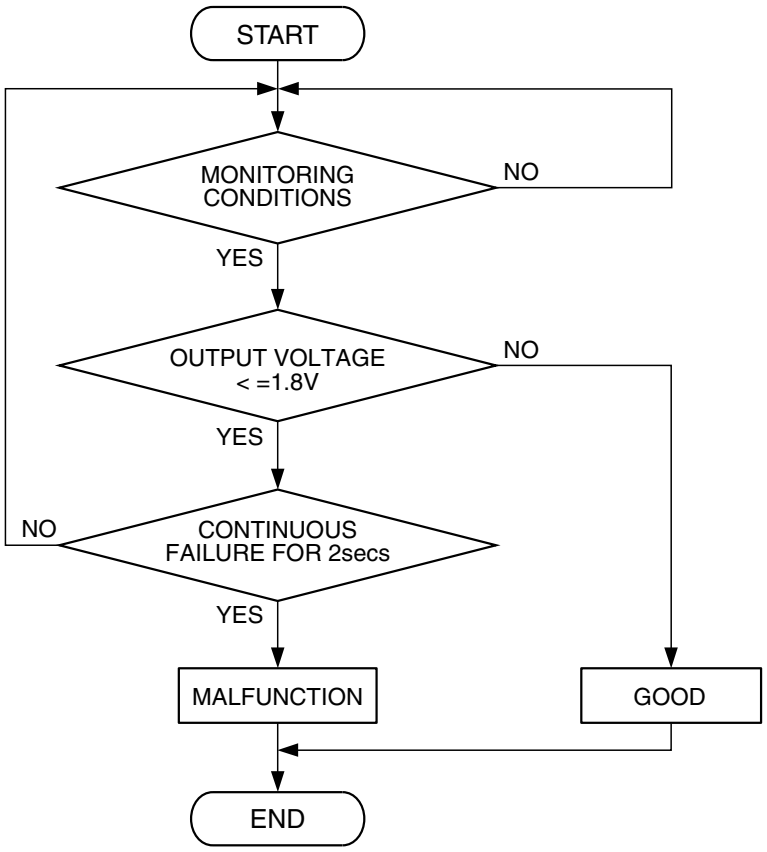
Judgement Criterion

- Mass airflow sensor output voltage has continued to be 3.5 volts or higher for 2 seconds.

TSB Revision

DTC SET CONDITIONS <Range/Performance problem – low >

Logic Flow Chart



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Check Conditions

- Throttle position sensor output voltage is 1.5 volts or higher.
- Mass airflow sensor output voltage is 0.2 volt or higher.

Judgement Criterion

- Mass airflow sensor output voltage has continued to be 1.8 volts or lower for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 7 P.13A-9.

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

- Mass airflow sensor failed.
- Mass airflow sensor circuit harness damage, or connector damage.
- PCM failed.

DIAGNOSIS

Required Special Tools:

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

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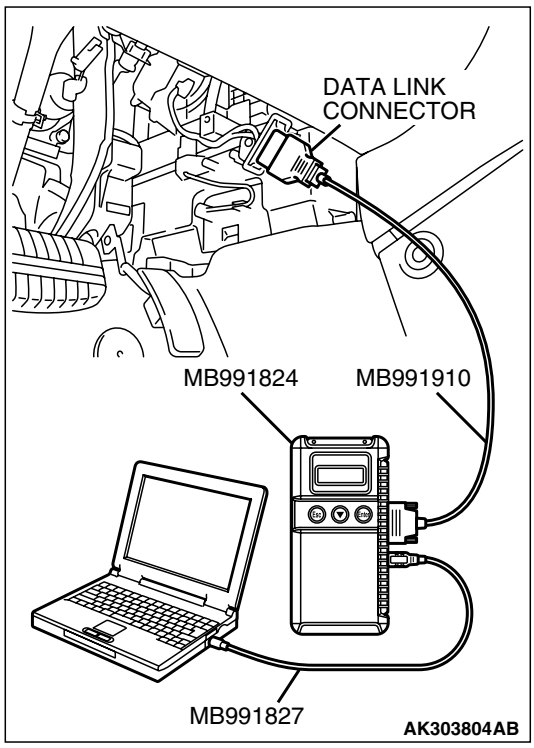


STEP 1. Using scan tool MB991958, check data list item 10: Mass Airflow Sensor.

⚠ 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.

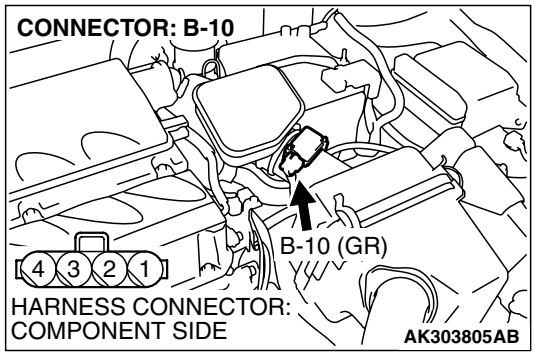
(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991958 to the data reading mode for item 10, Mass Airflow Sensor.
(4) Warm up the engine to normal operating temperature: 80°C to 95°C (176°F to 203°F).
- The standard value during idling should be between 1,300 and 1,620 millivolts.
- When the engine is revved, the mass airflow rate should increase according to the increase in engine speed.

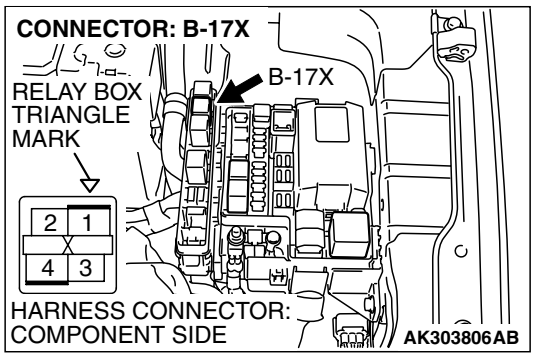
(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed 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 B-10 at mass airflow sensor and harness connector B-17X at MFI relay 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 go to Step 9.

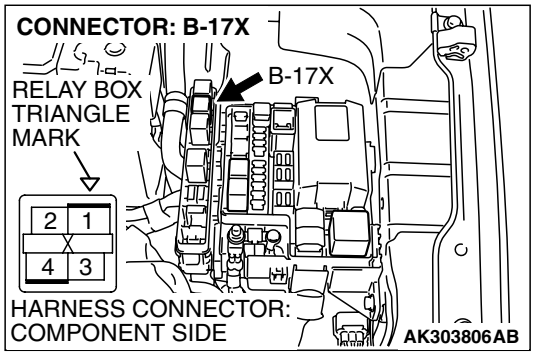
TSB Revision

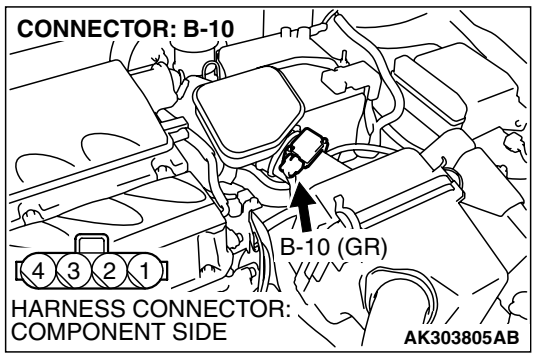
STEP 3. Check for harness damage between MFI relay connector B-17X (terminal No. 4) and mass airflow sensor connector B-10 (terminal No. 2).

Q: Is the harness wire in good condition?

YES : Go to Step 4.

NO : Repair it. Then go to Step 9.



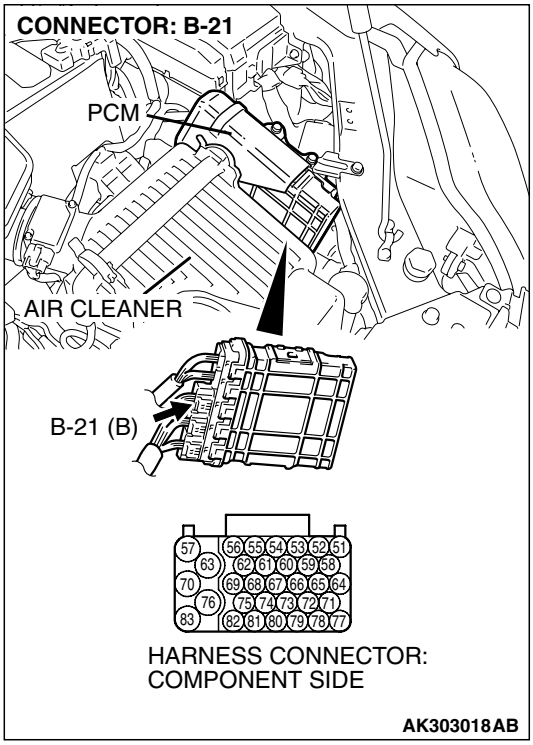


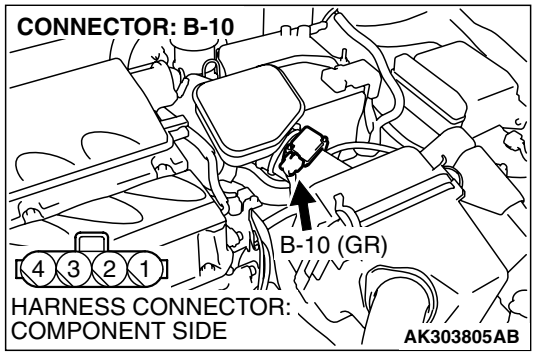
STEP 4. Check harness connector B-21 at PCM for damage.

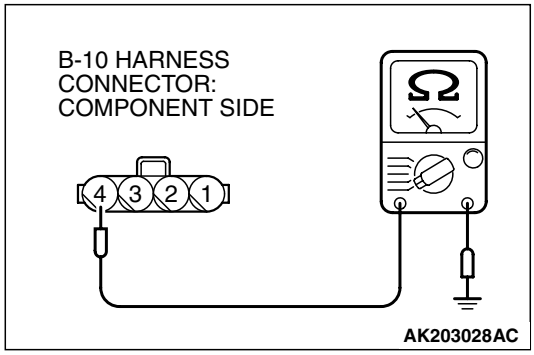
Q: Is the harness connector in good condition?

YES : Go to Step 5.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 9.







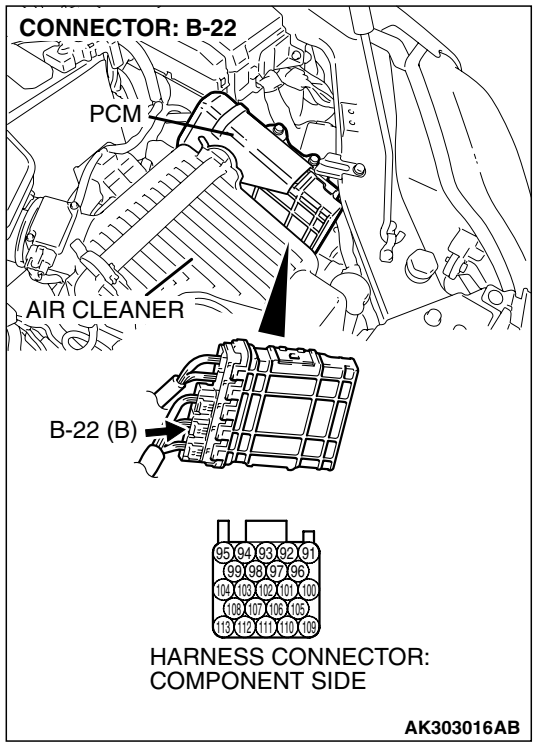
STEP 5. Check the continuity at mass airflow sensor harness side connector B-10.

(1) Disconnect the connector B-10 and measure at the harness side.
(2) Check for the continuity between terminal No. 4 and ground.
- Continuity (2 Ω or less)

Q: Does continuity exist?

YES : Go to Step 6.

NO : Repair harness wire between mass airflow sensor connector B-10 (terminal No. 4) and PCM connector B-21 (terminal No. 69) because of harness damage. Then go to Step 9.



STEP 6. Check harness connector B-22 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 7.

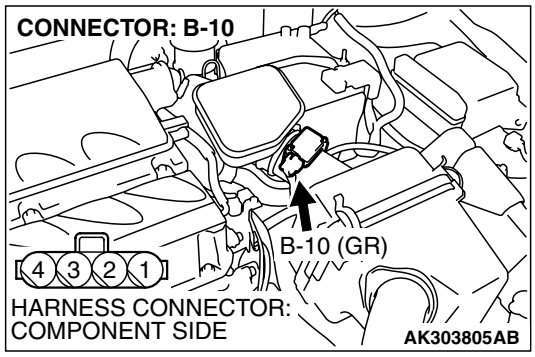
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 9.

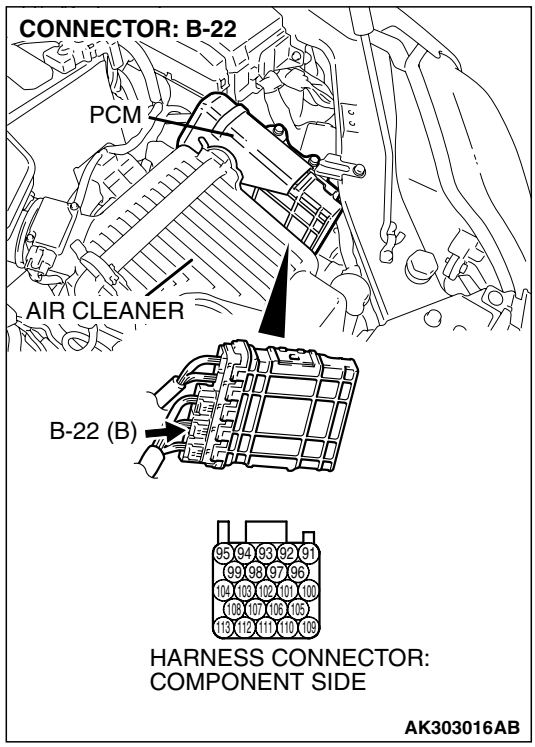
STEP 7. Check for harness damage between mass airflow sensor connector B-10 (terminal No. 3) and PCM connector B-22 (terminal No. 108).

Q: Is the harness wire in good condition?

YES : Go to Step 8.

NO : Repair it. Then go to Step 9.





STEP 8. Replace the mass airflow sensor.

(1) Replace the mass airflow sensor.

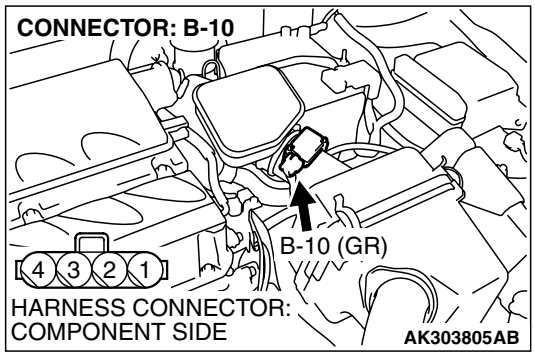
(2) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 7 P.13A-9.

(3) Check the diagnostic trouble code (DTC).

Q: Is DTC P0101 set?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 9.

NO : The inspection is complete.



STEP 9. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 7 P.13A-9.

(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0101 set?

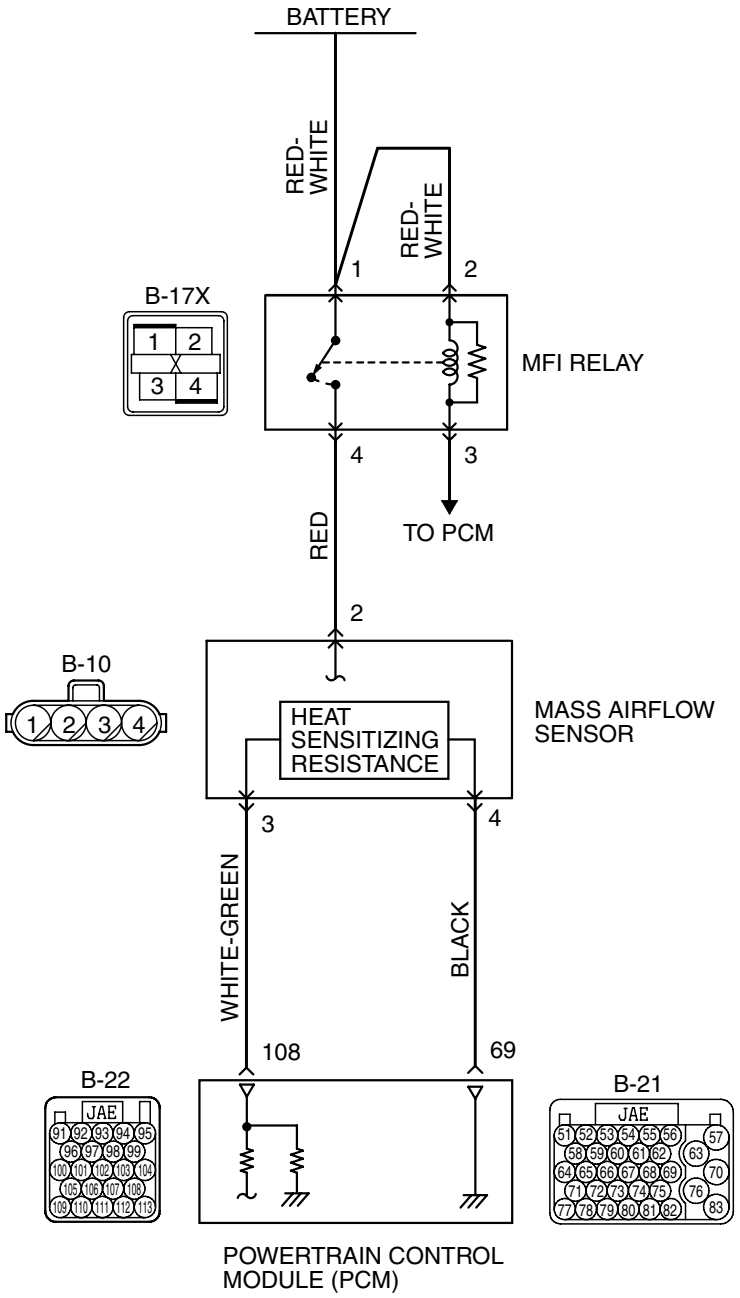
YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0102: Mass Airflow Circuit Low Input

⚠ CAUTION
If DTC P0102 has been set, TCL related DTC U1120 is also set. After P0102 has been diagnosed, don't forget to erase DTC U1120.

Mass Airflow Sensor Circuit



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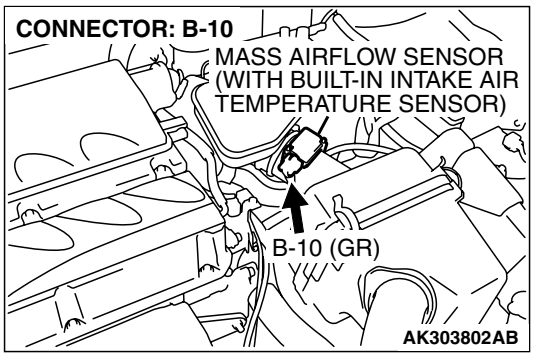
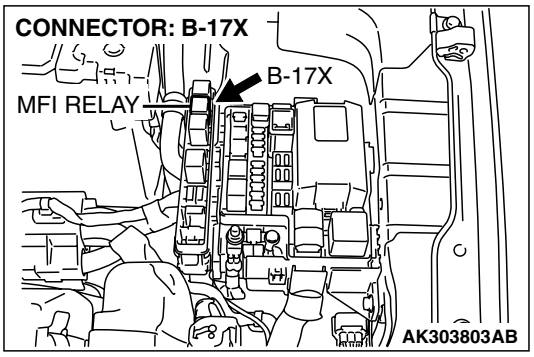
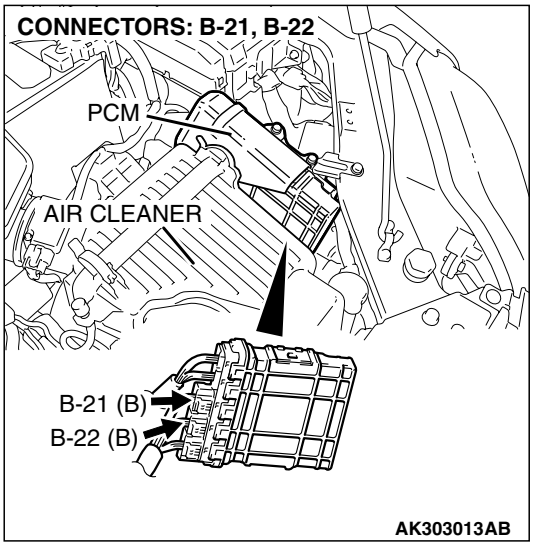






CIRCUIT OPERATION

- The mass airflow sensor power is supplied from the MFI relay (terminal No. 4), and the ground is provided on the PCM (terminal No. 69).
- A voltage that is according to the mass airflow rate is sent to the PCM (terminal No. 108) from the mass airflow sensor output terminal (terminal No. 3).

TECHNICAL DESCRIPTION

- While the engine is running, the mass airflow sensor outputs voltage which corresponds to the mass airflow rate.
- The PCM checks whether the voltage output by the mass airflow sensor while the engine is running is within a specified range.

DESCRIPTIONS OF MONITOR METHODS

Mass airflow sensor output voltage is out of specified range.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

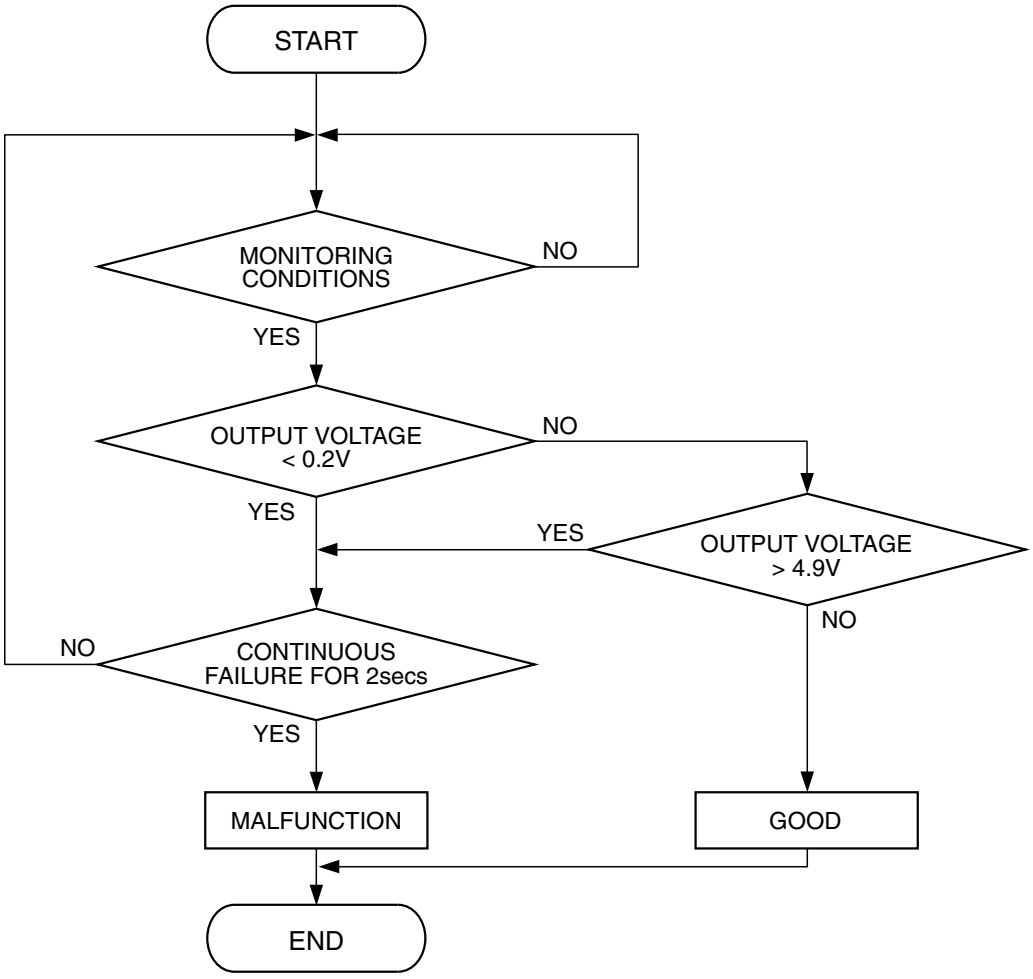
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



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Check Condition

- 3 seconds or more have passed since the ignition switch was turned to "ON" position.

Judgement Criterion

- Mass airflow sensor output voltage has continued to be lower than 0.2 volt for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 24 P.13A-9.

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

- Mass airflow sensor failed.
- Open or shorted mass airflow sensor circuit, or connector damage.
- PCM failed.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable

TSB Revision

- MB991910: Main Harness A
- MB991923: Power Plant ECU Check Harness

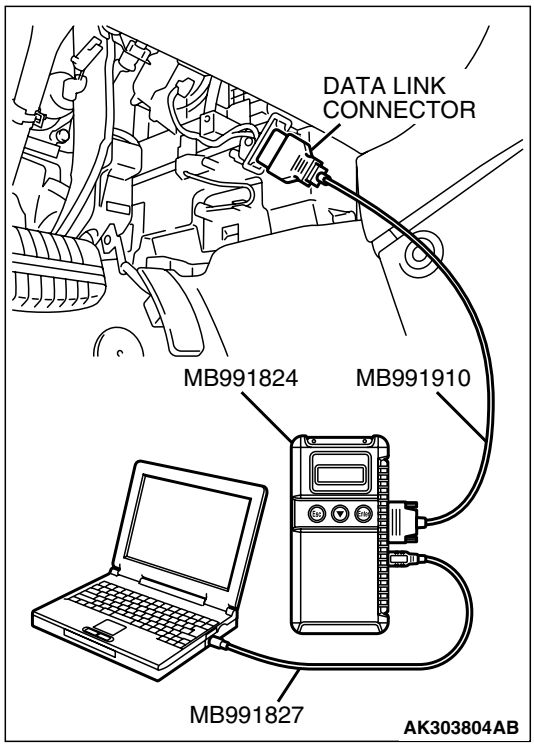
STEP 1. Using scan tool MB991958, check data list item 10: Mass Airflow Sensor.

⚠ 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) Set scan tool MB991958 to the data reading mode for item 10, Mass Airflow Sensor.
(4) Warm up the engine to normal operating temperature: 80°C to 95°C (176°F to 203°F).
- The standard value during idling should be between 1,300 and 1,620 millivolts.
- When the engine is revved, the mass airflow rate should increase according to the increase in engine speed.

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



Q: Is the sensor operating properly?

YES : It can be assumed 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.

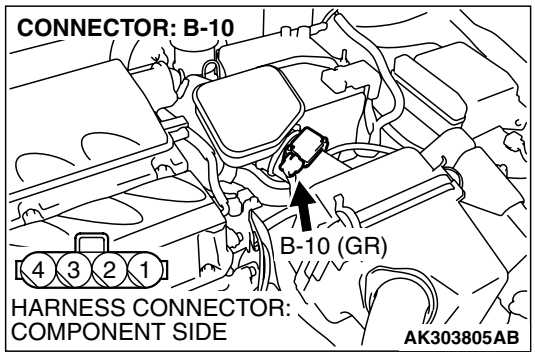
NO : Go to Step 2.

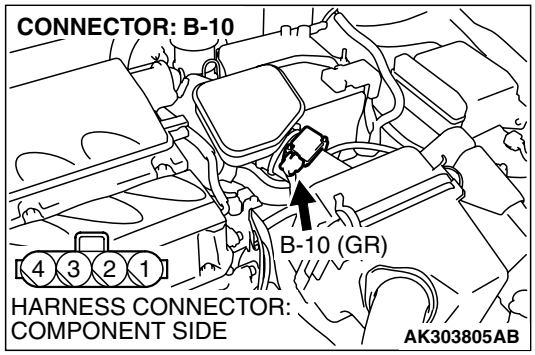
STEP 2. Check harness connector B-10 at mass airflow sensor for damage.

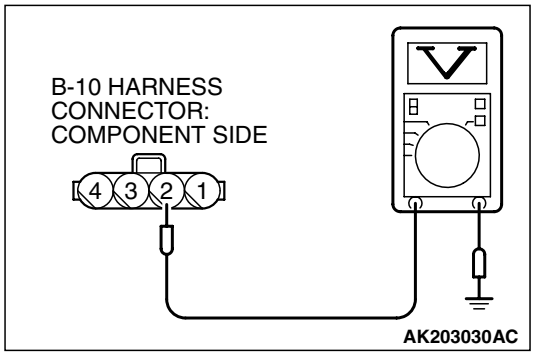
Q: Is the harness connector in good condition?

YES : Go to Step 3.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.







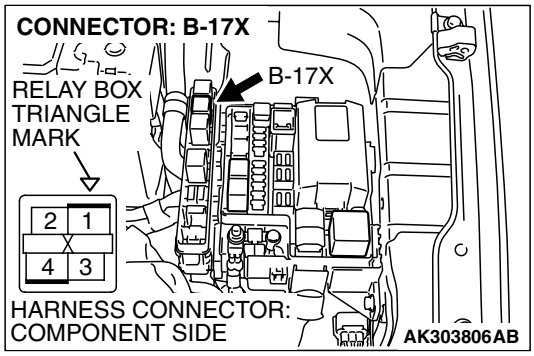
STEP 3. Measure the power supply voltage at mass airflow sensor harness side connector B-10.

(1) Disconnect the connector B-10 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal No. 2 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?

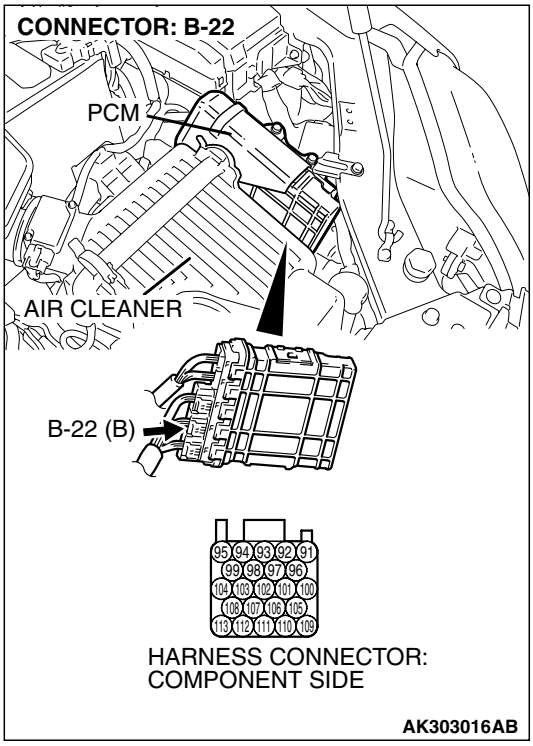
YES : Go to Step 5.
NO : Go to Step 4.



STEP 4. Check harness connector B-17X at MFI relay for damage.

Q: Is the harness connector in good condition?

YES : Repair harness wire between MFI relay connector B-17X (terminal No. 4) and mass airflow sensor connector B-10 (terminal No. 2) because of open circuit or short circuit to ground. Then go to Step 11.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.



STEP 5. Check harness connector B-22 at PCM for damage.

Q: Is the harness connector in good condition?

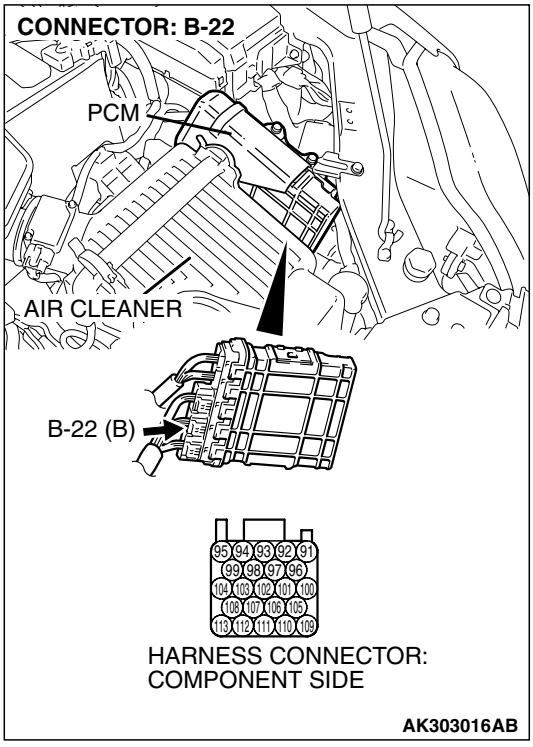
YES : Go to Step 6.

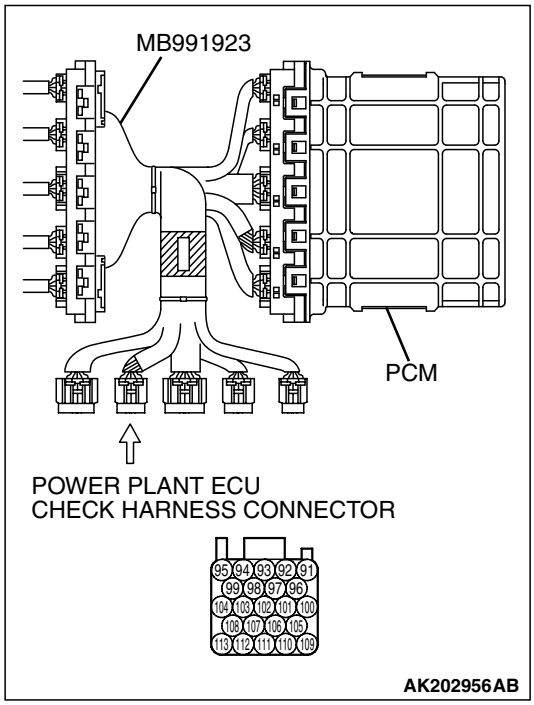
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.

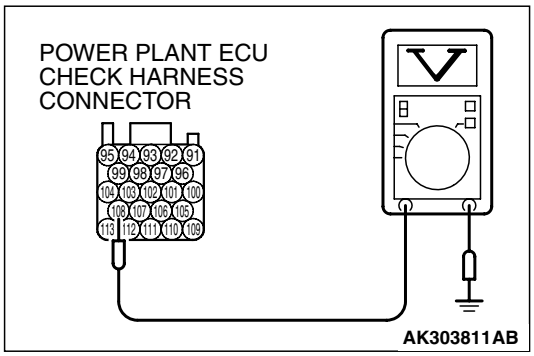
STEP 6. Measure the sensor output voltage at PCM connector B-22 by using power plant ECU check harness special tool MB991923.

(1) Disconnect all PCM connectors. Connect the power plant ECU check harness special tool MB991923 between the separated connectors.

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







(3) Measure the voltage between terminal No. 108 and ground.
- When the engine is revved, voltage should be increase in response to revving.

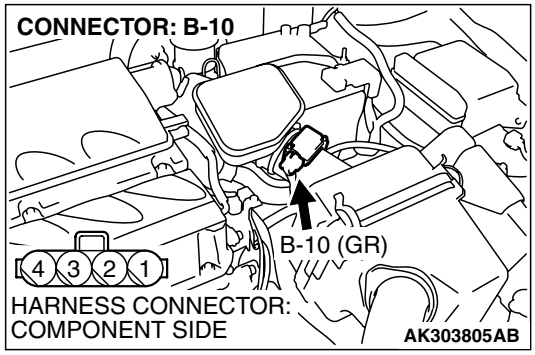
Q: Is the measured voltage normal?

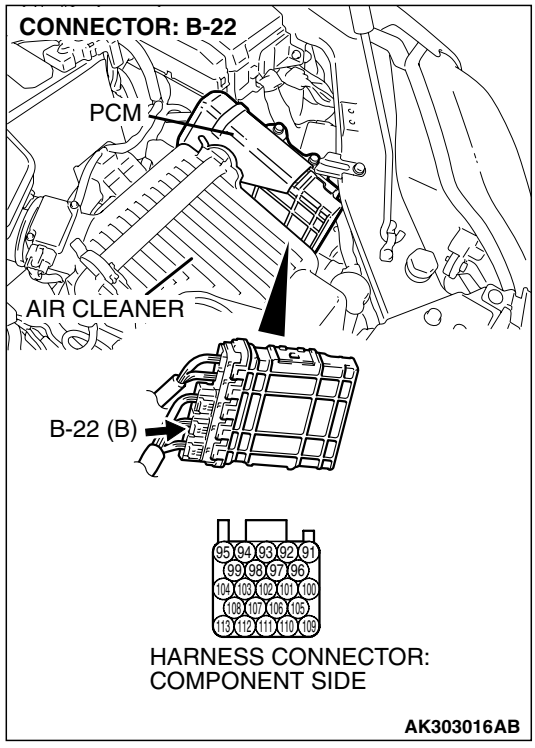
YES : Go to Step 9.
NO : Go to Step 7.

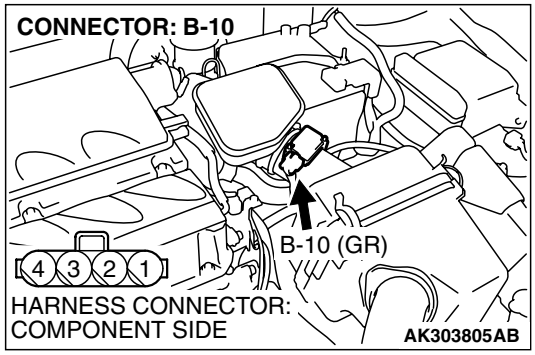
STEP 7. Check for open circuit or short circuit to ground between mass airflow sensor connector B-10 (terminal No. 3) and PCM connector B-22 (terminal No. 108).

Q: Is the harness wire in good condition?

YES : Replace the mass airflow sensor. Then go to Step 8.
NO : Repair it. Then go to Step 11.





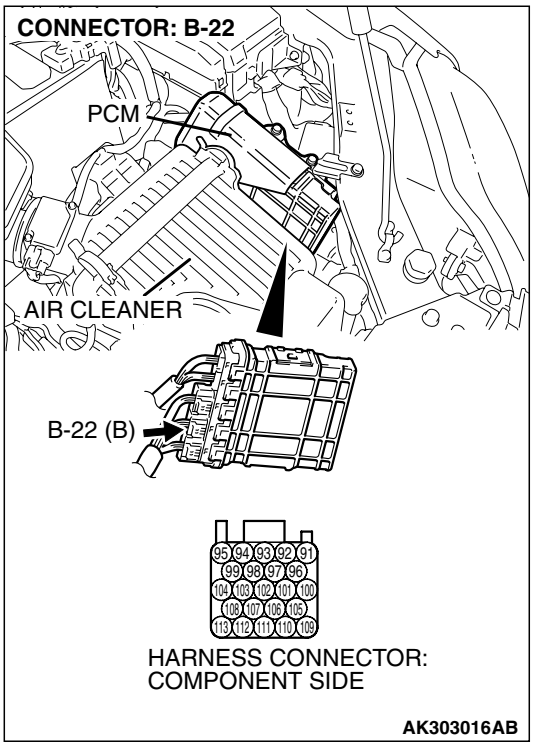


STEP 8. Replace the mass airflow sensor.

(1) Replace the mass airflow sensor.
(2) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 24 P.13A-9.
(3) Check the diagnostic trouble code (DTC).

Q: Is DTC P0102 set?

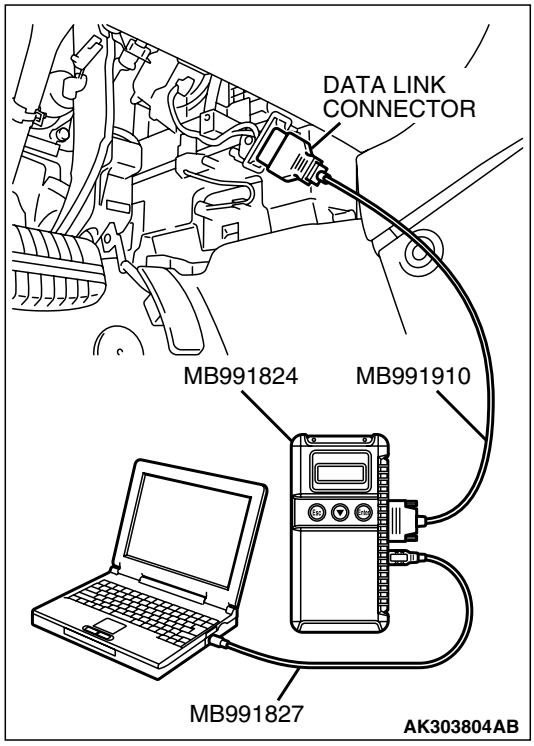
YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 11.
NO : The inspection is complete.



STEP 9. Check harness connector B-22 at PCM for damage.

Q: Is the harness 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 go to Step 10.



STEP 10. Using scan tool MB991958, check data list item 10: Mass Airflow 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) Set scan tool MB991958 to the data reading mode for item 10, Mass Airflow Sensor.
(4) Warm up the engine to normal operating temperature: 80°C to 95°C (176°F to 203°F).
- The standard value during idling should be between 1,300 and 1,620 millivolts.
- When the engine is revved, the mass airflow rate should increase according to the increase in engine speed.

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

Q: Is the sensor operating properly?

YES : It can be assumed 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 : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 11.

STEP 11. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 24 P.13A-9.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0102 set?

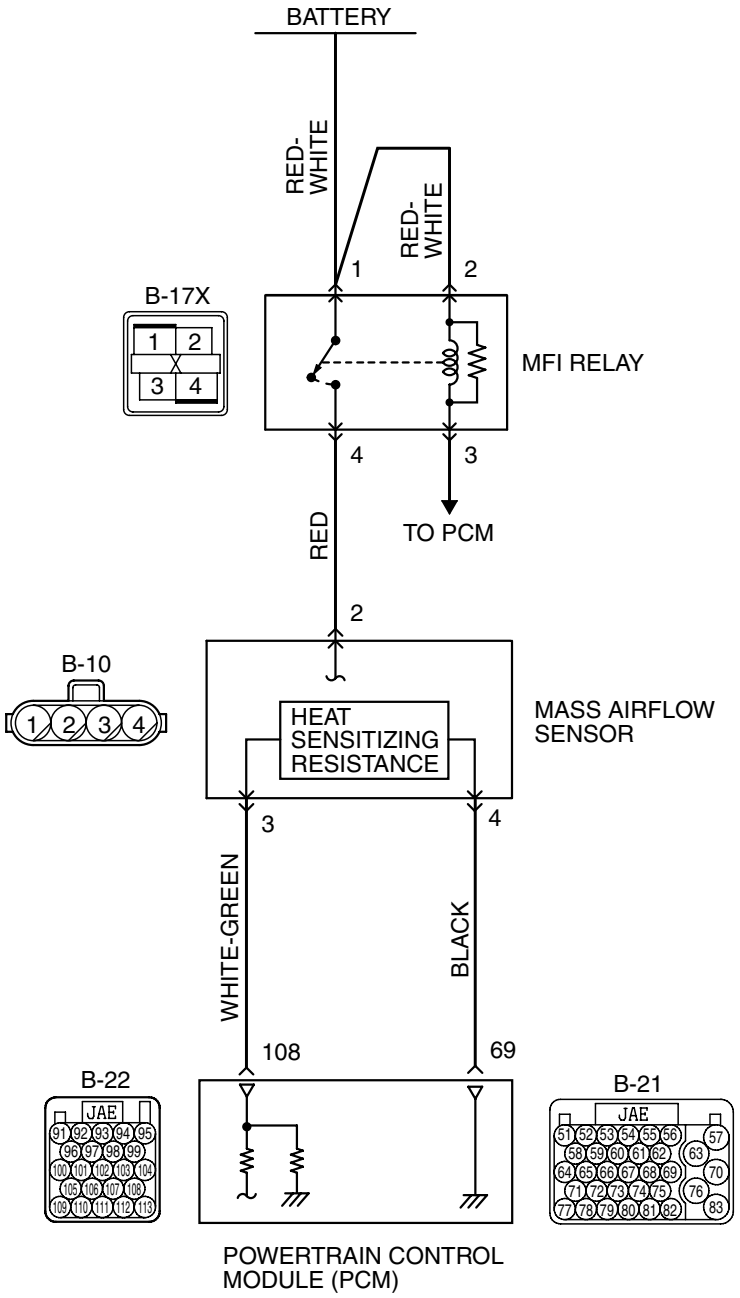
YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0103: Mass Airflow Circuit High Input

⚠ CAUTION

If DTC P0103 has been set, TCL related DTC U1120 is also set. After P0103 has been diagnosed, don't forget to erase DTC U1120.

Mass Airflow Sensor Circuit



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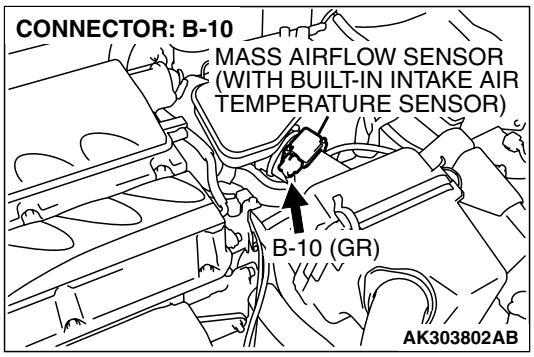
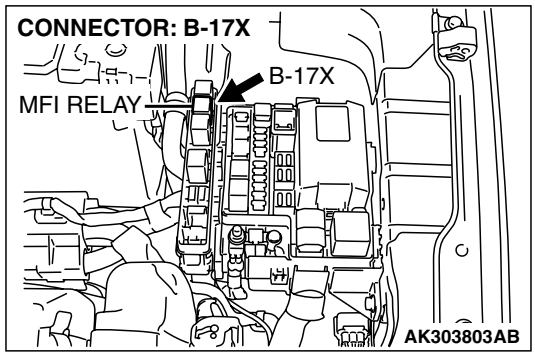
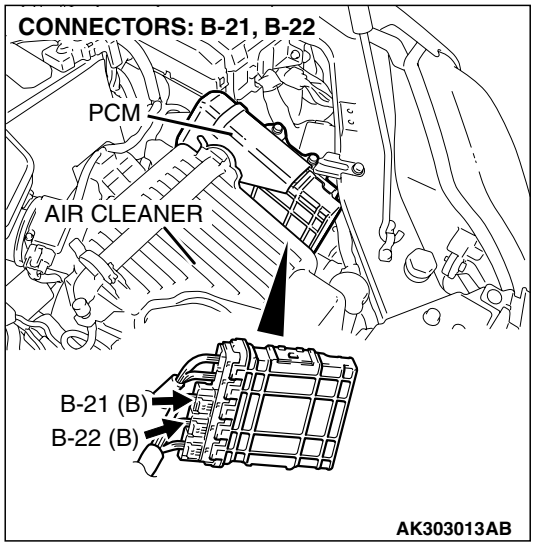
TSB Revision







CIRCUIT OPERATION

- The mass airflow sensor power is supplied from the MFI relay (terminal No. 4), and the ground is provided on the PCM (terminal No. 69).
- A voltage that is according to the mass airflow rate is sent to the PCM (terminal No. 108) from the mass airflow sensor output terminal (terminal No. 3).

TECHNICAL DESCRIPTION

- While the engine is running, the mass airflow sensor outputs voltage which corresponds to the mass airflow rate.
- The PCM checks whether the voltage output by the mass airflow sensor while the engine is running is within a specified range.

DESCRIPTIONS OF MONITOR METHODS

Mass airflow sensor output voltage is out of specified range.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

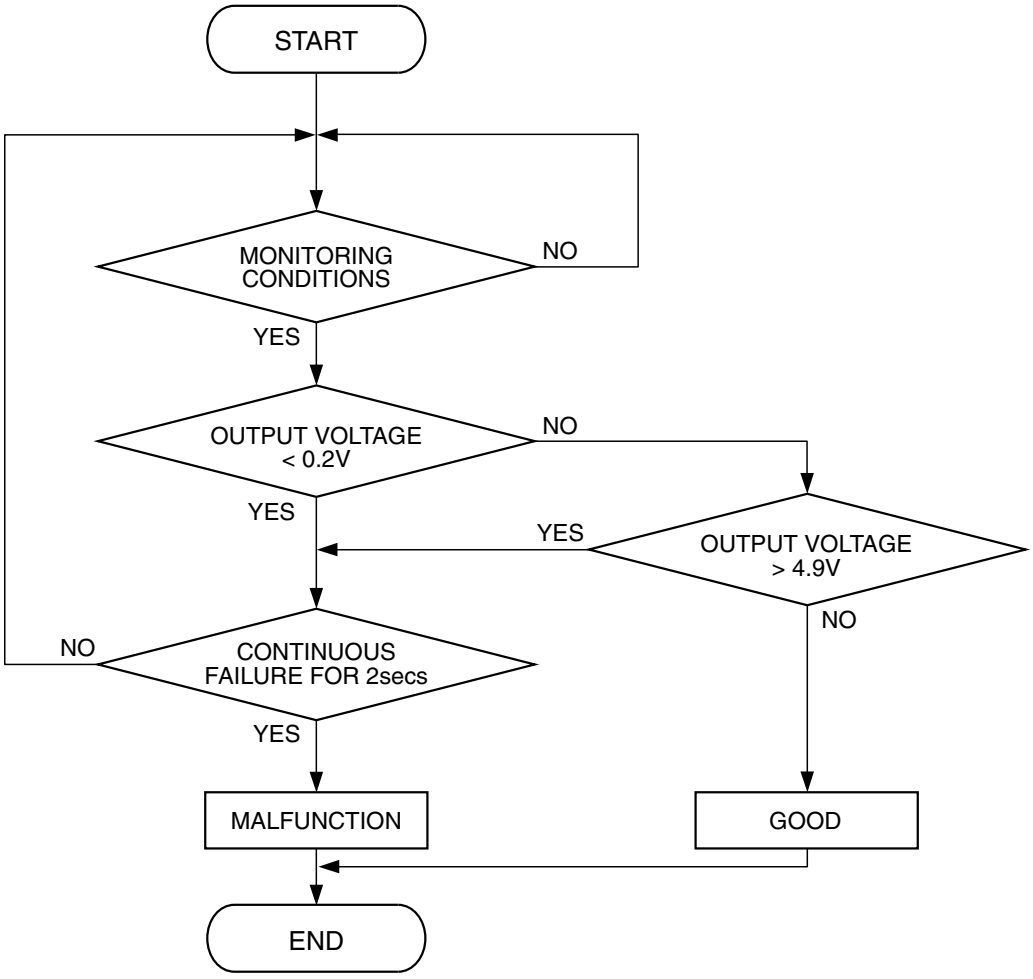
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



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Check Condition

- 3 seconds or more have passed since the ignition switch was turned to "ON" position.

Judgement Criterion

- Mass airflow sensor output voltage has continued to be higher than 4.9 volts for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 24 P.13A-9.

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

- Mass airflow sensor failed.
- Open mass airflow sensor circuit, or connector damage.
- PCM failed.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable

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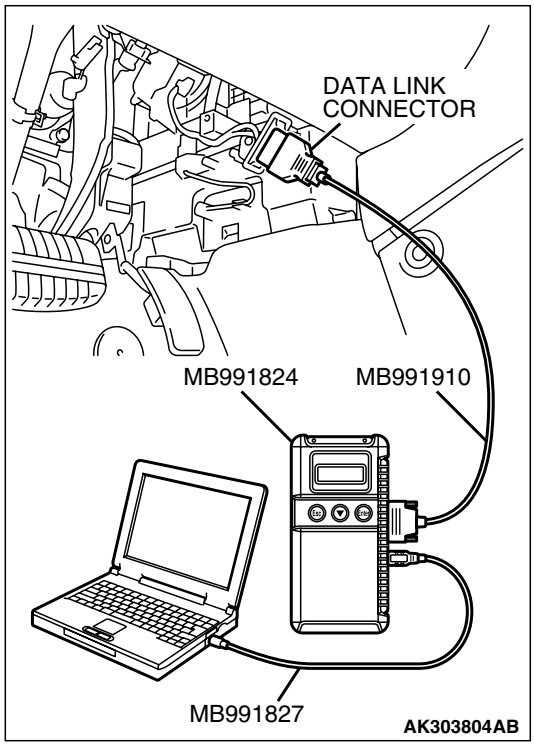
- MB991910: Main Harness A



STEP 1. Using scan tool MB991958, check data list item 10: Mass Airflow 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.

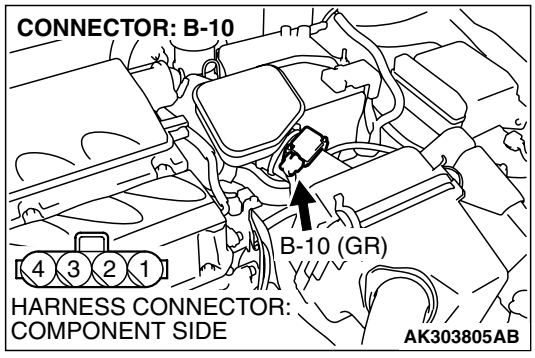
(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991958 to the data reading mode for item 10, Mass Airflow Sensor.
(4) Warm up the engine to normal operating temperature: 80°C to 95°C (176°F to 203°F).
- The standard value during idling should be between 1,300 and 1,620 millivolts.
- When the engine is revved, the mass airflow rate should increase according to the increase in engine speed.

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

Q: Is the sensor operating properly?

YES : It can be assumed 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.

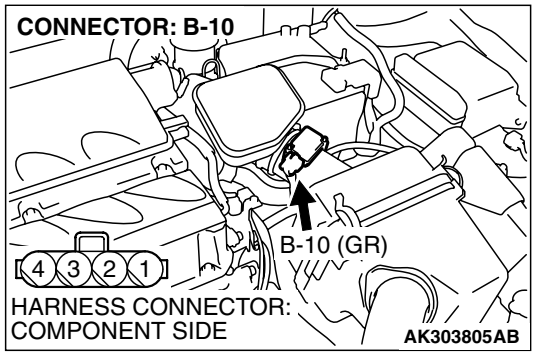


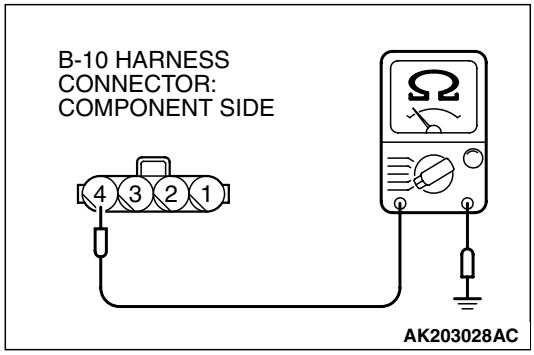
STEP 2. Check harness connector B-10 at mass airflow sensor for damage.

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 go to Step 8.



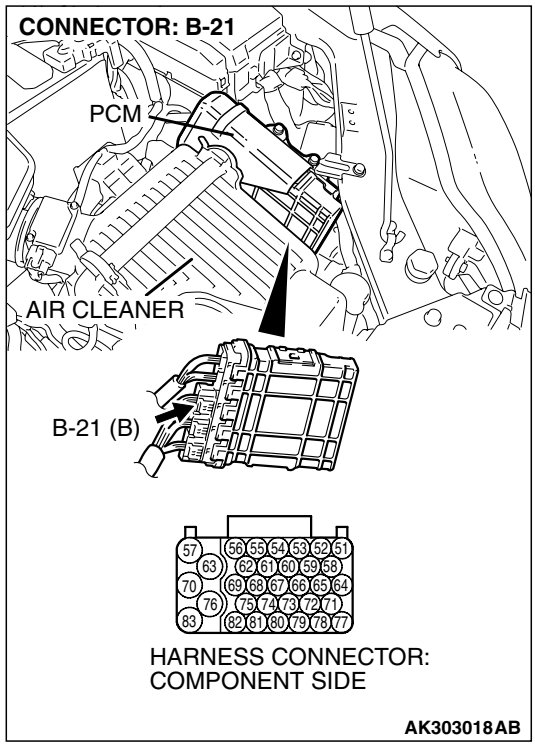


STEP 3. Check the continuity at mass airflow sensor harness side connector B-10.

(1) Disconnect the connector B-10 and measure at the harness side.
(2) Check for the continuity between terminal No. 4 and ground.
- Continuity (2 Ω or less)

Q: Does continuity exist?

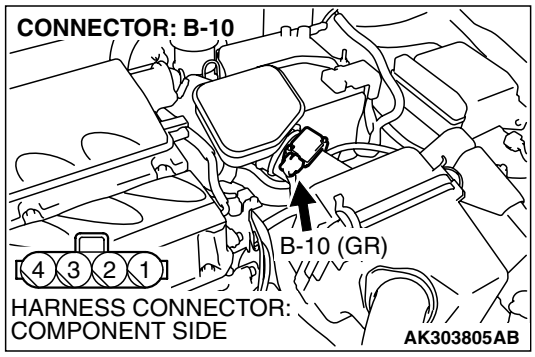
YES : Go to Step 7.
NO : Go to Step 4.

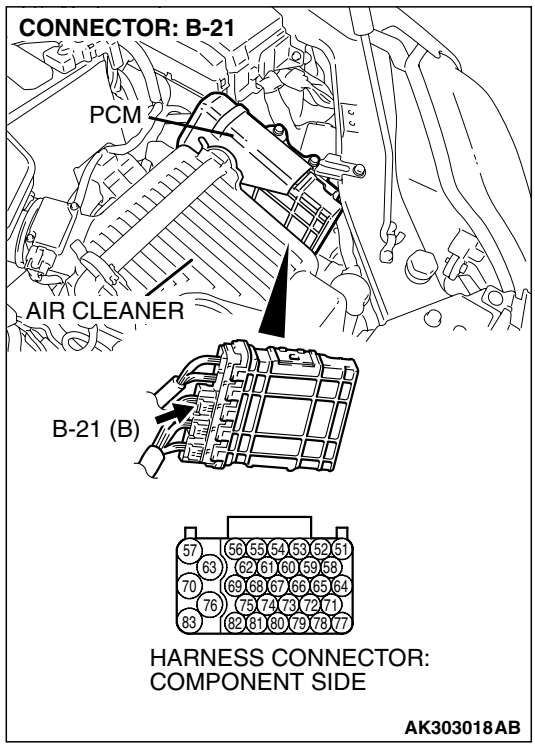


STEP 4. Check harness connector B-21 at PCM for damage.

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 go to Step 8.



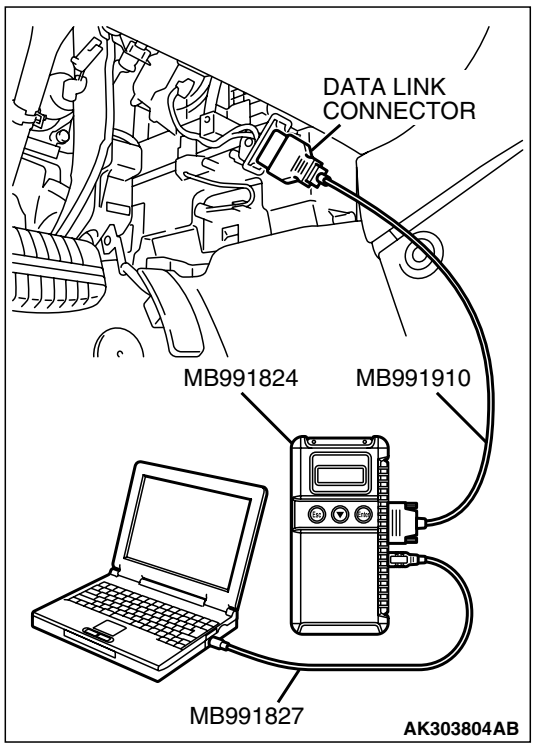


STEP 5. Check for open circuit between mass airflow sensor connector B-10 (terminal No. 4) and PCM connector B-21 (terminal No. 69).

Q: Is the harness wire in good condition?

YES : Go to Step 6.

NO : Repair it. Then go to Step 8.



STEP 6. Using scan tool MB991958, check data list item 10: Mass Airflow 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.

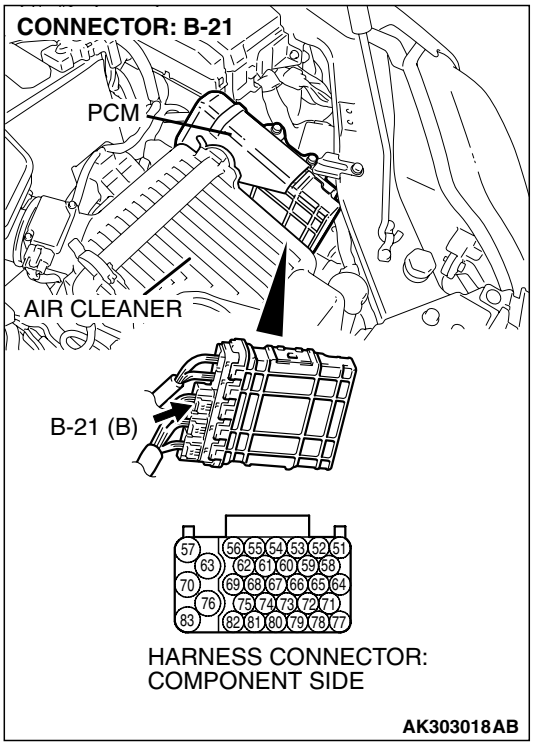
(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991958 to the data reading mode for item 10, Mass Airflow Sensor.
(4) Warm up the engine to normal operating temperature: 80°C to 95°C (176°F to 203°F).
- The standard value during idling should be between 1,300 and 1,620 millivolts.
- When the engine is revved, the mass airflow rate should increase according to the increase in engine speed.

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

Q: Is the sensor operating properly?

YES : It can be assumed 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 : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 8.



STEP 7. Check harness connector B-21 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Replace the mass airflow sensor. Then go to Step 8.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 8.

TSB Revision

STEP 8. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 24 P.13A-9.

(2) Check the diagnostic trouble code (DTC).

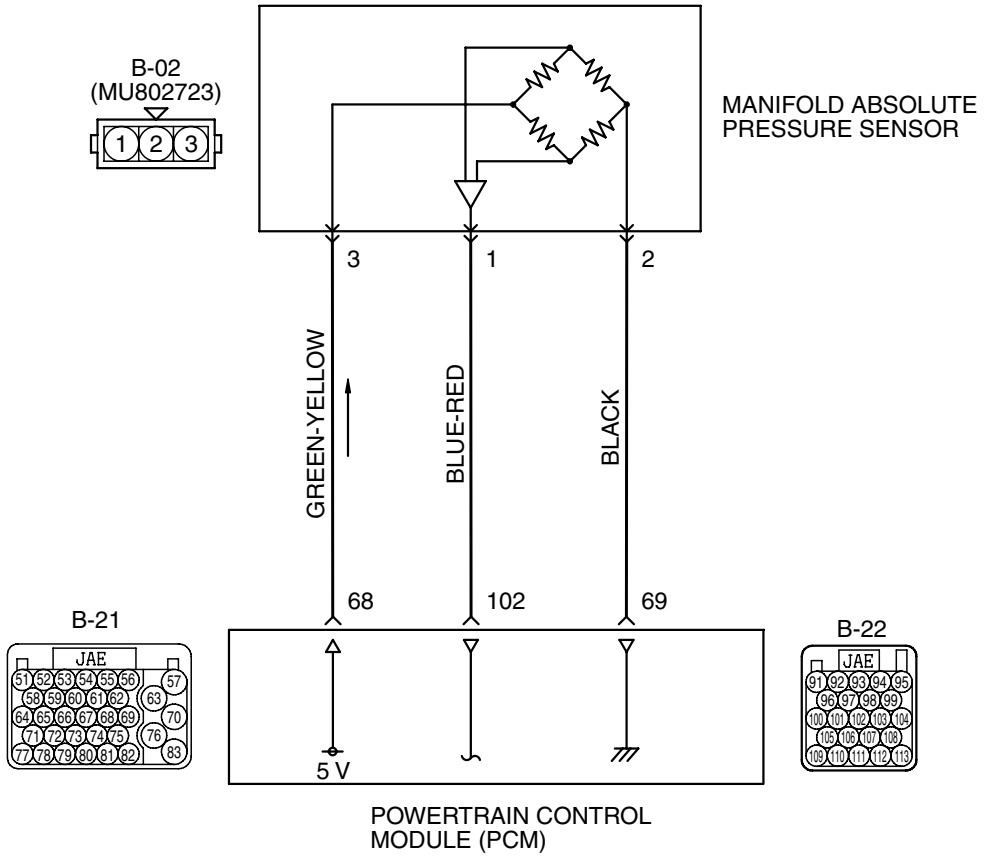
Q: Is DTC P0103 set?

YES : Retry the troubleshooting.

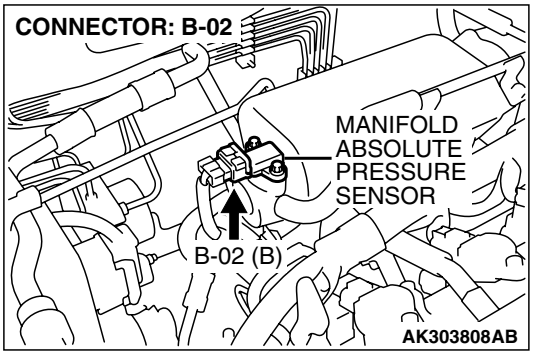
NO : The inspection is complete.

DTC P0106: Manifold Absolute Pressure Circuit Range/Performance Problem

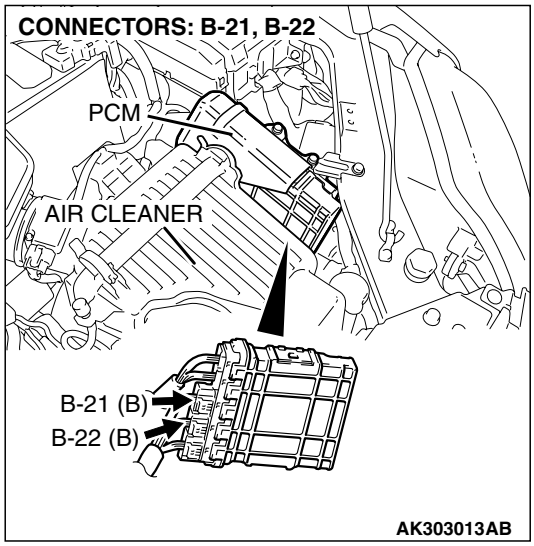
Manifold Absolute Pressure Sensor Circuit



AK400877



TSB Revision



CIRCUIT OPERATION

- A 5-volt voltage is supplied to the manifold absolute pressure sensor power terminal (terminal No. 3) from the PCM (terminal No. 68). The ground terminal (terminal No. 2) is grounded with PCM (terminal No. 69).
- A voltage that is proportional to the intake manifold pressure is sent to the PCM (terminal No. 102) from the manifold absolute pressure sensor output terminal (terminal No. 1).

TECHNICAL DESCRIPTION

- The manifold absolute pressure sensor outputs a voltage which corresponds to the intake manifold pressure.
- The PCM checks whether this voltage is within a specified range.

DESCRIPTIONS OF MONITOR METHODS

Compare load value with manifold absolute pressure sensor output voltage.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

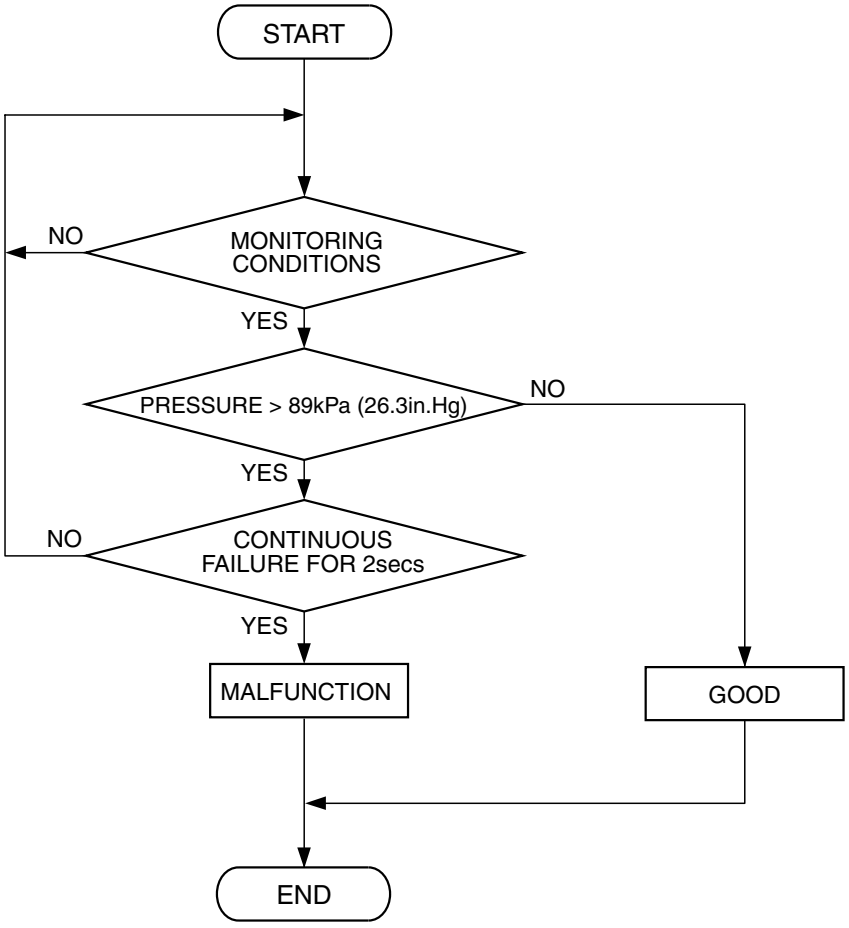
- Not applicable

Sensor (The sensor below is determined to be normal)

- Engine coolant temperature sensor
- Throttle position sensor
- Mass airflow sensor
- Intake air temperature sensor
- Barometric pressure sensor

DTC SET CONDITIONS <Range/Performance problem – high input>

Logic Flow Chart



AK401473

Check Conditions

- 8 minutes or more have passed since the engine starting sequence was completed, when the engine coolant temperature at engine start is 0°C (32°F) or lower.
- Engine speed is 1,500 r/min or lower.
- Throttle position sensor output voltage is 0.8 volt or lower.

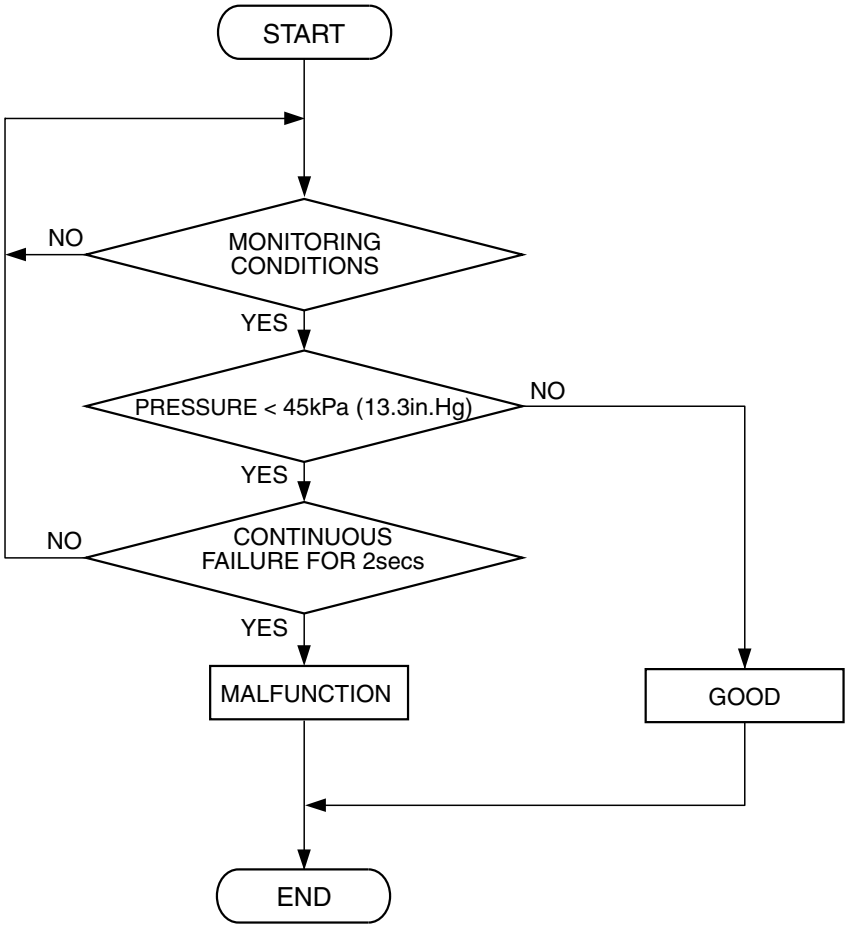
Judgement Criterion

- Manifold absolute pressure is 89 kPa (26.3 in.Hg) or higher for 2 seconds.

TSB Revision

DTC SET CONDITIONS <Range/Performance problem – low input>

Logic Flow Chart



AK401474

Check Conditions

- 8 minutes or more have passed since the engine starting sequence was completed, when the engine coolant temperature at engine start is 0°C (32°F) or lower.
- Engine speed is 1,500 r/min or higher.
- Throttle position sensor output voltage is 3.5 volts or higher.

Judgement Criterion

- Manifold absolute pressure is 45 kPa (13.3 in.Hg) or lower for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 7 P.13A-9.

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

- Manifold absolute pressure sensor failed.
- Harness damage.
- Connector damage.
- PCM failed.

TSB Revision

DIAGNOSIS

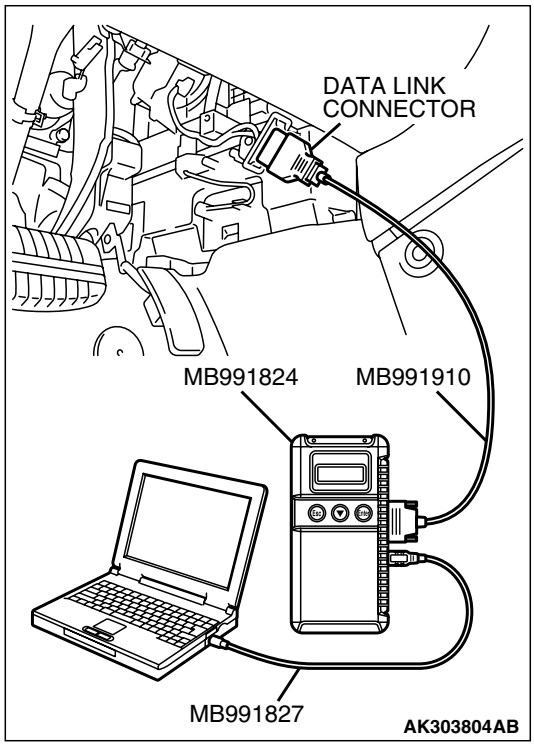
Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A
- MB991923: Power Plant ECU Check Harness

STEP 1. Using scan tool MB991958, check data list item 8: Manifold Absolute Pressure 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.



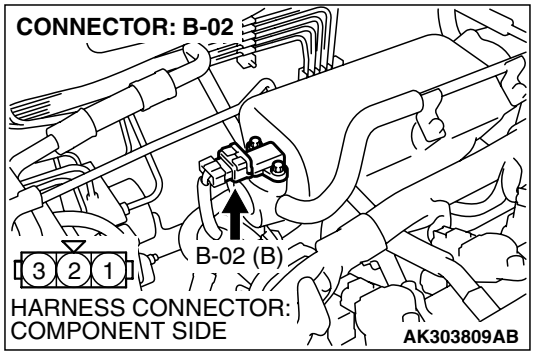
(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991958 to the data reading mode for item 8, Manifold Absolute Pressure Sensor.
  - When altitude is 0 m (0 foot), 101 kPa (29.8 in.Hg).
  - When altitude is 600 m (1,969 feet), 95 kPa (28.1 in.Hg).
  - When altitude is 1,200 m (3,937 feet), 88 kPa (26.0 in.Hg).
  - When altitude is 1,800 m (5,906 feet), 81 kPa (23.9 in.Hg).
(4) Start the engine.
  - When the engine is idling, 16 – 36 kPa (4.7 – 10.6 in.Hg).
  - When the engine is suddenly revved, manifold absolute pressure varies.
(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

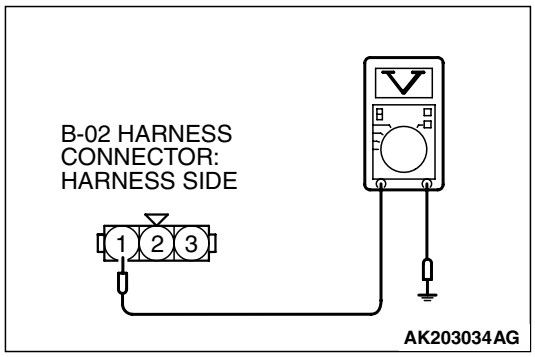
YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-14.

NO : Go to Step 2.

STEP 2. Measure the sensor output voltage at manifold absolute pressure sensor connector B-02 by backprobing.



(1) Do not disconnect the connector B-02.
(2) Turn the ignition switch to the "ON" position.



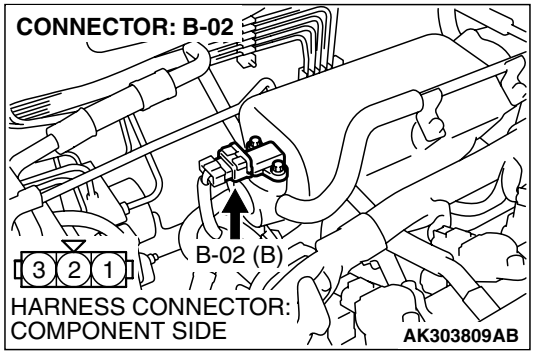
(3) Measure the voltage between terminal No. 1 and ground by backprobing.
- When altitude is 0 m (0 foot), voltage should be 3.7 and 4.3 volts.
- When altitude is 600 m (1,969 feet), voltage should be 3.4 and 4.0 volts.
- When altitude is 1,200 m (3,937 feet), voltage should be 3.2 and 3.8 volts.
- When altitude is 1,800 m (5,906 feet), voltage should be 2.9 and 3.5 volts.

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

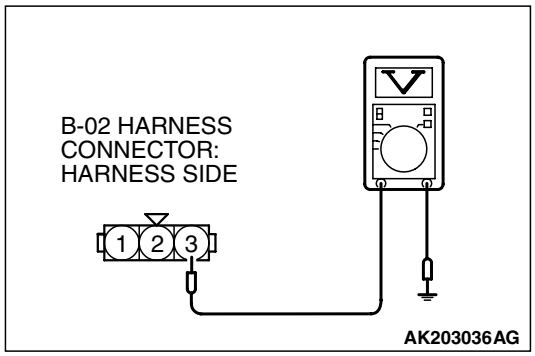
Q: Is the measured voltage normal?

YES : Go to Step 10.
NO : Go to Step 3.

STEP 3. Measure the sensor supply voltage at manifold absolute pressure sensor connector B-02 by backprobing.



(1) Do not disconnect the connector B-02.
(2) Turn the ignition switch to the "ON" position.

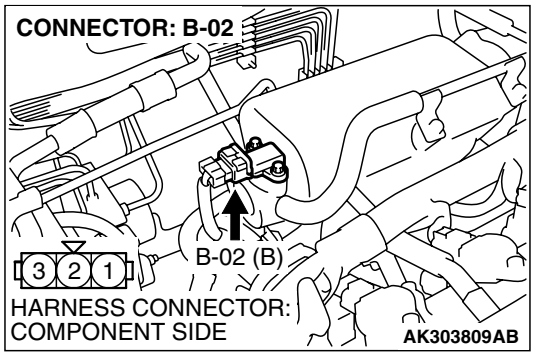


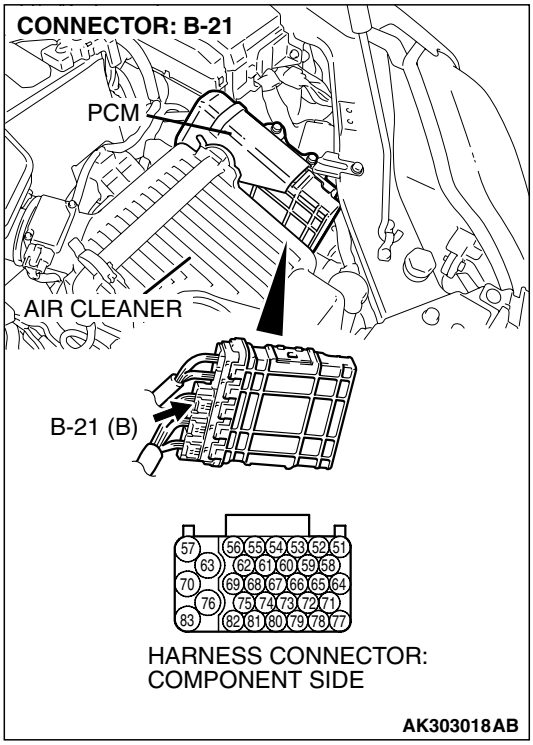
(3) Measure the voltage between terminal No. 3 and ground by backprobing.
- Voltage should be between 4.9 and 5.1 volts.

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

Q: Is the measured voltage between 4.9 and 5.1 volts?

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



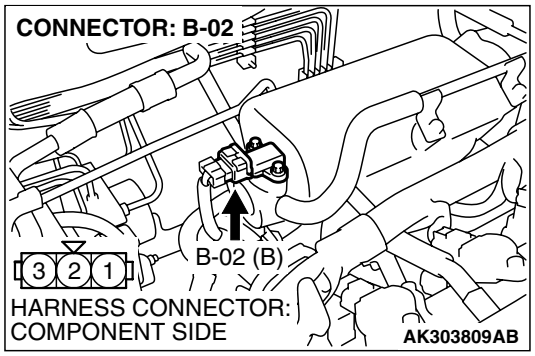


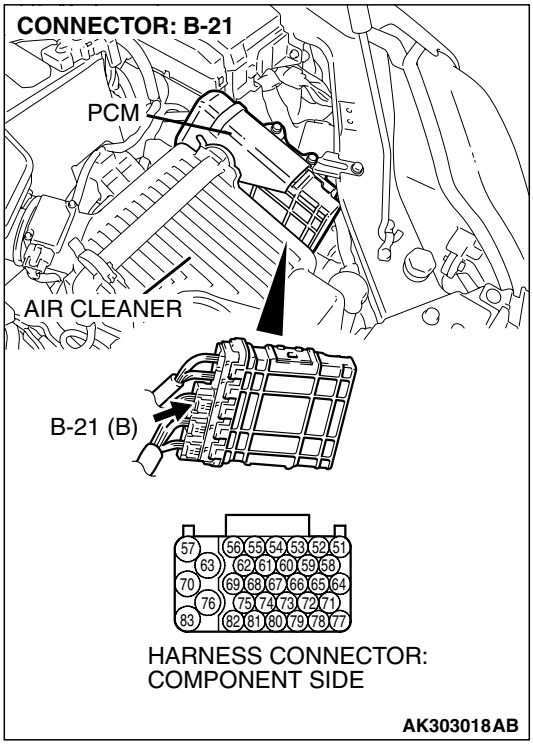
STEP 4. Check harness connector B-02 at the manifold absolute pressure sensor and harness connector B-21 at PCM for damage.

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 go to Step 13.



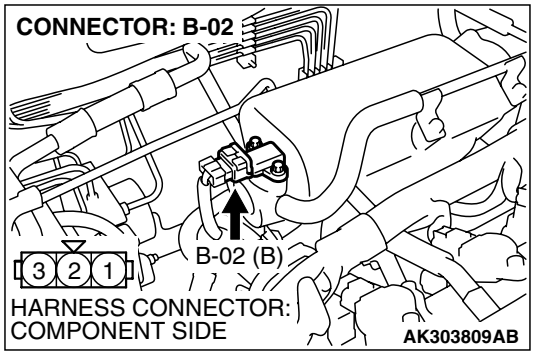


STEP 5. Check for harness damage between manifold absolute pressure sensor connector B-02 (terminal No. 3) and PCM connector B-21 (terminal No. 68).

Q: Is the harness wire in good condition?

YES : Go to Step 12.

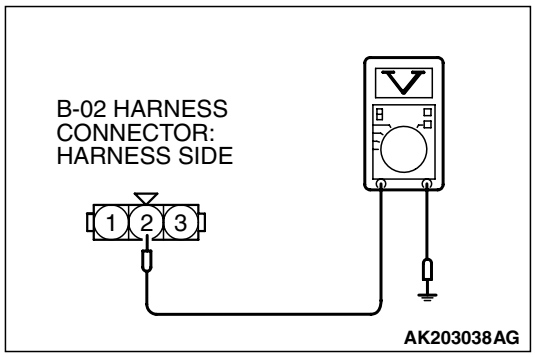
NO : Repair it. Then go to Step 13.



STEP 6. Measure the ground voltage at manifold absolute pressure sensor connector B-02 by backprobing.

(1) Do not disconnect the connector B-02.

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



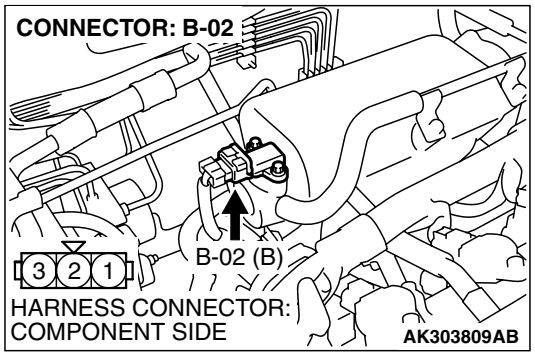
(3) Measure the voltage between terminal No. 2 and ground by backprobing.
- Voltage should be 0.5 volt or less.

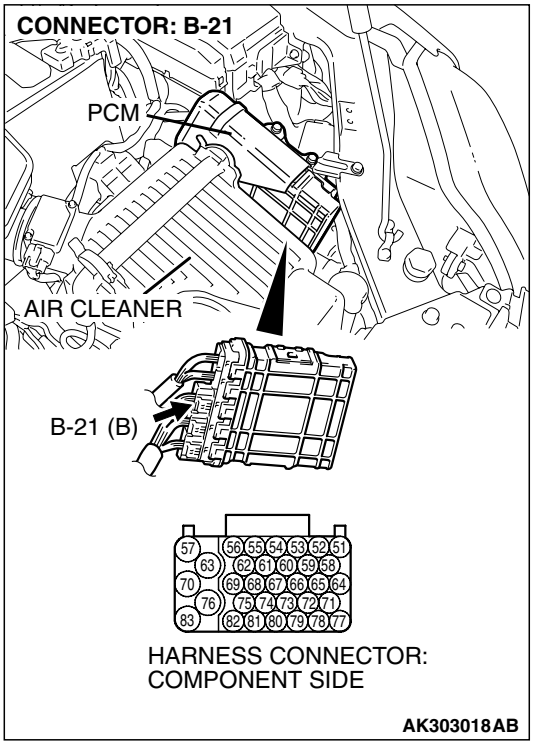
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the measured voltage 0.5 volt or less?

YES : Go to Step 9.

NO : Go to Step 7.





STEP 7. Check harness connector B-02 at the manifold absolute pressure sensor and harness connector B-21 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 8.

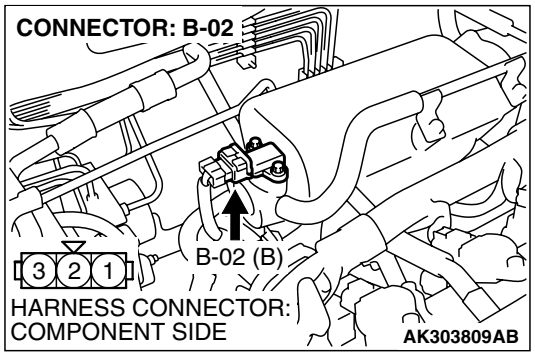
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 13.

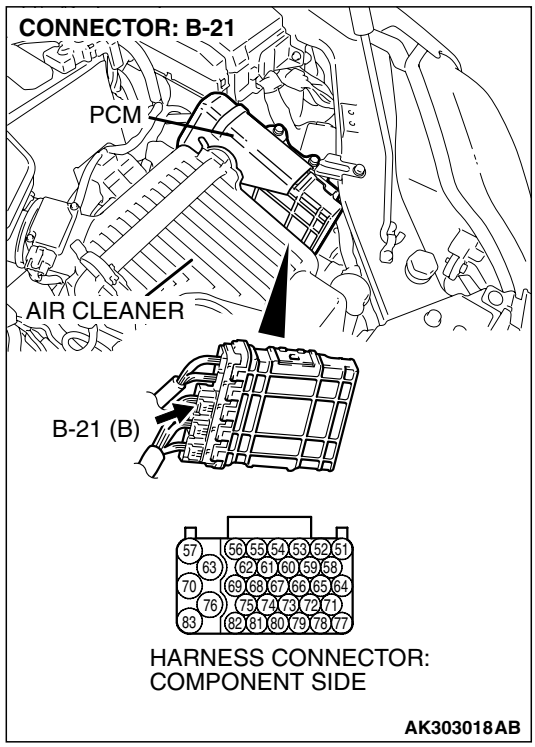
STEP 8. Check for harness damage between manifold absolute pressure sensor connector B-02 (terminal No. 2) and PCM connector B-21 (terminal No. 69).

Q: Is the harness wire in good condition?

YES : Go to Step 12.

NO : Repair it. Then go to Step 13.



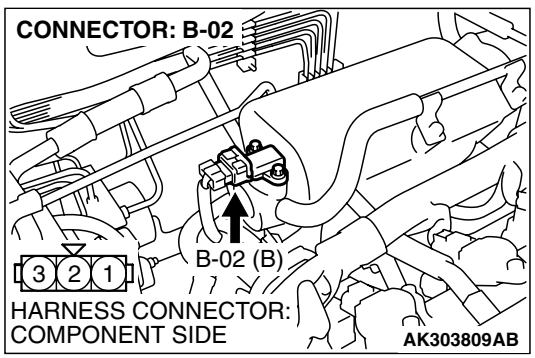


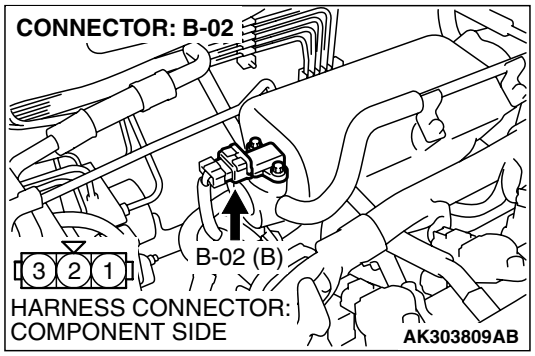
STEP 9. Check harness connector B-02 at manifold absolute pressure sensor for damage.

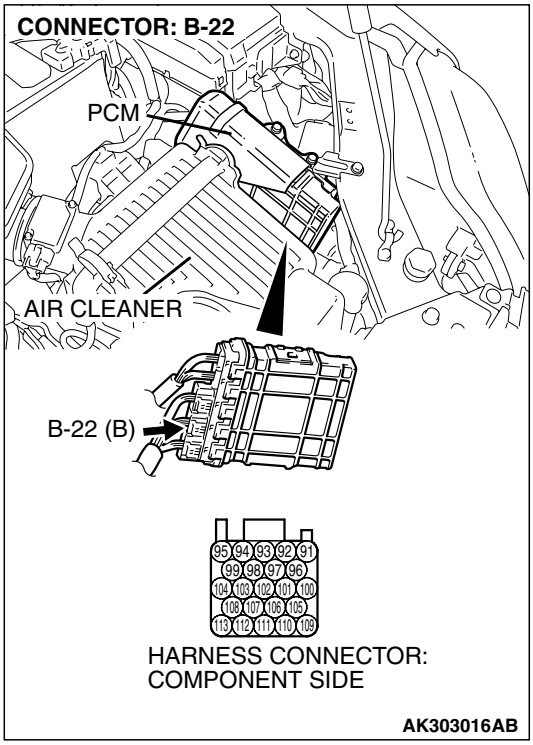
Q: Is the harness connector in good condition?

YES : Replace the manifold absolute pressure sensor. Then go to Step 13.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 13.





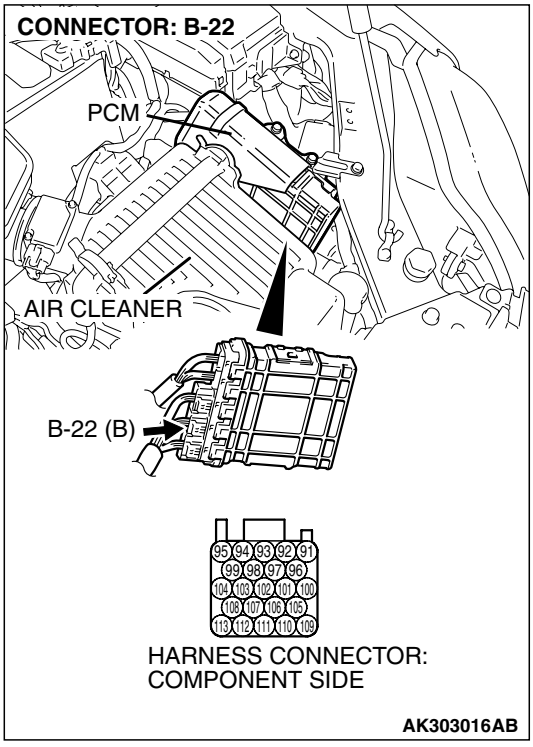


STEP 10. Check harness connector B-02 at the manifold absolute pressure sensor and harness connector B-22 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 11.

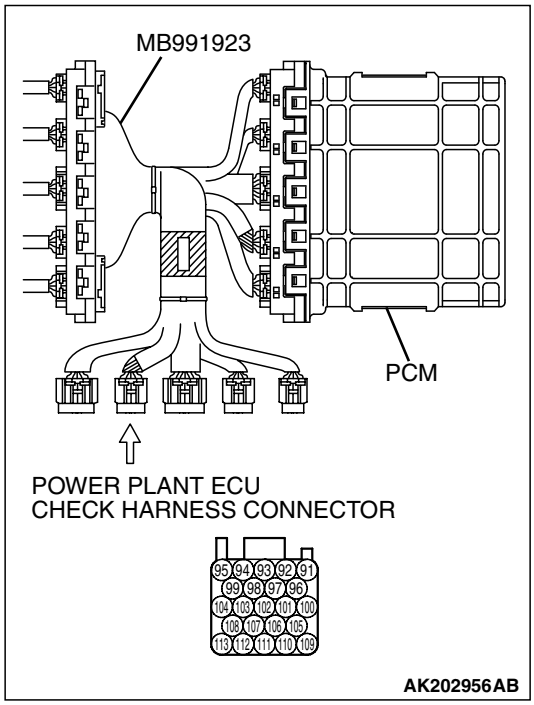
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 13.

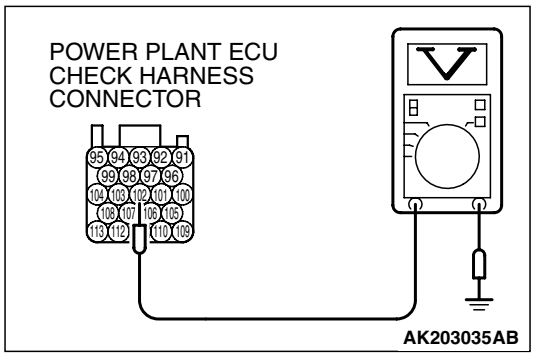


STEP 11. Measure the sensor output voltage at PCM connector B-22 by using power plant ECU check harness special tool MB991923.

(1) Disconnect all PCM connectors. Connect the power plant ECU check harness special tool MB991923 between the separated connectors.

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





(3) Measure the voltage between terminal No. 102 and ground.
- When altitude is 0 m (0 foot), voltage should be 3.7 and 4.3 volts.
- When altitude is 600 m (1,969 feet), voltage should be 3.4 and 4.0 volts.
- When altitude is 1,200 m (3,937 feet), voltage should be 3.2 and 3.8 volts.
- When altitude is 1,800 m (5,906 feet), voltage should be 2.9 and 3.5 volts.

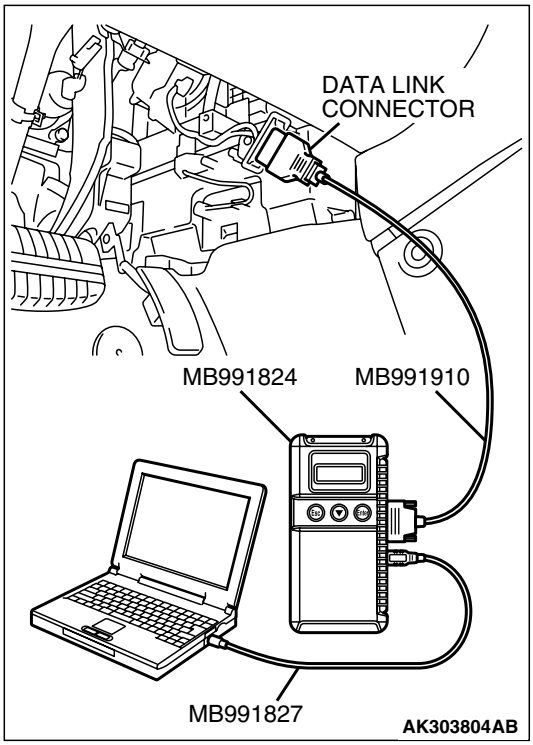
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the measured voltage normal?

YES : Go to Step 12.

NO : Repair harness wire between manifold absolute pressure sensor connector B-02 (terminal No. 1) and PCM connector B-22 (terminal No. 102) because of harness damage. Then go to Step 13.

STEP 12. Using scan tool MB991958, check data list item 8: Manifold Absolute Pressure Sensor.



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

(2) Set scan tool MB991958 to the data reading mode for item 8, Manifold Absolute Pressure Sensor.
- When altitude is 0 m (0 foot), 101 kPa (29.8 in.Hg).
- When altitude is 600 m (1,969 feet), 95 kPa (28.1 in.Hg).
- When altitude is 1,200 m (3,937 feet), 88 kPa (26.0 in.Hg).
- When altitude is 1,800 m (5,906 feet), 81 kPa (23.9 in.Hg).

(3) Start the engine.
- When the engine is idling, 16 – 36 kPa (4.7 – 10.6 in.Hg).
- When the engine is suddenly revved, manifold absolute pressure varies.

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

Q: Is the sensor operating properly?

YES : It can be assumed 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 : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 13.

STEP 13. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 7 P.13A-9.

(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0106 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

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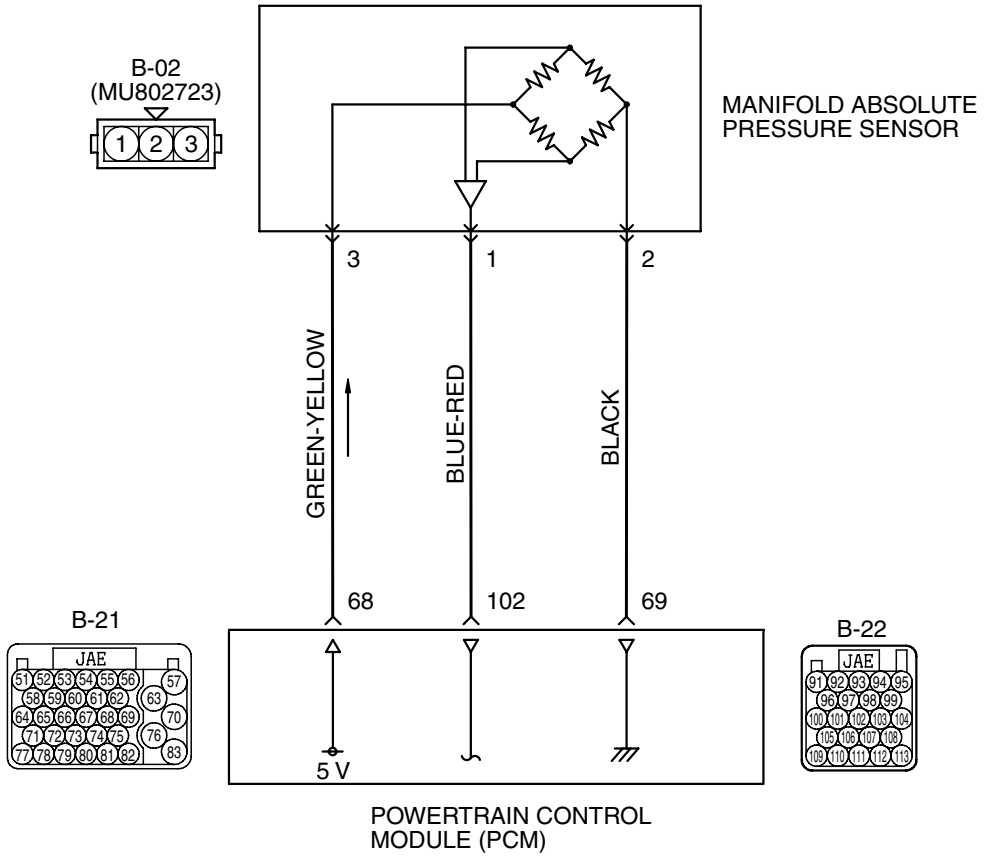
DTC P0107: Manifold Absolute Pressure Circuit Low Input

Manifold Absolute Pressure Sensor Circuit



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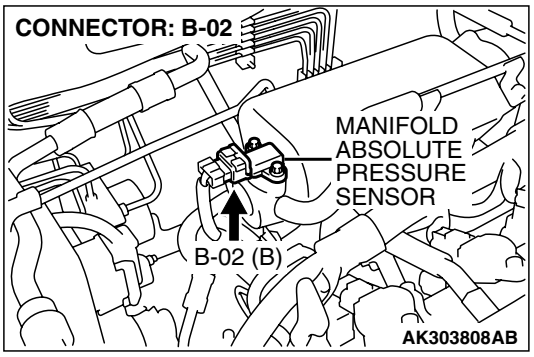

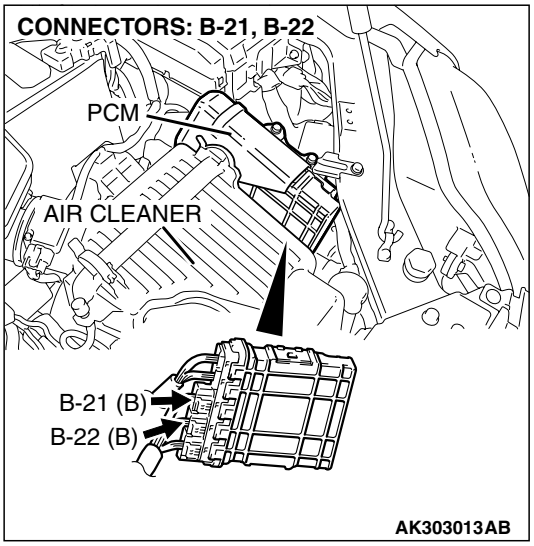

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CIRCUIT OPERATION

- A 5-volt voltage is supplied to the manifold absolute pressure sensor power terminal (terminal No. 3) from the PCM (terminal No. 68). The ground terminal (terminal No. 2) is grounded with PCM (terminal No. 69).
- A voltage that is proportional to the intake manifold pressure is sent to the PCM (terminal No. 102) from the manifold absolute pressure sensor output terminal (terminal No. 1).

TECHNICAL DESCRIPTION

- The manifold absolute pressure sensor outputs a voltage which corresponds to the intake manifold pressure.
- The PCM checks whether this voltage is within a specified range.

DESCRIPTIONS OF MONITOR METHODS

Manifold absolute pressure sensor output voltage is out of specified range.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

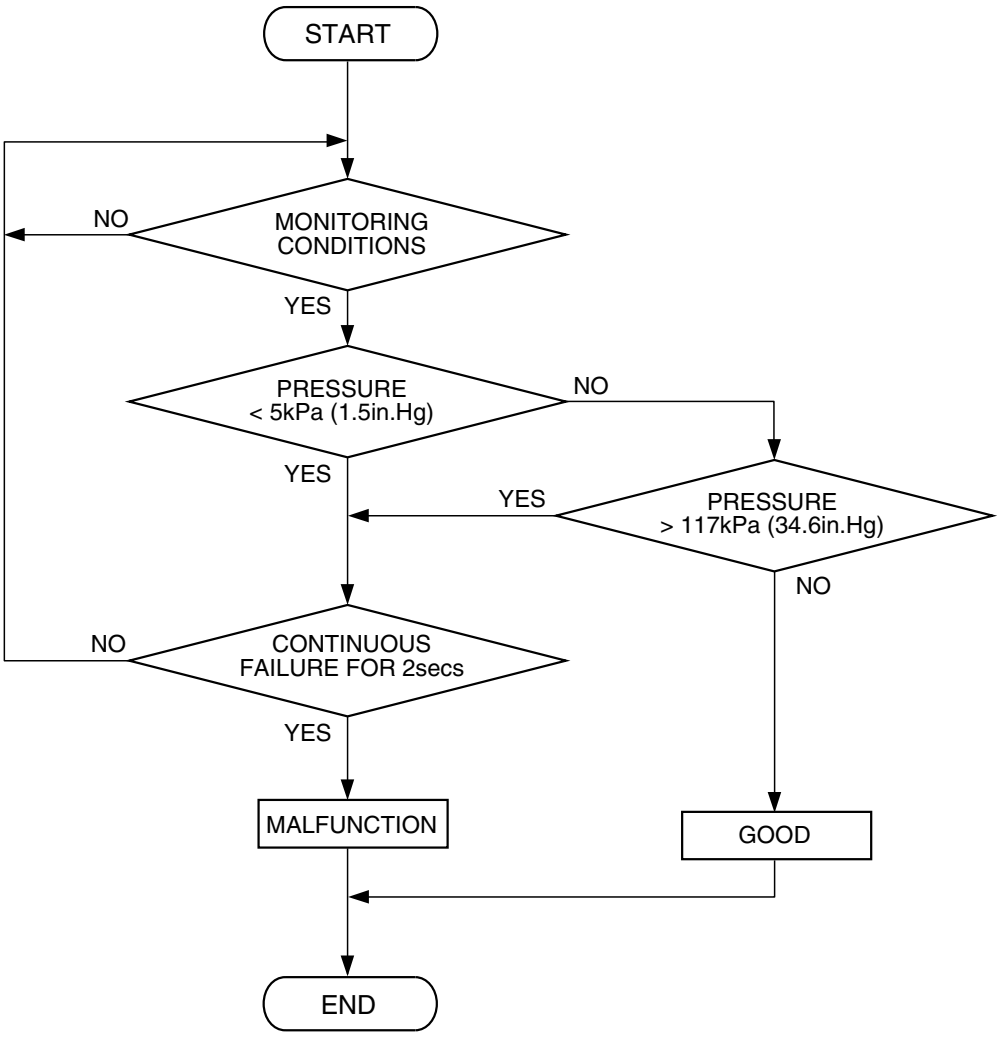
- Not applicable

Sensor (The sensor below is determined to be normal)

- Engine coolant temperature sensor
- Throttle position sensor
- Mass airflow sensor
- Intake air temperature sensor
- Barometric pressure sensor

DTC SET CONDITIONS

Logic Flow Chart



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Check Conditions

- 8 minutes or more have passed since the engine starting sequence was completed, when the engine coolant temperature at engine start is 0°C (32°F) or lower.
- Volumetric efficiency is higher than 20 percent.

Judgement Criterion

- Manifold absolute pressure is 5 kPa (1.5 in.Hg) or lower for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 7 P.13A-9.

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

- Manifold absolute pressure sensor failed.
- Open or shorted manifold absolute pressure sensor circuit, harness damage or connector damage.
- PCM failed.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.

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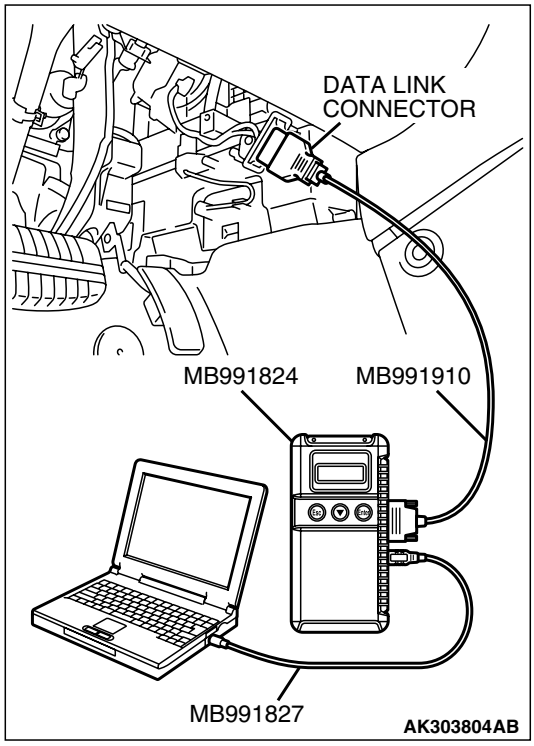
- MB991827: USB Cable
- MB991910: Main Harness A

- MB991923: Power Plant ECU Check Harness



STEP 1. Using scan tool MB991958, check data list item 8: Manifold Absolute Pressure 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) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991958 to the data reading mode for item 8, Manifold absolute Pressure Sensor.
- When altitude is 0 m (0 foot), 101 kPa (29.8 in.Hg).
- When altitude is 600 m (1,969 feet), 95 kPa (28.1 in.Hg).
- When altitude is 1,200 m (3,937 feet), 88 kPa (26.0 in.Hg).
- When altitude is 1,800 m (5,906 feet), 81 kPa (23.9 in.Hg).

(4) Start the engine.
- When the engine is idling, 16 – 36 kPa (4.7 – 10.6 in.Hg).
- When the engine is suddenly revved, manifold absolute pressure varies.

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

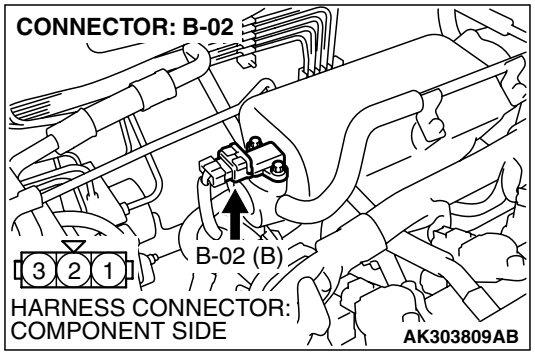
Q: Is the sensor operating properly?

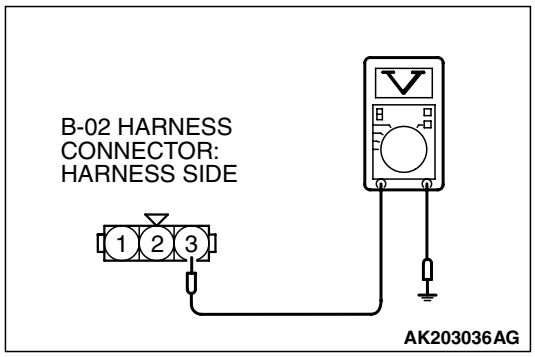
YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-14.

NO : Go to Step 2.

STEP 2. Measure the sensor supply voltage at manifold absolute pressure sensor connector B-02 by backprobing.

(1) Do not disconnect the connector B-02.
(2) Turn the ignition switch to the "ON" position.





(3) Measure the voltage between terminal No. 3 and ground by backprobing.
- Voltage should be between 4.9 and 5.1 volts.

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

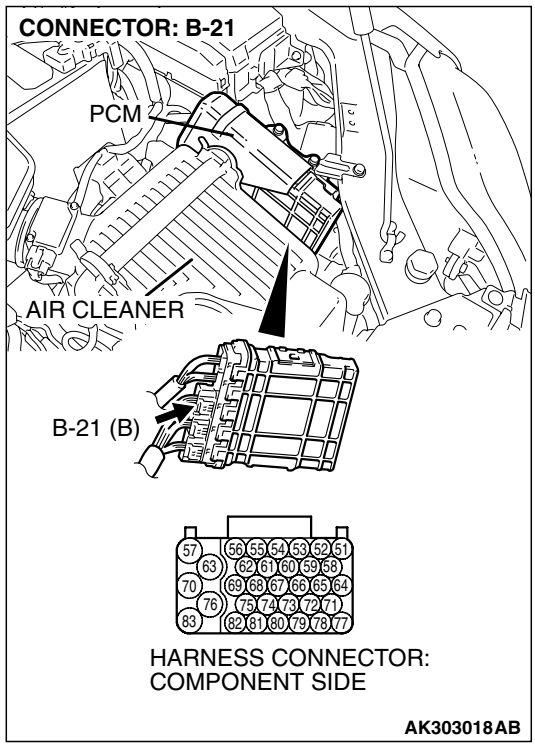
Q: Is the measured voltage between 4.9 and 5.1 volts?

YES : Go to Step 8.
NO : Go to Step 3.

STEP 3. Check harness connector B-21 at PCM for damage.

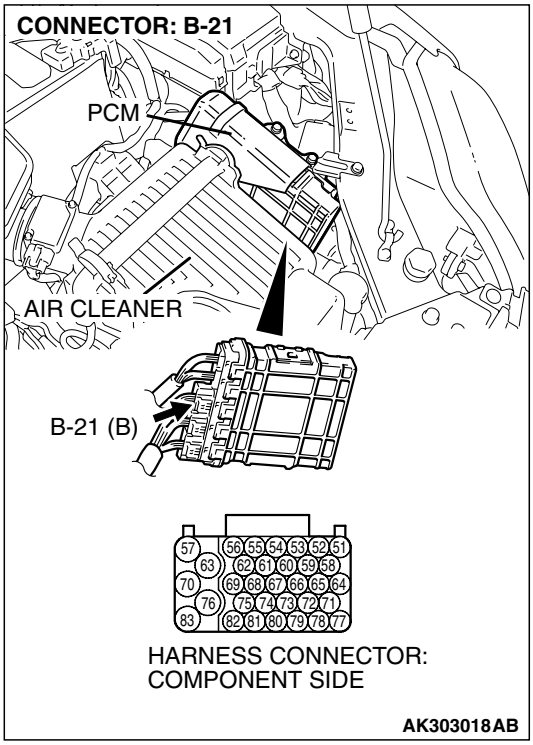
Q: Is the harness connector in good condition?

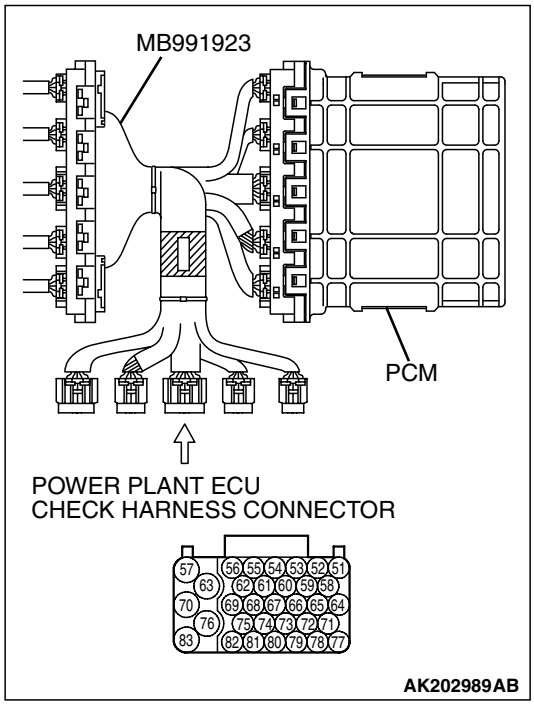
YES : Go to Step 4.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

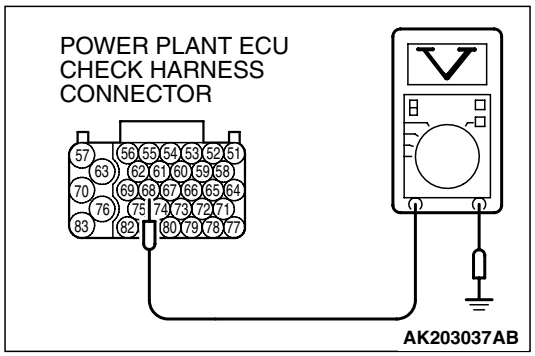


STEP 4. Measure the sensor supply voltage at PCM connector B-21 by using power plant ECU check harness special tool MB991923.

(1) Disconnect all PCM connectors. Connect the power plant ECU check harness special tool MB991923 between the separated connectors.
(2) Turn the ignition switch to the "ON" position.







(3) Measure the voltage between terminal No. 68 and ground.
- Voltage should be between 4.9 and 5.1 volts.

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

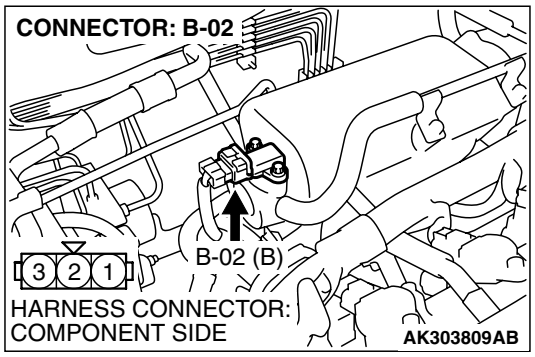
Q: Is the measured voltage between 4.9 and 5.1 volts?

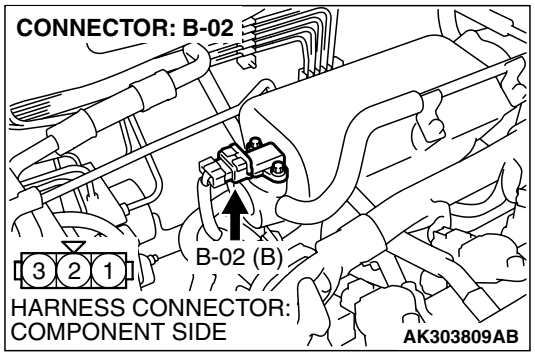
YES : Go to Step 7.
NO : Go to Step 5.

STEP 5. Check harness connector B-02 at the manifold absolute pressure sensor for damage.

Q: Is the connector in good condition?

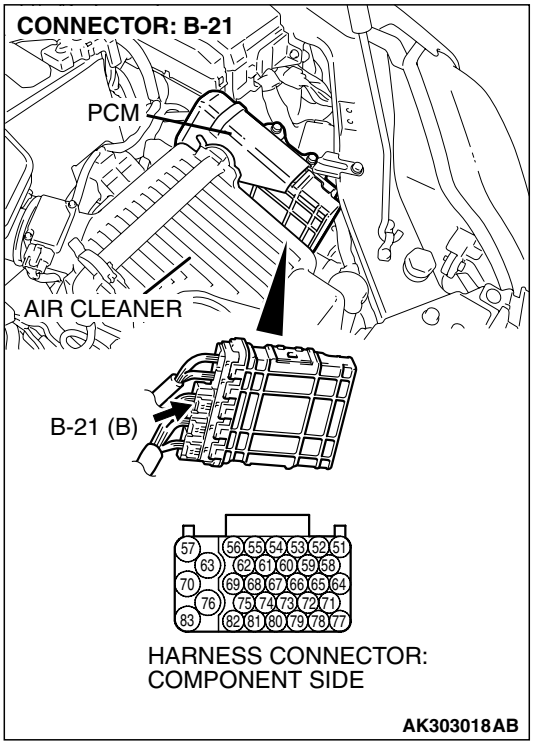
YES : Go to Step 6.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.





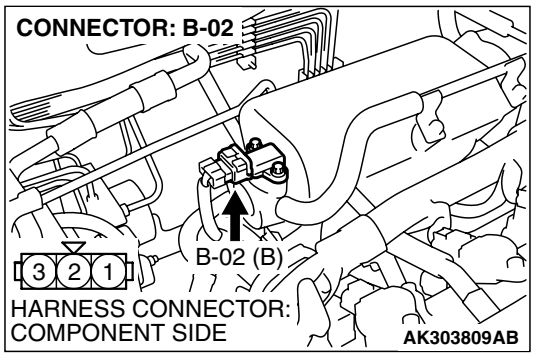
STEP 6. Check for short circuit to ground between manifold absolute pressure sensor connector B-02 (terminal No. 3) and PCM connector B-21 (terminal No. 68).
Q: Is the harness wire in good condition?

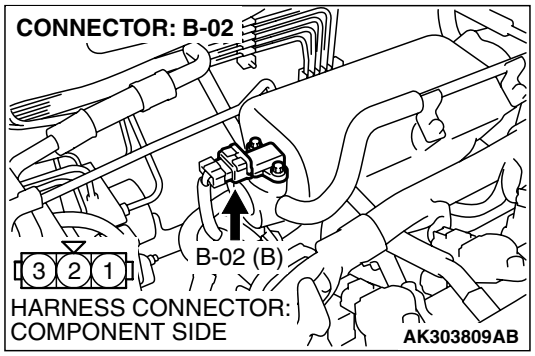
YES : Go to Step 11.
NO : Repair it. Then go to Step 12.

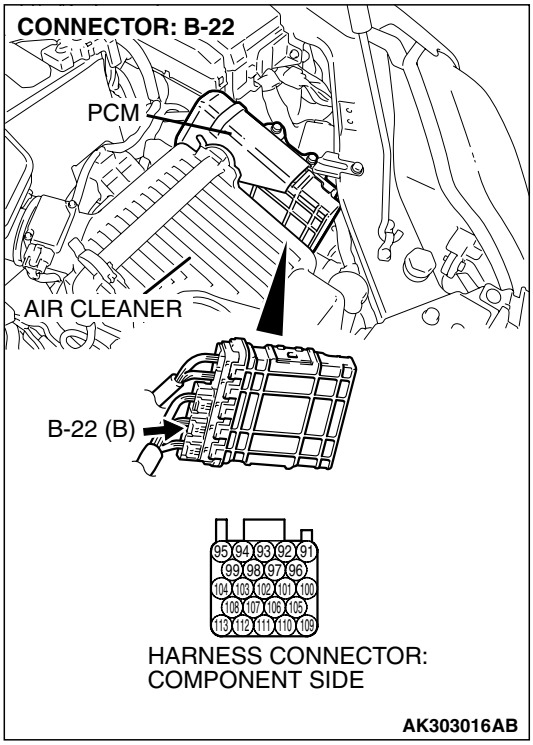


STEP 7. Check harness connector B-02 at the manifold absolute pressure sensor for damage.
Q: Is the connector in good condition?

YES : Repair harness wire between manifold absolute pressure sensor connector B-02 (terminal No. 3) and PCM connector B-21 (terminal No. 68) because of open circuit. Then go to Step 12.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.





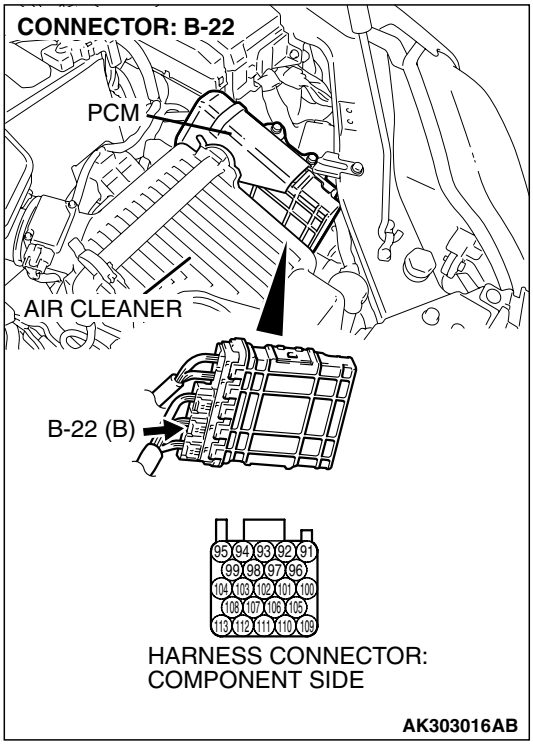


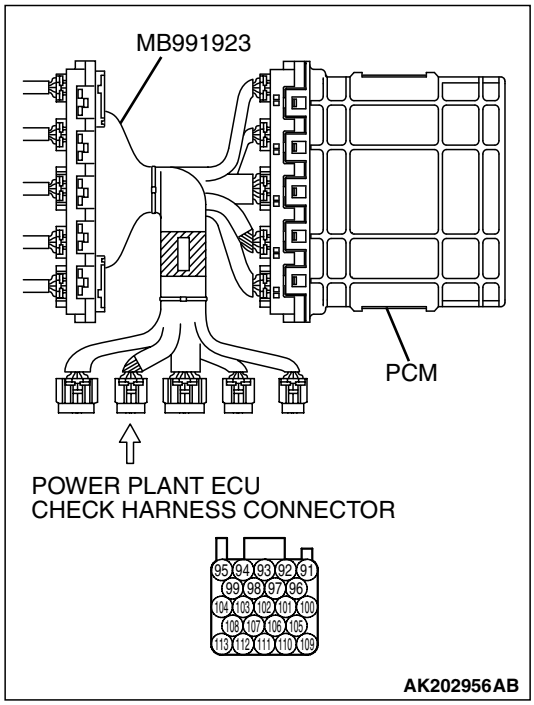
STEP 8. Check harness connector B-02 at the manifold absolute pressure sensor and connector B-22 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 9.

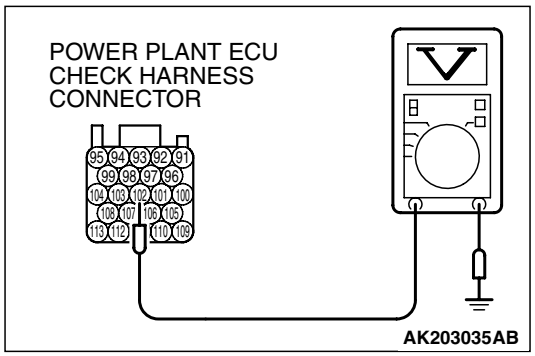
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.





STEP 9. Measure the sensor output voltage at PCM connector B-22 by using power plant ECU check harness special tool MB991923.

(1) Disconnect all PCM connectors. Connect the power plant ECU check harness special tool MB991923 between the separated connectors.
(2) Turn the ignition switch to the "ON" position.



(3) Measure the voltage between terminal No. 102 and ground.
- When altitude is 0 m (0 foot), voltage should be 3.7 and 4.3 volts.
- When altitude is 600 m (1,969 feet), voltage should be 3.4 and 4.0 volts.
- When altitude is 1,200 m (3,937 feet), voltage should be 3.2 and 3.8 volts.
- When altitude is 1,800 m (5,906 feet), voltage should be 2.9 and 3.5 volts.

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

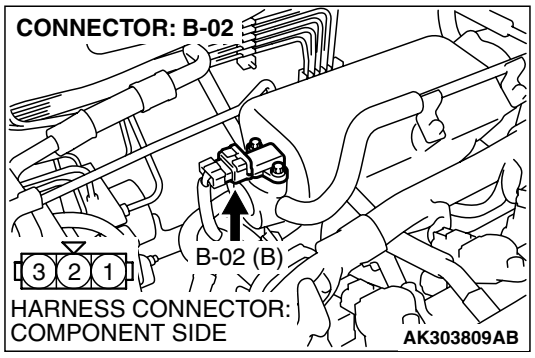
Q: Is the measured voltage normal?

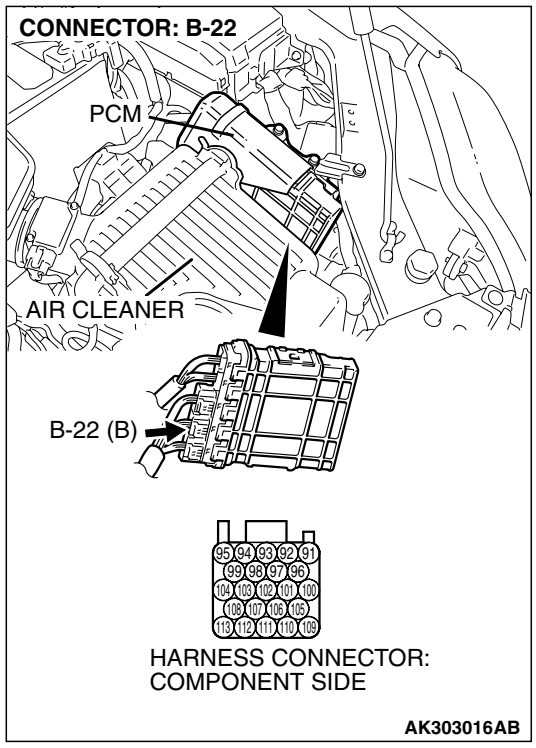
YES : Go to Step 11.
NO : Go to Step 10.

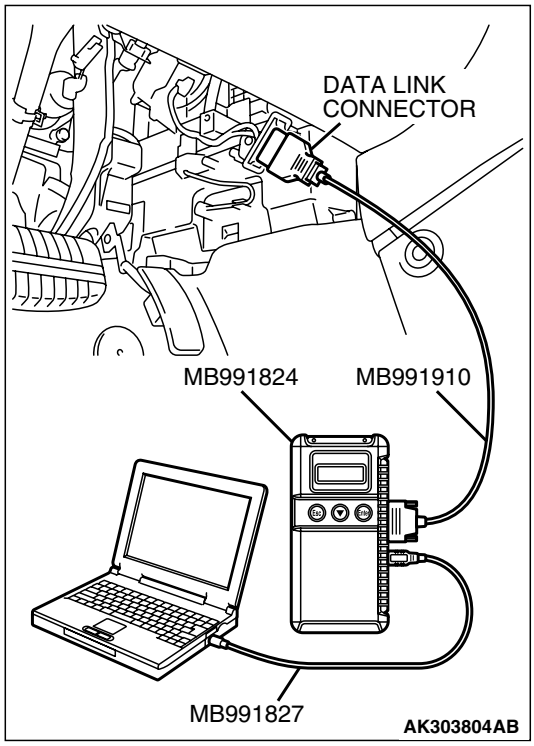
STEP 10. Check for open or short circuit to ground between manifold absolute pressure sensor connector B-02 (terminal No. 1) and PCM connector B-22 (terminal No. 102).

Q: Is the harness wire in good condition?

YES : Replace the manifold absolute pressure sensor. Then go to Step 12.
NO : Repair it. Then go to Step 12.







STEP 11. Using scan tool MB991958, check data list item 8: Manifold Absolute Pressure Sensor.

(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool MB991958 to the data reading mode for item 8, Manifold Absolute Pressure Sensor.
- When altitude is 0 m (0 foot), 101 kPa (29.8 in.Hg).
- When altitude is 600 m (1,969 feet), 95 kPa (28.1 in.Hg).
- When altitude is 1,200 m (3,937 feet), 88 kPa (26.0 in.Hg).
- When altitude is 1,800 m (5,906 feet), 81 kPa (23.9 in.Hg).

(3) Start the engine.
- When the engine is idling, 16 – 36 kPa (4.7 – 10.6 in.Hg).
- When the engine is suddenly revved, manifold absolute pressure varies.

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

Q: Is the sensor operating properly?

YES : It can be assumed 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 : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 12.

STEP 12. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 7 P.13A-9.
(2) Check the diagnostic trouble code (DTC).

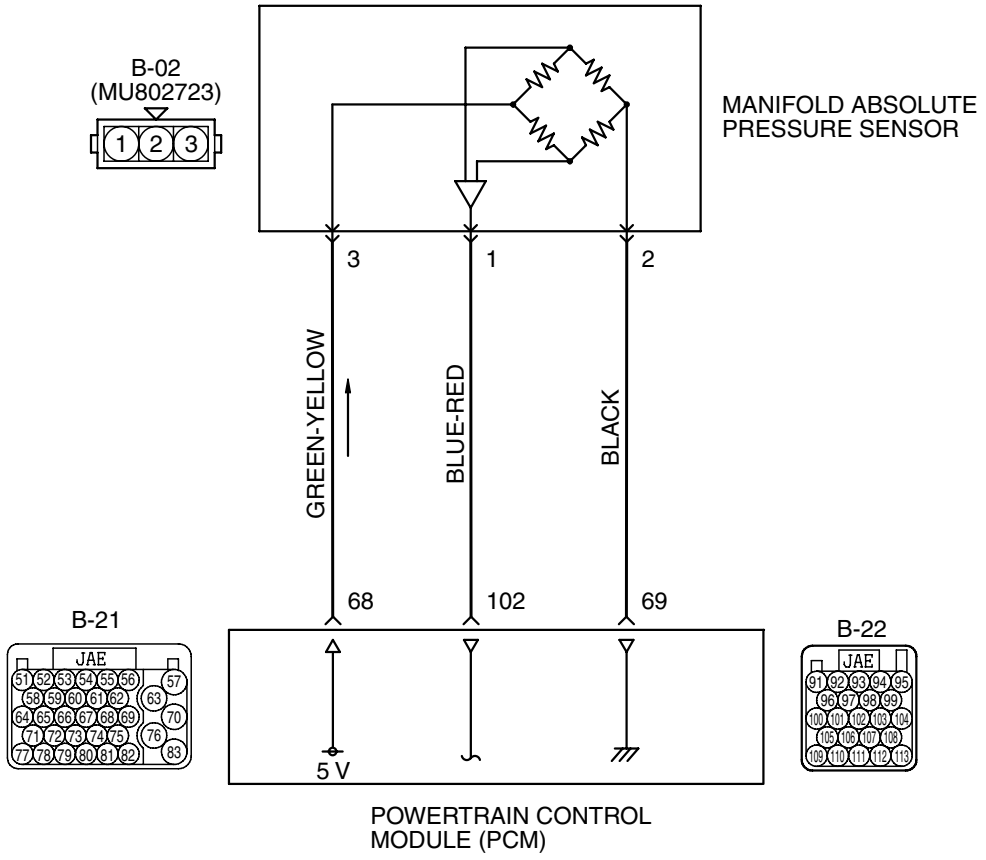
Q: Is DTC P0107 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0108: Manifold Absolute Pressure Circuit High Input

Manifold Absolute Pressure Sensor Circuit



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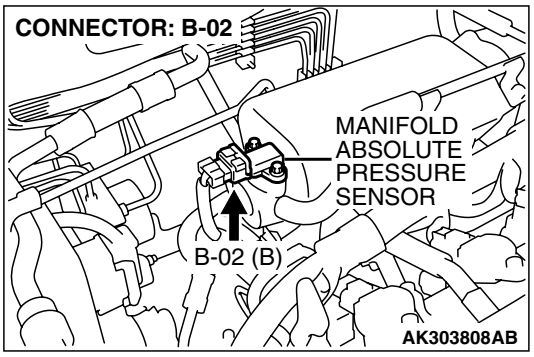

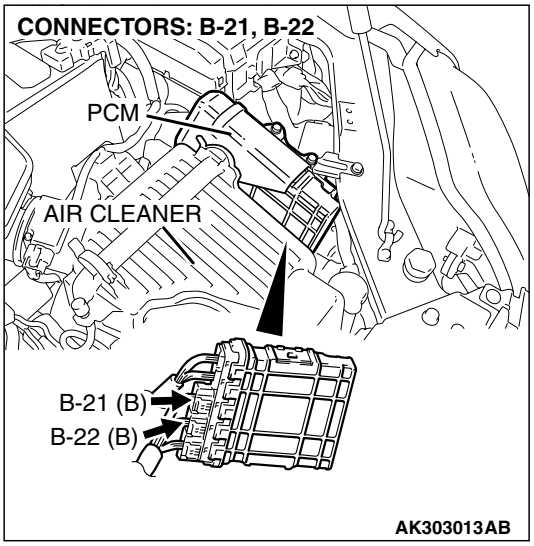

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CIRCUIT OPERATION

- A 5-volt voltage is supplied to the manifold absolute pressure sensor power terminal (terminal No. 3) from PCM (terminal No. 68). The ground terminal (terminal No. 2) is grounded with PCM (terminal No. 69).
- A voltage that is proportional to the intake manifold pressure is sent to the PCM (terminal No. 102) from the manifold absolute pressure sensor output terminal (terminal No. 1).

TECHNICAL DESCRIPTION

- The manifold absolute pressure sensor outputs a voltage which corresponds to the intake manifold pressure.
- The PCM checks whether this voltage is within a specified range.

DESCRIPTIONS OF MONITOR METHODS

Manifold absolute pressure sensor output voltage is out of specified range.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

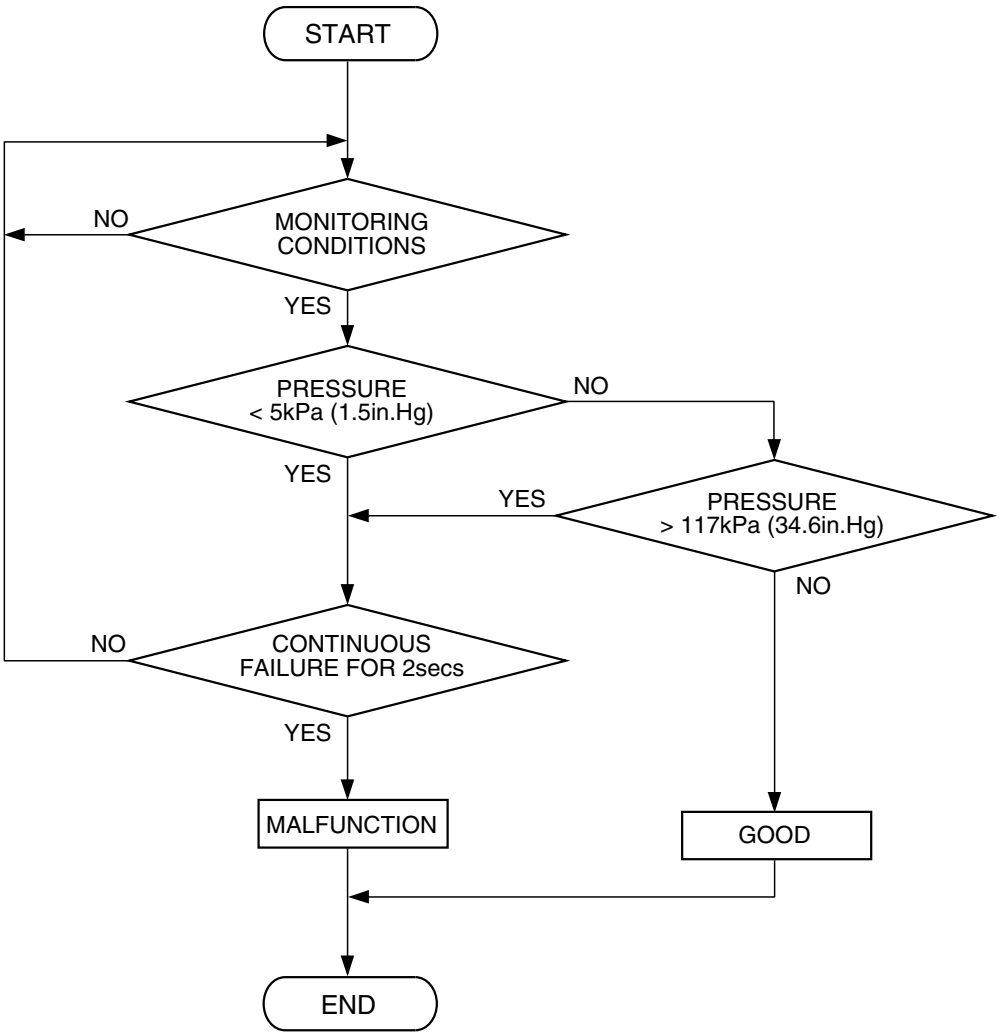
- Not applicable

Sensor (The sensor below is determined to be normal)

- Engine coolant temperature sensor
- Throttle position sensor
- Mass airflow sensor
- Intake air temperature sensor
- Barometric pressure sensor

DTC SET CONDITIONS

Logic Flow Chart



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Check Condition

- 8 minutes or more have passed since the engine starting sequence was completed, when the engine coolant temperature at engine start is 0°C (32°F) or lower.

Judgement Criterion

- Manifold absolute pressure is higher than 117 kPa (34.6 in.Hg) for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 24 P.13A-9.

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

- Manifold absolute pressure sensor failed.
- Open manifold absolute pressure sensor circuit, or connector damage.
- PCM failed.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable

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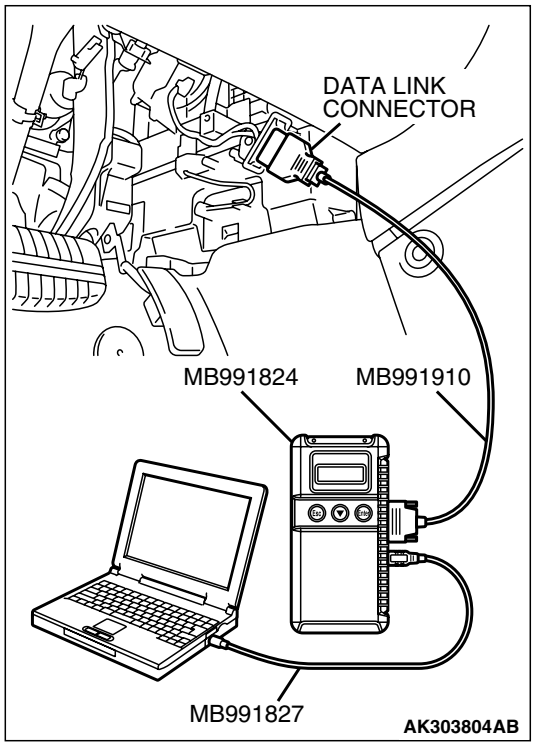
- MB991910: Main Harness A



STEP 1. Using scan tool MB991958, check data list item 8: Manifold Absolute Pressure 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) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991958 to the data reading mode for item 8, Manifold Absolute Pressure Sensor.
- When altitude is 0 m (0 foot), 101 kPa (29.8 in.Hg).
- When altitude is 600 m (1,969 feet), 95 kPa (28.1 in.Hg).
- When altitude is 1,200 m (3,937 feet), 88 kPa (26.0 in.Hg).
- When altitude is 1,800 m (5,906 feet), 81 kPa (23.9 in.Hg).

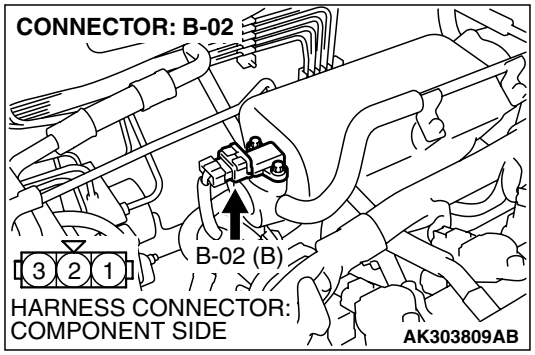
(4) Start the engine.
- When the engine is idling, 16 – 36 kPa (4.7 – 10.6 in.Hg).
- When the engine is suddenly revved, manifold absolute pressure varies.

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

Q: Is the sensor operating properly?

YES : It can be assumed 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.

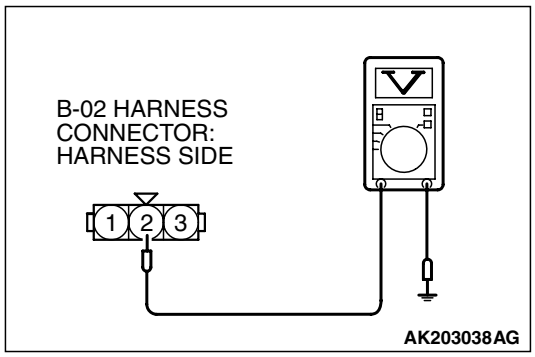
NO : Go to Step 2.



STEP 2. Measure the ground voltage at manifold absolute pressure sensor connector B-02 by backprobing.

(1) Do not disconnect the connector B-02.

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



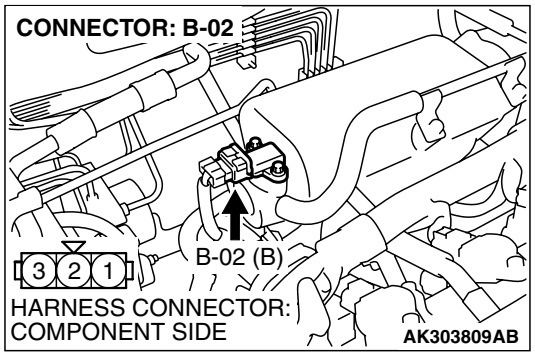
(3) Measure the voltage between terminal No. 2 and ground by backprobing.
- Voltage should be 0.5 volt or less.

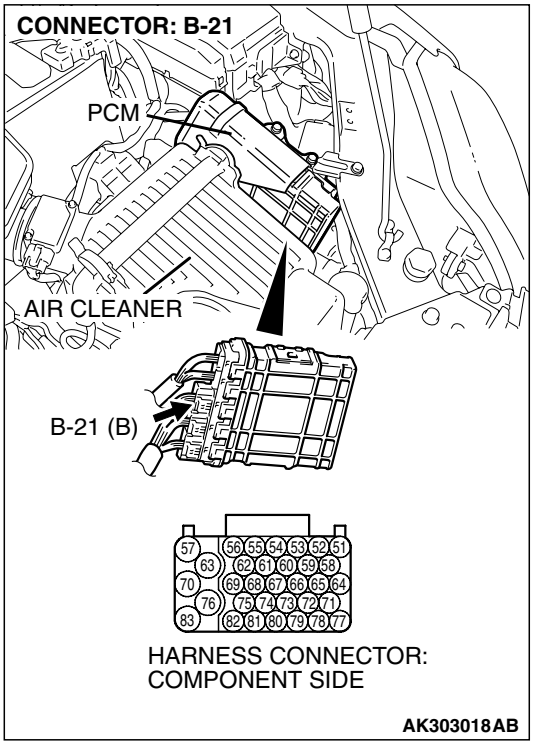
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the measured voltage 0.5 volt or less?

YES : Go to Step 6.

NO : Go to Step 3.



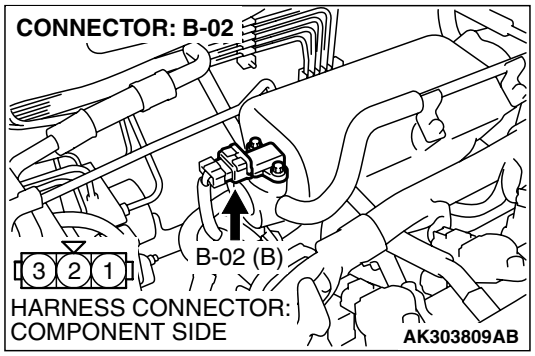


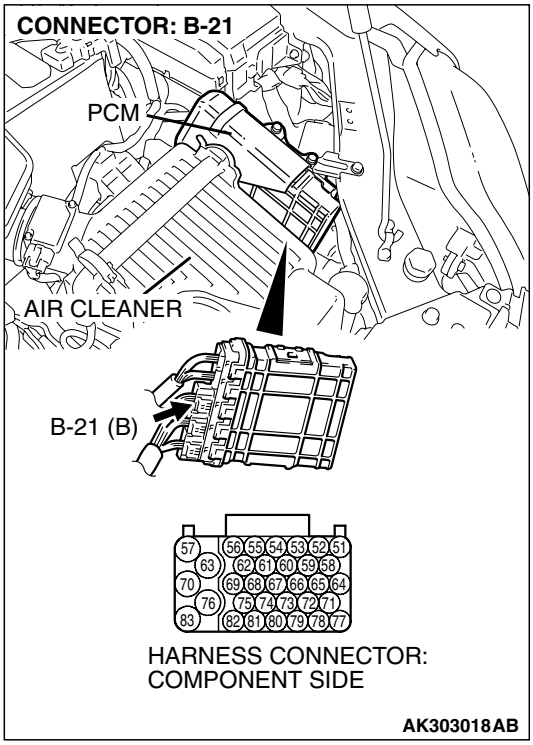
STEP 3. Check harness connector B-02 at the manifold absolute pressure sensor and harness connector B-21 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 4.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 7.



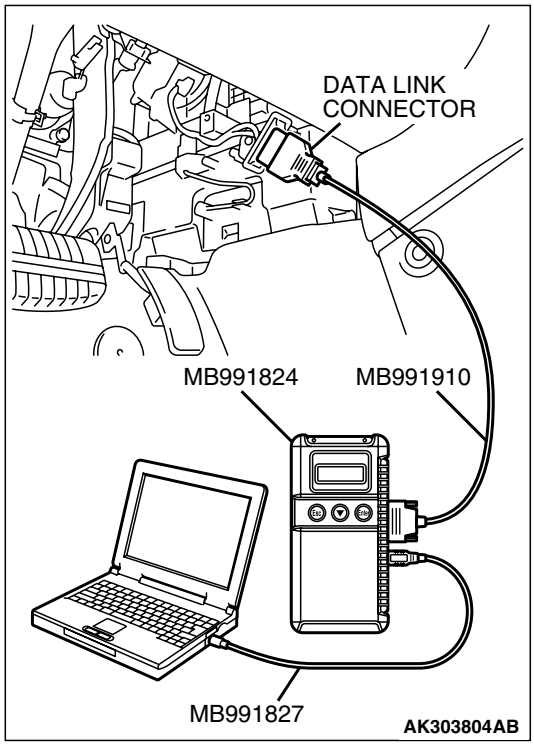


STEP 4. Check for open circuit between manifold absolute pressure sensor connector B-02 (terminal No. 2) and PCM connector B-21 (terminal No. 69).

Q: Is the harness wire in good condition?

YES : Go to Step 5.

NO : Repair it. Then go to Step 7.



STEP 5. Using scan tool MB991958, check data list item 8: Manifold Absolute Pressure Sensor.

(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool MB991958 to the data reading mode for item 8, Manifold Absolute Pressure Sensor.
- When altitude is 0 m (0 foot), 101 kPa (29.8 in.Hg).
- When altitude is 600 m (1,969 feet), 95 kPa (28.1 in.Hg).
- When altitude is 1,200 m (3,937 feet), 88 kPa (26.0 in.Hg).
- When altitude is 1,800 m (5,906 feet), 81 kPa (23.9 in.Hg).

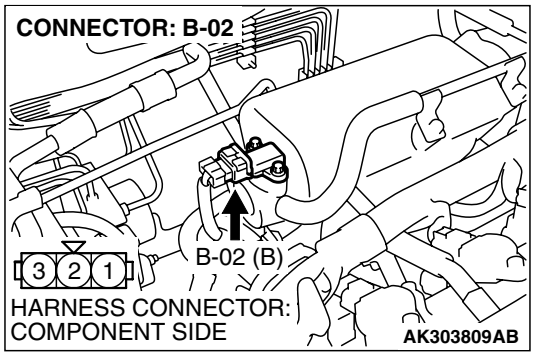
(3) Start the engine.
- When the engine is idling, 16 – 36 kPa (4.7 – 10.6 in.Hg).
- When the engine is suddenly revved, manifold absolute pressure varies.

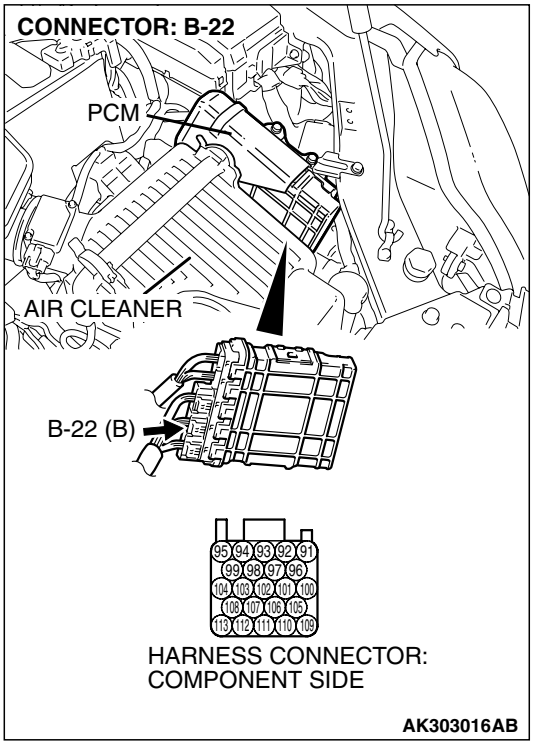
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed 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 : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 7.





STEP 6. Check harness connector B-02 at the manifold absolute pressure sensor and harness connector B-22 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Replace the manifold absolute pressure sensor. Then go to Step 7.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 7.

STEP 7. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 24 P.13A-9.

(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0108 set?

YES : Retry the troubleshooting.

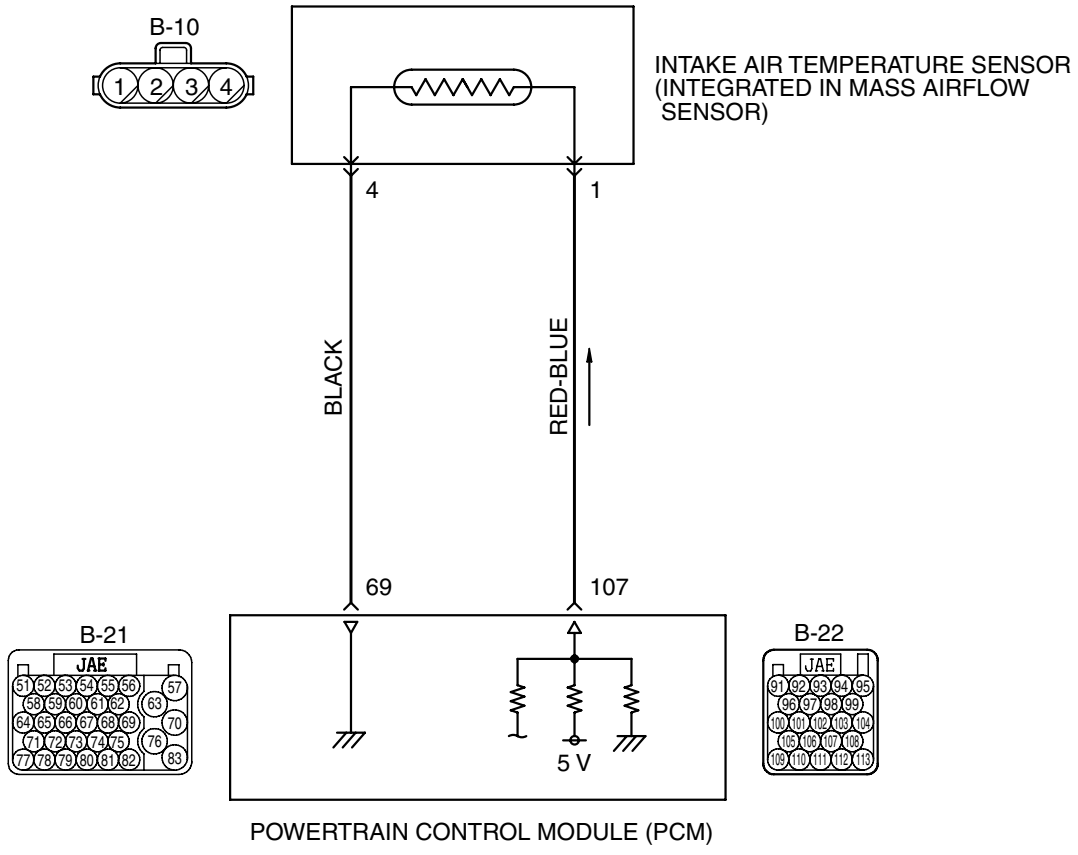
NO : The inspection is complete.

DTC P0111: Intake Air Temperature Circuit Range/Performance Problem

⚠ CAUTION

If DTC P0111 has been set, TCL related DTC U1120 is also set. After P0111 has been diagnosed, don't forget to erase DTC U1120.

Intake Air Temperature Sensor Circuit



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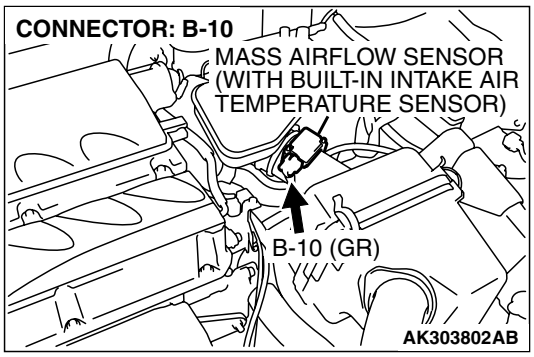

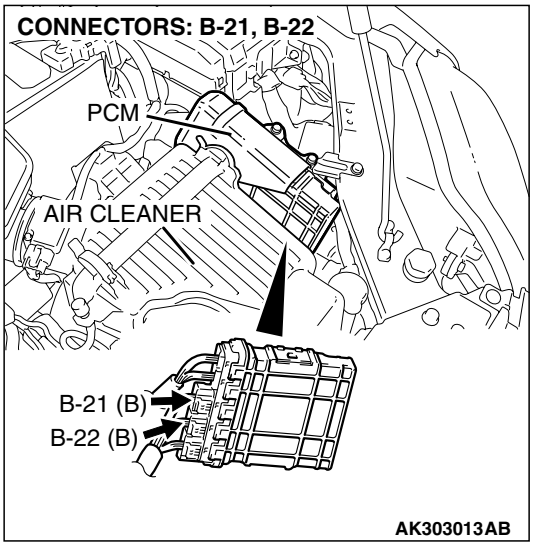

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CIRCUIT OPERATION

- Approximately 5 volts are applied to the intake air temperature sensor output terminal (terminal No. 1) from the PCM (terminal No. 107) via the resistor in the PCM. The ground terminal (terminal No. 4) is grounded with PCM (terminal No. 69).
- The intake air temperature sensor is a negative temperature coefficient type of resistor. When the intake air temperature rises, the resistance decreases.
- The intake air temperature sensor output voltage increases when the resistance increases and decreases when the resistance decreases.

TECHNICAL DESCRIPTION

- The intake air temperature sensor converts the intake air temperature to a voltage.
- The PCM checks whether this voltage is within a specified range.

DESCRIPTIONS OF MONITOR METHODS

Intake air temperature sensor output voltage does not change when specified go/stop operations are repeated.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

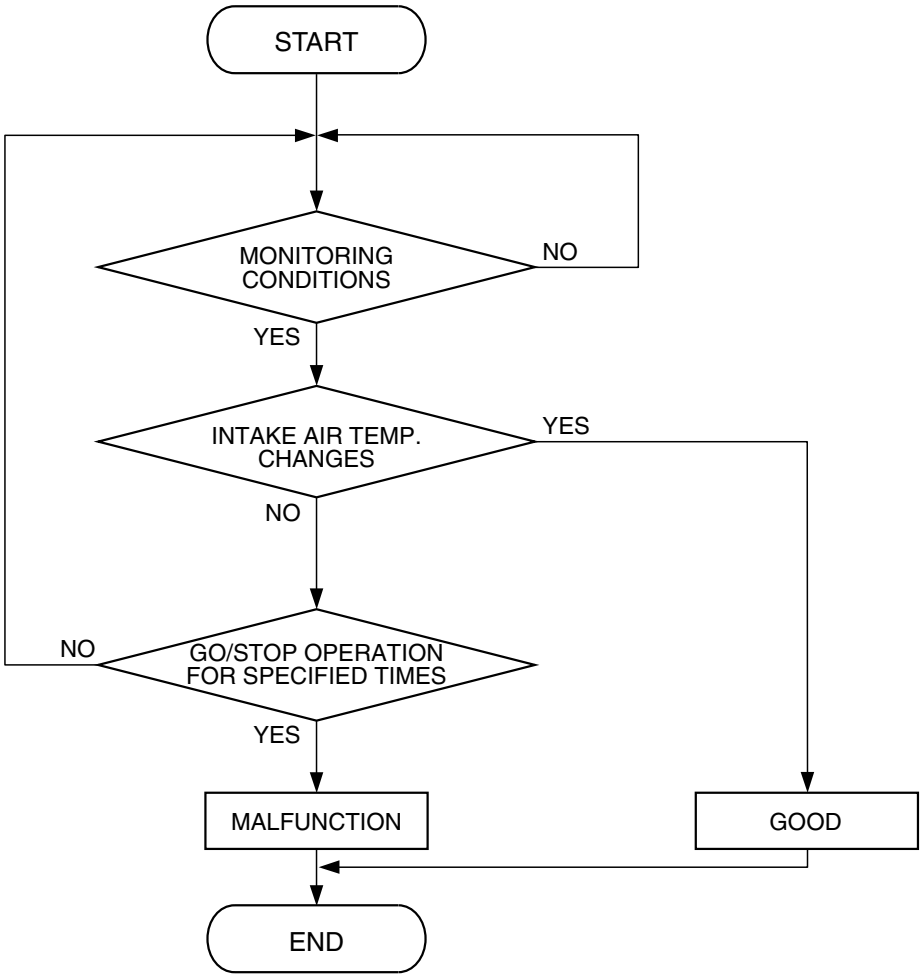
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



AK302012

Check Conditions

- Engine coolant temperature is higher than 76°C (169°F).
- Repeat 2 or more times: drive[*1], stop[*2].

  Drive[*1]: vehicle speed higher than 50 km/h (31 mph) lasting a total of more than 60 seconds.

  Stop[*2]: vehicle speed lower than 1.5 km/h (1.0 mph) lasting more than 30 seconds.

Judgement Criterion

- Changes in the intake air temperature is lower than 1°C (1.8°F).

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 8 P.13A-9.

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

- Intake air temperature sensor failed.
- Open intake air temperature sensor circuit, harness damage or connector damage.
- PCM failed.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)

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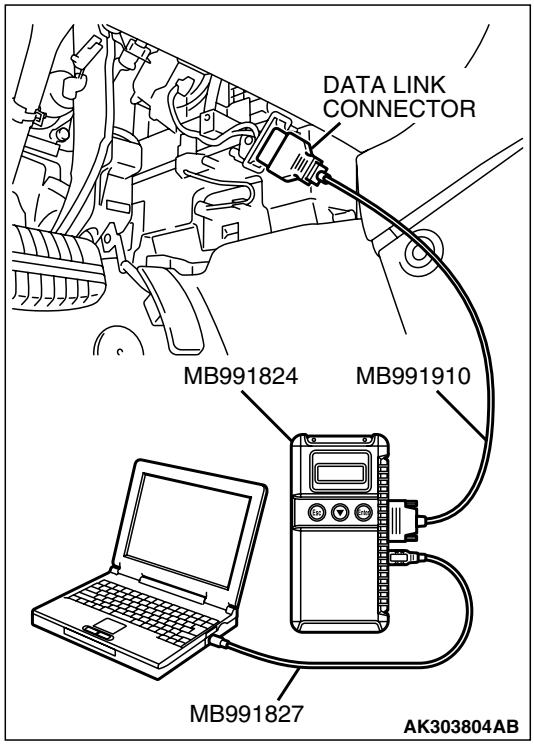
- MB991824: V.C.I.
- MB991827: USB Cable
- MB991910: Main Harness A

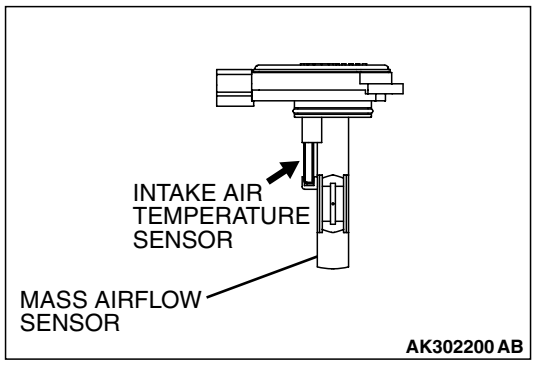
STEP 1. Using scan tool MB991958, check data list item 5: Intake Air Temperature Sensor.

⚠ 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) Remove the mass airflow sensor from the air intake hose.
(3) Turn the ignition switch to the "ON" position.
(4) Set scan tool MB991958 to the data reading mode for item 5, Intake Air Temperature Sensor.





(5) Heating the sensor using a hair drier.
- The indicated temperature increases.

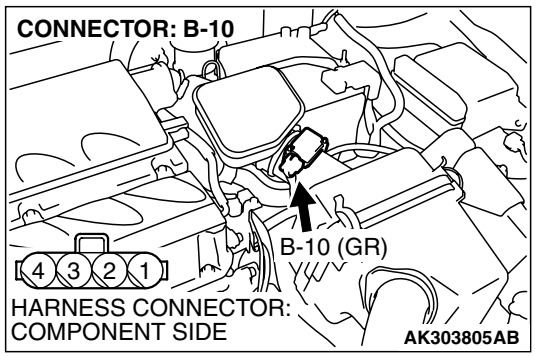
NOTE: Do not allow it to increase over 80°C (176°F).

(6) Turn the ignition switch to the "LOCK" (OFF) position.
(7) Attach the mass airflow sensor.

Q: Is the sensor operating properly?

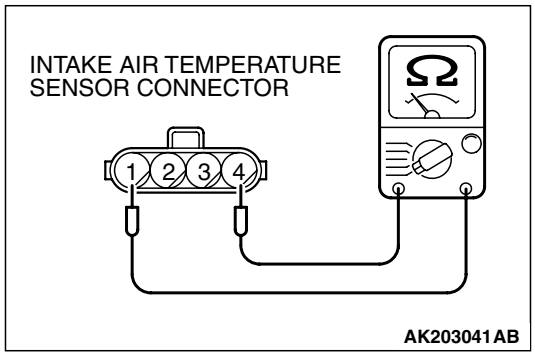
YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-14.

NO : Go to Step 2.

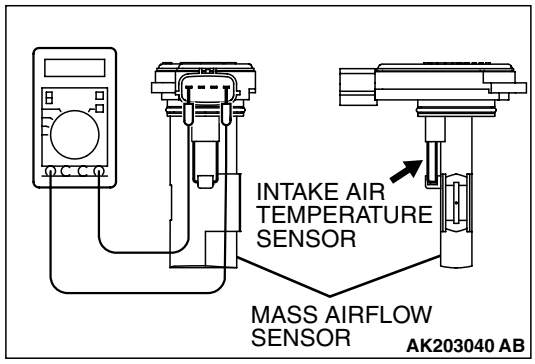


STEP 2. Check the intake air temperature sensor.

(1) Disconnect the intake air temperature sensor connector B-10.



(2) Measure the resistance between intake air temperature sensor side connector terminal No. 1 and No. 4.



(3) Measure resistance while heating the sensor using a hair drier.

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)]

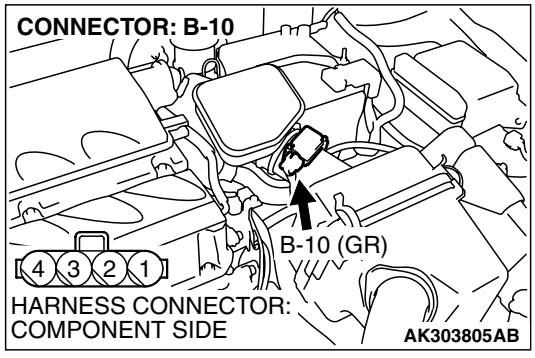
Q: Is the measured resistance at the standard value?

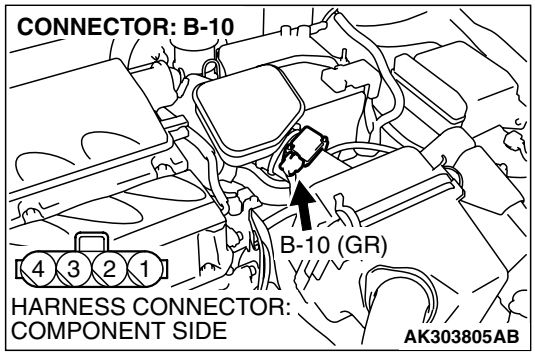
YES : Go to Step 3.
NO : Replace the mass airflow sensor. Then go to Step 9.

STEP 3. Check harness connector B-10 at the intake air temperature sensor for damage.

Q: Is the harness connector in good condition?

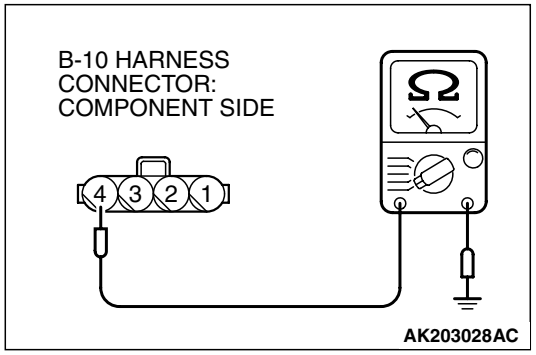
YES : Go to Step 4.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 9.





STEP 4. Check the continuity at intake air temperature sensor harness side connector B-10.

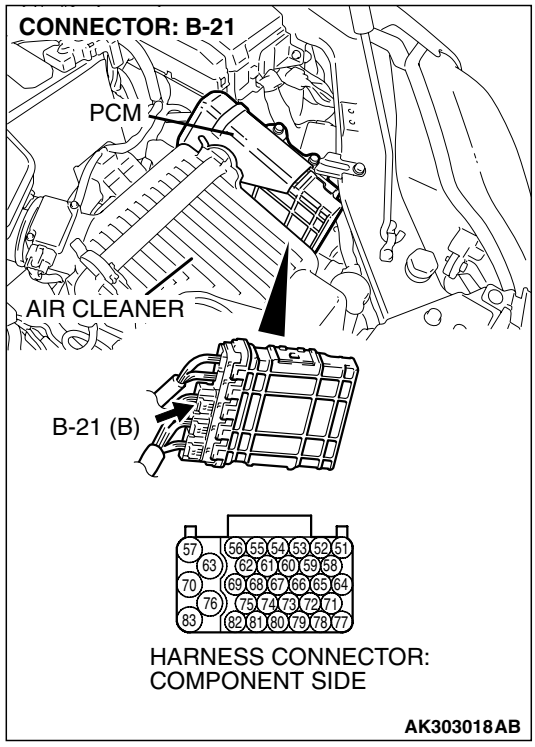
(1) Disconnect the connector B-10 and measure at the harness side.



(2) Check for the continuity between terminal No. 4 and ground.
- Continuity (2 Ω or less)

Q: Does continuity exist?

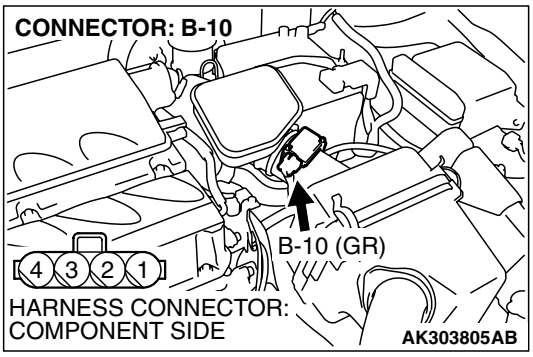
YES : Go to Step 7.
NO : Go to Step 5.

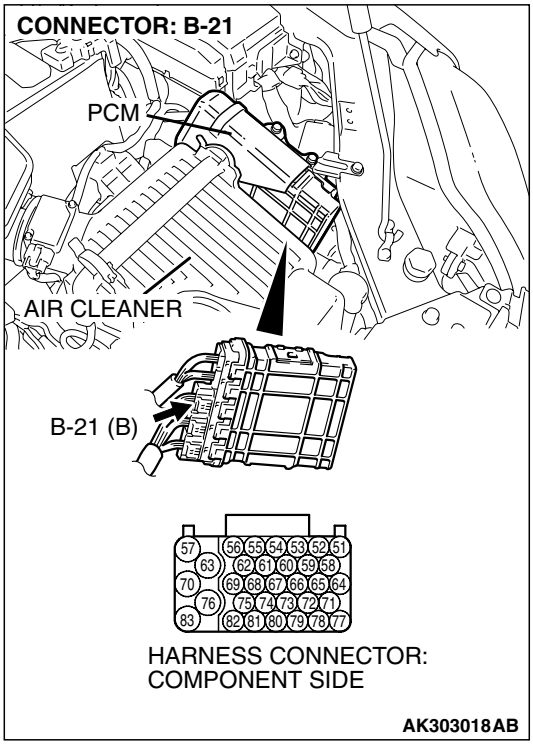


STEP 5. Check harness connector B-21 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 6.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 9.

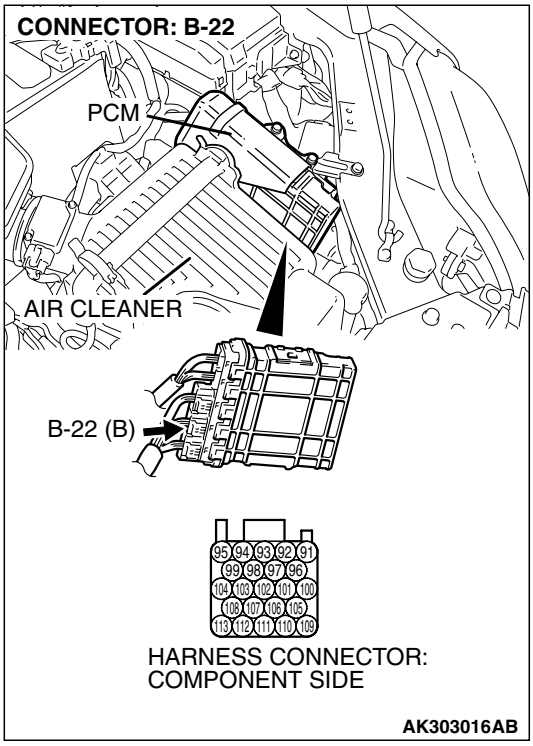




STEP 6. Check for open circuit and harness damage between intake air temperature sensor connector B-10 (terminal No. 4) and PCM connector B-21 (terminal No. 69).
Q: Is the harness wire in good condition?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 9.

NO : Repair it. Then go to Step 9.

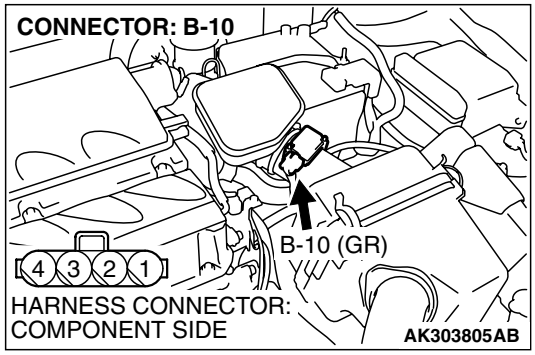


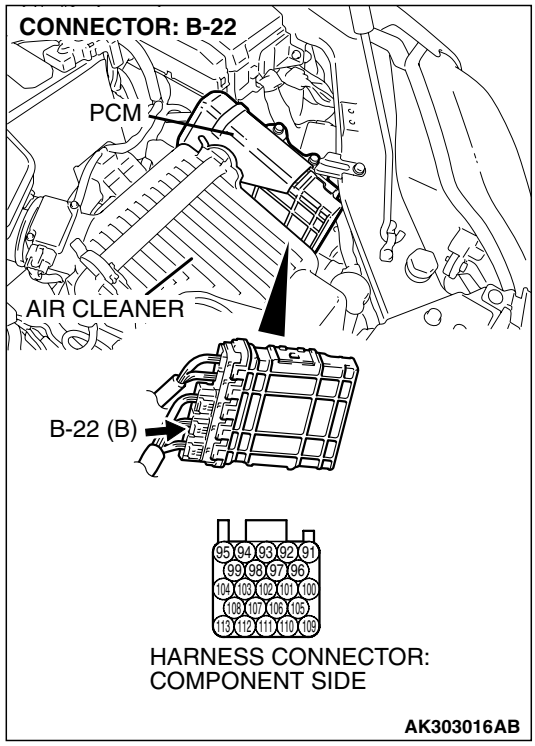
STEP 7. Check harness connector B-22 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 8.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 9.





STEP 8. Check for open circuit and harness damage between intake air temperature sensor connector B-10 (terminal No. 1) and PCM connector B-22 (terminal No. 107).

Q: Is the harness wire in good condition?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 9.

NO : Repair it. Then go to Step 9.

STEP 9. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 8 P.13A-9.

(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0111 set?

YES : Retry the troubleshooting.

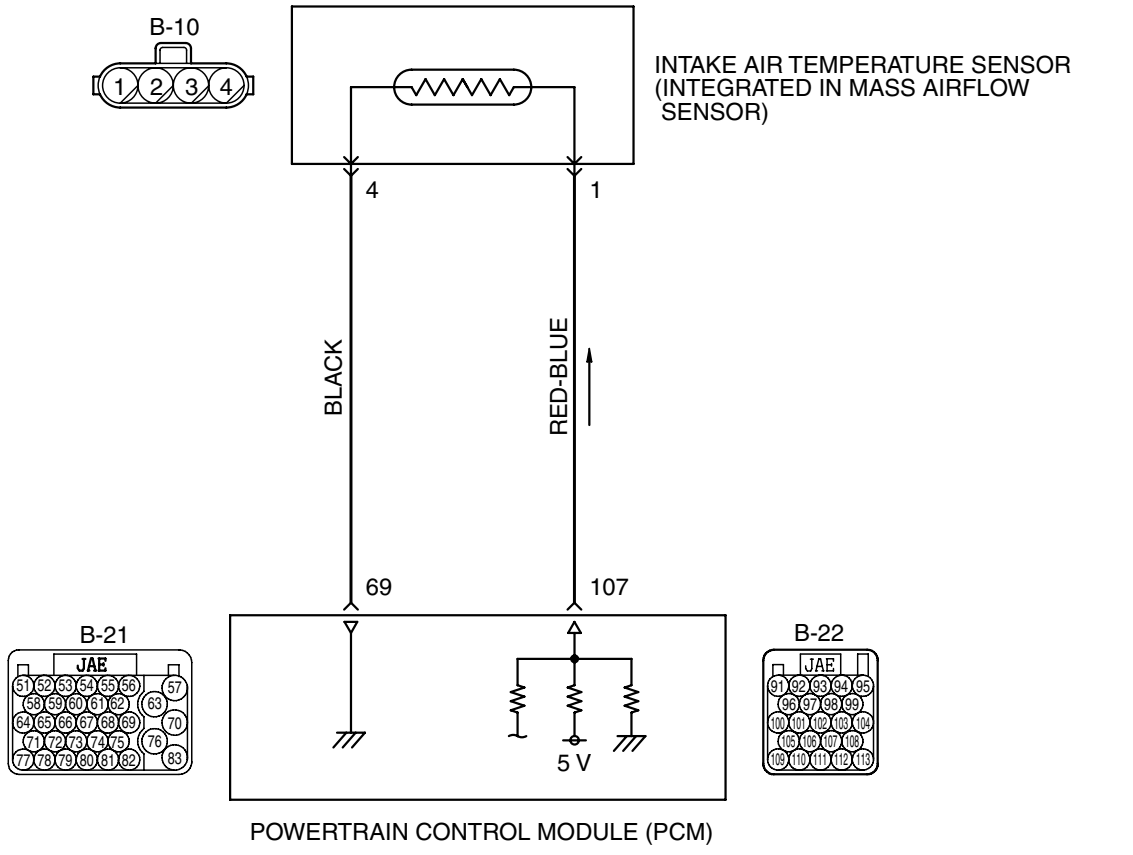
NO : The inspection is complete.

DTC P0112: Intake Air Temperature Circuit Low Input

⚠ CAUTION

If DTC P0112 has been set, TCL related DTC U1120 is also set. After P0112 has been diagnosed, don't forget to erase DTC U1120.

Intake Air Temperature Sensor Circuit



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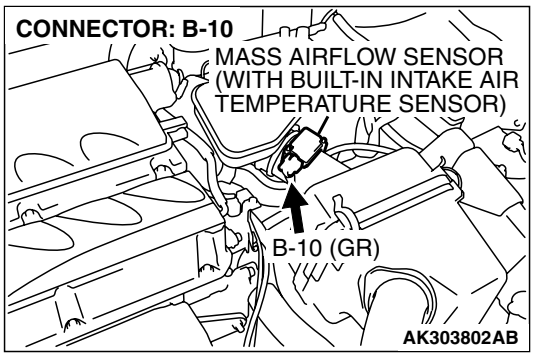
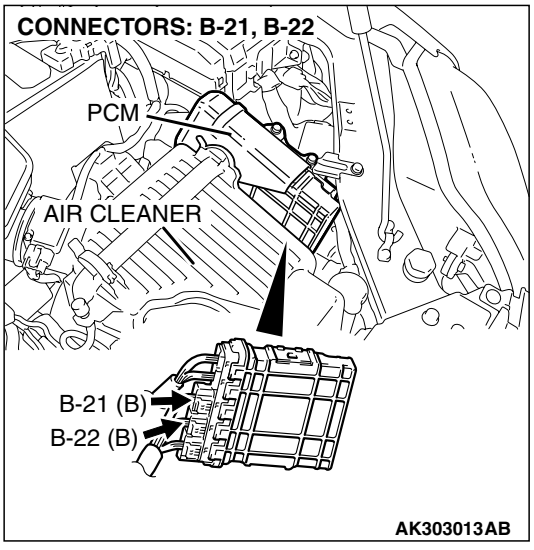




TSB Revision

CIRCUIT OPERATION

- Approximately 5 volts are applied to the intake air temperature sensor output terminal (terminal No. 1) from the PCM (terminal No. 107) via the resistor in the PCM. The ground terminal (terminal No. 4) is grounded with PCM (terminal No. 69).
- The intake air temperature sensor is a negative temperature coefficient type of resistor. When the intake air temperature rises, the resistance decreases.
- The intake air temperature sensor output voltage increases when the resistance increases and decreases when the resistance decreases.

TECHNICAL DESCRIPTION

- The intake air temperature sensor converts the intake air temperature to a voltage.
- The PCM checks whether this voltage is within a specified range.

DESCRIPTIONS OF MONITOR METHODS

Intake air temperature sensor output voltage is out of specified range.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

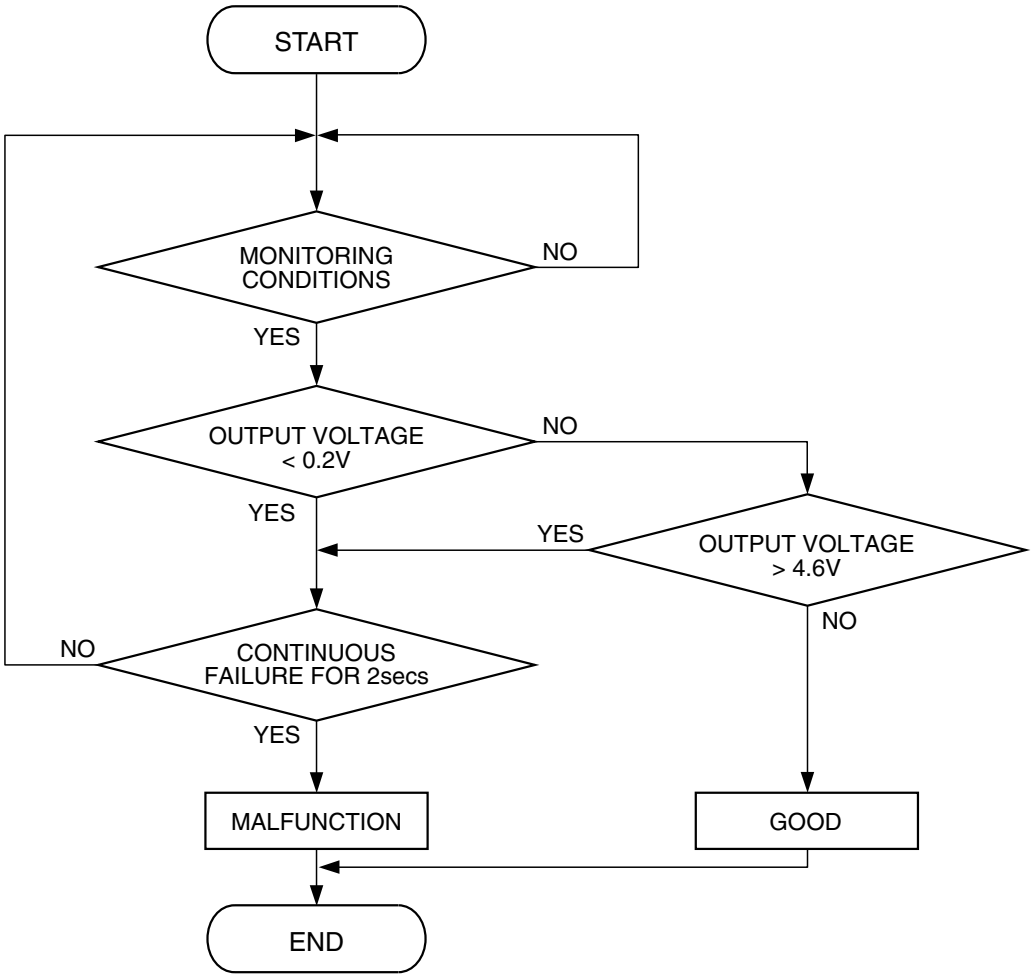
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



AK302013

Check Condition

- 2 seconds or more have passed since the engine starting sequence was completed.

Judgement Criterion

- Intake air temperature sensor output voltage has continued to be 0.2 volt or lower [corresponding to an air intake temperature of 115°C (239°F) or higher] for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 24 P.13A-9.

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

- Intake air temperature sensor failed.
- Shorted intake air temperature sensor circuit, or connector damage.
- PCM failed.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable

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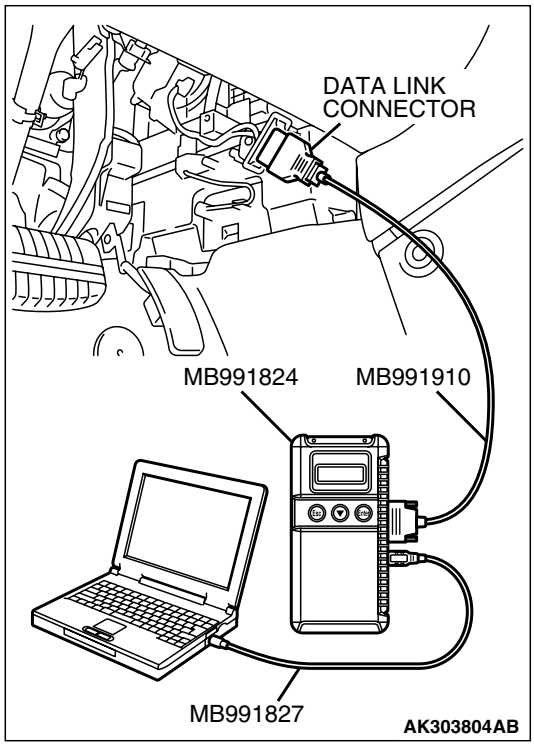
- MB991910: Main Harness A



STEP 1. Using scan tool MB991958, check data list item 5: Intake Air 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.

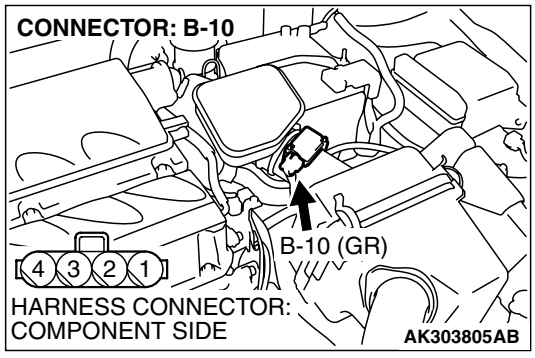
(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991958 to the data reading mode for item 5, Intake Air Temperature Sensor.
- The intake air temperature and temperature shown with the scan tool should approximately match.

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

Q: Is the sensor operating properly?

YES : It can be assumed 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.

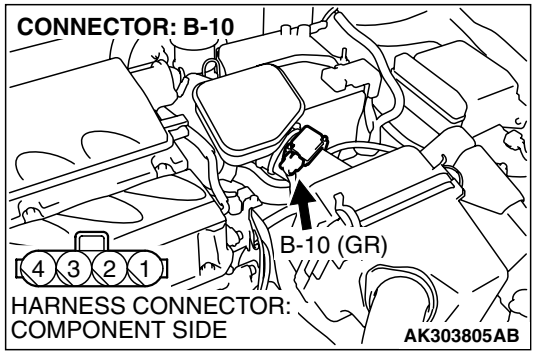


STEP 2. Check harness connector B-10 at the intake air temperature sensor for damage.

Q: Is the harness connector in good condition?

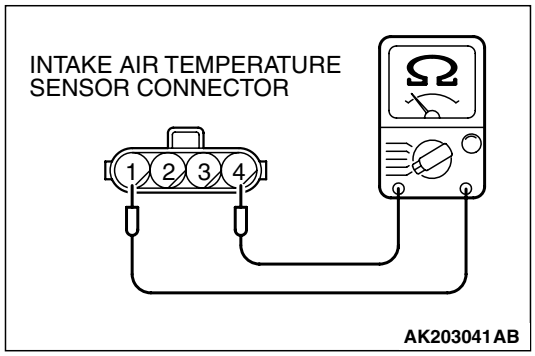
YES : Go to Step 3.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 6.



STEP 3. Check the intake air temperature sensor.

(1) Disconnect the intake air temperature sensor connector B-10.

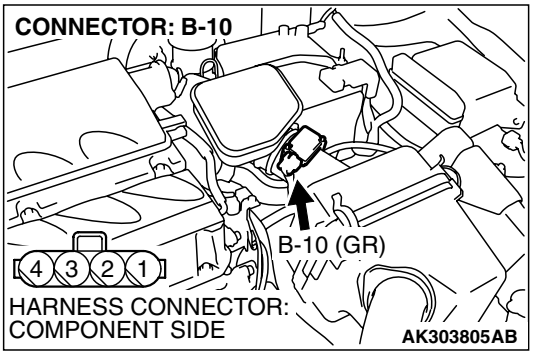


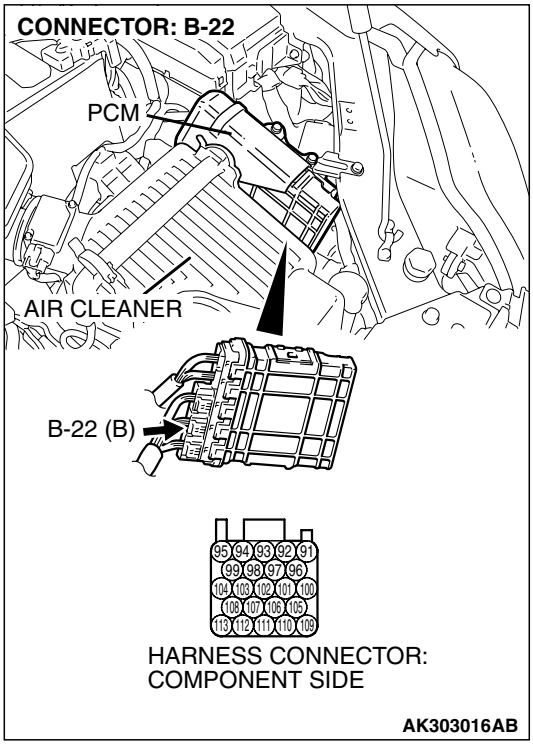
(2) Measure the resistance between intake air temperature sensor side connector terminal No. 1 and No. 4.
- There should be continuity. (0.30 – 20 kΩ)

Q: Is the measured resistance between 0.30 and 20 kΩ?

YES : Go to Step 4.

NO : Replace the mass airflow sensor. Then go to Step 6.



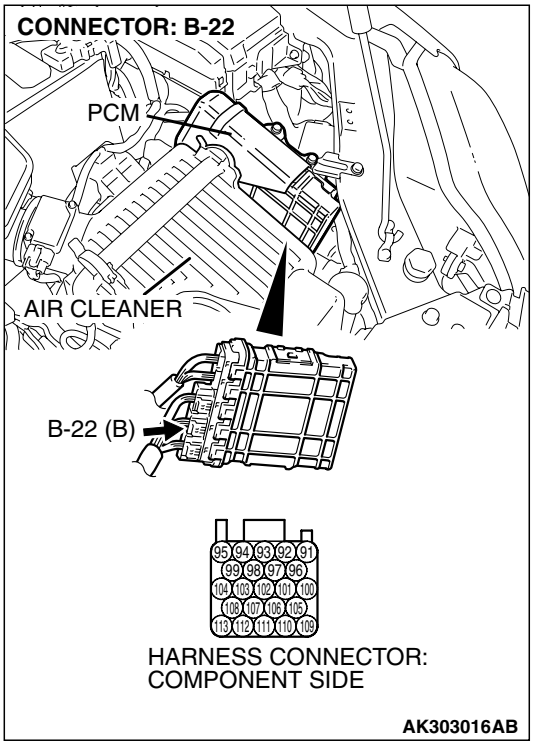


STEP 4. Check for short circuit to ground between intake air temperature sensor connector B-10 (terminal No. 1) and PCM connector B-22 (terminal No. 107).

Q: Is the harness wire in good condition?

YES : Go to Step 5.

NO : Repair it. Then go to Step 6.



STEP 5. Check harness connector B-22 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 6.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 6.

STEP 6. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 24 P.13A-9.

(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0112 set?

YES : Retry the troubleshooting.

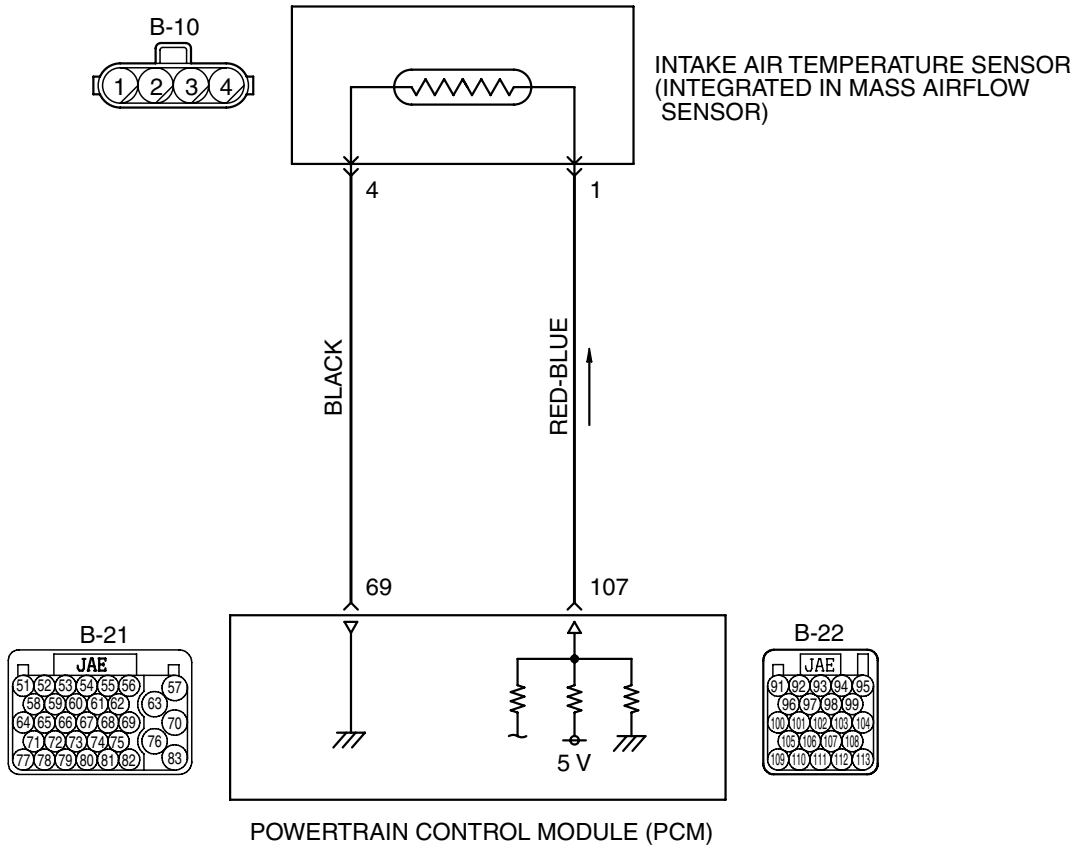
NO : The inspection is complete.

DTC P0113: Intake Air Temperature Circuit High Input

⚠ CAUTION

If DTC P0113 has been set, TCL related DTC U1120 is also set. After P0113 has been diagnosed, don't forget to erase DTC U1120.

Intake Air Temperature Sensor Circuit



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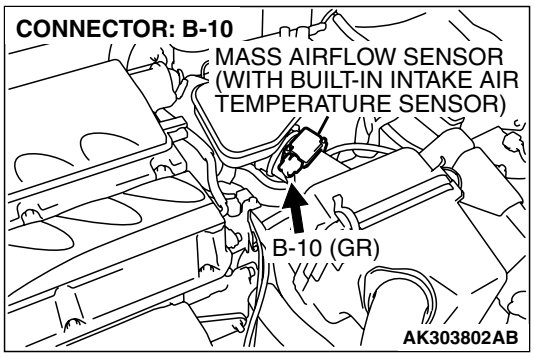

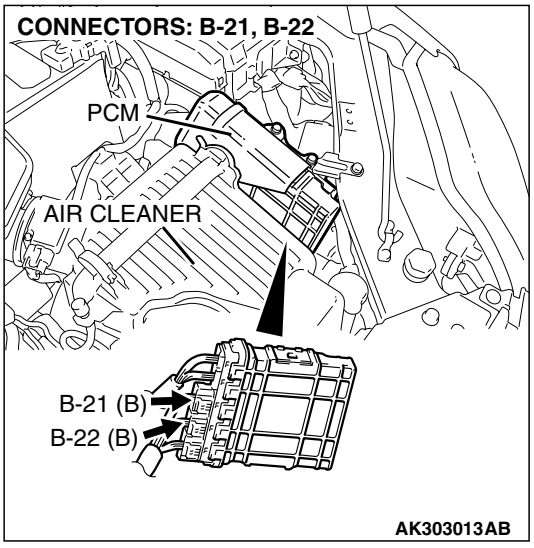

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CIRCUIT OPERATION

- Approximately 5 volts are applied to the intake air temperature sensor output terminal (terminal No. 1) from the PCM (terminal No. 107) via the resistor in the PCM. The ground terminal (terminal No. 4) is grounded with PCM (terminal No. 69).
- The intake air temperature sensor is a negative temperature coefficient type of resistor. When the intake air temperature rises, the resistance decreases.
- The intake air temperature sensor output voltage increases when the resistance increases and decreases when the resistance decreases.

TECHNICAL DESCRIPTION

- The intake air temperature sensor converts the intake air temperature to a voltage.
- The PCM checks whether this voltage is within a specified range.

DESCRIPTIONS OF MONITOR METHODS

Intake air temperature sensor output voltage is out of specified range.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

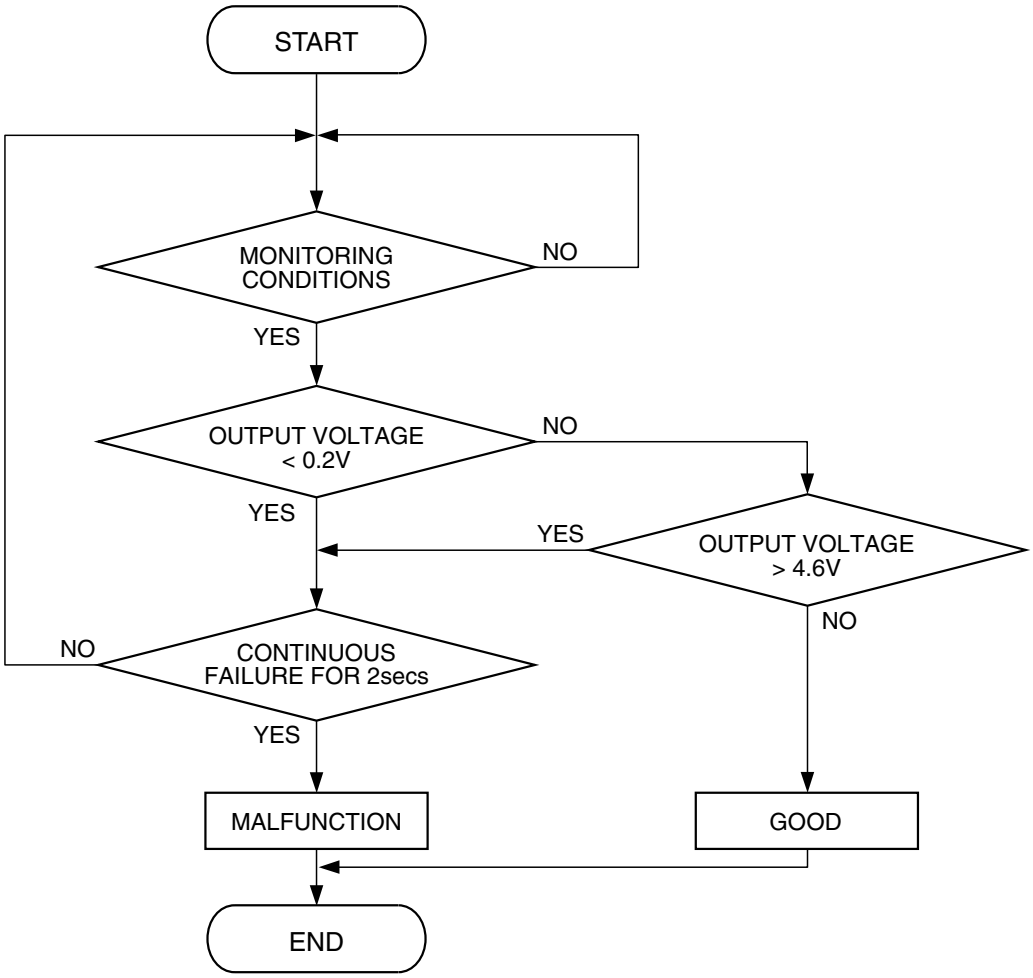
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



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Check Condition

- 2 seconds or more have passed since the engine starting sequence was completed.

Judgement Criterion

- Intake air temperature sensor output voltage has continued to be 4.6 volts or higher [corresponding to an air intake temperature of –40°C (–40°F) or lower] for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 24 P.13A-9.

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

- Intake air temperature sensor failed.
- Open intake air temperature sensor circuit, or connector damage.
- PCM failed.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable

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- MB991910: Main Harness A
- MB991923: Power Plant ECU Check Harness

STEP 1. Using scan tool MB991958, check data list item 5: Intake Air 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.

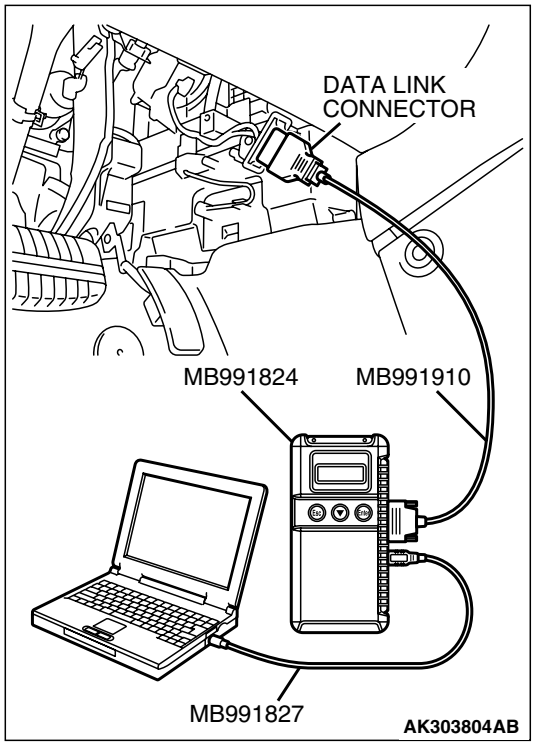
(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991958 to the data reading mode for item 5, Intake Air Temperature Sensor.
- The intake air temperature and temperature shown with the scan tool should approximately match.

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

Q: Is the sensor operating properly?

YES : It can be assumed 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.

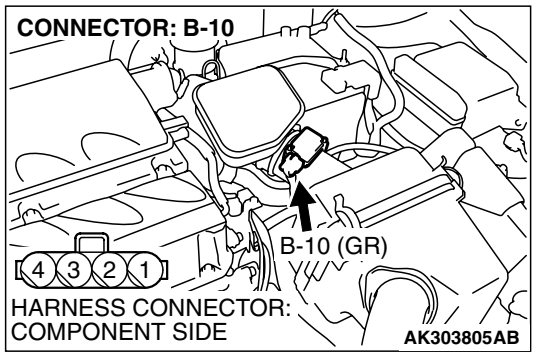


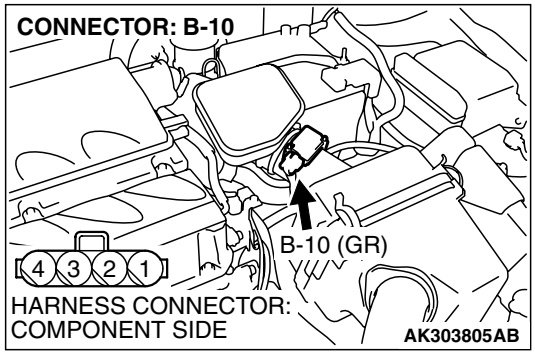
STEP 2. Check harness connector B-10 at the intake air temperature sensor for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 3.

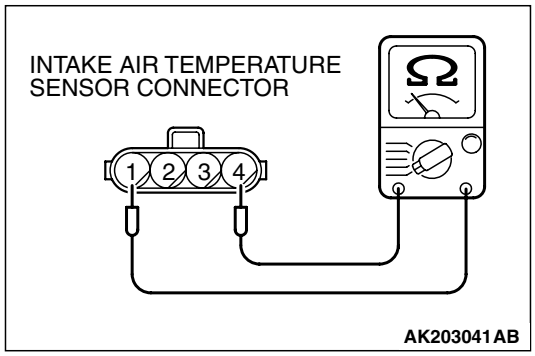
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.





STEP 3. Check the intake air temperature sensor.

(1) Disconnect the intake air temperature sensor connector B-10.



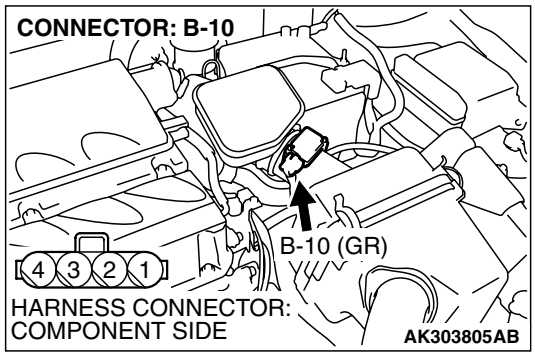
(2) Measure the resistance between intake air temperature sensor side connector terminal No. 1 and No. 4.
- There should be continuity. (0.30 – 20 kΩ)

Q: Is the measured resistance between 0.30 and 20 kΩ?

YES : Go to Step 4.

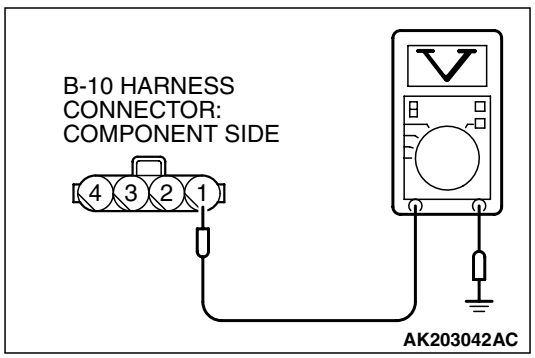
NO : Replace the mass airflow sensor. Then go to Step 11.

STEP 4. Measure the sensor supply voltage at intake air temperature sensor harness side connector B-10.



(1) Disconnect the connector B-10 and measure at the harness side.

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



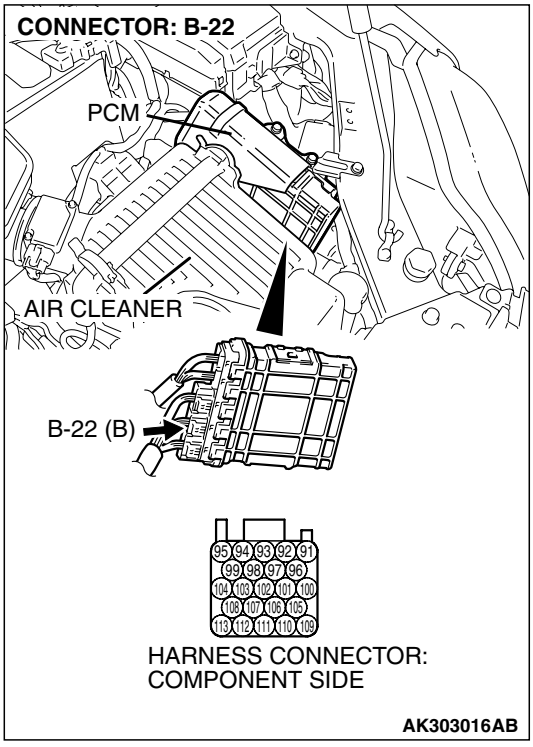
(3) Measure the voltage between terminal No. 1 and ground.
- Voltage should be between 4.5 and 4.9 volts.

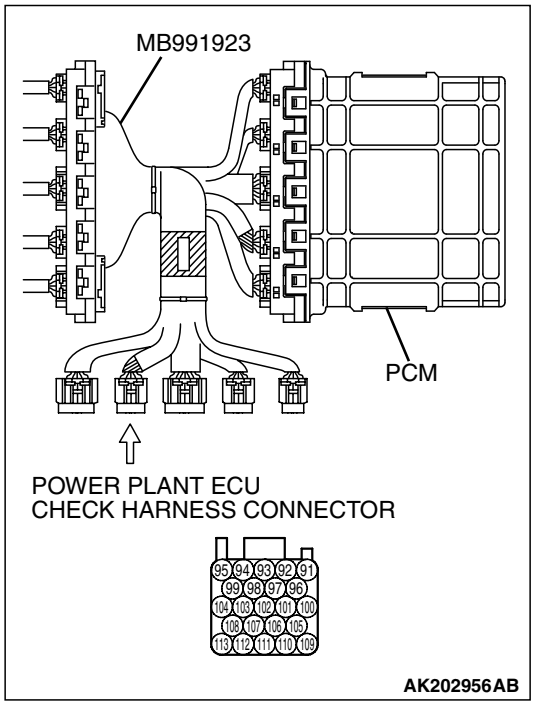
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the measured voltage between 4.5 and 4.9 volts?

YES : Go to Step 8.

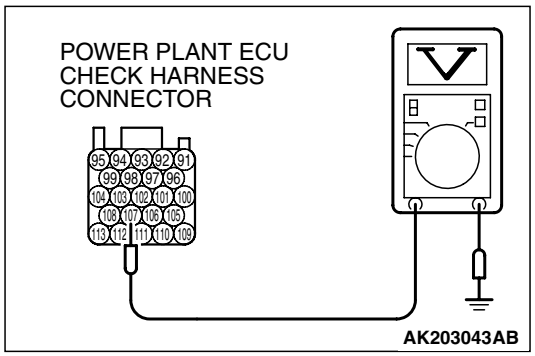
NO : Go to Step 5.





STEP 5. Measure the sensor supply voltage at PCM connector B-22 by using power plant ECU check harness special tool MB991923.

(1) Disconnect all PCM connectors. Connect the power plant ECU check harness special tool MB991923 between the separated connectors.
(2) Disconnect the intake air temperature sensor connector B-10.
(3) Turn the ignition switch to the "ON" position.

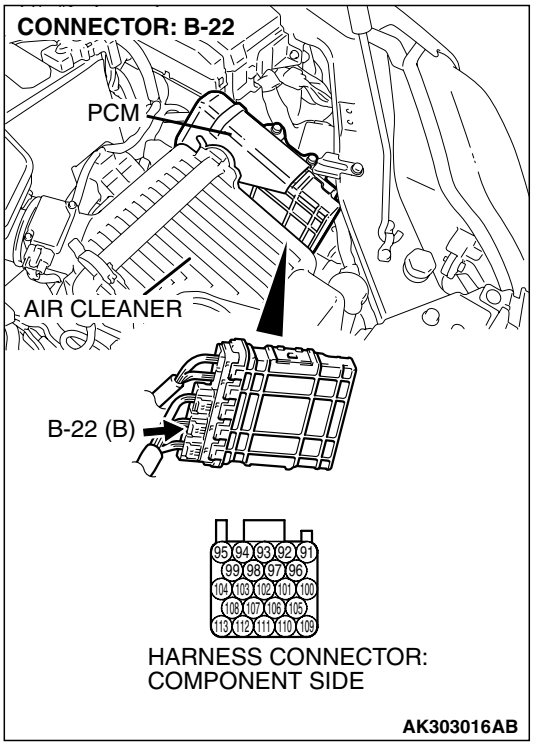


(4) Measure the voltage between terminal No. 107 and ground.
- Voltage should be between 4.5 and 4.9 volts.

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

Q: Is the measured voltage between 4.5 and 4.9 volts?

YES : Go to Step 6.
NO : Go to Step 7.

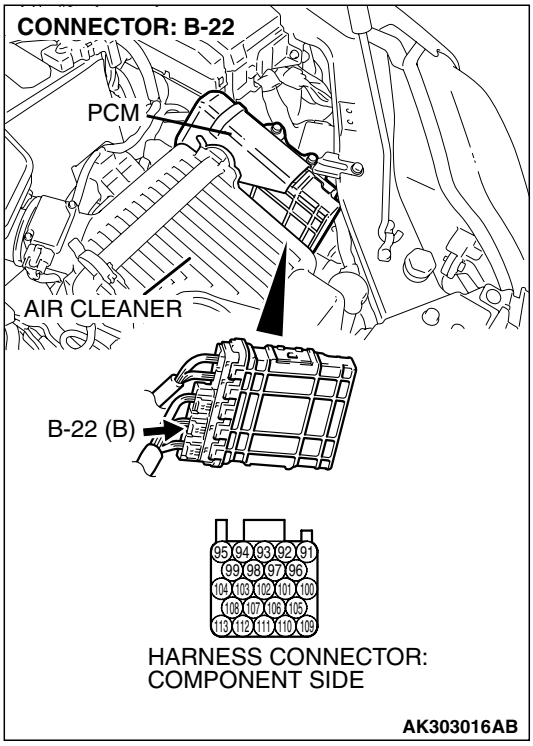


STEP 6. Check harness connector B-22 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Repair harness wire between intake air temperature sensor connector B-10 (terminal No. 1) and PCM connector B-22 (terminal No. 107) because of open circuit. Then go to Step 11.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.

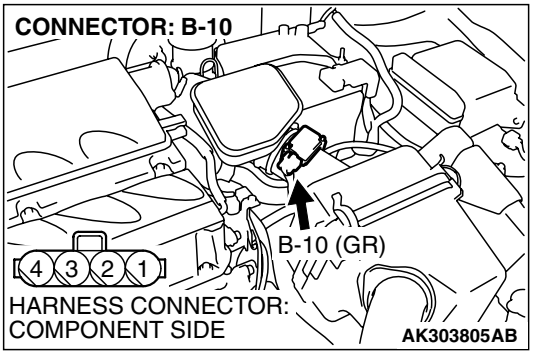


STEP 7. Check harness connector B-22 at PCM for damage.

Q: Is the harness connector in good condition?

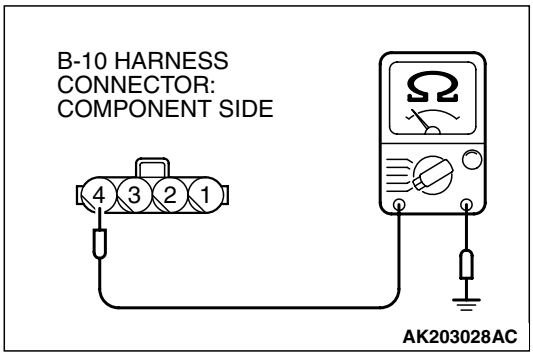
YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 11.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.



STEP 8. Check the continuity at intake air temperature sensor harness side connector B-10.

(1) Disconnect the connector B-10 and measure at the harness side.

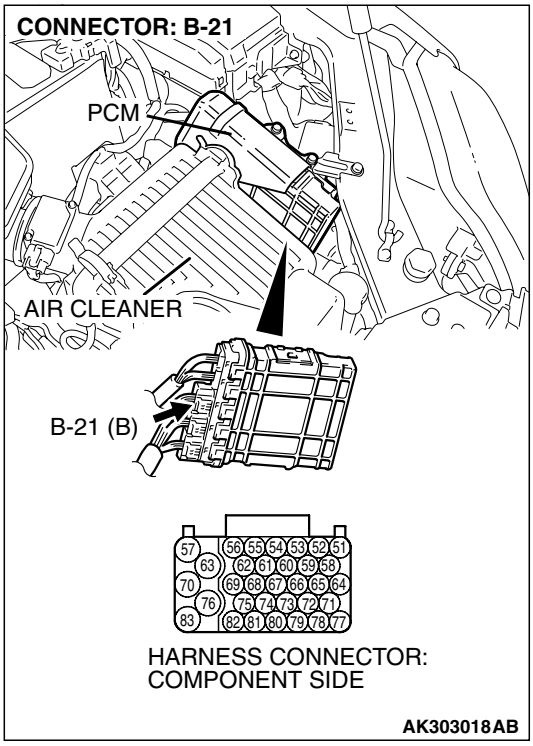


(2) Check for the continuity between terminal No. 4 and ground.
- Continuity (2 Ω or less)

Q: Does continuity exist?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 11.

NO : Go to Step 9.

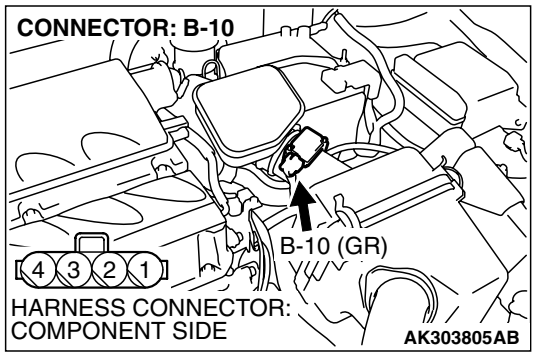


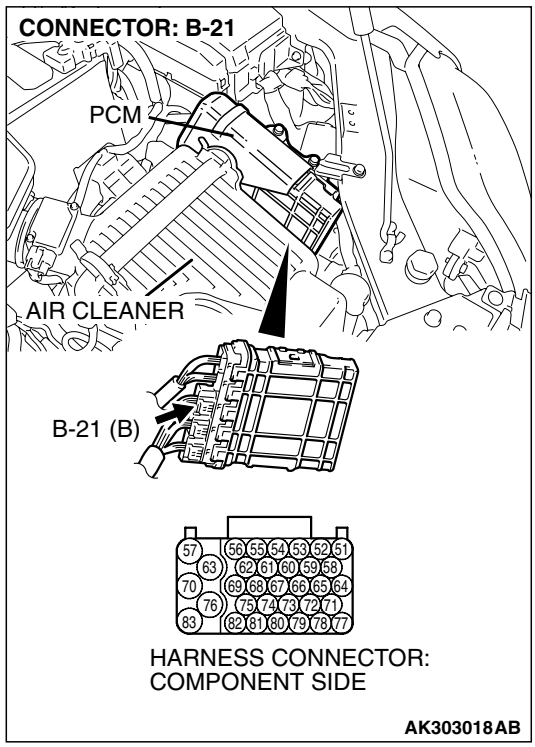
STEP 9. Check harness connector B-21 at PCM for damage.

Q: Is the harness 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 go to Step 11.





STEP 10. Check for open circuit between intake air temperature sensor connector B-10 (terminal No. 4) and PCM connector B-21 (terminal No. 69).

Q: Is the harness wire in good condition?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 11.

NO : Repair it. Then go to Step 11.

STEP 11. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 24 P.13A-9.

(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0113 set?

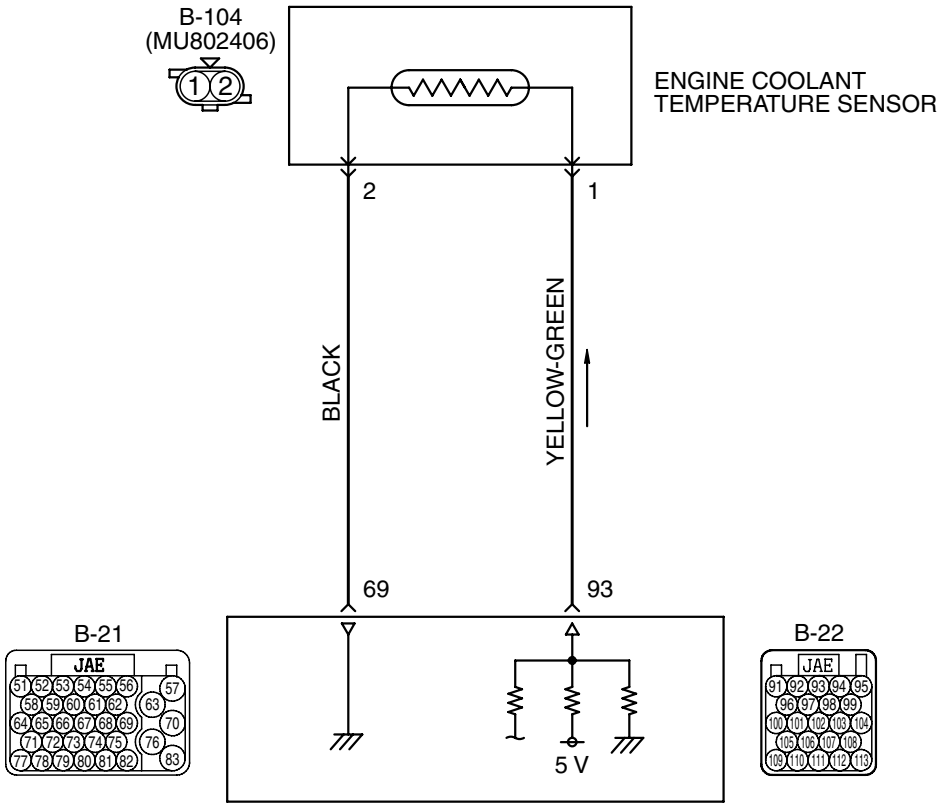
YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0116: Engine Coolant Temperature Circuit Range/Performance Problem

⚠ CAUTION
If DTC P0116 has been set, TCL related DTC U1120 is also set. After P0116 has been diagnosed, don't forget to erase DTC U1120.

Engine Coolant Temperature Sensor Circuit



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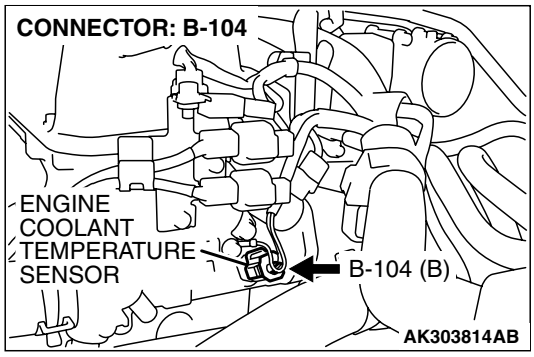

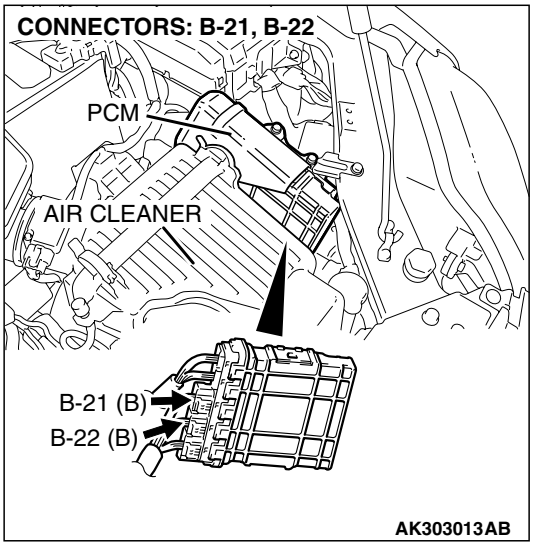

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CIRCUIT OPERATION

- 5-volt voltage is applied to the engine coolant temperature sensor output terminal (terminal No. 1) from the PCM (terminal No. 93) via the resistor in the PCM. The ground terminal (terminal No. 2) is grounded with PCM (terminal No. 69).
- The engine coolant temperature sensor is a negative temperature coefficient type of resistor. It has the characteristic that when the engine coolant temperature rises the resistance decreases.
- The engine coolant temperature sensor output voltage increases when the resistance increases and decreases when the resistance decreases.

TECHNICAL DESCRIPTION

- The engine coolant temperature sensor converts the engine coolant temperature to a voltage and outputs it.
- The PCM checks whether this voltage is within a specified range.

DESCRIPTIONS OF MONITOR METHODS

Engine coolant temperature sensor output voltage does not change for specified period when engine coolant temperature sensor output voltage at engine start is over 7°C (45°F).

MONITOR EXECUTION

Once per driving cycle

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

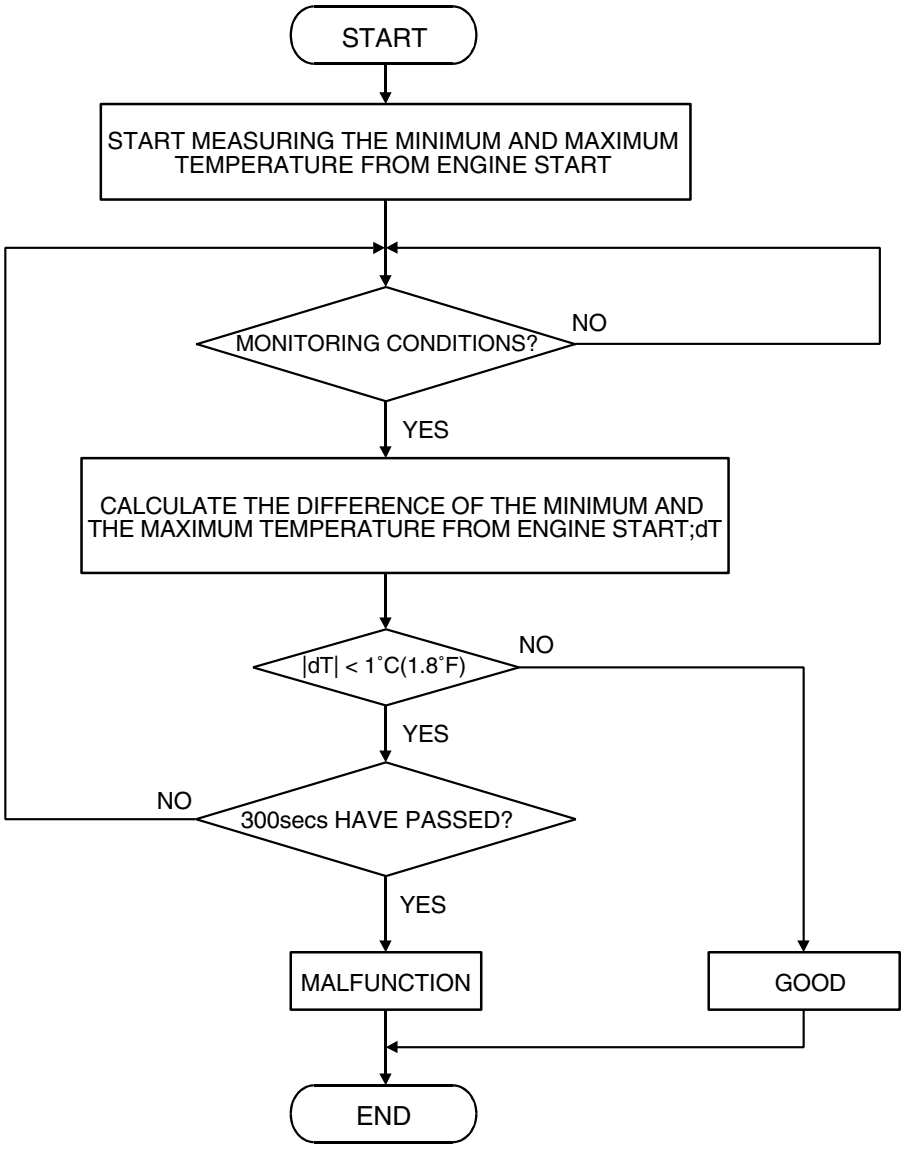
- Not applicable

Sensor (The sensor below is determined to be normal)

- Mass airflow sensor
- Engine coolant temperature sensor
- Intake air temperature sensor

DTC SET CONDITIONS

Logic Flow Chart



AK402381

Check Condition

- Engine coolant temperature was 7°C (45°F) or more when the engine started.

Judgement Criteria

- Engine coolant temperature fluctuates within 1°C (1.8°F) after 5 minutes have passed since the engine was started.
- However, time is not counted if any of the following conditions are met.
  1. Intake air temperature is 60°C (140°F) or more.
  2. Mass airflow sensor outputs is 10 g/sec or less.
  3. During fuel shut-off operation.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 9 P.13A-9.

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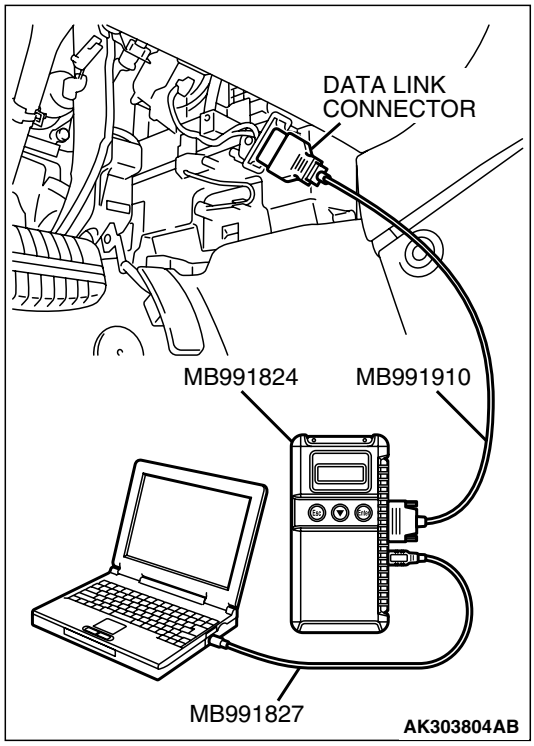
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Engine coolant temperature sensor failed.
- Harness damage or connector damage.
- PCM failed.

DIAGNOSIS

Required Special Tools:

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



STEP 1. Using scan tool MB991958, check data list item 6: Engine Coolant Temperature Sensor.

⚠ CAUTION

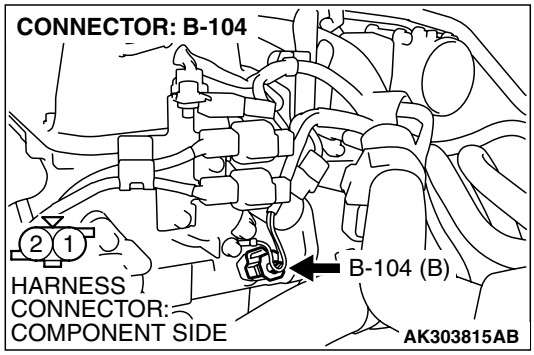
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991958 to the data reading mode for item 6, Engine Coolant Temperature Sensor.
  - The engine coolant temperature and temperature shown with the scan tool should approximately match.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

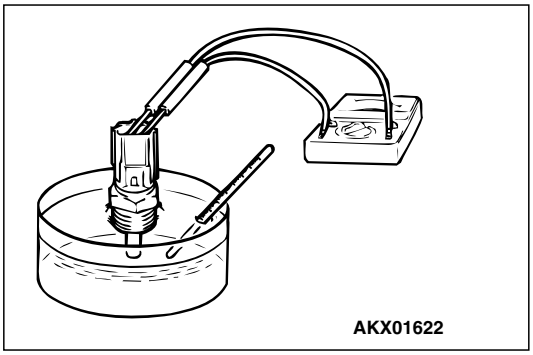
YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-14.

NO : Go to Step 2.



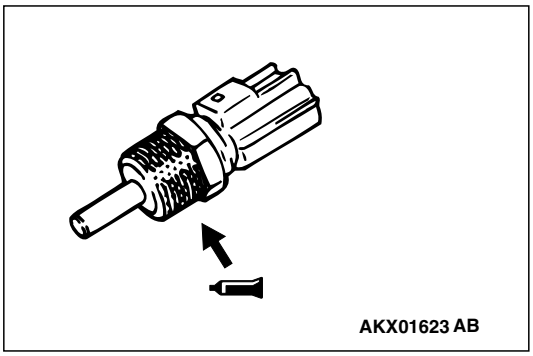
STEP 2. Check the engine coolant temperature sensor.

(1) Disconnect the engine coolant temperature sensor connector B-104.
(2) Remove the engine coolant temperature sensor.



(3) With the temperature sensing portion of engine coolant temperature sensor immersed in hot water, measure resistance.

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



(4) Apply 3M™ AAD part number 8731 or equivalent on the screw section of the engine coolant temperature sensor.
(5) Install the engine coolant temperature sensor, and tighten to the specified torque.

Tightening torque: 30 ± 9 N·m (22 ± 7 ft-lb)

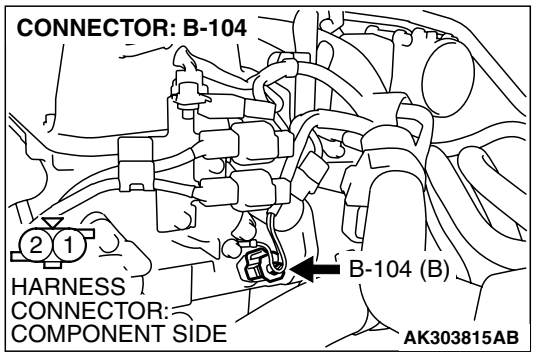
Q: Is the measured resistance at the standard value?

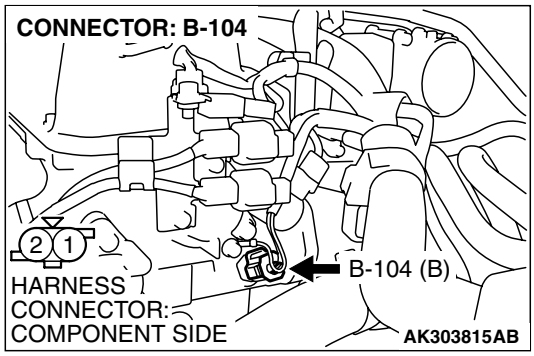
YES : Go to Step 3.
NO : Replace the engine coolant temperature sensor. Then go to Step 9.

STEP 3. Check harness connector B-104 at the engine coolant temperature sensor for damage.

Q: Is the harness connector in good condition?

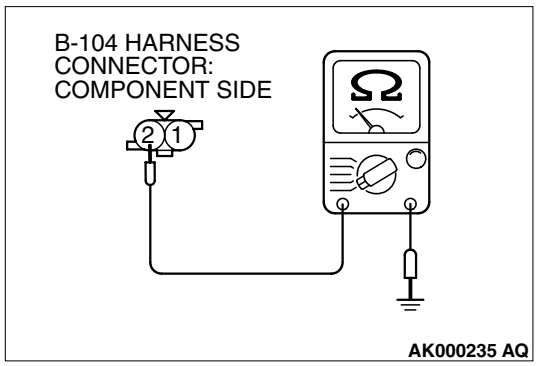
YES : Go to Step 4.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 9.





STEP 4. Check the continuity at engine coolant temperature sensor harness side connector B-104.

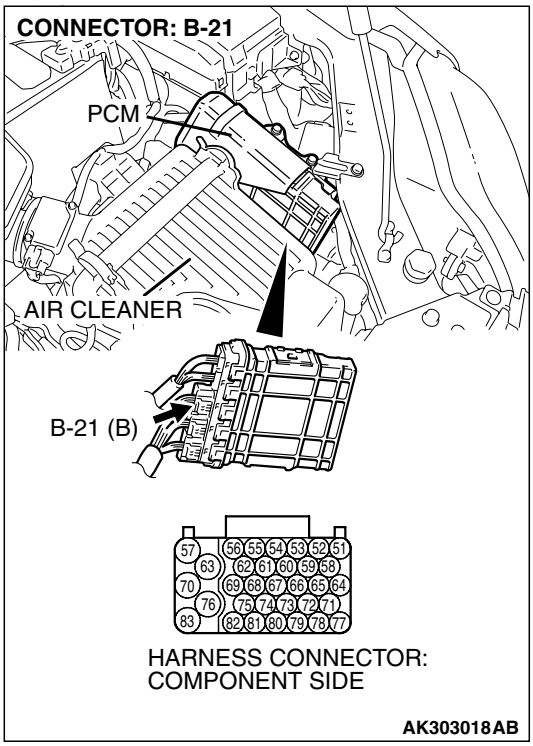
(1) Disconnect the connector B-104 and measure at the harness side.



(2) Check for the continuity between terminal No. 2 and ground.
- Continuity (2 Ω or less)

Q: Does continuity exist?

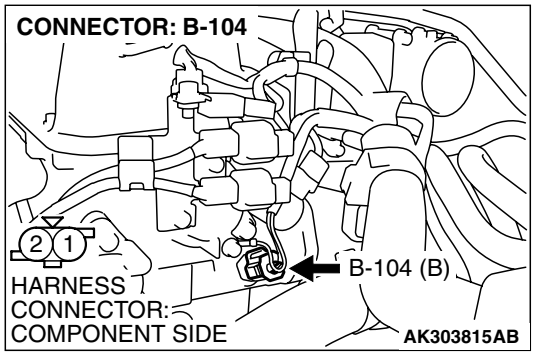
YES : Go to Step 7.
NO : Go to Step 5.

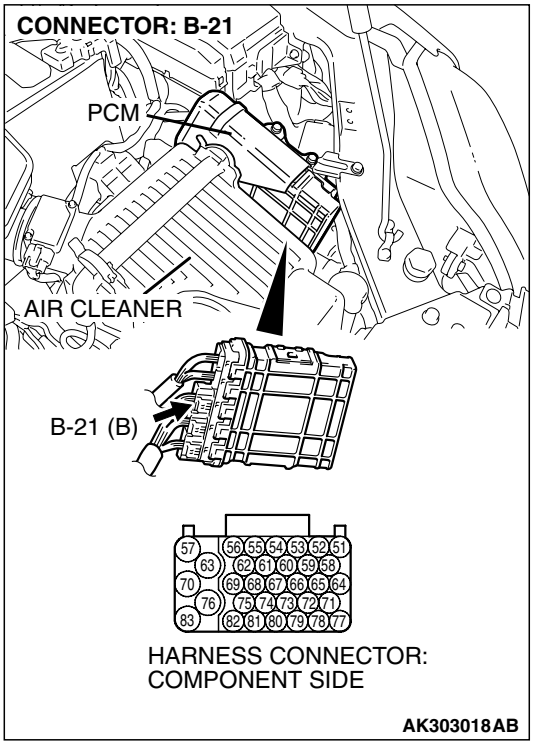


STEP 5. Check harness connector B-21 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 6.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 9.



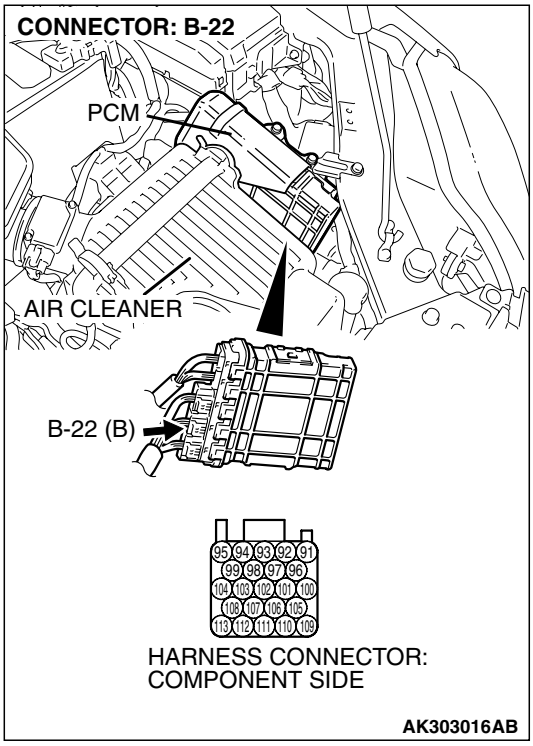


STEP 6. Check for harness damage between engine coolant temperature sensor connector B-104 (terminal No. 2) and PCM connector B-21 (terminal No. 69).

Q: Is the harness wire in good condition?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 9.

NO : Repair it. Then go to Step 9.

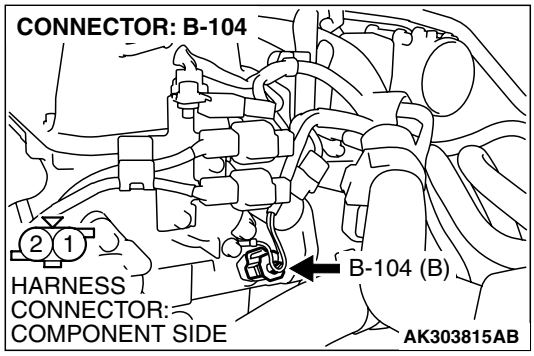


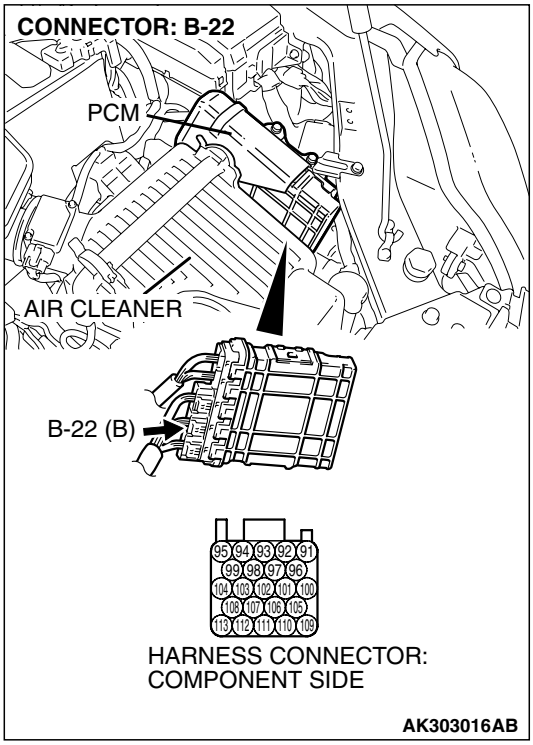
STEP 7. Check harness connector B-22 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 8.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 9.





STEP 8. Check for harness damage between engine coolant temperature sensor connector B-104 (terminal No. 1) and PCM connector B-22 (terminal No. 93).

Q: Is the harness wire in good condition?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 9.

NO : Repair it. Then go to Step 9.

STEP 9. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 9 P.13A-9.

(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0116 set?

YES : Retry the troubleshooting.

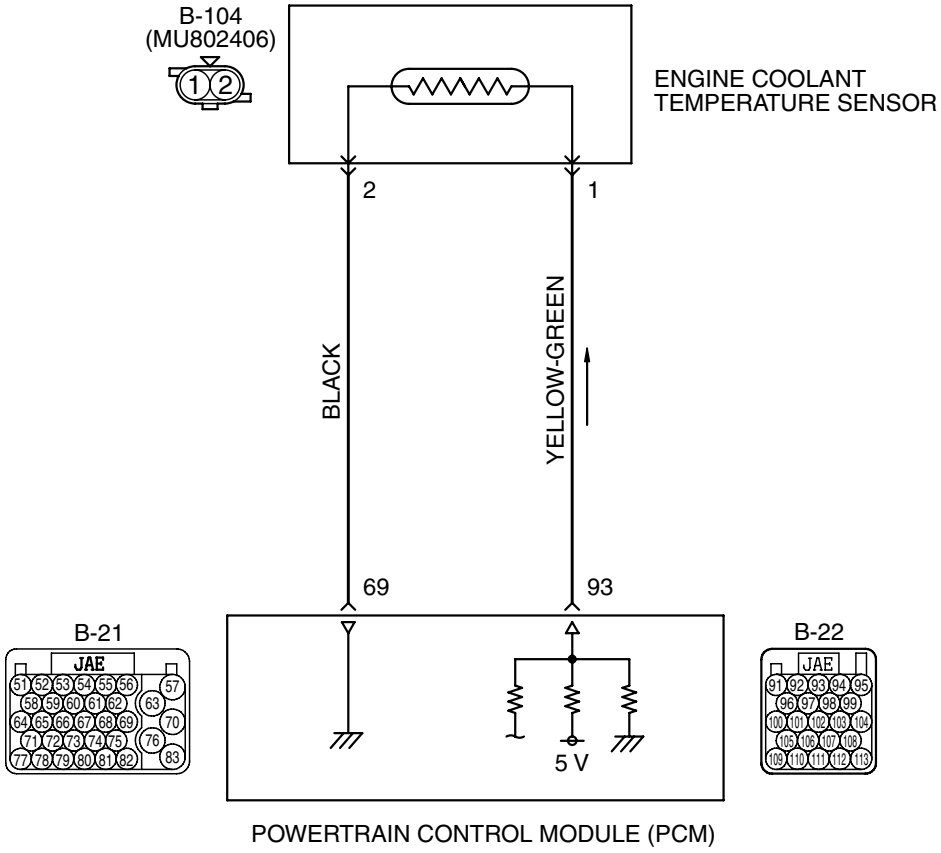
NO : The inspection is complete.

DTC P0117: Engine Coolant Temperature Circuit Low Input

⚠ CAUTION

If DTC P0117 has been set, TCL and air conditioner related DTC U1120 is also set. After P0117 has been diagnosed, don't forget to erase DTC U1120.

Engine Coolant Temperature Sensor Circuit



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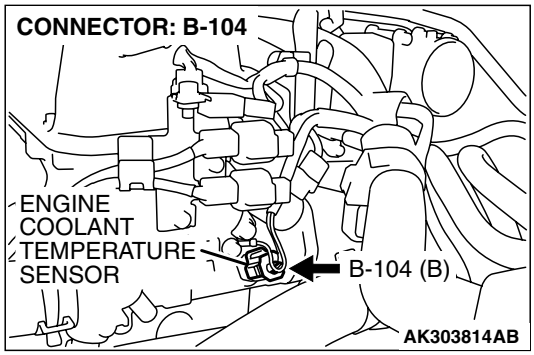
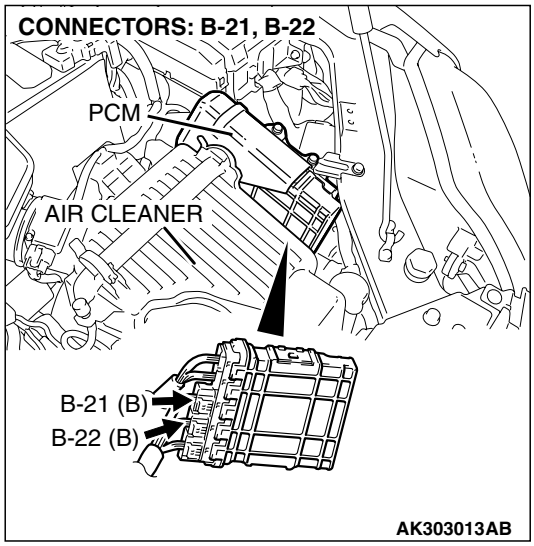


TSB Revision



CIRCUIT OPERATION

- 5-volt voltage is applied to the engine coolant temperature sensor output terminal (terminal No. 1) from the PCM (terminal No. 93) via the resistor in the PCM. The ground terminal (terminal No. 2) is grounded with PCM (terminal No. 69).
- The engine coolant temperature sensor is a negative temperature coefficient type of resistor. It has the characteristic that when the engine coolant temperature rises the resistance decreases.
- The engine coolant temperature sensor output voltage increases when the resistance increases and decreases when the resistance decreases.

TECHNICAL DESCRIPTION

- The engine coolant temperature sensor converts the engine coolant temperature to a voltage and outputs it.
- The PCM checks whether this voltage is within a specified range.

DESCRIPTIONS OF MONITOR METHODS

Engine coolant temperature sensor output voltage is out of specified range.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

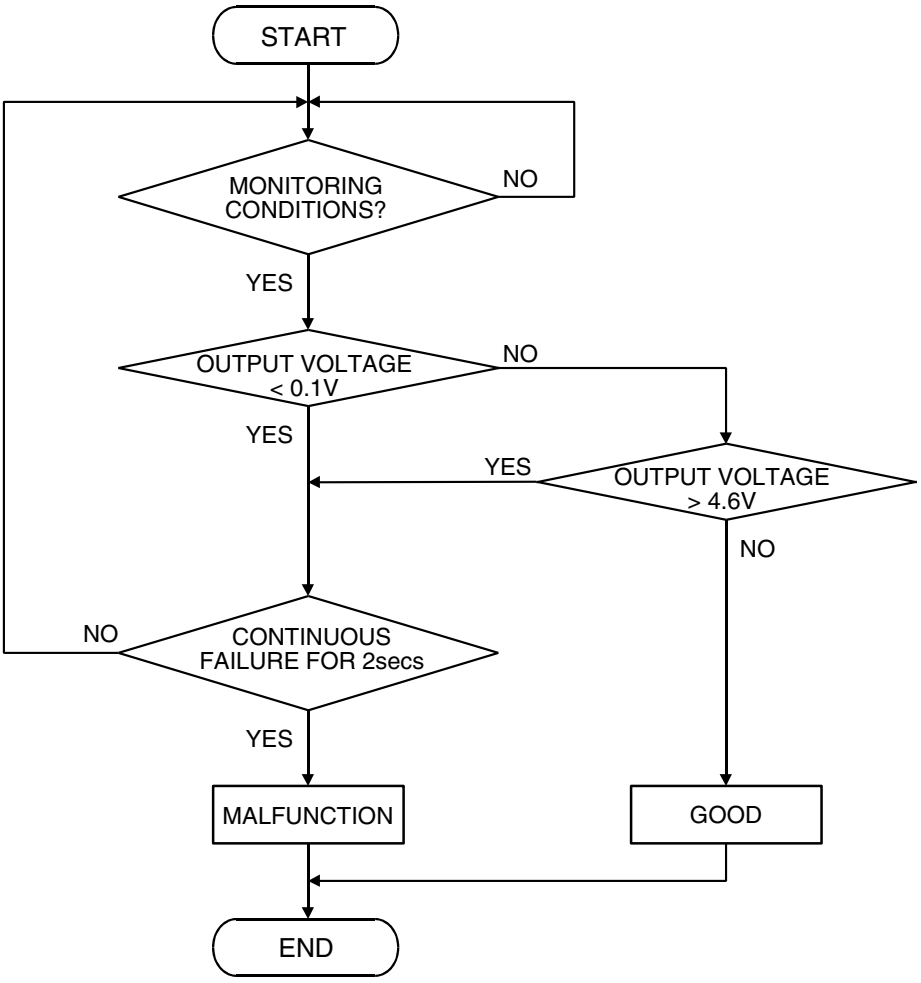
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable.

DTC SET CONDITIONS

Logic Flow Chart



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Check Condition

- 2 seconds or more have passed since the engine starting sequence was completed.

Judgement Criterion

- Engine coolant temperature sensor output voltage has continued to be 0.1 volt or lower for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 24 P.13A-9.

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

- Engine coolant temperature sensor failed.
- Shorted engine coolant temperature sensor circuit, or connector damage.
- PCM failed.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable

TSB Revision

- MB991910: Main Harness A

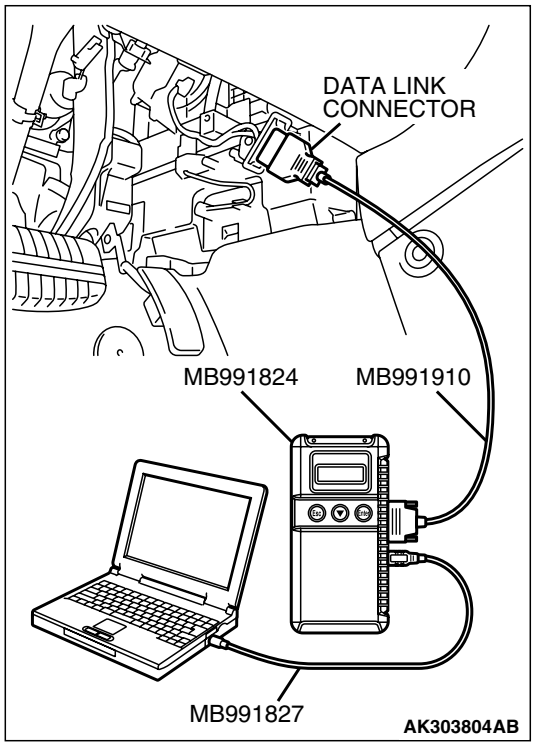
STEP 1. Using scan tool MB991958, check data list item 6: Engine Coolant Temperature Sensor.

⚠ 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) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991958 to the data reading mode for item 6, Engine Coolant Temperature Sensor.
- The engine coolant temperature and temperature shown with the scan tool should approximately match.

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

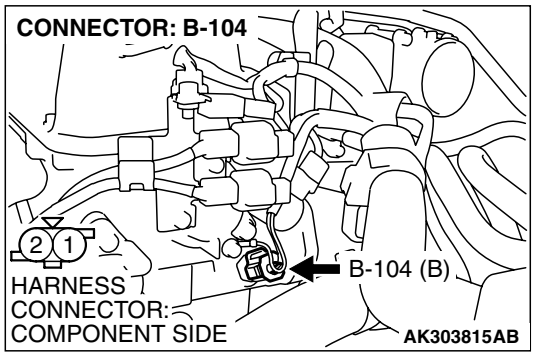


Q: Is the sensor operating properly?

YES : It can be assumed 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.

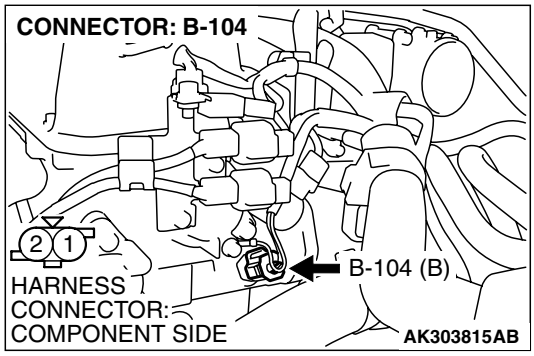
STEP 2. Check harness connector B-104 at the engine coolant temperature sensor for damage.

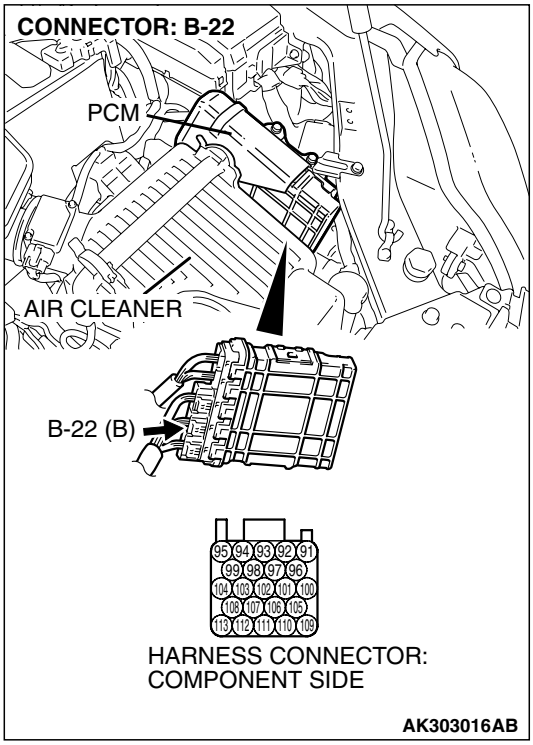


Q: Is the harness connector in good condition?

YES : Go to Step 3.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 6.



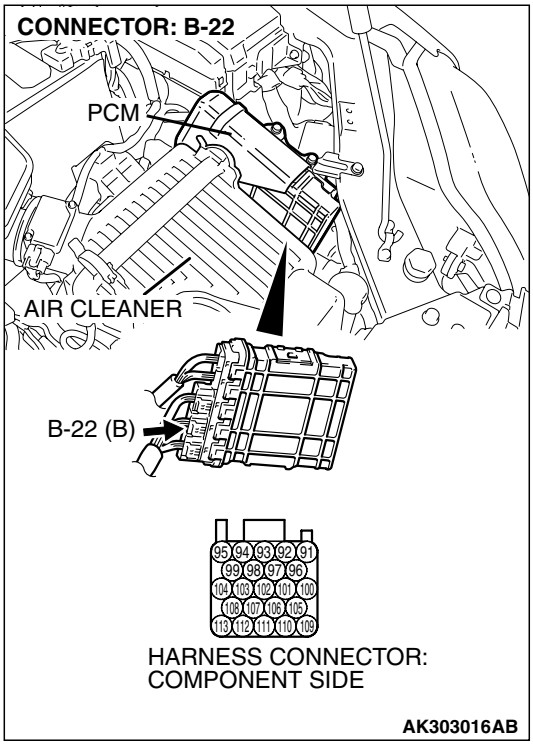


STEP 3. Check for short circuit to ground between engine coolant temperature sensor connector B-104 (terminal No. 1) and PCM connector B-22 (terminal No. 93).

Q: Is the harness wire in good condition?

YES : Go to Step 4.

NO : Repair it. Then go to Step 6.

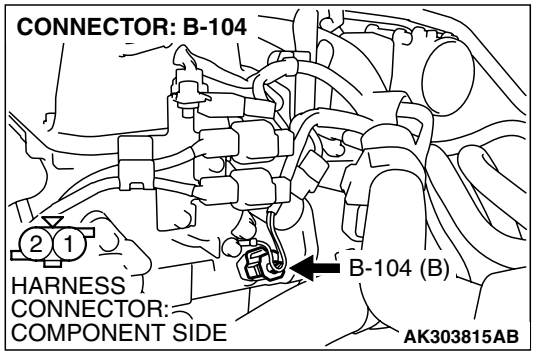


STEP 4. Check harness connector B-22 at PCM for damage.

Q: Is the harness connector in good condition?

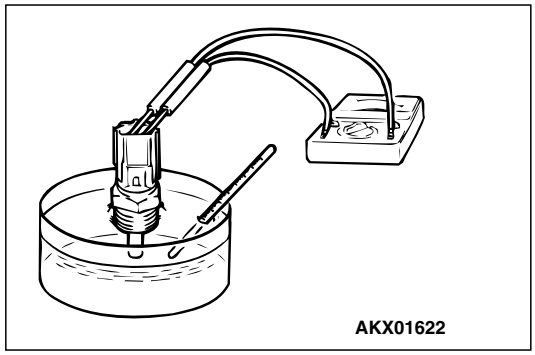
YES : Go to Step 5.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 6.



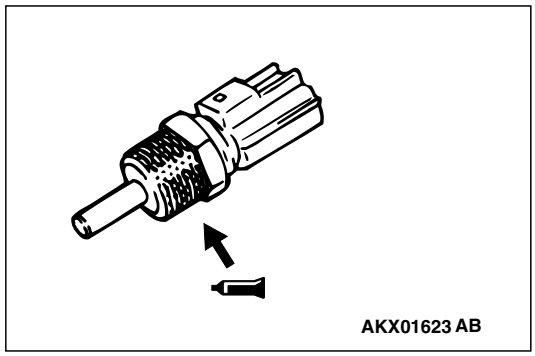
STEP 5. Check the engine coolant temperature sensor.

(1) Disconnect the engine coolant temperature sensor connector B-104.
(2) Remove the engine coolant temperature sensor.



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

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



(4) Apply 3M™ AAD part number 8731 or equivalent on the screw section of the engine coolant temperature sensor.
(5) Install the engine coolant temperature sensor, and tighten to the specified torque.

Tightening torque: 30 ± 9 N·m (22 ± 7 ft-lb)

Q: Is the measured resistance at the standard value?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 6.
NO : Replace the engine coolant temperature sensor. Then go to Step 6.

STEP 6. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 24 P.13A-9.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0117 set?

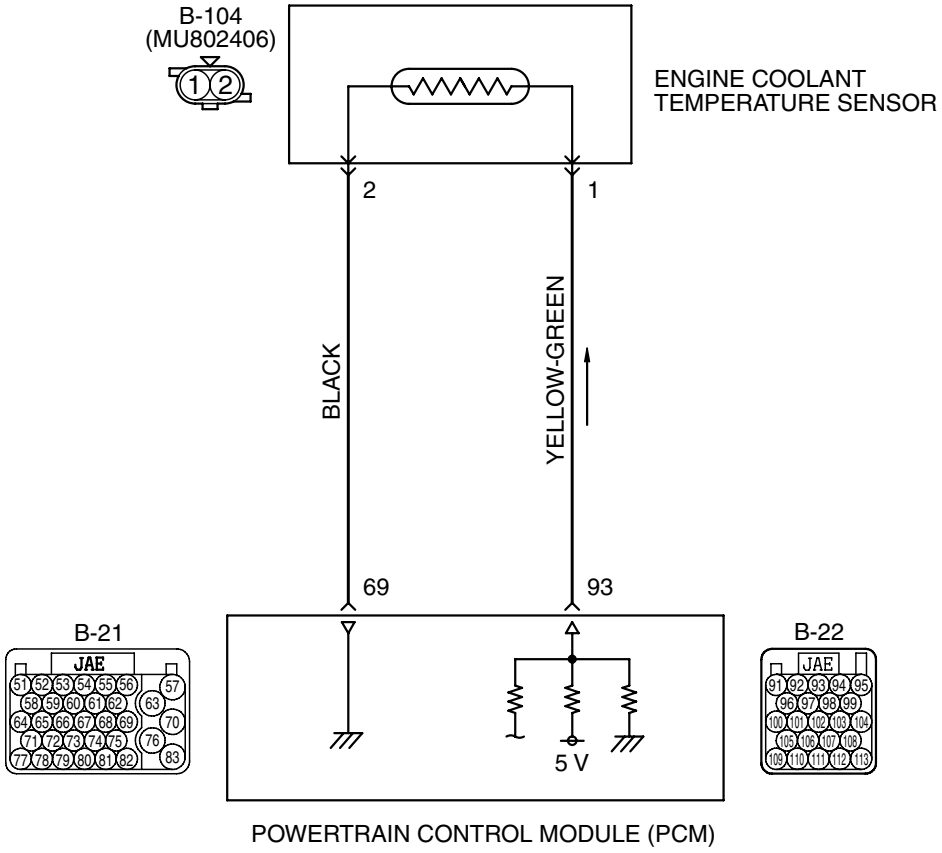
YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0118: Engine Coolant Temperature Circuit High Input

⚠ CAUTION

If DTC P0118 has been set, TCL and air conditioner related DTC U1120 is also set. After P0118 has been diagnosed, don't forget to erase DTC U1120.

Engine Coolant Temperature Sensor Circuit



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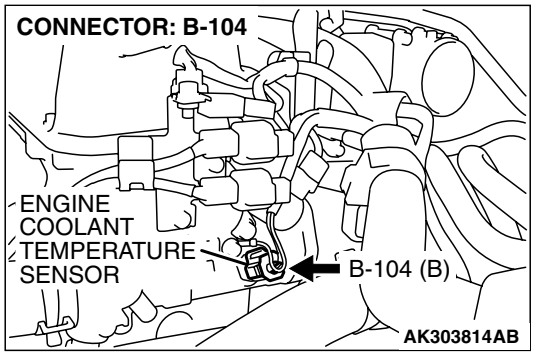
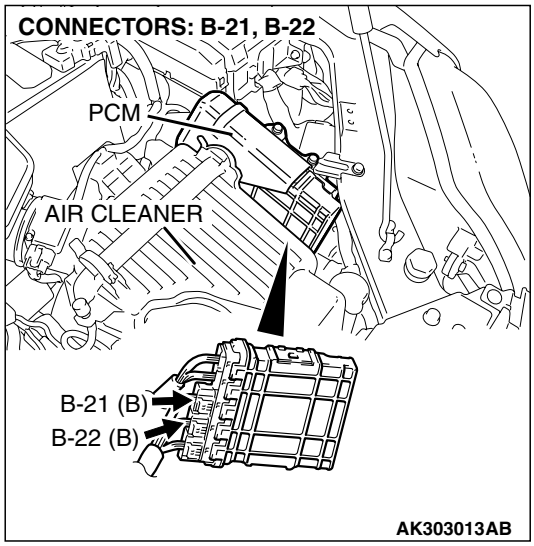


TSB Revision



CIRCUIT OPERATION

- 5-volt voltage is applied to the engine coolant temperature sensor output terminal (terminal No. 1) from the PCM (terminal No. 93) via the resistor in the PCM. The ground terminal (terminal No. 2) is grounded with PCM (terminal No. 69).
- The engine coolant temperature sensor is a negative temperature coefficient type of resistor. It has the characteristic that when the engine coolant temperature rises the resistance decreases.
- The engine coolant temperature sensor output voltage increases when the resistance increases and decreases when the resistance decreases.

TECHNICAL DESCRIPTION

- The engine coolant temperature sensor converts the engine coolant temperature to a voltage and outputs it.
- The PCM checks whether this voltage is within a specified range.

DESCRIPTIONS OF MONITOR METHODS

Engine coolant temperature sensor output voltage is out of specified range.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

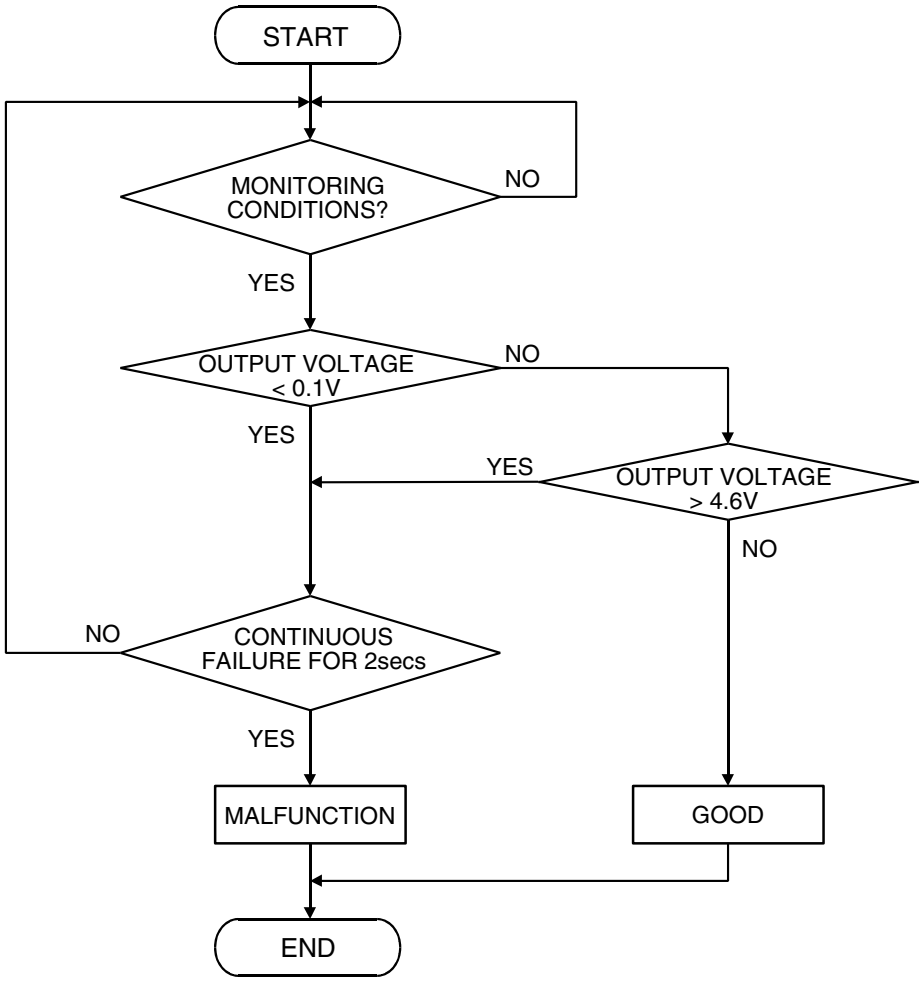
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



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Check Condition

- 2 seconds or more have passed since the engine starting sequence was completed.

Judgement Criterion

- Engine coolant temperature sensor output voltage has continued to be 4.6 volts or higher for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function–OBD-II Drive Cycle–Pattern 24 P.13A-9.

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

- Engine coolant temperature sensor failed.
- Open engine coolant temperature sensor circuit, or connector damage.
- PCM failed.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable

TSB Revision

- MB991910: Main Harness A
- MB991923: Power Plant ECU Check Harness

STEP 1. Using scan tool MB991958, check data list item 6: 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.

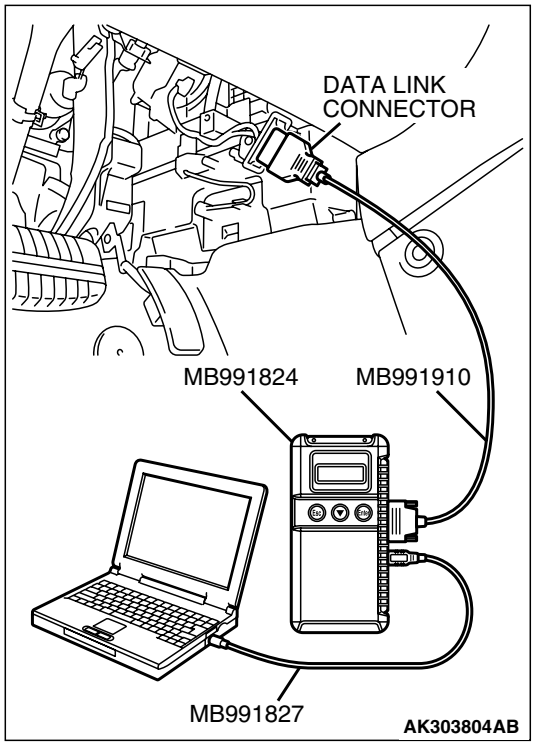
(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991958 to the data reading mode for item 6, Engine Coolant Temperature Sensor.
- The engine coolant temperature and temperature shown with the scan tool should approximately match.

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

Q: Is the sensor operating properly?

YES : It can be assumed 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.

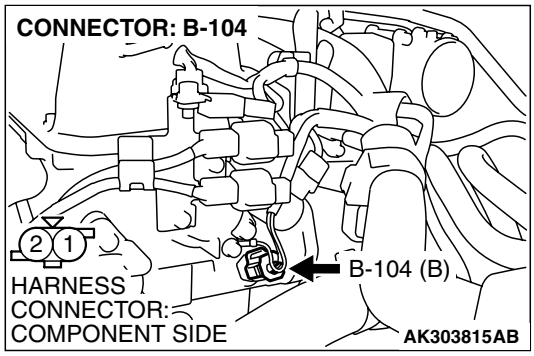


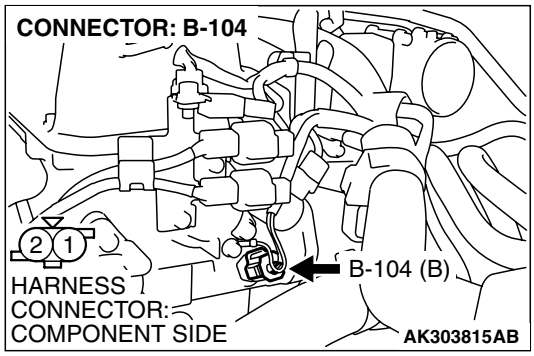
STEP 2. Check harness connector B-104 at the engine coolant temperature sensor for damage.

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 go to Step 11.

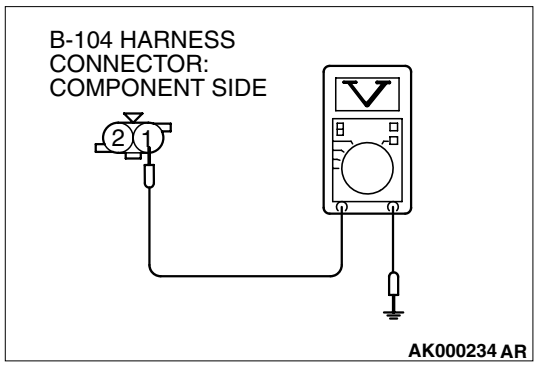




STEP 3. Measure the sensor supply voltage at engine coolant temperature sensor harness side connector B-104.

(1) Disconnect the connector B-104 and measure at the harness side.

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



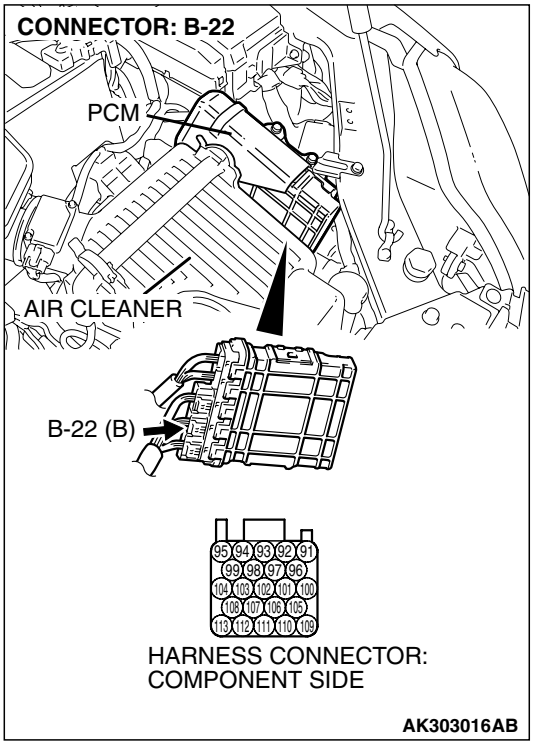
(3) Measure the voltage between terminal No. 1 and ground.
- Voltage should be between 4.5 and 4.9 volts.

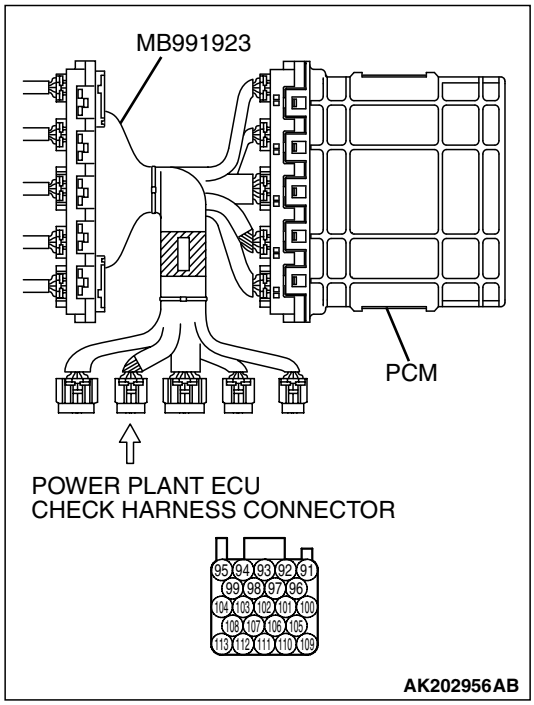
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the measured voltage between 4.5 and 4.9 volts?

YES : Go to Step 7.

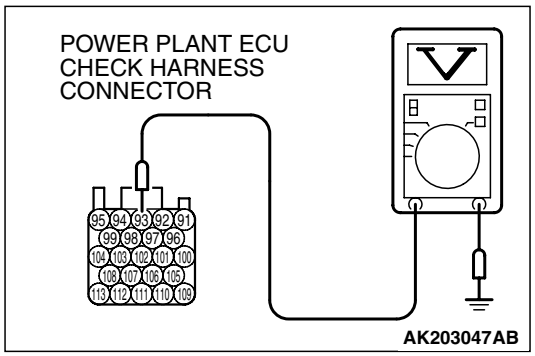
NO : Go to Step 4.





STEP 4. Measure the sensor supply voltage at PCM connector B-22 by using power plant ECU check harness special tool MB991923.

(1) Disconnect all PCM connectors. Connect the power plant ECU check harness special tool MB991923 between the separated connectors.
(2) Disconnect the engine coolant temperature sensor connector B-104.
(3) Turn the ignition switch to the "ON" position.

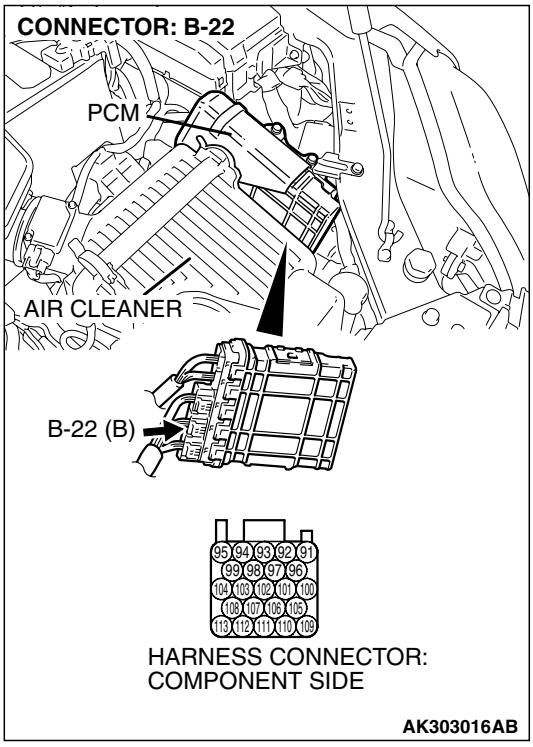


(4) Measure the voltage between terminal No. 93 and ground.
- Voltage should be between 4.5 and 4.9 volts.

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

Q: Is the measured voltage between 4.5 and 4.9 volts?

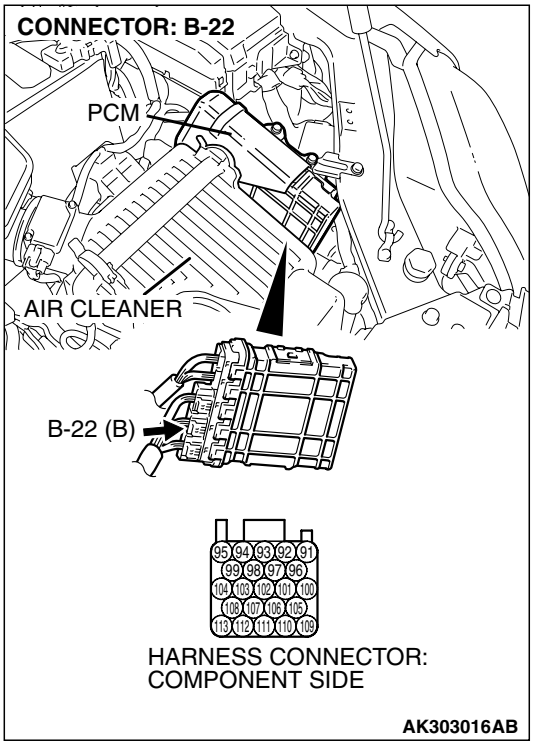
YES : Go to Step 5.
NO : Go to Step 6.



STEP 5. Check harness connector B-22 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Repair harness wire between engine coolant temperature sensor connector B-104 (terminal No. 1) and PCM connector B-22 (terminal No. 93) because of open circuit. Then go to Step 11.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.

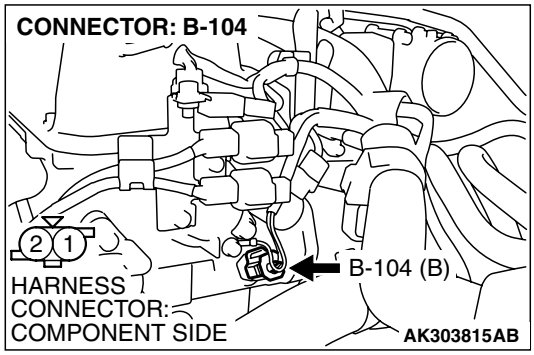


STEP 6. Check harness connector B-22 at PCM for damage.

Q: Is the harness connector in good condition?

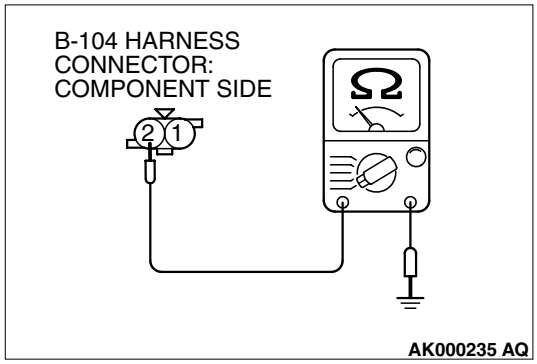
YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 11.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.



STEP 7. Check the continuity at engine coolant temperature sensor harness side connector B-104.

(1) Disconnect the connector B-104 and measure at the harness side.

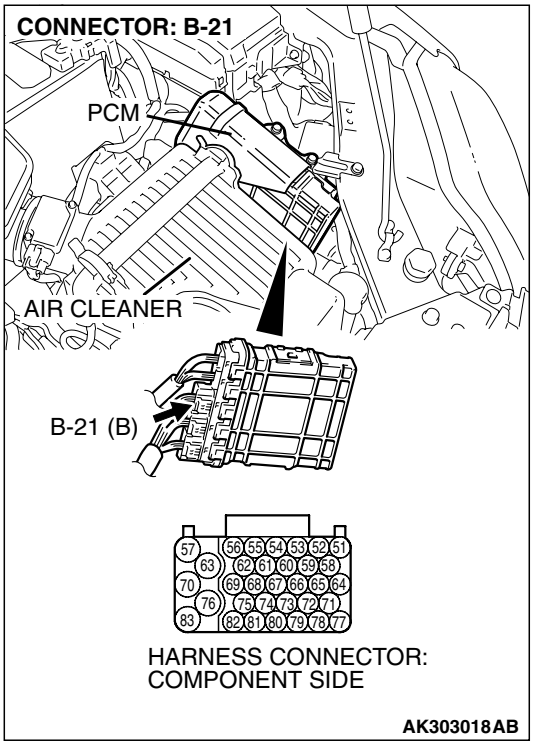


(2) Check for the continuity between terminal No. 2 and ground.
- Continuity (2 Ω or less)

Q: Does continuity exist?

YES : Go to Step 10.

NO : Go to Step 8.

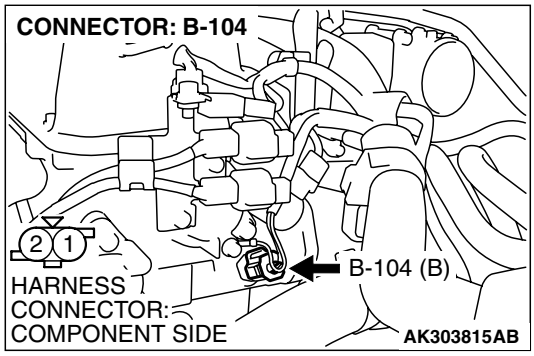


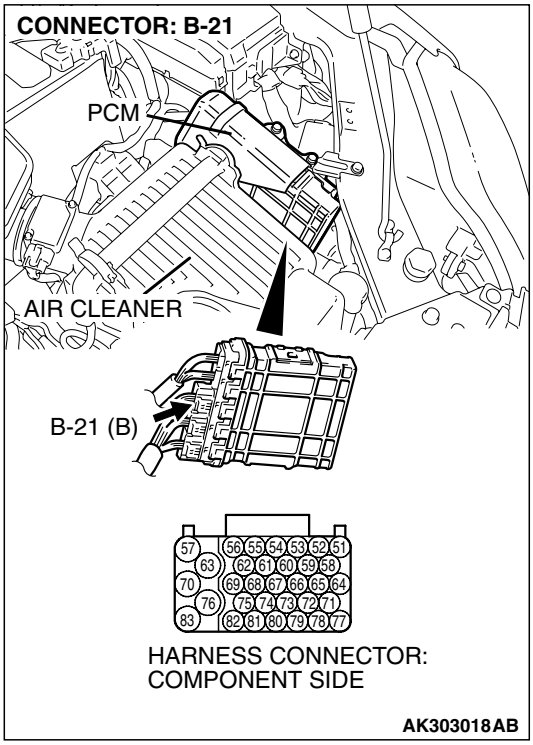
STEP 8. Check harness connector B-21 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 9.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.



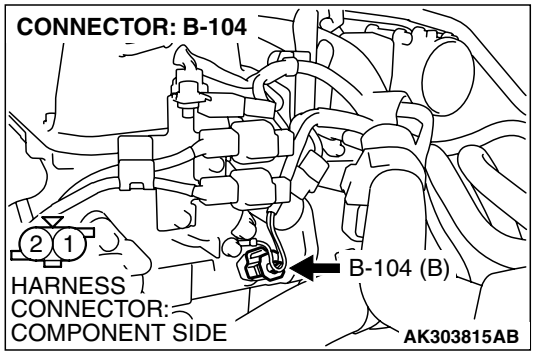


STEP 9. Check for open circuit between engine coolant sensor connector B-104 (terminal No. 2) and PCM connector B-21 (terminal No. 69).

Q: Is the harness wire in good condition?

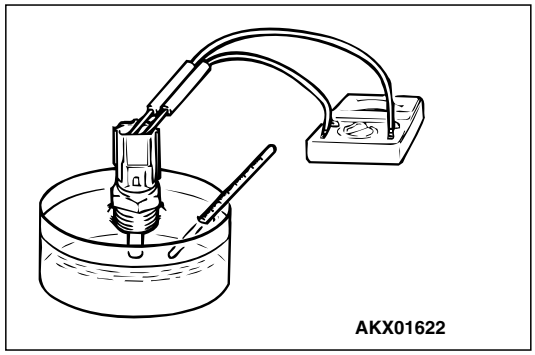
YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 11.

NO : Repair it. Then go to Step 11.



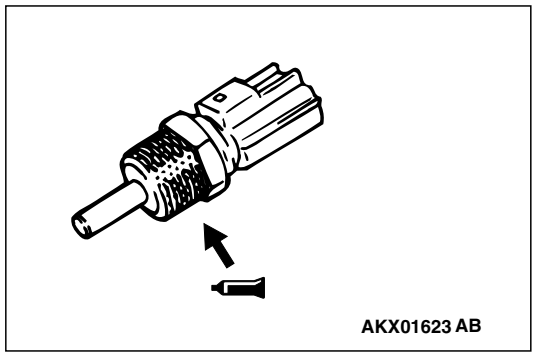
STEP 10. Check the engine coolant temperature sensor.

(1) Disconnect the engine coolant temperature sensor connector B-104.
(2) Remove the engine coolant temperature sensor.



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

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



(4) Apply 3M™ AAD part number 8731 or equivalent on the screw section of the engine coolant temperature sensor.
(5) Install the engine coolant temperature sensor, and tighten to the specified torque.

Tightening torque: 30 ± 9 N·m (22 ± 7 ft-lb)

Q: Is the measured resistance at the standard value?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 11.
NO : Replace the engine coolant temperature sensor. Then go to Step 11.

STEP 11. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 24 P.13A-9.
(2) Check the diagnostic trouble code (DTC).

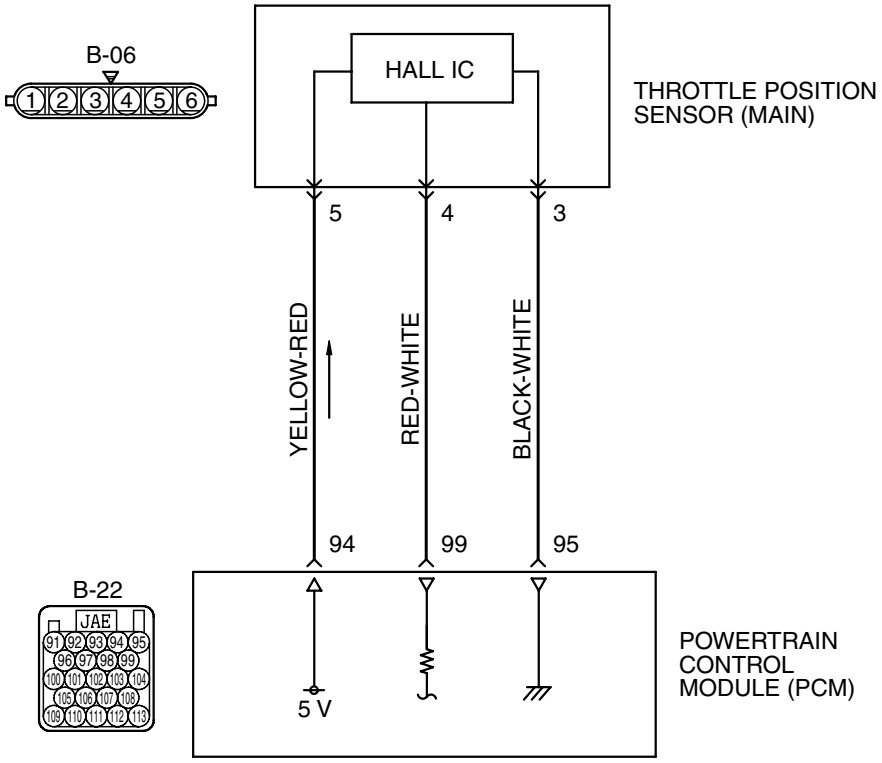
Q: Is DTC P0118 set?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0122: Throttle Position Sensor (main) Circuit Low Input

⚠ CAUTION
If DTC P0122 has been set, TCL related DTC U1120 is also set. After P0122 has been diagnosed, don't forget to erase DTC U1120.

Throttle Position Sensor (main) Circuit



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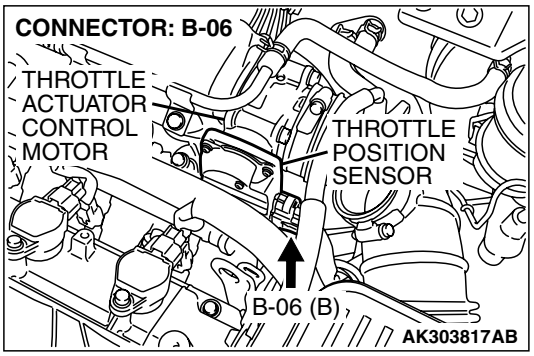

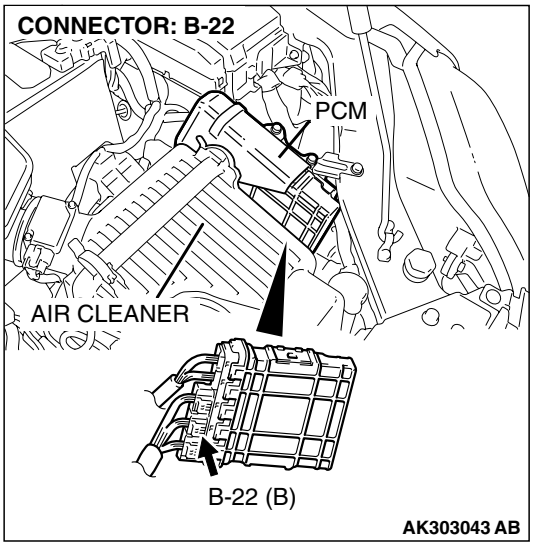

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CIRCUIT OPERATION

- A 5-volt power supply is applied on the throttle position sensor (main) power terminal (terminal No. 5) from the PCM (terminal No. 94).
  The ground terminal (terminal No. 3) is grounded with PCM (terminal No. 95).

TECHNICAL DESCRIPTION

- The throttle position sensor (main) outputs voltage which corresponds to the throttle valve opening angle.
- The PCM checks whether the voltage is within a specified range.

DESCRIPTIONS OF MONITOR METHODS

Throttle position sensor (main) output voltage is out of specified range.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

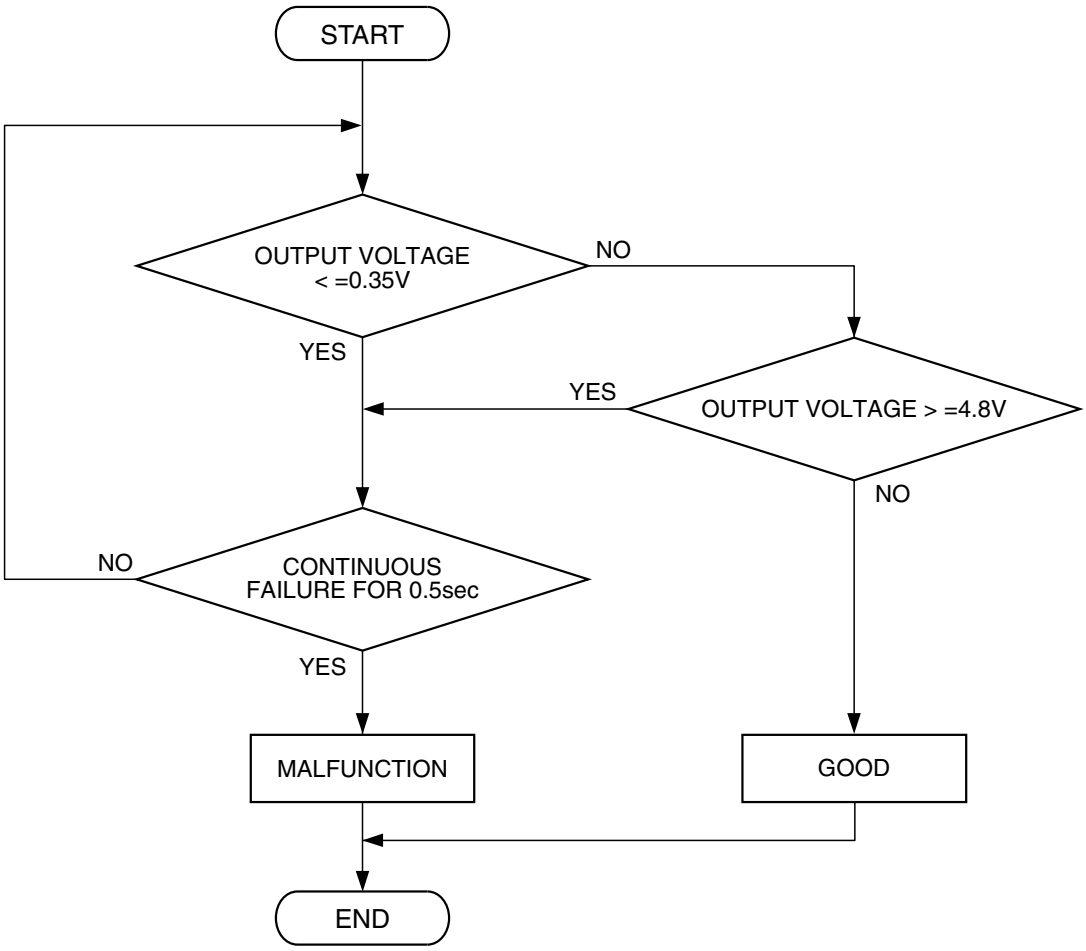
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



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Check Condition

- Ignition switch is "ON" position.

Judgement Criterion

- Throttle position sensor (main) output voltage should be 0.35 volt or less for 0.5 second.

OBD-II DRIVE CYCLE PATTERN

None.

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

- Throttle position sensor failed.
- Open or shorted throttle position sensor (main) circuit, harness damage, or connector damage.
- PCM failed.

DIAGNOSIS

Required Special Tools:

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

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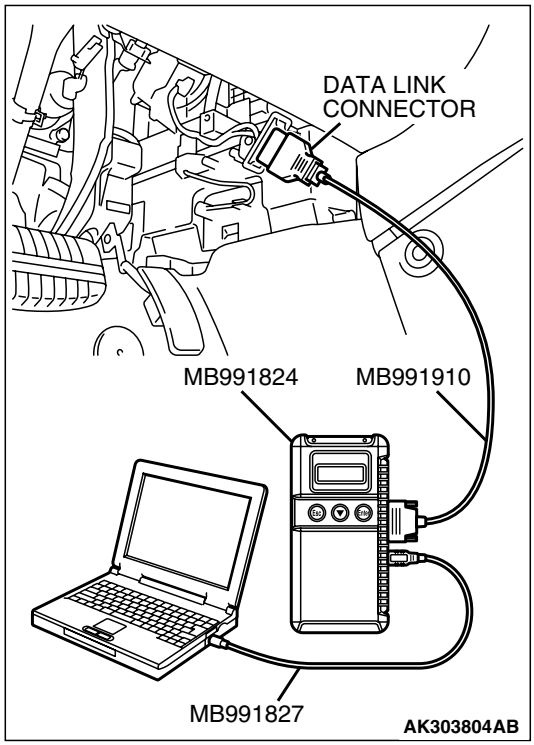
- MB991658: Test Harness

STEP 1. Using scan tool MB991958, check data list item 13: Throttle Position Sensor (main).



⚠ CAUTION

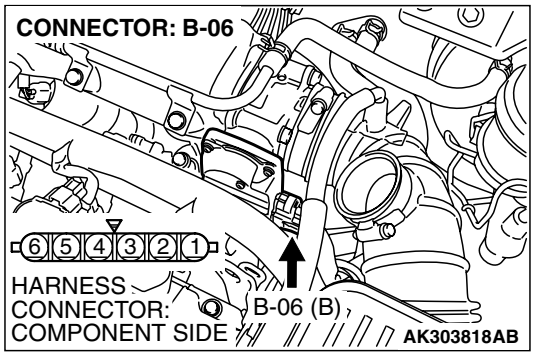
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK"(OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Detach the intake air hose at the throttle body.
(4) Disconnect the connector of the throttle position sensor.
(5) Use test harness special tool (MB991658) to connect only terminals No. 3, No. 4, No. 5, and No. 6.
(6) Set scan tool MB991958 to the data reading mode for item 13, Throttle Position Sensor (main).
  - Output voltage should be between 0.3 and 0.7 volt when the throttle valve is fully closed with your finger.
  - Output voltage should be between 4.0 volts or more when the throttle valve is fully open with your finger.
(7) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is the sensor operating properly?

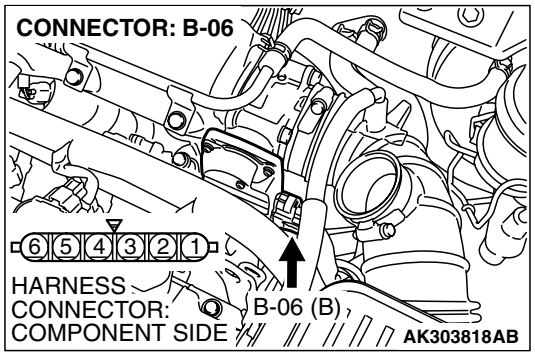
YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-14.
NO : Go to Step 2.

STEP 2. Check harness connector B-06 at throttle position sensor for damage.



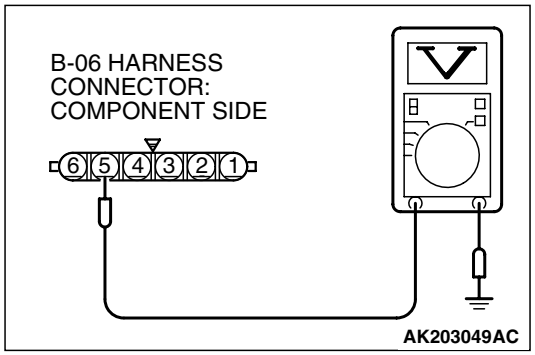
Q: Is the harness connector in good condition?

YES : Go to Step 3.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.



STEP 3. Measure the sensor supply voltage at throttle position sensor harness side connector B-06.

(1) Disconnect the connector B-06 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.

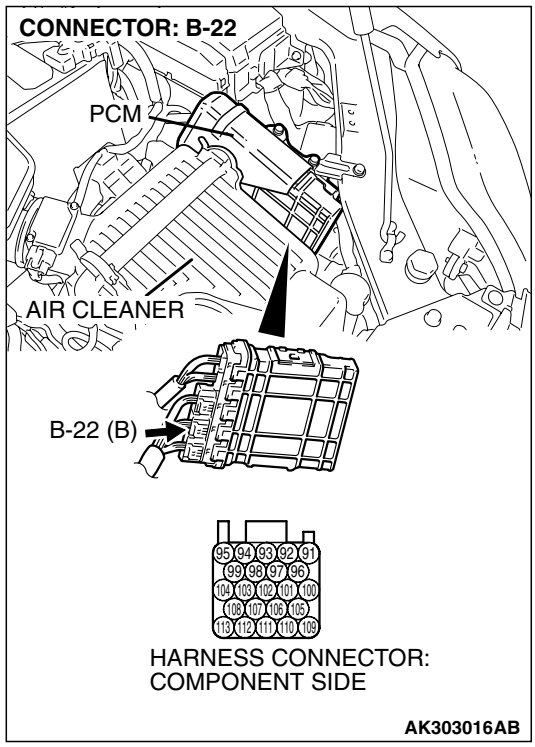


(3) Measure the voltage between terminal No. 5 and ground.
- Voltage should be between 4.9 and 5.1 volts.

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

Q: Is the measured voltage between 4.9 and 5.1 volts?

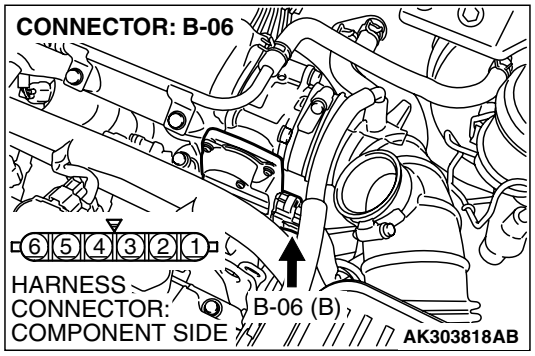
YES : Go to Step 7.
NO : Go to Step 4.

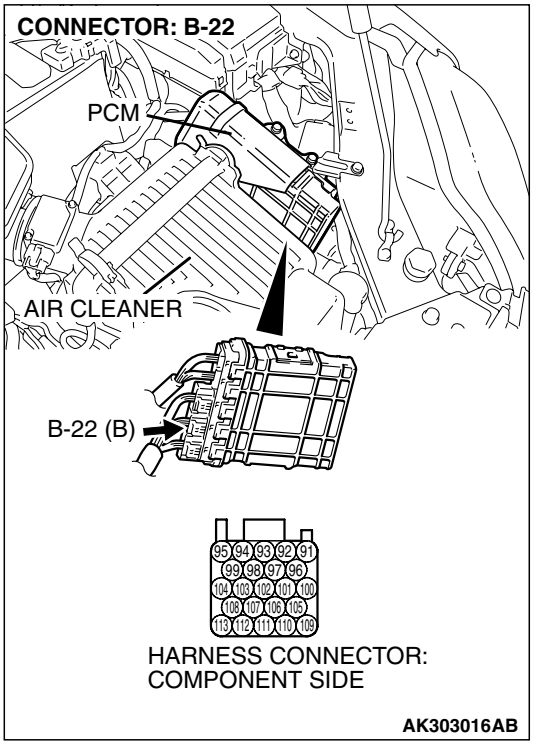


STEP 4. Check harness connector B-22 at PCM for damage.

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 go to Step 11.



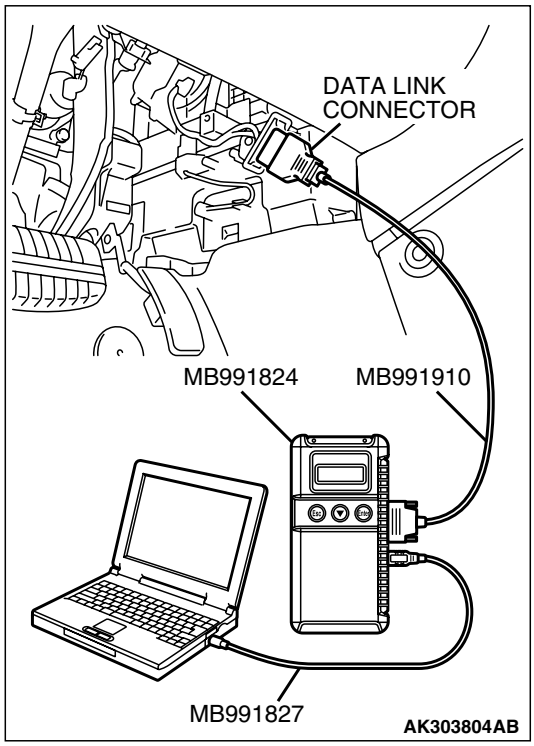


STEP 5. Check for open circuit and short circuit to ground between throttle position sensor connector B-06 (terminal No. 5) and PCM connector B-22 (terminal No. 94).

Q: Is the harness wire in good condition?

YES : Go to Step 6.

NO : Repair it. Then go to Step 11.



STEP 6. Using scan tool MB991958, check data list item 13: Throttle Position Sensor (main).

⚠ 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.

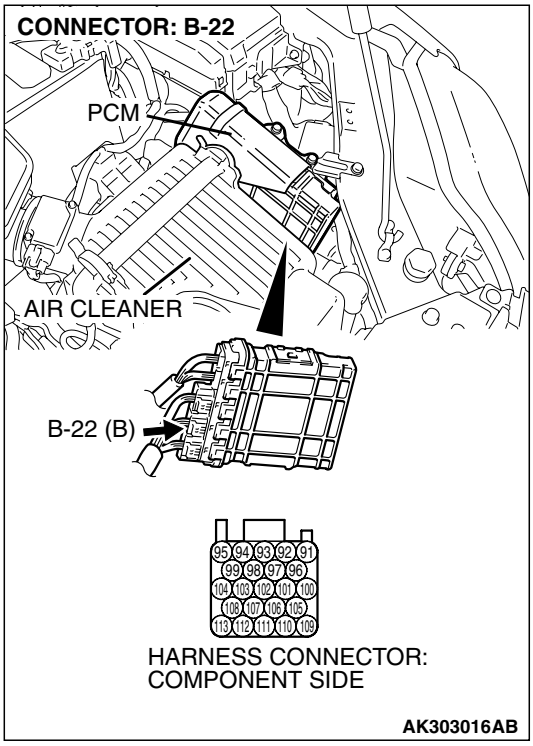
(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Detach the intake air hose at the throttle body.
(4) Disconnect the connector of the throttle position sensor.
(5) Use test harness special tool (MB991658) to connect only terminals No. 3, No. 4, No. 5, and No. 6.
(6) Set scan tool MB991958 to the data reading mode for item 13, Throttle Position Sensor (main).
- Output voltage should be between 0.3 and 0.7 volt when the throttle valve is fully closed with your finger.
- Output voltage should be 4.0 volts or more when the throttle valve is fully open with your finger.

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

Q: Is the sensor operating properly?

YES : It can be assumed 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 : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 11.

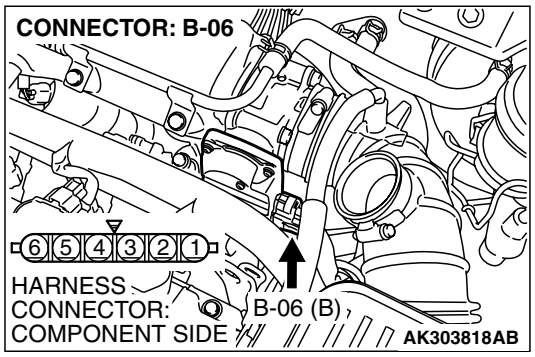


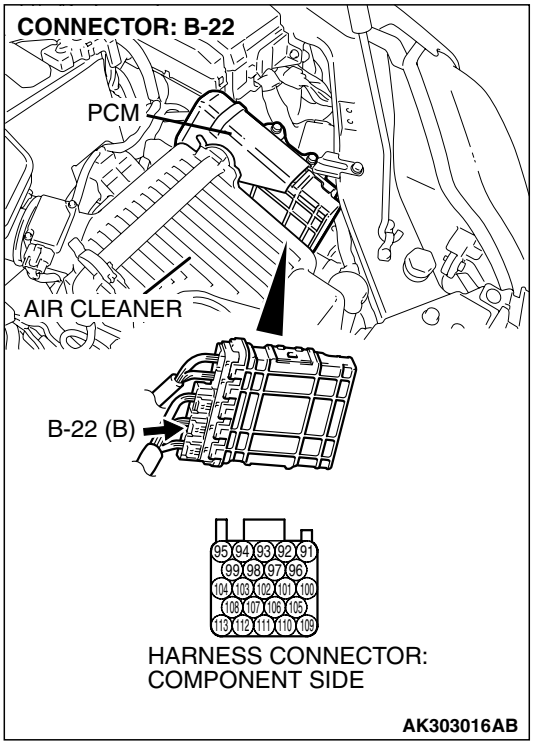
STEP 7. Check harness connector B-22 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 8.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.





STEP 8. Check for harness damage between throttle position sensor connector B-06 (terminal No. 5) and PCM connector B-22 (terminal No. 94).

Q: Is the harness wire in good condition?

YES : Go to Step 9.

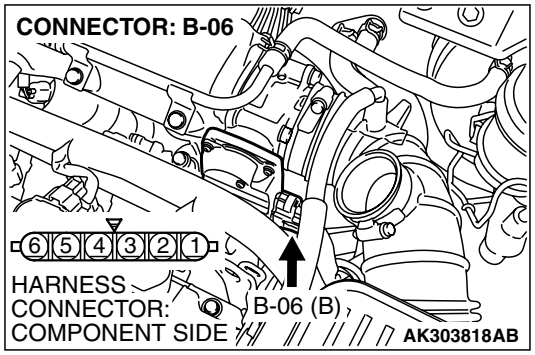
NO : Repair it. Then go to Step 11.

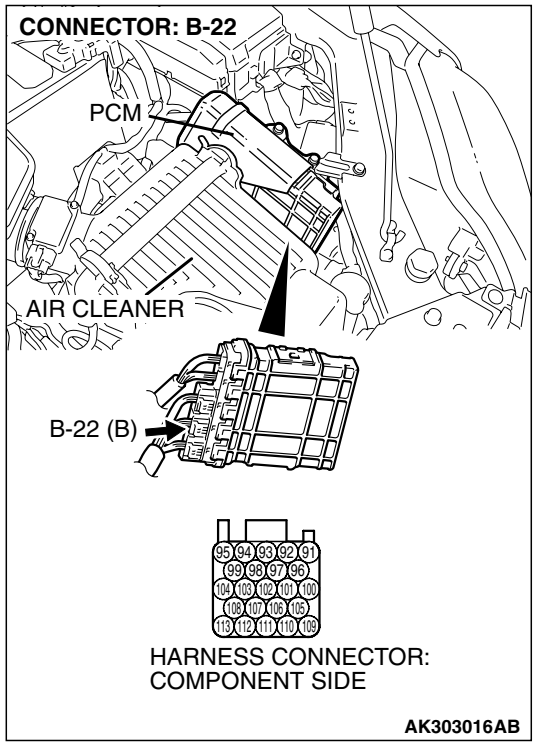
STEP 9. Check for open circuit, short circuit to ground and harness damage between throttle position sensor connector B-06 (terminal No. 4) and PCM connector B-22 (terminal No. 99).

Q: Is the harness wire in good condition?

YES : Go to Step 10.

NO : Repair it. Then go to Step 11.





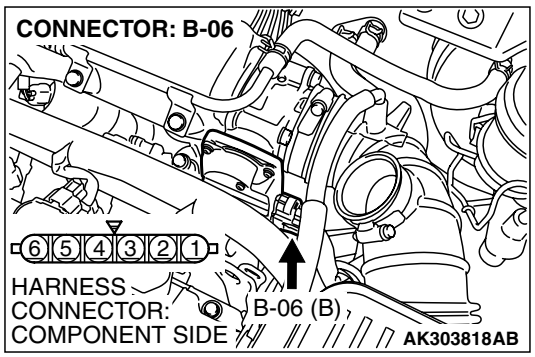
STEP10. Replace the throttle body assembly.

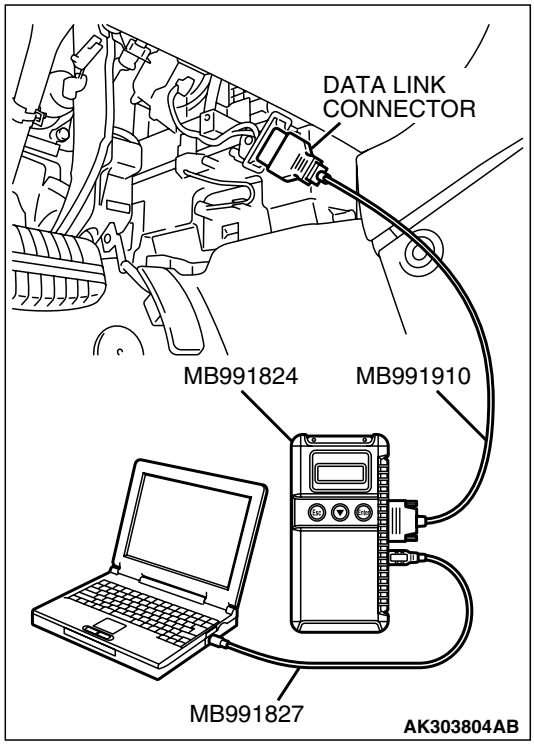
(1) Replace the throttle body assembly.
(2) Turn the ignition switch to the "ON" position.
(3) After the DTC has been deleted, read the DTC again.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC P0122 set?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 11.

NO : The inspection is complete.





STEP 11. 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) After the DTC has been deleted, read the DTC again.
(4) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is DTC P0122 set?

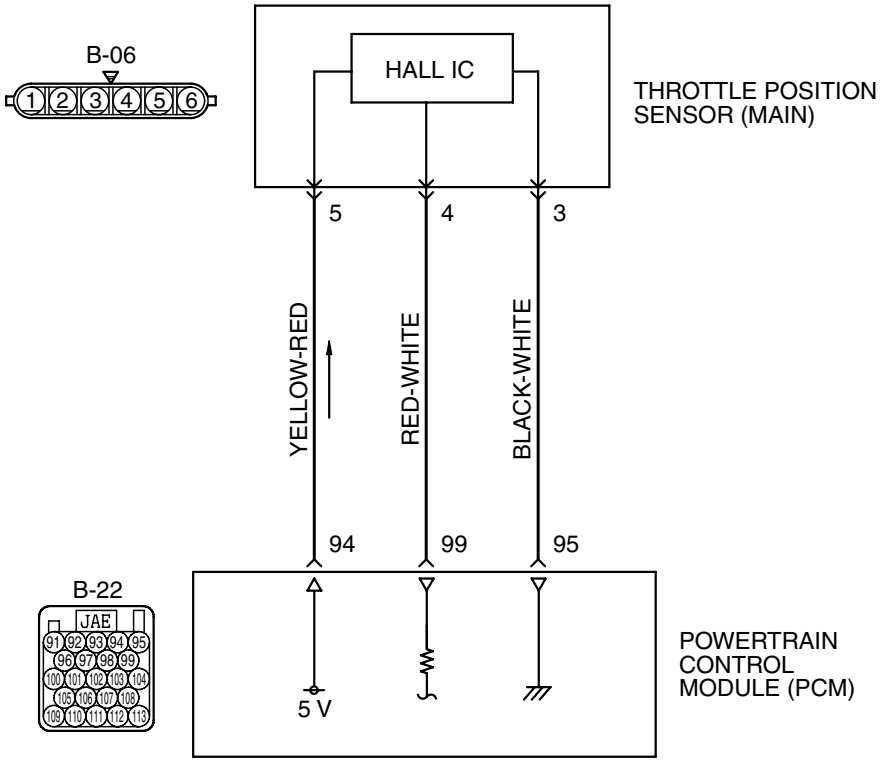
YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0123: Throttle Position Sensor (main) Circuit High Input

⚠ CAUTION

If DTC P0123 has been set, TCL related DTC U1120 is also set. After P0123 has been diagnosed, don't forget to erase DTC U1120.

Throttle Position Sensor (main) Circuit



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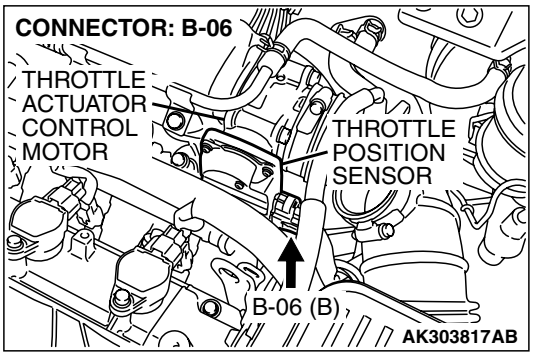

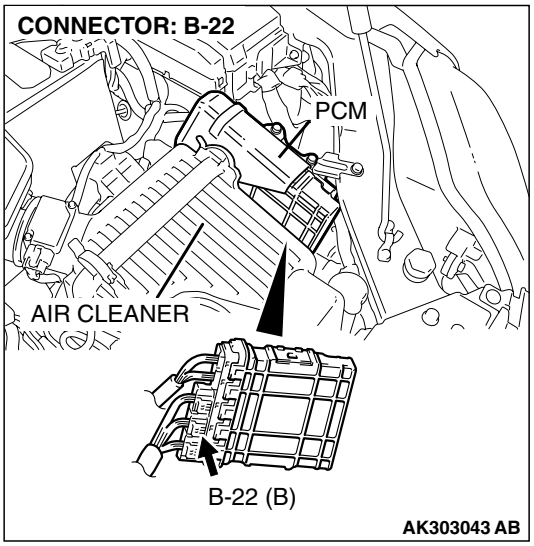

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CIRCUIT OPERATION

- A 5-volt power supply is applied on the throttle position sensor (main) power terminal (terminal No. 5) from the PCM (terminal No. 94).
  The ground terminal (terminal No. 3) is grounded with PCM (terminal No. 95).

TECHNICAL DESCRIPTION

- The throttle position sensor (main) outputs voltage which corresponds to the throttle valve opening angle.
- The PCM checks whether the voltage is within a specified range.

DESCRIPTIONS OF MONITOR METHODS

Throttle position sensor (main) output voltage is out of specified range.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

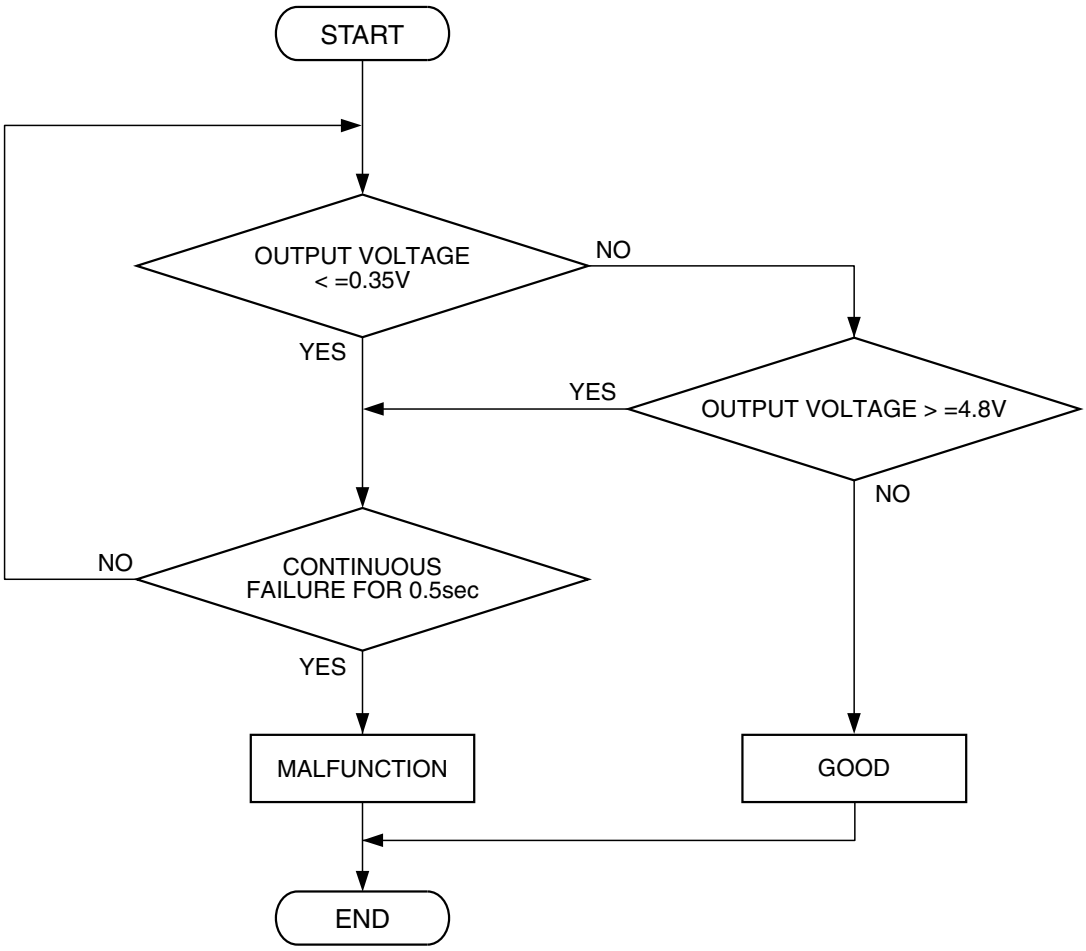
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



AK302016

Check Condition

- Ignition switch is "ON" position.

Judgement Criterion

- Throttle position sensor (main) output voltage should be 4.8 volts or more for 0.5 second.

OBD-II DRIVE CYCLE PATTERN

None.

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

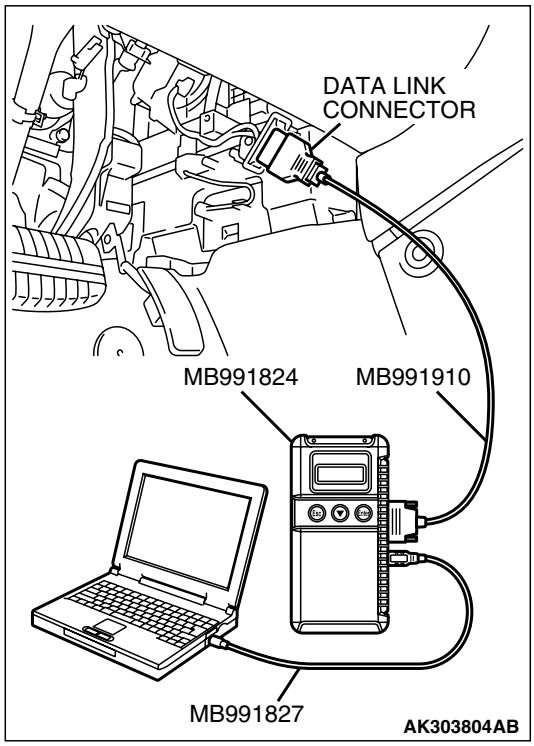
- Throttle position sensor failed.
- Open throttle position sensor (main) circuit, harness damage or connector damage.
- PCM failed.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A
- MB991658: Test Harness

TSB Revision



STEP 1. Using scan tool MB991958, check data list item 13: Throttle Position Sensor (main).

⚠ 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.

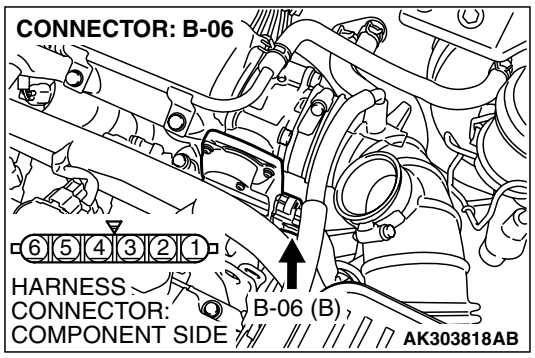
(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Detach the intake air hose at the throttle body.
(4) Disconnect the connector of the throttle position sensor.
(5) Use test harness special tool (MB991658) to connect only terminals No. 3, No. 4, No. 5, and No. 6.
(6) Set scan tool MB991958 to the data reading mode for item 13, Throttle Position Sensor (main).
- Output voltage should be between 0.3 and 0.7 volt when the throttle valve is fully closed with your finger.
- Output voltage should be 4.0 volts or more when the throttle valve is fully open with your finger.

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

Q: Is the sensor operating properly?

YES : It can be assumed 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.

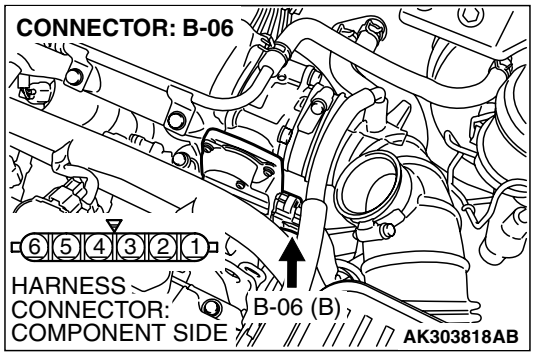


STEP 2. Check harness connector B-06 at throttle position sensor for damage.

Q: Is the harness connector in good condition?

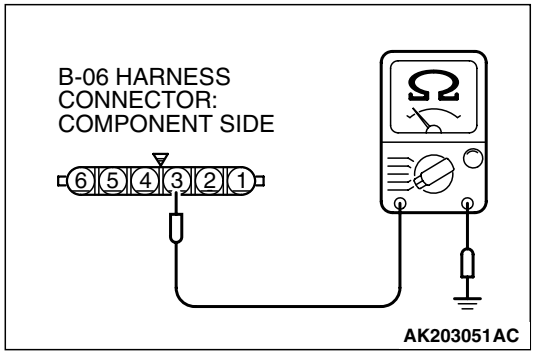
YES : Go to Step 3.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 8.



STEP 3. Check the continuity at throttle position sensor harness side connector B-06.

(1) Disconnect the connector B-06 and measure at the harness side.



(2) Measure the continuity between terminal No. 3 and ground
- Continuity (2 Ω or less)

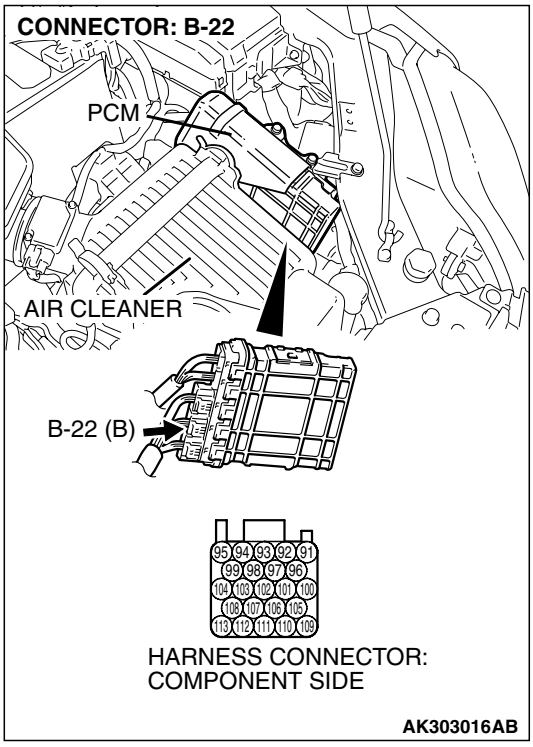
Q: Does continuity exist?

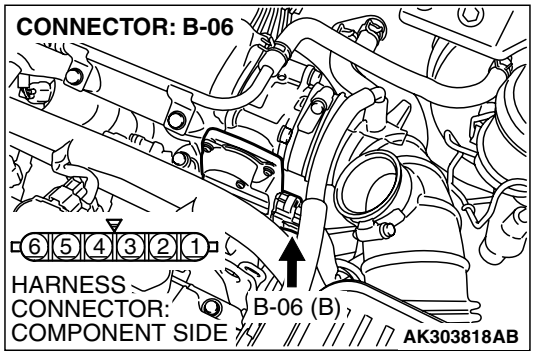
YES : Go to Step 7.
NO : Go to Step 4.

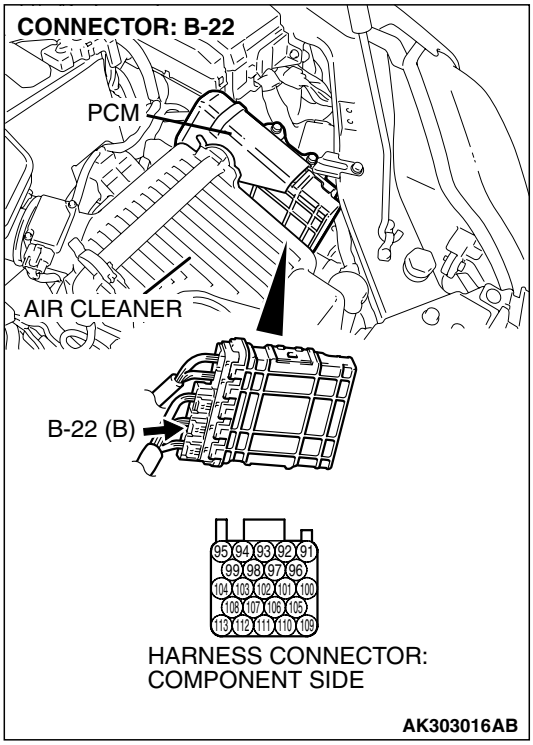
STEP 4. Check harness connector B-22 at PCM for damage.

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 go to Step 8.





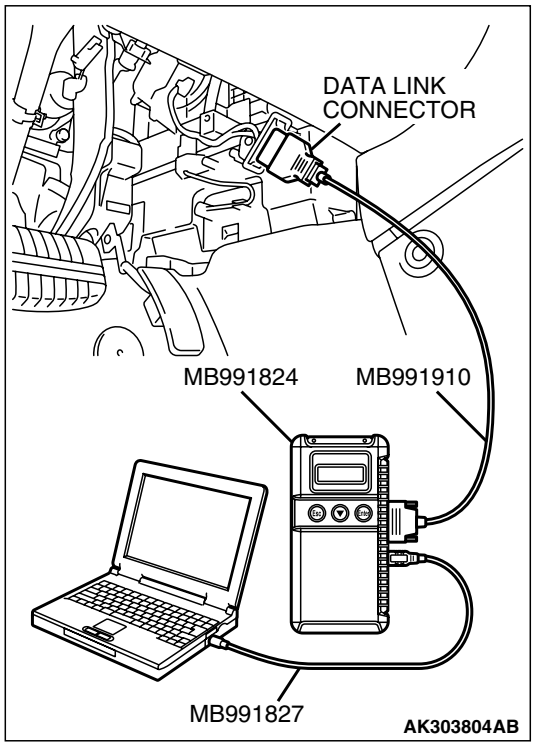


STEP 5. Check for open circuit and harness damage between throttle position sensor connector B-06 (terminal No. 3) and PCM connector B-22 (terminal No. 95).

Q: Is the harness wire in good condition?

YES : Go to Step 6.

NO : Repair it. Then go to Step 8.



STEP 6. Using scan tool MB991958, check data list item 13: Throttle Position Sensor (main).

⚠ 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.

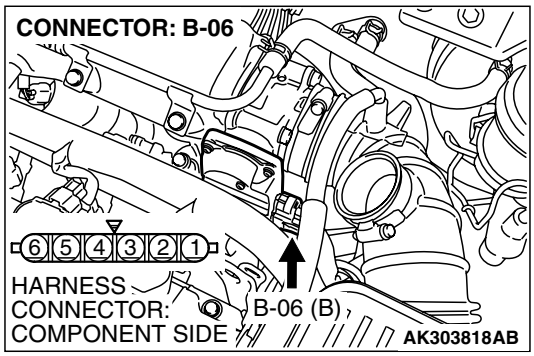
(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Detach the intake air hose at the throttle body.
(4) Disconnect the connector of the throttle position sensor.
(5) Use test harness special tool (MB991658) to connect only terminals No. 3, No. 4, No. 5, and No. 6.
(6) Set scan tool MB991958 to the data reading mode for item 13, Throttle Position Sensor (main).
- Output voltage should be between 0.3 and 0.7 volt when the throttle valve is fully closed with your finger.
- Output voltage should be 4.0 volts or more when the throttle valve is fully open with your finger.

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

Q: Is the sensor operating properly?

YES : It can be assumed 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 : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 8.



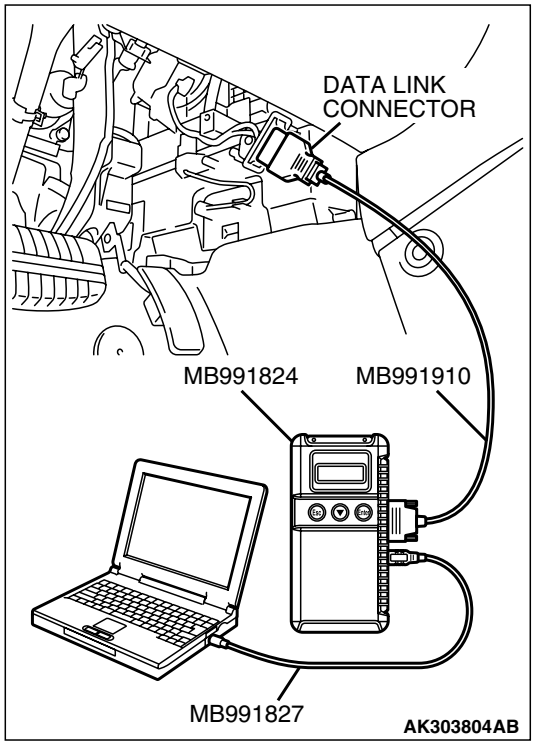
STEP 7. Replace the throttle body assembly.

(1) Replace the throttle body assembly.
(2) Turn the ignition switch to the "ON" position.
(3) After the DTC has been deleted, read the DTC again.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC P0123 set?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 8.

NO : The inspection is complete.



STEP 8. 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) After the DTC has been deleted, read the DTC again.
(4) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is DTC P0123 set?

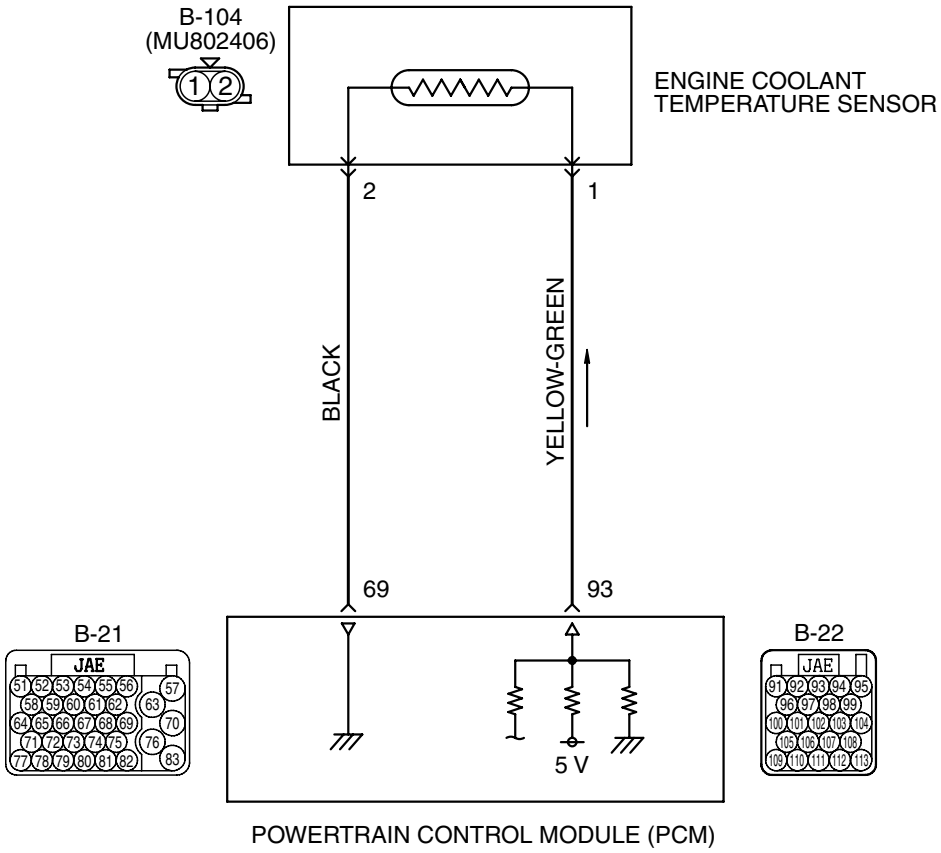
YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0125: Insufficient Coolant Temperature for Closed Loop Fuel Control

⚠ CAUTION

If DTC P0125 has been set, TCL related DTC U1120 is also set. After P0125 has been diagnosed, don't forget to erase DTC U1120.

Engine Coolant Temperature Sensor Circuit



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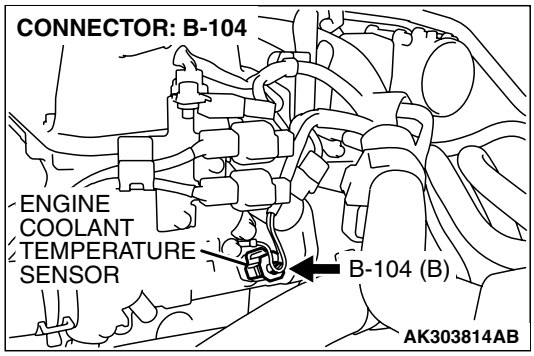

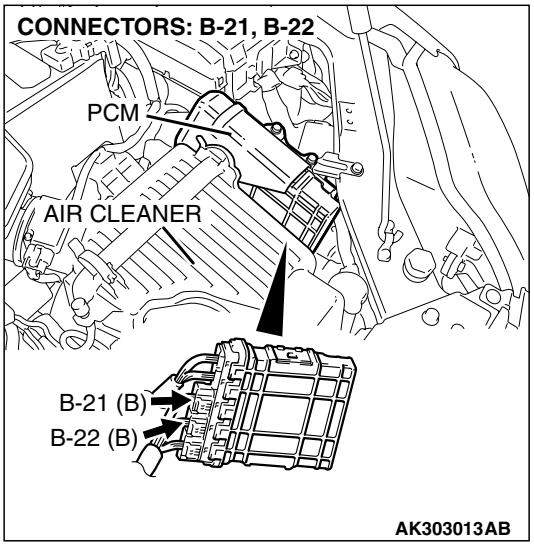

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CIRCUIT OPERATION

- 5-volt voltage is applied to the engine coolant temperature sensor output terminal (terminal No. 1) from the PCM (terminal No. 93) via the resistor in the PCM. The ground terminal (terminal No. 2) is grounded with PCM (terminal No. 69).
- The engine coolant temperature sensor is a negative temperature coefficient type of resistor. It has the characteristic that when the engine coolant temperature rises the resistance decreases.
- The engine coolant temperature sensor output voltage increases when the resistance increases and decreases when the resistance decreases.

TECHNICAL DESCRIPTION

- The engine coolant temperature sensor converts the engine coolant temperature to a voltage and outputs it.
- The PCM checks whether this voltage is within a specified range.

DESCRIPTIONS OF MONITOR METHODS

- Engine coolant temperature sensor output voltage drops from over 40°C (104°F) to under 40°C (104°F) and keeps under 40°C (104°F) for 5 minutes.
- Engine coolant temperature sensor output voltage does not reach close loop enable temperature within specified period when engine coolant temperature sensor output voltage at engine start is under 7°C (45°F).

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

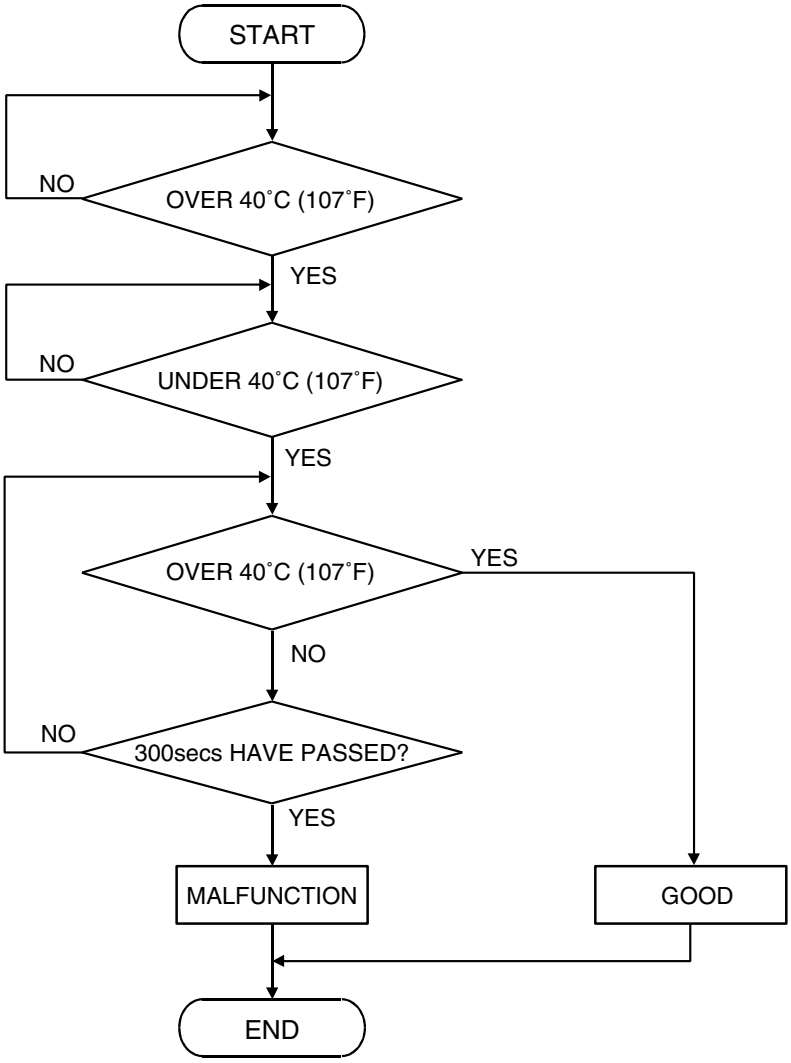
- Not applicable

Sensor (The sensor below is determined to be normal)

- Mass airflow sensor
- Engine coolant temperature sensor
- Intake air temperature sensor

DTC SET CONDITIONS <Range/Performance problem – drift>

Logic Flow Chart



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Check Conditions, Judgement Criteria

- Engine coolant temperature decreases from higher than 40°C (104°F) to lower than 40°C (104°F).
- Then the engine coolant temperature has continued to be 40°C (104°F) or lower for 5 minutes.

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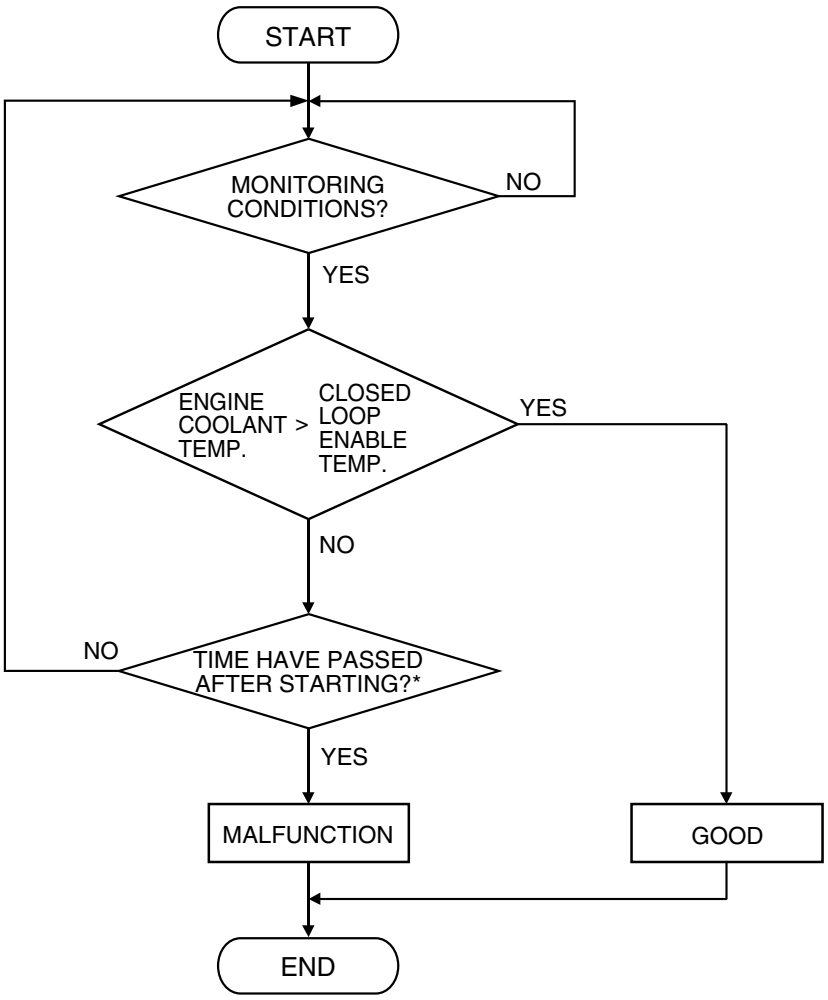
DTC SET CONDITIONS <Range/Performance problem – low input (Time to reach closed loop temperature)>

Logic Flow Chart



*: SEE DTC SET CONDITIONS-SET CONDITIONS, JUDGMENT CRITERIA

AK503609

Check Conditions, Judgement Criteria

- About 60 – 300 seconds have passed for the engine coolant temperature to rise to about 7°C (45°F) after starting sequence was completed.
- However, time is not counted when fuel is shut off.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 9 P.13A-9.

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

- Engine coolant temperature sensor failed.
- Harness damage in engine coolant temperature sensor circuit or connector damage.
- PCM failed.

TSB Revision

DIAGNOSIS

Required Special Tools:

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

STEP 1. Using scan tool MB991958, check data list item 6: Engine Coolant Temperature Sensor.

⚠ CAUTION

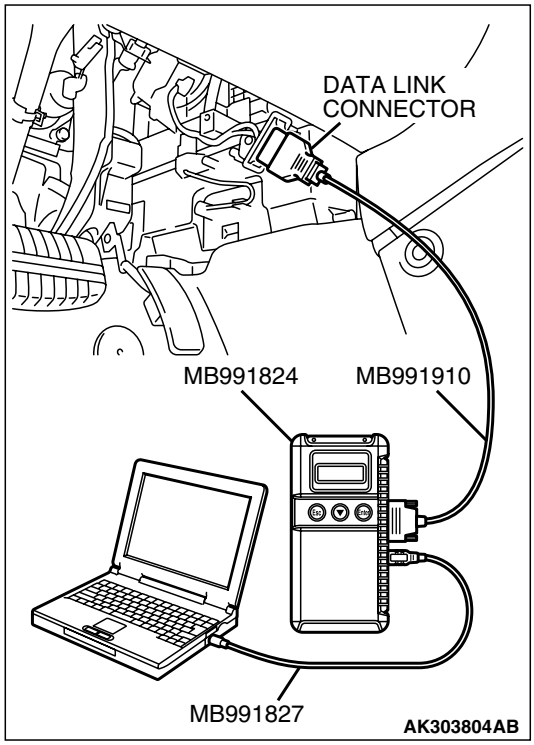
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

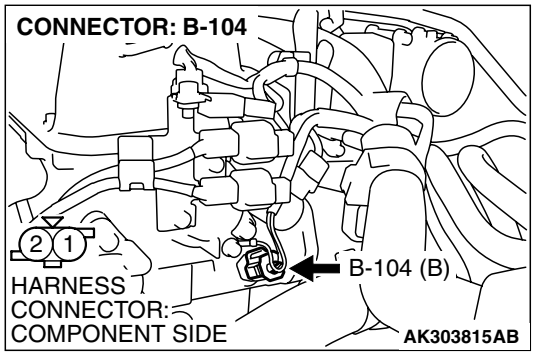
(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991958 to the data reading mode for item 6, Engine Coolant Temperature Sensor.
  - The engine coolant temperature and temperature shown with the scan tool should approximately match.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed 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.

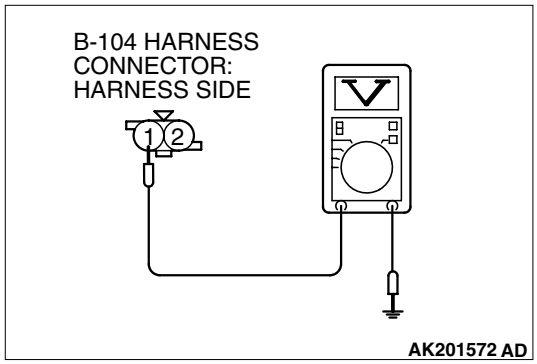
NO : Go to Step 2.





STEP 2. Measure the sensor output voltage at engine coolant temperature sensor connector B-104 by backprobing.

(1) Do not disconnect the connector B-104.
(2) Turn the ignition switch to the "ON" position.



(3) Measure the voltage between terminal No. 1 and ground by backprobing.
- When engine coolant temperature is –20°C (–4°F), voltage should be between 3.9 and 4.5 volts.
- When engine coolant temperature is 0°C (32°F), voltage should be between 3.2 and 3.8 volts.
- When engine coolant temperature is 20°C (68°F), voltage should be between 2.3 and 2.9 volts.
- When engine coolant temperature is 40°C (104°F), voltage should be between 1.3 and 1.9 volts.
- When engine coolant temperature is 60°C (140°F), voltage should be between 0.7 and 1.3 volts.
- When engine coolant temperature is 80°C (176°F), voltage should be between 0.3 and 0.9 volt.

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

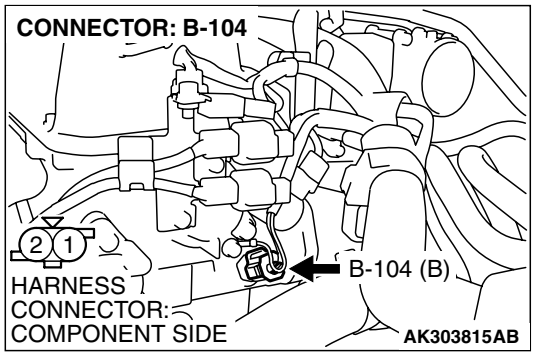
Q: Is the measured voltage within the specified range?

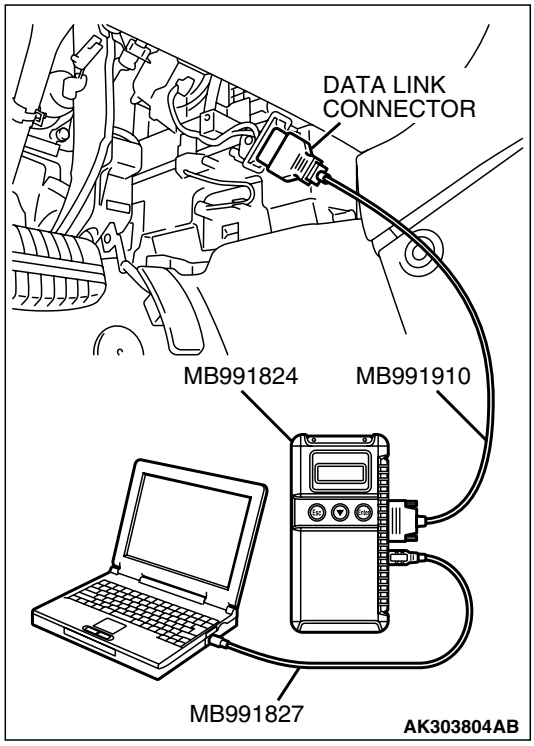
YES : Go to Step 3.
NO : Go to Step 5.

STEP 3. Check harness connector B-104 at the engine coolant temperature sensor for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 4.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.





STEP 4. Using scan tool MB991958, check data list item 6: 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.

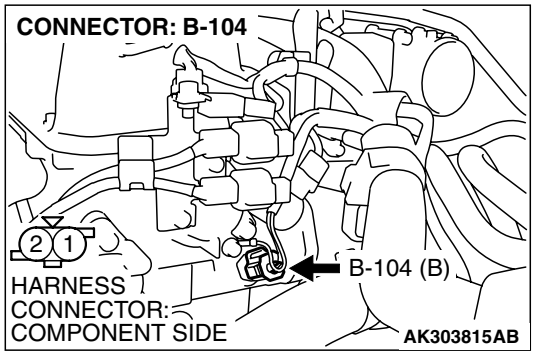
(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991958 to the data reading mode for item 6, Engine Coolant Temperature Sensor.
- The engine coolant temperature and temperature shown with the scan tool should approximately match.

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

Q: Is the sensor operating properly?

YES : It can be assumed 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 : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 14.

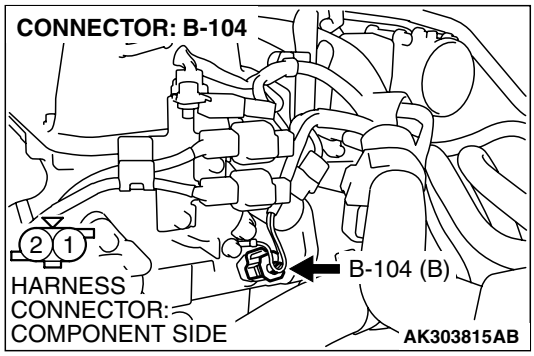


STEP 5. Check harness connector B-104 at engine coolant temperature sensor for damage.

Q: Is the harness connector in good condition?

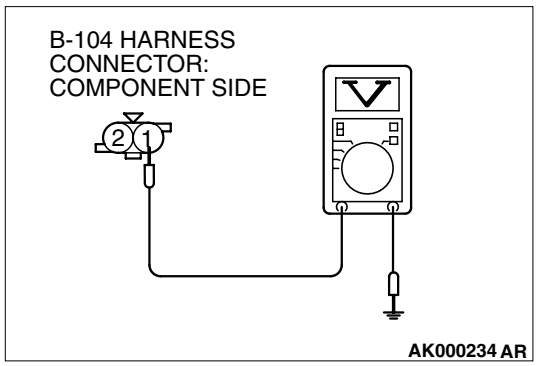
YES : Go to Step 6.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.



STEP 6. Measure the sensor supply voltage at engine coolant temperature sensor harness side connector B-104.

(1) Disconnect the connector B-104 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 between 4.5 and 4.9 volts.

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

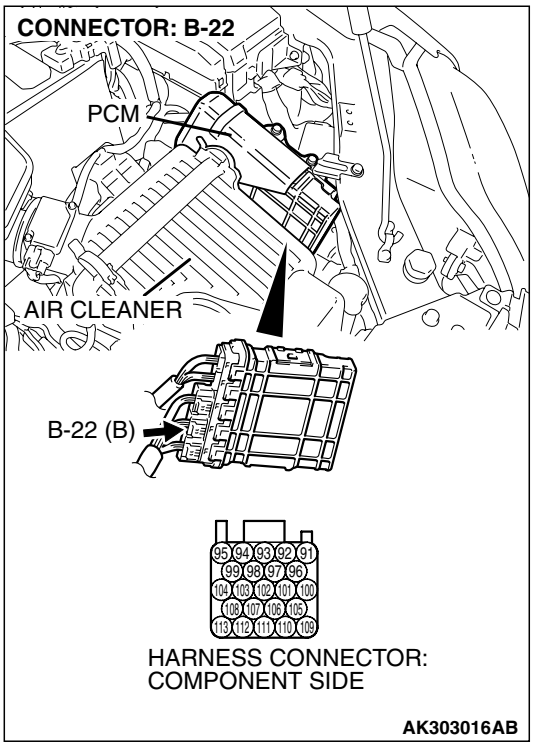
Q: Is the measured voltage between 4.5 and 4.9 volts?

YES : Go to Step 8.
NO : Go to Step 7.

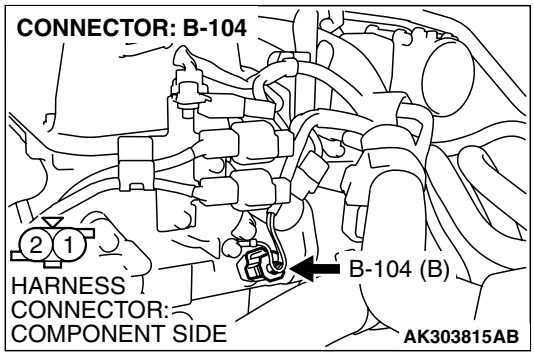
STEP 7. Check harness connector B-22 at PCM for damage.

Q: Is the harness connector in good condition?

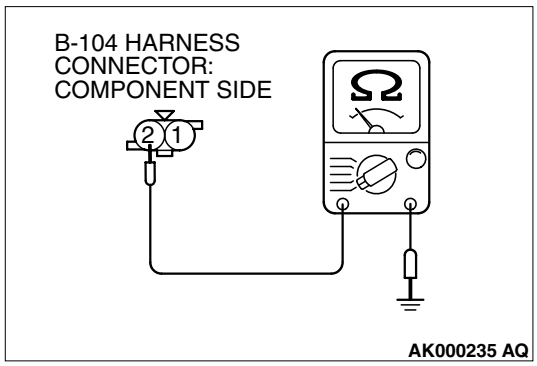
YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 14.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.



STEP 8. Check the continuity at engine coolant temperature sensor harness side connector B-104.



(1) Disconnect the connector B-104 and measure at the harness side.

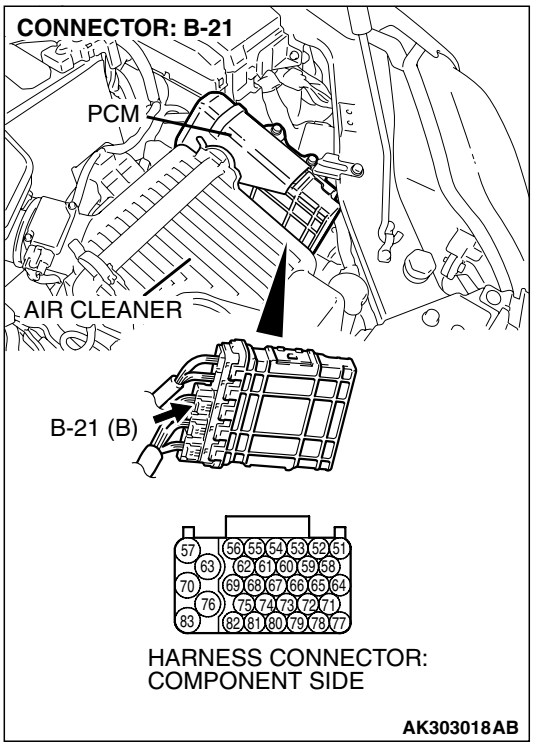


(2) Check for the continuity between terminal No. 2 and ground.
- Continuity (2 Ω or less)

Q: Does continuity exist?

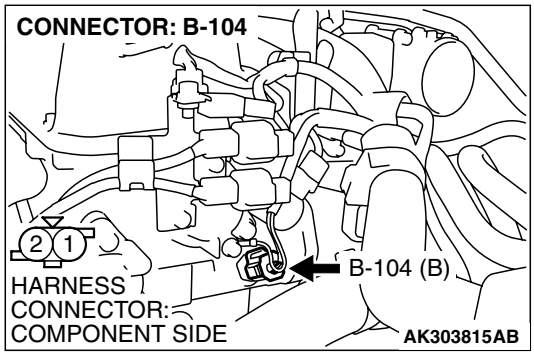
YES : Go to Step 11.
NO : Go to Step 9.

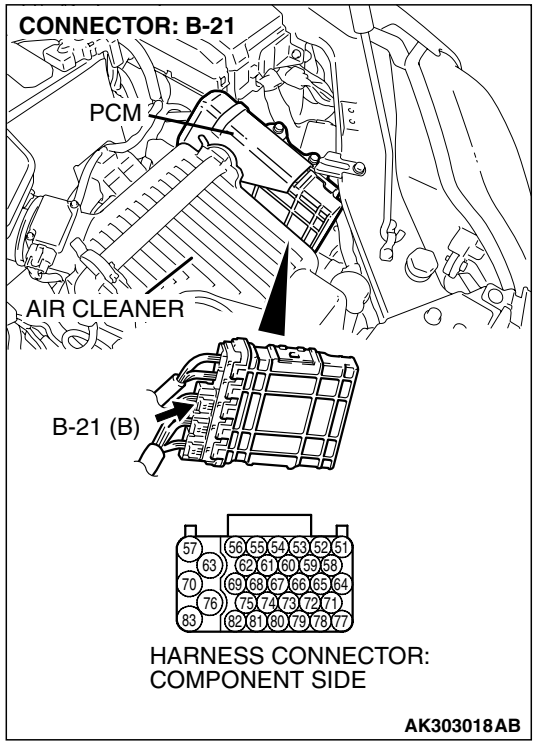
STEP 9. Check harness connector B-21 at PCM for damage.



Q: Is the harness 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 go to Step 14.



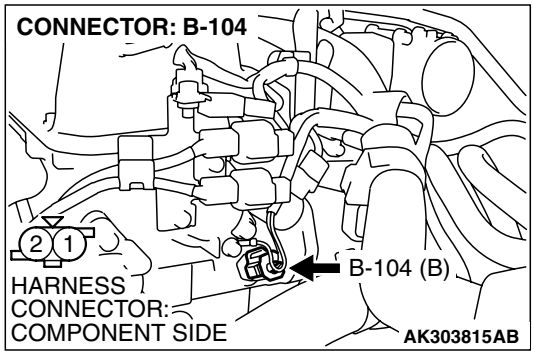


STEP 10. Check for harness damage between engine coolant temperature sensor connector B-104 (terminal No. 2) and PCM connector B-21 (terminal No. 69).

Q: Is the harness wire in good condition?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 14.

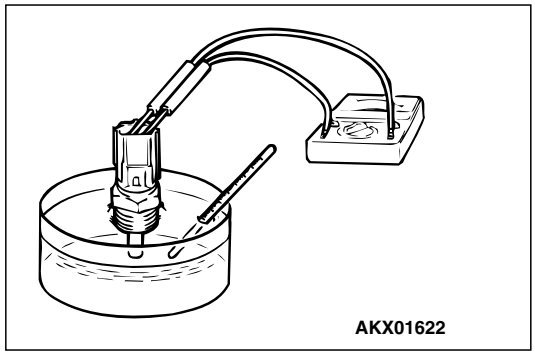
NO : Repair it. Then go to Step 14.



STEP 11. Check the engine coolant temperature sensor.

(1) Disconnect the engine coolant temperature sensor connector B-104.

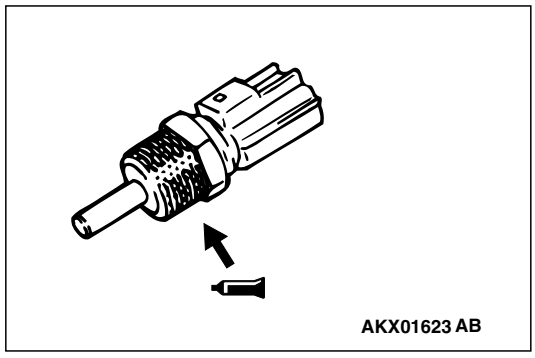
(2) Remove the engine coolant temperature sensor.



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

Standard value:

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



(4) Apply 3M™ AAD part number 8731 or equivalent on the screw section of the engine coolant temperature sensor.

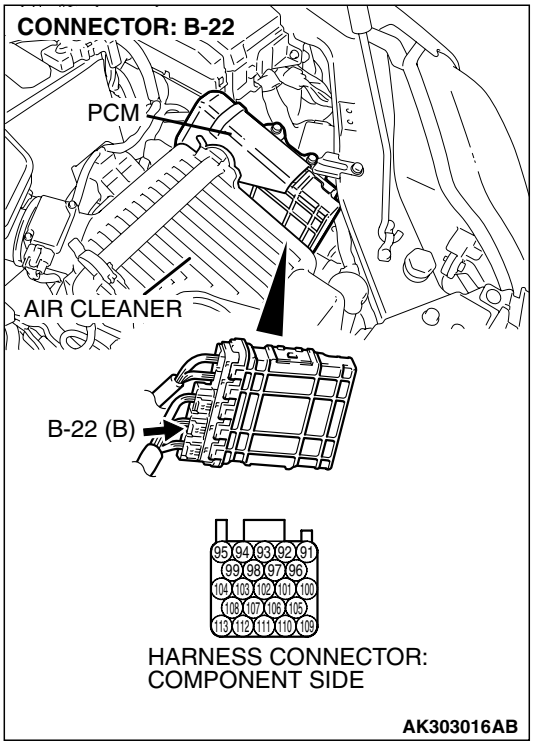
(5) Install the engine coolant temperature sensor, and tighten to the specified torque.

Tightening torque: 30 ± 9 N·m (22 ± 7 ft-lb)

Q: Is the measured resistance at the standard value?

YES : Go to Step 12.

NO : Replace the engine coolant temperature sensor. Then go to Step 14.

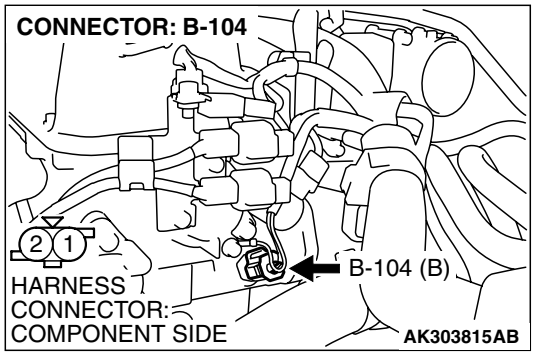


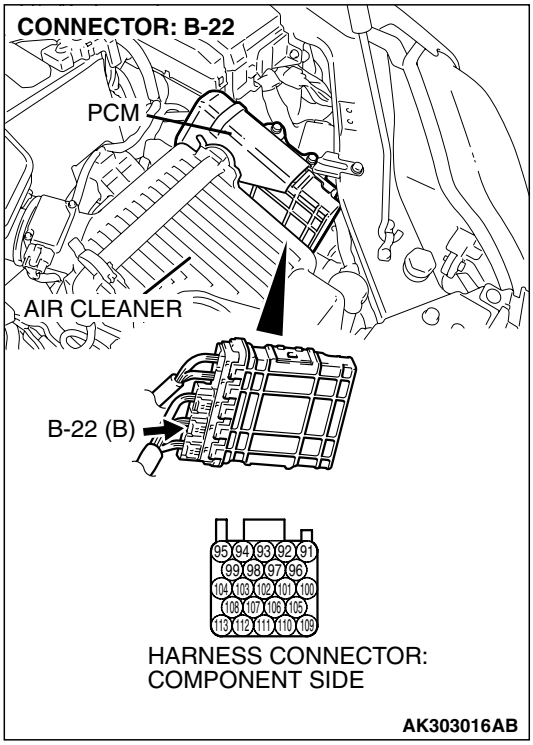
STEP 12. Check harness connector B-22 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 13.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.





STEP 13. Check for harness damage between engine coolant temperature sensor connector B-104 (terminal No. 1) and PCM connector B-22 (terminal No. 93).

Q: Is the harness wire in good condition?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 14.

NO : Repair it. Then go to Step 14.

STEP 14. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 9 P.13A-9.

(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0125 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0128: Coolant Thermostat (Coolant Temperature Below Thermostat Regulating Temperature)

TECHNICAL DESCRIPTION

- The PCM checks the time for the cooling water temperature to reach the judgement temperature.

DESCRIPTIONS OF MONITOR METHODS

Engine coolant temperature does not reach 77°C (171°F) within specified period after cold start.

TSB Revision

MONITOR EXECUTION
Once per driving cycle

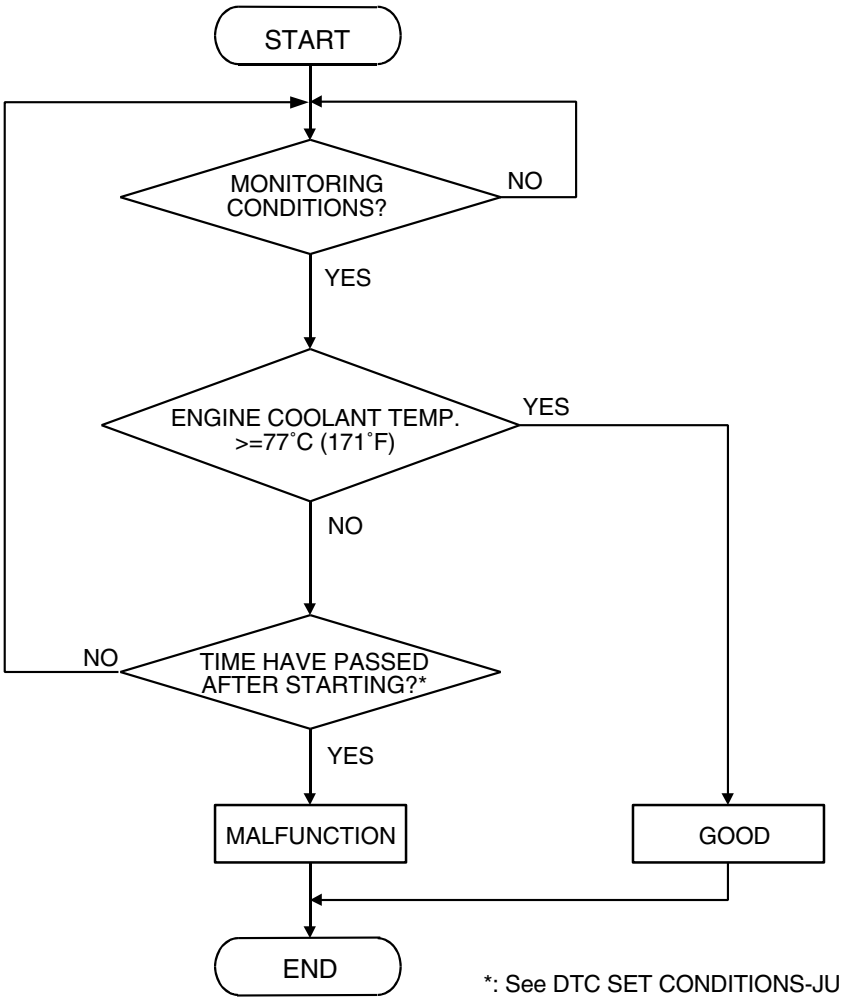
MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)
- Not applicable

Sensor (The sensor below is determined to be normal)
- Mass airflow sensor
- Engine coolant temperature sensor
- Intake air temperature sensor

DTC SET CONDITIONS

Logic Flow Chart



*: See DTC SET CONDITIONS-JUDGMENT CRITERIA

AK204044

Check Conditions
- Engine coolant temperature is between –10°C (14°F) and 77°C (171°F) when the engine is started.
- The engine coolant temperature – intake air temperature is 5°C (9°F) or less when the engine is started.
- The intake air temperature when the engine is started – intake air temperature is 5°C (9°F) or less.
- The total time of the mass airflow sensor output whose state is below 10 g/sec within 600 seconds.

TSB Revision

Judgement Criteria

- The time for the engine coolant temperature to rise to 77°C (171°F) takes longer than approximately 11 to 32 minutes.

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

- The thermostat is faulty.
- PCM failed.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 10 P.13A-9.

DIAGNOSIS

STEP 1. Check the cooling system.

Refer to GROUP 14, Engine Cooling Diagnosis P.14-3.

Q: Is the cooling system normal?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 2.

NO : Repair it. Then go to Step 2.

STEP 2. Test the OBD-II drive cycle.

(1) Carry out test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 10 P.13A-9.

(2) Check the diagnostic trouble code (DTC).

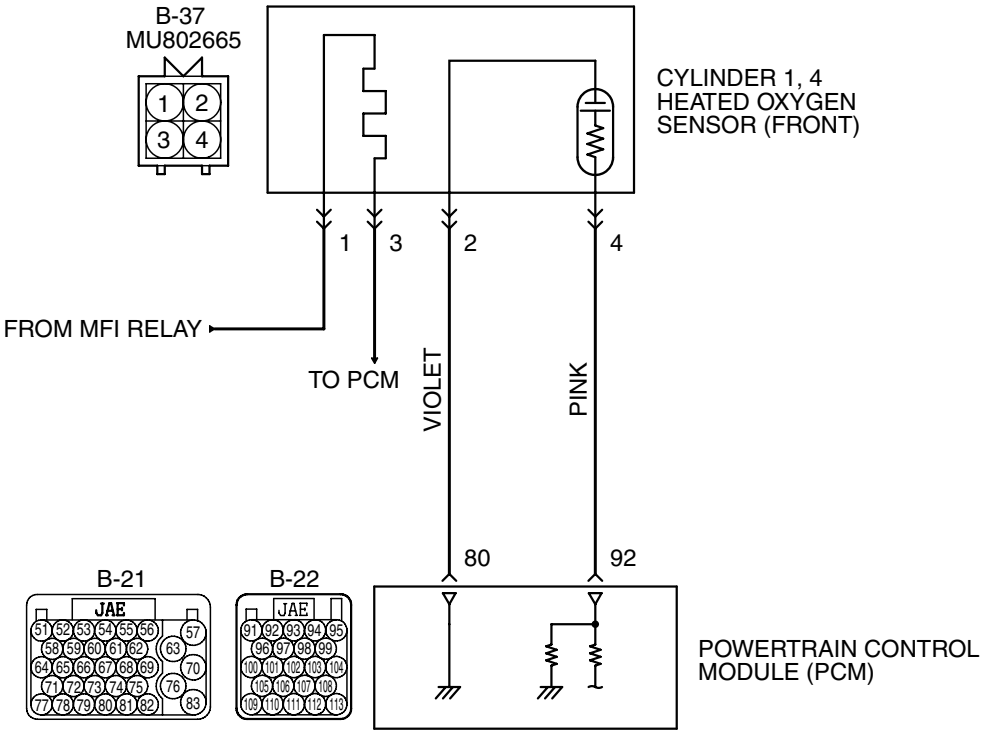
Q: Is DTC P0128 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0131: Cylinder 1, 4 Heated Oxygen Sensor (front) Circuit Low Voltage

Cylinder 1, 4 Heated Oxygen Sensor (front) Circuit



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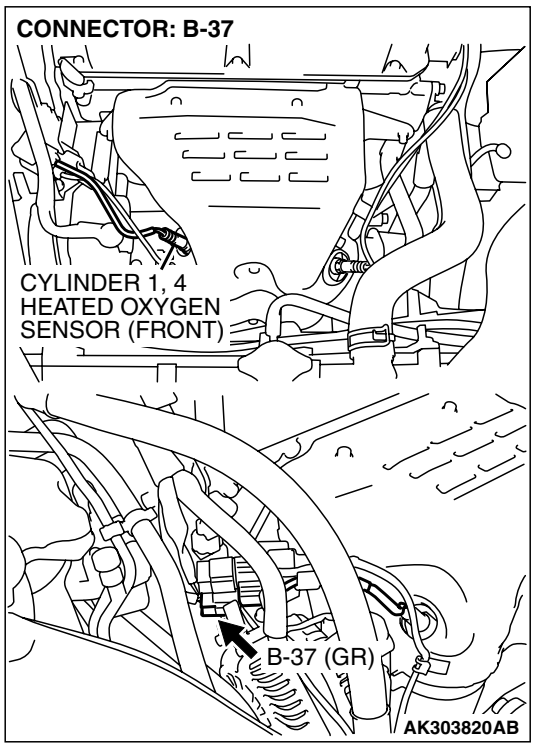
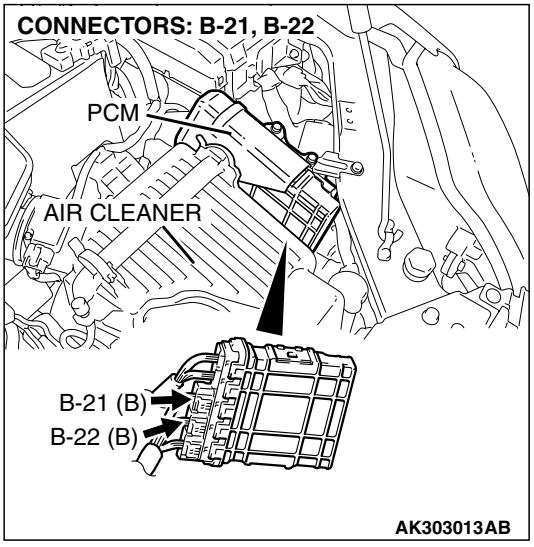




TSB Revision

CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the PCM (terminal No. 92) from the output terminal (terminal No. 4) of the cylinder 1, 4 heated oxygen sensor (front).
- Terminal No. 2 of the cylinder 1, 4 heated oxygen sensor (front) is grounded with PCM (terminal No. 80).
- The PCM applies an offset voltage of 0.5 volt to terminal No. 2 of the cylinder 1, 4 heated oxygen sensor (front).

TECHNICAL DESCRIPTION

- The cylinder 1, 4 heated oxygen sensor (front) detects the concentration of oxygen in the exhaust gas; it converts those data to voltage, and inputs the resulting signals to the PCM.
- When the cylinder 1, 4 heated oxygen sensor (front) begins to deteriorate, the heated oxygen sensor signal response becomes poor.
- The PCM checks for the cylinder 1, 4 heated oxygen sensor (front) output voltage.

DESCRIPTIONS OF MONITOR METHODS

Cylinder 1, 4 heated oxygen sensor (front) output voltage is under the specified range.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

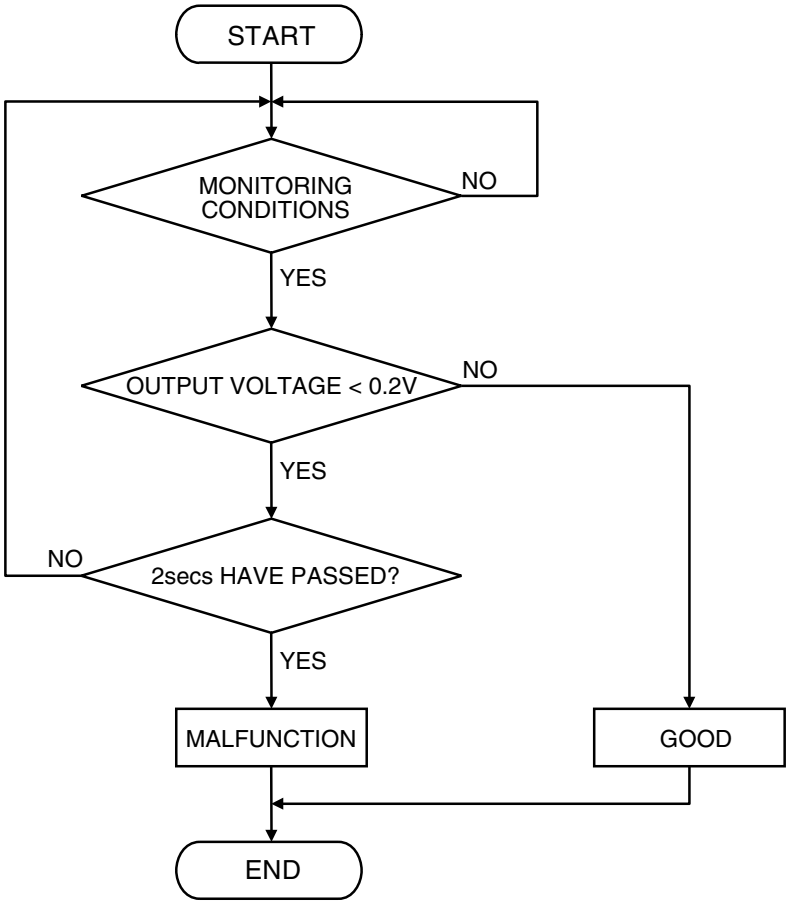
- Heated oxygen sensor heater (front) monitor
- Misfire monitor
- Fuel system monitor

Sensor (The sensor below is determined to be normal)

- Mass airflow sensor
- Engine coolant temperature sensor
- Intake air temperature sensor
- Barometric pressure sensor
- Throttle position sensor
- Accelerator pedal position sensor

DTC SET CONDITIONS

Logic Flow Chart



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Check Conditions

- Heated oxygen sensor offset voltage is between 0.4 and 0.6 volt.
- Battery positive voltage is between 11 and 16.5 volts.
- Typically 60 seconds have passed since the engine starting sequence was completed.

Judgement Criterion

- Cylinder 1, 4 heated oxygen sensor (front) output voltage is lower than 0.2 volt for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 23 P.13A-9.

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

- Cylinder 1, 4 heated oxygen sensor (front) failed.
- Open or shorted circuit in cylinder1, 4 heated oxygen sensor (front) output line, or harness damage.
- Open circuit in cylinder 1, 4 heated oxygen sensor (front) ground line, or harness damage.
- Connector damage.
- PCM failed.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.

TSB Revision

- MB991827: USB Cable
- MB991910: Main Harness A

- MB991316: Test Harness
- MB991923: Power Plant ECU Check Harness

STEP 1. Using scan tool MB991958, check data list item AC: Cylinder 1, 4 Heated Oxygen Sensor (front).

⚠ 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.

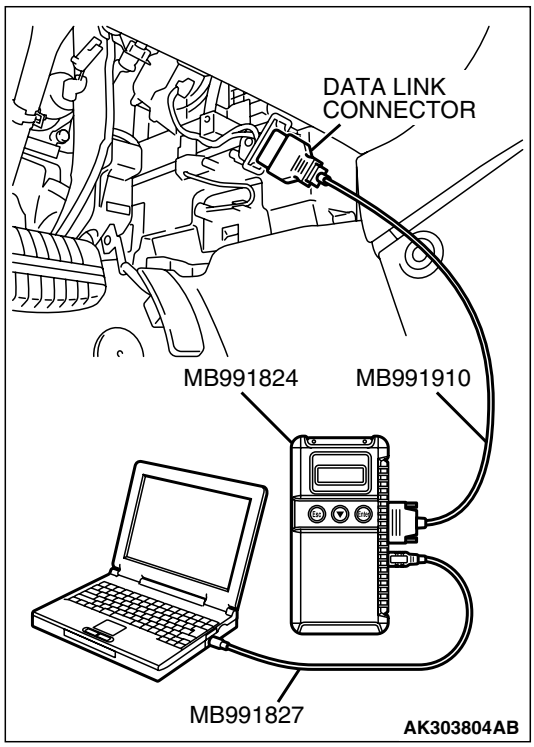
(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991958 to the data reading mode for item AC, Cylinder 1, 4 Heated Oxygen Sensor (front).
- Warm up the engine. When the engine is revved, the output voltage should measure 0.6 to 1.0 volt.
- Warm up the engine. When the engine is idling, the output voltage should repeat 0.4 volt and 0.6 to 1.0 volt alternately.

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

Q: Is the sensor operating properly?

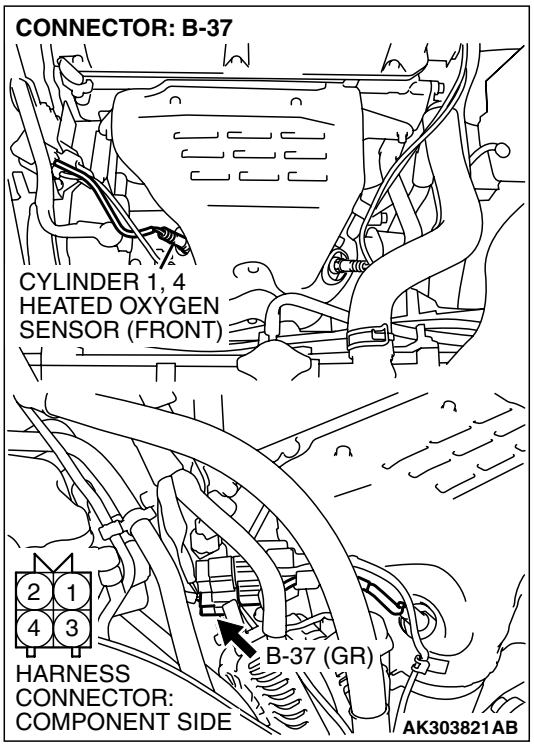
YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-14.

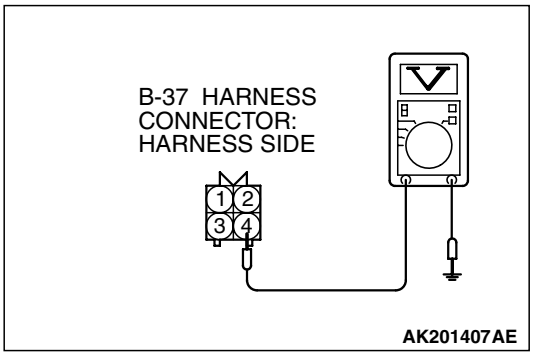
NO : Go to Step 2.



STEP 2. Measure the sensor output voltage at cylinder 1, 4 heated oxygen sensor (front) connector B-37 by backprobing

(1) Do not disconnect the connector B-37.
(2) Start the engine and run at idle.





(3) Measure the voltage between terminal No. 4 and ground by backprobing.
- Warm up the engine. When the engine is 2,500 r/min, the output voltage should repeat 0.5 to 1.4 volts alternately.

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

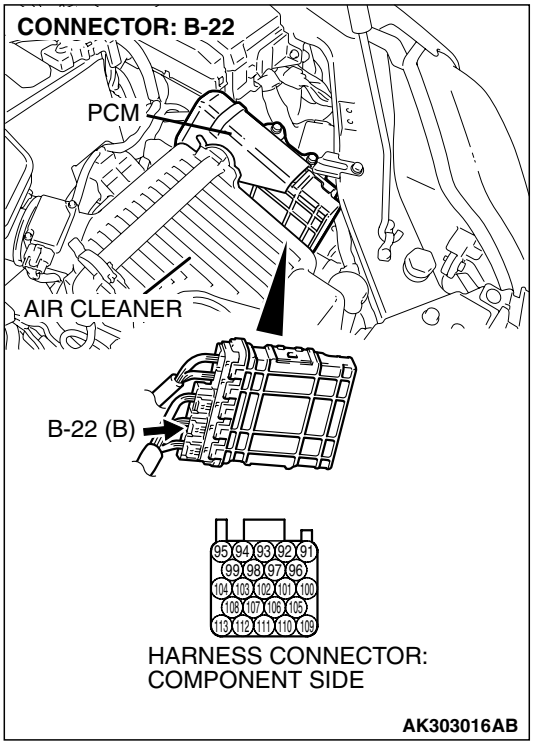
Q: Is the measured voltage within the specified range?

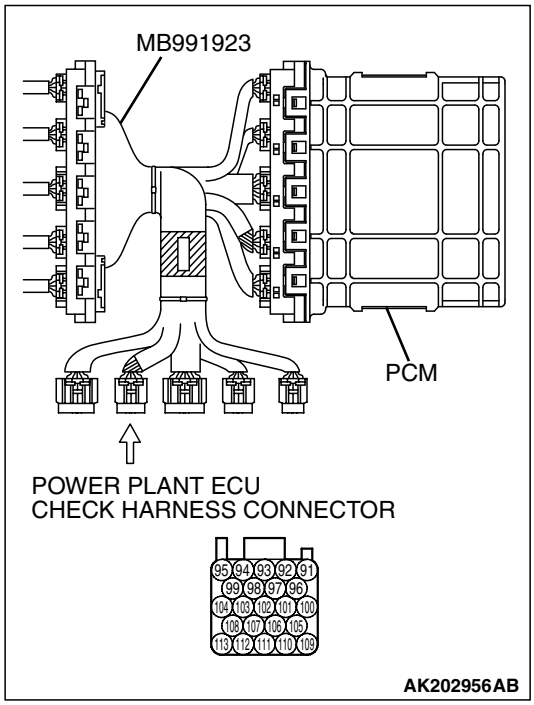
YES : Go to Step 3.
NO : Go to Step 7.

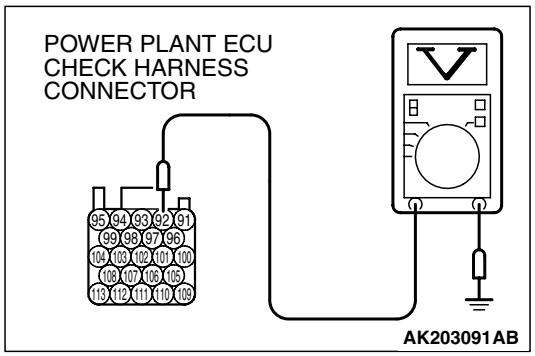
STEP 3. Measure the sensor output voltage at PCM connector B-22 by using power plant ECU check harness special tool MB991923.

(1) Disconnect all PCM connectors. Connect the power plant ECU check harness special tool MB991923 between the separated connectors.

(2) Start the engine and run at idle.





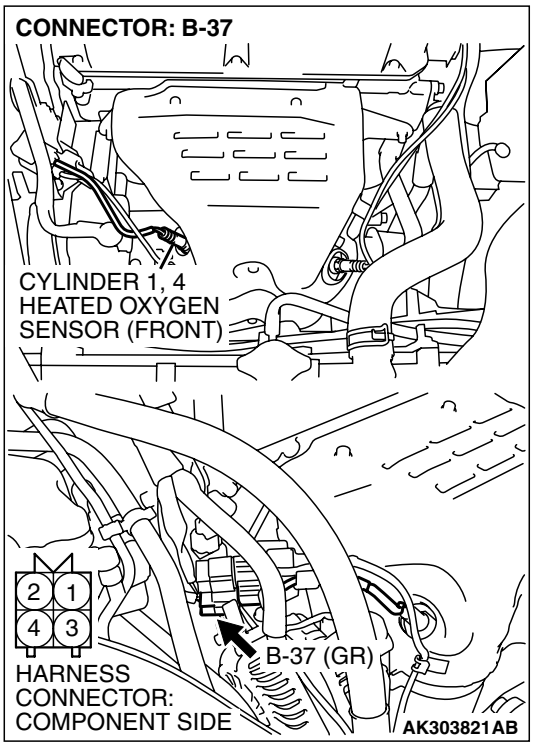


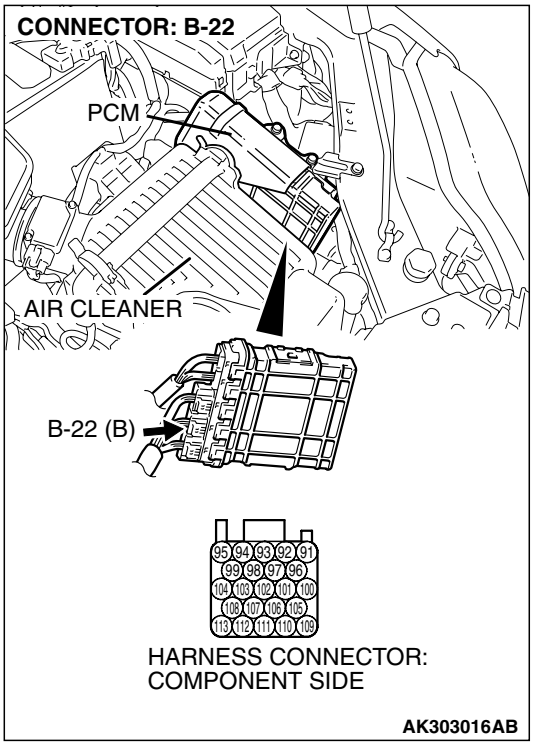
(3) Measure the voltage between terminal No. 92 and ground.
- Warm up the engine. When the engine is 2,500 r/min, the output voltage should repeat 0.5 to 1.4 volts alternately.

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

Q: Is the measured voltage within the specified range?

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



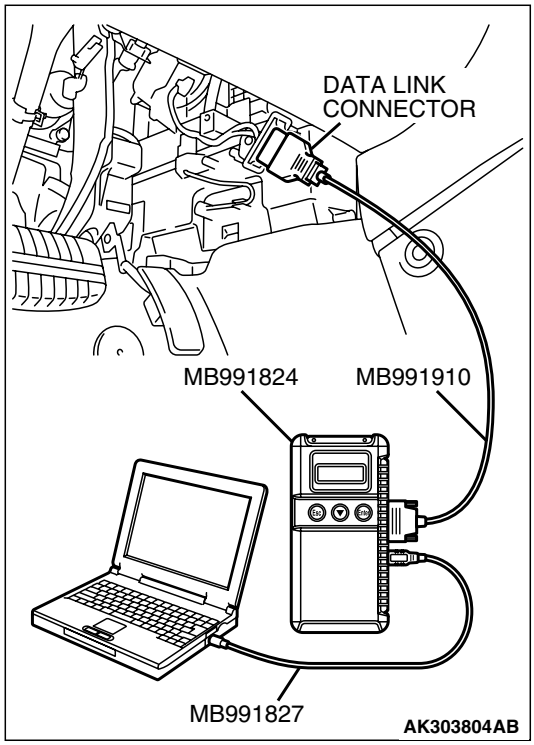


STEP 4. Check harness connector B-37 at cylinder 1, 4 heated oxygen sensor (front) and harness connector B-22 at PCM for damage.

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 go to Step 14.



STEP 5. Using scan tool MB991958, check data list item AC: Cylinder 1, 4 Heated Oxygen Sensor (front).

⚠ 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.

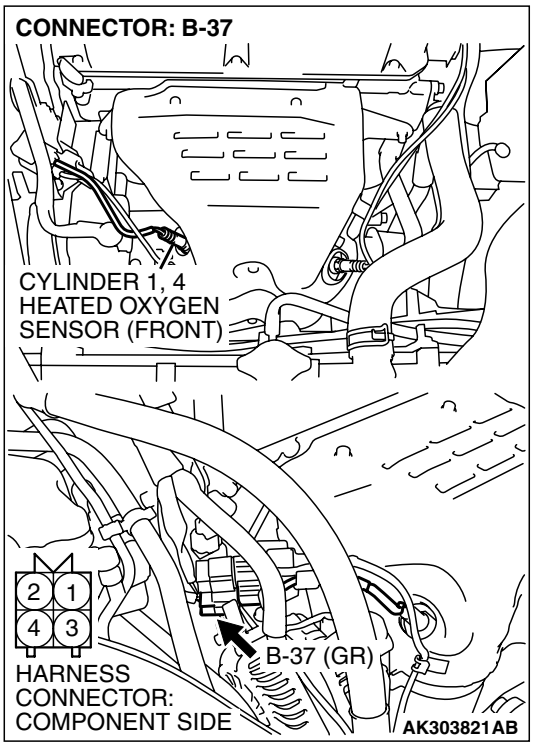
(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991958 to the data reading mode for item AC, Cylinder 1, 4 Heated Oxygen Sensor (front).
- Warming up the engine. When the engine is revved, the output voltage should be 0.6 to 1.0 volt.
- Warming up the engine. When the engine is idling, the output voltage should repeat 0.4 volt and 0.6 to 1.0 volt alternately.

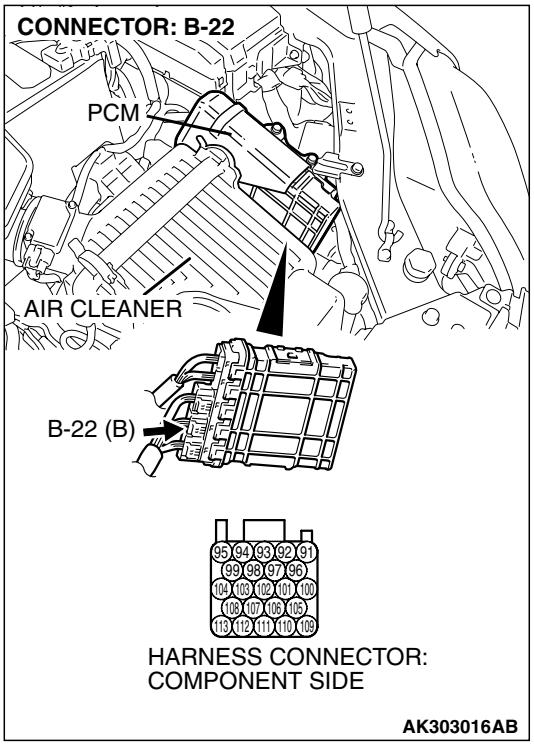
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed 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 : Replace the PCM. Then go to Step 14.



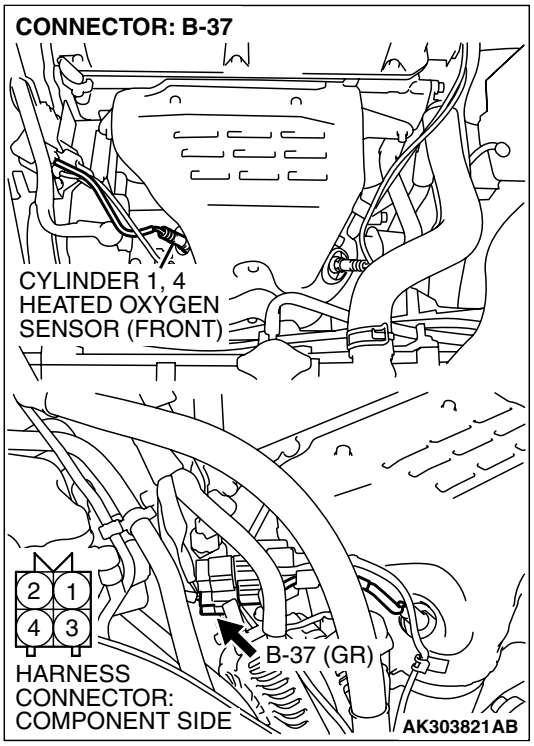


STEP 6. Check harness connector B-37 at cylinder 1, 4 heated oxygen sensor (front) and harness connector B-22 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Repair harness wire between cylinder 1, 4 heated oxygen sensor (front) connector B-37 (terminal No. 4) and PCM connector B-22 (terminal No. 92) because of open circuit or harness damage. Then go to Step 14.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.

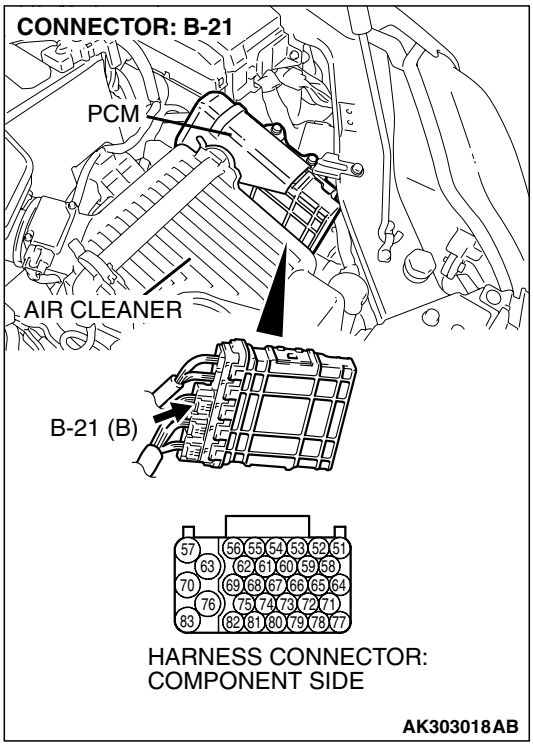


STEP 7. Check harness connector B-37 at cylinder 1, 4 heated oxygen sensor (front) for damage.

Q: Is the harness connector in good condition?

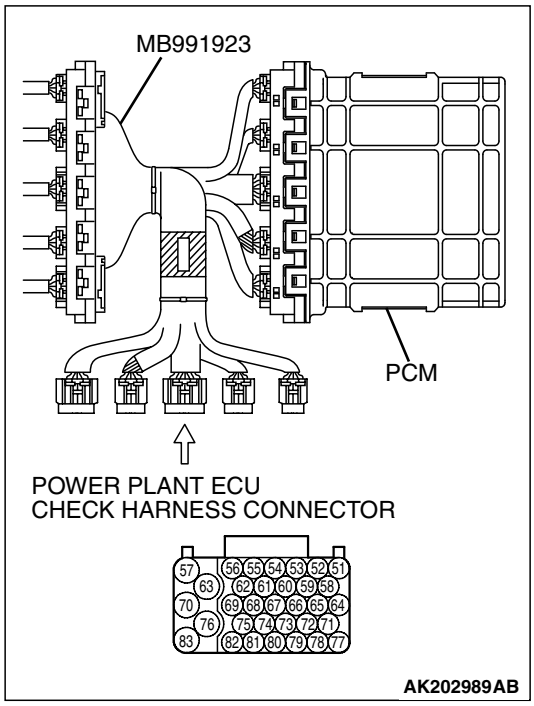
YES : Go to Step 8.

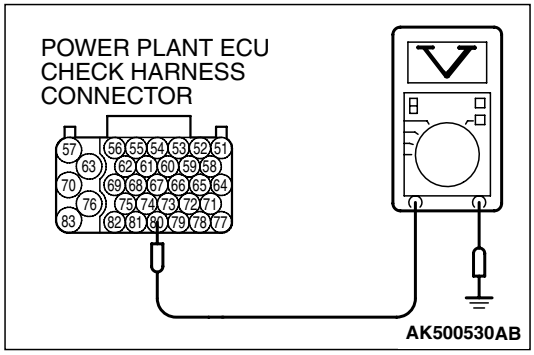
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.



STEP 8. Measure the sensor offset voltage at PCM connector B-21 by using power plant ECU check harness special tool MB991923.

(1) Disconnect all PCM connectors. Connect the power plant ECU check harness special tool MB991923 between the separated connectors.
(2) Turn the ignition switch to the "ON" position.



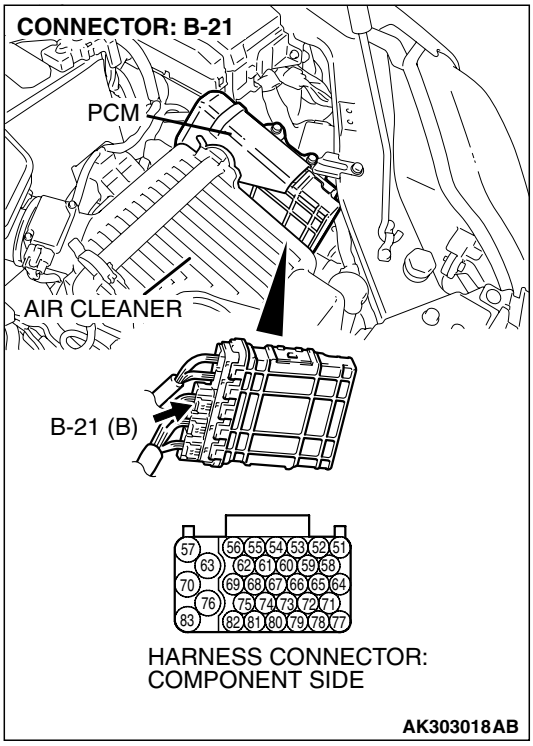


(3) Measure the voltage between terminal No. 80 and ground.
- Voltage should be between 0.4 and 0.6 volt.

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

Q: Is the measured voltage between 0.4 and 0.6 volts?

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

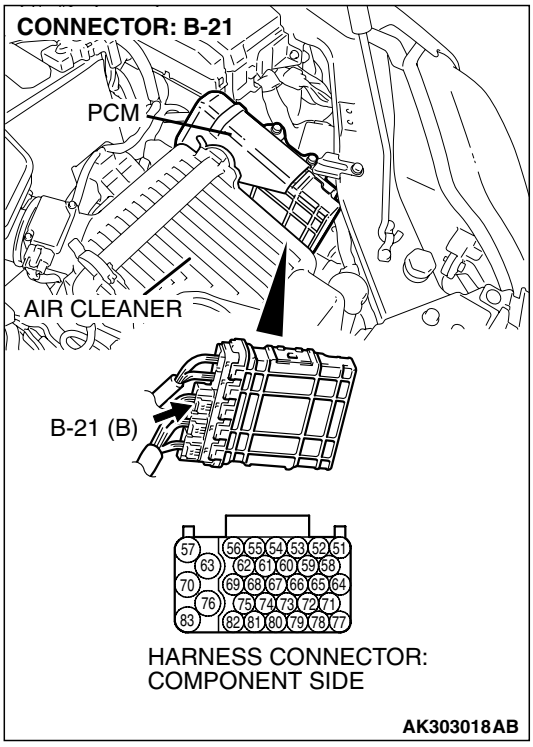


STEP 9. Check harness connector B-21 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Repair harness wire between cylinder 1, 4 headed oxygen sensor (front) connector B-37 (terminal No.2) and PCM connector B-21 (terminal No. 80) because of open circuit or harness damage. Then go to Step 14.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.

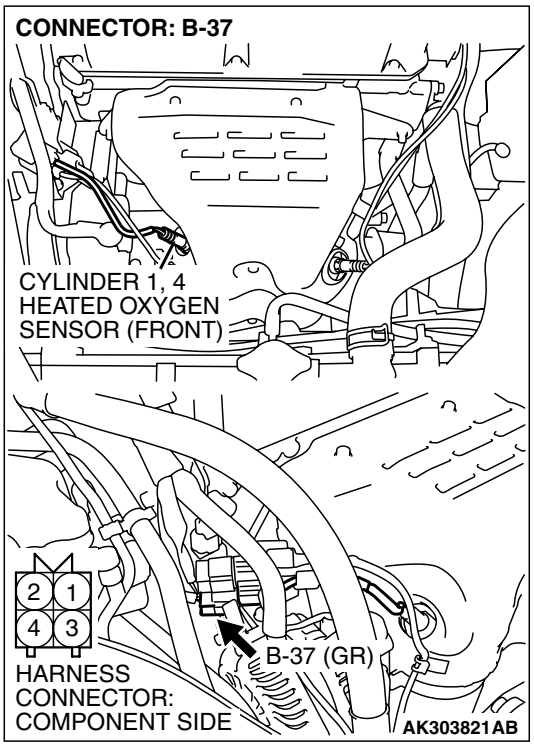


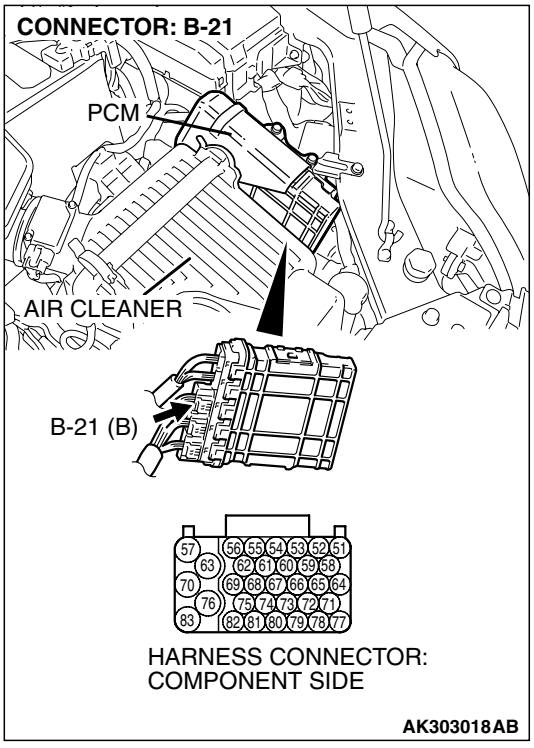
STEP 10. Check harness connector B-21 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 11.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.





STEP 11. Check for harness damage between cylinder 1, 4 heated oxygen sensor (front) connector B-37 (terminal No. 2) and PCM connector B-21 (terminal No. 80).

Q: Is the harness wire in good condition?

YES : Go to Step 12.

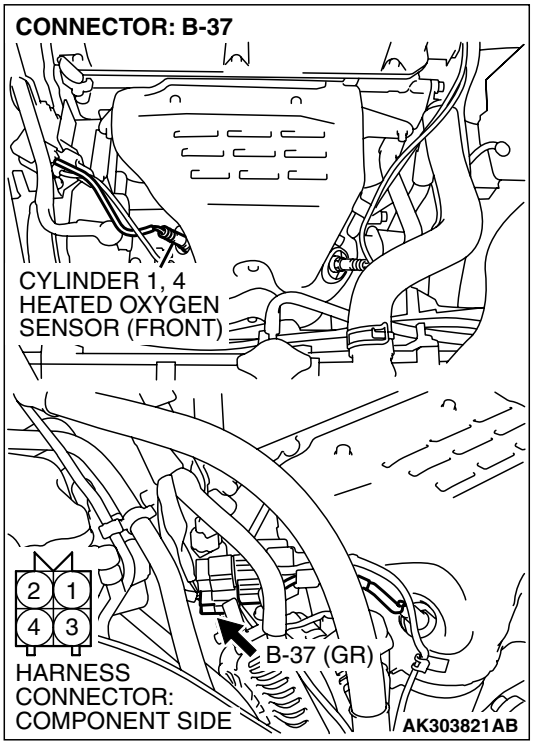
NO : Repair it. Then go to Step 14.

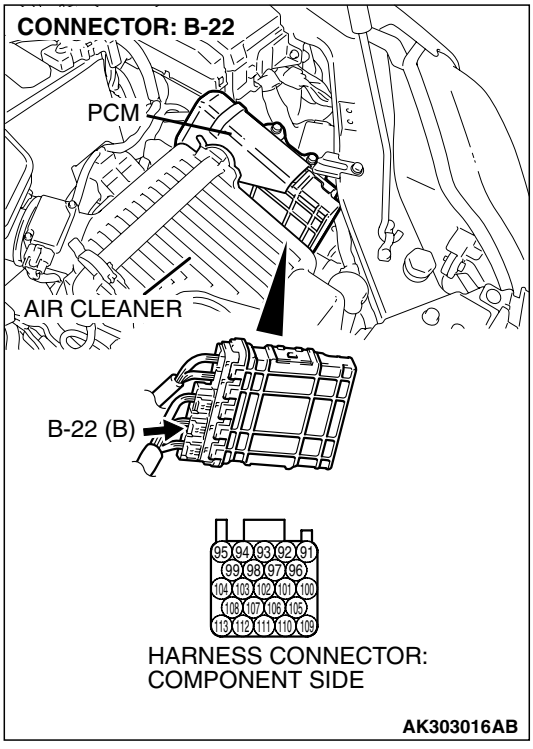
STEP 12. Check for short circuit to ground and harness damage between cylinder 1, 4 heated oxygen sensor (front) connector B-37 (terminal No. 4) and PCM connector B-22 (terminal No. 92).

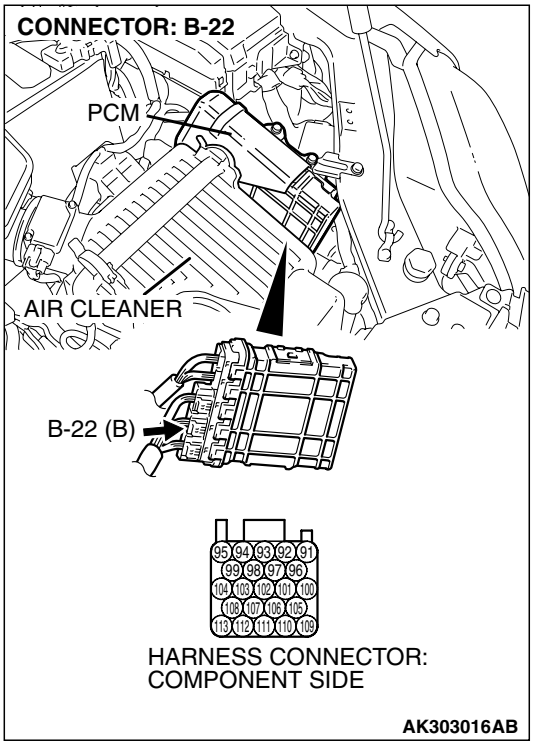
Q: Is the harness wire in good condition?

YES : Go to Step 13.

NO : Repair it. Then go to Step 14.

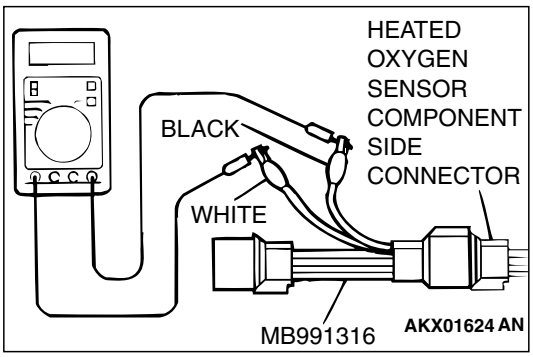






STEP 13. Check the cylinder 1, 4 heated oxygen sensor (front).

(1) Disconnect the cylinder 1, 4 heated oxygen sensor (front) connector B-37 and connect test harness special tool MB991316 to the connector on the cylinder 1, 4 heated oxygen sensor (front) side.
(2) Warm up the engine until engine coolant temperature reaches 80°C (176°F) or higher.
(3) Rev the engine for 5 minutes or more with the engine speed of 4,500 r/min.



(4) Connect a digital voltage meter between terminal No. 2 (black clip) and terminal No. 4 (white clip).
(5) While repeatedly revving the engine, measure the cylinder 1, 4 heated oxygen sensor (front) output voltage.

Standard value: 0.6 – 1.0 V

⚠ CAUTION

- **Be very careful when connecting the jumper wires; incorrect connection can damage the heated oxygen sensor.**
- **Be careful the heater can be damaged if a voltage 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 a jumper wire to connect the terminal No. 1 (red clip) and the terminal No. 3 (blue clip) of the heated oxygen sensor with the positive terminal and the negative terminal of 8 volts power supply respectively, then check again.

Q: Is the measured voltage between 0.6 and 1.0 volt?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 14.

NO : Replace the cylinder 1, 4 heated oxygen sensor (front). Then go to Step 14.

TSB Revision

STEP 14. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 23 P.13A-9.

(2) Check the diagnostic trouble code (DTC).

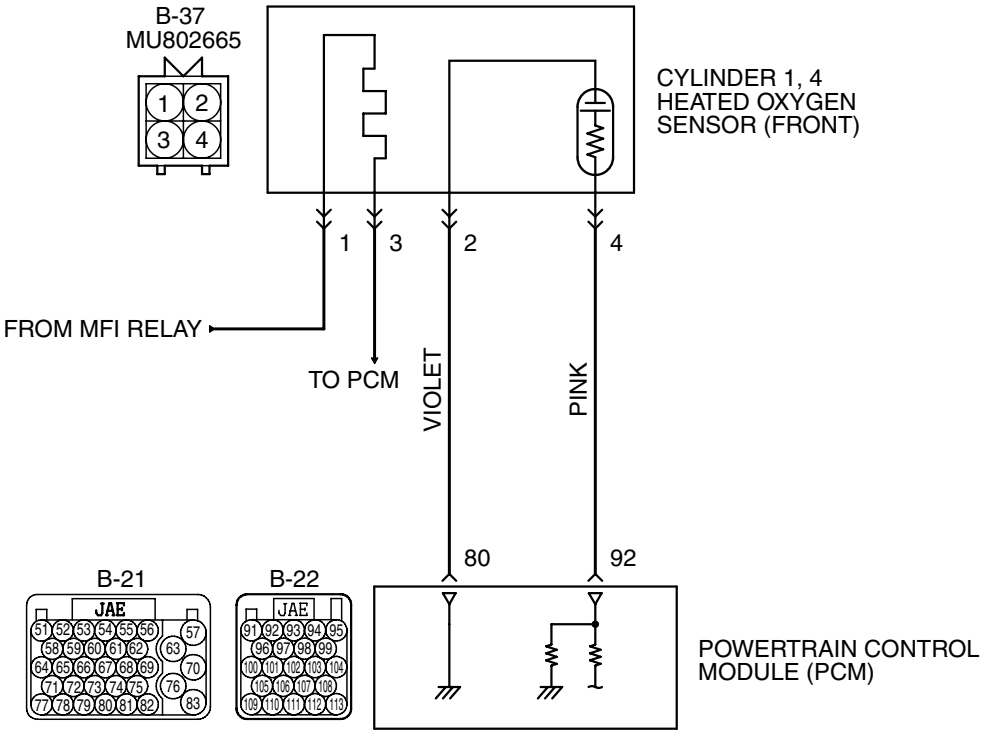
Q: Is DTC P0131 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0132: Cylinder 1, 4 Heated Oxygen Sensor (front) Circuit High Voltage

Cylinder 1, 4 Heated Oxygen Sensor (front) Circuit



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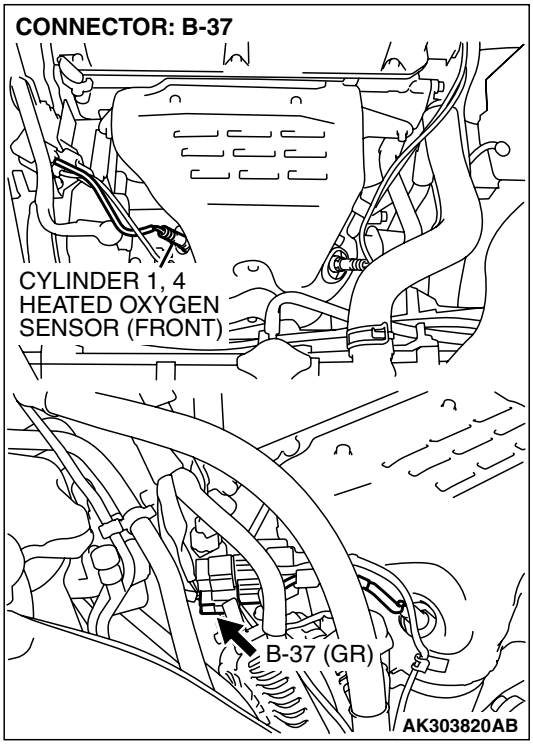
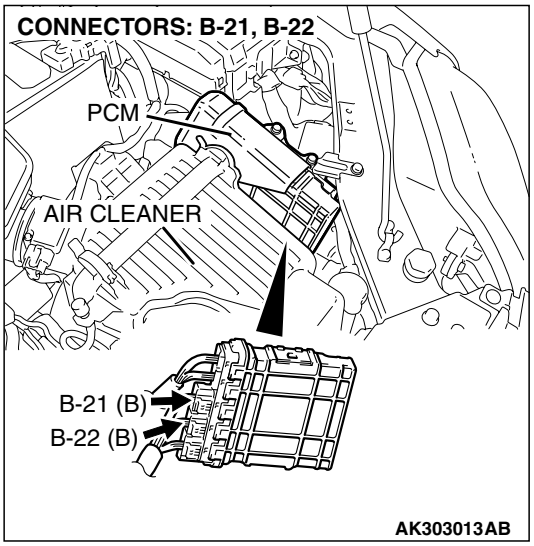




CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the PCM (terminal No. 92) from the output terminal (terminal No. 4) of the cylinder 1, 4 heated oxygen sensor (front).
- Terminal No. 2 of the cylinder 1, 4 heated oxygen sensor (front) is grounded with PCM (terminal No. 80).
- The PCM applies an offset voltage of 0.5 volt to terminal No. 2 of the cylinder 1, 4 heated oxygen sensor (front).

TECHNICAL DESCRIPTION

- The cylinder 1, 4 heated oxygen sensor (front) detects the concentration of oxygen in the exhaust gas; it converts those data to voltage, and inputs the resulting signals to the PCM.
- When the cylinder 1, 4 heated oxygen sensor (front) begins to deteriorate, the heated oxygen sensor signal response becomes poor.
- The PCM checks for the cylinder 1, 4 heated oxygen sensor (front) output voltage.

DESCRIPTIONS OF MONITOR METHODS

Cylinder 1, 4 heated oxygen sensor (front) output voltage is over specified range.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

- Heated oxygen sensor heater (front) monitor
- Misfire monitor
- Fuel system monitor

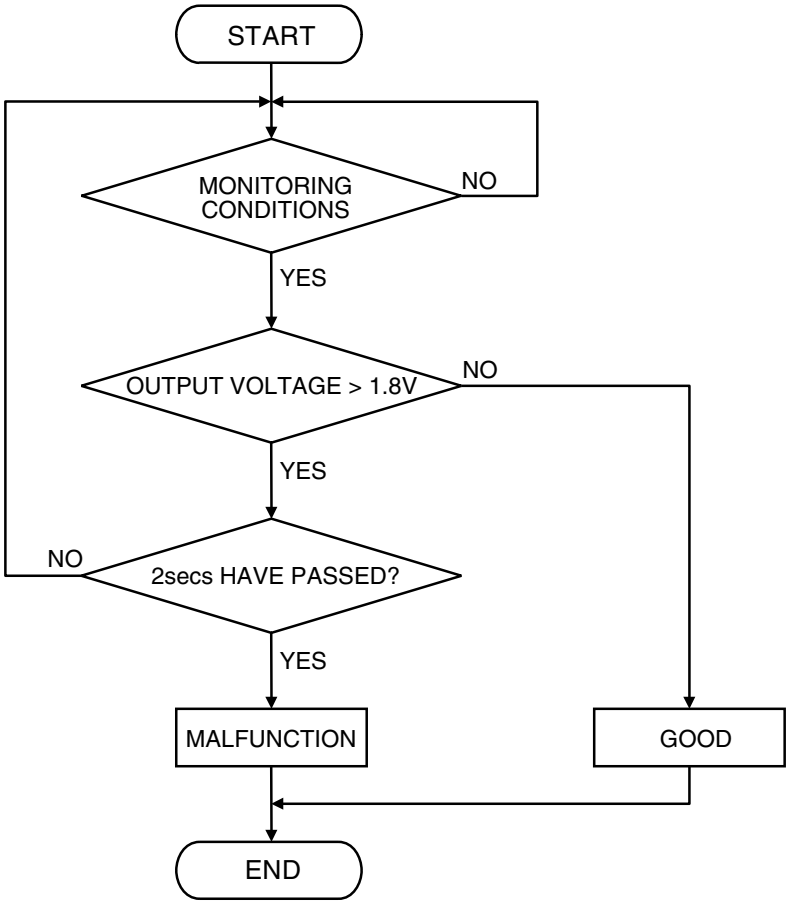
Sensor (The sensor below is determined to be normal)

- Mass airflow sensor
- Engine coolant temperature sensor
- Intake air temperature sensor
- Barometric pressure sensor
- Throttle position sensor
- Accelerator pedal position sensor

TSB Revision

DTC SET CONDITION

Logic Flow Chart



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Check Condition

- 2 seconds or more have passed since the engine starting sequence was completed.
- Heated oxygen sensor offset voltage is between 0.4 and 0.6 volt.

Judgement Criterion

- Cylinder 1, 4 heated oxygen sensor (front) output voltage has continued to be 1.8 volts or higher for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

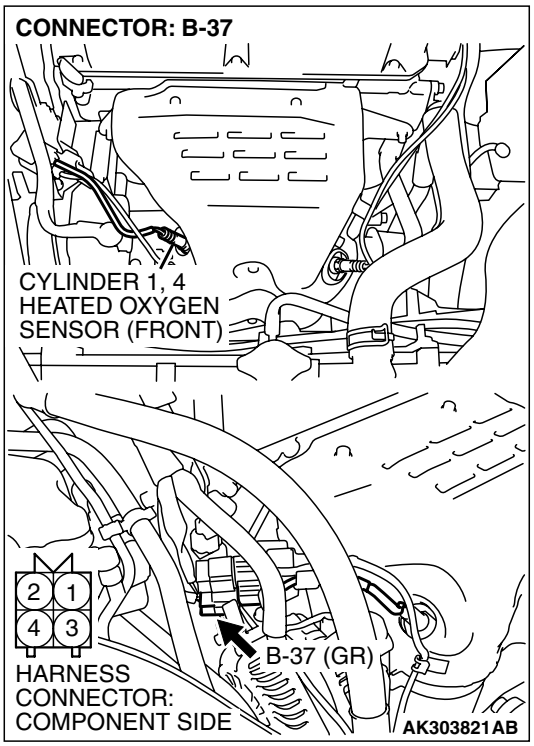
Refer to Diagnosis Function – OBD-II Drive Cycle – Pattern 24 P.13A-9.

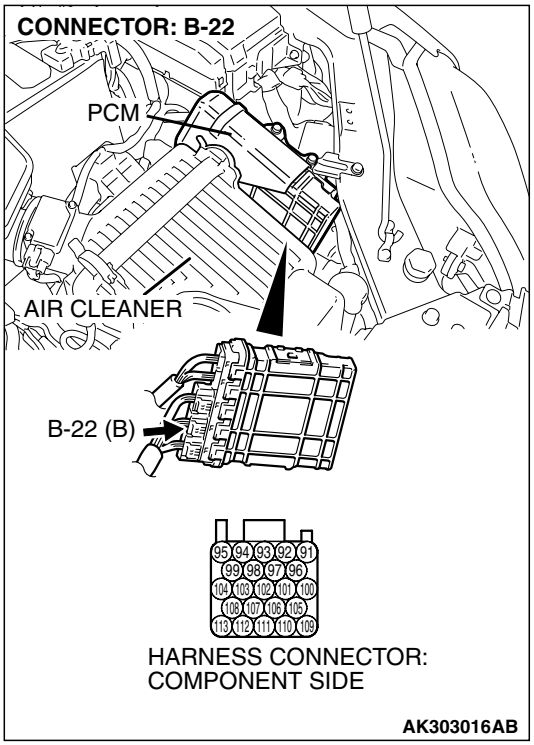
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Short circuit in cylinder 1, 4 heated oxygen sensor (front) output line.
- Connector damage.
- PCM failed.

TSB Revision

DIAGNOSIS



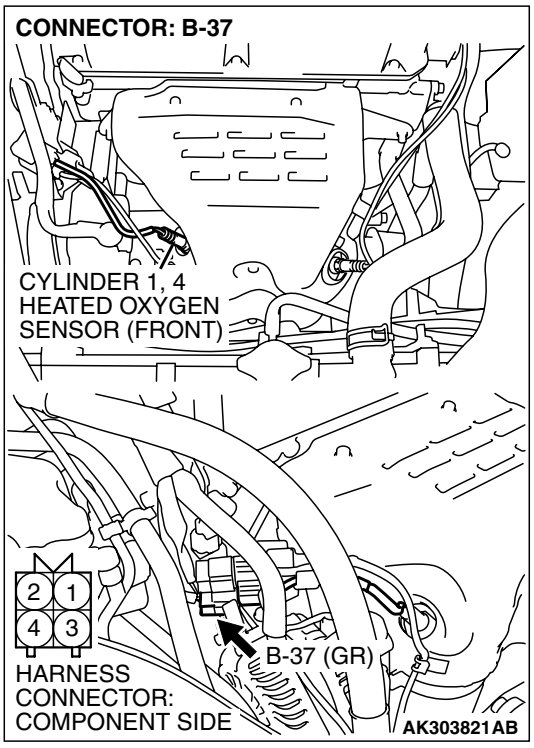


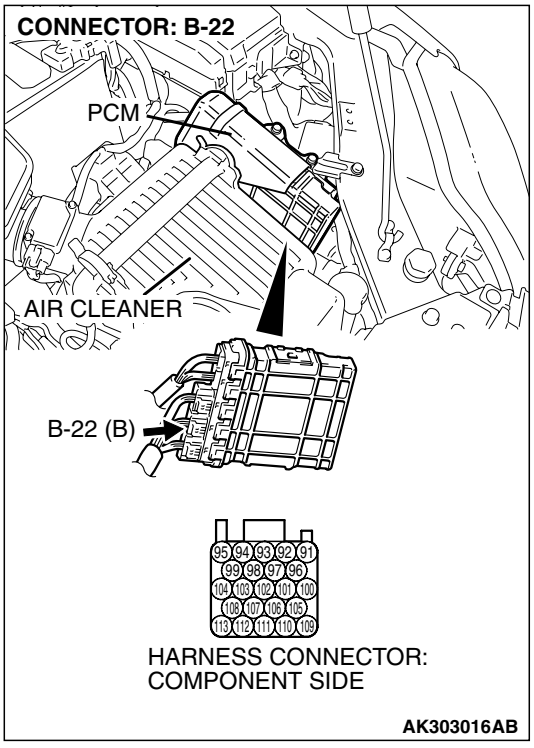
STEP 1. Check harness connector B-37 at cylinder 1, 4 heated oxygen sensor (front) and harness connector B-22 at PCM for damage.

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 go to Step 3.





STEP 2. Check for short circuit to power supply between cylinder 1, 4 heated oxygen sensor (front) connector B-37 (terminal No. 4) and PCM connector B-22 (terminal No. 92).
Q: Is the harness wire in good condition?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 3.

NO : Repair it. Then go to Step 3.

STEP 3. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 24 P.13A-9.

(2) Check the diagnostic trouble code (DTC).

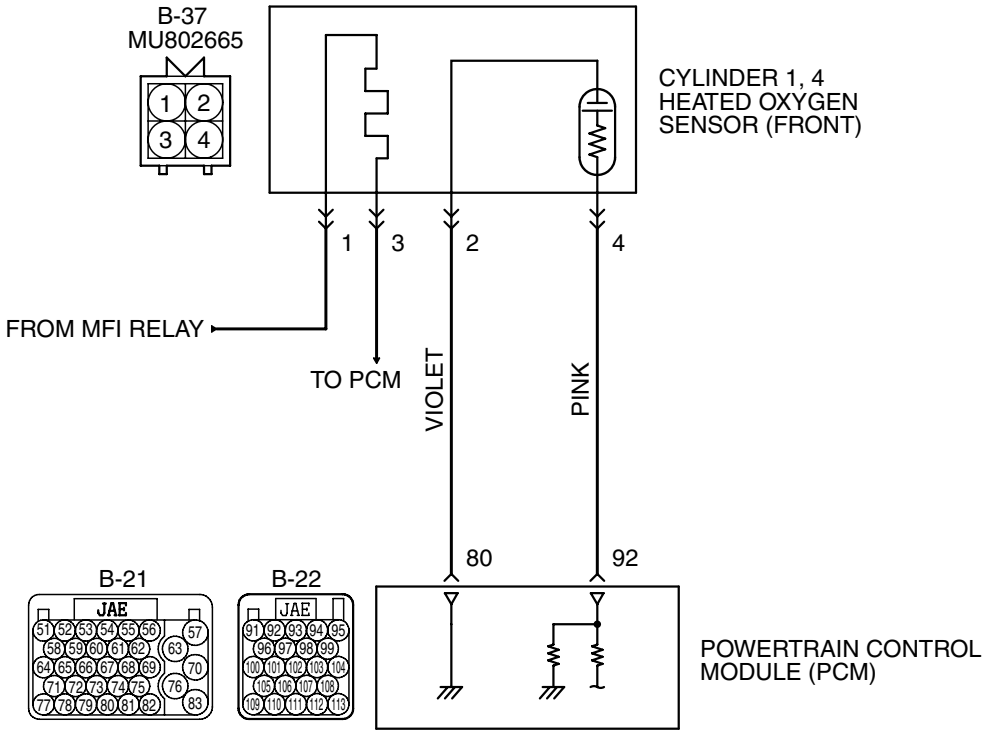
Q: Is DTC P0132 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0133: Cylinder 1, 4 Heated Oxygen Sensor (front) Circuit Slow Responce

Cylinder 1, 4 Heated Oxygen Sensor (front) Circuit



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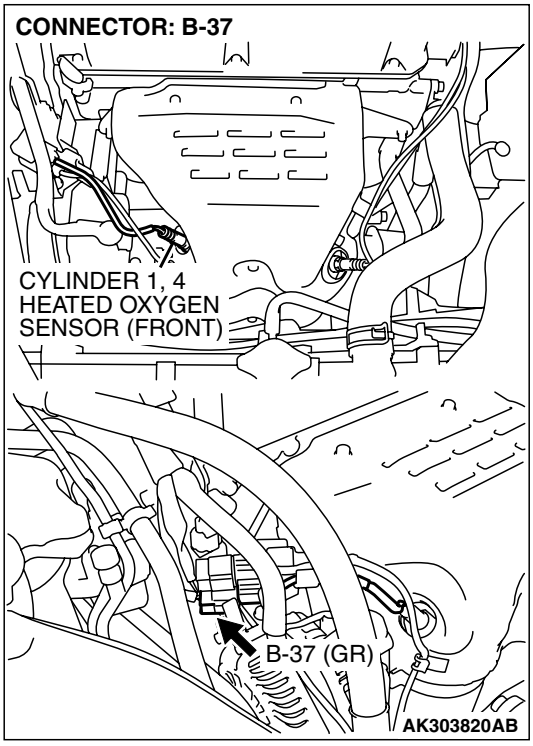
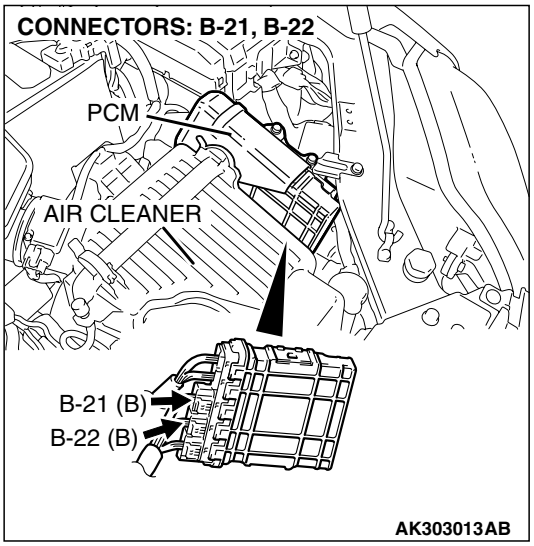




CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the PCM (terminal No. 92) from the output terminal (terminal No. 4) of the cylinder 1, 4 heated oxygen sensor (front).
- Terminal No. 2 of the cylinder 1, 4 heated oxygen sensor (front) is grounded with PCM (terminal No. 80).
- The PCM applies an offset voltage of 0.5 volt to terminal No. 2 of the cylinder 1, 4 heated oxygen sensor (front).

TECHNICAL DESCRIPTION

- The cylinder 1, 4 heated oxygen sensor (front) detects the concentration of oxygen in the exhaust gas; it converts those data to voltage, and inputs the resulting signals to the PCM.
- When the cylinder 1, 4 heated oxygen sensor (front) begins to deteriorate, the heated oxygen sensor signal response becomes poor.
- The PCM checks for the cylinder 1, 4 heated oxygen sensor (front) rich/lean switching frequency.

DESCRIPTIONS OF MONITOR METHODS

Cylinder 1, 4 heated oxygen sensor (front) rich/lean switching frequency is under specified value.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

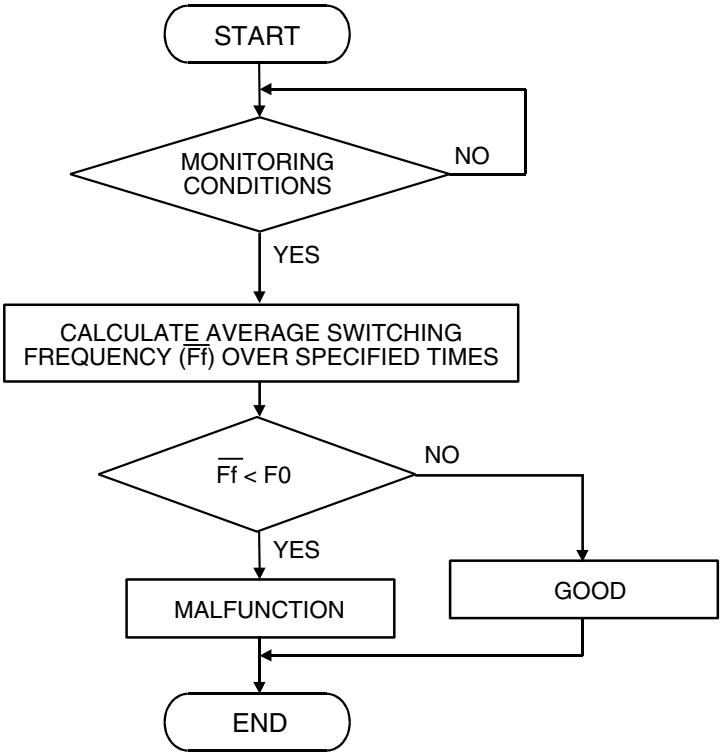
- Heated oxygen sensor heater (front) monitor
- Misfire monitor
- Fuel system monitor

Sensor (The sensor below is determined to be normal)

- Mass airflow sensor
- Engine coolant temperature sensor
- Intake air temperature sensor
- Barometric pressure sensor
- Throttle position sensor
- Accelerator pedal position sensor

DTC SET CONDITIONS

Logic Flow Chart



F0: THRESHOLD VALUE FOR AVERAGE SWITCHING FREQUENCY

AK302021

Check Conditions

- Engine coolant temperature is higher than 60°C (140°F).
- Engine speed is between 1,200 and 3,500 r/min.
- Volumetric efficiency is between 25 and 60 percent.
- Under the closed loop air/fuel control.
- The accelerator pedal is open.
- Short-term fuel trim is between –25 and +25 percent.
- More than 2 seconds have elapsed after the above mentioned conditions have been met.
- The PCM monitors for this condition for 7 cycles of 10 seconds each during the drive cycle.

Judgement Criterion

- The average of the cylinder 1, 4 heated oxygen sensor (front) rich/lean switching frequency is less then 9 times per 10 seconds.

NOTE: If the sensor switching frequency is lower than the Judgement Criteria due to the M.U.T.-III OBD-II test Mode – HO2S Test Results, it is assumed that the heated oxygen sensor has deteriorated. If it is higher, it is assumed that the harness is damaged or has a short circuit.
If the heated oxygen sensor signal voltage has not changed even once (lean/rich) after the DTC was erased, the sensor switch time will display as 0 second.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 1 P.13A-9.

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

- Cylinder 1, 4 heated oxygen sensor (front) deteriorated.
- Connector damage.
- PCM failed.

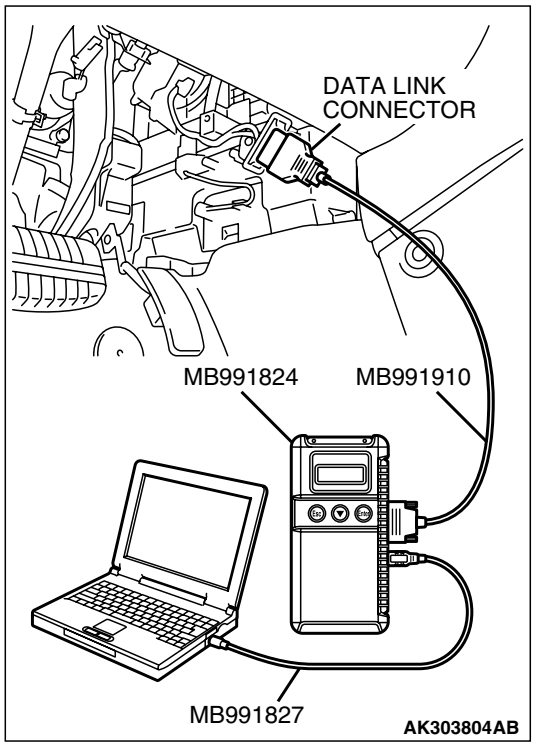
TSB Revision

DIAGNOSIS

Required Special Tools:

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

STEP 1. Using scan tool MB991958, check data list item AC: Cylinder 1, 4 Heated Oxygen Sensor (front).



⚠ CAUTION

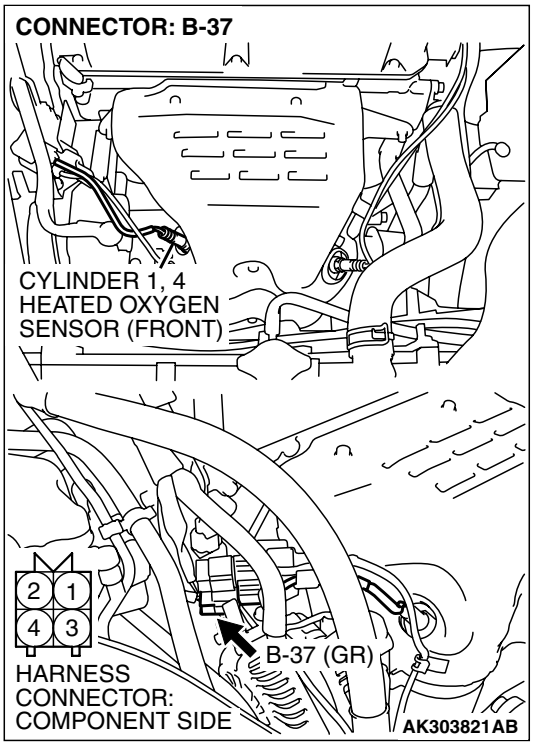
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(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 AC, Cylinder 1, 4 Heated Oxygen Sensor (front).
(4) Warm up the engine, 2,500 r/min.
  - Output voltage repeats 0.4 volt or less and 0.6 – 1.0 volt 10 times or more within 10 seconds.
(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

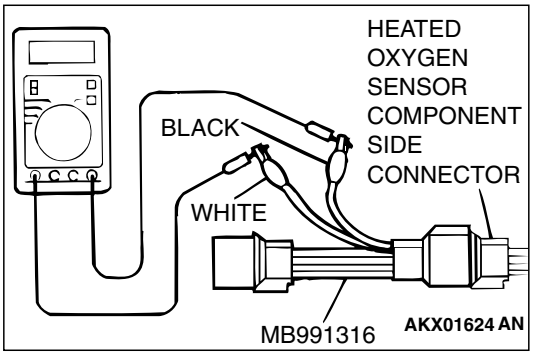
YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-14.

NO : Go to Step 2.



STEP 2. Check the cylinder 1, 4 heated oxygen sensor (front).

(1) Disconnect the cylinder 1, 4 heated oxygen sensor (front) connector B-37 and connect test harness special tool MB991316 to the connector on the cylinder 1, 4 heated oxygen sensor (front) side.
(2) Warm up the engine until engine coolant temperature reaches 80°C (176°F) or higher.
(3) Rev the engine for 5 minutes or more with the engine speed of 4,500 r/min.



(4) Connect a digital voltage meter between terminal No. 2 (black clip) and terminal No. 4 (white clip).
(5) Warm up the engine, 2,500 r/min
- Output voltage repeats 0 – 0.4 volt and 0.6 – 1.0 volt 10 times or more within 10 seconds.

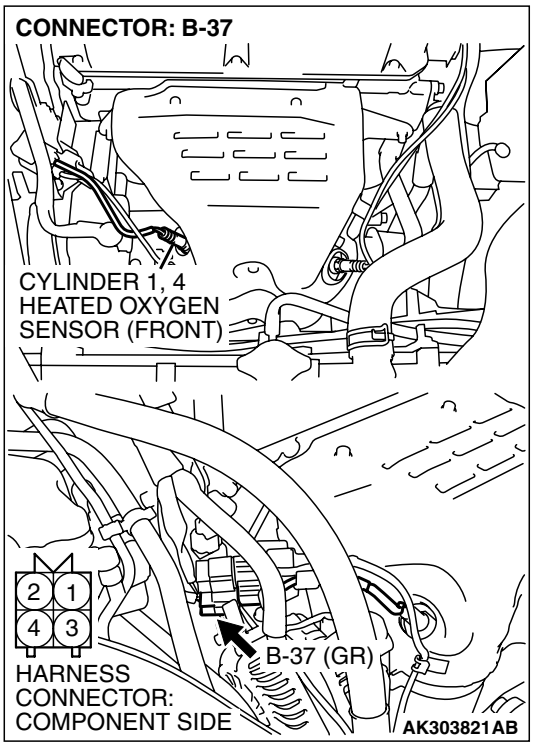
⚠ CAUTION

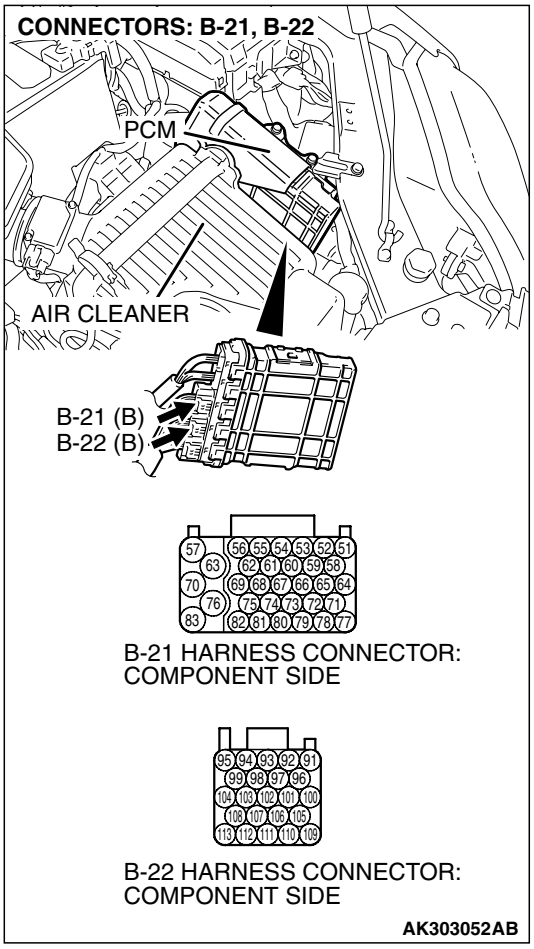
- **Be very careful when connecting the jumper wires; incorrect connection can damage the heated oxygen sensor.**
- **Be careful the heater is broken when voltage of beyond 8 volts is applied to the heated oxygen sensor heater.**

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 a jumper wire to connect the terminal No. 1 (red clip) and the terminal No. 3 (blue clip) of the heated oxygen sensor with the positive terminal and the negative terminal of 8 volts power supply respectively, then check again.

Q: Is the sensor operating properly?

YES : Go to Step 3.
NO : Replace the cylinder 1, 4 heated oxygen sensor (front). Then go to Step 4.





STEP 3. Check harness connector B-37 at cylinder 1, 4 heated oxygen sensor (front) and harness connector B-21, B-22 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 4.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 4.

TSB Revision

STEP 4. Test the OBD-II drive cycle.
(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 1 P.13A-9.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0133 set?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0134: Cylinder 1, 4 Heated Oxygen Sensor (front) No Activity Detected

⚠ CAUTION
If DTC P0134 has been set, TCL related DTC U1120 is also set. After P0134 has been diagnosed, don't forget to erase DTC U1120.

Cylinder 1, 4 Heated Oxygen Sensor (front) No Activity Detected Circuit
- Refer to DTC P0131 – Cylinder 1, 4 Heated Oxygen Sensor (Front) Circuit Low Voltage P.13A-278.
- Refer to DTC P0201 – Injector Circuit-cylinder 1 P.13A-468.
- Refer to DTC P0204 – Injector Circuit-cylinder 4 P.13A-498.

CIRCUIT OPERATION
- Refer to DTC P0131 – Cylinder 1, 4 Heated Oxygen Sensor (Front) Circuit Low Voltage P.13A-278.
- Refer to DTC P0201 – Injector Circuit-cylinder 1 P.13A-468.
- Refer to DTC P0204 – Injector Circuit-cylinder 4 P.13A-498.

TECHNICAL DESCRIPTION
- The PCM effects air/fuel ratio feedback control in accordance with the signals from the cylinder 1, 4 heated oxygen sensor (front).
- If the cylinder 1, 4 heated oxygen sensor (front) has deteriorated, corrections will be made by the cylinder 1, 4 heated oxygen sensor (rear).
- DTC P0134 becomes stored in memory if a failure is detected in the above air/fuel ratio feedback control system.

DESCRIPTIONS OF MONITOR METHODS
Cylinder 1, 4 heated oxygen sensor (front) output voltage does not cross lean/rich criteria (about 0.5 volt) within specified period.

MONITOR EXECUTION
Continuous

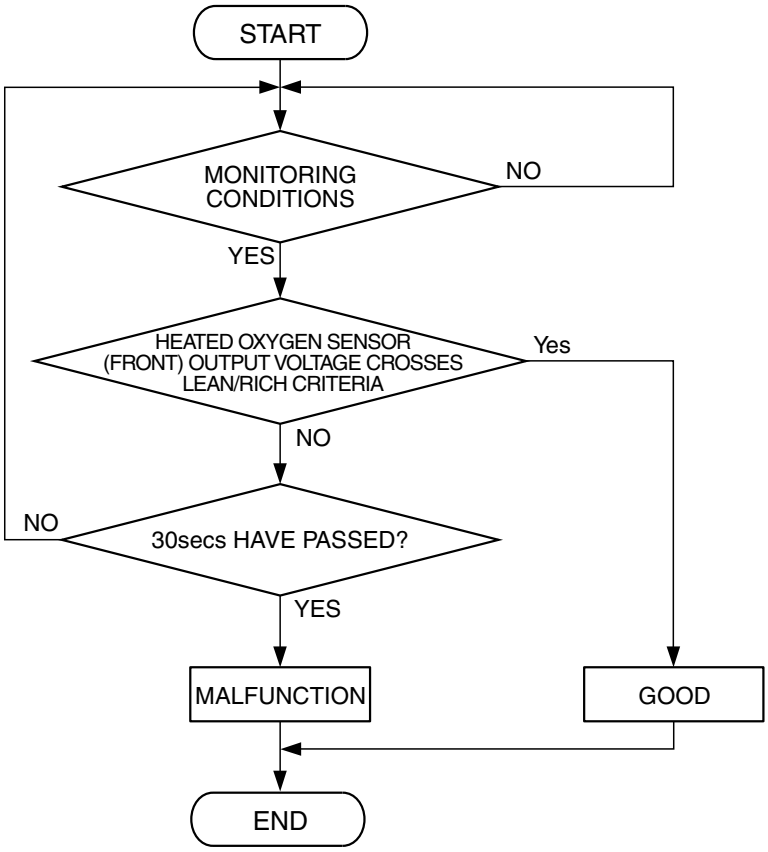
MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)
- Misfire monitor

Sensor (The sensor below is determined to be normal)
- Mass airflow sensor
- Engine coolant temperature sensor
- Intake air temperature sensor
- Barometric pressure sensor
- Throttle position sensor

DTC SET CONDITIONS

Logic Flow Chart



AK503610

Check Conditions

- 20 seconds or more have passed since the engine starting sequence was completed.
- Engine coolant temperature is higher than 7°C (45°F).
- Engine speed is higher than 1,200 r/min.
- Volumetric efficiency is higher than 30 percent.
- Throttle position sensor output voltage is lower than 4 volts.
- Except while fuel is being shut off.
- Monitoring time: 30 seconds.

Judgement Criterion

- Cylinder 1, 4 heated oxygen sensor (front) output voltage does not get across lean/rich criteria (about 0.5 volt) within about 30 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 12 P.13A-9.

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

- Cylinder 1, 4 heated oxygen sensor (front) deteriorated.
- Harness damage in cylinder 1, 4 heated oxygen sensor (front) output line.
- Cylinder 1, 4 heated oxygen sensor (rear) deteriorated.

  NOTE: When the cylinder 1, 4 heated oxygen sensor (front) begins to deteriorate, the heated oxygen sensor output voltage will deviate from the voltage when the sensor was new (normally 0.5 volt at stoichiometric ratio). This deviation will be corrected by the cylinder 1, 4 heated oxygen sensor (rear).

TSB Revision

If the cylinder 1, 4 heated oxygen sensor (rear) responds poorly because it has deteriorated, it will improperly correct the cylinder 1, 4 heated oxygen sensor (front). Thus, even when closed loop control is being effected, the fluctuation of the cylinder 1, 4 heated oxygen sensor (front) output voltage decreases, without intersecting with 0.5 volt. As a result, there is a possibility of DTC P0134 becoming registered.

- Open circuit in cylinder 1, 4 injector.
- Harness damage in cylinder 1, 4 injector circuit.
- Connector damage.
- PCM failed.
- Exhaust leak.
- Air drawn in from gaps in gasket, seals, etc.
- Incorrect fuel pressure.

DIAGNOSIS

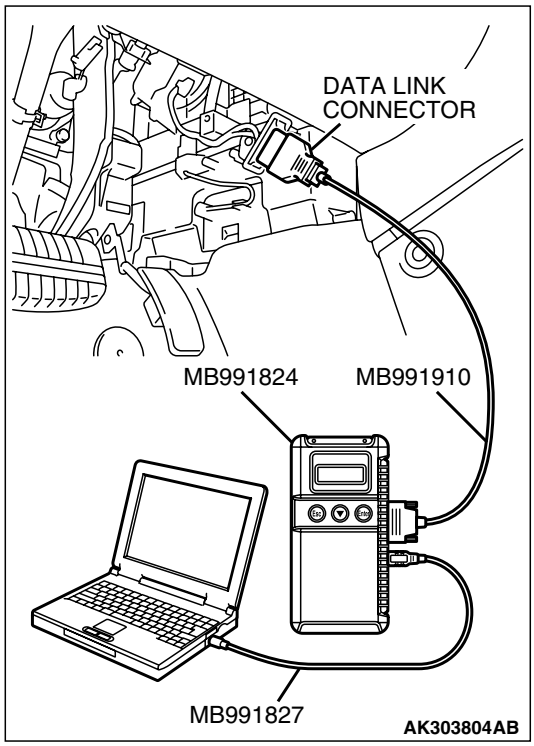
Required Special Tools:

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

STEP 1. Using scan tool MB991958, check data list item AD: 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 AD, Cylinder 1, 4 Heated Oxygen Sensor (rear).
  - Warming up the engine. When the engine is revved, the output voltage should repeat 0 volt and 0.6 to 1.0 volt alternately.
(4) Turn the ignition switch to the "LOCK" (OFF) position.



Q: Is the sensor operating properly?

YES : Go to Step 2.
NO : Refer to DTC P0137 – Cylinder 1, 4 Heated Oxygen Sensor (rear) Circuit Low Voltage P.13A-315, DTC P0138 – Cylinder 1, 4 Heated Oxygen Sensor (rear) Circuit High Voltage P.13A-332, DTC P0139 – Cylinder 1, 4 Heated Oxygen Sensor (rear) Circuit Slow Response P.13A-337, P0140 – Cylinder 1, 4 Heated Oxygen Sensor (rear) Circuit No Activity Detected P.13A-341.

STEP 2. Check for exhaust leak.

Q: Are there any abnormalities?

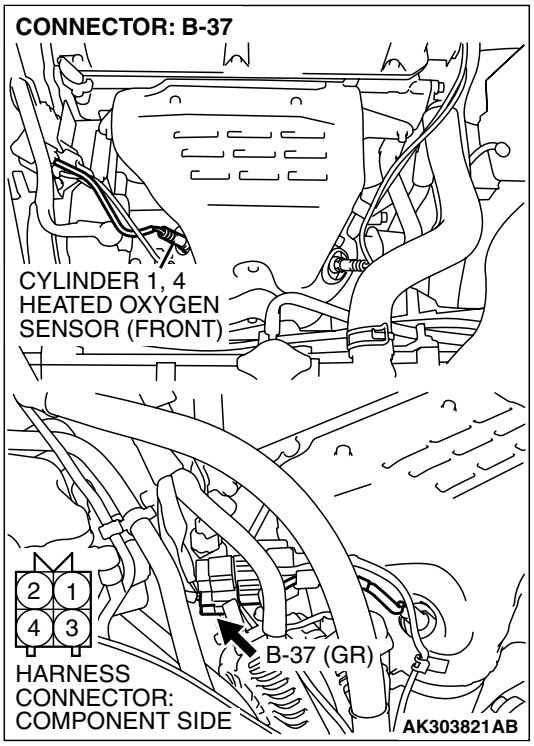
YES : Repair it. Then go to Step 12.
NO : Go to Step 3.

STEP 3. Check for intake system vacuum leak.

Q: Are there any abnormalities?

YES : Repair it. Then go to Step 12.
NO : Go to Step 4.

TSB Revision

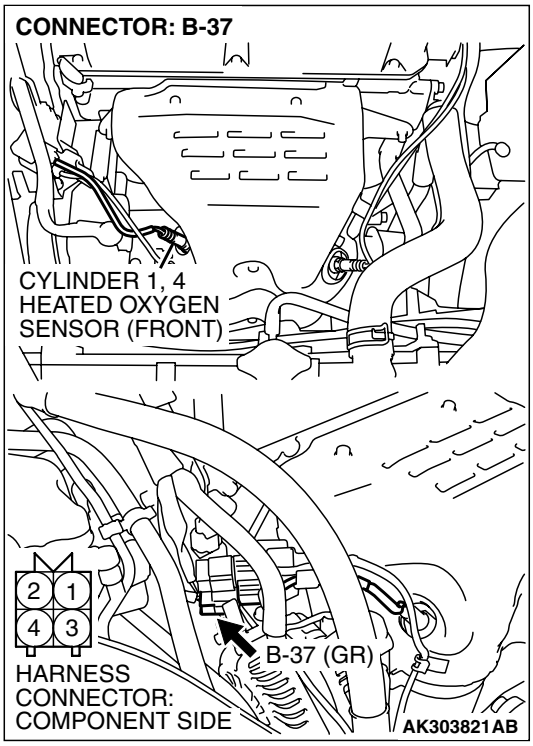


STEP 4. Check harness connector B-37 at the cylinder 1, 4 heated oxygen sensor (front) for damage.

Q: Is the harness connector in good condition?

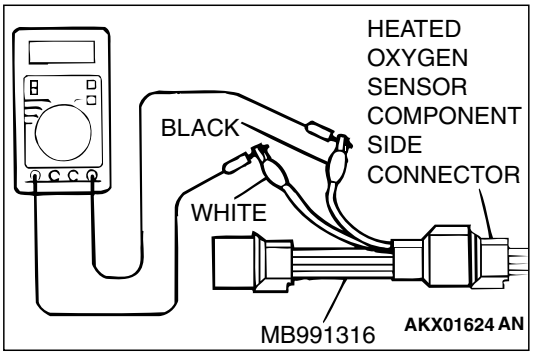
YES : Go to Step 5.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.



STEP 5. Check the cylinder 1, 4 heated oxygen sensor (front).

(1) Disconnect the cylinder 1, 4 heated oxygen sensor (front) connector B-37 and connect test harness special tool MB991316 to the connector on the cylinder 1, 4 heated oxygen sensor (front) side.
(2) Warm up the engine until engine coolant temperature reaches 80°C (176°F) or higher.
(3) Rev the engine for 5 minutes or more with the engine speed of 4,500 r/min.



(4) Connect a digital voltage meter between terminal No. 2 (black clip) and terminal No. 4 (white clip).
(5) While repeatedly revving the engine, measure the cylinder 1, 4 heated oxygen sensor (front) output voltage.

Standard value: 0.6 – 1.0 V

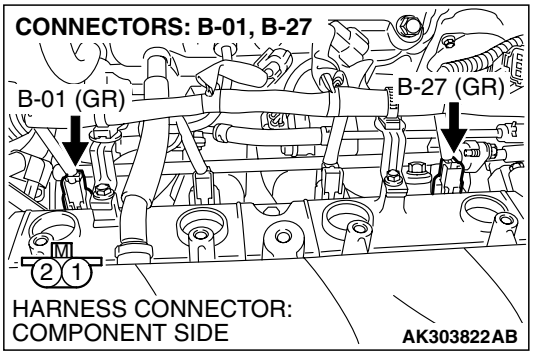
⚠ CAUTION

- **Be very careful when connecting the jumper wires; incorrect connection can damage the heated oxygen sensor.**
- **Be careful the heater can be damaged if a voltage 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 a jumper wire to connect the terminal No. 1 (red clip) and the terminal No. 3 (blue clip) of the heated oxygen sensor with the positive terminal and the negative terminal of 8 volts power supply respectively, then check again.

Q: Is the measured voltage between 0.6 and 1.0 volt?

YES : Go to Step 6.
NO : Replace the cylinder 1, 4 heated oxygen sensor (front). Then go to Step 12.

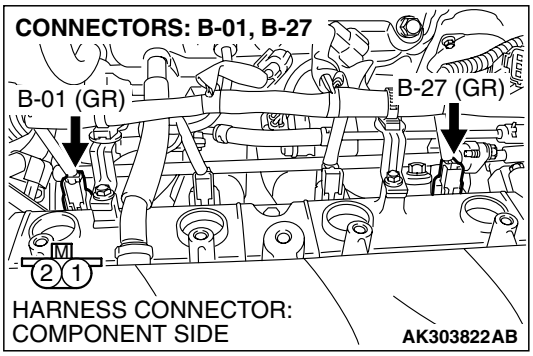


STEP 6. Check harness connector B-01, B-27 at injector for damage.

Q: Is the harness connector in good condition?

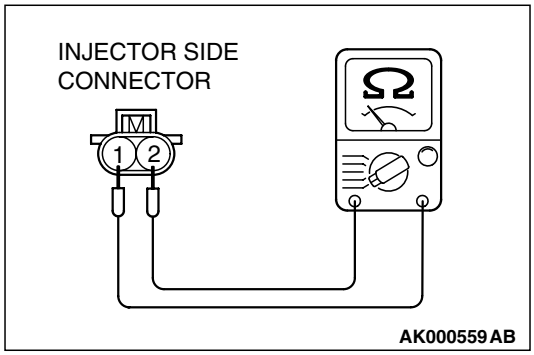
YES : Go to Step 7.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.



STEP 7. Check the cylinder 1, 4 injector.

(1) Disconnect each injector connector.



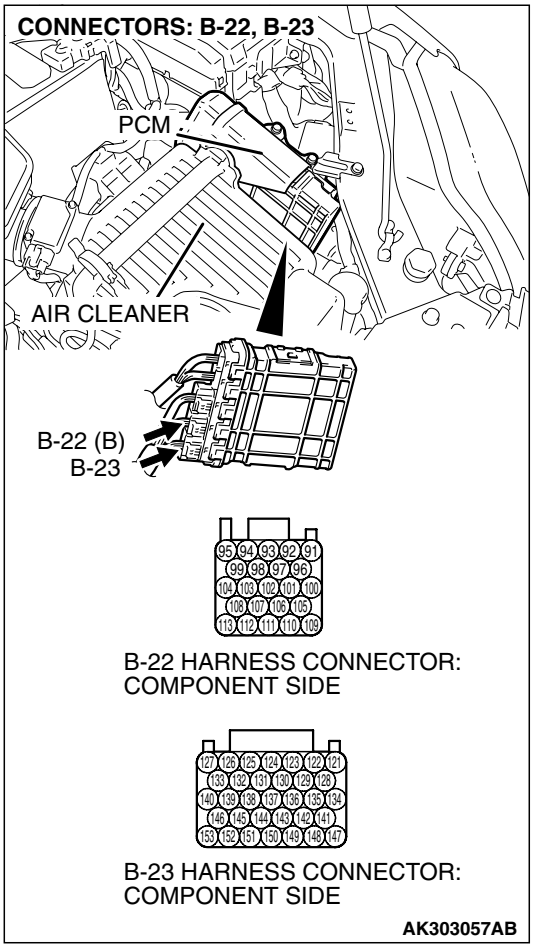
(2) Measure the resistance between injector side connector terminal No. 1 and No. 2.

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

Q: Is the measured resistance between 10.5 and 13.5 ohms [at 20°C (68°F)]?

YES : Go to Step 8.

NO : Replace the injector. Then go to Step 12.



STEP 8. Check harness connector B-22, B-23 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 9.

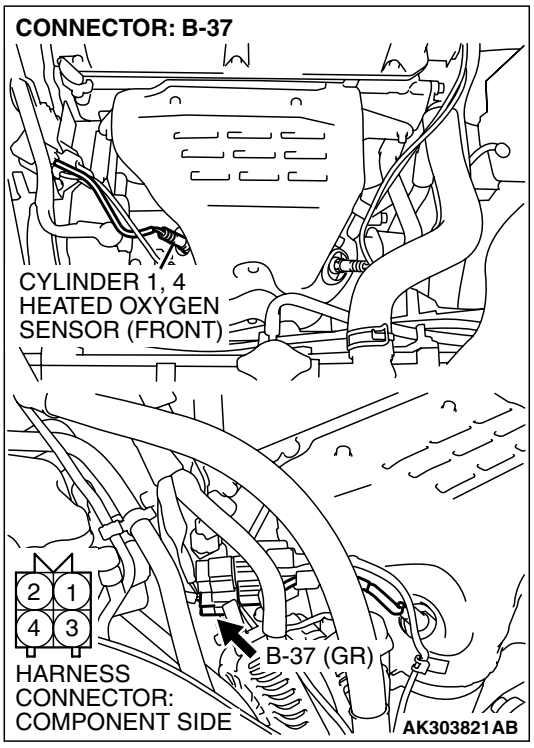
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

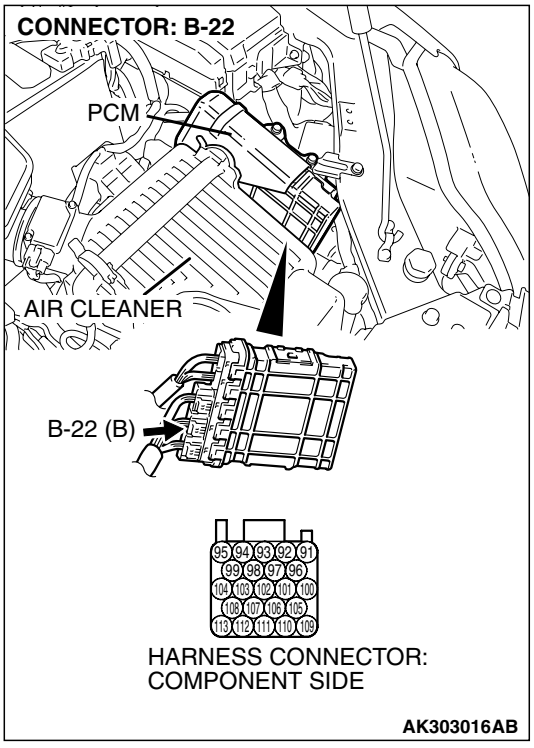
STEP 9. Check for harness damage between cylinder 1, 4 heated oxygen sensor (front) connector B-37 (terminal No. 4) and PCM connector B-22 (terminal No. 92).

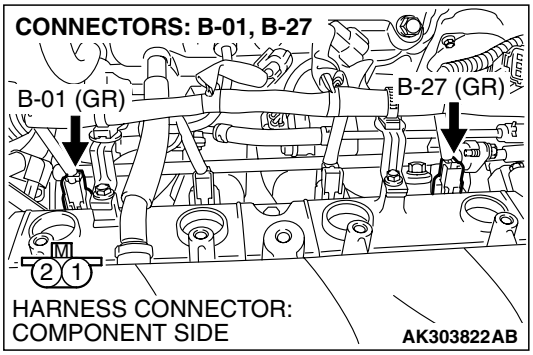
Q: Is the harness wire in good condition?

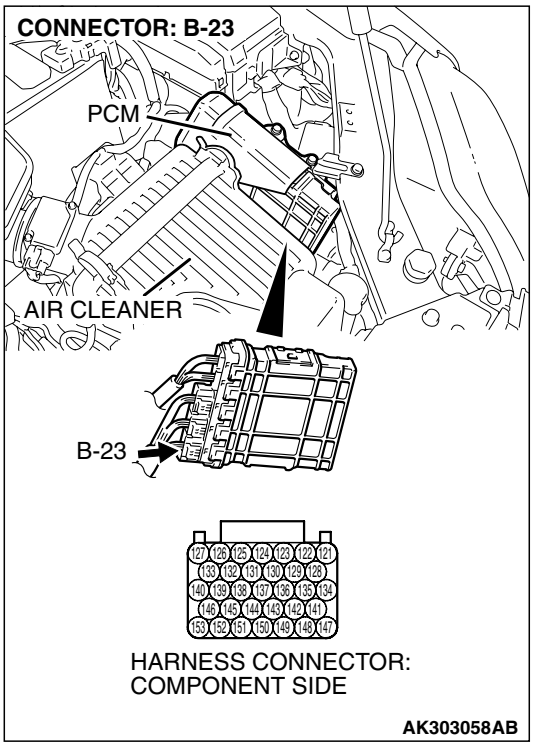
YES : Go to Step 10.

NO : Repair it. Then go to Step 12.









STEP 10. Check for harness damage between cylinder 1, 4 injector connector and PCM connector.

a. Check the harness wire between injector connector B-01 (terminal No. 2) and PCM connector B-23 (terminal No. 153) when checking No. 1 cylinder.

b. Check the harness wire between injector connector B-27 (terminal No. 2) and PCM connector B-23 (terminal No. 139) when checking No. 4 cylinder.

Q: Is the harness wire in good condition?

YES : Go to Step 11.

NO : Repair it. Then go to Step 12.

STEP 11. Check the fuel pressure.

Refer to On-vehicle Service – Fuel Pressure Test P.13A-1163.

Q: Is the fuel pressure normal?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 12.

NO : Repair it. Then go to Step 12.

STEP 12. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 12 P.13A-9.

(2) Check the diagnostic trouble code (DTC).

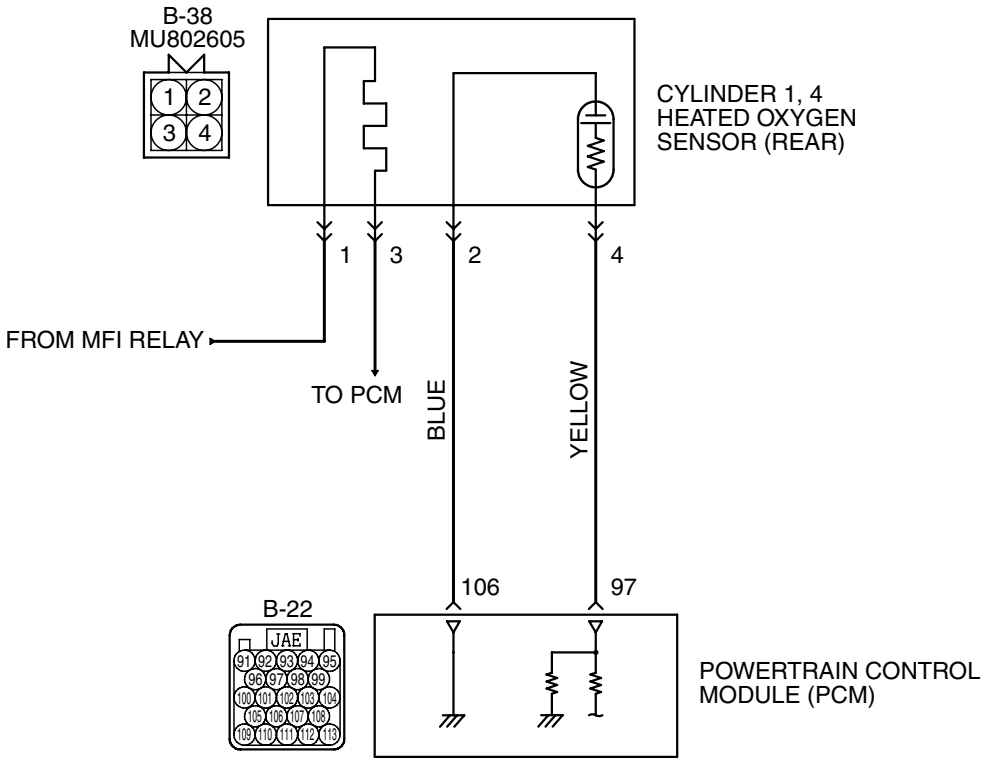
Q: Is DTC P0134 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0137: Cylinder 1, 4 Heated Oxygen Sensor (rear) Circuit Low Voltage

Cylinder 1, 4 Heated Oxygen Sensor (rear) Circuit



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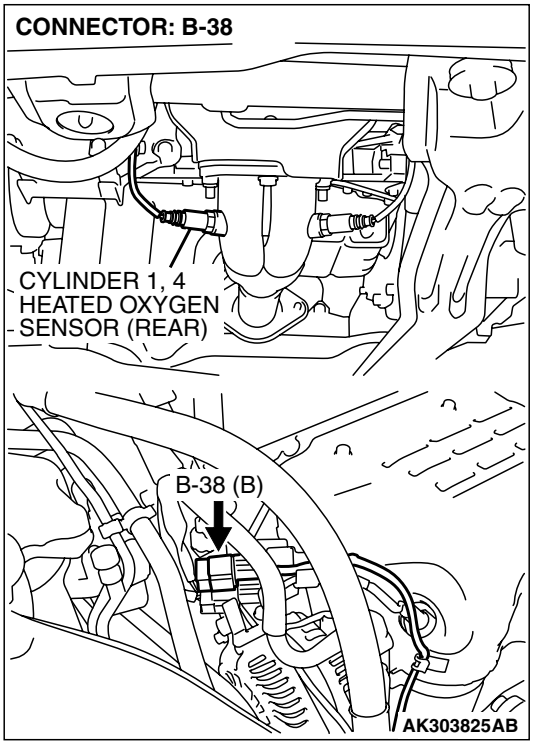

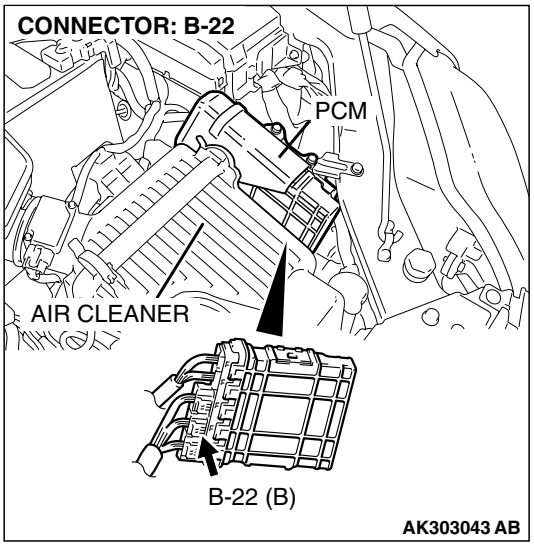

CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the PCM (terminal No. 97) from the output terminal (terminal No. 4) of the cylinder 1, 4 heated oxygen sensor (rear).
- Terminal No. 2 of the cylinder 1, 4 heated oxygen sensor (rear) is grounded with PCM (terminal No. 106).
- The PCM applies an offset voltage of 0.5 volt to terminal No. 2 of the cylinder 1, 4 heated oxygen sensor (rear).

TECHNICAL DESCRIPTION

- The output signal of the cylinder 1, 4 heated oxygen sensor (front) is compensated by the output signal of the cylinder 1, 4 heated oxygen sensor (rear).
- The PCM checks for an open circuit in the cylinder 1, 4 heated oxygen sensor (rear) output voltage.

DESCRIPTIONS OF MONITOR METHODS

Cylinder 1, 4 heated oxygen sensor (rear) output voltage is under the specified range.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

- Heated oxygen sensor heater (front) monitor
- Heated oxygen sensor heater (rear) monitor
- Air/fuel ratio feedback monitor

Sensor (The sensor below is determined to be normal)

- Mass airflow sensor
- Engine coolant temperature sensor
- Intake air temperature sensor
- Barometric pressure sensor

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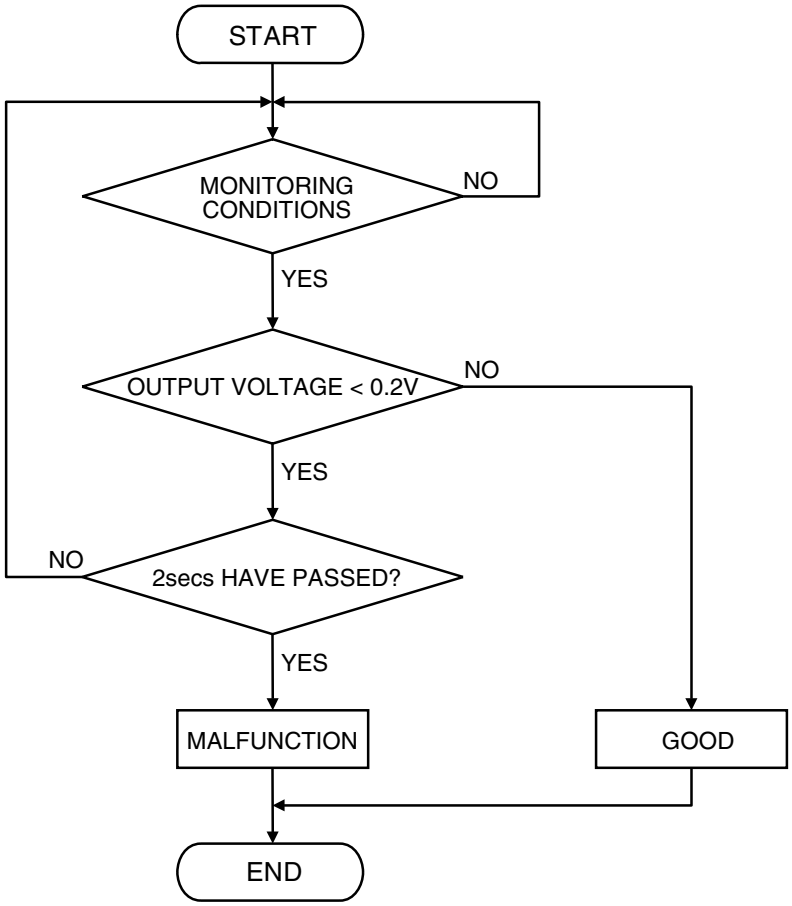
DTC SET CONDITIONS

Logic Flow Chart



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Check Conditions

- Heated oxygen sensor offset voltage is between 0.4 and 0.6 volt.
- Battery positive voltage is between 11 and 16.5 volts.
- 3 minutes or more have passed since the engine starting sequence was completed.

Judgement Criterion

- Cylinder 1, 4 heated oxygen sensor output voltage is lower than 0.2 volt for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 23 P.13A-9.

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

- Cylinder 1, 4 heated oxygen sensor (rear) failed.
- Open or shorted circuit in cylinder 1, 4 heated oxygen sensor (rear) output line or harness damage.
- Open circuit in cylinder 1, 4 heated oxygen sensor (rear) ground line or harness damage.
- Connector damage.
- PCM failed.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.

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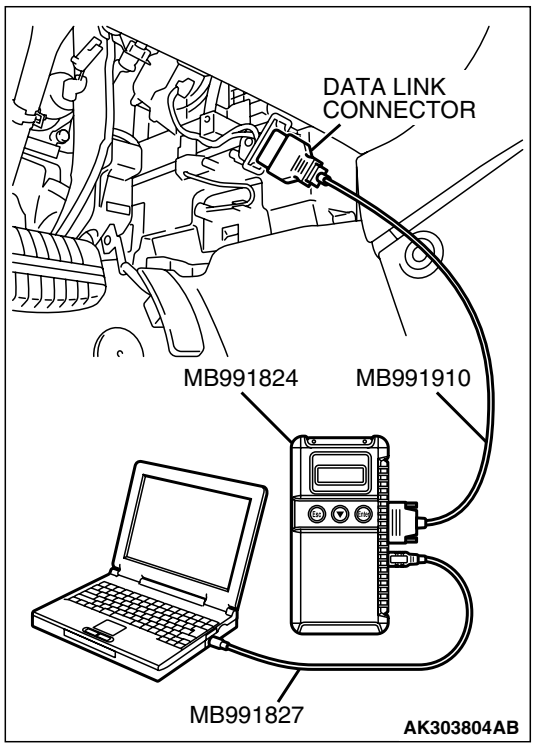
- MB991827: USB Cable
- MB991910: Main Harness A
- MD998464: Test Harness
- MB991923: Power Plant ECU Check Harness



STEP 1. Using scan tool MB991958, check data list item AD: 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 AD, Cylinder 1, 4 Heated Oxygen Sensor (rear).
  a. Transaxle: "L" range
  b. Drive with wide open throttle
  c. Engine: 3,500 r/min
    - The output voltages should be between 0.6 and 1.0 volt.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

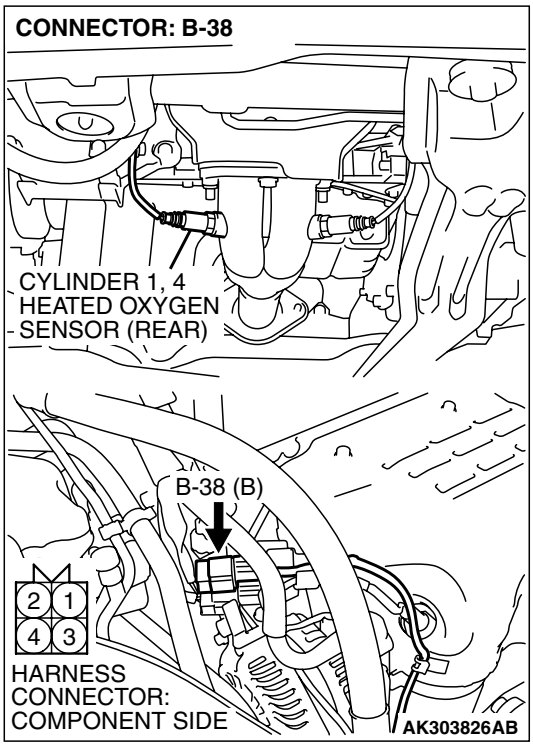
Q: Is the sensor operating properly?

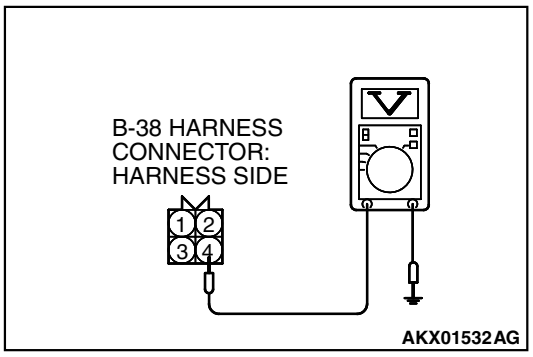
YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-14.

NO : Go to Step 2.

STEP 2. Measure the sensor output voltage at cylinder 1, 4 heated oxygen sensor (rear) connector B-38 by backprobing

(1) Do not disconnect the connector B-38.
(2) Start the engine and run at idle.





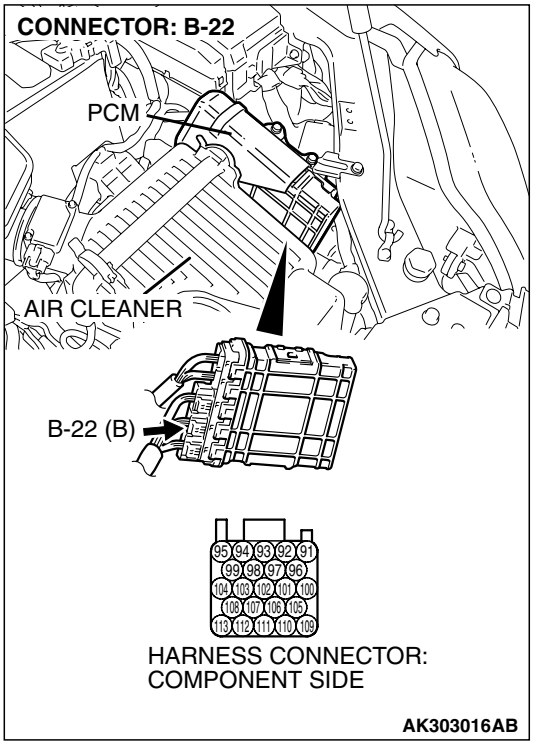
(3) Measure the voltage between terminal No. 4 and ground by backprobing under the following driving.
   a. Transaxle: "L" range
   b. Drive with wide open throttle
   c. Engine: 3,500 r/min or more
      - The output voltage should be between 1.0 and 1.5 volts.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

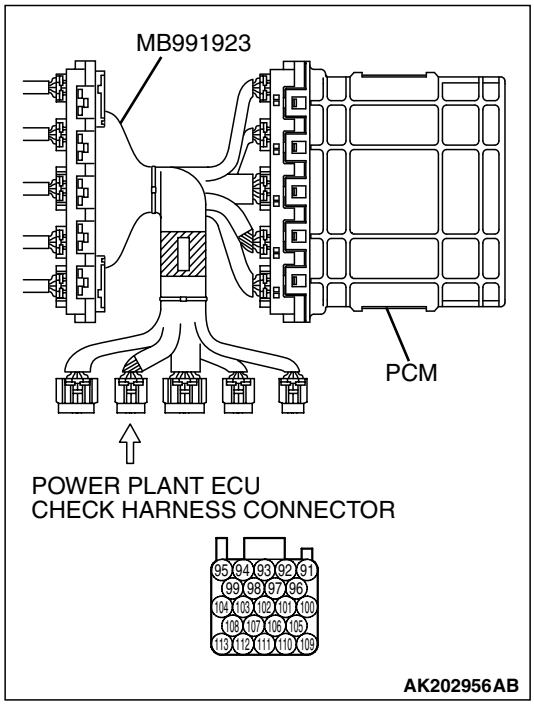
Q: Is the measured voltage within the specified range?

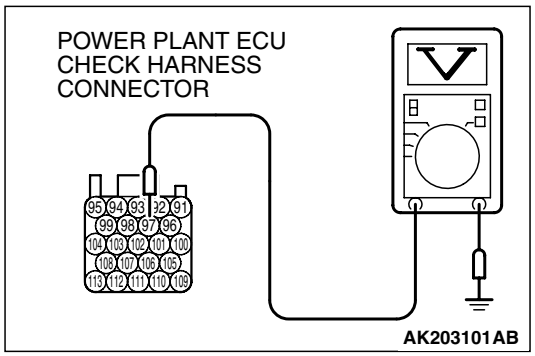
YES : Go to Step 3.
NO : Go to Step 7.

STEP 3. Measure the sensor output voltage at PCM connector B-22 by using power plant ECU check harness special tool MB991923.

(1) Disconnect all PCM connectors. Connect the power plant ECU check harness special tool MB991923 between the separated connectors.
(2) Start the engine and run at idle.







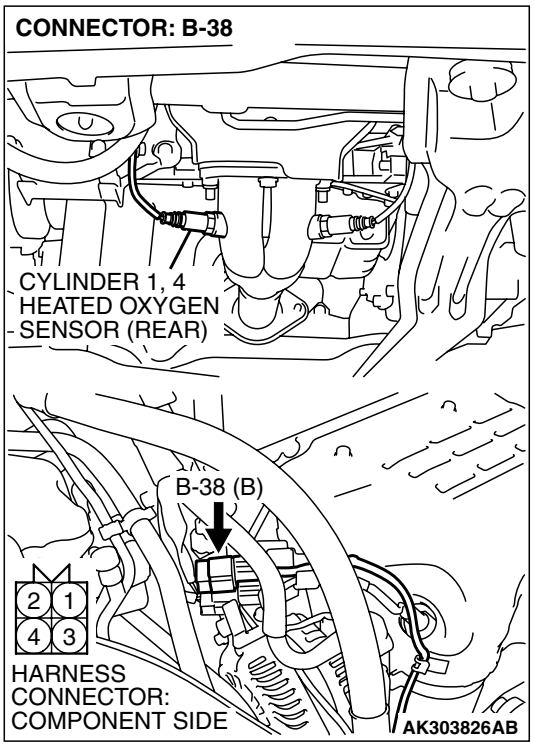
(3) Measure the voltage between terminal No. 97 and ground by backprobing under the following driving.
   a. Transaxle: "L" range
   b. Drive with wide open throttle
   c. Engine: 3,500 r/min or more
      - The output voltage should be between 1.0 and 1.5 volts.

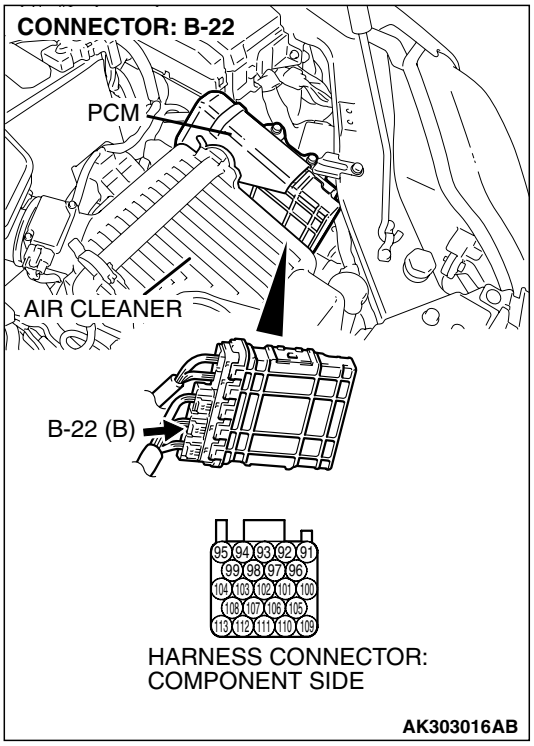
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the measured voltage between 1.0 and 1.5 volts?

YES : Go to Step 4.

NO : Go to Step 6.



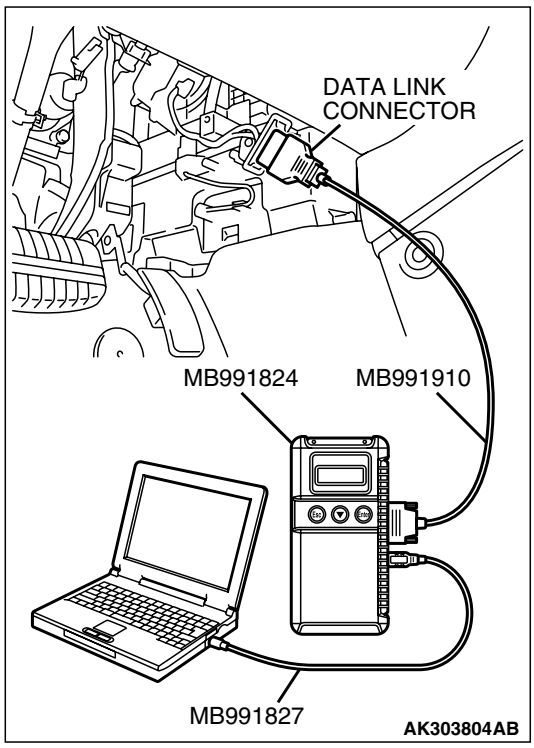


STEP 4. Check harness connector B-38 at cylinder 1, 4 heated oxygen sensor (rear) and harness connector B-22 at PCM for damage.

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 go to Step 14.



STEP 5. Using scan tool MB991958, check data list item AD: Cylinder 1, 4 Heated Oxygen Sensor (rear).

⚠ CAUTION

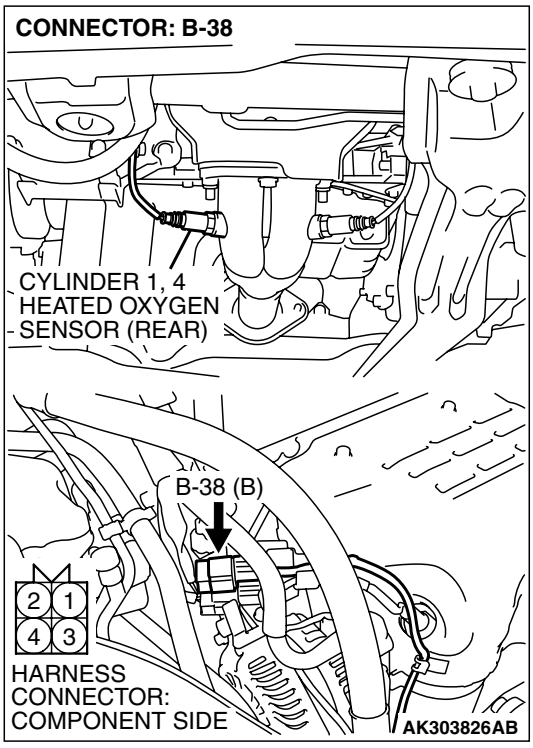
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

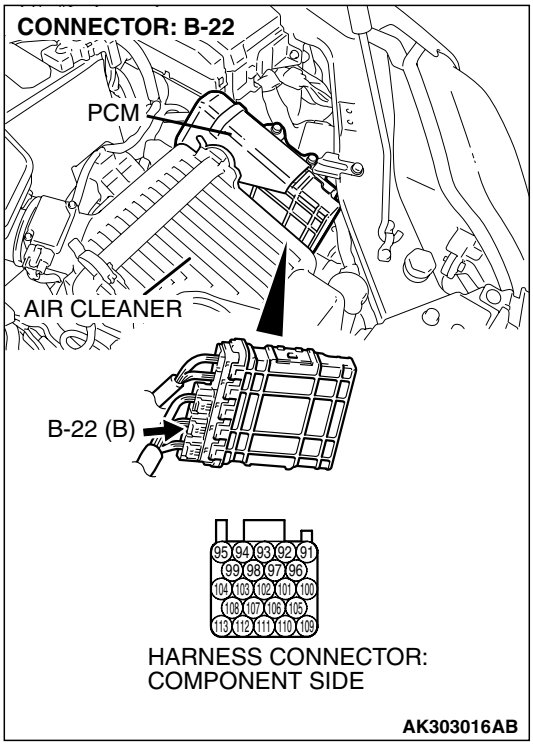
(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991958 to the data reading mode for item AD, Cylinder 1, 4 Heated Oxygen Sensor (rear).
  a. Transaxle: A/T: "L" range
  b. Drive with wide open throttle
  c. Engine: 3,500 r/min or more
    - The output voltage should be between 0.6 and 1.0 volt.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed 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 : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 14.



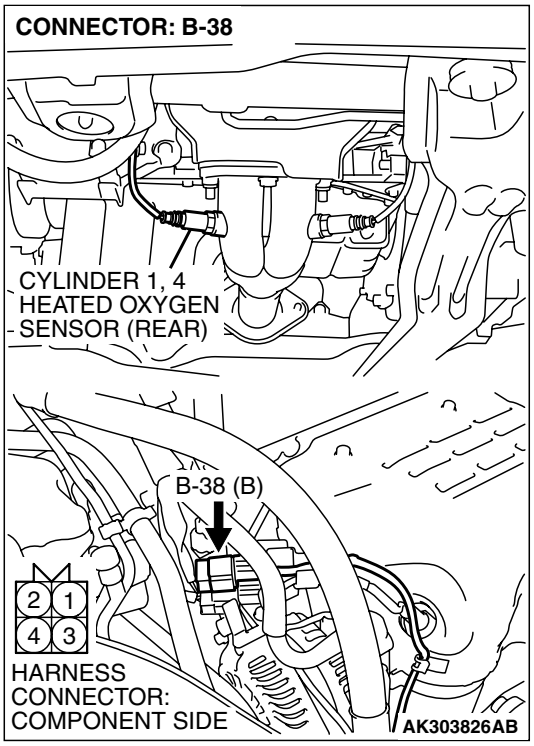


STEP 6. Check harness connector B-38 at cylinder 1, 4 heated oxygen sensor (rear) and harness connector B-22 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Repair harness wire between cylinder 1, 4 heated oxygen sensor (rear) connector B-38 (terminal No. 4) and PCM connector B-22 (terminal No. 97) because of open circuit or harness damage. Then go to Step 14.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.

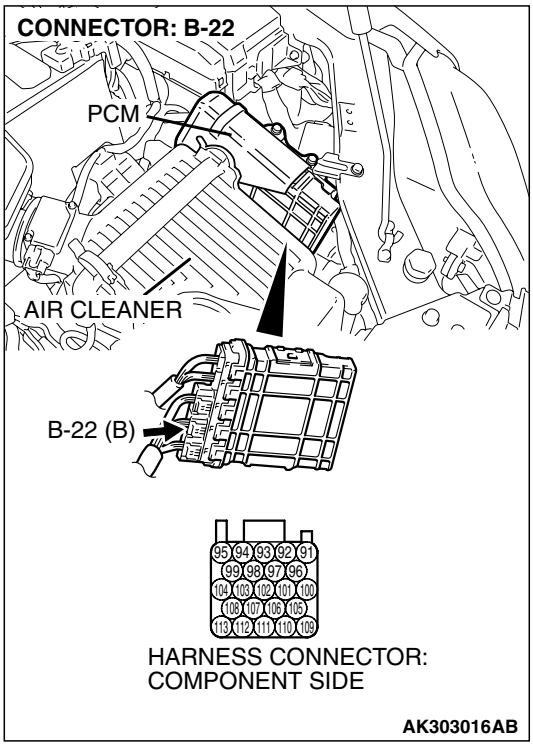


STEP 7. Check harness connector B-38 at cylinder 1, 4 heated oxygen sensor (rear) for damage.

Q: Is the harness connector in good condition?

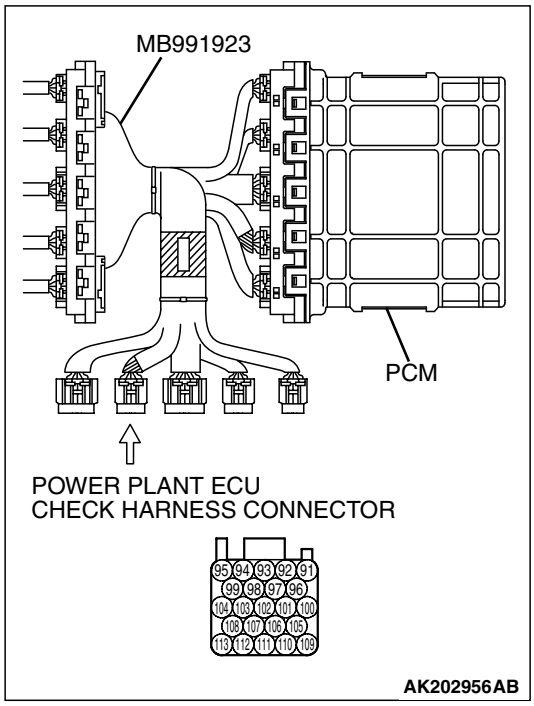
YES : Go to Step 8.

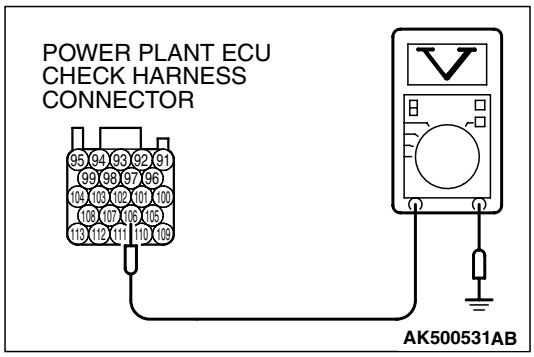
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.



STEP 8. Measure the sensor offset voltage at PCM connector B-22 by using power plant ECU check harness special tool MB991923.

(1) Disconnect all PCM connectors. Connect the power plant ECU check harness special tool MB991923 between the separated connectors.
(2) Turn the ignition switch to the "ON" position.



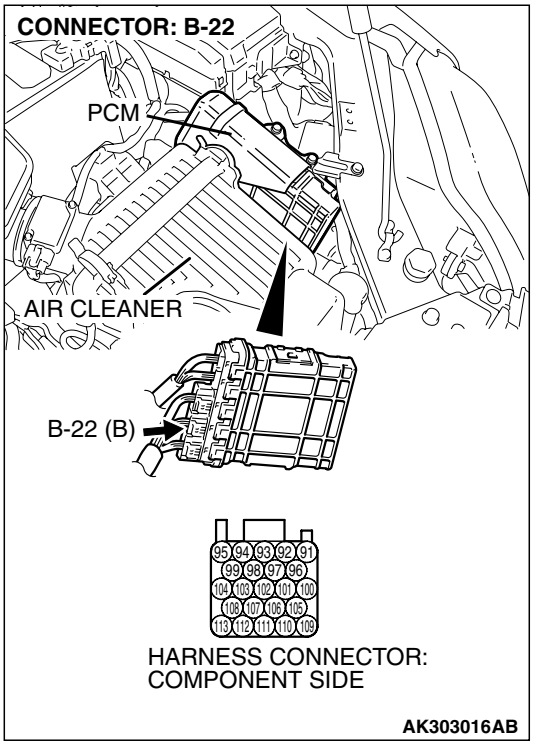


(3) Measure the voltage between terminal No. 106 and ground.
- Voltage should be between 0.4 and 0.6 volt.

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

Q: Is the measured voltage between 0.4 and 0.6 volt?

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

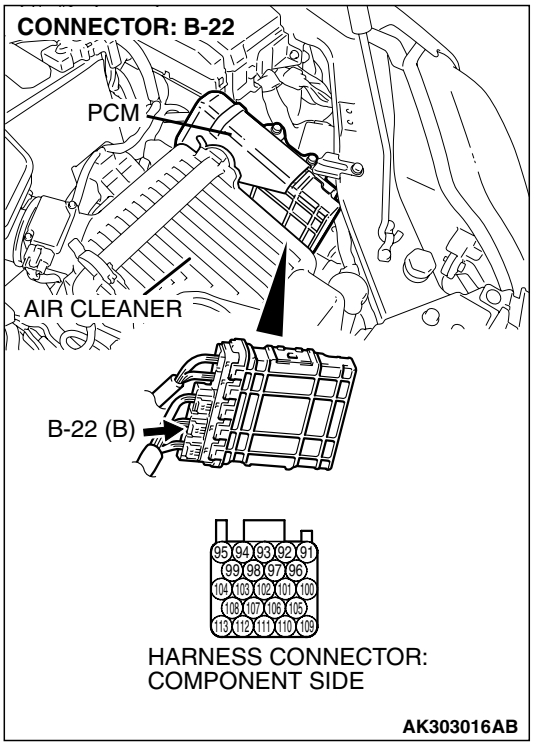


STEP 9. Check harness connector B-22 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Repair harness wire between cylinder 1, 4 heated oxygen sensor (rear) connector B-38 (terminal No. 2) and PCM connector B-22 (terminal No. 106) because of open circuit or harness damage. Then go to Step 14.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.



STEP 10. Check harness connector B-22 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 11.

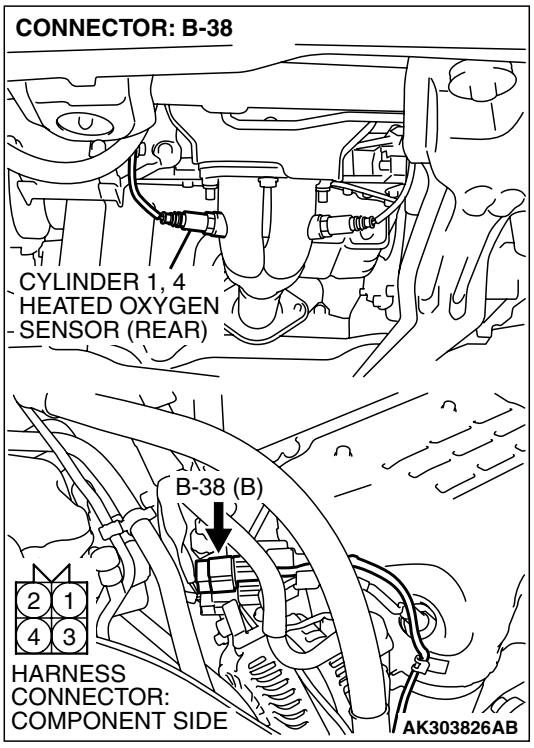
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.

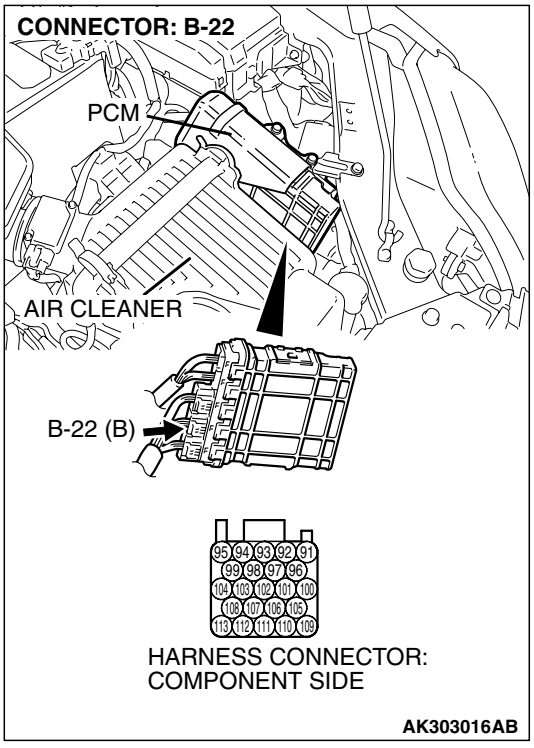
STEP 11. Check for harness damage between cylinder 1, 4 heated oxygen sensor (rear) connector B-38 (terminal No. 2) and PCM connector B-22 (terminal No. 106).

Q: Is the harness wire in good condition?

YES : Go to Step 12.

NO : Repair it. Then go to Step 14.



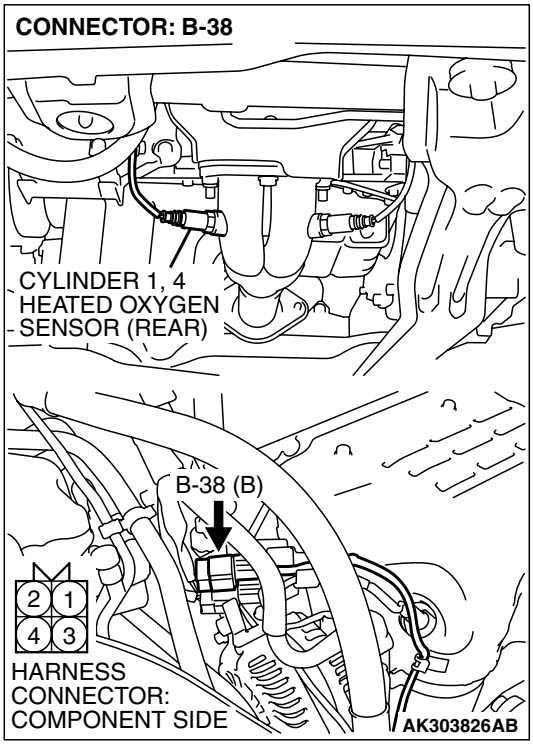


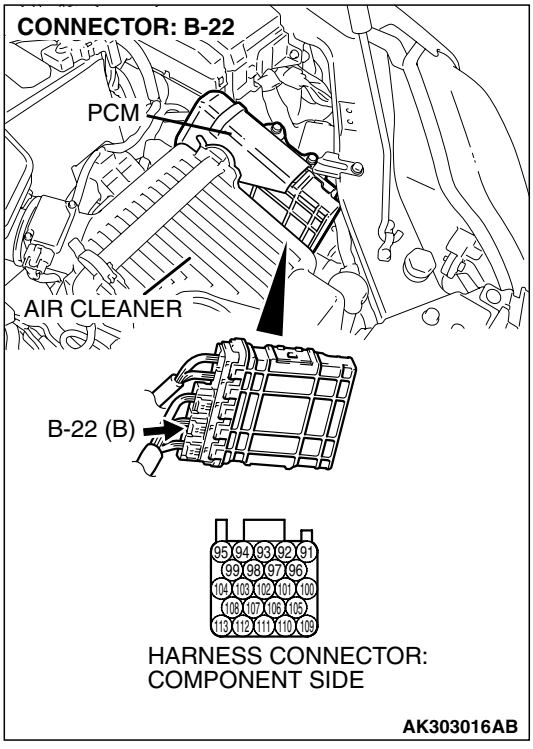
STEP 12. Check for short circuit to ground and harness damage between cylinder 1, 4 heated oxygen sensor (rear) connector B-38 (terminal No. 4) and PCM connector B-22 (terminal No. 97).

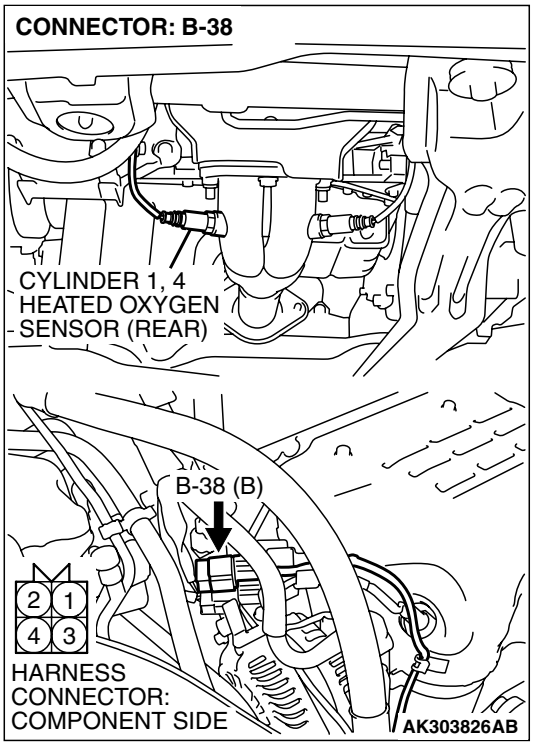
Q: Is the harness wire in good condition?

YES : Go to Step 13.

NO : Repair it. Then go to Step 14.

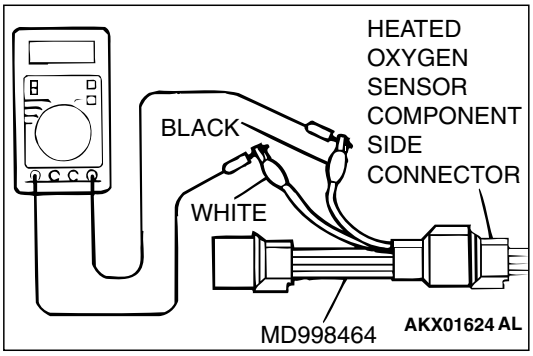






STEP 13. Check the cylinder 1, 4 heated oxygen sensor (rear).

(1) Disconnect the cylinder 1, 4 heated oxygen sensor (rear) connector B-38 and connect test harness special tool MD998464 to the connector on the cylinder 1, 4 heated oxygen sensor (rear) side.
(2) Warm up the engine until engine coolant temperature reaches 80°C (176°F) or higher.
(3) Drive at 50 km/h (31mph) or more for 10 minutes.



(4) Connect a digital voltage meter between terminal No. 2 (black clip) and terminal No. 4 (white clip).
(5) Measure the output voltage of heated oxygen sensor under the following driving.
- Transaxle: "L" range
- Drive with wide open throttle
- Engine: 3,500 r/min or more

Standard value: 0.6 – 1.0 V

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.

Q: Is the measured voltage between 0.6 and 1.0 volt?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 14.
NO : Replace the cylinder 1, 4 heated oxygen sensor (rear). Then go to Step 14.

STEP 14. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 23 P.13A-9.
(2) Check the diagnostic trouble code (DTC).

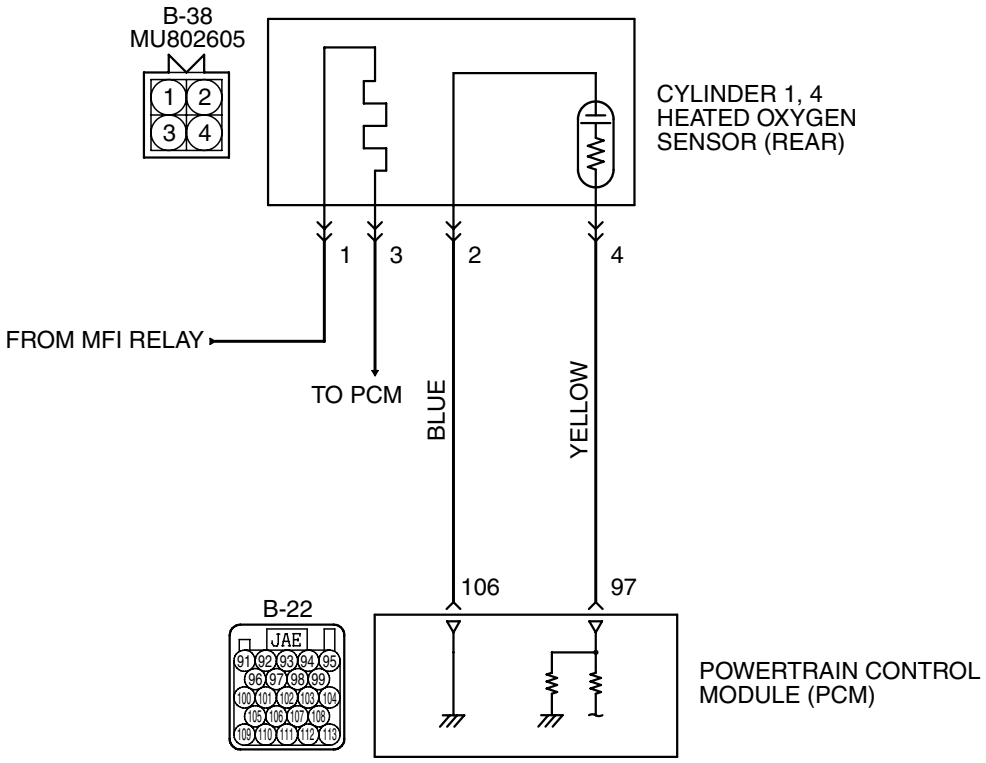
Q: Is DTC P0137 set?

YES : Retry the troubleshooting.
NO : The inspection is complete.

TSB Revision

DTC P0138: Cylinder 1, 4 Heated Oxygen Sensor (rear) Circuit High Voltage

Cylinder 1, 4 Heated Oxygen Sensor (rear) Circuit



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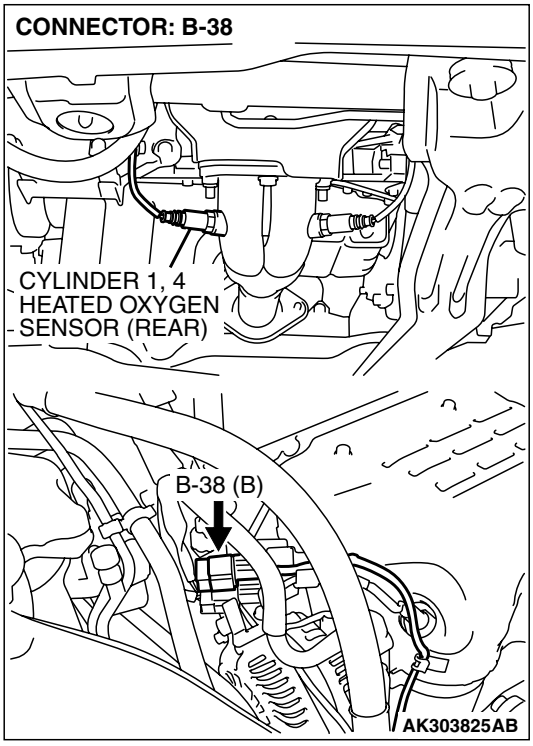
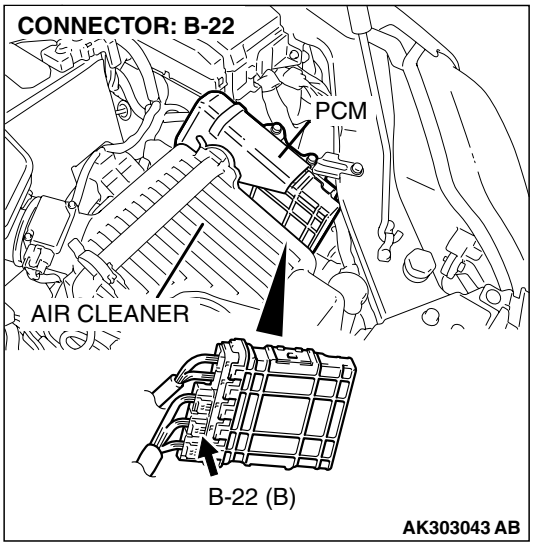




CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the PCM (terminal No. 97) from the output terminal (terminal No. 4) of the cylinder 1, 4 heated oxygen sensor (rear).
- Terminal No. 2 of the cylinder 1, 4 heated oxygen sensor (rear) is grounded with PCM (terminal No. 106).
- The PCM applies an offset voltage of 0.5 volt to terminal No. 2 of the cylinder 1, 4 heated oxygen sensor (rear).

TECHNICAL DESCRIPTION

- The output signal of the cylinder 1, 4 heated oxygen sensor (front) is compensated by the output signal of the cylinder 1, 4 heated oxygen sensor (rear).
- The PCM checks for the cylinder 1, 4 heated oxygen sensor (rear) output voltage.

DESCRIPTIONS OF MONITOR METHODS

Cylinder 1, 4 heated oxygen sensor (rear) output voltage is over specified range.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

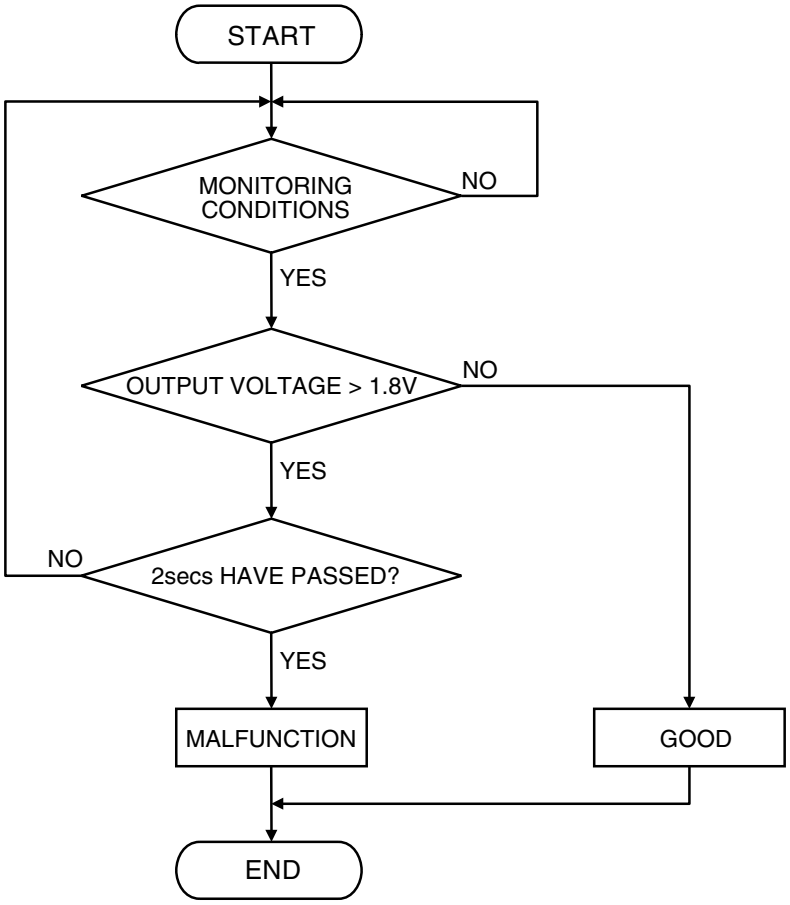
- Heated oxygen sensor heater (front) monitor
- Heated oxygen sensor heater (rear) monitor
- Air/fuel ratio feedback monitor

Sensor (The sensor below is determined to be normal)

- Mass airflow sensor
- Engine coolant temperature sensor
- Intake air temperature sensor
- Barometric pressure sensor

DTC SET CONDITIONS

Logic Flow Chart



AK500035

Check Conditions

- 2 seconds or more have passed since the engine starting sequence was completed.
- Heated oxygen sensor offset voltage is between 0.4 and 0.6 volt.

Judgement Criterion

- Cylinder 1, 4 heated oxygen sensor (rear) output voltage has continued to be 1.8 volts or higher for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 24 P.13A-9.

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

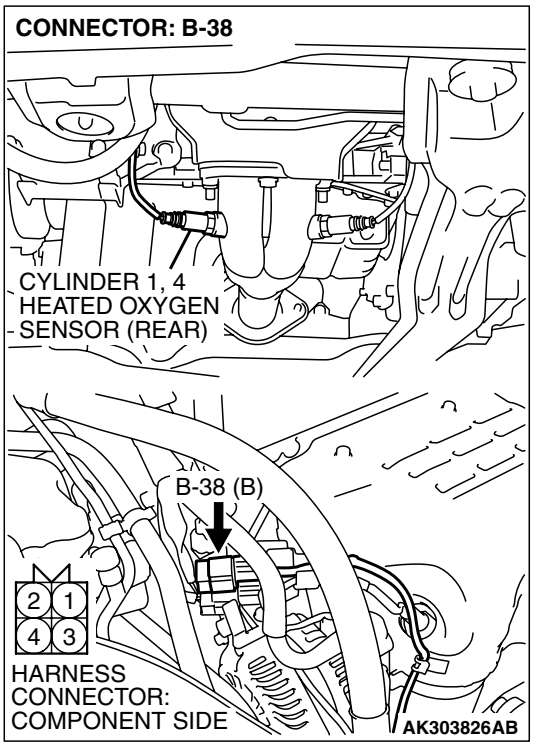
- Short circuit in cylinder 1, 4 heated oxygen sensor (rear) output line.
- Connector damage.
- PCM failed.

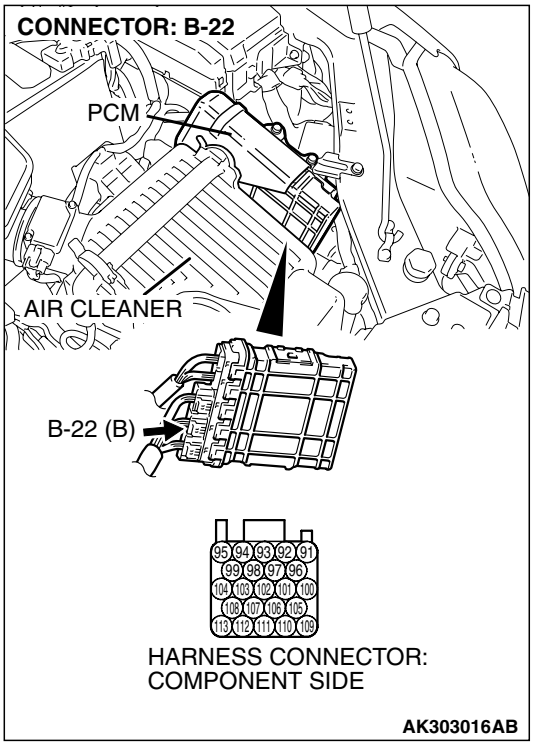
DIAGNOSIS

Required Special Tools:

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

TSB Revision



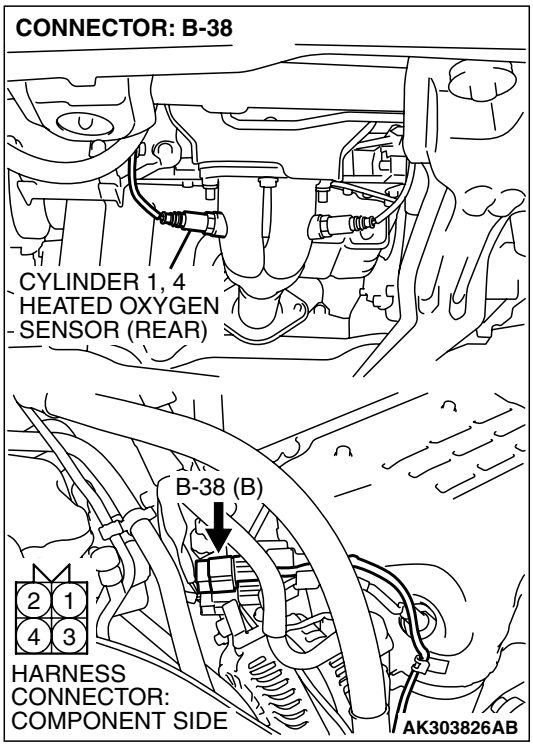


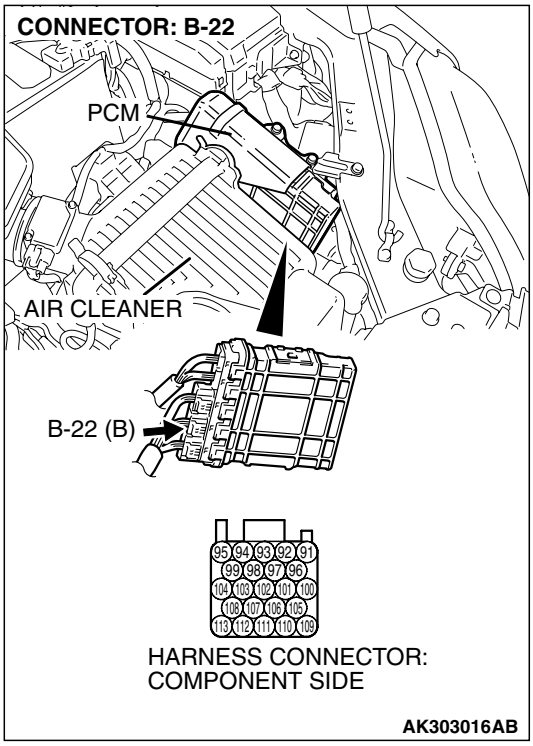
STEP 1. Check harness connector B-38 at cylinder 1, 4 heated oxygen sensor (rear) and harness connector B-22 at PCM for damage.

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 go to Step 3.





STEP 2. Check for short circuit to power supply between cylinder 1, 4 heated oxygen sensor (rear) connector B-38 (terminal No. 4) and PCM connector B-22 (terminal No. 97).
Q: Is the harness wire in good condition?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 3.

NO : Repair it. Then go to Step 3.

STEP 3. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 24 P.13A-9.

(2) Check the diagnostic trouble code (DTC).

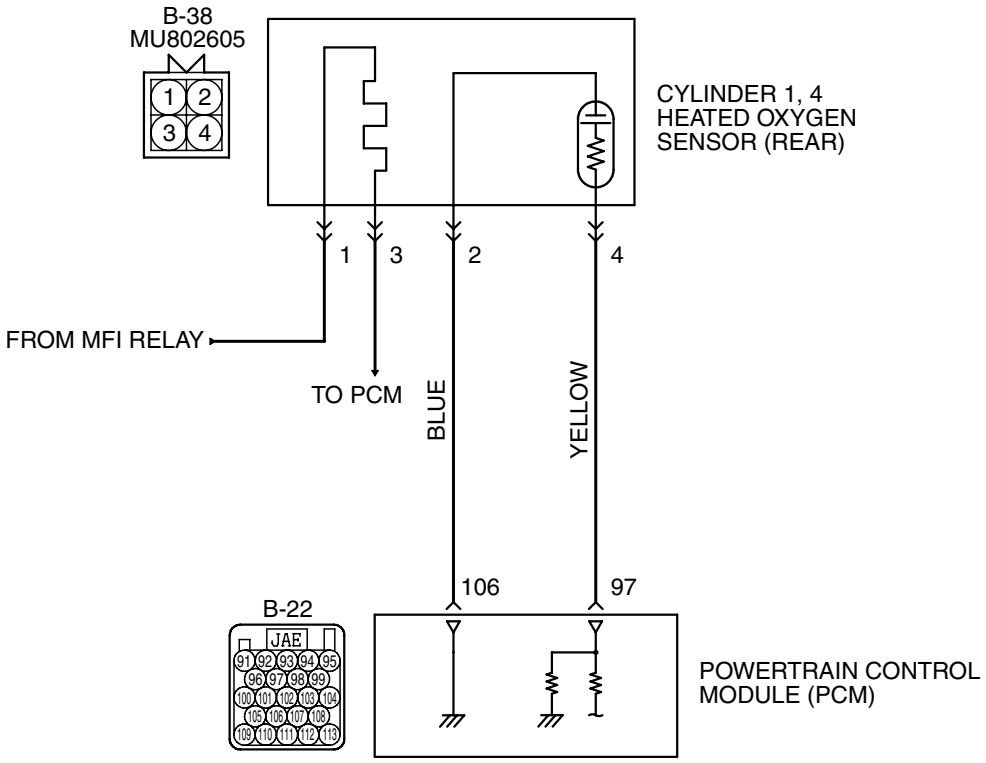
Q: Is DTC P0138 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0139: Cylinder 1, 4 Heated Oxygen Sensor (rear) Circuit Slow Responce

Cylinder 1, 4 Heated Oxygen Sensor (rear) Circuit



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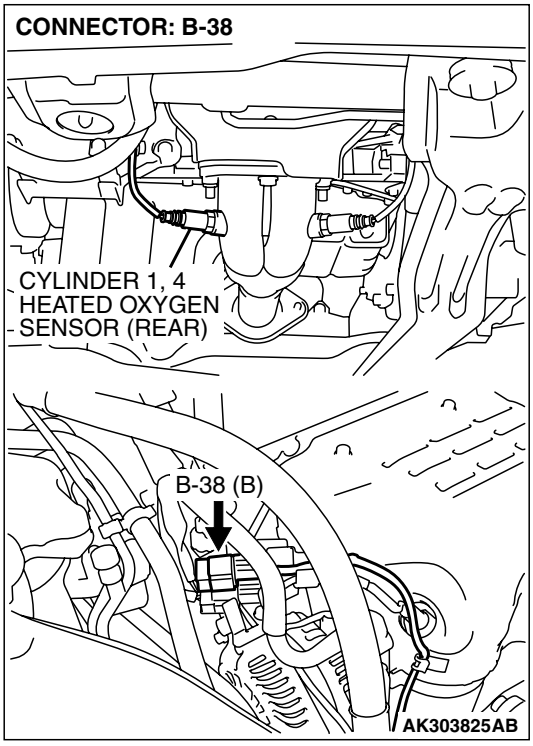
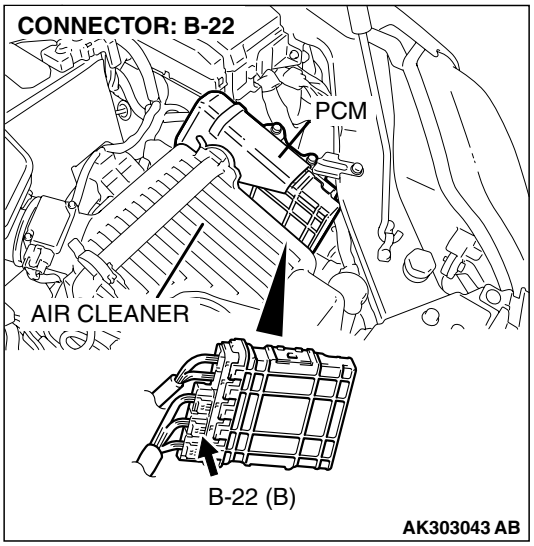




CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the PCM (terminal No. 97) from the output terminal (terminal No. 4) of the cylinder 1, 4 heated oxygen sensor (rear).
- Terminal No. 2 of the cylinder 1, 4 heated oxygen sensor (rear) is grounded with PCM (terminal No. 106).
- The PCM applies an offset voltage of 0.5 volt to terminal No. 2 of the cylinder 1, 4 heated oxygen sensor (rear)

TECHNICAL DESCRIPTION

- The output signal of the cylinder 1, 4 heated oxygen sensor (front) is compensated by the output signal of the cylinder 1, 4 heated oxygen sensor (rear).
- The PCM checks for the cylinder 1, 4 heated oxygen sensor (rear) output voltage.

DESCRIPTIONS OF MONITOR METHODS

Cylinder 1, 4 heated oxygen sensor (rear) output voltage does not reach 0.2 volt after fuel cut operation.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

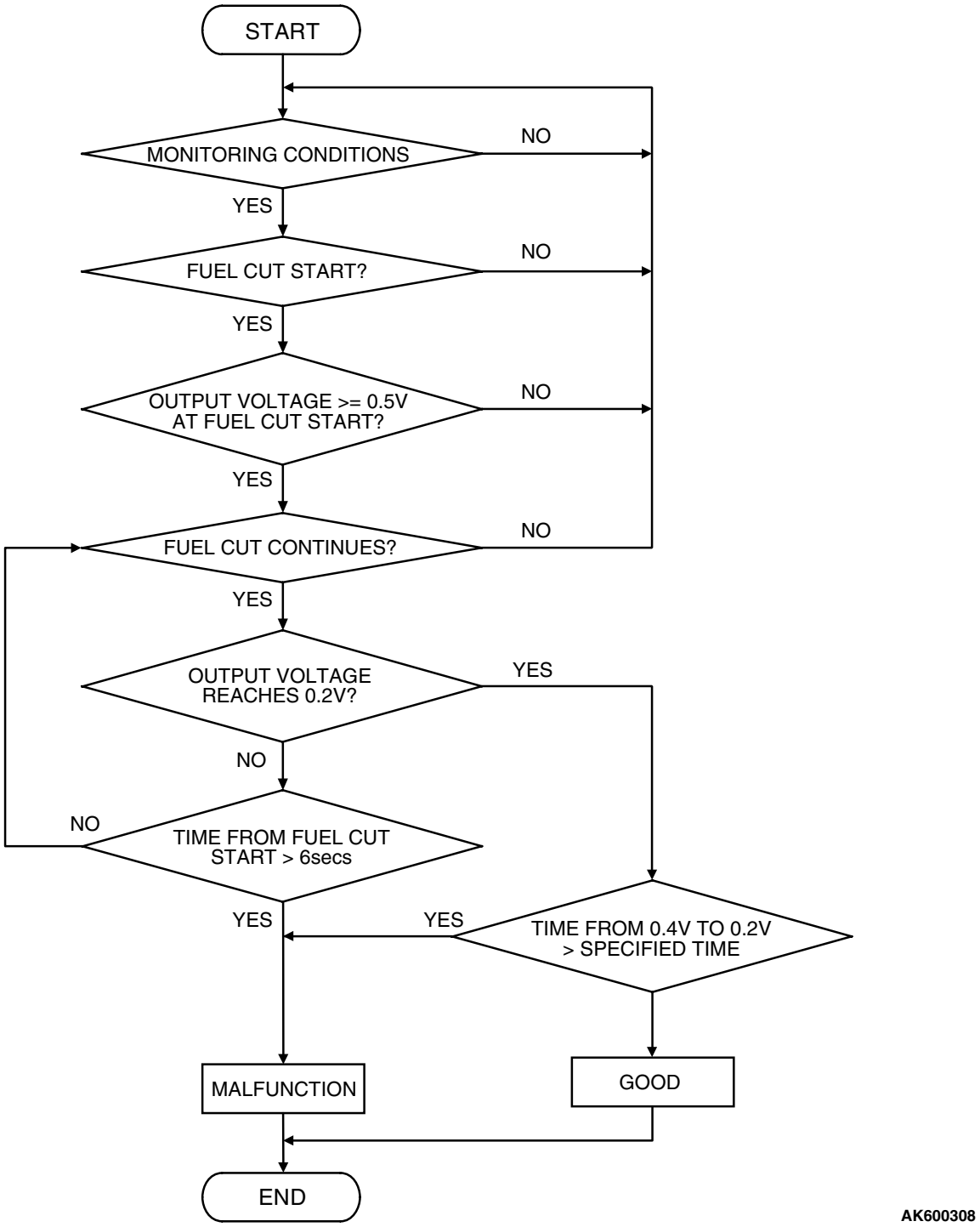
- Heated oxygen sensor heater (front) monitor
- Heated oxygen sensor heater (rear) monitor
- Air/fuel ratio feedback monitor

Sensor (The sensor below is determined to be normal)

- Mass airflow sensor
- Engine coolant temperature sensor
- Intake air temperature sensor
- Barometric pressure sensor

DTC SET CONDITIONS

Logic Flow Chart



AK600308

Check Conditions

- Engine coolant temperature is higher than 76°C (169°F).
- The cylinder 1, 4 heated oxygen sensor (front) is active.
- The cumulative mass airflow sensor output is higher than 1,638 g.
- Fuel is being shut off.

TSB Revision

Judgement Criterion

- Cylinder 1, 4 heated oxygen sensor (rear) output voltage does not reach 0.2 volt for 6 seconds from fuel cut start.

or

- Cylinder 1, 4 heated oxygen sensor (rear) output voltage does not reach 0.2 volt for specified time from 0.4 volt.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 11 P.13A-9.

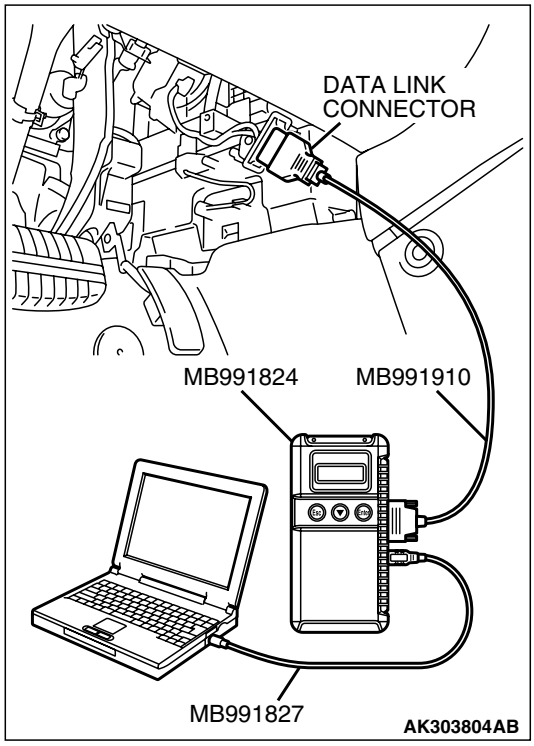
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Cylinder 1, 4 heated oxygen sensor (rear) deteriorated.
- Connector damage.
- PCM failed.

DIAGNOSIS

Required Special Tools:

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



STEP 1. Using scan tool MB991958, check data list item AD: 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 AD, Cylinder 1, 4 Heated Oxygen Sensor (rear).
(4) Warm up the engine.
  - After increasing the output voltage 0.5 volt or more by the engine revving, finish it. Then confirm that the output voltage reduces to 0.2 volt or less within 6 seconds.
(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed 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 : Replace the heated oxygen sensor (rear). Then go to Step 2.

STEP 2. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 11 P.13A-9.

(2) Check the diagnostic trouble code (DTC).

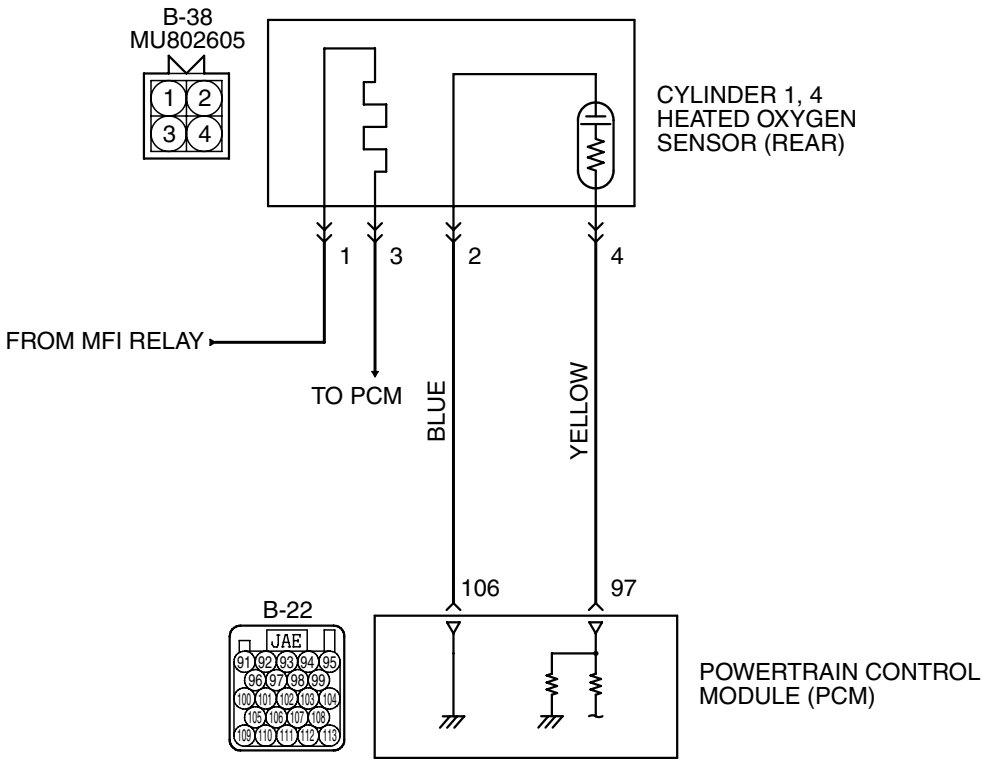
Q: Is DTC P0139 set?

YES : Refer to DTC P0137 – Cylinder 1, 4 Heated Oxygen Sensor (rear) Circuit Low Voltage P.13A-315, DTC P0138 – Cylinder 1, 4 Heated Oxygen Sensor (rear) Circuit High Voltage P.13A-332.

NO : The inspection is complete.

DTC P0140: Cylinder 1, 4 Heated Oxygen Sensor (rear) Circuit No Activity Detected

Cylinder 1, 4 Heated Oxygen Sensor (rear) Circuit



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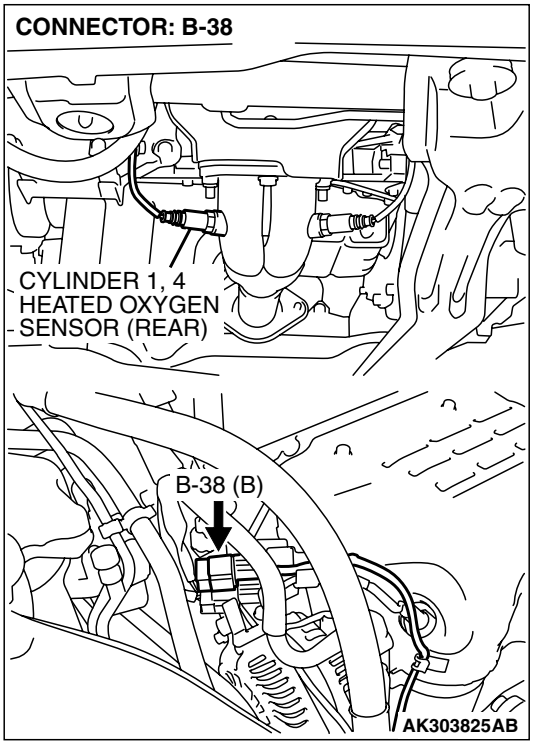
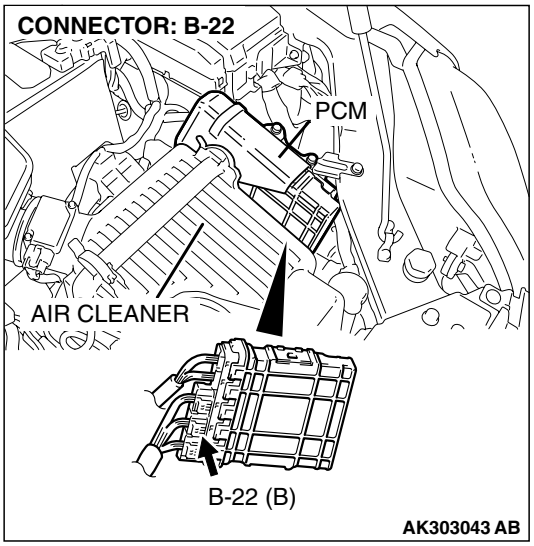
TSB Revision





CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the PCM (terminal No. 97) from the output terminal (terminal No. 4) of the cylinder 1, 4 heated oxygen sensor (rear).
- Terminal No. 2 of the cylinder 1, 4 heated oxygen sensor (rear) is grounded with PCM (terminal No. 106).
- The PCM applies an offset voltage of 0.5 volt to terminal No. 2 of the cylinder 1, 4 heated oxygen sensor (rear).

TECHNICAL DESCRIPTION

- The output signal of the cylinder 1, 4 heated oxygen sensor (front) is compensated by the output signal of the cylinder 1, 4 heated oxygen sensor (rear).
- The PCM checks for the cylinder 1, 4 heated oxygen sensor (rear) output voltage.

DESCRIPTIONS OF MONITOR METHODS

Cylinder 1, 4 heated oxygen sensor (rear) output voltage does not change during specified go/stop operations including fuel cut are repeated.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

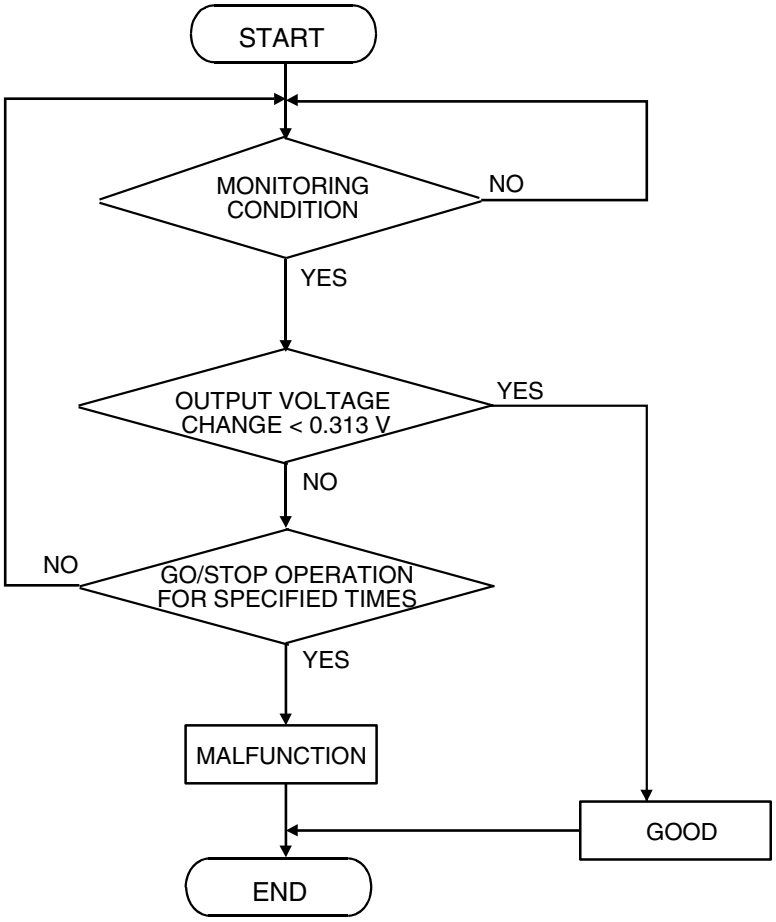
- Heated oxygen sensor heater (front) monitor
- Heated oxygen sensor heater (rear) monitor
- Air/fuel ratio feedback monitor

Sensor (The sensor below is determined to be normal)

- Mass airflow sensor
- Engine coolant temperature sensor
- Intake air temperature sensor
- Barometric pressure sensor

DTC SET CONDITIONS

Logic Flow Chart



AK302399

Check Conditions

- Engine coolant temperature is higher than 76°C (169°F).
- The cylinder 1, 4 heated oxygen sensor (front) is active.
- The cumulative mass airflow sensor output is higher than 1,638 g.
- Repeat 3 or more times: drive[*1], stop[*2].

  Drive[*1]:
  - Engine speed is higher than 1,500 r/min.
  - Volumetric efficiency is higher than 40 percent.
  - Vehicle speed is higher than 30 km/h (19 mph).
  - A total of more than 10 seconds have elapsed with the above mentioned conditions, and more than 2 seconds have elapsed with the fuel shut off.

  Stop[*2]:
  - Vehicle speed is lower than 1.5 km/h (1 mph).

Judgement Criterion

- Change in the output voltage of the cylinder 1, 4 heated oxygen sensor (rear) is lower than 0.313 volt. <Federal>

or

- Change in the output voltage of the cylinder 1, 4 heated oxygen sensor (rear) is lower than 0.234 volt. <California>

NOTE: Monitoring stops after fuel has been shut off for more than 38 seconds.

TSB Revision

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 13 P.13A-9.

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

- Cylinder 1, 4 heated oxygen sensor (rear) deteriorated.
- Connector damage.
- PCM failed.

DIAGNOSIS

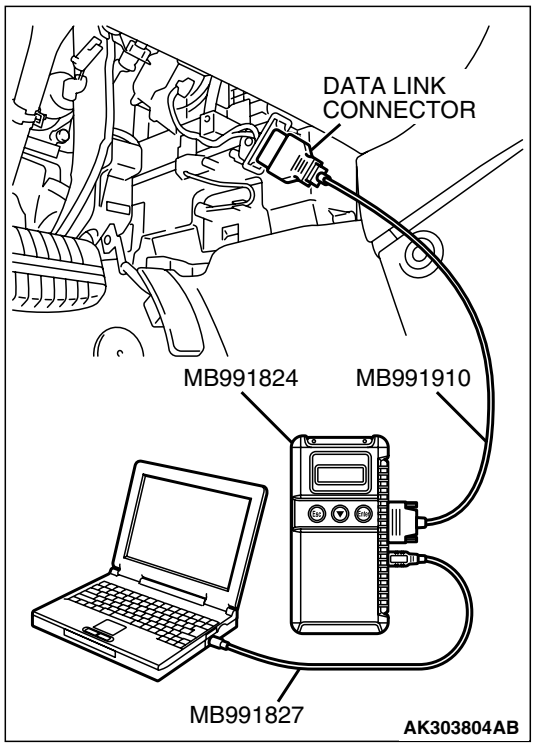
Required Special Tools:

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

STEP 1. Using scan tool MB991958, check data list item AD: 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 AD, Cylinder 1, 4 Heated Oxygen Sensor (rear).
  a. Transaxle: "L" range
  b. Drive with wide open throttle
  c. Engine: 3,500 r/min
    - The output voltages should be between 0.6 and 1.0 volt.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed 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 : Replace the heated oxygen sensor (rear). Then go to Step 2.

STEP 2. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 13 P.13A-9.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0140 set?

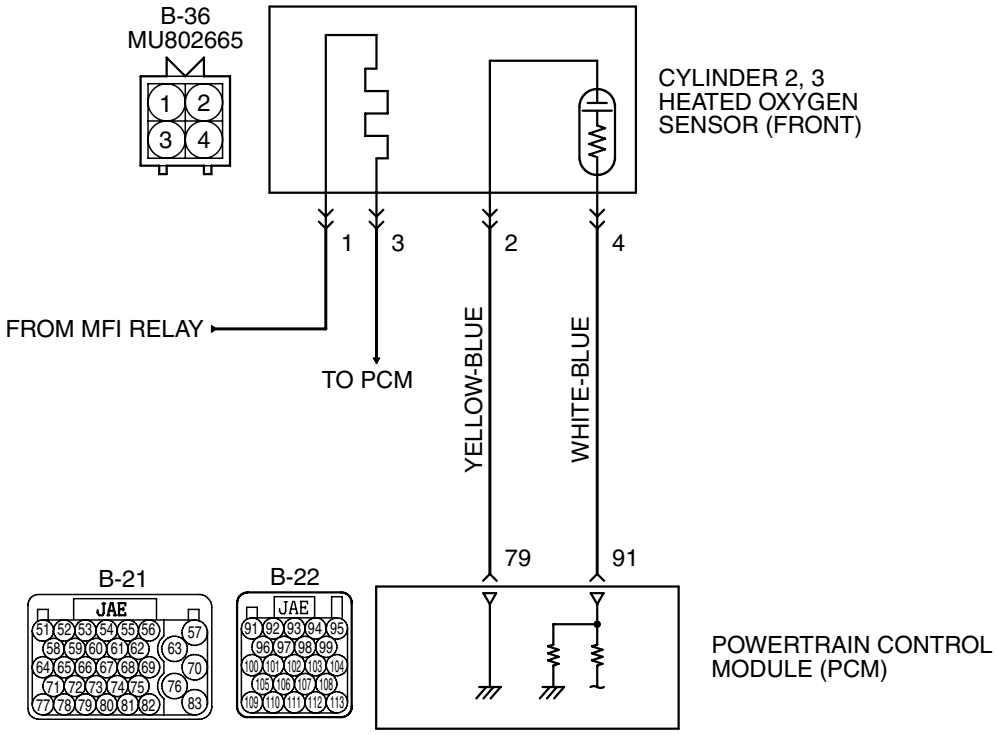
YES : Refer to DTC P0137 – Cylinder 1, 4 Heated Oxygen Sensor (rear) Circuit Low Voltage P.13A-315, DTC P0138 – Cylinder 1, 4 Heated Oxygen Sensor (rear) Circuit High Voltage P.13A-332.

NO : The inspection is complete.

TSB Revision

DTC P0151: Cylinder 2, 3 Heated Oxygen Sensor (front) Circuit Low Voltage

Cylinder 2, 3 Heated Oxygen Sensor (front) Circuit



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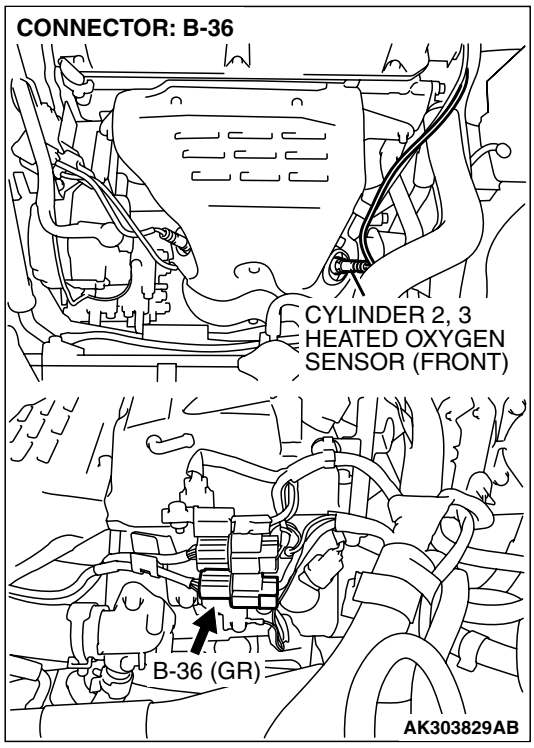
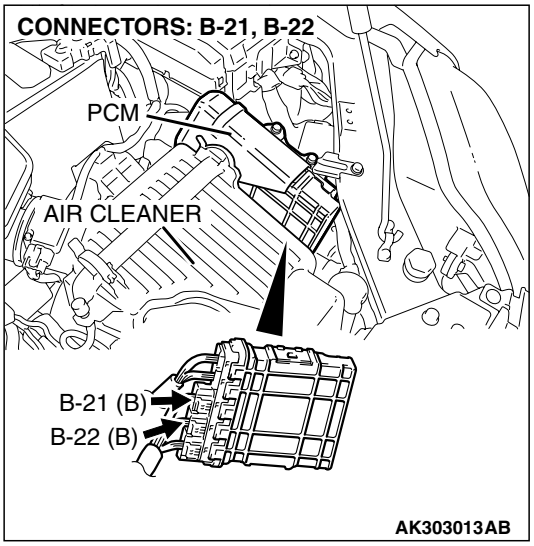




TSB Revision

CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the PCM (terminal No. 91) from the output terminal (terminal No. 4) of the cylinder 2, 3 heated oxygen sensor (front).
- Terminal No. 2 of the cylinder 2, 3 heated oxygen sensor (front) is grounded with PCM (terminal No. 79).
- The PCM applies an offset voltage of 0.5 volt to terminal No. 2 of the cylinder 1, 4 heated oxygen sensor (front).

TECHNICAL DESCRIPTION

- The cylinder 2, 3 heated oxygen sensor (front) detects the concentration of oxygen in the exhaust gas; it converts those data to voltage, and inputs the resulting signals to the PCM.
- When the cylinder 2, 3 heated oxygen sensor (front) begins to deteriorate, the heated oxygen sensor signal response becomes poor.
- The PCM checks for the cylinder 2, 3 heated oxygen sensor (front) output voltage.

DESCRIPTIONS OF MONITOR METHODS

Cylinder 2, 3 heated oxygen sensor (front) output voltage is under specified range.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

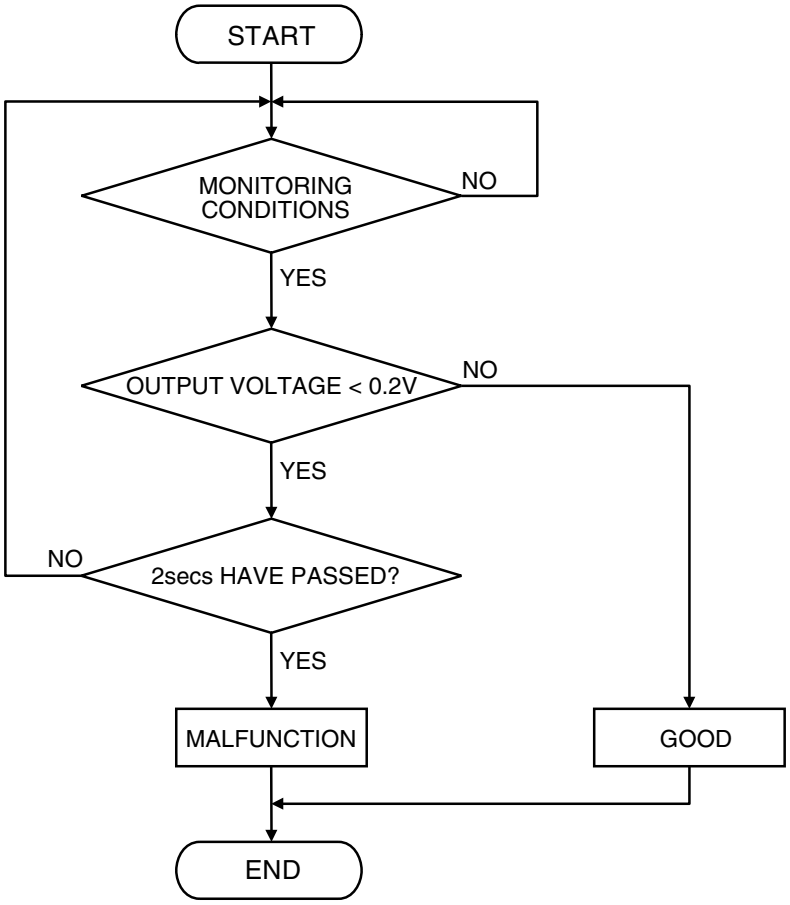
- Heated oxygen sensor heater (front) monitor
- Misfire monitor
- Fuel system monitor

Sensor (The sensor below is determined to be normal)

- Mass airflow sensor
- Engine coolant temperature sensor
- Intake air temperature sensor
- Barometric pressure sensor
- Throttle position sensor
- Accelerator pedal position sensor

DTC SET CONDITIONS

Logic Flow Chart



AK500034

Check Conditions

- Heated oxygen sensor offset voltage is between 0.4 and 0.6 volt.
- Battery positive voltage is between 11 and 16.5 volts.
- Typically 60 seconds have passed since the engine starting sequence was completed.

Judgement Criterion

- Cylinder 1, 4 heated oxygen sensor (front) output voltage is lower than 0.2 volt.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 23 P.13A-9.

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

- Cylinder 2, 3 heated oxygen sensor (front) failed.
- Open or shorted circuit in cylinder 2, 3 heated oxygen sensor (front) output line, or harness damage.
- Open circuit in cylinder 2, 3 heated oxygen sensor (front) ground line, or harness damage.
- Connector damage.
- PCM failed.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.

TSB Revision

- MB991827: USB Cable
- MB991910: Main Harness A
- MB991316: Test Harness
- MB991923: Power Plant ECU Check Harness

STEP 1. Using scan tool MB991958, check data list item AE: Cylinder 2, 3 Heated Oxygen Sensor (front).

⚠ 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.

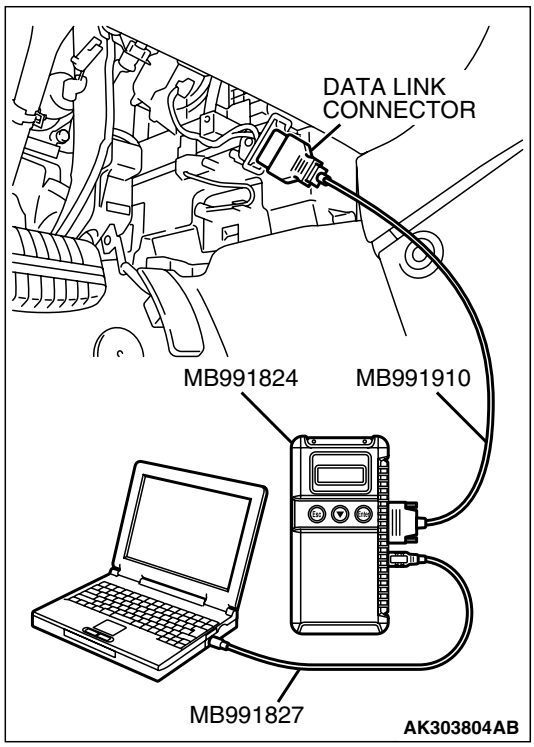
(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991958 to the data reading mode for item AE, Cylinder 2, 3 Heated Oxygen Sensor (front).
- Warm up the engine. When the engine is revved, the output voltage should measure 0.6 to 1.0 volt.
- Warm up the engine. When the engine is idling, the output voltage should repeat 0.4 volt and 0.6 to 1.0 volt alternately.

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

Q: Is the sensor operating properly?

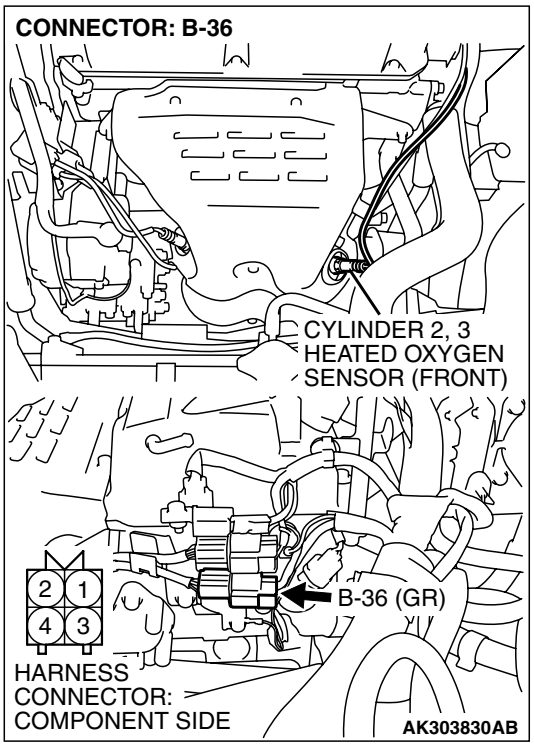
YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-14.

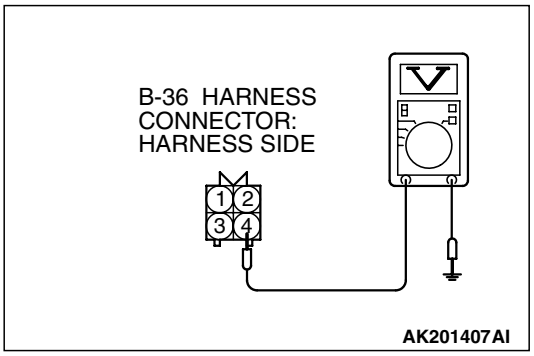
NO : Go to Step 2.



STEP 2. Measure the sensor output voltage at cylinder 2, 3 heated oxygen sensor (front) connector B-36 by backprobing

(1) Do not disconnect the connector B-36.
(2) Start the engine and run at idle.



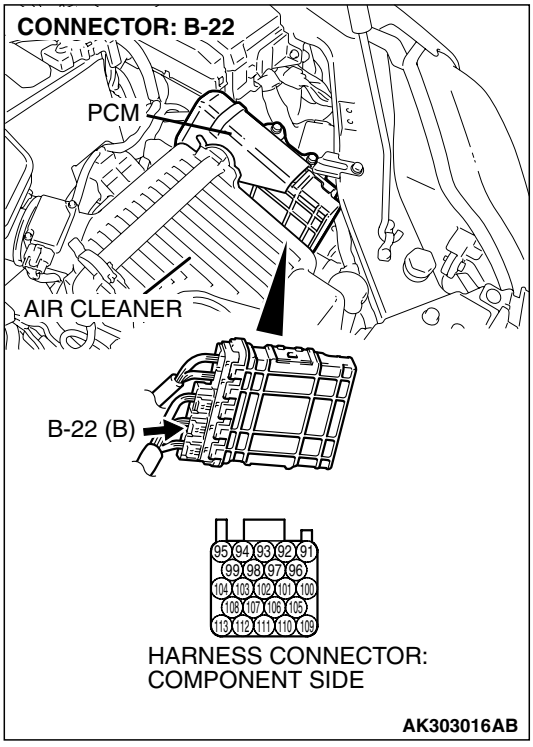


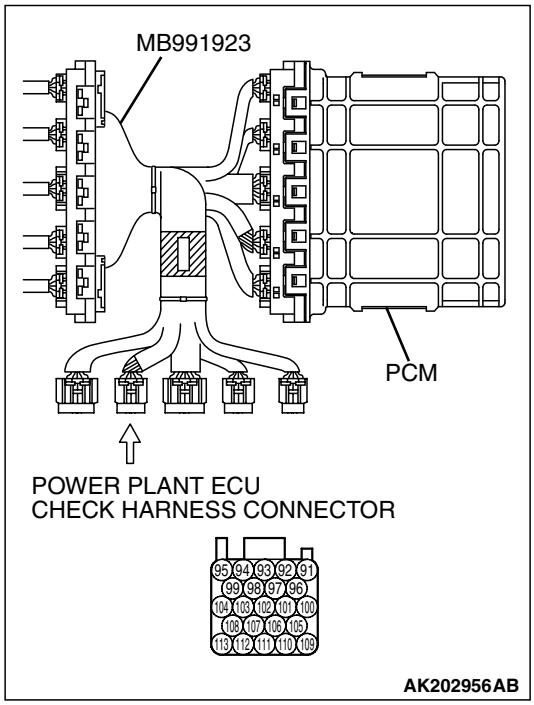
(3) Measure the voltage between terminal No. 4 and ground by backprobing.
- Warm up the engine. When the engine is 2,500 r/min, the output voltage should repeat 0.5 to 1.4 volts alternately.

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

Q: Is the measured voltage within the specified range?

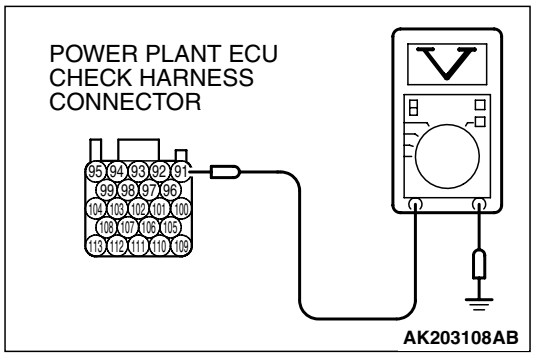
YES : Go to Step 3.
NO : Go to Step 7.





STEP 3. Measure the sensor output voltage at PCM connector B-22 by using power plant ECU check harness special tool MB991923.

(1) Disconnect all PCM connectors. Connect the power plant ECU check harness special tool MB991923 between the separated connectors.
(2) Start the engine and run at idle.

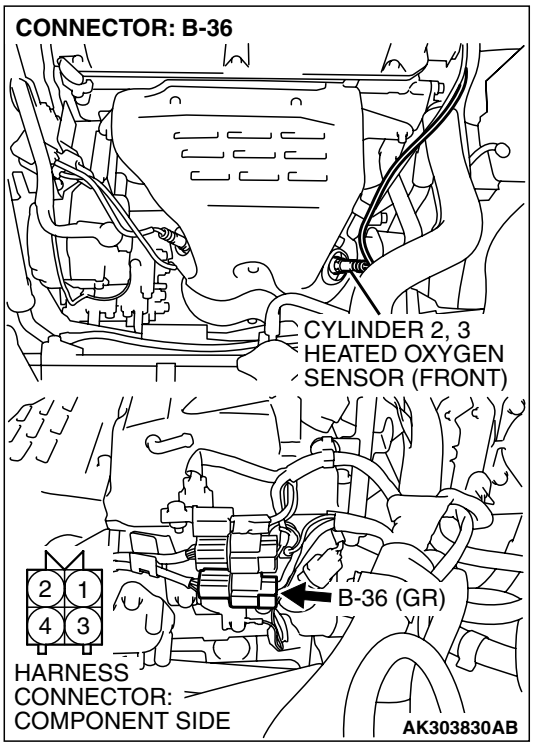


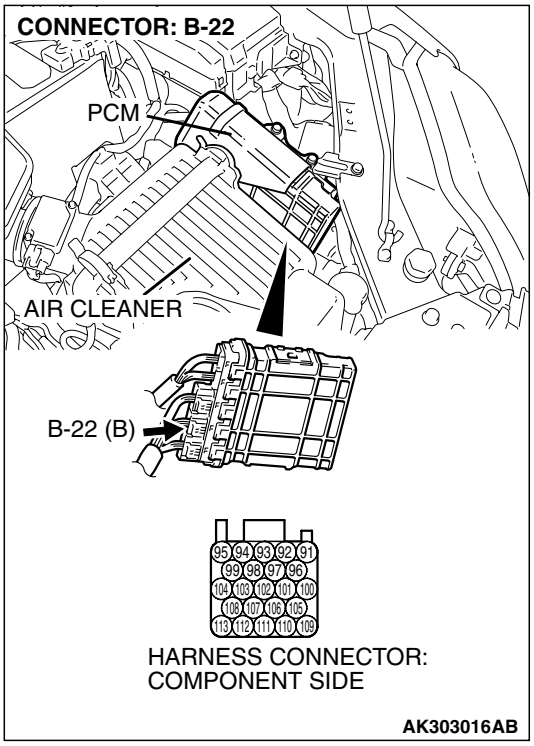
(3) Measure the voltage between terminal No. 91 and ground.
- Warm up the engine. When the engine is 2,500 r/min, the output voltage should repeat 0.5 to 1.4 volts alternately.

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

Q: Is the measured voltage within the specified range?

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



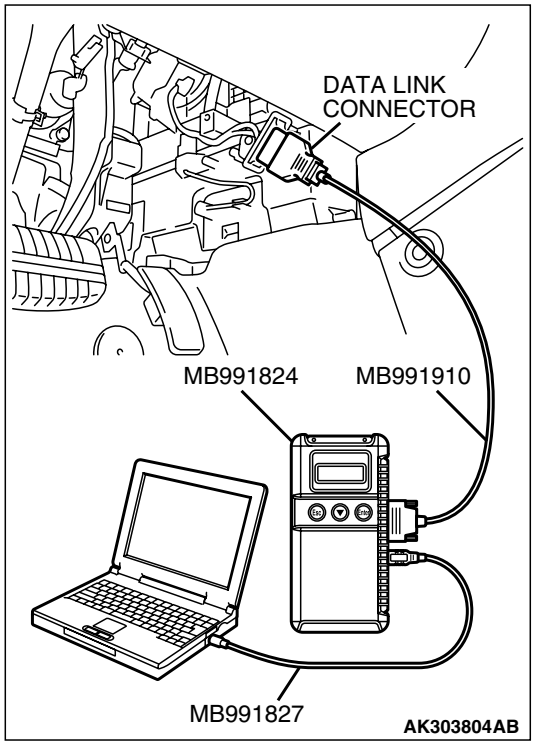


STEP 4. Check harness connector B-36 at cylinder 2, 3 heated oxygen sensor (front) and harness connector B-22 at PCM for damage.

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 go to Step 14.



STEP 5. Using scan tool MB991958, check data list item AE: Cylinder 2, 3 Heated Oxygen Sensor (front).

⚠ 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.

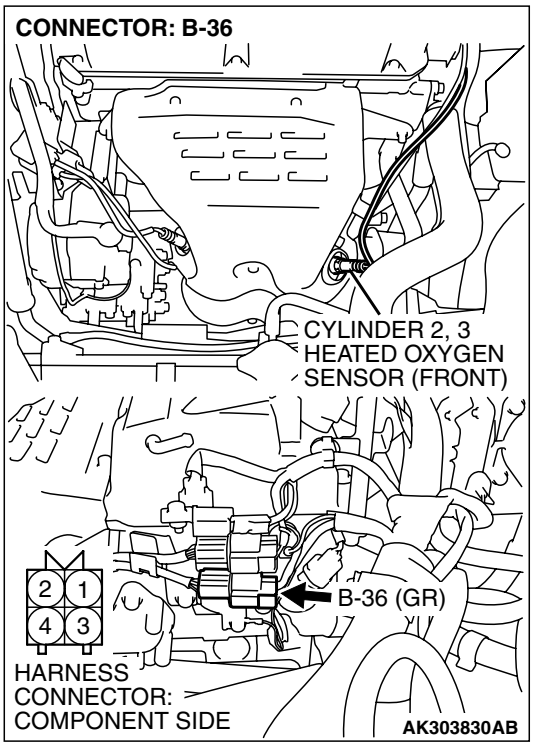
(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991958 to the data reading mode for item AE, Cylinder 2, 3 Heated Oxygen Sensor (front).
- Warming up the engine. When the engine is revved, the output voltage should be 0.6 to 1.0 volt.
- Warming up the engine. When the engine is idling, the output voltage should repeat 0.4 volt and 0.6 to 1.0 volt alternately.

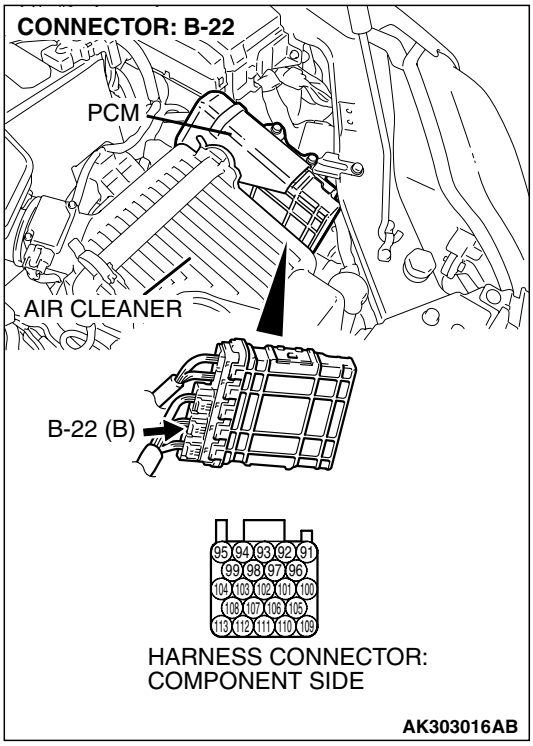
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed 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 : Replace the PCM. Then go to Step 14.



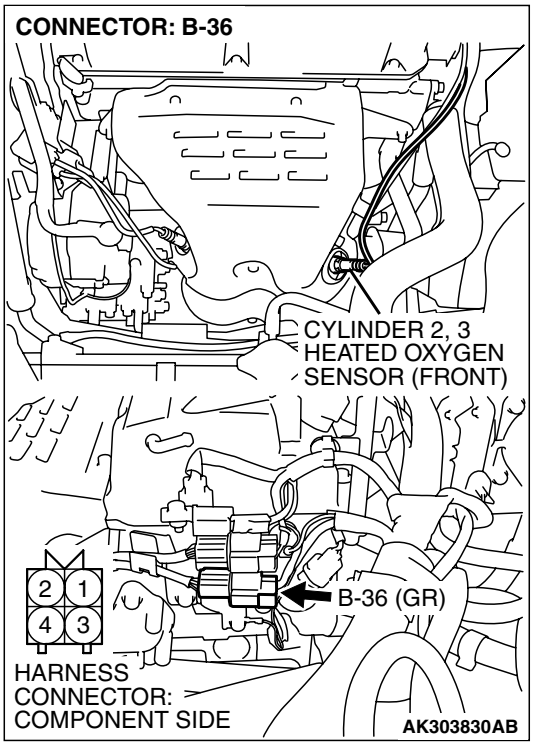


STEP 6. Check harness connector B-36 at cylinder 2, 3 heated oxygen sensor (front) and harness connector B-22 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Repair harness wire between cylinder 2, 3 heated oxygen sensor (front) connector B-36 (terminal No. 4) and PCM connector B-22 (terminal No. 91) because of open circuit or harness damage. Then go to Step 14.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.

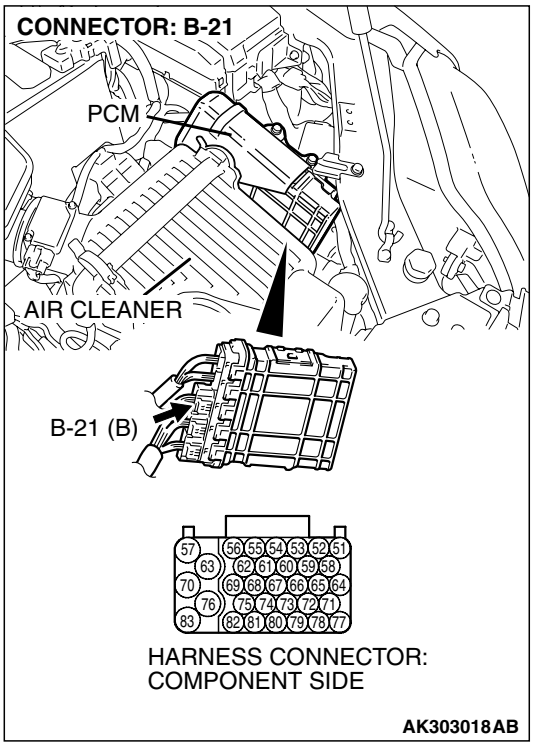


STEP 7. Check harness connector B-36 at cylinder 2, 3 heated oxygen sensor (front) for damage.

Q: Is the harness connector in good condition?

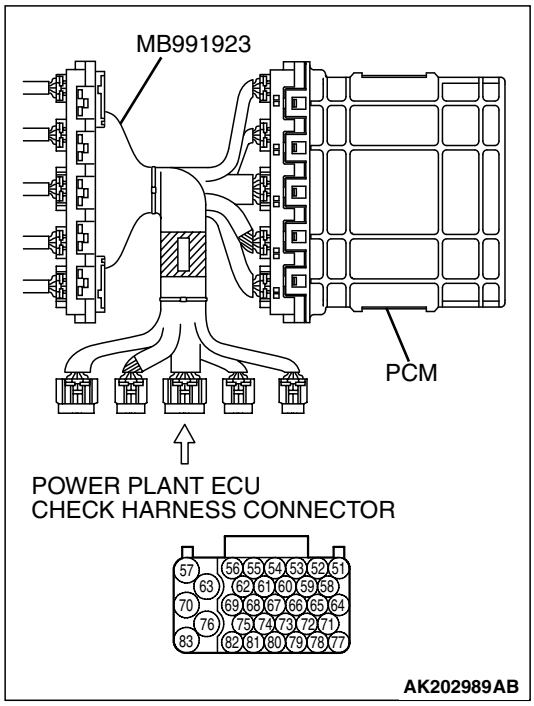
YES : Go to Step 8.

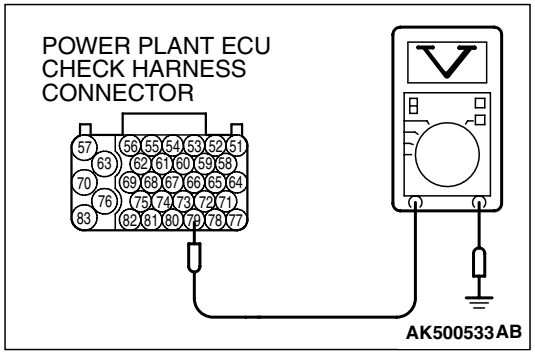
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.



STEP 8. Measure the sensor offset voltage at PCM connector B-21 by using power plant ECU check harness special tool MB991923.

(1) Disconnect all PCM connectors. Connect the power plant ECU check harness special tool MB991923 between the separated connectors.
(2) Turn the ignition switch to the "ON" position.



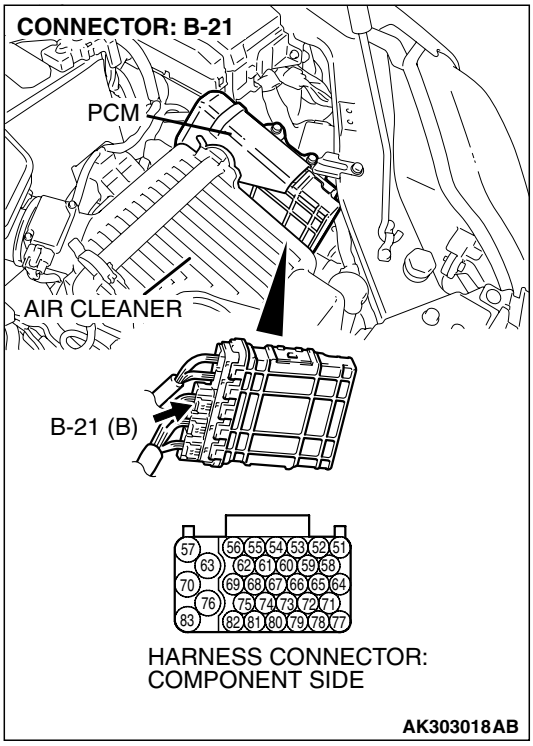


(3) Measure the voltage between terminal No. 79 and ground.
- Voltage should be between 0.4 and 0.6 volt.

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

Q: Is the measured voltage between 0.4 and 0.6 volt?

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

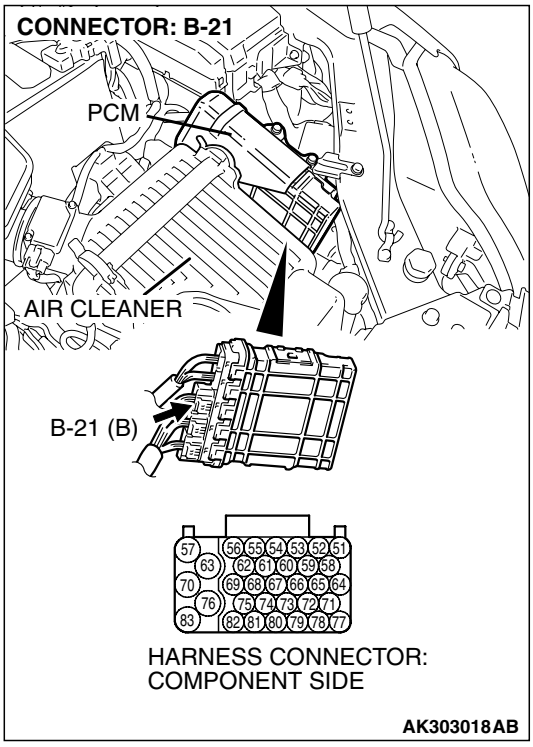


STEP 9. Check harness connector B-21 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Repair harness wire between cylinder 2, 3 heated oxygen sensor (front) connector B-36 (terminal No. 2) and PCM connector B-21 (terminal No. 79) because of open circuit or harness damage. Then go to Step 14.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.



STEP 10. Check harness connector B-21 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 11.

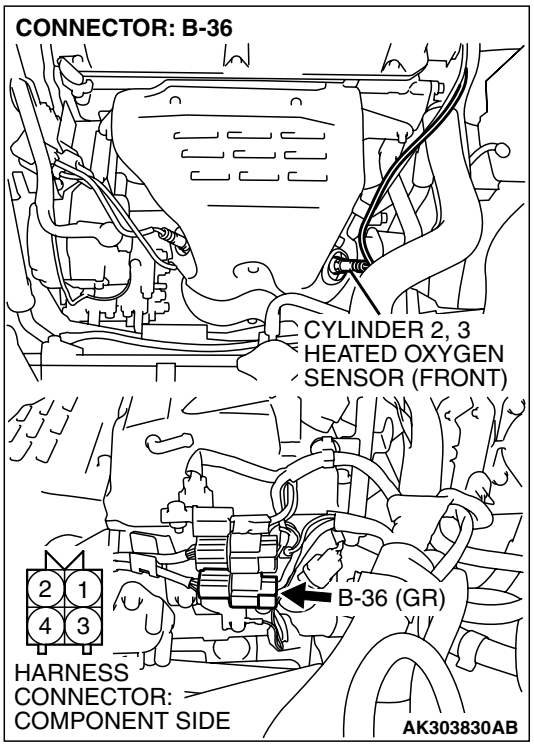
NO : Repair or replace it. Then go to Step 14.

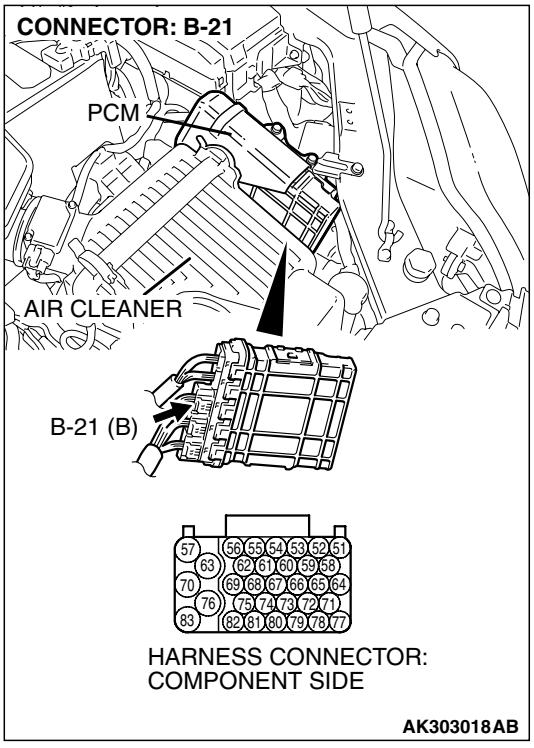
STEP 11. Check for harness damage between cylinder 2, 3 heated oxygen sensor (front) connector B-36 (terminal No. 2) and PCM connector B-21 (terminal No. 79).

Q: Is the harness wire in good condition?

YES : Go to Step 12.

NO : Repair it. Then go to Step 14.



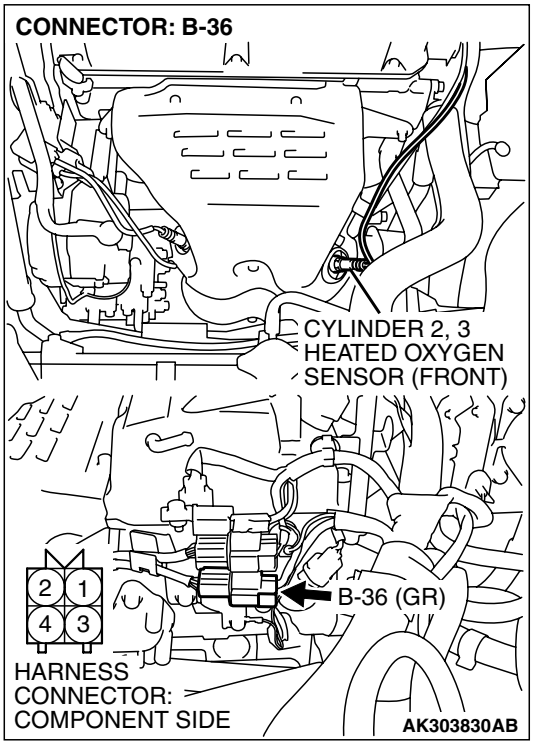


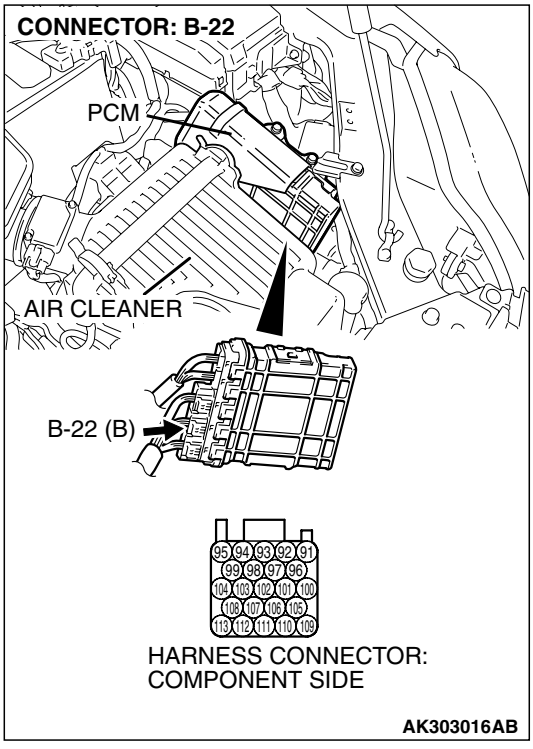
STEP 12. Check for short circuit to ground and harness damage between cylinder 2, 3 heated oxygen sensor (front) connector B-36 (terminal No. 4) and PCM connector B-22 (terminal No. 91).

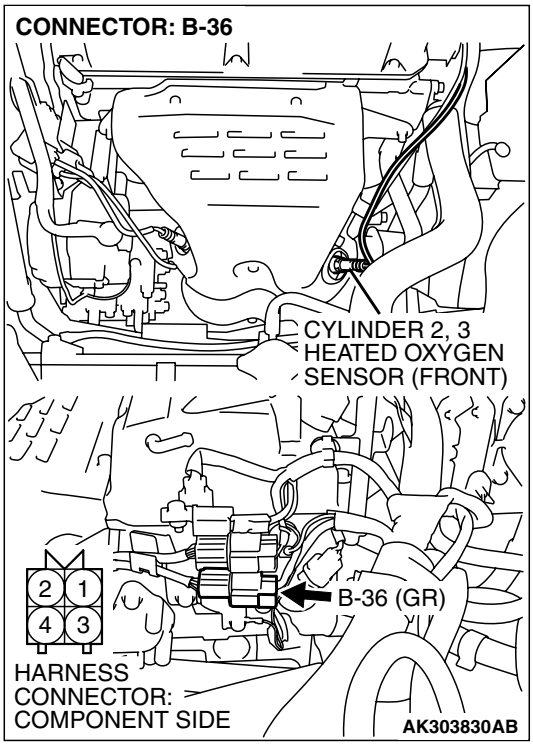
Q: Is the harness wire in good condition?

YES : Go to Step 13.

NO : Repair it. Then go to Step 14.

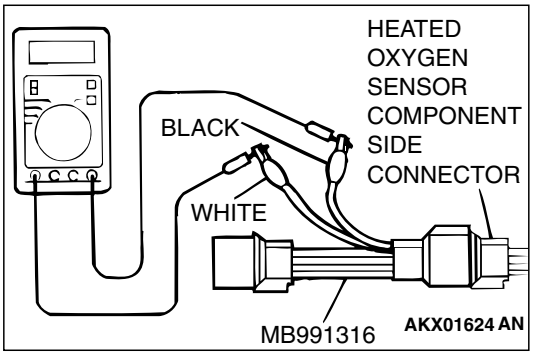






STEP 13. Check the cylinder 2, 3 heated oxygen sensor (front).

(1) Disconnect the cylinder 2, 3 heated oxygen sensor (front) connector B-36 and connect test harness special tool MB991316, to the connector on the cylinder 2, 3 heated oxygen sensor (front) side.
(2) Warm up the engine until engine coolant temperature reaches 80°C (176°F) or higher.
(3) Rev the engine for 5 minutes or more with the engine speed of 4,500 r/min.



(4) Connect a digital voltage meter between terminal No. 2 (black clip) and terminal No. 4 (white clip).
(5) While repeatedly revving the engine, measure the cylinder 2, 3 heated oxygen sensor (front) output voltage.

Standard value: 0.6 – 1.0 V

⚠ CAUTION

- **Be very careful when connecting the jumper wires; incorrect connection can damage the heated oxygen sensor.**
- **Be careful the heater can be damaged if a voltage 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 a jumper wire to connect the terminal No. 1 (red clip) and the terminal No. 3 (blue clip) of the heated oxygen sensor with the positive terminal and the negative terminal of 8 volts power supply respectively, then check again.

Q: Is the measured voltage between 0.6 and 1.0 volt?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 14.

NO : Replace the cylinder 2, 3 heated oxygen sensor (front). Then go to Step 14.

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STEP 14. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 23 P.13A-9.

(2) Check the diagnostic trouble code (DTC).

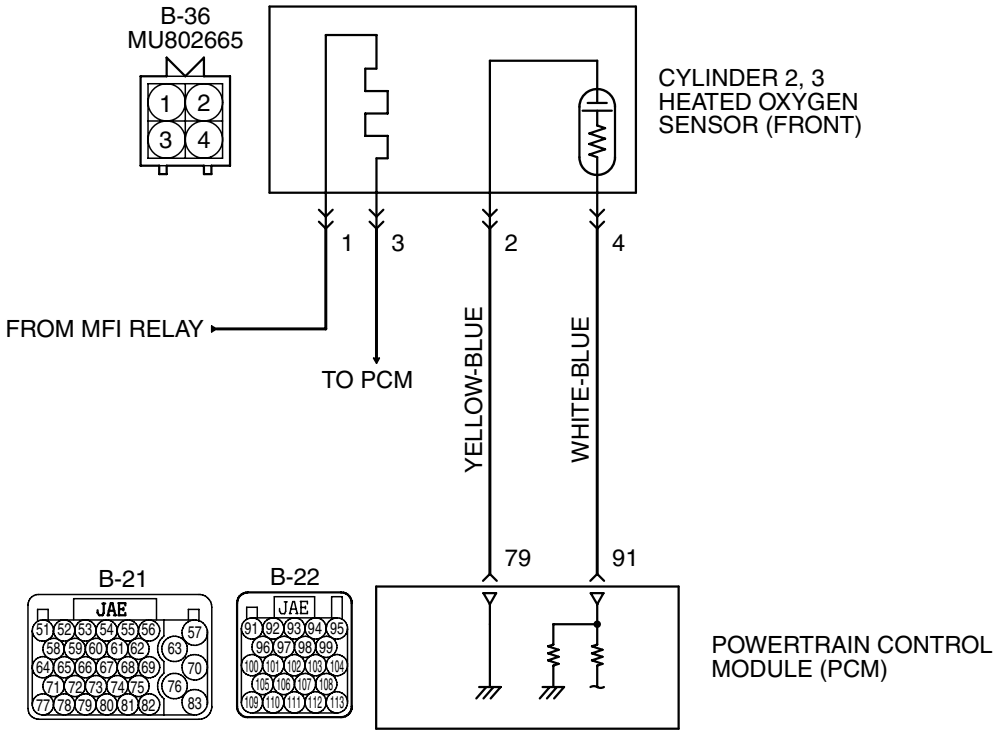
Q: Is DTC P0151 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0152: Cylinder 2, 3 Heated Oxygen Sensor (front) Circuit High Voltage

Cylinder 2, 3 Heated Oxygen Sensor (front) Circuit



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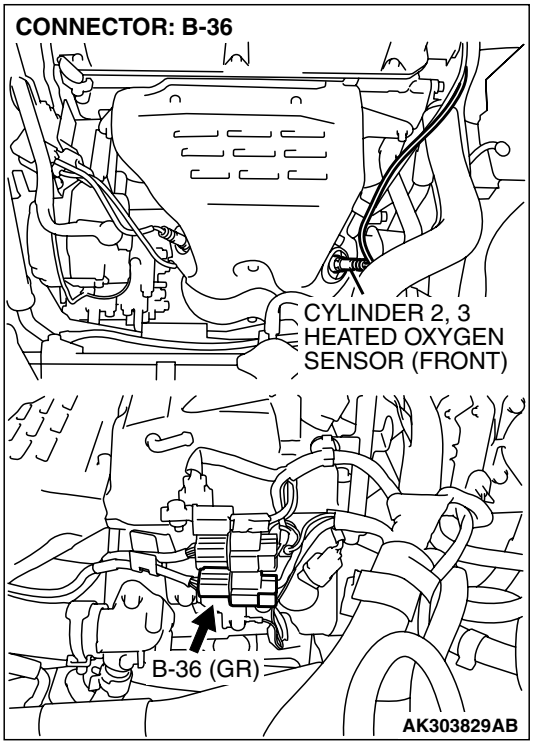
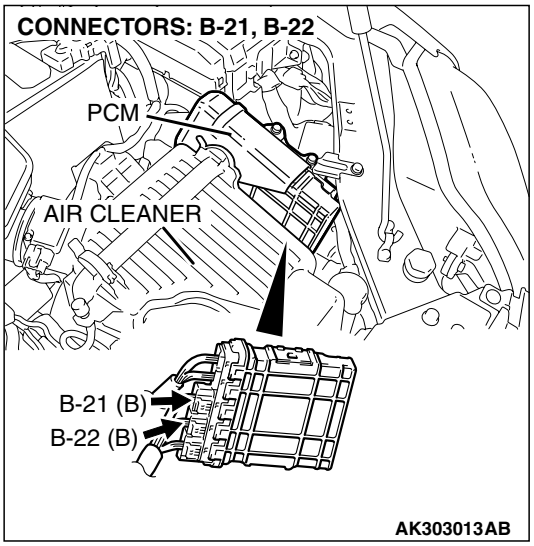




CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the PCM (terminal No. 91) from the output terminal (terminal No. 4) of the cylinder 2, 3 heated oxygen sensor (front).
- Terminal No. 2 of the cylinder 2, 3 heated oxygen sensor (front) is grounded with PCM (terminal No. 79).
- The PCM applies an offset voltage of 0.5 volt to terminal No. 2 of the cylinder 1, 4 heated oxygen sensor (front).

TECHNICAL DESCRIPTION

- The cylinder 2, 3 heated oxygen sensor (front) detects the concentration of oxygen in the exhaust gas; it converts those data to voltage, and inputs the resulting signals to the PCM.
- When the cylinder 2, 3 heated oxygen sensor (front) begins to deteriorate, the heated oxygen sensor signal response becomes poor.
- The PCM checks for the cylinder 2, 3 heated oxygen sensor (front) output voltage.

DESCRIPTIONS OF MONITOR METHODS

Cylinder 2, 3 heated oxygen sensor (front) output voltage is over specified range.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

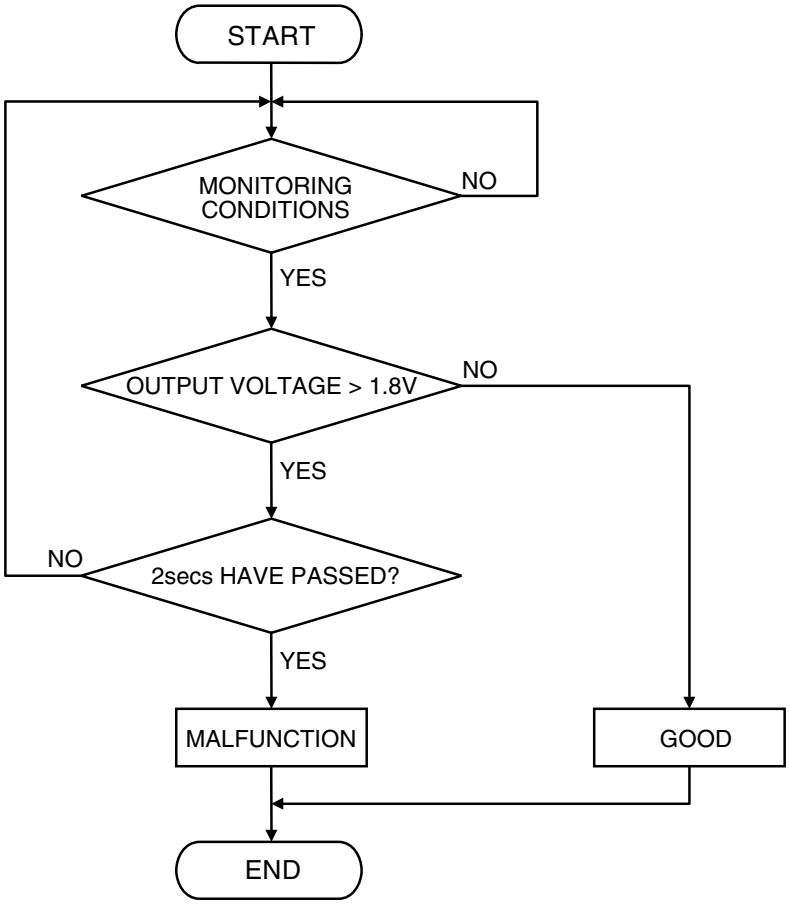
- Heated oxygen sensor heater (front) monitor
- Misfire monitor
- Fuel system monitor

Sensor (The sensor below is determined to be normal)

- Mass airflow sensor
- Engine coolant temperature sensor
- Intake air temperature sensor
- Barometric pressure sensor
- Throttle position sensor
- Accelerator pedal position sensor

DTC SET CONDITIONS

Logic Flow Chart



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Check Condition

- 2 seconds or more have passed since the engine starting sequence was completed.
- Heated oxygen sensor offset voltage is between 0.4 and 0.6 volt.

Judgement Criterion

- Cylinder 2, 3 heated oxygen sensor (front) output voltage has continued to be 1.8 volts or higher for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 24 P.13A-9.

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

- Short circuit in cylinder 2, 3 heated oxygen sensor (front) output line.
- Connector damage.
- PCM failed.

TSB Revision

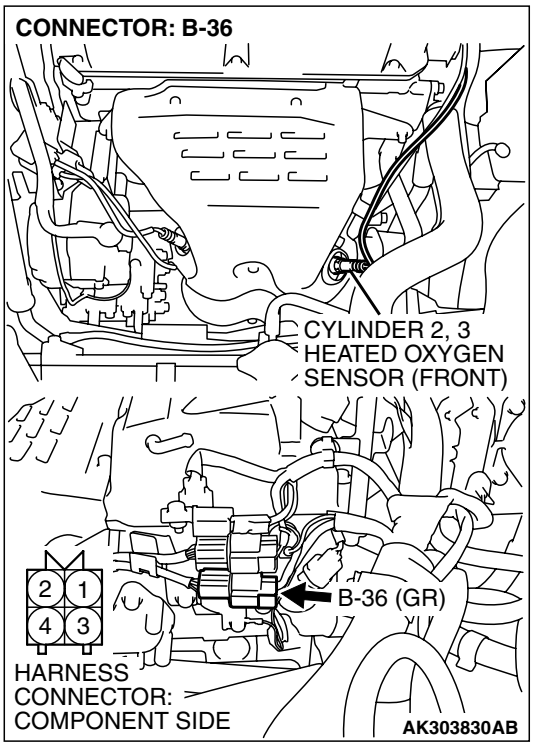
DIAGNOSIS

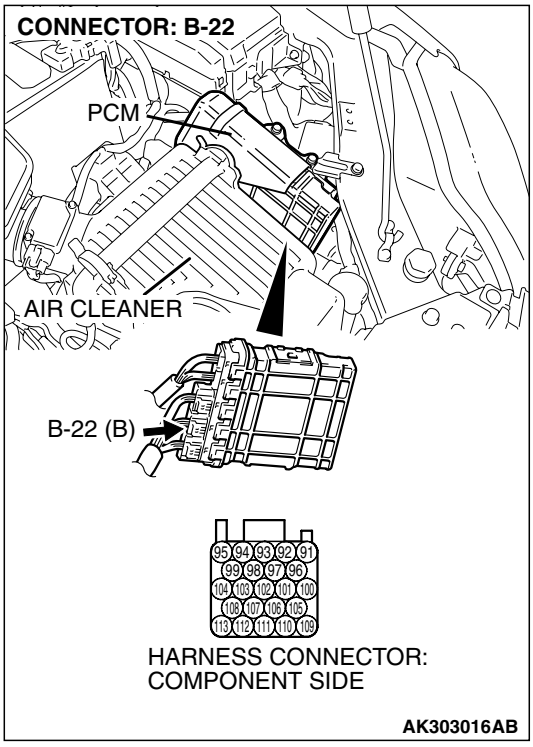
STEP 1. Check harness connector B-36 at cylinder 2, 3 heated oxygen sensor (front) and harness connector B-22 at PCM for damage.

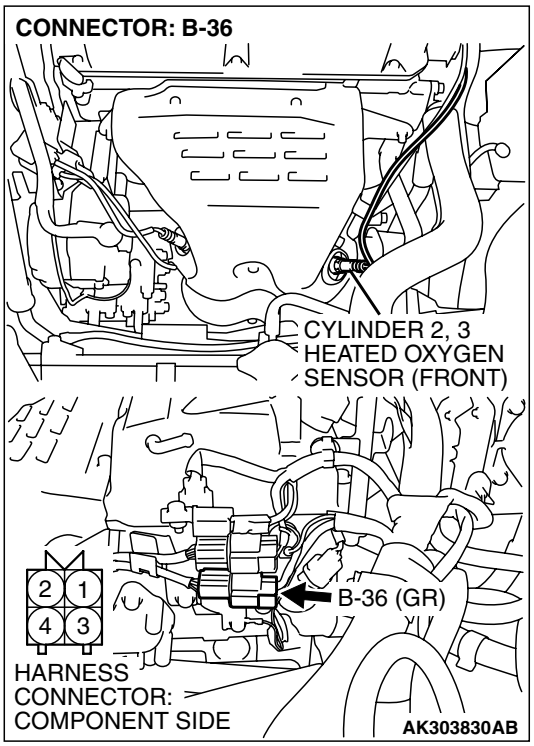
Q: Is the harness connector in good condition?

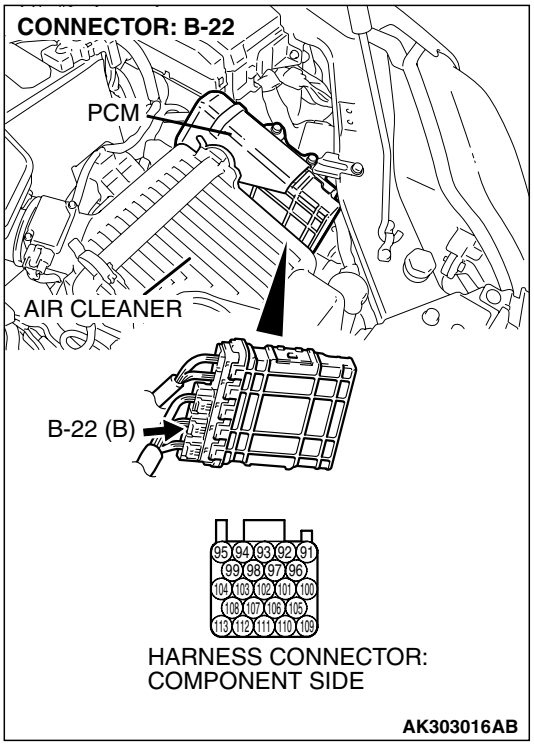
YES : Go to Step 2.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 3.









STEP 2. Check for short circuit to power supply between cylinder 2, 3 heated oxygen sensor (front) connector B-36 (terminal No. 4) and PCM connector B-22 (terminal No. 91).
Q: Is the harness wire in good condition?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 3.

NO : Repair it. Then go to Step 3.

STEP 3. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 24 P.13A-9.

(2) Check the diagnostic trouble code (DTC).

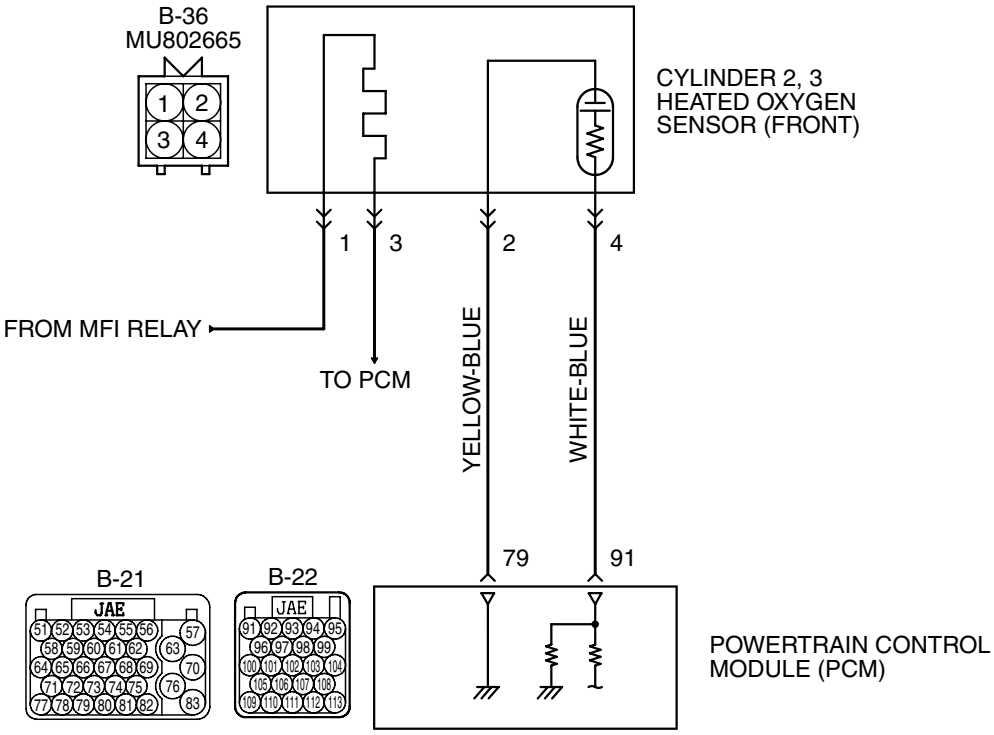
Q: Is DTC P0152 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0153: Cylinder 2, 3 Heated Oxygen Sensor (front) Circuit Slow Responce

Cylinder 2, 3 Heated Oxygen Sensor (front) Circuit



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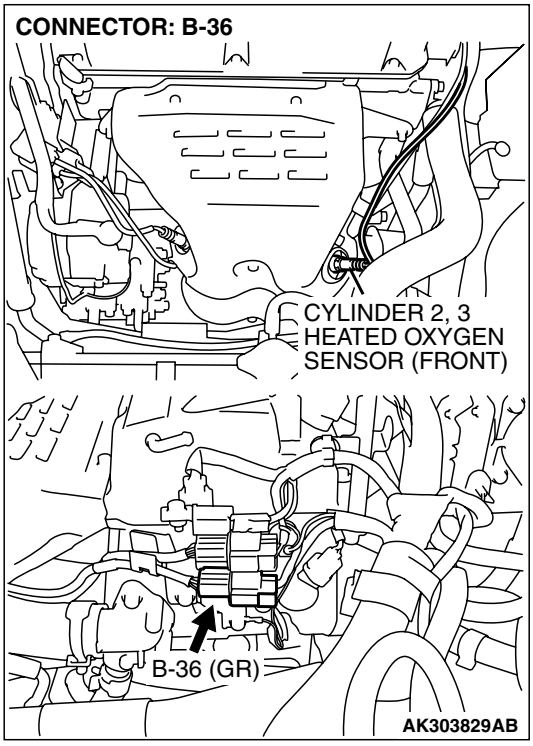
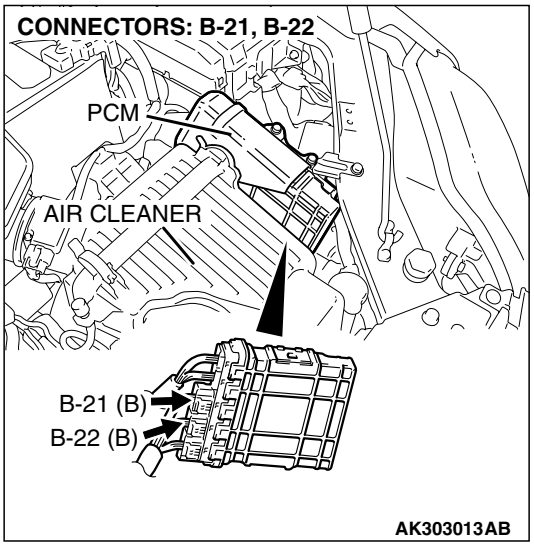




CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the PCM (terminal No. 91) from the output terminal (terminal No. 4) of the cylinder 2, 3 heated oxygen sensor (front).
- Terminal No. 2 of the cylinder 2, 3 heated oxygen sensor (front) is grounded with PCM (terminal No. 79).
- The PCM applies an offset voltage of 0.5 volt to terminal No. 2 of the cylinder 1, 4 heated oxygen sensor (front).

TECHNICAL DESCRIPTION

- The cylinder 2, 3 heated oxygen sensor (front) detects the concentration of oxygen in the exhaust gas; it converts those data to voltage, and inputs the resulting signals to the PCM.
- When the cylinder 2, 3 heated oxygen sensor (front) begins to deteriorate, the cylinder 2, 3 heated oxygen sensor signal response becomes poor.
- The PCM checks for circuit the cylinder 2, 3 heated oxygen sensor (front) rich/lean switching frequency.

DESCRIPTIONS OF MONITOR METHODS

Cylinder 2, 3 heated oxygen sensor (front) rich/lean switching frequency is under specified value.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

- Heated oxygen sensor heater (front) monitor
- Misfire monitor
- Fuel system monitor

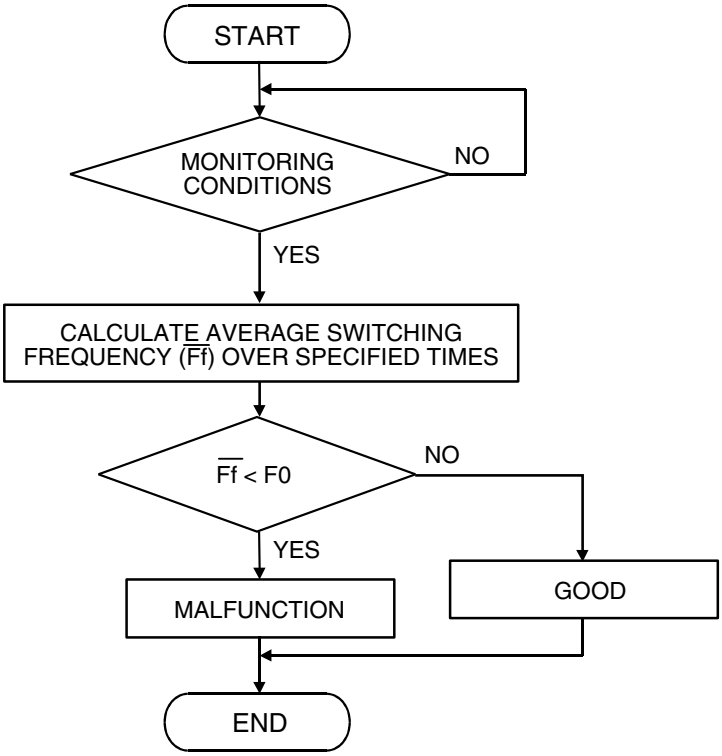
Sensor (The sensor below is determined to be normal)

- Mass airflow sensor
- Engine coolant temperature sensor
- Intake air temperature sensor
- Barometric pressure sensor
- Throttle position sensor
- Accelerator pedal position sensor

TSB Revision

DTC SET CONDITIONS

Logic Flow Chart



F0: THRESHOLD VALUE FOR AVERAGE SWITCHING FREQUENCY

AK302021

Check Conditions

- Engine coolant temperature is higher than 60°C (140°F).
- Engine speed is between 1,200 and 3,500 r/min.
- Volumetric efficiency is between 25 and 60 percent.
- Under the closed loop air/fuel control.
- The accelerator pedal is open.
- Short-term fuel trim is at between –25 and +25 percent.
- More than 2 seconds have elapsed after the above mentioned conditions have been met.
- The PCM monitors for this condition for 7 cycles of 10 seconds each during the drive cycle.

Judgement Criterion

- The average of the cylinder 2, 3 heated oxygen sensor (front) rich/lean switching frequency is less than 9 times per 10 seconds.

NOTE: If the sensor switching frequency is lower than the Judgement Criteria due to the M.U.T.-III OBD-II test Mode – HO2S Test Results, it is assumed that the heated oxygen sensor has deteriorated. If it is higher, it is assumed that the harness is damaged or has a short circuit.
If the heated oxygen sensor signal voltage has not changed even once (lean/rich) after the DTC was erased, the sensor switch time will display as 0 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 1 P.13A-9.

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

- Cylinder 2, 3 heated oxygen sensor (front) deteriorated.
- Connector damage.
- PCM failed.

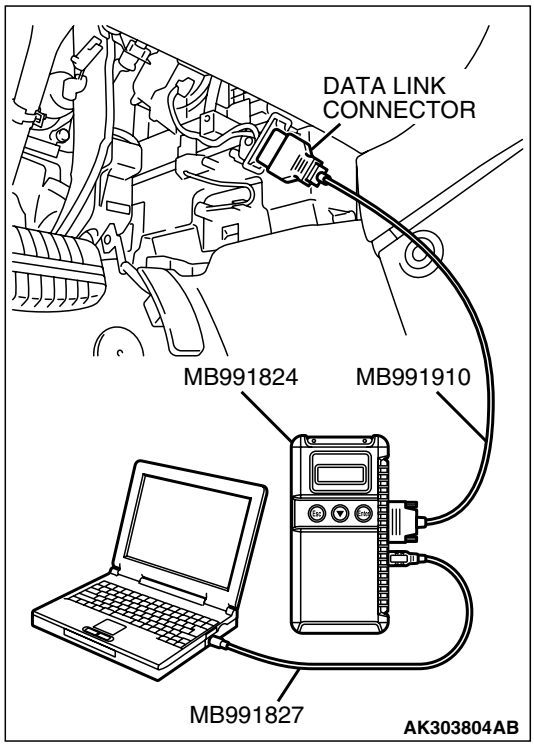
TSB Revision

DIAGNOSIS

Required Special Tools:

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

STEP 1. Using scan tool MB991958, check data list item AE: Cylinder 2, 3 Heated Oxygen Sensor (front).



⚠ 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.

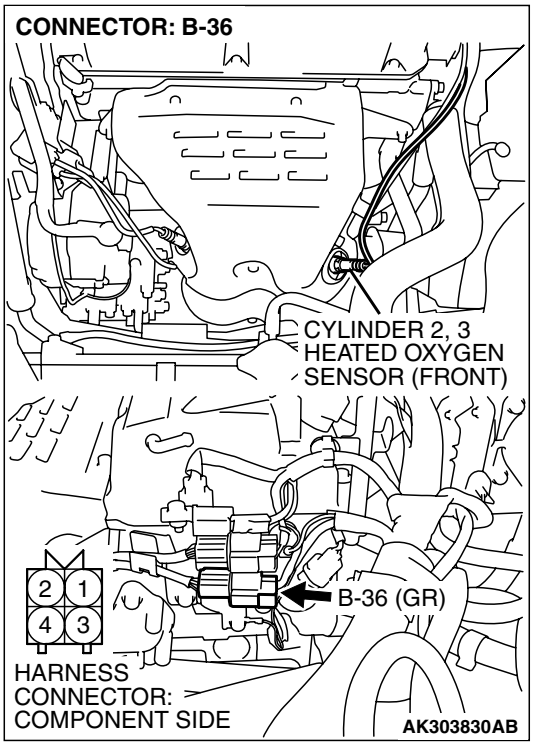
(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991958 to the data reading mode for item AE, Cylinder 2, 3 Heated Oxygen Sensor (front).
(4) Warm up the engine, 2,500 r/min.
  - Output voltage repeats 0.4 volt or less and 0.6 – 1.0 volt 10 times or more within 10 seconds.
(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

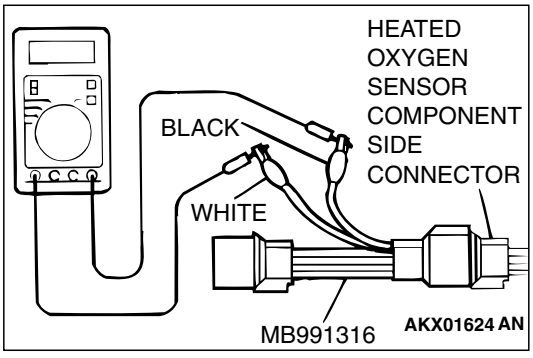
YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-14.

NO : Go to Step 2.

STEP 2. Check the cylinder 2, 3 heated oxygen sensor (front).



(1) Disconnect the cylinder 2, 3 heated oxygen sensor (front) connector B-36 and connect test harness special tool MB991316 to the connector on the cylinder 2, 3 heated oxygen sensor (front) side.
(2) Warm up the engine until engine coolant temperature reaches 80°C (176°F) or higher.
(3) Rev the engine for 5 minutes or more with the engine speed of 4,500 r/min.



(4) Connect a digital voltage meter between terminal No. 2 (black clip) and terminal No. 4 (white clip).
(5) Warm up the engine, 2,500 r/min
- Output voltage repeats 0 – 0.4 volt and 0.6 – 1.0 volt 10 times or more within 10 seconds.

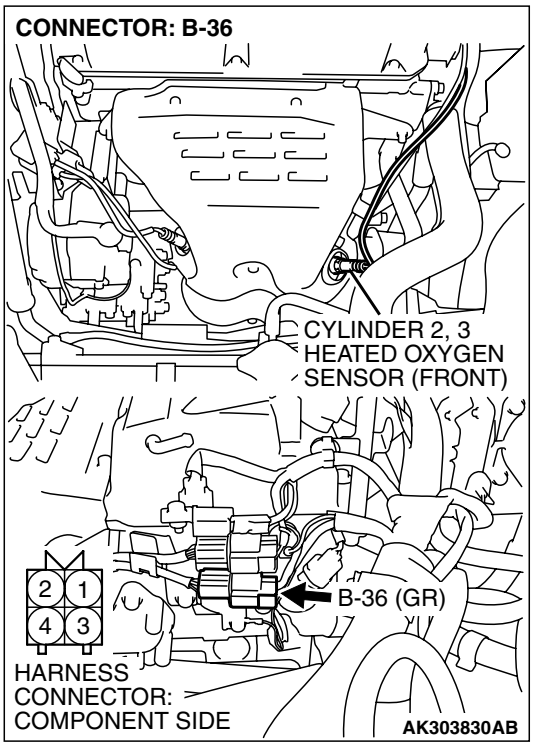
⚠ CAUTION

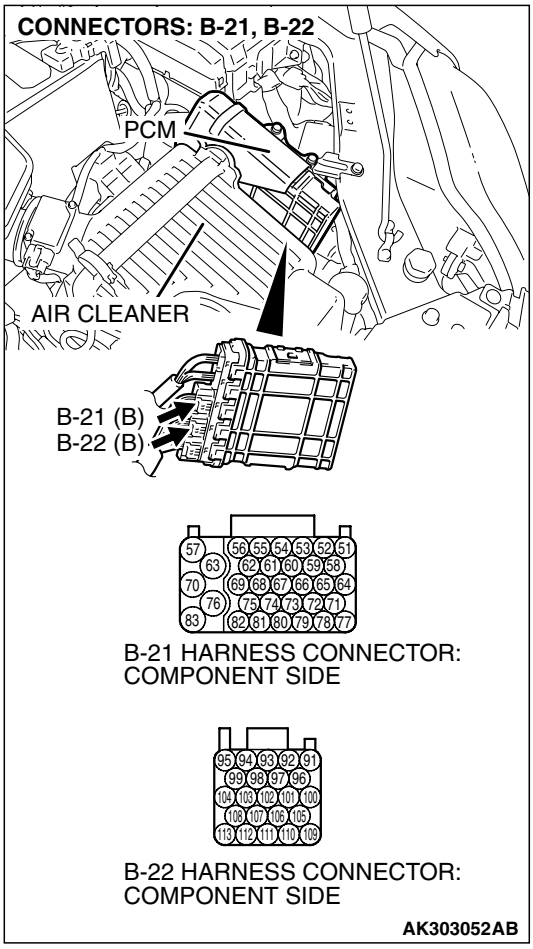
- **Be very careful when connecting the jumper wires; incorrect connection can damage the heated oxygen sensor.**
- **Be careful the heater is broken when voltage of beyond 8 volts is applied to the heated oxygen sensor heater.**

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 a jumper wire to connect the terminal No. 1 (red clip) and the terminal No. 3 (blue clip) of the heated oxygen sensor with the positive terminal and the negative terminal of 8 volts power supply respectively, then check again.

Q: Is the sensor operating properly?

YES : Go to Step 3.
NO : Replace the cylinder 2, 3 heated oxygen sensor (front). Then go to Step 4.





STEP 3. Check harness connector B-36 at cylinder 2, 3 heated oxygen sensor (front) and harness connector B-21, B-22 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11.Then go to Step 4.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 4.

TSB Revision

STEP 4. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 1 P.13A-9.

(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0153 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0154: Cylinder 2, 3 Heated Oxygen Sensor (front) No Activity Detected

⚠ CAUTION

If DTC P0154 has been set, TCL related DTC U1120 is also set. After P0154 has been diagnosed, don't forget to erase DTC U1120.

Cylinder 2, 3 Heated Oxygen Sensor (front) No Activity Detected Circuit

- Refer to DTC P0151 – Cylinder 2, 3 Heated Oxygen Sensor (Front) Circuit Low Voltage P.13A-345.
- Refer to DTC P0202 – Injector Circuit-cylinder 2 P.13A-478.
- Refer to DTC P0203 – Injector Circuit-cylinder 3 P.13A-488.

CIRCUIT OPERATION

- Refer to DTC P0151 – Cylinder 2, 3 Heated Oxygen Sensor (Front) Circuit Low Voltage P.13A-345.
- Refer to DTC P0202 – Injector Circuit-cylinder 2 P.13A-478.
- Refer to DTC P0203 – Injector Circuit-cylinder 3 P.13A-488.

TECHNICAL DESCRIPTION

- The PCM effects air/fuel ratio feedback control in accordance with the signals from the cylinder 2, 3 heated oxygen sensor (front).
- If the cylinder 2, 3 heated oxygen sensor (front) has deteriorated, corrections will be made by the cylinder 2, 3 heated oxygen sensor (rear).
- DTC P0154 becomes stored in memory if a failure is detected in the above air/fuel ratio feedback control system.

DESCRIPTIONS OF MONITOR METHODS

Cylinder 2, 3 heated oxygen sensor (front) output voltage does not cross lean/rich criteria (about 0.5 volt) within specified period.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

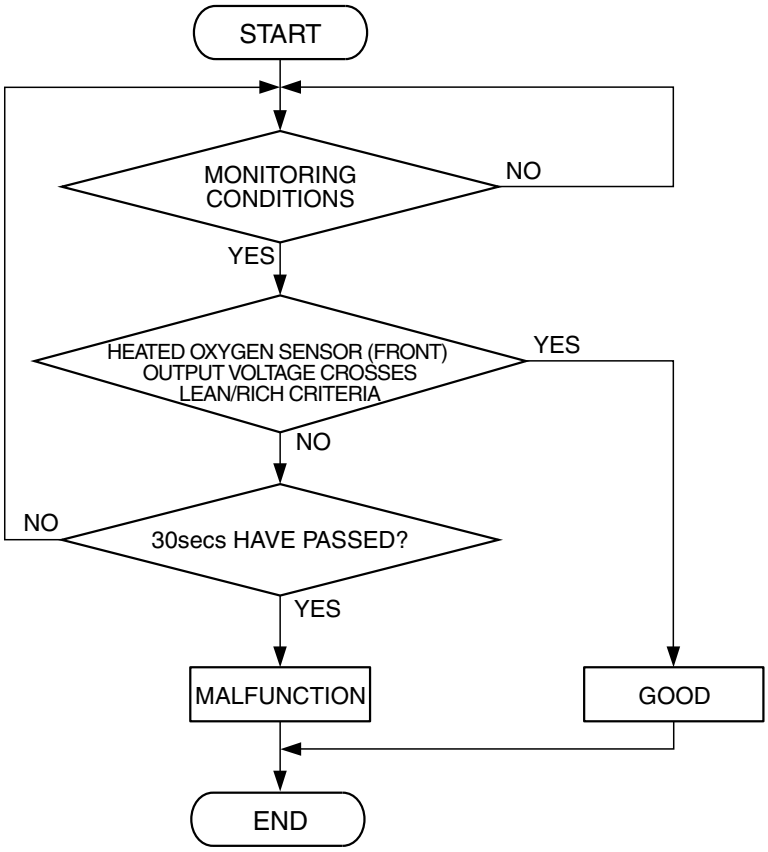
- Misfire monitor

Sensor (The sensor below is determined to be normal)

- Mass airflow sensor
- Engine coolant temperature sensor
- Intake air temperature sensor
- Barometric pressure sensor
- Throttle position sensor

DTC SET CONDITIONS

Logic Flow Chart



AK503611

Check Conditions

- 20 seconds or more have passed since the engine starting sequence was completed.
- Engine coolant temperature is higher than 7°C (45° F).
- Engine speed is higher than 1,200 r/min.
- Volumetric efficiency is higher than 30 percent.
- Throttle position sensor output voltage is lower than 4 volts.
- Except while fuel is being shut off.
- Monitoring time: 30 seconds.

Judgement Criterion

- Cylinder 2, 3 heated oxygen sensor (front) output voltage does not get across lean/rich criteria (about 0.5 volt) within about 30 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 12 P.13A-9.

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

- Cylinder 2, 3 heated oxygen sensor (front) deteriorated.
- Harness damage in cylinder 2, 3 heated oxygen sensor (front) output line.
- Cylinder 2, 3 heated oxygen sensor (rear) deteriorated.

  NOTE: When the cylinder 2, 3 heated oxygen sensor (front) begins to deteriorate, the heated oxygen sensor output voltage will deviate from the voltage when the sensor was new (normally 0.5 volt at stoichiometric ratio). This deviation will be corrected by the cylinder 2, 3 heated oxygen sensor (rear).

TSB Revision

If the cylinder 2, 3 heated oxygen sensor (rear) responds poorly because it has deteriorated, it will improperly correct the cylinder 2, 3 heated oxygen sensor (front). Thus, even when closed loop control is being effected, the fluctuation of the cylinder 2, 3 heated oxygen sensor (front) output voltage decreases, without intersecting with 0.5 volt. As a result, there is a possibility of DTC P0154 becoming registered.

- Open circuit in cylinder 2, 3 injector.
- Harness damage in cylinder 2, 3 injector circuit.
- Connector damage.
- PCM failed.
- Exhaust leak.
- Air drawn in from gaps in gasket, seals, etc.
- Incorrect fuel pressure.

DIAGNOSIS

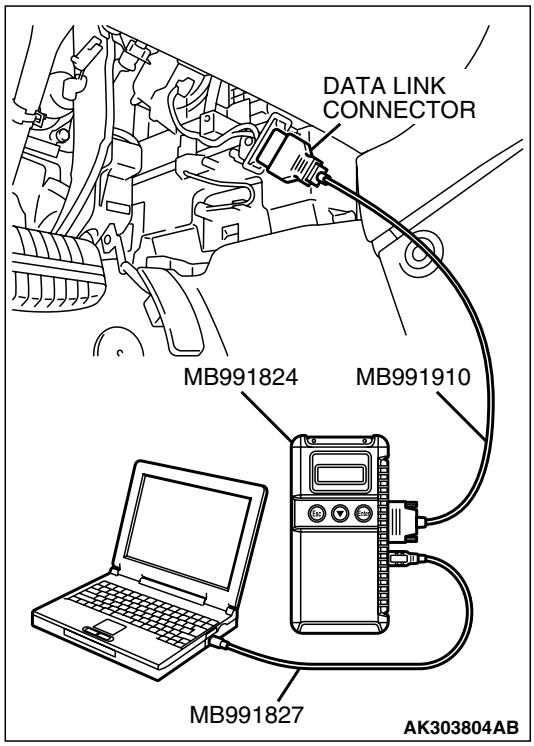
Required Special Tools:

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

STEP 1. Using scan tool MB991958, check data list item AF: 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 AF, Cylinder 2, 3 Heated Oxygen Sensor (rear).
  - Warming up the engine. When the engine is revved, the output voltage should repeat 0 volt and 0.6 to 1.0 volt alternately.
(4) Turn the ignition switch to the "LOCK" (OFF) position.



Q: Is the sensor operating properly?

YES : Go to Step 2.
NO : Refer to DTC P0157 – Cylinder 2, 3 Heated Oxygen Sensor (rear) Circuit Low Voltage P.13A-382, DTC P0158 – Cylinder 2, 3 Heated Oxygen Sensor (rear) Circuit High Voltage P.13A-399, DTC P0159 – Cylinder 2, 3 Heated Oxygen Sensor (rear) Circuit Slow Response P.13A-404, DTC P0160 – Cylinder 2, 3 Heated Oxygen Sensor (rear) Circuit No Activity Detected P.13A-408.

STEP 2. Check for exhaust leak.

Q: Are there any abnormalities?

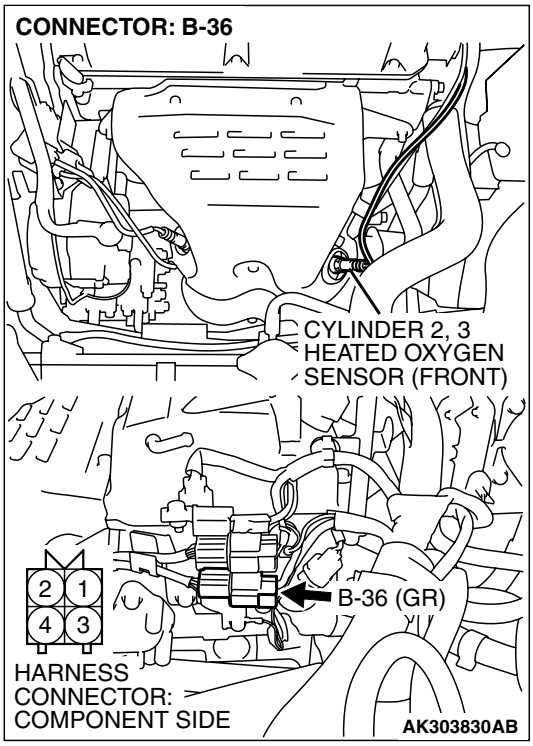
YES : Repair it. Then go to Step 12.
NO : Go to Step 3.

STEP 3. Check for intake system vacuum leak.

Q: Are there any abnormalities?

YES : Repair it. Then go to Step 12.
NO : Go to Step 4.

TSB Revision



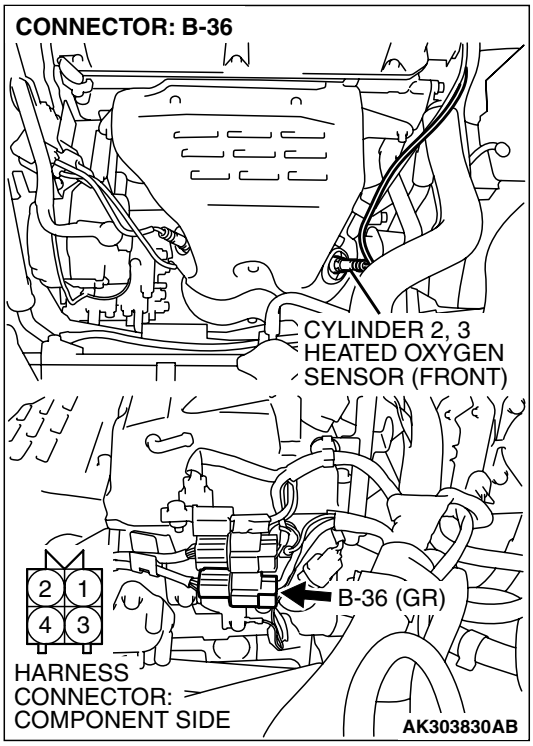
STEP 4. Check harness connector B-36 at the cylinder 2, 3 heated oxygen sensor (front) for damage.

Q: Is the harness connector in good condition?

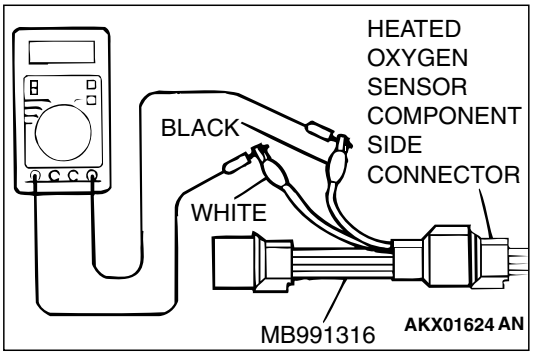
YES : Go to Step 5.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

STEP 5. Check the cylinder 2, 3 heated oxygen sensor (front).



(1) Disconnect the cylinder 2, 3 heated oxygen sensor (front) connector B-36 and connect test harness special tool MB991316 to the connector on the cylinder 2, 3 heated oxygen sensor (front) side.
(2) Warm up the engine until engine coolant temperature reaches 80°C (176°F) or higher.
(3) Rev the engine for 5 minutes or more with the engine speed of 4,500 r/min.



(4) Connect a digital voltage meter between terminal No. 2 (black clip) and terminal No. 4 (white clip).
(5) While repeatedly revving the engine, measure the cylinder 2, 3 heated oxygen sensor (front) output voltage.

Standard value: 0.6 – 1.0 V

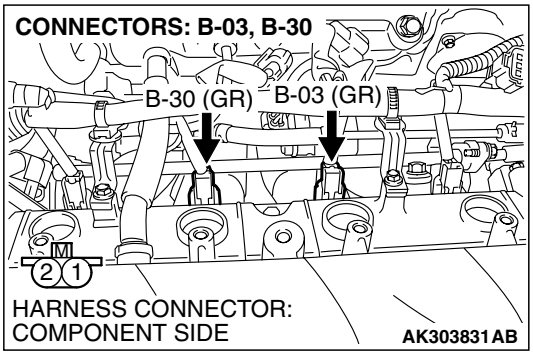
⚠ CAUTION

- **Be very careful when connecting the jumper wires; incorrect connection can damage the heated oxygen sensor.**
- **Be careful the heater can be damaged if a voltage 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 a jumper wire to connect the terminal No. 1 (red clip) and the terminal No. 3 (blue clip) of the heated oxygen sensor with the positive terminal and the negative terminal of 8 volts power supply respectively, then check again.

Q: Is the measured voltage between 0.6 and 1.0 volt?

YES : Go to Step 6.
NO : Replace the cylinder 2, 3 heated oxygen sensor (front). Then go to Step 12.

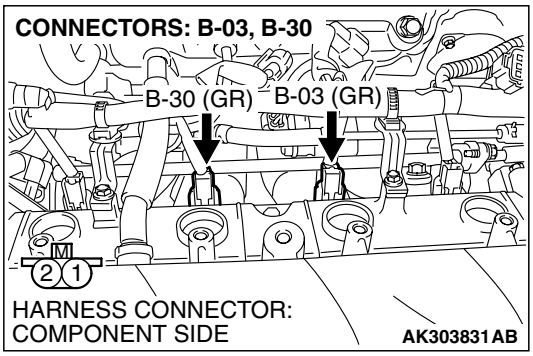


STEP 6. Check harness connector B-03, B-30 at injector for damage.

Q: Is the harness connector in good condition?

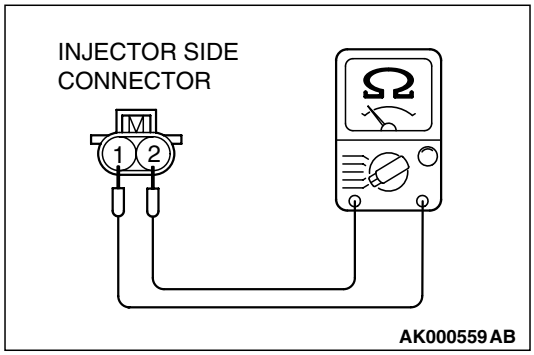
YES : Go to Step 7.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.



STEP 7. Check the cylinder 2, 3 injector.

(1) Disconnect each injector connector.



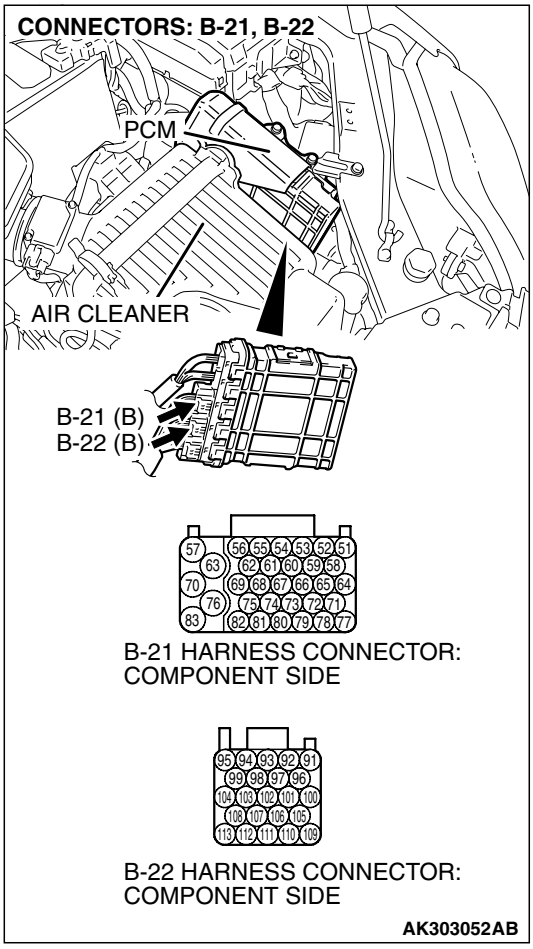
(2) Measure the resistance between injector side connector terminal No. 1 and No. 2.

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

Q: Is the measured resistance between 10.5 and 13.5 ohms [at 20°C (68°F)]?

YES : Go to Step 8.

NO : Replace the injector. Then go to Step 12.



STEP 8. Check harness connector B-21, B-22 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 9.

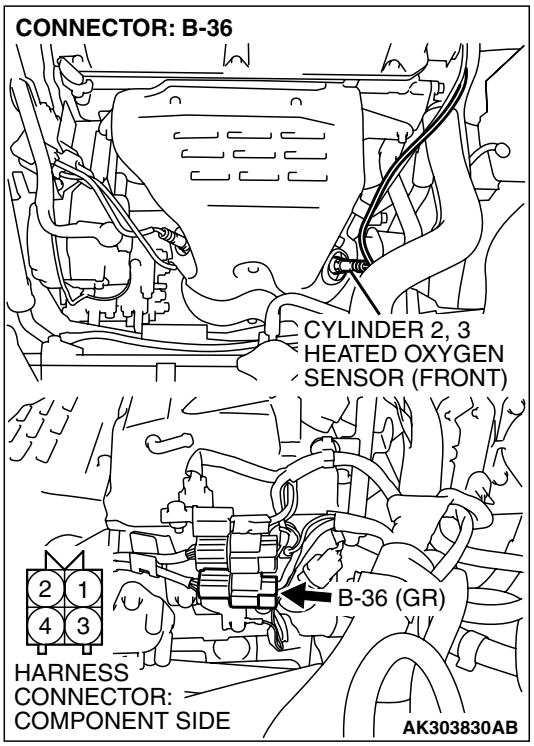
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

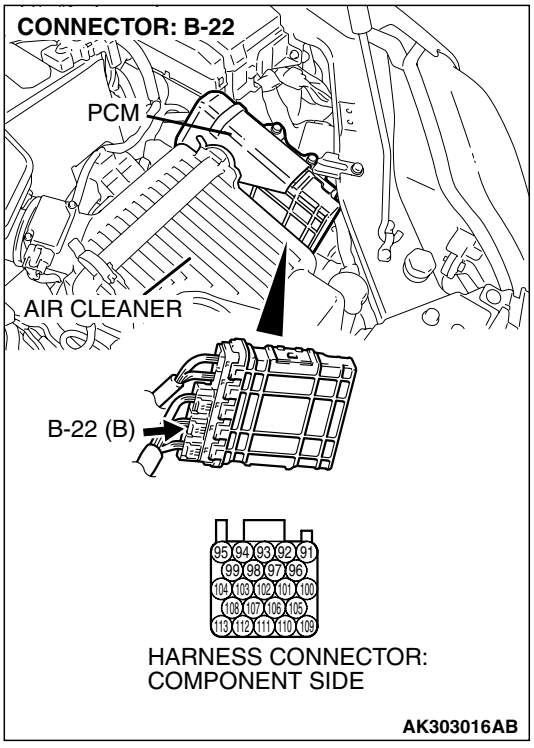
STEP 9. Check for harness damage between cylinder 2, 3 heated oxygen sensor (front) connector B-36 (terminal No. 4) and PCM connector B-22 (terminal No. 91).

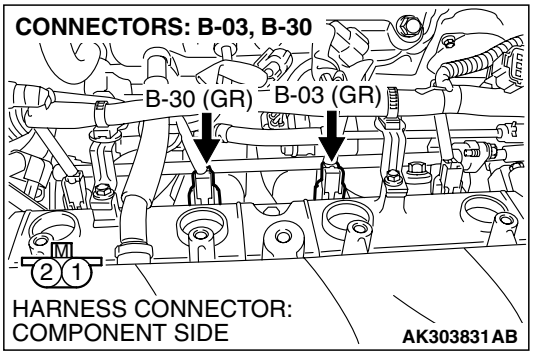
Q: Is the harness wire in good condition?

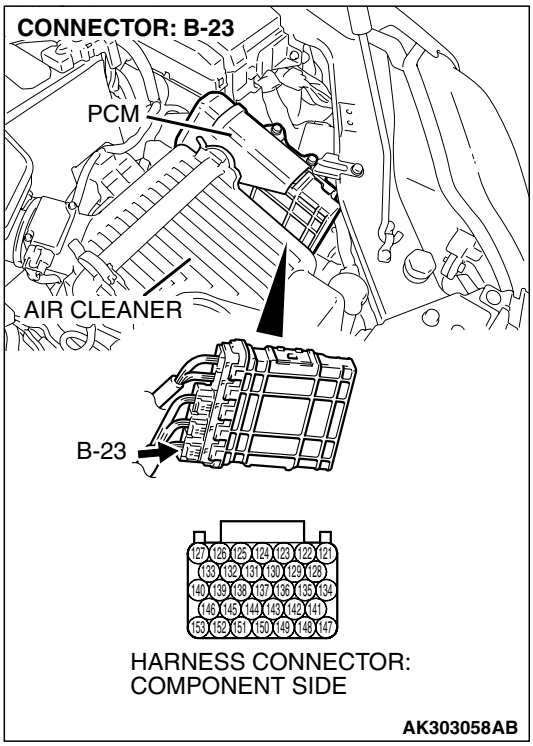
YES : Go to Step 10.

NO : Repair it. Then go to Step 12.









STEP 10. Check for harness damage between cylinder 2, 3 injector connector and PCM connector.

a. Check the harness wire between injector connector B-30 (terminal No. 2) and PCM connector B-23 (terminal No. 146) at No. 2 cylinder.

b. Check the harness wire between injector connector B-03 (terminal No. 2) and PCM connector B-23 (terminal No. 140) at No. 3 cylinder.

Q: Is the harness wire in good condition?

YES : Go to Step 11.

NO : Repair it. Then go to Step 12.

STEP 11. Check the fuel pressure.

Refer to On-vehicle Service – Fuel Pressure Test P.13A-1163.

Q: Is the fuel pressure normal?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 12.

NO : Repair it. Then go to Step 12.

STEP 12. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 12 P.13A-9.

(2) Check the diagnostic trouble code (DTC).

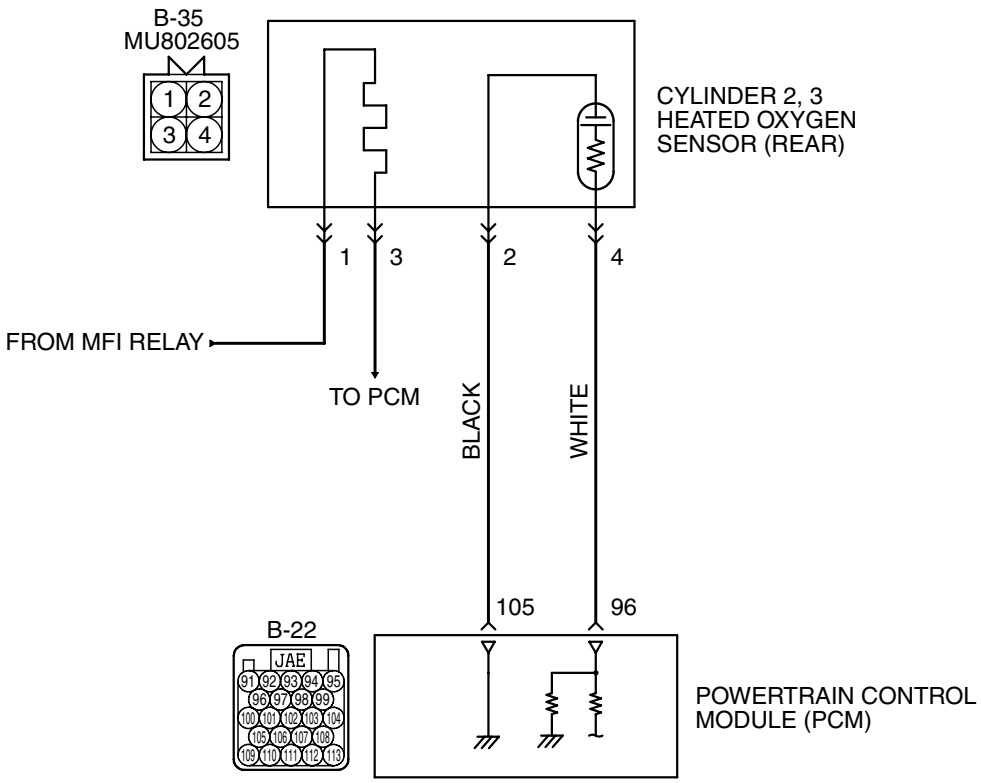
Q: Is DTC P0154 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0157: Cylinder 2, 3 Heated Oxygen Sensor (rear) Circuit Low Voltage

Cylinder 2, 3 Heated Oxygen Sensor (rear) Circuit



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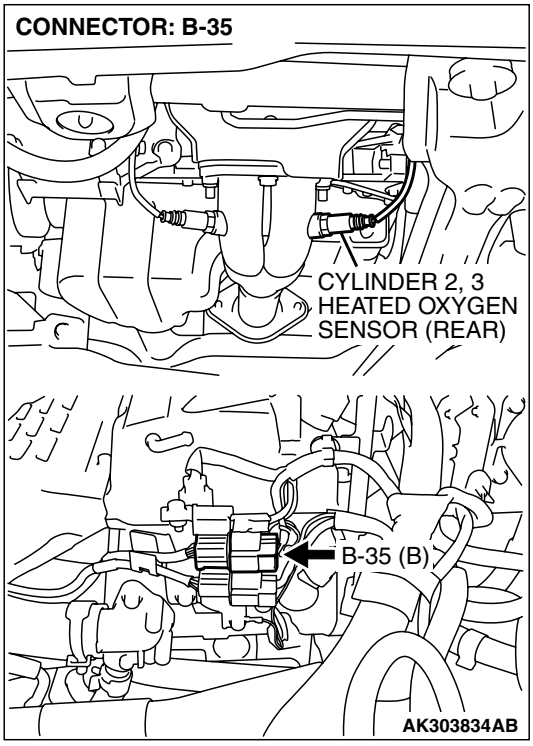
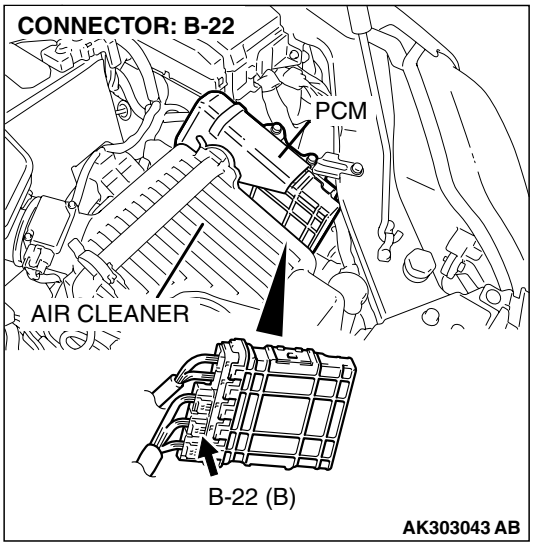




CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the PCM (terminal No. 96) from the output terminal (terminal No. 4) of the cylinder 2, 3 heated oxygen sensor (rear).
- Terminal No. 2 of the cylinder 2, 3 heated oxygen sensor (rear) is grounded with PCM (terminal No. 105).
- The PCM applies an offset voltage of 0.5 volt to terminal No. 2 of the cylinder 1, 4 heated oxygen sensor (front).

TECHNICAL DESCRIPTION

- The output signal of the cylinder 2, 3 heated oxygen sensor (front) is compensated by the output signal of the cylinder 2, 3 heated oxygen sensor (rear).
- The PCM checks for the cylinder 2, 3 heated oxygen sensor (rear) output voltage.

DESCRIPTIONS OF MONITOR METHODS

Cylinder 2, 3 heated oxygen sensor (rear) output voltage is under the specified range.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

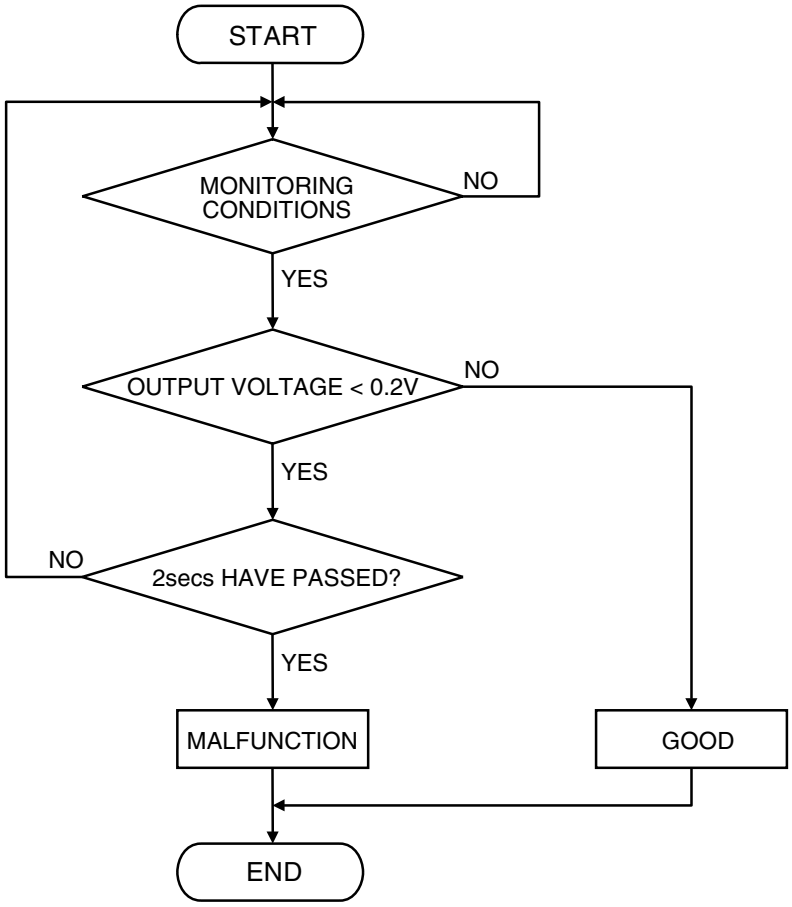
- Heated oxygen sensor heater (front) monitor
- Heated oxygen sensor heater (rear) monitor
- Air/fuel ratio feedback monitor

Sensor (The sensor below is determined to be normal)

- Mass airflow sensor
- Engine coolant temperature sensor
- Intake air temperature sensor
- Barometric pressure sensor

DTC SET CONDITIONS

Logic Flow Chart



AK502674

Check Conditions

- Heated oxygen sensor offset voltage is between 0.4 and 0.6 volt.
- Battery positive voltage is between 11 and 16.5 volts.
- 3 minutes or more have passed since the engine starting sequence was completed.

Judgement Criterion

- Cylinder 1, 4 heated oxygen sensor output voltage is lower than 0.2 volt for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 23 P.13A-9.

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

- Cylinder 2, 3 heated oxygen sensor (rear) failed.
- Open or shorted circuit in cylinder 2, 3 heated oxygen sensor (rear) output line, or harness damage.
- Open circuit in cylinder 2, 3 heated oxygen sensor (rear) ground line, or harness damage.
- Connector damage.
- PCM failed.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.

TSB Revision

- MB991827: USB Cable
- MB991910: Main Harness A

- MD998464: Test Harness
- MB991923: Power Plant ECU Check Harness

STEP 1. Using scan tool MB991958, check data list item AF: Cylinder 2, 3 Heated Oxygen Sensor (rear).

⚠ CAUTION

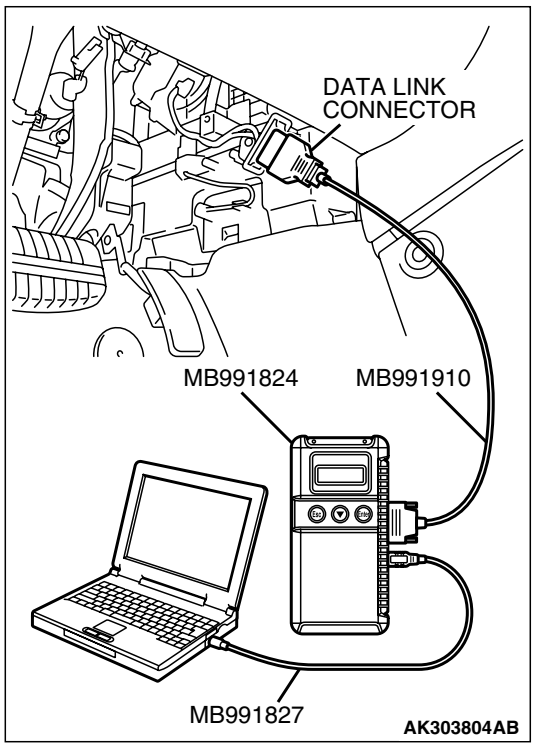
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(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 AF, Cylinder 2, 3 Heated Oxygen Sensor (rear).
  a. Transaxle: A/T: "L" range
  b. Drive with wide open throttle
  c. Engine: 3,500 r/min
    - The output voltages should be between 0.6 and 1.0 volt.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

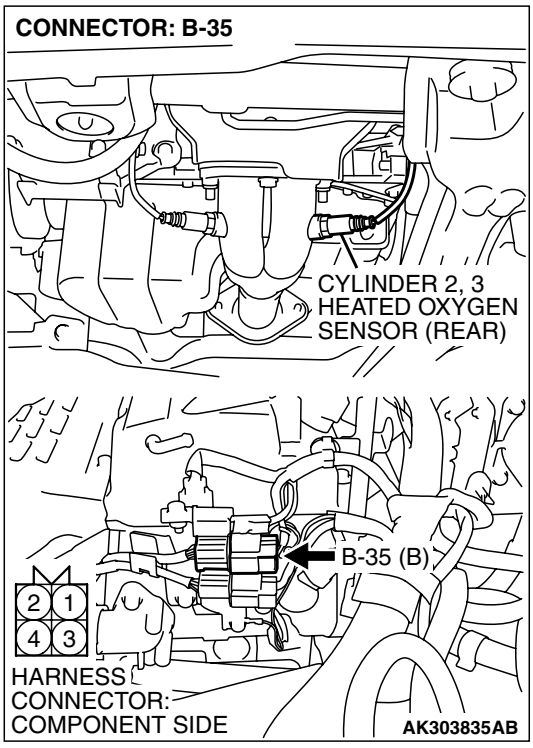
YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfuncitons P.00-14.

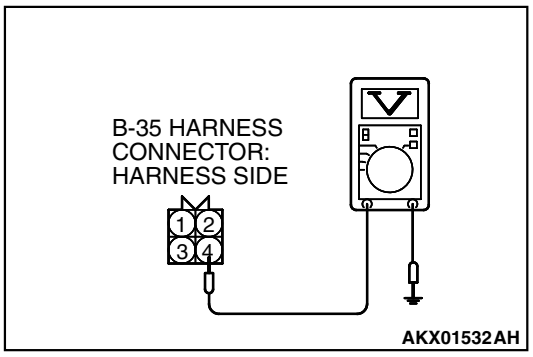
NO : Go to Step 2.



STEP 2. Measure the sensor output voltage at cylinder 2, 3 heated oxygen sensor (rear) connector B-35 by backprobing.

(1) Do not disconnect the connector B-35.
(2) Start the engine and run at idle.

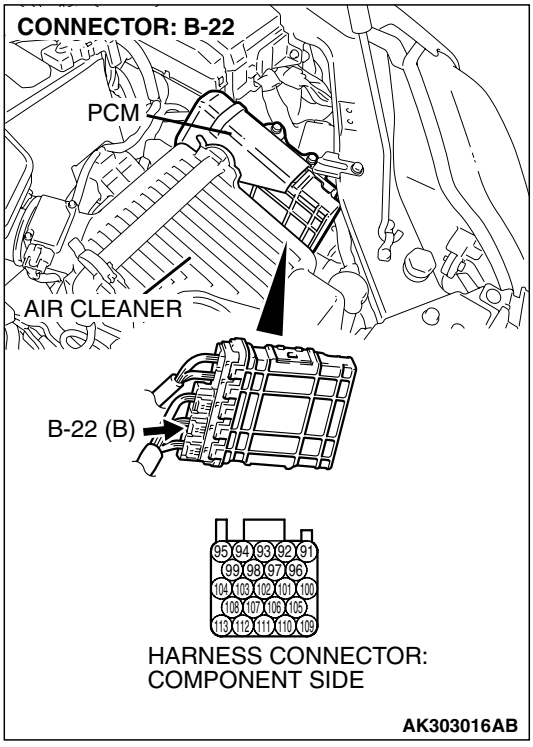


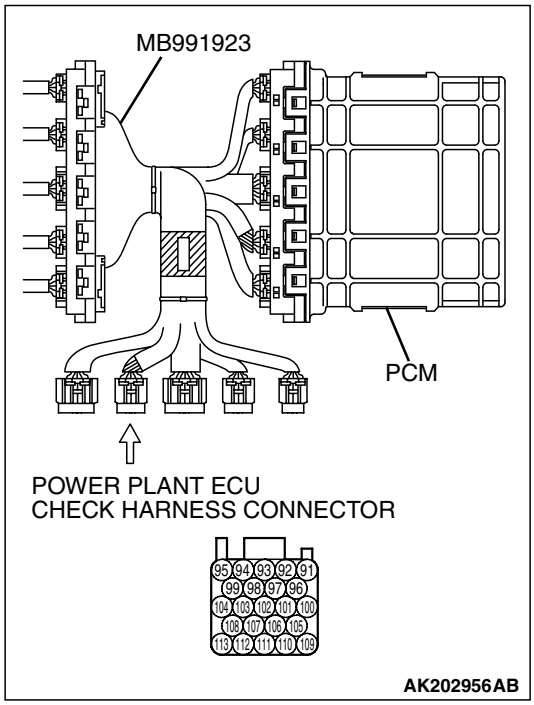


(3) Measure the voltage between terminal No. 4 and ground by backprobing under the following driving.
   a. Transaxle: "L" range
   b. Drive with wide open throttle
   c. Engine: 3,500 r/min or more
      - The output voltage should be between 1.0 and 1.5 volts.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the measured voltage between 1.0 and 1.5 volts?

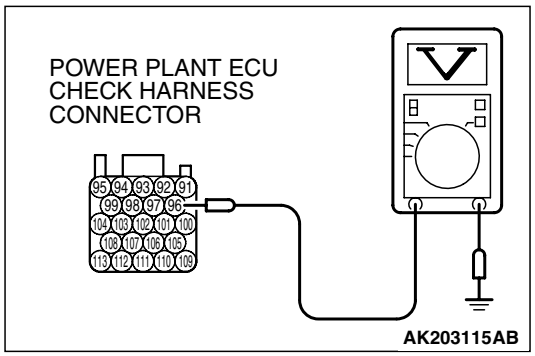
YES : Go to Step 3.
NO : Go to Step 7.





STEP 3. Measure the sensor output voltage at PCM connector B-22 by using power plant ECU check harness special tool MB991923.

(1) Disconnect all PCM connectors. Connect the power plant ECU check harness special tool MB991923 between the separated connectors.
(2) Start the engine and run at idle.



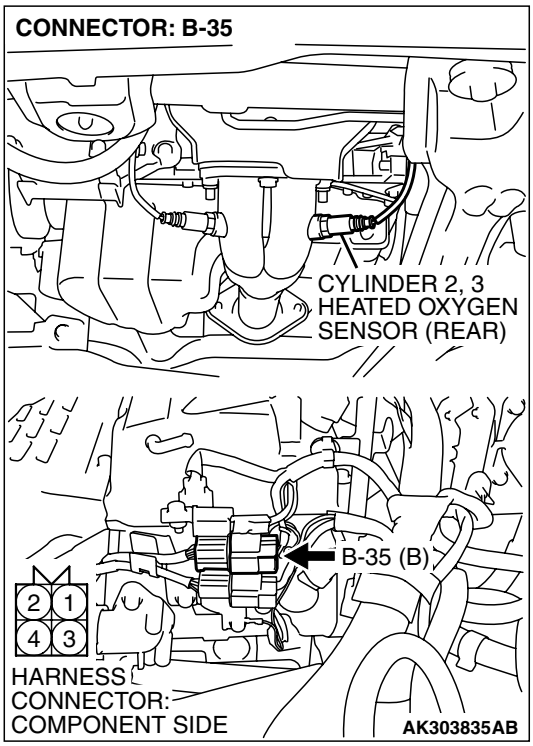
(3) Measure the voltage between terminal No. 96 and ground by backprobing under the following driving.
   a. Transaxle: "L" range
   b. Drive with wide open throttle
   c. Engine: 3,500 r/min or more
      - The output voltage should be between 1.0 and 1.5 volts.

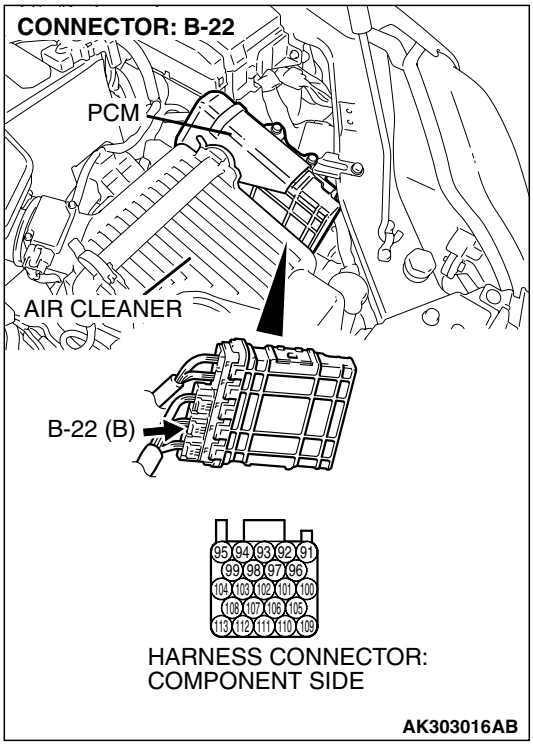
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the measured voltage between 1.0 and 1.5 volts?

YES : Go to Step 4.

NO : Go to Step 6.



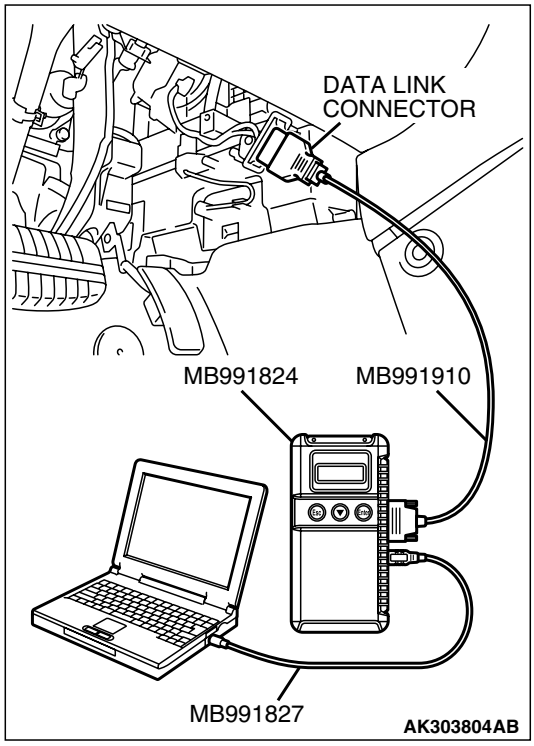


STEP 4. Check harness connector B-35 at cylinder 2, 3 heated oxygen sensor (rear) and harness connector B-22 at PCM for damage.

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 go to Step 14.



STEP 5. Using scan tool MB991958, check data list item AF: Cylinder 2, 3 Heated Oxygen Sensor (rear).

⚠ CAUTION

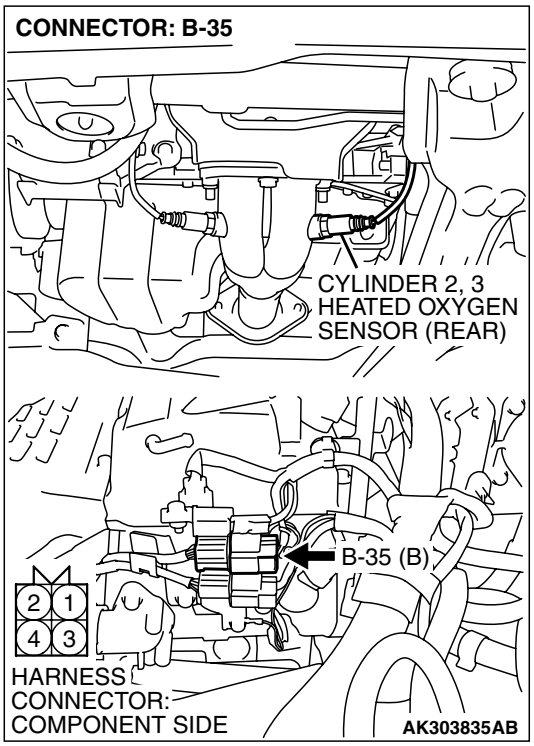
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

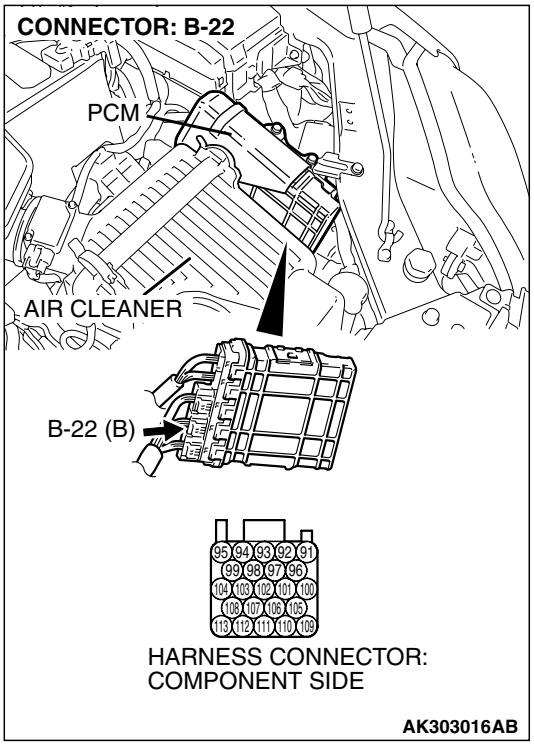
(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991958 to the data reading mode for item AF, Cylinder 2, 3 Heated Oxygen Sensor (rear).
  a. Transaxle: A/T: "L" range
  b. Drive with wide open throttle
  c. Engine: 3,500 r/min
    - The output voltages should be between 0.6 and 1.0 volt.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed 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 : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 14.



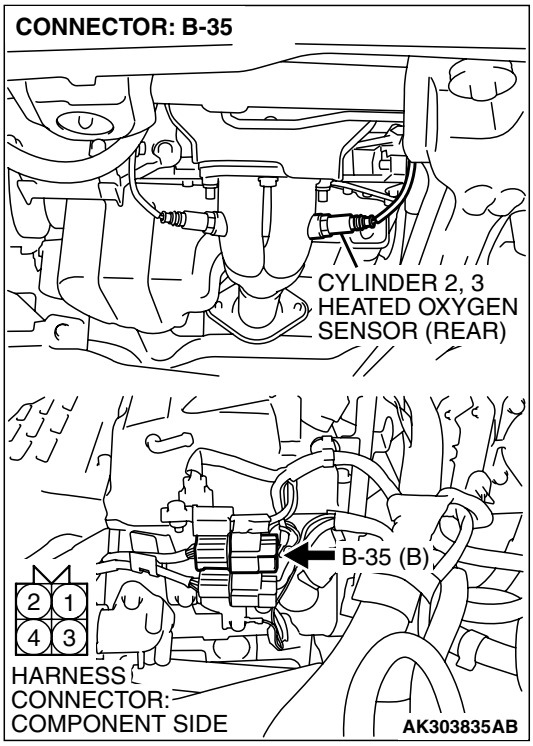


STEP 6. Check harness connector B-35 at cylinder 2, 3 heated oxygen sensor (rear) and harness connector B-22 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Repair harness wire between cylinder 2, 3 heated oxygen sensor (rear) connector B-35 (terminal No. 4) and PCM connector B-22 (terminal No. 96) because of open circuit or harness damage. Then go to Step 14.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.

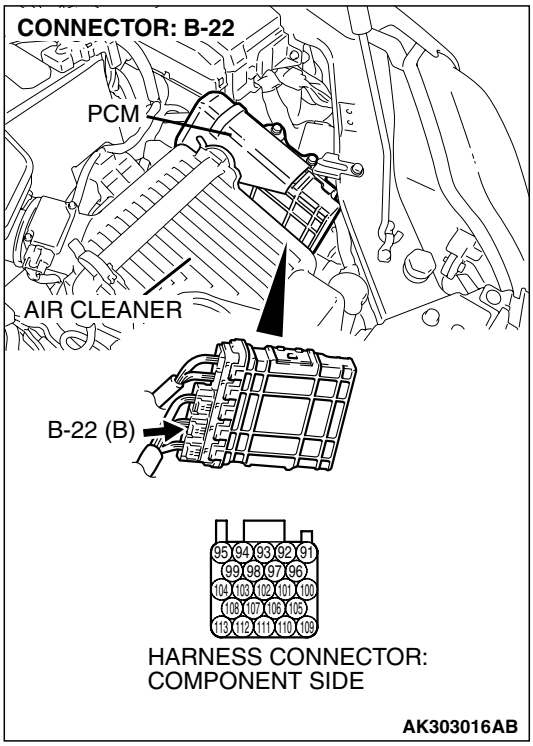


STEP 7. Check harness connector B-35 at cylinder 2, 3 heated oxygen sensor (rear) for damage.

Q: Is the harness connector in good condition?

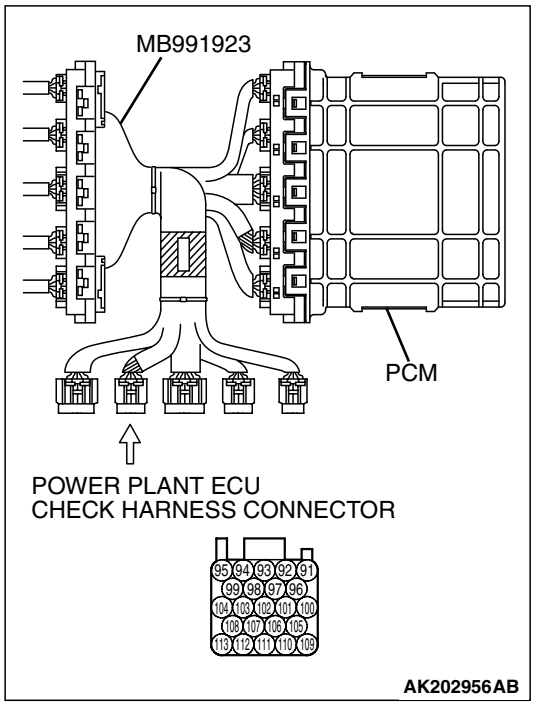
YES : Go to Step 8.

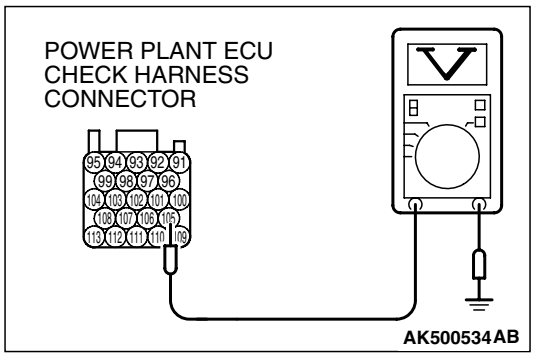
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.



STEP 8. Measure the sensor offset voltage at PCM connector B-22 by using power plant ECU check harness special tool MB991923.

(1) Disconnect all PCM connectors. Connect the power plant ECU check harness special tool MB991923 between the separated connectors.
(2) Turn the ignition switch to the "ON" position.



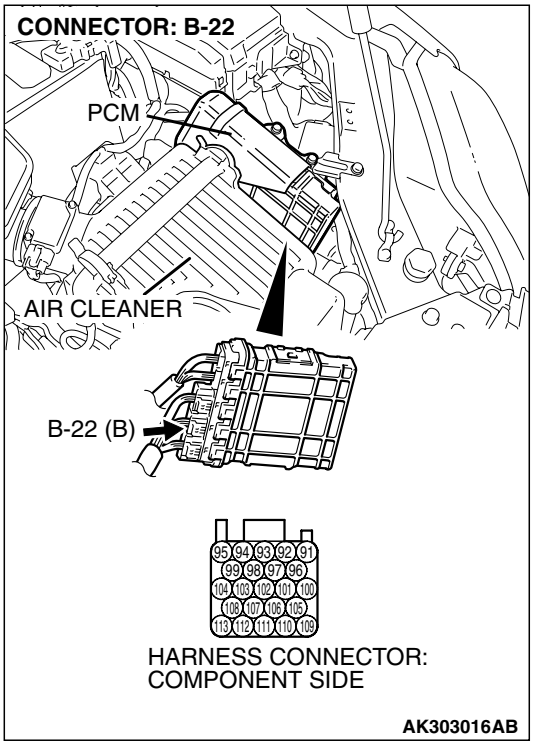


(3) Measure the voltage between terminal No. 105 and ground.
- Voltage should be between 0.4 and 0.6 volt.

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

Q: Is the measured voltage between 0.4 and 0.6 volt?

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

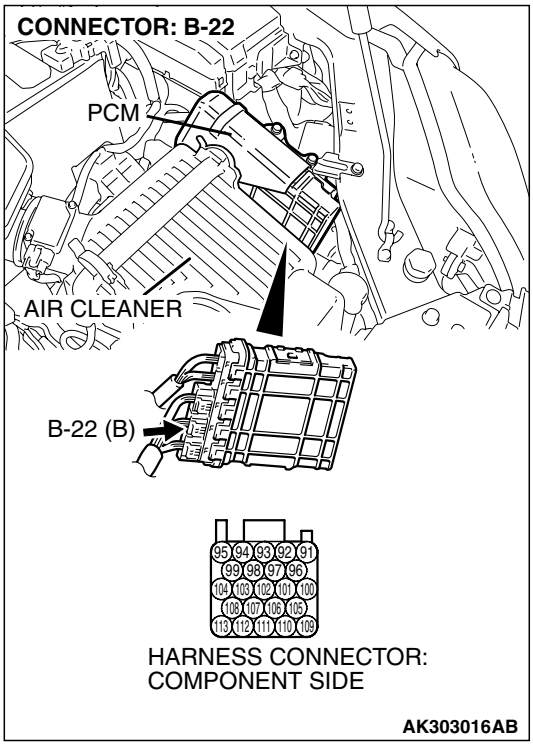


STEP 9. Check harness connector B-22 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Repair harness wire between cylinder 2, 3 heated oxygen sensor (rear) connector B-35 (terminal No. 2) and PCM connector B-22 (terminal No. 105) because of open circuit or harness damage. Then go to Step 14.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.

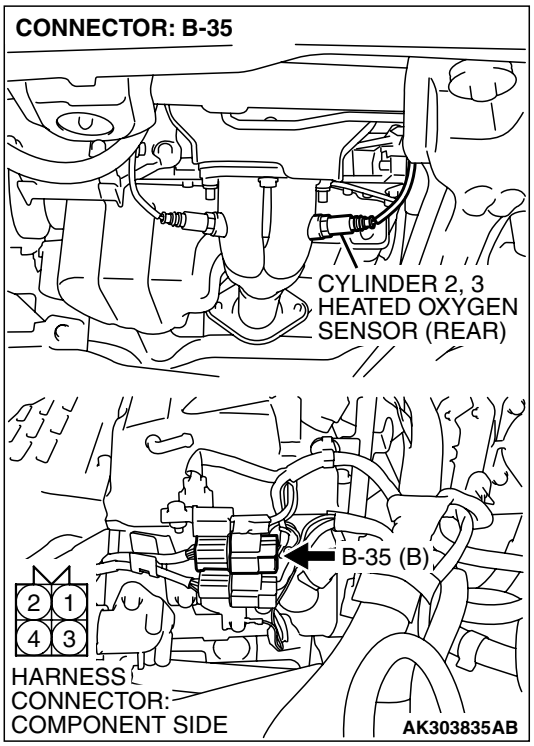


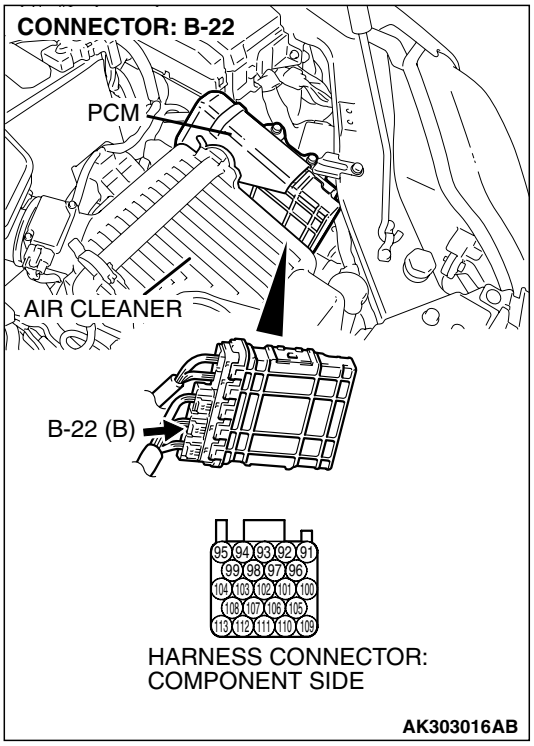
STEP 10. Check harness connector B-22 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 11.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.



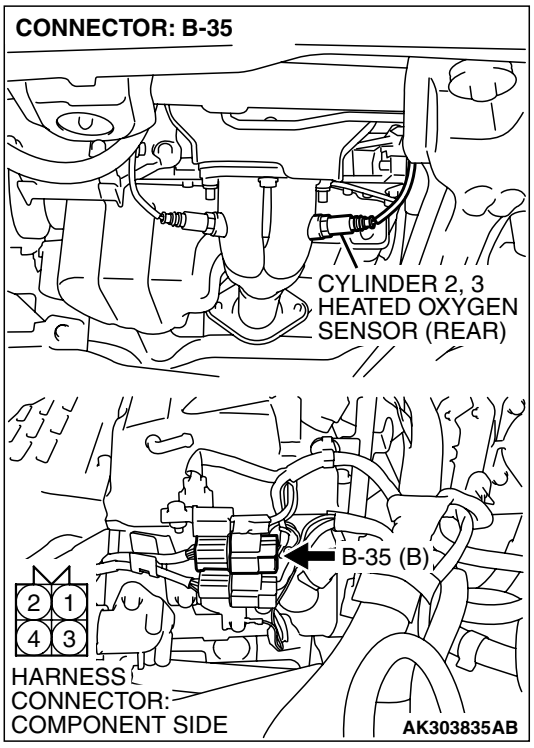


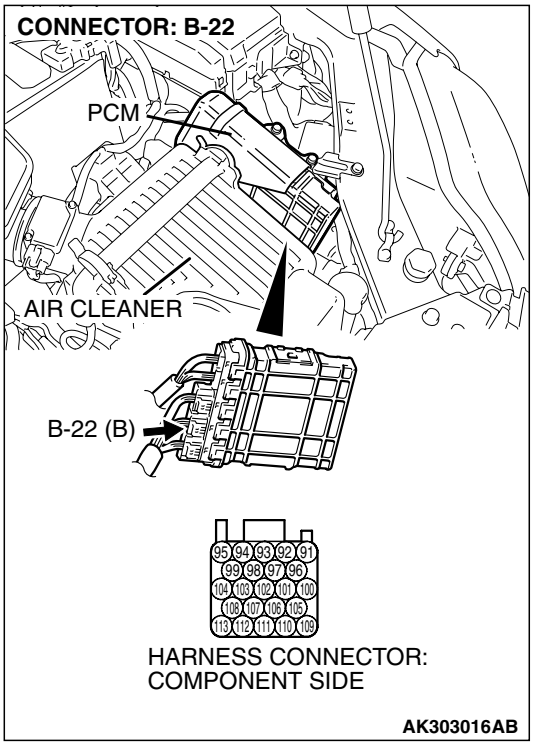
STEP 11. Check for harness damage between cylinder 2, 3 heated oxygen sensor (rear) connector B-35 (terminal No. 2) and PCM connector B-22 (terminal No. 105).

Q: Is the harness wire in good condition?

YES : Go to Step 12.

NO : Repair it. Then go to Step 14.

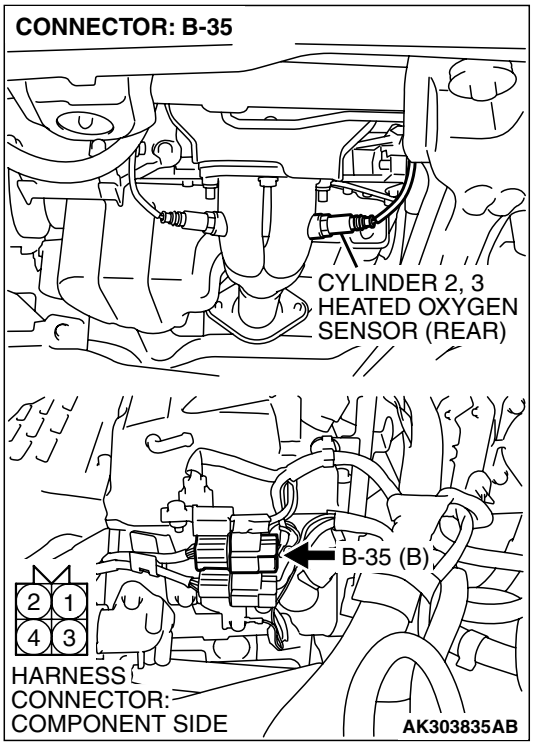




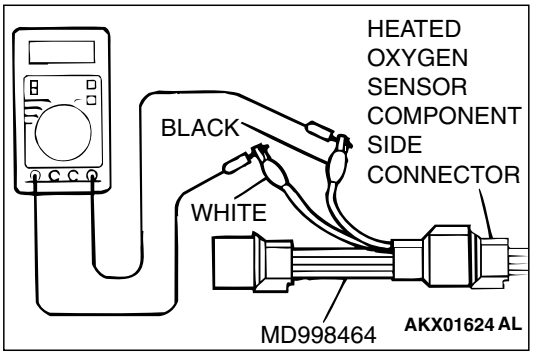
STEP 12. Check for short circuit to ground between cylinder 2, 3 heated oxygen sensor (rear) connector B-35 (terminal No. 4) and PCM connector B-22 (terminal No. 96).
Q: Is the harness wire in good condition?

YES : Go to Step 13.
NO : Repair it. Then go to Step 14.

STEP 13. Check the cylinder 2, 3 heated oxygen sensor (rear).



(1) Disconnect the cylinder 2, 3 heated oxygen sensor (rear) connector B-35 and connect test harness special tool MD998464 to the connector on the cylinder 2, 3 heated oxygen sensor (rear) side.
(2) Warm up the engine until engine coolant temperature reaches 80°C (176°F) or higher.
(3) Drive at 50 km/h (31mph) or more for 10 minutes.



(4) Connect a digital voltage meter between terminal No. 2 (black clip) and terminal No. 4 (white clip).
(5) Measure the output voltage of heated oxygen sensor under the following driving.
   a. Transaxle: "L" range
   b. Drive with wide open throttle
   c. Engine: 3,500 r/min or more

Standard value: 0.6 – 1.0 V

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.

Q: Is the measured voltage between 0.6 and 1.0 volt?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 14.

NO : Replace the cylinder 2, 3 heated oxygen sensor (rear). Then go to Step 14.

STEP 14. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 23 P.13A-9.

(2) Check the diagnostic trouble code (DTC).

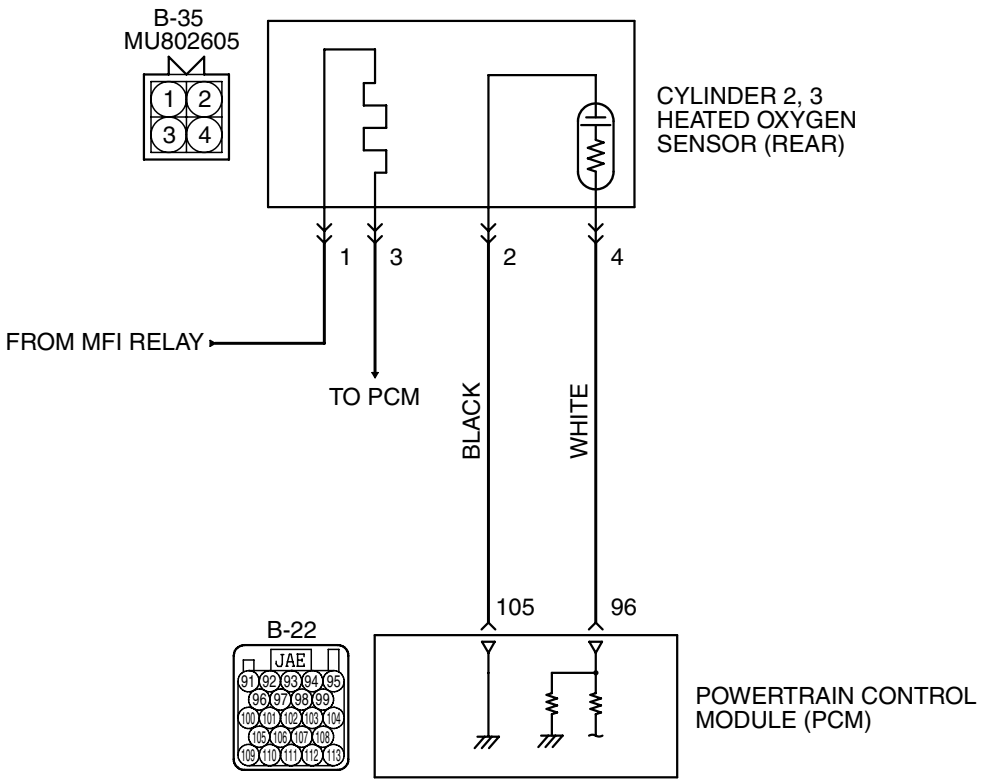
Q: Is DTC P0157 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0158: Cylinder 2, 3 Heated Oxygen Sensor (rear) Circuit High Voltage

Cylinder 2, 3 Heated Oxygen Sensor (rear) Circuit



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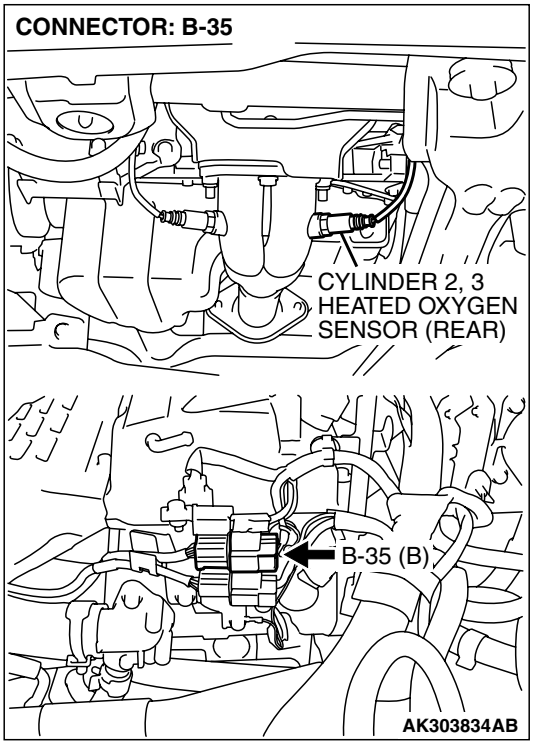
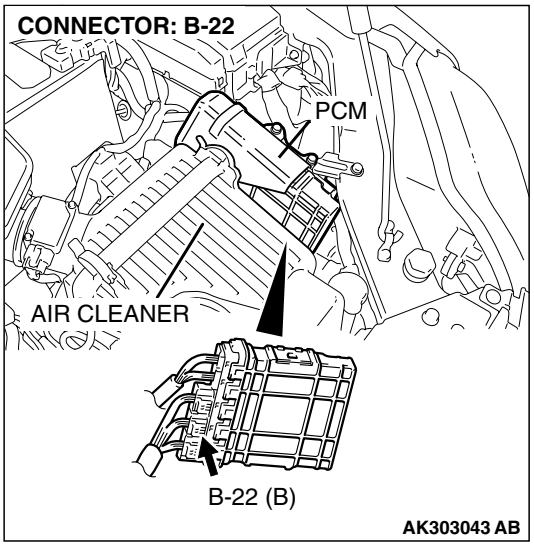




CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the PCM (terminal No. 96) from the output terminal (terminal No. 4) of the cylinder 2, 3 heated oxygen sensor (rear).
- Terminal No. 2 of the cylinder 2, 3 heated oxygen sensor (rear) is grounded with PCM (terminal No. 105).
- The PCM applies an offset voltage of 0.5 volt to terminal No. 2 of the cylinder 1, 4 heated oxygen sensor (rear).

TECHNICAL DESCRIPTION

- The output signal of the cylinder 2, 3 heated oxygen sensor (front) is compensated by the output signal of the cylinder 2, 3 heated oxygen sensor (rear).
- The PCM checks for the cylinder 2, 3 heated oxygen sensor (rear) output voltage.

DESCRIPTIONS OF MONITOR METHODS

Cylinder 2, 3 heated oxygen sensor (rear) output voltage is over specified range.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

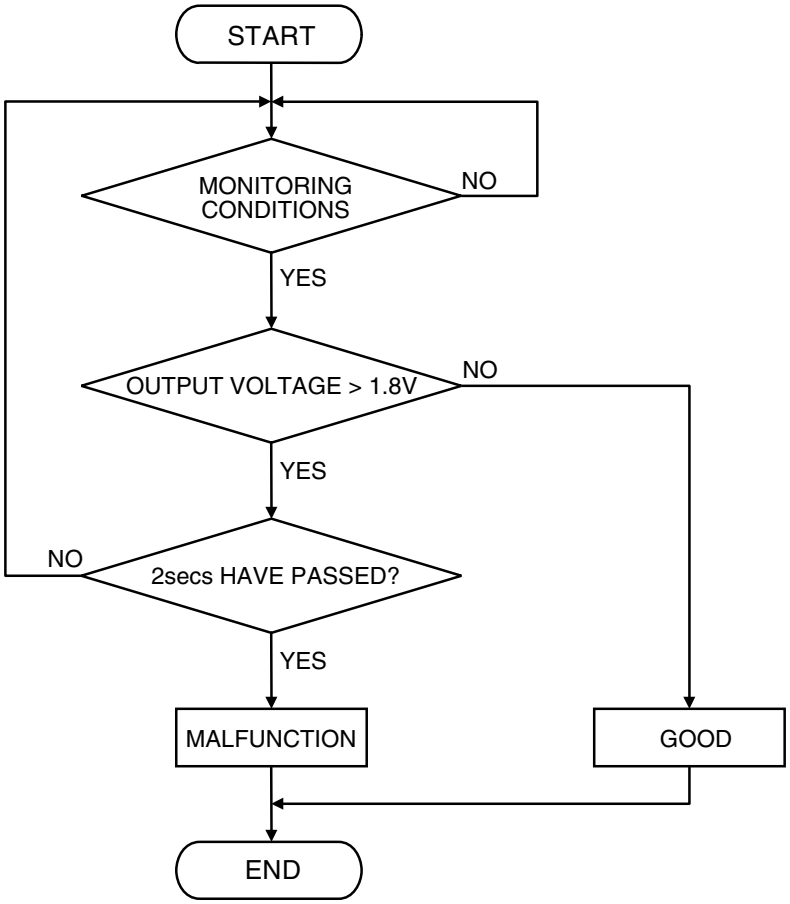
- Heated oxygen sensor heater (front) monitor
- Heated oxygen sensor heater (rear) monitor
- Air/fuel ratio feedback monitor

Sensor (The sensor below is determined to be normal)

- Mass airflow sensor
- Engine coolant temperature sensor
- Intake air temperature sensor
- Barometric pressure sensor

DTC SET CONDITIONS

Logic Flow Chart



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Check Condition

- 2 seconds or more have passed since the engine starting sequence was completed.
- Heated oxygen sensor offset voltage is between 0.4 and 0.6 volt.

Judgement Criterion

- Cylinder 2, 3 heated oxygen sensor (rear) output voltage has continued to be 1.8 volts or higher for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 24 P.13A-9.

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

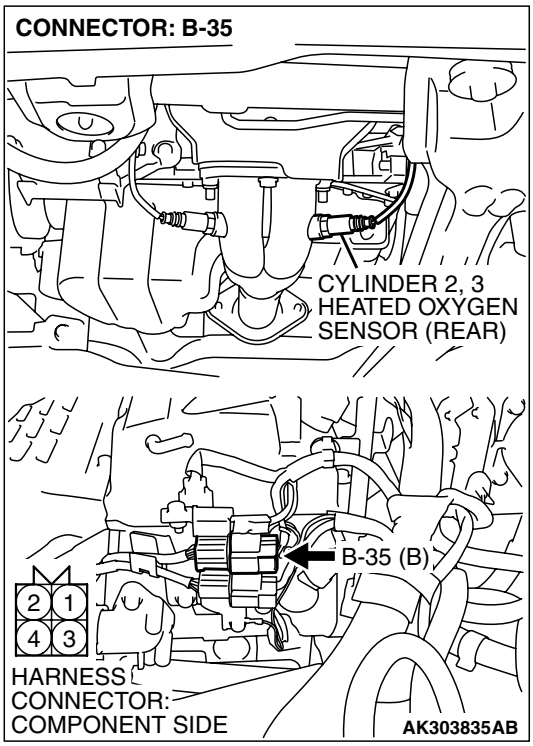
- Short circuit in cylinder 2, 3 heated oxygen sensor (rear) output line.
- Connector damage.
- PCM failed.

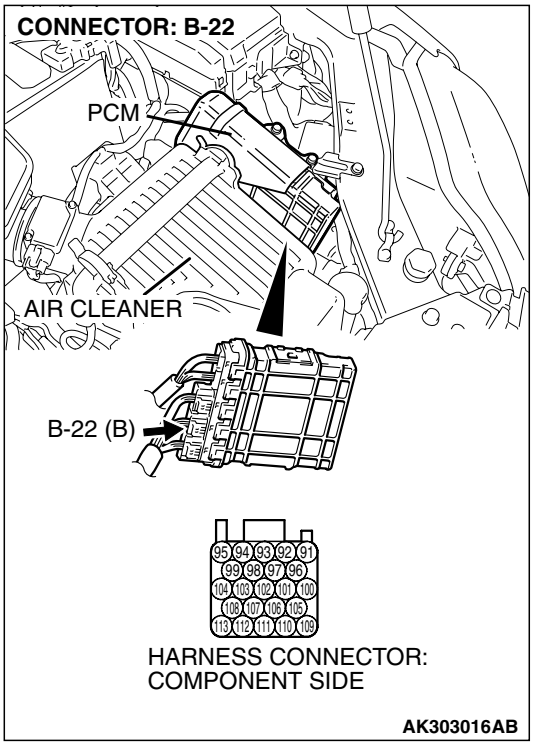
DIAGNOSIS

Required Special Tools:

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

TSB Revision



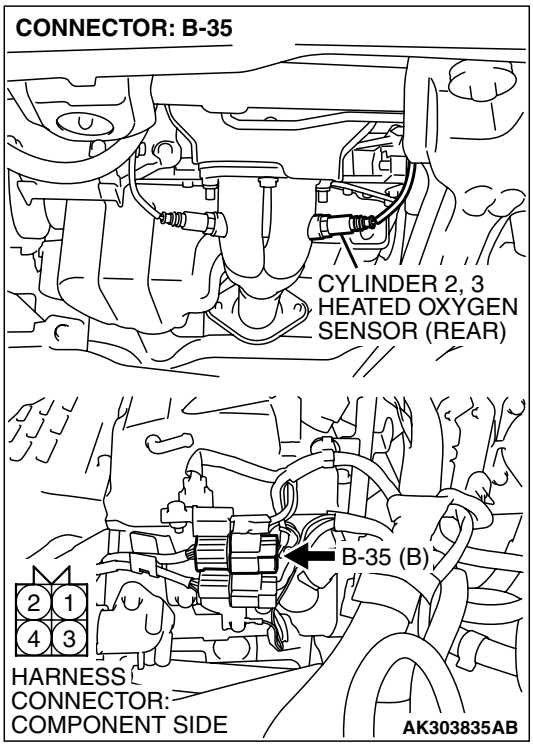


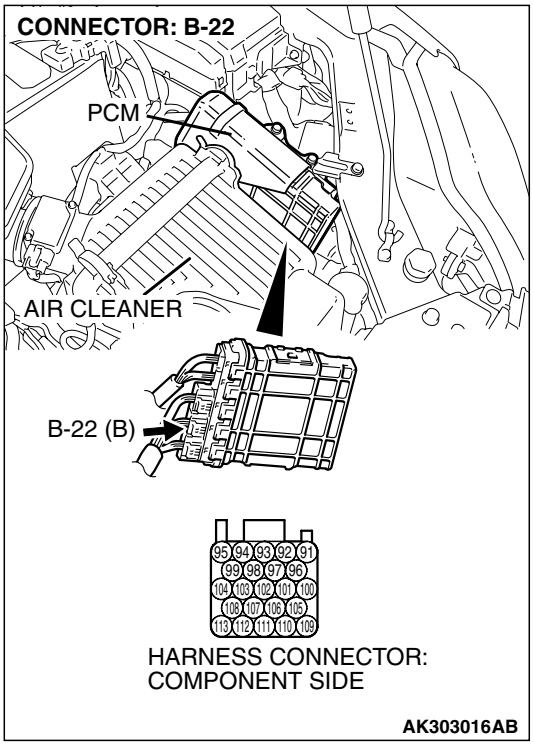
STEP 1. Check harness connector B-35 at cylinder 2, 3 heated oxygen sensor (rear) and harness connector B-22 at PCM for damage.

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 go to Step 3.





STEP 2. Check for short circuit to power supply between cylinder 2, 3 heated oxygen sensor (rear) connector B-35 (terminal No. 4) and PCM connector B-22 (terminal No. 96).
Q: Is the harness wire in good condition?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 3.

NO : Repair it. Then go to Step 3.

STEP 3. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 24 P.13A-9.

(2) Check the diagnostic trouble code (DTC).

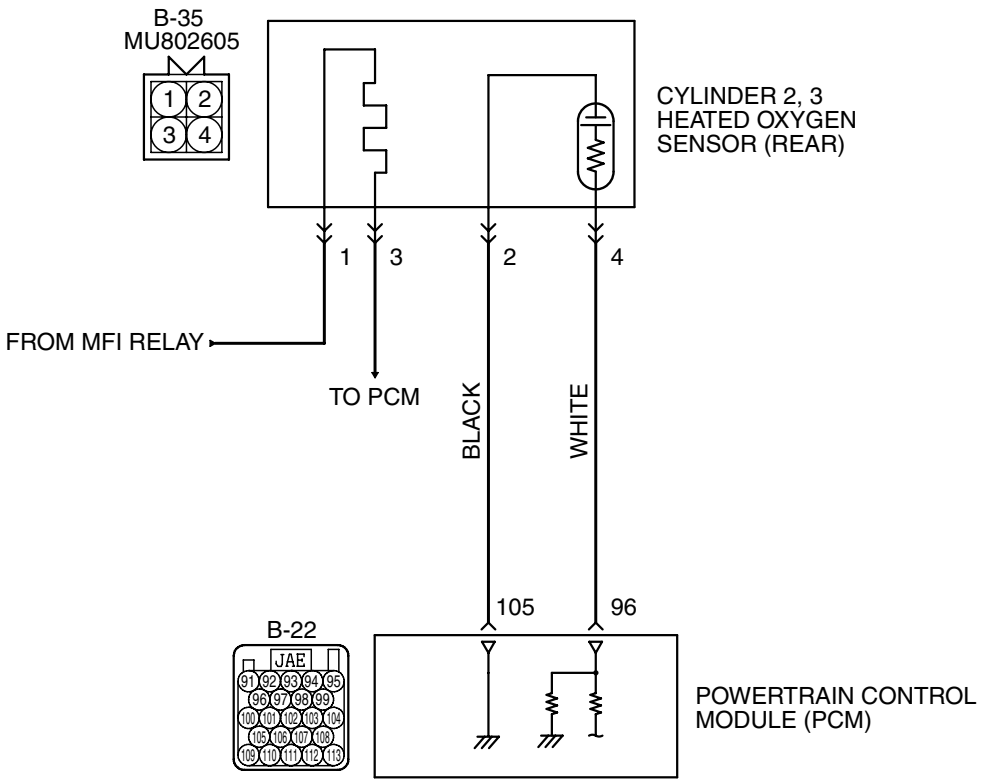
Q: Is DTC P0158 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0159: Cylinder 2, 3 Heated Oxygen Sensor (rear) Circuit Slow Responce

Cylinder 2, 3 Heated Oxygen Sensor (rear) Circuit



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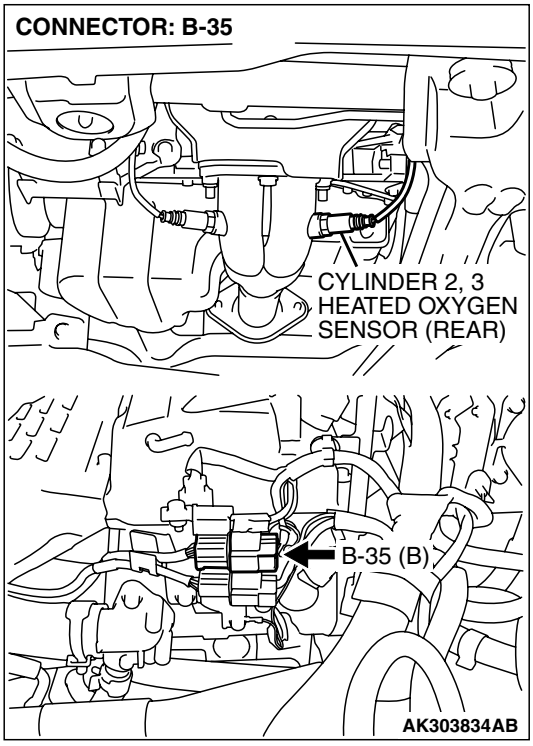
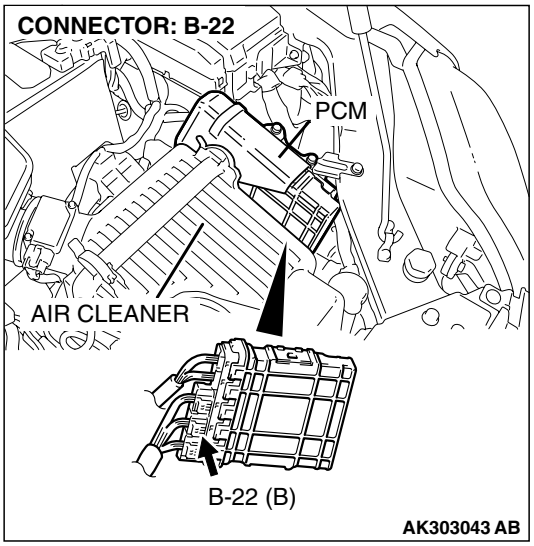




CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the PCM (terminal No. 96) from the output terminal (terminal No. 4) of the cylinder 2, 3 heated oxygen sensor (rear).
- Terminal No. 2 of the cylinder 2, 3 heated oxygen sensor (rear) is grounded with PCM (terminal No. 105).
- The PCM applies an offset voltage of 0.5 volt to terminal No. 2 of the cylinder 1, 4 heated oxygen sensor (rear).

TECHNICAL DESCRIPTION

- The output signal of the cylinder 2, 3 heated oxygen sensor (front) is compensated by the output signal of the cylinder 2, 3 heated oxygen sensor (rear).
- The PCM checks for the cylinder 2, 3 heated oxygen sensor (rear) output voltage.

DESCRIPTIONS OF MONITOR METHODS

Cylinder 2, 3 heated oxygen sensor (rear) output voltage does not reach 0.2 volt after fuel cut operation.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

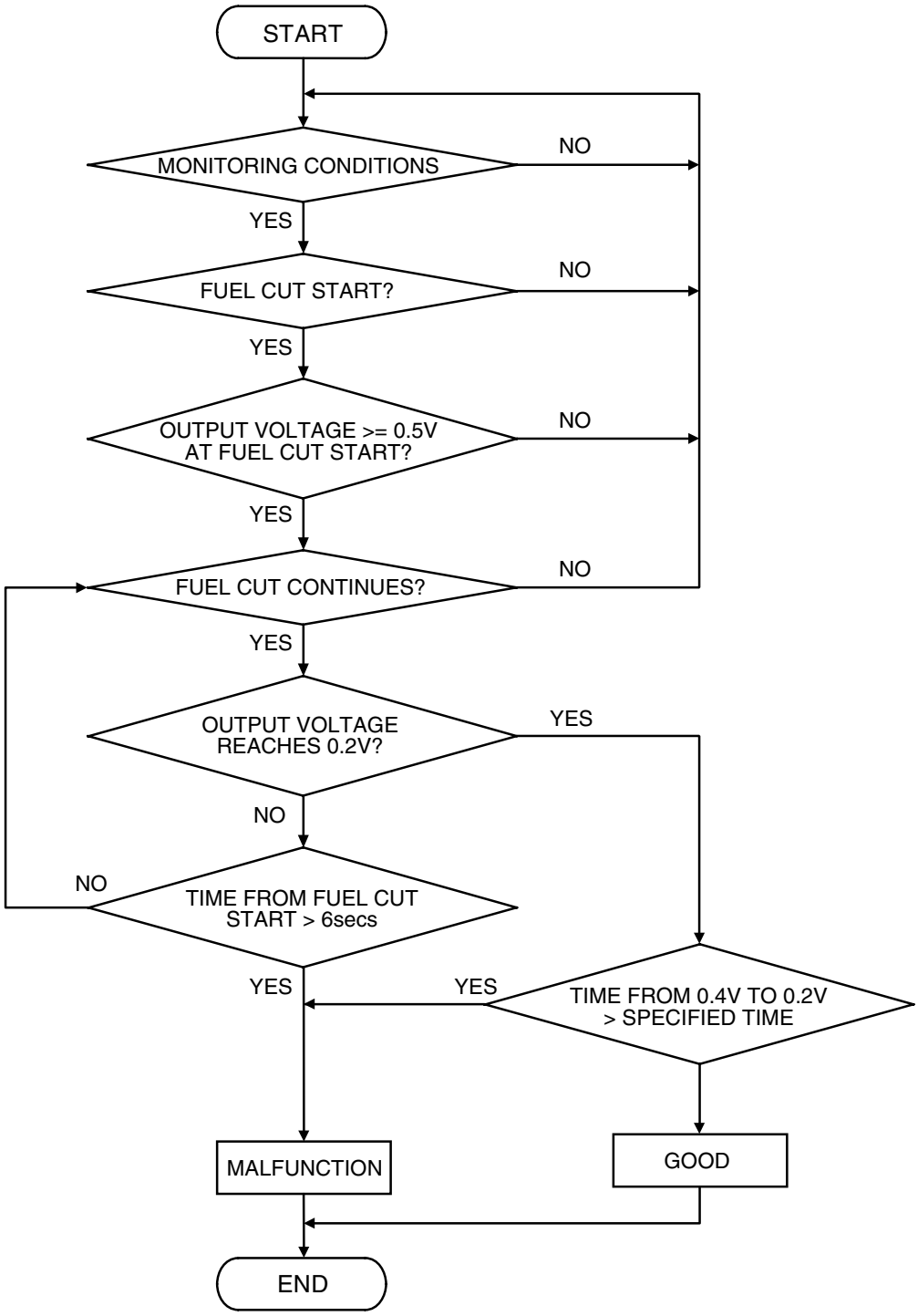
- Heated oxygen sensor heater (front) monitor
- Heated oxygen sensor heater (rear) monitor
- Air/fuel ratio feedback monitor

Sensor (The sensor below is determined to be normal)

- Mass airflow sensor
- Engine coolant temperature sensor
- Intake air temperature sensor
- Barometric pressure sensor

DTC SET CONDITIONS

Logic Flow Chart



AK600308

Check Conditions

- Engine coolant temperature is higher than 76°C (169°F).
- The cylinder 2, 3 heated oxygen sensor (front) is active.
- The cumulative mass airflow sensor output is higher than 1,638 g.
- Fuel is being shut off.

TSB Revision

Judgement Criterion

- Cylinder 2, 3 heated oxygen sensor (rear) output voltage does not reach 0.2 volt for 6 seconds from fuel cut start.

or

- Cylinder 2, 3 heated oxygen sensor (rear) output voltage does not reach 0.2 volt for specified time from 0.4 volt.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 11 P.13A-9.

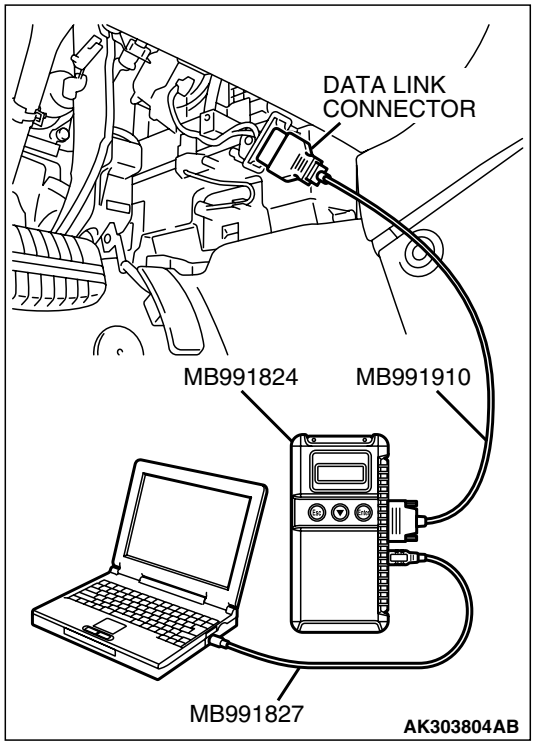
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Cylinder 2, 3 heated oxygen sensor (rear) deteriorated.
- Connector damage.
- PCM failed.

DIAGNOSIS

Required Special Tools:

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



STEP 1. Using scan tool MB991958, check data list item AF: 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 AF, Cylinder 2, 3 Heated Oxygen Sensor (rear).
(4) Warm up the engine.
  - After increasing the output voltage 0.5 volt or more by the engine revving, finish it. Then confirm that the output voltage reduces to 0.2 volt or less within 6 seconds.
(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfuncitons P.00-14.

NO : Replance the heated oxygen sensor (rear). Then go to Step 2.

STEP 2. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 11 P.13A-9.

(2) Check the diagnostic trouble code (DTC).

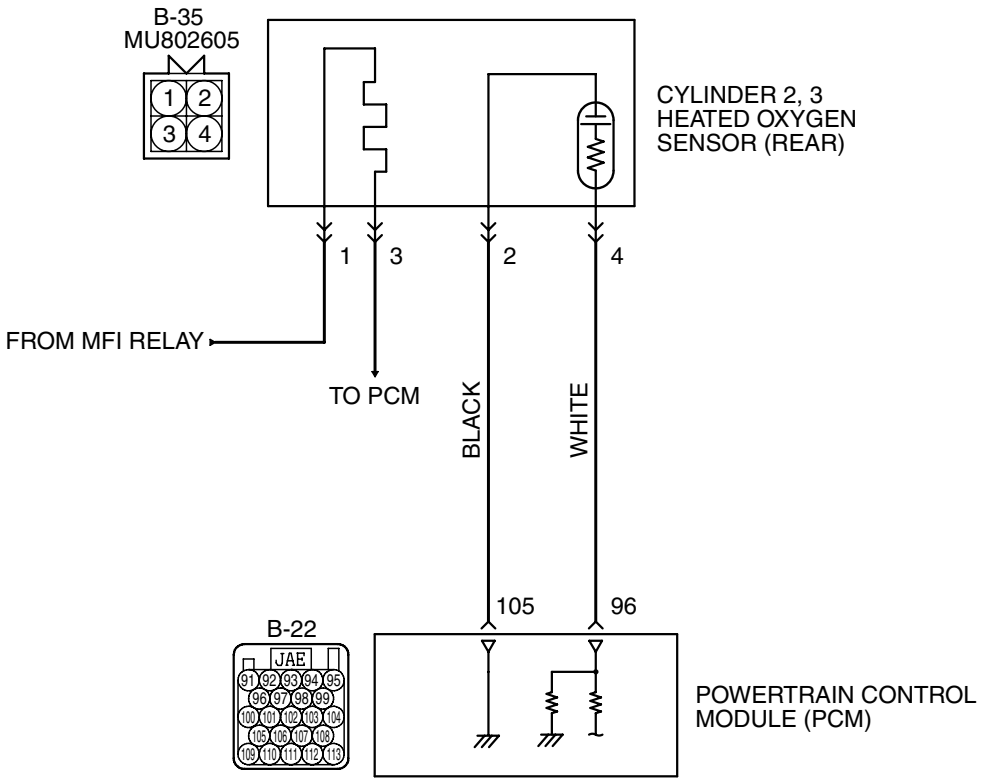
Q: Is DTC P0159 set?

YES : Refer to DTC P0157 – Cylinder 2, 3 Heated Oxygen Sensor (rear) Circuit Low Voltage P.13A-382, DTC P0158 – Cylinder 2, 3 Heated Oxygen Sensor (rear) Circuit High Voltage P.13A-399.

NO : The inspection is complete.

DTC P0160: Cylinder 2, 3 Heated Oxygen Sensor (rear) Circuit No Activity Detected

Cylinder 2, 3 Heated Oxygen Sensor (rear) Circuit



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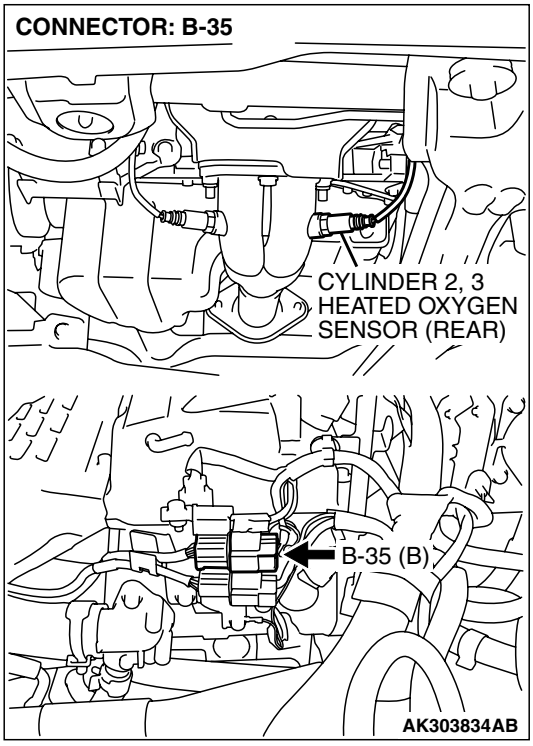
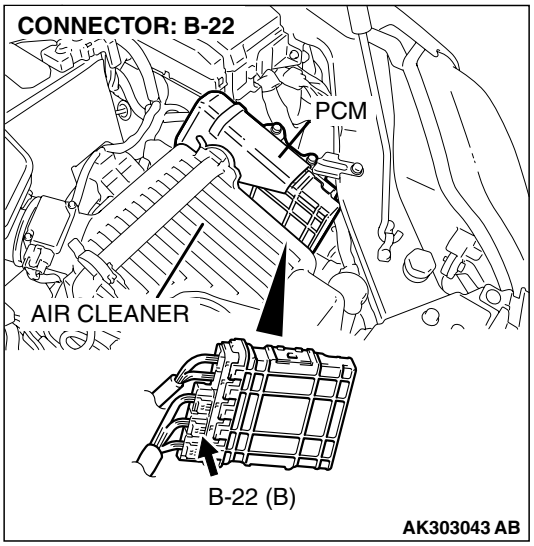




CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the PCM (terminal No. 96) from the output terminal (terminal No. 4) of the cylinder 2, 3 heated oxygen sensor (rear).
- Terminal No. 2 of the cylinder 2, 3 heated oxygen sensor (rear) is grounded with PCM (terminal No. 105).
- The PCM applies an offset voltage of 0.5 volt to terminal No. 2 of the cylinder 1, 4 heated oxygen sensor (rear).

TECHNICAL DESCRIPTION

- The output signal of the cylinder 2, 3 heated oxygen sensor (front) is compensated by the output signal of the cylinder 2, 3 heated oxygen sensor (rear).
- The the PCM checks for the cylinder 2, 3 heated oxygen sensor (rear) output voltage.

DESCRIPTIONS OF MONITOR METHODS

Cylinder 2, 3 heated oxygen sensor (rear) output voltage does not change during specified go/stop operations including fuel cut are repeated.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

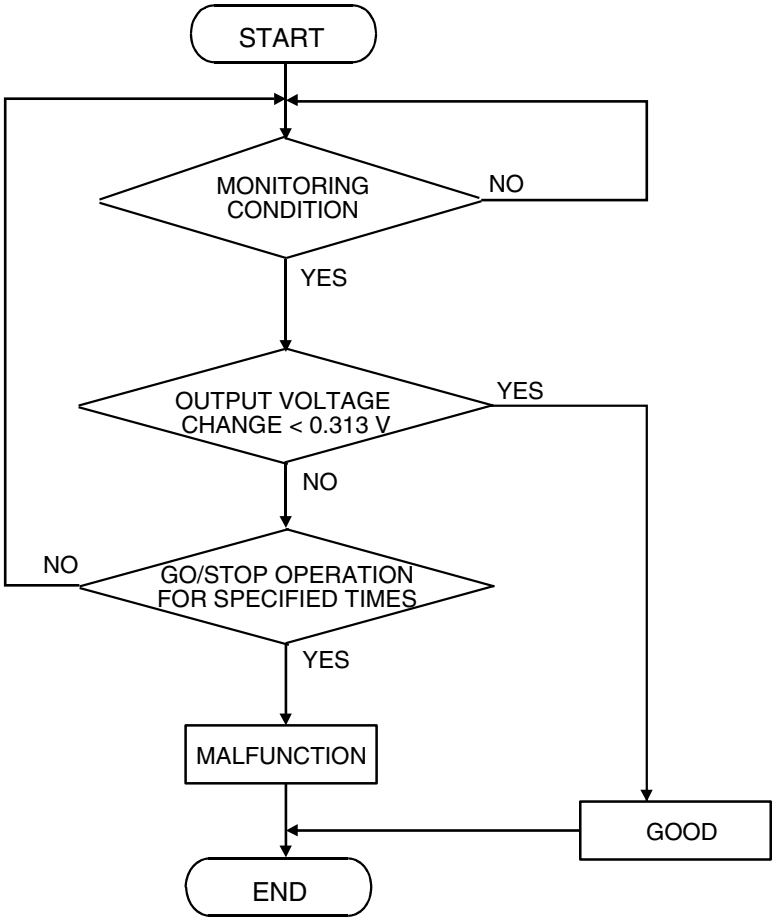
- Heated oxygen sensor heater (front) monitor
- Heated oxygen sensor heater (rear) monitor
- Air/fuel ratio feedback monitor

Sensor (The sensor below is determined to be normal)

- Mass airflow sensor
- Engine coolant temperature sensor
- Intake air temperature sensor
- Barometric pressure sensor

DTC SET CONDITIONS

Logic Flow Chart



AK302399

Check Conditions

- Engine coolant temperature is higher than 76°C (169°F).
- The cylinder 2, 3 heated oxygen sensor (front) is active.
- The cumulative mass airflow sensor output is higher than 1,638 g.
- Repeat 3 or more times: drive[*1], stop[*2].

  Drive[*1]:
  - Engine speed is higher than 1,500 r/min.
  - Volumetric efficiency is higher than 40 percent.
  - Vehicle speed is higher than 30 km/h (19 mph).
  - A total of more than 10 seconds have elapsed with the above mentioned conditions, and more than 2 seconds have elapsed with the fuel shut off.

  Stop[*2]:
  - Vehicle speed is lower than 1.5 km/h (1 mph).

Judgement Criterion

- Change in the output voltage of the cylinder 2, 3 heated oxygen sensor (rear) is lower than 0.313 volt.<Federal>

or

- Change in the output voltage of the cylinder 2, 3 heated oxygen sensor (rear) is lower than 0.234 volt. <California>

NOTE: Monitoring stops after fuel has been shut off for more than 38 seconds.

TSB Revision

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 13 P.13A-9.

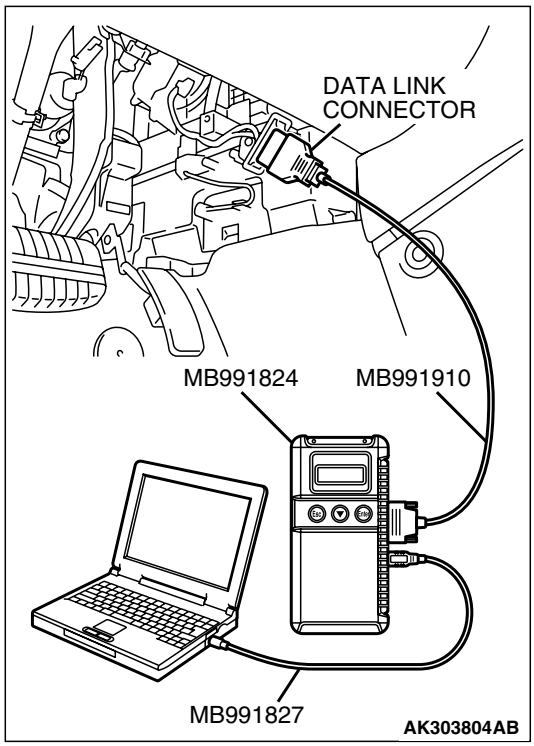
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Cylinder 2, 3 heated oxygen sensor (rear) deteriorated.
- Connector damage.
- PCM failed.

DIAGNOSIS

Required Special Tools:

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



STEP 1. Using scan tool MB991958, check data list item AF: 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 AF, Cylinder 2, 3 Heated Oxygen Sensor (rear).
  a. Transaxle: A/T: "L" range
  b. Drive with wide open throttle
  c. Engine: 3,500 r/min
    - The output voltage should be between 0.6 and 1.0 volt.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfuncitons P.00-14.

NO : Replace the heated oxygen sensor (rear). Then go to Step 2.

STEP 2. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 13 P.13A-9.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0160 set?

YES : Refer to DTC P0157 – Cylinder 2, 3 Heated Oxygen Sensor (rear) Circuit Low Voltage P.13A-382, DTC P0158 – Cylinder 2, 3 Heated Oxygen Sensor (rear) Circuit High Voltage P.13A-399.

NO : The inspection is complete.

TSB Revision

DTC P0171: System too Lean (cylinder 1, 4)

⚠ CAUTION
If DTC P0171 has been set, TCL related DTC U1120 is also set. After P0171 has been diagnosed, don't forget to erase DTC U1120.

Fuel Trim Circuit
- Refer to DTC P0201 – Injector Circuit-cylinder 1 P.13A-468, DTC P0204 – Injector Circuit-cylinder 4 P.13A-498.

CIRCUIT OPERATION
- Refer to DTC P0201 – Injector Circuit-cylinder 1 P.13A-468, DTC P0204 – Injector Circuit-cylinder 4 P.13A-498.

TECHNICAL DESCRIPTION
- If a malfunction occurs in the fuel system, the fuel trim value becomes too large.
- The PCM checks whether the fuel trim value is within a specified range.

DESCRIPTIONS OF MONITOR METHODS
Cylinder 1, 4 air/fuel learning value (long time fuel trim) and air/fuel feedback integral value (short time fuel trim) are too lean.

MONITOR EXECUTION
Continuous

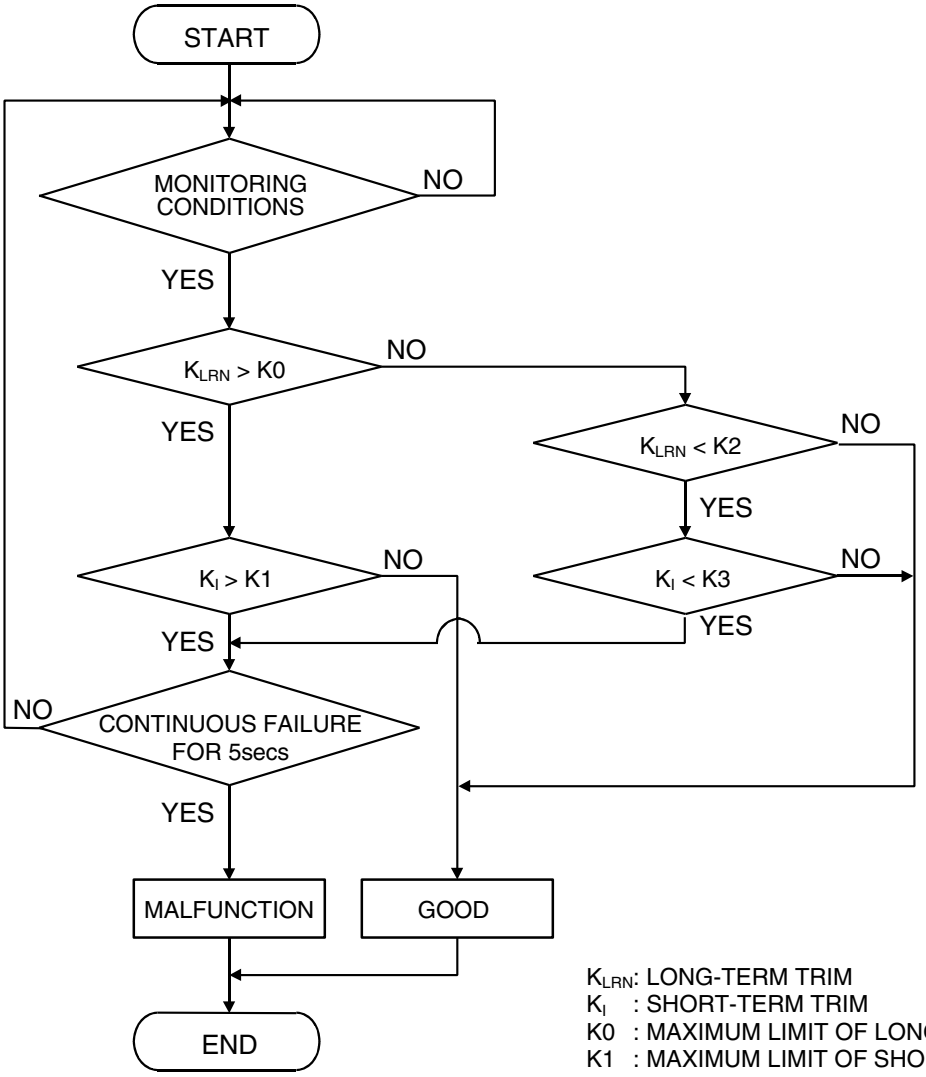
MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)
- Misfire monitor

Sensor (The sensor below is determined to be normal)
- Mass airflow sensor
- Engine coolant temperature sensor
- Intake air temperature sensor
- Barometric pressure sensor
- Throttle position sensor

DTC SET CONDITIONS

Logic Flow Chart



K_{LRN}: LONG-TERM TRIM
K_I : SHORT-TERM TRIM
K0 : MAXIMUM LIMIT OF LONG-TERM TRIM
K1 : MAXIMUM LIMIT OF SHORT-TERM TRIM
K2 : MINIMUM LIMIT OF LONG-TERM TRIM
K3 : MINIMUM LIMIT OF SHORT-TERM TRIM

AK204050

Check Conditions

- Engine coolant temperature is lower than 100°C (212°F) when the engine is started.
- Intake air temperature is lower than 60°C (140°F) when the engine is started.
- Under the closed loop air/fuel ratio control.
- Engine coolant temperature is higher than 76°C (169°F).
- Mass airflow sensor output is 6 g/sec or more.

Judgement Criteria

- Long-term fuel trim has continued to be higher than +12.5 percent for 5 seconds.

or

- Short-term fuel trim has continued to be higher than +10.0 percent for 5 seconds.

Check Conditions

- Engine coolant temperature is lower than 100°C (212°F) when the engine is started.
- Intake air temperature is lower than 60°C (140°F) when the engine is started.
- Under the closed loop air/fuel ratio control.
- Engine coolant temperature is higher than 76°C (169°F).
- Mass airflow sensor output is 6 g/sec or less.

TSB Revision

Judgement Criteria
- Long-term fuel trim has continued to be higher than +12.5 percent for 5 seconds.

or
- Short-term fuel trim has continued to be higher than +15.0 percent for 5 seconds.

Check Conditions
- Engine coolant temperature is higher than 100°C (212°F) when the engine is started.
- Intake air temperature is higher than 60°C (140°F) when the engine is started.
- Under the closed loop air/fuel ratio control.
- Engine coolant temperature is higher than 76°C (169°F).
- Mass airflow sensor output is 6 g/sec or more.

Judgement Criteria
- Long-term fuel trim has continued to be higher than +12.5 percent or 5 seconds.

or
- Short-term fuel trim has continued to be higher than +20.0 percent for 5 seconds.

Check Conditions
- Engine coolant temperature is higher than 100°C (212°F) when the engine is started.
- Intake air temperature is higher than 60°C (140°F) when the engine is started.
- Under the closed loop air/fuel ratio control.
- Engine coolant temperature is higher than 76°C (169°F).
- Mass airflow sensor output is 6 g/sec or less.

Judgement Criteria
- Long-term fuel trim has continued to be higher than +12.5 percent or 5 seconds.

or
- Short-term fuel trim has continued to be higher than +25.0 percent for 5 seconds.

Check Conditions
- Engine coolant temperature is higher than 76°C (169°F).
- Under the closed loop air/fuel ratio control.

Judgement Criteria
- Long-term fuel trim has continued to be +12.5 percent for 2 seconds.

or
- Short-term fuel trim has continued to be +25.0 percent for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 22 P.13A-9.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)
- Mass airflow sensor failed.
- Injector (Number 1, 4) failed.
- Incorrect fuel pressure.
- Air drawn in from gaps in gasket, seals, etc.
- Engine coolant temperature sensor failed.
- Intake air temperature sensor failed.
- Barometric pressure sensor failed.
- Manifold absolute pressure sensor failed.
- Exhaust leak.
- Use of incorrect or contaminated fuel.
- Harness damage in cylinder 1, 4 injector circuit or connector damage.
- PCM failed.

DIAGNOSIS

Required Special Tools:
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A

STEP 1. Check for exhaust leak.

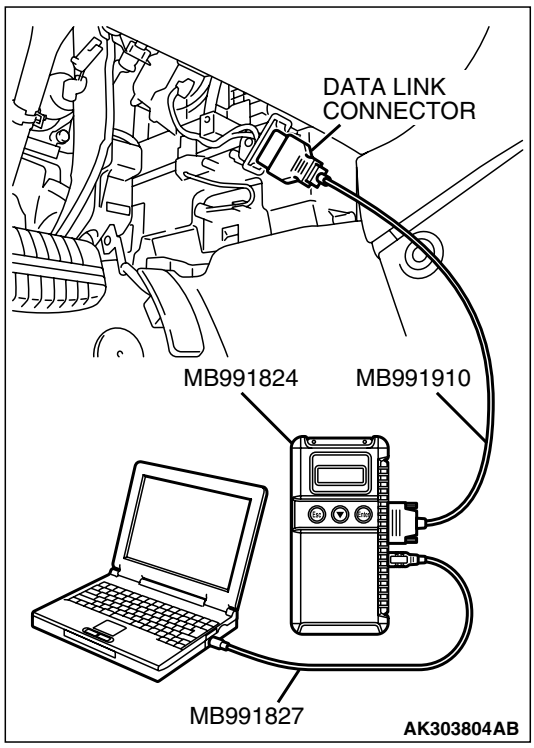
Q: Are there any abnormalities?

YES : Repair it. Then go to Step 14.
NO : Go to Step 2.

STEP 2. Check for intake system vacuum leak.

Q: Are there any abnormalities?

YES : Repair it. Then go to Step 14.
NO : Go to Step 3.



STEP 3. Using scan tool MB991958, check data list item 10: Mass Airflow 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.

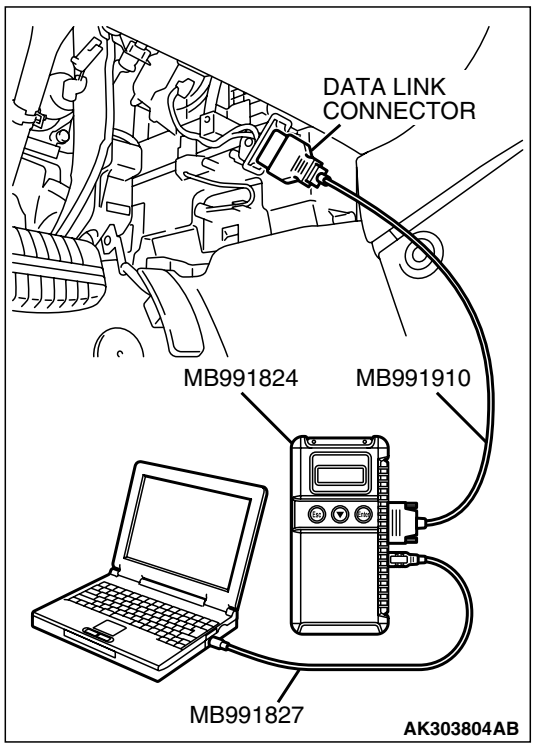
(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991958 to the data reading mode for item 10, Mass Airflow Sensor.
(4) Warm up the engine to normal operating temperature: 80°C to 95°C (176°F to 203°F).
- When idling, between 1,300 and 1,620 millivolts.
- When 2,500 r/min, between 1,600 and 1,970 millivolts.

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

Q: Is the sensor operating properly?

YES : Go to Step 4.

NO : Refer to DTC P0101 – Mass Airflow Circuit Range/Performance Problem P.13A-130, DTC P0102 – Mass Airflow Circuit Low Input P.13A-139, DTC P0103 – Mass Airflow Circuit High Input P.13A-149.



STEP 4. Using scan tool MB991958, check data list item 5: Intake Air Temperature Sensor.

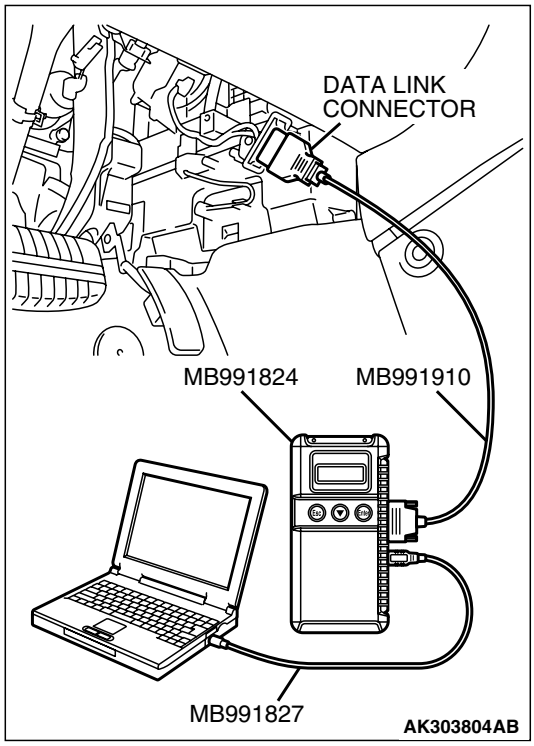
(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool MB991958 to the data reading mode for item 5, Intake Air Temperature Sensor.
- The intake air temperature and temperature shown with the scan tool should approximately match.

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

Q: Is the sensor operating properly?

YES : Go to Step 5.

NO : Refer to DTC P0111 – Intake Air Temperature Circuit Range/Performance Problem P.13A-191, DTC P0112 – Intake Air Temperature Circuit Low Input P.13A-200, DTC P0113 – Intake Air Temperature Circuit High Input P.13A-207.



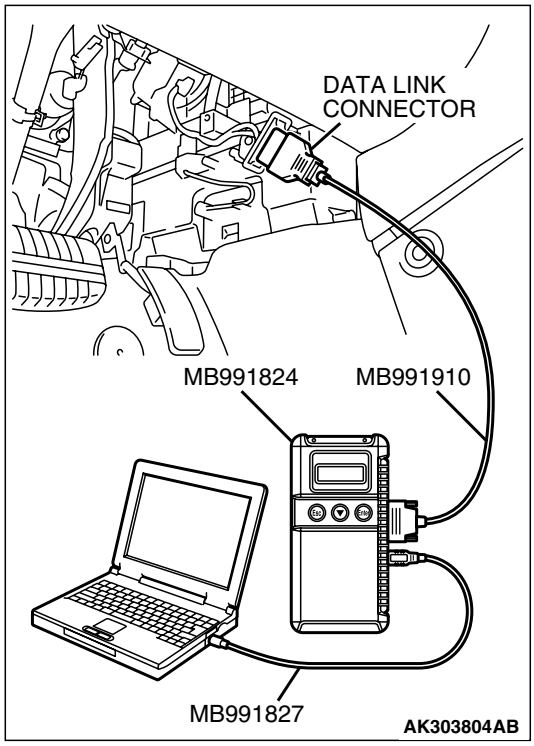
STEP 5. Using scan tool MB991958, check data list item 6: Engine Coolant Temperature Sensor.

(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool MB991958 to the data reading mode for item 6, Engine Coolant Temperature Sensor.
- The engine coolant temperature and temperature shown with the scan tool should approximately match.

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

Q: Is the sensor operating properly?

YES : Go to Step 6.
NO : Refer to DTC P0116 – Engine Coolant Temperature Circuit Range/Performance ProblemP.13A-217, DTC P0117 – Engine Coolant Temperature Circuit Low Input P.13A-226, DTC P0118 – Engine Coolant Temperature Circuit High Input P.13A-233.



STEP 6. Using scan tool MB991958, check data list item 8: Manifold Absolute Pressure Sensor.

(1) Turn the ignition switch the "ON" position.
(2) Set scan tool MB991958 to the data reading mode for item 8, Manifold Absolute Pressure Sensor.
- When altitude is 0 m (0 foot), 101 kPa (29.8 in.Hg).
- When altitude is 600 m (1,969 feet), 95 kPa (28.1 in.Hg).
- When altitude is 1,200 m (3,937 feet), 88 kPa (26.0 in.Hg).
- When altitude is 1,800 m (5,906 feet), 81 kPa (23.9 in.Hg).

(3) Start the engine.
- When the engine is idling, 16 – 36 kPa (4.7 – 10.6 in.Hg).
- When the engine is suddenly revved, manifold absolute pressure varies.

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

Q: Is the sensor operating properly?

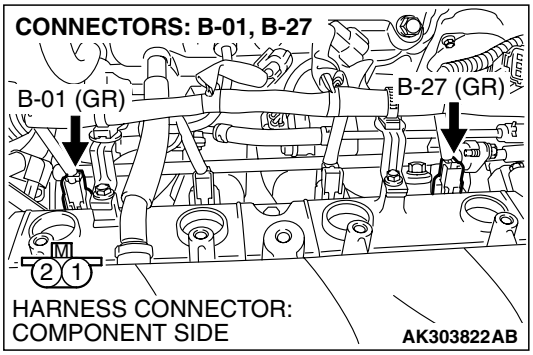
YES : Go to Step 7.
NO : Refer to DTC P0106 – Manifold Absolute Pressure Circuit Range/Performance Problem P.13A-156, DTC P0107 – Manifold Absolute Pressure Circuit Low Input P.13A-170, DTC P0108 – Manifold Absolute Pressure Circuit High Input P.13A-182.

STEP 7. Check harness connector B-01, B-27 at injector for damage.

Q: Is the harness connector in good condition?

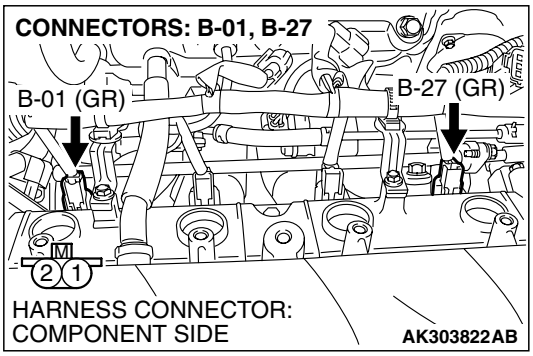
YES : Go to Step 8.

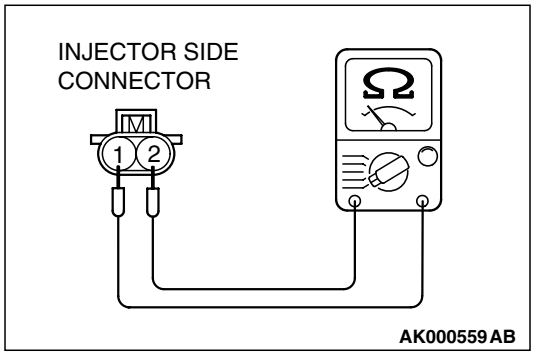
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.



STEP 8. Check the cylinder 1, 4 injector.

(1) Disconnect the cylinder 1, 4 injector connector B-01, B-27.





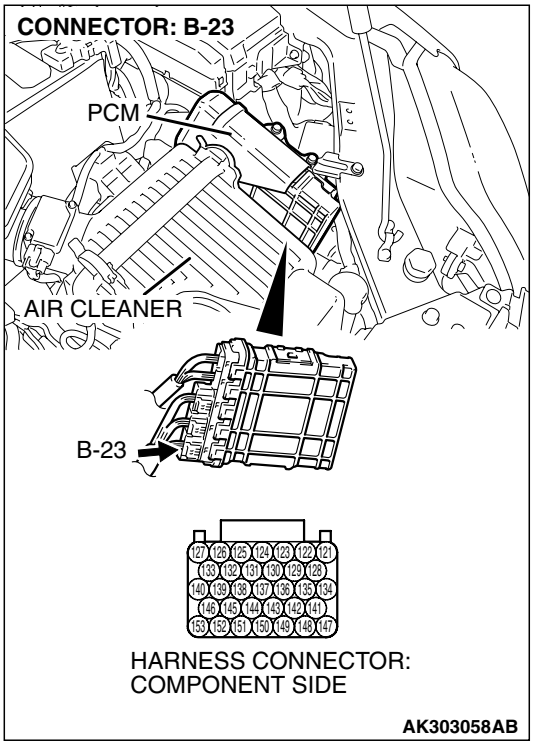
(2) Measure the resistance between each injector side connector terminal No. 1 and No. 2.

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

Q: Is the measured resistance between 10.5 and 13.5 ohms [at 20°C (68°F)]?

YES : Go to Step 9.

NO : Replace the injector. Then go to Step 14.

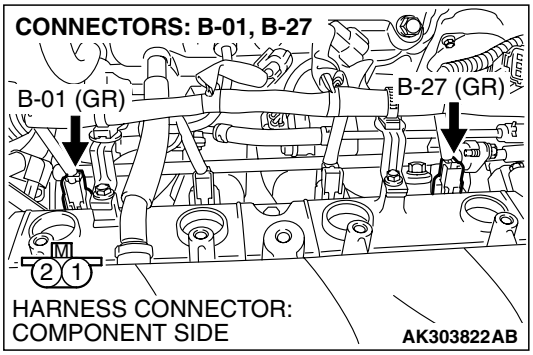


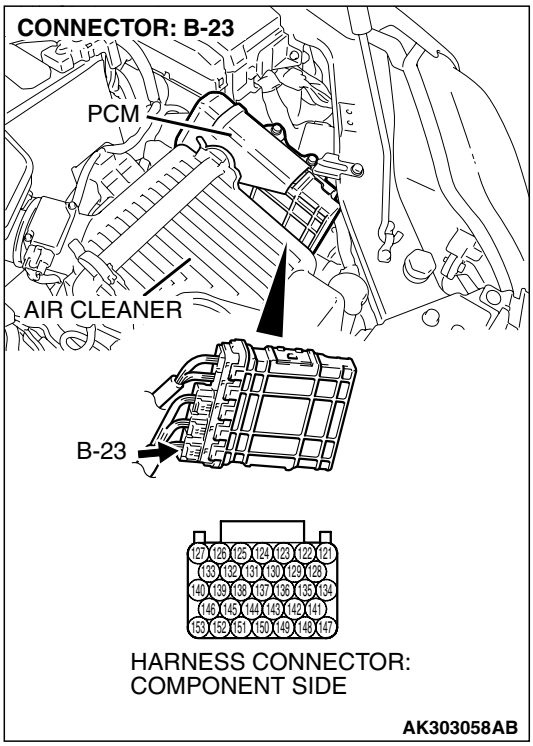
STEP 9. Check harness connector B-23 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step10.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.





STEP 10. Check for harness damage between cylinder 1, 4 injector connector and PCM connector.

a. Check the harness wire between injector connector B-01 (terminal No. 2) and PCM connector B-23 (terminal No. 153) at No. 1 cylinder injector.

b. Check the harness wire between injector connector B-27 (terminal No. 2) and PCM connector B-23 (terminal No. 139) at No. 4 cylinder injector.

Q: Is the harness wire in good condition?

YES : Go to Step 11.

NO : Repair it. Then go to Step 14.

STEP 11. Check the fuel pressure.

Refer to On-vehicle Service – Fuel Pressure Test P.13A-1163.

Q: Is the fuel pressure normal?

YES : Go to Step 12.

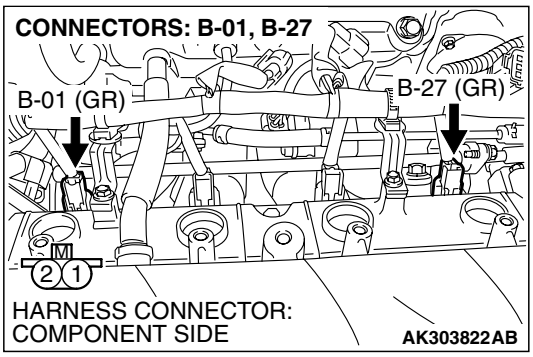
NO : Repair it. Then go to Step 14.

STEP 12. Check for entry of foreign matter (water, kerosene, etc.) into fuel.

Q: Are there any abnormalities?

YES : Replace the fuel. Then go to Step 14.

NO : Go to Step 13.



STEP 13. Replace the cylinder 1, 4 injector.

(1) Replace the cylinder 1, 4 injector.
(2) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 22 P.13A-9.
(3) Check the diagnostic trouble code (DTC).

Q: Is DTC P0171 set?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 14.
NO : The inspection is complete.

STEP 14. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 22 P.13A-9.
(2) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0171 set?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0172: System too Rich (cylinder 1, 4)

⚠ CAUTION
If DTC P0172 has been set, TCL related DTC U1120 is also set. After P0172 has been diagnosed, don't forget to erase DTC U1120.

Fuel Trim Circuit

- Refer to DTC P0201 – Injector Circuit-cylinder 1 P.13A-468, DTC P0204 – Injector Circuit-cylinder 4 P.13A-498.

CIRCUIT OPERATION

- Refer to DTC P0201 – Injector Circuit-cylinder 1 P.13A-468, DTC P0204 – Injector Circuit-cylinder 4 P.13A-498.

TECHNICAL DESCRIPTION

- If a malfunction occurs in the fuel system, the fuel trim value becomes too small.
- The PCM checks whether the fuel trim value is within a specified range.

DESCRIPTIONS OF MONITOR METHODS

Cylinder 1, 4 air/fuel learning value (long time fuel trim) and air/fuel feedback integral value (short time fuel trim) are too rich.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

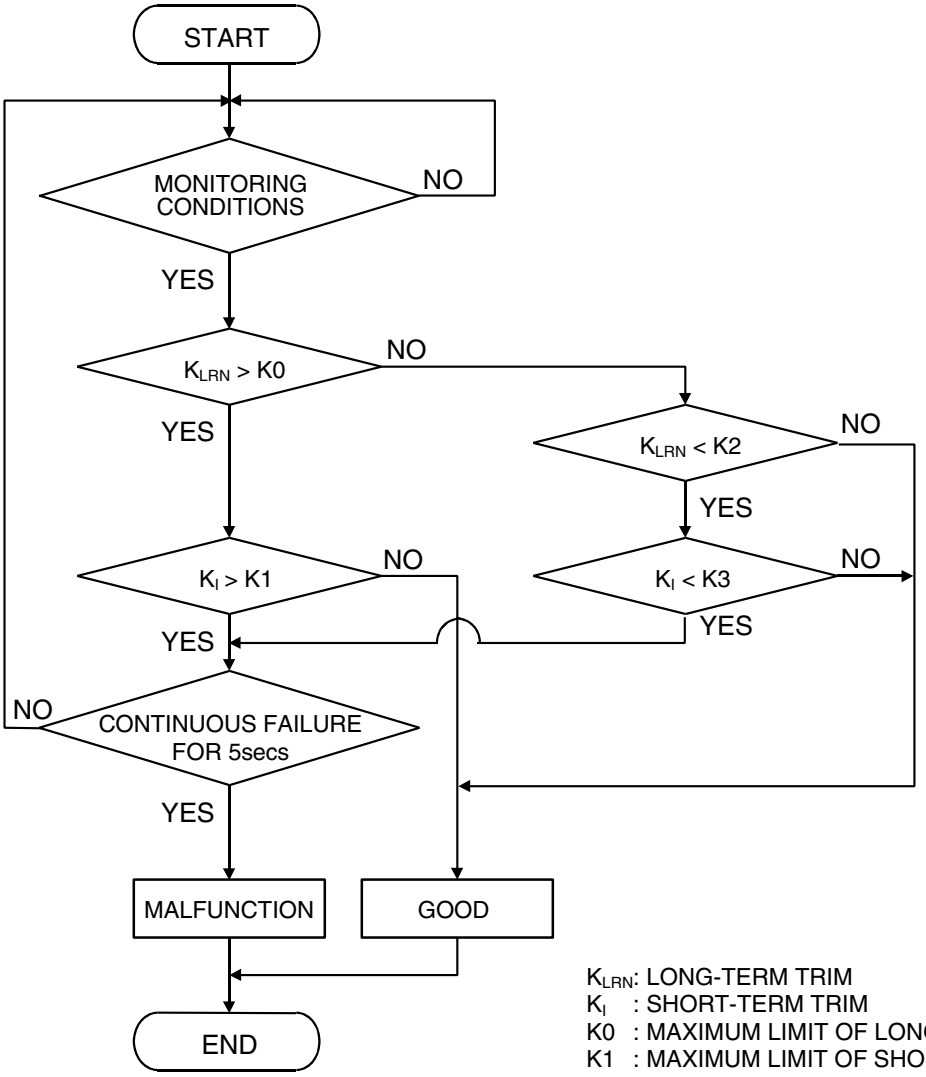
- Misfire monitor

Sensor (The sensor below is determined to be normal)

- Mass airflow sensor
- Engine coolant temperature sensor
- Intake air temperature sensor
- Barometric pressure sensor
- Throttle position sensor

DTC SET CONDITIONS

Logic Flow Chart



K_{LRN}: LONG-TERM TRIM
K_I : SHORT-TERM TRIM
K0 : MAXIMUM LIMIT OF LONG-TERM TRIM
K1 : MAXIMUM LIMIT OF SHORT-TERM TRIM
K2 : MINIMUM LIMIT OF LONG-TERM TRIM
K3 : MINIMUM LIMIT OF SHORT-TERM TRIM

AK204050

Check Conditions

- Under the closed loop air/fuel ratio control.
- Engine coolant temperature is higher than 76°C (169°F).
- Mass airflow sensor output is 6 g/sec or more.

Judgement Criteria

- Long-term fuel trim has continued to be lower than –12.5 percent for 5 seconds.

or

- Short-term fuel trim has continued to be lower than –10.0 percent for 5 seconds.

Check Conditions

- Under the closed loop air/fuel ratio control.
- Engine coolant temperature is higher than 76°C (169°F).
- Mass airflow sensor output is 6 g/sec or less.

Judgement Criteria

- Long-term fuel trim has continued to be lower than –12.5 percent for 5 seconds.

or

- Short-term fuel trim has continued to be lower than –15.0 percent for 5 seconds.

TSB Revision

Check Conditions

- Engine coolant temperature is higher than 76°C (169°F).
- Under the closed loop air/fuel ratio control.

Judgement Criteria

- Long-term fuel trim has continued to be –12.5 percent for 2 seconds.

or

- Short-term fuel trim has continued to be –25.0 percent for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 22 P.13A-9.

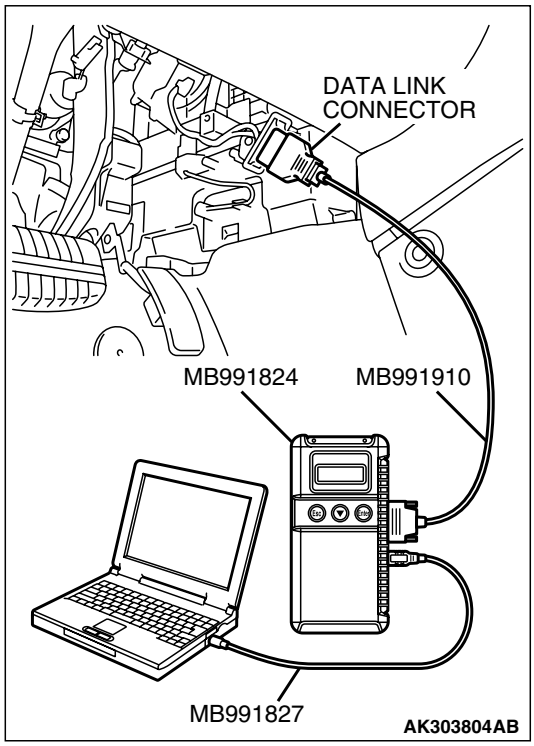
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Mass airflow sensor failed.
- Injector (Number 1, 4) failed.
- Incorrect fuel pressure.
- Engine coolant temperature sensor failed.
- Intake air temperature sensor failed.
- Barometric pressure sensor failed.
- Manifold absolute pressure sensor failed.
- Harness damage in cylinder 1, 4 injector circuit or connector damage.
- PCM failed.

DIAGNOSIS

Required Special Tools:

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



STEP 1. Using scan tool MB991958, check data list item 10: Mass Airflow Sensor.

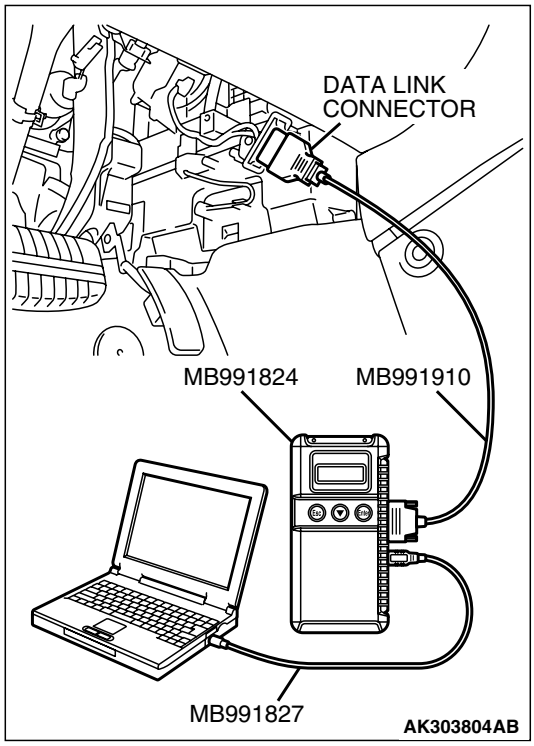
⚠ CAUTION

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) Set scan tool MB991958 to the data reading mode for item 10, Mass Airflow Sensor.
(4) Warm up the engine to normal operating temperature: 80°C to 95°C (176°F to 203°F).
  - When idling, between 1,300 and 1,620 millivolts.
  - When 2,500 r/min, between 1,600 and 1,970 millivolts.
(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : YES: Go to Step 2.
NO : Refer to DTC P0101 – Mass Airflow Circuit Range/Performance Problem P.13A-130, DTC P0102 – Mass Airflow Circuit Low Input P.13A-139, DTC P0103 – Mass Airflow Circuit High Input P.13A-149.



STEP 2. Using scan tool MB991958, check data list item 5: Intake Air Temperature Sensor.

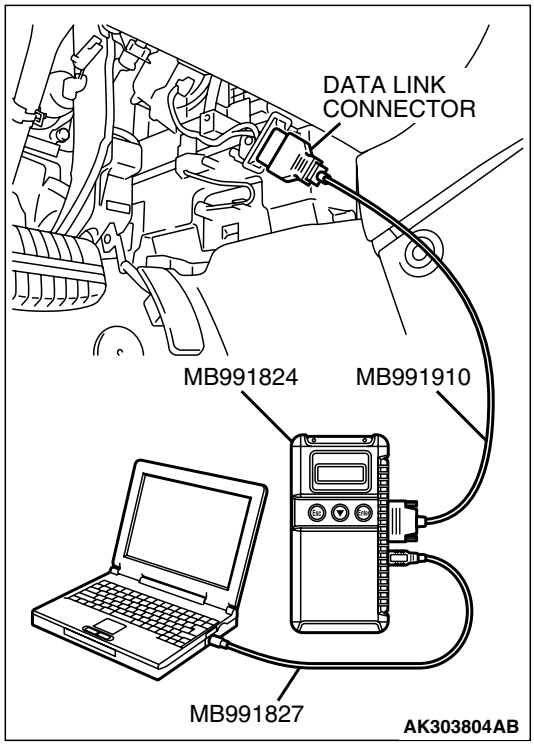
(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool MB991958 to the data reading mode for item 5, Intake Air Temperature Sensor.
- The intake air temperature and temperature shown with the scan tool should approximately match.

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

Q: Is the sensor operating properly?

YES : Go to Step 3.

NO : Refer to DTC P0111 – Intake Air Temperature Circuit Range/Performance Problem P.13A-191, DTC P0112 – Intake Air Temperature Circuit Low Input P.13A-200, DTC P0113 – Intake Air Temperature Circuit High Input P.13A-207.



STEP 3. Using scan tool MB991958, check data list item 6: Engine Coolant Temperature Sensor.

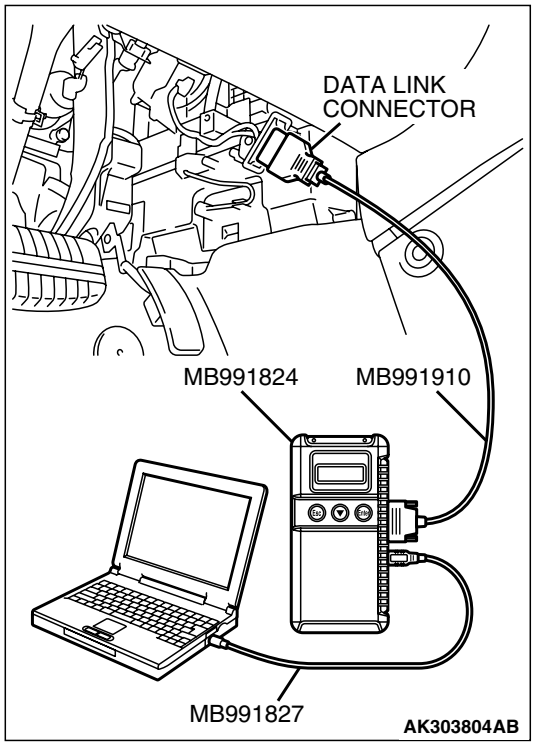
(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool MB991958 to the data reading mode for item 6, Engine Coolant Temperature Sensor.
- The engine coolant temperature and temperature shown with the scan tool should approximately match.

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

Q: Is the sensor operating properly?

YES : Go to Step 4.

NO : Refer to DTC P0116 – Engine Coolant Temperature Circuit Range/Performance ProblemP.13A-217, DTC P0117 – Engine Coolant Temperature Circuit Low Input P.13A-226, DTC P0118 – Engine Coolant Temperature Circuit High Input P.13A-233.



STEP 4. Using scan tool MB991958, check data list item 8: Manifold Absolute Pressure Sensor.

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

(2) Set scan tool MB991958 to the data reading mode for item 8, Manifold Absolute Pressure Sensor.
- When altitude is 0 m (0 foot), 101 kPa (29.8 in.Hg).
- When altitude is 600 m (1,969 feet), 95 kPa (28.1 in.Hg).
- When altitude is 1,200 m (3,937 feet), 88 kPa (26.0 in.Hg).
- When altitude is 1,800 m (5,906 feet), 81 kPa (23.9 in.Hg).

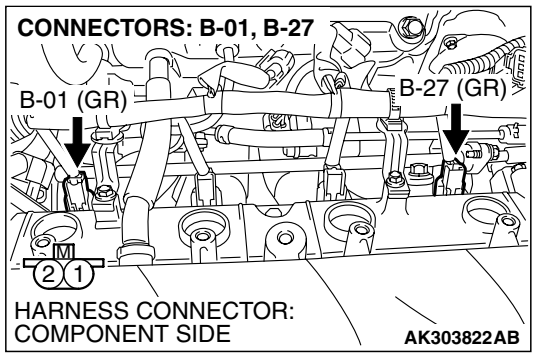
(3) Start the engine.
- When the engine is idling, 16 – 36 kPa (4.7 – 10.6 in.Hg).
- When the engine is suddenly revved, manifold absolute pressure varies.

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

Q: Is the sensor operating properly?

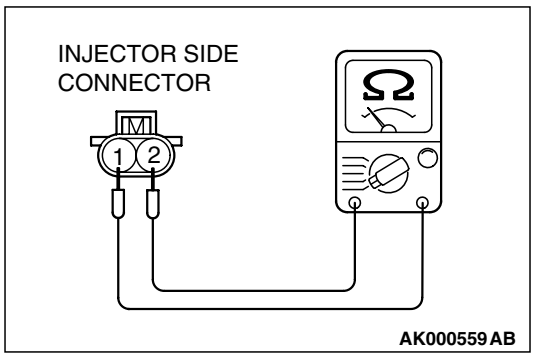
YES : Go to Step 5.

NO : Refer to DTC P0106 – Manifold Absolute Pressure Circuit Range/Performance Problem P.13A-156, DTC P0107 – Manifold Absolute Pressure Circuit Low Input P.13A-170, DTC P0108 – Manifold Absolute Pressure Circuit High Input P.13A-182.



STEP 5. Check the cylinder 1, 4 injector.

(1) Disconnect the cylinder 1, 4 injector connector B-01, B-27.



(2) Measure the resistance between each injector side connector terminal No. 1 and No. 2.

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

Q: Is the measured resistance between 10.5 and 13.5 ohms [at 20°C (68°F)]?

YES : Go to Step 6.

NO : Replace the injector. Then go to Step 8.

STEP 6. Check the fuel pressure.
Refer to On-vehicle Service – Fuel Pressure Test P.13A-1163.

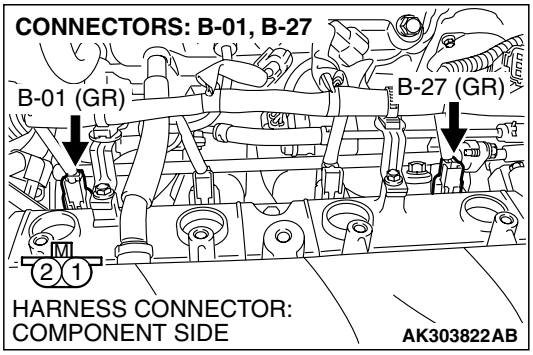
Q: Is the fuel pressure normal?

YES : Go to Step 7.
NO : Repair it. Then go to Step 8.

STEP 7. Replace the cylinder 1, 4 injector.
(1) Replace the cylinder 1, 4 injector.
(2) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 22 P.13A-9.
(3) Check the diagnostic trouble code (DTC).

Q: Is DTC P0172 set?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 8.
NO : The inspection is complete.



STEP 8. Test the OBD-II drive cycle.
(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 22 P.13A-9.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0172 set?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0174: System too Lean (cylinder 2, 3)

⚠ CAUTION
If DTC P0174 has been set, TCL related DTC U1120 is also set. After P0174 has been diagnosed, don't forget to erase DTC U1120.

Fuel Trim Circuit
- Refer to DTC P0202 – Injector Circuit-cylinder 2 P.13A-478, DTC P0203 – Injector Circuit-cylinder 3 P.13A-488.

CIRCUIT OPERATION
- Refer to DTC P0202 – Injector Circuit-cylinder 2 P.13A-478, DTC P0203 – Injector Circuit-cylinder 3 P.13A-488.

TECHNICAL DESCRIPTION
- If a malfunction occurs in the fuel system, the fuel trim value becomes too large.
- The PCM checks whether the fuel trim value is within a specified range.

DESCRIPTIONS OF MONITOR METHODS
Cylinder 2, 3 air/fuel learning value (long time fuel trim) and air/fuel feedback integral value (short time fuel trim) are too lean.

MONITOR EXECUTION
Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)
- Misfire monitor

Sensor (The sensor below is determined to be normal)
- Mass airflow sensor

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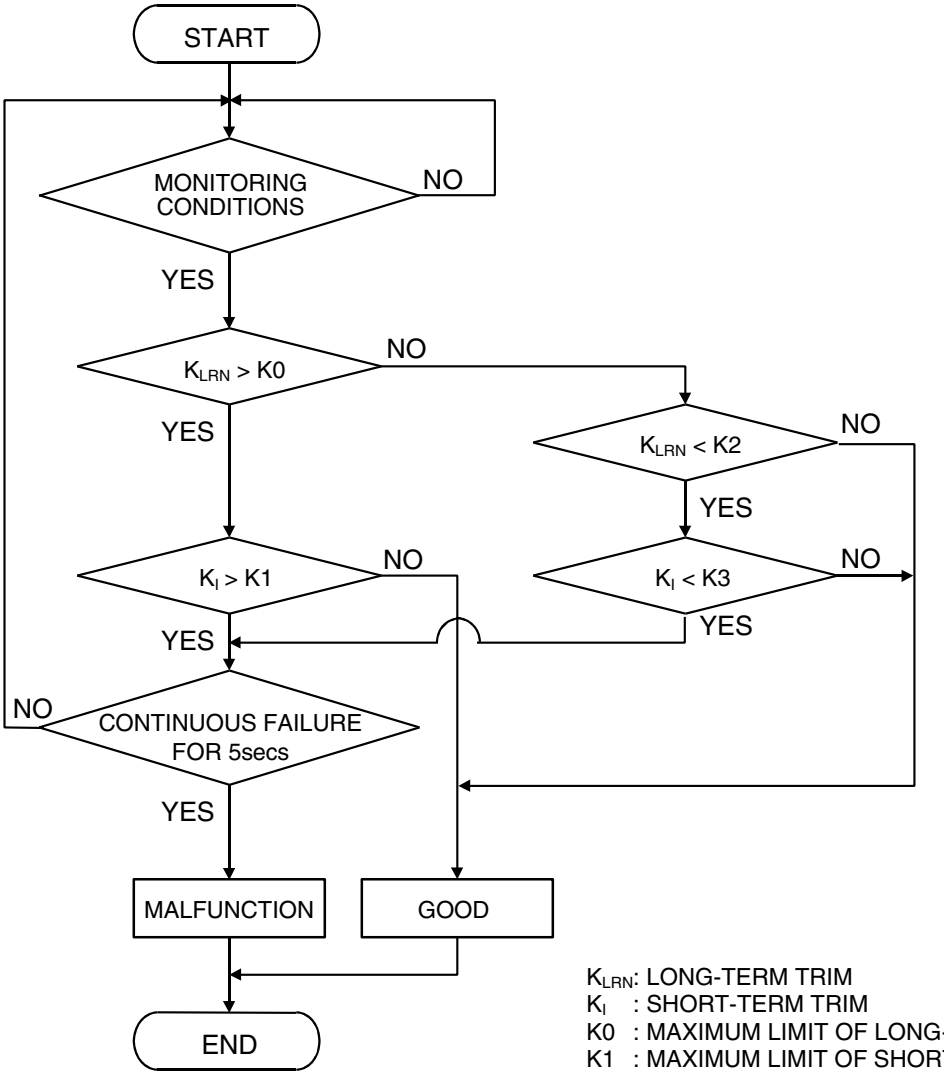
- Engine coolant temperature sensor
- Intake air temperature sensor
- Barometric pressure sensor
- Throttle position sensor

DTC SET CONDITIONS

Logic Flow Chart



K_{LRN}: LONG-TERM TRIM
K_I : SHORT-TERM TRIM
K0 : MAXIMUM LIMIT OF LONG-TERM TRIM
K1 : MAXIMUM LIMIT OF SHORT-TERM TRIM
K2 : MINIMUM LIMIT OF LONG-TERM TRIM
K3 : MINIMUM LIMIT OF SHORT-TERM TRIM

AK204050

Check Conditions

- Engine coolant temperature is lower than 100°C (212°F) when the engine is started.
- Intake air temperature is lower than 60°C (140°F) when the engine is started.
- Under the closed loop air/fuel ratio control.
- Engine coolant temperature is higher than 76°C (169°F).
- Mass airflow sensor output is 6 g/sec or more.

Judgement Criteria

- Long-term fuel trim has continued to be higher than +12.5 percent for 5 seconds.

or

- Short-term fuel trim has continued to be higher than +10.0 percent for 5 seconds.

Check Conditions

- Engine coolant temperature is lower than 100°C (212°F) when the engine is started.

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- Intake air temperature is lower than 60°C (140°F) when the engine is started.
- Under the closed loop air/fuel ratio control.
- Engine coolant temperature is higher than 76°C (169°F).
- Mass airflow sensor output is 6 g/sec or less.

Judgement Criteria

- Long-term fuel trim has continued to be higher than +12.5 percent for 5 seconds.

or

- Short-term fuel trim has continued to be higher than +15.0 percent for 5 seconds.

Check Conditions

- Engine coolant temperature is higher than 100°C (212°F) when the engine is started.
- Intake air temperature is higher than 60°C (140°F) when the engine is started.
- Under the closed loop air/fuel ratio control.
- Engine coolant temperature is higher than 76°C (169°F).
- Mass airflow sensor output is 6 g/sec or more.

Judgement Criteria

- Long-term fuel trim has continued to be higher than +12.5 percent for 5 seconds.

or

- Short-term fuel trim has continued to be higher than +20.0 percent for 5 seconds.

Check Conditions

- Engine coolant temperature is higher than 100°C (212°F) when the engine is started.
- Intake air temperature is higher than 60°C (140°F) when the engine is started.
- Under the closed loop air/fuel ratio control.
- Engine coolant temperature is higher than 76°C (169°F).
- Mass airflow sensor output is 6 g/sec or less.

Judgement Criteria

- Long-term fuel trim has continued to be higher than +12.5 percent for 5 seconds.

or

- Short-term fuel trim has continued to be higher than +25.0 percent for 5 seconds.

Check Conditions

- Engine coolant temperature is higher than 76°C (169°F).
- Under the closed loop air/fuel ratio control.

Judgement Criteria

- Long-term fuel trim has continued to be +12.5 percent for 2 seconds.

or

- Short-term fuel trim has continued to be +25.0 percent for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 22 P.13A-9.

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

- Mass airflow sensor failed.
- Injector (Number 2, 3) failed.
- Incorrect fuel pressure.
- Air drawn in from gaps in gasket, seals, etc.
- Engine coolant temperature sensor failed.
- Intake air temperature sensor failed.
- Barometric pressure sensor failed.
- Manifold absolute pressure sensor failed.
- Exhaust leak.
- Use of incorrect or contaminated fuel.
- Harness damage in cylinder 2, 3 injector circuit or connector damage.
- PCM failed.

DIAGNOSIS

Required Special Tools:

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

STEP 1. Check for exhaust leak.

Q: Are there any abnormalities?

YES : Repair it. Then go to Step 14.
NO : Go to Step 2.

STEP 2. Check for intake system vacuum leak.

Q: Are there any abnormalities?

YES : Repair it. Then go to Step 14.
NO : Go to Step 3.

STEP 3. Using scan tool MB991958, check data list item 10: Mass Airflow Sensor.

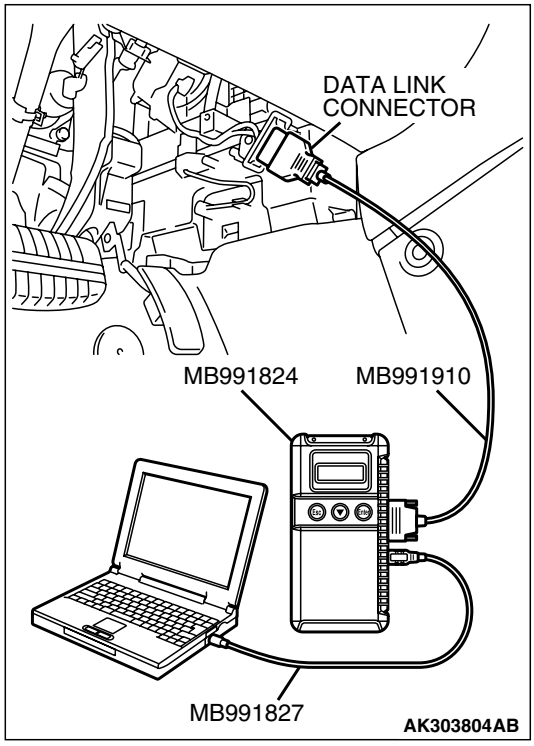
⚠ CAUTION
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

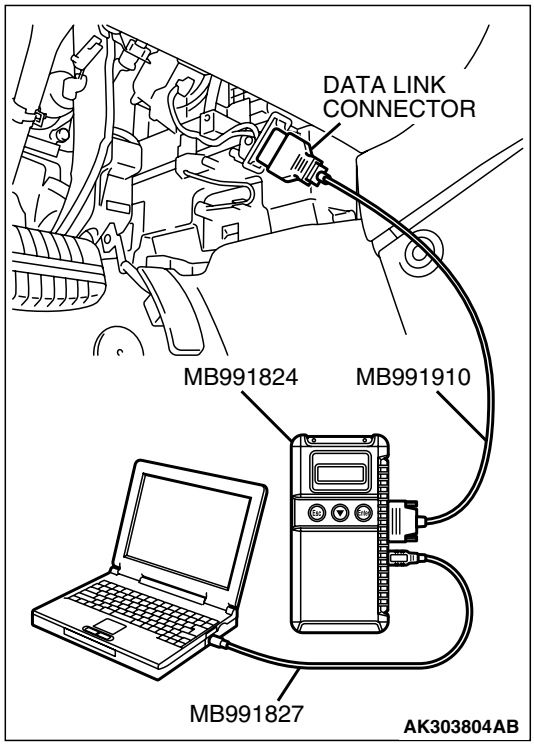
(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991958 to the data reading mode for item 10, Mass Airflow Sensor.
(4) Warm up the engine to normal operating temperature: 80°C to 95°C (176°F to 203°F).
- When idling, between 1,300 and 1,620 millivolts.
- When 2,500 r/min, between 1,600 and 1,970 millivolts.

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

Q: Is the sensor operating properly?

YES : Go to Step 4.
NO : Refer to DTC P0101 – Mass Airflow Circuit Range/Performance Problem P.13A-130, DTC P0102 – Mass Airflow Circuit Low Input P.13A-139, DTC P0103 – Mass Airflow Circuit High Input P.13A-149.





STEP 4. Using scan tool MB991958, check data list item 5: Intake Air Temperature Sensor.

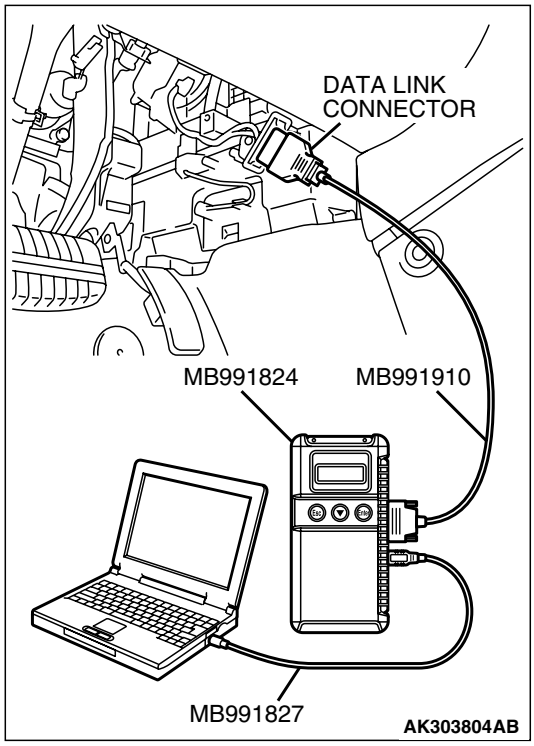
(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool MB991958 to the data reading mode for item 5, Intake Air Temperature Sensor.
- The intake air temperature and temperature shown with the scan tool should approximately match.

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

Q: Is the sensor operating properly?

YES : Go to Step 5.

NO : Refer to DTC P0111 – Intake Air Temperature Circuit Range/Performance Problem P.13A-191, DTC P0112 – Intake Air Temperature Circuit Low Input P.13A-200, DTC P0113 – Intake Air Temperature Circuit High Input P.13A-207.



STEP 5. Using scan tool MB991958, check data list item 6: Engine Coolant Temperature Sensor.

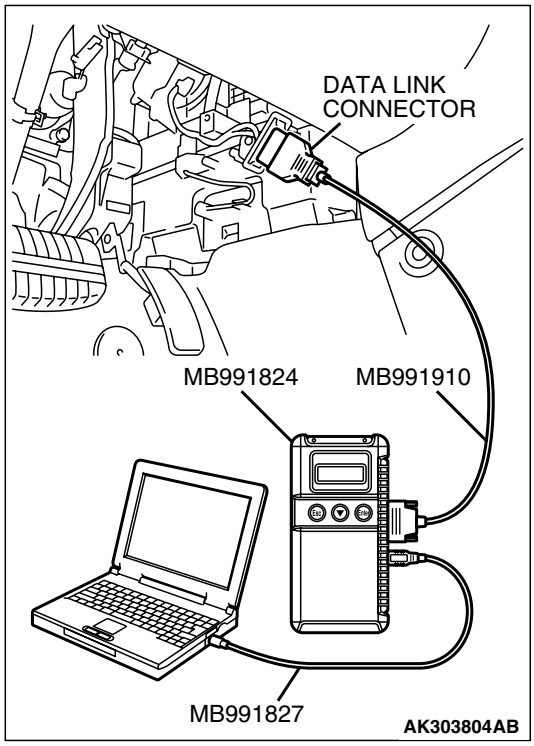
(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool MB991958 to the data reading mode for item 6, Engine Coolant Temperature Sensor.
- The engine coolant temperature and temperature shown with the scan tool should approximately match.

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

Q: Is the sensor operating properly?

YES : Go to Step 6.

NO : Refer to DTC P0116 – Engine Coolant Temperature Circuit Range/Performance Problem P.13A-217, DTC P0117 – Engine Coolant Temperature Circuit Low Input P.13A-226, DTC P0118 – Engine Coolant Temperature Circuit High Input P.13A-233.



STEP 6. Using scan tool MB991958, check data list item 8: Manifold Absolute Pressure Sensor.

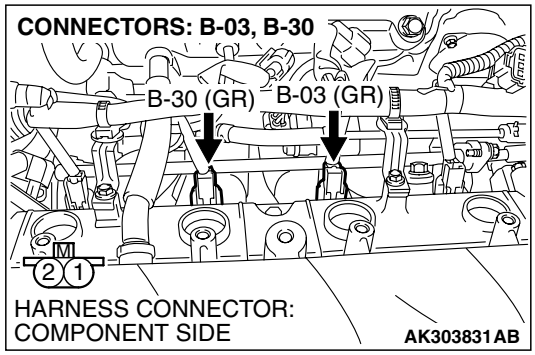
(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool MB991958 to the data reading mode for item 8, Manifold Absolute Pressure Sensor.
- When altitude is 0 m (0 foot), 101 kPa (29.8 in.Hg).
- When altitude is 600 m (1,969 feet), 95 kPa (28.1 in.Hg).
- When altitude is 1,200 m (3,937 feet), 88 kPa (26.0 in.Hg).
- When altitude is 1,800 m (5,906 feet), 81 kPa (23.9 in.Hg).

(3) Start the engine.
- When the engine is idling, 16 – 36 kPa (4.7 – 10.6 in.Hg).
- When the engine is suddenly revved, manifold absolute pressure varies.

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

Q: Is the sensor operating properly?

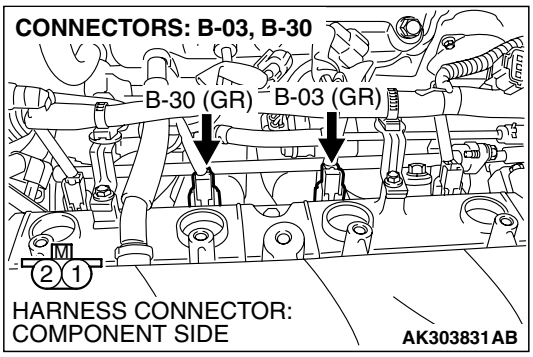
YES : Go to Step 7.
NO : Refer to DTC P0106 – Manifold Absolute Pressure Circuit Range/Performance Problem P.13A-156, DTC P0107 – Manifold Absolute Pressure Circuit Low Input P.13A-170, DTC P0108 – Manifold Absolute Pressure Circuit High Input P.13A-182.



STEP 7. Check harness connector B-03, B-30 at injector for damage.

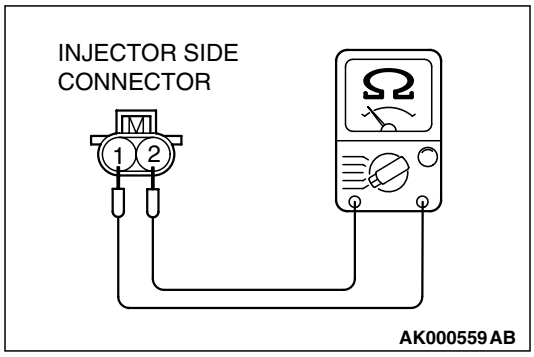
Q: Is the harness connector in good condition?

YES : Then go to Step 8.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.



STEP 8. Check the cylinder 2, 3 injector.

(1) Disconnect the cylinder 2, 3 injector connector B-03, B-30.



(2) Measure the resistance between each injector side connector terminal No. 1 and No. 2.

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

Q: Is the measured resistance between 10.5 and 13.5 ohms [at 20°C (68°F)]?

YES : Go to Step 9.

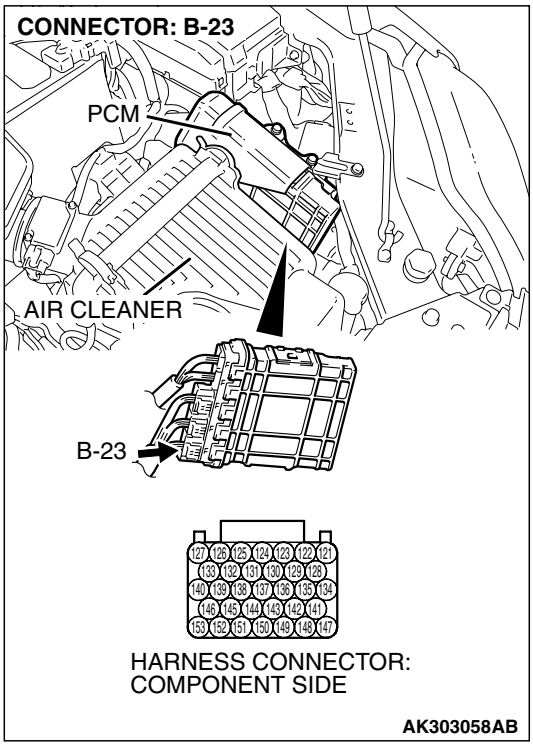
NO : Replace the injector. Then go to Step 14.

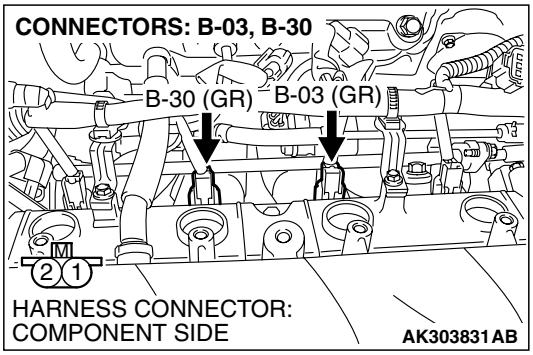
STEP 9. Check harness connector B-23 at PCM for damage.

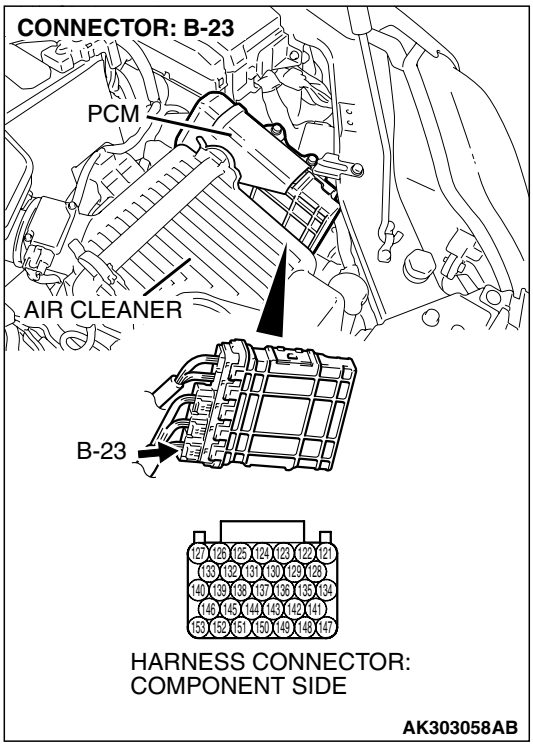
Q: Is the harness connector in good condition?

YES : Go to Step 10.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.







STEP 10. Check for harness damage between cylinder 2, 3 injector connector and PCM connector.

a. Check the harness wire between injector connector B-30 (terminal No. 2) and PCM connector B-23 (terminal No. 146) at No. 2 cylinder injector.

b. Check the harness wire between injector connector B-03 (terminal No. 2) and PCM connector B-23 (terminal No. 140) at No. 3 cylinder injector.

Q: Is the harness wire in good condition?

YES : Go to Step 11.

NO : Repair it. Then go to Step 14.

STEP 11. Check the fuel pressure.

Refer to On-vehicle Service – Fuel Pressure Test P.13A-1163.

Q: Is the fuel pressure normal?

YES : Go to Step 12.

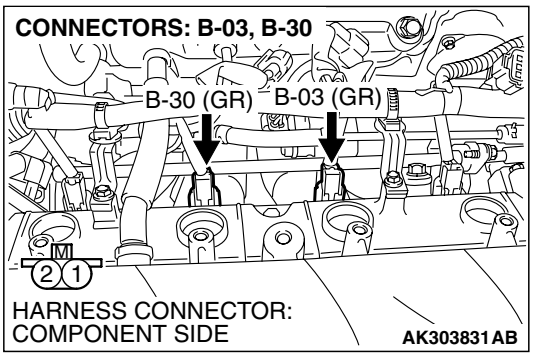
NO : Repair it. Then go to Step 14.

STEP 12. Check for entry of foreign matter (water, kerosene, etc.) into fuel.

Q: Are there any abnormalities?

YES : Replace the fuel. Then go to Step 14.

NO : Go to Step 13.



STEP 13. Replace the cylinder 2, 3 injector.

(1) Replace the cylinder 2, 3 injector.
(2) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 22 P.13A-9.
(3) Check in the diagnostic trouble code (DTC).

Q: Is DTC P0174 set?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 14.
NO : The inspection is complete.

STEP 14. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 22 P.13A-9.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0174 set?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0175: System too Rich (cylinder 2, 3)

⚠ CAUTION
If DTC P0175 has been set, TCL related DTC U1120 is also set. After P0175 has been diagnosed, don't forget to erase DTC U1120.

Fuel Trim Circuit

- Refer to DTC P0202 – Injector Circuit-cylinder 2 P.13A-478, DTC P0203 – Injector Circuit-cylinder 3 P.13A-488.

CIRCUIT OPERATION

- Refer to DTC P0202 – Injector Circuit-cylinder 2 P.13A-478, DTC P0203 – Injector Circuit-cylinder 3 P.13A-488.

TECHNICAL DESCRIPTION

- If a malfunction occurs in the fuel system, the fuel trim value becomes too small.
- The PCM checks whether the fuel trim value is within a specified range.

DESCRIPTIONS OF MONITOR METHODS

Cylinder 2, 3 air/fuel learning value (long time fuel trim) and air/fuel feedback integral value (short time fuel trim) are too rich.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

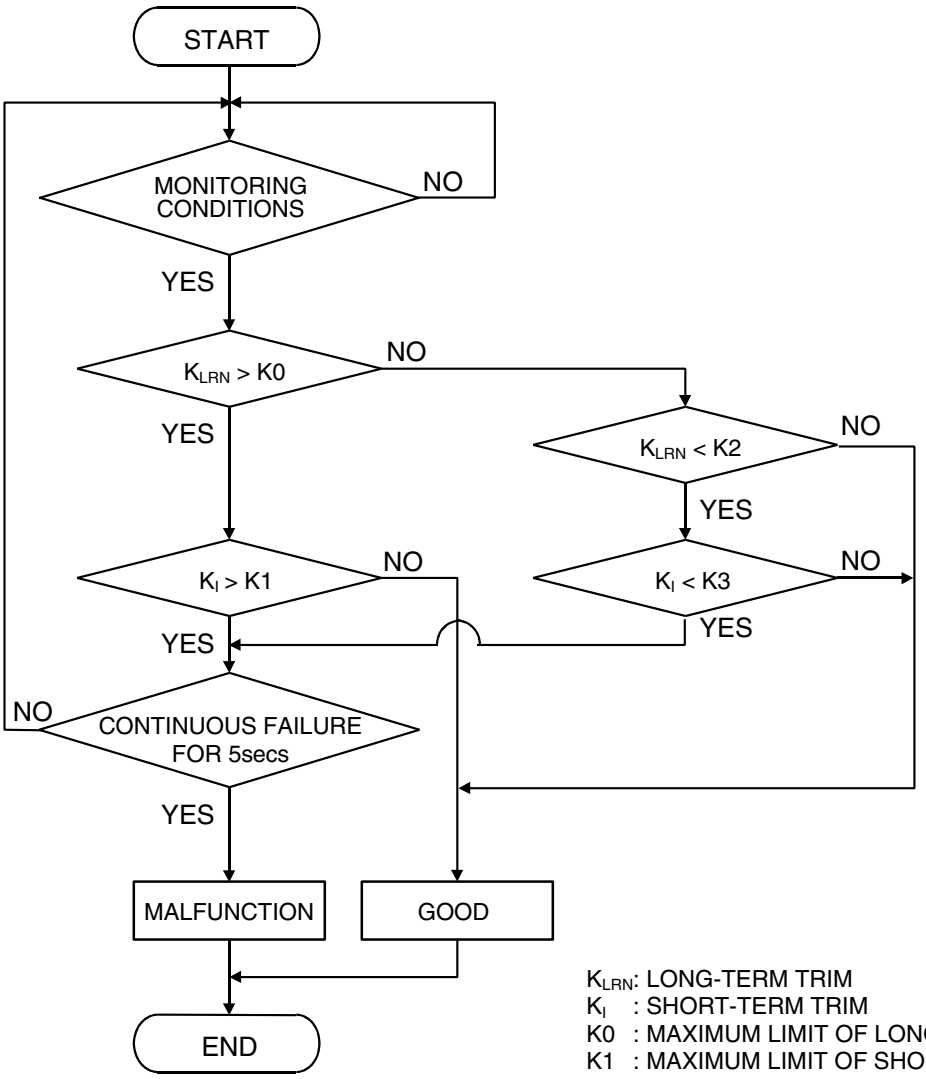
- Misfire monitor

Sensor (The sensor below is determined to be normal)

- Mass airflow sensor
- Engine coolant temperature sensor
- Intake air temperature sensor
- Barometric pressure sensor
- Throttle position sensor

DTC SET CONDITIONS

Logic Flow Chart



K_{LRN}: LONG-TERM TRIM
K_I : SHORT-TERM TRIM
K0 : MAXIMUM LIMIT OF LONG-TERM TRIM
K1 : MAXIMUM LIMIT OF SHORT-TERM TRIM
K2 : MINIMUM LIMIT OF LONG-TERM TRIM
K3 : MINIMUM LIMIT OF SHORT-TERM TRIM

AK204050

DTC SET CONDITIONS

Check Conditions

- Under the closed loop air/fuel ratio control.
- Engine coolant temperature is higher than 76°C (169°F).
- Mass airflow sensor output is 6 g/sec or more.

Judgement Criteria

- Long-term fuel trim has continued to be lower than –12.5 percent for 5 seconds.

or

- Short-term fuel trim has continued to be lower than –10.0 percent for 5 seconds.

Check Conditions

- Under the closed loop air/fuel ratio control.
- Engine coolant temperature is higher than 76°C (169°F).
- Mass airflow sensor output is 6 g/sec or less.

Judgement Criteria

- Long-term fuel trim has continued to be lower than –12.5 percent for 5 seconds.

or

- Short-term fuel trim has continued to be lower than –15.0 percent for 5 seconds.

TSB Revision

Check Conditions

- Engine coolant temperature is higher than 76°C (169°F).
- Under the closed loop air/fuel ratio control.

Judgement Criteria

- Long-term fuel trim has continued to be –12.5 percent for 2 seconds.

or

- Short-term fuel trim has continued to be –25.0 percent for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 22 P.13A-9.

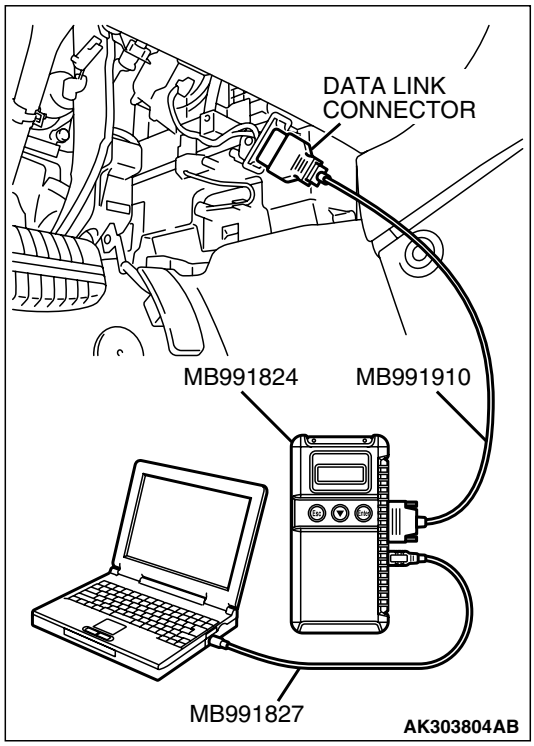
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Mass airflow sensor failed.
- Injector (Number 2, 3) failed.
- Incorrect fuel pressure.
- Engine coolant temperature sensor failed.
- Intake air temperature sensor failed.
- Barometric pressure sensor failed.
- Manifold absolute pressure sensor failed.
- Harness damage in cylinder 2, 3 injector circuit or connector damage.
- PCM failed.

DIAGNOSIS

Required Special Tools:

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



STEP 1. Using scan tool MB991958, check data list item 10: Mass Airflow Sensor.

⚠ CAUTION

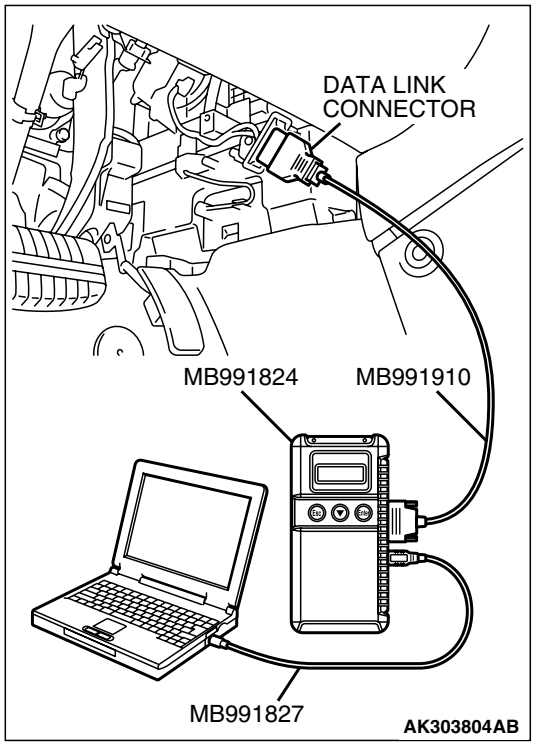
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991958 to the data reading mode for item 10, Mass Airflow Sensor.
(4) Warm up the engine to normal operating temperature: 80°C to 95°C (176°F to 203°F).
  - When idling, between 1,300 and 1,620 millivolts.
  - When 2,500 r/min, between 1,600 and 1,970 millivolts.
(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 2.

NO : Refer to DTC P0101 – Mass Airflow Circuit Range/Performance Problem P.13A-130, DTC P0102 – Mass Airflow Circuit Low Input P.13A-139, DTC P0103 – Mass Airflow Circuit High Input P.13A-149.



STEP 2. Using scan tool MB991958, check data list item 5: Intake Air Temperature Sensor.

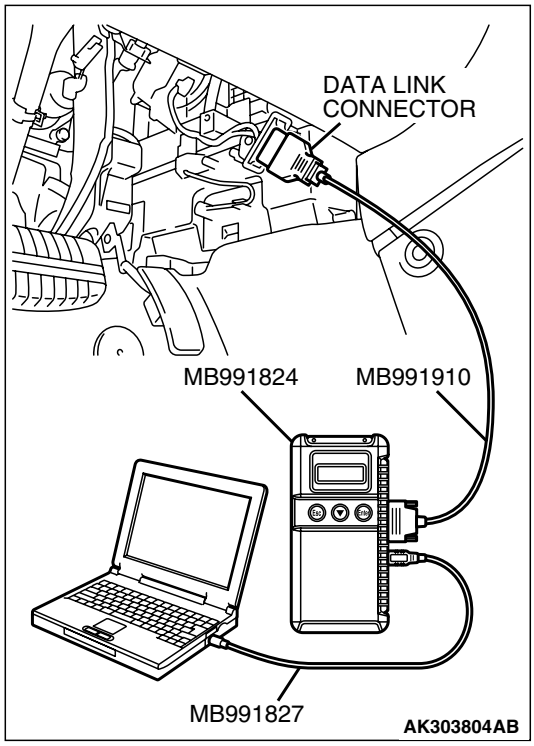
(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool MB991958 to the data reading mode for item 5, Intake Air Temperature Sensor.
- The intake air temperature and temperature shown with the scan tool should approximately match.

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

Q: Is the sensor operating properly?

YES : Go to Step 3.

NO : Refer to DTC P0111 – Intake Air Temperature Circuit Range/Performance Problem P.13A-191 DTC P0112 – Intake Air Temperature Circuit Low Input P.13A-200, DTC P0113 – Intake Air Temperature Circuit High Input P.13A-207.



STEP 3. Using scan tool MB991958, check data list item 6: Engine Coolant Temperature Sensor.

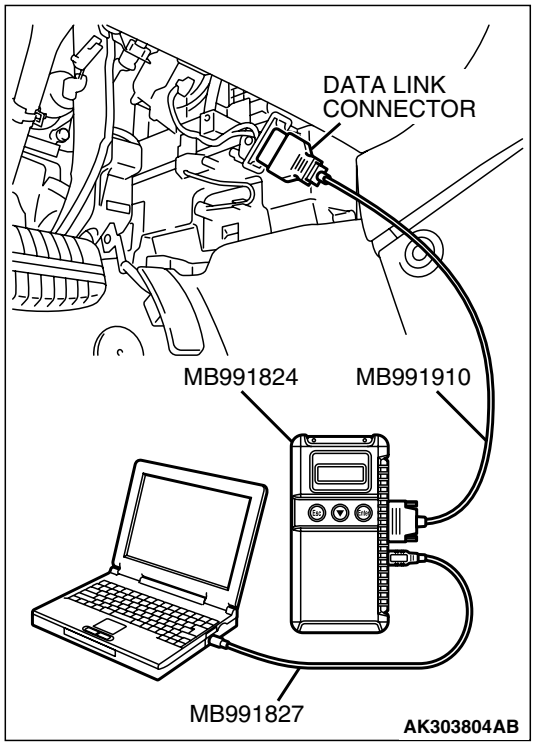
(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool MB991958 to the data reading mode for item 6, Engine Coolant Temperature Sensor.
- The engine coolant temperature and temperature shown with the scan tool should approximately match.

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

Q: Is the sensor operating properly?

YES : Go to Step 4.

NO : Refer to DTC P0116 – Engine Coolant Temperature Circuit Range/Performance Problem P.13A-217, DTC P0117 – Engine Coolant Temperature Circuit Low Input P.13A-226, DTC P0118 – Engine Coolant Temperature Circuit High Input P.13A-233.



STEP 4. Using scan tool MB991958, check data list item 8: Manifold Absolute Pressure Sensor.

(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool MB991958 to the data reading mode for item 8, Manifold Absolute Pressure Sensor.
- When altitude is 0 m (0 foot), 101 kPa (29.8 in.Hg).
- When altitude is 600 m (1,969 feet), 95 kPa (28.1 in.Hg).
- When altitude is 1,200 m (3,937 feet), 88 kPa (26.0 in.Hg).
- When altitude is 1,800 m (5,906 feet), 81 kPa (23.9 in.Hg).

(3) Start the engine.
- When the engine is idling, 16 – 36 kPa (4.7 – 10.6 in.Hg).
- When the engine is suddenly revved, manifold absolute pressure varies.

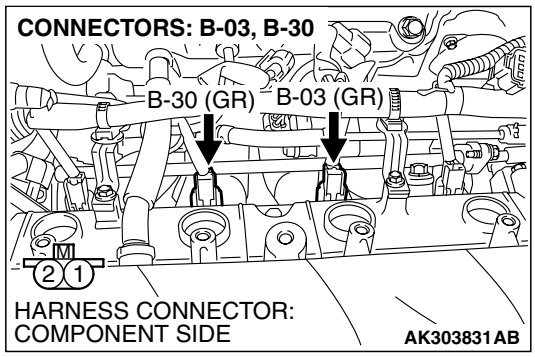
(4) Turn the ignition switch to the "LOCK" (OFF) position.

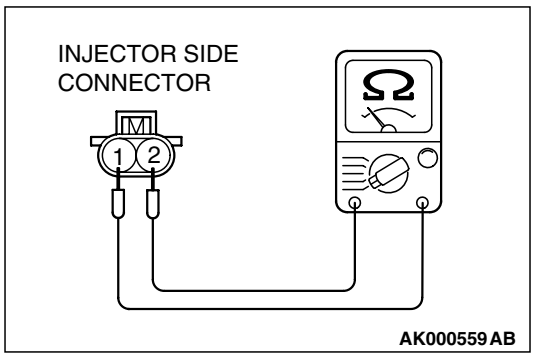
Q: Is the sensor operating properly?

YES : Go to Step 5.
NO : Refer to DTC P0106 – Manifold Absolute Pressure Circuit Range/Performance Problem P.13A-156, DTC P0107 – Manifold Absolute Pressure Circuit Low Input P.13A-170, DTC P0108 – Manifold Absolute Pressure Circuit High Input P.13A-182.

STEP 5. Check the cylinder 2, 3 injector.

(1) Disconnect the cylinder 2, 3 injector connector B-03, B-30.





(2) Measure the resistance between each injector side connector terminal No. 1 and No. 2.

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

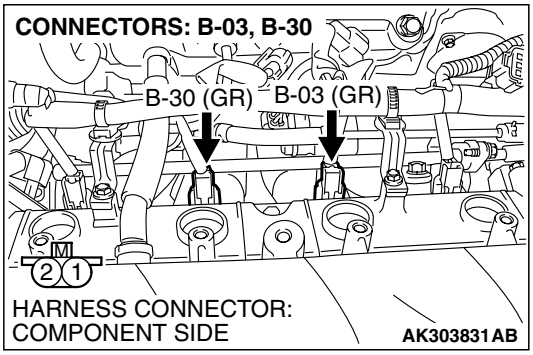
Q: Is the measured resistance between 10.5 and 13.5 ohms [at 20°C (68°F)]?

YES : Go to Step 6.
NO : Replace the injector. Then go to Step 8.

STEP 6. Check the fuel pressure.
Refer to On-vehicle Service – Fuel Pressure Test P.13A-1163.

Q: Is the fuel pressure normal?

YES : Go to Step 7.
NO : Repair it. Then go to Step 8.



STEP 7. Replace the cylinder 2, 3 injector.
(1) Replace the cylinder 2, 3 injector.
(2) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 22 P.13A-9.
(3) Check the diagnostic trouble code (DTC).

Q: Is DTC P0175 set?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 8.
NO : The inspection is complete.

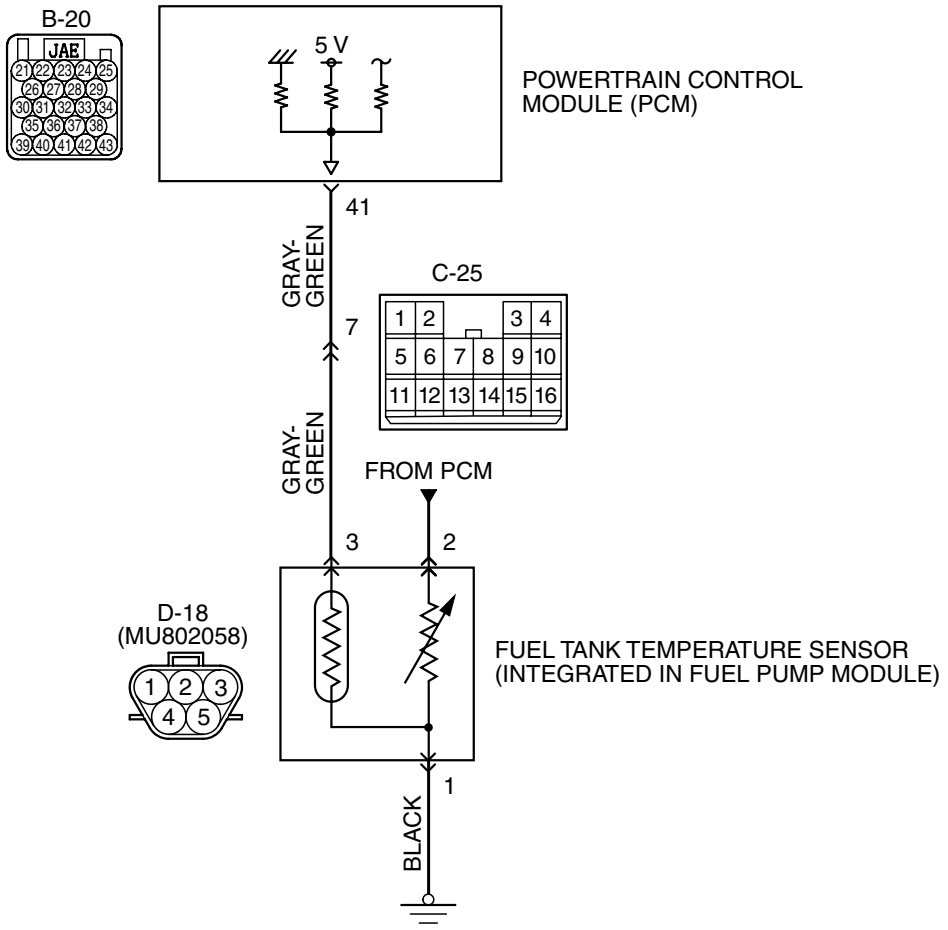
STEP 8. Test the OBD-II drive cycle.
(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 22 P.13A-9.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0175 output?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0181: Fuel Tank Temperature Sensor Circuit Range/Performance

Fuel Tank Temperature Sensor Circuit



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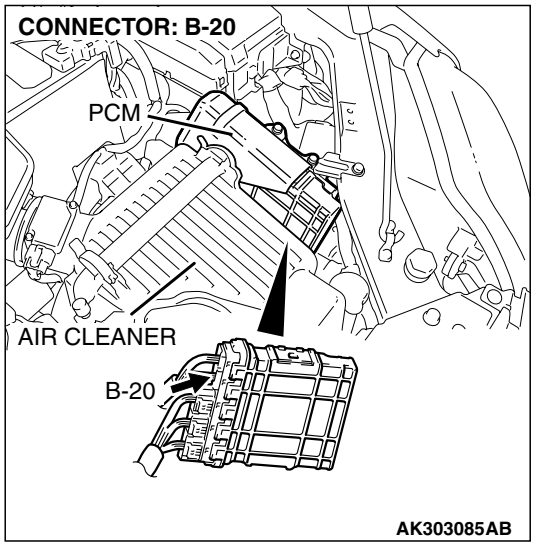
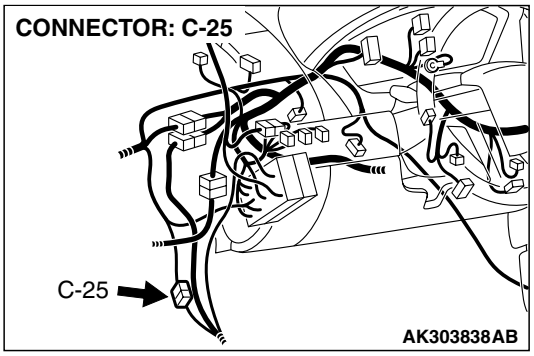
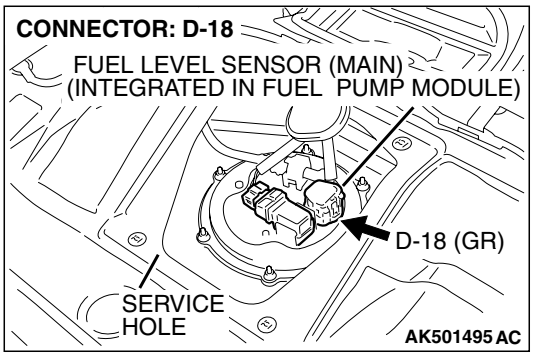




TSB Revision



CIRCUIT OPERATION

- 5-volt voltage is applied to the fuel tank temperature sensor output terminal (terminal No. 3) from the PCM (terminal No. 41) via the resistor in the PCM.
- The fuel tank temperature sensor output voltage increases when the resistance increases and decreases when the resistance decreases. The ground terminal (terminal No. 1) is grounded to the vehicle body.

TECHNICAL DESCRIPTION

- The fuel tank temperature sensor converts the fuel tank temperature to a voltage.
- The PCM detects the fuel tank temperature with this output voltage.

DESCRIPTIONS OF MONITOR METHODS

Fuel tank temperature at engine start is higher than engine coolant temperature at engine start by specified value when engine is cold start condition.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

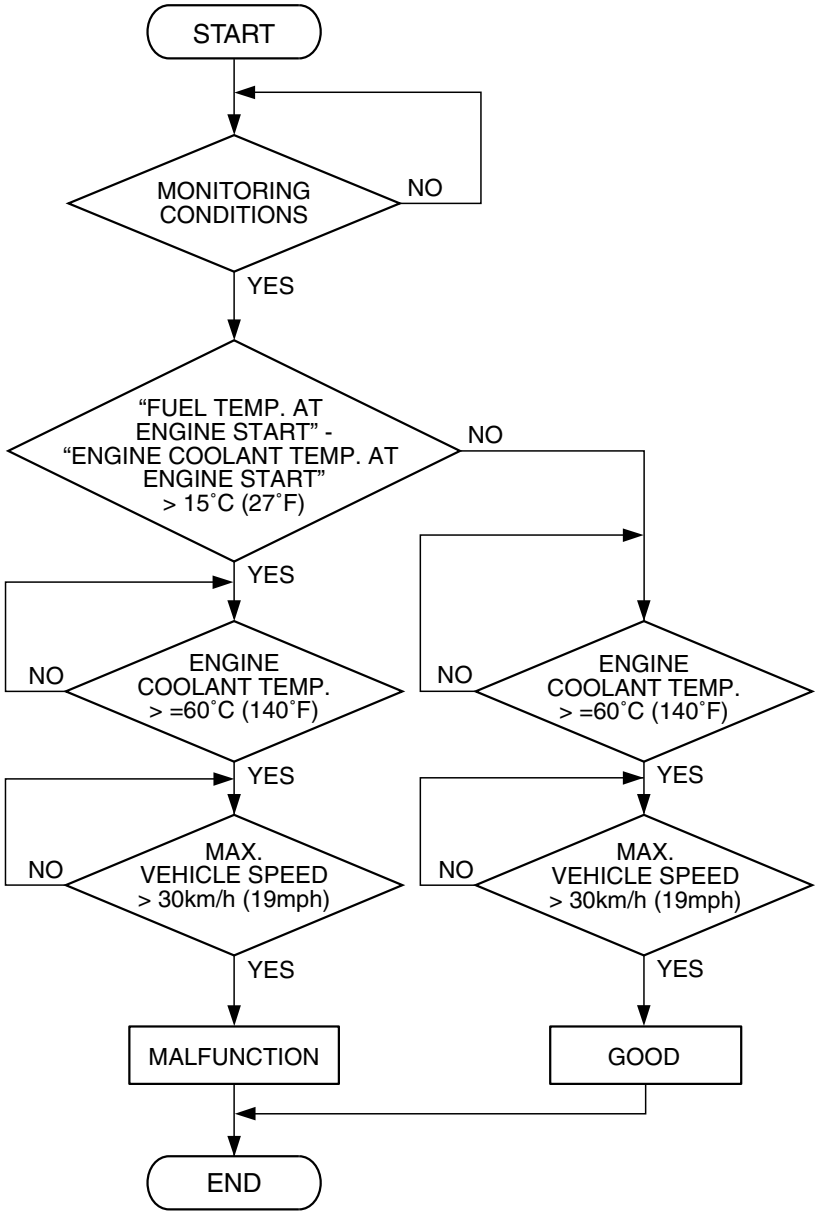
- Not applicable

Sensor (The sensor below is determined to be normal)

- Engine coolant temperature sensor
- Intake air temperature sensor

DTC SET CONDITIONS

Logic Flow Chart



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Check Conditions

- The engine coolant temperature – intake air temperature is 5°C (9°F) or less when the engine is started.
- The engine coolant temperature is between –10°C (14°F) and 36°C (97°F) when the engine is started.
- The engine coolant temperature is higher than 60°C (140°F).
- Maximum vehicle speed is higher than 30 km/h (19 mph) after the engine starting sequence has been completed.

Judgement Criterion

- The fuel tank temperature – engine coolant temperature is 15°C (27°F) or more when the engine is started.

TSB Revision

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 14 P.13A-9.

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

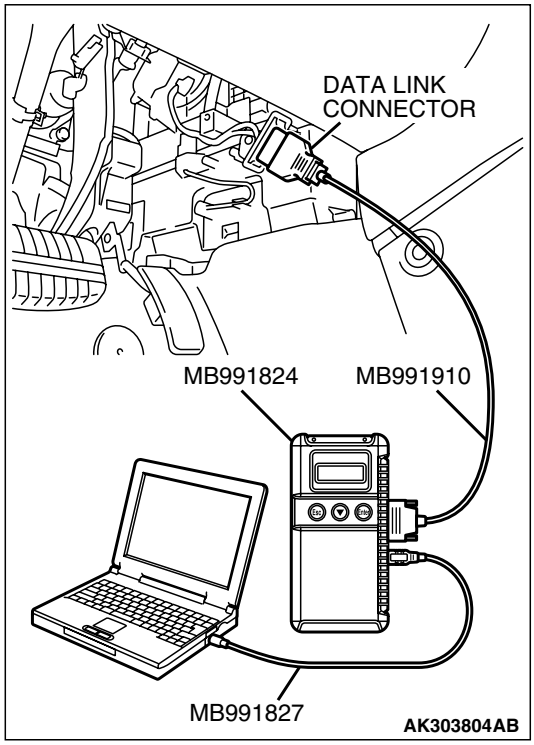
- Fuel tank temperature sensor failed.
- Open or shorted fuel tank temperature sensor circuit, harness damage, or connector damage.
- PCM failed.

NOTE: A diagnostic trouble code (DTC) could be output if the engine and the radiator have been flushed repeatedly when the engine coolant temperature was high (or the fuel tank temperature was high). Because this is not a failure, the DTC must be erased.
Make sure to test drive the vehicle in accordance with the OBD-II drive cycle pattern in order to verify that a DTC will not be output.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A
- MB991923: Power Plant ECU Check Harness



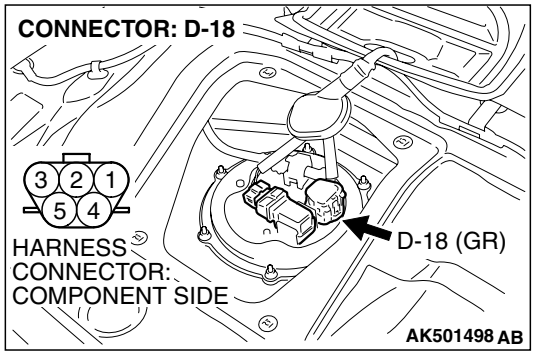
STEP 1. Using scan tool MB991958, check data list item 53: Fuel Tank Temperature Sensor.

⚠ 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) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991958 to the data reading mode for item 53, Fuel Tank Temperature Sensor.
  - Approximately the same as the ambient air temperature when the engine is cooled.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed 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.

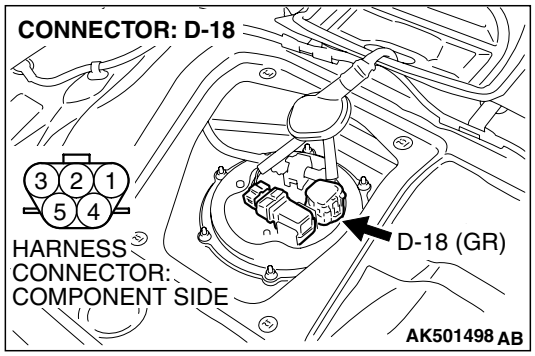


STEP 2. Check harness connector D-18 at the fuel tank temperature sensor for damage.

Q: Is the harness connector in good condition?

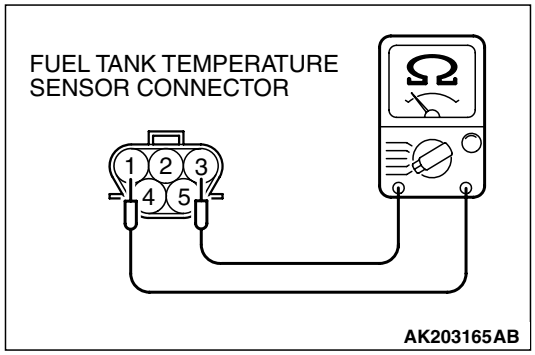
YES : Go to Step 3.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.



STEP 3. Check the fuel tank temperature sensor.

(1) Disconnect the fuel tank temperature sensor connector D-18.



(2) Measure the resistance between terminal No. 1 and No. 3 of the fuel tank temperature sensor.

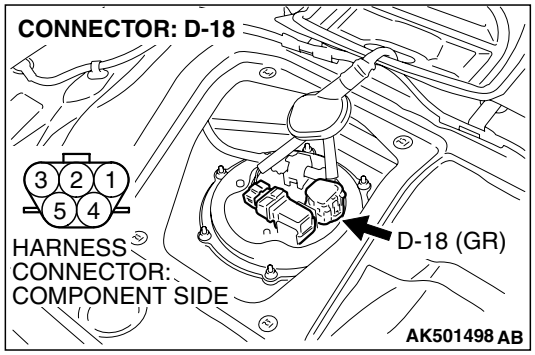
Standard value:
0.5 – 12.0 kΩ

Q: Is the measured resistance between 0.5 and 12.0 kΩ?

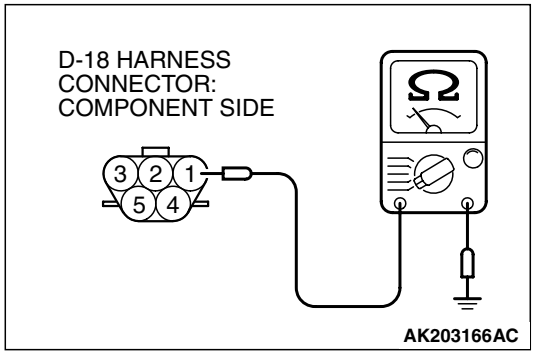
YES : Go to Step 4.

NO : Replace the fuel tank temperature sensor. Then go to Step 12.

STEP 4. Check the continuity at fuel tank temperature sensor harness side connector D-18.



(1) Disconnect the connector D-18 and measure at the harness side.



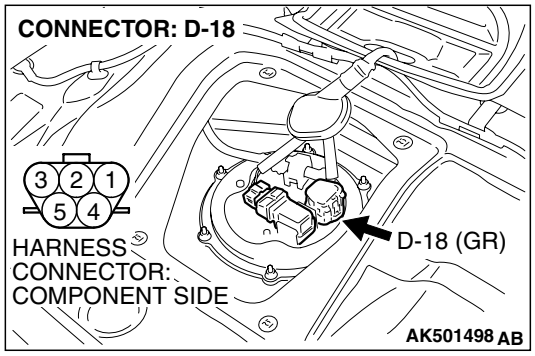
(2) Check for the continuity between terminal No. 1 and ground.
- Continuity (2 Ω or less)

Q: Does continuity exist?

YES : Go to Step 5.

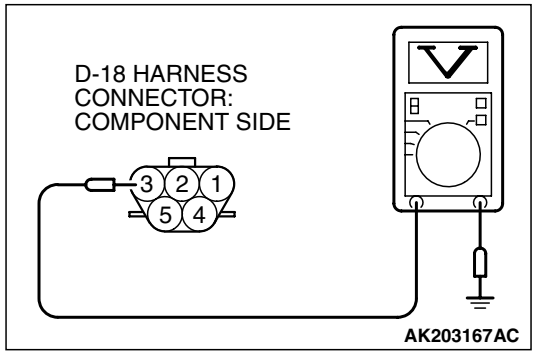
NO : Repair harness wire between fuel tank temperature sensor connector D-18 (terminal No. 1) and ground because of open circuit or harness damage. Then go to Step 12.

STEP 5. Measure the sensor supply voltage at fuel tank temperature sensor harness side connector D-18.



(1) Disconnect the connector D-18 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 between 4.5 and 4.9 volts

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

Q: Is the measured voltage between 4.5 and 4.9 volts?

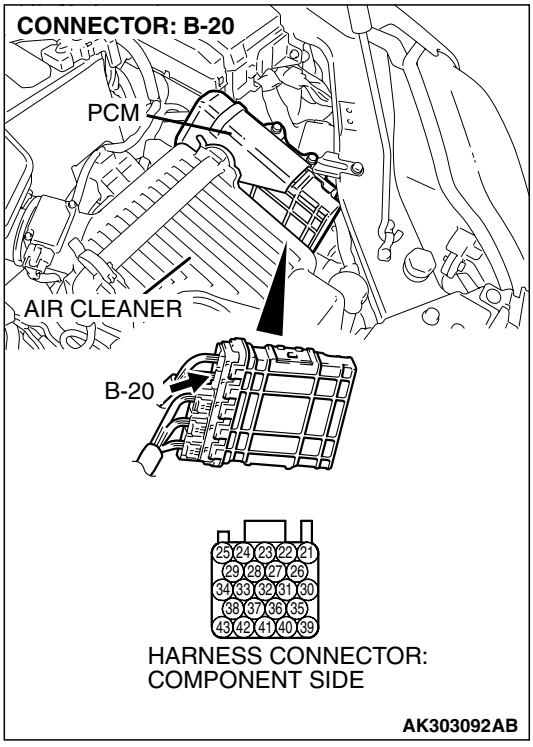
YES : Go to Step 6.

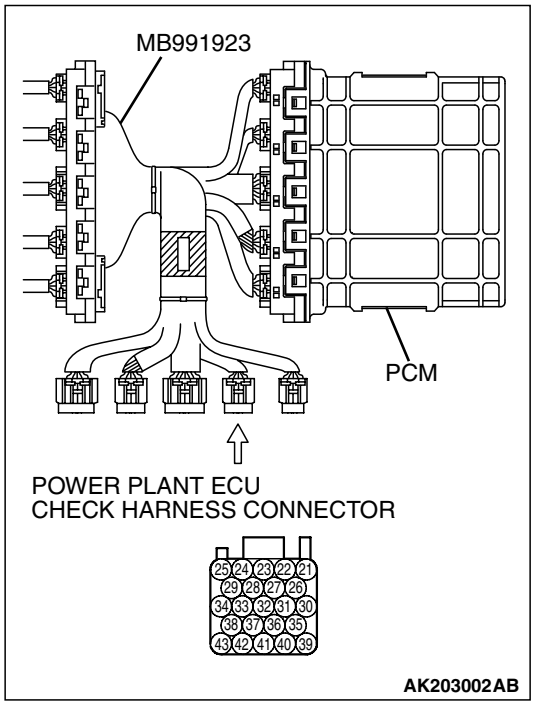
NO : Go to Step 10.

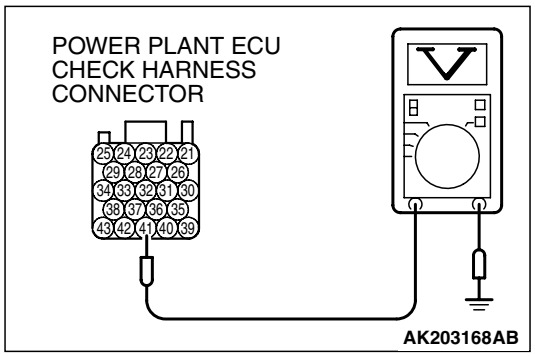
STEP 6. Measure the sensor supply voltage at PCM connector B-20 by using power plant ECU check harness special tool MB991923.

(1) Disconnect all PCM connectors. Connect the power plant ECU check harness special tool MB991923 between the separated connectors.

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







(3) Measure the voltage between terminal No. 41 and ground.
- When fuel tank temperature is 0°C (32°F), voltage should be between 2.7 and 3.1 volts.
- When fuel tank temperature is 20°C (68°F), voltage should be between 2.1 and 2.5 volts.
- When fuel tank temperature is 40°C (104°F), voltage should be between 1.6 and 2.0 volts.
- When fuel tank temperature is 80°C (176°F), voltage should be between 0.8 and 1.2 volts.

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

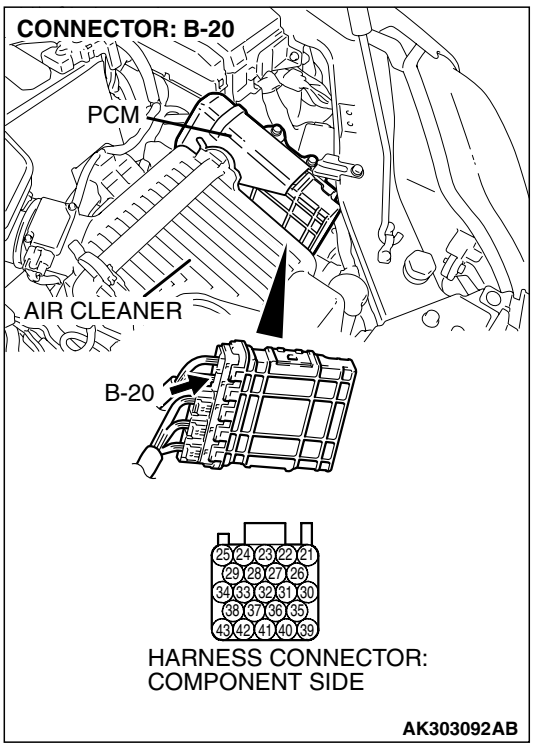
Q: Is the measured voltage normal?

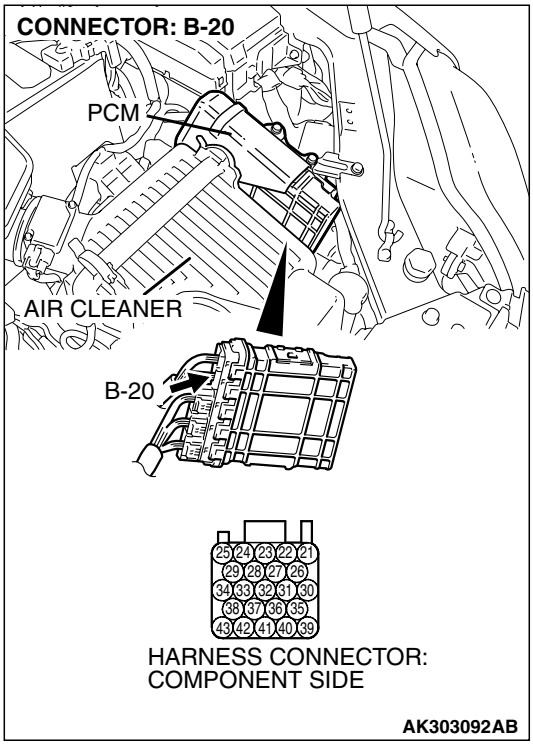
YES : Go to Step 7.
NO : Go to Step 8.

STEP 7. Check harness connector B-20 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Check harness connector C-25 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 tank temperature sensor connector D-18 (terminal No. 3) and PCM connector B-20 (terminal No. 41) because of open circuit. Then go to Step 12.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.





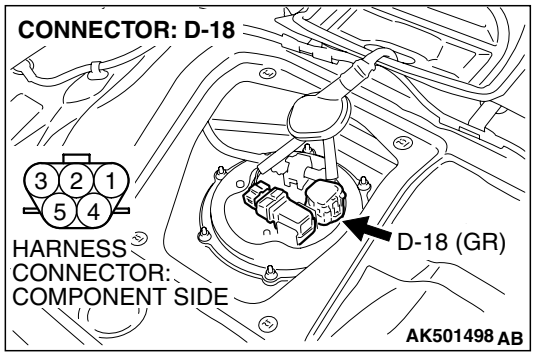
STEP 8. Check harness connector B-20 at PCM for damage.

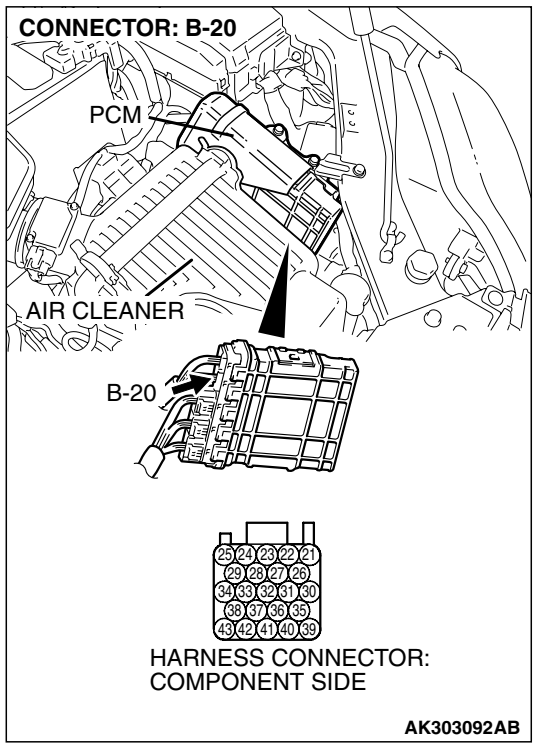
Q: Is the harness connector in good condition?

YES : Go to Step 9.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

STEP 9. Check for short circuit to ground between fuel tank temperature sensor connector D-18 (terminal No. 3) and PCM connector B-25 (terminal No. 41).



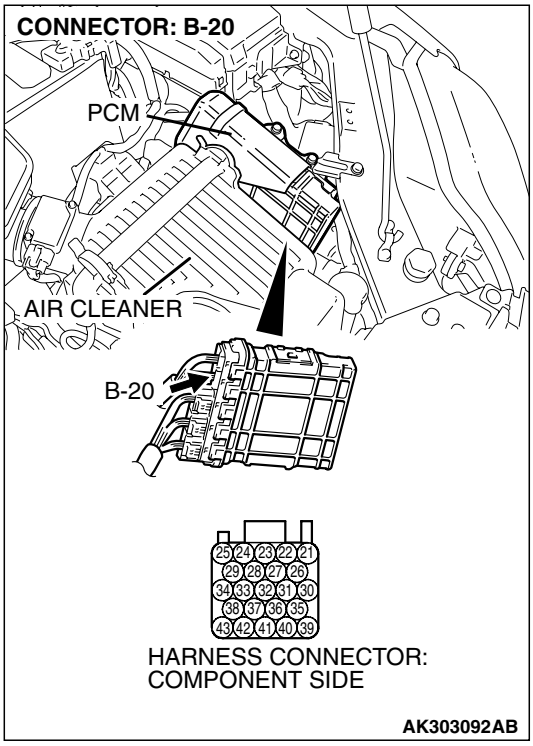


NOTE: Check harness after checking intermediate connector C-25. If intermediate connector is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

Q: Is the harness wire in good condition?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 12.

NO : Repair it. Then go to Step 12.



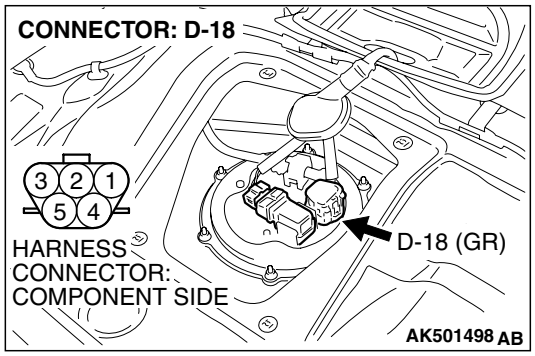
STEP 10. Check harness connector B-20 at PCM for damage.

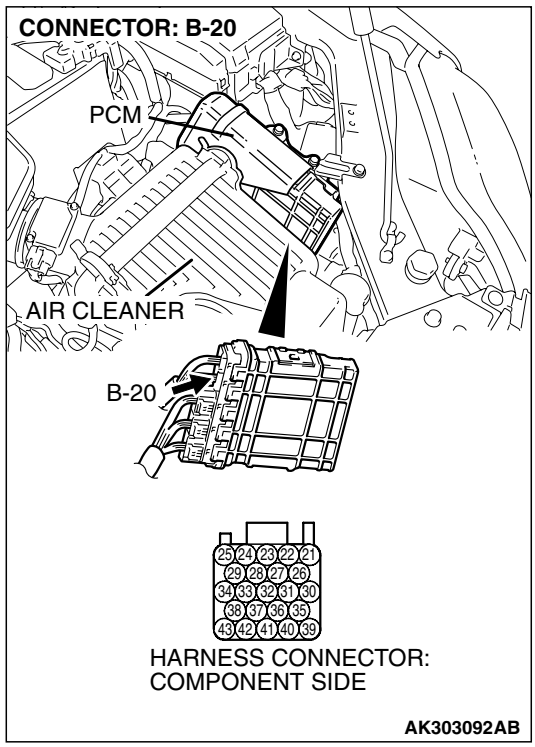
Q: Is the harness connector in good condition?

YES : Go to Step 11.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

STEP 11. Check for harness damage between fuel tank temperature sensor connector D-18 (terminal No. 3) and PCM connector B-20 (terminal No. 41).





NOTE: Check harness after checking intermediate connector C-25. If intermediate connector is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

Q: Is the harness wire in good condition?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 12.

NO : Repair it. Then go to Step 12.

STEP 12. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 14 P.13A-9.

(2) Check the diagnostic trouble code (DTC).

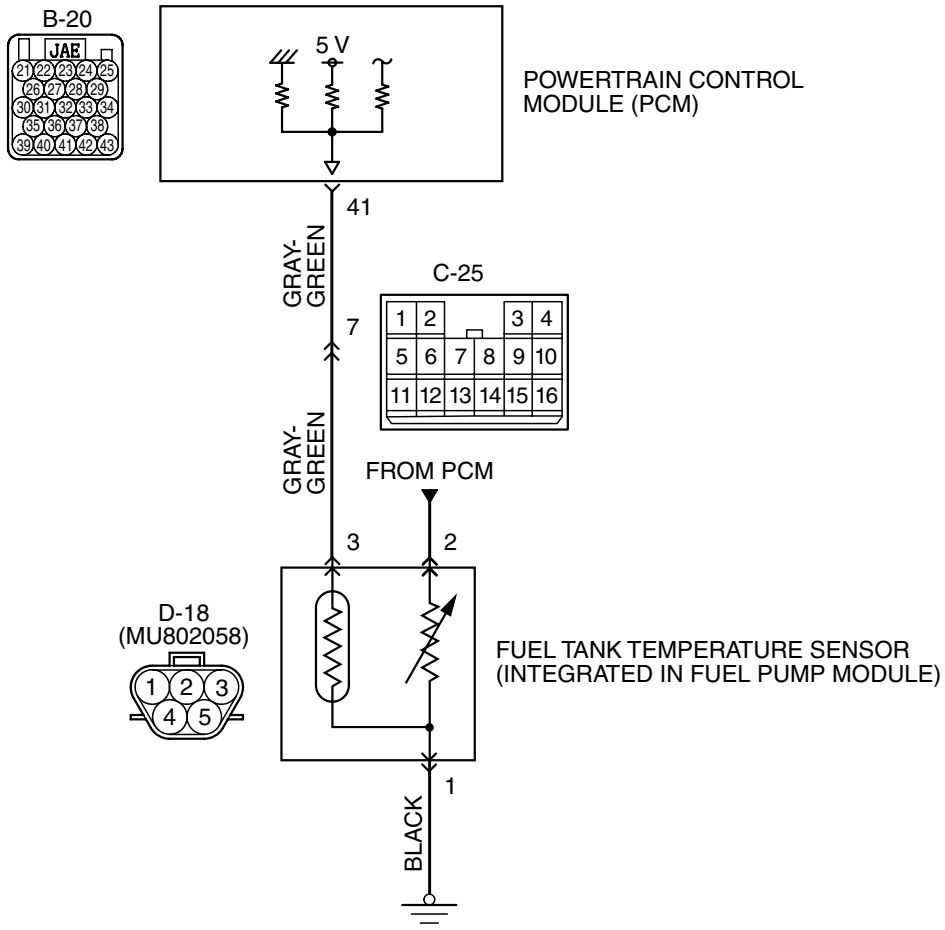
Q: Is DTC P0181 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0182: Fuel Tank Temperature Sensor Circuit Low Input

Fuel Tank Temperature Sensor Circuit



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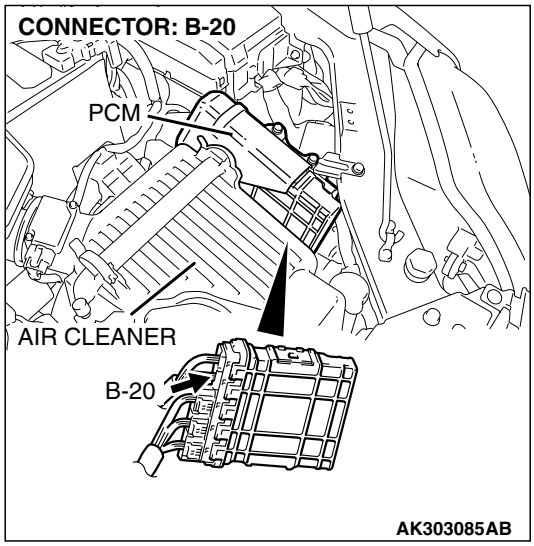
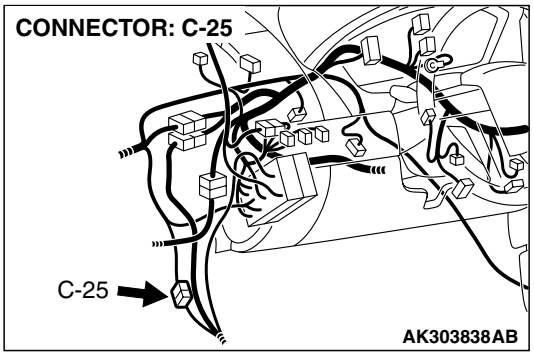
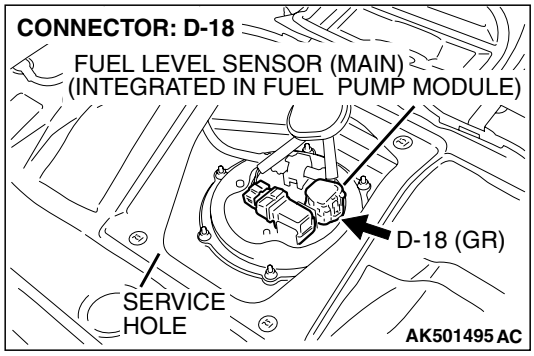






CIRCUIT OPERATION

- 5-volt voltage is applied to the fuel tank temperature sensor output terminal (terminal No. 3) from the PCM (terminal No. 41) via the resistor in the PCM.
- The fuel tank temperature sensor output voltage increases when the resistance increases and decreases when the resistance decreases. The ground terminal (terminal No. 1) is grounded to the vehicle body.

TECHNICAL DESCRIPTION

- The fuel tank temperature sensor converts the fuel tank temperature to a voltage.
- The PCM detects the fuel tank temperature with this output voltage.

DESCRIPTIONS OF MONITOR METHODS

Fuel tank temperature sensor output voltage is out of specified range.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

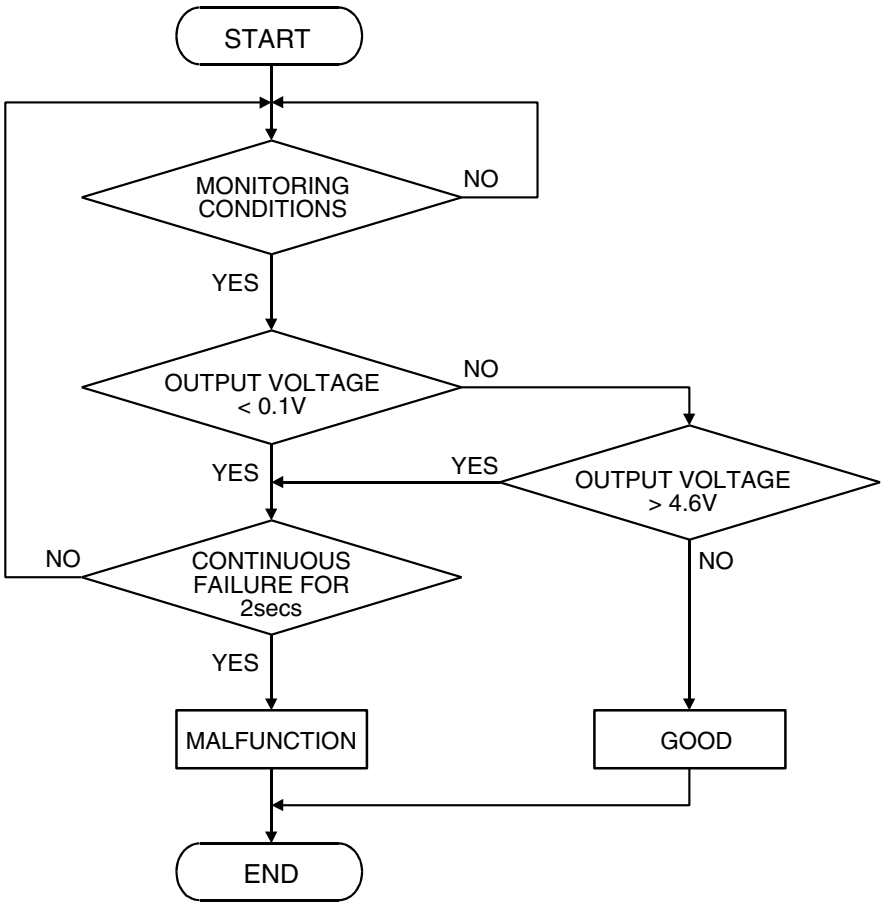
- Not applicable

Sensor (The sensor below is determined to be normal)

- Engine coolant temperature sensor
- Intake air temperature sensor

DTC SET CONDITIONS

Logic Flow Chart



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Check Condition

- 2 seconds or more have passed since the engine starting sequence was completed.

Judgement Criterion

- Sensor output voltage has continued to be 0.1 volt or lower for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 24 P.13A-9.

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

- Fuel tank temperature sensor failed.
- Shorted fuel tank temperature sensor circuit or connector damage.
- PCM failed.

DIAGNOSIS

Required Special Tools:

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

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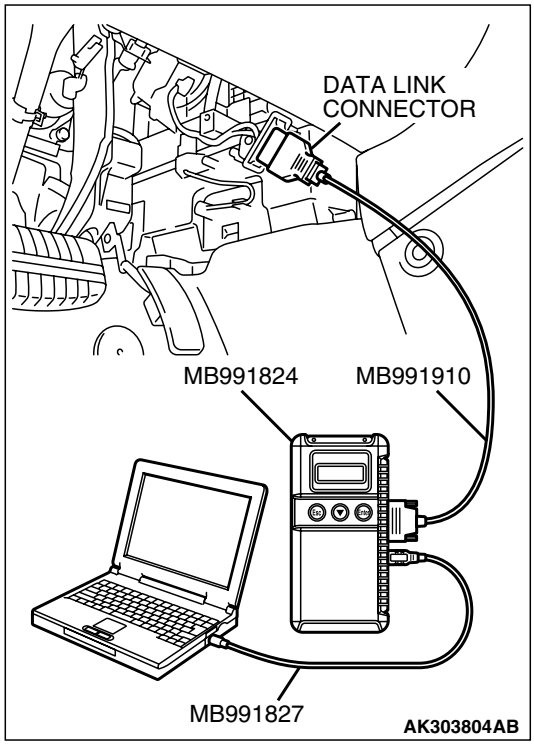


STEP 1. Using scan tool MB991958, check data list item 53: Fuel Tank Temperature Sensor.

⚠ 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.

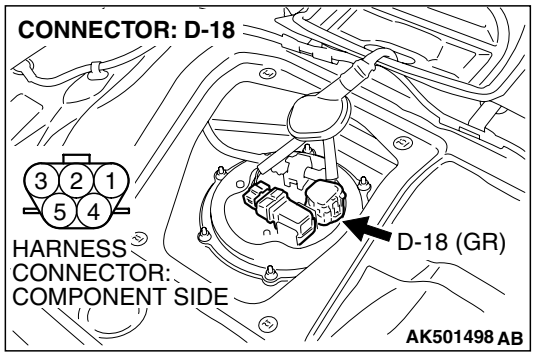
(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991958 to the data reading mode for item 53, Fuel Tank Temperature Sensor.
- Approximately the same as the ambient air temperature when the engine is cooled.

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

Q: Is the sensor operating properly?

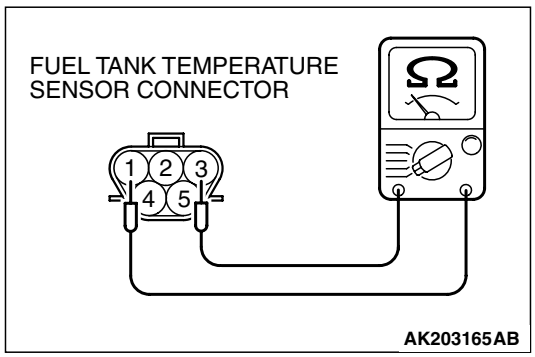
YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-14.

NO : Go to Step 2.



STEP 2. Check the fuel tank temperature sensor.

(1) Disconnect the fuel tank temperature sensor connector D-18.



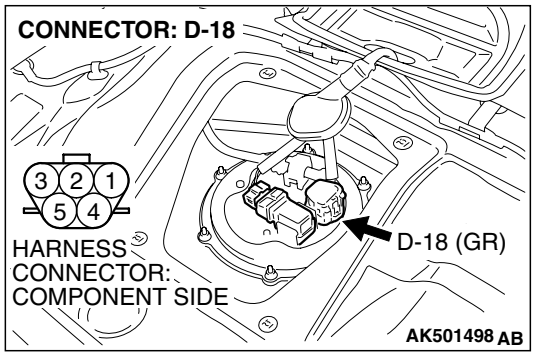
(2) Measure the resistance between terminal No. 1 and No. 3 of the fuel tank temperature sensor.

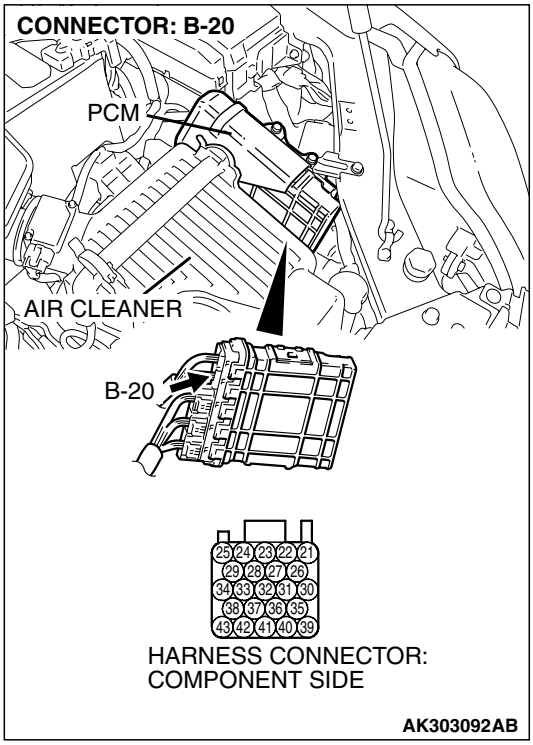
Standard value:
0.5 – 12.0 kΩ

Q: Is the measured resistance between 0.5 and 12.0 kΩ?

YES : Go to Step 3.

NO : Replace the fuel tank temperature sensor. Then go to Step 5.





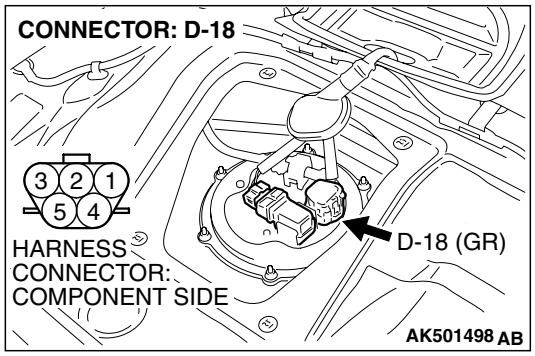
STEP 3. Check harness connector D-18 at the fuel tank temperature sensor and harness connector B-20 at PCM for damage.

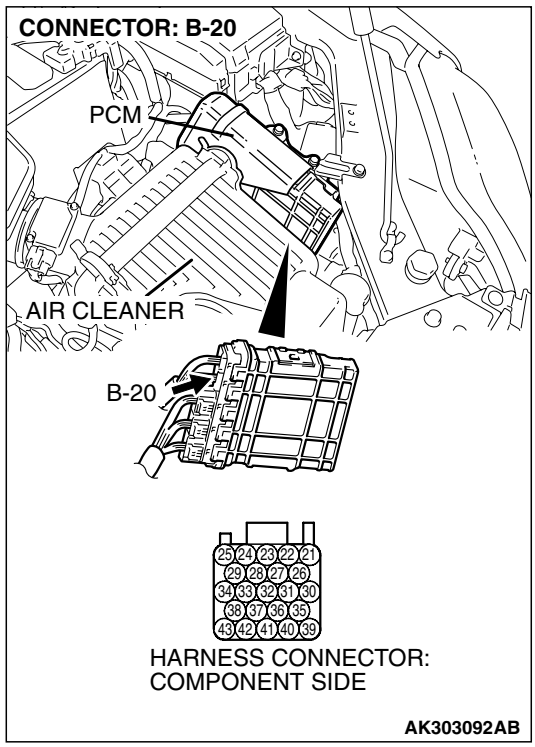
Q: Is the harness connector in good condition?

YES : Go to Step 4.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 5.

STEP 4. Check for short circuit to ground between fuel tank temperature sensor connector D-18 and PCM connector B-20.





NOTE: Check harness after checking intermediate connector C-25. If the intermediate connector is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 5.

Q: Is the harness wire in good condition?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 5.

NO : Repair it. Then go to Step 5.

STEP 5. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 24 P.13A-9.

(2) Check the diagnostic trouble code (DTC).

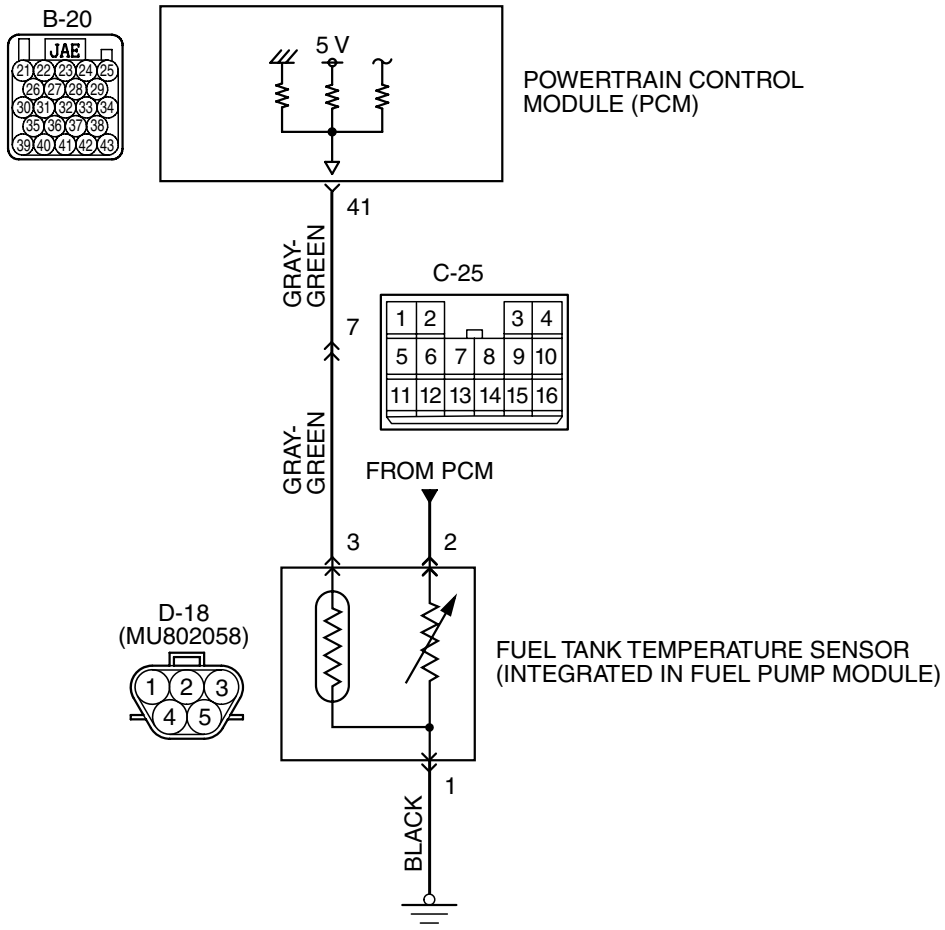
Q: Is DTC P0182 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0183: Fuel Tank Temperature Sensor Circuit High Input

Fuel Tank Temperature Sensor Circuit



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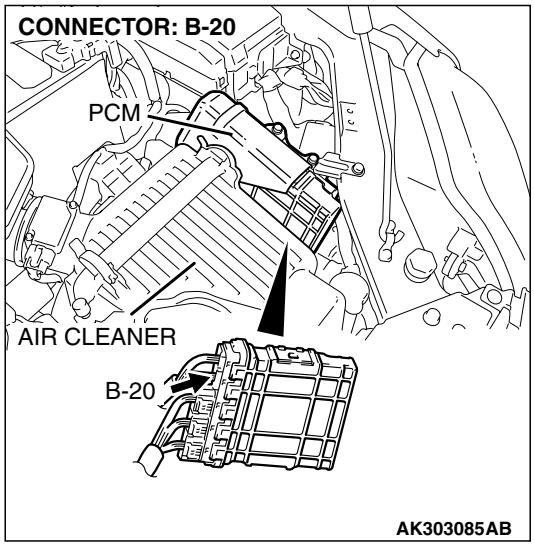
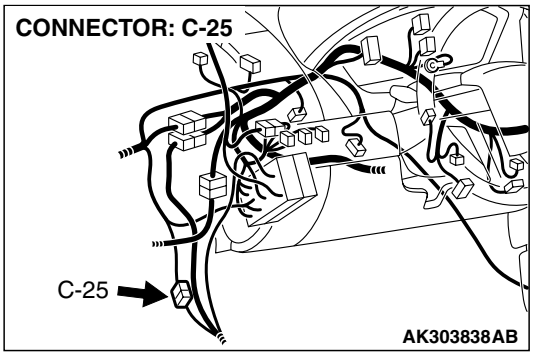
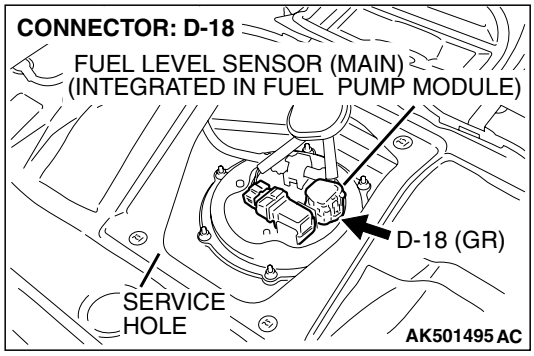






CIRCUIT OPERATION

- 5-volt voltage is applied to the fuel tank temperature sensor output terminal (terminal No. 3) from the PCM (terminal No. 41) via the resistor in the PCM.
- The fuel tank temperature sensor output voltage increases when the resistance increases and decreases when the resistance decreases. The ground terminal (terminal No. 1) is grounded to the vehicle body.

TECHNICAL DESCRIPTION

- The fuel tank temperature sensor converts the fuel tank temperature to a voltage.
- The PCM detects the fuel tank temperature with this output voltage.

DESCRIPTIONS OF MONITOR METHODS

Fuel tank temperature sensor output voltage is out of specified range.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

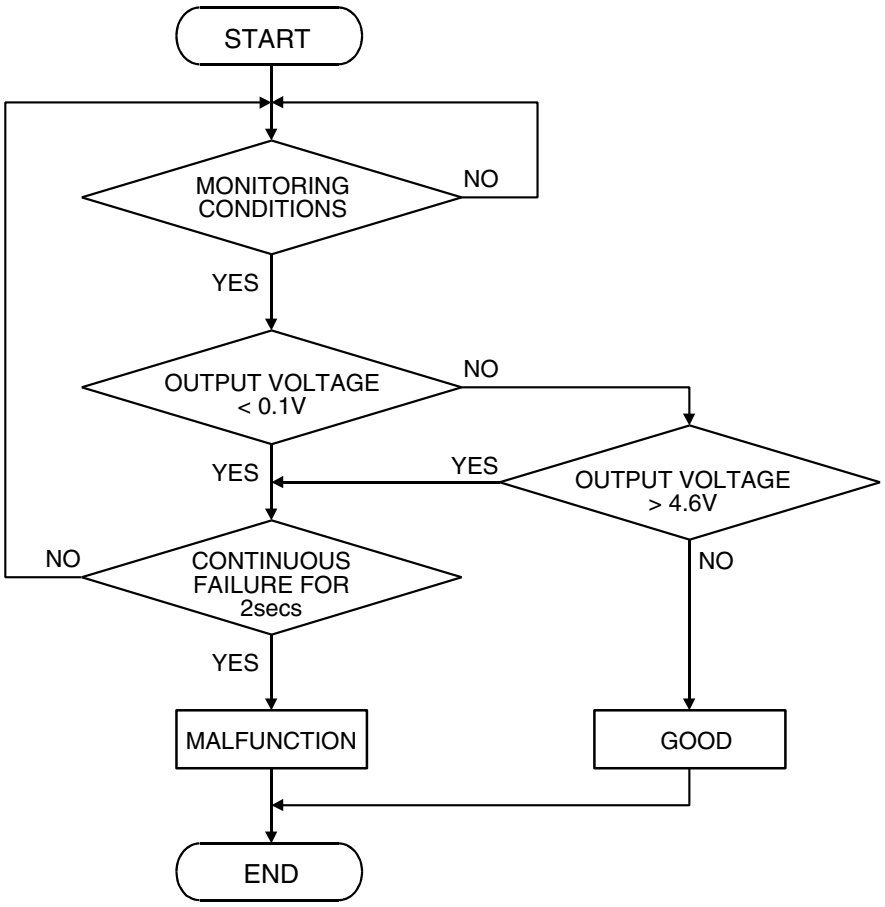
- Not applicable

Sensor (The sensor below is determined to be normal)

- Engine coolant temperature sensor
- Intake air temperature sensor

DTC SET CONDITIONS

Logic Flow Chart



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Check Condition

- 2 seconds or more have passed since the engine starting sequence was completed.

Judgement Criterion

- Sensor output voltage has continued to be 4.6 volts or higher for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 24 P.13A-9.

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

- Fuel tank temperature sensor failed.
- Open fuel tank temperature sensor circuit, harness damage, or connector damage.
- PCM failed.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A
- MB991923: Power Plant ECU Check Harness

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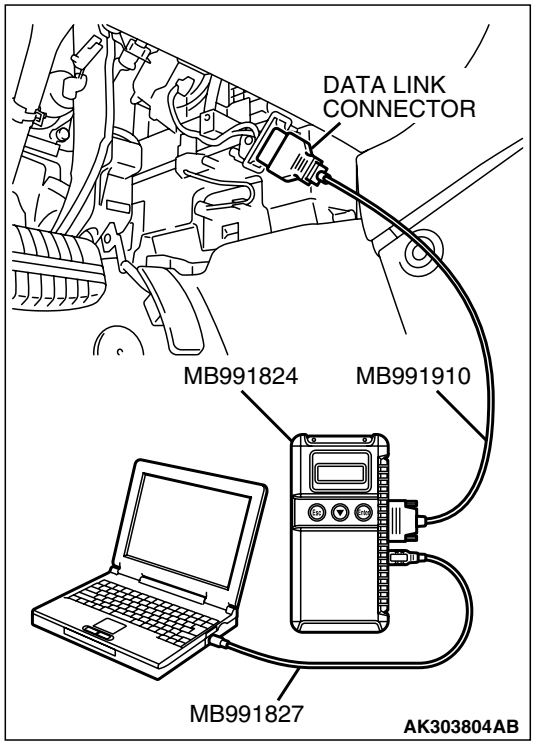


STEP 1. Using scan tool MB991958, check data list item 53: Fuel Tank Temperature Sensor.

⚠ 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.

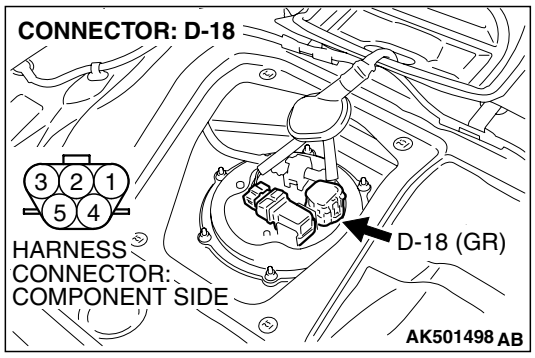
(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991958 to the data reading mode for item 53, Fuel Tank Temperature Sensor.
- Approximately the same as the ambient air temperature when the engine is cooled.

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

Q: Is the sensor operating properly?

YES : It can be assumed 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.

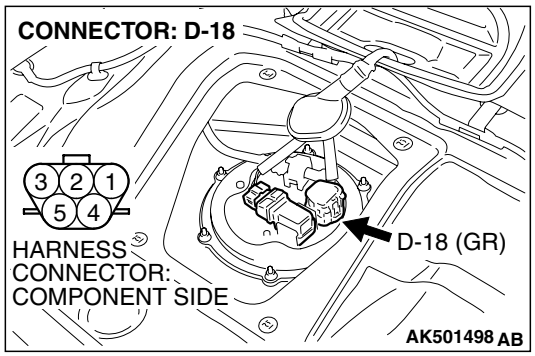


STEP 2. Check harness connector D-18 at the fuel tank temperature sensor for damage.

Q: Is the harness connector in good condition?

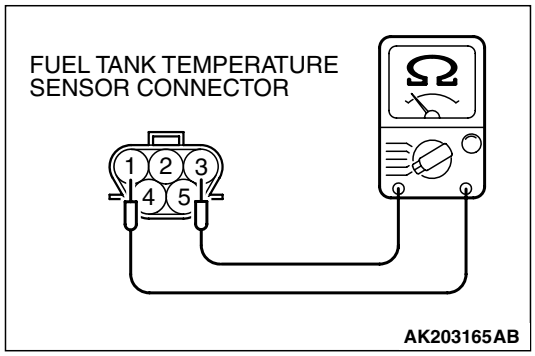
YES : Go to Step 3.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.



STEP 3. Check the fuel tank temperature sensor.

(1) Disconnect the fuel tank temperature sensor connector D-18.



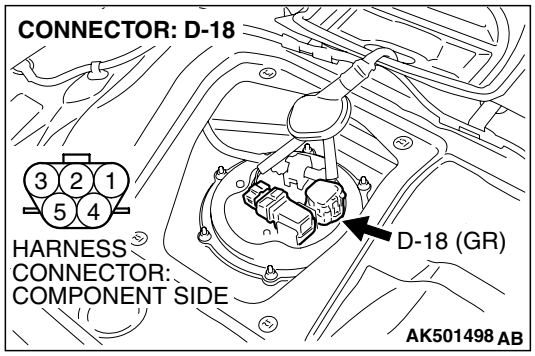
(2) Measure the resistance between terminal No. 1 and No. 3 of the fuel tank temperature sensor.

Standard value:
0.5 – 12.0 kΩ

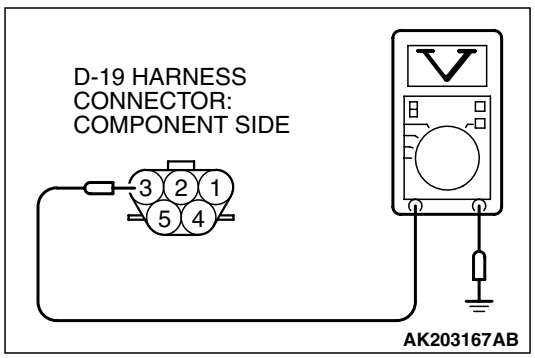
Q: Is the measured resistance between 0.5 and 12.0 kΩ?

YES : Go to Step 4.
NO : Replace the fuel tank temperature sensor. Then go to Step 11.

STEP 4. Check the sensor supply voltage at fuel tank temperature sensor harness side connector D-18.



(1) Disconnect the connector D-18 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.

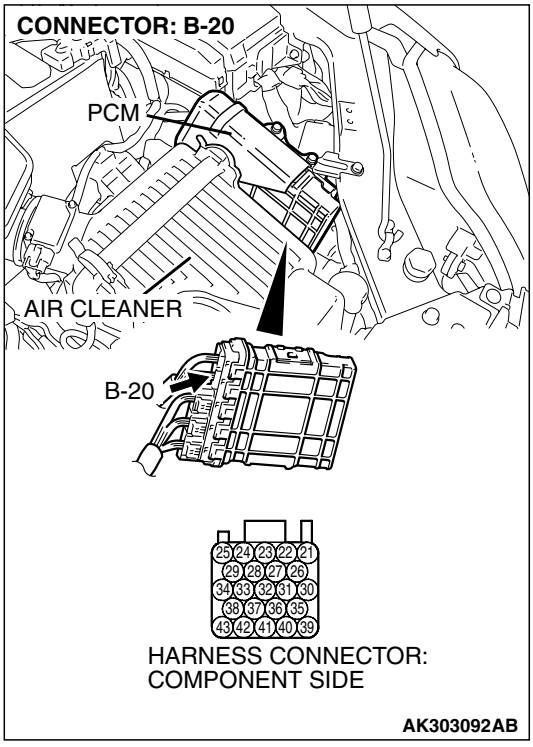


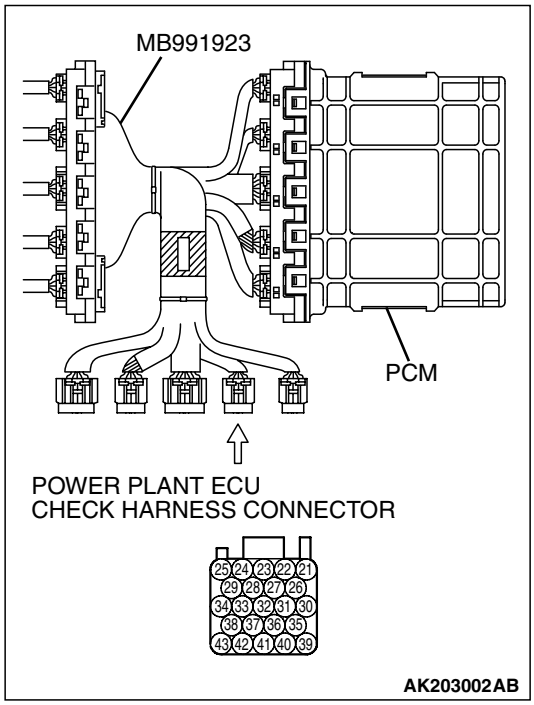
(3) Measure the voltage between terminal No. 3 and ground.
- Voltage should be between 4.5 and 4.9 volts.

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

Q: Is the measured voltage between 4.5 and 4.9 volts?

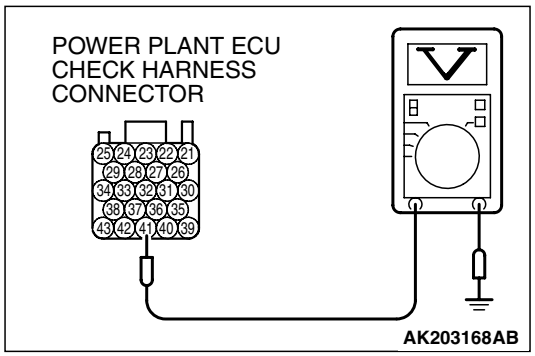
YES : Go to Step 8.
NO : Go to Step 5.





STEP 5. Check the sensor supply voltage at PCM connector B-20 by using power plant ECU check harness special tool MB991923.

(1) Disconnect all PCM connectors. Connect the power plant ECU check harness special tool MB991923 between the separated connectors.
(2) Disconnect the fuel tank temperature sensor connector D-18.
(3) Turn the ignition switch to the "ON" position.

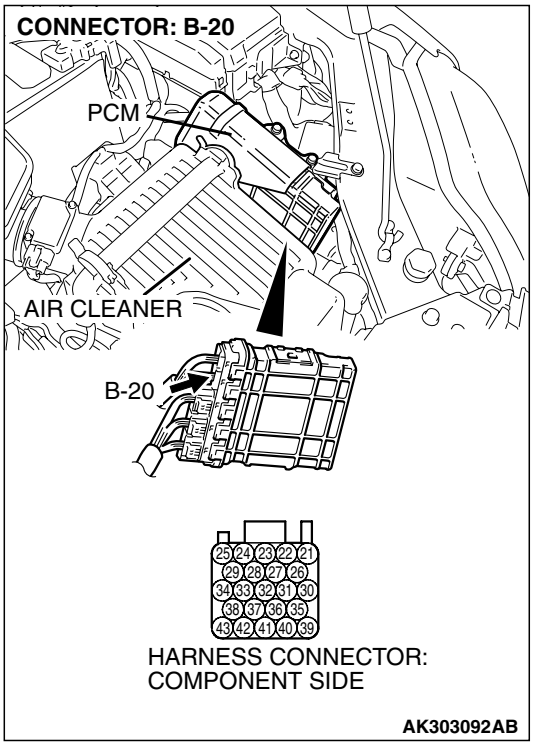


(4) Measure the voltage between terminal No. 41 and ground.
- Voltage should be between 4.5 and 4.9 volts.

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

Q: Is the measured voltage between 4.5 and 4.9 volts?

YES : Go to Step 6.
NO : Go to Step 7.

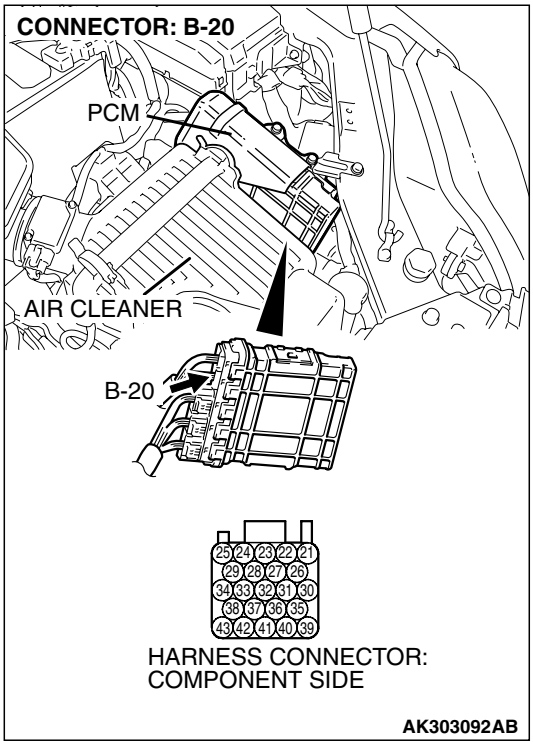


STEP 6. Check harness connector B-20 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Check harness connector C-25 at intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. If the intermediate connector is in good condition, repair the harness wire between fuel tank temperature sensor connector D-18 and PCM connector B-20 because of open circuit. Then go to Step 11.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.

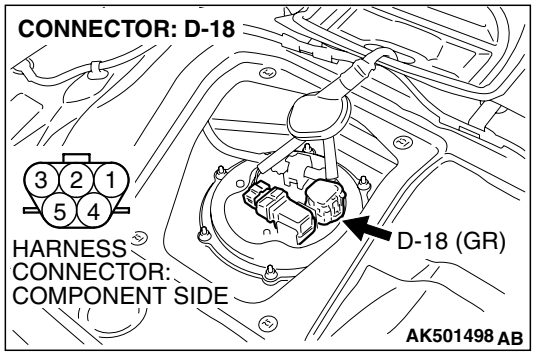


STEP 7. Check harness connector B-20 at PCM for damage.

Q: Is the harness connector in good condition?

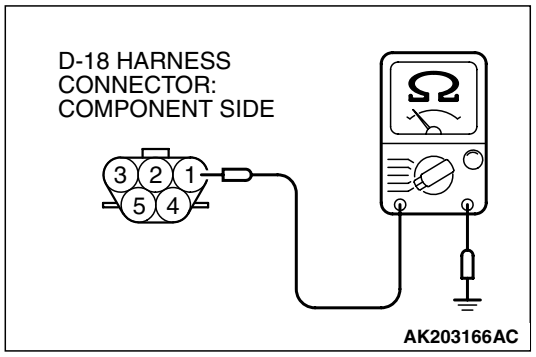
YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 11.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.



STEP 8. Check the continuity at fuel tank temperature sensor harness side connector D-18.

(1) Disconnect the connector D-18 and measure at the harness side.

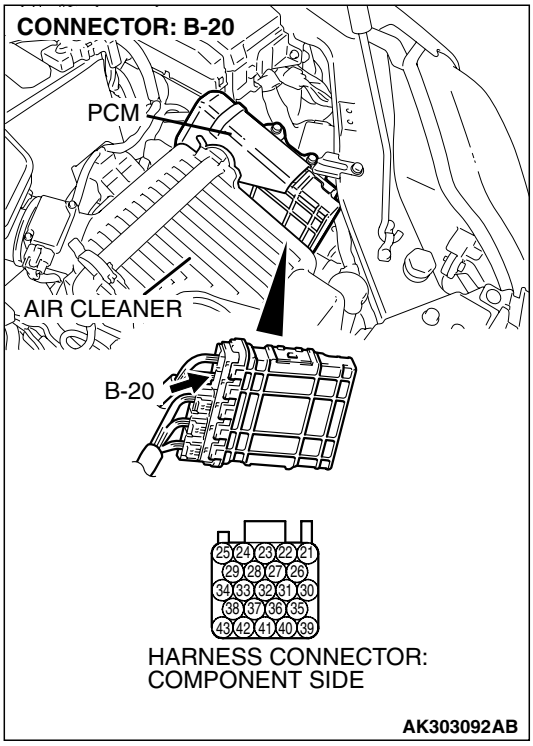


(2) Check for the continuity between terminal No. 1 and ground.
- Continuity (2 Ω or less)

Q: Does continuity exist?

YES : Go to Step 9.

NO : Repair harness wire between fuel tank temperature sensor connector D-18 (terminal No. 1) and ground because of open circuit or harness damage. Then go to Step 11.



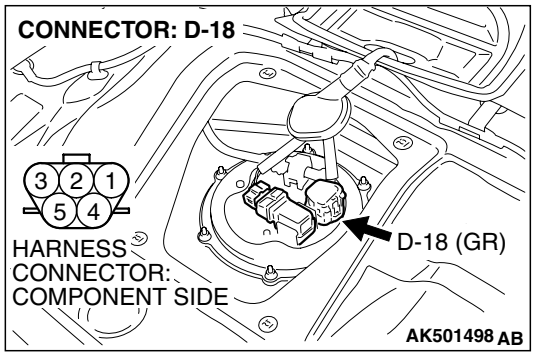
STEP 9. Check harness connector B-20 at PCM for damage.

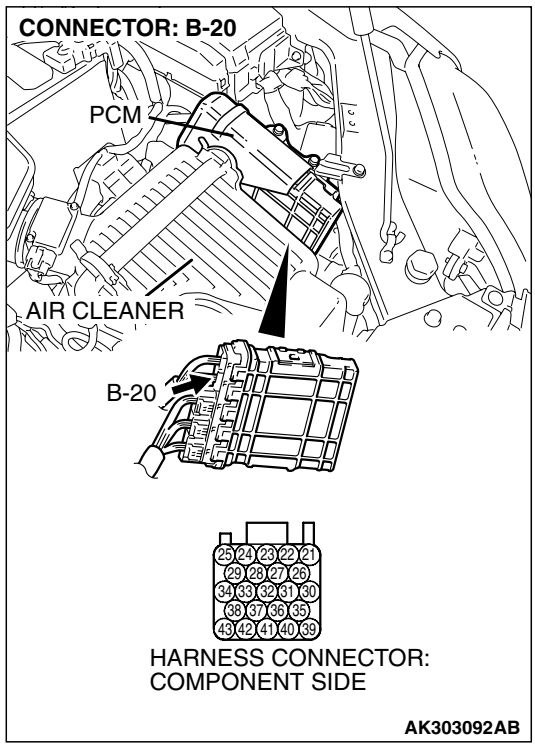
Q: Is the harness connector in good condition?

YES : Go to Step 10.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.

STEP 10. Check for open circuit and harness damage between fuel tank temperature sensor connector D-18 and PCM connector B-20.





NOTE: Check harness after checking intermediate connector C-25. If the intermediate connector is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.

Q: Is the harness wire in good condition?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 11.

NO : Repair it. Then go to Step 11.

STEP 11. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 24 P.13A-9.

(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0183 set?

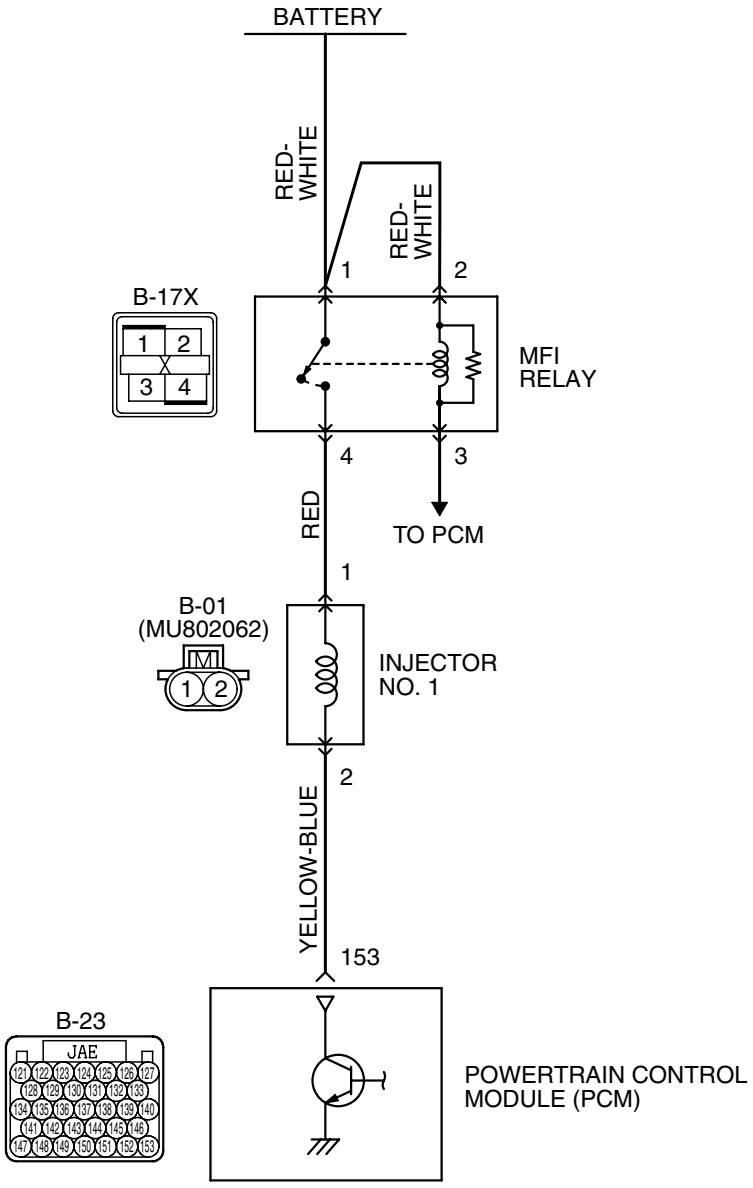
YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0201: Injector Circuit-Cylinder 1

⚠ CAUTION
If DTC P0201 has been set, TCL related DTC U1120 is also set. After P0201 has been diagnosed, don't forget to erase DTC U1120.

Injector Circuit-Cylinder 1



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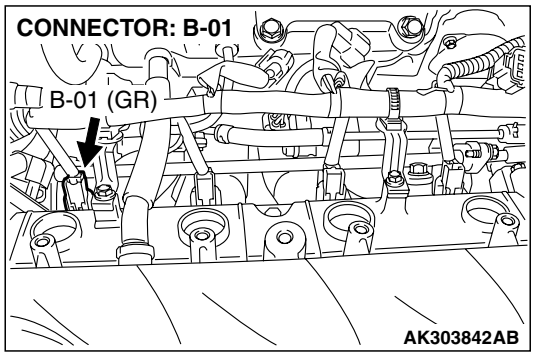
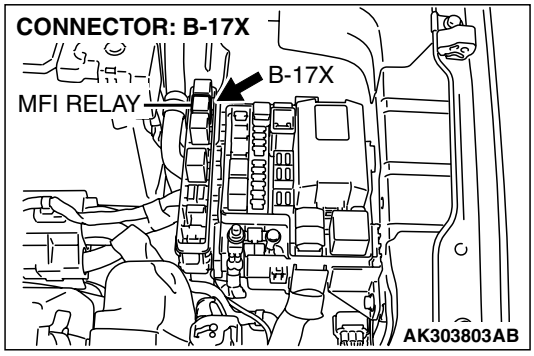
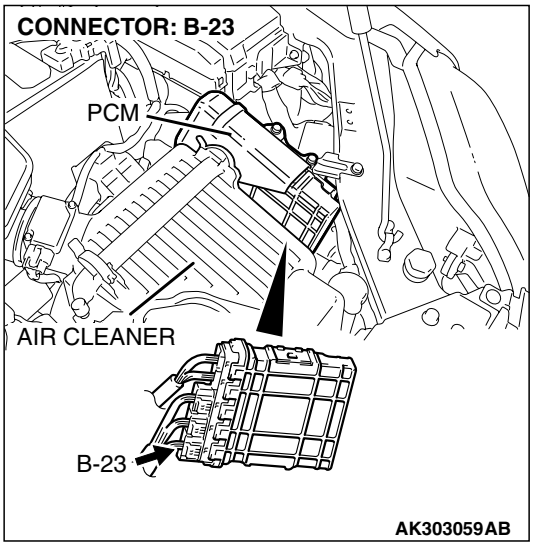






CIRCUIT OPERATION

- The injector power is supplied from the MFI relay (terminal No. 4).
- The PCM controls the injector by turning the power transistor in the PCM "ON" and "OFF".

TECHNICAL DESCRIPTION

- The amount of fuel injected by the injector is controlled by the amount of continuity time the coil is grounded by the PCM.

DESCRIPTIONS OF MONITOR METHODS

The PCM detects open circuit and short malfunction.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

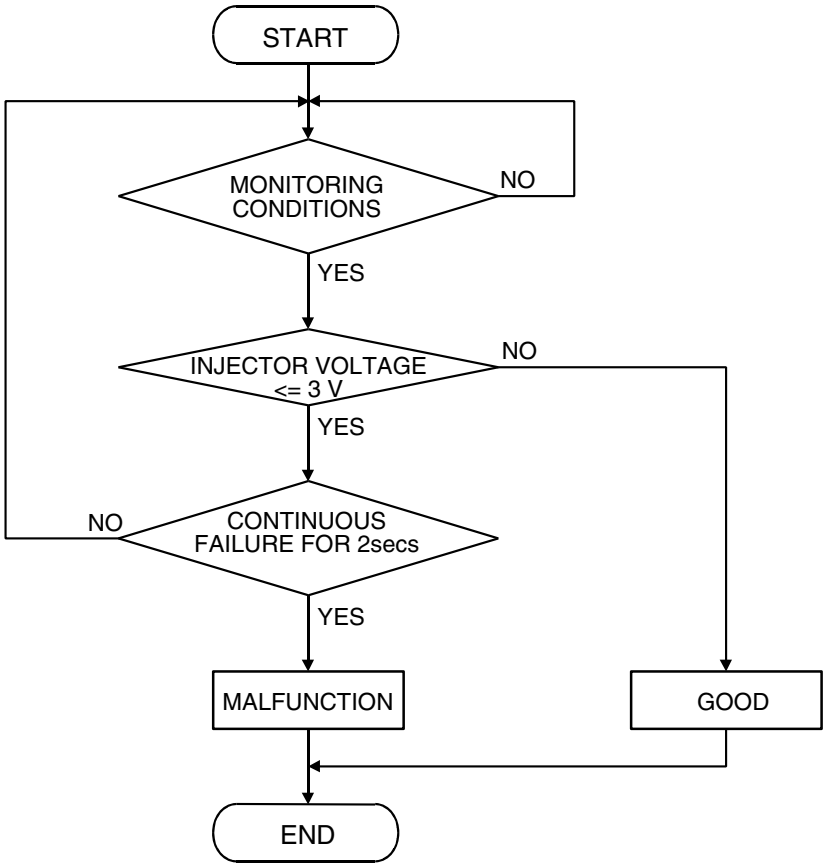
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS <Circuit continuity – open circuit and shorted low>

Logic Flow Chart



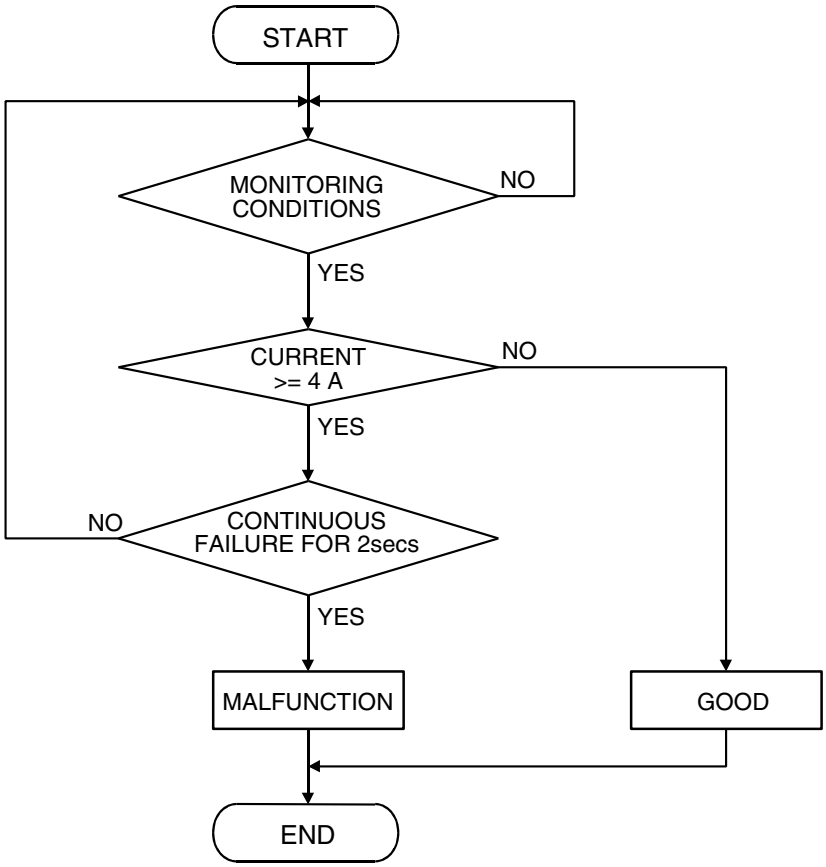
AK503614

Check Condition
- Engine is running.

Judgement Criterion
- The supply voltage is 3 volts or less without the injector driving.

DTC SET CONDITIONS <Circuit continuity – shorted high>

Logic Flow Chart



AK401592

Check Condition
- Engine is running.

Judgement Criterion
- The coil current is 4 ampere or more with the injector driving.

OBD-II DRIVE CYCLE PATTERN
Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 24 P.13A-9.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)
- No.1 cylinder injector failed.
- Open or shorted No.1 cylinder injector circuit, harness damage or connector damage.
- PCM failed.

DIAGNOSIS

Required Special Tools:
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A
- MB991658: Test Harness
- MB991923: Power Plant ECU Check Harness

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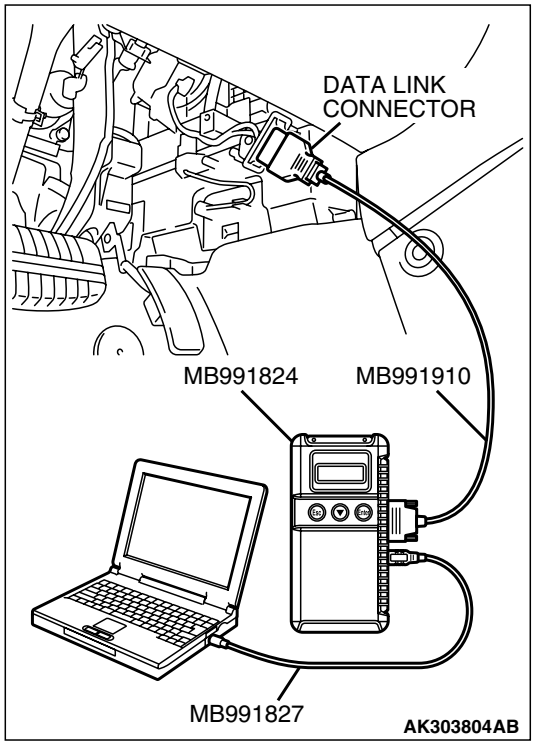


STEP 1. Using scan tool MB991958, check actuator test item 1: No. 1 Injector.

⚠ 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.

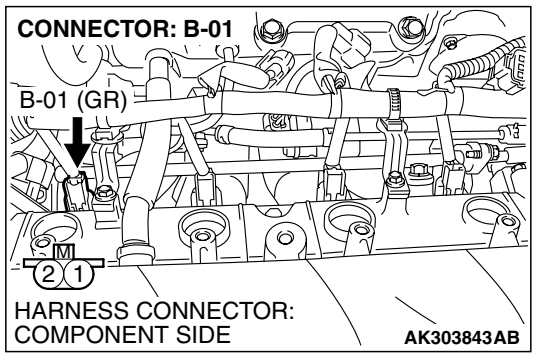
(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991958 to the actuator testing mode for item 1 No. 1 injector.
(4) Warm up the engine to normal operating temperature: 80°C to 95°C (176°F to 203°F).
- The idle should become slightly rougher.

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

Q: Is the actuator operating properly?

YES : It can be assumed 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.



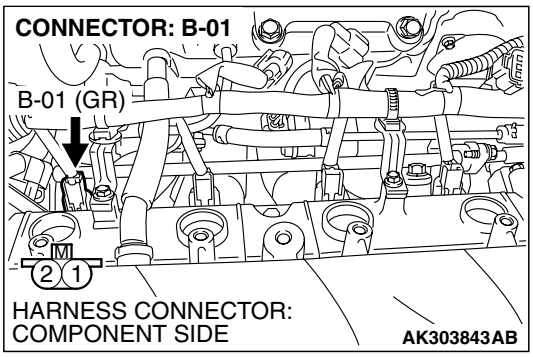
STEP 2. Check harness connector B-01 at No. 1 cylinder injector for damage.

Q: Is the harness connector in good condition?

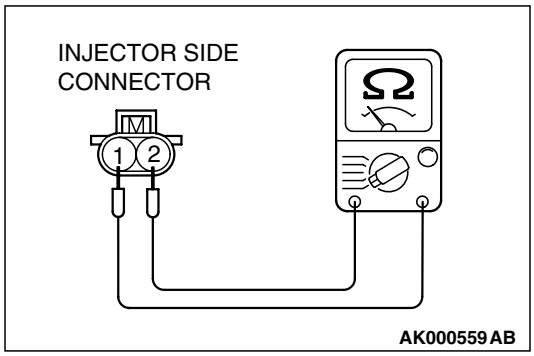
YES : Go to Step 3.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 10.

STEP 3. Check the No. 1 cylinder injector.



(1) Disconnect the No. 1 cylinder injector connector B-01.



(2) Measure the resistance between injector side connector terminal No. 1 and No. 2.

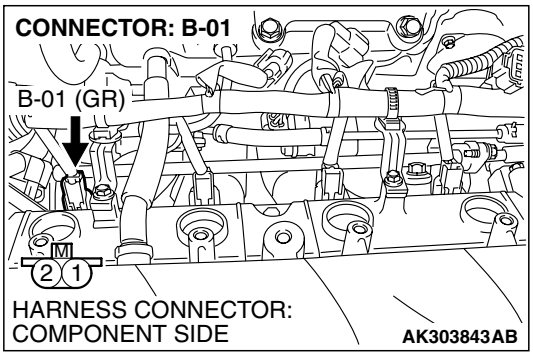
Standard value: 10.5 – 13.5 Ω [at 20°C (68°F)]

Q: Is the measured resistance between 10.5 and 13.5 ohms [at 20°C (68°F)]?

YES : Go to Step 4.

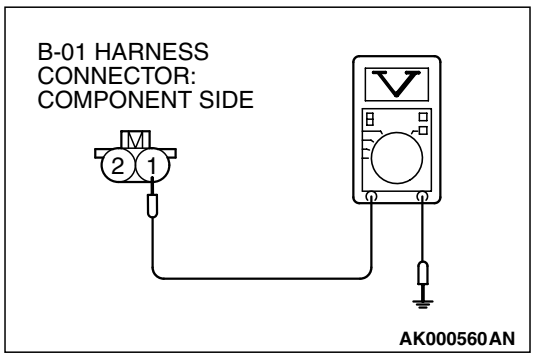
NO : Replace the No. 1 cylinder injector. Then go to Step 10.

STEP 4. Measure the power supply voltage at No. 1 cylinder injector connector.



(1) Disconnect connector B-01 and measure at the harness side.

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



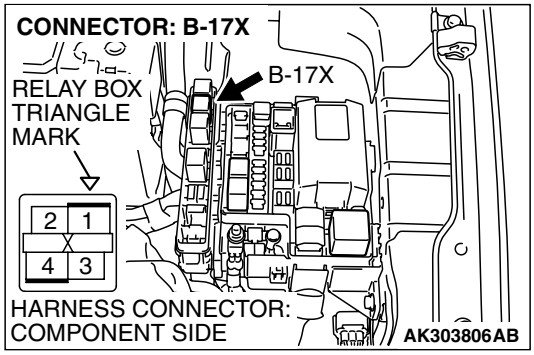
(3) Measure the voltage between terminal No. 1 and ground.
- Voltage should be battery positive voltage.

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

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

YES : Go to Step 6.

NO : Go to Step 5.

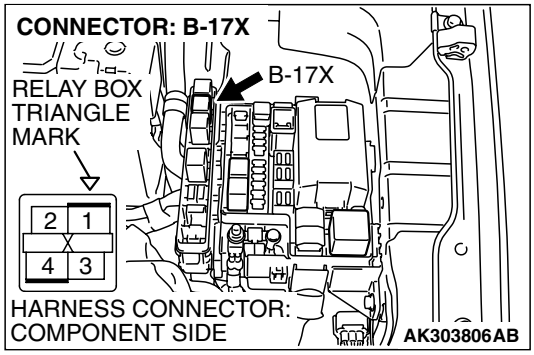


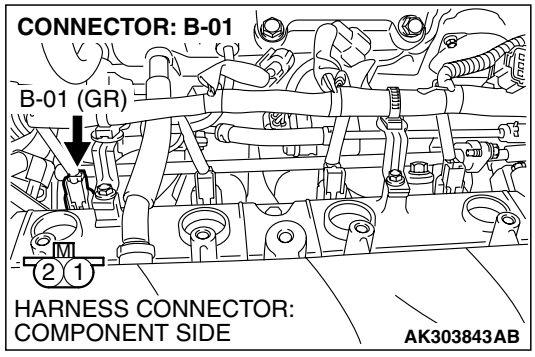
STEP 5. Check harness connector B-17X at MFI relay for damage.

Q: Is the harness connector in good condition?

YES : Repair harness wire between MFI relay connector B-17X (terminal No. 4) and No. 1 cylinder injector connector B-01 (terminal No. 1). Then go to Step 10.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 10.



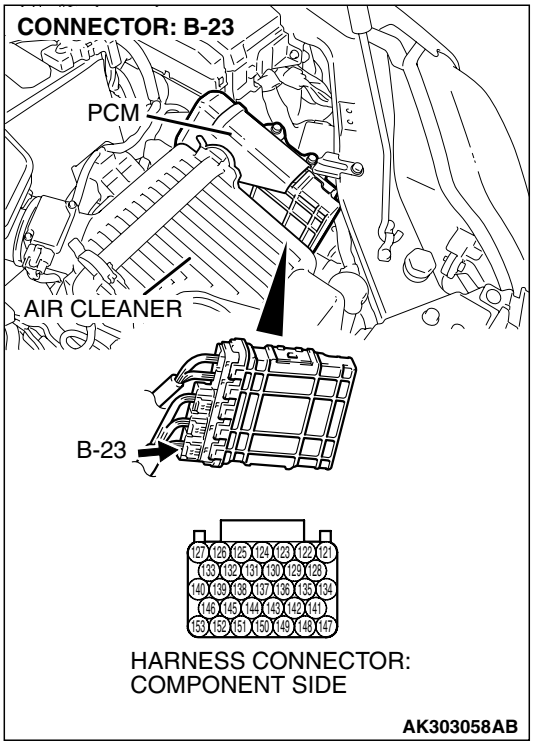


STEP 6. Check for harness damage between MFI relay connector B-17X (terminal No. 4) and No. 1 cylinder injector connector B-01 (terminal No. 1).

Q: Is the harness wire in good condition?

YES : Go to Step 7.

NO : Repair it. Then go to Step 10.

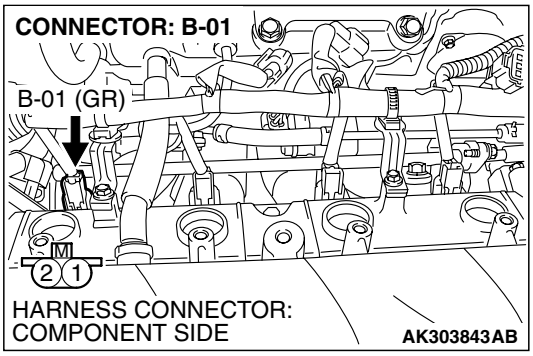


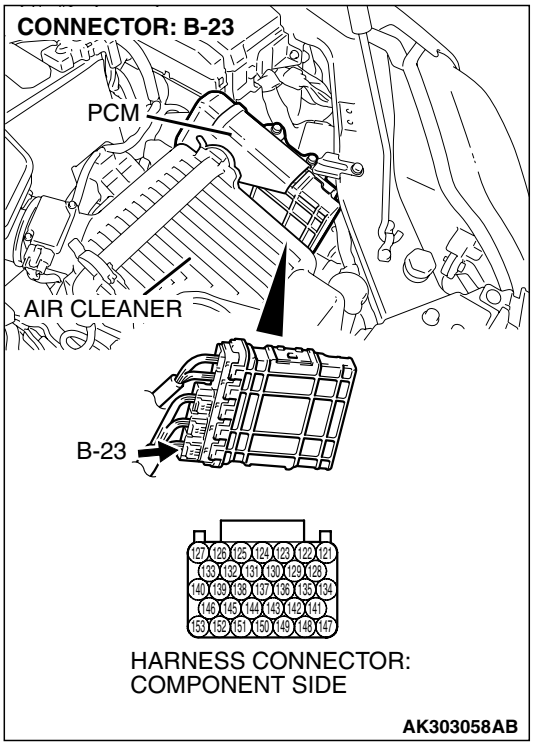
STEP 7. Check harness connector B-23 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 8.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 10.



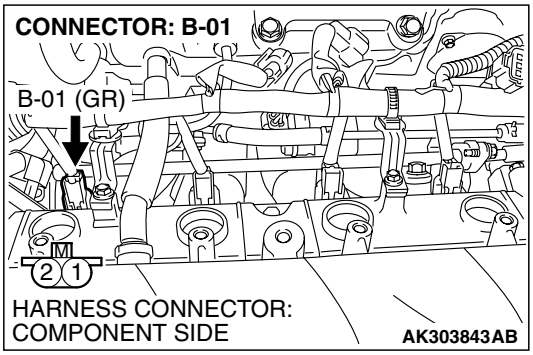


STEP 8. Check for open circuit and short circuit to ground and harness damage between No. 1 cylinder injector connector B-01 (terminal No. 2) and PCM connector B-23 (terminal No. 153).

Q: Is the harness wire in good condition?

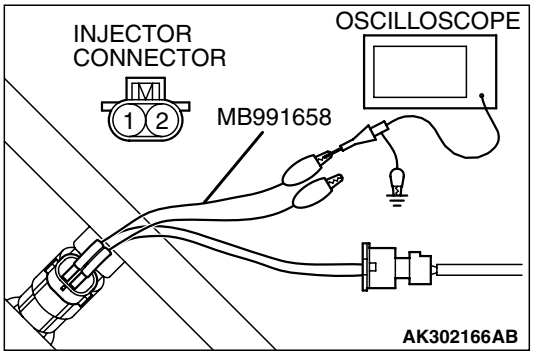
YES : Go to Step 9.

NO : Repair it. Then go to Step 10.



STEP 9. Using the oscilloscope, check the No. 1 cylinder injector.

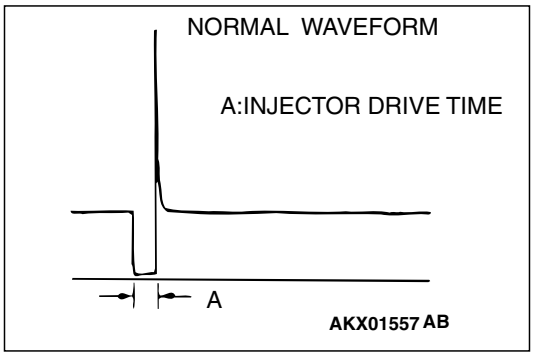
(1) Disconnect the No. 1 cylinder injector connector B-01 and connect the test harness special tool MB991658 between the separated connectors. (All terminals should be connected.)



(2) Connect the oscilloscope probe to the injector side connector terminal No. 2.

NOTE: When measuring with the PCM side connector, disconnect all PCM connectors. Connect the check harness special tool (MB991923) between the separated connectors. Then connect the oscilloscope probe to the check harness connector terminal No. 153.

(3) Start the engine and run at idle.



(4) Measure the waveform.
- The waveform should show a normal pattern similar to the illustration.

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

Q: Is the waveform normal?

YES : It can be assumed 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 : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 10.

STEP 10. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 24 P.13A-9.

(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0201 set?

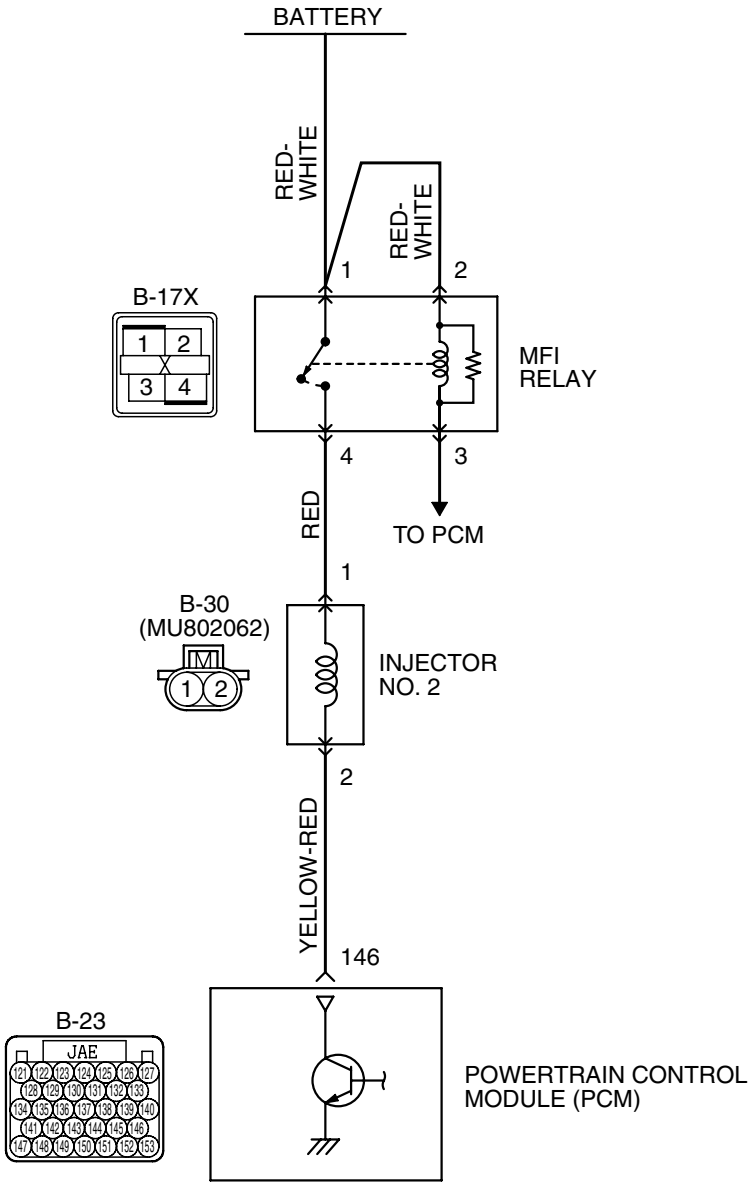
YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0202: Injector Circuit-Cylinder 2

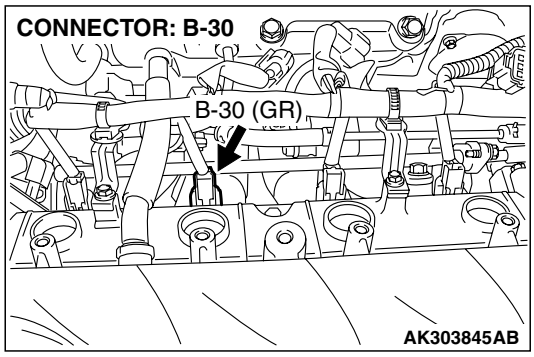
⚠ CAUTION
If DTC P0202 has been set, TCL related DTC U1120 is also set. After P0202 has been diagnosed, don't forget to erase DTC U1120.

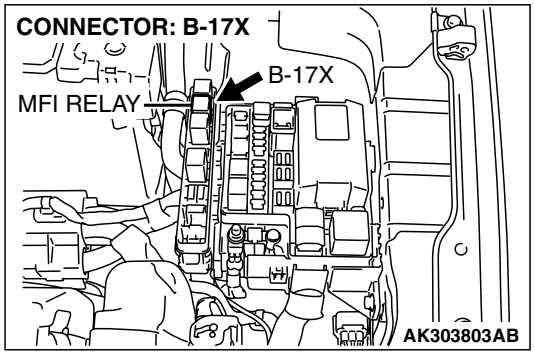
Injector Circuit-Cylinder 2

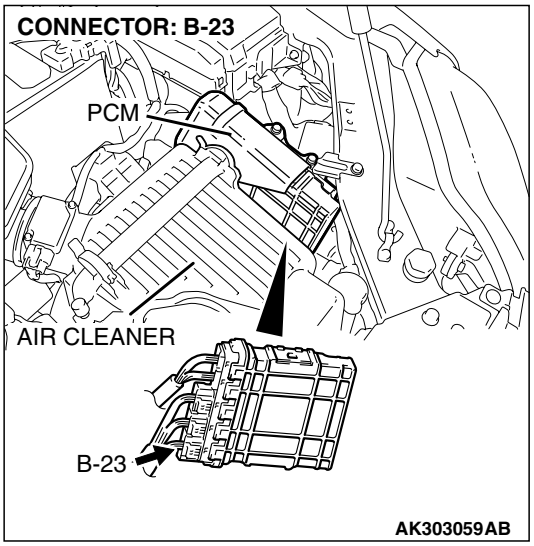


AK400885

TSB Revision







CIRCUIT OPERATION

- The injector power is supplied from the MFI relay (terminal No. 4).
- The PCM controls the injector by turning the power transistor in the PCM "ON" and "OFF".

TECHNICAL DESCRIPTION

- The amount of fuel injected by the injector is controlled by the amount of continuity time the coil is grounded by the PCM.

DESCRIPTIONS OF MONITOR METHODS

The PCM detects open circuit and short malfunction.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

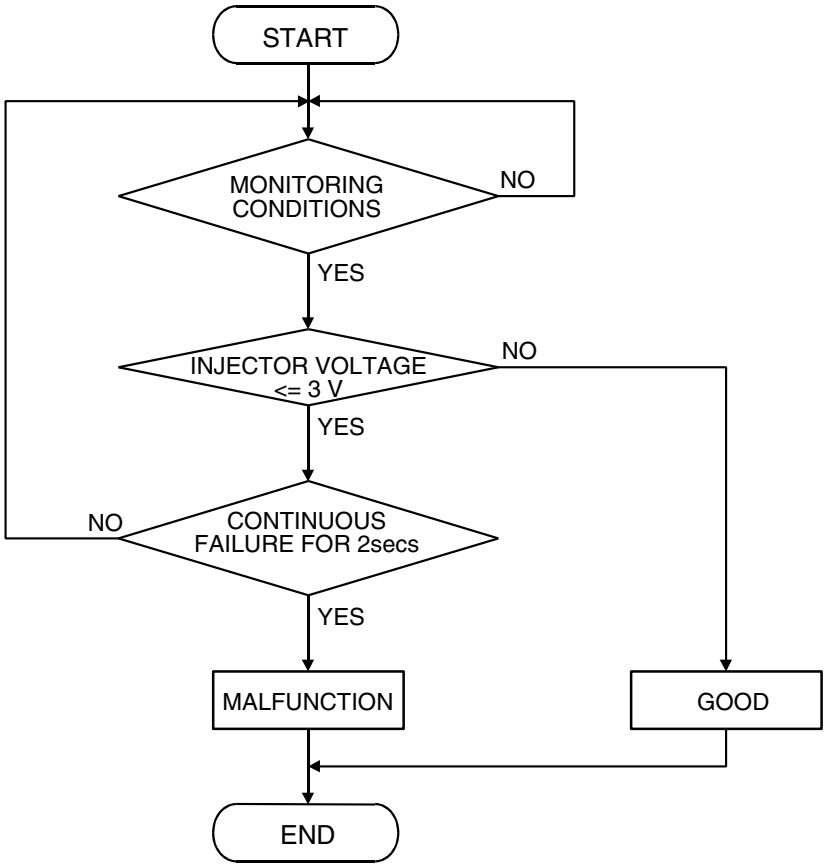
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS <Circuit continuity – open circuit and shorted low>

Logic Flow Chart



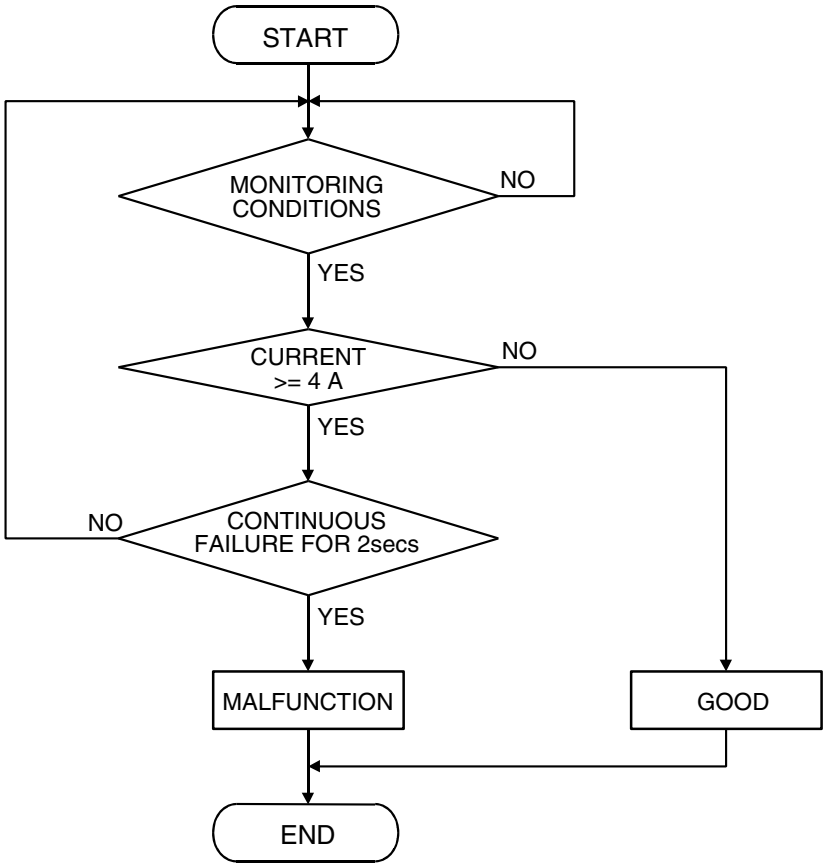
AK503614

Check Condition
- Engine is running.

Judgement Criterion
- The supply voltage is 3 volts or less without the injector driving.

DTC SET CONDITIONS <Circuit continuity – open circuit and shorted high>

Logic Flow Chart



AK401592

Check Condition
- Engine is running.

Judgement Criterion
- The coil current is 4 ampere or more with the injector driving.

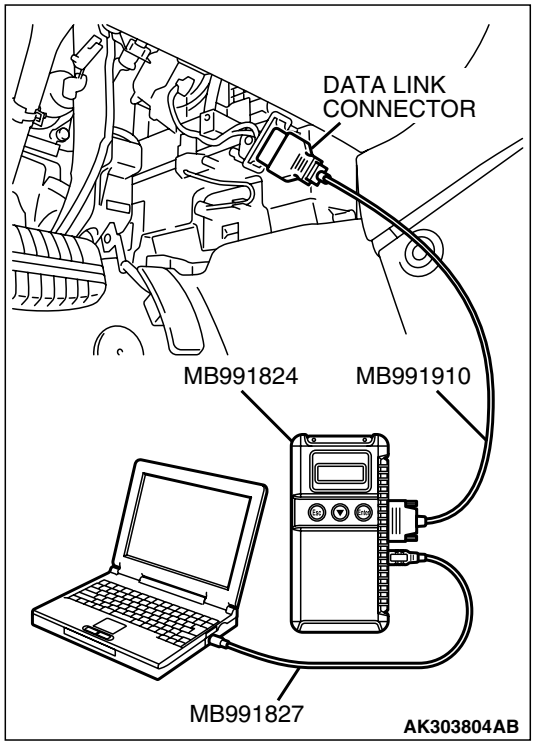
OBD-II DRIVE CYCLE PATTERN
Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 24 P.13A-9.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)
- No.2 cylinder injector failed.
- Open or shorted No.2 cylinder injector circuit, harness damage or connector damage.
- PCM failed.

DIAGNOSIS

Required Special Tools:
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A
- MB991658: Test Harness
- MB991923: Power Plant ECU Check Harness

TSB Revision



STEP 1. Using scan tool MB991958, check actuator test item 2: No. 2 Injector.

⚠ 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.

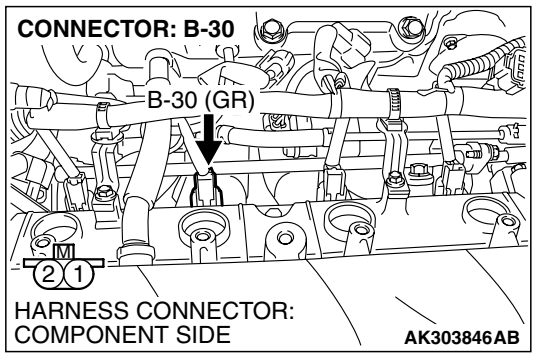
(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991958 to the actuator testing mode for item 2 No. 2 injector.
(4) Warm up the engine to normal operating temperature: 80°C to 95°C (176°F to 203°F).
- The idle should become slightly rougher.

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

Q: Is the actuator operating properly?

YES : It can be assumed 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.

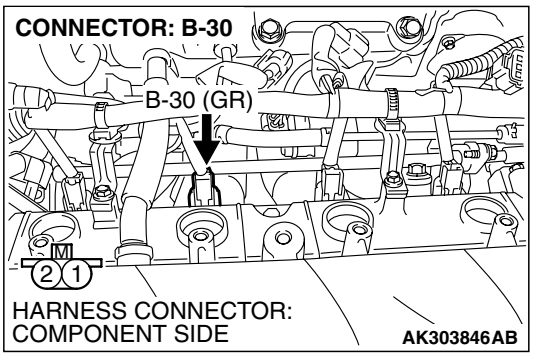


STEP 2. Check harness connector B-30 at No. 2 cylinder injector for damage.

Q: Is the harness connector in good condition?

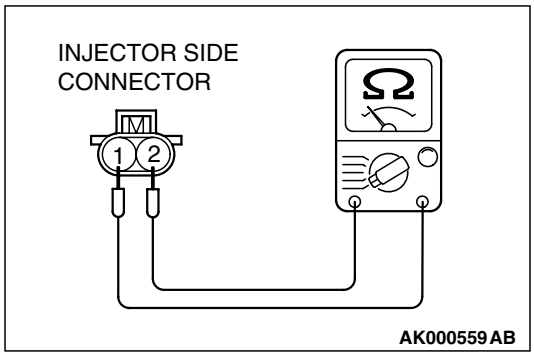
YES : Go to Step 3.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 10.



STEP 3. Check the No. 2 cylinder injector.

(1) Disconnect the No. 2 cylinder injector connector B-30.



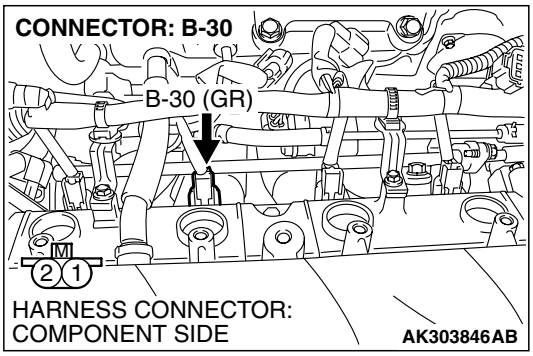
(2) Measure the resistance between injector side connector terminal No. 1 and No. 2.

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

Q: Is the measured resistance between 10.5 and 13.5 ohms [at 20°C (68°F)]?

YES : Go to Step 4.

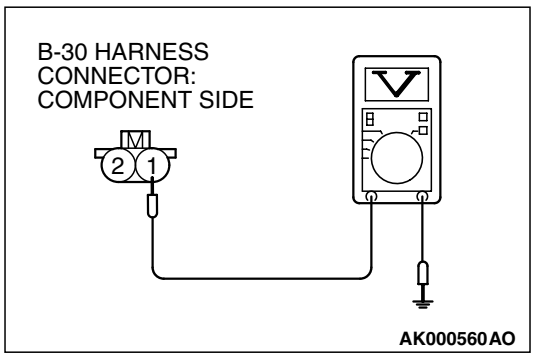
NO : Replace the No. 2 cylinder injector. Then go to Step 10.



STEP 4. Measure the power supply voltage at No. 2 cylinder injector connector.

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

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



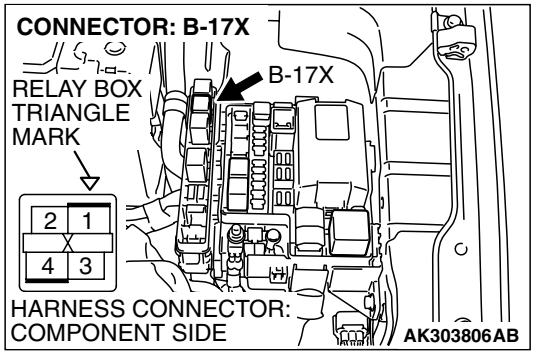
(3) Measure the voltage between terminal No. 1 and ground.
- Voltage should be battery positive voltage.

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

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

YES : Go to Step 6.

NO : Go to Step 5.

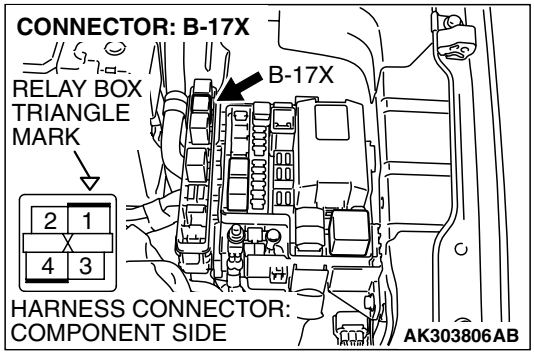


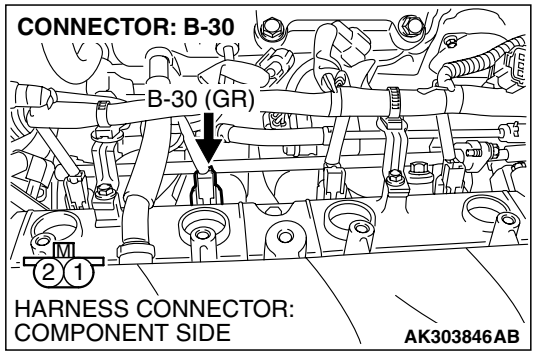
STEP 5. Check harness connector B-17X at MFI relay for damage.

Q: Is the harness connector in good condition?

YES : Repair harness wire between MFI relay connector B-17X (terminal No. 4) and No. 2 cylinder injector connector B-30 (terminal No. 1). Then go to Step 10.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 10.



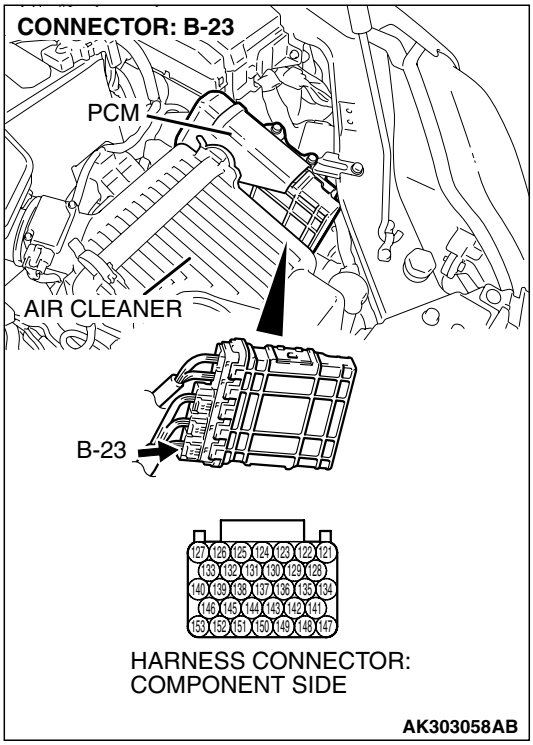


STEP 6. Check for harness damage between MFI relay connector B-17X (terminal No. 4) and No. 2 cylinder injector connector B-30 (terminal No. 1).

Q: Is the harness wire in good condition?

YES : Go to Step 7.

NO : Repair it. Then go to Step 10.

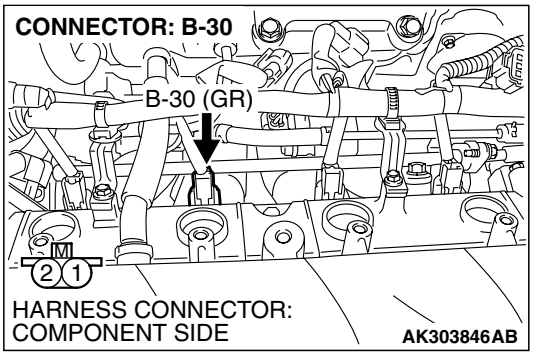


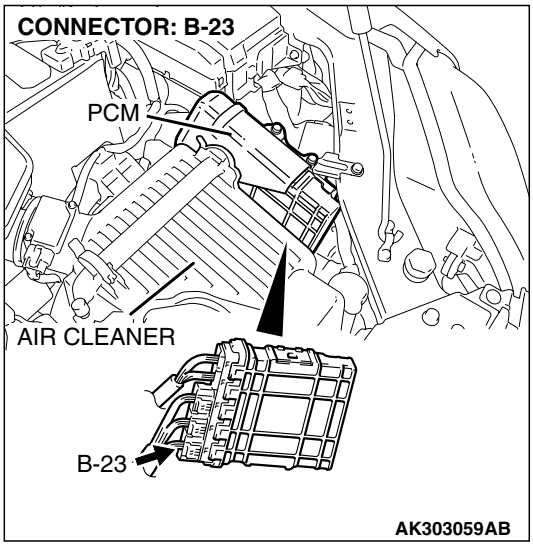
STEP 7. Check harness connector B-23 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 8.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 10.



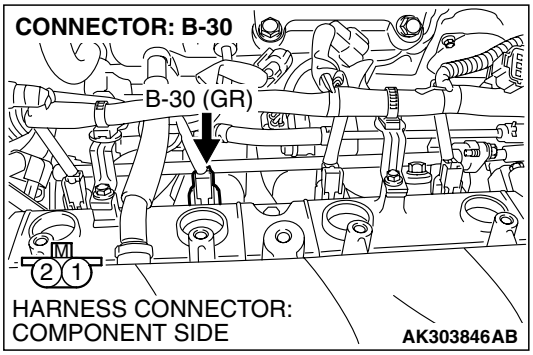


STEP 8. Check for open circuit and short circuit to ground and harness damage between No. 2 cylinder injector connector B-30 (terminal No. 2) and PCM connector B-23 (terminal No. 146).

Q: Is the harness wire in good condition?

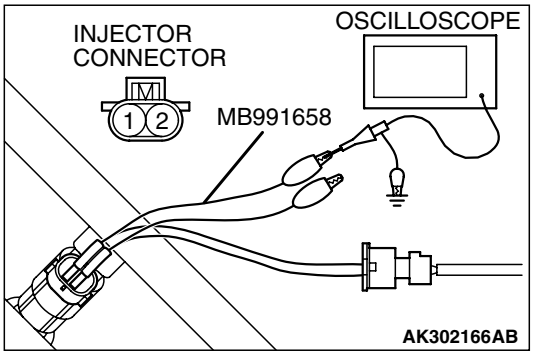
YES : Go to Step 9.

NO : Repair it. Then go to Step 10.



STEP 9. Using the oscilloscope, check the No. 2 cylinder injector.

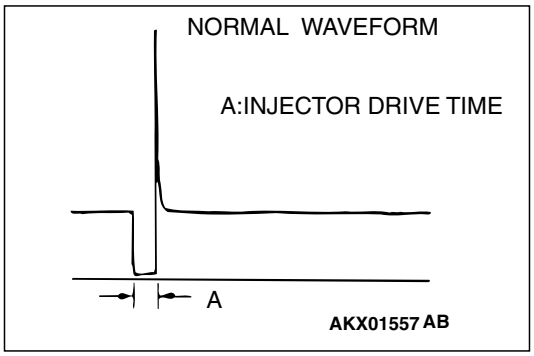
(1) Disconnect the No. 2 cylinder injector connector B-30 and connect the test harness special tool MB991658 between the separated connectors. (All terminals should be connected.)



(2) Connect the oscilloscope probe to the injector side connector terminal No. 2.

NOTE: When measuring with the PCM side connector, disconnect all PCM connectors. Connect the check harness special tool (MB991923) between the separated connectors. Then connect the oscilloscope probe to the check harness connector terminal No. 146.

(3) Start the engine and run at idle.



(4) Measure the waveform.
- The waveform should show a normal pattern similar to the illustration.

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

Q: Is the waveform normal?

YES : It can be assumed 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 : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 10.

STEP 10. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 24 P.13A-9.

(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0202 set?

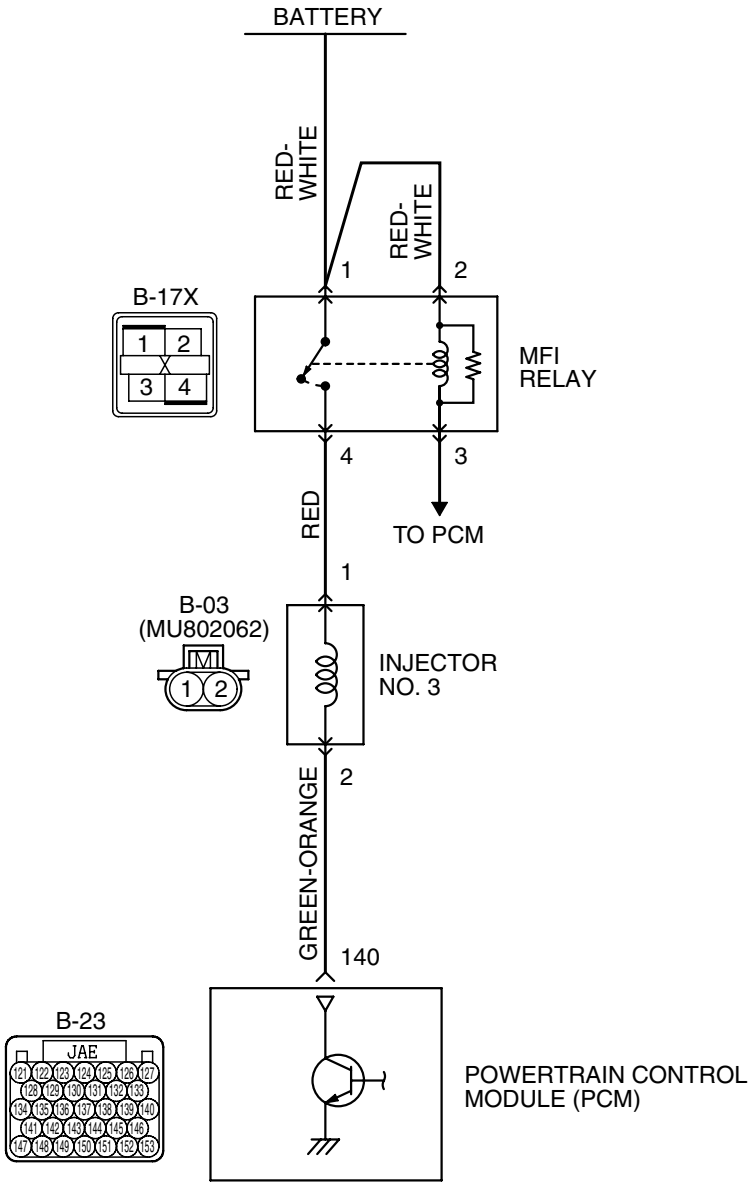
YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0203: Injector Circuit-Cylinder 3

⚠ CAUTION
If DTC P0203 has been set, TCL related DTC U1120 is also set. After P0203 has been diagnosed, don't forget to erase DTC U1120.

Injector Circuit-Cylinder 3



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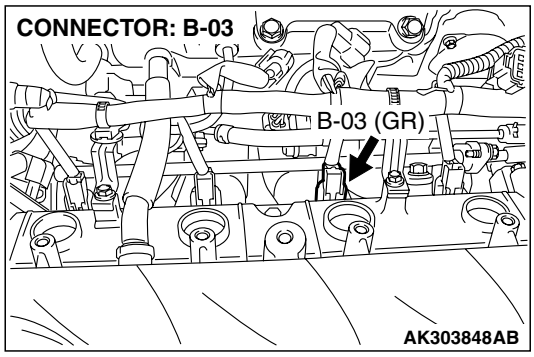
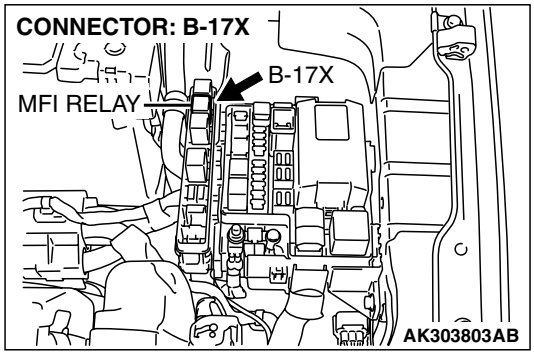
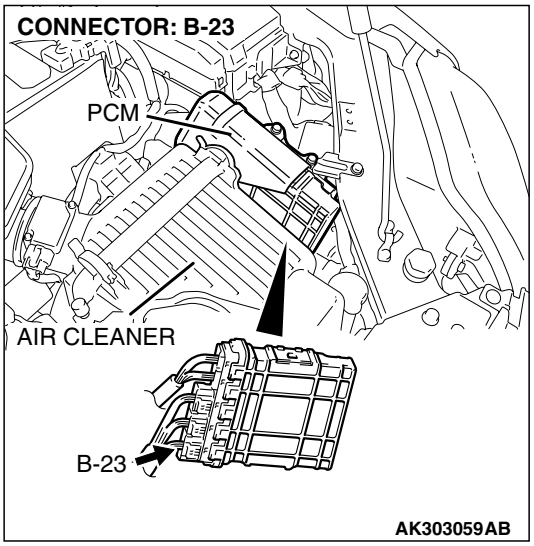
TSB Revision







CIRCUIT OPERATION

- The injector power is supplied from the MFI relay (terminal No. 4).
- The PCM controls the injector by turning the power transistor in the PCM "ON" and "OFF".

TECHNICAL DESCRIPTION

- The amount of fuel injected by the injector is controlled by the amount of continuity time the coil is grounded by the PCM.

DESCRIPTIONS OF MONITOR METHODS

The PCM detects open circuit and short malfunction.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

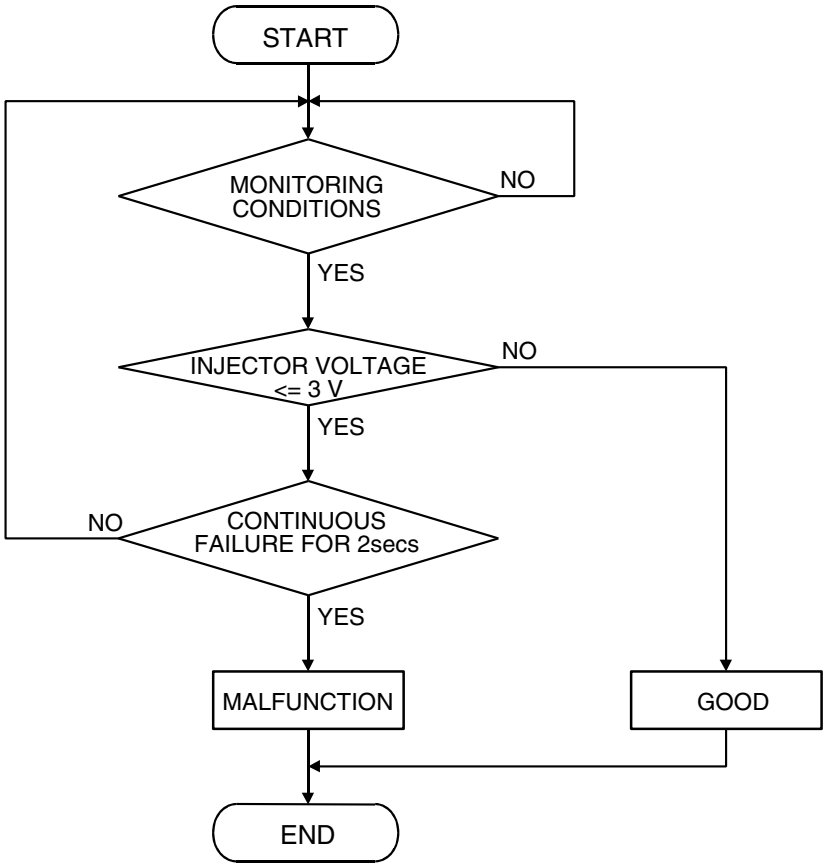
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS <Circuit continuity – open circuit and shorted low>

Logic Flow Chart



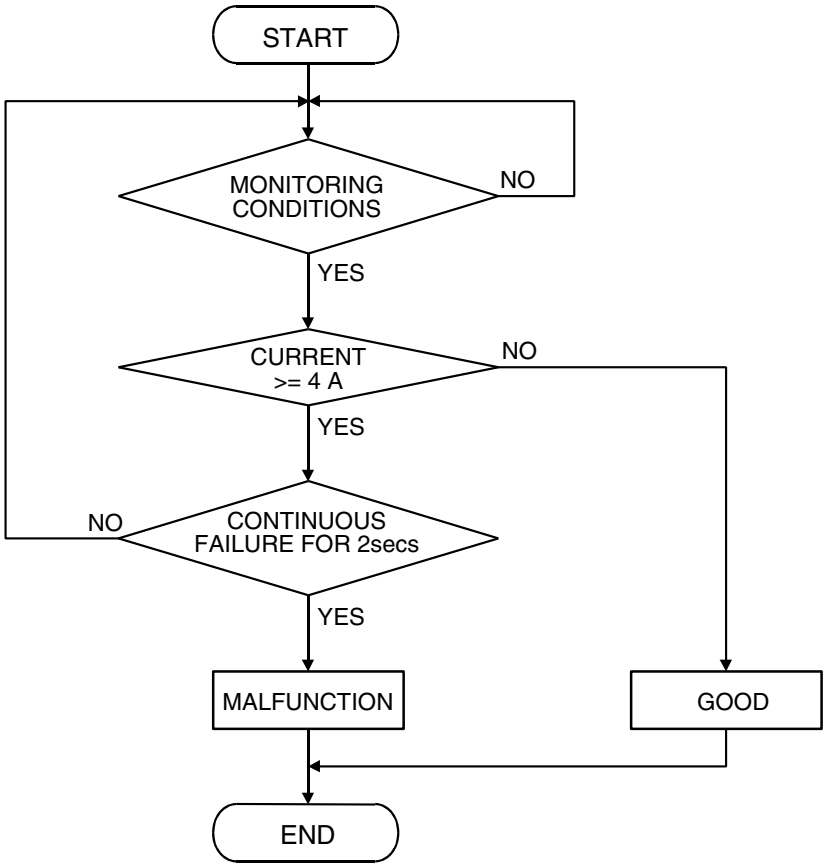
AK503614

Check Condition
- Engine is running.

Judgement Criterion
- The supply voltage is 3 volts or less without the injector driving.

DTC SET CONDITIONS <Circuit continuity – open circuit and shorted high>

Logic Flow Chart



AK401592

Check Condition
- Engine is running.

Judgement Criterion
- The coil current is 4 ampere or more with the injector driving.

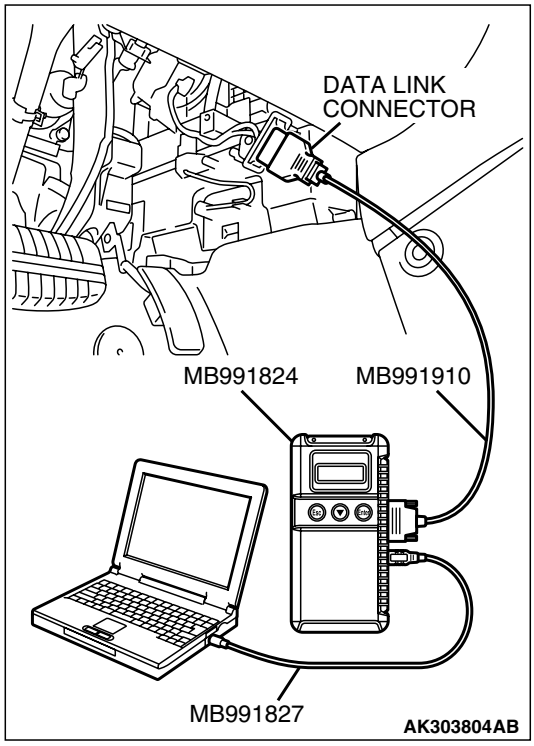
OBD-II DRIVE CYCLE PATTERN
Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 24 P.13A-9.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)
- No. 3 cylinder injector failed.
- Open or shorted No. 3 cylinder injector circuit, harness damage or connector damage.
- PCM failed.

DIAGNOSIS

Required Special Tools:
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A
- MB991658: Test Harness
- MB991923: Power Plant ECU Check Harness

TSB Revision



STEP 1. Using scan tool MB991958, check actuator test item 3: No.3 Injector.

⚠ 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.

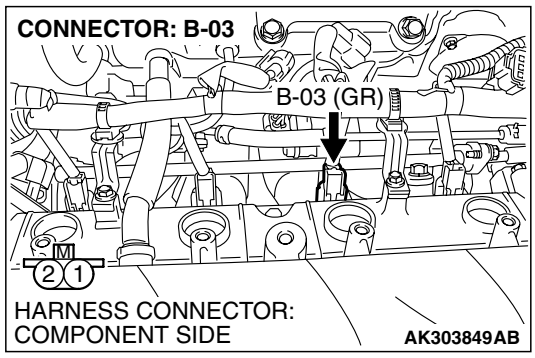
(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991958 to the actuator testing mode for item 3 No. 3 injector.
(4) Warm up the engine to normal operating temperature: 80°C to 95°C (176°F to 203°F).
- The idle should become slightly rougher.

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

Q: Is the actuator operating properly?

YES : It can be assumed 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.

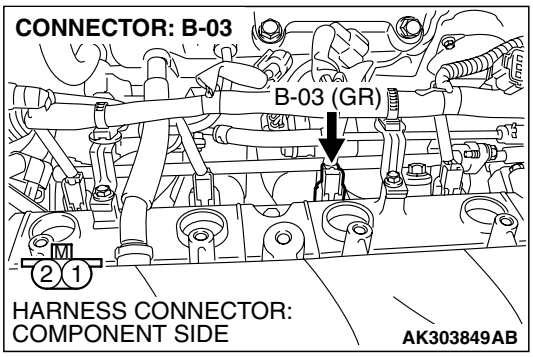


STEP 2. Check harness connector B-03 at No. 3 cylinder injector for damage.

Q: Is the harness connector in good condition?

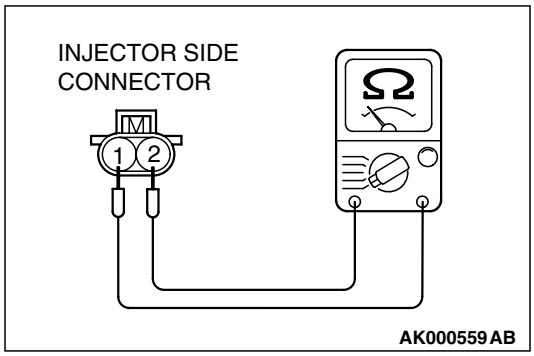
YES : Go to Step 3.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 10.



STEP 3. Check the No. 3 cylinder injector.

(1) Disconnect the No. 3 cylinder injector connector B-03.



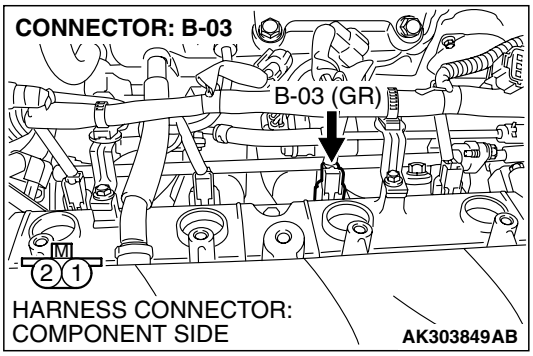
(2) Measure the resistance between injector side connector terminal No. 1 and No. 2.

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

Q: Is the measured resistance between 10.5 and 13.5 ohms [at 20°C (68°F)]?

YES : Go to Step 4.

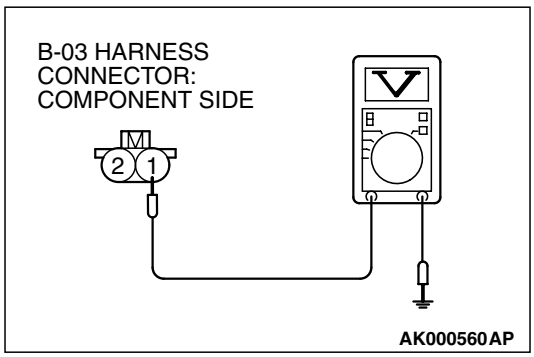
NO : Replace the No. 3 cylinder injector. Then go to Step 10.



STEP 4. Measure the power supply voltage at No. 3 cylinder injector connector.

(1) Disconnect connector B-03 and measure at the harness side.

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



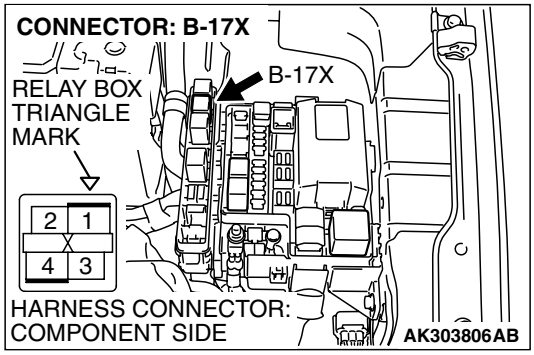
(3) Measure the voltage between terminal No. 1 and ground.
- Voltage should be battery positive voltage.

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

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

YES : Go to Step 6.

NO : Go to Step 5.

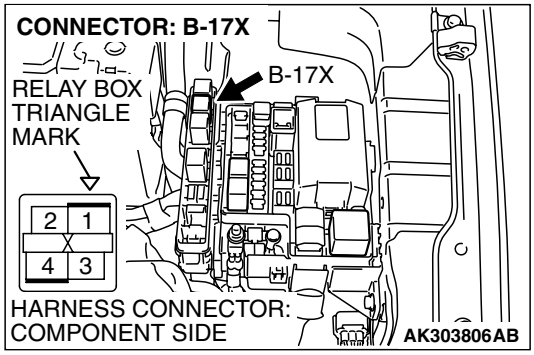


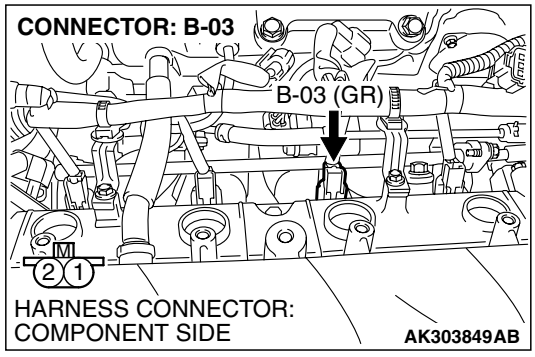
STEP 5. Check harness connector B-17X at MFI relay for damage.

Q: Is the harness connector in good condition?

YES : Repair harness wire between MFI relay connector B-17X (terminal No. 4) and No. 3 cylinder injector connector B-03 (terminal No. 1). Then go to Step 10.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 10.



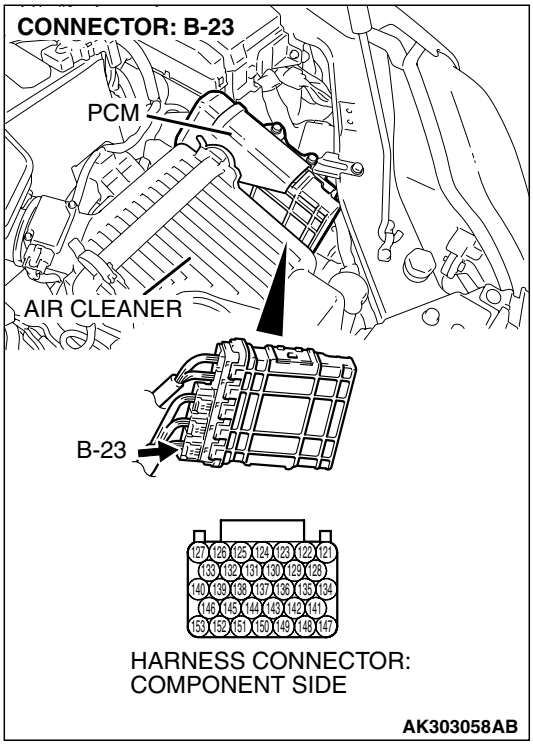


STEP 6. Check for harness damage between MFI relay connector B-17X (terminal No. 4) and No. 3 cylinder injector connector B-03 (terminal No. 1).

Q: Is the harness wire in good condition?

YES : Go to Step 7.

NO : Repair it. Then go to Step 10.

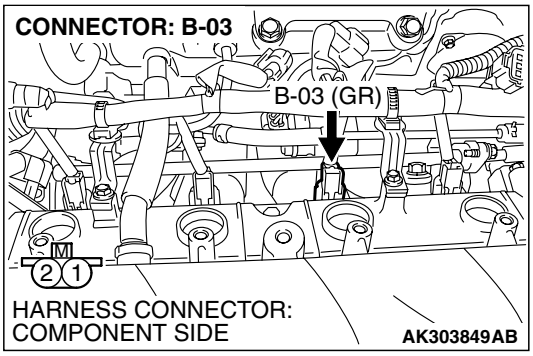


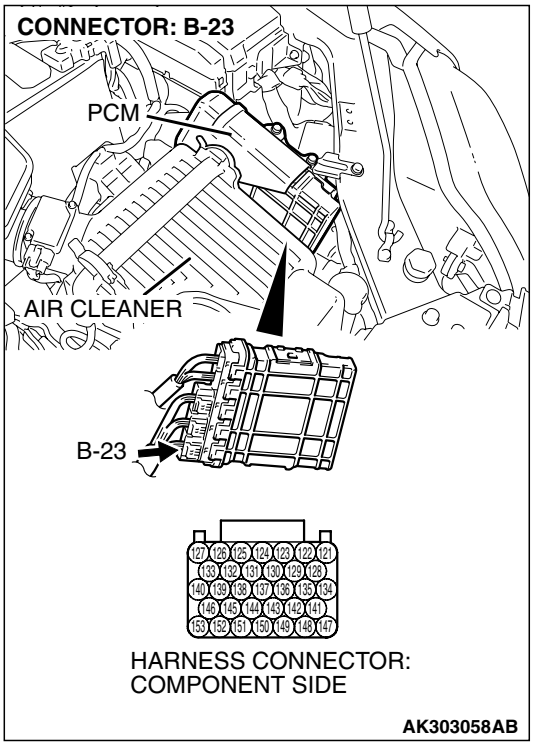
STEP 7. Check harness connector B-23 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 8.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 10.



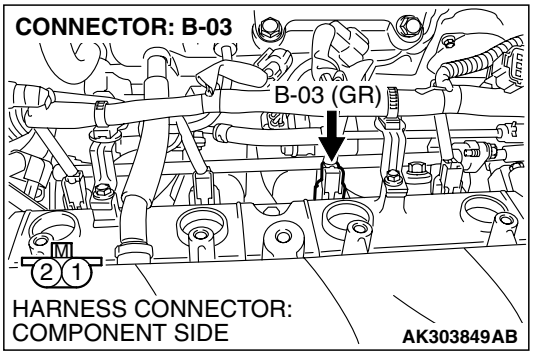


STEP 8. Check for open circuit and short circuit to ground and harness damage between No. 3 cylinder injector connector B-03 (terminal No. 2) and PCM connector B-23 (terminal No. 140).

Q: Is the harness wire in good condition?

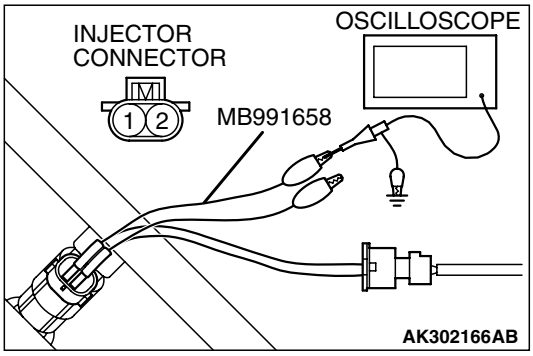
YES : Go to Step 9.

NO : Repair it. Then go to Step 10.



STEP 9. Using the oscilloscope, check the No. 3 cylinder injector.

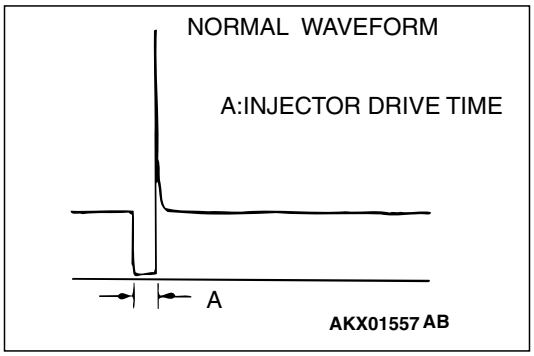
(1) Disconnect the injector No. 3 connector B-03 and connect the test harness special tool MB991658 between the separated connectors. (All terminals should be connected.)



(2) Connect the oscilloscope probe to the injector side connector terminal No. 2.

NOTE: When measuring with the PCM side connector, disconnect all PCM connectors. Connect the check harness special tool (MB991923) between the separated connectors. Then connect the oscilloscope probe to the check harness connector terminal No. 140.

(3) Start the engine and run at idle.



(4) Measure the waveform.
- The waveform should show a normal pattern similar to the illustration.

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

Q: Is the waveform normal?

YES : It can be assumed 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 : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 10.

STEP 10. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 24 P.13A-9.

(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0203 set?

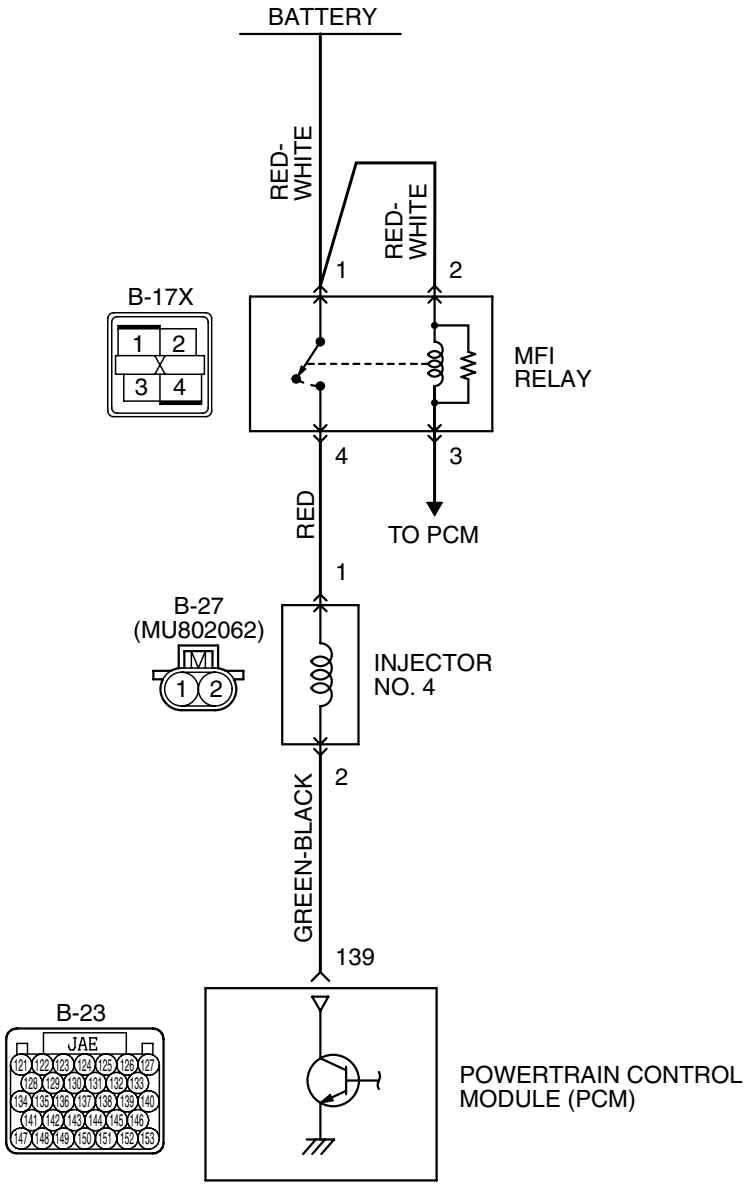
YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0204: Injector Circuit-Cylinder 4

⚠ CAUTION
If DTC P0204 has been set, TCL related DTC U1120 is also set. After P0204 has been diagnosed, don't forget to erase DTC U1120.

Injector Circuit-Cylinder 4



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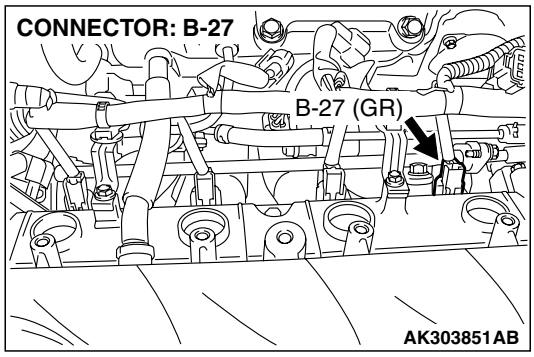
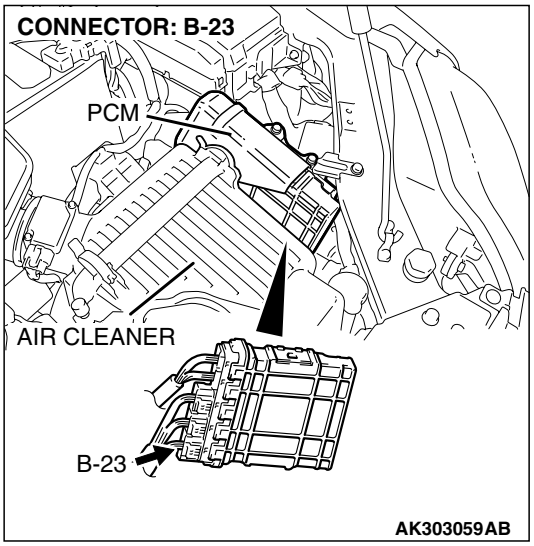
TSB Revision





CIRCUIT OPERATION
- The injector power is supplied from the MFI relay (terminal No. 4).
- The PCM controls the injector by turning the power transistor in the PCM "ON" and "OFF".

TECHNICAL DESCRIPTION
- The amount of fuel injected by the injector is controlled by the amount of continuity time the coil is grounded by the PCM.

DESCRIPTIONS OF MONITOR METHODS
The PCM detects open circuit and short malfunction.

MONITOR EXECUTION
Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)
- Not applicable

Sensor (The sensor below is determined to be normal)
- Not applicable

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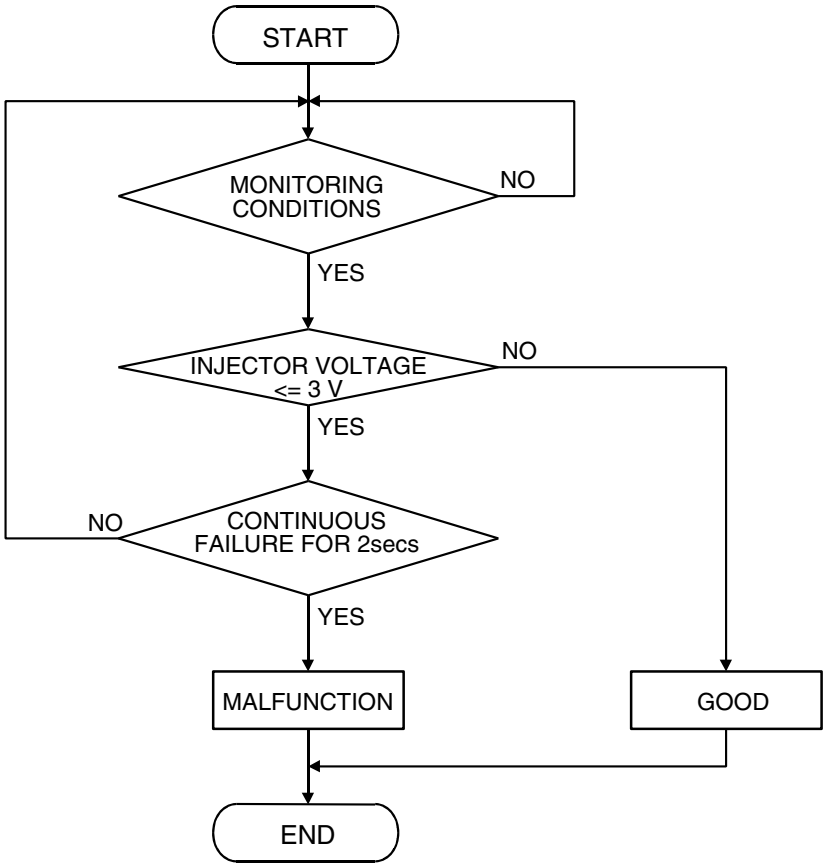
DTC SET CONDITIONS <Circuit continuity – open circuit and shorted low>

Logic Flow Chart



AK503614

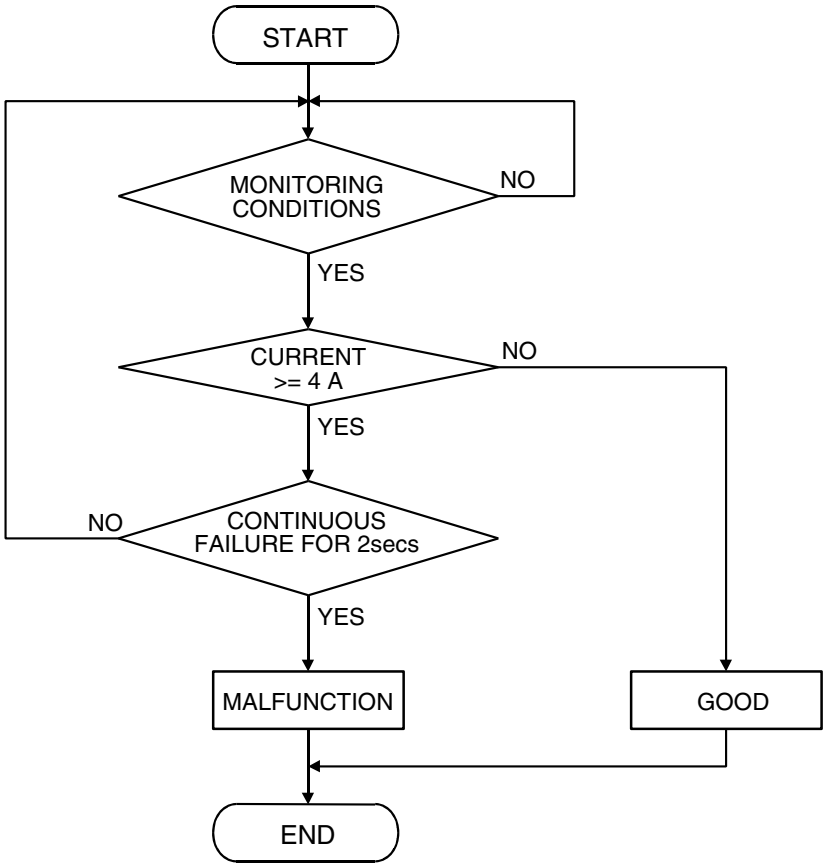
Check Condition
- Engine is running.

Judgement Criterion
- The supply voltage is 3 volts or less without the injector driving.

TSB Revision

DTC SET CONDITIONS <Circuit continuity – shorted high>

Logic Flow Chart



AK401592

Check Condition
- Engine is running.

Judgement Criterion
- The coil current is 4 ampere or more with the injector driving.

OBD-II DRIVE CYCLE PATTERN
Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 24 P.13A-9.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)
- No. 4 cylinder injector failed.
- Open or shorted No. 4 cylinder injector circuit, harness damage or connector damage.
- PCM failed.

DIAGNOSIS

Required Special Tools:
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A
- MB991658: Test Harness
- MB991923: Power Plant ECU Check Harness

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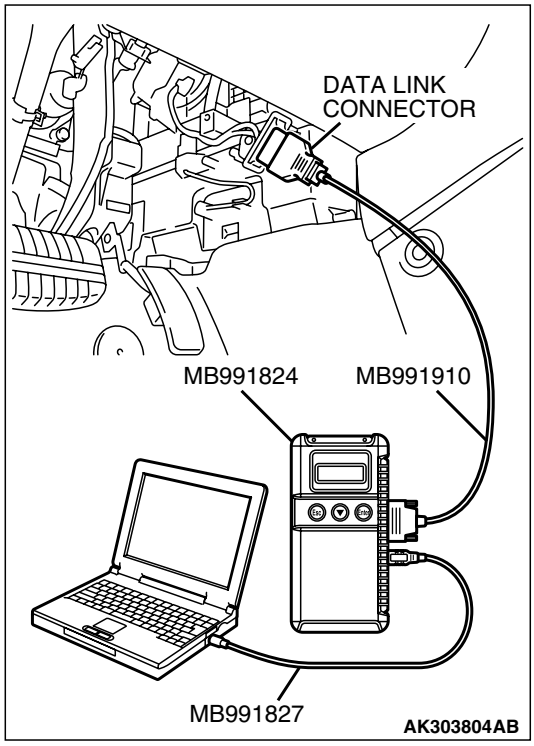


STEP 1. Using scan tool MB991958, check actuator test item 4: No. 4 Injector.

⚠ 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.

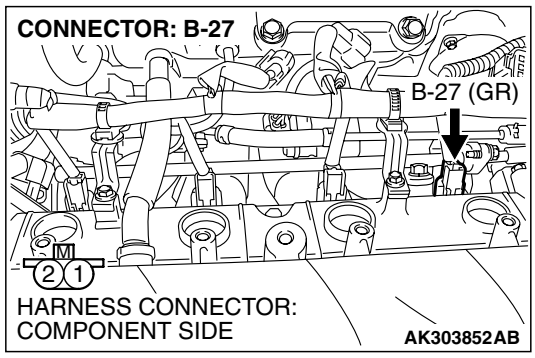
(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991958 to the actuator testing mode for item 4 No. 4 injector.
(4) Warm up the engine to normal operating temperature: 80°C to 95°C (176°F to 203°F).
- The idle should become slightly rougher.

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

Q: Is the actuator operating properly?

YES : It can be assumed 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.

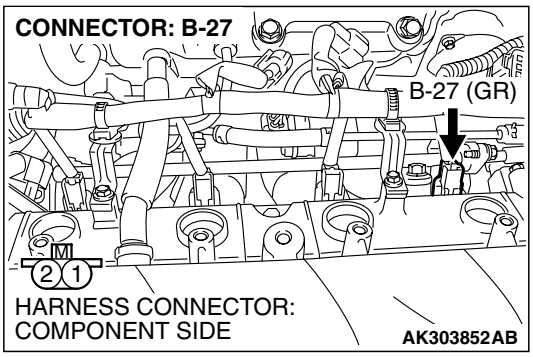


STEP 2. Check harness connector B-27 at No. 4 cylinder injector for damage.

Q: Is the harness connector in good condition?

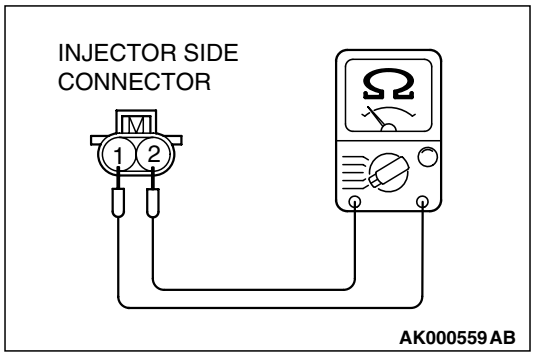
YES : Go to Step 3.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 10.



STEP 3. Check the No. 4 cylinder injector.

(1) Disconnect the No. 4 cylinder injector connector B-27.



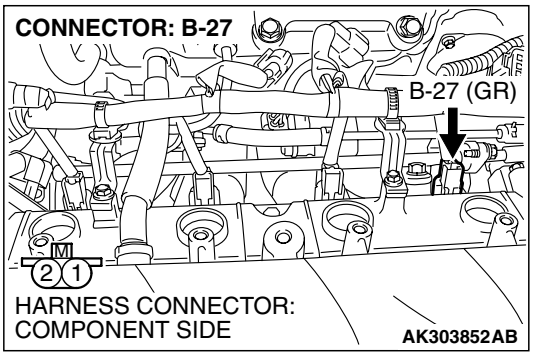
(2) Measure the resistance between injector side connector terminal No. 1 and No. 2.

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

Q: Is the measured resistance between 10.5 and 13.5 ohms [at 20°C (68°F)]?

YES : Go to Step 4.

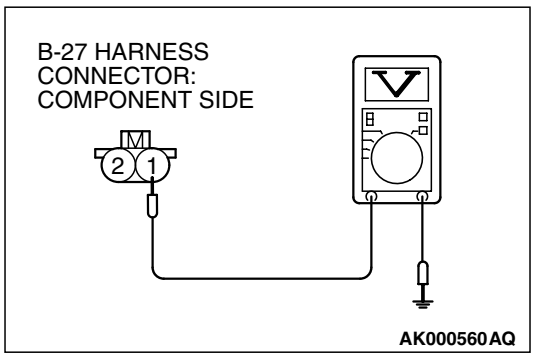
NO : Replace the No. 4 cylinder injector. Then go to Step 10.



STEP 4. Measure the power supply voltage at No. 4 cylinder injector connector.

(1) Disconnect connector B-27 and measure at the harness side.

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



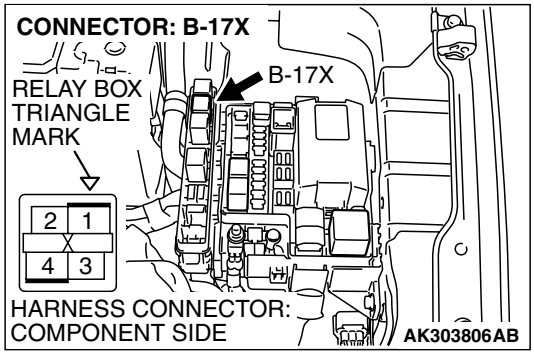
(3) Measure the voltage between terminal No. 1 and ground.
- Voltage should be battery positive voltage.

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

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

YES : Go to Step 6.

NO : Go to Step 5.

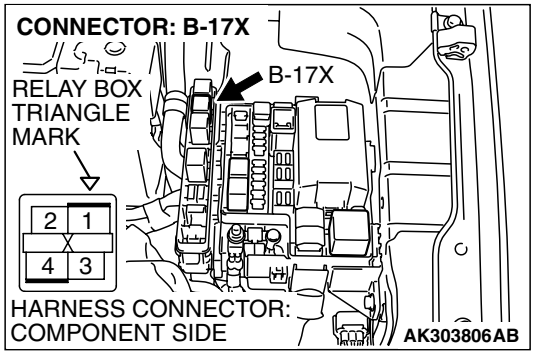


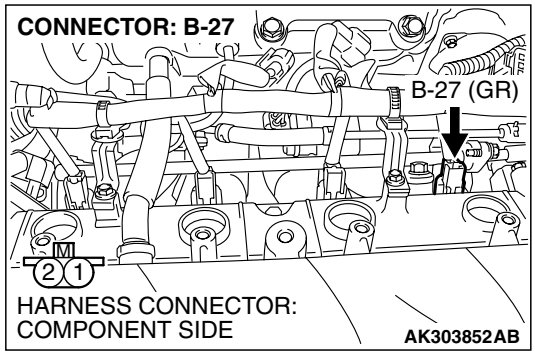
STEP 5. Check harness connector B-17X at MFI relay for damage.

Q: Is the harness connector in good condition?

YES : Repair harness wire between MFI relay connector B-17X (terminal No. 4) and No. 4 cylinder injector connector B-27 (terminal No. 1). Then go to Step 10.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 10.



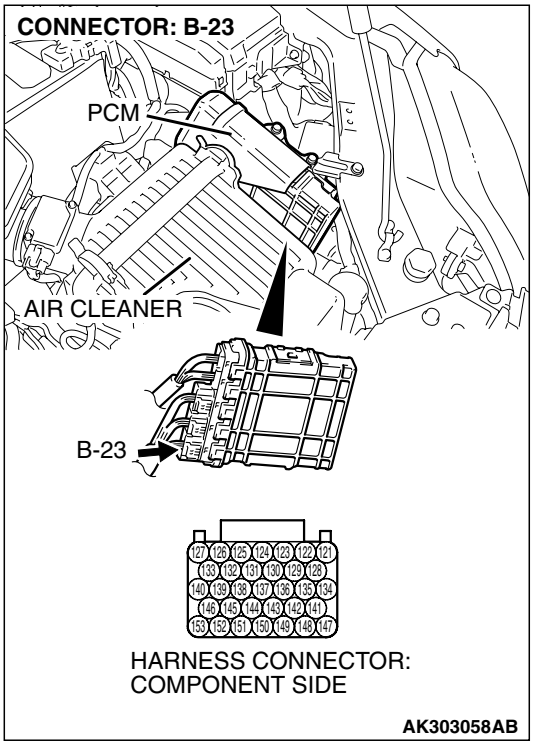


STEP 6. Check for harness damage between MFI relay connector B-17X (terminal No. 4) and No. 4 cylinder injector connector B-27 (terminal No. 1).

Q: Is the harness wire in good condition?

YES : Go to Step 7.

NO : Repair it. Then go to Step 10.

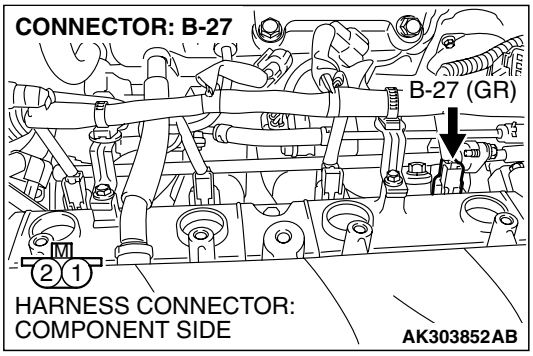


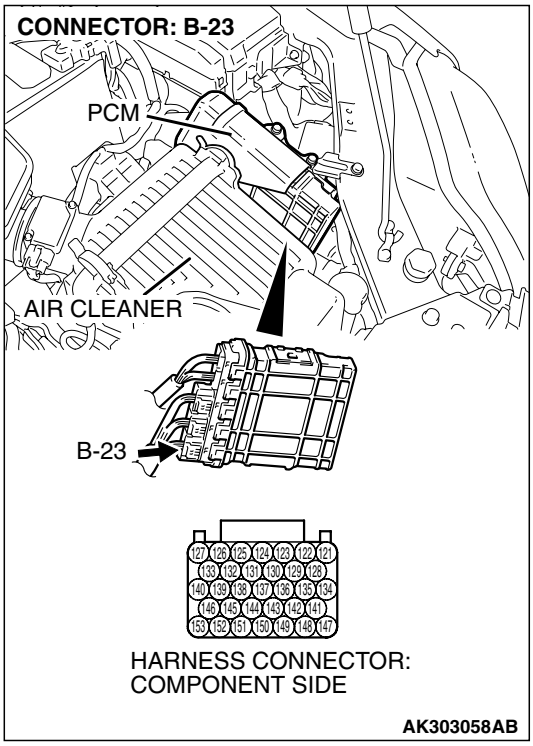
STEP 7. Check harness connector B-23 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 8.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 10.



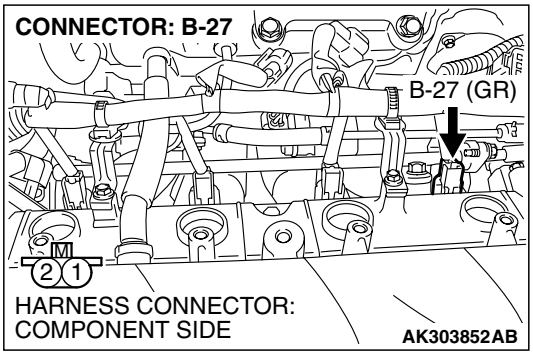


STEP 8. Check for open circuit and short circuit to ground and harness damage between No. 4 cylinder injector connector B-27 (terminal No. 2) and PCM connector B-23 (terminal No. 139).

Q: Is the harness wire in good condition?

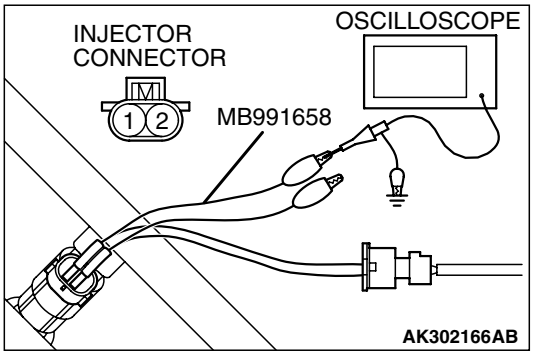
YES : Go to Step 9.

NO : Repair it. Then go to Step 10.



STEP 9. Using the oscilloscope, check the No. 4 cylinder injector.

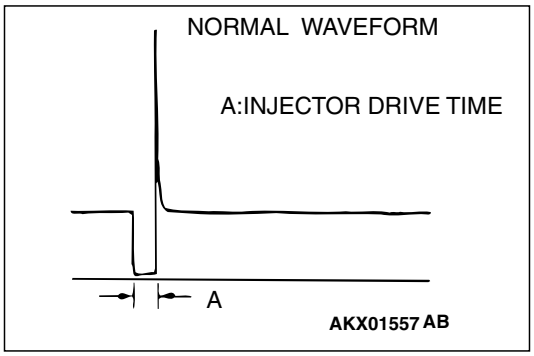
(1) Disconnect the No. 4 cylinder injector connector B-27 and connect the test harness special tool MB991658 between the separated connectors. (All terminals should be connected.)



(2) Connect the oscilloscope probe to the injector side connector terminal No. 2.

NOTE: When measuring with the PCM side connector, disconnect all PCM connectors. Connect the check harness special tool (MB991923) between the separated connectors. Then connect the oscilloscope probe to the check harness connector terminal No. 139.

(3) Start the engine and run at idle.



(4) Measure the waveform.
- The waveform should show a normal pattern similar to the illustration.

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

Q: Is the waveform normal?

YES : It can be assumed 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 : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 10.

STEP 10. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 24 P.13A-9.

(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0204 set?

YES : Retry the troubleshooting.

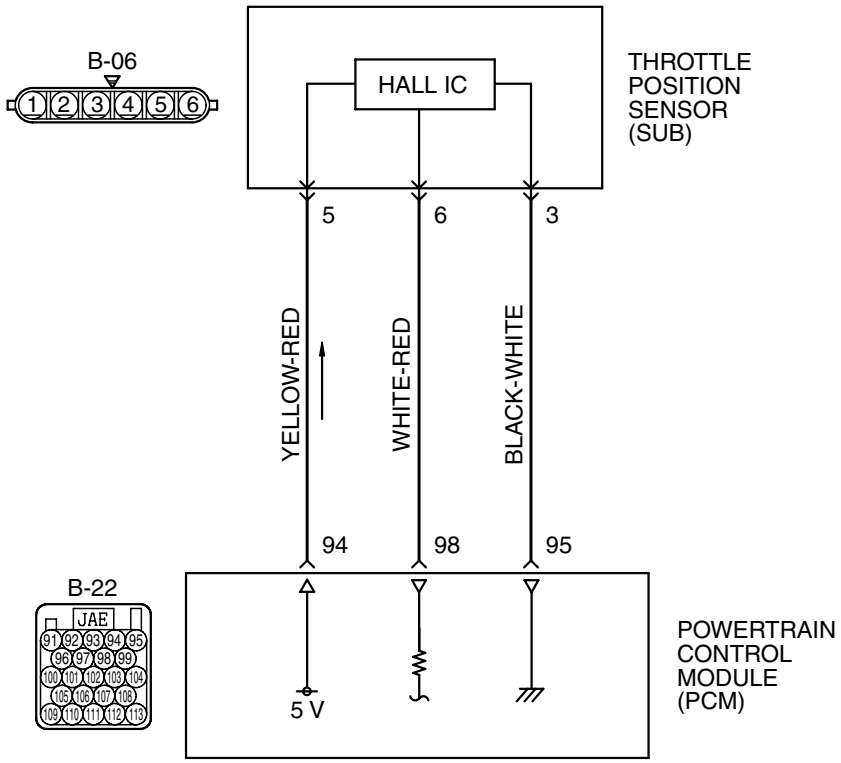
NO : The inspection is complete.

DTC P0222: Throttle Position Sensor (sub) Circuit Low Input

⚠ CAUTION

If DTC P0222 has been set, TCL related DTC U1120 is also set. After P0222 has been diagnosed, don't forget to erase DTC U1120.

Throttle Position Sensor (sub) Circuit



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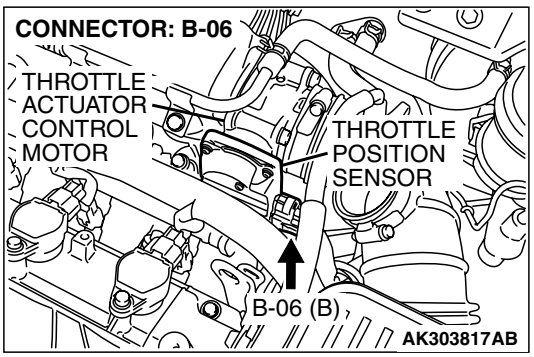

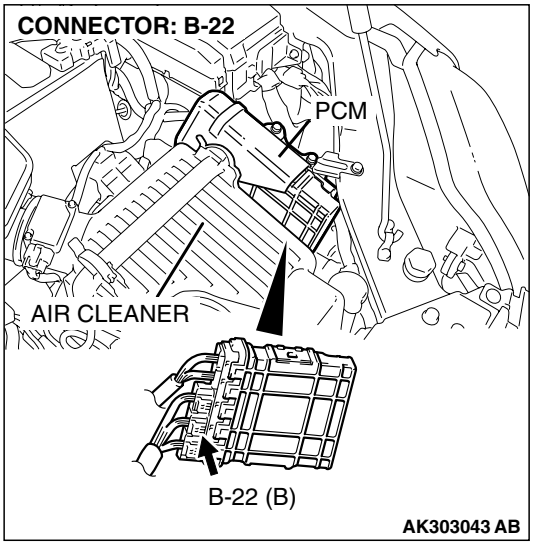

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CIRCUIT OPERATION

- A 5-volt power supply is applied on the throttle position sensor (sub) power terminal (terminal No. 5) from the PCM (terminal No. 94).
  The ground terminal (terminal No. 3) is grounded with PCM (terminal No. 95).

TECHNICAL DESCRIPTION

- The throttle position sensor (sub) outputs voltage which corresponds to the throttle valve opening angle.
- The PCM checks whether the voltage is within a specified range.

DESCRIPTIONS OF MONITOR METHODS

Throttle position sensor (sub) output voltage is out of specified range.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

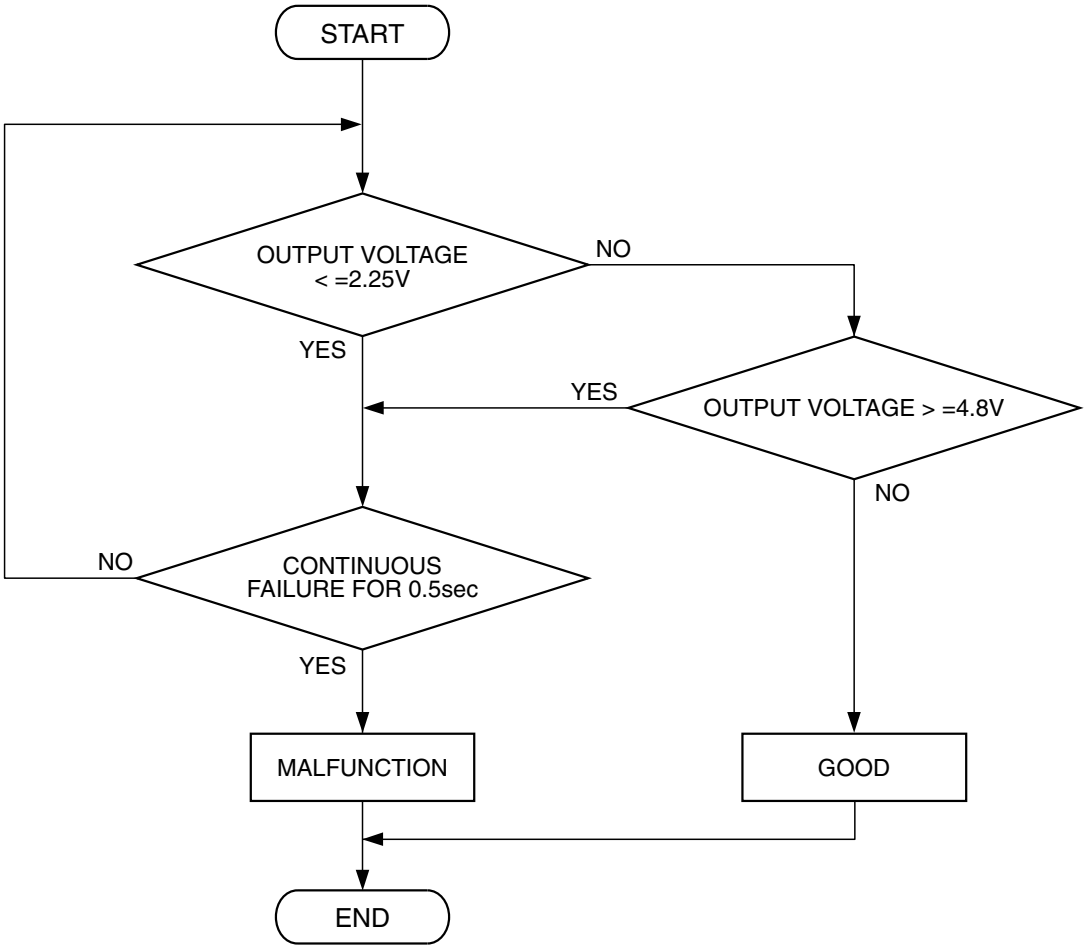
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



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Check Condition
- Ignition switch is "ON" position.

Judgement Criterion
- Throttle position sensor (sub) output voltage should be 2.25 volts or less for 0.5 second.

OBD-II DRIVE CYCLE PATTERN
None.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)
- Throttle position sensor failed.
- Open or shorted throttle position sensor (sub) circuit, harness damage, or connector damage.
- PCM failed.

DIAGNOSIS

Required Special Tools:
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A
- MB991658: Test Harness

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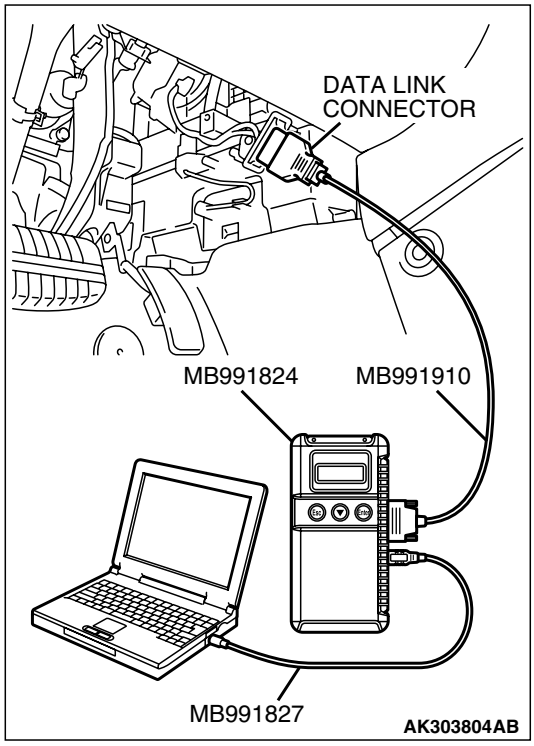


STEP 1. Using scan tool MB991958, check data list item 15: Throttle Position Sensor (sub).

⚠ 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.

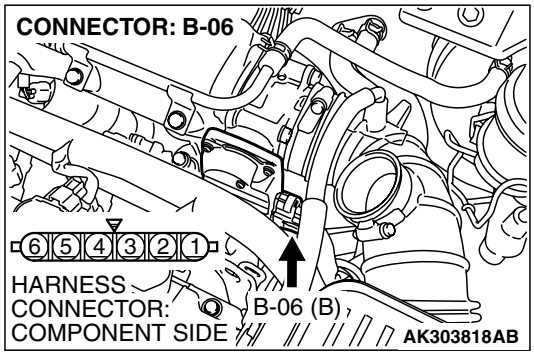
(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Detach the intake air hose at the throttle body.
(4) Disconnect the connector of the throttle position sensor.
(5) Use test harness special tool (MB991658) to connect only terminals No. 3, No. 4, No. 5, and No. 6.
(6) Set scan tool MB991958 to the data reading mode for item 15, Throttle Position Sensor (sub).
- Output voltage should be between 2.2 and 2.8 volts when the throttle valve is fully closed with your finger.
- Output voltage should be 4.6 volts or more when the throttle valve is fully open with your finger.

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

Q: Is the sensor operating properly?

YES : It can be assumed 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.

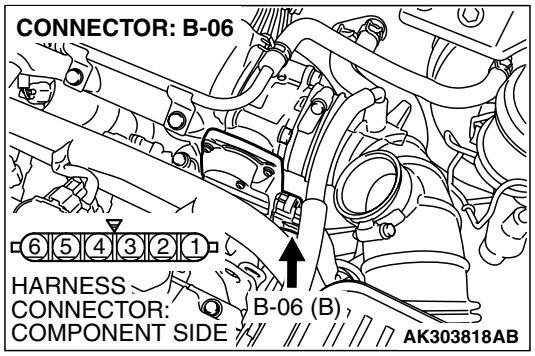


STEP 2. Check harness connector B-06 at throttle position sensor for damage.

Q: Is the harness connector in good condition?

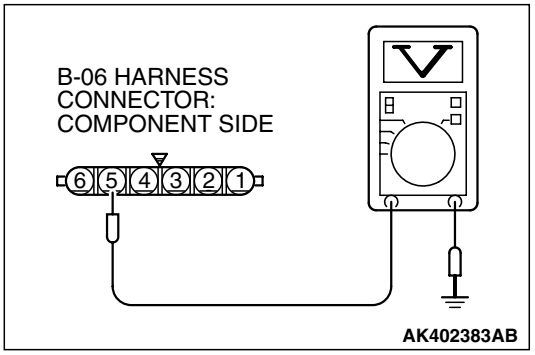
YES : Go to Step 3.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.



STEP 3. Measure the sensor supply voltage at throttle position sensor harness side connector B-06.

(1) Disconnect the connector B-06 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.

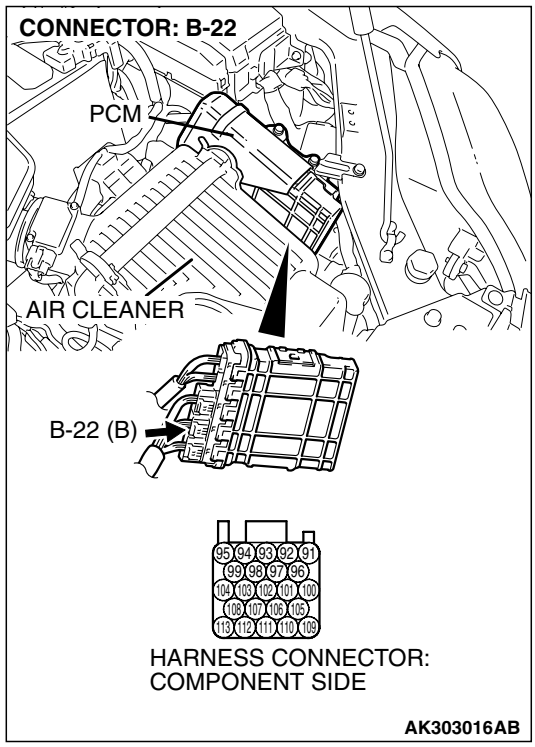


(3) Measure the voltage between terminal No. 5 and ground.
- Voltage should be between 4.9 and 5.1 volts.

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

Q: Is the measured voltage between 4.9 and 5.1 volts?

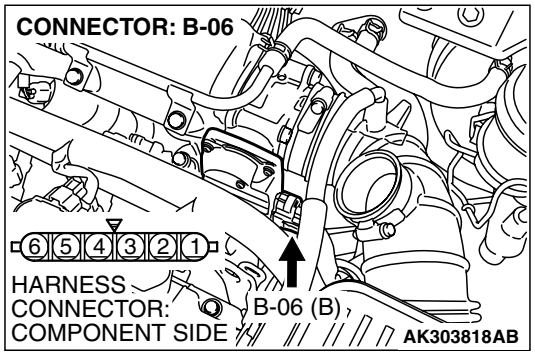
YES : Go to Step 7.
NO : Go to Step 4.

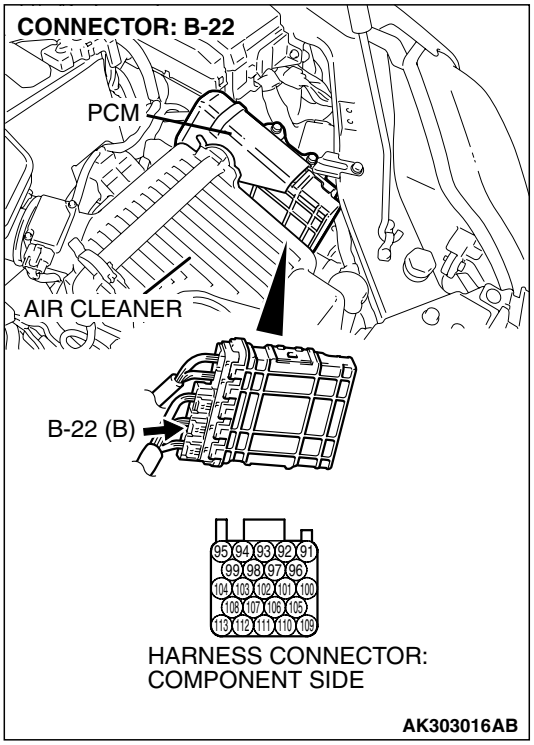


STEP 4. Check harness connector B-22 at PCM for damage.

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 go to Step 11.



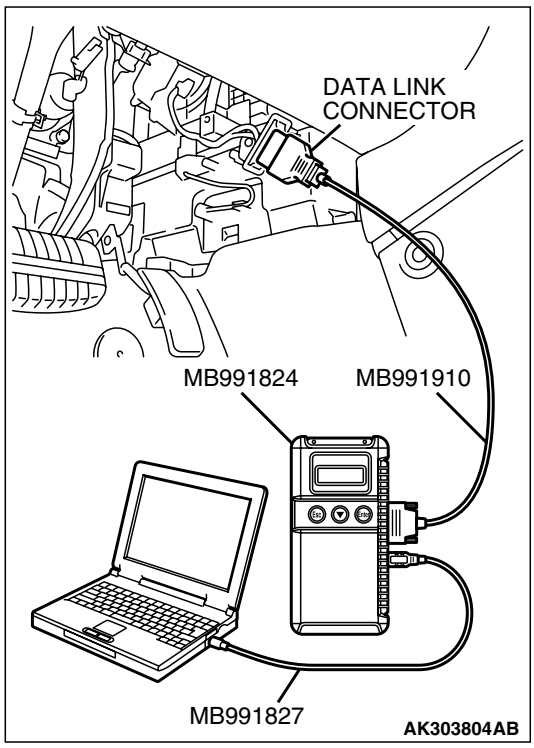


STEP 5. Check for open circuit and short circuit to ground between throttle position sensor connector B-06 (terminal No. 5) and PCM connector B-22 (terminal No. 94).

Q: Is the harness wire in good condition?

YES : Go to Step 6.

NO : Repair it. Then go to Step 11.



STEP 6. Using scan tool MB991958, check data list item 15: Throttle Position Sensor (sub).

⚠ 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.

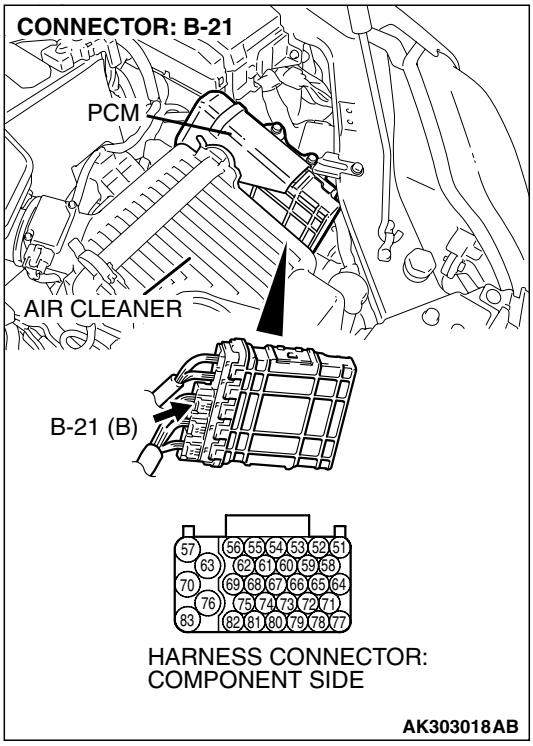
(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Detach the intake air hose at the throttle body.
(4) Disconnect the connector of the throttle position sensor.
(5) Use test harness special tool (MB991658) to connect only terminals No. 3, No. 4, No. 5, and No. 6.
(6) Set scan tool MB991958 to the data reading mode for item 15, Throttle Position Sensor (sub).
- Output voltage should be between 2.2 and 2.8 volts when the throttle valve is fully closed with your finger.
- Output voltage should be 4.6 volts or more when the throttle valve is fully open with your finger.

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

Q: Is the sensor operating properly?

YES : It can be assumed 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 : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 11.

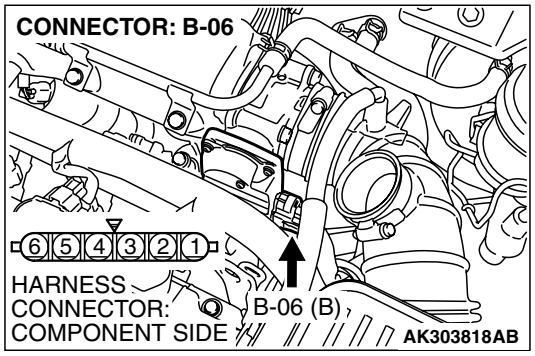


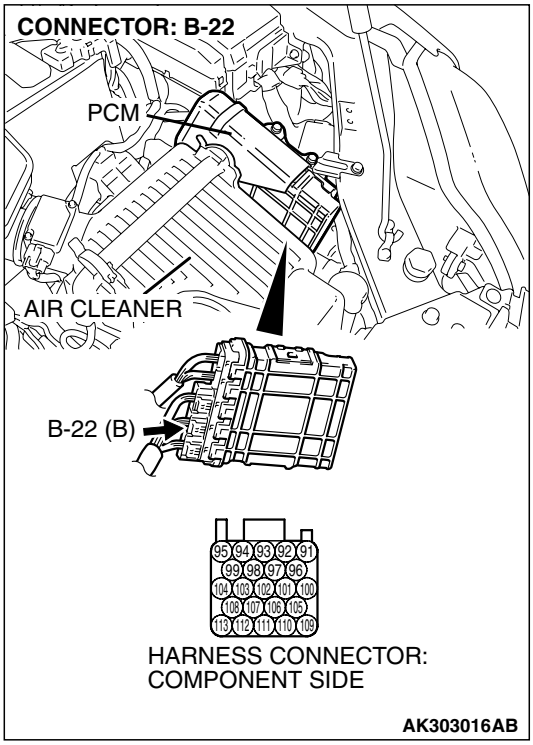
STEP 7. Check harness connector B-22 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 8.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.





STEP 8. Check for harness damage between throttle position sensor connector B-06 (terminal No. 5) and PCM connector B-22 (terminal No. 94).

Q: Is the harness wire in good condition?

YES : Go to Step 9.

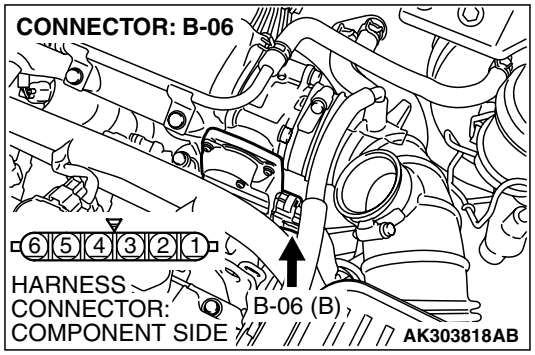
NO : Repair it. Then go to Step 11.

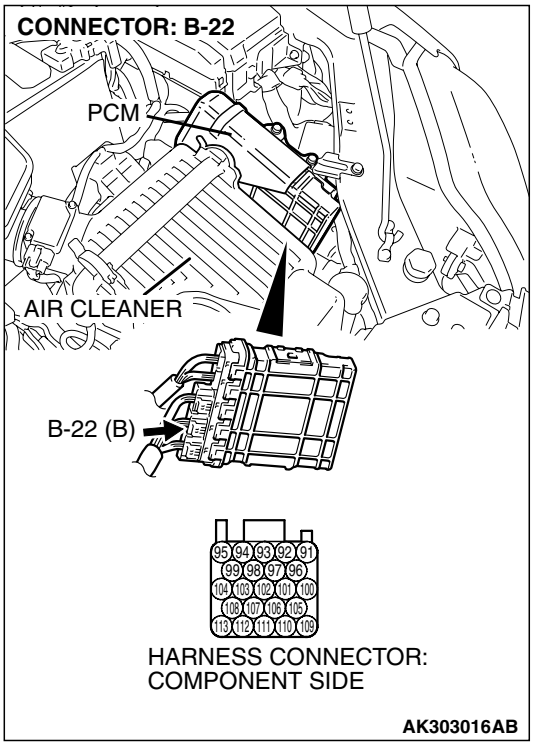
STEP 9. Check for open circuit, short circuit to ground and harness damage between throttle position sensor connector B-06 (terminal No. 6) and PCM connector B-22 (terminal No. 98).

Q: Is the harness wire in good condition?

YES : Go to Step 10.

NO : Repair it. Then go to Step 11.





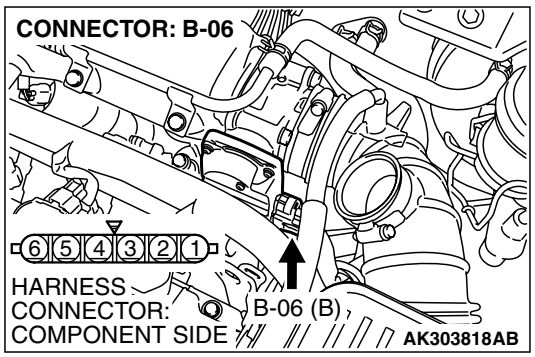
STEP 10. Replace the throttle body assembly.

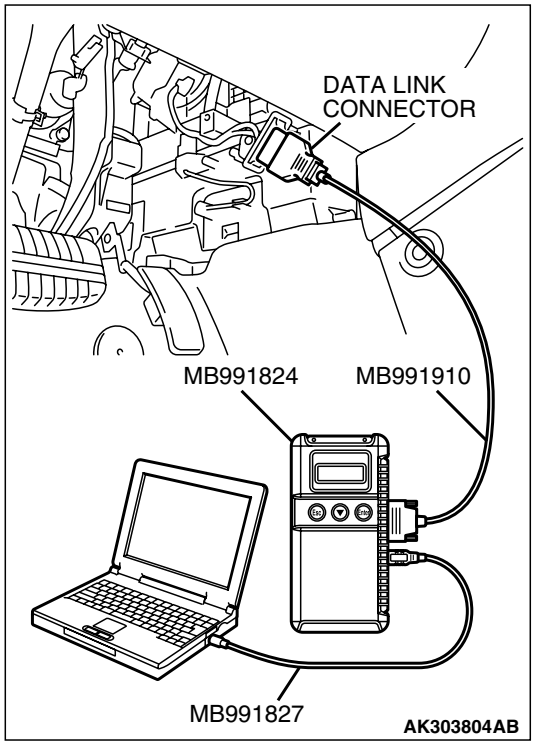
(1) Replace the throttle body assembly.
(2) Turn the ignition switch to the "ON" position.
(3) After the DTC has been deleted, read the DTC again.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC P0222 set?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 11.

NO : The inspection is complete.





STEP 11. 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) After the DTC has been deleted, read the DTC again.
(4) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is DTC P0222 set?

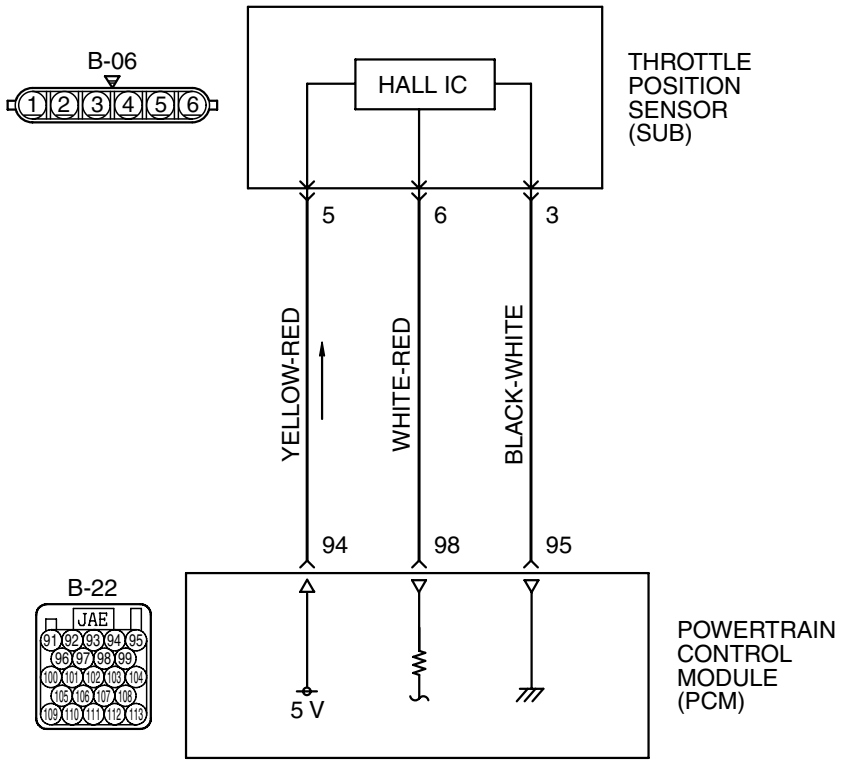
YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0223: Throttle Position Sensor (sub) Circuit High Input

⚠ CAUTION

If DTC P0223 has been set, TCL related DTC U1120 is also set. After P0223 has been diagnosed, don't forget to erase DTC U1120.

Throttle Position Sensor (sub) Circuit



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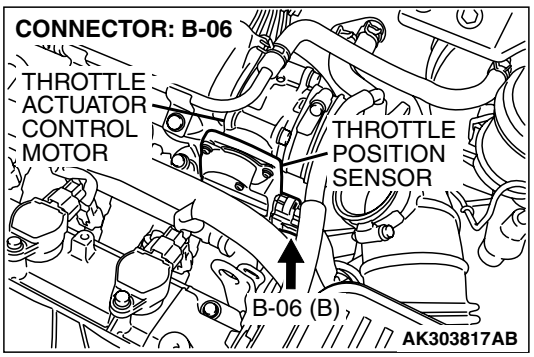
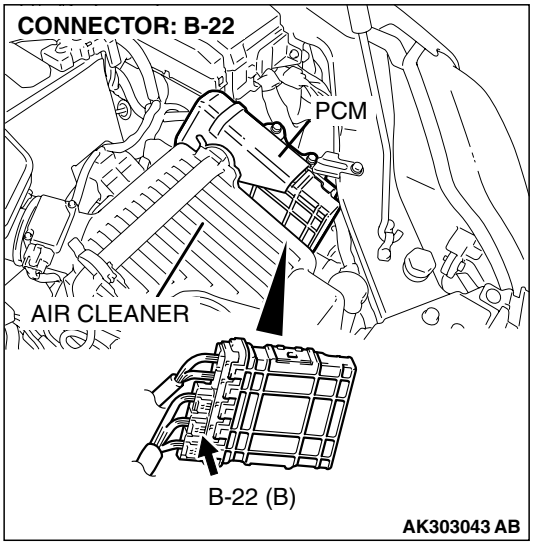




TSB Revision

CIRCUIT OPERATION

- A 5-volt power supply is applied on the throttle position sensor (sub) power terminal (terminal No. 5) from the PCM (terminal No. 94).
  The ground terminal (terminal No. 3) is grounded with PCM (terminal No. 95).

TECHNICAL DESCRIPTION

- The throttle position sensor (sub) outputs voltage which corresponds to the throttle valve opening angle.
- The PCM checks whether the voltage is within a specified range.

DESCRIPTIONS OF MONITOR METHODS

Throttle position sensor (sub) output voltage is out of specified range.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

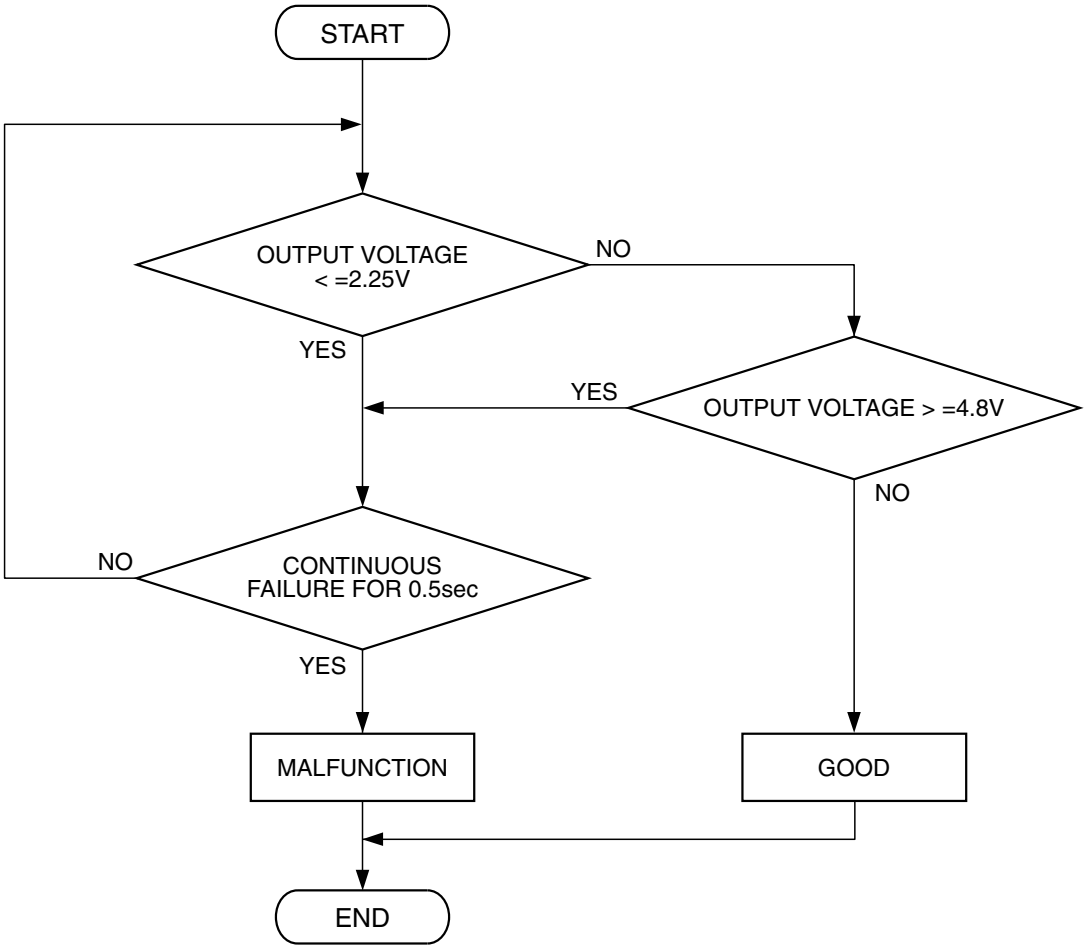
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



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Check Condition
- Ignition switch is "ON" position.

Judgement Criterion
- Throttle position sensor (sub) output voltage should be 4.8 volts or more for 0.5 second.

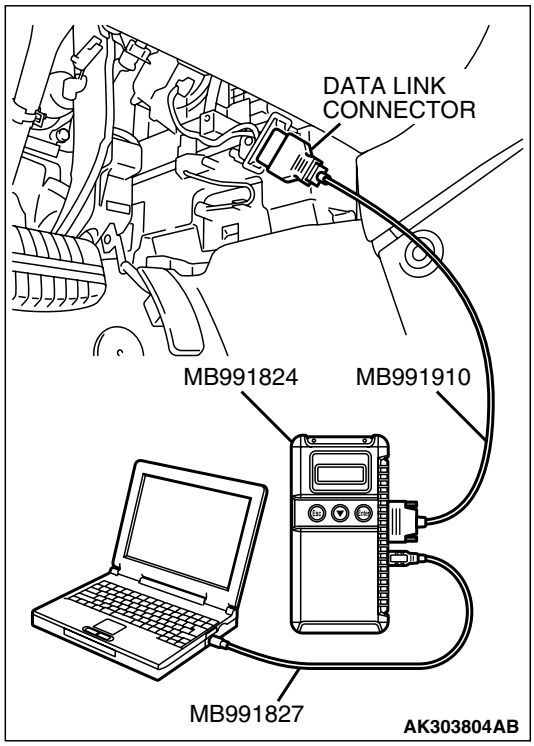
OBD-II DRIVE CYCLE PATTERN
None.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)
- Throttle position sensor failed.
- Open throttle position sensor (sub) circuit, harness damage, or connector damage.
- PCM failed.

DIAGNOSIS

Required Special Tools:
- MB991958: Scan tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A
- MB991658: Test Harness

TSB Revision



STEP 1. Using scan tool MB991958, check data list item 15: Throttle Position Sensor (sub).

⚠ 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.

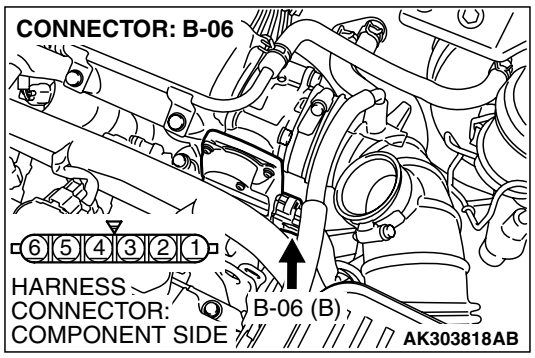
(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Detach the intake air hose at the throttle body.
(4) Disconnect the connector of the throttle position sensor.
(5) Use test harness special tool (MB991658) to connect only terminals No. 3, No. 4, No. 5, and No. 6.
(6) Set scan tool MB991958 to the data reading mode for item 15, Throttle Position Sensor (sub).
- Output voltage should be between 2.2 and 2.8 volts when the throttle valve is fully closed with your finger.
- Output voltage should be 4.6 volts or more when the throttle valve is fully open with your finger.

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

Q: Is the sensor operating properly?

YES : It can be assumed 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.

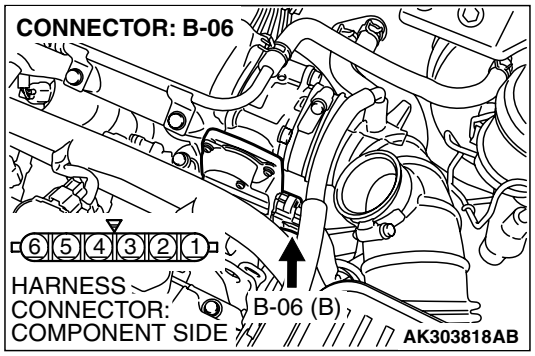


STEP 2. Check harness connector B-06 at throttle position sensor for damage.

Q: Is the harness connector in good condition?

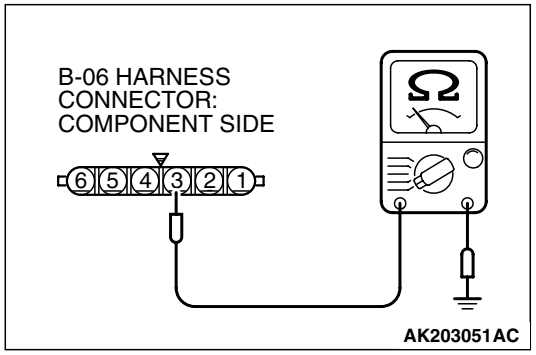
YES : Go to Step 3.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 8.



STEP 3. Check the continuity at throttle position sensor harness side connector B-06.

(1) Disconnect the connector B-06 and measure at the harness side.



(2) Measure the continuity between terminal No. 3 and ground.
- Continuity (2 Ω or less)

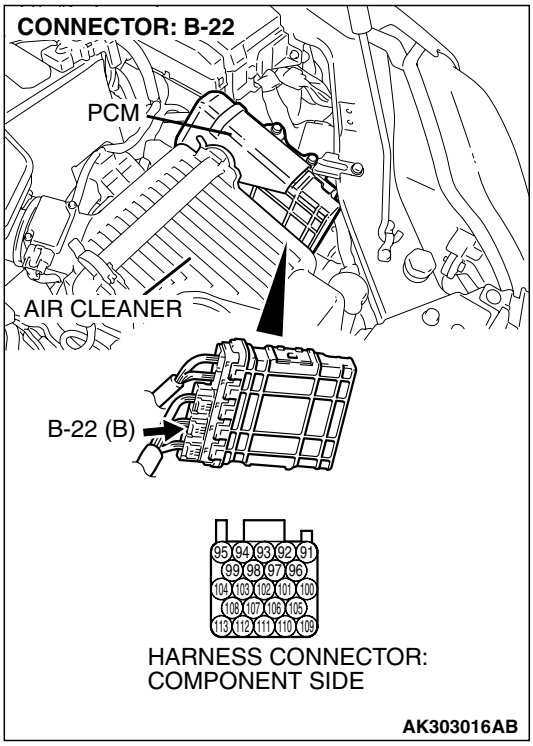
Q: Does continuity exist?

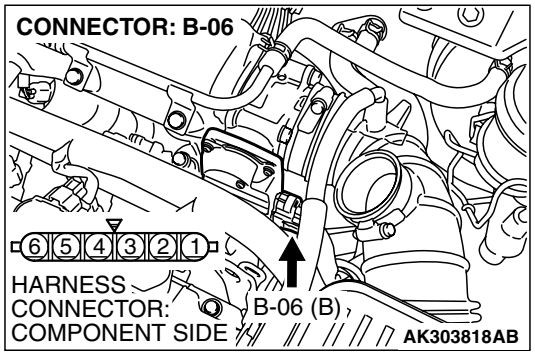
YES : Go to Step 7.
NO : Go to Step 4.

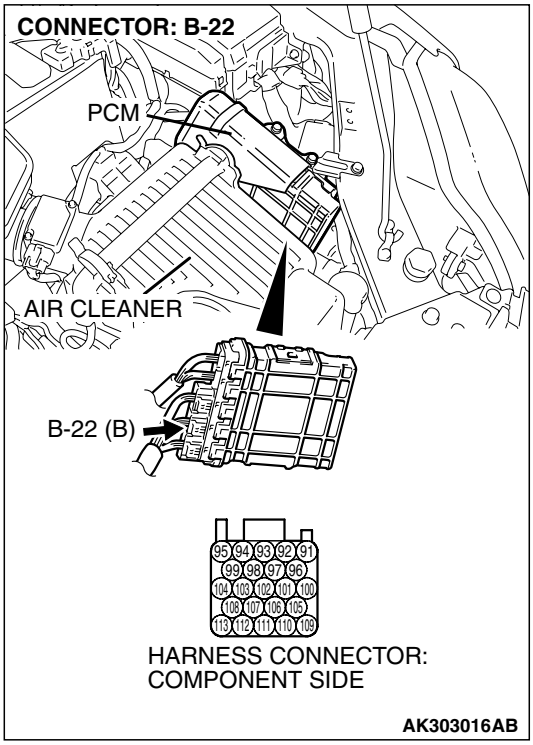
STEP 4. Check harness connector B-22 at PCM for damage.

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 go to Step 8.





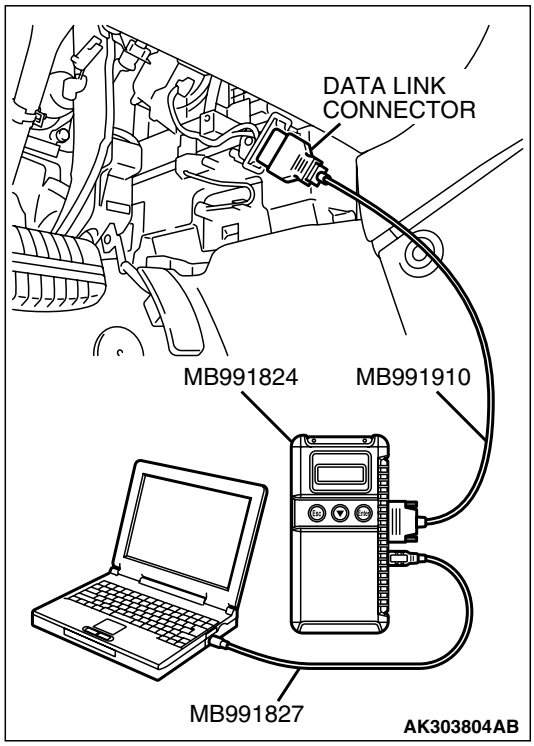


STEP 5. Check for open circuit and harness damage between throttle position sensor connector B-06 (terminal No. 3) and PCM connector B-22 (terminal No. 95).

Q: Is the harness wire in good condition?

YES : Go to Step 6.

NO : Repair it. Then go to Step 8.



STEP 6. Using scan tool MB991958, check data list item 15: Throttle Position Sensor (sub).

⚠ 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

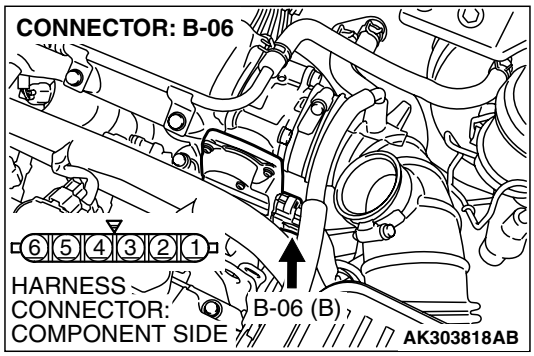
(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Detach the intake air hose at the throttle body.
(4) Disconnect the connector of the throttle position sensor.
(5) Use test harness special tool (MB991658) to connect only terminals No. 3, No. 4, No. 5, and No. 6.
(6) Set scan tool MB991958 to the data reading mode for item 15, Throttle Position Sensor (sub).
- Output voltage should be between 2.2 and 2.8 volts when the throttle valve is fully closed with your finger.
- Output voltage should be 4.6 volts or more when the throttle valve is fully open with your finger.

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

Q: Is the sensor operating properly?

YES : It can be assumed 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 : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 8.



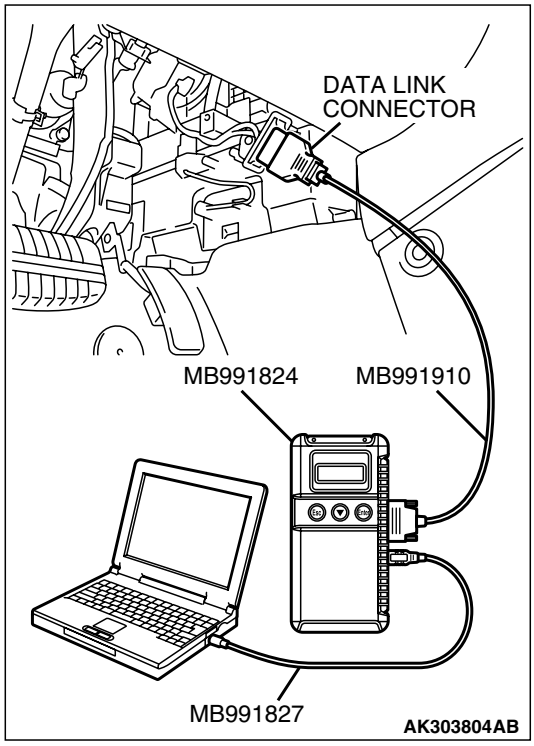
STEP 7. Replace the throttle body assembly.

(1) Replace the throttle body assembly.
(2) Turn the ignition switch to the "ON" position.
(3) After the DTC has been deleted, read the DTC again.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC P0223 set?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 8.

NO : The inspection is complete.



STEP 8. 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) After the DTC has been deleted, read the DTC again.
(4) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is DTC P0223 set?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0300: Random/Multiple Cylinder Misfire Detected

⚠ CAUTION

If DTC P0300 has been set, TCL related DTC U1120 is also set. After P0300 has been diagnosed, don't forget to erase DTC U1120.

TECHNICAL DESCRIPTION

- If a misfire occurs while the engine is running, the engine speed changes for an instant.
- The PCM checks for such changes in engine speed.

DESCRIPTIONS OF MONITOR METHODS

Monitor angular acceleration of crankshaft and detect malfunction when negative variation of the angular acceleration is large.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

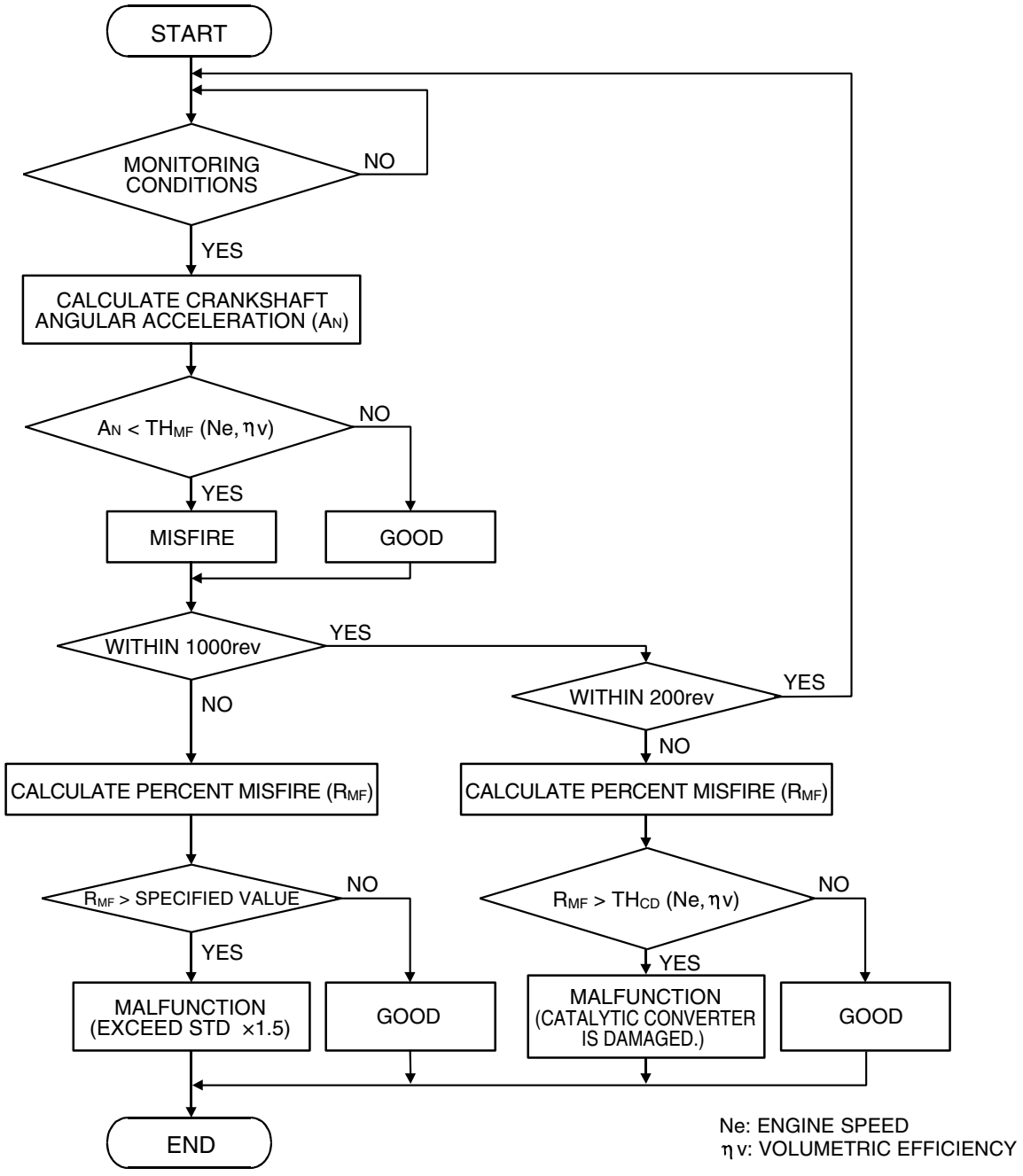
- Not applicable

Sensor (The sensor below is determined to be normal)

- Camshaft position sensor
- Mass airflow sensor
- Engine coolant temperature sensor
- Intake air temperature sensor
- Barometric pressure sensor
- Throttle position sensor

DTC SET CONDITIONS

Logic Flow Chart



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Check Conditions

- Engine speed is between 500 and 6,500 r/min.
- Engine coolant temperature is higher than −10°C (14°F).
- Barometric pressure is higher than 76 kPa (22.4 in.Hg).
- Volumetric efficiency is between 30 and 60 percent.
- Adaptive learning is complete for the vane which generates a crankshaft position signal.
- While the engine is running, excluding gear shifting, deceleration, sudden acceleration/deceleration and A/C compressor switching.
- The throttle deviation is −0.6 V/10 ms to +0.6 V/10 ms.

TSB Revision

Judgement Criteria (change in the angular acceleration of the crankshaft is used for misfire detection)

- Misfire has occurred more frequently than allowed during the last 200 revolutions [when the catalyst temperature is higher than 1,000°C (1,832°F)].

or

- Misfire has occurred in 1.1 % or more of the last 1,000 revolutions (corresponding to 1.5 times the limit of emission standard).

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 15 P.13A-9.

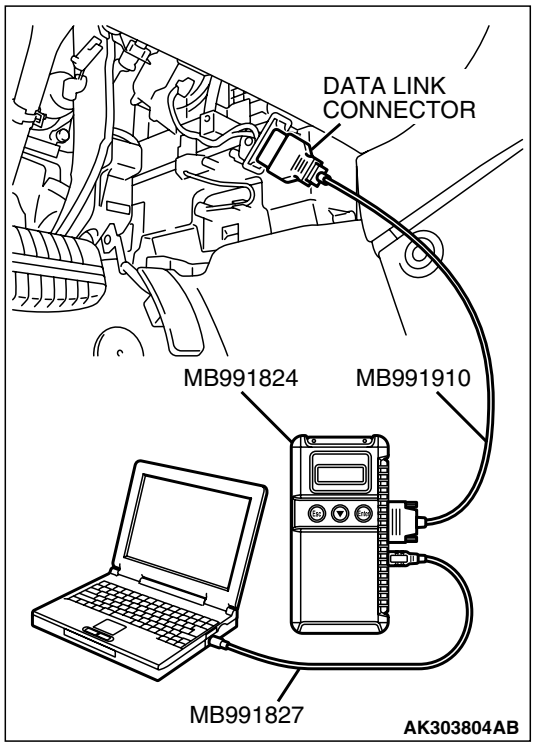
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Ignition system related part(s) failed.
- Poor crankshaft position sensor.
- Incorrect air/fuel ratio.
- Low compression pressure.
- Skipping of timing belt teeth.
- EGR system and EGR valve failed.
- PCM failed.

DIAGNOSIS

Required Special Tools:

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



STEP 1. Using scan tool MB991958, check data list item 2: Crankshaft Position Sensor.

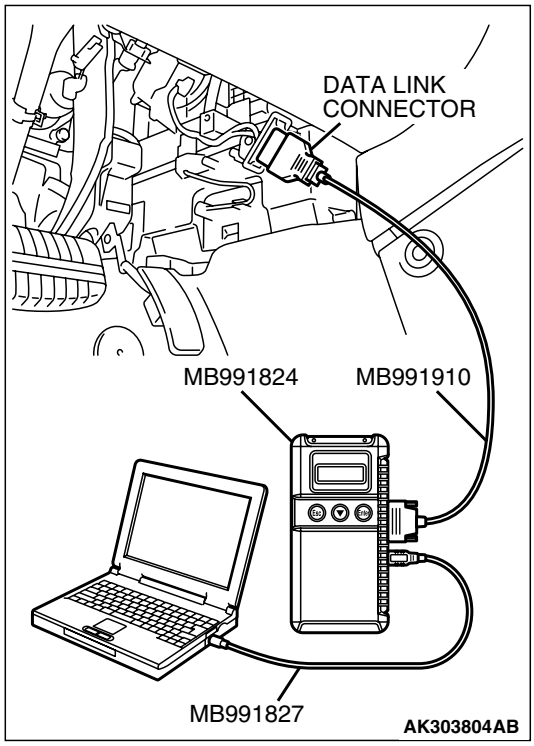
⚠ CAUTION

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) Set scan tool MB991958 to the data reading mode for item 2, Crankshaft Position Sensor.
(4) Check the waveform of the crankshaft position sensor while keeping the engine speed constant.
  - The pulse width should be constant.
(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 2.
NO : Refer to, DTC P0335 – Crankshaft Position Sensor Circuit P.13A-553.



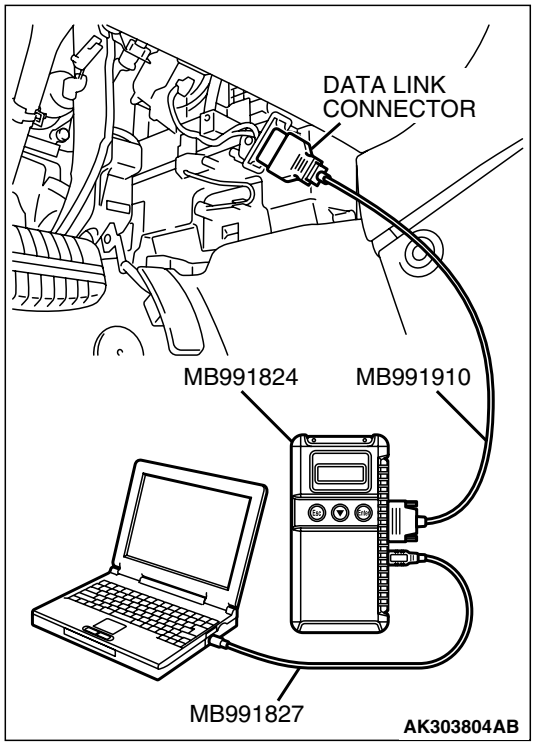
STEP 2. Using scan tool MB991958, check data list item 26: Cylinder 1, 4 Long-Term Fuel Trim.

(1) Start the engine and run at idle.
(2) Set scan tool MB991958 to the data reading mode for item 26, Cylinder 1, 4 Long-Term Fuel Trim.
- The fuel trim should be between –12.5 and +12.5 percent when the engine is 2,500 r/min (during closed loop) after the engine is warmed.

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

Q: Is the specification normal?

YES : Go to Step 3.
NO : Refer to DTC P0171 – System too Lean (cylinder 1, 4) P.13A-412, DTC P0172 – System too Rich (cylinder 1, 4) P.13A-420.



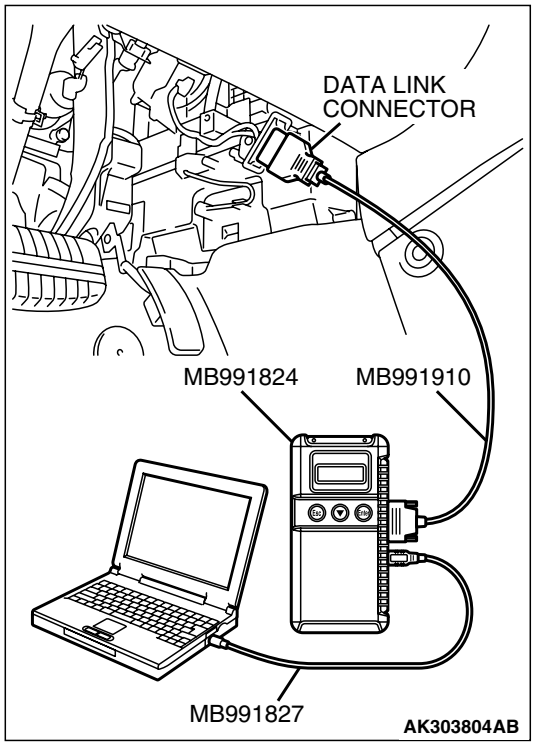
STEP 3. Using scan tool MB991958, check data list item 27: Cylinder 2, 3 Long-Term Fuel Trim.

(1) Start the engine and run at idle.
(2) Set scan tool MB991958 to the data reading mode for item 27, Cylinder 2, 3 Long-Term Fuel Trim.
- The fuel trim should be between –12.5 and +12.5 percent when the engine is 2,500 r/min (during closed loop) after the engine is warmed.

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

Q: Is the specification normal?

YES : Go to Step 4.
NO : Refer to DTC P0174 – System too Lean (cylinder 2, 3) P.13A-425, DTC P0175 – System too Rich (cylinder 2, 3) P.13A-433.



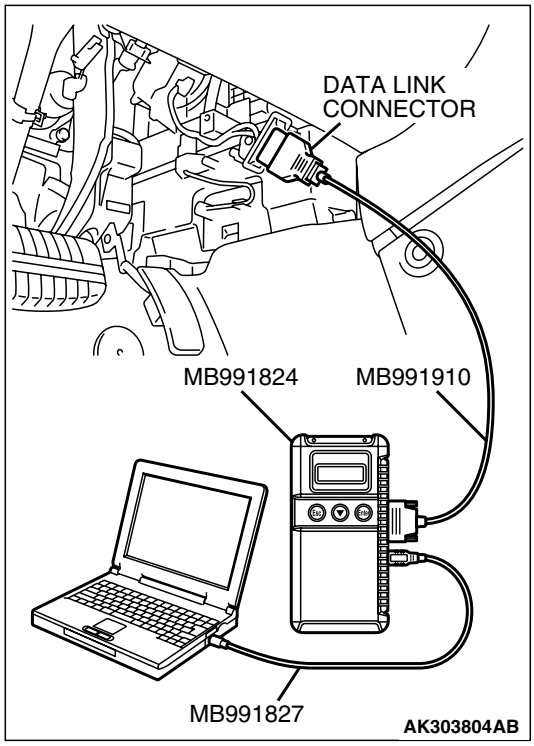
STEP 4. Using scan tool MB991958, check data list item 28: Cylinder 1, 4 Short-Term Fuel Trim.

(1) Start the engine and run at idle.
(2) Set scan tool MB991958 to the data reading mode for item 28, Cylinder 1, 4 Short-Term Fuel Trim.
- The fuel trim should be between –25 and +25 percent when the engine is 2,500 r/min (during closed loop) after the engine is warmed.

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

Q: Is the specification normal?

YES : Go to Step 5.
NO : Refer to DTC P0171 – System too Lean (cylinder 1, 4) P.13A-412, DTC P0172 – System too Rich (cylinder 1, 4) P.13A-420.



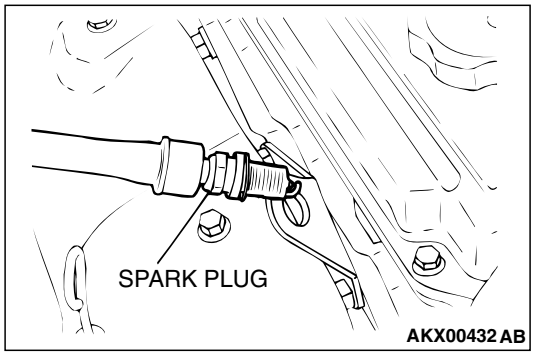
STEP 5. Using scan tool MB991958, check data list item 29: Cylinder 2, 3 Short-Term Fuel Trim.

(1) Start the engine and run at idle.
(2) Set scan tool MB991958 to the data reading mode for item 29, Cylinder 2, 3 Short-Term Fuel Trim.
- The fuel trim should be between –25 and +25 when the engine is 2,500 r/min (during closed loop) after the engine is warmed.

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

Q: Is the specification normal?

YES : Go to Step 6.
NO : Refer to DTC P0174 – System too Lean (cylinder 2, 3) P.13A-425, DTC P0175 – System too Rich (cylinder 2, 3) P.13A-433.



STEP 6. Visual check of ignition spark.

(1) Remove the spark plug and install it to the ignition coil.
(2) Connect the ignition coil connector.
(3) Remove all injector connector.
(4) At the engine start, check each spark plug produces a spark.

Q: Did it spark?

YES : Go to Step 8.
NO : Go to Step 7.

STEP 7. Check the spark plugs.

Refer to GROUP 16, Ignition System – On-vehicle Service – Spark Plug Check And Cleaning.P.16-39

Q: Is the spark plug normal?

YES : Refer to INSPECTION PROCEDURE 32 – Ignition Circuit System P.13A-1105.
NO : Replace the faulty spark plug. Then go to Step 10.

STEP 8. Check the following items.

(1) Check the following items, and repair or replace the defective component.
  a. Check for skipped timing belt teeth.
  b. Check compression.
  c. EGR valve failed.

Q: Are there any abnormalities?

YES : Repair or replace it. Then go to Step 10.
NO : Go to Step 9.

STEP 9. Check the trouble symptoms.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 15 P.13A-9.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0300 set?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 10.
NO : It can be assumed 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.

STEP 10. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 15 P.13A-9.

(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0300 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0301: Cylinder 1 Misfire Detected

⚠ CAUTION

If DTC P0301 has been set, TCL related DTC U1120 is also set. After P0301 has been diagnosed, don't forget to erase DTC U1120.

TECHNICAL DESCRIPTION

- If a misfire occurs while the engine is running, the engine speed changes for an instant.
- The PCM checks for such changes in engine speed.

DESCRIPTIONS OF MONITOR METHODS

Monitor angular acceleration of crankshaft and detect malfunction when negative variation of the angular acceleration is large.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

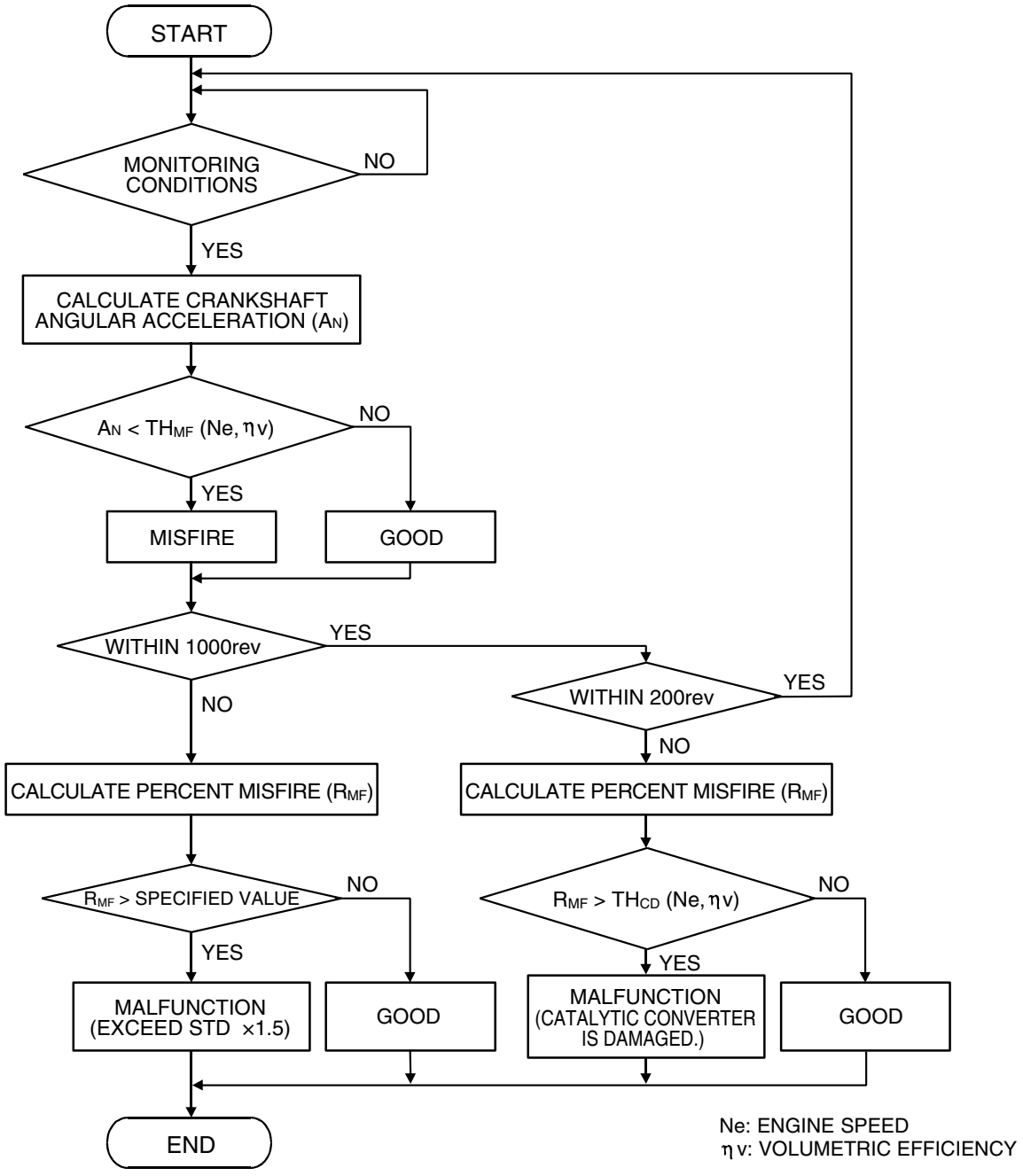
- Not applicable

Sensor (The sensor below is determined to be normal)

- Camshaft position sensor
- Mass airflow sensor
- Engine coolant temperature sensor
- Intake air temperature sensor
- Barometric pressure sensor
- Throttle position sensor

DTC SET CONDITIONS

Logic Flow Chart



AK302033

Check Conditions

- Engine speed is between 500 and 6,500 r/min.
- Engine coolant temperature is higher than −10°C (14°F).
- Barometric pressure is higher than 76 kPa (22.4 in.Hg).
- Volumetric efficiency is at between 30 and 60 percent.
- Adaptive learning is complete for the vane which generates a crankshaft position signal.
- While the engine is running, excluding gear shifting, deceleration, sudden acceleration/deceleration and A/C compressor switching.
- The throttle deviation is −0.06 V/10 ms to +0.06 V/10 ms.

TSB Revision

Judgement Criteria (change in the angular acceleration of the crankshaft is used for misfire detection)

- Misfire has occurred more frequently than allowed during the last 200 revolutions [when the catalyst temperature is higher than 1,000°C (1,832°F)].

or

- Misfire has occurred in 1.1 % or more of the last 1,000 revolutions (corresponding to 1.5 times the limit of emission standard).

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 15 P.13A-9.

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

- Ignition system related part(s) failed.
- Low compression pressure.
- PCM failed.

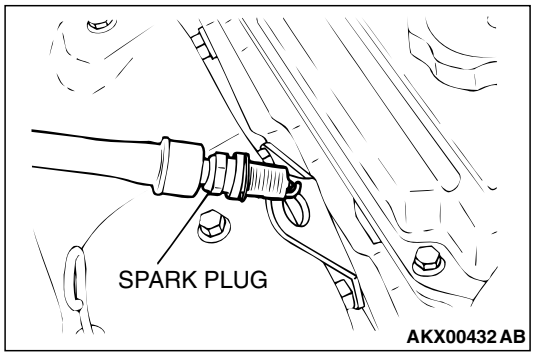
DIAGNOSIS

STEP 1. Visual check on ignition spark of No. 1 cylinder.

(1) Remove the spark plug and install it to the ignition coil.
(2) Connect the ignition coil connector.
(3) Remove all injector connector.
(4) At the engine start, check spark plug produces a spark.

Q: Did it spark?

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



STEP 2. Check the No. 1 cylinder spark plug.

Refer to GROUP 16, Ignition System – On-vehicle Service – Spark Plug Check And Cleaning P.16-39.

Q: Is the spark plug normal?

YES : Refer to, INSPECTION PROCEDURE 32 – Ignition Circuit System P.13A-1105.
NO : Replace the No. 1 cylinder spark plug. Then go to Step 5.

STEP 3. Check the compression.

Refer to GROUP 11A, On-Vehicle Service – Compression Pressure Check P.11A-17.

Q: Are there any abnormalities?

YES : Repair or replace it. Then go to Step 5.
NO : Go to Step 4.

STEP 4. Check the trouble symptoms.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 15 P.13A-9.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0301 set?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 5.
NO : It can be assumed 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.

STEP 5. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 15 P.13A-9.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0301 set?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0302: Cylinder 2 Misfire Detected

⚠ CAUTION
If DTC P0302 has been set, TCL related DTC U1120 is also set. After P0302 has been diagnosed, don't forget to erase DTC U1120.

TECHNICAL DESCRIPTION

- If a misfire occurs while the engine is running, the engine speed changes for an instant.
- The PCM checks for such changes in engine speed.

DESCRIPTIONS OF MONITOR METHODS

Monitor angular acceleration of crankshaft and detect malfunction when negative variation of the angular acceleration is large.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

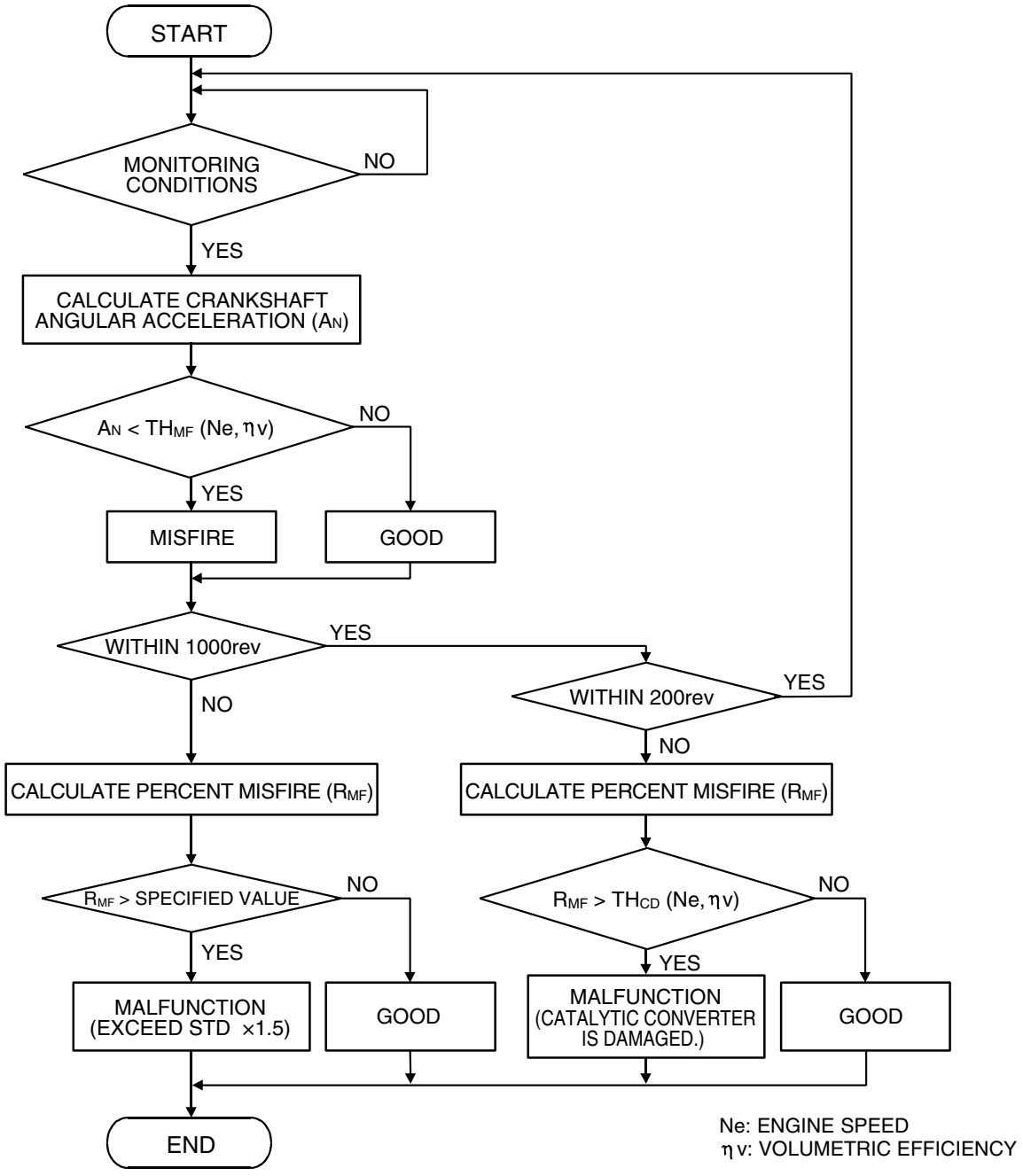
- Not applicable

Sensor (The sensor below is determined to be normal)

- Camshaft position sensor
- Mass airflow sensor
- Engine coolant temperature sensor
- Intake air temperature sensor
- Barometric pressure sensor
- Throttle position sensor

DTC SET CONDITIONS

Logic Flow Chart



AK302033

Check Conditions

- Engine speed is between 500 and 6,500 r/min.
- Engine coolant temperature is higher than −10°C (14°F).
- Barometric pressure is higher than 76 kPa (22.4 in.Hg).
- Volumetric efficiency is at between 30 and 60 percent.
- Adaptive learning is complete for the vane which generates a crankshaft position signal.
- While the engine is running, excluding gear shifting, deceleration, sudden acceleration/deceleration and A/C compressor switching.
- The throttle deviation is −0.06 V/10 ms to +0.06 V/10 ms.

TSB Revision

Judgement Criteria (change in the angular acceleration of the crankshaft is used for misfire detection)

- Misfire has occurred more frequently than allowed during the last 200 revolutions [when the catalyst temperature is higher than 1,000°C (1,832°F)].

or

- Misfire has occurred in 1.1 % or more of the last 1,000 revolutions (corresponding to 1.5 times the limit of emission standard).

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 15 P.13A-9.

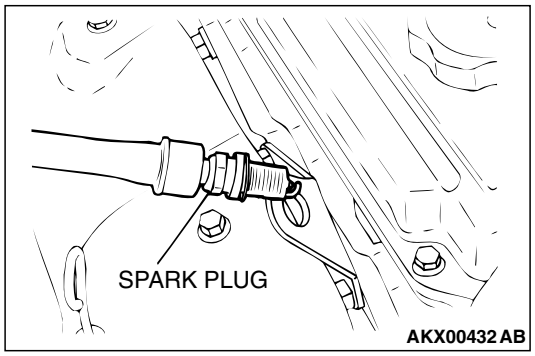
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Ignition system related part(s) failed.
- Low compression pressure.
- PCM failed.

DIAGNOSIS

STEP 1. Visual check on ignition spark of No. 2 cylinder.

(1) Remove the spark plug and install it to the ignition coil.
(2) Connect the ignition coil connector.
(3) Remove all injector connector.
(4) At the engine start, check spark plug produces a spark.



Q: Did it spark?

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

STEP 2. Check the No. 2 cylinder spark plug.

Refer to GROUP 16, Ignition System – On-vehicle Service – Spark Plug Check And Cleaning P.16-39.

Q: Is the spark plug normal?

YES : Refer to, INSPECTION PROCEDURE 32 – Ignition Circuit System P.13A-1105.
NO : Replace the No. 2 cylinder spark plug. Then go to Step 5.

STEP 3. Check the compression.

Refer to GROUP 11A, On-Vehicle Service – Compression Pressure Check P.11A-17.

Q: Are there any abnormalities?

YES : Repair or replace it. Then go to Step 5.
NO : Go to Step 4.

STEP 4. Check the trouble symptoms.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 15 P.13A-9.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0302 set?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 5.
NO : It can be assumed 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.

STEP 5. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 15 P.13A-9.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0302 set?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0303: Cylinder 3 Misfire Detected

⚠ CAUTION
If DTC P0303 has been set, TCL related DTC U1120 is also set. After P0303 has been diagnosed, don't forget to erase DTC U1120.

TECHNICAL DESCRIPTION

- If a misfire occurs while the engine is running, the engine speed changes for an instant.
- The PCM checks for such changes in engine speed.

DESCRIPTIONS OF MONITOR METHODS

Monitor angular acceleration of crankshaft and detect malfunction when negative variation of the angular acceleration is large.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

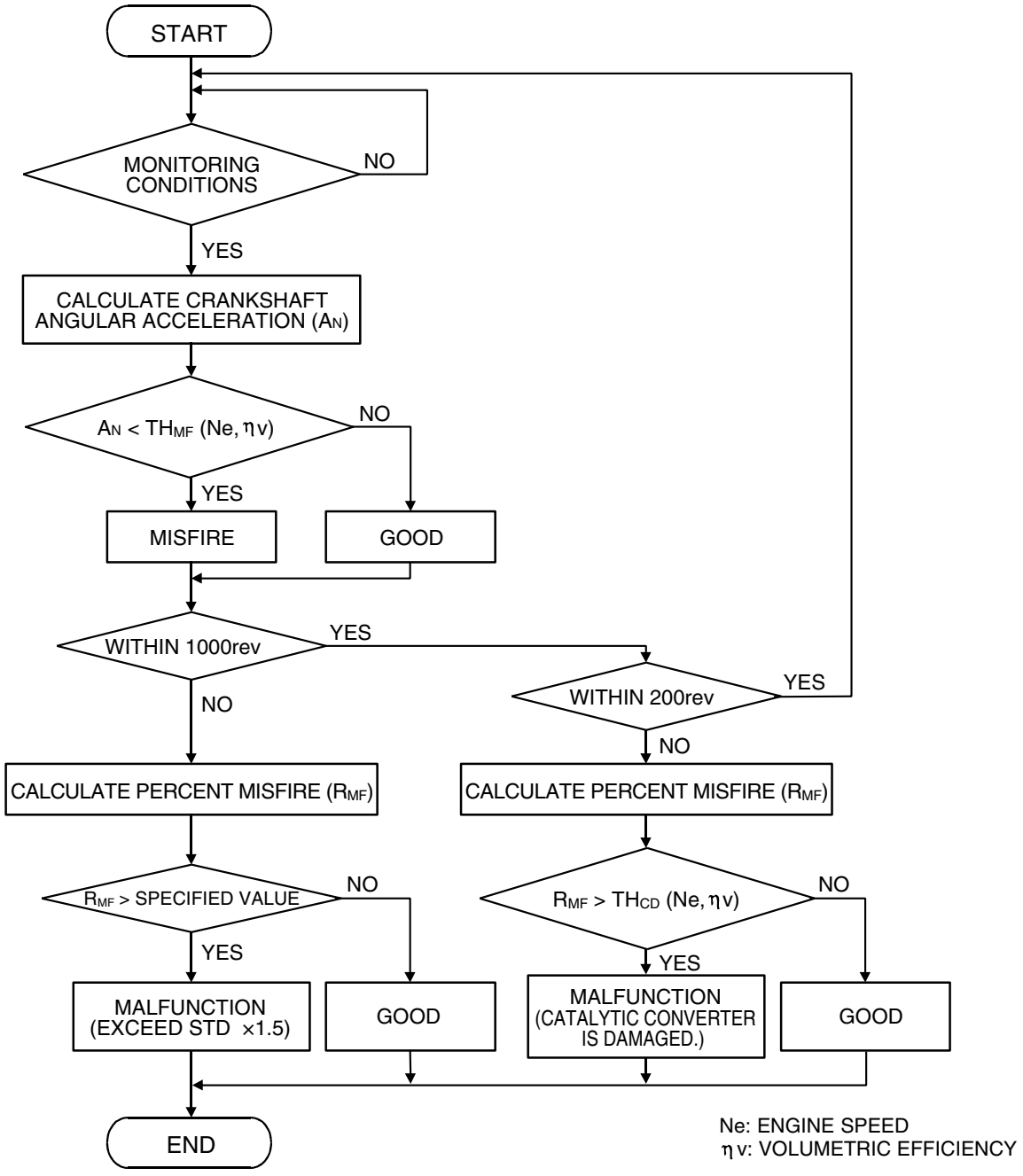
- Not applicable

Sensor (The sensor below is determined to be normal)

- Camshaft position sensor
- Mass airflow sensor
- Engine coolant temperature sensor
- Intake air temperature sensor
- Barometric pressure sensor
- Throttle position sensor

DTC SET CONDITIONS

Logic Flow Chart



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Check Conditions

- Engine speed is between 500 and 6,500 r/min.
- Engine coolant temperature is higher than −10°C (14°F).
- Barometric pressure is higher than 76 kPa (22.4 in.Hg).
- Volumetric efficiency is at between 30 and 60 percent.
- Adaptive learning is complete for the vane which generates a crankshaft position signal.
- While the engine is running, excluding gear shifting, deceleration, sudden acceleration/deceleration and A/C compressor switching.
- The throttle deviation is −0.06 V/10 ms to +0.06 V/10 ms.

TSB Revision

Judgement Criteria (change in the angular acceleration of the crankshaft is used for misfire detection)

- Misfire has occurred more frequently than allowed during the last 200 revolutions [when the catalyst temperature is higher than 1,000°C (1,832°F)].

or

- Misfire has occurred in 1.1 % or more of the last 1,000 revolutions (corresponding to 1.5 times the limit of emission standard).

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 15 P.13A-9.

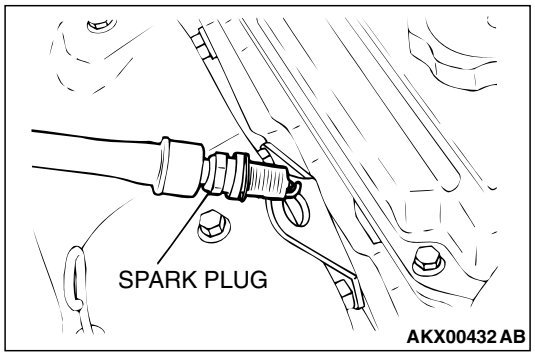
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Ignition system related part(s) failed.
- Low compression pressure.
- PCM failed.

DIAGNOSIS

STEP 1. Visual check on ignition spark of No. 3 cylinder .

(1) Remove the spark plug and install it to the ignition coil.
(2) Connect the ignition coil connector.
(3) Remove all injector connector.
(4) At the engine start, check spark plug produces a spark.



Q: Did it spark?

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

STEP 2. Check the No. 3 cylinder spark plug.

Refer to GROUP 16, Ignition System – On-vehicle Service – Spark Plug Check And Cleaning P.16-39.

Q: Is the spark plug normal?

YES : Refer to, INSPECTION PROCEDURE 32 – Ignition Circuit System P.13A-1105.
NO : Replace the No. 3 cylinder spark plug. Then go to Step 5.

STEP 3. Check the compression.

Refer to GROUP 11A, On-Vehicle Service – Compression Pressure Check P.11A-17.

Q: Are there any abnormalities?

YES : Repair or replace it. Then go to Step 5.
NO : Go to Step 4.

STEP 4. Check the trouble symptoms.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 15 P.13A-9.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0303 set?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 5.
NO : It can be assumed 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.

STEP 5. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 15 P.13A-9.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0303 set?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0304: Cylinder 4 Misfire Detected

⚠ CAUTION
If DTC P0304 has been set, TCL related DTC U1120 is also set. After P0304 has been diagnosed, don't forget to erase DTC U1120.

TECHNICAL DESCRIPTION

- If a misfire occurs while the engine is running, the engine speed changes for an instant.
- The PCM checks for such changes in engine speed.

DESCRIPTIONS OF MONITOR METHODS

Monitor angular acceleration of crankshaft and detect malfunction when negative variation of the angular acceleration is large.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

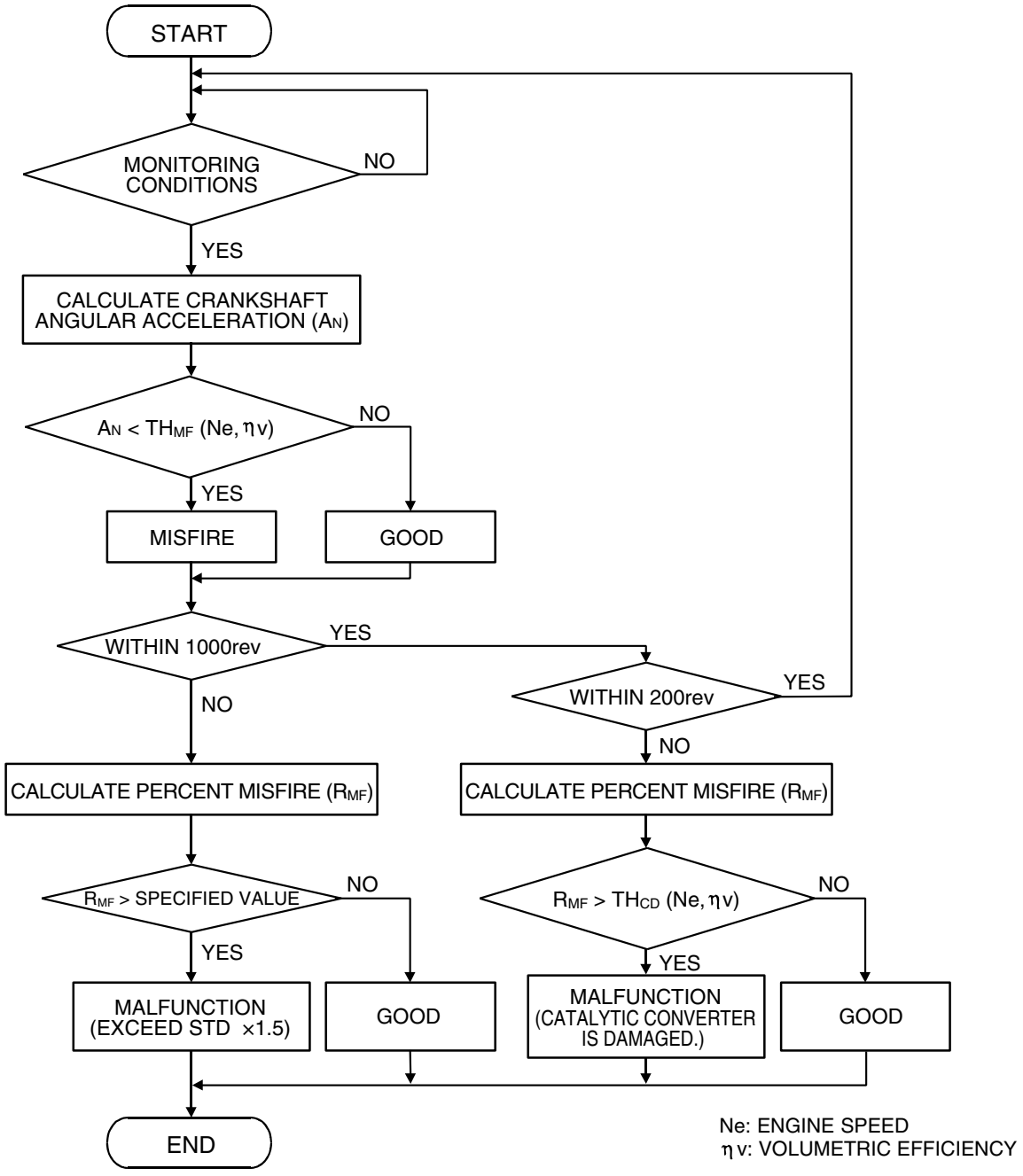
- Not applicable

Sensor (The sensor below is determined to be normal)

- Camshaft position sensor
- Mass airflow sensor
- Engine coolant temperature sensor
- Intake air temperature sensor
- Barometric pressure sensor
- Throttle position sensor

DTC SET CONDITIONS

Logic Flow Chart



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Check Conditions

- Engine speed is between 500 and 6,500 r/min.
- Engine coolant temperature is higher than −10°C (14°F).
- Barometric pressure is higher than 76 kPa (22.4 in.Hg).
- Volumetric efficiency is at between 30 and 60 percent.
- Adaptive learning is complete for the vane which generates a crankshaft position signal.
- While the engine is running, excluding gear shifting, deceleration, sudden acceleration/deceleration and A/C compressor switching.
- The throttle deviation is −0.06 V/10 ms to +0.06 V/10 ms.

TSB Revision

Judgement Criteria (change in the angular acceleration of the crankshaft is used for misfire detection)

- Misfire has occurred more frequently than allowed during the last 200 revolutions [when the catalyst temperature is higher than 1,000°C (1,832°F)].

or

- Misfire has occurred in 1.1 % or more of the last 1,000 revolutions (corresponding to 1.5 times the limit of emission standard).

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 15 P.13A-9.

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

- Ignition system related part(s) failed.
- Low compression pressure.
- PCM failed.

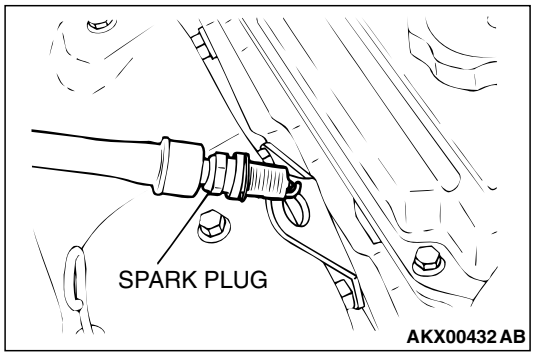
DIAGNOSIS

STEP 1. Visual check on ignition spark of No. 4 cylinder.

(1) Remove the spark plug and install it to the ignition coil.
(2) Connect the ignition coil connector.
(3) Remove all injector connector.
(4) At the engine start, check spark plug produces spark.

Q: Did it spark?

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



STEP 2. Check the No. 4 cylinder spark plug.

Refer to GROUP 16, Ignition System – On-vehicle Service – Spark Plug Check And Cleaning P.16-39.

Q: Is the spark plug normal?

YES : Refer to, INSPECTION PROCEDURE 32 – Ignition Circuit System P.13A-1105.
NO : Replace the No. 4 cylinder spark plug. Then go to Step 5.

STEP 3. Check the compression.

Refer to GROUP 11A, On-Vehicle Service – Compression Pressure Check P.11A-17.

Q: Are there any abnormalities?

YES : Repair or replace it. Then go to Step 5.
NO : Go to Step 4.

STEP 4. Check the trouble symptoms.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 15 P.13A-9.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0304 set?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 5.
NO : It can be assumed 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.

STEP 5. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 15 P.13A-9.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0304 set?

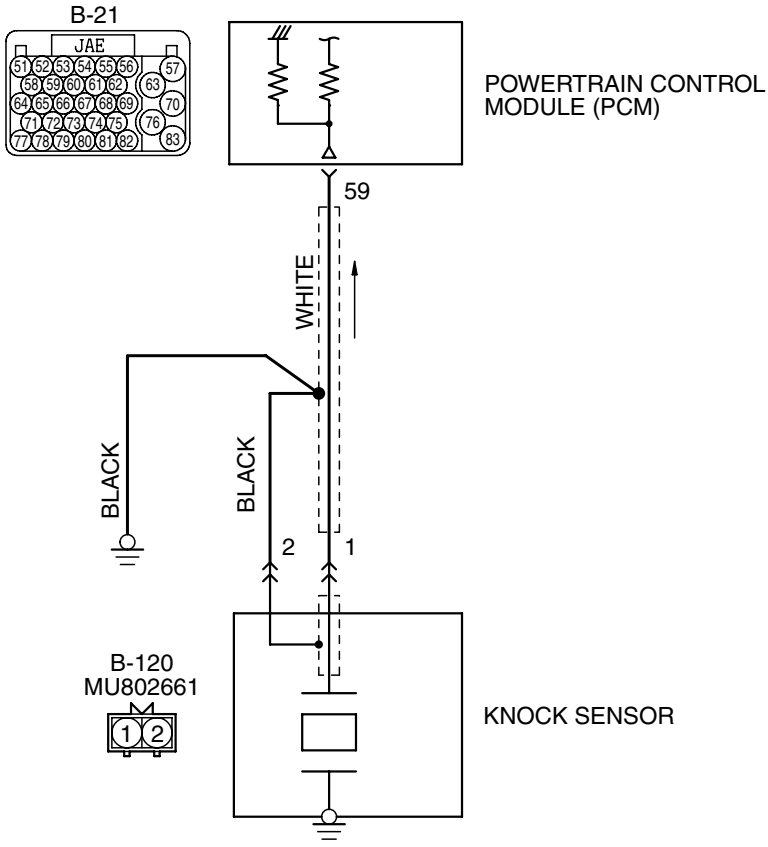
YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0325: Knock Sensor Circuit

⚠ CAUTION

If DTC P0325 has been set, TCL related DTC U1120 is also set. After P0325 has been diagnosed, don't forget to erase DTC U1120.

Knock Sensor Circuit



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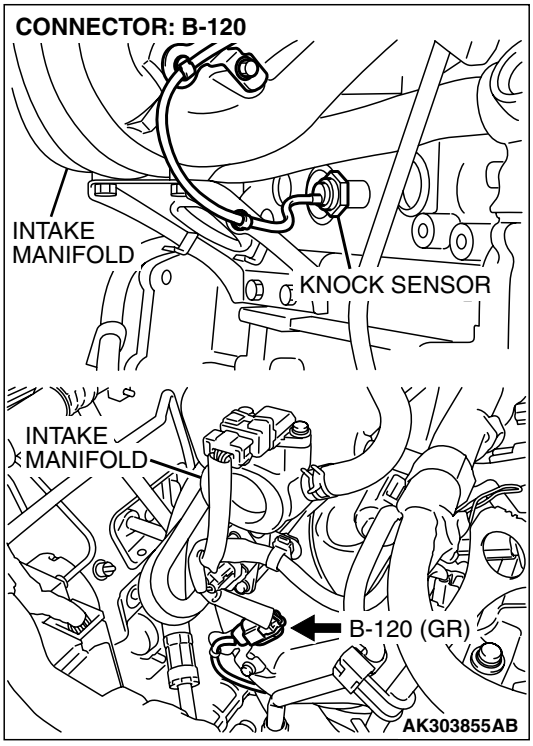
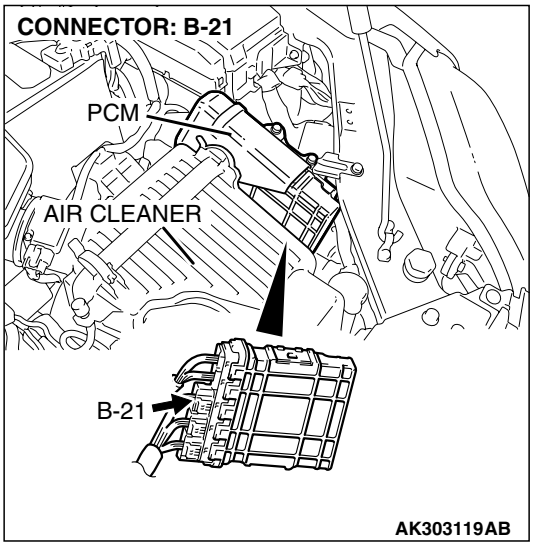




CIRCUIT OPERATION

- The knock sensor sends a signal voltage to the PCM (terminal No. 59).

TECHNICAL DESCRIPTION

- The knock sensor converts the vibration of the cylinder block into a voltage and outputs it. If there is a malfunction of the knock sensor, the voltage output will not change.
- The PCM checks whether the voltage output changes.

DTC SET CONDITIONS

Check Conditions

- 2 seconds or more have passed since the starting sequence was completed.
- Engine speed is higher than 2,500 r/min.

Judgement Criterion

- Knock sensor output voltage (knock sensor peak voltage in each 1/2 turn of the crankshaft) has not changed more than 0.06 volt in the last consecutive 200 periods.

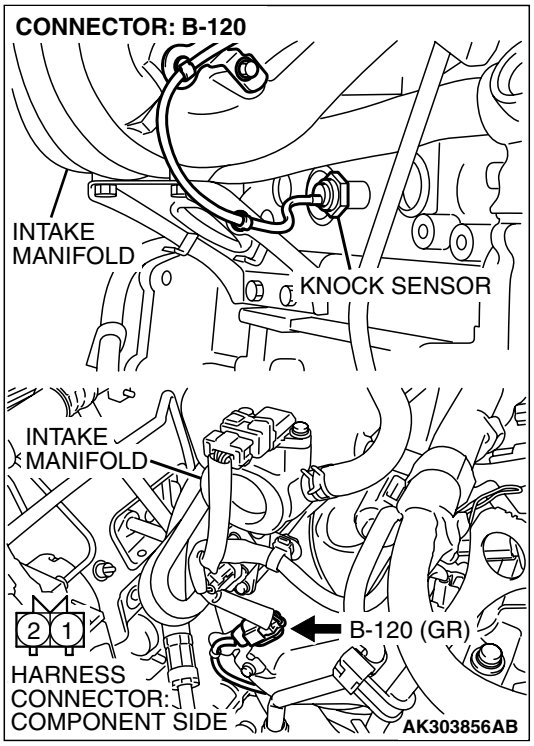
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Knock sensor failed.
- Open or shorted knock sensor circuit, harness damage or connector damage.
- PCM failed.

DIAGNOSIS

Required Special Tools:

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

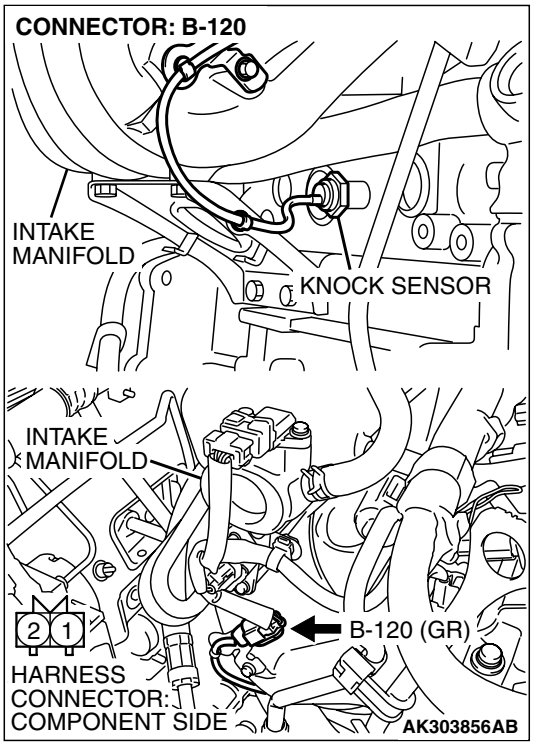


STEP 1. Check harness connector B-120 at the knock sensor for damage.

Q: Is the harness connector in good condition?

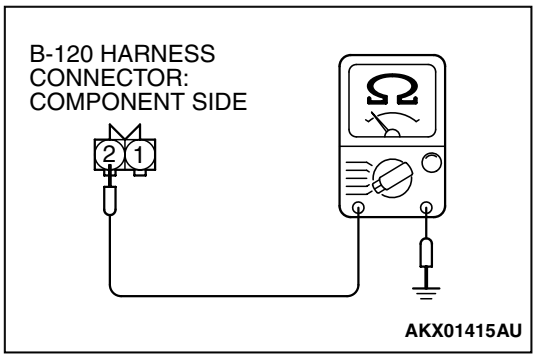
YES : Go to Step 2.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 6.



STEP 2. Check the continuity at knock sensor harness side connector B-120.

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

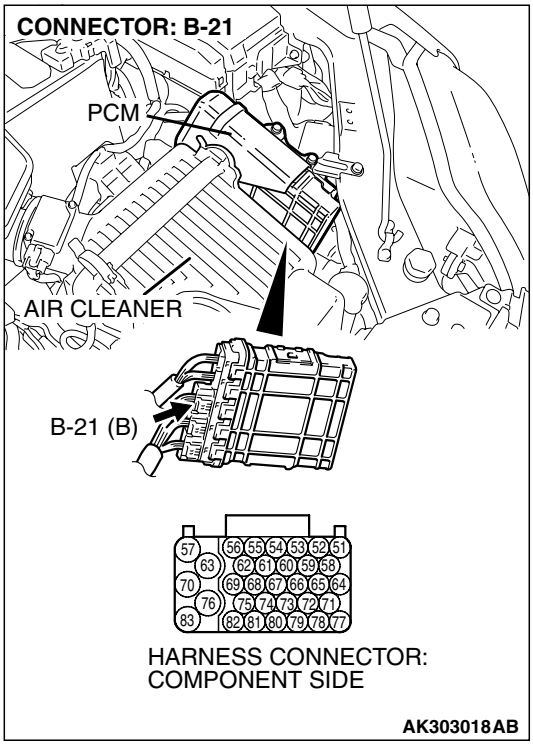


(2) Check for the continuity between terminal No. 2 and ground.
- Continuity (2 Ω or less)

Q: Does continuity exist?

YES : Go to Step 3.

NO : Repair harness wire between knock sensor connector B-120 (terminal No. 2) and ground because of open circuit or harness damage. Then go to Step 6.



STEP 3. Check harness connector B-21 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 4.

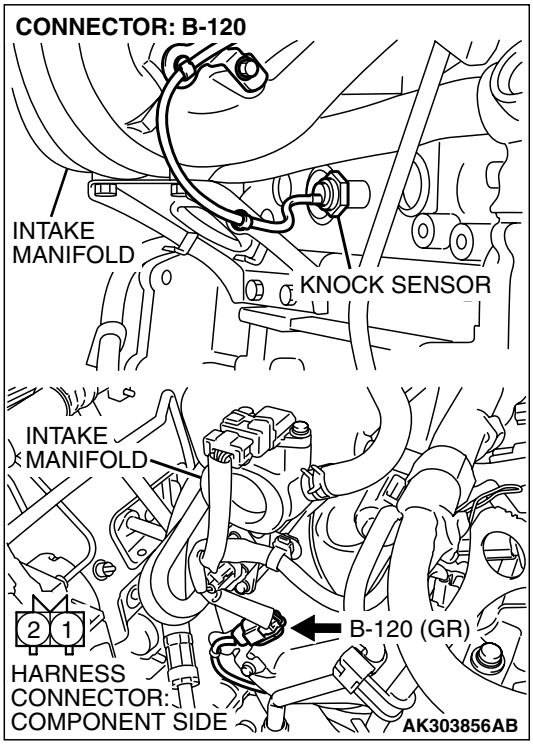
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 6.

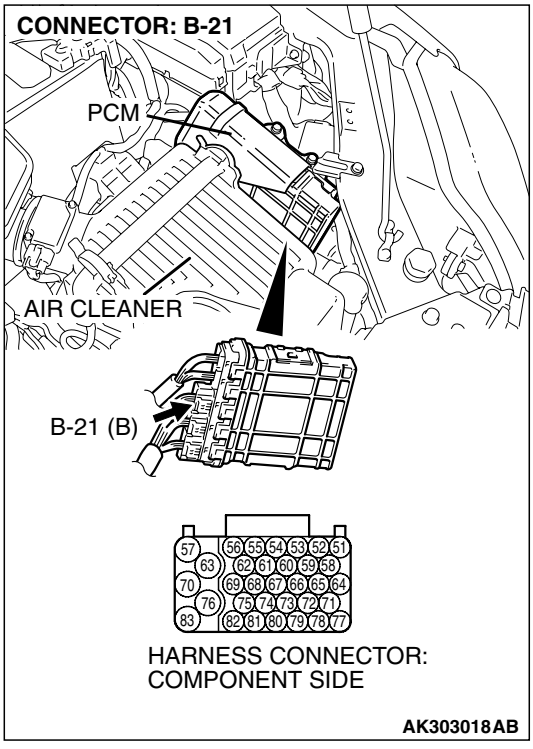
STEP 4. Check for open circuit and short circuit to ground and harness damage between knock sensor connector B-120 (terminal No. 1) and PCM connector B-21 (terminal No. 59).

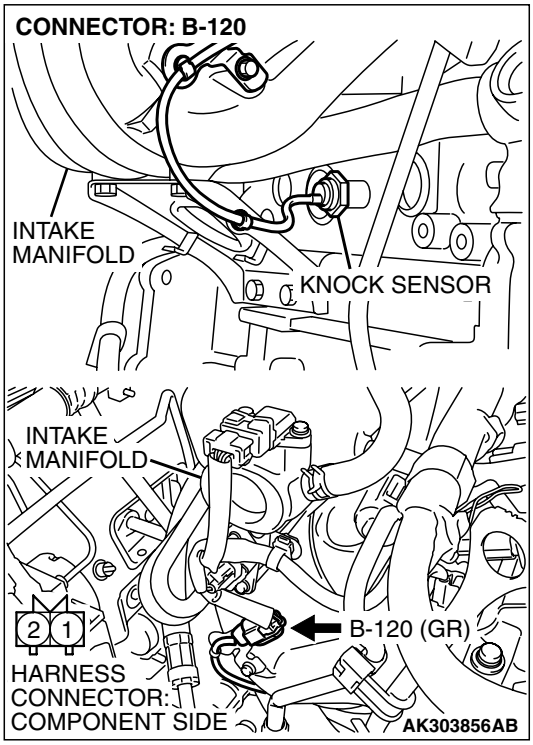
Q: Is the harness wire in good condition?

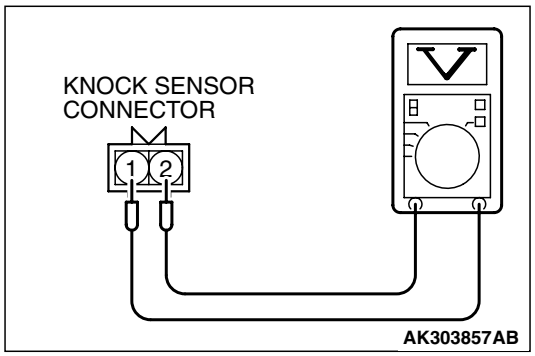
YES : Go to Step 5.

NO : Repair it. Then go to Step 6.









STEP 5. Check the knock sensor.

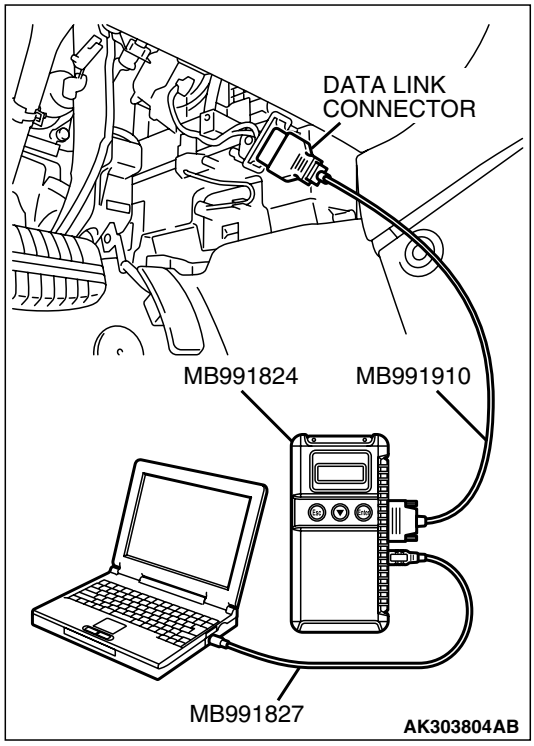
(1) Disconnect the knock sensor connector B-120.
(2) Start the engine and run at idle.
(3) Measure the voltage between knock sensor side connector terminal No. 1 (output) and No. 2 (ground).
(4) Gradually increase the engine speed.
- The voltage increases with the increase in the engine speed.

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

Q: Is the sensor operating properly?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 6.

NO : Replace the knock sensor. Then go to Step 6.



STEP 6. 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) Erase the DTC.
(4) Test drive under the following conditions:
- Engine speed: 3000 – 5000r/min
- Engine load: 40% or more
- Drive a minimum of 3 seconds after the above conditions have been met.

(5) After completing the test drive, read the DTC. Turn the ignition switch to the "LOCK" (OFF) position.

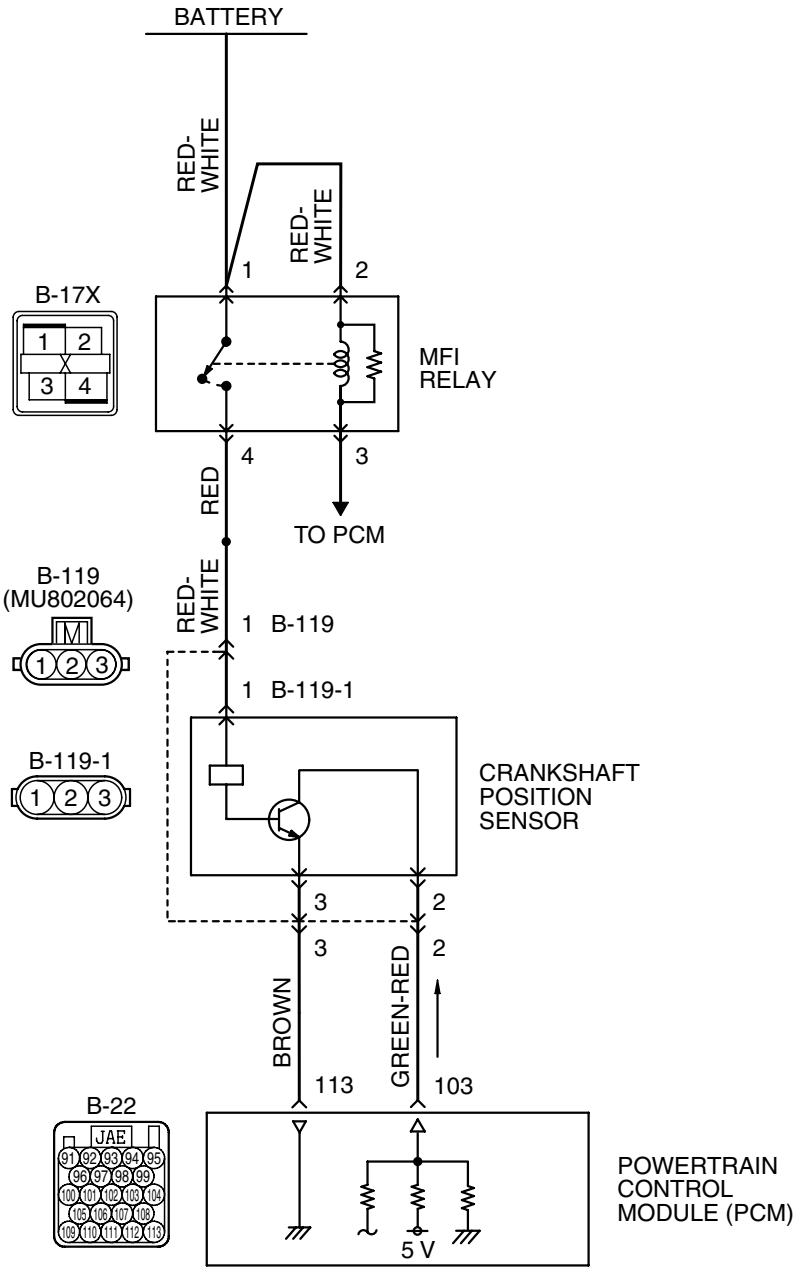
Q: Is DTC P0325 set?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0335: Crankshaft Position Sensor Circuit

⚠ CAUTION
If DTC P0335 has been set, TCL related DTC U1120 is also set. After P0335 has been diagnosed, don't forget to erase DTC U1120.

Crankshaft Position Sensor Circuit



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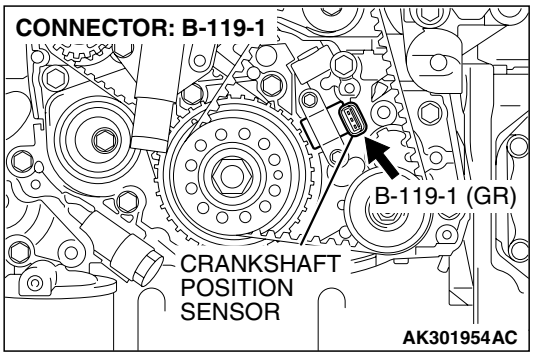
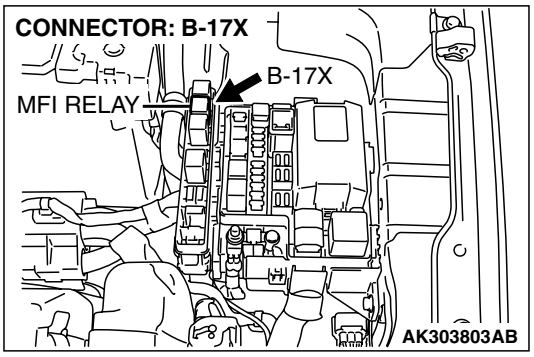
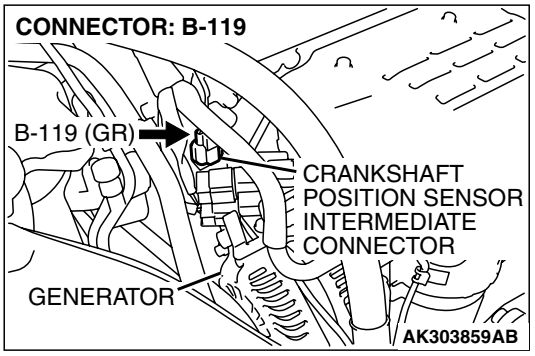
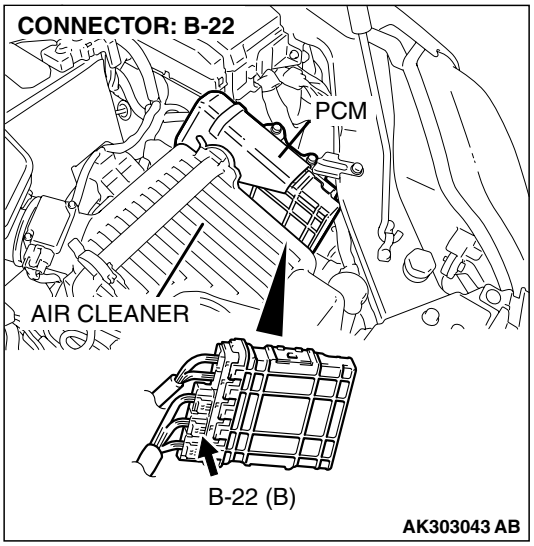
TSB Revision









CIRCUIT OPERATION

- The crankshaft position sensor power is supplied from the MFI relay (terminal No. 4).
- Terminal No. 3 of the crankshaft position sensor is grounded with PCM (terminal No. 113).
- A 5-volt voltage is applied on the crankshaft position sensor output terminal (terminal No. 2) from the PCM (terminal No. 103). The crankshaft position sensor generates a pulse signal when the output terminal is opened and grounded.

TECHNICAL DESCRIPTION

- The crankshaft position sensor detects the crank angle (position) of each cylinder, and converts that data to pulse signals, then which are input to the PCM.
- When the engine is running, the crankshaft position sensor outputs a pulse signal.
- The PCM checks whether pulse signal is input while the engine is cranking.

DESCRIPTIONS OF MONITOR METHODS

- Crankshaft position sensor signal does not change.
- Crankshaft position sensor signal is not normal pattern.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

- Not applicable

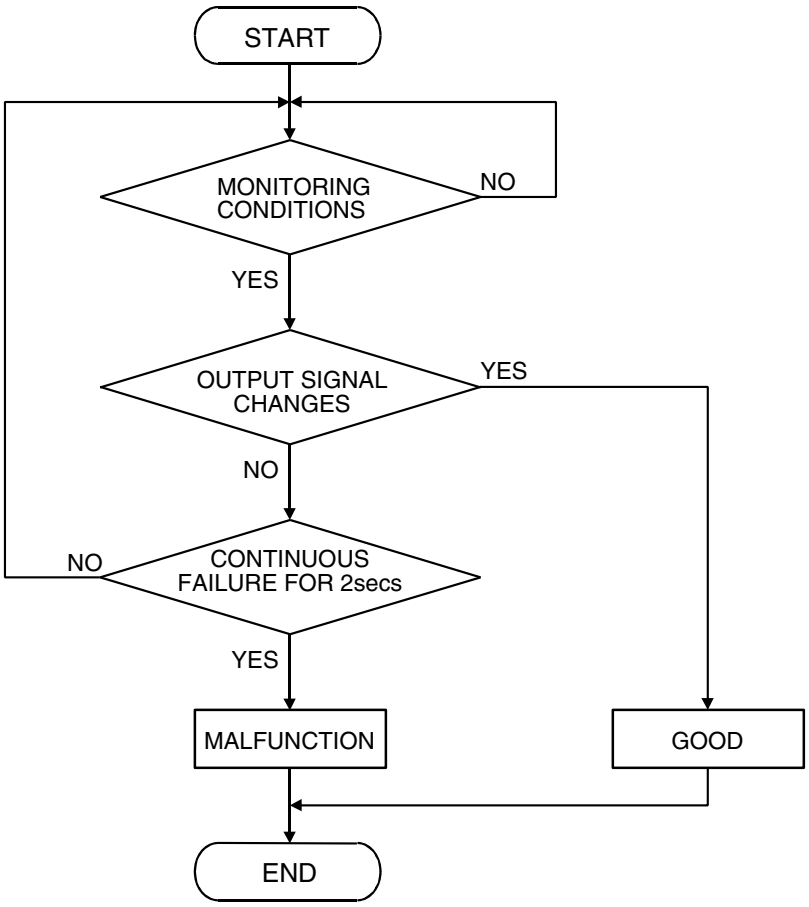
Sensor (The sensor below is determined to be normal)

- Not applicable

TSB Revision

DTC SET CONDITIONS <Circuit continuity>

Logic Flow Chart



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Check Condition

- Engine is being cranked.

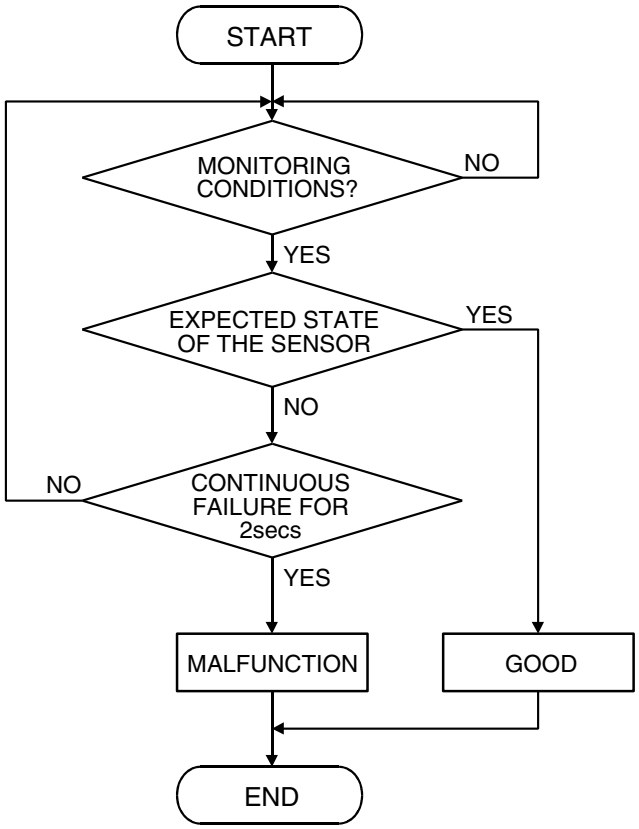
Judgement Criterion

- Crankshaft position sensor output voltage has not changed (no pulse signal is input) for 2 seconds.

TSB Revision

DTC SET CONDITIONS <Range/Performance problem – alignment>

Logic Flow Chart



AK302035

Check Condition, Judgement Criterion

- Normal signal pattern has not been input for cylinder identification from the crankshaft position sensor signal and camshaft position sensor signal for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 24 P.13A-9.

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

- Crankshaft position sensor failed.
- Open or shorted crankshaft position sensor circuit, or harness damage, or connector damage.
- PCM failed.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A
- MB991658: Test Harness
- MB991923: Power Plant ECU Check Harness

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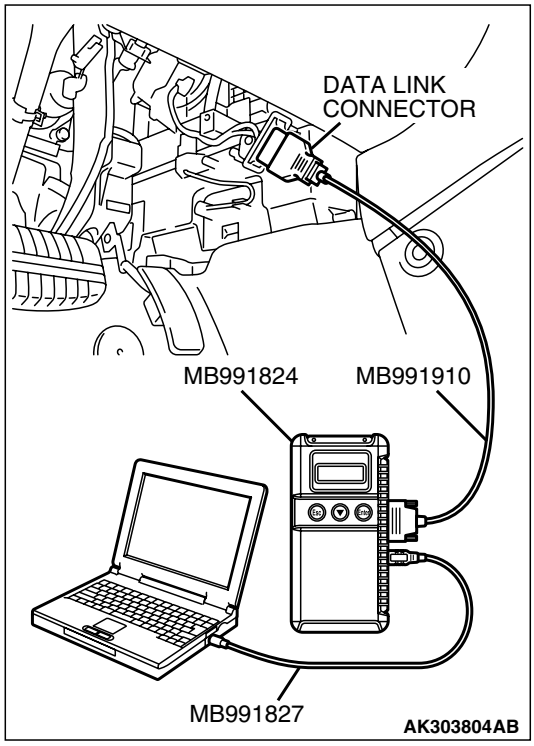


STEP 1. Using scan tool MB991958, check data list item 2: Crankshaft Position Sensor.

⚠ 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) Set scan tool MB991958 to the data reading mode for item 2, Crankshaft Position Sensor.
- The tachometer and engine speed indicated on the scan tool should match.

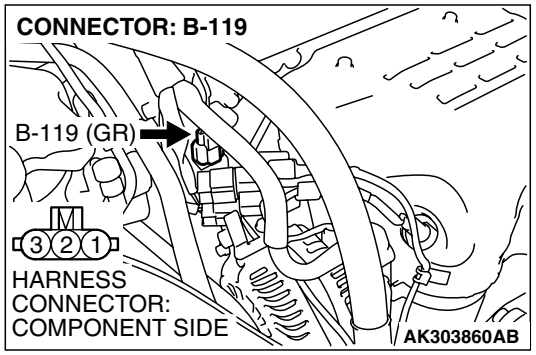
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

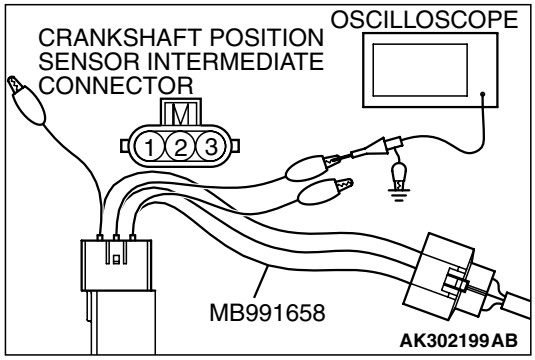
YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-14.

NO : Go to Step 2.

STEP 2. Using the oscilloscope, check the crankshaft position sensor.



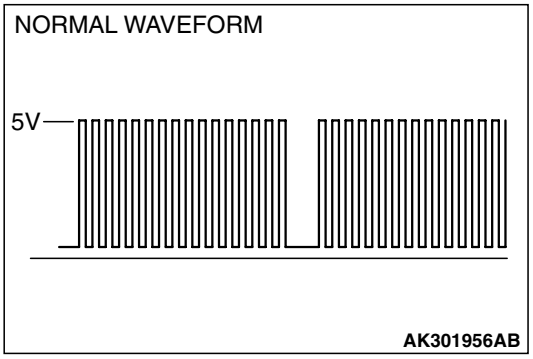
(1) Disconnect the crankshaft position sensor intermediate connector B-119 and connect the test harness special tool (MB991658) between the separated connectors.



(2) Connect the oscilloscope probe to terminal No. 2 of the crankshaft position sensor side connector.

NOTE: When measuring with the PCM side connector, disconnect all PCM connectors. Connect the check harness special tool (MB991923) between the separated connectors. Then connect the oscilloscope probe to the check harness connector terminal No. 103.

(3) Start the engine and run at idle.



(4) Check the waveform.
- The waveform should show a pattern similar to the illustration.

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

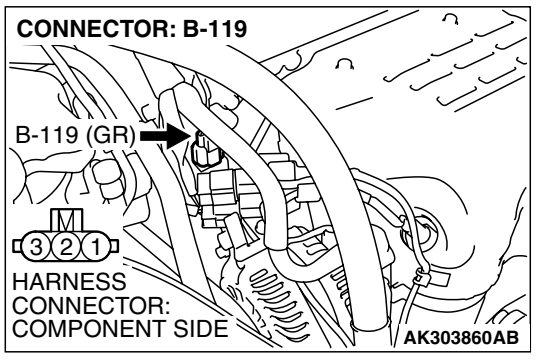
Q: Is the waveform normal?

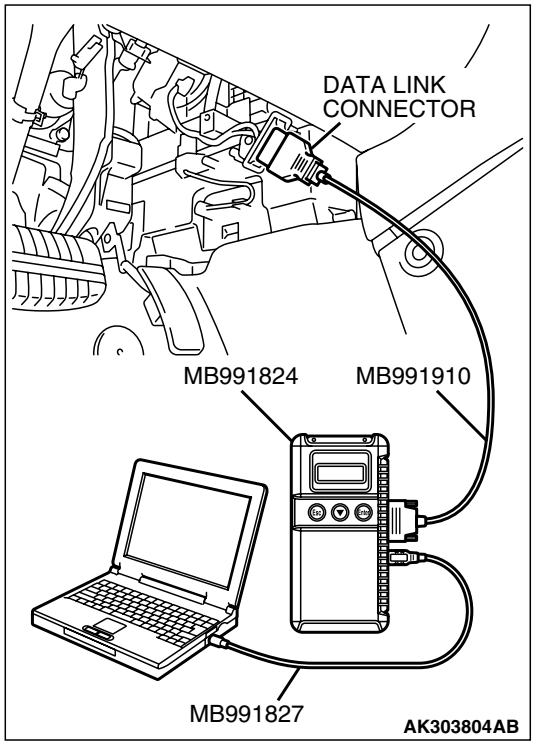
YES : Go to Step 3.
NO : Go to Step 5.

STEP 3. Check harness connector B-119 at the crankshaft position sensor intermediate connector for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 4.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 22.





STEP 4. Using scan tool MB991958, check data list item 2: Crankshaft Position 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.

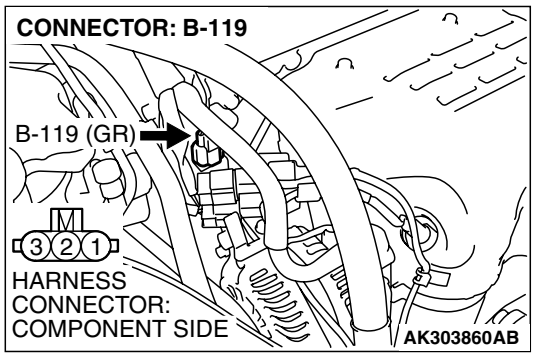
(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991958 to the data reading mode for item 2, Crankshaft Position Sensor.
- The tachometer and engine speed indicated on the scan tool should match.

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

Q: Is the sensor operating properly?

YES : It can be assumed 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 : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 22.



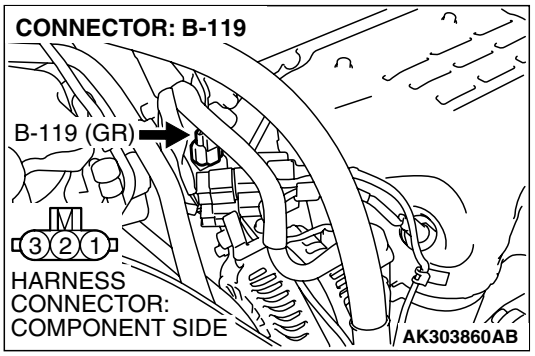
STEP 5. Check harness connector B-119 at the crankshaft position sensor intermediate connector for damage.

Q: Is the harness connector in good condition?

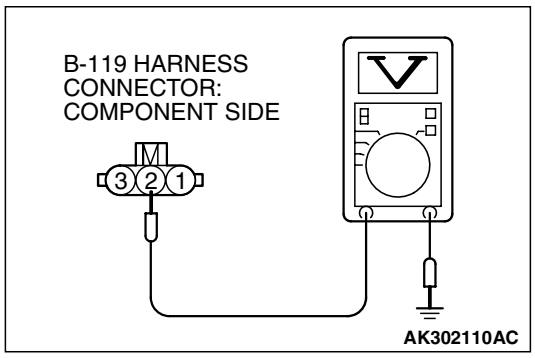
YES : Go to Step 6.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 22.

STEP 6. Measure the sensor supply voltage at crankshaft position sensor intermediate harness side connector B-119.



(1) Disconnect the connector B-119 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.

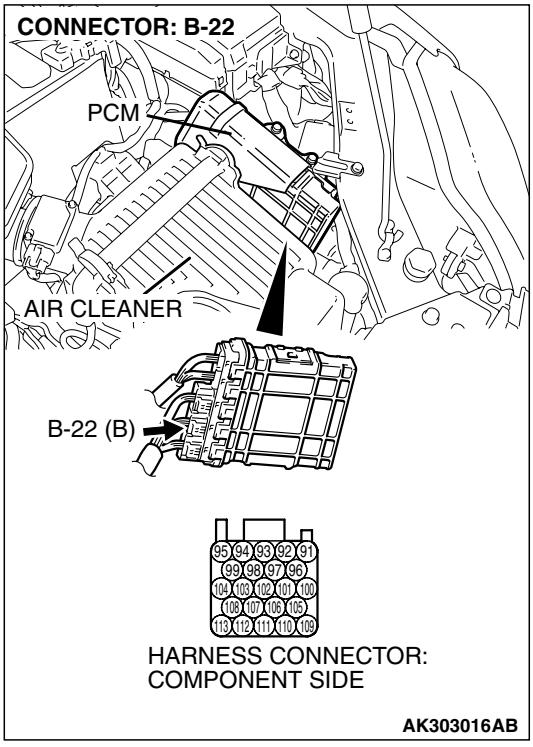


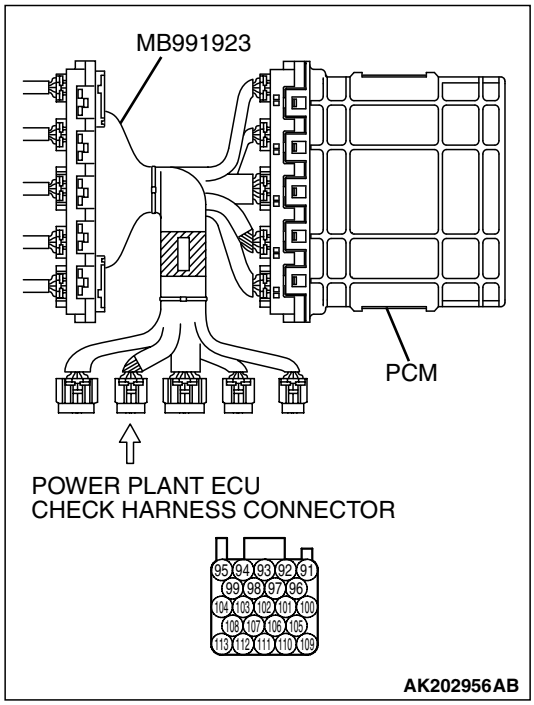
(3) Measure the voltage between terminal No. 2 and ground.
- Voltage should be between 4.9 and 5.1 volts.

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

Q: Is the measured voltage between 4.9 and 5.1 volts?

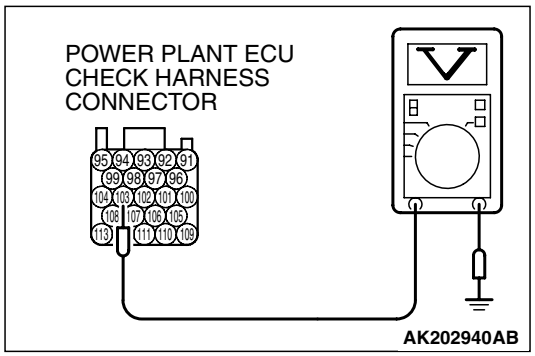
YES : Go to Step 11.
NO : Go to Step 7.





STEP 7. Measure the sensor supply voltage at PCM connector B-22 by using power plant ECU check harness special tool MB991923.

(1) Disconnect all PCM connectors. Connect the power plant ECU check harness special tool MB991923 between the separated connectors.
(2) Disconnect the crankshaft position sensor intermediate connector B-119.
(3) Turn the ignition switch to the "ON" position.

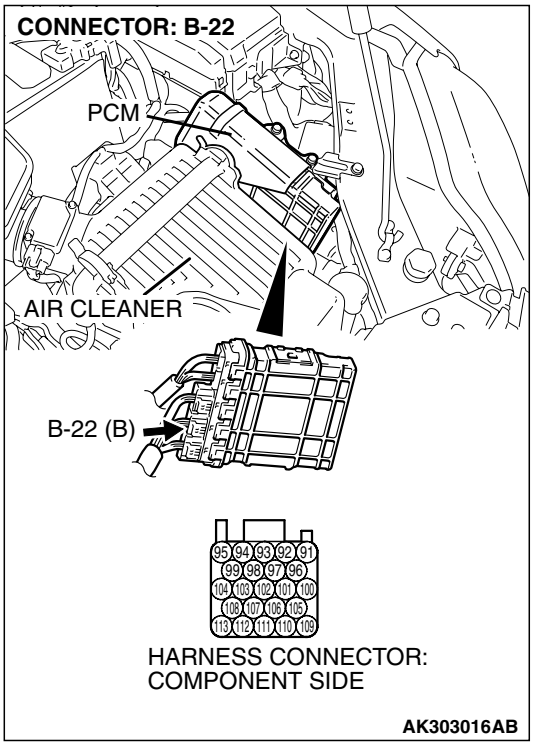


(4) Measure the voltage between terminal No. 103 and ground.
- Voltage should be between 4.9 and 5.1 volts.

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

Q: Is the measured voltage between 4.9 and 5.1 volts?

YES : Go to Step 8.
NO : Go to Step 9.

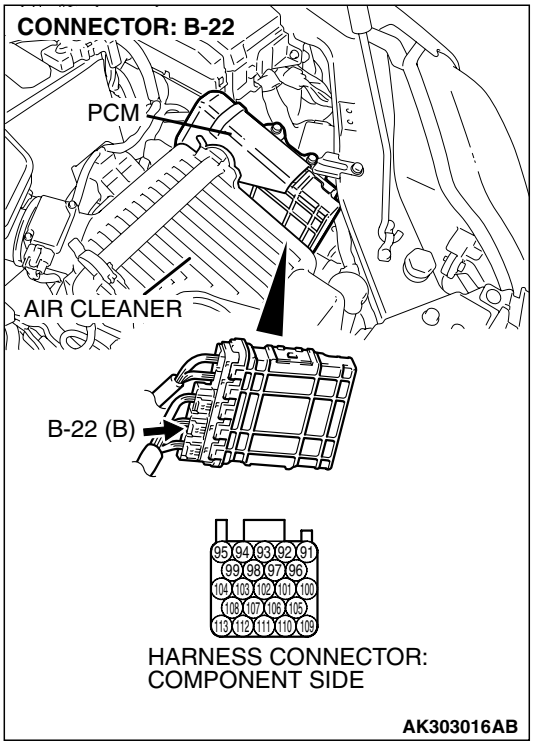


STEP 8. Check harness connector B-22 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Repair harness wire between crankshaft position sensor intermediate connector B-119 (terminal No. 2) and PCM connector B-22 (terminal No. 103) because of open circuit. Then go to Step 22.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 22.

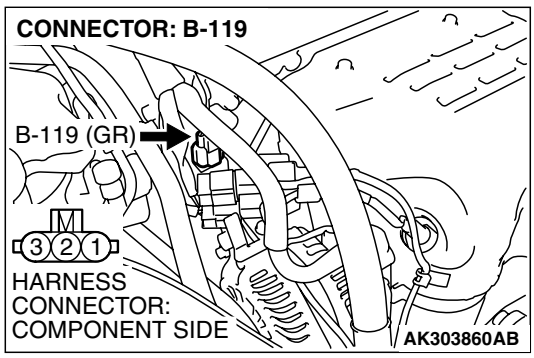


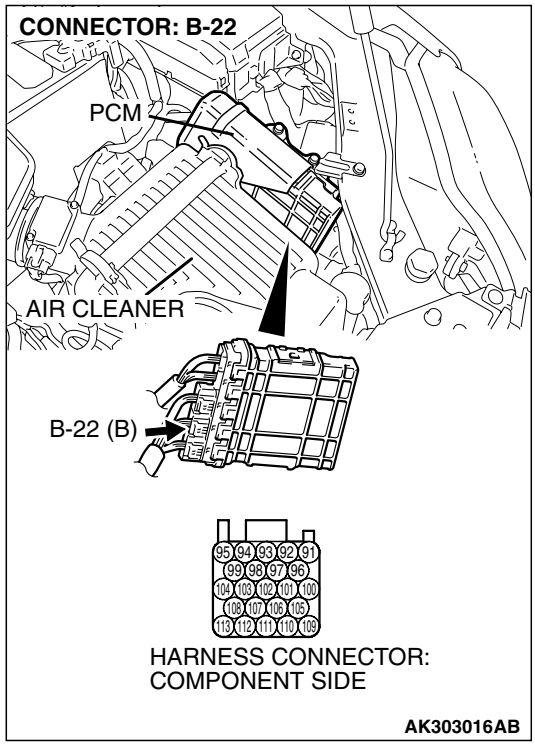
STEP 9. Check harness connector B-22 at PCM for damage.

Q: Is the harness 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 go to Step 22.





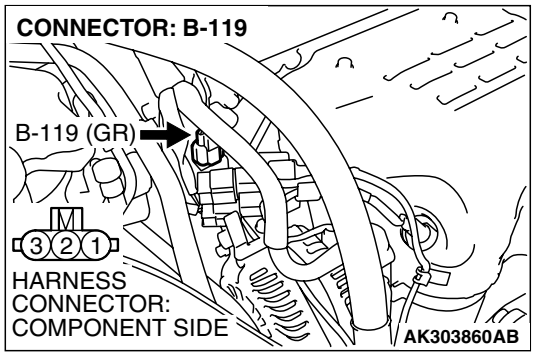
STEP 10. Check for short circuit to ground between crankshaft position sensor intermediate connector B-119 (terminal No. 2) and PCM connector B-22 (terminal No. 103).

Q: Is the harness wire in good condition?

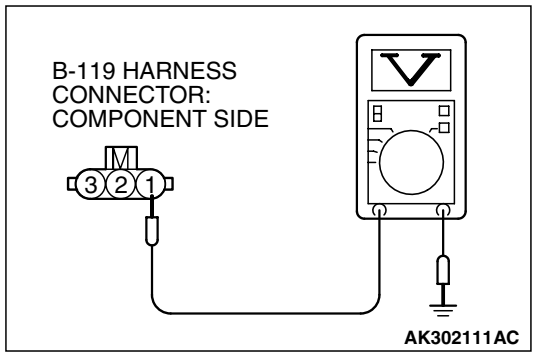
YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 22.

NO : Repair it. Then go to Step 22.

STEP 11. Measure the power supply voltage at crankshaft position sensor intermediate harness side connector B-119.



(1) Disconnect the connector B-119 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.



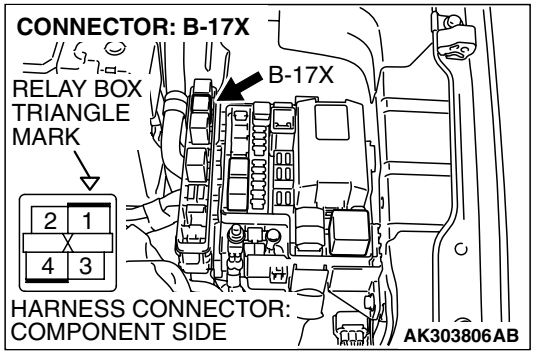
(3) Measure the voltage between terminal No. 1 and ground.
- Voltage should be battery positive voltage.

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

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

YES : Go to Step 13.
NO : Go to Step 12.

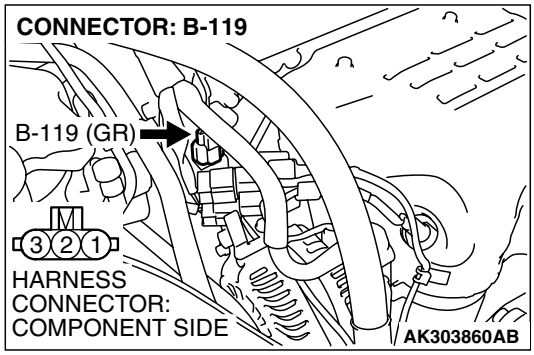
STEP 12. Check harness connector B-17X at MFI relay for damage.



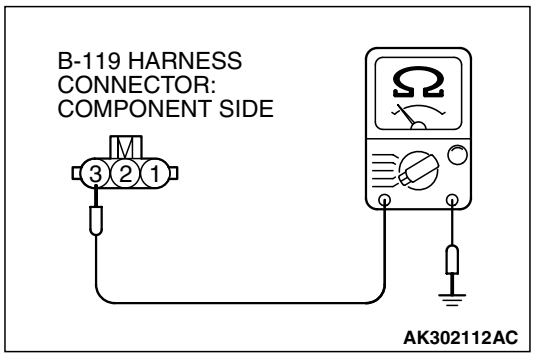
Q: Is the harness connector in good condition?

YES : Repair harness wire between MFI relay connector B-17X (terminal No. 4) and crankshaft position sensor intermediate connector B-119 (terminal No. 1) because of open circuit or short circuit to ground. Then go to Step 22.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 22.

STEP 13. Check the continuity at crankshaft position sensor intermediate harness side connector B-119.



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

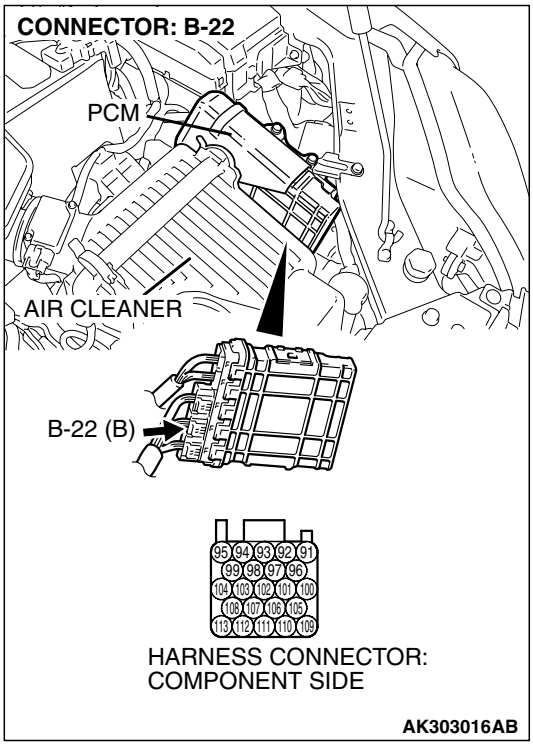


(2) Check for the continuity between terminal No. 3 and ground.
- Continuity (2 Ω or less)

Q: Does continuity exist?

YES : Go to Step 16.
NO : Go to Step 14.

STEP 14. Check harness connector B-22 at PCM for damage.



Q: Is the harness connector in good condition?

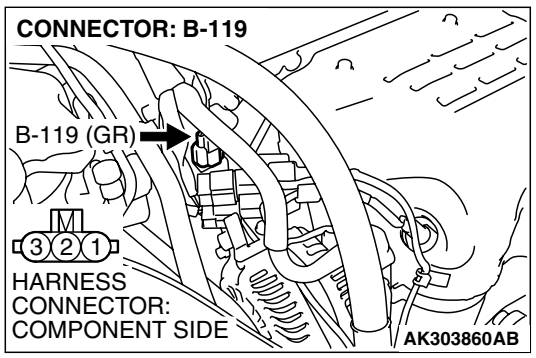
YES : Go to Step 15.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 22.

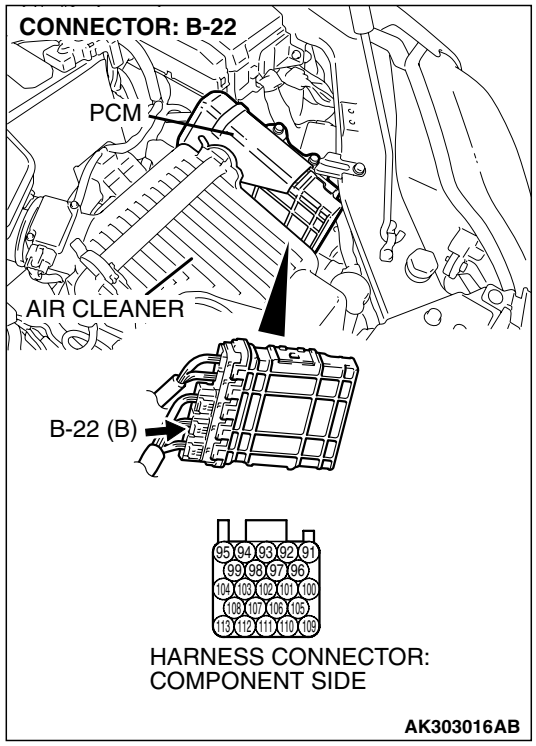
STEP 15. Check for open circuit and harness damage between crankshaft position sensor intermediate connector B-119 (terminal No. 3) and PCM connector B-22 (terminal No. 113).

Q: Is the harness wire in good condition?

YES : Replace the PCM.When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 22.

NO : Repair it. Then go to Step 22.



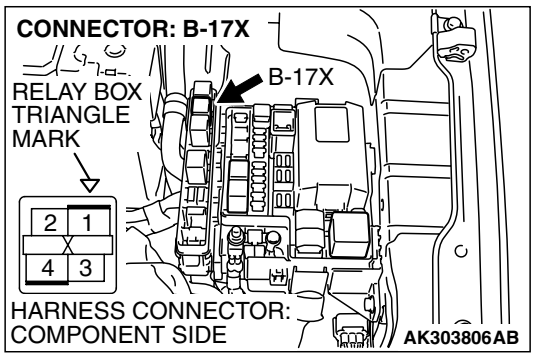


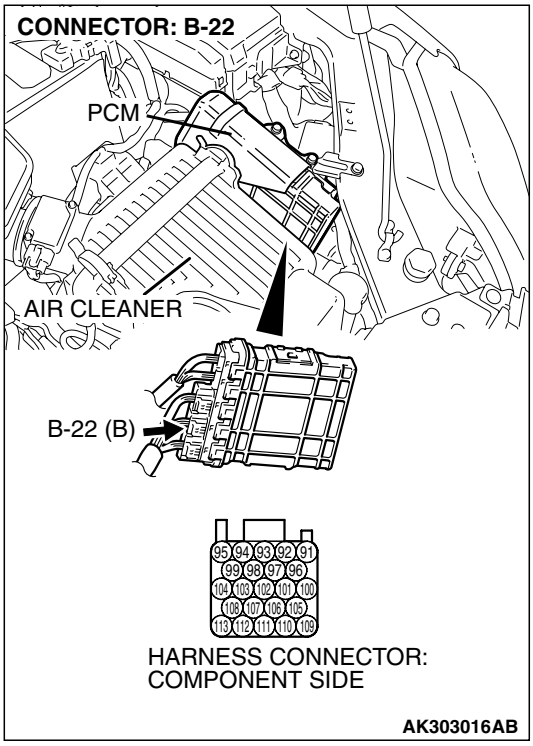
STEP 16. Check harness connector B-17X at the MFI relay for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 17.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 22.



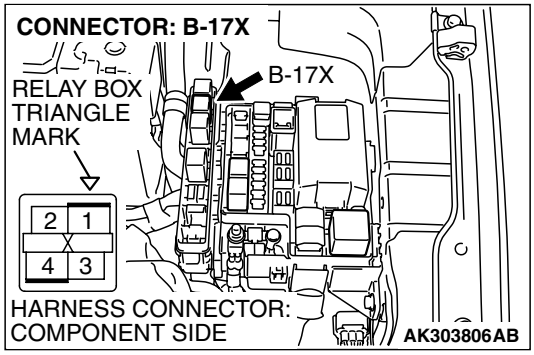


STEP 17. Check harness connector B-22 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 18.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 22.

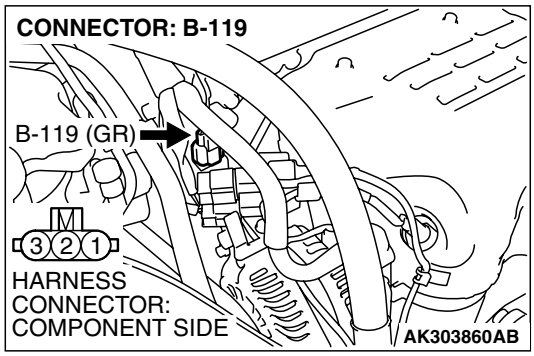


STEP 18. Check for harness damage between MFI relay connector B-17X (terminal No. 4) and crankshaft position sensor intermediate connector B-119 (terminal No. 1).

Q: Is the harness wire in good condition?

YES : Go to Step 19.

NO : Repair it. Then go to Step 22.

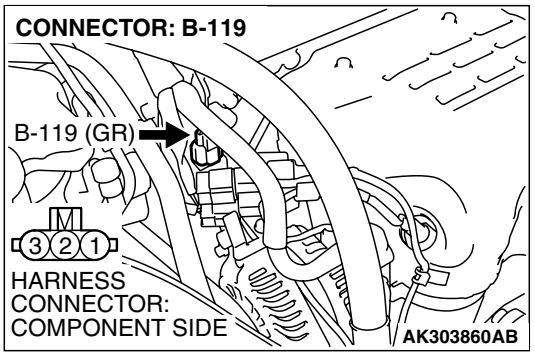


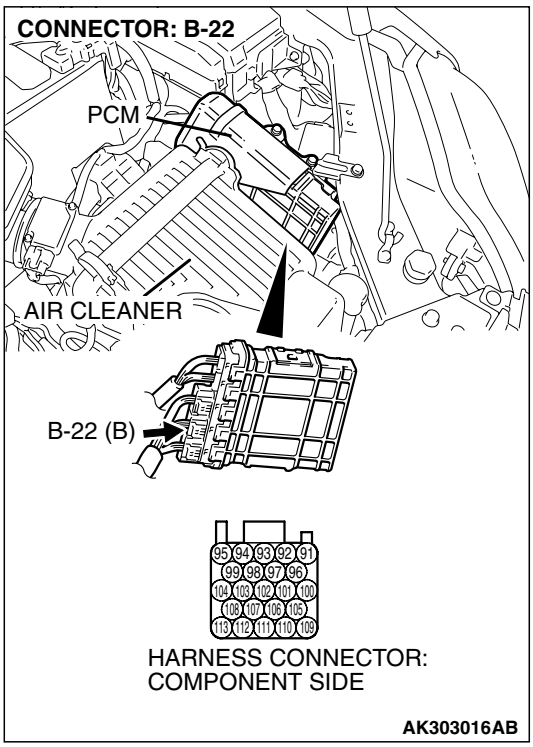
STEP 19. Check for harness damage between crankshaft position sensor intermediate connector B-119 (terminal No. 2) and PCM connector B-22 (terminal No. 103).

Q: Is the harness wire in good condition?

YES : Go to Step 20.

NO : Repair it. Then go to Step 22.



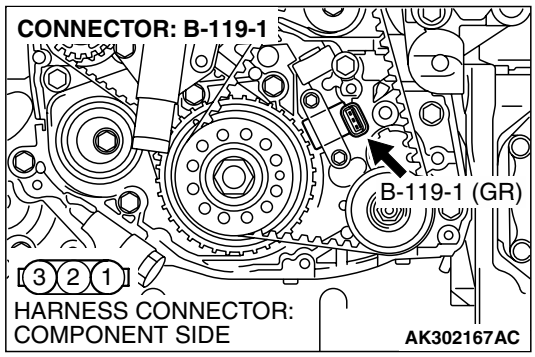


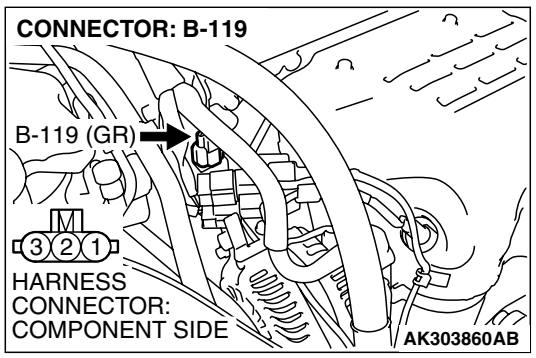
STEP 20. Check harness connector B-119-1 at crankshaft position sensor for damage.

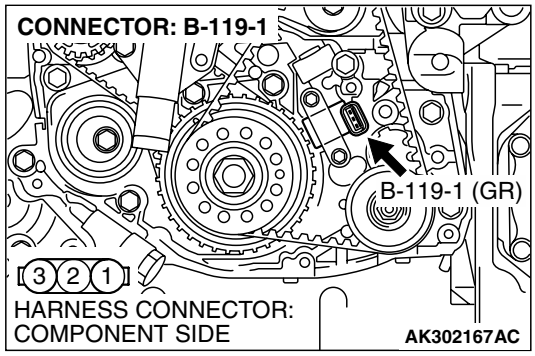
Q: Is the harness connector in good condition?

YES : Go to Step 21.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 22.







STEP 21. Check for open circuit and short circuit to ground and harness damage between crankshaft position sensor intermediate connector B-119 and crankshaft position sensor connector B-119-1.

Q: Is the harness wire in good condition?

YES : Replace the crankshaft position sensor. Then go to Step 22.

NO : Replace the timing belt cover (lower). Then go to Step 22.

STEP 22. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 24 P.13A-9.

(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0335 set?

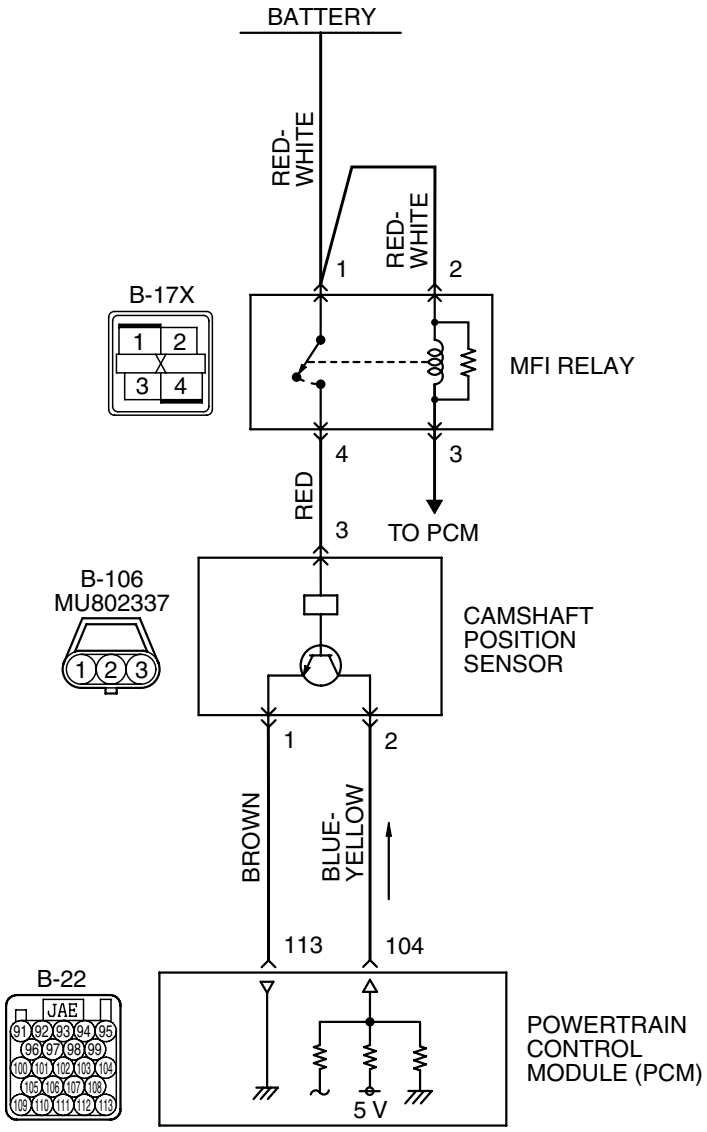
YES : Retry the troubleshooting.

NO : The inspection is complete.

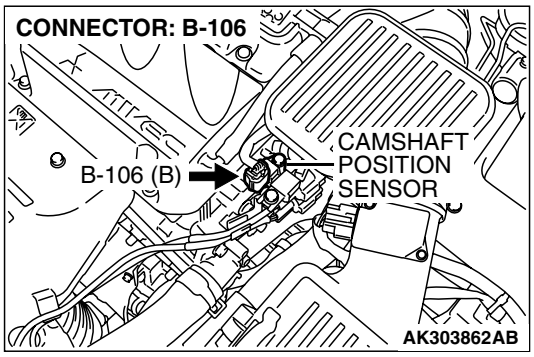
DTC P0340: Camshaft Position Sensor Circuit

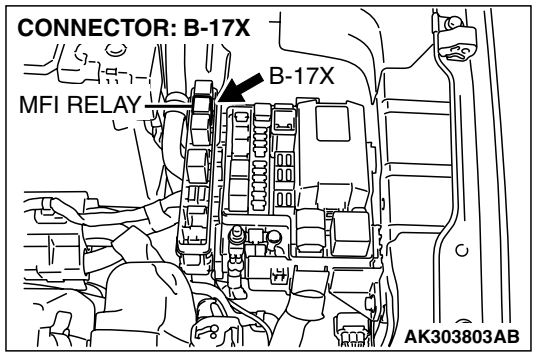
⚠ CAUTION
If DTC P0340 has been set, TCL related DTC U1120 is also set. After P0340 has been diagnosed, don't forget to erase DTC U1120.

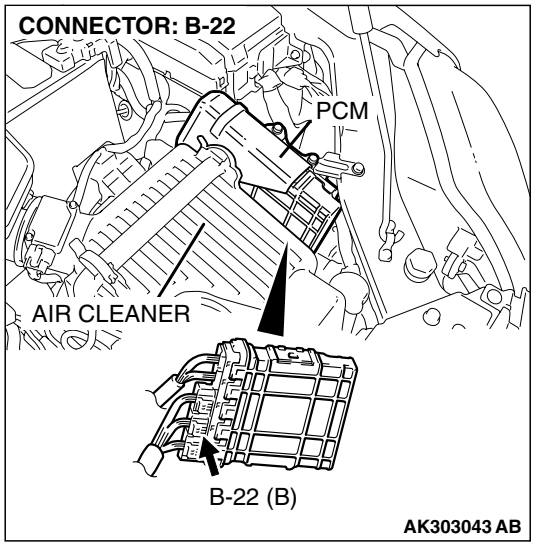
Camshaft Position Sensor Circuit



AK400890







CIRCUIT OPERATION

- The camshaft position sensor power is supplied from the MFI relay (terminal No. 4).
- Terminal No. 1 of the camshaft position sensor is grounded with PCM (terminal No. 113).
- A 5-volt voltage is applied on the camshaft position sensor output terminal (terminal No. 2) from the PCM (terminal No. 104). The camshaft position sensor generates a pulse signal when the output terminal is opened and grounded.

TECHNICAL DESCRIPTION

- The camshaft position sensor functions to detect the top dead center position of the number 1 cylinder and to convert that data to pulse signals that are input to the PCM.
- When the engine is running, the camshaft position sensor outputs a pulse signal.
- The PCM checks whether pulse signal is input while the engine is cranking.

DESCRIPTIONS OF MONITOR METHODS

- Camshaft position sensor signal does not change.
- Camshaft position sensor signal is not normal pattern.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

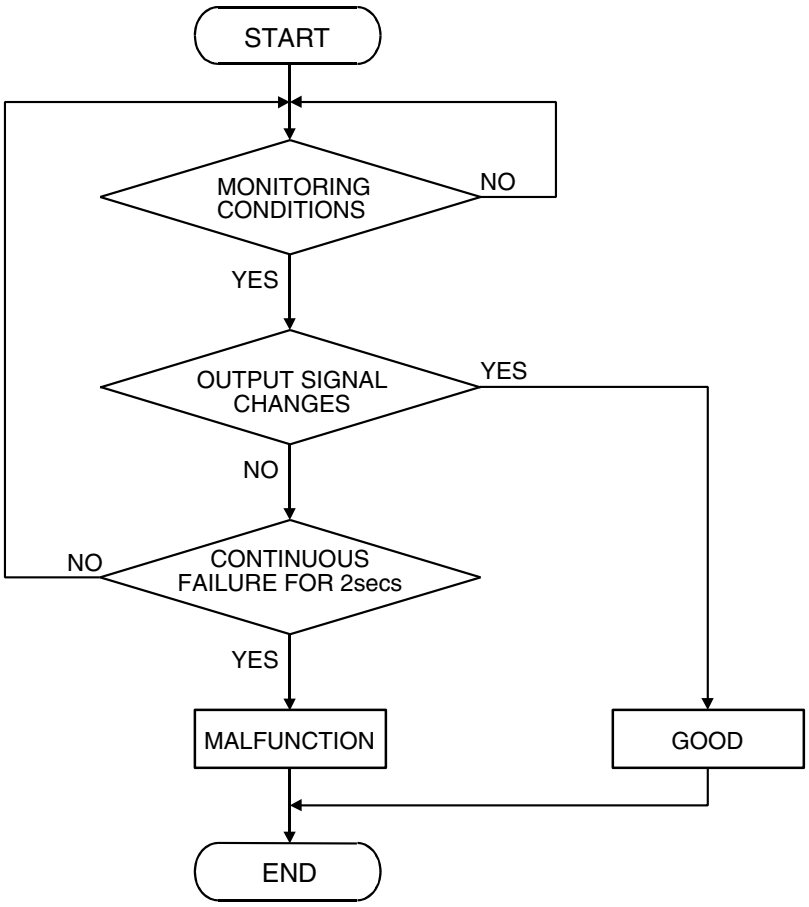
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS <Circuit continuity>

Logic Flow Chart



AK302034

Check Condition

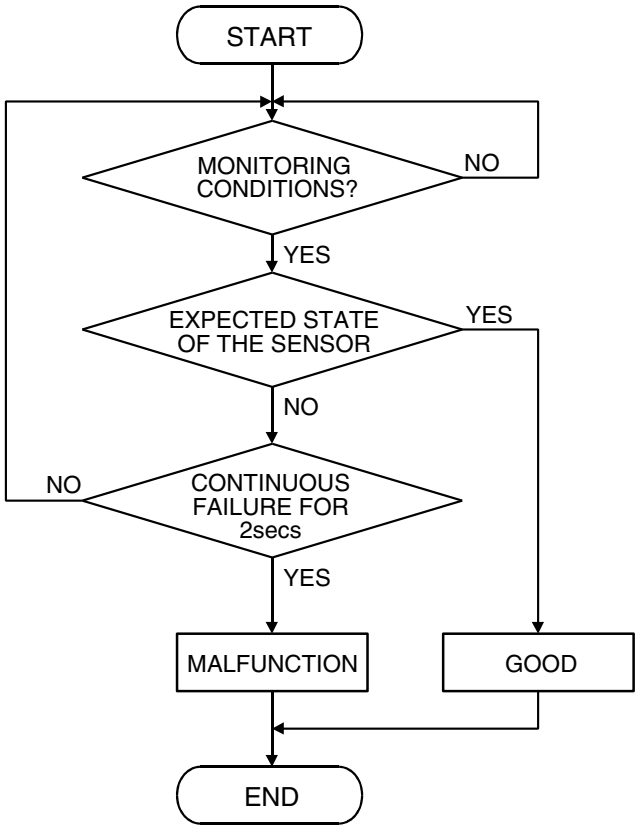
- Engine speed is higher than 50 r/min.

Judgement Criterion

- Camshaft position sensor output voltage has not changed (no pulse signal is input) for 2 seconds.

DTC SET CONDITIONS <Range/Performance problem – alignment>

Logic Flow Chart



AK302035

Check Condition

- Engine speed is higher than 50 r/min.

Judgement Criterion

- Normal signal pattern has not been input for cylinder identification from the crankshaft position sensor signal and camshaft position sensor signal for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 24 P.13A-9.

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

- Camshaft position sensor failed.
- Open or shorted camshaft position sensor circuit, or harness damage, or connector damage.
- PCM failed.

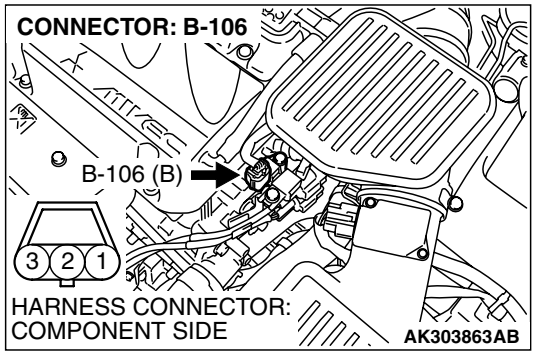
DIAGNOSIS

Required Special Tools:

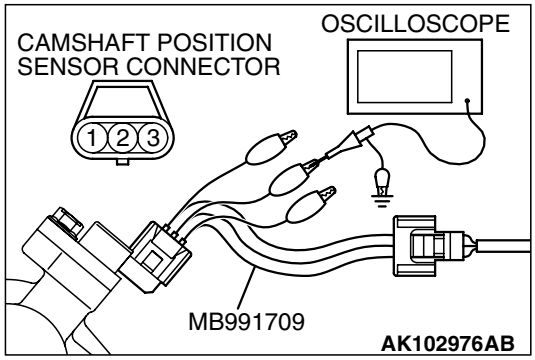
- MB991709: Test Harness
- MB991923: Power Plant ECU Check Harness

TSB Revision

STEP 1. Using the oscilloscope, check the camshaft position sensor.



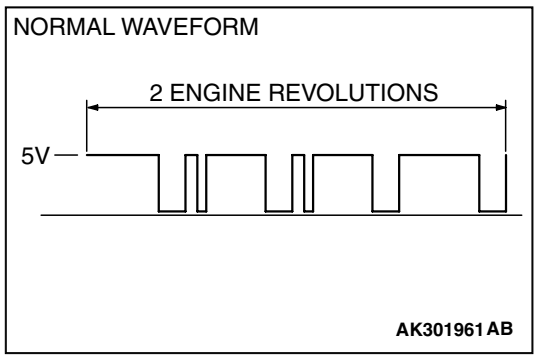
(1) Disconnect the camshaft position sensor connector B-106, and connect test harness special tool (MB991709) between the separated connectors. (All terminals should be connected.)



(2) Connect the oscilloscope probe to the camshaft position sensor side connector terminal No. 2.

NOTE: When measuring with the PCM side connector, disconnect all PCM connectors. Connect the check harness special tool (MB991923) between the separated connectors. Then connect the oscilloscope probe to the check harness connector terminal No. 104.

(3) Start the engine and run at idle.



(4) Check the waveform.
- The waveform should show a pattern similar to the illustration.

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

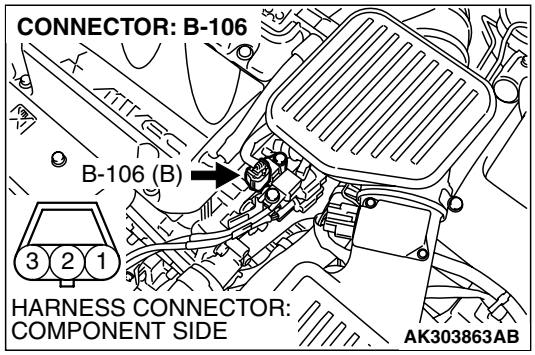
Q: Is the waveform normal?

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

STEP 2. Check harness connector B-106 at camshaft position sensor 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 go to Step 20.



STEP 3. Check the trouble symptoms.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 24 P.13A-9.

(2) Check the diagnostic trouble code (DTC).

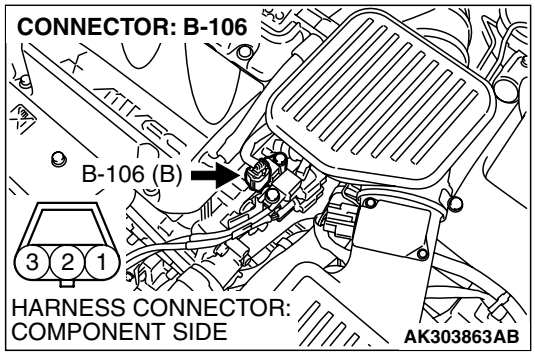
Q: Is DTC P0340 set?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 20.

NO : It can be assumed 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.

STEP 4. Check harness connector B-106 at camshaft position sensor for damage.

Q: Is the harness connector in good condition?



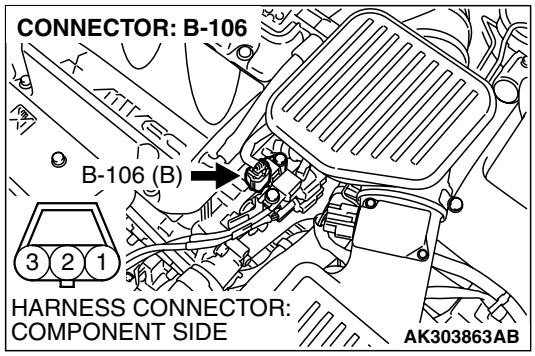
YES : Go to Step 5.

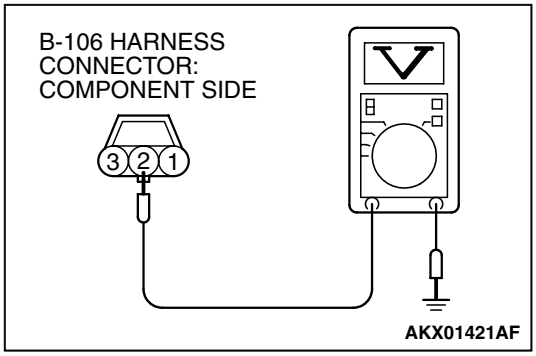
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 20.

STEP 5. Measure the sensor supply voltage at camshaft position sensor connector B-106.

(1) Disconnect the connector B-106 and measure at the harness side.

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





(3) Measure the voltage between terminal No. 2 and ground.
- Voltage should be between 4.9 and 5.1 volts.

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

Q: Is the measured voltage between 4.9 and 5.1 volts?

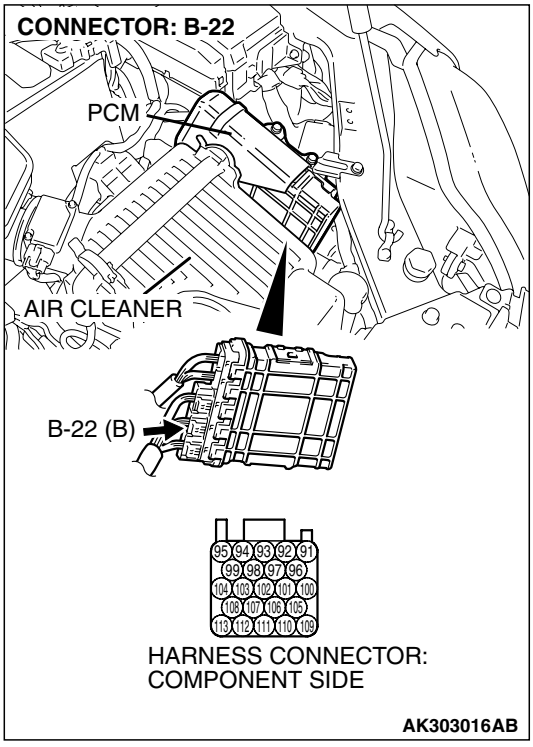
YES : Go to Step 10.

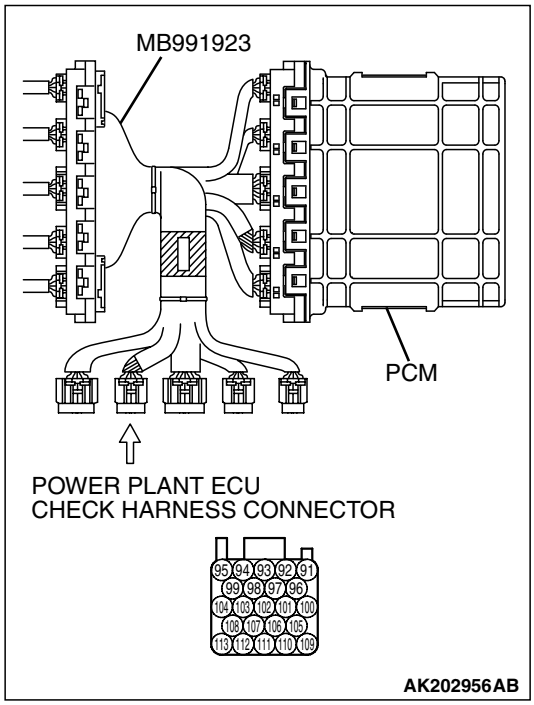
NO : Go to Step 6.

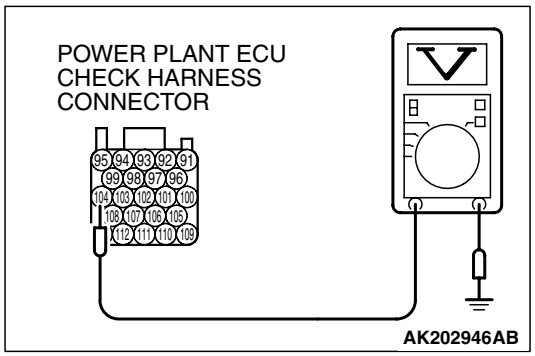
TSB Revision

STEP 6. Measure the sensor supply voltage at PCM connector B-22 by using power plant ECU check harness special tool MB991923.

(1) Disconnect the all PCM connectors. Connect the power plant ECU check harness special tool MB991923 between the separated connectors.
(2) Disconnect the camshaft position sensor connector B-106.
(3) Turn the ignition switch to the "ON" position.





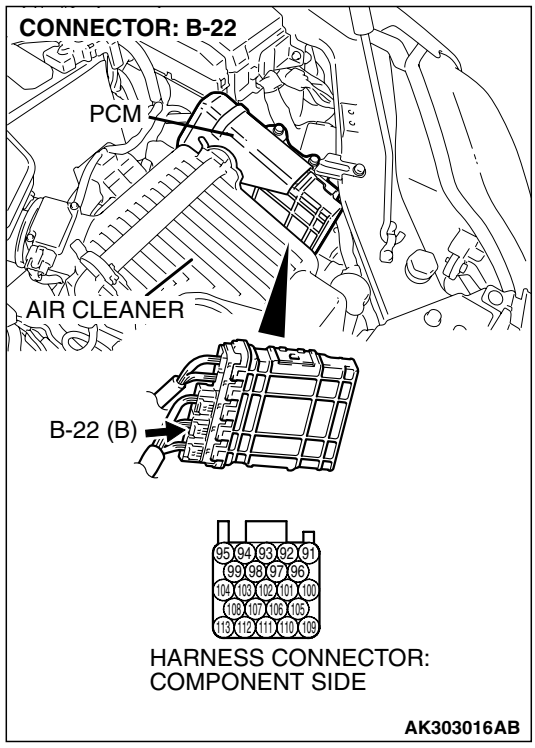


(4) Measure the voltage between terminal No. 104 and ground.
- Voltage should be between 4.9 and 5.1 volts.

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

Q: Is the measured voltage between 4.9 and 5.1 volts?

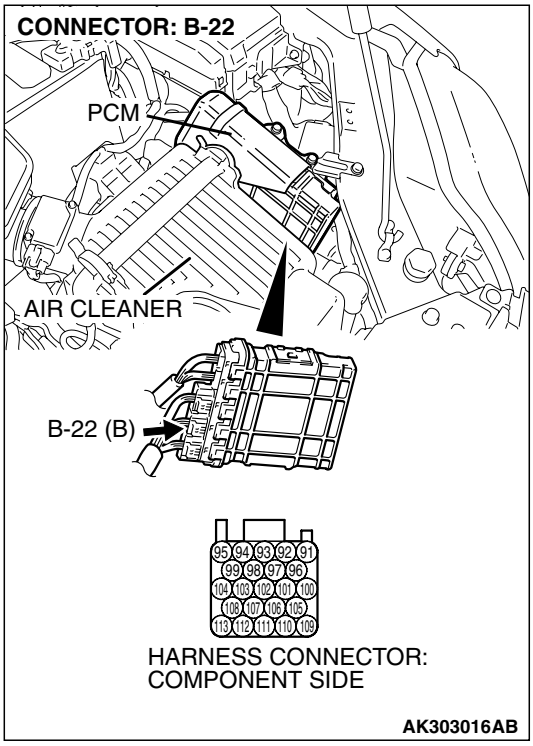
YES : Go to Step 7.
NO : Go to Step 8.



STEP 7. Check harness connector B-22 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Repair harness wire between camshaft position sensor connector B-106 (terminal No. 2) and PCM connector B-22 (terminal No. 104) because of open circuit. Then go to Step 20.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 20.

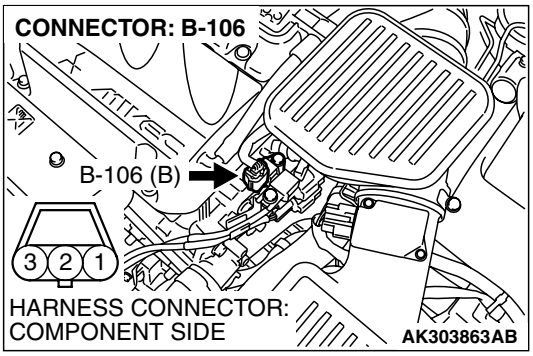


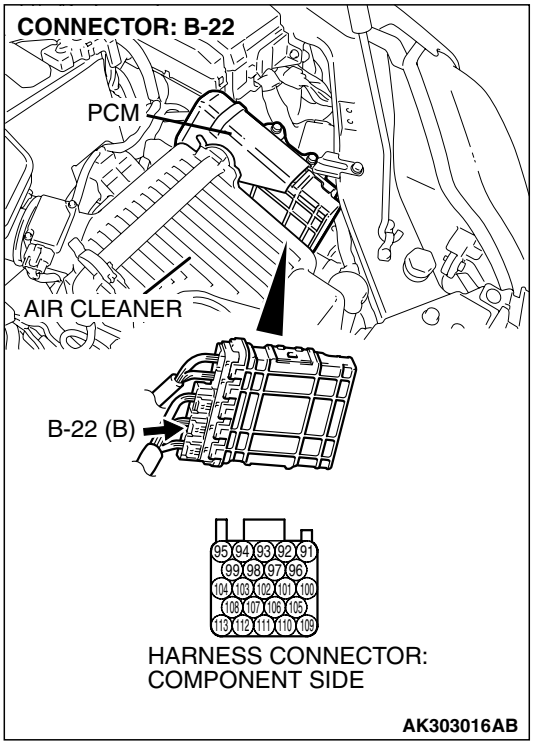
STEP 8. Check harness connector B-22 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 9.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 20.





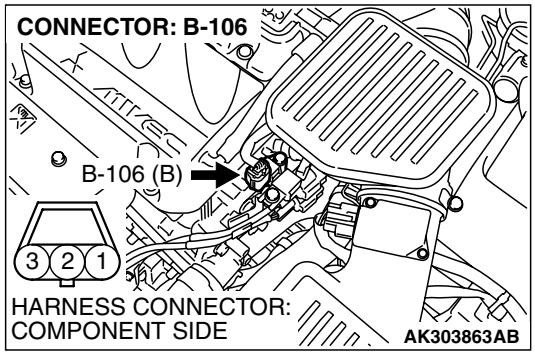
STEP 9. Check for short circuit to ground between camshaft position sensor connector B-106 (terminal No. 2) and PCM connector B-22 (terminal No. 104).

Q: Is the harness wire in good condition?

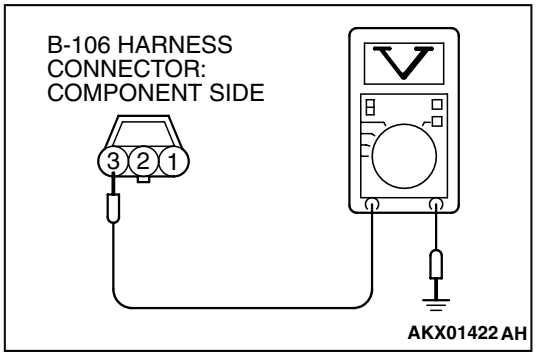
YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 20.

NO : Repair it. Then go to Step 20.

STEP 10. Measure the power supply voltage at camshaft position sensor connector B-106.



(1) Disconnect the connector B-106 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.



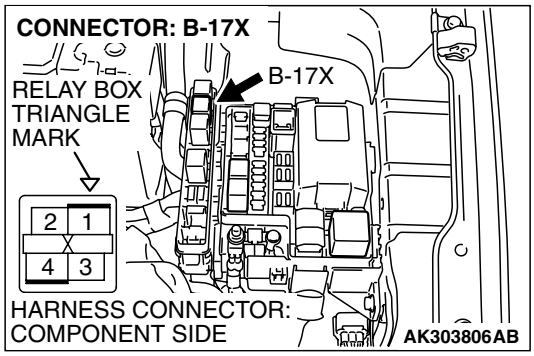
(3) Measure the voltage between terminal No. 3 and ground.
- Voltage should be battery positive voltage.

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

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

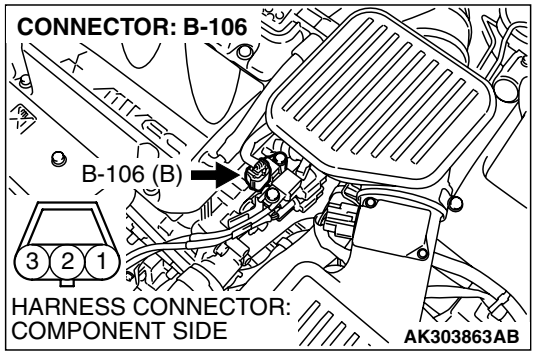
YES : Go to Step 12.
NO : Go to Step 11.

STEP 11. Check harness connector B-17X at MFI relay for damage.



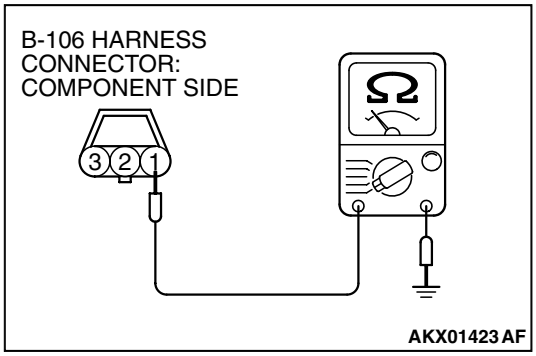
Q: Is the harness connector in good condition?

YES : Repair harness wire between MFI relay connector B-17X (terminal No. 4) and camshaft position sensor connector B-106 (terminal No. 3) because of open circuit or short circuit to ground. Then go to Step 20.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 20.



STEP 12. Check the continuity at camshaft position sensor connector B-106.

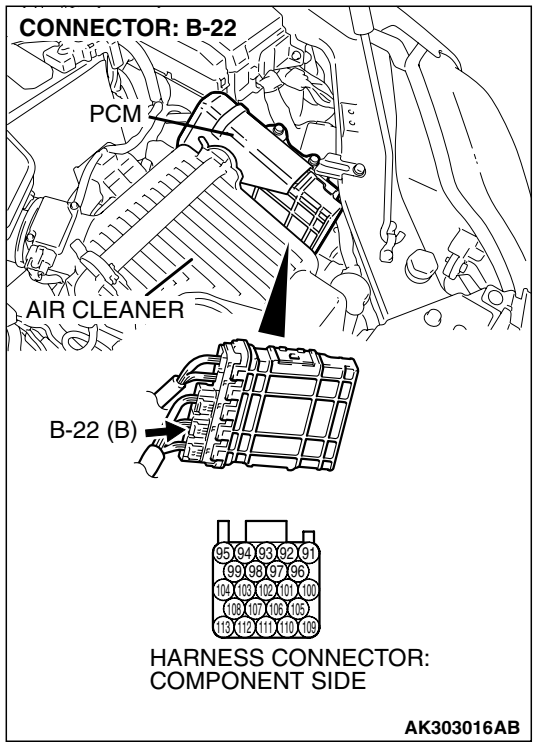
(1) Disconnect the connector B-106 and measure at the harness side.



(2) Check for the continuity between terminal No. 1 and ground.
- Continuity (2 Ω or less).

Q: Does continuity exist?

YES : Go to Step 15.
NO : Go to Step 13.



STEP 13. Check harness connector B-22 at PCM for damage.

Q: Is the harness connector in good condition?

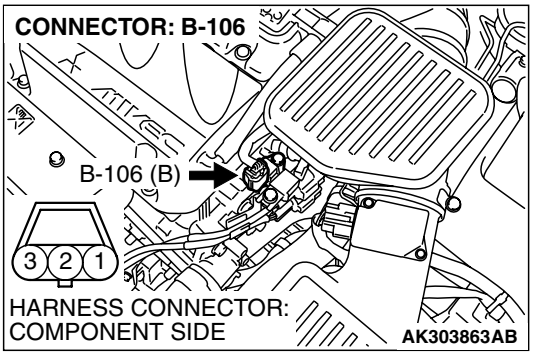
YES : Go to Step 14.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 20.

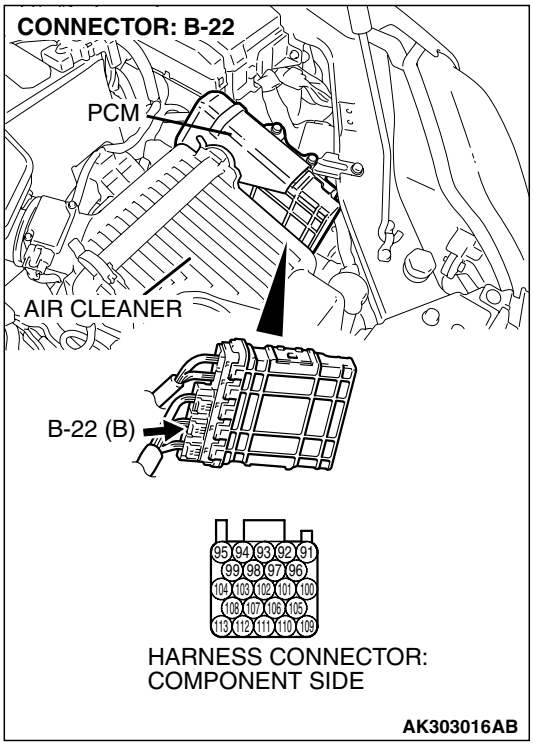
STEP 14. Check for open circuit and harness damage between camshaft position sensor connector B-106 (terminal No. 1) and PCM connector B-22 (terminal No. 113).

Q: Is the harness wire in good condition?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 20.

NO : Repair it. Then go to Step 20.



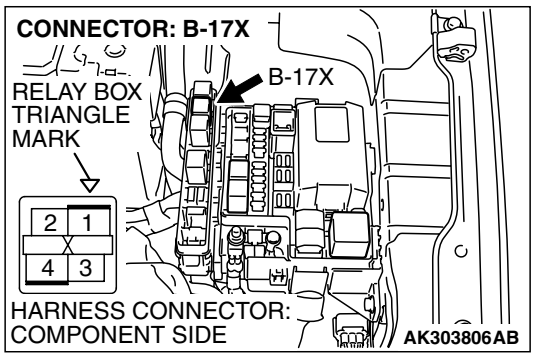


STEP 15. Check harness connector B-17X at the MFI relay for damage.

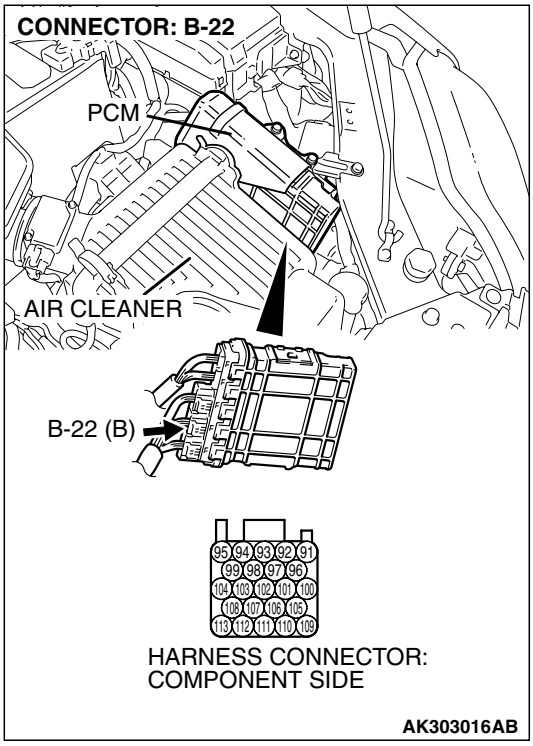
Q: Is the harness connector in good condition?

YES : Go to Step 16.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 20.



TSB Revision

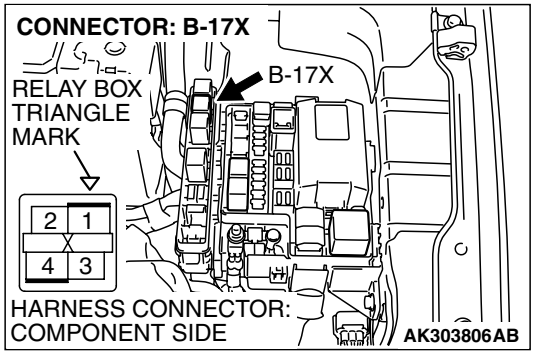


STEP 16. Check harness connector B-22 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 17.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 20.

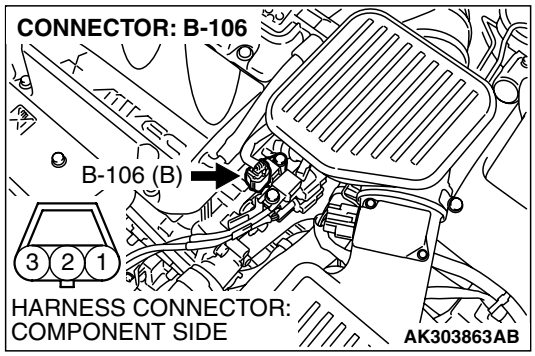


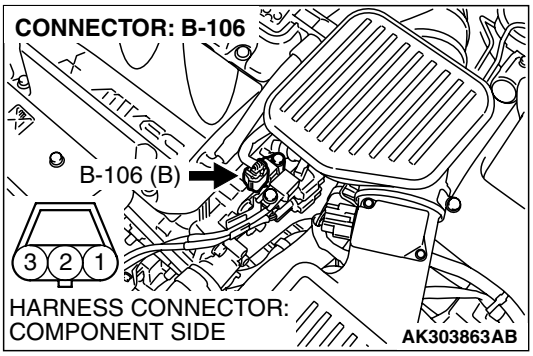
STEP 17. Check for harness damage between MFI relay connector B-17X (terminal No. 4) and camshaft position sensor connector B-106 (terminal No. 3).

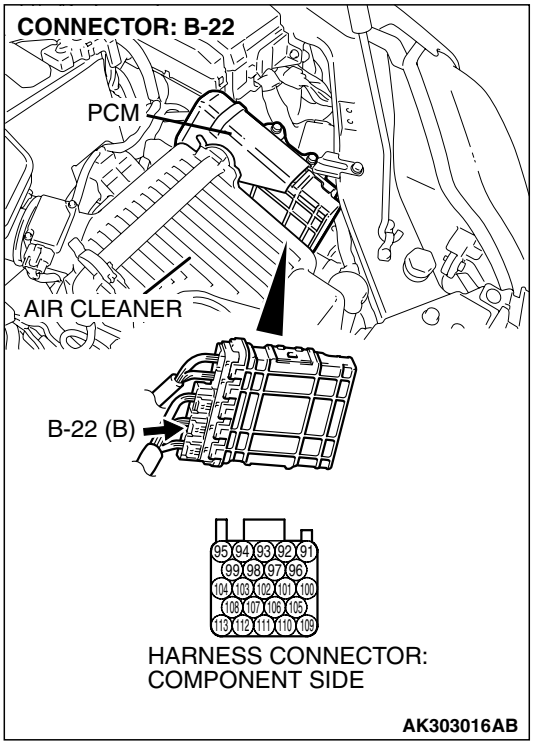
Q: Is the harness wire in good condition?

YES : Go to Step 18.

NO : Repair it. Then go to Step 20.







STEP 18. Check for harness damage between camshaft position sensor connector B-106 (terminal No. 2) and PCM connector B-22 (terminal No. 104).

Q: Is the harness wire in good condition?

YES : Go to Step 19.

NO : Repair it. Then go to Step 20.

STEP 19. Check the camshaft position sensing cylinder.

Q: Is the camshaft position sensing cylinder in good condition?

YES : Replace the camshaft position sensor. Then go to Step 20.

NO : Repair it. Then go to Step 20.

STEP 20. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 24 P.13A-9.

(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0340 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

TSB Revision

DTC P0401: Exhaust Gas Recirculation Flow Insufficient Detected

TECHNICAL DESCRIPTION
- When the EGR valve (stepper motor) is actuated from the fully closed position toward the open position while the engine is running, EGR gas flows.
- The PCM checks how the EGR gas flow signal changes.

DESCRIPTIONS OF MONITOR METHODS
Small manifold pressure change during exhaust gas recirculation (EGR) operation from closed to open.

MONITOR EXECUTION
Continuous

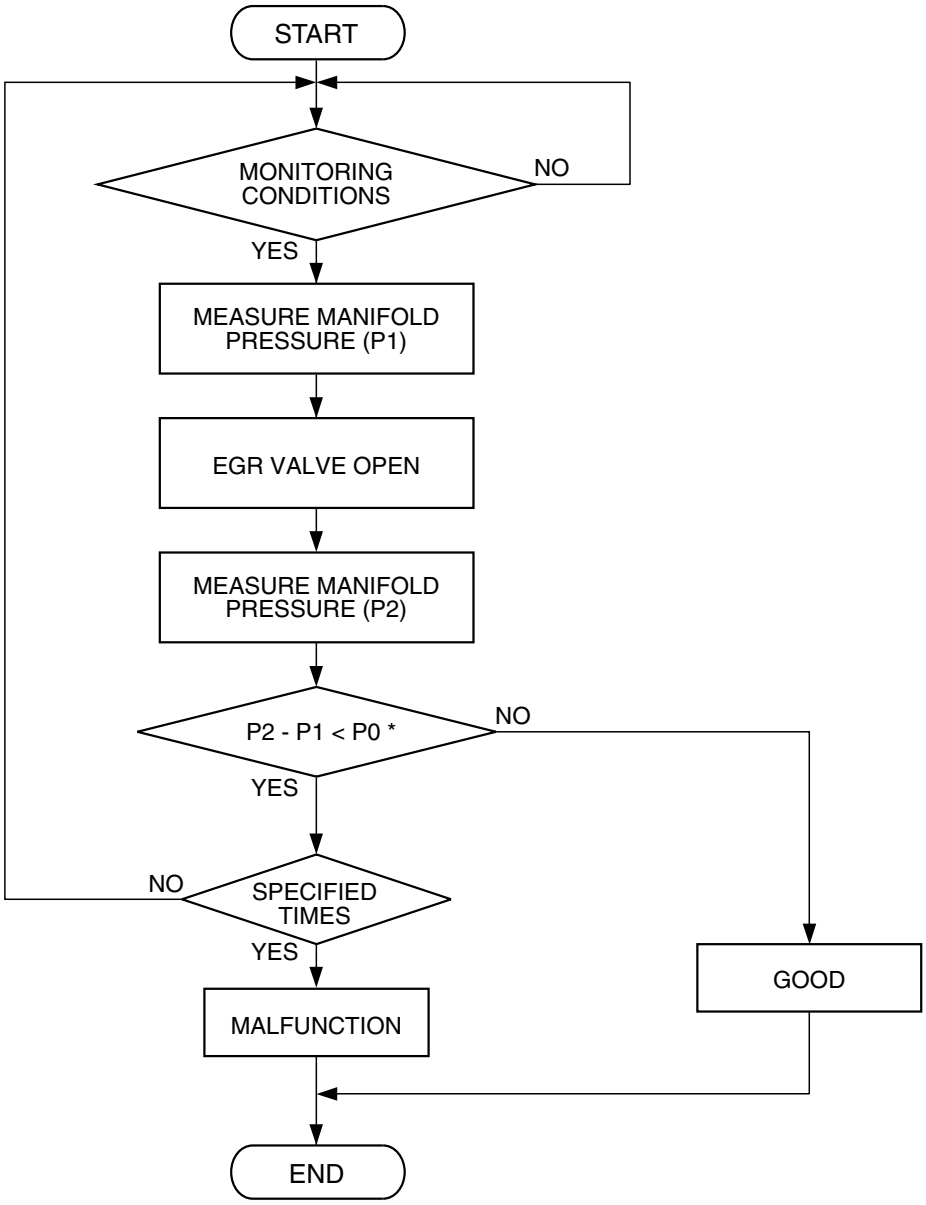
MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)
- EGR stepper motor monitor

Sensor (The sensor below is determined to be normal)
- Mass airflow sensor
- Engine coolant temperature sensor
- Intake air temperature sensor
- Barometric pressure sensor
- Throttle position sensor
- Accelerator pedal position sensor
- Manifold absolute pressure sensor

DTC SET CONDITIONS

Logic Flow Chart



* P0 : THRESHOLD VALUE

AK302036

Check Conditions

- At least 20 seconds have passed since the last monitor was complete.
- Engine coolant temperature is higher than 76°C (169°F).
- Engine speed is at between 1,100 and 1,750 r/min.
- Intake air temperature is higher than −10°C (14°F).
- Barometric pressure is higher than 76 kPa (22.4 in.Hg).
- Vehicle speed is 20 km/h (32 mph) or more.
- At least 90 seconds have passed since manifold absolute pressure sensor output voltage fluctuated 1.5 volts or more.
- Battery positive voltage is higher than 10.3 volts.
- Accelerator pedal is closed.
- Volumetric efficiency is lower than 23.8 percent.
- The PCM monitors for this condition for 3 cycles of 2.0 seconds each during the drive cycle.

TSB Revision

Judgement Criterion

- When the EGR valve opens to the prescribed opening, when intake manifold pressure fluctuation width is lower than 2.0 kPa (0.59 in.Hg).

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 3 P.13A-9.

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

- Contaminated EGR valve and EGR passage.
- EGR valve (stopper motor) failed.
- Open or shorted EGR valve (stopper motor) circuit, or connector damage.
- Manifold absolute pressure sensor failed.
- PCM failed.

DIAGNOSIS

Required Special Tools:

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

STEP 1. Check the EGR system

Refer to GROUP 17, Emission Control System – Exhaust Gas Recirculation (EGR) System – General Information P.17-95.

Q: Are there any abnormalities?

YES : Repair it. Then go to Step 3.
NO : Go to Step 2.

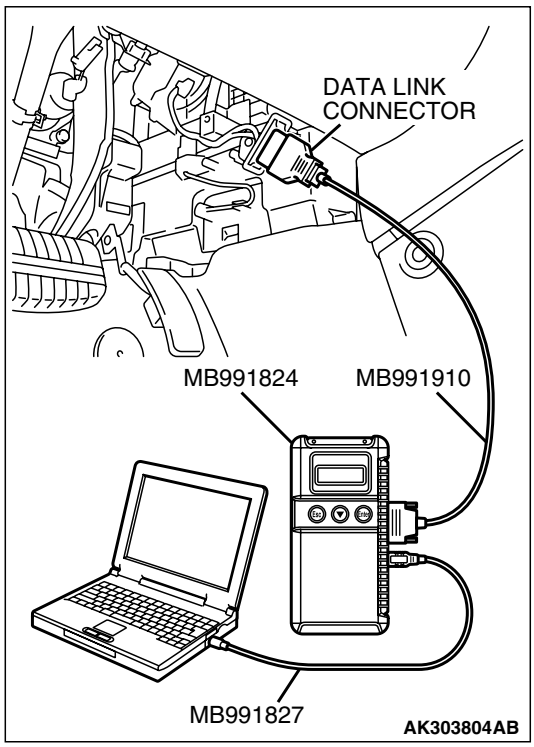
STEP 2. Using scan tool MB991958, check data list item 8: Manifold Absolute Pressure Sensor.

⚠ 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) Set scan tool MB991958 to the data reading mode for item 8, Manifold Absolute Pressure Sensor.
(4) Warm up the engine to normal operating temperature: 80°C to 95°C (176°F to 203°F).
  - Should be between 16 – 36 kPa (4.7 – 10.6 in.Hg) at engine idling.
(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Clean the EGR valve and EGR passage. Then go to Step 3.
NO : Refer to DTC P0106 – Manifold Absolute Pressure Sensor Circuit Range/Performance Problem P.13A-156, DTC P0107 – Manifold Absolute Pressure Sensor Circuit Low Input P.13A-170, DTC P0108 – Manifold Absolute Pressure Sensor Circuit High Input P.13A-182.



STEP 3. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 3 P.13A-9.

(2) Check the diagnostic trouble code (DTC).

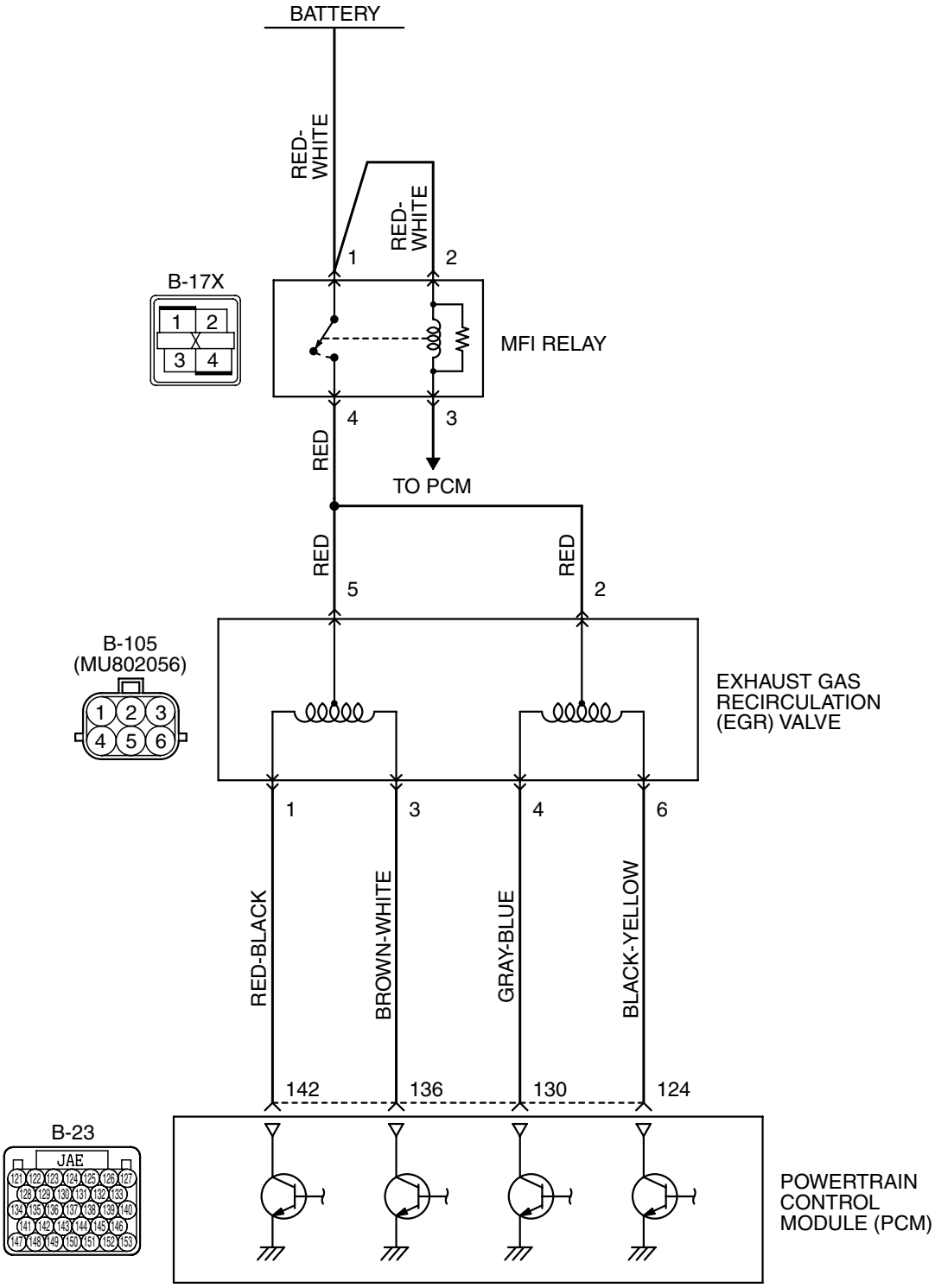
Q: Is DTC P0401 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0403: Exhaust Gas Recirculation Control Circuit

EGR Valve Circuit



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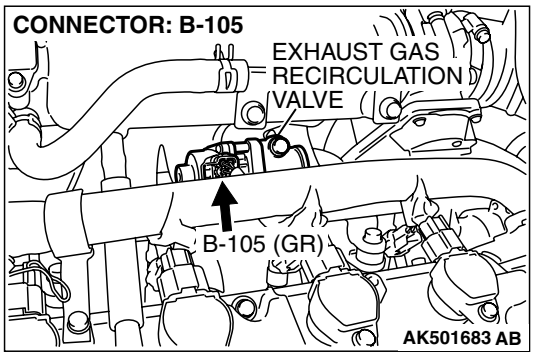
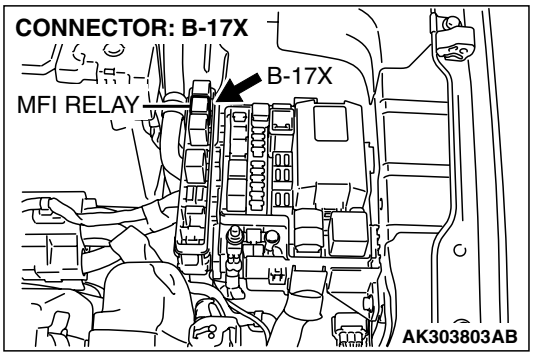
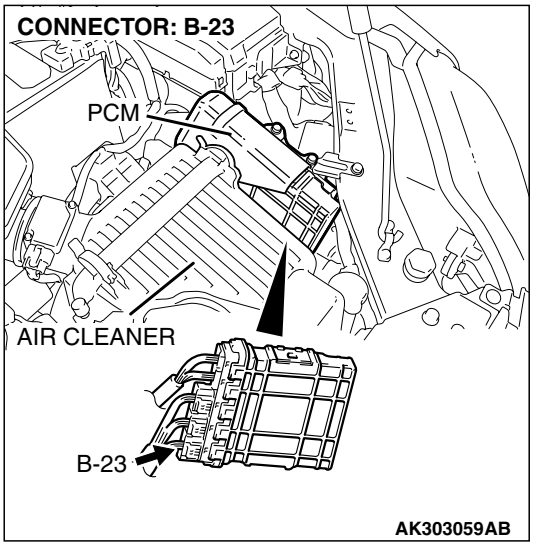
TSB Revision







CIRCUIT OPERATION

- The EGR valve power is supplied from the MFI relay (terminal No. 4).
- The PCM (terminals No. 124, No. 130, No. 136, No. 142) drives the stepper motor by sequentially turning "ON" the power transistors in the PCM and providing ground to the idle air control motor (terminal No. 1, No. 3, No. 4, No. 6).

TECHNICAL DESCRIPTION

- To judge if there is open circuit in the EGR valve (stepper motor) drive circuit, PCM measure the surge voltage of the EGR valve motor coil.

DESCRIPTIONS OF MONITOR METHODS

Off-surge does not occur after stepper motor is operated on to off.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

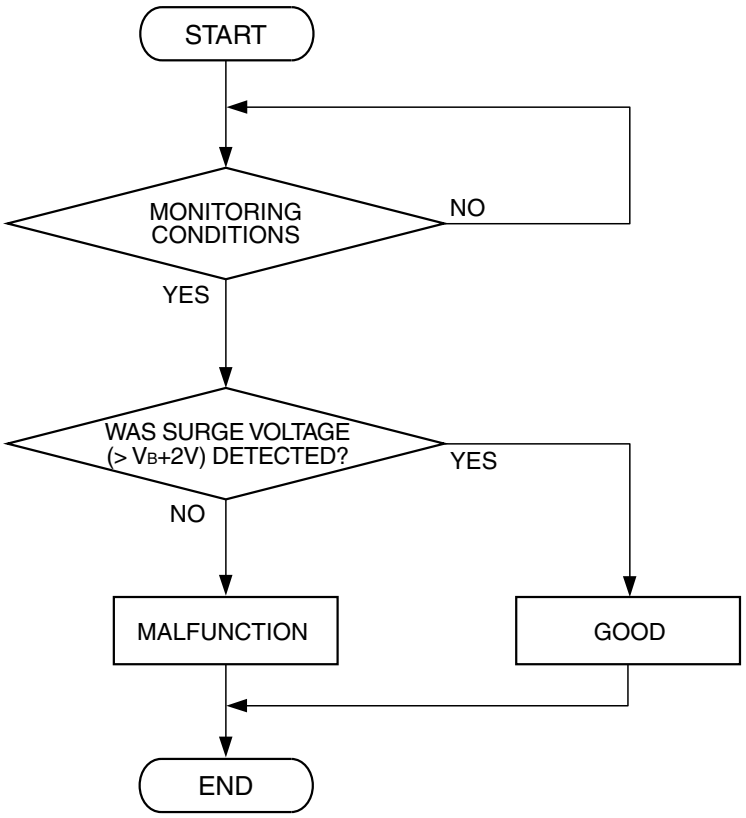
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



AK204017

Check Conditions
- Battery positive voltage is higher than 10.3 volts.
- In a few seconds, just after ignition switch is turned to the "ON" position from the "LOCK"(OFF) position. (While EGR valve is being initialized.)

Judgement Criterion
- The EGR valve motor coil surge voltage (battery positive voltage +2 volts) is not detected for 3 seconds.

Check Conditions
- Battery positive voltage is higher than 10.3 volts.
- EGR valve is in operation after the engine starting process is complete.

Judgement Criterion
- The EGR valve motor coil surge voltage (battery positive voltage +2 volts) is not detected for 30 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 24 P.13A-9.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)
- EGR valve (stepper motor) failed.
- Open or shorted EGR valve (stepper motor) circuit, harness damage or connector damage.
- PCM failed.

DIAGNOSIS

Required Special Tools:
- MB991958: Scan tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A

TSB Revision

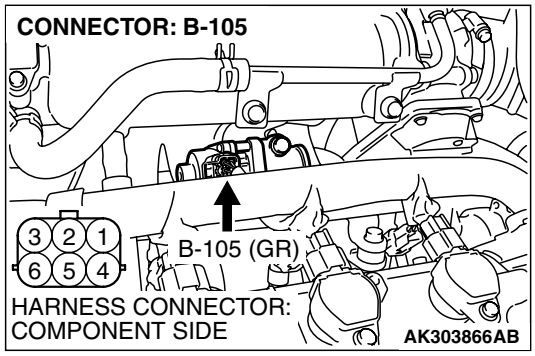
- MB991658: Test Harness Set
- MB991923: Power Plant ECU Check Harness

STEP 1. Check harness connector B-105 at EGR valve for damage.

Q: Is the harness connector in good condition?

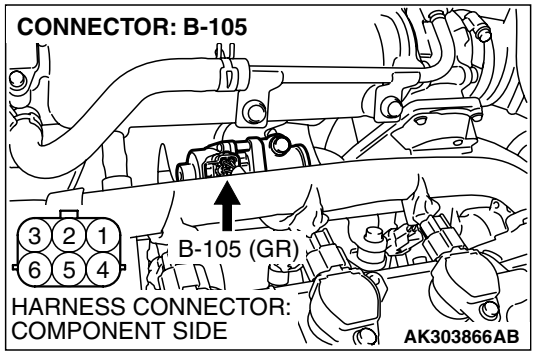
YES : Go to Step 2.

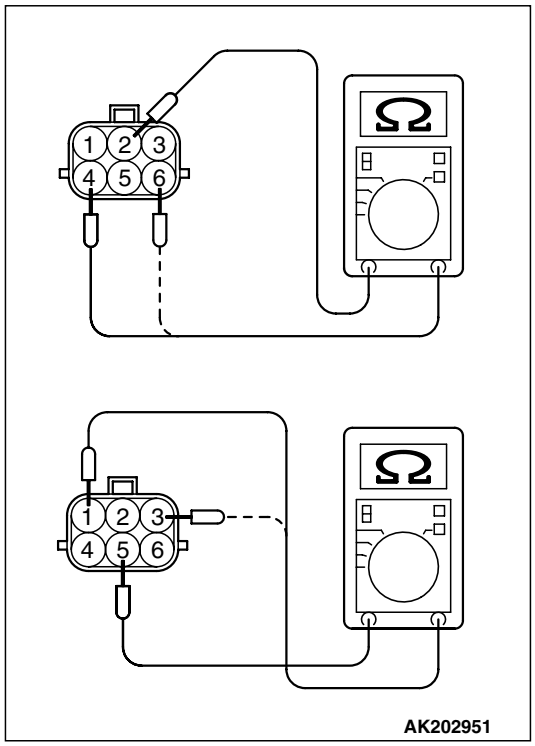
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.



STEP 2. Measure the EGR valve motor coil resistance.

(1) Disconnect the EGR valve connector B-105.





(2) Measure the resistance between EGR valve connector terminal No. 2 and either terminal No. 4 or terminal No. 6.

Standard value: 20 – 24 Ω [at 20°C (68°F)]

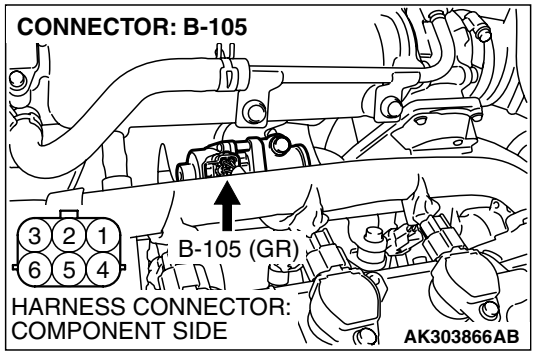
(3) Measure the resistance between EGR valve connector terminal No. 5 and either terminal No. 1 or terminal No. 3.

Standard value: 20 – 24 Ω [at 20°C (68°F)]

Q: Is the measured resistance between 20 and 24 ohms [at 20°C (68°F)]?

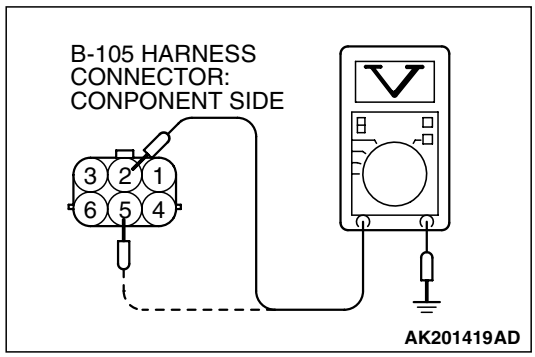
YES : Go to Step 3.

NO : Replace the EGR valve. Then go to Step 12.



STEP 3. Measure the power supply voltage at EGR valve harness side connector B-105.

(1) Disconnect the connector B-105 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.

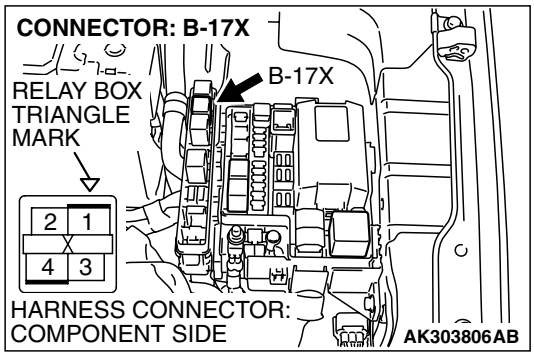


(3) Measure the voltage between terminal No. 2, No. 5 and ground.
- Voltage should be battery positive voltage.

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

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

YES : Go to Step 5.
NO : Go to Step 4.



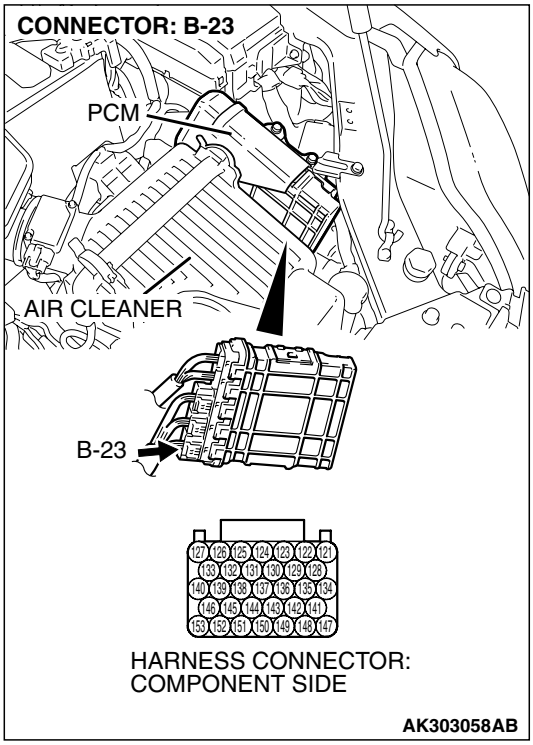
STEP 4. Check harness connector B-17X at MFI relay for damage.

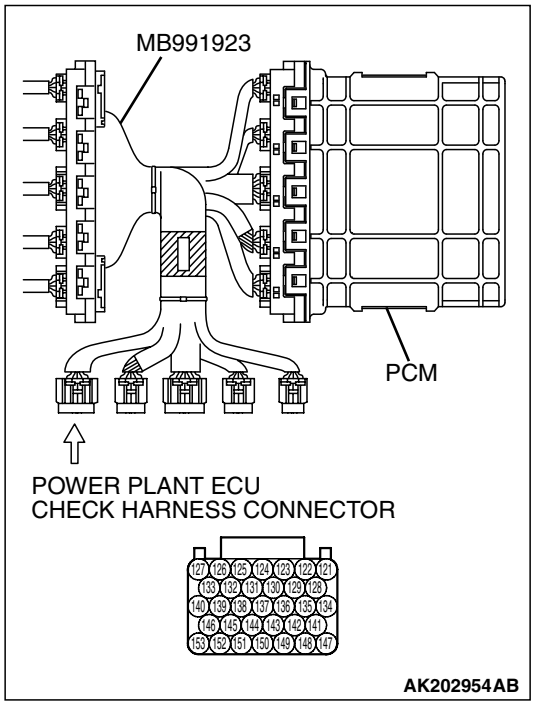
Q: Is the harness connector in good condition?

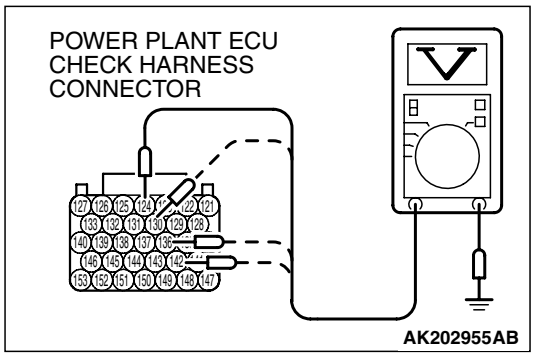
YES : Repair harness wire between MFI relay connector B-17X (terminal No. 4) and EGR valve connector B-105 (terminal No. 2, No. 5) because of open circuit or short circuit to ground. Then go to Step 12.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

STEP 5. Measure the power supply voltage at PCM connector B-23 by using power plant ECU check harness special tool MB991923.

(1) Disconnect all PCM connectors. Connect the power plant ECU check harness special tool MB991923 between the separated connectors.







(2) Measure the voltage between terminal (No. 124, No. 130, No. 136, No. 142) and ground.
- The voltage should be between 5 and 8 volts for approximately 3 seconds when the Ignition switch is turned from the "LOCK" (OFF) position to the "ON" position.

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

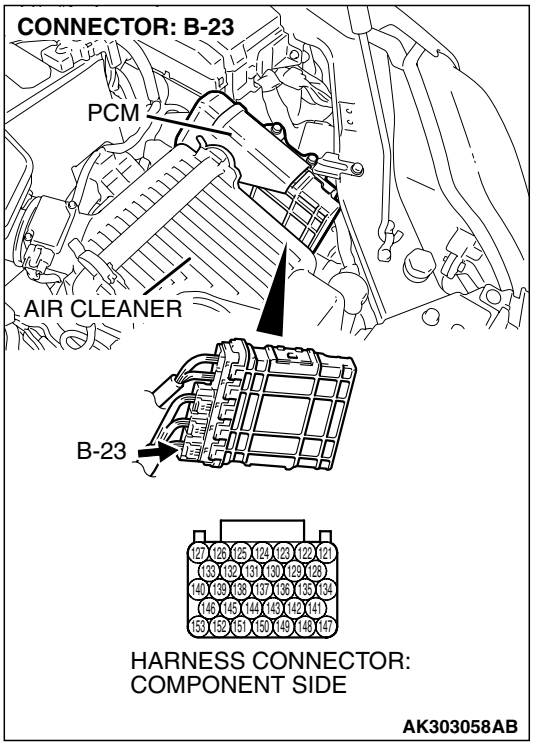
Q: Is the voltage normal?

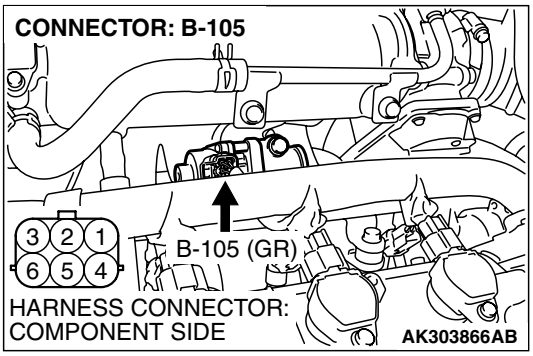
YES : Go to Step 8.
NO : Go to Step 6.

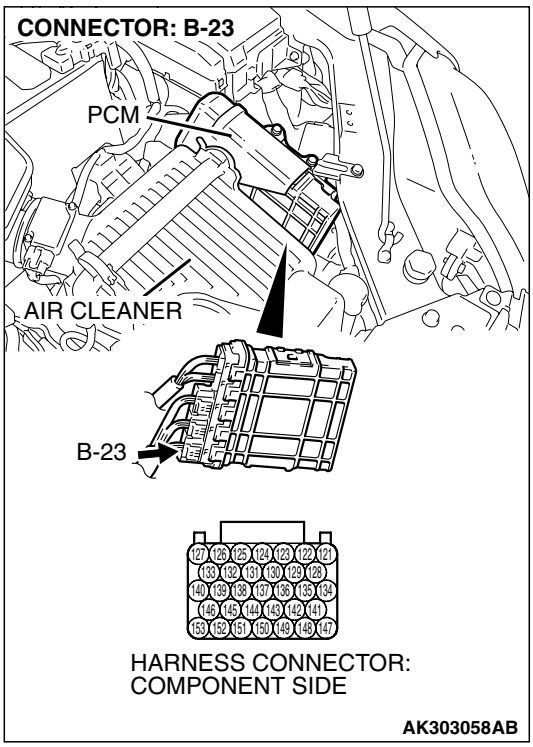
STEP 6. Check harness connector B-23 at PCM for damage.

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 go to Step 12.







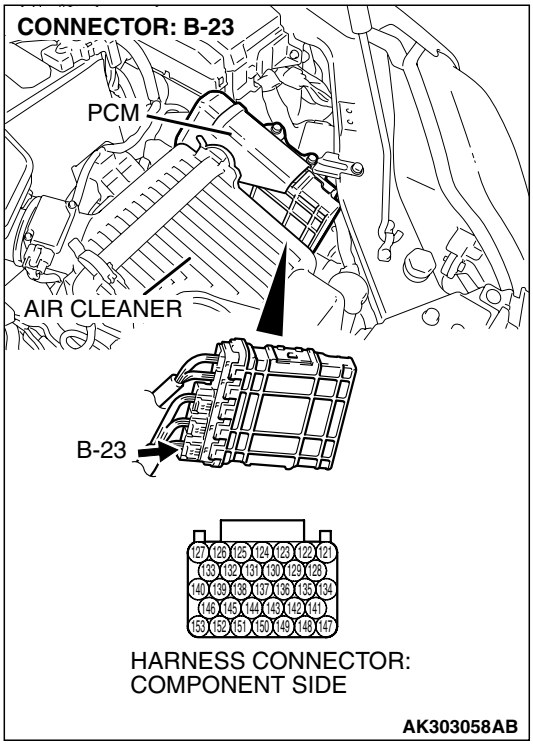
STEP 7. Check for open circuit and short circuit to ground between EGR valve connector B-105 and PCM connector B-23.

a. EGR valve connector B-105 (terminal No. 1) and PCM connector B-23 (terminal No. 142).
b. EGR valve connector B-105 (terminal No. 3) and PCM connector B-23 (terminal No. 136).
c. EGR valve connector B-105 (terminal No. 4) and PCM connector B-23 (terminal No. 130).
d. EGR valve connector B-105 (terminal No. 6) and PCM connector B-23 (terminal No. 124).

Q: Is the harness wire in good condition?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 12.

NO : Repair it. Then go to Step 12.



STEP 8. Check harness connector B-23 at PCM for damage.

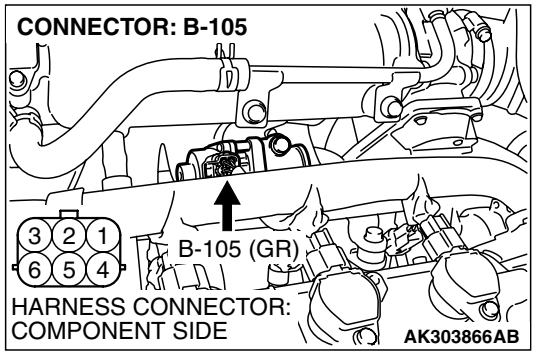
Q: Is the harness connector in good condition?

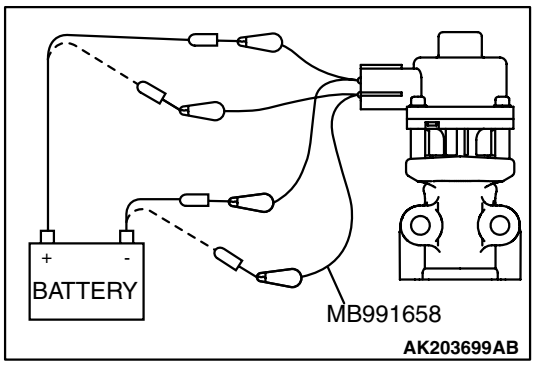
YES : Go to Step 9.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

STEP 9. Check the EGR valve operation using special tool MB991658.

(1) Remove the EGR valve.





(2) Connect special tool MB991658 to the EGR valve. (All terminals should be connected.)
(3) Use the jumper wires to connect terminal No. 5 of the EGR valve connector to the positive battery terminal.
(4) Check to ensure that the motor operates when the terminal No. 1 and No. 3 of the EGR valve connector are respectively connected to the negative battery terminal using a jumper wire.
- Vibration should be present at each application of voltage to test clip combination.

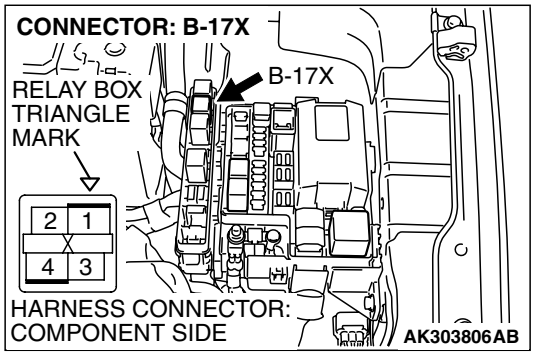
(5) Then, use jumper wires to connect the terminal No. 2 of the EGR valve connector to the positive battery terminal.
(6) Check to ensure that the motor operates when terminal No. 4 and No. 6 of the EGR valve connector are respectively connected to the negative battery terminal using a jumper wire.
- Vibration should be present at each application of voltage to test clip combination.

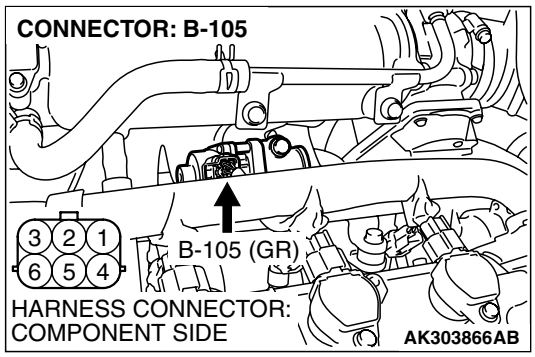
(7) Reinstall the EGR valve, using a new gasket, and tighten to the specified torque.

Tighten torque: 24 ± 3 N·m [17 ± 3 ft·lb]

Q: Is the EGR valve operating properly?

YES : Go to Step 10.
NO : Replace the EGR valve. Then go to Step 12.



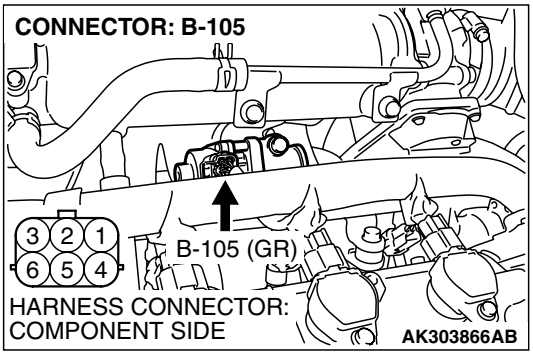


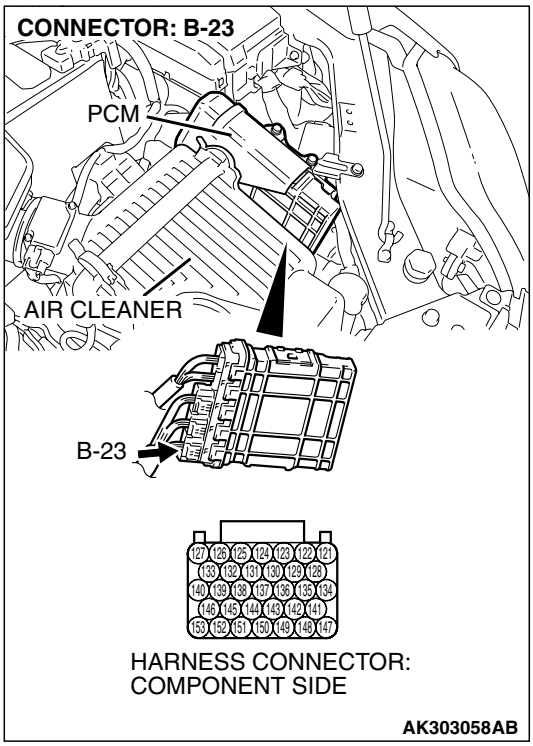
STEP 10. Check for harness damage between MFI relay connector B-17X (terminal No. 4) and EGR valve connector B-105 (terminal No. 2, No. 5).

Q: Is the harness wire in good condition?

YES : Go to Step 11.

NO : Repair it. Then go to Step 12.





STEP 11. Check for harness damage between EGR valve connector B-105 and PCM connector B-23.

a. EGR valve connector B-105 (terminal No. 1) and PCM connector B-23 (terminal No. 142).
b. EGR valve connector B-105 (terminal No. 3) and PCM connector B-23 (terminal No. 136).
c. EGR valve connector B-105 (terminal No. 4) and PCM connector B-23 (terminal No. 130).
d. EGR valve connector B-105 (terminal No. 6) and PCM connector B-23 (terminal No. 124).

Q: Is the harness wire in good condition?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 12.
NO : Repair it. Then go to Step 12.

STEP 12. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 24 P.13A-9.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0403 set?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0421: Warm Up Catalyst Efficiency Below Threshold (cylinder 1, 4)

TECHNICAL DESCRIPTION

- The signal from the rear heated oxygen sensor differs from the front heated oxygen sensor, because the catalytic converter purifies exhaust gas. When the catalytic converter has deteriorated, the signal from the front heated oxygen sensor becomes similar to the rear heated oxygen sensor.
- The PCM compares the output of the front and rear heated oxygen sensor signals.

DESCRIPTIONS OF MONITOR METHODS

Front and rear heated oxygen sensor rich/lean switching frequencies are nearly equal.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

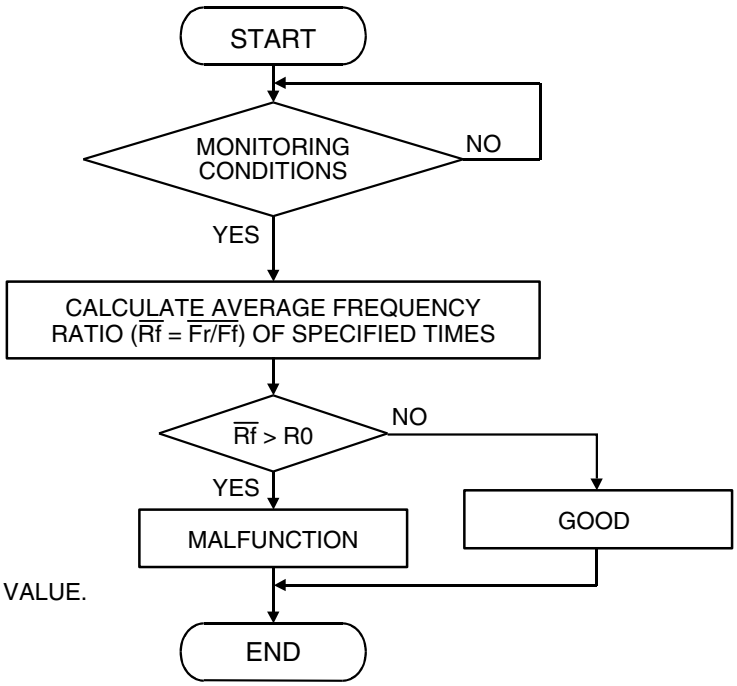
- Heated oxygen sensor (front) monitor
- Heated oxygen sensor (rear) monitor
- Heated oxygen sensor heater (front) monitor
- Heated oxygen sensor heater (rear) monitor
- Misfire monitor
- Fuel system monitor
- Air/fuel ratio feedback monitor

Sensor (The sensor below is determined to be normal)

- Mass airflow sensor
- Engine coolant temperature sensor
- Intake air temperature sensor
- Barometric pressure sensor
- Throttle position sensor
- Accelerator pedal position sensor

DTC SET CONDITIONS

Logic Flow Chart



R0: AVERAGE THRESHOLD VALUE.

AK302038

Check Conditions

- Engine speed is lower than 3,000 r/min.
- Accelerator pedal is open.
- Mass airflow is between 14 and 45 g/sec.
- More than 3 seconds have elapsed after the above-mentioned three conditions have been met.

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- Intake air temperature is higher than –10°C (14°F).
- Barometric pressure is higher than 76 kPa (22.4 in.Hg).
- Under the closed loop air/fuel ratio control.
- Vehicle speed is 1.5 km/h (1.0 mph) or more.
- The PCM monitors for this condition for 5 cycles of 10 seconds each during the drive cycle.
- Short-term fuel trim is higher than –25 percent and lower than +25 percent.
- The cumulative mass airflow is higher than 1,638 g.

Judgement Criterion

- The frequency ratio of cylinder 1, 4 heated oxygen sensor (rear) and cylinder 1, 4 heated oxygen sensor (front) is more than 0.7.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 4 P.13A-9.

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

- Cylinder 1, 4 side catalytic converter deteriorated.
- Cylinder 1, 4 heated oxygen sensor failed.
- Exhaust leak.
- PCM failed.

DIAGNOSIS

Required Special Tools:

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

STEP 1. Replace the cylinder 1, 4 side catalytic converter.

(1) Replace the cylinder 1, 4 side catalytic converter.
(2) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 4 P.13A-9.
(3) Check the diagnostic trouble code (DTC).

Q: Is DTC P0421 set?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11.
NO : The inspection is complete.

DTC P0431: Warm Up Catalyst Efficiency Below Threshold (cylinder 2, 3)

TECHNICAL DESCRIPTION

- The signal from the rear heated oxygen sensor differs from the front heated oxygen sensor, because the catalytic converter purifies exhaust gas. When the catalytic converter has deteriorated, the signal from the front heated oxygen sensor becomes similar to the rear heated oxygen sensor.
- The PCM compares the output of the front and rear heated oxygen sensor signals.

DESCRIPTIONS OF MONITOR METHODS

Front and rear heated oxygen sensor rich/lean switching frequencies are nearly equal.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

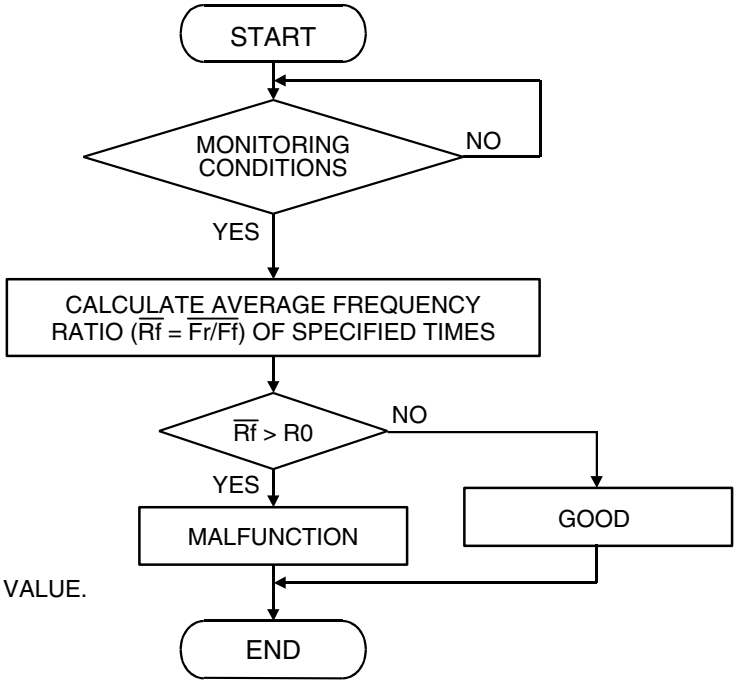
Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

- Heated oxygen sensor (front) monitor
- Heated oxygen sensor (rear) monitor
- Heated oxygen sensor heater (front) monitor
- Heated oxygen sensor heater (rear) monitor
- Misfire monitor
- Fuel system monitor
- Air/fuel ratio feedback monitor

Sensor (The sensor below is determined to be normal)
- Mass airflow sensor
- Engine coolant temperature sensor
- Intake air temperature sensor
- Barometric pressure sensor
- Throttle position sensor
- Accelerator pedal position sensor

DTC SET CONDITIONS

Logic Flow Chart



R0: AVERAGE THRESHOLD VALUE.

AK302038

Check Conditions
- Engine speed is lower than 3,000 r/min.
- Accelerator pedal is open.
- Mass airflow is between 14 and 45 g/sec.
- More than 3 seconds have elapsed after the above-mentioned three conditions have been met.
- Intake air temperature is higher than −10°C (14°F).
- Barometric pressure is higher than 76 kPa (22.4 in.Hg).
- Under the closed loop air/fuel ratio control.
- Vehicle speed is 1.5 km/h (1.0 mph) or more.
- The PCM monitors for this condition for 5 cycles of 10 seconds each during the drive cycle.
- Short-term fuel trim is higher than –25 percent and lower than +25 percent.
- The cumulative mass airflow is higher than 1,638 g.

Judgement Criterion
- The frequency ratio of left bank heated oxygen sensor (rear) and left bank heated oxygen sensor (front) is more than 0.7.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 4 P.13A-9.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)
- Cylinder 2, 3 side catalytic converter deteriorated.
- Cylinder 2, 3 heated oxygen sensor failed.
- Exhaust leak.
- PCM failed.

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DIAGNOSIS

Required Special Tools:

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

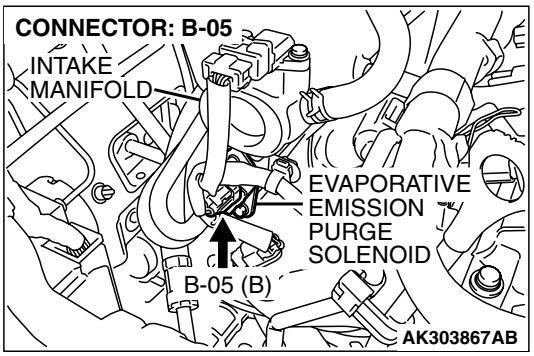
STEP 1. Replace the cylinder 2, 3 side catalytic converter.

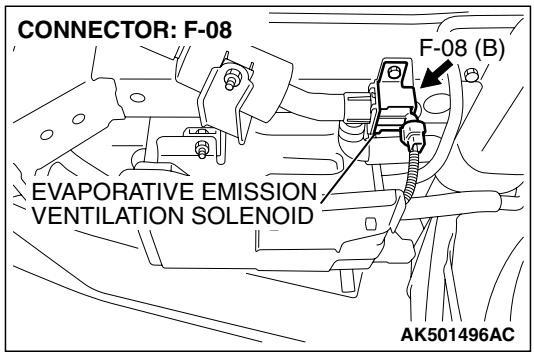
(1) Replace the cylinder 2, 3 side catalytic converter.
(2) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 4 P.13A-9.
(3) Check the diagnostic trouble code (DTC).

Q: Is DTC P0431 set?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11.
NO : The inspection is complete.

DTC P0441: Evaporative Emission Control System Incorrect Purge Flow





TECHNICAL DESCRIPTION

- PCM detects a stuck open condition of evaporative emission purge solenoid and a stuck closed condition of evaporative emission ventilation solenoid by pressure change in fuel tank.
- Stuck open evaporative emission purge solenoid is judged through monitoring leak of evaporative emission system.
- Stuck closed evaporative emission ventilation solenoid is judged after 20 seconds from end of monitoring leak of evaporative emission system, or of usual operation of evaporative emission purge solenoid from ON to OFF.

DESCRIPTIONS OF MONITOR METHODS

Fuel tank pressure decreases largely during purge-cut.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

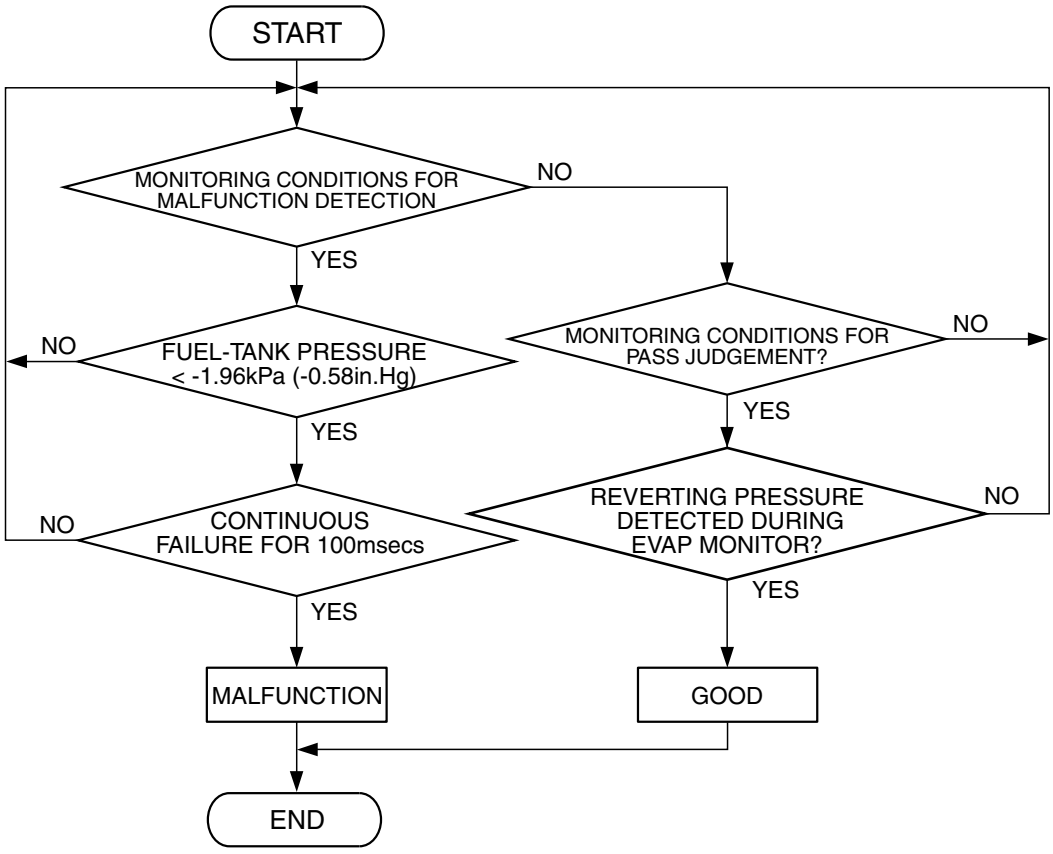
- Fuel tank pressure sensor monitor

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



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Check Conditions

- Engine is running.
- ON duty cycle of the evaporative emission purge solenoid is 0 percent.
- 20 seconds have elapsed since the duty cycle of the evaporative emission purge solenoid has turned to 0 percent.

Judgement Criterion

- The pressure in the fuel tank is –1.96 kPa (–0.58 in.Hg) or less for 0.1 second.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 5 P.13A-9.

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

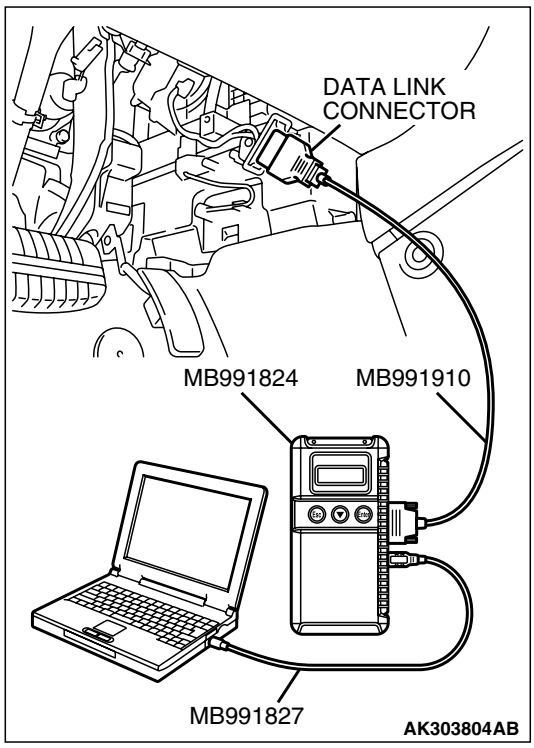
- Evaporative emission purge solenoid failed.
- Evaporative emission ventilation solenoid failed.
- Fuel tank differential pressure sensor circuit related part(s) failed.

DIAGNOSIS

Required Special Tools:

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

TSB Revision



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

⚠ CAUTION

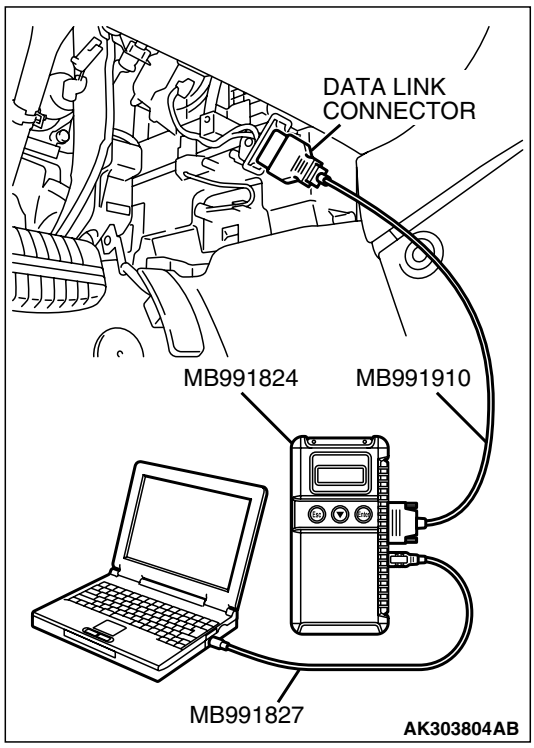
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(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 DTC P0451 set?

YES : Refer to DTC P0451 - Evaporative Emission Control System Pressure Sensor Range/Performance P.13A-667.

NO : Go to Step 2.



STEP 2. Using scan tool MB991958, check data list item 52: Fuel Tank Differential Pressure Sensor.

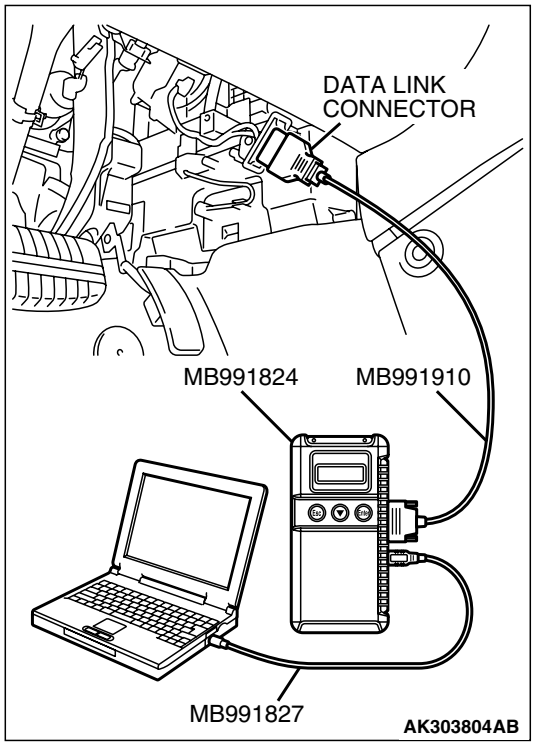
(1) Turn the ignition switch to the "ON" position.
(2) Remove the fuel cap.
(3) Set scan tool MB991958 to the data reading mode for item 52, Fuel Tank Differential Pressure Sensor.
- The fuel tank differential pressures should be 1,200 and 3,800 millivolts.

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

Q: Is the fuel tank pressure between 1,200 and 3,800 millivolts?

YES : Go to Step 3.

NO : Refer to DTC P0451 - Evaporative Emission Control System Pressure Sensor Range/Performance P.13A-667.



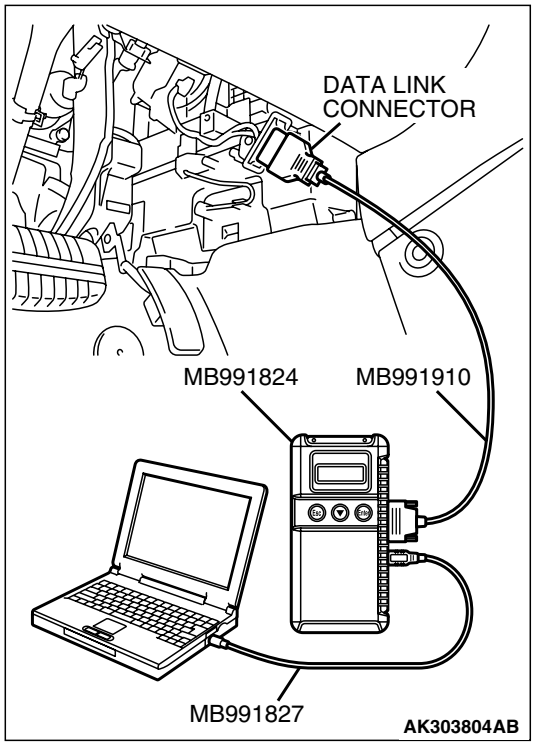
STEP 3. Using scan tool MB991958, check actuator test item 10: Evaporative Emission Purge Solenoid.

(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool MB991958 to the actuator test mode for item 10, Evaporative emission purge solenoid.
- An operation sound should be heard and vibration should be felt when the evaporative emission purge solenoid is operated.

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

Q: Is the solenoid operating properly?

YES : Go to Step 4.
NO : Replace the evaporative emission purge solenoid. Then go to Step 5.



STEP 4. Using scan tool MB991958, check actuator test item 15: Evaporative Emission Ventilation Solenoid.

(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool MB991958 to the actuator test mode for item 15, Evaporative emission ventilation solenoid.
- An operation sound should be heard and vibration should be felt when the evaporative emission ventilation solenoid is operated.

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

Q: Is the solenoid operating properly?

YES : Repair or replace the vent hose and air filter. Then go to Step 5.
NO : Replace the evaporative emission ventilation solenoid. Then go to Step 5.

STEP 5. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 5 P.13A-9.

(2) Read the diagnostic trouble code.

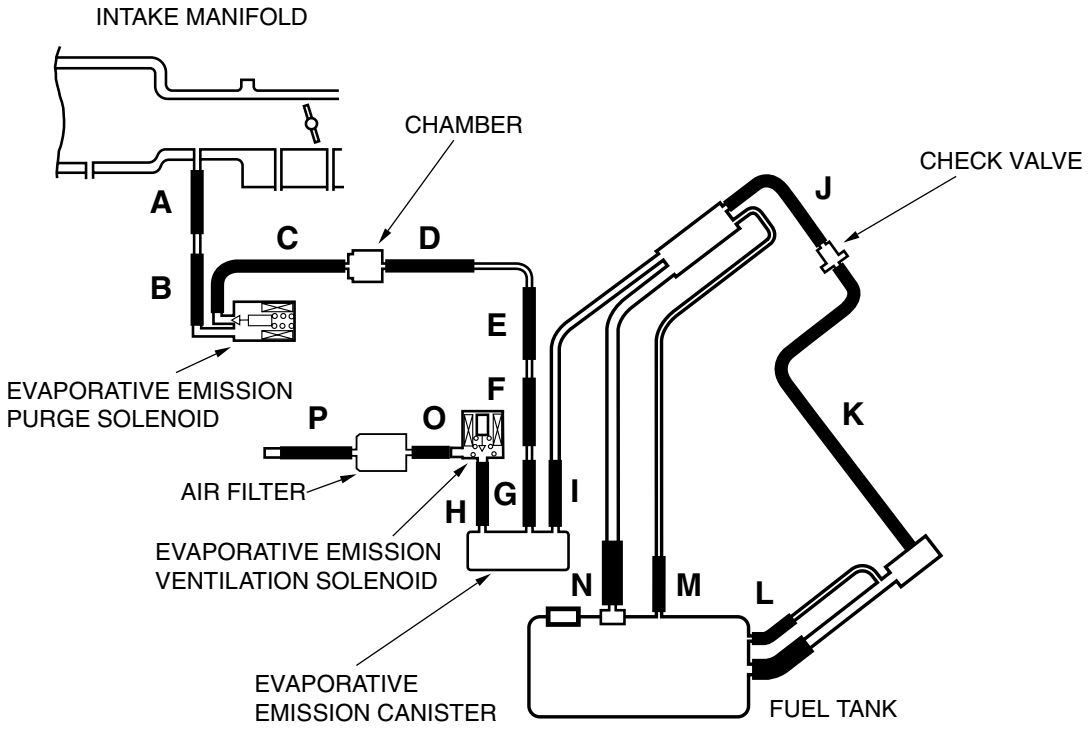
Q: Is DTC P0441 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0442: Evaporative Emission System Leak Detected (Small Leak)

SYSTEM DIAGRAM



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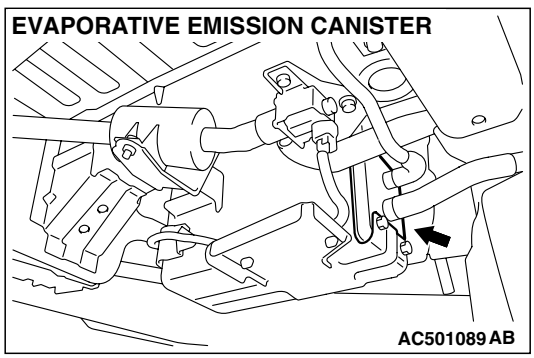

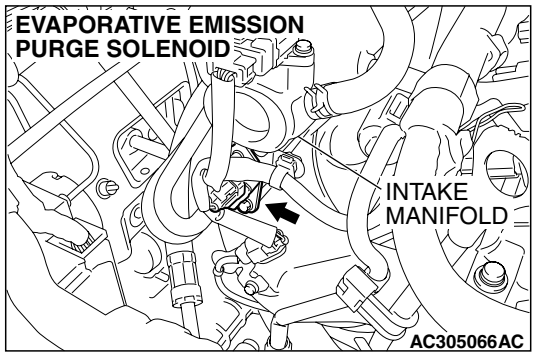

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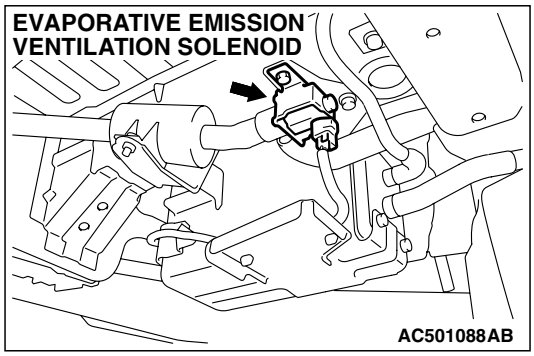


TECHNICAL DESCRIPTION

- The PCM monitors the Evaporative Emission (EVAP) System pressure.
- The PCM controls the evaporative emission ventilation solenoid. It closes the evaporative emission ventilation solenoid to seal the evaporative emission canister side of the system.
- The evaporative emission purge solenoid is opened to allow manifold vacuum to create low pressure (vacuum) in the EVAP system.
- When the EVAP system develops a vacuum of 2 kPa (0.29 psi), the evaporative emission purge solenoid is closed and the fuel system vacuum is maintained at 2 kPa. (0.29 psi).
- The PCM determines whether there is a leak in the EVAP system by monitoring the vacuum inside the fuel tank.
- The test is stopped when fuel vapor pressure exceeds predetermined limits.

DESCRIPTIONS OF MONITOR METHODS

- Measure reverting pressure after depressurizing by intake manifold negative pressure and detect malfunction if reverting pressure rises largely.

MONITOR EXECUTION

- Once per driving cycle.

MONITOR EXECUTION CONDITIONS (OTHER MONITOR AND SENSOR)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

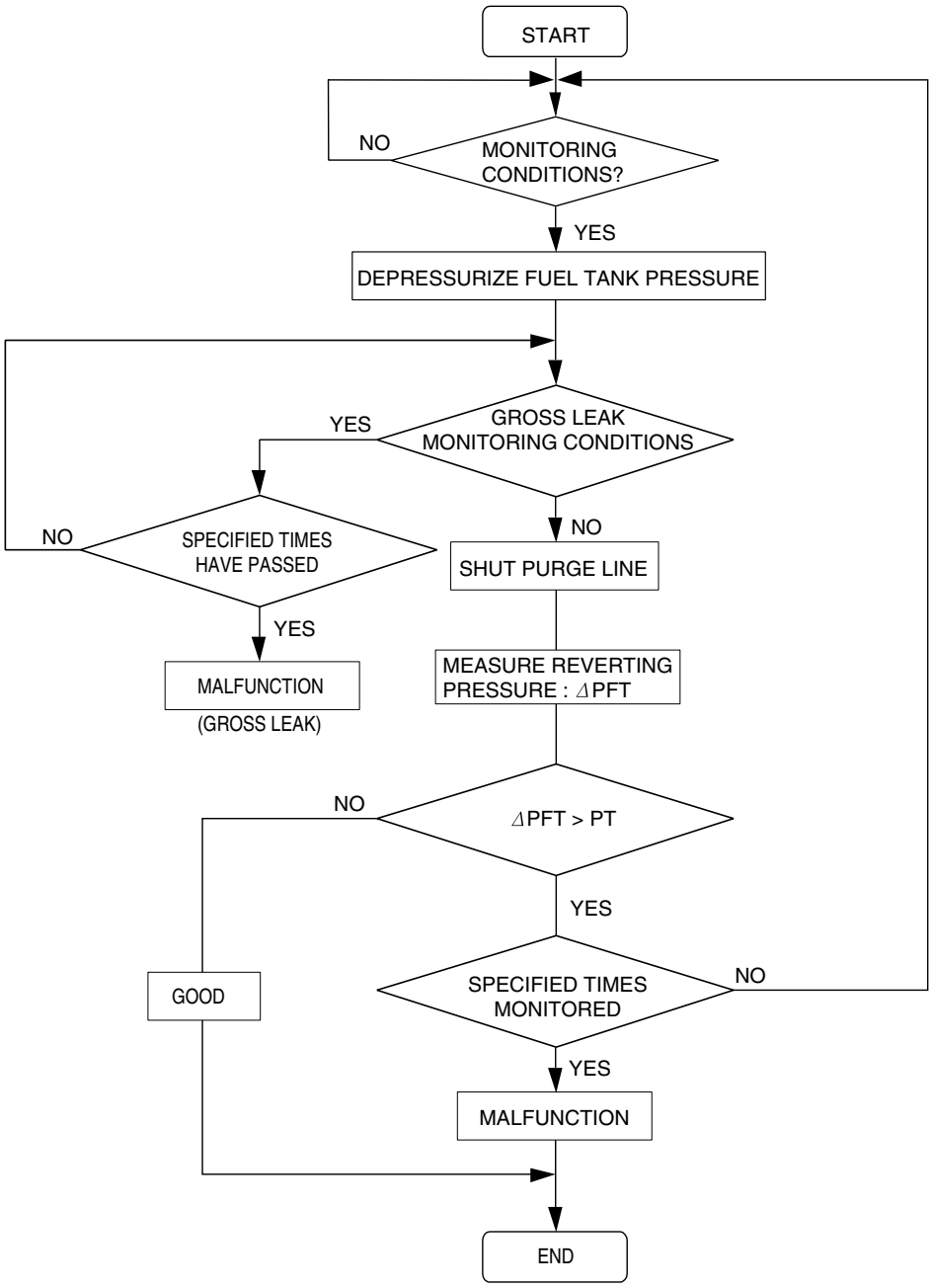
- Evaporative emission purge solenoid monitor
- Evaporative emission purge system monitor
- Fuel tank differential pressure sensor monitor
- Evaporative emission ventilation solenoid monitor
- Fuel level sensor monitor
- Fuel temperature sensor monitor

Sensor (The sensors below are determined to be normal)

- Mass airflow sensor
- Barometric pressure sensor
- Intake air temperature sensor
- Engine coolant temperature sensor

LOGIC FLOW CHARTS (Monitor Sequence)

0.04in, 0.02in GROSS LEAK MONITOR



AC306649

DTC SET CONDITIONS

Remaining fuel amount is 15 – 40 percent of capacity (fuel level sensor output signal voltage is 1.4 – 2.4 volts).

Check Conditions A: At Start up

- Intake air temperature is 36°C (97°F) or less when the engine is started.
- The engine coolant temperature is 36 °C (97 °F) or less when the engine is started.

Check Conditions B: For Test to Run

- The fuel tank temperature is less than 36 °C (97 °F), and less than 13 minutes have elapsed since the engine was started.
- Engine coolant temperature is greater than 60°C (140°F).
- Power steering pressure switch: "OFF"

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- Barometric pressure is greater than 76 kPa (11 psi).
- Fuel tank differential pressure sensor output voltage is 1 to 4 volts.
- Vehicle speed is greater than or equal to 20 km/h (12.4 mph).

Check Conditions C: For Test to Stop

- Intake air temperature is greater than –10°C (14°F).
- When the evaporative emission purge solenoid and evaporative emission ventilation solenoid are closed, the pressure in the fuel tank is less than 451 Pa (0.065 psi).
- The pressure fluctuation is less than 647 Pa (0.094 psi).
- 10 seconds have elapsed since the start of the previous monitoring.
- Monitoring time: 75 – 125 seconds.

Judgment Criterion

- Internal pressure of the fuel tank has changed more than 981 Pa (0.142 psi) in 20 seconds after the tank and vapor line were closed.

  NOTE: The monitoring time (75 – 125 seconds) depends on the fuel level and the temperature in the fuel tank.
  The next monitoring occurs at least 10 seconds later.

DTC SET CONDITIONS

Remaining fuel amount is 40 – 85 percent of capacity (fuel level sensor output voltage is 2.4 – 3.7 volts).

Check Conditions A: At Start up

- Intake air temperature is less than 36 °C (97 °F) when the engine is started.
- The engine coolant temperature is less than 36 °C (97 °F) when the engine is started.

Check Conditions B: For Test to Run

- The fuel tank temperature is less than 36 °C (97 °F).
- Barometric pressure is greater than 76 kPa (11 psi).
- Fuel tank differential pressure sensor output voltage is 1 to 4 volts.

Check Conditions C: For Test to Stop

- Intake air temperature is greater than –10 °C (14°F).
- Engine coolant temperature is greater than 20 °C (68 °F).
- When the evaporative emission purge solenoid and evaporative emission ventilation solenoid are closed, the pressure in the fuel tank is less than 324 Pa (0.047 psi).
- 10 seconds have elapsed since the start of the previous monitoring.
- Monitoring time: 10 – 14 minutes.

Judgment Criterion

- Internal pressure of the fuel tank has changed more than 2 kPa (0.29 psi) in 128 seconds after the tank and vapor line were closed.

  NOTE: The monitoring time (10 – 14 minutes) depends on the fuel level and the temperature in the fuel tank.
  The next monitoring occurs at least 10 seconds later.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 5 P.13A-9.

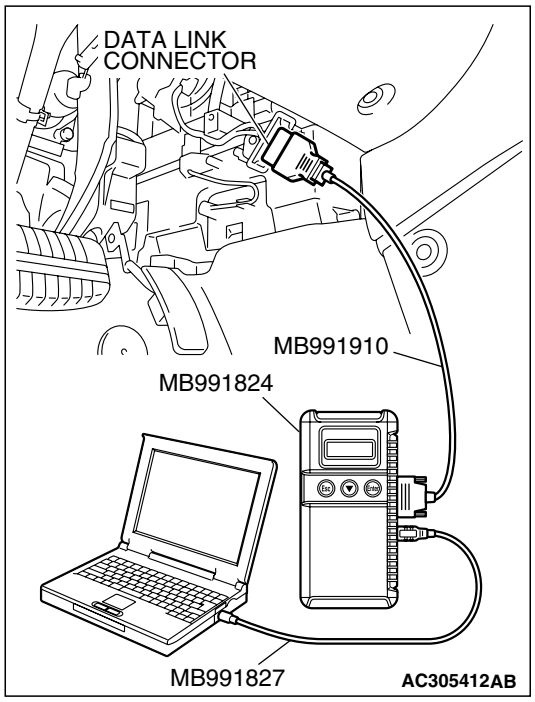
TROUBLESHOOTING HINTS (THE MOST LIKELY CAUSES FOR THIS CODE TO BE SET ARE:)

- Loose fuel cap.
- Fuel cap relief pressure is incorrect.
- Evaporative emission canister seal is leaking.
- Fuel tank, purge line or vapor line seal is leaking.
- Evaporative emission ventilation solenoid does not seal.

DIAGNOSIS

Required Special Tools:

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



STEP 1. Using scan tool MB991958, check the evaporative emission system monitor test.

⚠ 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.**
- **During this test, the PCM will automatically increase the engine speed to 1,600 r/min or greater. Check that the transaxle is set to the "P" position.**

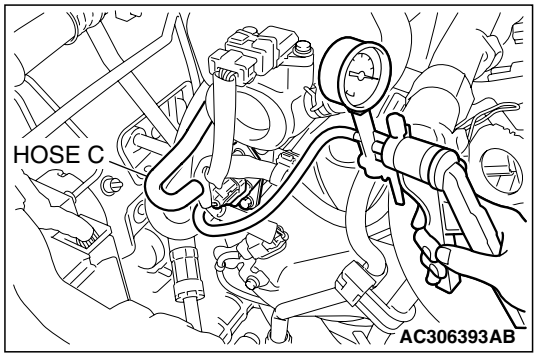
(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Erase the DTCs using scan tool MB991958.
(4) Check that the fuel cap is securely closed (Tighten until three clicks are heard).
(5) Start the engine.
(6) Select "System Test."
(7) Select "Evap Leak Mon."
(8) During this test, keep the accelerator pedal at the idle position.
(9) Keep the engine speed and engine load within the specified range. When the monitor test starts, the "In Progress" item on scan tool MB991958 will change from "NO" to "YES."
(10) Turn the ignition switch to the "LOCK" (OFF) position, and disconnect scan tool MB991958.

Q: Is "Evap Leak Mon. Completed. Test Failed and DTCs Set" displayed on scan tool MB991958?

YES : A malfunction has been detected during the monitor test. Refer to the Diagnostic Trouble Code Chart and diagnose any other DTCs that are set P.13A-45. If no other DTC's have been set, go to Step 2.

NO <"Evap Leak Mon. Completed. Test Passed" is displayed on scan tool MB991958.> : The evaporative emission system is working properly at this time. Explain to the customer that an improperly tightened fuel cap can cause the MIL to illuminate. Return the vehicle to the customer.

NO <"Evap Leak Mon. Discontinued. Retest again from the first" is displayed on scan tool MB991958.> : The EVAP monitor has been interrupted during the test. Turn the ignition switch to the "LOCK" (OFF) position once, and repeat the monitoring from Step 1.

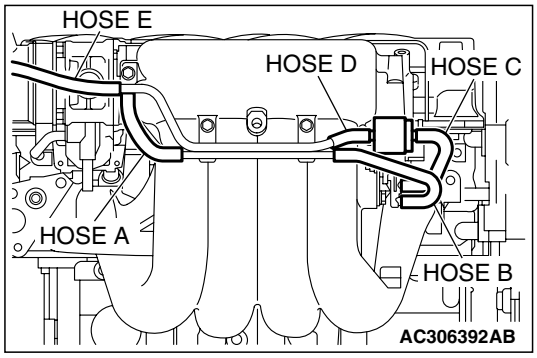


STEP 2. Check the evaporative emission purge solenoid for leaks.

(1) Disconnect hose C from the evaporative emission purge solenoid and connect a hand vacuum pump to the nipple of the evaporative emission purge solenoid.
(2) Use the hand vacuum pump to confirm that the evaporative emission purge solenoid holds vacuum.
(3) Disconnect the hand vacuum pump, and reconnect hose C to the evaporative emission purge solenoid.

Q: Does the evaporative emission purge solenoid hold vacuum?

YES : Go to Step 3.
NO : Replace the evaporative emission purge solenoid. Then go to Step 15.

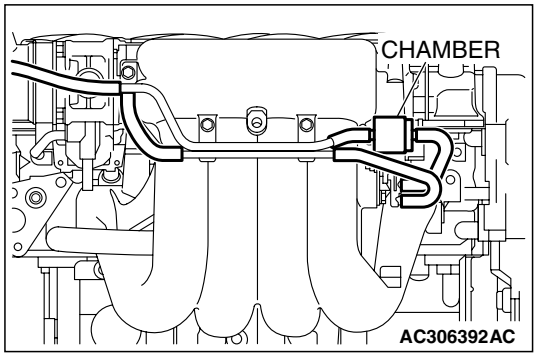


STEP 3. Check for leaks in evaporative emission hoses A through E.

Use a hand vacuum pump to test each hose from hose A to hose E.

Q: Do the hoses hold vacuum?

YES : Go to Step 4.
NO : Replace any damaged hose. Then go to Step 15.

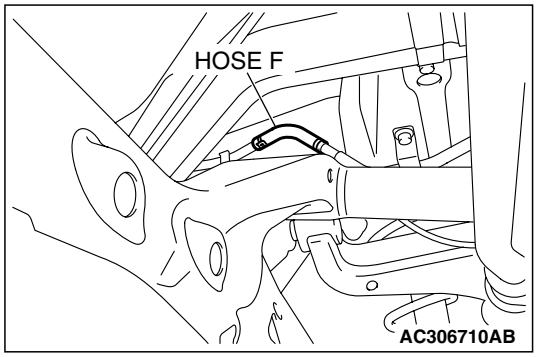


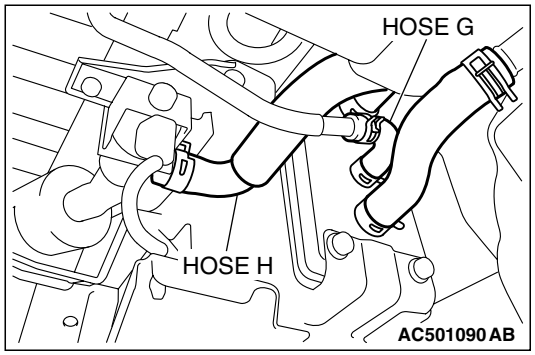
STEP 4. Check for leaks in the chamber.

(1) Connect a hand vacuum pump to the nipple.
(2) Plug the other nipple.
(3) Apply vacuum with the hand vacuum pump, and confirm that the applied vacuum does not fluctuate.

Q: Is the chamber in good condition?

YES : Go to Step 5.
NO : Replace the chamber. Then go to Step 15.





STEP 5. Check for leaks in evaporative emission hoses F through H.

Use a hand vacuum pump to test each hose from hose F to hose H.

Q: Do the hoses hold vacuum?

YES : Go to Step 6.

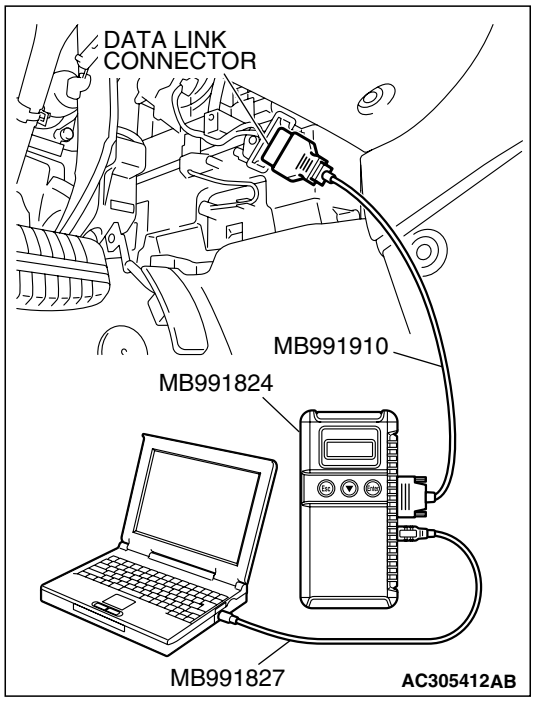
NO : Replace any damaged hose. Then go to Step 15.

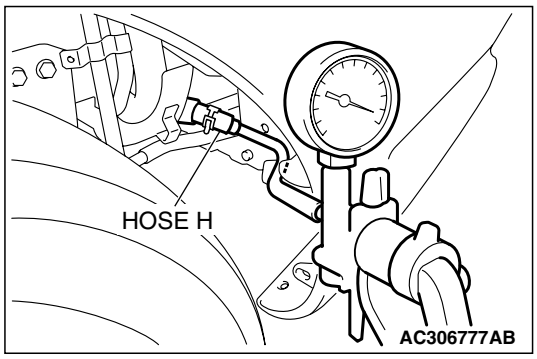
STEP 6. Using scan tool MB991958, check actuator test item 15: Evaporative emission ventilation solenoid.

⚠ 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) Remove the fuel tank filler tube protector (Refer to GROUP 13C, Fuel Tank P.13C-9).





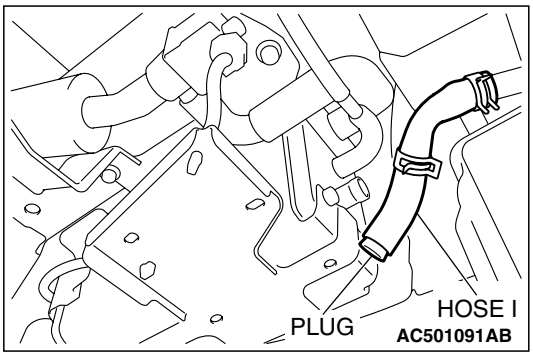
(3) Disconnect hose H from evaporative emission canister and connect hand vacuum pump to hose H.
(4) Turn the ignition switch to the "ON" position.
(5) Set scan tool MB991958 to actuator test mode.
- item 15: Evaporative Emission Ventilation Solenoid.
  - While the evaporative emission ventilation solenoid is energized, operate the hand vacuum pump and confirm that the solenoid holds vacuum.

(6) Turn the ignition switch to the "LOCK" (OFF) position, and disconnect scan tool MB991958.
(7) Disconnect the hand vacuum pump, and connect hose H to the evaporative emission canister.
(8) Reinstall the fuel tank filler tube protector (Refer to GROUP 13C, Fuel Tank P.13C-9).

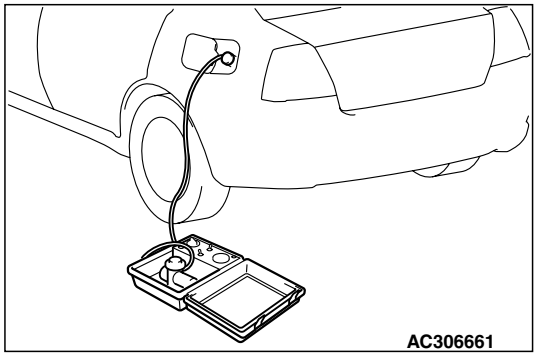
Q: Did the evaporative emission ventilation solenoid hold vacuum?

YES : Go to Step 7.
NO : Replace the evaporative emission ventilation solenoid (Refer to GROUP 17, Evaporative emission canister and fuel tank pressure relief valve removal and installation P.17-102). Then go to Step 15.

STEP 7. Pressure test the evaporative emission system lines from hoses I to N.



(1) Disconnect hose I from the evaporative emission canister, and plug hose I securely.
(2) Confirm that the evaporative emission system pressure pump (Miller number 6872A) is operating properly. Perform the self-test as described in the pump manufacturer's instructions.
(3) Remove the fuel cap.



(4) Connect the evaporative emission system pressure pump (Miller number 6872A) to the fuel tank filler tube by using fuel tank adapter (MLR-8382).
(5) Pressure test the system to determine whether any leaks are present.

NOTE: The "Pressure test" in this procedure refers to the I/M240 Simulation Test. The eight steps of this test are described in the manufacturer's instructions for the evaporative emission system pressure pump, Miller number 6872A.

(6) Remove the evaporative emission system pressure pump (Miller number 6872A) and the fuel tank adapter (MLR-8382), and reinstall the fuel cap.
(7) Connect hose I to the evaporative emission canister.

Q: Is the evaporative emission system line free of leaks?

YES : Go to Step 13.
NO : Go to Step 8.

STEP 8. Check for leaks in evaporative emission hoses I through K.

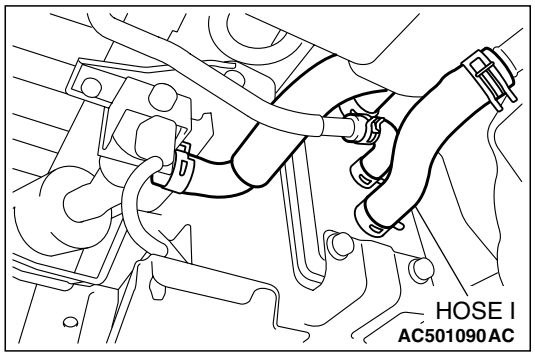
(1) Remove the fuel tank filler tube protector (Refer to GROUP 13C, Fuel Tank P.13C-9).

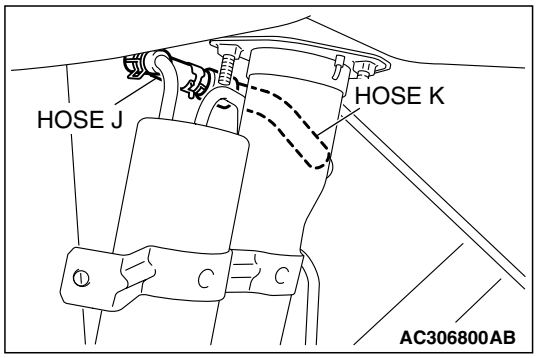
(2) Use a hand vacuum pump to test each hose from hose I to hose K.

Q: Do the hoses hold vacuum?

YES : Go to Step 9.

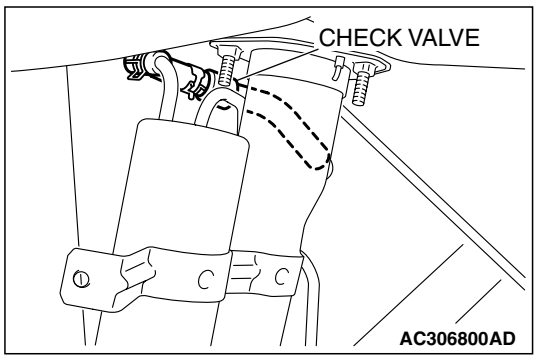
NO : Replace any damaged hose. Then go to Step 15.





STEP 9. Test check valve.

(1) Check valve is a one-way check valve.

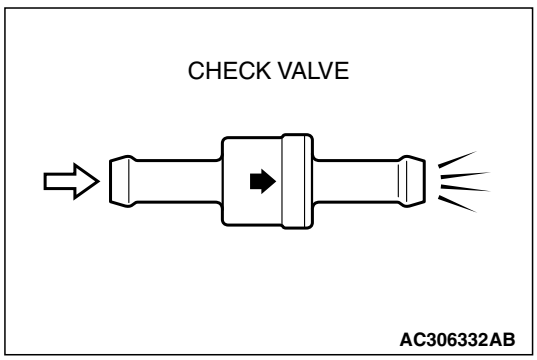


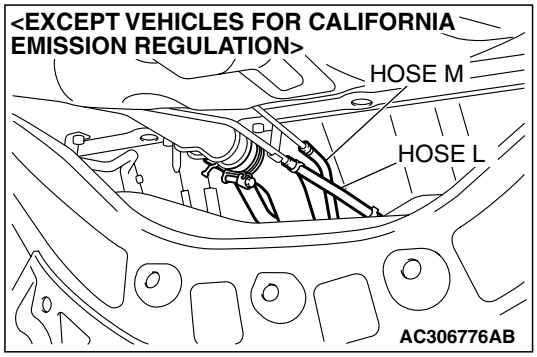
(2) Check valve should allow air to flow in only one direction.

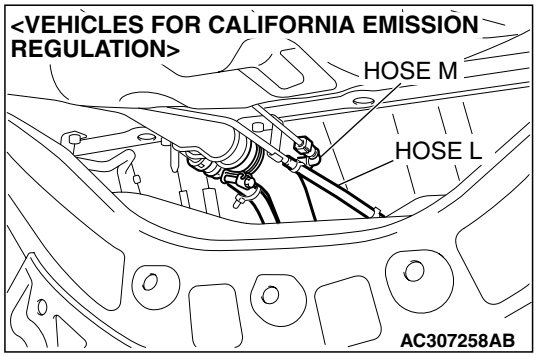
Q: Does check valve allow air to pass in one direction only?

YES : Go to Step 10.

NO : Replace check valve, and reinstall the fuel tank filler tube protector (Refer to GROUP 13C, Fuel Tank P.13C-9). Then go to Step 15.







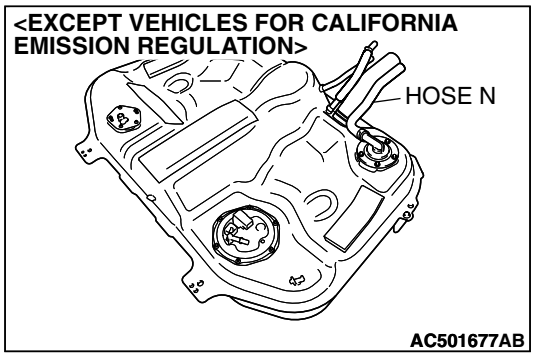
STEP 10. Check for leaks in evaporative emission hoses L and M.

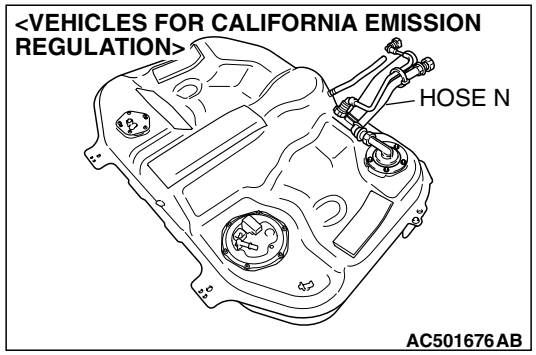
Use a hand vacuum pump to test each hose L and M.

Q: Do the hoses hold vacuum?

YES : Go to Step 11.

NO : Replace any damaged hose. Then go to Step 15.





STEP 11. Check for leaks in evaporative emission hose N.

(1) Remove the fuel tank assembly (Refer to GROUP 13C, Fuel Tank P.13C-9).

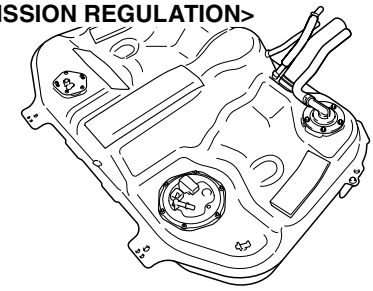
(2) Use the hand vacuum pump to check the hose N.

Q: Is the hose hold vacuum?

YES : Go to Step 12.

NO : Replace the hose and reinstall the fuel tank assembly (Refer to GROUP 13C, Fuel Tank P.13C-9). Then go to Step 15.

<EXCEPT VEHICLES FOR CALIFORNIA EMISSION REGULATION>



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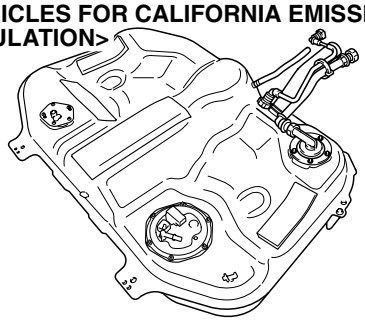

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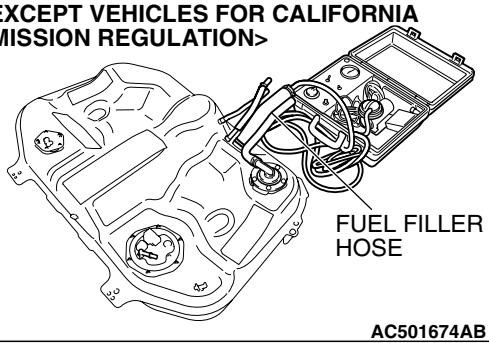
STEP 12. Check for leaks in the fuel tank.

(1) Visually check for cracks or other leaks in the fuel tank.

NOTE: Carefully check the fuel pump module and the fuel tank differential pressure sensor installation in the fuel tank.

<EXCEPT VEHICLES FOR CALIFORNIA EMISSION REGULATION>



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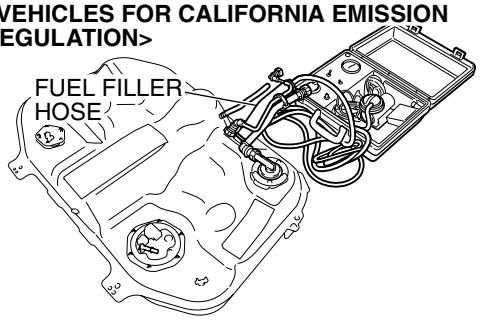

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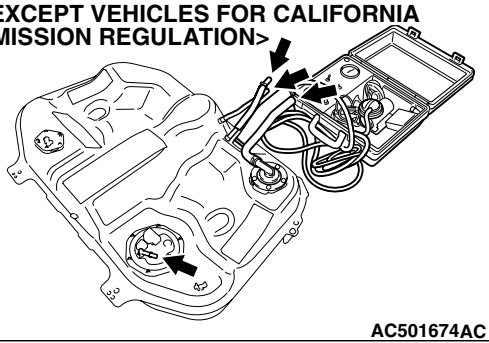
(2) Connect the evaporative emission system pressure pump (Miller number 6872A) to the fuel filler hose.

<EXCEPT VEHICLES FOR CALIFORNIA EMISSION REGULATION>



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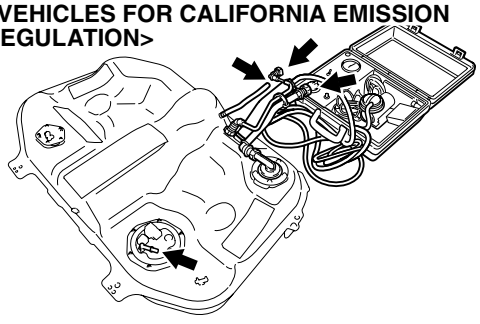

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(3) Plug the hose and the nipple shown in the illustration.

NOTE: If these items are not securely plugged now, the fuel could leak in the next step.

(4) Pressurize the fuel tank with the evaporative emission system pressure pump.

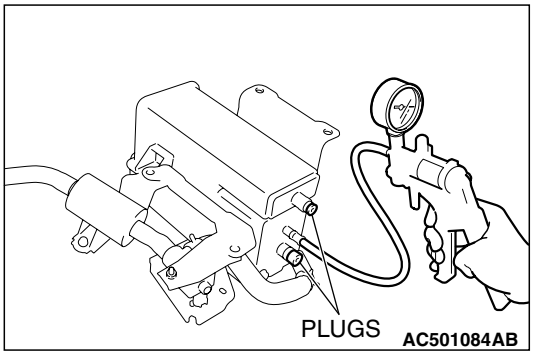
(5) In the pressurized state, check for leaks by applying a soapy water solution to each section and look for bubbles.

Q: Are any leaks found?

YES <When there is a leak from the attachment points of the fuel pump module, fuel tank differential pressure sensor, fuel level sensor (sub) or leveling valve.> : Reassemble the leaked parts and check again that there are no leaks. Then reinstall the fuel tank (Refer to GROUP 13C, Fuel Tank P.13C-9). Then go to Step 15.

YES <When there is a leak from the fuel tank.> : Replace the fuel tank (Refer to GROUP 13C, Fuel Tank P.13C-9). Go to Step 15.

NO : When there is no leak, reinstall the fuel tank (Refer to GROUP 13C, Fuel Tank P.13C-9). Then go to Step 14.

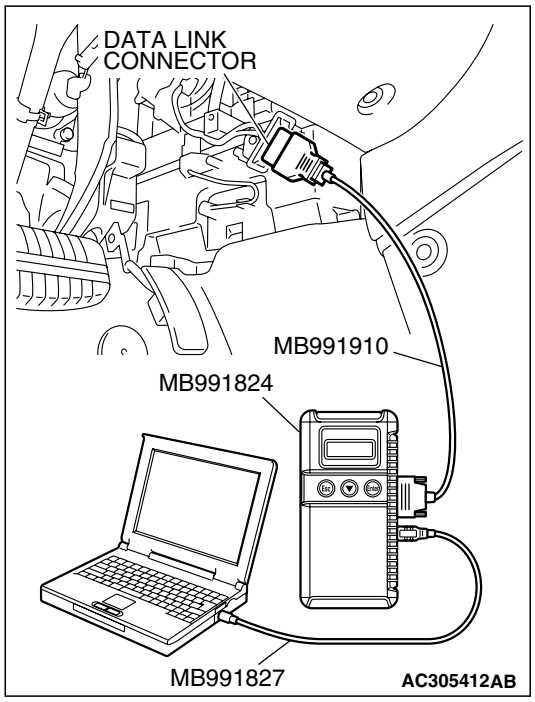


STEP 13. Check the evaporative emission canister for vacuum leaks.

(1) Remove the evaporative emission canister (Refer to GROUP 17, Evaporative Emission Canister and Fuel Tank Pressure Relief Valve P.17-102).
(2) Connect a hand vacuum pump to the evaporative emission canister and plug the other nipples.
(3) Apply a pressure on the hand vacuum pump, and confirm that air is maintained.
(4) Disconnect the hand vacuum pump and remove the plugs, and then install the evaporative emission canister (Refer to GROUP 17, Evaporative Emission Canister and Fuel Tank Pressure Relief Valve P.17-102).

Q: Is the evaporative emission canister in good condition?

YES : Go to Step 14.
NO : Replace the evaporative emission canister (Refer to GROUP 17, Evaporative Emission Canister and Fuel Tank Pressure Relief Valve P.17-102). Then go to Step 15 .



STEP 14. Using scan tool MB991958, check the evaporative emission system monitor test.

⚠ 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.**
- **During this test, the PCM automatically increases the engine speed to 1,600 r/min or greater. Check that the transaxle is set to the "P" position.**

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Erase the DTCs using scan tool MB991958.
(4) Check that the fuel cap is securely closed (Tighten until three clicks are heard).
(5) Start the engine.
(6) Select "System Test."
(7) Select "Evap Leak Mon."
(8) During the test, keep the accelerator pedal at the idle position.
(9) Keep the engine speed and engine load within the specified range. When the monitor test starts, the "In Progress" item on scan tool MB991958 will change from "NO" to "YES."
(10) Turn the ignition switch to the "LOCK" (OFF) position. Disconnect scan tool MB991958.

Q: Is "Evap Leak Mon. Completed. Test Failed and DTCs Set" displayed on scan tool MB991958?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Ignition Switch – Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 15.

NO <"Evap Leak Mon. Completed. Test Passed" is displayed on scan tool MB991958.> : The evaporative emission system is working properly at this time. Go to Step 15 .

NO <"Evap Leak Mon. Discontinued. Retest again from the first" is displayed on scan tool MB991958.> : The EVAP monitor has been interrupted during the test. Turn the ignition switch to the "LOCK" (OFF) position once, and repeat the monitoring from Step 14.

STEP 15. Perform the OBD-II drive cycle.

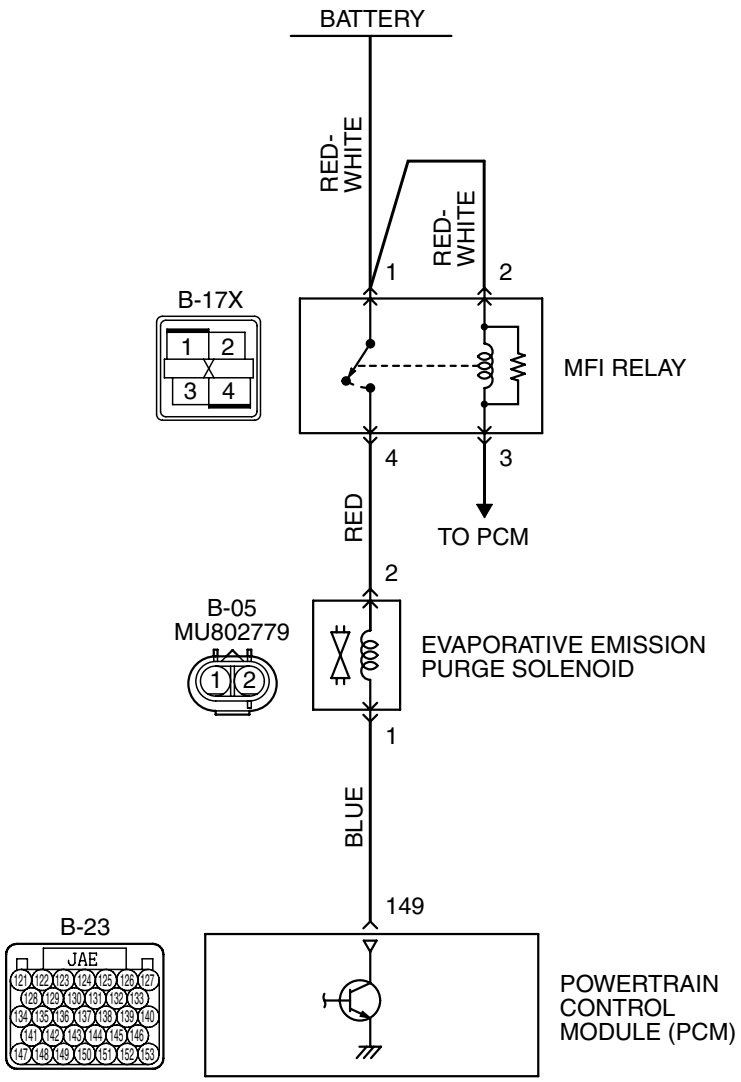
(1) Confirm the repair by performing the appropriate drive cycle (Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 5 P.13A-9).
(2) Read the DTC.

Q: Is DTC P0442 set?

YES : Repeat the troubleshooting from Step 1.
NO : The procedure is complete.

DTC P0443: Evaporative Emission Control System Purge Control Valve Circuit

Evaporative Emission Purge Solenoid Circuit



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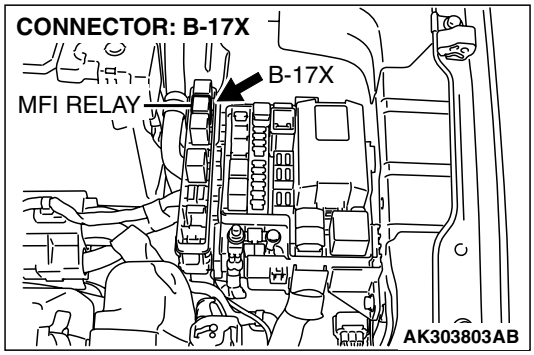
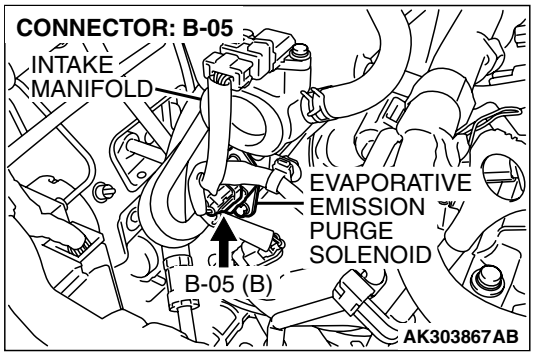
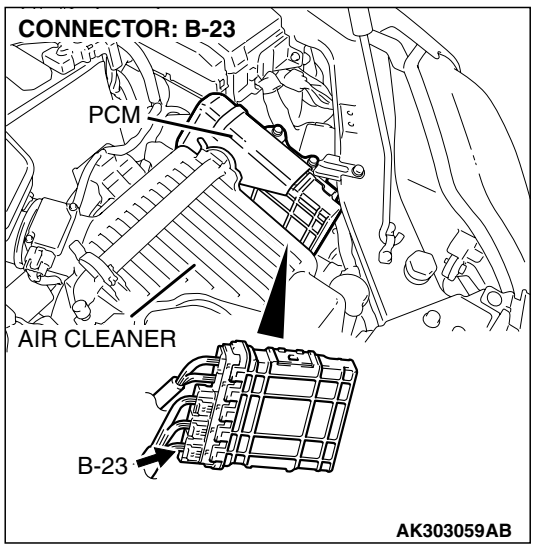




TSB Revision



CIRCUIT OPERATION

- The evaporative emission purge solenoid power is supplied from the MFI relay (terminal No. 4).
- The PCM controls ground evaporative emission purge solenoid by turning the power transistor in the PCM "ON" and "OFF".

TECHNICAL DESCRIPTION

- To judge if there is open circuit in the evaporative emission purge solenoid drive circuit, the PCM measures the surge voltage of the evaporative emission purge solenoid coil.

DESCRIPTIONS OF MONITOR METHODS

Off-surge does not occur after solenoid is operated from on to off.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

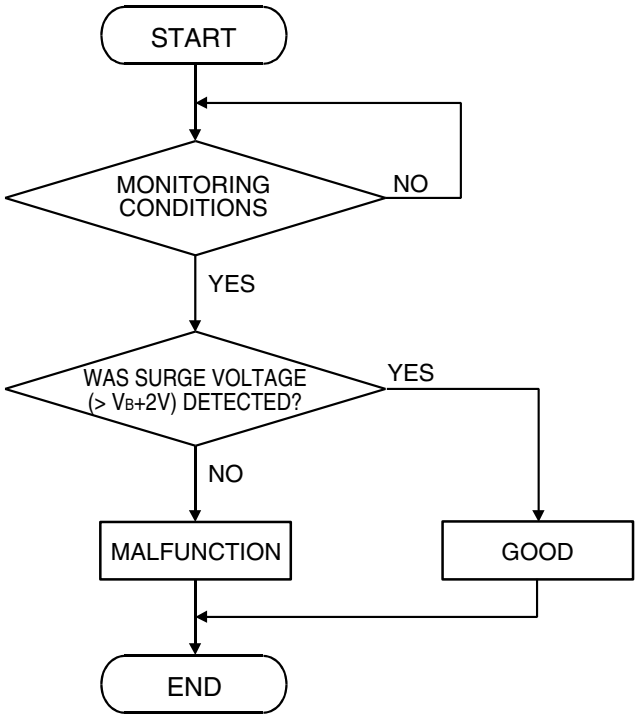
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



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Check Conditions
- Engine is being cranked.
- Battery positive voltage is between 10 and 16.5 volts.

Judgement Criteria
- The evaporative emission purge solenoid coil surge voltage (battery positive voltage + 2 volts) is not detected for 0.2 second.
- The PCM monitors for this condition once during the drive cycle.

Check Conditions
- Battery positive voltage is between 10 and 16.5 volts.
- ON duty cycle of the evaporative emission purge solenoid is between 10 and 90 percent.
- Evaporative emission ventilation solenoid is off.
- More than 1 second has elapsed after the above mentioned conditions have been met.

Judgement Criterion
- The evaporative emission purge solenoid coil surge voltage (battery positive voltage + 2 volts) is not detected for 1 second after the evaporative emission purge solenoid is turned off.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 24 P.13A-9.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)
- Evaporative emission purge solenoid failed.
- Open or shorted evaporative emission purge solenoid circuit, harness damage, or connector damage.
- PCM failed.

DIAGNOSIS

Required Special Tools:
- MB991958: Scan tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.

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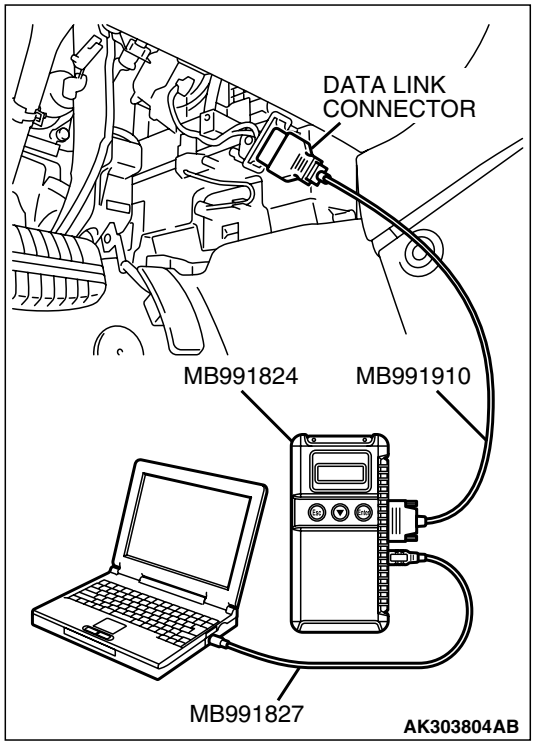
- MB991827: USB Cable
- MB991910: Main Harness A
- MB991923: Power Plant ECU Check Harness

STEP 1. Using scan tool MB991958, check actuator test item 10: Evaporative Emission Purge Solenoid.

⚠ 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 10, Evaporative emission purge solenoid.
- An operation sound should be heard and vibration should be felt when the evaporative emission purge solenoid is operated.

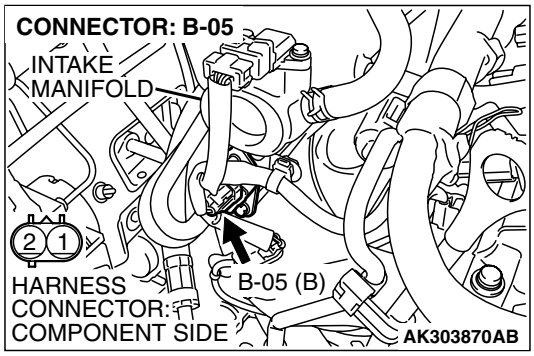
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the solenoid operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points – How Cope with Intermittent Malfunctions P.00-14.

NO : Go to Step 2.

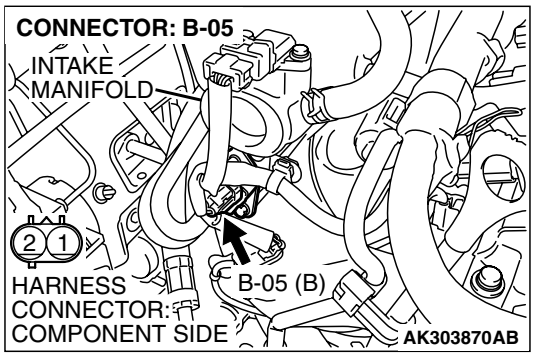
STEP 2 Check harness connector B-05 at the evaporative emission purge solenoid for damage.



Q: Is the harness connector in good condition?

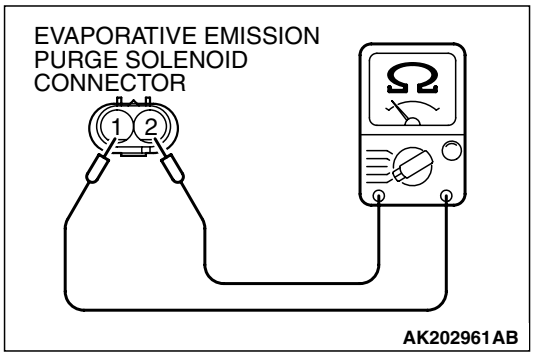
YES : Go to Step 3.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.



STEP 3 Check the evaporative emission purge solenoid.

(1) Disconnect the evaporative emission purge solenoid connector B-05.



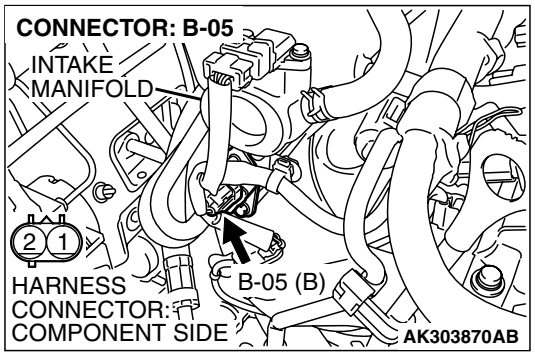
(2) Measure the resistance between evaporative emission purge solenoid side connector terminal No. 1 and No. 2.

Standard value: 30 – 34 Ω [at 20°C (68°F)]

Q: Is the measured resistance between 30 and 34 ohms [at 20°C (68°F)]?

YES : Go to Step 4.

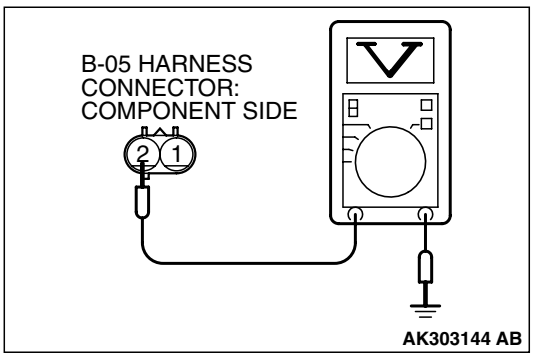
NO : Replace the evaporative emission purge solenoid. Then go to Step 12.



STEP 4. Measure the power supply voltage at evaporative emission purge solenoid harness side connector B-05.

(1) Disconnect the connector B-05 and measure at the harness side.

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



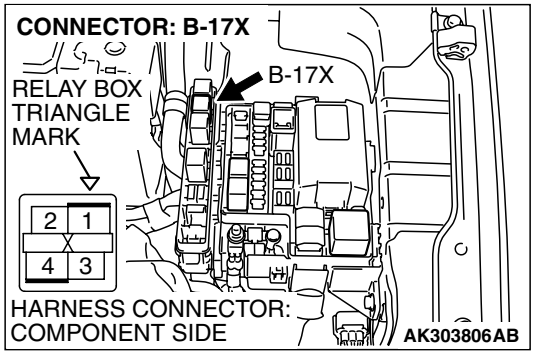
(3) Measure the voltage between terminal No. 2 and ground.
- Voltage should be battery positive voltage.

(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 : Go to Step 5.

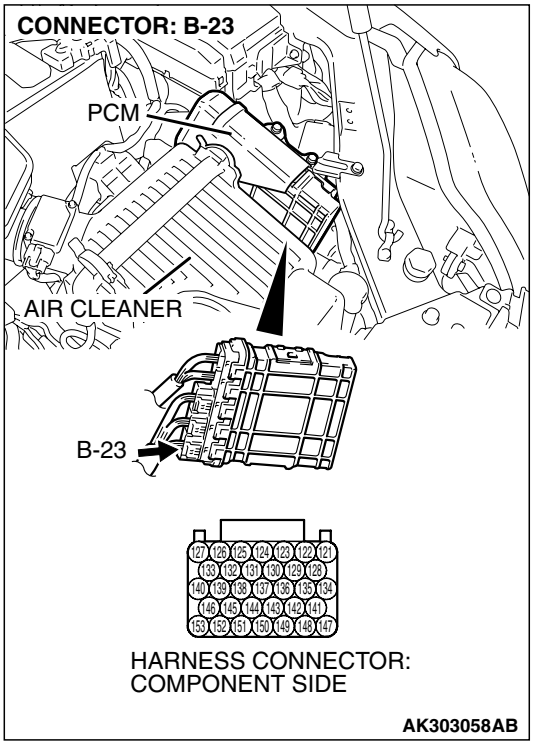


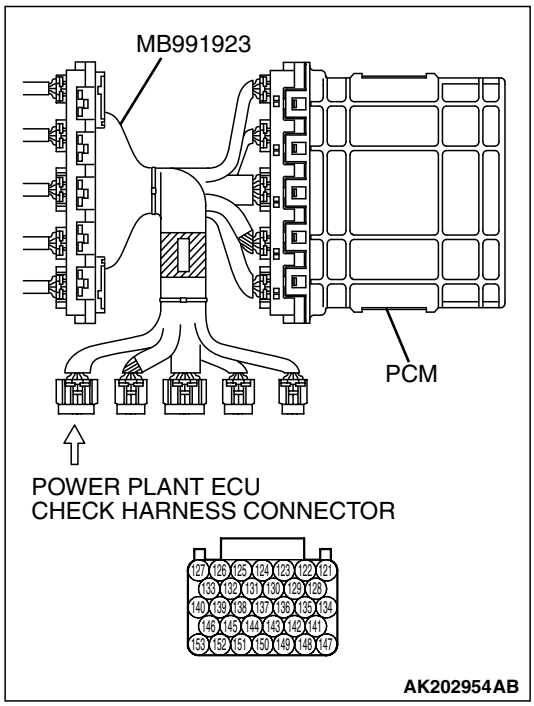
STEP 5. Check harness connector B-17X at MFI relay for damage.

Q: Is the harness connector in good condition?

YES : Repair harness wire between MFI relay connector B-17X (terminal No. 4) and evaporative emission purge solenoid connector B-05 (terminal No. 2) because of open circuit or short circuit to ground. Then go to Step 12.

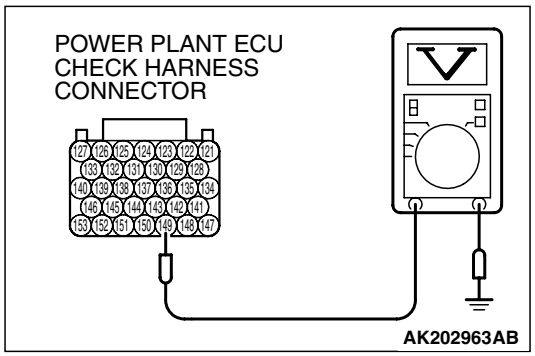
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.





STEP 6. Measure the power supply voltage at PCM connector B-23 by using power plant ECU check harness special tool MB991923.

(1) Disconnect all PCM connectors. Connect the power plant ECU check harness special tool MB991923 between the separated connectors.
(2) Turn the ignition switch to the "ON" position.



(3) Measure the voltage between terminal No. 149 and ground.
- Voltage should be battery positive voltage.

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

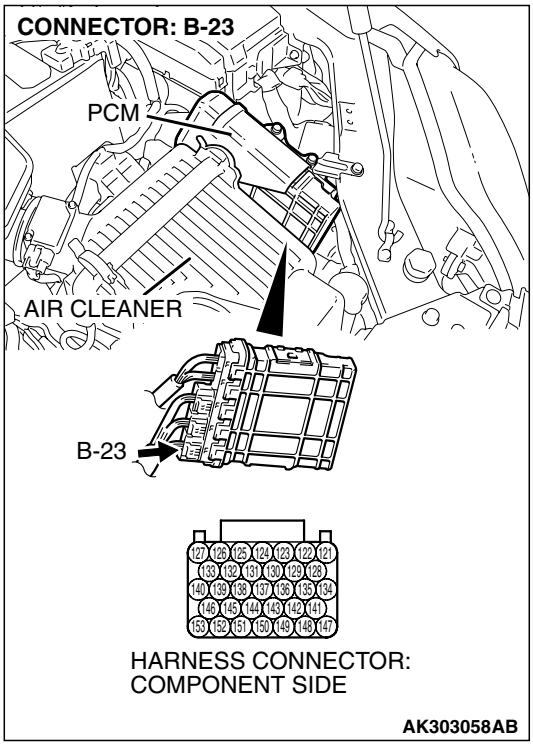
Q: Is battery positive voltage (approximately 12 volts) present?

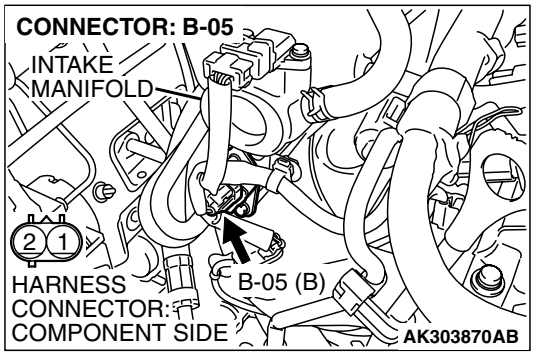
YES : Go to Step 9.
NO : Go to Step 7.

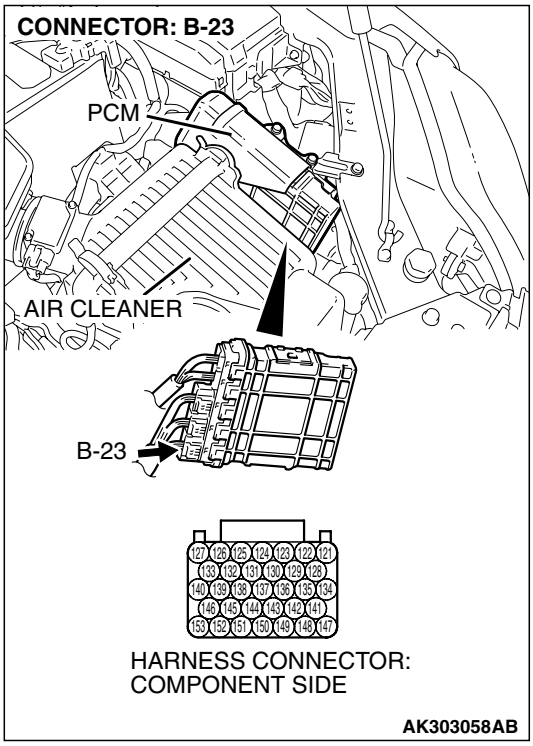
STEP 7. Check harness connector B-23 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 8.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.





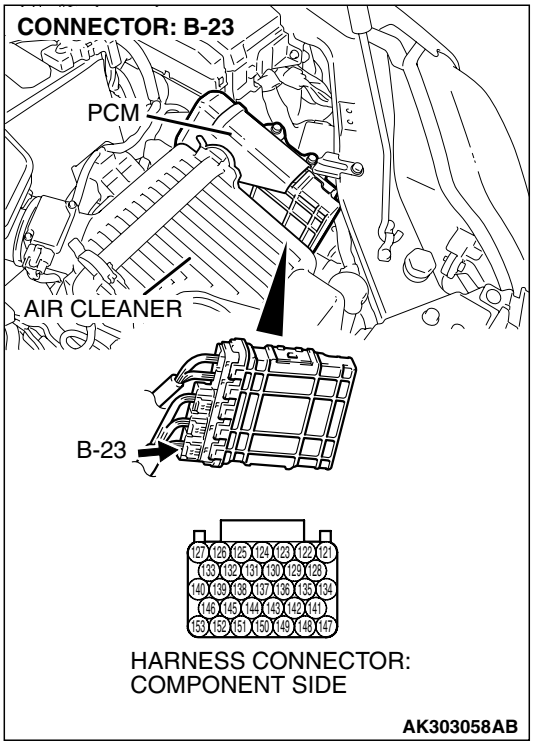


STEP 8. Check for open circuit and short circuit to ground between evaporative emission purge solenoid connector B-05 (terminal No. 1) and PCM connector B-23 (terminal No. 149).

Q: Is the harness wire in good condition?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 12.

NO : Repair it. Then go to Step 12.

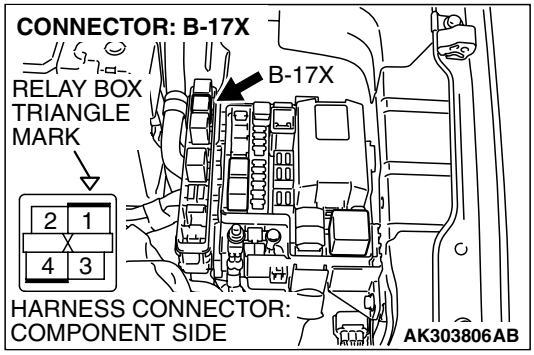


STEP 9. Check harness connector B-23 at PCM for damage.

Q: Is the harness 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 go to Step 12.

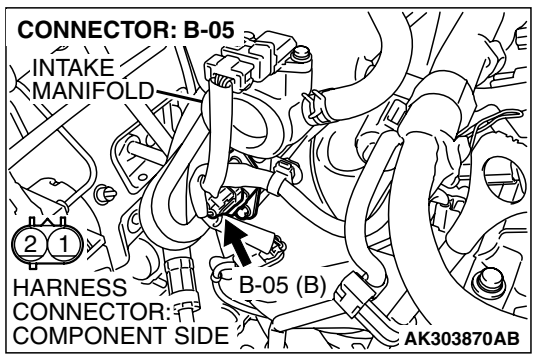


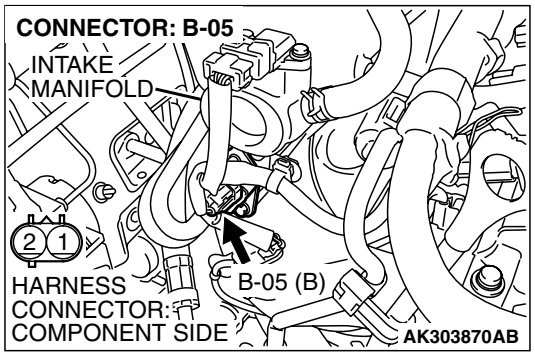
STEP 10. Check for harness damage between MFI relay connector B-17X (terminal No. 4) and evaporative emission purge solenoid connector B-05 (terminal No. 2).

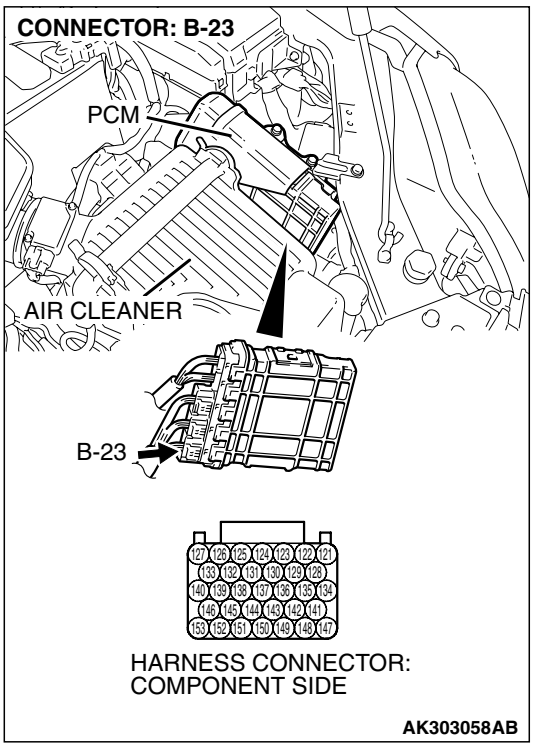
Q: Is the harness wire in good condition?

YES : Go to Step 11.

NO : Repair it. Then go to Step 12.







STEP 11. Check for harness damage between evaporative emission purge solenoid connector B-05 (terminal No. 1) and PCM connector B-23 (terminal No. 149).

Q: Is the harness wire in good condition?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 12.

NO : Repair it. Then go to Step 12.

STEP 12. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 24 P.13A-9.

(2) Check the diagnostic trouble code (DTC).

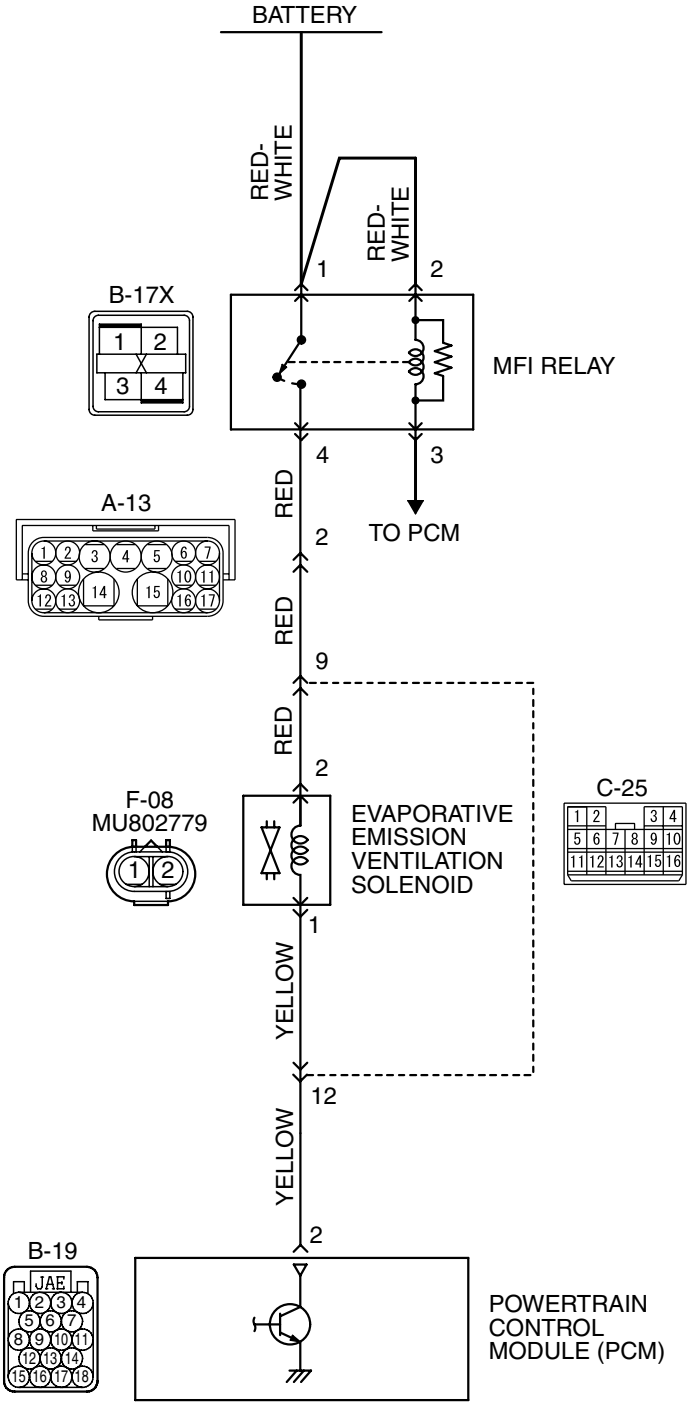
Q: Is DTC P0443 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0446: Evaporative Emission Control System Vent Control Circuit

Evaporative Emission Ventilation Solenoid Circuit



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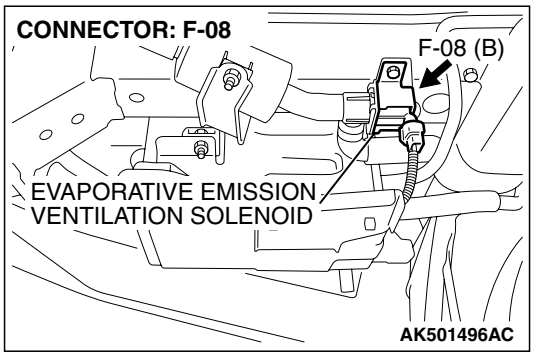

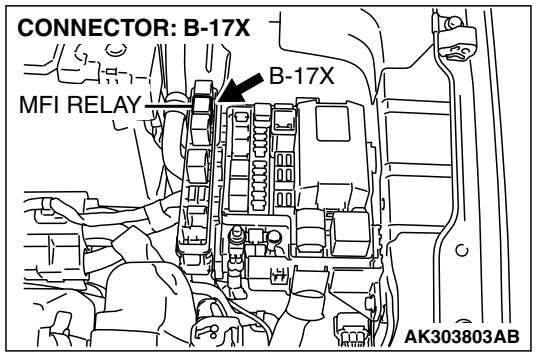

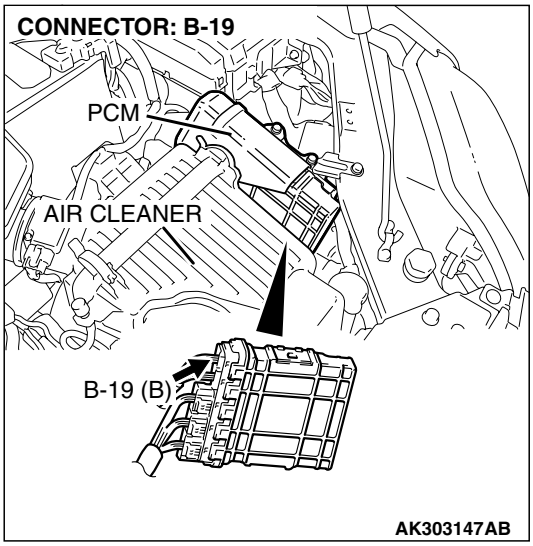

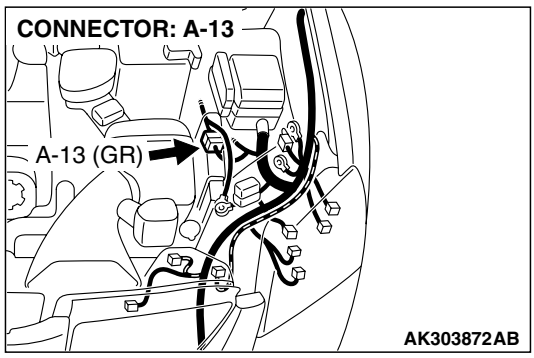

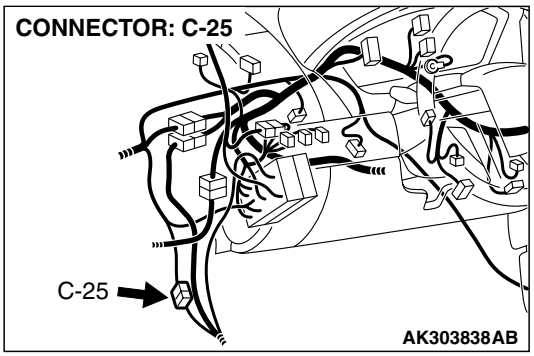

CIRCUIT OPERATION

- The evaporative emission ventilation solenoid power is supplied from the MFI relay (terminal No. 4).
- The PCM controls the evaporative emission ventilation solenoid ground by turning the power transistor in the PCM ON and OFF.

TECHNICAL DESCRIPTION

- To judge if there is open circuit in the evaporative emission ventilation solenoid drive circuit, PCM measures the surge voltage of the evaporative emission ventilation solenoid coil.
- The PCM drives the evaporative emission ventilation solenoid. After the solenoid is turned off, the PCM will check if the solenoid coil produces a surge voltage (battery positive voltage + 2 volts).

DESCRIPTIONS OF MONITOR METHODS

Off-surge does not occur after solenoid is operated on to off.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

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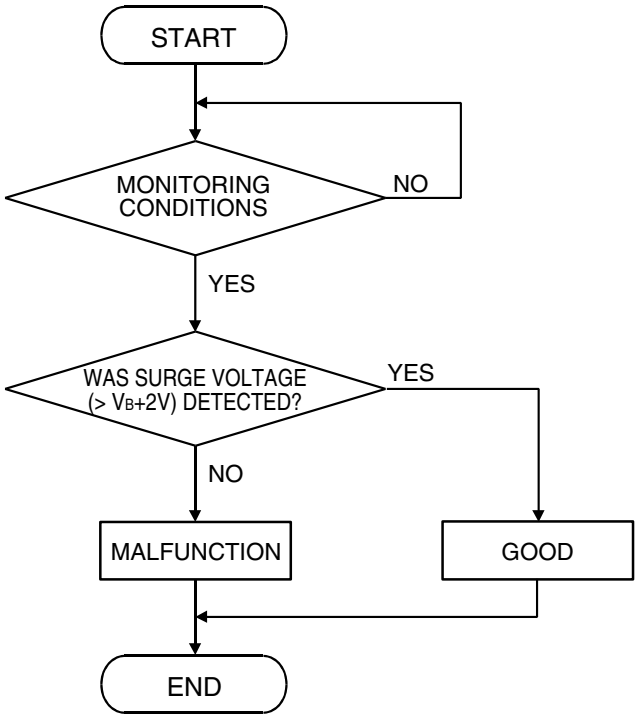
DTC SET CONDITIONS

Logic Flow Chart



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Check Conditions
- Engine is being cranked.
- Battery positive voltage is between 10 and 16.5 volts.

Judgement Criteria
- The evaporative emission ventilation solenoid coil surge voltage (battery positive voltage + 2 volts) is not detected for 0.2 second.
- The PCM monitors for this condition once during the drive cycle.

Check Conditions
- Battery positive voltage is at between 10 and 16.5 volts.
- ON duty cycle of the evaporative emission purge solenoid is 0 percent.
- Evaporative emission ventilation solenoid is ON.
- More than 1 second has elapsed after the above mentioned conditions have been met.

Judgement Criterion
- The evaporative emission ventilation solenoid coil surge voltage (battery positive voltage + 2 volts) is not detected for 1 second after the evaporative emission ventilation solenoid is turned OFF.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 24 P.13A-9.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)
- Evaporative emission ventilation solenoid failed.
- Open or shorted evaporative emission ventilation solenoid circuit, harness damage, or connector damage.
- PCM failed.

DIAGNOSIS

Required Special Tools:
- MB991958: Scan tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.

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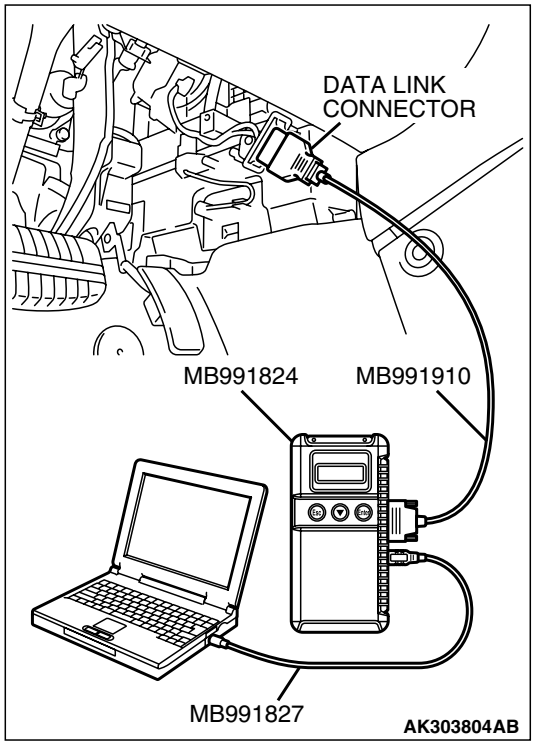
- MB991827: USB Cable
- MB991910: Main Harness A
- MB991923: Power Plant ECU Check Harness

STEP 1. Using scan tool MB991958, check actuator test item 15: Evaporative Emission Ventilation Solenoid.

⚠ 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 15, Evaporative emission ventilation solenoid.
- An operation sound should be heard and vibration should be felt when the evaporative emission ventilation solenoid is operated.

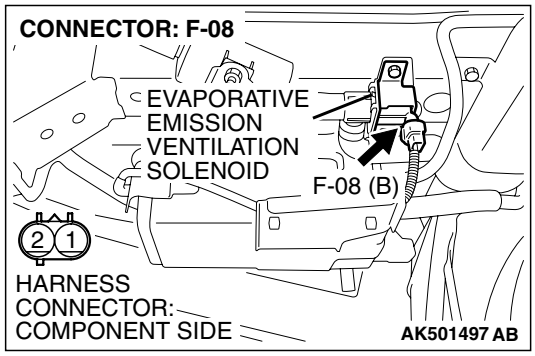
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the solenoid operating properly?

YES : It can be assumed 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 F-08 at the evaporative emission ventilation solenoid for damage.

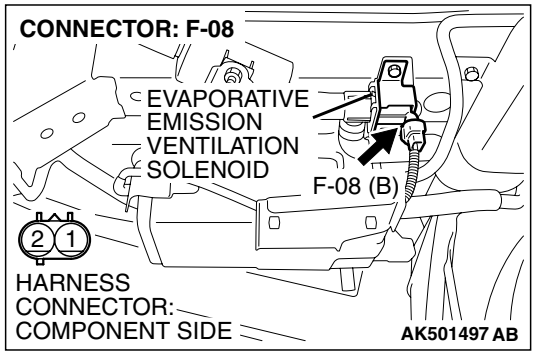


Q: Is the harness connector in good condition?

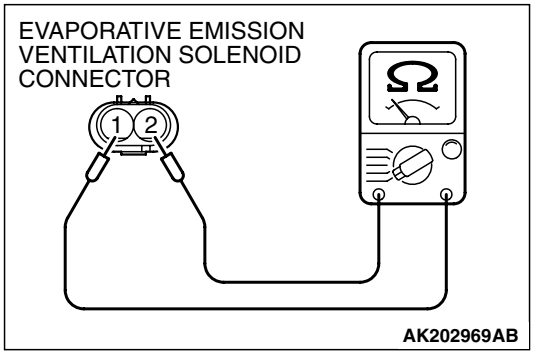
YES : Go to Step 3.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

STEP 3. Check the evaporative emission ventilation solenoid.



(1) Disconnect the evaporative emission ventilation solenoid connector F-08.



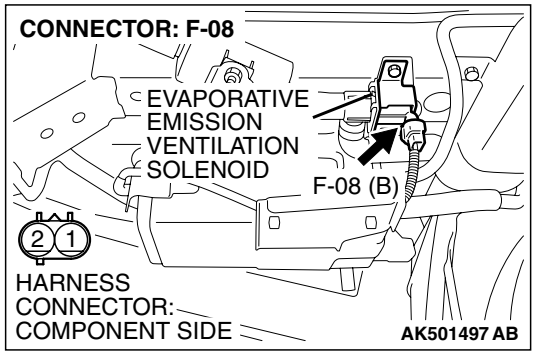
(2) Measure the resistance between evaporative emission ventilation solenoid side connector terminal No. 1 and No. 2.

Standard value: 17 – 21 Ω [at 20°C (68°F)]

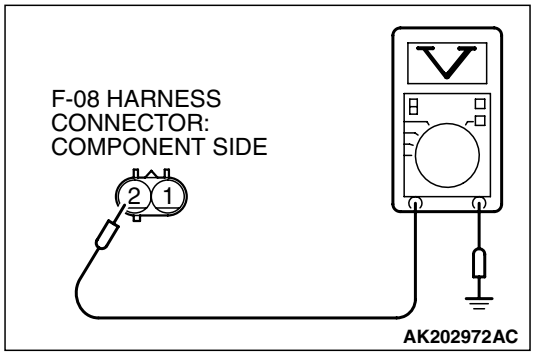
Q: Is the measured resistance between 17 and 21 ohms [at 20°C (68°F)]?

YES : Go to Step 4.
NO : Replace it. Then go to Step 12.

STEP 4. Measure the power supply voltage at evaporative emission ventilation solenoid harness side connector F-08.



(1) Disconnect the connector F-08 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.

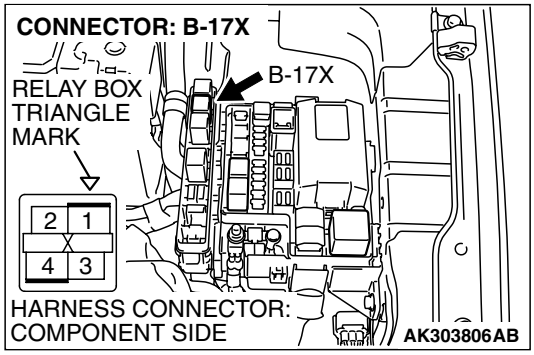


(3) Measure the voltage between terminal No. 2 and ground.
- Voltage should be battery positive voltage.

(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 : Go to Step 5.



STEP 5. Check harness connector B-17X at MFI relay for damage.

Q: Is the harness connector in good condition?

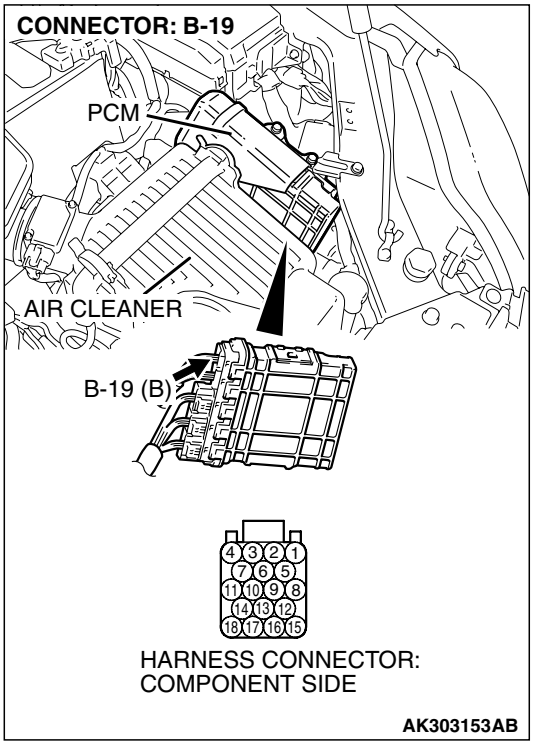
YES : Check connectors A-13 and C-25 at intermediate connectors for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. If intermediate connectors are in good condition, repair harness wire between MFI relay connector B-17X (terminal No. 4) and evaporative emission ventilation solenoid connector F-08 (terminal No. 2) because of open circuit or short circuit to ground. Then go to Step 12.

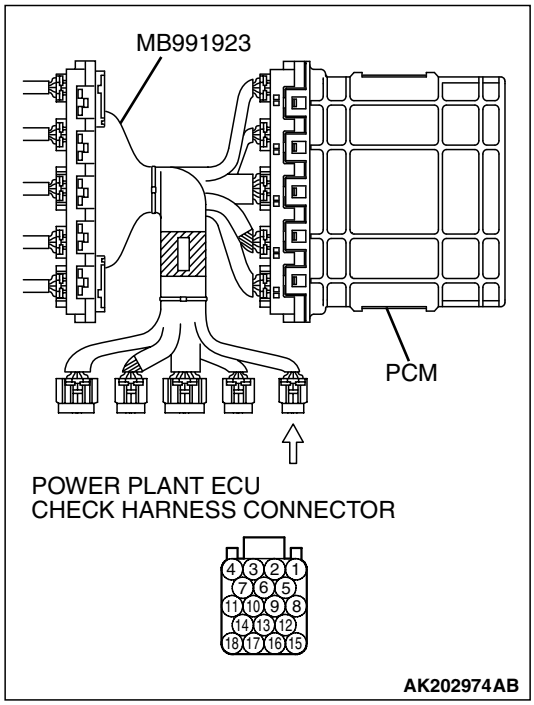
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

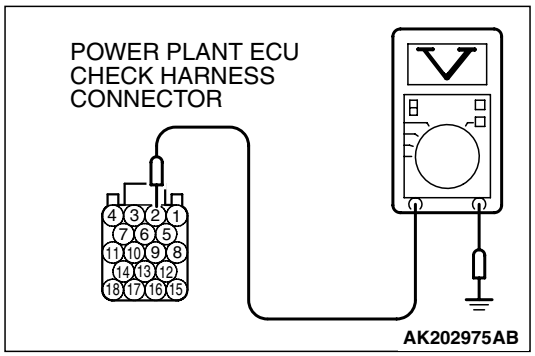
STEP 6. Measure the power supply voltage at PCM connector B-19 by using power plant ECU check harness special tool MB991923.

(1) Disconnect all PCM connectors. Connect the power plant ECU check harness special tool MB991923 between the separated connectors.

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







(3) Measure the voltage between terminal No. 2 and ground.
- Voltage should be battery positive voltage.

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

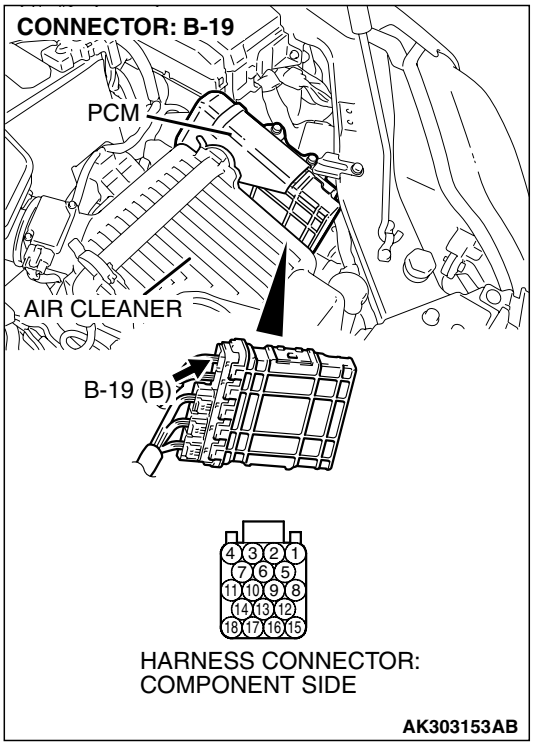
Q: Is battery positive voltage (approximately 12 volts) present?

YES : Go to Step 9.
NO : Go to Step 7.

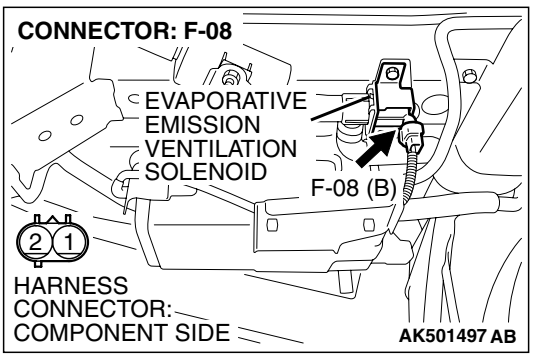
STEP 7. Check harness connector B-19 at PCM for damage.

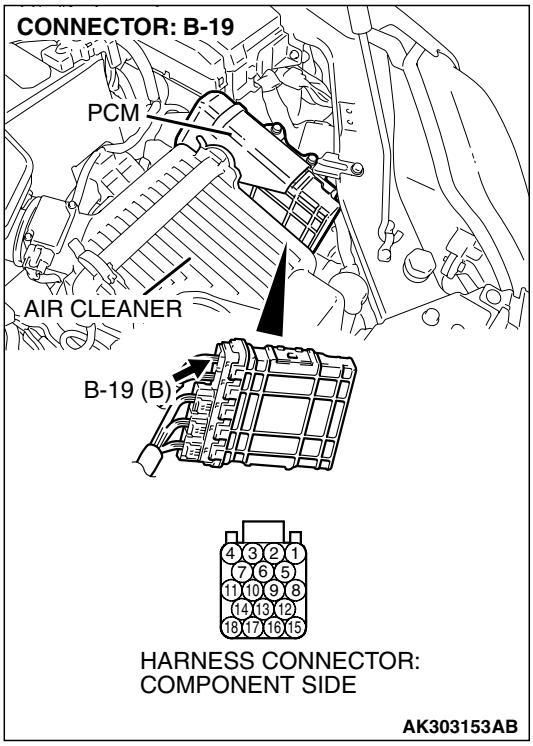
Q: Is the harness connector in good condition?

YES : Go to Step 8.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.



STEP 8. Check for open circuit and short circuit to ground between evaporative emission ventilation solenoid connector F-08 (terminal No. 1) and PCM connector B-19 (terminal No. 2).



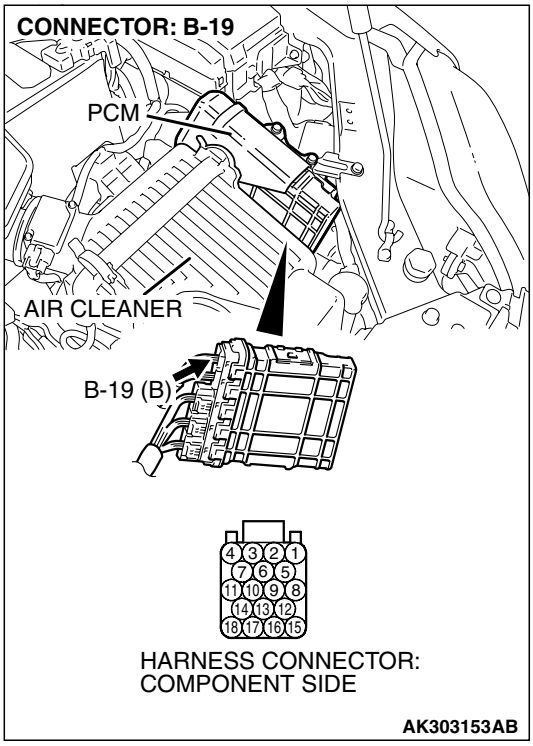


NOTE: Check harness after checking intermediate connector C-26. If intermediate connector is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

Q: Is the harness wire in good condition?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 12.

NO : Repair it. Then go to Step 12.

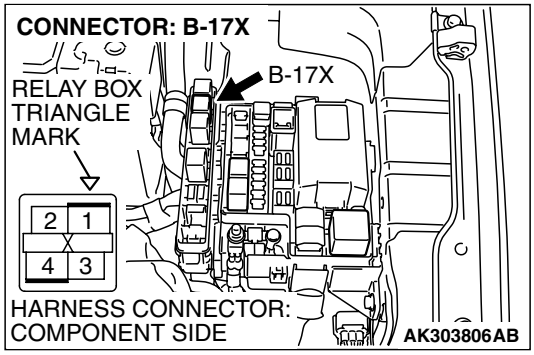


STEP 9. Check harness connector B-19 at PCM for damage.

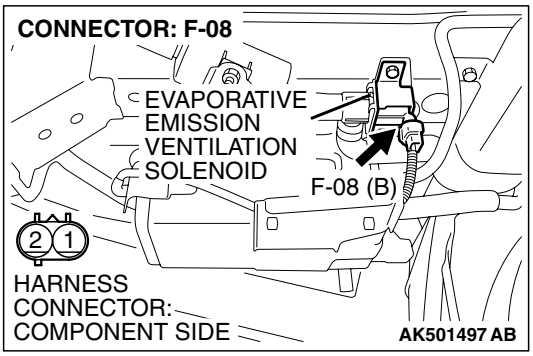
Q: Is the harness connector in good condition?

YES : Go to Step 10.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.



STEP 10. Check for harness damage between MFI relay connector B-17X (terminal No. 4) and evaporative emission ventilation solenoid connector F-08 (terminal No. 2).



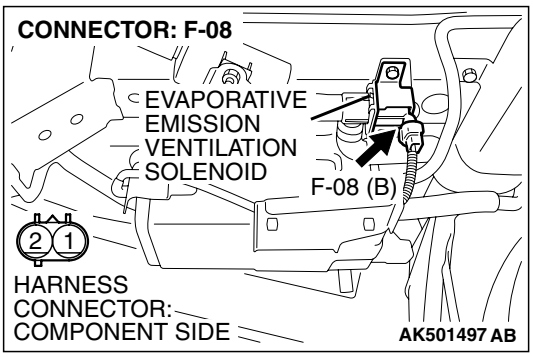
NOTE: Check harness after checking intermediate connectors A-13 and C-25. If intermediate connectors are damaged, repair or replace them. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

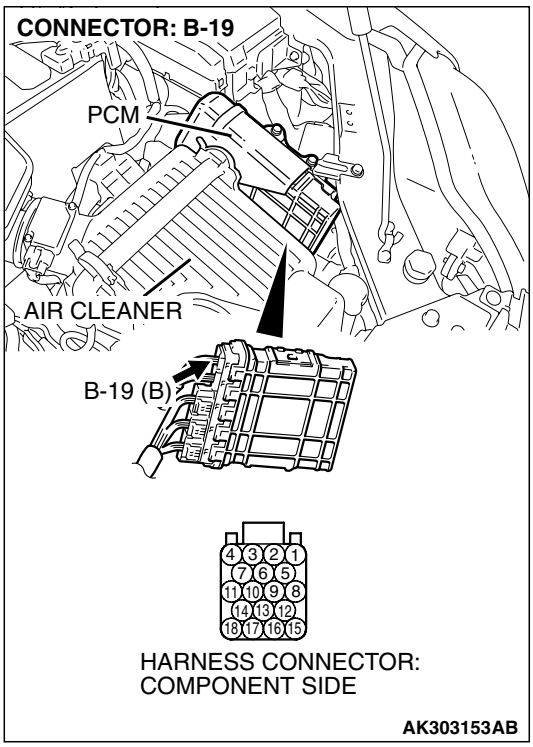
Q: Is the harness wire in good condition?

YES : Go to Step 11.

NO : Repair it. Then go to Step 12.

STEP 11. Check for harness damage between evaporative emission ventilation solenoid connector F-08 (terminal No. 1) and PCM connector B-19 (terminal No. 2).





NOTE: Check harness after checking intermediate connector C-25. If intermediate connector is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

Q: Is the harness wire in good condition?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 12.

NO : Repair it. Then go to Step 12.

STEP 12. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 24 P.13A-9.

(2) Check the diagnostic trouble code (DTC).

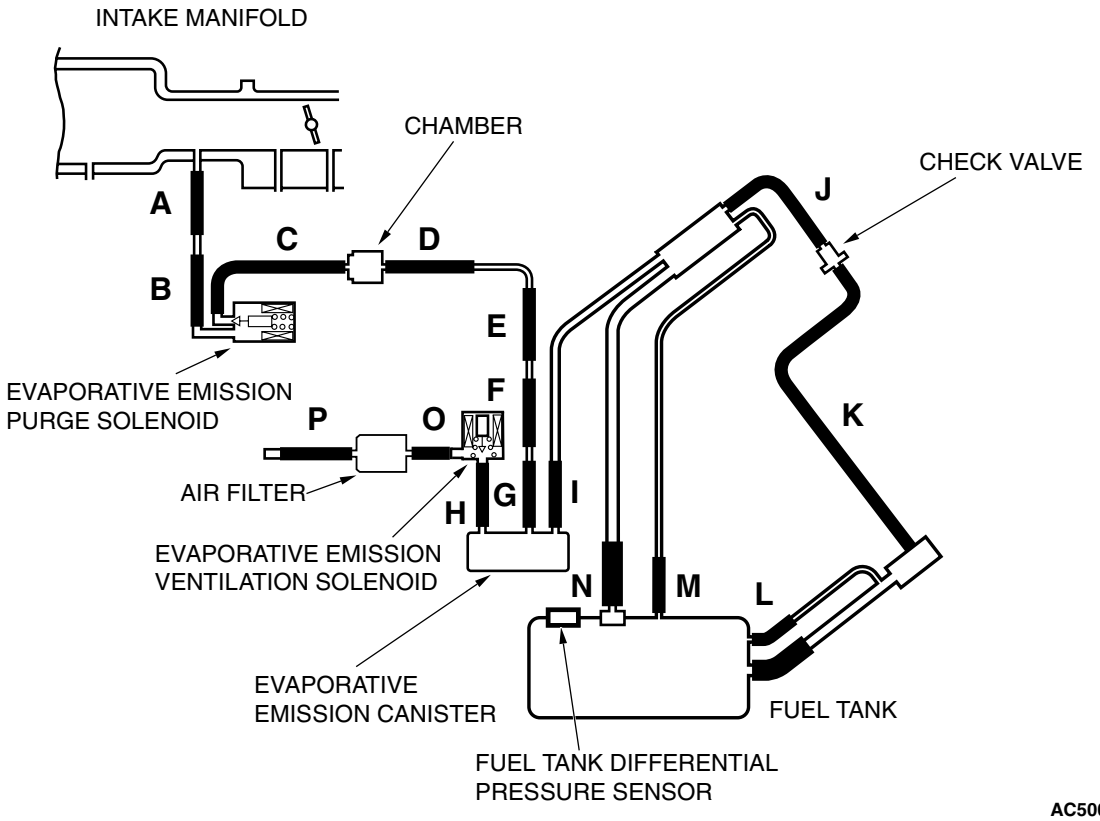
Q: Is DTC P0446 set?

YES : Retry the troubleshooting.

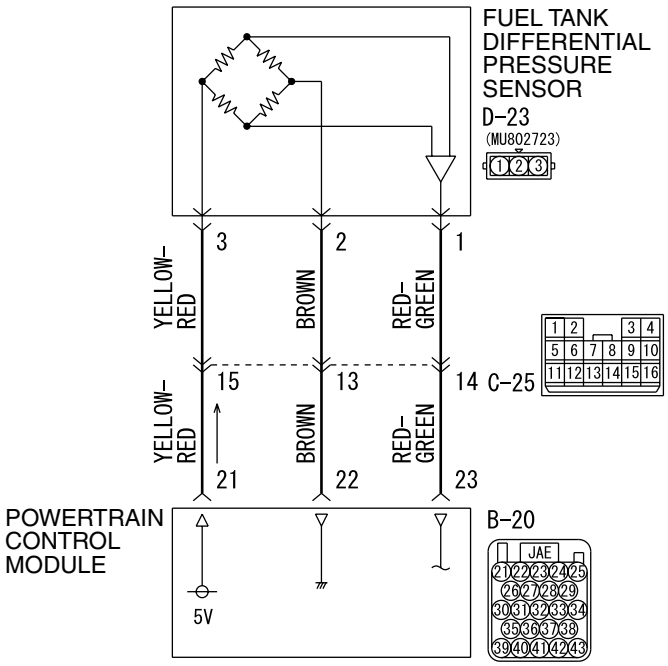
NO : The inspection is complete.

DTC P0450: Evaporative Emission System Pressure Sensor malfunction

SYSTEM DIAGRAM



Fuel Tank Differential Pressure Sensor Circuit



W4P13M02AA
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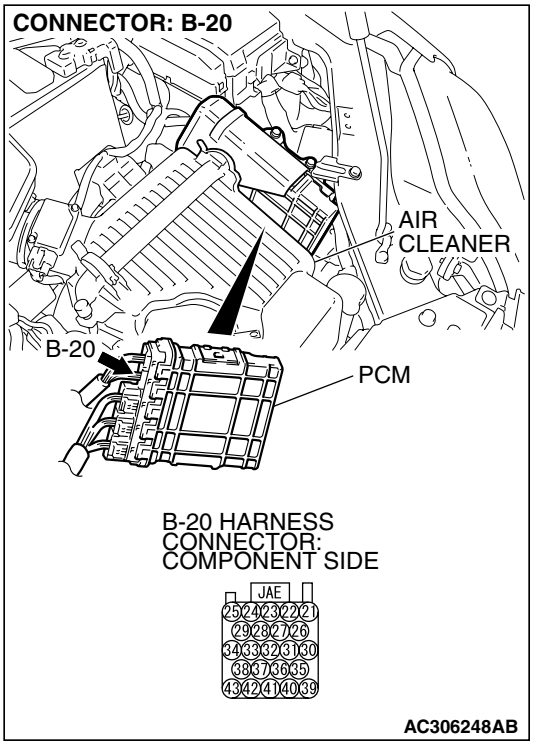
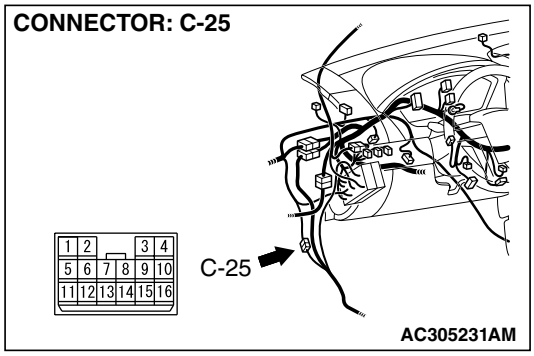
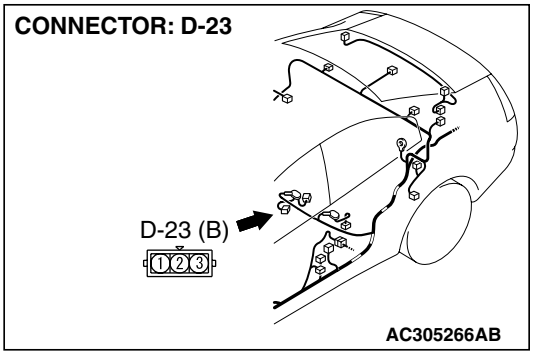




TSB Revision



CIRCUIT OPERATION

- The PCM (terminal 21) supplies a 5-volt reference signal to the fuel tank differential pressure sensor (terminal 3). The fuel tank differential pressure sensor (terminal 2) is grounded through the PCM (terminal 22).
- The fuel tank differential pressure sensor (terminal 1) returns a voltage signal to the PCM (terminal 23) that is proportional to the pressure in the fuel tank.

TECHNICAL DESCRIPTION

- The PCM monitors the fuel tank differential pressure sensor output voltage.
- The PCM determines whether the fuel tank differential pressure sensor signal voltage is within normal operating parameters.

DESCRIPTIONS OF MONITOR METHODS

- Compare purge solenoid status with fuel tank differential pressure sensor output voltage.

MONITOR EXECUTION

- Continuous.

MONITOR EXECUTION CONDITIONS (OTHER MONITOR AND SENSOR)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

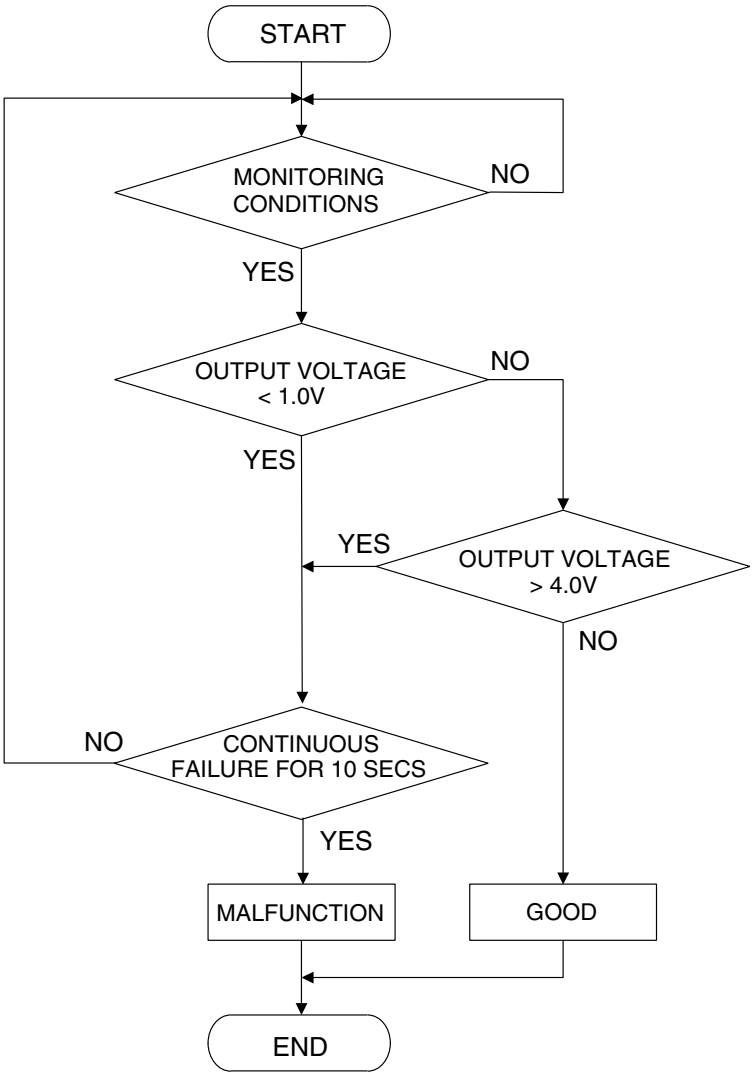
- Evaporative emission purge solenoid monitor
- Evaporative emission ventilation solenoid monitor

Sensor (The sensors below are determined to be normal)

- Mass airflow sensor
- Barometric pressure sensor
- Intake air temperature sensor
- Engine coolant temperature sensor
- Accelerator pedal position sensor

LOGIC FLOW CHARTS (Monitor Sequence)

RATIONALITY - HIGH/LOW



AC401446

DTC SET CONDITIONS

Check Conditions

- Intake air temperature is greater than 5°C (41°F).
- Engine speed is 1,600 r/min or greater.
- Volumetric efficiency is between 20 and 70 percent.

Judgment Criterion

- When the evaporative emission purge solenoid is off, the fuel differential pressure sensor output voltage remains 1.0 volt or less for ten seconds.

Check Conditions

- Intake air temperature is between 5°C (41°F) and 45°C (113°F) or greater.
- Engine speed is 1,600 r/min or greater.
- Volumetric efficiency is between 20 and 70 percent.

Judgment Criterion

- When the evaporative emission purge solenoid valve is fully operational (100 percent ratio), the fuel differential pressure sensor output voltage remains at 4.0 volts or greater for ten seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 5 P.13A-9.

TROUBLESHOOTING HINTS (THE MOST LIKELY CAUSES FOR THIS CODE TO BE SET ARE:)

- Malfunction of the fuel tank differential pressure sensor.
- A damaged harness in the fuel tank differential pressure sensor circuit.
- Malfunction of the PCM.

TSB Revision

OVERVIEW OF TROUBLESHOOTING

- DTC P0450 can be set by a faulty fuel tank differential pressure sensor or related circuit, or PCM failure.
- To check for system blockage, do a performance test which uses a mechanical vacuum gauge and scan tool MB991958 set on the fuel tank differential pressure sensor (TANK PRS SNSR 73). The mechanical gauge reading is used to verify scan tool MB991958 reading. A comparison of the mechanical gauge with the reading on scan tool MB991958 will locate a problem in the system.

DIAGNOSIS

Required Special Tools:

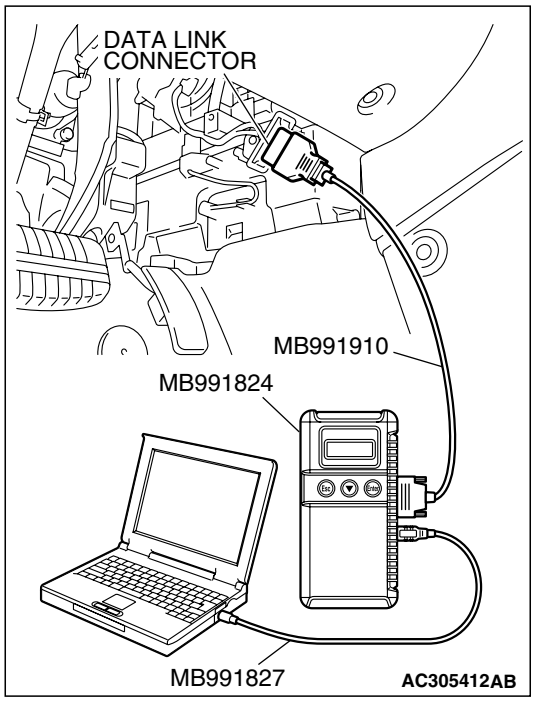
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A
- MB991658: Test Harness Set
- MB991923: Power Plant ECU Check Harness

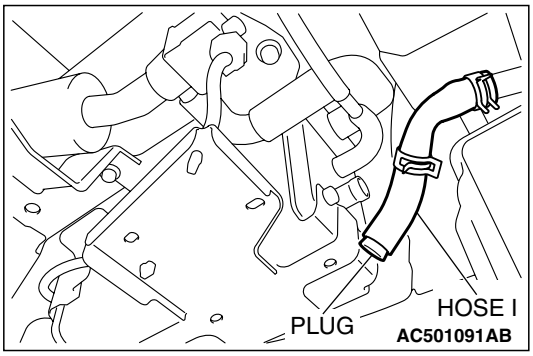
STEP 1. Using scan tool MB991958, check data list item 52: Fuel Tank Differential Pressure Sensor.

⚠ CAUTION

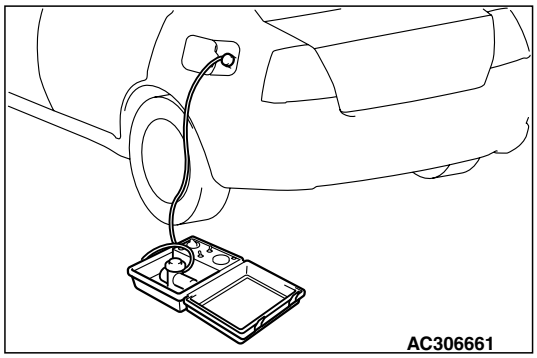
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.





(2) Disconnect hose I from the evaporative emission canister, and plug the hose.
(3) Turn the ignition switch to the "ON" position.
(4) Remove the fuel cap.
(5) Set scan tool MB991958 to the data reading mode.
- Item 52, Fuel Tank Differential Pressure Sensor.
  - The fuel tank pressure reading on the scan tool should be 2,050 to 2,950 mV.



(6) Connect the evaporative emission system pressure pump (Miller number 6872A) to the fuel tank filler tube by using fuel tank adapter (MLR-8382) and pressurize the fuel tank.
- The fuel tank pressure reading should increase.

(7) Turn the ignition switch to the "LOCK" (OFF) position. Then disconnect scan tool MB991958.
(8) Remove the evaporative emission system pressure pump (Miller number 6872A) and the fuel tank adapter (MLR-8382), and reinstall the fuel cap.
(9) Connect hose I to the evaporative emission canister.

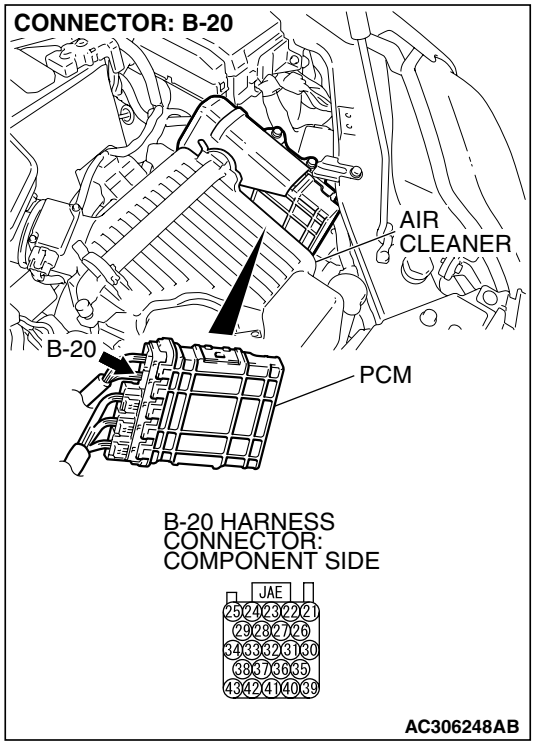
Q: Is the fuel tank pressure between 2,050 to 2,950 mV?

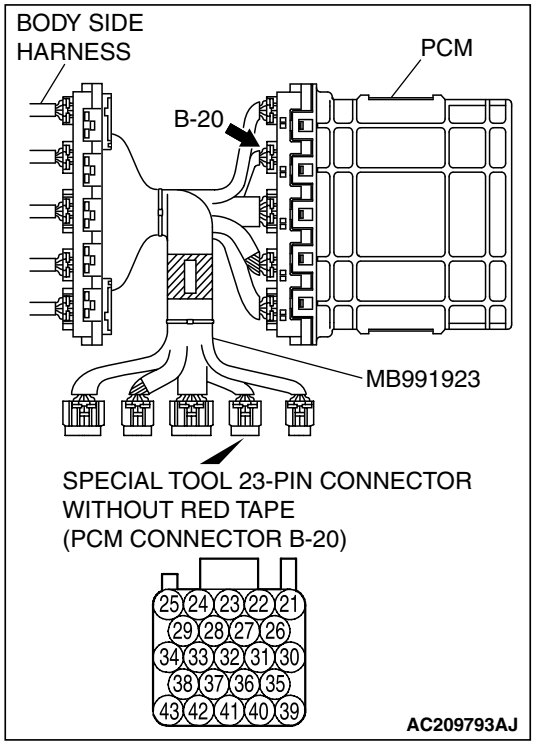
YES : It can be assumed that this malfunction is intermittent (Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-14). Go to Step 17.

NO : Go to Step 2.

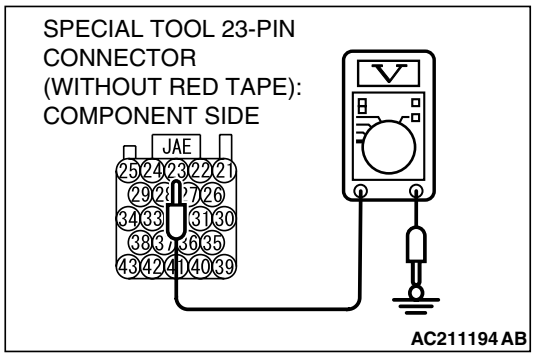
STEP 2. Measure the sensor output voltage at PCM connector B-20 by using check harness special tool MB991923.

(1) Disconnect all the connectors from the PCM.





(2) Connect special tool MB991923 (check harness) between the PCM and the body-side harness connector.
(3) Turn the ignition switch to the "ON" position.
(4) Remove the fuel cap.



(5) Measure the voltage between terminal 23 and ground.
- The voltage should measure between 2.0 and 3.0 volts.

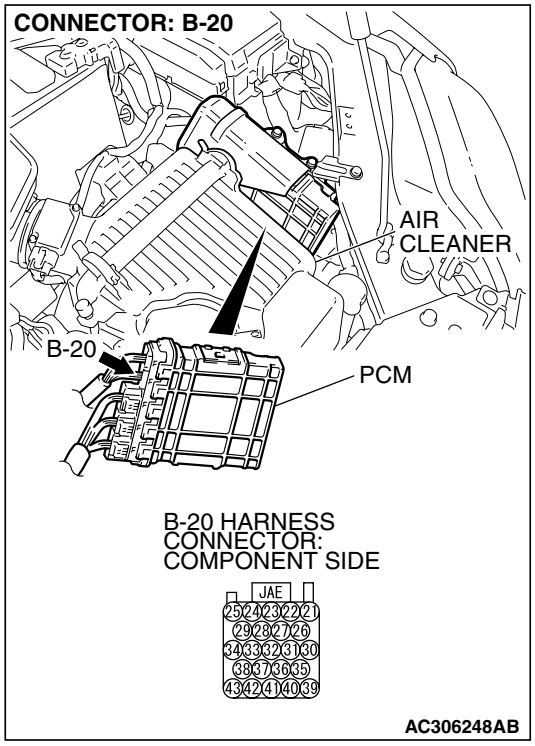
(6) Install the fuel cap.
(7) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the measured voltage between 2.0 and 3.0 volts?

YES : Go to Step 16.
NO : Go to Step 3.

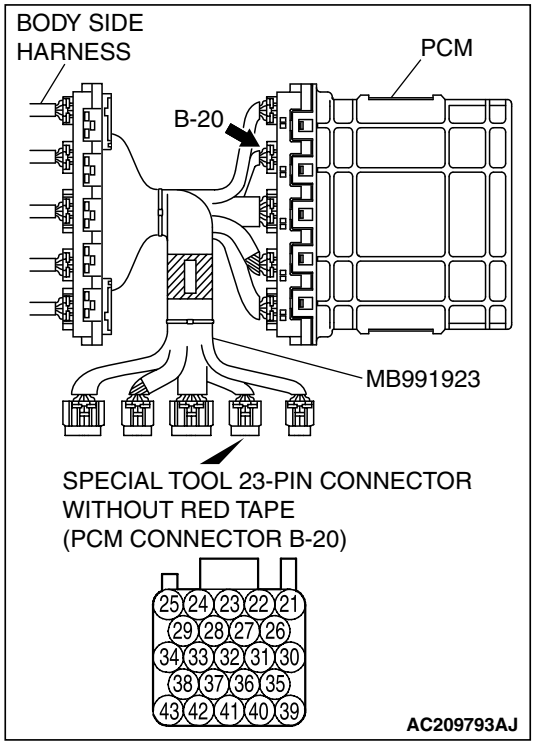
STEP 3. Measure the 5-volt reference signal at PCM connector B-20 by using check harness special tool MB991923.

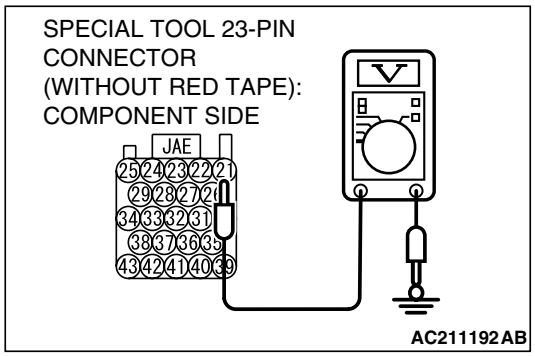
(1) Disconnect all the connectors from the PCM.



(2) Connect special tool MB991923 (check harness) between the PCM and the body-side harness connector.

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





(4) Measure the voltage between terminal 21 and ground.
- The voltage should measure between 4.9 and 5.1 volts.

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

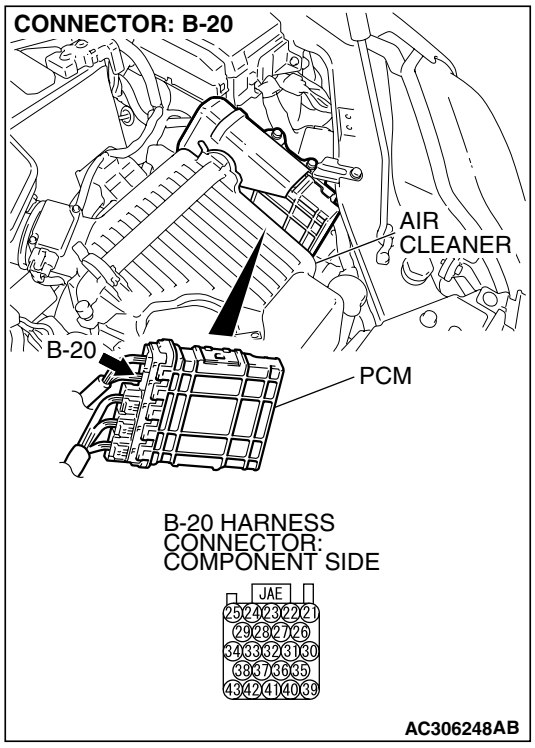
Q: Is the measured voltage between 4.9 and 5.1 volts?

YES : Go to Step 5.
NO : Go to Step 4.

STEP 4. Check PCM connector B-20 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

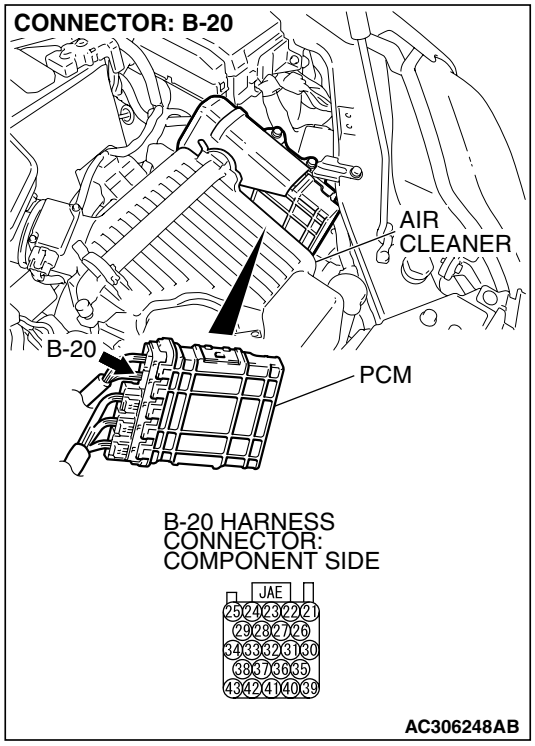
Q: Are the connector and terminals in good condition?

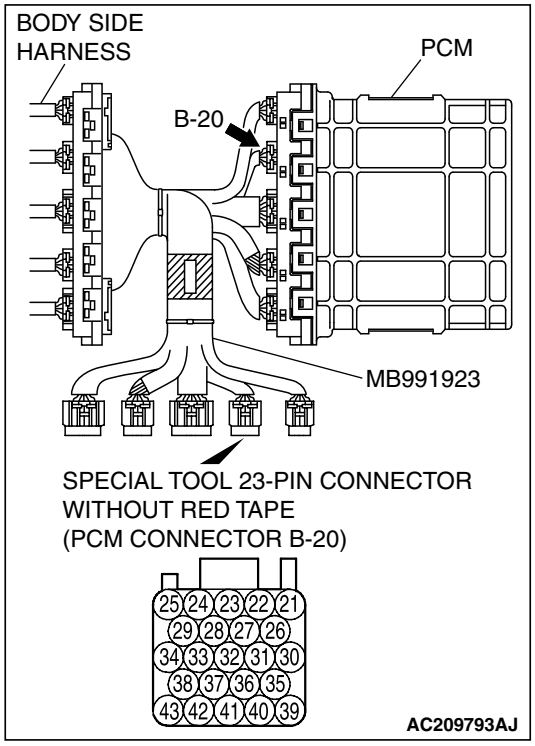
YES : Go to Step 16.
NO : Repair or replace the faulty components (Refer to GROUP 00E, Harness Connector Inspection P.00E-2). Then go to Step 17.



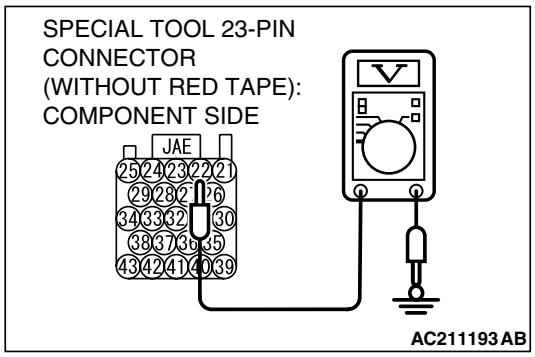
STEP 5. Measure the sensor output voltage at PCM connector B-20 by using check harness special tool MB991923.

(1) Disconnect all the connectors from the PCM.





(2) Connect special tool MB991923 (check harness) between the PCM and the body-side harness connector.
(3) Turn the ignition switch to the "ON" position.
(4) Remove the fuel cap.



(5) Measure the voltage between terminal 22 and ground.
- The voltage should measure 0.5 volt or less.

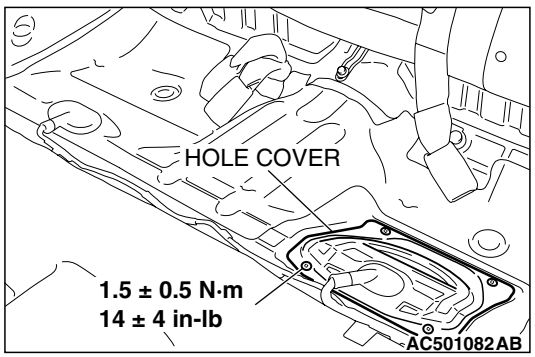
(6) Install the fuel cap.
(7) Turn the ignition switch to the "LOCK" (OFF) position.

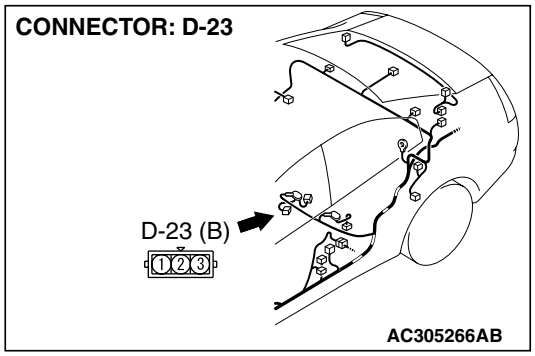
Q: Is the measured voltage 0.5 volt or less?

YES : Go to Step 6.
NO : Go to Step 9.

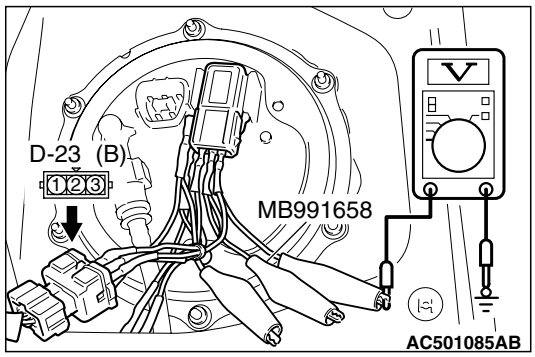
STEP 6. Measure the signal voltage at intermediate connector D-23.

(1) Remove the rear seat cushion assembly (Refer to GROUP 52A, Rear Seat P.52A-45).
(2) Remove the hole cover.





(3) Disconnect fuel tank differential pressure sensor connector D-23.



(4) Use special tool MB991658 to connect terminals 1,2 and 3 of the fuel tank differential pressure sensor connector D-23.
(5) Turn the ignition switch to the "ON" position.
(6) Remove the fuel cap.
(7) Measure the voltage between connector D-23 terminal 1 and ground.
- The voltage should measure between 2.0 and 3.0 volts.

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

Q: Is the measured voltage between 2.0 and 3.0 volts?

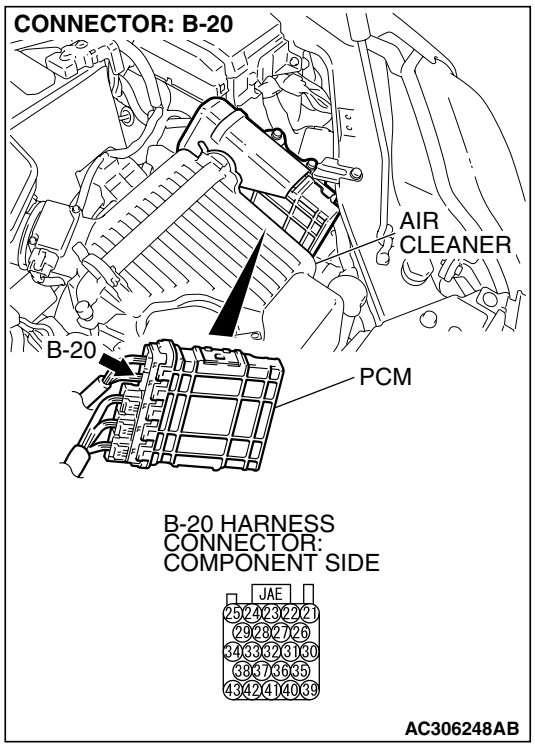
YES : Go to Step 7.
NO : Go to Step 15.

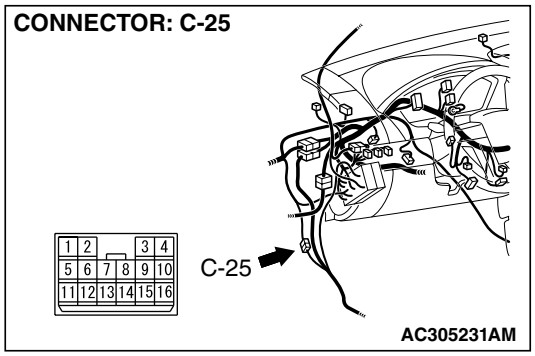
STEP 7. Check PCM connector B-20, intermediate connector C-25 and fuel tank differential pressure sensor connector D-23 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

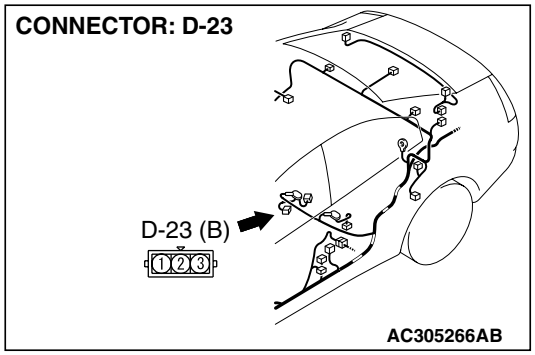
Q: Are the connectors and terminals in good condition?

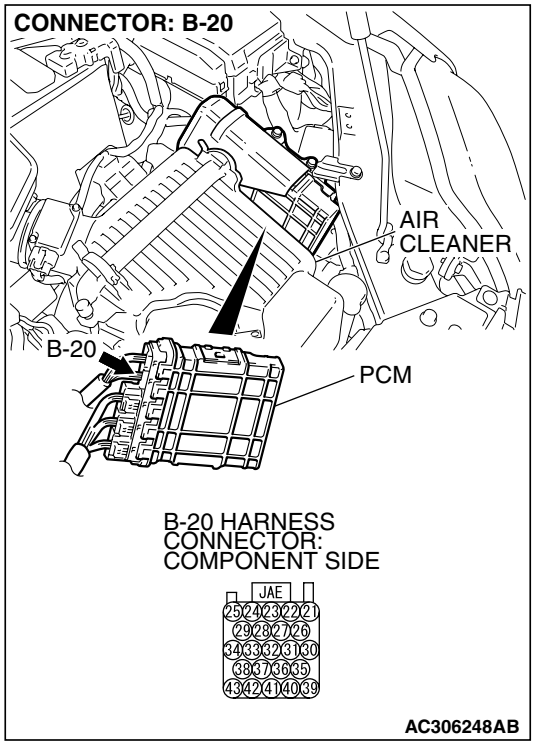
YES : Go to Step 8.

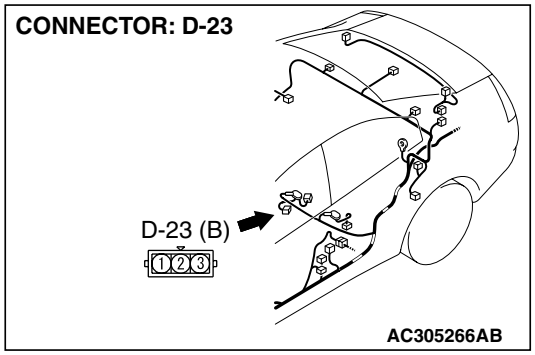
NO : Repair or replace the faulty components (Refer to GROUP 00E, Harness Connector Inspection P.00E-2). Then go to Step 17.











STEP 8. Check the harness wire between PCM connector B-20 terminal 23 and fuel tank differential pressure sensor connector D-23 terminal 1 for damage.

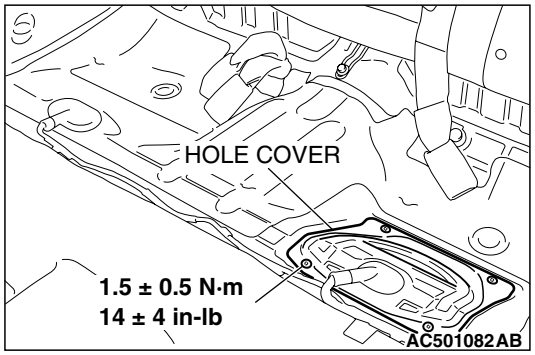
Q: Is the harness wire in good condition?

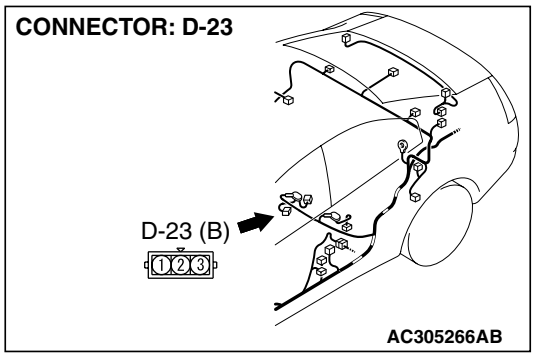
YES : This malfunction is intermittent (Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-14). Go to Step 17.

NO : Repair the damaged harness wire. Then go to Step 17.

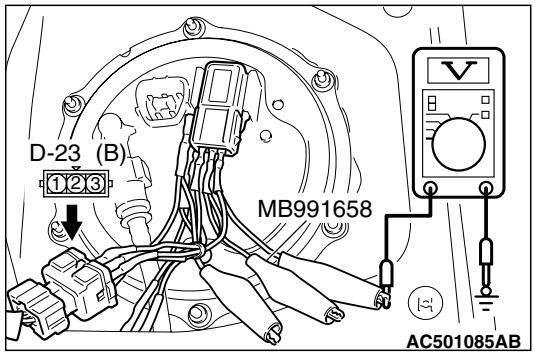
STEP 9. Measure the 5-volt reference signal at fuel tank differential pressure sensor connector D-23.

(1) Remove the rear seat cushion assembly (Refer to GROUP 52A, Rear Seat P.52A-45).
(2) Remove the hole cover.





(3) Disconnect fuel tank differential pressure sensor connector D-23.



(4) Use special tool MB991658 to connect terminals 1,2 and 3 of the fuel tank differential pressure sensor connector D-23.
(5) Turn the ignition switch to the "ON" position.
(6) Measure the voltage between terminal 3 and ground.
- The voltage should measure between 4.9 and 5.1 volts.

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

Q: Is the measured voltage between 4.9 and 5.1 volts?

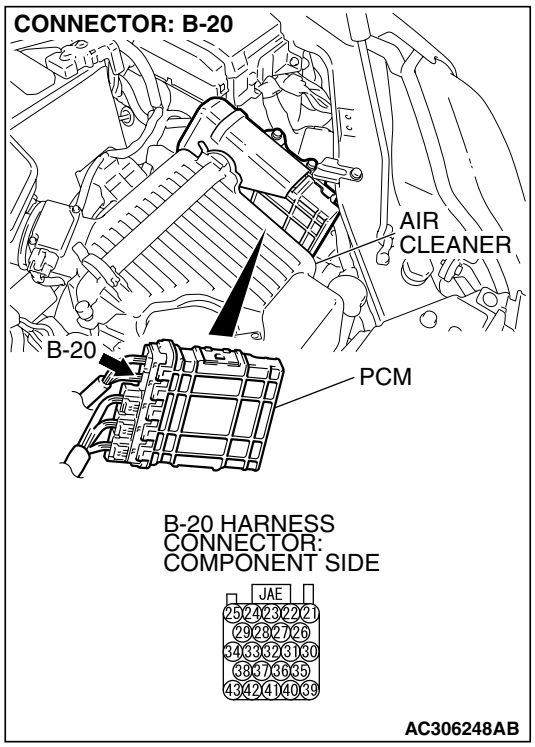
YES : Go to Step 12.
NO : Go to Step 10.

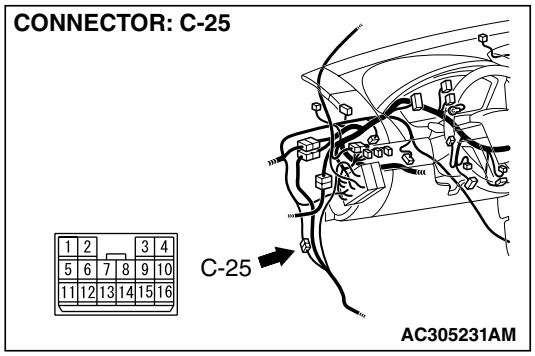
STEP 10. Check PCM connector B-20, intermediate connector C-25 and fuel tank differential pressure sensor connector D-23 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

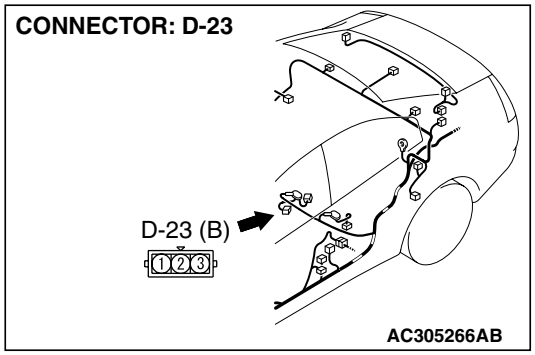
Q: Are the connectors and terminals in good condition?

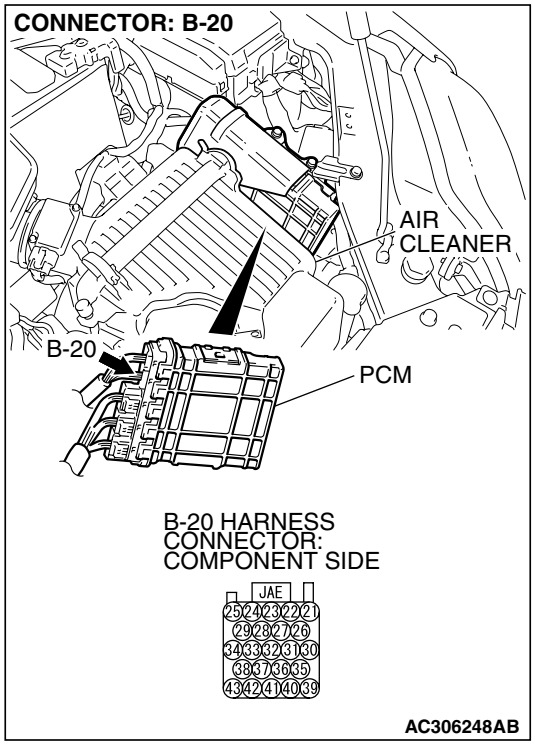
YES : Go to Step 11.

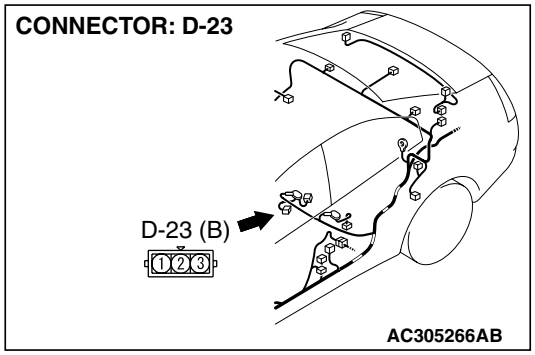
NO : Repair or replace the faulty components (Refer to GROUP 00E, Harness Connector Inspection P.00E-2). Then go to Step 17.











STEP 11. Check the harness wire between PCM connector B-20 terminal 21 and fuel tank differential pressure sensor connector D-23 terminal 3 for damage.

Q: Are the harness wires in good condition?

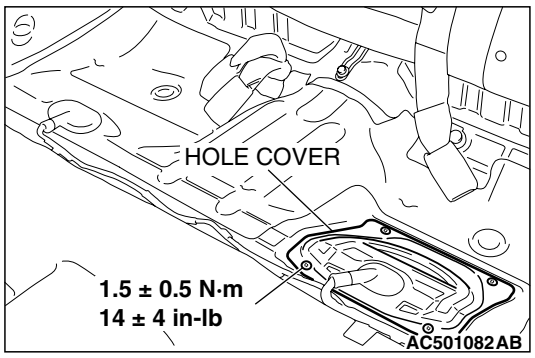
YES : It can be assumed that this malfunction is intermittent (Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-14). Go to Step 17.

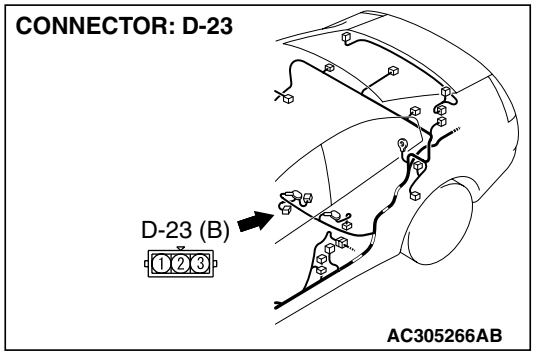
NO : Repair the damaged harness wires. Then go to Step 17.

STEP 12. Measure the fuel tank differential pressure sensor return voltage at fuel tank differential pressure sensor connector D-23.

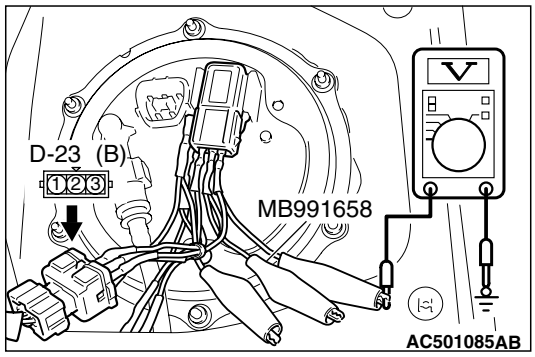
(1) Remove the rear seat cushion assembly (Refer to GROUP 52A, Rear Seat P.52A-45).

(2) Remove the hole cover.





(3) Disconnect fuel tank differential pressure sensor connector D-23.



(4) Use special tool MB991658 to connect terminals 1,2 and 3 of the fuel tank differential pressure sensor connector D-23.

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

(6) Measure the voltage between terminal 2 and ground.
- The voltage should measure 0.5 volt or less.

(7) Turn the ignition switch to the “LOCK” (OFF) position.

Q: Is the measured voltage 0.5 volt or less?

YES : Go to Step 13.

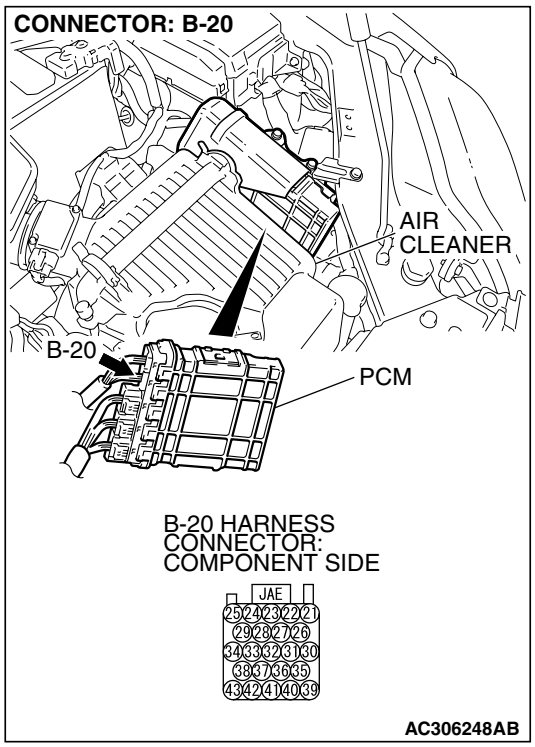
NO : Go to Step 17.

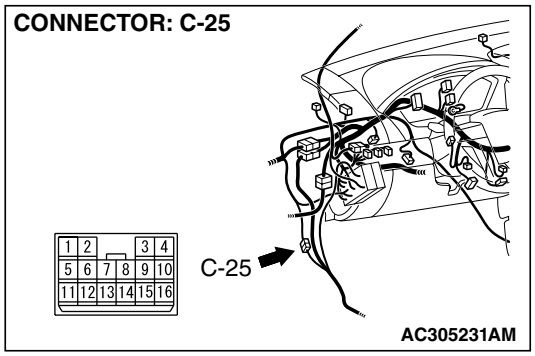
STEP 13. Check PCM connector B-20, intermediate connector C-25 and fuel tank differential pressure sensor connector D-23 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

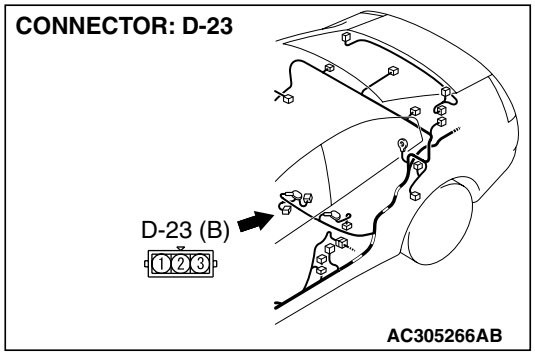
Q: Are the connectors and terminals in good condition?

YES : Go to Step 14.

NO : Repair or replace the faulty components (Refer to GROUP 00E, Harness Connector Inspection P.00E-2). Then go to Step 17.

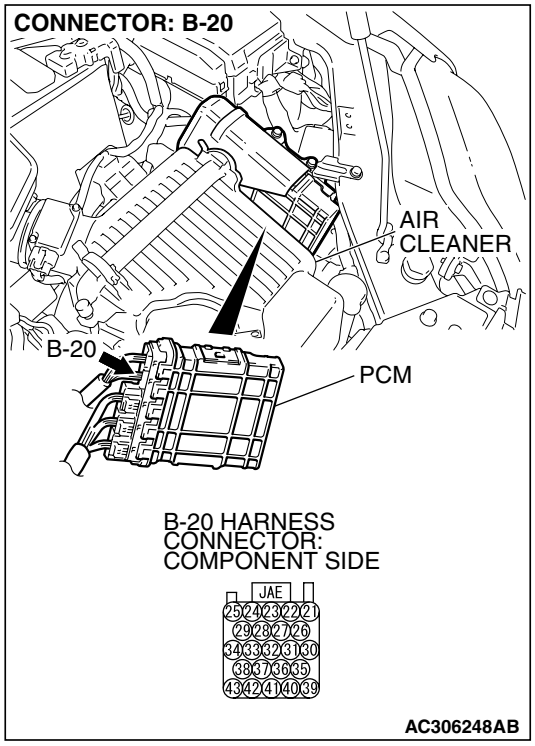


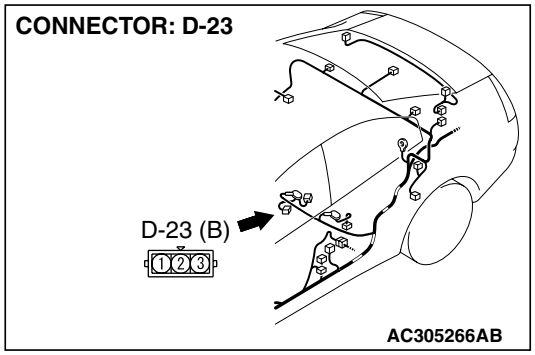




STEP 14. Check the harness wires between PCM connector B-20 terminal 22 and fuel tank differential pressure sensor connector D-23 terminal 2 for damage.
Q: Are the harness wires in good condition?

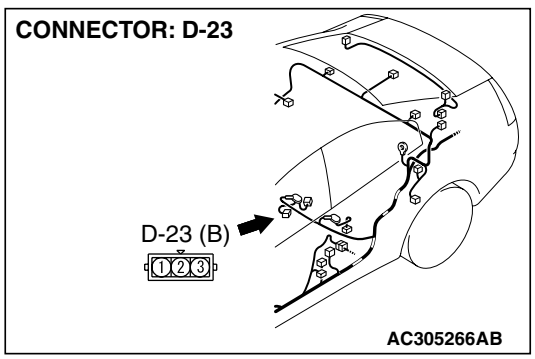
YES : Go to Step 17.
NO : Repair the damaged harness wires. Then go to Step 17.





STEP 15. Check fuel tank differential pressure sensor connector D-23 for loose, corroded or damaged terminals, or terminals pushed back in the connector.
Q: Is the connectors and terminals in good condition?

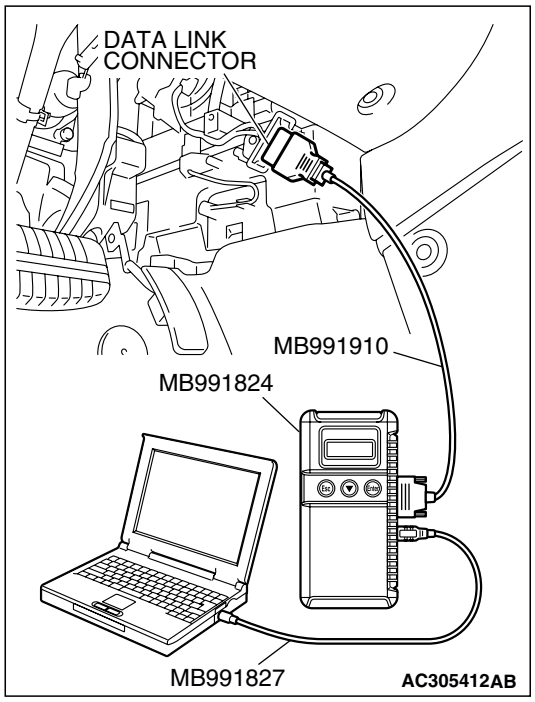
YES : Replace the fuel tank differential pressure sensor. Then go to Step 17.
NO : Repair or replace the faulty components (Refer to GROUP 00E, Harness Connector Inspection P.00E-2). Then go to Step 17.

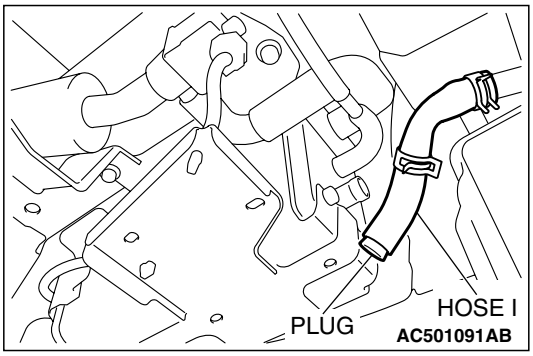


STEP 16. Using scan tool MB991958, check data list item 52: Fuel Tank Differential Pressure Sensor.

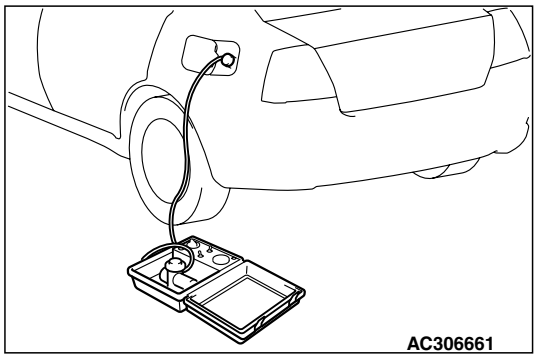
⚠ CAUTION
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.





(2) Disconnect hose I from the evaporative emission canister, and plug the hose.
(3) Turn the ignition switch to the "ON" position.
(4) Remove the fuel cap.
(5) Set scan tool MB991958 to the data reading mode.
- Item 52, Fuel Tank Differential Pressure Sensor.
  - The fuel tank pressure reading on the scan tool should be 2,050 to 2,950 mV.



(6) Connect the evaporative emission system pressure pump (Miller number 6872A) to the fuel tank filler tube by using fuel tank adapter (MLR-8382) and pressurize the fuel tank.
- The fuel tank pressure reading should increase.

(7) Turn the ignition switch to the "LOCK" (OFF) position. Then disconnect scan tool MB991958.
(8) Remove the evaporative emission system pressure pump (Miller number 6872A) and the fuel tank adapter (MLR-8382), and reinstall the fuel cap.
(9) Connect hose I to the evaporative emission canister.

Q: Is the fuel tank pressure between 2,050 to 2,950 mV?

YES : It can be assumed 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). Go to Step 17.

NO : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11.

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Then go to Step 17.

STEP 17. Perform the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern (Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 5 P.13A-9).

(2) Read the diagnostic trouble code (DTC).

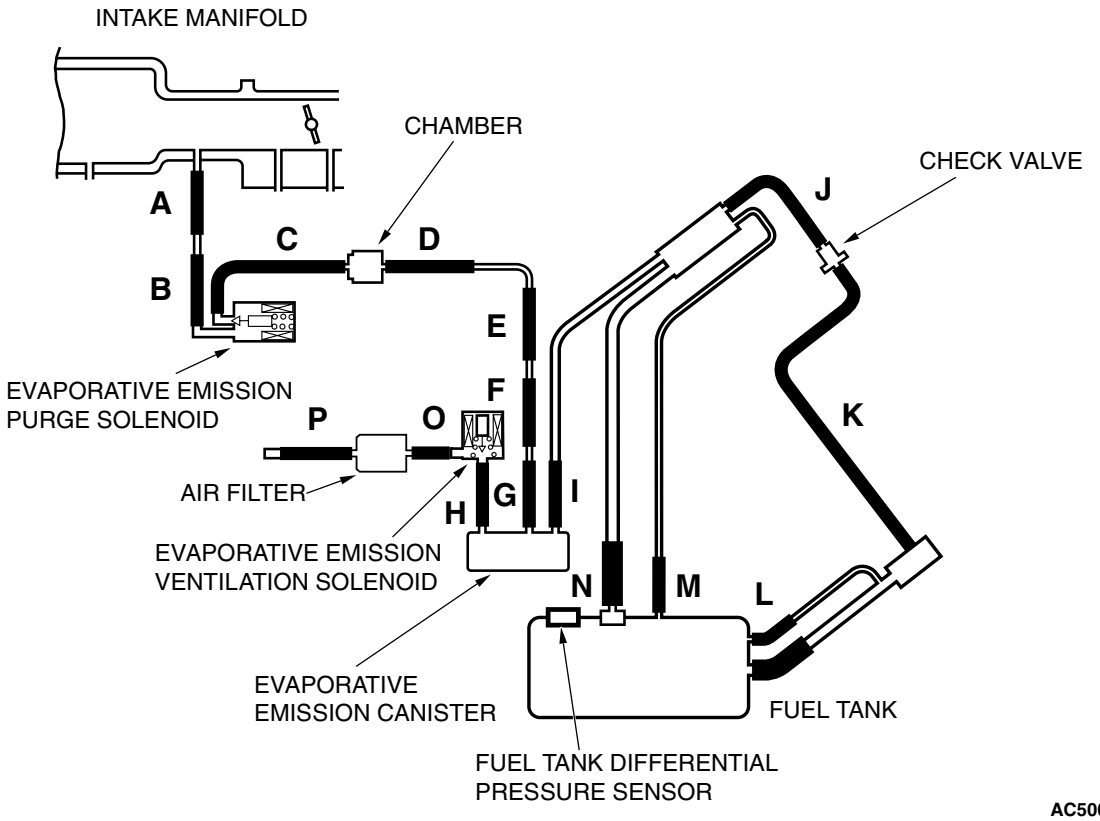
Q: Is DTC P0450 set?

YES : Repeat the troubleshooting from Step 2.

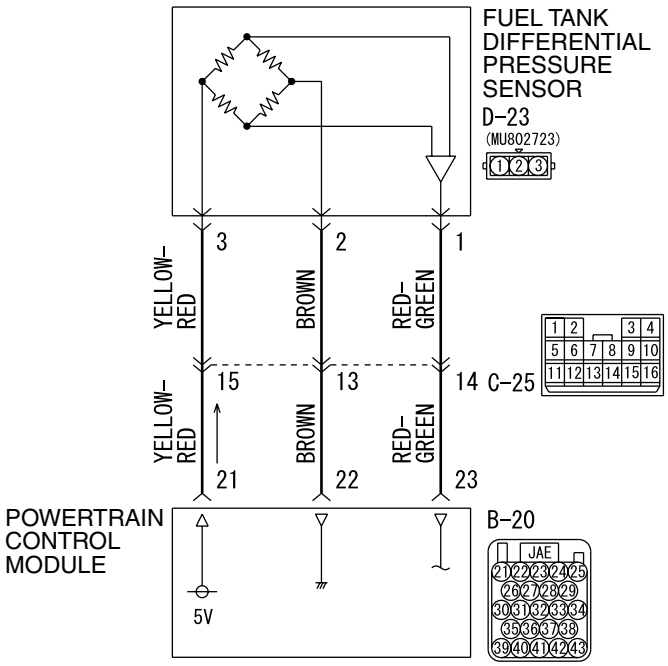
NO : The procedure is complete.

DTC P0451: Evaporative Emission System Pressure Sensor Range/Performance

SYSTEM DIAGRAM



Fuel Tank Differential Pressure Sensor Circuit



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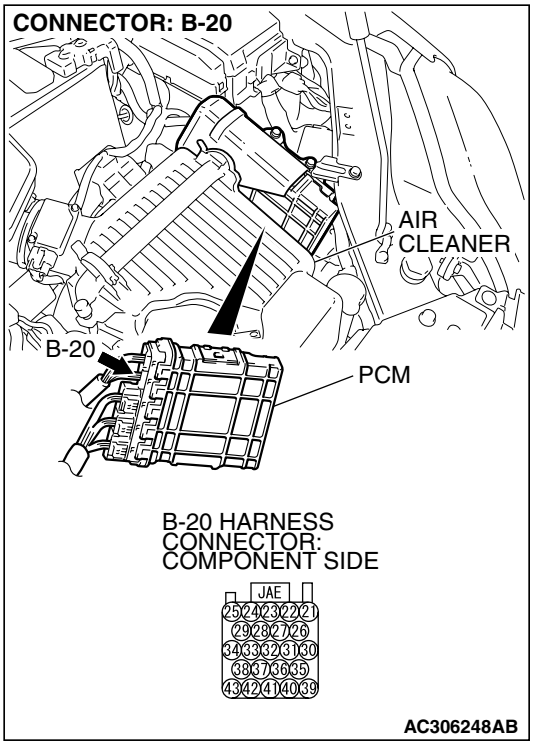

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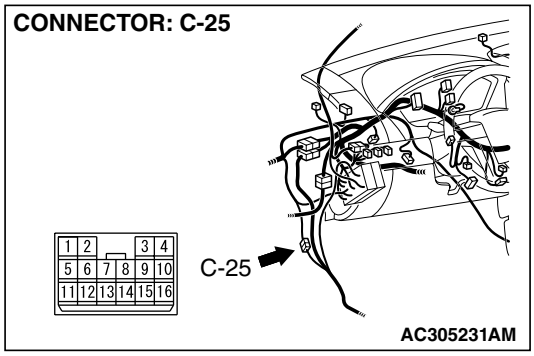

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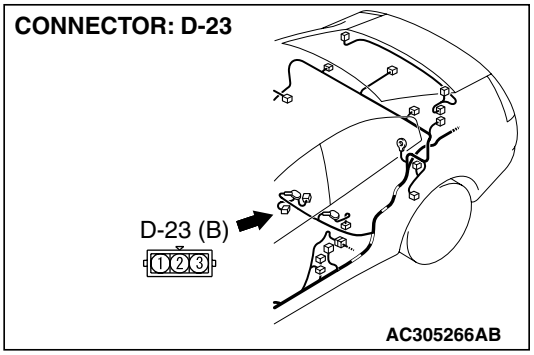
TSB Revision



CIRCUIT OPERATION

- The PCM (terminal 21) supplies a 5-volt reference signal to the fuel tank differential pressure sensor (terminal 3). The fuel tank differential pressure sensor (terminal 2) is grounded through the PCM (terminal 22).
- The fuel tank differential pressure sensor (terminal 1) returns a voltage signal to the PCM (terminal 23) that is proportional to the pressure in the fuel tank.

TECHNICAL DESCRIPTION

- The PCM monitors the fuel tank differential pressure sensor signal voltage.
- The PCM determines whether the fuel tank differential pressure sensor signal voltage is within normal operating parameters.

DESCRIPTIONS OF MONITOR METHODS

- Detect malfunction if change of fuel tank differential pressure sensor output voltage during idling stays large during specified go/stop operations.

MONITOR EXECUTION

- Continuous.

MONITOR EXECUTION CONDITIONS (OTHER MONITOR AND SENSOR)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

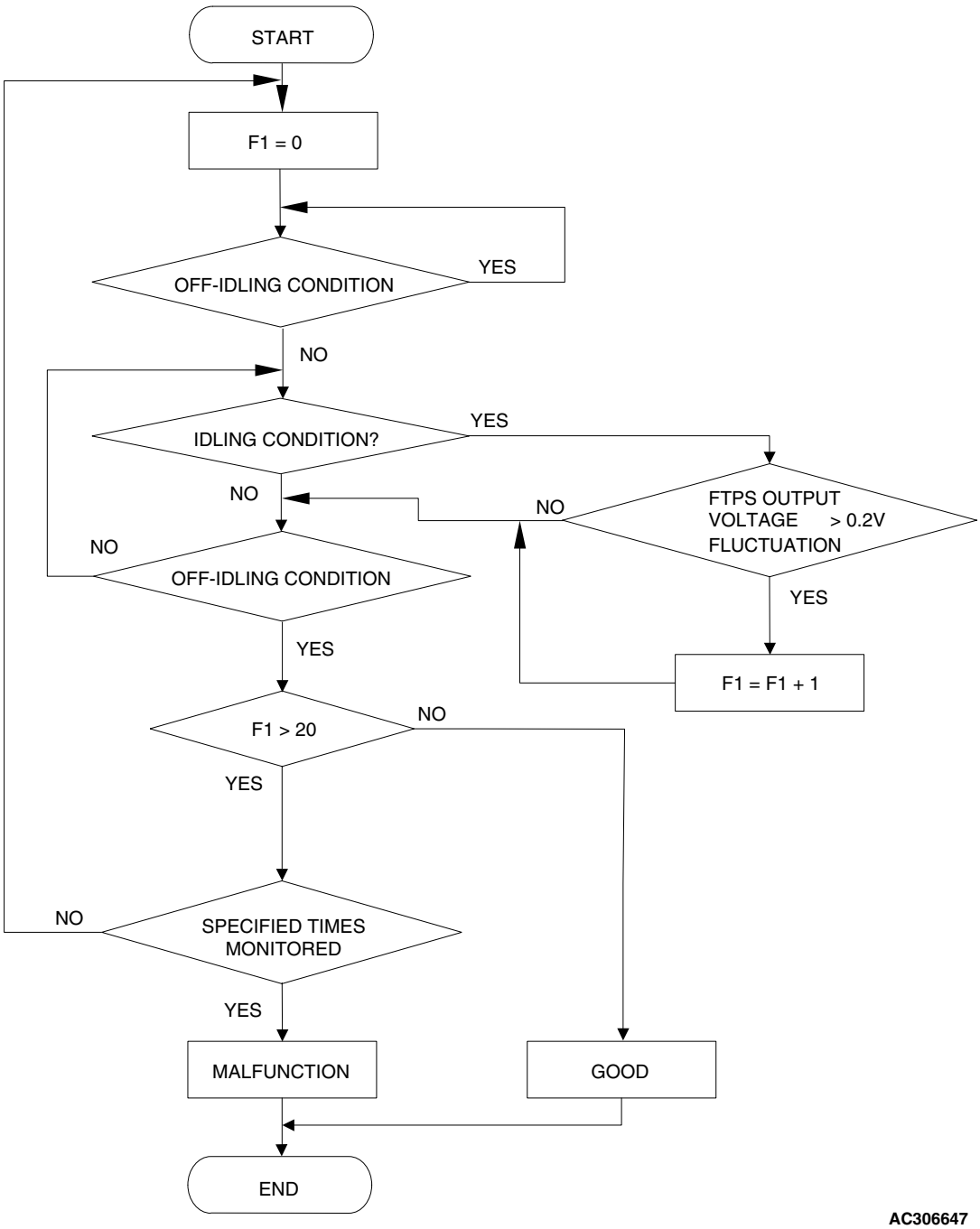
- Evaporative emission purge solenoid monitor
- Evaporative emission ventilation solenoid monitor

Sensor (The sensors below are determined to be normal)

- Mass airflow sensor
- Barometric pressure sensor
- Intake air temperature sensor
- Engine coolant temperature sensor
- Accelerator pedal position sensor

LOGIC FLOW CHARTS (Monitor Sequence)

RATIONALITY - NOISE



AC306647

DTC SET CONDITIONS

Check Conditions

- Throttle valve is closed.
- Vehicle speed is 1.5 km/h (0.93 mph) or less.

Judgment Criteria

- If the voltage signal from the fuel tank differential pressure sensor changes by 0.2 volt or more, DTC P0451 will set. The code may also set if a sudden pressure fluctuation occurs twenty times while the engine is idling, and then four consecutive times during normal driving.

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NOTE: If the number of sudden pressure fluctuations does not reach twenty during any one period of engine idling, or if the ignition switch is turned OFF, the counter will reset to zero.

NOTE: The conditions for deviating from idling operation are as follows:

- *Vehicle speed is 50 km/h (31 mph) or greater.*

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 15 P.13A-9.

TROUBLESHOOTING HINTS (THE MOST LIKELY CAUSES FOR THIS CODE TO BE SET ARE:)

- Malfunction of the fuel tank differential pressure sensor.
- A damaged harness in the fuel tank differential pressure sensor circuit.
- Malfunction of the PCM.

OVERVIEW OF TROUBLESHOOTING

- DTC P0451 can be set by a faulty fuel tank differential pressure sensor or related circuit, or PCM failure.
- To check for system blockage, do a performance test which uses a mechanical vacuum gauge and scan tool MB991958 set on the fuel tank differential pressure sensor (TANK PRS SNSR 73). The mechanical gauge reading is used to verify scan tool MB991958 reading. A comparison of the mechanical gauge with the reading on scan tool MB991958 will locate a problem in the system.

DIAGNOSIS

Required Special Tools:

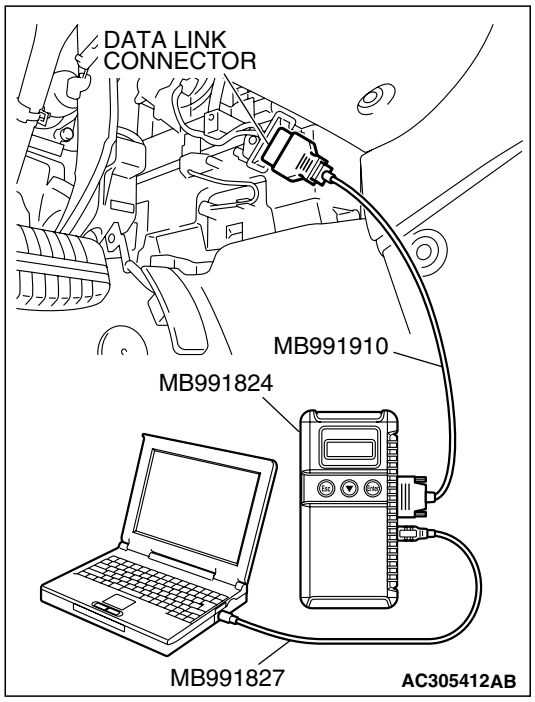
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A
- MB991658: Test Harness Set
- MB991923: Power Plant ECU Check Harness

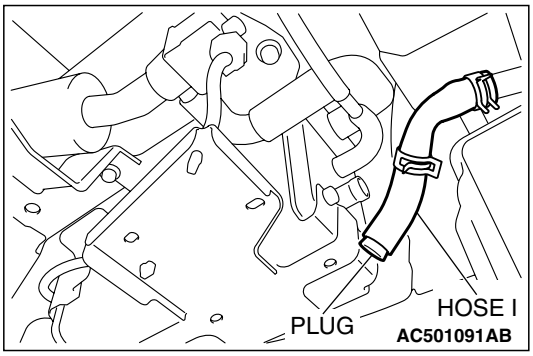
STEP 1. Using scan tool MB991958, check data list item 52: Fuel Tank Differential Pressure Sensor.

⚠ CAUTION

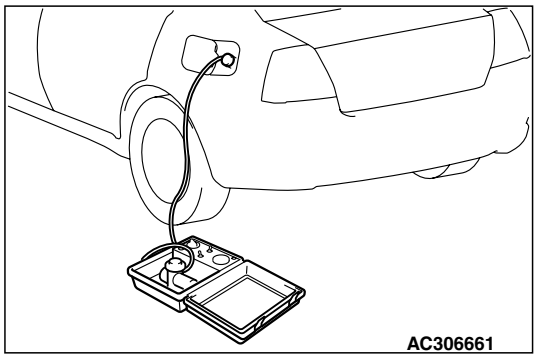
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.





(2) Disconnect hose I from the evaporative emission canister, and plug the hose.
(3) Turn the ignition switch to the "ON" position.
(4) Remove the fuel cap.
(5) Set scan tool MB991958 to the data reading mode.
- Item 52, Fuel Tank Differential Pressure Sensor.
  - The fuel tank pressure reading on the scan tool should be 2,050 to 2,950 mV.



(6) Connect the evaporative emission system pressure pump (Miller number 6872A) to the fuel tank filler tube by using fuel tank adapter (MLR-8382) and pressurize the fuel tank.
- The fuel tank pressure reading should increase.

(7) Turn the ignition switch to the "LOCK" (OFF) position. Then disconnect scan tool MB991958.
(8) Remove the evaporative emission system pressure pump (Miller number 6872A) and the fuel tank adapter (MLR-8382), and reinstall the fuel cap.
(9) Connect hose I to the evaporative emission canister.

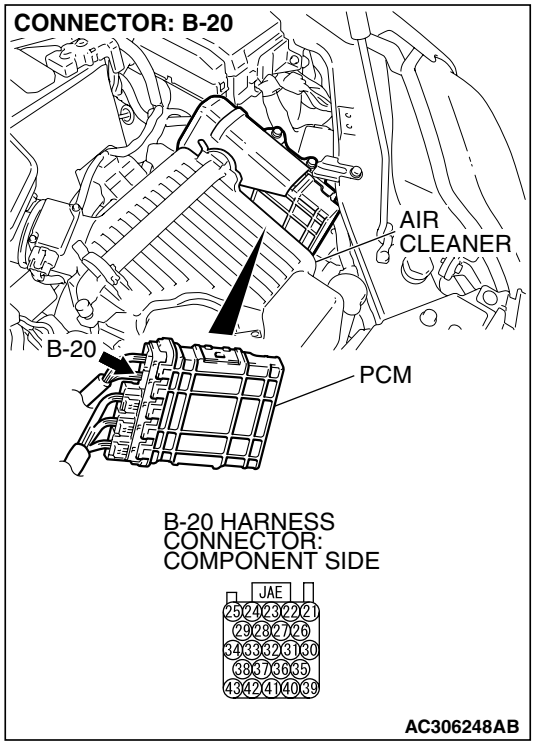
Q: Is the fuel tank pressure between 2,050 to 2,950 mV?

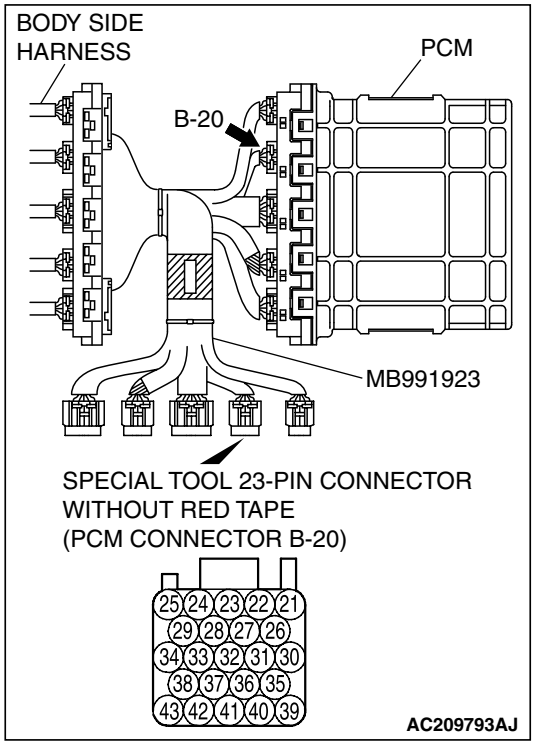
YES : It can be assumed that this malfunction is intermittent (Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-14). Go to Step 17.

NO : Go to Step 2.

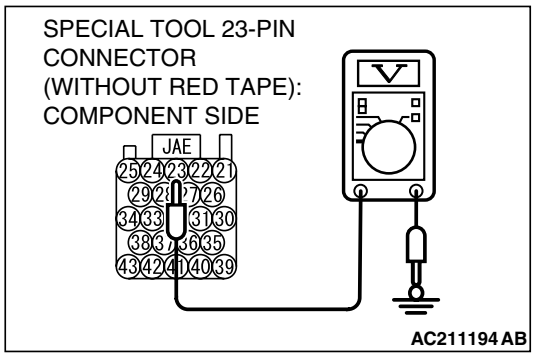
STEP 2. Measure the sensor output voltage at PCM connector B-20 by using check harness special tool MB991923.

(1) Disconnect all the connectors from the PCM.





(2) Connect special tool MB991923 (check harness) between the PCM and the body-side harness connector.
(3) Turn the ignition switch to the "ON" position.
(4) Remove the fuel cap.



(5) Measure the voltage between terminal 23 and ground.
- The voltage should measure between 2.0 and 3.0 volts.

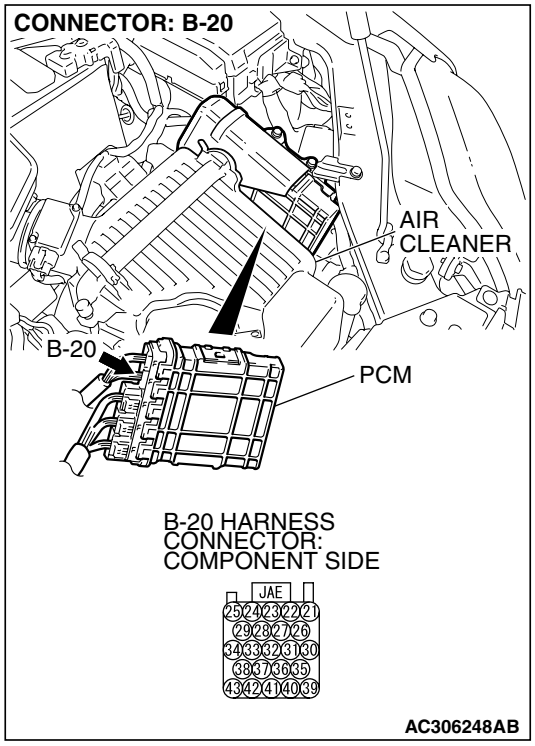
(6) Install the fuel cap.
(7) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the measured voltage between 2.0 and 3.0 volts?

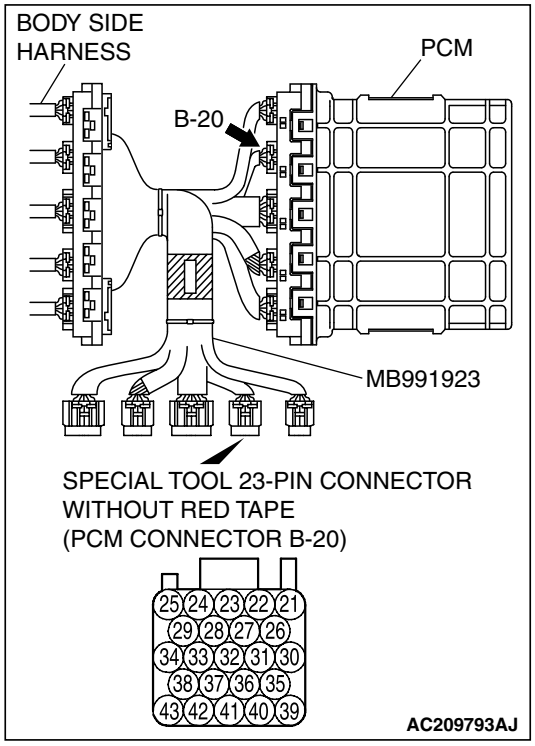
YES : Go to Step 16.
NO : Go to Step 3.

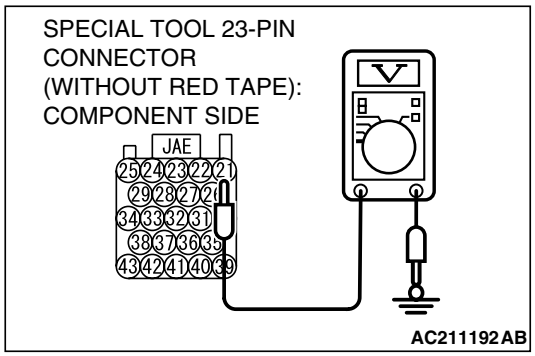
STEP 3. Measure the 5-volt reference signal at PCM connector B-20 by using check harness special tool MB991923.

(1) Disconnect all the connectors from the PCM.



(2) Connect special tool MB991923 (check harness) between the PCM and the body-side harness connector.
(3) Turn the ignition switch to the "ON" position.





(4) Measure the voltage between terminal 21 and ground.
- The voltage should measure between 4.9 and 5.1 volts.

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

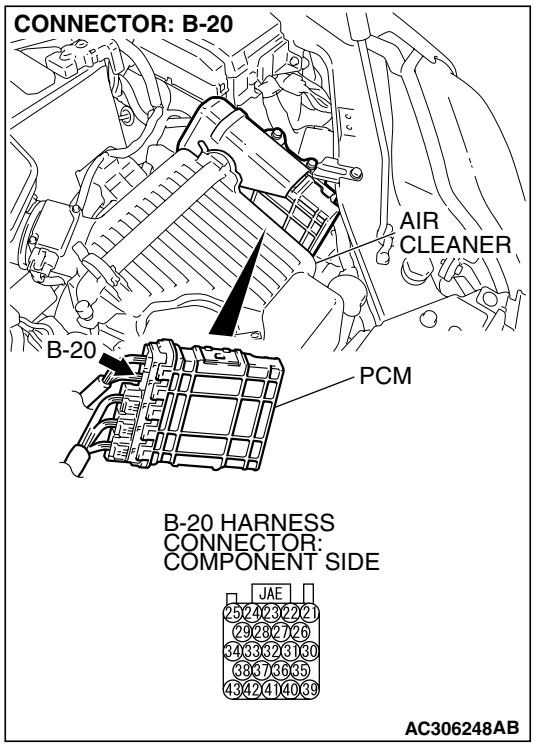
Q: Is the measured voltage between 4.9 and 5.1 volts?

YES : Go to Step 5.
NO : Go to Step 4.

STEP 4. Check PCM connector B-20 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

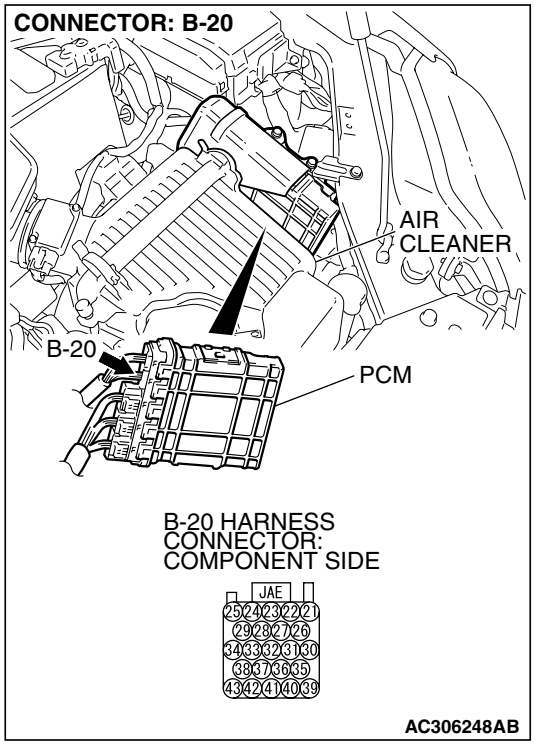
Q: Are the connector and terminals in good condition?

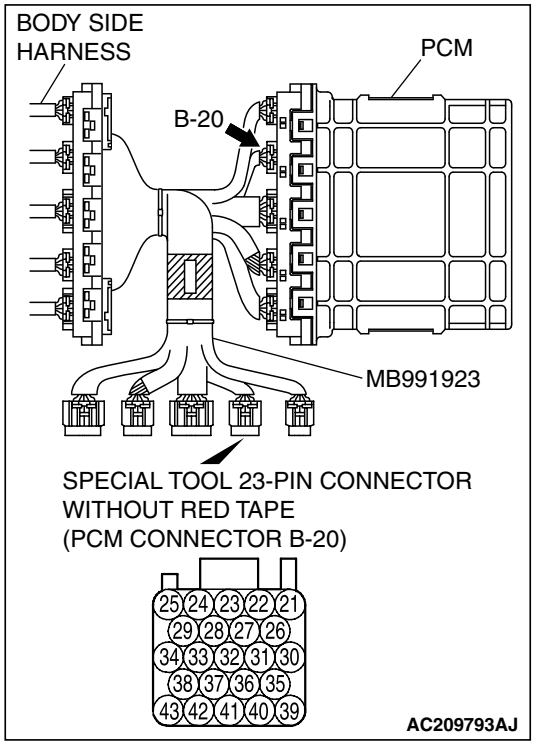
YES : Go to Step 16.
NO : Repair or replace the faulty components (Refer to GROUP 00E, Harness Connector Inspection P.00E-2). Then go to Step 17.



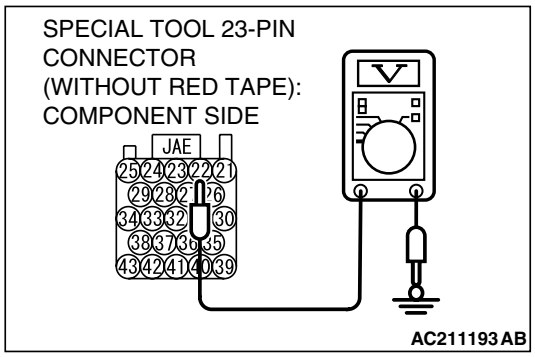
STEP 5. Measure the sensor output voltage at PCM connector B-20 by using check harness special tool MB991923.

(1) Disconnect all the connectors from the PCM.





(2) Connect special tool MB991923 (check harness) between the PCM and the body-side harness connector.
(3) Turn the ignition switch to the "ON" position.
(4) Remove the fuel cap.



(5) Measure the voltage between terminal 22 and ground.
- The voltage should measure 0.5 volt or less.

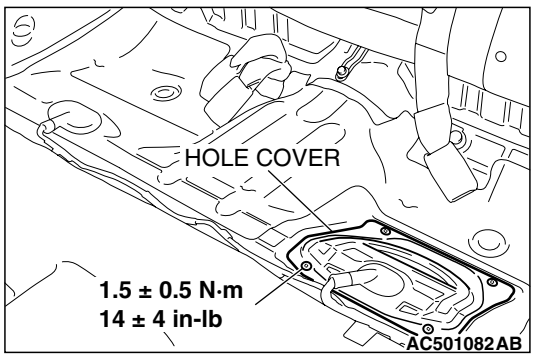
(6) Install the fuel cap.
(7) Turn the ignition switch to the "LOCK" (OFF) position.

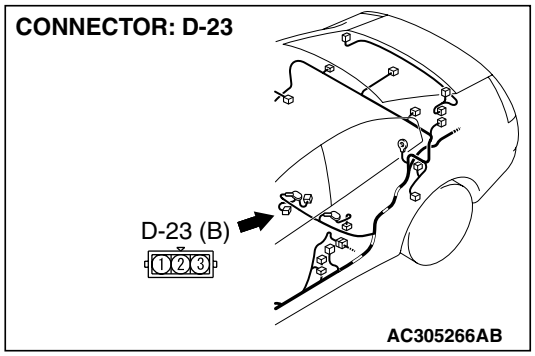
Q: Is the measured voltage 0.5 volt or less?

YES : Go to Step 6.
NO : Go to Step 9.

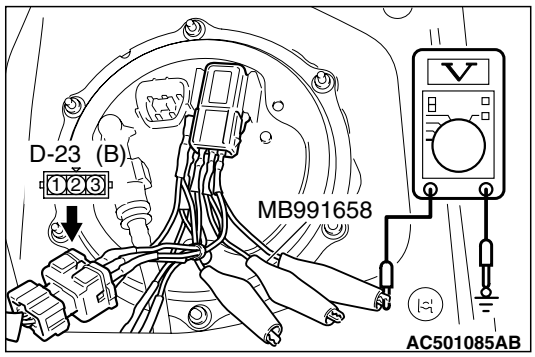
STEP 6. Measure the signal voltage at intermediate connector D-23.

(1) Remove the rear seat cushion assembly (Refer to GROUP 52A, Rear Seat P.52A-45).
(2) Remove the hole cover.





(3) Disconnect fuel tank differential pressure sensor connector D-23.



(4) Use special tool MB991658 to connect terminals 1,2 and 3 of the fuel tank differential pressure sensor connector D-23.
(5) Turn the ignition switch to the "ON" position.
(6) Remove the fuel cap.
(7) Measure the voltage between connector D-23 terminal 1 and ground.
- The voltage should measure between 2.0 and 3.0 volts.

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

Q: Is the measured voltage between 2.0 and 3.0 volts?

YES : Go to Step 7.
NO : Go to Step 15.

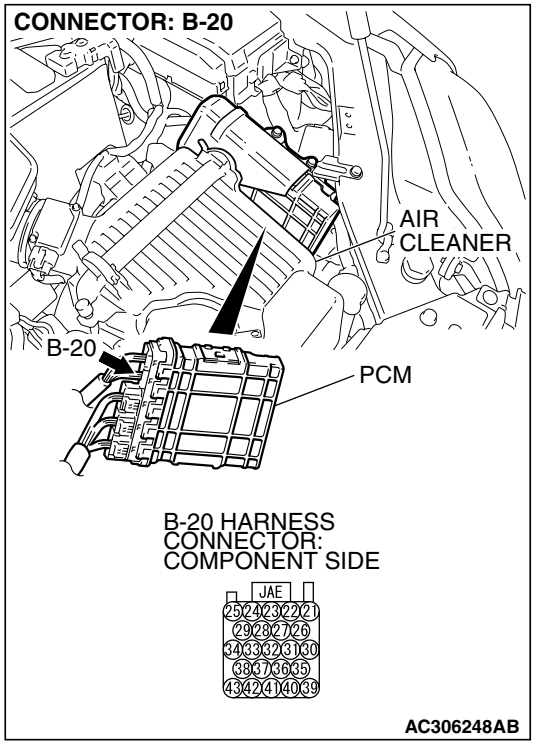
STEP 7. Check PCM connector B-20, intermediate connector C-25 and fuel tank differential pressure sensor connector D-23 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

Q: Are the connectors and terminals in good condition?

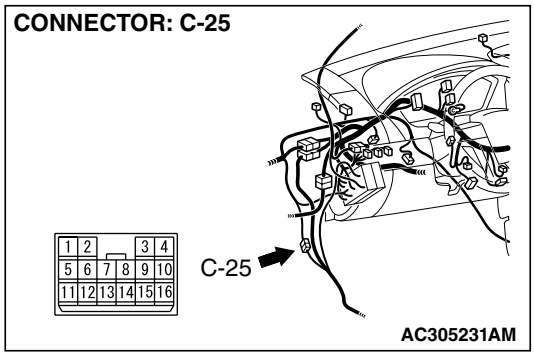
YES : Go to Step 8.

NO : Repair or replace the faulty components (Refer to GROUP 00E, Harness Connector Inspection P.00E-2). Then go to Step 17.

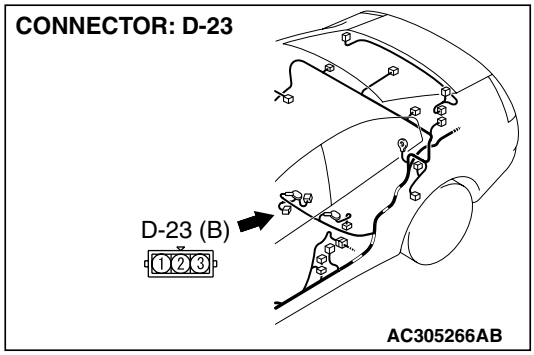
CONNECTOR: B-20

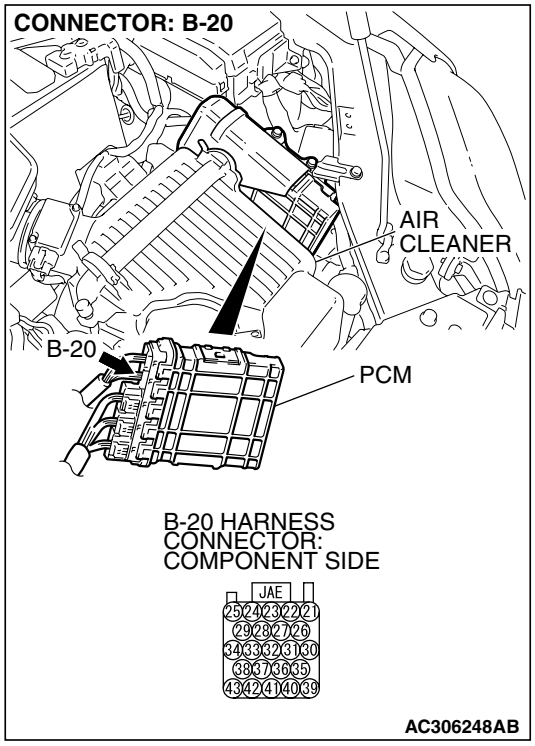


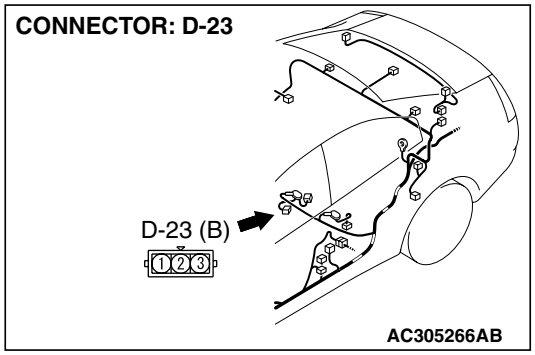
CONNECTOR: C-25



CONNECTOR: D-23







STEP 8. Check the harness wire between PCM connector B-20 terminal 23 and fuel tank differential pressure sensor connector D-23 terminal 1 for damage.

Q: Is the harness wire in good condition?

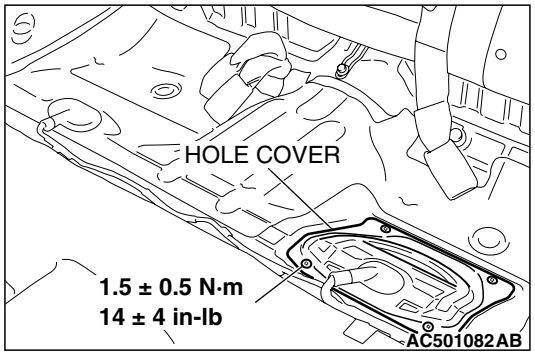
YES : This malfunction is intermittent (Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-14). Go to Step 17.

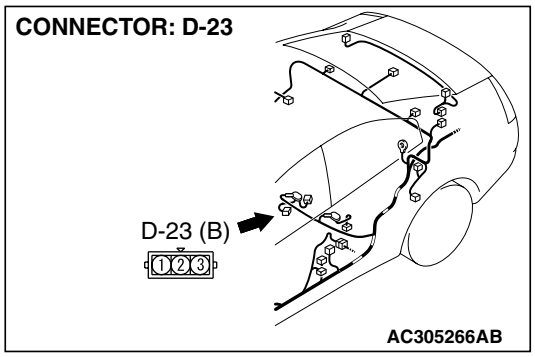
NO : Repair the damaged harness wire. Then go to Step 17.

STEP 9. Measure the 5-volt reference signal at fuel tank differential pressure sensor connector D-23.

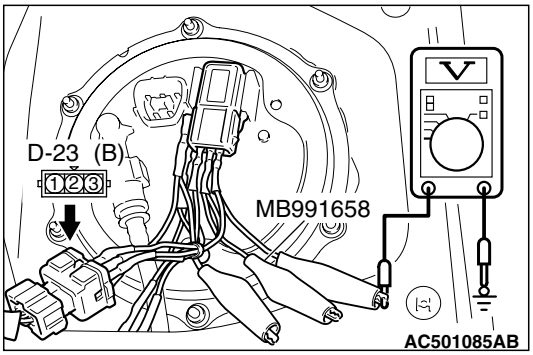
(1) Remove the rear seat cushion assembly (Refer to GROUP 52A, Rear Seat P.52A-45).

(2) Remove the hole cover.





(3) Disconnect fuel tank differential pressure sensor connector D-23.



(4) Use special tool MB991658 to connect terminals 1,2 and 3 of the fuel tank differential pressure sensor connector D-23.

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

(6) Measure the voltage between terminal 3 and ground.
- The voltage should measure between 4.9 and 5.1 volts.

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

Q: Is the measured voltage between 4.9 and 5.1 volts?

YES : Go to Step 12.

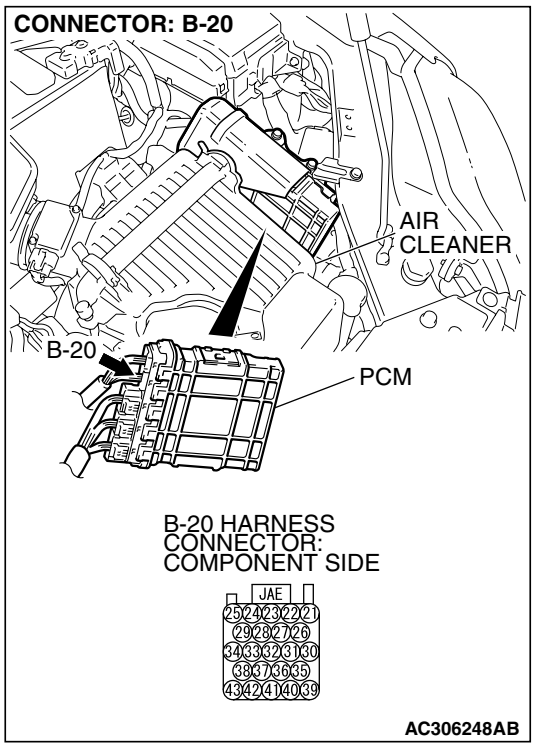
NO : Go to Step 10.

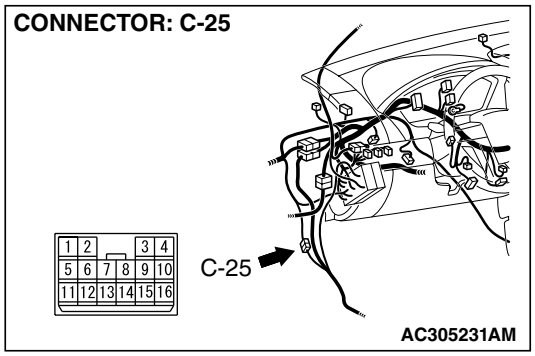
STEP 10. Check PCM connector B-20, intermediate connector C-25 and fuel tank differential pressure sensor connector D-23 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

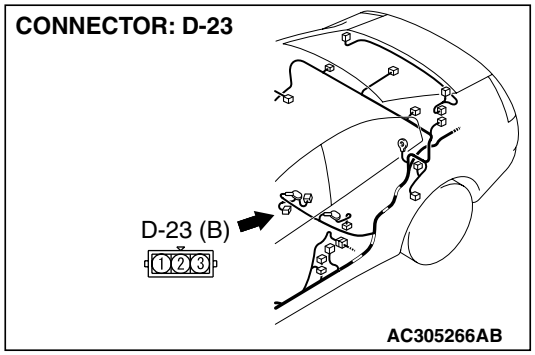
Q: Are the connectors and terminals in good condition?

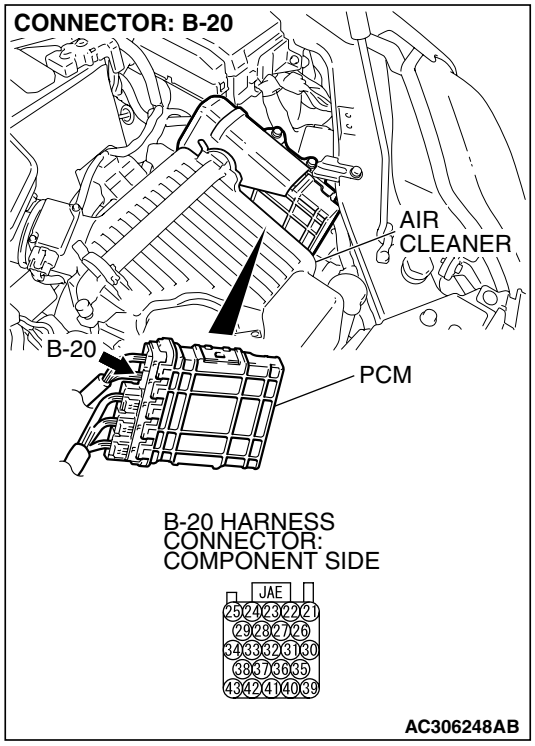
YES : Go to Step 11.

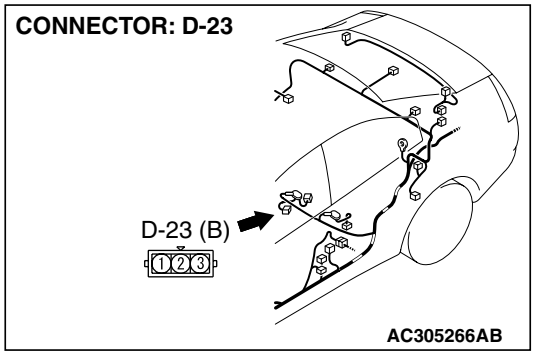
NO : Repair or replace the faulty components (Refer to GROUP 00E, Harness Connector Inspection P.00E-2). Then go to Step 17.











STEP 11. Check the harness wire between PCM connector B-20 terminal 21 and fuel tank differential pressure sensor connector D-23 terminal 3 for damage.

Q: Are the harness wires in good condition?

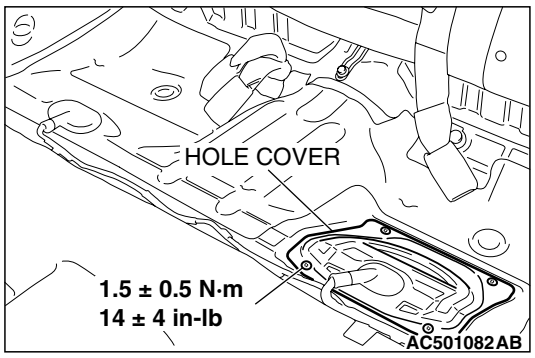
YES : It can be assumed that this malfunction is intermittent (Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-14). Go to Step 17.

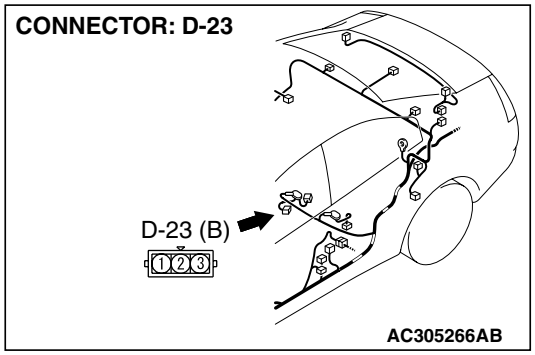
NO : Repair the damaged harness wires. Then go to Step 17.

STEP 12. Measure the fuel tank differential pressure sensor return voltage at fuel tank differential pressure sensor connector D-23.

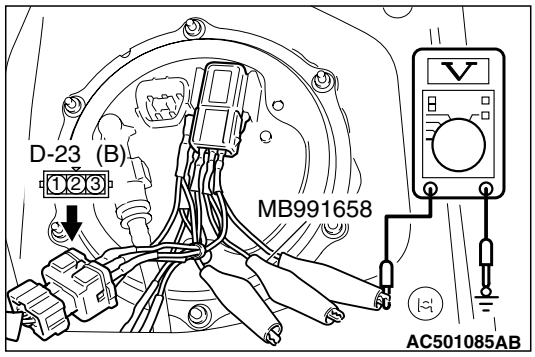
(1) Remove the rear seat cushion assembly (Refer to GROUP 52A, Rear Seat P.52A-45).

(2) Remove the hole cover.





(3) Disconnect fuel tank differential pressure sensor connector D-23.



(4) Use special tool MB991658 to connect terminals 1,2 and 3 of the fuel tank differential pressure sensor connector D-23.

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

(6) Measure the voltage between terminal 2 and ground.
- The voltage should measure 0.5 volt or less.

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

Q: Is the measured voltage 0.5 volt or less?

YES : Go to Step 13.

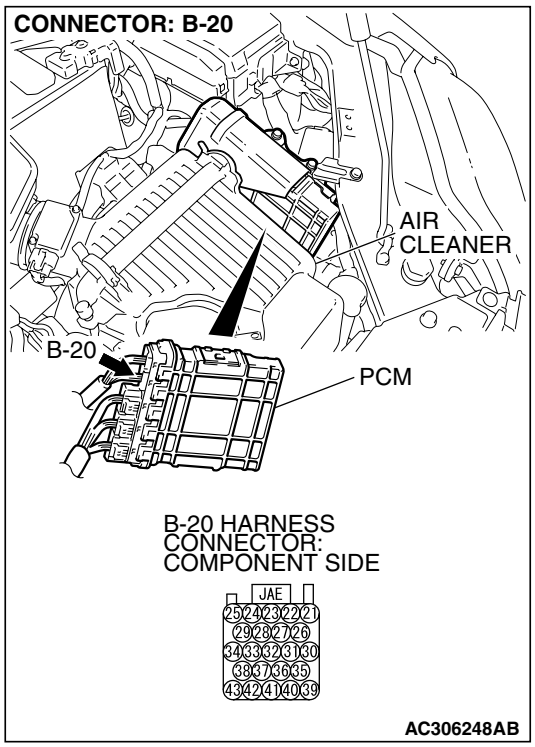
NO : Go to Step 17.

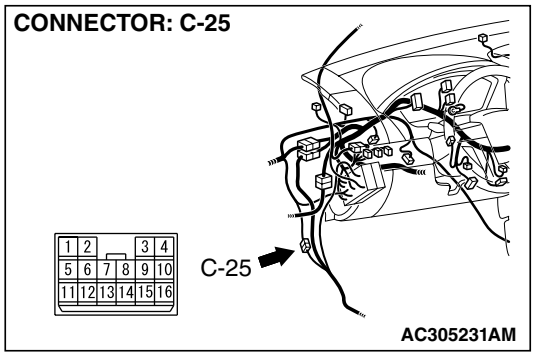
STEP 13. Check PCM connector B-20, intermediate connector C-25 and fuel tank differential pressure sensor connector D-23 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

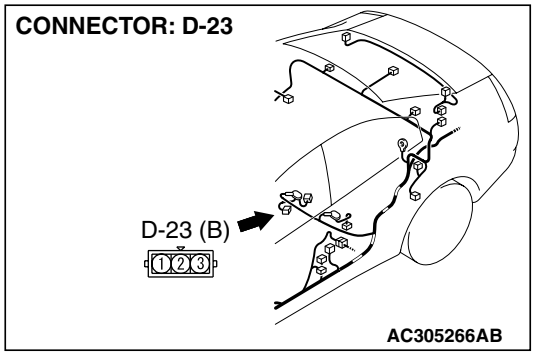
Q: Are the connectors and terminals in good condition?

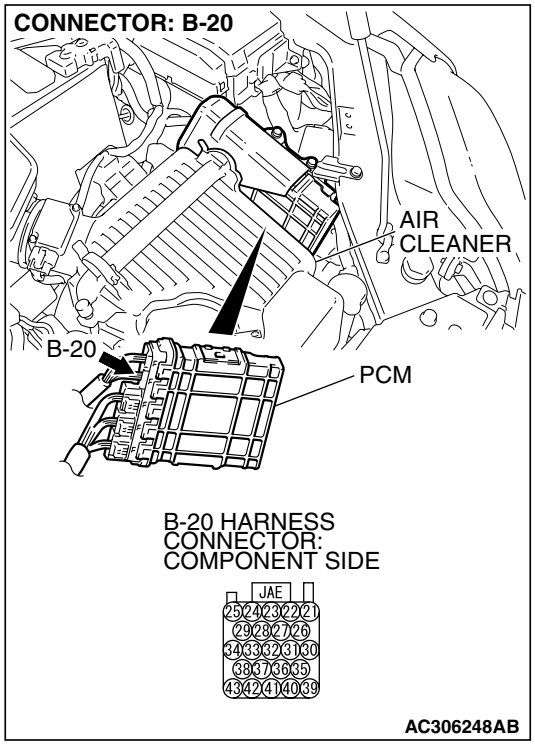
YES : Go to Step 14.

NO : Repair or replace the faulty components (Refer to GROUP 00E, Harness Connector Inspection P.00E-2). Then go to Step 17.



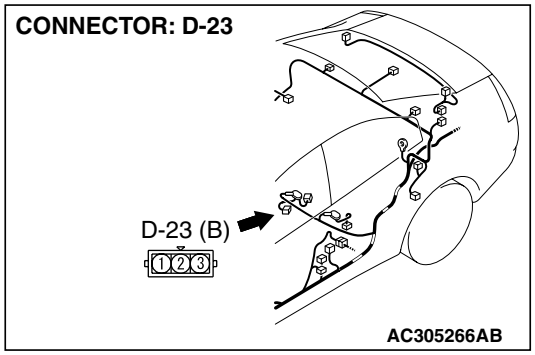


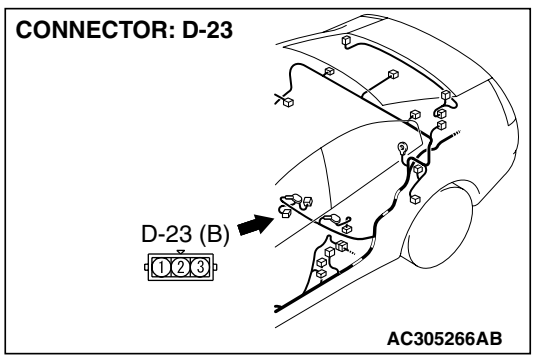




STEP 14. Check the harness wires between PCM connector B-20 terminal 22 and fuel tank differential pressure sensor connector D-23 terminal 2 for damage.
Q: Are the harness wires in good condition?

YES : Go to Step 17.
NO : Repair the damaged harness wires. Then go to Step 17.





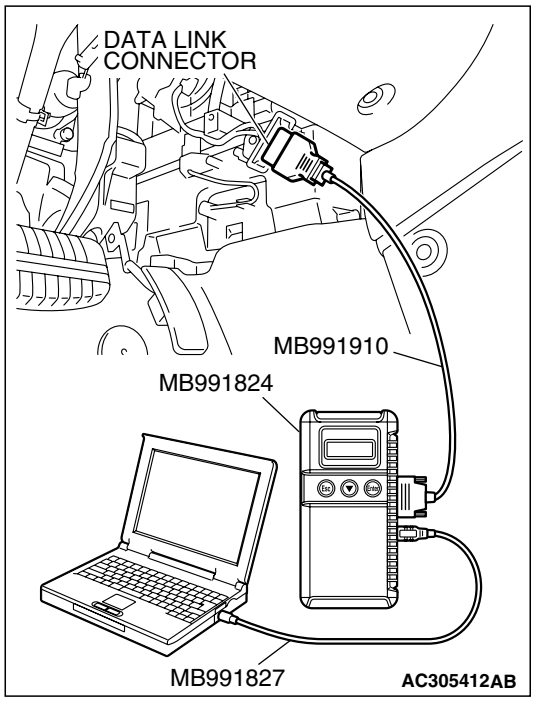
STEP 15. Check fuel tank differential pressure sensor connector D-23 for loose, corroded or damaged terminals, or terminals pushed back in the connector.
Q: Is the connectors and terminals in good condition?

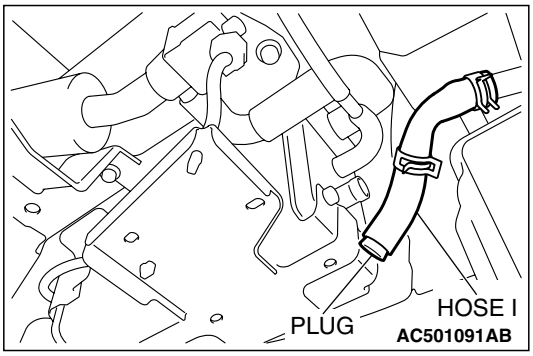
YES : Replace the fuel tank differential pressure sensor. Then go to Step 17.
NO : Repair or replace the faulty components (Refer to GROUP 00E, Harness Connector Inspection P.00E-2). Then go to Step 17.

STEP 16. Using scan tool MB991958, check data list item 52: Fuel Tank Differential Pressure Sensor.

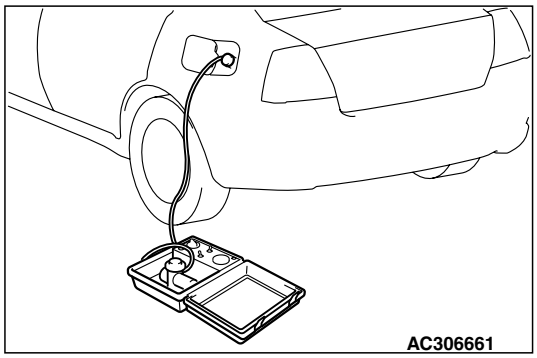
⚠ CAUTION
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.





(2) Disconnect hose I from the evaporative emission canister, and plug the hose.
(3) Turn the ignition switch to the "ON" position.
(4) Remove the fuel cap.
(5) Set scan tool MB991958 to the data reading mode.
- Item 52, Fuel Tank Differential Pressure Sensor.
  - The fuel tank pressure reading on the scan tool should be 2,050 to 2,950 mV.



(6) Connect the evaporative emission system pressure pump (Miller number 6872A) to the fuel tank filler tube by using fuel tank adapter (MLR-8382) and pressurize the fuel tank.
- The fuel tank pressure reading should increase.

(7) Turn the ignition switch to the "LOCK" (OFF) position. Then disconnect scan tool MB991958.
(8) Remove the evaporative emission system pressure pump (Miller number 6872A) and the fuel tank adapter (MLR-8382), and reinstall the fuel cap.
(9) Connect hose I to the evaporative emission canister.

Q: Is the fuel tank pressure between 2,050 to 2,950 mV?

YES : It can be assumed 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). Go to Step 17.

NO : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11.

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Then go to Step 17.

STEP 17. Perform the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern (Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 15 P.13A-9).

(2) Read the diagnostic trouble code (DTC).

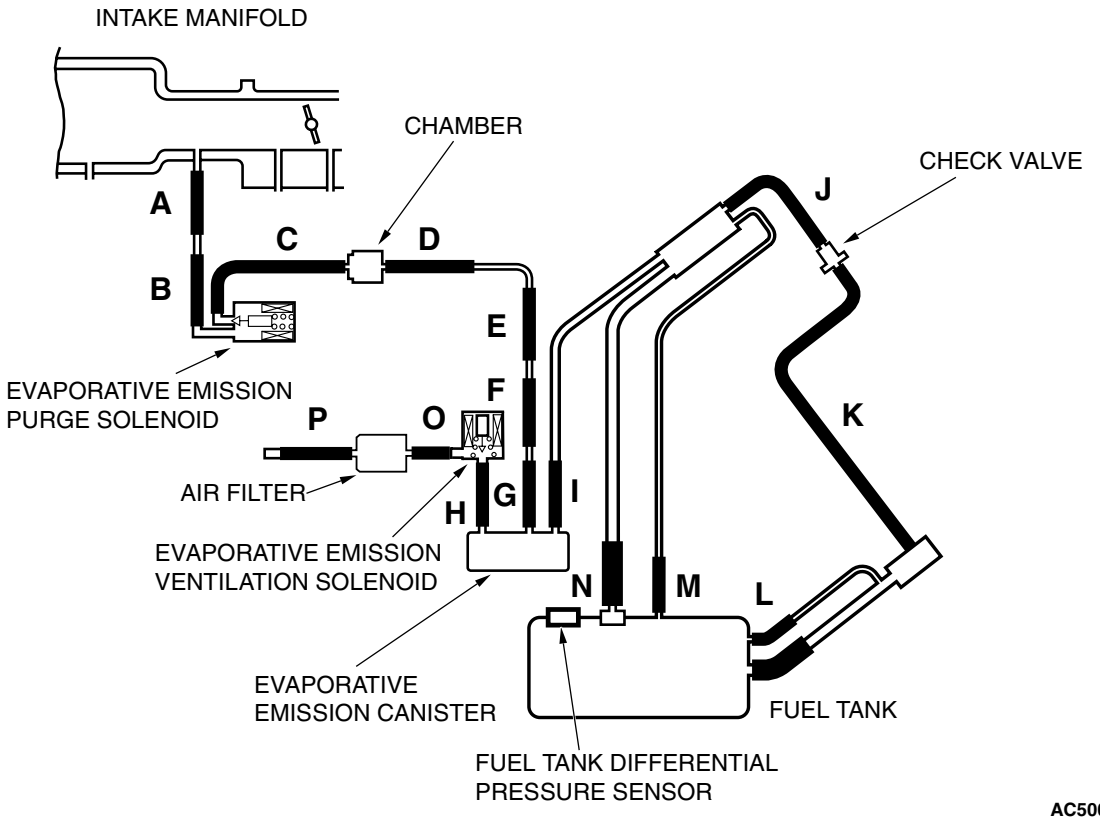
Q: Is DTC P0451 set?

YES : Repeat the troubleshooting from Step 2.

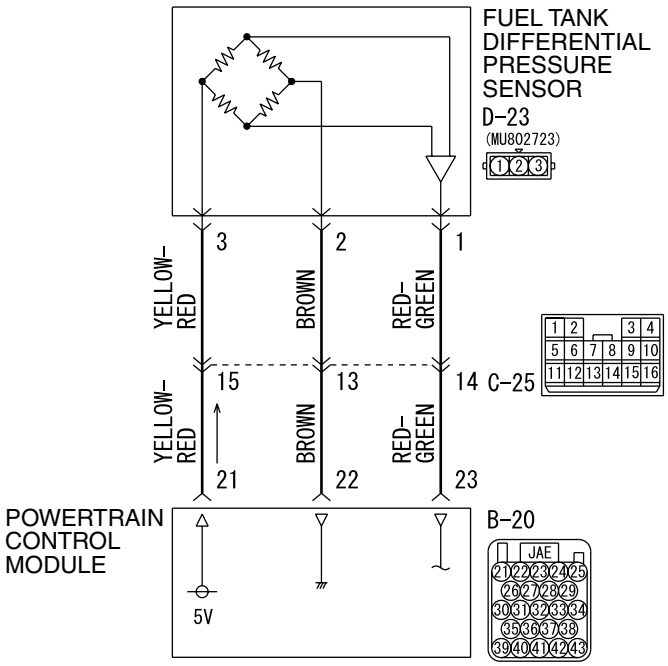
NO : The procedure is complete.

DTC P0452: Evaporative Emission System Pressure Sensor Low Input

SYSTEM DIAGRAM



Fuel Tank Differential Pressure Sensor Circuit



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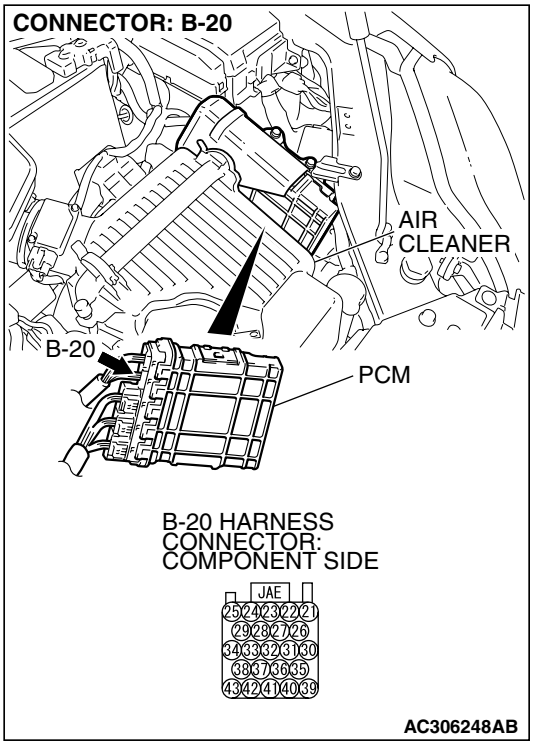

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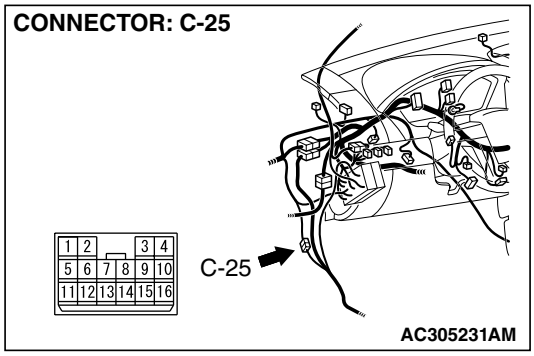
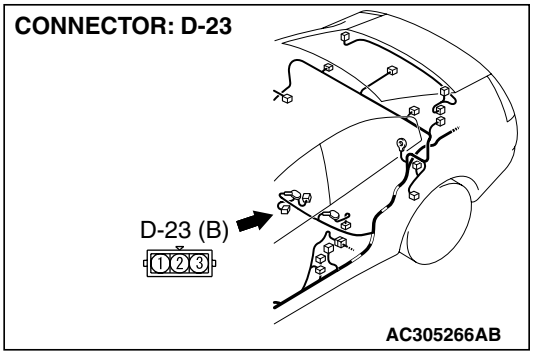


AC305231AM

TSB Revision



CIRCUIT OPERATION

- The PCM (terminal 21) supplies a 5-volt reference signal to the fuel tank differential pressure sensor (terminal 3). The fuel tank differential pressure sensor (terminal 2) is grounded through the PCM (terminal 22).
- The fuel tank differential pressure sensor (terminal 1) returns a voltage signal to the PCM (terminal 23) that is proportional to the pressure in the fuel tank.

TECHNICAL DESCRIPTION

- The PCM monitors the fuel tank differential pressure sensor output voltage.
- The PCM determines whether the fuel tank differential pressure sensor signal voltage is within normal operating parameters.

DESCRIPTIONS OF MONITOR METHODS

- Compare purge solenoid status with fuel tank differential pressure sensor output voltage.

MONITOR EXECUTION

- Continuous.

MONITOR EXECUTION CONDITIONS (OTHER MONITOR AND SENSOR)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

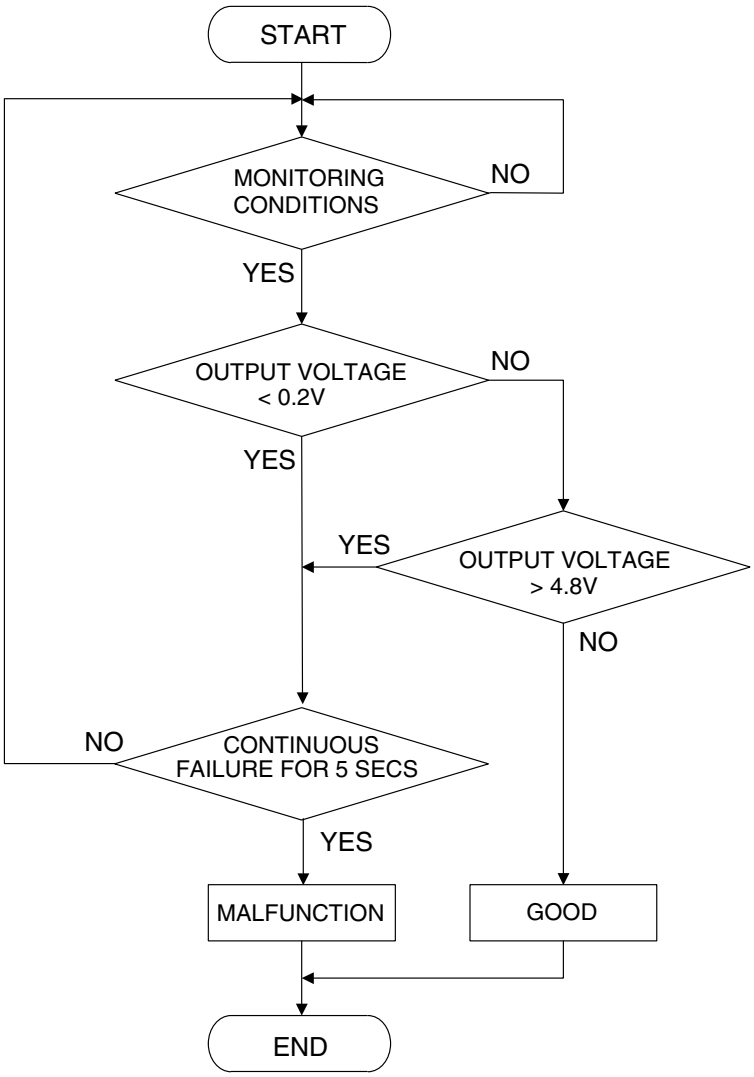
- Evaporative emission purge solenoid monitor
- Evaporative emission ventilation solenoid monitor

Sensor (The sensors below are determined to be normal)

- Mass airflow sensor
- Barometric pressure sensor
- Intake air temperature sensor
- Engine coolant temperature sensor
- Accelerator pedal position sensor

LOGIC FLOW CHARTS (Monitor Sequence)

RANGE CHECK - MIN. / MAX.



AC407445

DTC SET CONDITIONS

Check Condition

- 2 seconds or more have passed since the starting sequence was completed.

Judgment Criterion

- The fuel tank differential pressure sensor output voltage remains 0.2 volt or less for 5 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 20 P.13A-9.

TROUBLESHOOTING HINTS (THE MOST LIKELY CAUSES FOR THIS CODE TO BE SET ARE:)

- Malfunction of the fuel tank differential pressure sensor.
- A damaged harness in the fuel tank differential pressure sensor circuit.
- Malfunction of the PCM.

OVERVIEW OF TROUBLESHOOTING

- DTC P0452 can be set by a faulty fuel tank differential pressure sensor or related circuit, or PCM failure.

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- To check for system blockage, do a performance test which uses a mechanical vacuum gauge and scan tool MB991958 set on the fuel tank differential pressure sensor (TANK PRS SNSR 73). The mechanical gauge reading is used to verify scan tool MB991958 reading. A comparison of the mechanical gauge with the reading on scan tool MB991958 will locate a problem in the system.

DIAGNOSIS

Required Special Tools:

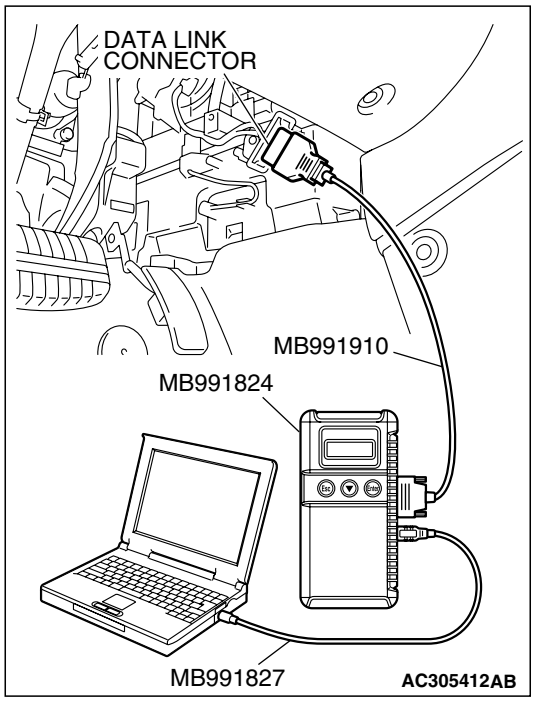
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A
- MB991658: Test Harness Set
- MB991923: Power Plant ECU Check Harness

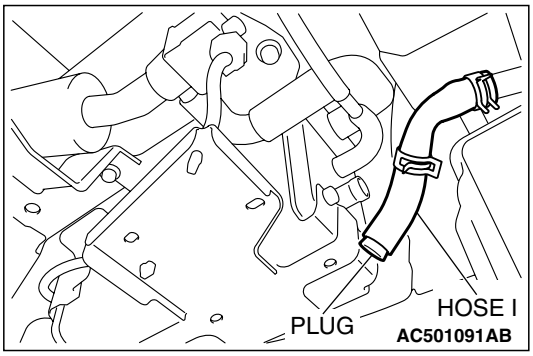
STEP 1. Using scan tool MB991958, check data list item 52: Fuel Tank Differential Pressure Sensor.

⚠ CAUTION

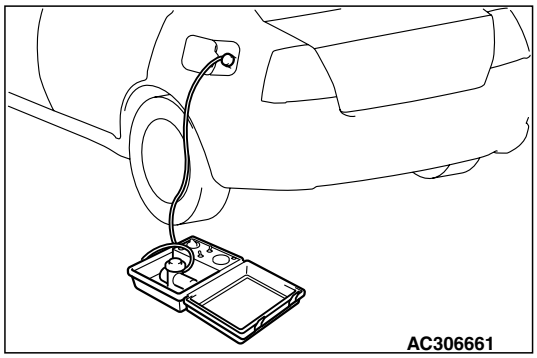
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.





(2) Disconnect hose I from the evaporative emission canister, and plug the hose.
(3) Turn the ignition switch to the "ON" position.
(4) Remove the fuel cap.
(5) Set scan tool MB991958 to the data reading mode.
- Item 52, Fuel Tank Differential Pressure Sensor.
  - The fuel tank pressure reading on the scan tool should be 2,050 to 2,950 mV.



(6) Connect the evaporative emission system pressure pump (Miller number 6872A) to the fuel tank filler tube by using fuel tank adapter (MLR-8382) and pressurize the fuel tank.
- The fuel tank pressure reading should increase.

(7) Turn the ignition switch to the "LOCK" (OFF) position. Then disconnect scan tool MB991958.
(8) Remove the evaporative emission system pressure pump (Miller number 6872A) and the fuel tank adapter (MLR-8382), and reinstall the fuel cap.
(9) Connect hose I to the evaporative emission canister.

Q: Is the fuel tank pressure between 2,050 to 2,950 mV?

YES : It can be assumed 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). Go to Step 17.

NO : Go to Step 2.

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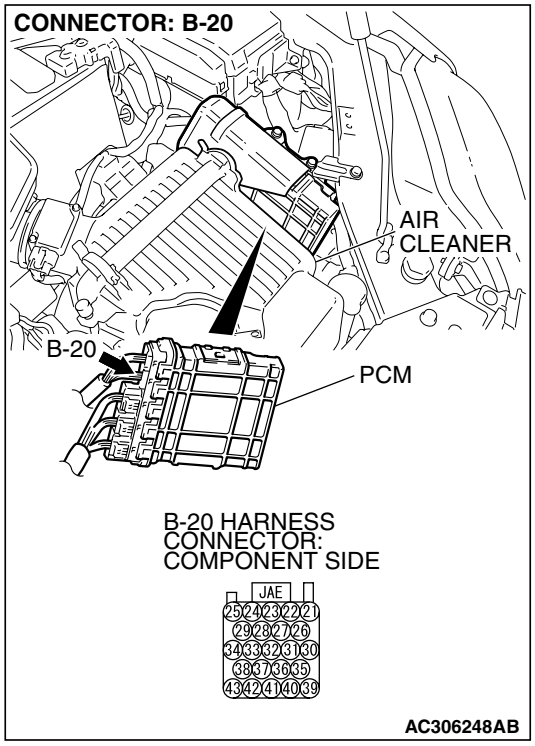
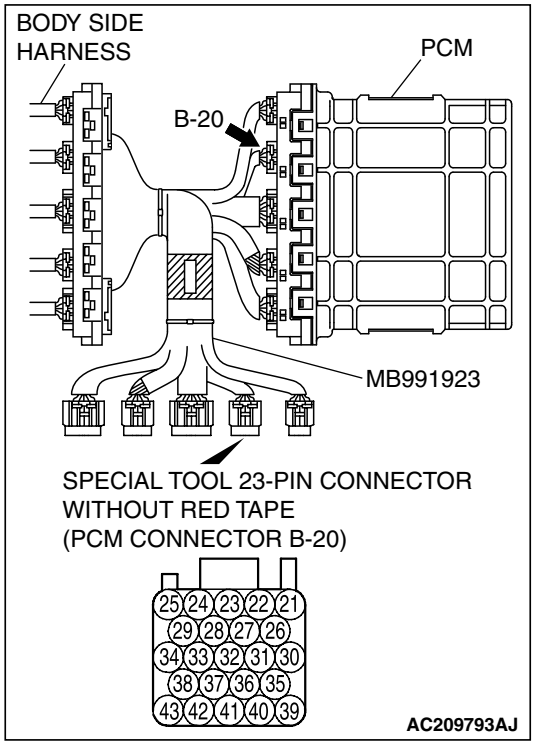
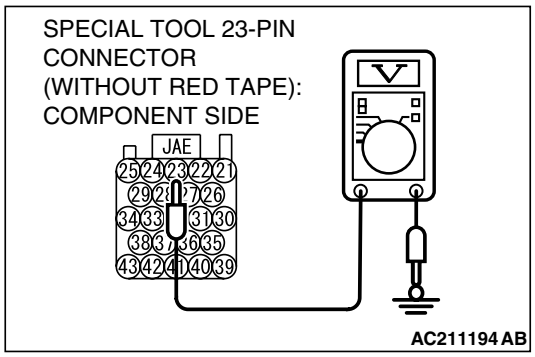
STEP 2. Measure the sensor output voltage at PCM connector B-20 by using check harness special tool MB991923.

(1) Disconnect all the connectors from the PCM.





(2) Connect special tool MB991923 (check harness) between the PCM and the body-side harness connector.
(3) Turn the ignition switch to the "ON" position.
(4) Remove the fuel cap.



(5) Measure the voltage between terminal 23 and ground.
- The voltage should measure between 2.0 and 3.0 volts.

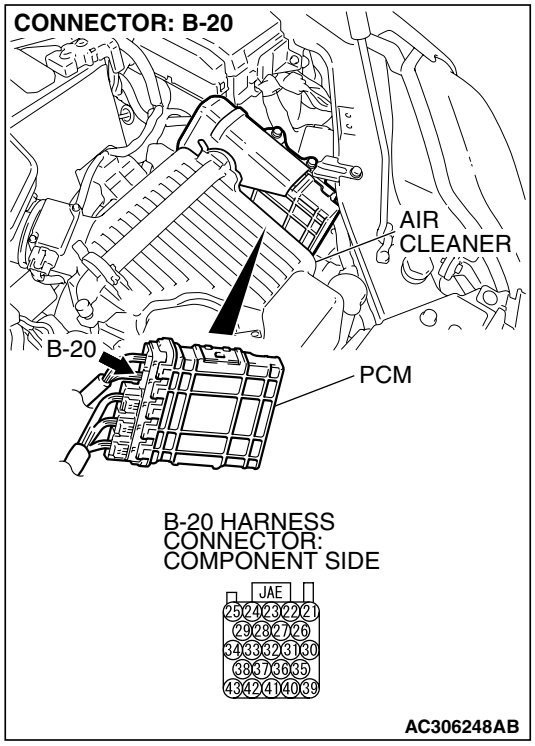
(6) Install the fuel cap.
(7) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the measured voltage between 2.0 and 3.0 volts?

YES : Go to Step 16.
NO : Go to Step 3.

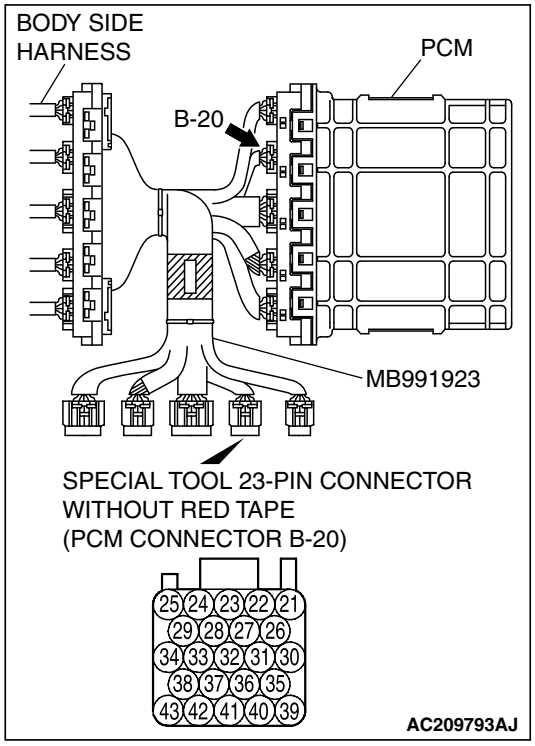
STEP 3. Measure the 5-volt reference signal at PCM connector B-20 by using check harness special tool MB991923.

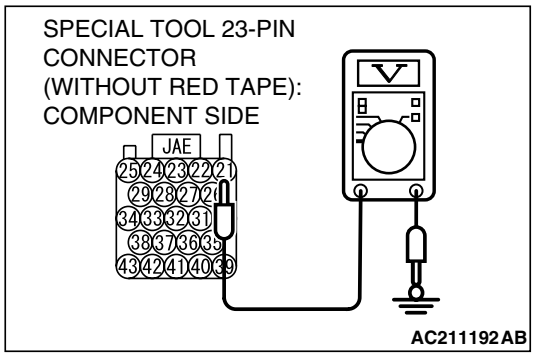
(1) Disconnect all the connectors from the PCM.



(2) Connect special tool MB991923 (check harness) between the PCM and the body-side harness connector.

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





(4) Measure the voltage between terminal 21 and ground.
- The voltage should measure between 4.9 and 5.1 volts.

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

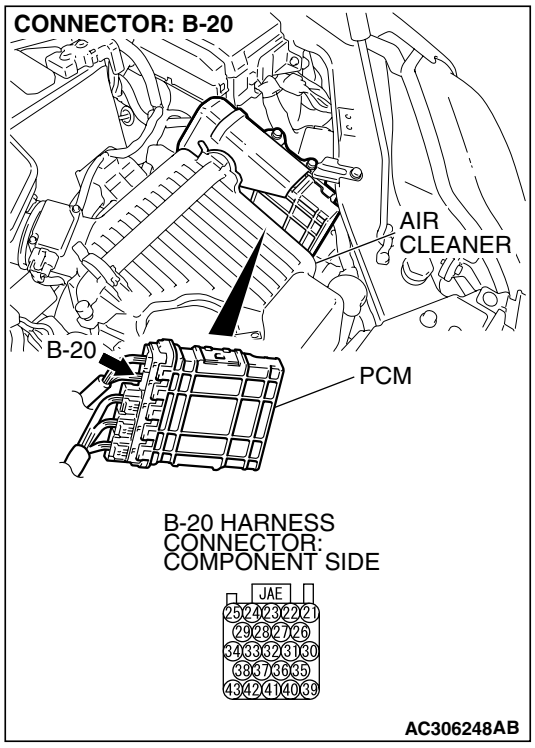
Q: Is the measured voltage between 4.9 and 5.1 volts?

YES : Go to Step 5.
NO : Go to Step 4.

STEP 4. Check PCM connector B-20 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

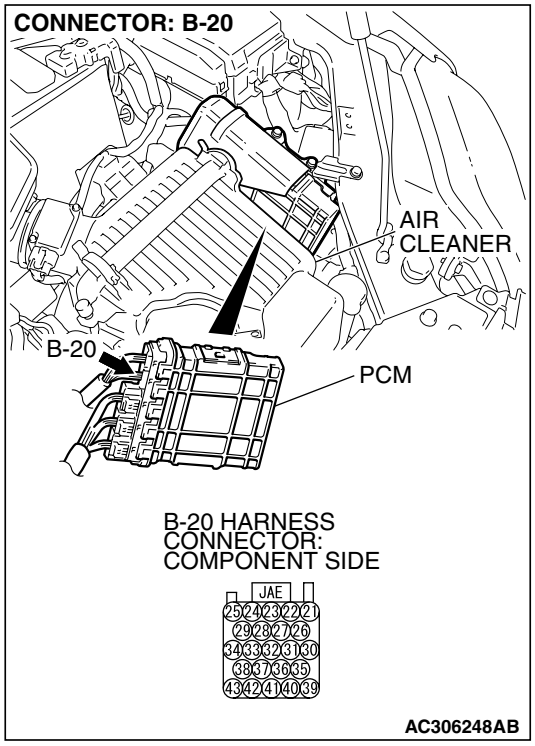
Q: Are the connector and terminals in good condition?

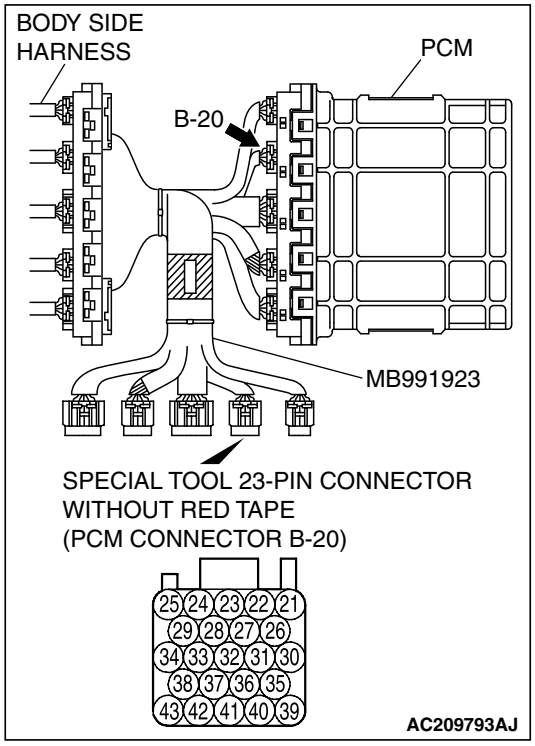
YES : Go to Step 16.
NO : Repair or replace the faulty components (Refer to GROUP 00E, Harness Connector Inspection P.00E-2). Then go to Step 17.



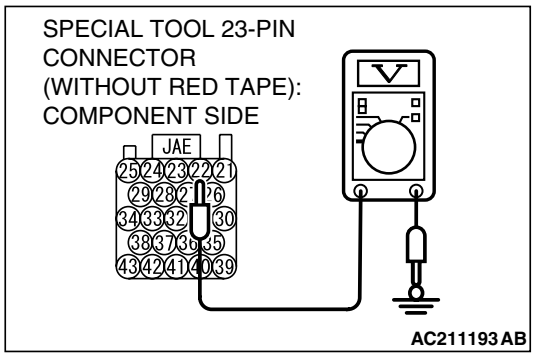
STEP 5. Measure the sensor output voltage at PCM connector B-20 by using check harness special tool MB991923.

(1) Disconnect all the connectors from the PCM.





(2) Connect special tool MB991923 (check harness) between the PCM and the body-side harness connector.
(3) Turn the ignition switch to the "ON" position.
(4) Remove the fuel cap.



(5) Measure the voltage between terminal 22 and ground.
- The voltage should measure 0.5 volt or less.

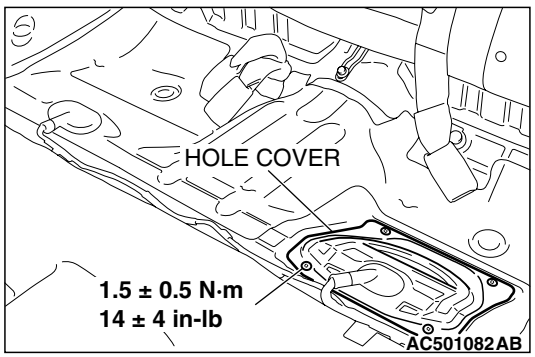
(6) Install the fuel cap.
(7) Turn the ignition switch to the "LOCK" (OFF) position.

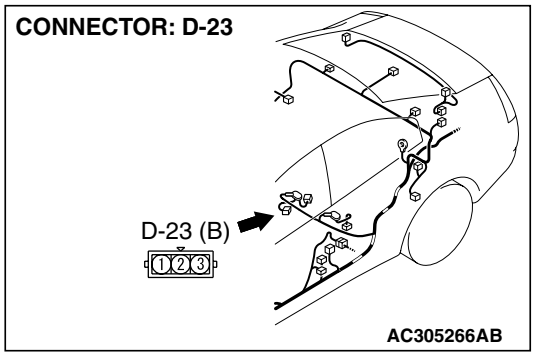
Q: Is the measured voltage 0.5 volt or less?

YES : Go to Step 6.
NO : Go to Step 9.

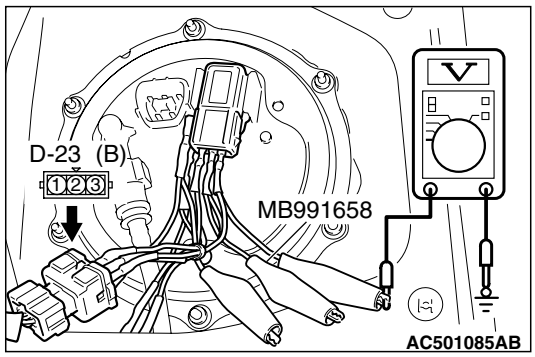
STEP 6. Measure the signal voltage at intermediate connector D-23.

(1) Remove the rear seat cushion assembly (Refer to GROUP 52A, Rear Seat P.52A-45).
(2) Remove the hole cover.





(3) Disconnect fuel tank differential pressure sensor connector D-23.



(4) Use special tool MB991658 to connect terminals 1,2 and 3 of the fuel tank differential pressure sensor connector D-23.
(5) Turn the ignition switch to the "ON" position.
(6) Remove the fuel cap.
(7) Measure the voltage between connector D-23 terminal 1 and ground.
- The voltage should measure between 2.0 and 3.0 volts.

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

Q: Is the measured voltage between 2.0 and 3.0 volts?

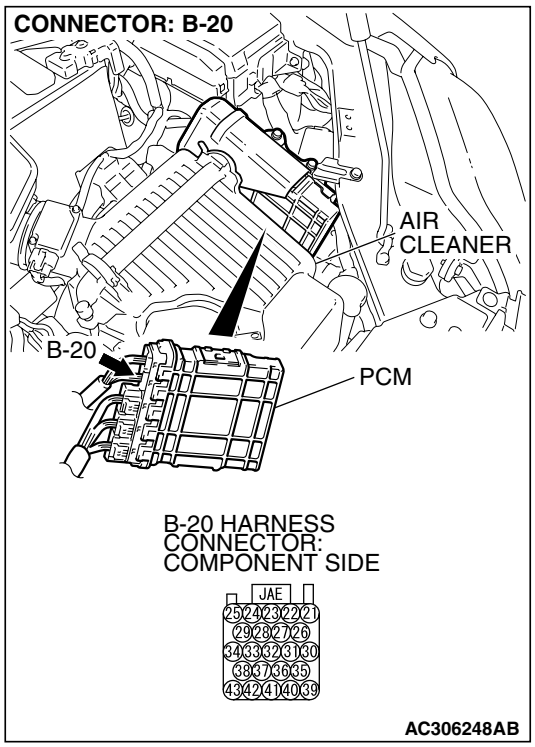
YES : Go to Step 7.
NO : Go to Step 15.

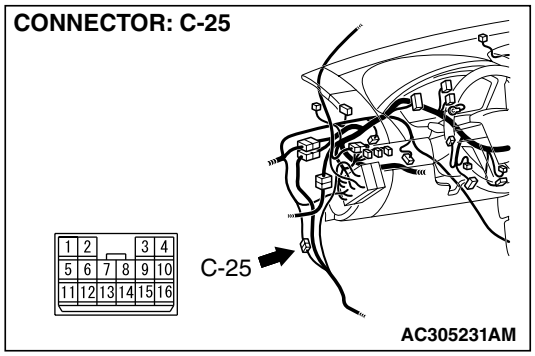
STEP 7. Check PCM connector B-20, intermediate connector C-25 and fuel tank differential pressure sensor connector D-23 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

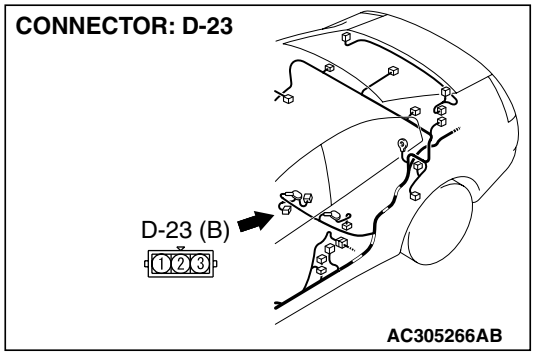
Q: Are the connectors and terminals in good condition?

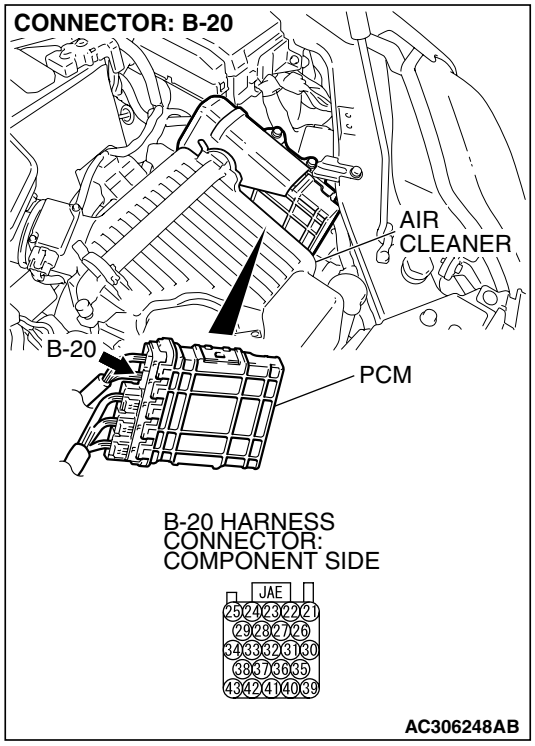
YES : Go to Step 8.

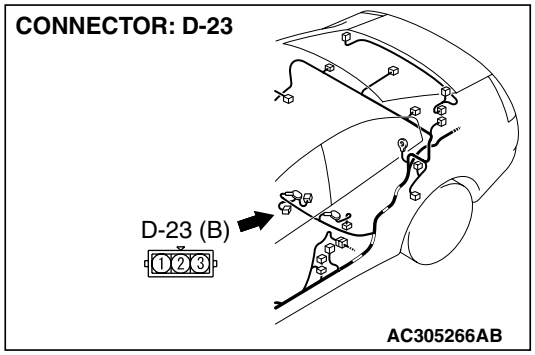
NO : Repair or replace the faulty components (Refer to GROUP 00E, Harness Connector Inspection P.00E-2). Then go to Step 17.











STEP 8. Check the harness wire between PCM connector B-20 terminal 23 and fuel tank differential pressure sensor connector D-23 terminal 1 for damage.

Q: Is the harness wire in good condition?

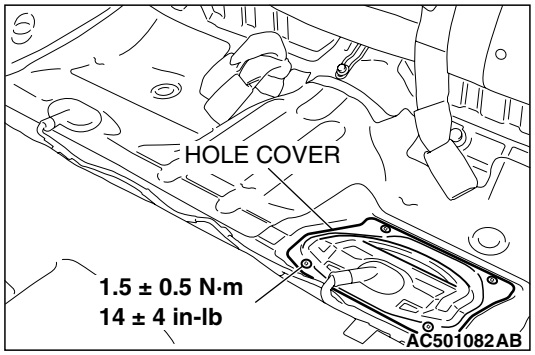
YES : This malfunction is intermittent (Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-14). Go to Step 17.

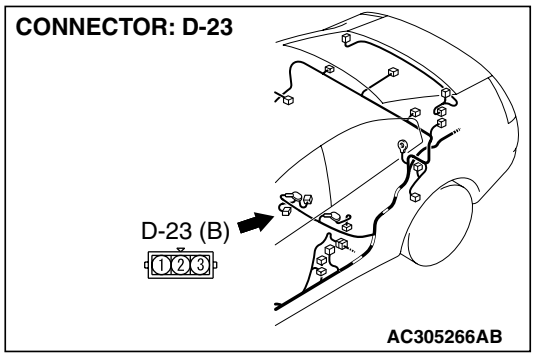
NO : Repair the damaged harness wire. Then go to Step 17.

STEP 9. Measure the 5-volt reference signal at fuel tank differential pressure sensor connector D-23.

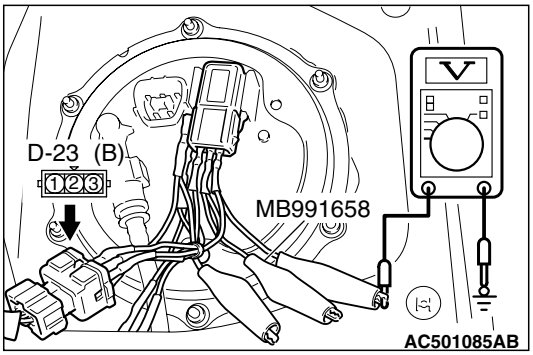
(1) Remove the rear seat cushion assembly (Refer to GROUP 52A, Rear Seat P.52A-45).

(2) Remove the hole cover.





(3) Disconnect fuel tank differential pressure sensor connector D-23.



(4) Use special tool MB991658 to connect terminals 1,2 and 3 of the fuel tank differential pressure sensor connector D-23.

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

(6) Measure the voltage between terminal 3 and ground.
- The voltage should measure between 4.9 and 5.1 volts.

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

Q: Is the measured voltage between 4.9 and 5.1 volts?

YES : Go to Step 12.

NO : Go to Step 10.

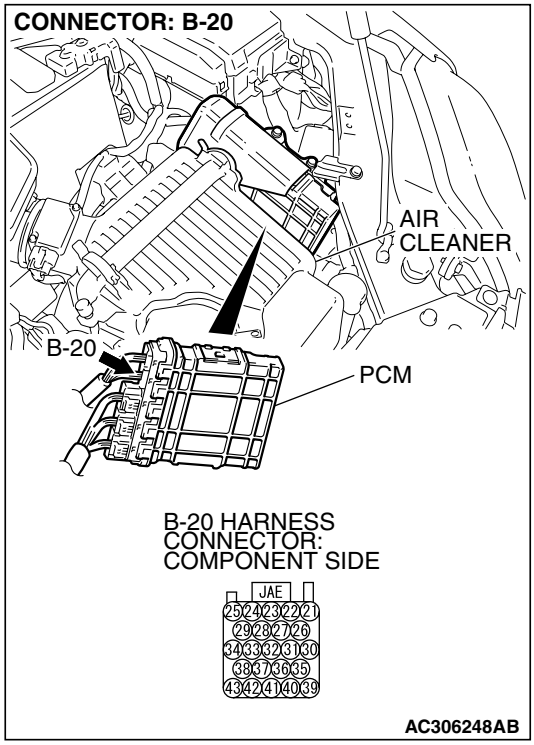
STEP 10. Check PCM connector B-20, intermediate connector C-25 and fuel tank differential pressure sensor connector D-23 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

Q: Are the connectors and terminals in good condition?

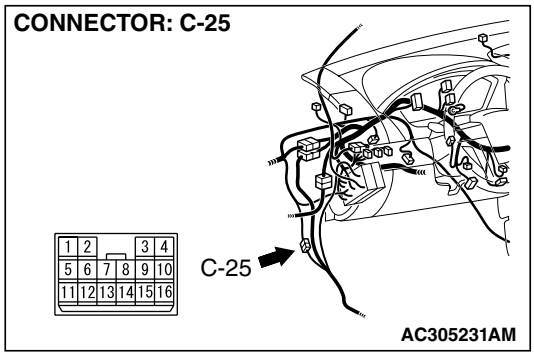
YES : Go to Step 11.

NO : Repair or replace the faulty components (Refer to GROUP 00E, Harness Connector Inspection P.00E-2). Then go to Step 17.

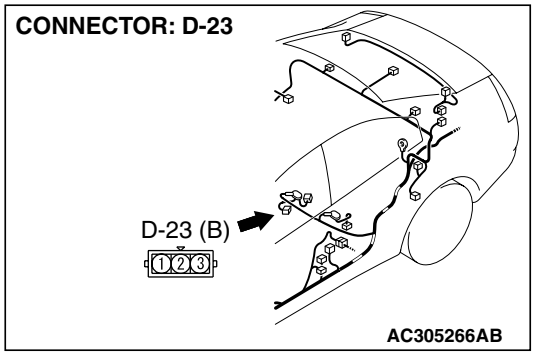
CONNECTOR: B-20

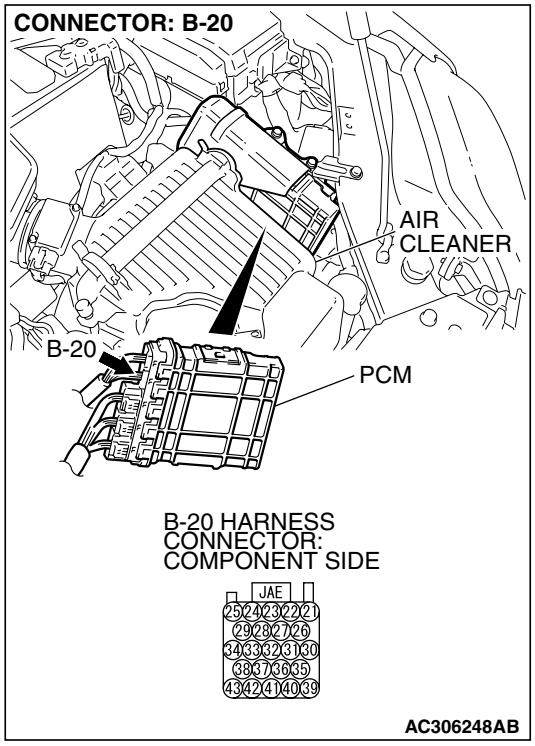


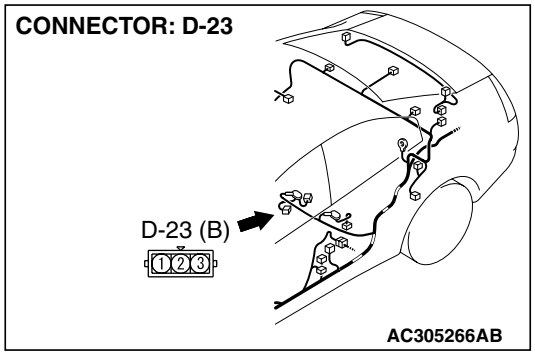
CONNECTOR: C-25



CONNECTOR: D-23







STEP 11. Check the harness wire between PCM connector B-20 terminal 21 and fuel tank differential pressure sensor connector D-23 terminal 3 for damage.

Q: Are the harness wires in good condition?

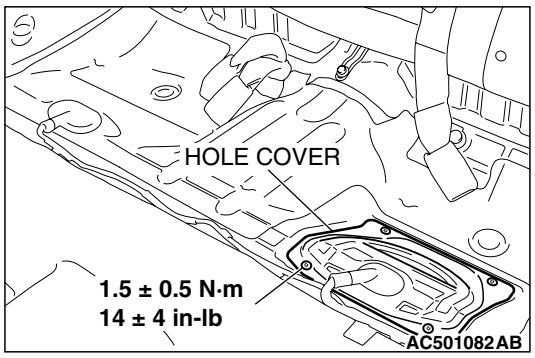
YES : It can be assumed that this malfunction is intermittent (Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-14). Go to Step 17.

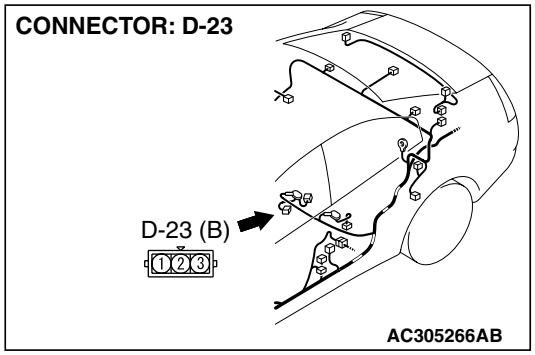
NO : Repair the damaged harness wires. Then go to Step 17.

STEP 12. Measure the fuel tank differential pressure sensor return voltage at fuel tank differential pressure sensor connector D-23.

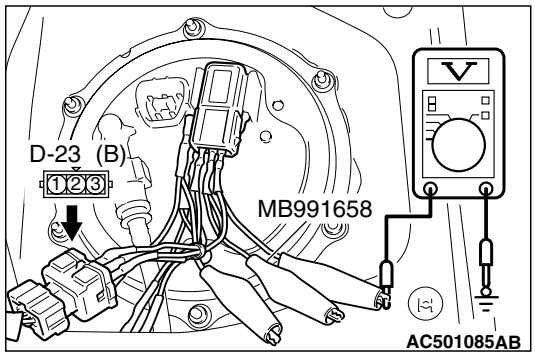
(1) Remove the rear seat cushion assembly (Refer to GROUP 52A, Rear Seat P.52A-45).

(2) Remove the hole cover.





(3) Disconnect fuel tank differential pressure sensor connector D-23.



(4) Use special tool MB991658 to connect terminals 1,2 and 3 of the fuel tank differential pressure sensor connector D-23.

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

(6) Measure the voltage between terminal 2 and ground.
- The voltage should measure 0.5 volt or less.

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

Q: Is the measured voltage 0.5 volt or less?

YES : Go to Step 13.

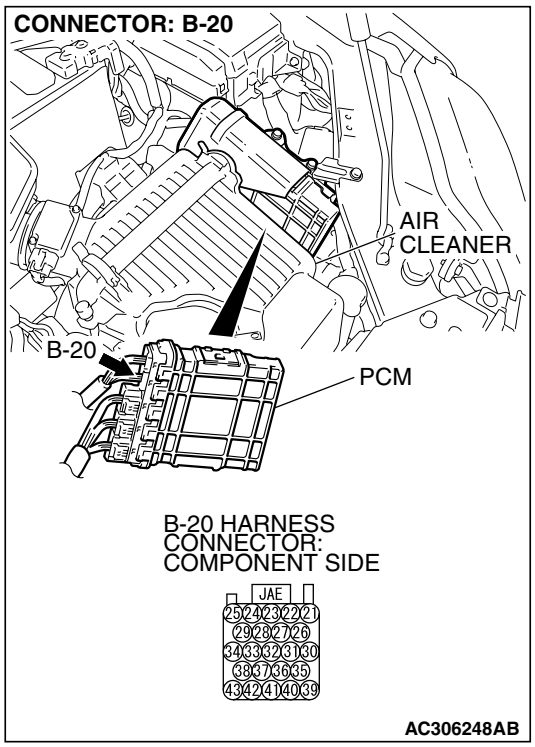
NO : Go to Step 17.

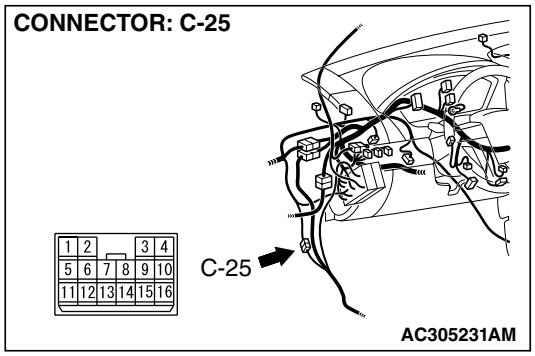
STEP 13. Check PCM connector B-20, intermediate connector C-25 and fuel tank differential pressure sensor connector D-23 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

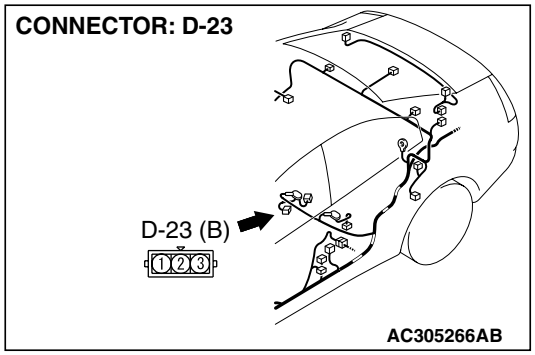
Q: Are the connectors and terminals in good condition?

YES : Go to Step 14.

NO : Repair or replace the faulty components (Refer to GROUP 00E, Harness Connector Inspection P.00E-2). Then go to Step 17.

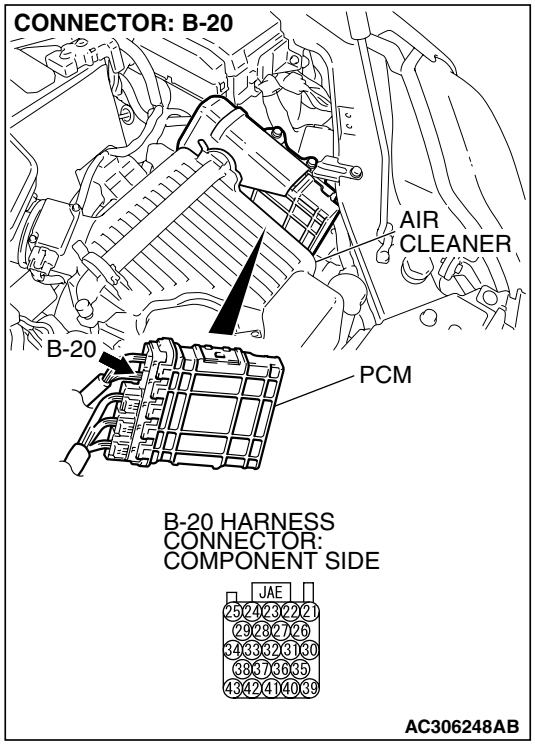


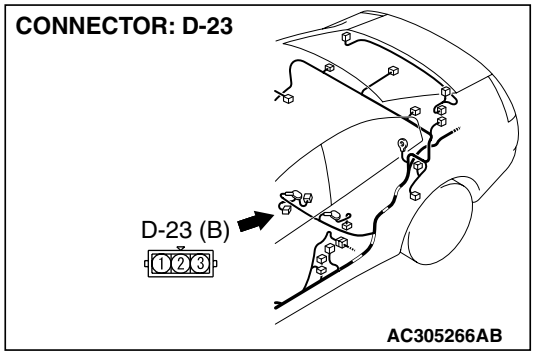




STEP 14. Check the harness wires between PCM connector B-20 terminal 22 and fuel tank differential pressure sensor connector D-23 terminal 2 for damage.
Q: Are the harness wires in good condition?

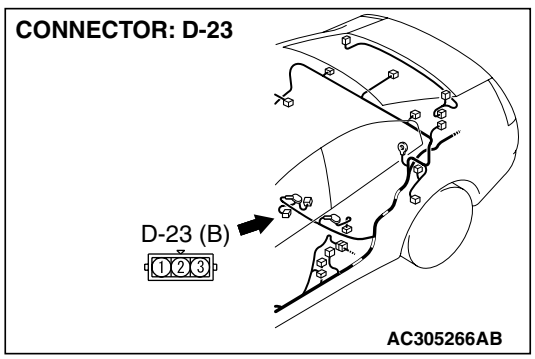
YES : Go to Step 17.
NO : Repair the damaged harness wires. Then go to Step 17.





STEP 15. Check fuel tank differential pressure sensor connector D-23 for loose, corroded or damaged terminals, or terminals pushed back in the connector.
Q: Is the connectors and terminals in good condition?

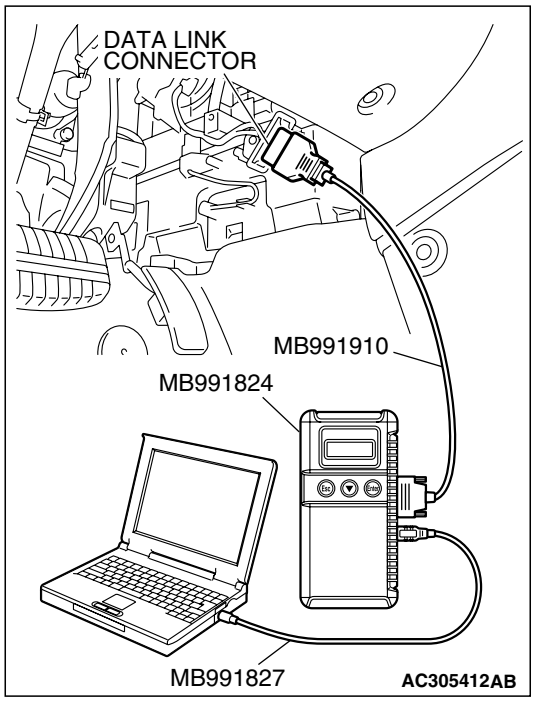
YES : Replace the fuel tank differential pressure sensor. Then go to Step 17.
NO : Repair or replace the faulty components (Refer to GROUP 00E, Harness Connector Inspection P.00E-2). Then go to Step 17.

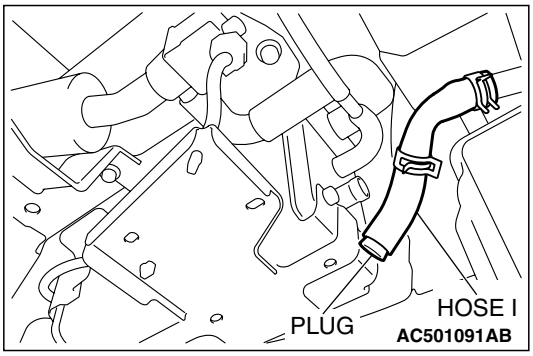


STEP 16. Using scan tool MB991958, check data list item 52: Fuel Tank Differential Pressure Sensor.

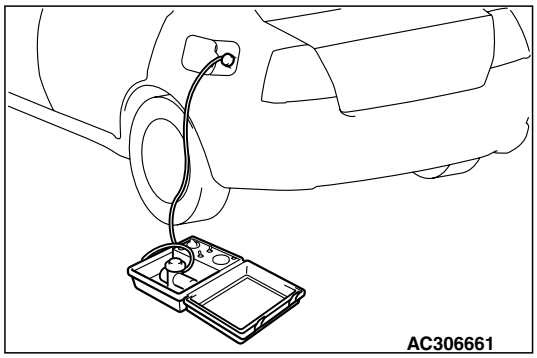
⚠ CAUTION
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.





(2) Disconnect hose I from the evaporative emission canister, and plug the hose.
(3) Turn the ignition switch to the "ON" position.
(4) Remove the fuel cap.
(5) Set scan tool MB991958 to the data reading mode.
- Item 52, Fuel Tank Differential Pressure Sensor.
  - The fuel tank pressure reading on the scan tool should be 2,050 to 2,950 mV.



(6) Connect the evaporative emission system pressure pump (Miller number 6872A) to the fuel tank filler tube by using fuel tank adapter (MLR-8382) and pressurize the fuel tank.
- The fuel tank pressure reading should increase.

(7) Turn the ignition switch to the "LOCK" (OFF) position. Then disconnect scan tool MB991958.
(8) Remove the evaporative emission system pressure pump (Miller number 6872A) and the fuel tank adapter (MLR-8382), and reinstall the fuel cap.
(9) Connect hose I to the evaporative emission canister.

Q: Is the fuel tank pressure between 2,050 to 2,950 mV?

YES : It can be assumed 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). Go to Step 17.

NO : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11.

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Then go to Step 17.

STEP 17. Perform the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern (Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 20 P.13A-9).

(2) Read the diagnostic trouble code (DTC).

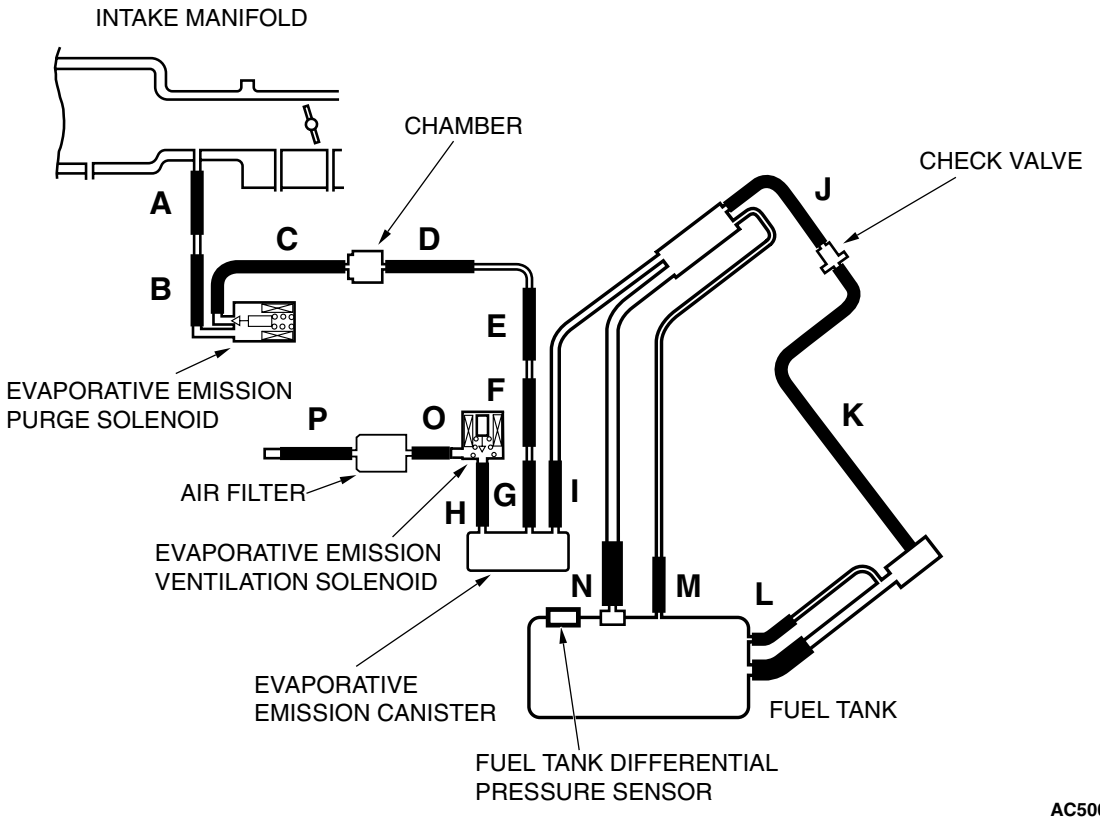
Q: Is DTC P0452 set?

YES : Repeat the troubleshooting from Step 2.

NO : The procedure is complete.

DTC P0453: Evaporative Emission System Pressure Sensor High Input

SYSTEM DIAGRAM



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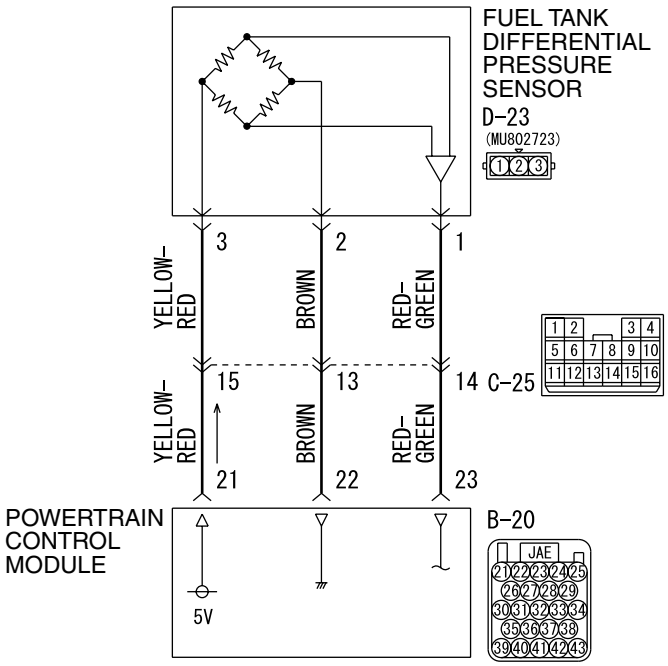
Fuel Tank Differential Pressure Sensor Circuit



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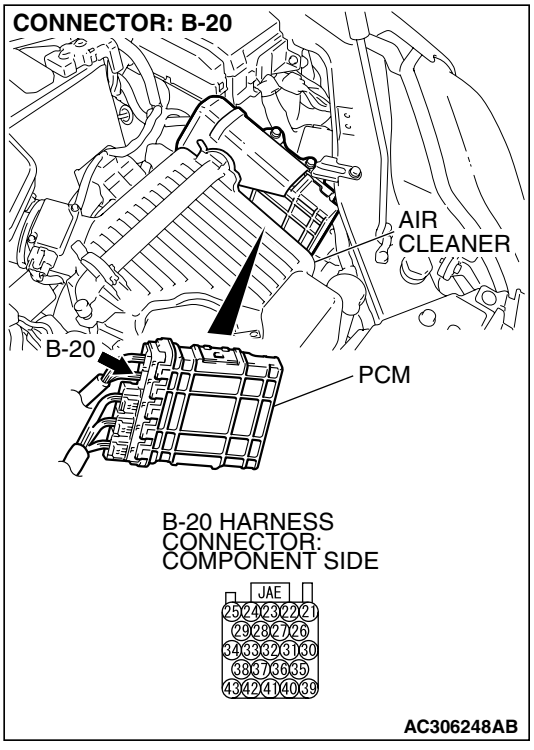

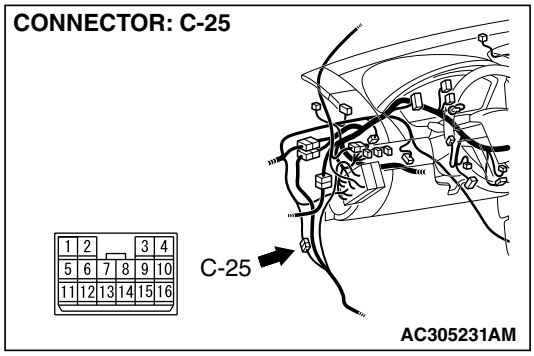

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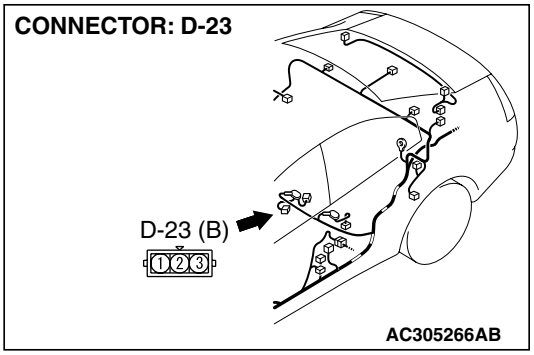


CIRCUIT OPERATION

- The PCM (terminal 21) supplies a 5-volt reference voltage to the fuel tank differential pressure sensor (terminal 3). The PCM (terminal 22) supplies a ground to the fuel tank differential pressure sensor (terminal 2).
- The PCM (terminal 23) receives a voltage signal proportional to the pressure in the fuel tank from the fuel tank differential pressure sensor (terminal 1).

TECHNICAL DESCRIPTION

- To determine whether the fuel tank differential pressure sensor is defective, the PCM monitors the fuel tank differential pressure sensor output voltage.
- The PCM judges if the fuel tank differential pressure sensor output voltage is normal.

NOTE: In rare cases, this DTC may be also set under some fuel and driving conditions regardless of the fuel pressure sensor output voltage when the fuel system is clogged.

DESCRIPTIONS OF MONITOR METHODS

- Compare purge solenoid status with fuel tank differential pressure sensor output voltage.

MONITOR EXECUTION

- Continuous.

MONITOR EXECUTION CONDITIONS (OTHER MONITOR AND SENSOR)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

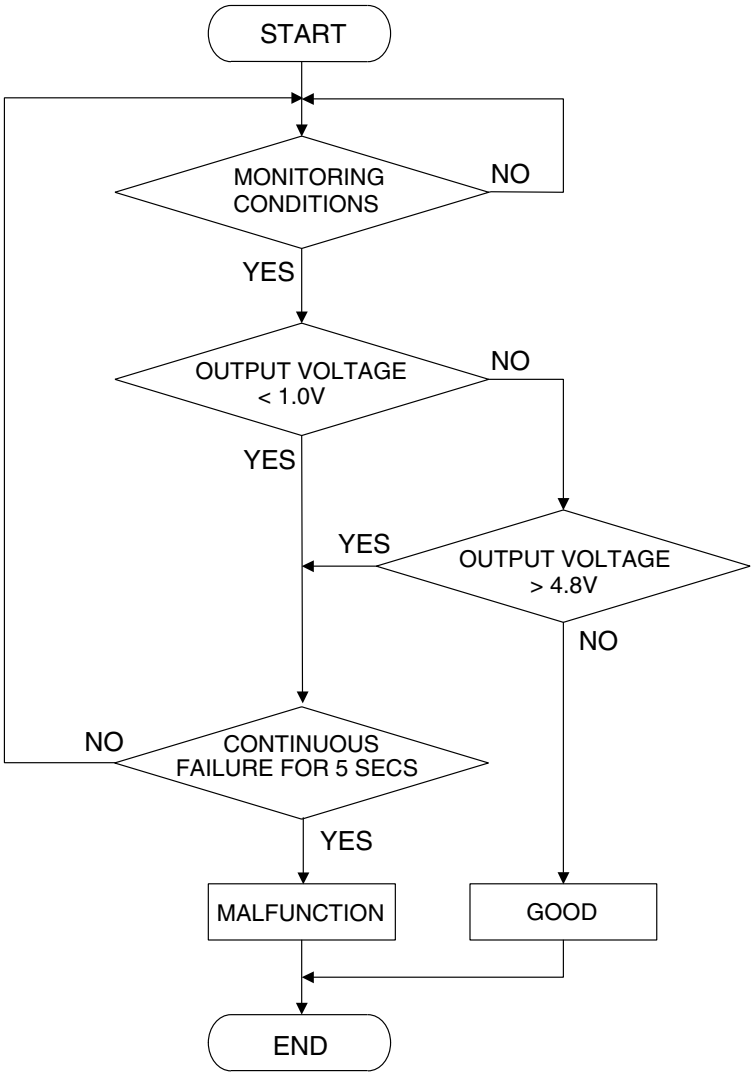
- Evaporative emission purge solenoid monitor
- Evaporative emission ventilation solenoid monitor

Sensor (The sensors below are determined to be normal)

- Mass airflow sensor
- Barometric pressure sensor
- Intake air temperature sensor
- Engine coolant temperature sensor
- Accelerator pedal position sensor

LOGIC FLOW CHARTS (Monitor Sequence)

RANGE CHECK - MIN. / MAX.



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DTC SET CONDITIONS

Check Conditions

- 2 seconds or more have passed since the starting sequence was completed.
- The fuel temperature is 36°C (97°F) or less.
- Remaining fuel level is 85% or less when the engine is started.

Judgment Criterion

- The fuel tank differential pressure sensor output voltage remains 4.8 volt or greater for 5 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 20 P.13A-9.

TROUBLESHOOTING HINTS (THE MOST LIKELY CAUSES FOR THIS CODE TO BE SET ARE:)

- Malfunction of the fuel tank differential pressure sensor.
- Open or shorted fuel tank differential pressure sensor circuit.
- Malfunction of the PCM.

OVERVIEW OF TROUBLESHOOTING

- DTC P0453 can be set by a faulty fuel tank differential pressure sensor or related circuit, or PCM failure.

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- To check for system blockage, do a performance test which uses a mechanical vacuum gauge and scan tool MB991958 set on the fuel tank differential pressure sensor (TANK PRS SNSR 73). The mechanical gauge reading is used to verify scan tool reading. A comparison of the mechanical gauge with the reading on scan tool MB991958 will locate a problem in the system.

DIAGNOSIS

Required Special Tools:

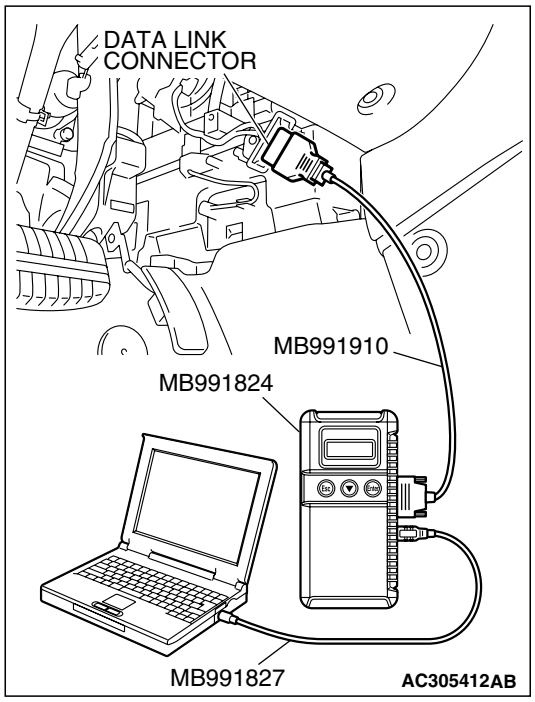
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A
- MB991658: Test Harness Set
- MB991923: Power Plant ECU Check Harness

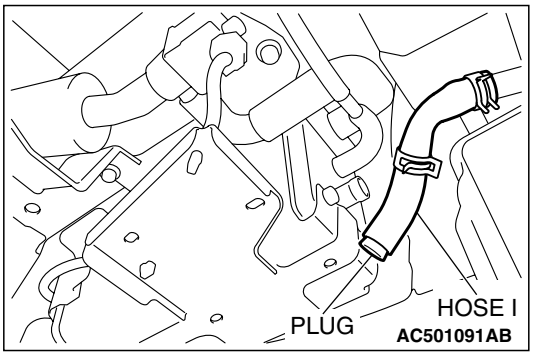
STEP 1. Using scan tool MB991958, check data list item 52: Fuel Tank Differential Pressure Sensor.

⚠ CAUTION

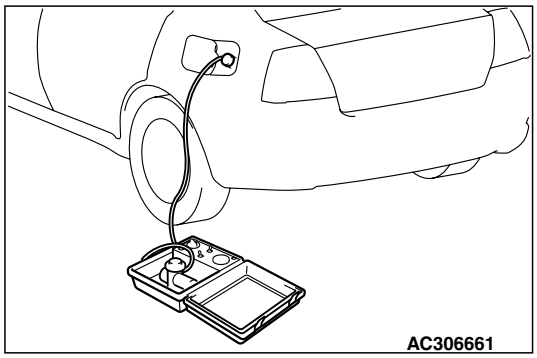
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.





(2) Disconnect hose I from the evaporative emission canister, and plug the hose.
(3) Turn the ignition switch to the "ON" position.
(4) Remove the fuel cap.
(5) Set scan tool MB991958 to the data reading mode.
- Item 52, Fuel Tank Differential Pressure Sensor.
  - The fuel tank pressure reading on the scan tool should be 2,050 to 2,950 mV.



(6) Connect the evaporative emission system pressure pump (Miller number 6872A) to the fuel tank filler tube by using fuel tank adapter (MLR-8382) and pressurize the fuel tank.
- The fuel tank pressure reading should increase.

(7) Turn the ignition switch to the "LOCK" (OFF) position. Then disconnect scan tool MB991958.
(8) Remove the evaporative emission system pressure pump (Miller number 6872A) and the fuel tank adapter (MLR-8382), and reinstall the fuel cap.
(9) Connect hose I to the evaporative emission canister.

Q: Is the fuel tank pressure between 2,050 to 2,950 mV?

YES : It can be assumed 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). Go to Step 17.

NO : Go to Step 2.

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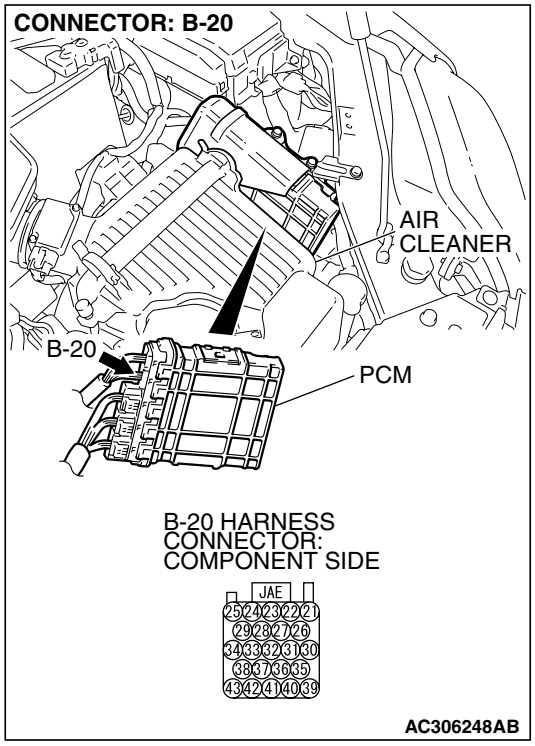
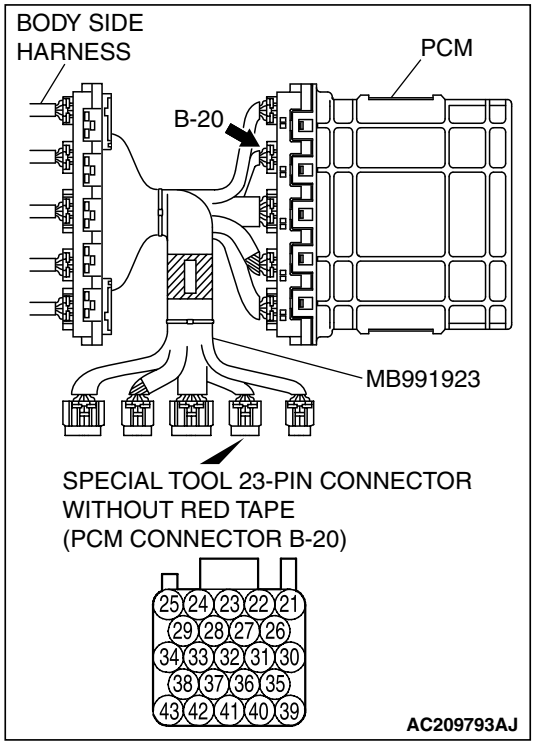
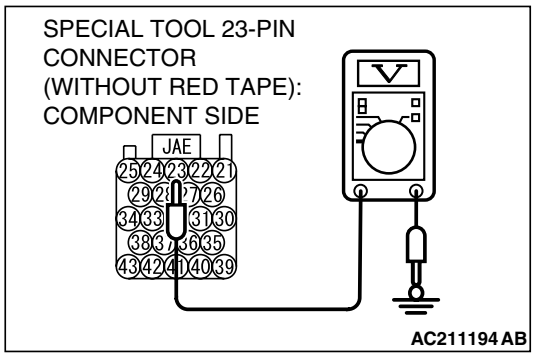
STEP 2. Measure the sensor output voltage at PCM connector B-20 by using check harness special tool MB991923.

(1) Disconnect all the connectors from the PCM.





(2) Connect special tool MB991923 (check harness) between the PCM and the body-side harness connector.
(3) Turn the ignition switch to the "ON" position.
(4) Remove the fuel cap.



(5) Measure the voltage between terminal 23 and ground.
- The voltage should measure between 2.0 and 3.0 volts.

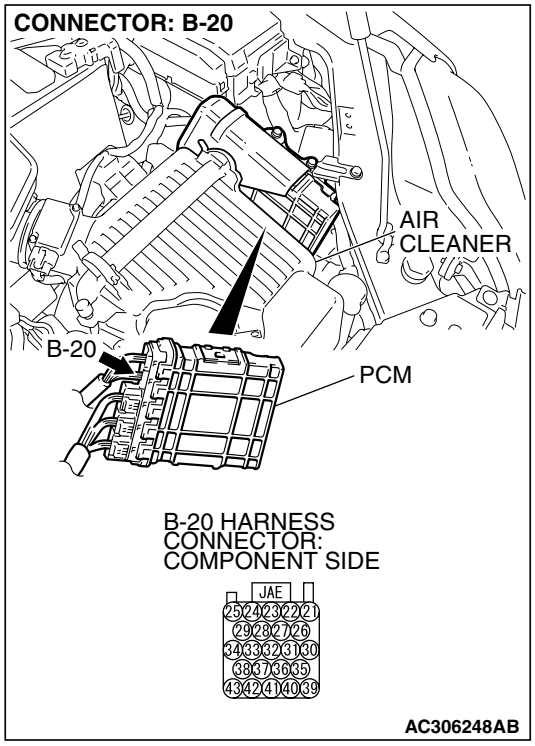
(6) Install the fuel cap.
(7) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the measured voltage between 2.0 and 3.0 volts?

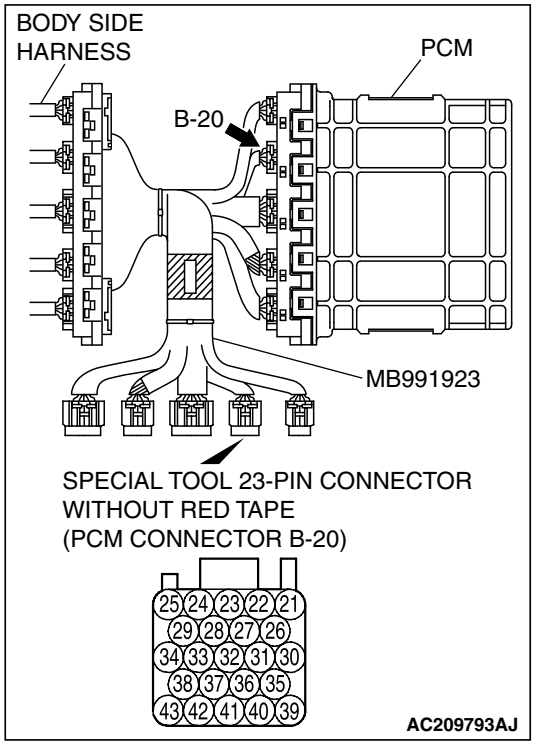
YES : Go to Step 16.
NO : Go to Step 3.

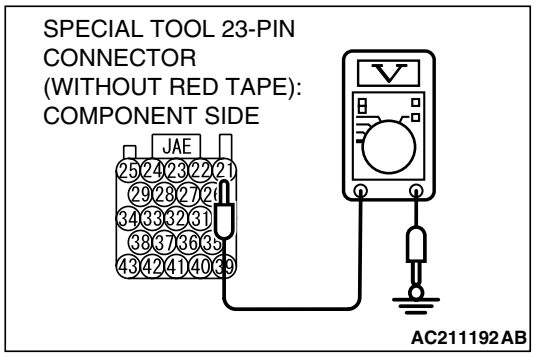
STEP 3. Measure the 5-volt reference signal at PCM connector B-20 by using check harness special tool MB991923.

(1) Disconnect all the connectors from the PCM.



(2) Connect special tool MB991923 (check harness) between the PCM and the body-side harness connector.
(3) Turn the ignition switch to the "ON" position.





(4) Measure the voltage between terminal 21 and ground.
- The voltage should measure between 4.9 and 5.1 volts.

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

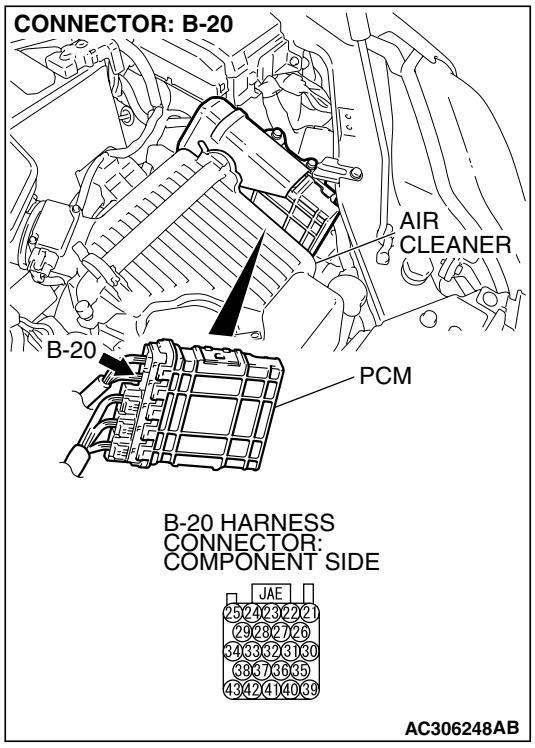
Q: Is the measured voltage between 4.9 and 5.1 volts?

YES : Go to Step 5.
NO : Go to Step 4.

STEP 4. Check PCM connector B-20 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

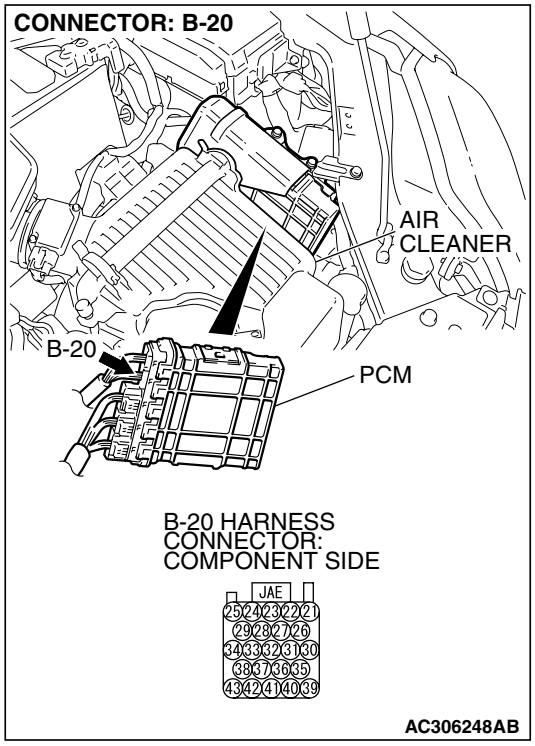
Q: Are the connector and terminals in good condition?

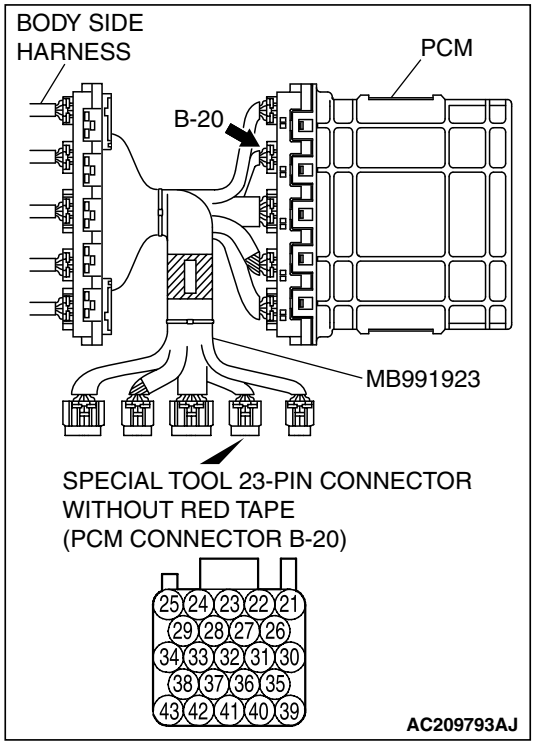
YES : Go to Step 16.
NO : Repair or replace the faulty components (Refer to GROUP 00E, Harness Connector Inspection P.00E-2). Then go to Step 17.



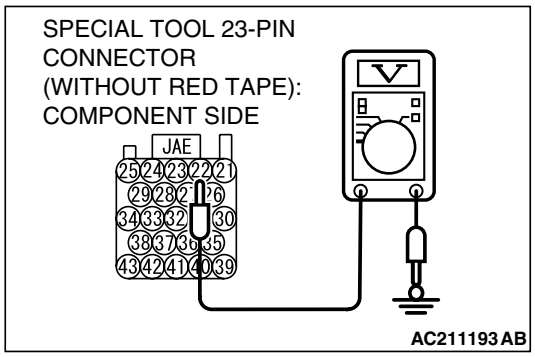
STEP 5. Measure the sensor output voltage at PCM connector B-20 by using check harness special tool MB991923.

(1) Disconnect all the connectors from the PCM.





(2) Connect special tool MB991923 (check harness) between the PCM and the body-side harness connector.
(3) Turn the ignition switch to the "ON" position.
(4) Remove the fuel cap.



(5) Measure the voltage between terminal 22 and ground.
- The voltage should measure 0.5 volt or less.

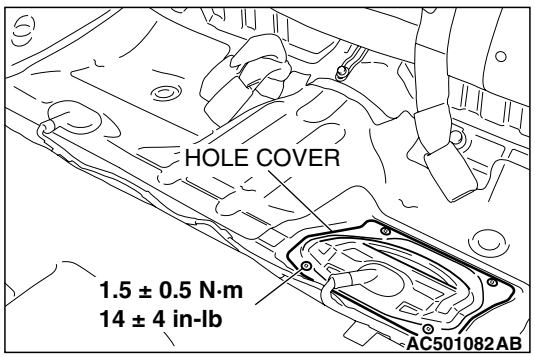
(6) Install the fuel cap.
(7) Turn the ignition switch to the "LOCK" (OFF) position.

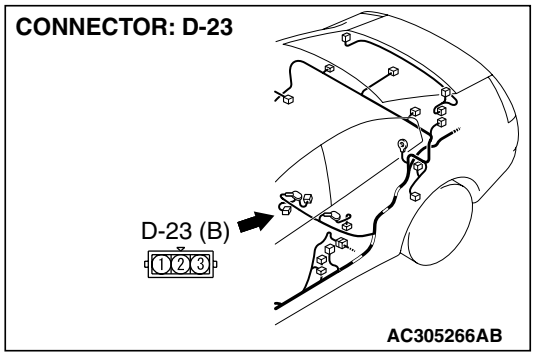
Q: Is the measured voltage 0.5 volt or less?

YES : Go to Step 6.
NO : Go to Step 9.

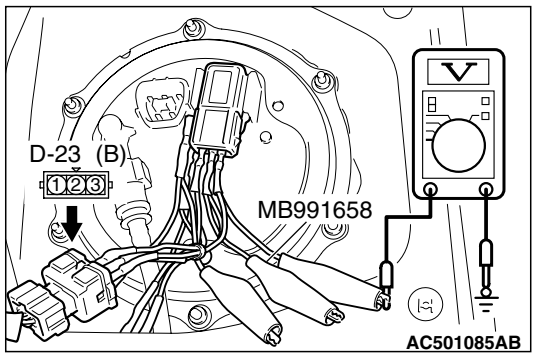
STEP 6. Measure the signal voltage at intermediate connector D-23.

(1) Remove the rear seat cushion assembly (Refer to GROUP 52A, Rear Seat P.52A-45).
(2) Remove the hole cover.





(3) Disconnect fuel tank differential pressure sensor connector D-23.



(4) Use special tool MB991658 to connect terminals 1,2 and 3 of the fuel tank differential pressure sensor connector D-23.
(5) Turn the ignition switch to the "ON" position.
(6) Remove the fuel cap.
(7) Measure the voltage between connector D-23 terminal 1 and ground.
- The voltage should measure between 2.0 and 3.0 volts.

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

Q: Is the measured voltage between 2.0 and 3.0 volts?

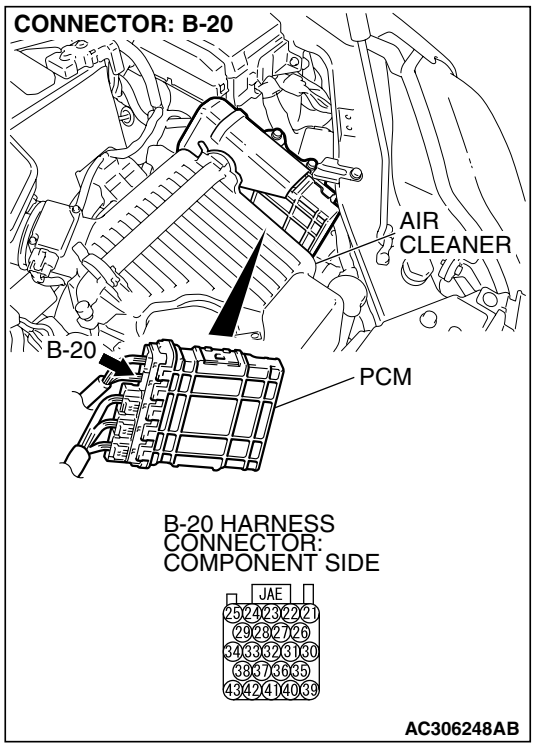
YES : Go to Step 7.
NO : Go to Step 15.

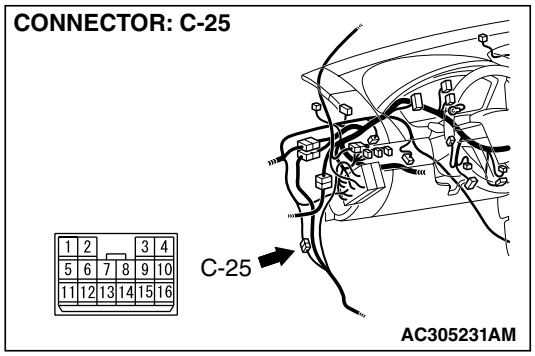
STEP 7. Check PCM connector B-20, intermediate connector C-25 and fuel tank differential pressure sensor connector D-23 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

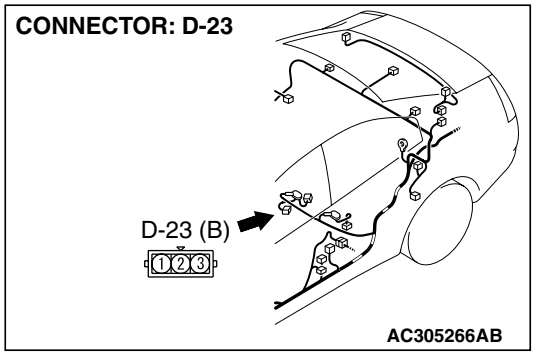
Q: Are the connectors and terminals in good condition?

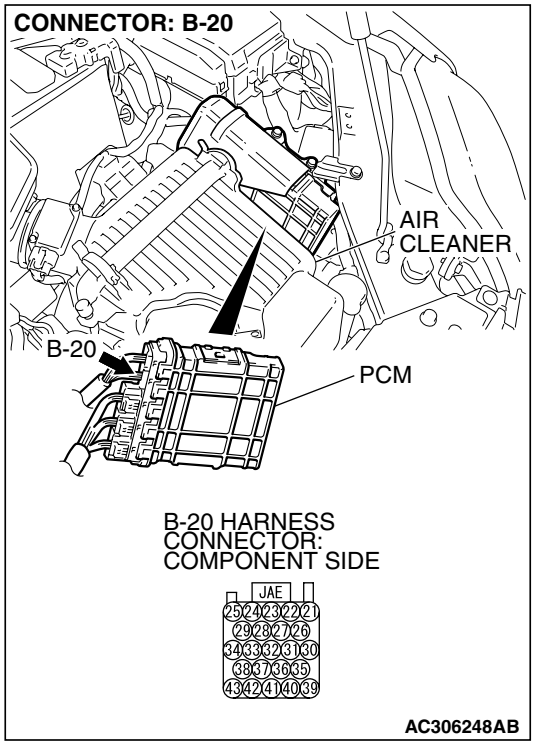
YES : Go to Step 8.

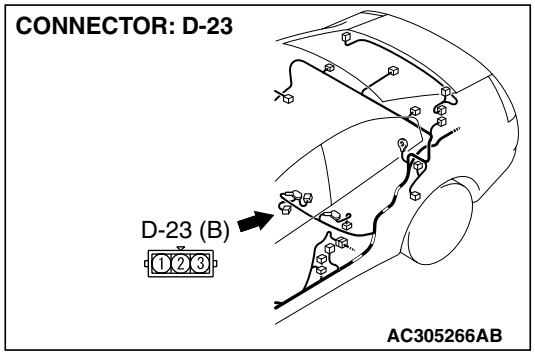
NO : Repair or replace the faulty components (Refer to GROUP 00E, Harness Connector Inspection P.00E-2). Then go to Step 17.











STEP 8. Check the harness wire between PCM connector B-20 terminal 23 and fuel tank differential pressure sensor connector D-23 terminal 1 for damage.

Q: Is the harness wire in good condition?

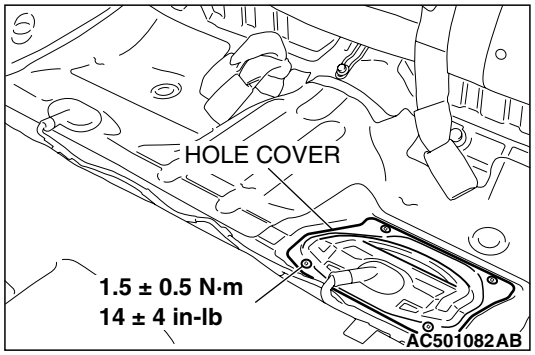
YES : This malfunction is intermittent (Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-14). Go to Step 17.

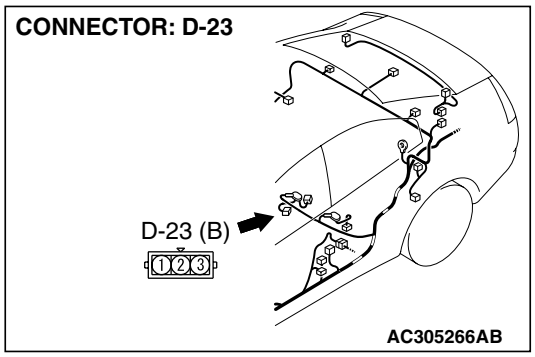
NO : Repair the damaged harness wire. Then go to Step 17.

STEP 9. Measure the 5-volt reference signal at fuel tank differential pressure sensor connector D-23.

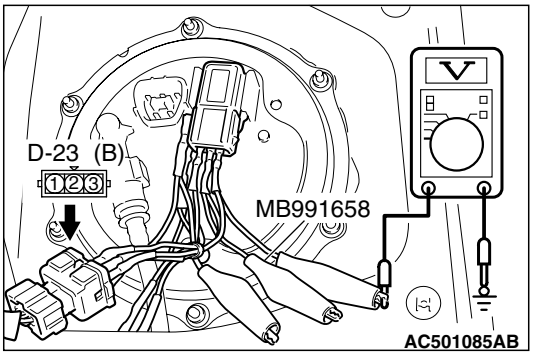
(1) Remove the rear seat cushion assembly (Refer to GROUP 52A, Rear Seat P.52A-45).

(2) Remove the hole cover.





(3) Disconnect fuel tank differential pressure sensor connector D-23.



(4) Use special tool MB991658 to connect terminals 1,2 and 3 of the fuel tank differential pressure sensor connector D-23.

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

(6) Measure the voltage between terminal 3 and ground.
- The voltage should measure between 4.9 and 5.1 volts.

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

Q: Is the measured voltage between 4.9 and 5.1 volts?

YES : Go to Step 12.

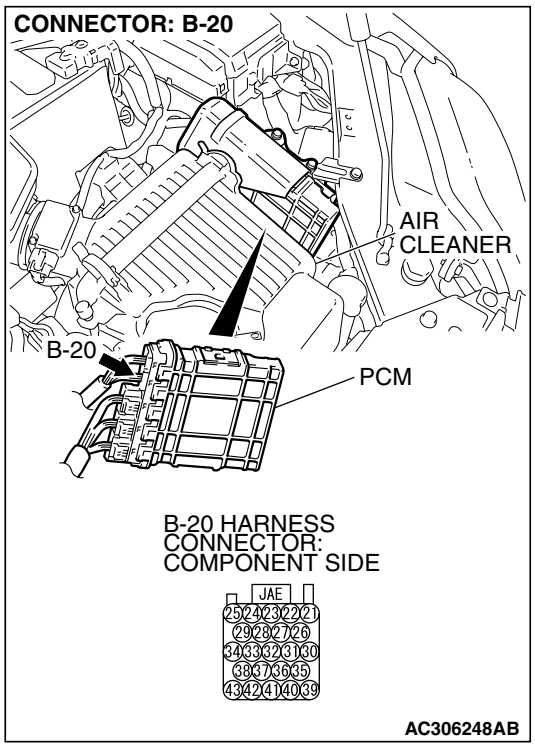
NO : Go to Step 10.

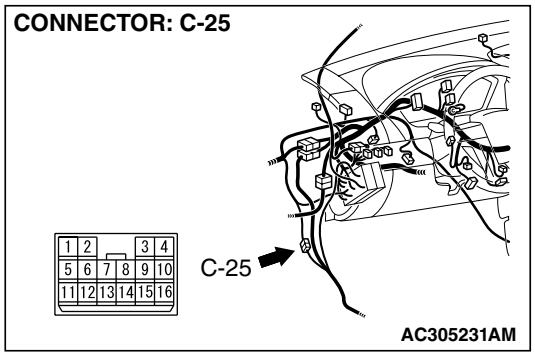
STEP 10. Check PCM connector B-20, intermediate connector C-25 and fuel tank differential pressure sensor connector D-23 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

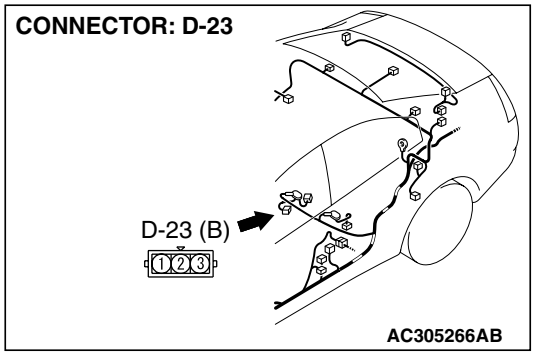
Q: Are the connectors and terminals in good condition?

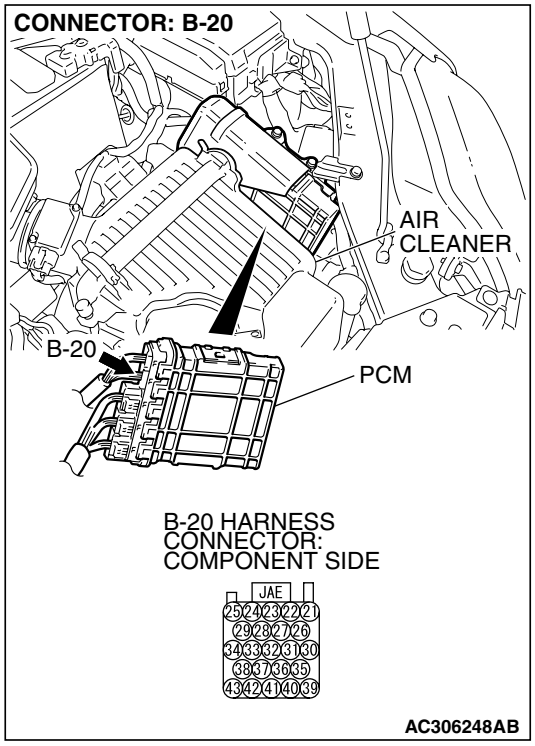
YES : Go to Step 11.

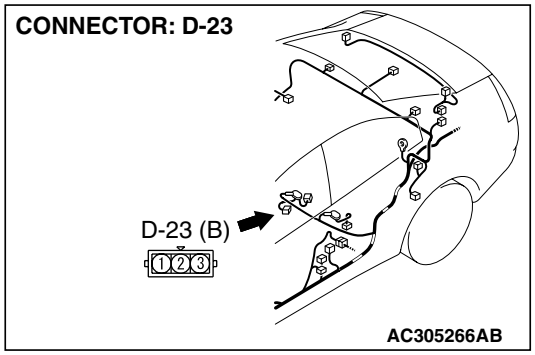
NO : Repair or replace the faulty components (Refer to GROUP 00E, Harness Connector Inspection P.00E-2). Then go to Step 17.











STEP 11. Check the harness wire between PCM connector B-20 terminal 21 and fuel tank differential pressure sensor connector D-23 terminal 3 for damage.

Q: Are the harness wires in good condition?

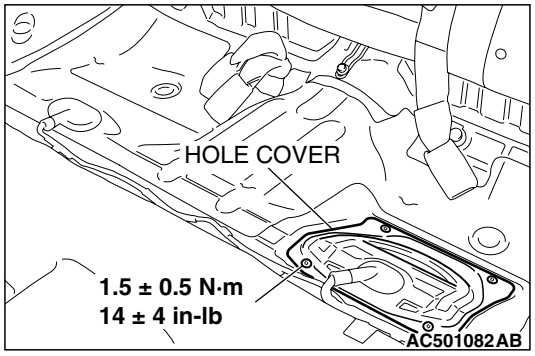
YES : It can be assumed that this malfunction is intermittent (Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-14). Go to Step 17.

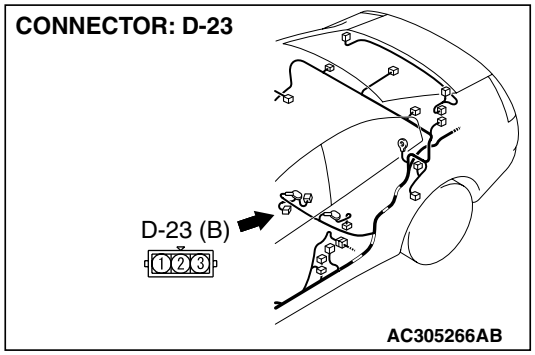
NO : Repair the damaged harness wires. Then go to Step 17.

STEP 12. Measure the fuel tank differential pressure sensor return voltage at fuel tank differential pressure sensor connector D-23.

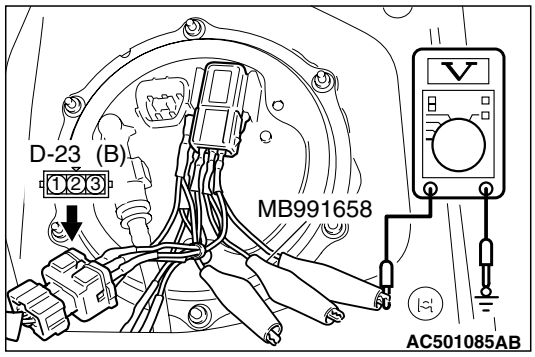
(1) Remove the rear seat cushion assembly (Refer to GROUP 52A, Rear Seat P.52A-45).

(2) Remove the hole cover.





(3) Disconnect fuel tank differential pressure sensor connector D-23.



(4) Use special tool MB991658 to connect terminals 1,2 and 3 of the fuel tank differential pressure sensor connector D-23.

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

(6) Measure the voltage between terminal 2 and ground.
- The voltage should measure 0.5 volt or less.

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

Q: Is the measured voltage 0.5 volt or less?

YES : Go to Step 13.

NO : Go to Step 17.

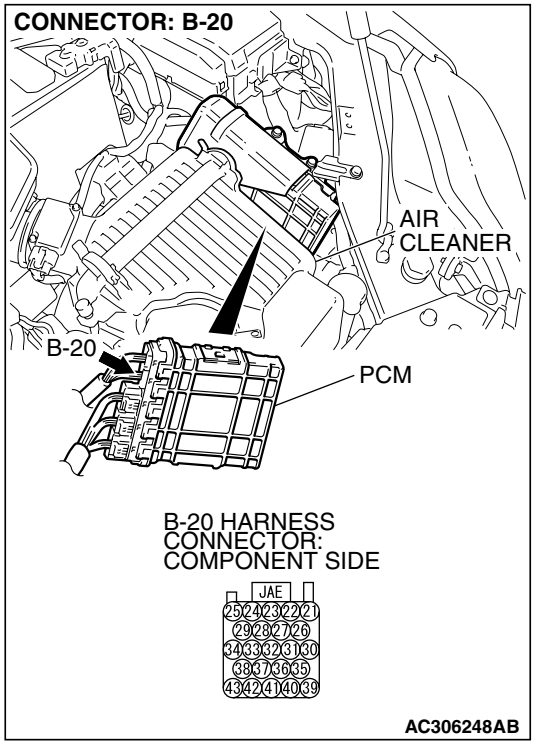
STEP 13. Check PCM connector B-20, intermediate connector C-25 and fuel tank differential pressure sensor connector D-23 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

Q: Are the connectors and terminals in good condition?

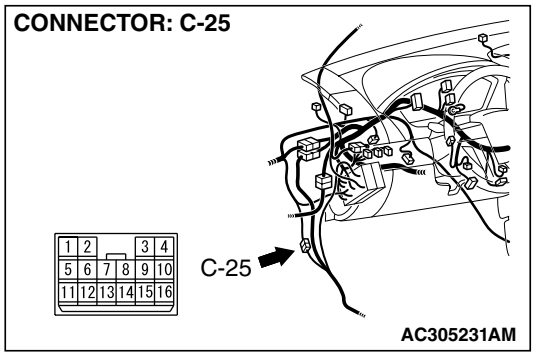
YES : Go to Step 14.

NO : Repair or replace the faulty components (Refer to GROUP 00E, Harness Connector Inspection P.00E-2). Then go to Step 17.

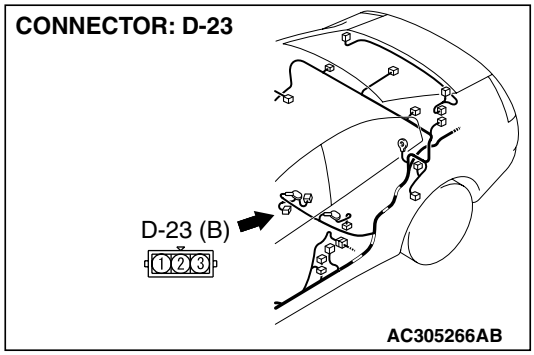
CONNECTOR: B-20

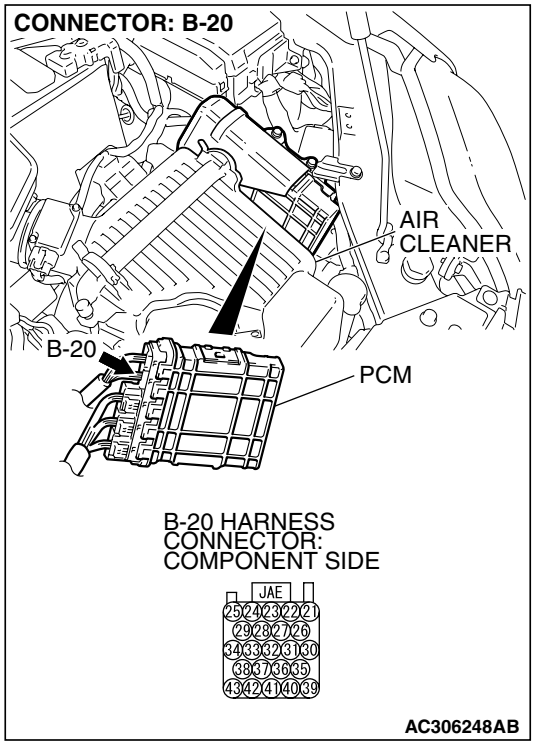


CONNECTOR: C-25



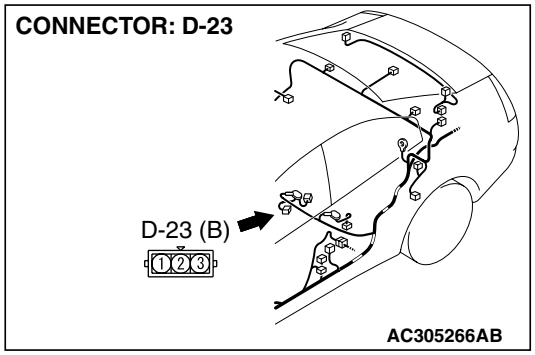
CONNECTOR: D-23

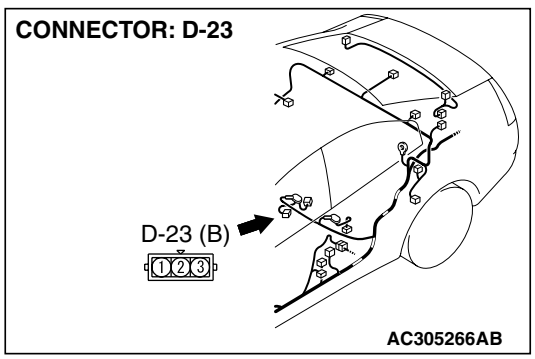




STEP 14. Check the harness wires between PCM connector B-20 terminal 22 and fuel tank differential pressure sensor connector D-23 terminal 2 for damage.
Q: Are the harness wires in good condition?

YES : Go to Step 17.
NO : Repair the damaged harness wires. Then go to Step 17.





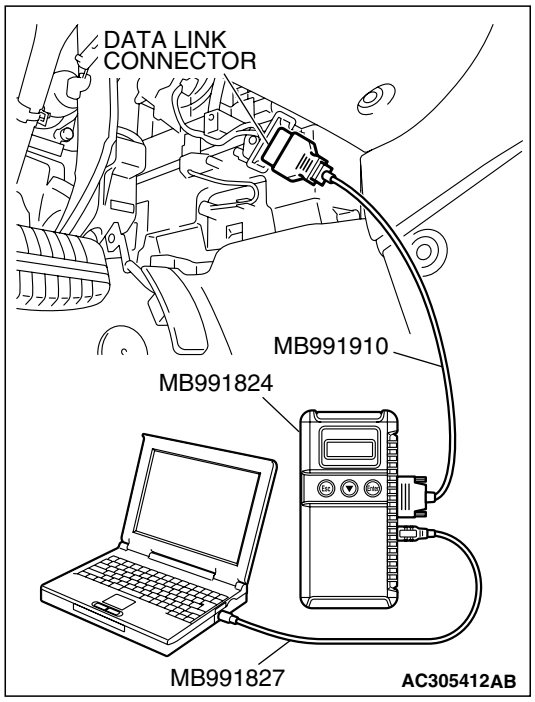
STEP 15. Check fuel tank differential pressure sensor connector D-23 for loose, corroded or damaged terminals, or terminals pushed back in the connector.
Q: Is the connectors and terminals in good condition?

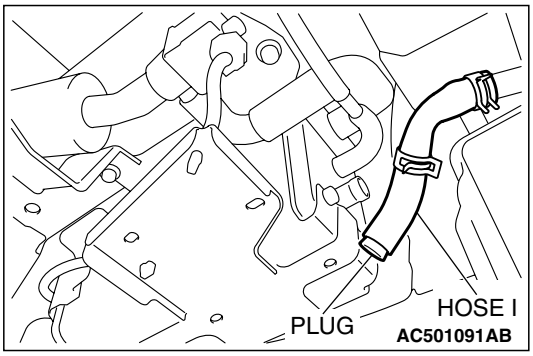
YES : Replace the fuel tank differential pressure sensor. Then go to Step 17.
NO : Repair or replace the faulty components (Refer to GROUP 00E, Harness Connector Inspection P.00E-2). Then go to Step 17.

STEP 16. Using scan tool MB991958, check data list item 52: Fuel Tank Differential Pressure Sensor.

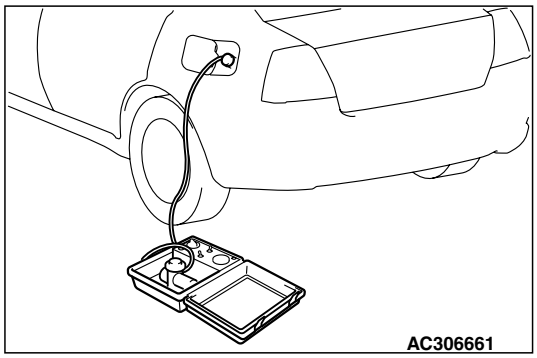
⚠ CAUTION
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.





(2) Disconnect hose I from the evaporative emission canister, and plug the hose.
(3) Turn the ignition switch to the "ON" position.
(4) Remove the fuel cap.
(5) Set scan tool MB991958 to the data reading mode.
- Item 52, Fuel Tank Differential Pressure Sensor.
  - The fuel tank pressure reading on the scan tool should be 2,050 to 2,950 mV.



(6) Connect the evaporative emission system pressure pump (Miller number 6872A) to the fuel tank filler tube by using fuel tank adapter (MLR-8382) and pressurize the fuel tank.
- The fuel tank pressure reading should increase.

(7) Turn the ignition switch to the "LOCK" (OFF) position. Then disconnect scan tool MB991958.
(8) Remove the evaporative emission system pressure pump (Miller number 6872A) and the fuel tank adapter (MLR-8382), and reinstall the fuel cap.
(9) Connect hose I to the evaporative emission canister.

Q: Is the fuel tank pressure between 2,050 to 2,950 mV?

YES : It can be assumed 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). Go to Step 17.

NO : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11.

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Then go to Step 17.

STEP 17. Perform the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern (Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 20 P.13A-9).

(2) Read the diagnostic trouble code (DTC).

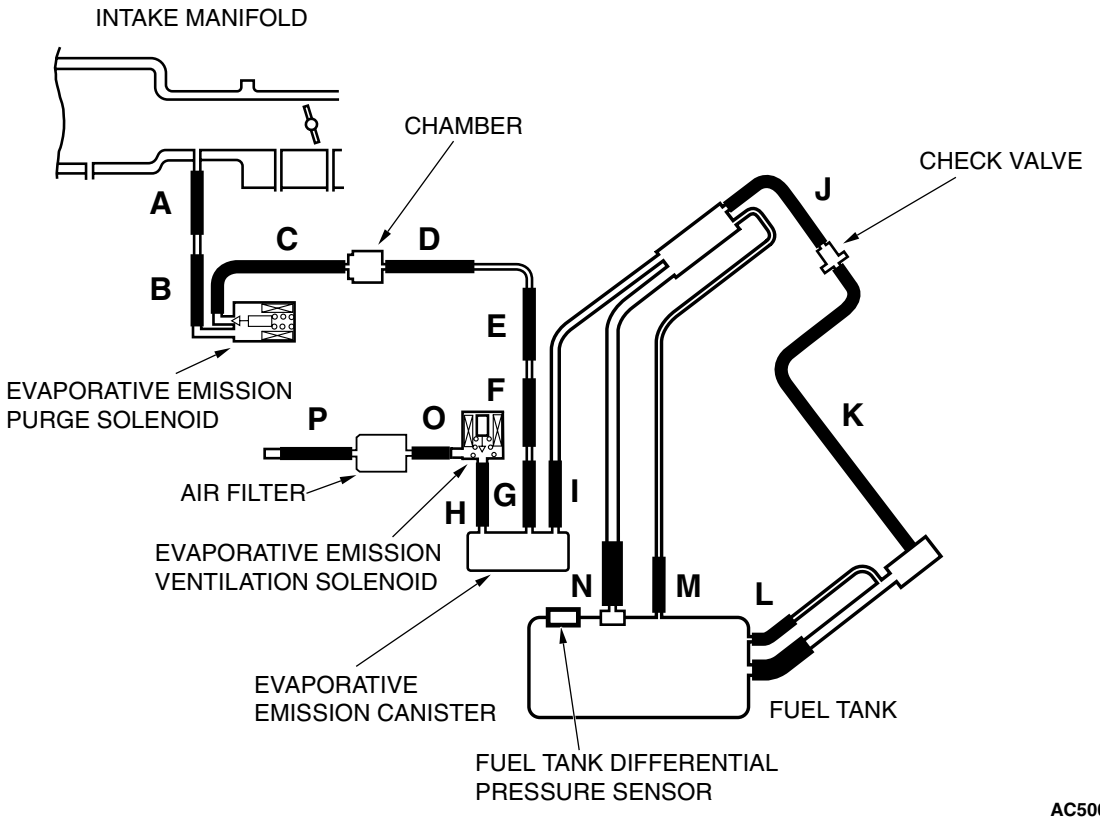
Q: Is DTC P0453 set?

YES : Repeat the troubleshooting from Step 2.

NO : The procedure is complete.

DTC P0455: Evaporative Emission System Leak Detected (Gross Leak)

SYSTEM DIAGRAM



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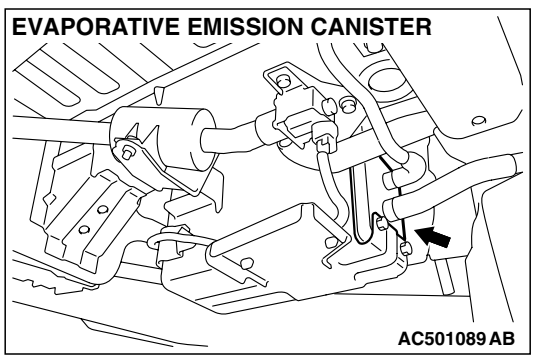

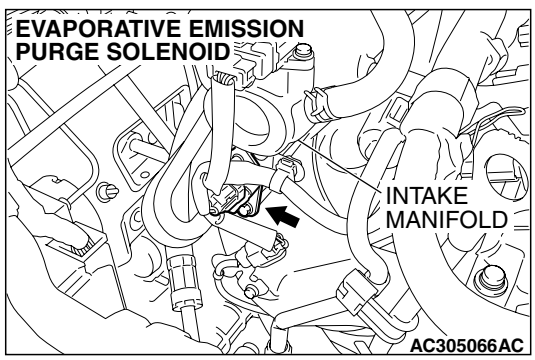

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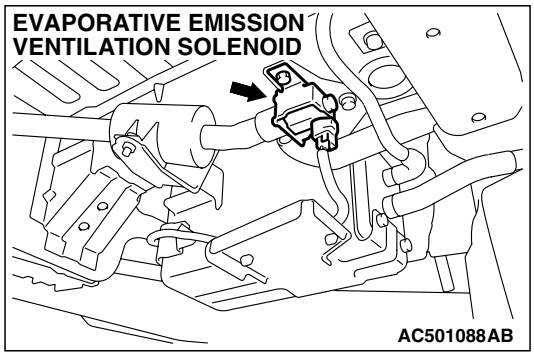


TECHNICAL DESCRIPTION

- The fuel tank may be under a slight pressure or vacuum depending on the state of the Evaporative Emission (EVAP) System. The PCM monitors and responds to these pressure/vacuum changes. If the pressure/vacuum varies from the specified range, the PCM will set DTC P0455.
- The PCM energizes the evaporative emission ventilation solenoid to shut off the evaporative emission canister outlet port.
- The evaporative emission purge solenoid is activated to apply engine manifold vacuum to the EVAP system.
- When the fuel system develops a vacuum of 2 kPa (0.29 psi), the evaporative emission purge solenoid is turned "off" and the fuel system vacuum is maintained at 2 kPa (0.29 psi).
- The PCM determines whether there is a leak or clog in the fuel system by measuring the change in vacuum inside the fuel tank.
- The test is stopped when fuel vapor pressure is determined to be too high.

DESCRIPTIONS OF MONITOR METHODS

- Depressurizing EVAP system by intake manifold negative pressure is impossible within specified period.

MONITOR EXECUTION

- Once per driving cycle.

MONITOR EXECUTION CONDITIONS (OTHER MONITOR AND SENSOR)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

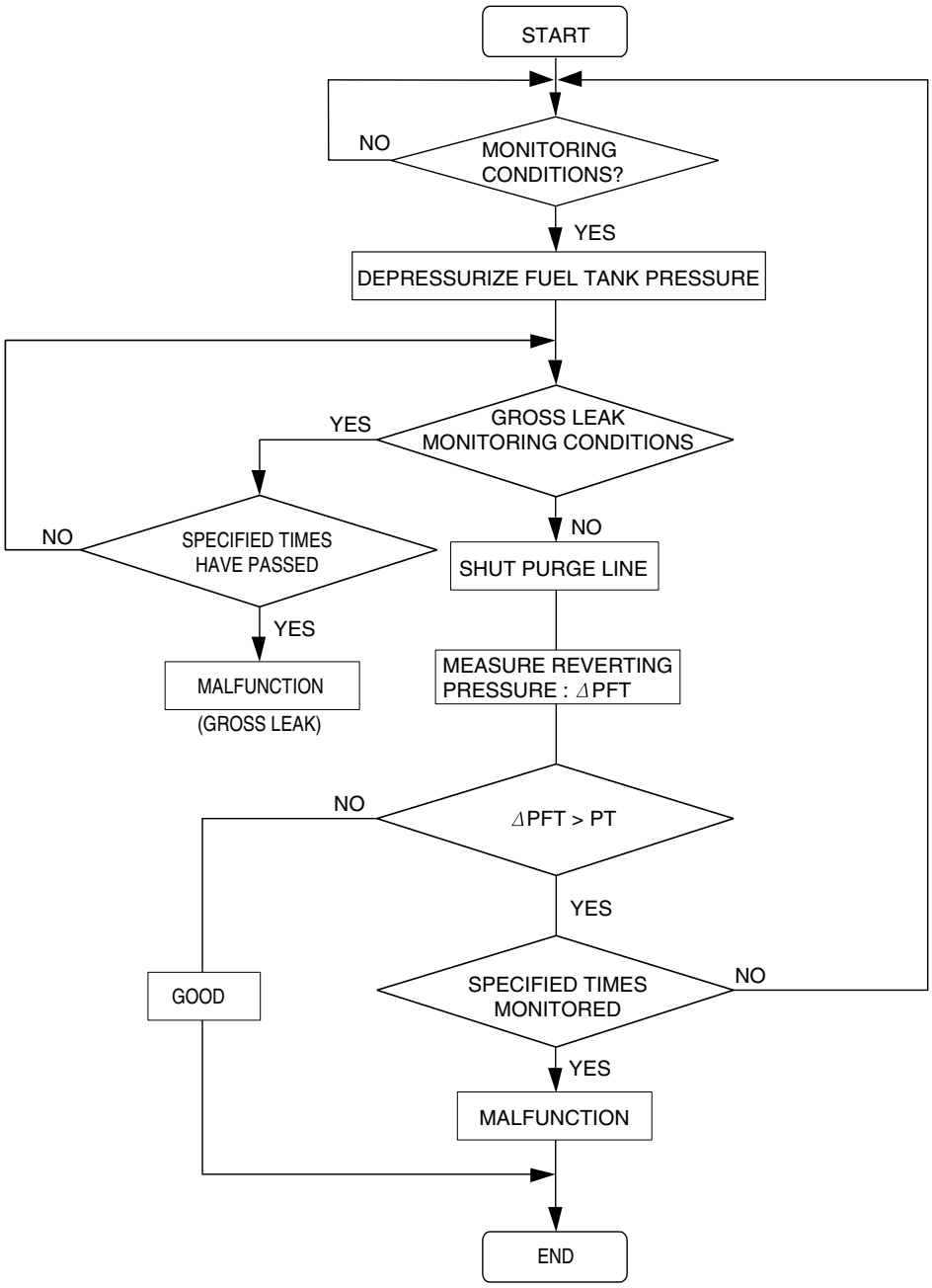
- Evaporative emission purge solenoid monitor
- Evaporative emission purge system monitor
- Fuel tank differential pressure sensor monitor
- Evaporative emission ventilation solenoid monitor
- Fuel level sensor monitor
- Fuel temperature sensor monitor

Sensor (The sensors below are determined to be normal)

- Mass airflow sensor
- Barometric pressure sensor
- Intake air temperature sensor
- Engine coolant temperature sensor

LOGIC FLOW CHARTS (Monitor Sequence)

0.04in, 0.02in GROSS LEAK MONITOR



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DTC SET CONDITIONS

Check Conditions A: At Start up

- Intake air temperature is 36°C (97°F) or less upon engine start up.
- The engine coolant temperature is 36°C (97°F) or less upon engine start up.

Check Conditions B: For Test to Run

- The engine coolant temperature is 60°C (140°F) or greater and the fuel tank is 15 – 40 percent full.
- The engine coolant temperature is 20°C (68°F) or greater and the fuel tank is 40 – 85 percent full.
- The engine speed is greater than or equal to 1,600 r/min.
- Barometric pressure is greater than 76 kPa (11 psi).

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- Volumetric efficiency is between 20 and 70 percent.
- The fuel tank temperature is 36°C (97°F) or less.
- The fuel tank differential pressure sensor output voltage is 1 – 4 volts.

Check Conditions C: For Test to Stop

- The intake air temperature is greater than 5°C (41°F).
- When the evaporative emission purge solenoid and evaporative emission ventilation solenoid are closed, the pressure in the fuel tank rises to 451 Pa (0.065 psi) or less and the amount of remaining fuel is 15 – 40 percent of capacity upon engine start-up.
- When the evaporative emission purge solenoid and evaporative emission ventilation solenoid are closed, the pressure in the fuel tank rises to 324 Pa (0.047 psi) or less and the amount of remaining fuel is 40 – 85 percent of capacity upon engine start-up.
- 10 seconds have elapsed from the start of the previous monitoring.
- Monitoring time: 150 seconds.

Judgment Criterion

- The fuel tank internal pressure is 2 kPa (0.29 psi) or more after the evaporative emission purge solenoid valve has been driven when the fuel tank and vapor line were closed.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 5 P.13A-9.

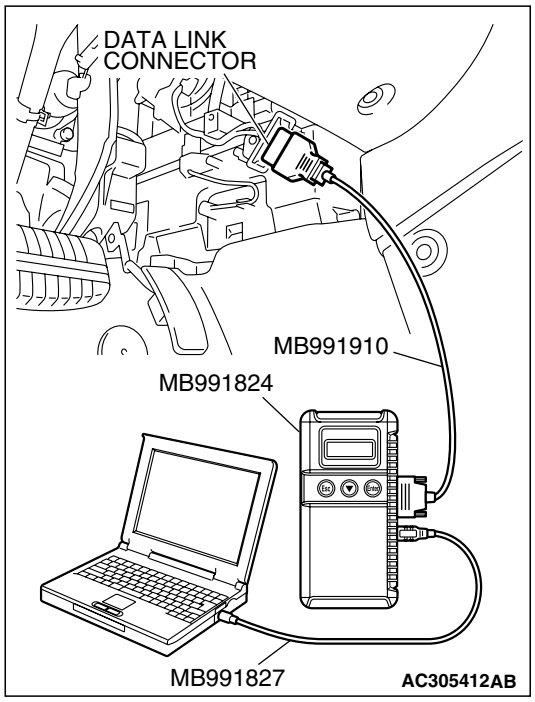
TROUBLESHOOTING HINTS (THE MOST LIKELY CAUSES FOR THIS CODE TO BE SET ARE:)

- Loose fuel cap.
- Fuel cap relief pressure is incorrect.
- Fuel overflow limiter valve failed.
- Purge line or vapor line is clogged.
- Fuel tank, purge line or vapor line seal failed.
- Evaporative emission purge solenoid valve failed.
- Evaporative emission ventilation solenoid valve failed.
- Fuel tank differential pressure sensor failed.
- Evaporative emission canister seal is faulty.
- Evaporative emission canister is clogged.

DIAGNOSIS

Required Special Tools:

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



STEP 1. Using scan tool MB991958, check the evaporative emission system monitor test.

⚠ 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.**
- **During this test, the PCM will automatically increase the engine speed to 1,600 r/min or greater. Check that the transaxle is set to the "P" position.**

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Erase the DTCs using scan tool MB991958.
(4) Check that the fuel cap is securely closed (Tighten until three clicks are heard).
(5) Start the engine.
(6) Select "System Test."
(7) Select "Evap Leak Mon."
(8) During this test, keep the accelerator pedal at the idle position.
(9) Keep the engine speed and engine load within the specified range. When the monitor test starts, the "In Progress" item on scan tool MB991958 will change from "NO" to "YES."
(10) Turn the ignition switch to the "LOCK" (OFF) position, and disconnect scan tool MB991958.

Q: Is "Evap Leak Mon. Completed. Test Failed and DTCs Set" displayed on scan tool MB991958?

YES : A malfunction has been detected during the monitor test. Refer to the Diagnostic Trouble Code Chart and diagnose any other DTCs that are set P.13A-45. If no other DTC's have been set, go to Step 2.

NO <"Evap Leak Mon. Completed. Test Passed" is displayed on scan tool MB991958.> : The evaporative emission system is working properly at this time. Explain to the customer that an improperly tightened fuel cap can cause the MIL to illuminate. Return the vehicle to the customer.

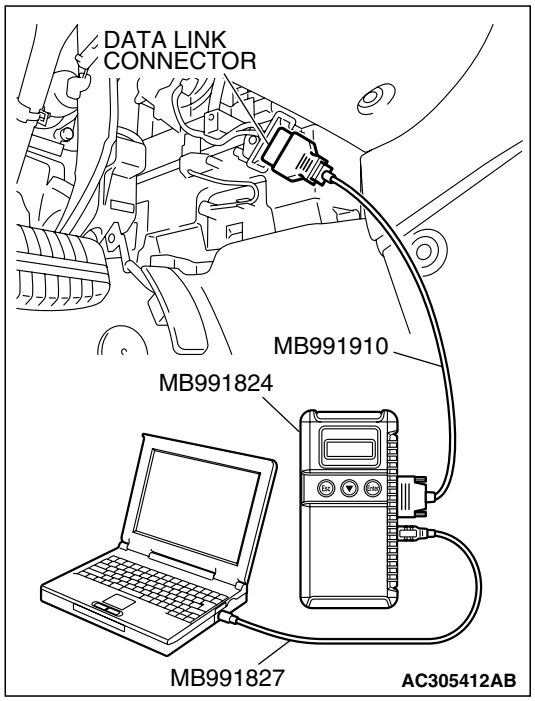
NO <"Evap Leak Mon. Discontinued. Retest again from the first" is displayed on scan tool MB991958.> : The EVAP monitor has been interrupted during the test. Turn the ignition switch to the "LOCK" (OFF) position once, and repeat the monitoring from Step 1.

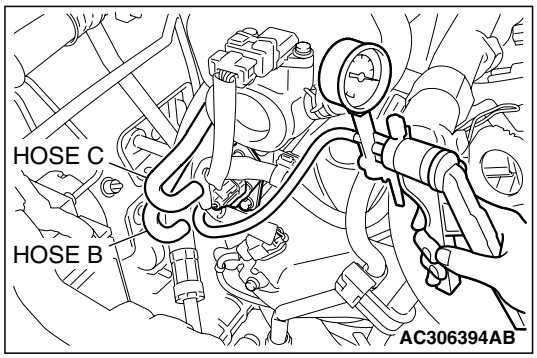
STEP 2. Using scan tool MB991958, check actuator test item 10: Evaporative Emission Purge Solenoid Valve.

⚠ 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.



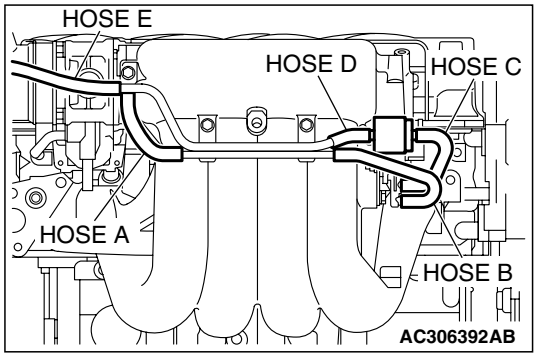


(2) Disconnect hoses B and C from the evaporative emission purge solenoid valve side, and connect the hand vacuum pump to the evaporative emission purge solenoid valve instead of hose C.
(3) Turn the ignition switch to the "ON" position.
(4) Set scan tool MB991958 to actuator test mode.
- Item 10: Evaporative Emission Purge Solenoid Valve.
  - When the evaporative emission purge solenoid valve is operated, apply a pressure on the hand vacuum pump and confirm that air is blown from the other side nipple.

(5) Turn the ignition switch to the "LOCK" (OFF) position.
(6) Disconnect the hand vacuum pump, and connect hoses A and B to the evaporative emission purge solenoid valve.

Q: Is the solenoid valve in good condition?

YES : Go to Step 3.
NO : Replace the evaporative emission purge solenoid valve. Then go to Step 19.



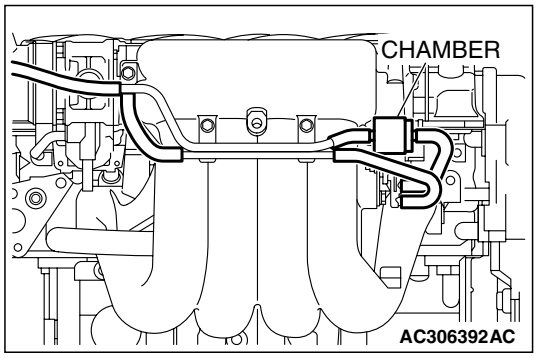
STEP 3. Check for leaks and clogging in evaporative emission hoses A through E.

Use a hand vacuum pump to test each hose from hose A to hose E.

Q: Are the hoses in good condition?

YES : Go to Step 4.

NO : Replace the damaged hose. Then go to Step 19.



STEP 4. Check for leaks and clogging in the chamber.

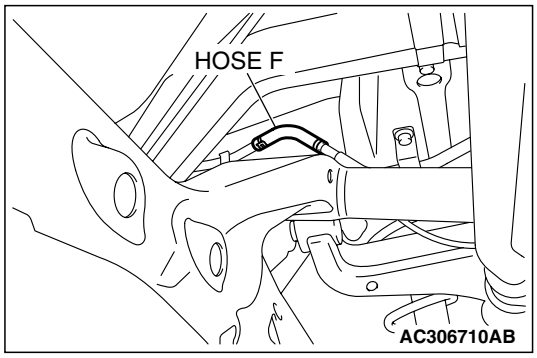
(1) When you blow the chamber, it should pass less air.

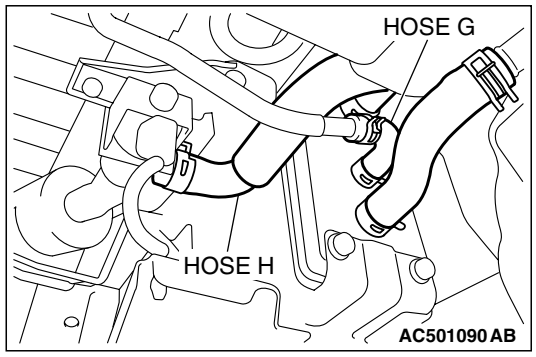
(2) When you blow the chamber, on air should leak from the chamber body.

Q: Is the chamber in good condition?

YES : Go to Step 5.

NO : Replace the chamber. Then go to Step 19.





STEP 5. Check for leaks and clogging in evaporative emission hoses F through H.

Perform a vacuum test using a hand vacuum pump on hoses F through H.

Q: Are the hoses in good condition?

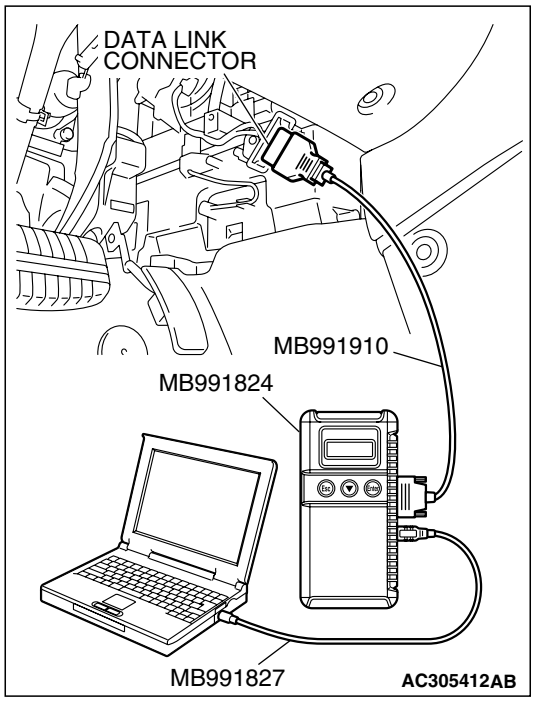
YES : Go to Step 6.

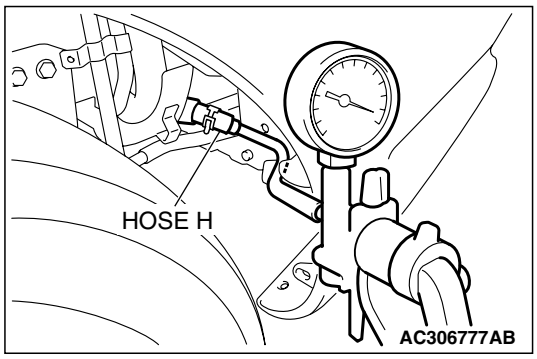
NO : Replace the damaged hose. Then go to Step 19.

STEP 6. Using scan tool MB991958, check actuator test item 15: Evaporative emission ventilation solenoid.

⚠ 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) Remove the fuel tank filler tube protector (Refer to GROUP 13C, Fuel Tank P.13C-9).



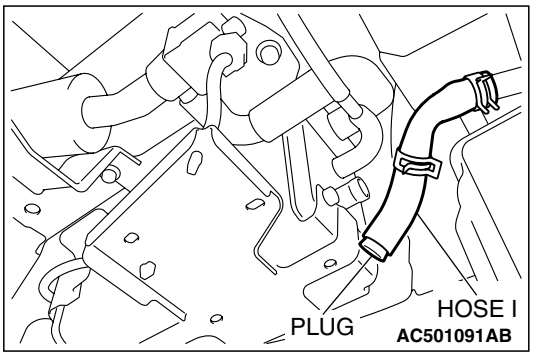


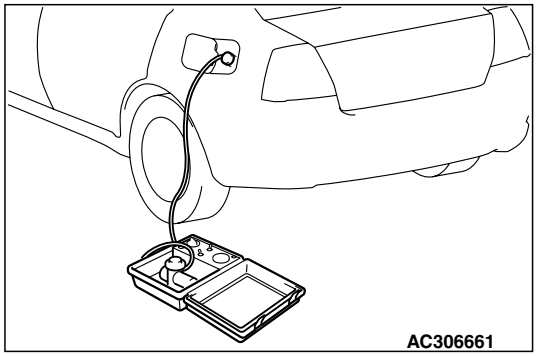
(3) Disconnect hose H from evaporative emission canister and connect hand vacuum pump to hose H.
(4) Turn the ignition switch to the "ON" position.
(5) Set scan tool MB991958 to actuator test mode.
- Item 15: Evaporative Emission Ventilation Solenoid.
  - While the evaporative emission ventilation solenoid is energized, operate the hand vacuum pump and confirm that the solenoid holds vacuum.

(6) Turn the ignition switch to the "LOCK" (OFF) position, and disconnect scan tool MB991958.
(7) Disconnect the hand vacuum pump, and connect hose H to the evaporative emission canister.
(8) Reinstall the fuel tank filler tube protector (Refer to GROUP 13C, Fuel Tank P.13C-9).

Q: Did the evaporative emission ventilation solenoid hold vacuum?

YES : Go to Step 7.
NO : Replace the evaporative emission ventilation solenoid (Refer to GROUP 17, Evaporative emission canister and fuel tank pressure relief valve removal and installation P.17-102). Then go to Step 19.





STEP 7. Pressure test the evaporative emission system lines from hoses I to N.

(1) Disconnect hose I from the evaporative emission canister, and plug hose I securely.
(2) Confirm that the evaporative emission system pressure pump (Miller number 6872A) is operating properly. Perform the self-test as described in the pump manufacturer's instructions.
(3) Remove the fuel cap.
(4) Connect the evaporative emission system pressure pump (Miller number 6872A) to the fuel tank filler tube by using fuel tank adapter (MLR-8382).
(5) Pressure test the system to determine whether any leaks are present.

NOTE: The "Pressure test" in this procedure refers to the I/M240 Simulation Test. The eight steps of this test are described in the manufacturer's instructions for the evaporative emission system pressure pump, Miller number 6872A.

(6) Remove the evaporative emission system pressure pump (Miller number 6872A) and the fuel tank adapter (MLR-8382), and reinstall the fuel cap.
(7) Connect hose I to the evaporative emission canister.

Q: Is the evaporative emission system line free of leaks?

YES : Go to Step 13.
NO : Go to Step 8.

STEP 8. Check for leaks in evaporative emission hoses I through K.

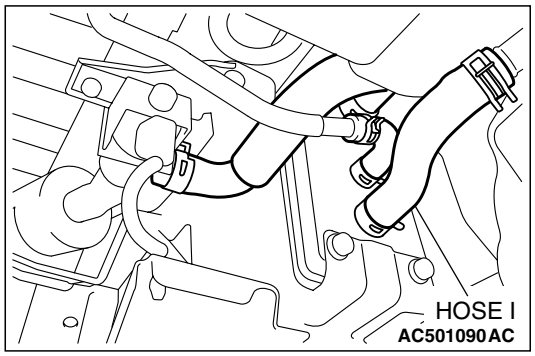
(1) Remove the fuel tank filler tube protector (Refer to GROUP 13C, Fuel Tank P.13C-9).

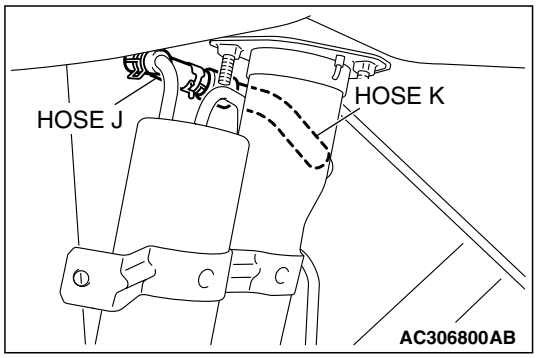
(2) Use a hand vacuum pump to test each hose from hose I to hose K.

Q: Do the hoses hold vacuum?

YES : Go to Step 9.

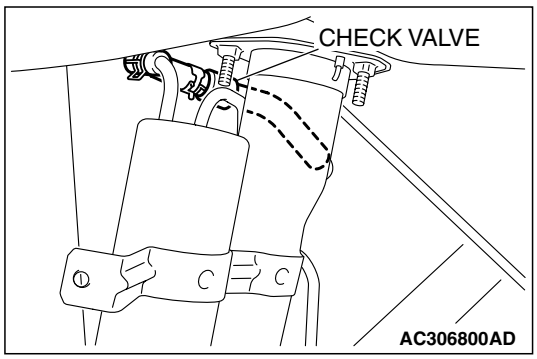
NO : Replace any damaged hose. Then go to Step 19.





STEP 9. Test check valve.

(1) Check valve is a one-way check valve.

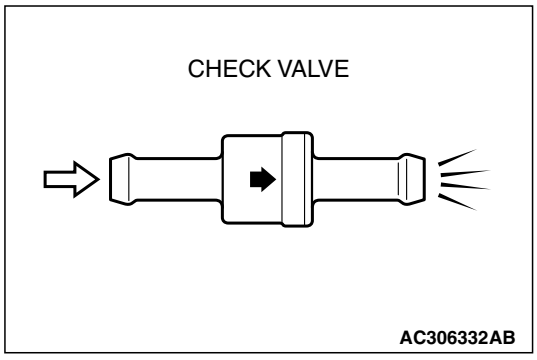


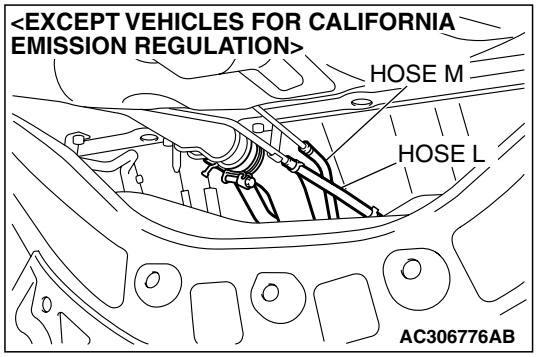
(2) Check valve should allow air to flow in only one direction.

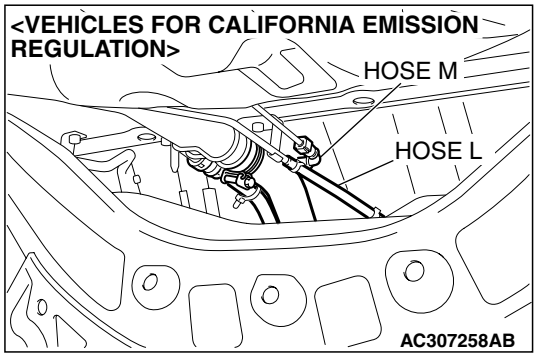
Q: Does check valve allow air to pass in one direction only?

YES : Go to Step 10.

NO : Replace check valve, and reinstall the fuel tank filler tube protector (Refer to GROUP 13C, Fuel Tank P.13C-9). Then go to Step 19.







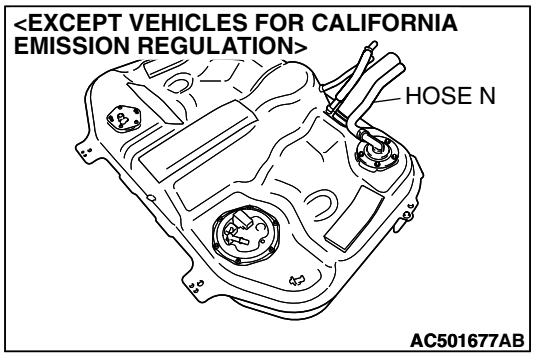
STEP 10. Check for leaks in evaporative emission hoses L and M.

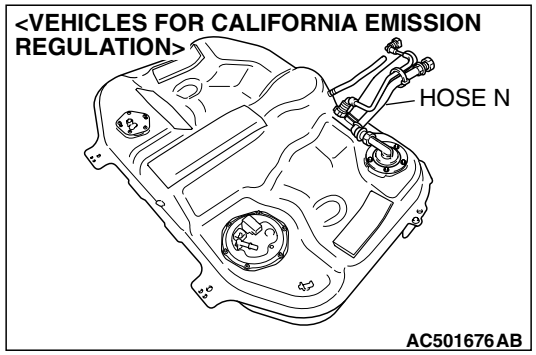
Use a hand vacuum pump to test each hose L and M.

Q: Do the hoses hold vacuum?

YES : Go to Step 11.

NO : Replace any damaged hose. Then go to Step 19.





STEP 11. Check for leaks in evaporative emission hose N.

(1) Remove the fuel tank assembly (Refer to GROUP 13C, Fuel Tank P.13C-9).

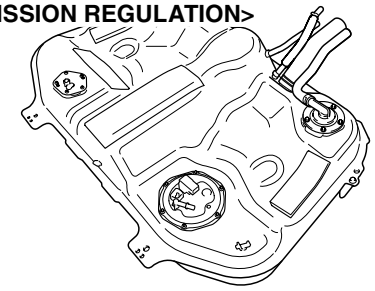
(2) Use the hand vacuum pump to check the hose N.

Q: Is the hose hold vacuum?

YES : Go to Step 12.

NO : Replace the hose and reinstall the fuel tank assembly (Refer to GROUP 13C, Fuel Tank P.13C-9). Then go to Step 19.

<EXCEPT VEHICLES FOR CALIFORNIA EMISSION REGULATION>



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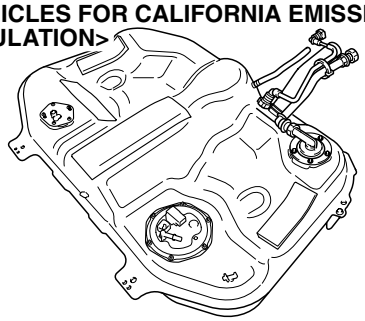

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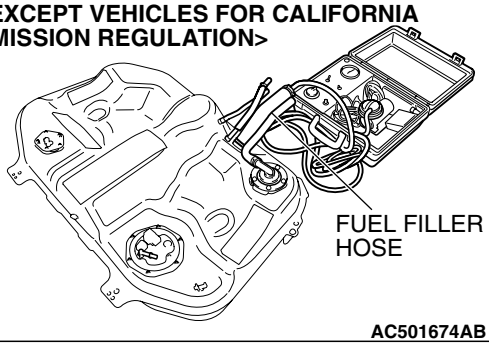
STEP 12. Check for leaks in the fuel tank.

(1) Visually check for cracks or other leaks in the fuel tank.

NOTE: Carefully check the fuel pump module and the fuel tank differential pressure sensor installation in the fuel tank.

<EXCEPT VEHICLES FOR CALIFORNIA EMISSION REGULATION>



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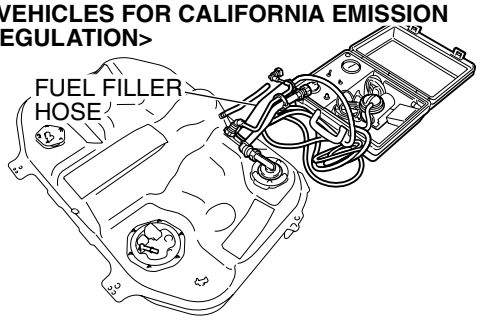

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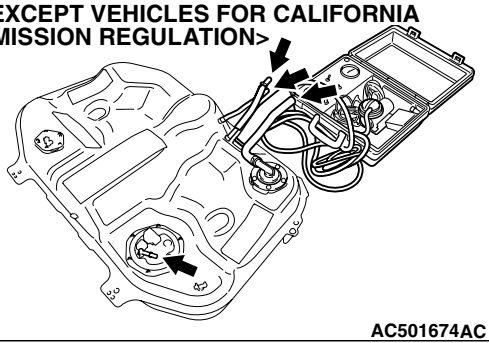
(2) Connect the evaporative emission system pressure pump (Miller number 6872A) to the fuel filler hose.

<EXCEPT VEHICLES FOR CALIFORNIA EMISSION REGULATION>



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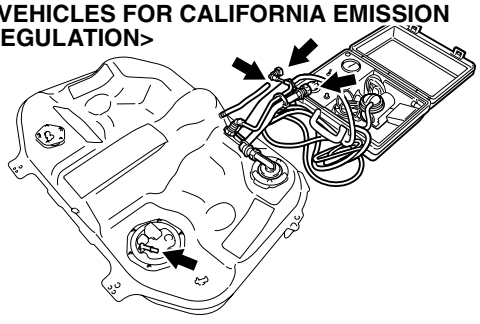

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(3) Plug the hose and the nipple shown in the illustration.

NOTE: If these items are not securely plugged now, the fuel could leak in the next step.

(4) Pressurize the fuel tank with the evaporative emission system pressure pump.

(5) In the pressurized state, check for leaks by applying a soapy water solution to each section and look for bubbles.

Q: Are any leaks found?

YES <When there is a leak from the attachment points of the fuel pump module, fuel tank differential pressure sensor, fuel level sensor (sub) or leveling valve.> : Reassemble the leaked parts and check again that there are no leaks. Then reinstall the fuel tank (Refer to GROUP 13C, Fuel Tank P.13C-9). Then go to Step 19.

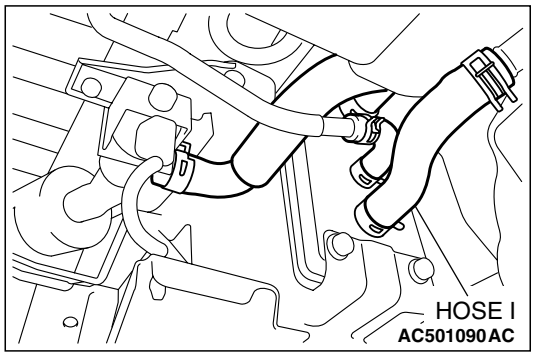
YES <When there is a leak from the fuel tank.> : Replace the fuel tank (Refer to GROUP 13C, Fuel Tank P.13C-9). Go to Step 19.

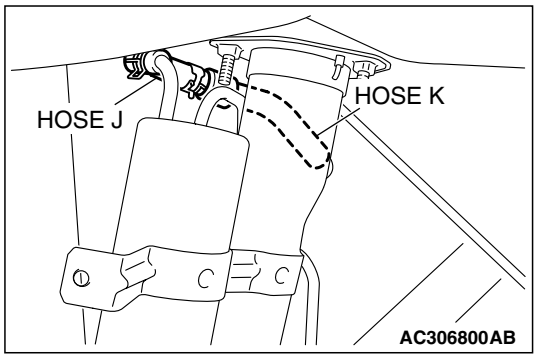
NO : When there is no leak, reinstall the fuel tank (Refer to GROUP 13C, Fuel Tank P.13C-9). Then go to Step 18.

STEP 13. Check for clogging in evaporative emission system hoses I through K.

(1) Remove the fuel tank filler tube protector (Refer to GROUP 13C, Fuel Tank P.13C-9).

(2) Use a hand vacuum pump on each hose from hoses I to K.





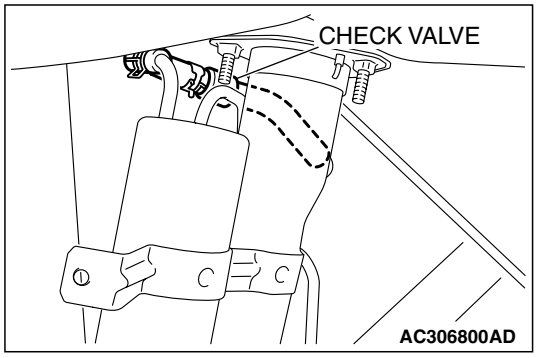
Q: Are the hoses in good condition?

YES : Go to Step 14.

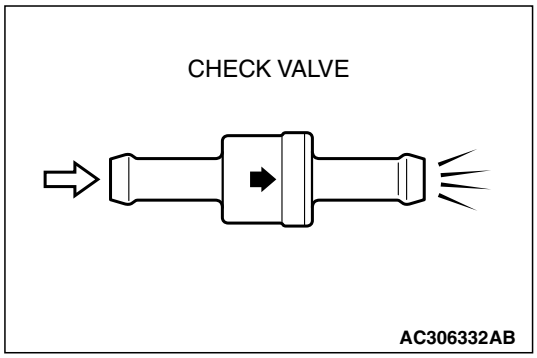
NO : Replace the damaged hose, and the fuel tank filler tube protector (Refer to GROUP 13C, Fuel Tank P.13C-9). Then go to Step 19.

STEP 14. Test check valve.

(1) Check valve is a one-way check valve.



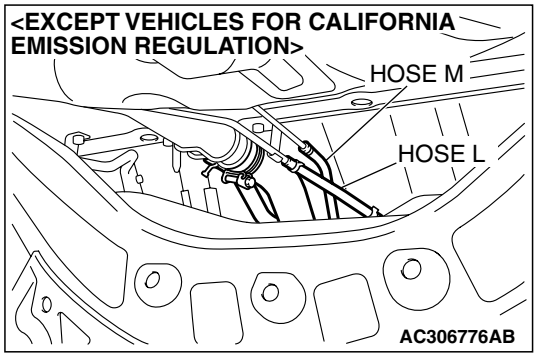
(2) Check valve should allow air to flow in only one direction.

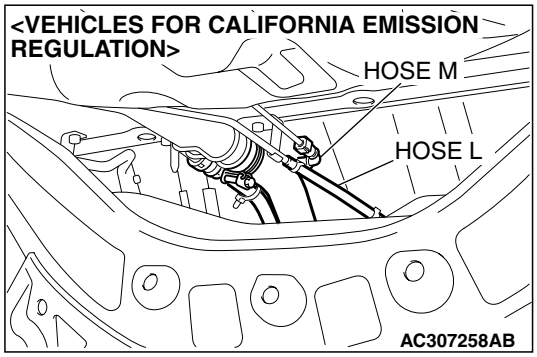


Q: Does check valve allow air to pass in one direction only?

YES : Go to Step 15.

NO : Replace check valve, and reinstall the fuel tank filler tube protector (Refer to GROUP 13C, Fuel Tank P.13C-9). Then go to Step 19.





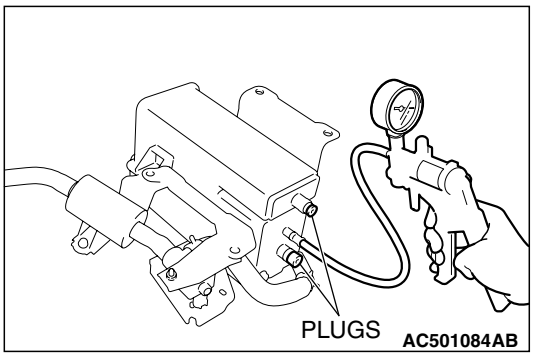
STEP 15. Check for clogging in evaporative emission hoses L and M.

Use a hand vacuum pump to test each hose L and M.

Q: Are the hoses in good condition?

YES : Go to Step 16.

NO : Replace any damaged hose. Then go to Step 19.



STEP 16. Check the evaporative emission canister for leaks and clogging.

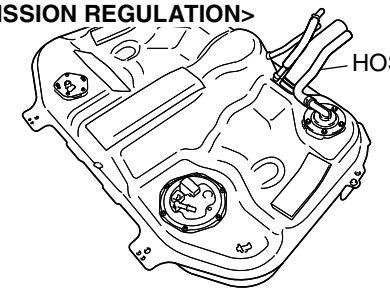
(1) Remove the evaporative emission canister (Refer to GROUP 17, Evaporative Emission Canister and Fuel Tank Pressure Relief Valve P.17-102).
(2) Connect a hand vacuum pump to the evaporative emission canister and plug the other nipples.
(3) Apply a pressure on the hand vacuum pump, and confirm that air is maintained.
(4) When the plugs are removed, check for air leakage.
(5) Disconnect the hand vacuum pump and install the evaporative emission canister (Refer to GROUP 17, Evaporative Emission Canister and Fuel Tank Pressure Relief Valve P.17-102).

Q: Is the evaporative emission canister in good condition?

YES : Go to Step 17.

NO : Replace the evaporative emission canister (Refer to GROUP 17, Evaporative Emission Canister and Fuel Tank Pressure Relief Valve P.17-102). Then go to Step 19 .

<EXCEPT VEHICLES FOR CALIFORNIA EMISSION REGULATION>



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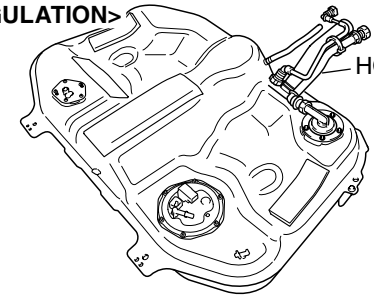

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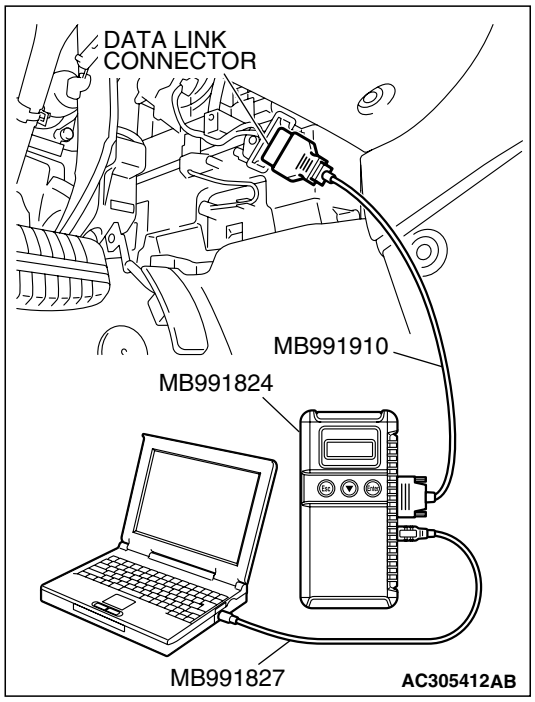
STEP 17. Check for clogging in evaporative emission hose N.

(1) Remove the fuel tank assembly (Refer to GROUP 13C, Fuel Tank P.13C-9).
(2) Use the hand vacuum pump to check the hose N.

Q: Is the hose in good condition?

YES : Reinstall the fuel tank assembly (Refer to GROUP 13C, Fuel Tank P.13C-9). Then go to Step 18.

NO : Replace any damaged hose and reinstall the fuel tank assembly (Refer to GROUP 13C, Fuel Tank P.13C-9). Then go to Step 19.



STEP 18. Using scan tool MB991958, check the evaporative emission system monitor test.

⚠ 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.**
- **During this test, the PCM automatically increases the engine speed to 1,600 r/min or greater. Check that the transaxle is set to the "P" position.**

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Erase the DTCs using scan tool MB991958.
(4) Check that the fuel cap is securely closed (Tighten until three clicks are heard).
(5) Start the engine.
(6) Select "System Test."
(7) Select "Evap Leak Mon."
(8) During the test, keep the accelerator pedal at the idle position.
(9) Keep the engine speed and engine load within the specified range. When the monitor test starts, the "In Progress" item on scan tool MB991958 will change from "NO" to "YES."
(10) Turn the ignition switch to the "LOCK" (OFF) position. Disconnect scan tool MB991958.

Q: Is "Evap Leak Mon. Completed. Test Failed and DTCs Set" displayed on scan tool MB991958?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Ignition Switch – Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 19 .

NO <"Evap Leak Mon. Completed. Test Passed" is displayed on scan tool MB991958.> : The evaporative emission system is working properly at this time. Go to Step 19 .

NO <"Evap Leak Mon. Discontinued. Retest again from the first" is displayed on scan tool MB991958.> : The EVAP monitor has been interrupted during the test. Turn the ignition switch to the "LOCK" (OFF) position once, and repeat the monitoring from Step 18.

STEP 19. Perform the OBD-II drive cycle.

(1) Confirm the repair by performing the appropriate drive cycle (Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 5 P.13A-9).
(2) Read the DTC.

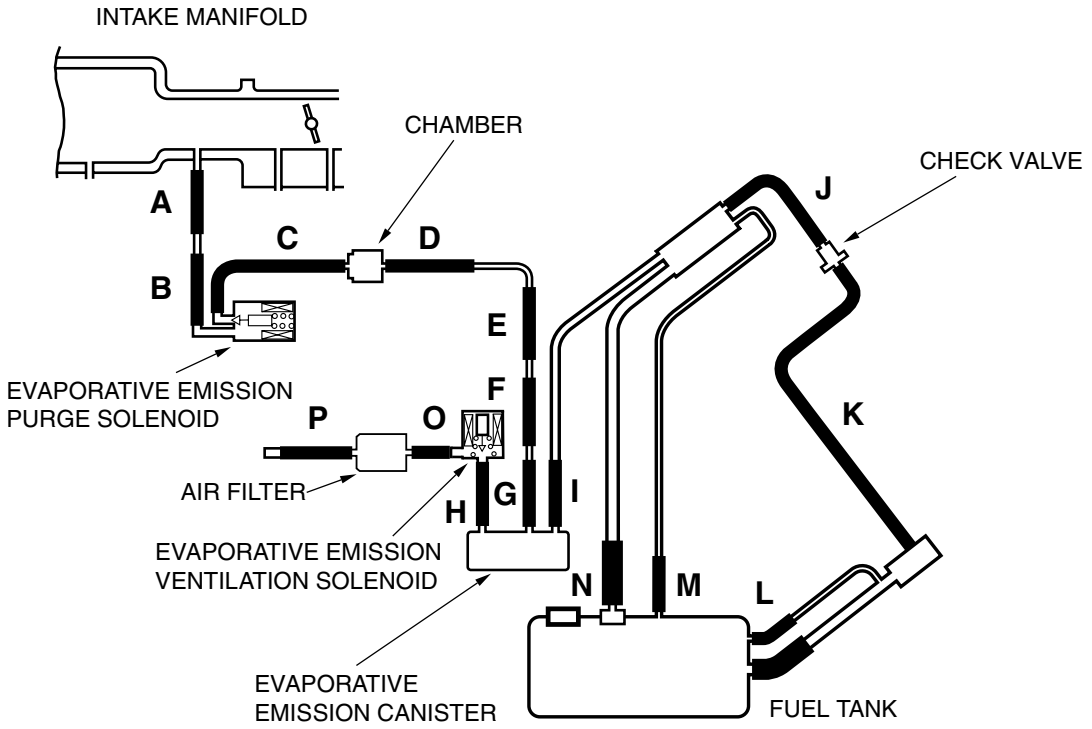
Q: Is DTC P0455 set?

YES : Repeat the troubleshooting from Step 1.
NO : The procedure is complete.

TSB Revision

DTC P0456: Evaporative Emission System Leak Detected (Very Small Leak)

SYSTEM DIAGRAM



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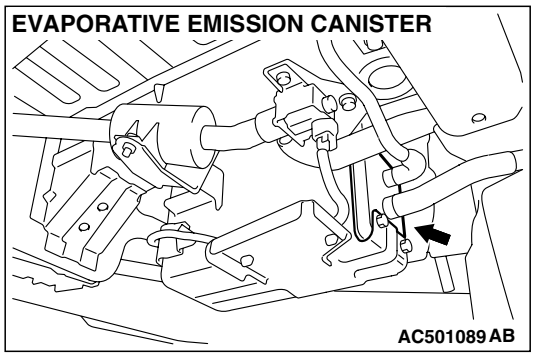
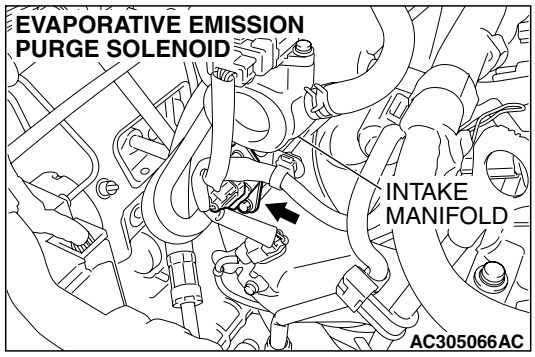
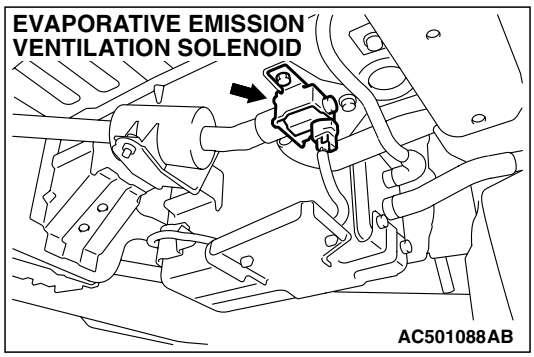






TECHNICAL DESCRIPTION

- The PCM monitors the Evaporative Emission (EVAP) System pressure.

TSB Revision

- The PCM controls the evaporative emission ventilation solenoid. It closes the evaporative emission ventilation solenoid to seal the evaporative emission canister side of the system.
- The evaporative emission purge solenoid is opened to allow manifold vacuum to create low pressure (vacuum) in the EVAP system.
- When the EVAP system develops a vacuum of 2 kPa (0.29 psi), the evaporative emission purge solenoid is closed and the fuel system vacuum is maintained at 2 kPa (0.29 psi).
- The PCM determines whether there is a leak in the EVAP system by monitoring the vacuum inside the fuel tank.
- The test is stopped when fuel vapor pressure exceeds predetermined limits.

DESCRIPTIONS OF MONITOR METHODS

- Measure reverting pressure after depressurizing by intake manifold negative pressure and detect malfunction if reverting pressure rises largely.

MONITOR EXECUTION

- Once per driving cycle.

MONITOR EXECUTION CONDITIONS (OTHER MONITOR AND SENSOR)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

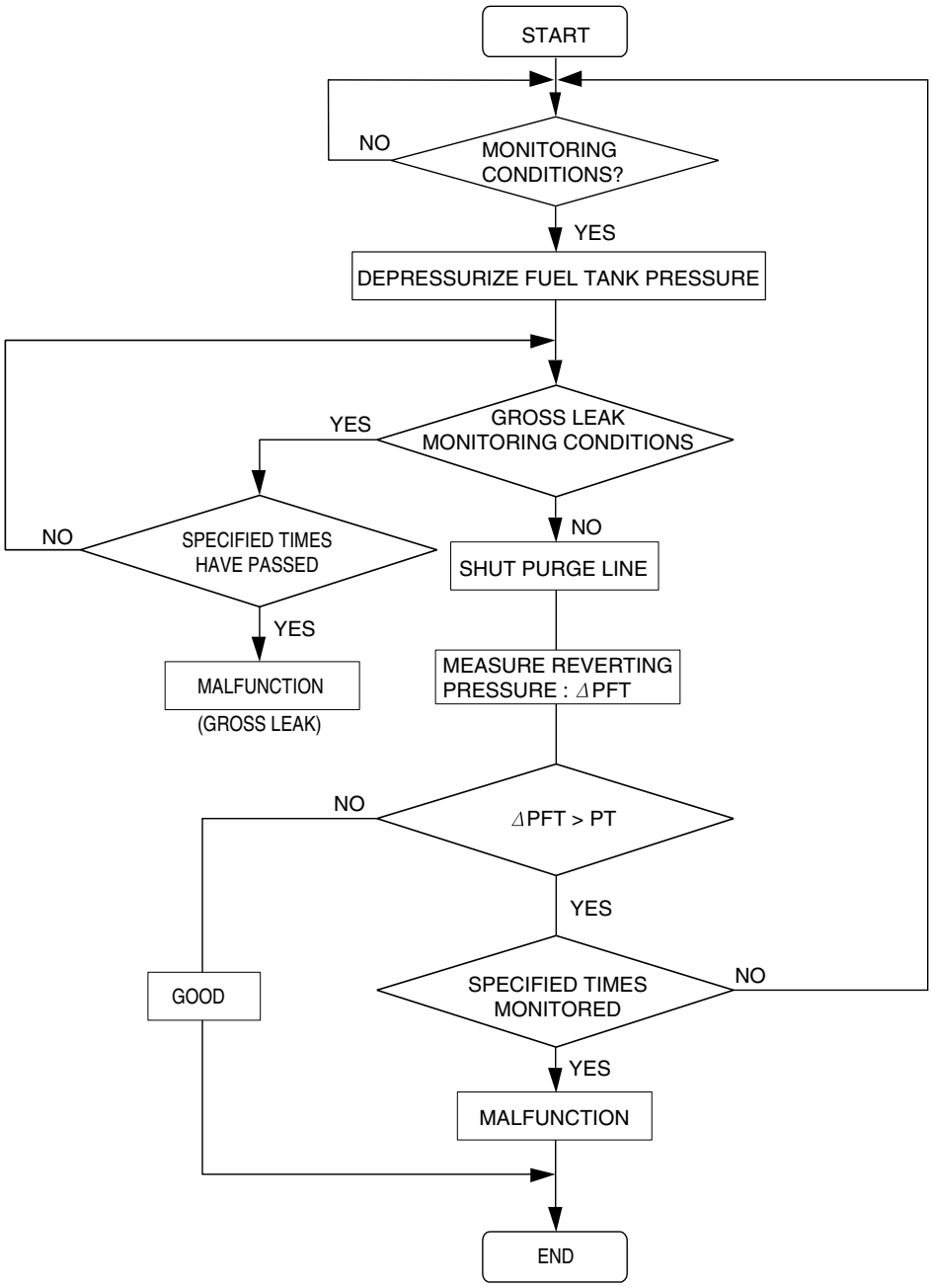
- Evaporative emission purge solenoid monitor
- Evaporative emission purge system monitor
- Fuel tank differential pressure sensor monitor
- Evaporative emission ventilation solenoid monitor
- Fuel level sensor monitor
- Fuel temperature sensor monitor

Sensor (The sensors below are determined to be normal)

- Mass airflow sensor
- Barometric pressure sensor
- Intake air temperature sensor
- Engine coolant temperature sensor

LOGIC FLOW CHARTS (Monitor Sequence)

0.04in, 0.02in GROSS LEAK MONITOR



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DTC SET CONDITIONS

Check Conditions A: At Start up

- Intake air temperature is 36°C (97°F) or less when the engine is started.
- The engine coolant temperature is 36°C (97°F) or less when the engine is started.
- The fuel level sensor output voltage is 2.4 – 3.7 volts when the engine starts and the amount of remaining fuel is 40 – 85 percent of capacity.

Check Conditions B: For Test to Run

- Barometric pressure is greater than 76 kPa (11 psi).
- The fuel tank temperature is 33°C (91°F) or less.
- Fuel tank differential pressure sensor output voltage is 1 to 4 volts.

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Check Conditions C: For Test to Stop

- Engine coolant temperature is greater than 20 °C (68 °F).
- Intake air temperature is greater than -10 °C (14 °F).
- When the evaporative emission purge solenoid and evaporative emission ventilation solenoid are closed, the pressure rises in the fuel tank is less than 324 Pa (0.047 psi).
- 10 seconds have elapsed from the start of the previous monitoring.
- Monitoring time: 10 – 14 minutes.

Judgment Criterion

- Internal pressure of the fuel tank has changed more than 1,177 – 1,373 Pa (0.177 – 0.199 psi) in 128 seconds after the tank and vapor line were closed.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 6 P.13A-9.

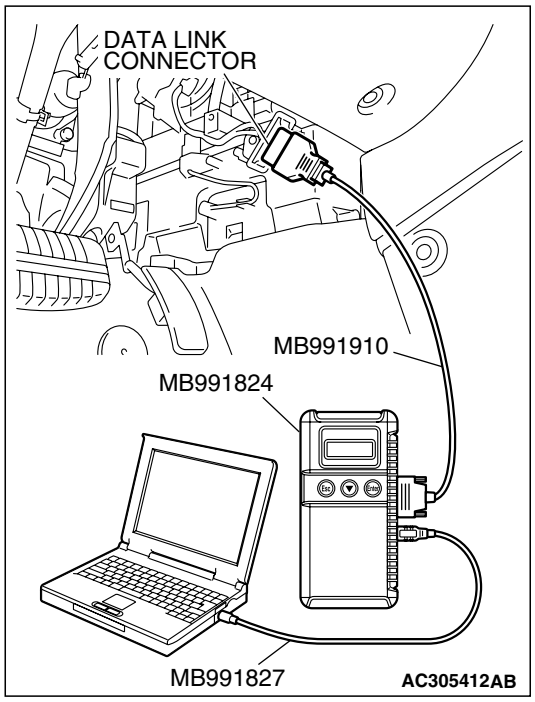
TROUBLESHOOTING HINTS (THE MOST LIKELY CAUSES FOR THIS CODE TO BE SET ARE:)

- Loose fuel cap.
- Fuel cap relief pressure is incorrect.
- Malfunction of the evaporative emission canister seal.
- Malfunction of the fuel tank, purge line or vapor line seal.
- Malfunction of the evaporative emission ventilation solenoid.

DIAGNOSIS

Required Special Tools:

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



STEP 1. Using scan tool MB991958, check the evaporative emission system monitor test.

⚠ 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.**
- **During this test, the PCM will automatically increase the engine speed to 1,600 r/min or greater. Check that the transaxle is set to the "P" position.**

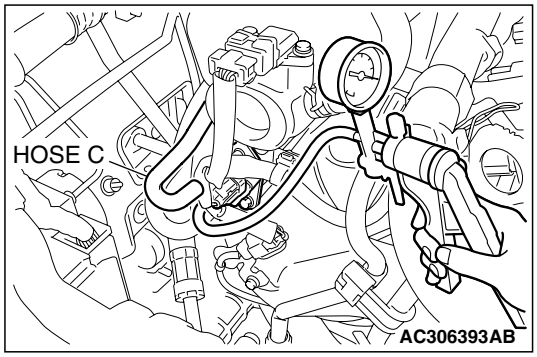
(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Erase the DTCs using scan tool MB991958.
(4) Check that the fuel cap is securely closed (Tighten until three clicks are heard).
(5) Start the engine.
(6) Select "System Test."
(7) Select "Evap Leak Mon."
(8) During this test, keep the accelerator pedal at the idle position.
(9) Keep the engine speed and engine load within the specified range. When the monitor test starts, the "In Progress" item on scan tool MB991958 will change from "NO" to "YES."
(10) Turn the ignition switch to the "LOCK" (OFF) position, and disconnect scan tool MB991958.

Q: Is "Evap Leak Mon. Completed. Test Failed and DTCs Set" displayed on scan tool MB991958?

YES : A malfunction has been detected during the monitor test. Refer to the Diagnostic Trouble Code Chart and diagnose any other DTCs that are set P.13A-45. If no other DTC's have been set, go to Step 2.

NO <"Evap Leak Mon. Completed. Test Passed" is displayed on scan tool MB991958.> : The evaporative emission system is working properly at this time. Explain to the customer that an improperly tightened fuel cap can cause the MIL to illuminate. Return the vehicle to the customer.

NO <"Evap Leak Mon. Discontinued. Retest again from the first" is displayed on scan tool MB991958.> : The EVAP monitor has been interrupted during the test. Turn the ignition switch to the "LOCK" (OFF) position once, and repeat the monitoring from Step 1.

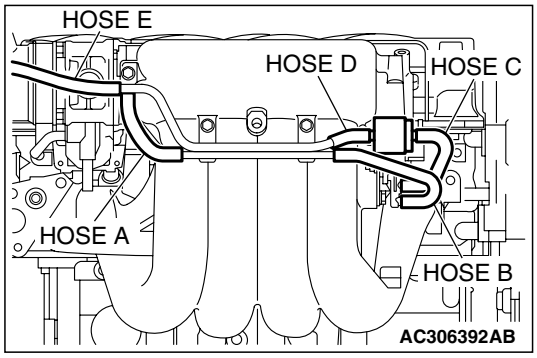


STEP 2. Check the evaporative emission purge solenoid for leaks.

(1) Disconnect hose C from the evaporative emission purge solenoid and connect a hand vacuum pump to the nipple of the evaporative emission purge solenoid.
(2) Use the hand vacuum pump to confirm that the evaporative emission purge solenoid holds vacuum.
(3) Disconnect the hand vacuum pump, and reconnect hose C to the evaporative emission purge solenoid.

Q: Does the evaporative emission purge solenoid hold vacuum?

YES : Go to Step 3.
NO : Replace the evaporative emission purge solenoid. Then go to Step 15.

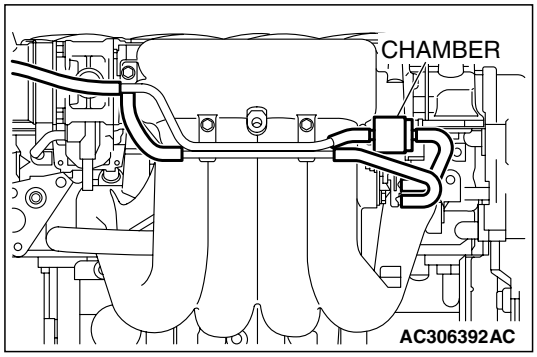


STEP 3. Check for leaks in evaporative emission hoses A through E.

Use a hand vacuum pump to test each hose from hose A to hose E.

Q: Do the hoses hold vacuum?

YES : Go to Step 4.
NO : Replace any damaged hose. Then go to Step 15.

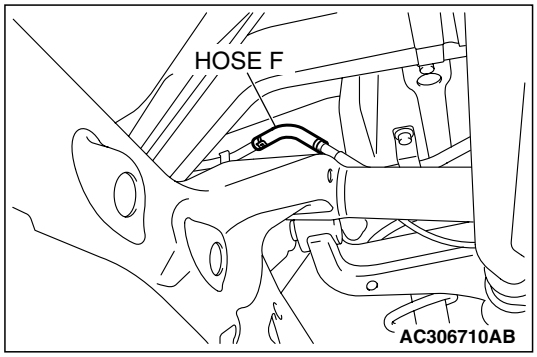


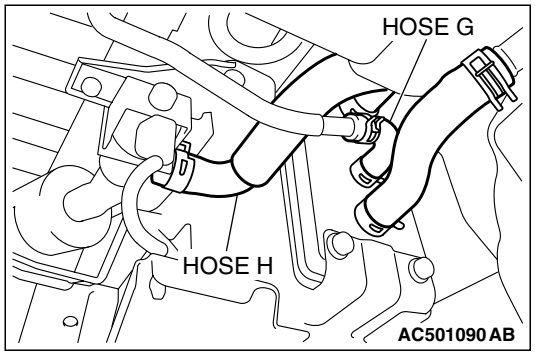
STEP 4. Check for leaks in the chamber.

(1) Connect a hand vacuum pump to the nipple.
(2) Plug the other nipple.
(3) Apply vacuum with the hand vacuum pump, and confirm that the applied vacuum does not fluctuate.

Q: Is the chamber in good condition?

YES : Go to Step 5.
NO : Replace the chamber. Then go to Step 15.





STEP 5. Check for leaks in evaporative emission hoses F through H.

Use a hand vacuum pump to test each hose from hose F to hose H.

Q: Do the hoses hold vacuum?

YES : Go to Step 6.

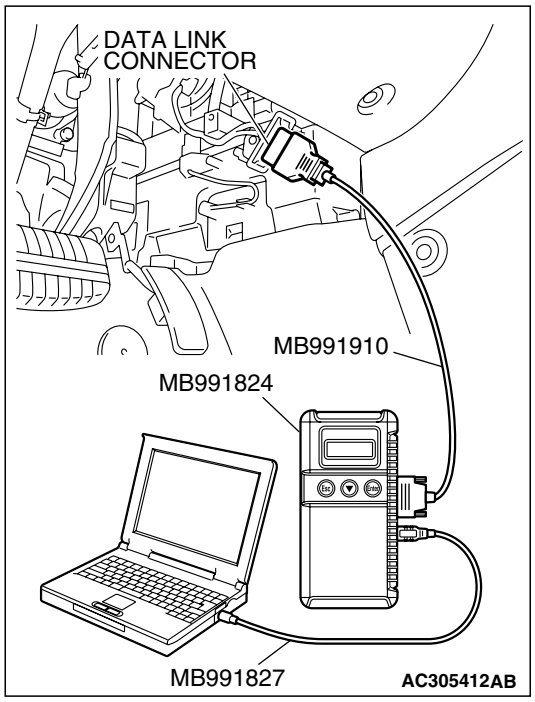
NO : Replace any damaged hose. Then go to Step 15.

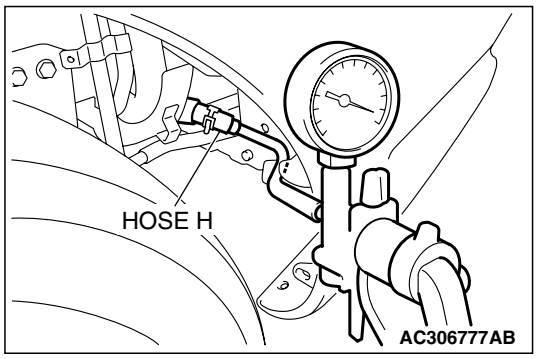
STEP 6. Using scan tool MB991958, check actuator test item 15: Evaporative emission ventilation solenoid.

⚠ 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) Remove the fuel tank filler tube protector (Refer to GROUP 13C, Fuel Tank P.13C-9).



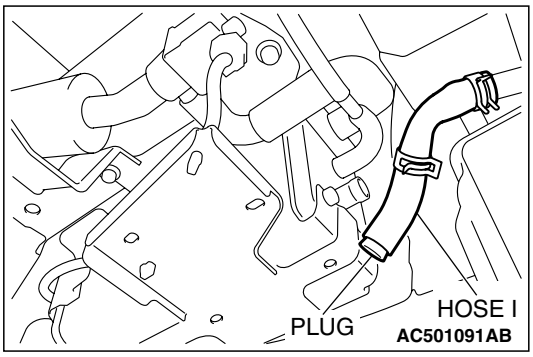


(3) Disconnect hose H from evaporative emission canister and connect hand vacuum pump to hose H.
(4) Turn the ignition switch to the "ON" position.
(5) Set scan tool MB991958 to actuator test mode.
- Item 15: Evaporative Emission Ventilation Solenoid.
  - While the evaporative emission ventilation solenoid is energized, operate the hand vacuum pump and confirm that the solenoid holds vacuum.

(6) Turn the ignition switch to the "LOCK" (OFF) position, and disconnect scan tool MB991958.
(7) Disconnect the hand vacuum pump, and connect hose H to the evaporative emission canister.
(8) Reinstall the fuel tank filler tube protector (Refer to GROUP 13C, Fuel Tank P.13C-9).

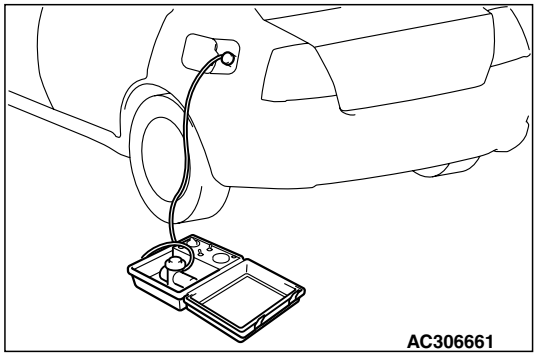
Q: Did the evaporative emission ventilation solenoid hold vacuum?

YES : Go to Step 7.
NO : Replace the evaporative emission ventilation solenoid (Refer to GROUP 17, Evaporative emission canister and fuel tank pressure relief valve removal and installation P.17-102). Then go to Step 15.



STEP 7. Pressure test the evaporative emission system lines from hoses I to N.

(1) Disconnect hose I from the evaporative emission canister, and plug hose I securely.
(2) Confirm that the evaporative emission system pressure pump (Miller number 6872A) is operating properly. Perform the self-test as described in the pump manufacturer's instructions.
(3) Remove the fuel cap.



(4) Connect the evaporative emission system pressure pump (Miller number 6872A) to the fuel tank filler tube by using fuel tank adapter (MLR-8382).
(5) Pressure test the system to determine whether any leaks are present.

NOTE: The "Pressure test" in this procedure refers to the I/M240 Simulation Test. The eight steps of this test are described in the manufacturer's instructions for the evaporative emission system pressure pump, Miller number 6872A.

(6) Remove the evaporative emission system pressure pump (Miller number 6872A) and the fuel tank adapter (MLR-8382), and reinstall the fuel cap.
(7) Connect hose I to the evaporative emission canister.

Q: Is the evaporative emission system line free of leaks?

YES : Go to Step 13.
NO : Go to Step 8.

STEP 8. Check for leaks in evaporative emission hoses I through K.

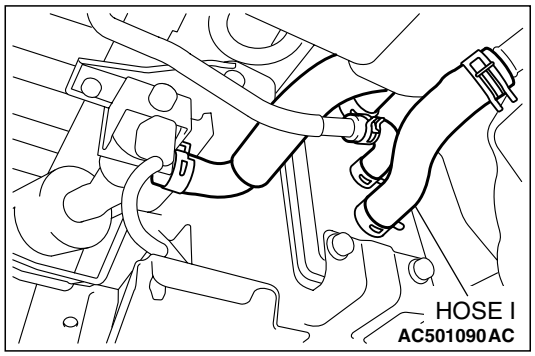
(1) Remove the fuel tank filler tube protector (Refer to GROUP 13C, Fuel Tank P.13C-9).

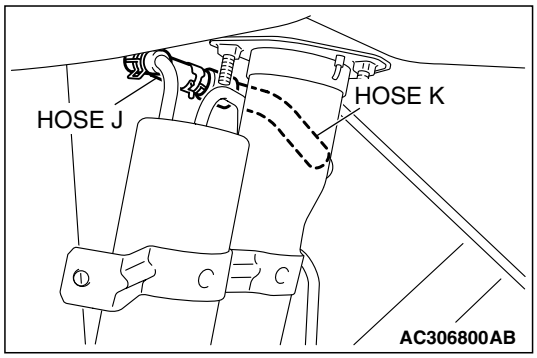
(2) Use a hand vacuum pump to test each hose from hose I to hose K.

Q: Do the hoses hold vacuum?

YES : Go to Step 9.

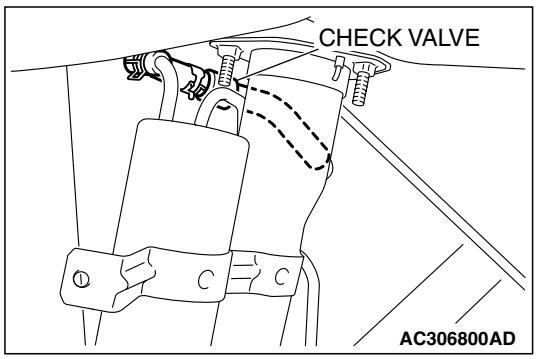
NO : Replace any damaged hose. Then go to Step 15.





STEP 9. Test check valve.

(1) Check valve is a one-way check valve.

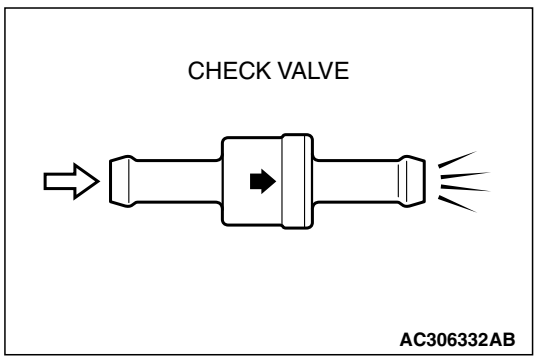


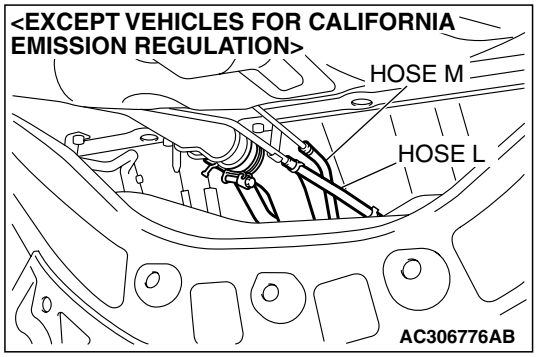
(2) Check valve should allow air to flow in only one direction.

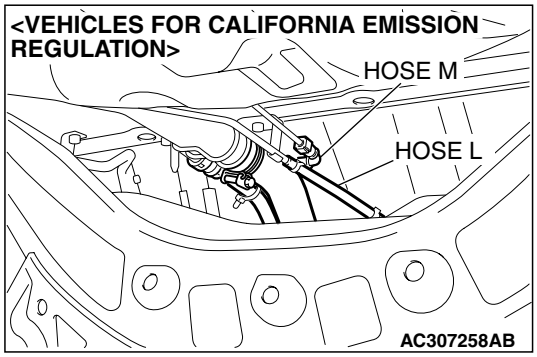
Q: Does check valve allow air to pass in one direction only?

YES : Go to Step 10.

NO : Replace check valve, and reinstall the fuel tank filler tube protector (Refer to GROUP 13C, Fuel Tank P.13C-9). Then go to Step 15.







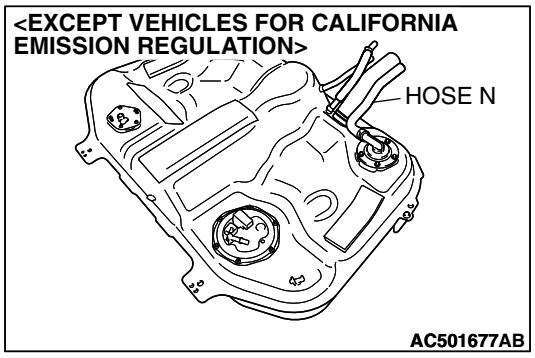
STEP 10. Check for leaks in evaporative emission hoses L and M.

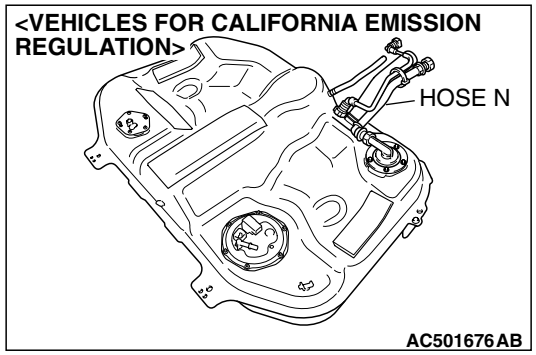
Use a hand vacuum pump to test each hose L and M.

Q: Do the hoses hold vacuum?

YES : Go to Step 11.

NO : Replace any damaged hose. Then go to Step 15.





STEP 11. Check for leaks in evaporative emission hose N.

(1) Remove the fuel tank assembly (Refer to GROUP 13C, Fuel Tank P.13C-9).

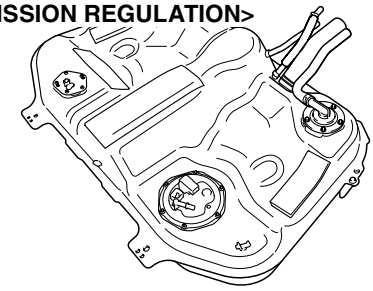
(2) Use the hand vacuum pump to check the hose N.

Q: Is the hose hold vacuum?

YES : Go to Step 12.

NO : Replace the hose and reinstall the fuel tank assembly (Refer to GROUP 13C, Fuel Tank P.13C-9). Then go to Step 15.

<EXCEPT VEHICLES FOR CALIFORNIA EMISSION REGULATION>



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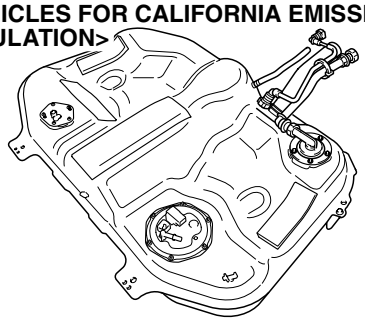

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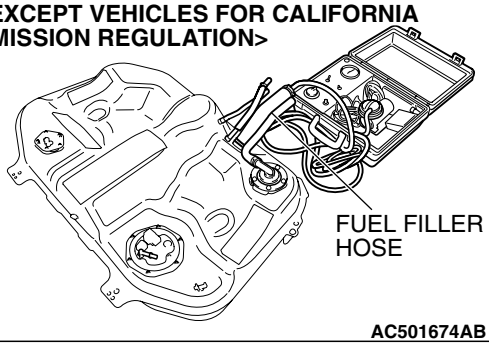
STEP 12. Check for leaks in the fuel tank.

(1) Visually check for cracks or other leaks in the fuel tank.

NOTE: Carefully check the fuel pump module and the fuel tank differential pressure sensor installation in the fuel tank.

<EXCEPT VEHICLES FOR CALIFORNIA EMISSION REGULATION>



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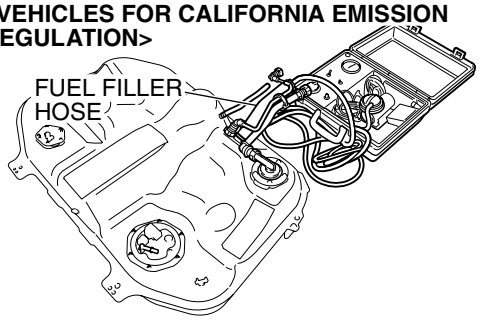

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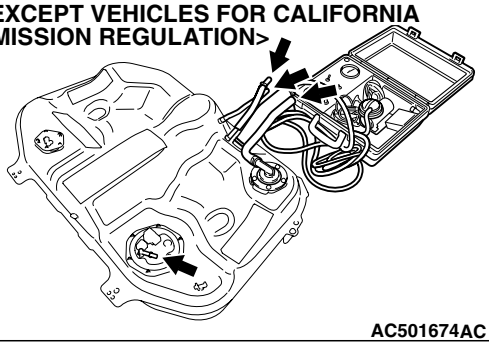
(2) Connect the evaporative emission system pressure pump (Miller number 6872A) to the fuel filler hose.

<EXCEPT VEHICLES FOR CALIFORNIA EMISSION REGULATION>



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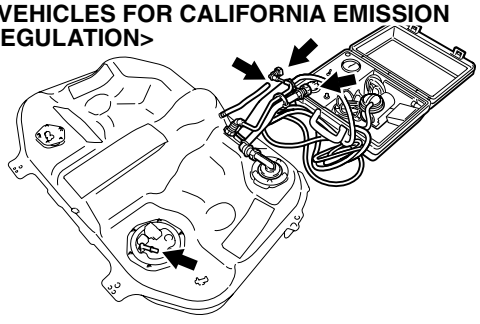

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(3) Plug the hose and the nipple shown in the illustration.

NOTE: If these items are not securely plugged now, the fuel could leak in the next step.

(4) Pressurize the fuel tank with the evaporative emission system pressure pump.

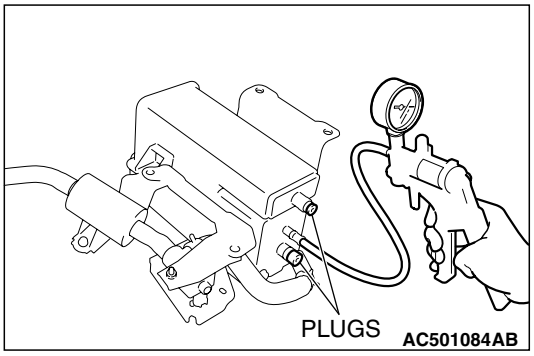
(5) In the pressurized state, check for leaks by applying a soapy water solution to each section and look for bubbles.

Q: Are any leaks found?

YES <When there is a leak from the attachment points of the fuel pump module, fuel tank differential pressure sensor, fuel level sensor (sub) or leveling valve.> : Reassemble the leaked parts and check again that there are no leaks. Then reinstall the fuel tank (Refer to GROUP 13C, Fuel Tank P.13C-9). Then go to Step 15.

YES <When there is a leak from the fuel tank.> : Replace the fuel tank (Refer to GROUP 13C, Fuel Tank P.13C-9). Go to Step 15.

NO : When there is no leak, reinstall the fuel tank (Refer to GROUP 13C, Fuel Tank P.13C-9). Then go to Step 14.

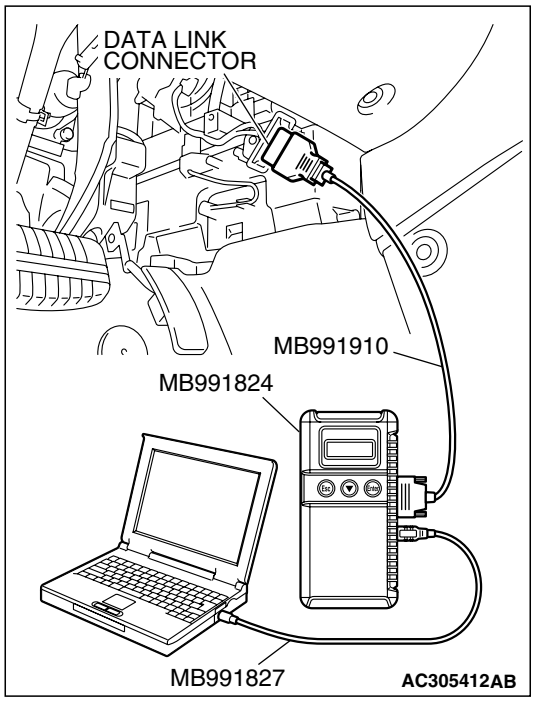


STEP 13. Check the evaporative emission canister for vacuum leaks.

(1) Remove the evaporative emission canister (Refer to GROUP 17, Evaporative Emission Canister and Fuel Tank Pressure Relief Valve P.17-102).
(2) Connect a hand vacuum pump to the evaporative emission canister and plug the other nipples.
(3) Apply a pressure on the hand vacuum pump, and confirm that air is maintained.
(4) Disconnect the hand vacuum pump and remove the plugs, and then install the evaporative emission canister (Refer to GROUP 17, Evaporative Emission Canister and Fuel Tank Pressure Relief Valve P.17-102).

Q: Is the evaporative emission canister in good condition?

YES : Go to Step 14.
NO : Replace the evaporative emission canister (Refer to GROUP 17, Evaporative Emission Canister and Fuel Tank Pressure Relief Valve P.17-102). Then go to Step 15 .



STEP 14. Using scan tool MB991958, check the evaporative emission system monitor test.

⚠ 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.**
- **During this test, the PCM automatically increases the engine speed to 1,600 r/min or greater. Check that the transaxle is set to the "P" position.**

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Erase the DTCs using scan tool MB991958.
(4) Check that the fuel cap is securely closed (Tighten until three clicks are heard).
(5) Start the engine.
(6) Select "System Test."
(7) Select "Evap Leak Mon."
(8) During the test, keep the accelerator pedal at the idle position.
(9) Keep the engine speed and engine load within the specified range. When the monitor test starts, the "In Progress" item on scan tool MB991958 will change from "NO" to "YES."
(10) Turn the ignition switch to the "LOCK" (OFF) position. Disconnect scan tool MB991958.

Q: Is "Evap Leak Mon. Completed. Test Failed and DTCs Set" displayed on scan tool MB991958?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Ignition Switch – Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 15.

NO <"Evap Leak Mon. Completed. Test Passed" is displayed on scan tool MB991958.> : The evaporative emission system is working properly at this time. Go to Step 15 .

NO <"Evap Leak Mon. Discontinued. Retest again from the first" is displayed on scan tool MB991958.> : The EVAP monitor has been interrupted during the test. Turn the ignition switch to the "LOCK" (OFF) position once, and repeat the monitoring from Step 14.

STEP 15. Perform the OBD-II drive cycle.

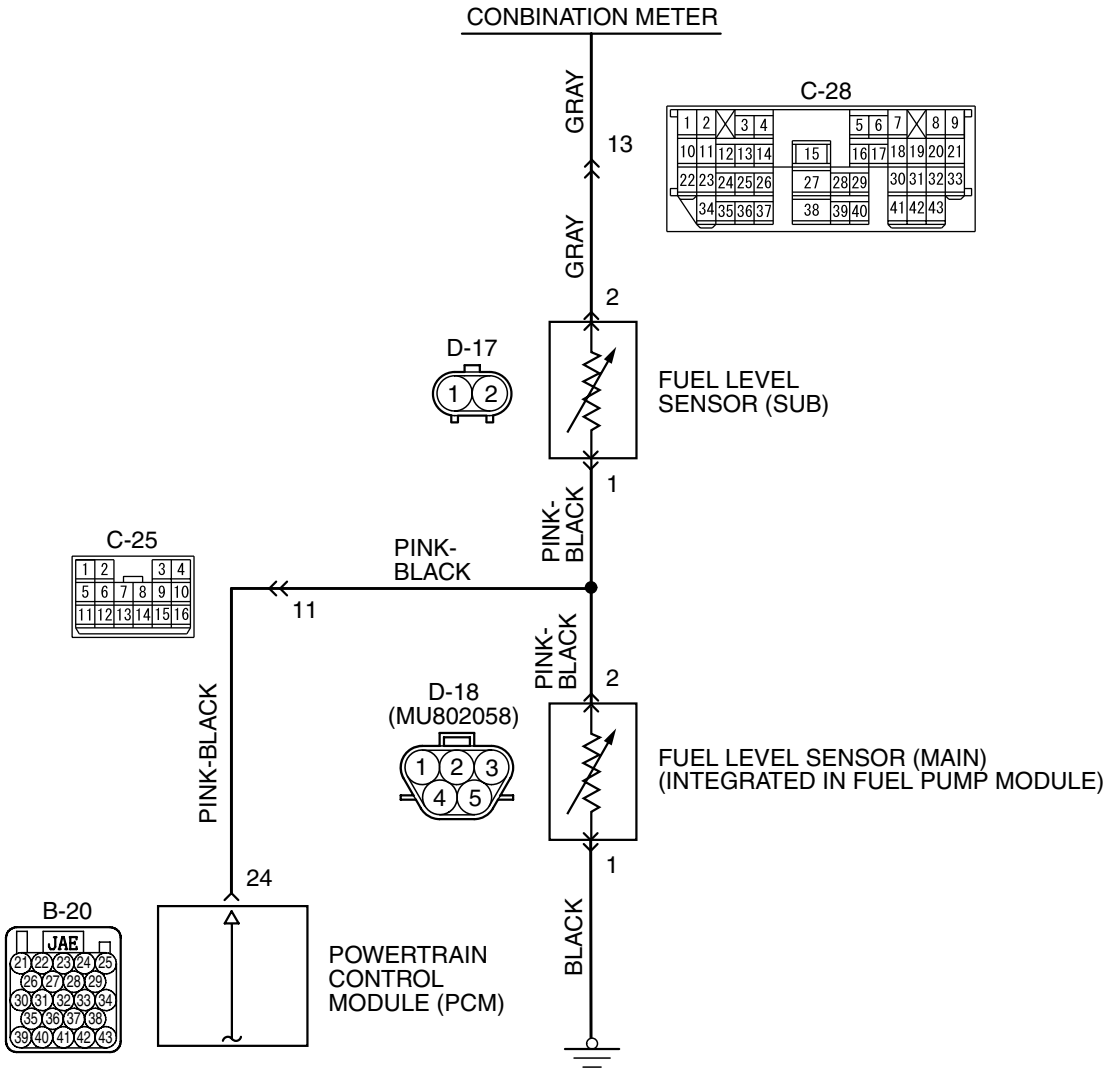
(1) Confirm the repair by performing the appropriate drive cycle (Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 6 P.13A-9).
(2) Read the DTC.

Q: Is DTC P0456 set?

YES : Repeat the troubleshooting from Step 1.
NO : The procedure is complete.

DTC P0461: Fuel Level Sensor (main) Circuit Range/Performance

Fuel Level Sensor Circuit



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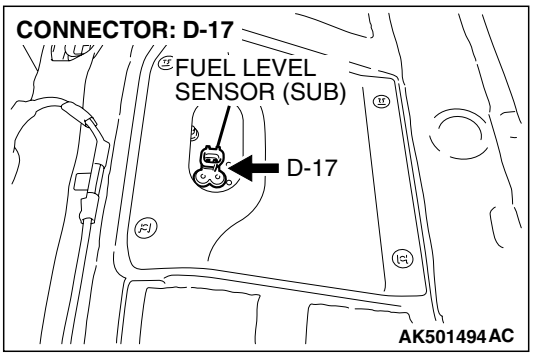
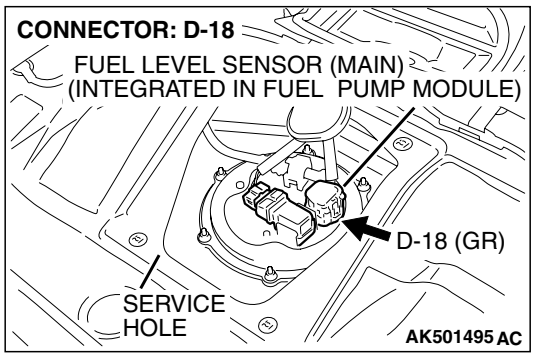
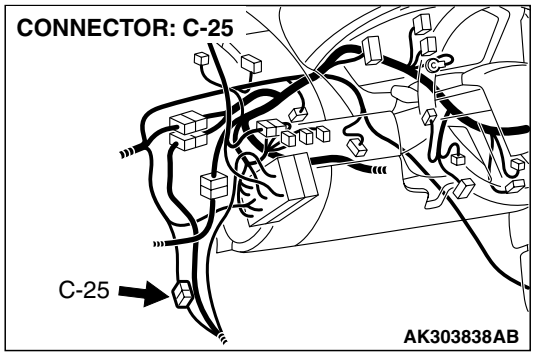
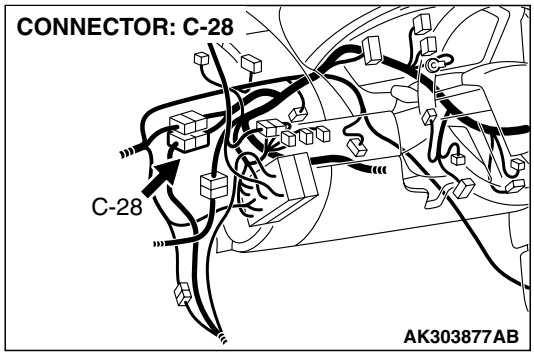
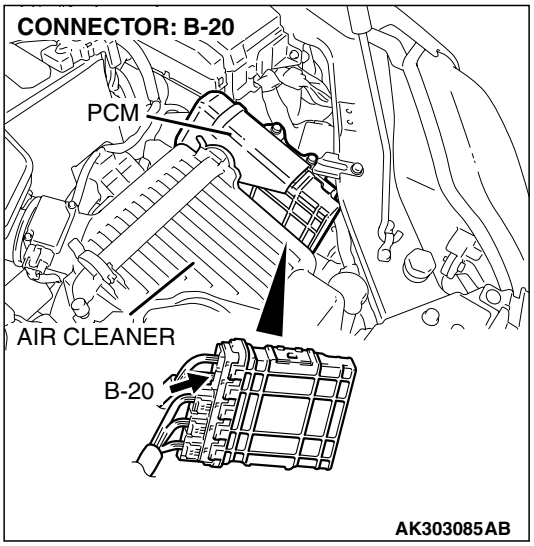




TSB Revision







CIRCUIT OPERATION
- The fuel level sensor (main) output voltage is input in PCM (terminal No. 24).

TECHNICAL DESCRIPTION
- Branch the output voltage from the fuel level sensor circuit, and input it into PCM.
- The PCM detects the amount of fuel left in the fuel tank with this signal, and also controls the fuel level warning light.

DESCRIPTIONS OF MONITOR METHODS
Detect malfunction if change of fuel level sensor output voltage is small when sum of fuel injection is large.

MONITOR EXECUTION
Continuous

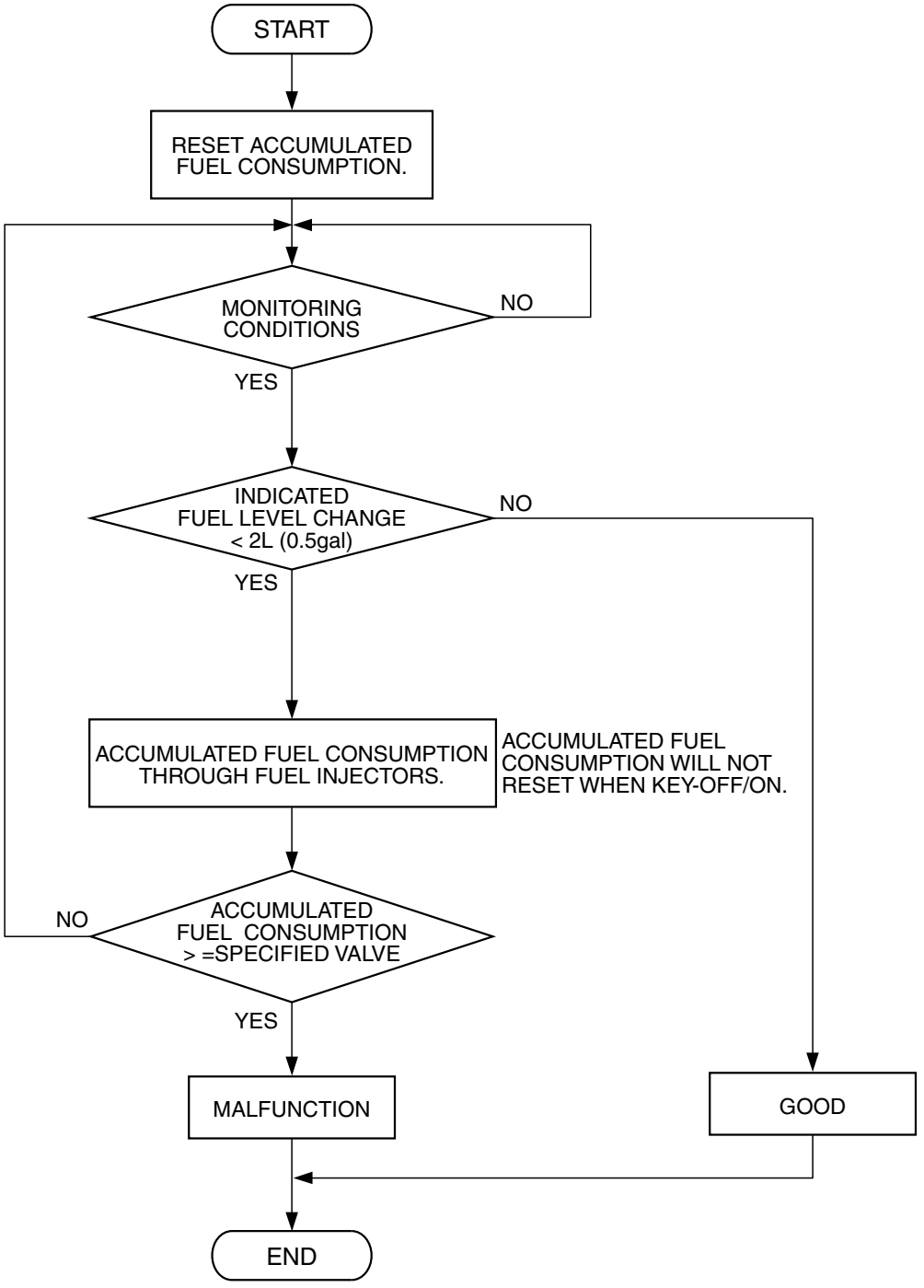
MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)
- Not applicable

Sensor (The sensor below is determined to be normal)
- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



AK500577

TSB Revision

Check Condition, Judgement Criterion

- When the fuel consumption calculated from the operation time of the injector amounts to 30 liters (7.9 gal), the diversity of the amount of fuel in tank calculated from the fuel level sensor is 2 liters (0.5 gal) or less.

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

- Fuel pump module or fuel level sensor failed.
- Harness damage or connector damage in fuel level sensor circuit.
- PCM failed.

OBD-II DRIVE CYCLE PATTERN

None.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan tool (M.U.T.-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).

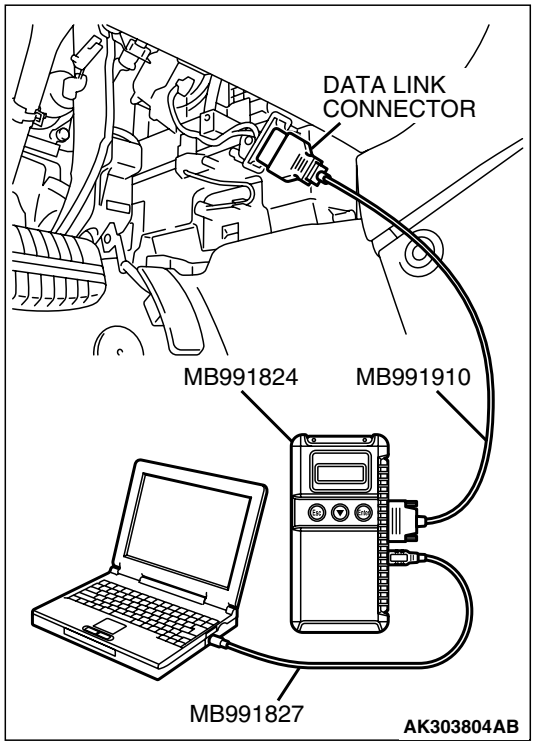
⚠ CAUTION

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 DTC P2066 set?

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



STEP 2. Check fuel gauge.

Q: Is the fuel gauge functioning?

YES : Go to Step 3.
NO : Refer to GROUP 54A, Chassis Electrical – Combination Meters Assembly – Symptom Chart P.54A-86.

STEP 3. Check the trouble symptoms.
Check that the fuel gauge operates correctly.

Q: Does the fuel gauge operate correctly?

YES : It can be assumed 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.

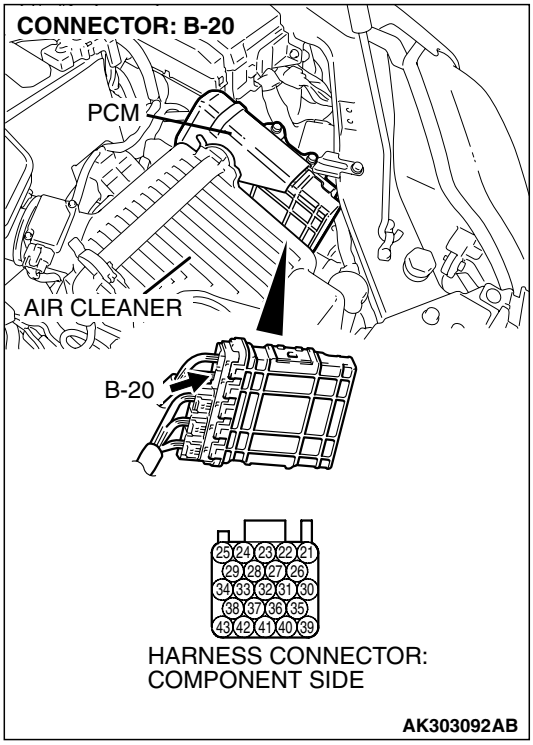
NO : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 8.

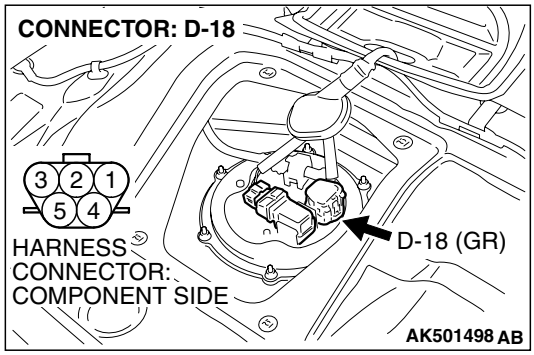
STEP 4. Check harness connector D-18 at fuel level sensor (main) and harness connector B-20 at PCM for damage.

Q: Is the harness connector in good condition?

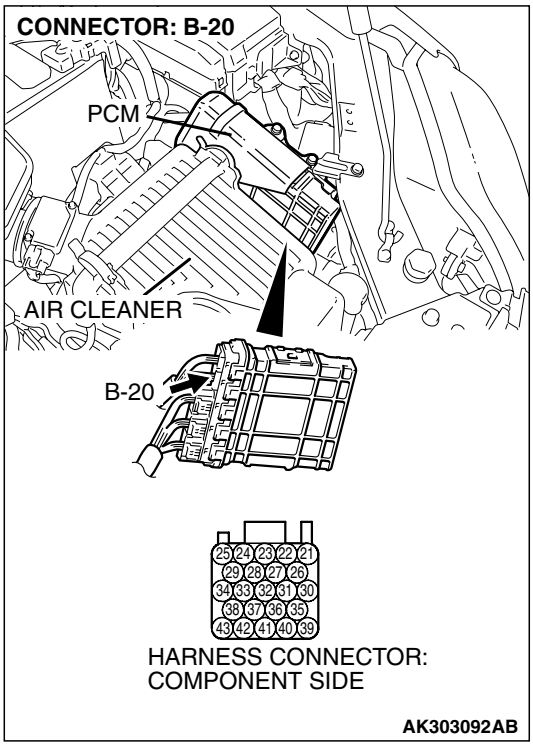
YES : Go to Step 5.

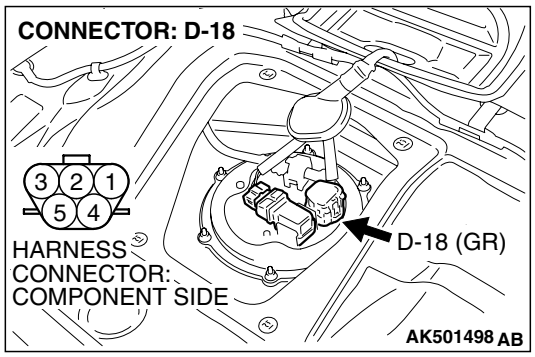
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 8.





STEP 5. Check for harness damage between fuel level sensor (main) connector D-18 (terminal No. 2) and PCM connector B-20 (terminal No. 24).





NOTE: Check harness after checking intermediate connector C-25. If intermediate connector is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 8.

Q: Is the harness wire in good condition?

YES : Go to Step 6.
NO : Repair it. Then go to Step 8.

STEP 6. Check the fuel pump module.

Check to see if the fuel pump module is normal. Refer to GROUP 54A, Chassis Electrical – Combination Meters Assembly and Vehicle Speed Sensor – On-Vehicle Service – Fuel Level Sensor Check P.54A-121.

Q: Is the fuel pump module normal?

YES : Go to Step 7.
NO : Replace the fuel pump module. Then go to Step 8.

TSB Revision

STEP 7. Check the trouble symptoms.
Check that the fuel gauge operates correctly.

Q: Does the fuel gauge operate correctly?

YES : It can be assumed 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 : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 8.

STEP 8. Check the trouble symptoms.
Check that the fuel gauge operates correctly.

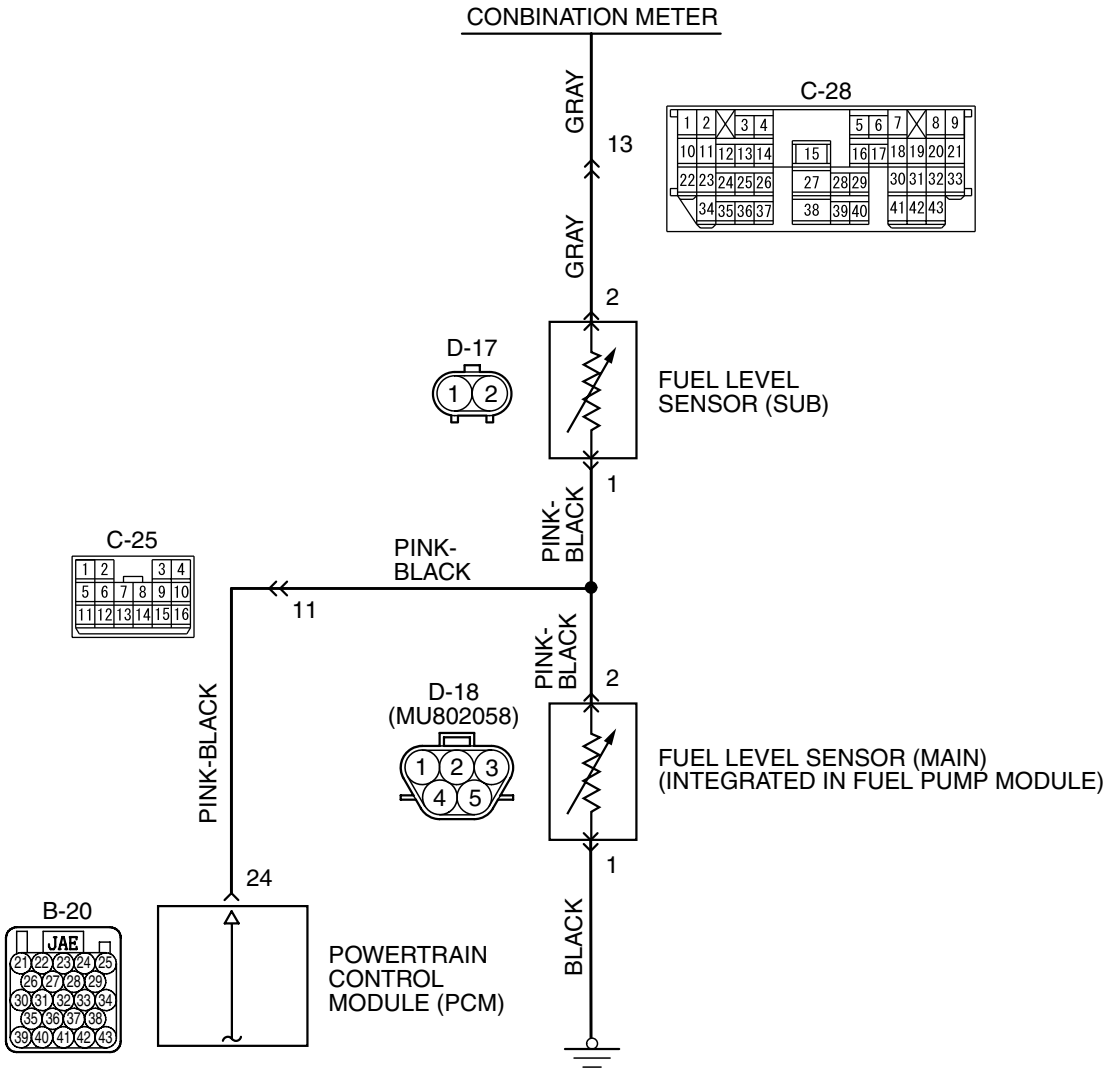
Q: Does the fuel gauge operate correctly?

YES : The inspection is complete.

NO : Retry the troubleshooting.

DTC P0462: Fuel Level Sensor Circuit Low Input

Fuel Level Sensor Circuit



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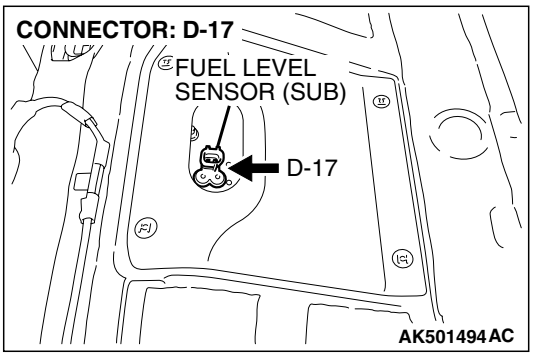
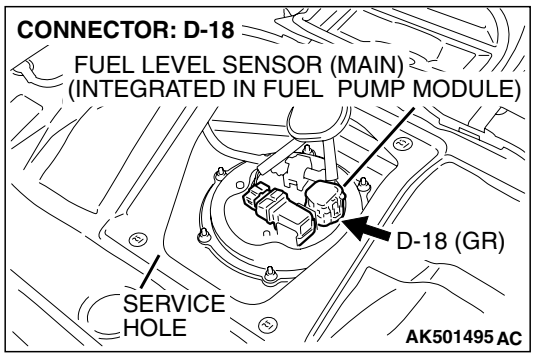
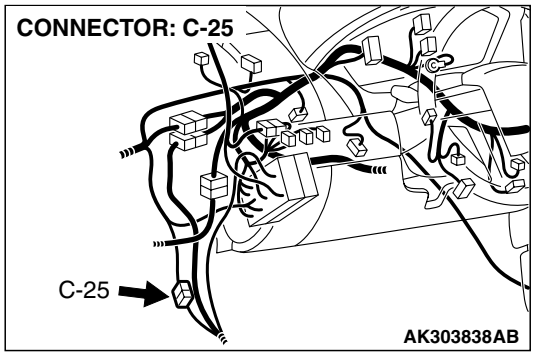
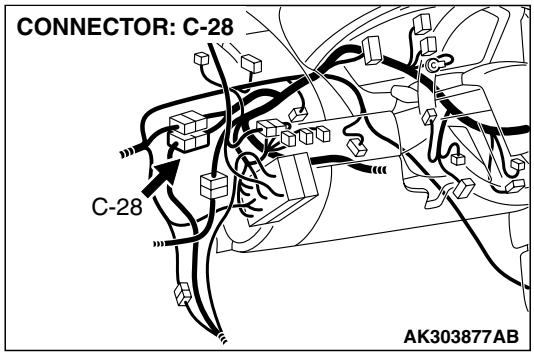
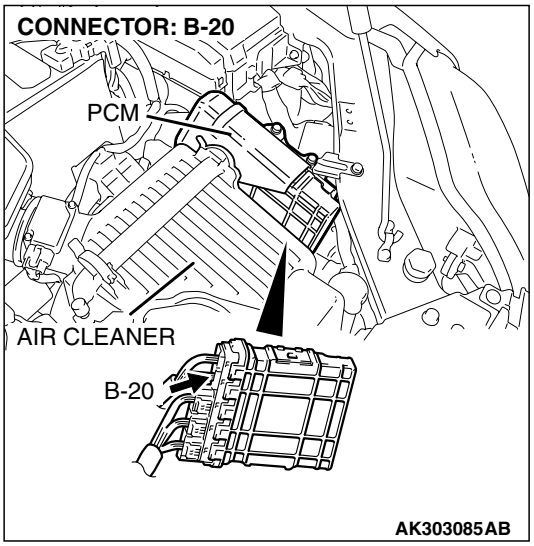




TSB Revision







CIRCUIT OPERATION
- The fuel level sensor output voltage is input in combination meter (terminal No. 13).

TECHNICAL DESCRIPTION
- The fuel level sensor converts the rest of the fuel to a voltage.
- The combination meter sends the data regarding the rest of the fuel to the PCM.
- The PCM checks whether this data is within a specified range.

DESCRIPTIONS OF MONITOR METHODS
A short circuit is detected while monitoring the fuel level sensor output.

MONITOR EXECUTION
Continuous

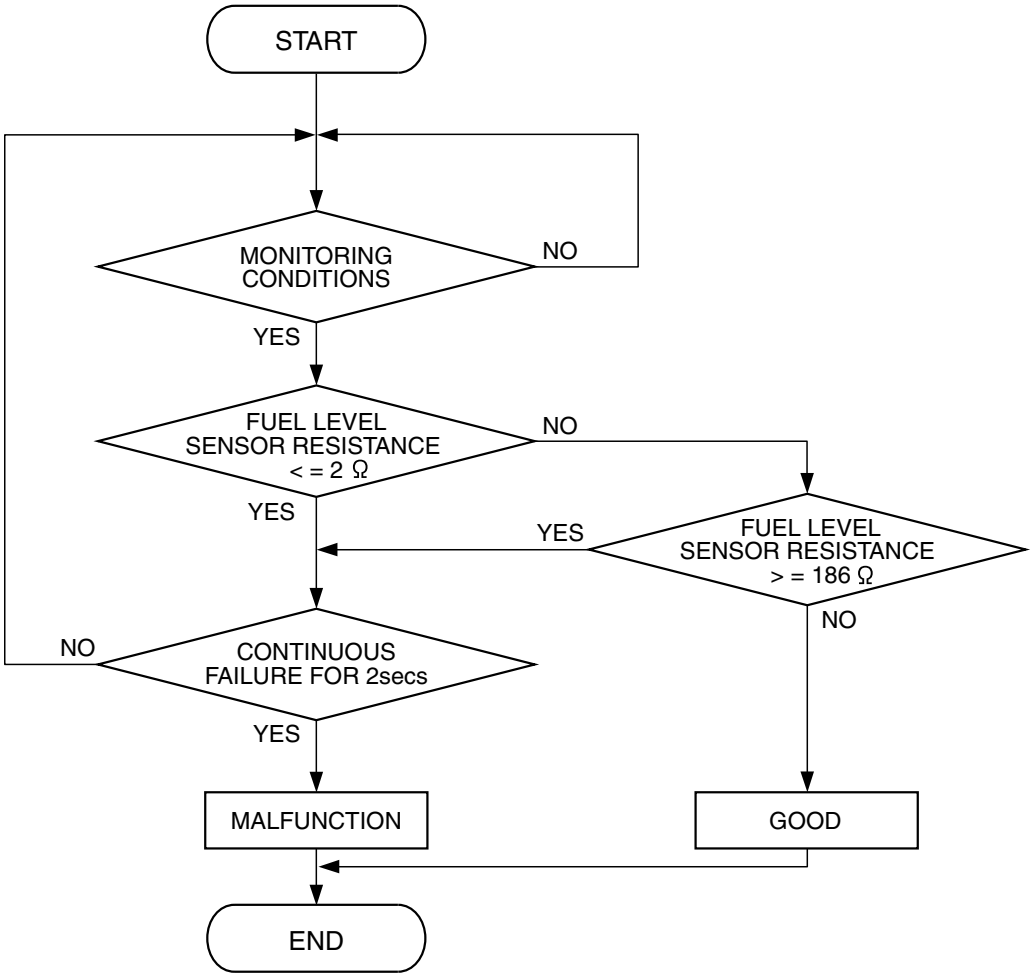
MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)
- Not applicable

Sensor (The sensor below is determined to be normal)
- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



AK503615

Check Conditions

- Battery positive voltage is between 11 and 16.5 volts.
- 2 seconds or more have passed since the engine starting sequence was completed.

Judgement Criterion

- Fuel level sensor resistance has continued to 2 ohms or less for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 24 P.13A-9.

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

- Fuel level sensor failed.
- Shorted fuel level sensor circuit or connector damage.
- PCM failed.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable

TSB Revision

- MB991910: Main Harness A

STEP 1. Check fuel gauge.

Q: Is the fuel gauge functioning?

YES : Go to Step 2.

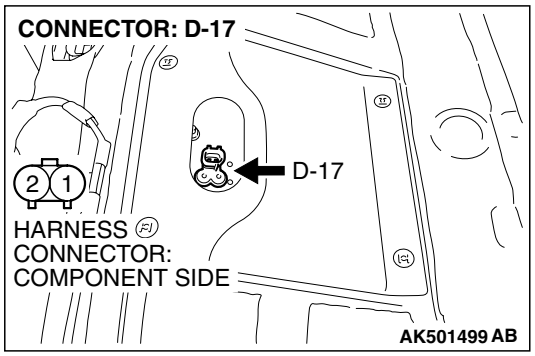
NO : Refer to GROUP 54A, Chassis Electrical – Combination Meters Assembly – Symptom Chart P.54A-86.

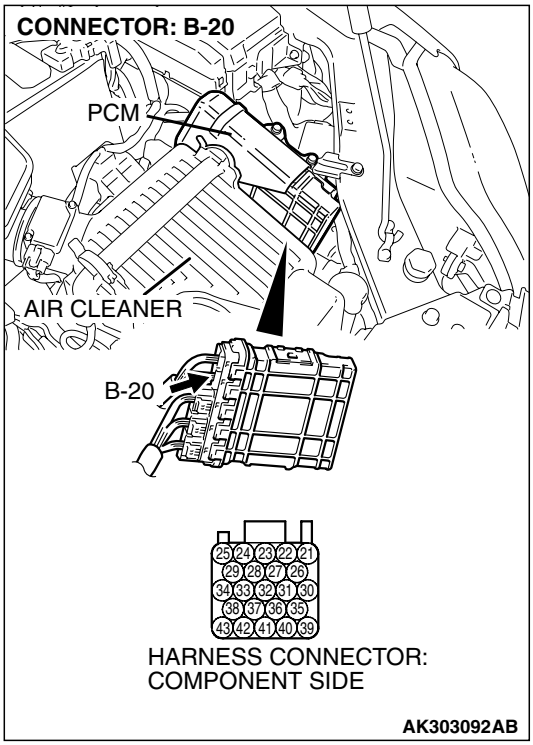
STEP 2. Check harness connector B-20 at PCM and harness connector D-17 at fuel level sensor (sub) for damage.

Q: Is the harness connector in good condition?

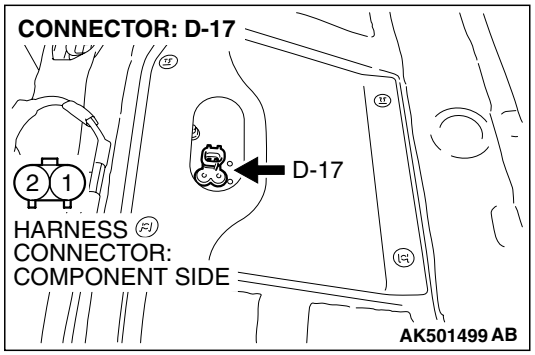
YES : Go to Step 3.

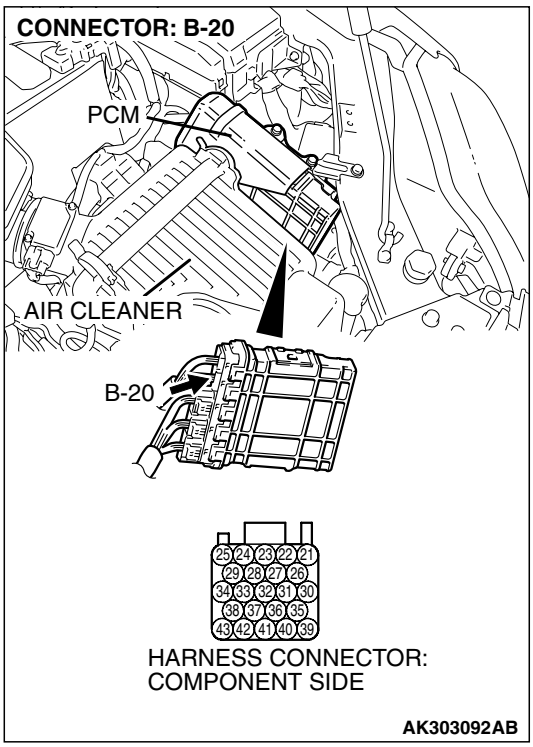
NO : Repair or replace them. Refer to GROUP 00E, Harness Connector Inspection P.00E-2 Then go to Step 7.





STEP 3. Check for short circuit to ground between PCM connector B-20 (terminal No. 24) and fuel level sensor (sub) connector D-17 (terminal No. 1).



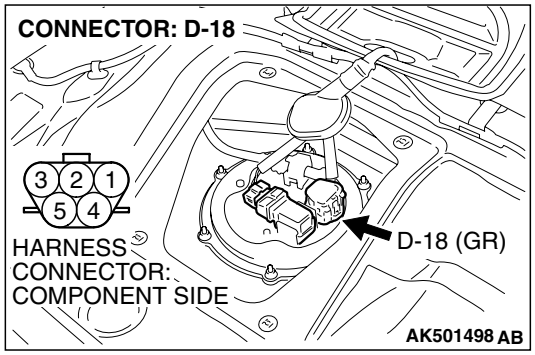


NOTE: Check harness after checking intermediate connector C-25. If intermediate connector is damaged, repair or replace them. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 7.

Q: Is the harness wire in good condition?

YES : Go to Step 4.

NO : Repair it. Then go to Step 7.

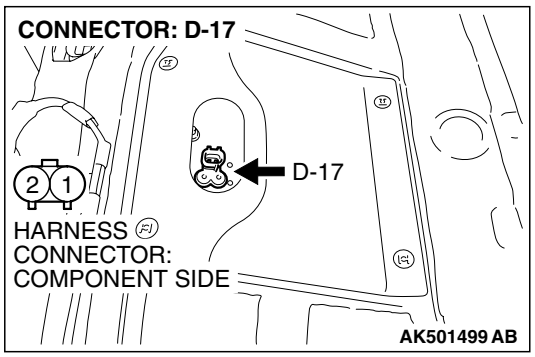


STEP 4. Check harness connector D-18 at fuel level sensor (main) for damage.

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 go to Step 7.

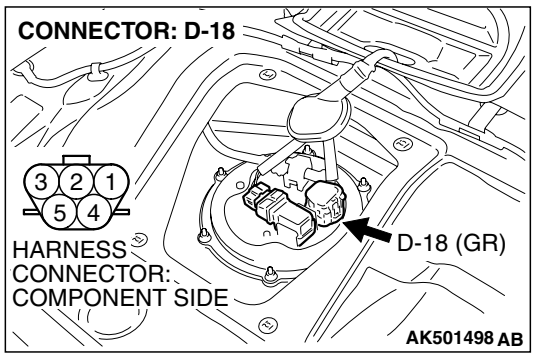


STEP 5. Check for short circuit to ground between fuel level sensor (main) connector D-18 (terminal No. 2) and fuel level sensor (sub) connector D-17 (terminal No. 1).

Q: Is the harness wire in good condition?

YES : Go to Step 6.

NO : Repair it. Then go to Step 7.



STEP 6. Check the trouble symptoms.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 24 P.13A-9.

(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0462 set?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 7.

NO : It can be assumed 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.

STEP 7. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 24 P.13A-9.

(2) Check the diagnostic trouble code (DTC).

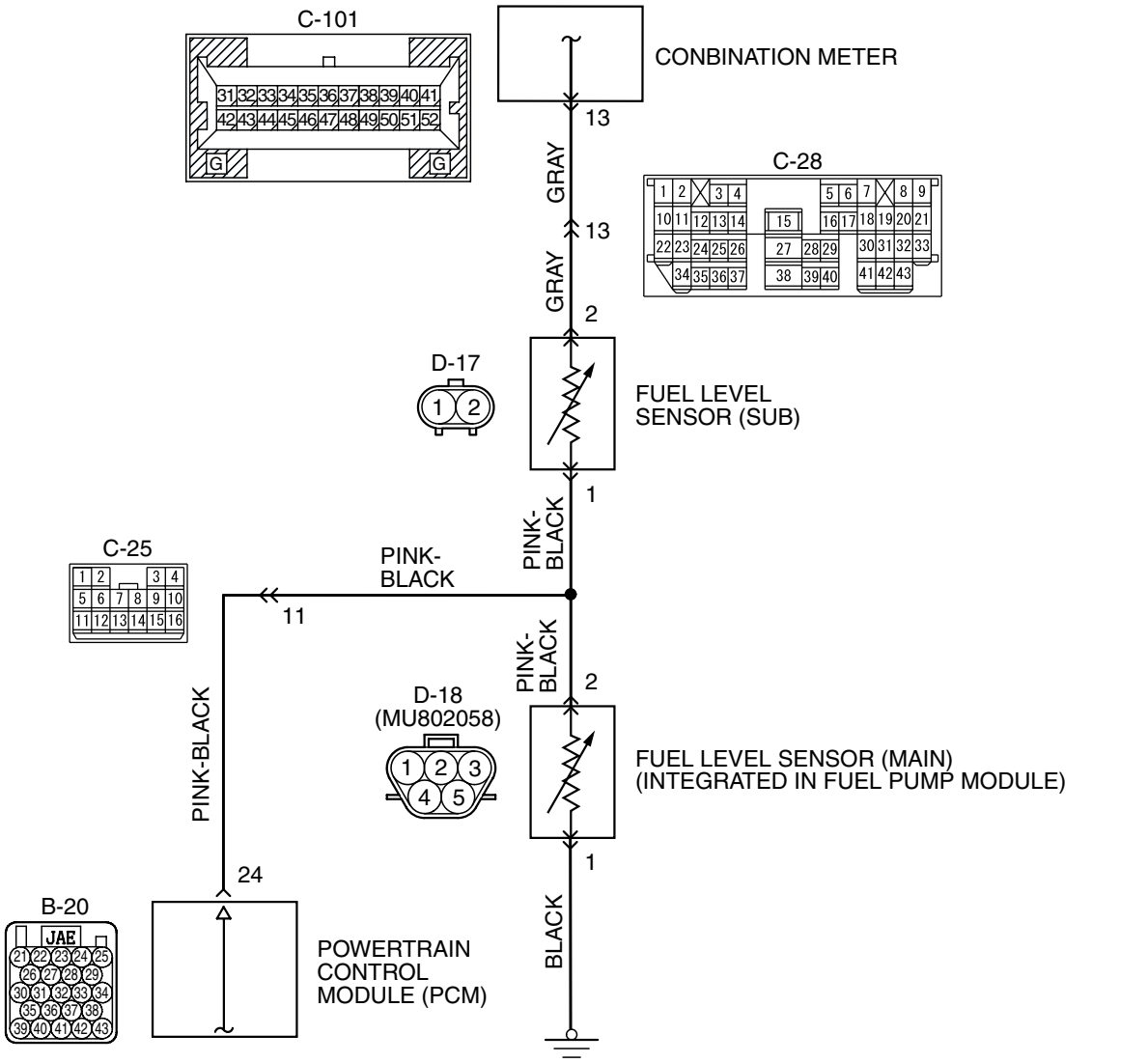
Q: Is DTC P0462 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0463: Fuel Level Sensor Circuit High Input

Fuel Level Sensor Circuit



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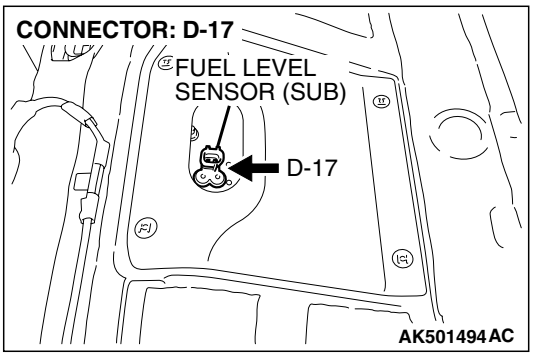
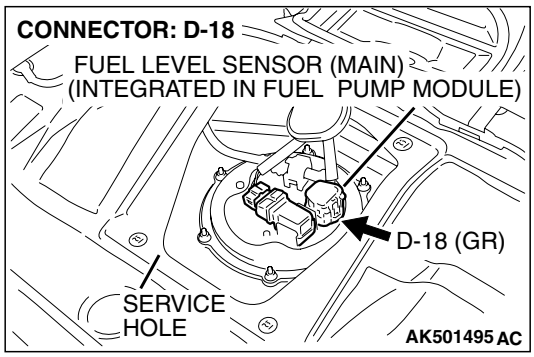
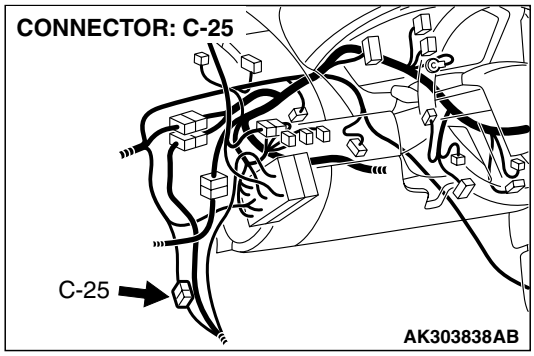
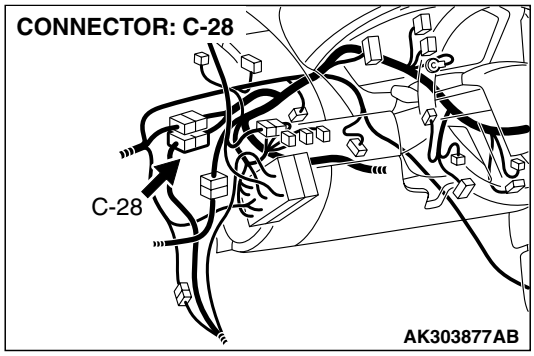
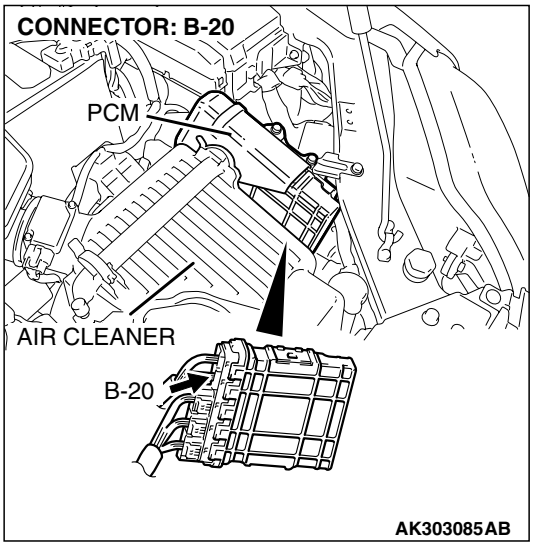




TSB Revision







CIRCUIT OPERATION

- The fuel level sensor output voltage is input in combination meter (terminal No. 13).

TECHNICAL DESCRIPTION

- The fuel level sensor converts the rest of the fuel to a voltage.
- The combination meter sends the data regarding the rest of the fuel to the PCM.
- The PCM checks whether this data is within a specified range.

DESCRIPTIONS OF MONITOR METHODS

An open circuit is detected while monitoring the intake air temperature sensor output.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

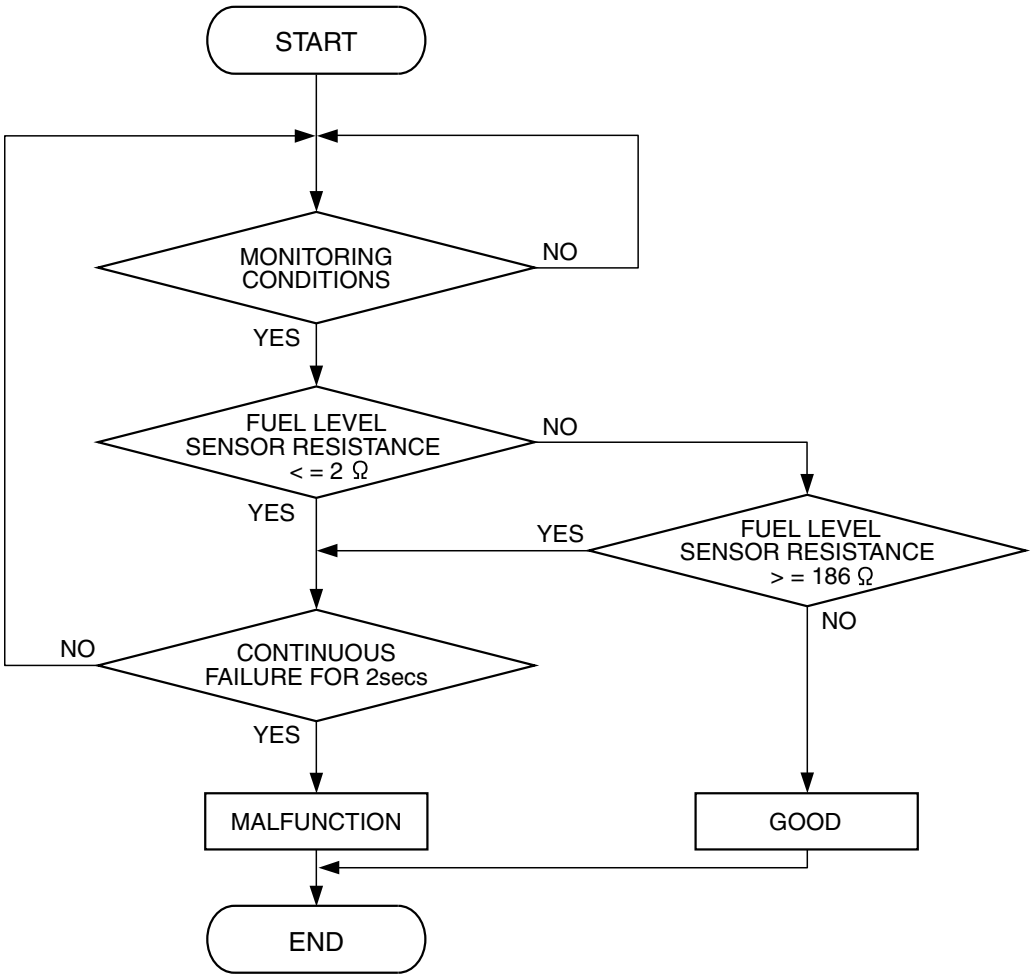
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



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Check Conditions

- Battery positive voltage is between 11 and 16.5 volts.
- 2 seconds or more have passed since the engine staring sequence was completed.

Judgement Criterion

- Fuel level sensor resistance has continued to be 186 ohms or more for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 24 P.13A-9.

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

- Fuel level sensor failed.
- Open or shorted fuel level sensor circuit, or connector damage.
- PCM failed.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable

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- MB991910: Main Harness A

STEP 1. Check fuel gauge.

Q: Is the fuel gauge functioning?

YES : Go to Step 2.

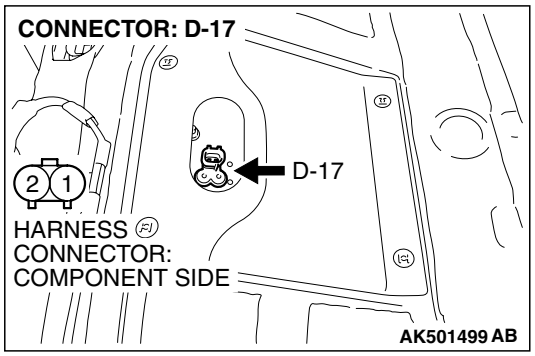
NO : Refer to GROUP 54A, Chassis Electrical – Combination Meters Assembly – Symptom Chart P.54A-86.

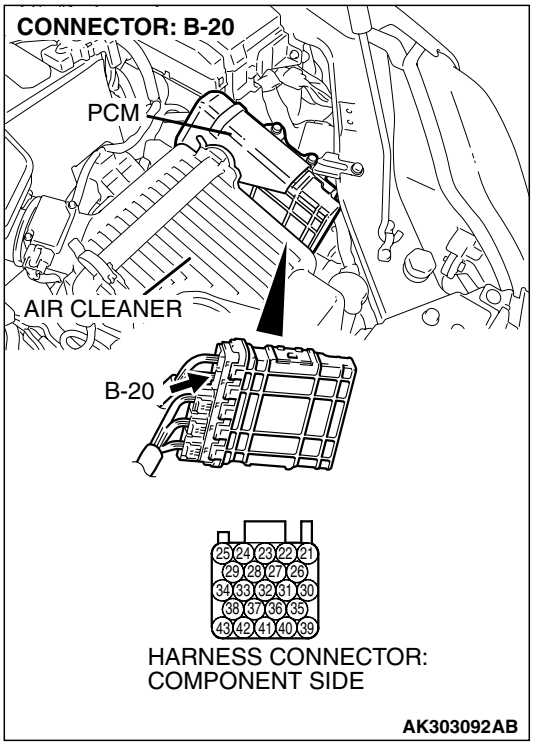
STEP 2. Check harness connector B-20 at PCM and harness connector D-17 at fuel level sensor (sub) for damage.

Q: Is the harness connector in good condition?

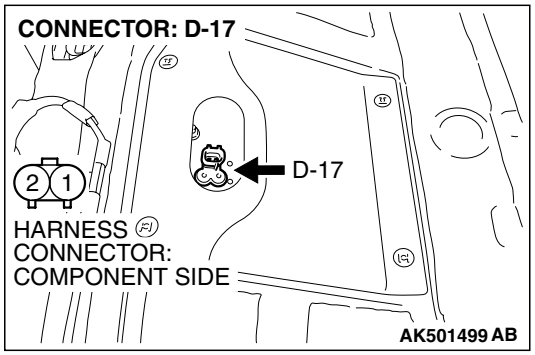
YES : Go to Step 3.

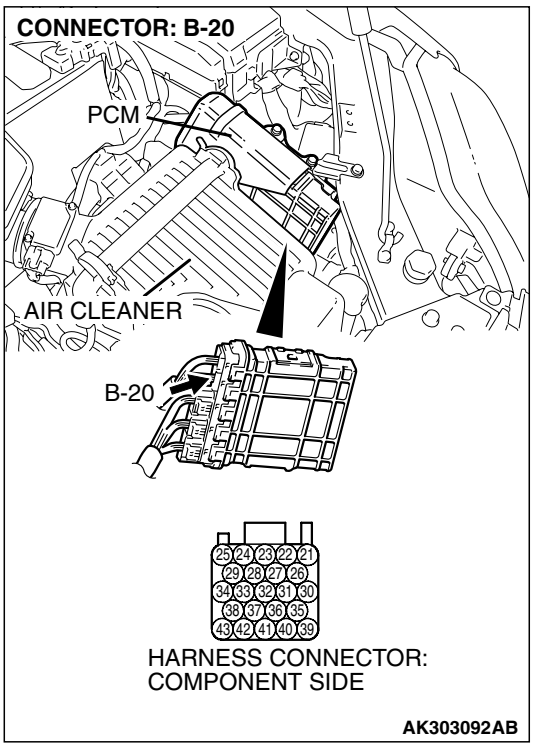
NO : Repair or replace them. Refer to GROUP 00E, Harness Connector Inspection P.00E-2 Then go to Step 7.





STEP 3. Check for short circuit to ground between PCM connector B-20 (terminal No. 24) and fuel level sensor (sub) connector D-17 (terminal No. 1).

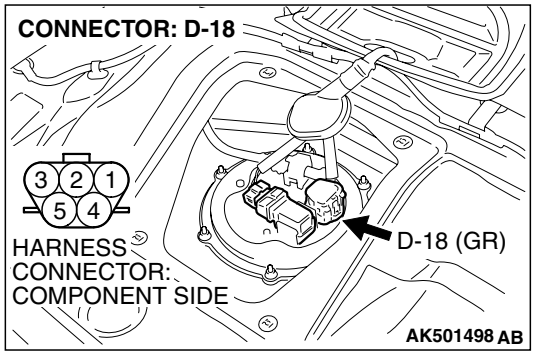




NOTE: Check harness after checking intermediate connector C-25. If intermediate connector is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 7.

Q: Is the harness wire in good condition?

YES : Go to Step 4.
NO : Repair it. Then go to Step 7.

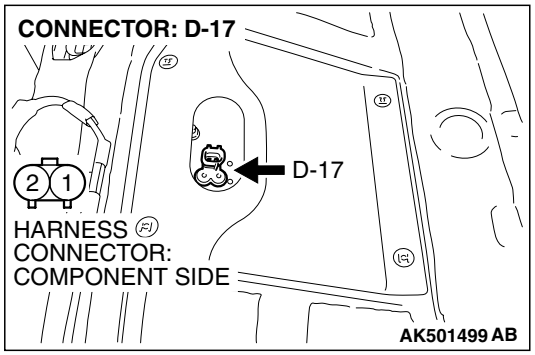


STEP 4. Check harness connector D-18 at fuel level sensor (main) for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 5.

NO : Repair or replace them. Refer to GROUP 00E, Harness Connector Inspection P.00E-2 Then go to Step 7.

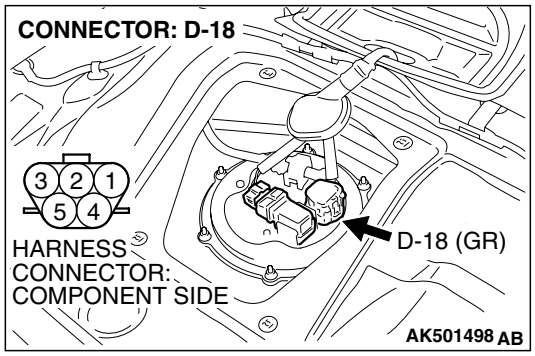


STEP 5. Check for open circuit and short circuit to ground between fuel level sensor (main) connector D-18 (terminal No. 2) and fuel level sensor (sub) connector D-17 (terminal No. 1).

Q: Is the harness wire in good condition?

YES : Go to Step 6.

NO : Repair it. Then go to Step 7.



STEP 6. Check the trouble symptoms.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 24 P.13A-9.

(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0463 set?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 7.

NO : It can be assumed 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.

STEP 7. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 24 P.13A-9.

(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0463 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0506: Idle Control Sytem RPM Lower Than Expected

⚠ CAUTION

If DTC P0506 has been set, TCL related DTC U1120 is also set. After P0506 has been diagnosed, don't forget to erase DTC U1120.

TECHNICAL DESCRIPTION

- The amount of air taken in during idling is regulated by the opening and closing of the throttle valve.
- The PCM checks the difference between the actual engine speed and the target engine speed.

DESCRIPTIONS OF MONITOR METHODS

Difference between actual and target idle speed is over the specified value.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

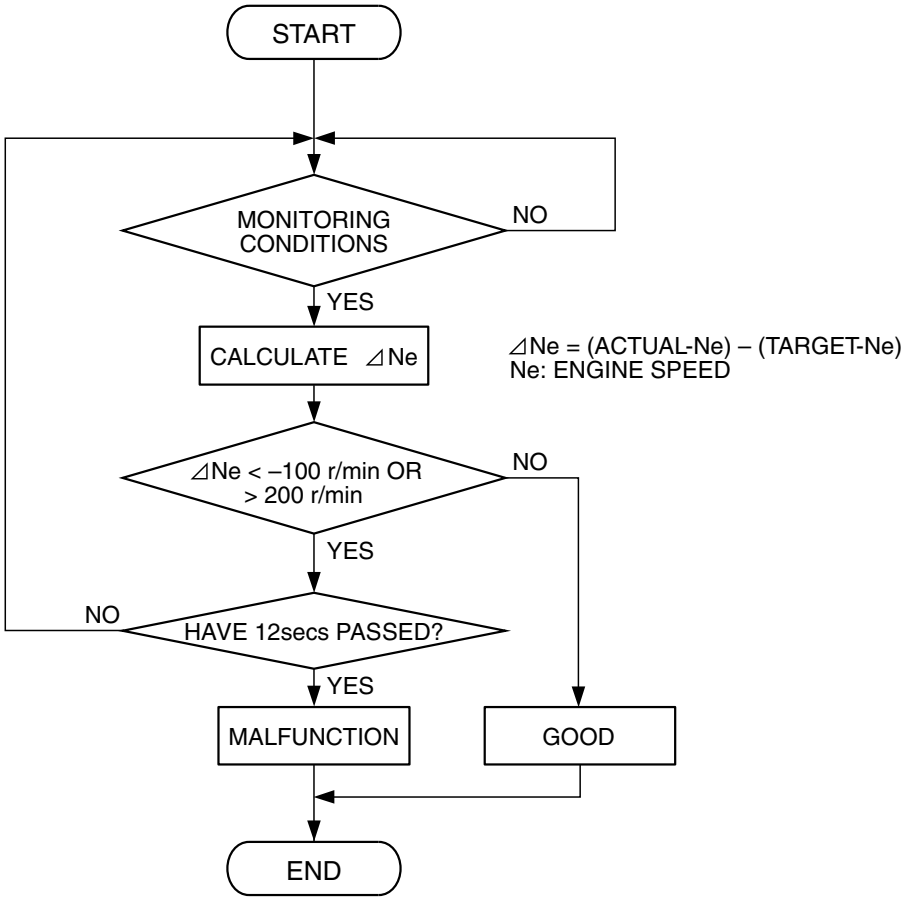
- Misfire monitor
- Exhaust gas recirculation (EGR) system monitor
- Fuel system monitor

Sensor (The sensor below is determined to be normal)

- Mass airflow sensor
- Engine coolant temperature sensor
- Intake air temperature sensor
- Barometric pressure sensor
- Throttle position sensor

DTC SET CONDITIONS

Logic Flow Chart



AK302165

Check Conditions

- Under the closed loop idle speed control.
- The engine coolant temperature is more than 77°C (171°F).
- Battery positive voltage is higher than 10 volts.
- Power steering pressure switch: OFF
- Volumetric efficiency is lower than 40 percent.
- Barometric pressure is higher than 76 kPa (22.4 in.Hg).
- Intake air temperature is higher than –10°C (14°F).
- 3 seconds have elapsed from the start of the previous monitoring.
- Target throttle actuator control motor position is more than 512 steps.

Judgement Criterion

- The actual idle speed is more than 100 r/min lower than the target idle speed for 12 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 20 P.13A-9.

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

- Throttle valve area is dirty.
- PCM failed.

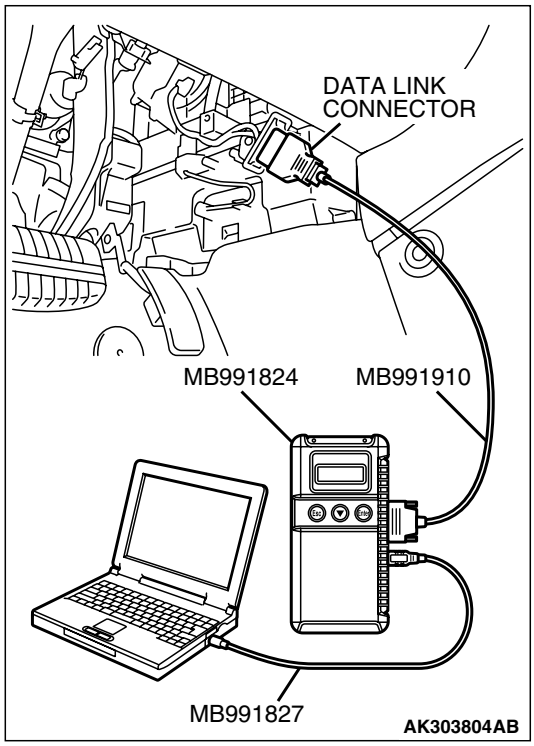
DIAGNOSIS

Required Special Tools

- MB991958: Scan tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable

TSB Revision

- 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) Set scan tool MB991958, read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the diagnostic trouble code other than P0506 set?

YES : Refer to Diagnostic Trouble Code Chart P.13A-45.
NO : Go to Step 2.

STEP 2. Check the throttle body. (throttle valve area)

Q: Is the throttle valve area dirty?

YES : Perform cleaning. Refer to Throttle body (throttle valve area) cleaning P.13A-1162. Then go to Step 4.
NO : Go to Step 3.

STEP 3. Replace the throttle body assembly.

(1) Replace the throttle body assembly
(2) Carry out test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 20 P.13A-9.
(3) Check the diagnostic trouble code (DTC).

Q: Is DTC P0506 set?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 4.
NO : The inspection is complete.

STEP 4. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 20 P.13A-9.

(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0506 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0507: Idle Control Sytem RPM Higher Than Expected

⚠ CAUTION

If DTC P0507 has been set, TCL related DTC U1120 is also set. After P0507 has been diagnosed, don't forget to erase DTC U1120.

TECHNICAL DESCRIPTION

- The amount of air taken in during idling is regulated by the opening and closing of the throttle valve.
- The PCM checks the difference between the actual engine speed and the target engine speed.

DESCRIPTIONS OF MONITOR METHODS

Difference between actual and target idle speed is over the specified value.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

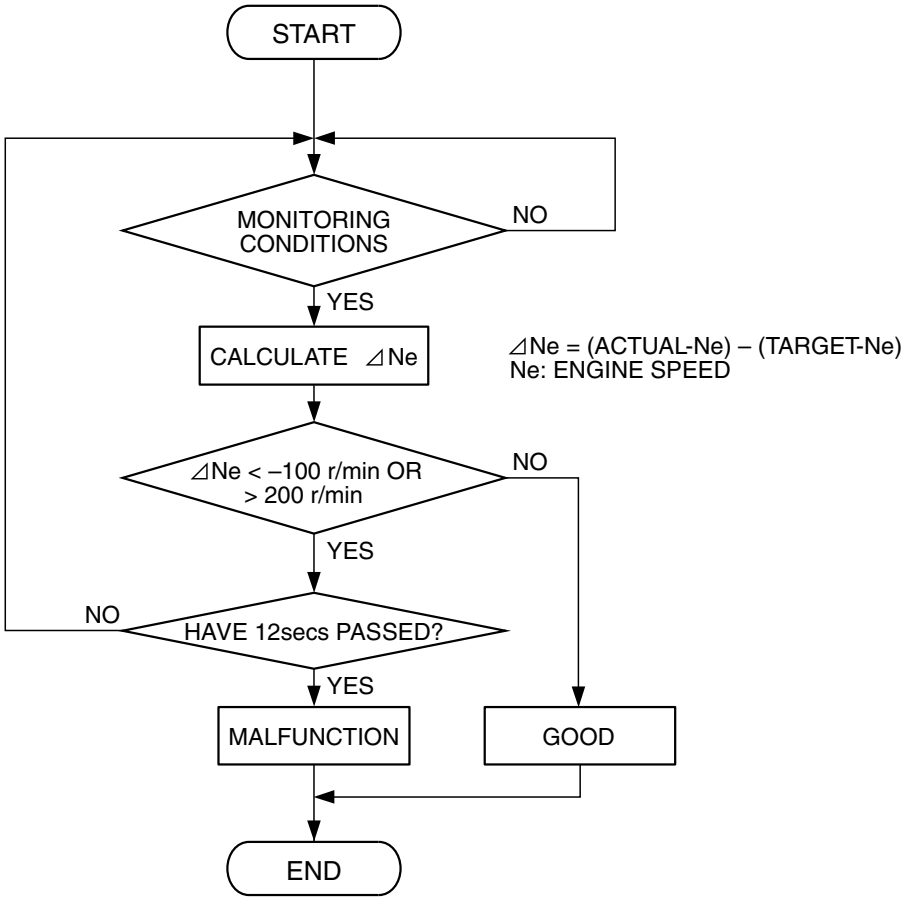
- Misfire monitor
- Exhaust gas recirculation (EGR) system monitor
- Fuel system monitor

Sensor (The sensor below is determined to be normal)

- Mass airflow sensor
- Engine coolant temperature sensor
- Intake air temperature sensor
- Barometric pressure sensor
- Throttle position sensor

DTC SET CONDITIONS

Logic Flow Chart



AK302165

Check Conditions

- Vehicle speed has reached 1.5 km/h (1.0 mph) or more at least once.
- Under the closed loop idle speed control.
- Engine coolant temperature is higher than 77°C (171°F).
- Battery positive voltage is higher than 10 volts.
- Barometric pressure is higher than 76 kPa (22.4 in.Hg).
- Intake air temperature is higher than –10°C (14°F).
- 3 seconds have elapsed from the start of the previous monitoring.
- Target throttle actuator control motor position is 0 steps.

Judgement Criterion

- Actual idle speed has continued to be higher than the target idle speed by 200 r/min (300 r/min*) or more for 12 seconds.
  *: Specs in parentheses are applicable if the maximum air temperature during the previous operation was more than 45°C (113°F).

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 20 P.13A-9.

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

- Intake system vacuum leak.
- PCM failed.

DIAGNOSIS

Required Special Tools

- MB991958: Scan tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.

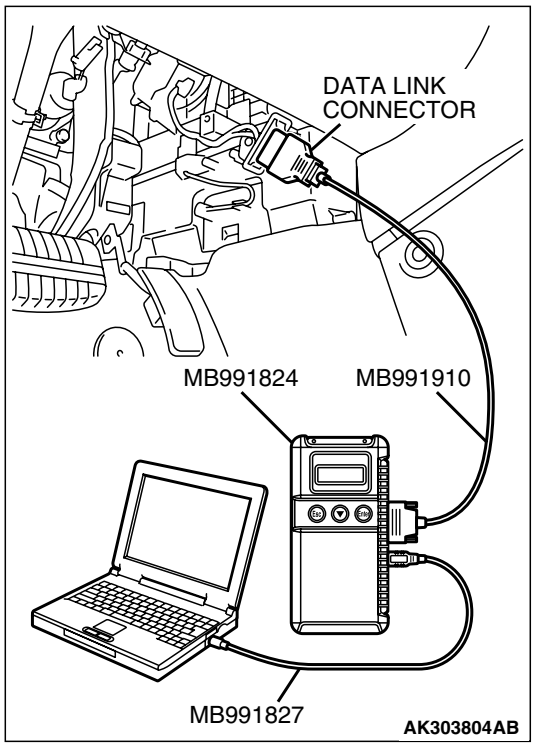
TSB Revision

- 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) Set scan tool MB991958, read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the diagnostic trouble code other than P0507 set?

YES : Refer to Diagnostic Trouble Code Chart P.13A-45.
NO : Go to Step 2.

STEP 2. Check the intake system vacuum leak.

Q: Are there any abnormalities?

YES : Repair or replace it. Then go to Step 4.
NO : Go to Step 3.

STEP 3. Replace the throttle body assembly.

(1) Replace the throttle body assembly
(2) Carry out test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 20 P.13A-9.
(3) Check the diagnostic trouble code (DTC).

Q: Is DTC P0507 set?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 4.
NO : The inspection is complete.

STEP 4. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 20 P.13A-9.

(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0507 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0513: Immobilizer Malfunction

TECHNICAL DESCRIPTION

- PCM monitors the communication condition with the immobilizer-ECU. When an abnormality in communication is found, PCM prevents engine start.

DTC SET CONDITIONS

Check Condition

- Ignition switch: ON

Judgement Criterion

- When the communication error between PCM and the immobilizer-ECU continues for 2 seconds or more.

or

- When it was different in the encrypted code sent from immobilizer-ECU and operation result by PCM.

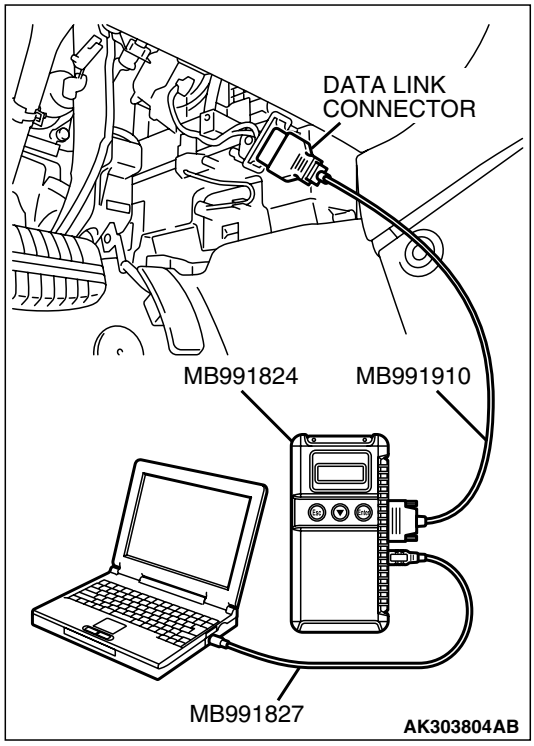
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Malfunction of harness or connector.
- Malfunction of immobilizer-ECU.
- Malfunction of PCM.

DIAGNOSIS

Required Special Tools:

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



STEP 1. Using scan tool MB991958, read the immobilizer 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 immobilizer-DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

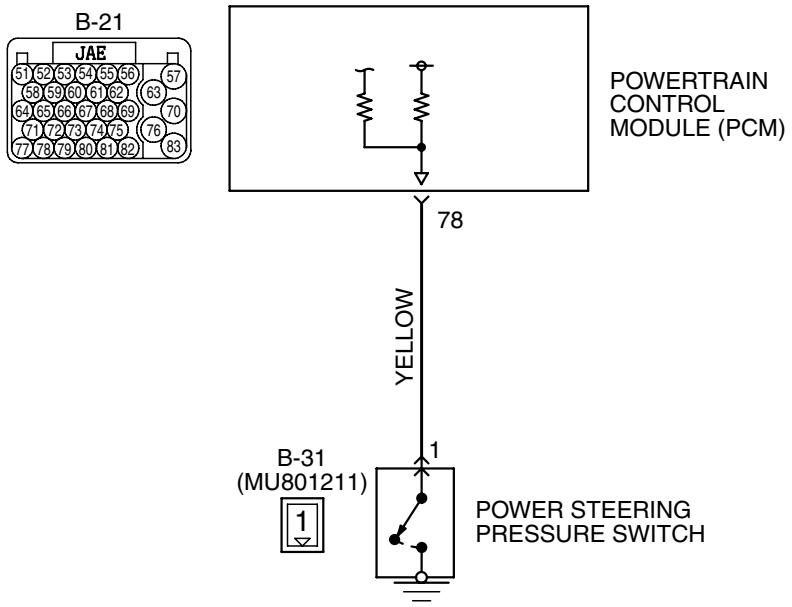
Q: Is the immobilizer-DTC set?

YES : Refer to GROUP 54A, Immobilizer System – Diagnostic Trouble Code Chart P.54A-15.

NO : If DTC P0513 is output again after the MFI-DTC has been erased, replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then check that the DTC P0513 does not reset.

DTC P0551: Power Steering Pressure Switch Circuit Range/Performance

Power Steering Pressure Switch Circuit



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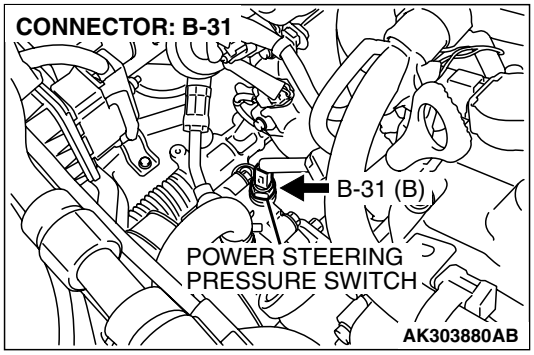
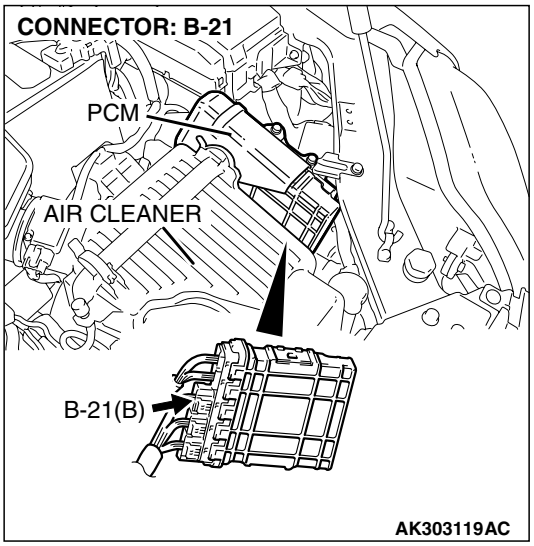




CIRCUIT OPERATION

- A battery positive voltage is applied to the power steering pressure switch output terminal (terminal No. 1) from the PCM (terminal No. 78) via the resistor in the PCM.

TECHNICAL DESCRIPTION

- The power steering pressure switch converts the existence of a power steering load into a high/low voltage, and inputs it into the PCM.

TSB Revision

- When the steering wheel is turned, hydraulic pressure rises. The power steering pressure switch closes, and the applied battery positive voltage will be grounded. With this, the power steering pressure switch output voltage will fluctuate between 0 and 12 volts.
- While driving with the steering wheel held straight, the power steering pressure switch turns "OFF".
- The PCM checks whether the power steering pressure switch turns "OFF" or "ON" during driving.

DESCRIPTIONS OF MONITOR METHODS

Power steering pressure switch stays on during specified go/stop operations.

DTC SET CONDITIONS

Logic Flow Chart

MONITOR EXECUTION

Continuous

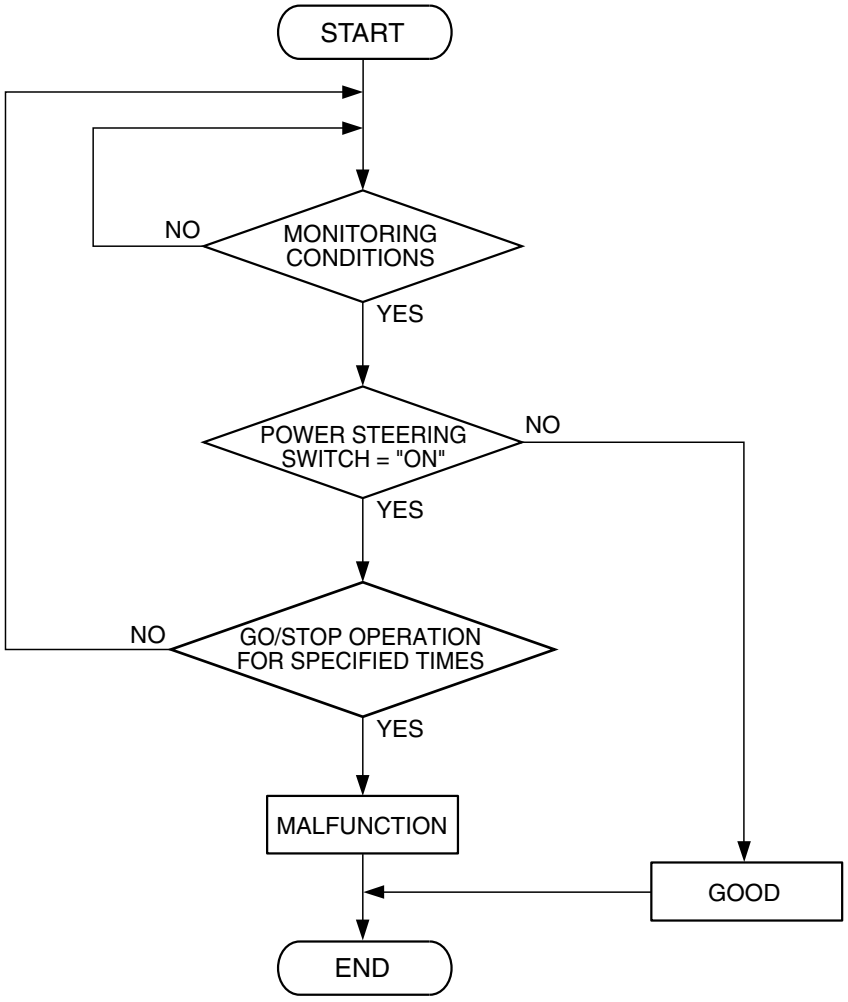
MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

- Not applicable

Sensor (The sensor below is determined to be normal)

- Engine coolant temperature sensor



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TSB Revision

Check Conditions

- Engine coolant temperature is higher than 20°C (68°F).
- Drive for 4 seconds or more with the vehicle speed is 50 km/h (31 mph) or more. Stop the vehicle [vehicle speed is 1.5 km/h (1.0 mph) or less]. Repeat 10 times or more.

Judgement Criterion

- Power steering pressure switch continues to be "ON".

OBD-II DRIVE CYCLE PATTERN

None.

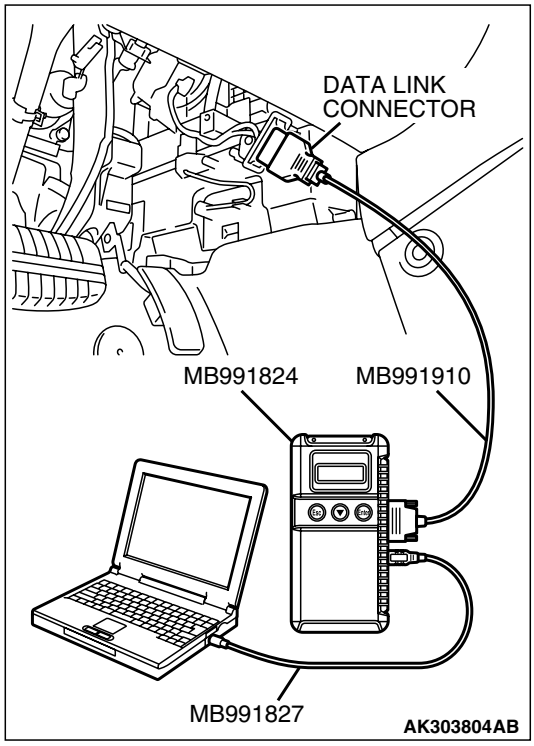
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Power steering pressure switch failed.
- Open or shorted power steering pressure switch circuit, harness damage, or connector damage.
- PCM failed.

DIAGNOSIS

Required Special Tools:

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



STEP 1. Using scan tool MB991958, check data list item 83: Power Steering Pressure Switch.

⚠ 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 83, Power Steering Pressure Switch.
  - If the steering wheel is not turned while idling, "OFF" will be displayed.
  - If the steering wheel is turned while idling, "ON" will be displayed.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the switch operating properly?

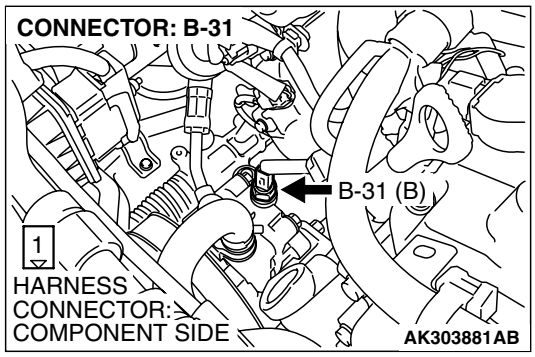
YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-14.

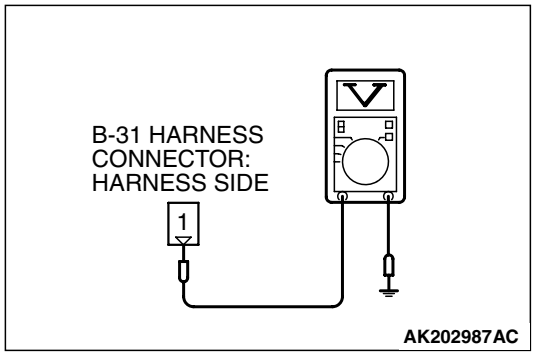
NO : Go to Step 2.

STEP 2. Measure the power supply voltage at power steering pressure switch connector B-31 by backprobing.

(1) Do not disconnect the connector B-31.

(2) Start the engine and run at idle.





(3) Measure the voltage between terminal No. 1 and ground by backprobing.
- When steering wheel is not turned, voltage should be battery positive voltage.
- When steering wheel is turned, voltage should be 1 volt or less.

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

Q: Is the measured voltage within the specified range?

YES : Go to Step 3.

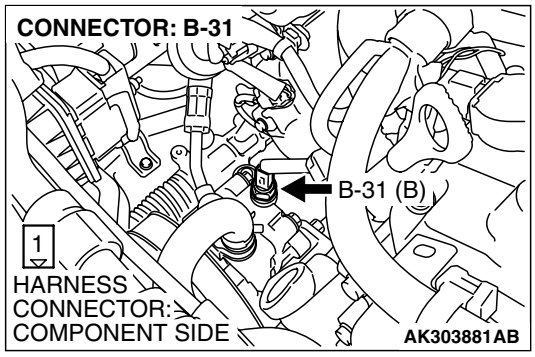
NO : Go to Step 5.

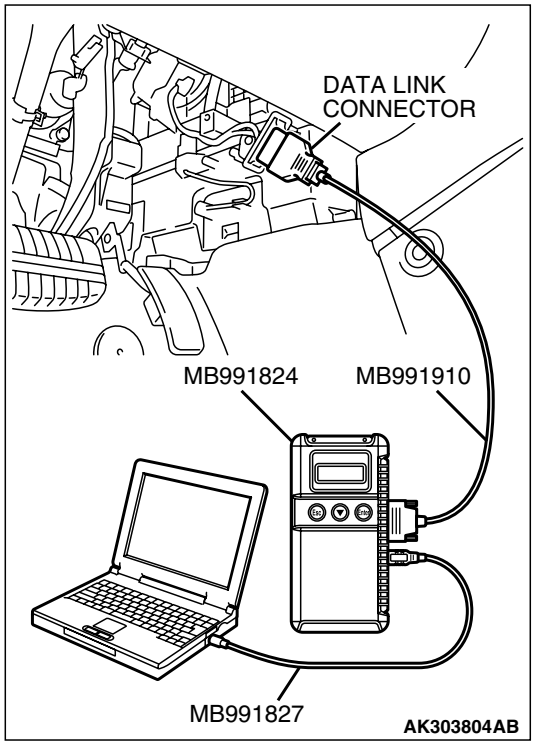
STEP 3. Check harness connector B-31 at power steering pressure switch for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 4.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.





STEP 4. Using scan tool MB991958, check data list item 83: Power Steering Pressure Switch.

⚠ 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.

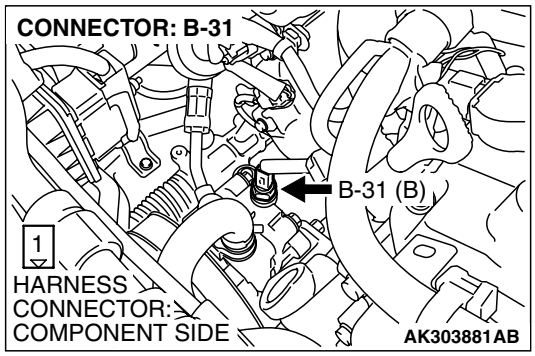
(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991958 to the data reading mode for item 83, Power Steering Pressure Switch.
- If the steering wheel is not turned while idling, "OFF" will be displayed.
- If the steering wheel is turned while idling, "ON" will be displayed.

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

Q: Is the switch operating properly?

YES : It can be assumed 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 : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 14.

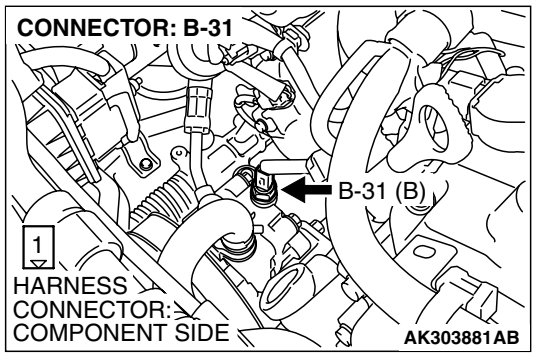


STEP 5. Check harness connector B-31 at power steering pressure switch for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 6.

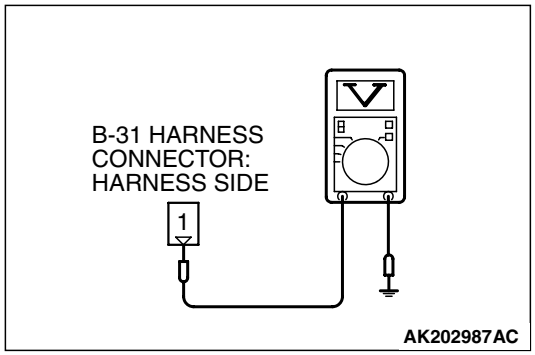
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.



STEP 6. Measure the power supply voltage at power steering pressure switch harness side connector B-31.

(1) Disconnect the connector B-31 and measure at the harness side.

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



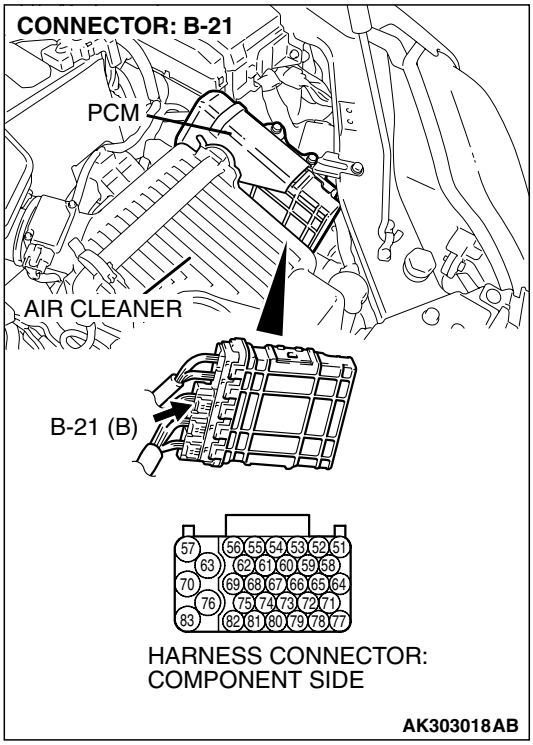
(3) Measure the voltage between terminal No. 1 and ground.
- Voltage should be battery positive voltage.

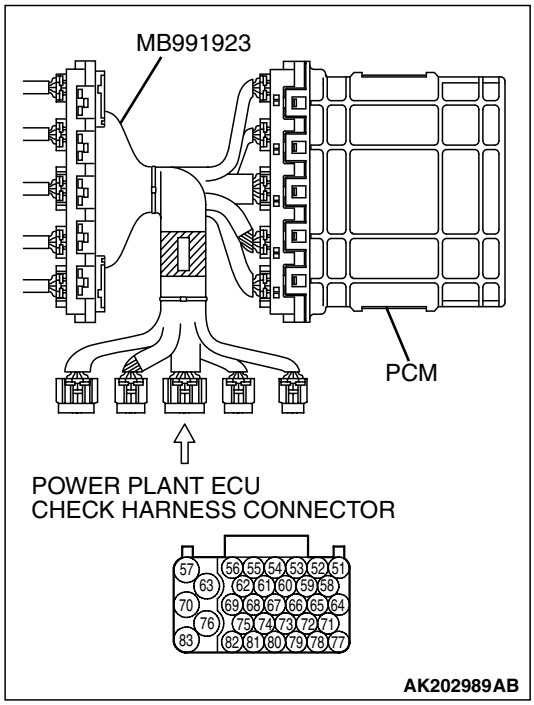
(4) Turn the ignition switch to the "LOCK" (OFF) position.

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

YES : Go to Step 11.

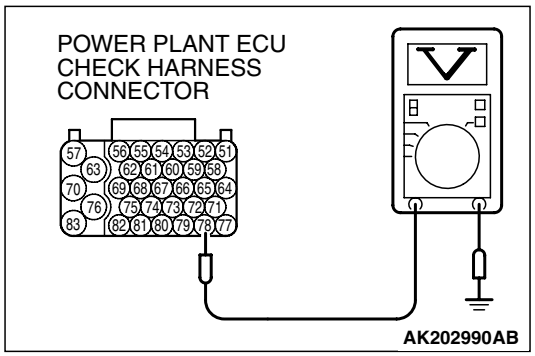
NO : Go to Step 7.





STEP 7. Measure the power supply voltage at PCM connector B-21 by using power plant ECU check harness special tool MB991923.

(1) Disconnect all PCM connectors. Connect the power plant ECU check harness special tool MB991923 between the separated connectors.
(2) Disconnect the power steering pressure switch connector B-31.
(3) Turn the ignition switch to the "ON" position.

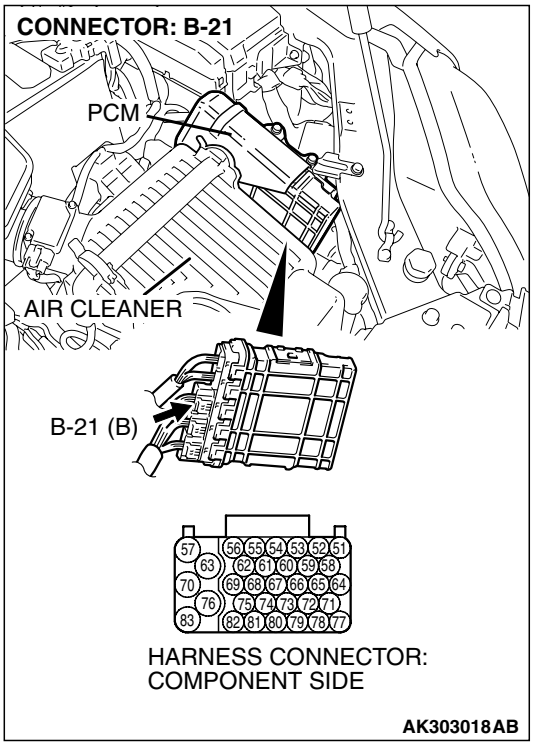


(4) Measure the voltage between terminal No. 78 and ground.
- Voltage should be between battery positive voltage.

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

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

YES : Go to Step 8.
NO : Go to Step 9.

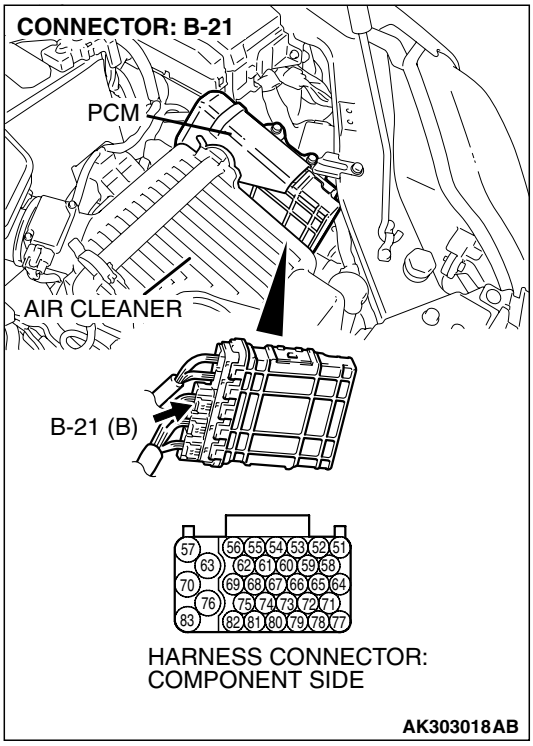


STEP 8. Check harness connector B-21 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Repair harness wire between power steering pressure switch connector B-31 (terminal No. 1) and PCM connector B-21 (terminal No. 78) because of open circuit. Then go to Step 14.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.



STEP 9. Check harness connector B-21 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 10.

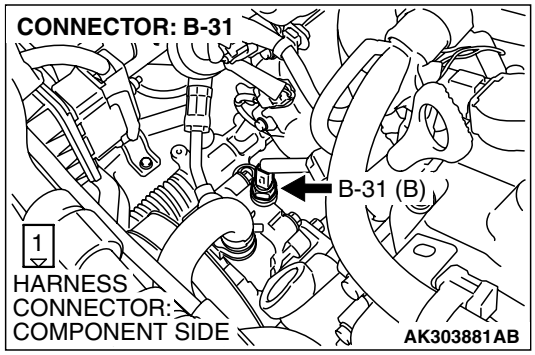
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.

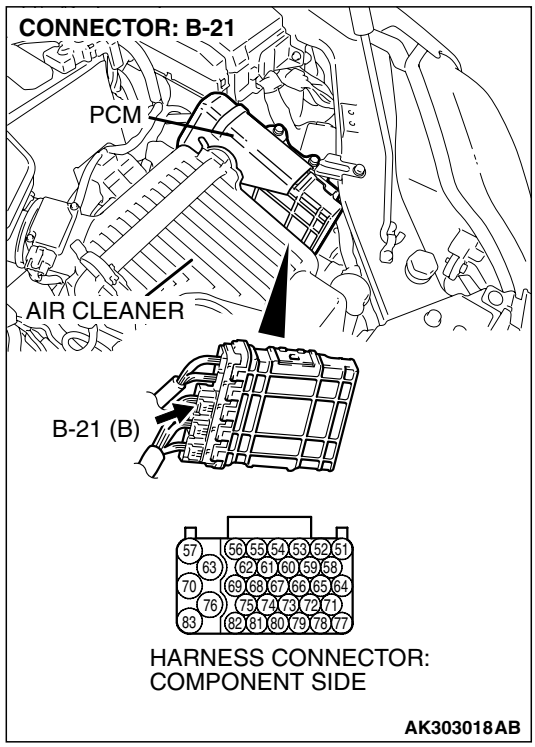
STEP 10. Check for short circuit to ground between power steering pressure switch connector B-31 (terminal No. 1) and PCM connector B-21 (terminal No. 78).

Q: Is the harness wire in good condition?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 14.

NO : Repair it. Then go to Step 14.





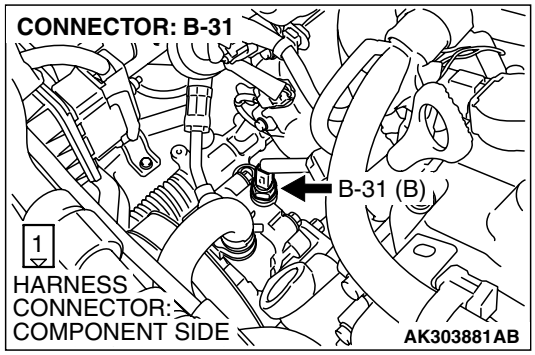
STEP 11. Replace the power steering pressure switch.

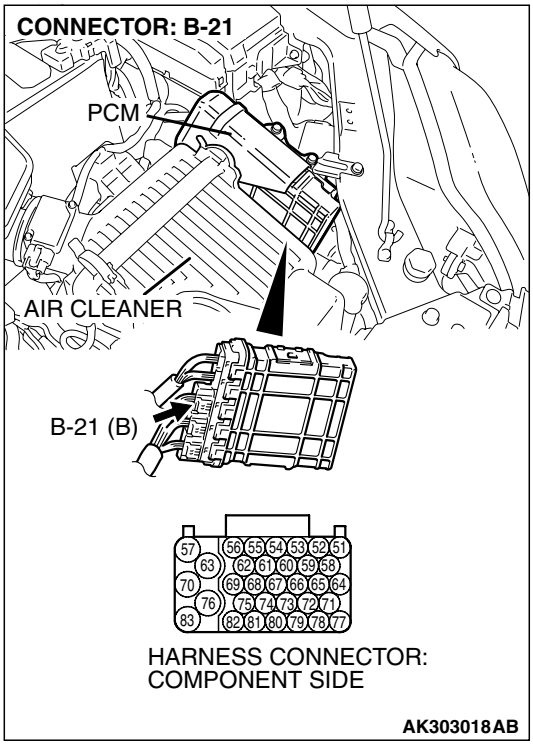
(1) Replace the power steering pressure switch.
(2) Check the trouble symptoms.
(3) Read in the diagnostic trouble code (DTC).

Q: Is DTC P0551 set?

YES : Go to Step 12.

NO : Go to Step 14.



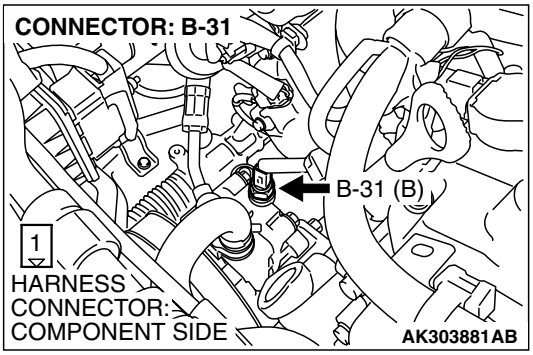


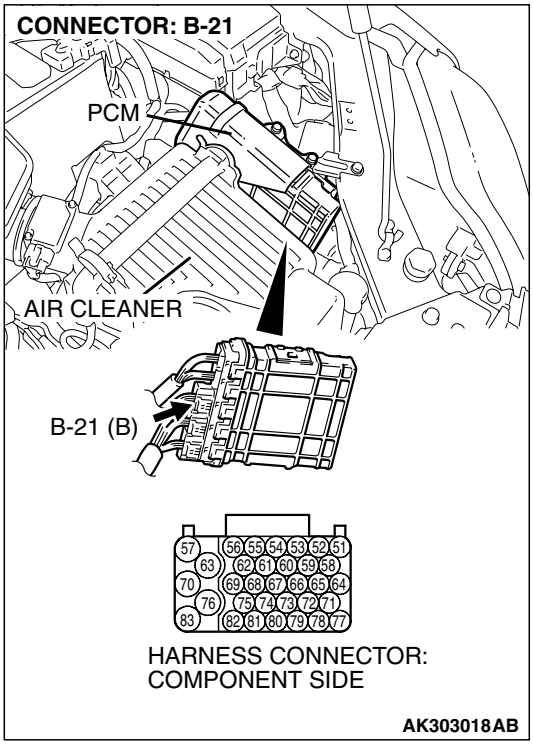
STEP 12. Check harness connector B-21 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 13.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.



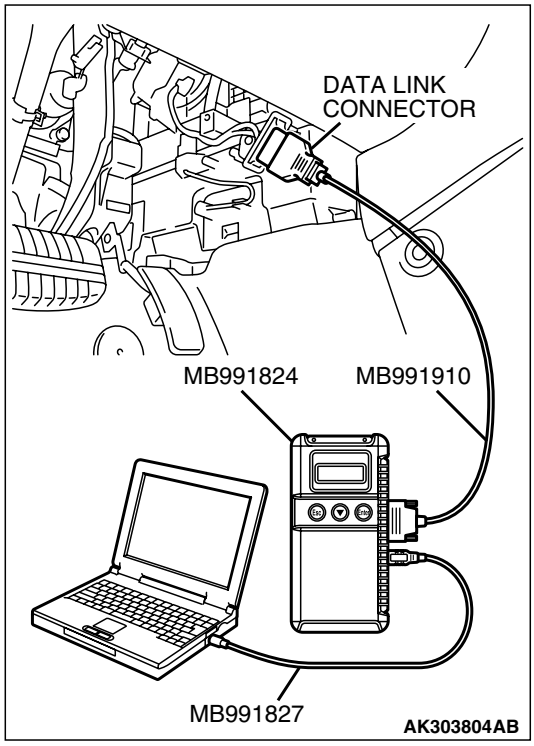


STEP 13. Check for harness damage between power steering pressure switch connector B-31 (terminal No. 1) and PCM connector B-21 (terminal No. 78).

Q: Is the harness wire in good condition?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 14.

NO : Repair it. Then go to Step 14.



STEP 14. Using scan tool MB991958, check data list item 83: Power Steering Pressure Switch.

⚠ 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 83, Power Steering Pressure Switch.
- If the steering wheel is not turned while idling, "OFF" will be displayed.
- If the steering wheel is turned while idling, "ON" will be displayed.

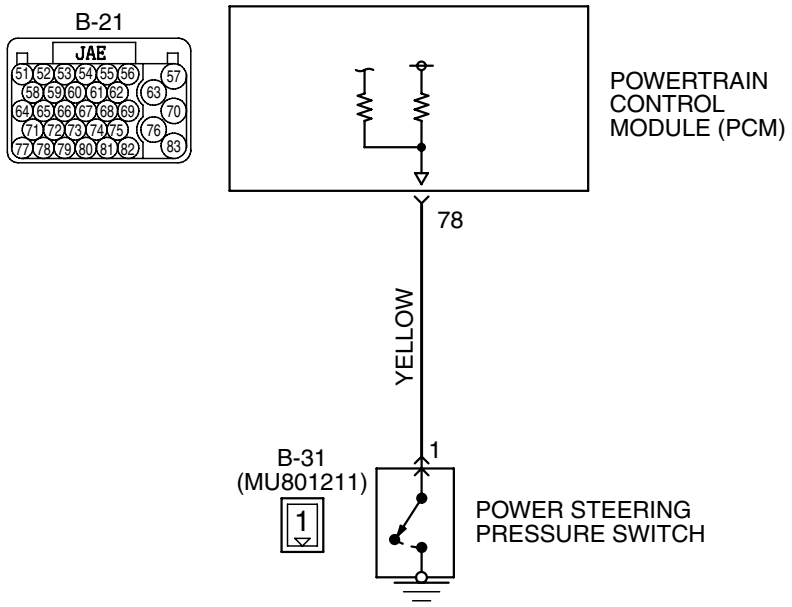
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the switch operating properly?

YES : The inspection is complete.
NO : Retry the troubleshooting.

DTC P0554: Power Steering Pressure Switch Circuit Intermittent

Power Steering Pressure Switch Circuit



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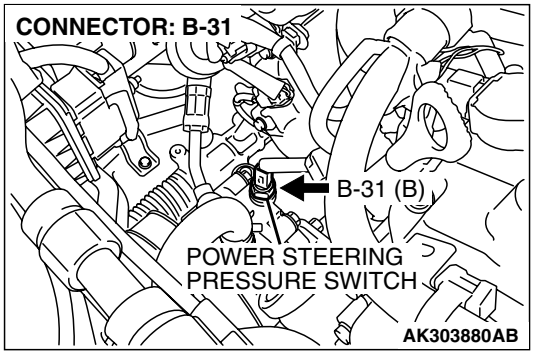
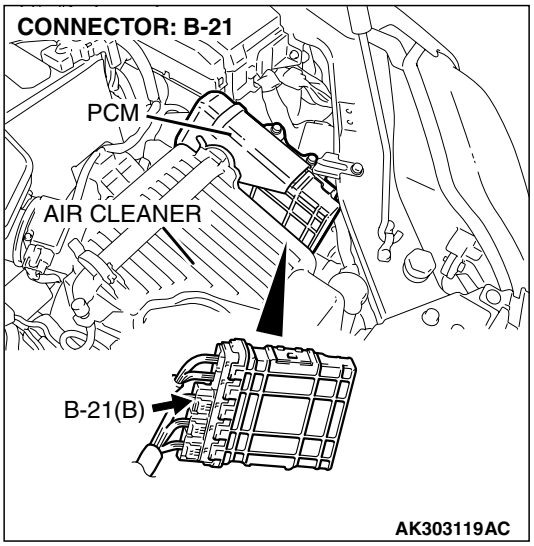




CIRCUIT OPERATION

- A battery positive voltage is applied to the power steering pressure switch output terminal (terminal No. 1) from the PCM (terminal No. 78) via the resistor in the PCM.

TECHNICAL DESCRIPTION

- The power steering pressure switch converts the existence of a power steering load into a high/low voltage, and inputs it into the PCM.

TSB Revision

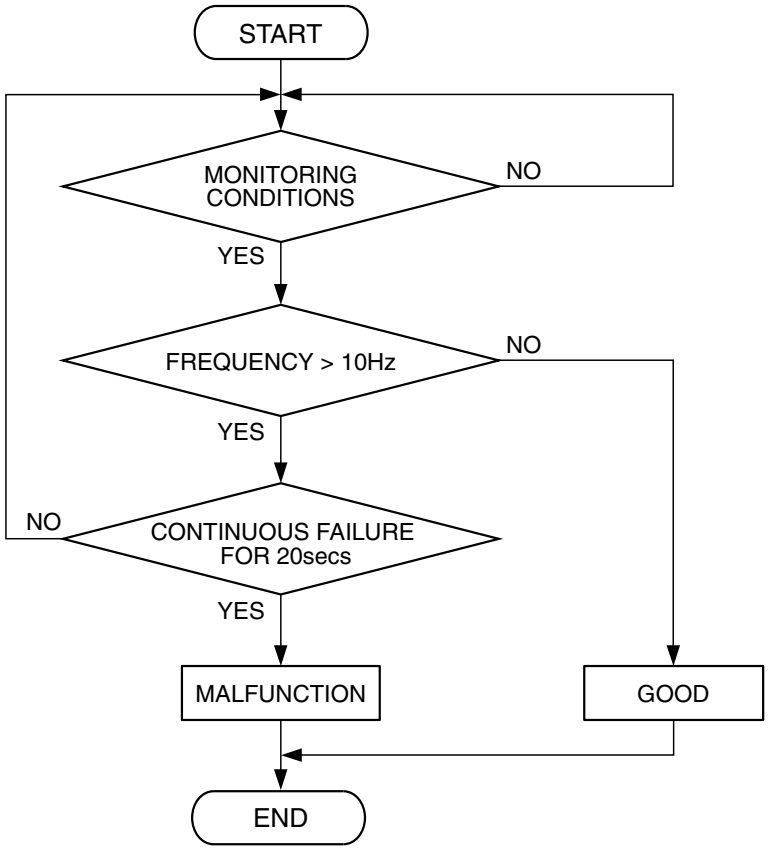
- When the steering wheel is turned, hydraulic pressure rises. The power steering pressure switch closes, and the applied battery positive voltage will be grounded. With this, the power steering pressure switch output voltage will fluctuate between 0 and 12 volts.
- While driving with the steering wheel held straight, the power steering pressure switch turns "OFF".
- The PCM checks whether the power steering pressure switch turns "OFF" or "ON" during driving.

DESCRIPTIONS OF MONITOR METHODS

Power steering pressure switch changes from off to on more than 10 times for 1 second.

DTC SET CONDITIONS

Logic Flow Chart



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MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

- Not applicable

Sensor (The sensor below is determined to be normal)

- Engine coolant temperature sensor

Check Conditions

- Engine coolant temperature is higher than 20°C (68°F).

TSB Revision

- Vehicle speed is higher than 50 km/h (31 mph).

Judgement Criterion

- The ON/OFF frequency of a power steering pressure switch is 10 Hz or more for 20 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 17 P.13A-9

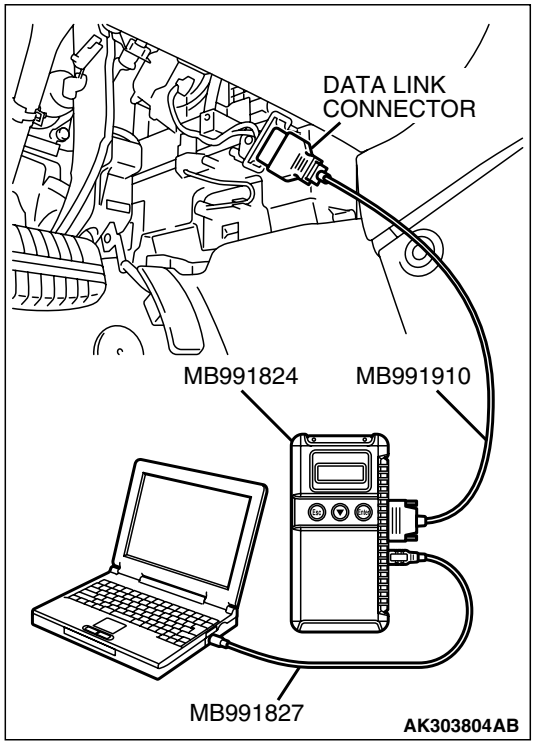
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Power steering pressure switch failed.
- Incorrect power steering fluid level.
- Incorrect oil pump pressure.
- Harness damage in power steering pressure switch circuit, or connector damage.
- PCM failed.

DIAGNOSIS

Required Special Tools:

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



STEP 1. Using scan tool MB991958, check data list item 83: Power Steering Pressure Switch.

⚠ 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 83, Power Steering Pressure Switch.
  - If the steering wheel is not turned while idling, "OFF" will be displayed.
  - If the steering wheel is turned while idling, "ON" will be displayed.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed 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 the power steering fluid level.

Refer to GROUP 37, On-Vehicle Service – Fluid Level Check P.37-19.

Q: Are there any abnormalities?

YES : Repair it. Then go to Step 7.

NO : Go to Step 3.

STEP 3. Check the power steering pressure switch.
Refer to GROUP 37, On-Vehicle Service – Power Steering Pressure Switch CheckP.37-22.

Q: Are there any abnormalities?

YES : Replace the power steering pressure switch. Then go to Step 7.
NO : Go to Step 4.

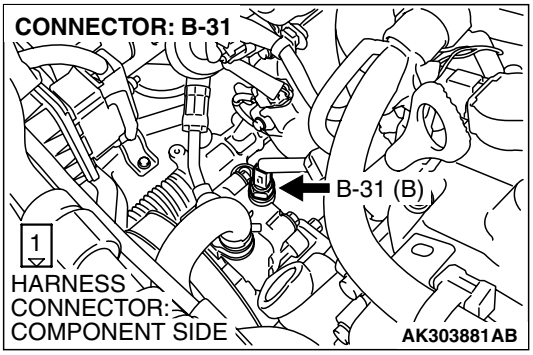
STEP 4. Check the oil pump pressure.
Refer to GROUP 37, On-Vehicle Service – Oil Pump Pressure Test P.37-21.

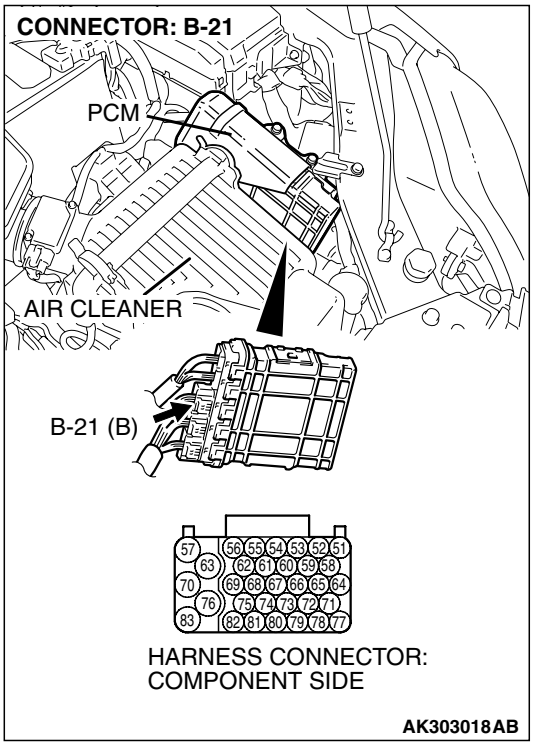
Q: Are there any abnormalities?

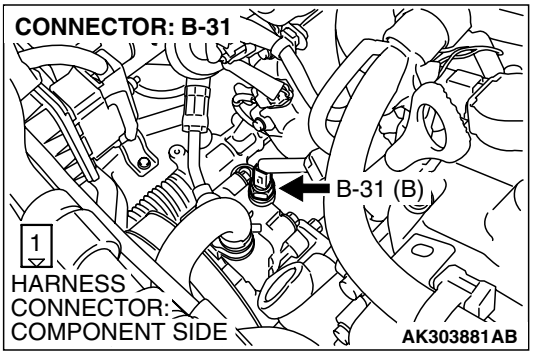
YES : Repair it. Then go to Step 7.
NO : Go to Step 5.

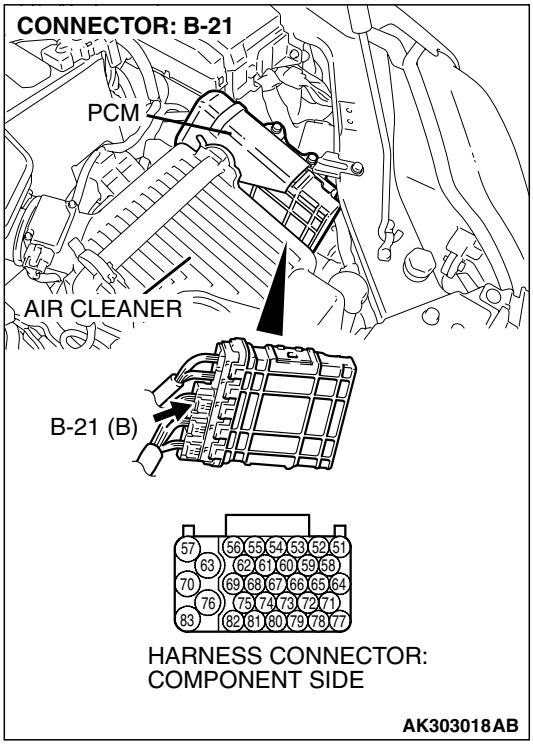
STEP 5. Check harness connector B-31 at the power steering pressure switch and harness connector B-21 at PCM for damage.
Q: Is the harness connector in good condition?

YES : Go to Step 6.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 7.









STEP 6. Check for harness damage between power steering pressure switch connector B-31 (terminal No. 1) and PCM connector B-21 (terminal No. 78).

Q: Is the harness wire in good condition?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 7.

NO : Repair it. Then go to Step 7.

STEP 7. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 17 P.13A-9.

(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0554 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0603: EEPROM Malfunction

TECHNICAL DESCRIPTION

- PCM stored the information such as the idle learned value and so on in the memory of PCM.

TSB Revision

DESCRIPTIONS OF MONITOR METHODS

To check whether the information such as the idle learned value and so on is stored in the memory of PCM.

MONITOR EXECUTION

Once per driving cycle

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

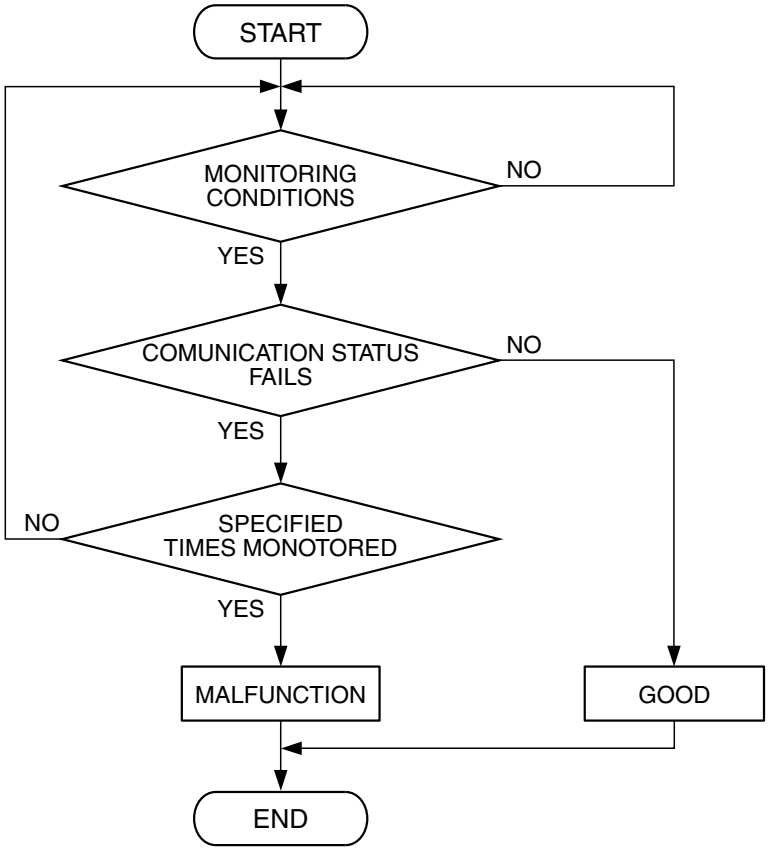
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



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Check Condition

- Ignition switch is in "ON" position.

Judgement Criterion

- The latest data that was flashed while the ignition switch was in "LOCK" (OFF) position are not stored correctly.

OBD-II DRIVE CYCLE PATTERN

None.

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

- PCM failed.

TSB Revision

DIAGNOSIS

Required Special Tools:

- MB991958: Scan tool (M.U.T.-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

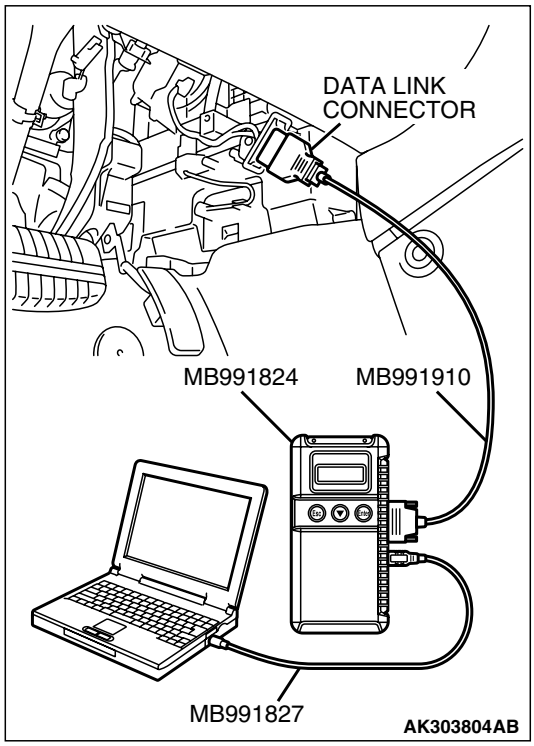
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK"(OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) After the DTC has been deleted, read the DTC again.
(4) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is DTC P0603 set?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11.

NO : It can be assumed 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.



DTC P0606: Powertrain Control Module Main Processor Malfunction

TECHNICAL DESCRIPTION

- Throttle actuator control processor checks the PCM for abnormal conditions.

DESCRIPTIONS OF MONITOR METHODS

No watch dog pulse is detected.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Check Condition

- Ignition switch is "ON" position.

Judgement Criterion

- No surveillance pulse signals should be input for 0.5 second.

OBD-II DRIVE CYCLE PATTERN

None.

TSB Revision

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

- PCM failed.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan tool (M.U.T.-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

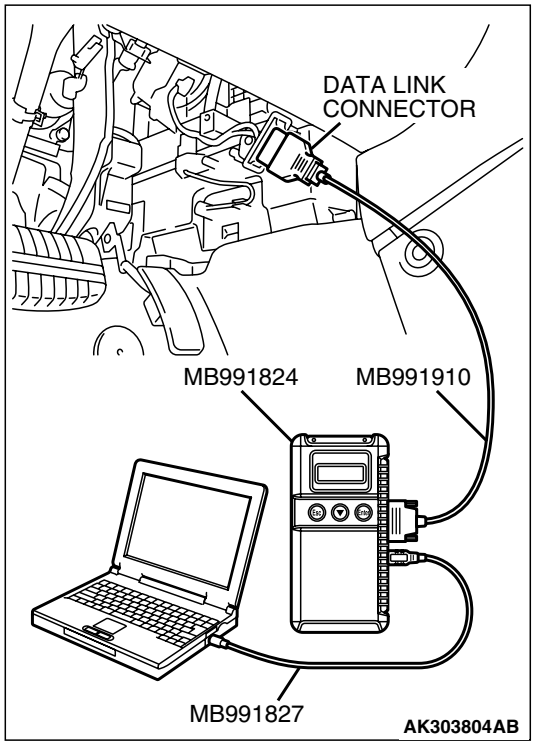
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK"(OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) After the DTC has been deleted, read the DTC again.
(4) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is DTC P0606 set?

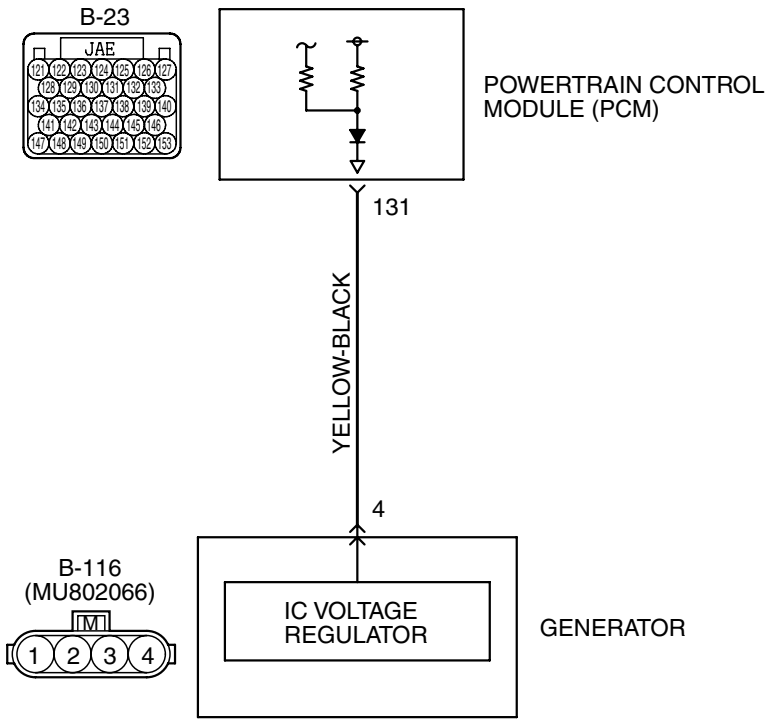
YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11.

NO : It can be assumed 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.



DTC P0622: Generator FR Terminal Circuit Malfunction

Generator Circuit



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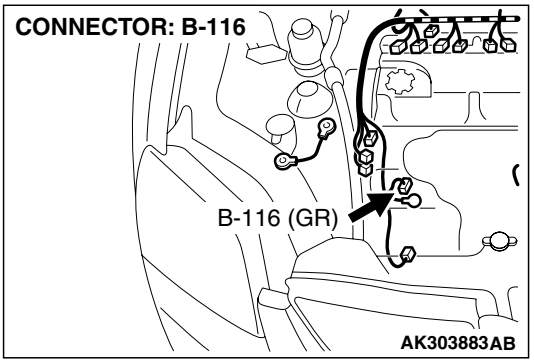
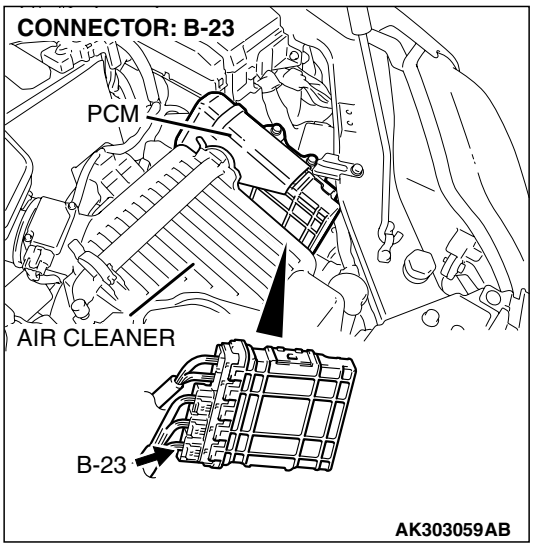




CIRCUIT OPERATION

- The PCM (terminal No. 131) apply a battery voltage into the generator FR terminal No. 4 via resistance inside the unit.

TECHNICAL DESCRIPTION

- When the generator field coils are controlled, the generator FR terminal inputs signal to the PCM.
- The PCM detects the generator output with the input signal, and controls the idle air control motor according to the generator output.

TSB Revision

DTC SET CONDITIONS

Check Condition

- Engine speed is higher than 50 r/min.

Judgement Criterion

- Input voltage from the generator FR terminal has continued to be approximately battery positive voltage for 20 seconds.

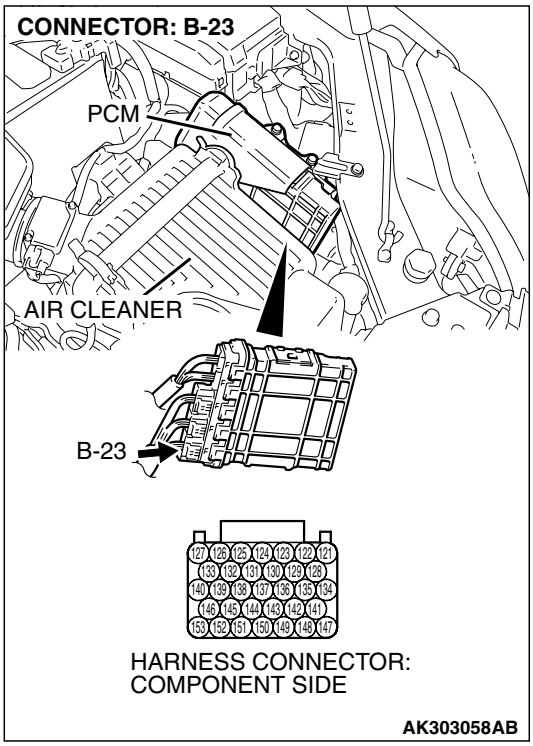
TROUBLESHOOTING HINTS (The most likely causes for this code to be set area:)

- Generator failed.
- Open or shorted circuit in generator FR terminal circuit, harness damage or connector damage.
- PCM failed.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A
- MB991923: Power Plant ECU Check Harness

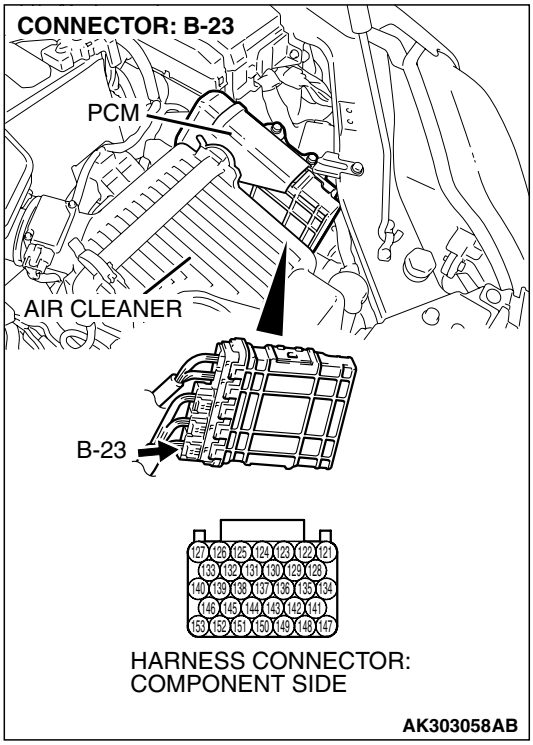


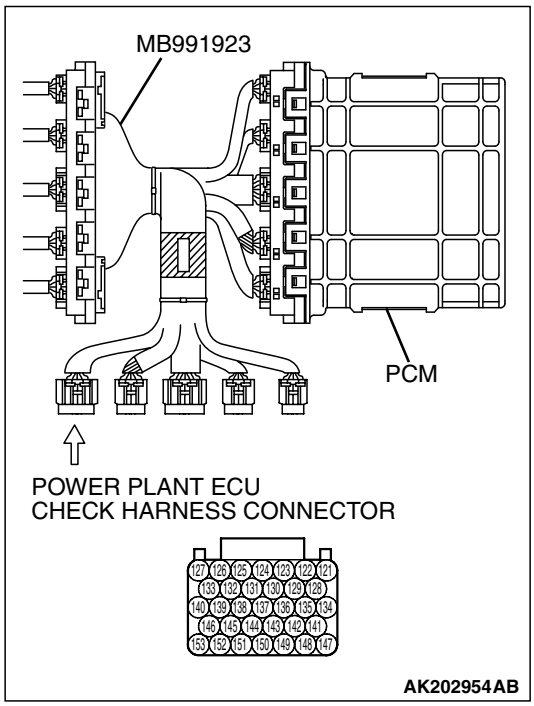
STEP 1. Check harness connector B-23 at PCM connector for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 2.

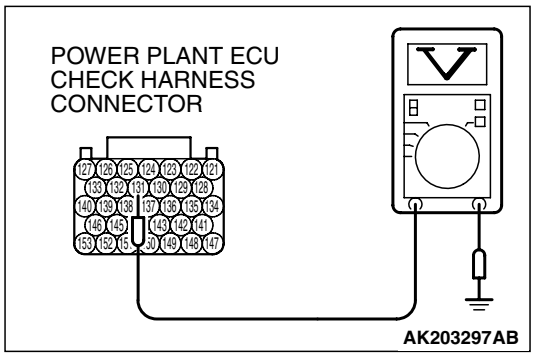
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 8.





STEP 2. Measure the voltage at PCM connector B-23 by using power plant ECU check harness special tool MB991923.

(1) Disconnect all PCM connectors. Connect the power plant ECU check harness special tool MB991923 between the separated connectors.
(2) Start the engine and run at idle.



(3) Measure the voltage between terminal No. 131 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 should be drop.

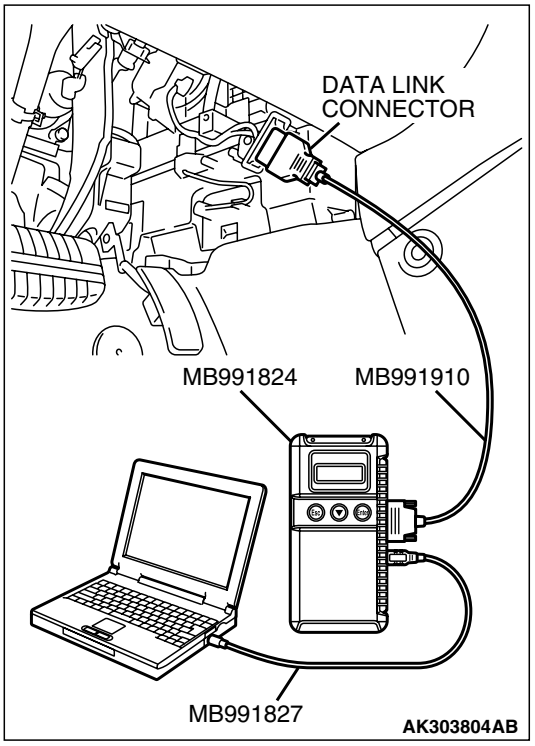
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Did the measured voltage drop?

YES : Go to Step 3.
NO : Go to Step 4.

STEP 3. Using scan tool MB991958, read the diagnostic trouble code (DTC).

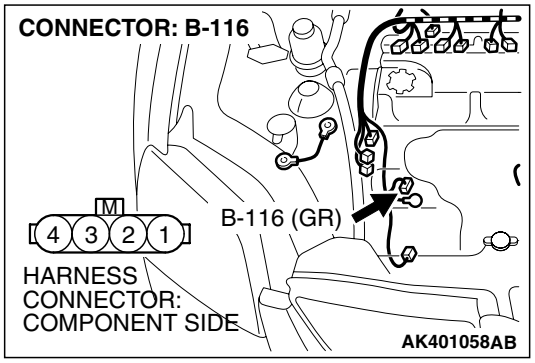
⚠ CAUTION
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.



(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine and run at idle.
(3) Read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC P0622 set?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 8.
NO : It can be assumed 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.

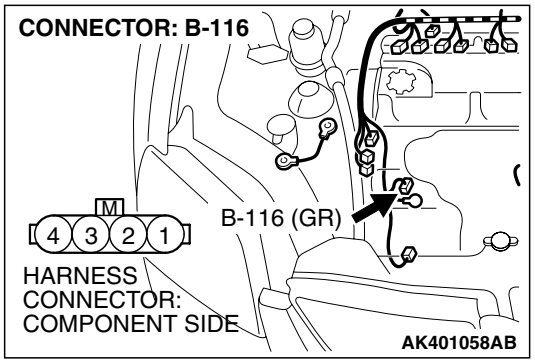


STEP 4. Check harness connector B-116 at generator connector for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 5.

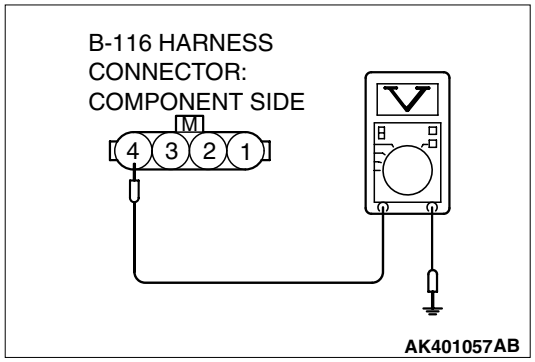
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 8.



STEP 5. Measure the voltage at generator harness side connector B-116.

(1) Disconnect the connector B-116 and measure at the harness side.

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



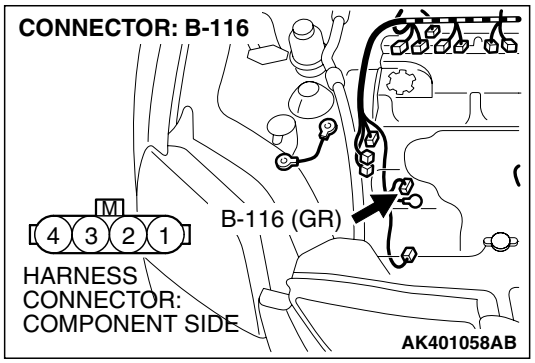
(3) Measure the voltage between terminal No. 4 and ground.
- Voltage should measure battery positive voltage.

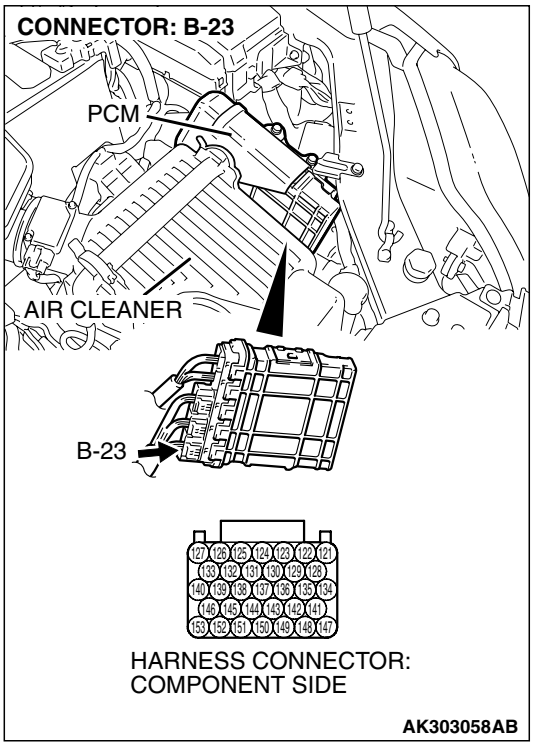
(4) Turn the ignition switch to the "LOCK" (OFF) position.

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

YES : Go to Step 7.

NO : Go to Step 6.



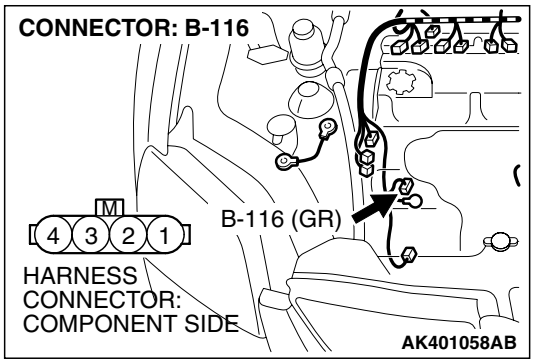


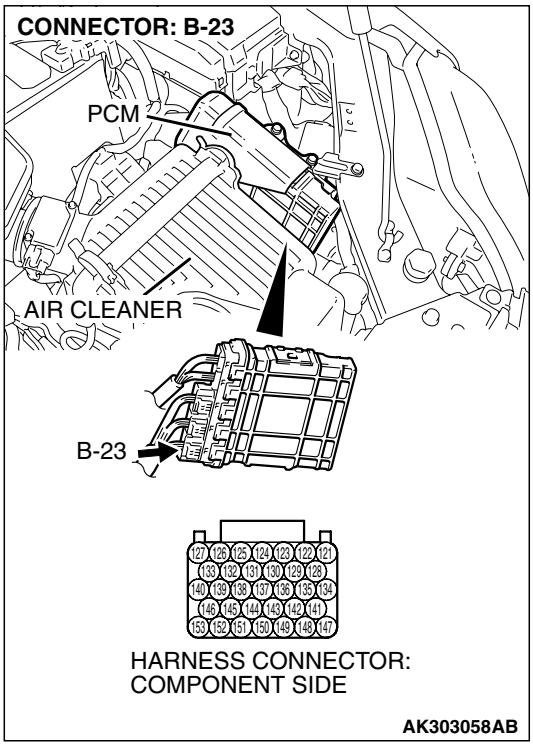
STEP 6. Check for open circuit and short circuit to ground between generator connector B-116 (terminal No. 4) and PCM connector B-23 (terminal No. 131).

Q: Is the harness wire in good condition?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 8.

NO : Repair it. Then go to Step 8.



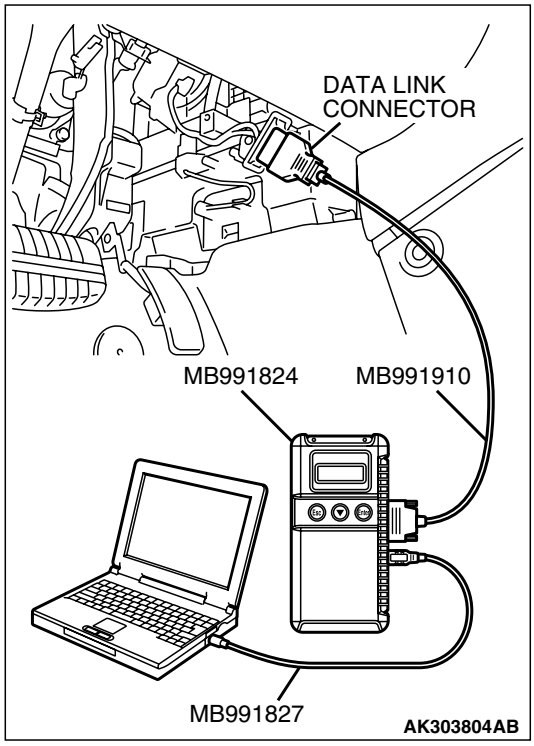


STEP 7. Check for harness damage between generator connector B-116 (terminal No. 4) and PCM connector B-23 (terminal No. 131).

Q: Is the harness wire in good condition?

YES : Replace the generator. Then go to Step 8.

NO : Repair it. Then go to Step 8.



STEP 8. 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) Start the engine and run at idle.
(3) Read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC P0622 set?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0630: Vehicle Identification Number (VIN) Malfunction

TECHNICAL DESCRIPTION

- The Vehicle Identification Number (VIN) is stored in the PCM by the vehicle manufacturer.

DESCRIPTIONS OF MONITOR METHODS

The PCM checks whether the VIN is being entered or not.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

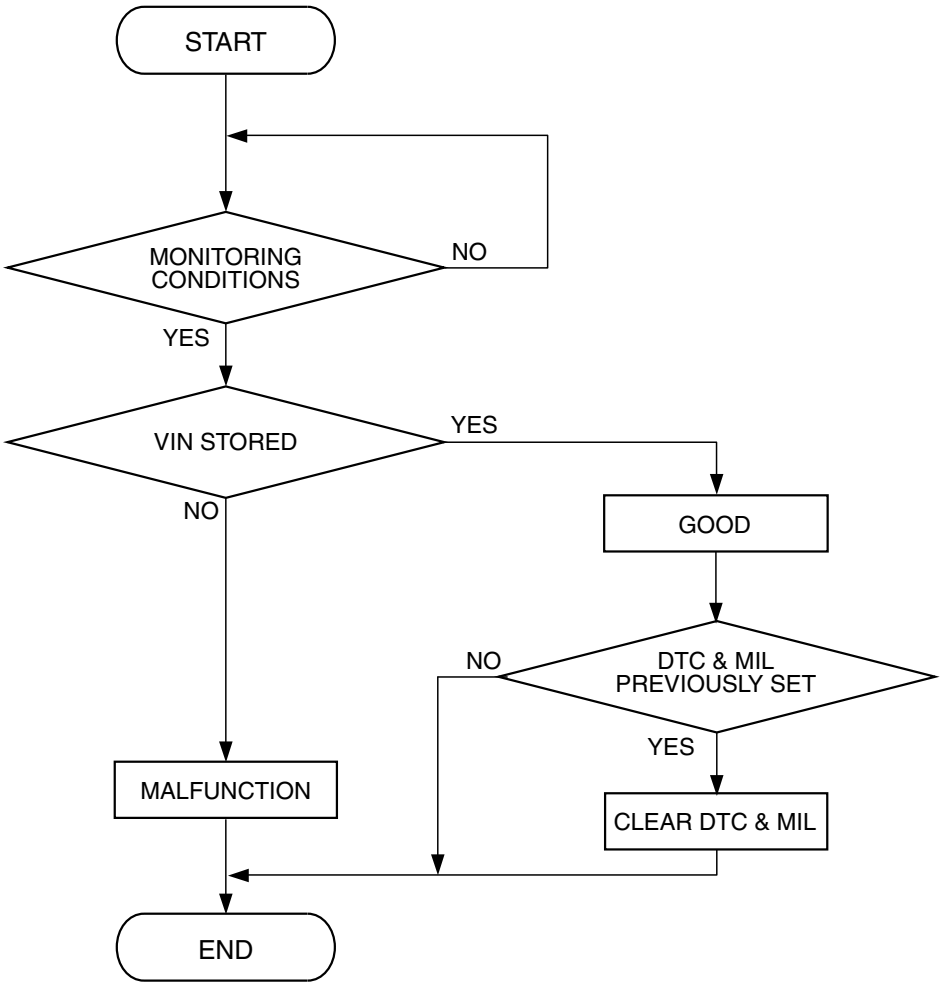
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



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Check Condition
- Ignition switch is in "ON" position.

Judgement Criterion
- VIN (current) has not been written.

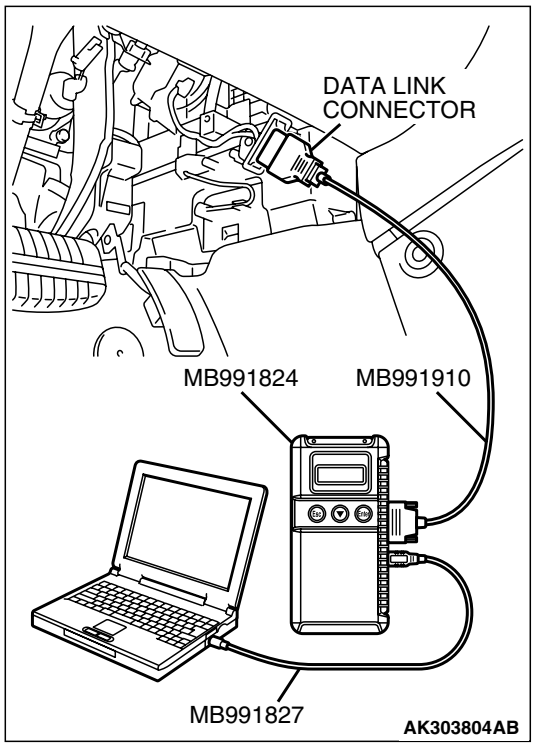
OBD-II DRIVE CYCLE PATTERN
None.

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

DIAGNOSIS

Required Special Tools:
- MB991958: Scan tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A

TSB Revision



STEP 1. Using scan tool MB991958, check VIN Information.

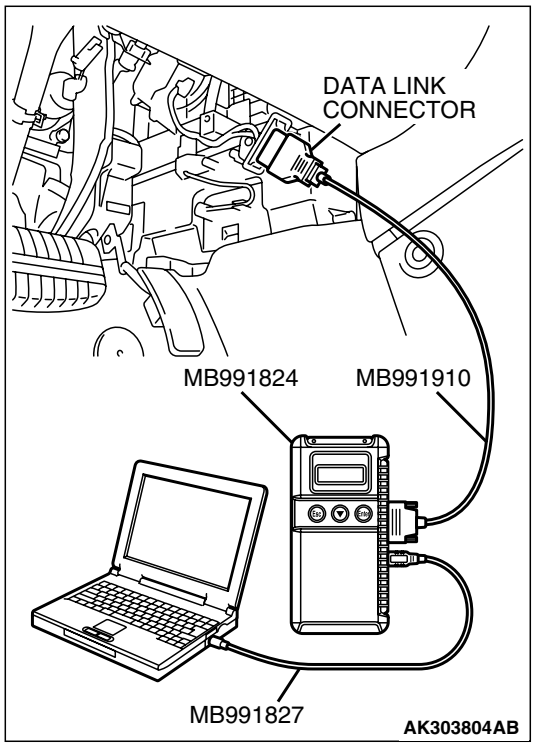
⚠ CAUTION

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) Set scan tool MB991958 to the coding mode for VIN Information.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Has VIN (current) been written?

YES : Go to Step 2.
NO : Write VIN. Then go to Step 3.



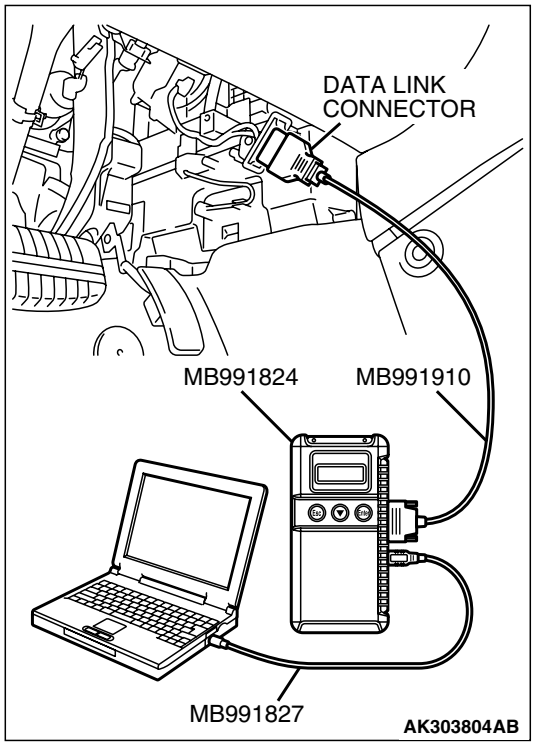
STEP 2. Using scan tool MB991958, read the diagnostic trouble code (DTC)

(1) Turn the ignition switch to the "ON" position.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0630 set?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11.
NO : It can be assumed 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.

TSB Revision



STEP 3. Using scan tool MB991958, read the diagnostic trouble code (DTC)

(1) Turn the ignition switch to the "ON" position.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0630 set?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11.

NO : The inspection is complete.

DTC P0638: Throttle Actuator Control Motor Circuit Range/Performance Problem

⚠ CAUTION
If DTC P0638 has been set, TCL related DTC U1120 is also set. After P0638 has been diagnosed, don't forget to erase DTC U1120.

THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE PROBLEM CIRCUIT

- Refer to DTC P2101 – Throttle Actuator Control Motor Circuit P.13A-902.

CIRCUIT OPERATION

- Refer to DTC P2101 – Throttle Actuator Control Motor Circuit P.13A-902.

TECHNICAL DESCRIPTION

- PCM checks the electronic controlled throttle system for abnormal conditions.

DESCRIPTIONS OF MONITOR METHODS

Difference between throttle position sensor (main) output and target opening is greater than the specified value.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Check Conditions

- Battery positive voltage is higher than 8.3 volts.
- Throttle position sensor (main) output voltage is between 0.35 and 4.8 volts.
- Drop of throttle position sensor (main) output voltage per 100 milliseconds is more than 0.04 volt.

TSB Revision

Judgement Criterion
- Throttle position sensor (main) output voltage has continued to be higher than the target throttle position sensor (main) voltage by 0.5 volt or more for 0.5 second.

Check Conditions
- Battery positive voltage is higher than 8.3 volts.
- Throttle position sensor (main) output voltage is between 0.35 and 4.8 volts.

Judgement Criterion
- Difference between throttle position sensor (main) output voltage and target throttle position sensor (main) voltage is 1 volt or higher for 1 seconds.

OBD-II DRIVE CYCLE PATTERN
None.

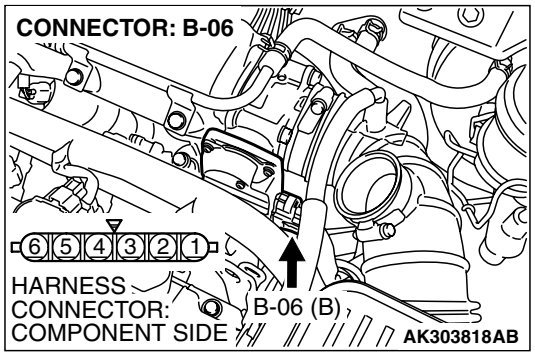
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)
- Throttle valve return spring failed.
- Throttle valve operation failed.
- Throttle actuator control motor failed.
- Harness damage in throttle actuator control motor circuit, or connector damage.
- PCM failed.

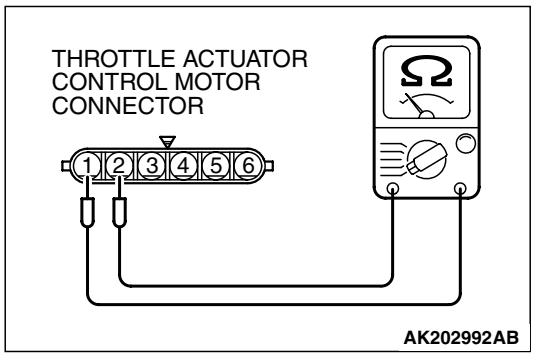
DIAGNOSIS

Required Special Tools:
- MB991958: Scan tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A

STEP 1. Check the throttle actuator control motor.

(1) Disconnect the connector B-06.





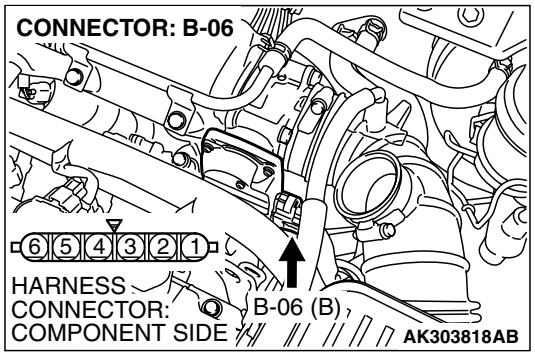
(2) Measure the resistance between throttle actuator control motor side connector terminal No. 1 and No. 2.

Standard value: 0.3 – 80 Ω [at 20°C (68°F)]

Q: Is the measured resistance between 0.3 and 80 ohms [at 20°C (68°F)]?

YES : Go to Step 2.

NO : Replace the throttle body assembly. Then go to Step 7.

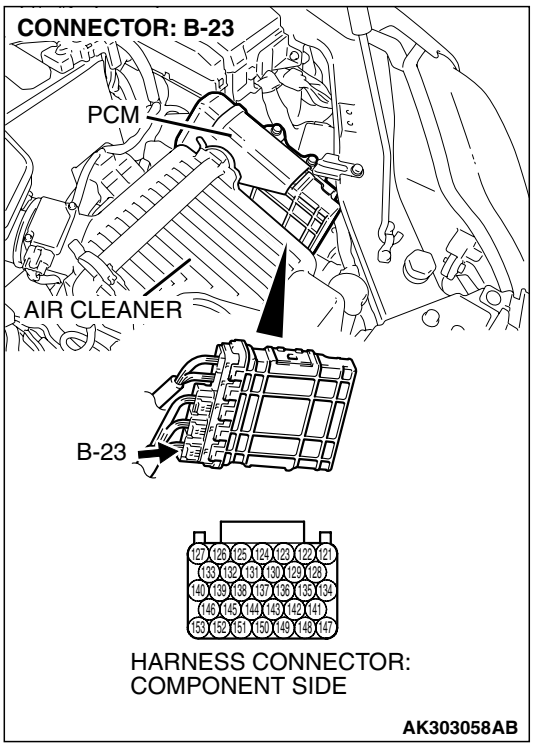


STEP 2. Check harness connector B-06 at throttle actuator control motor for damage.

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 go to Step 7..

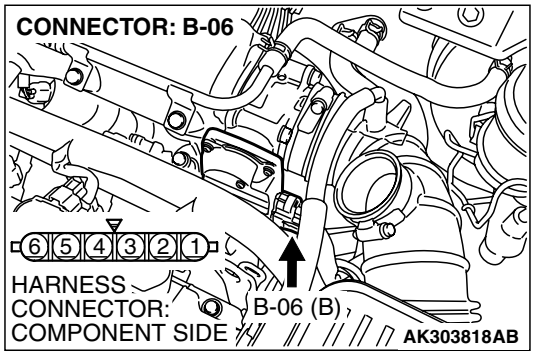


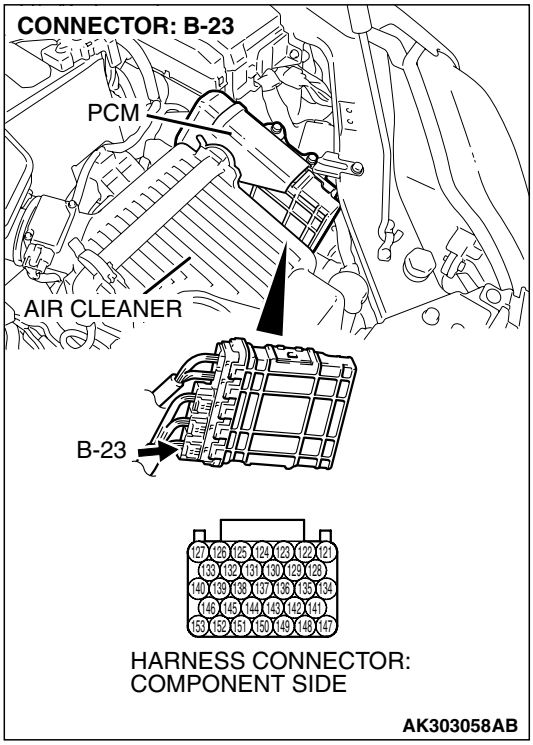
STEP 3. Check harness connector B-23 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 4.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 7.



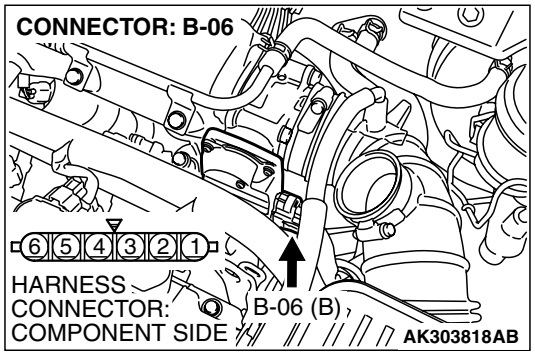


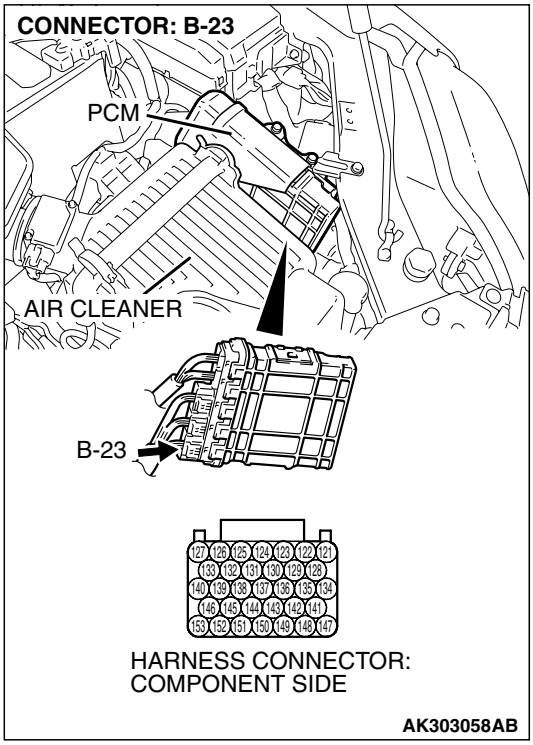
STEP 4. Check for harness damage between throttle actuator control motor connector B-06 (terminal No. 1) and PCM connector B-23 (terminal No. 147).

Q: Is the harness wire in good condition?

YES : Go to Step 5.

NO : Repair it. Then go to Step 7.



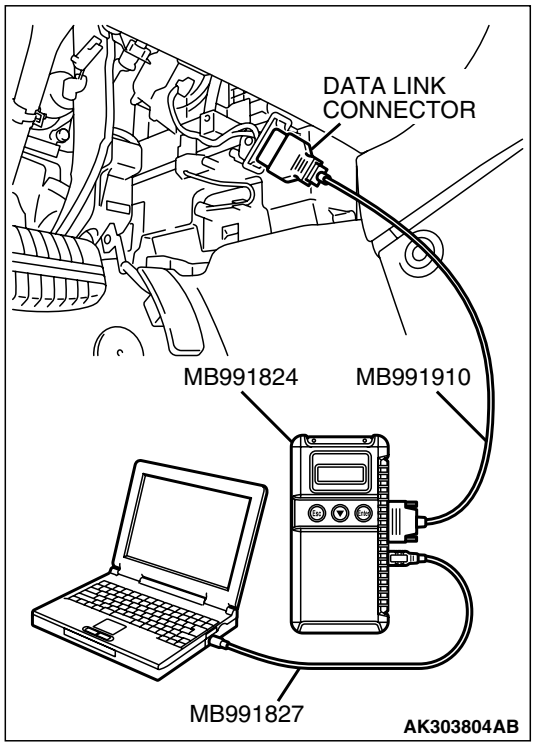


STEP 5. Check for harness damage between throttle actuator control motor connector B-06 (terminal No. 2) and PCM connector B-23 (terminal No. 141).

Q: Is the harness wire in good condition?

YES : Go to Step 6.

NO : Repair it. Then go to Step 7.



STEP 6. Using scan tool MB991958, read the diagnostic trouble code (DTC).

⚠ CAUTION

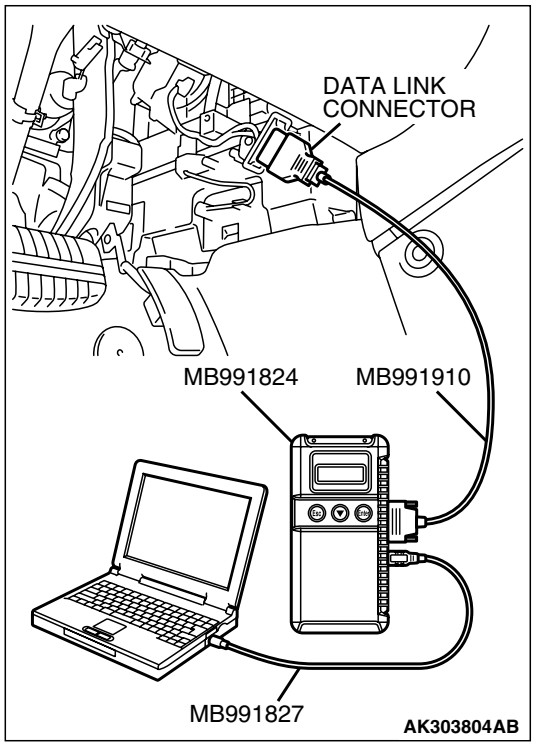
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK"(OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) After the DTC has been deleted, read the DTC again.
(4) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is DTC P0638 set?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 7.

NO : It can be assumed 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.



STEP 7. Using scan tool MB991958, read the diagnostic trouble code (DTC).

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) After the DTC has been deleted, read the DTC again.
(4) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is DTC P0638 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0642: Throttle Position Sensor Power Supply

TECHNICAL DESCRIPTION
- PCM checks the throttle position sensor power voltage for abnormal conditions.

DESCRIPTIONS OF MONITOR METHODS
Throttle position sensor source voltage is smaller than the specified value.

MONITOR EXECUTION
Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)
- Not applicable

Sensor (The sensor below is determined to be normal)
- Not applicable

DTC SET CONDITIONS

Check Conditions
- Battery positive voltage is higher than 6.3 volts.

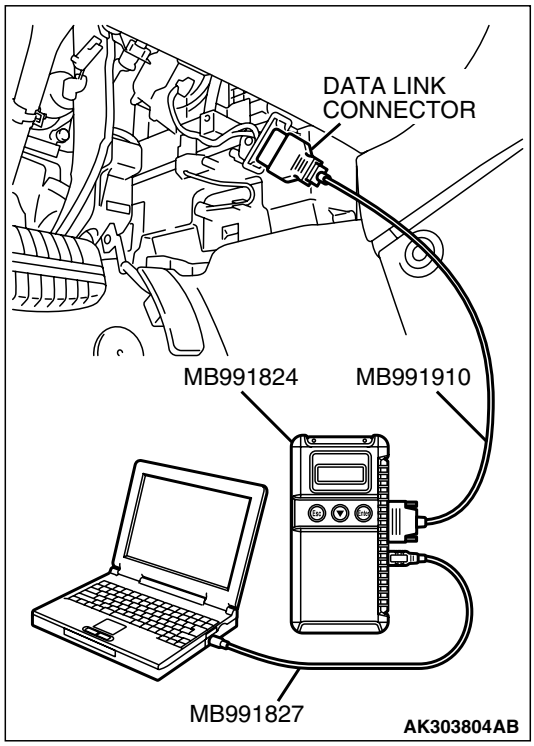
Judgement Criteria
- Throttle position sensor power voltage should be 4.1 volts or less for 0.3 second.

OBD-II DRIVE CYCLE PATTERN
None.

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

DIAGNOSIS

Required Special Tools:
- MB991958: Scan tool (M.U.T.-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) After the DTC has been deleted, read the DTC again.
(4) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is DTC P0642 set?

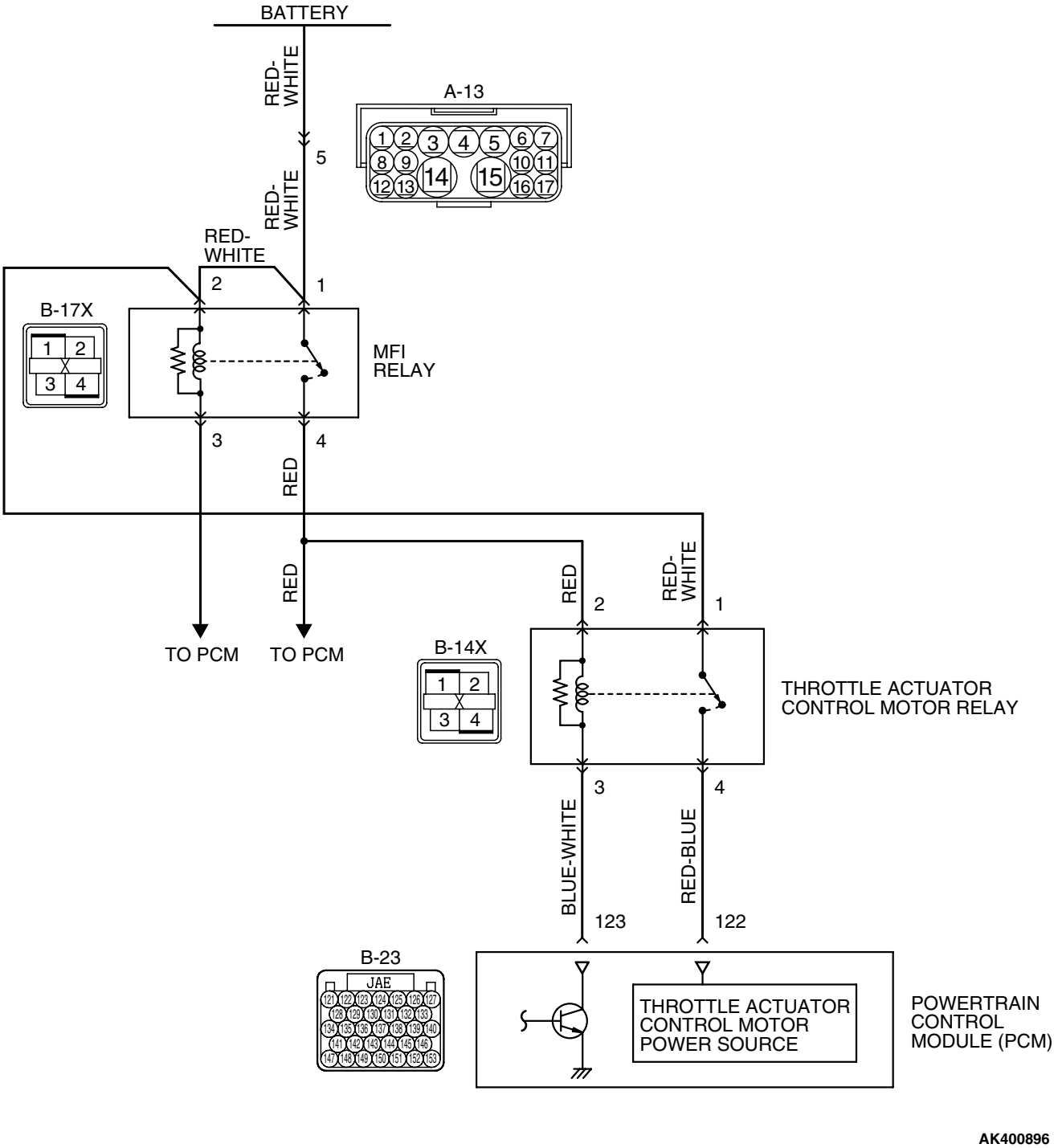
YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11.

NO : It can be assumed 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.

DTC P0657: Throttle Actuator Control Motor Relay Circuit Malfunction

⚠ CAUTION
If DTC P0657 has been set, TCL related DTC U1120 is also set. After P0657 has been diagnosed, don't forget to erase DTC U1120.

Throttle Actuator Contorol Motor Relay Circuit



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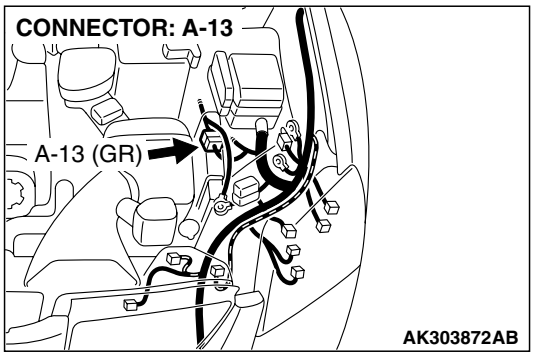
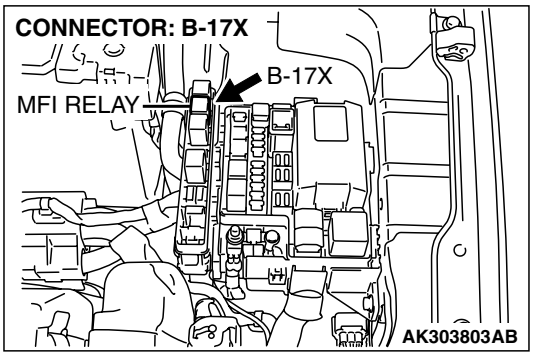
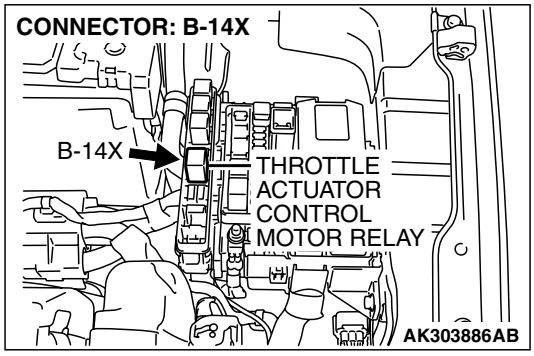
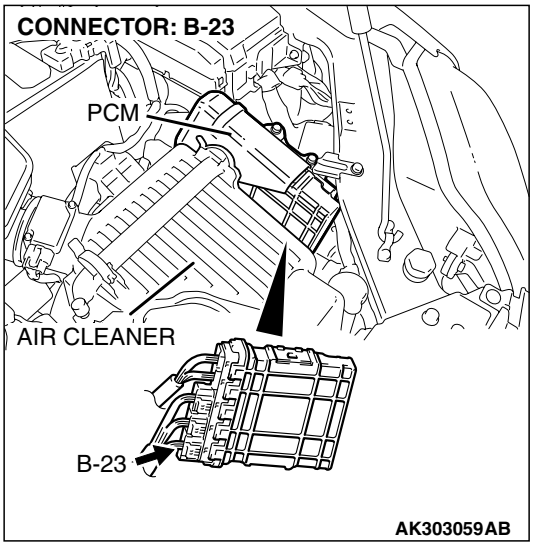








CIRCUIT OPERATION

- Battery positive voltage is applied to the throttle actuator control motor relay terminal (terminal No. 1).
- Battery positive voltage is applied to the throttle actuator control motor relay terminal (terminal No. 2) from the MFI relay (terminal No. 4).
- PCM (terminal No. 123) applies current to the throttle actuator control motor relay coil by turning ON the power transistor in the unit in order to turn the relay ON.
- When the throttle actuator control motor relay turns ON, battery positive voltage is supplied by the throttle actuator control motor relay (terminal No. 4) to the PCM (terminal No. 122).

TECHNICAL DESCRIPTION

- When the ignition switch ON signal is input into the PCM, the PCM turns ON the throttle actuator control motor relay.

DESCRIPTIONS OF MONITOR METHODS

Throttle actuator control motor relay circuit voltage is smaller than the specified value.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Check Condition

- Battery positive voltage is higher than 8.3 volts.

Judgement Criterion

- The power line voltage of the electronic controlled throttle valve system should be 6.0 volts or less for 0.35 second.

TSB Revision

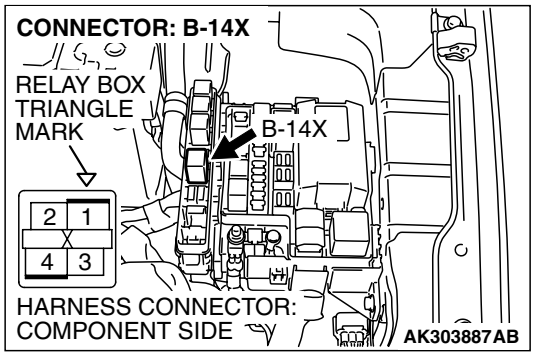
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Throttle actuator control motor relay failed.
- Open or shorted throttle actuator control motor relay circuit, or connector damage.
- PCM failed.

DIAGNOSIS

Required Special Tools:

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



STEP 1. Check harness connector B-14X at throttle actuator control motor relay for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 2.

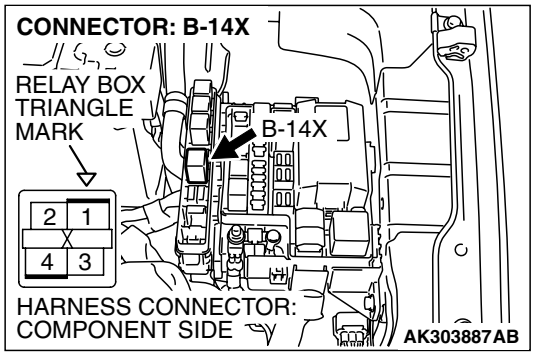
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.

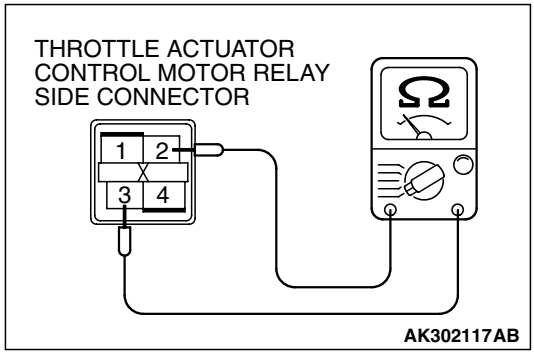
STEP 2. Check the throttle actuator control motor relay.

⚠ CAUTION

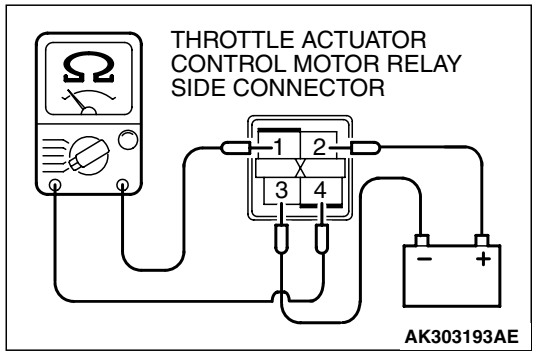
Because it is not possible to distinguish the top and the bottom of the throttle actuator control motor relay, inspect it with the triangle mark printed on the relay facing upward.

(1) Remove the throttle actuator control motor relay.





(2) Check for continuity between the throttle actuator control motor relay terminal No. 2 and No. 3.
- There should be continuity (approximately 70 ohms).



(3) Use jumper wires to connect throttle actuator control motor relay terminal No. 2 to the positive battery terminal and terminal No. 3 to the negative battery terminal.
(4) Check the continuity between the throttle actuator control motor relay terminal No. 1 and No. 4 while connecting and disconnecting the jumper wire at the negative battery terminal.
- Continuity (2 Ω or less) <Negative battery terminal connected.>
- Should be open loop. <Negative battery terminal disconnected.>

(5) Install the throttle actuator control motor relay.

Q: Is the measured resistance normal?

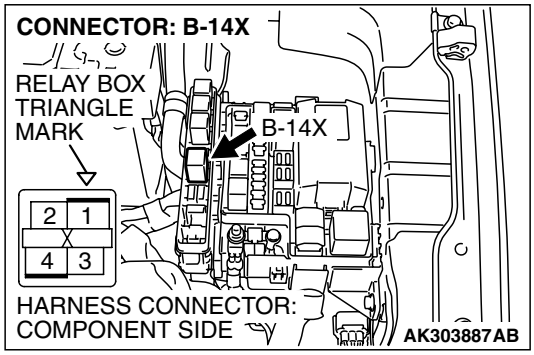
YES : Go to Step 3.
NO : Replace the throttle actuator control motor relay. Then go to Step 14.

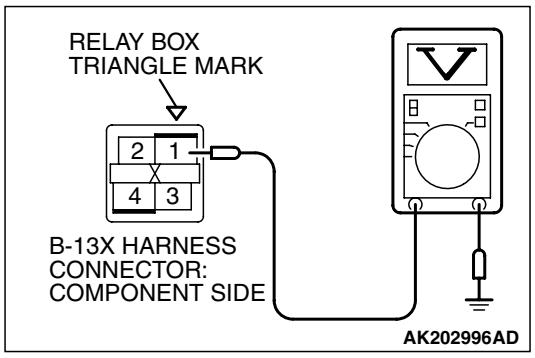
STEP 3. Measure the power supply voltage at throttle actuator control motor relay harness side connector B-14X

⚠ CAUTION

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

(1) Disconnect the connector B-14X and measure at the harness side.





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

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

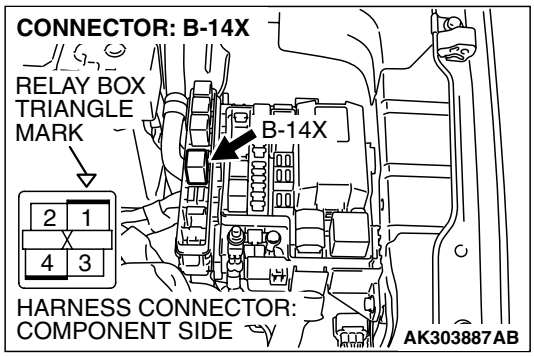
YES : Go to Step 4.

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 A-13 is in good condition, repair it because of open circuit or short circuit to ground between battery and throttle actuator control motor relay connector B-14X (terminal No. 1). Then go to Step 14.

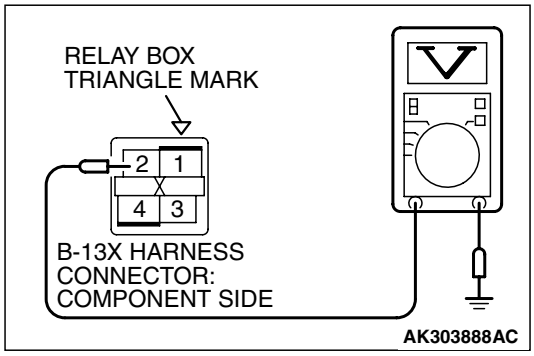
STEP 4. Measure the power supply voltage at throttle actuator control motor relay harness side connector B-14X.

⚠ CAUTION

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



(1) Disconnect the connector B-14X and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.



(3) Measure the voltage between terminal No. 2 and ground.
- Voltage should be battery positive voltage.

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

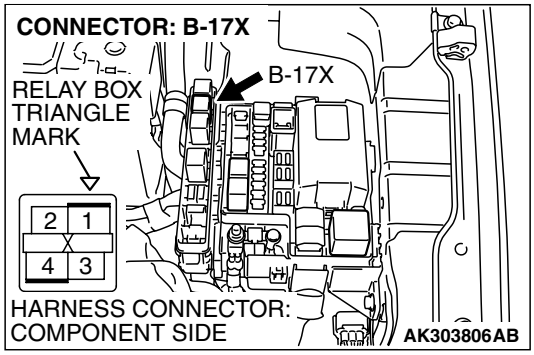
Q: Is battery positive voltage (approximately 12 volts) present?

YES : Go to Step 6.
NO : Go to Step 5.

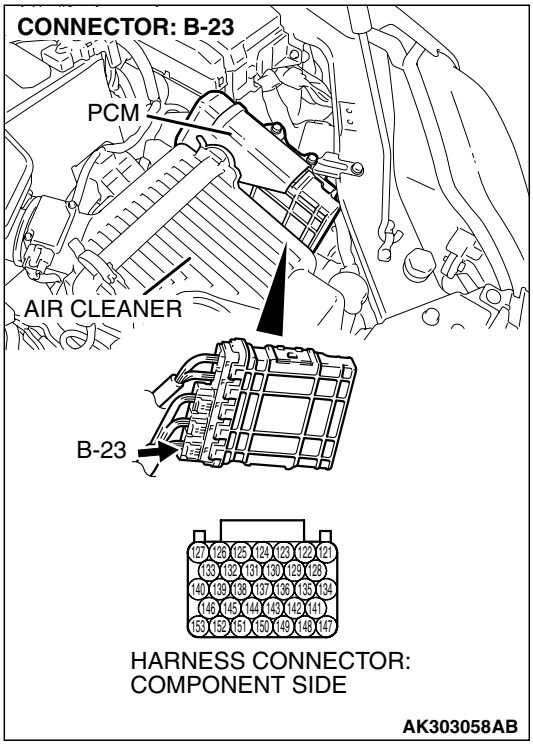
STEP 5. Check harness connector B-17X at MFI relay for damage.

Q: Is the harness connector in good condition?

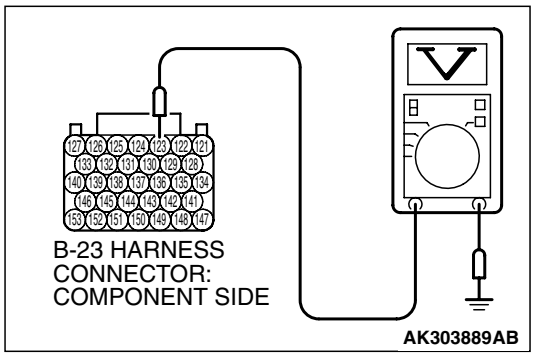
YES : Repair harness wire between MFI relay connector B-17X (terminal No. 4) and throttle actuator control motor relay connector B-14X (terminal No. 2) because of open circuit or short circuit to ground. Then go to Step 14.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.



STEP 6. Measure the power supply voltage at PCM harness side connector B-23.



(1) Disconnect the connector B-23 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.



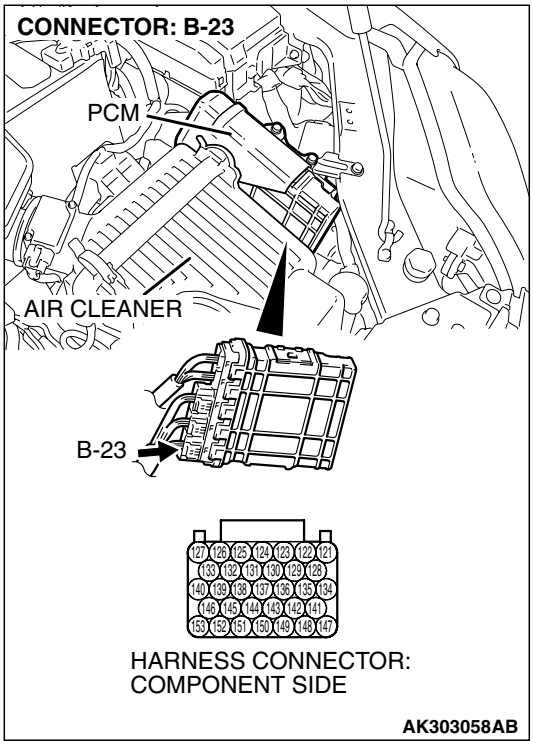
(3) Measure the voltage between terminal No. 123 and ground.
- Voltage should be battery positive voltage.

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

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

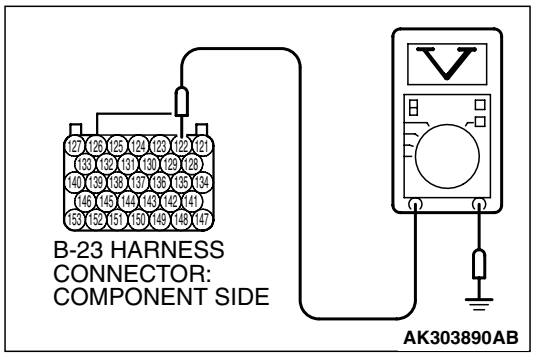
YES : Go to Step 7.

NO : Repair harness wire between throttle actuator control motor relay connector B-14X (terminal No. 3) and PCM connector B-23 (terminal No. 123) because of open circuit or short circuit to ground. Then go to Step 14.



STEP 7. Measure the power supply voltage at PCM harness side connector B-23.

(1) Disconnect the connector B-23 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.

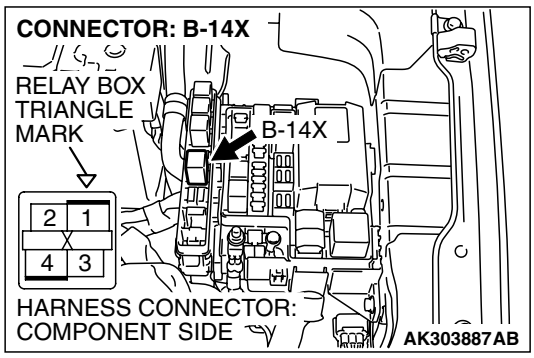


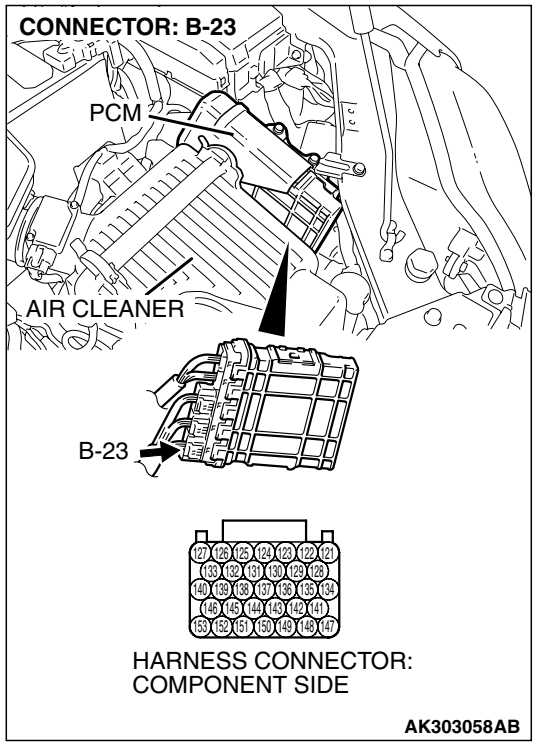
(3) Measure the voltage between terminal No. 122 and ground.
- Voltage should be battery positive voltage.

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

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

YES : Go to Step 10.
NO : Go to Step 8.



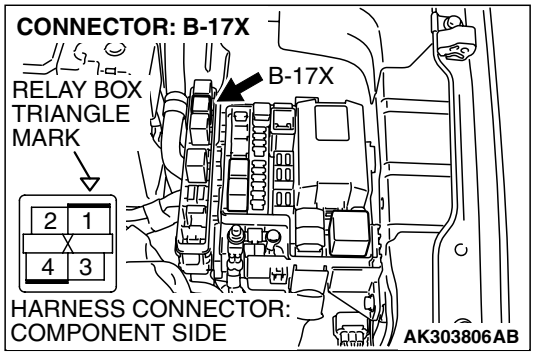


STEP 8. Check for open circuit and short circuit to ground between throttle actuator control motor relay connector B-14X (terminal No. 4) and PCM connector B-23 (terminal No. 122).

Q: Is the harness wire in good condition?

YES : Go to Step 9.

NO : Repair it. Then go to Step 14.

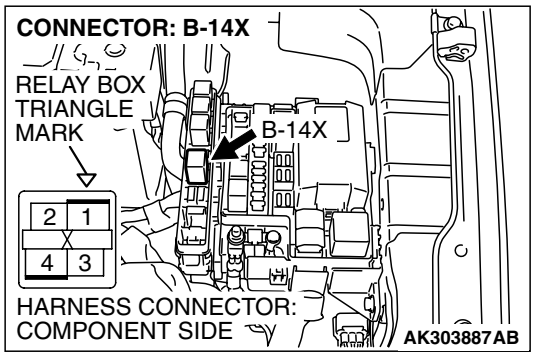


STEP 9. Check for harness damage between MFI relay connector B-17X (terminal No. 4) and throttle actuator control motor relay connector B-14X (terminal No. 2).

Q: Is the harness wire in good condition?

YES : Repair harness wire between throttle actuator control motor relay connector B-14X (terminal No. 3) and PCM connector B-23 (terminal No. 123) because of harness damage. Then go to Step 14.

NO : Repair it. Then go to Step 14.

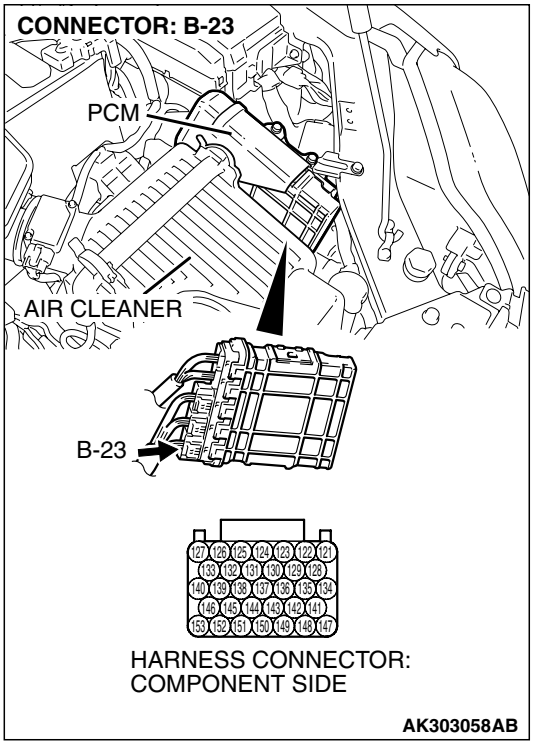


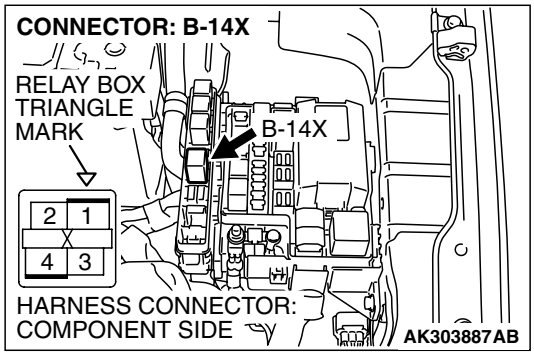
STEP 10. Check harness connector B-23 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 11.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.



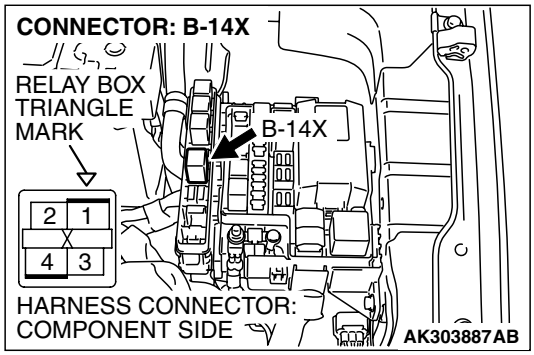


STEP 11. Check for harness damage between battery and throttle actuator control motor relay connector B-14X (terminal No. 1).

Q: Is the harness wire in good condition?

YES : Go to Step 12.

NO : Repair it. Then go to Step 14.

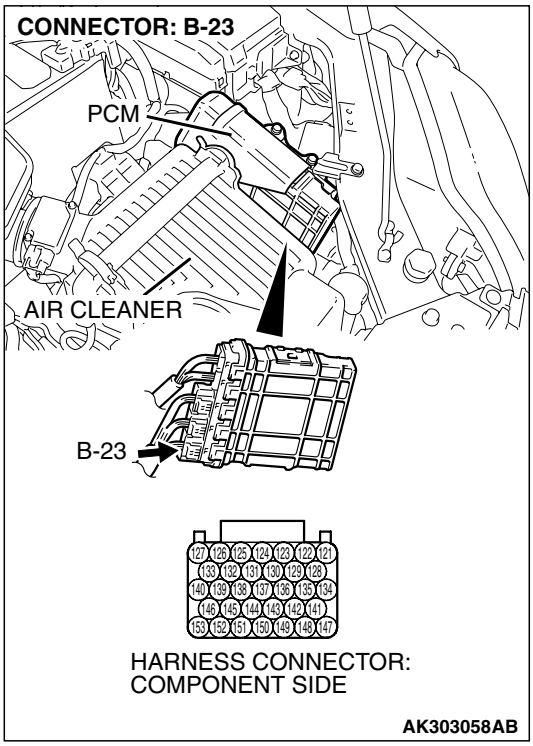


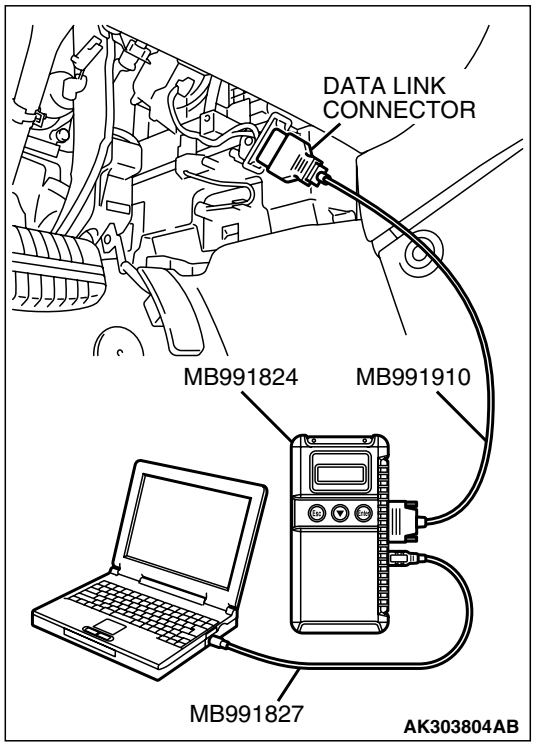
STEP 12. Check for harness damage between throttle actuator control motor relay connector B-14X (terminal No. 4) and PCM connector B-23 (terminal No. 122).

Q: Is the harness wire in good condition?

YES : Go to Step 13.

NO : Repair it. Then go to Step 14.





STEP 13. Using scan tool MB991958, read the diagnostic trouble code (DTC).

⚠ CAUTION

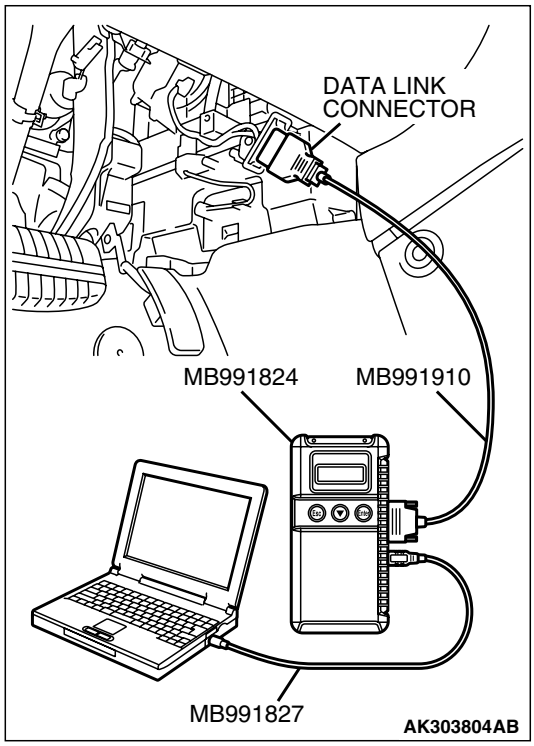
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) After the DTC has been deleted, read the DTC again.
(4) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is DTC P0657 set?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 14.

NO : It can be assumed 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.



STEP 14. Using scan tool MB991958, read the diagnostic trouble code (DTC).

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) After the DTC has been deleted, read the DTC again.
(4) Turn the ignition switch to the "LOCK"(OFF) position.

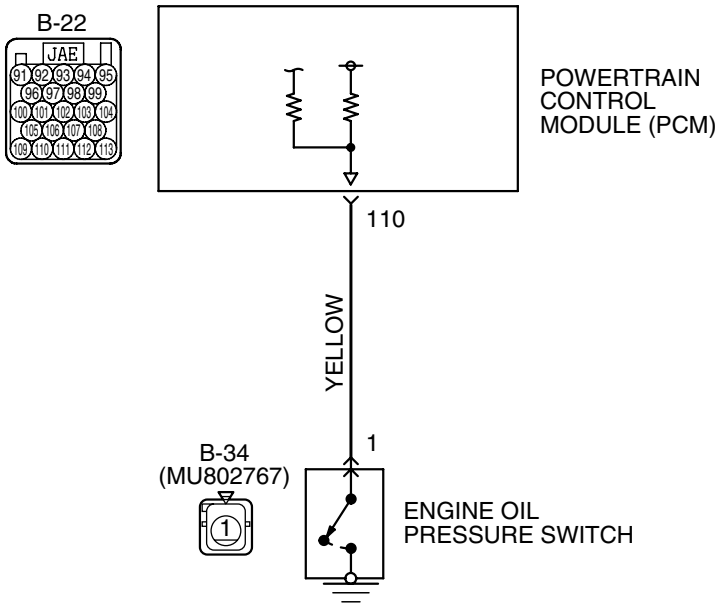
Q: Is DTC P0657 set?

YES : Retry the troubleshooting.
NO : The inspection is complete.

TSB Revision

DTC P1020: Mitsubishi Innovative Valve Timing Electronic Control System (MIVEC) Performance Problem

Engine Oil Pressure Switch Circuit



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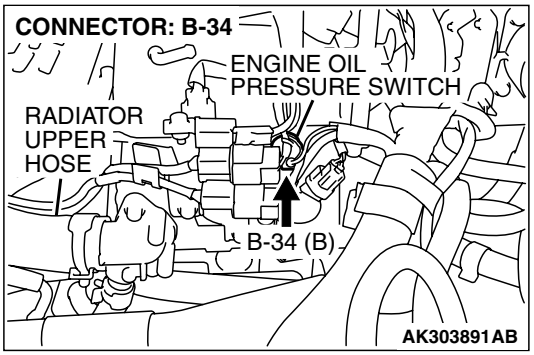
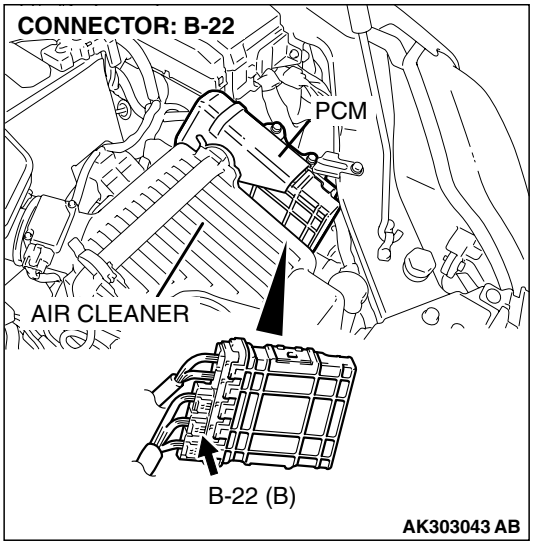




CIRCUIT OPERATION

- A battery positive voltage is applied to the engine oil pressure switch output terminal (terminal No. 1) from the PCM (terminal No. 110) via the resistor in the PCM.

TECHNICAL DESCRIPTION

- The engine oil pressure switch converts the existence of a engine oil pressure into a high/low voltage, and inputs it into the PCM.

TSB Revision

- When the engine oil control valve operates, the engine oil pressure in the MIVEC system rises. The engine oil pressure switch opens, thus interrupting the application of the battery positive voltage. As a result, the output voltage of the engine oil pressure switch will fluctuate between 0 and 12 volts.

DESCRIPTIONS OF MONITOR METHODS

Compare engine oil pressure switch status with engine operating condition.

MONITOR EXECUTION

Continuous

- The PCM checks whether the engine oil pressure switch turns "OFF" or "ON" during driving.

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

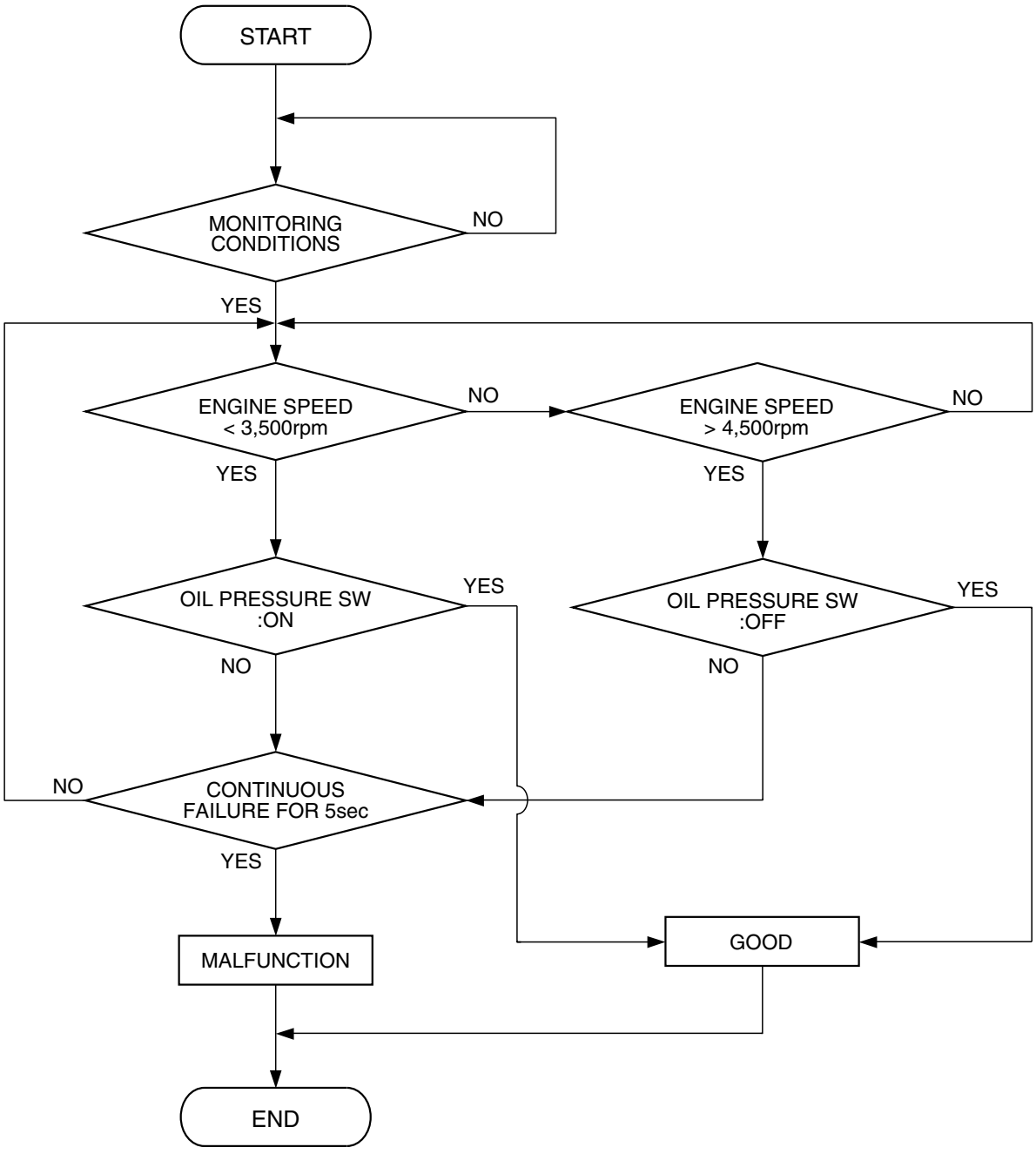
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



AK403641

Check Conditions

- 30 seconds or more have passed since the engine starting sequence was completed.
- Engine coolant temperature is 77°C (171°F) or higher.
- Battery positive voltage is between 10 and 16.5 volts.

TSB Revision

Judgement Criteria

- Engine speed is 3,500 r/min or lower and engine oil pressure switch is OFF for 5 seconds.

or

- Engine speed is 4,500 r/min or higher and engine oil pressure switch is ON for 5 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 21 P.13A-9.

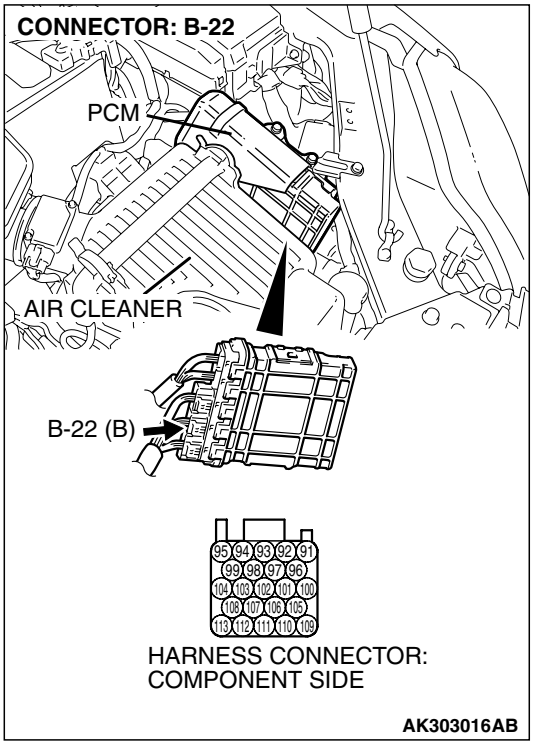
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

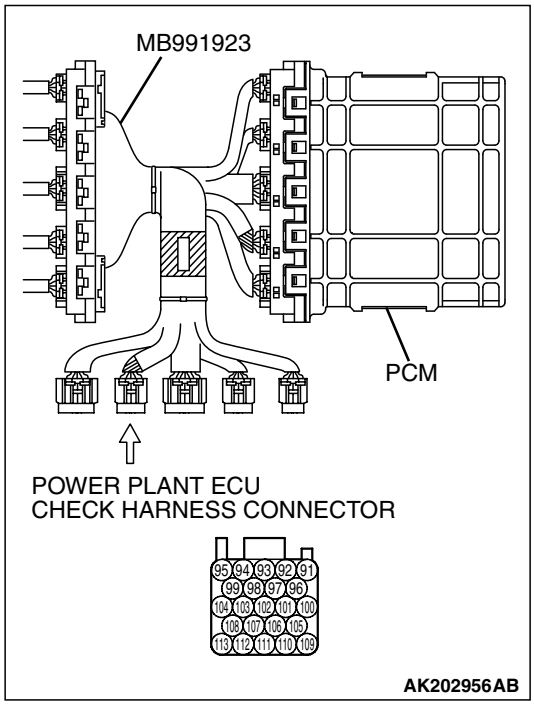
- Engine oil pressure switch failed.
- Engine oil control valve failed.
- Open or shorted engine oil pressure switch circuit, harness damage or connector damage.

DIAGNOSIS

Required Special Tools:

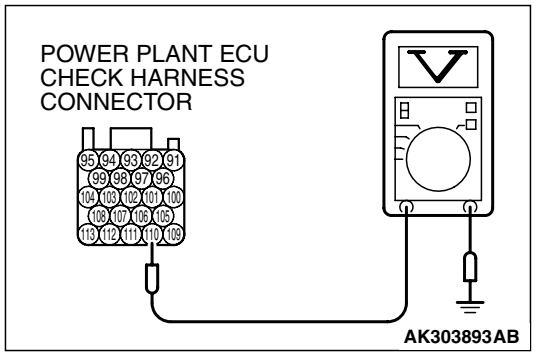
- MB991958: Scan tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A
- MB991923: Power Plant ECU Check Harness





STEP 1. Measure the power supply voltage at PCM connector B-22 by using power plant ECU check harness special tool MB991923.

(1) Disconnect all PCM connectors. Connect the power plant ECU check harness special tool MB991923 between the separated connectors.
(2) Start the engine and run at idle.



(3) Measure the voltage between terminal No. 110 and ground.
- Voltage should be 1 volt or less when engine is idling.
- Voltage should be battery positive voltage when engine speed is higher than 4,500 r/min.

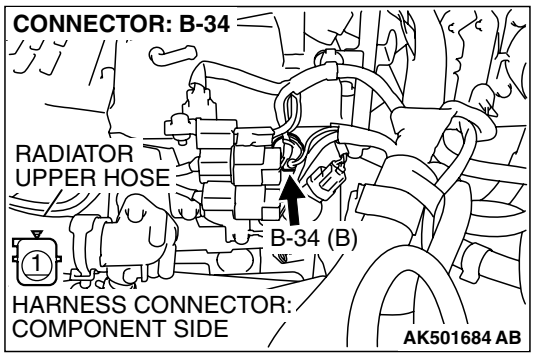
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the measured voltage normal?

YES : It can be assumed 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 B-34 at engine oil pressure switch for damage.

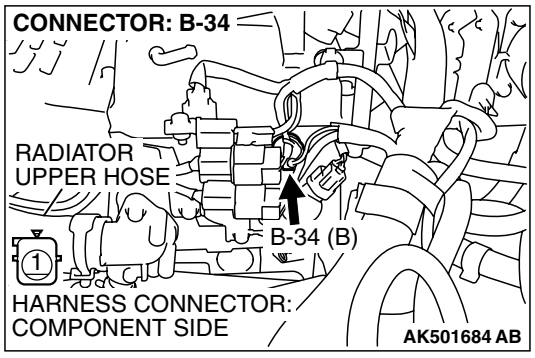


Q: Is the harness connector in good condition?

YES : Go to Step 3.

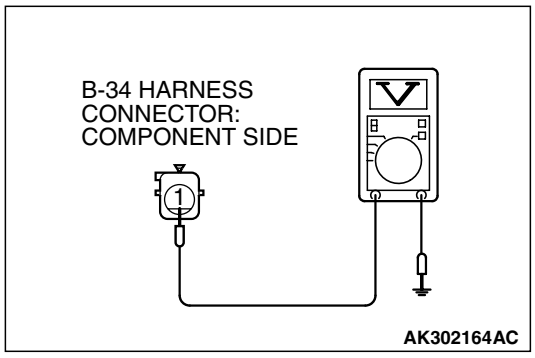
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 10.

STEP 3. Measure the power supply voltage at engine oil pressure switch connector B-34.



(1) Disconnect the connector B-34 and measure at the harness side.

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



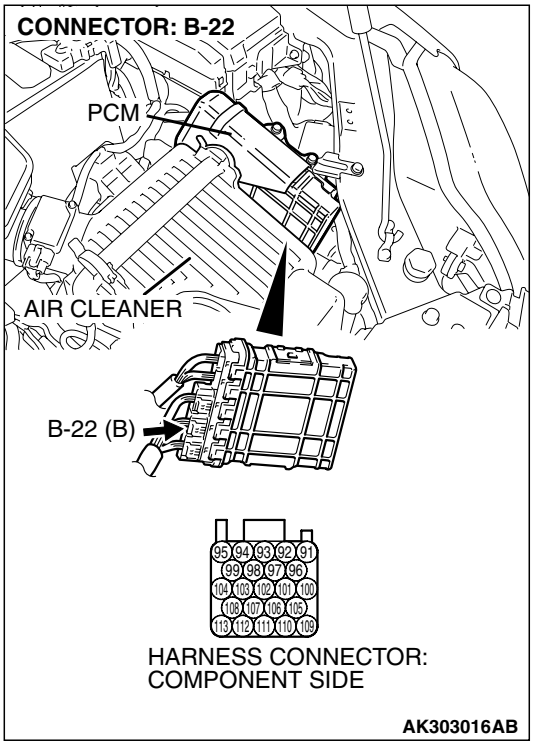
(3) Measure the voltage between terminal No. 1 and ground.
- Voltage should be battery positive voltage.

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

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

YES : Go to Step 6.

NO : Go to Step 4.

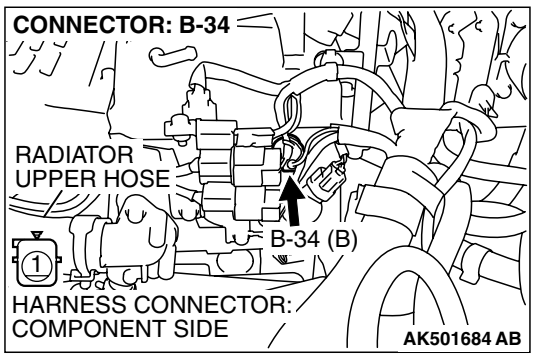


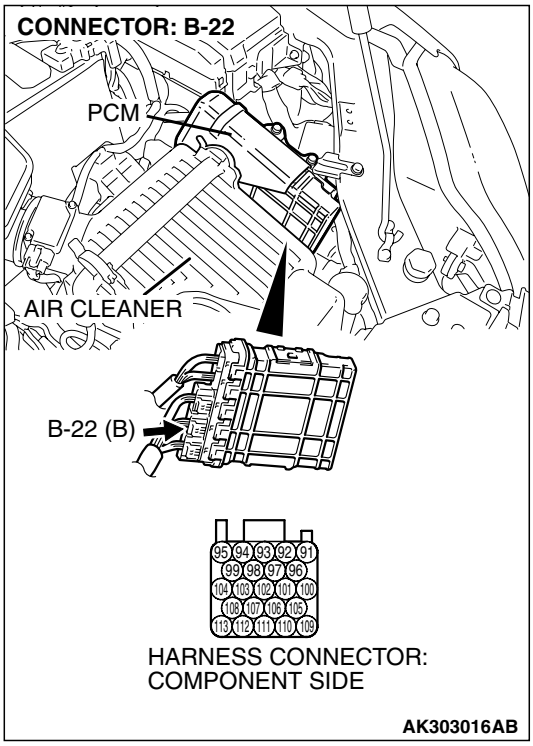
STEP 4. Check harness connector B-22 at PCM for damage.

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 go to Step 10.



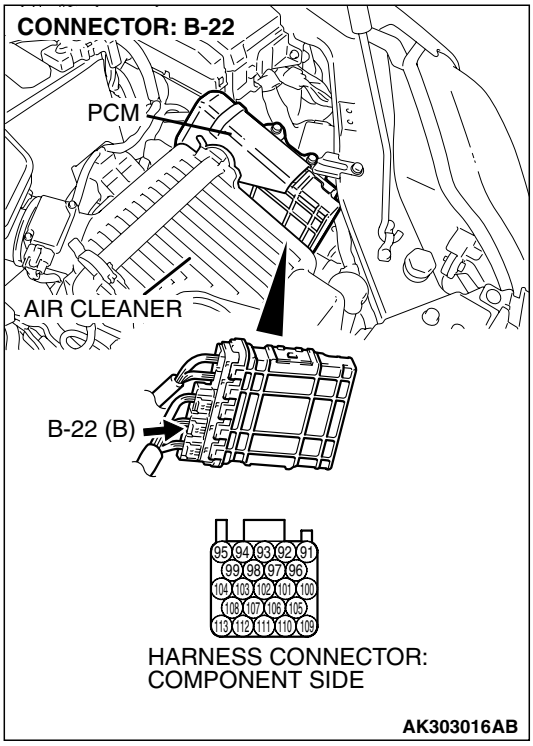


STEP 5. Check for open or shorted circuit to ground between engine oil pressure switch connector B-34 (terminal No. 1) and PCM connector B-22 (terminal No. 110).

Q: Is the harness wire in good condition?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 10.

NO : Repair it. Then go to Step 10.

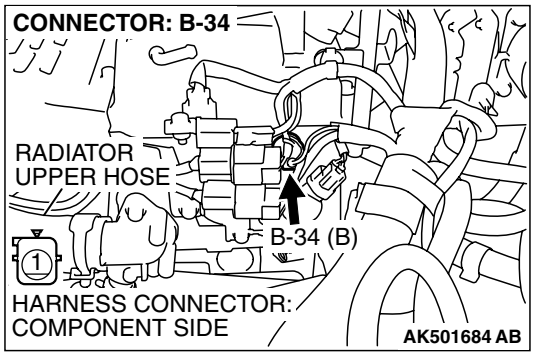


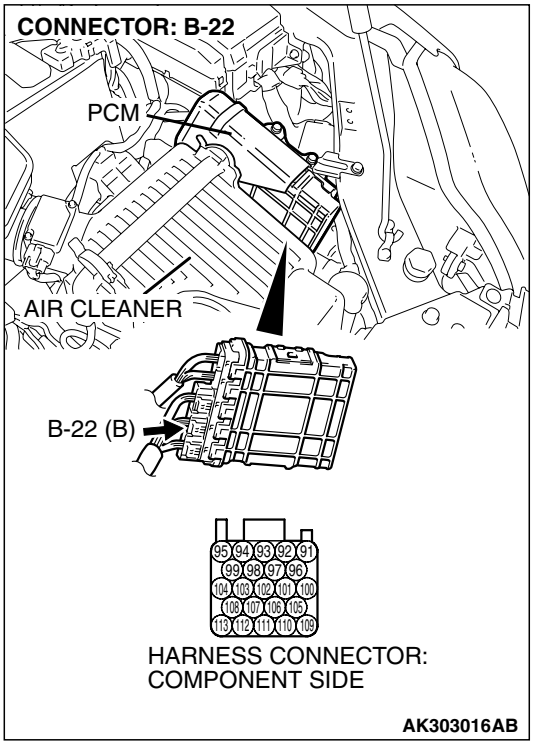
STEP 6. Check harness connector B-22 at PCM for damage.

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 go to Step 10.



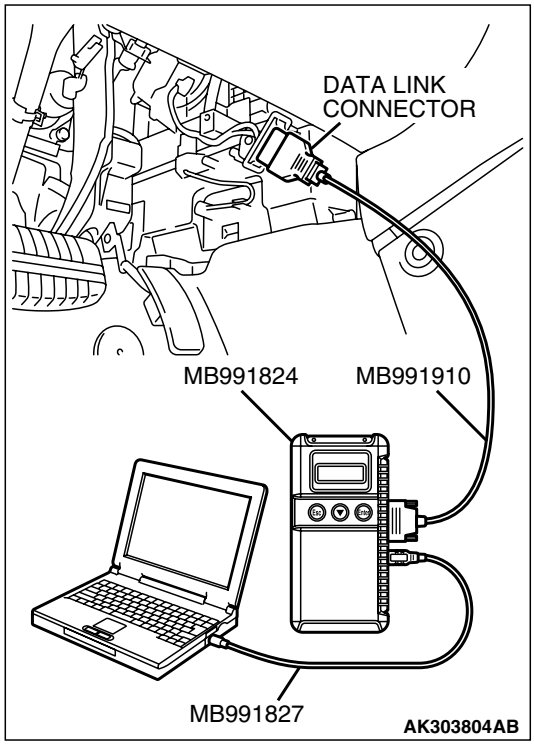


STEP 7. Check for harness damage between engine oil pressure switch connector B-34 (terminal No. 1) and PCM connector B-22 (terminal No. 110).

Q: Is the harness wire in good condition?

YES : Go to Step 8.

NO : Repair it. Then go to Step 10.



STEP 8. Using scan tool MB991958, check data list item 98: Engine Oil Control Valve.

⚠ 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 data reading mode for item 98, Engine oil control valve.
- Warm up the engine. With the engine is idling, the engine oil control valve should be "OFF"
- Warm up the engine. With the engine is 4,500 r/min, the engine oil control valve should be "ON"

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

Q: Is the engine oil control valve operating properly?

YES : Replace the engine oil pressure switch. Then go to Step 9.
NO : Replace the engine oil control valve. Then go to Step 10.

STEP 9. Check the trouble symptoms.

(1) Carry out test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 21 P.13A-9.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P1020 set?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 10.
NO : The Inspection is complete.

STEP 10. Test the OBD-II drive cycle.

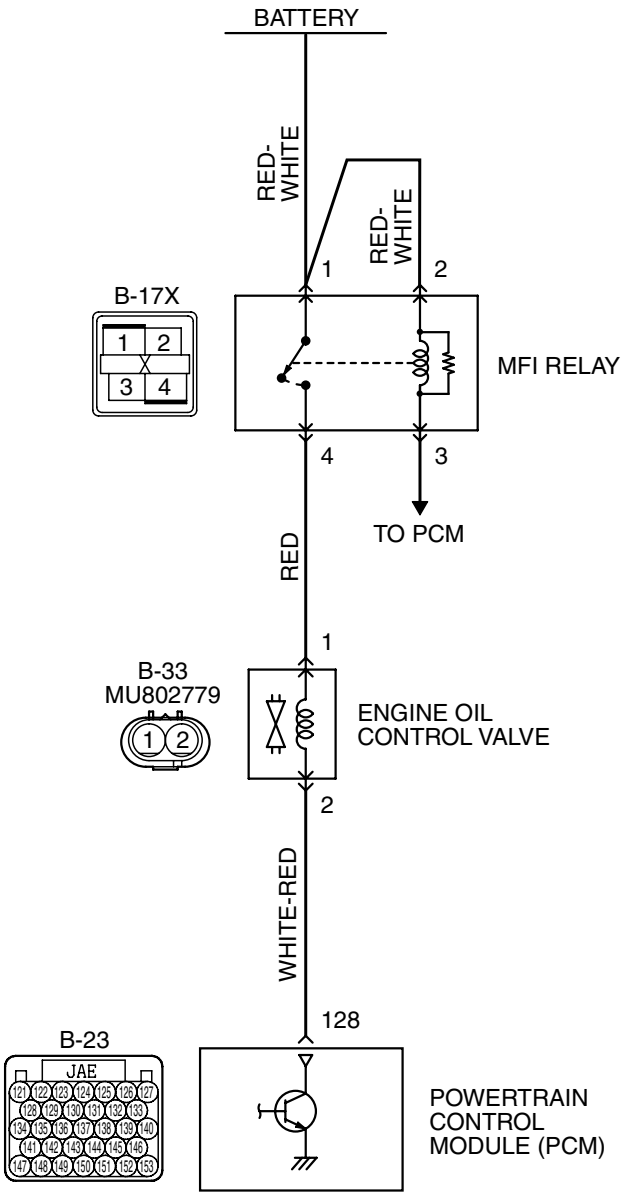
(1) Carry out test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 21 P.13A-9.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P1020 set?

YES : Retry the trouble shooting.
NO : The Inspection is complete.

DTC P1021: Engine Oil Control Valve Circuit

Engine Oil Control Valve Circuit



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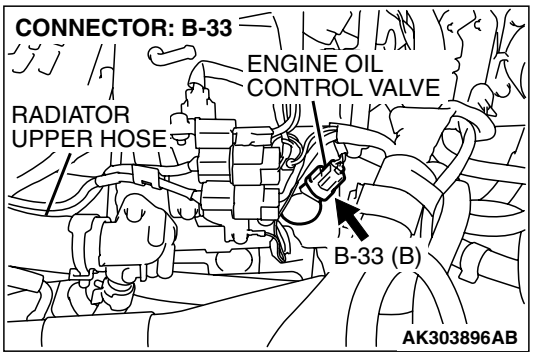
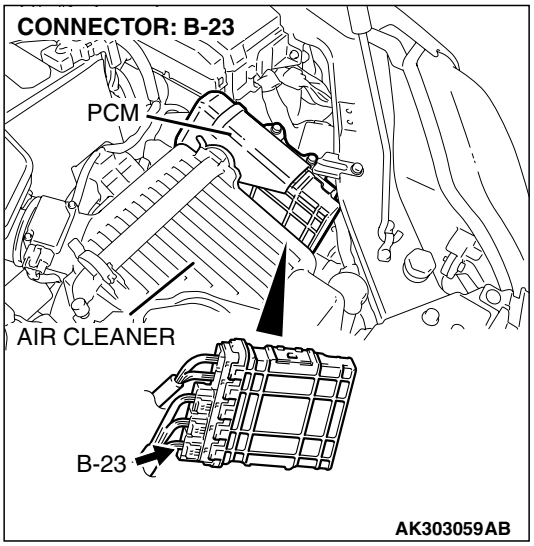
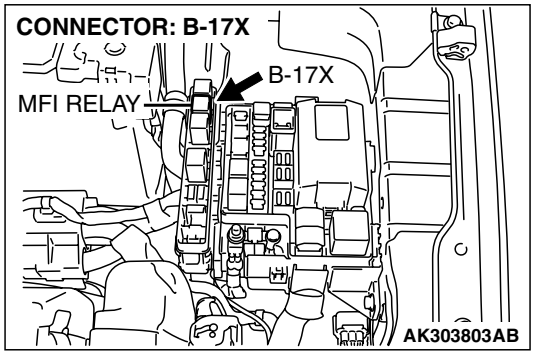
TSB Revision







CIRCUIT OPERATION
- The engine oil control valve power is supplied from the MFI relay (terminal No. 4).
- The PCM controls ground engine oil control valve by turning the power transistor in the PCM "ON" and "OFF".

TECHNICAL DESCRIPTION
- The engine oil control valve switches the cams to operate the MIVEC system in the low-speed or high-speed mode in accordance with the signals from the PCM.

DESCRIPTIONS OF MONITOR METHODS
Circuit voltage stays low when solenoid status is off.

MONITOR EXECUTION
Continuous

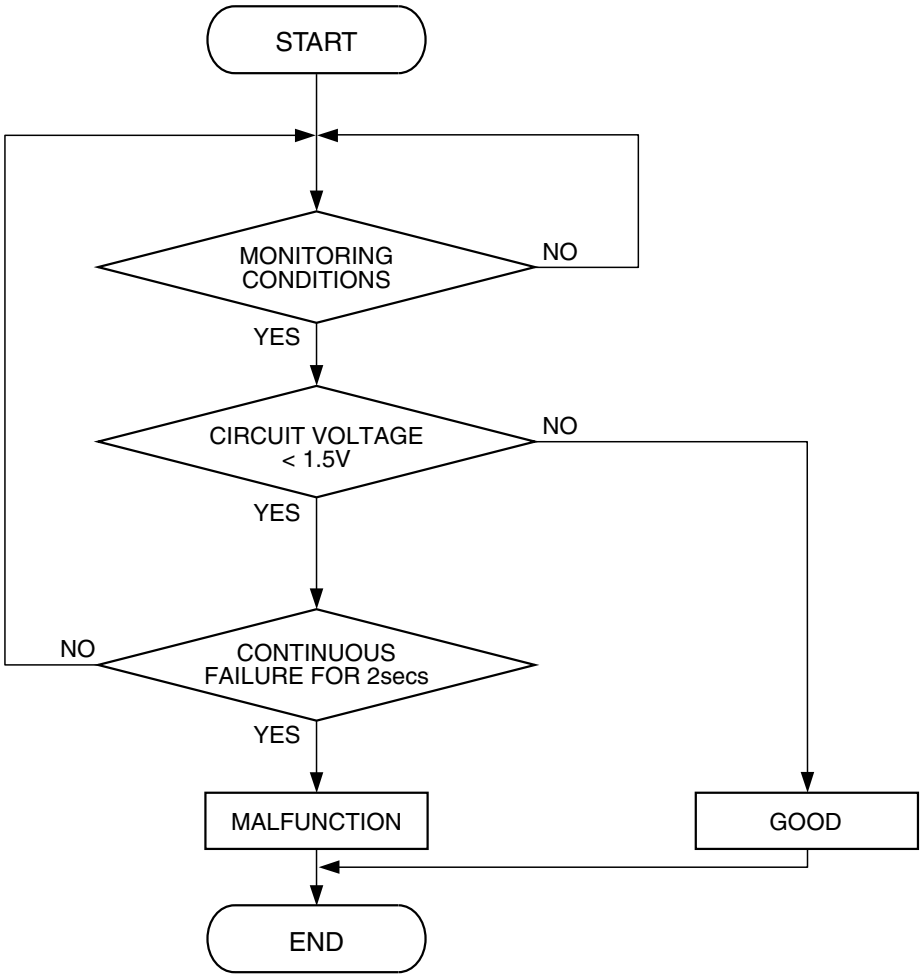
MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)
- Not applicable

Sensor (The sensor below is determined to be normal)
- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



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Check Conditions

- Ignition switch: "ON"
- Engine oil control valve is "OFF".
- Battery positive voltage is between10 and 16.5 volts.
- 0.1 second has elapsed after the above mentions have been met.

Judgement Criterion

- The PCM terminal voltage of engine control valve circuit is less than 1.5 volts for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 24 P.13A-9.

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

- Engine oil control valve failed.
- Open or shorted engine oil control valve circuit, or harness damage or connector damage.
- PCM failed.

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DIAGNOSIS

Required Special Tools:

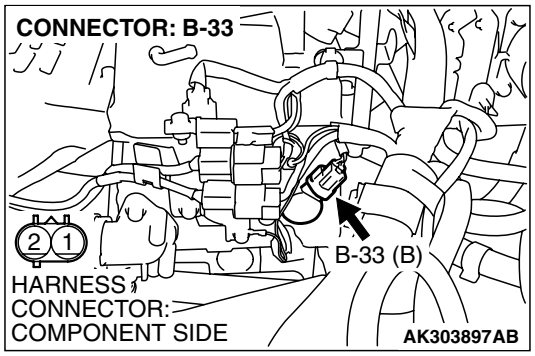
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A
- MB991923: Power Plant ECU Check Harness

STEP 1. Check harness connector B-33 at the engine oil control valve for damage.

Q: Is the harness connector in good condition?

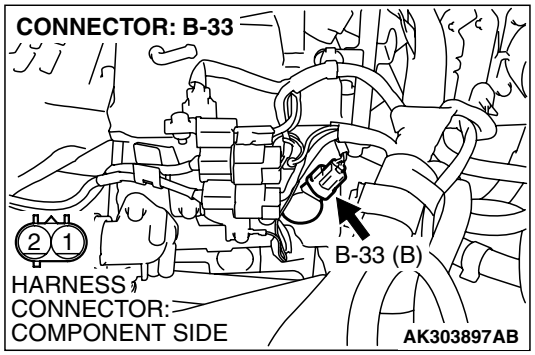
YES : Go to Step 2.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.



STEP 2. Check the engine oil control valve.

(1) Disconnect the engine oil control valve connector B-33.



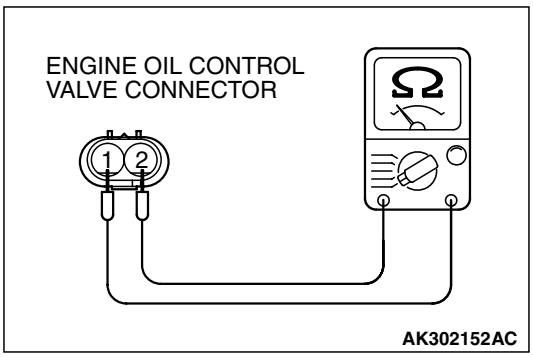
(2) Measure the resistance between engine oil control valve side connector terminal No. 1 and No. 2.

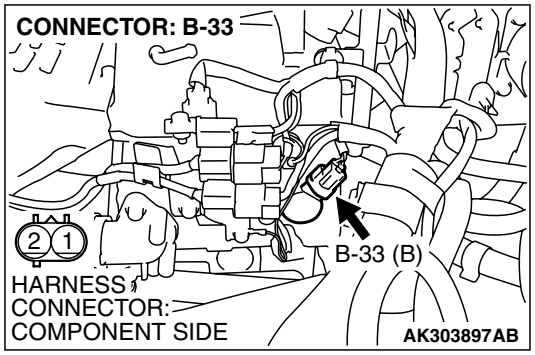
Standard value: 6.9 – 7.9 Ω [at 20°C (68°F)]

Q: Is the measured resistance between 6.9 and 7.9 ohms [at 20°C (68°F)]?

YES : Go to Step 3.

NO : Replace the engine oil control valve. Then go to Step 12.

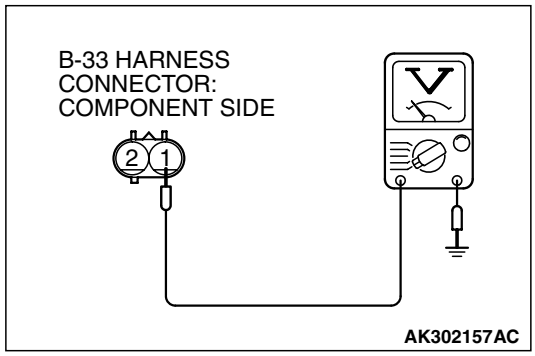




STEP 3. Measure the power supply voltage at engine oil control valve harness side connector B-33.

(1) Disconnect the connector B-33 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.

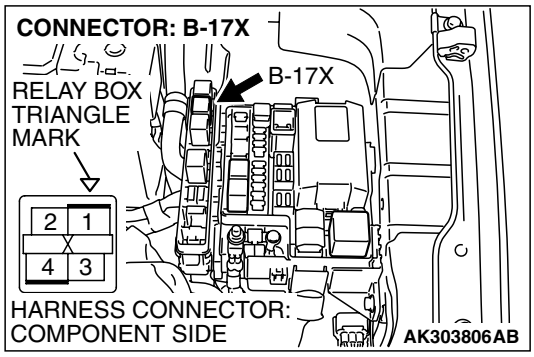
(4) Turn the ignition switch to the "LOCK" (OFF) position.

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

YES : Go to Step 5.

NO : Go to Step 4.

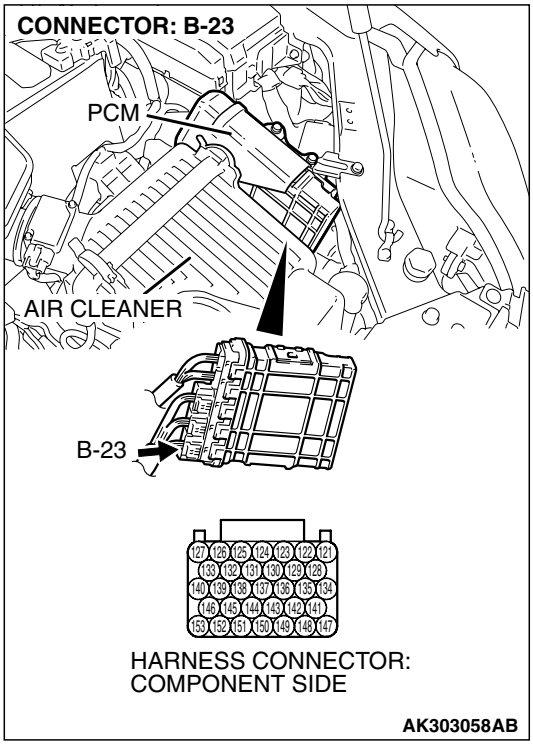
STEP 4. Check harness connector B-17X at MFI relay for damage.

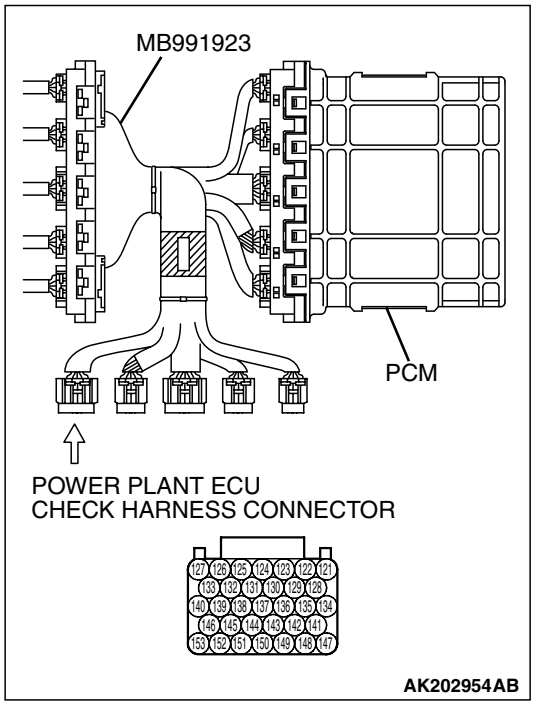


Q: Is the harness connector in good condition?

YES : Repair harness wire between MFI relay connector B-17X (terminal No. 4) and engine oil control valve connector B-33 (terminal No. 1) because of open circuit or short circuit to ground. Then go to Step 12.

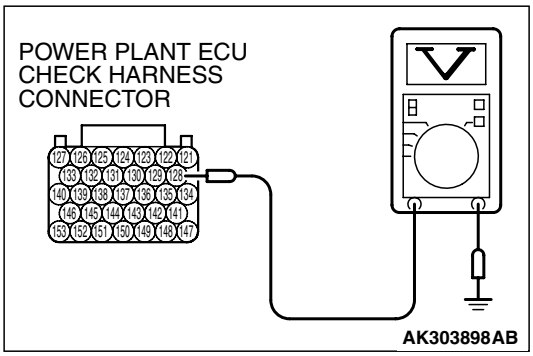
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.





STEP 5. Measure the power supply voltage at PCM connector B-23 by using power plant ECU check harness special tool MB991923.

(1) Disconnect all PCM connectors. Connect the power plant ECU check harness special tool MB991923 between the separated connectors.
(2) Turn the ignition switch to the "ON" position.



(3) Measure the voltage between terminal No. 128 and ground.
- Voltage should be battery positive voltage.

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

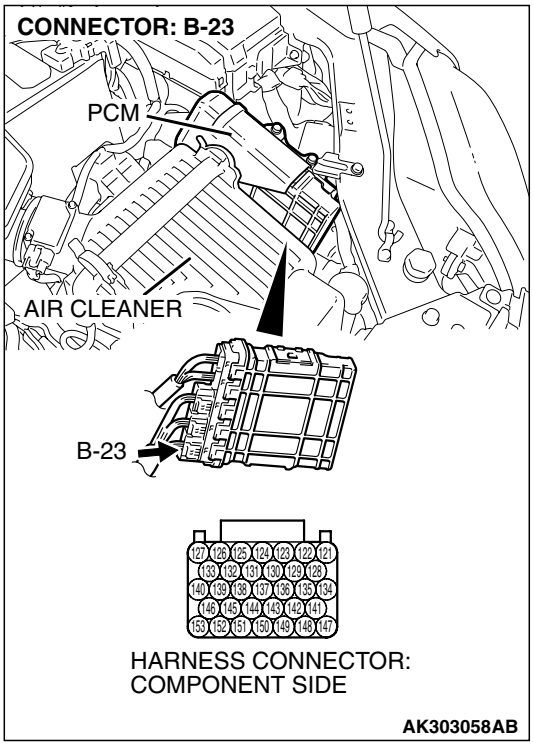
Q: Is battery positive voltage (approximately 12 volts) present?

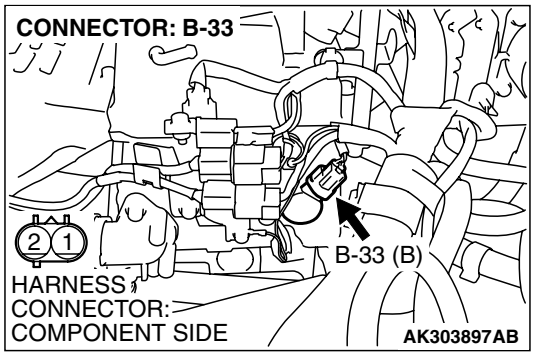
YES : Go to Step 8.
NO : Go to Step 6.

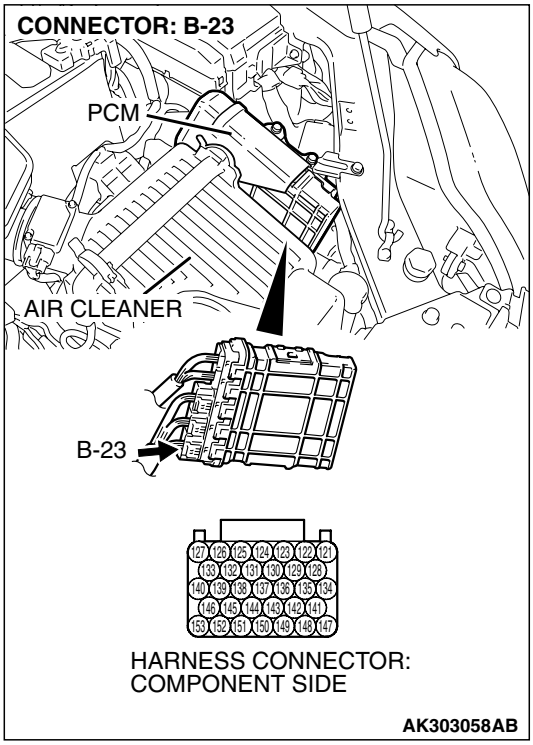
STEP 6. Check harness connector B-23 at PCM for damage.

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 go to Step 12.





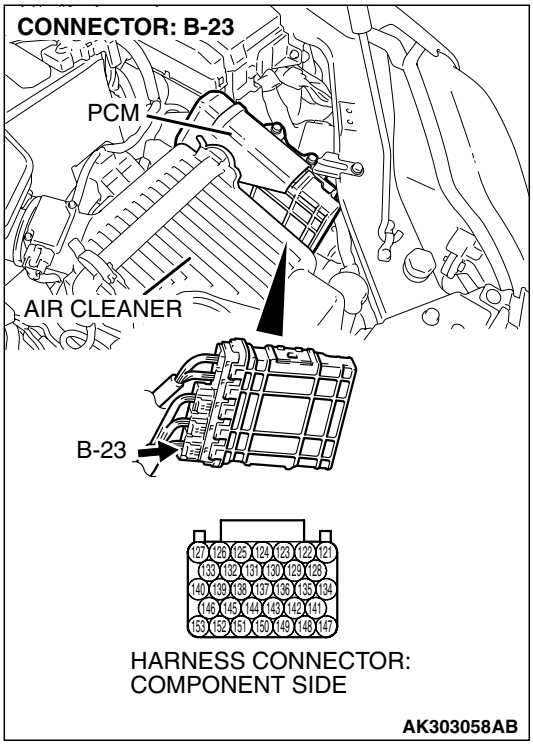


STEP 7. Check for open circuit and short circuit to ground between engine oil control valve connector B-33 (terminal No. 2) and PCM connector B-23 (terminal No. 128).

Q: Is the harness wire in good condition?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 12.

NO : Repair it. Then go to Step 12.

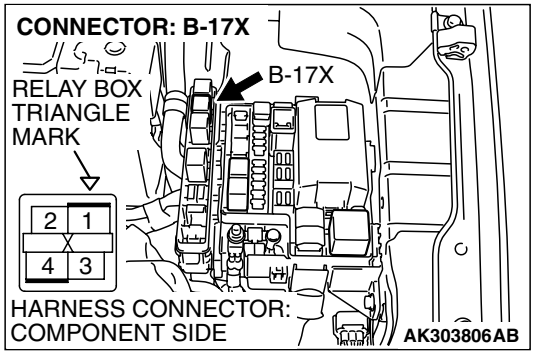


STEP 8. Check harness connector B-23 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 9.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

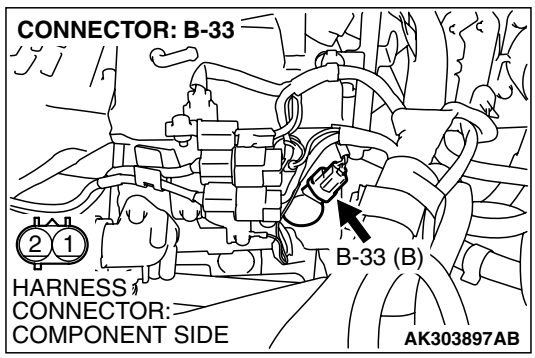


STEP 9. Check for harness damage between MFI relay connector B-17X (terminal No. 4) and engine oil control valve connector B-33 (terminal No. 1).

Q: Is the harness wire in good condition?

YES : Go to Step 10.

NO : Repair it. Then go to Step 12.



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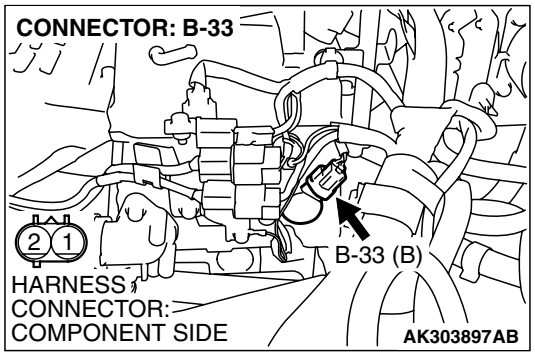
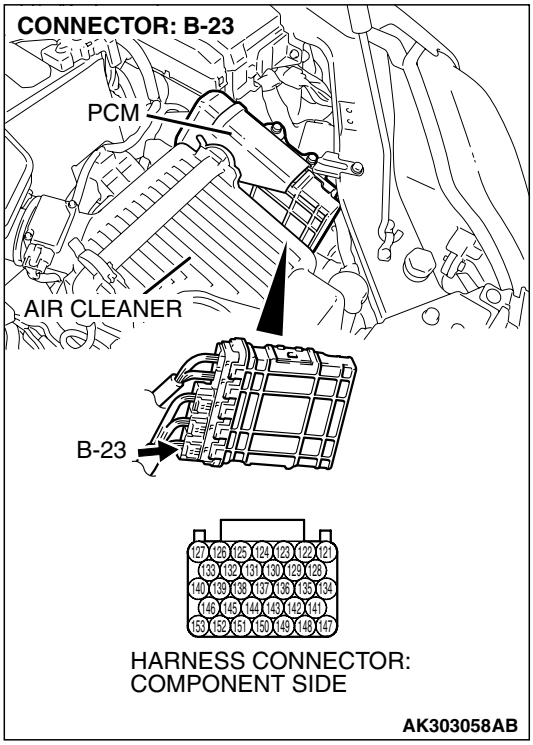




STEP 10. Check for harness damage between engine oil control valve connector B-33 (terminal No. 2) and PCM connector B-23 (terminal No. 128).

Q: Is the harness wire in good condition?

YES : Go to Step 11.

NO : Repair it. Then go to Step 12.

STEP 11.Check the trouble symptoms.

(1) Carry out test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 24 P.13A-9.

(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P1021 set?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 12.

NO : It can be assumed 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.

TSB Revision

STEP 12. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 24 P.13A-9.

(2) Check the diagnostic trouble code (DTC).

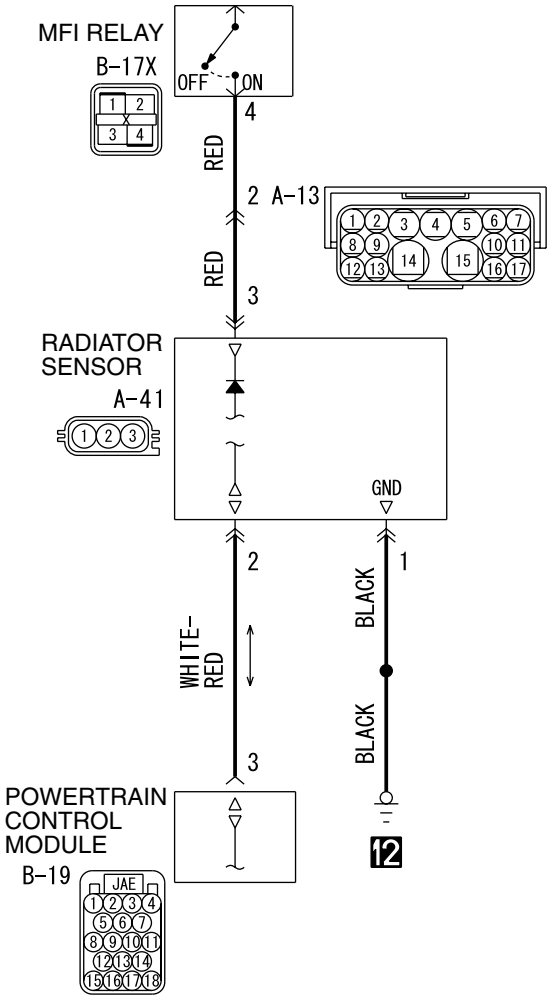
Q: Is DTC P1021 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P1540: LIN Communication Check by PCM (Sending Message to Radiator Sensor)/DTC P1541: LIN Communication Check by PCM (Receiving Message from Radiator Sensor)

Radiator Sensor Circuit



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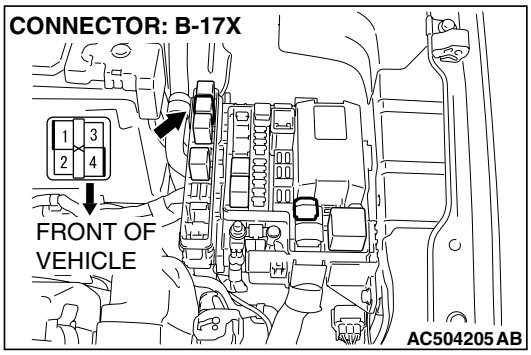
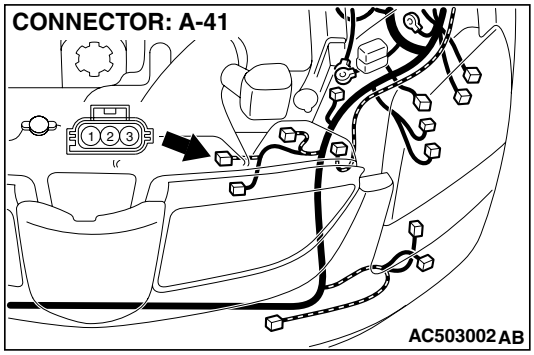
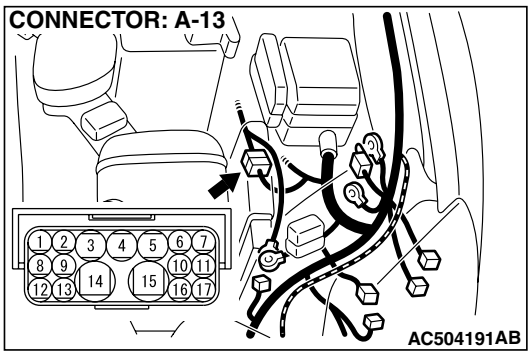
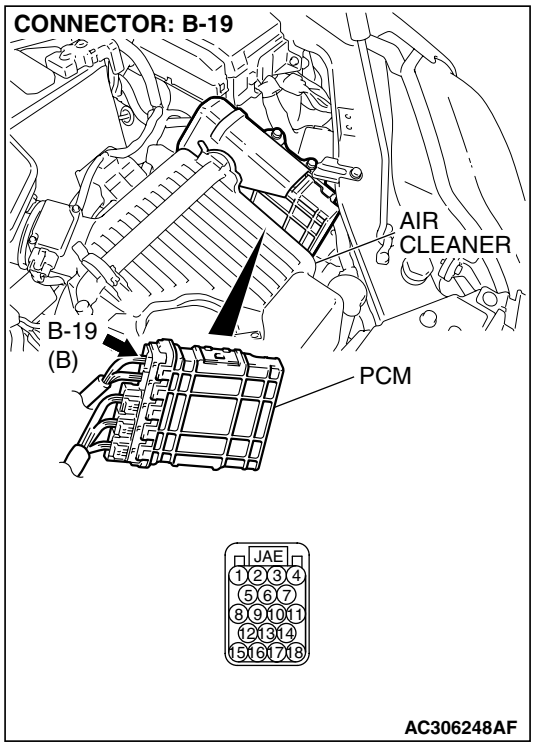








CIRCUIT OPERATION

- The battery voltage is applied from the ignition switch to the radiator sensor (terminal No.3), and it is grounded to the vehicle body from the radiator sensor (terminal No.1).
- The radiator sensor (terminal No.2) sends the sensor signal to the powertrain control module (terminal No.3).

TECHNICAL DESCRIPTION

- The PCM judges the tampering of the DOR radiator according to the signal from the radiator sensor.

MONITOR EXECUTION

- Continuous

MONITOR EXECUTION CONDITIONS (OTHER MONITOR AND SENSOR)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

- Not applicable

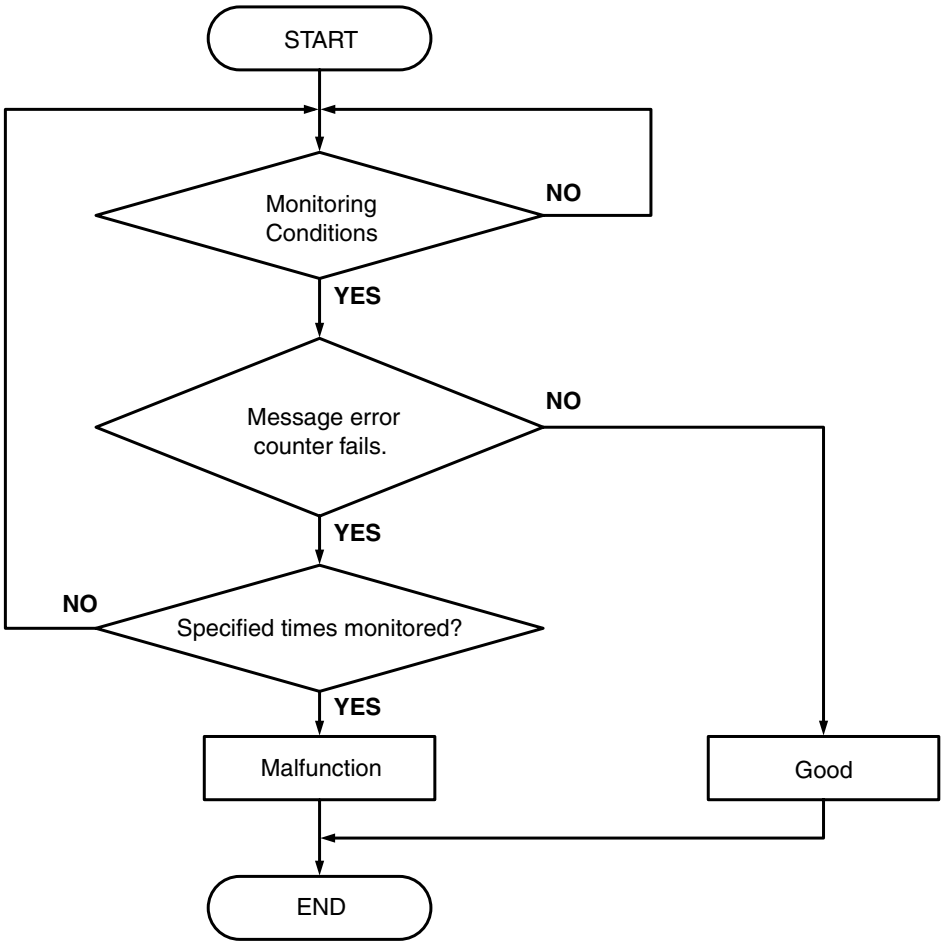
Sensor (The sensor below is determined to be normal)

- Not applicable

TSB Revision

DTC SET CONDITIONS

Logic Flow Chart



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Check Condition

- Ignition switch: "ON"
- Battery positive voltage is higher than 10 volts
- Engine coolant temp -30°C(-22°F) to 105°C(221°F)

Judgement Criteria

- The radiator sensor cannot receive the data from the PCM <When P1540 is set>.
- The PCM cannot receive the data from the radiator sensor <When P1541 is set>.
- When the PCM is defective

TROUBLESHOOTING HINTS (THE MOST LIKELY CAUSES FOR THIS CODE TO BE SET ARE:)

- Tampering of the DOR radiator
- Malfunction of the PCM
- A poor connection, open circuit, short circuit or damaged circuit is present in the radiator sensor circuit.

DIAGNOSIS

Required Special Tools:

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

TSB Revision

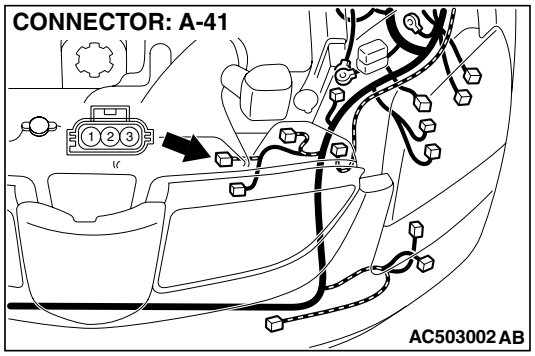
STEP 1. Measure the battery positive voltage.

(1) Measure the battery positive voltage during cranking.
- The voltage should remain greater than 8 volts while the engine is cranked.

Q: Does the voltage remain greater than 8 volts while the engine is cranked?

YES : Go to Step 2.
NO : Refer to GROUP 54A, Battery – Battery check P.54A-6.

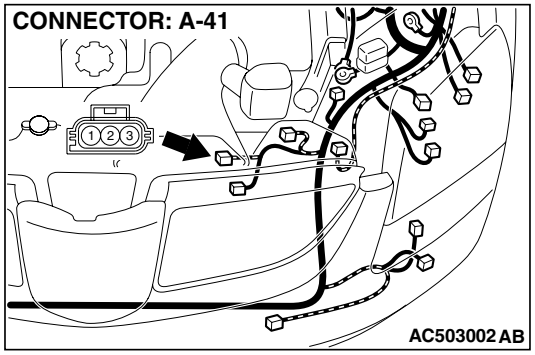
STEP 2. Check harness connector A-41 at the radiator sensor for damage.



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 go to Step 9.

STEP 3. Measure the supply voltage at radiator sensor connector A-41.



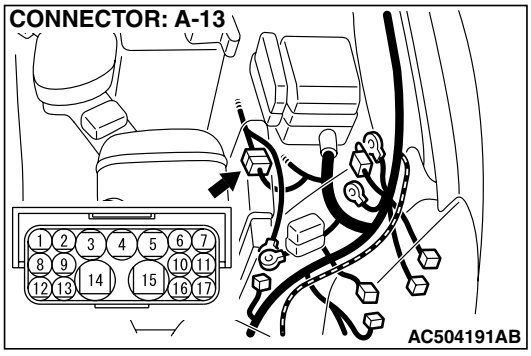
(1) Disconnect radiator sensor harness connector A-41.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between harness connector A-41 terminal No.3 and ground.
- The voltage should equal battery positive voltage.

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

Q: Is the measured voltage battery positive voltage?

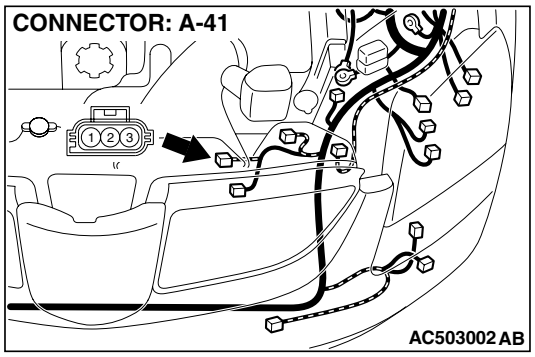
YES : Go to Step 6.
NO : Go to Step 4.

STEP 4. Check intermediate connector A-13 for loose, corroded or damaged terminals, or terminals pushed back in the connector.



Q: Are the connectors and terminals in good condition?

YES : Go to Step 5.
NO : Repair or replace the damaged components. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 9.

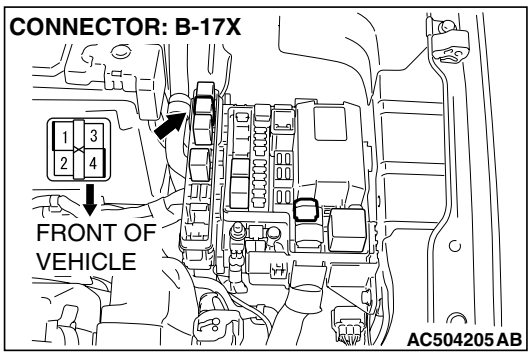


STEP 5. Check for harness damage between radiator sensor connector A-41 (terminal No.3) and MFI relay connector B-17X (terminal No.4).

Q: Is the harness wire in good condition?

YES : Then go to Step 6.

NO : Repair it. Then go to Step 9.



STEP 6. Check for continuity at radiator sensor harness side connector A-41

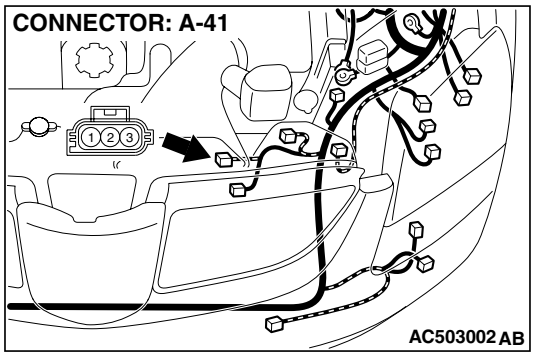
(1) Disconnect the connector A-41 and measure at the harness side.

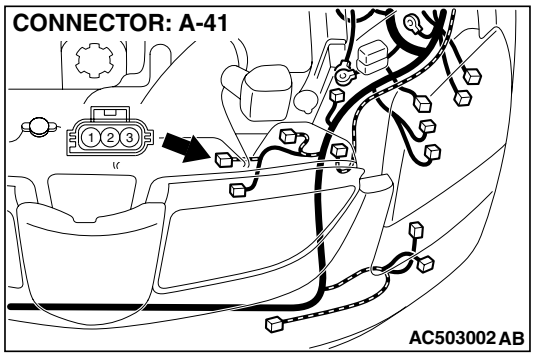
(2) Check for the continuity between terminal No.1 and ground.
- Should be less than 2 ohms.

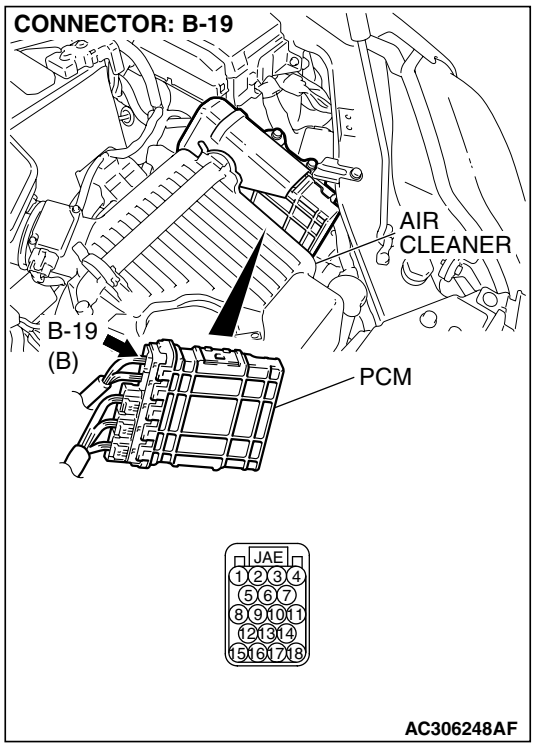
Q: Does continuity exist?

YES : Go to Step 7.

NO : Repair it. Then go to Step 9.







STEP 7. Check for harness damage between radiator sensor connector A-41 (terminal No.1) and PCM connector B-19 (terminal No.3).

- Check the communication lines for earth circuit. <When P1540 is set>
- Check the communication lines for open circuit. <When P1541 is set>

Q: Is the harness wire in good condition?

YES : Go to Step 8.
NO : Repair it. Then go to Step 9.

STEP 8. Replace the DOR radiator

Check the diagnostic trouble code (DTC).

Q: Is DTC P1540 or P1541 set?

YES : Replace the PCM. Then go to Step 9.
NO : The procedure is complete.

STEP 9. Perform the OBD-II drive cycle.

Check the diagnostic trouble code (DTC).

Q: Is DTC P1540 or P1541 set?

YES : Repeat the troubleshooting.
NO : The procedure is complete.

DTC P1543: DOR Radiator Tampering Monitor (Temperature Check After Thermostat Open)

RADIATOR SENSOR CIRCUIT
Refer to P.13A-862.

CIRCUIT OPERATION
Refer to P.13A-862.

MONITOR EXECUTION
- Once per driving cycle

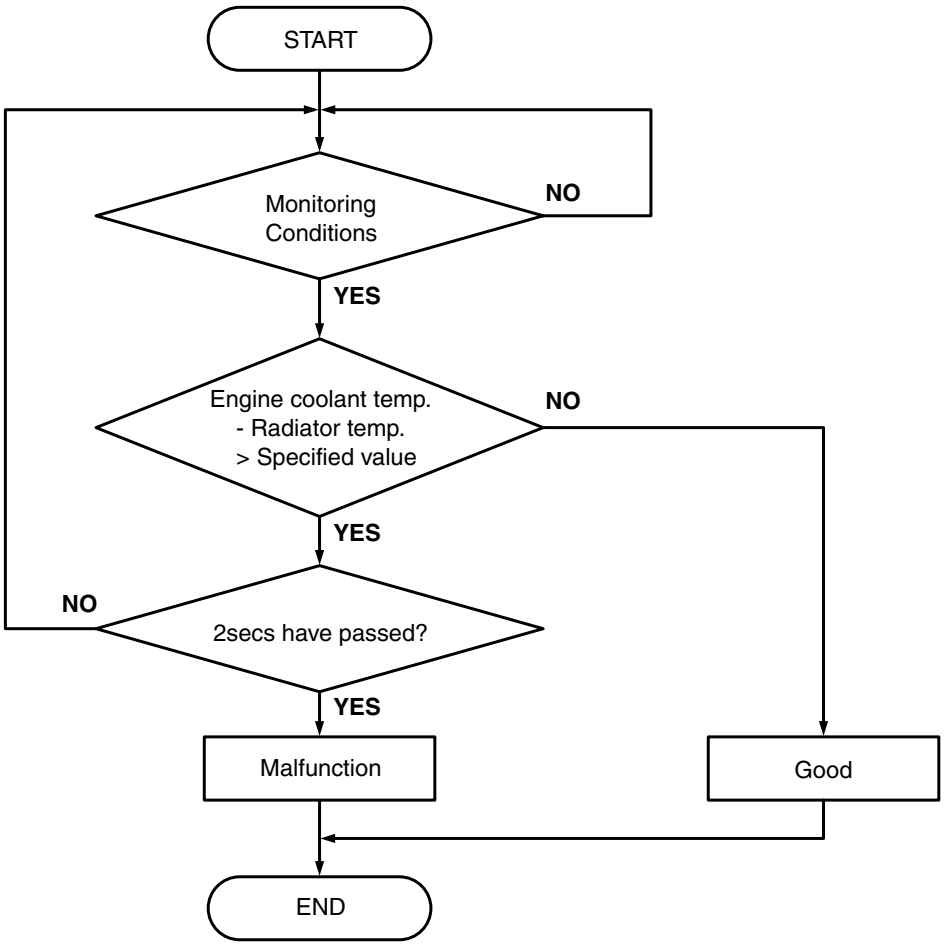
MONITOR EXECUTION CONDITIONS (OTHER MONITOR AND SENSOR)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)
- Not applicable

Sensor (The sensor below is determined to be normal)
- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



AC502906AC

Check Condition
- Battery positive voltage is higher than 11 volts.
- Intake air temp from 0 °C(32°F) to 40 °C(104°F).
- Engine coolant temperature is less than 40 °C(104°F).
- The engine coolant temperature - intake air temperature is 5°C (41°F) or less at engine is start.
- When the engine coolant temperature is 77°C (171°F) or higher under the following conditions.
  1. Drive the vehicle at the engine speed of 1,700 r/min or more for 10 minutes.

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2. The engine load is 30 percent or more.

Judgement Criteria

- When the output temperature of the radiator sensor after the thermostat valve is opened is low

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 18 P.13A-9.

TROUBLESHOOTING HINTS (THE MOST LIKELY CAUSES FOR THIS CODE TO BE SET ARE:)

- Tampering of the DOR radiator
- Engine coolant is insufficient or has deteriorated.
- Malfunction of the thermostat
- Malfunction of the water pump
- Malfunction of the PCM

DIAGNOSIS

Required Special Tools:

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

STEP 1. Check the engine coolant.

- If the engine coolant is reducing to much, check for coolant leaks and repair if necessary.

Q: Is the check result normal?

YES : Go to Step 2.
NO : Replace or replenish the engine coolant.

STEP 2. Check the thermostat.

- Thermostat inspection (Refer to GROUP 14, Thermostat inspection P.14-20).

Q: Is the check result normal?

YES : Go to Step 3.
NO : Repair it. Then go to Step 6.

STEP 3. Water pump check

- Water pump check

Q: Is the check result normal?

YES : Go to Step 4.
NO : Repair it. Then go to Step 6.

STEP 4. DOR radiator sensor installation check

- Check that the sensor is installed securely and operates normally.

Q: Is the check result normal?

YES : Go to Step 5.
NO : Replace the DOR radiator. Then go to Step 6.

STEP 5. Replace the DOR radiator

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 18 P.13A-9.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P1543 set?

YES : Replace the PCM. Then go to Step 6.
NO : The procedure is complete.

STEP 6. Perform the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 18 P.13A-9.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P1543 set?

YES : Repeat the troubleshooting.
NO : The procedure is complete.

DTC P1544: DOR Radiator Tampering Monitor (Temperature Check Before Thermostat Open)

RADIATOR SENSOR CIRCUIT
Refer to P.13A-862.

CIRCUIT OPERATION
Refer to P.13A-862.

MONITOR EXECUTION
- Once per driving cycle

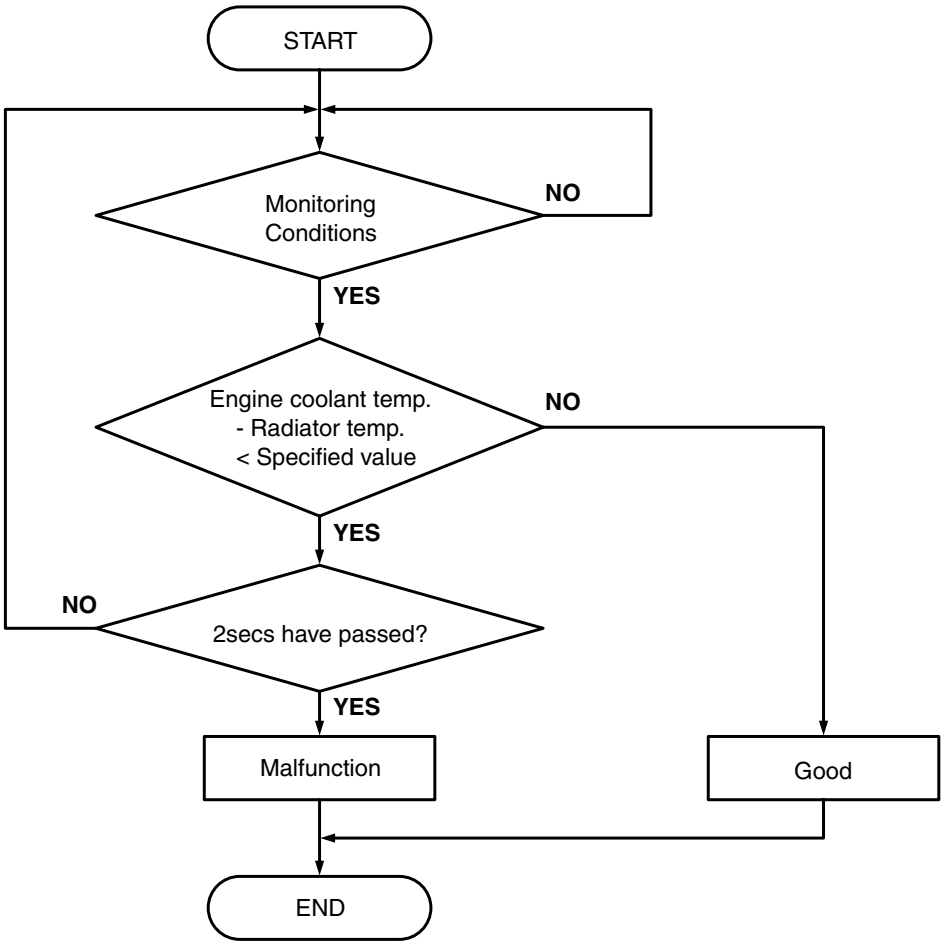
MONITOR EXECUTION CONDITIONS (OTHER MONITOR AND SENSOR)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)
- Not applicable

Sensor (The sensor below is determined to be normal)
- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



AC502906AD

Check Condition

- Battery positive voltage is higher than 11 volts.
- Intake air temp from 0 °C(32°F) to 40 °C(104°F).
- Engine coolant temperature is less than 40 °C(104°F) when at engine start.
- The engine coolant temperature - intake air temperature is 5°C (41°F) or less at engine start.
- Vehicle speed is lower than 1.5km/h (1mph).

Judgement Criteria

- When the output temperature of the radiator sensor before the thermostat valve is opened is high, the sensor is defective.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 19 P.13A-9.

TROUBLESHOOTING HINTS (THE MOST LIKELY CAUSES FOR THIS CODE TO BE SET ARE:)

- Tampering of the DOR radiator
- Malfunction of the thermostat
- Engine coolant is insufficient or has deteriorated.
- Malfunction of the water pump
- Malfunction of the PCM

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable

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- MB991910: Main Harness A

STEP 1. Check the thermostat.
- Thermostat inspection (Refer to GROUP 14, Thermostat inspection P.14-20).

Q: Is the check result normal?

YES : Go to Step 2.
NO : Repair it. Then go to Step 4.

STEP 2. DOR radiator sensor installation check
- Check that the sensor is installed securely and operates normally.

Q: Is the check result normal?

YES : Go to Step 3.
NO : Replace the DOR radiator. Then go to Step 4.

STEP 3. Replace the DOR radiator
(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 19 P.13A-9.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P1544 set?

YES : Replace the PCM. Then go to Step 4.
NO : The procedure is complete.

STEP 4. Perform the OBD-II drive cycle.
(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 19 P.13A-9.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P1544 set?

YES : Repeat the troubleshooting.
NO : The procedure is complete.

DTC P1545: DOR Radiator Tampering Monitor (Temperature Change After Thermostat Open)

RADIATOR SENSOR CIRCUIT
Refer to P.13A-862.

CIRCUIT OPERATION
Refer to P.13A-862.

MONITOR EXECUTION
- Continuous

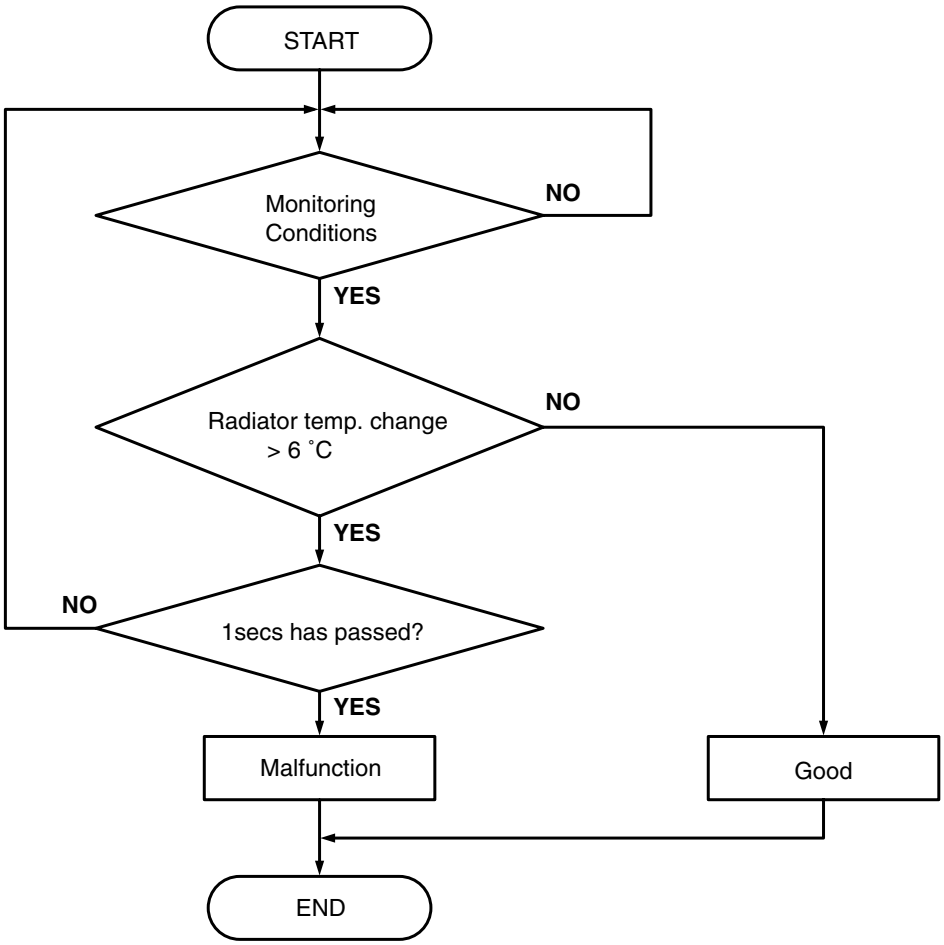
MONITOR EXECUTION CONDITIONS (OTHER MONITOR AND SENSOR)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)
- Not applicable

Sensor (The sensor below is determined to be normal)
- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



AC502906AE

Check Condition

- Battery positive voltage is higher than 11 volts.
- Intake air temp from 0 °C(32°F) to 40 °C(104°F).
- Engine coolant temperature is less than 40 °C(104°F) at engine start.
- The engine coolant temperature - intake air temperature is 5°C (41°F) or less when at engine start.
- Engine coolant temperature is higher than 77°C (171°F).

Judgement Criteria

- When the output temperature of the radiator sensor after the thermostat valve is opened is rising by 6°C (43°F) or more in 1 second.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 19 P.13A-9.

TROUBLESHOOTING HINTS (THE MOST LIKELY CAUSES FOR THIS CODE TO BE SET ARE:)

- Tampering of the DOR radiator

DIAGNOSIS

Required Special Tools:

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

TSB Revision

STEP 1. DOR radiator sensor installation check
- Check that the sensor is installed securely and operates normally.

Q: Is the check result normal?

YES : Go to Step 2.
NO : Replace the DOR radiator. Then go to Step 3.

STEP 2. Replace the DOR radiator
(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 19 P.13A-9.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P1545 set?

YES : Replace the PCM. Then go to Step 3.
NO : The procedure is complete.

STEP 3. Perform the OBD-II drive cycle.
(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 19 P.13A-9.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P1545 set?

YES : Repeat the troubleshooting.
NO : The procedure is complete.

DTC P1546: DOR Radiator Tampering Monitor (Temperature Check at Cold Start)

RADIATOR SENSOR CIRCUIT
Refer to P.13A-862.

CIRCUIT OPERATION
Refer to P.13A-862.

MONITOR EXECUTION
- Once per driving cycle

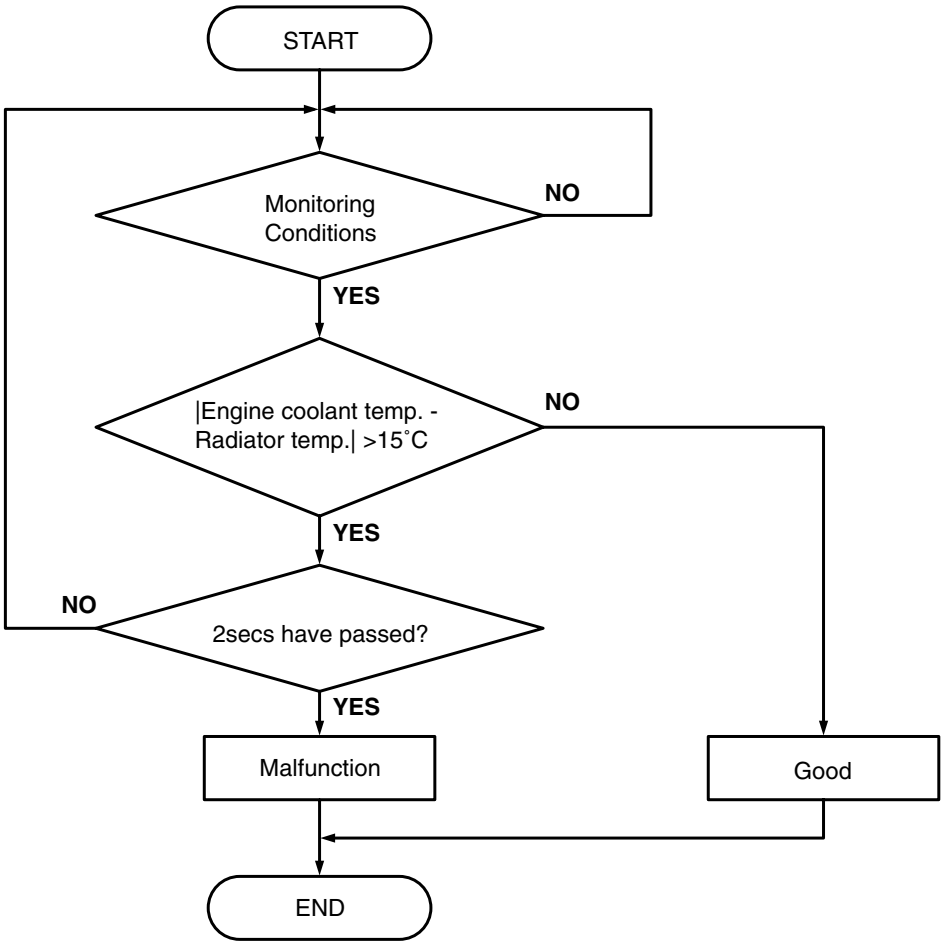
MONITOR EXECUTION CONDITIONS (OTHER MONITOR AND SENSOR)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)
- Not applicable

Sensor (The sensor below is determined to be normal)
- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



AC502906AF

Check Condition

- Battery positive voltage is higher than 11 volts.
- Intake air temp from 0 °C(32°F) to 40 °C(104°F).
- Engine coolant temperature is less than 40 °C(104°F) at engine start.
- The engine coolant temperature - intake air temperature is 5°C (41°F) or less at engine start.

Judgement Criteria

- When the difference between the radiator sensor output temperature after the engine is started and the coolant temperature is 15°C (59°F) or more.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 19 P.13A-9.

TROUBLESHOOTING HINTS (THE MOST LIKELY CAUSES FOR THIS CODE TO BE SET ARE:)

- Tampering of the DOR radiator

DIAGNOSIS

Required Special Tools:

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

TSB Revision

STEP 1. DOR radiator sensor installation check
- Check that the sensor is installed securely and operates normally.

Q: Is the check result normal?

YES : Go to Step 2.
NO : Replace the DOR radiator. Then go to Step 3.

STEP 2. Replace the DOR radiator
(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 19 P.13A-9.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P1546 set?

YES : Replace the PCM. Then go to Step 3.
NO : The procedure is complete.

STEP 3. Perform the OBD-II drive cycle.
(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 19 P.13A-9.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P1546 set?

YES : Repeat the troubleshooting.
NO : The procedure is complete.

DTC P1547: DOR Radiator Tampering Monitor (Rationality Check)

RADIATOR SENSOR CIRCUIT
Refer to P.13A-862.

CIRCUIT OPERATION
Refer to P.13A-862.

MONITOR EXECUTION
- Once per driving cycle

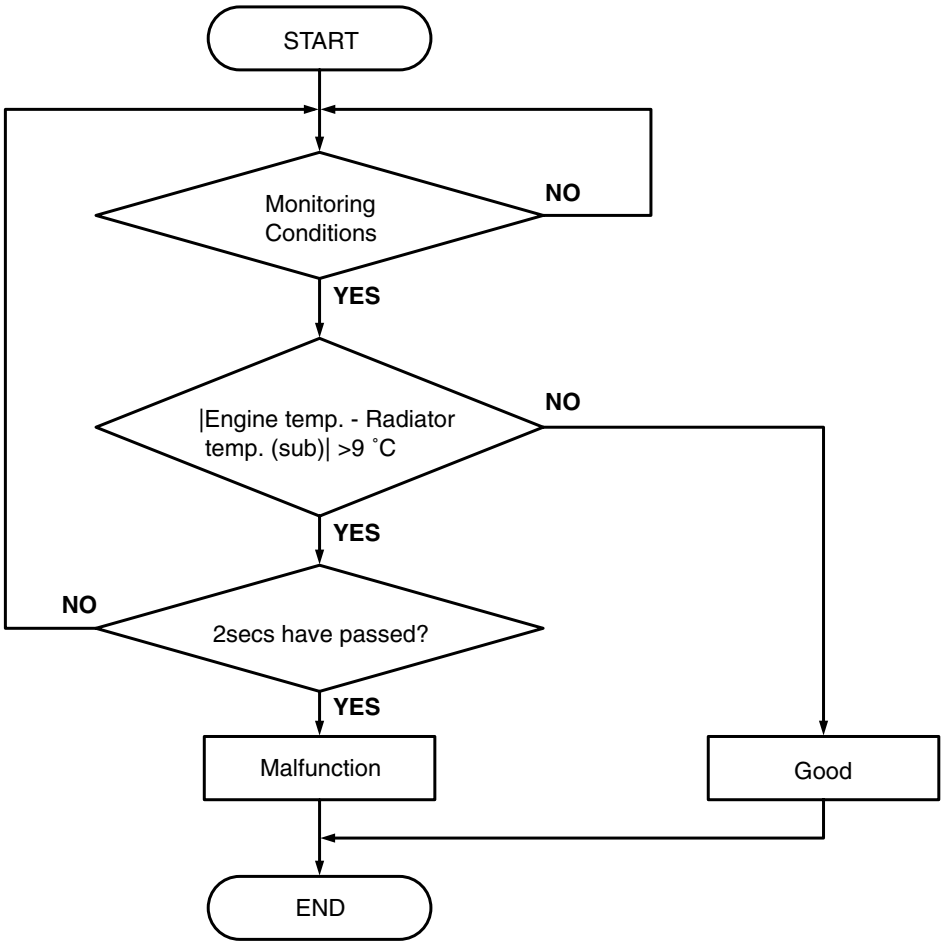
MONITOR EXECUTION CONDITIONS (OTHER MONITOR AND SENSOR)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)
- Not applicable

Sensor (The sensor below is determined to be normal)
- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



AC502906AG

Check Condition

- Battery positive voltage is higher than 11 volts.
- Intake air temp from 0 °C(32°F) to 40 °C(104°F).
- Engine coolant temperature is less than 40 °C(104°F) when the engine started.
- The engine coolant temperature - intake air temperature is 5°C (41°F) or less at engine start.
- When the engine coolant temperature is 77°C (171°F) or higher under the following conditions.
  1. Drive the vehicle at the engine speed of 1,700 r/min or more for 10 minutes.
  2. The engine load is 30 percent or more.

Judgement Criteria

- The temperature difference between thermistor 1 and thermistor 2 is 6°C (43°F) or more.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 18 P.13A-9.

TROUBLESHOOTING HINTS (THE MOST LIKELY CAUSES FOR THIS CODE TO BE SET ARE:)

- Tampering of the DOR radiator

TSB Revision

DIAGNOSIS

Required Special Tools:
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A

STEP 1. DOR radiator sensor installation check
- Check that the sensor is installed securely and operates normally.

Q: Is the check result normal?

YES : Go to Step 2.
NO : Replace the DOR radiator. Then go to Step 3.

STEP 2. Replace the DOR radiator
(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 18 P.13A-9.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P1547 set?

YES : Replace the PCM. Then go to Step 3.
NO : The procedure is complete.

STEP 3. Perform the OBD-II drive cycle.
(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 18 P.13A-9.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P1547 set?

YES : Repeat the troubleshooting.
NO : The procedure is complete.

DTC P1580: DOR Radiator Tampering Monitor (Encrypted Message)

RADIATOR SENSOR CIRCUIT
Refer to P.13A-862.

CIRCUIT OPERATION
Refer to P.13A-862.

MONITOR EXECUTION
- Continuous

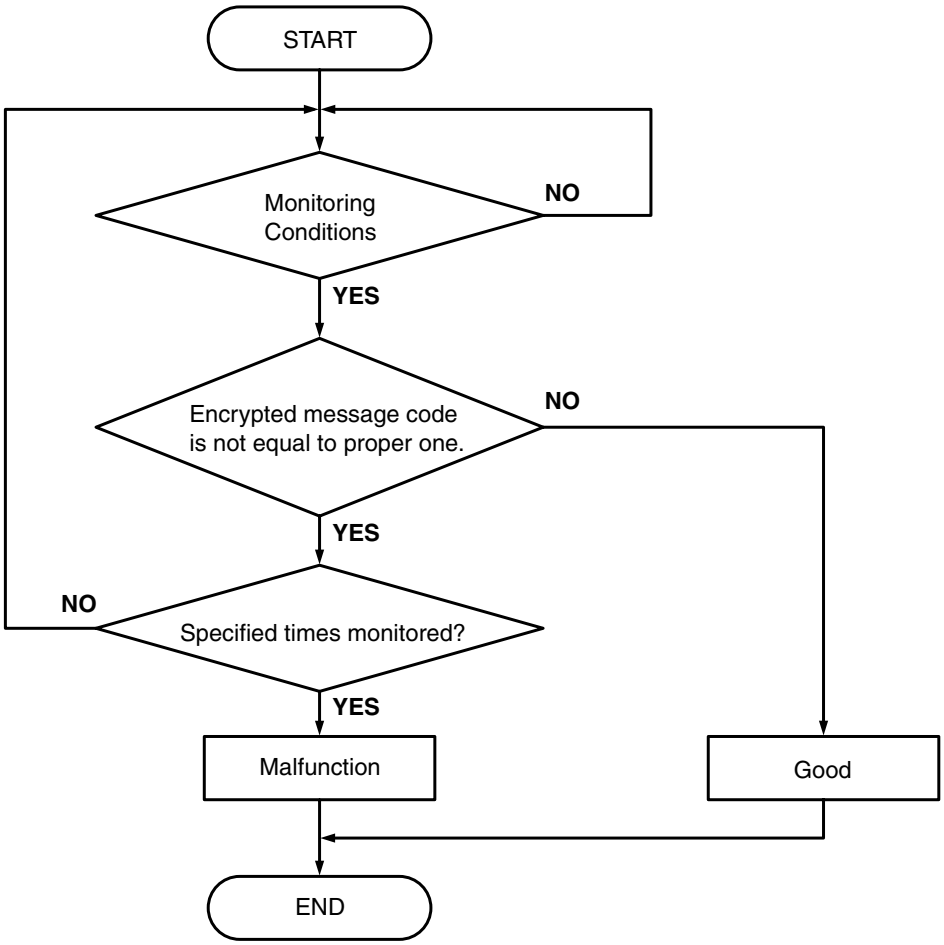
MONITOR EXECUTION CONDITIONS (OTHER MONITOR AND SENSOR)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)
- Not applicable

Sensor (The sensor below is determined to be normal)
- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



AC502906AH

Check Condition

- Battery positive voltage is higher than 11 volts
- Engine coolant between -30°C(-22°F) and 110°C(230°F)

Judgement Criteria

- Communication error

TROUBLESHOOTING HINTS (THE MOST LIKELY CAUSES FOR THIS CODE TO BE SET ARE:)

- Malfunction of the radiator sensor
- Malfunction of the PCM

DIAGNOSIS

Required Special Tools:

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

TSB Revision

STEP 1. Replace the DOR radiator
Check the diagnostic trouble code (DTC).

Q: Is DTC P1580 set?

YES : Replace the PCM. Then go to Step 2.
NO : The procedure is complete.

STEP 2. Perform the OBD-II drive cycle.
Check the diagnostic trouble code (DTC).

Q: Is DTC P1580 set?

YES : Repeat the troubleshooting.
NO : The procedure is complete.

DTC P1602: Communication Malfunction (between PCM Main Processor and System LSI)

TECHNICAL DESCRIPTION
- PCM checks the communication status for abnormal conditions.

DESCRIPTIONS OF MONITOR METHODS
Communication between PCM main processor and system LSI is impossible.

MONITOR EXECUTION
Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)
- Not applicable

Sensor (The sensor below is determined to be normal)
- Not applicable

DTC SET CONDITIONS

Check Condition
- Ignition switch is "ON" position.

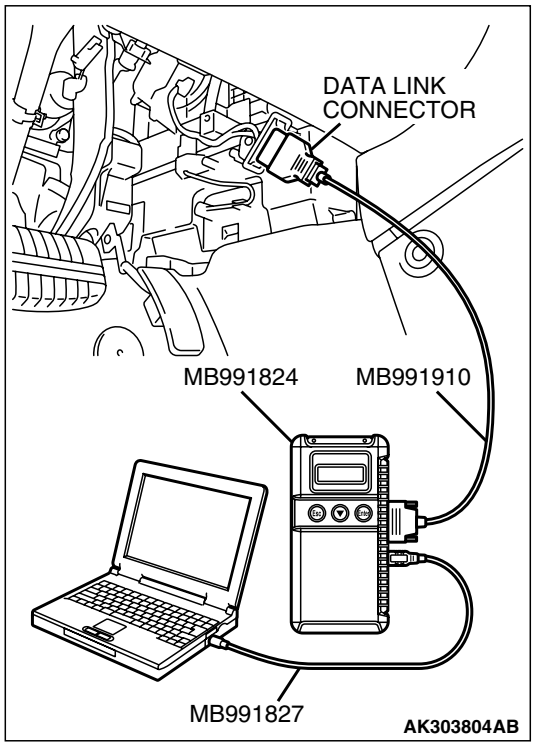
Judgement Criterion
- PCM detects an error in communication between PCM main processor and system LSI for 0.07 second.

OBD-II DRIVE CYCLE PATTERN
None.

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

DIAGNOSIS

Required Special Tools:
- MB991958: Scan Tool (M.U.T.-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) After the DTC has been deleted, read the DTC again.
(4) Turn the ignition switch to the "LOCK"(OFF) position.

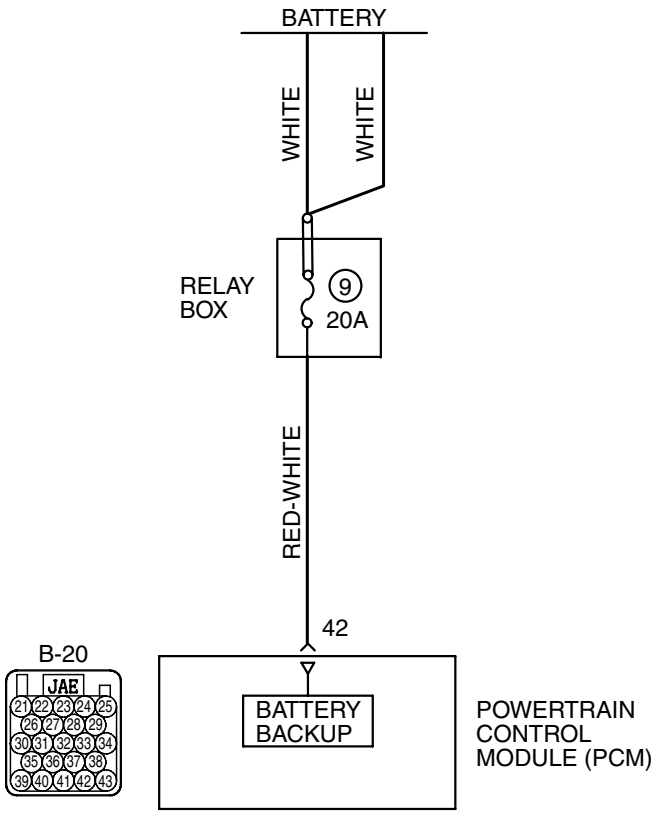
Q: Is DTC P01602 set?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11.

NO : It can be assumed 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.

DTC P1603: Battery Backup Line Malfunction

Battery Backup Circuit



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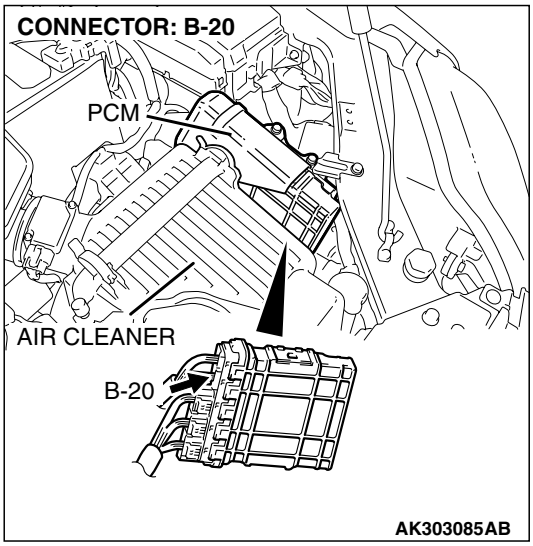


TSB Revision

TECHNICAL DESCRIPTION

- The PCM checks the open circuit of battery backup line.

NOTE: When the system detects an open circuit in the battery backup line, it makes 1 failure judgment of other diagnostic trouble codes (DTCs).

DESCRIPTIONS OF MONITOR METHODS

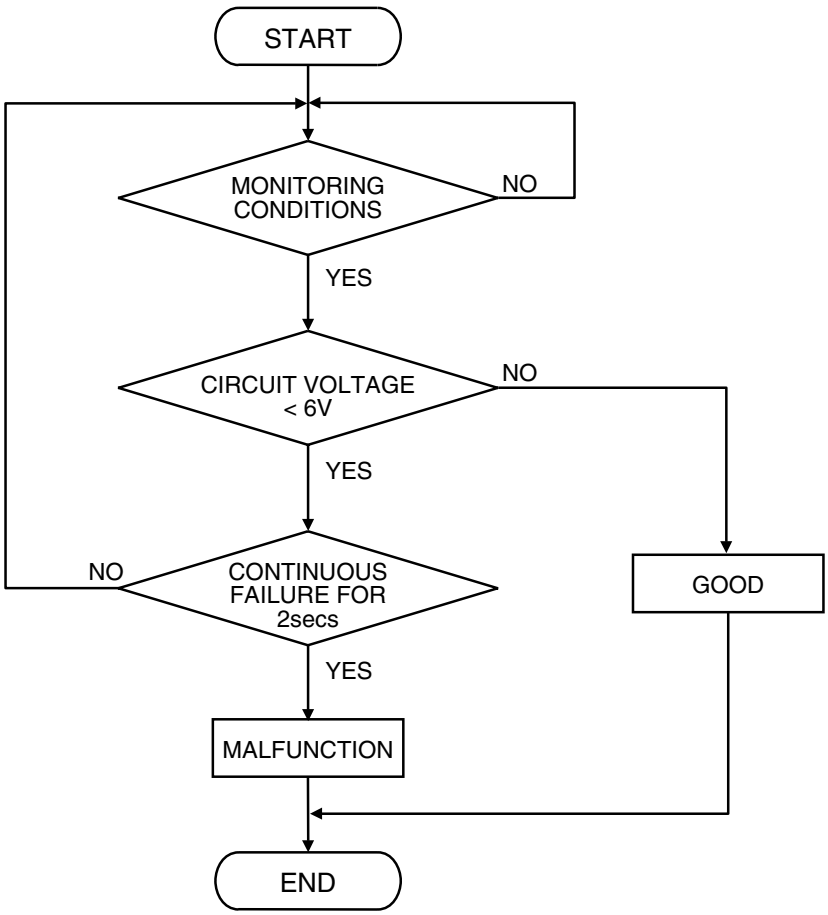
Battery backup line voltage is under specified value.

MONITOR EXECUTION

Continuous

DTC SET CONDITIONS

Logic Flow Chart



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Check Conditions

- Engine starting sequence was completed.
- Battery positive voltage is higher than 10 volts.

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

Judgement Criterion

- Battery backup line voltage has continued to be 6 volts or lower for 2 seconds.

TSB Revision

OBD-II DRIVE CYCLE PATTERN
None.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)
- Open or shorted battery backup line, harness damage or connector damage.
- PCM failed.

DIAGNOSIS

Required Special Tools:
- MB991958: Scan tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A
- MB991923: Power Plant ECU Check Harness

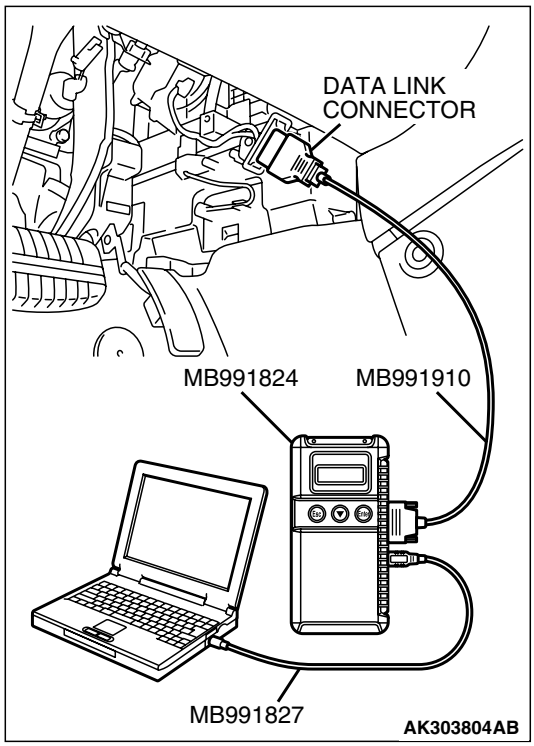
STEP 1. Using scan tool MB991958, read the diagnostic trouble code (DTC).

⚠ 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) Erase the DTC.
(4) Start the engine and run it at idle.
(5) Read the DTC.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

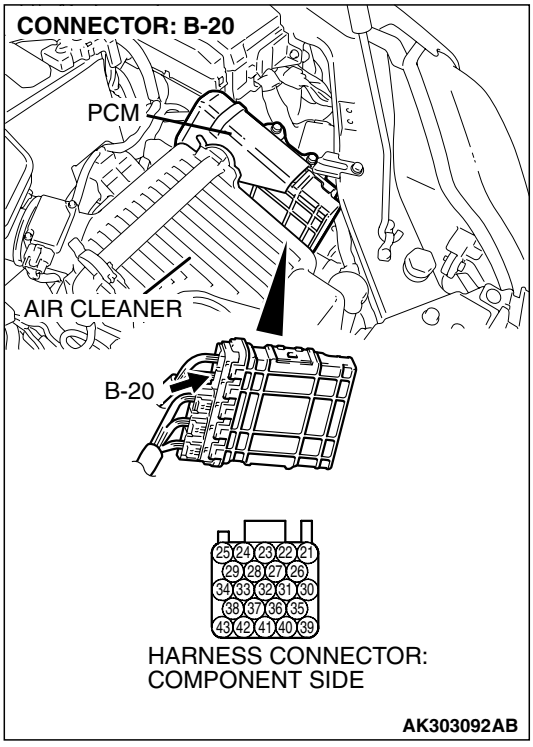
Q: Is DTC P1603 set?

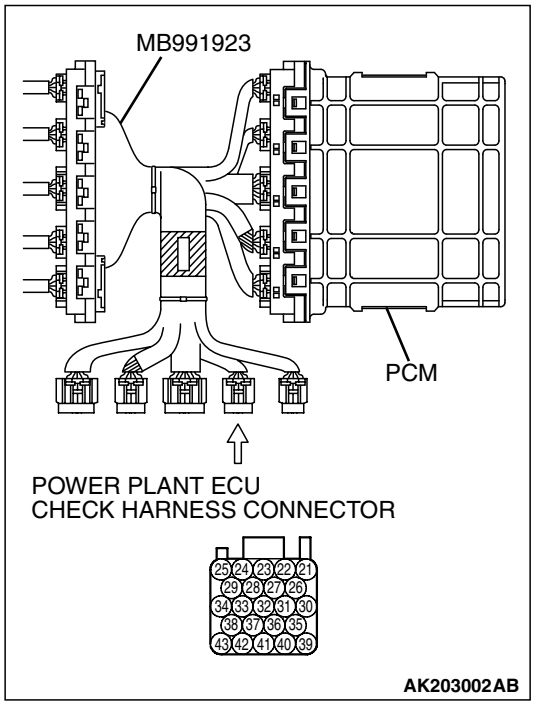
YES : Go to Step 2.
NO : The inspection is complete.

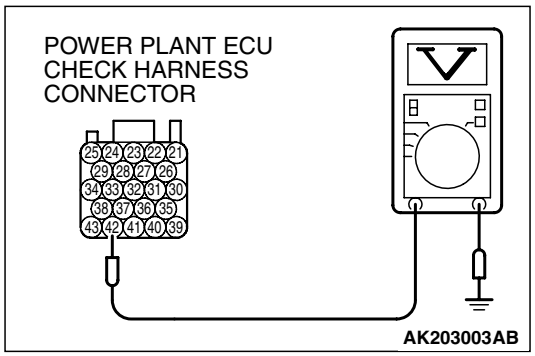


STEP 2. Measure the backup power supply voltage at PCM connector B-20 by using power plant ECU check harness special tool MB991923.

(1) Disconnect all PCM connectors. Connect the power plant ECU check harness special tool MB991923 between the separated connectors.







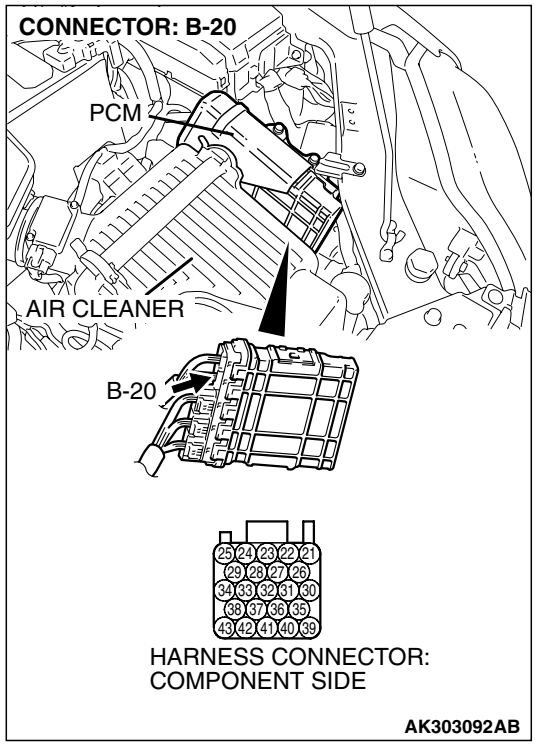
(2) Measure the voltage between terminal No. 42 and ground.
- Voltage should be battery positive voltage.

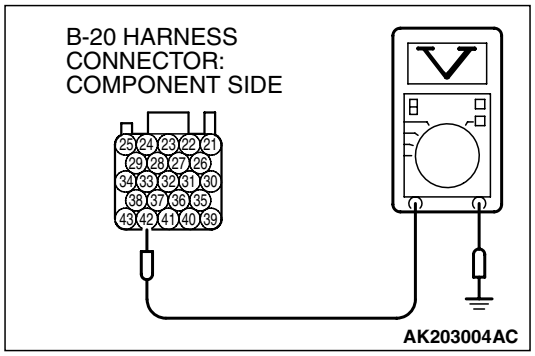
Q: Is battery positive voltage (approximately 12 volts) present?

YES : Go to Step 5.
NO : Go to Step 3.

STEP 3. Measure the backup power supply voltage at PCM harness side connector B-20.

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

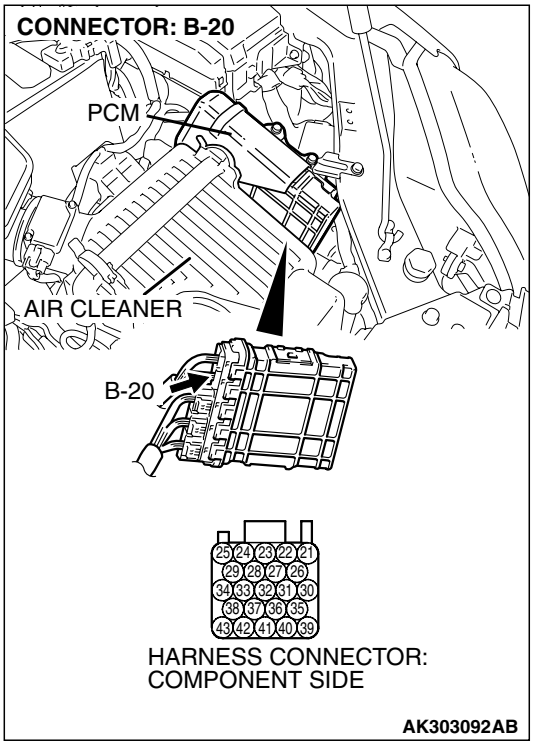




(2) Measure the voltage between terminal No. 42 and ground.
- Voltage should be battery positive voltage.

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

YES : Go to Step 4.
NO : Repair harness wire between battery and PCM connector B-20 (terminal No. 42) because of open circuit or short circuit to ground. Then go to Step 6.

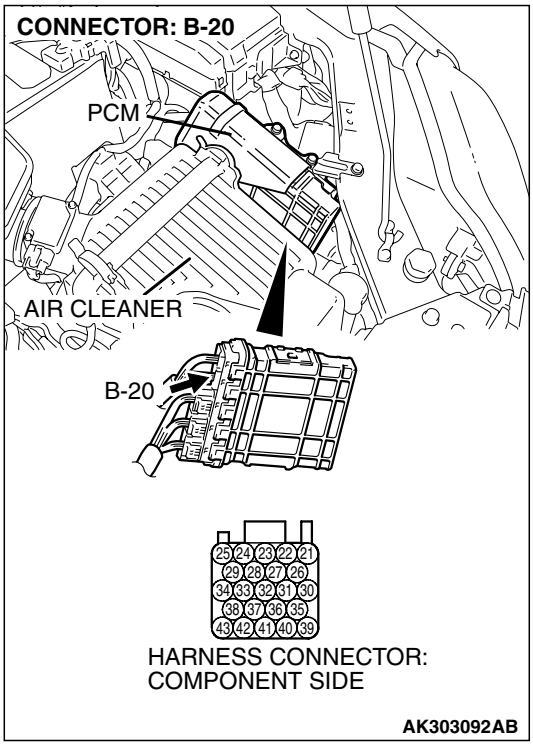


STEP 4. Check harness connector B-20 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Repair harness wire between battery and PCM connector B-20 (terminal No. 42) because of harness damage. Then go to Step 6.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 6.

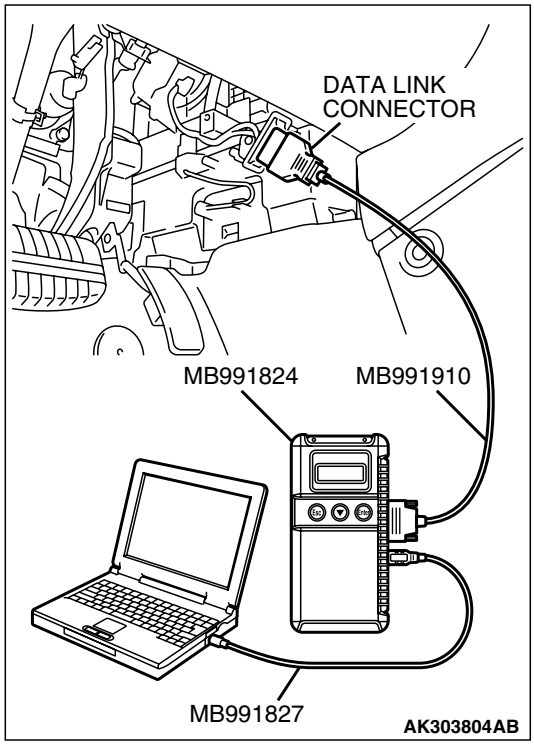


STEP 5. Check harness connector B-20 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 6.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 6.



STEP 6. 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.

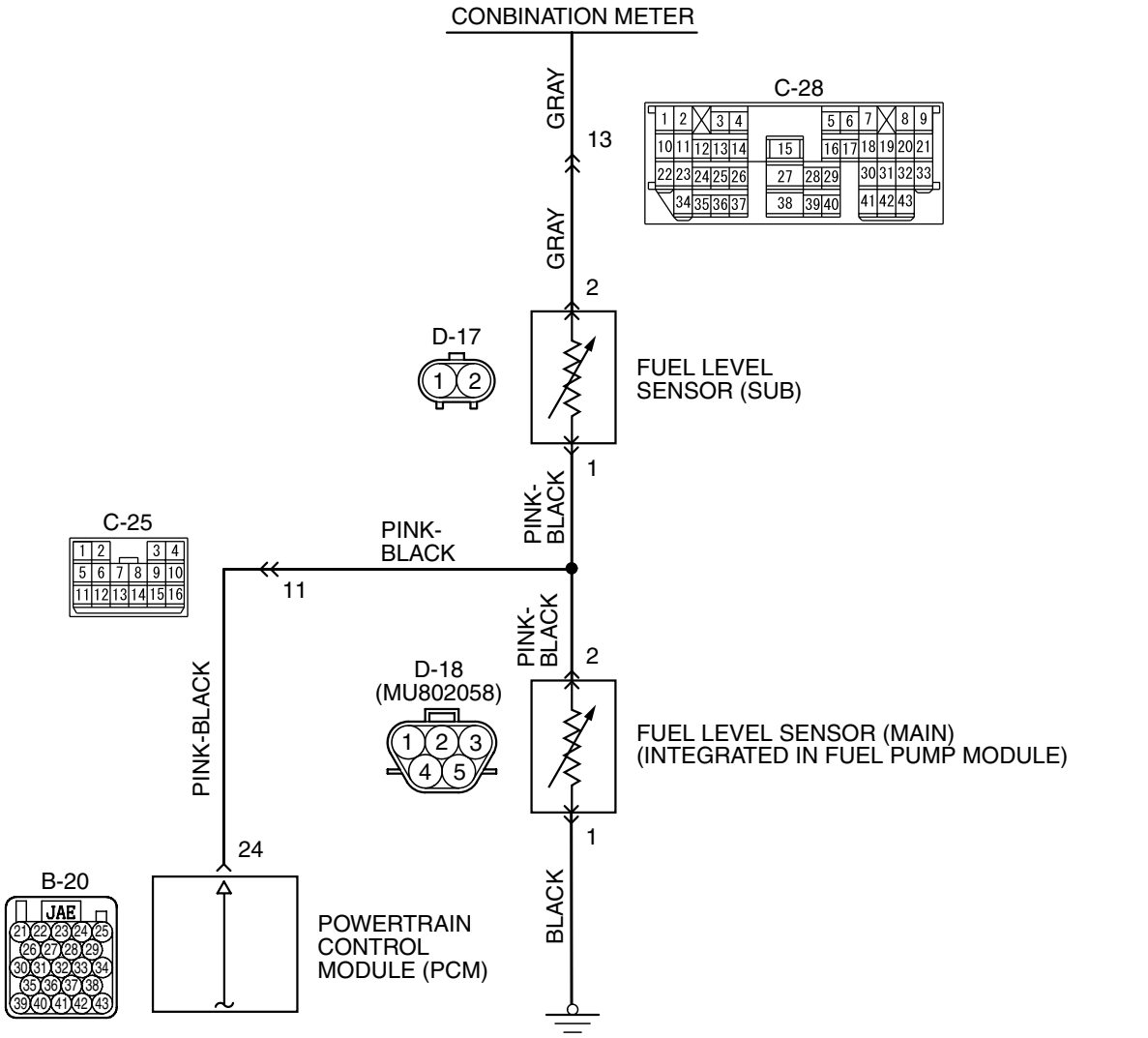
(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC P1603 set?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P2066: Fuel Level Sensor (sub) Circuit Range/Performance

Fuel Level Sensor Circuit



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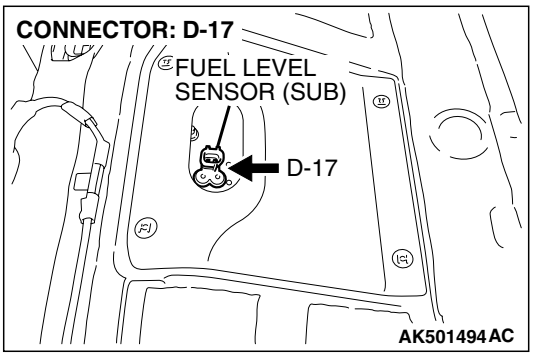
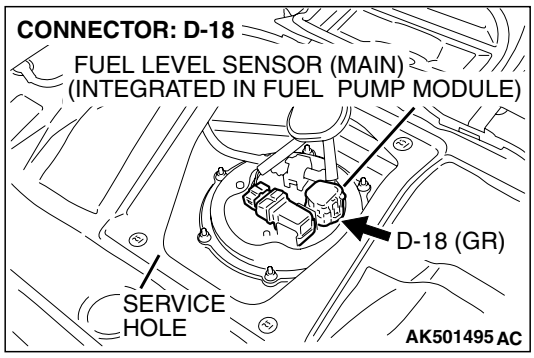
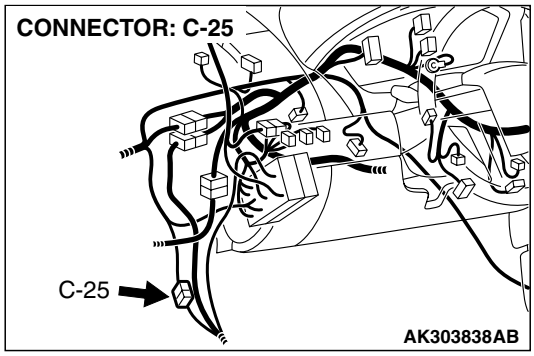
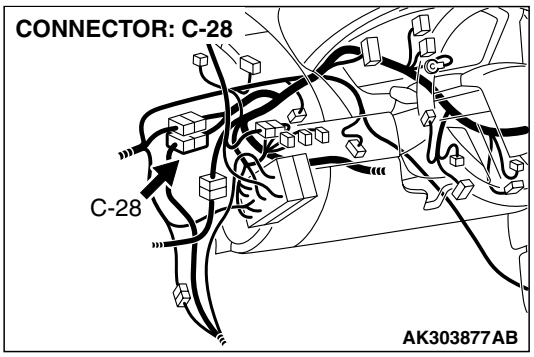
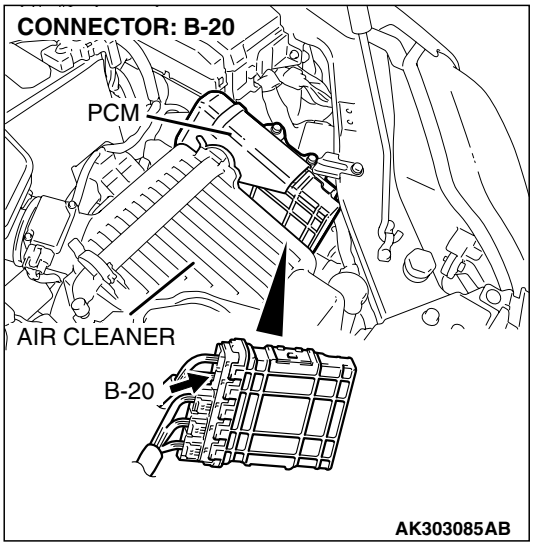




TSB Revision







CIRCUIT OPERATION
- The fuel level sensor (sub) drive signal is input in combination meter (terminal No. 13).

TECHNICAL DESCRIPTION
- Branch the drive signal from the fuel level sensor circuit, and input it into combination meter.
- The combination meter detects the amount of fuel left in the fuel tank with this signal, and also controls the fuel level warning light.

DESCRIPTIONS OF MONITOR METHODS

Detect malfunction if change of fuel level sensor output voltage is small when sum of fuel injection is large.

MONITOR EXECUTION

Continuous

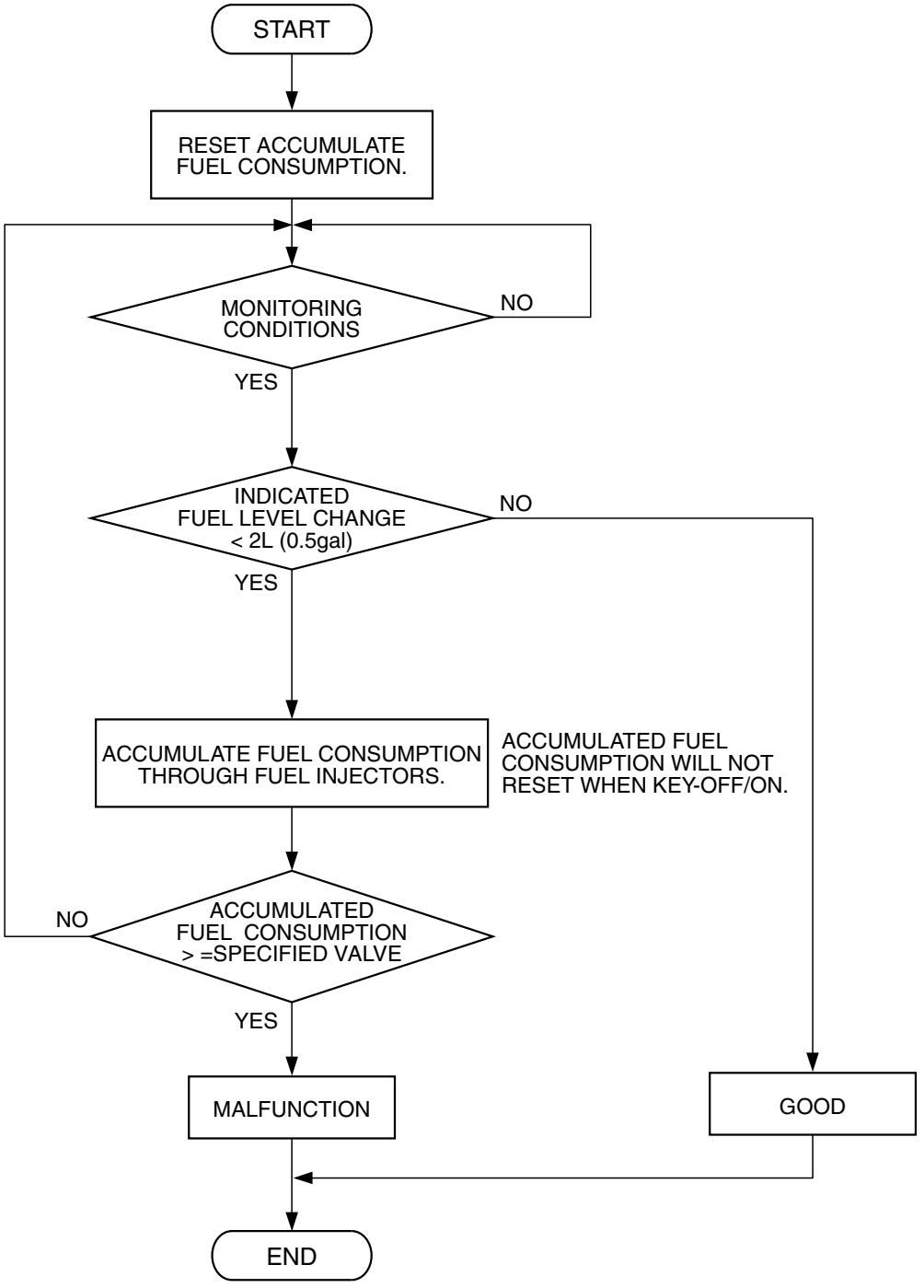
MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)
- Not applicable

Sensor (The sensor below is determined to be normal)
- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



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TSB Revision

Check Condition, Judgement Criterion

- When the fuel consumption calculated from the operation time of the injector amounts to 30 liters (7.9 gal), the diversity of the amount of fuel in tank calculated from the fuel level sensor is 2 liters (0.5 gal) or less.

OBD-II DRIVE CYCLE PATTERN

None.

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

- Fuel pump module or fuel level sensor (sub) failed.
- PCM failed.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan tool (M.U.T.-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).

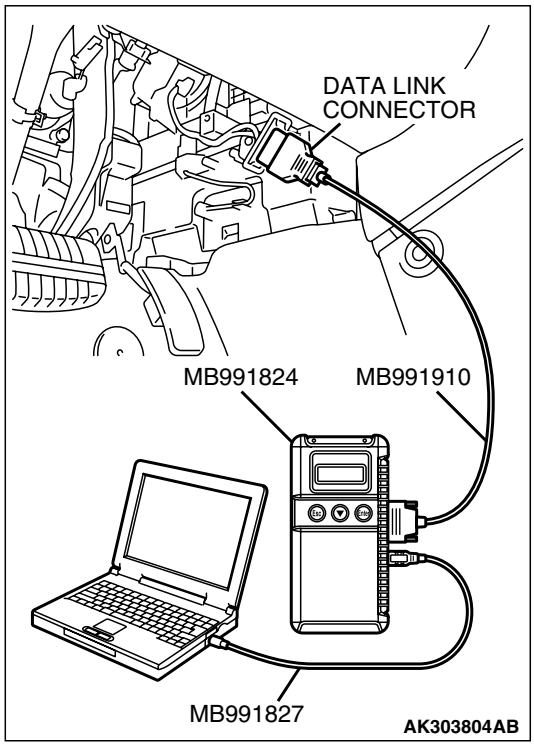
⚠ CAUTION

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 DTC P0461 set?

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



STEP 2. Check fuel gauge.

Q: Is the fuel gauge functioning?

YES : Go to Step 3.
NO : Refer to GROUP 54A, Chassis Electrical – Combination Meter Assembly – Trouble Symptom Chart P.54A-86.

STEP 3. Check the trouble symptoms.
Check that the fuel gauge operates correctly.

Q: Does the fuel gauge operate correctly?

YES : It can be assumed 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 : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11.Then go to Step 6.

STEP 4. Check the fuel level sensor (sub).
Check to see if the fuel level sensor is normal. Refer to GROUP 54A, Chassis Electrical – Combination Meters Assembly and Vehicle Speed Sensor – On-Vehicle Service – Fuel Level Sensor Check P.54A-121.

Q: Is the fuel level sensor (sub) normal?

YES : Go to Step 5.

NO : Replace the fuel level sensor (sub). Then go to Step 6.

STEP 5. Check the trouble symptoms.
Check that the fuel gauge operates correctly.

Q: Does the fuel gauge operate correctly?

YES : It can be assumed 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 : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11.Then go to Step 6.

STEP 6. Check the trouble symptoms.
Check that the fuel gauge operates correctly.

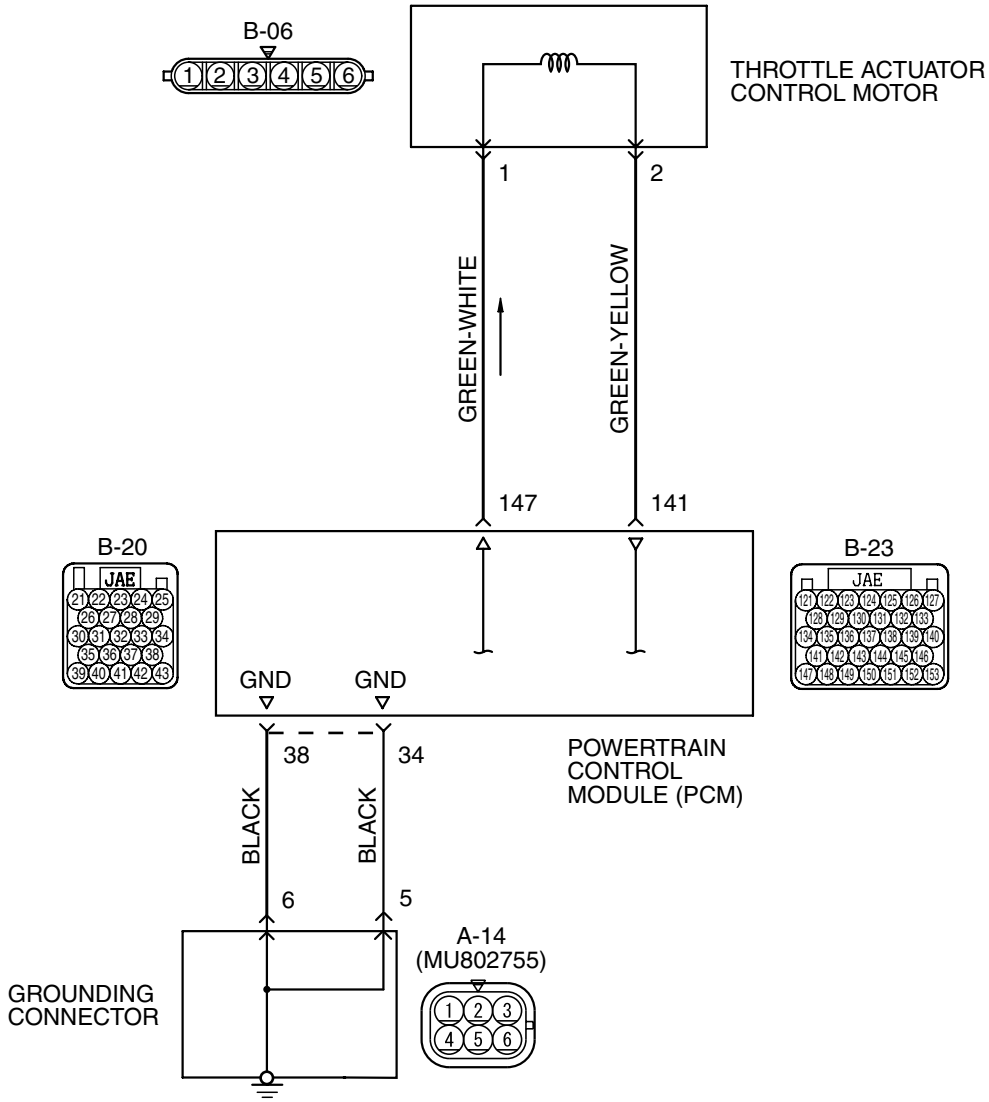
Q: Does the fuel gauge operate correctly?

YES : The inspection is complete.

NO : Retry the troubleshooting.

DTC P2100: Throttle Actuator Control Motor Circuit (open)

Throttle Actuator Control Motor Circuit



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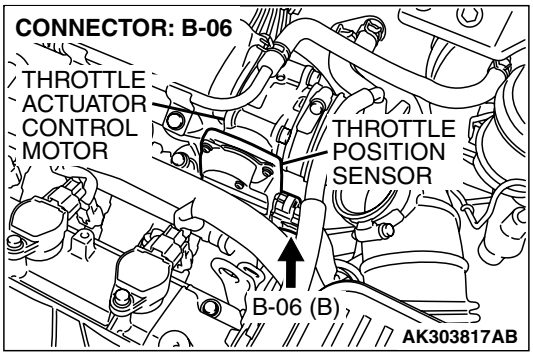
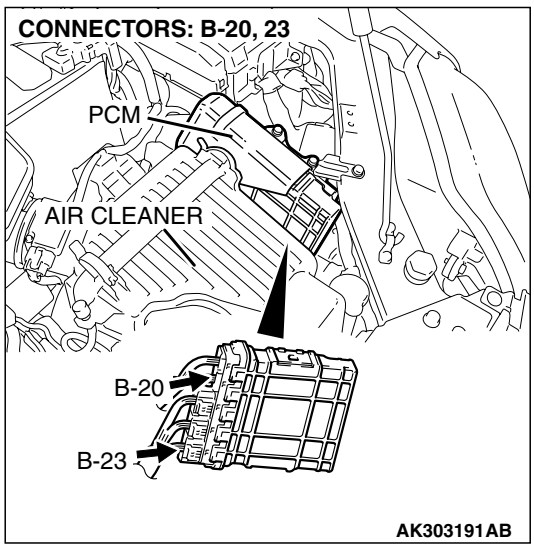


TSB Revision



CIRCUIT OPERATION
- Controls the current that is applied from the PCM (terminals No. 141, No. 147) to the throttle actuator control motor (terminals No. 1, No. 2).

TECHNICAL DESCRIPTION
- PCM varies the direction and the amperage of the current that is applied to the throttle actuator control motor in order to control the opening of the throttle valve.

DESCRIPTIONS OF MONITOR METHODS
The voltage difference between the throttle position sensor output voltage and the throttle position sensor output at the throttle actuator control motor relay off is smaller than the specified value.

MONITOR EXECUTION
Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)
- Not applicable

Sensor (The sensor below is determined to be normal)
- Not applicable

DTC SET CONDITIONS

Check Condition
- Battery positive voltage is higher than 8.3 volts.
- The output voltage of the (main) throttle position sensor minus the proposed output voltage becomes 0.1 volt or more.
- The output voltage of the (sub) throttle position sensor minus the proposed output voltage becomes 0.1 volt or more.

or
- Battery positive voltage is higher than 8.3 volts.
- The proposed output voltage minus the output voltage of the (main) throttle position sensor becomes 1 volt or more.
- The proposed output voltage minus the output voltage of the (sub) throttle position sensor becomes 1 volt or more.

Judgement Criteria
- The output voltage of the (main) throttle position sensor minus the learning value of the middle - opened degree becomes 0.2 volt or less for 0.9 second.

or
- The output voltage of the (sub) throttle position sensor minus the learning value of the middle - opened degree becomes 0.2 volt or less for 0.9 second.

OBD-II DRIVE CYCLE PATTERN
None.

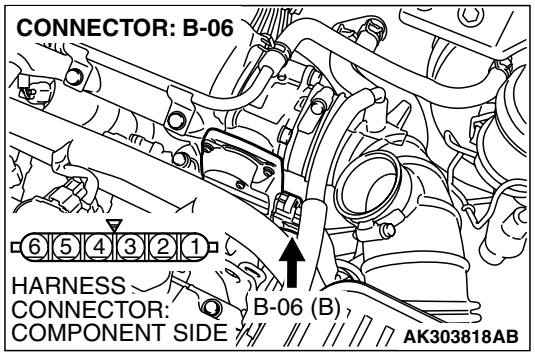
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)
- Throttle actuator control motor failed.
- Open throttle actuator control motor circuit, harness damage or connector damage.
- PCM failed.

DIAGNOSIS

Required Special Tools:

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

STEP 1. Check harness connector B-06 at throttle actuator control motor for damage.



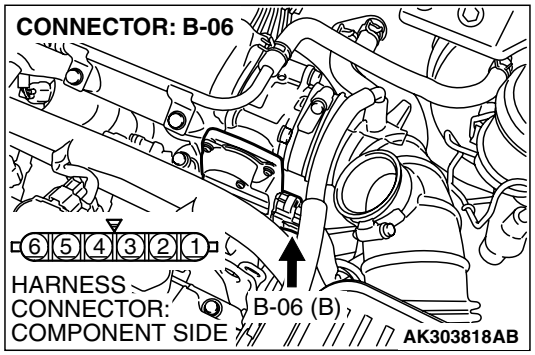
Q: Is the harness connector in good condition?

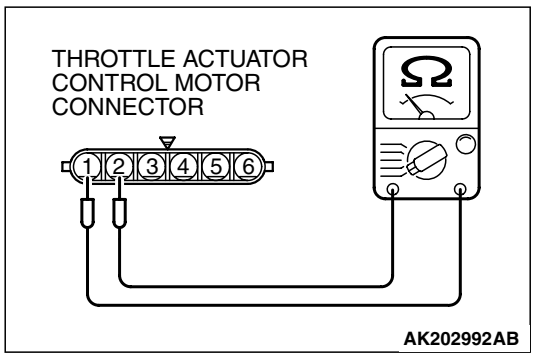
YES : Go to Step 2.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 8.

STEP 2. Check the throttle actuator control motor.

(1) Disconnect the connector B-06.





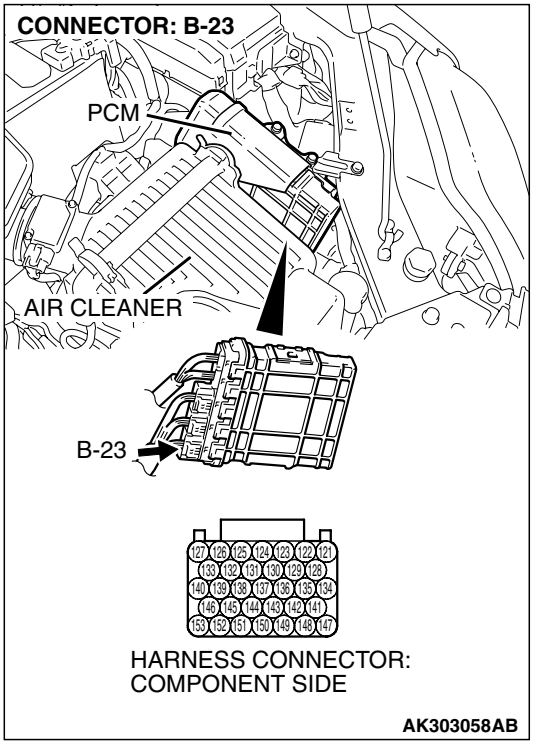
(2) Measure the resistance between throttle actuator control motor side connector terminal No. 1 and No. 2.

Standard value: 0.3 – 80 Ω [at 20°C (68°F)]

Q: Is the measured resistance between 0.3 and 80 ohms [at 20°C (68°F)]?

YES : Go to Step 3.

NO : Replace the throttle body assembly. Then go to Step 8.



STEP 3. Check harness connector B-23 at PCM for damage

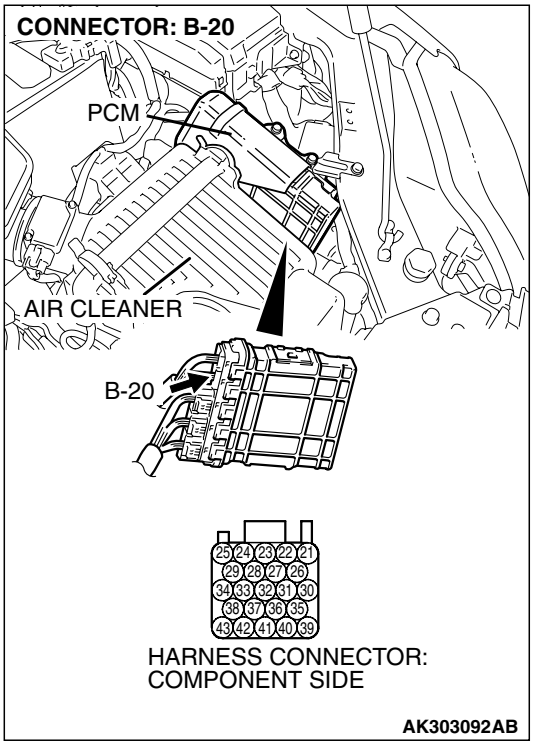
Q: Is the harness connector in good condition?

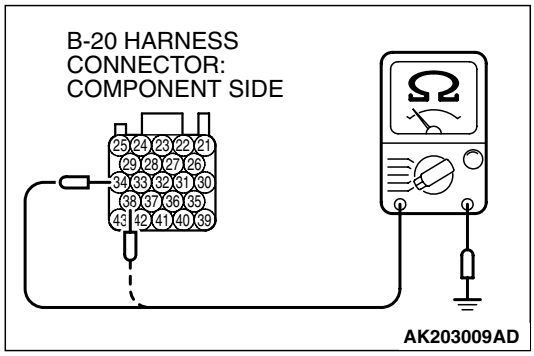
YES : Go to Step 4.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 8.

STEP 4. Check the continuity at PCM harness side connector B-20.

(1) Disconnect the connector B-19 and measure at the harness side.



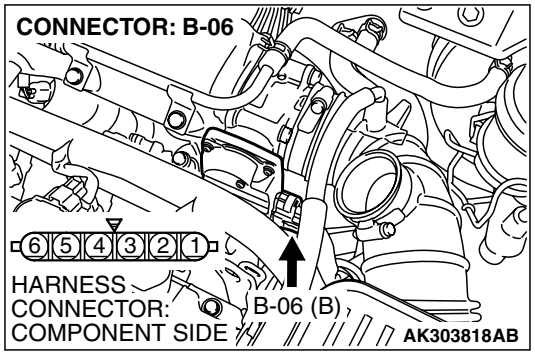


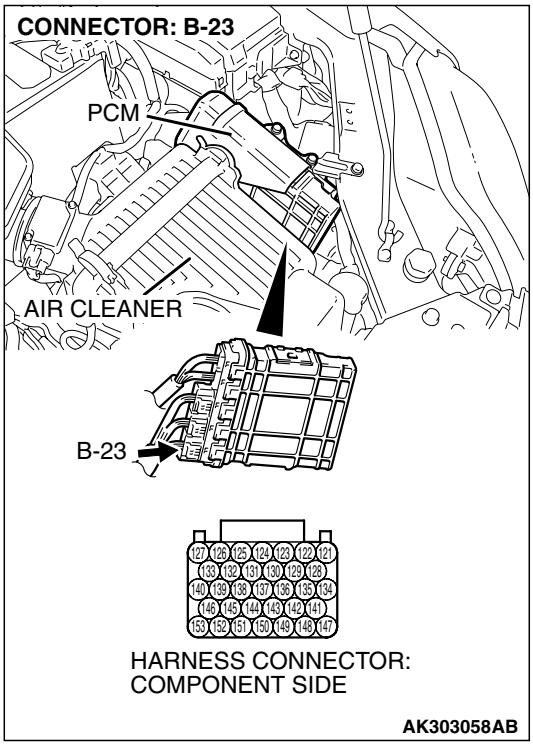
(2) Measure the continuity between terminals No. 34, No. 38 and ground.
- Continuity (2 Ω or less)

Q: Does continuity exist?

YES : Go to Step 5.

NO : Repair harness wire between PCM connector B-20 (terminals No. 34, No. 38) and ground because of open circuit or harness damage. Then go to Step 8.



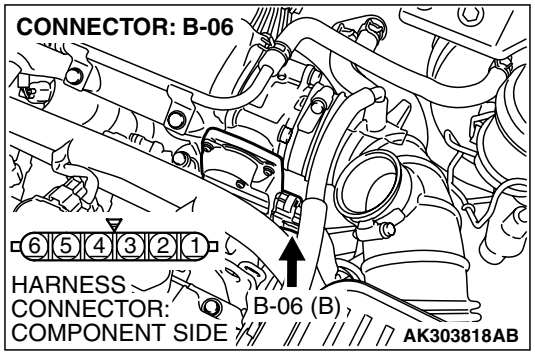


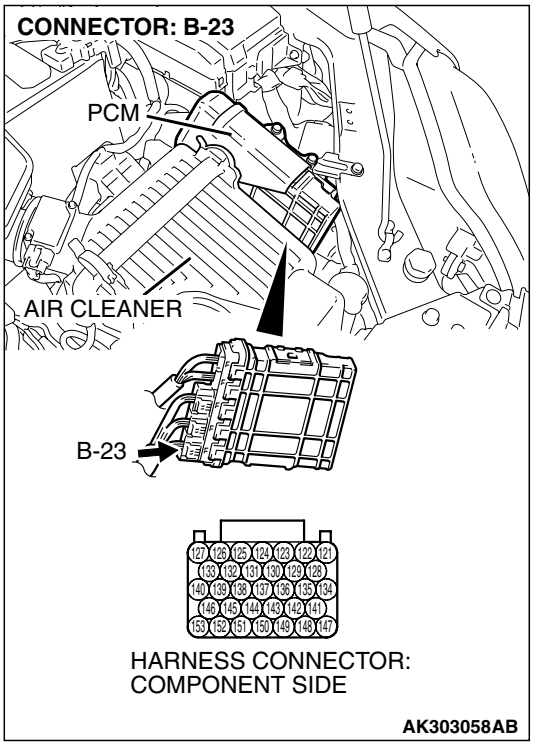
STEP 5. Check for open circuit and harness damage between throttle actuator control motor connector B-06 (terminal No. 1) and PCM connector B-23 (terminal No. 147).

Q: Is the harness wire in good condition?

YES : Go to Step 6.

NO : Repair it. Then go to Step 8.



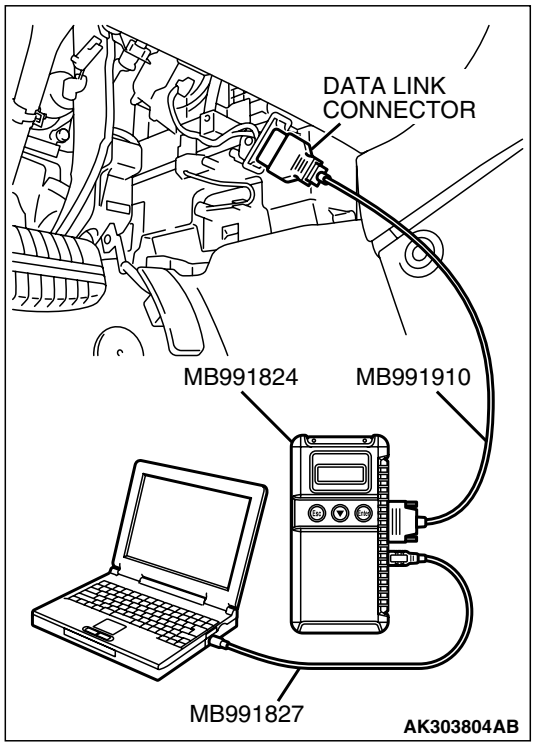


STEP 6. Check for open circuit and harness damage between throttle actuator control motor connector B-06 (terminal No. 2) and PCM connector B-23 (terminal No. 141).

Q: Is the harness wire in good condition?

YES : Go to Step 7.

NO : Repair it. Then go to Step 8.



STEP 7. Using scan tool MB991958, read the diagnostic trouble code (DTC).

⚠ CAUTION

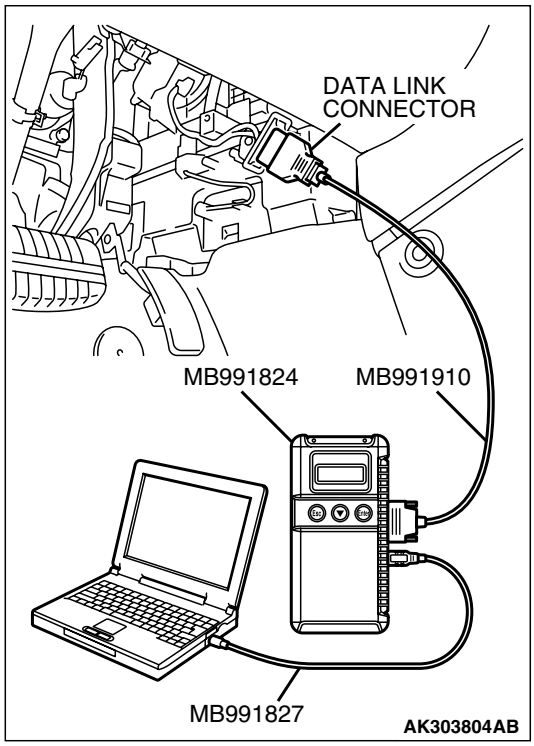
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK"(OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) After the DTC has been deleted, read the DTC again.
(4) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is DTC P2100 set?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 8.

NO : It can be assumed 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.



STEP 8. Using scan tool MB991958, read the diagnostic trouble code (DTC).

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) After the DTC has been deleted, read the DTC again.
(4) Turn the ignition switch to the "LOCK"(OFF) position.

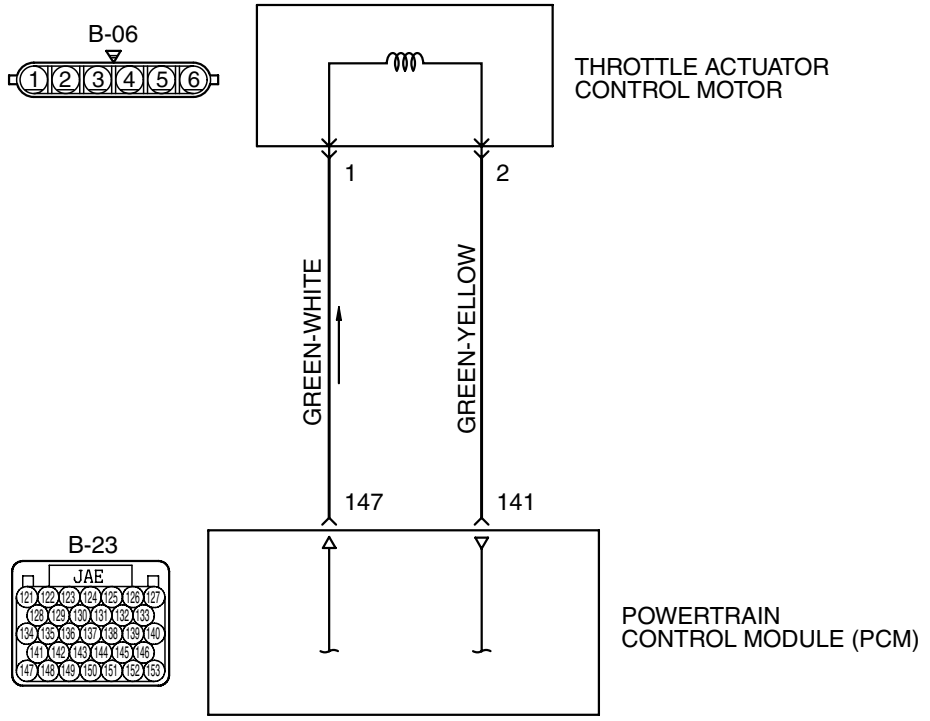
Q: Is DTC P2100 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P2101: Throttle Actuator Control Motor Magneto Malfunction

Throttle Actuator Control Motor Circuit



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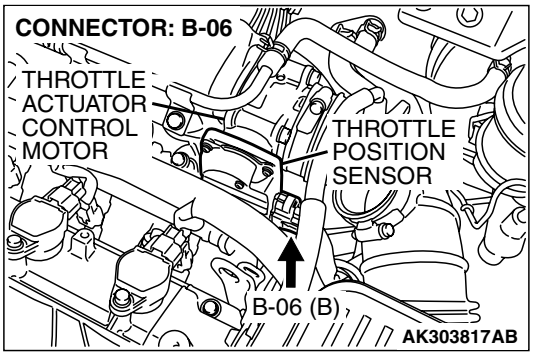
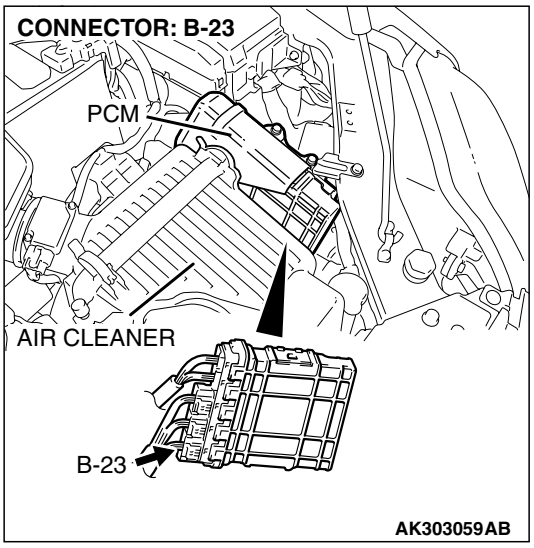




CIRCUIT OPERATION
- Controls the current that is applied from PCM (terminals No. 141, No. 147) to the throttle actuator control motor (terminals No. 1, No. 2)

TECHNICAL DESCRIPTION
- PCM check whether the throttle actuator control motor magneto has failed.

DESCRIPTIONS OF MONITOR METHODS
Throttle actuator control motor intelligent power device detects shorted-high/low and overheat of itself.

MONITOR EXECUTION
Continuous

TSB Revision

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)
- Not applicable

Sensor (The sensor below is determined to be normal)
- Not applicable

DTC SET CONDITIONS

Check Condition
- Battery positive voltage is higher than 8.3 volts.

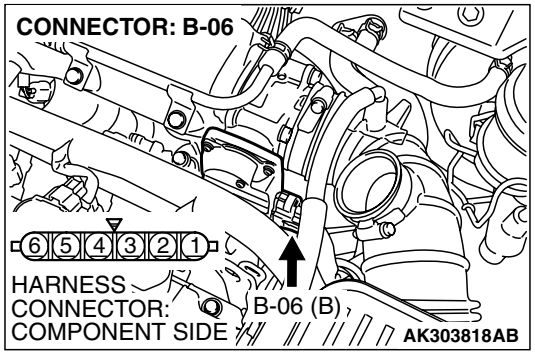
Judgement Criterion
- The coil current of the throttle actuator control motor is 8 ampere or more for 0.3 second.

OBD-II DRIVE CYCLE PATTERN
None.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)
- Throttle actuator control motor failed.
- Shorted throttle actuator control motor circuit, harness damage or connector damage.
- PCM failed.

DIAGNOSIS

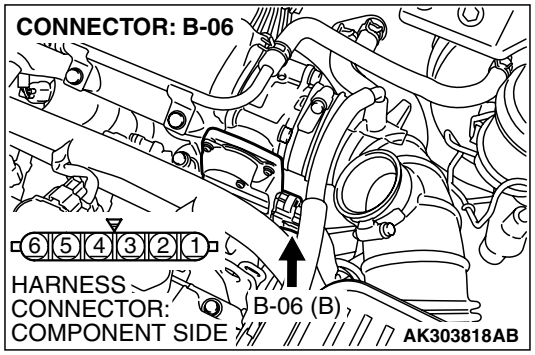
Required Special Tools:
- MB991958: Scan tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A



STEP 1. Check harness connector B-06 at throttle actuator control motor for damage.
Q: Is the harness connector in good condition?

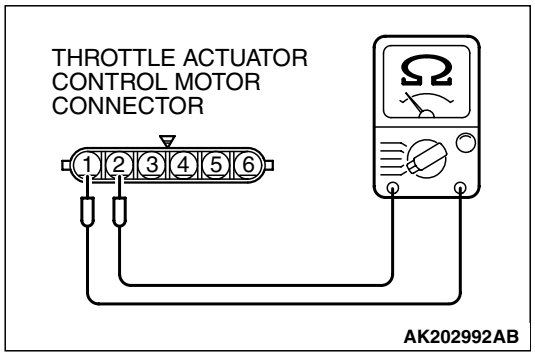
YES : Go to Step 2.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 7.



STEP 2. Check the throttle actuator control motor.

(1) Disconnect the connector B-06.



(2) Measure the resistance between throttle actuator control motor side connector terminal No. 1 and No. 2.

Standard value: 0.3 – 80 Ω [at 20°C (68°F)]

Q: Is the measured resistance between 0.3 and 80 ohms [at 20°C (68°F)]?

YES : Go to Step 3.

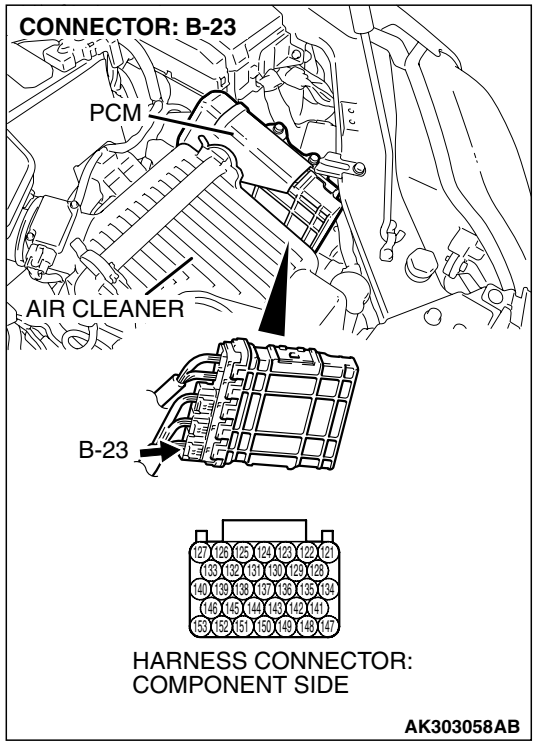
NO : Replace the throttle body assembly. Then go to Step 7.

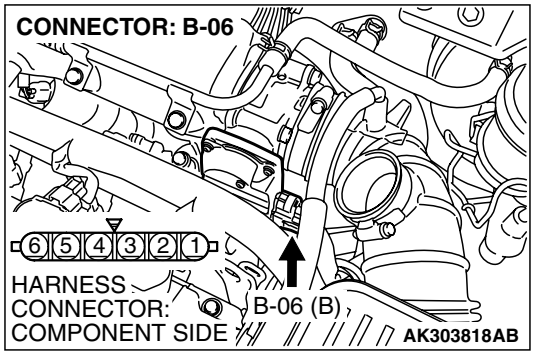
STEP 3. Check harness connector B-23 at PCM for damage

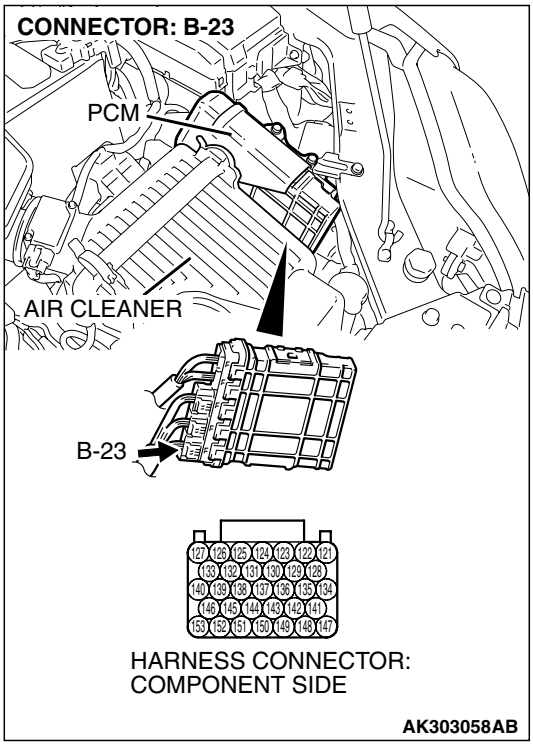
Q: Is the harness connector in good condition?

YES : Go to Step 4.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 7.





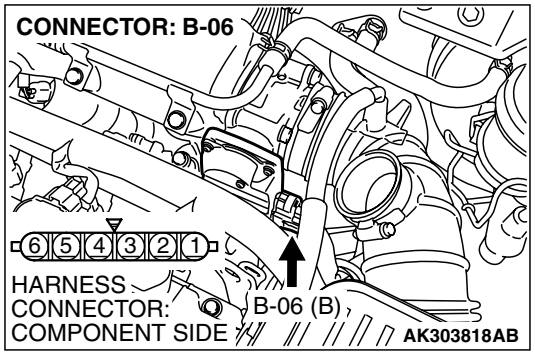


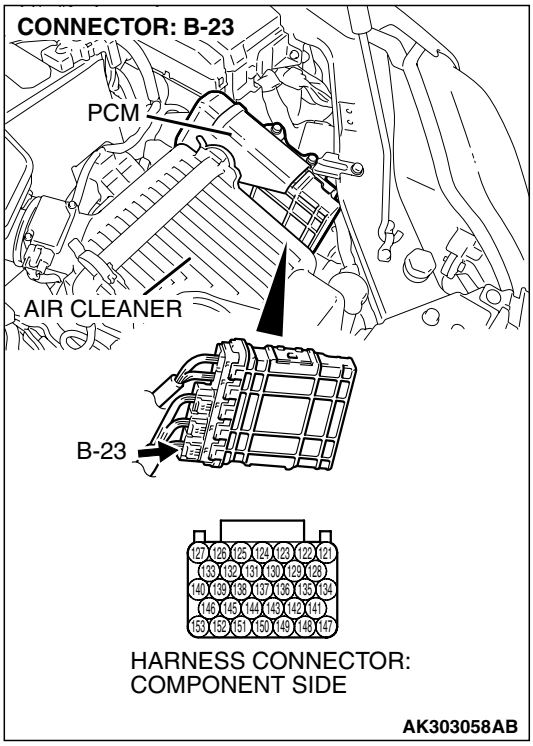
STEP 4. Check for short circuit to ground and harness damage between throttle actuator control motor connector B-06 (terminal No. 1) and PCM connector B-23 (terminal No. 147).

Q: Is the harness wire in good condition?

YES : Go to Step 5.

NO : Repair it. Then go to Step 7.



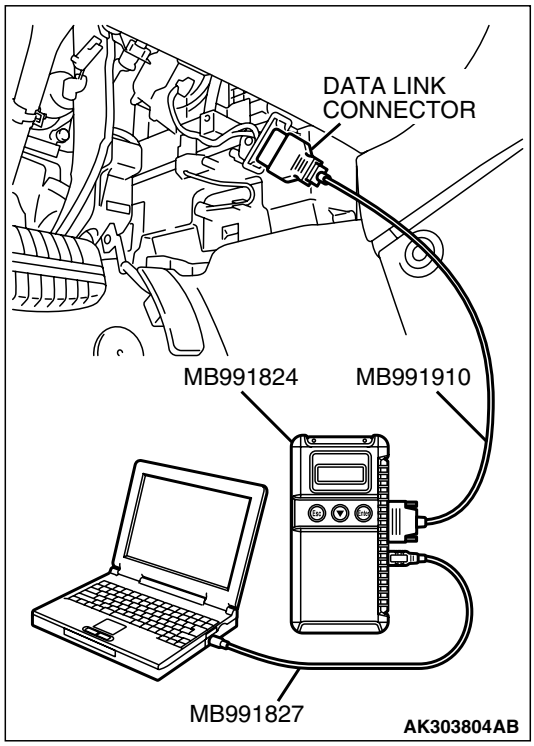


STEP 5. Check for short circuit to ground and harness damage between throttle actuator control motor connector B-06 (terminal No. 2) and PCM connector B-23 (terminal No. 141).

Q: Is the harness wire in good condition?

YES : Go to Step 6.

NO : Repair it. Then go to Step 7.



STEP 6. Using scan tool MB991958, read the diagnostic trouble code (DTC).

⚠ CAUTION

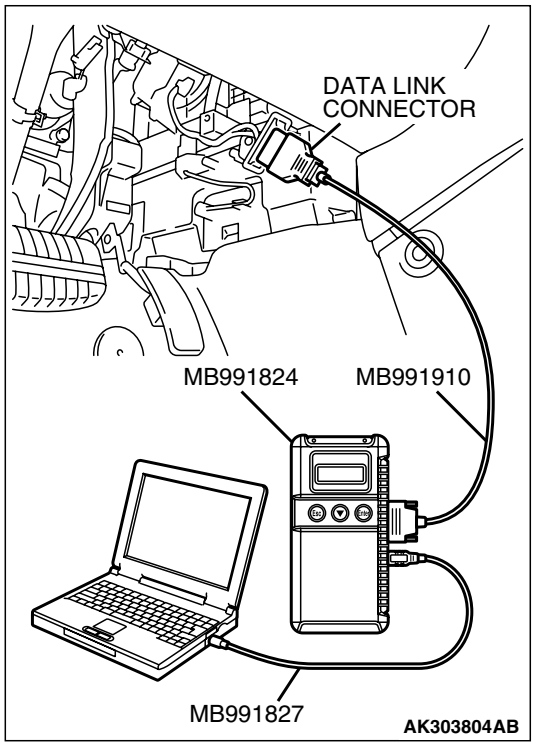
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK"(OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) After the DTC has been deleted, read the DTC again.
(4) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is DTC P2101 set?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 7.

NO : It can be assumed 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.



STEP 7. Using scan tool MB991958, read the diagnostic trouble code (DTC).

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) After the DTC has been deleted, read the DTC again.
(4) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is DTC P2101 set?

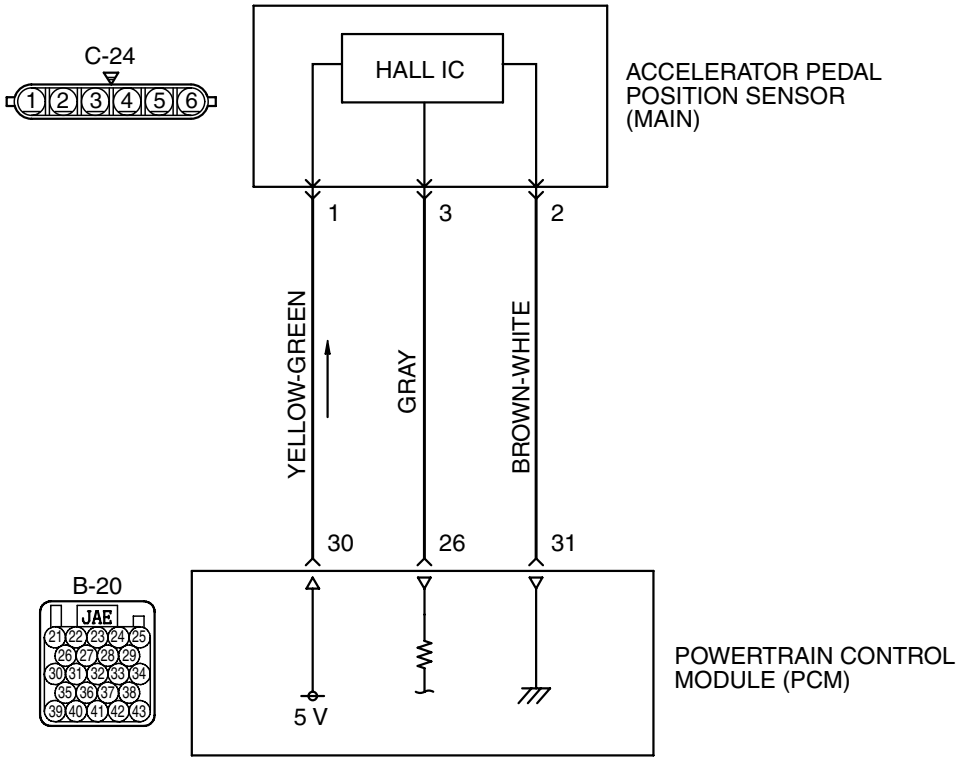
YES : Retry the troubleshooting.

NO : The inspection is complete.

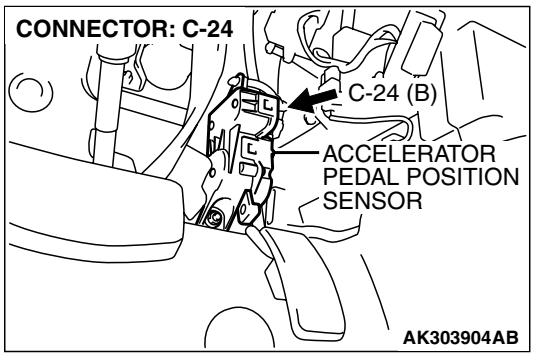
DTC P2122: Accelerator Pedal Position Sensor (main) Circuit Low Input

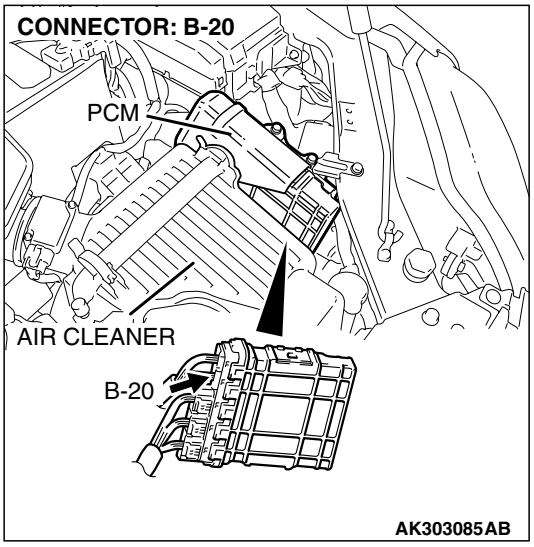
⚠ CAUTION
If DTC P2122 has been set, TCL related DTC U1120 and U1400 are also set. After P2122 has been diagnosed, don't forget to erase DTC U1120 and U1400.

Accelerator Pedal Position Sensor (main) Circuit



AK303903





TSB Revision

CIRCUIT OPERATION

- A 5-volt power supply is applied on the accelerator pedal position sensor (main) power terminal (terminal No. 1) from the PCM (terminal No. 30). The ground terminal (terminal No. 2) is grounded with PCM (terminal No. 31).

TECHNICAL DESCRIPTION

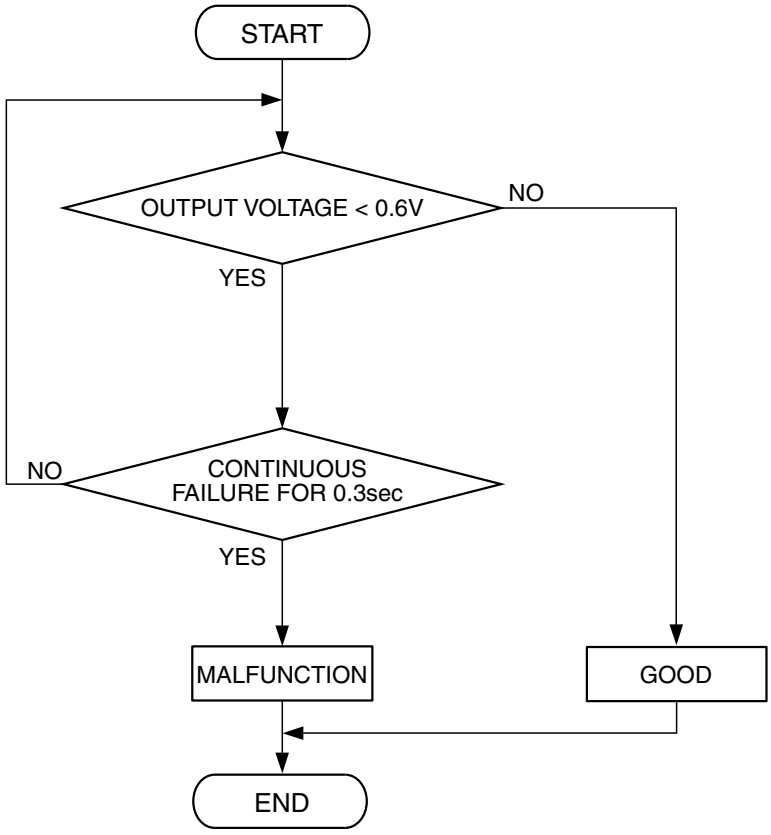
- The accelerator pedal position sensor (main) outputs voltage which corresponds to the accelerator pedal depression.
- The PCM checks whether the voltage is within a specified range.

DESCRIPTIONS OF MONITOR METHODS

Accelerator pedal position sensor (main) output voltage is out of specified range.

DTC SET CONDITIONS

Logic Flow Chart



AK303905

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

Check Condition

- Ignition switch is "ON" position.

TSB Revision

Judgement Criterion

- Accelerator pedal position sensor (main) output voltage is 0.6 volt or less for 0.3 second.

OBD-II DRIVE CYCLE PATTERN

None.

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

- Accelerator pedal position sensor failed.
- Open or shorted accelerator pedal position sensor (main) circuit, harness damage or connector damage.
- PCM failed.

DIAGNOSIS

Required Special Tools:

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

STEP 1. Using scan tool MB991958, check data list item 11: Accelerator Pedal Position Sensor (main).

⚠ CAUTION

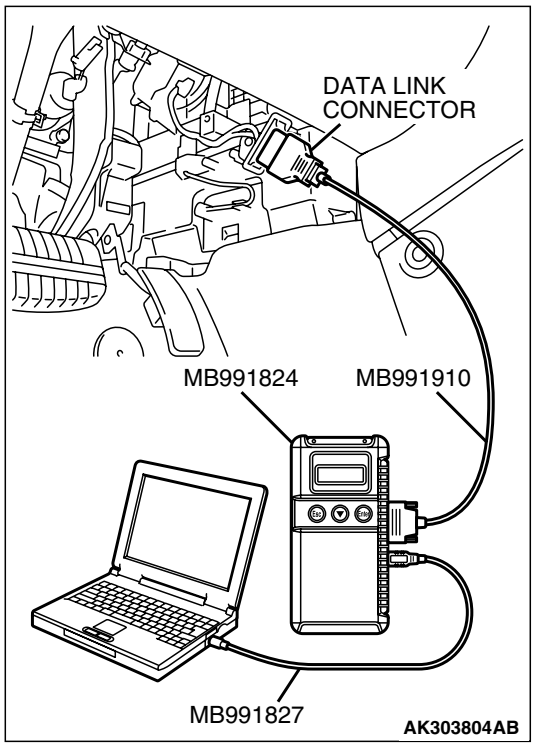
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK"(OFF) position before connecting or disconnecting scan tool MB991958.

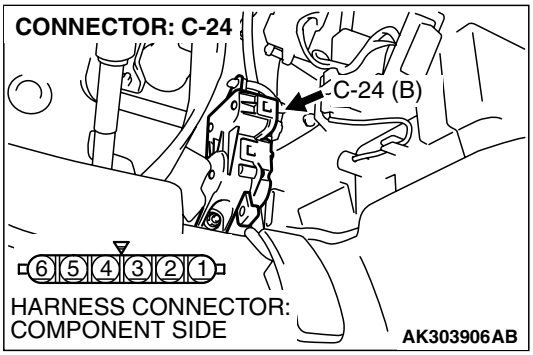
(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991958 to the data reading mode for item 11, Accelerator Pedal Position Sensor (main).
  - Output voltage is between 0.735 and 1.335 volts when foot is released from accelerator pedal.
  - Output voltage is 4.0 volts or higher when accelerator pedal is fully depressed.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed 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.



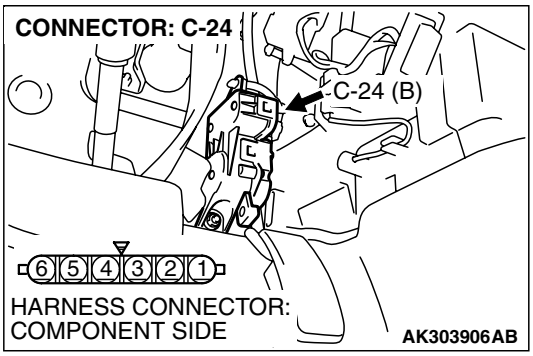


STEP 2. Check harness connector C-24 at accelerator pedal position sensor for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 3.

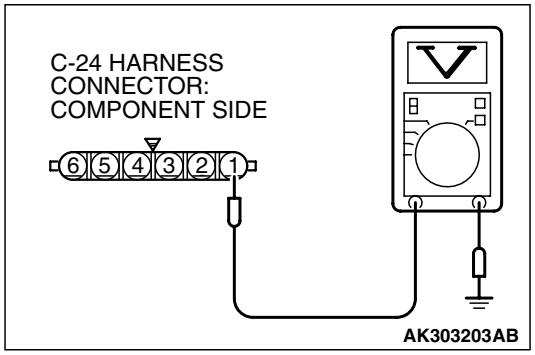
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.



STEP 3. Measure the sensor supply voltage at accelerator pedal position sensor harness side connector C-24.

(1) Disconnect the connector C-24 and measure at the harness side.

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



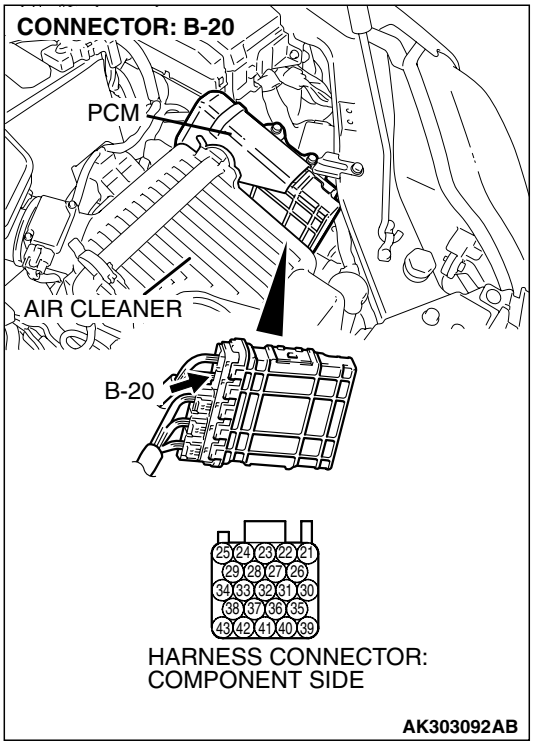
(3) Measure the voltage between terminal No. 1 and ground.
- Voltage should be between 4.9 and 5.1 volts.

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

Q: Is the measured voltage between 4.9 and 5.1 volts?

YES : Go to Step 7.

NO : Go to Step 4.

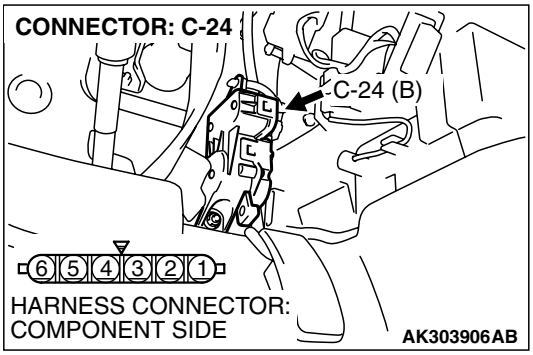


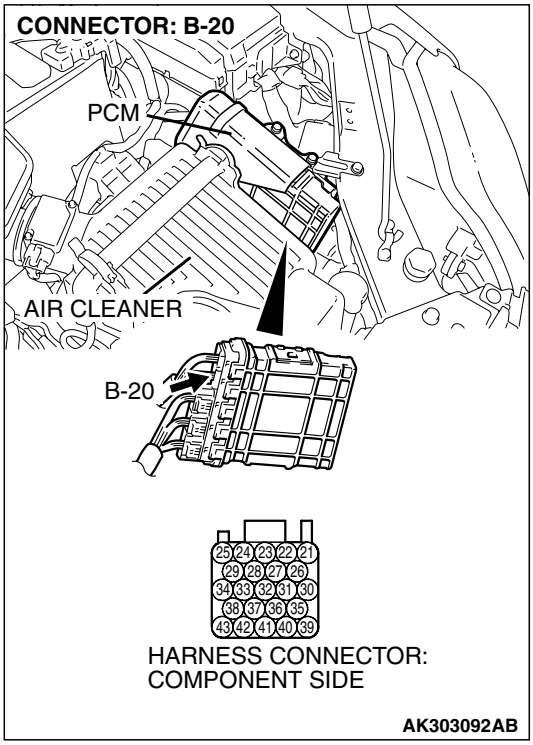
STEP 4. Check harness connector B-20 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 5.

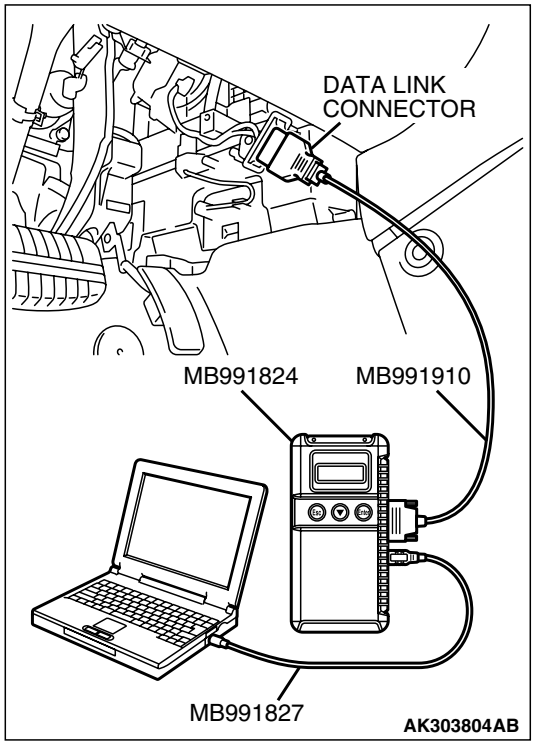
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.





STEP 5. Check for open circuit and short circuit to ground between accelerator pedal position sensor connector C-24 (terminal No. 1) and PCM connector B-20 (terminal No. 30).
Q: Is the harness wire in good condition?

YES : Go to Step 6.
NO : Repair it. Then go to Step 11.



STEP 6. Using scan tool MB991958, check data list item 11: Accelerator Pedal Position Sensor (main).

⚠ 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.

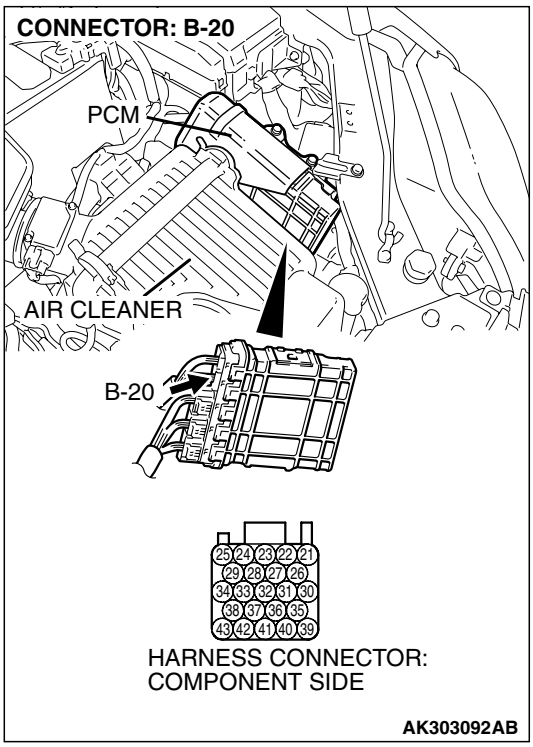
(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991958 to the data reading mode for item 11, Accelerator Pedal Position Sensor (main).
- Output voltage is between 0.735 and 1.335 volts when foot is released from accelerator pedal.
- Output voltage is 4.0 volts or higher when accelerator pedal is fully depressed.

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

Q: Is the sensor operating properly?

YES : It can be assumed 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 : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 11.



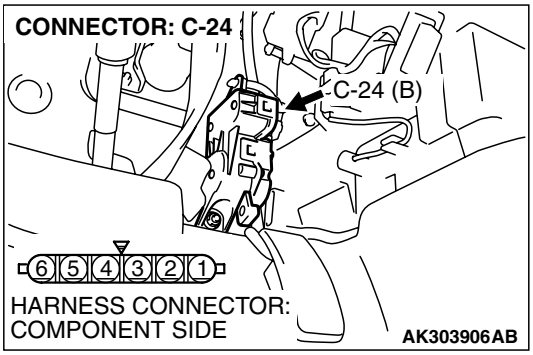
STEP 7. Check harness connector B-20 at PCM for damage.

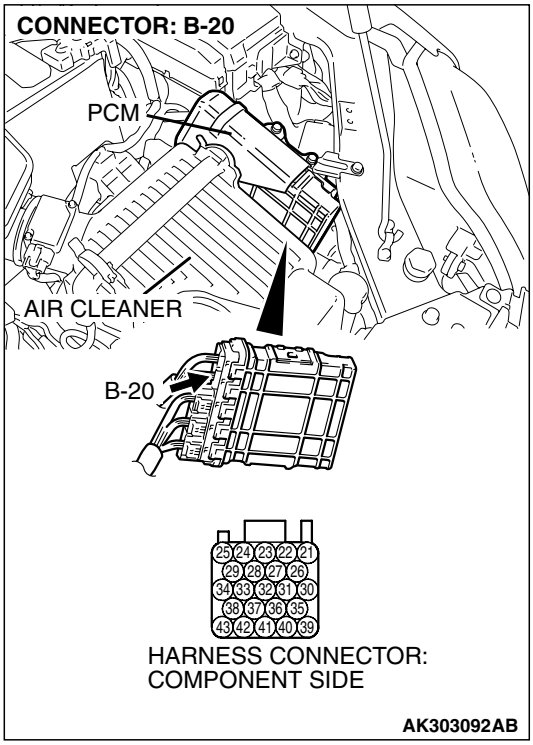
Q: Is the harness connector in good condition?

YES : Go to Step 8.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.

TSB Revision





STEP 8. Check for harness damage between accelerator pedal position sensor connector C-24 (terminal No. 1) and PCM connector B-20 (terminal No. 30).

Q: Is the harness wire in good condition?

YES : Go to Step 9.

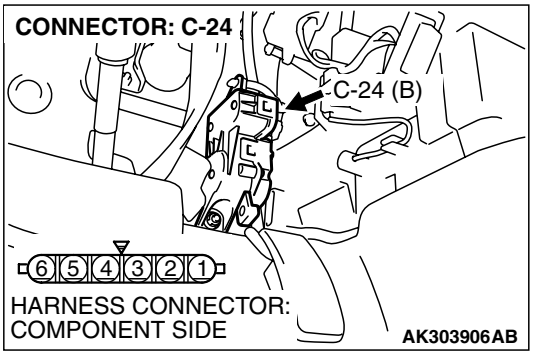
NO : Repair it. Then go to Step 11.

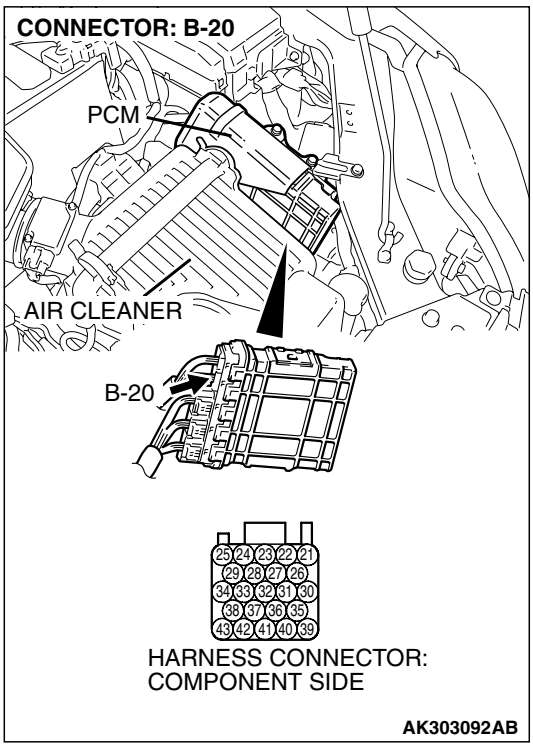
STEP 9. Check for harness damage between accelerator pedal position sensor connector C-24 (terminal No. 3) and PCM connector B-20 (terminal No. 26).

Q: Is the harness wire in good condition?

YES : Go to Step 10.

NO : Repair it. Then go to Step 11.





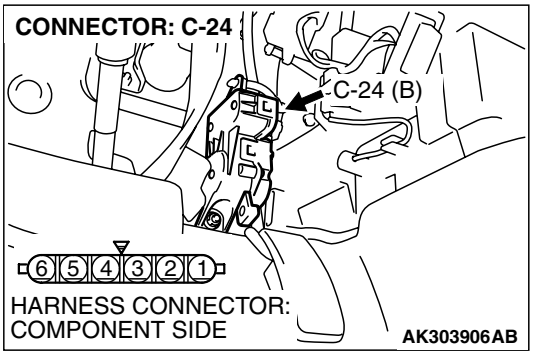
STEP 10. Replace the accelerator pedal position sensor.

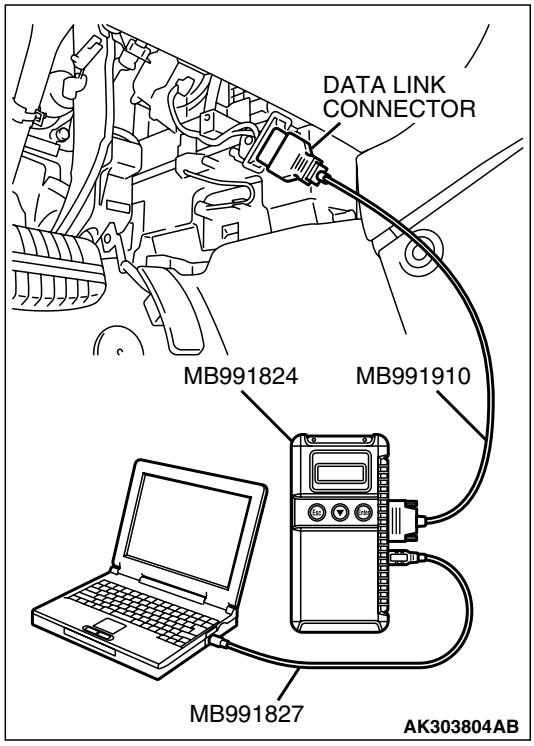
(1) Replace the accelerator pedal position sensor.
(2) Turn the ignition switch to the "ON" position.
(3) After the DTC has been deleted, read the DTC again.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC P2122 set?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 11.

NO : The inspection is complete.





STEP 11. 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) After the DTC has been deleted, read the DTC again.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

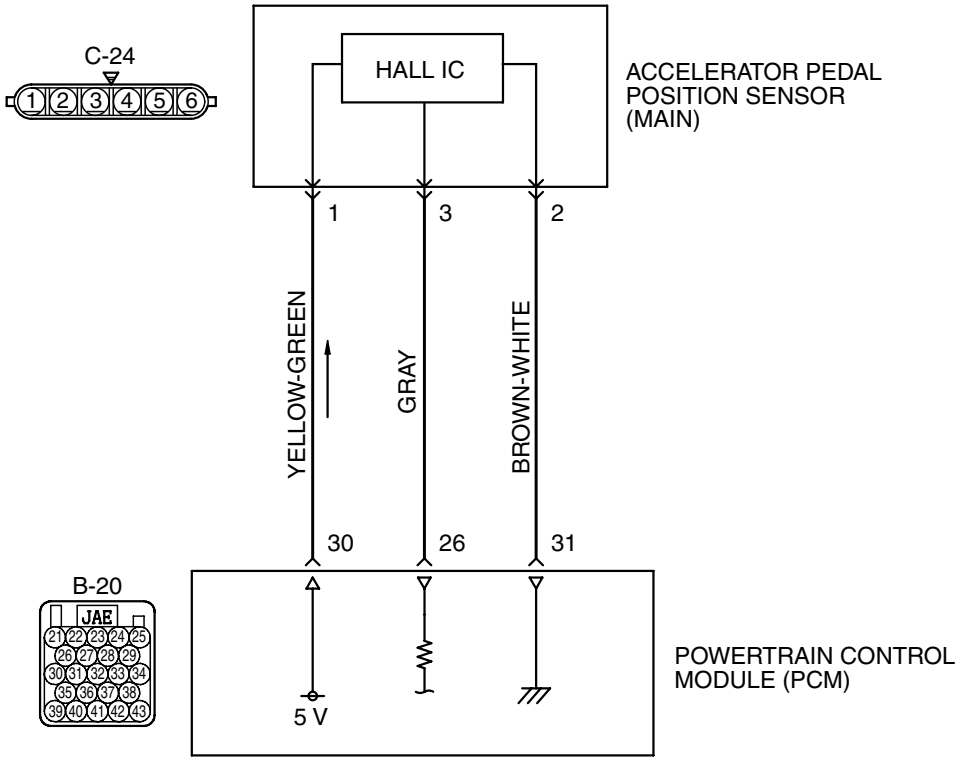
Q: Is DTC P2122 set?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P2123: Accelerator Pedal Position Sensor (main) Circuit High Input

⚠ CAUTION
If DTC P2123 has been set, TCL related DTC U1120 and U1400 are also set. After P2123 has been diagnosed, don't forget to erase DTC U1120 and U1400.

Accelerator Pedal Position Sensor (main) Circuit



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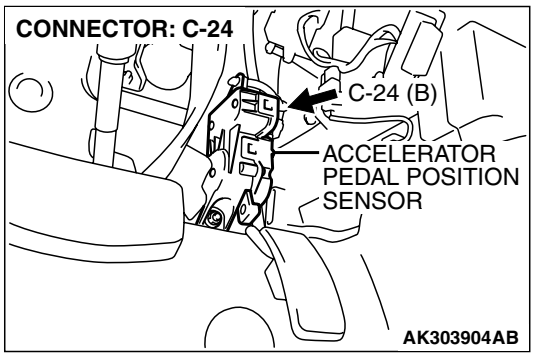
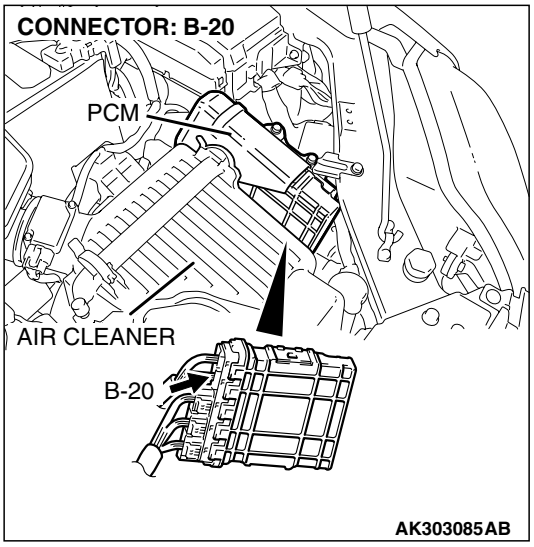




TSB Revision

CIRCUIT OPERATION

- A 5-volt power supply is applied on the accelerator pedal position sensor (main) power terminal (terminal No. 1) from the PCM (terminal No. 30). The ground terminal (terminal No. 2) is grounded with PCM (terminal No. 31).

TECHNICAL DESCRIPTION

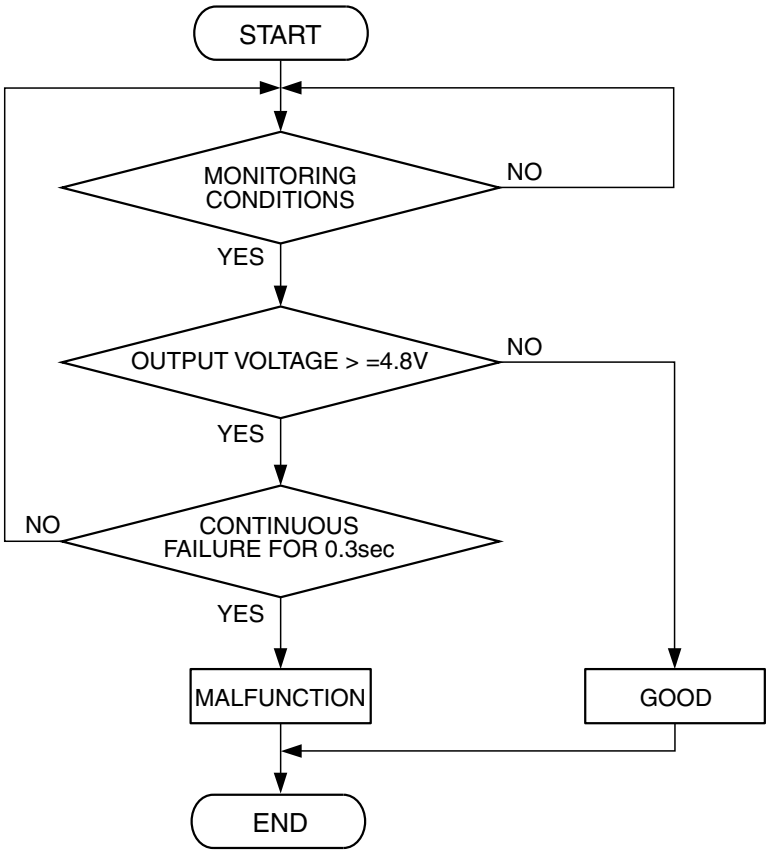
- The accelerator pedal position sensor (main) outputs voltage which corresponds to the accelerator pedal depression.
- The PCM checks whether the voltage is within a specified range.

DESCRIPTIONS OF MONITOR METHODS

Accelerator pedal position sensor (main) output voltage is out of specified range.

DTC SET CONDITIONS

Logic Flow Chart



AK303907

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

Check Condition

- Ignition switch is "ON" position.

TSB Revision

Judgement Criterion

- Accelerator pedal position sensor (main) output voltage should be 4.8 volts or higher for 0.3 second.

OBD-II DRIVE CYCLE PATTERN

None.

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

- Accelerator pedal position sensor failed.
- Open accelerator pedal position sensor (main) circuit, harness damage or connector damage.
- PCM failed.

DIAGNOSIS

Required Special Tools:

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

STEP 1. Using scan tool MB991958, check data list item 11: Accelerator Pedal Position Sensor (main).

⚠ CAUTION

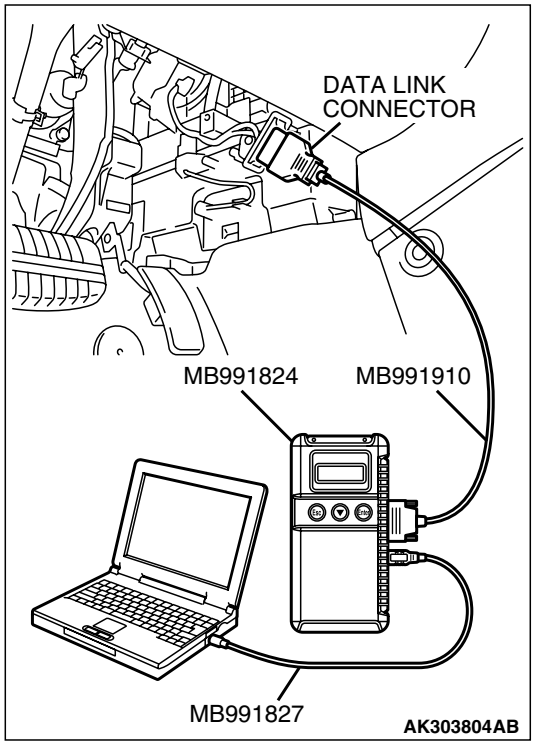
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

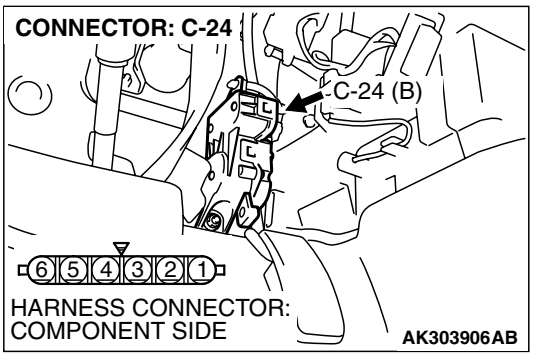
(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991958 to the data reading mode for item 11, Accelerator Pedal Position Sensor (main).
  - Output voltage is between 0.735 and 1.335 volts when foot is released from accelerator pedal.
  - Output voltage is 4.0 volts or higher when accelerator pedal is fully depressed.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed 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.



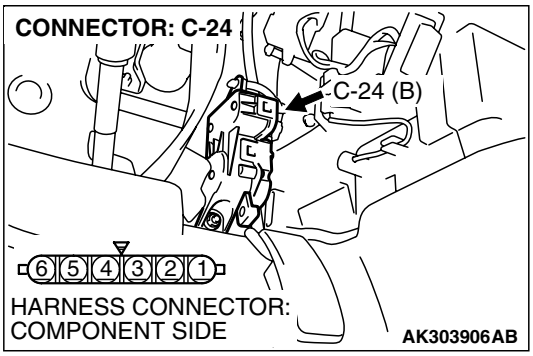


STEP 2. Check harness connector C-24 at accelerator pedal position sensor for damage.

Q: Is the harness connector in good condition?

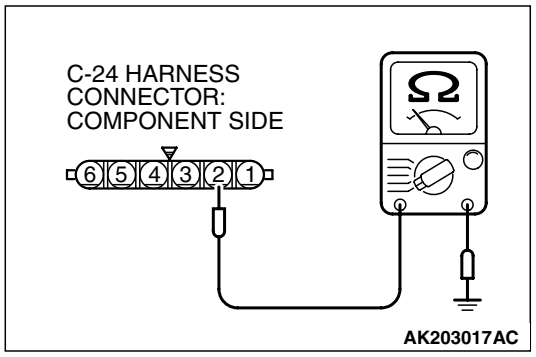
YES : Go to Step 3.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 8.



STEP 3. Check the continuity at accelerator pedal position sensor harness side connector C-24.

(1) Disconnect the connector C-24 and measure at the harness side.

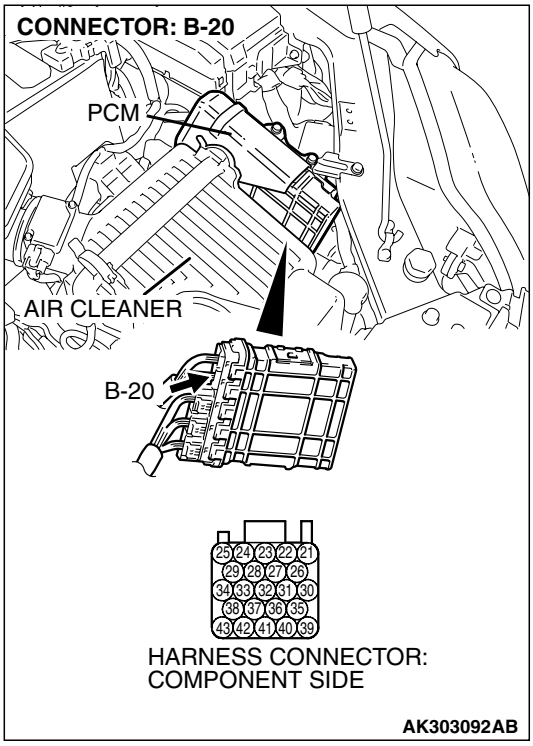


(2) Measure the continuity between terminal No. 2 and ground.
- Continuity (2 Ω or less)

Q: Does continuity exist?

YES : Go to Step 6.

NO : Go to Step 4.



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

Q: Is the harness connector in good condition?

YES : Go to Step 5.

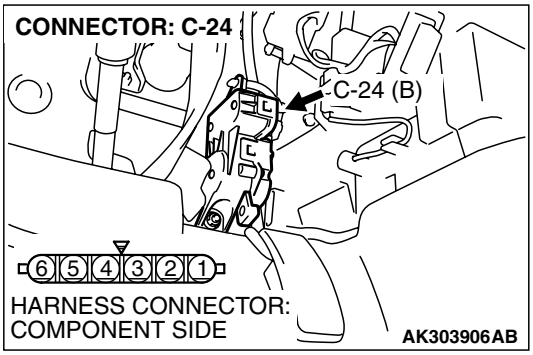
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 8.

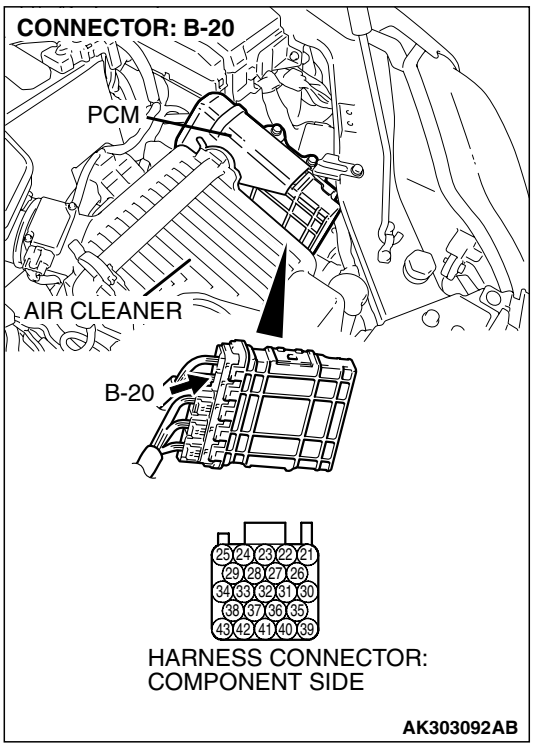
STEP 5. Check for open circuit and harness damage between accelerator pedal position sensor connector C-24 (terminal No. 2) and PCM connector B-20 (terminal No. 31).

Q: Is the harness wire in good condition?

YES : Go to Step 7.

NO : Repair it. Then go to Step 8.





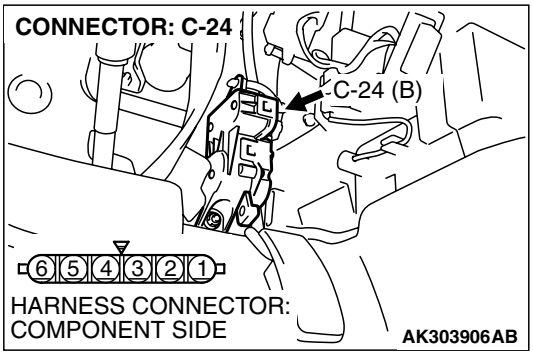
STEP 6. Replace the accelerator pedal position sensor.

(1) Replace the accelerator pedal position sensor.
(2) Turn the ignition switch to the "ON" position.
(3) After the DTC has been deleted, read the DTC again.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC P2123 set?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 8.

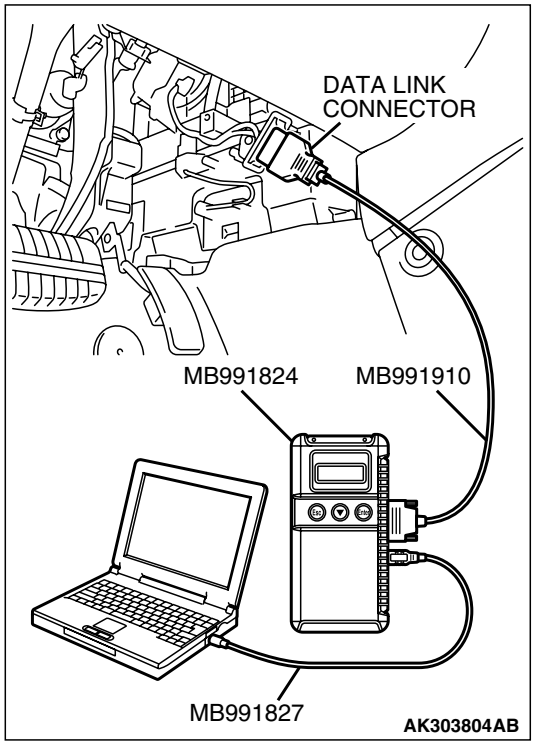
NO : The inspection is complete.



STEP 7. Using scan tool MB991958, check data list item 11: Accelerator Pedal Position Sensor (main).

⚠ 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 data reading mode for item 11, Accelerator Pedal Position Sensor (main).
- Output voltage is between 0.735 and 1.335 volts when foot is released from accelerator pedal.
- Output voltage is 4.0 volts or higher when accelerator pedal is fully depressed.

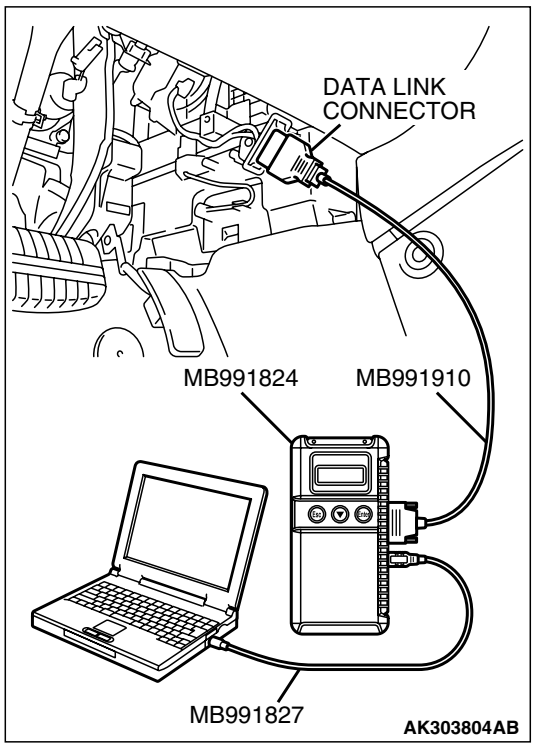
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed 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 : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 8.

STEP 8. Using scan tool MB991958, read the diagnostic trouble code (DTC).



(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) After the DTC has been deleted, read the DTC again.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC P2123 set?

YES : Retry the troubleshooting.

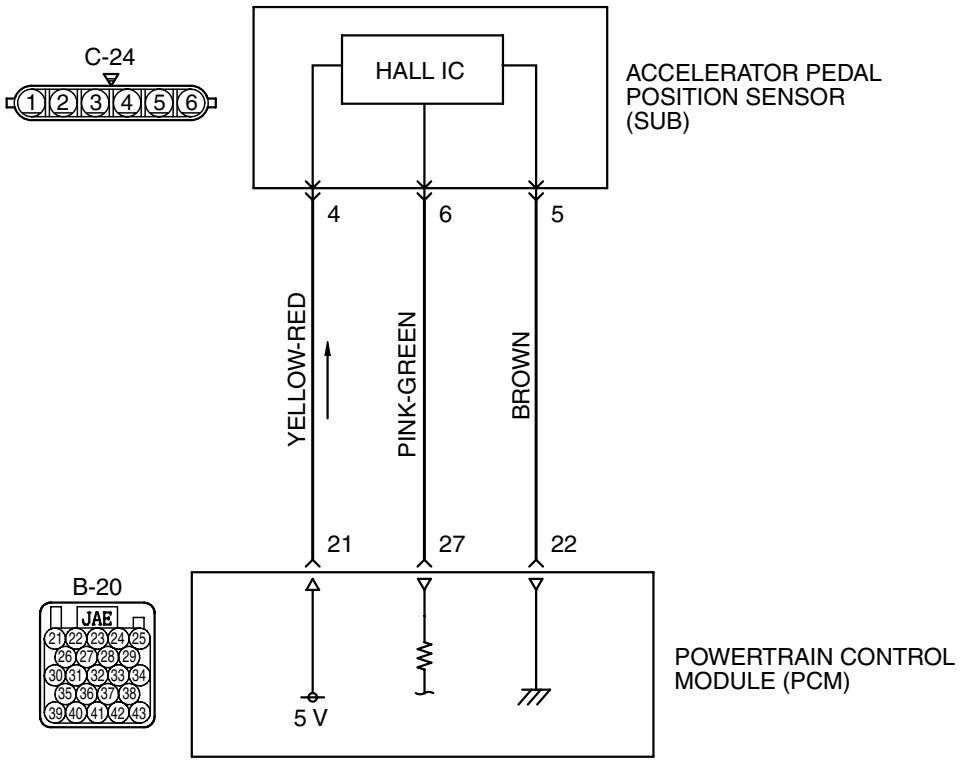
NO : The inspection is complete.

TSB Revision

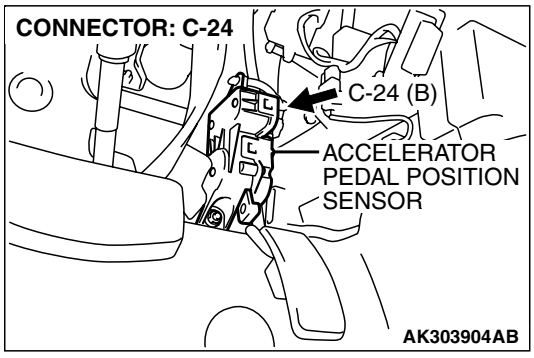
DTC P2127: Accelerator Pedal Position Sensor (sub) Circuit Low Input

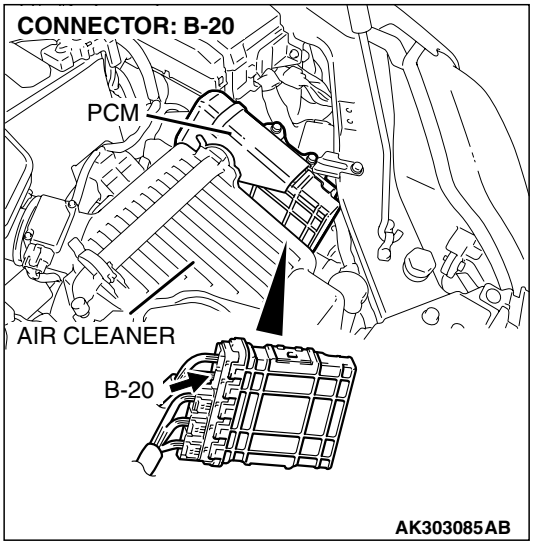
⚠ CAUTION
If DTC P2127 has been set, TCL related DTC U1120 is also set. After P2127 has been diagnosed, don't forget to erase DTC U1120.

Accelerator Pedal Position Sensor (sub) Circuit



AK303908





TSB Revision

CIRCUIT OPERATION

- A 5-volt power supply is applied on the accelerator pedal position sensor (sub) power terminal (terminal No. 4) from the PCM (terminal No. 21). The ground terminal (terminal No. 5) is grounded with PCM (terminal No. 22).

TECHNICAL DESCRIPTION

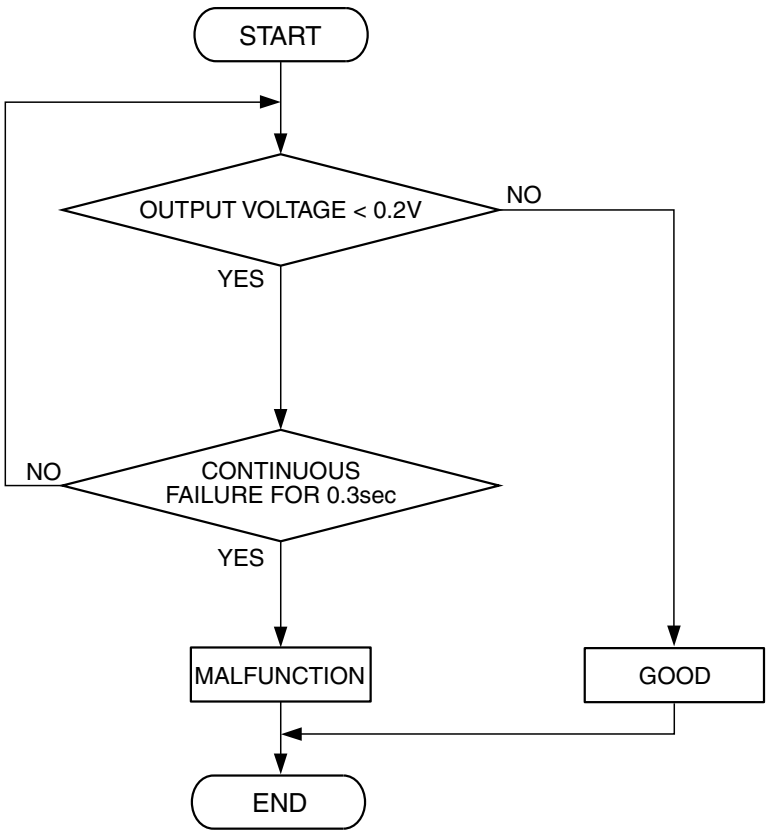
- The accelerator pedal position sensor (sub) outputs voltage which corresponds to the accelerator pedal depression.
- The PCM checks whether the voltage is within a specified range.

DESCRIPTIONS OF MONITOR METHODS

Accelerator pedal position sensor (sub) output voltage is out of specified range.

DTC SET CONDITIONS

Logic Flow Chart



AK303909

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

Check Condition

- Ignition switch is "ON" position.

TSB Revision

Judgement Criterion

- Accelerator pedal position sensor (sub) output voltage is 0.2 volt or less for 0.3 second.

OBD-II DRIVE CYCLE PATTERN

None.

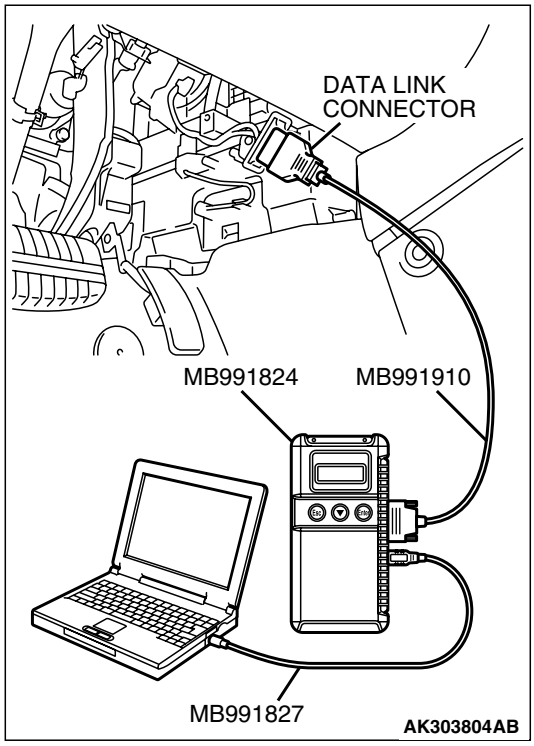
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Accelerator pedal position sensor failed.
- Open or shorted accelerator pedal position sensor (sub) circuit, harness damage or connector damage.
- PCM failed.

DIAGNOSIS

Required Special Tools:

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



STEP 1. Using scan tool MB991958, check data list item 12: Accelerator Pedal Position Sensor (sub).

⚠ CAUTION

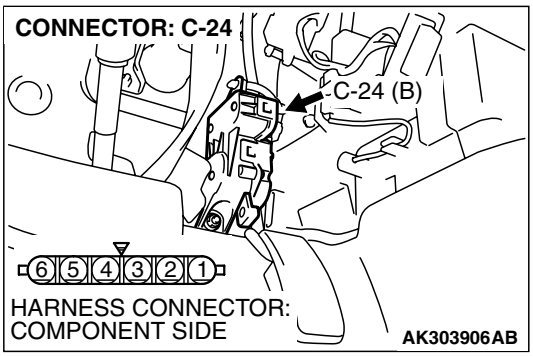
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK"(OFF) position before connecting or disconnecting scan tool MB991958.

(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 data reading mode for item 12, Accelerator Pedal Position Sensor (sub).
  - Output voltage is between 0.435 and 1.035 volts when foot is released from accelerator pedal.
  - Output voltage is 3.6 volts or higher when accelerator pedal is fully depressed.
(4) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed 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.

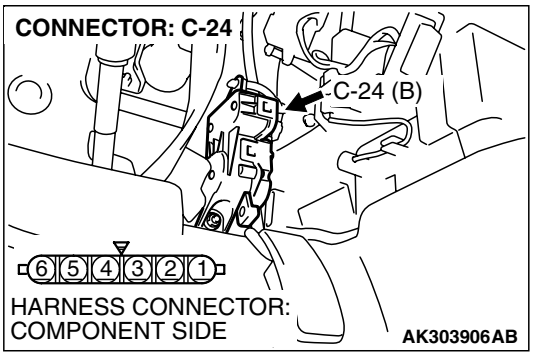


STEP 2. Check harness connector C-24 at accelerator pedal position sensor for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 3.

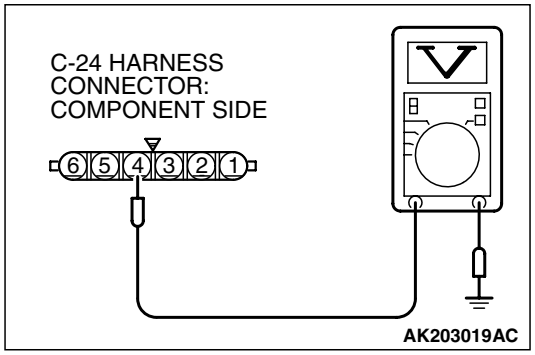
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.



STEP 3. Measure the sensor supply voltage at accelerator pedal position sensor harness side connector C-24.

(1) Disconnect the connector C-24 and measure at the harness side.

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



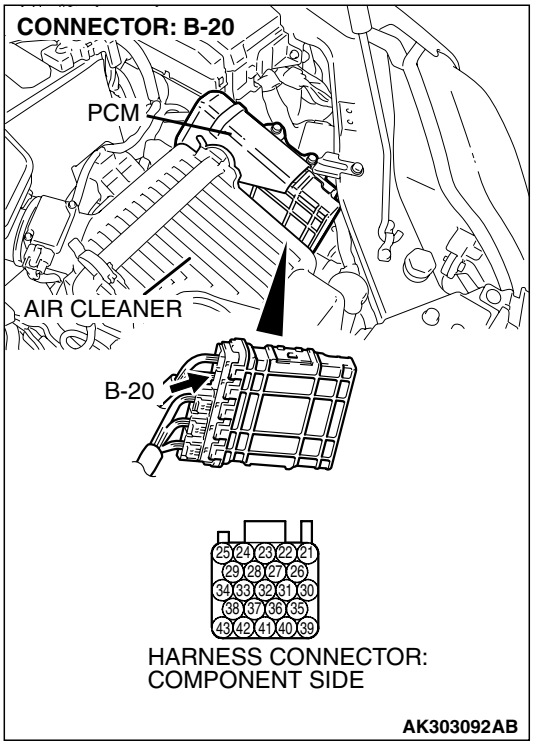
(3) Measure the voltage between terminal No. 4 and ground.
- Voltage should be between 4.9 and 5.1 volts.

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

Q: Is the measured voltage between 4.9 and 5.1 volts?

YES : Go to Step 7.

NO : Go to Step 4.

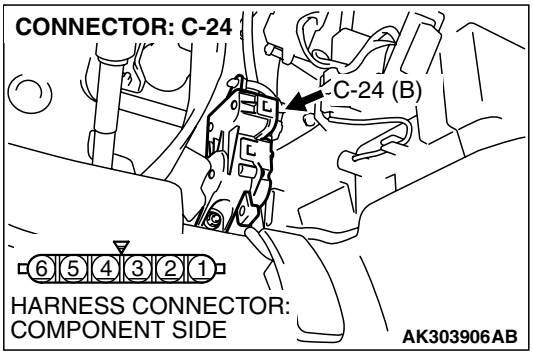


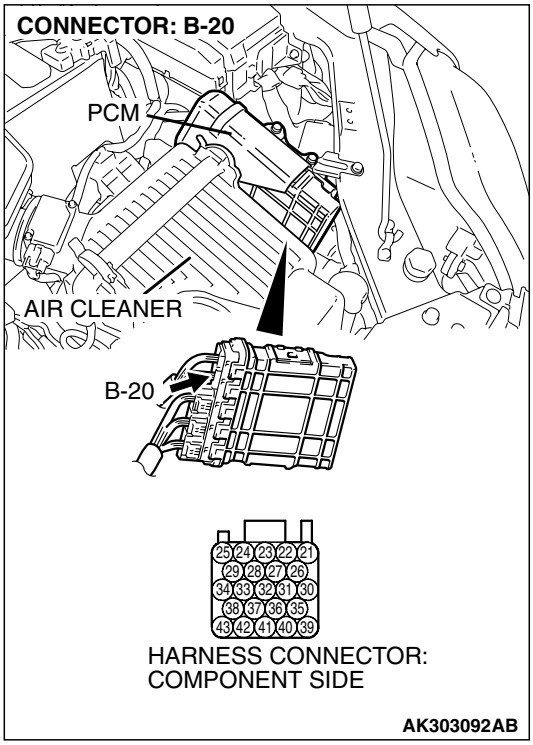
STEP 4. Check harness connector B-20 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 5.

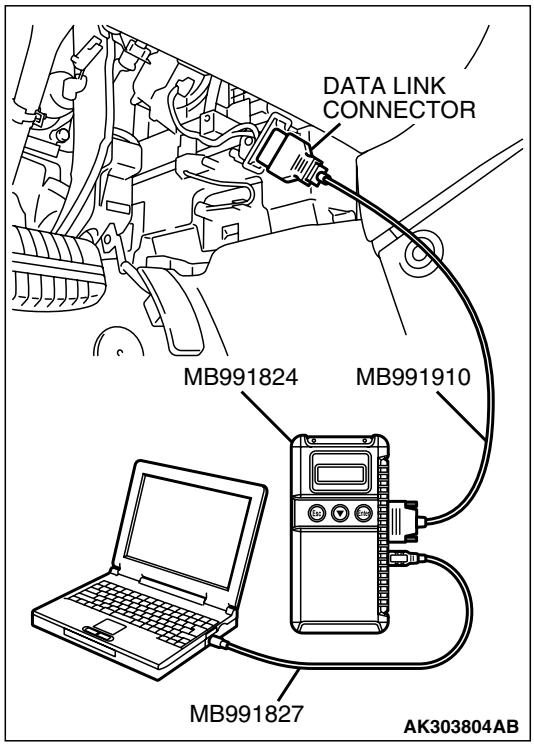
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.





STEP 5. Check for open circuit and short circuit to ground between accelerator pedal position sensor connector C-24 (terminal No. 4) and PCM connector B-20 (terminal No. 21).
Q: Is the harness wire in good condition?

YES : Go to Step 6.
NO : Repair it. Then go to Step 11.



STEP 6. Using scan tool MB991958, check data list item 12: Accelerator Pedal Position Sensor (sub).

⚠ 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.

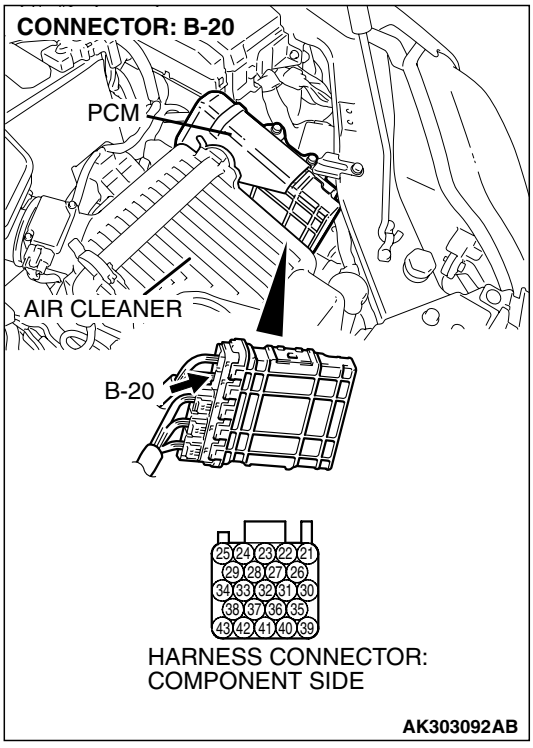
(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991958 to the data reading mode for item 12, Accelerator Pedal Position Sensor (sub).
- Output voltage is between 0.435 and 1.035 volts when foot is released from accelerator pedal.
- Output voltage is 3.6 volts or higher when accelerator pedal is fully depressed.

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

Q: Is the sensor operating properly?

YES : It can be assumed 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 : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 11.

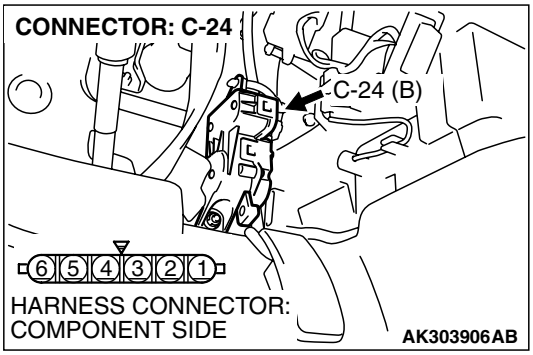


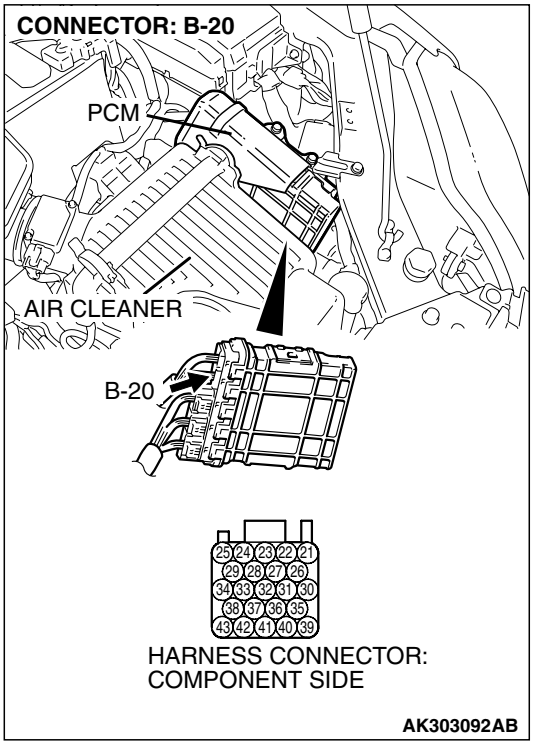
STEP 7. Check harness connector B-20 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 8.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.





STEP 8. Check for harness damage between accelerator pedal position sensor connector C-24 (terminal No. 4) and PCM connector B-20 (terminal No. 21).

Q: Is the harness wire in good condition?

YES : Go to Step 9.

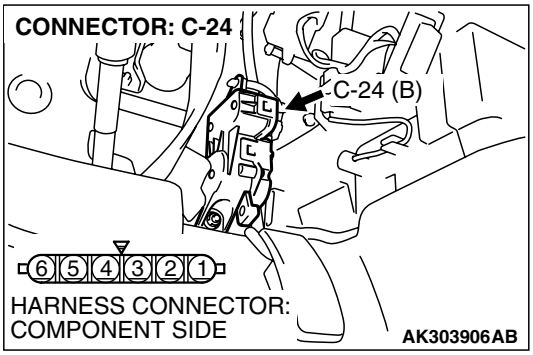
NO : Repair it. Then go to Step 11.

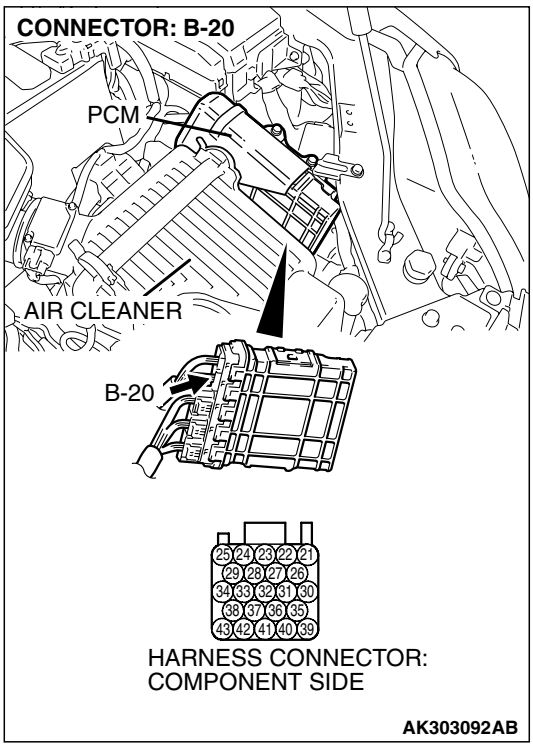
STEP 9. Check for harness damage between accelerator pedal position sensor connector C-24 (terminal No. 6) and PCM connector B-20 (terminal No. 27)

Q: Is the harness wire in good condition?

YES : Go to Step 10.

NO : Repair it. Then go to Step 11.





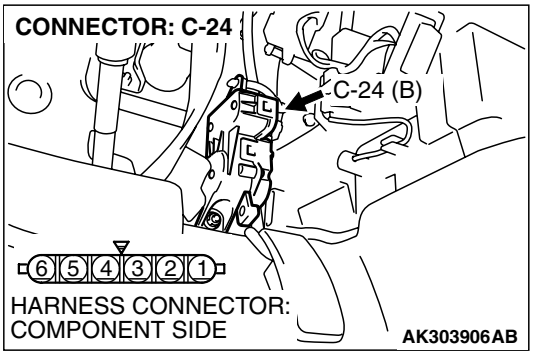
STEP 10. Replace the accelerator pedal position sensor.

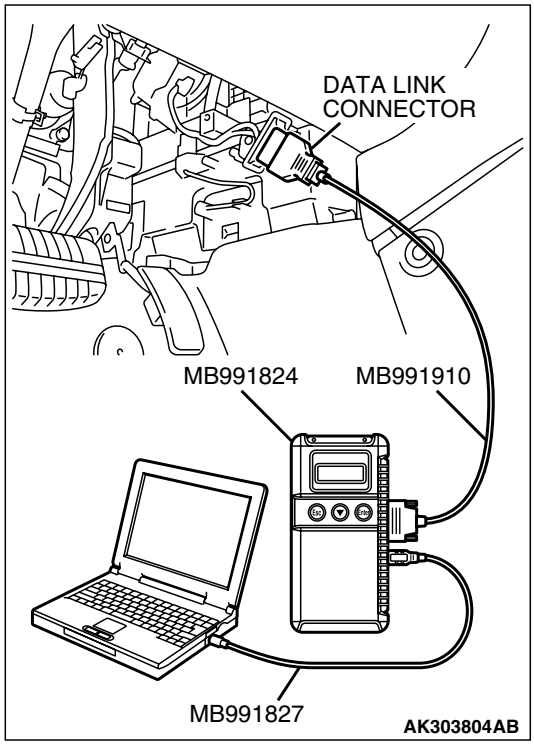
(1) Replace the accelerator pedal position sensor.
(2) Turn the ignition switch to the "ON" position.
(3) After the DTC has been deleted, read the DTC again.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC P2127 set?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 11.

NO : The inspection is complete.





STEP 11. 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) After the DTC has been deleted, read the DTC again.
(4) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is DTC P2127 set?

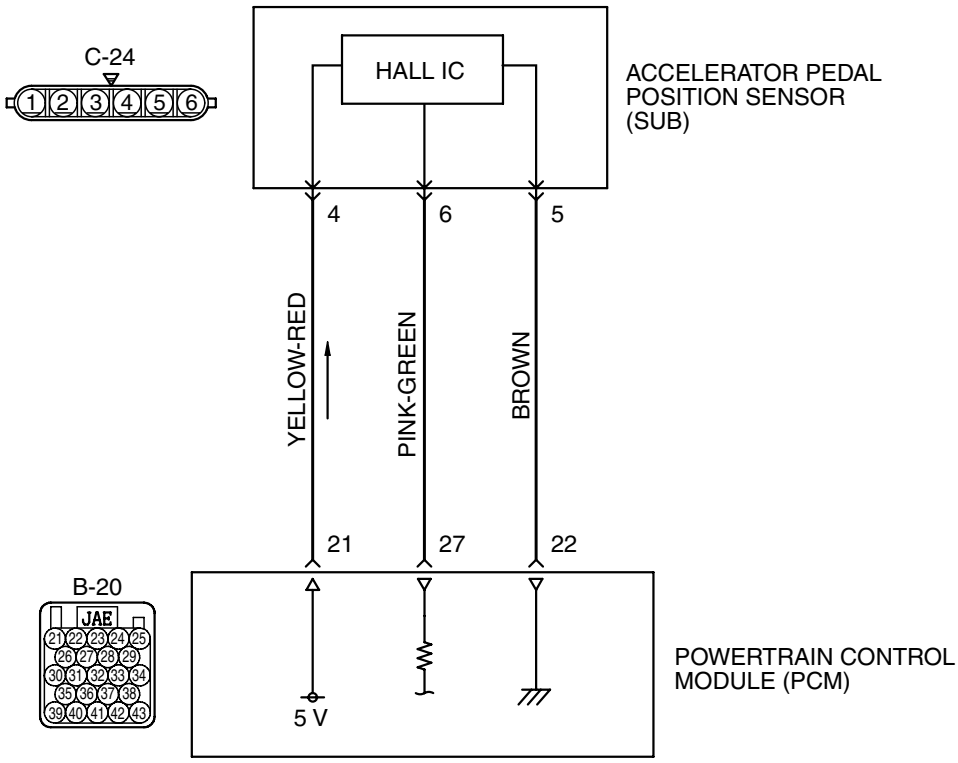
YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P2128: Accelerator Pedal Position Sensor (sub) Circuit High Input

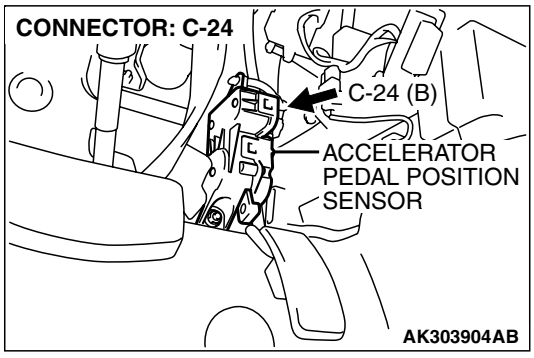
⚠ CAUTION

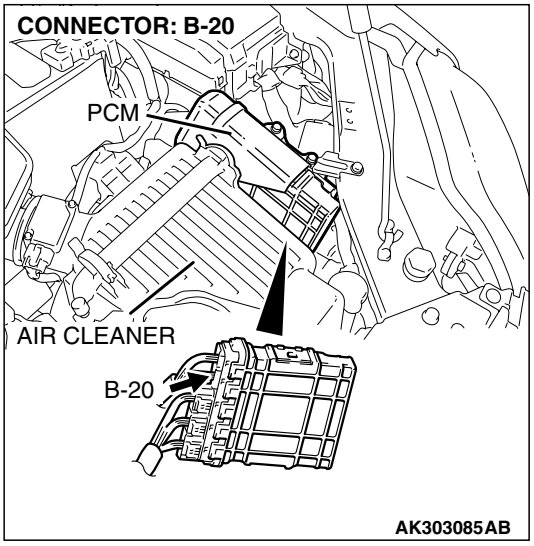
If DTC P2128 has been set, TCL related DTC U1120 is also set. After P2128 has been diagnosed, don't forget to erase DTC U1120.

Accelerator Pedal Position Sensor (sub) Circuit



AK303908





TSB Revision

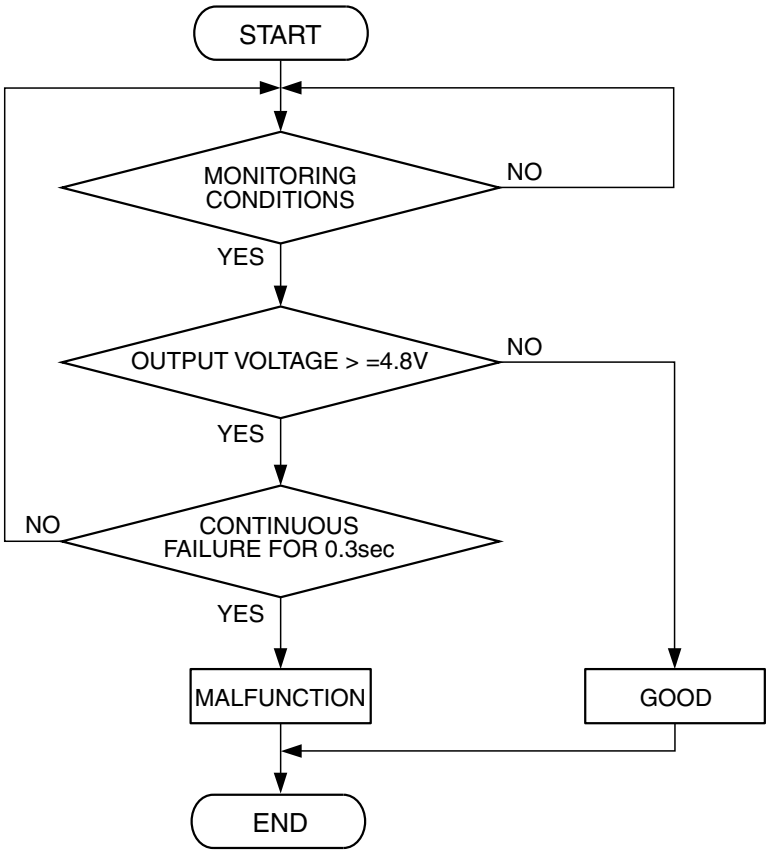
CIRCUIT OPERATION
- A 5-volt power supply is applied on the accelerator pedal position sensor (sub) power terminal (terminal No. 4) from the PCM (terminal No. 21). The ground terminal (terminal No. 5) is grounded with PCM (terminal No. 22).

TECHNICAL DESCRIPTION
- The accelerator pedal position sensor (sub) outputs voltage which corresponds to the accelerator pedal depression.
- The PCM checks whether the voltage is within a specified range.

DESCRIPTIONS OF MONITOR METHODS
Accelerator pedal position sensor (sub) output voltage is out of specified range.

DTC SET CONDITIONS

Logic Flow Chart



AK303907

MONITOR EXECUTION
Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)
- Not applicable

Sensor (The sensor below is determined to be normal)
- Not applicable

Check Condition
- Ignition switch is "ON" position.

TSB Revision

Judgement Criterion

- Accelerator pedal position sensor (sub) output voltage is 4.8 volts or higher for 0.3 second.

OBD-II DRIVE CYCLE PATTERN

None.

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

- Accelerator pedal position sensor failed.
- Open accelerator pedal position sensor (sub) circuit, harness damage or connector damage.
- PCM failed.

DIAGNOSIS

Required Special Tools:

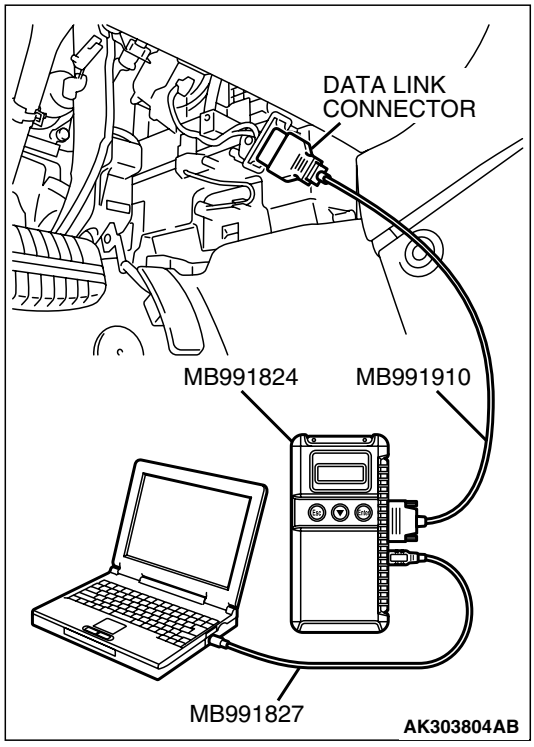
- MB991958: Scan tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A

STEP 1. Using scan tool MB991958, check data list item 12: Accelerator Pedal Position Sensor (sub).

⚠ 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 data reading mode for item 12, Accelerator Pedal Position Sensor (sub).
  - Output voltage is between 0.435 and 1.035 volts when foot is released from accelerator pedal.
  - Output voltage is 3.6 volts or higher when accelerator pedal is fully depressed.
(4) Turn the ignition switch to the "LOCK"(OFF) position.



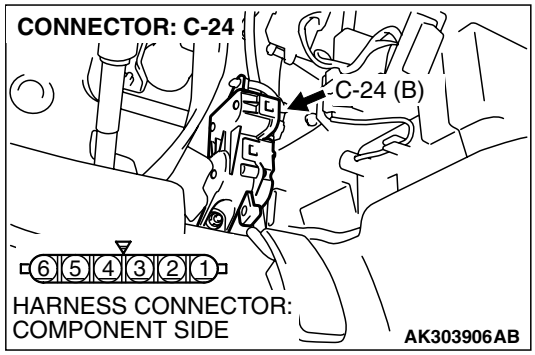
Q: Is the sensor operating properly?

YES : It can be assumed 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-24 at accelerator pedal position sensor for damage.

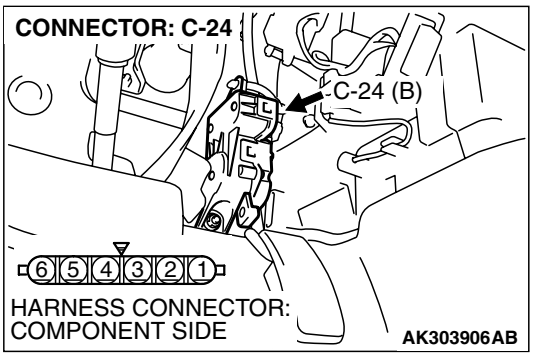
Q: Is the harness connector in good condition?



YES : Go to Step 3.

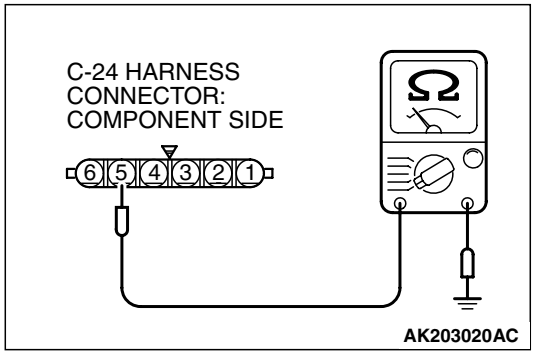
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 8.

TSB Revision



STEP 3. Check the continuity at accelerator pedal position sensor harness side connector C-24.

(1) Disconnect the connector C-24 and measure at the harness side.



(2) Measure the continuity between terminal No. 5 and ground.
- Continuity (2 Ω or less)

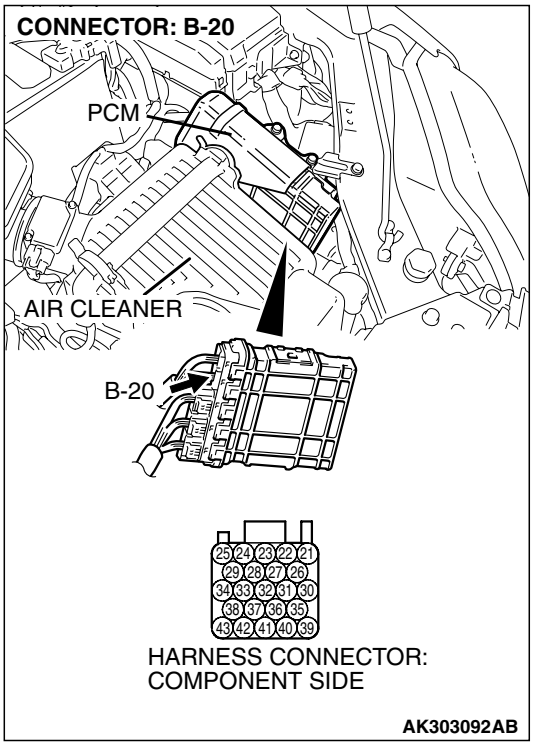
Q: Does continuity exist?

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

STEP 4. Check harness connector B-20 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 go to Step 8.

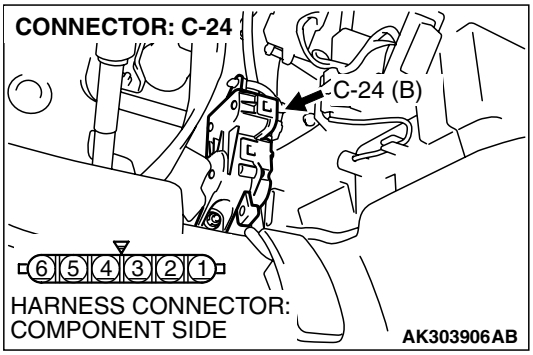


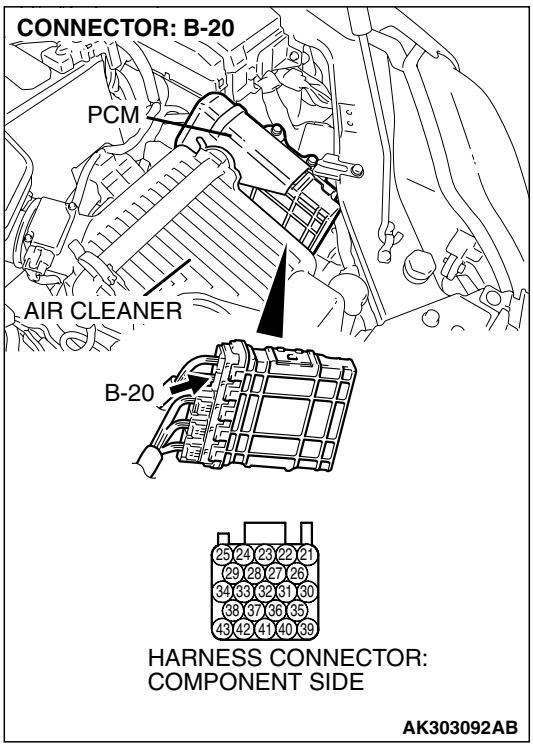
STEP 5. Check for open circuit and harness damage between accelerator pedal position sensor connector C-24 (terminal No. 5) and PCM connector B-20 (terminal No. 22).

Q: Is the harness wire in good condition?

YES : Go to Step 7.

NO : Repair it. Then go to Step 8.





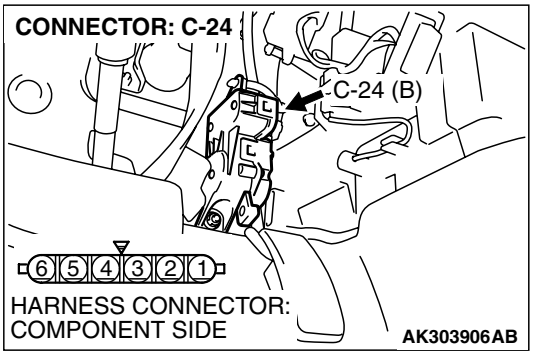
STEP 6. Replace the accelerator pedal position sensor.

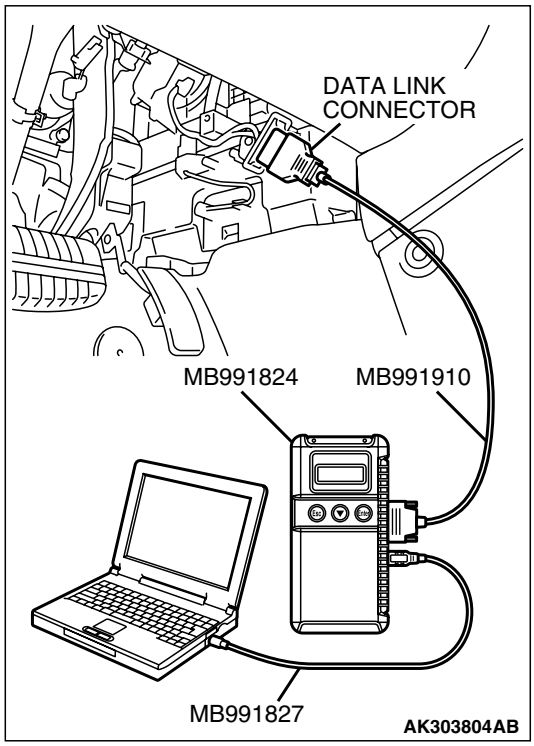
(1) Replace the accelerator pedal position sensor.
(2) Turn the ignition switch to the "ON" position.
(3) After the DTC has been deleted, read the DTC again.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC P2128 set?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 8.

NO : The inspection is complete.





STEP 7. Using scan tool MB991958, check data list item 12: Accelerator Pedal Position Sensor (sub).

⚠ 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.

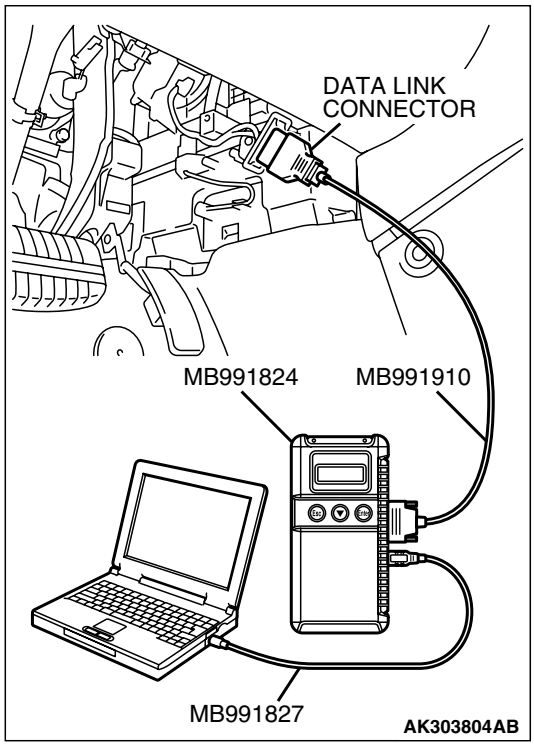
(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991958 to the data reading mode for item 12, Accelerator Pedal Position Sensor (sub).
- Output voltage is between 0.435 and 1.035 volts when foot is released from accelerator pedal.
- Output voltage is 3.6 volts or higher when accelerator pedal is fully depressed.

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

Q: Is the sensor operating properly?

YES : It can be assumed 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 : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 8.



STEP 8. Using scan tool MB991958, read the diagnostic trouble code (DTC).

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) After the DTC has been deleted, read the DTC again.
(4) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is DTC P2128 set?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P2135: Throttle Position Sensor (main and sub) Range/Performance Problem

⚠ CAUTION
If DTC P2135 has been set, TCL related DTC U1120 is also set. After P2135 has been diagnosed, don't forget to erase DTC U1120.

THROTTLE POSITION SENSOR (MAIN AND SUB) RANGE/PERFORMANCE PROBLEM CIRCUIT

- Refer to DTC P0122 – Throttle Position Sensor (main) Circuit P.13A-244.
- Refer to DTC P0222 – Throttle Position Sensor (sub) Circuit P.13A-508.

CIRCUIT OPERATION

- Refer to DTC P0122 – Throttle Position Sensor (main) Circuit P.13A-244.
- Refer to DTC P0222 – Throttle Position Sensor (sub) Circuit P.13A-508.

TECHNICAL DESCRIPTION

- PCM checks the throttle position sensor output signal characteristics for abnormal conditions.

DESCRIPTIONS OF MONITOR METHODS

Detect malfunction if the relation between throttle position sensor (main) and throttle position sensor (sub) is wrong.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

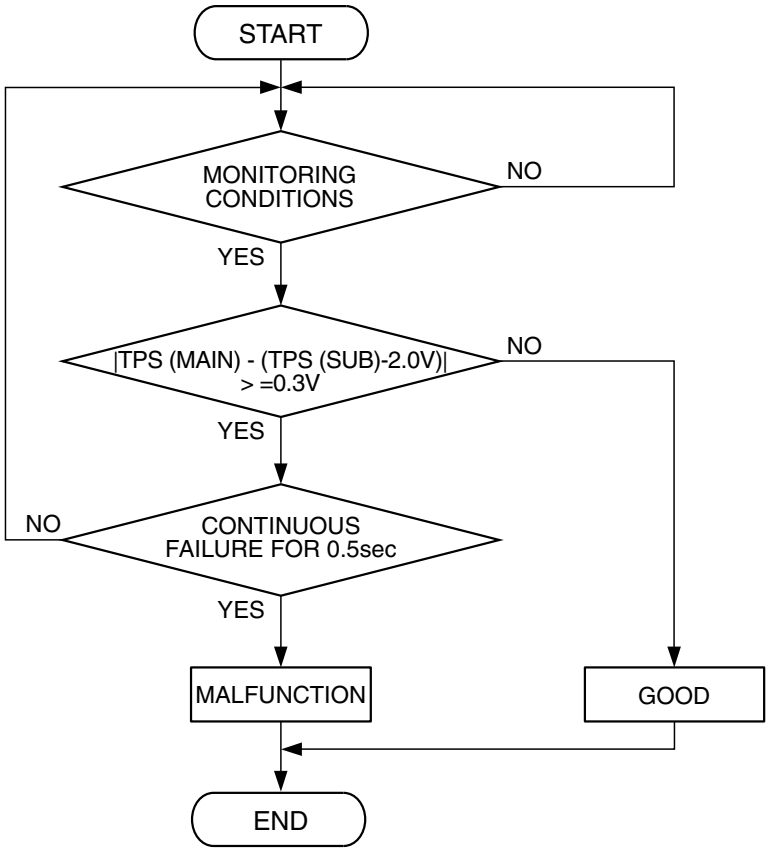
- Not applicable

Sensor (The sensor below is determined to be normal)

- Mass airflow sensor

DTC SET CONDITIONS <Range/Performance problem-relation between main and sub>

Logic Flow Chart



AK302047

Check Conditions

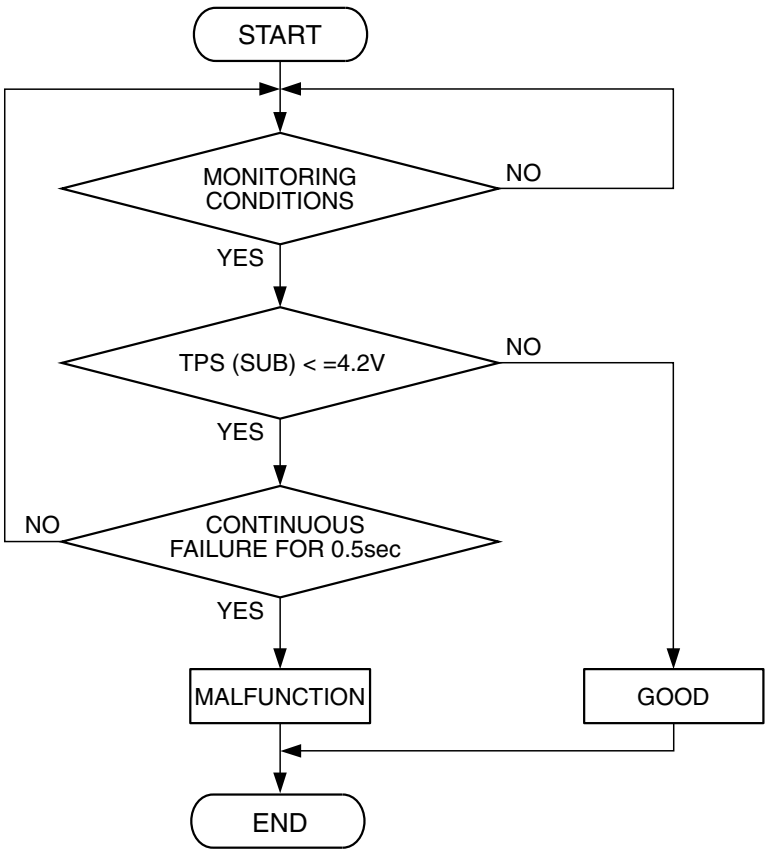
- Ignition switch is "ON" position.
- Throttle position sensor (main) output voltage is between 0.35 and 2.5 volts.
- Throttle position sensor (sub) output voltage is between 2.25 and 4.8 volts.

Judgement Criterion

- Voltage obtained with the formula given below is 0.3 volt or higher for 0.5 second: throttle position sensor (main) output voltage – [throttle position sensor (sub) output voltage – 2 volts]

TSB Revision

Logic Flow Chart



AK302048

Check Conditions

- Ignition switch is "ON" position.
- Throttle position sensor (main) output voltage is between 2.5 and 4.8 volts.
- Throttle position sensor (sub) output voltage is higher than 2.25 volts.

Judgement Criterion

- Throttle position sensor (sub) output voltage is 4.2 volts or lower.

OBD-II DRIVE CYCLE PATTERN

None.

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

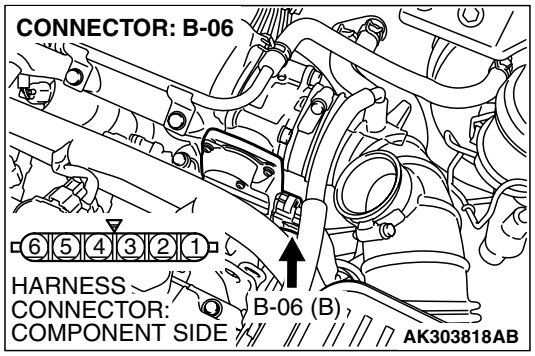
- Throttle position sensor failed.
- Shorted throttle position sensor circuit or connector damage.
- PCM failed.

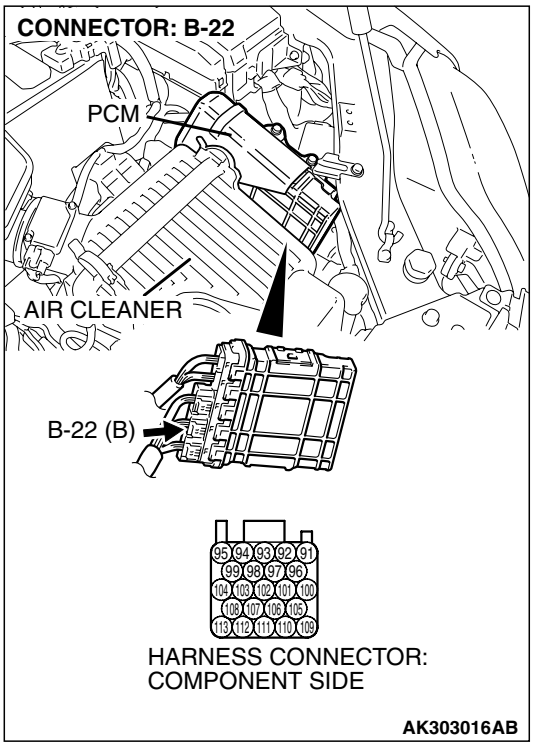
DIAGNOSIS

Required Special Tools:

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

TSB Revision

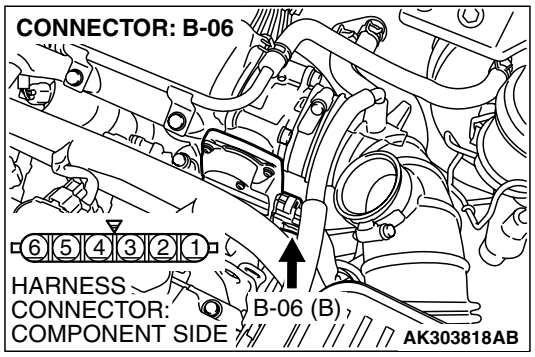


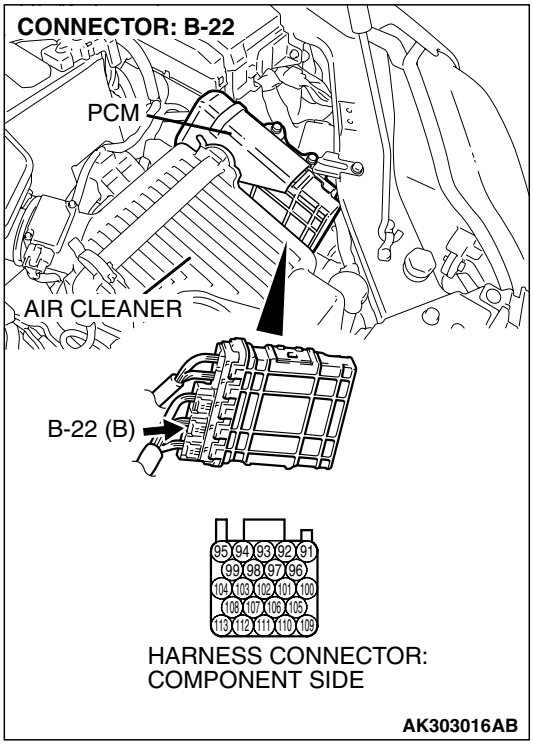


STEP 1. Check harness connector B-06 at throttle position sensor and harness connector B-22 at PCM for damage.
Q: Is the harness connector in good condition?

YES : Go to Step 2.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 5.





STEP 2. Check for short circuit to ground between throttle position sensor connector B-06 (terminal No. 6) and PCM connector B-22 (terminal No. 98).

Q: Is the harness wire in good condition?

YES : Go to Step 3.

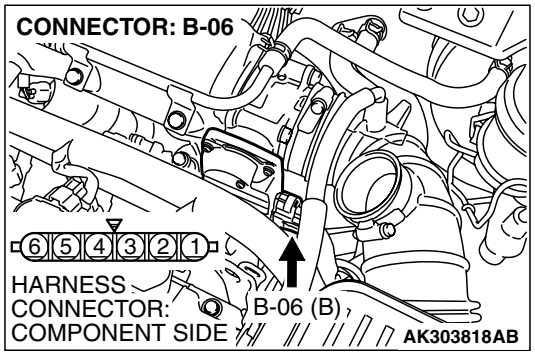
NO : Repair it. Then go to Step 5.

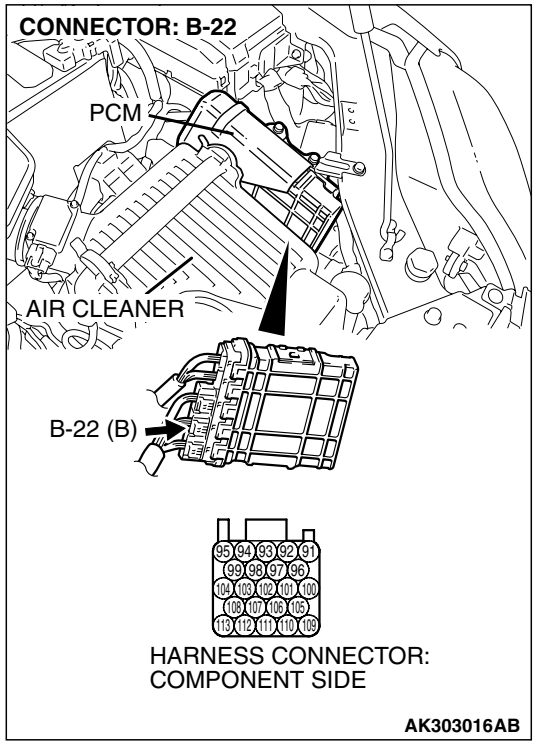
STEP 3. Check for short circuit to ground between throttle position sensor connector B-06 (terminal No. 4) and PCM connector B-22 (terminal No. 99).

Q: Is the harness wire in good condition?

YES : Go to Step 4.

NO : Repair it. Then go to Step 5.





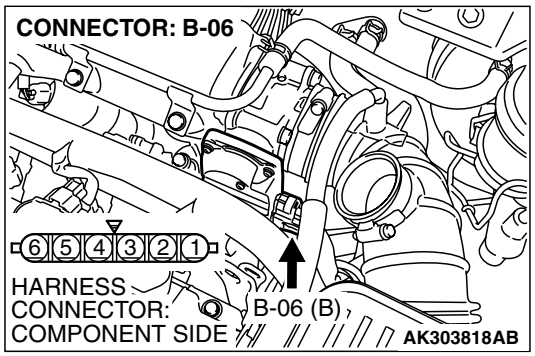
STEP 4. Replace the throttle body assembly.

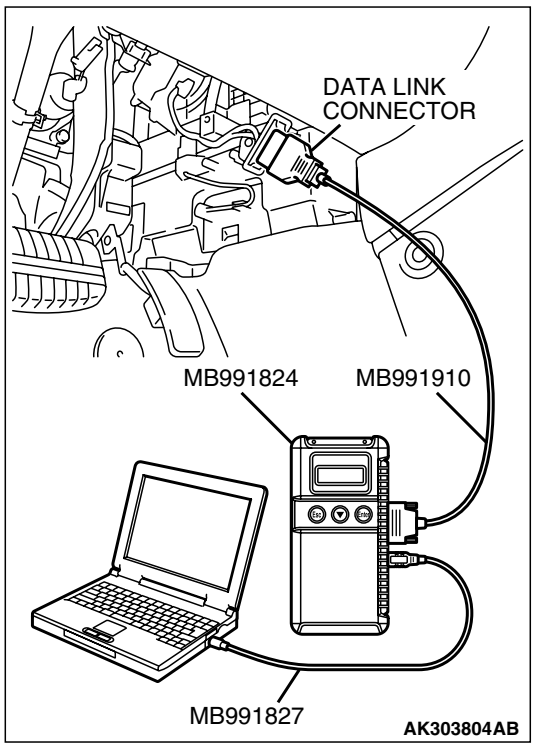
(1) Replace the throttle body assembly.
(2) Turn the ignition switch to the "ON" position.
(3) Erase the DTC.
(4) Depress the accelerator pedal fully for a few seconds.
(5) Turn the ignition switch to the "LOCK" (OFF) position.
(6) Check the DTC.

Q: Is DTC P2135 set?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 5.

NO : The inspection is complete.





STEP 5. 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) Erase the DTC.
(4) Depress the accelerator pedal fully for a few seconds.
(5) Turn the ignition switch to the "LOCK" (OFF) position.
(6) Check the DTC.

Q: Is DTC P2135 set?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P2138: Accelerator Pedal Position Sensor (main and sub) Circuit Range/Performance Problem

⚠ CAUTION
If DTC P2138 has been set, TCL related DTC U1120 and U1400 are also set. After P2138 has been diagnosed, don't forget to erase DTC U1120 and U1400.

ACCELERATOR PEDAL POSITION SENSOR (MAIN AND SUB) RANGE/PERFORMANCE PROBLEM CIRCUIT

- Refer to DTC P2122 – Accelerator Pedal Position Sensor (main) Circuit P.13A-908.
- Refer to DTC P2127 – Accelerator Pedal Position Sensor (sub) Circuit P.13A-925.

CIRCUIT OPERATION

- Refer to DTC P2122 – Accelerator Pedal Position Sensor (main) Circuit P.13A-908.
- Refer to DTC P2127 – Accelerator Pedal Position Sensor (sub) Circuit P.13A-925.

TECHNICAL DESCRIPTION

- PCM checks the accelerator pedal position sensor output signal characteristics for abnormal conditions.

DESCRIPTIONS OF MONITOR METHODS

Detect malfunction if the relation between accelerator pedal position sensor (main) and accelerator pedal position sensor (sub) is wrong.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

- Not applicable

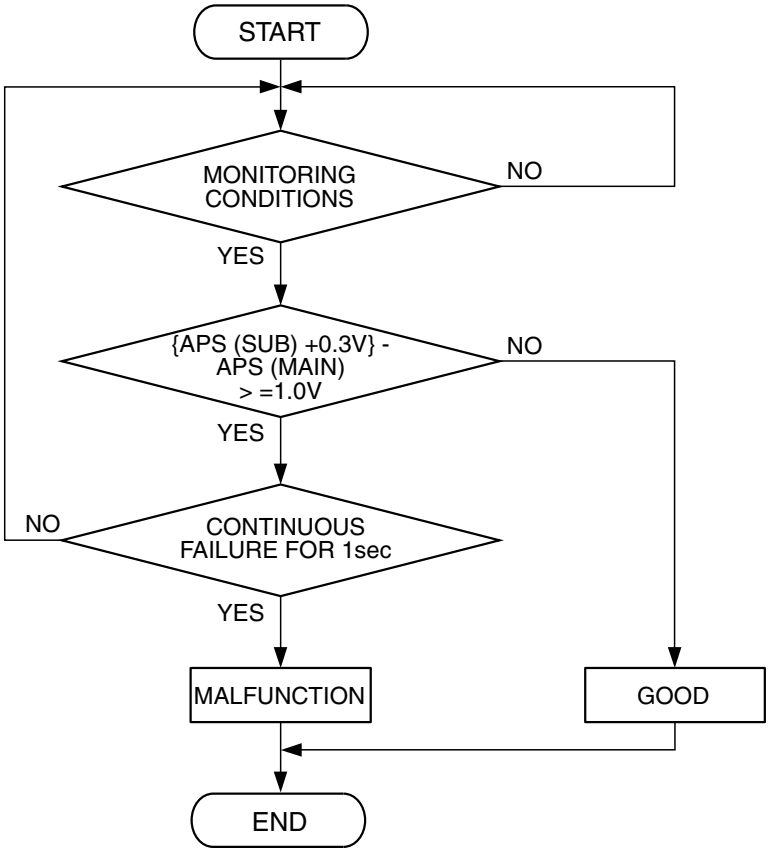
Sensor (The sensor below is determined to be normal)

- Not applicable

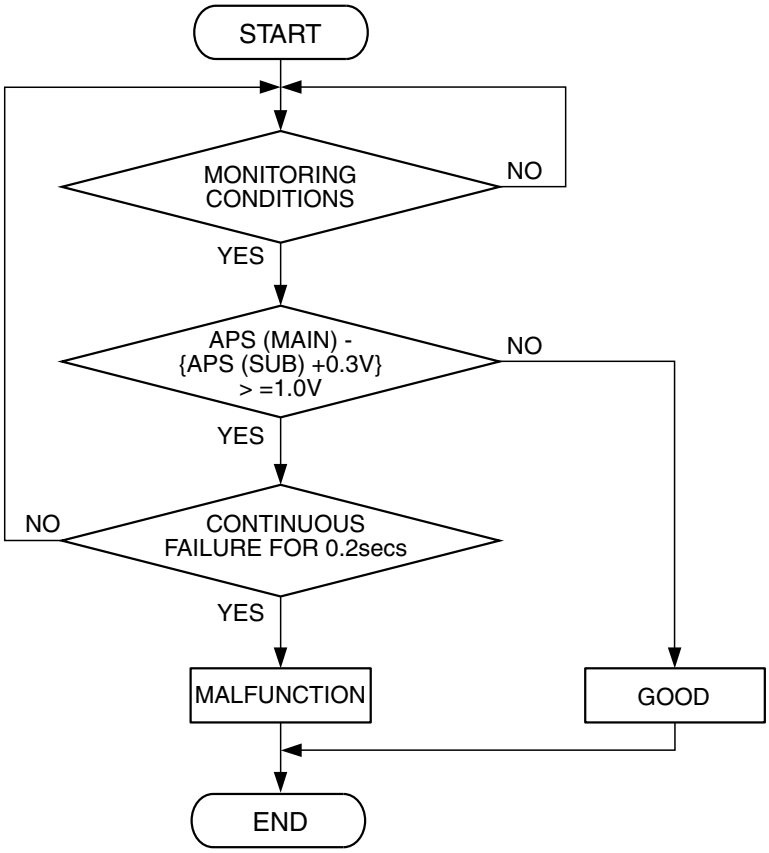
TSB Revision

DTC SET CONDITIONS

Logic Flow Chart



AK303910



AK303911

Check Conditions

- Ignition switch is "ON" position.
- Accelerator pedal position sensor (main) output voltage is between 0.6 and 4.8 volts.
- Accelerator pedal position sensor (sub) output voltage is between 0.2 and 4.8 volts.
- Change of accelerator pedal position sensor (sub) output voltage per 25 milliseconds is lower than 0.06 volt.

Judgement Criteria

- Voltage obtained with the formula given below is 1.0 volt or higher for 1 second: [accelerator pedal position sensor (sub) output voltage +0.3 volt] – accelerator pedal position sensor (main) output voltage.
  or
- Voltage obtained with the formula given below is 1.0 volt or higher for 0.2 second: [accelerator pedal position sensor (main) output voltage – [accelerator pedal position sensor (sub) output voltage +0.3 volt].

OBD-II DRIVE CYCLE PATTERN

None.

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

- Accelerator pedal position sensor failed.
- Harness damage in accelerator pedal position sensor circuit or connector damage.
- PCM failed.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable

TSB Revision

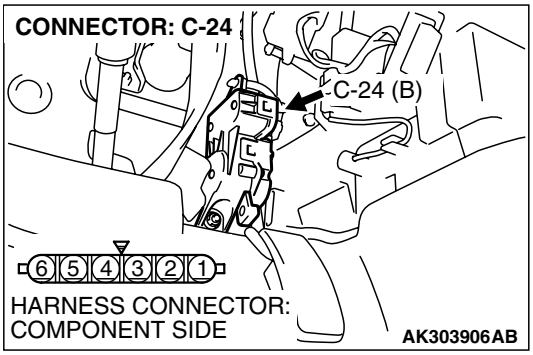
- MB991910: Main Harness A

STEP 1. Check harness connector C-24 at accelerator pedal position sensor for damage.

Q: Is the harness connector in good condition?

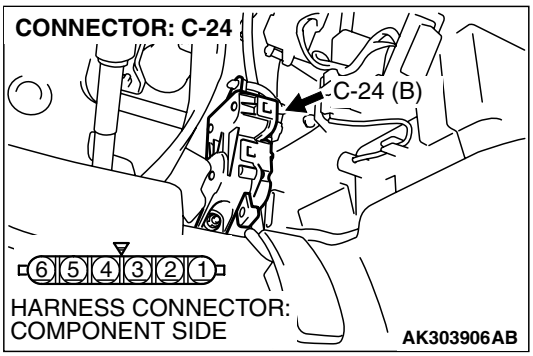
YES : Go to Step 2.

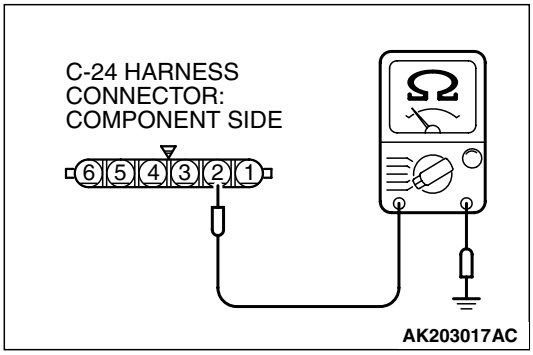
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 16.



STEP 2. Check the continuity at accelerator pedal position sensor harness side connector C-24.

(1) Disconnect the connector C-24 and measure at the harness side.





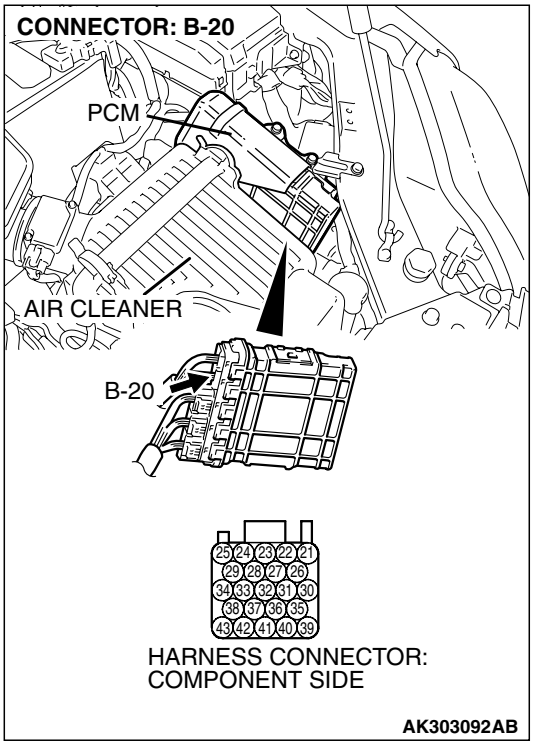
(2) Measure the continuity between terminal No. 2 and ground.

- Continuity (2 Ω or less)

Q: Does continuity exist?

YES : Go to Step 6.

NO : Go to Step 3.

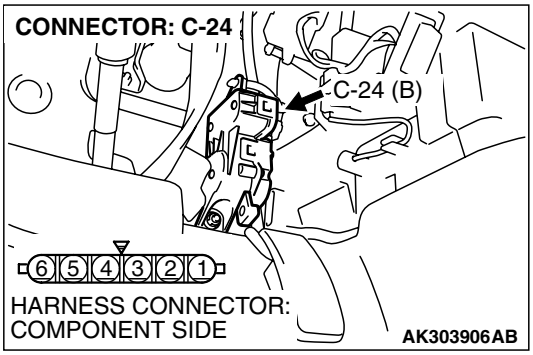


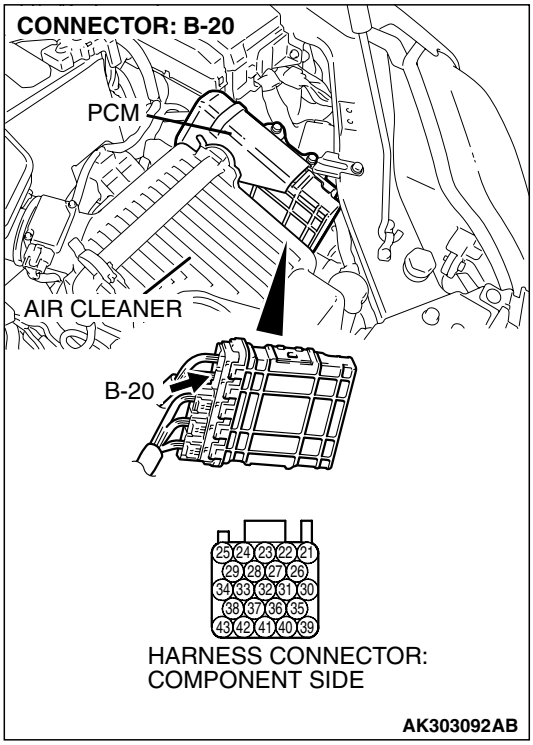
STEP 3. Check harness connector B-20 at PCM for damage.

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

YES : Go to Step 4.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 16.





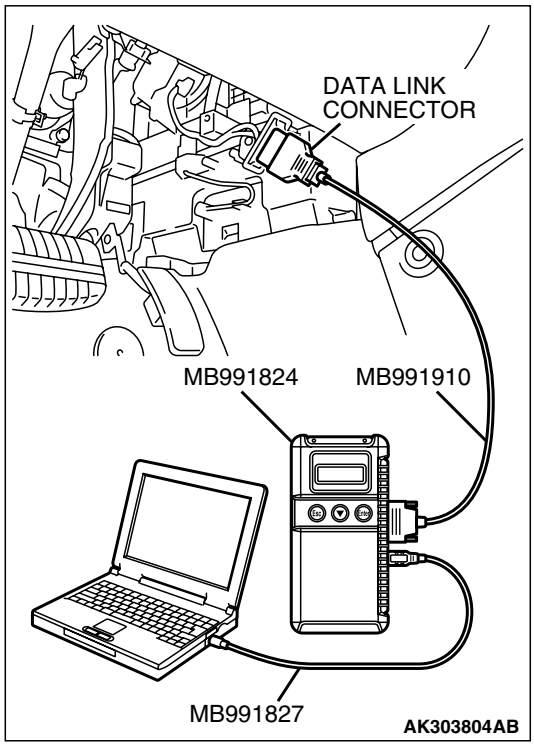
STEP 4. Check for harness damage between accelerator pedal position sensor connector C-24 (terminal No. 2) and PCM connector B-20 (terminal No. 31).

Q: Is the harness wire in good condition?

YES : Go to Step 5.

NO : Repair it. Then go to Step 16.

STEP 5. 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.

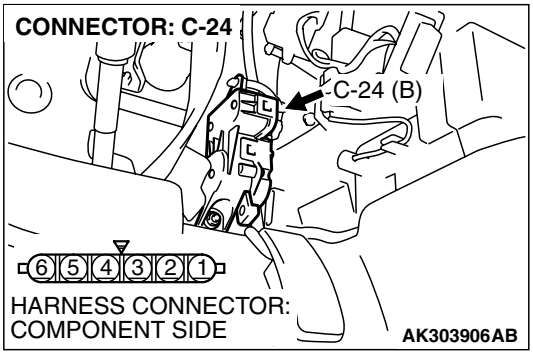
(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) After the DTC has been deleted, read the DTC again.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC P2138 set?

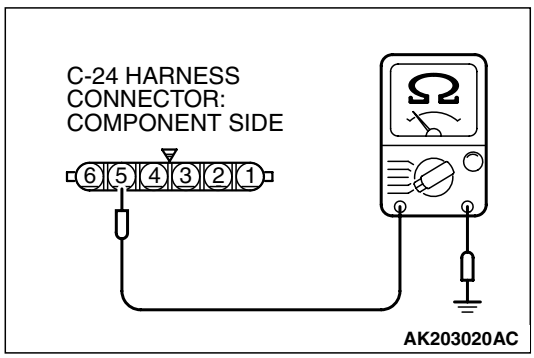
YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 16.

NO : It can be assumed 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.

STEP 6. Check the continuity at accelerator pedal position sensor harness side connector C-24.



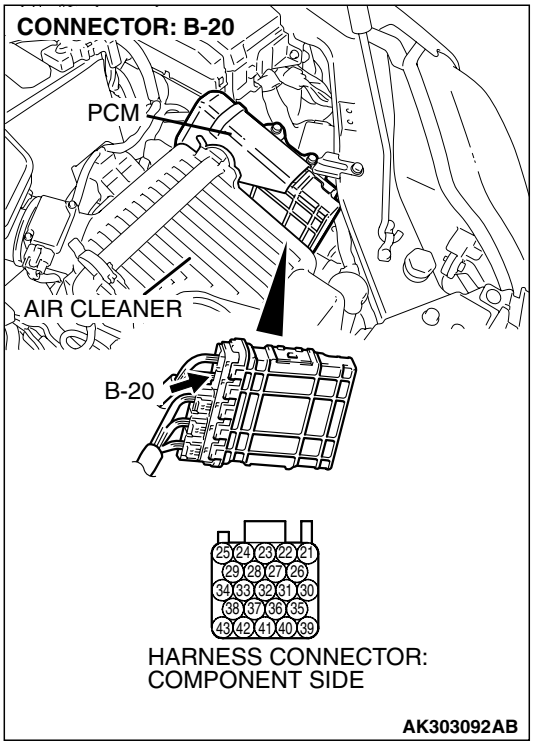
(1) Disconnect the connector C-24 and measure at the harness side.



(2) Measure the continuity between terminal No. 5 and ground.
- Continuity (2 Ω or less)

Q: Does continuity exist?

YES : Go to Step 10.
NO : Go to Step 7.

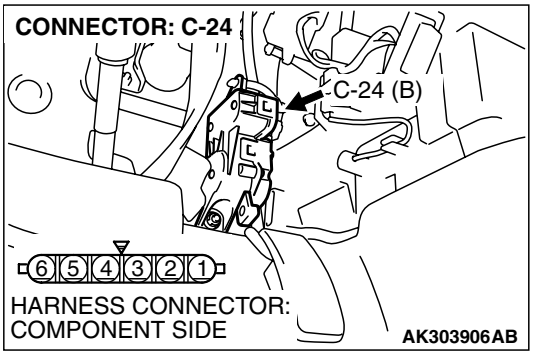


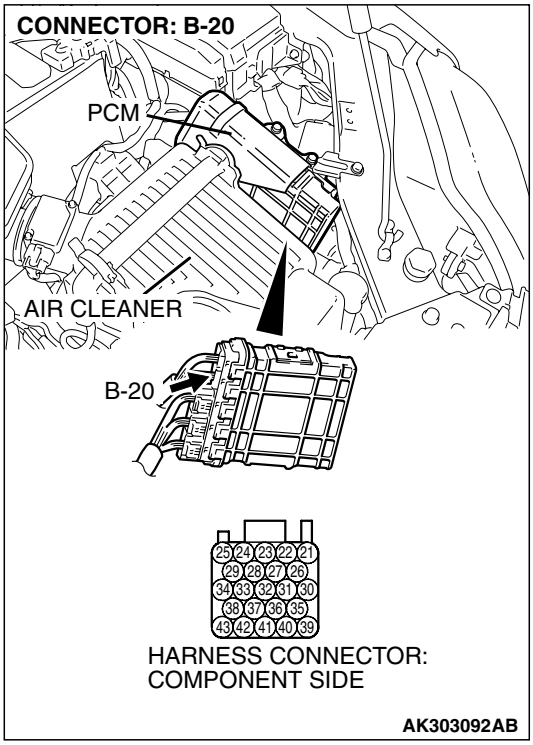
STEP 7. Check harness connector B-20 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 8.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 16.



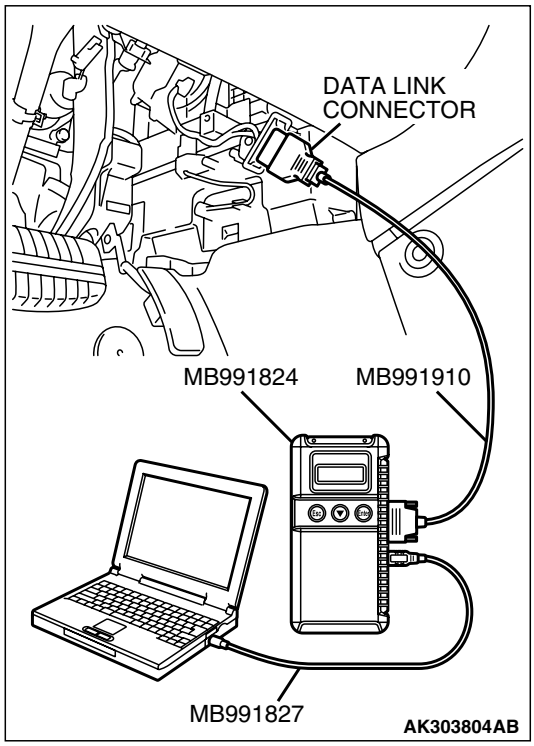


STEP 8. Check for harness damage between accelerator pedal position sensor connector C-24 (terminal No. 5) and PCM connector B-20 (terminal No. 22).

Q: Is the harness wire in good condition?

YES : Go to Step 9.

NO : Repair it. Then go to Step 16.



STEP 9. Using scan tool MB991958, read the diagnostic trouble code (DTC).

⚠ CAUTION

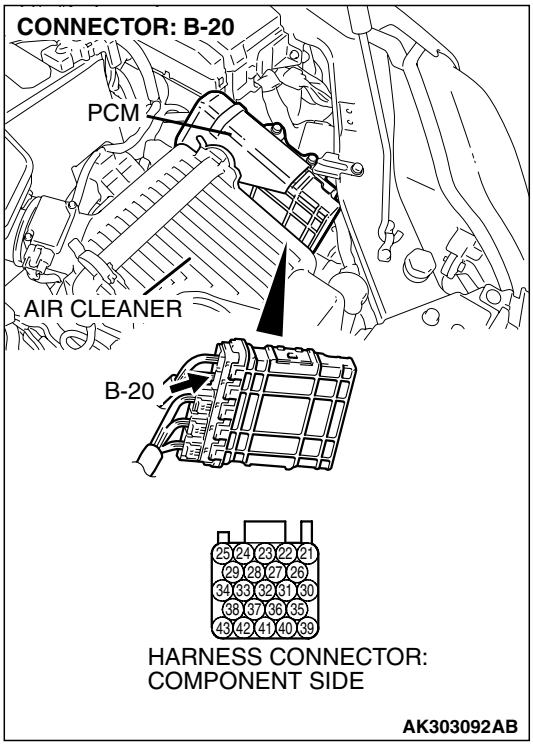
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) After the DTC has been deleted, read the DTC again.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC P2138 set?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 16.

NO : It can be assumed 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.

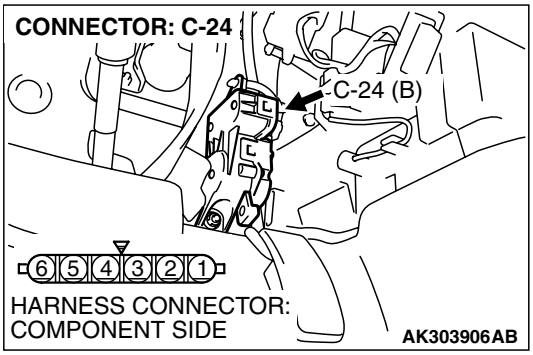


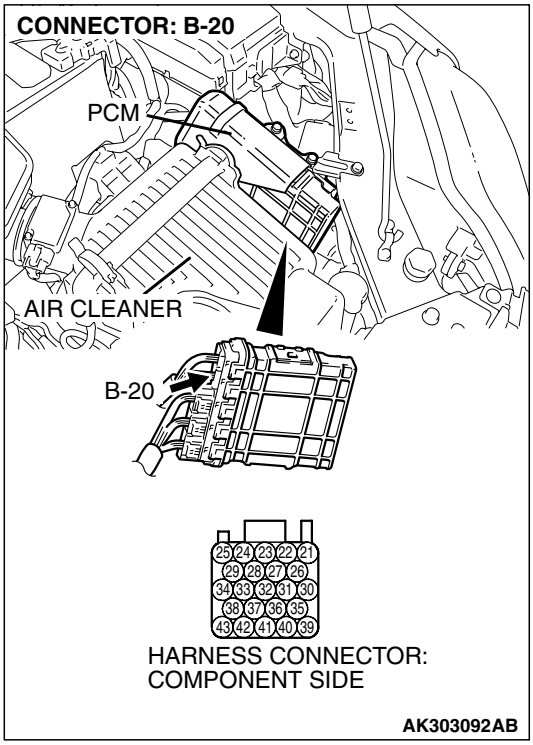
STEP 10. Check harness connector B-20 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 11.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 16.



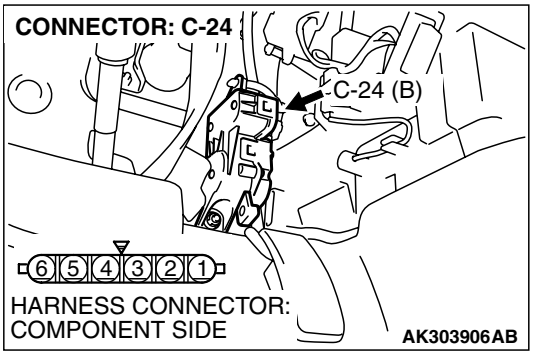


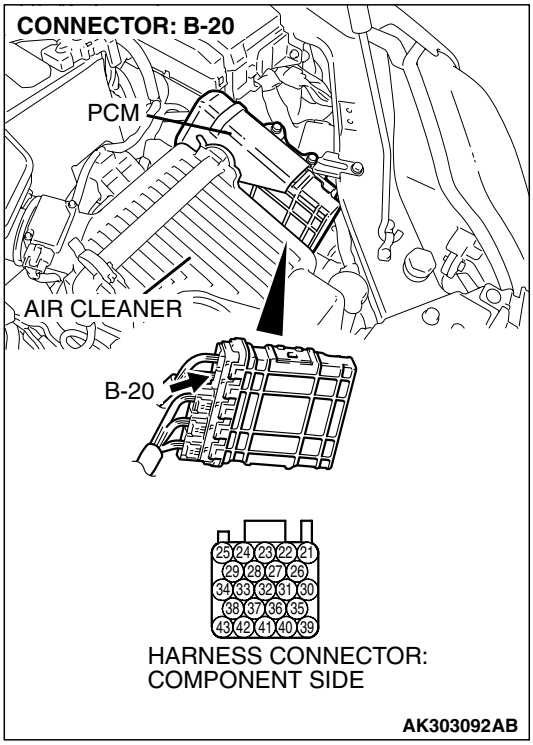
STEP 11. Check for harness damage between accelerator pedal position sensor connector C-24 (terminal No. 1) and PCM connector B-20 (terminal No. 30).

Q: Is the harness wire in good condition?

YES : Go to Step 12.

NO : Repair it. Then go to Step 16.



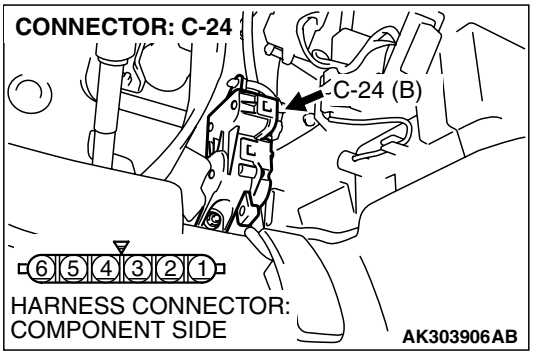


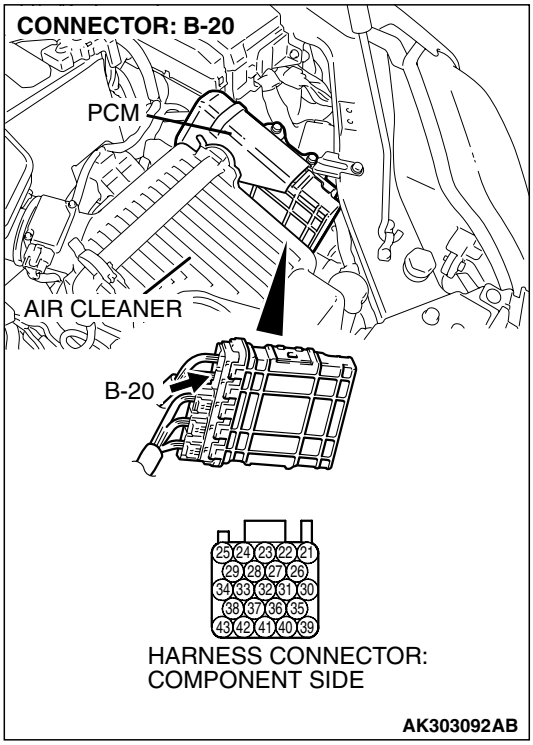
STEP 12. Check for harness damage between accelerator pedal position sensor connector C-24 (terminal No. 4) and PCM connector B-20 (terminal No. 21).

Q: Is the harness wire in good condition?

YES : Go to Step 13.

NO : Repair it. Then go to Step 16.





STEP 13. Check for harness damage between accelerator pedal position sensor connector C-24 (terminal No. 3) and PCM connector B-20 (terminal No. 26).

Q: Is the harness wire in good condition?

YES : Go to Step 14.

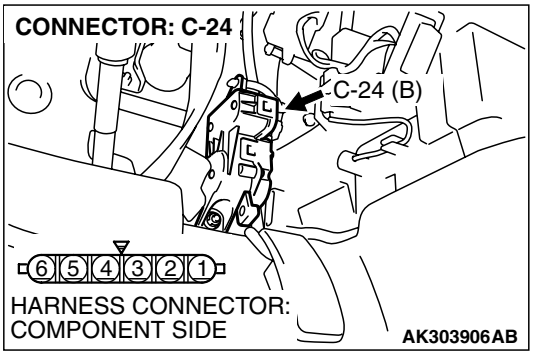
NO : Repair it. Then go to Step 16.

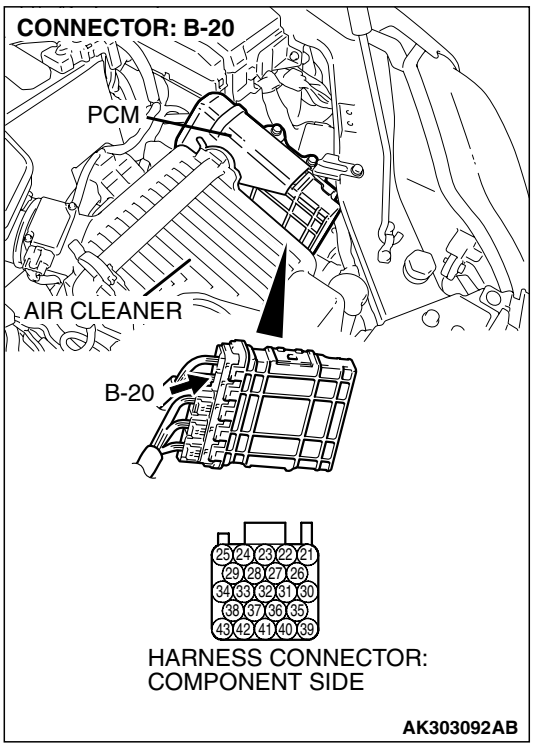
STEP 14. Check for harness damage between accelerator pedal position sensor connector C-24 (terminal No. 6) and PCM connector B-20 (terminal No. 27).

Q: Is the harness wire in good condition?

YES : Go to Step 15.

NO : Repair it. Then go to Step 16.





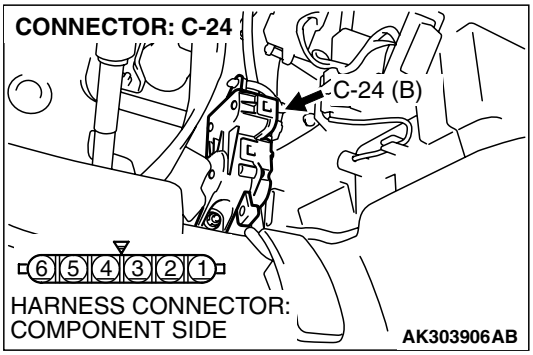
STEP 15. Replace the accelerator pedal position sensor.

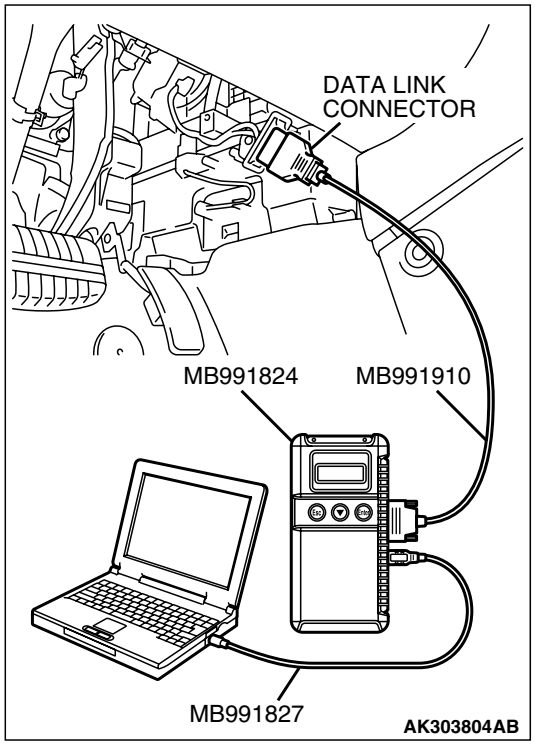
(1) Replace the accelerator pedal position sensor.
(2) Turn the ignition switch to the "ON" position.
(3) After the DTC has been deleted, read the DTC again.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC P2138 set?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 16.

NO : The inspection is complete.





STEP 16. 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) After the DTC has been deleted, read the DTC again.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC P2138 set?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P2195: Cylinder 1, 4 Heated Oxygen Sensor (front) Inactive

⚠ CAUTION
If DTC P2195 has been set, TCL related DTC U1120 is also set. After P2195 has been diagnosed, don't forget to erase DTC U1120.

TECHNICAL DESCRIPTION

- The PCM effects air/fuel ratio feedback control in accordance with the signals from the cylinder 1, 4 heated oxygen sensor (front).
- If the cylinder 1, 4 heated oxygen sensor (front) has deteriorated, corrections will be made by the cylinder 1, 4 heated oxygen sensor (rear).
- DTC P2195 becomes stored in memory if a failure is detected in the cylinder 1, 4 heated oxygen sensor (front).

DESCRIPTIONS OF MONITOR METHODS

Cylinder 1, 4 heated oxygen sensor (front) output voltage does not cross lean/rich criteria (about 0.5 volt) within specified period.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

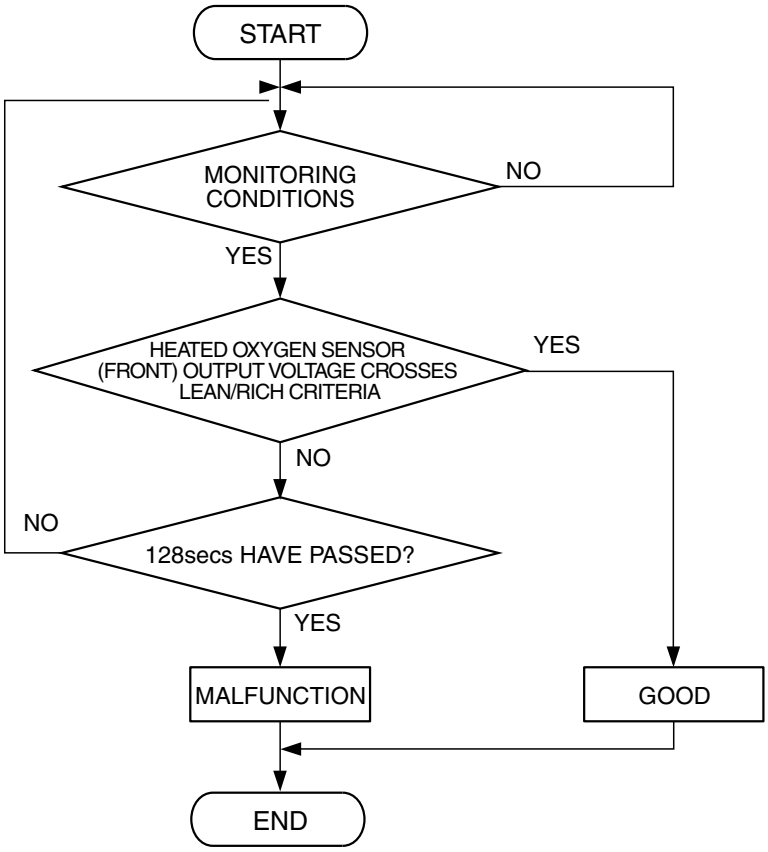
- Heated oxygen sensor (front) monitor
- Misfire monitor

Sensor (The sensor below is determined to be normal)

- Engine coolant temperature sensor
- Intake air temperature sensor

DTC SET CONDITIONS

Logic Flow Chart



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Check Conditions

- More than 20 seconds or more have passed since the engine starting sequence was completed.
- Engine coolant temperature is higher than 7°C (45°F) or more.
- Under the closed loop air/fuel ratio control.
- Intake air temperature is more than −10°C (14°F).

Judgement Criterion

- Cylinder 1, 4 heated oxygen sensor (front) output voltage is less than lean/rich criteria (about 0.5 volt) for 128 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 23 P.13A-9.

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

- Cylinder 1, 4 heated oxygen sensor (front) deteriorated.
- PCM failed.

DIAGNOSIS

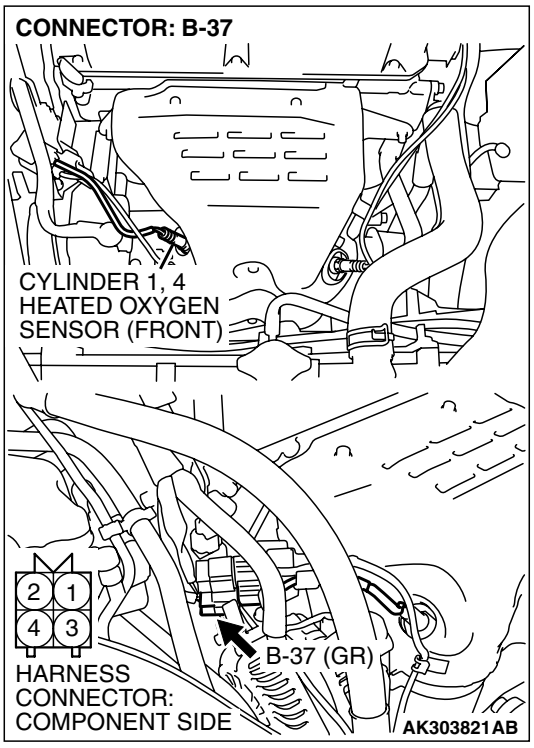
Required Special Tools:

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

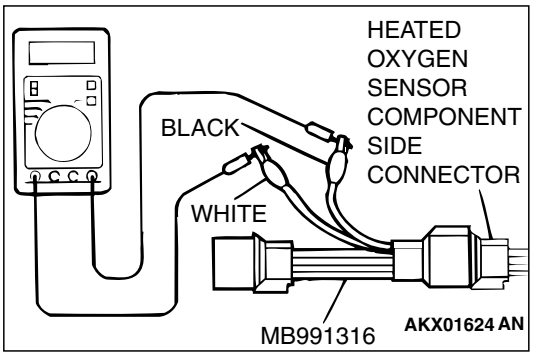
TSB Revision

- MB991316: Test Harness

STEP 1. Check the cylinder 1, 4 heated oxygen sensor (front).



(1) Disconnect the cylinder 1, 4 heated oxygen sensor (front) connector B-37 and connect test harness special tool MB991316 to the connector on the cylinder 1, 4 heated oxygen sensor (front) side.
(2) Warm up the engine until engine coolant temperature reaches 80°C (176°F) or higher.
(3) Rev the engine for 5 minutes or more with the engine speed of 4,500 r/min.



(4) Connect a digital voltage meter between terminal No. 2 (black clip) and terminal No. 4 (white clip).
(5) While repeatedly revving the engine, measure the cylinder 1, 4 heated oxygen sensor (front) output voltage.

Standard value: 0.6 – 1.0 V

⚠ CAUTION

- **Be very careful when connecting the jumper wires; incorrect connection can damage the heated oxygen sensor.**
- **Be careful the heater can be damaged if a voltage 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 a jumper wire to connect the terminal No. 1 (red clip) and the terminal No. 3 (blue clip) of the heated oxygen sensor with the positive terminal and the negative terminal of 8 volts power supply respectively, then check again.

Q: Is the measured voltage between 0.6 and 1.0 volt?

YES : Go to Step 2.
NO : Replace the cylinder 1, 4 heated oxygen sensor (front). Then go to Step 3.

STEP 2. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 23 P.13A-9.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P2195 set?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 3.
NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions.

STEP 3. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 23 P.13A-9.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P2195 set?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P2197: Cylinder 2, 3 Heated Oxygen Sensor (front) Inactive

⚠ CAUTION
If DTC P2197 has been set, TCL related DTC U1120 is also set. After P2197 has been diagnosed, don't forget to erase DTC U1120.

TECHNICAL DESCRIPTION

- The PCM effects air/fuel ratio feedback control in accordance with the signals from the cylinder 2, 3 heater oxygen sensor (front).
- If the cylinder 2, 3 heated oxygen sensor (front) has deteriorated, corrections will be made by the cylinder 2, 3 heated oxygen sensor (rear).
- DTC P2197 becomes stored in memory if a failure is detected in the cylinder 2, 3 heated oxygen sensor (front).

DESCRIPTIONS OF MONITOR METHODS

Cylinder 2, 3 heated oxygen sensor (front) output voltage does not cross lean/rich criteria (about 0.5 volt) within specified period.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

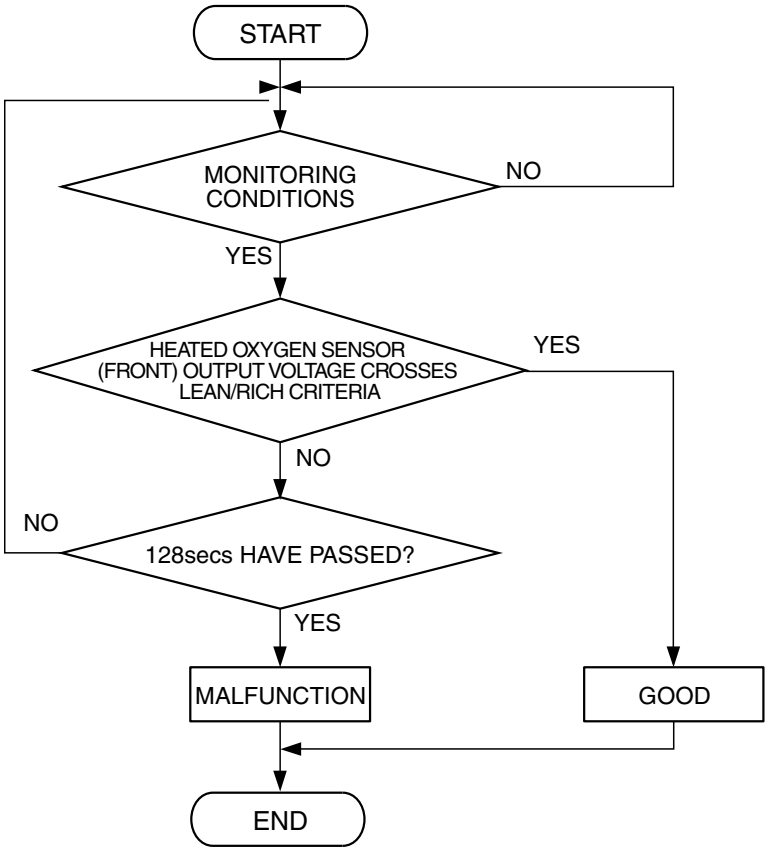
- Heated oxygen sensor (front) monitor
- Misfire monitor

Sensor (The sensor below is determined to be normal)

- Engine coolant temperature sensor
- Intake air temperature sensor

DTC SET CONDITIONS

Logic Flow Chart



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Check Conditions

- More than 20 seconds or more have passed since the engine starting sequence was completed.
- Engine coolant temperature is 7°C (45° F) or more.
- Under the closed loop air/fuel ratio control.
- Intake air temperature is more than –10°C (14° F).

Judgement Criterion

- Cylinder 2, 3 heated oxygen sensor (front) output voltage is less than lean/rich criteria (about 0.5 volt) for 128 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 23 P.13A-9.

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

- Cylinder 2, 3 heated oxygen sensor (front) deteriorated.
- PCM failed.

DIAGNOSIS

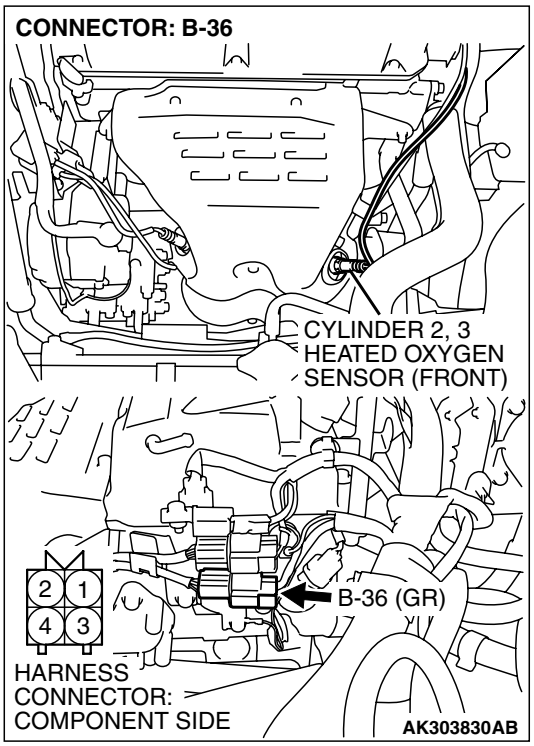
Required Special Tools:

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

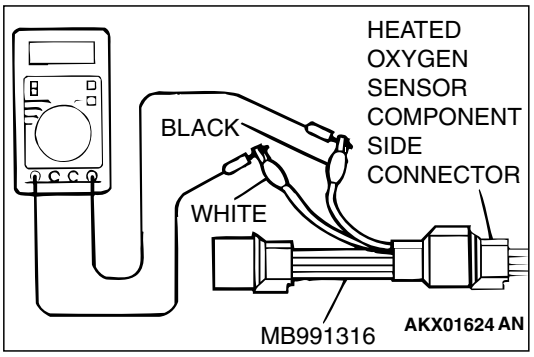
TSB Revision

- MB991316: Test Harness

STEP 1. Check the cylinder 2, 3 heated oxygen sensor (front).



(1) Disconnect the cylinder 2, 3 heated oxygen sensor (front) connector B-36 and connect test harness special tool MB991316, to the connector on the cylinder 2, 3 heated oxygen sensor (front) side.
(2) Warm up the engine until engine coolant temperature reaches 80°C (176°F) or higher.
(3) Rev the engine for 5 minutes or more with the engine speed of 4,500 r/min.



(4) Connect a digital voltage meter between terminal No. 2 (black clip) and terminal No. 4 (white clip).
(5) While repeatedly revving the engine, measure the cylinder 2, 3 heated oxygen sensor (front) output voltage.

Standard value: 0.6 – 1.0 V

⚠ CAUTION

- **Be very careful when connecting the jumper wires; incorrect connection can damage the heated oxygen sensor.**
- **Be careful the heater can be damaged if a voltage 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 a jumper wire to connect the terminal No. 1 (red clip) and the terminal No. 3 (blue clip) of the heated oxygen sensor with the positive terminal and the negative terminal of 8 volts power supply respectively, then check again.

Q: Is the measured voltage between 0.6 and 1.0 volt?

YES : Go to Step 2.
NO : Replace the cylinder 2, 3 heated oxygen sensor (front). Then go to Step 3.

STEP 2. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 23 P.13A-9.

(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P2197 set?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 3.

NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions.

STEP 3. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 23 P.13A-9.

(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P2197 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P2228: Barometric Pressure Circuit Low Input

⚠ CAUTION

If DTC P2228 has been set, TCL related DTC U1120 is also set. After P2228 has been diagnosed, don't forget to erase DTC U1120.

TECHNICAL DESCRIPTION

- The barometric pressure sensor outputs a voltage which corresponds to the barometric pressure.
- The PCM checks whether this voltage is within a specified range.

DESCRIPTIONS OF MONITOR METHODS

Barometric pressure sensor output voltage is out of reasonable barometric pressure range.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

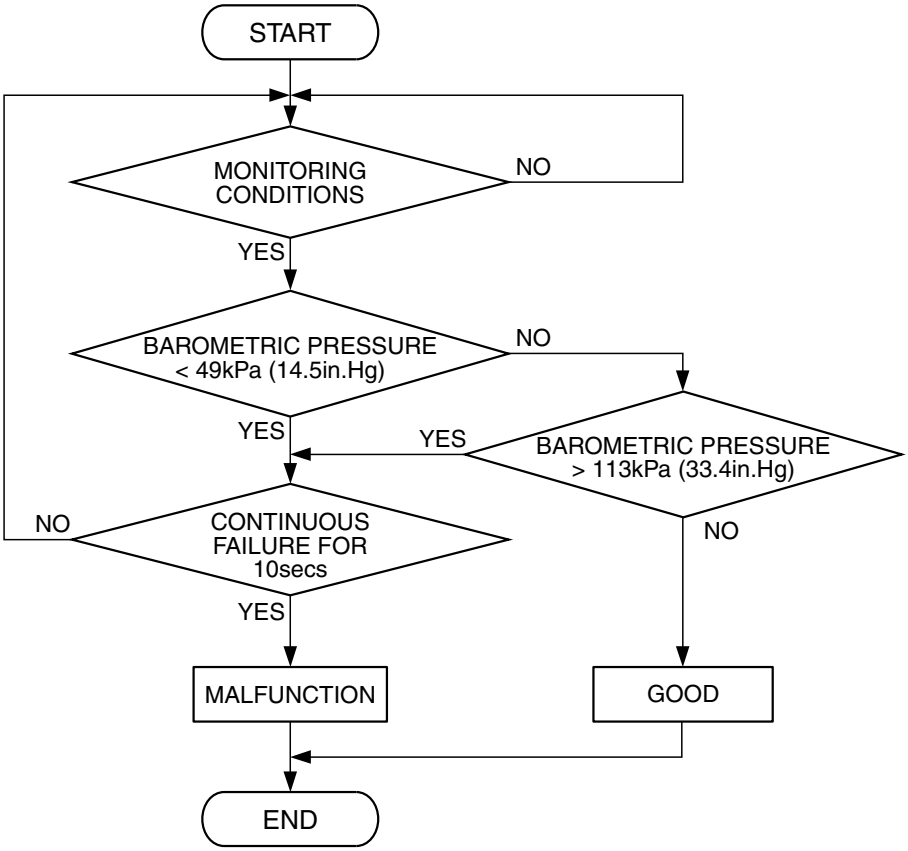
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



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Check Conditions

- 2 seconds or more have passed since the engine starting sequence was completed.
- Battery positive voltage is higher than 8 volts.

Judgement Criterion

- Barometric pressure sensor output signal has continued to be 49 kPa (14.5 in.Hg) or lower (approximately 15,000 ft above sea level) for 10 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 24 P.13A-9.

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

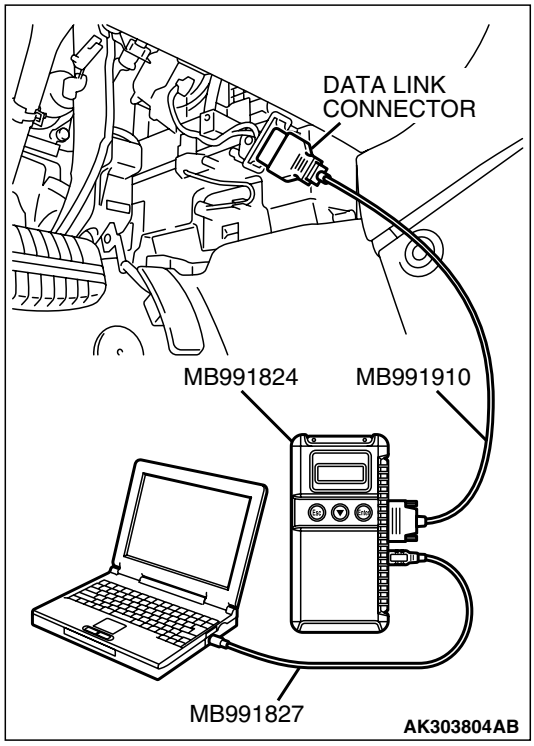
- PCM failed.

DIAGNOSIS

Required Special Tools:

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

TSB Revision



STEP 1. Test the OBD-II drive cycle.

⚠ 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) Carry out the test drive with the drive cycle pattern. Refer to DIagnostic Function – OBD-II Drive Cycle – Pattern 24 P.13A-9.
(4) Check the diagnostic trouble code (DTC).

Q: Is DTC P2228 set?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11.

NO : It can be assumed 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.

DTC P2229: Barometric Pressure Circuit High Input

⚠ CAUTION
If DTC P2229 has been set, TCL related DTC U1120 is also set. After P2229 has been diagnosed, don't forget to erase DTC U1120.

TECHNICAL DESCRIPTION

- The barometric pressure sensor outputs a voltage which corresponds to the barometric pressure.
- The PCM checks whether this voltage is within a specified range.

DESCRIPTIONS OF MONITOR METHODS

Barometric pressure sensor output voltage is out of reasonable barometric pressure range.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

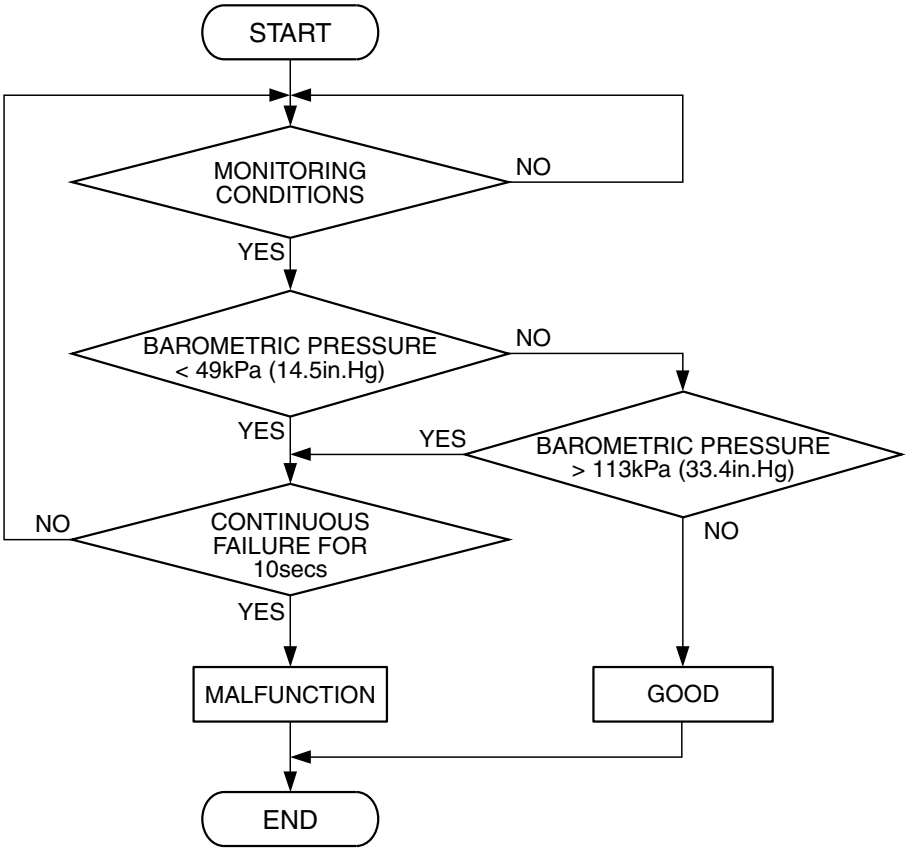
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



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Check Conditions

- 2 seconds or more have passed since the engine starting sequence was completed.
- Battery positive voltage is higher than 8 volts.

Judgement Criterion

- Barometric pressure sensor output signal has continued to be 113 kPa (33.4 in.Hg) or higher (approximately 4,000 ft below sea level) for 10 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 24 P.13A-9.

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

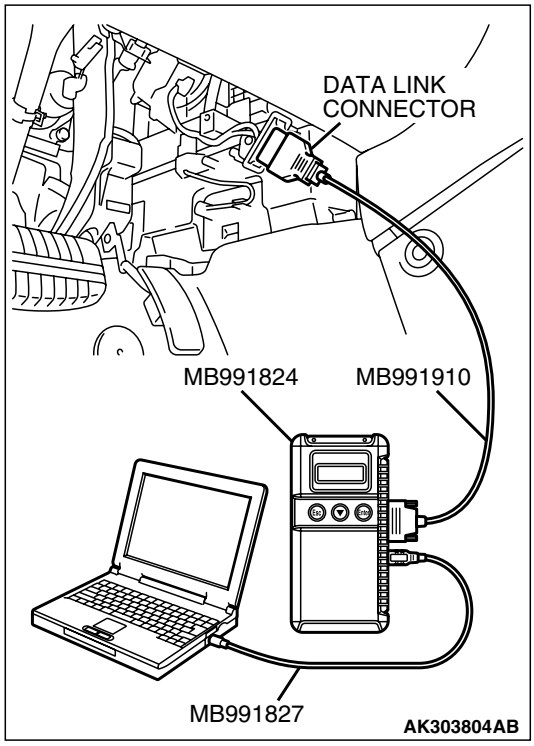
- PCM failed.

DIAGNOSIS

Required Special Tools:

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

TSB Revision



STEP 1. Test the OBD-II drive cycle.

⚠ 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) Carry out the test drive with the drive cycle pattern. Refer to DIagnostic Function – OBD-II Drive Cycle – Pattern 24 P.13A-9.
(4) Check the diagnostic trouble code (DTC).

Q: Is DTC P2229 set?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11.

NO : It can be assumed 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.

DTC P2252: Heated Oxygen Sensor Offset Circuit Low Voltage

TECHNICAL DESCRIPTION

- The PCM applies an offset voltage of 0.5 volt to the heated oxygen sensor.
- The PCM checks for heated oxygen sensor offset voltage.

DESCRIPTIONS OF MONITOR METHODS

Heated oxygen sensor offset voltage is under specified range.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

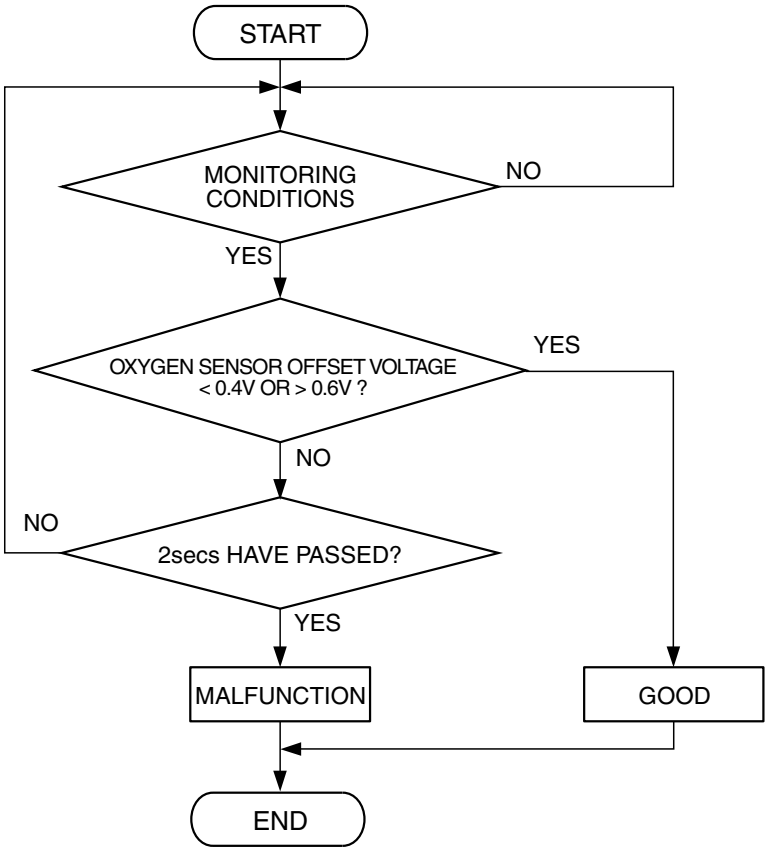
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITION

Logic Flow Chart



AK600318

Check Condition

- 2 seconds or more have passed since the engine starting sequence was completed.

Judgement Criterion

- Heated oxygen sensor offset voltage has continued to be 0.4 volt or lower for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnosis Function – OBD-II Drive Cycle – Pattern 24 P.13A-9.

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

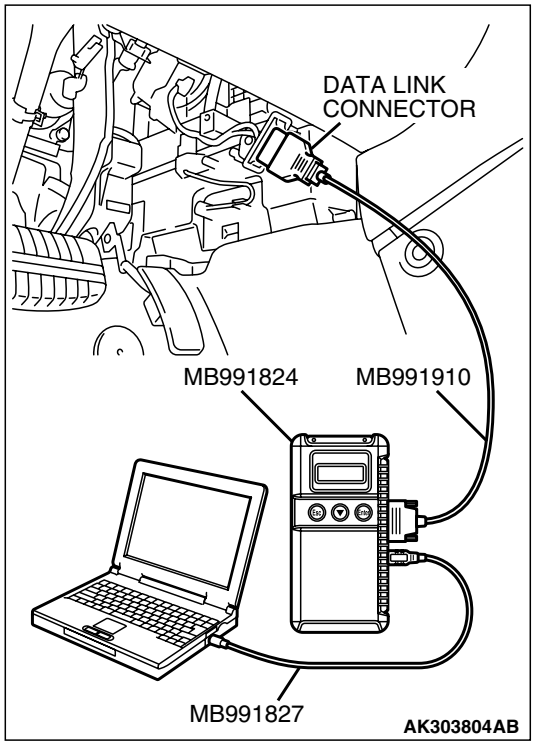
- PCM failed.

DIAGNOSIS

Required Special Tools:

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

TSB Revision



STEP 1. Test the OBD-II drive cycle.

⚠ 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) Carry out the test drive with the drive cycle pattern. Refer to DIagnostic Function – OBD-II Drive Cycle – Pattern 24 P.13A-9.
(4) Check the diagnostic trouble code (DTC).

Q: Is DTC P2252 set?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11.

NO : It can be assumed 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.

DTC P2253: Heated Oxygen Sensor Offset Circuit High Voltage

TECHNICAL DESCRIPTION

- The PCM applies an offset voltage of 0.5 volt to the heated oxygen sensor
- The PCM checks for heated oxygen sensor offset voltage.

DESCRIPTIONS OF MONITOR METHODS

Heated oxygen sensor offset voltage is over specified range.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

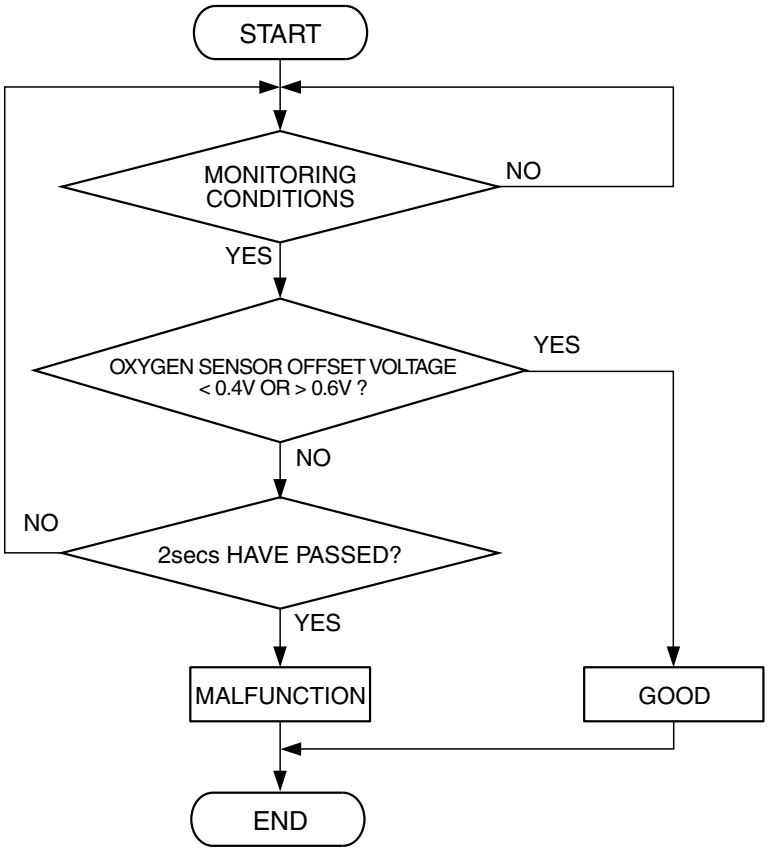
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITION

Logic Flow Chart



AK600318

Check Condition

- 2 seconds or more have passed since the engine starting sequence was completed.

Judgement Criterion

- Heated oxygen sensor offset voltage has continued to be 0.6 volt or higher for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

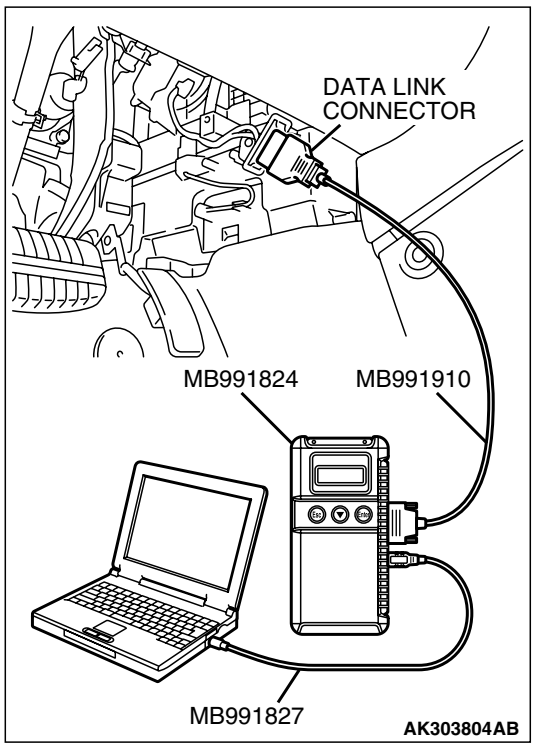
Refer to Diagnosis Function – OBD-II Drive Cycle – Pattern 24 P.13A-9.

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

- PCM failed.

TSB Revision

DIAGNOSIS



STEP 1. Test the OBD-II drive cycle.

⚠ 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) Carry out the test drive with the drive cycle pattern. Refer to Diagnostic Function OBD-II Drive Cycle – Pattern 24 P.13A-9.
(4) Check the diagnostic trouble code (DTC).

Q: Is DTC P2253 set?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11.

NO : It can be assumed 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.

DTC P2567: LIN Communication Check by Radiator Sensor (Thermistor Error)

RADIATOR SENSOR CIRCUIT
Refer to P.13A-862.

CIRCUIT OPERATION
Refer to P.13A-862.

MONITOR EXECUTION
- Continuous

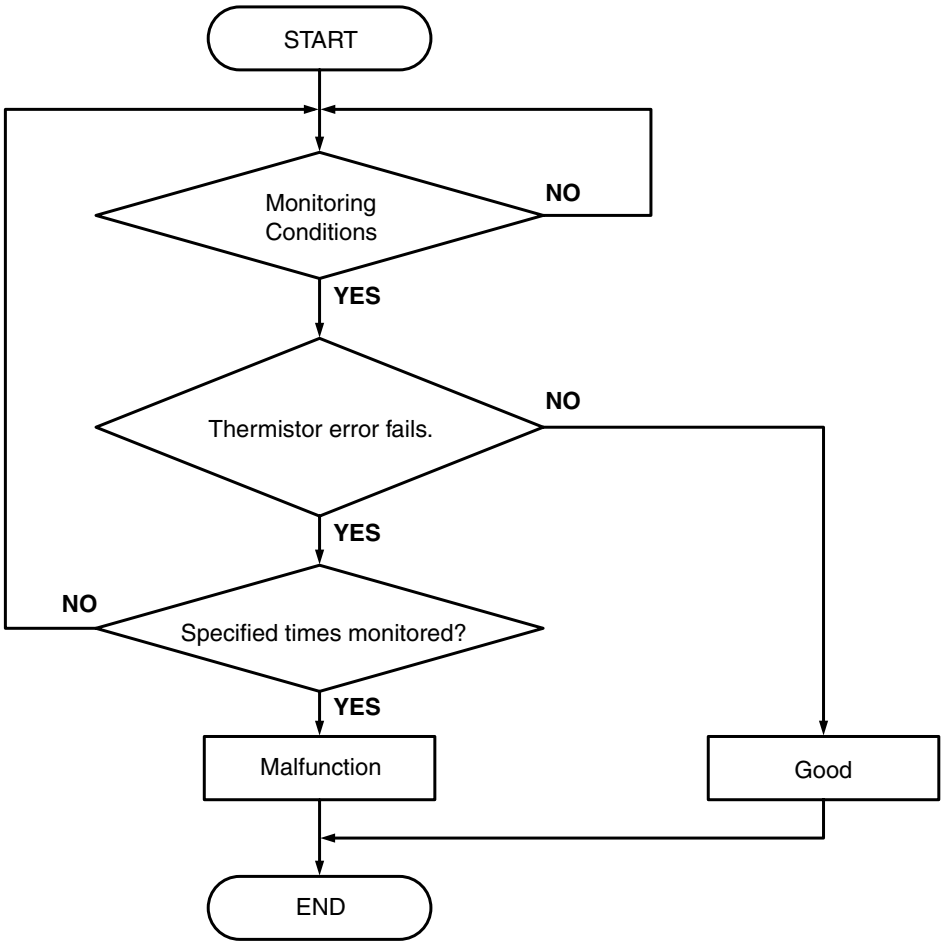
MONITOR EXECUTION CONDITIONS (OTHER MONITOR AND SENSOR)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)
- Not applicable

Sensor (The sensor below is determined to be normal)
- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



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Check Condition

- Ignition switch: "ON"
- Battery positive voltage is higher than 11 volts
- Engine coolant temp -30°C(-22°F) to 110°C(230°F)

Judgement Criteria

- When the radiator sensor is defective
- When the PCM is defective

TROUBLESHOOTING HINTS (THE MOST LIKELY CAUSES FOR THIS CODE TO BE SET ARE:)

- Malfunction of the radiator sensor
- Malfunction of the PCM

DIAGNOSIS

Required Special Tools:

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

TSB Revision

STEP 1. Replace the DOR radiator
Check the diagnostic trouble code (DTC).

Q: Is DTC P2567 set?

YES : Replace the PCM. Then go to Step 2.
NO : The procedure is complete.

STEP 2. Perform the OBD-II drive cycle.
Check the diagnostic trouble code (DTC).

Q: Is DTC P2567 set?

YES : Repeat the troubleshooting.
NO : The procedure is complete.

DTC U1073: Bus Off

⚠ CAUTION
- **If the PCM output the DTC U1073, make sure to diagnose the CAN bus line.**
- **Before replacing the ECU, make sure that the communication circuit is operating normally.**

DTC SET CONDITIONS

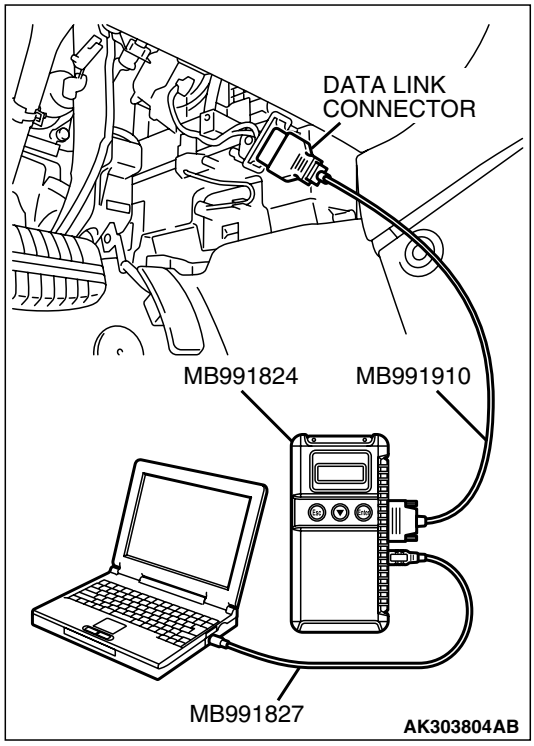
Check Conditions
- Always

Judgement Criteria
- Bus off error detected

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)
- CAN line harness damage or connector damage.
- PCM failed.

DIAGNOSIS

Required Special Tools:
- MB991958: Scan tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A



STEP 1. Using scan tool MB991958, diagnose CAN bus line.

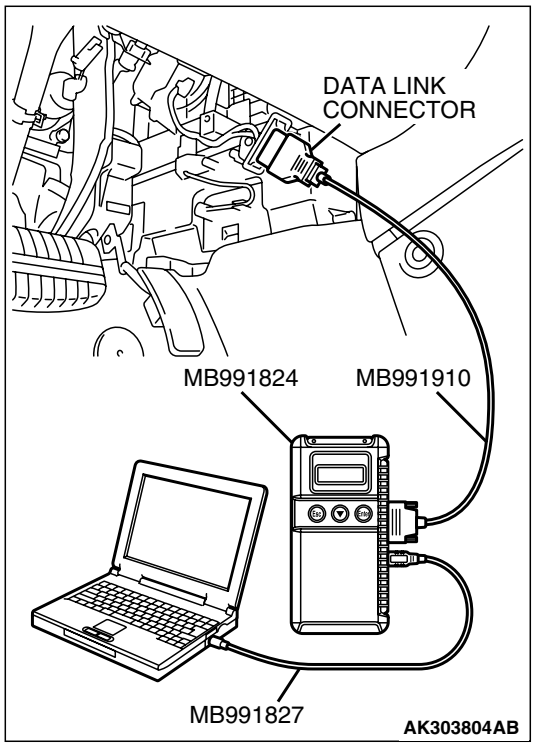
⚠ CAUTION

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

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Diagnose CAN bus line.
(4) Turn the ignition switch the "LOCK" (OFF) position.

Q: Is the CAN bus line normal?

YES : Go to Step 2.
NO : Repair the CAN bus line. Refer to GROUP 54C, Can bus Diagnostics Table P.54C-16. Then go to Step 3.

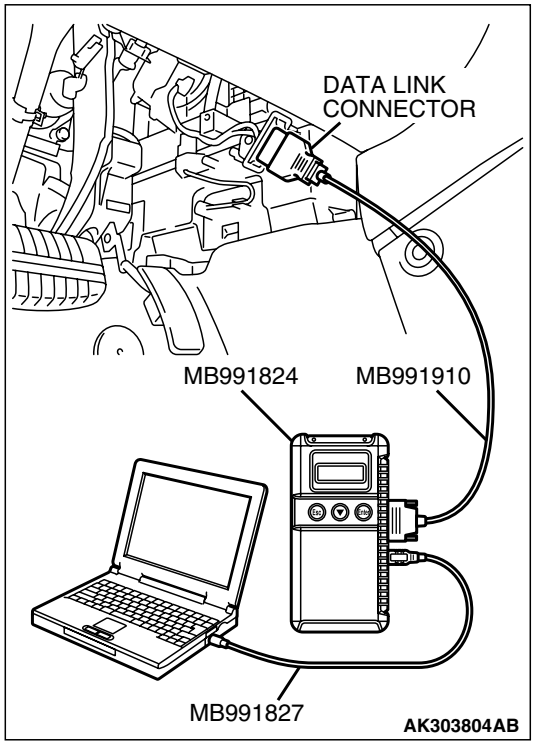


STEP 2. Recheck for diagnostic trouble code.

Check again if the DTC is set.
(1) Erase the DTC.
(2) Turn the ignition switch to the "ON" position.
(3) Check if the DTC is set.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC U1073 set?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 3.
NO : It can be assumed 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.



STEP 3. Recheck for diagnostic trouble code.
Check again if the DTC is set.
(1) Erase the DTC.
(2) Turn the ignition switch to the "ON" position.
(3) Check if DTC is set.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC U1073 set?

YES : Go to Step 1.
NO : The inspection is complete.

DTC U1102: ABS-ECU TIME-OUT

⚠ CAUTION
- **If the PCM output the DTC U1102, make sure to diagnose the CAN bus line.**
- **Before replacing the ECU, make sure that the communication circuit is operating normally.**

DTC SET CONDITIONS

Check Conditions
- Battery positive voltage is 10 volts or higher.
- Engine is not cranked, or at least 3 seconds have passed since engine was cranked.

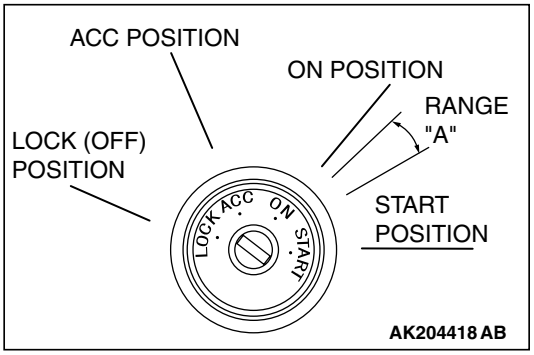
Judgement Criterion
- Unable to receive ABS-ECU signals through the CAN bus line.

COMMENT

Current Trouble
- Some of the possible causes are a harness or connector damage between the PCM and the ABS-ECU on the CAN bus line, a failure in the ABS-ECU power supply system, a failure in the ABS-ECU, or a failure in the PCM.

Past Trouble
- Proceed to troubleshoot based on a harness or connector damage on the CAN bus line between the PCM and ABS-ECU, and a failure in the ABS power supply system. Refer to "How to cope with past trouble" (Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-14).

⚠ CAUTION



When the ignition key is maintained within the range "A" (i.e., the ignition switch IG2 is in OFF position but the cranking does not start) for more than 1 second, PCM stores DTC U1102 (the past trouble).

NOTE: If a malfunction occurred in the past, a failure cannot be discovered through the MB991958 CAN bus diagnosis even if there might be a problem with the CAN bus. In this case, refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-14. Furthermore, it is possible to narrow down the areas of the possible failures from the DTCs that are output by the ECUs, which are communicating on the CAN bus (Refer to GROUP 54C, CAN bus line Diagnostics Flow P.54C-8).

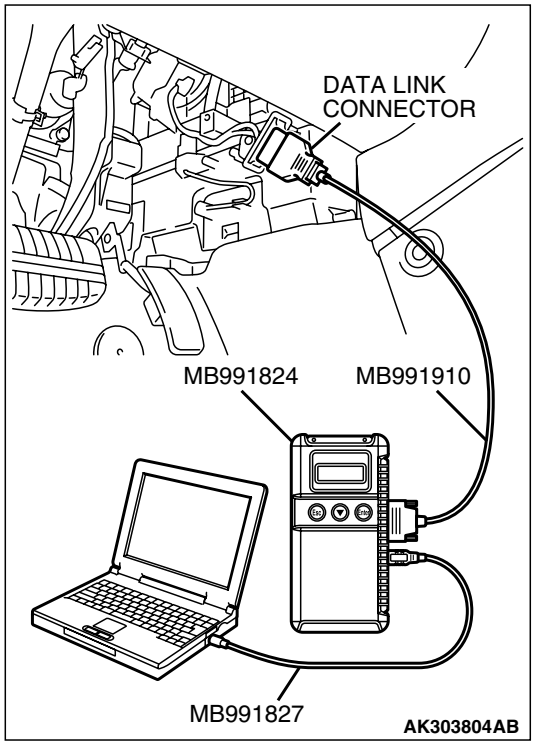
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- CAN line harness damage or connector damage.
- ABS-ECU failed.
- PCM failed.

DIAGNOSIS

Required Special Tools:

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



STEP 1. Using scan tool MB991958, diagnose CAN bus line.

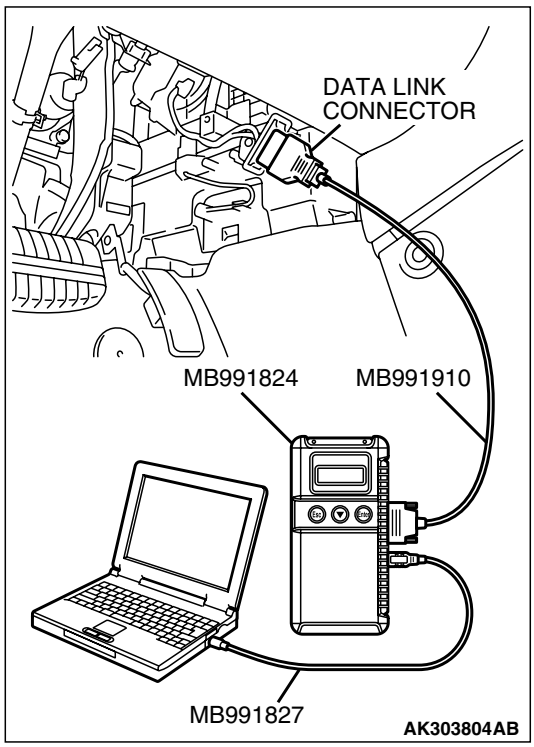
⚠ CAUTION

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) Diagnose CAN bus line.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the CAN bus line normal?

YES : Go to Step 2.
NO : Repair the CAN bus line. Refer to GROUP 54C, Can Bus Diagnostics Table P.54C-16. Then go to Step 6.

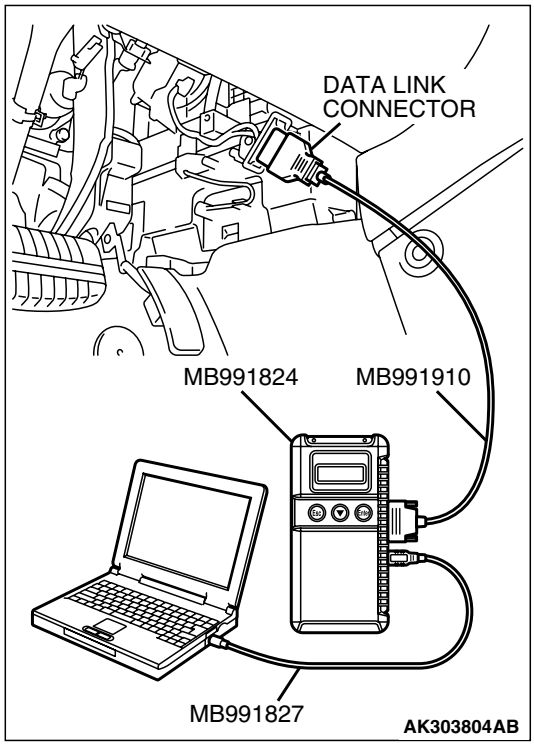


STEP 2. Using scan tool MB991958, read the diagnostic trouble code (DTC).

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

Q: Is the ABS-DTC set?

YES : Refer to GROUP 35B, Anti-Lock Braking System-Diagnostic Trouble Code Chart P.35B-8.
NO : Go to Step 3.

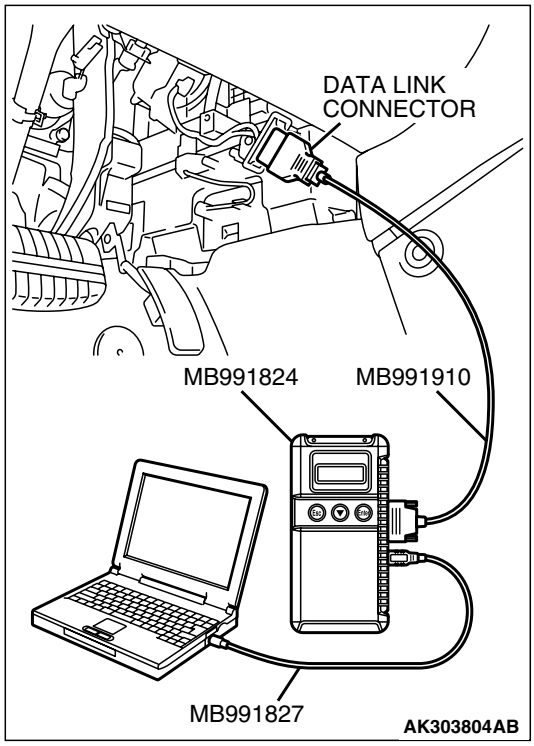


STEP 3. Using scan tool MB991958, read the diagnostic trouble code (DTC).

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

Q: Is DTC U1102 set?

YES : Go to Step 4.
NO : Go to Step 5.

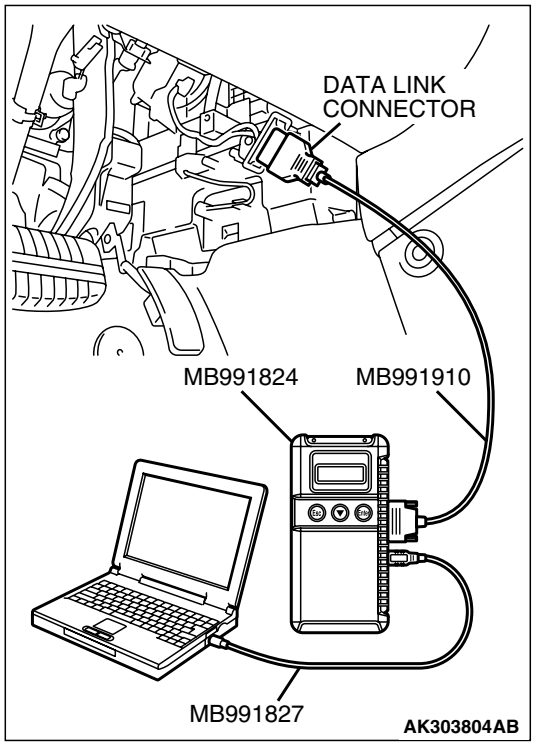


STEP 4. Using scan tool MB991958, read the diagnostic trouble code (DTC).

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) After the MFI-DTC has been deleted, read the MFI-DTC again.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC U1102 set?

YES : Replace the ABS-ECU. Then go to Step 6.
NO : It can be assumed that this malfunction is intermittent of CAN bus line between PCM and ABS-ECU. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-14.



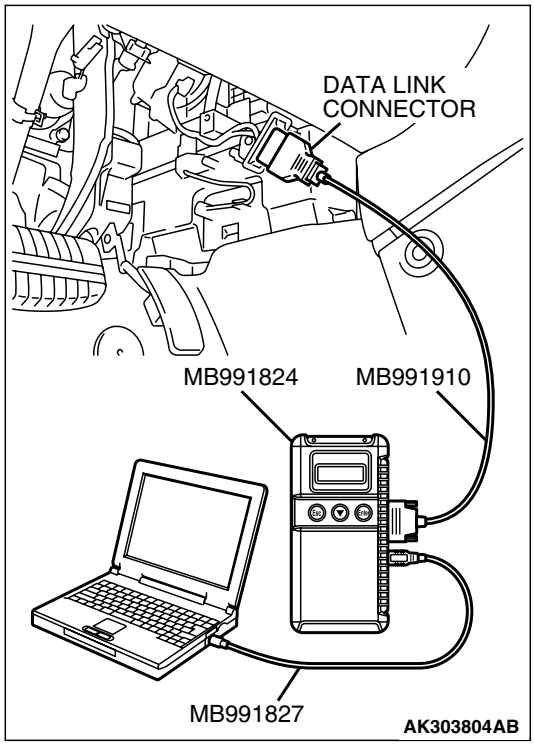
STEP 5. Using scan tool MB991958, read the diagnostic trouble code (DTC).

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) After the MFI-DTC has been deleted, read the MFI-DTC again.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC U1102 set?

YES : Replace he PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 6.

NO : It can be assumed that this malfunction is intermittent of CAN bus line between PCM and ABS-ECU. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-14.



STEP 6. Using scan tool MB991958, read the diagnostic trouble code (DTC).

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) After the MFI-DTC has been deleted, read the MFI-DTC again.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC U1102 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC U1108: COMBINATION METER TIME-OUT

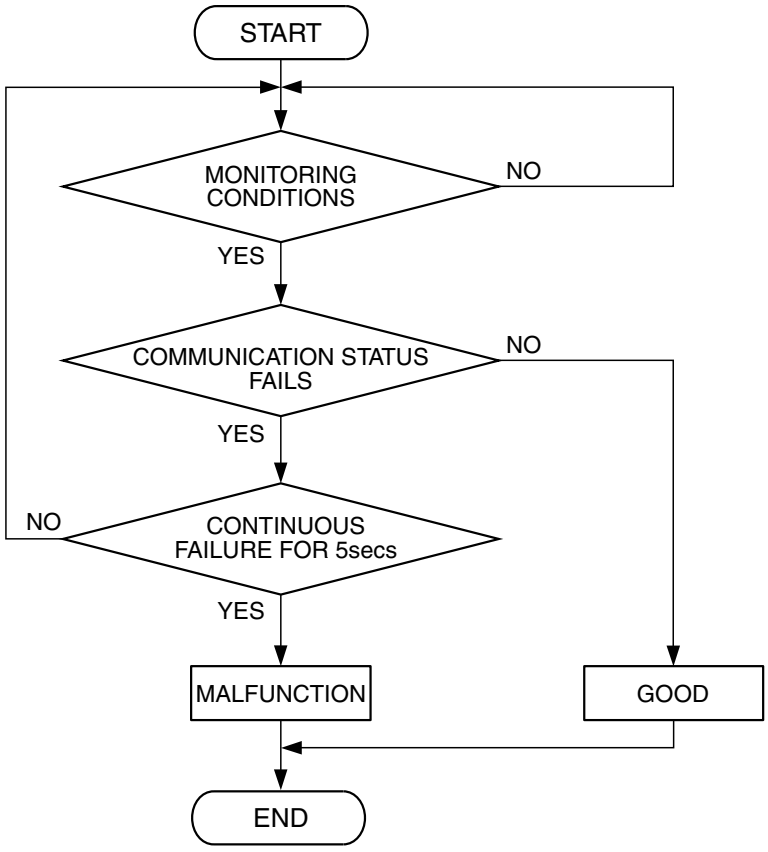
⚠ CAUTION
- **If the PCM output the DTC U1102, make sure to diagnose the CAN bus line.**
- **Before replacing the ECU, make sure that the communication circuit is operating normally.**

DESCRIPTIONS OF MONITOR METHODS
There is no data from combination meter for the specified time. (Meter also detect communication error with PCM.)

MONITOR EXECUTION
Continuous

DTC SET CONDITIONS

Lgic Flow Chart



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Check Condition
- Battery positive voltage is 10 volts or higher.

Judgement Criterion
- Unable to receive combination meter signals through the CAN bus line for 5 seconds.

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)
- Not applicable

Sensor (The sensor below is determined to be normal)
- Not applicable

TSB Revision

COMMENT

Current Trouble

- Some of the possible causes are a harness or connector damage between the PCM and the combination meter on the CAN bus line, a failure in the combination meter power supply system, a failure in the combination meter, or a failure in the PCM.

Past Trouble

- Proceed to troubleshoot based on a harness or connector damage on the CAN bus line between the PCM and combination meter, and a failure in the combination meter power supply system. Refer to "How to cope with past trouble" (Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-14).

NOTE: If a malfunction occurred in the past, a failure cannot be discovered through the M.U.T. – III CAN bus diagnosis even if there might be a problem with the CAN bus. In this case, refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-14. Furthermore, it is possible to narrow down the areas of the possible failures from the DTCs that are output by the ECUs, which are communicating on the CAN bus (Refer to GROUP 54C, CAN bus line Diagnostics Flow P.54C-8).

OBD-II DRIVE CYCLE PATTERN

None.

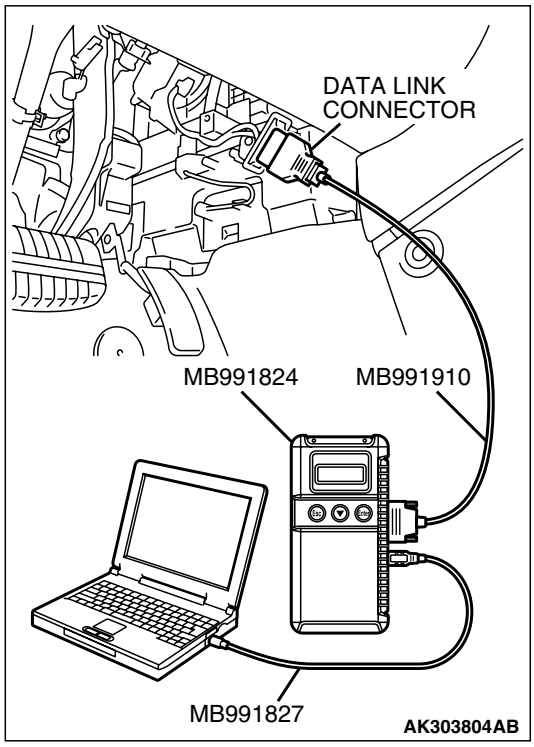
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- CAN line harness damage or connector damage.
- Combination meter failed.
- PCM failed.

DIAGNOSIS

Required Special Tools:

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



STEP 1. Using scan tool MB991958, diagnose CAN bus line.

⚠ CAUTION

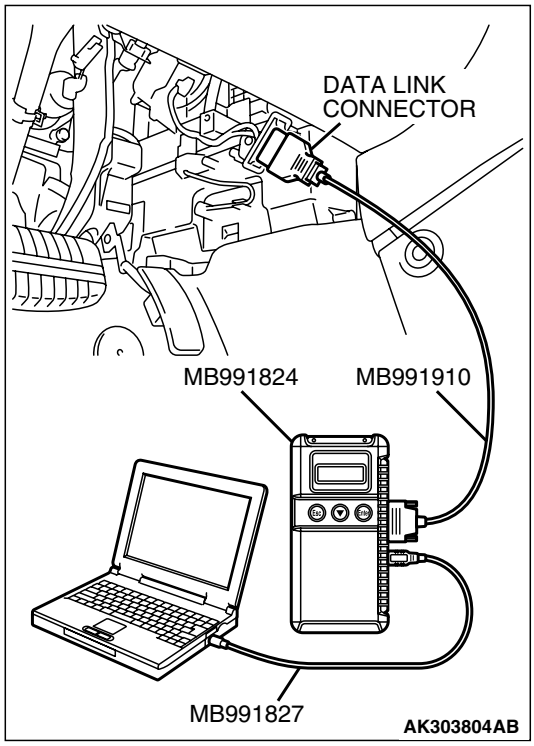
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Diagnose CAN bus line.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the CAN bus line normal?

YES : Go to Step 2.
NO : Repair the CAN bus line. Refer to GROUP 54C, Can Bus Diagnostics Table P.54C-16. Then go to Step 6.

TSB Revision

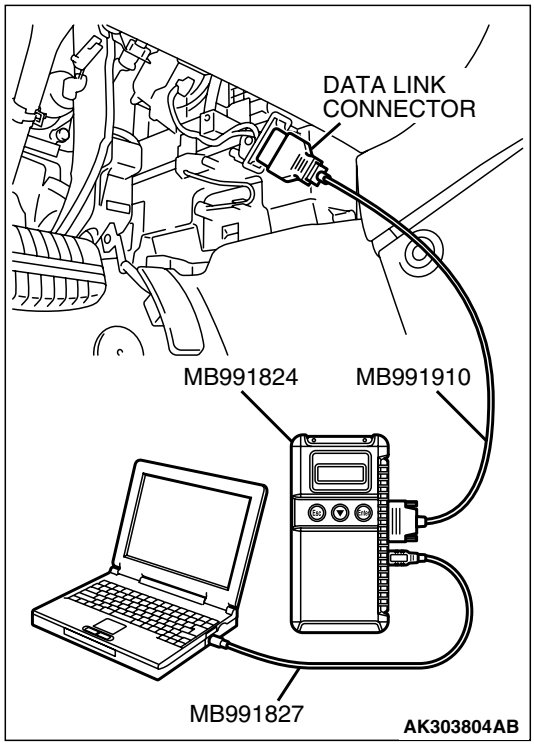


STEP 2. Using scan tool MB991958, read the diagnostic trouble code (DTC).

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

Q: Is the combination meter-DTC set?

YES : Refer to GROUP 54A, Chassis Electrical – Combination Meter Assembly – Diagnostic Trouble Code Chart P.54A-54.
NO : Go to Step 3.

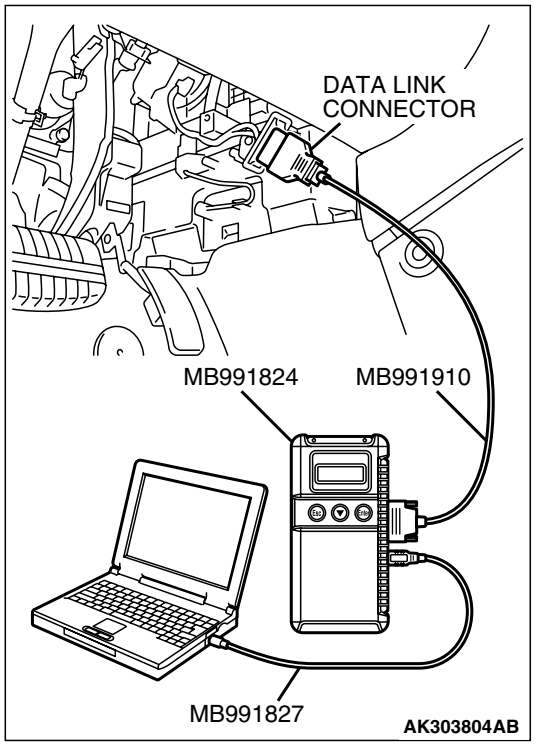


STEP 3. Using scan tool MB991958, read the diagnostic trouble code (DTC).

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

Q: Is DTC 013 set?

YES : Go to Step 4.
NO : Go to Step 5.

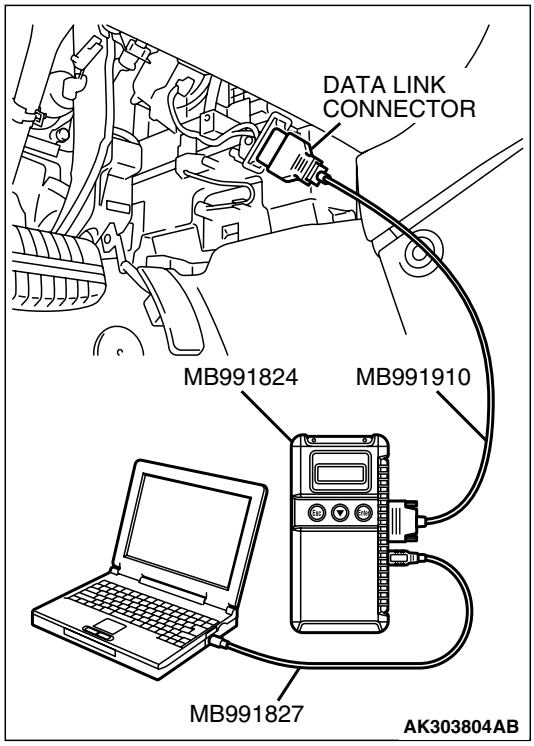


STEP 4. Using scan tool MB991958, read the diagnostic trouble code (DTC).

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) After the MFI-DTC has been deleted, read the MFI-DTC again.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC U1108 set?

YES : Replace the combination meter. Then go to Step 6.
NO : It can be assumed that this malfunction is intermittent of CAN bus line between PCM and combination meter. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-14.

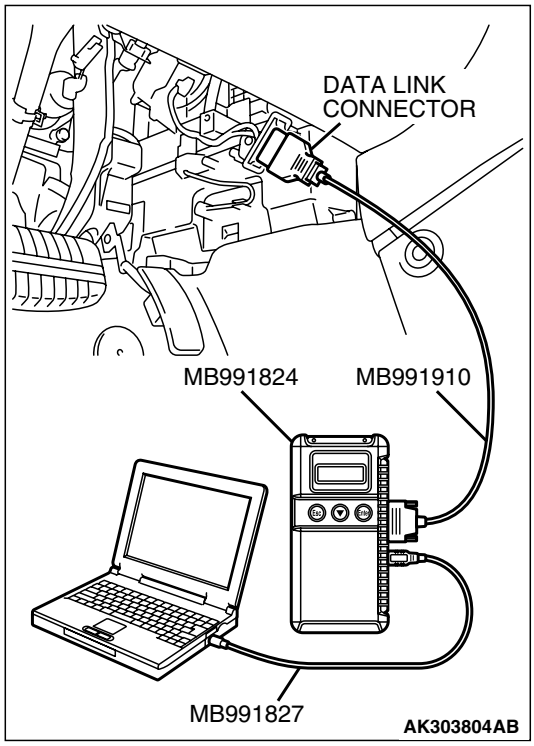


STEP 5. Using scan tool MB991958, read the diagnostic trouble code (DTC).

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) After the MFI-DTC has been deleted, read the MFI-DTC again.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC U1108 set?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 6.
NO : It can be assumed that this malfunction is intermittent of CAN bus line between PCM and combination meter. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-14.



STEP 6. Using scan tool MB991958, read the diagnostic trouble code (DTC).

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) After the MFI-DTC has been deleted, read the MFI-DTC again.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC U1108 set?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC U1109: ETACS-ECU TIME-OUT

⚠ CAUTION

- **If the PCM output the DTC U1109, make sure to diagnose the CAN bus line.**
- **Before replacing the ECU, make sure that the communication circuit is operating normally.**

DTC SET CONDITIONS

Check Conditions

- Battery positive voltage is 10 volts or higher.
- Engine is not cranked, or at least 3 seconds or more have passed since engine was cranked.

Judgement Criterion

- Unable to receive ETACS-ECU signals through the CAN bus line.

COMMENT

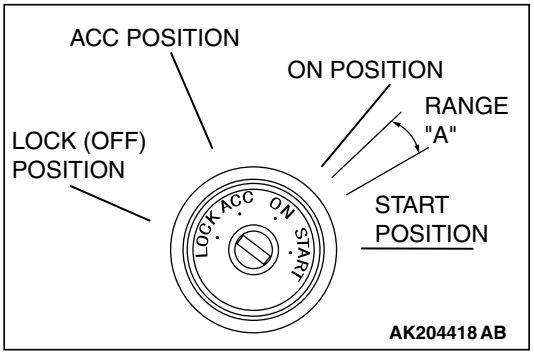
Current Trouble

- Some of the possible causes are a harness or connector damage between the PCM and the ETACS-ECU on the CAN bus line, a failure in the ETACS-ECU power supply system, a failure in the ETACS-ECU, or a failure in the PCM.

Past Trouble

- Proceed to troubleshoot based on a harness or connector damage on the CAN bus line between the PCM and ETACS-ECU, and a failure in the ETACS power supply system. Refer to "How to cope with past trouble" (Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-14).

⚠ CAUTION



When the ignition key is maintained within the range "A" (i.e., the ignition switch IG2 is in OFF position but the cranking does not start) for more than 1 second, PCM stores DTC U1110 (the past trouble).

NOTE: If a malfunction occurred in the past, a failure cannot be discovered through the MB991958 CAN bus diagnosis even if there might be a problem with the CAN bus. In this case, refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-14. Furthermore, it is possible to narrow down the areas of the possible failures from the DTCs that are output by the ECUs, which are communicating on the CAN bus (Refer to GROUP 54C, CAN bus line Diagnostics Flow P.54C-8).

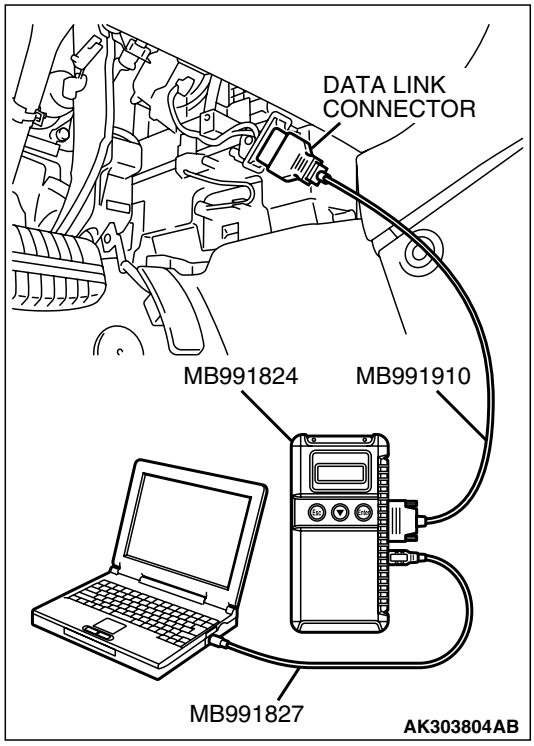
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- CAN line harness damage or connector damage.
- ETACS-ECU failed.
- PCM failed.

DIAGNOSIS

Required Special Tools:

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



STEP 1. Using scan tool MB991958, diagnose CAN bus line.

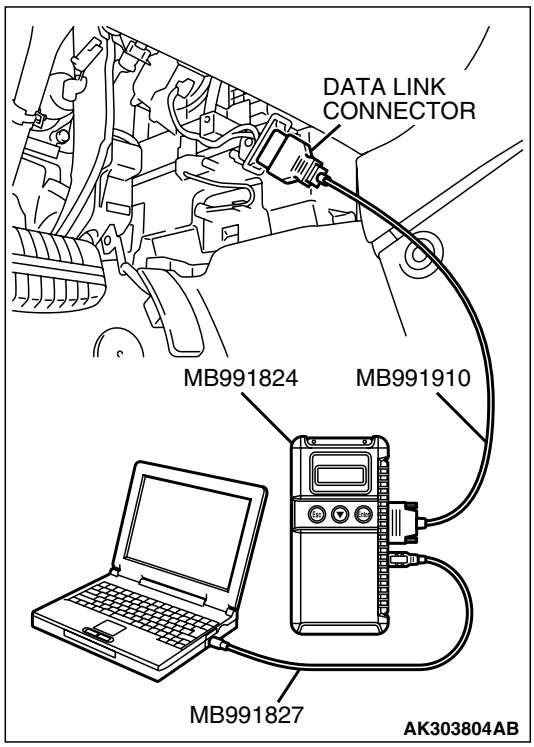
⚠ CAUTION

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) Diagnose CAN bus line.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the CAN bus line normal?

YES : Go to Step 2.
NO : Repair the CAN bus line. Refer to GROUP 54C, Can Bus Diagnostics Table P.54C-16. Then go to Step 6.

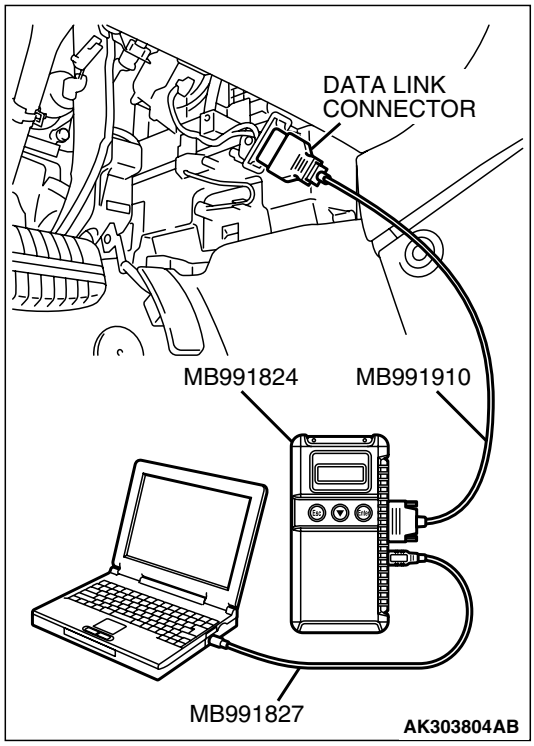


STEP 2. Using scan tool MB991958, read the diagnostic trouble code (DTC).

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

Q: Is the ETACS-DTC set?

YES : Refer to GROUP 54B, SWS Diagnosis – Diagnostic Trouble Code Chart P.54B-30.
NO : Go to Step 3.

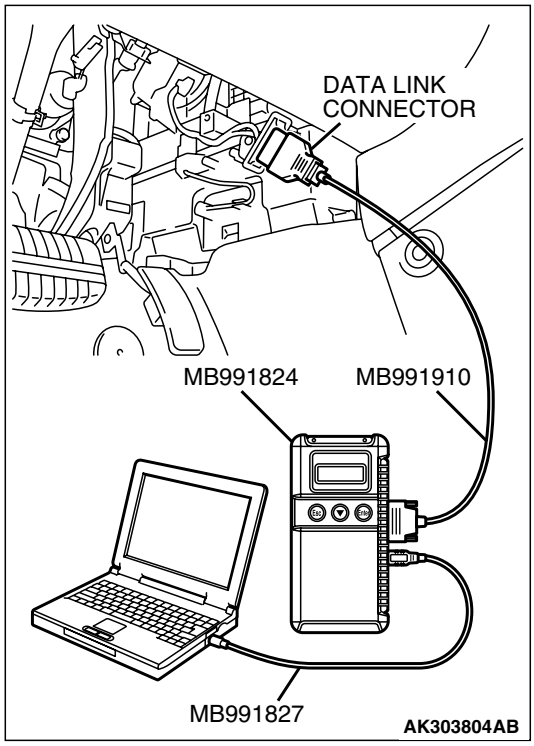


STEP 3. Using scan tool MB991958, read the diagnostic trouble code (DTC).

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

Q: Is DTC U1109 set?

YES : Go to Step 4.
NO : Go to Step 5.

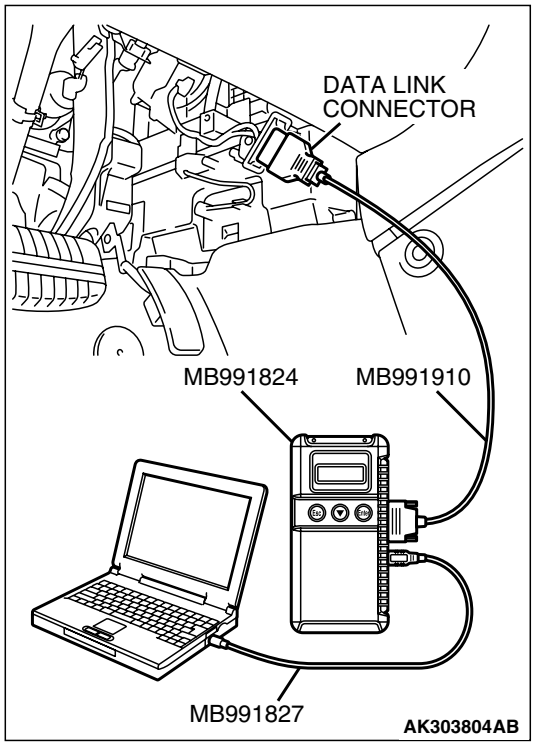


STEP 4. Using scan tool MB991958, read the diagnostic trouble code (DTC).

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) After the MFI-DTC has been deleted, read the MFI-DTC again.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC U1109 set?

YES : Replace the ETACS-ECU. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 6.
NO : It can be assumed that this malfunction is intermittent of CAN bus line between PCM and ETACS-ECU. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-14.



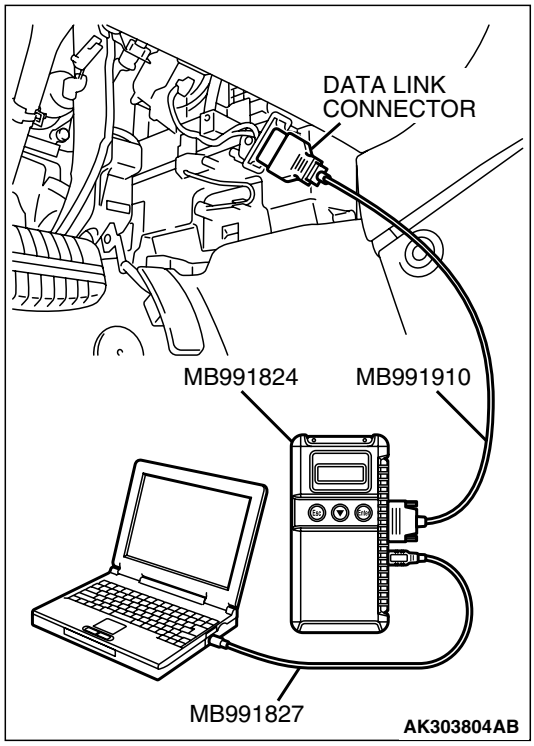
STEP 5. Using scan tool MB991958, read the diagnostic trouble code (DTC).

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) After the MFI-DTC has been deleted, read the MFI-DTC again.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC U1109 set?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 6.

NO : It can be assumed that this malfunction is intermittent of CAN bus line between PCM and ETACS-ECU. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-14.



STEP 6. Using scan tool MB991958, read the diagnostic trouble code (DTC).

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) After the MFI-DTC has been deleted, read the MFI-DTC again.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC U1109 set?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC U1110: A/C-ECU TIME-OUT

⚠ CAUTION

- **If the PCM output the DTC U1110, make sure to diagnose the CAN bus line.**
- **Before replacing the ECU, make sure that the communication circuit is operating normally.**

DTC SET CONDITIONS

Check Conditions

- Battery positive voltage is 10 volts or higher.
- Engine is not cranked, or at least 3 seconds or more have passed since engine was cranked.

Judgement Criterion

- Unable to receive A/C-ECU signals through the CAN bus line.

COMMENT

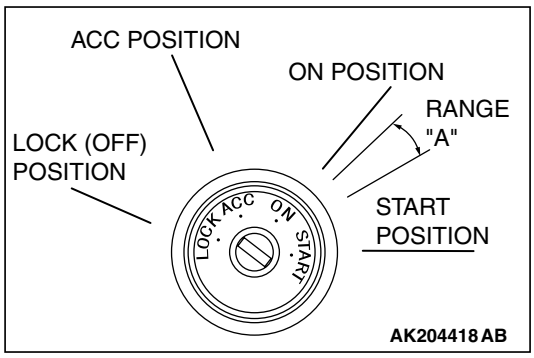
Current Trouble

- Some of the possible causes are a harness or connector damage between the PCM and the A/C-ECU on the CAN bus line, a failure in the A/C-ECU power supply system, a failure in the A/C-ECU, or a failure in the PCM.

Past Trouble

- Proceed to troubleshoot based on a harness or connector damage on the CAN bus line between the PCM and A/C-ECU, and a failure in the A/C power supply system. Refer to "How to cope with past trouble" (Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-14).

⚠ CAUTION



When the ignition key is maintained within the range "A" (i.e., the ignition switch IG2 is in OFF position but the cranking does not start) for more than 1 second, PCM stores DTC U1110 (the past trouble).

NOTE: If a malfunction occurred in the past, a failure cannot be discovered through the MB991958 CAN bus diagnosis even if there might be a problem with the CAN bus. In this case, refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-14. Furthermore, it is possible to narrow down the areas of the possible failures from the DTCs that are output by the ECUs, which are communicating on the CAN bus (Refer to GROUP 54C, CAN bus line Diagnostics Flow P.54C-8).

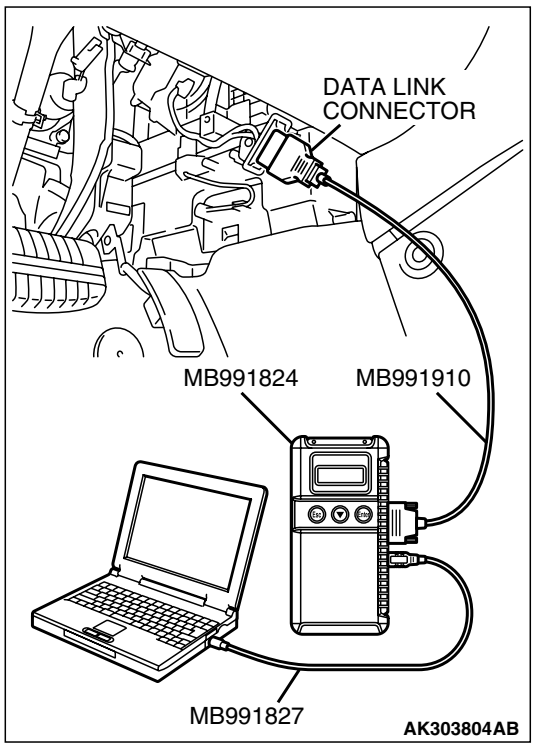
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- CAN line harness damage or connector damage.
- A/C-ECU failed.
- PCM failed.

DIAGNOSIS

Required Special Tools:

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



STEP 1. Using scan tool MB991958, diagnose CAN bus line.

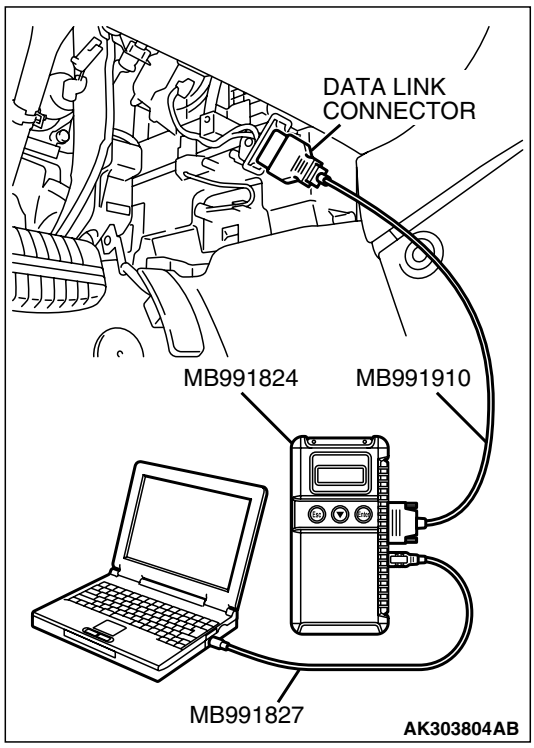
⚠ CAUTION

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) Diagnose CAN bus line.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the CAN bus line normal?

YES : Go to Step 2.
NO : Repair the CAN bus line. Refer to GROUP 54C, Can Bus Diagnostics Table P.54C-16. Then go to Step 6.

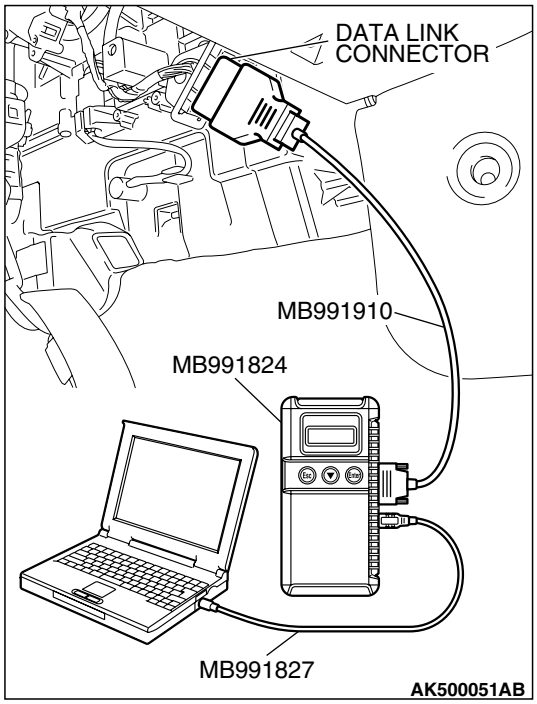


STEP 2. Using scan tool MB991958, read the diagnostic trouble code (DTC).

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

Q: Is the A/C-DTC set?

YES : Refer to GROUP 55B, Auto A/C Diagnosis – Diagnostic Trouble Code Chart P.55B-7.
NO : Go to Step 3.

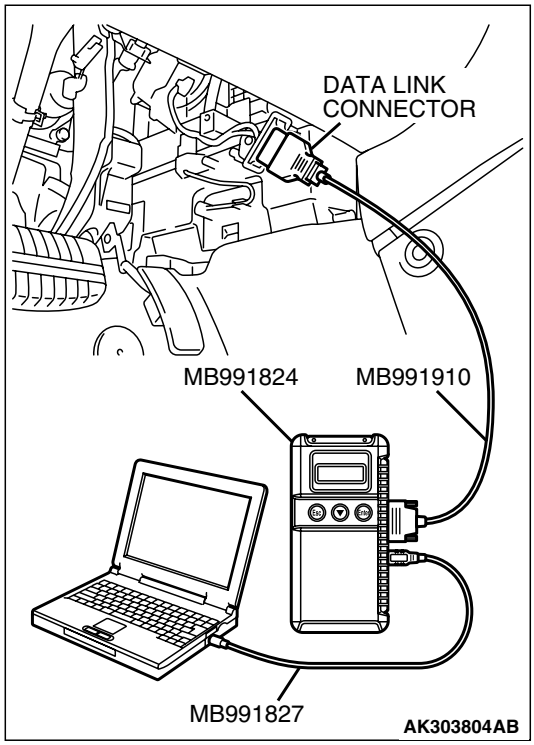


STEP 3. Using scan tool MB991958, read the diagnostic trouble code (DTC).

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

Q: Is DTC 012 set?

YES : Go to Step 4.
NO : Go to Step 5.

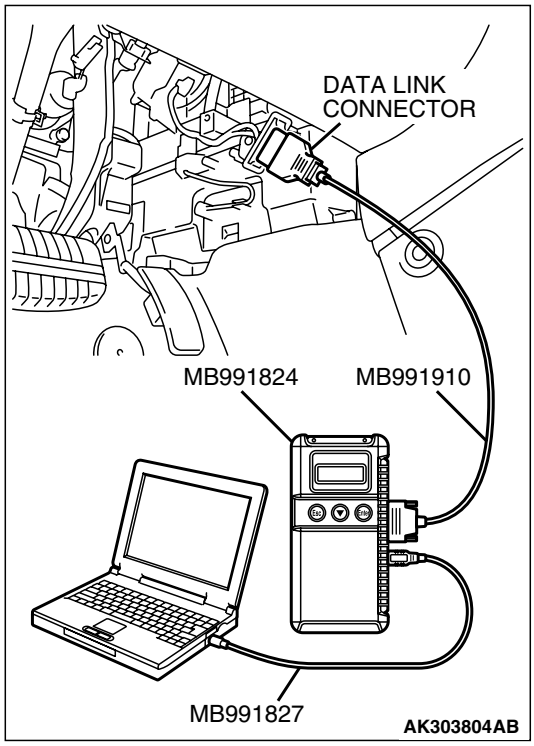


STEP 4. Using scan tool MB991958, read the diagnostic trouble code (DTC).

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) After the MFI-DTC has been deleted, read the MFI-DTC again.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC U1110 set?

YES : Replace the A/C-ECU. Then go to Step 6.
NO : It can be assumed that this malfunction is intermittent of CAN bus line between PCM and A/C-ECU. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-14.



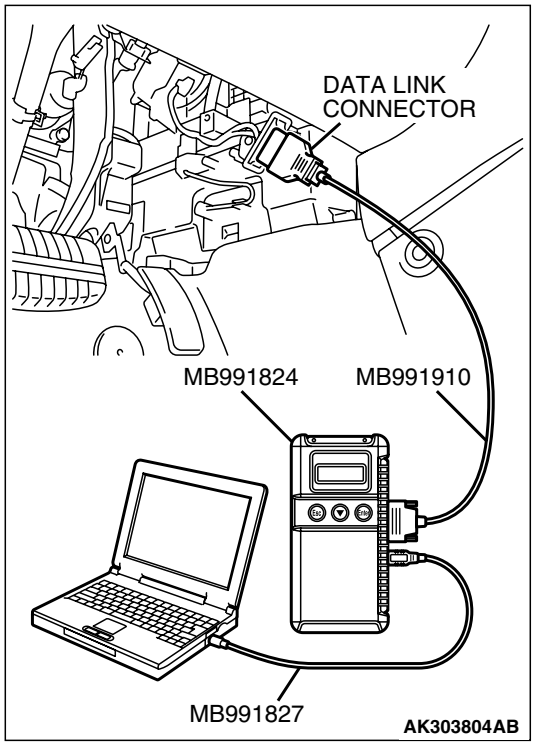
STEP 5. Using scan tool MB991958, read the diagnostic trouble code (DTC).

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) After the MFI-DTC has been deleted, read the MFI-DTC again.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC U1110 set?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 6.

NO : It can be assumed that this malfunction is intermittent of CAN bus line between PCM and A/C-ECU. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-14.



STEP 6. Using scan tool MB991958, read the diagnostic trouble code (DTC).

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) After the MFI-DTC has been deleted, read the MFI-DTC again.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC U1110 set?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC U1117: IMMOBILIZER-ECU TIME-OUT

⚠ CAUTION

- **If the PCM output the DTC U1117, make sure to diagnose the CAN bus line.**
- **Before replacing the ECU, make sure that the communication circuit is operating normally.**

DTC SET CONDITIONS

Check Condition

- Ignition switch is in ON position.

Judgement Criterion

- Unable to receive ETACS-ECU (immobilizer-ECU) signals through the CAN bus line.

COMMENT

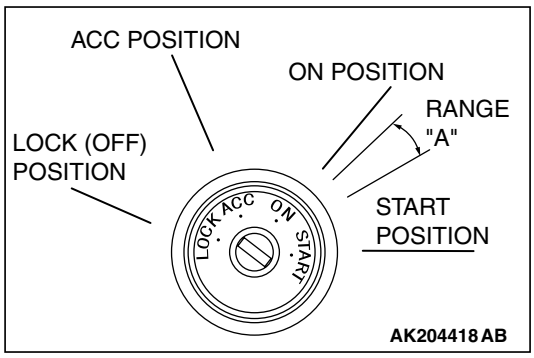
Current Trouble

- Some of the possible causes are a harness or connector damage between the PCM and the ETACS-ECU (immobilizer-ECU) on the CAN bus line, a failure in the ETACS-ECU (immobilizer-ECU) power supply system, a failure in the ETACS-ECU (immobilizer-ECU), or a failure in the PCM.

Past Trouble

- Proceed to troubleshoot based on a harness or connector damage on the CAN bus line between the PCM and ETACS-ECU (immobilizer-ECU), and a failure in the ETACS-ECU (immobilizer-ECU) power supply system. Refer to "How to cope with past trouble" (Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-14).

⚠ CAUTION



When the ignition key is maintained within the range "A" (i.e., the ignition switch IG2 is in OFF position but the cranking does not start) for more than 1 second, PCM stores DTC U1117 (the past trouble).

NOTE: If a malfunction occurred in the past, a failure cannot be discovered through the MB991958 CAN bus diagnosis even if there might be a problem with the CAN bus. In this case, refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-14. Furthermore, it is possible to narrow down the areas of the possible failures from the DTCs that are output by the ECUs, which are communicating on the CAN bus (Refer to GROUP 54C, CAN bus line Diagnostics Flow P.54C-8).

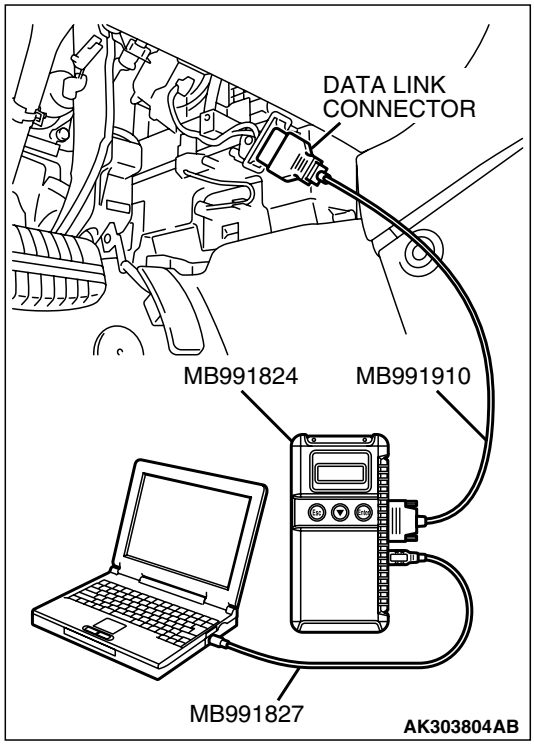
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- CAN line harness damage or connector damage.
- ETACS-ECU (immobilizer-ECU) failed.
- PCM failed.

DIAGNOSIS

Required Special Tools:

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



STEP 1. Using scan tool MB991958, diagnose CAN bus line.

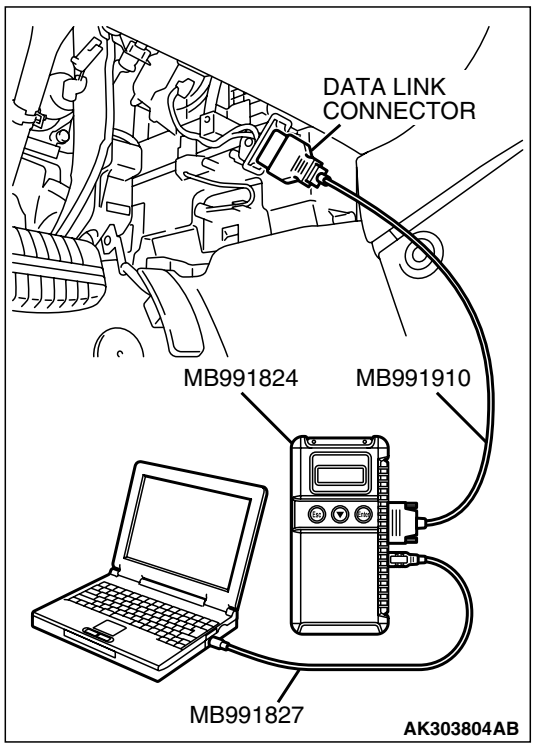
⚠ CAUTION

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) Diagnose CAN bus line.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the CAN bus line normal?

YES : Go to Step 2.
NO : Repair the CAN bus line. Refer to GROUP 54C, Can Bus Diagnostics Table P.54C-16. Then go to Step 3.

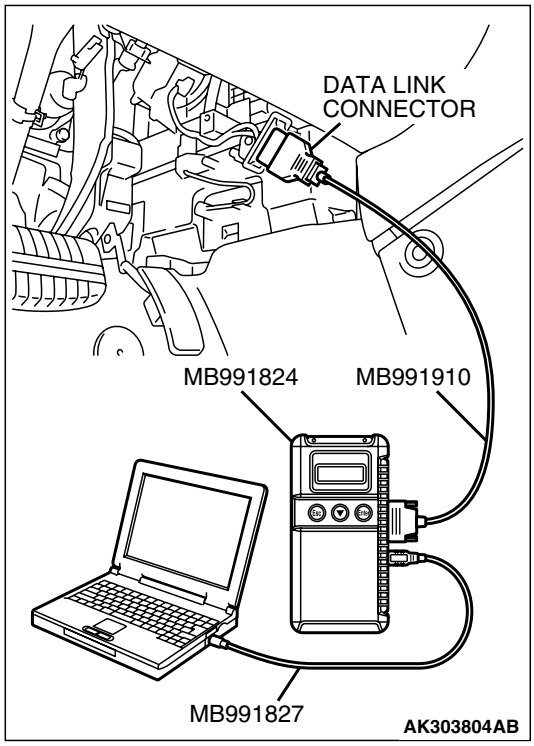


STEP 2. Using scan tool MB991958, read the diagnostic trouble code (DTC).

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

Q: Is the immobilizer-DTC set?

YES : Refer to GROUP 54A, Immobilizer System – Diagnostic Trouble Code Chart P.54A-15.
NO : Go to Step 3.



STEP 3. Using scan tool MB991958, read the diagnostic trouble code (DTC).

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) After the MFI-DTC has been deleted, read the MFI-DTC again.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC U1117 set?

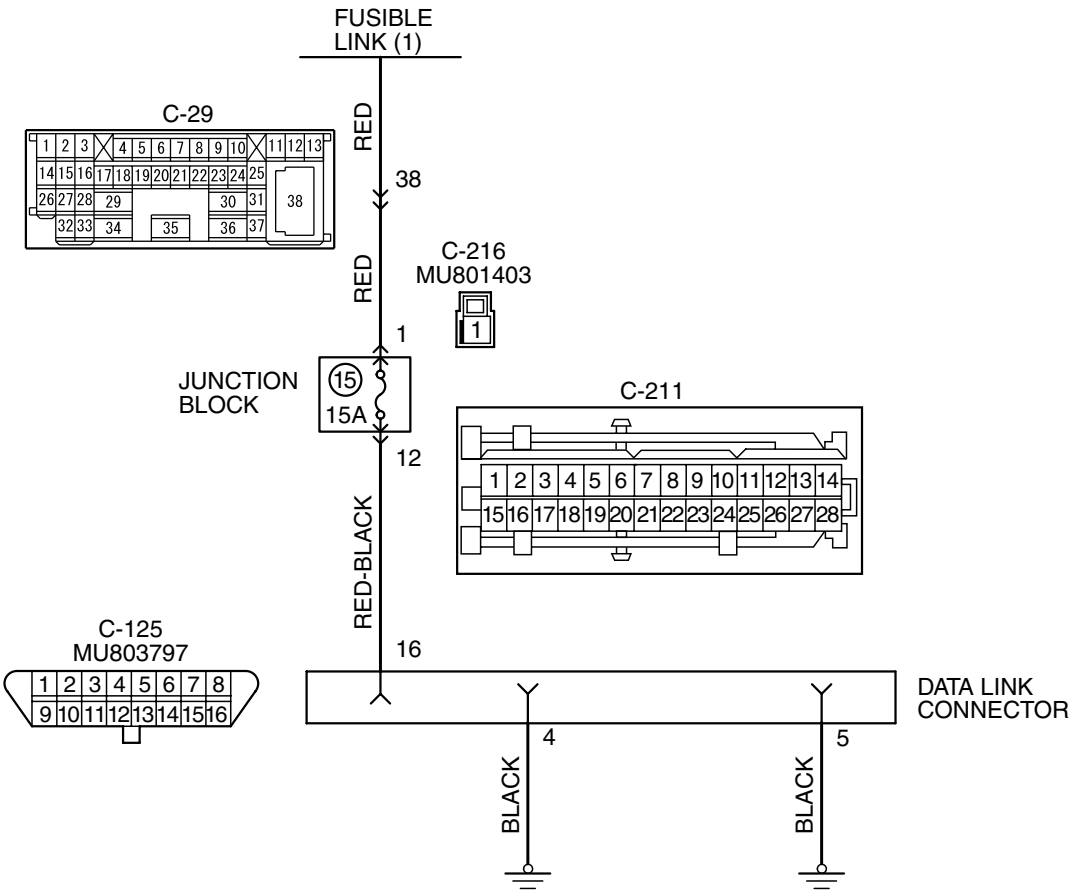
YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11.

NO : It can be assumed that this malfunction is intermittent of CAN bus line between PCM and ETACS-ECU (immobilizer-ECU). Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-14.

SYMPTOM PROCEDURES

INSPECTION PROCEDURE 1: Communication with Scan Tool Is Not Possible. (Comunication with All Systems Is Not Possible.)

Data Link Connector Circuit



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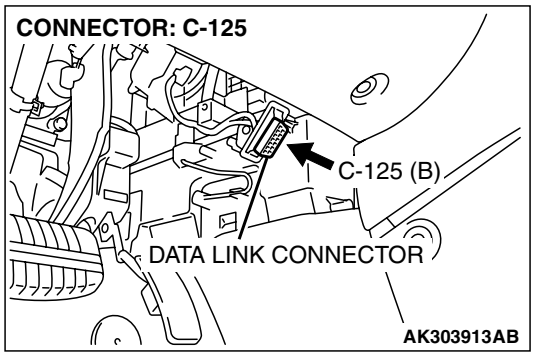

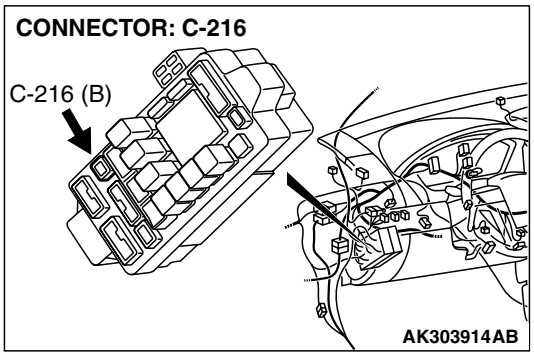

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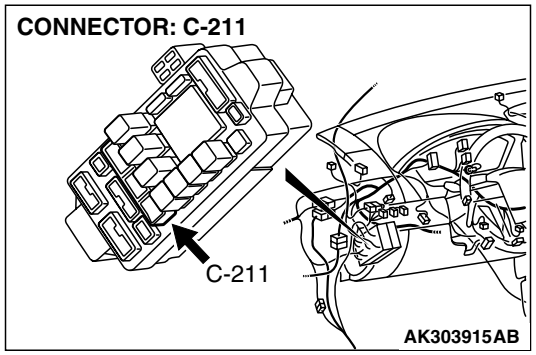
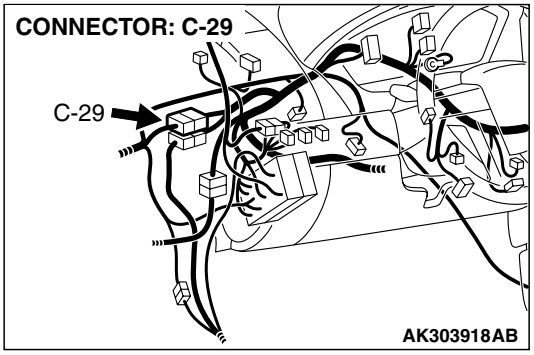




CIRCUIT OPERATION

- A battery positive voltage is applied on the data link connector power terminal (terminal No. 16). The ground terminals (terminal No. 4, No. 5) are grounded to the vehicle body.

COMMENT

- The cause is probably a defect in power supply system (including ground) for the on-board diagnostic test mode line.

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

- Malfunction of the data link connector.
- Damaged harness wire.

DIAGNOSIS

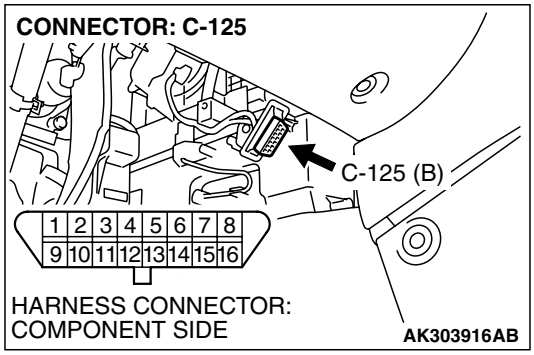
STEP 1. Measure the power supply voltage at data link connector C-125.

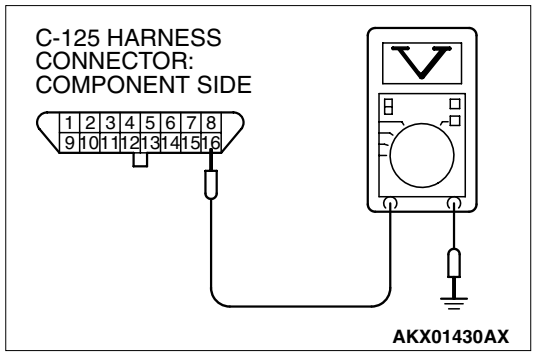
(1) Measure voltage between terminal No. 16 and ground.
- Voltage should be battery positive voltage.

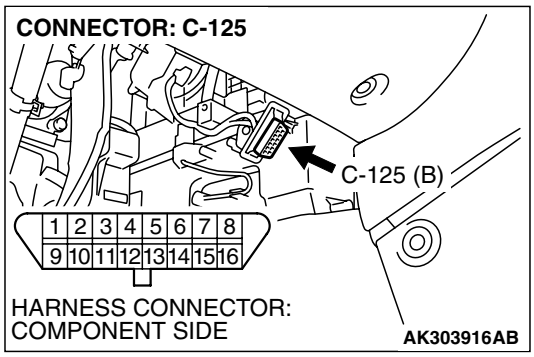
Q: Is battery positive voltage (approximately 12 volts) present?

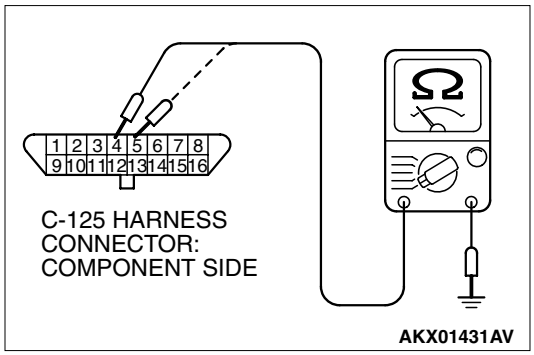
YES : Go to step 2.

NO : Check harness connectors C-29, C-216 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 C-29, C-216 and C-211 are in good condition, repair an open circuit between fusible link (1) and data link connector C-125 (terminal No. 16). Then confirm that the malfunction symptom is eliminated.









STEP 2. Check the continuity at data link connector C-125.

(1) Check for the continuity between terminal No. 4, No. 5 and ground.
- Continuity (2 Ω or less)

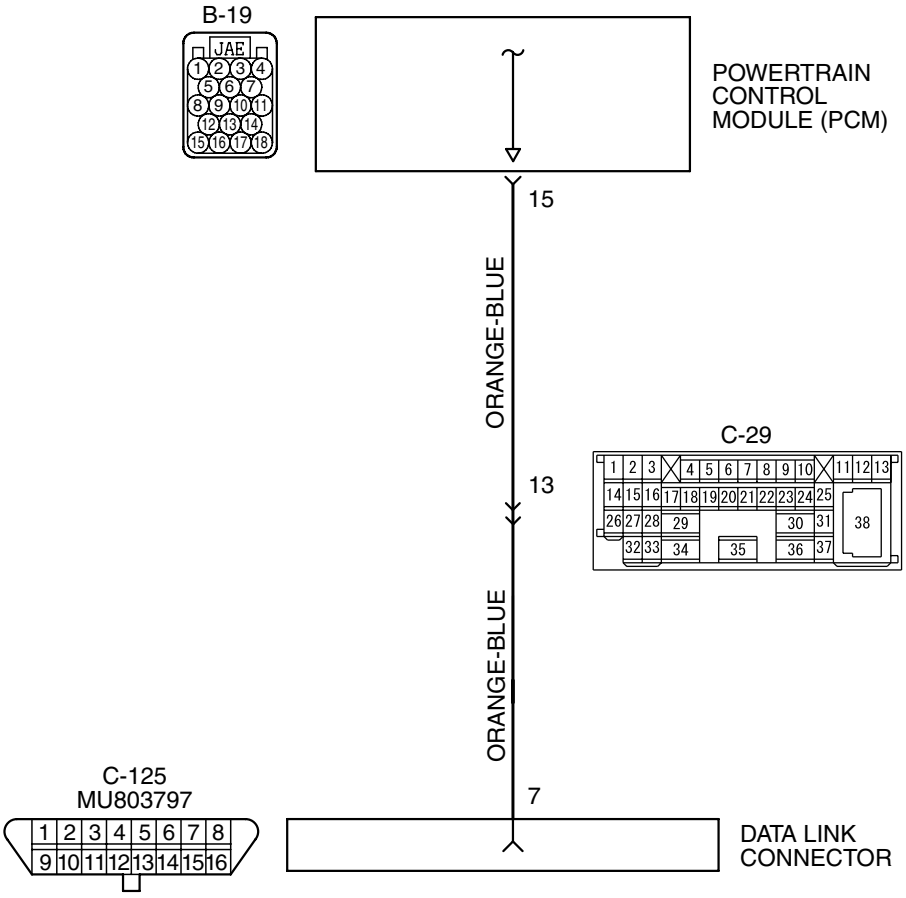
Q: Does continuity exist?

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

NO : Repair an open circuit or harness damage between data link connector C-125 (terminal No. 4, No. 5) and ground. Then confirm that the malfunction symptom is eliminated.

INSPECTION PROCEDURE 2: Scan Tool Communication with PCM Is Not Possible.

Data Link Connector Circuit



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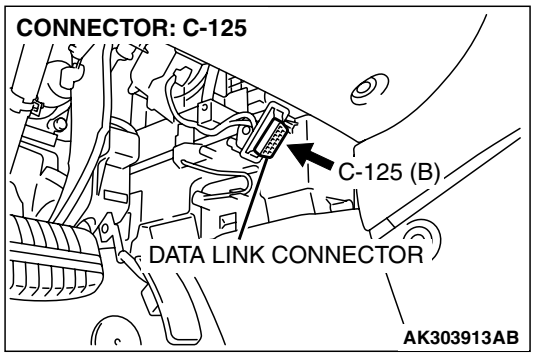

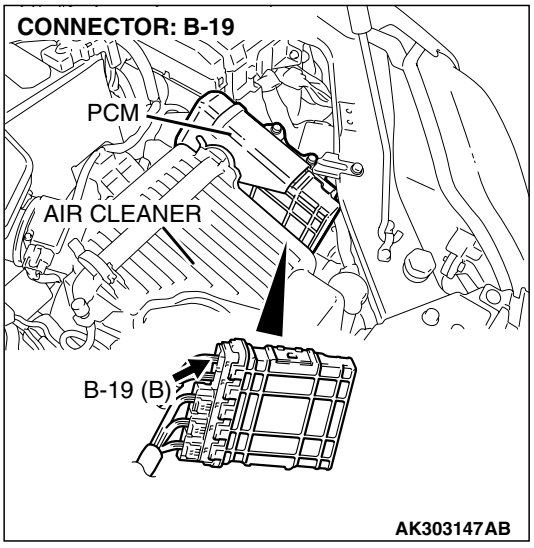

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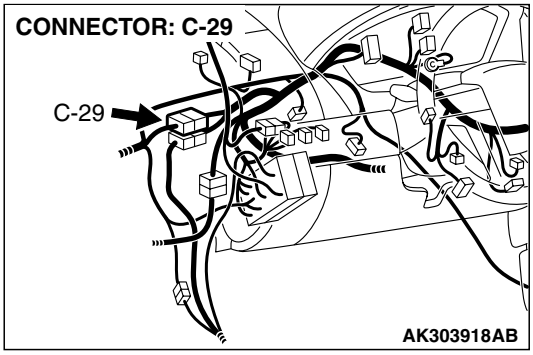


CIRCUIT OPERATION

- A diagnostic output is made from the PCM (terminal No. 15) to the diagnostic output terminal (terminal No. 7) of the data link connector.

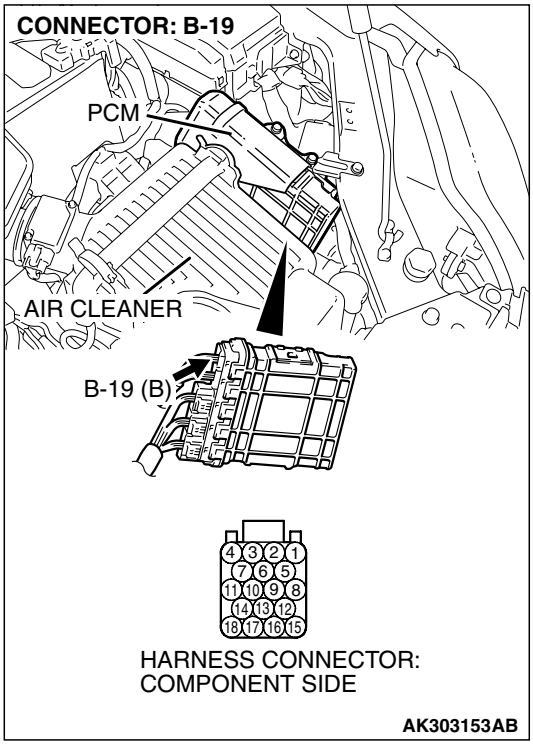
COMMENT

- No power supply to PCM.
- Defective ground circuit of PCM.
- Defective PCM.
- Improper communication line between PCM and scan tool.

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

- Malfunction of PCM power supply circuit.
- Malfunction of the PCM.
- Malfunction of the PCM.
- Open circuit between PCM and data link connector.

DIAGNOSIS



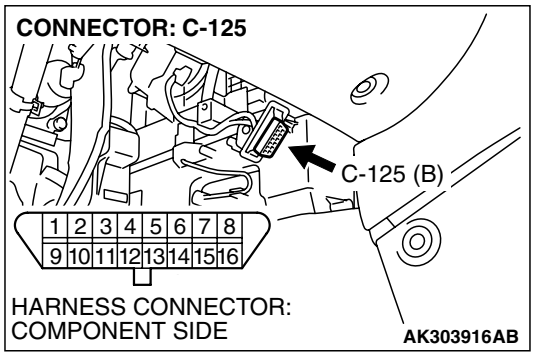
STEP 1. Check harness connector B-19 at PCM for damage.

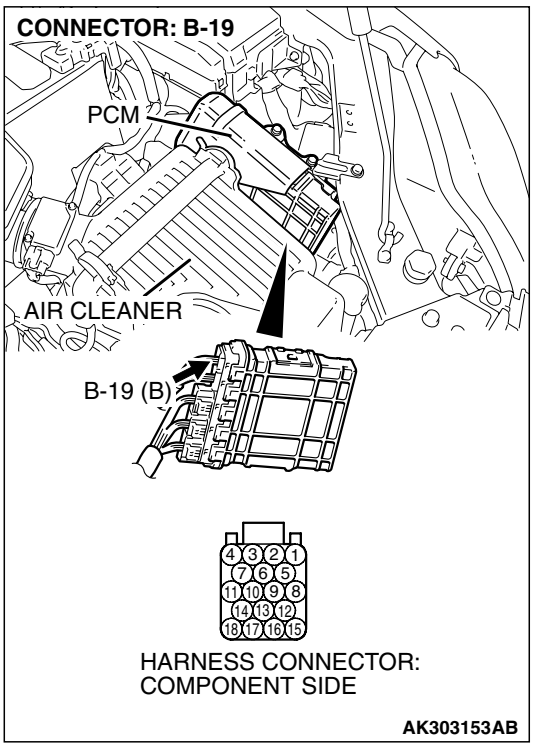
Q: Is the harness connector in good condition?

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.

STEP2. Check for open circuit, short circuit to ground and harness damage between data link connector C-125 (terminal No. 7) and PCM connector B-19 (terminal No. 15).





NOTE: Check harness after checking intermediate connectors C-29. If intermediate connector C-29 is damaged, repair or replace them. Refer 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 : Refer to INSPECTION PROCEDURE 28 – Power Supply System and Ignition Switch-IG System P.13A-1075.

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

INSPECTION PROCEDURE 3: The Malfunction Indicator Lamp (SERVICE ENGINE SOON or Check Engine Lamp) Does Not Illuminate Right after the Ignition Switch Is Turned to the "ON" Position.

COMMENT

- The combination meter causes the malfunction indicator lamp (SERVICE ENGINE SOON or Check Engine Lamp) to illuminate for 20 seconds immediately after the ignition switch is turned to the "ON" position occurred.

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

- Malfunction of the malfunction indicator lamp (SERVICE ENGINE SOON or Check Engine Lamp).
- Open or shorted malfunction indicator lamp (SERVICE ENGINE SOON or Check Engine Lamp) circuit.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan tool (M.U.T.-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).

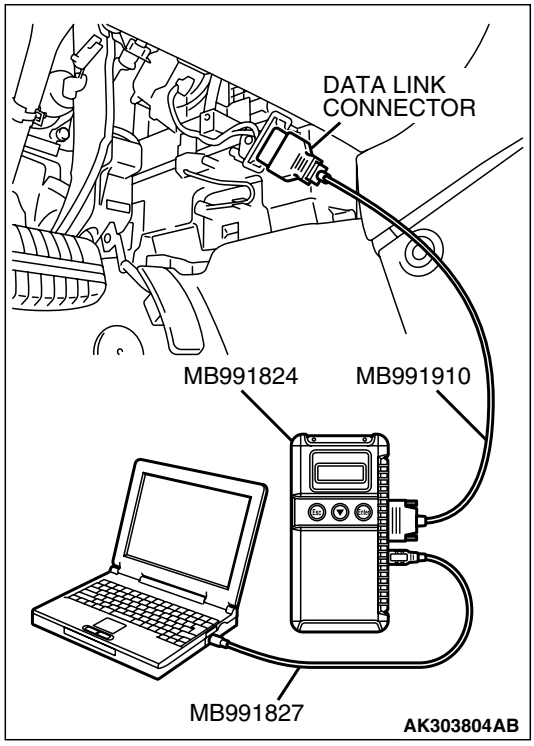
⚠ CAUTION

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 DTC set?

YES : Refer to Diagnostic Trouble Code Chart P.13A-45.
NO : Go to step 2.



STEP 2. Check the trouble symptoms.

(1) Turn the ignition switch to the "ON" position.
- The malfunction indicator lamp (SERVICE ENGINE SOON or Check Engine Lamp) should illuminate immediately after the ignition switch is turned to the "ON" position.

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

Q: Does the malfunction indicator lamp (SERVICE ENGINE SOON or Check Engine Lamp) illuminate?

YES : It can be assumed 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 : Replace the combination meter.

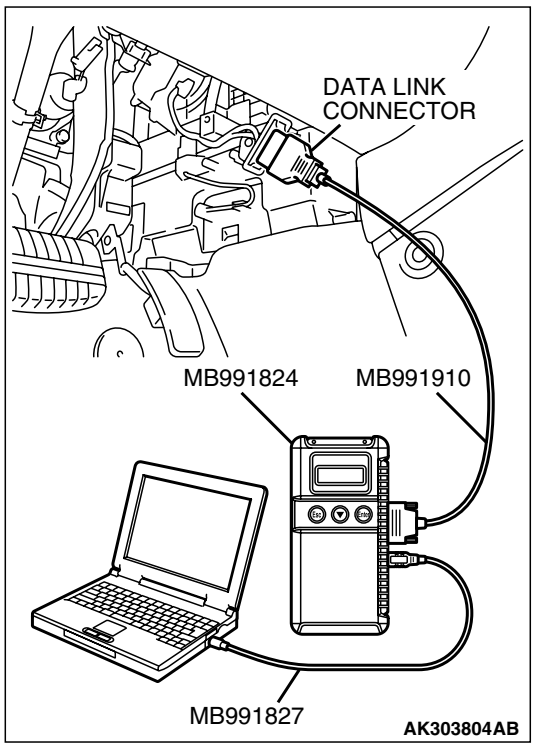
INSPECTION PROCEDURE 4: The Malfunction Indicator Lamp (SERVICE ENGINE SOON or Check Engine Lamp) Remains Illuminated and Never Goes Out.

COMMENT
- In cases such as the above, the cause is probably that the PCM is detecting a problem in a sensor or actuator, or that one of the malfunctions listed at next has probably occurred.

TROUBLESHOOTING HINTS (The most likely causes for this case:)
- Shorted the malfunction indicator lamp (SERVICE ENGINE SOON or Check Engine Lamp) circuit.

DIAGNOSIS

Required Special Tools:
- Scan Tool (M.U.T.-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 DTC set?

YES : Refer to Diagnostic Trouble Code Chart P.13A-45.
NO : Go to Step. 2.

STEP 2. Check the trouble symptoms.

(1) Turn the ignition switch to the "ON" position.
- The malfunction indicator lamp (SERVICE ENGINE SOON or Check Engine Lamp) should go out when 20 seconds have passed after the ignition switch was turned to the "ON" position.

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

Q: Does the malfunction indicator lamp (SERVICE ENGINE SOON or Check Engine Lamp) go out?

YES : It can be assumed 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 : Replace the combination meter.

INSPECTION PROCEDURE 5: Cranks, Won't Start

CRANKS, WON'T START CIRCUIT
- Refer to Ignition circuit P.13A-1105.

CIRCUIT OPERATION
- Refer to Ignition circuit P.13A-1105.

COMMENT
- In cases such as the above, the cause is probably no spark, fuel delivery, or fuel quality problems. In addition, foreign materials (water, kerosene, etc.) may be mixed with the fuel.

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

- Malfunction of the ignition system.
- Malfunction of the fuel pump system.
- Malfunction of the injector system.
- Malfunction of the PCM.
- Contaminated fuel.

DIAGNOSIS

Required Special Tools:

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

STEP 1. Measure the battery positive voltage.

(1) Measure the battery positive voltage during cranking.
- The voltage should remain greater than 8 volts while the engine is cranked.

Q: Does the voltage remain greater than 8 volts while the engine is cranked?

YES : Go to Step 2.

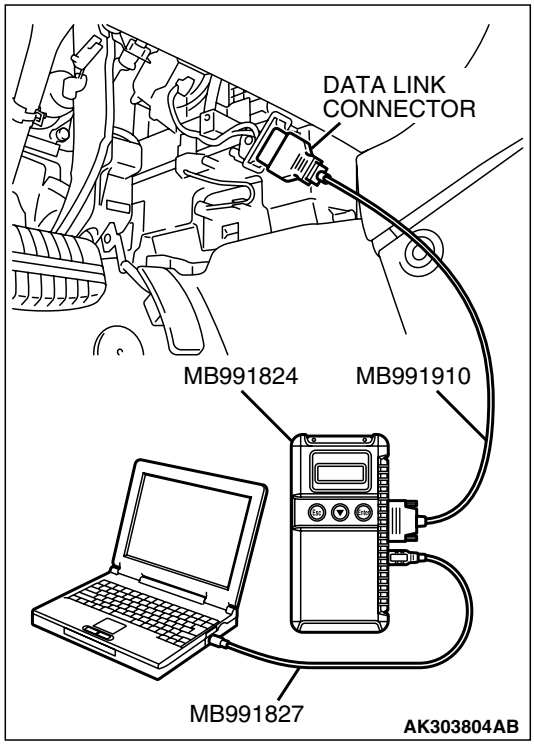
NO : Check the battery. Refer to GROUP 54A, Battery – Battery check P.54A-6. Then confirm that the malfunction symptom is eliminated.

STEP 2. Check the timing belt for breaks.

Q: Is the timing belt good condition?

YES : Go to Step 3.

NO : Replace timing belt. Then confirm that the malfunction symptom is eliminated.



STEP 3. Using scan tool MB991958, read the diagnostic trouble code (DTC).

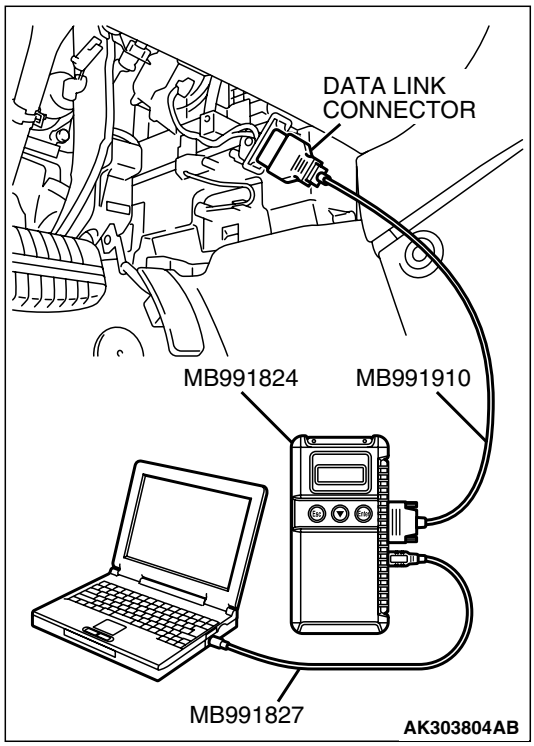
⚠ CAUTION

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-45.
NO : Go to Step 4.



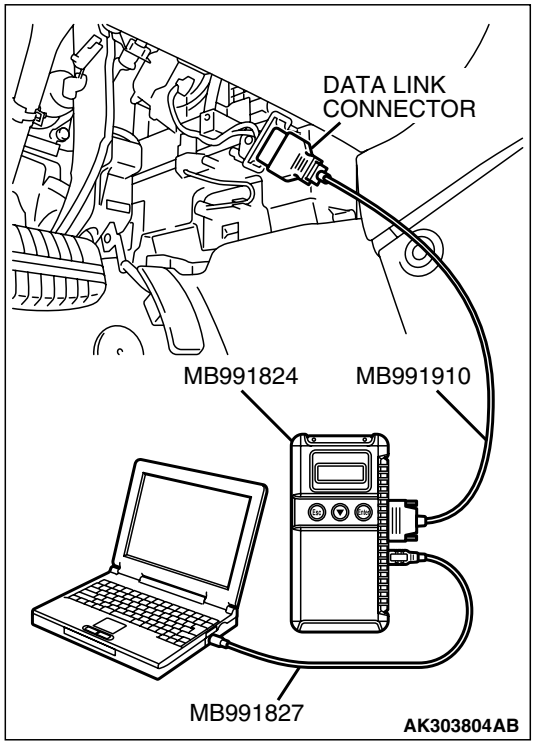
STEP 4. Using scan tool MB991958, check data list.

(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-1116.
  a. Item 1: Power Supply Voltage
  b. Item 2: Crankshaft Position Sensor
  c. Item 6: Engine Coolant Temperature Sensor
(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.

TSB Revision

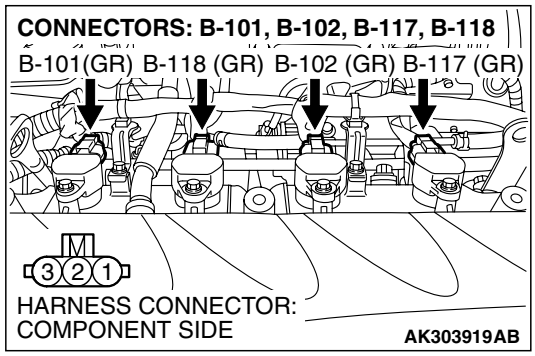


STEP 5. Using scan tool MB991958, check actuator test.

(1) Turn the ignition switch to the "ON" position.
(2) Check the following items in the actuator test. Refer to Actuator Test Reference Table P.13A-1137.
  a. Item 9: Fuel pump
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the actuator operating properly?

YES : Go to Step 6.
NO : Repair or replace it.Then confirm that the malfunction symptom is eliminated.



STEP 6. Check the ignition system.

(1) Connect the timing to terminal No. 1 of the ignition coil connector B-101, B-102, B-117 or B-118 in order.
(2) Crank the engine.
  • The timing light flashes.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Does the timing light flash?

YES : Go to Step 7.
NO : Refer to INSPECTION PROCEDURE 32 – Ignition Circuit System P.13A-1105.

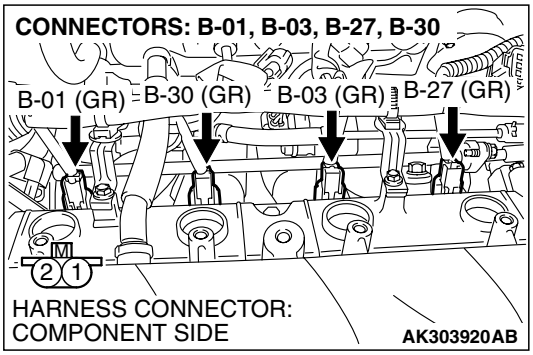
STEP 7. Check the ignition timing.

(1) Check the ignition timing at cranking.

Standard value: 5° BTDC ± 3°

Q: Is the ignition timing normal?

YES : Go to Step 8.
NO : Check that the crankshaft position sensor and timing belt cover are in the correct position. Then confirm that the malfunction symptom is eliminated.

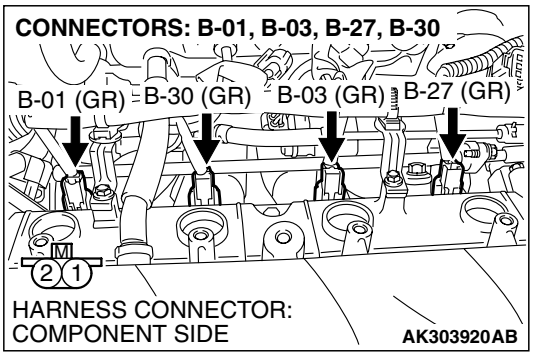


STEP 8. Check harness connector B-01 or B-03 or B-27 or B-30 at injector for damage.

Q: Is the harness connector in good condition?

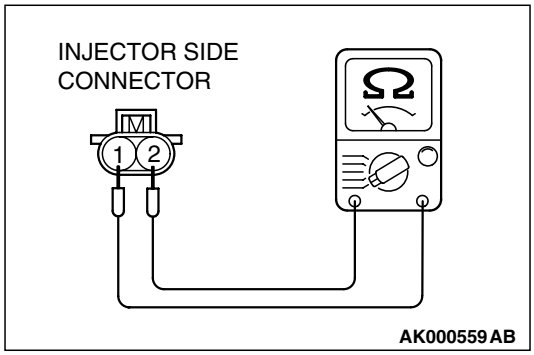
YES : Go to Step 9.

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



STEP 9. Check the injector.

(1) Disconnect the injector connector B-01, B-03, B-27 and B-30.



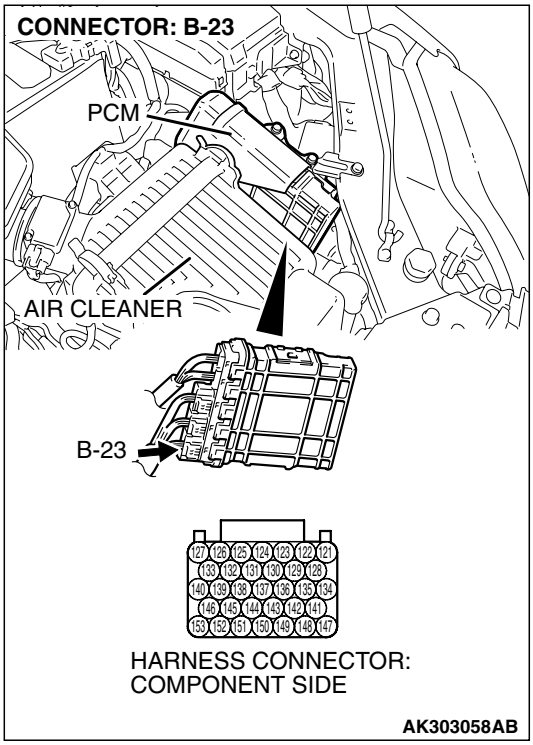
(2) Measure the resistance between each injector side connector terminal No. 1 and No. 2.

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

Q: Is the measured resistance between 10.5 and 13.5 ohms [at 20°C (68°F)]?

YES : Go to Step 10.

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

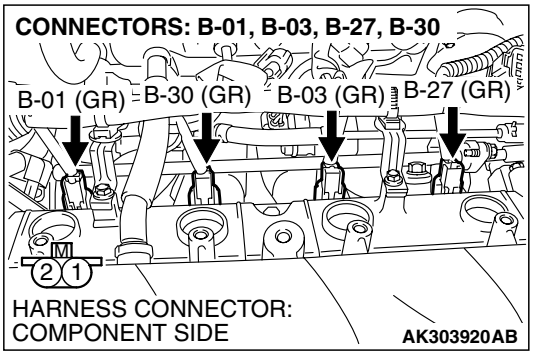


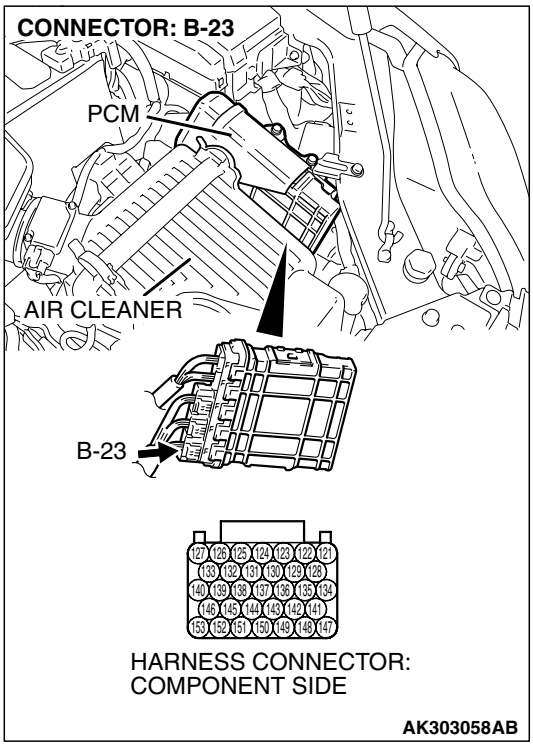
STEP 10. Check harness connector B-23 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 11.

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





STEP 11. Check for harness damage between injector connector and PCM connector.

a. Check the harness wire between injector connector B-01 (terminal No. 2) and PCM connector B-23 (terminal No. 153) at No. 1 cylinder.
b. Check the harness wire between injector connector B-30 (terminal No. 2) and PCM connector B-23 (terminal No. 146) at No. 2 cylinder.
c. Check the harness wire between injector connector B-03 (terminal No. 2) and PCM connector B-23 (terminal No. 140) at No. 3 cylinder.
d. Check the harness wire between injector connector B-27 (terminal No. 2) and PCM connector B-23 (terminal No. 139) at No. 4 cylinder.

Q: Is the harness wire in good condition?

YES : Check the following items, and repair or replace the defective items.
a. Check the ignition coil and spark plugs.
b. Check if the injectors are clogged.
c. Check if fuel is contaminated.
d. Check compression.
Then confirm that the malfunction symptom is eliminated.

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

INSPECTION PROCEDURE 6: Starts Up and Dies.

COMMENT

- In such cases as the above, the cause is usually improper air/fuel mixture. It is possible, though less likely, that the spark plugs are generating sparks but the sparks are weak.

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

- Malfunction of the ignition system.
- Malfunction of the injector system.
- Contaminated fuel.
- Poor compression.
- Dirtiness around throttle valve.
- Malfunction of the PCM.

DIAGNOSIS

Required Special Tools:

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

STEP 1. Check the fuse number 23 (junction block).

Check the fuse number 23 (junction block)

Q: Is the fuse number 23 (junction block) normal?

YES : Go to Step 2.

NO : Repair the fuse number 23 (junction block).

STEP 2. Measure the battery positive voltage.

(1) Measure the battery positive voltage during cranking.

- The voltage should remain greater than 8 volts while the engine is cranked.

Q: Does the voltage remain greater than 8 volts while the engine is cranked?

YES : Go to Step 3.

NO : Refer to GROUP 54A, Battery – Battery check P.54A-6.

STEP 3. Using scan tool MB991958, read the diagnostic trouble code (DTC).

⚠ CAUTION

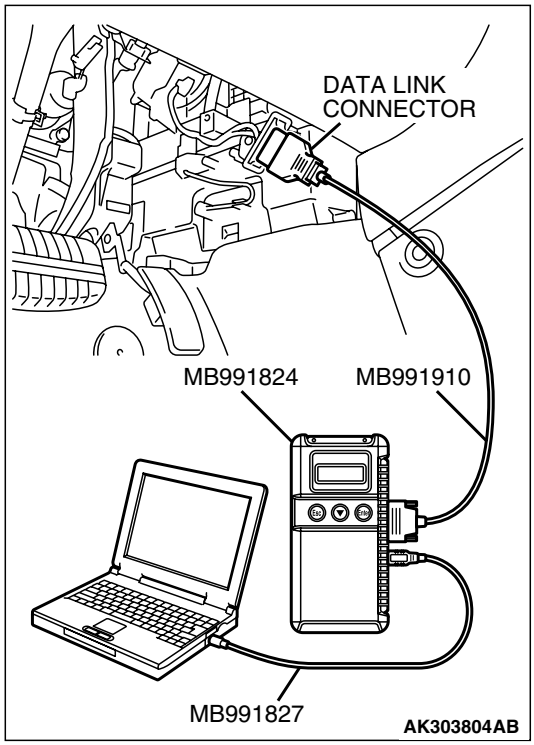
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

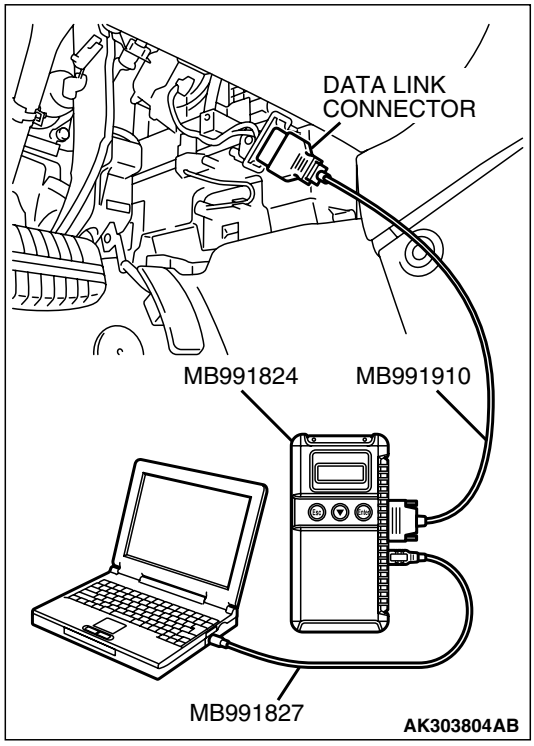
(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the DTC set?

YES : Refer to Diagnostic Trouble Code Chart P.13A-45.

NO : Go to Step 4.



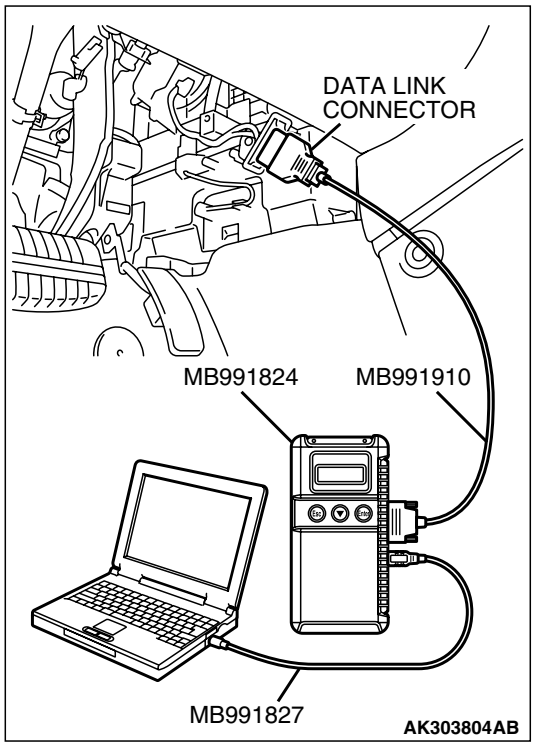


STEP 4. Using scan tool MB991958, check actuator test.

(1) Turn the ignition switch to the "ON" position.
(2) Check the following items in the actuator test. Refer to Actuator Test Reference Table P.13A-1137.
   a. Item 9: Fuel Pump
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the actuator 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 in the data list. Refer to Data List Reference Table P.13A-1116.
   a. Item 6: Engine Coolant Temperature Sensor
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 6.
NO : Repair or replace it. Then confirm that the malfunction symptom is eliminated.

STEP 6. Inspection of throttle body (throttle valve area) for dirtiness.

Q: Is the throttle valve area dirty?

YES : Refer to On-vehicle Service – Throttle Body (Throttle Valve Area) Cleaning P.13A-1162.

NO : Go to Step 7.

STEP 7. Check the ignition timing.

(1) Check the ignition timing at cranking.

Standard value: 5° BTDC ± 3°

Q: Is the ignition timing normal?

YES : Go to Step 8.

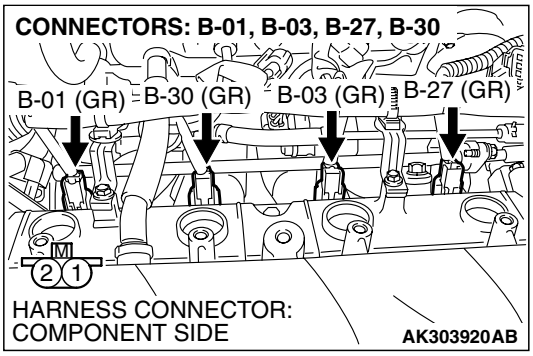
NO : Check that the crankshaft position sensor and timing belt cover are in the correct position. Then confirm that the malfunction symptom is eliminated.

STEP 8. Check harness connector B-01 or B-03 or B-26 or B-29 at injector for damage.

Q: Is the harness connector in good condition?

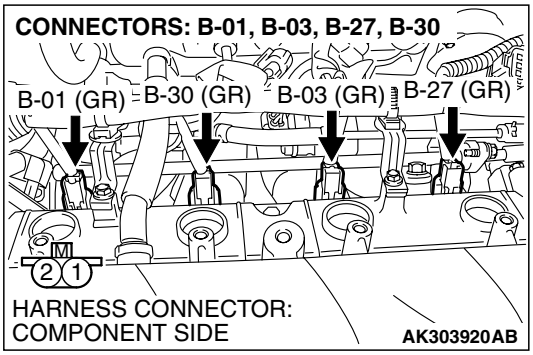
YES : Go to Step 9.

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



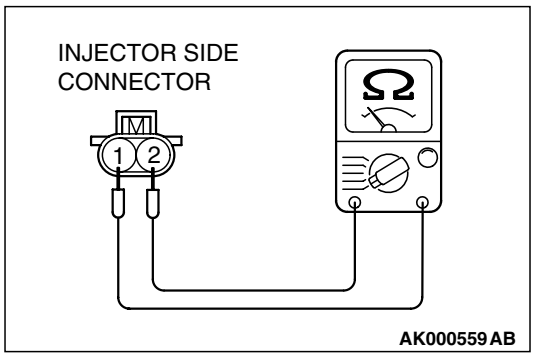
STEP 9. Check the injector.

(1) Disconnect the injector connector B-01, B-03, B-27 and B-30.



(2) Measure the resistance between each injector side connector terminal No. 1 and No. 2.

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

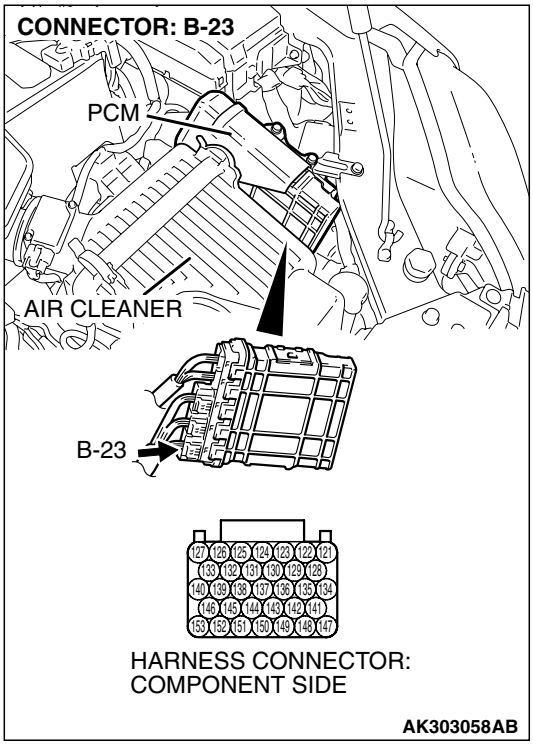


Q: Is the measured resistance between 10.5 and 13.5 ohms [at 20°C (68°F)]?

YES : Go to Step 10.

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

TSB Revision

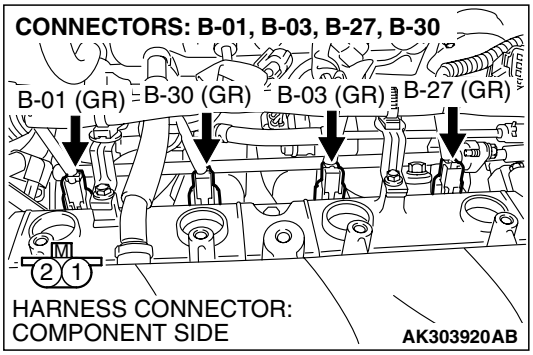


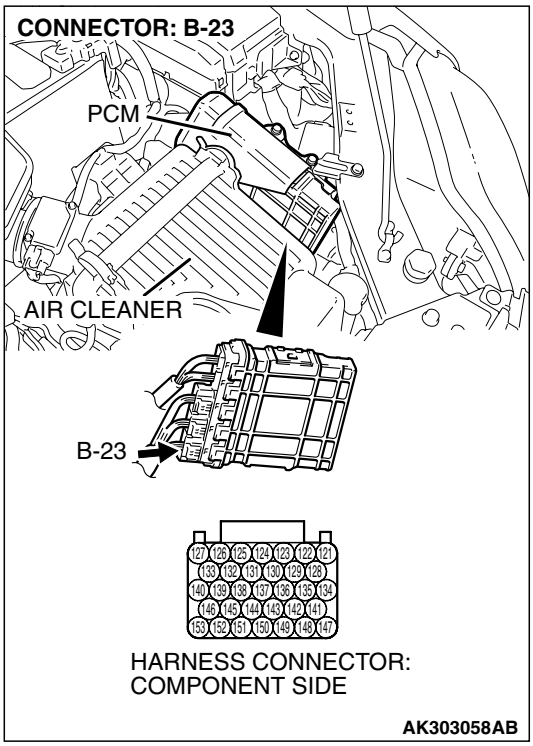
STEP 10. Check harness connector B-23 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 11.

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





STEP 11. Check for harness damage between injector connector and PCM connector.

a. Check the harness wire between injector connector B-01 (terminal No. 2) and PCM connector B-23 (terminal No. 153) at No. 1 cylinder.
b. Check the harness wire between injector connector B-30 (terminal No. 2) and PCM connector B-23 (terminal No. 146) at No. 2 cylinder.
c. Check the harness wire between injector connector B-03 (terminal No. 2) and PCM connector B-23 (terminal No. 140) at No. 3 cylinder.
d. Check the harness wire between injector connector B-27 (terminal No. 2) and PCM connector B-23 (terminal No. 139) at No. 4 cylinder.

Q: Is the harness wire in good condition?

YES : Check the following items, and repair or replace the defective items.
- a. Check the ignition coil and spark plugs.
- b. Check if the injectors are clogged.
- c. Check compression pressure.
- d. Check fuel lines for clogging.
- e. Check if the foreign materials (water, kerosene, etc.) got into fuel.

Then confirm that the malfunction symptom is eliminated.

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

INSPECTION PROCEDURE 7: Hard Starting

COMMENT

- In cases such as the above, the cause is usually either weak spark, improper air/fuel mixture or low compression.

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

- Malfunction of the ignition system.
- Malfunction of the injector system.
- Poor fuel quality. (Contamination)
- Poor compression.

DIAGNOSIS

Required Special Tools:

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

TSB Revision

STEP 1. Measure the battery positive voltage.

(1) Measure the battery positive voltage during cranking.
- The voltage should remain greater than 8 volts while the engine is cranked.

Q: Does the voltage remain greater than 8 volts while the engine is cranked?

YES : Go to Step 2.

NO : Refer to GROUP 54A, Battery – Battery check P.54A-6.

STEP 2. Using scan tool MB991958, read the diagnostic trouble code (DTC).

⚠ CAUTION

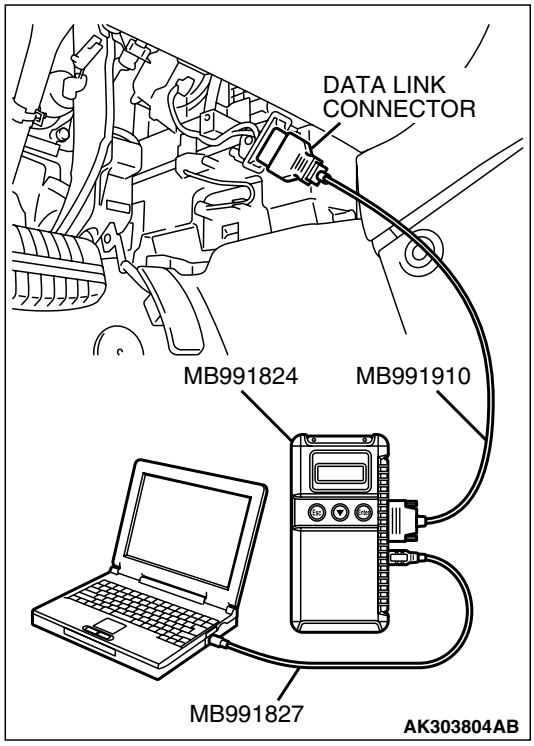
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

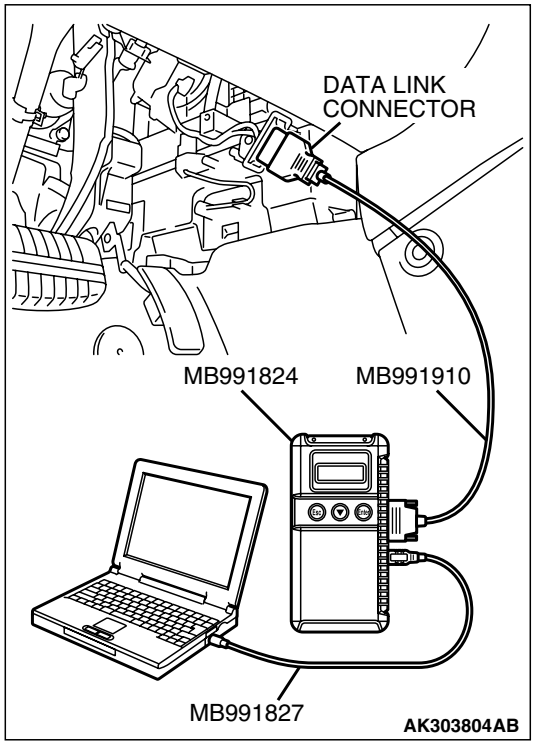
(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the DTC set?

YES : Refer to Diagnostic Trouble Code Chart P.13A-45.

NO : Go to Step 3.



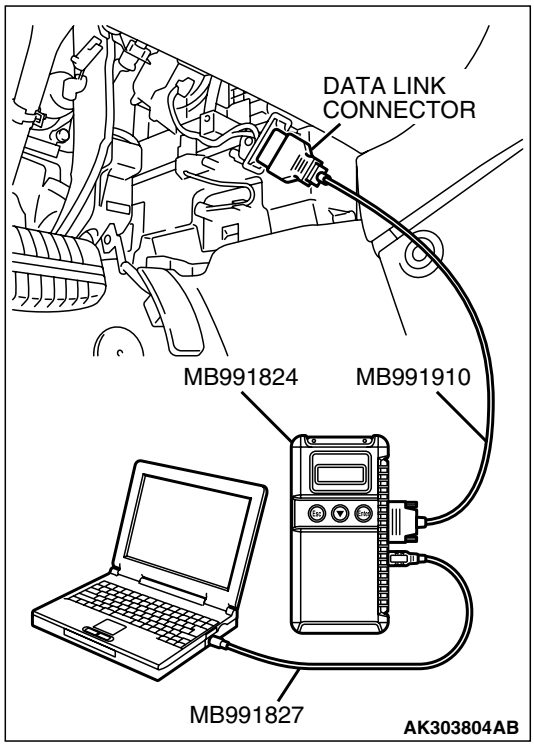


STEP 3. Using scan tool MB991958, check actuator test.

(1) Turn the ignition switch to the "ON" position.
(2) Check the following item in the actuator test. Refer to Actuator Test Reference Table P.13A-1137.
   a. Item 9: Fuel Pump
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the actuator 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 item in the data list. Refer to Data List Reference Table P.13A-45.
   a. Item 6: Engine Coolant Temperature Sensor
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 5.
NO : Repair or Replace it. Then confirm that the malfunction symptom is eliminated.

STEP 5. Check the ignition timing.

(1) Check the ignition timing at cranking.

Standard value: 5° BTDC ± 3°

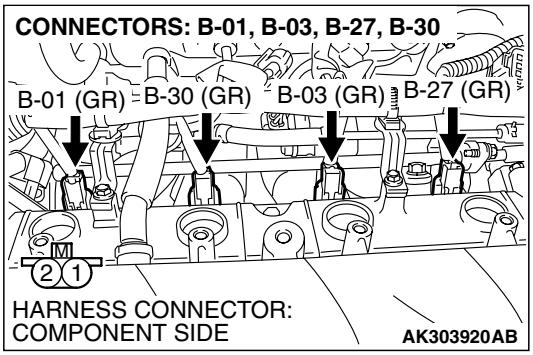
Q: Is the ignition timing normal?

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. Check harness connector B-01 or B-03 or B-27 or B-30 at injector for damage.

Q: Is the harness connector in good condition?

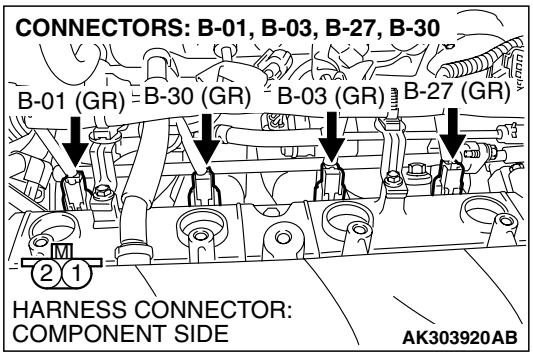


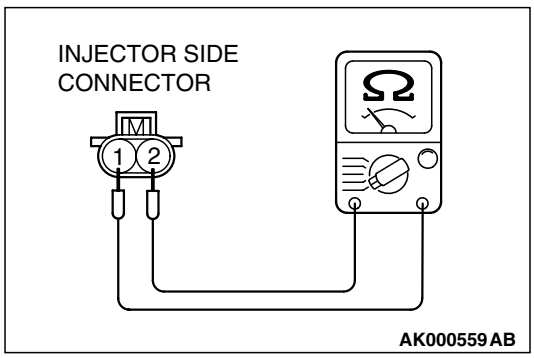
YES : Go to Step 7.

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 the injector.

(1) Disconnect the injector connector B-01, B-03, B-27 and B-30.





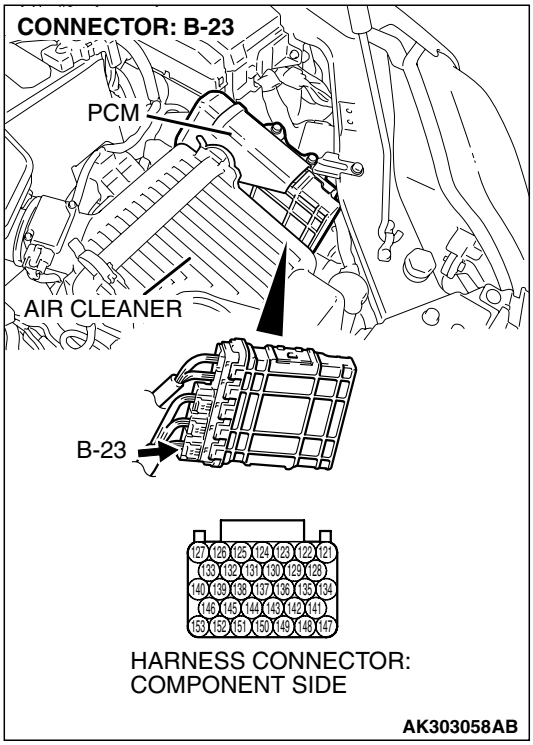
(2) Measure the resistance between each injector side connector terminal No. 1 and No. 2.

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

Q: Is the measured resistance between 10.5 and 13.5 ohms [at 20°C (68°F)]?

YES : Go to Step 8.

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

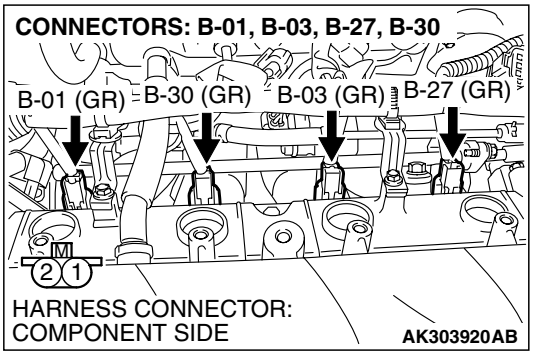


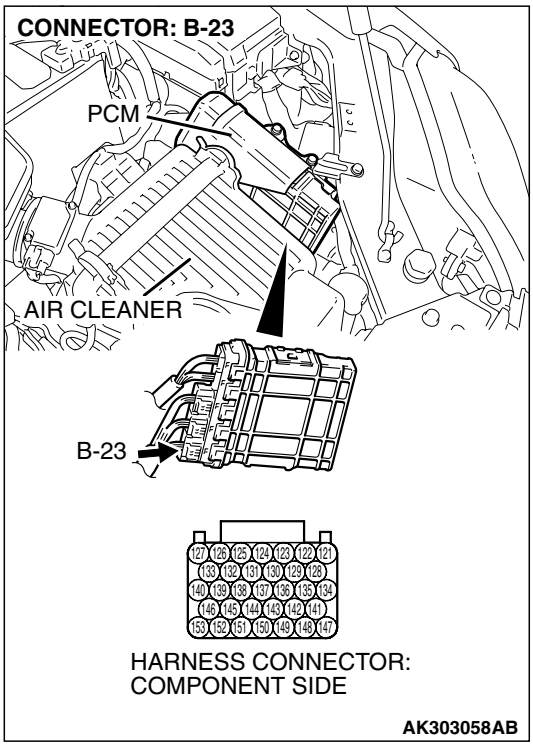
STEP 8. Check harness connector B-23 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 9.

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





STEP 9. Check for harness damage between injector connector and PCM connector.

a. Check the harness wire between injector connector B-01 (terminal No. 2) and PCM connector B-23 (terminal No. 153) at No. 1 cylinder.
b. Check the harness wire between injector connector B-30 (terminal No. 2) and PCM connector B-23 (terminal No. 146) at No. 2 cylinder.
c. Check the harness wire between injector connector B-03 (terminal No. 2) and PCM connector B-23 (terminal No. 140) at No. 3 cylinder.
d. Check the harness wire between injector connector B-27 (terminal No. 2) and PCM connector B-23 (terminal No. 139) at No. 4 cylinder.

Q: Is the harness wire in good condition?

YES : Check the following items, and repair or replace the defective items.
  a. Check the ignition coil and spark plugs.
  b. Check if the injectors are clogged.
  c. Check compression pressure.
  d. Check if the foreign materials (water, kerosene, etc.) got into fuel.

Then confirm that the malfunction symptom is eliminated.

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

INSPECTION PROCEDURE 8: Unstable Idle (rough idle, hunting).

COMMENT

- In cases such as the above, the cause is probably the air/fuel mixture or electronic control throttle valve system. Other systems affecting idle quality include the ignition system and compression.

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 evaporative emission purge solenoid system.
- Malfunction of the EGR valve.
- Poor compression pressure.
- Vacuum leak.

DIAGNOSIS

Required Special Tools:

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

STEP 1. Check if the battery terminal is disconnected

Q: Has the battery terminal been disconnected lately?

YES : Start the engine and let it run at idle for approximate 10 minutes after engine warm up. Then, if a malfunction occurs, go to Step 2.

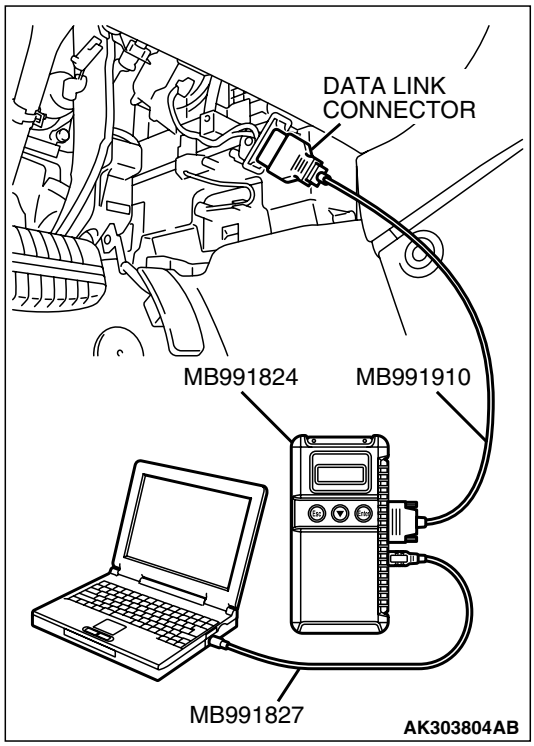
NO : Go to Step 2.

STEP 2. Using scan tool MB991958, read the diagnostic trouble code (DTC).

⚠ CAUTION

To prevent damage to scan tool MB991958, always turn the ignition switch is 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-45.

NO : Go to Step 3.

STEP 3. Check the engine idling state.

Q: Is it noticeably hunting?

YES : Go to Step 4.

NO : Go to Step 5.

STEP 4. Check the following items.

(1) Carry out the following cleaning.
   a. Refer to On-vehicle Service – Clean the throttle valve area P.13A-1162.

(2) After cleaning, confirm that the malfunction symptom is eliminated.

Q: Is the malfunction symptom resolved?

YES : The check is completed.

NO : Check the following items, and repair or replace the defective items.
   a. Broken intake manifold gasket.
   b. Broken air intake hose.
   c. Broken vacuum hose.
   d. Positive crankcase ventilation valve does not operate.

Then confirm that the malfunction symptom is eliminated.

STEP 5. Using scan tool MB991958, check actuator test items 1, 2, 3, 4: Injector.

⚠ CAUTION

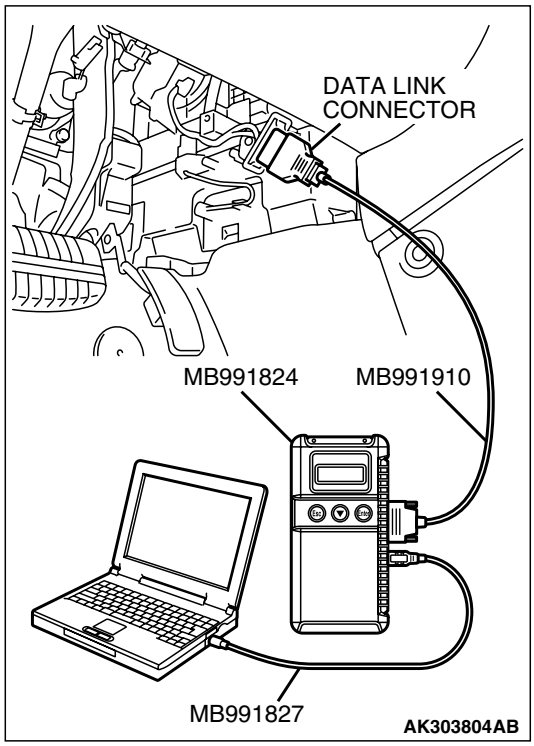
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

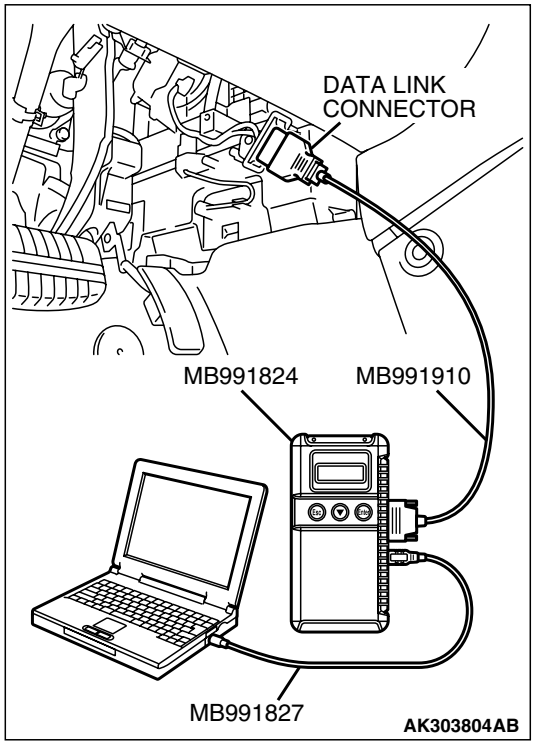
(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Check following items in the actuator test. Refer to Actuator Test Reference Table P.13A-1137.
   a. Item 1, 2, 3, 4: Injector
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Are they operating properly?

YES : Go to Step 6.

NO : Refer to DTC P0201 – Injector Circuit-cylinder 1 P.13A-468, DTC P0202 – Injector Circuit-cylinder 2 P.13A-478, DTC P0203 – Injector Circuit-cylinder 3 P.13A-488, DTC P0204 – Injector Circuit-cylinder 4P.13A-498.



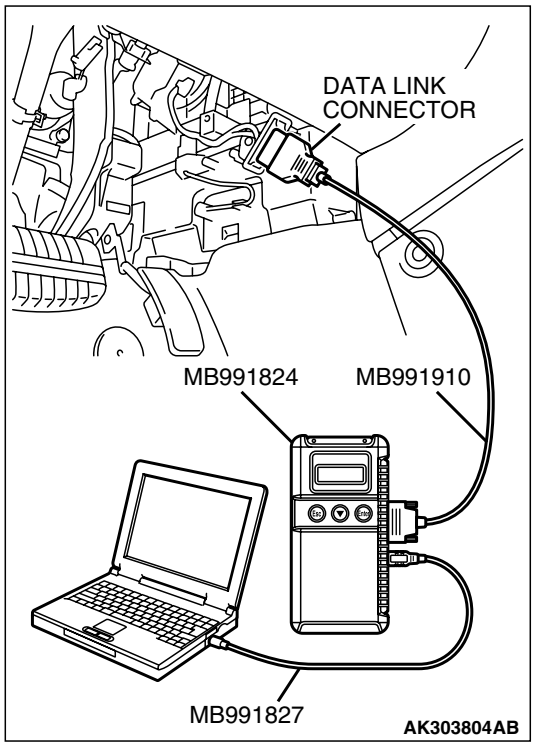


STEP 6. Using scan tool MB991958, check data list.

(1) Turn the ignition switch to the "ON" position.
(2) Check the following items in the data list. Refer to Data List Reference Table P.13A-1116.
   a. Item 5: Intake Air Temperature Sensor
   b. Item 6: Engine Coolant Temperature Sensor
   c. Item 83: Power Steering Pressure Switch
   d. Item AC: Cylinder 1, 4 Heated Oxygen Sensor (front)
   e. Item AD: Cylinder 1, 4 Heated Oxygen Sensor (rear)
   f. Item AE: Cylinder 2, 3 Heated Oxygen Sensor (front)
   g. Item AF: Cylinder 2, 3 Heated Oxygen Sensor (rear)
   h. Item BB: Barometric Pressure Sensor
(3) 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.

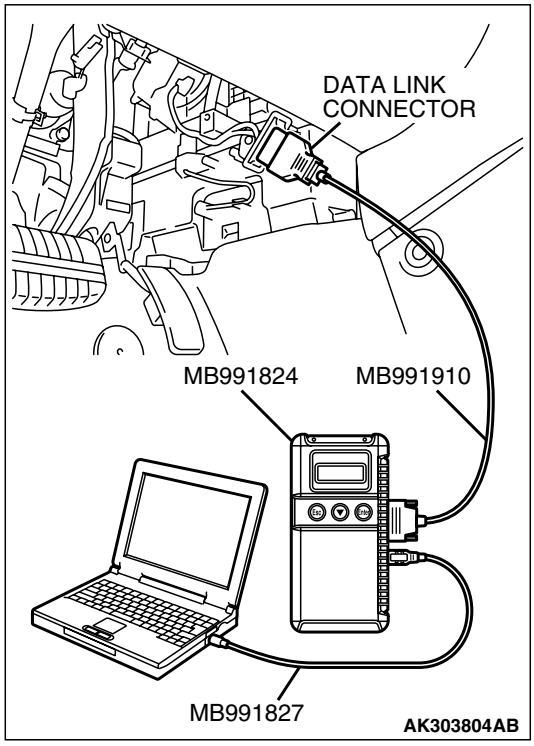


STEP 7. Using scan tool MB991958, check actuator test.

(1) Turn the ignition switch to the "ON" position.
(2) Check the following item in the actuator test. Refer to Actuator Test Reference Table P.13A-1137.
   a. Item 10: Evaporative Emission Purge Solenoid
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the actuator operating properly?

YES : Go to Step 8.
NO : Repair or replace it. Then confirm that the malfunction symptom is eliminated.



STEP 8. 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-1116.
   a. Item AC: Cylinder 1, 4 Heated Oxygen Sensor (front)
   b. Item AE: 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: Is the sensor operating properly?

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

STEP 9. Check the fuel pressure.

Refer to On-vehicle Service – Fuel Pressure Test P.13A-1163.

Q: Is the fuel pressure normal?

YES : a. Check the following items, and repair or replace the defective items.
- 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 10. Check the ignition timing.
Refer to GROUP 11A, On-vehicle Service – Ignition Timing Check P.11A-14.

Q: Is the ignition timing normal?

YES : Check the following items, and repair or replace the defective items.
a. Check the ignition coil and spark plugs.
b. Check the purge control system.
c. Check compression pressure.
d. Check if the foreign materials (water, kerosene, etc.) got into fuel.
e. Check the EGR valve.
Then confirm that the malfunction symptom is eliminated.

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

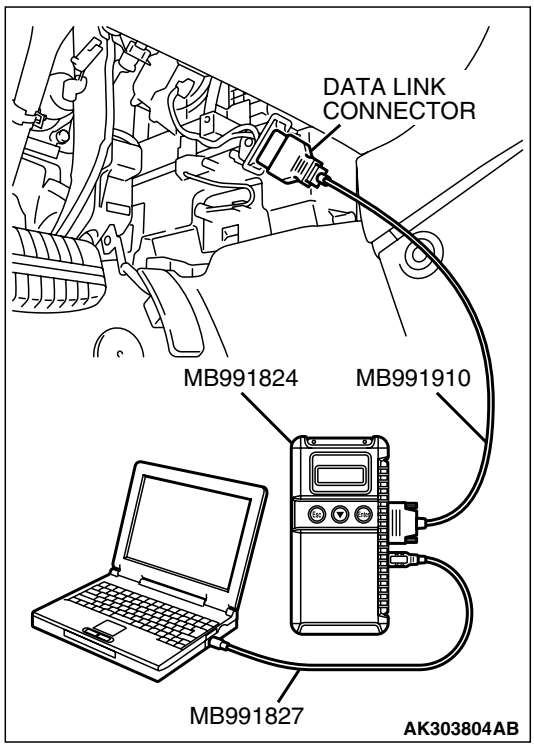
INSPECTION PROCEDURE 9: Idle speed is high (improper idle speed).

COMMENT
- In such cases as the above, the cause is probably that the intake air volume during idle is too great.

TROUBLESHOOTING HINTS (The most likely causes for this case:)
- Malfunction of the electronic control throttle valve system.
- Malfunction of the throttle body.

DIAGNOSIS

Required Special Tools:
- MB991958: Scan Tool (M.U.T.-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).

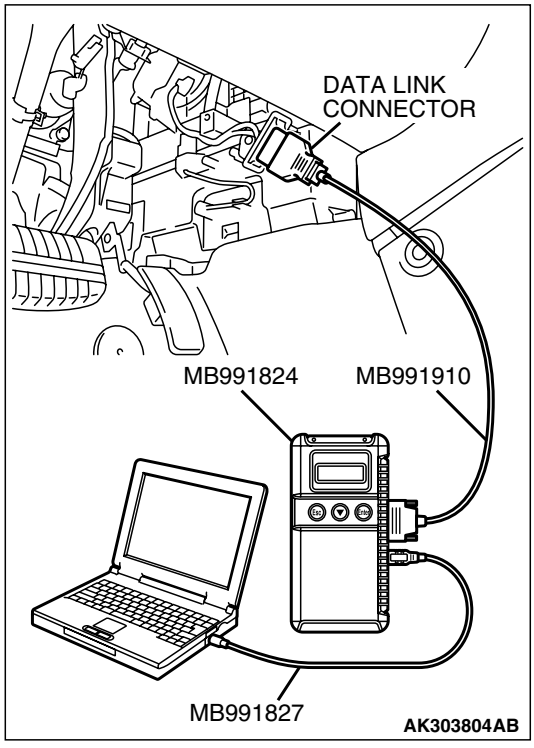
⚠ CAUTION

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-45.
NO : Go to Step 2.



STEP 2. 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 item in the data list. Refer to Data List Reference Table P.13A-1116.
    a. Item 6: Engine Coolant Temperature Sensor
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 3.
NO : Repair or replace it. Then confirm that the malfunction symptom is eliminated.

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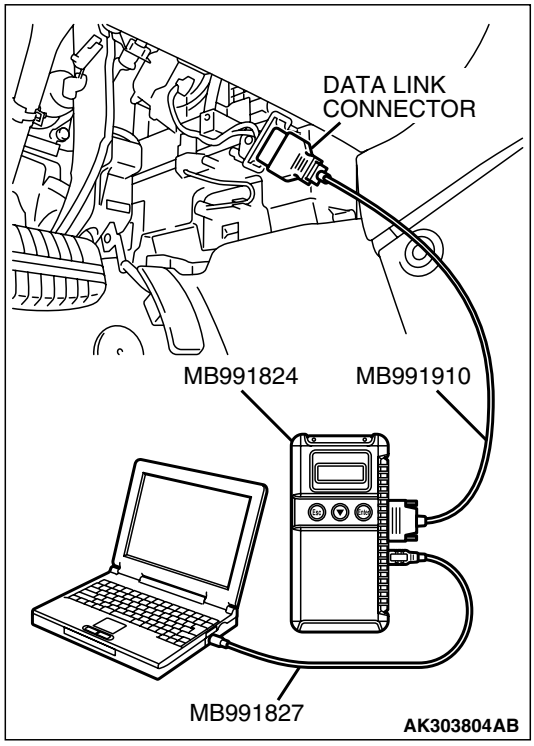


STEP 3. Using scan tool MB991958, check actuator test.

(1) Turn the ignition switch to the "ON" position.
(2) Check the following item in the actuator test. Refer to Actuator Test Reference Table P.13A-1137.
  a. Item 10: Evaporative Emission Purge Solenoid
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the actuator operating properly?

YES : Refer to On-vehicle Service – Throttle Body (Throttle Valve Area) Cleaning P.13A-1162.

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

INSPECTION PROCEDURE 10: Idle Speed Is Low (Improper Idle Speed).

COMMENT

- In cases such as the above, the cause is probably that the intake air volume during idle is too small.

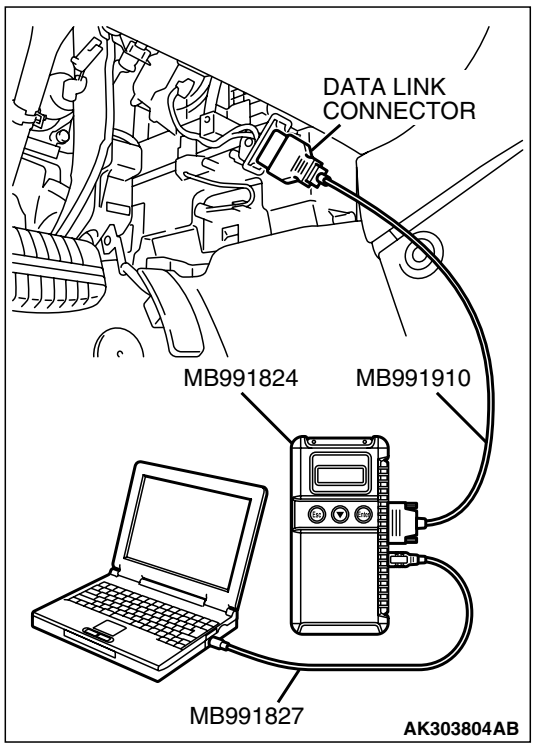
TROUBLESHOOTING HINTS (The most likely causes for this case:)

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

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-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).

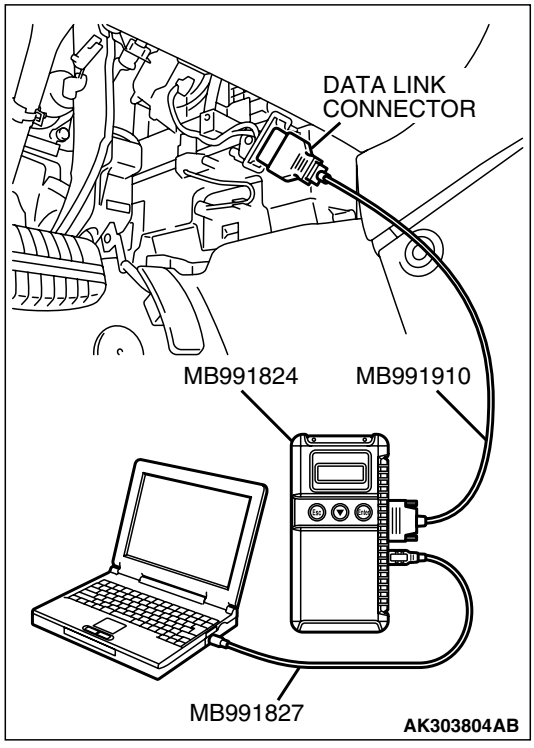
⚠ CAUTION

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-45.
NO : Go to Step 2.



STEP 2. 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 item in the data list. Refer to Data List Reference Table P.13A-1116.
    a. Item 6: Engine Coolant Temperature Sensor
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Refer to On-vehicle Service – Throttle Body (Throttle Valve Area) Cleaning P.13A-1162.
NO : Repair or replace it. Then confirm that the malfunction symptom is eliminated.

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INSPECTION PROCEDURE 11: When the engine is cold, it stalls at idle (die out).

COMMENT

- In such cases as the above, the air/fuel mixture may be inappropriate when the engine is cold.

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

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

DIAGNOSIS

Required Special Tools:

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

STEP 1. Check if the battery terminal is disconnected.

Q: Has the battery terminal been disconnected lately?

YES : Start the engine and let it run at idle for approximate 10 minutes after engine warm up. Then, if a malfunction occurs, go to Step 2.

NO : Go to Step 2.

STEP 2. Using scan tool MB991958, read the diagnostic trouble code (DTC).

⚠ CAUTION

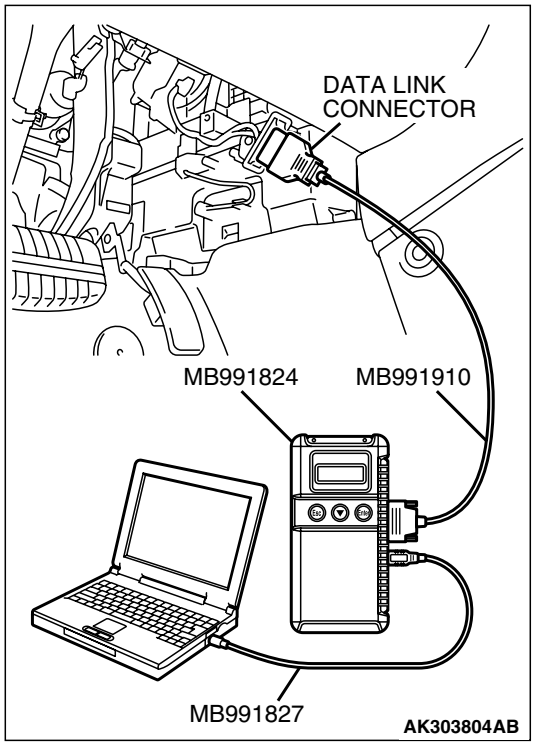
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(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-45.

NO : Go to Step 3.



STEP 3. Checking by depressing and releasing the accelerator pedal.

Q: Does the engine stall right after the accelerator pedal is released?

YES : Refer to On-vehicle Service – Throttle Body (Throttle Valve Area) Cleaning P.13A-1162.

NO : Go to Step 4.

STEP 4. Check the engine idling.

Q: Does it idle properly after warming up?

YES : Go to Step 5.

NO : Refer to, INSPECTION PROCEDURE 8 – Unstable Idle (Rough Idle, Hunting) P.13A-1024.

STEP 5. Using scan tool MB991958, check actuator test items 1, 2, 3, 4: Injector.

⚠ CAUTION

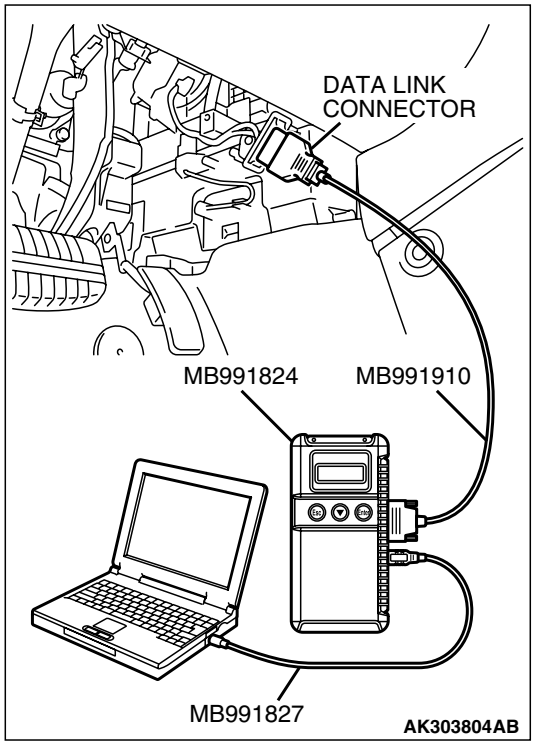
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

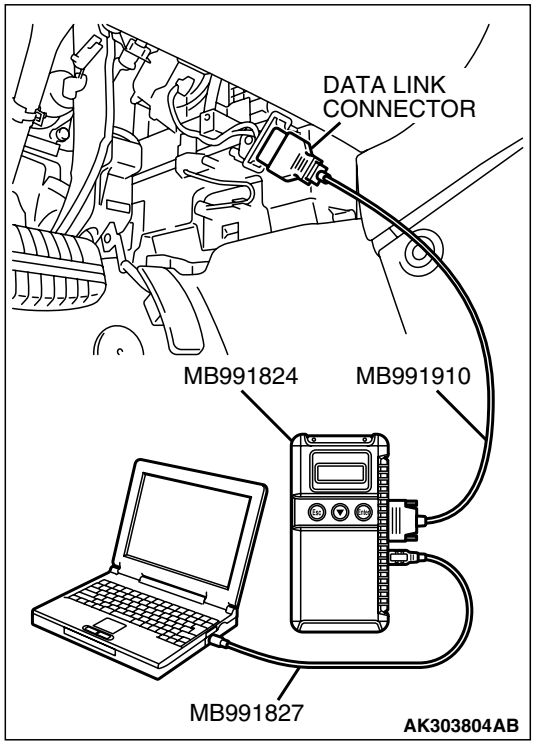
(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Check following items in the actuator test. Refer to Actuator Test Reference Table P.13A-1137.
  a. Item 1, 2, 3, 4: Injector
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Are they operating properly?

YES : Go to Step 6.

NO : Refer to DTC P0201 – Injector Circuit-cylinder 1 P.13A-468, DTC P0202 – Injector Circuit-cylinder 2 P.13A-478, DTC P0203 – Injector Circuit-cylinder 3 P.13A-488, DTC P0204 – Injector Circuit-cylinder 4 P.13A-498.





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

(1) Turn the ignition switch to the "ON" position.
(2) Check the following item in the data list. Refer to Data List Reference Table P.13A-1116.
  a. Item 6: Engine Coolant Temperature Sensor
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 7.
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-1163.

Q: Is the fuel pressure normal?

YES : Go to Step 8.
NO : Repair or replace it. Then confirm that the malfunction symptom is eliminated.

STEP 8. Check the ignition timing.

Refer to GROUP 11A, On-vehicle Service – Ignition Timing Check P.11A-14.

Q: Is the ignition timing 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 engine oil viscosity.
  d. Check the EGR valve.

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

INSPECTION PROCEDURE 12: When the Engine Is Hot, It Stalls at Idle (die out).

COMMENT

- In cases such as the above, the ignition system, air/fuel mixture, electronic control throttle valve system or compression pressure may be faulty. In addition, if the engine suddenly stalls, the cause may also be a connector damage.

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 valve.
- Vacuum leak.
- Improper connector contact.

DIAGNOSIS

Required Special Tools:

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

STEP 1. Check if the battery terminal is disconnected.

Q: Has the battery terminal been disconnected lately?

YES : Start the engine and let it run at idle for approximate 10 minutes after engine warm up. Then, if a malfunction occurs, go to step 2.

NO : Go to Step 2.

STEP 2. Using scan tool MB991958, read the diagnostic trouble code (DTC).

⚠ CAUTION

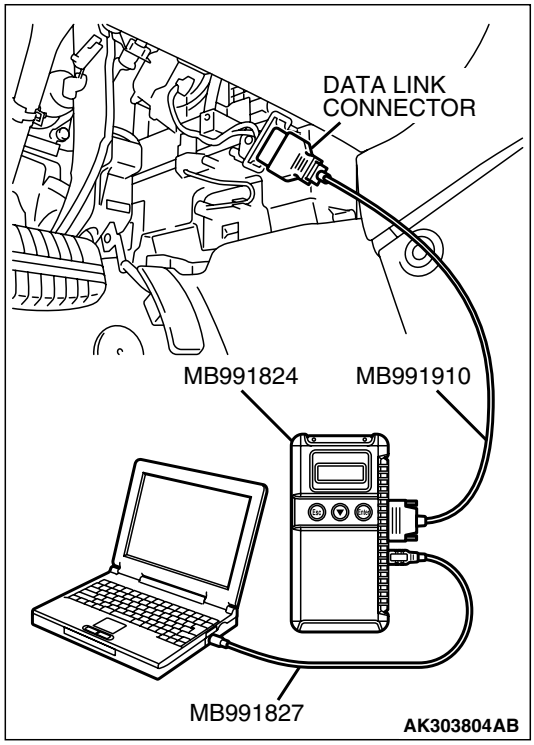
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

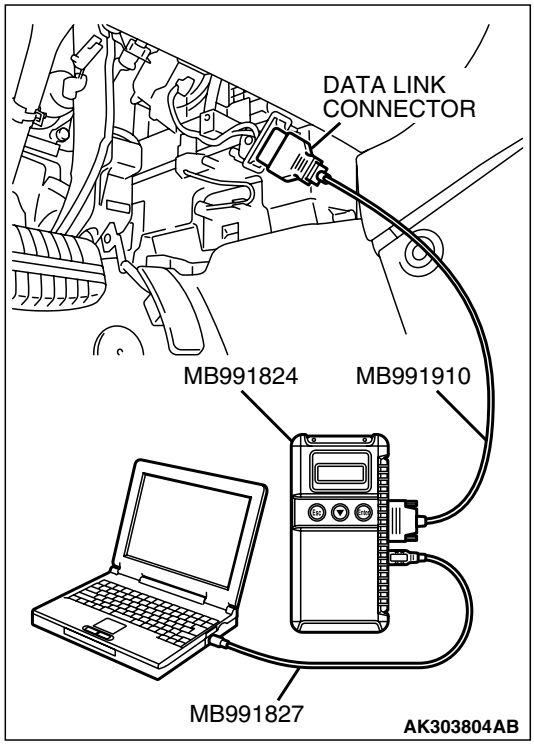
(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the DTC set?

YES : Refer to Diagnostic Trouble Code Chart P.13A-45.

NO : Go to Step 3.





STEP 3. Using scan tool MB991958, check actuator test items 1, 2, 3, 4: Injector.

⚠ 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 following items in the actuator test. Refer to Actuator Test Reference Table P.13A-1137.
  a. Item 1, 2, 3, 4: Injector
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Are they operating properly?

YES : Go to Step 4.
NO : Refer to DTC P0201 – Injector Circuit-cylinder 1 P.13A-468, DTC P0202 – Injector Circuit-cylinder 2 P.13A-478, DTC P0203 – Injector Circuit-cylinder 3 P.13A-488, DTC P0204 – Injector Circuit-cylinder 4 P.13A-498.

STEP 4. Checking by depressing and releasing the accelerator pedal.

Q: Does the engine stall right after the accelerator pedal is released?

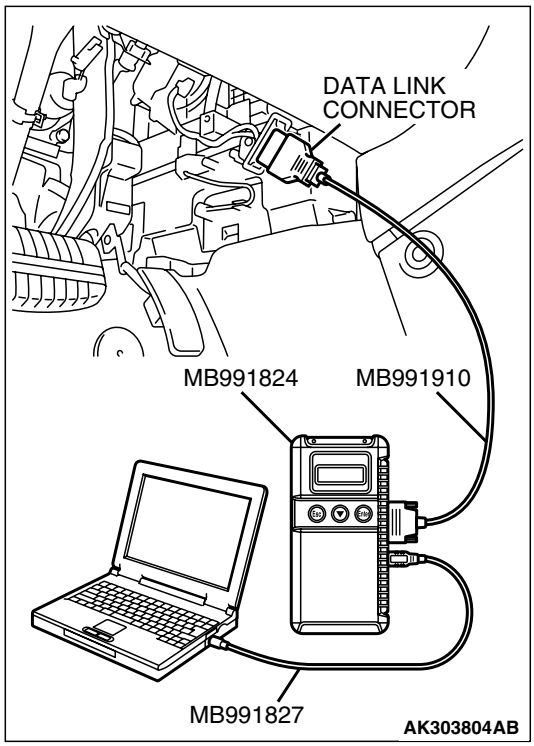
YES : Refer to On-vehicle Service – Throttle Body (Throttle Valve Area) Cleaning P.13A-1162.
NO : Go to Step 5.

STEP 5. Engine stall reproduction test.

Q: Is it easy to reproduce the engine stall?

YES : Go to Step 6.
NO : Check if the following signals change suddenly by wiggling the circuit harness and connectors.
  a. Crankshaft position sensor signal.
  b. Mass airflow sensor signal.
  c. Injector drive signal.
  d. Primary and secondary ignition signal.
  e. Fuel pump drive signal.
  f. PCM power supply voltage.

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



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

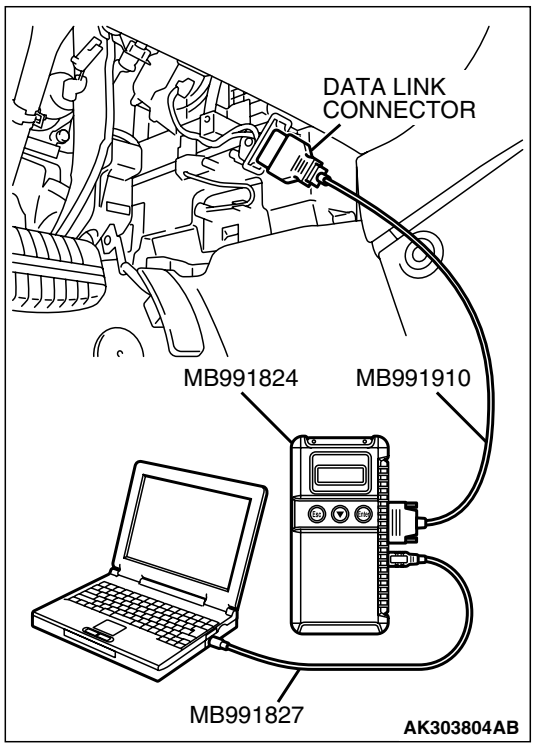
⚠ CAUTION

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-1116.
   a. Item 5: Intake Air Temperature Sensor
   b. Item 6: Engine Coolant Temperature Sensor
   c. Item 83: Power Steering Pressure Switch
   d. Item 31: EGR valve (stepper motor)
   e. Item 13: Throttle position sensor (main)
   f. Item AC: Cylinder 1, 4 Heated Oxygen Sensor (front)
   g. Item AD: Cylinder 1, 4 Heated Oxygen Sensor (rear)
   h. Item AE: Cylinder 2, 3 Heated Oxygen Sensor (front)
   i. Item AF: Cylinder 2, 3 Heated Oxygen Sensor (rear)
   j. Item BB: Barometric Pressure Sensor
(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.

(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-1116.
   a. Item AC: Cylinder 1, 4 Heated Oxygen Sensor (front)
   b. Item AE: Cylinder 2, 3 Heated Oxygen Sensor (front)
   • Fluctuates 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 9.
NO : Go to Step 8.

STEP 8. Check the fuel pressure.
Refer to On-vehicle Service – Fuel Pressure Test P.13A-1163.

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 9. Check the ignition timing.
Refer to GROUP 11A, On-vehicle Service – Ignition Timing Check P.11A-14.

Q: Is the ignition timing normal?

YES : Check the following items, and repair or replace the defective items.
a. Check the ignition coil and spark plugs.
b. Check if the injectors are clogged.
c. Check compression pressure.
d. Check if the foreign materials (water, kerosene, etc.) got into fuel.
e. Check the EGR valve.

Then confirm that the malfunction symptom is eliminated.

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

INSPECTION PROCEDURE 13: The Engine Stalls when Accelerating (Pass Out).

COMMENT
- In case such as the above, the cause is probably misfiring due to a weak spark, or an inappropriate air/fuel mixture when the accelerator pedal is depressed.

TROUBLESHOOTING HINTS (The most likely causes for this case:)
- Vacuum leak.
- Malfunction of the ignition system.
- Malfunction of the emission control system.

DIAGNOSIS

Required Special Tools:
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A

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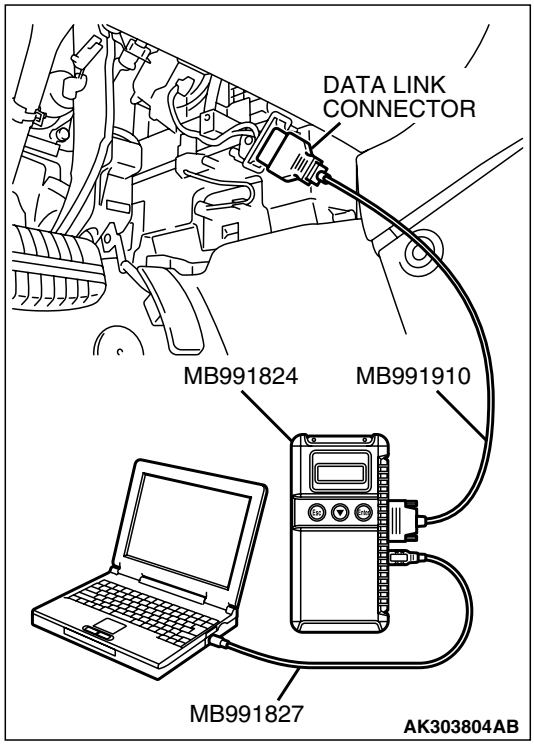


STEP 1. Using scan tool MB991958, read the diagnostic trouble code (DTC).

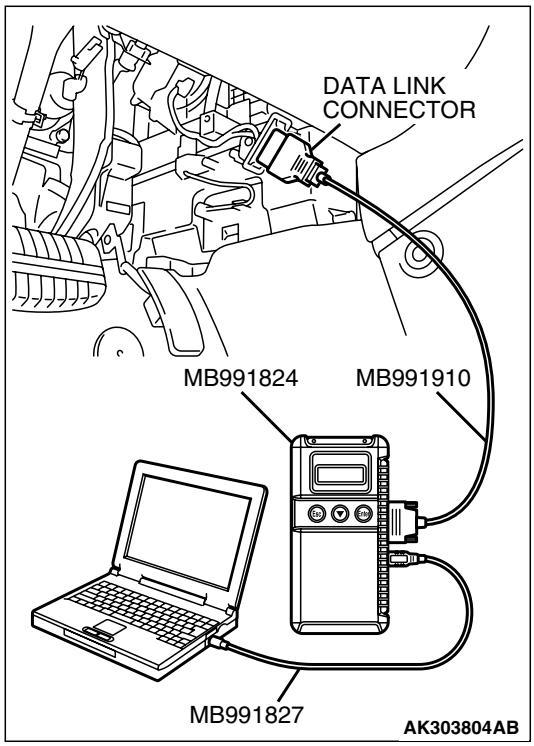
⚠ CAUTION

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-45.
NO : Go to Step 2.



STEP 2. Using scan tool MB991958, check actuator test.

(1) Turn the ignition switch to the "ON" position.
(2) Check the following item in the actuator test. Refer to Actuator Test Reference Table P.13A-1137.
   a. Item 10: Evaporative Emission Purge Solenoid
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the actuator operating properly?

YES : Check the following items, and repair or replace the defective items.
   a. Check the ignition coil and spark plugs.
   b. Check for vacuum leaks.
      - Broken intake manifold gasket.
      - Broken or disconnected vacuum hose.
      - Improper operation of the PCV valve.
      - Broken air intake hose.
   c. Check the EGR valve.

   Then confirm that the malfunction symptom is eliminated.

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

INSPECTION PROCEDURE 14: The engine stalls when decelerating.

COMMENT

- The intake air volume may be insufficient due to a defective electronic control throttle valve system.

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

- Malfunction of the electronic control throttle valve system.

DIAGNOSIS

Required Special Tools:

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

STEP 1. Check if the battery terminal is disconnected.

Q: Has the battery terminal been disconnected lately?

YES : Start the engine and let it run at idle for approximate 10 minutes after engine warm up. Then if a malfunction occurs, go to step 2.

NO : Go to Step 2.

STEP 2. Using scan tool MB991958, read the diagnostic trouble code (DTC).

⚠ CAUTION

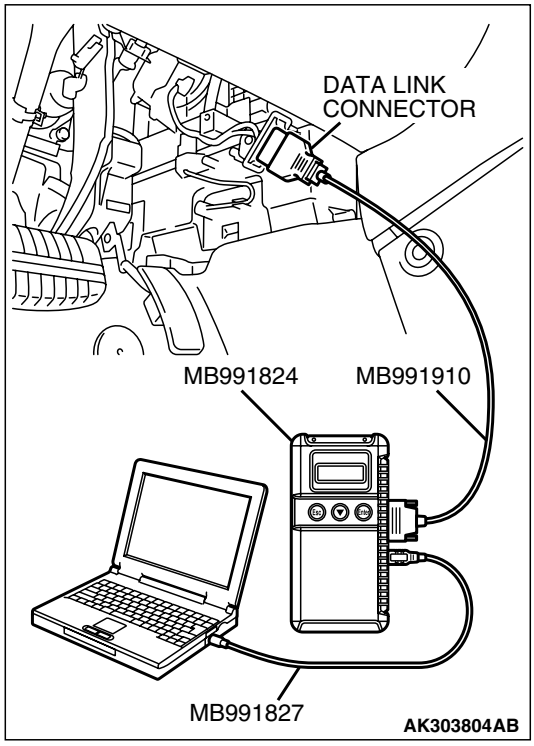
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

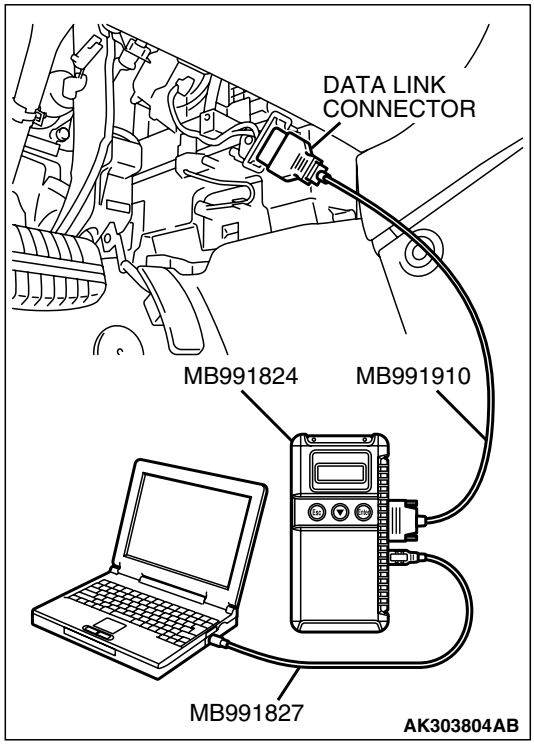
(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the DTC set?

YES : Refer to Diagnostic Trouble Code Chart P.13A-45.

NO : Go to Step 3.





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

(1) Turn the ignition switch to the "ON" position.
(2) Check the following items in the data list. Refer to Data List Reference Table P.13A-1116.
  a. Item 13: Throttle Position Sensor (main)
  b. Item 15: Throttle Position Sensor (sub)
  c. Item 11: Accelerator Pedal Position Sensor (main)
  d. Item 12: Accelerator Pedal Position Sensor (sub)
(3) 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. Inspection of throttle body (throttle valve area) for dirtiness.

Q: Is the throttle valve area dirty?

YES : Refer to On-vehicle Service – Throttle Body (Throttle Valve Area) Cleaning P.13A-1162.
NO : Check the following items, and repair, replace or clean the defective sections.
  a. Check the ignition coil and spark plugs.
  b. Check the EGR valve.

Then confirm that the malfunction symptom is eliminated.

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 (M.U.T.-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).

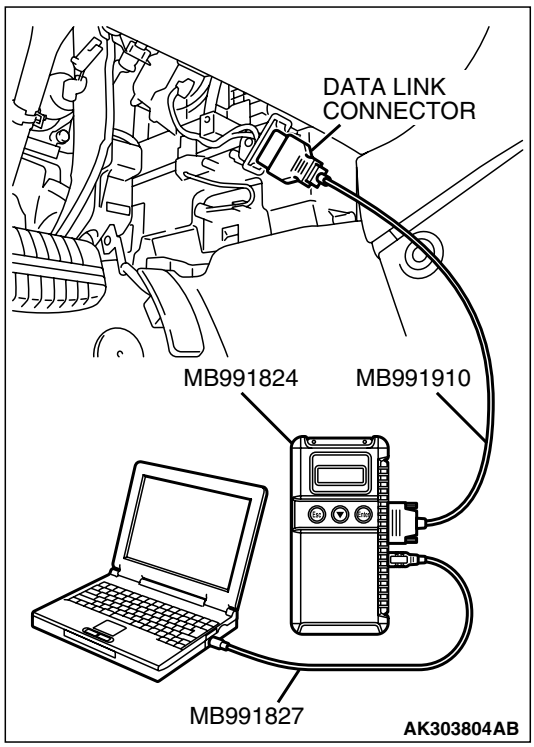
⚠ CAUTION

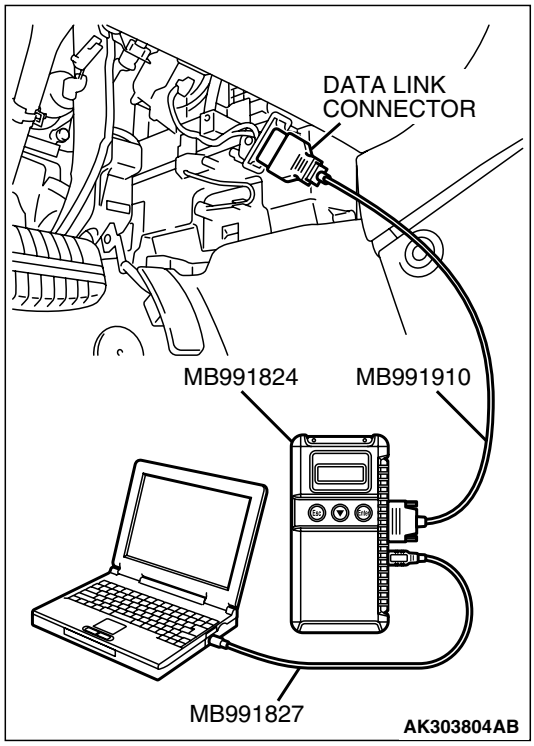
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(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-45.
NO : Go to Step 2.





STEP 2. Using scan tool MB991958, check actuator test items 1, 2, 3, 4: Injector.

(1) Check following items in the actuator test. Refer to Actuator Test Reference Table P.13A-1137.
   a. Item 1, 2, 3, 4: 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-468, DTC P0202 – Injector Circuit-cylinder 2 P.13A-478, DTC P0203 – Injector Circuit-cylinder 3 P.13A-488, DTC P0204 – Injector Circuit-cylinder 4 P.13A-498.

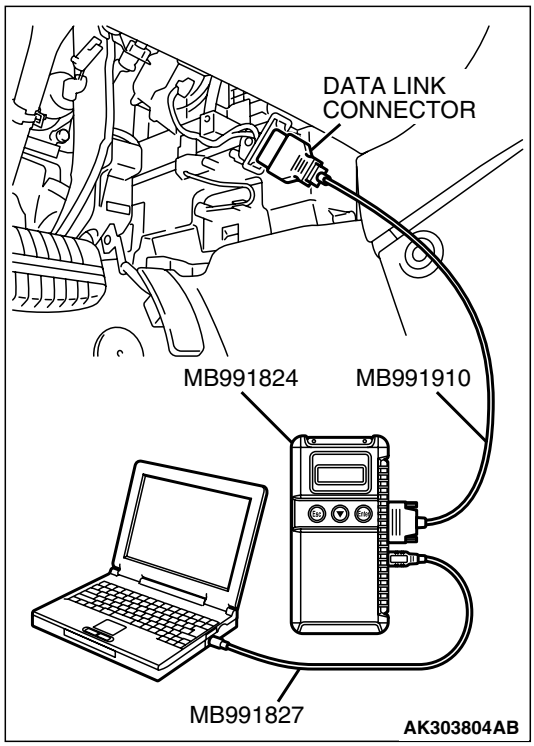
STEP 3. Check the ignition timing.

(1) Refer to GROUP 11A, On-vehicle Service – Ignition Timing Check P.11A-14.

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.

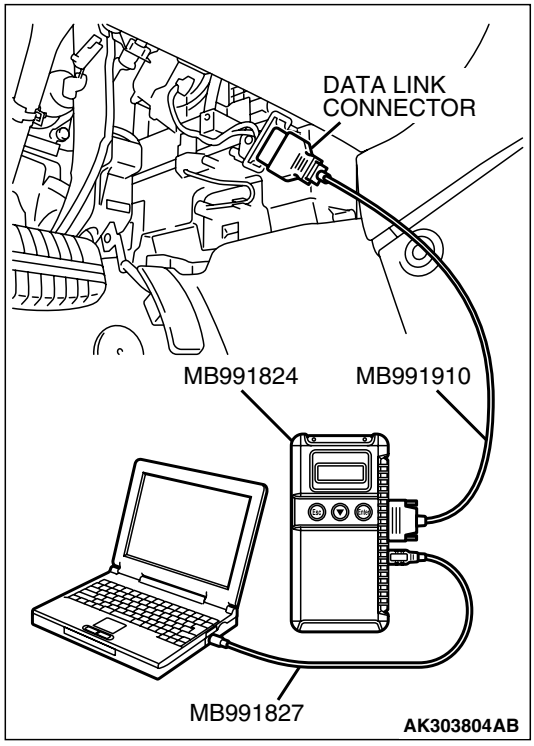
⚠ CAUTION

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-1116.
   a. Item 5: Intake Air Temperature Sensor
   b. Item 6: Engine Coolant Temperature Sensor
   c. Item AC: Cylinder 1, 4 Heated Oxygen Sensor (front)
   d. Item AD: Cylinder 1, 4 Heated Oxygen Sensor (rear)
   e. Item AE: Cylinder 2, 3 Heated Oxygen Sensor (front)
   f. Item AF: Cylinder 2, 3 Heated Oxygen Sensor (rear)
   g. Item BB: Barometric Pressure Sensor
(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-1116.
   a. Item AC: Cylinder 1, 4 Heated Oxygen Sensor (front)
   b. Item AE: 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-1163.

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-1163.

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.

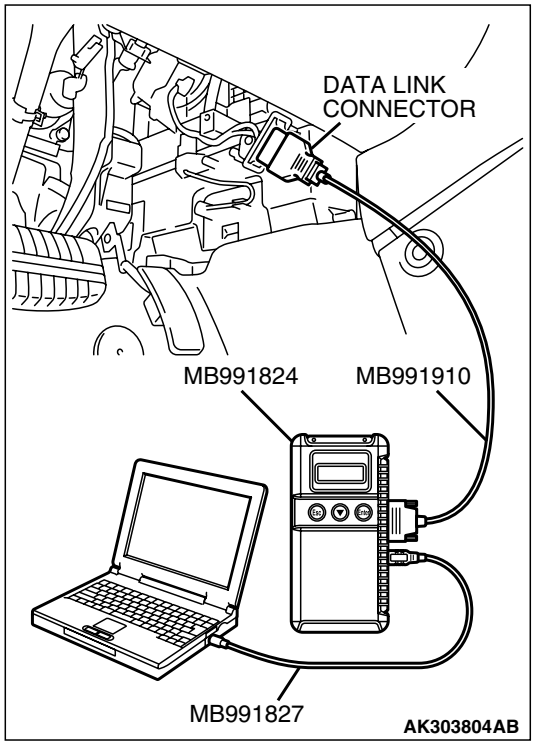
INSPECTION PROCEDURE 16: Acceleration shock.

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 (M.U.T.-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-45.

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.

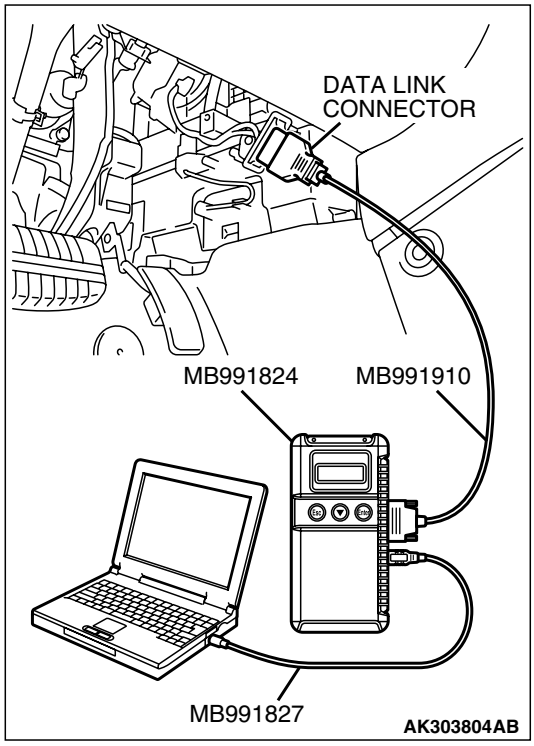
INSPECTION PROCEDURE 17: Deceleration Shock

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 (M.U.T.-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-45.
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.

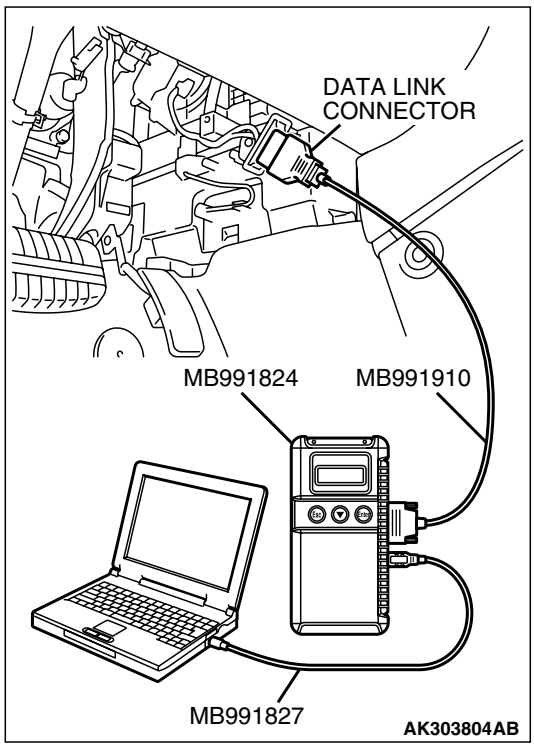
TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Malfunction of the ignition system.
- Malfunction of air/fuel ratio control system.
- Malfunction of the electronic control throttle valve system.
- Malfunction of the fuel supply system.
- Poor compression pressure.
- Clogged exhaust system.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-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).

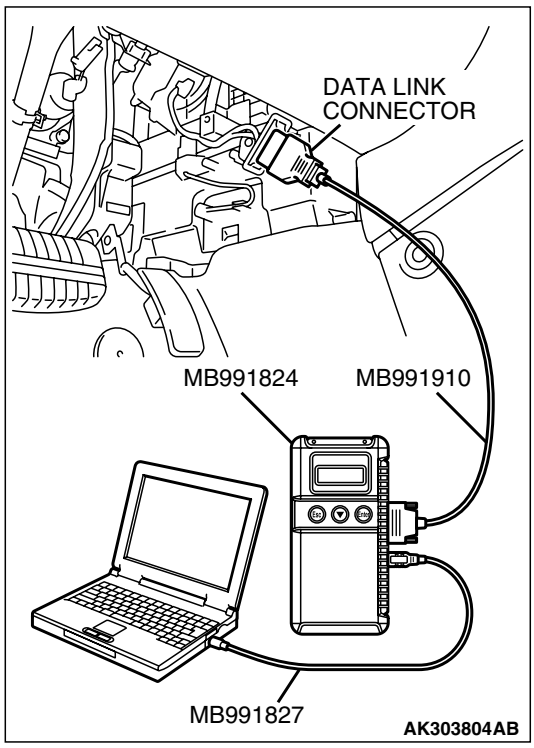
⚠ CAUTION

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-45.
NO : Go to Step 2.



STEP 2. Using scan tool MB991958, check actuator test items 1, 2, 3, 4: 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-1137.
  a. Item 1, 2, 3, 4: 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-468, DTC P0202 – Injector Circuit-cylinder 2 P.13A-478, DTC P0203 – Injector Circuit-cylinder 3 P.13A-488, DTC P0204 – Injector Circuit-cylinder 4 P.13A-498.

STEP 3. Check the ignition timing.

Refer to GROUP 11A, On-vehicle Service – Ignition Timing Check P.11A-14.

Q: Is the ignition timing normal?

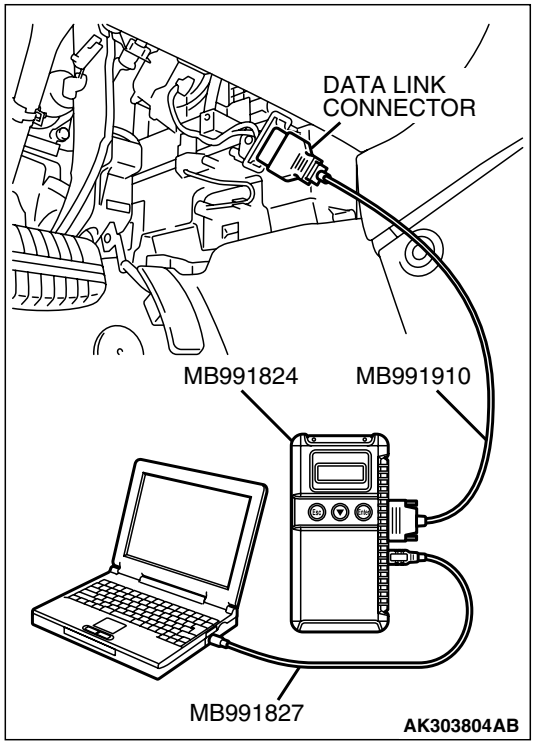
YES : Go to Step 4.

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.

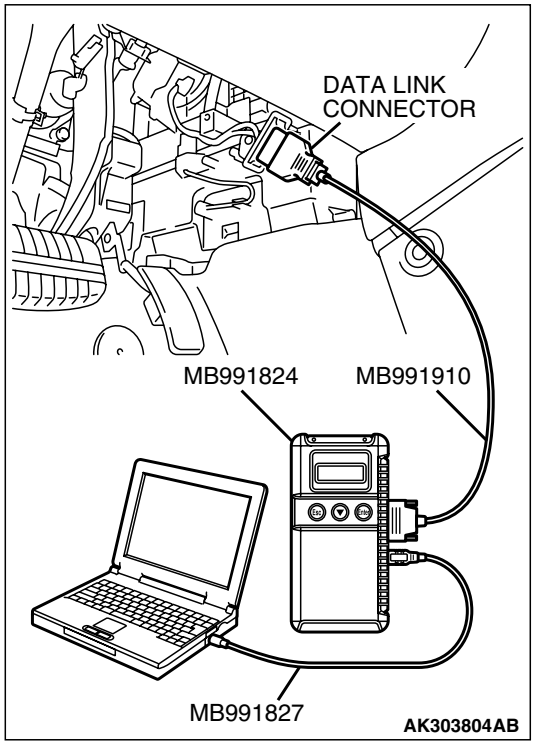


(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Check the following items in the data list. Refer to Data List Reference Table P.13A-1116.
   a. Item 5: Intake Air Temperature Sensor
   b. Item 6: Engine Coolant Temperature Sensor
   c. Item AC: Cylinder 1, 4 Heated Oxygen Sensor (front)
   d. Item AD: Cylinder 1, 4 Heated Oxygen Sensor (rear)
   e. Item AE: Cylinder 2, 3 Heated Oxygen Sensor (front)
   f. Item AF: Cylinder 2, 3 Heated Oxygen Sensor (rear)
   g. Item BB: Barometric Pressure Sensor
(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-1116.
   a. Item AC: Cylinder 1, 4 Heated Oxygen Sensor (front)
   b. Item AE: 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-1163.

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-1163.

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.

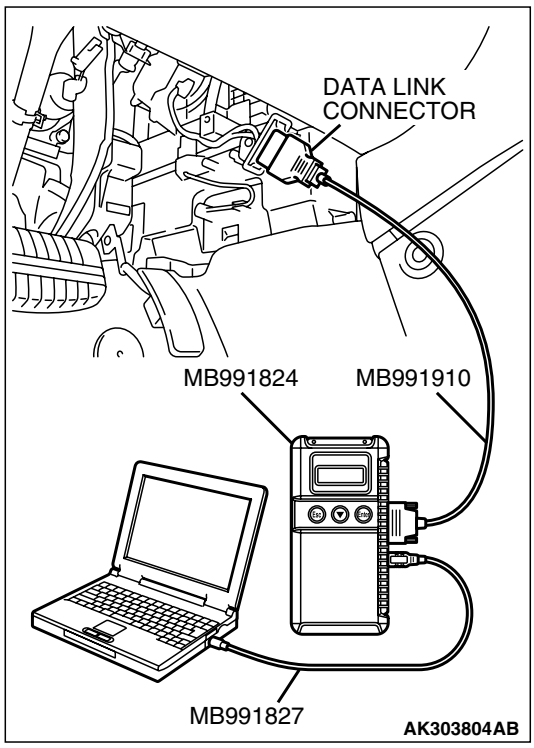
INSPECTION PROCEDURE 19: Surge.

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 (M.U.T.-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).

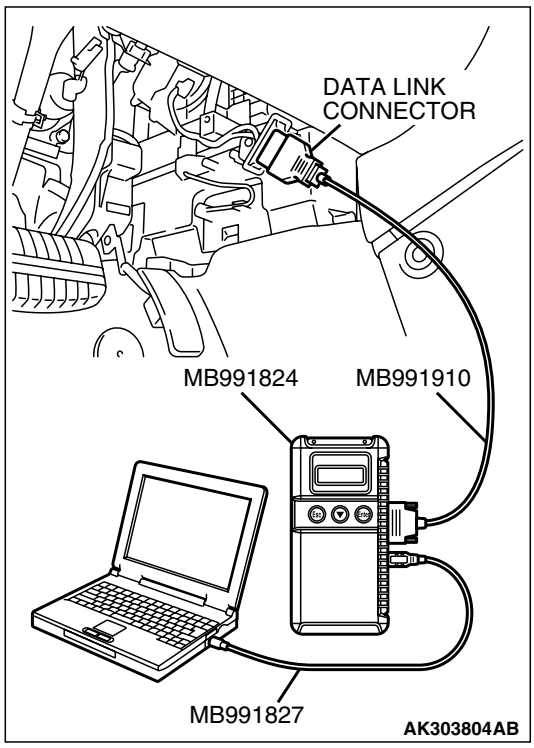
⚠ CAUTION

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-45.
NO : Go to Step 2.



STEP 2. Using scan tool MB991958, check actuator test items 1, 2, 3, 4: 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-1137.
  a. Item 1, 2, 3, 4: 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-468, DTC P0202 – Injector Circuit-cylinder 2 P.13A-478, DTC P0203 – Injector Circuit-cylinder 3 P.13A-488, DTC P0204 – Injector Circuit-cylinder 4 P.13A-498.

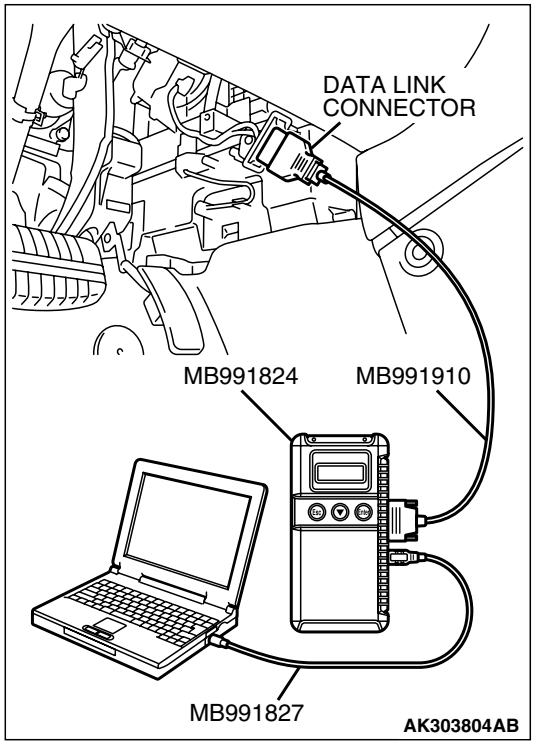
STEP 3. Check the ignition timing.
Refer to GROUP 11A, On-vehicle Service – Ignition Timing Check P.11A-14.

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.

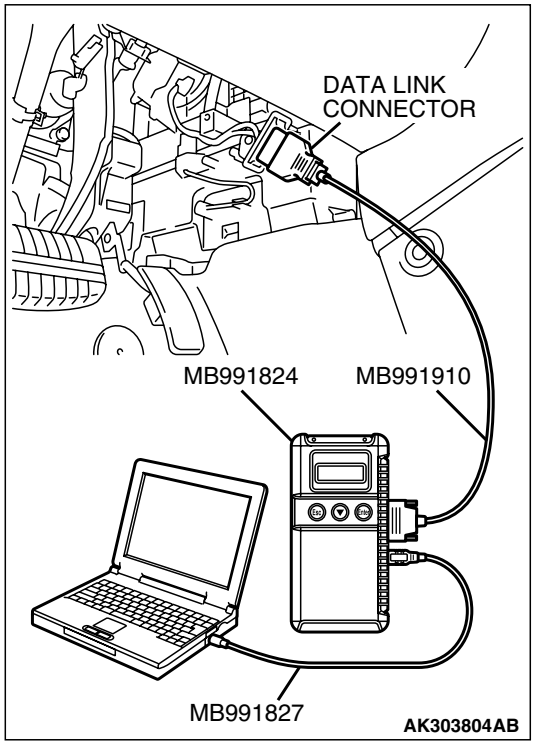
⚠ CAUTION
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.



(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-1116.
  a. Item 5: Intake Air Temperature Sensor
  b. Item 6: Engine Coolant Temperature Sensor
  c. Item AC: Cylinder 1, 4 Heated Oxygen Sensor (front)
  d. Item AD: Cylinder 1, 4 Heated Oxygen Sensor (rear)
  e. Item AE: Cylinder 2, 3 Heated Oxygen Sensor (front)
  f. Item AF: Cylinder 2, 3 Heated Oxygen Sensor (rear)
  g. Item BB: Barometric Pressure Sensor
(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-1116.
  a. Item AC: Cylinder 1, 4 Heated Oxygen Sensor (front)
  b. Item AE: 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-1163.

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-1163.

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.

TSB Revision

INSPECTION PROCEDURE 20: Knocking

COMMENT

- Incases 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 (M.U.T.-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).

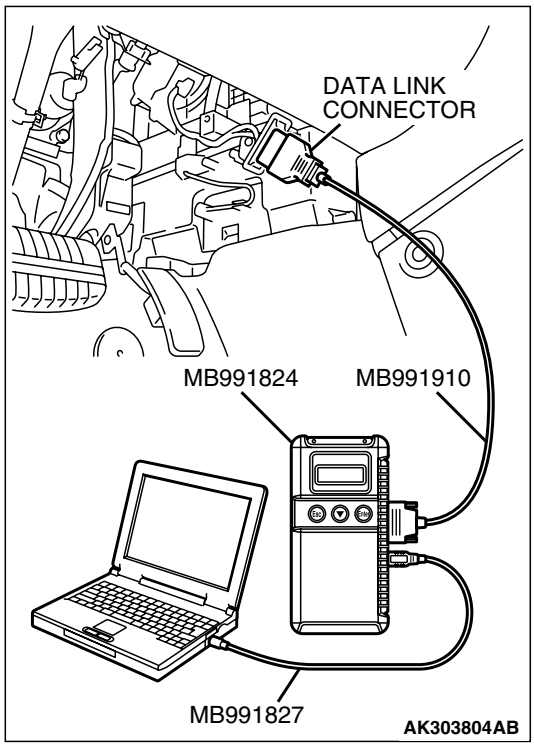
⚠ CAUTION

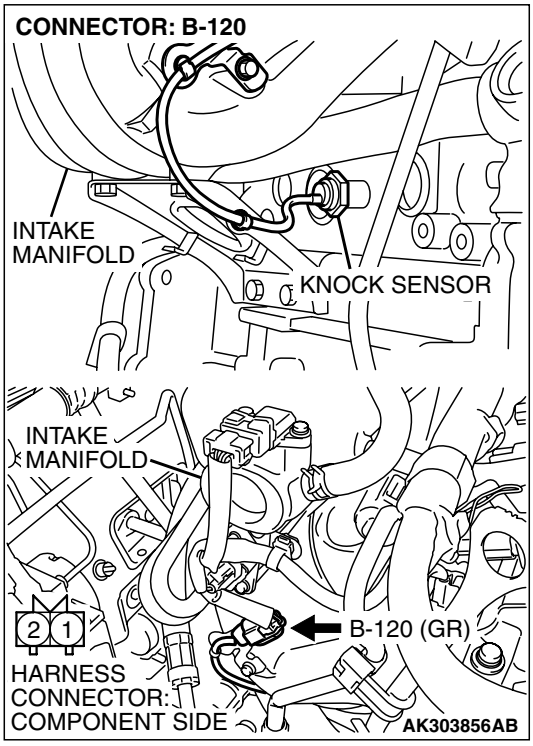
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(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-45.
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-545.

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.

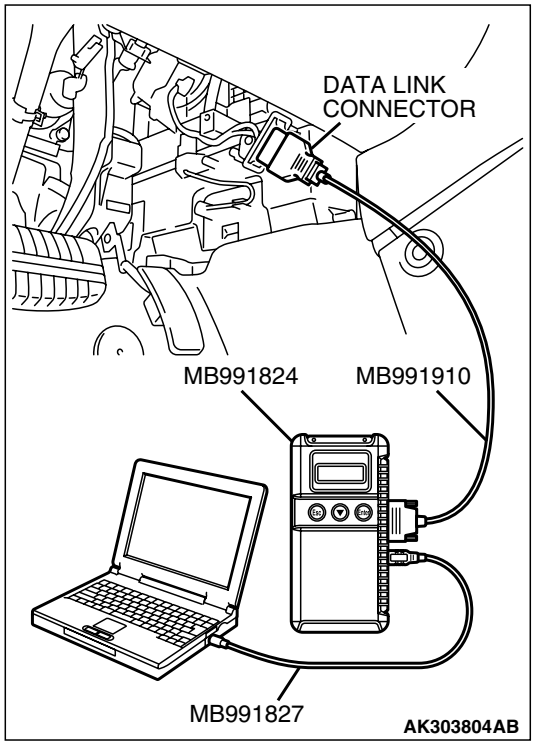
TROUBLESHOOTING HINTS (The most likely causes for this case:)

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

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-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?

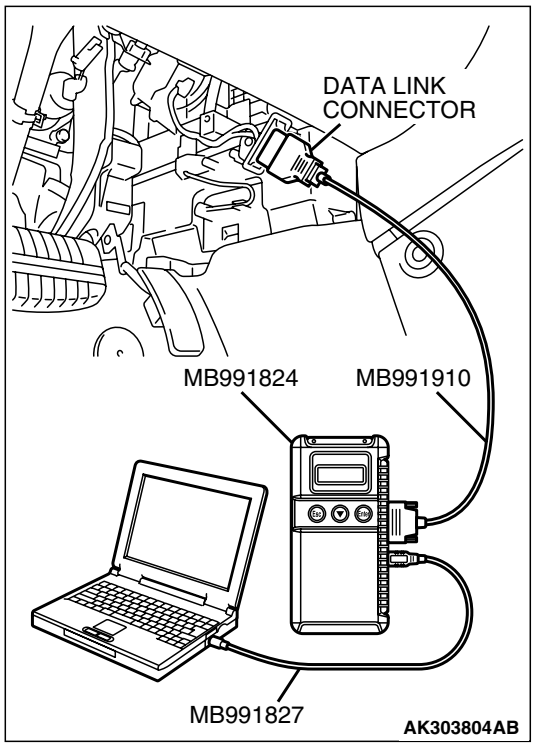
YES : Refer to Diagnostic Trouble Code Chart P.13A-45.
NO : Go to Step 2.

STEP 2. Check the ignition timing.

Refer to GROUP 11A, On-vehicle Service – Ignition Timing Check P.11A-14.

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.

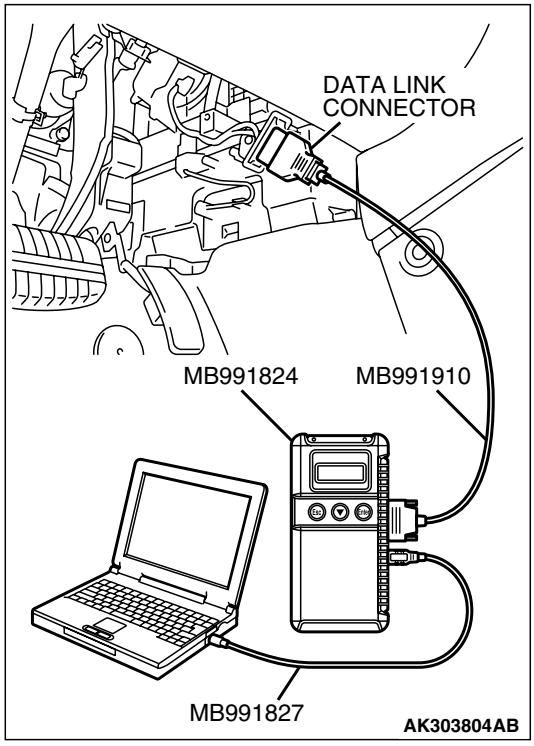
⚠ CAUTION

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-1116.
  a. Item 6: Engine Coolant Temperature Sensor
  b. Item 5: Intake Air Temperature Sensor
  c. Item AC: Cylinder 1, 4 Heated Oxygen Sensor (front)
  d. Item AD: Cylinder 1, 4 Heated Oxygen Sensor (rear)
  e. Item AE: Cylinder 2, 3 Heated Oxygen Sensor (front)
  f. Item AF: Cylinder 2, 3 Heated Oxygen Sensor (rear)
  g. Item BB: Barometric Pressure Sensor
(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-1116.
  a. Item AC: Cylinder 1, 4 Heated Oxygen Sensor (front)
  b. Item AE: 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-1163.

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 (M.U.T.-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.

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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.

STEP 3. Check the driveability.

Q: Is the driveability normal?

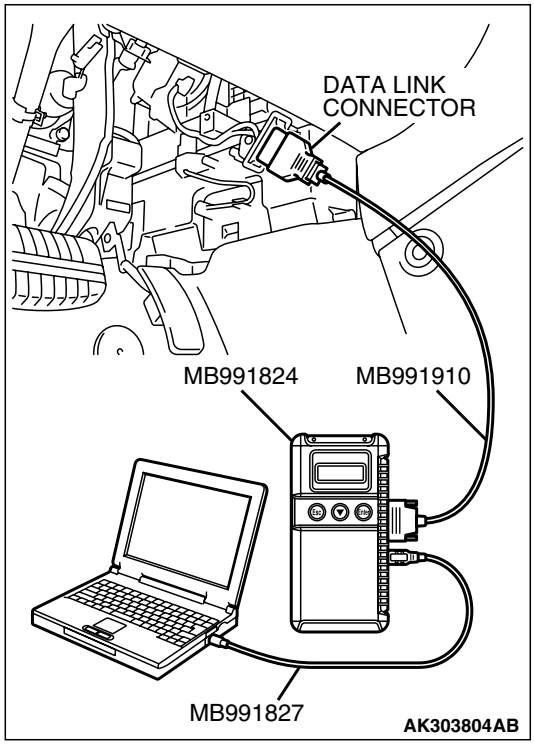
YES : Go to Step 4.

NO : Refer to Trouble Symptom Chart P.13A-50.

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-45.

NO : Go to Step 5.

STEP 5. Check the ignition timing.

Refer to GROUP 11A, On-vehicle Service – Ignition Timing Check P.11A-14.

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.

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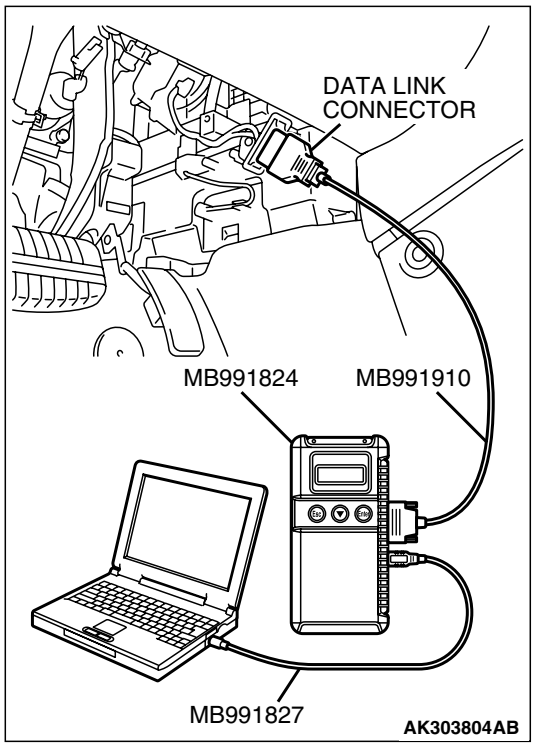


STEP 6. Using scan tool MB991958, check data list.

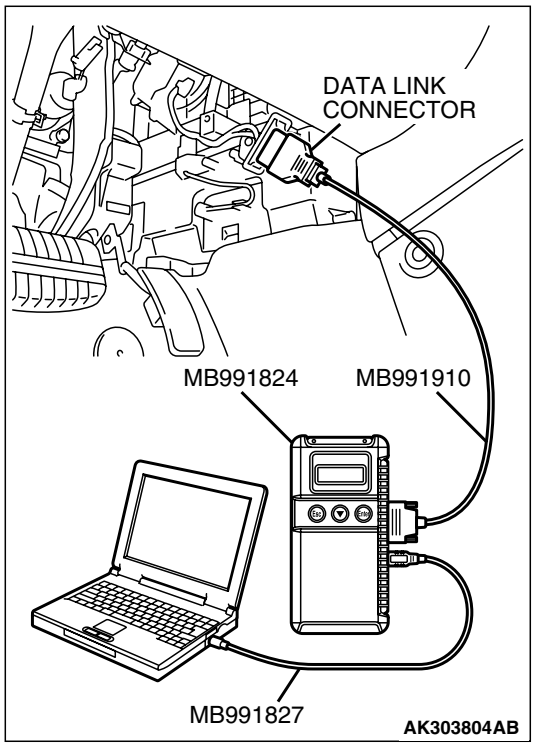
⚠ CAUTION

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-1116.
   a. Item 6: Engine Coolant Temperature Sensor
   b. Item 5: Intake Air Temperature Sensor
   c. Item AD: Cylinder 1, 4 Heated Oxygen Sensor (rear)
   d. Item AF: Cylinder 2, 3 Heated Oxygen Sensor (rear)
   e. Item BB: Barometric Pressure Sensor
(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.

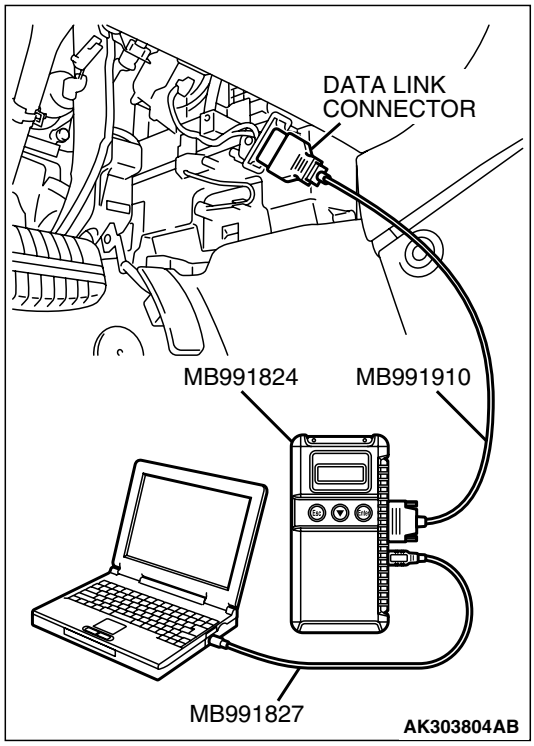


STEP 7. Using scan tool MB991958, check data list item AC: Cylinder 1, 4 Heated oxygen sensor (front).

(1) Start the engine and run at idle.
(2) Set scan tool MB991958 to the data reading mode for item AC, Cylinder 1, 4 Heated Oxygen Sensor (front).
   • Warm up the engine. When the engine is 2,500 r/min, the output voltage changes repeatedly between 0.4 volt or less and 0.6 – 1.0 volt.
(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 P0131 – Cylinder 1, 4 Heated Oxygen Sensor (front) Circuit Low Voltage P.13A-278, DTC P0132 – Cylinder 1, 4 Heated Oxygen Sensor (front) Circuit High Voltage P.13A-295, DTC P0133 – Cylinder 1, 4 Heated Oxygen Sensor (front) Circuit Slow Response P.13A-300, DTC P0134 – Cylinder 1, 4 Heated Oxygen Sensor (front) Circuit No Activity Detected P.13A-306.



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

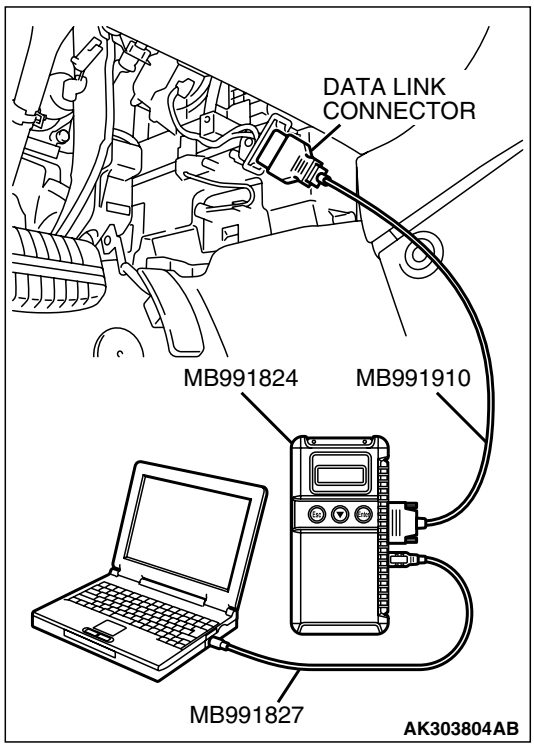
(1) Start the engine and run at idle.
(2) Set scan tool MB991958 to the data reading mode for item AE, Cylinder 2, 3 Heated Oxygen Sensor (front).
- Warm up the engine. When the engine is 2,500 r/min, the output voltage changes repeatedly between 0.4 volt or less and 0.6 – 1.0 volt.

(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 P0151 – Cylinder 2, 3 Heated Oxygen Sensor (front) Circuit Low Voltage P.13A-345, DTC P0152 – Cylinder 2, 3 Heated Oxygen Sensor (front) Circuit High Voltage P.13A-362, DTC P0153 – Cylinder 2, 3 Heated Oxygen Sensor (front) Circuit Slow Response P.13A-367, DTC P0154 – Cylinder 2, 3 Heated Oxygen Sensor (front) Circuit No Activity Detected P.13A-373.



STEP 9. Using scan tool MB991958, check data list item AD: 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 AD, Cylinder 1, 4 Heated Oxygen Sensor (rear).
   a. Transaxle: A/T: "L" range
   b. Drive with wide open throttle
   c. Engine: 3,500 r/min
      - The output voltages should be between 0.6 and 1.0 volt.

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

Q: Is the sensor operating properly?

YES : Go to Step 10.

NO : Refer to DTC P0137 – Cylinder 1, 4 Heated Oxygen Sensor (rear) Circuit Low Voltage P.13A-315, DTC P0138 – Cylinder 1, 4 Heated Oxygen Sensor (rear) Circuit High Voltage P.13A-332, DTC P0139 – Cylinder 1, 4 Heated Oxygen Sensor (rear) Circuit Slow Response P.13A-337, DTC P0140 – Cylinder 1, 4 Heated Oxygen Sensor (rear) Circuit No Activity Detected P.13A-341.

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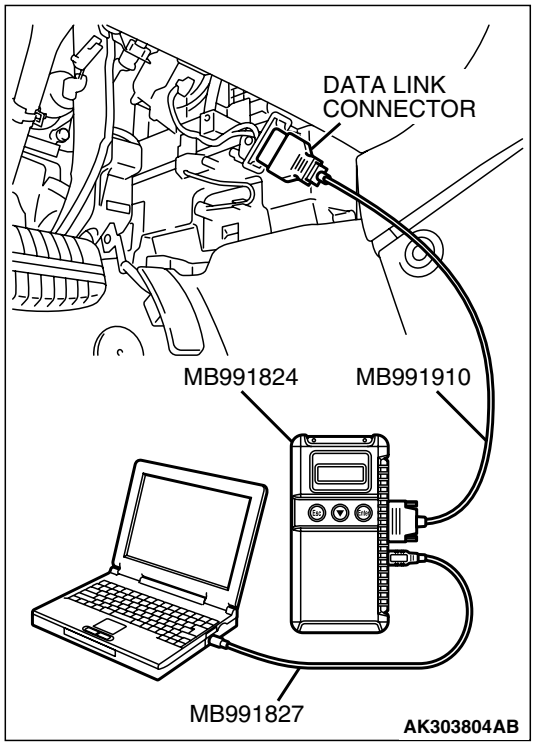


STEP 10. Using scan tool MB991958, check data list item AF: Cylinder 2, 3 Heated oxygen sensor (rear).

(1) Start the engine and run at idle.
(2) Set scan tool MB991958 to the data reading mode for item AF, Cylinder 2, 3 Heated Oxygen Sensor (rear).
  a. Transaxle: A/T: "L" range
  b. Drive with wide open throttle
  c. Engine: 3,500 r/min
    - The output voltages should be between 0.6 and 1.0 volt.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 11.
NO : Refer to DTC P0157 – Cylinder 2, 3 Heated Oxygen Sensor (rear) Circuit Low Voltage P.13A-382, DTC P0158 – Cylinder 2, 3 Heated Oxygen Sensor (rear) Circuit High Voltage P.13A-399, DTC P0159 – Cylinder 2, 3 Heated Oxygen Sensor (rear) Circuit Slow Response P.13A-404, DTC P0160 – Cylinder 2, 3 Heated Oxygen Sensor (rear) Circuit No Activity Detected P.13A-408.

STEP 11. Check the EGR system.

Refer to GROUP 17, Emission Control System – General Description (EGR System) P.17-95.

Q: Is the EGR system normal?

YES : Go to Step 12.
NO : Repair or replace it. Then confirm that the malfunction symptom is eliminated.

STEP 12. Check the fuel pressure.

Refer to On-vehicle Service – Fuel Pressure Test P.13A-1163.

Q: Is the fuel pressure normal?

YES : Go to Step 13.
NO : Repair or replace it. Then confirm that the malfunction symptom is eliminated.

STEP 13. 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.

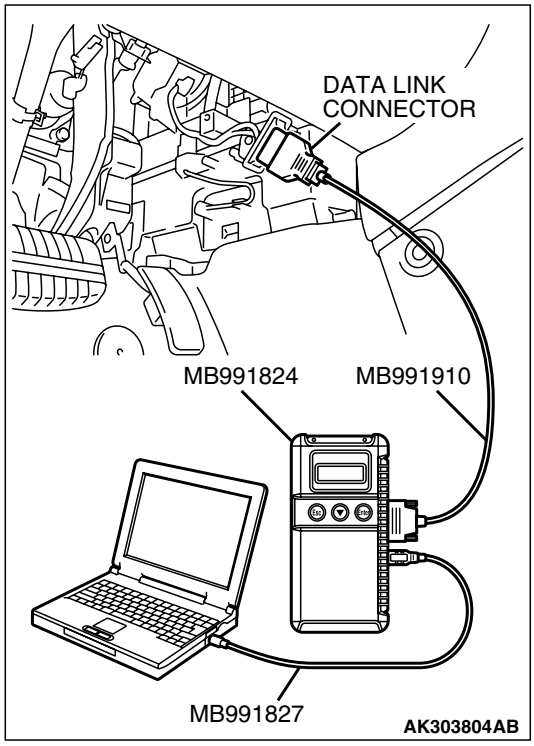
TROUBLESHOOTING HINTS (The most likely causes for this case:)

- 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 (M.U.T.-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-45.
NO : Refer to GROUP 17, Emission Control System – Purge Control System Check (Purge Flow Check) P.17-92.

INSPECTION PROCEDURE 25: Pressure Test of the Evaporative System Failure

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.17-93.

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.17-95.

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.

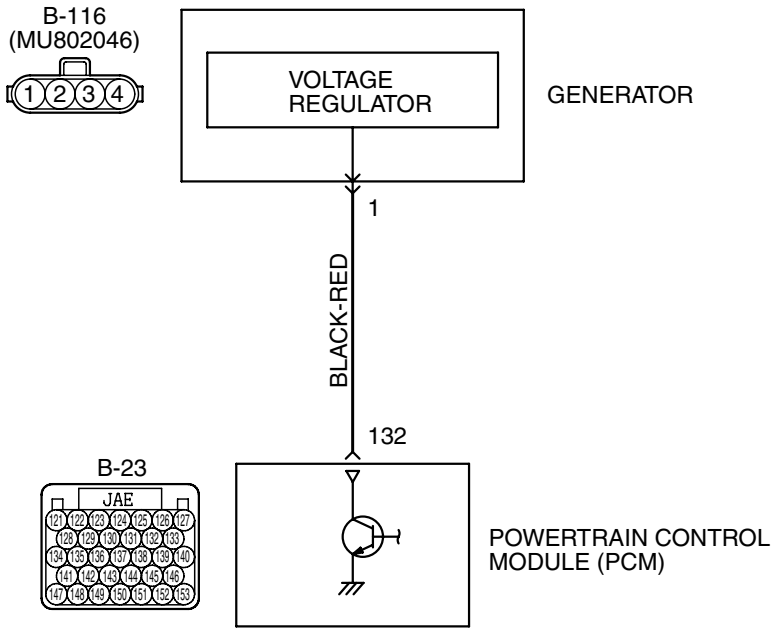
b. Check for leaks from the fuel tank.

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



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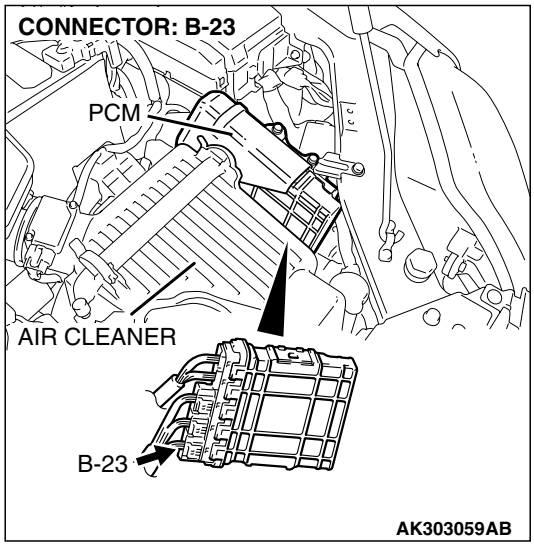
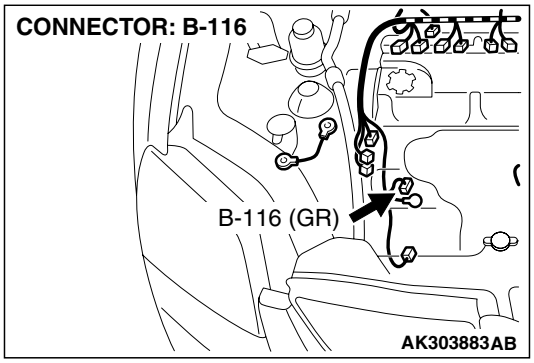




CIRCUIT OPERATION

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

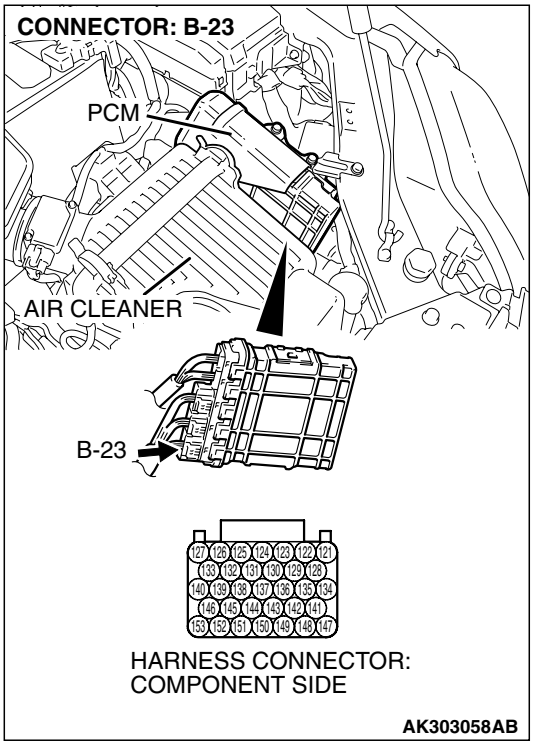
TROUBLESHOOTING HINTS (The most likely causes for this charging system:)

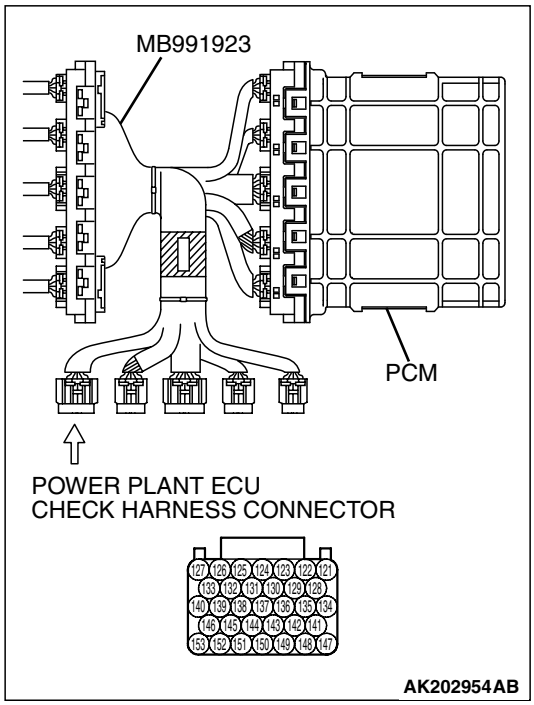
- Malfunction of the charging system.
- Short circuit in harness between generator G terminal and PCM.
- PCM failed.

DIAGNOSIS

Required Special Tool:

- MB991923: Power Train ECU Check Harness

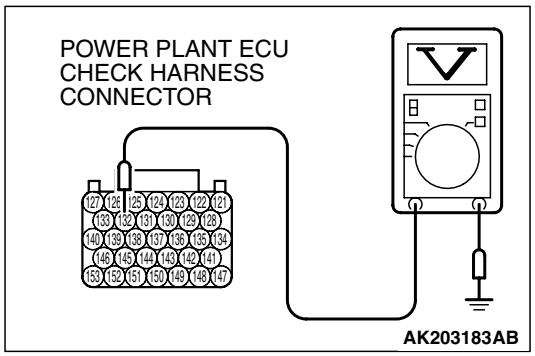




STEP 1. Measure the voltage at PCM connector B-23 by using check harness special tool MB991923.

(1) Disconnect all PCM connectors. Connect the 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.

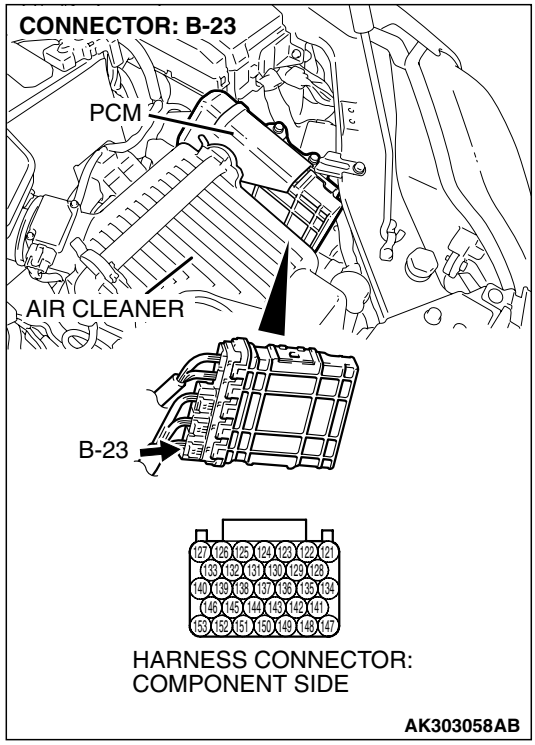
NO : Replace the generator. Then confirm that the malfunction symptom is eliminated.

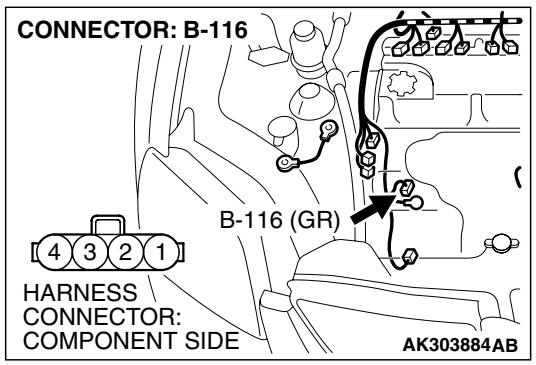
STEP 2. Check harness connector B-23 at PCM connector and harness connector B-116 at generator connector for damage.

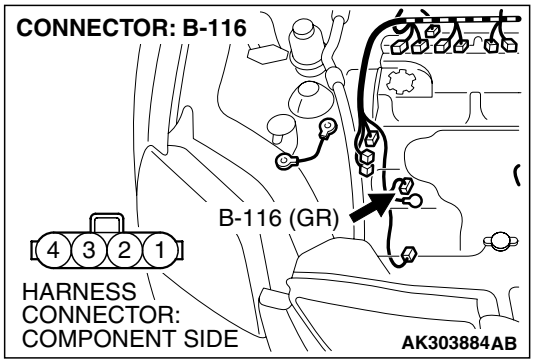
Q: Is the harness connector in good condition?

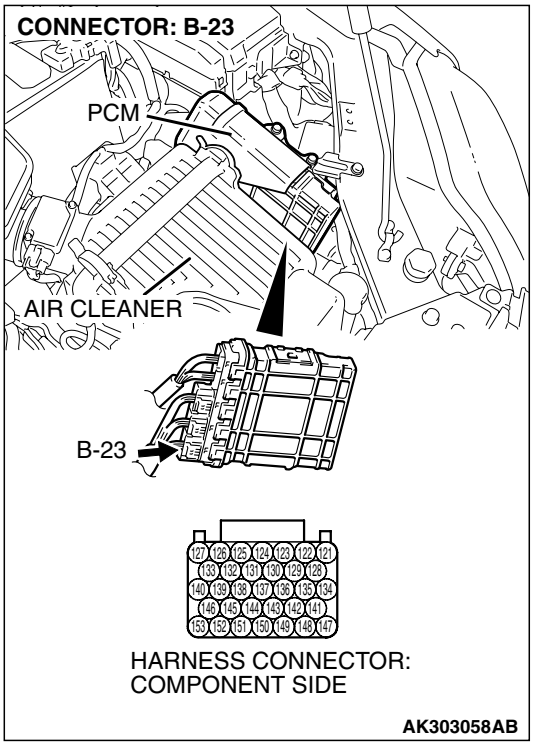
YES : Go to Step 3.

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









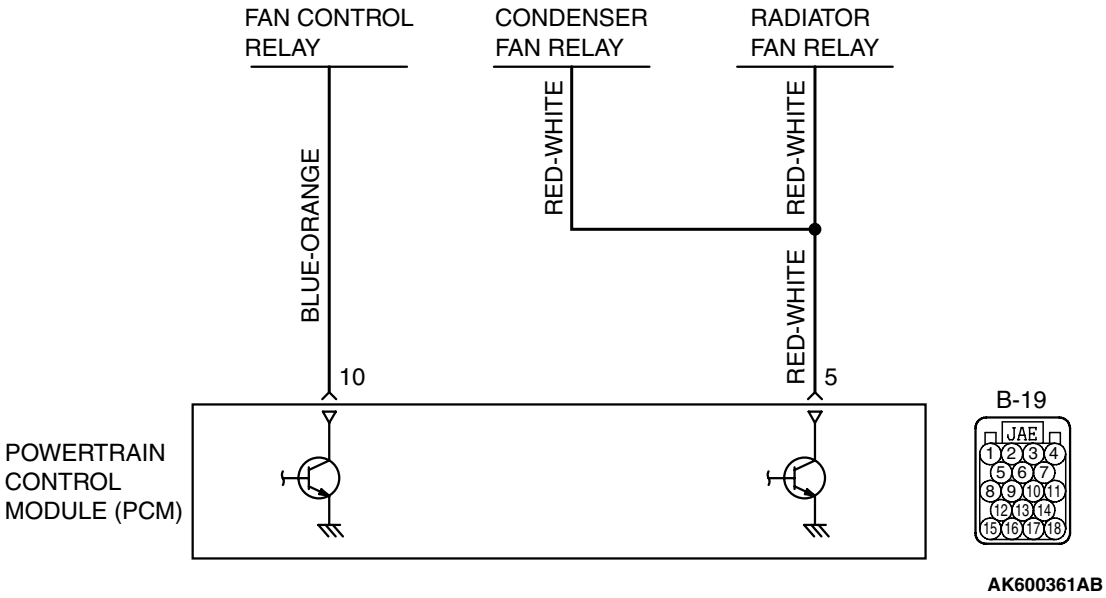
STEP 3. Check for open circuit and short circuit to ground and harness damage between generator connector B-116 (terminal No. 1) and PCM connector B-23 (terminal No. 132).

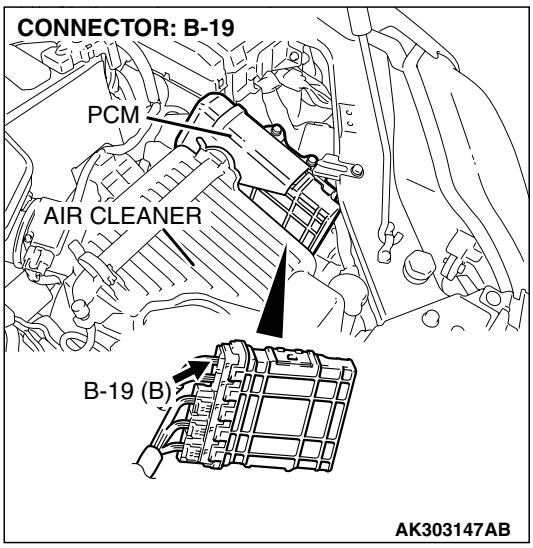
Q: Is the harness wire in good condition?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. 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:)

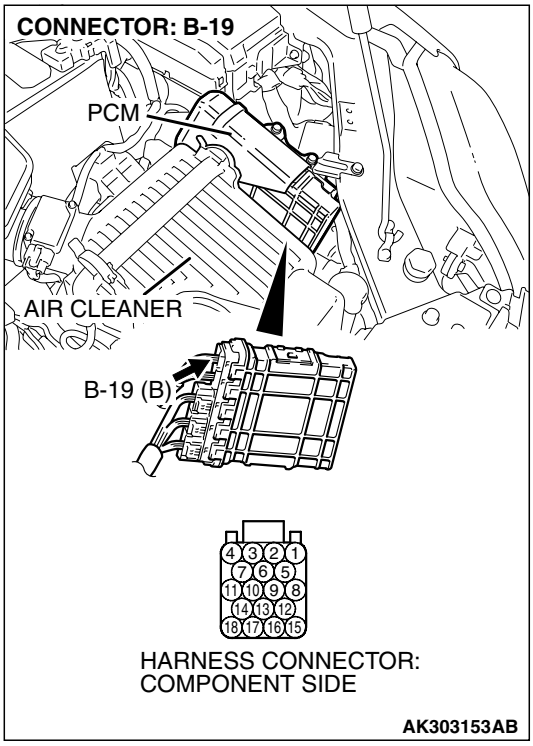
- Malfunction of the fan control relay.
- Malfunction of the condenser fan relay.
- Malfunction of the radiator fan relay.
- Malfunction of the condenser fan motor.
- Malfunction of the radiator fan motor.
- Improper connector contact, open or shorted harness wire.
- PCM failed.

DIAGNOSIS

Required Special Tools:

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

TSB Revision

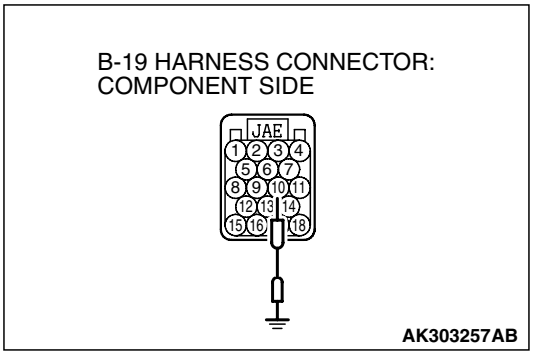


STEP 1. Check harness connector B-19 at PCM for damage.

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.

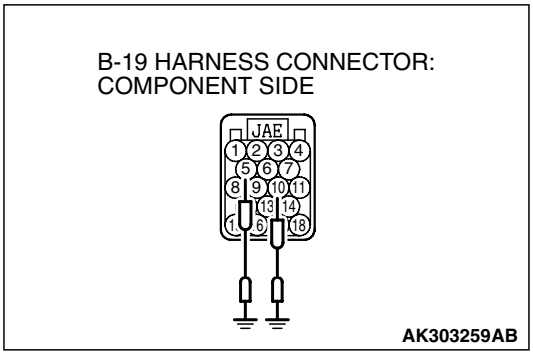
(1) Disconnect the B-19 at PCM connector.
(2) Turn the ignition switch to the "ON" position.
(3) Check the fan condition.
- When the terminal No.10 is grounded by the jumper cable, the radiator and condenser fans should run.
- When the terminal No.10 is grounded first and then both of the terminal No.10 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.

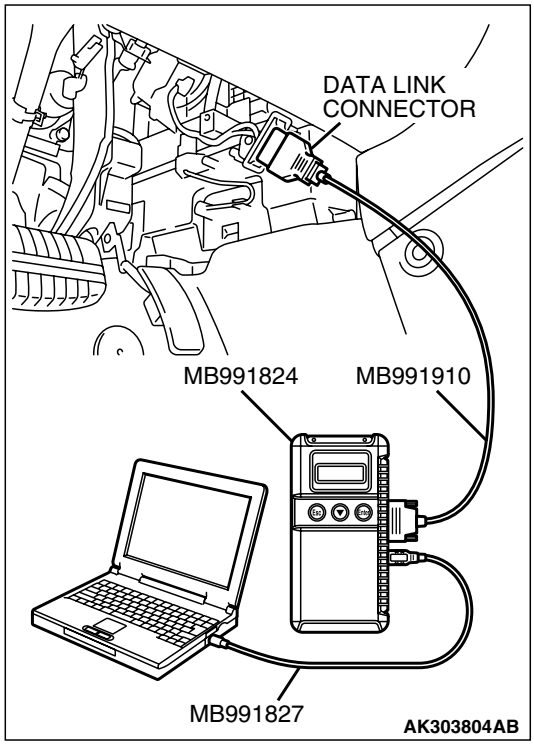
(4) Turn the ignition switch to the "LOCK" (OFF) position.

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 6: 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-1116.
  a. Item 6: 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.

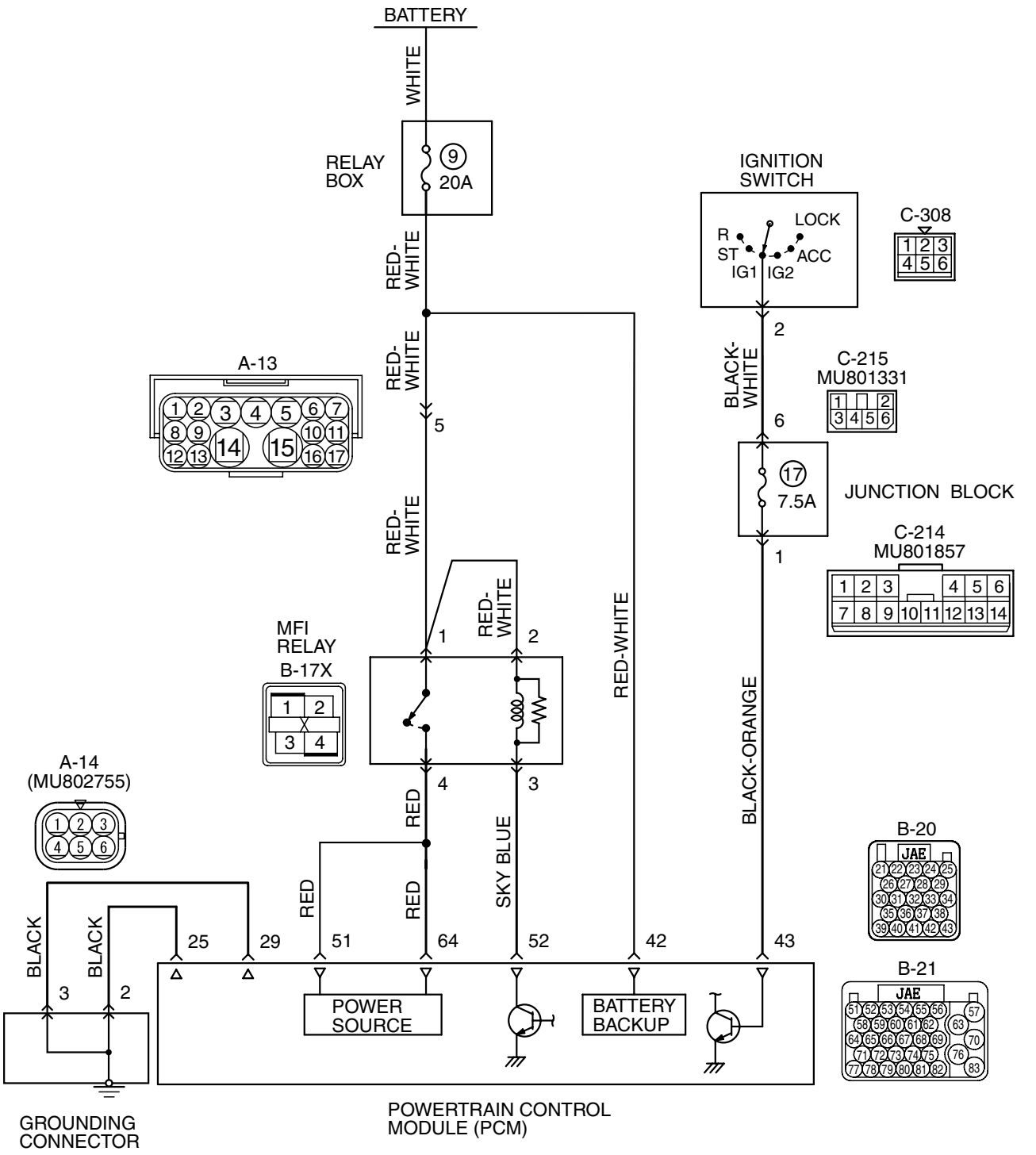
Refer to GROUP 14, Engine Cooling Diagnosis P.14-3.

Q: Is the cooling system normal?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11.
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



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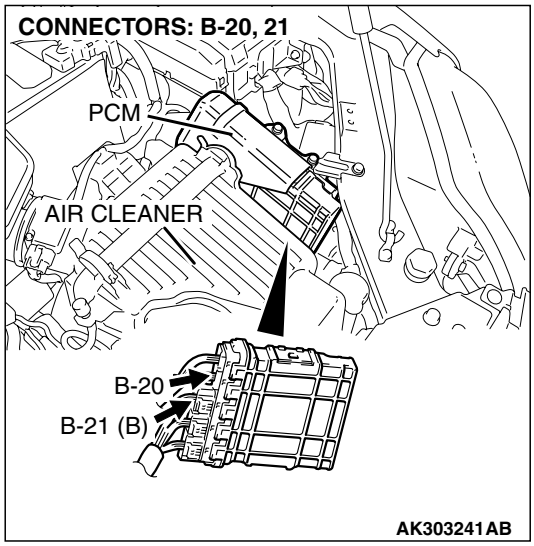

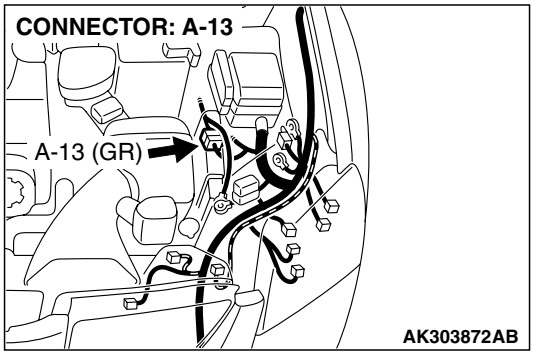

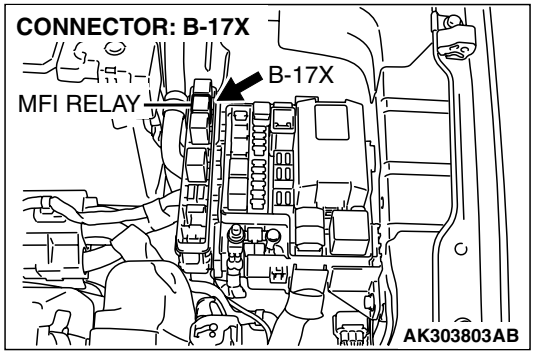

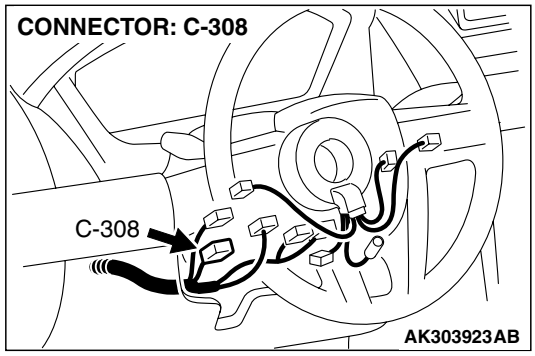

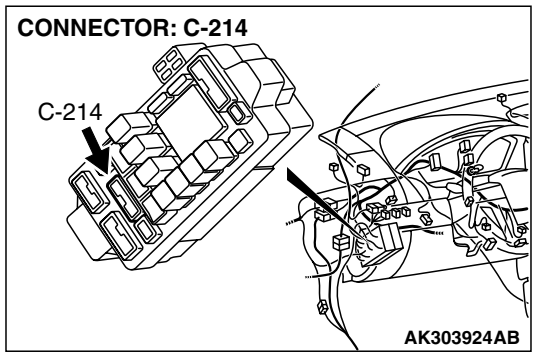

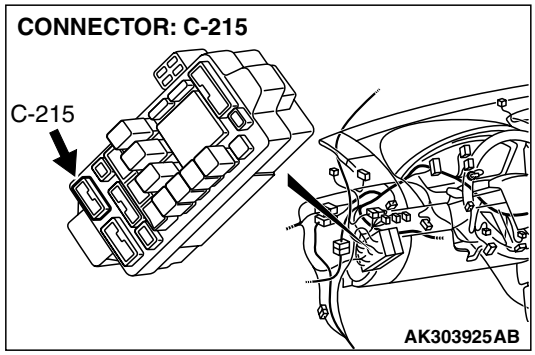

CIRCUIT OPERATION

- Battery positive voltage is applied to the MFI relay (terminals No. 1, No. 2).
- 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).
- A battery positive voltage is constantly supplied to the PCM (terminal No. 42) as the backup power.
- The PCM (terminals No. 25, No. 29) is grounded to the vehicle body.

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

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

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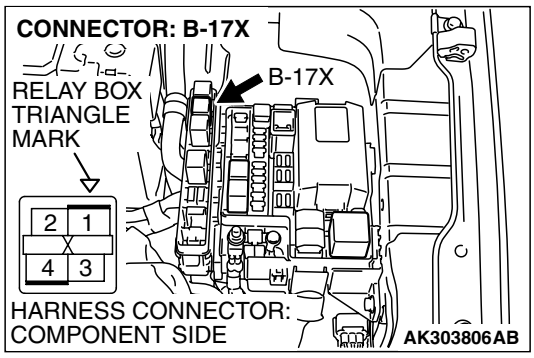
DIAGNOSIS



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

Q: Is the connector in good condition?

YES : Go to Step 2.

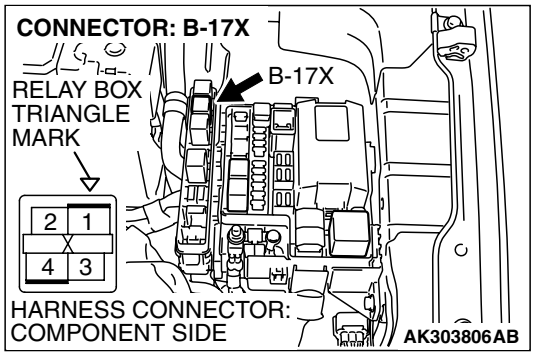
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.

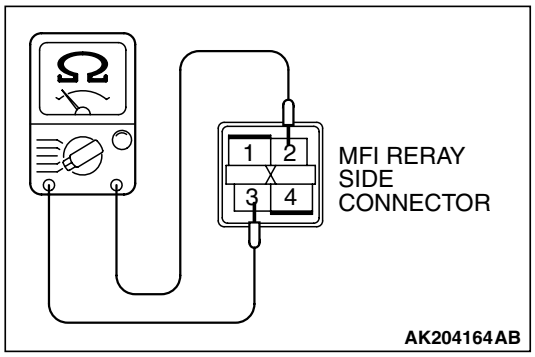
STEP 2. Check the MFI relay.

⚠ CAUTION

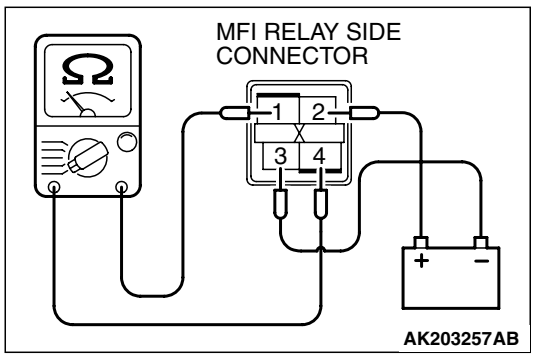
Because it is not possible to distinguish the top and the bottom of the MFI relay, inspect it with the triangle mark printed on the relay facing upward.

(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.
- Continuity (2 Ω or less) <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.

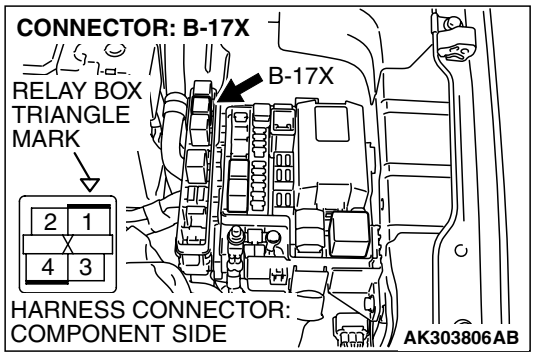
NO : Replace the MFI relay. Then confirm that the malfunction symptom is eliminated.

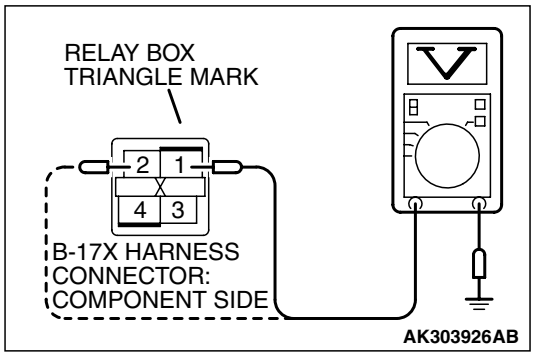
STEP 3. Measure the power supply voltage at MFI relay harness side connector B-17X.

⚠ 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.



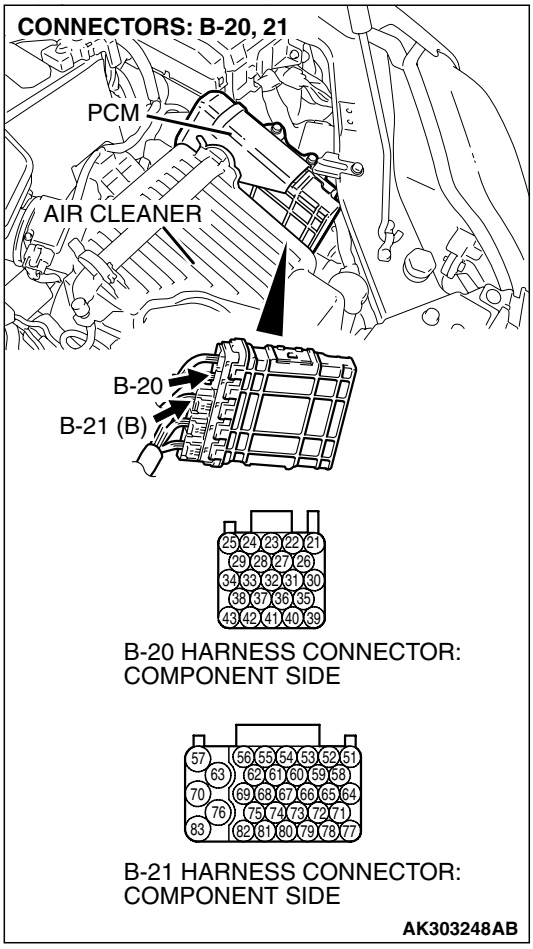


(2) Measure the voltage between terminals No. 1, No. 2 and ground.
- Voltage should be battery positive voltage.

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.

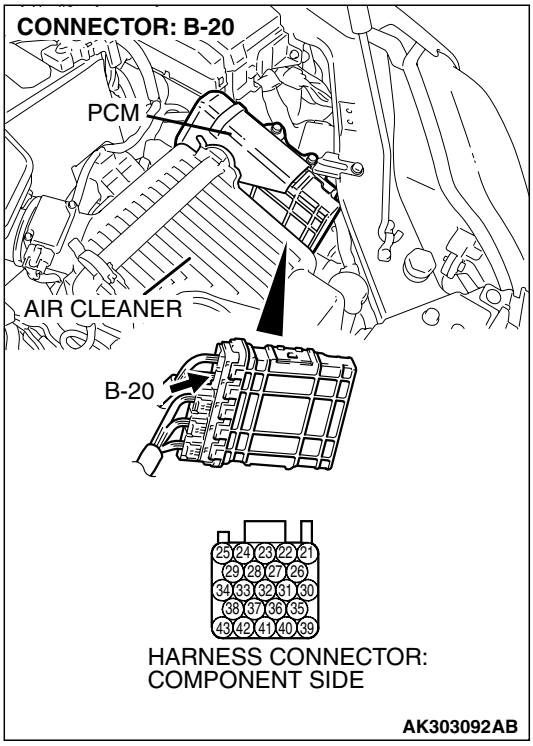


STEP 4. Check harness connector B-20 and B-21 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 5.

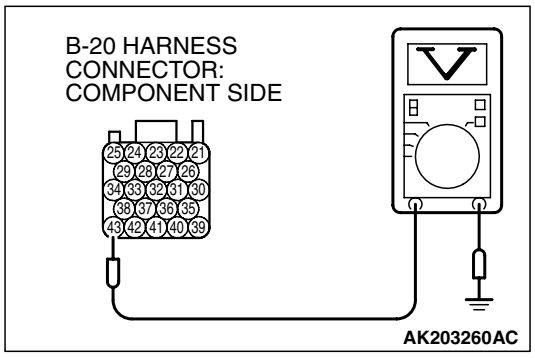
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.



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.

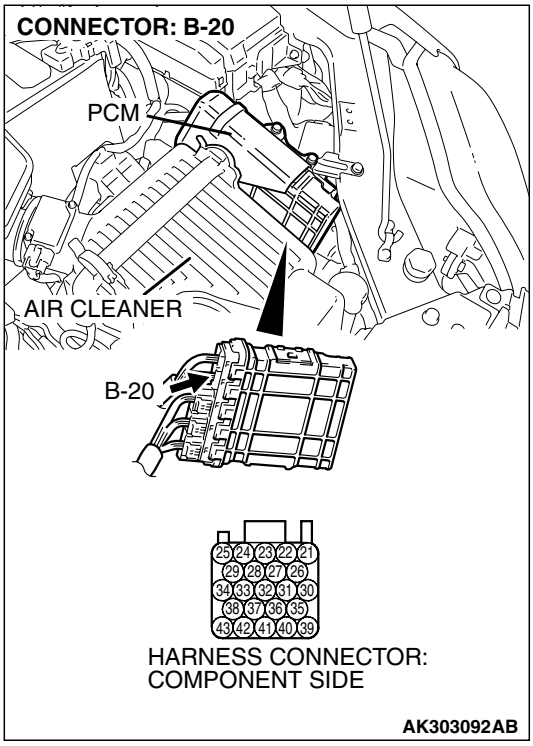
Q: Is battery positive voltage (approximately 12 volts) present?

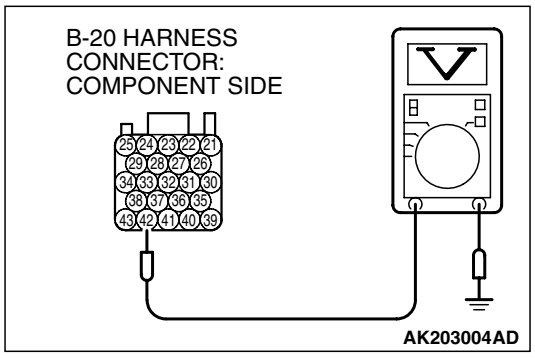
YES : Go to Step 6.

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-19 (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.

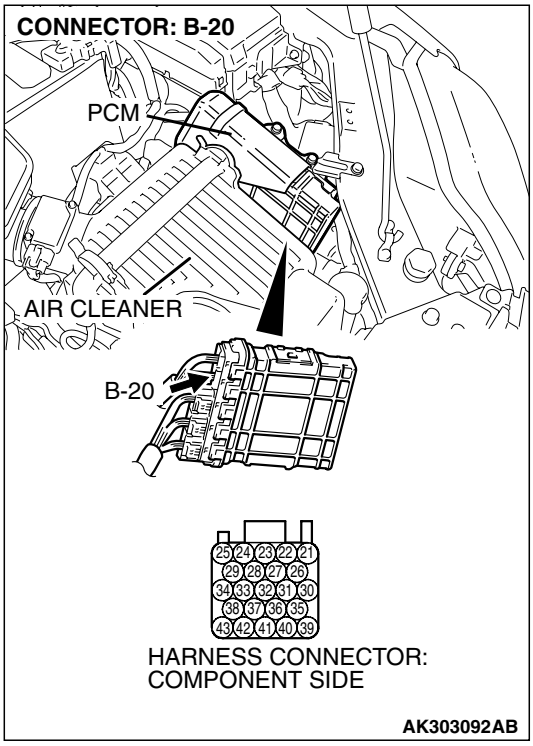
Q: Is battery positive voltage (approximately 12 volts) present?

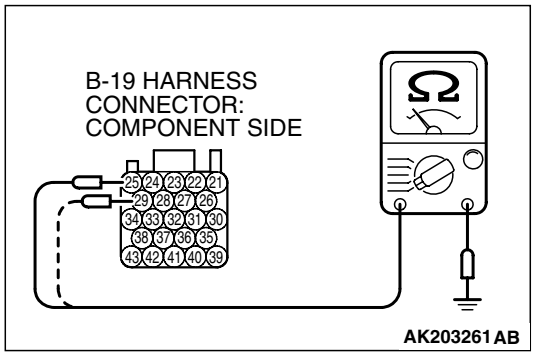
YES : Go to Step 7.

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.
- Continuity (2 Ω or less)

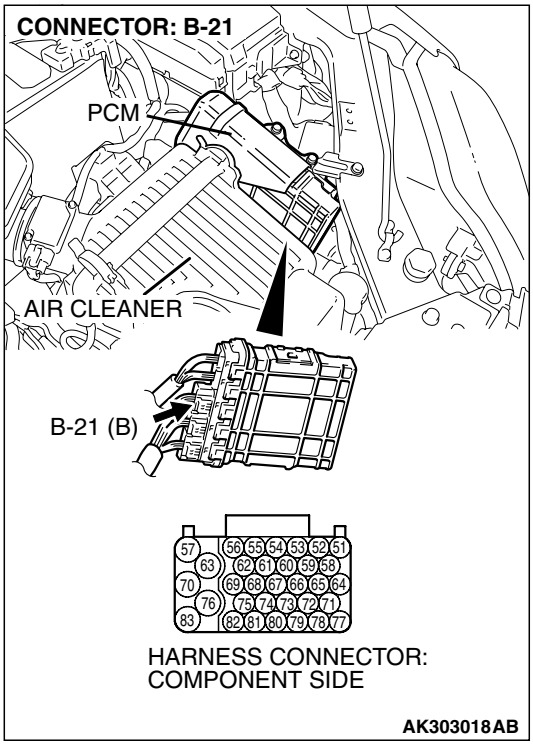
Q: Does continuity exist?

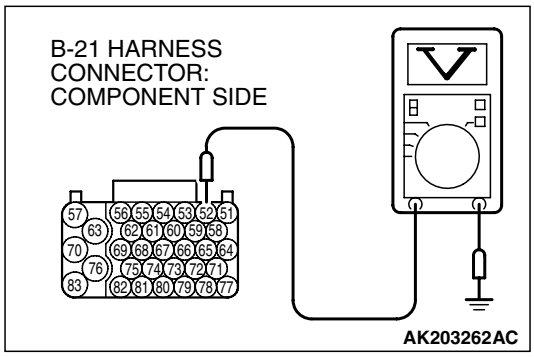
YES : Go to Step 8.

NO : 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?

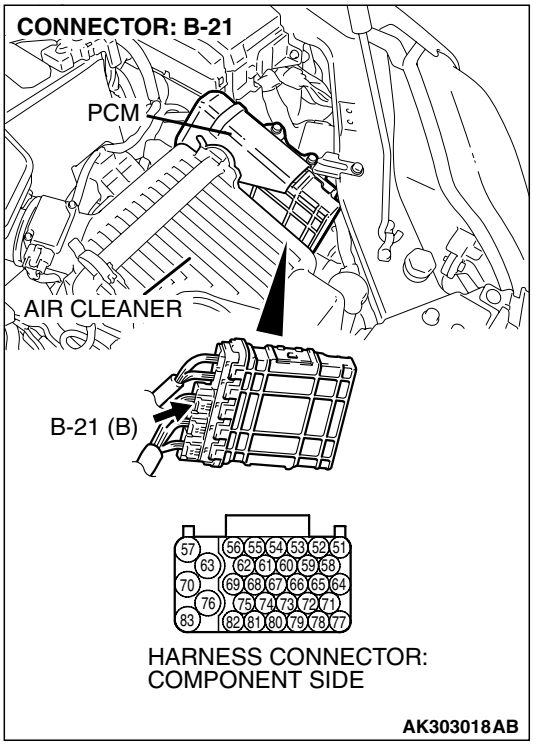
YES : Go to Step 9.

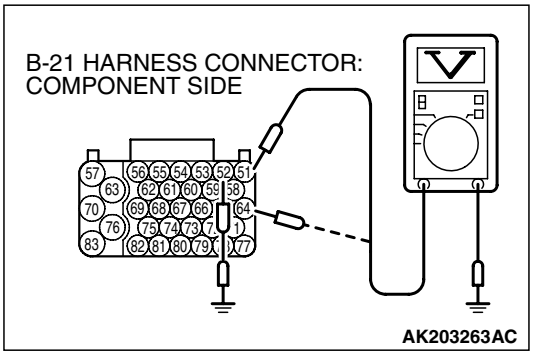
NO : Repair harness wire between MFI relay connector B-17X (terminal No. 3) and PCM connector B-21 (terminal No. 52) because of open circuit. Then confirm that the malfunction symptom is eliminated.

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.

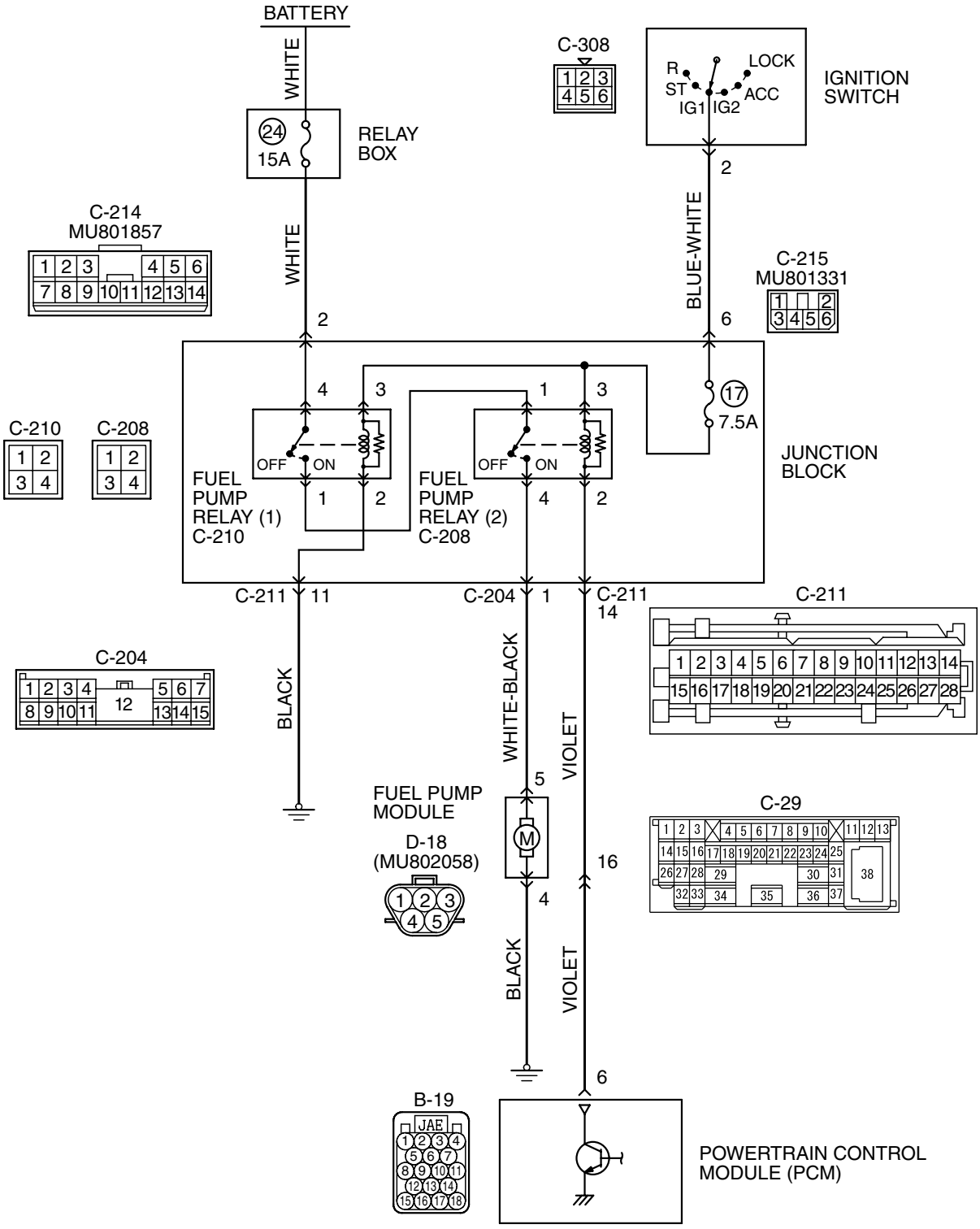
Q: Is battery positive voltage (approximately 12 volts) present?

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



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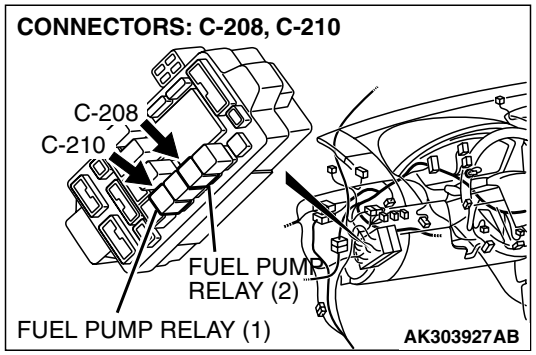
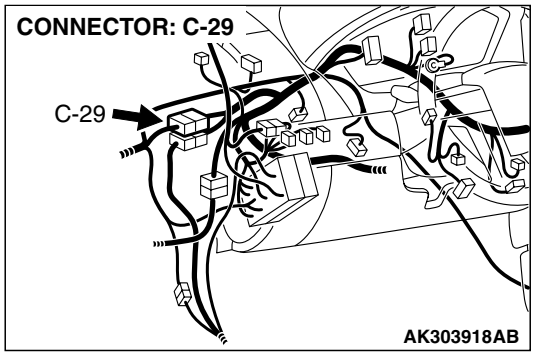
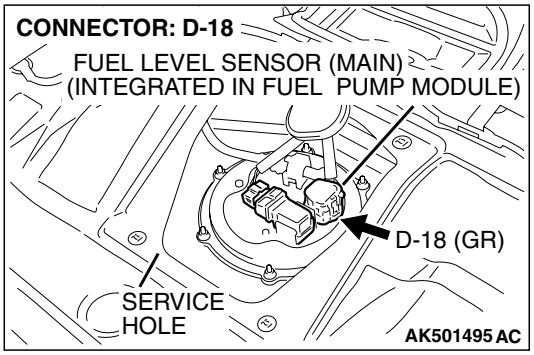
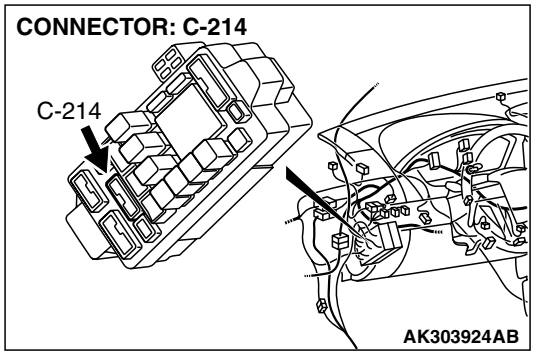
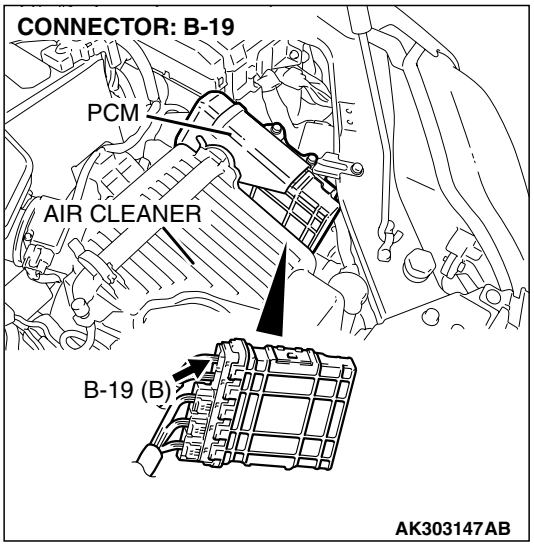
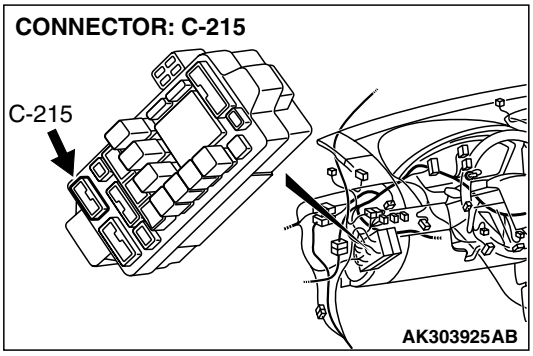

CONNECTORS: C-208, C-210
C-208
C-210
FUEL PUMP RELAY (2)
FUEL PUMP RELAY (1)
AK303927AB

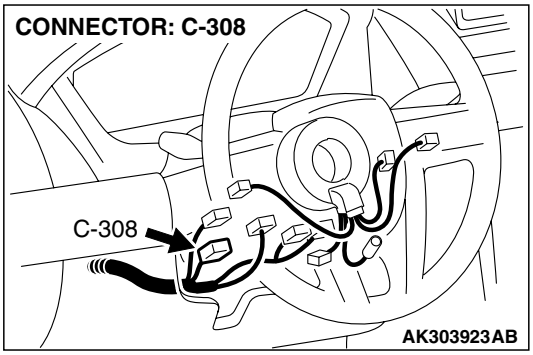

CONNECTOR: C-29
C-29
AK303918AB

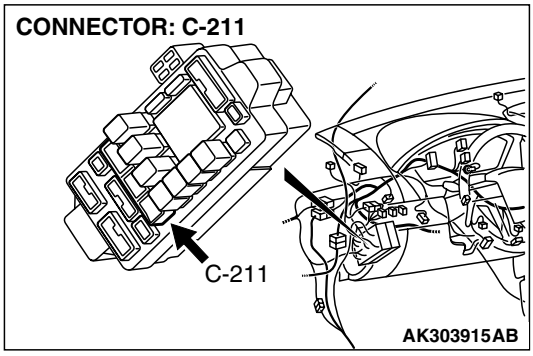

CONNECTOR: D-18
FUEL LEVEL SENSOR (MAIN)
(INTEGRATED IN FUEL PUMP MODULE)
D-18 (GR)
SERVICE HOLE
AK501495AC

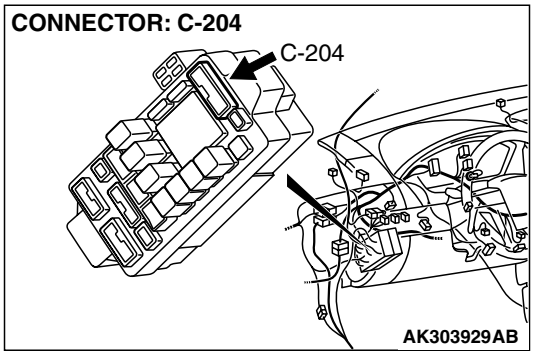

CONNECTOR: C-214
C-214
AK303924AB


CONNECTOR: B-19
PCM
AIR CLEANER
B-19 (B)
AK303147AB


CONNECTOR: C-215
C-215
AK303925AB


CONNECTOR: C-308
C-308
AK303923AB


CONNECTOR: C-211
C-211
AK303915AB



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).

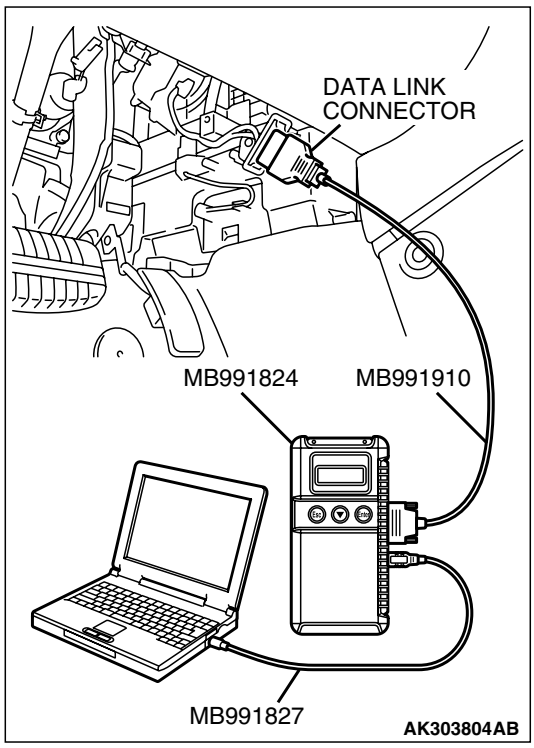
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

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

DIAGNOSIS

Required Special Tools:

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



STEP 1. Using scan tool MB991958, check actuator test item 9: 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.

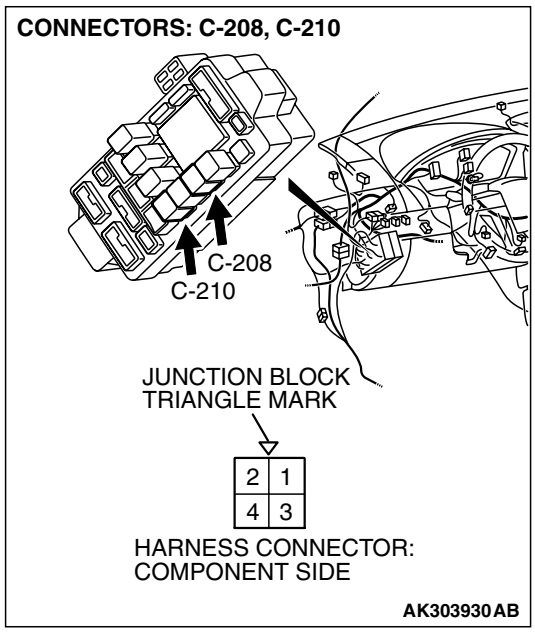
(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991958 to the actuator test mode for item 9, Fuel Pump.
- An operation sound of the fuel pump should be heard.

(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.

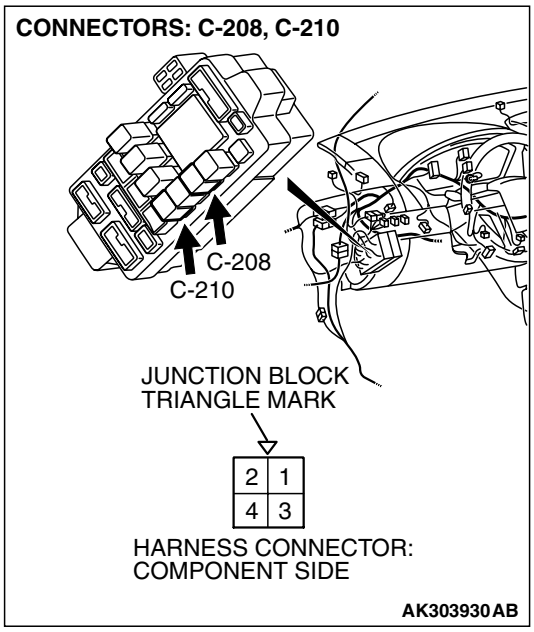
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.

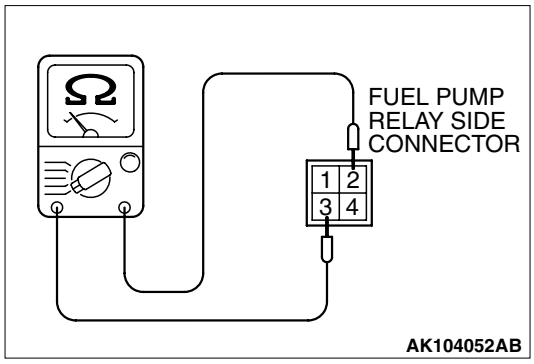
STEP 3. Check the fuel pump relay 1 and 2.

⚠ CAUTION

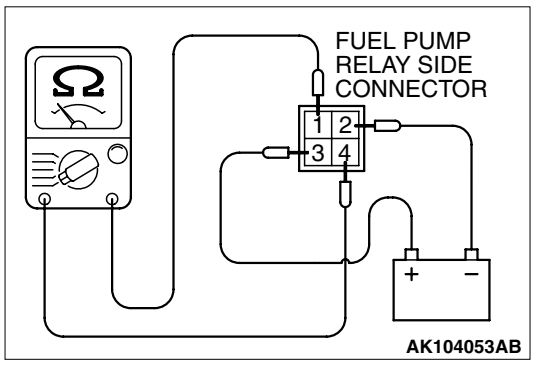
Because it is not possible to distinguish the top and the bottom of the fuel pump relay, inspect it with the triangle mark printed on the relay facing upward.

(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.
- Continuity (2 Ω or less) <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.

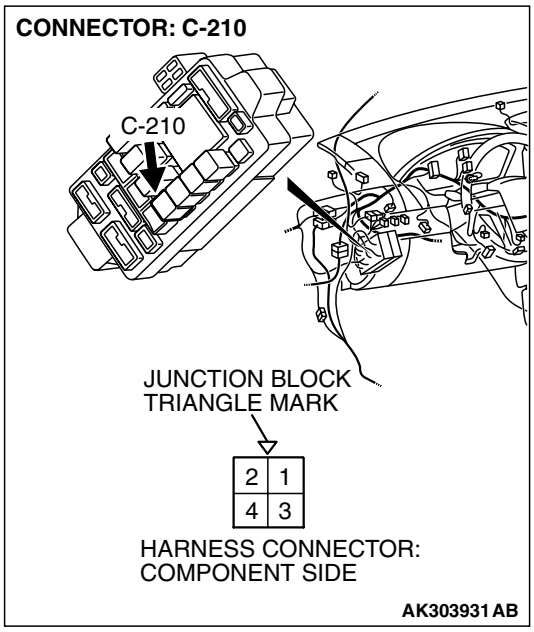
NO : Replace the fuel pump relay 1 and/or 2. Then confirm that the malfunction symptom is eliminated.

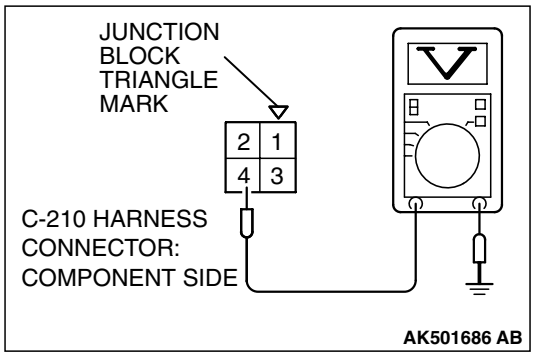
STEP 4. Measure the power supply voltage at fuel pump relay 1 harness side connector C-210.

⚠ 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.

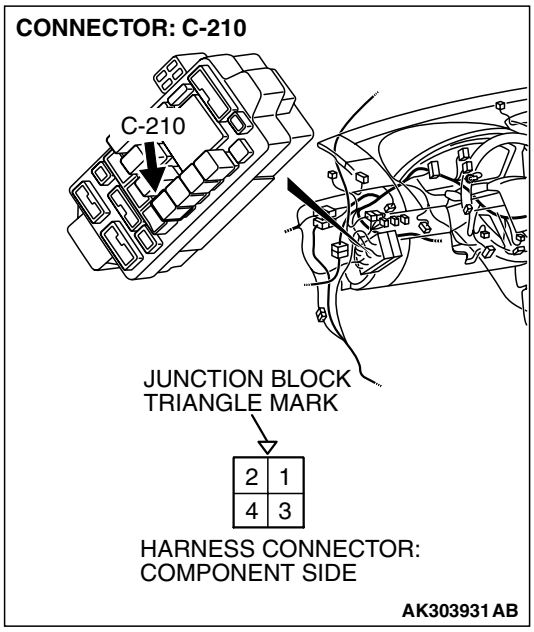
STEP 5. Measure the power supply voltage at fuel pump relay 1 harness side connector C-210.

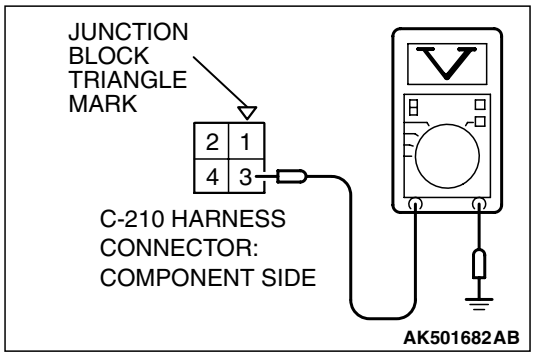
⚠ CAUTION

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.

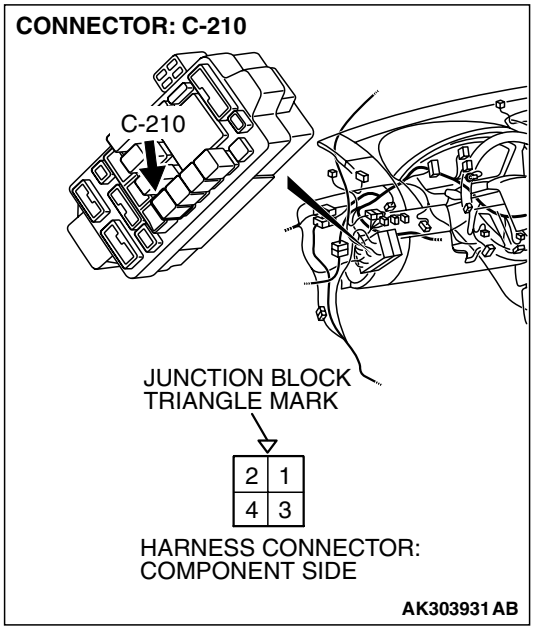
NO : Check harness connector C-215 at intermediate connector for damage, and repair or replace as required. Refer to, GROUP 00E, Harness Connector Inspection P.00E-2. If intermediate connector is in good condition, repair harness wire between ignition switch connector C-308 (terminal No. 2) and fuel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

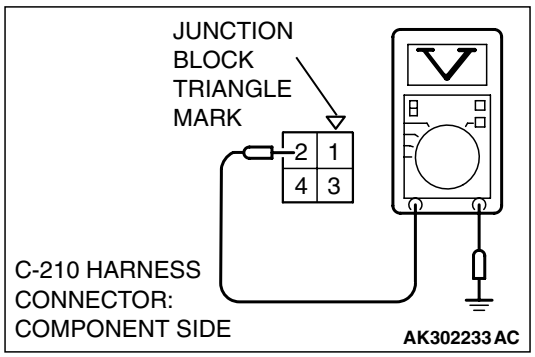
STEP 6. Check for continuity at fuel pump relay 1 harness side connector C-210.

⚠ 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.
- Continuity (2 Ω or less)

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.

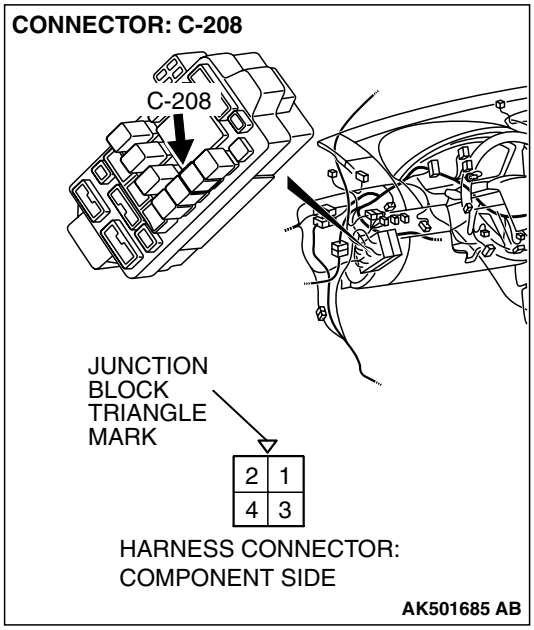
STEP 7. Measure the power supply voltage at fuel pump relay 2 harness side connector C-208.

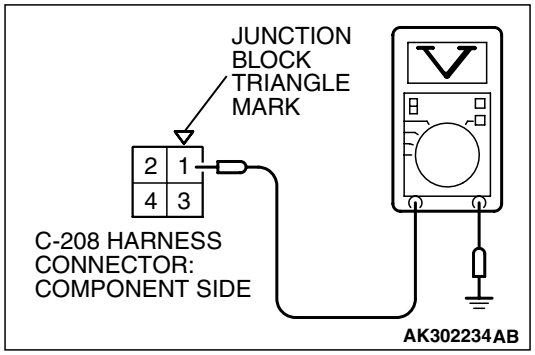
⚠ CAUTION

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.





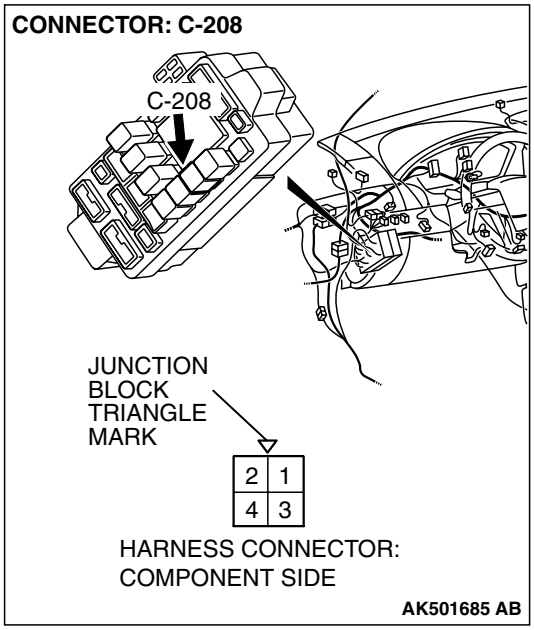
(3) Measure the voltage between terminal No. 1 and ground.
- Voltage should be battery positive voltage.

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.

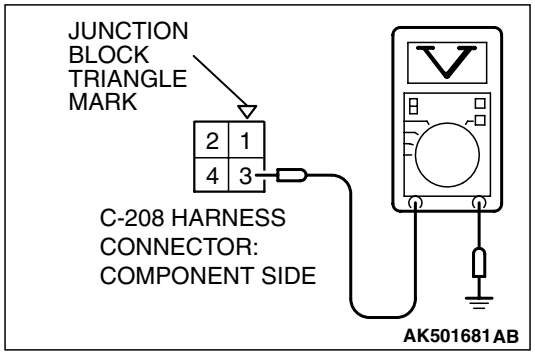
STEP 8. Measure the power supply voltage at fuel pump relay 2 harness side connector C-208.



⚠ 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.

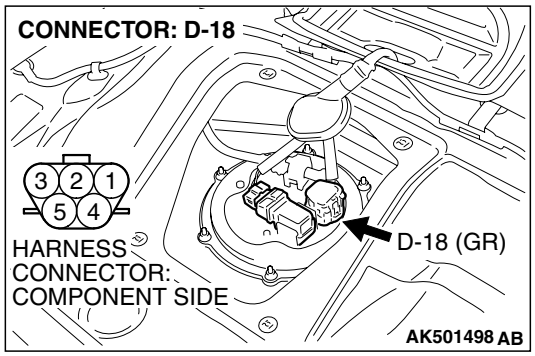
NO : Check harness connector C-215 at intermediate connector for damage, and repair or replace as required. Refer to, GROUP 00E, Harness Connector Inspection P.00E-2. If intermediate connector is in good condition, repair harness wire between ignition switch connector C-308 (terminal No. 2) and fuel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

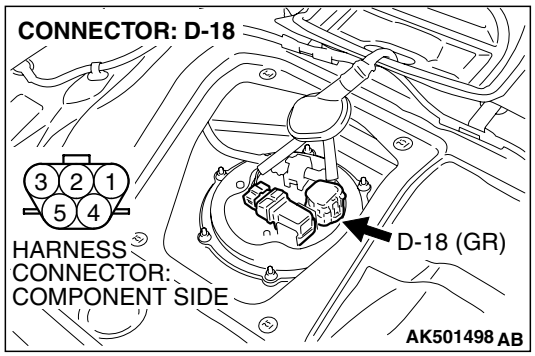
STEP 9. Check connector D-18 at fuel pump for damage.

Q: Is the connector in good condition?

YES : Go to Step 10.

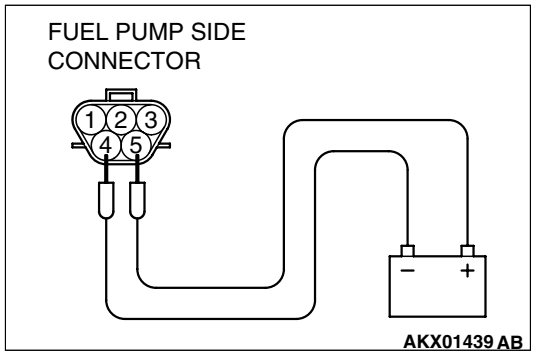
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.





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.

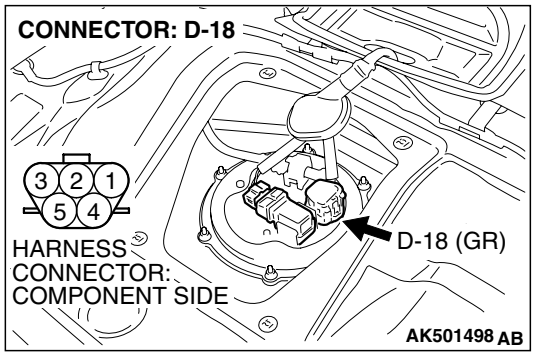
Q: Is the fuel pump operating properly?

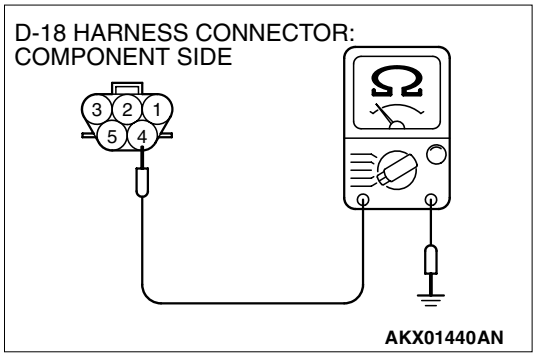
YES : Go to Step 11.

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.



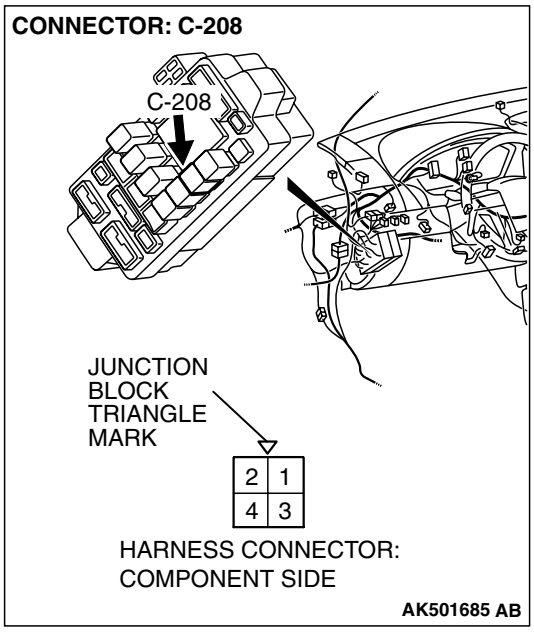


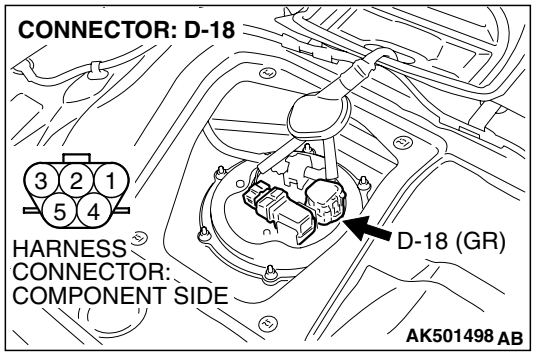
(2) Check for the continuity between terminal No. 4 and ground.
- Continuity (2 Ω or less)

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.





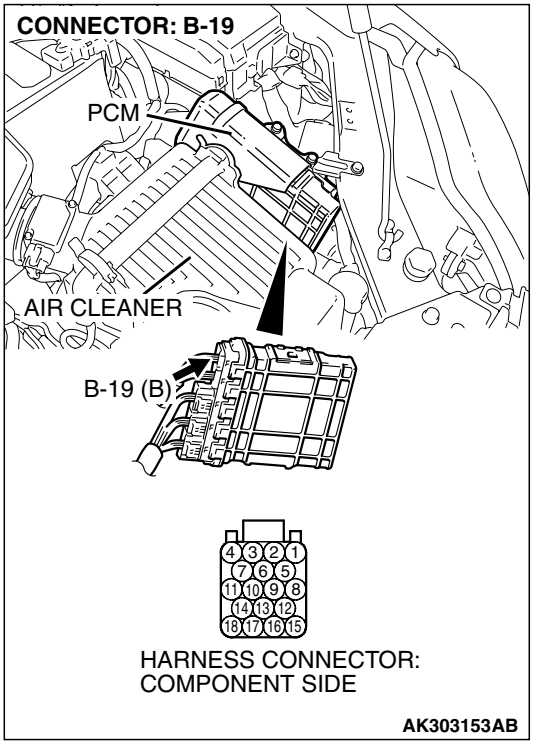
STEP 12. Check for open circuit and short circuit to ground and harness damage between fuel pump relay 2 connector C-208 (terminal No. 4) and fuel pump connector D-18 (terminal No. 5).

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.

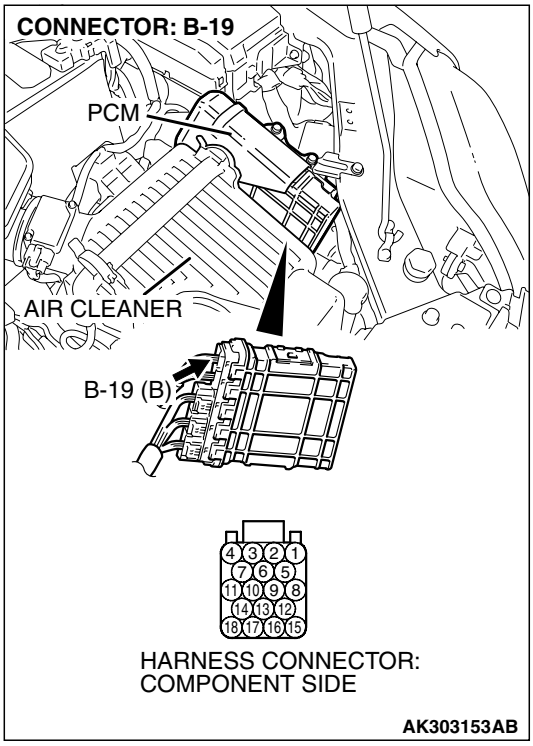


STEP 13. Check connector B-19 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 14.

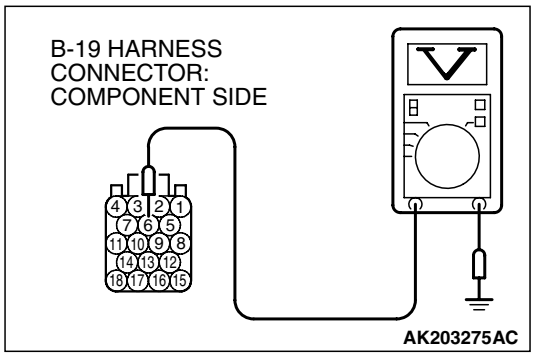
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.



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.

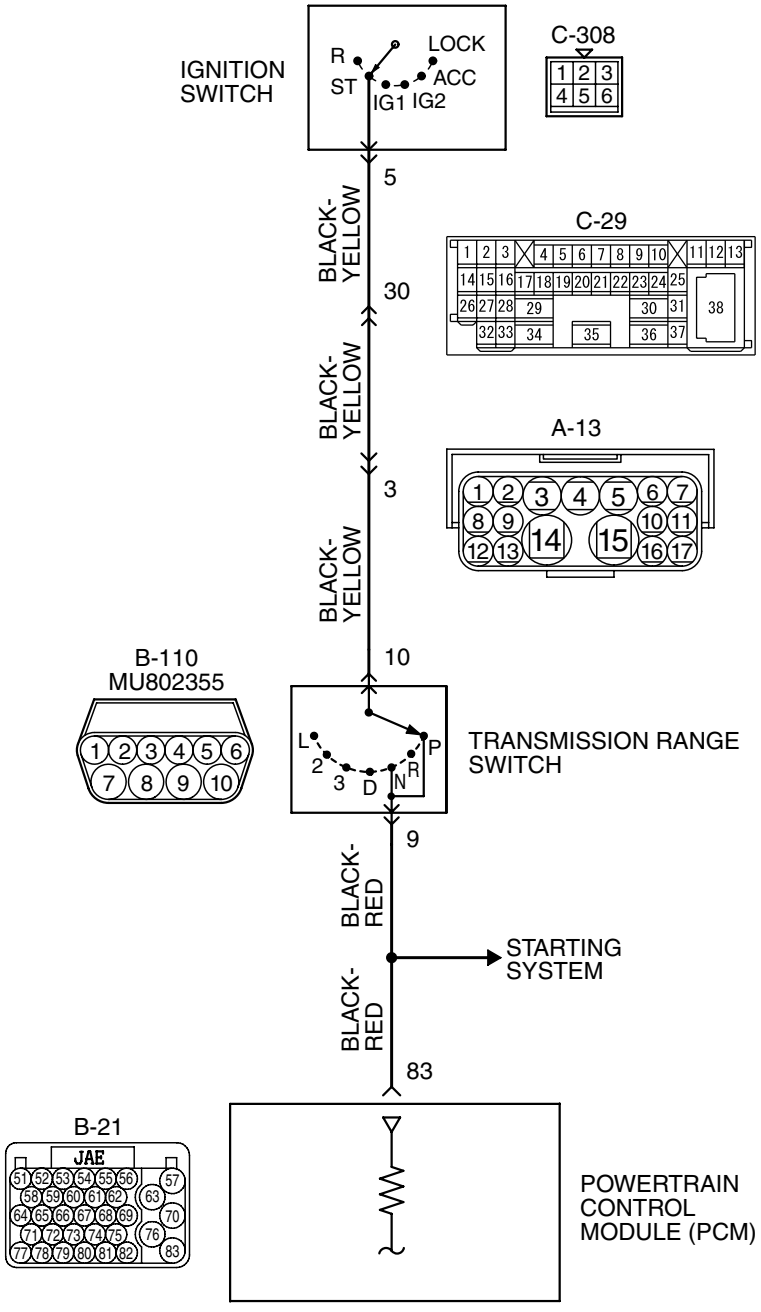
Q: Is battery positive voltage (approximately 12 volts) present?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. 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



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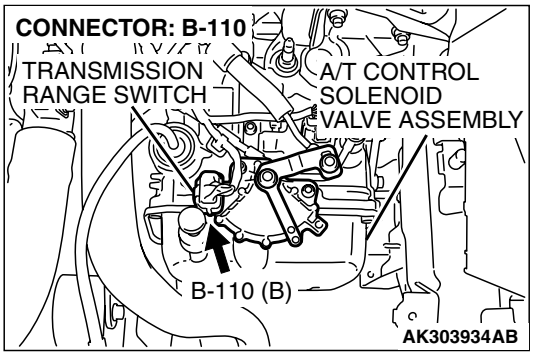
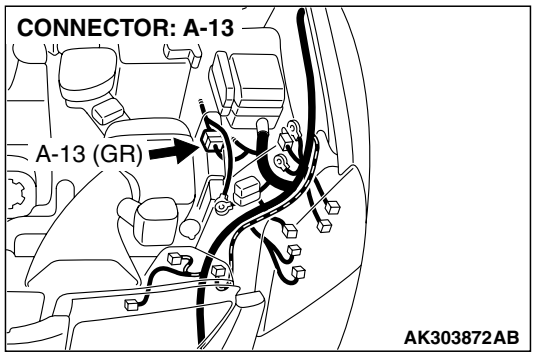
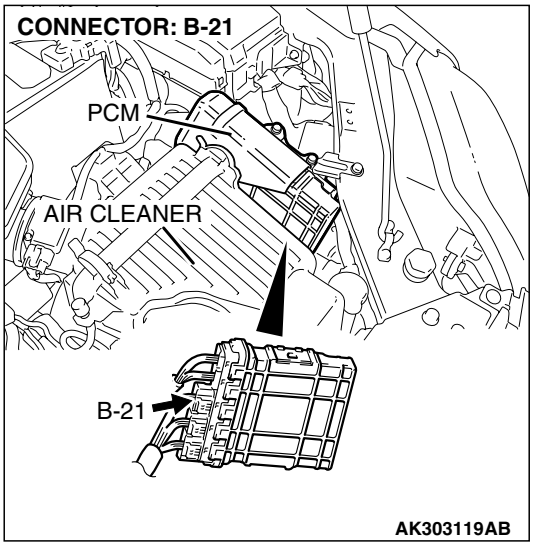
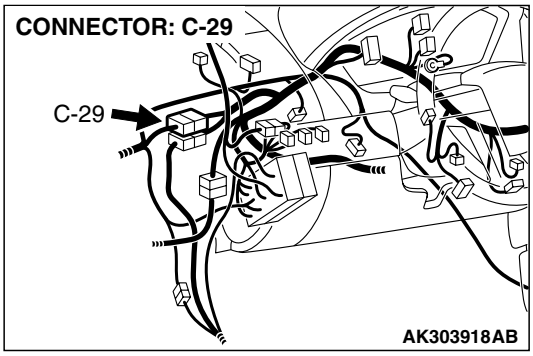
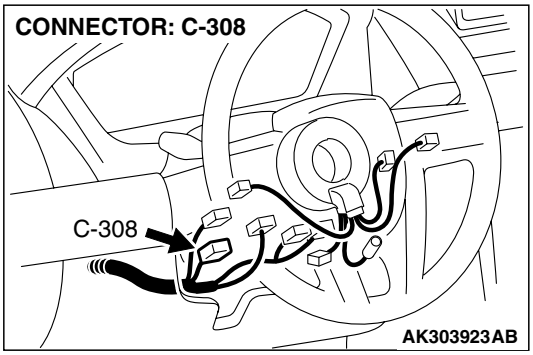










COMMENT

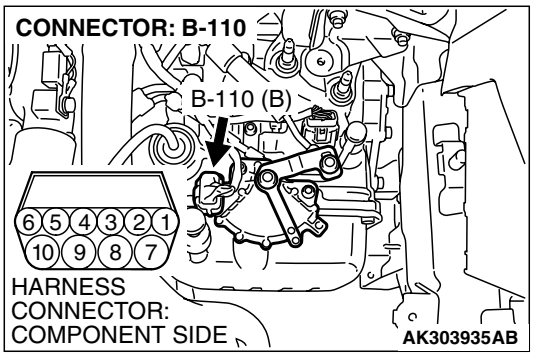
- If the selector lever is moved to "P" or "N" range and the ignition switch is turned to "START" position, battery positive voltage is supplied to PCM (terminal No. 83) through the ignition switch and transmission range switch. Because of this, the PCM detects that the engine is cranking.
- The transmission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

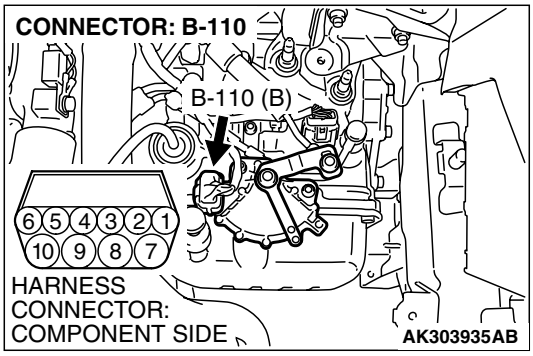
Refer to GROUP 23A, On-vehicle Service – Essential Service – Transmission Range Switch Continuity Check P.23A-372.

Q: Are there any abnormalities?

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

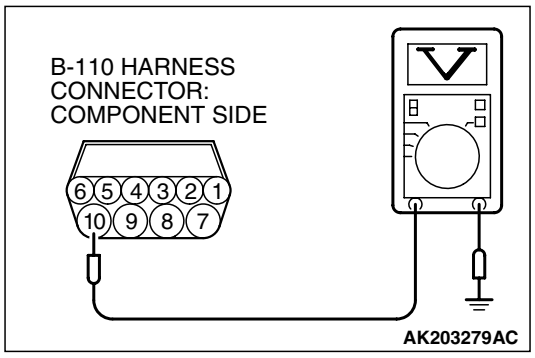
NO : Go to Step 3.

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.

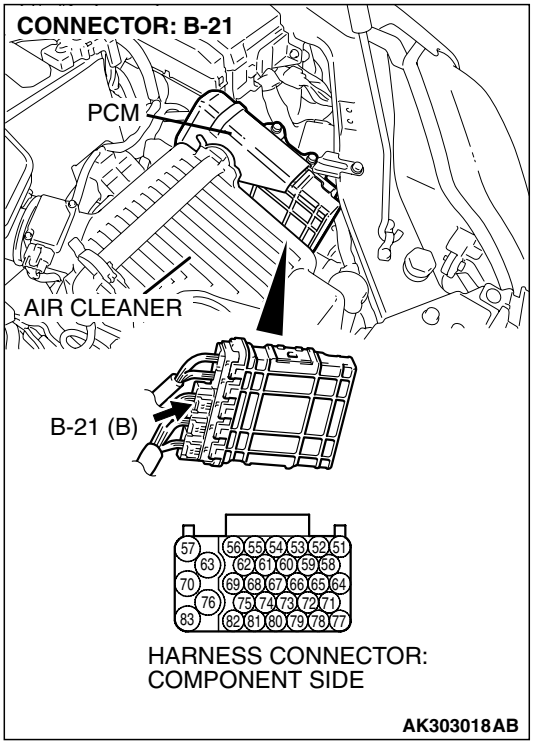
(4) Turn the ignition switch to the "LOCK" (OFF) position.

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 connectors 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.

TSB Revision

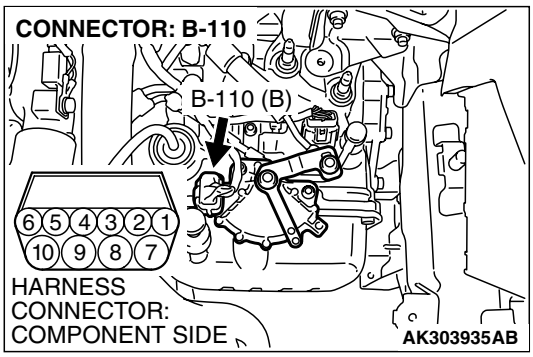


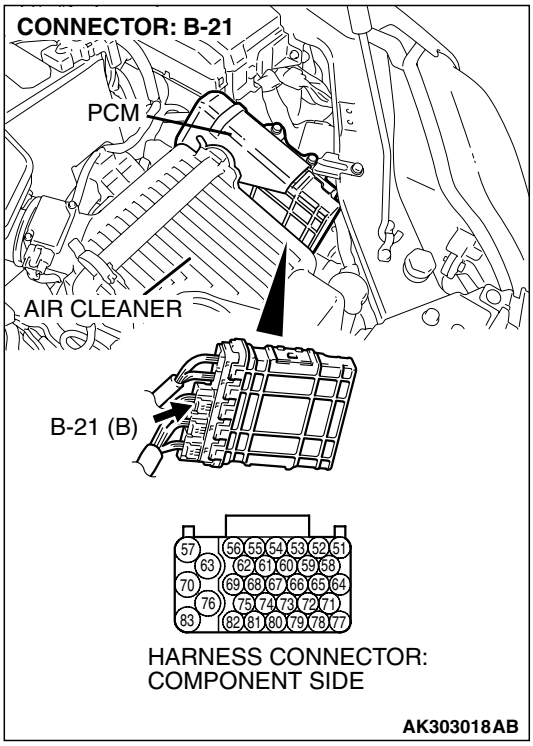
STEP 4. Check connector B-21 at PCM for damage.

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.





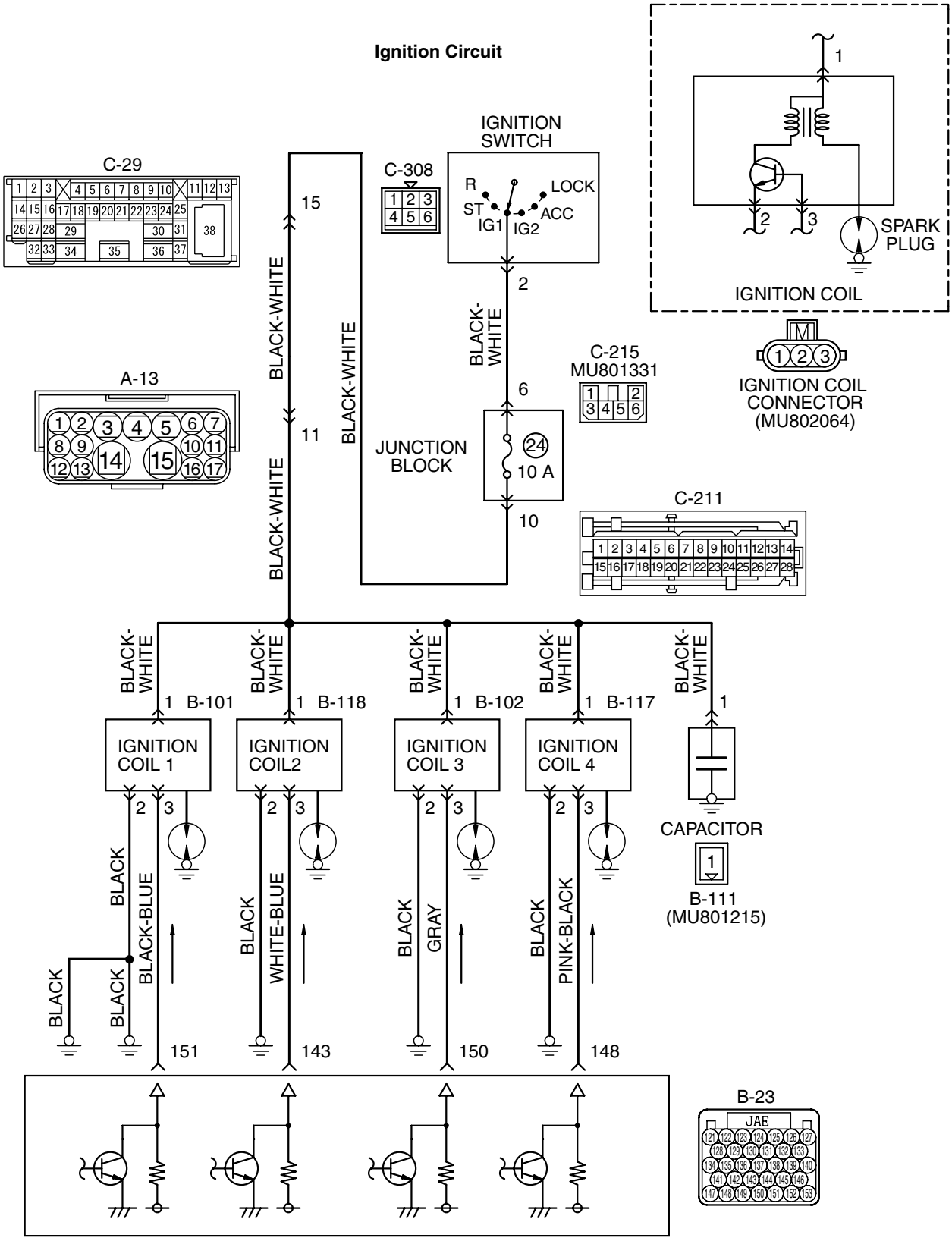
STEP 5. Check for open circuit and short circuit to ground and harness damage between transmission range switch connector B-110 (terminal No. 9) and PCM connector B-21 (terminal No. 83).

Q: Is the harness wire in good condition?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. 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



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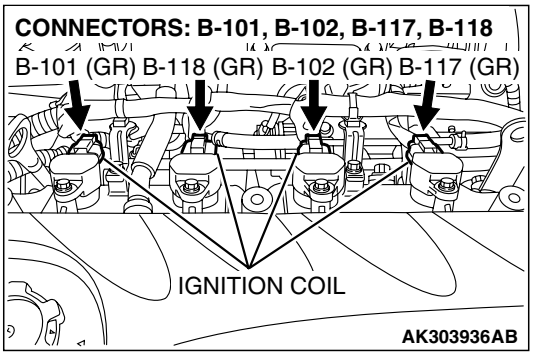
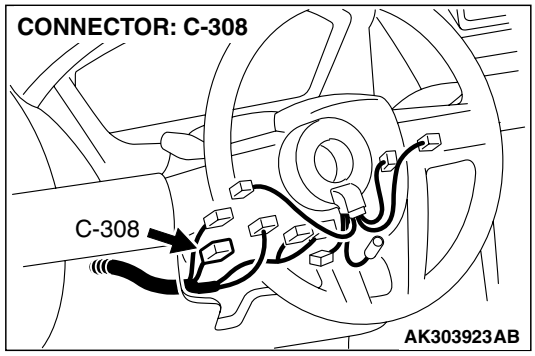
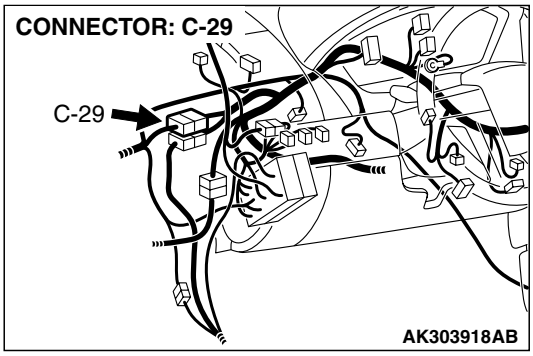
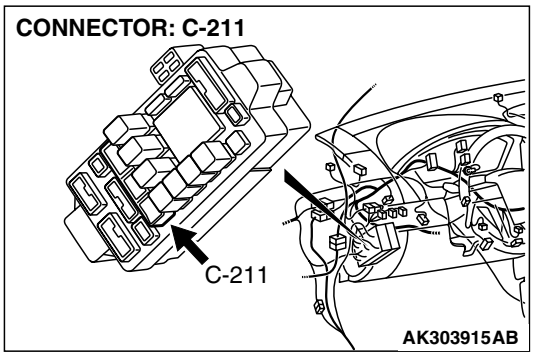
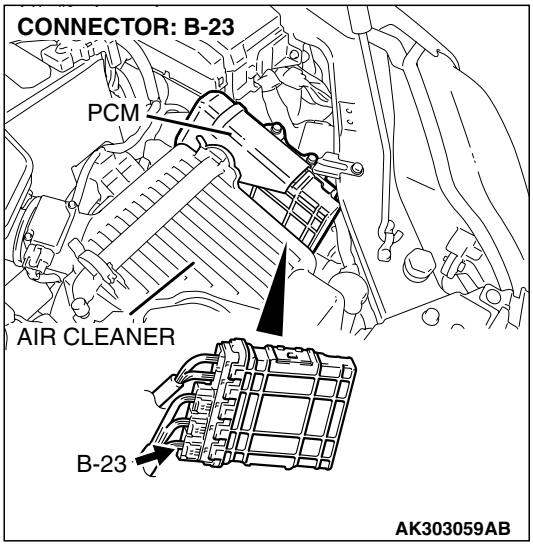
TSB Revision

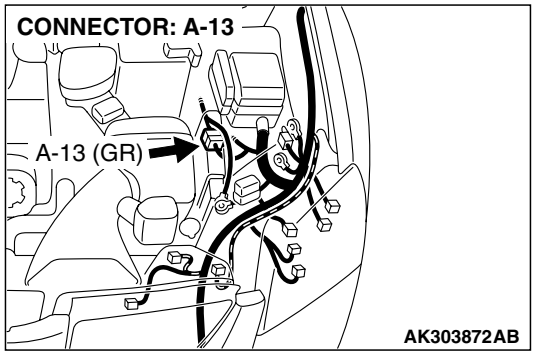


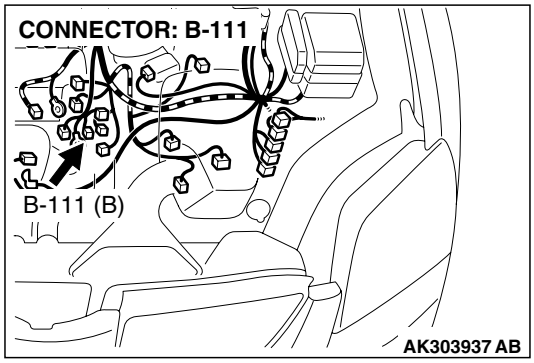


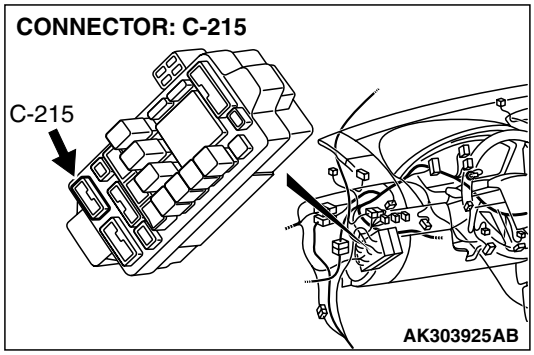












CIRCUIT OPERATION

- 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.

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- 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

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.

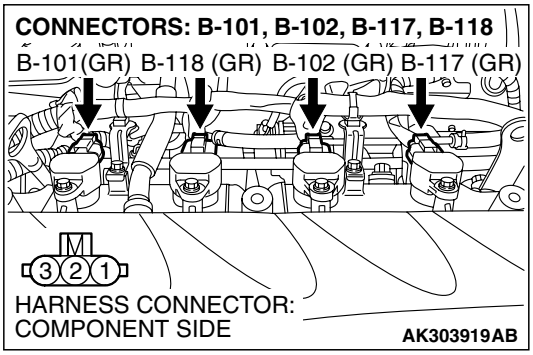
NO : Go to Step 2.

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

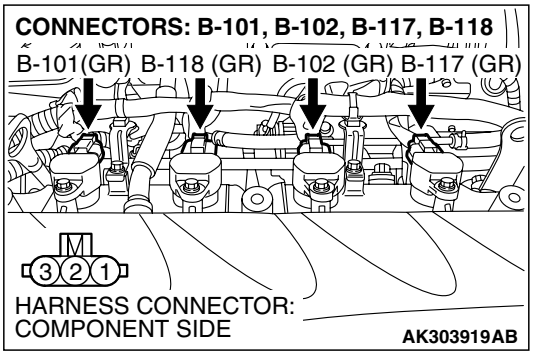
Q: Is the harness connector in good condition?

YES : Go to Step 3.

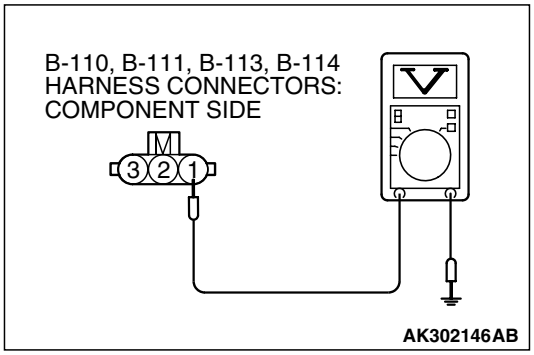
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.



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.



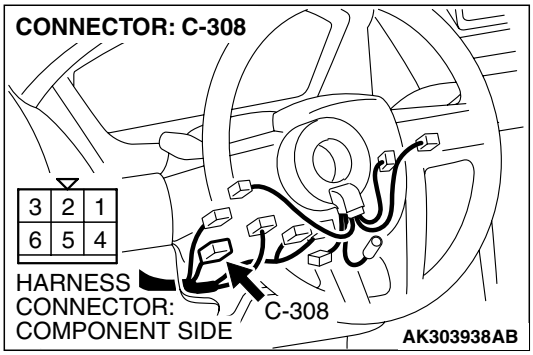
(3) Measure the voltage between terminal No. 1 and ground.
- Voltage should be battery positive voltage.

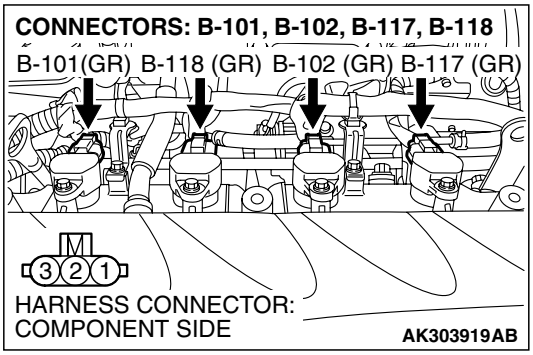
(4) Turn the ignition switch to the "LOCK" (OFF) position.

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, and C-215. 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?

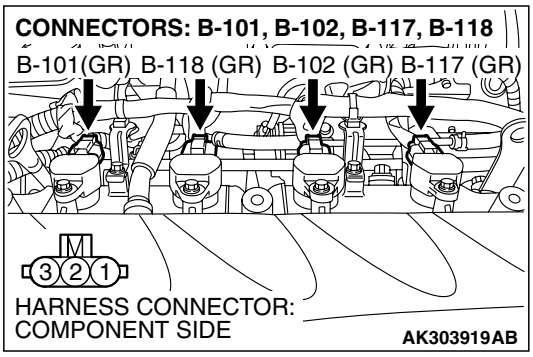
YES : Repair harness wire between ignition switch connector C-308 (terminal No. 2) and capacitor connector B-111 (terminal No. 1) because of short circuit to ground. Then confirm that the malfunction symptom is eliminated.

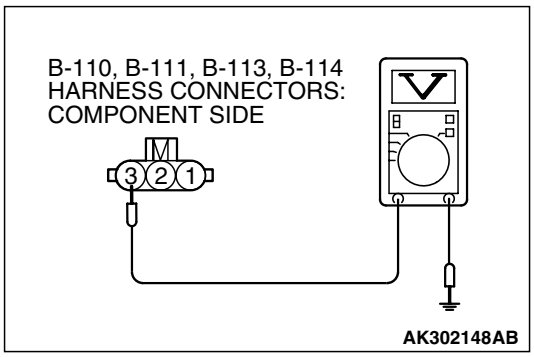
NO : Repair it. Then confirm that the malfunction symptom is eliminated.

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.





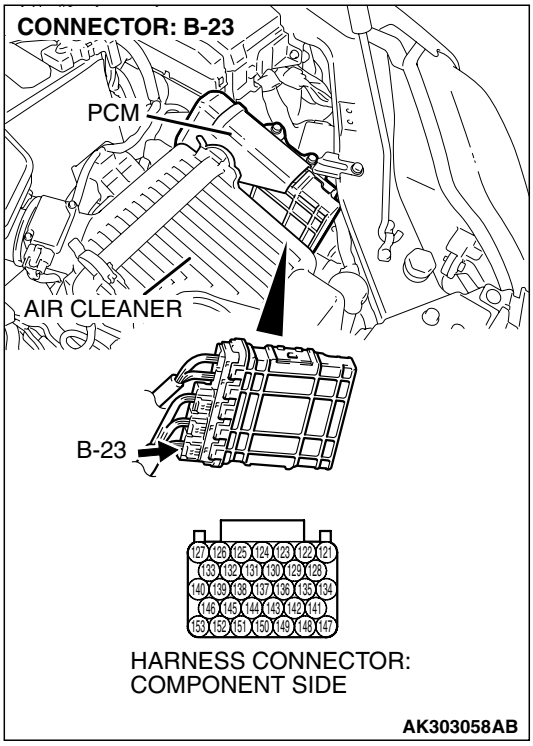
(3) Measure the voltage between terminal No. 3 and ground.
- Voltage should be 0.3 and 3.0 volts.

(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.

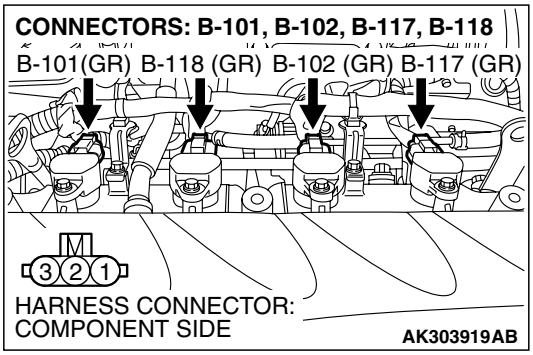


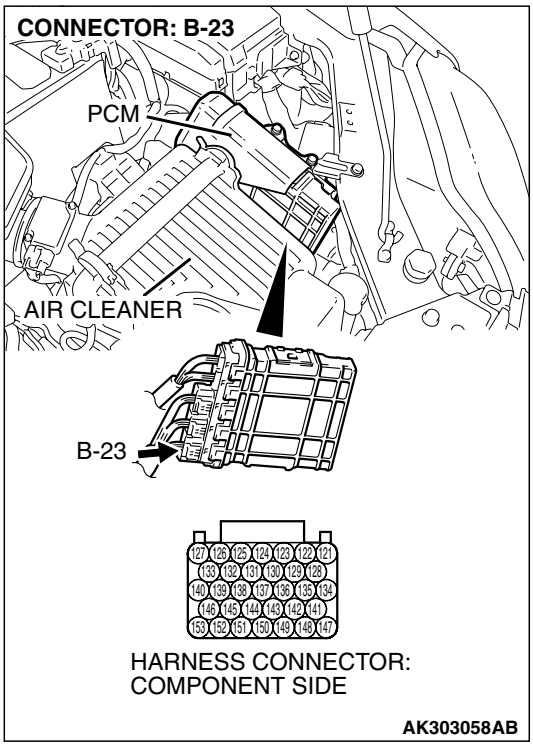
STEP 6. Check harness connector B-23 at PCM for damage.

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.

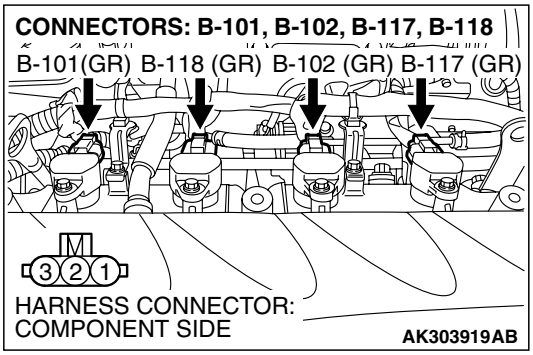
c. Check the harness wire between ignition coil connector B-102 (terminal No. 3) and PCM connector B-23 (terminal No. 150) at ignition coil 3.

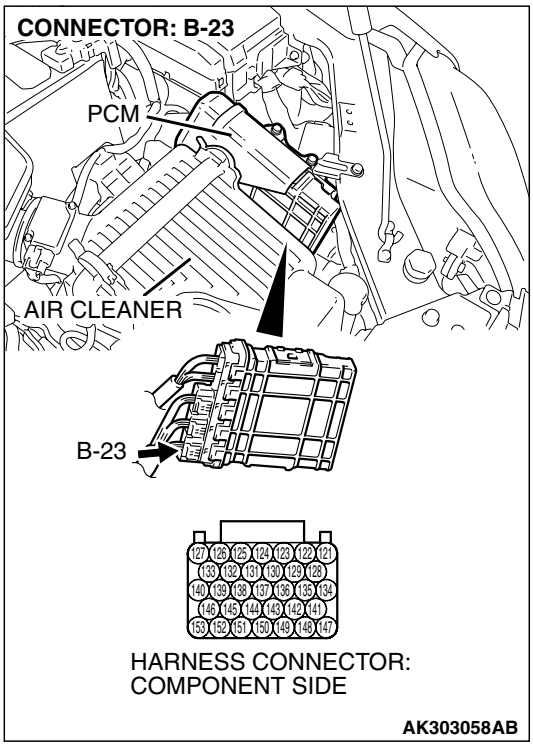
d. Check the harness wire between ignition coil connector B-117 (terminal No. 3) and PCM connector B-23 (terminal No. 148) at ignition coil 4.

Q: Is the harness wire in good condition?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. 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.

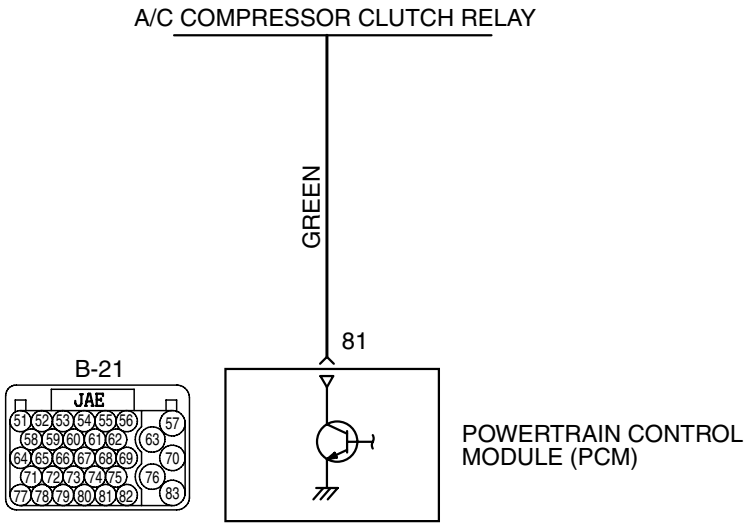
Q: Is the harness wire in good condition?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. 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.

A/C Circuit



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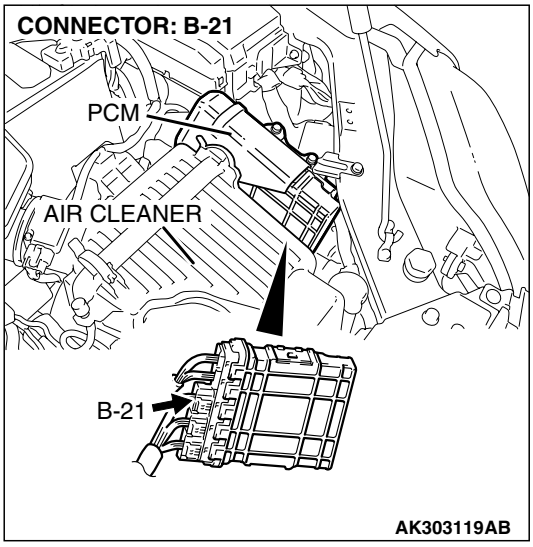


COMMENT

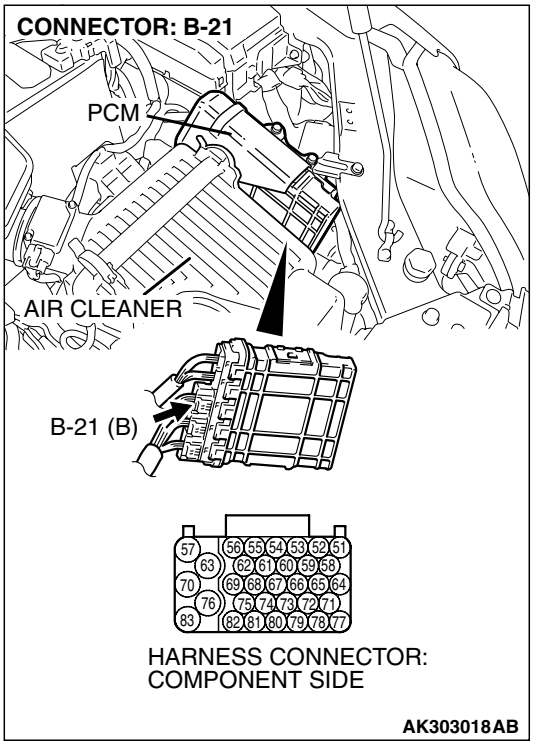
- When the A/C is "ON" the PCM turns "ON" the power transistor in the PCM. The PCM delays A/C engagement momentarily while it increases idle r/min. Then the A/C compressor clutch relay coil will be energized.
  With this, the A/C compressor clutch relay turns "ON", and the A/C compressor clutch operates.

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.

TSB Revision

DIAGNOSIS

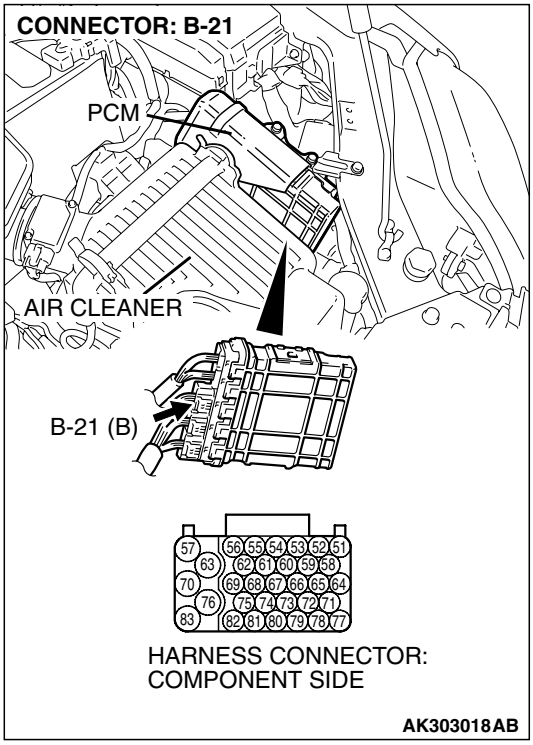


STEP 1. Check harness connector B-21 at PCM for damage.

Q: Is the harness connector in good condition?

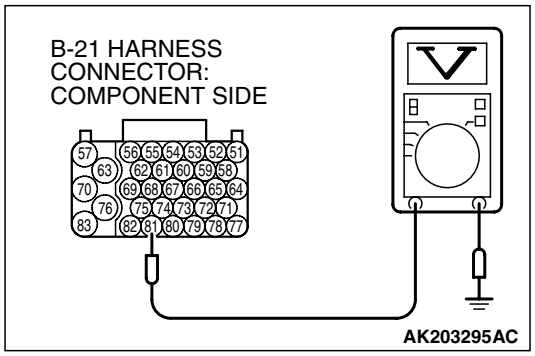
YES : Go to Step 2.

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. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11. Then confirm that the malfunction symptom is eliminated.

NO : Refer to GROUP 55A, Manual A/C Diagnosis – Introduction To Heater, Air Conditioning And Ventilation Diagnosis P.55A-6 <Manual A/C>, 55B, Automatic A/C Diagnosis – Introduction To Heater, Air Conditioning And Ventilation Diagnosis P.55B-3 <Automatic A/C>. Then confirm that the malfunction symptom is eliminated.

DATA LIST REFERENCE TABLE

M1131152002504

⚠ 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: 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.*

M.U.T.-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
A/C compressor relay	93	A/C compressor relay	• Engine: warming up, idling • A/C switch: "OFF"		OFF	Procedure No. 32	P.13A-1113
			• Engine: warming up, idling • A/C switch: "ON"	A/C compressor clutch is not operating	OFF		
				A/C compressor clutch is operating	ON		
A/C SW1	76	A/C switch	• Engine: warming up, idling • A/C switch: "OFF"		OFF	Procedure No. 32	P.13A-1113
			• Engine: warming up, idling • A/C switch: "ON"	A/C compressor clutch is not operating	OFF		
				A/C compressor clutch is operating	ON		
Absolute load value	72	Absolute load value	Engine: warming up	Engine idling	10 – 20%	–	–
				2,500 r/min	10 – 20%		
				Revving engine	Load value increases according to amount of revving.		

M.U.T.-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
Airflow sensor	AA	Mass airflow sensor*1	• Engine coolant temperature: 80 – 95°C (176 – 203°F) • Lights, electric cooling fan and all accessories: "OFF"*4 • Transaxele: "P" range	Engine is idling	1.3 – 5.3 g/s	–	–
				2,500 r/min	5.0 – 13.0 g/s		
				Engine is revved	Increases in response to revving		
Airflow sensor	10	Mass airflow sensor*1	• Engine coolant temperature: 80 – 95°C (176 – 203°F) • Lights, electric cooling fan and all accessories: "OFF"*4 • Transaxle: "P" range	Engine is idling	1,300 – 1,620 mV	–	–
				2,500 r/min	1,600 – 1,970 mV		
				Engine is revved	Increase in response to revving		
APP sensor (main)	BE	Accelerator pedal position sensor (main)	Ignition switch: "ON"	Release the accelerator pedal	15 – 25%	Code No. P2122, P2123	P.13A-908, P.13A-918
				Depress the accelerator pedal gradually	Increases in response to the pedal depression stroke		
				Depress the accelerator pedal fully	80% or more		

M.U.T.-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
APP sensor (main)	11	Accelerator pedal position sensor (main)	Ignition switch: "ON"	Release the accelerator pedal	735 – 1,335 mV	Code No. P2122, P2123	P.13A-908, P.13A-918
				Depress the accelerator pedal gradually	Increases in response to the pedal depression stroke		
				Depress the accelerator pedal fully	4,000 mV or more		
APP sensor (sub)	BF	Accelerator pedal position sensor (sub)	Ignition switch: "ON"	Release the accelerator pedal	9– 19%	Code No. P2127, P2128	P.13A-925, P.13A-935
				Depress the accelerator pedal gradually	Increases in response to the pedal depression stroke		
				Depress the accelerator pedal fully	74% or more		
APP sensor (sub)	12	Accelerator pedal position sensor (sub)	Ignition switch: "ON"	Release the accelerator pedal	435 – 1,035 mV	Code No. P2127, P2128	P.13A-967, P.13A-969
				Depress the accelerator pedal gradually	Increases in response to the pedal depression stroke		
				Depress the accelerator pedal fully	3,600 mV or more		

M.U.T.-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
Barometric pressure sensor	BB	Barometric pressure sensor	Ignition switch: "ON"	Engine stopped [At altitude of 0 m (0 ft.)]	101 kPa (29.8 in.Hg)	Code No. P2228, P2229	P.13A-967, P.13A-969
				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)		
Brake light switch	74	Brake light switch	Ignition switch: "ON"	Depress the brake pedal fully	ON	–	–
				Release the brake pedal	OFF		
Calculated load value	73	Calculated load value	Engine: warming up	Engine: idling	10% – 30%	–	–
				2,500 r/min	10% – 30%		
Closed throttle position switch	84	Closed throttle position switch	Ignition switch: "ON"	Depress the accelerator pedal fully	ON	–	–
				Release the accelerator pedal	OFF		
Cranking signal	79	Cranking signal (ignition switch-ST)	Ignition switch: "ON"	Engine: stopped	OFF	Procedure No. 30	P.13A-1100
				Engine: cranking	ON		

M.U.T.-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
Crankshaft position sensor	2	Crankshaft position sensor	• Engine: cranking • Tachometer: connected		Engine speeds displayed on the scan tool and tachometer are identical.	Code No.P0335	P.13A-553
			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)	600 – 800 r/ min		
ECT sensor	6	Engine coolant temperature sensor	Ignition switch: "ON" or with engine running	Engine coolant temperature is –20°C (–4° F)	–20°C (–4°F)	Code No. P0116, P0117, P0118	P.13A-217, P.13A-226, P.13A-233
				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)		
Target EGR step motor	BA	Target EGR valve (stepper motor)	• The target duty ratio of the EGR valve driving is shown. • "0%" means "fully closed EGR valve" and "100%" means "fully opened EGR valve".		0 – 100% (Display range)	–	–

M.U.T.-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
EGR step motor	31	EGR valve (stepper motor)	• Engine coolant temperature: 80 – 95°C (176 – 203°F) • Lights, electric cooling fan and all accessories: "OFF"*4 • Transaxle: "P" range	Engine is idling	2 – 8 Step	Code No. P0403	P.13A-590
				2,500 r/min	2 – 8 Step		
Engine control relay	95	Engine control relay	Ignition switch: "ON"		ON	–	–
ETV relay	96	Throttle actuator control motor relay	Ignition switch: "ON"		ON	–	–
EVAP. emission purge SOL. duty	49	Evaporative emission purge solenoid duty	Engine: warming up with Open loop drive condition, without EVAP leak monitor		1% or more	–	–
Fuel level gauge	51	Fuel level gauge	Ignition switch: "ON" • The residual fuel amount in the tank is shown. • "0%" means "Empty" and "100%" means "Full".		0 – 100% (Display range)	–	–
Fuel pump relay	97	Fuel pump relay	Ignition switch: "ON"		OFF	–	–
			Engine:cranking		ON		
Fuel system status (bank 1)	105	Cylinder 1, 4 fuel control system status (bank 1)	Engine: warming up	2,500 r/min	CL: Using O2S	–	–
				When engine is suddenly revved	OL: DRV condition		
Fuel system status (bank 2)	106	Cylinder 2, 3 fuel control system status (bank 2)	Engine: warming up	2,500 r/min	CL: Using O2S	–	–
				When engine is suddenly revved	OL: DRV condition		

M.U.T.-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
Fuel tank differential PRS. SNSR	52	Fuel tank differential pressure sensor	• Ignition switch: "ON" • Fuel cap removal		1,200 – 3,800 mV	–	–
Fuel tank temperature sensor	53	Fuel tank temperature sensor	• In cooled state • Ignition switch: "ON"		Approximately the same as the outdoor temperature	Code No. P0181, P0182, P0183	P.13A-439, P.13A-451, P.13A-457
Ignition switch	85	Ignition switch (IG1)	Ignition switch: "ON"		ON	–	–
Injectors	17	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 – 13 ms		
		Injectors*3	• Engine coolant temperature: 80 – 95°C (176 – 203°F) • Lights, electric cooling fan and all accessories: "OFF" • Transaxle: "P" range	Engine is idling	1.3 – 3.3 ms		
				2,500 r/min	1.0 – 3.0 ms		
				When engine is suddenly revved	Increases		

M.U.T.-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
Intake air temperature sensor	5	Intake air temperature sensor	Ignition switch: "ON" or with engine running	Intake air temperature is –20°C (–4° F)	–20°C (–4° F)	Code No. P0111, P0112, P0113	P.13A-191, P.13A-200, P.13A-207
				Intake air temperature is 0°C (32°F)	0°C (32°F)		
				Intake air temperature is 20°C (68°F)	20°C (68°F)		
				Intake air temperature is 40°C (104°F)	40°C (104°F)		
				Intake air temperature is 80°C (176°F)	80°C (176°F)		
ISC learned value (A/C OFF)	19	Idle speed control learned value (at A/C OFF)	Ignition switch: "ON" • The learning value is shown, which compensates the idle speed control throttle opening degree (the throttle valve opening degree). • " –128 Step" means "the fully closed side" and "128 Step" means "the fully open side".		–128 to 128 Step (Display range)	–	–
ISC learned value (A/C ON)	20	Idle speed control learned value (at A/C ON)	Ignition switch: "ON" • When A/C is in "ON" position, the learning value is shown, which compensates the idle speed control throttle opening degree (the throttle valve opening degree). • "-128 Step" means "the fully closed side" and "128 Step" means "the fully open side".		–128 to 128 Step (Display range)	–	–
Knock retard	32	Knock retard	Engine: warming up, sudden racing		According to acceleration, knock retard is increased.	–	–

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M.U.T.-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
Learned knock retard	33	Knock control learned value	Ignition switch: "ON" • The learning value is shown, which compensates the ignition time based on the knock sensor. • "0%" means "retard angle" and "100%" means "advance angle".		0 – 100 % (Display range)	–	–
Long term fuel trim (bank 1)	26	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	P.13A-412, P.13A-420
Long term fuel trim (bank 2)	27	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	P.13A-425, P.13A-433
MAP sensor	8	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	P.13A-156, P.13A-170, P.13A-182
				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		
Normally closed brake switch	89	Normally closed brake switch	Ignition switch: "ON"	Depress the brake pedal	OFF	–	–
				Release the brake pedal	ON		

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M.U.T.-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
Oil control valve (bank 1)	98	Engine oil control valve	Engine: warming up	Engine is idling	OFF	–	–
				4,500 r/min	ON		
Oxygen sensor (bank1 sensor1)	AC	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.	0.2V or less → 0.6 – 1.0V (After several seconds have elapsed)	Code No. P0131, P0132, P0133, P0134, P2195	P.13A-278, P.13A-295, P.13A-300, P.13A-306, P.13A-961
				When engine is suddenly raced	0.6 – 1.0V		
			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	Voltage changes repeatedly between 0.4V or less and 0.6 –1.0V.		
				2,500 r/min			
Oxygen sensor (bank1 sensor2)	AD	Cylinder 1, 4 heated oxygen sensor (rear)	Engine: warming up	Transaxle: "L" range	0 and 0.6 – 1.0V	Code No. P0137, P0138, P0139, P0140	P.13A-315, P.13A-332, P.13A-337, P.13A-341
				Drive with wide open throttle			
				Engine: 3,500 r/min or more			

M.U.T.-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
Oxygen sensor (bank2 sensor1)	AE	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.	0.2V or less → 0.6 – 1.0V (After several seconds have elapsed)	Code No. P0151, P0152, P0153, P0154, P2197	P.13A-345, P.13A-362, P.13A-367, P.13A-373, P.13A-964
				When engine is suddenly raced	0.6 – 1.0V		
			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	Voltage changes repeatedly between 0.4V or less and 0.6 – 1.0V.		
				2,500 r/min			
Oxygen sensor (bank2 sensor2)	AF	Cylinder 2, 3 heated oxygen sensor (rear)	Engine: warming up	Transaxle: "L" range	0 and 0.6 – 1.0V	Code No. P0157, P0158, P0159, P0160	P.13A-382, P.13A-399, P.13A-404, P.13A-408
				Drive with wide open throttle			
				Engine: 3,500 r/min or more			
Power steering switch	83	Power steering pressure switch	Engine: idling	Steering wheel stationary	OFF	Code No.P0551	P.13A-790
				Steering wheel turning	ON		
Power supply voltage	1	Power supply voltage	Ignition switch: "ON"		Battery positive voltage	Procedure No. 28	P.13A-1075
Radiator fan control relay (high)	100	Radiator fan relay, condenser fan relay	Ignition switch: "ON"		OFF	–	–
			Carry out the actuator test to revolve the fan at high speed.		ON		
Radiator fan control relay (low)	101	Fan control relay	Ignition switch: "ON"		OFF	–	–
			Carry out the actuator test to revolve the fan at low speed.		ON		

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M.U.T.-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
Relative TP sensor	BC	Relative throttle position sensor	• Remove the intake air hose at the throttle body • Disconnect the throttle position sensor connector, and then connect terminals numbers No. 3, No. 4, No. 5 and No. 6 with the use of the special tool: MB991658. • Ignition switch: "ON"	Fully close the throttle valve with your finger	0–5%	–	–
				Fully open the throttle valve with your finger	88% or more		
Short term fuel trim (bank 1)	28	Cylinder 1, 4 short-term fuel trim	Engine: warming up, 2,500 r/min without any load (during closed loop)		– 25 to 25%	Code No. P0171, P0172	P.13A-412, P.13A-420
Short term fuel trim (bank 2)	29	Cylinder 2, 3 short-term fuel trim	Engine: warming up, 2,500 r/min without any load (during closed loop)		– 25 to 25%	Code No. P0174, P0175	P.13A-425, P.13A-433
Spark advance	16	Ignition timing advance	• Engine: warming up • Timing light is set (to check actual ignition timing)	Engine is idling	2 – 18° CA (BTDC)	–	–
				2,500 r/min	28 – 48° CA (BTDC)		
Target ETV value	59	Throttle actuator control motor target value	Engine: warming up • The target opening degree of the throttle valve is shown. • "0 V" means "fully closed throttle valve" and "5 V" means "fully opened throttle valve".		0 – 5 V (Display range)	–	–

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M.U.T.-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
Target idle speed	3	Target idle speed	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)	600 – 800 r/min		
Throttle actuator	58	Throttle actuator control motor	Engine: warming up • The target opening degree of the throttle valve is shown. • "0%" means "fully closed throttle valve" and "100%" means "fully opened throttle valve".		0 – 100% (Display range)	–	–
TP sensor(main)	AB	Throttle position sensor (main)	• Remove the intake air hose at the throttle body • Disconnect the throttle position sensor connector, and then connect terminals numbers No. 3, No. 4, No. 5 and No. 6 with the use of the special tool: MB991658. • Ignition switch: "ON"	Fully close the throttle valve with your finger	5 – 15%	Code No. P0122, P0123	P.13A-244, P.13A-255
				Fully open the throttle valve with your finger	80% or more		

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M.U.T.-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
TP sensor(main)	13	Throttle position sensor (main)	• Remove the intake air hose at the throttle body • 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. • Ignition switch: "ON"	Fully close the throttle valve with your finger	300 – 700 mV	Code No. P0122, P0123	P.13A-244, P.13A-255
				Fully open the throttle valve with your finger	4,000 mV or more		
			Engine: warming up, idling	No load	500 – 660 mV		
				A/C switch: "OFF" → "ON"	Voltage varies		
				Shift lever: "N" → "D"			
TP sensor (main) learned value	14	Throttle position sensor (main) mid opening learning value	This item shows the throttle valve opening learning value when the vehicle enters into the limp home mode.			–	–

M.U.T.-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
TP sensor(sub)	BD	Throttle position sensor (sub)	• Remove the intake air hose at the throttle body • Disconnect the throttle position sensor connector, and then connect terminals numbers No. 3, No. 4, No. 5 and No. 6 with the use of the special tool: MB991658. • Ignition switch: "ON"	Fully close the throttle valve with your finger	45 – 55%	Code No. P0222, P0223	P.13A-508, P.13A-519
				Fully open the throttle valve with your finger	80% or more		
TP sensor (sub)	15	Throttle position sensor (sub)	• Remove the intake air hose at the throttle body • 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. • Ignition switch: "ON"	Fully close the throttle valve with your finger	2,200 – 2,800 mV	Code No. P0222, P0223	P.13A-508, P.13A-519
				Fully open the throttle valve with your finger	4,600 mV or more		

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M.U.T.-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT	NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
Vehicle speed	4	Vehicle speed	Drive at 40 km/h (25 mph).	Approximately 40 km/h (25 mph)	–	–

GENERAL SCAN TOOL (GST) MODE 01 REFERENCE TABLE

M1131156000102

The purpose of this service of to allow access to current emission-related data values, including analogue inputs and outputs, digital inputs and outputs, and system status information.
The request for information includes a parameter identification (PID) value that indicates to the on-board system the specific information requested.
The PCM will respond to this message by transmitting the requested data value last determined by the system. All data values returned for sensor readings will be actual readings, not default or substitute values used by the system because of a fault with that sensor.

NOTE: GST MODE 01 can be accessed through the use of a general scan tool.

PARAMETER IDENTIFICATION (PID)	DESCRIPTION	COMMON EXAMPLE OF GENERAL SCAN TOOL DISPLAY	INSPECTION CONDITION	NORMAL CONDITION
01	Number of emission-related DTCs and MIL status	DTC and MIL status:	–	
	Number of DTCs stored in this ECU	DTC_CNT: xxxd		
	Malfunction Indicator Lamp (MIL) status	MIL: OFF or ON		
	Supported tests which are continuous	Support status of continuous monitors:		
	Misfire monitoring	MIS_SUP: YES		
	Fuel system monitoring	FUEL_SUP: YES		
	Comprehensive component monitoring	CCM_SUP: YES		
	Status of continuous monitoring tests since DTC cleared	Completion status of continuous monitors since DTC cleared:		
	Misfire monitoring	MIS_RDY: YES or NO		
	Fuel system monitoring	FUEL_RDY: YES or NO		
	Comprehensive component monitoring	CCM_RDY: YES or NO		
	Supported tests run at least once per trip	Support status of non-continuous monitors:		
	Catalyst monitoring	CAT_SUP: YES		

PARAMETER IDENTIFICATION (PID)	DESCRIPTION	COMMON EXAMPLE OF GENERAL SCAN TOOL DISPLAY	INSPECTION CONDITION	NORMAL CONDITION
	Heated catalyst monitoring	HCAT_SUP: NO		
	Evaporative system monitoring	EVAP_SUP: YES		
	Secondary air system monitoring	AIR_SUP: NO		
01	A/C system refrigerant monitoring	ACRF_SUP: NO	–	
	Oxygen sensor monitoring	O2S_SUP: YES		
	Oxygen sensor heater monitoring	HTR_SUP: YES		
	EGR system monitoring	EGR_SUP: YES		
	Status of tests run at least once per trip	Completion status of non-continuous monitors since DTC cleared:		
	Catalyst monitoring	CAT_RDY: YES or NO		
	Heated catalyst monitoring	HCAT_RDY: YES		
	Evaporative system monitoring	EVAP_RDY: YES or NO		
	Secondary air system monitoring	AIR_RDY: YES		
	A/C system refrigerant monitoring	ACRF_RDY: YES		
	Oxygen sensor monitoring	O2S_RDY: YES or NO		
	Oxygen sensor heater monitoring	HTR_RDY: YES or NO		
	EGR system monitoring	EGR_RDY: YES or NO		
03	Fuel system 1 status	FUELSYS1: OL/CL/OL-Drive/OL-Fault/CL-Fault	See M.U.T.-III item No. 105.	
	Fuel system 2 status	FUELSYS2: OL/CL/OL-Drive/OL-Fault/CL-Fault	See M.U.T.-III item No. 106.	
04	Calculated LOAD Value	LOAD_PCT: xxx.x%	See M.U.T.-III item No. 73.	
05	Engine Coolant Temperature	ECT: xxx°C (xxx°F)	See M.U.T.-III item No. 6.	
06	Short Term Fuel Trim–Bank 1	SHRTFT1: xxx.x%	See M.U.T.-III item No. 28.	
07	Long Term Fuel Trim–Bank 1	LONGFT1: xxx.x%	See M.U.T.-III item No. 26.	
08	Short Term Fuel Trim–Bank 2	SHRTFT2: xxx.x%	See M.U.T.-III item No. 29.	

PARAMETER IDENTIFICATION (PID)	DESCRIPTION	COMMON EXAMPLE OF GENERAL SCAN TOOL DISPLAY	INSPECTION CONDITION	NORMAL CONDITION
09	Long Term Fuel Trim–Bank 2	LONGFT2: xxx.x%	See M.U.T.-III item No. 27.	
0B	Intake Manifold Absolute Pressure	MAP: xxx kPa (xx.x inHg)	See M.U.T.-III item No. 8.	
0C	Engine RPM	RPM: xxxxx min $^{-1}$	See M.U.T.-III item No. 2.	
0D	Vehicle Speed Sensor	VSS: xxx km/h (xxx mph)	See M.U.T.-III item No. 4.	
0E	Ignition Timing Advance for #1 Cylinder	SPARKADV: xx°	See M.U.T.-III item No. 16.	
0F	Intake Air Temperature	IAT: xxx°C (xxx°F)	See M.U.T.-III item No. 5.	
10	Air Flow Rate from Mass Air Flow Sensor	MAF: xxx.xx g/s (xxxx.x lb/min)	See M.U.T.-III item No. AA.	
11	Absolute Throttle Position	TP: xxx.x%	See M.U.T.-III item No. AB.	
13	Location of Oxygen Sensor	O2SLOC: OxSxx	• Ignition switch: "ON"	O2S11 / O2S12 / O2S21 / O2S22
14	Bank 1 – Sensor 1	O2S11: x.xxx V	See M.U.T.-III item No. AC.	
		SHRTFT11: xxx.x%	Engine: warming up, 2,500 r/min without any load (during closed loop)	–25 to 25%
15	Bank 1 – Sensor 2	O2S12: x.xxx V	See M.U.T.-III item No. AD.	
18	Bank 2 – Sensor 1	O2S21: x.xxx V	See M.U.T.-III item No. AE.	
		SHRTFT21: xxx.x%	Engine: warming up, 2,500 r/min without any load (during closed loop)	–25 to 25%
19	Bank 2 – Sensor 2	O2S22: x.xxx V	See M.U.T.-III item No. AF.	
1C	OBD requirements to which vehicle is designed	OBDSUP: OBD II	Ignition switch: "ON"	OBD II
1F	Time Since Engine Start	RUNTM: xxxxx sec.	–	
21	Distance Travelled While MIL is Active	MIL DIST: xxxxx km (xxxxx miles)	–	
2C	Commanded EGR	EGR_PCT: xxx.x%	See M.U.T.-III item No. BA.	

PARAMETER IDENTIFICATION (PID)	DESCRIPTION	COMMON EXAMPLE OF GENERAL SCAN TOOL DISPLAY	INSPECTION CONDITION	NORMAL CONDITION
2E	Commanded Evaporative Purge	EVAP_PCT: xxx.x%	See M.U.T.-III item No. 49.	
2F	Fuel Level Input	FLI: xxx.x%	See M.U.T.-III item No. 51.	
30	Number of warm-ups since diagnostic trouble codes cleared	WARM_UPS: xxx	–	
31	Distance since diagnostic trouble codes cleared	CLR_DIST: xxxxx km (xxxxx miles)	–	
32	Evap System Vapor Pressure	EVAP_VP: xxxx.xx Pa (xx.xxx in H2O)	• Ignition switch: "ON" • Fuel cap removal	–3.3 to 3.3 kPa (–13.4 to 13.4 in.H2O)
33	Barometric Pressure	BARO: xxx kPa (xx.x inHg)	See M.U.T.-III item No. BB.	

PARAMETER IDENTIFICATION (PID)	DESCRIPTION	COMMON EXAMPLE OF GENERAL SCAN TOOL DISPLAY	INSPECTION CONDITION	NORMAL CONDITION
41	Monitor status this driving cycle		–	
	Enable status of continuous monitors this monitoring cycle:	Enable status of continuous monitors this monitoring cycle: NO means disable for rest of this monitoring cycle or not supported in PID 01, YES means enable for this monitoring cycle.		
	Misfire monitoring	MIS_ENA: NO or YES		
	Fuel system monitoring	FUEL_ENA: NO or YES		
	Comprehensive component monitoring	CCM_ENA: YES		
	Completion status of continuous monitors this monitoring cycle:	Completion status of continuous monitors this monitoring cycle:		
	Misfire monitoring	MIS_CMPL: YES or NO		
	Fuel system monitoring	FUEL_CMPL: YES or NO		
	Comprehensive component monitoring	CCM_CMPL: YES or NO		
	Enable status of non-continuous monitors this monitoring cycle:	Enable status of non-continuous monitors this monitoring cycle:		
	Catalyst monitoring	CAT_ENA: YES or NO		
	Heated catalyst monitoring	HCAT_ENA: NO		
	Evaporative system monitoring	EVAP_ENA: YES or NO		
	Secondary air system monitoring	AIR_ENA: YES or NO		
	A/C system refrigerant monitoring	ACRF_ENA: YES or NO		
	Oxygen sensor monitoring	O2S_ENA: YES or NO		
	Oxygen sensor heater monitoring	HTR_ENA: YES or NO		
	EGR system monitoring	EGR_ENA: YES or NO		
	Completion status of non-continuous monitors this monitoring cycle:	Completion status of non-continuous monitors this monitoring cycle:		
	Catalyst monitoring	CAT_CMPL: YES or NO		

PARAMETER IDENTIFICATION (PID)	DESCRIPTION	COMMON EXAMPLE OF GENERAL SCAN TOOL DISPLAY	INSPECTION CONDITION	NORMAL CONDITION
41	Evaporative system monitoring	EVAP_CMPL: YES or NO	–	
	Oxygen sensor monitoring	O2S_CMPL: YES or NO		
	Oxygen sensor heater monitoring	HTR_CMPL: YES or NO		
	EGR system monitoring	EGR_CMPL: YES or NO		
42	Control module voltage	VPWR: xx.xxx V	See M.U.T.-III item No.1.	
43	Absolute Load Value	LOAD_ABS: xxx.x%	See M.U.T.-III item No.72.	
44	Commanded Equivalence Ratio	EQ_RAT: x.xxx	Engine: running • "1" means "stoichiometric air fuel ratio". The smaller air fuel ratio, the rich return. The more air fuel ratio, the lean return.	0 – 1.999 (Display range)
45	Relative Throttle Position	TP_R: xxx.x%	See M.U.T.-III item No. BC.	
46	Ambient air temperature	AAT: xxx°C (xxx°F)	–	
47	Absolute Throttle Position B	TP_B: xxx.x%	See M.U.T.-III item No. BD.	
49	Accelerator Pedal Position D	APP_D: xxx.x%	See M.U.T.-III item No. BE.	
4A	Accelerator Pedal Position E	APP_E: xxx.x%	See M.U.T.-III item No. BF.	
4C	Commanded Throttle Actuator Control	TAC_PCT: xxx.x%	See M.U.T.-III item No.58.	

ACTUATOR TEST REFERENCE TABLE

M1131152501573

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

M.U.T.-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	DRIVE CONTENTS	INSPECTION REQUIRMENT	NORMAL CONDITION	INSPECTION PROCEDURE NO.	PEFEREC E PAGE
A/C relay	16	A/C compressor clutch relay	A/C compressor clutch relay turns from OFF to ON.	Ignition switch: "ON"	Clicks when A/C compressor clutch is driven.	Procedure No. 33	P.13A-1113
EVAP. emission purge SOL. Valve	10	Evaporative emission purge solenoid	Solenoid valve turns from OFF to ON.	Ignition switch: "ON"	Clicks when solenoid valve is driven.	Code No. P0443	P.13A-624
EVAP. emission ventilation SOL. Valve	15	Evaporative emission ventilation solenoid	Solenoid valve turns from OFF to ON.	Ignition switch: "ON"	Clicks when solenoid valve is driven.	Code No. P0446	P.13A-635
FUEL PUMP	9	Fuel pump	Fuel pump operate 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	P.13A-1086
Ignition timing 5 BTDC	11*	Basic ignition timing	Set to ignition timing adjustment mode	• Engine: idling • Connect timing light	5°BTDC	–	–
No. 1 injector	1	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	P.13A-468
No. 2 injector	2		Cut fuel to No. 2 injector			Code No. P0202	P.13A-478
No. 3 injector	3		Cut fuel to No. 3 injector			Code No. P0203	P.13A-488
No. 4 injector	4		Cut fuel to No. 4 injector			Code No. P0204	P.13A-498

M.U.T.-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	DRIVE CONTENTS	INSPECTION REQUIRMENT	NORMAL CONDITION	INSPECTION PROCEDURE NO.	PEFEREC E PAGE
Radiator fan (high)	12	Radiator fan, A/C condenser fan	Drive the fan motor	Ignition switch: "ON"	Radiator fan and A/C condenser fan rotate at high speed.	Procedure No. 27	P.13A-1072
Radiator fan (low)	13				Radiator fan and A/C condenser fan rotate.		
VVT oil control valve	17	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	P.13A-852

CHECK AT THE POWERTRAIN CONTROL MODULE (PCM)

M1131153600677

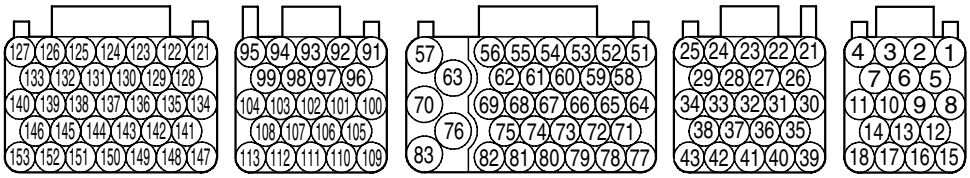
1. Disconnect the PCM connectors B-19, B-20, B-21, B-22 and B-23, and connect check harness special tool MB991923 between the PCM connectors.
2. Measure the voltage between each check harness connector terminal and check harness connector ground terminal (No. 25 or No. 29).

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



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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

TERMINAL NO.	INSPECTION ITEM	INSPECTION CONDITION (ENGINE CONDITION)		NORMAL CONDITION
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	Sensor supplied voltage	Ignition switch: "ON"		4.9 – 5.1 V
68				
23	Fuel tank differential pressure sensor	• Ignition switch: "ON" • Fuel cap removal		1.2 – 3.8 V
26	Accelerator pedal position sensor (main)	Ignition switch: "ON"	Release the accelerator pedal	0.7 – 1.4 V
			Depress the accelerator pedal fully	4.0 V or more
27	Accelerator pedal position sensor (sub)	Ignition switch: "ON"	Release the accelerator pedal	0.4 – 1.1 V
			Depress the accelerator pedal fully	3.6 V or more
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	1 V or less

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TERMINAL NO.	INSPECTION ITEM	INSPECTION CONDITION (ENGINE CONDITION)		NORMAL CONDITION
79	Cylinder 2, 3 heated oxygen sensor (front) offset voltage	Ignition switch: "ON"		0.4 – 0.6 V
80	Cylinder 1, 4 heated oxygen sensor (front) offset voltage	Ignition switch: "ON"		0.4 – 0.6 V
81	A/C compressor clutch relay	• Engine: idling • A/C switch: OFF→ ON (A/C compressor is operating)		B+→ 1 V or less as A/C clutch cycles
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		0.5 ←→ 1.4 V (changes repeatedly)
92	Cylinder 1, 4 heated oxygen sensor (front)	Engine: warming up, 2,500 r/min		0.5 ←→ 1.4 V (changes repeatedly)
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)	• Transaxle: "L" range • Drive with wide open throttle • Engine:3,500 r/min or more		0 and 1.0 – 1.5 V alternates
97	Cylinder 1, 4 heated oxygen sensor (rear)	• Transaxle: "L" range • Drive with wide open throttle • Engine:3,500 r/min or more		0 and 1.0 – 1.5 V alternates

TERMINAL NO.	INSPECTION ITEM	INSPECTION CONDITION (ENGINE CONDITION)		NORMAL CONDITION
98	Throttle position sensor (sub)	• Remove the intake air hose at the throttle body • 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. • Ignition switch: "ON"	Fully close the throttle valve with your finger	2.2 – 2.8 V
			Fully open the throttle valve with your finger	4.6 V or more
99	Throttle position sensor (main)	• Remove the intake air hose at the throttle body • 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. • Ignition switch: "ON"	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 revved.		Voltage varies
103	Crankshaft position sensor	Engine: cranking		0.4 – 4.0 V*1
		Engine: idling		2.0 – 3.0 V*1

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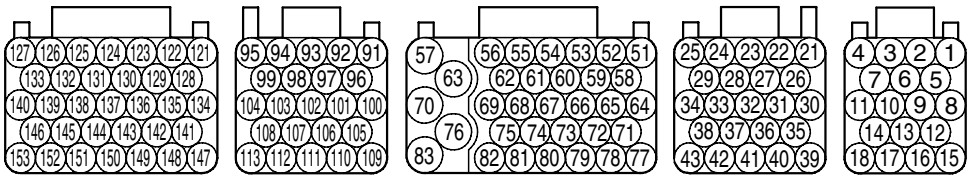
TERMINAL NO.	INSPECTION ITEM	INSPECTION CONDITION (ENGINE CONDITION)		NORMAL CONDITION
104	Camshaft position sensor	Engine: cranking		2.0 – 4.8 V*1
		Engine: idling		3.0 – 4.0 V*1
105	Cylinder 2, 3 heated oxygen sensor (rear) offset voltage	Ignition switch: "ON"		0.4 – 0.6 V
106	Cylinder 1, 4 heated oxygen sensor (rear) offset voltage	Ignition switch: "ON"		0.4 – 0.6 V
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
108	Mass airflow sensor	Engine: revving		Voltage increase in response to revving
110	Engine oil pressure switch	Engine: warming up, idling		1 V or less
		Engine: 4,500 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*1
		Engine: revving		9 – 11 V*1 → B+ (momentarily)
126	Cylinder 1, 4 heated oxygen sensor heater (front)	Engine: warming up, idling (15 seconds after starting engine)		9 – 11 V*1
		Engine: revving		9 – 11 V*1 → B+ (momentarily)
128	Engine oil control valve	Engine: warming up, idling		B+
		Engine: 4,500 r/min		1 V or less → 4.0 – 10 V*1(After a few seconds pass)

TERMINAL NO.	INSPECTION ITEM	INSPECTION CONDITION (ENGINE CONDITION)	NORMAL CONDITION
131	Generator FR terminal	• Engine: warming up, idling (radiator fan: stopped) • Headlight: OFF to ON*2 • Rear defogger switch: OFF to ON • Stop light switch: OFF to ON	Voltage drops
132	Generator G terminal	• Engine: warming up, idling (radiator fan: stopped) • Headlight: OFF to ON*2 • Rear defogger switch: OFF to ON • Stop light switch: OFF to ON	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 (–)	• Ignition switch: "ON" • Accelerator pedal: fully closed → fully opened	Decreases slightly (approximately 2 V) from battery voltage.
147	Throttle actuator control motor (+)	• Ignition switch: "ON" • Accelerator pedal: fully opened → fully closed	Decreases slightly (approximately 2 V) from battery voltage.
142	EGR valve (Stepper motor coil <A1>)	Ignition switch: "LOCK" (OFF) → "ON"	5 – 8 V*1 (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

TERMINAL NO.	INSPECTION ITEM	INSPECTION CONDITION (ENGINE CONDITION)	NORMAL CONDITION
151	Ignition coil – No. 1 (ignition power transistor)	Engine: 3,000 r/min	0.3 – 3.0 V*1
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	• Engine: warming up, idling • Suddenly depress the accelerator pedal	From 9 – 13 V*1 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



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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)]

TERMINAL NO.	INSPECTION ITEM	NORMAL CONDITION (INSPECTION CONDITION)
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)]
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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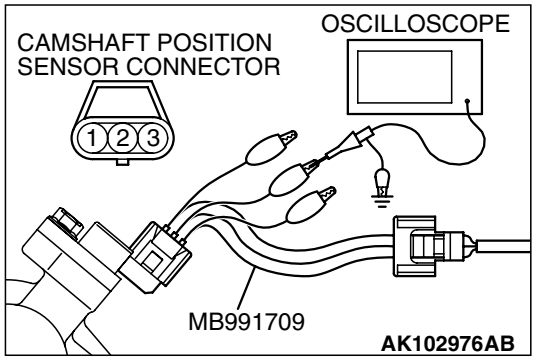
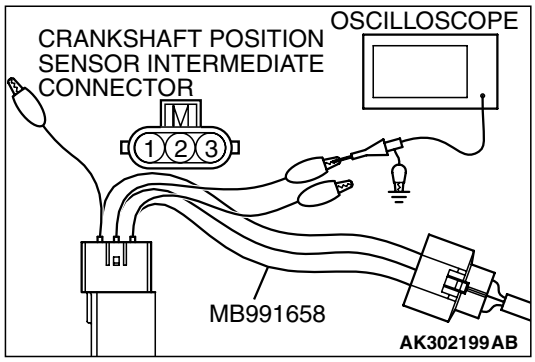
CAMSHAFT POSITION SENSOR AND CRANKSHAFT POSITION SENSOR



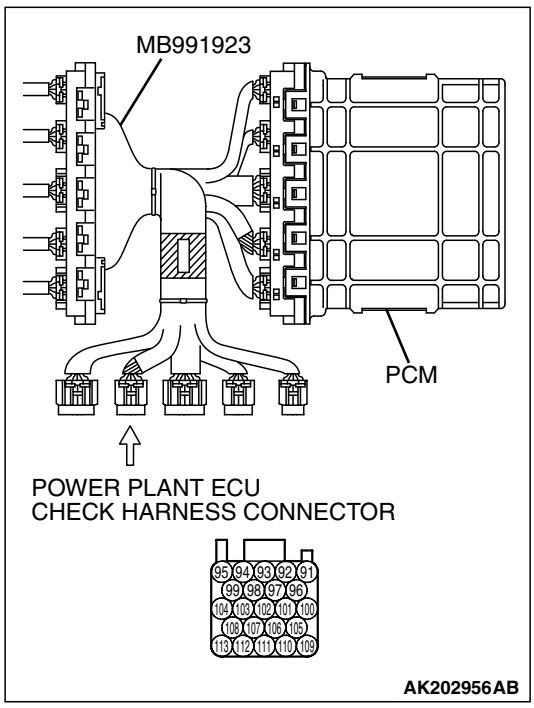


Required Special Tools:

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

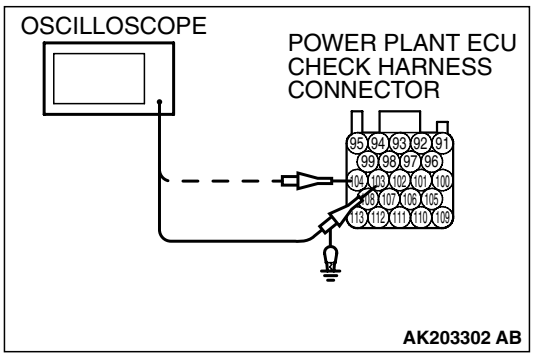
Measurement Method

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

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

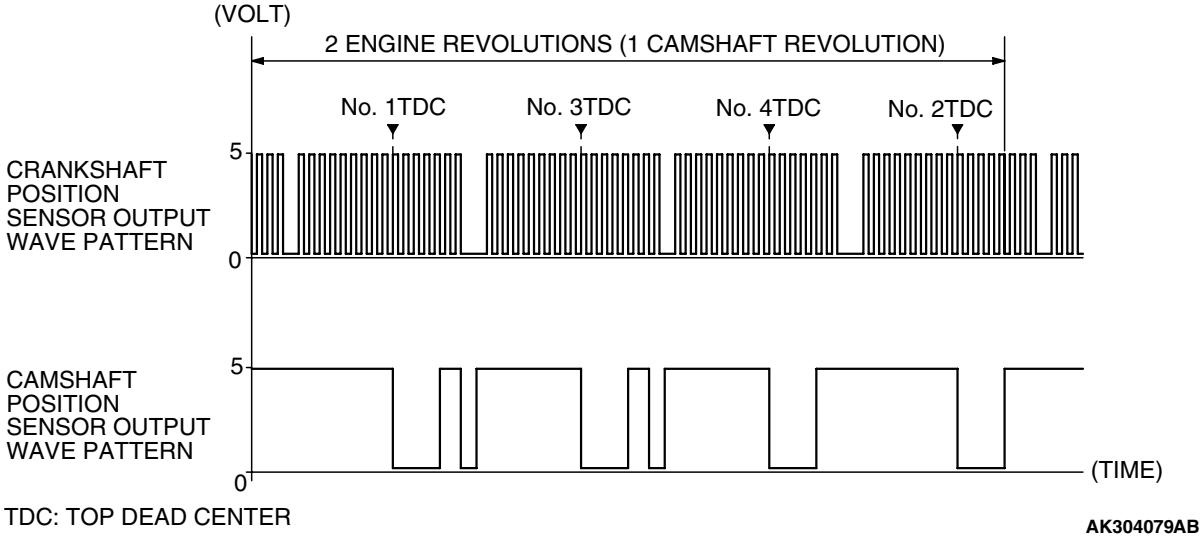


2. Connect the oscilloscope to check harness terminal No. 104. (Check the camshaft position sensor signal wave pattern.)
3. Connect the oscilloscope to check harness terminal No. 103. (Check the crankshaft position sensor signal wave pattern.)

Standard Wave Pattern

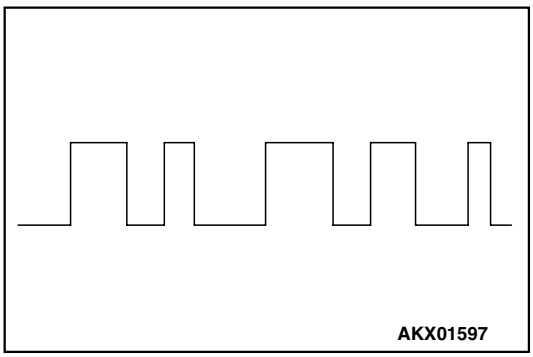
Observation condition	
Function	**Special pattern**
Pattern height	Low
Pattern selector	Display
Engine r/min	Idle speed

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.

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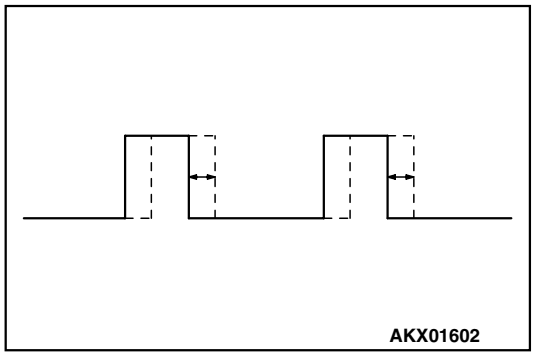


Example 2

Cause of problem

- Loose timing belt.
- Abnormality in sensor disc.

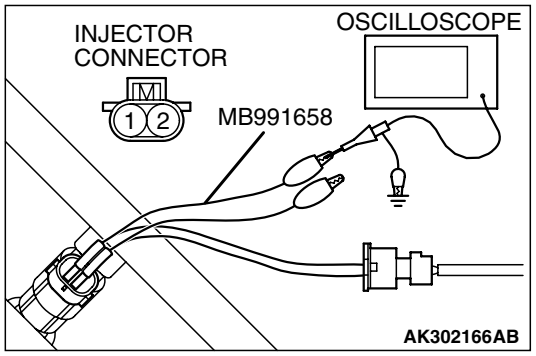
Wave pattern characteristics

- Wave pattern is displaced to the left or right.

INJECTOR

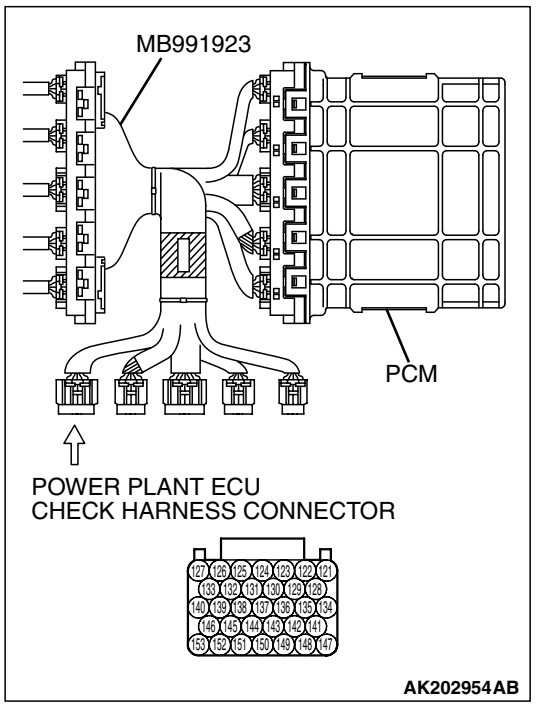
Required Special Tools:

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



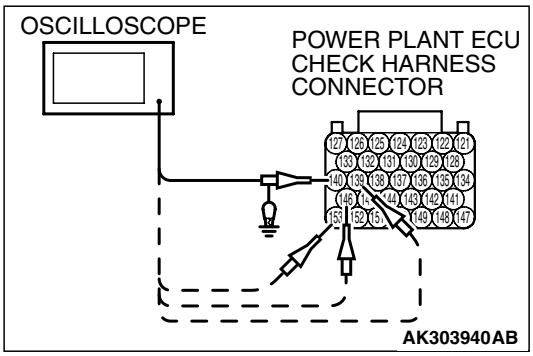
Measurement Method

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

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

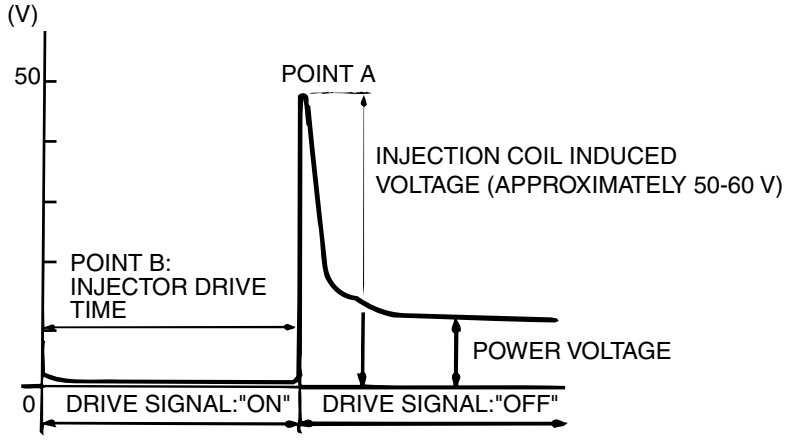


2. Connect the oscilloscope probe to each check harness connector terminal to analyze each cylinder:
   - Terminal No. 153 for the number 1 cylinder.
   - Terminal No. 146 for the number 2 cylinder.
   - Terminal No. 140 for the number 3 cylinder.
   - Terminal No. 139 for the number 4 cylinder.

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



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

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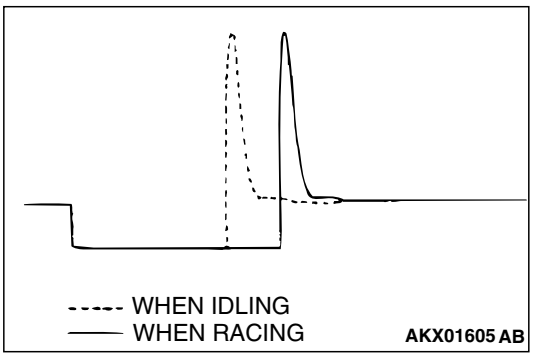
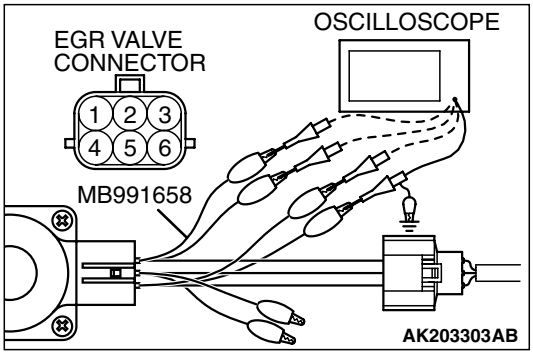


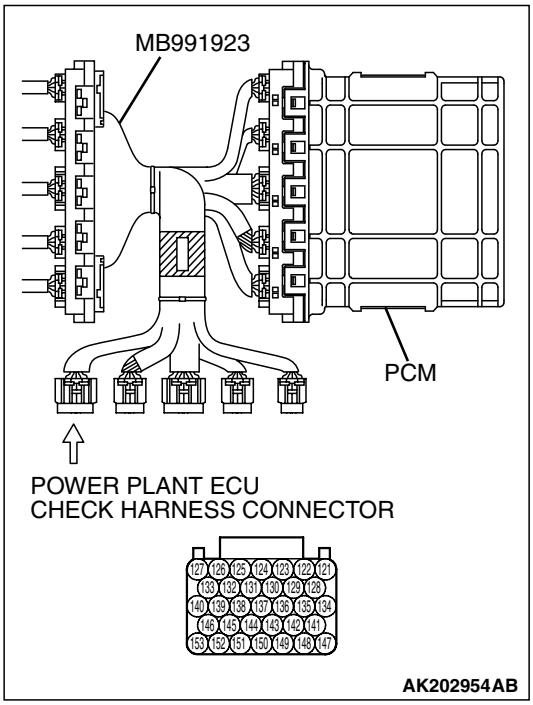
1. The injector drive time should be synchronized with the scan tool tester display.
2. When the engine is suddenly revved, the drive time will be greatly extended at first, but the drive time will soon return to original length.

EGR VALVE (STEPPER MOTOR)

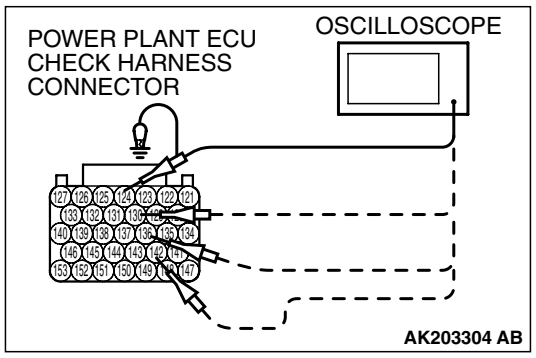
Required Special Tools:
- MB991658: Test Harness
- MB991923: Power Plant ECU Check Harness



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

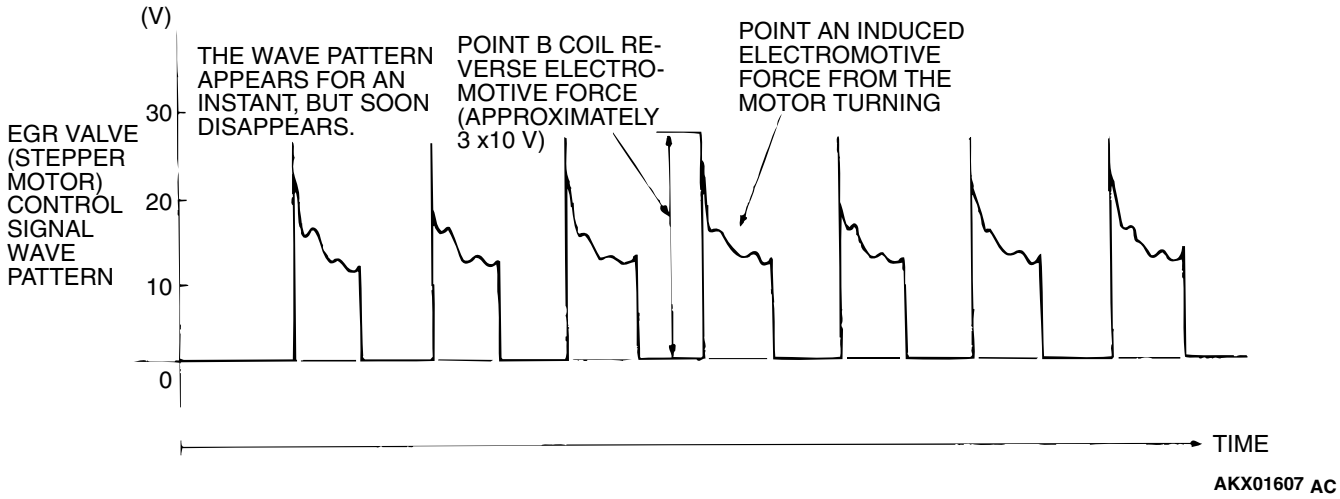


2. Connect the oscilloscope probe to check harness terminal No. 124, No. 130, No. 136 and No. 142.

Standard Wave Pattern

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

Standard wave pattern



Wave Pattern Observation Points

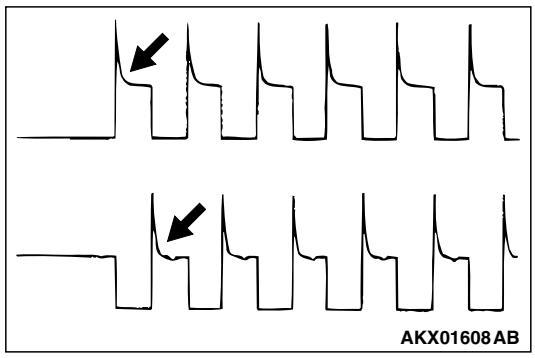
1. Check that the standard wave pattern appears when the EGR valve is operating.

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

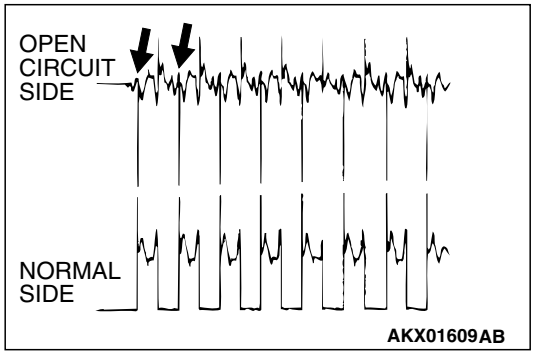
Example 1

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.

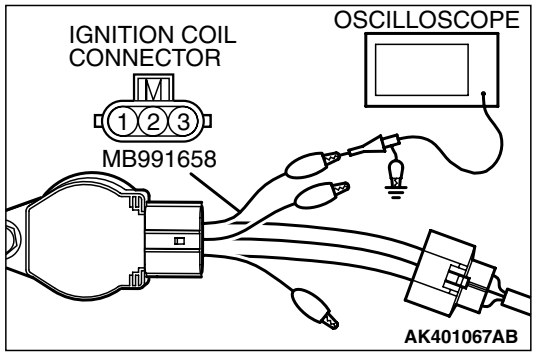
Wave pattern characteristics

- 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

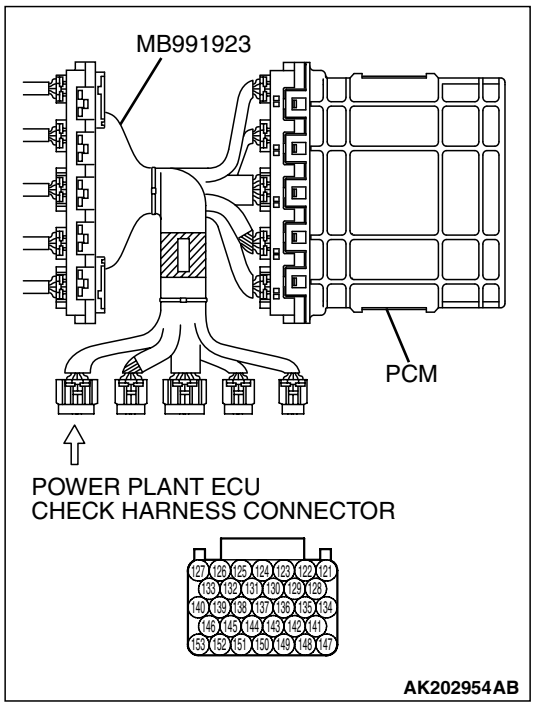
Required Special Tools:

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



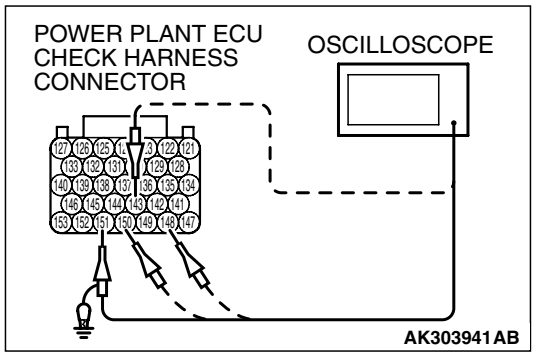
Measurement Method

1. Disconnect the ignition coil connector, and connect the test harness special tool (MB991658) between the separated connector.
2. Connect the oscilloscope probe to ignition coil connector terminal No. 3.



Alternate method

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

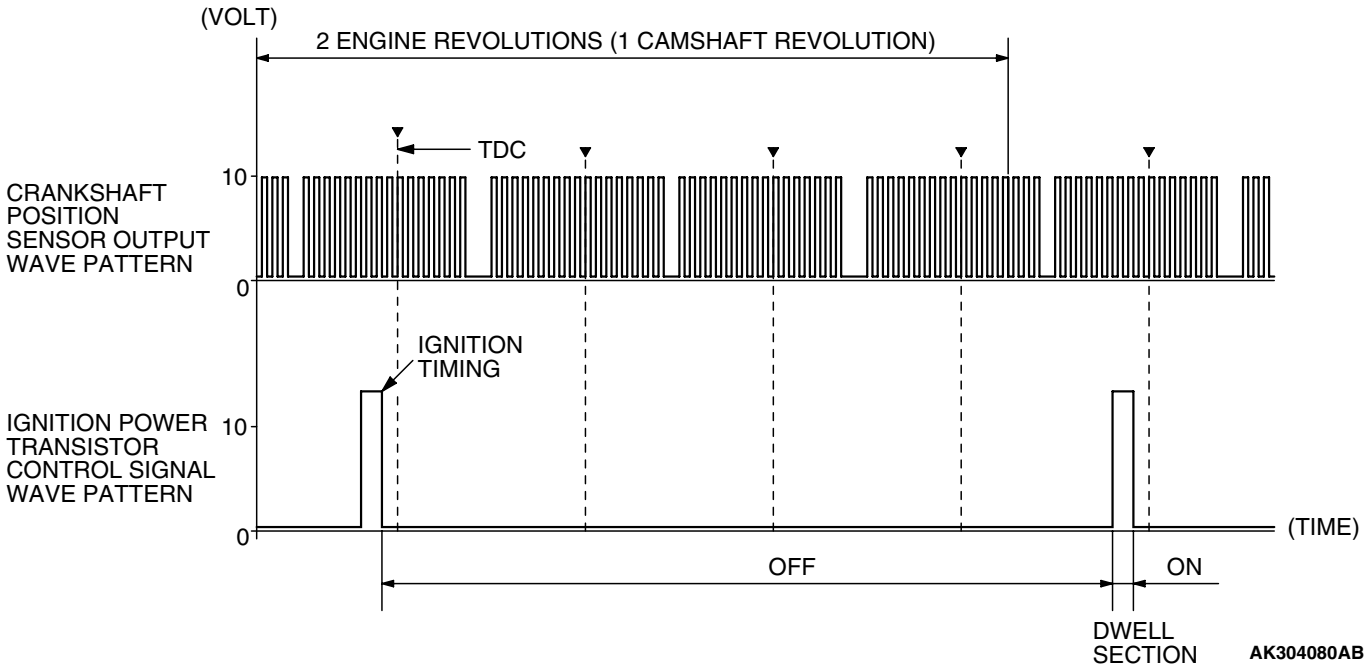


2. Connect the oscilloscope probe to each check harness connector terminal to analyze each cylinder:
   - Terminal No. 151 for the number 1 cylinder.
   - Terminal No. 143 for the number 2 cylinder.
   - Terminal No. 150 for the number 3 cylinder.
   - Terminal No. 148 for the number 4 cylinder.

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

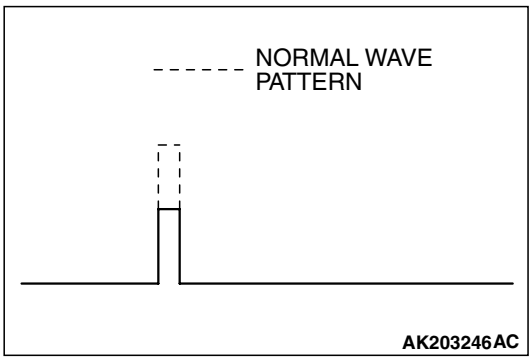
Point: The power transistor control signal (ignition timing) is advanced when the engine speed is increased.

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.



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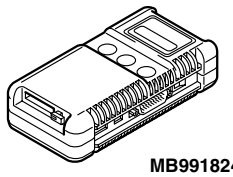
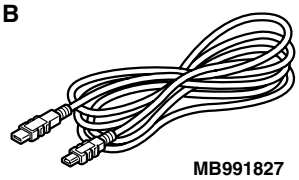
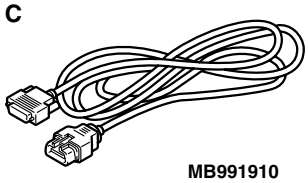
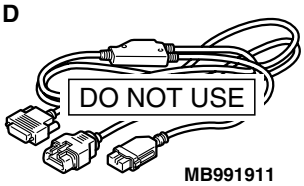
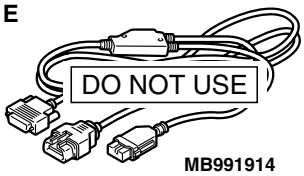
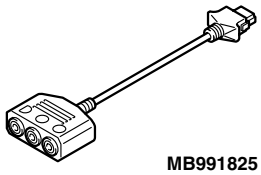
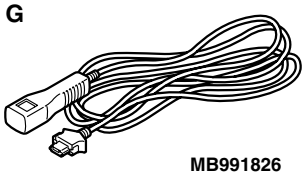
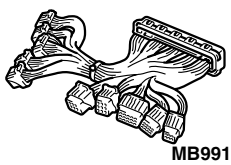
SPECIAL TOOLS

M1131000601538

TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
A  MB991824 B  MB991827 C  MB991910 D  MB991911 E  MB991914 F  MB991825 G  MB991826 MB991958	MB991958 A: MB991824 B: MB991827 C: MB991910 D: MB991911 E: MB991914 F: MB991825 G: MB991826 M.U.T.-III sub assembly A: Vehicle Communication Interface (V.C.I.) B: M.U.T.-III USB Cable C: M.U.T.-III Main Harness A (Vehicles with CAN communication system) D: M.U.T.-III Main Harness B (Vehicles without CAN communication system) E: M.U.T.-III Main Harness C (for Daimler Chrysler models only) F: M.U.T.-III Measurement Adapter G: M.U.T.-III Trigger Harness	MB991824-KIT *NOTE: G: MB991826 M.U.T.-III Trigger Harness is not necessary when pushing V.C.I. ENTER key.*	• Reading diagnostic trouble code • MFI system inspection • Measurement of fuel pressure **⚠ CAUTION** **For vehicles with CAN communication, use M.U.T.-III main harness A to send simulated vehicle speed. If you connect M.U.T.-III main harness B instead, the CAN communication does not function correctly.**
 MB991923	MB991923 Power plant ECU check harness	MD998478-01	• Inspection using an oscilloscope • Inspection of the powertrain control module (PCM) terminal voltage check

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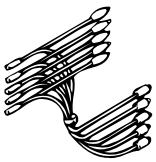
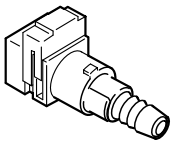
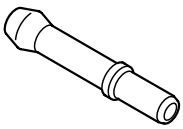
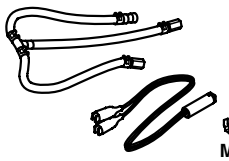
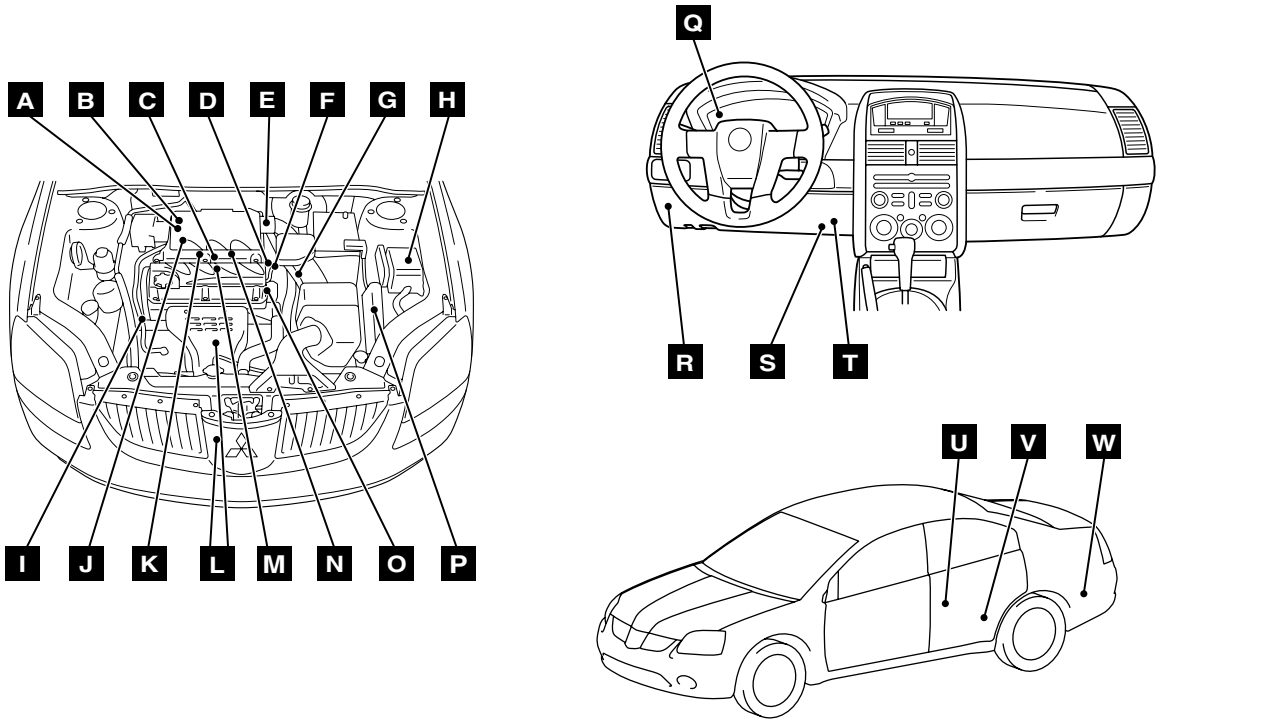
TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
	MB991709 Test harness	MB991709-01	Inspection using an oscilloscope
 MB991658	MB991658 Test harness	Tool not available	Inspection using an oscilloscope
	MD998464 Test harness (4 pin, square)	MD998464-01	Inspection of heated oxygen sensor
	MB991316 Test harness (4 pin, square)	Tool not available	Inspection of heated oxygen sensor
 MB992049	MB992049	Quick connector	• Measurement of fuel pressure
 MB992001	MB992001	Hose adaptor	• Measurement of fuel pressure
 MB991637	MB991637 Fuel pressure gauge set	Tool not available	Measurement of fuel pressure
 MD998707	MD998707	Injector test set	• Measurement of fuel pressure

ON-VEHICLE SERVICE

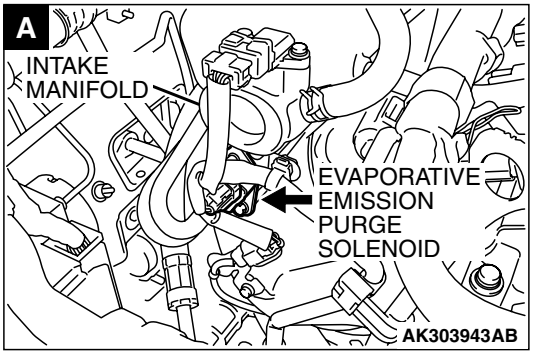
COMPONENT LOCATION

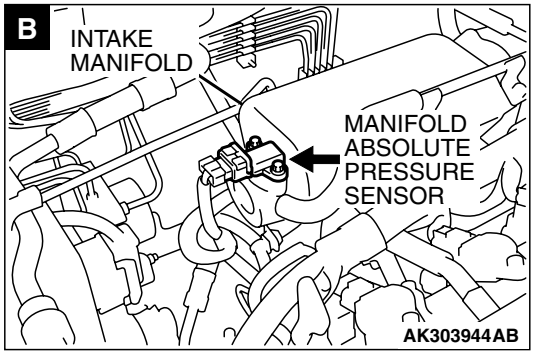
M1131002101700

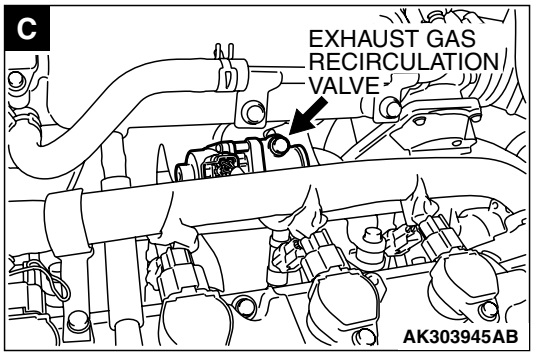
NAME	SYMBOL	NAME	SYMBOL
Accelerator pedal position sensor	S	Fuel pump relay	R
Camshaft position sensor	O	Fuel tank differential pressure sensor	U
Crankshaft position sensor	I	Fuel tank temperature sensor	V
Cylinder 1, 4 heated oxygen sensor (front)	L	Ignition coil	K
Cylinder 1, 4 heated oxygen sensor (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		

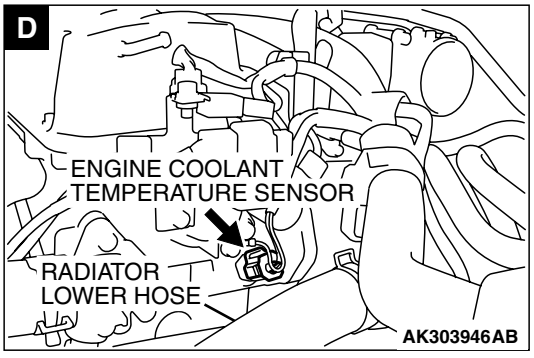


AK302225AB









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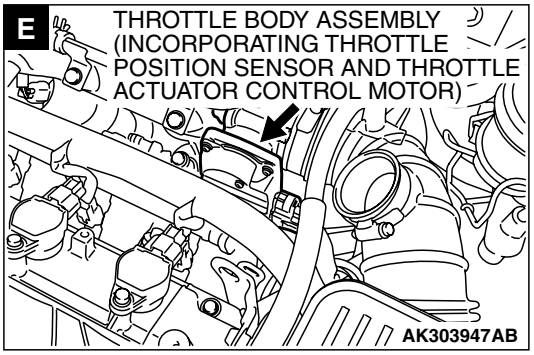
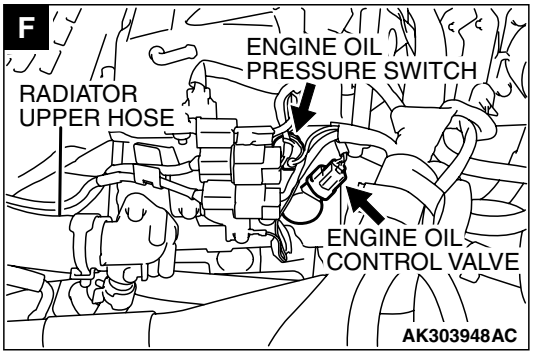
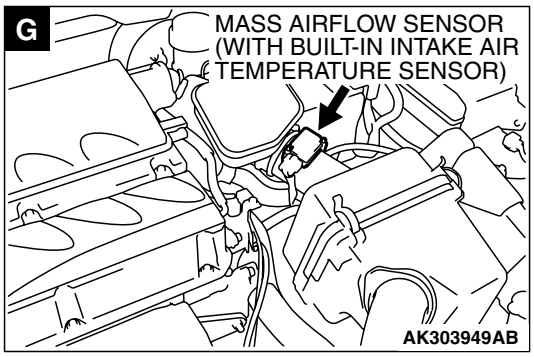
E


THROTTLE BODY ASSEMBLY
(INCORPORATING THROTTLE
POSITION SENSOR AND THROTTLE
ACTUATOR CONTROL MOTOR)
AK303947AB

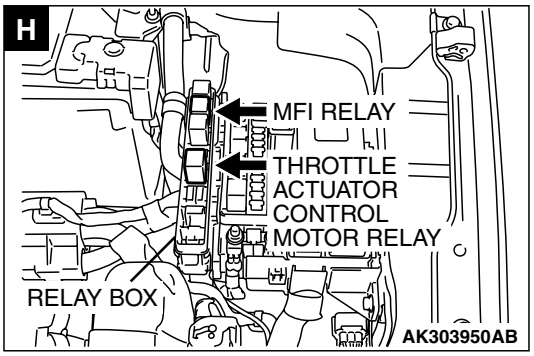
F


ENGINE OIL
PRESSURE SWITCH
RADIATOR
UPPER HOSE
ENGINE OIL
CONTROL VALVE
AK303948AC

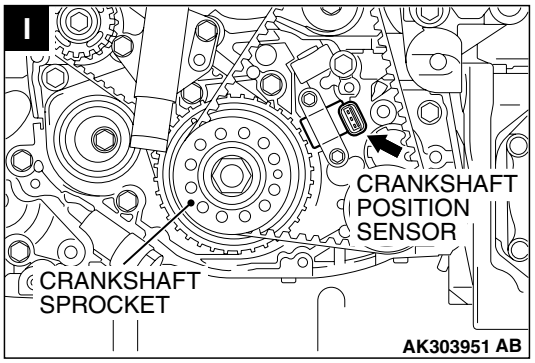
G


MASS AIRFLOW SENSOR
(WITH BUILT-IN INTAKE AIR
TEMPERATURE SENSOR)
AK303949AB

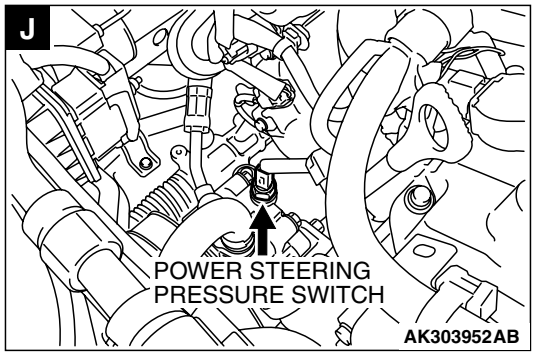
H


MFI RELAY
THROTTLE
ACTUATOR
CONTROL
MOTOR RELAY
RELAY BOX
AK303950AB

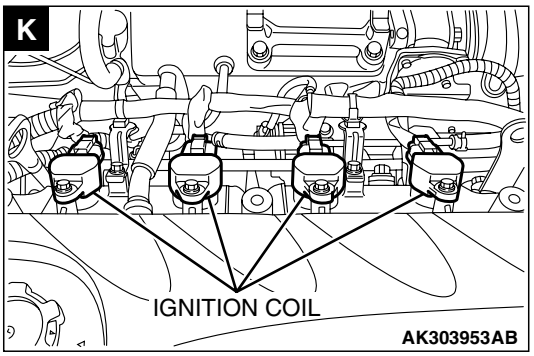
I

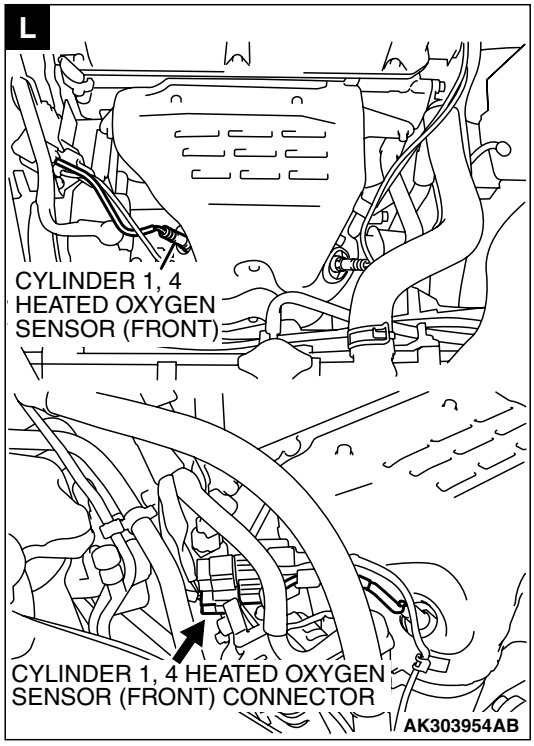

CRANKSHAFT
POSITION
SENSOR
CRANKSHAFT
SPROCKET
AK303951 AB

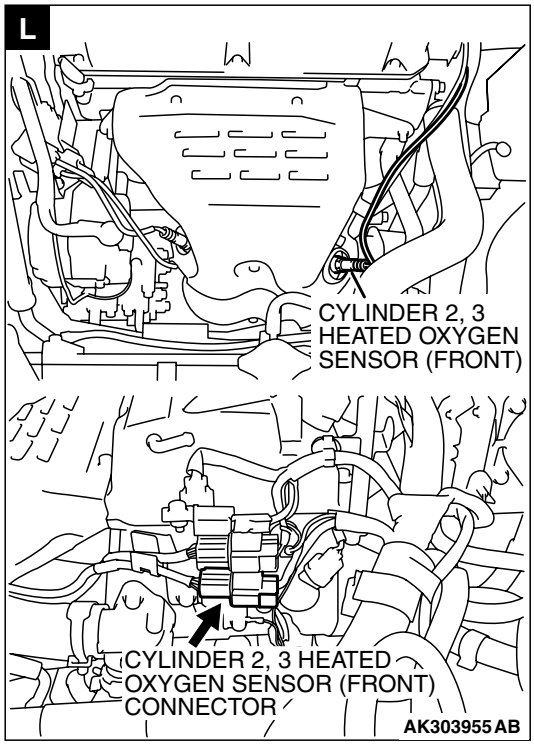
J

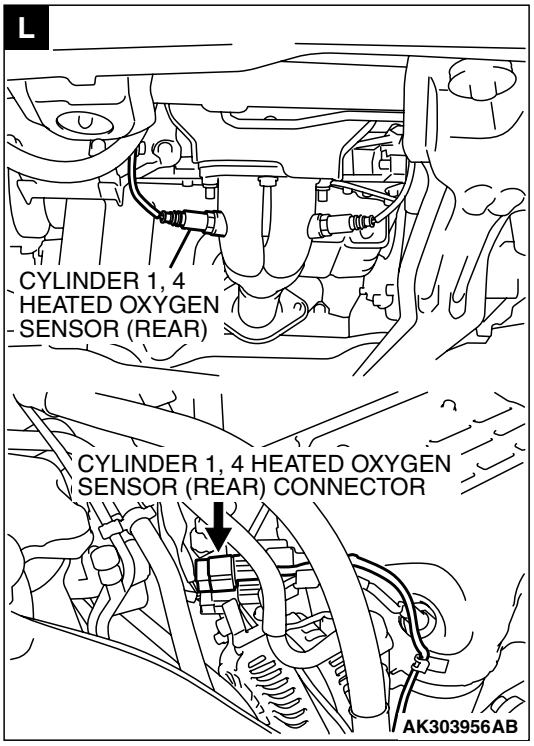

POWER STEERING
PRESSURE SWITCH
AK303952AB

K

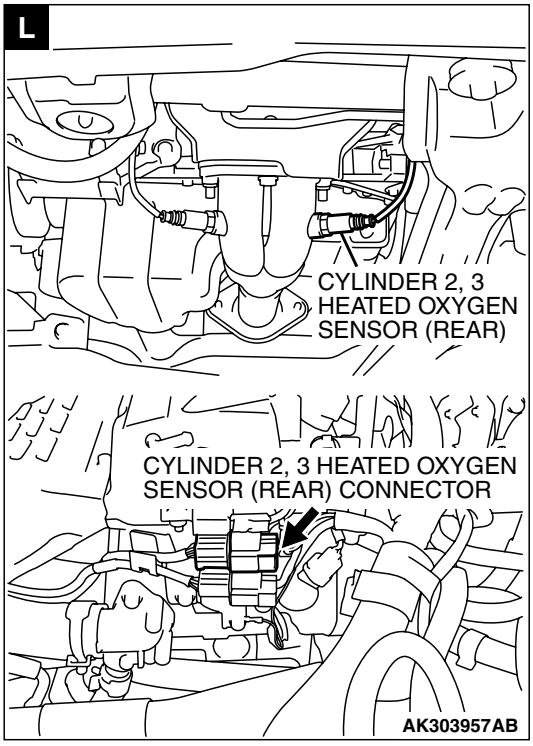

IGNITION COIL
AK303953AB


L
CYLINDER 1, 4
HEATED OXYGEN
SENSOR (FRONT)
CYLINDER 1, 4 HEATED OXYGEN
SENSOR (FRONT) CONNECTOR
AK303954AB


L
CYLINDER 2, 3
HEATED OXYGEN
SENSOR (FRONT)
CYLINDER 2, 3 HEATED
OXYGEN SENSOR (FRONT)
CONNECTOR
AK303955AB


L
CYLINDER 1, 4
HEATED OXYGEN
SENSOR (REAR)
CYLINDER 1, 4 HEATED OXYGEN
SENSOR (REAR) CONNECTOR
AK303956AB

L



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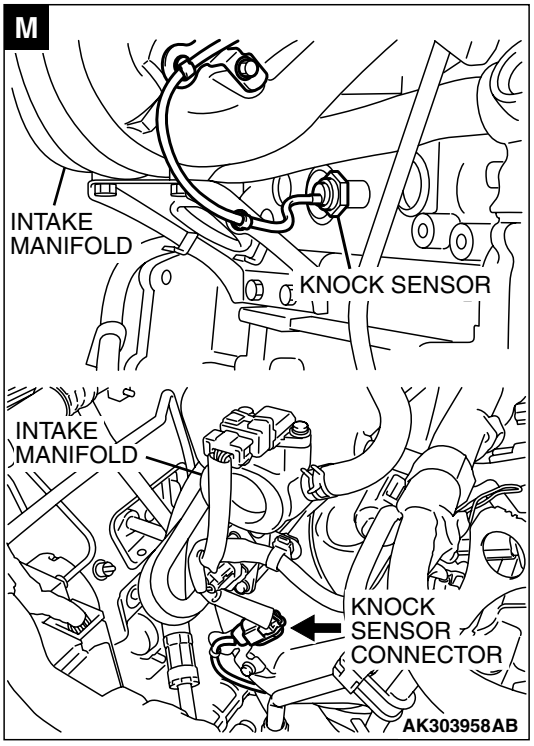

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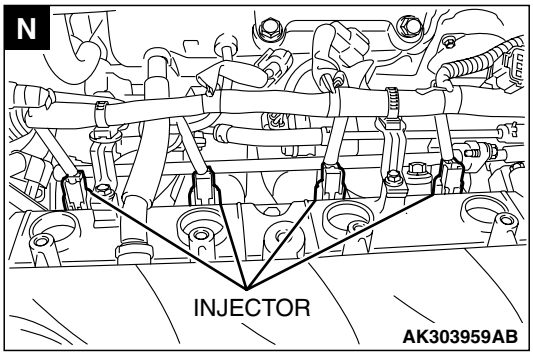
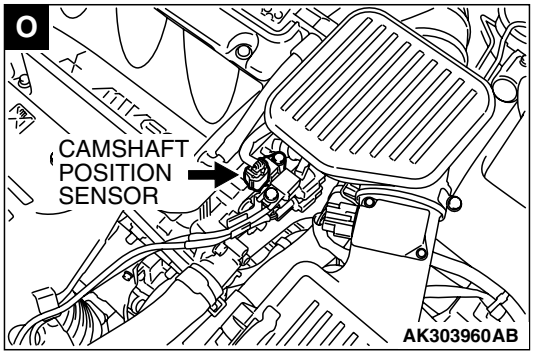
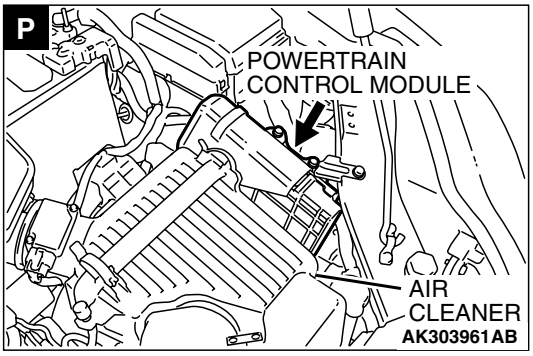


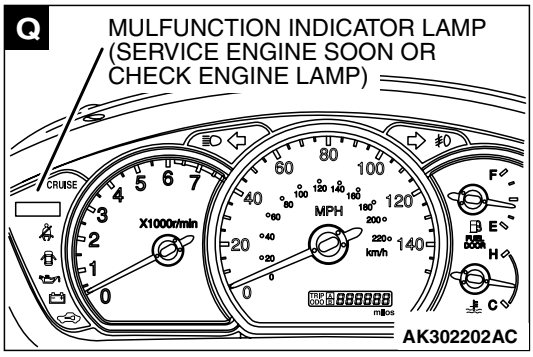
O



P

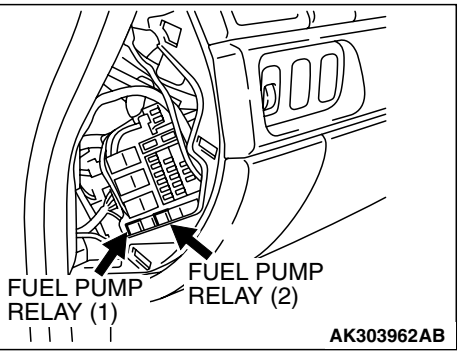


Q



TSB Revision

R



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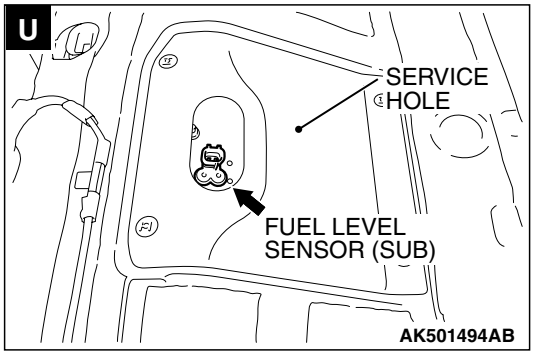

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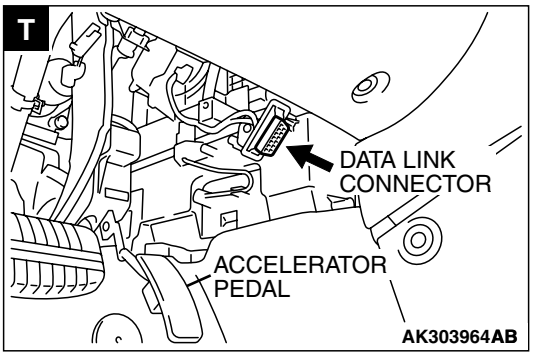

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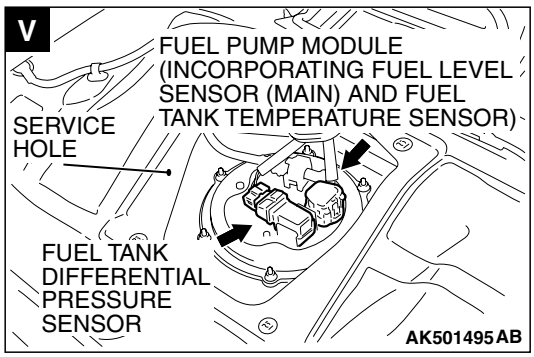

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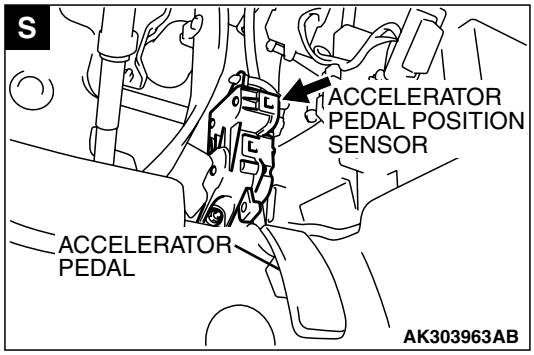

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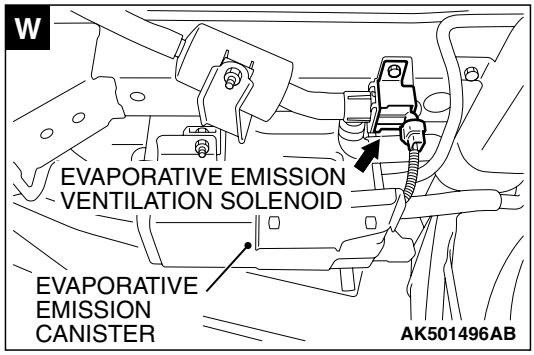

THROTTLE BODY (THROTTLE VALVE AREA) CLEANING

M1131001001120

⚠ ***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.

⚠ **CAUTION**

- **When the throttle body cleaning is performed, use scan tool MB991958 to initialize the learning value (Refer to GROUP 00, Initialization Procedure for Learning Value in MFI Engine P.00-31).**
- **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.**

1. Remove the throttle body.

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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

M1131001901253

Required Special Tools:

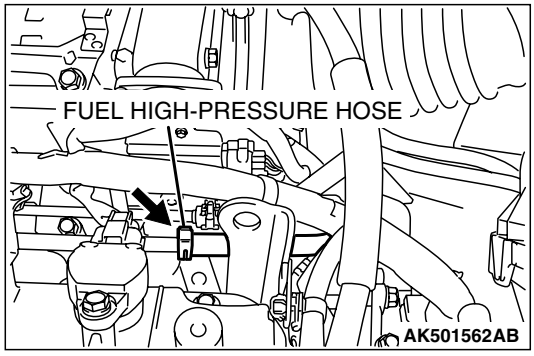
- MB991958: Scan tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A
- MB991637: Fuel Pressure Gauge Set
- MB992001: Hose Adaptor
- MB992049: Quick Connector
- MD998707: Test Device

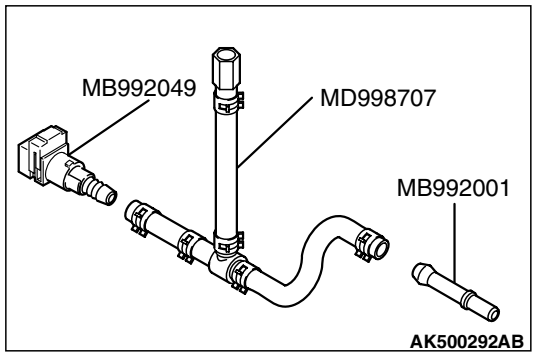
1. Release residual pressure from the fuel line to prevent fuel spray. (Refer to P.13A-1166.)

⚠ ***WARNING***

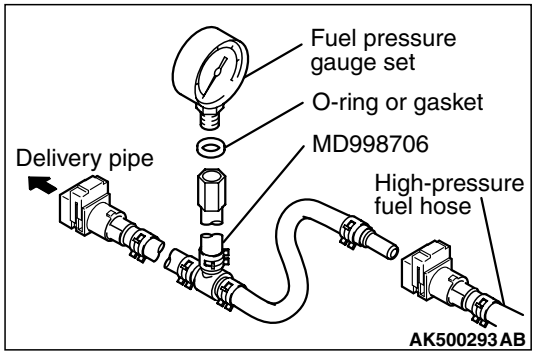
To prevent a fire, cover the hose connection with shop towels to prevent splashing of fuel that could be caused by some residual pressure in the fuel pipe line.

2. Disconnect the fuel high-pressure hose at the fuel rail side.



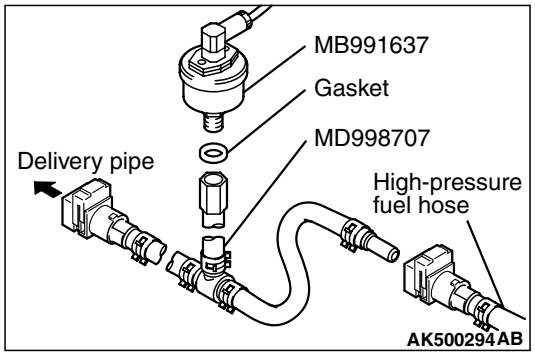


3. Assemble the special tool MD998707 of special tool as shown in figure.
4. Remove either the instillation adopter for the injector or another adopter.
5. Install the special tool MB992049 (quick connector) and the special tool MB992001 (hose adapter) to the hose without the adopter.
6. Assemble the fuel pressure measurement tools as follows.



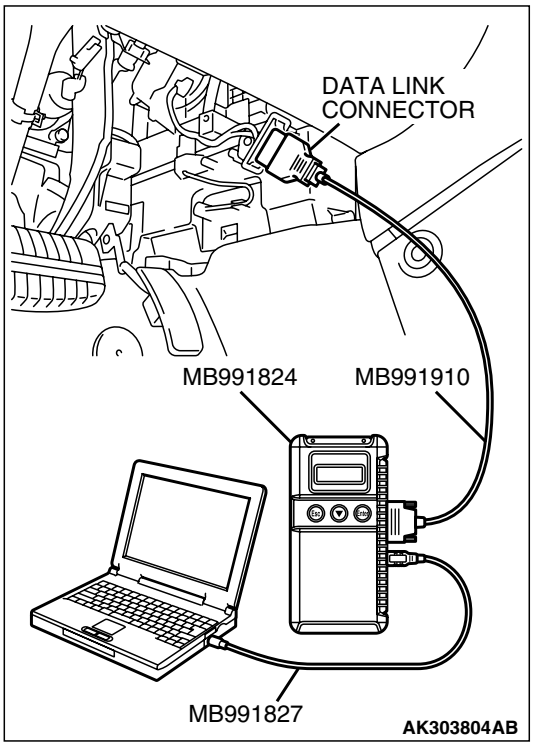
<When using the fuel pressure gauge>

1. Via a suitable O-ring or gasket, install the fuel pressure gauge to the special tool that has already assembled as described.
2. 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. Via a gasket, install the special tool MB991637 (fuel pressure gauge set) into the special tool that has already assembled as described.
2. 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.

7. Connect scan tool MB991958 to the data link connector.
8. Use Actuator test 9 to drive the fuel pump. Check that there is no fuel leaking from any section when the fuel pump is operating.
9. Stop the fuel pump.
10. Start the engine and run at idle.
11. Measure fuel pressure while the engine is running at idle.

    Standard value: Approximately 324 kPa (47 psi) at curb idle

12. Check to see that fuel pressure at idle does not drop even after the engine has been revved several times.

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

SYMPTOM	PROBABLE CAUSE	REMEDY
• Fuel pressure too low • Fuel pressure drops after racing	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

14. Stop the engine and observe fuel pressure gauge reading. It is normal if the reading does not drop within two minutes. If it does, observe the rate of drop and troubleshoot and repair according to the table below. Start, then stop the engine.
    (1) Squeeze the fuel supply line closed to confirm leak-down occurs from defective fuel pump check valve.
    (2) 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

15. Release residual pressure from the fuel pipe line. (Refer to P.13A-1166.)

⚠ ***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.

16. Remove the fuel pressure gauge and special tool from the delivery rail.
17. Fit the fuel high-pressure hose to the delivery pipe.
18. Check for fuel leaks.
    (1) Use scan tool MB991958 to operate the fuel pump.
    (2) Check the fuel line for leaks and repair as needed.
19. Disconnect scan tool MB991958.

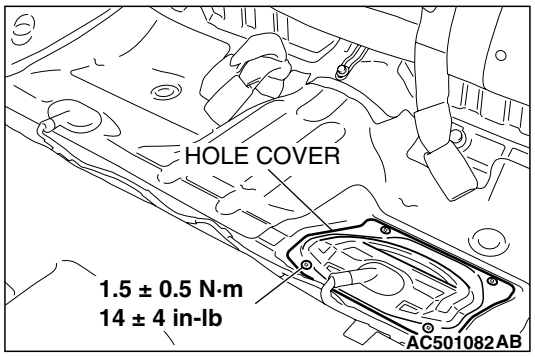
FUEL PUMP CONNECTOR DISCONNECTION (HOW TO REDUCE PRESSURIZED FUEL LINES)

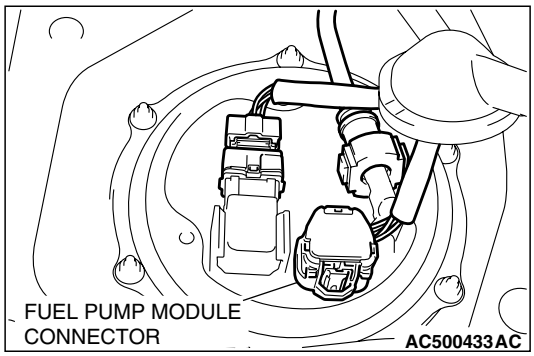
M1131000901120

⚠ ***WARNING***

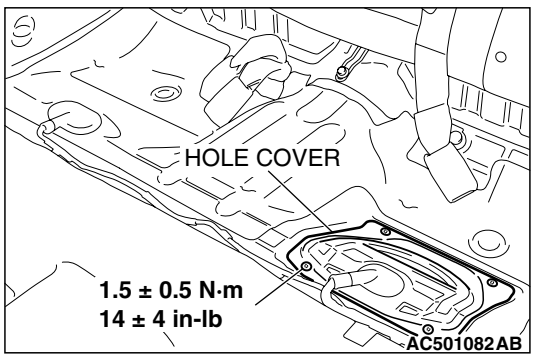
When removing the fuel pipe, etc., release fuel pressure to prevent fuel spray.

1. Remove the rear seat cushion assembly (Refer to GROUP 52A, Rear Seat P.52A-45).
2. Remove the hole cover.





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.

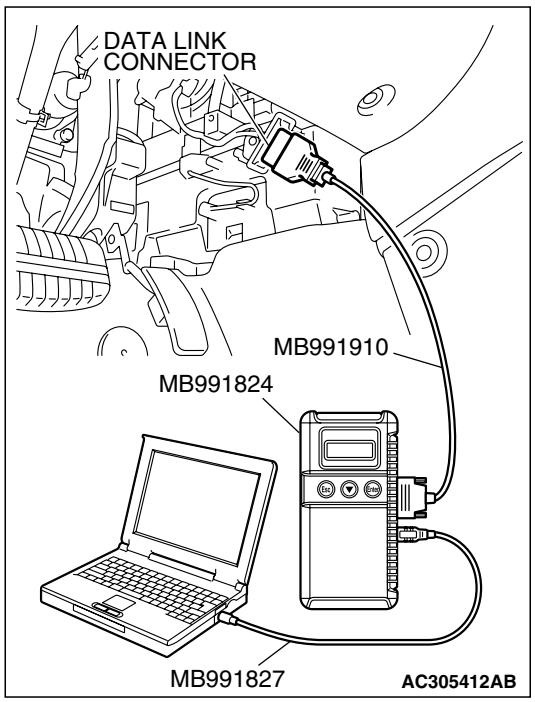
   Tightening torque: 1.5 ± 0.5 N·m (14 ± 4 in-lb)
7. Install the rear seat cushion assembly (Refer to GROUP 52A, Rear Seat Assembly P.52A-45).

FUEL PUMP OPERATION CHECK

M1131002001189

Required Special Tool:

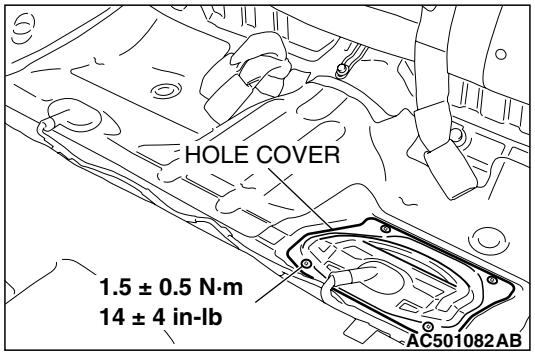
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A



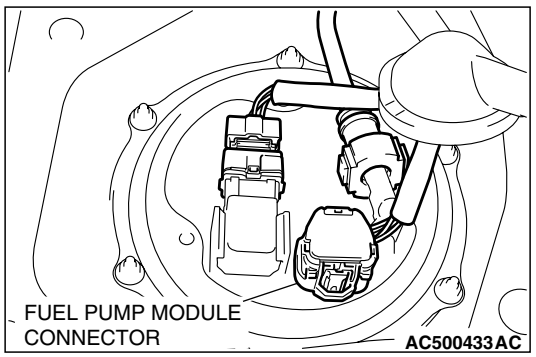
⚠ CAUTION

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

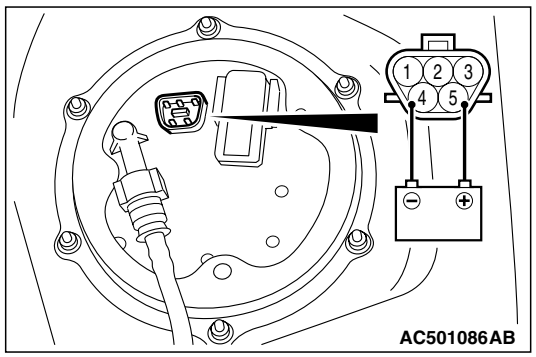
1. Check the operating of the fuel pump by using scan tool MB991958 to force-drive the fuel pump.
2. If the fuel pump will not operate, check by using the following procedure. If normal, check the fuel pump drive circuit.
   (1) Turn the ignition switch to the "LOCK" (OFF) position.
   (2) Remove the rear seat cushion assembly (Refer to GROUP 52A, Rear Seat P.52A-45).



(3) Remove the hole cover.



(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-6).

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.

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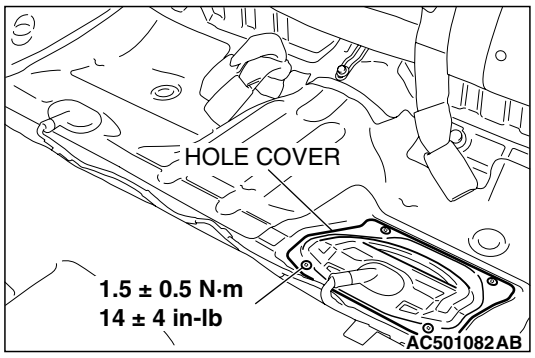


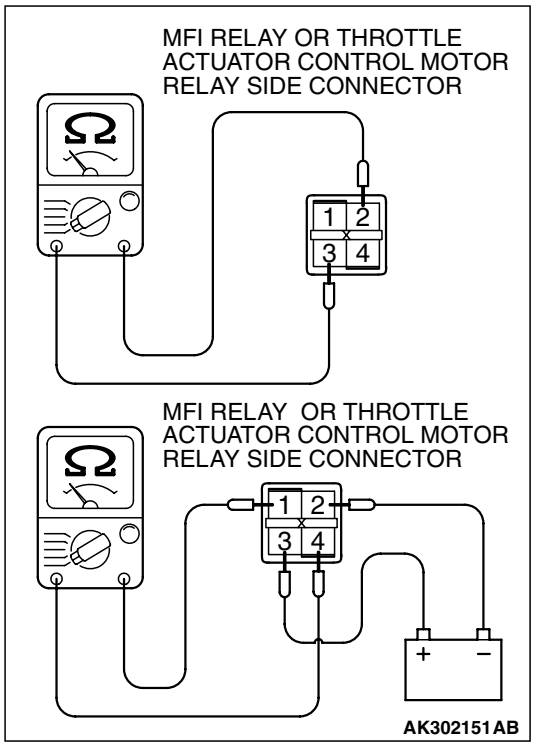
(6) Check for fuel pressure by pinching the fuel hose with fingertips.
(7) Connect the fuel pump module connector.
(8) Install the hole cover.

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-45).

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

M1131050000721

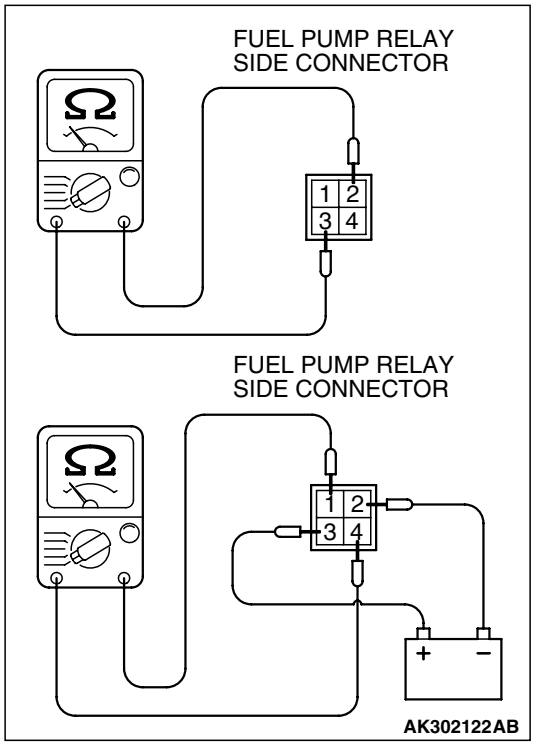


Inspect the MFI relay and throttle actuator control motor relay for continuity in accordance with the chart shown below.

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

M1131033000728

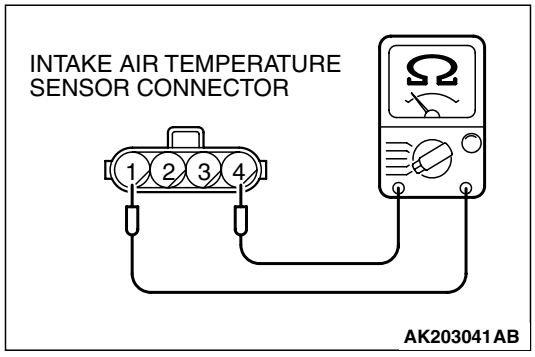


Inspect the fuel pump relay for continuity in accordance with the chart shown below.

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

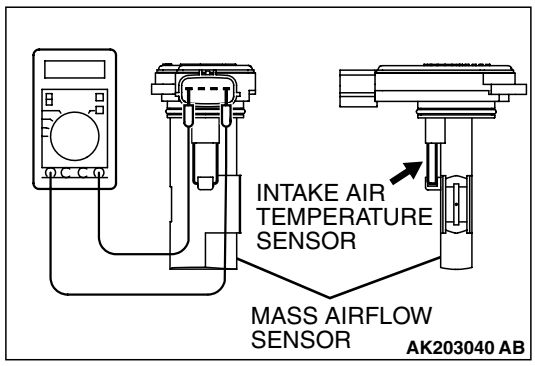
M1131002801077



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

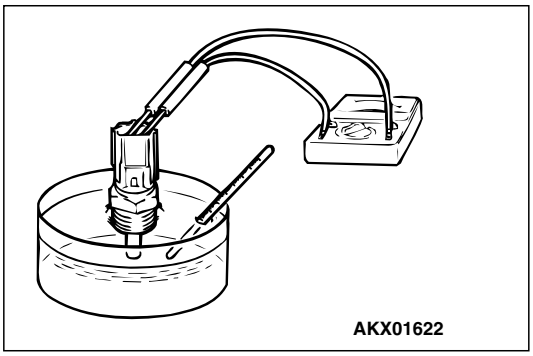
M1131003101026

⚠ CAUTION

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

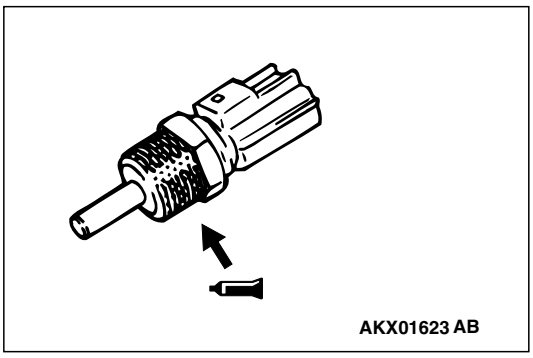
1. Drain engine coolant, then remove the engine coolant temperature sensor.
2. With the temperature sensing portion of engine coolant temperature sensor immersed in hot water, check the resistance.

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


AKX01622

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)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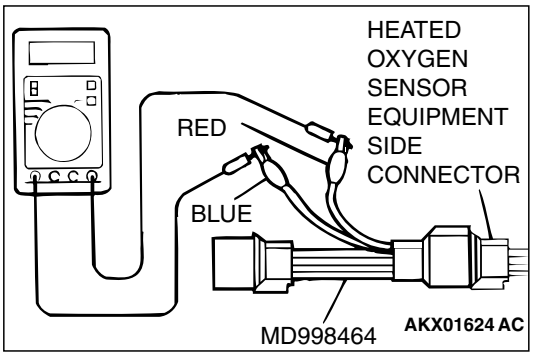
HEATED OXYGEN SENSOR CHECK

M1131005001564

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-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. 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 Ω 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. Drive at 50 km/h (31mph) or more for 10 minutes.

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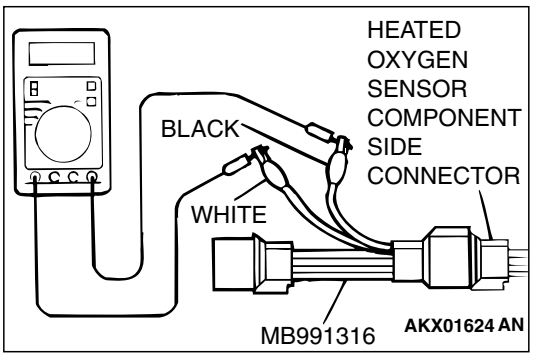


6. Connect a digital voltage meter between terminal No. 2 (black clip) and terminal No. 4 (white clip).
7. Measure the output voltage of the heated oxygen sensor under the following driving.
   - Transaxle: "L" range
   - Drive with wide open throttle
   - Engine: 3,500 r/min or more

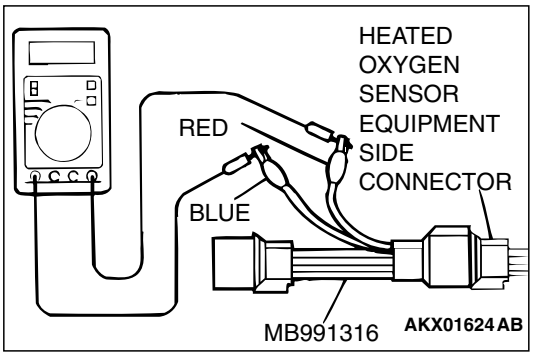
   Standard value:

HEATED OXYGEN SENSOR OUTPUT VOLTAGE	REMARKS
0.6 – 1.0 V	High load operation makes air/fuel ratio richer and normal heated oxygen sensor also can output voltage of 0.6 – 1.0 V.

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.

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

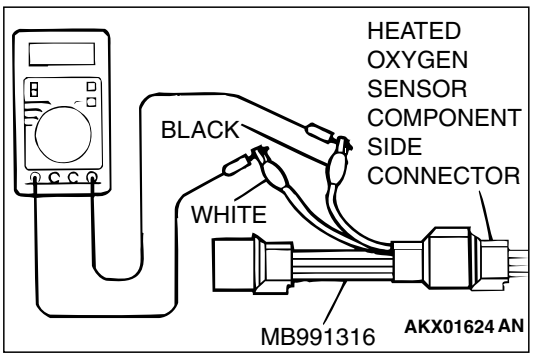
NOTE: For removal and installation of the heated oxygen sensor, refer to GROUP 15, Exhaust Pipe and Main Muffler P.15-32.



<Heated oxygen sensor (front)>

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 Ω 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. Rev the engine 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).
7. 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 V	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 V.

⚠ 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.

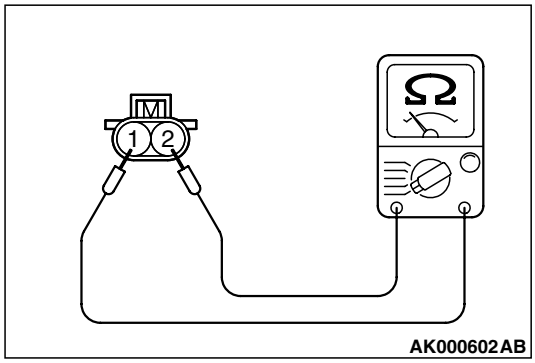
8. If the output voltage is not within the standard value, replace the heated oxygen sensor.

NOTE: For removal and installation of the heated oxygen sensor, refer to GROUP 15, Exhaust Pipe and Main Muffler P.15-32.

INJECTOR CHECK

M1131005201397

Measurement of Resistance between Terminals

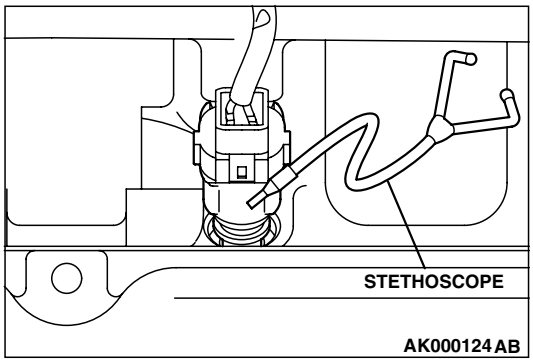


1. Disconnect the injector connector.
2. Measure resistance between terminals.

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

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

Checking operation sound



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

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

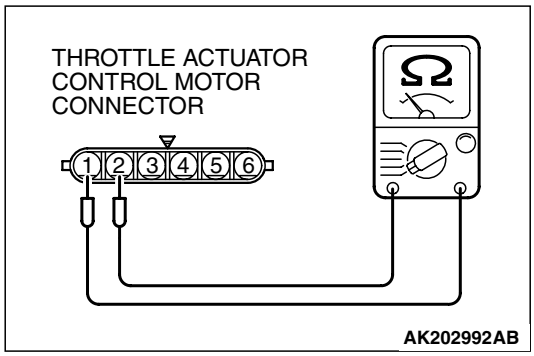
THROTTLE ACTUATOR CONTROL MOTOR CHECK

M1131051000456

<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.

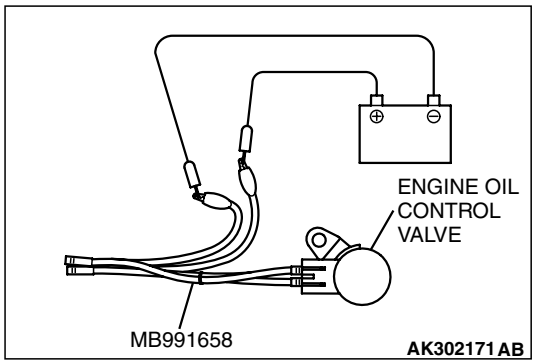
   Standard value: 0.3 – 80 Ω [at 20°C (68°F)]
3. If resistance is outside the standard value, replace the throttle body assembly.

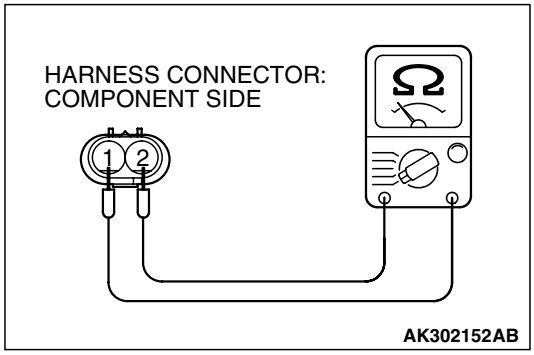
ENGINE OIL CONTROL VALVE CHECK

M1131053200371

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 Ω [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

M1131005600422

Refer to GROUP 17, Emission Control System – Evaporative Emission Control System – Evaporative Emission Purge Solenoid Check P.17-93.

EVAPORATVE EMISSION VENTILATION SOLENOID CHECK

M1131012800343

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.17-103.

EGR VALVE CHECK

M1131051500127

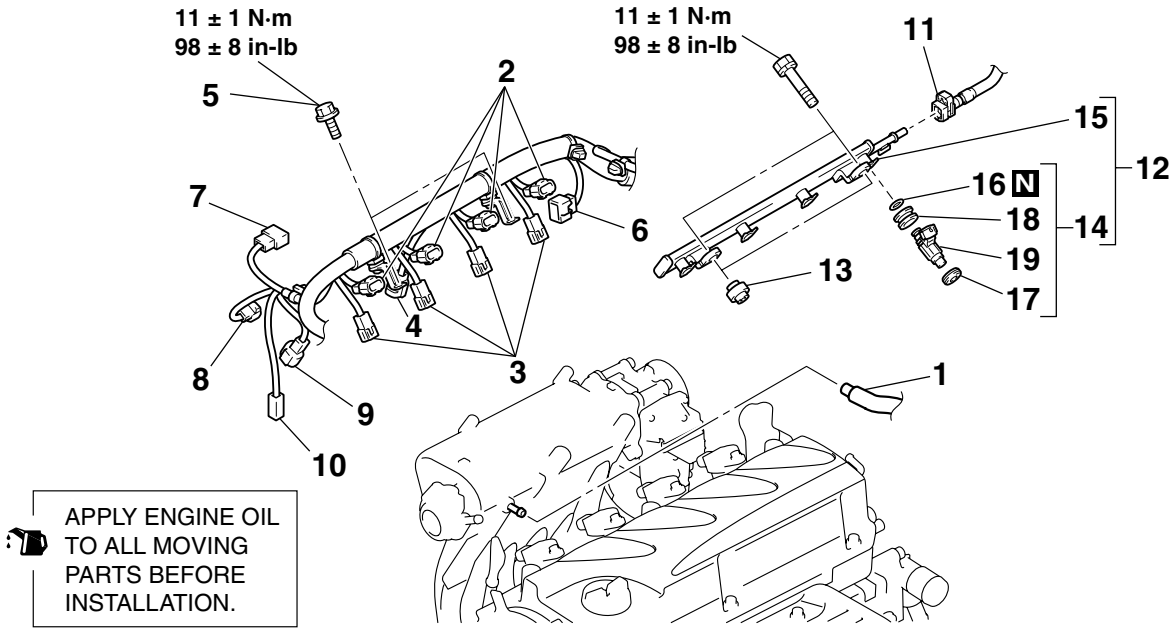
Refer to GROUP 17, Emission Control System – Exhaust Gas Recirculation (EGR) System – EGR Valve Check.P.17-97

INJECTOR

REMOVAL AND INSTALLATION

M1131007101307

Pre-removal Operation	Post-installation Operation
• Fuel Discharge Prevention (Refer to P.13A-1166). • Air Cleaner Cover and Air Intake Hose Removal (Refer to GROUP 15, Air Cleaner P.15-4).	• Air Cleaner Cover and Air Intake Hose Installation (Refer to GROUP 15, Air Cleaner P.15-4). • Fuel Leakage Inspection.



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REMOVAL STEPS

1. PCV HOSE CONNECTION
2. IGNITION COIL CONNECTORS
3. INJECTOR CONNECTORS
4. EGR VALVE CONNECTOR
5. ROCKER COVER BRACKET INSTALLATION BOLTS
6. THROTTLE POSITION SENSOR CONNECTOR
7. MANIFOLD ABSOLUTE PRESSURE SENSOR
8. EVAPORATIVE EMISSION PURGE SOLENOID CONNECTOR
9. KNOCK SENSOR CONNECTOR

REMOVAL STEPS (Continued)

10. POWER STEERING PRESSURE SWITCH CONNECTOR

<<A>> >>B<< 11. FUEL HIGH-PRESSURE HOSE CONNECTION

<<B>> 12. FUEL RAIL AND FUEL INJECTOR ASSEMBLY

13. INSULATORS

>>A<< 14. FUEL INJECTOR ASSEMBLY

15. FUEL RAIL
16. O-RING
17. INSULATORS
18. GROMMETS
19. FUEL INJECTORS

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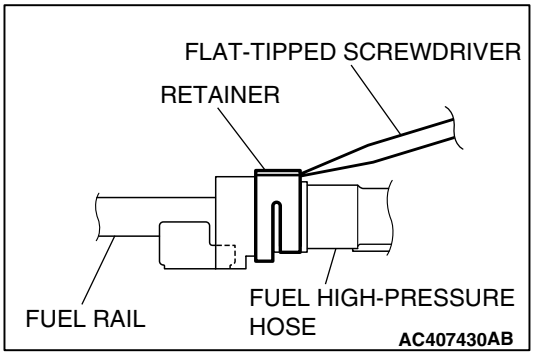
REMOVAL SERVICE POINTS

<<A>> FUEL HIGH-PRESSURE HOSE DISCONNECTION

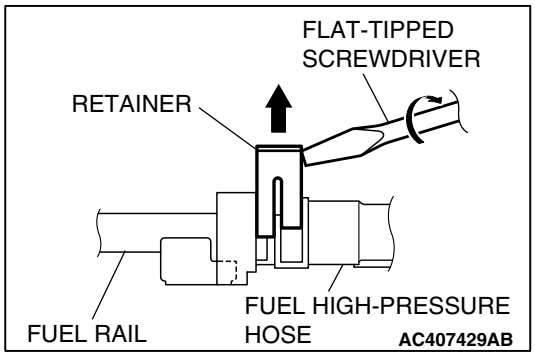
⚠ CAUTION

Do not kink the fuel high-pressure hose as it is made of plastics and will become damaged.

1. Insert a flat-tipped screwdriver [width 6 mm (0.24 inch), thickness 1 mm (0.04 inch)] to the retainer.



2. Turn the flat-tipped screwdriver approximately 90° to the arrowed direction, and lift the retainer to unlock and disconnect the fuel high-pressure hose.



<<B>> FUEL RAIL AND FUEL INJECTOR ASSEMBLY REMOVAL

⚠ CAUTION

Do not drop the injector.

Remove the fuel rail with the injectors attached to it.

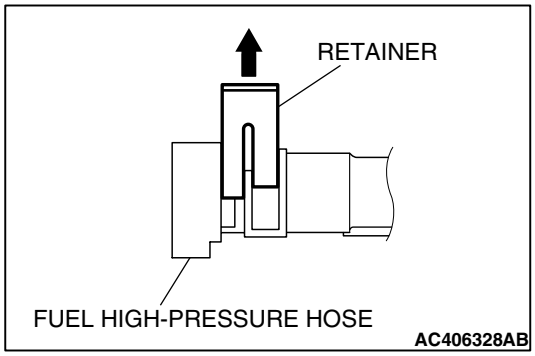
INSTALLATION SERVICE POINTS

>>A<< FUEL INJECTOR ASSEMBLY INSTALLATION

⚠ CAUTION

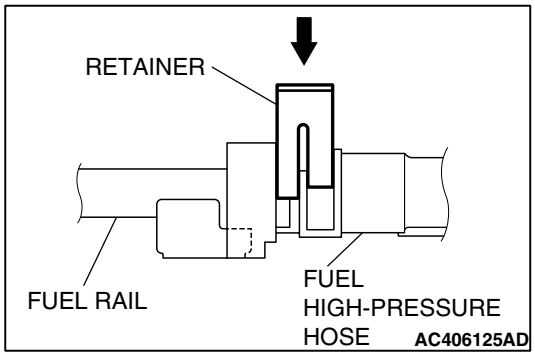
Do not let the engine oil get into the fuel rail.

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. Be careful not to damage the O-ring. After installing, check that the item turns smoothly.
3. If it dose not turn smoothly, the O-ring may be trapped, remove the item, re-install it into the fuel rail and check again.



>>B<< FUEL HIGH-PRESSURE HOSE CONNECTION

1. Pull up the retainer of fuel high-pressure hose to unlock before installing.



2. Install the fuel high-pressure hose to the fuel rail securely and push the retainer of fuel high-pressure hose downward and lock thoroughly.
3. After installing, slightly pull the fuel high-pressure hose and ensure that there is no disengaged fuel high-pressure hose. Also confirm that there is approximately 1 mm (0.04 inch) play at this time.

THROTTLE BODY ASSEMBLY

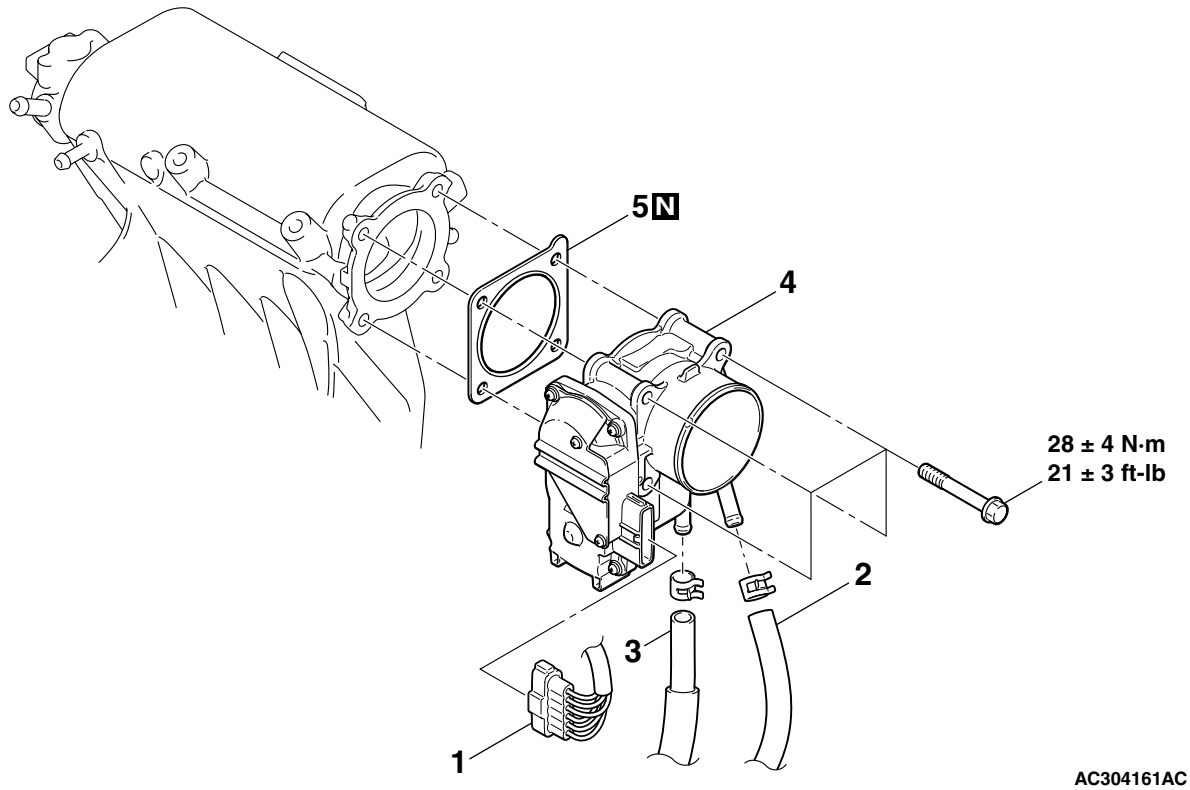
REMOVAL AND INSTALLATION

M1131007701202

⚠ CAUTION

- **When the throttle body assembly replacement is performed, use scan tool MB991958 to initialize the learning value (Refer to GROUP 00, Initialization Procedure for Learning Value in MFI Engine P.00-31).**
- **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 cannot work normally.**

Pre-removal Operation	Post-installation Operation
• Engine Coolant Draining [Refer to GROUP 00, Maintenance Service – Engine Coolant (Change) P.00-63]. • Air Cleaner Cover and Air Intake Hose Removal (Refer to GROUP 15, Air Cleaner P.15-4). • Battery Removal	• 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.00-63].



AC304161AC

REMOVAL STEPS

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

REMOVAL STEPS (Continued)

3. WATER FEED HOSE CONNECTION
4. THROTTLE BODY ASSEMBLY
>>A<< 5. THROTTLE BODY GASKET

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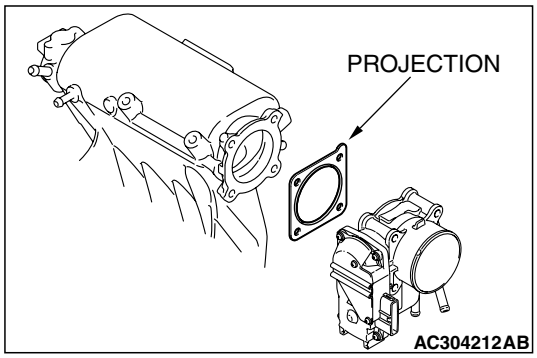
INSTALLATION SERVICE POINTS

>>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.

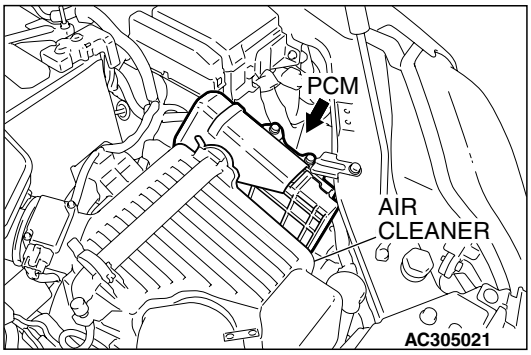
POWERTRAIN CONTROL MODULE (PCM)

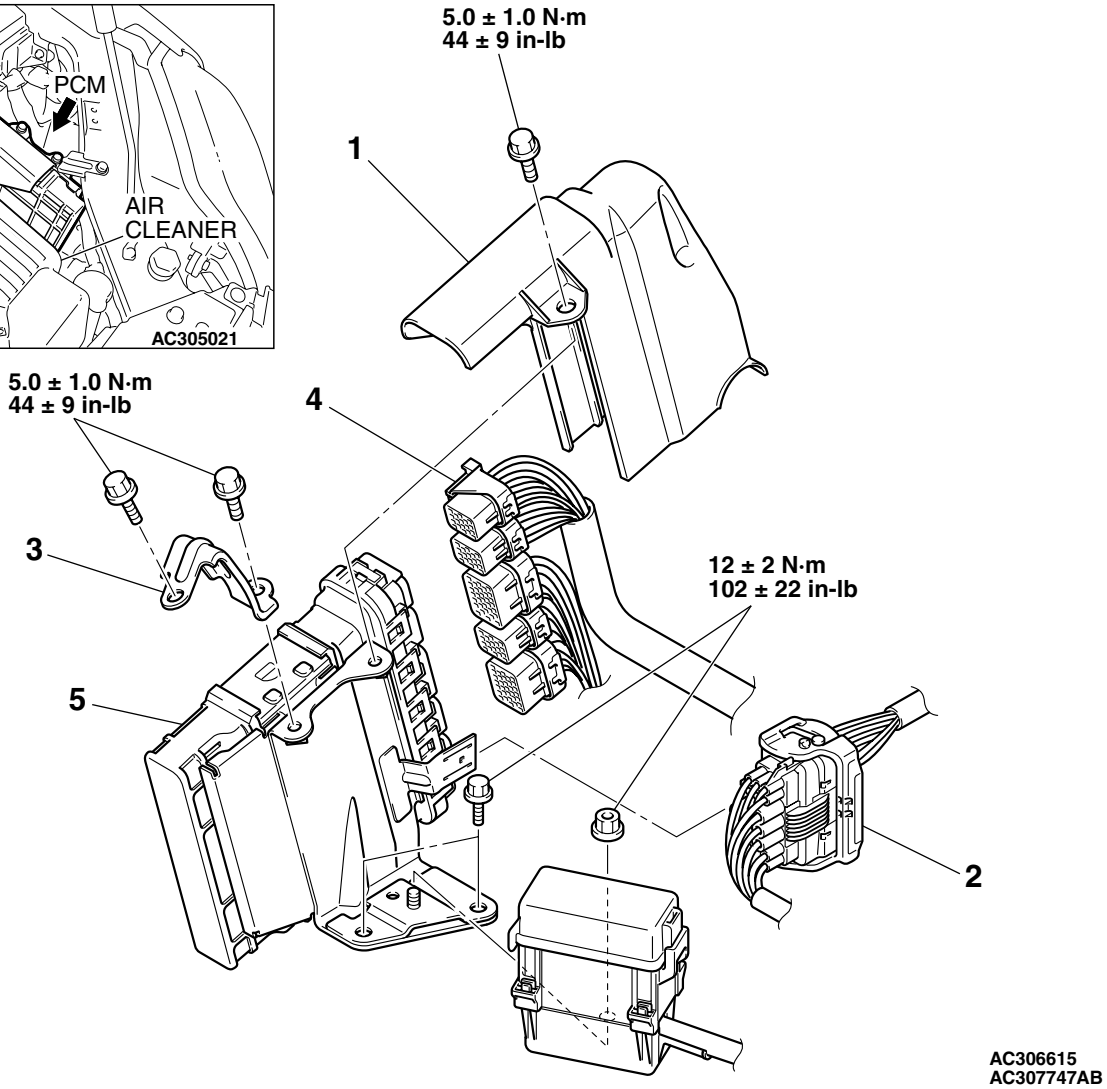
REMOVAL AND INSTALLATION

M1131033400618

⚠ CAUTION

Do not replace the PCM and the ETACS-ECU simultaneously. Always replace either one of the ECUs first, and register the encrypted code (Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11). Then, replace the other ECU.





REMOVAL STEPS

>>A<< • 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.

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SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

M1131011600669

ITEM	SPECIFICATION
Fuel rail bolt	11 ± 1 N·m (98 ± 8 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

M1131000201057

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.	E6T41684 <Federal> E6T41685 <California>
Sensors	Mass airflow sensor	Heat sensitizing type
	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

M1131000301407

ITEM		STANDARD VALUE
Fuel pressure kPa (psi)		Approximately 324 (47) at curb idle
Intake air temperature sensor resistance kΩ	–20°C (–4°F)	13 – 17
	0°C (32°F)	5.3 – 6.7
	20°C (86°F)	2.3 – 3.0
	40°C (104°F)	1.0 – 1.5
	60°C (140°F)	0.56 – 0.76
	80°C (176°F)	0.30 – 0.45
Engine coolant temperature sensor resistance kΩ	–20°C (–4°F)	14 – 17
	0°C (32°F)	5.1 – 6.5
	20°C (86°F)	2.1 – 2.7
	40°C (104°F)	0.9 – 1.3
	60°C (140°F)	0.48 – 0.68
	80°C (176°F)	0.26 – 0.36
Heated oxygen sensor output voltage V		0.6 – 1.0
Heated oxygen sensor heater resistance Ω	<Front>	4.5 – 8.0 [at 20°C (68°F)]
	<Rear>	11 – 18 [at 20°C (68°F)]
Injector coil resistance Ω		10.5 – 13.5 [at 20°C (68°F)]
Throttle actuator control motor coil resistance Ω		0.3 – 80 [at 20°C (68°F)]
Engine oil control valve coil resistance Ω		6.9 – 7.9 [at 20°C (68°F)]

SEALANT AND ADHESIVE

M1131000500969

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