GROUP 13Ab

MULTIPORT INJECTION SYSTEM (MFI) <DIAGNOSIS>

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TROUBLESHOOTING STRATEGY

M11310100001USA0000010000

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

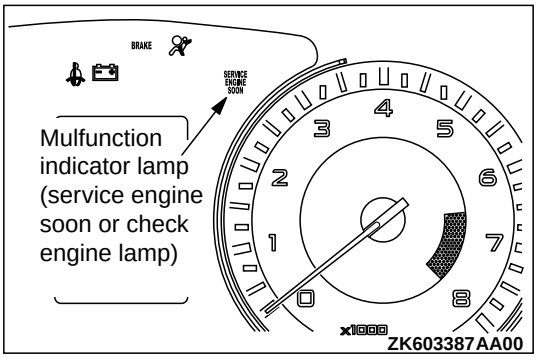
Use these steps to plan your diagnostic strategy. If you follow them carefully, you will be sure to have exhausted most of the possible ways to find an MFI fault.

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.00-15.
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. 00-15.
10. After repairs are completed, conduct a road test duplicating the complaint set conditions to confirm the malfunction has been corrected.

NOTE: If the engine control module (ECM) is replaced, Immobilizer Encrypted Code Registration should be carried out, Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P. 42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8.

DIAGNOSTIC FUNCTION

M11310100008USA0000010000



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 engine 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.

NOTE: When the Transmission Control Module (TCM) detects malfunctions related to the automatic transaxle, the Malfunction indicator Lamp (SERVICE ENGINE SOON or Check Engine Lamp) is also illuminated.

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

DTC	ITEM
P0031	Heated oxygen sensor heater circuit low (bank 1 sensor 1)
P0032	Heated oxygen sensor heater circuit high (bank 1 sensor 1)
P0037	Heated oxygen sensor heater circuit low (bank 1 sensor 2)
P0038	Heated oxygen sensor heater circuit high (bank 1 sensor 2)
P0043	Heated oxygen sensor heater circuit low (bank 1 sensor 3) <California>
P0044	Heated oxygen sensor heater circuit high (bank 1 sensor 3) <California>
P0051	Heated oxygen sensor heater circuit low (bank 2 sensor 1)
P0052	Heated oxygen sensor heater circuit low (bank 2 sensor 1)
P0057	Heated oxygen sensor heater circuit low (bank 2 sensor 2)
P0058	Heated oxygen sensor heater circuit high (bank 2 sensor 2)
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	Heated oxygen sensor circuit low voltage (bank 1 sensor 1)
P0132	Heated oxygen sensor circuit high voltage (bank 1 sensor 1)
P0133	Heated oxygen sensor circuit slow response (bank 1 sensor 1)
P0134*	Heated oxygen sensor circuit no activity detected (bank 1 sensor 1)
P0137	Heated oxygen sensor circuit low voltage (bank 1 sensor 2)
P0138	Heated oxygen sensor circuit high voltage (bank 1 sensor 2)
P0139	Heated oxygen sensor circuit slow response (bank 1 sensor 2)
P0140	Heated oxygen sensor circuit no activity detected (bank 1 sensor 2)
P0143	Heated oxygen sensor circuit low voltage (bank 1 sensor 3) <California>
P0144	Heated oxygen sensor circuit high voltage (bank 1 sensor 3) <California>

DTC	ITEM
P0145	Heated oxygen sensor circuit slow response (bank 1sensor 3) <California>
P0146	Heated oxygen sensor circuit no activity detected (bank 1 sensor 3) <California>
P0151	Heated oxygen sensor circuit low voltage (bank 2 sensor 1)
P0152	Heated oxygen sensor circuit high voltage (bank 2 sensor 1)
P0153	Heated oxygen sensor circuit slow response (bank 2 sensor 1)
P0154*	Heated oxygen sensor circuit no activity detected (bank 2 sensor 1)
P0157	Heated oxygen sensor circuit low voltage (bank 2 sensor 2)
P0158	Heated oxygen sensor circuit high voltage (bank 2 sensor 2)
P0159	Heated oxygen sensor circuit slow response (bank 2 sensor 2)
P0160	Heated oxygen sensor circuit no activity detected (bank 2 sensor 2)
P0171	System too lean (bank 1)
P0172	System too rich (bank 1)
P0174	System too lean (bank 2)
P0175	System too rich (bank 2)
P0181	Fuel temperature sensor circuit range/performance
P0182	Fuel temperature sensor circuit low input
P0183	Fuel 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
P0205	Injector circuit - cylinder 5
P0206	Injector circuit - cylinder 6
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
P0305	Cylinder 5 misfire detected
P0306	Cylinder 6 misfire detected
P0335*	Crankshaft position sensor circuit
P0340*	Camshaft position sensor circuit
P0401	Exhaust gas recirculation flow insufficient detected
P0421	Warm up catalyst efficiency below threshold (bank 1)
P0431	Warm up catalyst efficiency below threshold (bank 2)
P0441	Evaporative emission control system incorrect purge flow
P0442	Evaporative emission control system leak detected (small leak)

DTC	ITEM
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 circuit range/performance (main)
P0462	Fuel level sensor circuit low input
P0463	Fuel level sensor circuit high input
P0489	EGR valve (stepper motor) circuit malfunction (Ground short)
P0490	EGR valve (stepper motor) circuit malfunction (Battery short)
P0506	Idle control system RPM lower than expected
P0507	Idle control system RPM higher than expected
P0551	Power steering pressure switch circuit range/performance
P0552	Power steering pressure sensor circuit low input
P0553	Power steering pressure sensor circuit high input
P0603*	EEPROM malfunction
P0606*	Engine control module main processor malfunction
P0630*	Vehicle Identification Number (VIN) malfunction
P0638*	Throttle actuator control motor circuit range/ performance
P0642*	Throttle position sensor power supply
P0657*	Throttle actuator control motor relay circuit malfunction
P1020	Mitsubishi innovative valve timing electronic control system (MIVEC) performance problem
P1021	Engine oil control valve circuit
P1233*	Throttle position sensor (main) plausibility
P1234*	Throttle position sensor (sub) plausibility
P1235*	Mass airflow sensor plausibility
P1236*	A/D converter
P1237*	Accelerator pedal position sensor plausibility
P1238*	Mass airflow sensor plausibility (torque monitor)
P1239	Engine RPM plausibility
P1241	Torque monitor
P1540	LIN communication check by ECM (sending message to radiator sensor) <California>
P1541	LIN communication (receiving message from radiator sensor) <California>
P1543	DOR tampering monitor (temperature check after thermostat open) <California>
P1544	DOR tampering monitor (temperature check before thermostat open) <California>
P1545	DOR tampering monitor (temperature change after thermostat open) <California>

DTC	ITEM
P1546	DOR tampering monitor (temperature check at cold start) <California>
P1547	DOR tampering monitor (rationality check) <California>
P1580	DOR radiator tampering monitor (encrypted message) <California>
P1590*	TCM to ECM communication error in torque reduction request
P1603*	Battery backup line malfunction
P1676*	Variant coding
P2066	Fuel level sensor (sub) circuit range/performance
P2100*	Throttle actuator control motor circuit (open)
P2101*	Throttle actuator control motor magneto malfunction
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	Heated oxygen sensor inactive (bank 1 sensor 1)
P2197	Heated oxygen sensor inactive (bank 2 sensor 1)
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
P2423	HC adsorber (HC trap catalyst) efficiency below threshold <California>
P2567	LIN communication check by radiator sensor (thermistor error) <California>
U0101*	A/T-ECU time-out
U0141*	Combination meter time-out
U1180*	Combination meter time-out

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

NOTE: After the ECM 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 ECM 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. Also, sensor 3 indicates the sensor mounted at the position third closest to the engine.

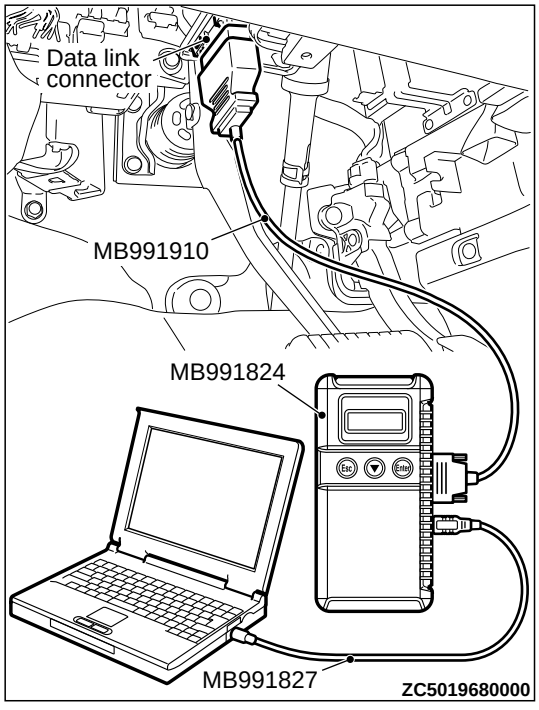
NOTE: Bank 1 indicates the right bank side cylinder, and bank 2 indicates the left bank side cylinder.

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.



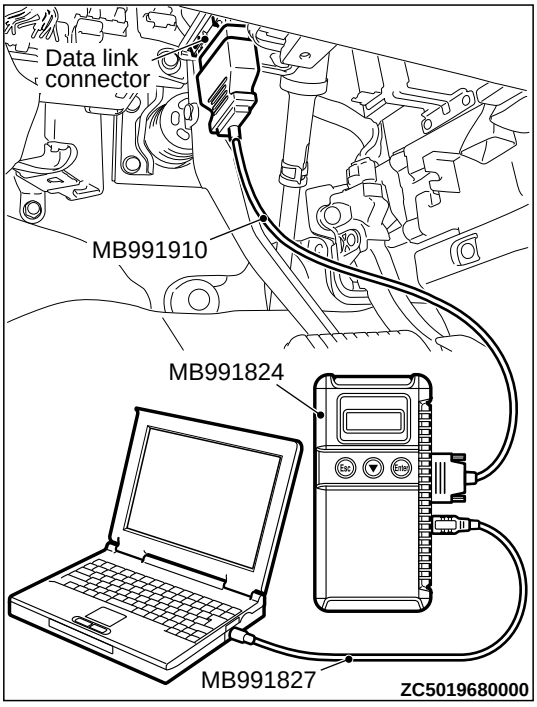
1. Ensure that the ignition switch is at the "LOCK" (OFF) position.
2. Start up the personal computer.
3. Connect special tool MB991827 to special tool MB991824 and the personal computer.
4. Connect special tool MB991910 to special tool MB991824.
5. Connect special tool MB991910 to the data link connector.
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.

1. Connect scan tool MB991958 to the data link connector.
2. Turn the ignition switch to the "ON" position.
3. Select "System select."
4. Choose "from 2006 MY" under "MODEL YEAR".
5. Check that "Vehicle Information" contents are correct.
6. Choose "MFI".
7. Select "Diagnostic Trouble Code"
8. If a DTC is set, it is shown.
9. Choose "Erase DTCs" to erase the DTC.

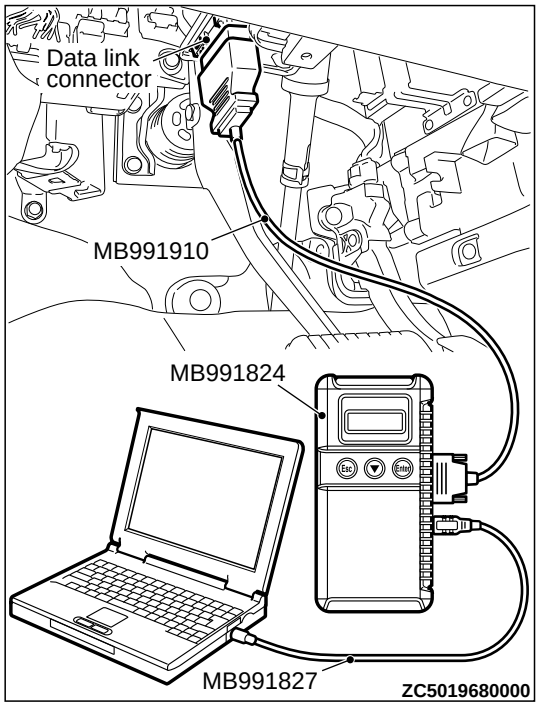
HOW TO READ DATA LIST

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.



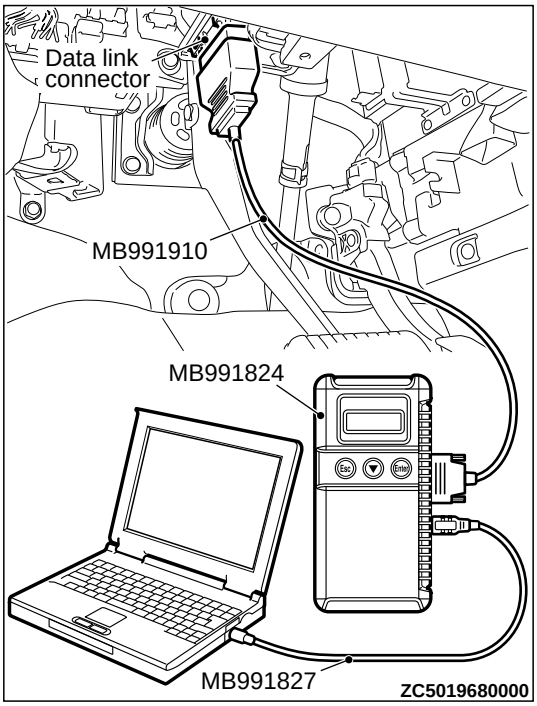
1. Connect scan tool MB991958 to the data link connector.
2. Turn the ignition switch to the "ON" position.
3. Select "System select."
4. Choose "from 2006 MY" under "MODEL YEAR".
5. Check that "Vehicle Information" contents are correct.
6. Choose "MFI".
7. Select "Data List."
8. Choose an appropriate 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 "System select."
4. Choose "from 2006 MY" under "MODEL YEAR".
5. Check that "Vehicle Information" contents are correct.
6. Choose "MFI".
7. Select "Actuator Test."
8. Choose an appropriate item and select the "OK" button.

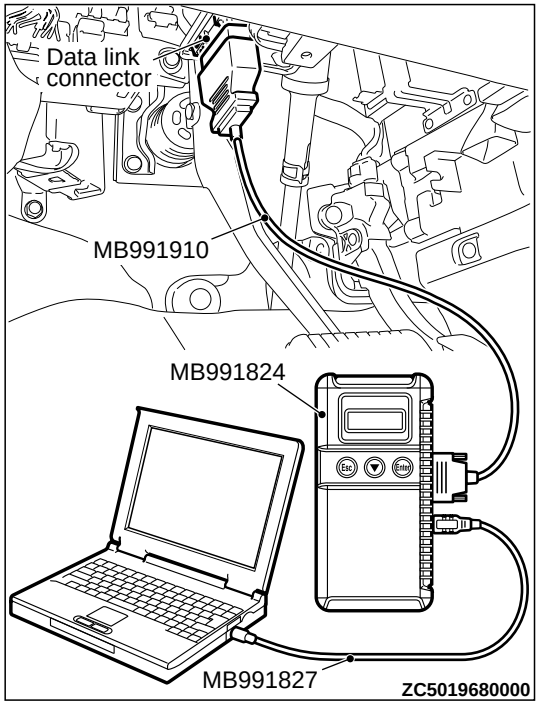
HOW TO DIAGNOSE THE CAN BUS LINES

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 ECM if the ECM 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 engine control module (ECM) 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 ECM monitors can be confirmed. The value at the last monitoring is output by ECM as a test result.

ON-BOARD DIAGNOSTIC MONITOR ID	STANDARDIZED / MANUFACTURER DEFIND 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	ECM monitors the deteriorated condition of the right bank heated oxygen sensor (front) by checking the rich/lean switching frequency of the right bank heated oxygen sensor (front).	× 1 count
02	82	Oxygen Sensor Monitor Bank 1 - Sensor 2 Output Voltage drop slope	ECM checks the output voltage of the left bank heated oxygen sensor (rear) in order to monitor whether the left bank heated oxygen sensor (rear) output is stuck.	× 0.122 mV
	05	Oxygen Sensor Monitor Bank 1 - Sensor 2 Rich To Lean Sensor Switch Time	ECM checks the rich to lean switching time of the right bank heated oxygen sensor (rear) in order to monitor the response of the right bank heated oxygen sensor (rear).	× 1 msec
	88	Oxygen Sensor Monitor Bank 1 - Sensor 2 Output Voltage drop slope	ECM checks the output voltage drop slope of the right bank heated oxygen sensor (rear) in order to monitor the response of the right bank heated oxygen sensor.	× 1 msec
03 <California>	82	Oxygen Sensor Monitor Bank 1 - Sensor 3 Output Voltage change	ECM checks the output voltage of the center exhaust pipe heated oxygen sensor in order to monitor whether the center exhaust pipe heated oxygen sensor output is stuck.	× 0.122 mV
	05	Oxygen Sensor Monitor Bank 1 - Sensor 3 Rich To Lean Sensor Switch Time	ECM checks the rich to lean switching time of the center exhaust pipe heated oxygen sensor in order to monitor the response of the center exhaust pipe heated oxygen sensor.	× 1 msec

ON-BOARD DIAGNOSTIC MONITOR ID	STANDARDIZED / MANUFACTURER DEFIND TEST ID	MONITORING ITEM	SIMPLE TECHNICAL DESCRIPTION	CONVERSION COEFFICIENT IN USING GENERAL SCAN TOOL
	88	Oxygen Sensor Monitor Bank 1 - Sensor 3 Output Voltage drop slope	ECM checks the output voltage drop slope of the center exhaust pipe heated oxygen sensor in order to monitor the response of the center exhaust pipe heated oxygen sensor.	× 1 msec
05	81	Oxygen Sensor Monitor Bank 2 - Sensor 1 Rich/Lean Switching frequency	ECM monitors the deteriorated condition of the left bank heated oxygen sensor (front) by checking the rich/lean switching frequency of the left bank heated oxygen sensor (front).	× 1 count
06	82	Oxygen Sensor Monitor Bank 2 - Sensor 2 Output Voltage change	ECM checks the output voltage of the left bank heated oxygen sensor (rear) in order to monitor whether the left bank heated oxygen sensor (rear) output is stuck.	× 0.122 mV
	05	Oxygen Sensor Monitor Bank 2 - Sensor 2 Rich To Lean Sensor Switch Time	ECM checks the rich to lean switching time of the left bank heated oxygen sensor (rear) in order to monitor the response of the left bank heated oxygen sensor (rear).	× 1 msec
	88	Oxygen Sensor Monitor Bank 2 - Sensor 2 Output Voltage drop slope	ECM checks the output voltage drop slope of the left bank heated oxygen sensor (rear) in order to monitor the response of the left bank heated oxygen sensor (rear).	× 1 msec
21	83	Catalyst Monitor Bank 1 Frequency ratio between Front- and Rear-Oxygen Sensors	ECM monitors the deterioration of catalyst at right bank side by the output frequency ratio between right bank heated oxygen sensor (front) and right bank heated oxygen sensor (rear).	× 0.039

ON-BOARD DIAGNOSTIC MONITOR ID	STANDARDIZED / MANUFACTURER DEFIND TEST ID	MONITORING ITEM	SIMPLE TECHNICAL DESCRIPTION	CONVERSION COEFFICIENT IN USING GENERAL SCAN TOOL
22	83	Catalyst Monitor Bank 2 Frequency ratio between Front- and Rear-Oxygen Sensors	ECM monitors the deterioration of catalyst at left bank side by the output frequency ratio between left bank heated oxygen sensor (front) and left bank heated oxygen sensor (rear).	× 0.039
31	84	EGR Monitor Difference of manifold pressure before and after EGR activation	ECM 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	ECM 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 ECM vacuumizes the fuel tank and the fuel line and then the specified time is passed, ECM 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 ECM vacuumizes the fuel tank and the fuel line and then the specified time is passed, ECM 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 DEFIND 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	ECM monitors angular acceleration of crankshaft and detect misfire. EWMA (Exponential Weighted Moving Average) misfire counts for last 10 driving cycles.	× 1 count
	0C	Mis-Fire General Data Misfire Counts For Last/ Current Driving Cycle	ECM monitors angular acceleration of crankshaft and detect misfire. Misfire counts for last/current driving cycle.	× 1 count
A2	0B	Mis-Fire Cylinder 1 Data EWMA Misfire Counts For Last 10 Driving Cycles	ECM monitors angular acceleration of crankshaft and detect misfire. EWMA (Exponential Weighted Moving Average) misfire counts for last 10 driving cycles.	× 1 count
	0C	Mis-Fire Cylinder 1 Data Misfire Counts For Last/ Current Driving Cycle	ECM monitors angular acceleration of crankshaft and detect misfire. Misfire counts for last/current driving cycle.	× 1 count
A3	0B	Mis-Fire Cylinder 2 Data EWMA Misfire Counts For Last 10 Driving Cycles	ECM monitors angular acceleration of crankshaft and detect misfire. EWMA (Exponential Weighted Moving Average) misfire counts for last 10 driving cycles.	× 1 count
	0C	Mis-Fire Cylinder 2 Data Misfire Counts For Last/ Current Driving Cycle	ECM monitors angular acceleration of crankshaft and detect misfire. Misfire counts for last/current driving cycle.	× 1 count
A4	0B	Mis-Fire Cylinder 3 Data EWMA Misfire Counts For Last 10 Driving Cycles.	ECM monitors angular acceleration of crankshaft and detect misfire. EWMA (Exponential Weighted Moving Average) misfire counts for last 10 driving cycles.	× 1 count

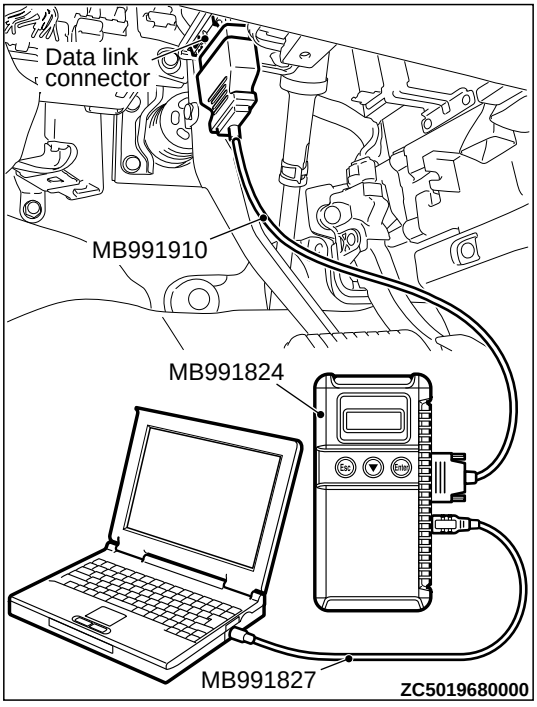
ON-BOARD DIAGNOSTIC MONITOR ID	STANDARDIZED / MANUFACTURER DEFIND TEST ID	MONITORING ITEM	SIMPLE TECHNICAL DESCRIPTION	CONVERSION COEFFICIENT IN USING GENERAL SCAN TOOL
A5	0B	Mis-Fire Cylinder 4 Data EWMA Misfire Counts For Last 10 Driving Cycles	ECM monitors angular acceleration of crankshaft and detect misfire. EWMA (Exponential Weighted Moving Average) misfire counts for last 10 driving cycles.	× 1 count
	0C	Mis-Fire Cylinder 4 Data Misfire Counts For Last/ Current Driving Cycle	ECM monitors angular acceleration of crankshaft and detect misfire. Misfire counts for last/current driving cycle.	× 1 count
A6	0B	Mis-Fire Cylinder 5 Data EWMA Misfire Counts For Last 10 Driving Cycles	ECM monitors angular acceleration of crankshaft and detect misfire. EWMA (Exponential Weighted Moving Average) misfire counts for last 10 driving cycles.	× 1 count
	0C	Mis-Fire Cylinder 5 Data Misfire Counts For Last/ Current Driving Cycle	ECM monitors angular acceleration of crankshaft and detect misfire. Misfire counts for last/current driving cycle.	× 1 count
A7	0B	Mis-Fire Cylinder 6 Data EWMA Misfire Counts For Last 10 Driving Cycles	ECM monitors angular acceleration of crankshaft and detect misfire. EWMA (Exponential Weighted Moving Average) misfire counts for last 10 driving cycles.	× 1 count
	0C	Mis-Fire Cylinder 6 Data Misfire Counts For Last/ Current Driving Cycle	ECM monitors angular acceleration of crankshaft and detect misfire. Misfire counts for last/current driving cycle.	× 1 count

ON-BOARD DIAGNOSTIC MONITOR ID	STANDARDIZED / MANUFACTURER DEFIND TEST ID	MONITORING ITEM	SIMPLE TECHNICAL DESCRIPTION	CONVERSION COEFFICIENT IN USING GENERAL SCAN TOOL
E1	87	HC Adsorber Monitor Bank 1 Response time delay between Rear- and 3rd-Oxygen Sensors <Applicable to SULEV model>	During forced rich control, time difference is monitored between two points: from when heated oxygen sensor (rear) is switched to "rich" to when center exhaust pipe heated oxygen sensor is switched to "rich".	× 1 msec

*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 ECM outputs the stored latest monitor test result.
NOTE: When the monitored test results are erased by the battery disconnection and so on, the ECM outputs the values in hexadecimal of "0000" or "FFFF", otherwise it outputs abnormal values and so on. In case of this, the ECU outputs are handled as invalid-values. When the first monitor (Readiness Status) is completed after this, the ECM outputs the valid-values.
NOTE: "Test Limit Type & Component ID byte" output from the ECM 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)
  - 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 engine control module (ECM) 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 engine control module (ECM) monitors the input/output signals (some signals all the time and others under specified conditions) of the ECM. When a malfunction continues for a specified time or longer after the irregular signal is initially monitored, the ECM judges that a malfunction has occurred. After the ECM 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 164 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 ECM 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 ECM.

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 ECM in order to erase the diagnostic memory. The 164 diagnostic items are all indicated sequentially from the smallest code number. The ECM 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 ECM detects multiple malfunctions, the ECM stores the "Freeze-frame" data for only

the first item that was detected. However, if the ECM detects a misfire or a fuel system malfunction, the ECM stores the data by giving priority to the misfire or fuel system malfunction, regardless of the order in which the malfunction was detects

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
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

ITEM NO.	M.U.T.-III SCAN TOOL DISPLAY	DATA ITEM	UNIT or STATE
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)
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 sensor monitor (DTC 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.

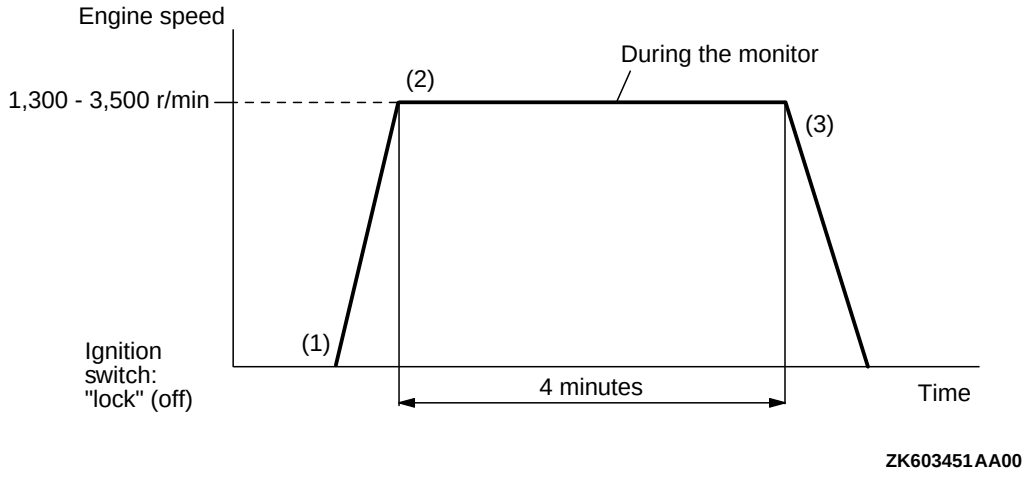
DRIVE CYCLE PATTERN LIST

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
Center exhaust pipe heated oxgen sensor heater monitor	P0043, P0044	
Exhaust gas recirculation (EGR) system monitor Readiness test item	P0401, P0489, P0490	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
Mass 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
Center exhaust pipe heated oxgen sensor monitor	P0145	

MONITOR ITEM	DIAGNOSTIC TROUBLE CODE (DTC)	PATTERN
HC adsorber (HC trap catalyst) monitor	P2423	
Air fuel ratio feedback monitor	P0134, P0154	12
Heated oxygen sensor (rear) monitor	P0140, P0160	13
Center exhaust pipe heated oxgen sensor monitor	P0146	
Fuel tank temperature sensor monitor	P0181	14
Misfire monitor	P0300, P0301, P0302, P0303, P0304, P0305, P0306	15
Fuel tank pressure sensor monitor	P0451	16
Throttle position sensor plausibility monitor	P1233, P1234	17
Mass airflow sensor plausibility monitor	P1235, P1238	
Torque monitor	P1241	
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, P0143, P0151, P0157, P2195, P2197	23
Mass 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, P0144, P0152, P0158, P2252, P2253	
Fuel tank temperature sensor monitor	P0182, P0183	
Injector monitor	P0201, P0202, P0203, P0204, P0205, P0206	
Crankshaft position sensor monitor	P0335	
Camshaft position sensor monitor	P0340	
Evaporative emission purge solenoid monitor	P0443	
Evaporative emission ventilation solenoid monitor	P0446	
Fuel tank pressure sensor monitor	P0452, P0453	
Fuel level sensor monitor	P0462, P0463	
Power steering pressure sensor monitor	P0552, P0553	
Engine oil control valve monitor	P1021, P1023	
Engine RPM plausibility monitor	P1239	

MONITOR ITEM	DIAGNOSTIC TROUBLE CODE (DTC)	PATTERN
Barometric pressure sensor monitor	P2228, P2229	

PATTERN 1

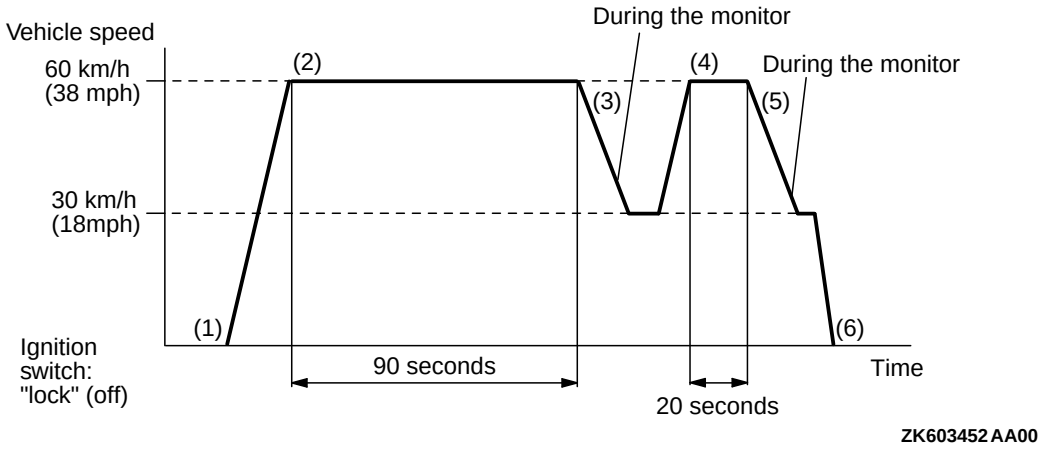
Drive cycle pattern	
Inspection conditions	▪Engine coolant temperature: More than 82°C (180°F) ▪Intake air temperature: More than -10°C (14°F) ▪Barometric pressure: More than 76 kPa (22.5 inHg) ▪Condition of A/T: Selector lever "D" range
Test procedure	1. Start the engine with all the accessories switched 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 1,300 r/min, less than 3,500 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

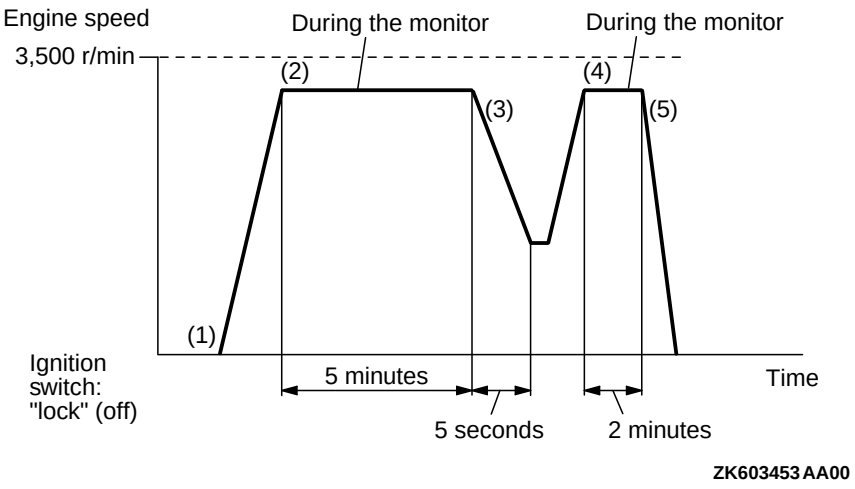
Test procedure	1. Start the engine with all the accessories switched OFF. 2. Let the engine idle for 10 seconds. (During the monitor) 3. Turn the ignition switch to the "LOCK" (OFF) position. 4. Start the engine and do Steps 1 to 3 again. *NOTE: When the vehicle is operating normally and the OBD-II Drive 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.

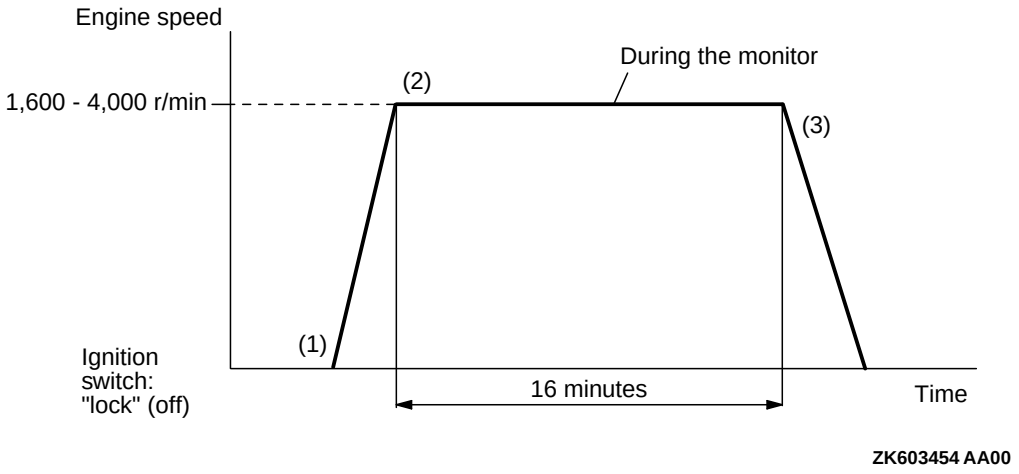
PATTERN 3

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	 ZK603453 AA00
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 3,500 r/min ▪Airflow rate: More than 14 g/sec, less than 41 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 3,500 r/min ▪Airflow rate: More than 14 g/sec, less than 41 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

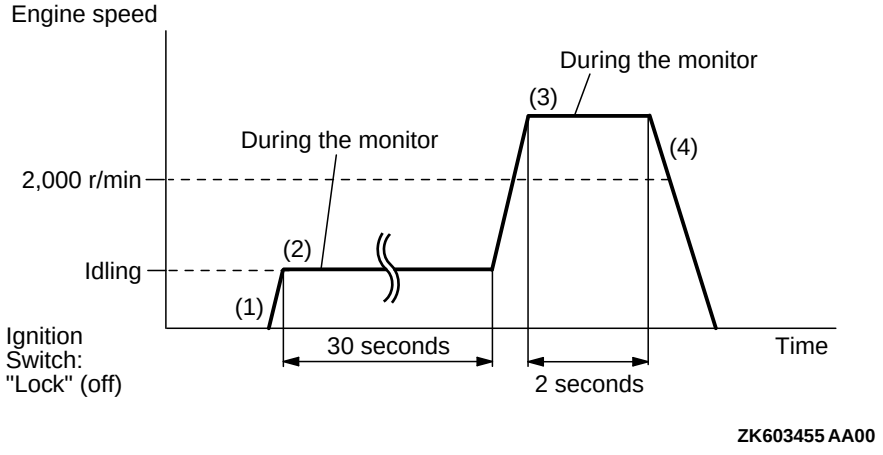
Drive cycle pattern	
Inspection conditions	▪Engine coolant temperature at engine start: Less than 36°C (96°F) ▪Intake air temperature at engine start: Less than 36°C (96°F) ▪Fuel amount at engine start: More than 15%, less than 40% ▪Engine coolant temperature: More than 60°C (41°F) ▪Intake air temperature: 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 20%, less than 60% ▪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

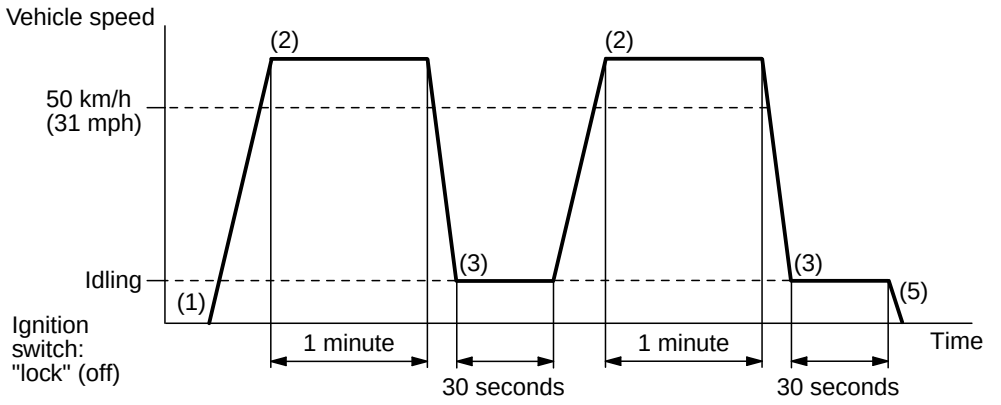
Inspection conditions	▪Engine coolant temperature at engine start: Less than 36°C (96°F) ▪Intake air temperature at engine start: Less than 36°C (96°F) ▪Fuel amount at engine start: More than 40%, less than 85% ▪Engine coolant temperature: More than 20°C (68°F) ▪Intake air temperature: More than 5°C (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.

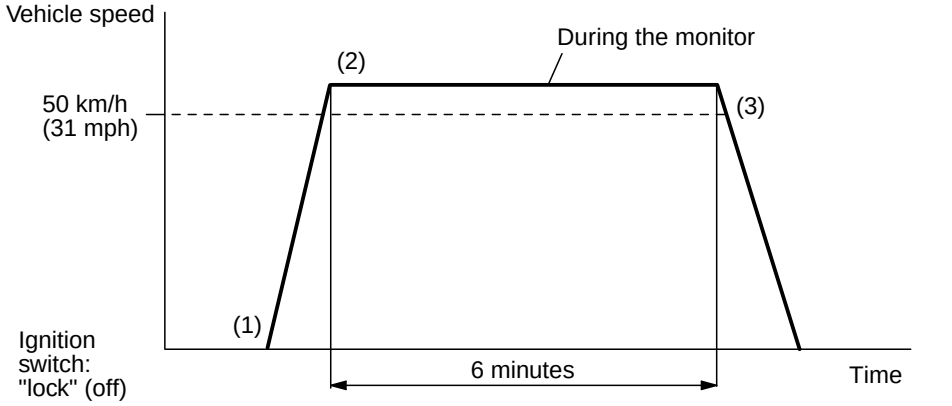
PATTERN 7

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

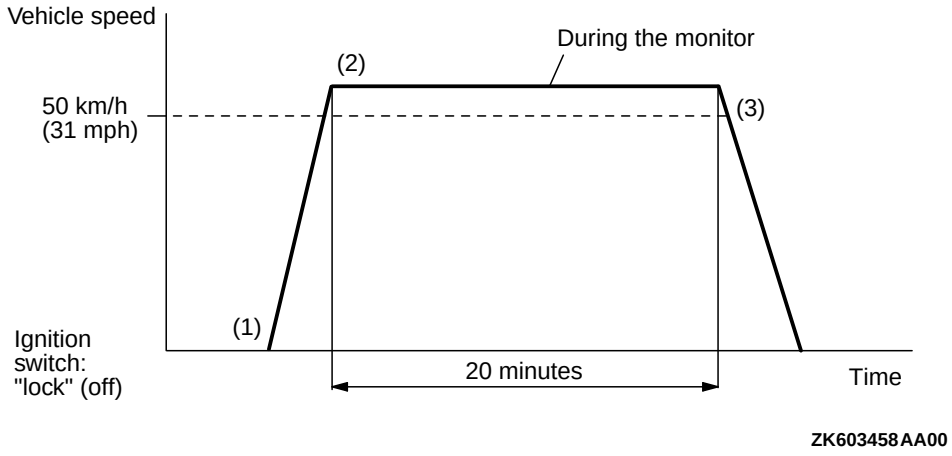
Drive cycle pattern	 ZK603456 AA00
Inspection conditions	▪Engine coolant temperature: More than 76°C (169°F) ▪Condition of A/T: Selector lever "D" range
Test procedure	1. Start the engine with all the accessories switched OFF. 2. Drive the vehicle at more than 50 km/h (31 mph) for 1 minute. 3. Stop at 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

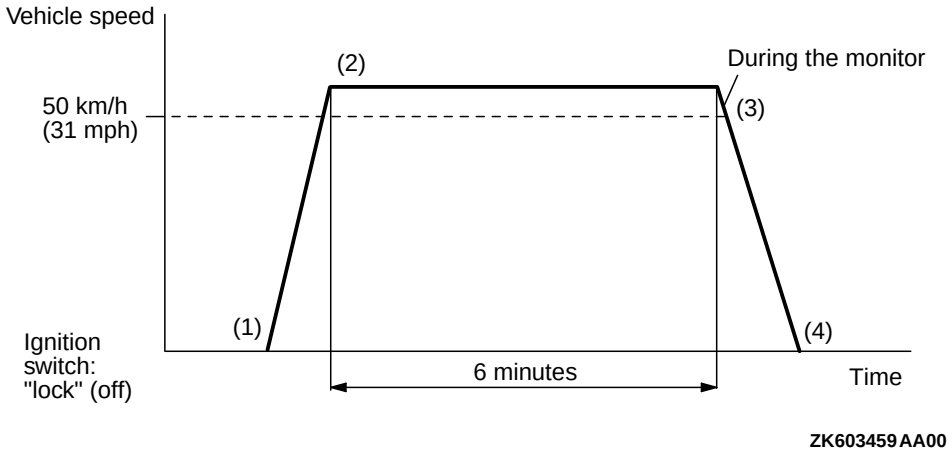
Drive cycle pattern	 ZK603457 AA00
Inspection conditions	▪Engine coolant temperature at engine start: More than 7°C (47°F) ▪Intake air temperature: Less than 60°C (140°F) ▪Engine coolant temperature: More than 40°C (104°F) ▪Condition of A/T: Selector lever "D" range
Test procedure	1. Start the engine 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 (31 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.

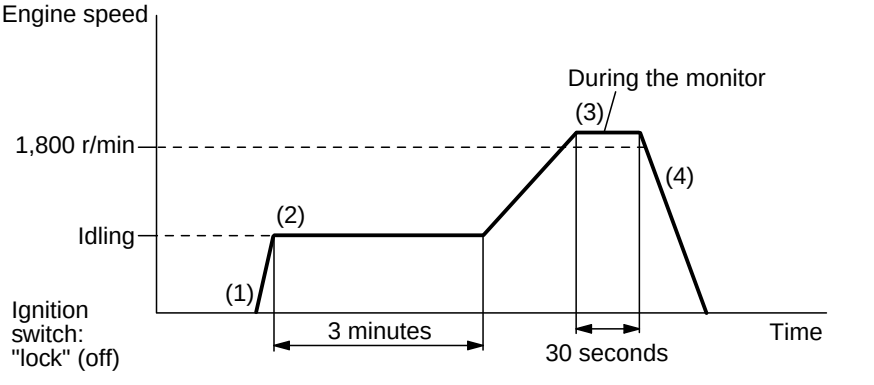
PATTERN 10

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

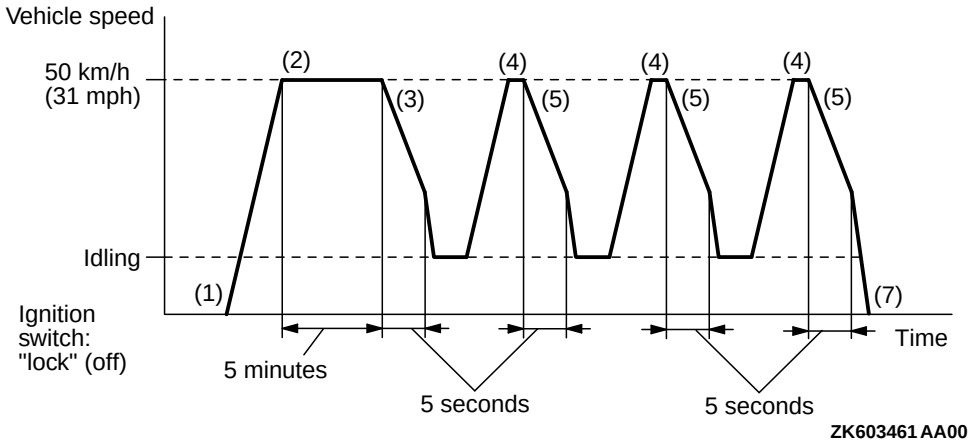
Drive cycle pattern	 ZK603459 AA00
Inspection conditions	▪Engine coolant temperature: More than 76°C (169°F) ▪Intake air temperature: More than -10°C (14°F) ▪Condition of A/T: Selector lever "D" range
Test procedure	1. Start the engine with all the accessories switched OFF. 2. Drive the vehicle at 50 km/h (31 mph) for 6 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	 ZK603460 AA00
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.

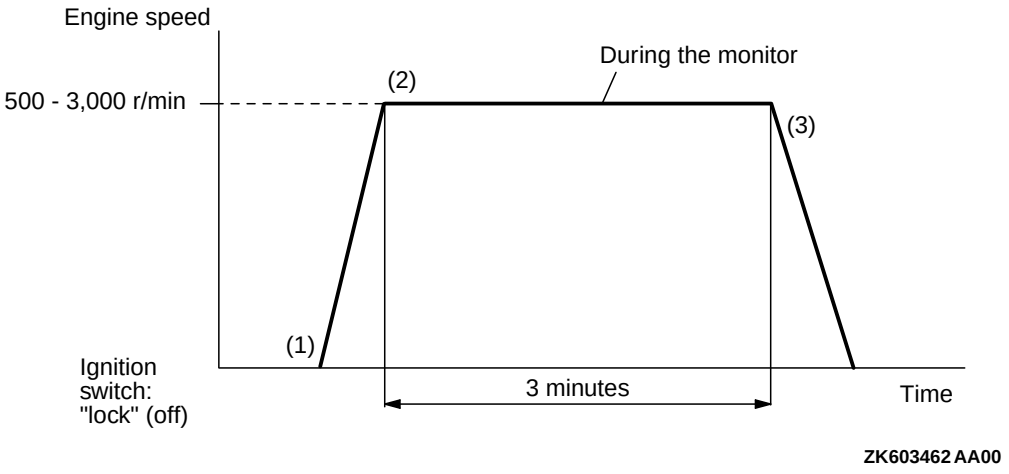
PATTERN 13

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 5 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.

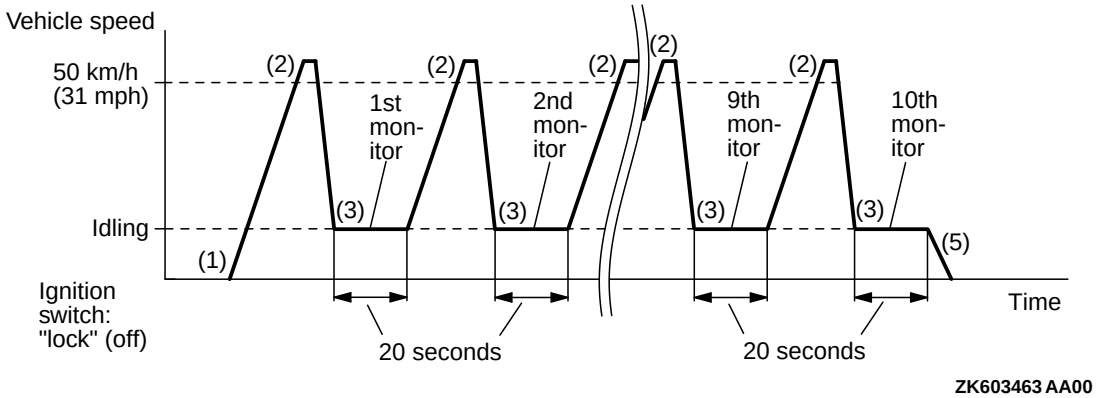
PATTERN 14

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

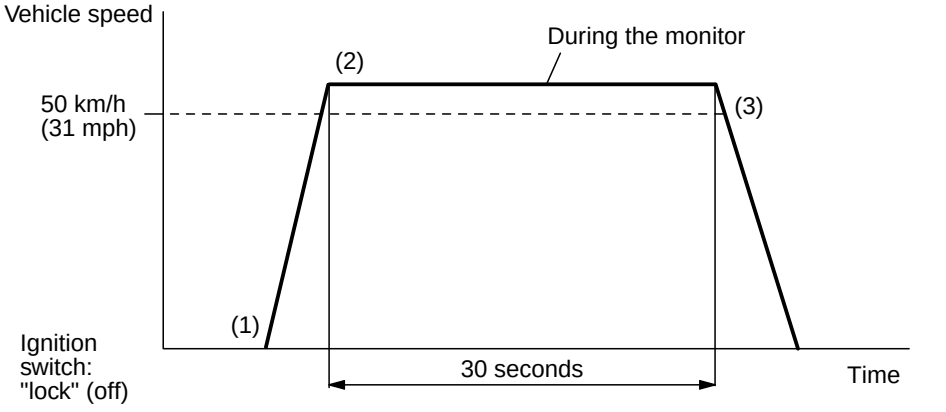
Drive cycle pattern	
Inspection conditions	▪Engine coolant temperature: More than -10°C (14°F) ▪Intake air temperature: More than -10°C (14°F) ▪Barometric pressure: More than 76 kPa (22.5 inHg) ▪Condition of A/T: Selector lever "D" range
Test procedure	1. Start the engine with all the accessories switched 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

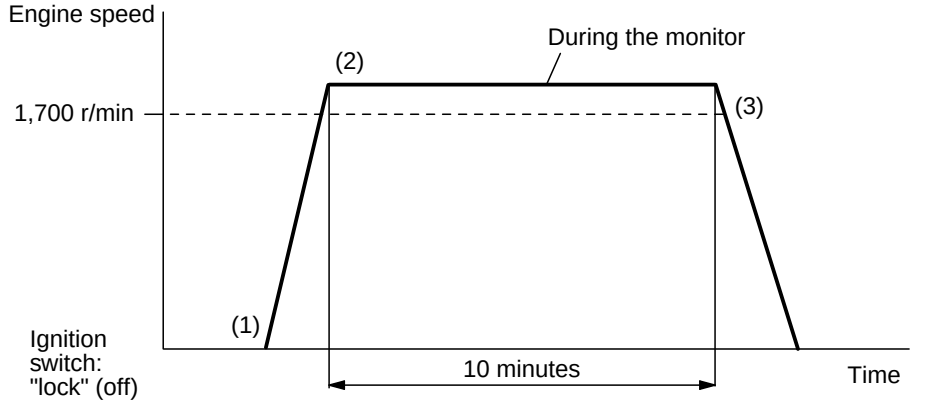
Drive cycle pattern	
Inspection condition	Condition of A/T: Selector lever "D" range
Test procedure	1. Start the engine with all the accessories switched OFF. 2. Accelerate until the vehicle speed is more than 50 km/h (31 mph). ▪Engine speed: More than 2,500 r/min

	▪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.

PATTERN 18

Drive cycle pattern	

Inspection conditions	▪Engine coolant temperature at the engine started: More than 0°C (32°F), 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 31% 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 0°C (32°F), less 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 5,200 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 ECM 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

M11310100160USA0000010000

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.)
Camshaft position sensor	Injects fuel simultaneously into all cylinders. (After the ignition switch is turned to "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.

MALFUNCTION ITEM	CONTROL CONTENTS DURING MALFUNCTION
Generator FR terminal	No generator output suppression control is performed for the electrical load (to be operated as an ordinary generator).
Misfire detection	The ECM 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.
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.

MALFUNCTION ITEM	CONTROL CONTENTS DURING MALFUNCTION
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

M11310100002USA0000010000

⚠ CAUTION

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

DTC	DIAGNOSTIC ITEM	REFERENCE PAGE
P0031	Heated oxygen sensor heater circuit low (bank 1 sensor 1)	P.13Ab-52
P0032	Heated oxygen sensor heater circuit high (bank 1 sensor 1)	P.13Ab-59
P0037	Heated oxygen sensor heater circuit low (bank 1 sensor 2)	P.13Ab-63
P0038	Heated oxygen sensor heater circuit high (bank 1 sensor 2)	P.13Ab-69
P0043	Heated oxygen sensor heater circuit low (bank 1 sensor 3) <California>	P.13Ab-73
P0044	Heated oxygen sensor heater circuit high (bank 1 sensor 3) <California>	P.13Ab-80
P0051	Heated oxygen sensor heater circuit low (bank 2 sensor 1)	P.13Ab-84
P0052	Heated oxygen sensor heater circuit high (bank 2 sensor 1)	P.13Ab-90
P0057	Heated oxygen sensor heater circuit low (bank 2 sensor 2)	P.13Ab-94
P0058	Heated oxygen sensor heater circuit high (bank 2 sensor 2)	P.13Ab-100
P0069	Abnormal correlation between manifold absolute pressure sensor and barometric pressure sensor	P.13Ab-104
P0101*	Mass airflow circuit range/performance problem	P.13Ab-108
P0102*	Mass airflow circuit low input	P.13Ab-115
P0103*	Mass airflow circuit high input	P.13Ab-121
P0106	Manifold absolute pressure circuit range/performance problem	P.13Ab-126
P0107	Manifold absolute pressure circuit low input	P.13Ab-132
P0108	Manifold absolute pressure circuit high input	P.13Ab-138
P0111*	Intake air temperature circuit range/performance problem	P.13Ab-143
P0112*	Intake air temperature circuit low input	P.13Ab-148
P0113*	Intake air temperature circuit high input	P.13Ab-152
P0116*	Engine coolant temperature circuit range/performance problem	P.13Ab-158
P0117*	Engine coolant temperature circuit low input	P.13Ab-163
P0118*	Engine coolant temperature circuit high input	P.13Ab-168
P0122*	Throttle position sensor (main) circuit low input	P.13Ab-174
P0123*	Throttle position sensor (main) circuit high input	P.13Ab-181
P0125*	Insufficient coolant temperature for closed loop fuel control	P.13Ab-187

DTC	DIAGNOSTIC ITEM	REFERENCE PAGE
P0128	Coolant thermostat (coolant temperature below thermostat regulating temperature)	P.13Ab-193
P0131	Heated oxygen sensor circuit low voltage (bank 1 sensor 1)	P.13Ab-196
P0132	Heated oxygen sensor circuit high voltage (bank 1 sensor 1)	P.13Ab-202
P0133	Heated oxygen sensor circuit slow response (bank 1 sensor 1)	P.13Ab-206
P0134*	Heated oxygen sensor circuit no activity detected (bank 1 sensor 1)	P.13Ab-210
P0137	Heated oxygen sensor circuit low voltage (bank 1 sensor 2)	P.13Ab-217
P0138	Heated oxygen sensor circuit high voltage (bank 1 sensor 2)	P.13Ab-222
P0139	Heated oxygen sensor circuit slow response (bank 1 sensor 2)	P.13Ab-226
P0140	Heated oxygen sensor circuit no activity detected (bank 1 sensor 2)	P.13Ab-230
P0143	Heated oxygen sensor circuit low voltage (bank 1 sensor 3) <California>	P.13Ab-235
P0144	Heated oxygen sensor circuit high voltage (bank 1 sensor 3) <California>	P.13Ab-240
P0145	Heated oxygen sensor circuit slow response (bank 1sensor 3) <California>	P.13Ab-244
P0146	Heated oxygen sensor circuit no activity detected (bank 1 sensor 3) <California>	P.13Ab-248
P0151	Heated oxygen sensor circuit low voltage (bank 2 sensor 1)	P.13Ab-253
P0152	Heated oxygen sensor circuit high voltage (bank 2 sensor 1)	P.13Ab-259
P0153	Heated oxygen sensor circuit slow response (bank 2 sensor 1)	P.13Ab-263
P0154*	Heated oxygen sensor circuit no activity detected (bank 2 sensor 1)	P.13Ab-268
P0157	Heated oxygen sensor circuit low voltage (bank 2 sensor 2)	P.13Ab-275
P0158	Heated oxygen sensor circuit high voltage (bank 2 sensor 2)	P.13Ab-280
P0159	Heated oxygen sensor circuit slow response (bank 2 sensor 2)	P.13Ab-284
P0160	Heated oxygen sensor circuit no activity detected (bank 2 sensor 2)	P.13Ab-288
P0171	System too lean (bank 1)	P.13Ab-293
P0172	System too rich (bank 1)	P.13Ab-300
P0174	System too lean (bank 2)	P.13Ab-304
P0175	System too rich (bank 2)	P.13Ab-311
P0181	Fuel temperature sensor circuit range/performance	P.13Ab-316
P0182	Fuel temperature sensor circuit low input	P.13Ab-321
P0183	Fuel temperature sensor circuit high input	P.13Ab-326
P0201	Injector circuit-cylinder 1	P.13Ab-332
P0202	Injector circuit-cylinder 2	P.13Ab-340
P0203	Injector circuit-cylinder 3	P.13Ab-347
P0204	Injector circuit-cylinder 4	P.13Ab-355
P0205	Injector circuit-cylinder 5	P.13Ab-362
P0206	Injector circuit-cylinder 6	P.13Ab-370
P0222*	Throttle position sensor (sub) circuit low input	P.13Ab-377
P0223*	Throttle position sensor (sub) circuit high input	P.13Ab-384

DTC	DIAGNOSTIC ITEM	REFERENCE PAGE
P0300	Random/multiple cylinder misfire detected	P.13Ab-389
P0301	Cylinder 1 misfire detected	P.13Ab-394
P0302	Cylinder 2 misfire detected	P.13Ab-397
P0303	Cylinder 3 misfire detected	P.13Ab-400
P0304	Cylinder 4 misfire detected	P.13Ab-403
P0305	Cylinder 5 misfire detected	P.13Ab-406
P0306	Cylinder 6 misfire detected	P.13Ab-409
P0326	Knock sensor circuit performance (bank 1)	P.13Ab-413
P0327	Knock sensor circuit low (bank 1)	P.13Ab-417
P0328	Knock sensor circuit high (bank 1)	P.13Ab-420
P0331	Knock sensor circuit performance (bank 2)	P.13Ab-423
P0332	Knock sensor circuit low (bank 2)	P.13Ab-426
P0333	Knock sensor circuit high (bank 2)	P.13Ab-429
P0335*	Crankshaft position sensor circuit	P.13Ab-433
P0340*	Camshaft position sensor circuit	P.13Ab-441
P0401	Exhaust gas recirculation flow insufficient detected	P.13Ab-448
P0421	Warm up catalyst efficiency below threshold (bank 1)	P.13Ab-451
P0431	Warm up catalyst efficiency below threshold (bank 2)	P.13Ab-453
P0441	Evaporative emission control system incorrect purge flow	P.13Ab-456
P0442	Evaporative emission control system leak detected (small leak)	P.13Ab-460
P0443	Evaporative emission control system purge control valve circuit	P.13Ab-473
P0446	Evaporative emission control system vent control circuit	P.13Ab-481
P0450	Evaporative emission control system pressure sensor malfunction	P.13Ab-488
P0451	Evaporative emission control system pressure sensor range/performance	P.13Ab-495
P0452	Evaporative emission control system pressure sensor low input	P.13Ab-504
P0453	Evaporative emission control system pressure sensor high input	P.13Ab-512
P0455	Evaporative emission control system leak detected (Gross leak)	P.13Ab-518
P0456	Evaporative emission control system leak detected (Very small leak)	P.13Ab-530
P0461	Fuel level sensor circuit range/performance (main)	P.13Ab-541
P0462	Fuel level sensor circuit low input	P.13Ab-544
P0463	Fuel level sensor circuit high input	P.13Ab-546
P0489	EGR valve (stepper motor) circuit malfunction (Ground short)	P.13Ab-549
P0490	EGR valve (stepper motor) circuit malfunction (Battery short)	P.13Ab-555
P0506	Idle control system RPM lower than expected	P.13Ab-559
P0507	Idle control system RPM higher than expected	P.13Ab-563
P0513	Immobilizer malfunction	P.13Ab-566
P0551	Power steering pressure sensor circuit range/performance	P.13Ab-568
P0552	Power steering pressure sensor circuit low input	P.13Ab-574

DTC	DIAGNOSTIC ITEM	REFERENCE PAGE
P0553	Power steering pressure sensor circuit high input	P.13Ab-580
P0603*	EEPROM malfunction	P.13Ab-585
P0606*	Engine control module main processor malfunction	P.13Ab-587
P0622	Generator FR terminal circuit malfunction	P.13Ab-589
P0630*	Vehicle Identification Number (VIN) malfunction	P.13Ab-593
P0638*	Throttle actuator control motor circuit range/ performance	P.13Ab-596
P0642*	Throttle position sensor power supply	P.13Ab-599
P0657*	Throttle actuator control motor relay circuit malfunction	P.13Ab-601
P0660	Intake manifold tuning circuit malfunction	P.13Ab-607
P1020	Mitsubishi innovative valve timing electronic control system (MIVEC) performance problem	P.13Ab-612
P1021	Engine oil control valve circuit	P.13Ab-620
P1231	Active stability control plausibility	P.13Ab-625
P1232	Fail safe system	P.13Ab-626
P1233*	Throttle position sensor (main) plausibility	P.13Ab-628
P1234*	Throttle position sensor (sub) plausibility	P.13Ab-630
P1235*	Mass airflow sensor plausibility	P.13Ab-633
P1236*	A/D converter	P.13Ab-636
P1237*	Accelerator pedal position sensor plausibility	P.13Ab-637
P1238*	Mass airflow sensor plausibility (torque monitor)	P.13Ab-640
P1239	Engine RPM plausibility	P.13Ab-643
P1240	Ignition angle	P.13Ab-646
P1241	Torque monitor	P.13Ab-647
P1242	Fail safe control monitor	P.13Ab-650
P1243	Inquiry/response error	P.13Ab-651
P1244	RAM test for all area	P.13Ab-652
P1245	Cycle RAM test (engine)	P.13Ab-653
P1246	Communication error	P.13Ab-654
P1247	A/T plausibility	P.13Ab-655
P1248	AWD plausibility <AWD>	P.13Ab-656
P1540	LIN communication check by ECM (sending message to radiator sensor) <California>	P.13Ab-658
P1541	LIN communication (receiving message from radiator sensor) <California>	P.13Ab-658
P1543	DOR tampering monitor (temperature check after thermostat open) <California>	P.13Ab-663
P1544	DOR tampering monitor (temperature check before thermostat open) <California>	P.13Ab-666
P1545	DOR tampering monitor (temperature change after thermostat open) <California>	P.13Ab-669

DTC	DIAGNOSTIC ITEM	REFERENCE PAGE
P1546	DOR tampering monitor (temperature check at cold start) <California>	P.13Ab-671
P1547	DOR tampering monitor (rationality check) <California>	P.13Ab-674
P1580	DOR radiator tampering monitor (encrypted message) <California>	P.13Ab-658
P1590*	TCM to ECM communication error in torque reduction request	P.13Ab-678
P1603*	Battery backup circuit malfunction	P.13Ab-680
P1676*	Variant coding	P.13Ab-684
P2066	Fuel level sensor circuit range/performance (sub) <AWD>	P.13Ab-686
P2100*	Throttle actuator control motor circuit (open)	P.13Ab-690
P2101*	Throttle actuator control motor magneto malfunction	P.13Ab-694
P2122*	Accelerator pedal position sensor (main) circuit low input	P.13Ab-697
P2123*	Accelerator pedal position sensor (main) circuit high input	P.13Ab-702
P2127*	Accelerator pedal position sensor (sub) circuit low input	P.13Ab-706
P2128*	Accelerator pedal position sensor (sub) circuit high input	P.13Ab-710
P2135*	Throttle position sensor (main and sub) circuit range/performance problem	P.13Ab-713
P2138*	Accelerator pedal position sensor (main and sub) circuit range/ performance	P.13Ab-717
P2195	Heated oxygen sensor inactive (bank1 sensor 1)	P.13Ab-721
P2197	Heated oxygen sensor inactive (bank2 sensor 1)	P.13Ab-724
P2228*	Barometric pressure circuit low input	P.13Ab-727
P2229*	Barometric pressure circuit high input	P.13Ab-729
P2252	Heated oxygen sensor offset circuit low voltage	P.13Ab-731
P2253	Heated oxygen sensor offset circuit high voltage	P.13Ab-733
P2423	HC adsorber (HC trap catalyst) efficiency below threshold <California>	P.13Ab-735
P2567	LIN communication check by radiator sensor (thermister error) <California>	P.13Ab-737
U0001	Bus off	P.13Ab-739
U0101*	A/T-ECU time-out	P.13Ab-740
U0114	AWD-ECU time-out <AWD>	P.13Ab-742
U0121	ABS-ECU/ASC-ECU time-out	P.13Ab-744
U0141*	ETACS-ECU time-out	P.13Ab-746
U0167	Immobilizer communication error	P.13Ab-749
U1180*	Combination meter time-out	P.13Ab-750

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

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

NOTE: After the ECM 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.*

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. Also, sensor 3

indicates the sensor mounted at the position third closest to the engine

NOTE: Bank 1 indicates the right bank side cylinder, and Bank 2 indicates the left bank side cylinder.

SYMPTOM CHART

M11310100003USA0000010000

⚠ 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 DTC(s). If DTC (s) are set, erase them all.

⚠ CAUTION

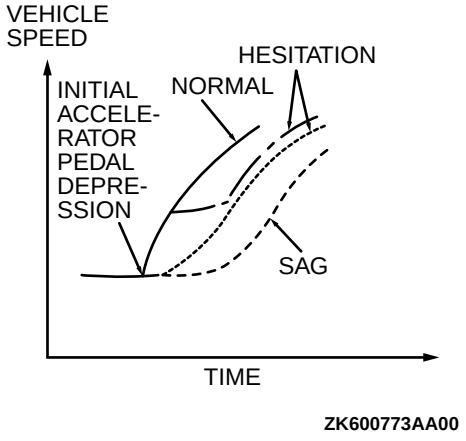
Disconnecting the battery cables or removing the combination meter will erase the learned value of the fuel gauge. To recover the learned value, input a vehicle speed (by actually driving the vehicle or inputting a simulated vehicle speed), and stop the vehicle. This will complete the learning process.

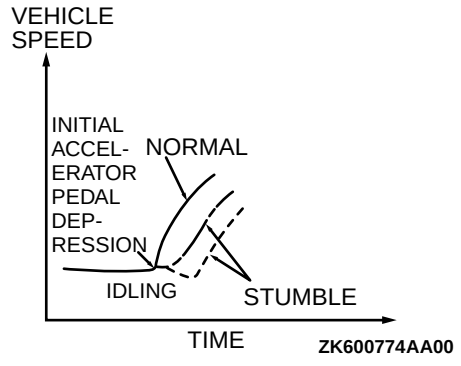
NOTE: Check that the ECM ground circuit is normal before checking for the cause of the problem.

TROUBLE SYMPTOMS		INSPECTION PROCEDURE	REFERENCE PAGE
Communication with scan tool is impossible	Communication with ECM only is not possible	1	P.13Ab-753
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	2	P.13Ab-756
	The Malfunction Indicator Lamp (SERVICE ENGINE SOON or Check Engine Lamp) remains illuminated and never goes out	3	P.13Ab-757
Starting	Cranks, won't start	4	P.13Ab-758
	Starts up and dies	5	P.13Ab-765
	Hard starting	6	P.13Ab-770
Idling stability (improper idling)	Unstable idle (rough idle, hunting)	7	P.13Ab-775
	Idle speed is high (improper idle speed)	8	P.13Ab-779
	Idle speed is low (improper idle speed)	9	P.13Ab-780
Idling stability (engine stalls)	When the engine is cold, it stalls at idle (die out)	10	P.13Ab-781
	When the engine is hot, it stalls at idle (die out)	11	P.13Ab-784
	The engine stalls when accelerating (pass out)	12	P.13Ab-787
	The engine stalls when decelerating	13	P.13Ab-789
Driving	Hesitation, sag, Stumble, Poor acceleration or Surge	14	P.13Ab-791
	Acceleration shock	15	P.13Ab-794
	Knocking	16	P.13Ab-795

TROUBLE SYMPTOMS		INSPECTION PROCEDURE	REFERENCE PAGE
Too high CO and HC concentration when idling		17	P.13Ab-797
IM240 test failure	Transient, mass emission tailpipe test failure	18	P.13Ab-799
	Purge flow test of the evaporative emission canister failure	19	P.13Ab-804
	Pressure test of the evaporative system failure	20	P.13Ab-805
Power supply system and ignition switch-IG system		21	P.13Ab-807
Fuel pump system		22	P.13Ab-813
Ignition switch-ST system and transmission range switch system		23	P.13Ab-819
Ignition circuit system		24	P.13Ab-826
A/C system		25	P.13Ab-831
Engine oil pressure switch system		26	P.13Ab-834

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.	
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".	 ZK600773AA00

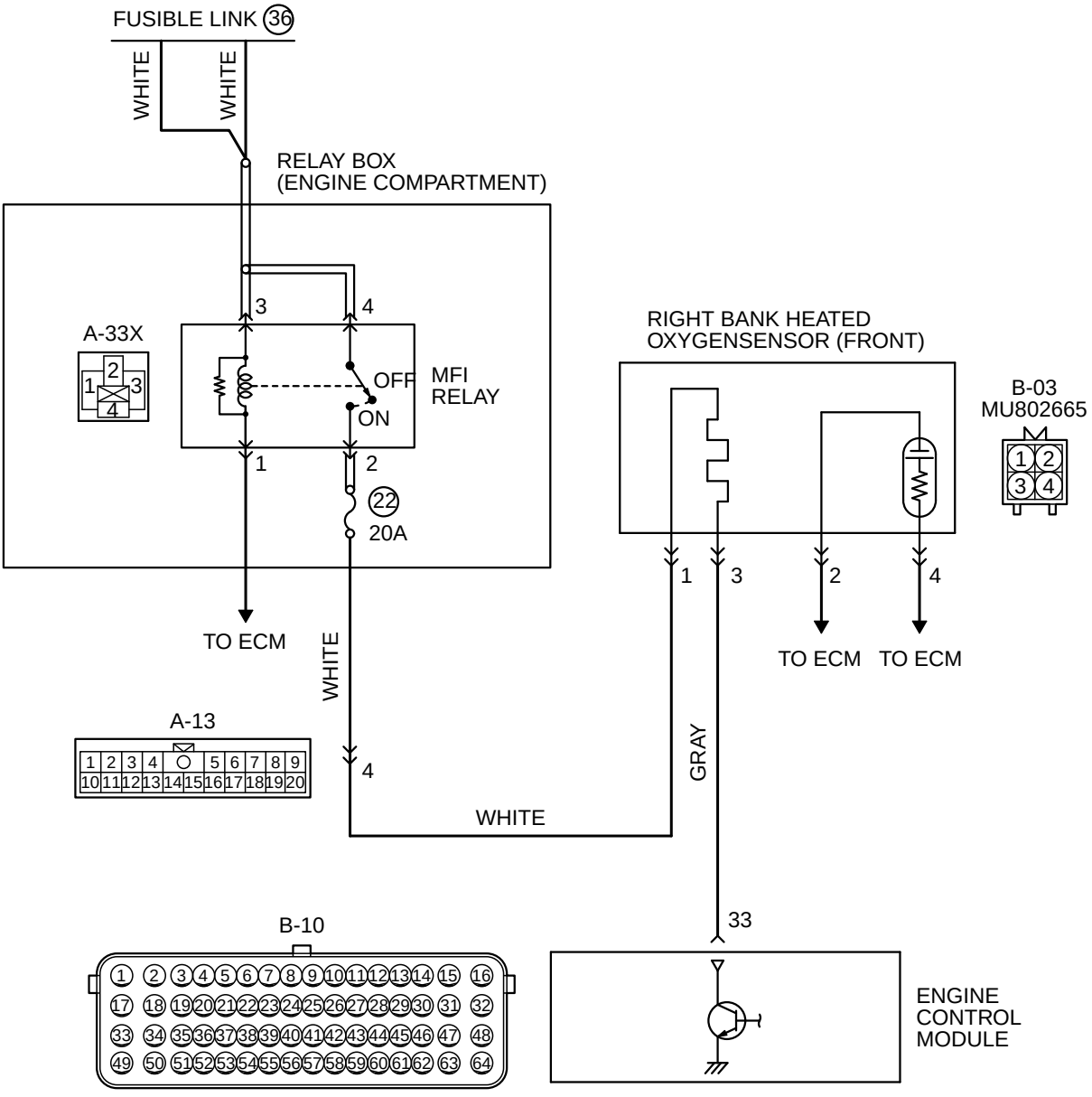
ITEMS		SYMPTOM	
	Poor acceleration	Poor acceleration is inability to obtain an acceleration corresponding to the degree of throttle opening, even though acceleration is smooth. Also the inability to reach maximum speed.	
	Stumble	Engine speed increase is delayed when the accelerator pedal is initially depressed for acceleration.	
	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

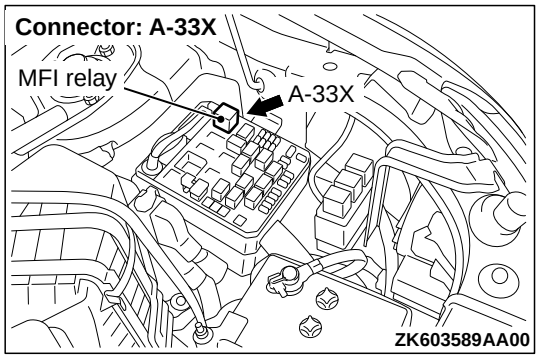
DTC P0031: Heated Oxygen Sensor Heater Control Circuit Low (bank 1, sensor 1)

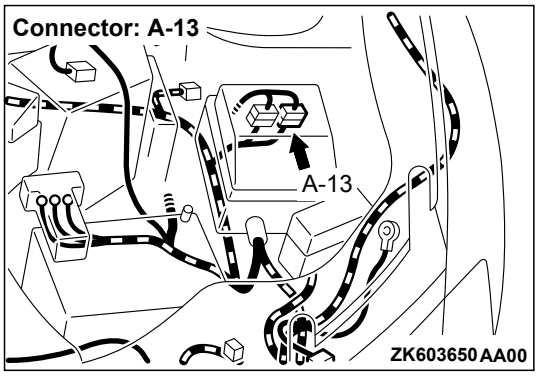
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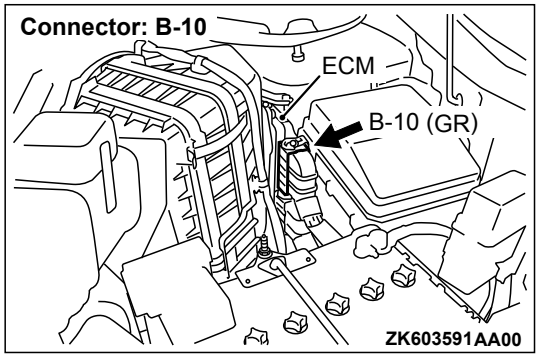
RIGHT BANK HEATED OXYGEN SENSOR (FRONT) HEATER CIRCUIT

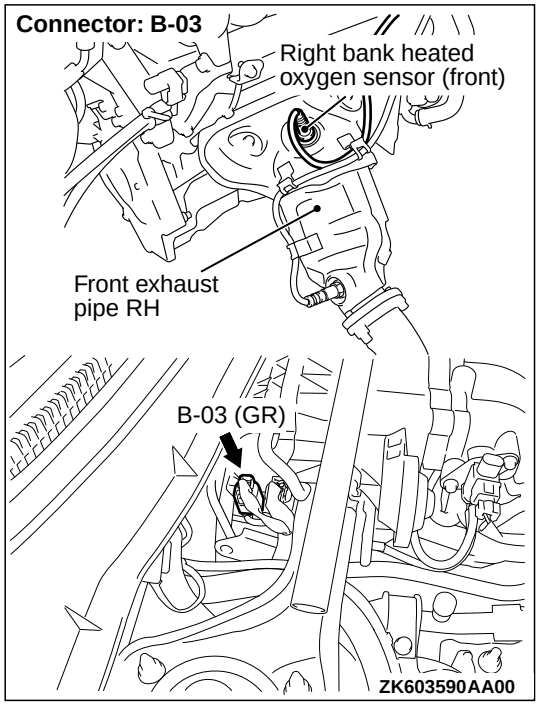


ZK602828 **AA00**









CIRCUIT OPERATION

- Power is supplied from the MFI relay (terminal No. 4) to the right bank heated oxygen sensor (front) heater.
- The ECM (terminal No. 33) controls continuity to the right bank heated oxygen sensor (front) heater by turning the power transistor in the PCM "ON" and "OFF".

TECHNICAL DESCRIPTION

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

DESCRIPTIONS OF MONITOR METHODS

Right bank 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)

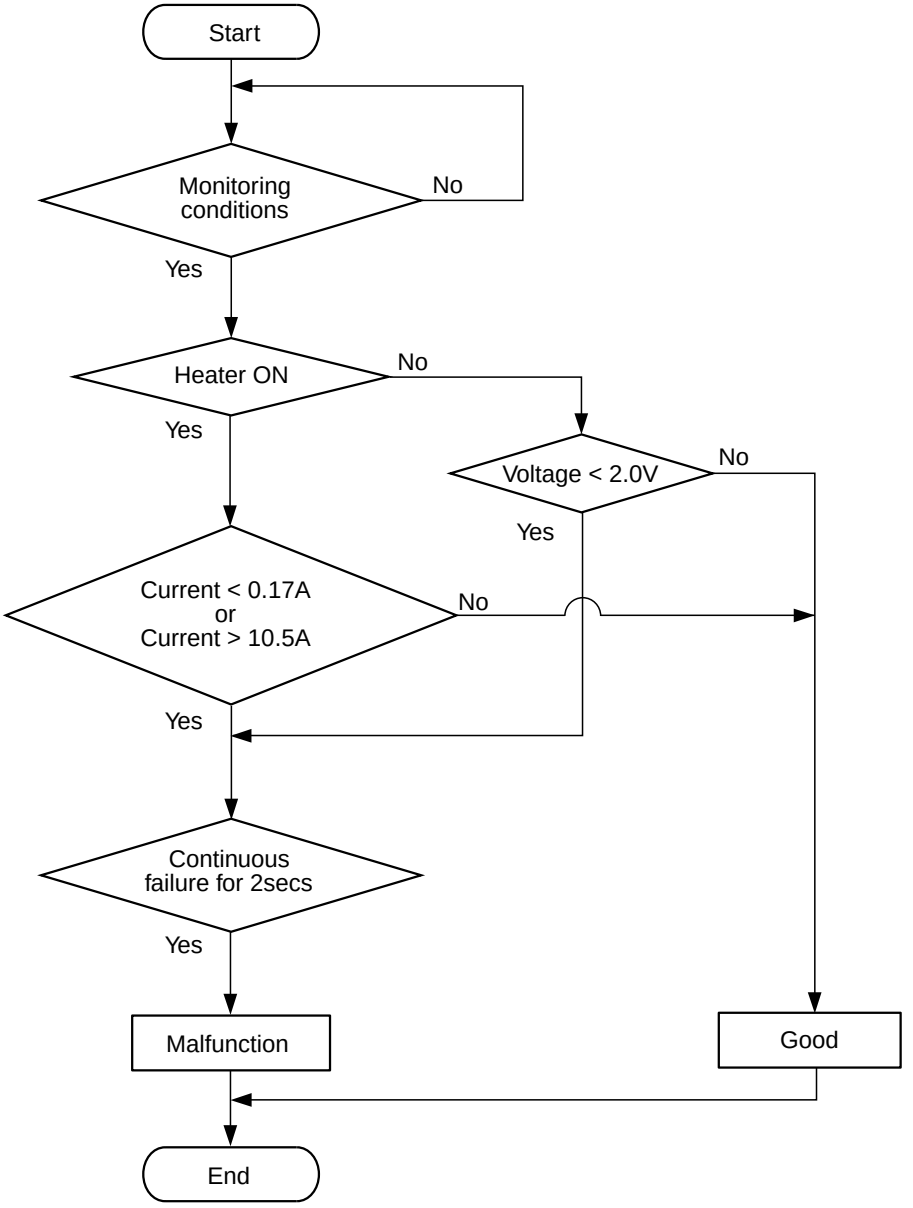
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITION

Logic Flow Chart



ZK603657 AA00

Check Conditions

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

Judgement Criterion

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

Check Conditions

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

Judgement Criterion

- The right bank heated oxygen sensor (front) heater voltage has continued to be lower than 2.0 voltage for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function - OBD-II Drive Cycle - Pattern 2 P.13Ab-8.

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

- Connector damage.
- Right bank heated oxygen sensor (front) heater.
- Harness damage
- ECM failed.

DIAGNOSIS

Required Special Tools:

- MB991316: Test Harness

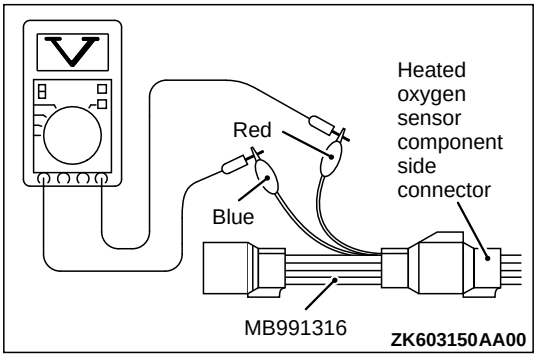
STEP 1. Check harness connector B-03 at the right bank heated oxygen sensor (front) and harness connector B-10 at the ECM for damage.

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 right bank heated oxygen sensor (front).



(1) Disconnect right bank heated oxygen sensor (front) connector B-03 and connect test harness special tool, MB991316, to the connector on the right bank 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)]?

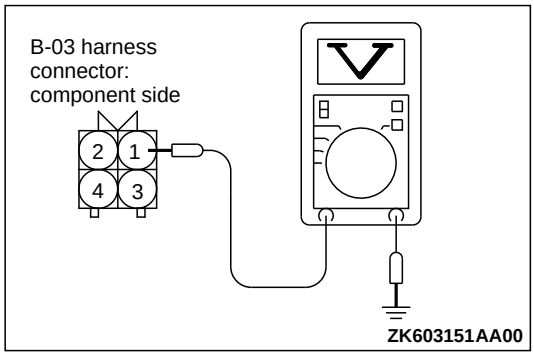
YES: Go to Step 3.

NO: Replace the right bank heated oxygen sensor (front). Then go to Step 6.

STEP 3. Measure the power supply voltage at right bank heated oxygen sensor (front) and harness side connector B-03.

(1) Disconnect the 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?

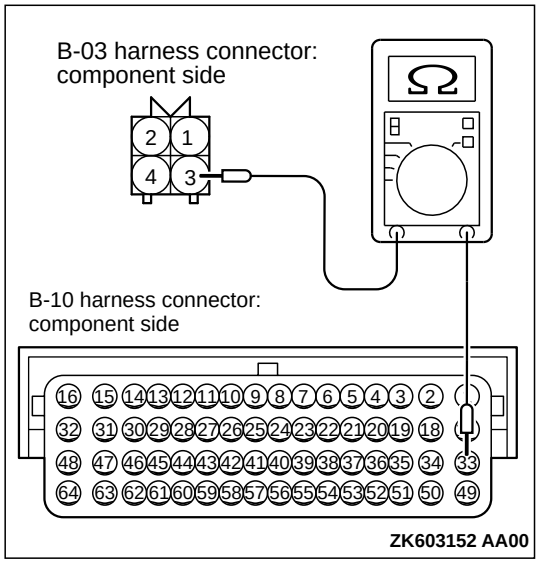
YES: Go to Step 4.

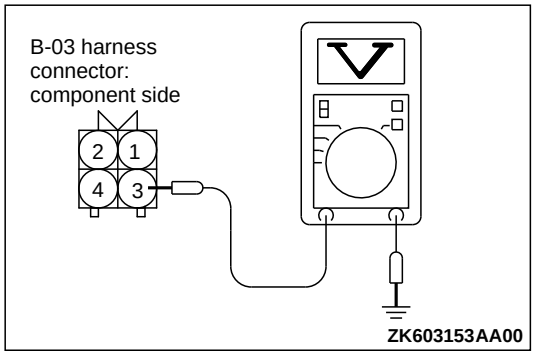
NO: Repair harness wire between the MFI relay connector A-33X (terminal No. 2) and the right bank heated oxygen sensor (front) connector B-03 (terminal No. 1) because of open circuit or harness damage. Then go to step 6.

STEP 4.Check for open circuit to ground or harness damage between right bank heated oxygen sensor (front) connector B-03 and ECM connector B-10.

(1) Disconnect the right bank heated oxygen sensor (front) connector B-03 and the ECM connector B-10.

(2) Measure the resistance between the heated oxygen sensor connector B-03 (terminal No. 3) and the ECM connector B-10 (terminal No. 33).
- Should be less than 2 ohms.





(3) Check for the continuity between the oxygen sensor connector B-03 (terminal No. 3) and ground.
- Not continuity.

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 trouble symptoms.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function - OBD-II Drive Cycle - Pattern 2 P. 13Ab-8.

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

Q:Is DTC P0031 set?

YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP

42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 6.
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.00-15.

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 2 P. 13Ab-8.
(2) Check the diagnostic trouble code (DTC).

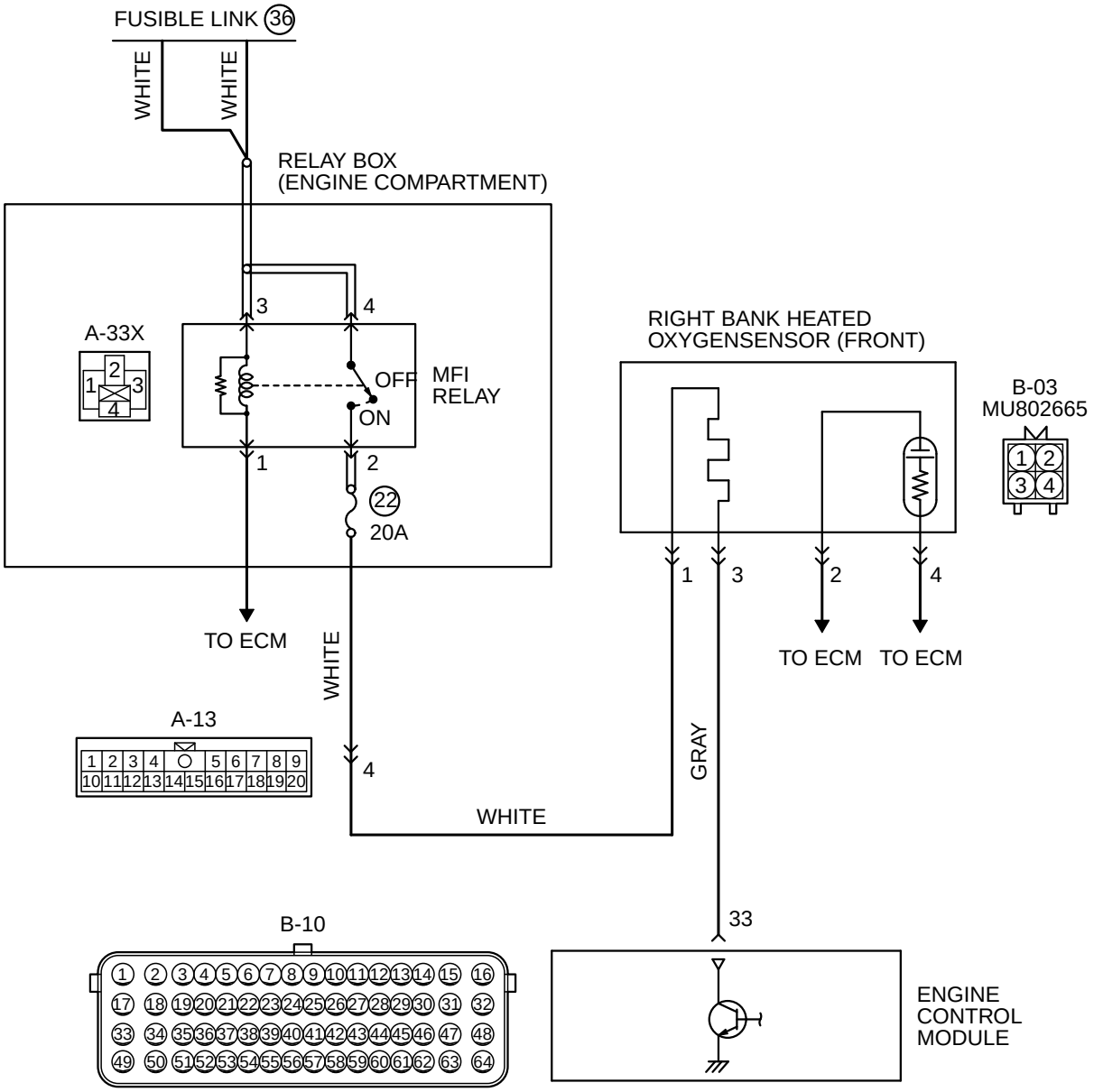
Q:Is DTC P0031 set?

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

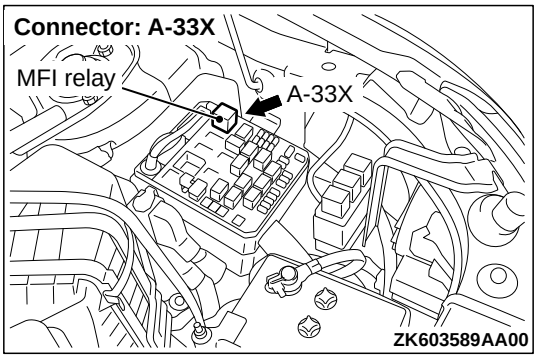
DTC P0032: Heated Oxygen Sensor Heater Control Circuit High (bank 1, sensor 1)

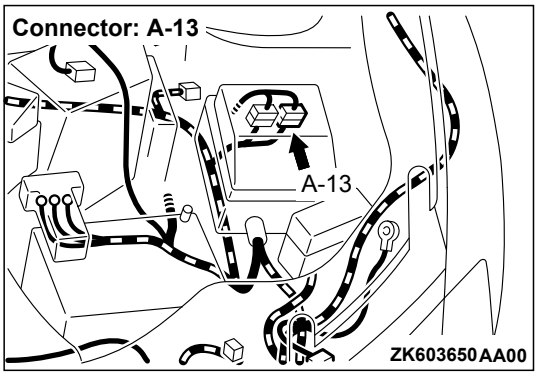
M11310100162USA0000010000

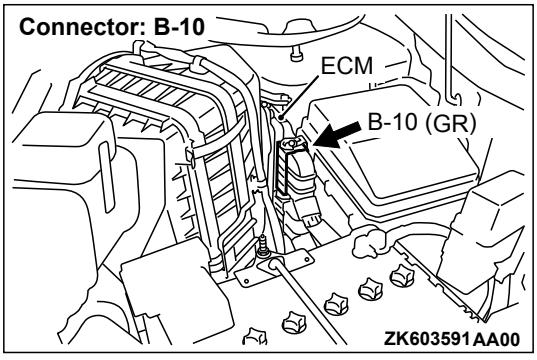
RIGHT BANK HEATED OXYGEN SENSOR (FRONT) HEATER CIRCUIT

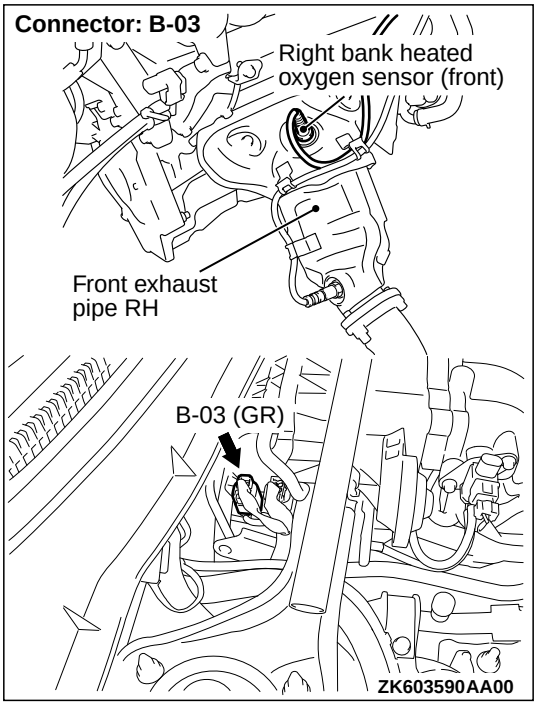


ZK602828 **AA00**









CIRCUIT OPERATION

- Power is supplied from the MFI relay (terminal No. 4) to the right bank heated oxygen sensor (front) heater.
- The ECM (terminal No. 33) controls continuity to the right bank heated oxygen sensor (front) heater by turning the power transistor in the ECM "ON" and "OFF".

TECHNICAL DESCRIPTION

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

DESCRIPTIONS OF MONITOR METHODS

Right bank 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)

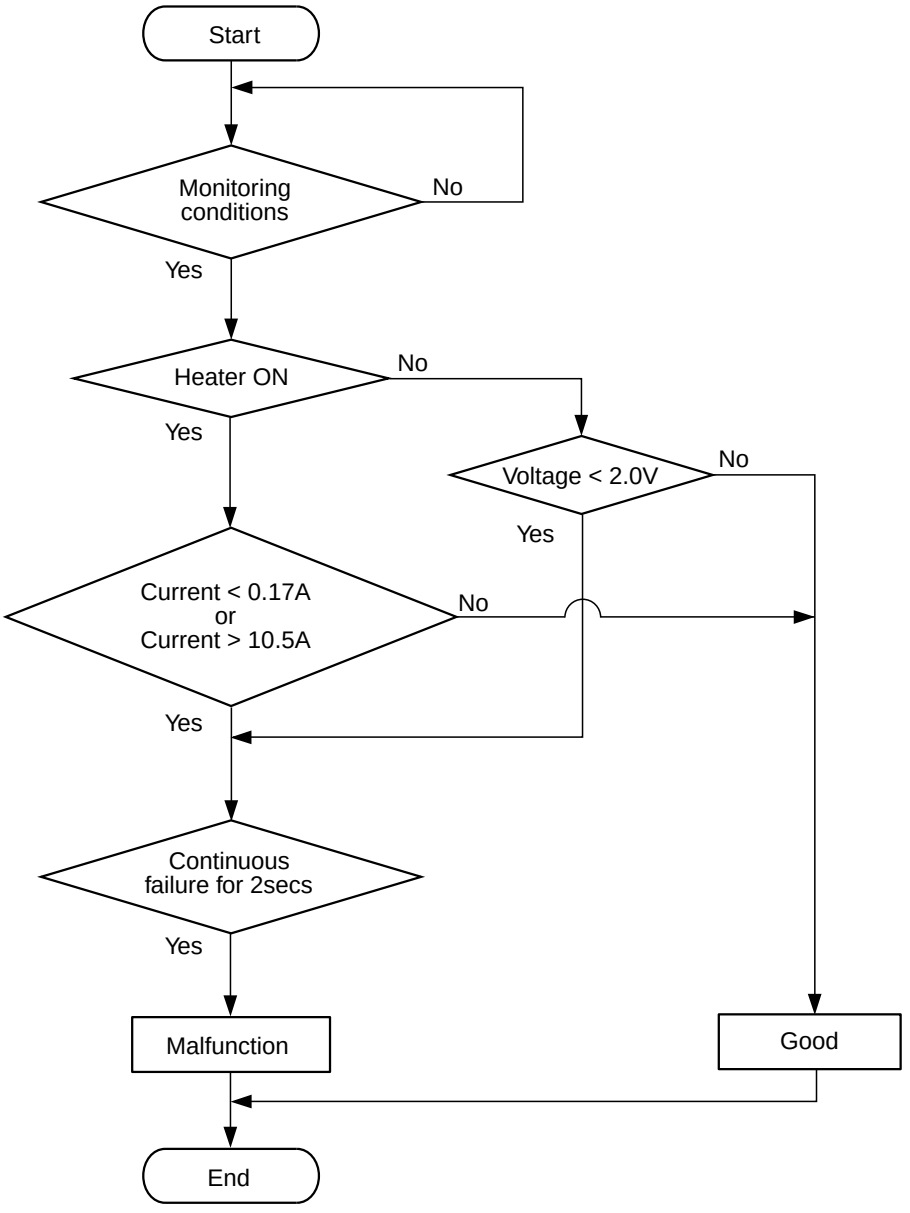
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITION

Logic Flow Chart



ZK603657 AA00

Check Conditions

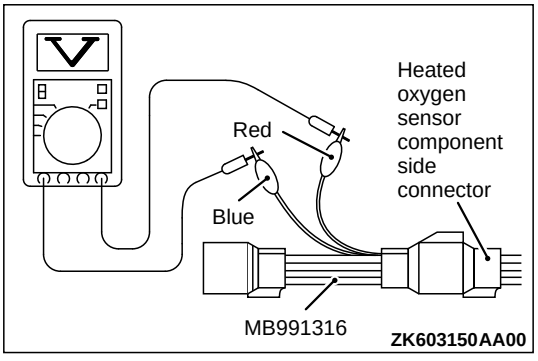
- More than 2 seconds have passed since the engine starting sequence was completed.
- While the right bank heated oxygen sensor (front) heater is on.
- Battery positive voltage is between 11 and 16.5 volts.

Judgement Criterion
- The right bank heated oxygen sensor (front) heater current has continued to be higher than 10.5 ampere for 2 seconds.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)
- Right bank heated oxygen sensor (front) heater.
- ECM failed.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function - OBD-II Drive Cycle - Pattern 2 P.13Ab-8.



DIAGNOSIS

Required Special Tool:
- MB991316: Test Harness

STEP 1. Check the right bank heated oxygen sensor (front).

(1) Disconnect right bank heated oxygen sensor (front) connector B-03 and connect test harness special tool, MB991316, to the connector on the right bank 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 right bank 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. 13Ab-8.

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

Q:Is DTC P0032 set?

YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. 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.00-15.

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. 13Ab-8.

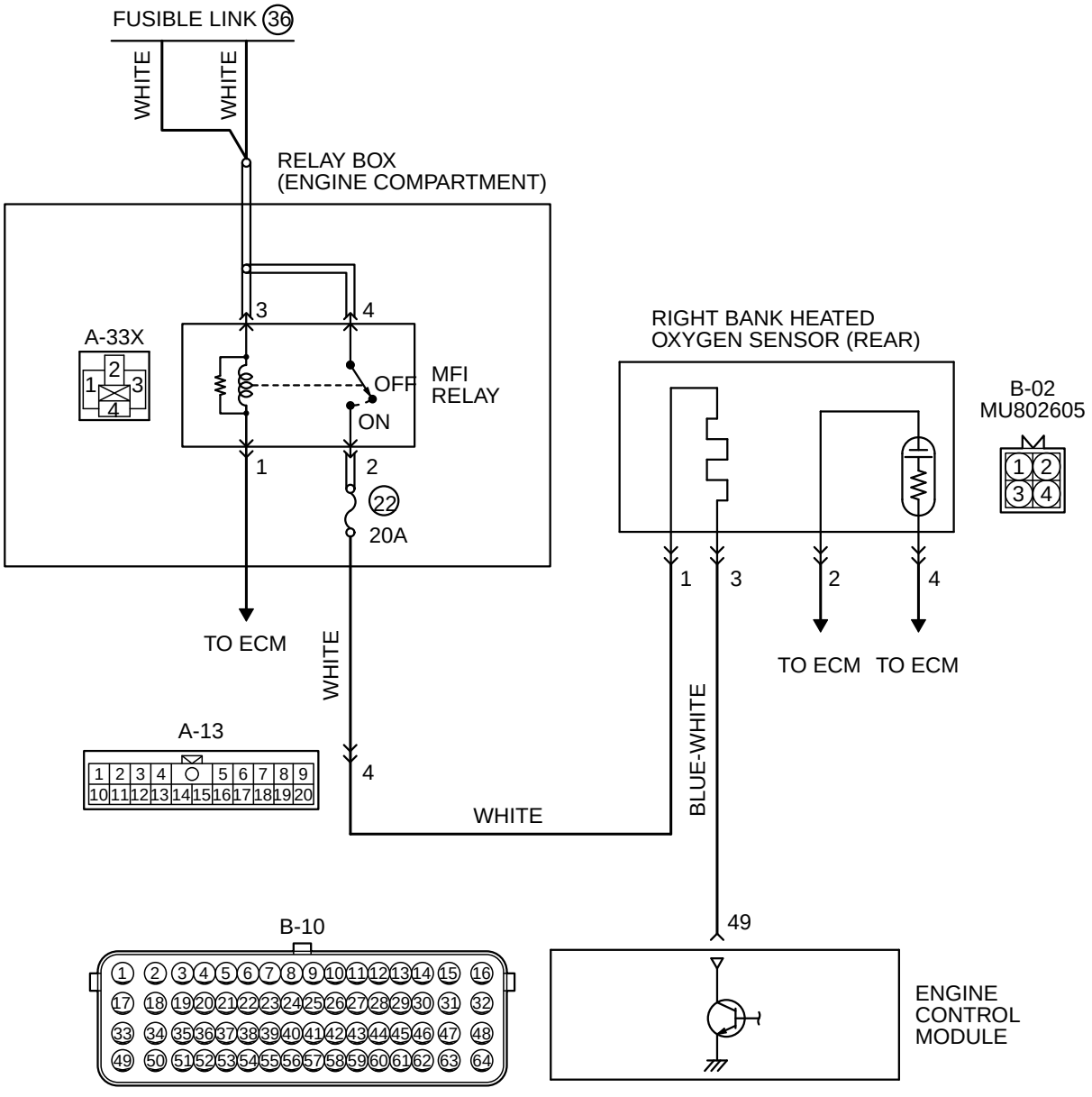
(2) Check the diagnostic trouble code (DTC).

Q:Is DTC P0032 set?
YES: Retry the troubleshooting.
NO: The inspection is complete.

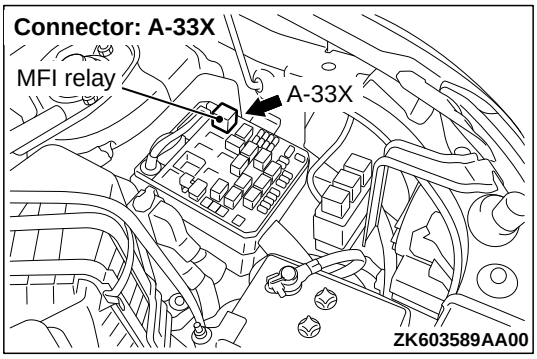
DTC P0037: Heated Oxygen Sensor Heater Control Circuit Low (bank 1, sensor 2)

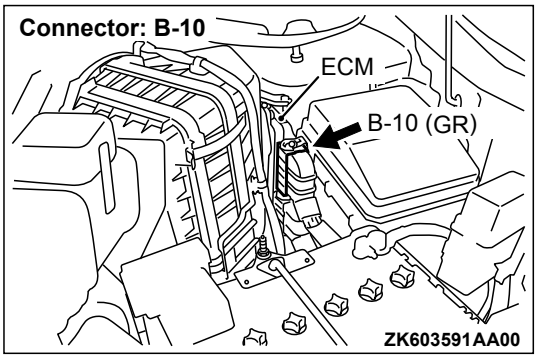
M11310100163USA0000010000

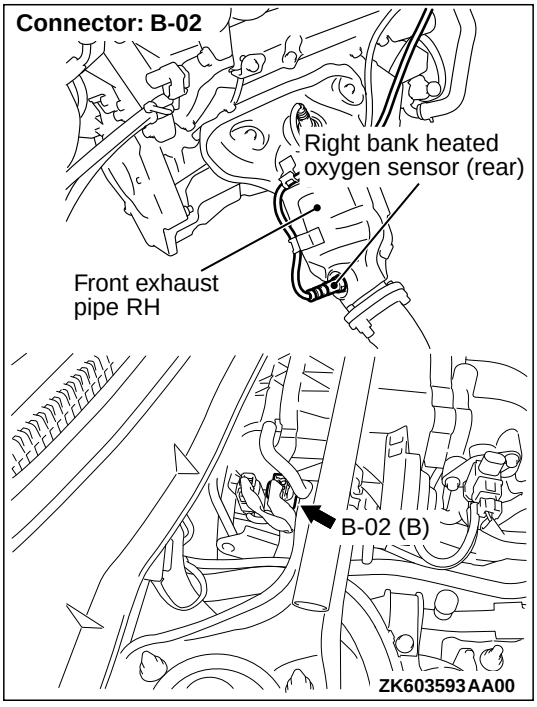
RIGHT BANK HEATED OXYGEN SENSOR (REAR) HEATER CIRCUIT

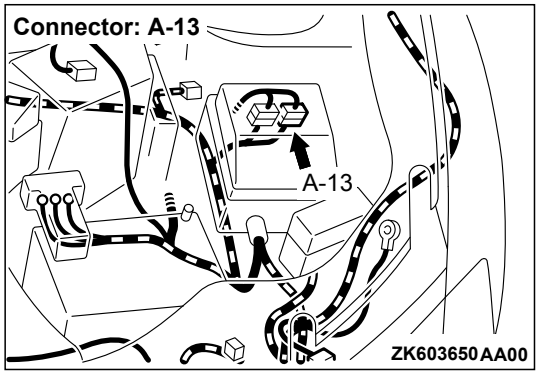


ZK602829 **AA00**









CIRCUIT OPERATION

- Power is supplied from the MFI relay (terminal No. 4) to the right bank heated oxygen sensor (rear) heater.
- The ECM (terminal No. 49) controls continuity to the right bank heated oxygen sensor (rear) heater by turning the power transistor in the ECM "ON" and "OFF".

TECHNICAL DESCRIPTION

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

DESCRIPTIONS OF MONITOR METHODS

Right bank 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)

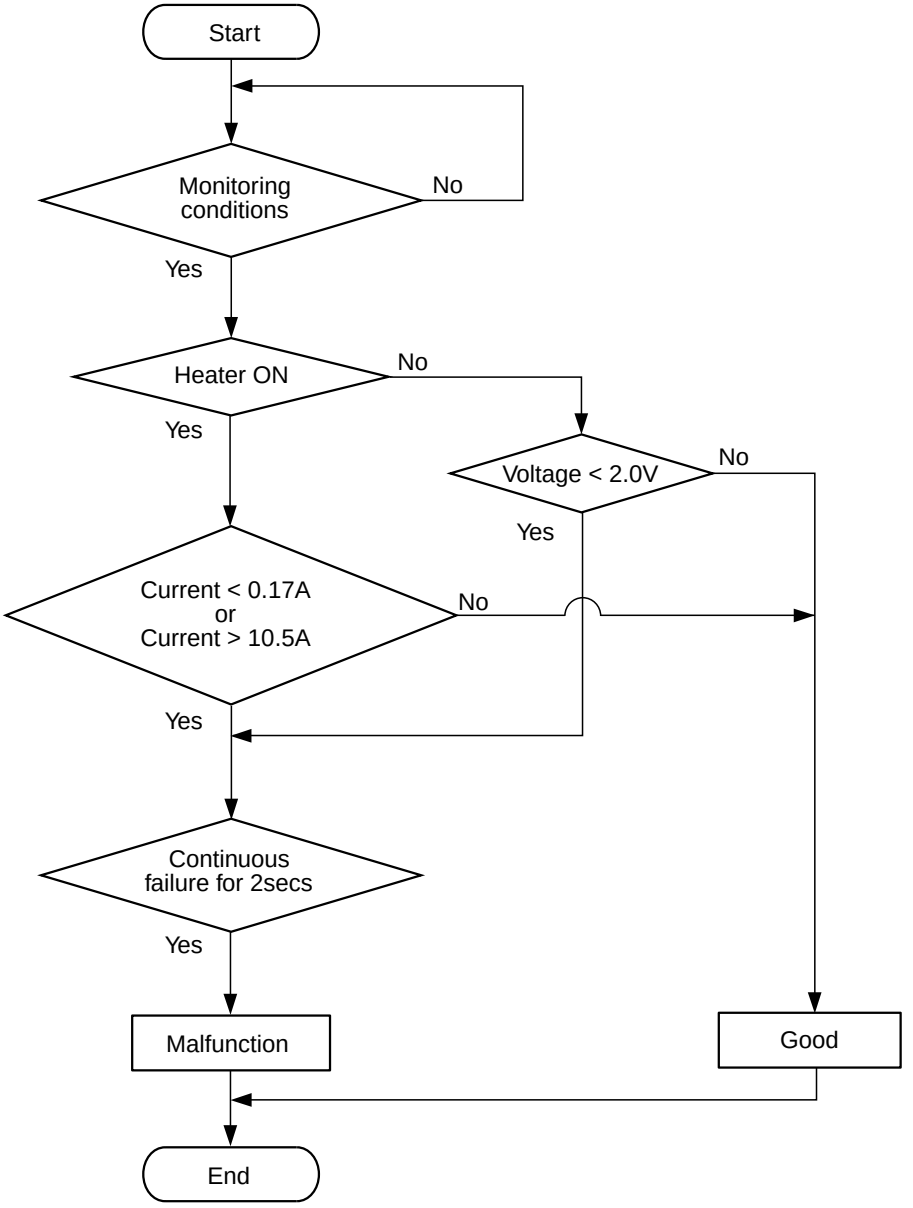
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITION

Logic Flow Chart



ZK603657 AA00

Check Conditions

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

Judgement Criterion

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

Check Conditions

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

Judgement Criterion

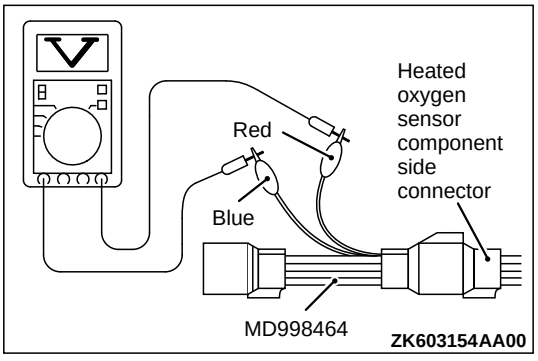
- The right bank heated oxygen sensor (rear) heater voltage has continued to be lower than 2.0 voltage for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function - OBD-II Drive Cycle - Pattern 2 P.13Ab-8.

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

- Right bank heated oxygen sensor (rear) heater failed.
- Connector damage.
- Harness damage
- ECM failed.



DIAGNOSIS

Required Special Tools:

- MB998464: Test Harness

STEP 1. Check harness connector B-02 at the right bank heated oxygen sensor (rear) and harness connector B-10 at the ECM 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 right bank heated oxygen sensor (rear).

(1) Disconnect the right bank heated oxygen sensor (rear) connector B-02 and connect test harness special tool, MD998464, to the connector on the right bank 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)]?

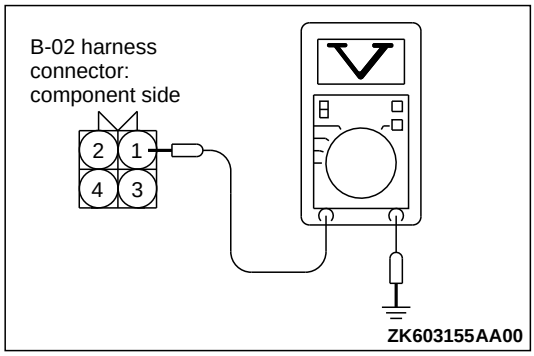
YES: Go to Step 3.

NO: Replace the right bank heated oxygen sensor (rear). Then go to Step 6.

STEP 3. Measure the power supply voltage at right bank heated oxygen sensor (rear) and harness side connector B-02.

(1) Disconnect the connector B-02 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?

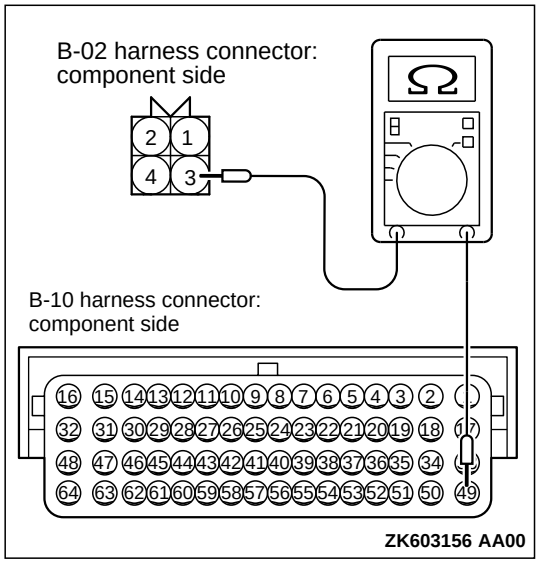
YES: Go to Step 4.

NO: Repair harness wire between the MFI relay connector A-33X (terminal No. 2) and the right bank heated oxygen sensor (rear) connector B-02 (terminal No. 1) because of open circuit or harness damage. Then go to step 6.

STEP 4.Check for open circuit to ground or harness damage between right bank heated oxygen sensor (rear) connector B-02 and ECM connector B-10.

(1) Disconnect the right bank heated oxygen sensor (rear) connector B-02 and the ECM connector B-10.

(2) Measure the resistance between the heated oxygen sensor connector B-02 (terminal No. 3) and ECM connector B-10 (terminal No. 49).
- Should be less than 2 ohms.

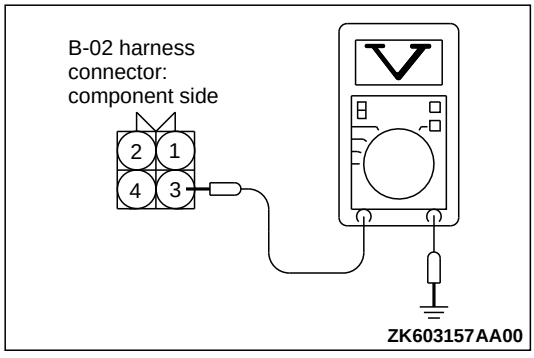


(3) Check for the continuity between the oxygen sensor connector B-02 (terminal No. 3) and ground.
- Not continuity.

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 trouble symptoms.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function - OBD-II Drive Cycle - Pattern 2 P. 13Ab-8.

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

Q:Is DTC P0037 set?

YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP

42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 6.
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.00-15.

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 2 P. 13Ab-8.
(2) Check the diagnostic trouble code (DTC).

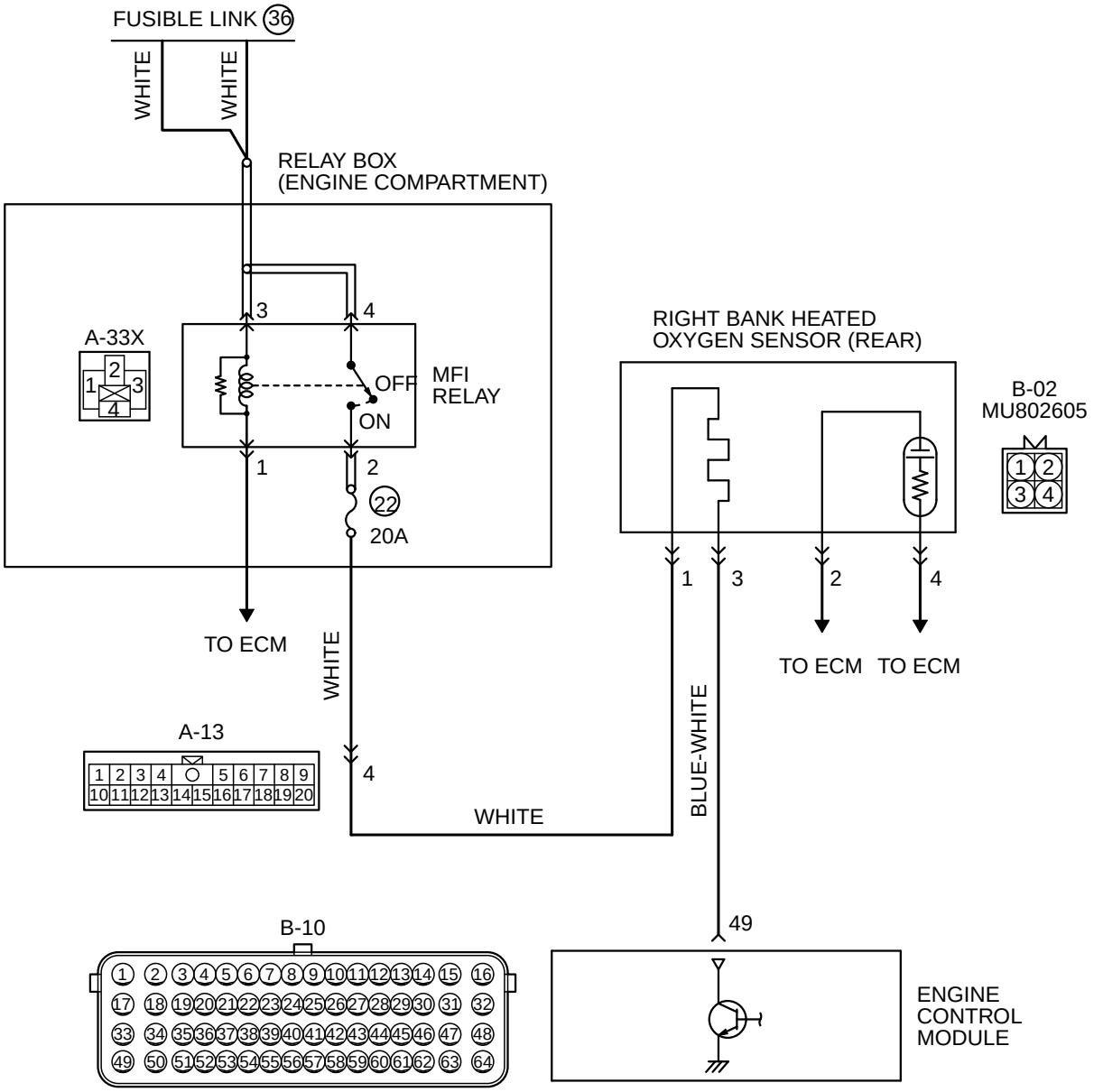
Q:Is DTC P0037 set?

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

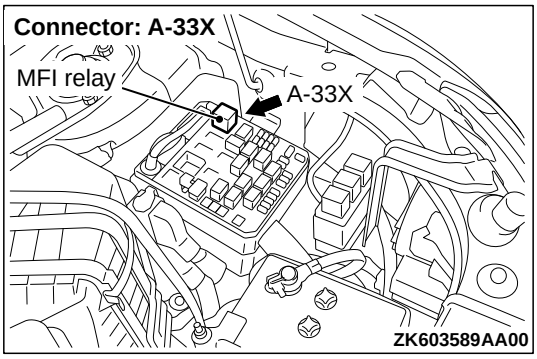
DTC P0038: Heated Oxygen Sensor Heater Control Circuit High (bank 1, sensor 2)

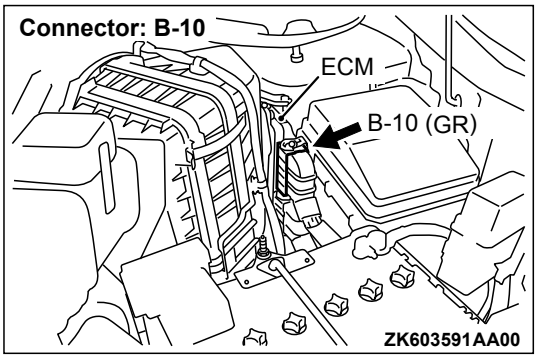
M11310100164USA0000010000

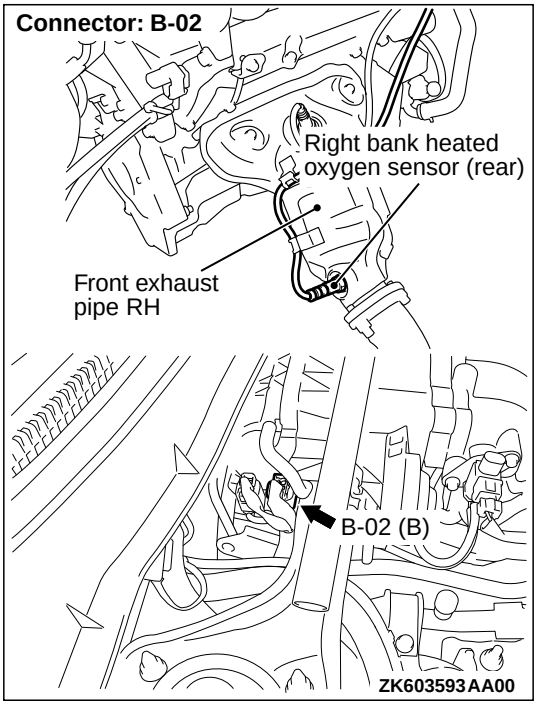
RIGHT BANK HEATED OXYGEN SENSOR (REAR) HEATER CIRCUIT

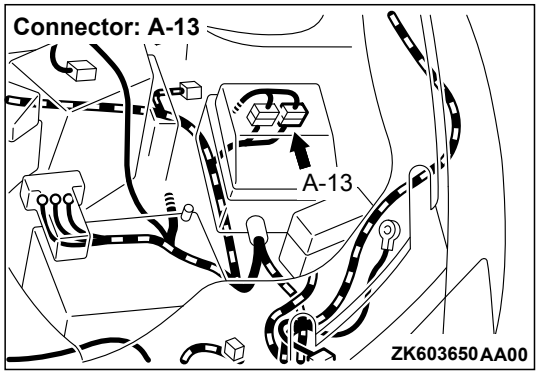


ZK602829 **AA00**









CIRCUIT OPERATION

- Power is supplied from the MFI relay (terminal No. 4) to the right bank heated oxygen sensor (rear) heater.
- The ECM (terminal No. 49) controls continuity to the right bank heated oxygen sensor (rear) heater by turning the power transistor in the ECM "ON" and "OFF".

TECHNICAL DESCRIPTION

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

DESCRIPTIONS OF MONITOR METHODS

Right bank 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)

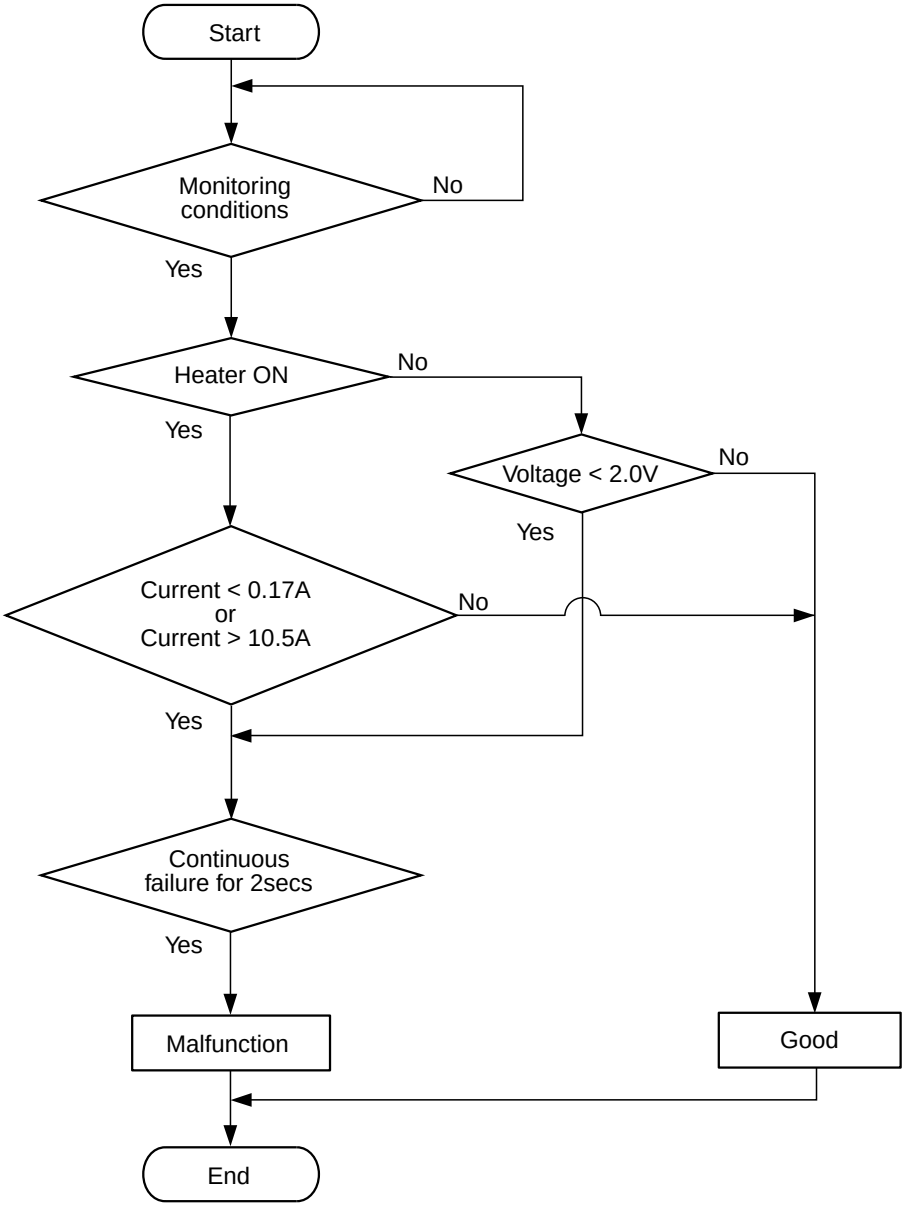
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITION

Logic Flow Chart



ZK603657 AA00

Check Conditions

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

Judgement Criterion

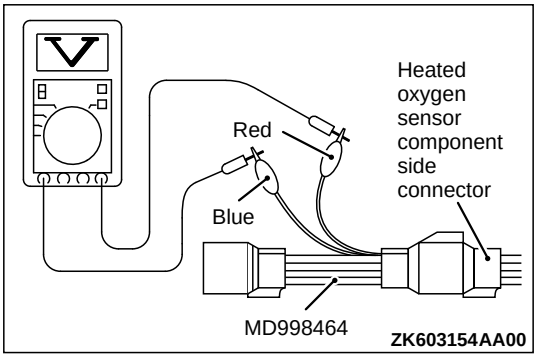
- The right bank heated oxygen sensor (rear) heater current has continued to be higher than 10.5 ampere for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function - OBD-II Drive Cycle - Pattern 2 P.13Ab-8.

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

- Right bank heated oxygen sensor (rear) failed.
- ECM failed.



DIAGNOSIS

Required Special Tool:
- MB991316: Test Harness

STEP 1. Check the right bank heated oxygen sensor (rear).

(1) Disconnect right bank heated oxygen sensor (rear) connector B-02 and connect test harness special tool, MD998464, to the connector on the right bank 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 right bank 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. 13Ab-8.

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

Q:Is DTC P0038 set?

YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. 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.00-15.

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. 13Ab-8.

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

Q:Is DTC P0038 set?

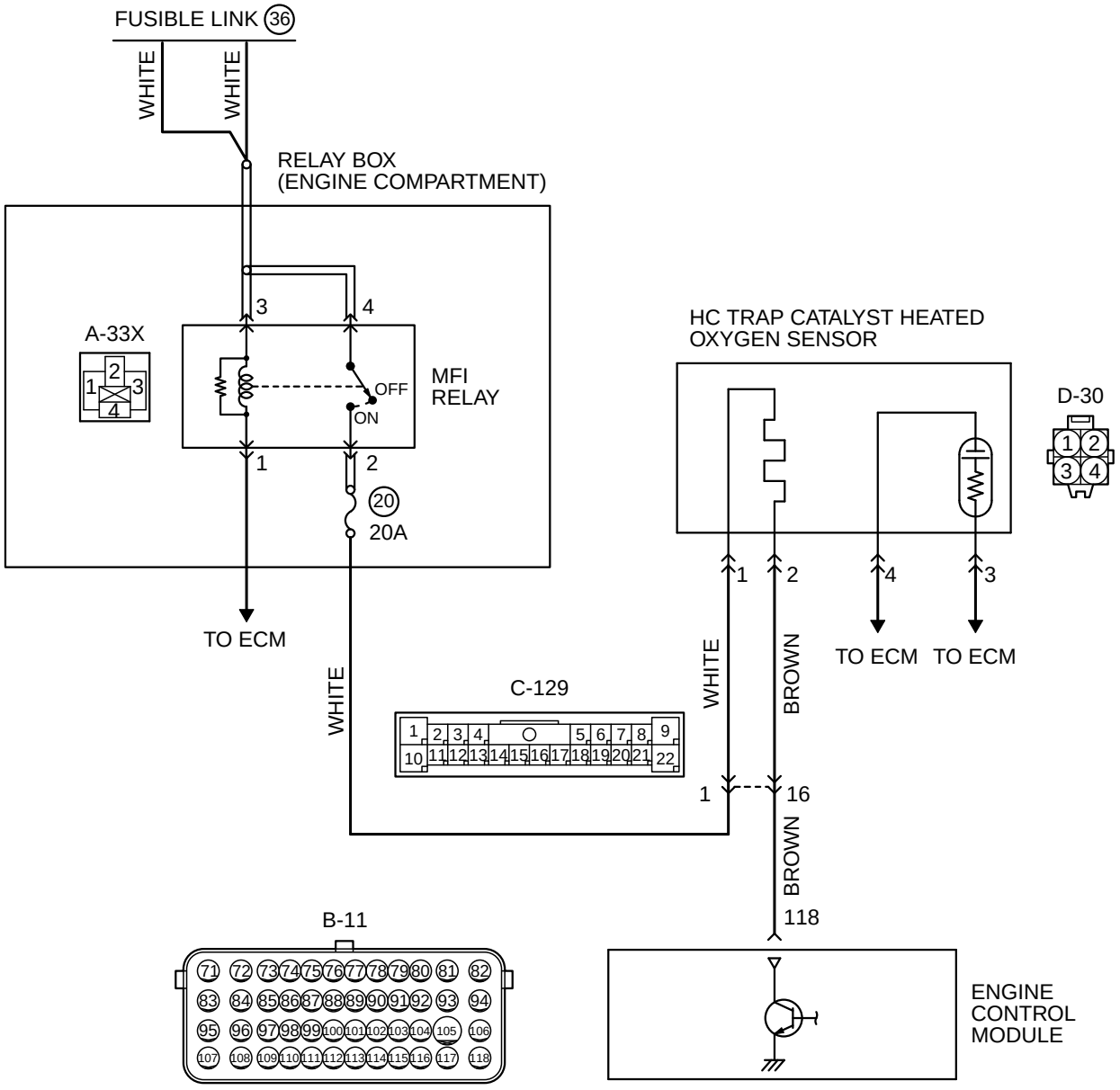
YES: Retry the troubleshooting.

NO: The inspection is complete.

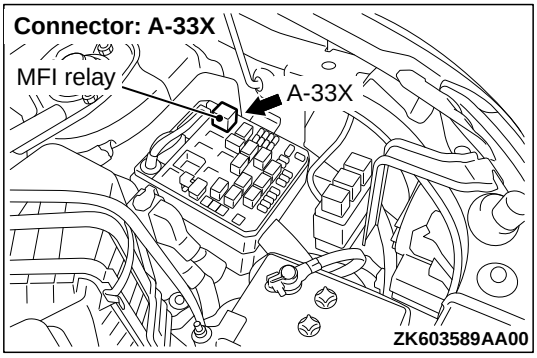
DTC P0043: Heated Oxygen Sensor Heater Control Circuit Low (bank 1, sensor 3) <California>

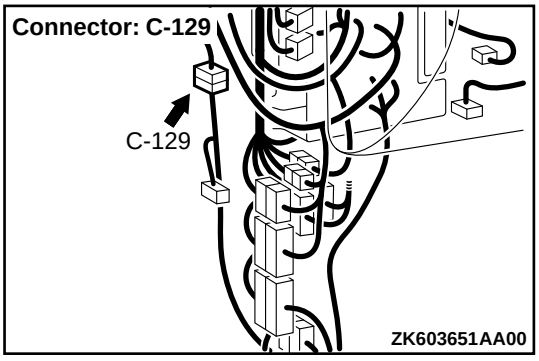
M11310100361USA0000010000

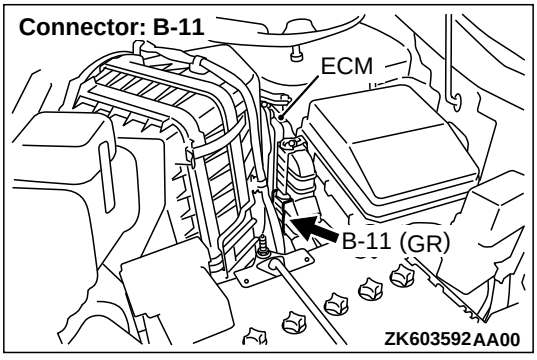
HC TRAP CATALYST HEATED OXYGEN SENSOR HEATER CIRCUIT

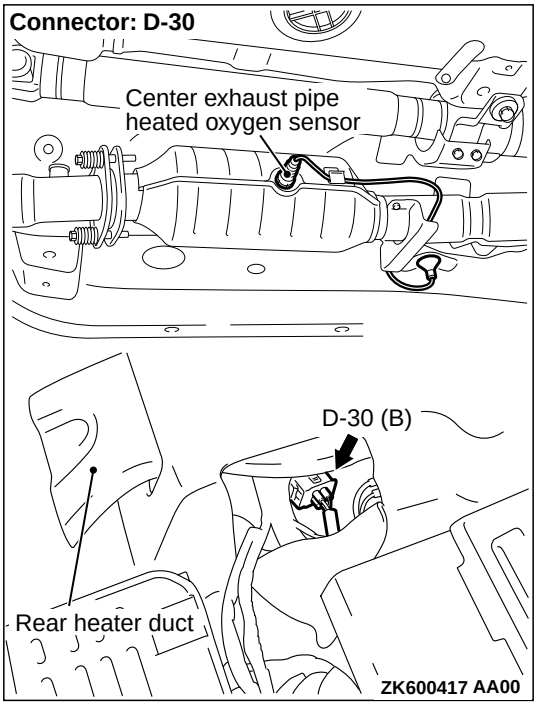


ZK602830AA00









CIRCUIT OPERATION

- Power is supplied from the MFI relay (terminal No. 4) to the right bank heated oxygen sensor (front) heater.
- The ECM (terminal No. 118) controls continuity to the center exhaust pipe heated oxygen sensor heater by turning the power transistor in the ECM "ON" and "OFF".

TECHNICAL DESCRIPTION

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

DESCRIPTIONS OF MONITOR METHODS

Center exhaust pipe heated oxygen sensor heater 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)

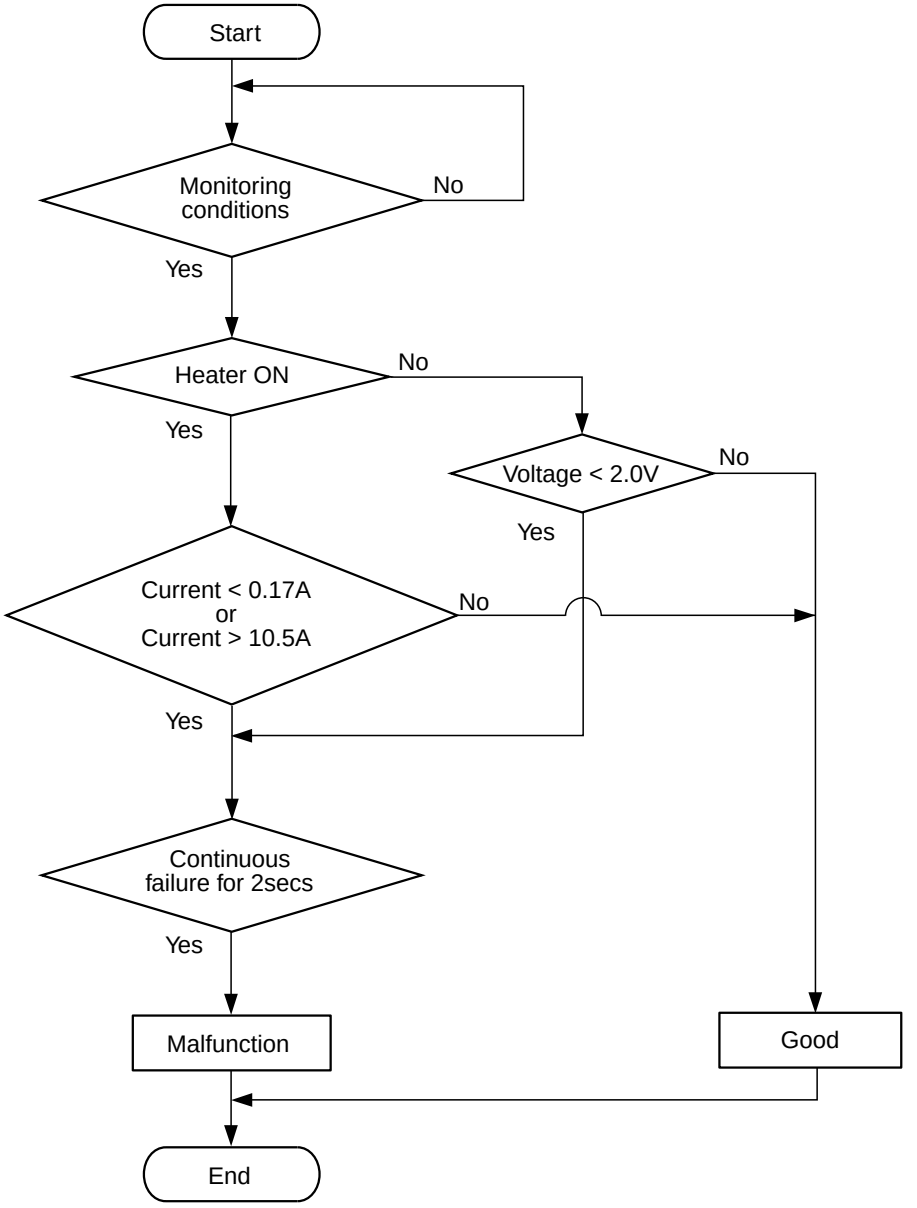
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITION

Logic Flow Chart



ZK603657 AA00

Check Conditions

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

Judgement Criterion

- The center exhaust pipe heated oxygen sensor (front) heater current has continued to be lower than 0.17 ampere for 2 seconds.

Check Conditions

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

Judgement Criterion

- The center exhaust pipe heated oxygen sensor (front) heater voltage has continued to be lower than 2.0 voltage for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function - OBD-II Drive Cycle - Pattern 2 P.13Ab-8.

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

- Connector damage.
- Center exhaust pipe heated oxygen sensor heater failed.
- Harness damage
- ECM failed.

DIAGNOSIS

Required Special Tool:

- MB991658: Test Harness

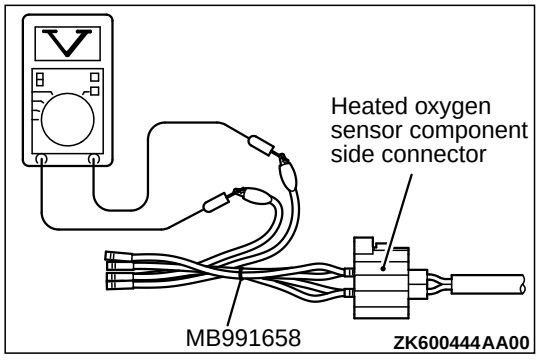
STEP 1. Check harness connector D-30 at the center exhaust pipe heated oxygen sensor (front) and the connector B-11 at ECM for damage.

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 center exhaust pipe heated oxygen sensor.



(1) Disconnect center exhaust pipe heated oxygen sensor connector D-30 and connect test harness special tool, MB991658, to the connector on the center exhaust pipe heated oxygen sensor side.

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

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)]?

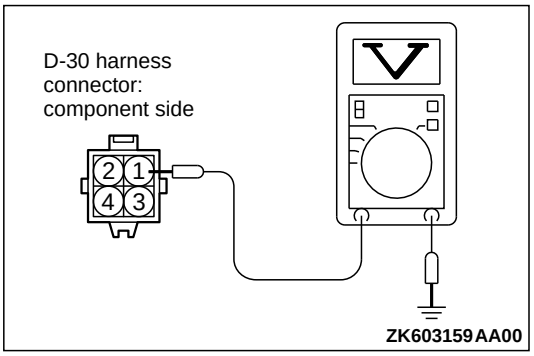
YES: Go to Step 3.

NO: Replace the center exhaust pipe heated oxygen sensor (front). Then go to Step 6.

STEP 3. Measure the power supply voltage at the center exhaust pipe heated oxygen sensor harness side connector D-30.

(1) Disconnect the connector D-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?

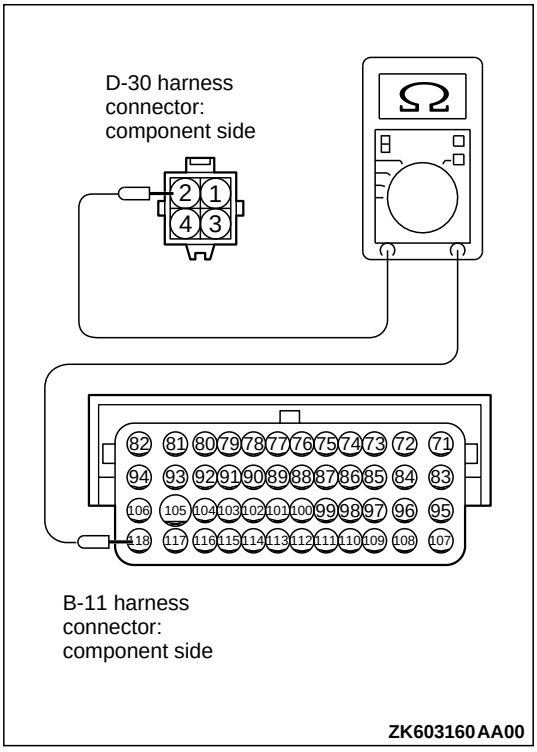
YES: Go to Step 4.

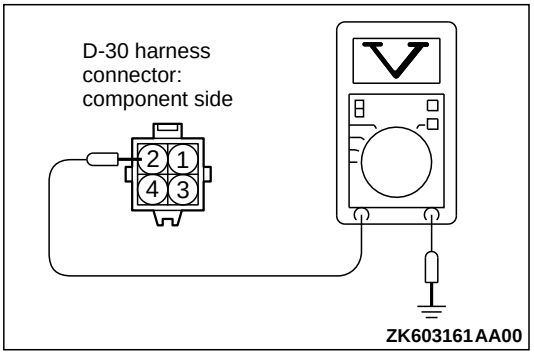
NO: Check harness connector C-129 at Intermediate connector for damage, and repair as required. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. If the Intermediate connector C-129 is good condition, repair harness wire between MFI relay connector A-33X (terminal No. 2) and center exhaust pipe heated oxygen sensor connector D-30 (terminal No. 1) because of open circuit or harness damage. Then go to step 6.

STEP 4.Check for open circuit to ground or harness damage between the center exhaust pipe heated oxygen sensor connector D-30 and ECM connector B-11.

(1) Disconnect the right bank heated oxygen sensor (rear) connector D-30 and the ECM connector B-11.

(2) Measure the resistance between the heated oxygen sensor connector D-30 (terminal No. 2) and ECM connector B-11 (terminal No. 118).
- Should be less than 2 ohms.





(3) Check for the continuity between the oxygen sensor connector D-30 (terminal No. 2) and ground.
- Not continuity.

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 trouble symptoms.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function - OBD-II Drive Cycle - Pattern 2 P. 13Ab-8.
(2) Check the diagnostic trouble code (DTC).

Q:Is DTC P0031 set?

YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 6.
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.00-15.

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 2 P. 13Ab-8.
(2) Check the diagnostic trouble code (DTC).

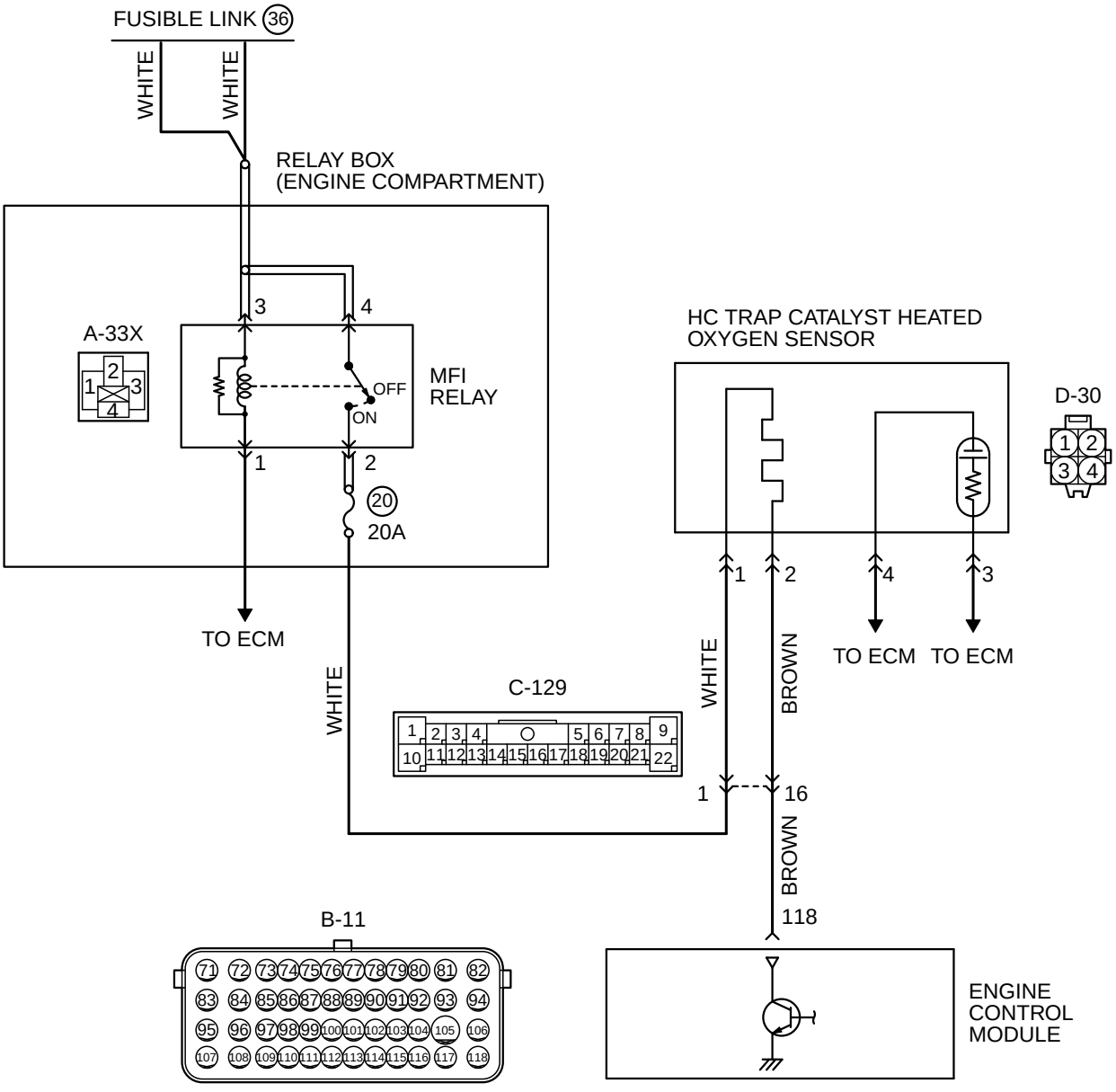
Q:Is DTC P0043 set?

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

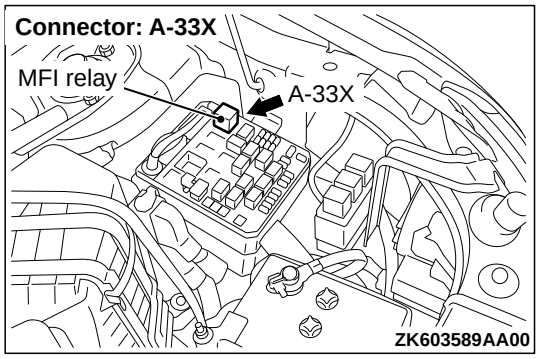
DTC P0044: Heated Oxygen Sensor Heater Control Circuit High (bank 1, sensor 3) <California>

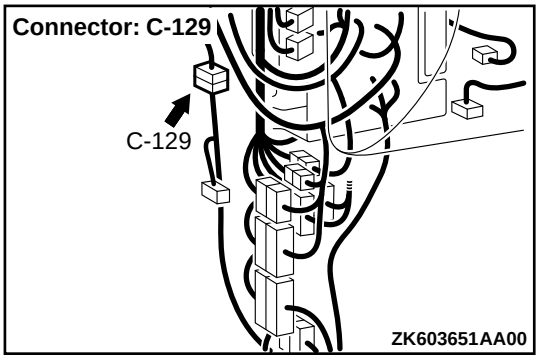
M11310100362USA0000010000

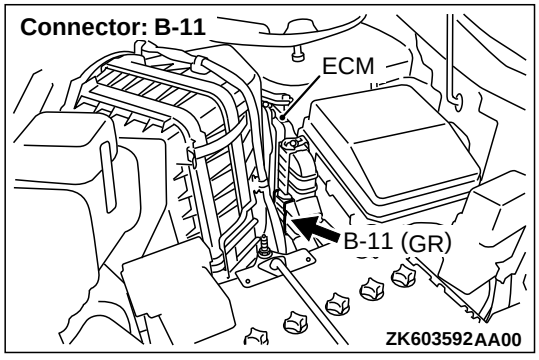
HC TRAP CATALYST HEATED OXYGEN SENSOR HEATER CIRCUIT

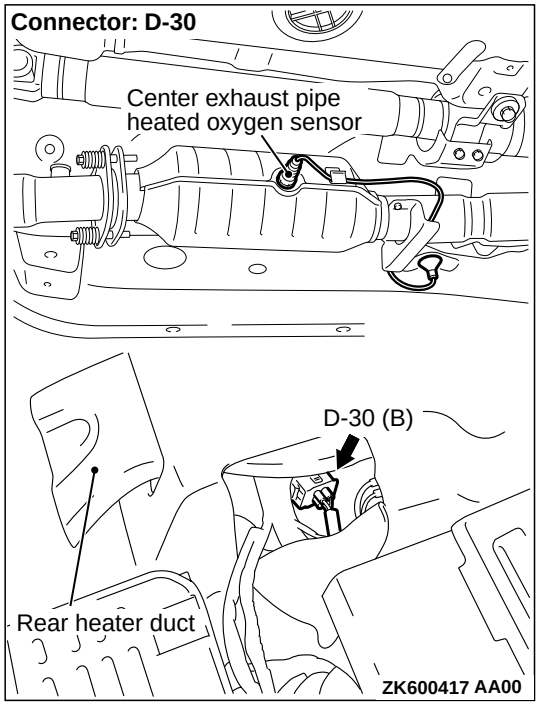


ZK602830AA00









CIRCUIT OPERATION

- Power is supplied from the MFI relay (terminal No. 4) to the heated oxygen sensor heater.
- The ECM (terminal No. 118) controls continuity to the center exhaust pipe heated oxygen sensor heater by turning the power transistor in the ECM "ON" and "OFF".

TECHNICAL DESCRIPTION

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

DESCRIPTIONS OF MONITOR METHODS

Center exhaust pipe heated oxygen sensor heater 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)

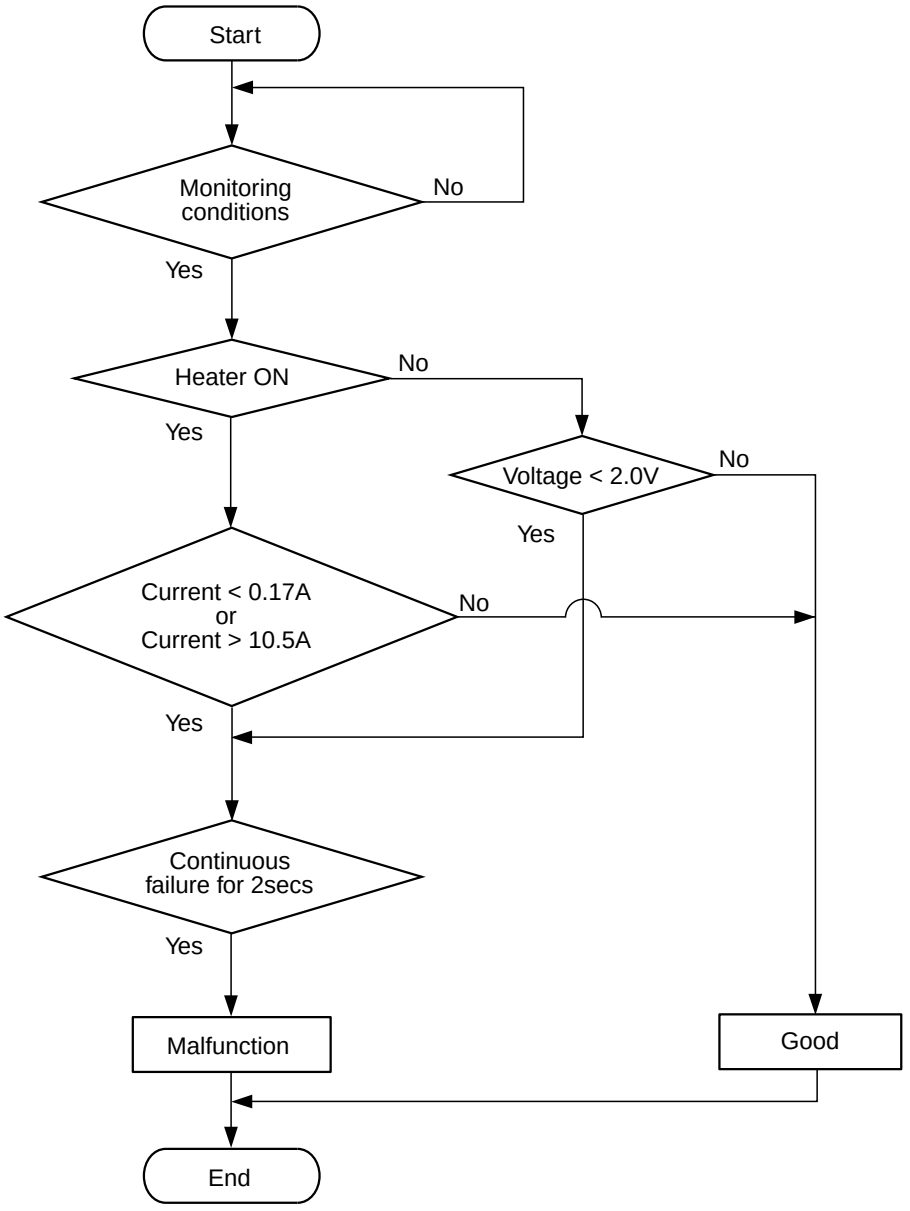
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITION

Logic Flow Chart



ZK603657 AA00

Check Conditions

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

Judgement Criterion

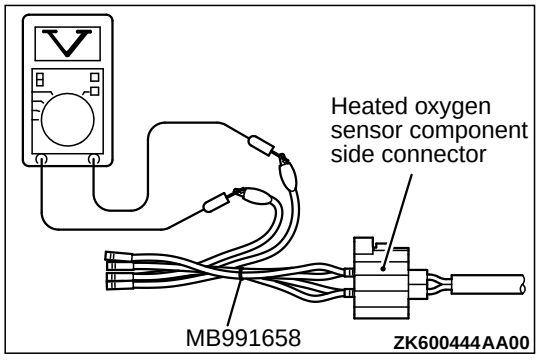
- The center exhaust pipe heated oxygen sensor heater current has continued to be higher than 10.5 ampere for 2 seconds.

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

- Center exhaust pipe heated oxygen sensor heater.
- ECM failed.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function - OBD-II Drive Cycle - Pattern 2 P.13Ab-8.



DIAGNOSIS

Required Special Tool:

- MB991658: Test Harness

STEP 1. Check the center exhaust pipe heated oxygen sensor.

(1) Disconnect center exhaust pipe heated oxygen sensor connector D-30 and connect test harness special tool, MB991658, to the connector on the center exhaust pipe heated oxygen sensor side.

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

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 center exhaust pipe heated oxygen sensor. 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. 13Ab-8.

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

Q:Is DTC P0044 set?

YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. 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.00-15.

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. 13Ab-8.

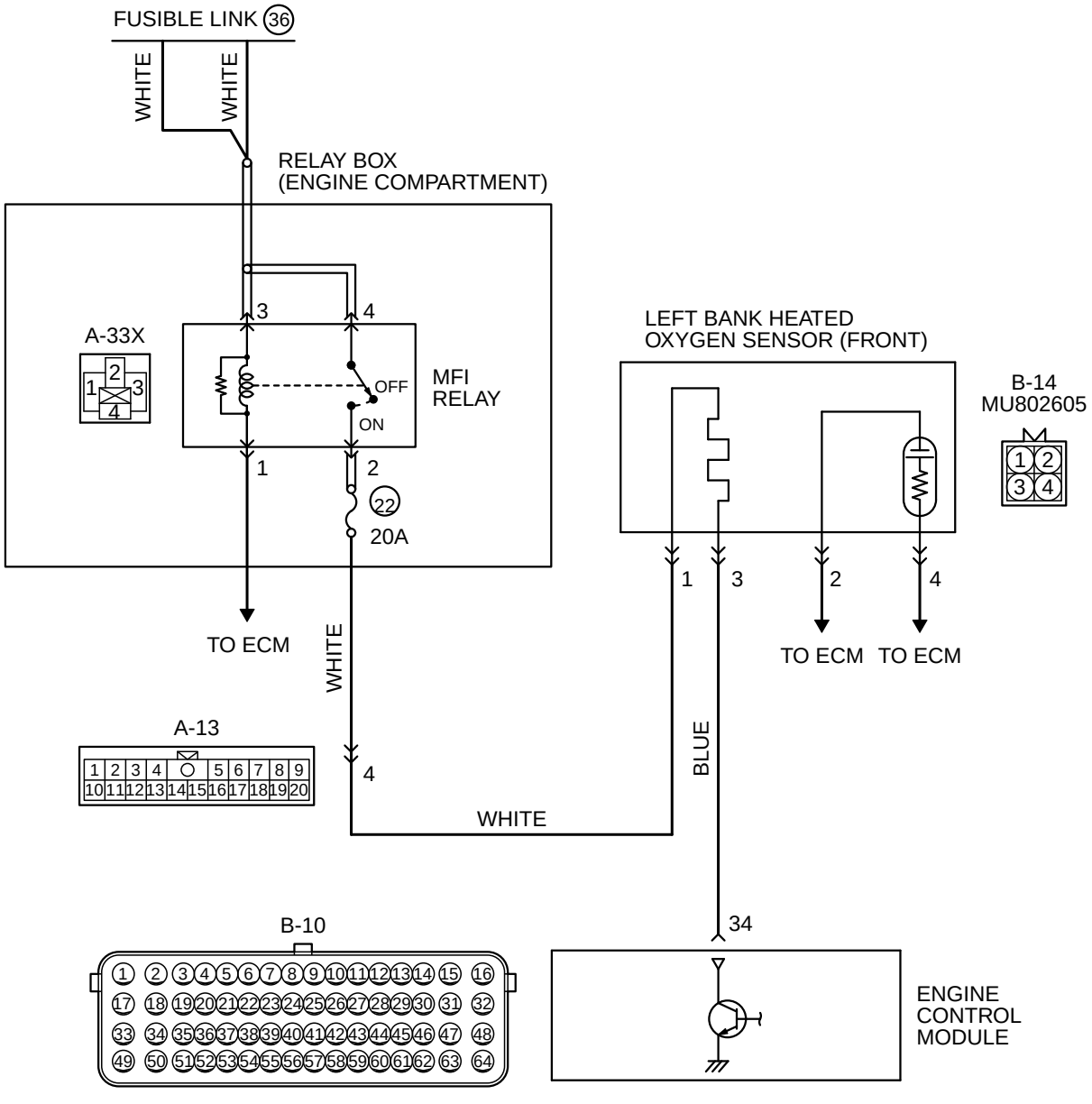
(2) Check the diagnostic trouble code (DTC).

Q:Is DTC P0044 set?
YES: Retry the troubleshooting.
NO: The inspection is complete.

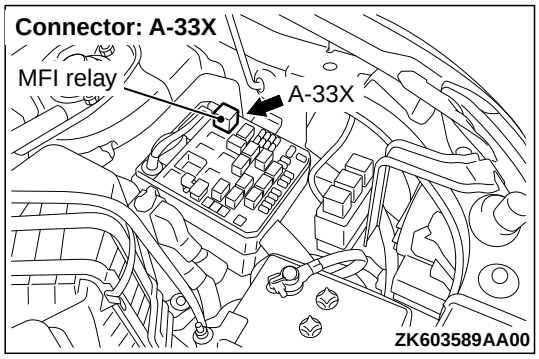
DTC P0051: Heated Oxygen Sensor Heater Control Circuit Low (bank 2, sensor 1)

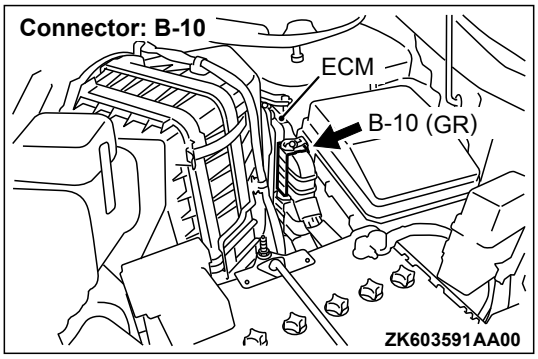
M11310100165USA0000010000

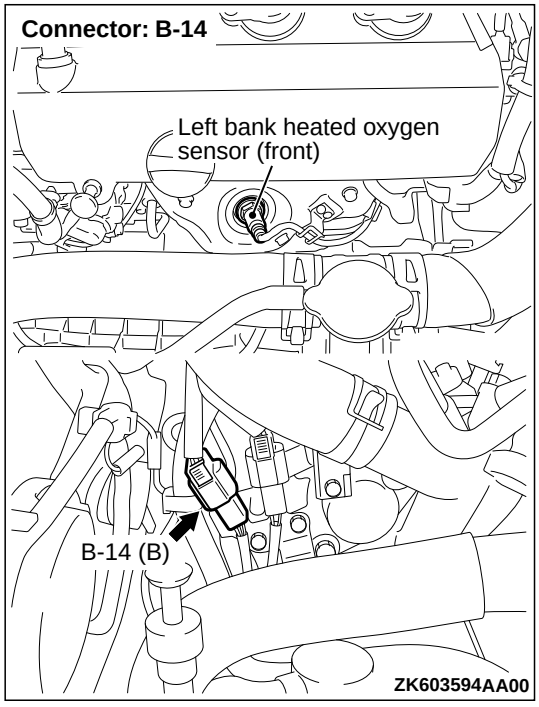
LEFT BANK HEATED OXYGEN SENSOR (FRONT) HEATER CIRCUIT

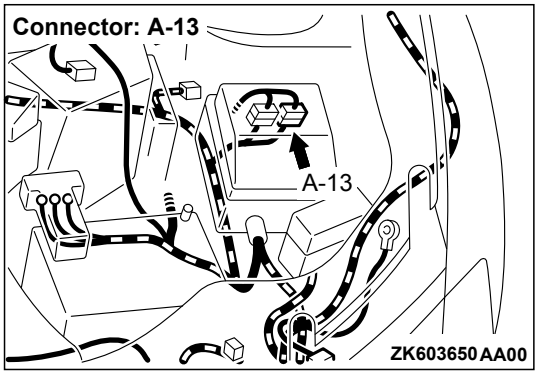


ZK602831 AA00









CIRCUIT OPERATION

- Power is supplied from the MFI relay (terminal No. 4) to the left bank heated oxygen sensor (front) heater.
- The ECM (terminal No. 34) controls continuity to the left bank heated oxygen sensor (front) heater by turning the power transistor in the ECM "ON" and "OFF".

TECHNICAL DESCRIPTION

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

DESCRIPTIONS OF MONITOR METHODS

Left bank 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)

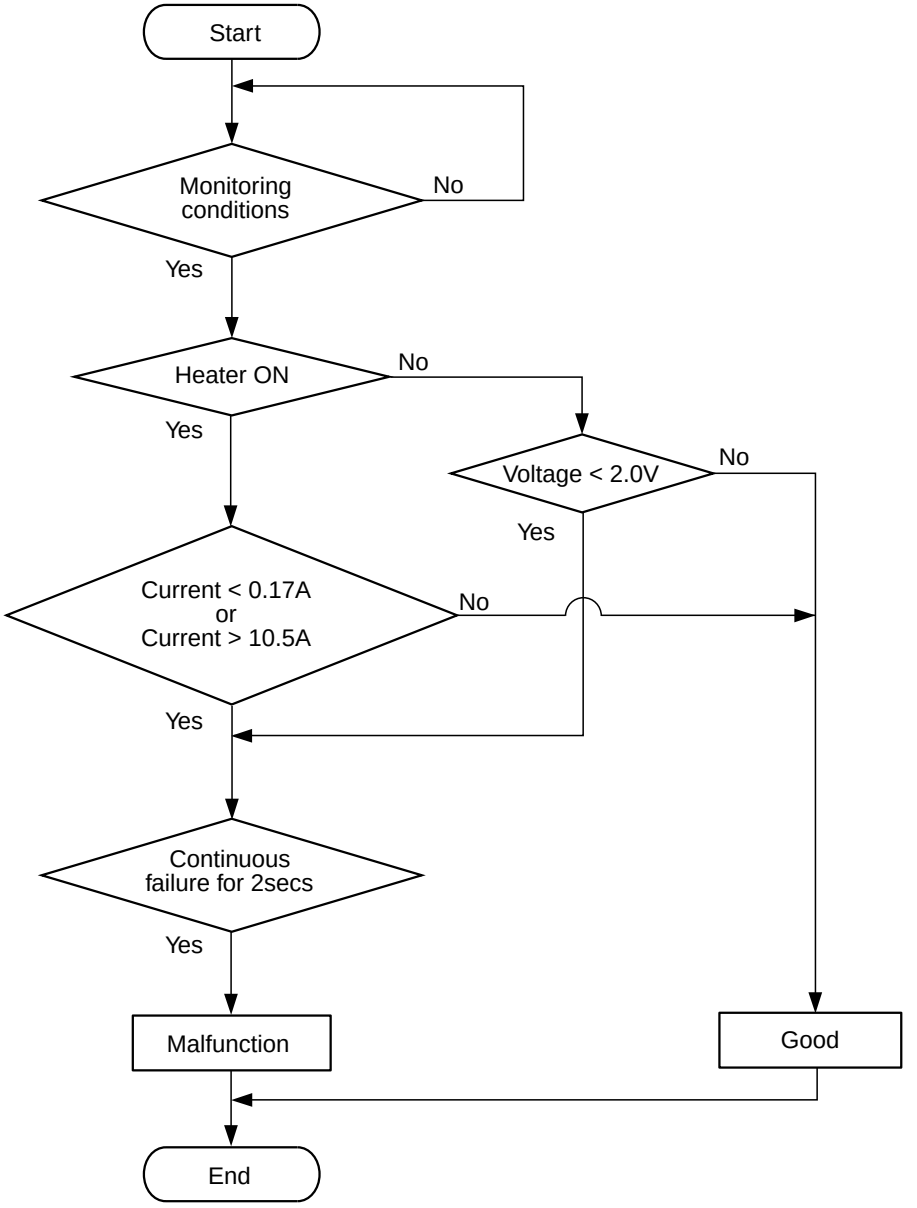
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITION

Logic Flow Chart



ZK603657 AA00

Check Conditions

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

Judgement Criterion

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

Check Conditions

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

Judgement Criterion

- The right bank heated oxygen sensor (front) heater voltage has continued to be lower than 2.0 voltage for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function - OBD-II Drive Cycle - Pattern 2 P.13Ab-8.

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

- Left bank heated oxygen sensor (front) heater.
- Connector damage.
- Harness damage
- ECM failed.

DIAGNOSIS

Required Special Tools:

- MD998464: Test Harness

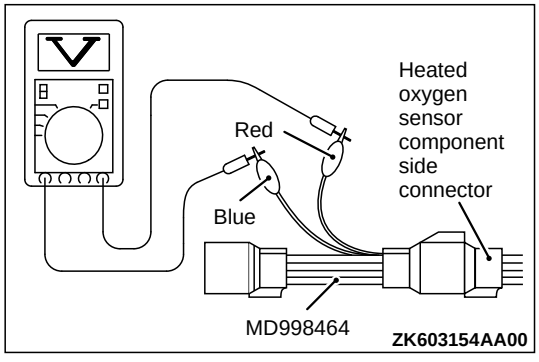
STEP 1. Check harness connector B-14 at the left bank heated oxygen sensor (front) and harness connector B-10 at the ECM for damage.

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 left bank heated oxygen sensor (front).



(1) Disconnect left bank heated oxygen sensor (front) connector B-14 and connect test harness special tool, MD998464, to the connector on the left bank 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).

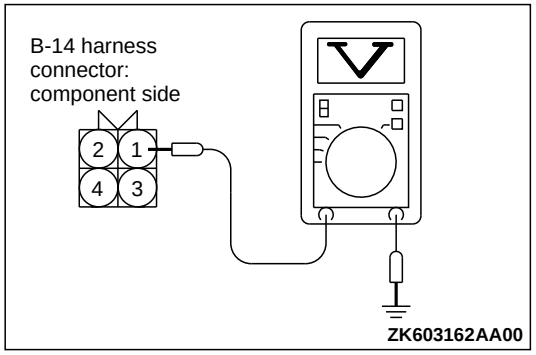
Standard value: 4.5 - 8.0 Ω [at 20°C (68°F)]

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 left bank heated oxygen sensor (front). Then go to Step 6.

STEP 3. Measure the power supply voltage at left bank heated oxygen sensor (front) harness side connector B-14.



(1) Disconnect the connector B-14 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 4.

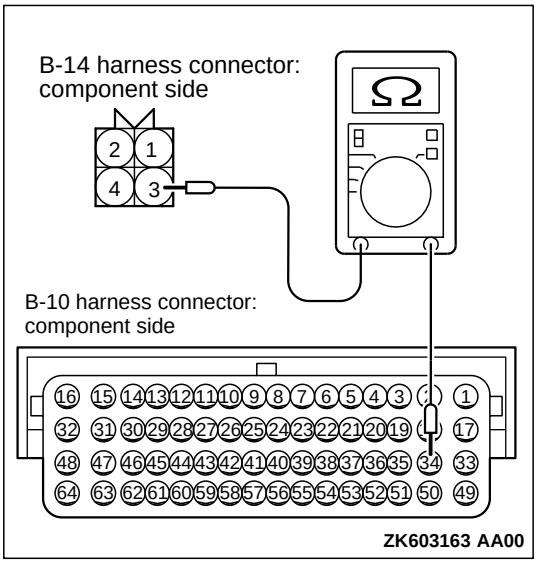
NO: Repair harness wire between the MFI relay connector A-33X (terminal No. 2) and the left bank heated oxygen

sensor (front) connector B-14 (terminal No. 1) because of open circuit or harness damage. Then go to step 6.

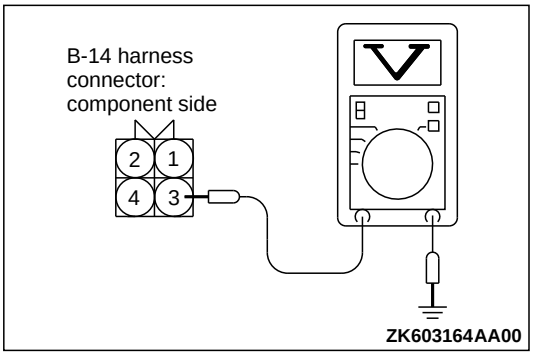
STEP 4.Check for open circuit to ground or harness damage between left bank heated oxygen sensor (front) connector B-14 and ECM connector B-10 (terminal No. 125).

(1) Disconnect the left bank heated oxygen sensor (front) connector B-14 and ECM connector B-10.

(2) Measure the resistance between heated oxygen sensor connector B-14 (terminal No. 3) and the ECM connector B-10 (terminal No. 34).
- Should be less than 2 ohms.



(3) Check for the continuity between the oxygen sensor connector B-14 (terminal No. 3) and ground.
- Not continuity.



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 trouble symptoms.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function - OBD-II Drive Cycle - Pattern 2 P. 13Ab-8.

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

Q:Is DTC P0051 set?

YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 6.

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.00-15.

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 2 P. 13Ab-8.

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

Q:Is DTC P0051 set?

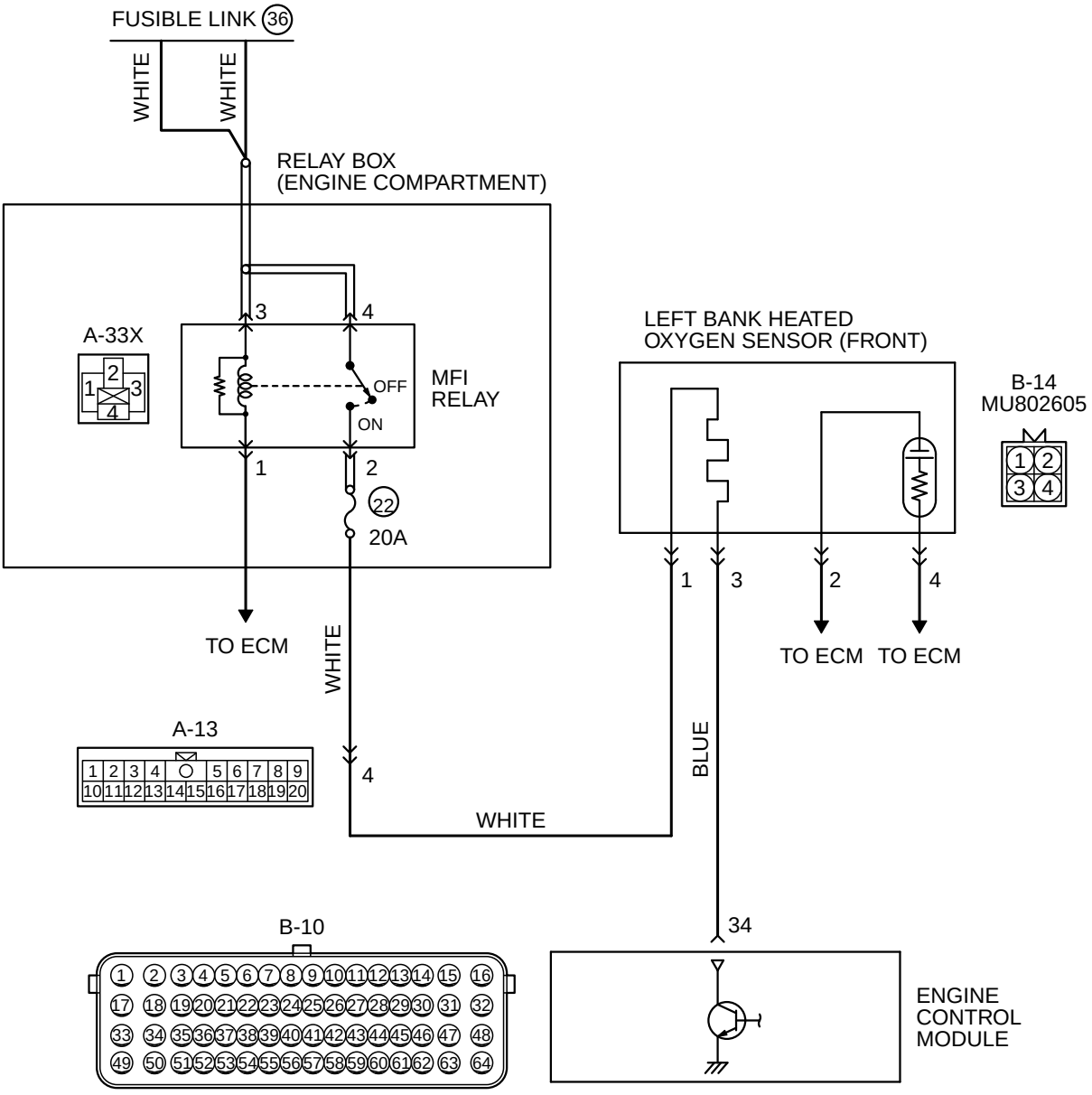
YES: Retry the troubleshooting.

NO: The inspection is complete.

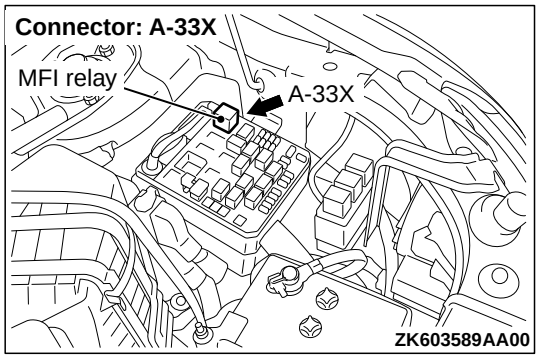
DTC P0052: Heated Oxygen Sensor Heater Control Circuit High (bank 2, sensor 1)

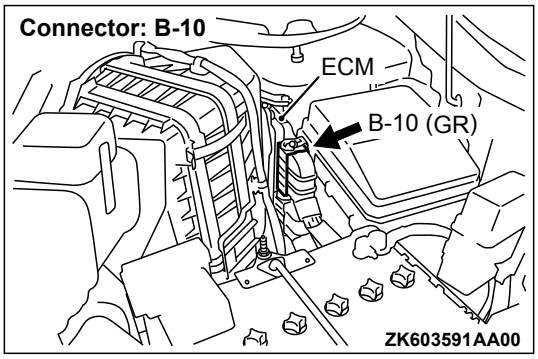
M11310100166USA0000010000

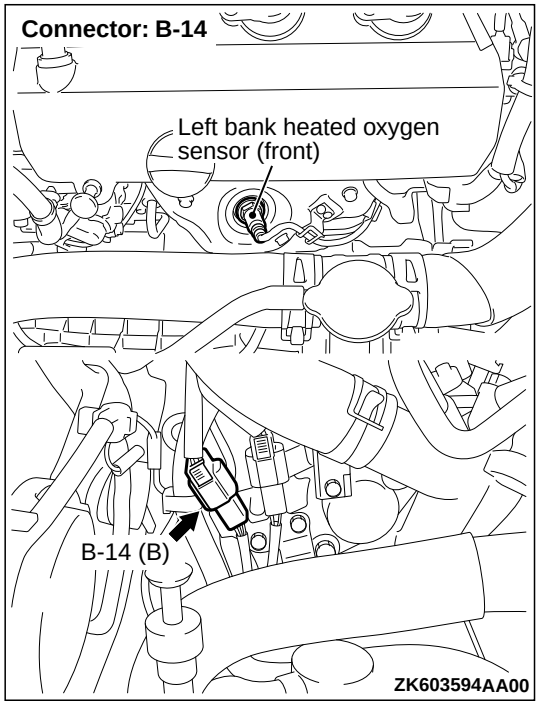
LEFT BANK HEATED OXYGEN SENSOR (FRONT) HEATER CIRCUIT

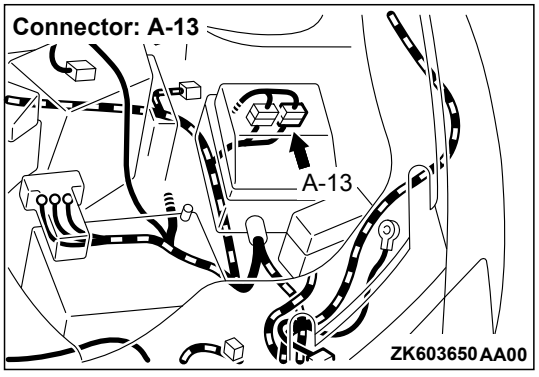


ZK602831 AA00









CIRCUIT OPERATION

- Power is supplied from the MFI relay (terminal No. 4) to the left bank heated oxygen sensor (front) heater.
- The ECM (terminal No. 34) controls continuity to the left bank heated oxygen sensor (front) heater by turning the power transistor in the ECM "ON" and "OFF".

TECHNICAL DESCRIPTION

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

DESCRIPTIONS OF MONITOR METHODS

Left bank 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)

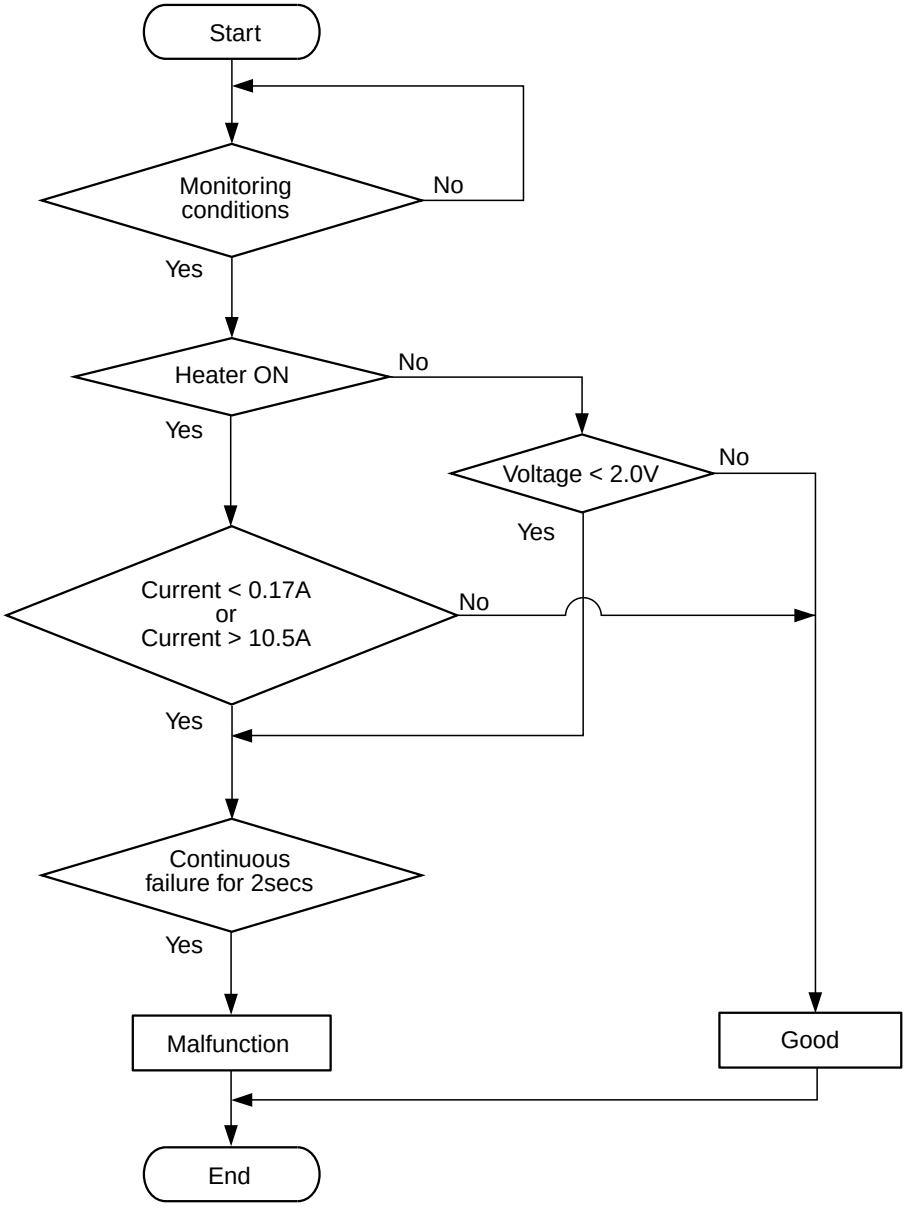
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITION

Logic Flow Chart



ZK603657 AA00

Check Conditions

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

Judgement Criterion

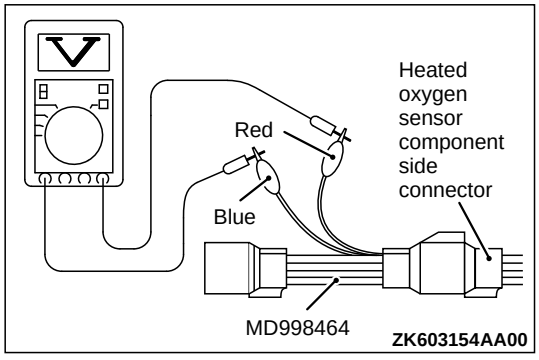
- The left bank heated oxygen sensor (front) heater current has continued to be higher than 10.5 ampere for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function - OBD-II Drive Cycle - Pattern 2 P.13Ab-8.

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

- Left bank heated oxygen sensor (front) heater failed.
- ECM failed.



DIAGNOSIS

Required Special Tool:
- MD998464: Test Harness

STEP 1. Check the left bank heated oxygen sensor (front).

(1) Disconnect left bank heated oxygen sensor (front) connector B-14 and connect test harness special tool, MD998464, to the connector on the left bank 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 left bank 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. 13Ab-8.

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

Q:Is DTC P0052 set?

YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. 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.00-15.

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. 13Ab-8.

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

Q:Is DTC P0052 set?

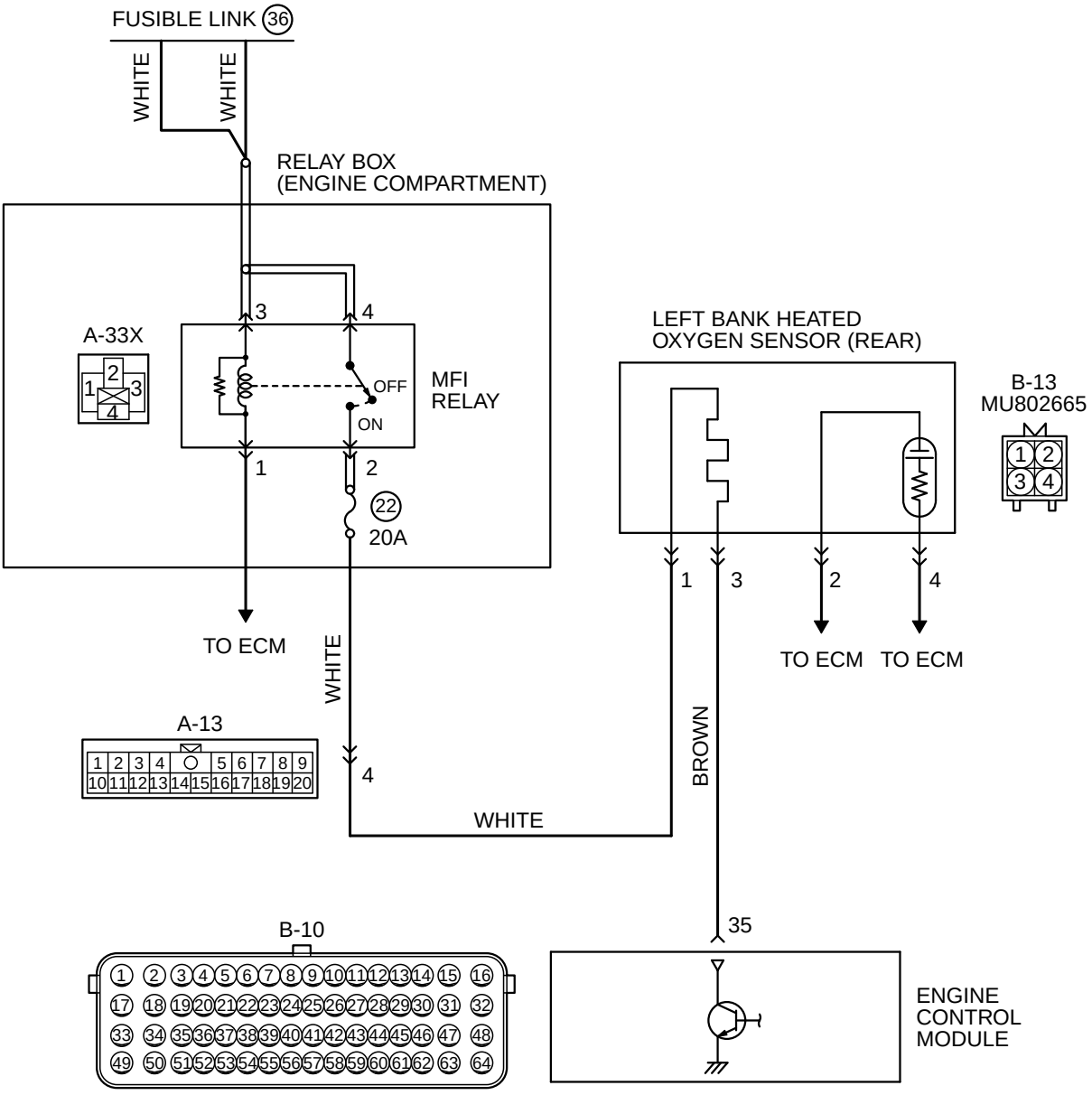
YES: Retry the troubleshooting.

NO: The inspection is complete.

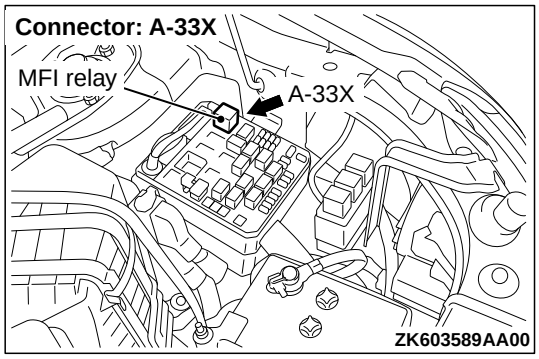
DTC P0057: Heated Oxygen Sensor Heater Control Circuit Low (bank 2, sensor 2)

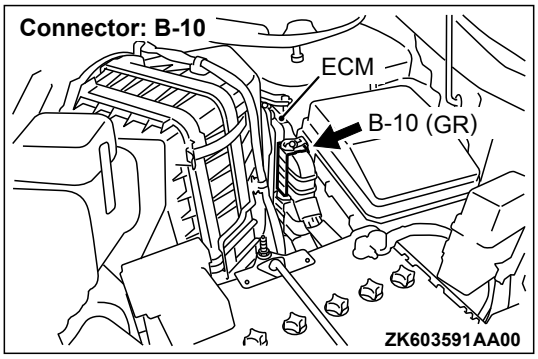
M11310100167USA0000010000

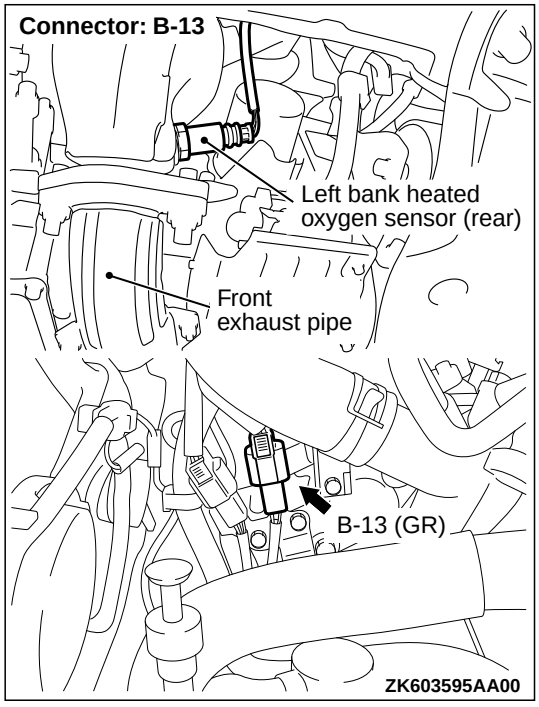
LEFT BANK HEATED OXYGEN SENSOR (REAR) HEATER CIRCUIT

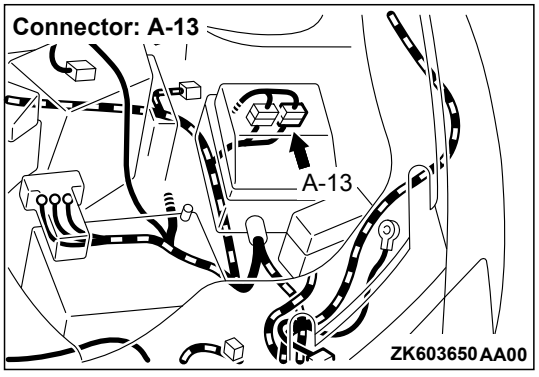


ZK602832 AA00









CIRCUIT OPERATION

- Power is supplied from the MFI relay (terminal No. 4) to the left bank heated oxygen sensor (rear) heater.
- The ECM (terminal No. 35) controls continuity to the left bank heated oxygen sensor (rear) heater by turning the power transistor in the ECM "ON" and "OFF".

TECHNICAL DESCRIPTION

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

DESCRIPTIONS OF MONITOR METHODS

Left bank 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)

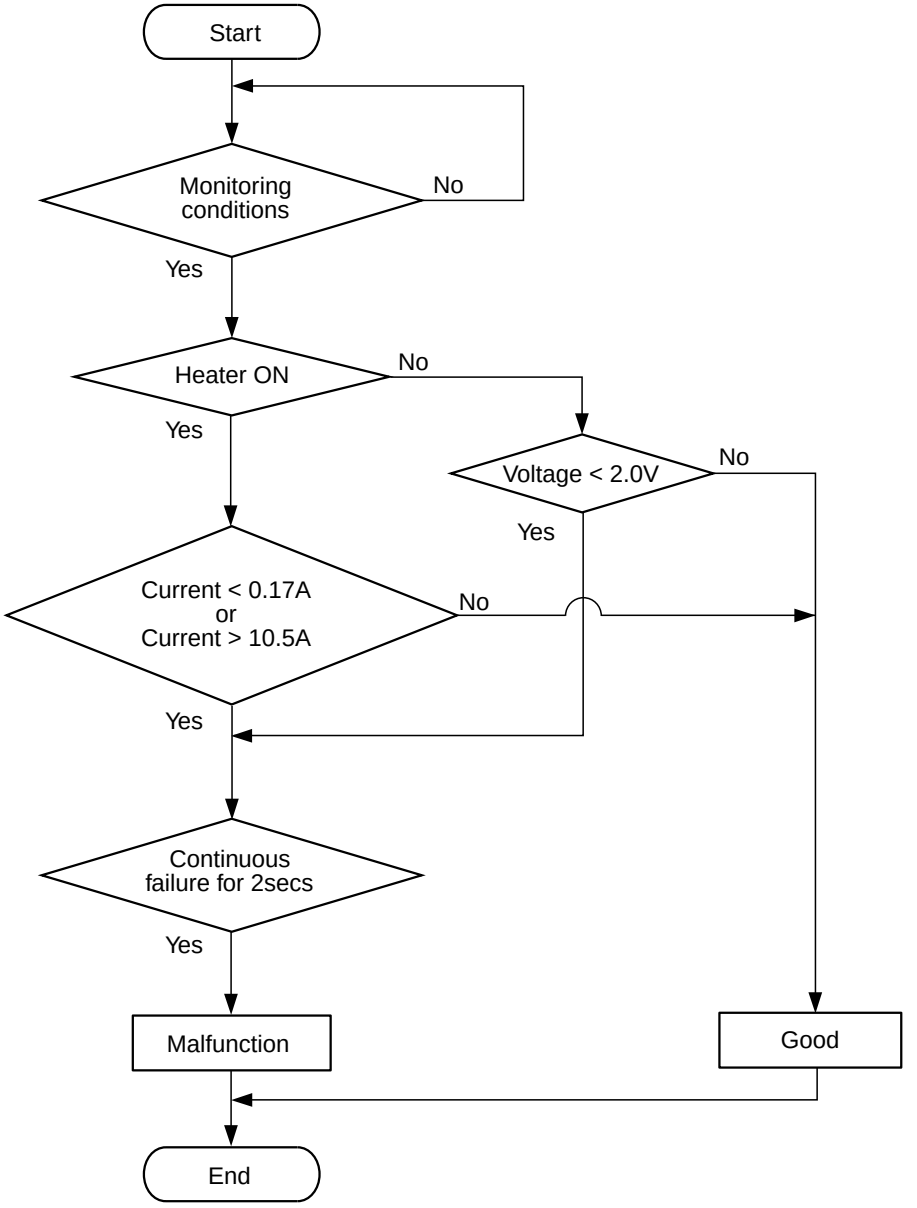
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITION

Logic Flow Chart



ZK603657 AA00

Check Conditions

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

Judgement Criterion

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

Check Conditions

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

Judgement Criterion

- The left bank heated oxygen sensor (rear) heater voltage has continued to be lower than 2.0 voltage for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function - OBD-II Drive Cycle - Pattern 2 P.13Ab-8.

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

- Left bank heated oxygen sensor (rear) heater failed.
- Connector damage.
- Harness damage
- Left bank heated oxygen sensor (rear) failed.
- ECM failed.

DIAGNOSIS

Required Special Tools:

- MB991316: Test Harness

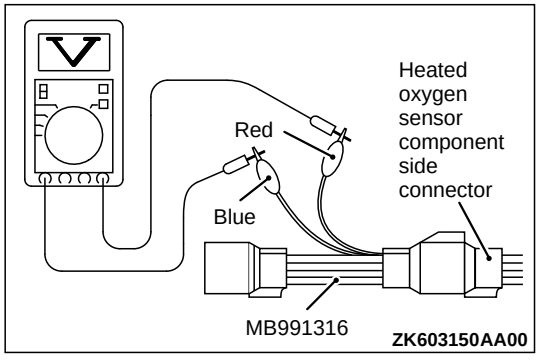
STEP 1. Check harness connector B-13 at the left bank heated oxygen sensor (rear) and harness connector B-10 at the ECM for damage.

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 left bank heated oxygen sensor (rear).



(1) Disconnect left bank heated oxygen sensor (rear) connector B-13 and connect test harness special tool, MB991316, to the connector on the left bank 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).

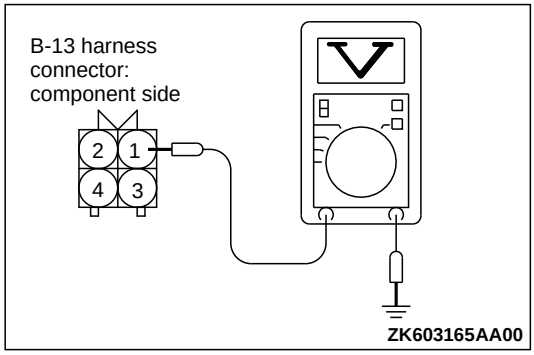
Standard value: 11 - 18 Ω [at 20°C (68°F)]

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

YES: Go to Step 3.

NO: Replace the left bank heated oxygen sensor (rear). Then go to Step 6.

STEP 3. Measure the power supply voltage at left bank heated oxygen sensor (rear) harness side connector B-13.



(1) Disconnect the connector B-13 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 4.

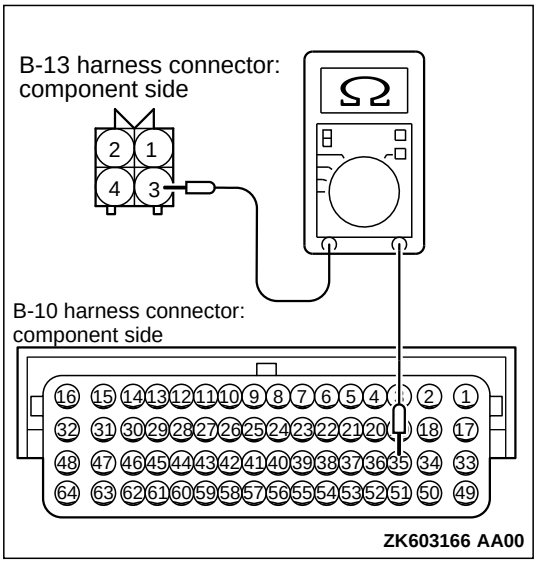
NO: Repair harness wire between the MFI relay connector A-33X (terminal No. 2) and the left bank heated oxygen

sensor (rear) connector B-13 (terminal No. 1) because of open circuit or harness damage. Then go to step 6.

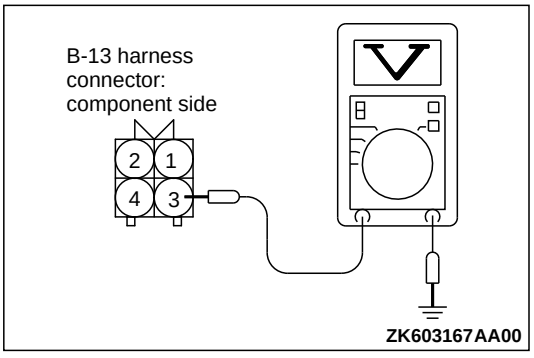
STEP 4.Check for open circuit to ground or harness damage between left bank heated oxygen sensor (rear) connector B-13 and ECM connector B-10.

(1) Disconnect the left bank heated oxygen sensor (front) connector B-13 and the ECM connector B-10.

(2) Measure the resistance between the heated oxygen sensor connector B-13 (terminal No. 3) and the ECM connector B-10 (terminal No. 35).
- Should be less than 2 ohms.



(3) Check for the continuity between the oxygen sensor connector B-13 (terminal No. 3) and ground.
- Not continuity.



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 trouble symptoms.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function - OBD-II Drive Cycle - Pattern 2 P. 13Ab-8.

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

Q:Is DTC P0057 set?

YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 6.

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.00-15.

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 2 P. 13Ab-8.

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

Q:Is DTC P0057 set?

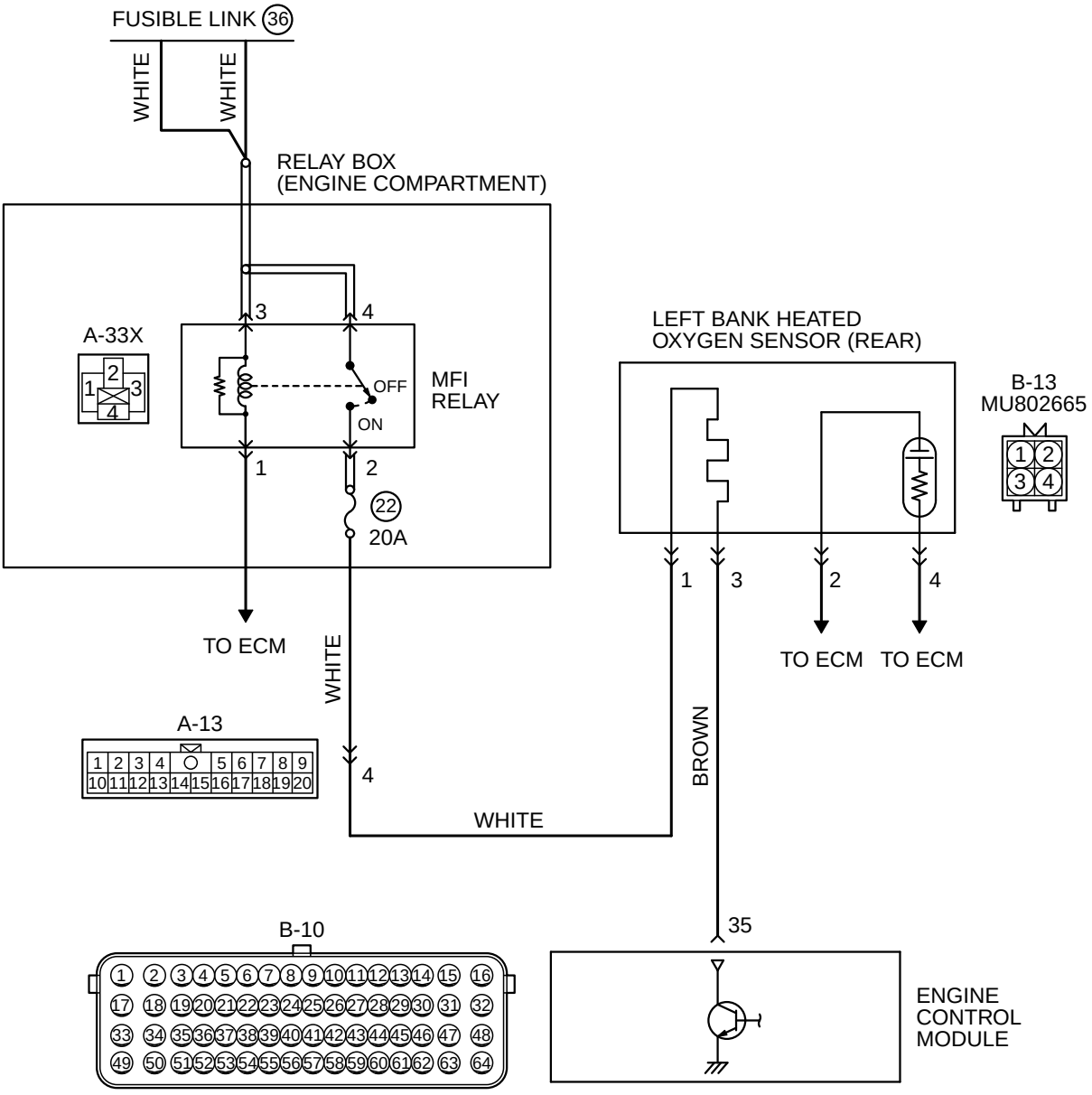
YES: Retry the troubleshooting.

NO: The inspection is complete.

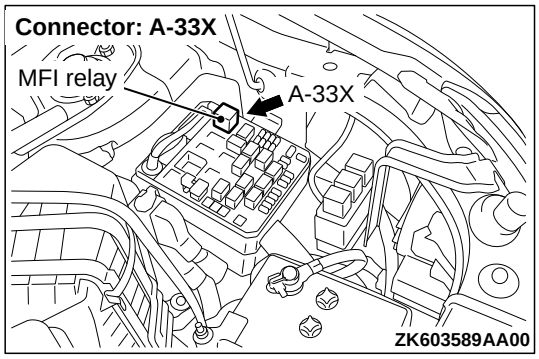
DTC P0058: Heated Oxygen Sensor Heater Control Circuit High (bank 2, sensor 2)

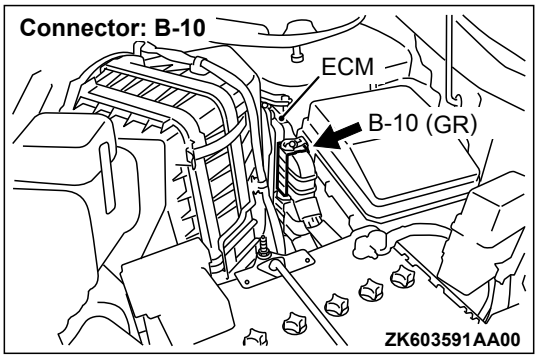
M11310100168USA0000010000

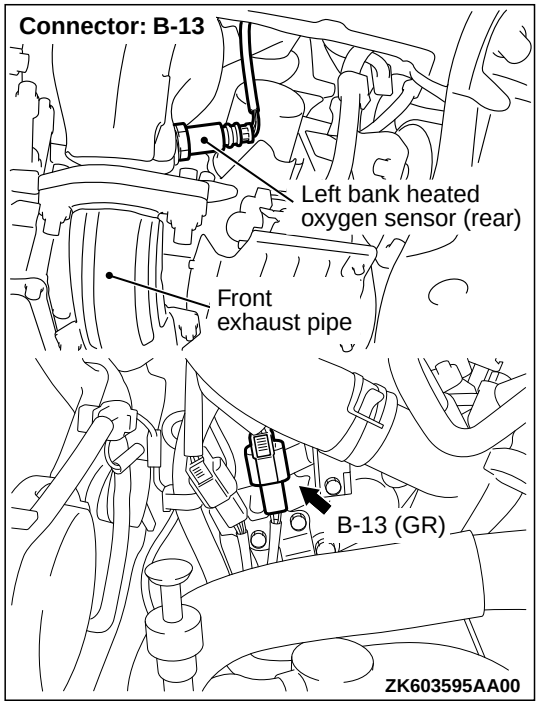
LEFT BANK HEATED OXYGEN SENSOR (REAR) HEATER CIRCUIT

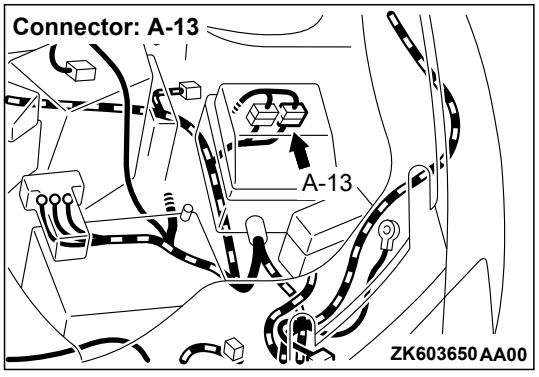


ZK602832 AA00









CIRCUIT OPERATION

- Power is supplied from the MFI relay (terminal No. 4) to the left bank heated oxygen sensor (rear) heater.
- The ECM (terminal No. 49) controls continuity to the left bank heated oxygen sensor (rear) heater by turning the power transistor in the ECM "ON" and "OFF".

BACKGROUND

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

DESCRIPTIONS OF MONITOR METHODS

Left bank 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)

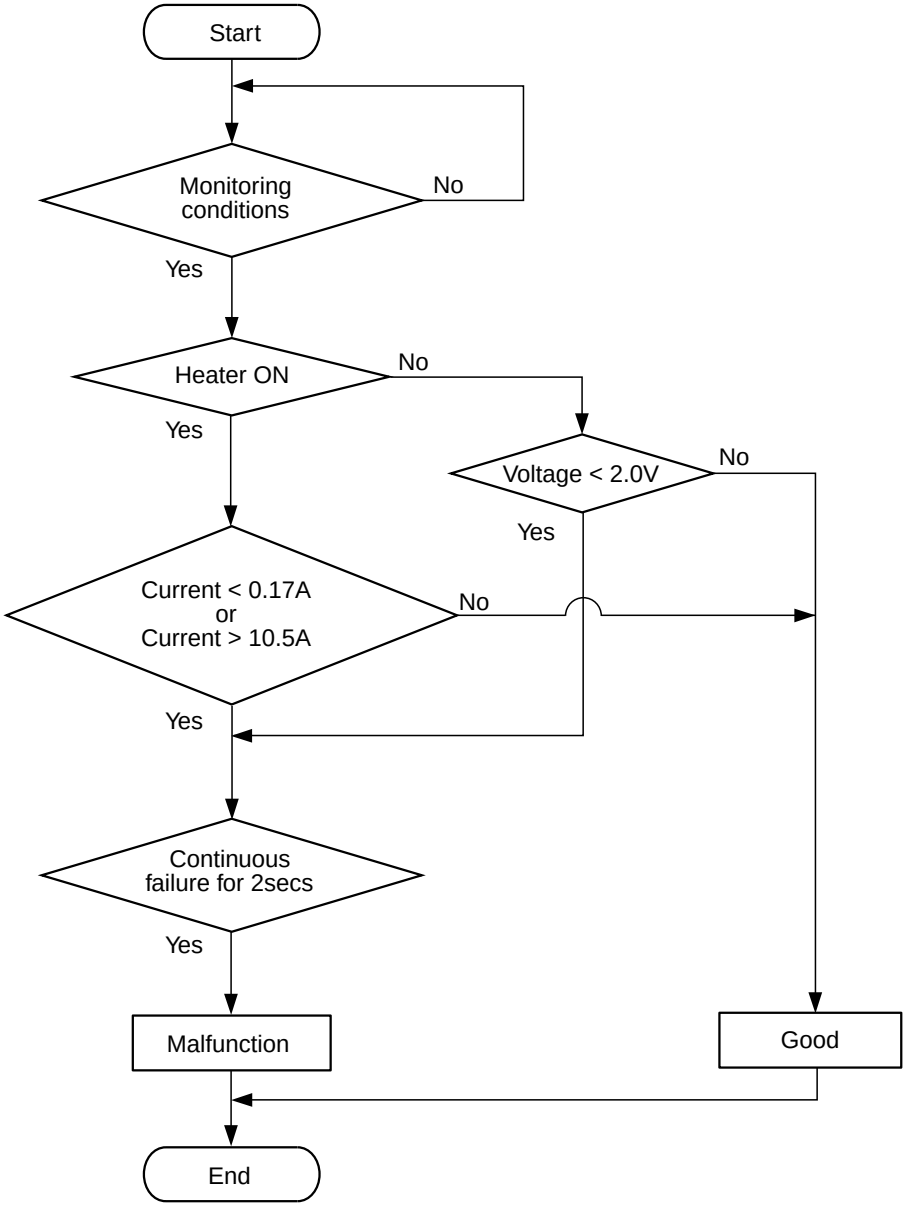
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITION

Logic Flow Chart



ZK603657 AA00

Check Conditions

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

Judgement Criterion

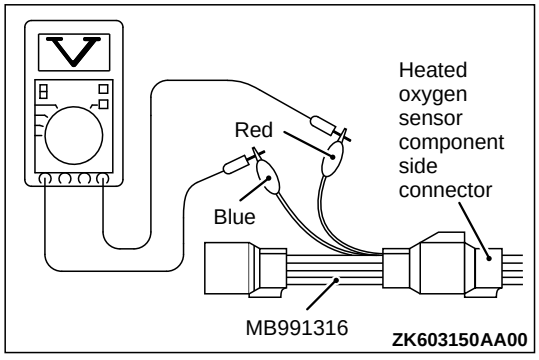
- The left bank heated oxygen sensor (rear) heater current has continued to be higher than 10.5 ampere for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function - OBD-II Drive Cycle - Pattern 2 P.13Ab-8.

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

- Left bank heated oxygen sensor (rear) heater failed.
- Left bank heated oxygen sensor (rear) failed.
- ECM failed.



DIAGNOSIS

Required Special Tool:
- MB991316: Test Harness

STEP 1. Check the left bank heated oxygen sensor (rear).

(1) Disconnect left bank heated oxygen sensor (rear) connector B-13 and connect test harness special tool, MB991316, to the connector on the left bank 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 left bank 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. 13Ab-8.

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

Q:Is DTC P0058 set?

YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. 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.00-15.

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. 13Ab-8.

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

Q:Is DTC P0058 set?

YES: Retry the troubleshooting.

NO: he inspection is complete.

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

M113101001 69USA0000010000

TECHNICAL DESCRIPTION

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

DESCRIPTIONS OF MONITOR METHODS

The ECM 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 ECM 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)

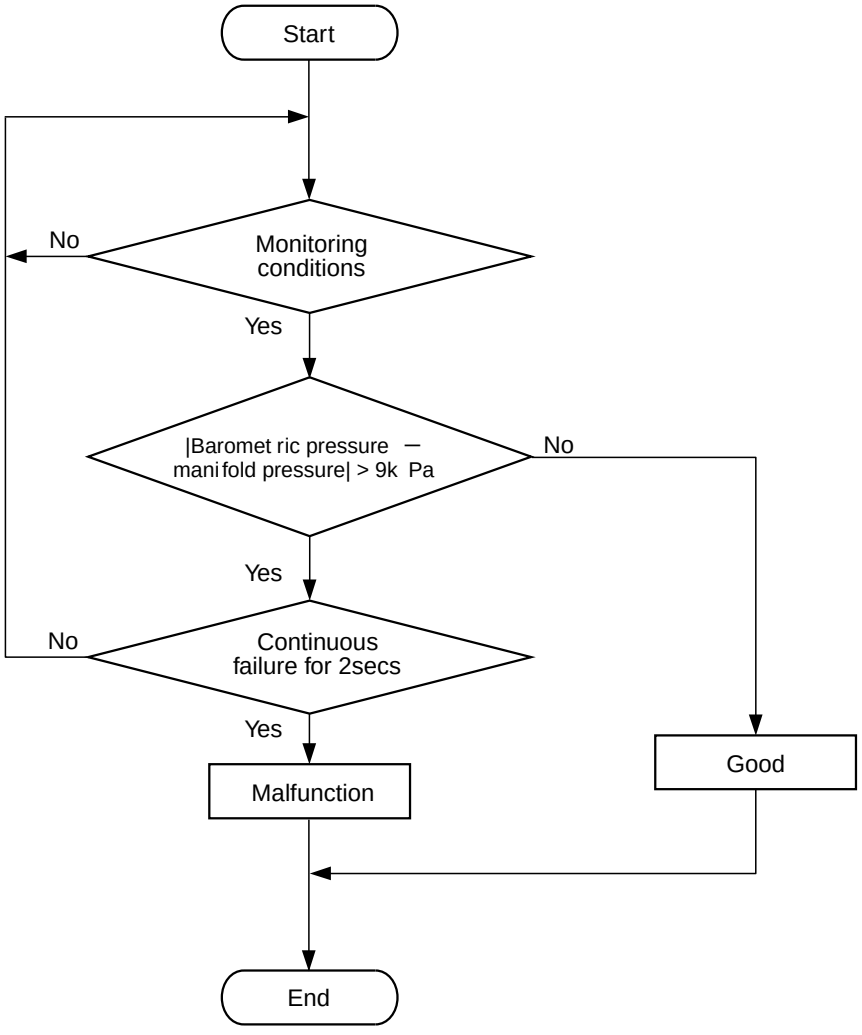
- Manifold absolute pressure sensor monitor
- Barometric pressure sensor monitor
- Engine coolant temperature sensor monitor

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITION

Logic Flow Chart



ZK603672 AA00

Check Conditions

- Ignition switch is in "LOCK" (OFF) position.
- After two 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.

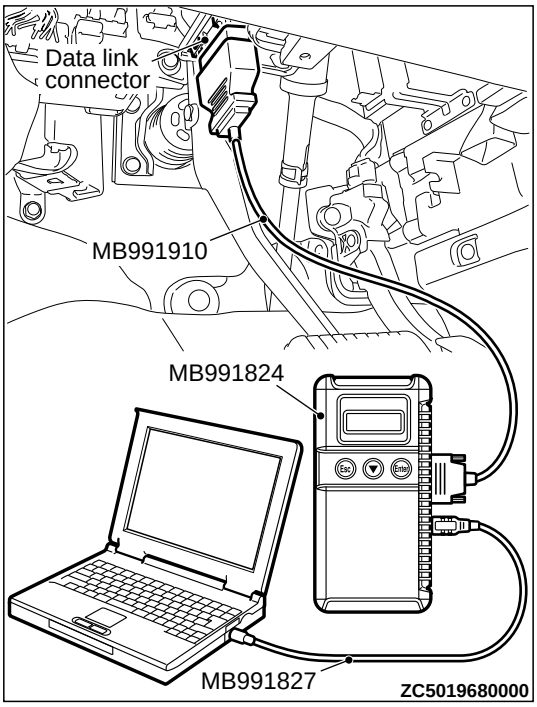
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Manifold absolute pressure sensor failed.
- Barometric pressure sensor failed.
- ECM 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) 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.13Ab-44.
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.13Ab-126, DTC P0107 - Manifold Absolute Pressure Circuit Low Input P.

13Ab-132, DTC P0108 - Manifold Absolute Pressure Circuit High Input P.13Ab-138.

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 ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. 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.00-15.

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.

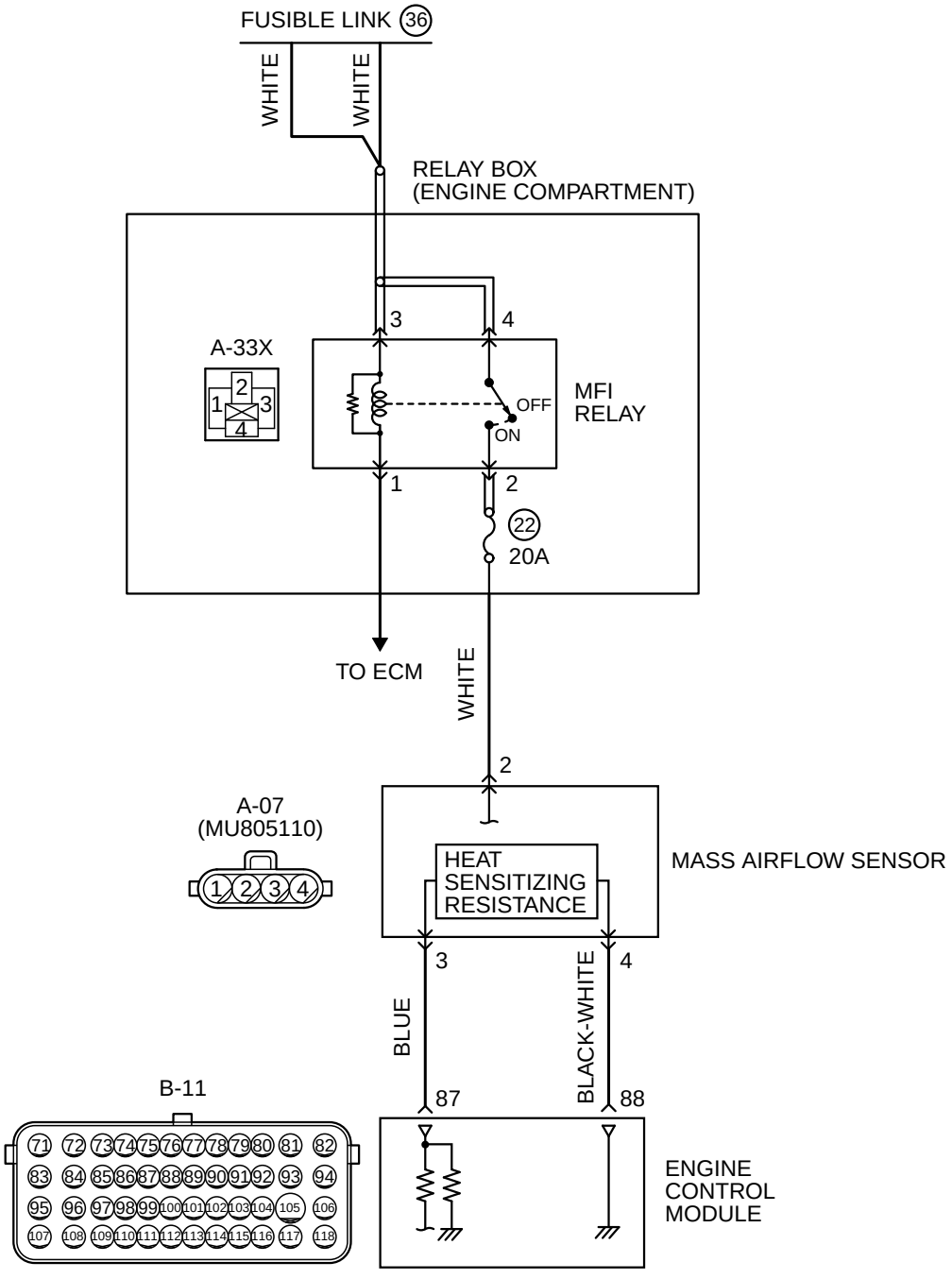
Q:Is DTC P0069 set?

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

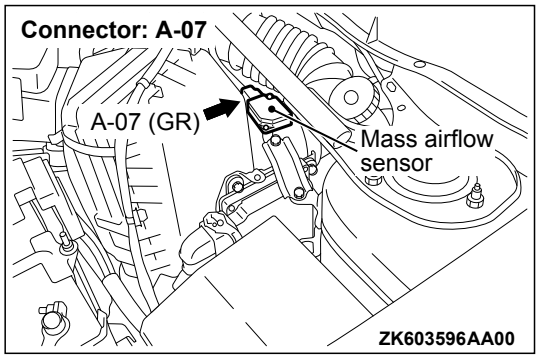
DTC P0101: Mass Airflow Circuit Range/Performance Problem

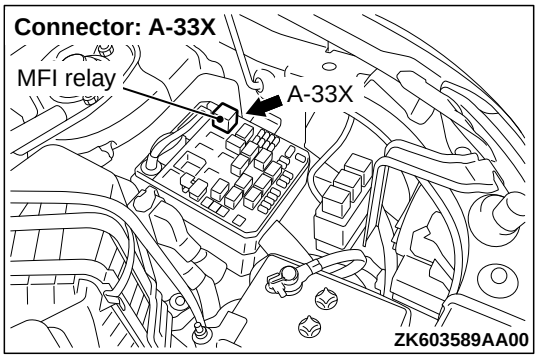
M11310100170USA0000010000

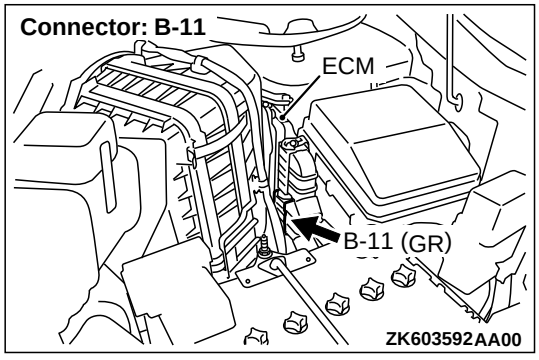
MASS AIRFLOW SENSOR CIRCUIT



ZK602833AA00







CIRCUIT OPERATION

- The mass airflow sensor power is supplied from the MFI relay (terminal No. 4), and the ground is provided on the ECM (terminal No. 88).
- A voltage that is according to the mass airflow rate is sent to the ECM (terminal No. 87) 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 ECM 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)

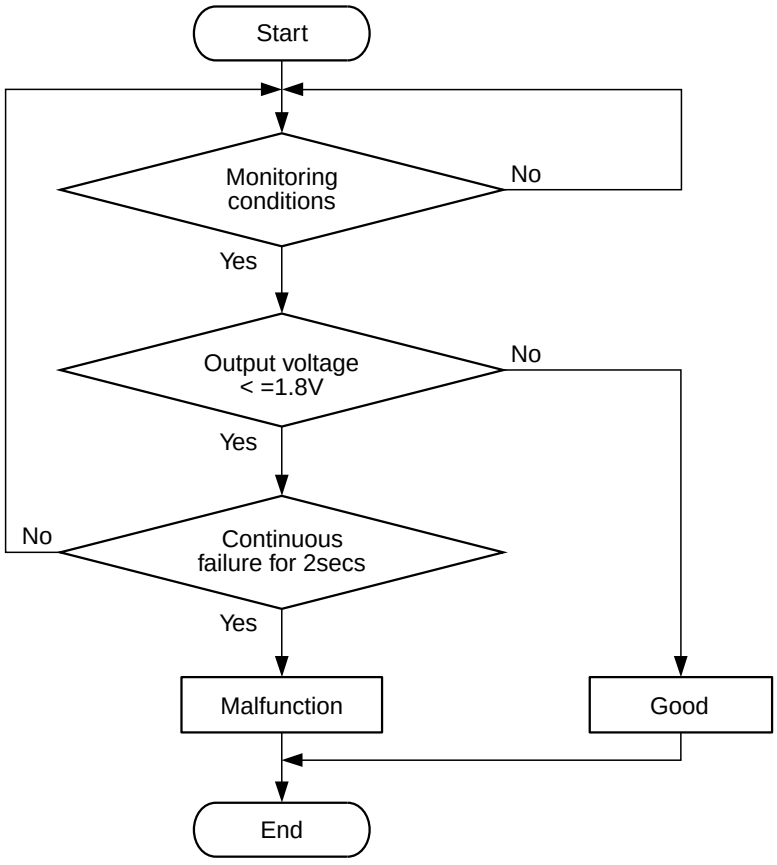
- Not applicable

Sensor (The sensor below is determined to be normal)

- Throttle position sensor

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

Logic Flow Chart



ZK603673 AA00

Check Conditions

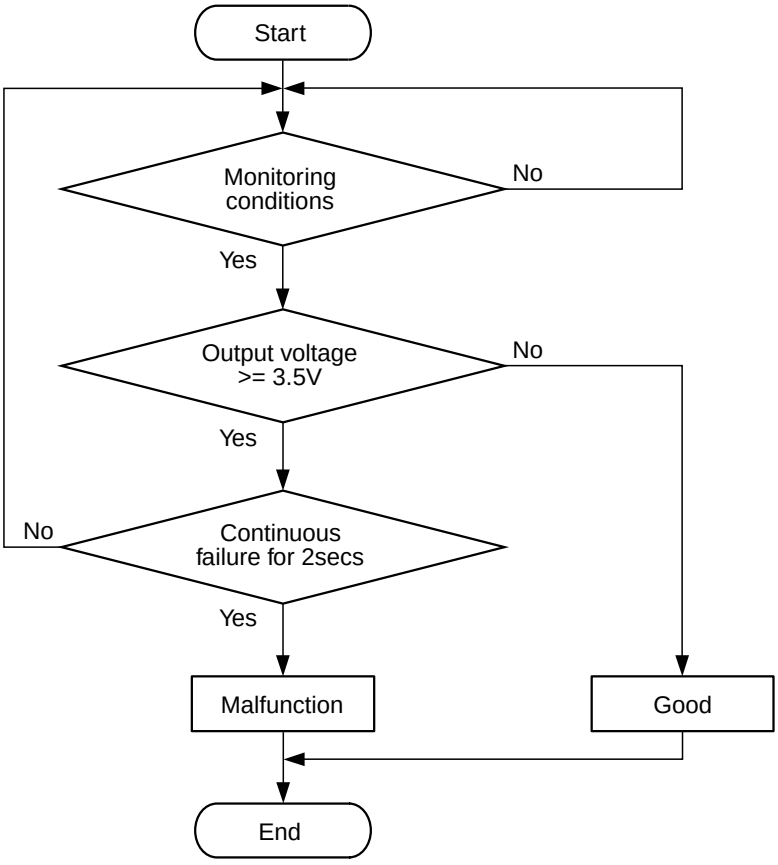
- Throttle position sensor output voltage is 1.5 volt or higher.
- Mass airflow sensor output voltage is 0.2 volt or higher.

Judgement Criterion

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

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

Logic Flow Chart



ZK603674AA00

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.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function - OBD-II Drive Cycle - Pattern 7 P.13Ab-8.

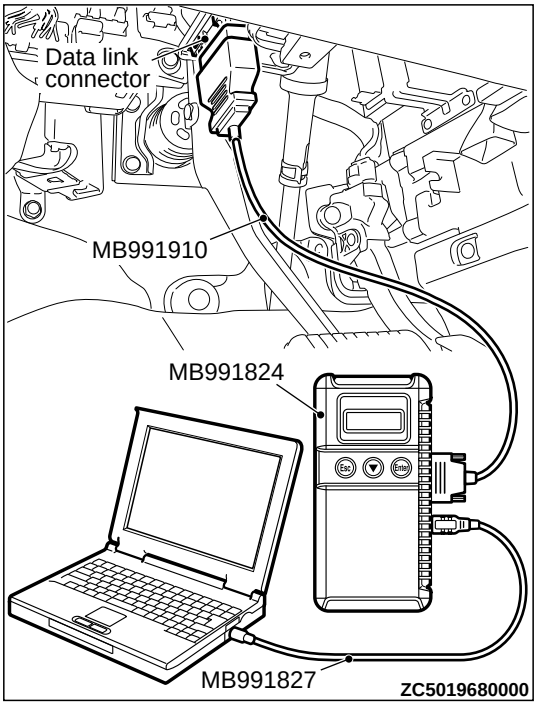
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Mass airflow sensor failed.
- Connector damage
- Harness damage
- ECM 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).
- The standard value during idling should be between 1,350 and 1,670 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.00-15.

NO: Go to Step 2.

STEP 2. Check harness connector A-07 at the mass airflow sensor and harness connector B-11 at the ECM for damage.

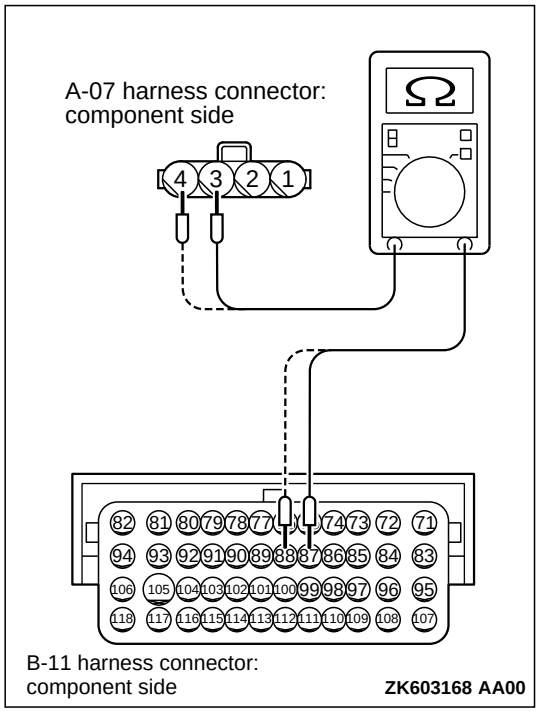
Q:Is the harness connector in good condition?

YES: Go to Step 3.

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

STEP 3. Check for harness damage between the mass airflow sensor connector A-07 and the ECM connector B-11.

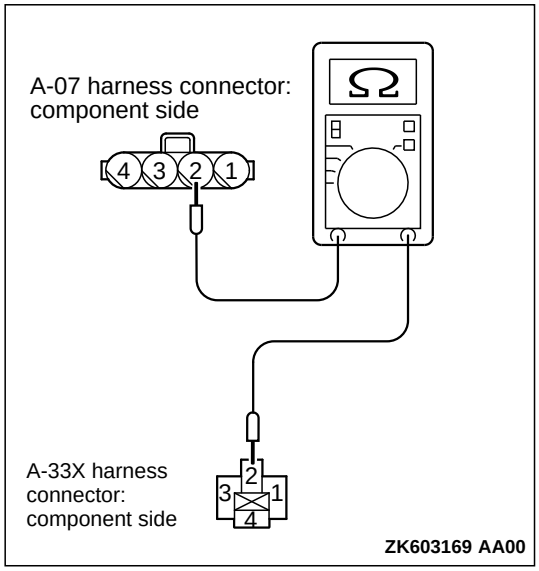
(1) Disconnect the mass airflow sensor connector A-07 and the ECM connector B-11.



(2) Measure the resistance between the mass airflow sensor connector A-07 and the ECM connector B-11.
a Connector A-07 (terminal No. 3) and Connector B-11 . (terminal No. 87).
b Connector A-07 (terminal No. 4) and Connector B-11 . (terminal No. 88).
▪Should be less than 2 ohms.

Q:Is the measured resistance less than 2 ohms?
YES: Go to Step 4.
NO: Repair it. Then go to Step 6.

STEP 4. Check for harness the MFI relay connector A-33X (terminal No. 2) and the mass airflow sensor connector A-07 (terminal No. 2).
(1) Disconnect the MFI relay connector A-33X and the mass airflow sensor connector A-07.
(2) Measure the resistance between the MFI relay connector A-33X (terminal No. 2) and the mass airflow sensor A-07 (terminal No. 2).
▪Should be less than 2 ohms.



Q:Is the measured resistance less than 2 ohms?
YES: Go to Step 5.
NO: Repair it. Then go to Step 6.

STEP 5. 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. 13Ab-8.
(3) Check the diagnostic trouble code (DTC).

Q:Is DTC P0101 set?
YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration

Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 6.
NO: The inspection is complete.

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 7 P. 13Ab-8.
(2) Check the diagnostic trouble code (DTC).

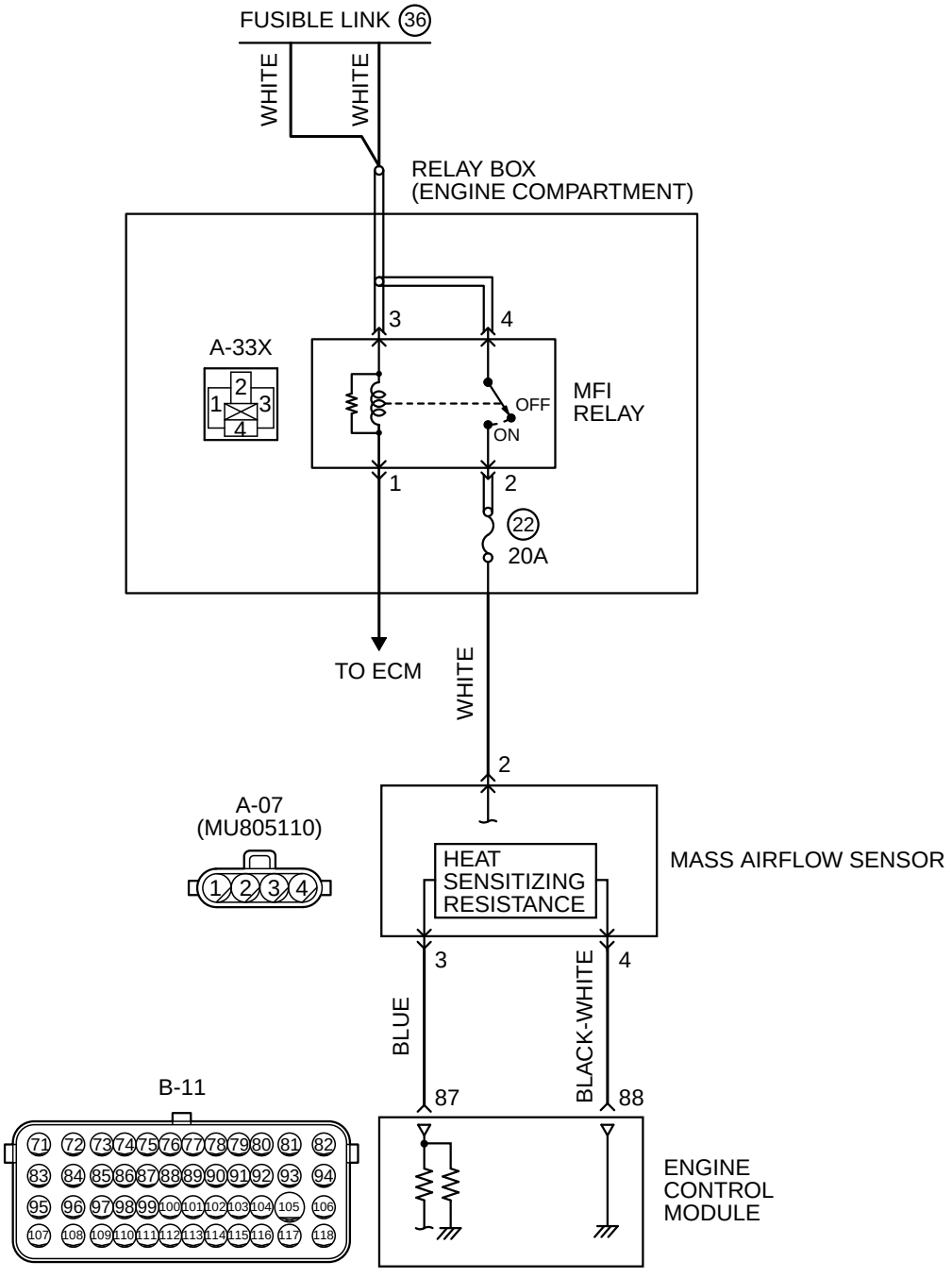
Q:Is DTC P0101 set?

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

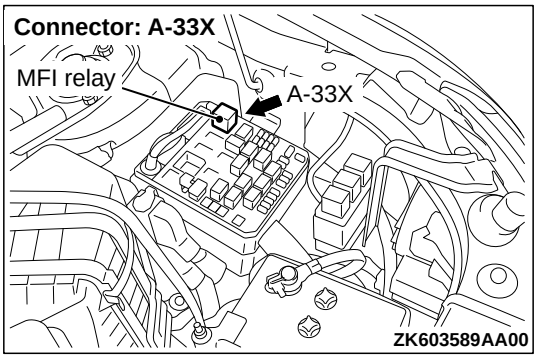
DTC P0102: Mass Airflow Circuit Low Input

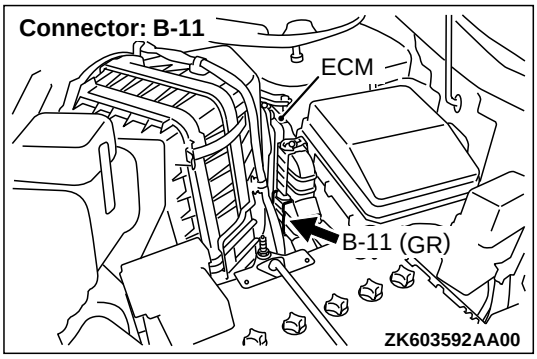
M11310100171USA0000010000

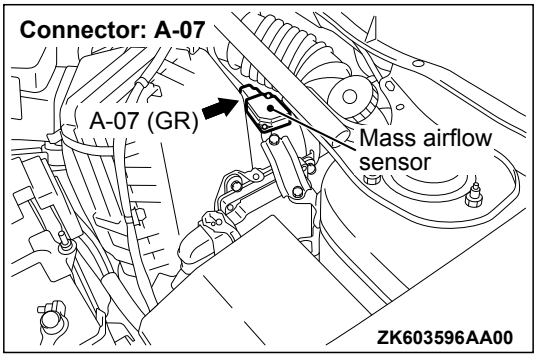
MASS AIRFLOW SENSOR CIRCUIT



ZK602833AA00







CIRCUIT OPERATION

- The mass airflow sensor power is supplied from the MFI relay (terminal No. 4), and the ground is provided on the ECM (terminal No. 88).
- A voltage that is according to the mass airflow rate is sent to the ECM (terminal No. 87) 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 ECM 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)

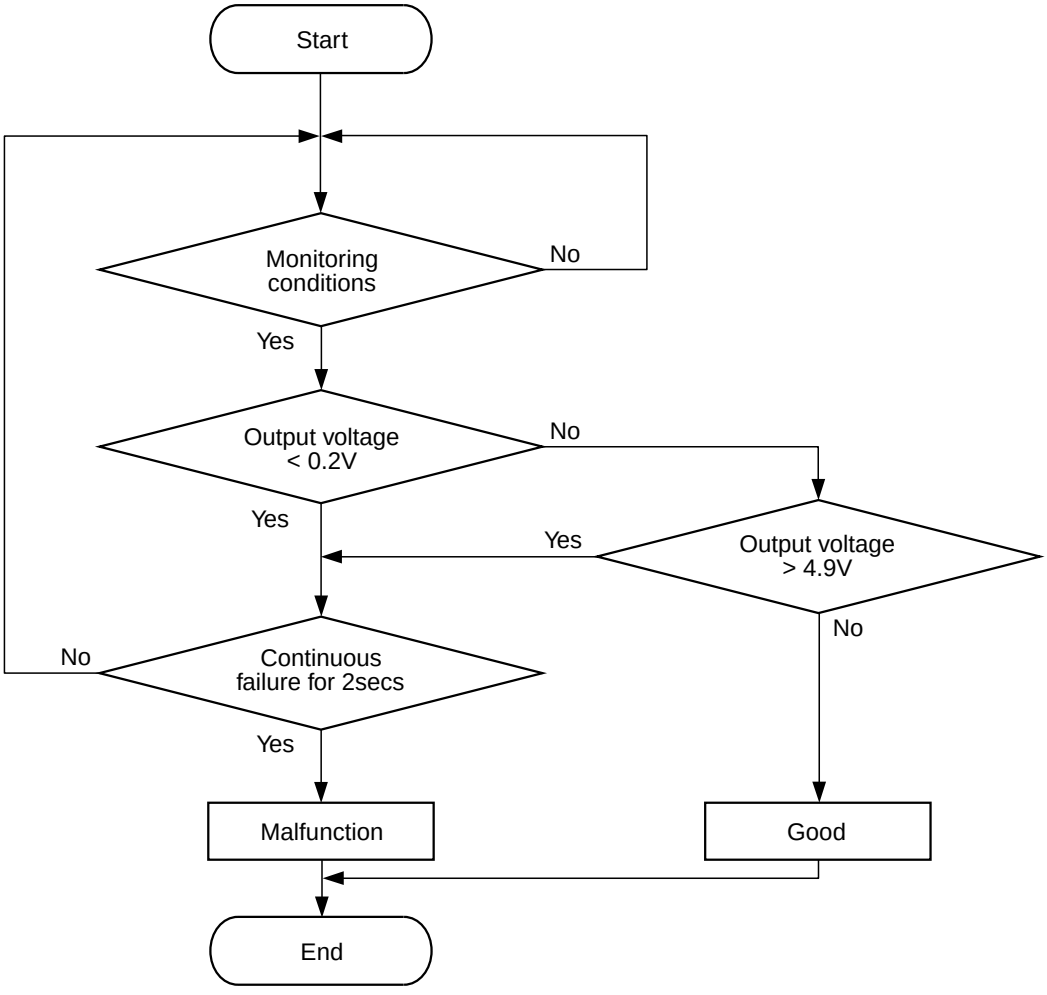
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



ZK603676 AA00

Check Conditions

- 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 0.2 volt or lower for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function - OBD-II Drive Cycle - Pattern 24 P.13Ab-8.

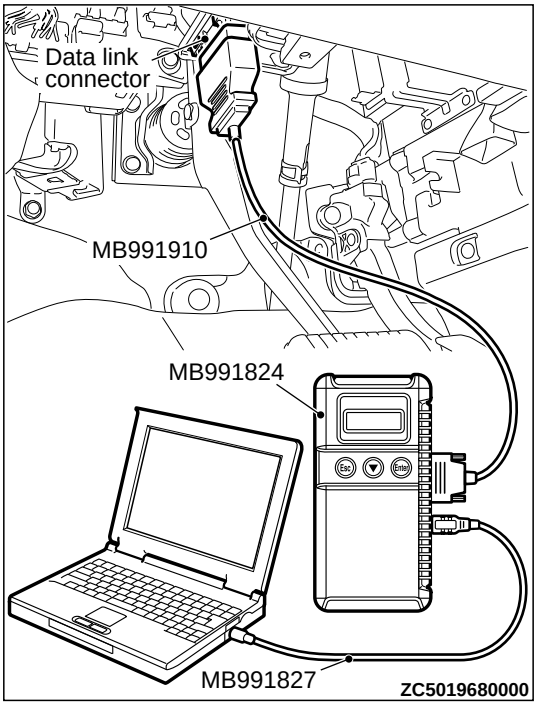
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Mass airflow sensor failed.
- Connector damage
- Harness damage
- ECM 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).
- The standard value during idling should be between 1,350 and 1,670 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.00-15.

NO: Go to Step 2.

STEP 2. Check harness connector A-07 at the mass airflow sensor and harness connector B-11 at the ECM for damage.

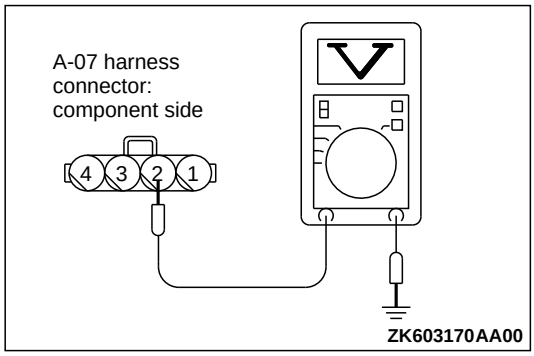
Q:Is the harness connector in good condition?

YES: Go to Step 3.

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

STEP 3. Measure the power supply voltage at the mass airflow sensor harness side connector A-07.

(1) Disconnect the connector A-07 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?

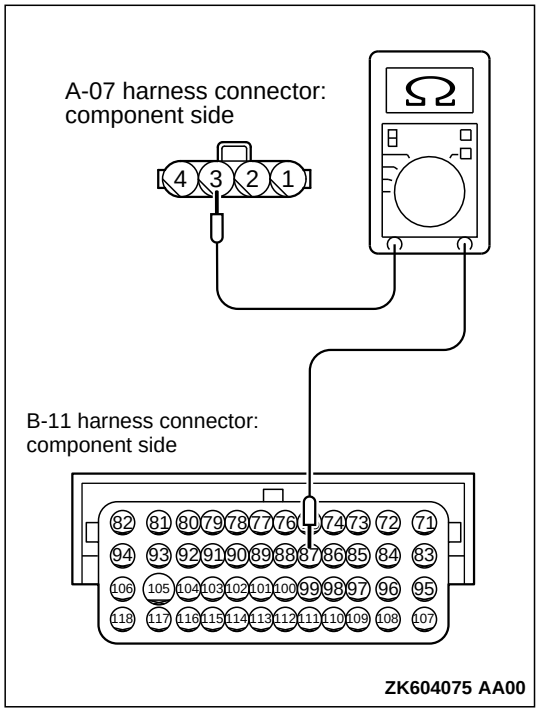
YES: Go to Step 4.

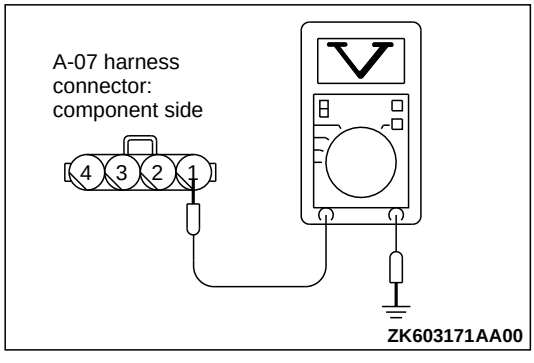
NO: Repair harness wire between the MFI relay connector A-33X (terminal No. 2) and the mass airflow sensor A-07 (terminal No. 2) because of open circuit or short circuit to ground. Then go to step 6.

STEP 4. Check for open circuit or short circuit to ground between the mass airflow sensor connector A-07 and ECM connector B-11.

(1) Disconnect the mass airflow sensor A-07 and the ECM connector B-10.

(2) Measure the resistance between the mass airflow sensor connector A-07 (terminal No. 3) and ECM connector B-11 (terminal No. 87).
- Should be less than 2 ohms.





(3) Check for the continuity between the mass airflow sensor A-07 (terminal No. 3) and ground.
- Not continuity.

Q:Is the harness wire in good condition?

YES: Go to Step 5.

NO: Repair it. Then go to Step 6.

STEP 5. 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. 13Ab-8.

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

Q:Is DTC P0102 set?

YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 6.

NO: The inspection is complete.

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. 13Ab-8.

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

Q:Is DTC P0102 set?

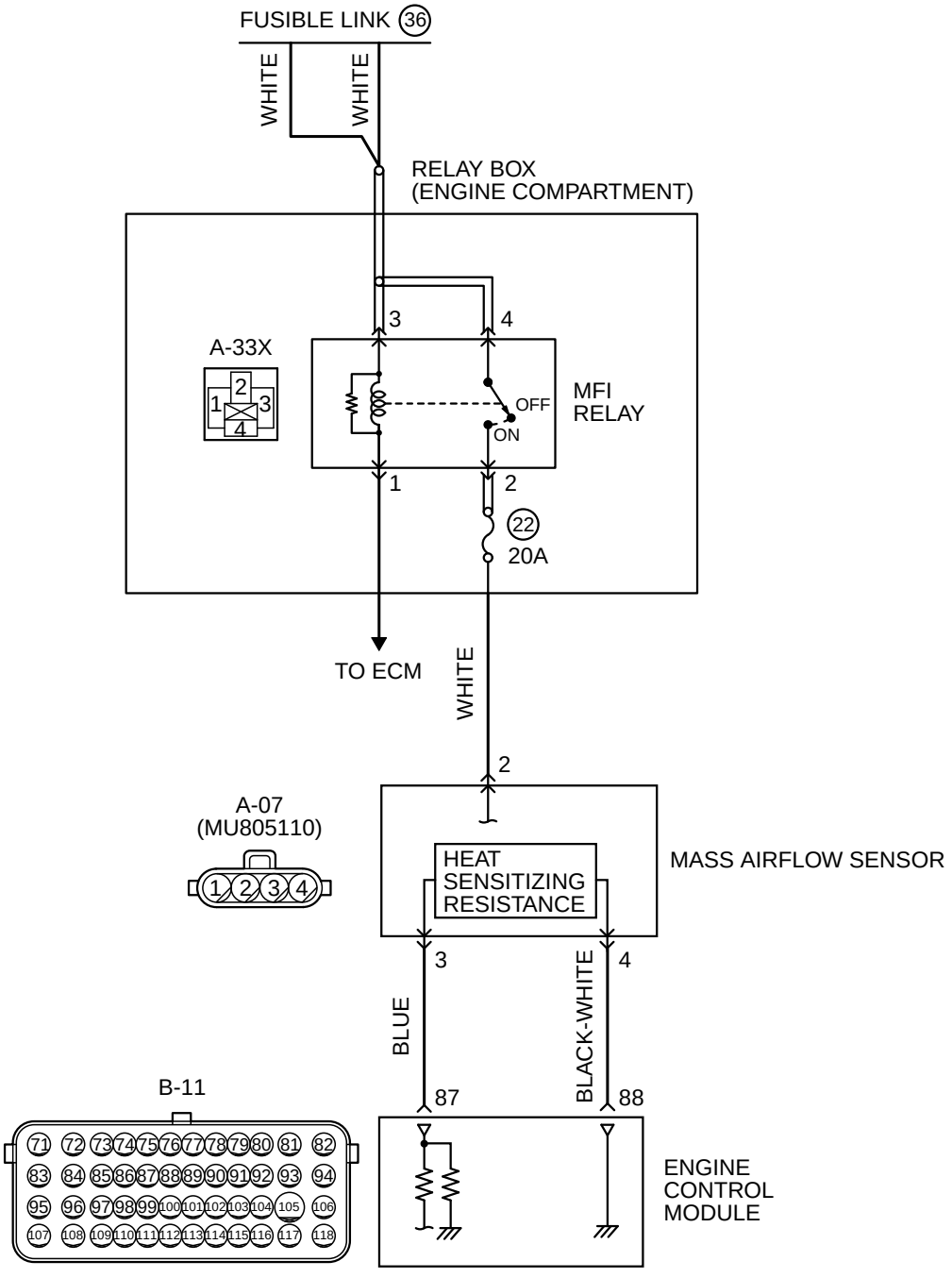
YES: Retry the troubleshooting.

NO: The inspection is complete.

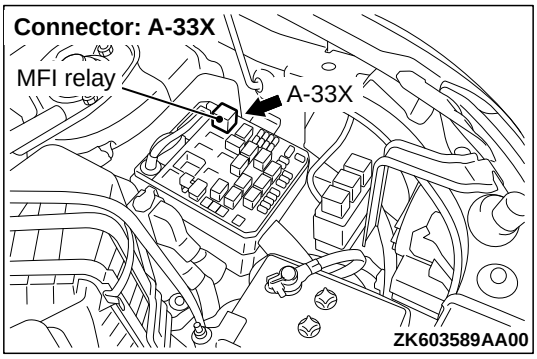
DTC P0103: Mass Airflow Circuit High Input

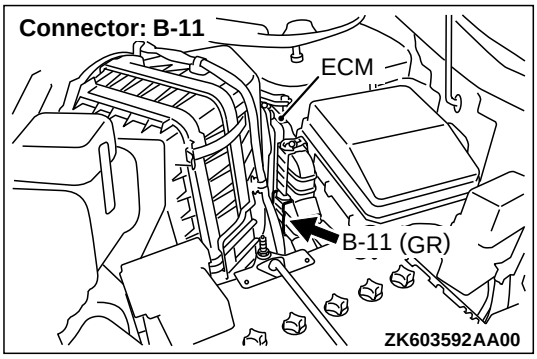
M11310100172USA0000010000

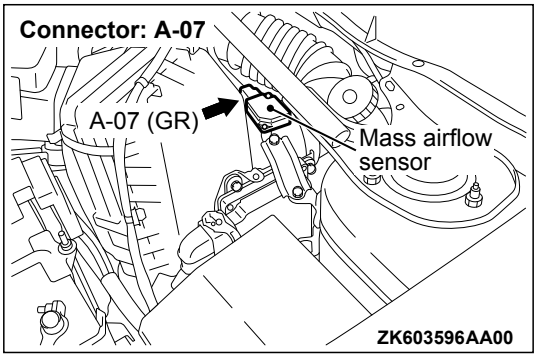
MASS AIRFLOW SENSOR CIRCUIT



ZK602833AA00







CIRCUIT OPERATION

- The mass airflow sensor power is supplied from the MFI relay (terminal No. 4), and the ground is provided on the ECM (terminal No. 88).
- A voltage that is according to the mass airflow rate is sent to the ECM (terminal No. 87) 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 ECM 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)

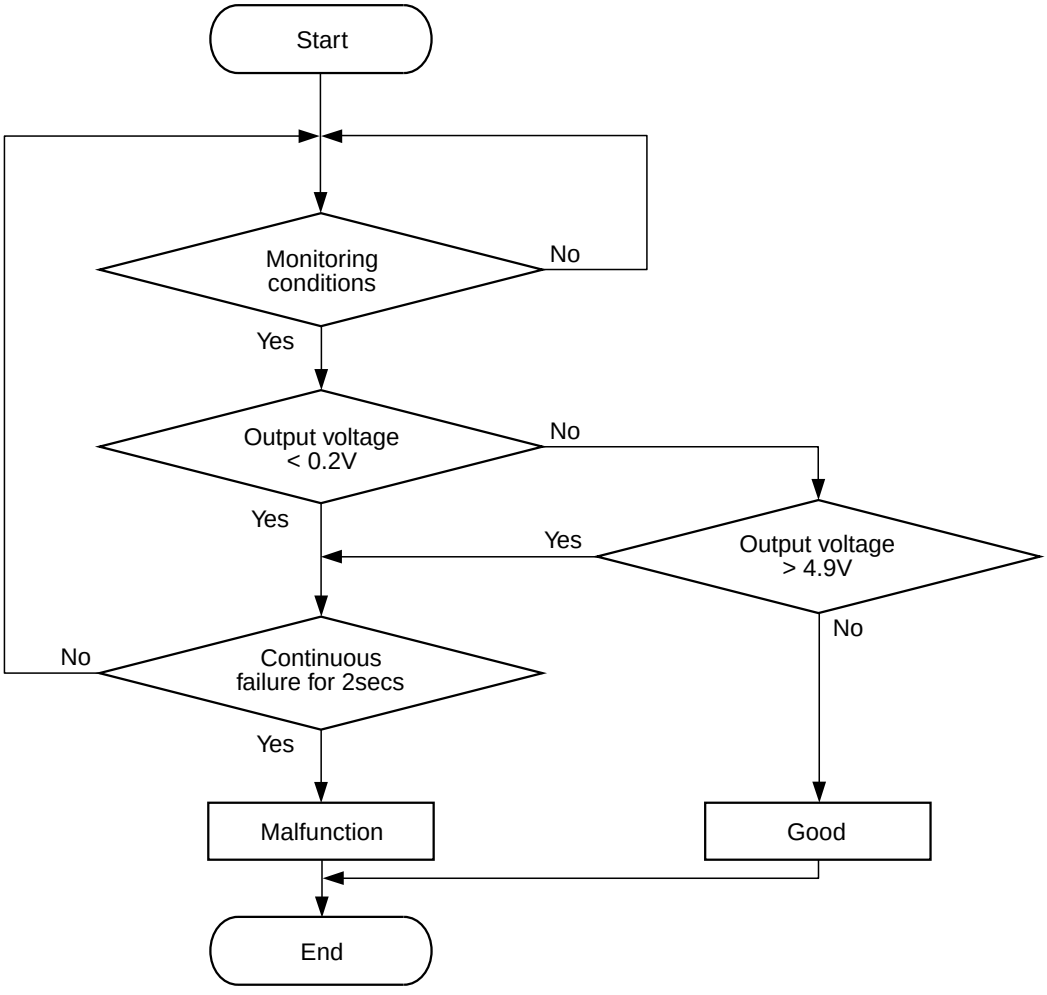
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



ZK603676 AA00

Check Conditions

- 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.13Ab-8.

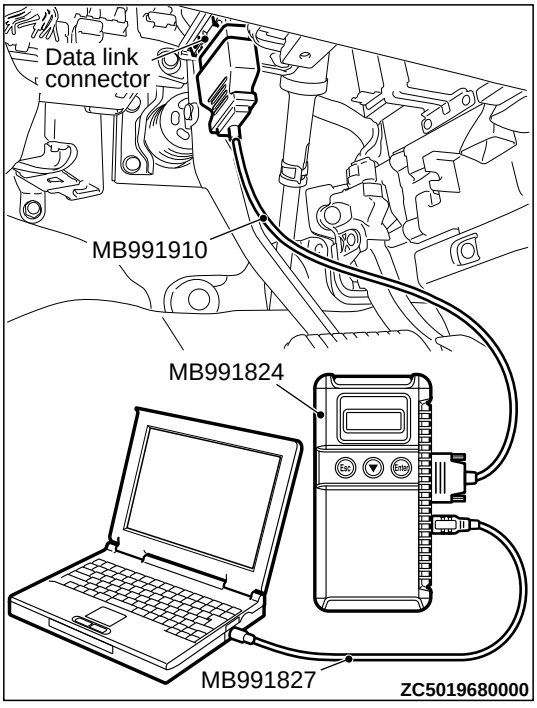
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Mass airflow sensor failed.
- Connector damage
- Harness damage
- ECM 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).
- The standard value during idling should be between 1,350 and 1,670 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.00-15.

NO: Go to Step 2.

STEP 2. Check harness connector A-07 at the mass airflow sensor and harness connector B-11 at the ECM for damage.

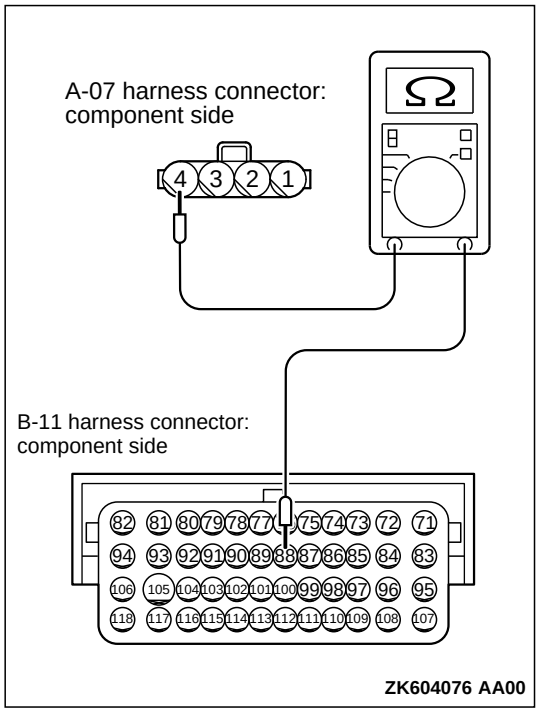
Q:Is the harness connector in good condition?

YES: Go to Step 3.

NO: Repair it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 5.

STEP 3. Check for the continuity between the mass airflow sensor connector A-07 and the ECM connector B-11.

(1) Disconnect the mass airflow sensor connector A-07 and the ECM connector B-11.



(2) Check for the continuity between the mass airflow sensor connector A-07 (terminal No. 4) and the ECM connector B-11 (terminal No. 88).
- Should be less than 2 ohms.

Q:Does continuity exist?
YES: Go to Step 4.
NO: Repair it. Then go to step 5.

STEP 4. 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. 13Ab-8.
(3) Check the diagnostic trouble code (DTC).

Q:Is DTC P0102 set?
YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 5.
NO: The inspection is complete.

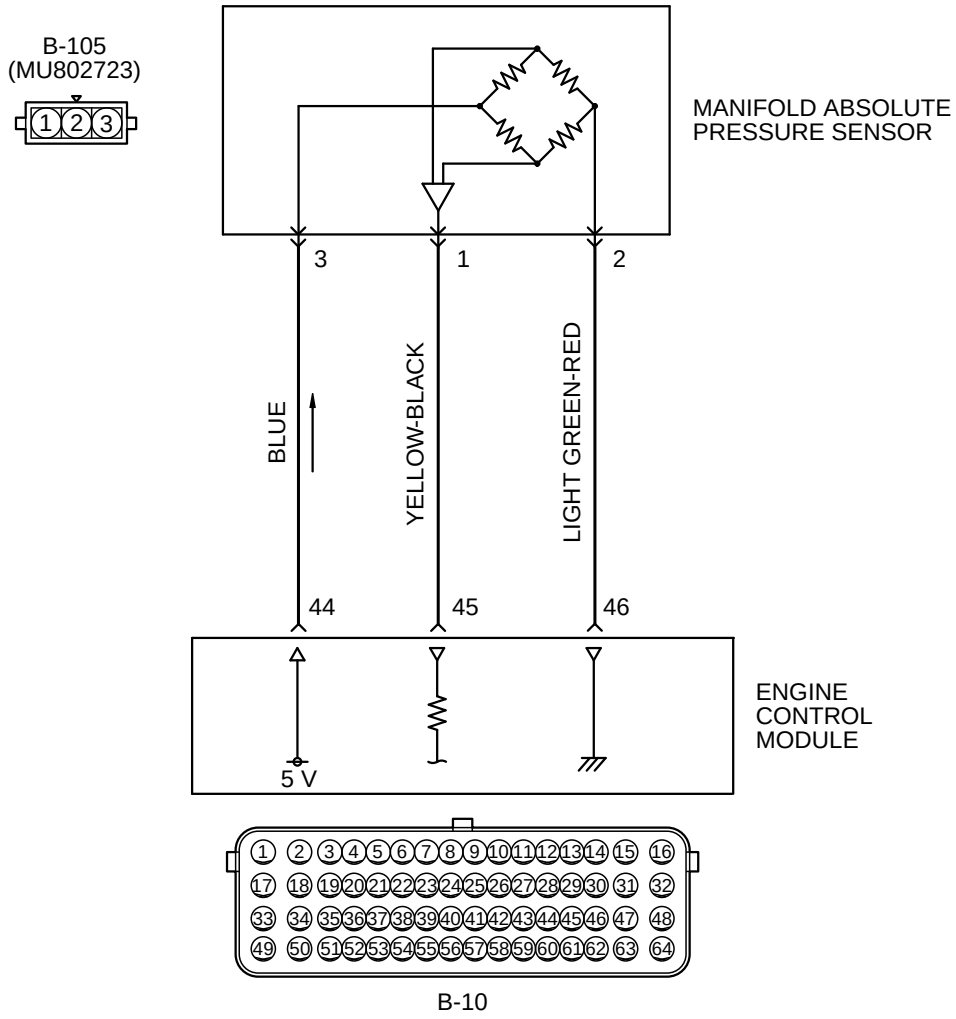
STEP 5. Test the OBD-II drive cycle.
(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function - OBD-II Drive Cycle - Pattern 24 P. 13Ab-8.
(2) Check the diagnostic trouble code (DTC).

Q:Is DTC P0103 set?
YES: Retry the troubleshooting.
NO: The inspection is complete.

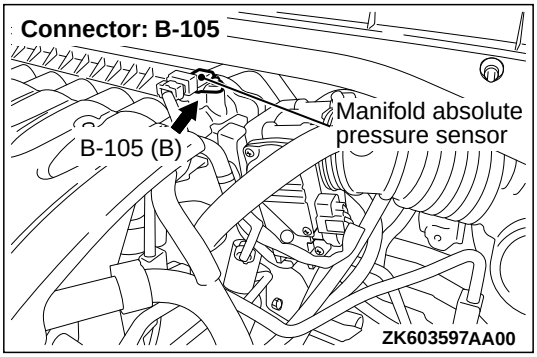
DTC P0106: Manifold Absolute Pressure Circuit Range/Performance Problem

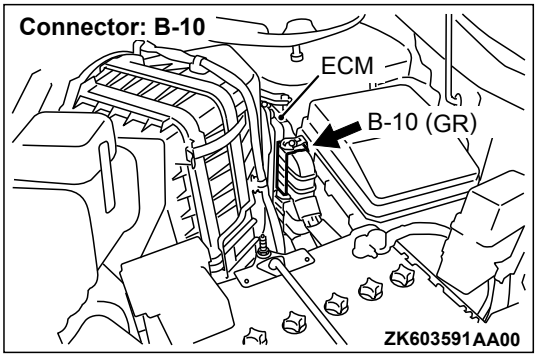
M11310100173USA0000010000

MANIFOLD ABSOLUTE PRESSURE SENSOR CIRCUIT



ZK602834AA00





CIRCUIT OPERATION

- A 5-volt voltage is supplied to the manifold absolute pressure sensor power terminal (terminal No. 3) from the ECM (terminal No. 44). The ground terminal (terminal No. 2) is grounded with ECM (terminal No. 46).
- A voltage that is proportional to the intake manifold pressure is sent to the ECM (terminal No. 45) 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 ECM 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)

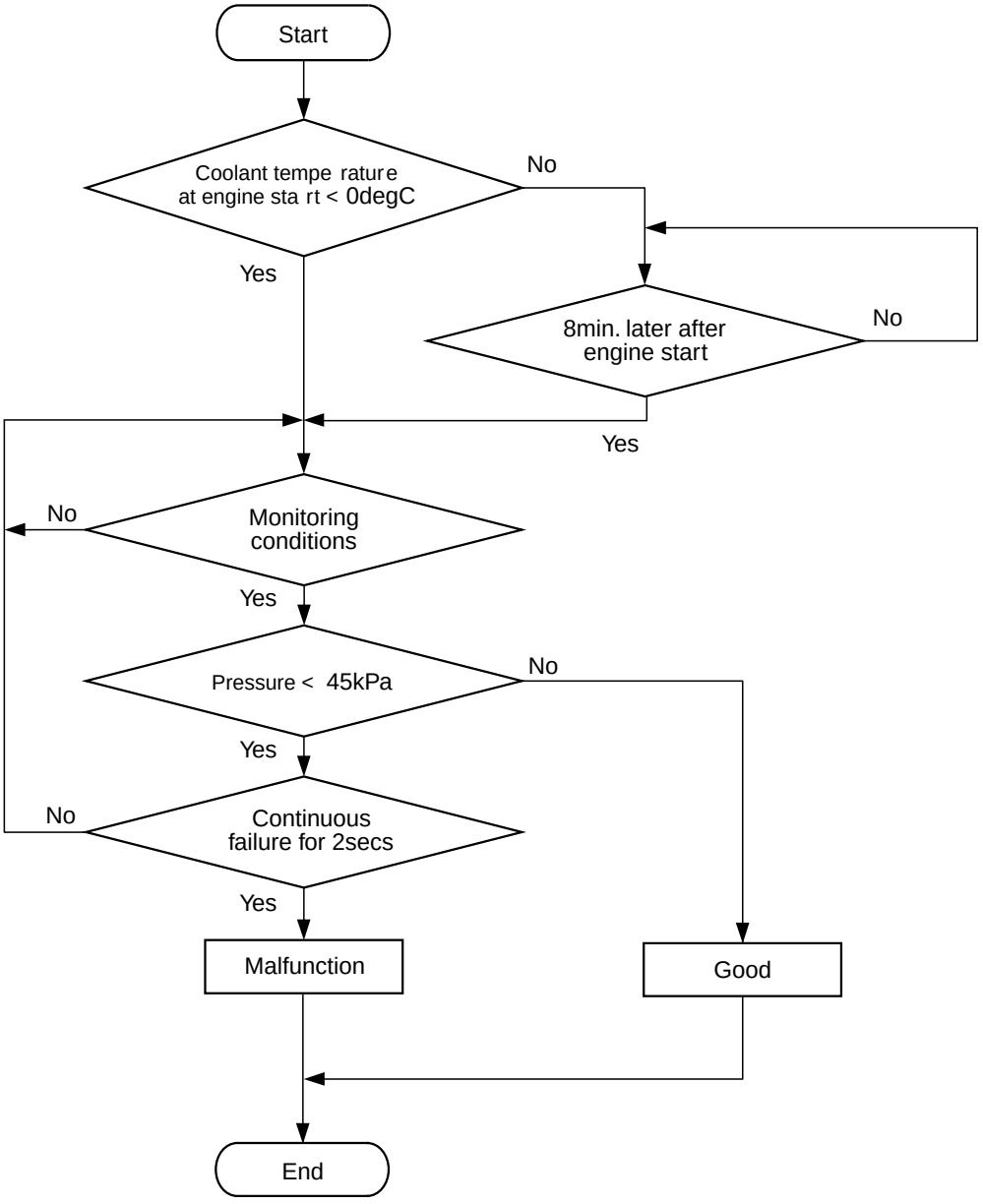
- Not applicable

Sensor (The sensor below is determined to be normal)

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

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

Logic Flow Chart



ZK603679 AA00

Check Conditions

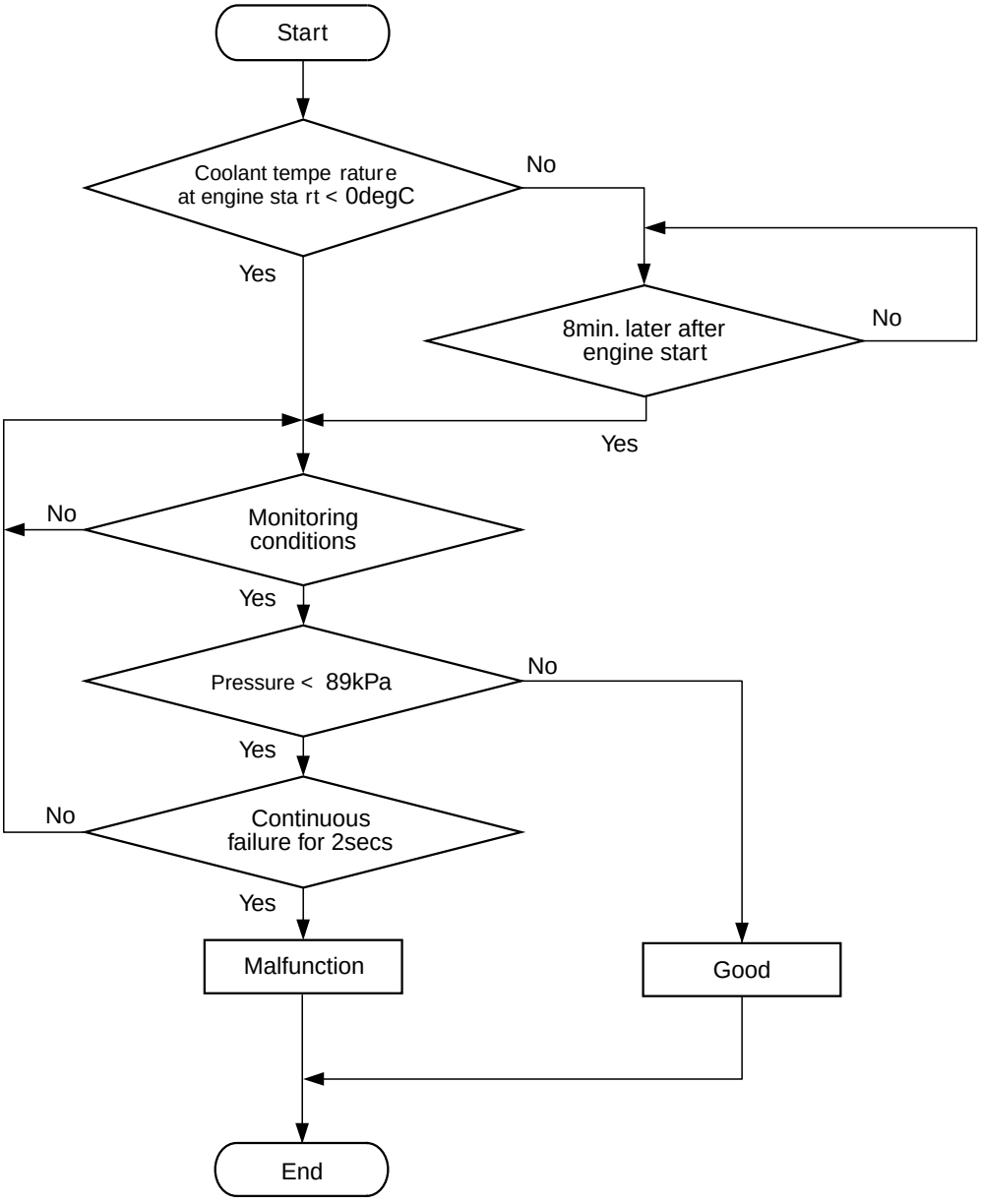
- 8 minutes or more have passed since the engine starting sequence was completed, when the engine coolant temperature at engine start is 0°C (32°F) or lower.
- Engine speed is higher than 1,500 r/min.
- Throttle position sensor output voltage is higher than 3.5 volts.

Judgement Criterion

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

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

Logic Flow Chart



ZK603680 AA00

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 lower than 1,500 r/min.
- Throttle position sensor output voltage is lower than 0.9 volt.

Judgement Criterion

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

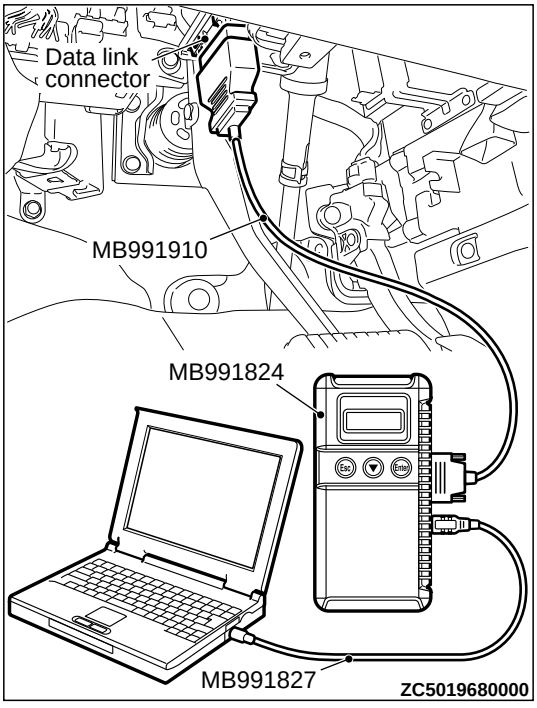
OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function - OBD-II Drive Cycle - Pattern 7 P.13Ab-8.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)
- Manifold absolute pressure sensor failed.
- Harness damage.
- Connector damage.
- ECM 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 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.00-15.

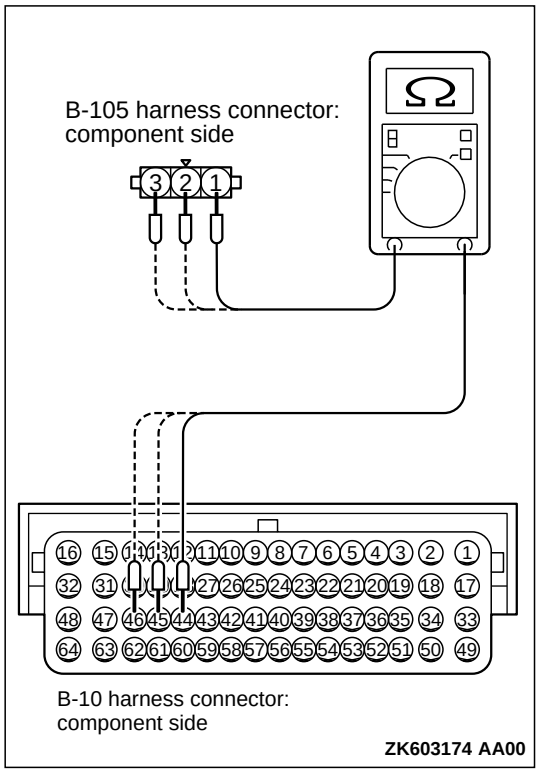
NO: Go to Step 2.

STEP 2. Check harness connector B-105 at the manifold absolute pressure sensor and harness connector B-10 at ECM for damage.

Q:Is the harness connector in good condition?

YES: Go to Step 3.

NO: Repair it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 5.



STEP 3. Check harness connector B-105 at the manifold absolute pressure sensor and harness connector B-10 at ECM for damage.

(1) Disconnect the manifold absolute pressure sensor connector B-105 between the ECM connector B-10.
- a. Measure the resistance between the manifold absolute pressure sensor connector B-105 (terminal No. 3) and the ECM connector B-10 (terminal No. 44).
- b. Measure the resistance between the manifold absolute pressure sensor connector B-105 (terminal No. 1) and the ECM connector B-10 (terminal No. 45).
- c. Measure the resistance between the manifold absolute pressure sensor connector B-105 (terminal No. 2) and the ECM connector B-10 (terminal No. 46).
  - ▪Should be less than 2 ohms.

Q:Is the harness wire in good condition?

YES: Go to step 4.

NO: Repair it. Then go to Step 6.

STEP 4. Replace the manifold absolute pressure sensor.

(1) Replace the manifold absolute pressure sensor.

(2) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function - OBD-II Drive Cycle - Pattern 7 P. 13Ab-8.

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

Q:Is DTC P0106 set?

YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 5.

NO: The inspection is complete.

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 7 P. 13Ab-8.

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

Q:Is DTC P0106 set?

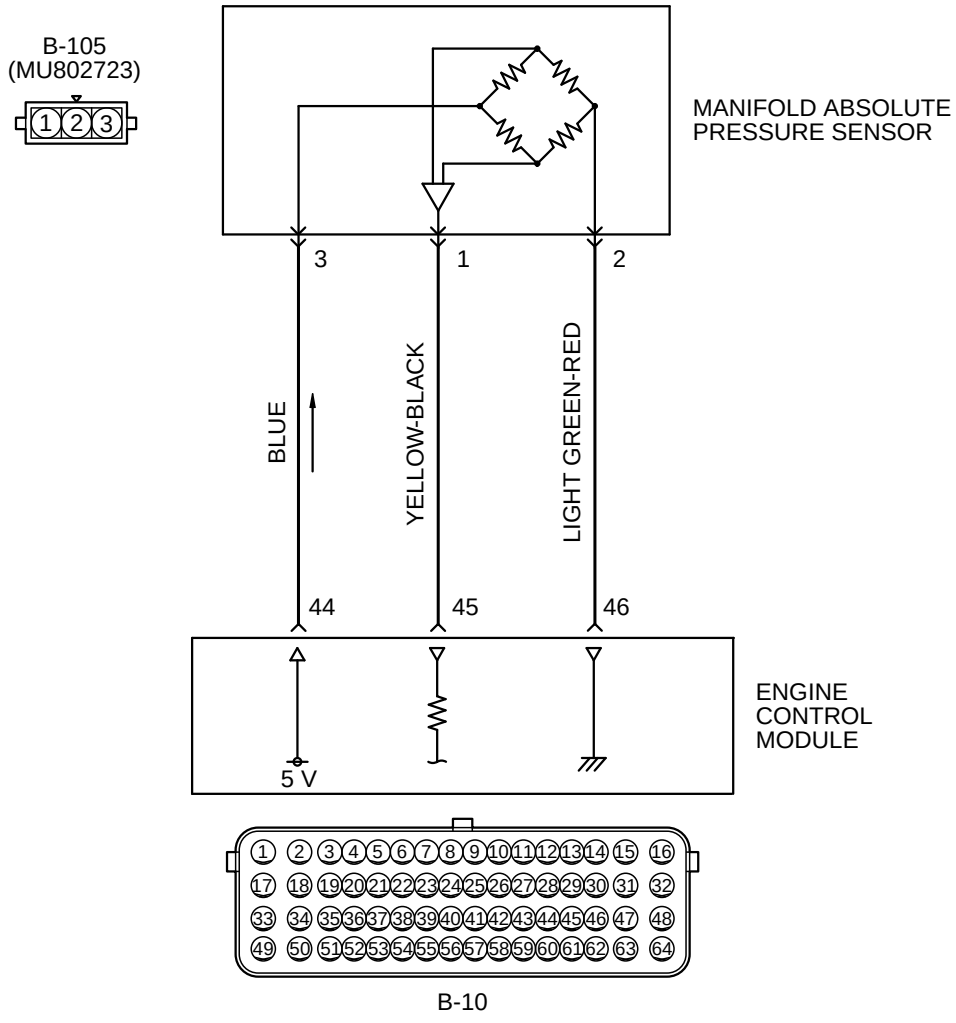
YES: IRetry the troubleshooting.

NO: The inspection is complete.

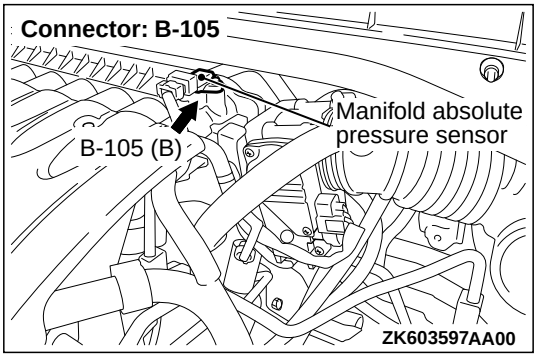
DTC P0107: Manifold Absolute Pressure Circuit Low Input

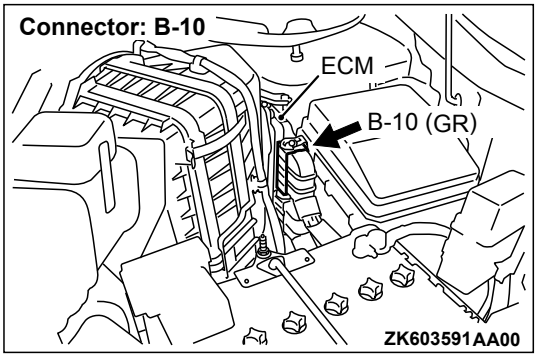
M11310100174USA0000010000

MANIFOLD ABSOLUTE PRESSURE SENSOR CIRCUIT



ZK602834AA00





CIRCUIT OPERATION

- A 5-volt voltage is supplied to the manifold absolute pressure sensor power terminal (terminal No. 3) from the ECM (terminal No. 44). The ground terminal (terminal No. 2) is grounded with ECM (terminal No. 46).
- A voltage that is proportional to the intake manifold pressure is sent to the ECM (terminal No. 45) 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 ECM 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)

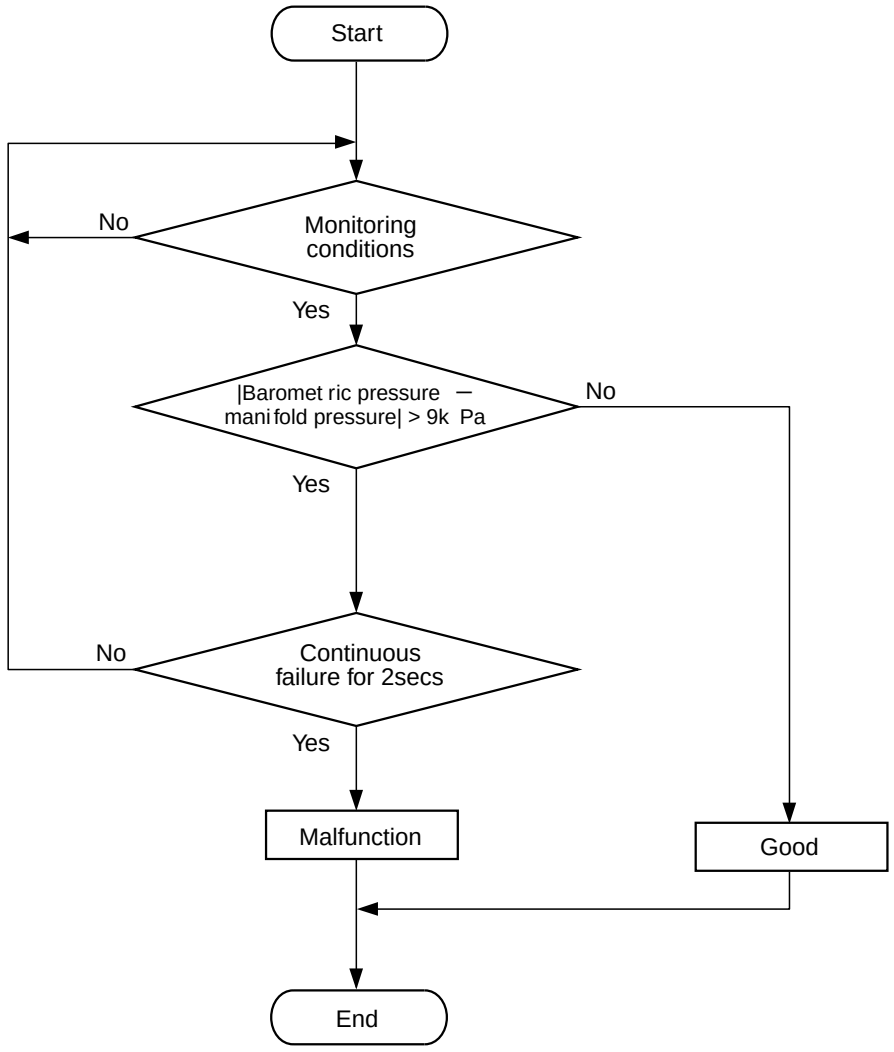
- Not applicable

Sensor (The sensor below is determined to be normal)

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

DTC SET CONDITIONS

Logic Flow Chart



ZK603685 AA00

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.13Ab-8.

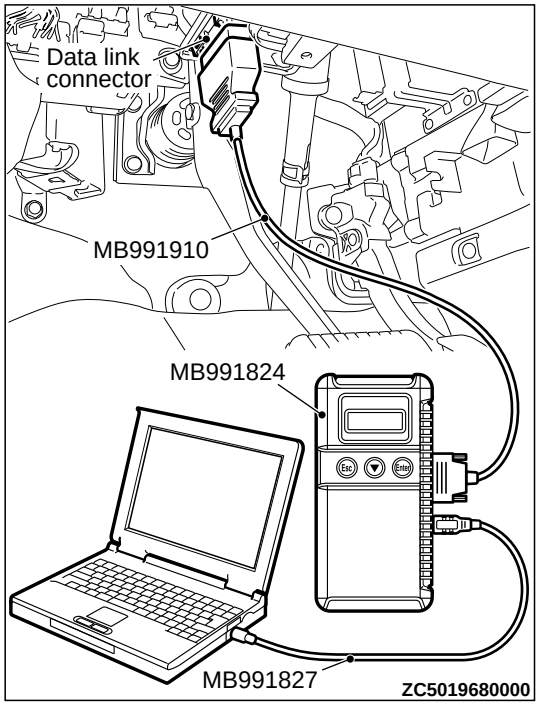
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Manifold absolute pressure sensor failed.
- Connector damage
- Harness damage
- ECM 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 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.00-15.

NO: Go to Step 2.

STEP 2. Check harness connector B-105 at the manifold absolute pressure sensor and harness connector B-10 at the ECM for damage.

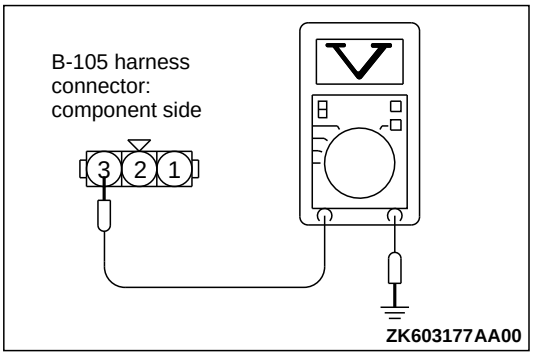
Q:Is the harness connector in good condition?

YES: Go to Step 3.

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

STEP 3. Measure the sensor supply voltage at manifold absolute pressure sensor connector B-105.

(1) Disconnect the connector B-105.
(2) Turn the ignition switch to the "ON" position.



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

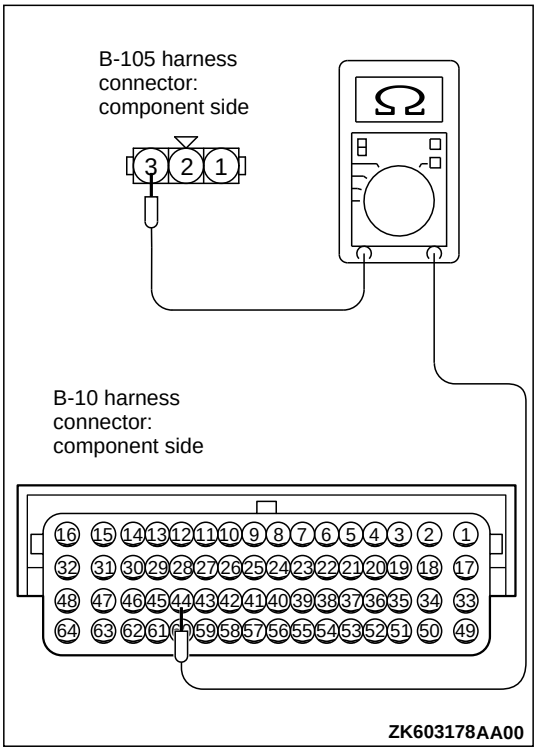
(4) Turn the ignition switch to the "LOCK" (OFF) position.

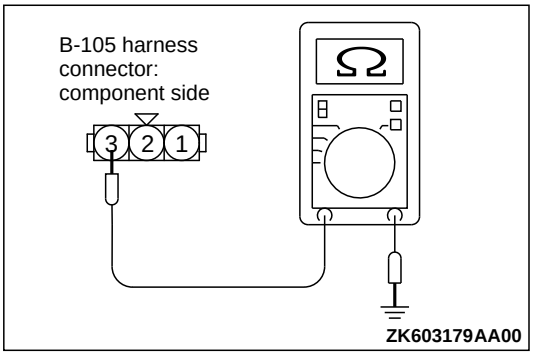
Q:Is the measured voltage between 4.9 and 5.1 volts?
YES: Go to Step 5.
NO: Go to Step 4.

STEP 4. Check for open circuit and short circuit to ground between manifold absolute pressure sensor connector B-105 and ECM connector B-10.

(1) Disconnect the manifold absolute pressure sensor connector B-105 and the ECM connector B-10

(2) Measure the resistance between the manifold absolute pressure sensor connector B-105 (terminal No. 3) and connector B-10 (terminal No. 44).
- Should be less than 2 ohms.





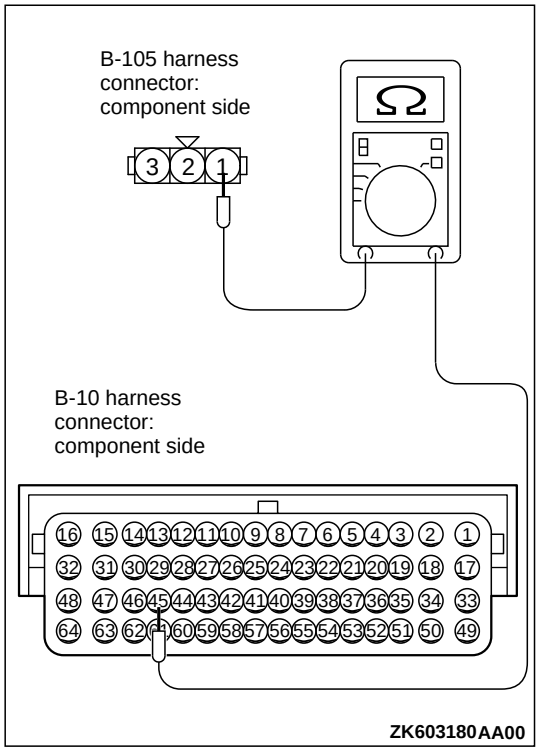
(3) Check for the continuity between the manifold absolute pressure sensor B-105 (terminal No. 3) and ground.
- Not continuity.

Q:Is the harness wire in good condition?
YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to step 7.
NO: Repair it. Then go to Step 7.

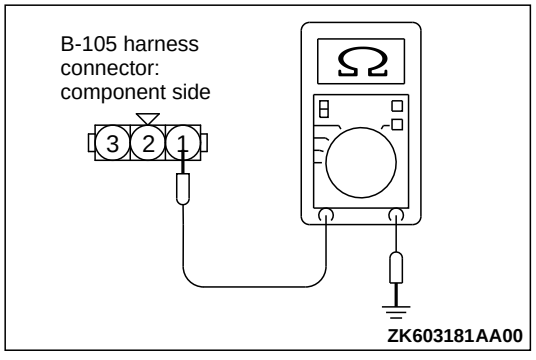
STEP 5. Check for open circuit and short curcuit to ground between manifold absolute pressure sensor connector B-105 and ECM connector B-10.

(1) Disconnect the manifold absolute pressure sensor connector B-105 between the ECM connector B-10.

(2) Measure the resistance between the manifold absolute pressure sensor connector B-105 (terminal No. 1) and connector B-10 (terminal No. 45).
- Should be less than 2 ohms.



(3) Check for the continuity between the manifold absolute pressure sensor B-105 (terminal No. 3) and ground.
- Not continuity.



Q:Is the harness in good condition?

YES: Go to Step 6.

NO: Repair it. Then go to Step 7.

STEP 6. Replace the manifold absolute pressure sensor.

(1) Replace the manifold absolute pressure sensor.

(2) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function - OBD-II Drive Cycle - Pattern 7 P. 13Ab-8.

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

Q:Is DTC P0107 set?

YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 7.

NO: The inspection is complete.

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 7 P. 13Ab-8.

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

Q:Is DTC P0107 set?

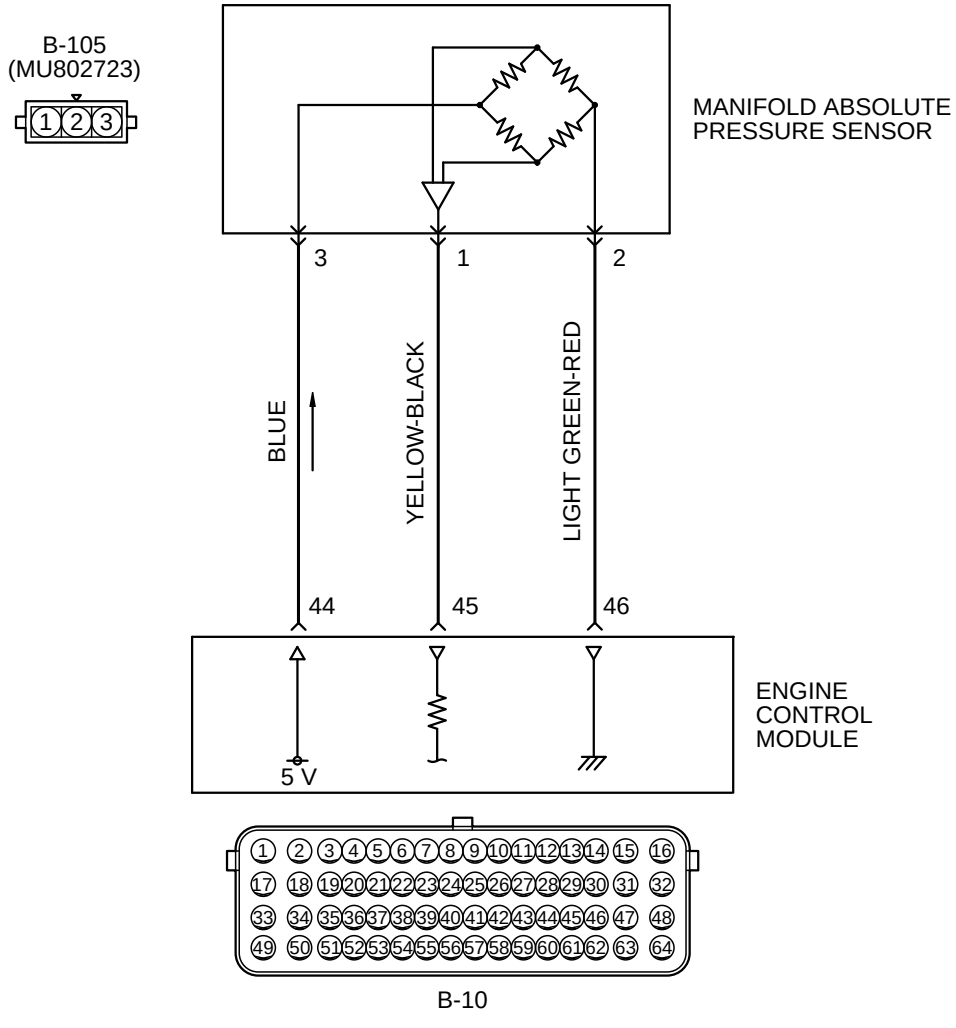
YES: Retry the troubleshooting.

NO: The inspection is complete.

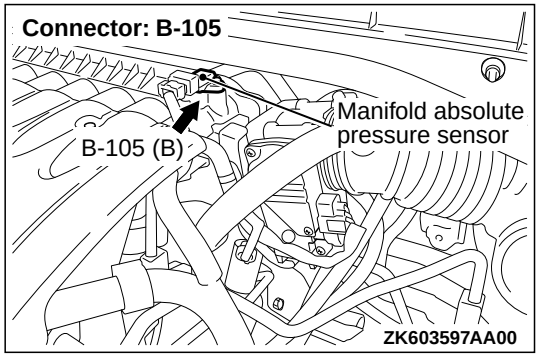
DTC P0108: Manifold Absolute Pressure Circuit High Input

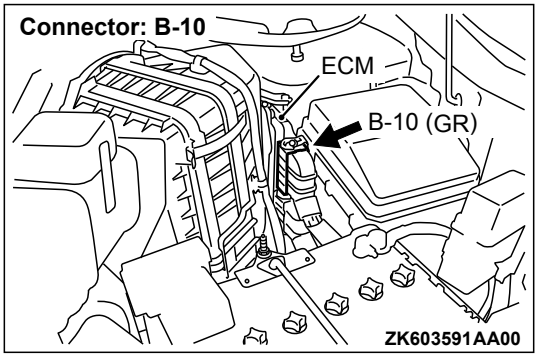
M11310100175USA0000010000

MANIFOLD ABSOLUTE PRESSURE SENSOR CIRCUIT



ZK602834AA00





CIRCUIT OPERATION

- A 5-volt voltage is supplied to the manifold absolute pressure sensor power terminal (terminal No. 3) from ECM (terminal No. 44). The ground terminal (terminal No. 2) is grounded with ECM (terminal No. 46).
- A voltage that is proportional to the intake manifold pressure is sent to the ECM (terminal No. 45) 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 ECM 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)

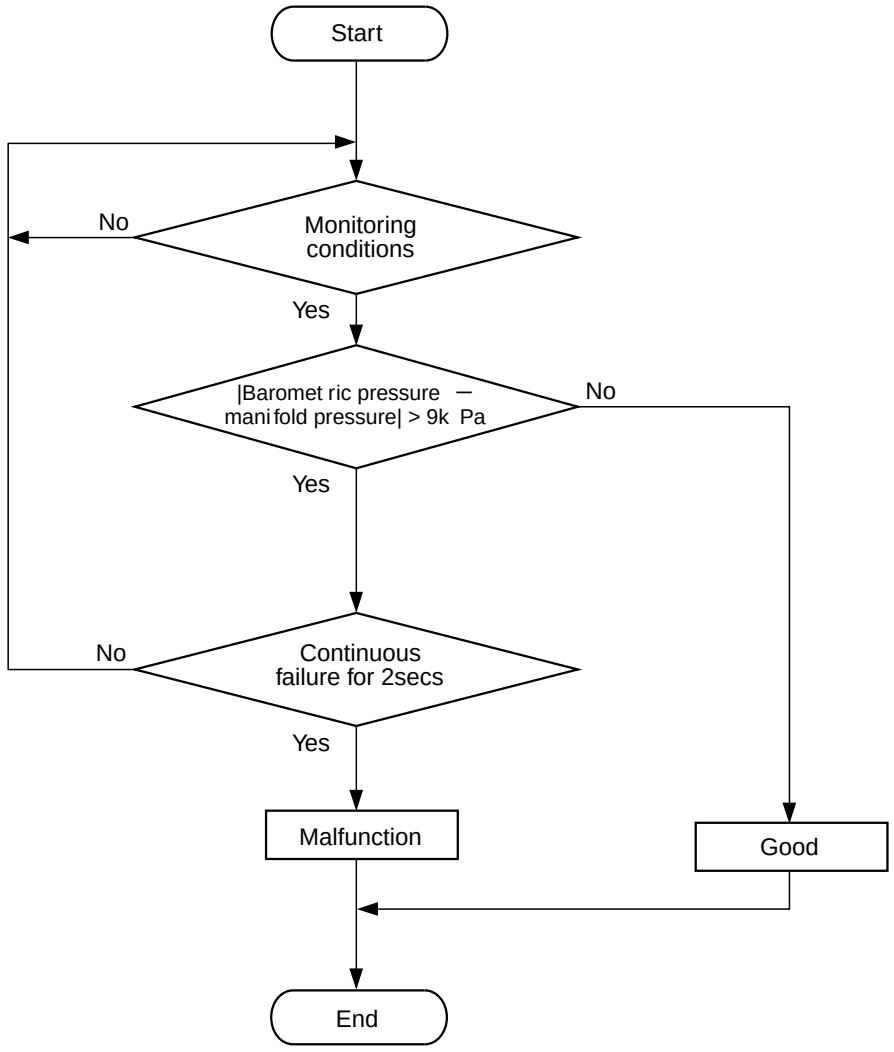
- Not applicable

Sensor (The sensor below is determined to be normal)

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

DTC SET CONDITIONS Range/Performance problem - low input

Logic Flow Chart



ZK603685 AA00

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.

Judgement Criterion

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

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function - OBD-II Drive Cycle - Pattern 24 P.13Ab-8.

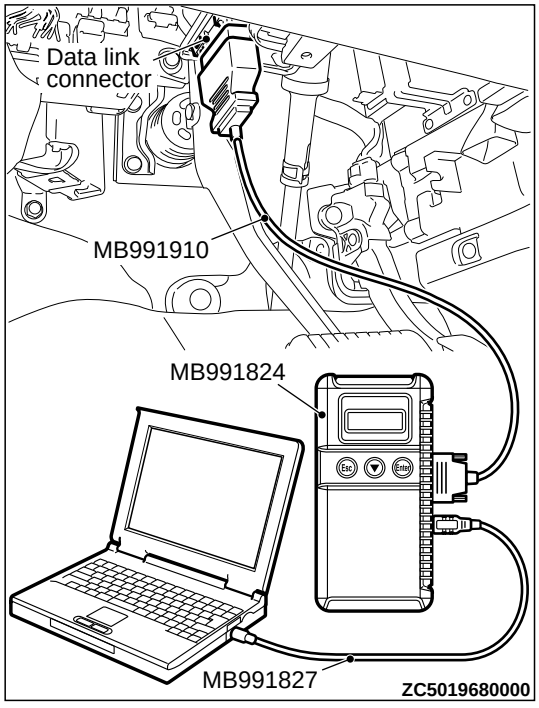
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Manifold absolute pressure sensor failed.
- Connector damage
- Harness damage
- ECM 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 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.00-15.

NO: Go to Step 2.

STEP 2. Check harness connector B-105 at the manifold absolute pressure sensor and harness connector B-10 at the ECM for damage.

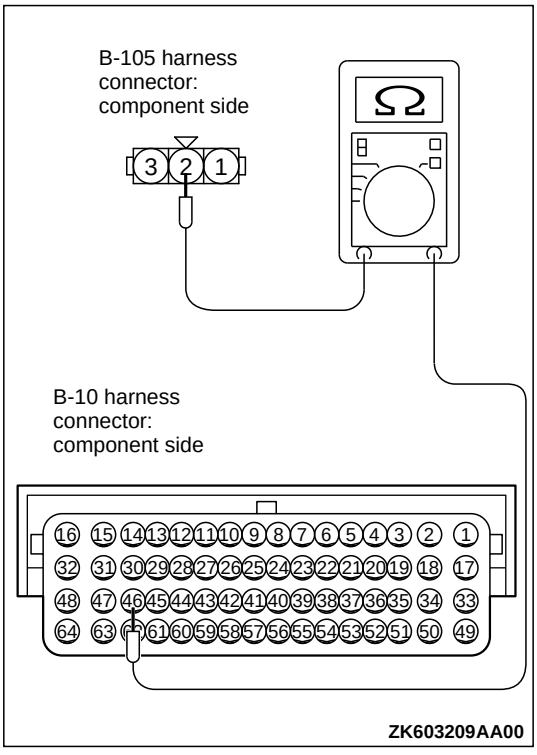
Q:Is the harness connector in good condition?

YES: Go to Step 3.

NO: Repair it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 5.

STEP 3. Check the continuity at the manifold absolute pressure sensor connector B-105 and the ECM connector B-10 for damage.

(1) Disconnect the manifold absolute pressure sensor connector B-105 and the ECM connector B-10.



(2) Check for the continuity between the manifold absolute pressure sensor connector B-105 (terminal No. 2) and the ECM connector B-10 (terminal No. 46).
- Should be less than 2 ohms.

Q:Is the harness in good condition?
YES: Go to Step 4.
NO: Repair it. Then go to step 5.

STEP 4. Replace the manifold absolute pressure sensor.
(1) Replace the manifold absolute pressure sensor.
(2) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function - OBD-II Drive Cycle - Pattern 24 P. 13Ab-8.
(3) Check the diagnostic trouble code (DTC).

Q:Is DTC P0108 set?
YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 5.
NO: The inspection is complete.

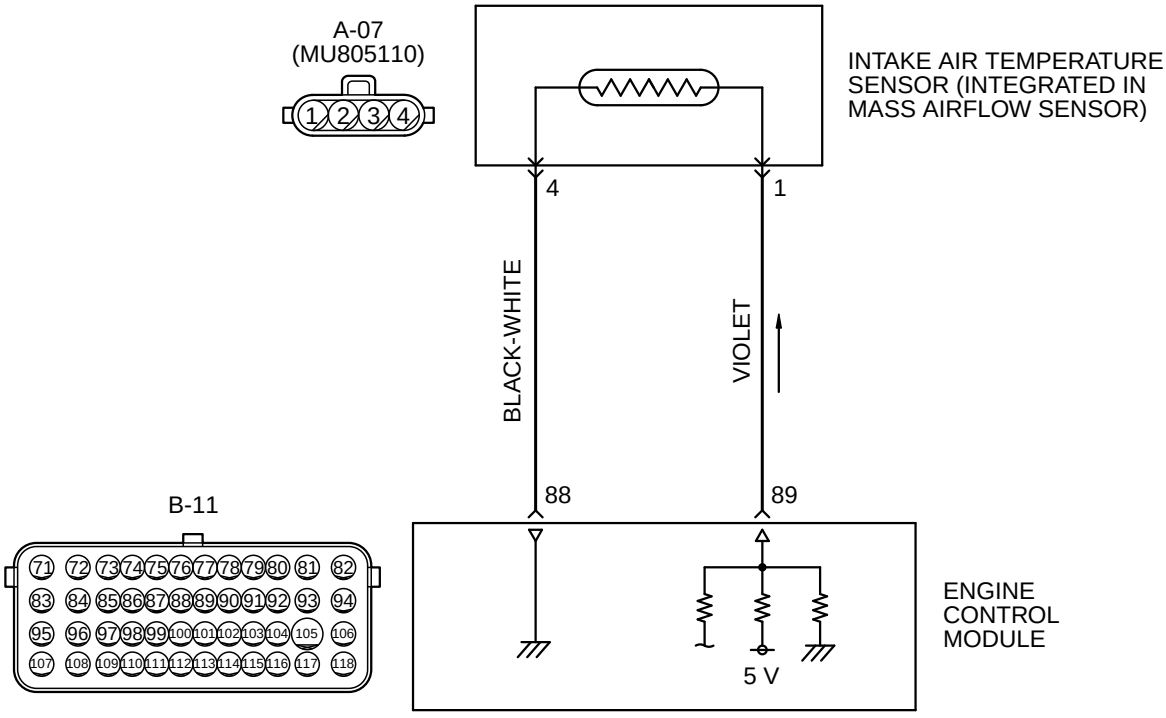
STEP 5. Test the OBD-II drive cycle.
(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function - OBD-II Drive Cycle - Pattern 24 P. 13Ab-8.
(2) Check the diagnostic trouble code (DTC).

Q:Is DTC P0108 set?
YES: Retry the troubleshooting.
NO: The inspection is complete.

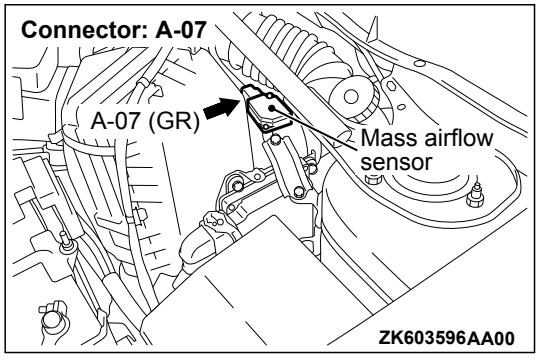
DTC P0111: Intake Air Temperature Circuit Range/Performance Problem

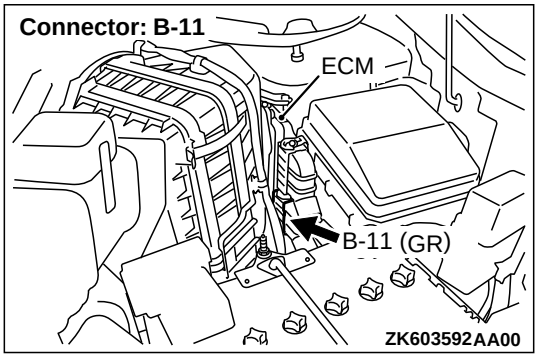
M11310100176USA0000010000

INTAKE AIR TEMPERATURE SENSOR CIRCUIT



ZK602835 AA00





CIRCUIT OPERATION

- Approximately 5 volts are applied to the intake air temperature sensor output terminal (terminal No. 1) from the ECM (terminal No. 89) via the resistor in the ECM. The ground terminal (terminal No. 4) is grounded with ECM (terminal No. 88).
- 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 ECM 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)

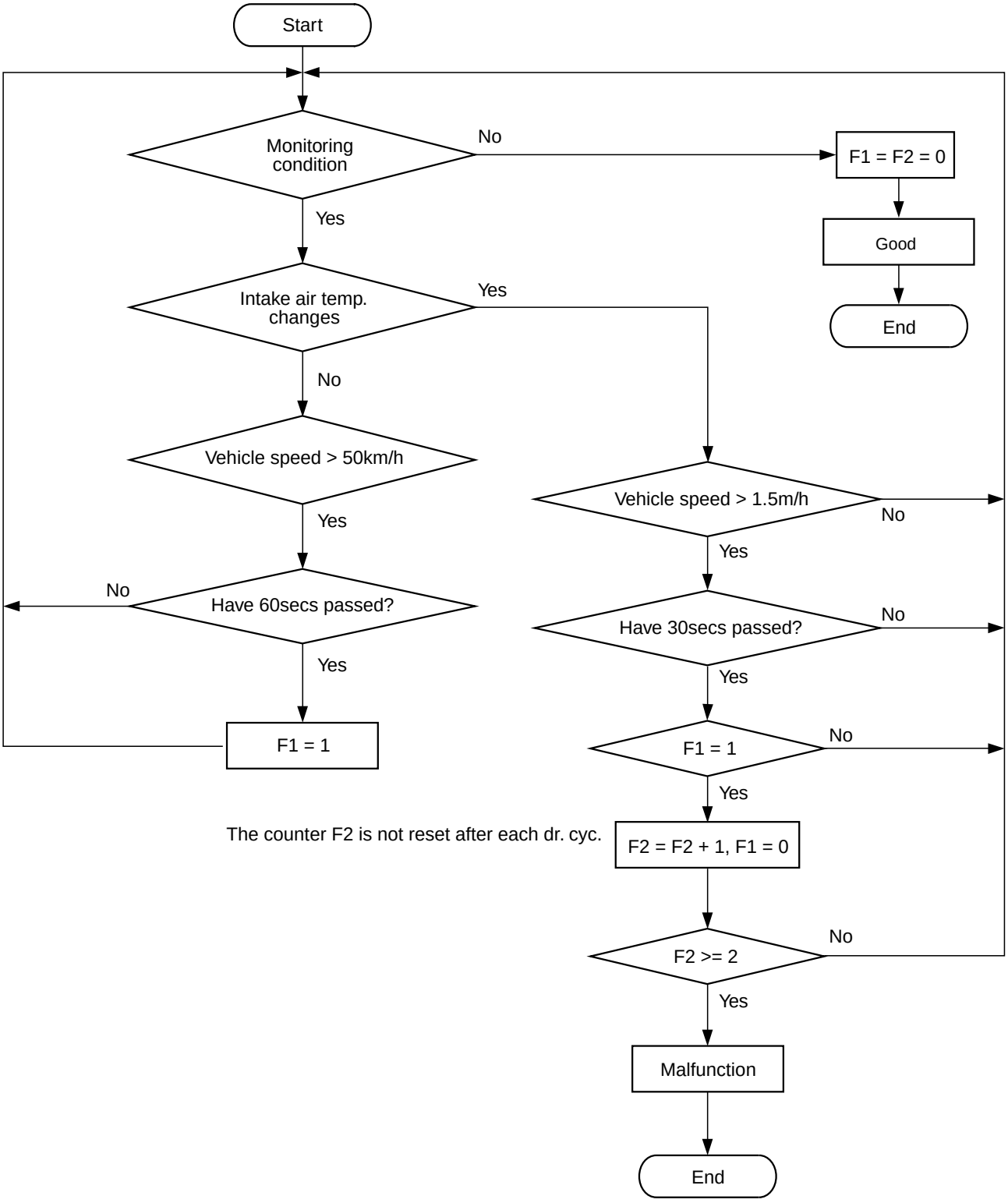
- Not applicable

Sensor (The sensor below is determined to be normal)

- Engine coolant temperature sensor

DTC SET CONDITIONS

Logic Flow Chart



ZK603687AA00

Check Conditions

- Engine coolant temperature is higher than 76°C (169°F).

- Repeat 2 or more times: drive*1, stop*1.
  - 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).

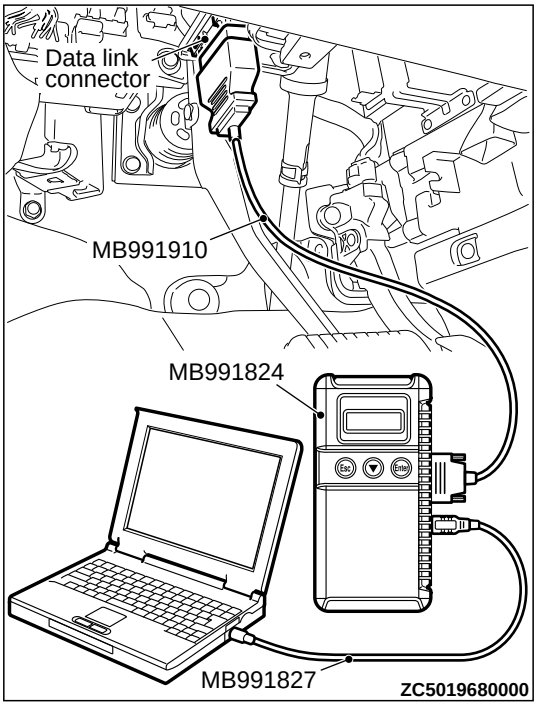
OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function - OBD-II Drive Cycle - Pattern 8 P.13Ab-8.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)
- Intake air temperature sensor failed.
- ECM 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 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.

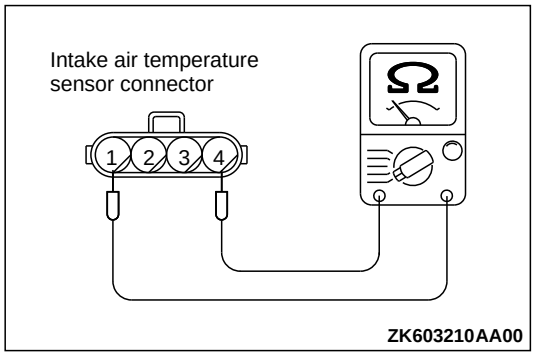
Q:Is the sensor operating properly?

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.00-15.

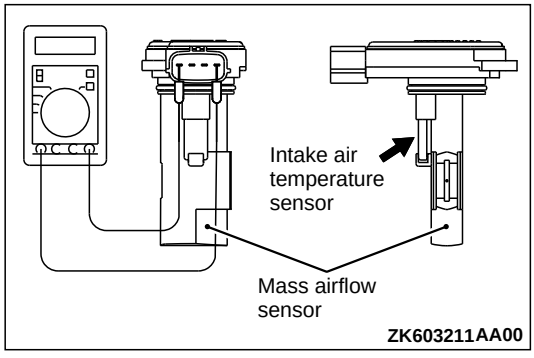
NO: Go to Step 2.

STEP 2. Check the intake air temperature sensor.

(1) Disconnect the intake air temperature sensor connector A-07.
(2) Remove the mass airflow sensor.



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



(4) 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: Replace the mass airflow sensor. Then go to Step 3.
NO: Go to Step 3.

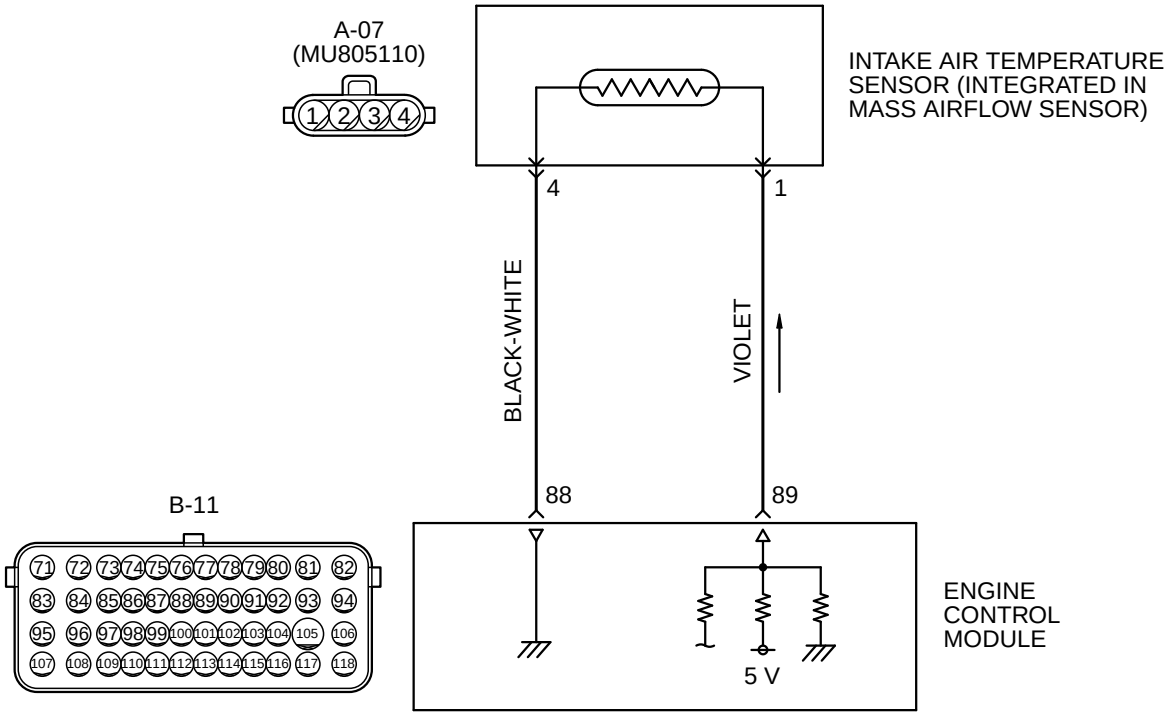
STEP 3. Test the OBD-II drive cycle.
(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function - OBD-II Drive Cycle - Pattern 8 P. 13Ab-8.
(2) Check the diagnostic trouble code (DTC).

Q:Is DTC P0111 set?
YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-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.00-15.

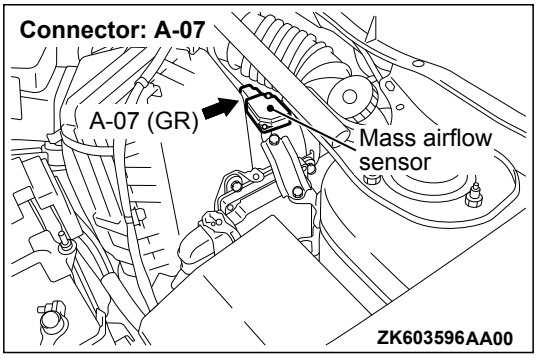
DTC P0112: Intake Air Temperature Circuit Low Input

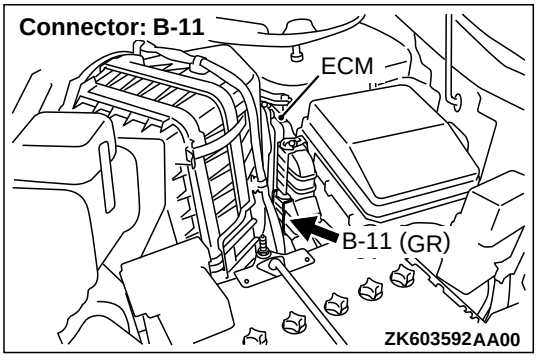
M11310100177USA0000010000

INTAKE AIR TEMPERATURE SENSOR CIRCUIT



ZK602835 AA00





CIRCUIT OPERATION

- Approximately 5 volts are applied to the intake air temperature sensor output terminal (terminal No. 1) from the ECM (terminal No. 89) via the resistor in the ECM. The ground terminal (terminal No. 4) is grounded with ECM (terminal No. 88).
- 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

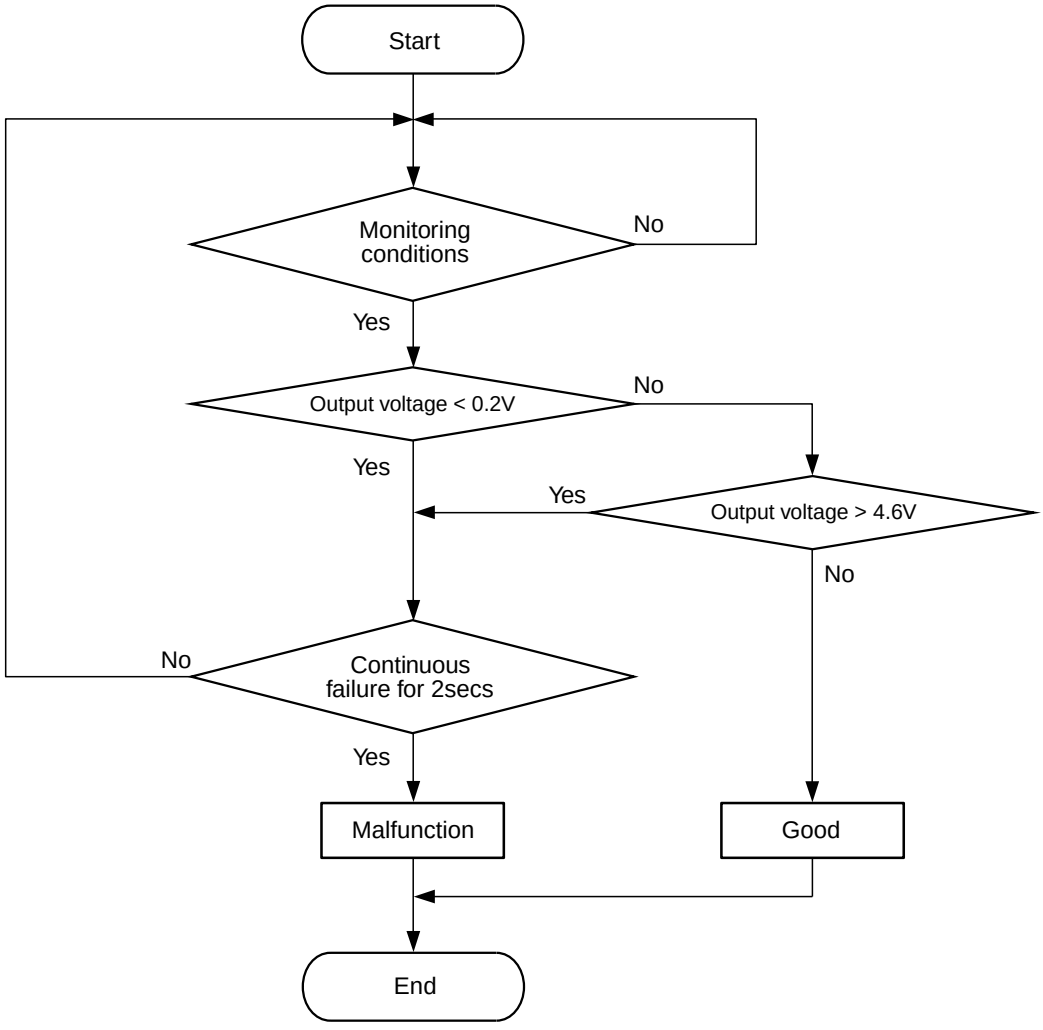
- The intake air temperature sensor converts the intake air temperature to a voltage.
- The ECM checks whether this voltage is within a specified range.

DESCRIPTIONS OF MONITOR METHODS

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

DTC SET CONDITIONS

Logic Flow Chart



ZK603691AA00

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

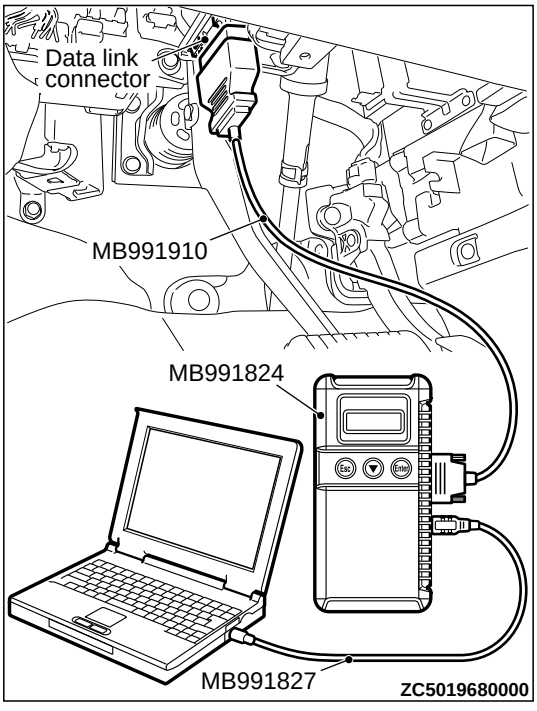
- 2 seconds or more have passed since the engine starting sequence was completed.

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.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)
- Intake air temperature sensor failed.
- Connector damage
- Harness damage
- ECM failed.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function - OBD-II Drive Cycle - Pattern 24 P.13Ab-8.



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 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: t 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.00-15.

NO: Go to Step 2.

STEP 2. Check harness connector A-07 at the intake air temperature sensor and harness connector B-11 at the ECM for damage.

Q:Is the harness connector in good condition?

YES: Go to Step 3.

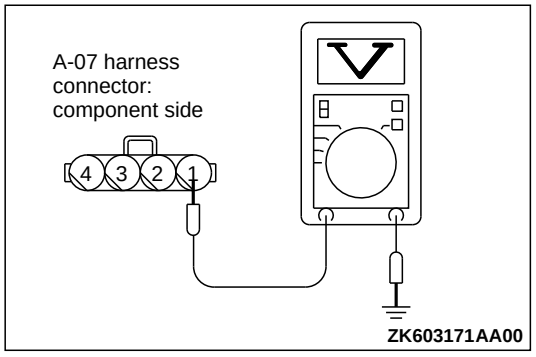
NO: Repair it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 5.

STEP 3. Check for open circuit to ground between the intake air temperature sensor connector A-07 and the ECM connector B-11.

(1) Disconnect the intake air temperature sensor A-07 and the ECM connector B-11.

(2) Check for the continuity between the intake air temperature sensor A-07 (terminal No. 1) and ground.

- Not continuity.



Q:Is the harness wire in good condition?

YES: Go to Step 4.

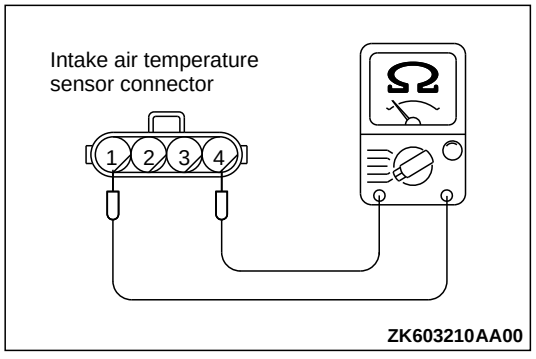
NO: Repair it. Then go to Step 5.

STEP 4. Check the intake air temperature sensor.

(1) Disconnect the intake air temperature sensor connector A-07.

(2) Remove the mass airflow sensor.

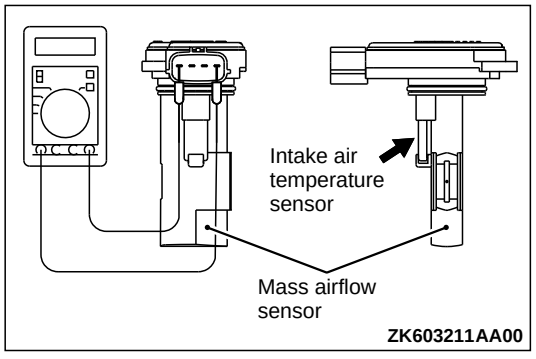
(3) Measure the resistance between intake air temperature sensor side connector terminal No. 1 and No. 4.



(4) 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: Replace the mass airflow sensor. Then go to Step 5.

NO: 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. 13Ab-8.

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

Q:Is DTC P0112 set?

YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration

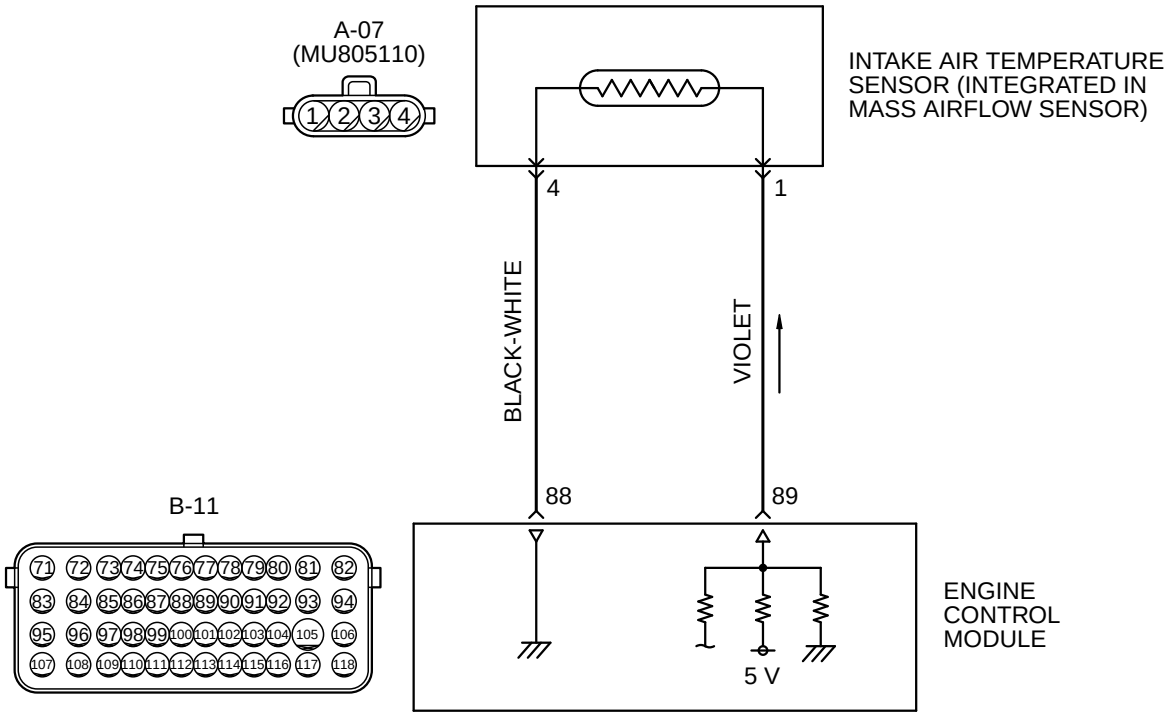
Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8.

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.00-15.

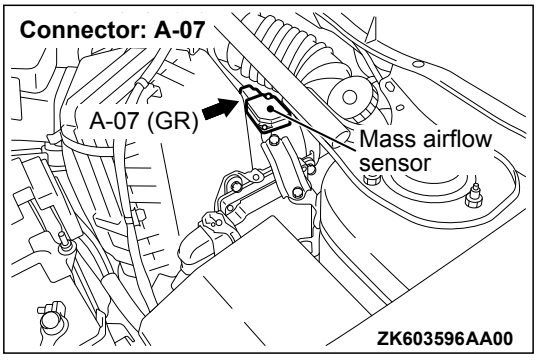
DTC P0113: Intake Air Temperature Circuit High Input

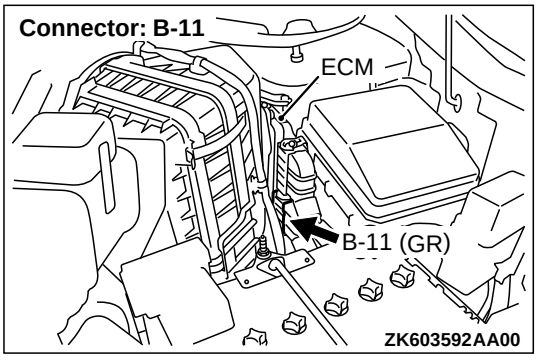
M11310100178USA0000010000

INTAKE AIR TEMPERATURE SENSOR CIRCUIT



ZK602835 AA00





CIRCUIT OPERATION

- Approximately 5 volts are applied to the intake air temperature sensor output terminal (terminal No. 1) from the ECM (terminal No. 89) via the resistor in the ECM. The ground terminal (terminal No. 4) is grounded with ECM (terminal No. 88).
- 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 ECM 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)

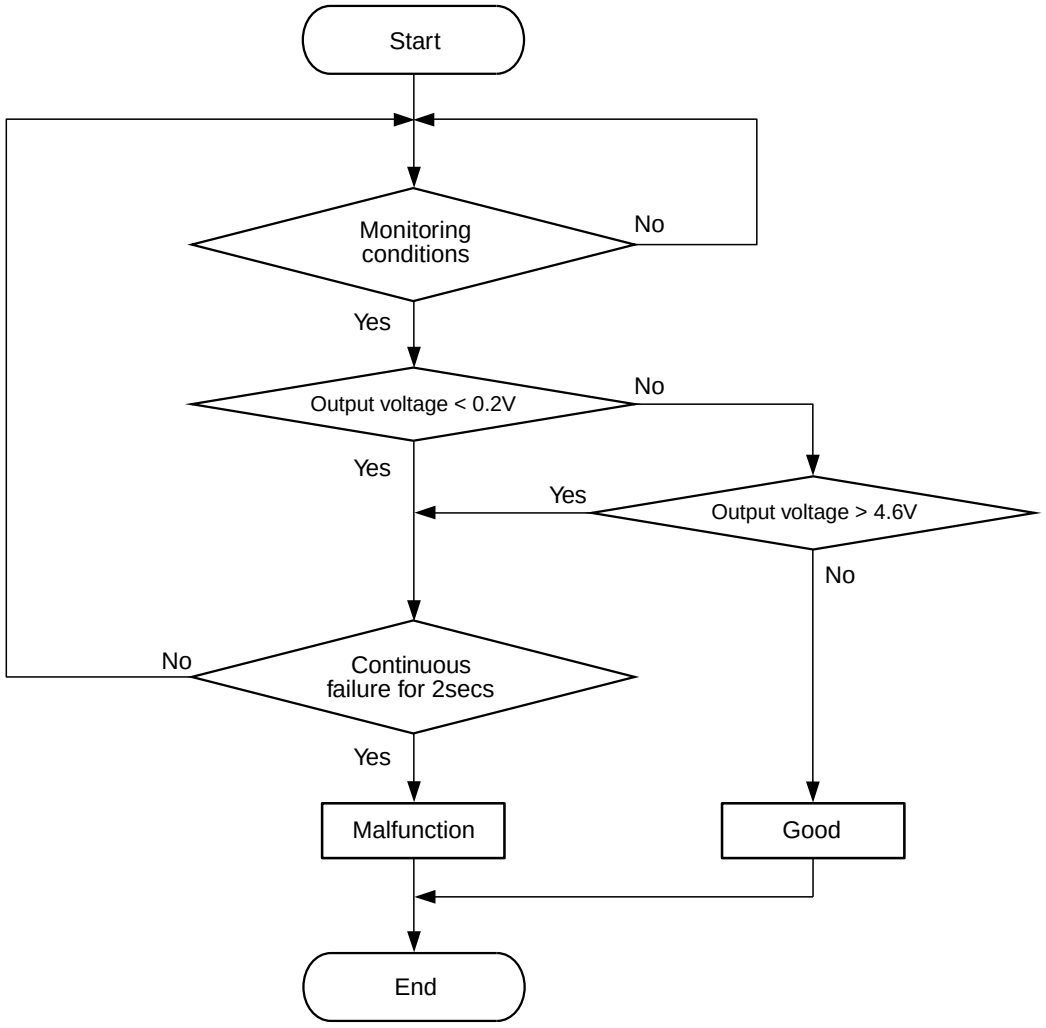
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



ZK603691AA00

Check Conditions

- 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.

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

- Intake air temperature sensor failed.
- Connector damage
- Harness damage
- ECM failed.

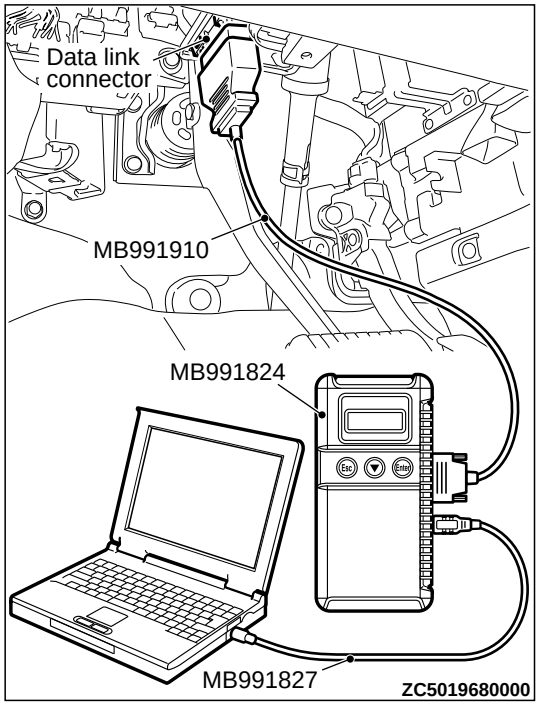
OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function - OBD-II Drive Cycle - Pattern 24 P.13Ab-8.

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 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.00-15.

NO: Go to Step 2.

STEP 2. Check harness connector A-07 at the intake air temperature sensor and harness connector B-11 at the ECM for damage.

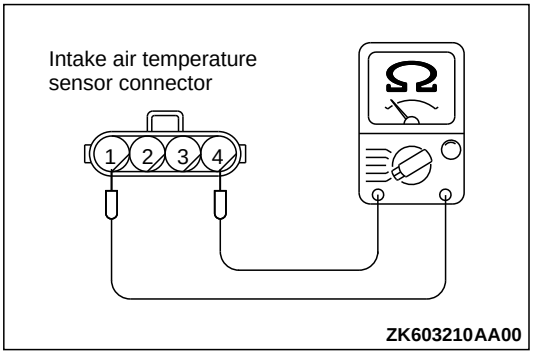
Q:Is the harness connector in good condition?

YES: Go to Step 3.

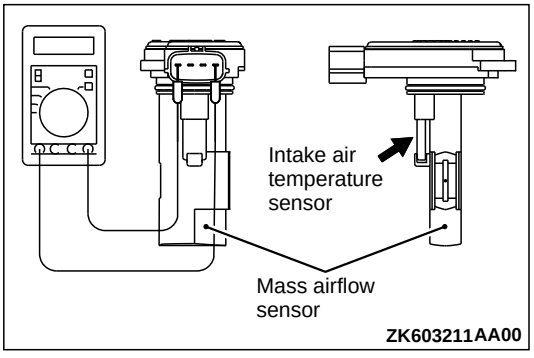
NO: Repair it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 5.

STEP 3. Check the intake air temperature sensor.

(1) Disconnect the intake air temperature sensor connector A-07.
(2) Remove the mass airflow sensor.



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

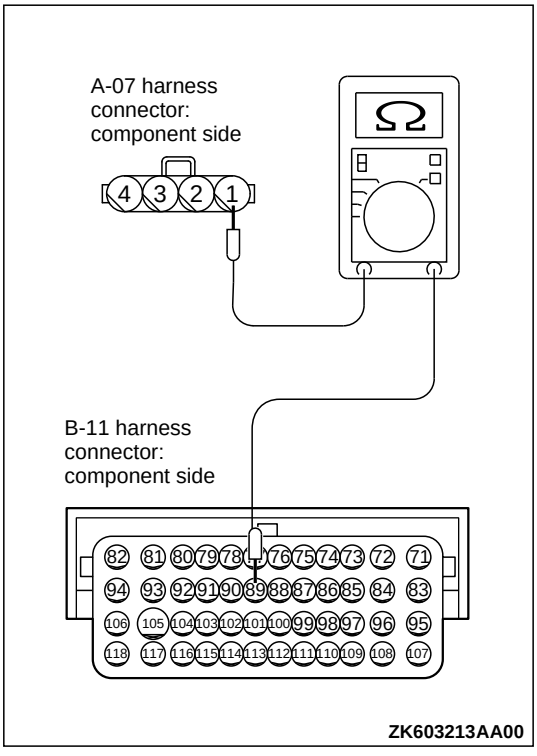


(4) Measure resistance while heating the sensor using a hair drier.

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: Replace the mass airflow sensor. Then go to Step 5.
NO: Go to Step 4.

STEP 4. Check for harness between the intake air temperature sensor connector A-07 and the ECM connector B-11.



(1) Disconnect the intake air temperature sensor connector A-07 and the ECM connector B-11.
(2) Measure the resistance between the intake air temperature sensor connector A-07 (terminal No. 1) and the ECM connector B-11 (terminal No. 89).
▪Should be less than 2 ohms.

Q:Is the harness wire in good condition?
YES: 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. 13Ab-8.

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

Q:Is DTC P0113 set?

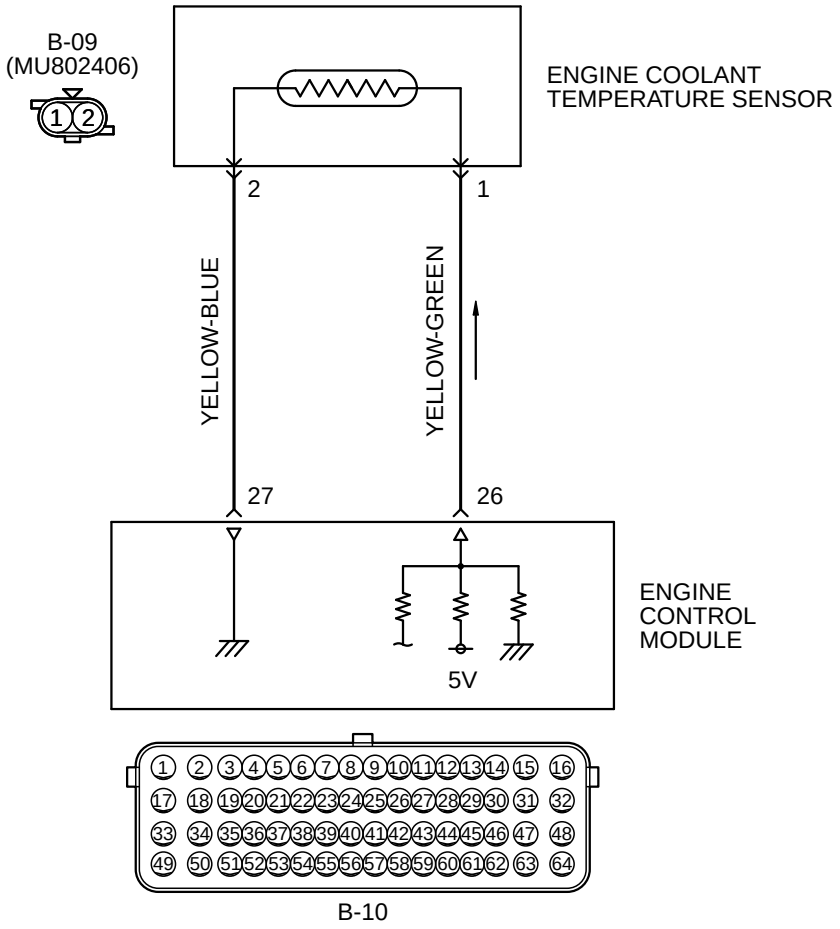
YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8.

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.00-15.

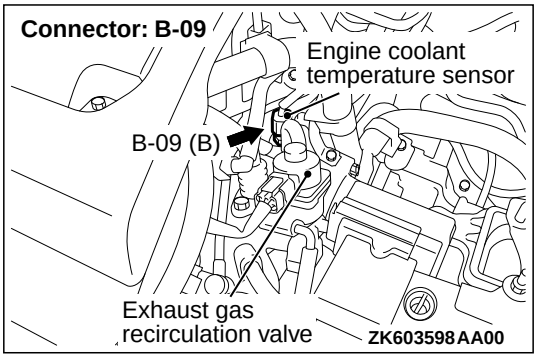
DTC P0116: Engine Coolant Temperature Circuit Range/Performance Problem

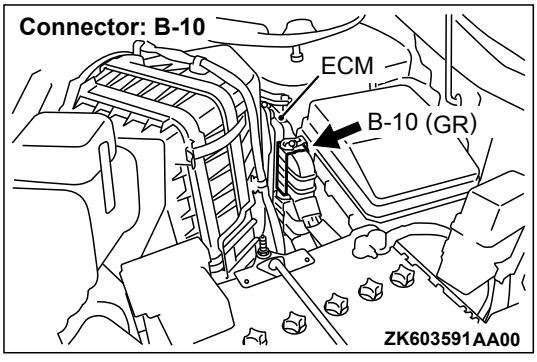
M11310100179USA0000010000

ENGINE COOLANT TEMPERATURE SENSOR CIRCUIT



ZK602836AA00





CIRCUIT OPERATION

- 5-volt voltage is applied to the engine coolant temperature sensor output terminal (terminal No. 1) from the ECM (terminal No. 26) via the resistor in the ECM. The ground terminal (terminal No. 2) is grounded with ECM (terminal No. 27).
- 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 resistor 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 ECM 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)

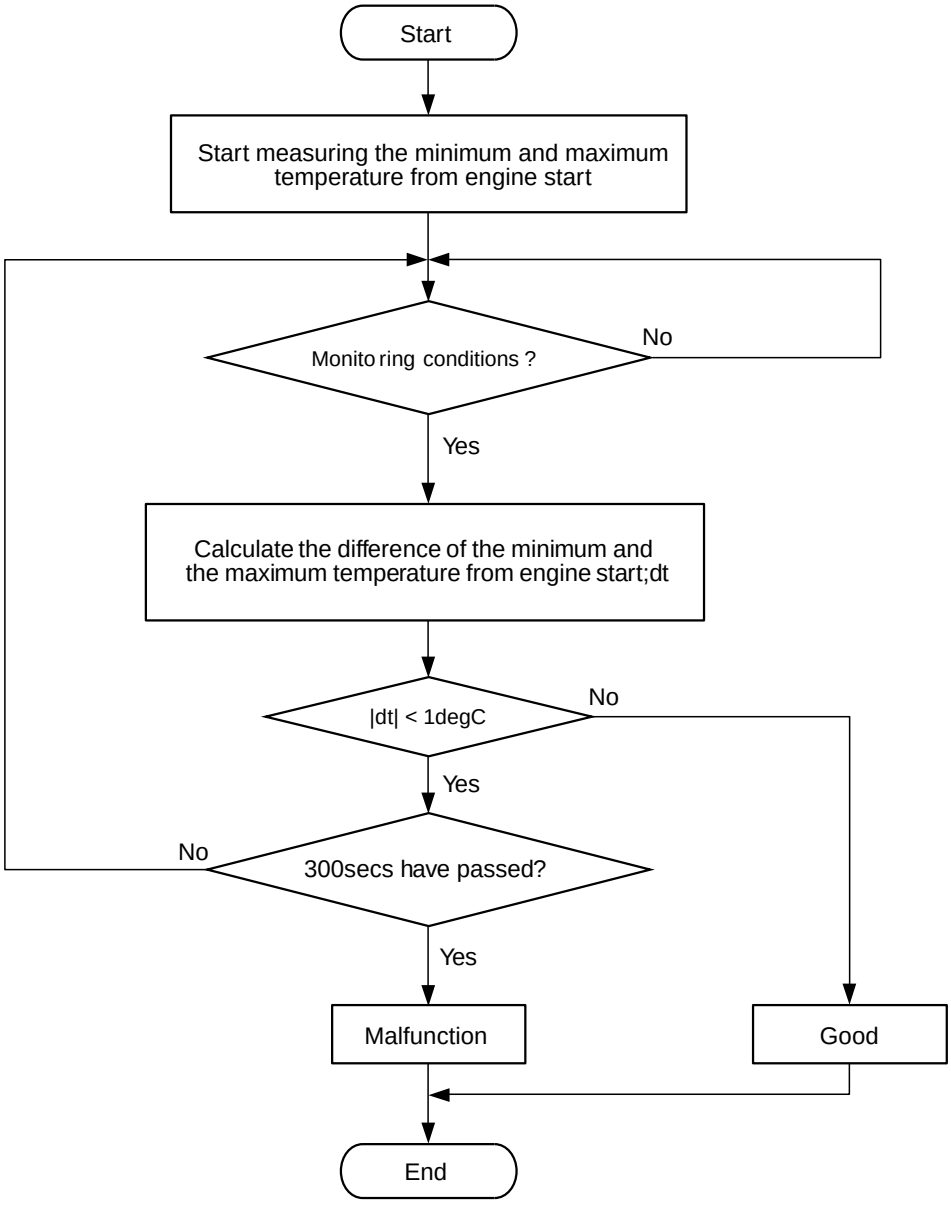
- Not applicable

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



ZK603694 AA00

Check Conditions

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

Judgement Criterion

- 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 output is 13 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.13Ab-8.

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

- Engine coolant temperature sensor failed.
- ECM failed.

DIAGNOSIS

Required Special Tools:

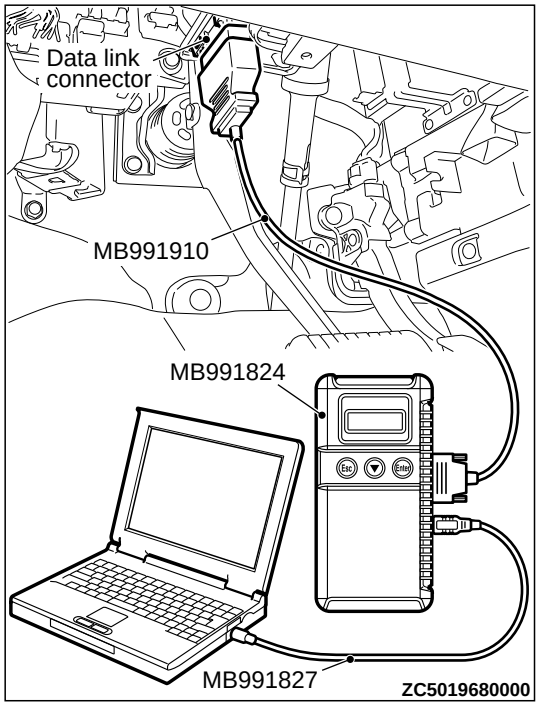
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A

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.



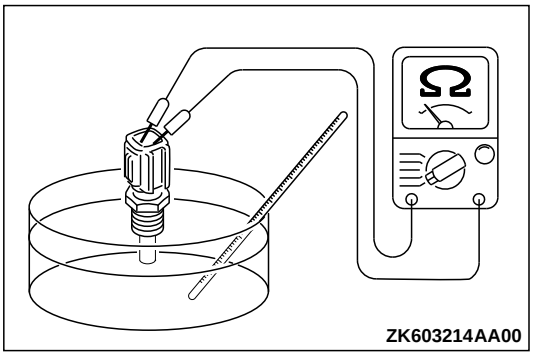
Q:Is the sensor operating properly?

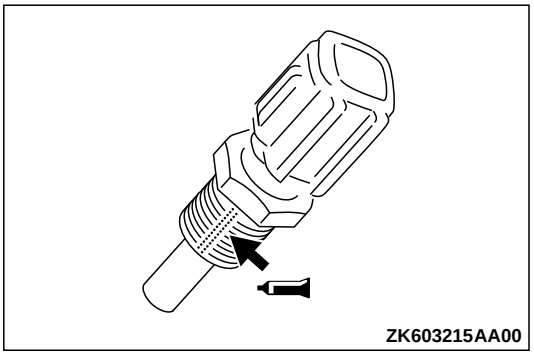
YES: It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points - How to Cope with Intermittent Malfunctions P.00-15.

NO: Go to Step 2.

STEP 2. Check the engine coolant temperature sensor.

(1) Disconnect the engine coolant temperature sensor connector B-09.
(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: 29 ± 10 N·m (22 ± 7 ft-lb)

Q:Is the measured resistance normal?
YES: Replace the engine coolant temperature sensor. Then go to step 3.
NO: Go to Step 3.

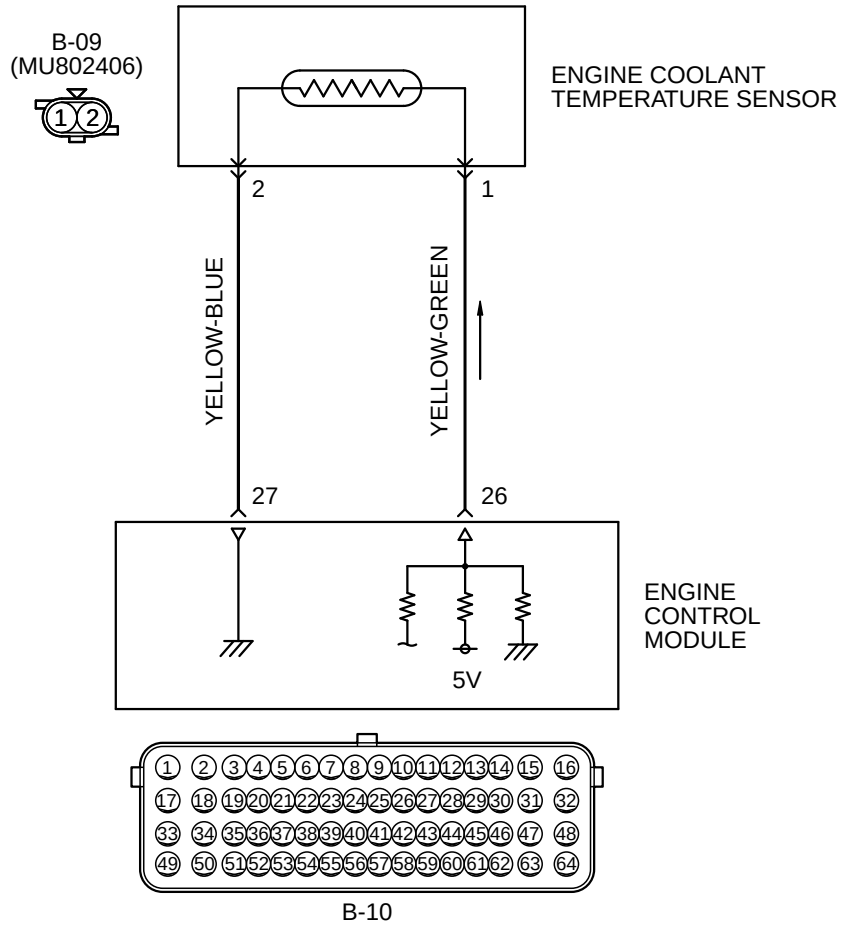
STEP 3. Test the OBD-II drive cycle.
(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function - OBD-II Drive Cycle - Pattern 9 P. 13Ab-8.
(2) Check the diagnostic trouble code (DTC).

Q:Is DTC P0116 set?
YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-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.00-15.

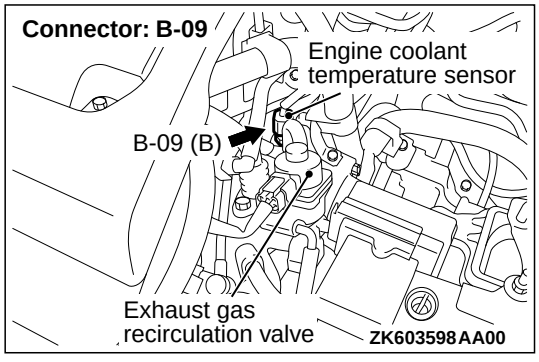
DTC P0117: Engine Coolant Temperature Circuit Low Input

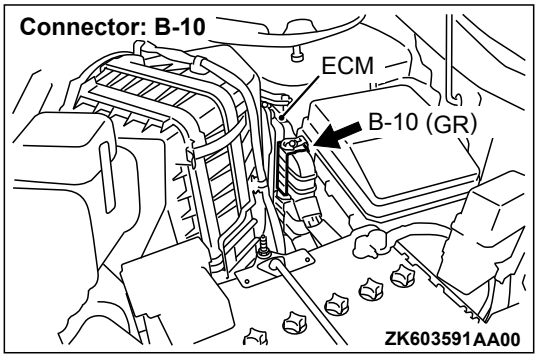
M11310100180USA0000010000

ENGINE COOLANT TEMPERATURE SENSOR CIRCUIT



ZK602836AA00





CIRCUIT OPERATION

- 5-volt voltage is applied to the engine coolant temperature sensor output terminal (terminal No. 1) from the ECM (terminal No. 26) via the resistor in the ECM. The ground terminal (terminal No. 2) is grounded with ECM (terminal No. 27).
- 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 ECM 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)

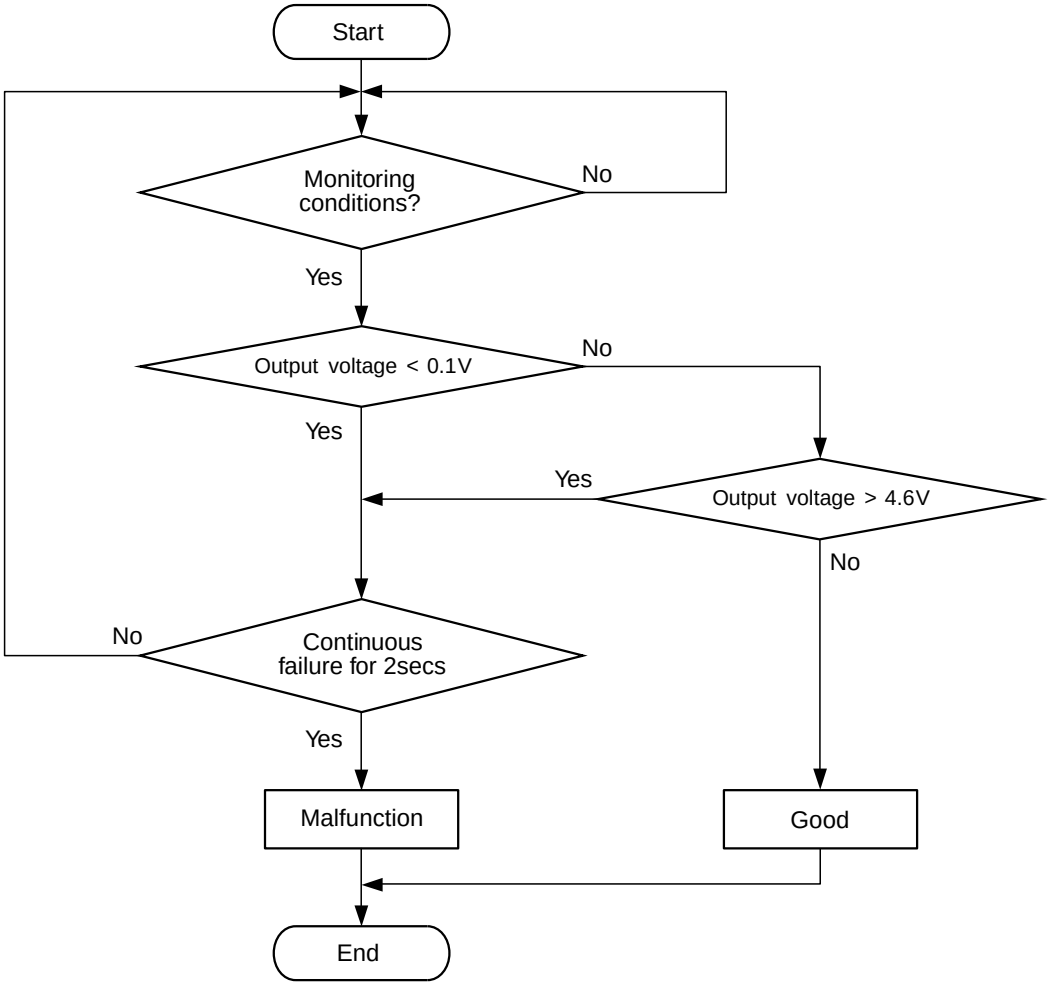
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



ZK603698 AA00

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 [corresponding to coolant temperature of 140°C (284°F) or higher] for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function - OBD-II Drive Cycle - Pattern 24 P.13Ab-8.

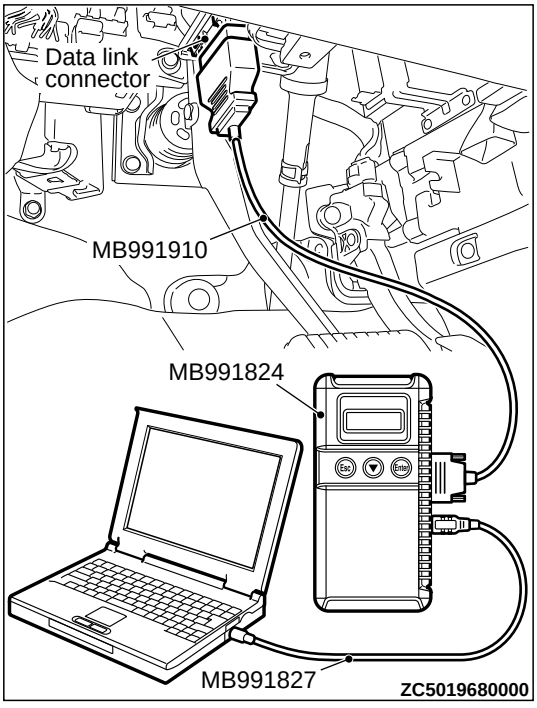
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Engine coolant temperature sensor failed.
- Connector damage
- Harness damage
- ECM 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.00-15.

NO: Go to Step 2.

STEP 2. Check harness connector B-09 at the engine coolant temperature sensor and harness connector B-10 at the ECM for damage.

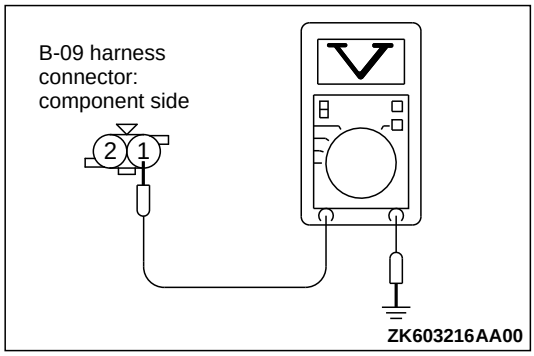
Q:Is the harness connector in good condition?

YES: Go to Step 3.

NO: Repair it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 5.

STEP 3. Check for open circuit to ground between the engine coolant temperature sensor connector B-09 and the ECM connector B-21.

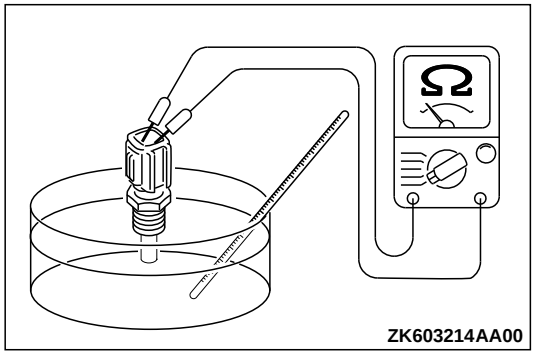
(1) Disconnect the engine coolant temperature sensor B-09 and the ECM connector B-10.



(2) Check for the continuity between the engine coolant temperature sensor B-09 (terminal No. 1) and ground.
- Not continuity.

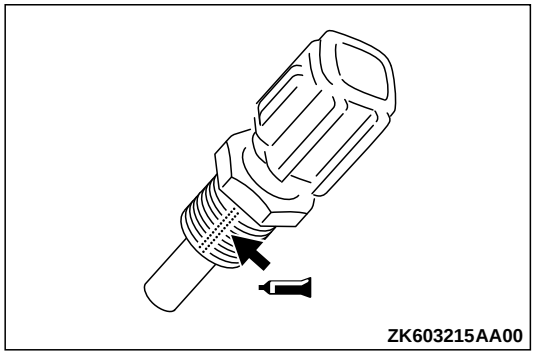
Q:Is the harness wire in good condition?
YES: Go to Step 4.
NO: Repair it. Then go to Step 5.

STEP 4. Check the engine coolant temperature sensor.
(1) Disconnect the engine coolant temperature sensor connector B-09.
(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: 29 ± 10 N·m (22 ± 7 ft-lb)



Q:Is the measured resistance at the standard value?
YES: Replace the engine coolant temperature sensor. Then go to Step 5.
NO: Go to Step 5.

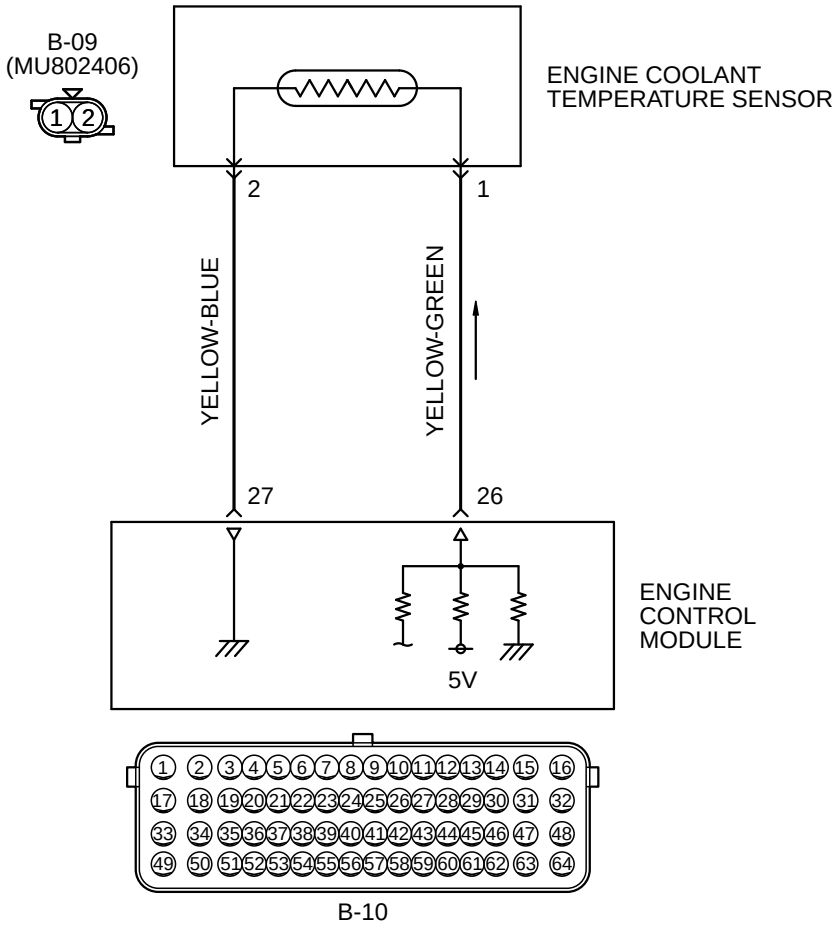
STEP 5. Test the OBD-II drive cycle.
(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function - OBD-II Drive Cycle - Pattern 24 P. 13Ab-8.
(2) Check the diagnostic trouble code (DTC).

Q:Is DTC P0117 set?
YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-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.00-15.

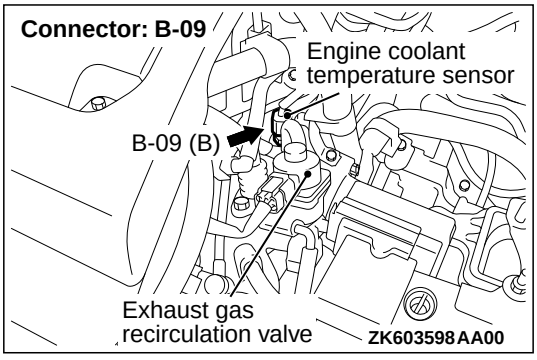
DTC P0118: Engine Coolant Temperature Circuit High Input

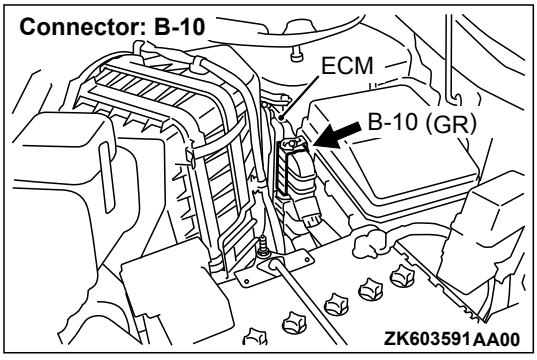
M11310100181USA0000010000

ENGINE COOLANT TEMPERATURE SENSOR CIRCUIT



ZK602836AA00





CIRCUIT OPERATION

- 5-volt voltage is applied to the engine coolant temperature sensor output terminal (terminal No. 1) from the ECM (terminal No. 26) via the resistor in the ECM. The ground terminal (terminal No. 2) is grounded with ECM (terminal No. 27).
- 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 ECM 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)

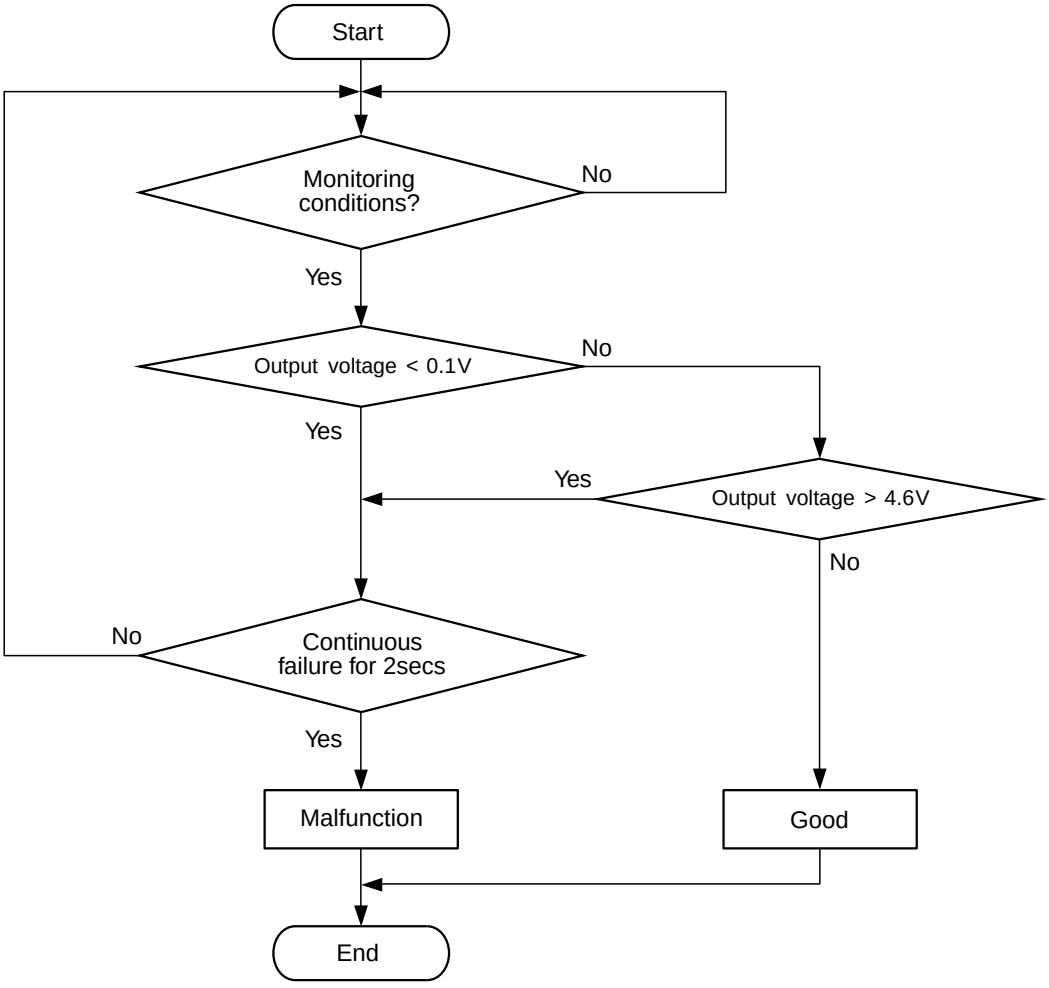
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



ZK603698 AA00

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 [corresponding to coolant temperature of -45°C (-49°F) or lower] for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function - OBD-II Drive Cycle - Pattern 24 P.13Ab-8.

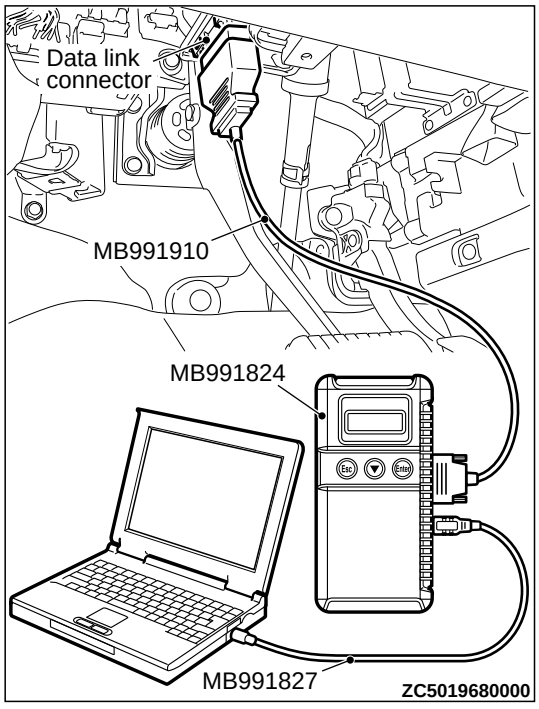
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Engine coolant temperature sensor failed.
- Connector damage
- Harness damage
- ECM 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.00-15.

NO: Go to Step 2.

STEP 2. Check harness connector B-09 at the engine coolant temperature sensor and harness connector B-10 at the ECM for damage.

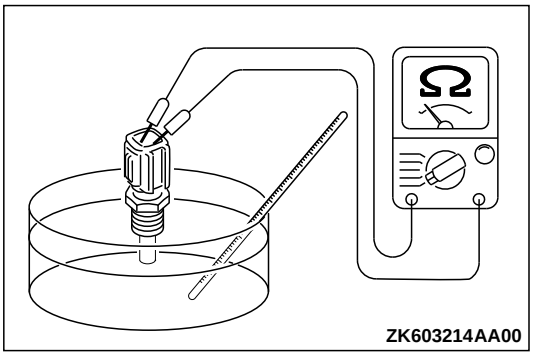
Q:Is the harness connector in good condition?

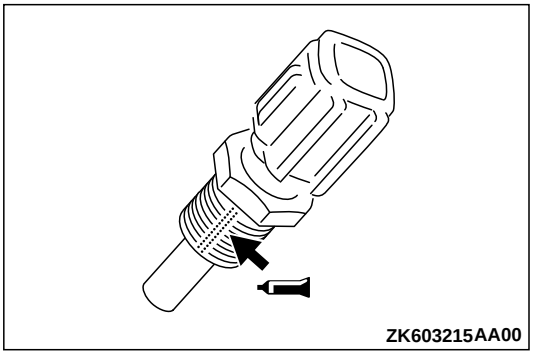
YES: Go to Step 3.

NO: Repair it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 5.

STEP 3. Check the engine coolant temperature sensor.

(1) Disconnect the engine coolant temperature sensor connector B-106.
(2) Remove the engine coolant temperature sensor.


ZK603214AA00


ZK603215AA00

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

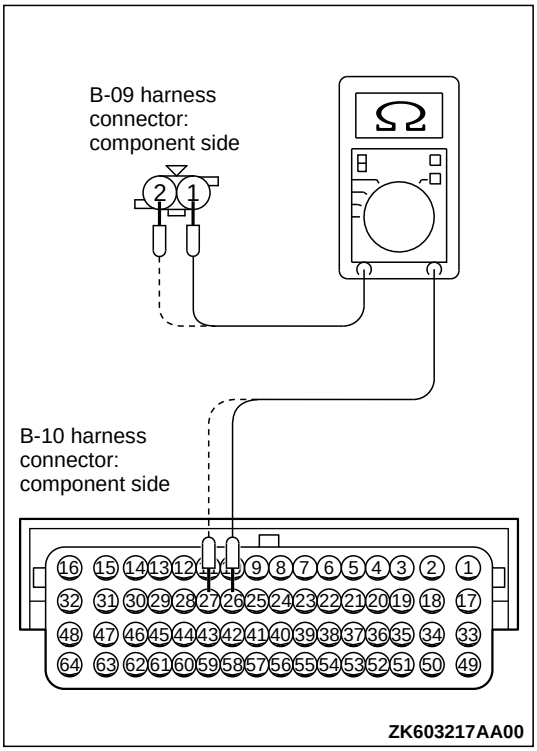
Standard value:
14 - 17 kΩ [at -20°C (-4°F)]
5.1 - 6.5 kΩ [at 0°C (32°F)]
2.1 - 2.7 kΩ [at 20°C (68°F)]
0.9 - 1.3 kΩ [at 40°C (104°F)]
0.48 - 0.68 kΩ [at 60°C (140°F)]
0.26 - 0.36 kΩ [at 80°C (176°F)]

(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: 29 ± 10 N·m (22 ± 7 ft-lb)

Q:Is the measured resistance at the standard value?
YES: Replace the engine coolant temperature sensor. Then go to Step 5.
NO: Go to Step 4.

STEP 4. Check for harness between the engine coolant temperature sensor connector B-09 and the ECM connector B-10.

(1) Disconnect the engine coolant temperature sensor connector B-09 and the ECM connector B-10.
(2) Measure the resistance between the engine coolant temperature sensor connector B-09 and the ECM connector B-10.
a Connector B-09 (terminal No. 1) and Connector B-10 (terminal No. 26).
b Connector B-09 (terminal No. 2) and Connector B-10 (terminal No. 27).
▪Should be less than 2 ohms.



ZK603217AA00

Q:Is the harness wire in good condition?
YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. 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. 13Ab-8.

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

Q:Is DTC P0118 set?

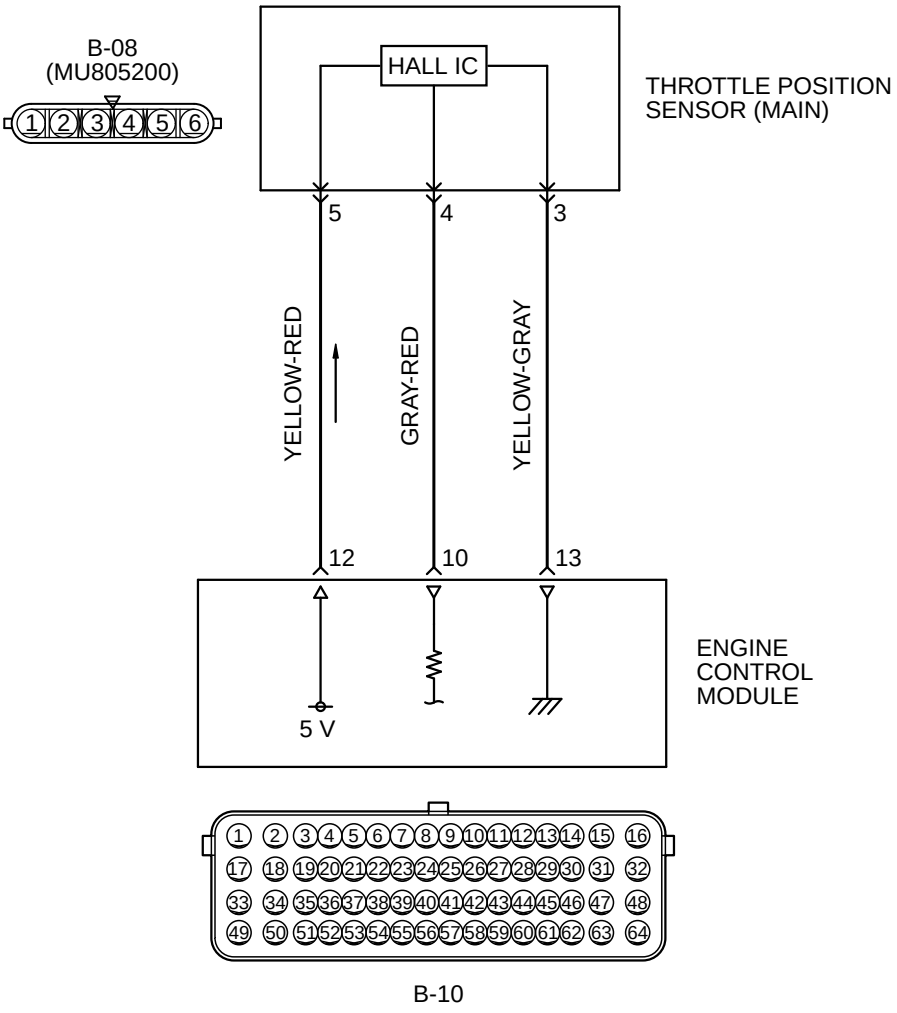
YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8.

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.00-15.

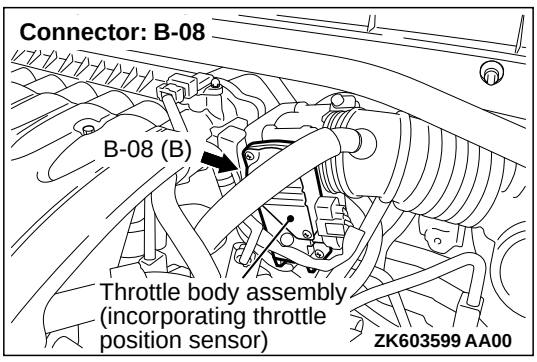
DTC P0122: Throttle Position Sensor (Main) Circuit Low Input

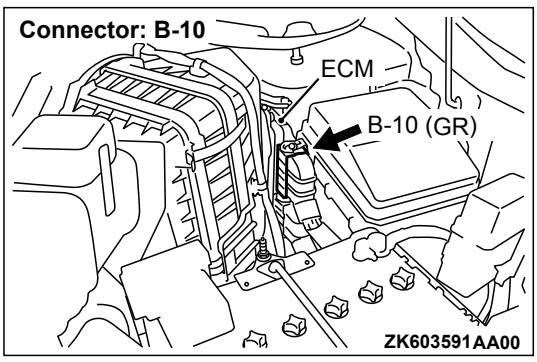
M11310100182USA0000010000

THROTTLE POSITION SENSOR (MAIN) CIRCUIT



ZK602837AA00





CIRCUIT OPERATION

- A 5-volt power supply is applied on the throttle position sensor (main) power terminal (terminal No. 5) from the ECM (terminal No. 12).
  The ground terminal (terminal No. 3) is grounded with ECM (terminal No. 13).

TECHNICAL DESCRIPTION

- The throttle position sensor (main) outputs voltage which corresponds to the throttle valve opening angle.
- The ECM 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)

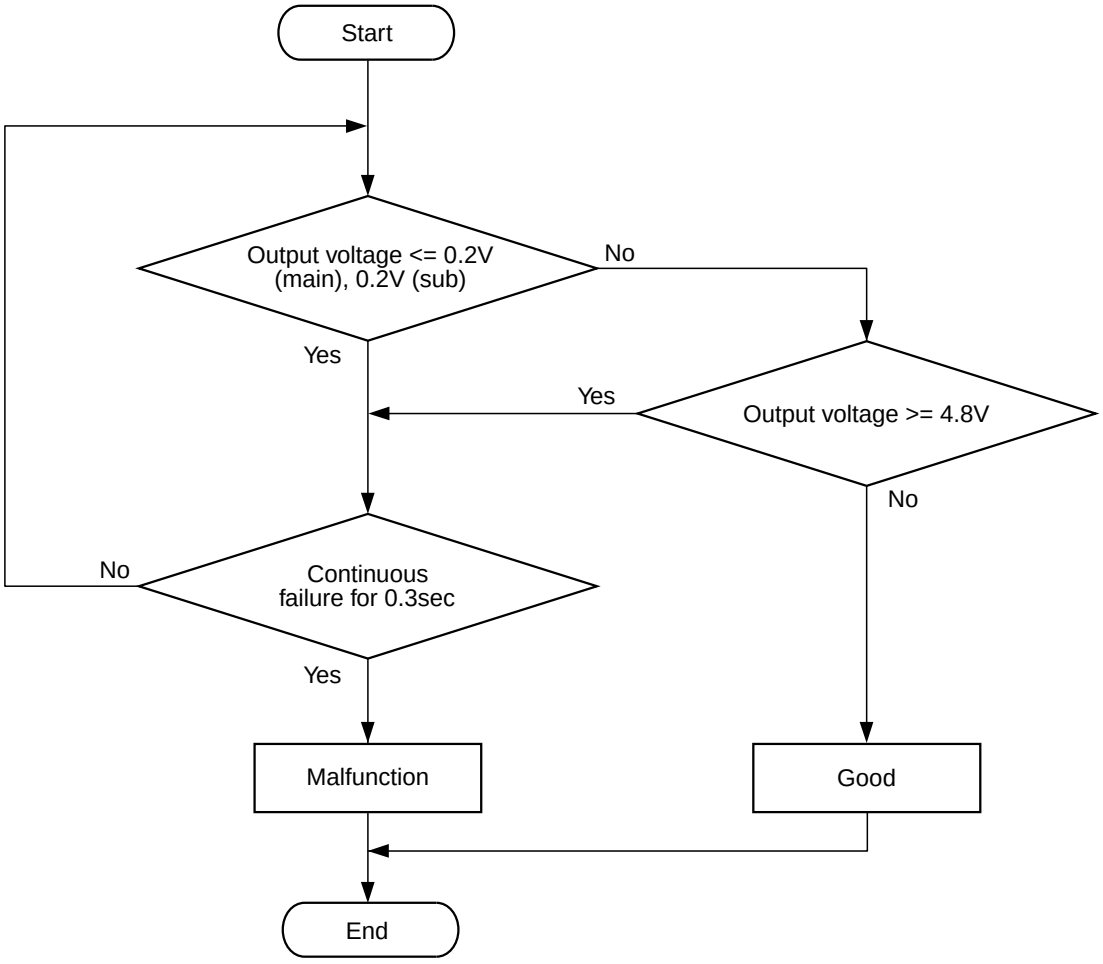
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



ZK603701 AA00

Check Condition
- Ignition switch is "ON" position.

Judgement Criterion
- Throttle position sensor (main) output voltage should be 0.2 volt or less for 0.3 second.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)
- Throttle position sensor failed.
- Connector damage
- Harness damage
- ECM failed.

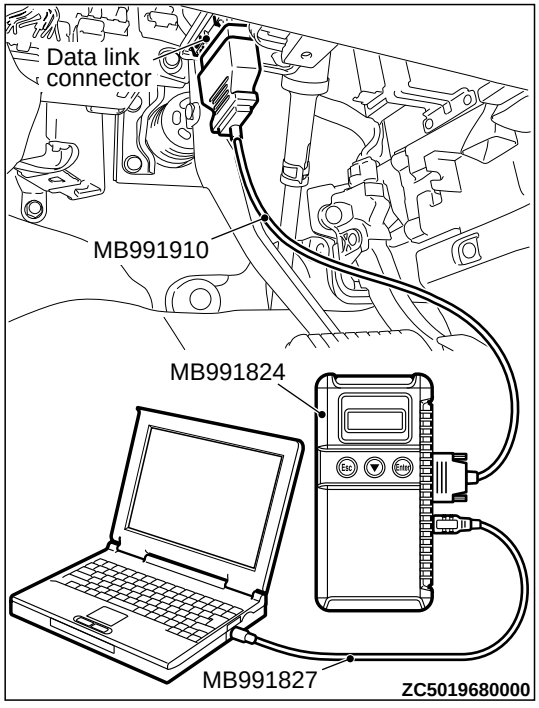
OBD-II DRIVE CYCLE PATTERN

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
- 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.00-15.

NO: Go to Step 2.

STEP 2. Check harness connector B-08 at the throttle position sensor and harness connector B-10 at the for damage.

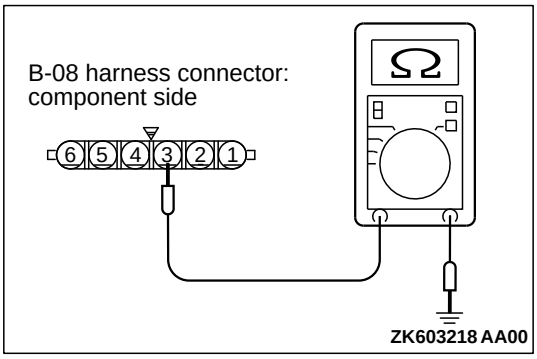
Q:Is the harness connector in good condition?

YES: Go to Step 3.

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

STEP 3. Measure the sensor supply voltage at throttle position sensor harness side connector B-08.

(1) Disconnect the connector B-08 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.

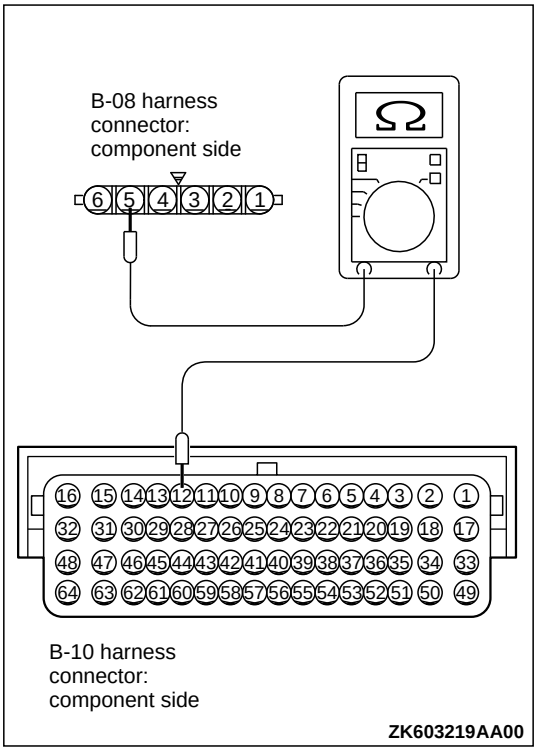
(4) Turn the ignition switch to the "LOCK" (OFF) position.

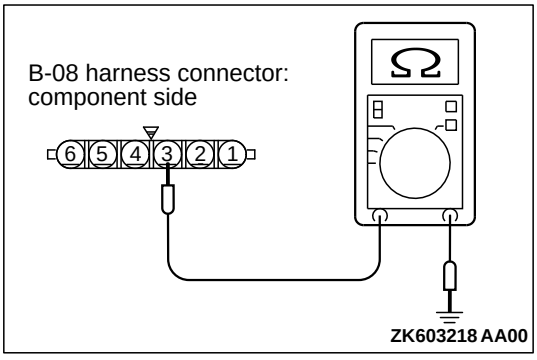
Q:Is the measured voltage between 4.9 and 5.1 volts?
YES: Go to Step 5.
NO: Go to Step 4.

STEP 4. Check for open circuit to ground or harness damage between the throttle position sensor connector B-08 and the ECM connector B-10.

(1) Disconnect the throttle position sensor connector B-08 and the ECM connector B-10.

(2) Measure the resistance between the throttle position sensor connector B-08 (terminal No. 5) and the ECM connector B-10 (terminal No. 12).
- Should be less than 2 ohms.





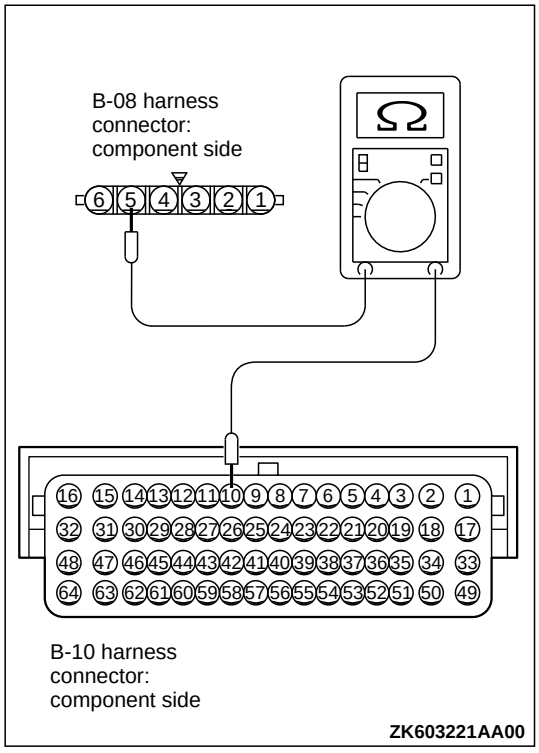
(3) Check for the continuity between the throttle position sensor connector B-08 (terminal No. 4) and ground.
- Not continuity.

Q:Is the harness wire in good condition?
YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to step 8.
NO: Repair it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 8.

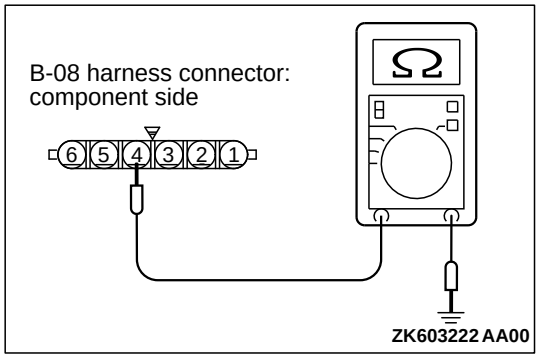
STEP 5. Check for open circuit to ground or harness damage between the throttle position sensor connector B-08 and ECM connector B-10.

(1) Disconnect the throttle position sensor connector B-08 and the ECM connector B-10.

(2) Measure the resistance between the throttle position sensor connector B-08 (terminal No. 4) and the ECM connector B-10 (terminal No. 10).
- Should be less than 2 ohms.



(3) Check for the continuity between the throttle position sensor connector B-08 (terminal No. 4) and ground.
- Not continuity.



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.00-15.

NO: Go to Step 7.

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 P0122 set?

YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. 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 P0122 set?

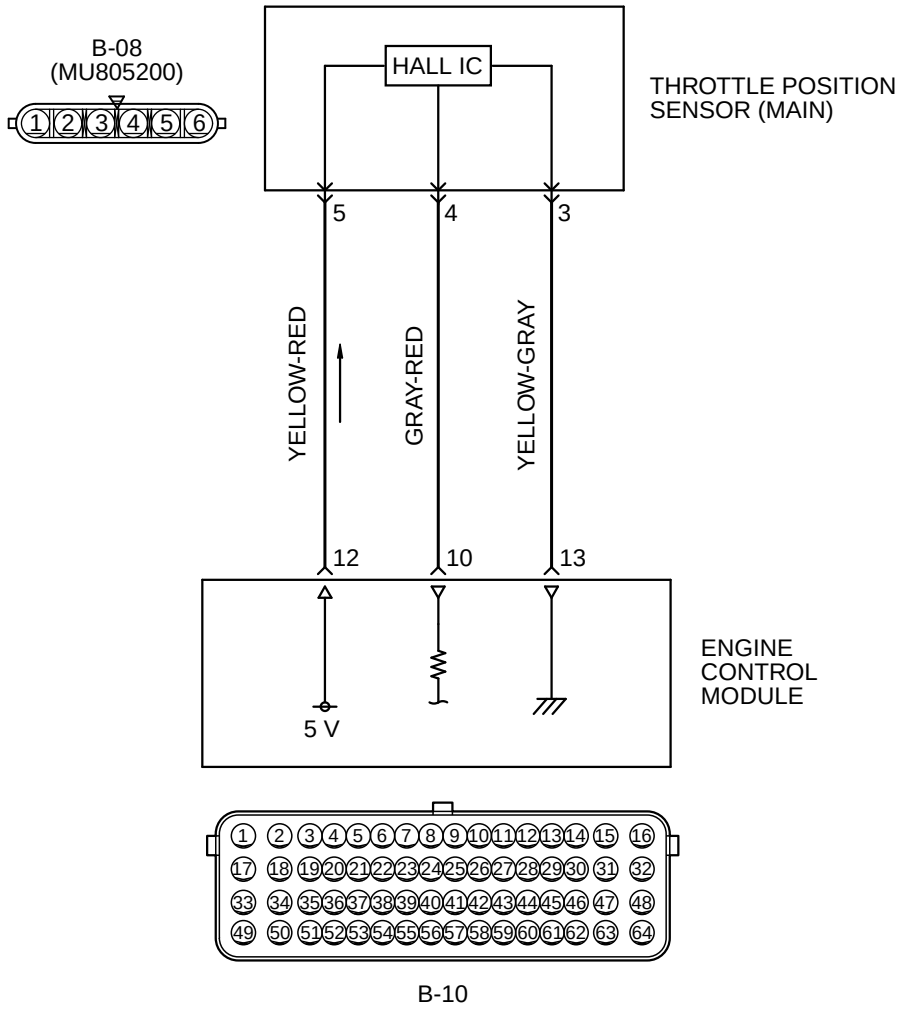
YES: Retry the troubleshooting.

NO: The inspection is complete.

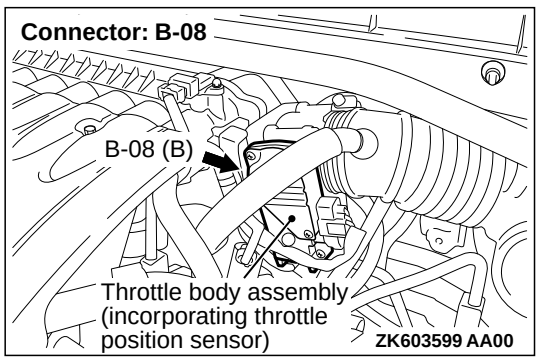
DTC P0123: Throttle Position Sensor (main) Circuit High Input

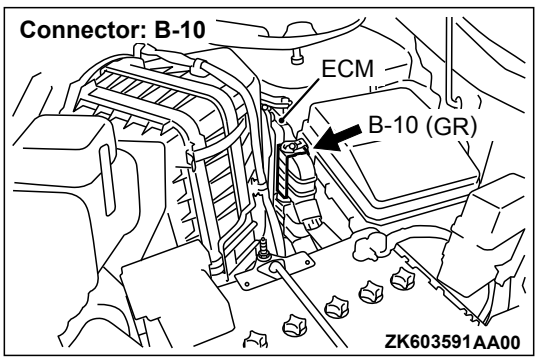
M11310100183USA0000010000

THROTTLE POSITION SENSOR (MAIN) CIRCUIT



ZK602837AA00





CIRCUIT OPERATION

- A 5-volt power supply is applied on the throttle position sensor (main) power terminal (terminal No. 5) from the ECM (terminal No. 12).
  The ground terminal (terminal No. 3) is grounded with ECM (terminal No. 13).

TECHNICAL DESCRIPTION

- The throttle position sensor (main) outputs voltage which corresponds to the throttle valve opening angle.
- The ECM 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)

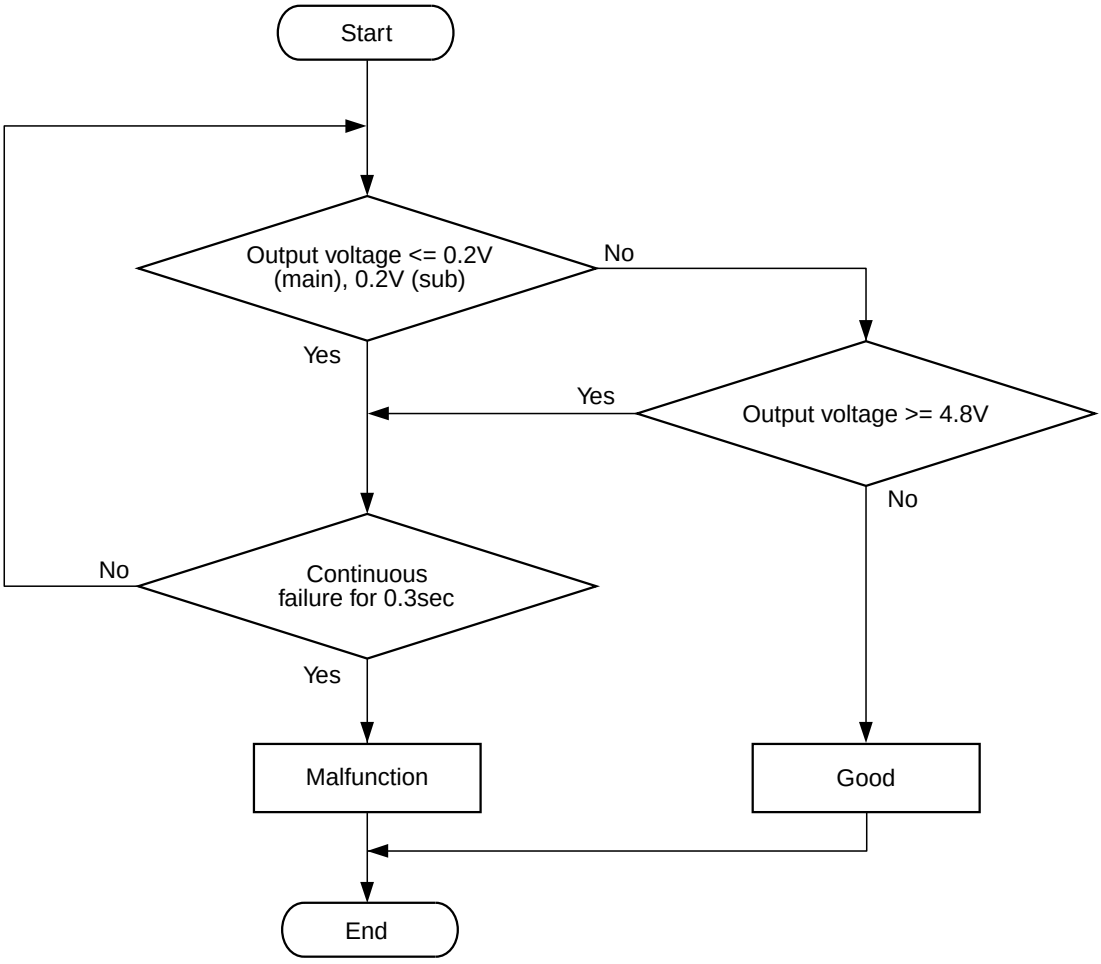
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



ZK603701 AA00

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.

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

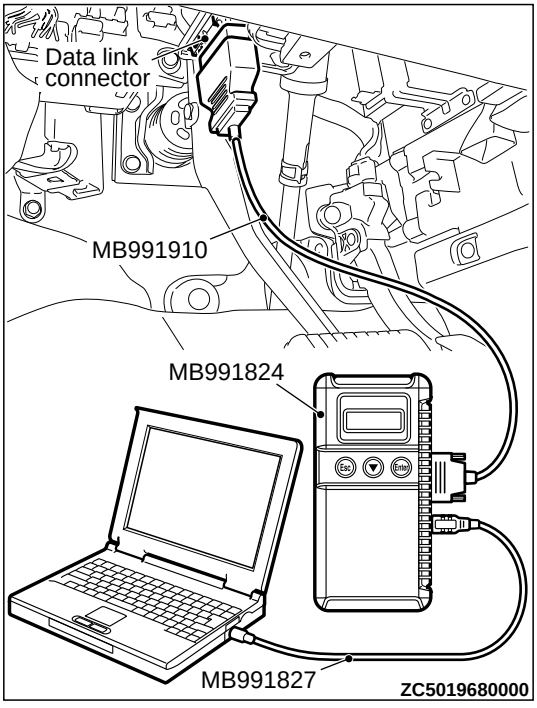
- Throttle position sensor failed.
- Harness damage
- Connector damage
- ECM failed.

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
- 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.00-15.

NO: Go to Step 2.

STEP 2. Check harness connector B-08 at the throttle position sensor and harness connector B-10 at the ECM for damage.

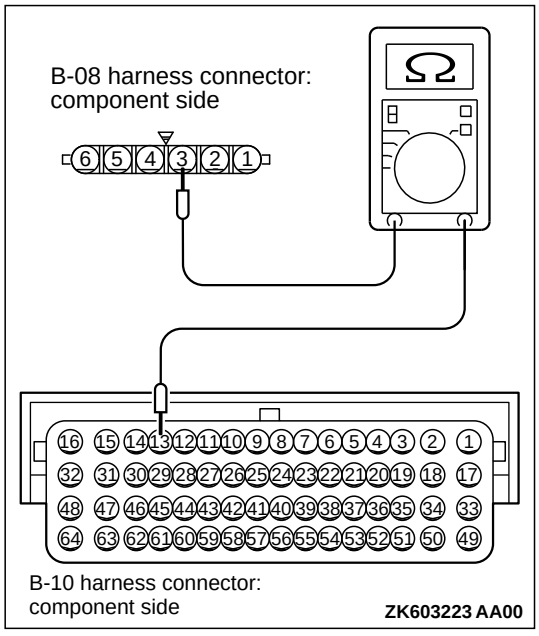
Q:Is the harness connector in good condition?

YES: Go to Step 3.

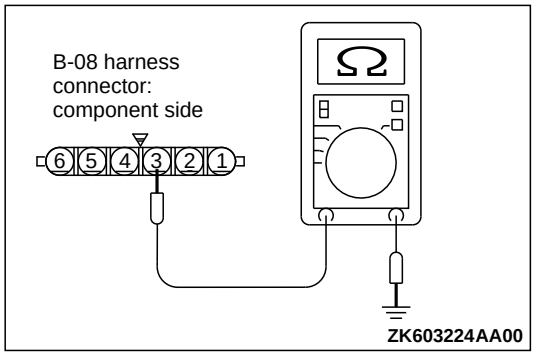
NO: Repair it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 3.

STEP 3. Check for open circuit and harness damage between the throttle position sensor connector B-08 and ECM connector B-10.

(1) Disconnect the throttle position sensor connector B-08 and the ECM connector B-10.



(2) Measure the resistance between the throttle position sensor connector B-08 (terminal No. 3) and the ECM connector B-10 (terminal No. 13).
- Should be less than 2 ohms.



(3) Check for the continuity between the throttle position sensor connector B-08 (terminal No. 3) and ground.
- Not continuity.

Q:Is the harness wire in good condition?
YES: Go to Step 4.
NO: Repair it. Then go to Step 6.

STEP 4. 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.00-15.
NO: Go to Step 5.

STEP 5. 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 ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 6.
NO: The procedure is complete.

STEP 6. Using scan tool MB991958, read the diagnostic trouble code (DTC)

⚠ CAUTION

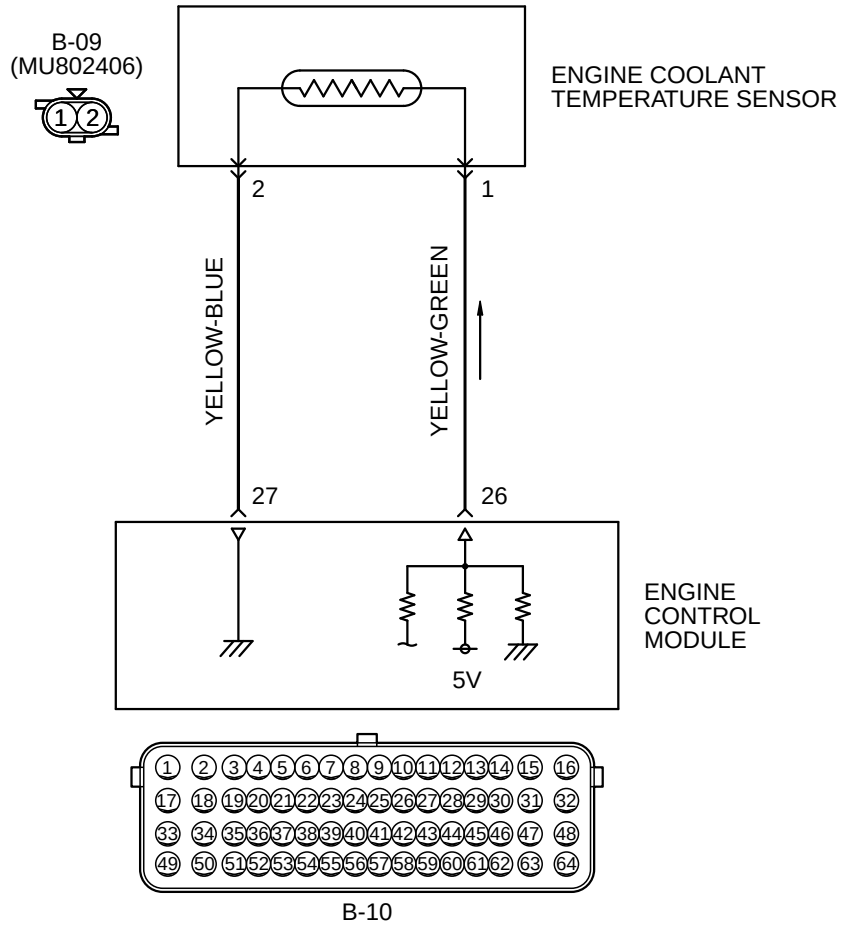
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.
(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) After the DTC has been deleted, read the DTC again.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q:Is DTC P0123 set?
YES: Retry the troubleshooting.
NO: The inspection is complete.

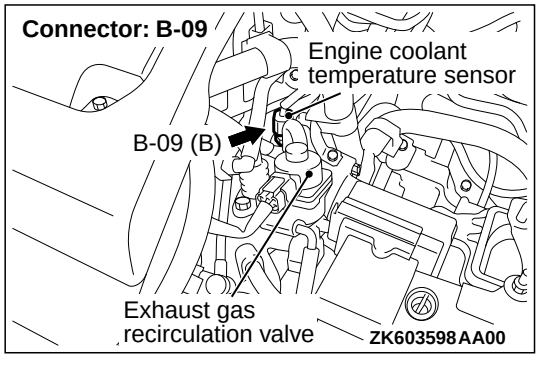
DTC P0125: Insufficient Coolant Temperature for Closed Loop Fuel Control

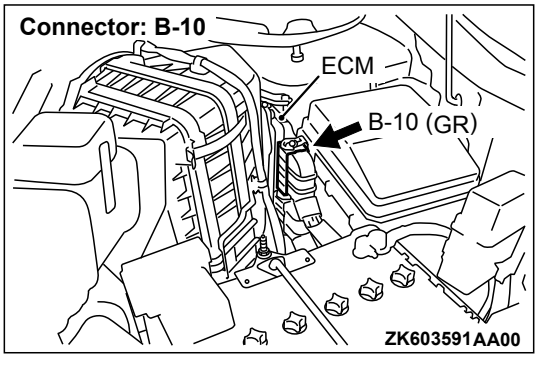
M11310100184USA0000010000

ENGINE COOLANT TEMPERATURE SENSOR CIRCUIT



ZK602836AA00





CIRCUIT OPERATION

- 5-volt voltage is applied to the engine coolant temperature sensor output terminal (terminal No. 1) from the ECM (terminal No. 26) via the resistor in the ECM. The ground terminal (terminal No. 2) is grounded with ECM (terminal No. 27).
- 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 ECM 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)

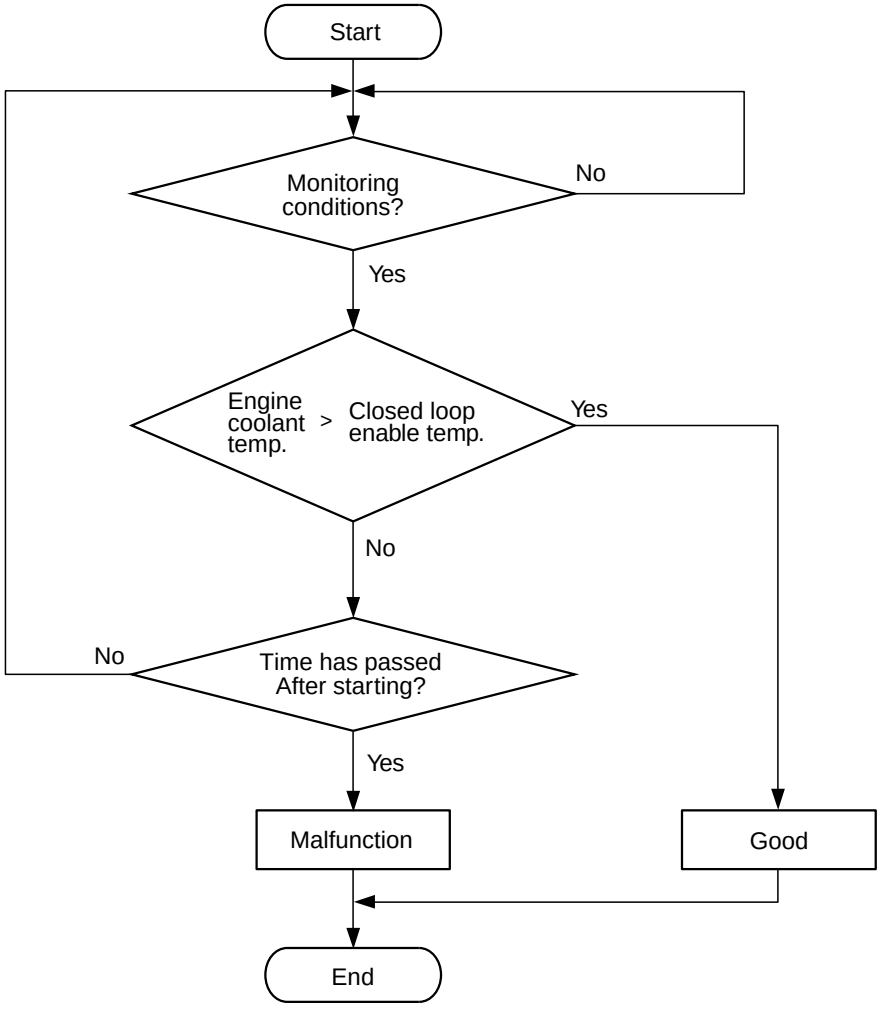
- Not applicable

Sensor (The sensor below is determined to be normal)

- Engine coolant temperature sensor
- Intake air temperature sensor

DTC SET CONDITIONS <Range/Performance problem - low input (time to reach closed loop temperature)>

Logic Flow Chart



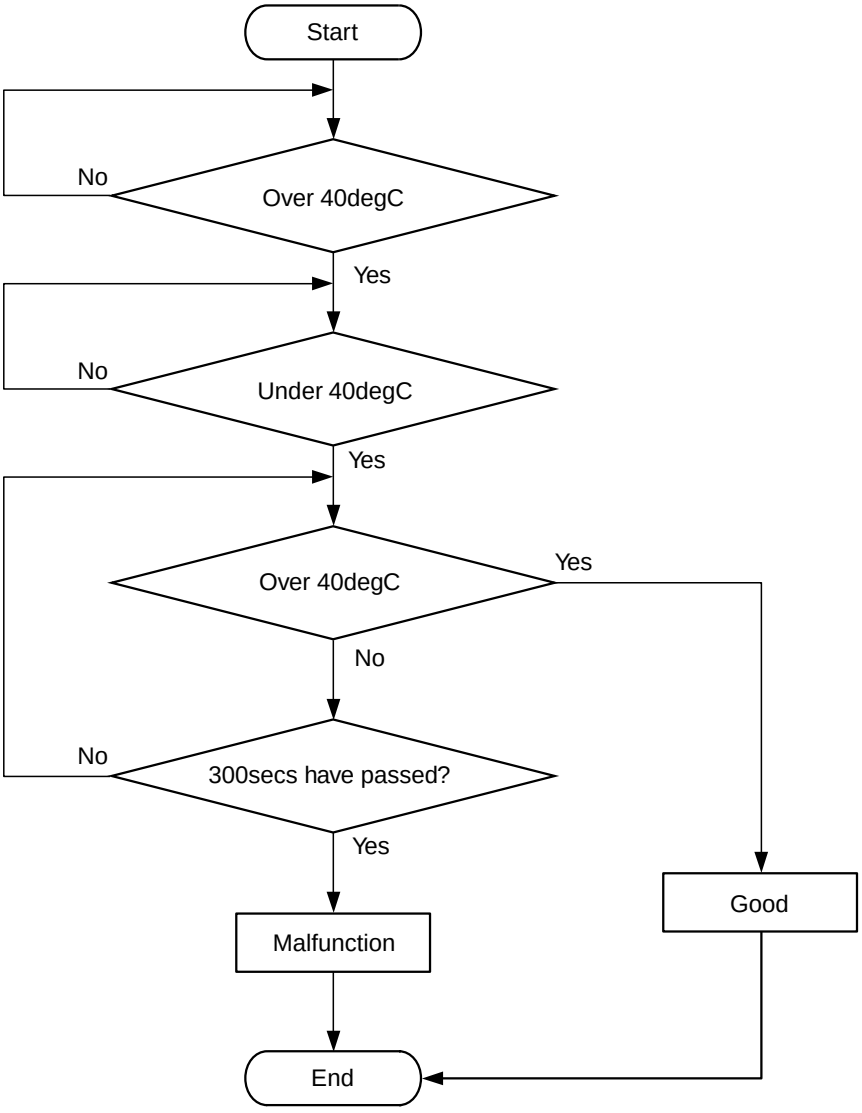
ZK603704AA00

Check Conditions, Judgement Criteria

- About 60 - 300 seconds have passed for the engine coolant temperature to rise to about 7°C (44.6°F) after starting sequence was completed.
- However, time is not counted when fuel is shut off.

DTC SET CONDITIONS <Range/Performance problem - drift>

Logic Flow Chart



ZK603705 AA00

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.

OBD-II DRIVE CYCLE PATTERN

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

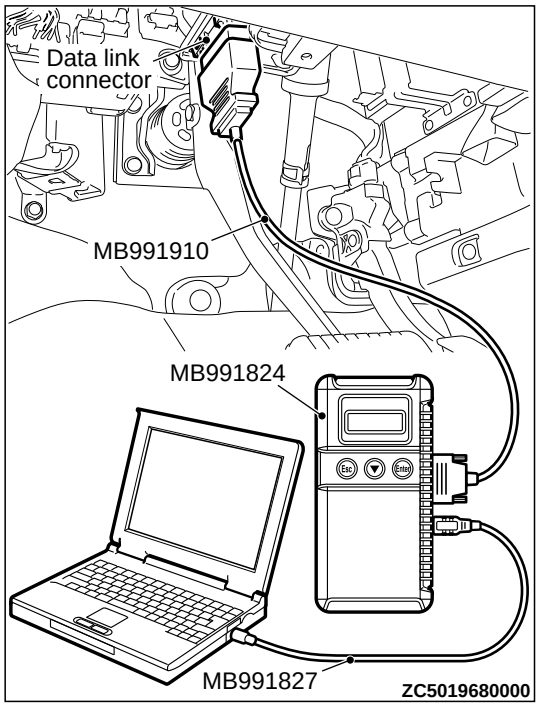
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Engine coolant temperature sensor failed.
- Harness damage
- Connector damage
- ECM 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.00-15.

NO: Go to Step 2.

STEP 2. Check harness connector B-09 at the engine coolant temperature sensor and harness connector B-10 at the ECM for damage.

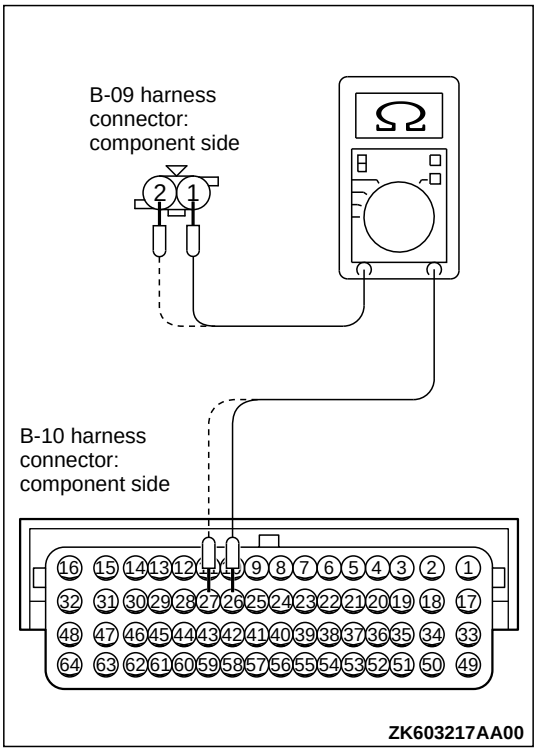
Q:Is the harness connector in good condition?

YES: Go to Step 3.

NO: Repair it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 5.

STEP 3. Check for harness between the engine coolant temperature sensor connector B-09 and the ECM connector B-10.

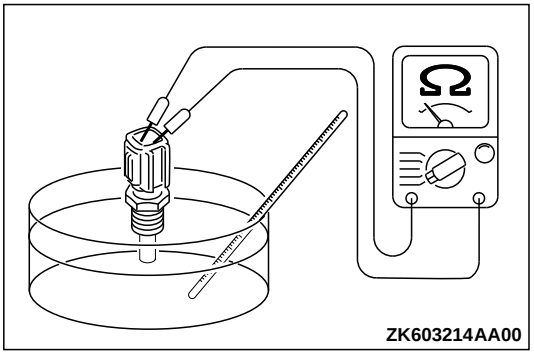
(1) Disconnect the engine coolant temperature sensor connector B-09 and the ECM connector B-10.



(2) Measure the resistance between the engine coolant temperature sensor connector B-09 and the ECM connector B-10.
 a Connector B-09 (terminal No. 1) and Connector B-10 (terminal No. 26).
 b Connector B-09 (terminal No. 2) and Connector B-10 (terminal No. 27).
 ▪Should be less than 2 ohms.

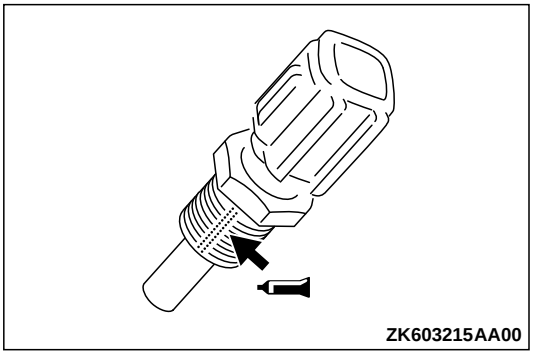
Q:Is the harness wire in good condition?
YES: Go to Step 4.
NO: Repair it. Then go to Step 5.

STEP 4. Check the engine coolant temperature sensor.



(1) Disconnect the engine coolant temperature sensor connector B-106.
(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: 29 ± 10 N·m (22 ± 7 ft-lb)

Q:Is the measured resistance at the standard value?
YES: Go to Step 5.
NO: Replace the engine coolant temperature sensor. 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 9 P. 13Ab-8.
(2) Check the diagnostic trouble code (DTC).

Q:Is DTC P0125 set?

YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-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.00-15.

DTC P0128: Coolant Thermostat (Coolant Temperature Below Thermostat Regulating Temperature)

M11310100185USA0000010000

TECHNICAL DESCRIPTION

- The ECM checks the time for the cooling water temperature to reach the judgment temperature.

DESCRIPTIONS OF MONITOR METHODS

Engine coolant temperature does not reach 77°C (171°F) within specified period after cold start.

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)

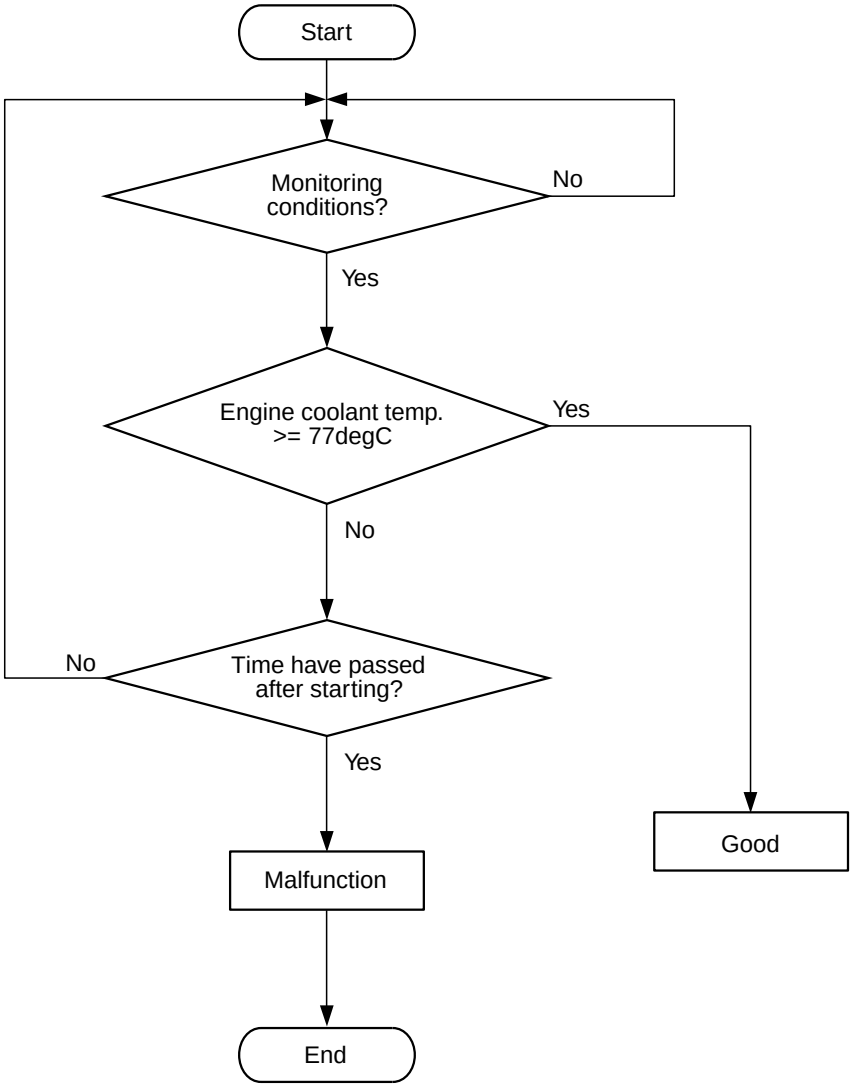
- Not applicable

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



ZK603707 AA00

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 15g/sec within 400 seconds.

Judgement Criteria

- The time for the engine coolant temperature to rise to 77°C (171°F) takes longer than approximately 11 to 20 minutes.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function - OBD-II Drive Cycle - Pattern 10 P.13Ab-8.

TROUBLESHOOTING HINTS

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

- The engine cooling system is faulty.
- ECM failed.

DIAGNOSIS

STEP 1. Check the cooling system.

Refer to GROUP14, Engine Cooling Diagnosis P.14-3.

Q:Is the cooling system normal?

YES: 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. 13Ab-8.

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

Q:Is DTC P0128 set?

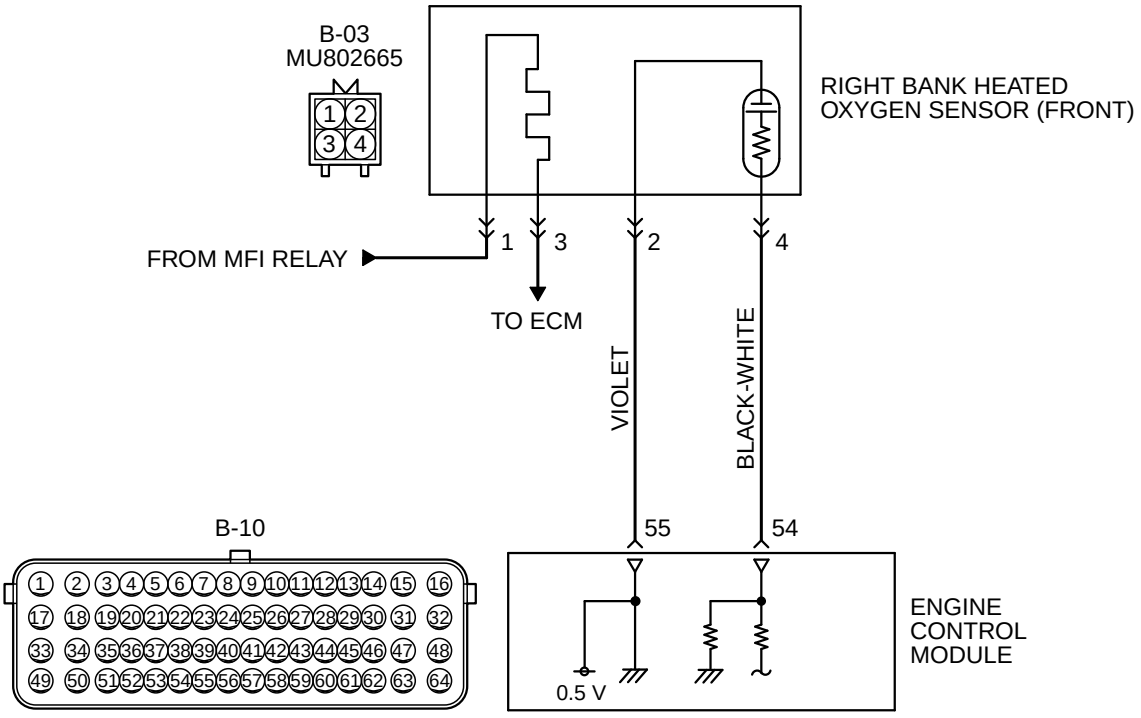
YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8.

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.00-15.

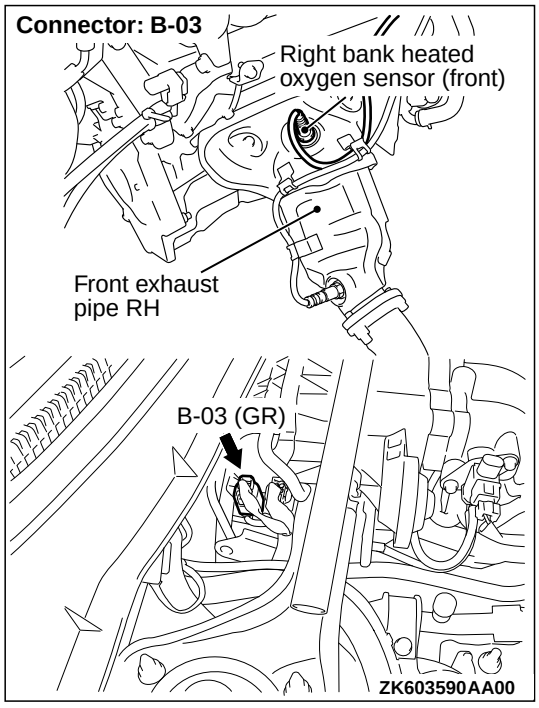
DTC P0131: Heated Oxygen Sensor Circuit Low Voltage (bank 1, sensor 1)

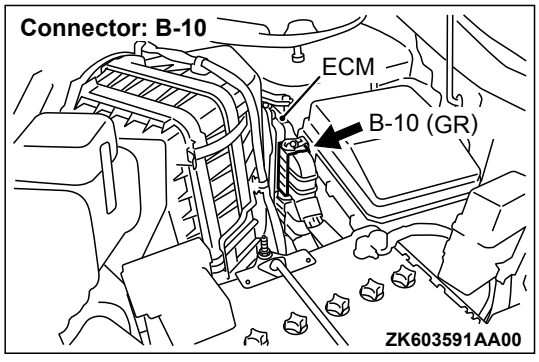
M11310100186USA0000010000

RIGHT BANK HEATED OXYGEN SENSOR (FRONT) CIRCUIT



ZK602838 AA00





CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the ECM (terminal No. 54) from the output terminal (terminal No. 4) of the right bank heated oxygen sensor (front).
- Terminal No. 2 of the right bank heated oxygen sensor (front) is grounded with ECM (terminal No. 55).
- The ECM applies an offset voltage of 0.5 volt to terminal No. 2 of the right bank heated oxygen sensor (front).

TECHNICAL DESCRIPTION

- The right bank 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 ECM.
- When the right bank heated oxygen sensor (front) begins to deteriorate, the heated oxygen sensor signal response becomes poor.
- The ECM also checks for an open circuit in the right bank heated oxygen sensor (front) output voltage.

DESCRIPTIONS OF MONITOR METHODS

Right bank heated oxygen sensor (front) output voltage is under specified range.

MONITOR EXECUTION

Continuous

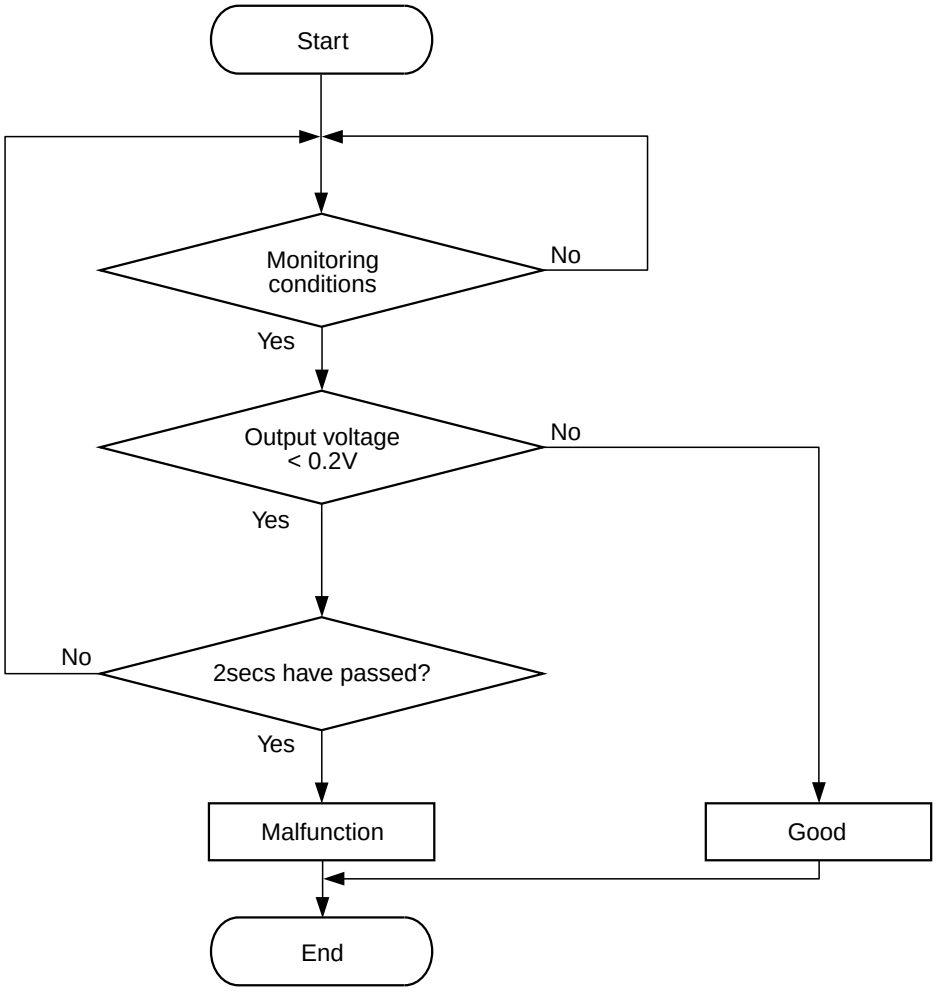
MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)
- Heated oxygen sensor heater (front) monitor

Sensor (The sensor below is determined to be normal)
- Engine coolant temperature sensor
- Intake air temperature sensor

DTC SET CONDITIONS

Logic Flow Chart



ZK603708 AA00

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
- Right bank 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.13Ab-8.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)
- Right bank heated oxygen sensor (front) failed.
- Harness damage
- Connector damage.
- ECM 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
- MB991316: Test Harness

STEP 1. Check harness connector B-03 at the right bank heated oxygen sensor (front) harness connector B-10 at the ECM 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 the right bank heated oxygen sensor (front).

(1) Disconnect the right bank heated oxygen sensor (front) connector B-03 and connect test harness special tool, MB991316, to the connector on the right bank heated oxygen sensor (front) side.

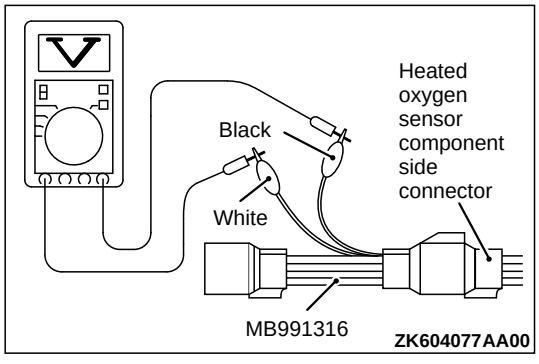
(2) Warm up the engine until engine coolant temperature reaches 80°C (176°F) or higher.

(3) Rev the engine for 5 minutes or more with the engine speed of 2,500 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 right bank heated oxygen sensor (front) output voltage.

Standard value: 0.6 - 1.0 volts



⚠ 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

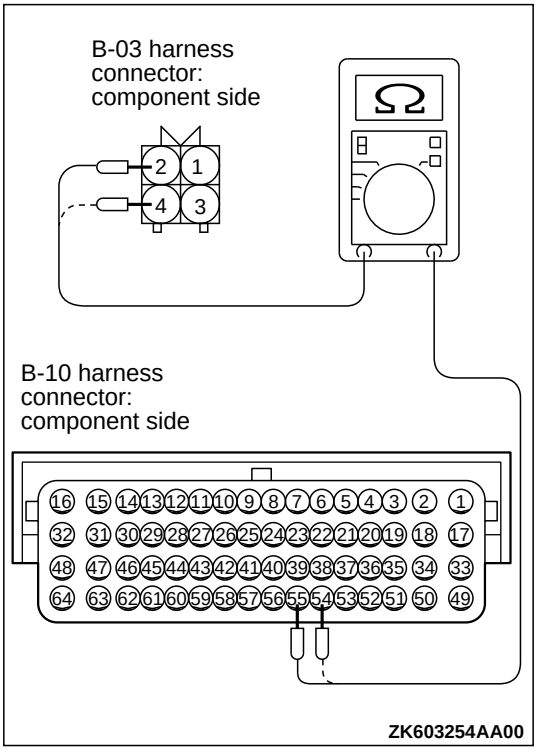
terminal of 8 volts power supply respectively, then check again.

Q:Is the voltage between 0.6 and 1.0 volts?
YES: Go to Step 3.
NO: Replace the right bank heated oxygen sensor (front). Then go to Step 5.

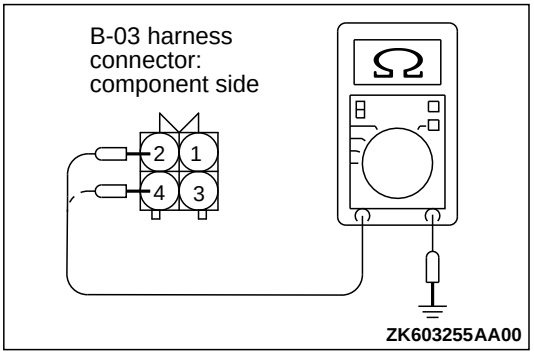
STEP 3. Check for harness between the right heated oxygen sensor (front) connector B-03 and the ECM connector B-10.

(1) Disconnect the right bank heated oxygen sensor (front) connector B-03 and the ECM connector B-10.

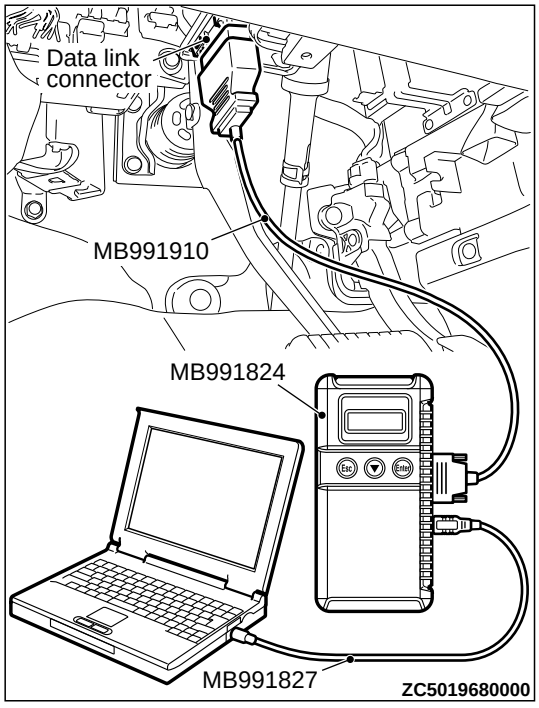
(2) Measure the resistance between the heated oxygen sensor connector B-03 and the ECM connector B-10.
- a Connector B-03 (terminal No. 2) and connector B-10 (terminal No. 55).
- b Connector B-03 (terminal No. 4) and connector B-10 (terminal No. 54).
- ▪Should be less than 2 ohms.



(3) Check for the continuity between the oxygen sensor connector B-03 and ground.
- a Connector B-03 (terminal No. 2) and ground.
- b Connector B-03 (terminal No. 4) and ground.
- ▪Not continuity.



Q:Is the harness wire in good condition?
YES: Go to Step 4.
NO: Repair it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 5.



STEP 4. Using scan tool MB991958, check data list item AC: Heated Oxygen Sensor Bank 1, Sensor 1 (right 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, Heated Oxygen Sensor Bank 1, Sensor 1 (right front).
- Warm up the engine. When the engine is revved, the output voltage should battery positive voltage.
- Warm up the engine. When the engine is idling, the output voltage should repeat 0.4 volt or less 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.00-15.

NO: Replace the ECM. 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 23 P. 13Ab-8.
(2) Check the diagnostic trouble code (DTC).

Q:Is DTC P0131 set?

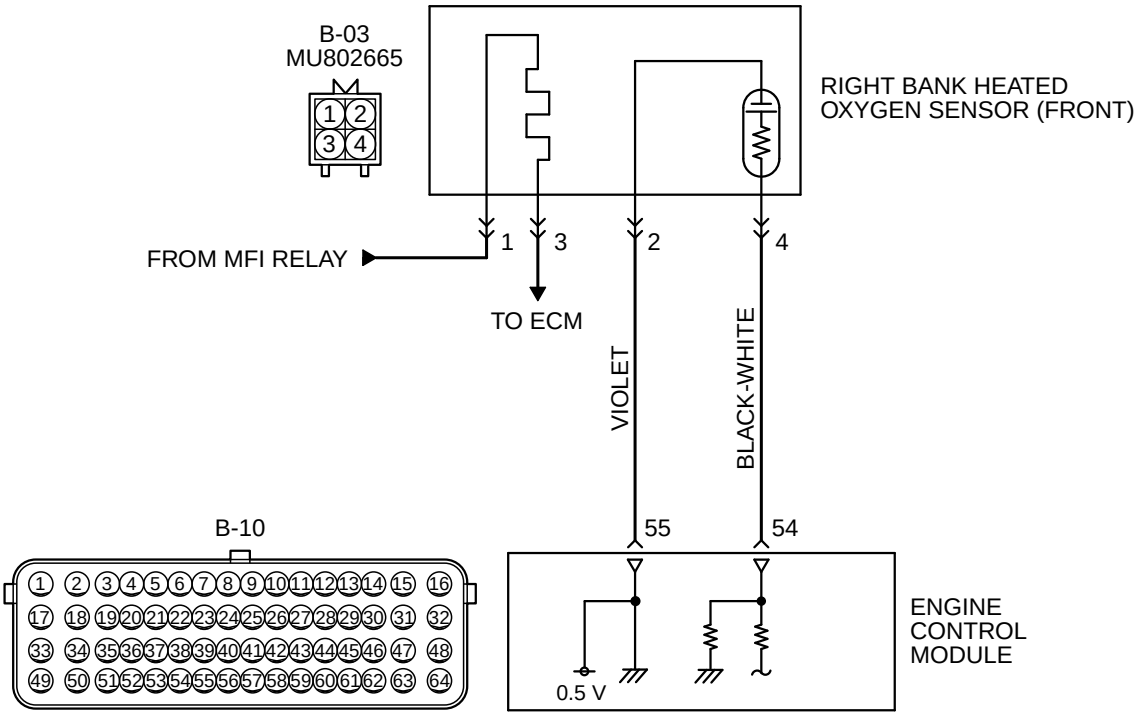
YES: Retry the troubleshooting.

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.00-15.

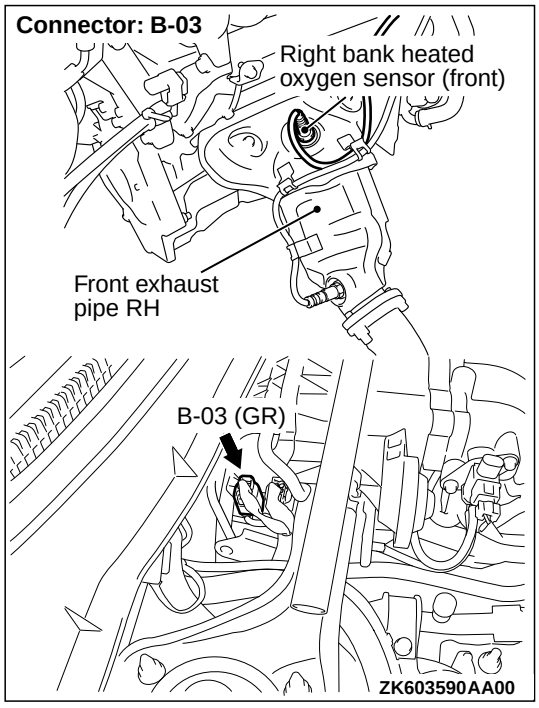
DTC P0132: Heated Oxygen Sensor Circuit High Voltage (bank 1, sensor 1)

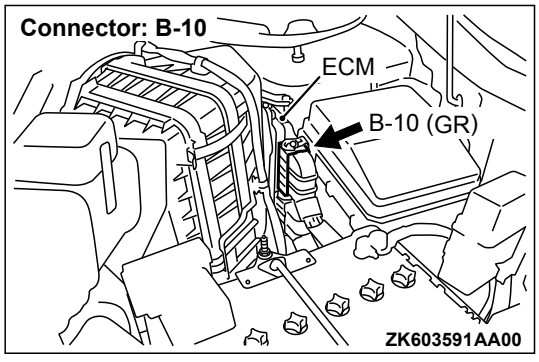
M11310100187USA0000010000

RIGHT BANK HEATED OXYGEN SENSOR (FRONT) CIRCUIT



ZK602838 AA00





CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the ECM (terminal No. 54) from the output terminal (terminal No. 4) of the right bank heated oxygen sensor (front).
- Terminal No. 2 of the right bank heated oxygen sensor (front) is grounded with ECM (terminal No. 55).
- The ECM applies an off set voltage of 0.5 volt to terminal No. 2 the right bank heated oxygen sensor (front).

TECHNICAL DESCRIPTION

- The right bank 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 ECM.
- When the right bank heated oxygen sensor (front) begins to deteriorate, the heated oxygen sensor signal response becomes poor.
- The ECM the right bank heated oxygen sensor (front) output voltage.

DESCRIPTIONS OF MONITOR METHODS

Right bank heated oxygen sensor (front) output voltage is over specified range.

MONITOR EXECUTION

Continuous

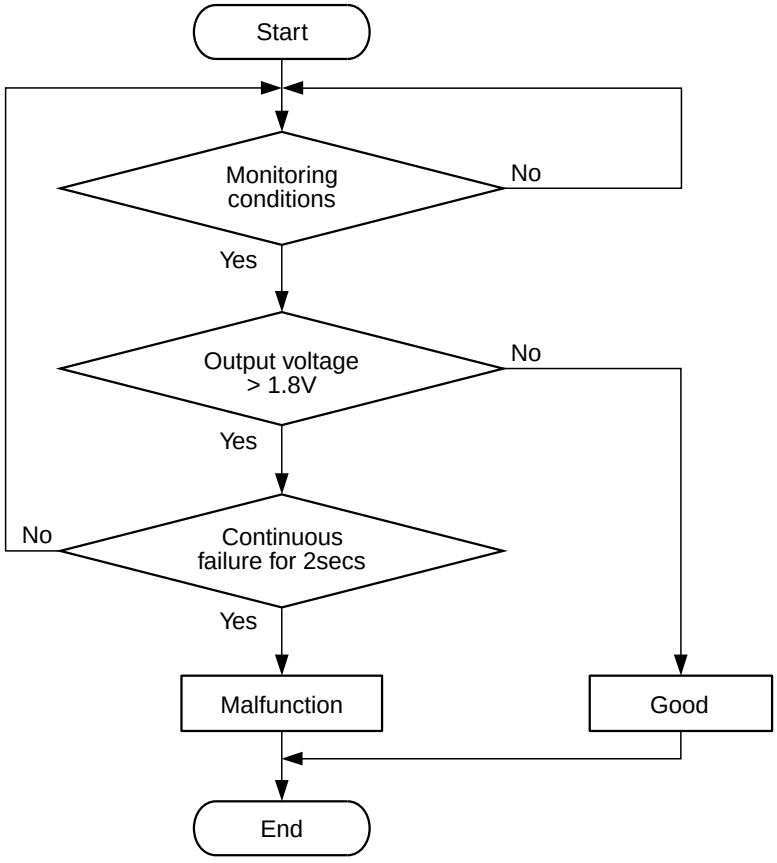
MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)
- Heated oxygen sensor heater (front) monitor

Sensor (The sensor below is determined to be normal)
- Engine coolant temperature sensor
- Intake air temperature sensor

DTC SET CONDITIONS

Logic Flow Chart



ZK603713 AA00

Check Conditions
- 2 seconds or more have passed since the engine starting sequence was completed.
- Heated oxygen sensor off set voltage is between 0.4 and 0.6 volt.

Judgement Criterion
- Right bank 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.13Ab-8.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)
- Harness damage
- Connector damage.
- ECM failed.

DIAGNOSIS

STEP 1. Check harness connector B-03 at right bank heated oxygen sensor (front) and harness connector B-10 at ECM for damage.

Q:Is the harness connector in good condition?

YES: Go to Step 2.

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

STEP 2. Check for short circuit to power supply between the right bank oxygen sensor connector B-03 and the ECM connector B-10.

Q:Is the harness wire in good condition?

YES: Go to Step 3.

NO: Repair it. Then go to Step 4.

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. 13Ab-8.

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

Q:Is DTC P0132 set?

YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. 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.00-15.

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 24 P. 13Ab-8.

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

Q:Is DTC P0132 set?

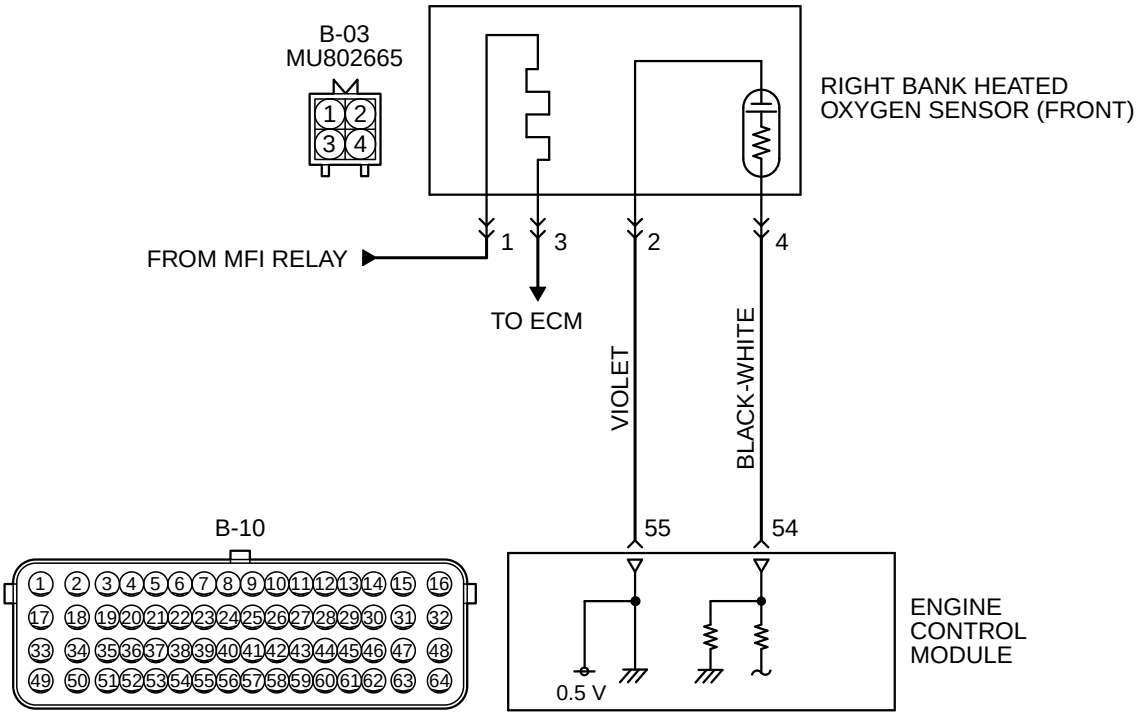
YES: Retry the troubleshooting.

NO: The inspection is complete.

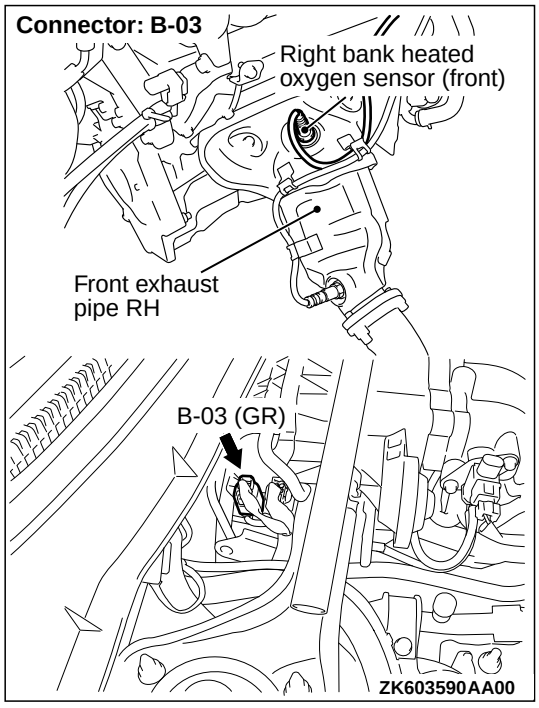
DTC P0133: Heated Oxygen Sensor Circuit Slow Response (bank 1, sensor 1)

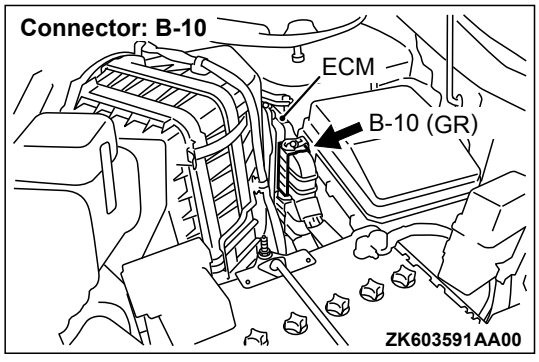
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RIGHT BANK HEATED OXYGEN SENSOR (FRONT) CIRCUIT



ZK602838 AA00





CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the ECM (terminal No. 54) from the output terminal (terminal No. 4) of the right bank heated oxygen sensor (front).
- Terminal No. 2 of the right bank heated oxygen sensor (front) is grounded with ECM (terminal No. 55).
- The ECM applies an off set voltage of 0.5 volt to terminal No. 2 of the right bank oxygen sensor (front).

TECHNICAL DESCRIPTION

- The right bank 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 ECM.
- When the right bank heated oxygen sensor (front) begins to deteriorate, the heated oxygen sensor signal response becomes poor.
- The ECM also checks for the right bank heated oxygen sensor (front) rich learn switching frequency.

DESCRIPTIONS OF MONITOR METHODS

Right bank 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)

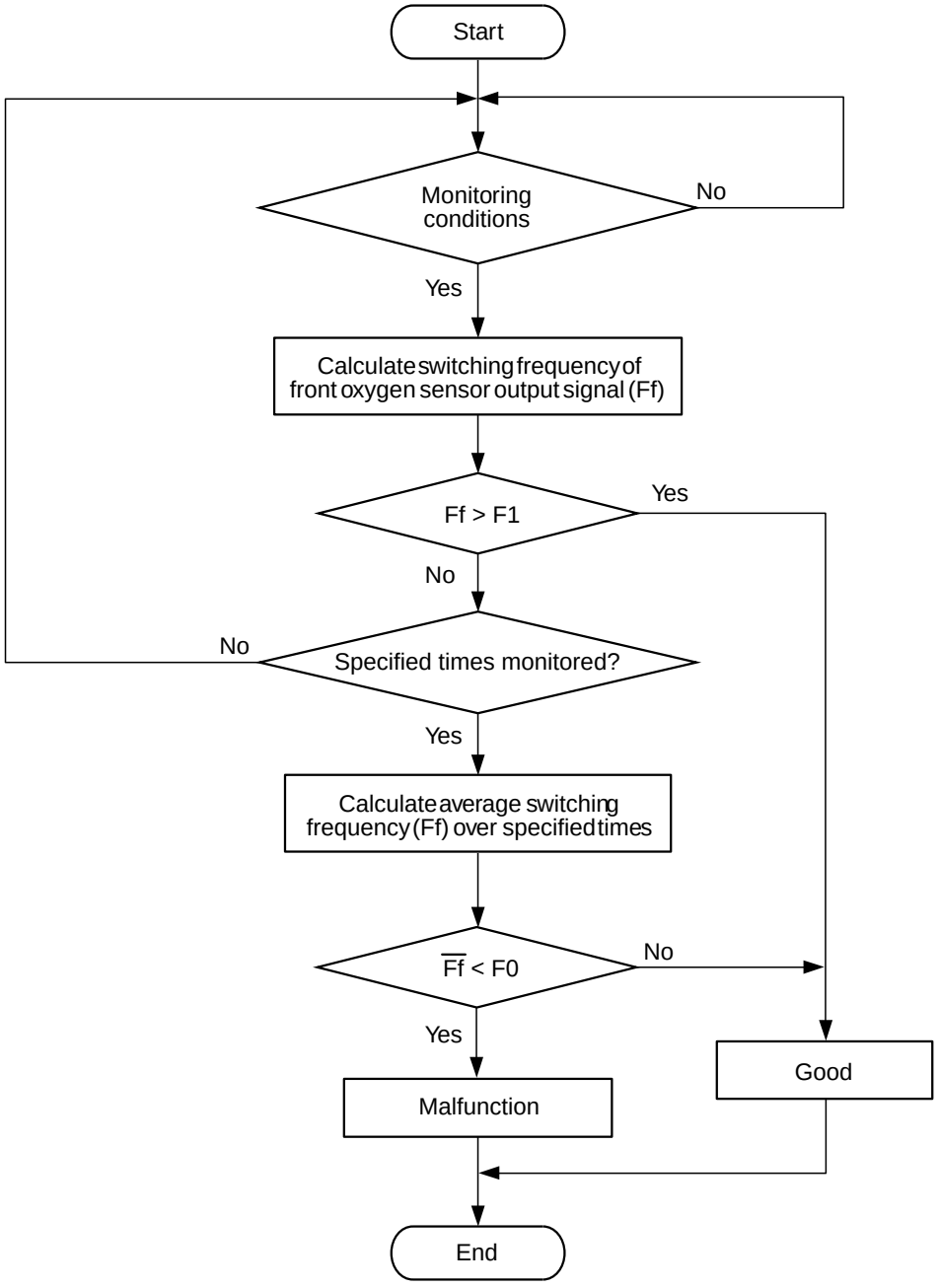
- Heated oxygen sensor heater (front) monitor

Sensor (The sensor below is determined to be normal)

- Engine coolant temperature sensor

DTC SET CONDITIONS

Logic Flow Chart



ZK603714 AA00

Check Conditions

- Engine coolant temperature is higher than 50°C (122°F).
- Engine speed is between 1,250 and 3,500 r/min.
- Volumetric efficiency is between 25 and 65 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 abovementioned conditions have been met.
- The ECM monitors for this condition for 5 cycles of 12 seconds each during the drive cycle.

Judgement Criterion

- The average of the right bank heated oxygen sensor (front) rich/lean switching frequency is less than 13 times per 12 seconds.

NOTE: If the sensor switching frequency is lower than the Judgment 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.13Ab-8.

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

- Right bank heated oxygen sensor (front) deteriorated.
- ECM failed.

DIAGNOSIS

Required Special Tools:

- MB991316: Test Harness

STEP 1. Check the right bank heated oxygen sensor (front)

(1) Disconnect the right bank heated oxygen sensor (front) connector B-03 and connect test harness special tool, MB991316, to the connector on the right bank heated oxygen sensor (front) side.

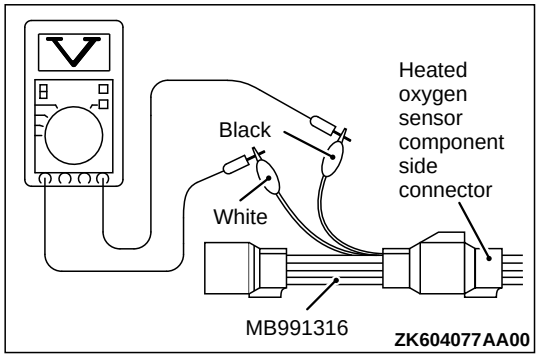
(2) Warm up the engine until engine coolant temperature reaches 80°C (176°F) or higher.

(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) Warn up the engine, 2,500 r/min.

- Output voltage repeats 0 - 0.4 volt or less and 0.6 - 1.0 volts 13 times or more within 12 seconds.



⚠ 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 sensor operating properly?
YES: Go to Step 2.
NO: Replace the right bank heated oxygen sensor (front). 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 1 P. 13Ab-8.
(2) Check the diagnostic trouble code (DTC).

Q:Is DTC P0133 set?
YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-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.00-15.

DTC P0134: Heated Oxygen Sensor Circuit No Activity Detected (bank 1, sensor 1)

M11310100189USA0000010000

Heated Oxygen Sensor Circuit No Activity Detected (bank 1, sensor 1) Circuit
- Refer to, DTC P0131 - Right Bank Heated Oxygen Sensor (Front) Circuit Low Voltage P.13Ab-196.
- Refer to, DTC P0201 P.13Ab-332, P0203 P. 13Ab-347, P0205 P.13Ab-362- Injector Circuit.

CIRCUIT OPERATION
- Refer to, DTC P0131 P.13Ab-196- Right Bank Heated Oxygen Sensor (Front) Circuit Low Voltage.
- Refer to, DTC P0201 P.13Ab-332, P0203 P. 13Ab-347, P0205 P.13Ab-362- Injector Circuit.

TECHNICAL DESCRIPTION
- The ECM effects air/fuel ratio feedback control in accordance with the signals from the right bank heater oxygen sensor (front).
- If the right bank heated oxygen sensor (front) has deteriorated, corrections will be made by the right bank 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
Right bank heated oxygen sensor (front) output voltage does not exceed lean/rich criteria (about 0.5 volt) within specified period.

MONITOR EXECUTION
Continuous

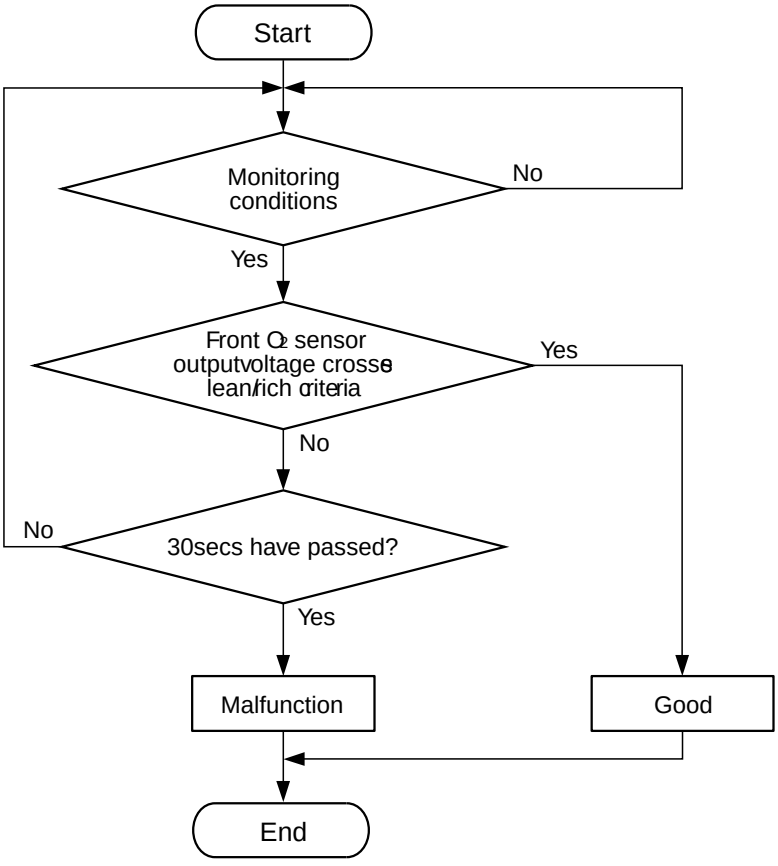
MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

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
- Accelerator pedal position sensor

DTC SET CONDITIONS

Logic Flow Chart



ZK603715 AA00

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

- Right bank 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.13Ab-8.

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

- Right bank heated oxygen sensor (front) deteriorated.
- Harness damage

NOTE: When the right bank 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 right bank heated oxygen sensor (rear). If the right bank heated oxygen sensor (rear) responds poorly because it has deteriorated, it will improperly correct the right

bank heated oxygen sensor (front). Thus, even when closed loop control is being effected, the fluctuation of the right bank 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.

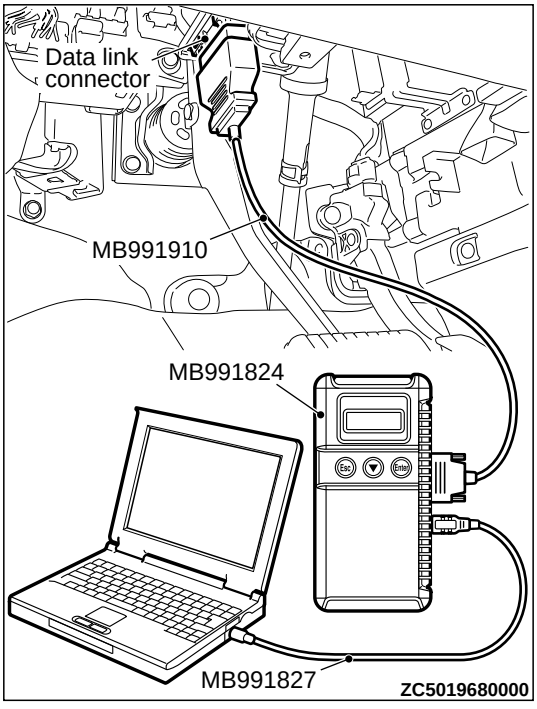
- Connector damage.
- Exhaust leak.
- Air drawn in from gaps in gasket, seals, etc.
- Incorrect fuel pressure.
- ECM failed.

- Open circuit in right bank injector.

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: Heated Oxygen Sensor Bank 1, Sensor 2 (right 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, Heated Oxygen Sensor Bank 1, Sensor 2 (right 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: Then go to Step 2.

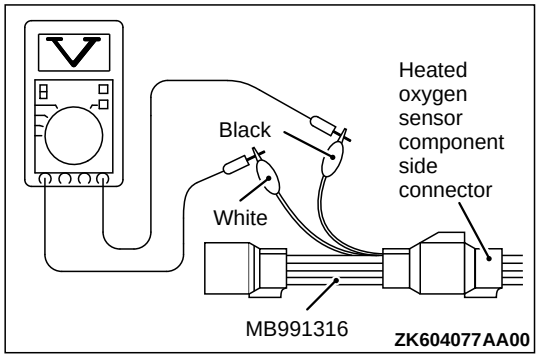
NO: Refer to, DTC P0137 - Heated Oxygen Sensor Circuit Low Voltage (bank 1, sensor 2) P.13Ab-217, DTC P0138 - Heated Oxygen Sensor Circuit High Voltage (bank 1, sensor 2) P.13Ab-222, DTC P0139 - Heated Oxygen Sensor Circuit Slow Response (bank 1, sensor 2) P.13Ab-226, DTC P0140 - Heated Oxygen Sensor Circuit No Activity detected (bank 1, sensor 2) P.13Ab-230.

STEP 2. Check harness connector B-03 at the right bank heated oxygen sensor (front) and harness connector B-10 at the ECM for damage.

Q:Is the harness connector in good condition?

YES: Go to Step 3.

NO: Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.13Ab-8. Then go to Step 14.



STEP 3. Check the right bank heated oxygen sensor (front).

(1) Disconnect the right bank heated oxygen sensor (front) connector B-03 and connect test harness special tool, MB991316, to the connector on the right bank 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 right bank heated oxygen sensor (front) output voltage.

Standard value: 0.6 - 1.0 volts

⚠ 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.**

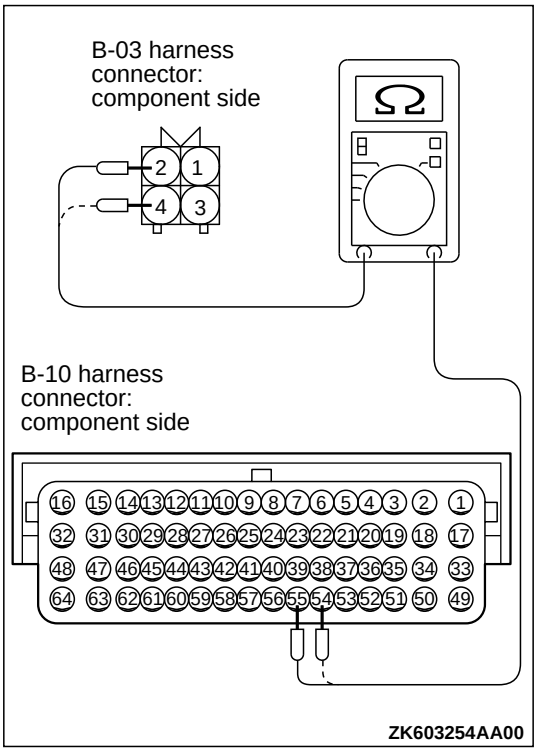
NOTE: If the sufficiently high temperature [of approximate 400° C (752° F) or more] is not reached although the heated oxygen sensor is normal, the output voltage would be possibly low although the rich air/fuel ratio. Therefore, if the output voltage is low, use a jumper wire to connect the terminal 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 voltage between 0.6 and 1.0 volts?

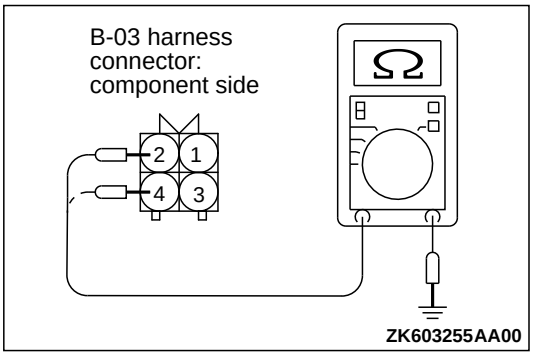
YES: Go to Step 4.
NO: Replace the right bank heated oxygen sensor (front). Then go to Step 14.

STEP 4. Check for harness between the right heated oxygen sensor (front) connector B-03 and the ECM connector B-10.

(1) Disconnect the right bank heated oxygen sensor (front) connector B-03 and the ECM connector B-10.



(2) Measure the resistance between the heated oxygen sensor connector B-03 and the ECM connector B-10.
a Connector B-03 (terminal No. 2) and connector B-10 (terminal No. 55).
b Connector B-03 (terminal No. 4) and connector B-10 (terminal No. 54).
- Should be less than 2 ohms.



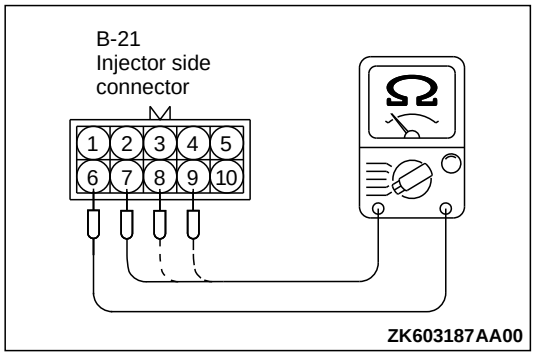
(3) Check for the continuity between the oxygen sensor connector B-03 and ground.
a Connector B-03 (terminal No. 2) and ground.
b Connector B-03 (terminal No. 4) and ground.
- Not continuity.

Q:Is the harness wire in good condition?
YES: Go to Step 5.
NO: Repair it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.

STEP 5. Check harness connector B-21 at 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 14.

STEP 6. Measure the right bank injector resistance at intermediate connector B-21.
(1) Disconnect the intermediate connector B-21.



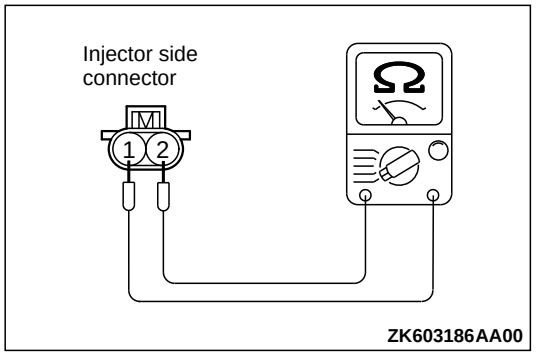
(2) Measure the resistance between each injector side connector terminal.
  a Measure the resistance between terminal No. 6 and No. 7 . when measuring No. 1 cylinder.
  b Measure the resistance between terminal No. 6 and No. 8 . when measuring No. 3 cylinder.
  c Measure the resistance between terminal No. 6 and No. 9 . when measuring No. 5 cylinder.
    ▪ Resistance should be between 10.5 and 13.5 ohms [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: Go to Step 7.

STEP 7. Check harness connector B-21 at right bank injector for damage.
(1) Remove the intake manifold.
(2) Check the right bank injector connector, which deviates from the standard value at Step 6.

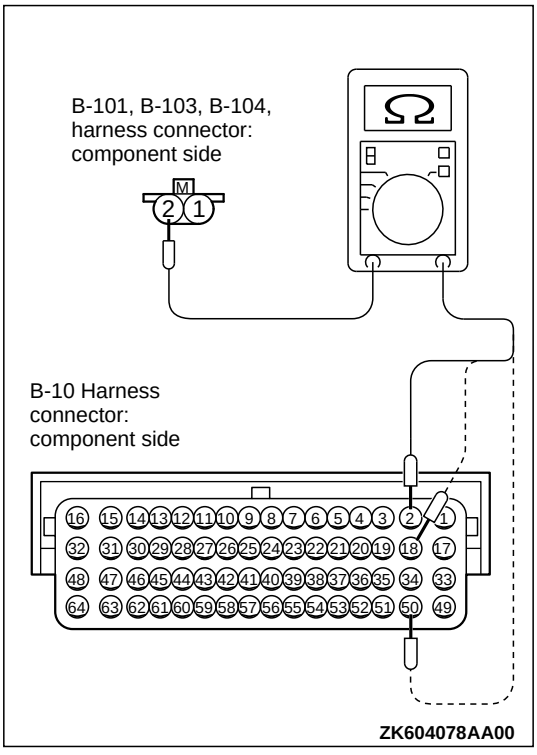
Q:Is the harness connector in good condition?
YES: Go to Step 8.
NO: Repair it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.

STEP 8. Check the right bank injector.
(1) Check the right bank injector, which deviates from the standard value at Step 6.
(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: Repair harness wire between the injector intermediate connector and the right bank injector connector because of harness damage. Then go to Step 9.
NO: Replace the injector. Then go to Step 14.

STEP 9. Check for harness between the right bank injector connector B-101, B-103, B-104 and the ECM connector B-10.
(1) Disconnect the right bank injector connector B-101, B-103, B-104 and the ECM connector B-10.



(2) Measure the resistance between the right bank injector connector B-101, B-103, B-104 and the ECM connector B-10.
- a Connector B-101(terminal No. 2) and the ECM connector B-10 (terminal No. 2) at No. 1 cylinder injector.
- b Connector B-103 (terminal No. 2) and the ECM connector B-10 (terminal No. 18) at No. 3 cylinder injector.
- c Connector B-104 (terminal No. 2) and the ECM connector B-10 (terminal No. 50) at No. 5 cylinder injector.
- Should be less than 2 ohms.

Q:Is the harness wire in good condition?
YES: Go to Step 10.
NO: Repair it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.

STEP 10. Check the fuel pressure.
Refer to On-vehicle Service - Fuel Pressure Test P.13Aa-17.

Q:Is the fuel pressure normal?
YES: Go to Step 11.
NO: Repair it. Then go to Step 14.

STEP 11. Check for exhaust leaks.

Q:Are there any abnormalities?
YES: Repair it. Then go to Step 14.
NO: Go to Step 14.

STEP 12. Check for intake system vacuum leak.

Q:Are there any abnormalities?
YES: Repair it. Then go to Step 14.
NO: Go to Step 14.

STEP 13. Check the trouble symptoms.
(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function - OBD-II Drive Cycle - Pattern 12 P. 13Ab-8.
(2) Check the diagnostic trouble code (DTC).

Q:Is DTC P0134 set?
YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. 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.00-15.

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 12 P. 13Ab-8.

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

Q:Is DTC P0134 set?

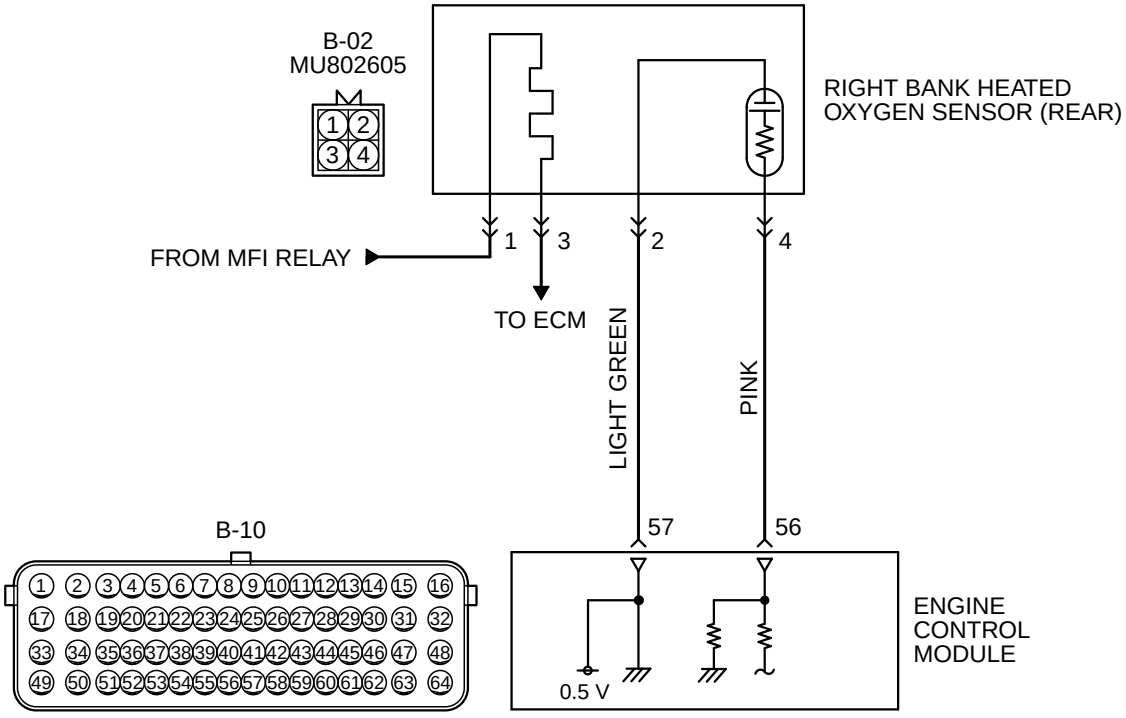
YES: Retry the troubleshooting.

NO: The inspection is complete.

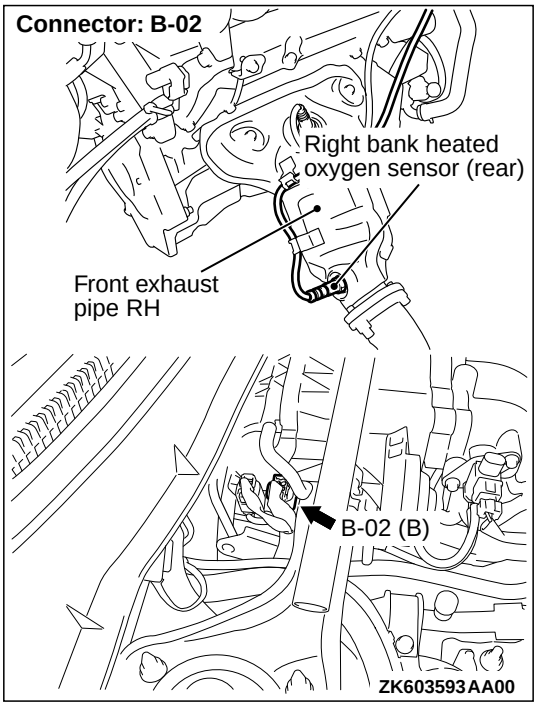
DTC P0137: Heated Oxygen Sensor Circuit Low Voltage (bank 1, sensor 2)

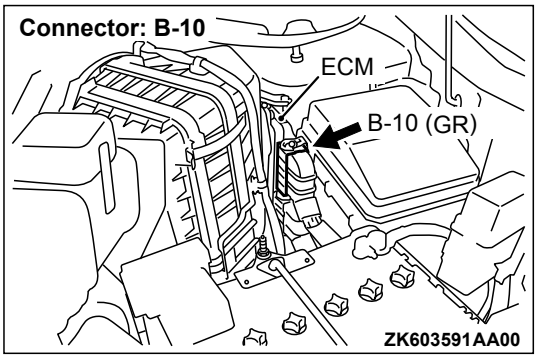
M11310100190USA0000010000

RIGHT BANK HEATED OXYGEN SENSOR (REAR) CIRCUIT



ZK602839 AA00





CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the ECM (terminal No. 56) from the output terminal (terminal No. 4) of the right bank heated oxygen sensor (rear).
- Terminal No. 2 of the right bank heated oxygen sensor (rear) is grounded with ECM (terminal No. 57).
- The ECM applies an off set voltage of 0.5 volt to terminal No. 2 of the right bank heated oxygen sensor (rear).

TECHNICAL DESCRIPTION

- The output signal of the right bank heated oxygen sensor (front) is compensated by the output signal of the right bank heated oxygen sensor (rear).
- The ECM checks for the right bank heated oxygen sensor (rear) output voltage.

DESCRIPTIONS OF MONITOR METHODS

Right bank 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)

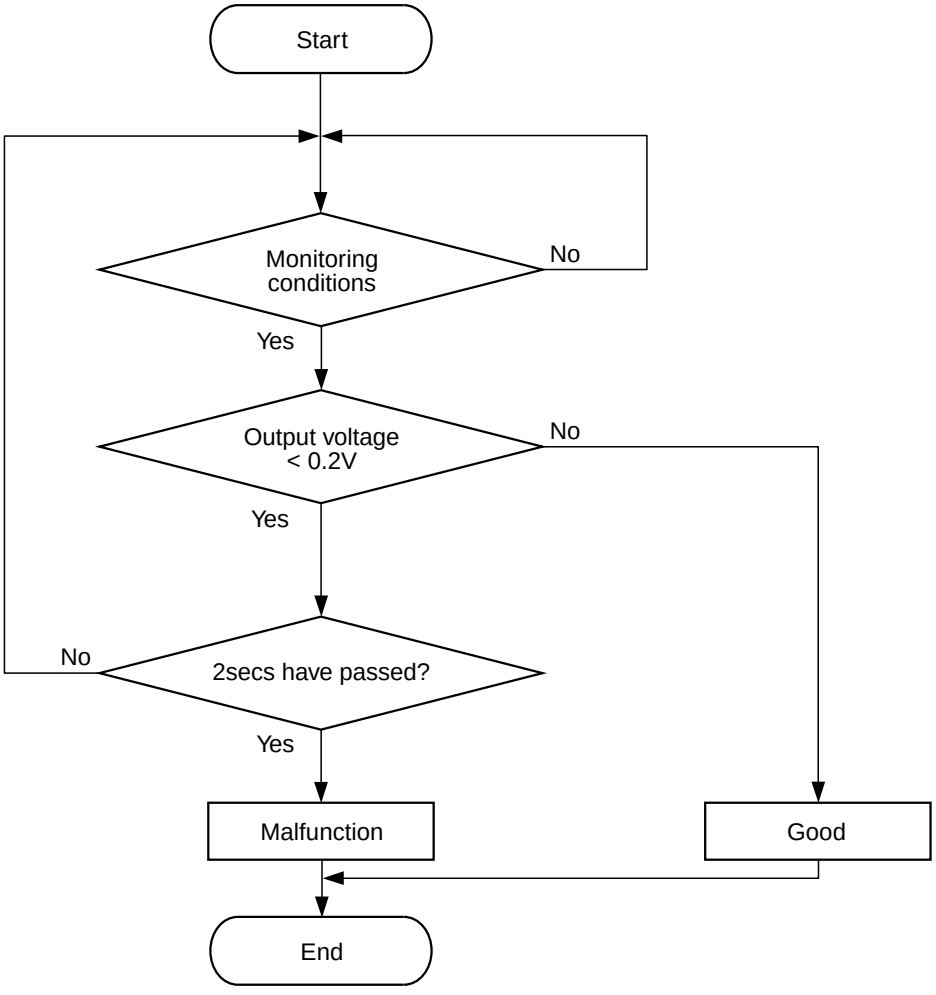
- Heated oxygen sensor heater (front) monitor
- Heated oxygen sensor heater (rear) monitor
- Air/fuel ratio feedback monitor

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



ZK603708 AA00

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

- Right bank 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.13Ab-8.

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

- Right bank heated oxygen sensor (rear) failed.
- Connector damage.
- Harness damage
- ECM 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
- MB998464: Test Harness

STEP 1. Check harness connector B-02 at the right bank heated oxygen sensor (rear) and harness connector B-10 at the ECM for damage.

Q:Is the harness connector in good condition?

YES: Go to Step 2.

NO: Repair it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 5.

STEP 2. Check the right bank heated oxygen sensor (rear).

(1) Disconnect the right bank heated oxygen sensor (rear) connector B-02 and connect test harness special tool, MB998464, to the connector on the right bank 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 (31 mph) or more for 10 minutes.

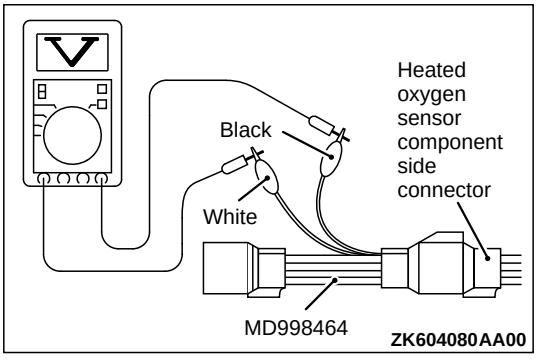
(4) Connect a digital voltage meter between terminal No. 2 (black clip) and terminal No. 4 (white clip).

(5) Measure the output voltage of heated oxygen sensor under the following driving.

a Transaxle: 2nd speed

b Drive with wide open throttle

c Engine: 3,500 r/min or more



Standard value: 0.6 - 1.0 volts

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.

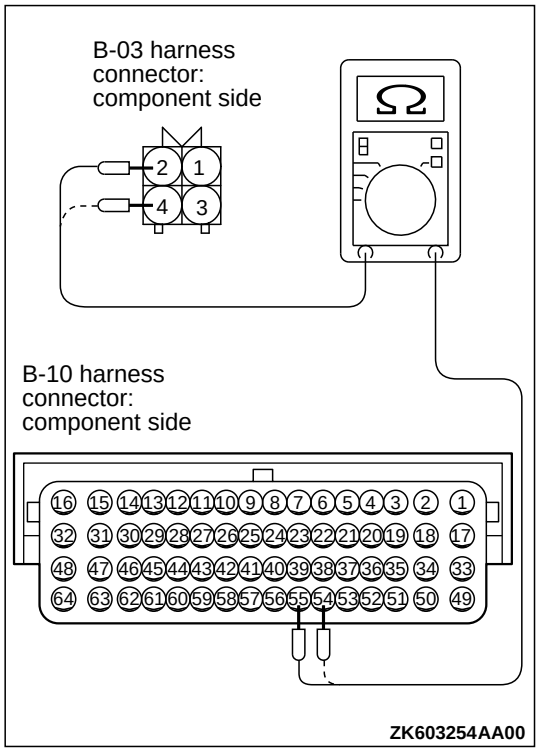
Q:Is the voltage between 0.6 and 1.0 volts?

YES: Go to Step 3.

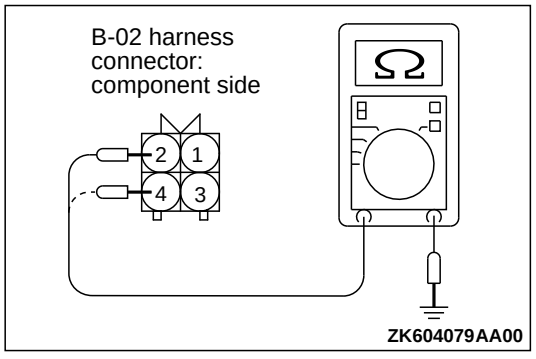
NO: Replace the right bank heated oxygen sensor (rear). Then go to Step 5.

STEP 3. Check for harness between the right bank heated oxygen sensor (rear) connector B-02 and the ECM connector B-10.

(1) Disconnect the right bank heated oxygen sensor (front) connector B-02 and the ECM connector B-10.



(2) Measure the resistance between the heated oxygen sensor connector B-02 and the ECM connector B-10.
 a Connector B-02 (terminal No. 2) and connector B-10 . (terminal No. 57).
 b Connector B-02 (terminal No. 4) and connector B-10 . (terminal No. 56).
 ▪Should be less than 2 ohms.



(3) Check for the continuity oxygen sensor connector B-03 and ground.
 a Connector B-02 (terminal No. 2) and ground.
 .
 b Connector B-02 (terminal No. 4) and ground.
 .
 ▪Not continuity.

Q:Is the harness wire in good condition?
YES: Go to Step 4.
NO: Repair it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 5.

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 23 P. 13Ab-8
(2) Check the diagnostic trouble code (DTC).

Q:Is DTC P0137 set?
YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. 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.00-15.

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 23 P. 13Ab-8.

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

Q:Is DTC P0137 set?

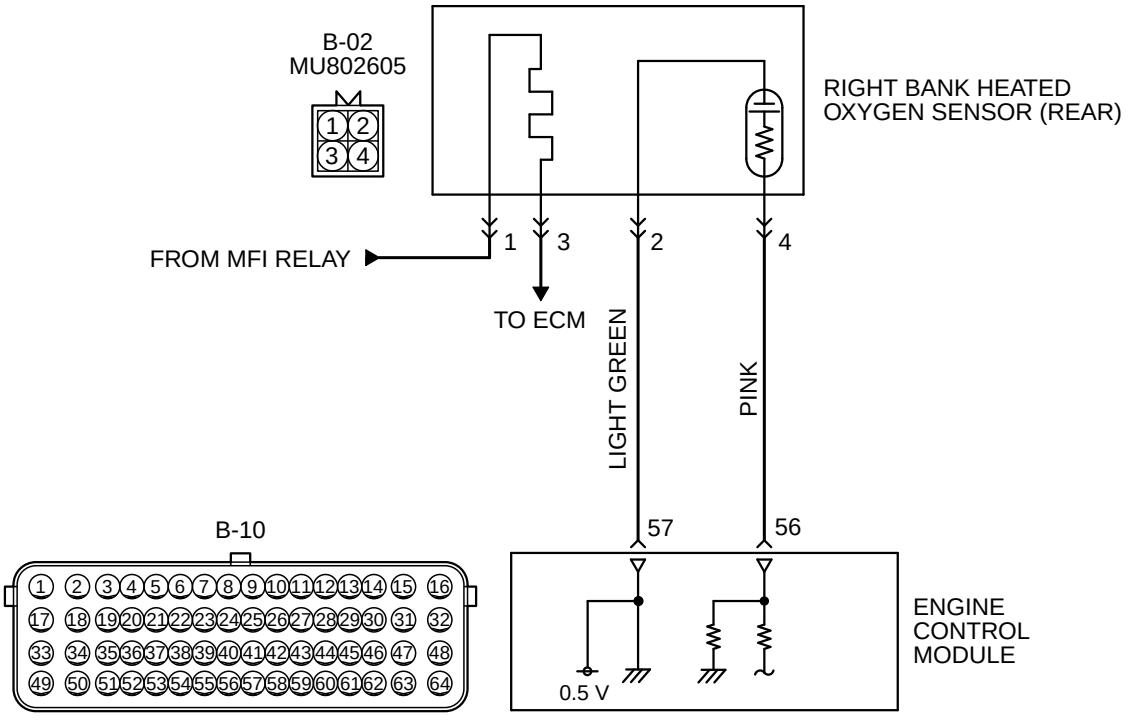
YES: Retry the troubleshooting.

NO: The inspection is complete.

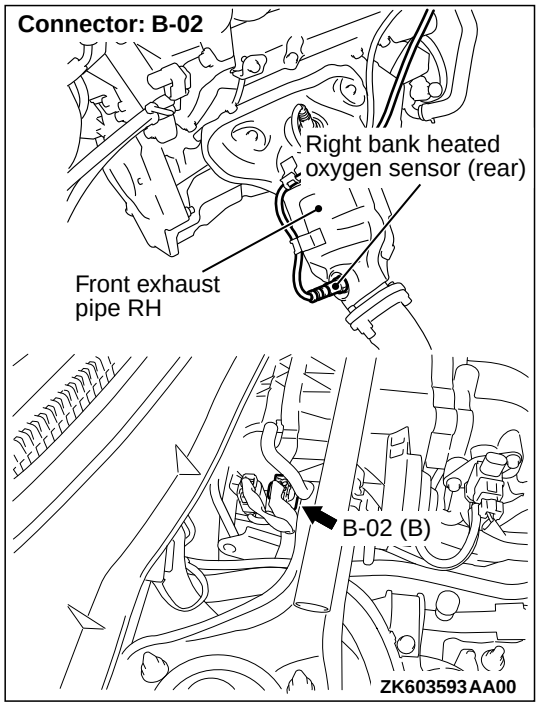
DTC P0138: Heated Oxygen Sensor Circuit High Voltage (bank 1, sensor 2)

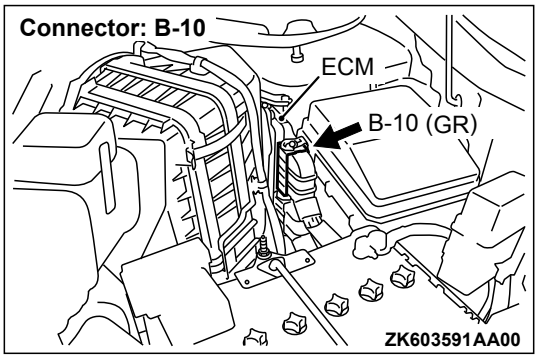
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RIGHT BANK HEATED OXYGEN SENSOR (REAR) CIRCUIT



ZK602839 AA00





CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the ECM (terminal No. 56) from the output terminal (terminal No. 4) of the right bank heated oxygen sensor (rear).
- Terminal No. 2 of the right bank heated oxygen sensor (rear) is grounded with ECM (terminal No. 57).
- The ECM applies an offset voltage of 0.5 volt to terminal No. 2 of the right bank heated oxygen sensor (rear).

TECHNICAL DESCRIPTION

- The output signal of the right bank heated oxygen sensor (front) is compensated by the output signal of the right bank heated oxygen sensor (rear).
- The ECM checks for the right bank heated oxygen sensor (rear) output voltage.

DESCRIPTIONS OF MONITOR METHODS

Right bank heated oxygen sensor (rear) output voltage is over 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)

- Not applicable

Sensor (The sensor below is determined to be normal)

- Engine coolant temperature sensor

DESCRIPTIONS OF MONITOR METHODS

Right bank heated oxygen sensor (rear) output voltage is over 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

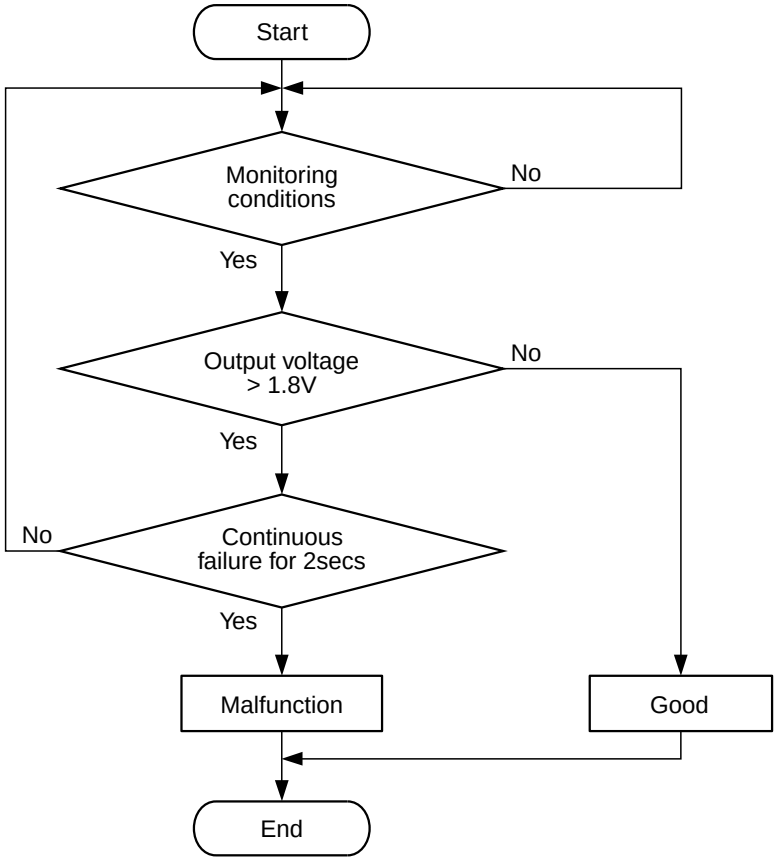
Sensor (The sensor below is determined to be normal)

- Mass airflow sensor
- Engine coolant temperature sensor

- Intake air temperature sensor
- Barometric pressure sensor

DTC SET CONDITION

Logic Flow Chart



ZK603713 AA00

Check Conditions

- 2 seconds or more have passed since the engine starting sequence was completed.
- Heated oxygen sensor off set voltage is between 0.4 and 0.6 volt.

Judgement Criterion

- Right bank 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.13Ab-8.

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

- Connector damage.
- Harness damage
- ECM 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-02 at the right bank heated oxygen sensor (rear) and harness connector B-10 at ECM for damage.

Q:Is the harness connector in good condition?
YES: Go to Step 2.
NO: Repair it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 4.

STEP 2. Check for short circuit to power supply between the right bank heated oxygen sensor (rear) connector B-02 (terminal No. 4) and the ECM connector B-10 (terminal No. 56).

Q:Is the harness wire in good condition?
YES: Go to Step 3.
NO: Repair it. Then go to Step 4.

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. 13Ab-8.
(2) Check the diagnostic trouble code (DTC).

Q:Is DTC P0138 set?
YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. 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.00-15.

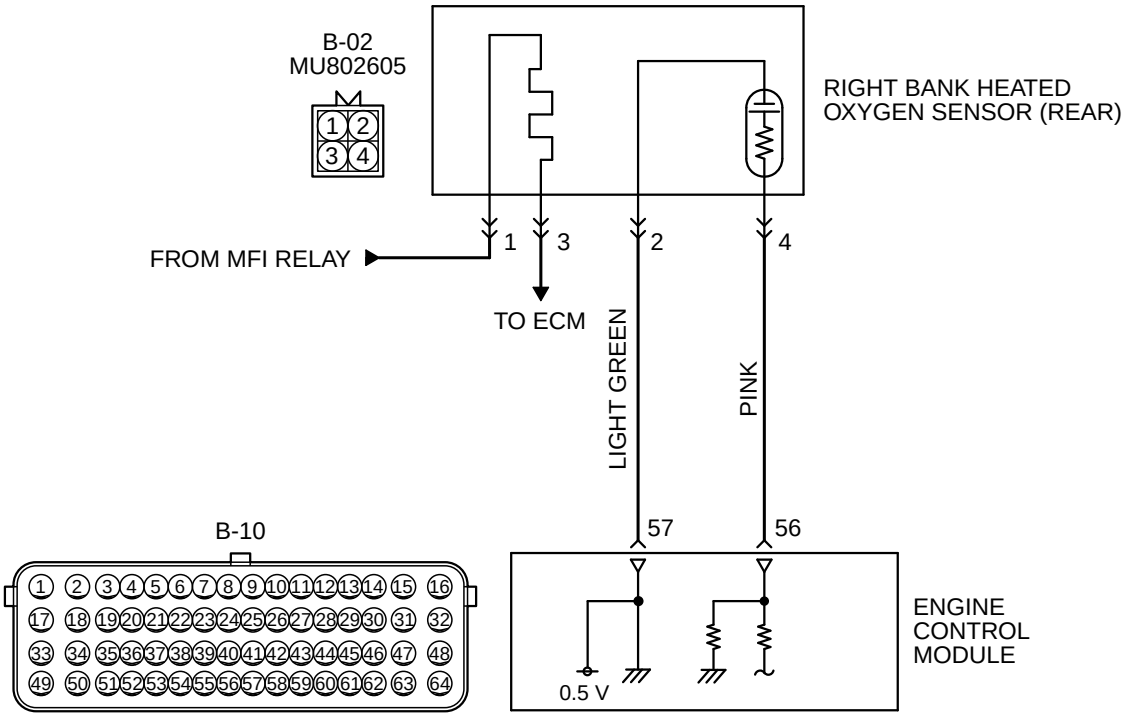
STEP 4. Test the OBD-II drive cycle.
(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function - OBD-II Drive Cycle - Pattern 24 P. 13Ab-8.
(2) Check the diagnostic trouble code (DTC).

Q:Is DTC P0138 set?
YES: Retry the troubleshooting.
NO: The inspection is complete.

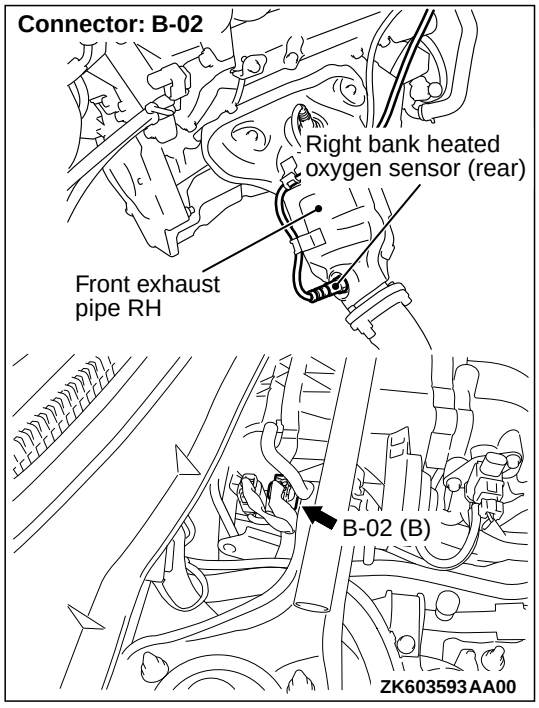
DTC P0139: Heated Oxygen Sensor Circuit Slow Response (bank 1, sensor 2)

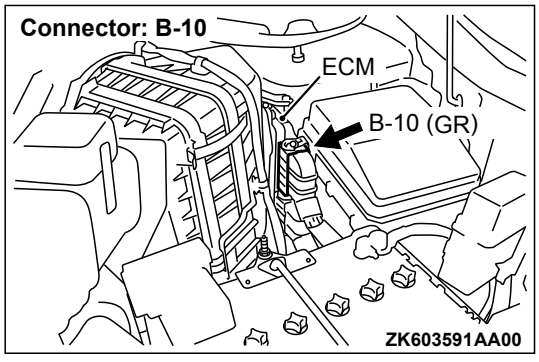
M11310100192USA0000010000

RIGHT BANK HEATED OXYGEN SENSOR (REAR) CIRCUIT



ZK602839 AA00





CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the ECM (terminal No. 56) from the output terminal (terminal No. 4) of the right bank heated oxygen sensor (rear).
- Terminal No. 2 of the right bank heated oxygen sensor (rear) is grounded with ECM (terminal No. 57).
- The ECM applies an offset voltage of 0.5 volt to terminal No. 2 of the right bank heated oxygen sensor (rear).

TECHNICAL DESCRIPTION

- The output signal of the right bank heated oxygen sensor (front) is compensated by the output signal of the right bank heated oxygen sensor (rear).
- The ECM checks for the right bank heated oxygen sensor (rear) output voltage.

DESCRIPTIONS OF MONITOR METHODS

Right bank 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

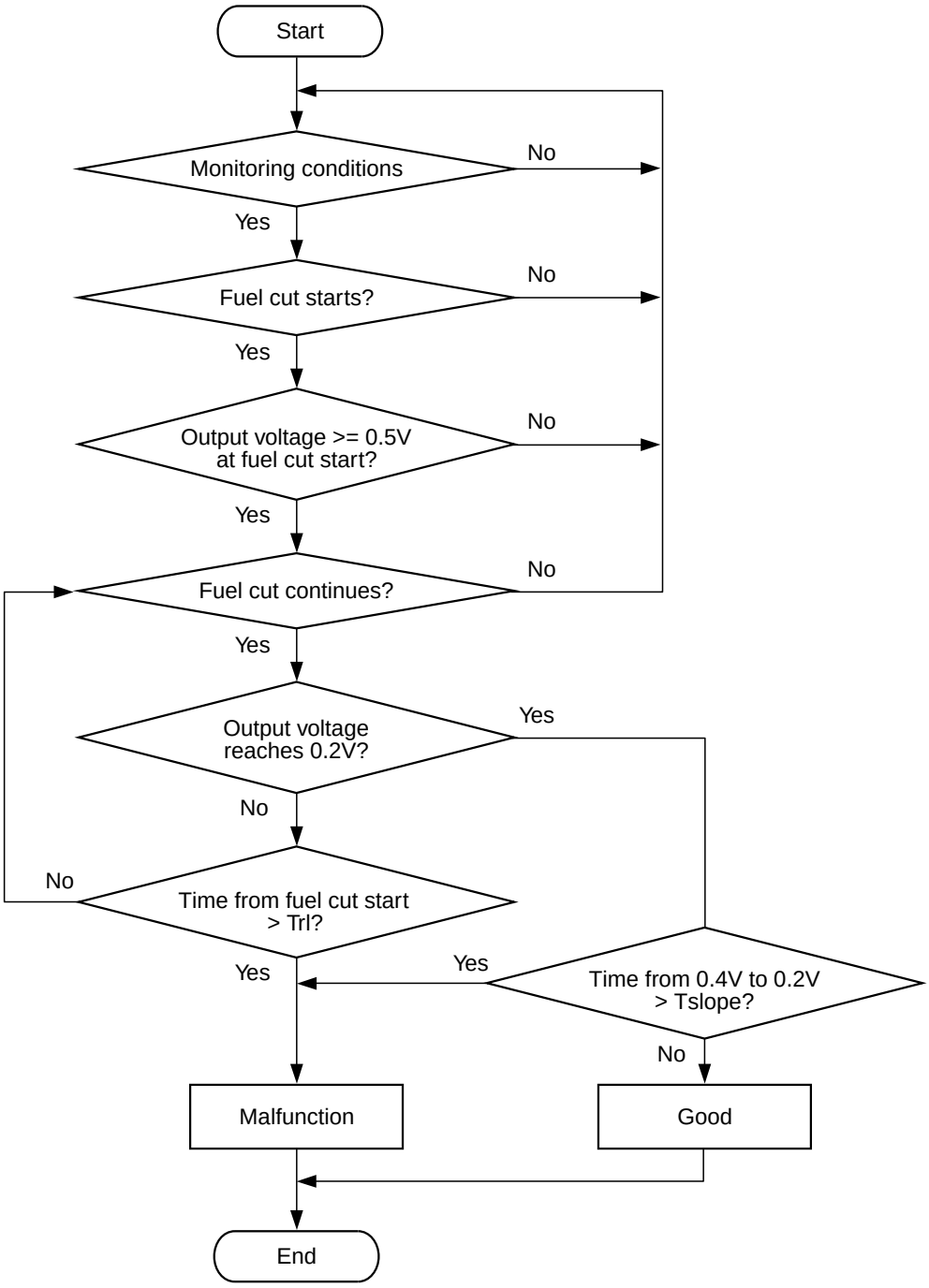
- Air/fuel ratio feedback monitor

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 CONDITION

Logic Flow Chart



ZK604081AA00

Check Conditions

- Engine coolant temperature is higher than 76°C (169°F).

- The right bank heated oxygen sensor (front) is active.
- The cumulative mass airflow sensor output is higher than 1638 g.
- Fuel is being shut off.

Judgement Criterion
- Right bank oxygen sensor (rear) output voltage does not reach 0.2 volt for 6 seconds from fuel cut start.

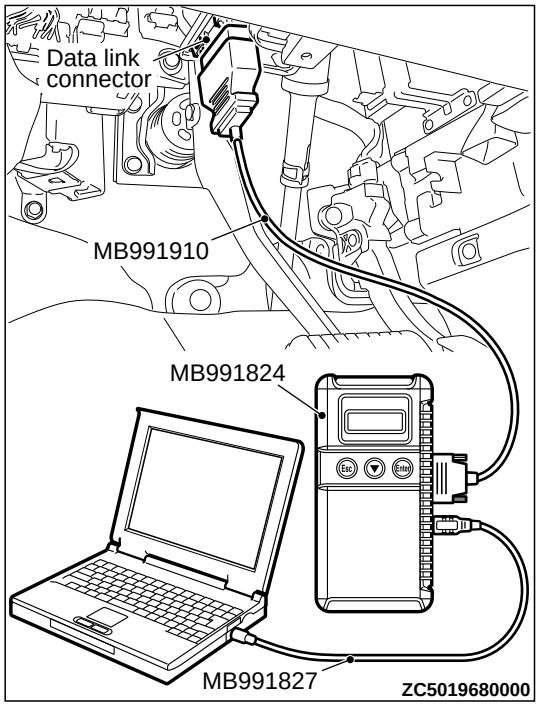
OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function - OBD-II Drive Cycle - Pattern 11 P.13Ab-8.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)
- Right bank heated oxygen sensor (rear) 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: Heated Oxygen Sensor Bank 1, Sensor 2 (right 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, Heated Oxygen Sensor Bank 1, Sensor 2 (right 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.00-15.

NO: Replace the right bank 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. 13Ab-8.
(2) Check the diagnostic trouble code (DTC).

Q:Is DTC P0139 set?

YES: Refer to DTC P0137 - Heated Oxygen Sensor Circuit Low Voltage (bank 1, sensor 2) P.13Ab-217, DTC P0138 -

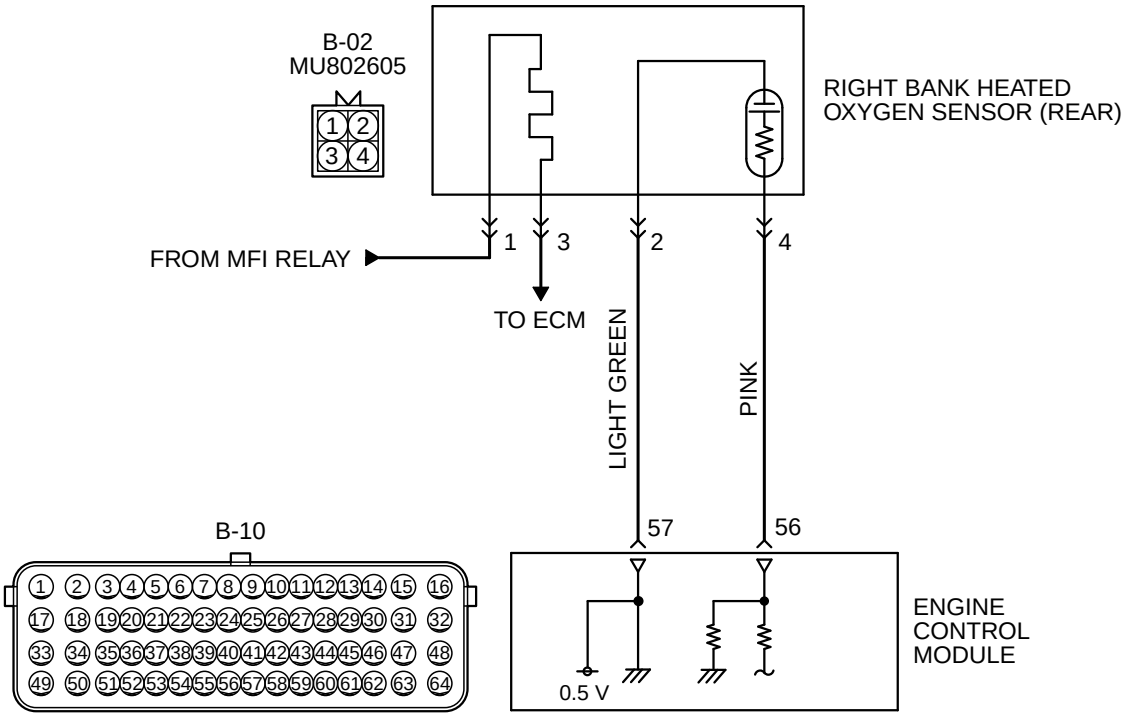
Heated Oxygen Sensor Circuit High Voltage (bank 1, sensor 2) P.13Ab-222.

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.00-15.

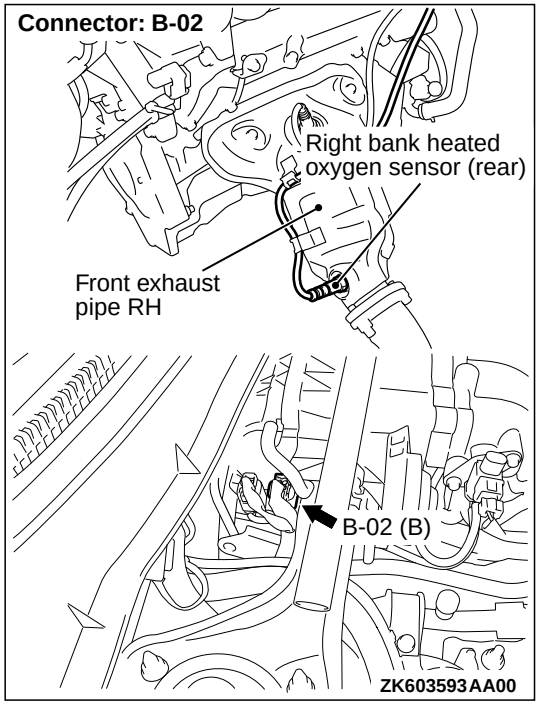
DTC P0140: Heated Oxygen Sensor Circuit No Activity Detected (bank 1, sensor 2)

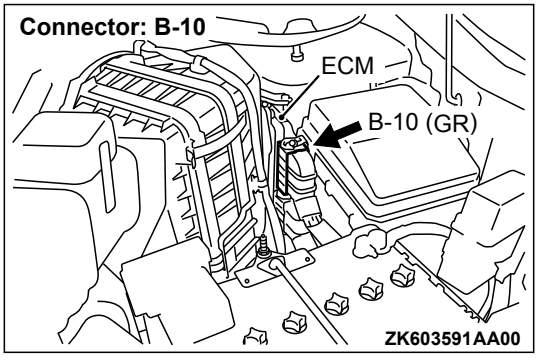
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RIGHT BANK HEATED OXYGEN SENSOR (REAR) CIRCUIT



ZK602839 AA00





CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the ECM (terminal No. 56) from the output terminal (terminal No. 4) of the right bank heated oxygen sensor (rear).
- Terminal No. 2 of the right bank heated oxygen sensor (rear) is grounded with ECM (terminal No. 57).
- The ECM applies an offset voltage of 0.5 volt to terminal No. 2 of the right bank oxygen sensor (rear).

TECHNICAL DESCRIPTION

- The output signal of the right bank heated oxygen sensor (front) is compensated by the output signal of the right bank heated oxygen sensor (rear).
- The ECM checks for the right bank heated oxygen sensor (rear) output voltage.

DESCRIPTIONS OF MONITOR METHODS

Right bank heated oxygen sensor (rear) output voltage does not change during specified.

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)

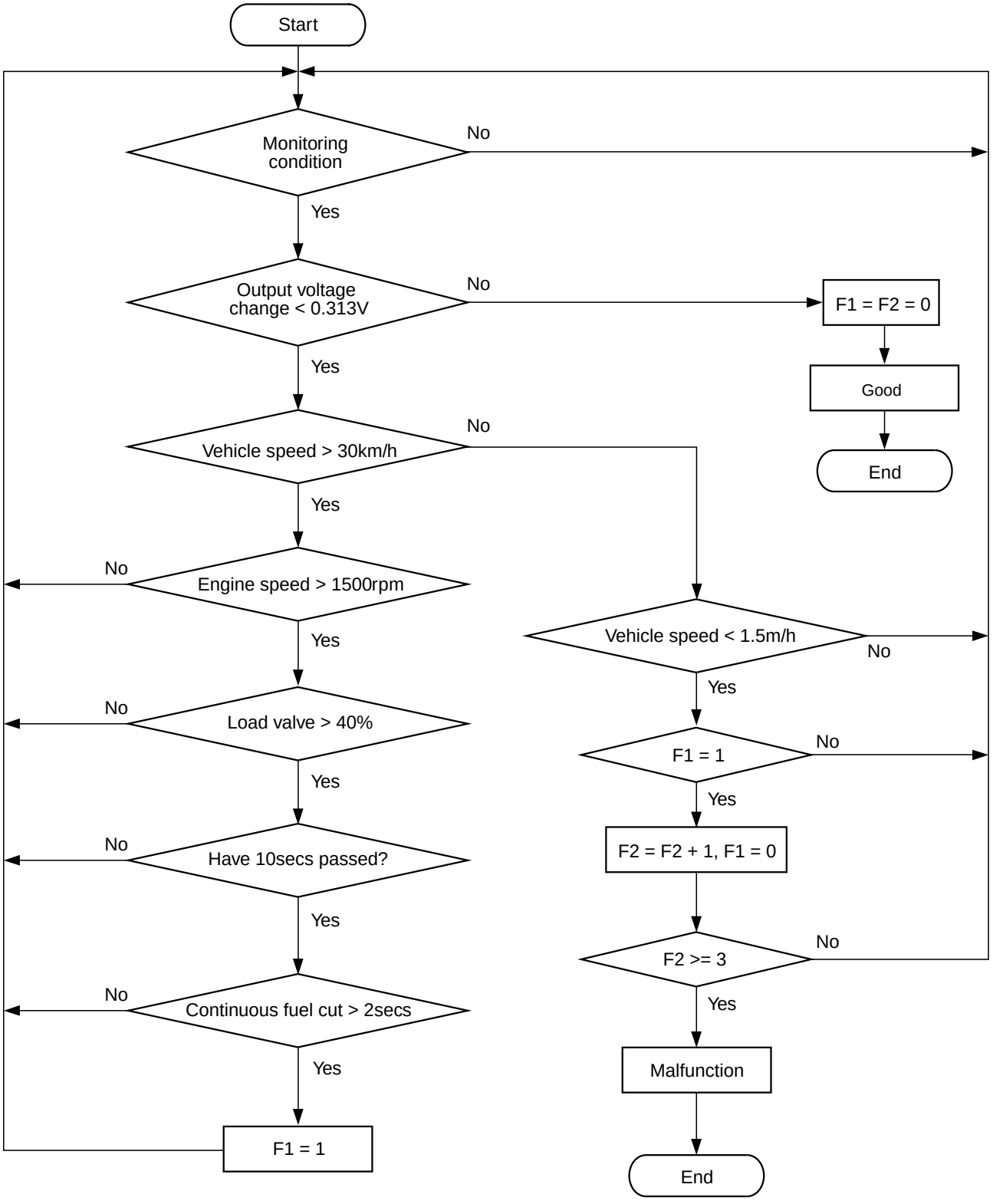
- Heated oxygen sensor heater (front) monitor
- Heated oxygen sensor heater (rear) monitor
- Air/fuel ratio feedback monitor

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 CONDITION

Logic Flow Chart



ZK603721AA00

Check Conditions
- Engine coolant temperature is higher than 76°C (169°F).
- The right bank heated oxygen sensor (front) is active.
- The cumulative mass airflow sensor output is higher than 1638 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 (1.0 mph).

Judgement Criterion
- Change in the output voltage of the right bank heated oxygen sensor (rear) is lower than 0.313 volt.

NOTE: Monitoring stops after fuel has been shut off for more than 38 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function - OBD-II Drive Cycle - Pattern 13 P.13Ab-8.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)
- Right bank heated oxygen sensor (rear) 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: Heated Oxygen Sensor Bank 1, Sensor 2 (right rear).

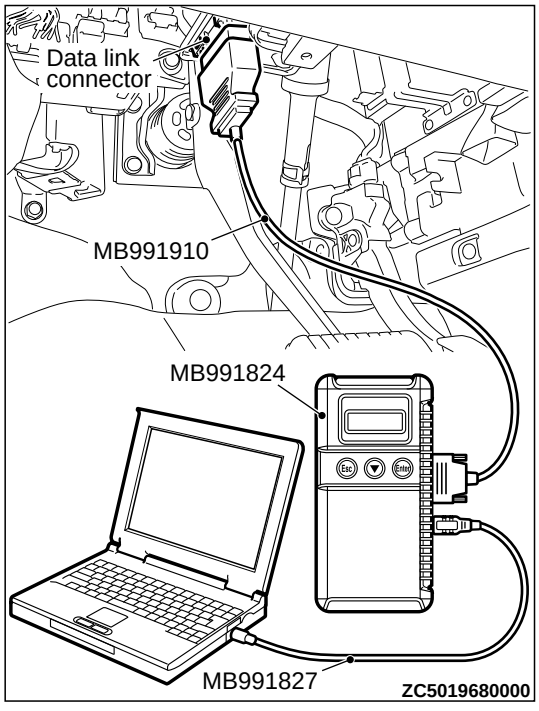
⚠ CAUTION

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, Heated Oxygen Sensor Bank 1, Sensor 2 (right rear).
a Transaxle: 2nd speed
.
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.00-15.
NO: replace the right bank 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 23 P. 13Ab-8.
(2) Check the diagnostic trouble code (DTC).

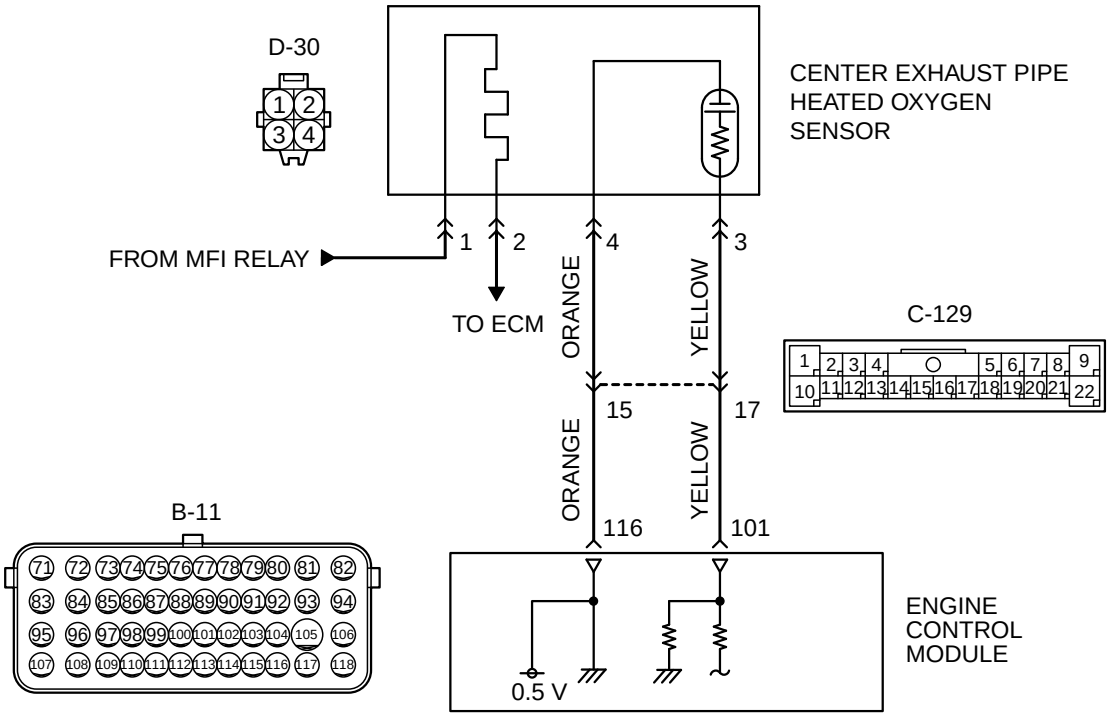
Q:Is DTC P0131 set?

YES: Refer to, P0137 - Heated Oxygen Sensor Circuit Low Voltage (bank 1, sensor 2) P.13Ab-217, DTC P0138 - Heated Oxygen Sensor Circuit High Voltage (bank 1, sensor 2) P. 13Ab-222.
NO: The inspection is complete.

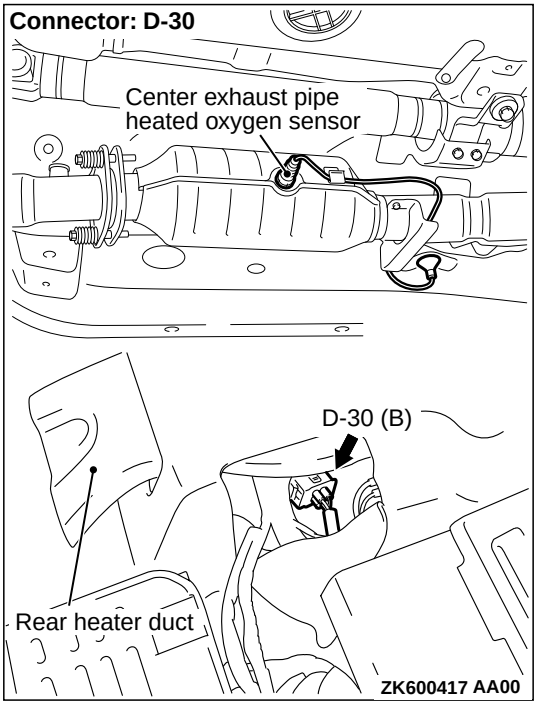
DTC P0143: Heated Oxygen Sensor Circuit Low Voltage (bank 1, sensor 3) <California>

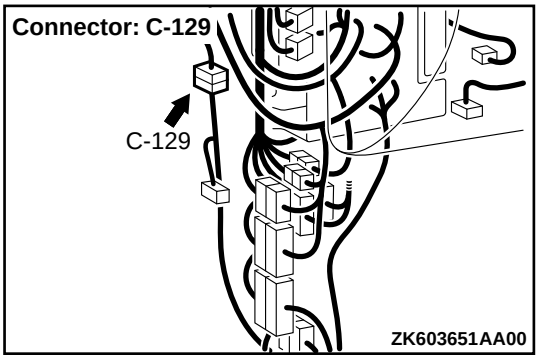
M11310100363USA0000010000

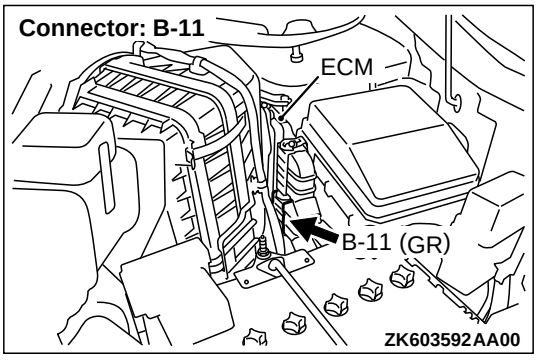
CENTER EXHAUST PIPE HEATED OXYGEN SENSOR CIRCUIT



ZK602864AA00







CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the ECM (terminal No. 101) from the output terminal (terminal No. 3) of the Center exhaust pipe heated oxygen sensor.
- Terminal No. 4 of the Center exhaust pipe heated oxygen sensor is grounded with ECM (terminal No. 116).
- The ECM applies an off set voltage of 0.5 volt to terminal No. 4 of the Center exhaust pipe heated oxygen sensor.

DECHNICAL DESCRIPTION

The ECM checks for the right bank heated oxygen sensor (rear) output voltage.

DESCRIPTIONS OF MONITOR METHODS

Center exhaust pipe heated oxygen sensor 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)

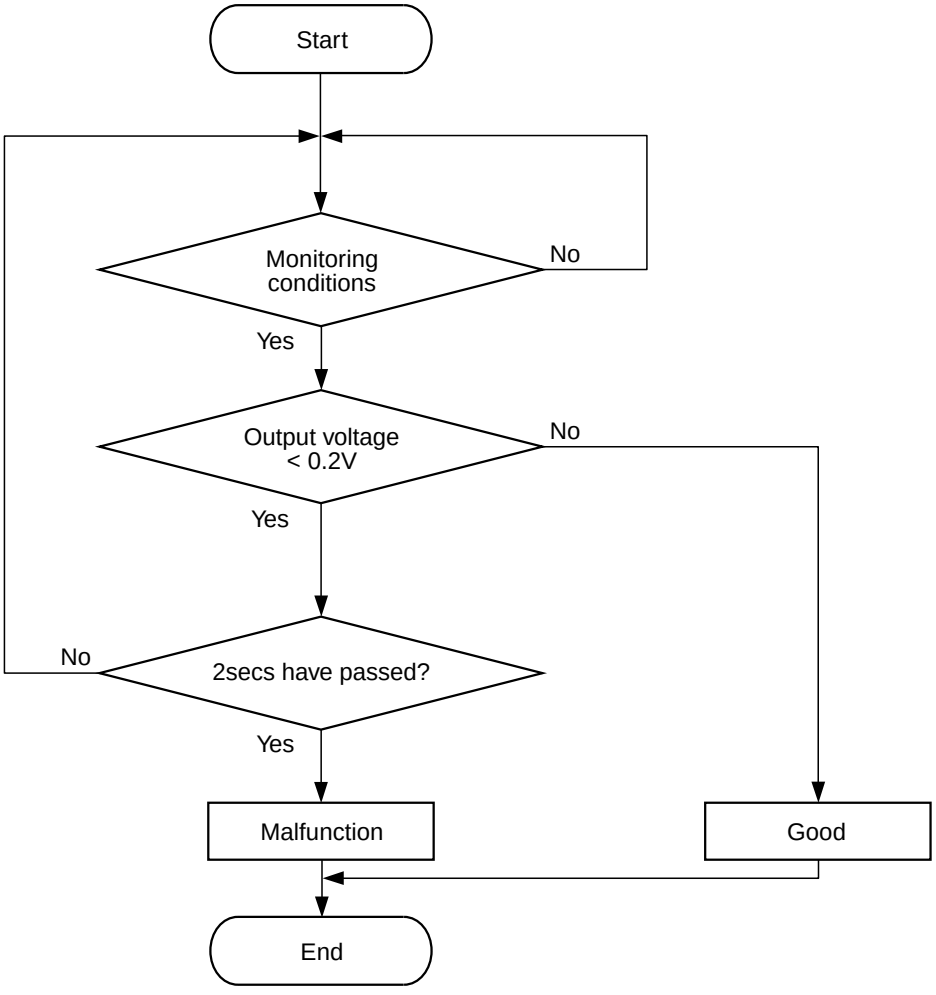
- Center exhaust pipe heated oxygen sensor heater (front) monitor

Sensor (The sensor below is determined to be normal)

- Engine coolant temperature sensor

DTC SET CONDITIONS

Logic Flow Chart



ZK603708 AA00

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

- Center exhaust pipe 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.13Ab-8.

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

- Center exhaust pipe Heated oxygen sensor failed.
- Connector damage.
- Harness damage
- ECM 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

STEP 1. Check harness connector D-30 at the center exhaust pipe heated oxygen sensor and harness connector B-11 at the ECM for damage.

Q:Is the harness connector in good condition?

YES: Go to Step 2.

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

STEP 2. Check the center exhaust pipe heated oxygen sensor (rear).

(1) Disconnect the center exhaust pipe heated oxygen sensor connector D-30 and connect test harness special tool, MB991658, to the connector on the right bank heated oxygen sensor side.

(2) Warm up the engine until engine coolant temperature reaches 80°C (176°F) or higher.

(3) Drive at 50 km/h (31 mph) or more for 10 minutes.

(4) Connect a digital voltage meter between terminal No. 3 and terminal No. 4.

(5) Measure the output voltage of heated oxygen sensor under the following driving.

a Transaxle: 2nd speed

.

b Drive with wide open throttle

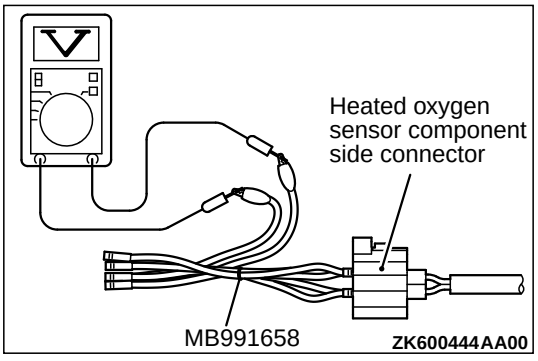
.

c Engine: 3,500 r/min or more

.

Standard value: 0.6 - 1.0 volts

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 voltage between 0.6 and 1.0 volts?

YES: Go to Step 3.

NO: Replace the center exhaust pipe heated oxygen sensor. Then go to Step 4.

STEP 3. Check for harness between the center exhaust pipe heated oxygen sensor connector D-30 and the ECM connector B-11.

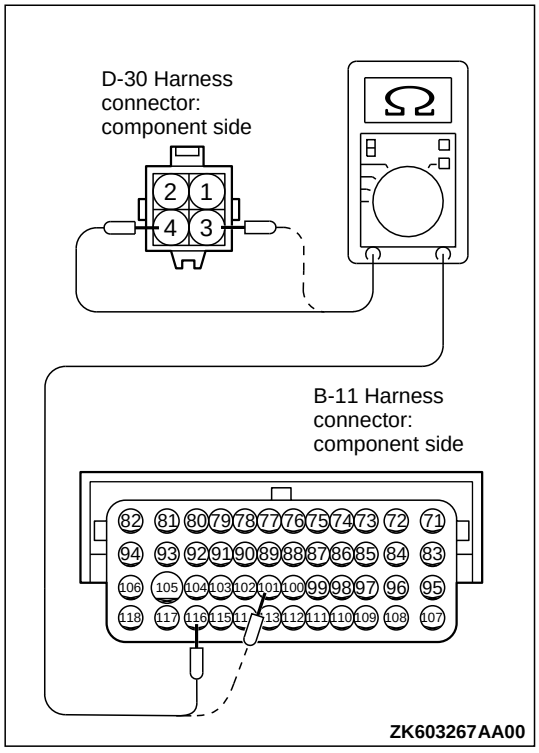
(1) Disconnect the center exhaust pipe heated oxygen sensor connector D-30 and the ECM connector B-11.

(2) Measure the resistance between the center exhaust pipe heated oxygen sensor connector D-30 and the ECM connector B-11.

a Connector D-30 (terminal No. 4) and connector B-11 . (terminal No. 116).

b Connector D-30 (terminal No. 3) and connector B-11 . (terminal No. 101).

▪Should be less than 2 ohms.

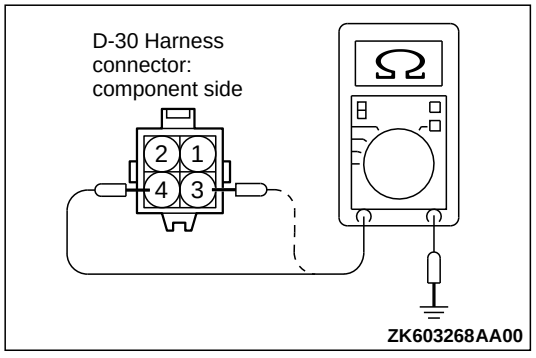


(3) Check for the continuity between the oxygen sensor connector D-30 and ground.

a Connector D-30 (terminal No. 4) and ground .

b Connector D-30 (terminal No. 3) and ground .

▪Not continuity.



Q:Is the harness wire in good condition?

YES: Go to Step 4.

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

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 23 P. 13Ab-8.

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

Q:Is DTC P0137 set?

YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8.

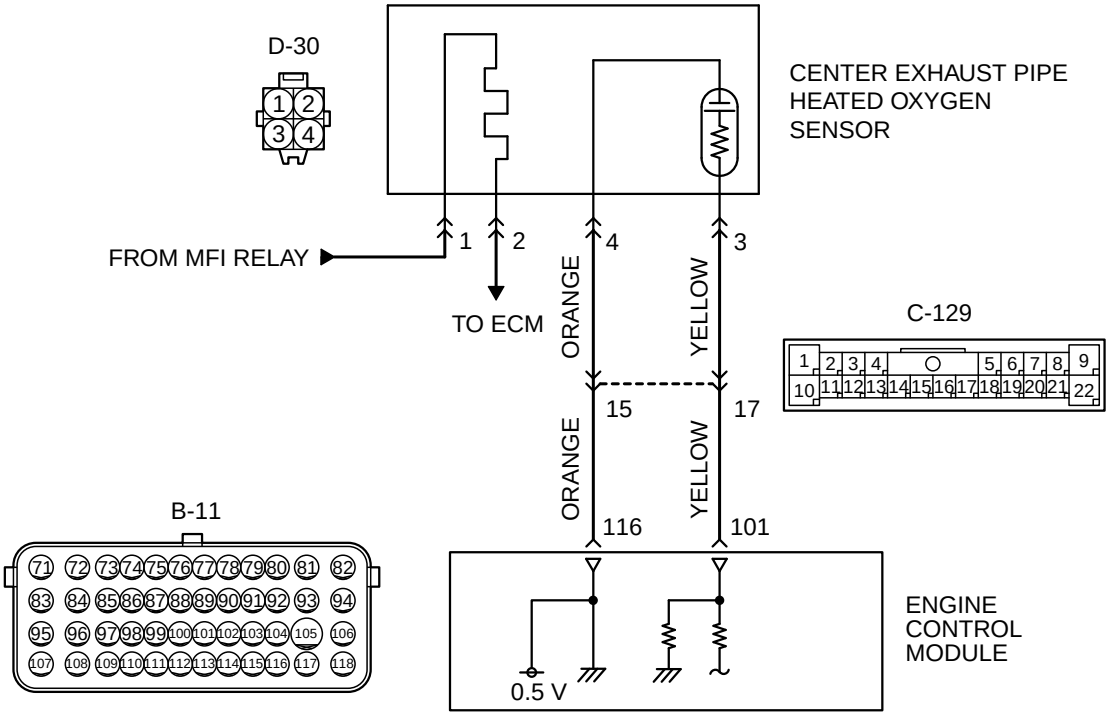
NO: It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use

Troubleshooting/Inspection Service Points How to Cope with Intermittent Malfunctions P.00-15.

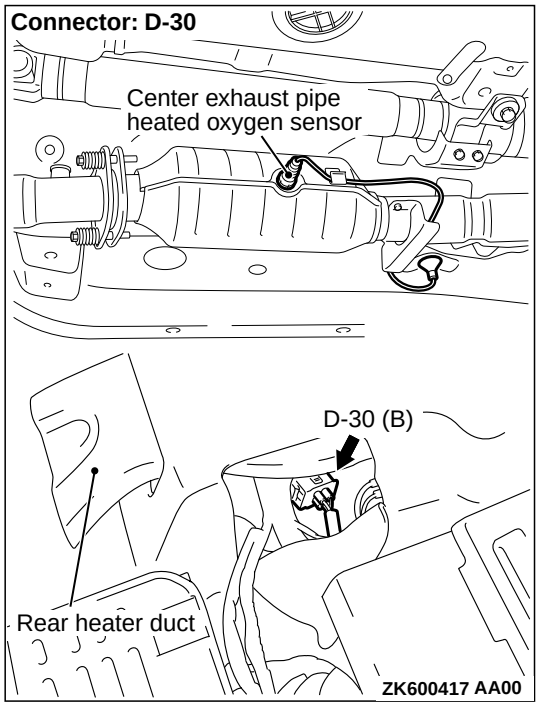
DTC P0144: Heated Oxygen Sensor Circuit High Voltage (bank 1, sensor 3)

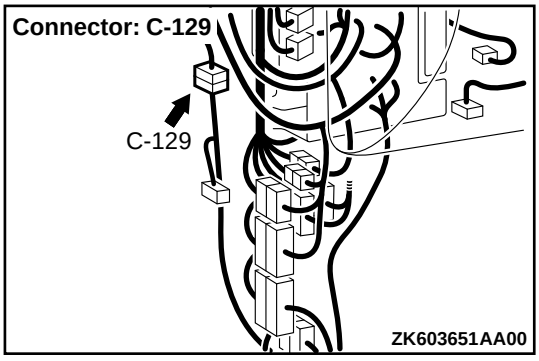
M11310100364USA0000010000

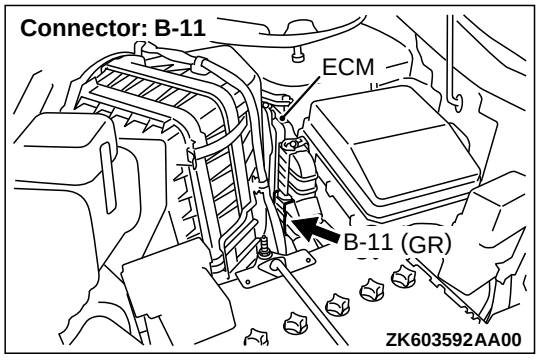
CENTER EXHAUST PIPE HEATED OXYGEN SENSOR CIRCUIT



ZK602864AA00







CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the ECM (terminal No. 101) from the output terminal (terminal No. 3) of the Center exhaust pipe heated oxygen sensor.
- Terminal No. 4 of the Center exhaust pipe heated oxygen sensor is grounded with ECM (terminal No. 116).
- The ECM applies an offset voltage of 0.5 volt to terminal No. 4 of the Center exhaust pipe heated oxygen sensor.

TECHNICAL DESCRIPTION

The ECM checks for the Center exhaust pipe heated oxygen sensor output voltage.

DESCRIPTIONS OF MONITOR METHODS

Center exhaust pipe heated oxygen sensor output voltage is over 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)

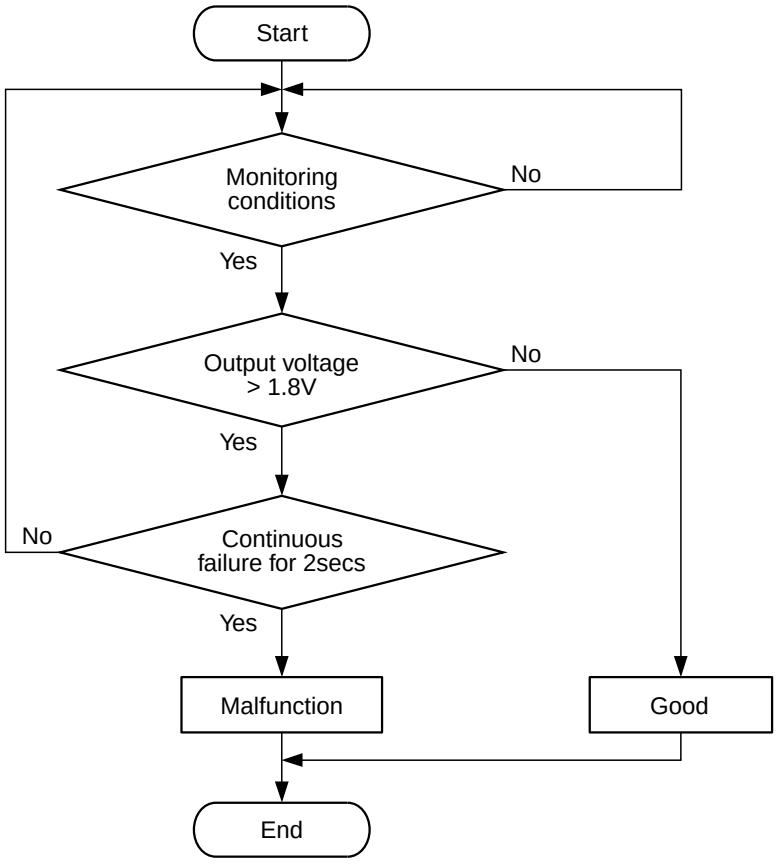
Not applicable.

Sensor (The sensor below is determined to be normal)

Not applicable.

DTC SET CONDITION

Logic Flow Chart



ZK603713 AA00

Check Conditions

- 2 seconds or more have passed since the engine starting sequence was completed.
- Heated oxygen sensor off set voltage is between 0.4 and 0.6 volt.

Judgement Criterion

- Center exhaust pipe Heated oxygen sensor 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.13Ab-8.

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

- Connector damage.
- Harness damage
- ECM 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 D-30 at the center exhaust pipe heated oxygen sensor and harness connector D-30 at ECM for damage.

Q:Is the harness connector in good condition?

YES: Go to Step 2.

NO: Repair 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 the center exhaust pipe heated oxygen sensor connector D-30 (terminal No. 3) and the ECM connector B-11 (terminal No. 101).

Q:Is the harness wire in good condition?

YES: 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. 13Ab-8.

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

Q:Is DTC P0138 set?

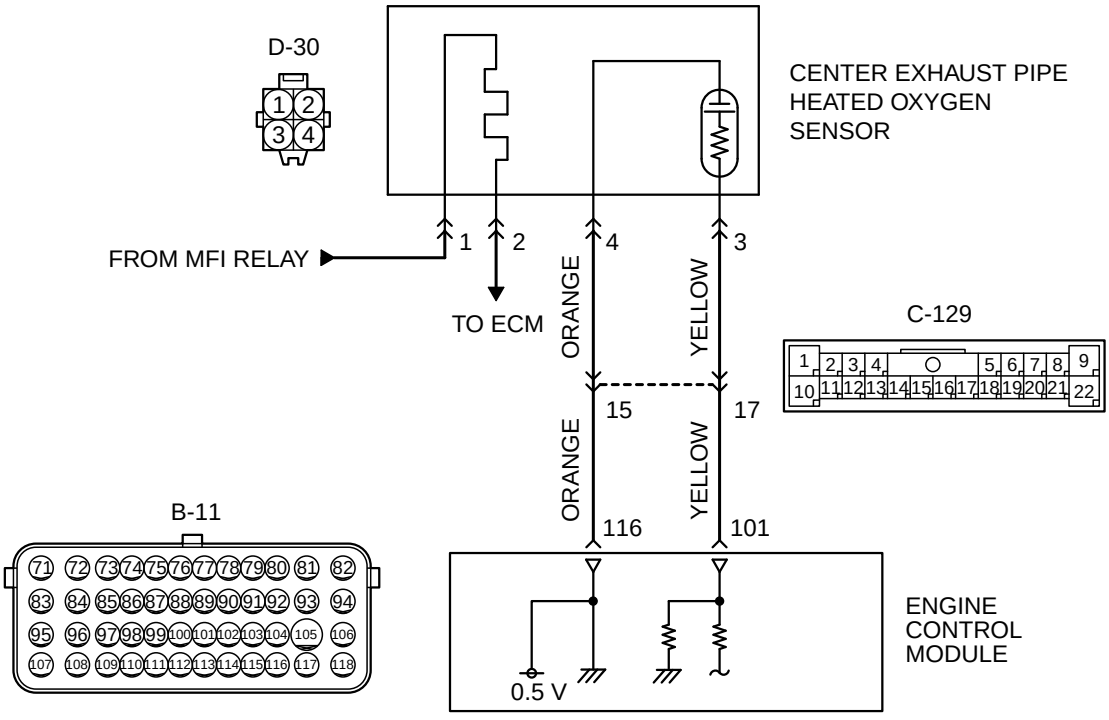
YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8.

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.00-15.

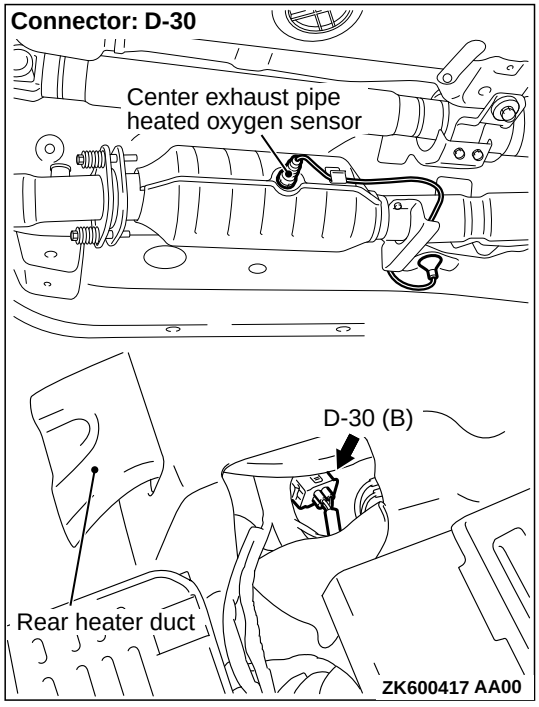
DTC P0145: Heated Oxygen Sensor Circuit Slow Response (bank 1, sensor 3)

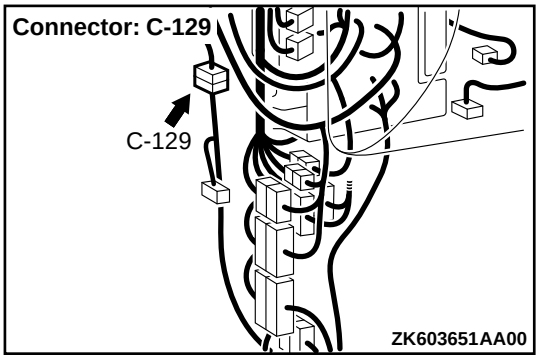
M11310100365USA0000010000

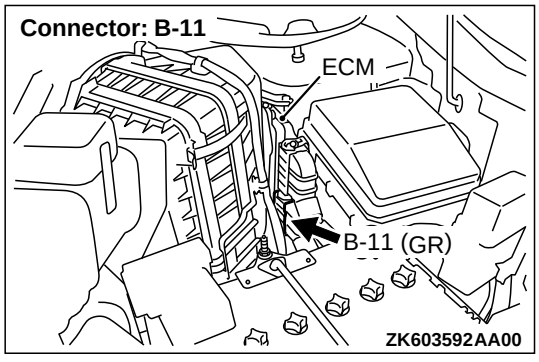
CENTER EXHAUST PIPE HEATED OXYGEN SENSOR CIRCUIT



ZK602864AA00







CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the ECM (terminal No. 101) from the output terminal (terminal No. 3) of the center exhaust pipe heated oxygen sensor.
- Terminal No. 4 of the center exhaust pipe heated oxygen sensor is grounded with ECM (terminal No. 116).
- The ECM applies an offset voltage of 0.5 volt to terminal No. 4 of the center exhaust pipe heated oxygen sensor.

TECHNICAL DESCRIPTION

The ECM checks for the center exhaust pipe heated oxygen sensor output voltage.

DESCRIPTIONS OF MONITOR METHODS

Center exhaust pipe heated oxygen sensor 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
- Center exhaust pipe heated oxygen sensor heater
- Air/fuel ratio feedback monitor

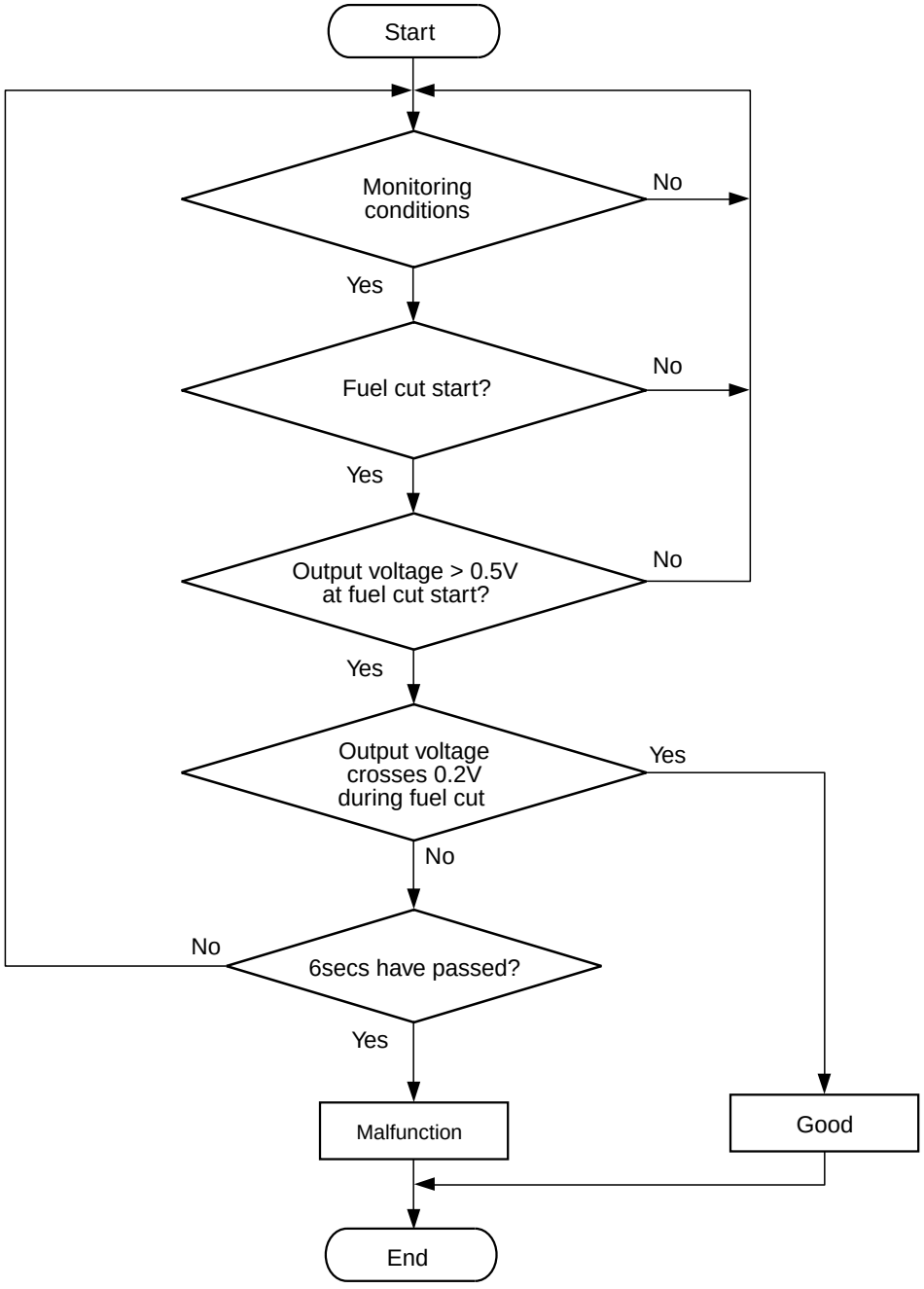
Sensor (The sensor below is determined to be normal)

- Mass airflow sensor

- Engine coolant temperature sensor

DTC SET CONDITIONS

Logic Flow Chart



ZK603720AA00

Check Conditions

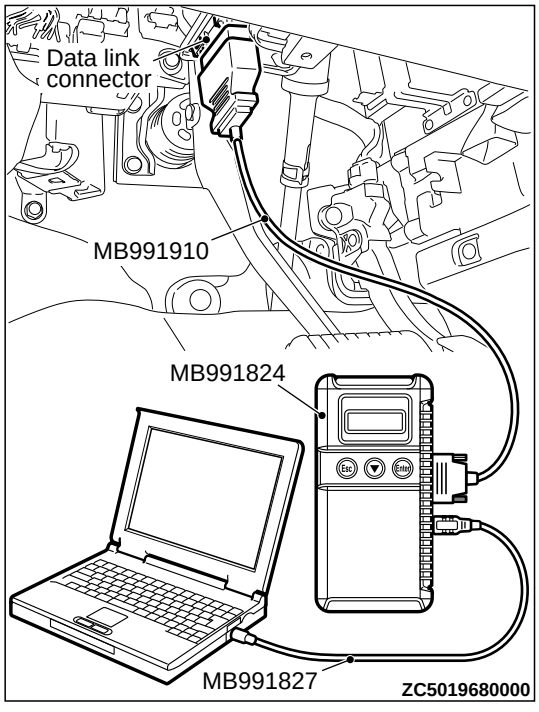
- Engine coolant temperature is higher than 76°C (169°F).
- The center exhaust pipe heated oxygen sensor (front) is active.
- The cumulative mass airflow sensor output is higher than 2,900 g.
- Fuel is being shut off.

Judgement Criterion
- Center exhaust pipe oxygen sensor output voltage does not reach 0.2 volt for 7 seconds from fuel cut start.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)
- Center exhaust pipe heated oxygen sensor failed.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function - OBD-II Drive Cycle - Pattern 11 P.13Ab-8.



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: Heated Oxygen Sensor Bank 1, Sensor 3 (center exhaust).

⚠ 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 B1, Heated Oxygen Sensor Bank 1, Sensor 3 (center exhaust pipe).
(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.00-15.

NO: Replace the center exhaust pipe heated oxygen sensor . 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. 13Ab-8.
(2) Check the diagnostic trouble code (DTC).

Q:Is DTC P0145 set?

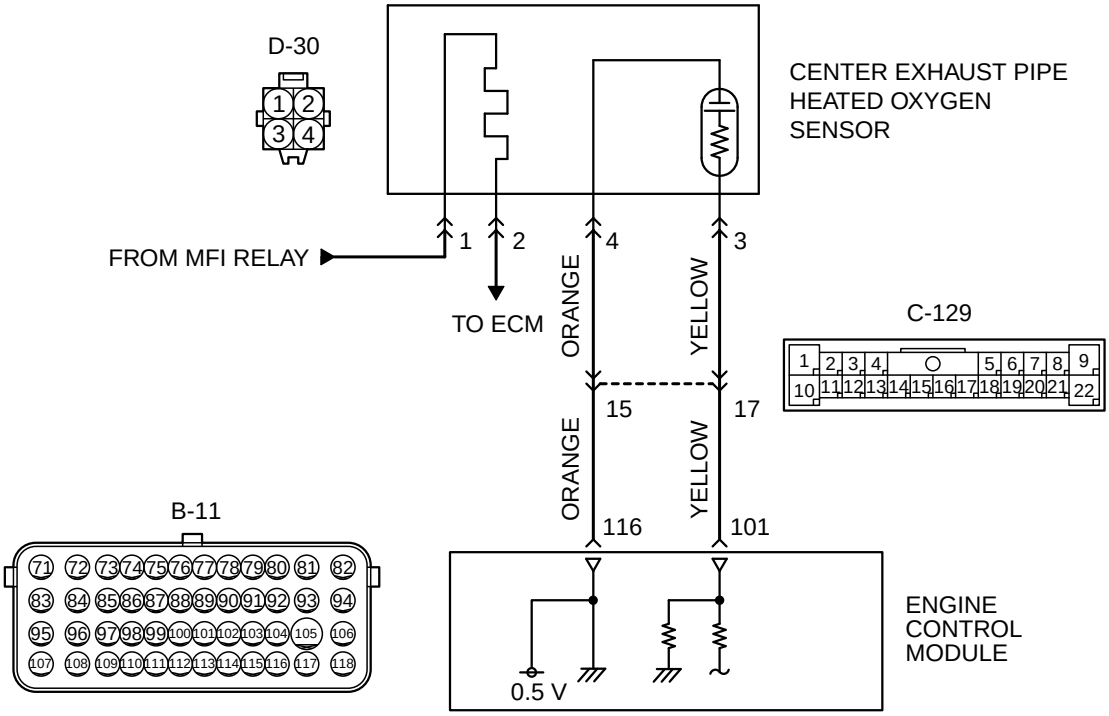
YES: Refer to DTC P0145 - Heated Oxygen Sensor Circuit Low Voltage (bank 1, sensor 3) P.13Ab-244, DTC P0144 -

Heated Oxygen Sensor Circuit High Voltage (bank 1, sensor 3) P.13Ab-240.
NO: The inspection is complete.

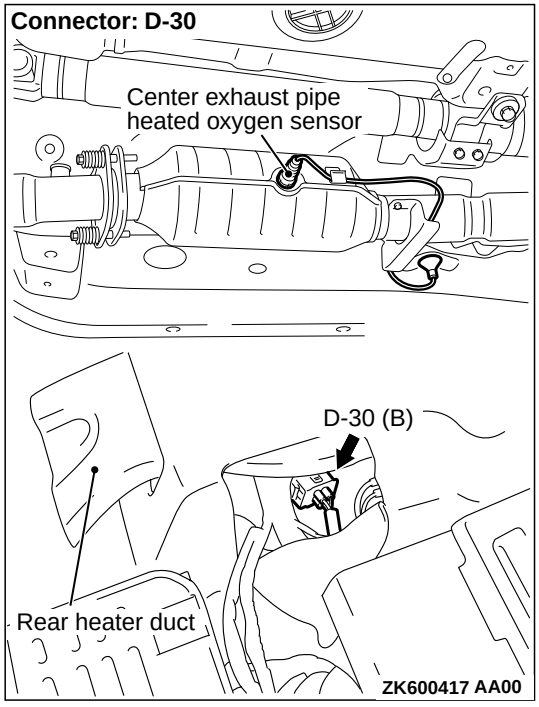
DTC P0146: Heated Oxygen Sensor Circuit Slow Response (bank 1, sensor 3)

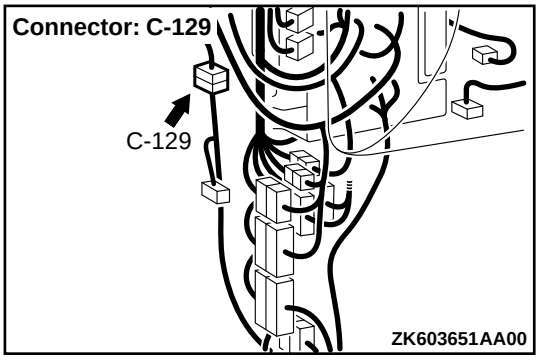
M11310100366USA0000010000

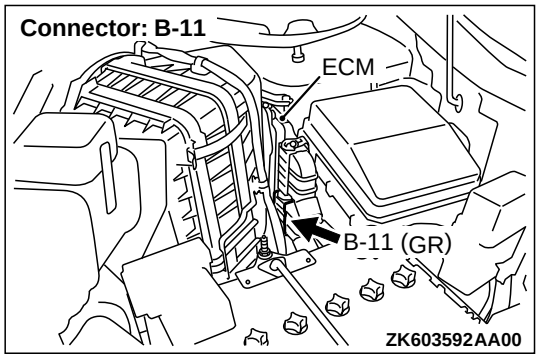
CENTER EXHAUST PIPE HEATED OXYGEN SENSOR CIRCUIT



ZK602864AA00







CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the ECM (terminal No. 101) from the output terminal (terminal No. 3) of the center exhaust pipe heated oxygen sensor.
- Terminal No. 4 of the center exhaust pipe heated oxygen sensor is grounded with ECM (terminal No. 106).
- The ECM applies an offset voltage of 0.5 volt to terminal No. 4 of the center exhaust pipe heated oxygen sensor.

TECHNICAL DESCRIPTION

The ECM checks for the center exhaust pipe heated oxygen sensor output voltage.

DESCRIPTIONS OF MONITOR METHODS

Center exhaust pipe heated oxygen sensor output voltage does not change during specified.

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
- Center exhaust pipe heated oxygen sensor
- Air/fuel ratio feedback monitor

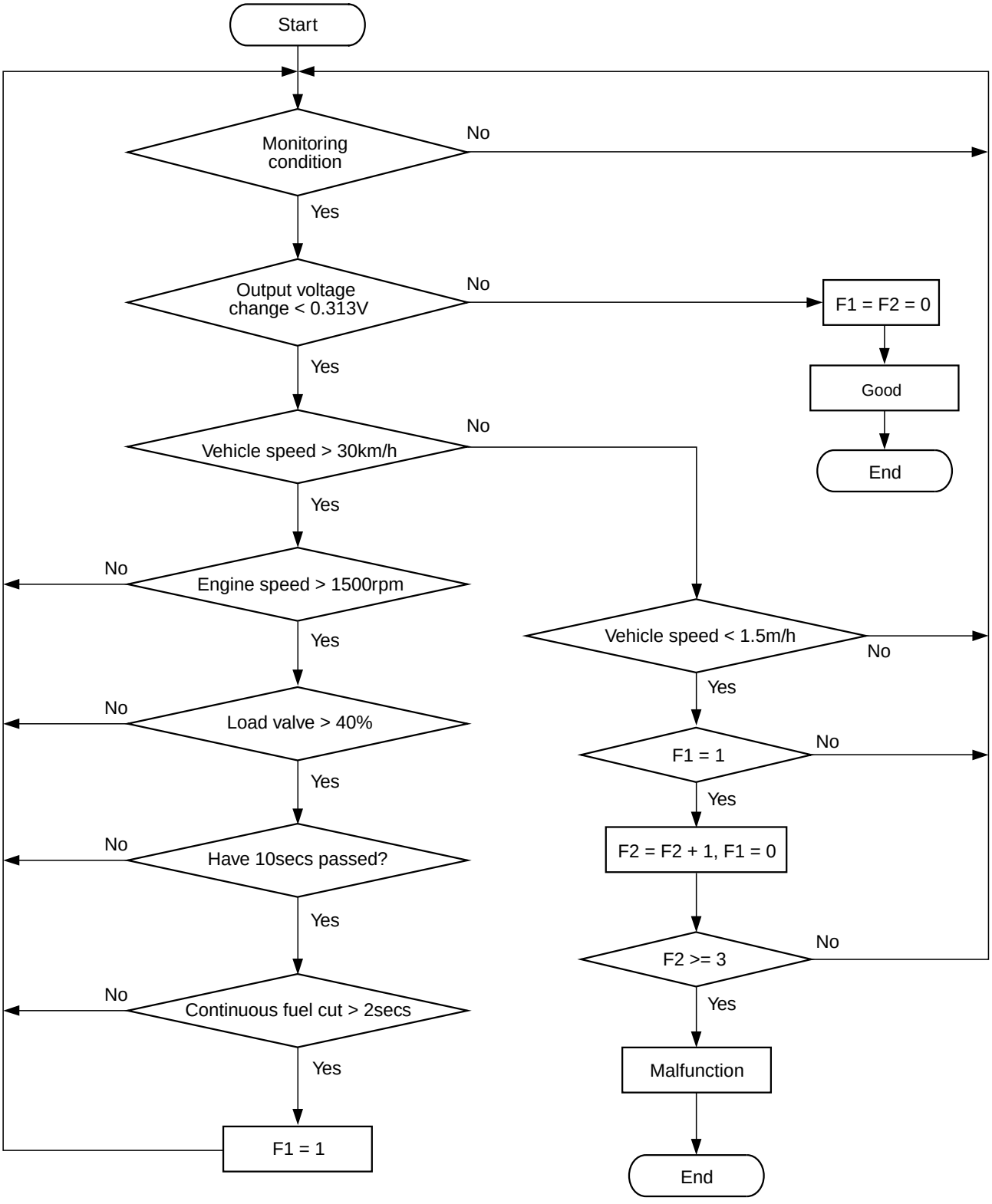
Sensor (The sensor below is determined to be normal)

- Mass airflow sensor

- Engine coolant temperature sensor
- Intake air temperature sensor
- Barometric pressure sensor

DTC SET CONDITIONS

Logic Flow Chart



ZK603721AA00

Check Conditions
- Engine coolant temperature is higher than 76°C (169°F).
- The center exhaust pipe heated oxygen sensor (front) is active.
- The cumulative mass airflow sensor output is higher than 2,900 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 (1.0 mph).

Judgement Criterion
- Change in the output voltage of the center exhaust pipe heated oxygen sensor is lower than 0.313 volt.

NOTE: Monitoring stops after fuel has been shut off for more than 38 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function - OBD-II Drive Cycle - Pattern 13 P.13Ab-8.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)
- Center exhaust pipe heated oxygen sensor 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

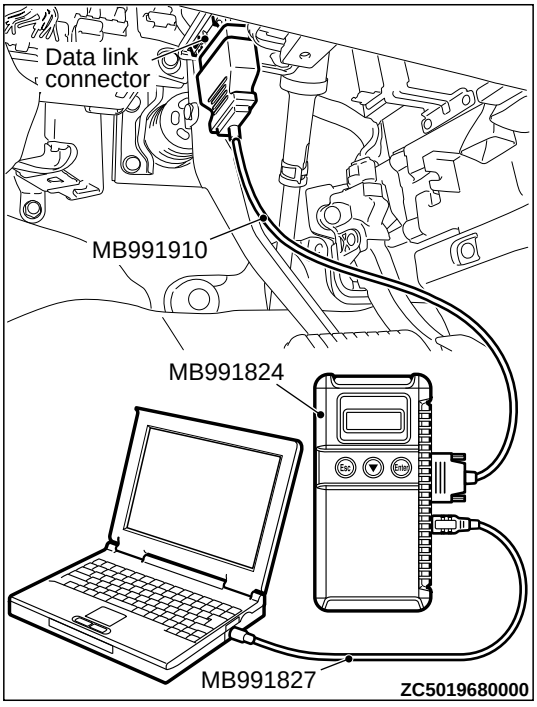
STEP 1. Using scan tool MB991958, check data list item AD: Heated Oxygen Sensor Bank 1, Sensor 3 (center exhaust pipe).

⚠ 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 B1, Heated Oxygen Sensor Bank 1, Sensor 3 (center exhaust pipe).
  a Transaxle: 2nd speed
  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.00-15.
NO: Go to Step 2.

STEP 2. Test the OBD-II drive cycle.

(1) Replace the center exhaust pipe heated oxygen sensor. When the center exhaust pipe heated oxygen sensor is replaced, carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function - OBD-II Drive Cycle - Pattern 13 P.13Ab-8.
(2) Check the diagnostic trouble code (DTC).

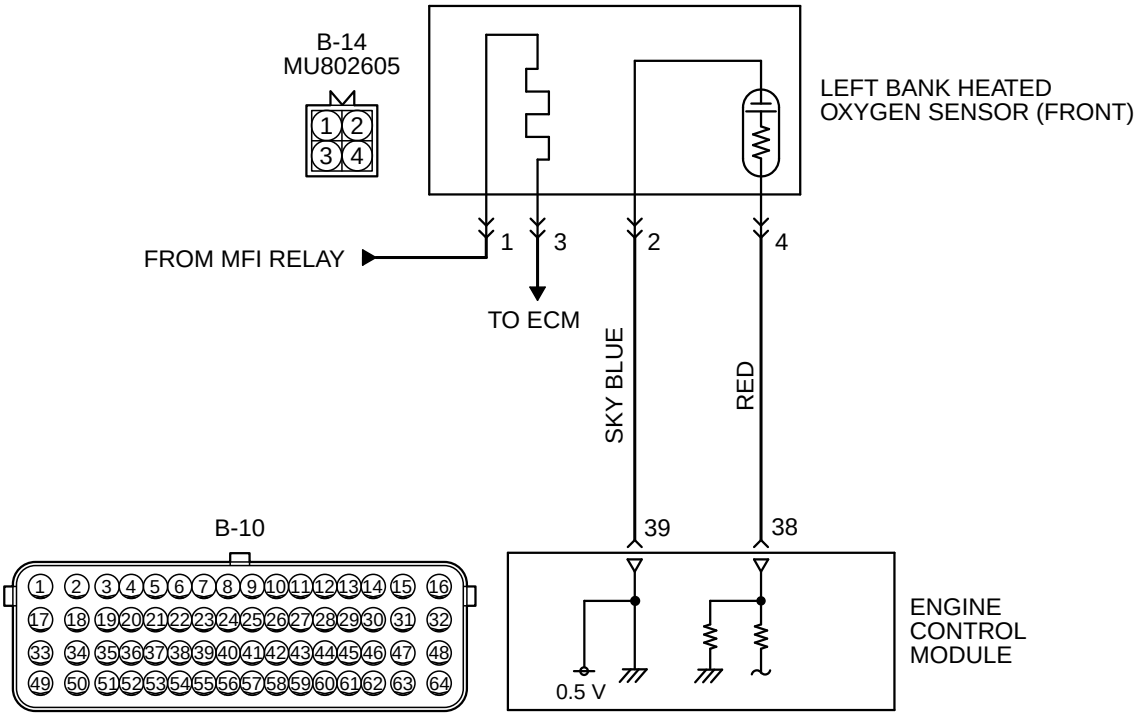
Q:Is DTC P0146 set?

YES: Refer to, P0143 - Heated Oxygen Sensor Circuit Low Voltage (bank 1, sensor 3) P.13Ab-235, DTC P0144 - Heated Oxygen Sensor Circuit High Voltage (bank 1, sensor 3) P.13Ab-240.
NO: The inspection is complete.

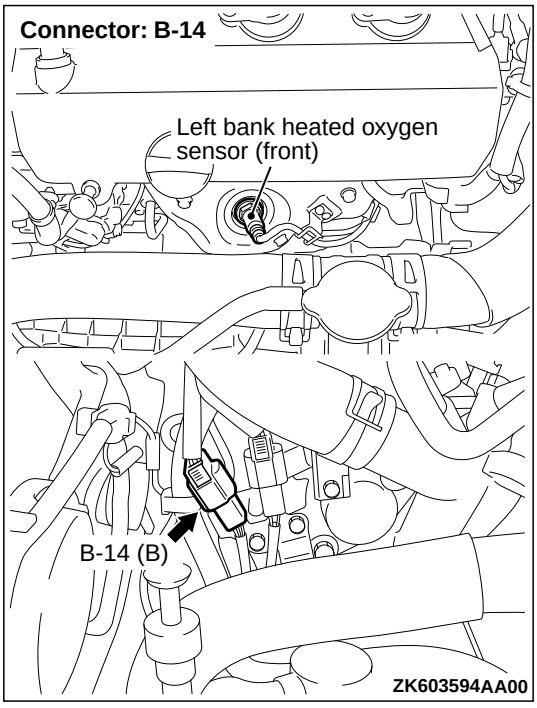
DTC P0151: Heated Oxygen Sensor Circuit Low Voltage (bank 2, sensor 1)

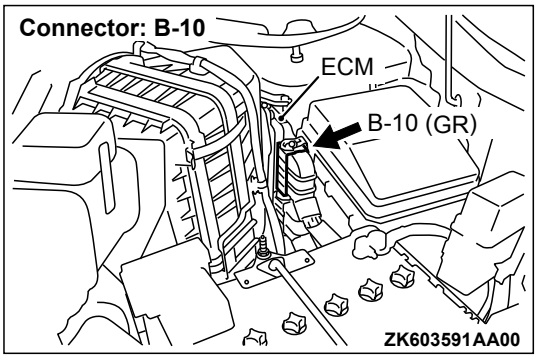
M11310100194USA0000010000

LEFT BANK HEATED OXYGEN SENSOR (FRONT) CIRCUIT



ZK602840 AA00





CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the ECM (terminal No. 38) from the output terminal (terminal No. 4) of the left bank heated oxygen sensor (front).
- Terminal No. 2 of the left bank heated oxygen sensor (front) is grounded with or ECM (terminal No. 39).
- The ECM applies an offset voltage of 0.5 volt to terminal No. 2 of the left bank heated oxygen sensor (front).

TECHNICAL DESCRIPTION

- The left bank heated oxygen sensor (front) detects the concentration of oxygen in the exhaust gas; it converts that data to voltage, and sends it to the ECM.
- When the left bank heated oxygen sensor (front) begins to deteriorate, the heated oxygen sensor signal response deteriorates also.
- The ECM also checks for the left bank heated oxygen sensor (front) output voltage.

DESCRIPTIONS OF MONITOR METHODS

The left bank 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)

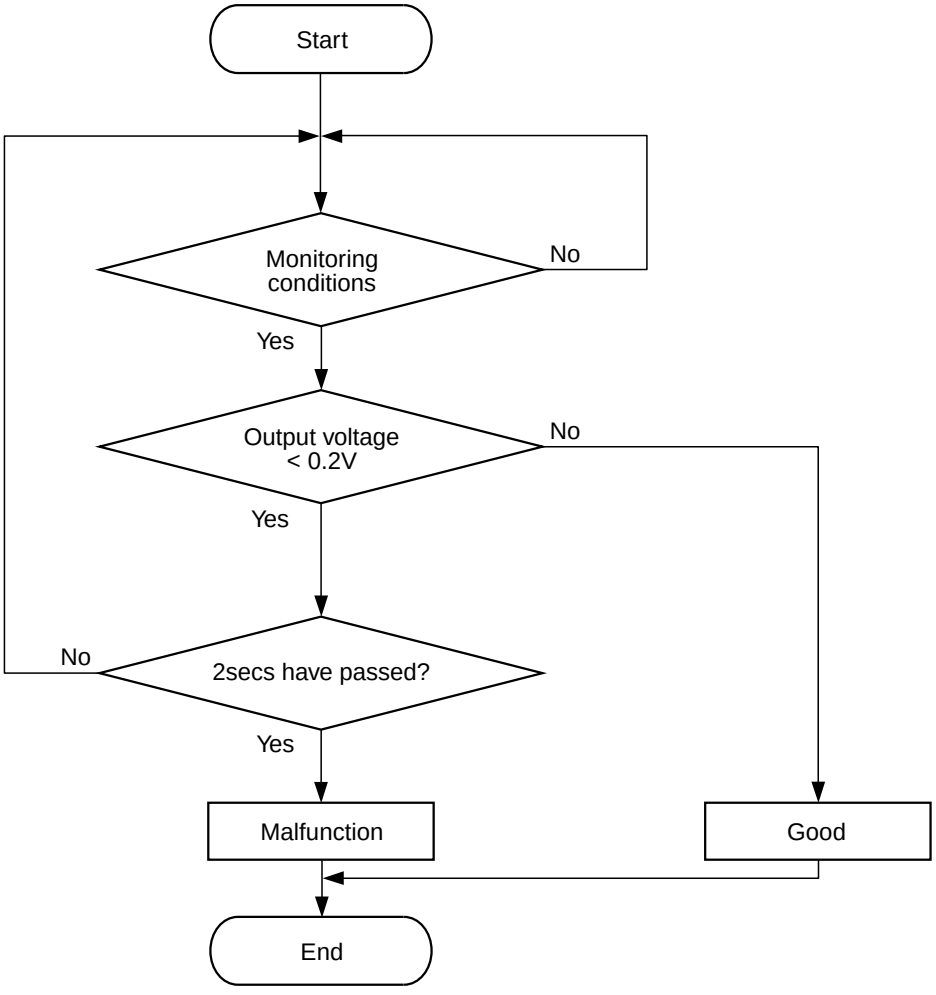
- Heated oxygen sensor heater (front) monitor
- Misfire monitor
- Fuel system monitor

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



ZK603708 AA00

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

- Left bank heated oxygen sensor (front) output voltage is lower than 0.2 volts.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function - OBD-II Drive Cycle - Pattern 23 P.13Ab-8.

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

- Left bank heated oxygen sensor (front) failed.
- Connector damage.
- Harness damage.
- ECM failed.

DIAGNOSIS

STEP 1. Check harness connector B-14 at the left bank heated oxygen sensor (front) and harness connector B-10 at the ECM 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 the left bank heated oxygen sensor (front).

(1) Disconnect the left bank heated oxygen sensor (front) connector B-14 and connect test harness special tool, MB998464, to the connector on the left bank heated oxygen sensor (front) side.

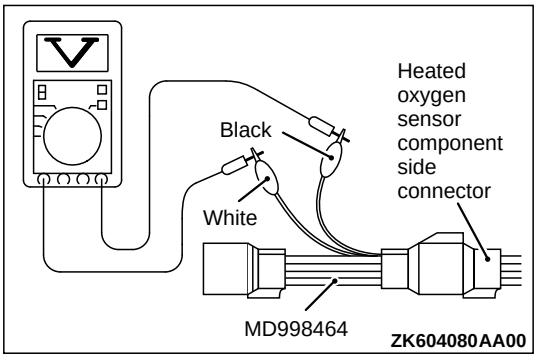
(2) Warm up the engine until engine coolant temperature reaches 80°C (176°F) or higher.

(3) Rev the engine for 5 minutes or more with the engine speed of 2,500 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 right bank heated oxygen sensor (front) output voltage.

Standard value: 0.6 - 1.0 volts



⚠ 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.

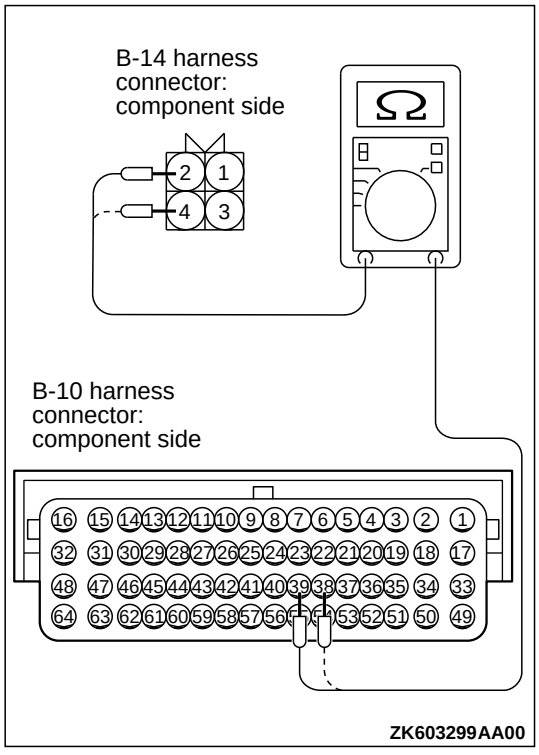
Q:Is the voltage between 0.6 and 1.0 volts?

YES: Go to Step 3.

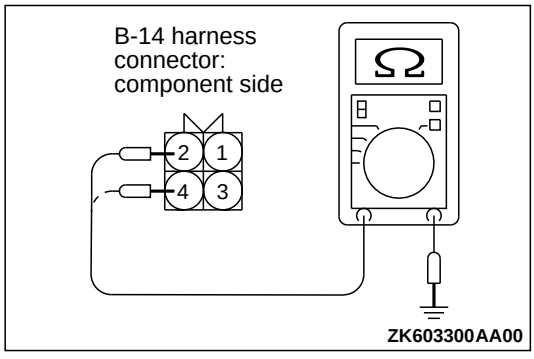
NO: Replace the left bank heated oxygen sensor (front). Then go to Step 5.

STEP 3. Check for harness between the left heated oxygen sensor (front) connector B-14 and the ECM connector B-10.

(1) Disconnect the left bank heated oxygen sensor (front) connector B-14 and the ECM connector B-10.

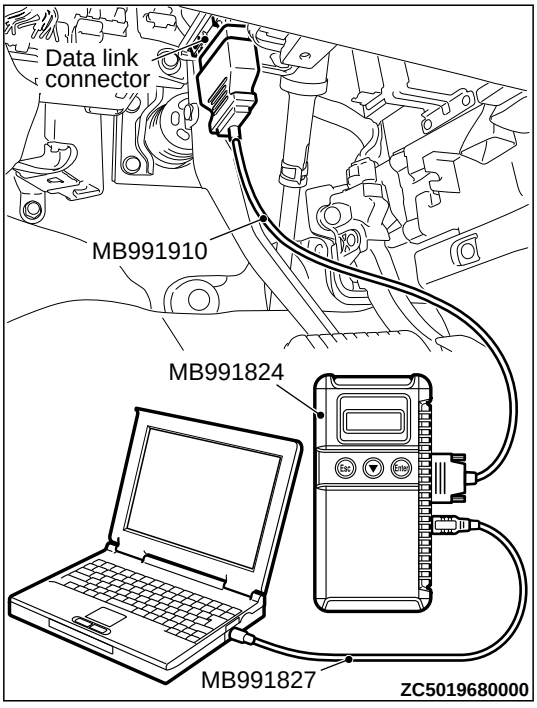


(2) Measure the resistance between the heated oxygen sensor connector B-14 and the ECM connector B-10.
a Connector B-14 (terminal No. 2) and connector B-10 (terminal No. 39).
b Connector B-14 (terminal No. 4) and connector B-10 (terminal No. 38).
- Should be less than 2 ohms.



(3) Check for the continuity between the oxygen sensor connector B-14 and ground.
a Connector B-14 (terminal No. 2) and ground
b Connector B-14 (terminal No. 4) and ground
- Not continuity.

Q:Is the harness wire in good condition?
YES: Go to Step 4.
NO: Repair it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 5.



STEP 4. Using scan tool MB991958, check data list item AE: Heated Oxygen Sensor Bank 2, Sensor 1 (left 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, Heated Oxygen Sensor Bank 2, Sensor 1 (left front).
- Warm up the engine. When the engine is revved, the output voltage should battery positive voltage.
- Warm up the engine. When the engine is idling, the output voltage should repeat 0.4 volt or less 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.00-15.

NO: Replace the ECM. 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 23 P. 13Ab-8.
(2) Check the diagnostic trouble code (DTC).

Q:Is DTC P0151 set?

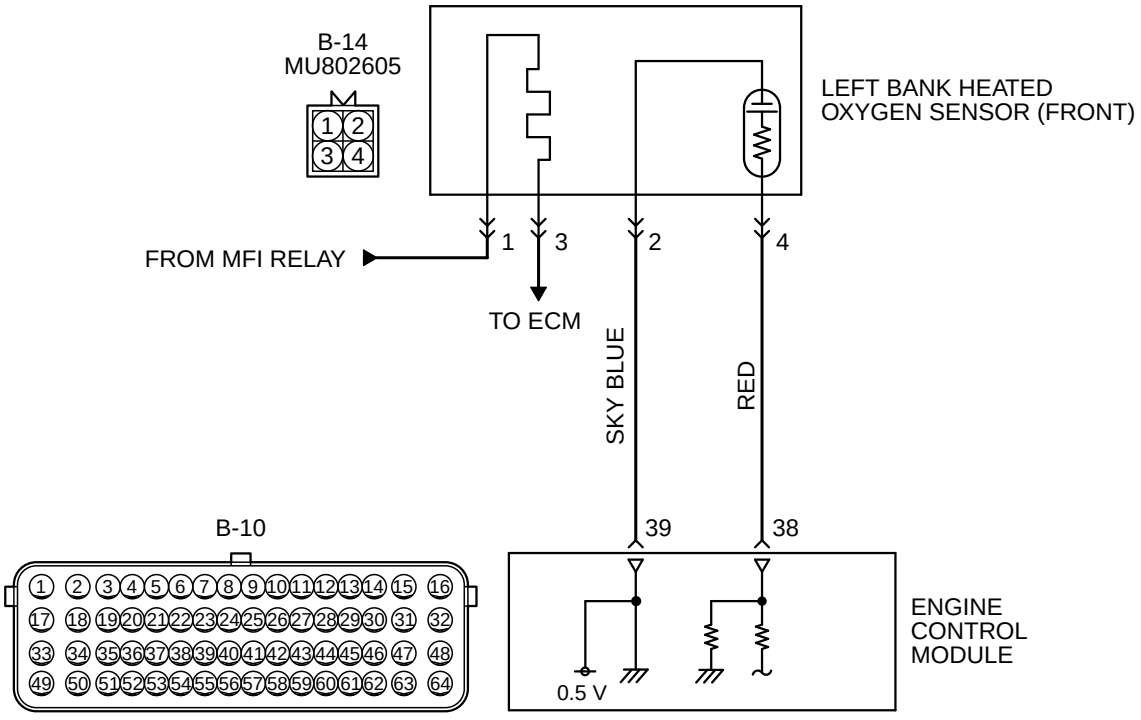
YES: Retry the troubleshooting.

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.00-15.

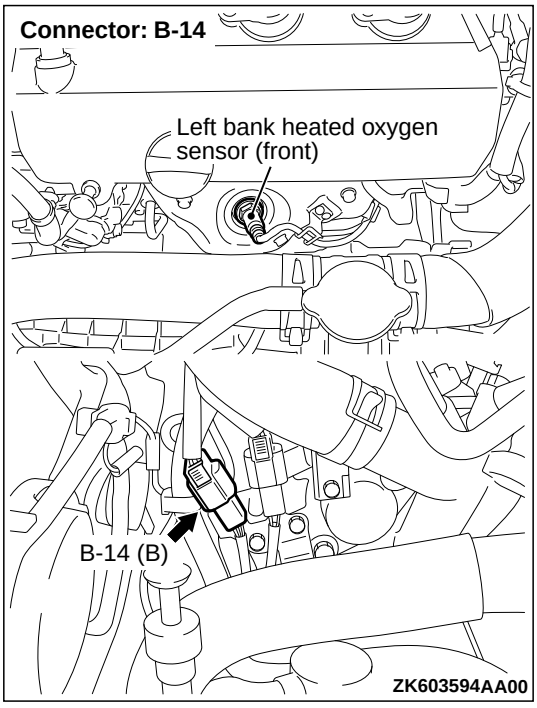
DTC P0152: Heated Oxygen Sensor Circuit High Voltage (bank 2, sensor 1)

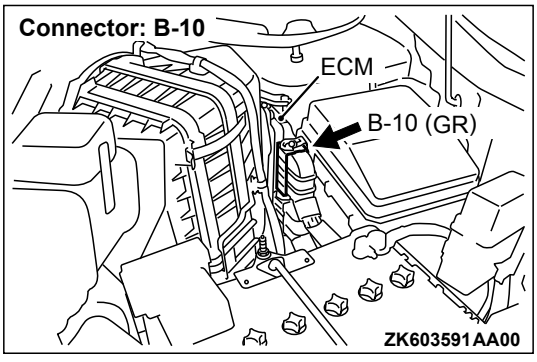
M11310100195USA0000010000

LEFT BANK HEATED OXYGEN SENSOR (FRONT) CIRCUIT



ZK602840 AA00





CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the ECM (terminal No. 38) from the output terminal (terminal No. 4) of the left bank heated oxygen sensor (front).
- Terminal No. 2 of the left bank heated oxygen sensor (front) is grounded with ECM (terminal No. 39).
- The ECM applies an offset voltage of 0.5 volt to terminal No. 2 of the left bank heated oxygen sensor (front).

TECHNICAL DESCRIPTION

- The left bank heated oxygen sensor (front) detects the concentration of oxygen in the exhaust gas; it converts those data to voltage, and input the resulting signals to the ECM.
- When the left bank heated oxygen sensor (front) begins to deteriorate, the heated oxygen sensor signal response becomes poor.
- The ECM also checks for the left bank heated oxygen sensor (front) output voltage.

DESCRIPTIONS OF MONITOR METHODS

Left bank heated oxygen sensor (front) output voltage is over specified range.

MONITOR EXECUTION

Continuous

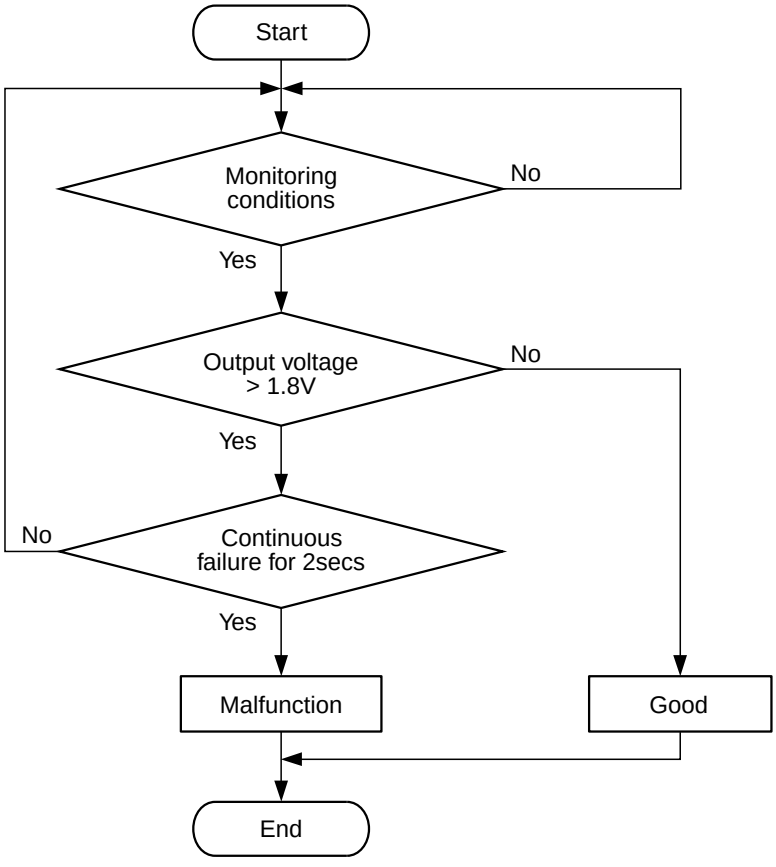
MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

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 CONDITION

Logic Flow Chart



ZK603713 AA00

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
- Left bank 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.13Ab-8.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)
- Harness damage.
- Connector damage.
- ECM failed.

DIAGNOSIS

STEP 1. Check harness connector B-14 (terminal No. 4) at left bank heated oxygen sensor (front) and harness connector B-10 (terminal No. 38) at ECM for damage.

Q:Is the harness connector in good condition?
YES: Go to Step 2.
NO: Repair it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 4.

STEP 2. Check for open circuit to power supply between the left bank oxygen sensor (front) connector B-14 and the ECM connector B-10.

Q:Is the harness wire in good condition?
YES: Go to Step 3.
NO: Repair it. Then go to Step 4.

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. 13Ab-8.
(2) Check the diagnostic trouble code (DTC).

Q:Is DTC P0152 set?
YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. 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.00-15.

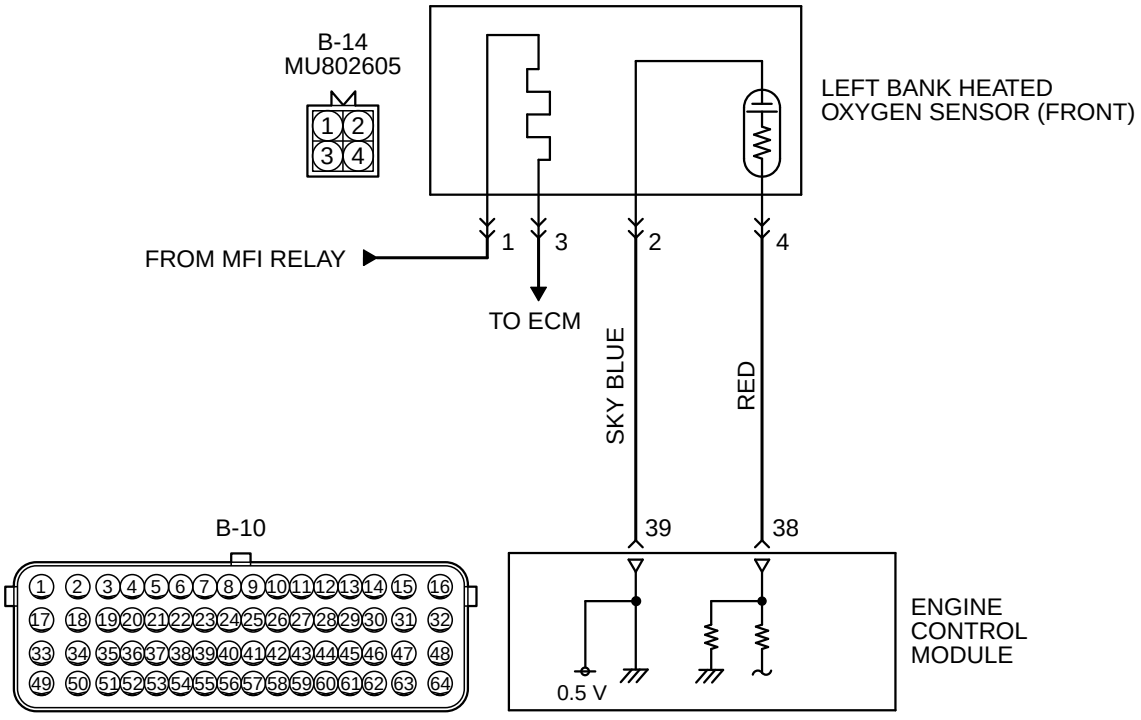
STEP 4. Test the OBD-II drive cycle.
(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function - OBD-II Drive Cycle - Pattern 24 P. 13Ab-8.
(2) Check the diagnostic trouble code (DTC).

Q:Is DTC P0152 set?
YES: Retry the troubleshooting.
NO: The inspection is complete.

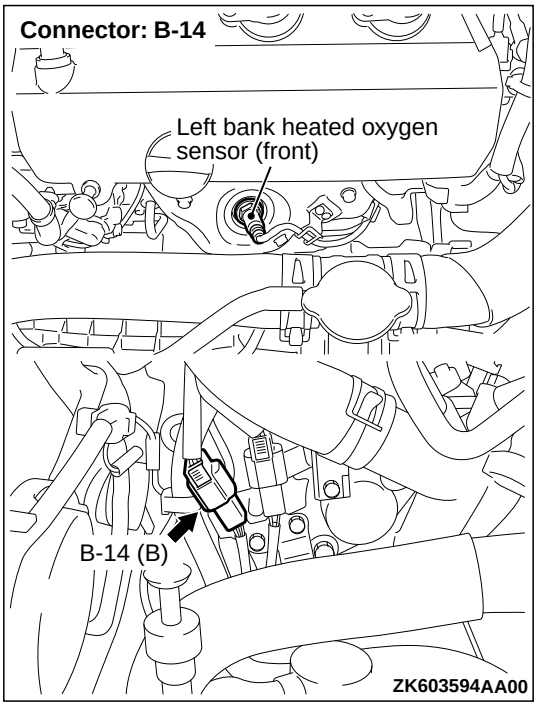
DTC P0153: Heated Oxygen Sensor Circuit Slow Response (bank 2, sensor 1)

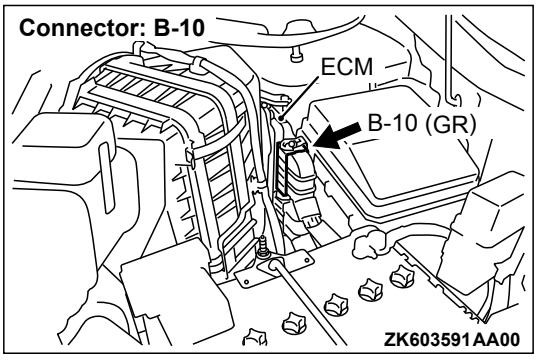
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LEFT BANK HEATED OXYGEN SENSOR (FRONT) CIRCUIT



ZK602840 AA00





CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the ECM (terminal No. 38) from the output terminal (terminal No. 4) of the left bank heated oxygen sensor (front).
- Terminal No. 2 of the left bank heated oxygen sensor (front) is grounded with ECM (terminal No. 39).
- The ECM applies an offset voltage of 0.5 volt to terminal No. 2 of the left bank heated oxygen sensor (front).

TECHNICAL DESCRIPTION

- The left bank 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 ECM.
- When the left bank heated oxygen sensor (front) begins to deteriorate, the left bank heated oxygen sensor signal response becomes poor.
- The ECM also checks for the left bank heated oxygen sensor (front) rich/lean switch frequency.

DESCRIPTIONS OF MONITOR METHODS

Left bank 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)

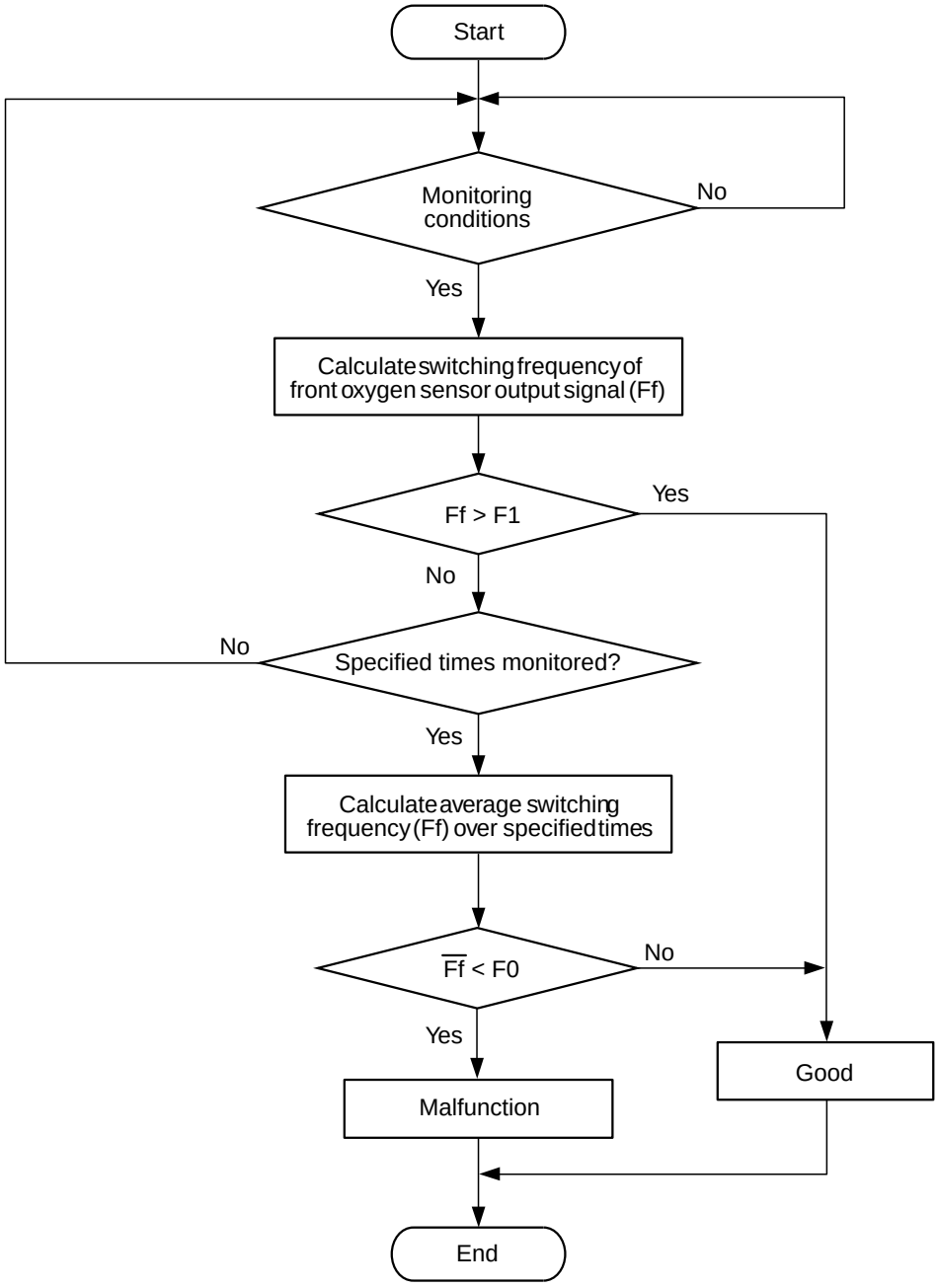
- Heated oxygen sensor heater (front) monitor
- Misfire monitor
- Fuel system monitor

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 CONDITION

Logic Flow Chart



ZK603714 AA00

Check Conditions

- Engine coolant temperature is higher than 50°C (122°F).
- Engine speed is between 1,250 and 3,500 r/min.
- Volumetric efficiency is between 25 and 65 percent.
- Under the closed loop air/fuel control.
- The accelerator pedal 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 ECM monitors for this condition for 5 cycles of 12 seconds each during the drive cycle.

Judgement Criterion

- The average of the left bank heated oxygen sensor (front) rich/lean switching frequency is less than 13 times per 12 seconds.

NOTE: If the sensor switching frequency is lower than the Judgment 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.13Ab-8.

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

- Left bank heated oxygen sensor (front) deteriorated.
- ECM failed.

DIAGNOSIS

Required Special Tools:

- MD998464: Test Harness

STEP 1. Check the left bank heated oxygen sensor (front).

(1) Disconnect the left bank heated oxygen sensor (front) connector B-14 and connect test harness special tool, MD998464, to the connector on the left bank heated oxygen sensor (front) side.

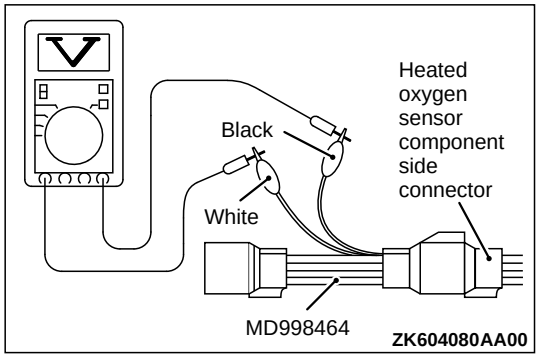
(2) Warm up the engine until engine coolant temperature reaches 80°C (176°F) or higher.

(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 engine, 2,500 r/min.

- Output voltage repeats 0 - 0.4 volt or less and 0.6 - 1.0 volts 13 times or more within 12 seconds.



⚠ 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 sensor operating properly?
YES: Go to Step 3.
NO: Replace the left bank heated oxygen sensor (front). 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 1 P. 13Ab-8.
(2) Check the diagnostic trouble code (DTC).

Q:Is DTC P0153 set?
YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-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.00-15.

DTC P0154: Heated Oxygen Sensor Circuit No Activity Detected (bank 2, sensor 1)

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Heated Oxygen Sensor Circuit No Activity Detected (bank 2, sensor 1) Circuit
- Refer to, DTC P0151 - Left Bank Heated Oxygen Sensor (Front) Circuit Low Voltage P.13Ab-253.
- Refer to, DTC P0202 P.13Ab-340, P0204 P. 13Ab-355, P0206 P.13Ab-370- Injector Circuit.

CIRCUIT OPERATION
- Refer to, DTC P0151 - Left Bank Heated Oxygen Sensor (Front) Circuit Low Voltage P.13Ab-253.
- Refer to, DTC P0202 P.13Ab-340, P0204 P. 13Ab-355, P0206 P.13Ab-370- Injector Circuit.

TECHNICAL DESCRIPTION
- The ECM effects air/fuel ratio feedback control in accordance with the signals from the left bank heater oxygen sensor (front).
- If the left bank heated oxygen sensor (front) has deteriorated, corrections will be made by the 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
Left bank heated oxygen sensor (front) output voltage does not exceed lean/rich criteria (about 0.5 volt) within specified period.

MONITOR EXECUTION
Continuous

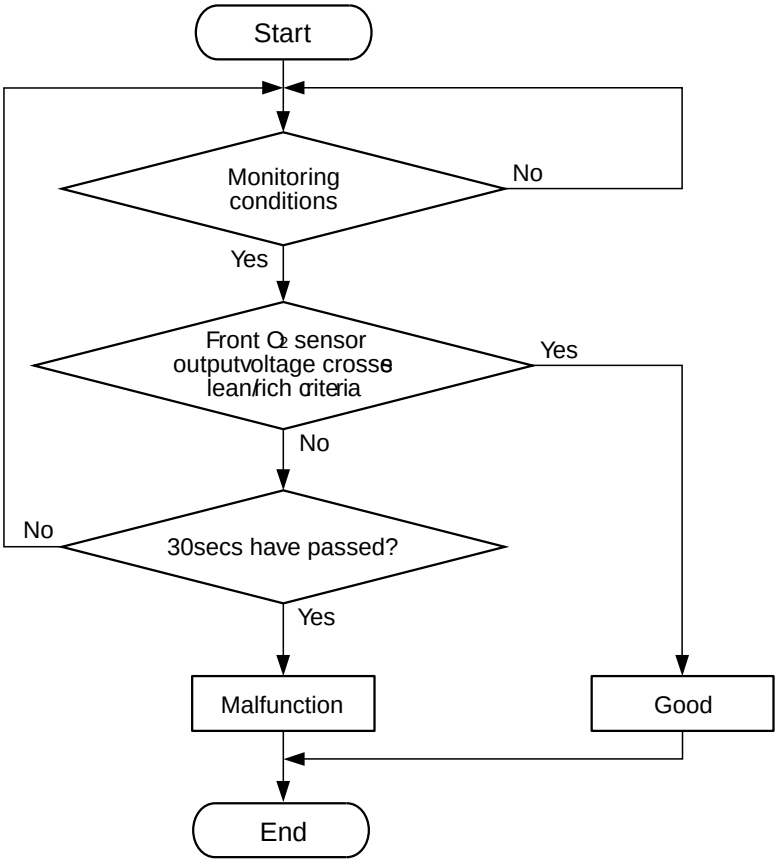
MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

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



ZK603715 AA00

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

- Left bank 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.13Ab-8.

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

- Left bank heated oxygen sensor (front) deteriorated.
- Harness damage.

NOTE: When the left bank 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 left bank heated oxygen sensor (rear). If the left bank heated oxygen sensor (rear) responds poorly because it has deteriorated, it will improperly correct the left

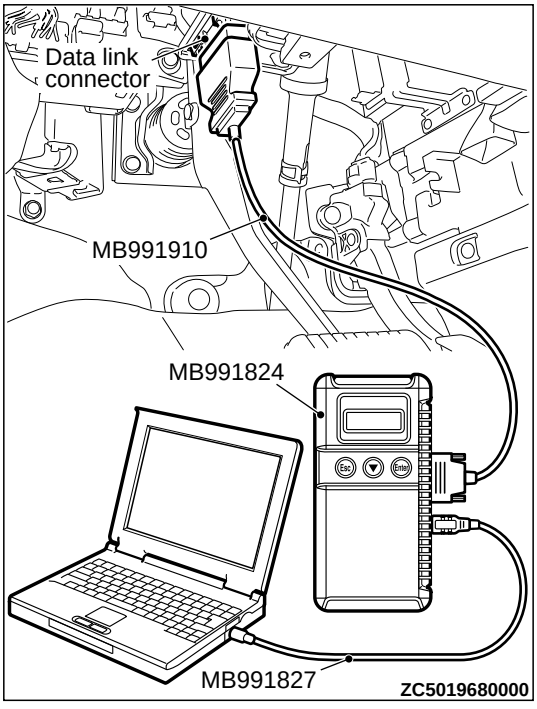
bank heated oxygen sensor (front). Thus, even when closed loop control is being effected, the fluctuation of the left bank heated oxygen sensor (front) output voltage decreases, without intersecting with 0.5 volt. As a result, there is a possibility of DTC P0154 becoming registered.

- Connector damage.
- Exhaust leak.
- Air drawn in from gaps in gasket, seals, etc.
- Incorrect fuel pressure.
- ECM failed.

- Open circuit in right bank injector.

DIAGNOSIS

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



STEP 1. Using scan tool MB991958, check data list item AF: Heated Oxygen Sensor Bank 2, Sensor 2 (left 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, Heated Oxygen Sensor Bank 2, Sensor 2 (left rear).
- Warm 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: Refer to, DTC P0157 - Heated Oxygen Sensor Circuit Low Voltage (bank 2, sensor 2) P.13Ab-275, DTC P0158 Heated Oxygen Sensor Circuit High Voltage (bank 2, sensor 2) P.13Ab-280, DTC P0159 - Heated Oxygen Sensor Circuit Slow Response (bank 2, sensor 2) P.13Ab-284, DTC P0160 - Heated Oxygen Sensor Circuit No Activity Detected (bank 2, sensor 2) P.13Ab-288.

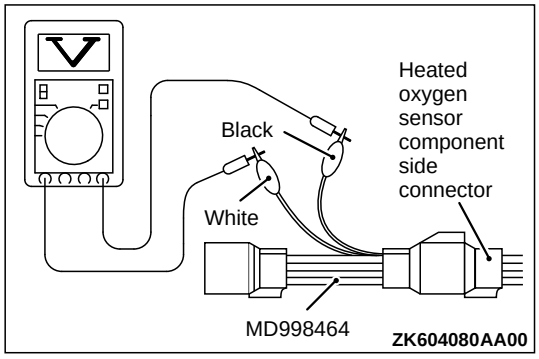
NO: Go to Step 2.

STEP 2. Check harness connector B-14 at the left bank heated oxygen sensor (front) and harness connector B-10 at the ECM for damage.

Q:Is the harness connector in good condition?

YES: Go to Step 3.

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



STEP 3. Check the left bank heated oxygen sensor (front).

(1) Disconnect the left bank heated oxygen sensor (front) connector B-14 and connect test harness special tool, MD998464 to the connector on the left bank 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 left bank heated oxygen sensor (front) output voltage.

Standard value: 0.6 - 1.0 volts

⚠ CAUTION

- **Be very careful when connecting the jumper wires; incorrect connection can damage the heated oxygen sensor.**
- **Be careful the heater can be damaged it voltage beyond 8 volts is applied to the heated oxygen sensor heater.**

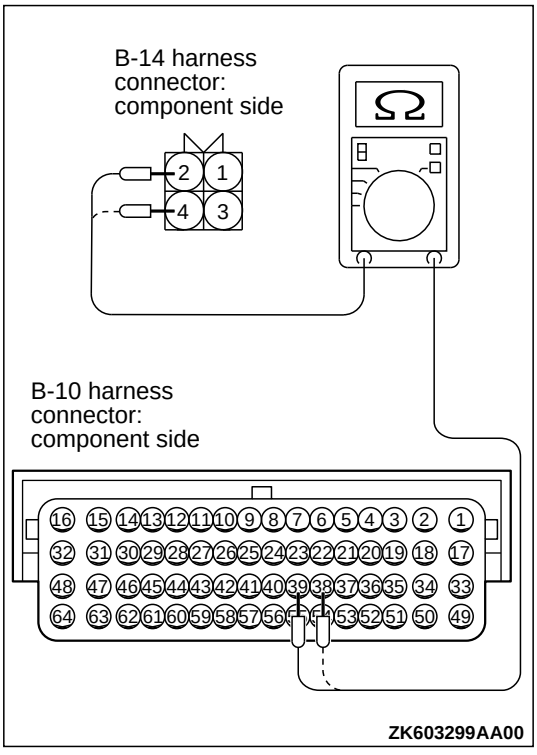
NOTE: If the sufficiently high temperature [of approximate 400° C (752° F) or more] is not reached although the heated oxygen sensor is normal, the output voltage would be possibly low although the rich air/fuel ratio. Therefore, if the output voltage is low, use a jumper wire to connect the terminal 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 voltage between 0.6 and 1.0 volts?

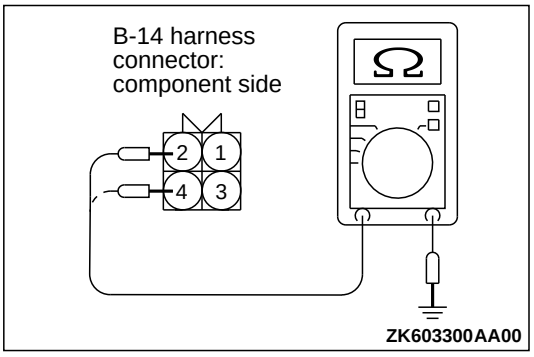
YES: Go to Step 4.
NO: Replace the left bank heated oxygen sensor (front). Then go to Step 12.

STEP 4. Check for harness between the left heated oxygen sensor (front) connector B-14 and the ECM connector B-10.

(1) Disconnect the left bank heated oxygen sensor (front) connector B-14 and the ECM connector B-10.



(2) Measure the resistance between the heated oxygen sensor connector B-14 and the ECM connector B-10.
a Connector B-14 (terminal No. 2) and connector B-10 (terminal No. 39).
b Connector B-14 (terminal No. 4) and connector B-10 (terminal No. 38).
- Should be less than 2 ohms.



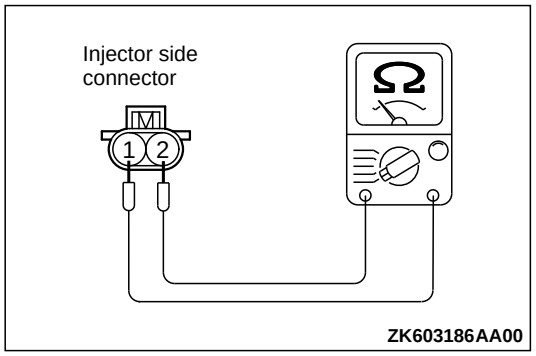
(3) Check for the continuity between the oxygen sensor connector B-14 and ground.
a Connector B-14 (terminal No. 2) and ground
b Connector B-14 (terminal No. 4) and ground
- Not continuity.

Q:Is the harness wire in good condition?
YES: Go to Step 4.
NO: Repair it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

STEP 5. Check harness connector B-115, B-116, B-120 at left bank injector for damage.
(1) Remove the intake manifold.
(2) Check the left bank injector 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 12.

STEP 6. Check the left bank injector.
(1) Disconnect each left bank injector connector.

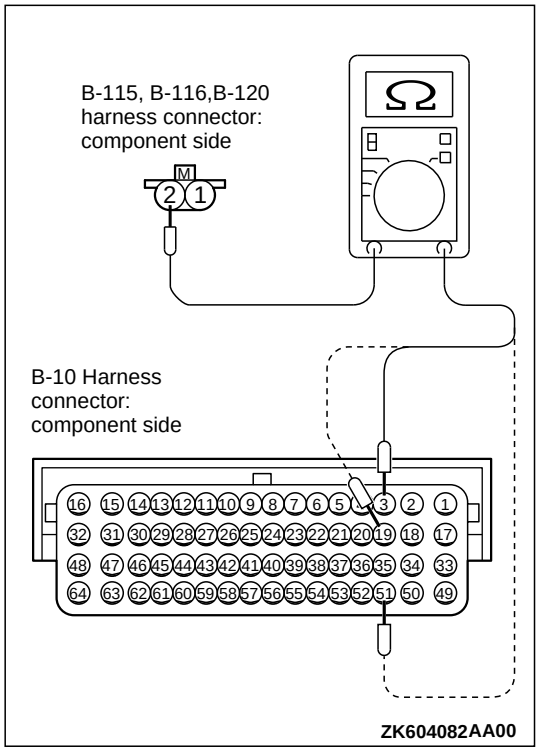


(2) Measure the resistance between injector side connector terminal No. 1 and No. 2.
Standard value: 10.5 - 13.5 Ω [at 20°C (68°F)]

Q:Is the measured resistance between 10.5 and 13.5 ohms [at 20°C (68°F)]?
YES: Go to Step 7.
NO: Replace the injector. Then go to Step 12.

STEP 7. Check for harness between the left bank injector connector B-115, B-116, B-120 and the ECM connector B-10.

(1) Disconnect the right bank injector connector B-115, B-116, B-120 and the ECM connector B-10.connector B-14 and the ECM connector B-10.
(2) Measure the resistance between the right bank injector connector B-115, B-116, B-120 and the ECM connector B-10.
a Connector B-115 (terminal No. 2) and connector B-10 . (terminal No. 51) at No. 6 Cylinder injector.
b Connector B-116 (terminal No. 2) and connector B-10 . (terminal No. 19) at No. 4 Cylinder injector.
c Connector B-120 (terminal No. 2) and connector B-10 . (terminal No. 3) at No. 2 Cylinder injector.
▪Should be less than 2 ohms.



Q:Is the harness wire in good condition?
YES: Go to Step 7.
NO: Repair it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

STEP 8. Check the fuel pressure.
Refer to On-vehicle Service - Fuel Pressure Test P.13Aa-17.

Q:Is the fuel pressure normal?
YES: Go to Step 9.
NO: Repair it. Then go to Step 12.

STEP 9. Check for exhaust leaks.

Q:Are there any abnormalities?
YES: Repair it. Then go to Step 12.
NO: Go to Step 10.

STEP 10. Check for intake system vacuum leak.

Q:Are there any abnormalities?
YES: Repair it. Then go to Step 12.

NO: 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 12 P. 13Ab-8.
(2) Check the diagnostic trouble code (DTC).

Q:Is DTC P0154 set?

YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. 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.00-15.

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. 13Ab-8.
(2) Check the diagnostic trouble code (DTC).

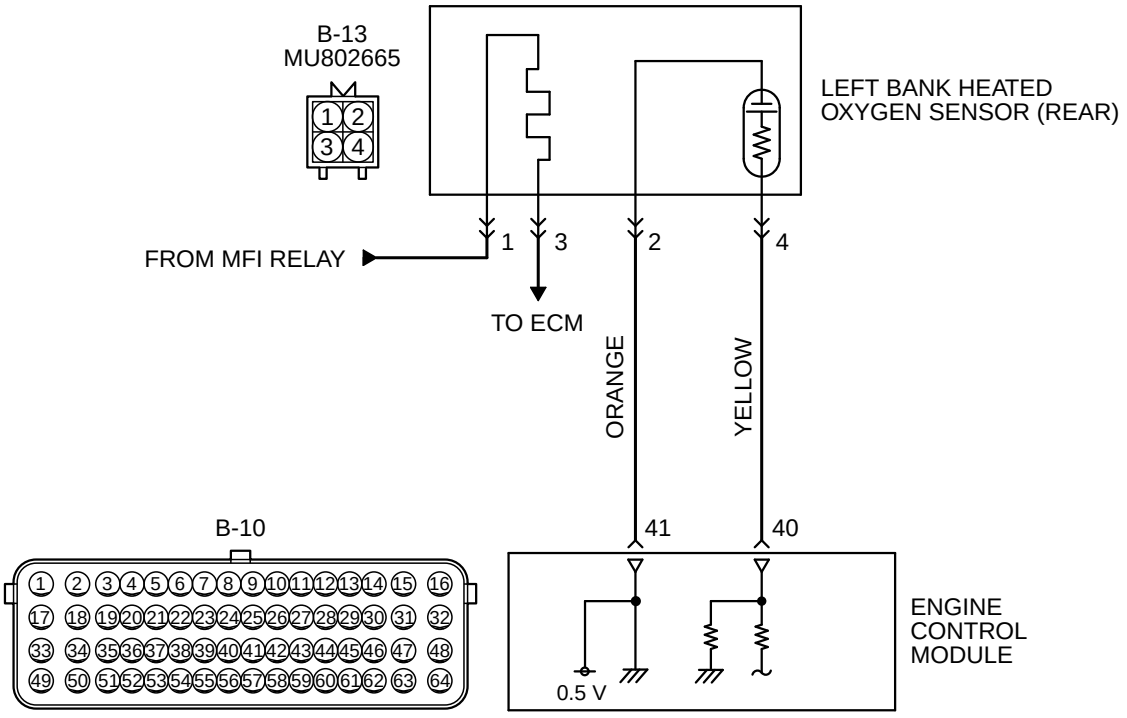
Q:Is DTC P0154 set?

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

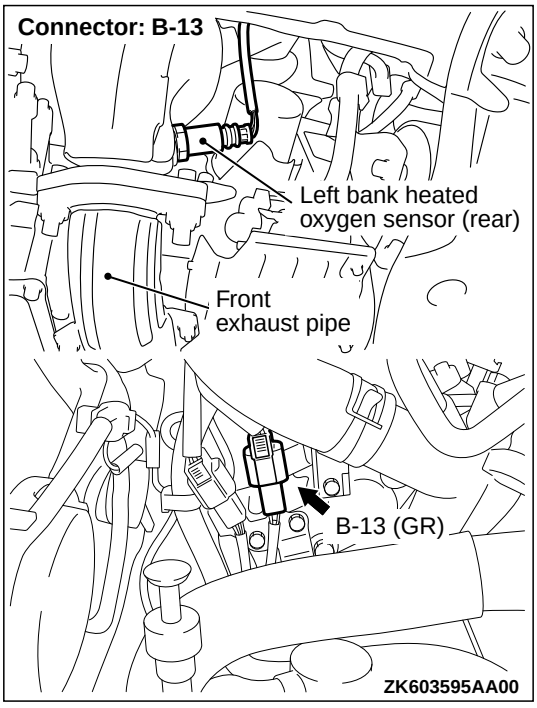
DTC P0157: Heated Oxygen Sensor Circuit Low Voltage (bank 2, sensor 2)

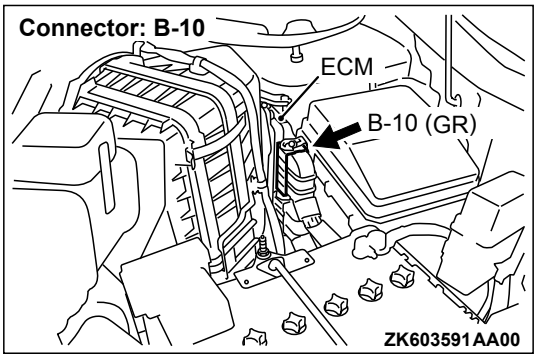
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LEFT BANK HEATED OXYGEN SENSOR (REAR) CIRCUIT



ZK602841 AA00





CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the ECM (terminal No. 40) from the output terminal (terminal No. 4) of the left bank heated oxygen sensor (rear).
- Terminal No. 2 of the left bank heated oxygen sensor (rear) is grounded with ECM (terminal No. 41).
- The ECM applies an offset voltage of 0.5 volt to terminal No. 2 of the left bank heated oxygen sensor (rear).

TECHNICAL DESCRIPTION

- The output signal of the left bank heated oxygen sensor (front) is compensated by the output signal of the left bank heated oxygen sensor (rear).
- The ECM check for the left bank heated oxygen sensor (rear) output voltage.

DESCRIPTIONS OF MONITOR METHODS

Left bank heated oxygen sensor (rear) out put 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

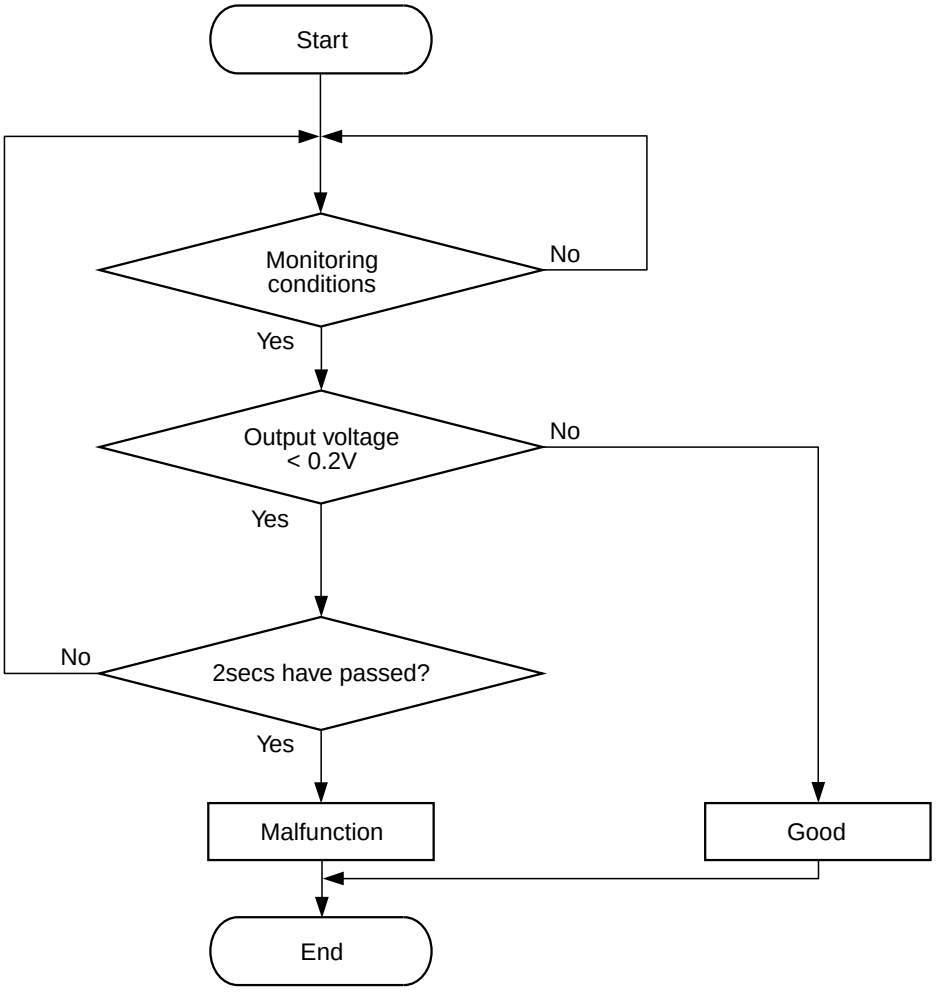
Sensor (The sensor below is determined to be normal)

- Mass airflow sensor

- Engine coolant temperature sensor
- Intake air temperature sensor
- Barometric pressure sensor

DTC SET CONDITIONS

Logic Flow Chart



ZK603708 AA00

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

- Left bank 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.13Ab-8.

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

- Left bank heated oxygen sensor (rear) failed.
- Connector damage.
- Harness damage.
- ECM failed.

DIAGNOSIS

Required Special Tools:
- MB991316: Test Harness

STEP 1. Check harness connector B-13 at the left bank heated oxygen sensor (rear) and harness connector B-10 at the ECM 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.

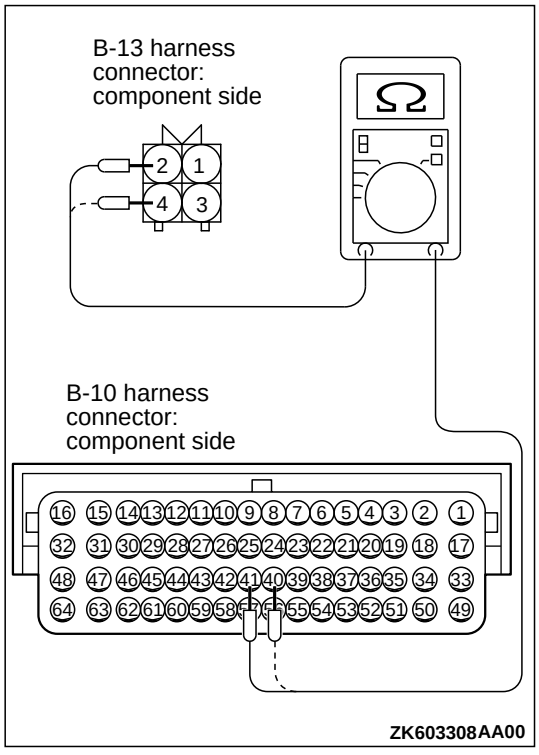
STEP 2. Check the left bank heated oxygen sensor (rear).
(1) Disconnect the left bank heated oxygen sensor (rear) connector B-13 and connect test harness special tool, MD991316 to the connector on the left bank heated oxygen sensor (rear) side.
(2) Warm up the engine until engine coolant temperature reaches 80°C (176°F) or higher.
(3) Drive at 50 km/h (31 mph) or more for 10 minutes.
(4) Connect a digital voltage meter between terminal No. 1 (red clip) and terminal No. 3 (blue clip).
(5) Measure the output voltage of heated oxygen sensor under the following driving.
a Transaxle: 2nd speed
.
b Drive with wide open throttle
.
c Engine: 3,500 r/min or more
.

Standard value: 0.6 - 1.0 volts

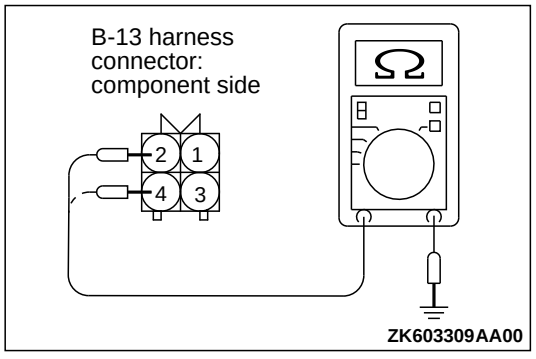
NOTE: If the sufficiently high temperature [of approximate 400° C (752° F) or more] is not reached although the heated oxygen sensor is normal, the output voltage would be possibly low although the rich air/fuel ratio.

Q:Is the measured resistance between 11 and 18 ohms [at 20°C (68°F)?
YES: Go to Step 3.
NO: Replace the left bank heated oxygen sensor (rear). Then go to Step 5.

STEP 3. Check for harness between the left bank heated oxygen sensor (rear) connector B-13 and ECM connector B-10.
(1) Disconnect the left bank heated oxygen sensor (rear) connector B-13 and the ECM connector B-10.
(2) Measure the resistance between the heated oxygen sensor connector B-13 and the ECM connector B-10.



a Connector B-13 (terminal No. 2) and connector B-10 (terminal No. 41).
b Connector B-13 (terminal No. 4) and connector B-10 (terminal No. 40).
- Should be less than 2 ohms.



(3) Check for the continuity between the oxygen sensor connector B-14 and ground.
a Connector B-13 (terminal No. 2) and ground
b Connector B-13 (terminal No. 4) and ground
- Not continuity.

Q:Is the harness wire in good condition?
YES: Go to Step 4.
NO: Repair it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 5.

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 23 P. 13Ab-8
(2) Check the diagnostic trouble code (DTC).

Q:Is DTC P0157 set?
YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. 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.00-15.

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 23 P. 13Ab-8.

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

Q:Is DTC P0157 set?

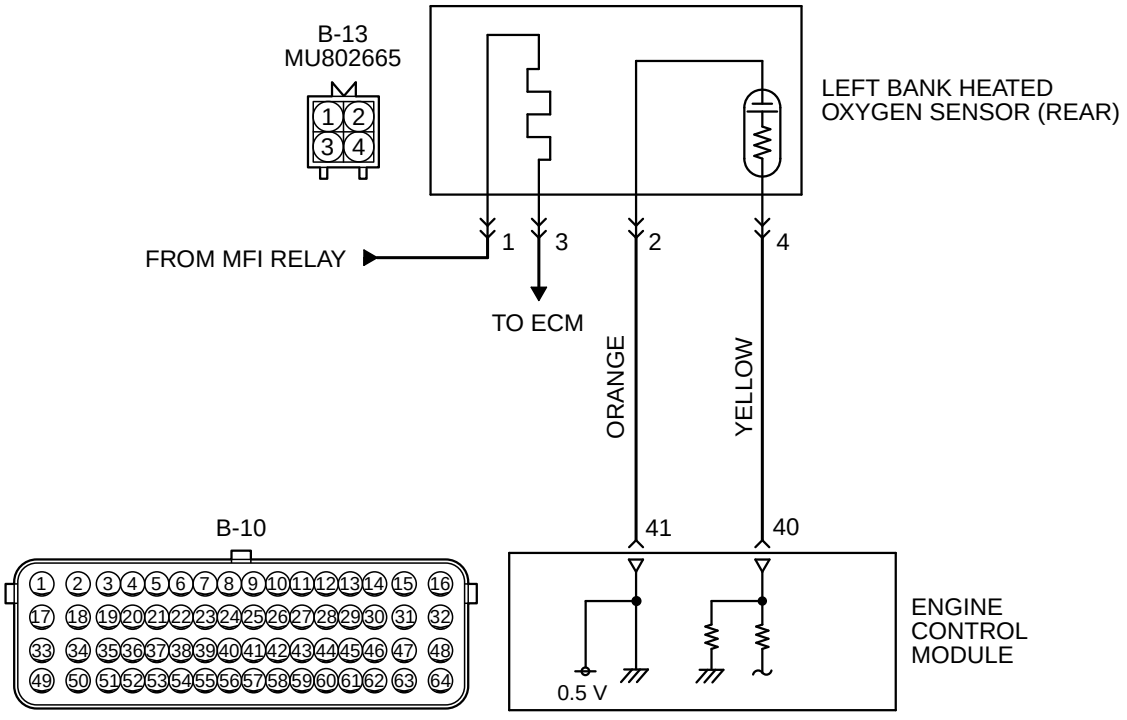
YES: Retry the troubleshooting.

NO: The inspection is complete.

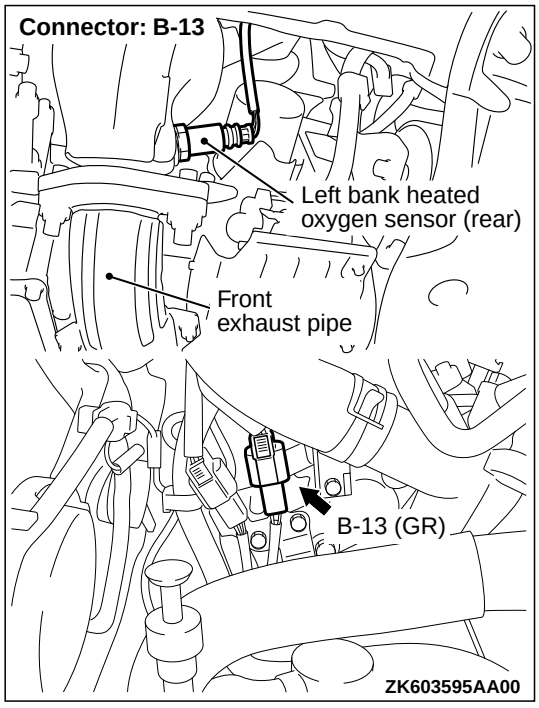
DTC P0158: Heated Oxygen Sensor Circuit High Voltage (bank 2, sensor 2)

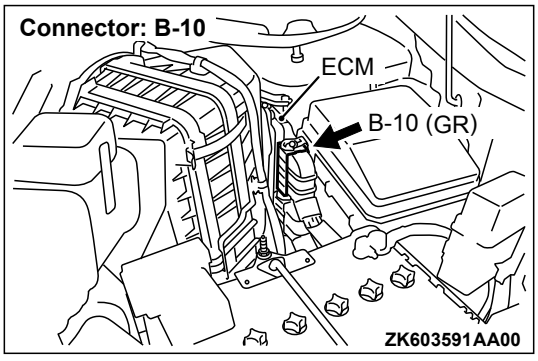
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LEFT BANK HEATED OXYGEN SENSOR (REAR) CIRCUIT



ZK602841 AA00





CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the ECM (terminal No. 40) from the output terminal (terminal No. 4) of the left bank heated oxygen sensor (rear).
- Terminal No. 2 of the left bank heated oxygen sensor (rear) is grounded with ECM (terminal No. 41).
- The ECM applies an offset voltage of 0.5 volt to terminal No. 2 of the left bank heated oxygen sensor (rear).

TECHNICAL DESCRIPTION

- The output signal of the left bank heated oxygen sensor (front) is compensated by the output signal of the left bank heated oxygen sensor (rear).
- The ECM checks for the left bank heated oxygen sensor (rear) output voltage.

DESCRIPTIONS OF MONITOR METHODS

Left bank heated oxygen sensor (rear) output voltage is over 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)

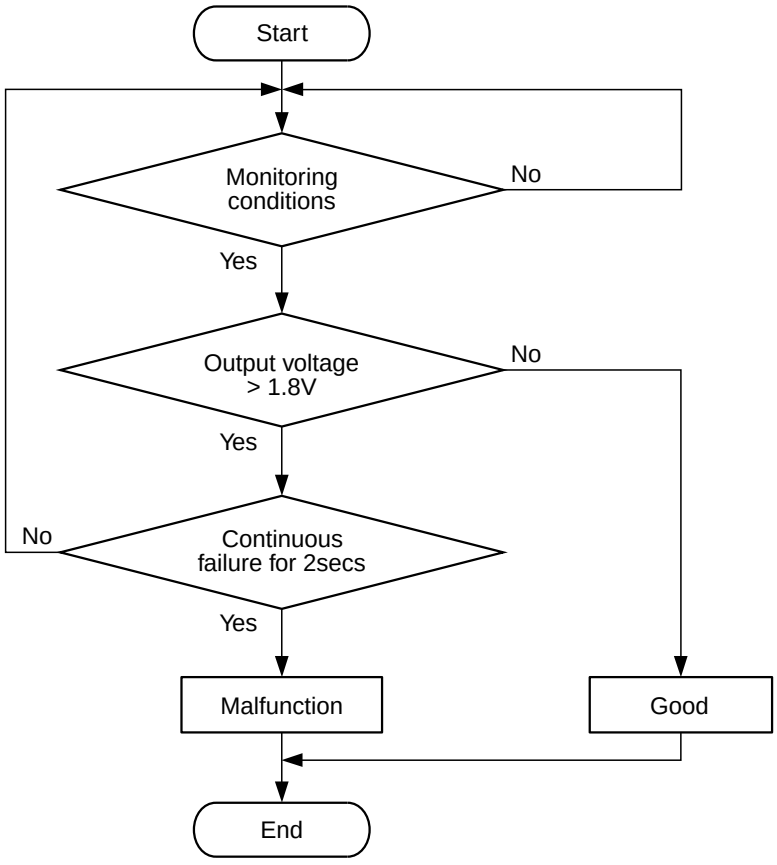
- Heated oxygen sensor heater (front) monitor
- Heated oxygen sensor heater (rear) monitor
- Air/fuel ratio feedback monitor

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 CONDITION

Logic Flow Chart



ZK603713 AA00

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

- Left bank 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.13Ab-8.

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

- Connector damage.
- Harness damage.
- ECM failed.

DIAGNOSIS

STEP 1. Check harness connector B-13 at the left bank heated oxygen sensor (rear) and harness connector B-10 at ECM for damage.

Q:Is the harness connector in good condition?
YES: Go to Step 2.
NO: Repair it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 4.

STEP 2. Check for short circuit to power supply between the left bank heated oxygen sensor (rear) connector B-13 (terminal No. 4) and the ECM connector B-10 (terminal No. 40).

Q:Is the harness wire in good condition?
YES: Go to Step 3.
NO: Repair it. Then go to Step 4.

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. 13Ab-8.
(2) Check the diagnostic trouble code (DTC).

Q:Is DTC P0158 set?
YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. 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.00-15.

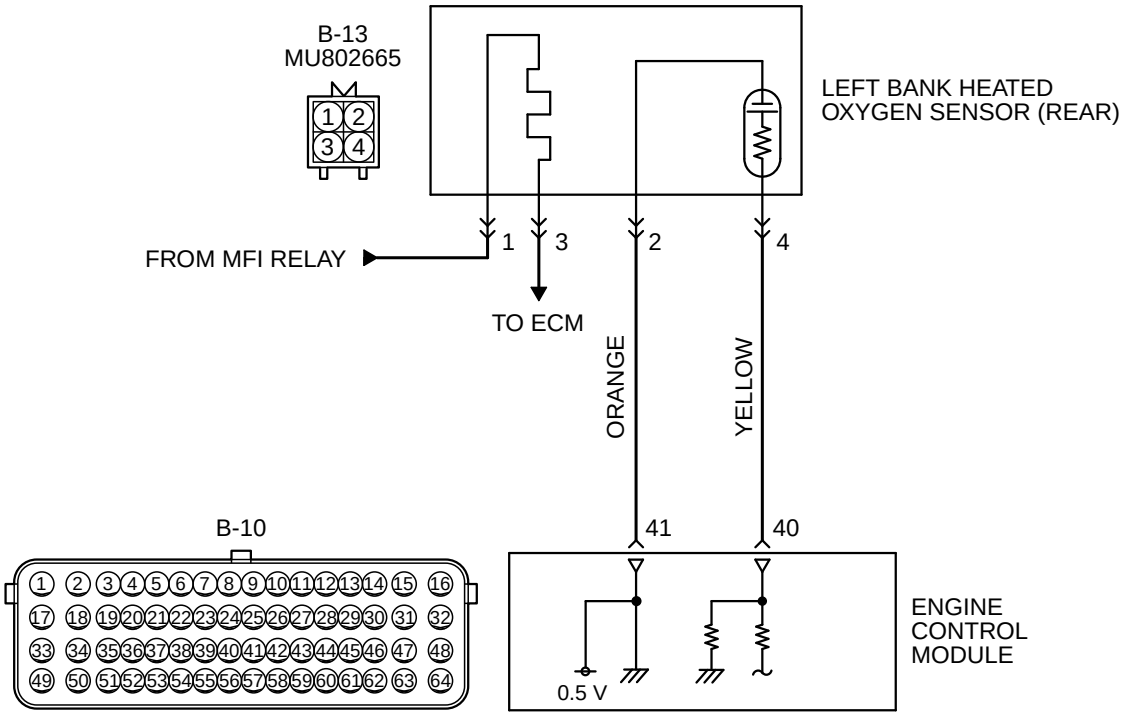
STEP 4. Test the OBD-II drive cycle.
(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function - OBD-II Drive Cycle - Pattern 24 P. 13Ab-8.
(2) Check the diagnostic trouble code (DTC).

Q:Is DTC P0158 set?
YES: Retry the troubleshooting.
NO: The inspection is complete.

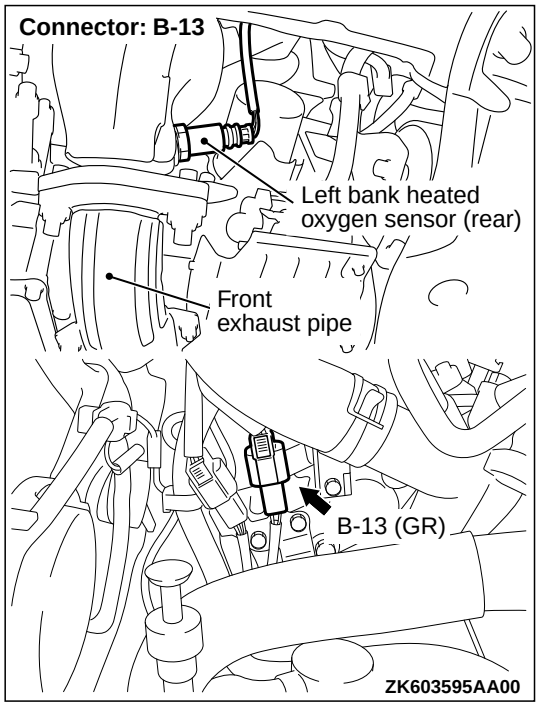
DTC P0159: Heated Oxygen Sensor Circuit Slow Response (bank 2, sensor 2)

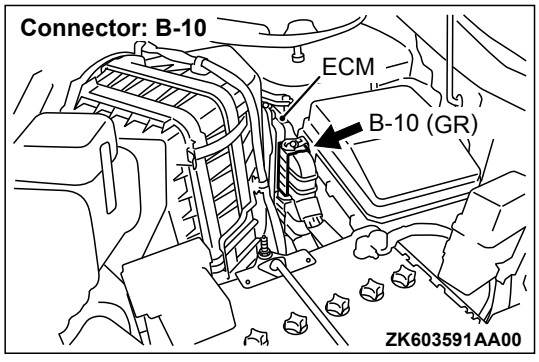
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LEFT BANK HEATED OXYGEN SENSOR (REAR) CIRCUIT



ZK602841 AA00





CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the ECM (terminal No. 40) from the output terminal (terminal No. 4) of the left bank heated oxygen sensor (rear).
- Terminal No. 2 of the left bank heated oxygen sensor (rear) is grounded with ECM (terminal No. 41).
- The ECM applies an offset voltage of 0.5 volt to terminal No. 2 of the left bank heated oxygen sensor (rear).

TECHNICAL DESCRIPTION

- The output signal of the heated left bank oxygen sensor (front) is compensated by the output signal of the left bank heated oxygen sensor (rear).
- The ECM checks for the left bank heated oxygen sensor (rear) output line.

DESCRIPTIONS OF MONITOR METHODS

Left bank 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)

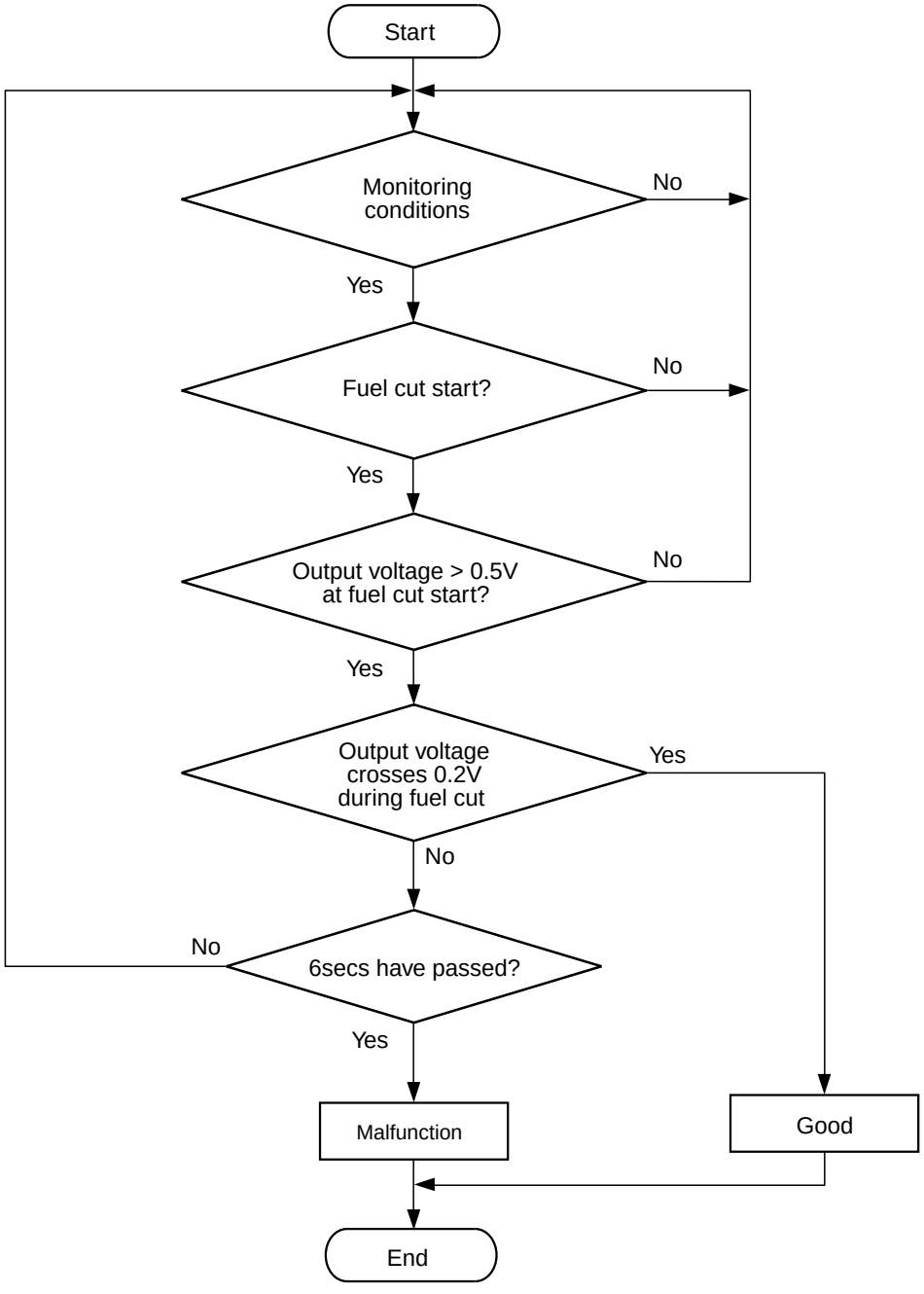
Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

- 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 CONDITION

Logic Flow Chart



ZK603720AA00

Check Conditions
- Engine coolant temperature is higher than 76°C (169°F).
- The left bank heated oxygen sensor (front) is active.
- The cumulative mass airflow sensor output is higher than 1,638 g.
- Fuel is being shut off.

Judgement Criterion

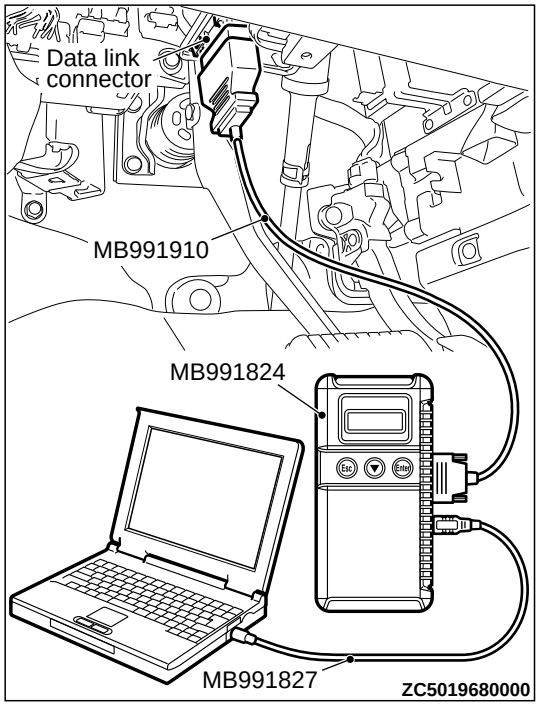
- Left bank heated oxygen sensor (rear) output voltage does not reach 0.2 volt for 6 seconds from fuel cut start.

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

- Left bank heated oxygen sensor (rear) deteriorated.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function - OBD-II Drive Cycle - Pattern 11 P.13Ab-8.



DIAGNOSIS

STEP 1. Using scan tool MB991958, check data list item AF: Heated Oxygen Sensor Bank 2, Sensor 2 (left 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, Heated Oxygen Sensor Bank 2, Sensor 2 (left 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.00-15.

NO: Replace the left bank 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. 13Ab-8.
(2) Check the diagnostic trouble code (DTC).

Q:Is DTC P0159 set?

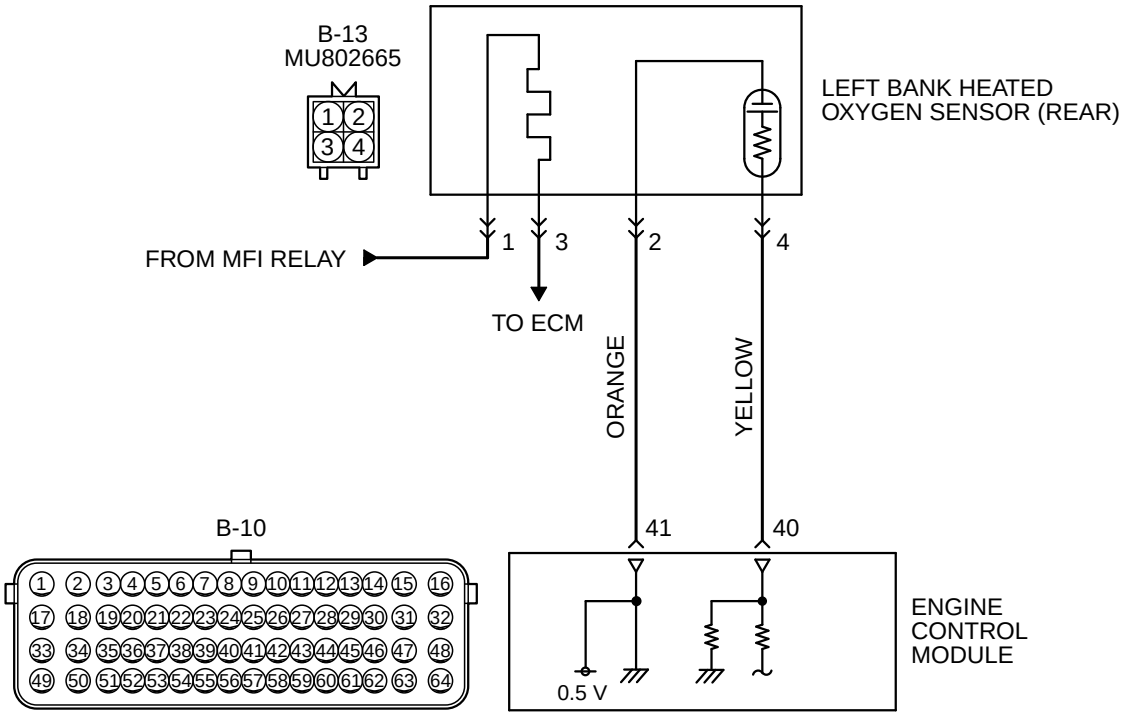
YES: Refer to DTC P0157 - Heated Oxygen Sensor Circuit Low Voltage (bank 2, sensor 2) P.13Ab-275, DTC P0158 - Heated Oxygen Sensor Circuit High Voltage (bank 2, sensor 2) P.13Ab-280.

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.00-15.

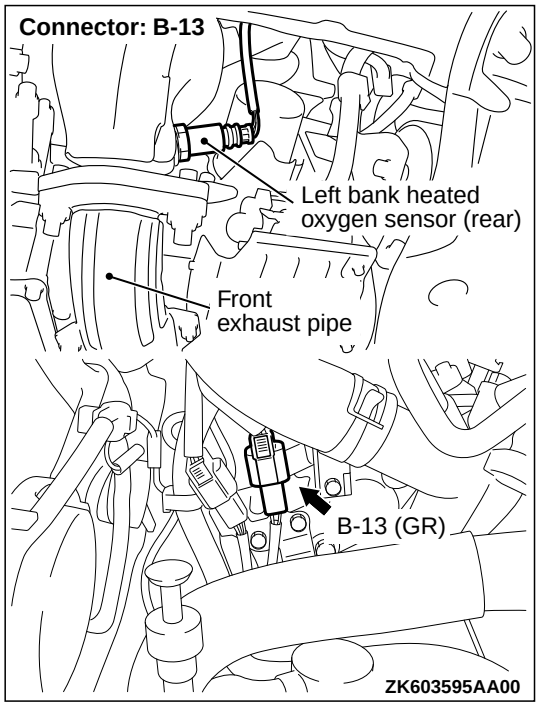
DTC P0160: Heated Oxygen Sensor Circuit No Activity Detected (bank 2, sensor 2)

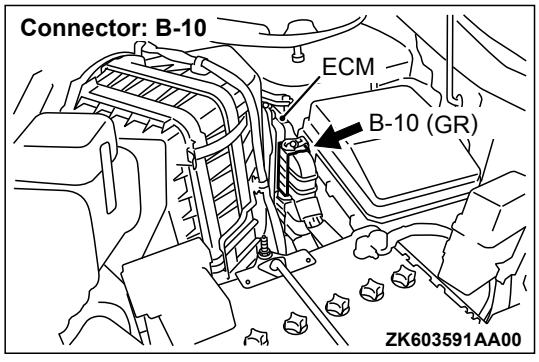
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LEFT BANK HEATED OXYGEN SENSOR (REAR) CIRCUIT



ZK602841 AA00





CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the ECM (terminal No. 40) from the output terminal (terminal No. 4) of the left bank heated oxygen sensor (rear).
- Terminal No. 2 of the left bank heated oxygen sensor (rear) is grounded with ECM (terminal No. 41).
- The ECM applies an offset voltage of 0.5 volt to terminal No. 2 of the left bank heated oxygen sensor (rear).

TECHNICAL DESCRIPTION

- The output signal of the heated left bank oxygen sensor (front) is compensated by the output signal of the left bank heated oxygen sensor (rear).
- The ECM checks for the left bank heated oxygen sensor (rear) output voltage.

DESCRIPTIONS OF MONITOR METHODS

Left bank heated oxygen sensor (rear) output voltage does not change during specified.

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

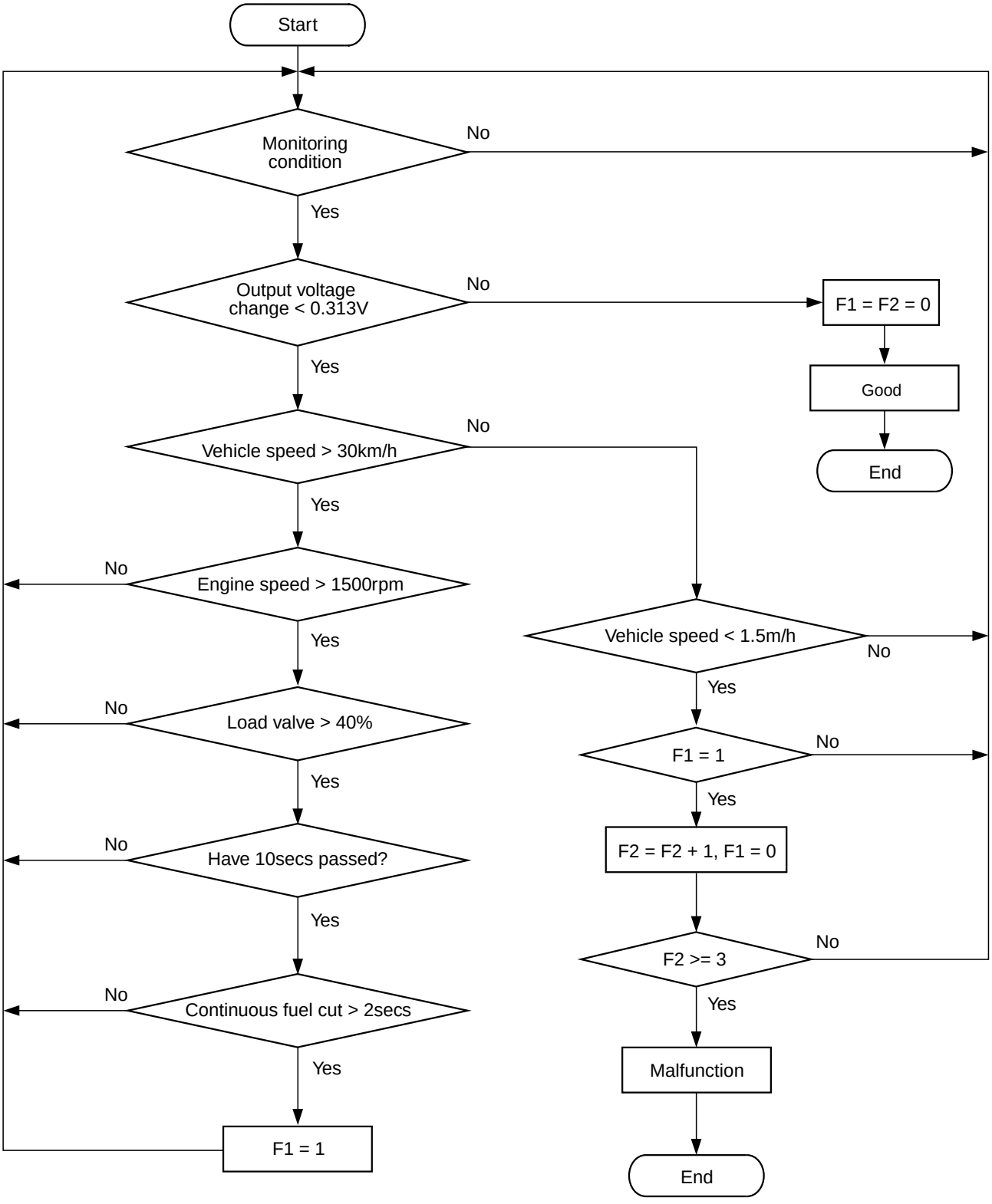
Sensor (The sensor below is determined to be normal)

- Mass airflow sensor

- Engine coolant temperature sensor
- Intake air temperature sensor
- Barometric pressure sensor

DTC SET CONDITION

Logic Flow Chart



ZK603721AA00

Check Conditions
- Engine coolant temperature is higher than 76°C (169°F).
- The left bank 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 (1.0 mph).

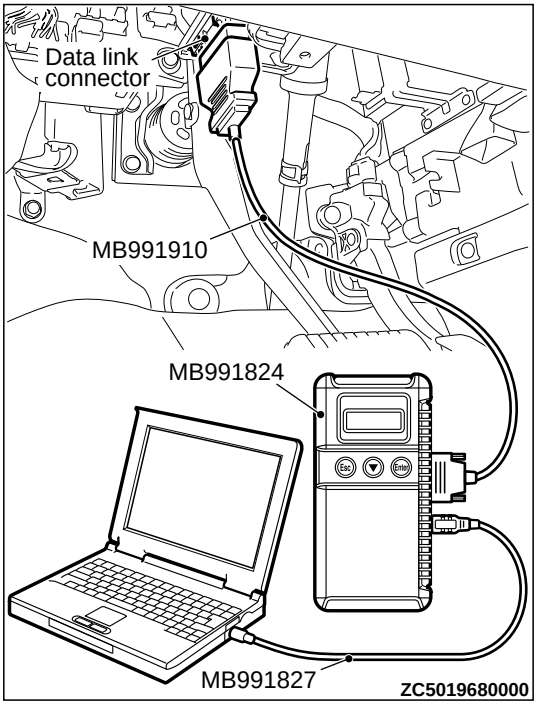
Judgement Criterion
- Change in the output voltage of the left bank heated oxygen sensor (rear) is lower than 0.313 volt.

NOTE: Monitoring stops after fuel has been shut off for more than 38 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function - OBD-II Drive Cycle - Pattern 13 P.13Ab-8.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)
- Left bank heated oxygen sensor (rear) deteriorated.
- ECM failed.



DIAGNOSIS

STEP 1. Using scan tool MB991958, check data list item AF: Heated Oxygen Sensor Bank 2, Sensor 2 (left 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, Heated Oxygen Sensor Bank 1, Sensor 3 (left rear).
a Transaxle: 2nd speed
.
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.00-15.

NO: Replace the left bank heated ogygen sensor (rear). 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. 13Ab-8.
(2) Check the diagnostic trouble code (DTC).

Q:Is DTC P0160 set?

YES: Refer to, P0157 - Heated Oxygen Sensor Circuit Low Voltage (bank 2, sensor 2) P.13Ab-275, DTC P0158 - Heated Oxygen Sensor Circuit High Voltage (bank 2, sensor 2) P. 13Ab-280.
NO: The inspection is complete.

DTC P0171: System too Lean (bank 1)

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Fuel Trim Circuit

- Refer to DTC P0201- Injector Circuit - Cylinder 1 P. 13Ab-332, P0203- Injector Circuit - Cylinder 3 P. 13Ab-347, P0205- Injector Circuit - Cylinder 5 P. 13Ab-362.

CIRCUIT OPERATION

- Refer to DTC P0201 - Injector Circuit - Cylinder 1 P. 13Ab-332, P0203- Injector Circuit - Cylinder 3 P. 13Ab-347, P0205- Injector Circuit - Cylinder 5 P. 13Ab-362.

TECHNICAL DESCRIPTION

- If a malfunction occurs in the fuel system, the fuel trim value becomes too large.
- The ECM checks whether the fuel trim value is within a specified range.

DESCRIPTIONS OF MONITOR METHODS

Right bank 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)

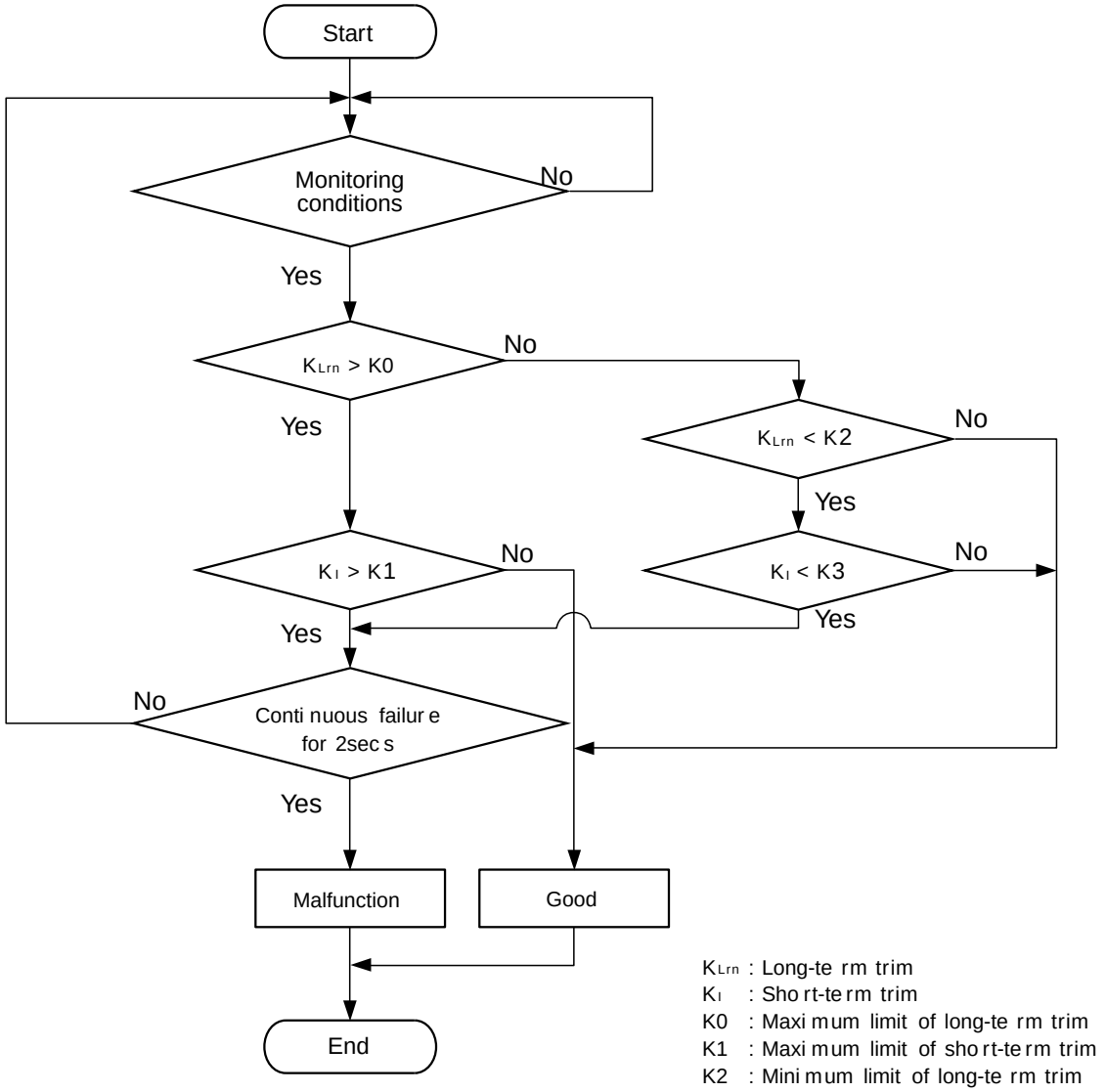
- Misfire monitor

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



ZK603728 AA00

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 12 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 +7.4 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 12 g/sec or less.

Judgement Criteria
- Long-term fuel trim has continued to be higher than +12.5 percent for 5 seconds.

or
- Long-term fuel trim has continued to be higher than +12.5 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 12 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 +17.6 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 12 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 +22.3 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.

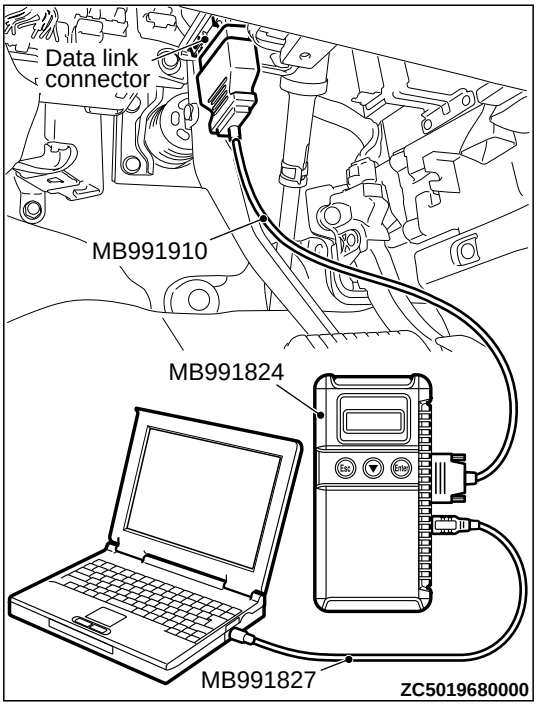
OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function - OBD-II Drive Cycle - Pattern 22 P.13Ab-8.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)
- Mass airflow sensor failed.
- Injector (Number 1, 3, 5) failed.
- Incorrect fuel pressure.
- Air drawn in from gaps in gasket, seals, etc.
- Intake air temperature sensor failed.
- Manifold absolute pressure sensor failed.
- Exhaust leak.
- Use of incorrect or contaminated fuel.
- Harness damage.
- Connector damage.
- ECM 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 1,350 and 1,670 millivolts.
- When 2,500 r/min, between 1,620 and 2,020 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.13Ab-108, DTC P0102 - Mass Airflow Circuit Low Input P.13Ab-115, DTC P0103 - Mass Airflow Circuit High Input P.13Ab-121.

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.13Ab-143, DTC P0112 - Intake Air Temperature Circuit Low Input P.13Ab-148, DTC P0113 - Intake Air Temperature Circuit High Input P.13Ab-152.

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.13Ab-158, DTC P0117 - Engine Coolant Temperature Circuit Low Input P.13Ab-163,

DTC P0118 - Engine Coolant Temperature Circuit High Input P.13Ab-168.

STEP 4. Using scan tool MB991958, check data list item 8: Manifold Absolute Pressure Sensor.

(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: Go to Step 5.
NO: Refer to DTC P0106 - Manifold Absolute Pressure Circuit Range / Performance Problem P.13Ab-126, DTC P0107 - Manifold Absolute Pressure Circuit Low Input P.13Ab-132, DTC P0108 -Manifold Absolute Pressure Circuit High Input P.13Ab-138.

STEP 5. Check the fuel pressure.

Refer to On-vehicle Service - Fuel Pressure Test P.13Aa-17

Q:Is the fuel pressure normal?

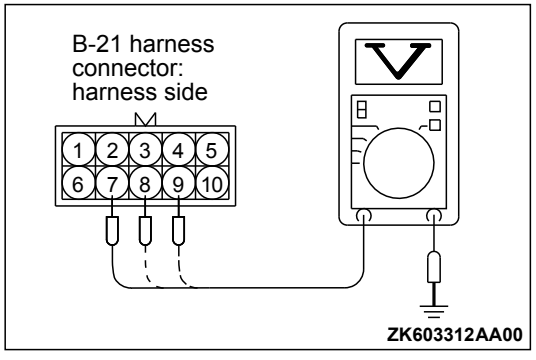
YES: Go to Step 6.
NO: Repair it. Then go to Step 16.

STEP 6. Check for harness connector B-21 at the intermediate connector and harness connector B-10 at the ECM for damage.

Q:Is the harness connector in good condition?

YES: Go to Step 7.
NO: Repair it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 16.

STEP 7. Measure the injector supply voltage at the intermediate connector harness B-21 and ground.

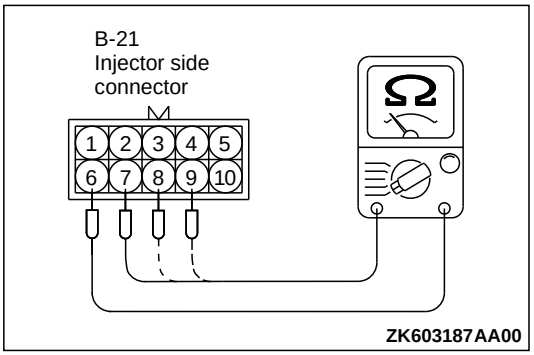


(1) Disconnect the intermediate connector B-21 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between each male connector side terminal and ground.
a. Connector B-21 (terminal No. 7) and ground.
b. Connector B-21 (terminal No. 8) and ground.
c. Connector B-21 (terminal No. 9) and ground.
- Voltage should be 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 8.
NO: Repair it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 16.

STEP 8. Check the right bank injector resistance at the intermediate connector B-21.



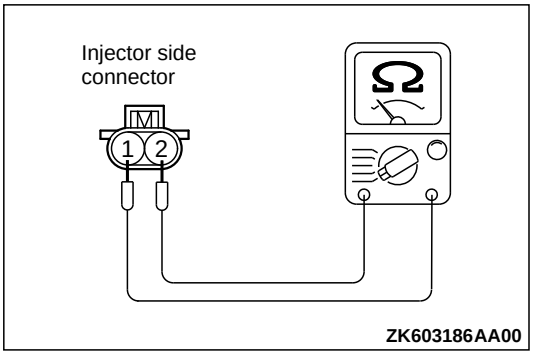
(1) Disconnect the intermediate connector B-21.
(2) Measure the resistance between each male connector side terminal.
a Measure the resistance between terminal No. 6 and No. 7 at No. 1 cylinder injector.
b Measure the resistance between terminal No. 6 and No. 8 at No. 3 cylinder injector.
c Measure the resistance between terminal No. 6 and No. 9 at No. 5 cylinder injector.
▪Resistance should be between 10.5 and 13.5 ohms [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 11.
NO: Go to Step 9.

STEP 9. Check for harness connector B-101, B-103, B-104 at right bank injector 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 16.

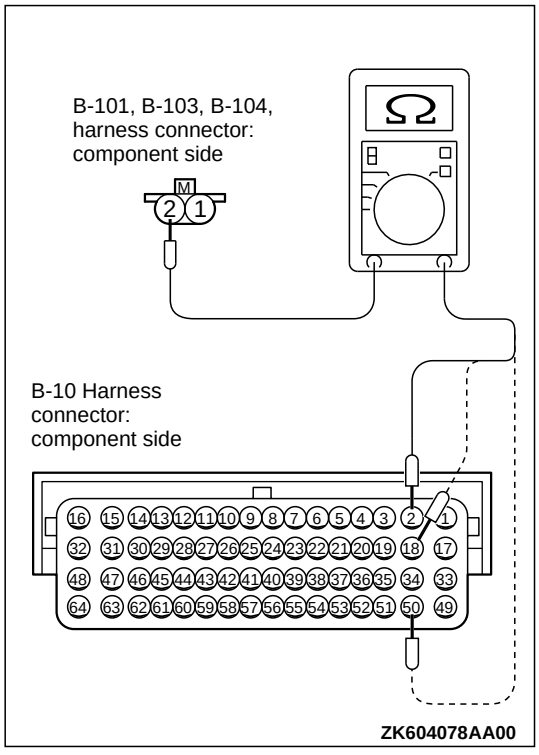
STEP 10. Check the right bank injector.



(1) Remove the intake manifold.
(2) Disconnect the right bank injector connector B-101, B-103, B-104.
(3) Measure the resistance between injector side connector terminal No. 1 and No. 2.
Standard value: 10.5 - 13.5 ohms [at 20°C (68°F)]

Q:Is the measured resistance between 10.5 and 13.5 ohms [at 20°C (68°F)]?
YES: Repair harness wire between injector intermediate connector and right bank injector connector because of harness damage. Then go to Step 16.
NO: Replace the injector. Then go to Step 16.

STEP 11. Check for harness between the right bank injector connector B-101, B-103, B-104 and the ECM connector B-10.
(1) Remove the intake manifold.
(2) Disconnect the right bank injector connector B-101, B-103, B-104 and the ECM connector B-10.



(3) Measure the resistance between the right bank injector connector B-101, B-103, B-104 and the ECM connector B-10.
a Connector B-101 (terminal No. 2) and connector B-10 . (terminal No. 2) at No. 1 cylinder injector.
b Connector B-103 (terminal No. 2) and connector B-10 . (terminal No. 18) at No. 3 cylinder injector.
c Connector B-104 (terminal No. 2) and connector B-10 . (terminal No.50) at No. 5 cylinder injector.
▪Should be less than 2 ohms.

Q:Is the harness wire in good condition?
YES: Go to Step 12.
NO: Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 16.

STEP 12. Check for exhaust leaks.

Q:Are there any abnormalities?
YES: Repair it. Then go to Step 16.
NO: Go to Step 13.

STEP 13. Check for intake system vacuum leak.

Q:Are there any abnormalities?
YES: Repair it. Then go to Step 16.
NO: Go to Step 14.

STEP 14. Check for entry of foreign matter (water, kerosene, etc.) into fuel.

Q:Are there any abnormalities?
YES: Replace the fuel. Then go to Step 16.
NO: Go to Step 15.

STEP 15. Replace the right bank injector.
(1) Replace the right bank injector.
(2) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function - OBD-II Drive Cycle - Pattern 22 P. 13Ab-8.
(3) Check the diagnostic trouble code (DTC).

Q:Is DTC P0171 set?
YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 16.
NO: The inspection is complete.

STEP 16. 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. 13Ab-8.
(2) Check the diagnostic trouble code (DTC).

Q:Is DTC P0171 set?

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

DTC P0172: System too Rich (bank 1)

M11310100203USA0000010000

Fuel Trim Circuit

- Refer to DTC P0201- Injector Circuit - Cylinder 1 P. 13Ab-332, P0203- Injector Circuit - Cylinder 3 P. 13Ab-347, P0205- Injector Circuit - Cylinder 5 P. 13Ab-362.

CIRCUIT OPERATION

- Refer to DTC P0201- Injector Circuit - Cylinder 1 P. 13Ab-332, P0203- Injector Circuit - Cylinder 3 P. 13Ab-347, P0205- Injector Circuit - Cylinder 5 P. 13Ab-362.

TECHNICAL DESCRIPTION

- If a malfunction occurs in the fuel system, the fuel trim value becomes too small.
- The ECM checks whether the fuel trim value is within a specified range.

DESCRIPTIONS OF MONITOR METHODS

Right bank 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)

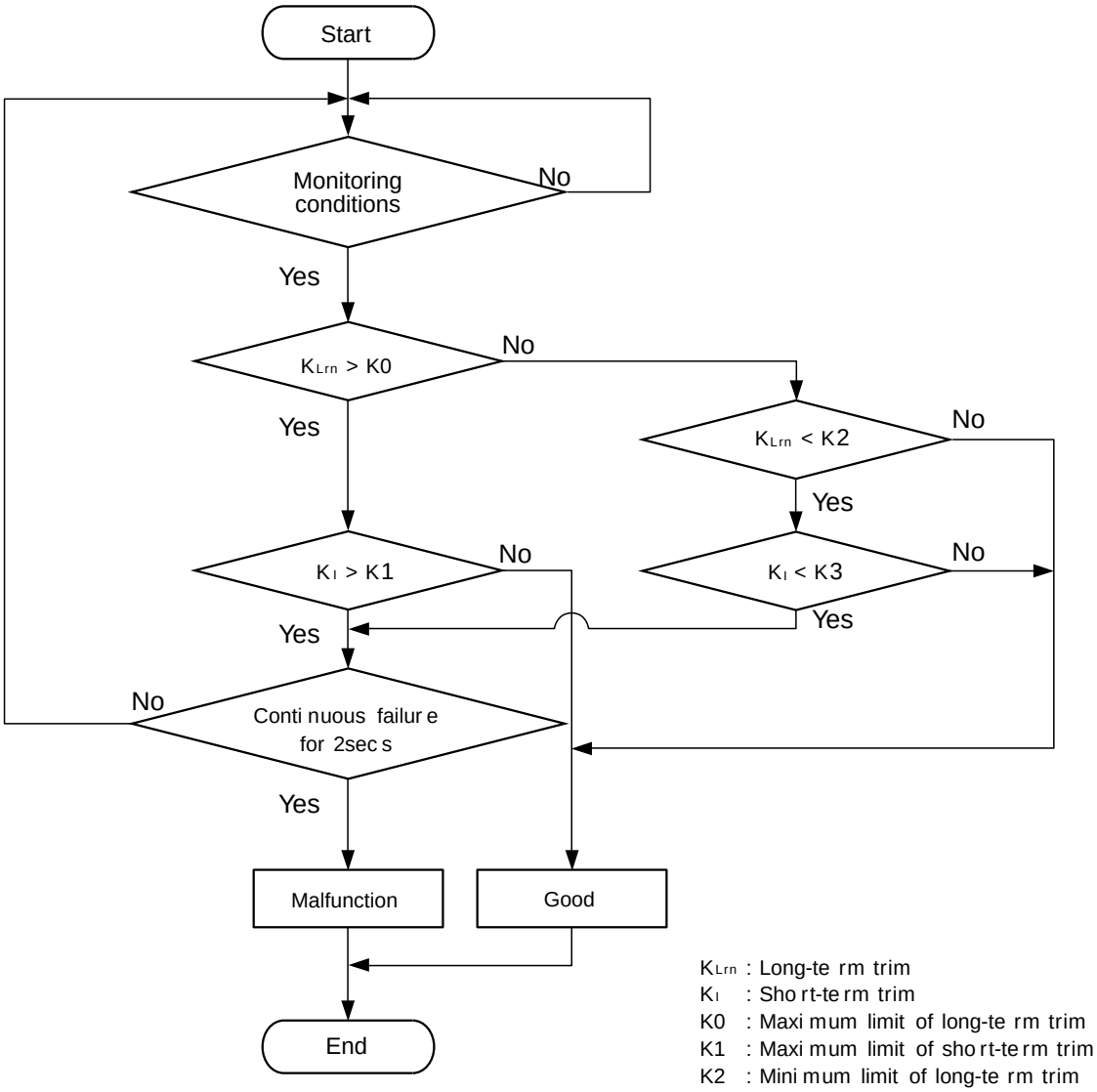
- Misfire monitor

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



ZK603728 AA00

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 12 g/sec or more.

Judgement Criterion
- 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 -7.4 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 12 g/sec or less.

Judgement Criterion
- 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 -12.5 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 Criterion
- Long-term fuel trim has continued to be -12.5 percent for 2 seconds.

or
- Short-term fuel trim has continued to be -50.0 percent for 2 seconds.

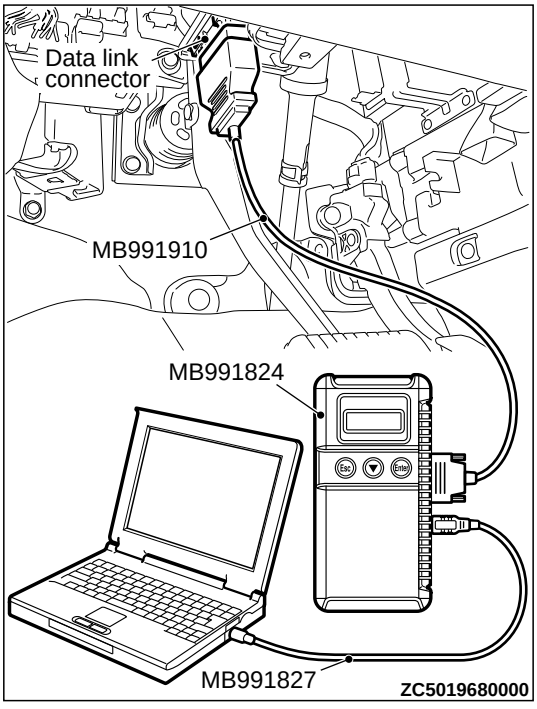
OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function - OBD-II Drive Cycle - Pattern 22 P.13Ab-8.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)
- Mass airflow sensor failed.
- Injector (Number 1, 3, 5) failed.
- Incorrect fuel pressure.
- Engine coolant temperature sensor failed.
- Intake air temperature sensor failed.
- Manifold absolute pressure sensor failed.
- ECM 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 1,350 and 1,670 millivolts.
- When 2,500 r/min, between 1,620 and 2,020 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.13Ab-108, DTC P0102 - Mass Airflow Circuit Low Input P.13Ab-115, DTC P0103 - Mass Airflow Circuit High Input P.13Ab-121.

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.13Ab-143, DTC P0112 - Intake Air Temperature Circuit Low Input P.13Ab-148, DTC P0113 - Intake Air Temperature Circuit High Input P.13Ab-152.

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.13Ab-158, DTC P0117 - Engine Coolant Temperature Circuit Low Input P.13Ab-163, DTC P0118 - Engine Coolant Temperature Circuit High Input P.13Ab-168.

STEP 4. Using scan tool MB991958, check data list item 8: Manifold Absolute Pressure Sensor.

(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?

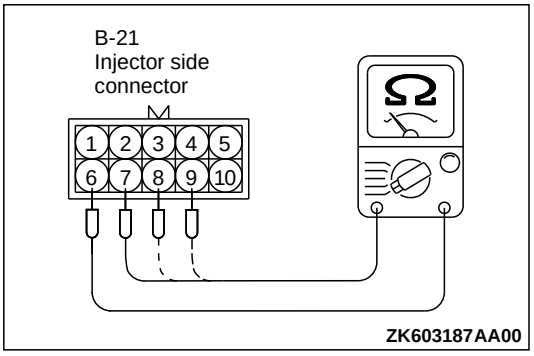
YES: Go to Step 5.

NO: Refer to DTC P0106 - Manifold Absolute Pressure Circuit Range / Performance Problem P.13Ab-126, DTC P0107 - Manifold Absolute Pressure Circuit Low Input P. 13Ab-132, DTC P0108 -Manifold Absolute Pressure Circuit High Input P.13Ab-138.

STEP 5. Check the fuel pressure.

Refer to On-vehicle Service - Fuel Pressure Test P.13Aa-17.

Q:Is the fuel pressure normal?



YES: Go to Step 6.
NO: Repair it. Then go to Step 8.

STEP 6. Check the right bank injector resistance at the intermediate connector B-21.

(1) Disconnect the intermediate connector B-21.
(2) Measure the resistance between each male connector side terminal.
  a Measure the resistance between terminal No. 6 and No. 7 at No. 1 cylinder injector.
  b Measure the resistance between terminal No. 6 and No. 8 at No. 3 cylinder injector.
  c Measure the resistance between terminal No. 6 and No. 9 at No. 5 cylinder injector.
    ▪Resistance should be between 10.5 and 13.5 ohms [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 7.
NO: Replace the injector. Then go to Step 8.

STEP 7. Check the trouble symptoms.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function - OBD-II Drive Cycle - Pattern 22 P. 13Ab-8.
(2) Check the diagnostic trouble code (DTC).

Q:Is DTC P0172 set?
YES: Replace the ECM . When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. 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.00-15

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. 13Ab-8.
(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 (bank 2)

M11310100204USA0000010000

Fuel Trim Circuit

- Refer to DTC P0202- Injector Circuit - Cylinder 2 P. 13Ab-340, P0204- Injector Circuit - Cylinder 4 P. 13Ab-355, P0206- Injector Circuit - Cylinder 6 P. 13Ab-370.

CIRCUIT OPERATION

- Refer to DTC P0202- Injector Circuit - Cylinder 2 P. 13Ab-340, P0204- Injector Circuit - Cylinder 4 P. 13Ab-355, P0206- Injector Circuit - Cylinder 6 P. 13Ab-370.

TECHNICAL DESCRIPTION

- If a malfunction occurs in the fuel system, the fuel trim value becomes too large.
- The ECM checks whether the fuel trim value is within a specified range.

DESCRIPTIONS OF MONITOR METHODS

Left bank 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)

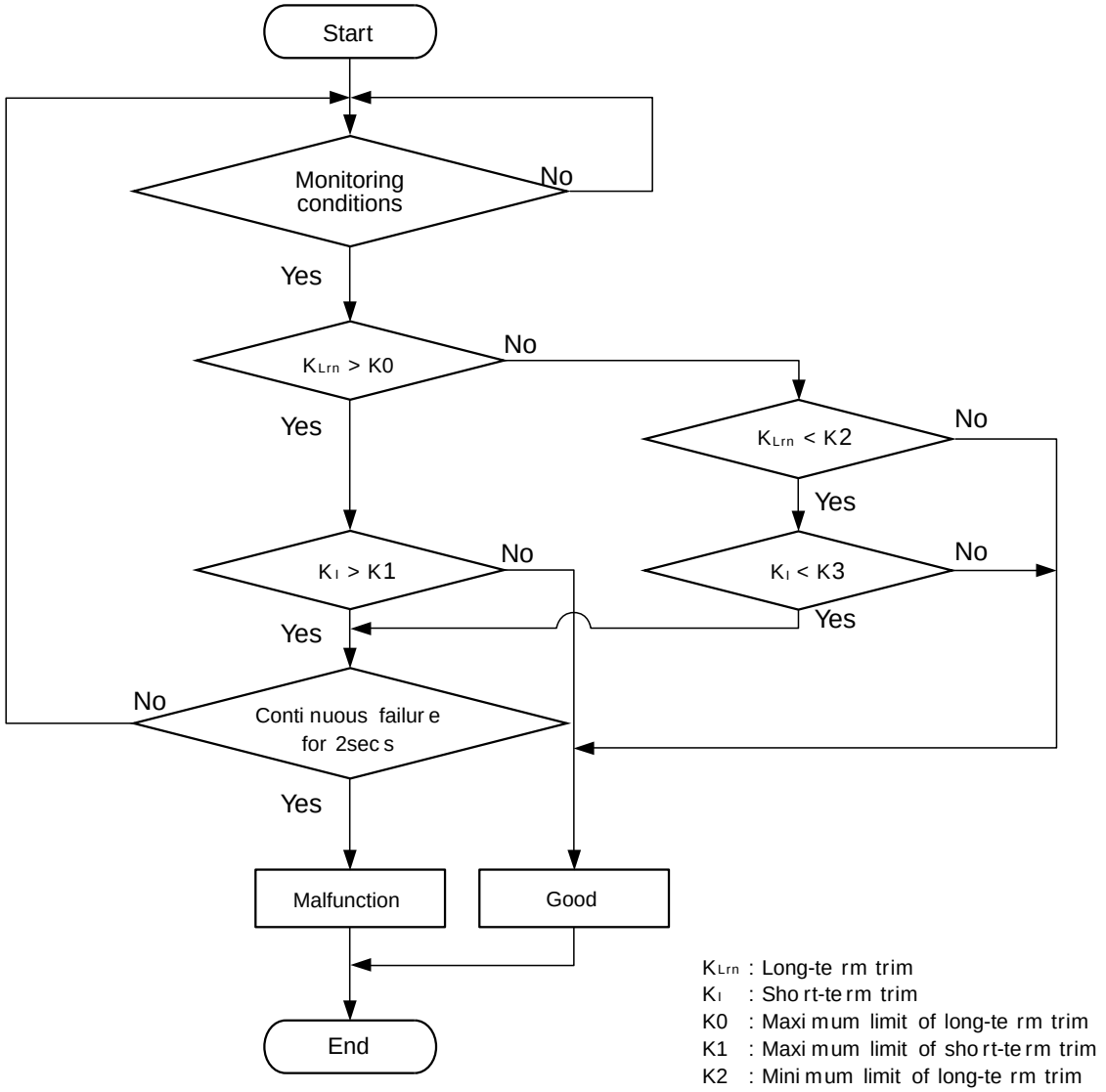
- Misfire monitor

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



ZK603728 AA00

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 12 g/sec or more.

Judgement Criterion

- 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 +7.4 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 12 g/sec or less.

Judgement Criterion
- 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 +17.6 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 12 g/sec or more.

Judgement Criterion
- 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 +17.6 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 12 g/sec or less.

Judgement Criterion
- 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 +22.3 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 Criterion
- 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.

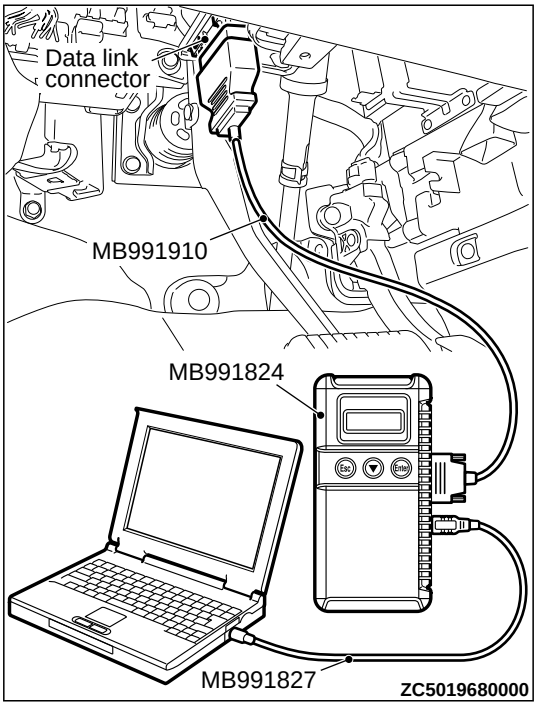
OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function - OBD-II Drive Cycle - Pattern 22 P.13Ab-8.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)
- Mass airflow sensor failed.
- Injector (Number 2, 4, 6) failed.
- Incorrect fuel pressure.
- Air drawn in from gaps in gasket, seals, etc.
- Engine coolant temperature sensor failed.
- Intake air temperature sensor failed.
- Manifold absolute pressure sensor failed.
- Exhaust leak.
- Use of incorrect or contaminated fuel.
- Harness damage.
- Connector damage.
- ECM 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 1,350 and 1,670 millivolts.
- When 2,500 r/min, between 1,620 and 2,020 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.13Ab-108, DTC P0102 - Mass Airflow Circuit Low Input P.13Ab-115, DTC P0103 - Mass Airflow Circuit High Input P.13Ab-121.

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.13Ab-143, DTC P0112 - Intake Air Temperature Circuit Low Input P.13Ab-148, DTC P0113 - Intake Air Temperature Circuit High Input P.13Ab-152.

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.13Ab-158, DTC P0117 - Engine Coolant Temperature Circuit Low Input P.13Ab-163,

DTC P0118 - Engine Coolant Temperature Circuit High Input P.13Ab-168.

STEP 4. Using scan tool MB991958, check data list item 8: Manifold Absolute Pressure Sensor.

(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: Go to Step 5.
NO: Refer to DTC P0106 - Manifold Absolute Pressure Circuit Range / Performance Problem P.13Ab-126DTC P0107 - Manifold Absolute Pressure Circuit Low Input P.13Ab-132, DTC P0108 -Manifold Absolute Pressure Circuit High Input P.13Ab-138.

STEP 5. Check the fuel pressure.

Refer to On-vehicle Service - Fuel Pressure Test P.13Aa-17.

Q:Is the fuel pressure normal?

YES: Go to Step 6.
NO: Repair it. Then go to Step 13.

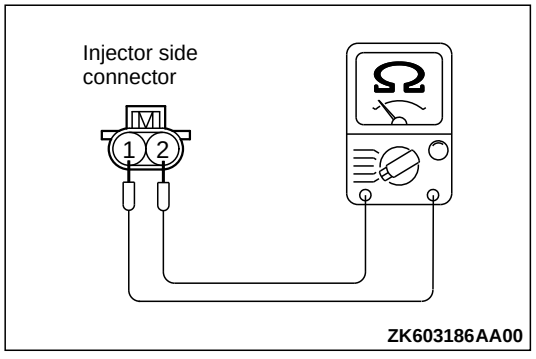
STEP 6. Check for harness connector B-115, B-116, B-120 at the left bank injector and harness connector B-10 at ECM for damage.

Q:Is the harness connector in good condition?

YES: Then go to Step 7.
NO: Repair it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 13.

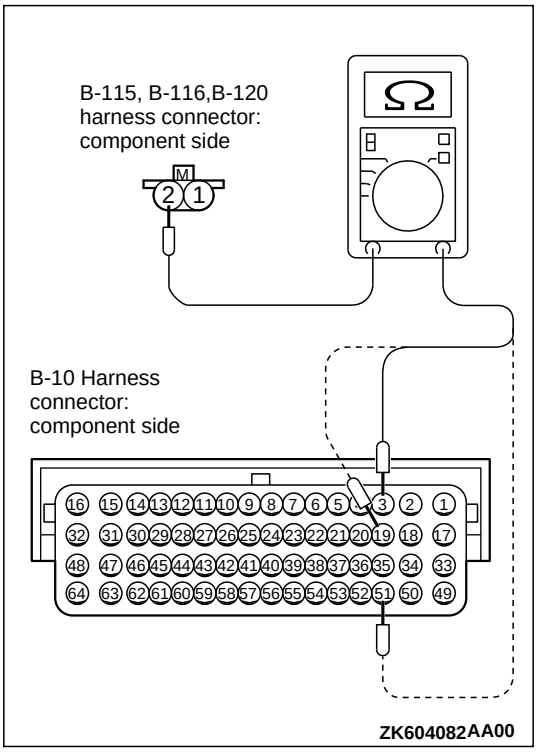
STEP 7. Check the left bank injector.

(1) Disconnect the left bank injector connector B-115, B-116, B-120.
(2) Measure the resistance between injector side connector terminal No. 1 and No. 2.
- Standard value: 10.5 and 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 13.



STEP 8. Check for harness between the left bank injector connector B-115, B-116, B-120 and the ECM connector B-10.

(1) Disconnect the left bank injector connector B-115, B-116, B-120 and the ECM connector B-10.

(2) Measure the resistance between the left bank injector connector B-115, B-116, B-120 and the ECM connector B-10.

▪Should be less than 2 ohms.

a Connector B-115 (terminal No. 2) and connector B-10 (terminal No. 51) at No. 6 cylinder injector.

b Connector B-116 (terminal No. 2) and connector B-10 (terminal No.19) at No. 4 cylinder injector.

c Connector B-120 (terminal No. 2) and connector B-10 (terminal No. 3) at No. 2 cylinder injector.

Q:Is the harness wire in good condition?

YES: Go to Step 9.

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

STEP 9. Check for exhaust leak.

Q:Are there any abnormalities?

YES: Repair it. Then go to Step 13.

NO: Go to Step 10.

STEP 10. Check for intake system vacuum leak.

Q:Are there any abnormalities?

YES: Repair it. Then go to Step 13.

NO: Go to Step 11.

STEP 11. Check for entry of foreign matter (water, kerosene, etc.) into fuel.

Q:Are there any abnormalities?

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

NO: Go to Step 12.

STEP 12. Replace the left bank injector.

(1) Replace the left bank injector.

(2) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function - OBD-II Drive Cycle - Pattern 22 P. 13Ab-8.

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

Q:Is DTC P0174 set?

YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 13.
NO: The inspection is complete.

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 22 P. 13Ab-8.
(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 (bank 2)

M11310100205USA0000010000

Fuel Trim Circuit
- Refer to DTC P0202- Injector Circuit - Cylinder 2 P. 13Ab-340, P0204- Injector Circuit - Cylinder 4 P. 13Ab-355, P0206- Injector Circuit - Cylinder 6 P. 13Ab-370.

CIRCUIT OPERATION
- Refer to DTC P0202- Injector Circuit - Cylinder 2 P. 13Ab-340, P0204- Injector Circuit - Cylinder 4 P. 13Ab-355, P0206- Injector Circuit - Cylinder 6 P. 13Ab-370.

TECHNICAL DESCRIPTION
- If a malfunction occurs in the fuel system, the fuel trim value becomes too small.
- The ECM checks whether the fuel trim value is within a specified range.

DESCRIPTIONS OF MONITOR METHODS
Left bank air/fuel learning value (long time fuel trim) and air/fuel feedback integral value (short time fuel trim) are too rich.

MONITOR EXECUTION
Continuous

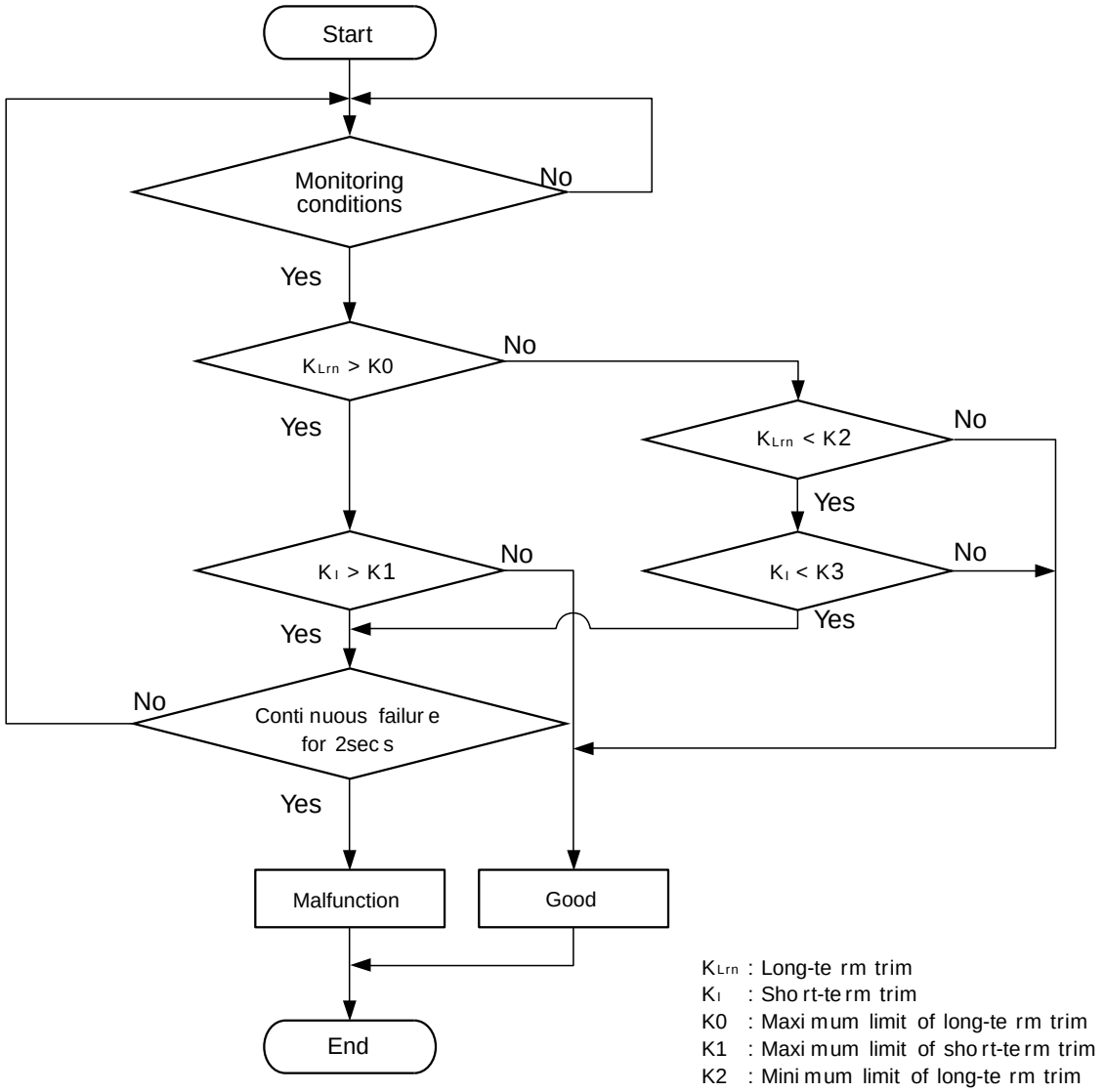
MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

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



ZK603728 AA00

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 12 g/sec or more.

Judgement Criterion
- 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 -7.4 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 12 g/sec or less.

Judgement Criterion
- 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 -12.5 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 Criterion
- Long-term fuel trim has continued to be -12.5 percent for 2 seconds.

or
- Short-term fuel trim has continued to be -50.0 percent for 2 seconds.

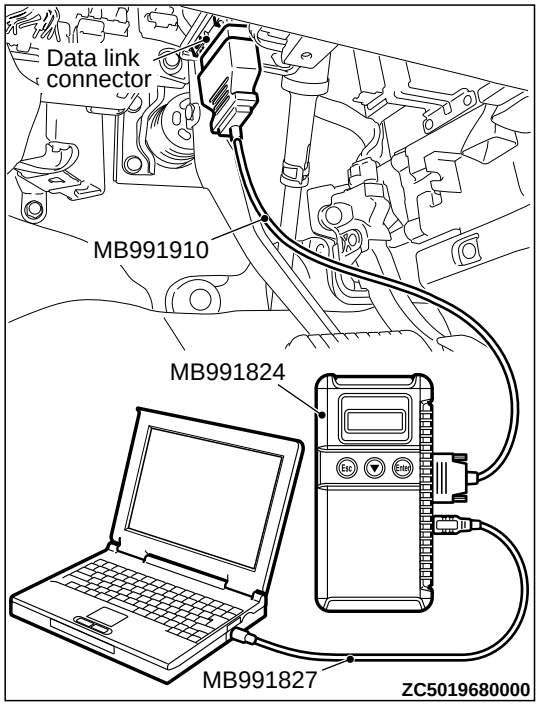
OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function - OBD-II Drive Cycle - Pattern 22 P.13Ab-8.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)
- Mass airflow sensor failed.
- Injector (Number 2, 4, 6) failed.
- Incorrect fuel pressure.
- Engine coolant temperature sensor failed.
- Intake air temperature sensor failed.
- Manifold absolute pressure sensor failed.
- ECM 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 1,350 and 1,670 millivolts.
- When 2,500 r/min, between 1,620 and 2,020 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.13Ab-108, DTC P0102 - Mass Airflow Circuit Low Input P.13Ab-115, DTC P0103 - Mass Airflow Circuit High Input P.13Ab-121.

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.13Ab-143, DTC P0112 - Intake Air Temperature Circuit Low Input P.13Ab-148, DTC P0113 - Intake Air Temperature Circuit High Input P.13Ab-152.

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.13Ab-158, DTC P0117 - Engine Coolant Temperature Circuit Low Input P.13Ab-163, DTC P0118 - Engine Coolant Temperature Circuit High Input P.13Ab-168.

STEP 4. Using scan tool MB991958, check data list item 8: Manifold Absolute Pressure Sensor.

(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: Go to Step 5.

NO: Refer to DTC P0106 - Manifold Absolute Pressure Circuit Range / Performance Problem P.13Ab-126DTC P0107 - Manifold Absolute Pressure Circuit Low Input P.13Ab-132, DTC P0108 -Manifold Absolute Pressure Circuit High Input P.13Ab-138.

STEP 5. Check the fuel pressure.

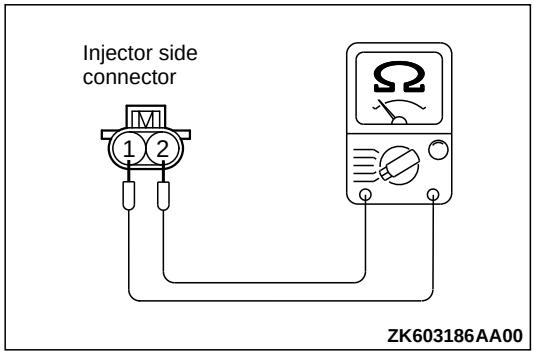
Refer to On-vehicle Service - Fuel Pressure Test P.13Aa-17.

Q:Is the fuel pressure normal?

YES: Go to Step 6.
NO: Repair it. Then go to Step 8.

STEP 6. Check the left bank injector.

(1) Disconnect the left bank injector connector B-115, B-116, B-120.



(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 7.
NO: Replace the injector. Then go to Step 8.

STEP 7. Check the trouble symptoms.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function - OBD-II Drive Cycle - Pattern 22 P. 13Ab-8.
(2) Check the diagnostic trouble code (DTC).

Q:Is DTC P0175 set?
YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. 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.00-15

STEP 8. Test the OBD-II drive cycle.

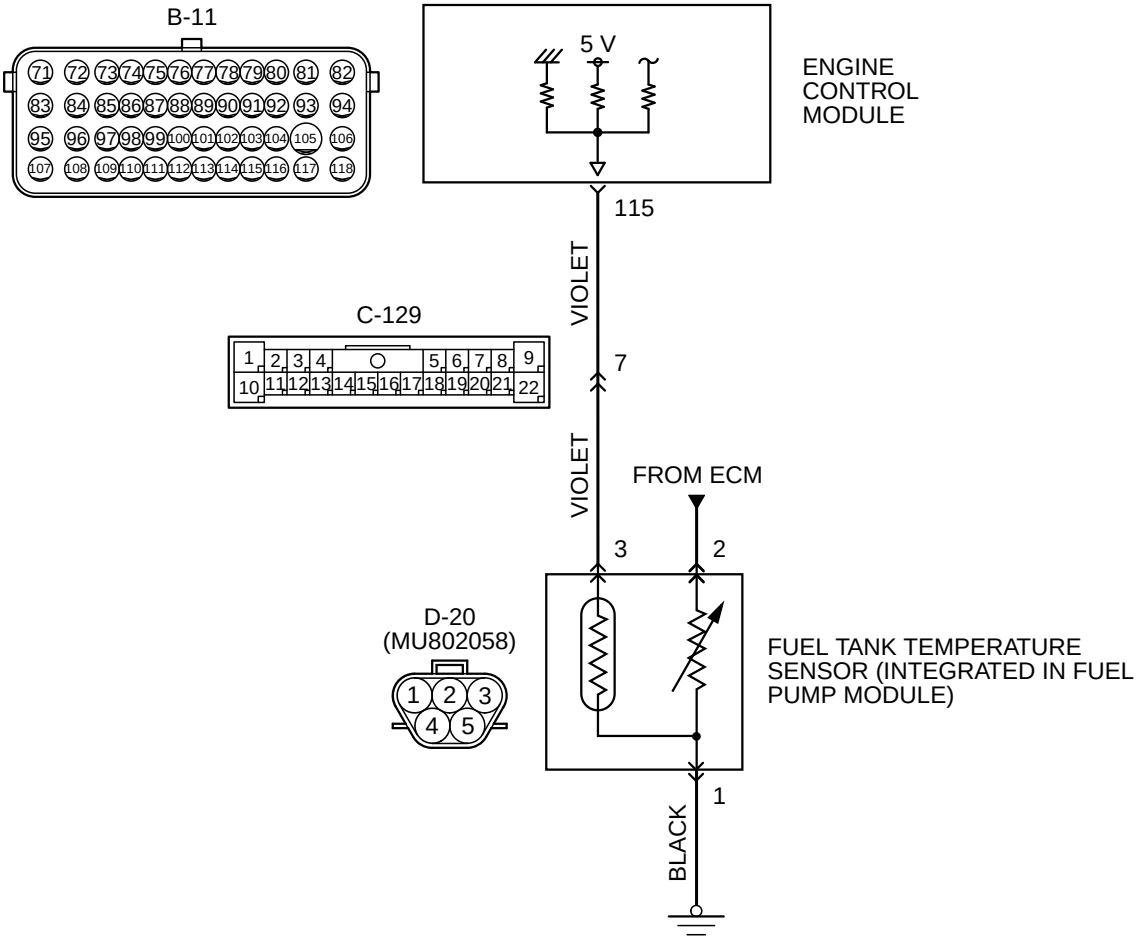
(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function - OBD-II Drive Cycle - Pattern 22 P. 13Ab-8.
(2) Check the diagnostic trouble code (DTC).

Q:Is DTC P0175 output?
YES: Retry the troubleshooting.
NO: The inspection is complete.

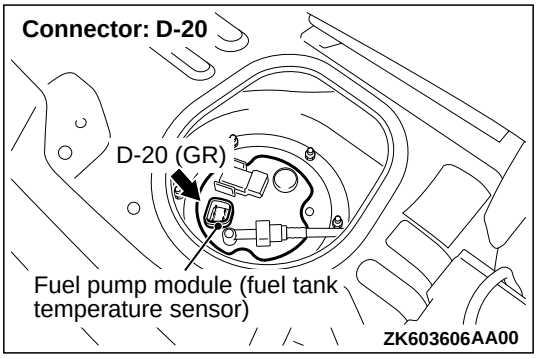
DTC P0181: Fuel Tank Temperature Sensor Circuit Range/Performance

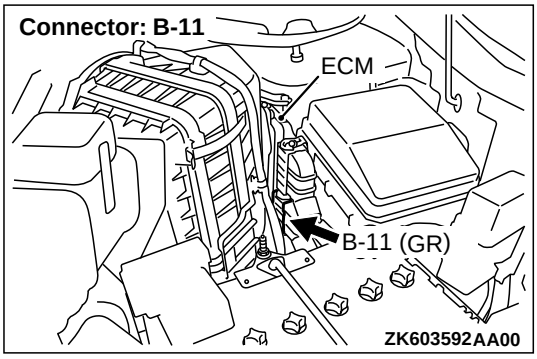
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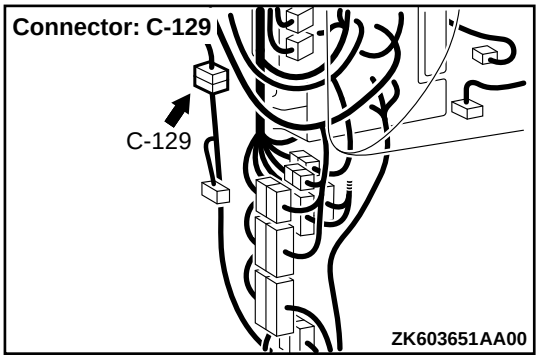
FUEL TANK TEMPERATURE SENSOR CIRCUIT



ZK602842 AA00







CIRCUIT OPERATION
- 5-volt voltage is applied to the fuel tank temperature sensor output terminal (terminal No. 3) from the ECM (terminal No. 115) via the resistor in the ECM.
- 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 ECM 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

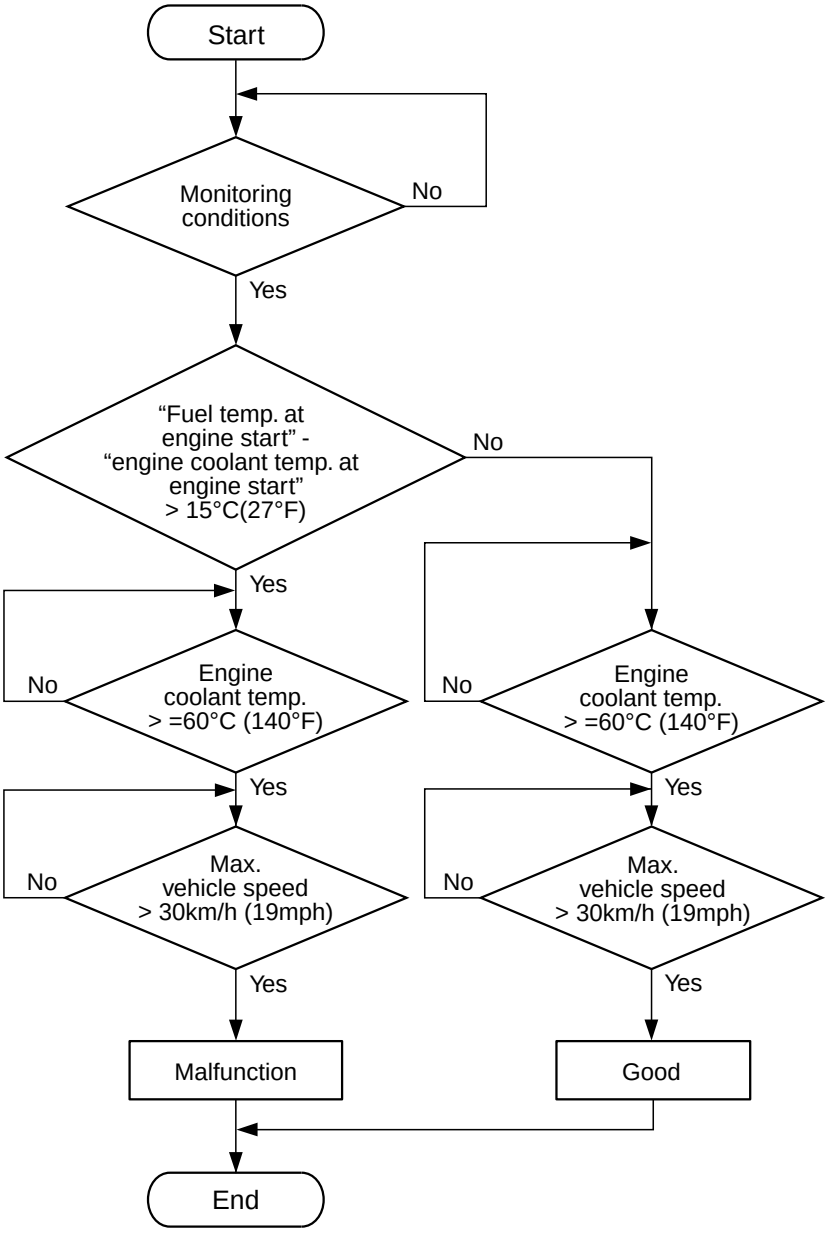
MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

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



ZK600871AA00

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.

OBD-II DRIVE CYCLE PATTERN

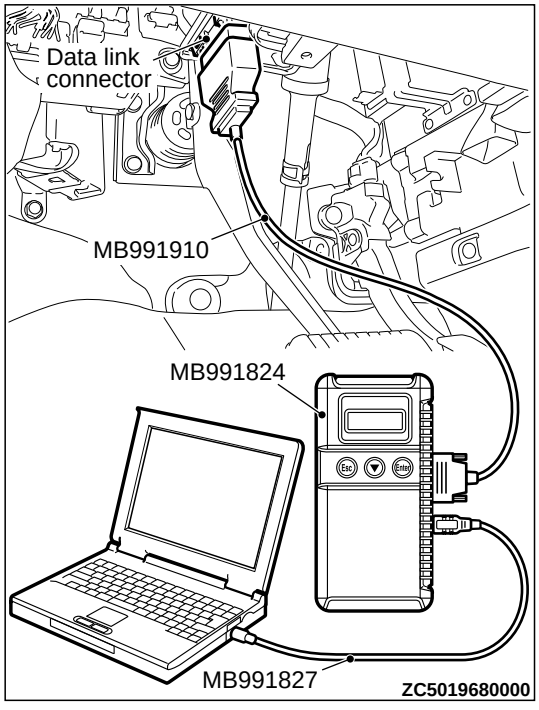
Refer to Diagnostic Function - OBD-II Drive Cycle - Pattern 14 P.13Ab-8.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)
- Fuel tank temperature sensor failed.
- Connector damage.
- ECM 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



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?

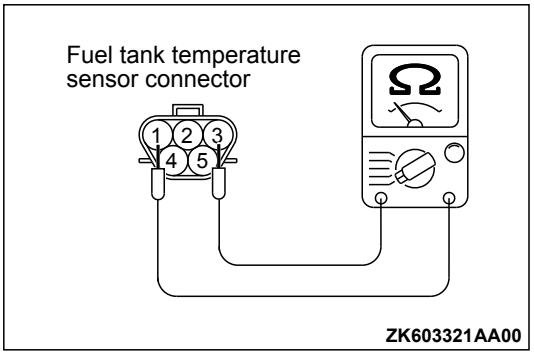
YES: It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points - How to Cope with Intermittent Malfunctions P.00-15.

NO: Go to Step 2.

STEP 2. Check the harness connector D-20 at the fuel tank temperature sensor and harness connector B-11 at the ECM for damage.

Q:Is the harness connector in good condition?

YES: Go to Step 3.



NO: Repair it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 5.

STEP 3. Check the fuel tank temperature sensor.

(1) Disconnect the fuel tank temperature sensor connector D-20.
(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 5.

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 22 P. 13Ab-8.
(2) Check the diagnostic trouble code (DTC).

Q:Is DTC P0181 set?

YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. 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.00-15.

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 14 P. 13Ab-8.
(2) Check the diagnostic trouble code (DTC).

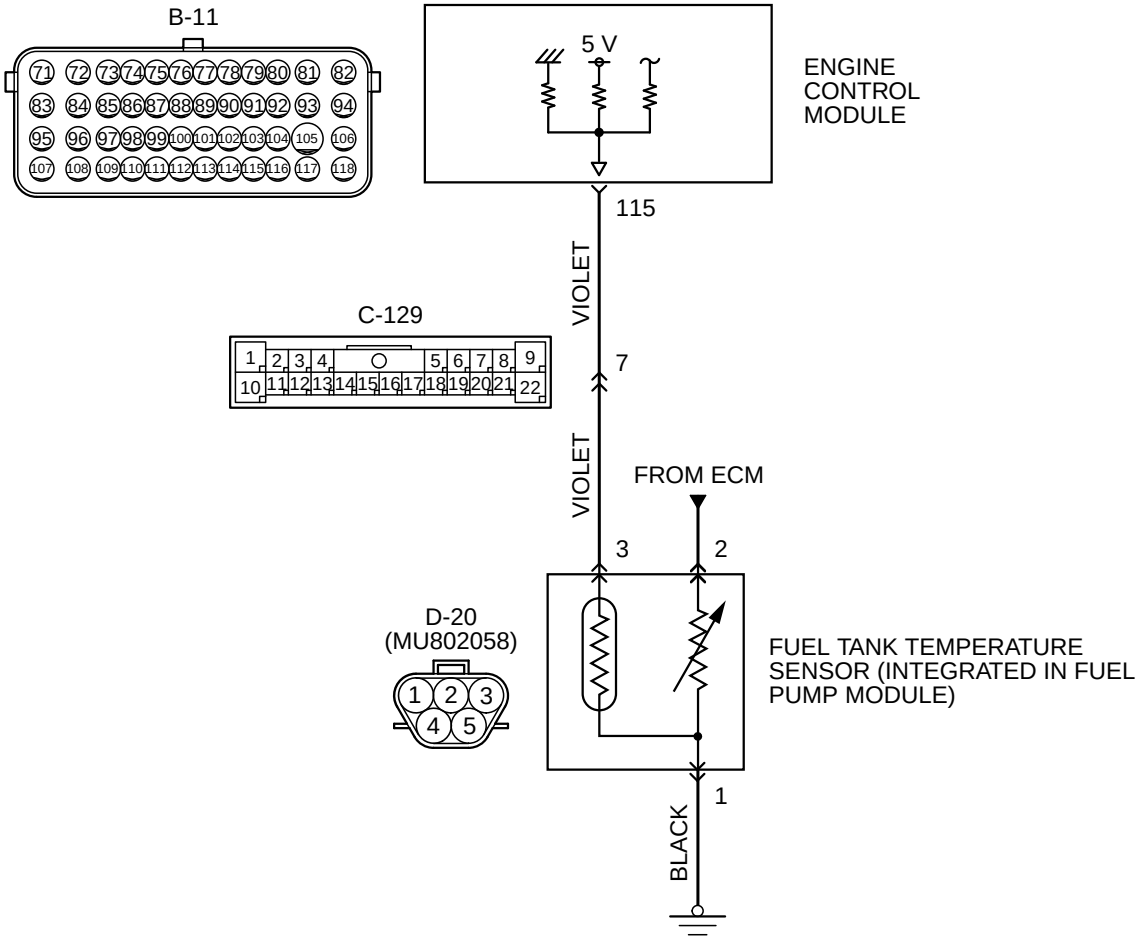
Q:Is DTC P0181 set?

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

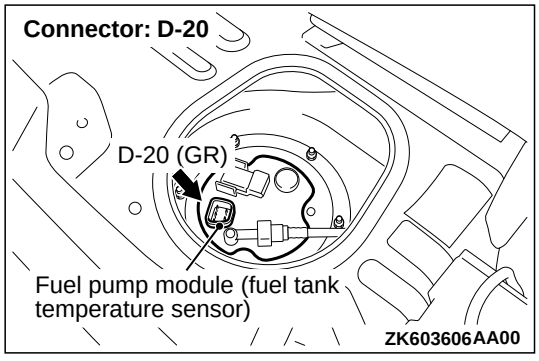
DTC P0182: Fuel Tank Temperature Sensor Circuit Low Input

M11310100207USA0000010000

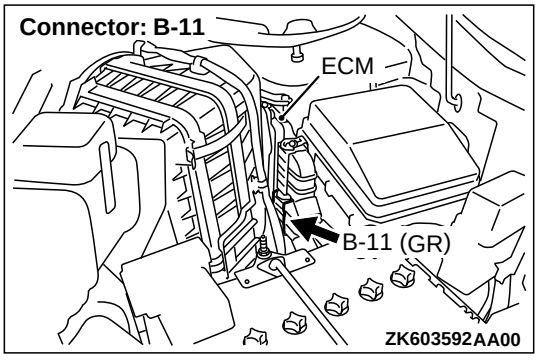
FUEL TANK TEMPERATURE SENSOR CIRCUIT



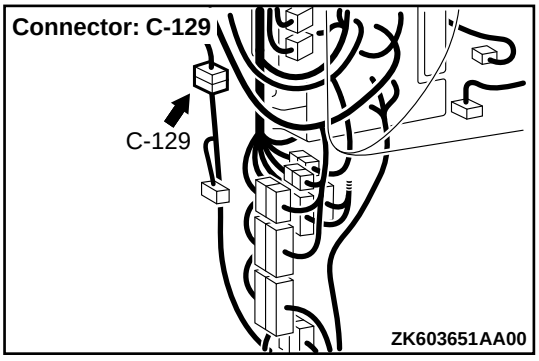
ZK602842 AA00



ZK603606 AA00



ZK603592 AA00



CIRCUIT OPERATION
- 5-volt voltage is applied to the fuel tank temperature sensor output terminal (terminal No. 3) from the ECM (terminal No. 115) via the resistor in the ECM.
- 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 ECM 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

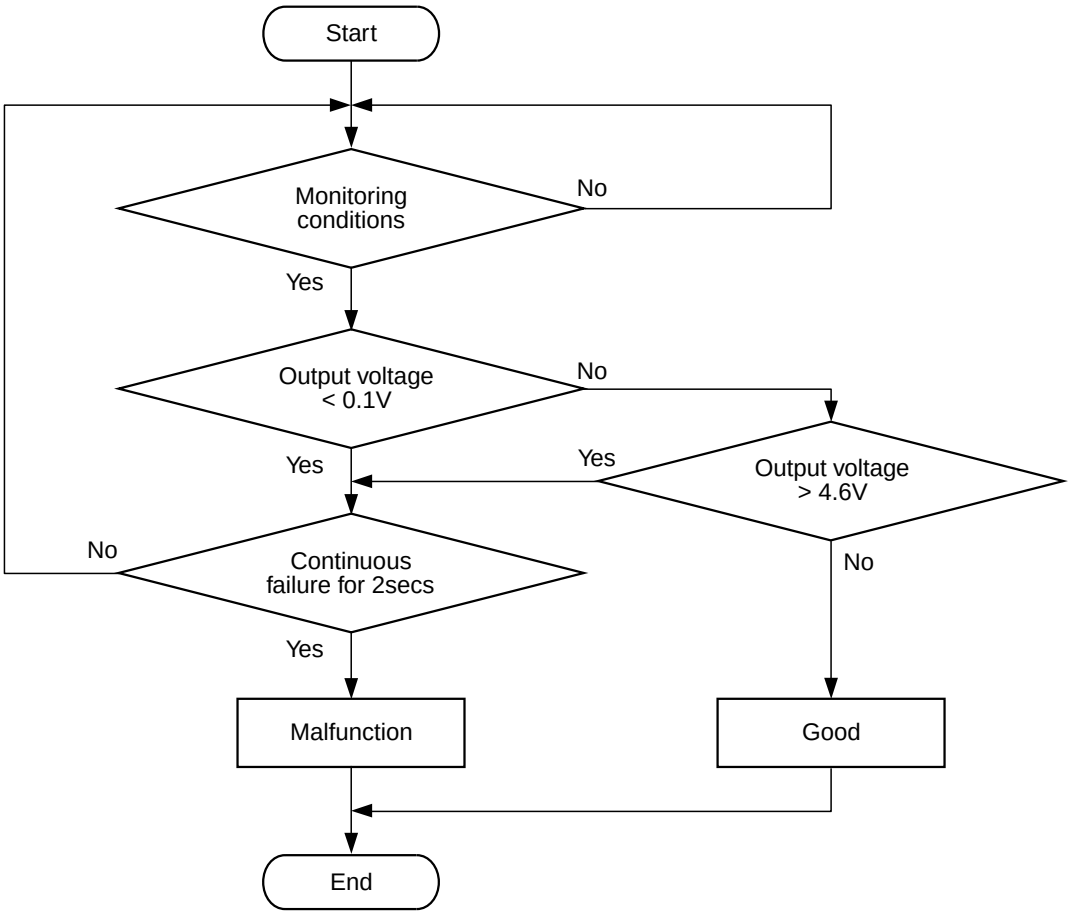
MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

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



ZK603734AA00

Check Conditions

- 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.

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

- Fuel tank temperature sensor failed.
- Connector damage.
- Harness damage.
- ECM failed.

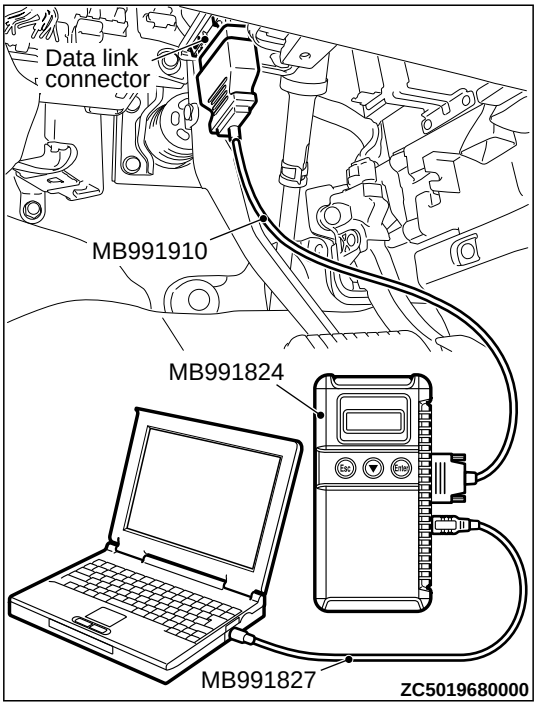
OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function - OBD-II Drive Cycle - Pattern 24 P.13Ab-8.

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 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.00-15.

NO: Go to Step 2.

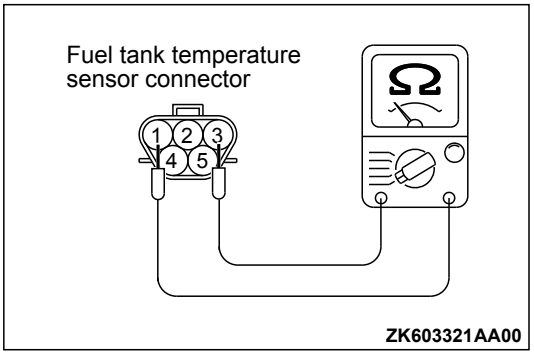
STEP 2. Check the harness connector D-20 at the fuel tank temperature sensor and harness connector B-11 at ECM for damage.

Q:Is the harness connector in good condition?

YES: Go to Step 3.

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

STEP 3. Check the fuel tank temperature sensor.



(1) Disconnect the fuel tank temperature sensor connector D-20.
(2) Measure the resistance between terminal No. 1 and No. 3 of the fuel tank temperature sensor.

Standard value: 0.5 - 12.0 kΩ

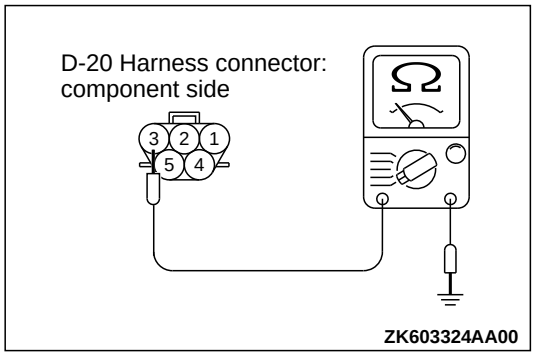
Q:Is the measured resistance between 0.5 and 12.0 kΩ?

YES: Go to Step 4.

NO: Replace the fuel tank temperature sensor. Then go to Step 6.

STEP 4. Check for short circuit to ground between the fuel temperature sensor connector D-20 and the ECM connector B-11.

(1) Disconnect the fuel temperature sensor connector D-20 and the ECM connector B-11.



(2) Check for the continuity between the temperature sensor connector D-20 (terminal No. 3) and ground.
- Not continuity.

Q:Is the harness wire in good condition?

YES: Go to Step 5.

NO: Check harness connector C-129 at Intermediate connector for damage, and repair as required. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. If the Intermediate connector C-129 is good condition, repair harness wire between the temperature sensor connector D-20 (terminal No. 3) and the ECM connector B-11 (terminal No.115) because of open circuit. Then go to Step 6.

STEP 5. Check the trouble symptoms.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function - OBD-II Drive Cycle - Pattern 22 P. 13Ab-8.

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

Q:Is DTC P0182 set?

YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 6.

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.00-15.

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. 13Ab-8.

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

Q:Is DTC P0182 set?

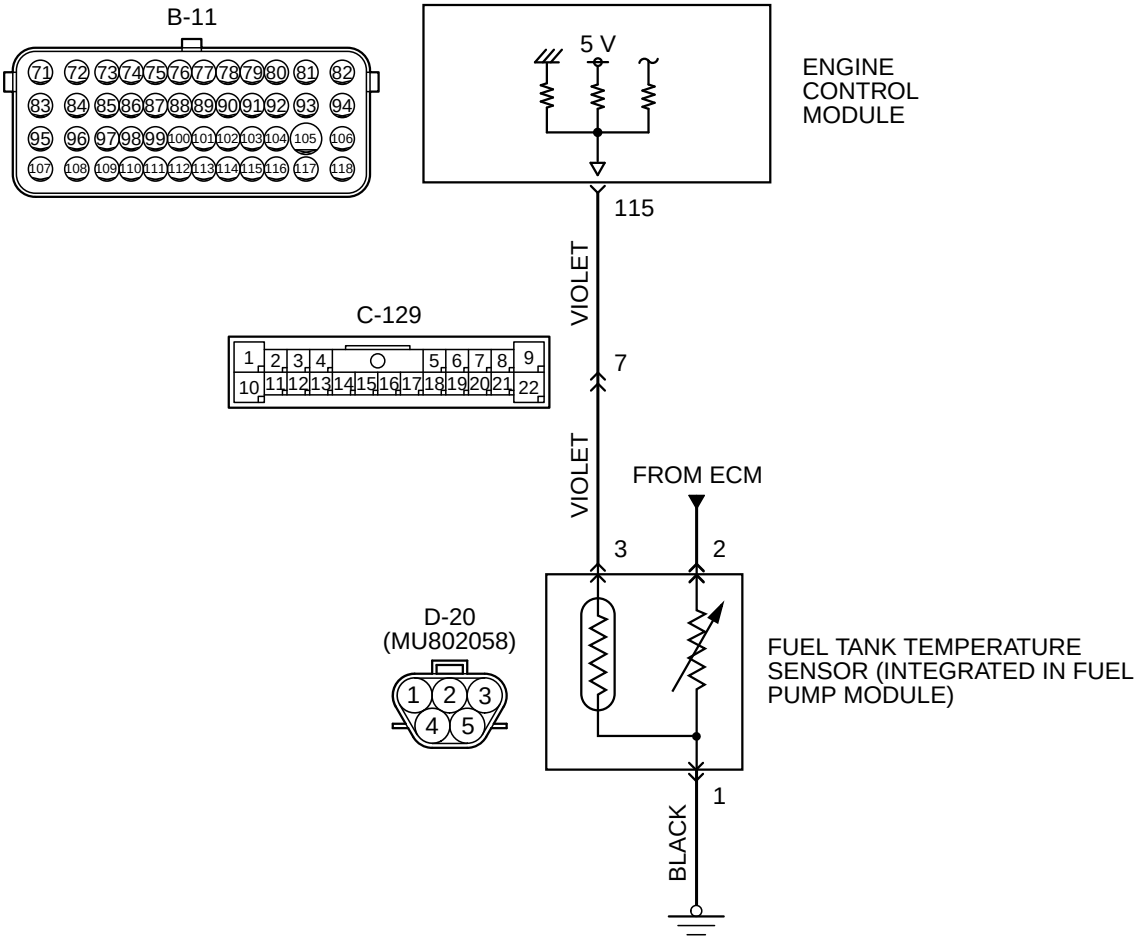
YES: Retry the troubleshooting.

NO: The inspection is complete.

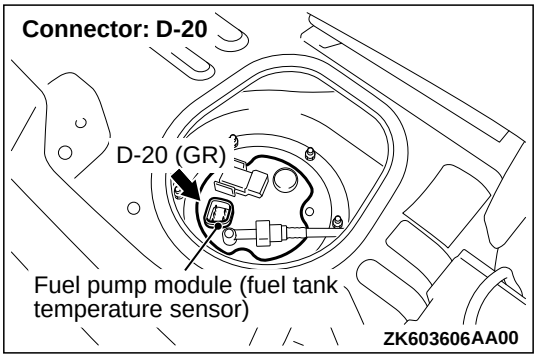
DTC P0183: Fuel Tank Temperature Sensor Circuit High Input

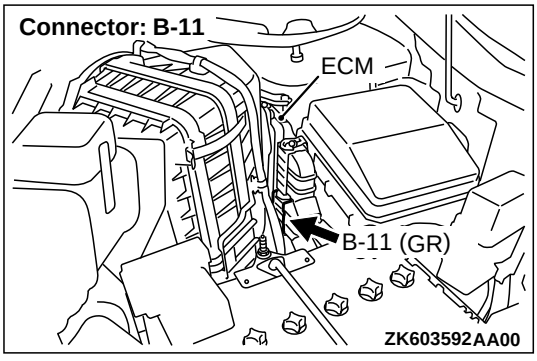
M11310100208USA0000010000

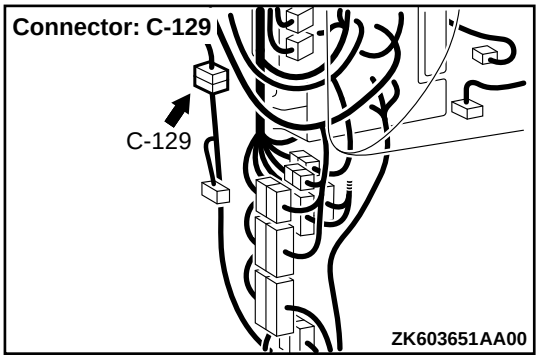
FUEL TANK TEMPERATURE SENSOR CIRCUIT



ZK602842 AA00







CIRCUIT OPERATION
- 5-volt voltage is applied to the fuel tank temperature sensor output terminal (terminal No. 3) from the ECM (terminal No. 115) via the resistor in the ECM.
- 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 ECM 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

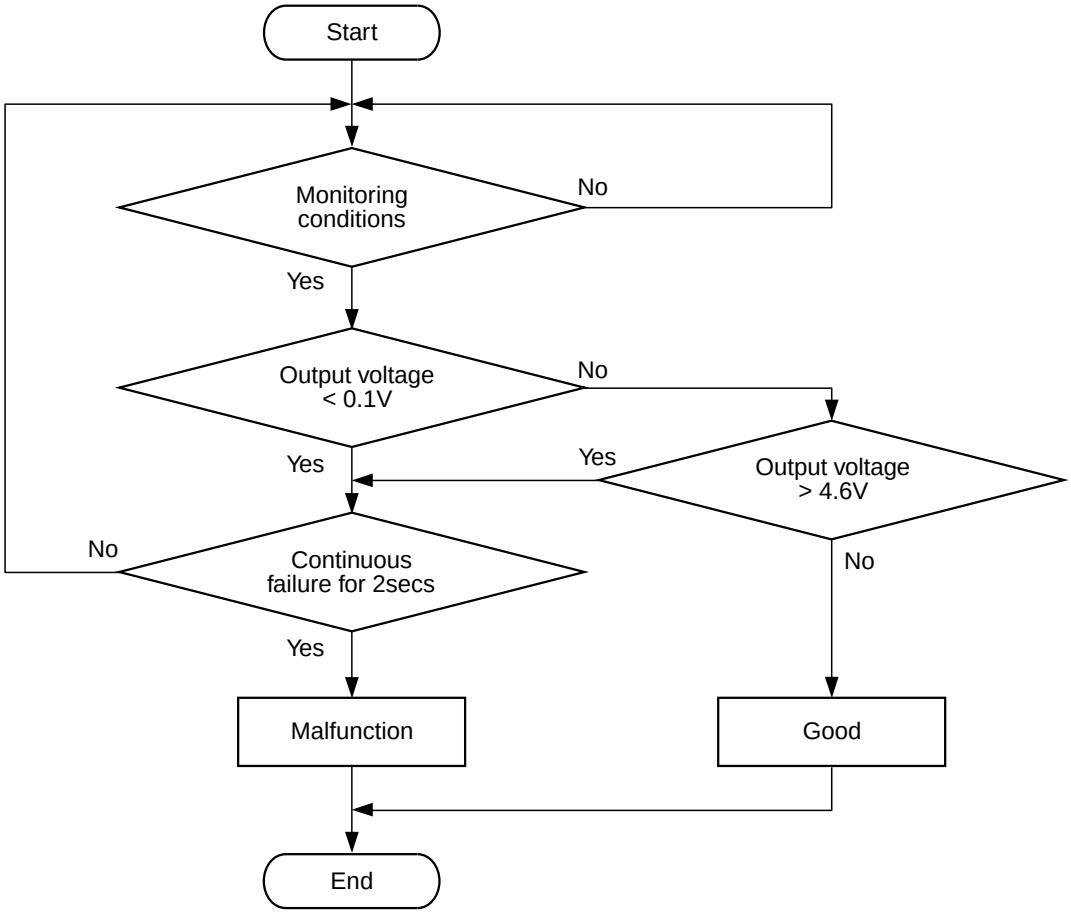
MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

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



ZK603734AA00

Check Conditions

- 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.

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

- Fuel tank temperature sensor failed.
- Connector damage.
- Harness damage.
- ECM failed.

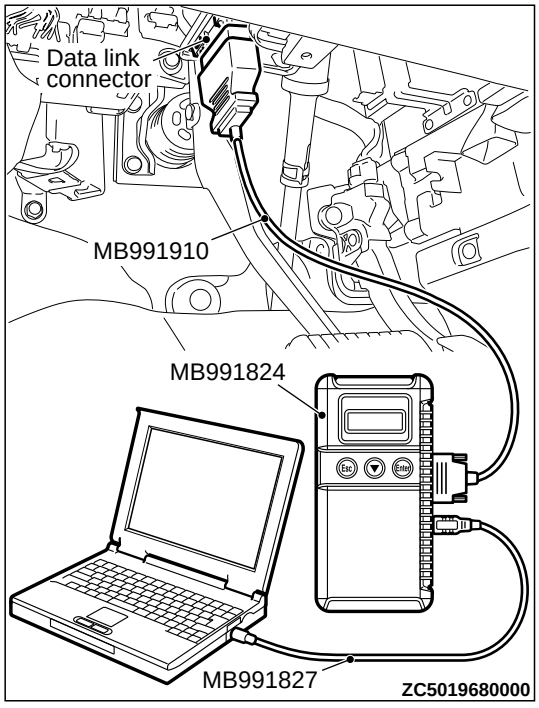
OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function - OBD-II Drive Cycle - Pattern 24 P.13Ab-8.

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 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.00-15.

NO: Go to Step 2.

STEP 2. Check the harness connector D-20 at the fuel tank temperature sensor and harness connector B-11 at the ECM for damage.

Q:Is the harness connector in good condition?

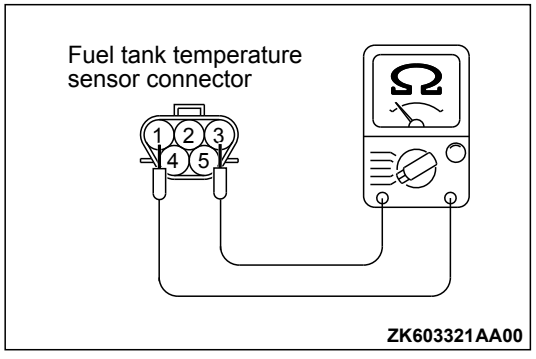
YES: Go to Step 3.

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

STEP 3. Check the fuel tank temperature sensor.

(1) Disconnect the fuel tank temperature sensor connector D-20.
(2) Measure the resistance between terminal No. 1 and No. 3 of the fuel tank temperature sensor.

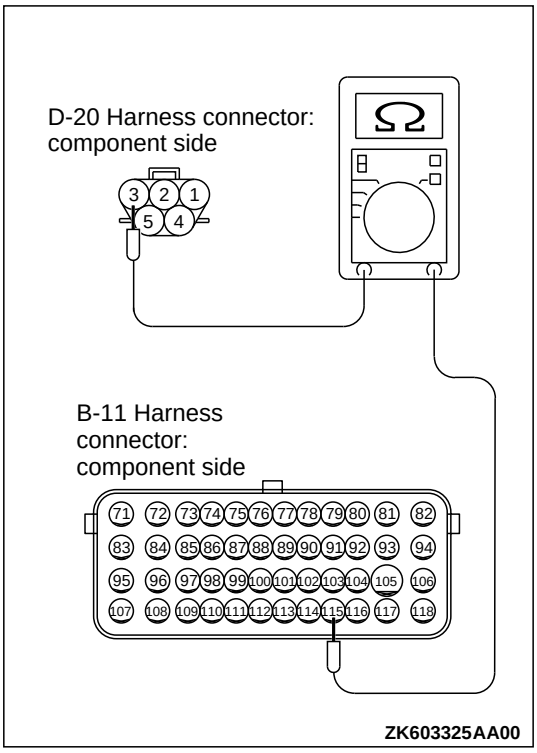
Standard value: 0.5 - 12.0 kΩ



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 7.



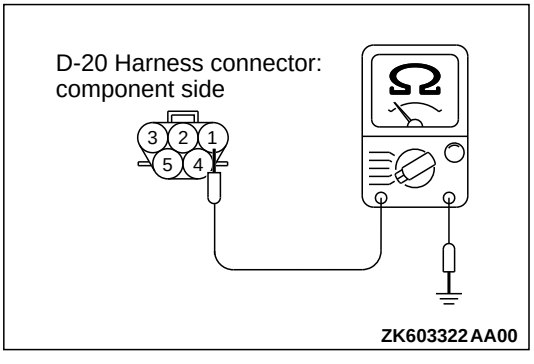
STEP 4. Check for open circuit and harness damage between the fuel temperature sensor connector D-20 and the ECM connector B-11.

(1) Disconnect the fuel temperature sensor connector D-20 and the ECM connector B-11.
(2) Measure the continuity between the temperature sensor connector D-20 (terminal No. 3) and the ECM connector B-11 (terminal No. 115).
- Should be less than 2 ohms.

Q:Is the harness wire in good condition?

YES: Go to Step 5.

NO: Check harness connector C-129 at Intermediate connector for damage, and repair as required. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. If the Intermediate connector C-129 is good condition, repair harness wire between the temperature sensor connector D-20 (terminal No.3) and the ECM connector B-11 (terminal No.115) because of open circuit. Then go to Step 7.



STEP 5. Check for open circuit and harness damage between at the fuel tank temperature sensor connector D-20 (terminal No. 1) and ground.

(1) Disconnect the connector D-20 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 6.

NO: Repair harness wire between the fuel tank temperature sensor connector D-20 (terminal No. 1) and ground because of open circuit or harness damage. 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. 13Ab-8.
(2) Check the diagnostic trouble code (DTC).

Q:Is DTC P0183 set?

YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. 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.00-15.

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. 13Ab-8.

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

Q:Is DTC P0183 set?

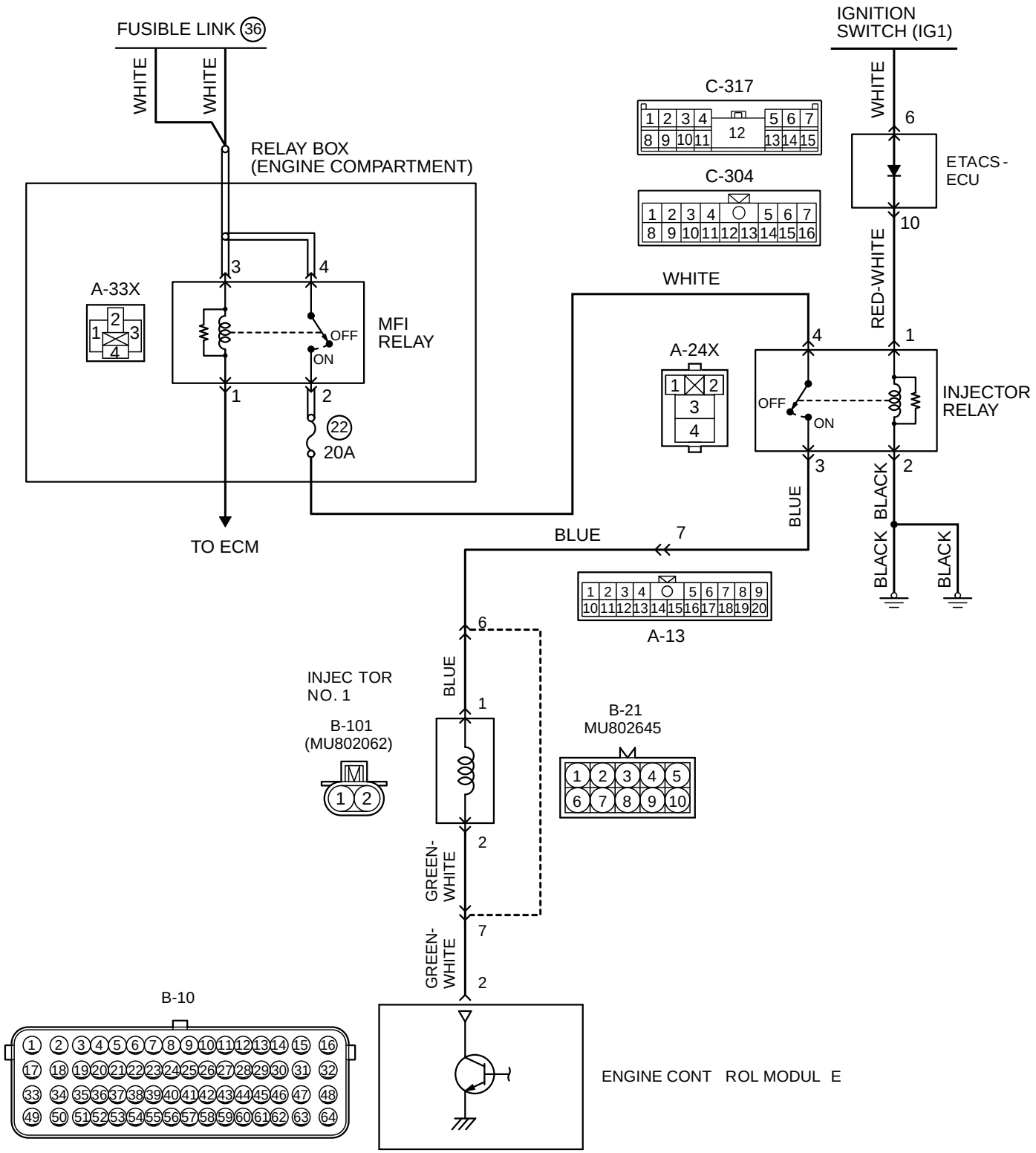
YES: Retry the troubleshooting.

NO: The inspection is complete.

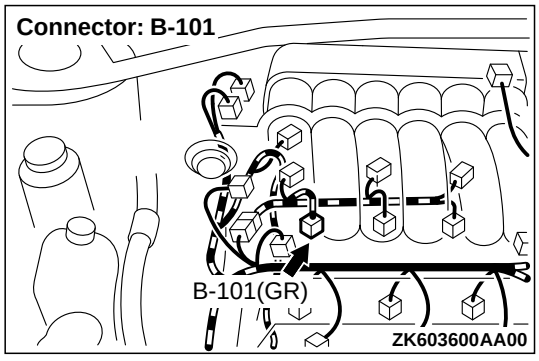
DTC P0201: Injector Circuit Malfunction - Cylinder 1

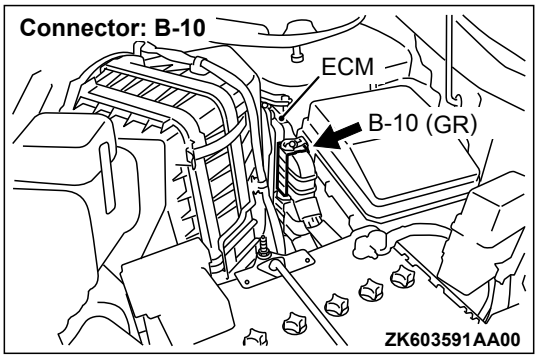
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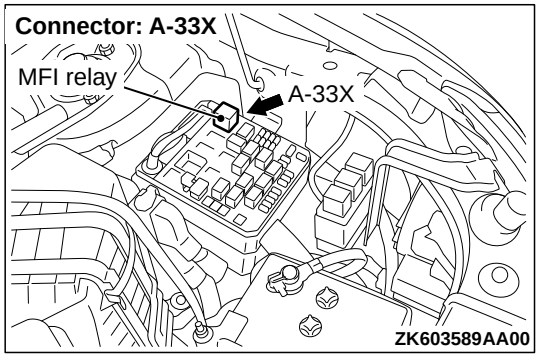
INJECTOR CIRCUIT-CYLINDER 1

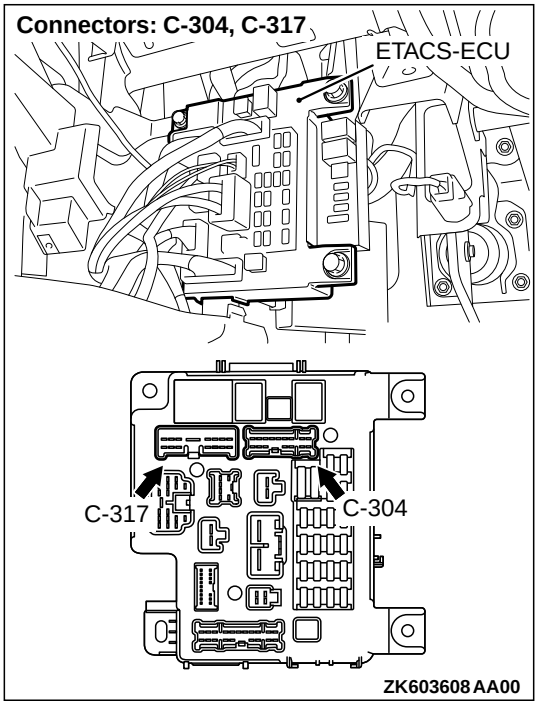


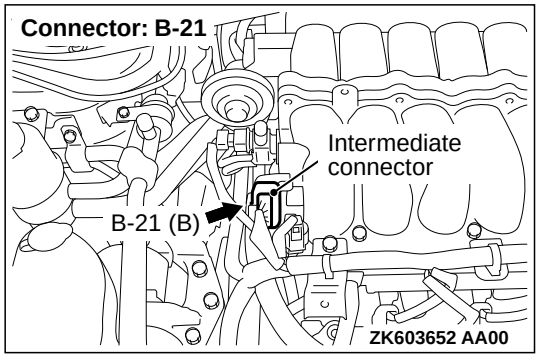
ZK602843 AA00

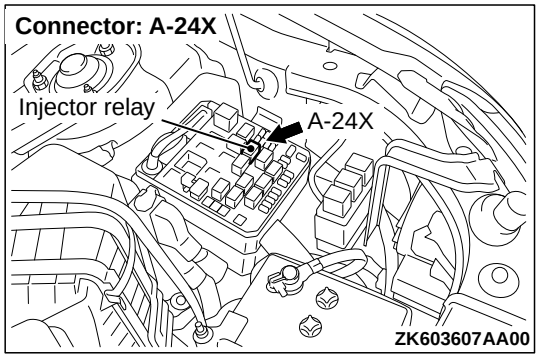


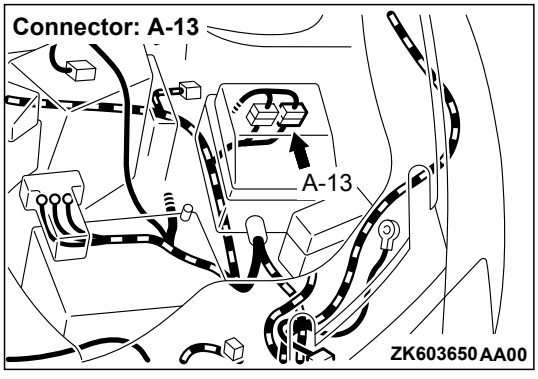












CIRCUIT OPERATION

- The injector power is supplied from the injector relay (terminal No. 3).
- The ECM controls the injector by turning the power transistor in the ECM "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 ECM.

DESCRIPTIONS OF MONITOR METHODS

The ECM detects open circuit and short malfunction.

MONITOR EXECUTION
Continuous

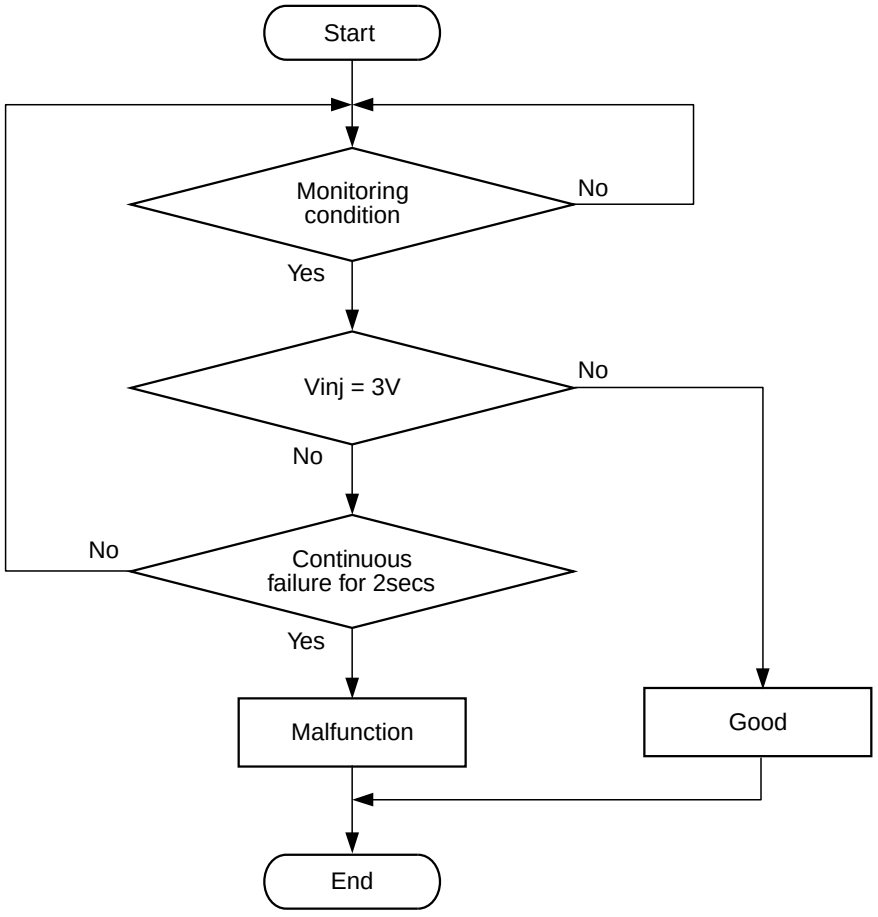
MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

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



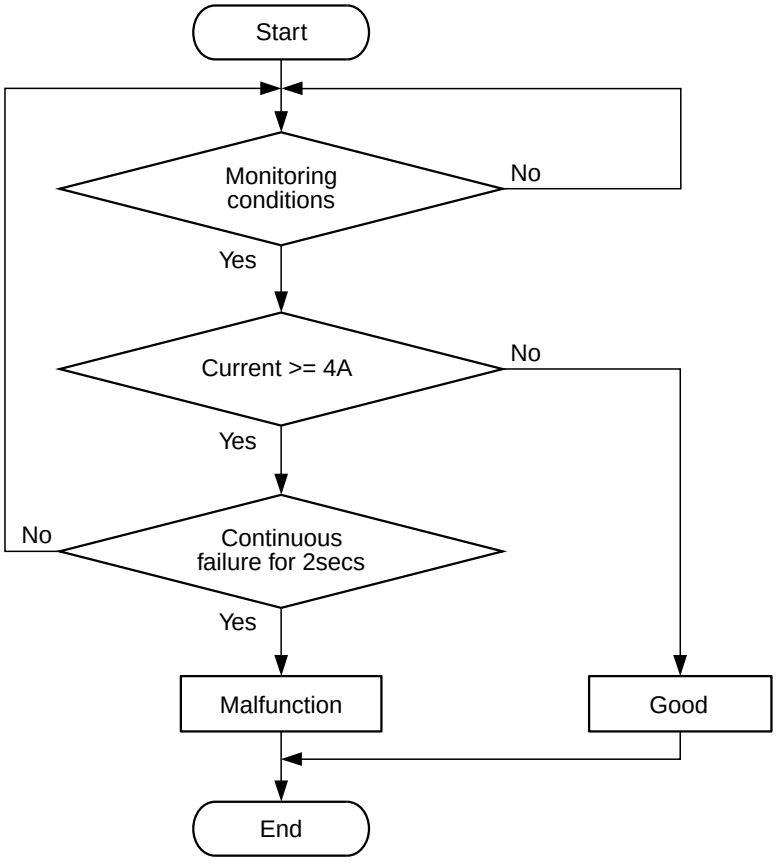
ZK603735AA00

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



ZK603736 AA00

Check Condition
- Engine is running.

Judgement Criterion
- The coil current is 4 ampere or more with the injector driving.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)
- No. 1 cylinder injector failed.
- Connector damage.
- Harness damage.
- ECM failed.

OBD-II DRIVE CYCLE PATTERN

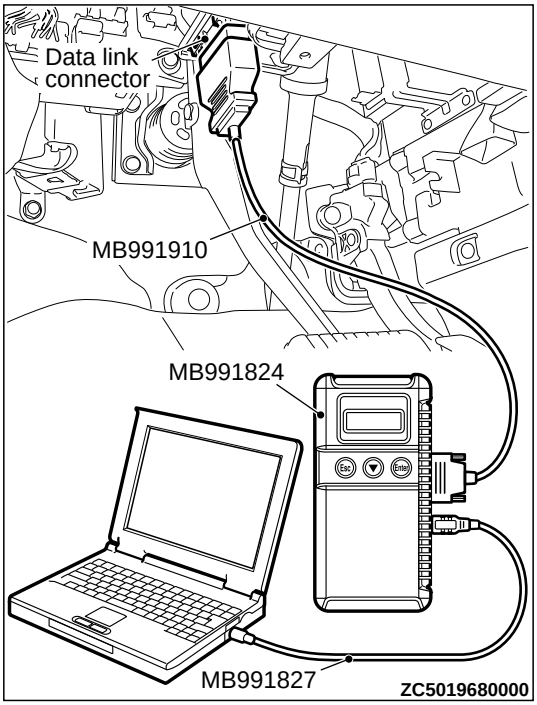
Refer to Diagnostic Function - OBD-II Drive Cycle - Pattern 24 P.13Ab-8.

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
- MB992110: Power Plant ECU Check Harness

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.00-15.

NO: Go to Step 2.

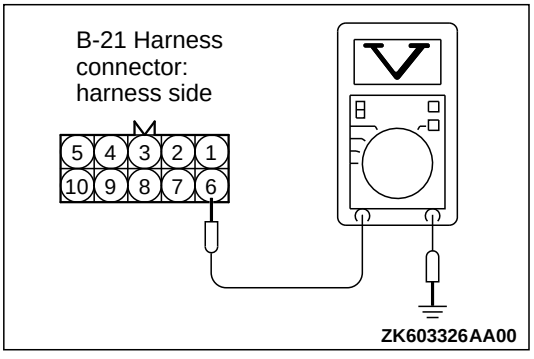
STEP 2. Check for harness connector B- 21 at the intermediate connector and B-10 at the ECM for damage.

Q:Is the harness connector in good condition?

YES: Go to Step 3.

NO: Repair it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 10.

STEP 3. Measure the injector supply voltage at the intermediate connector harness B-21 and ground.



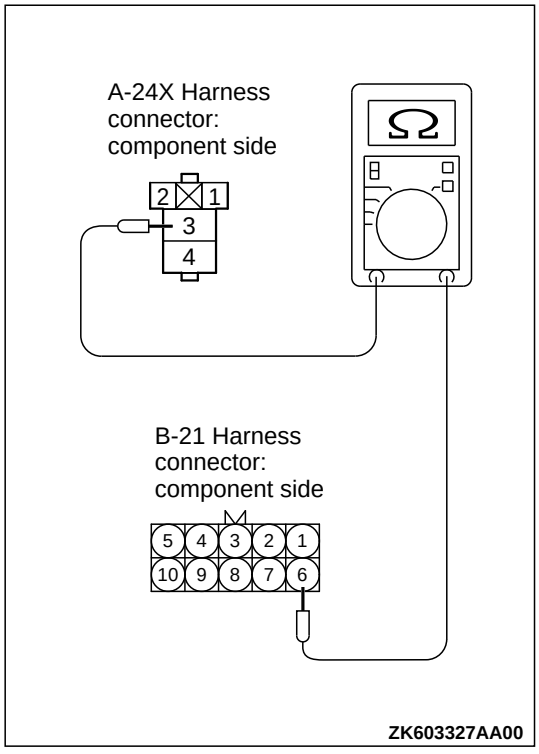
(1) Disconnect the intermediate connector B-21 and measure at the female connector side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal No. 6 and ground.
- Voltage should be battery positive voltage.

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

Q:Is the measured resistance battery positive voltage?

YES: Go to Step 5.

NO: Go to Step 4.



STEP 4. Check for harness between the injector relay connector A-24X and the intermediate connector B-21.

(1) Disconnect the injector relay connector A-24X and the intermediate connector B-21.

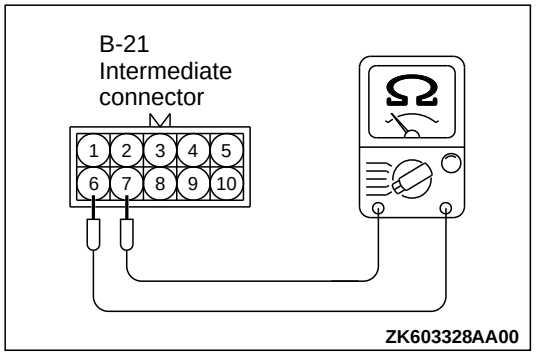
(2) Measure the resistance injector relay connector A-24X (terminal No. 3) and the intermediate connector B-21 (terminal No. 6).

- Should be less than 2 ohms.

Q:Is the harness wire in good condition?

YES: Go to Step 9.

NO: Repair it. Then go to Step 10.



STEP 5. Check the No. 1 cylinder injector resistance at intermediate connector B-21.

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

(2) Measure the resistance between terminal No. 6 and No. 7.

- Resistance should be between 10.5 and 13.5 ohms.

Q:Is the measured resistance between 10.5 and 13.5 ohms?

YES: Go to Step 8.

NO: Go to Step 6.

STEP 6. Check the harness connector B-101 at No. 1 cylinder injector for damage.

Remove the intake manifold.

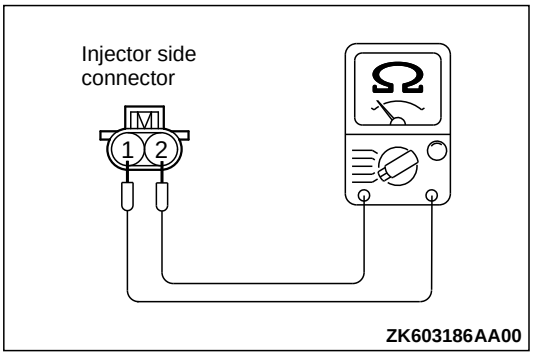
Q:Is the harness connector in good condition?

YES: Go to Step 7.

NO: Repair it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 10.

STEP 7. Check the No. 1 cylinder injector B-101.

(1) Disconnect the No. 1 cylinder injector connector B-101.



(2) Measure the resistance between injector side connector terminal No. 1 and No. 2.

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

Q:Is the measured resistance between 10.5 and 13.5 ohms [at 20°C (68°F)]?

YES:

Repair harness wire between the intermediate connector B-21 (terminal No. 6) and the injector connector B-101 (terminal No. 1) and harness wire between injector connector B-101 (terminal No. 2) and intermediate connector B-21 (terminal No. 7) because of open circuit or short circuit to ground or harness damage.

Then go to Step 10.

NO: Replace the No. 1 cylinder injector. Then go to Step 10.

STEP 8. Check for harness between the intermediate connector B-21and the ECM connector B-10.

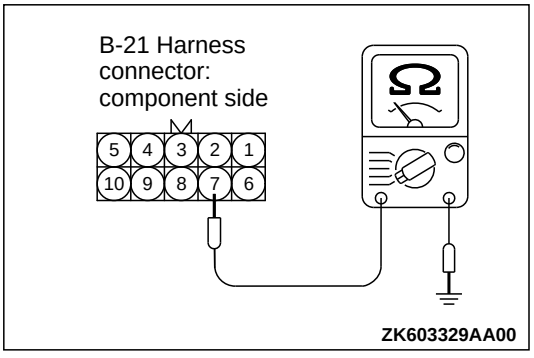
(1) Disconnect the intermediate connector B-21 and the ECM connector B-10.

(2) Measure the resistance between the intermediate connector B-21 (terminal No. 7) and the ECM connector B-10 (terminal No. 2).

- Should be less than 2 ohms.

(3) Measure the continuity between the intermediate connector B-21 (terminal No. 7) and ground.

- Not continuity



Q:Is the harness wire in good condition?

YES: Go to Step 9.

NO: Repair it. Refer to GROUP 00E, Harness Connector Inspection P.13Aa-17. Then go to Step 10.

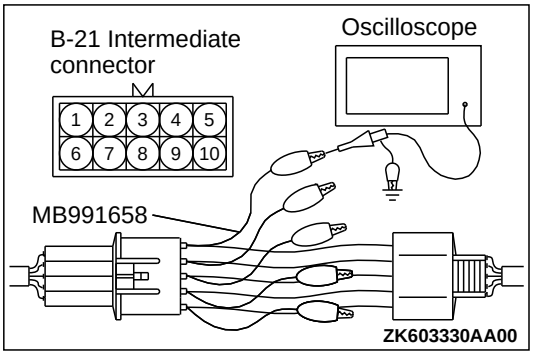
STEP 9. Using the oscilloscope, check the No. 1 cylinder injector.

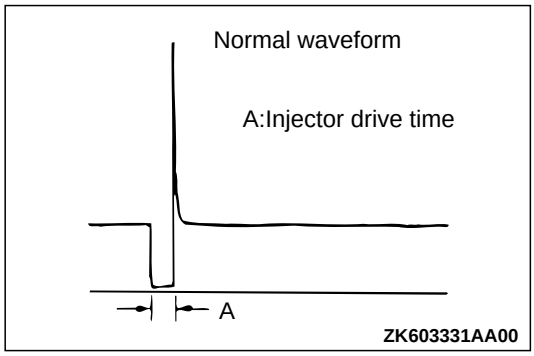
(1) Disconnect the intermediate connector B-21 and connect the test harness MB991658 between the separated connectors.

(2) Connect the oscilloscope probe to injector intermediate connector terminal to No. 7.

NOTE: When measuring with the ECM side connector, disconnect all ECM connectors. Connect the check harness special tool (MB992110) between the separated connectors. Then connect an oscilloscope probe to the check harness connector terminal No. 2.

(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 00, How to Use Troubleshooting/ Inspection Service Points - How to Cope with Intermittent Malfunctions P.00-15.

NO: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. 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. 13Ab-8.

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

Q:Is DTC P0201 set?

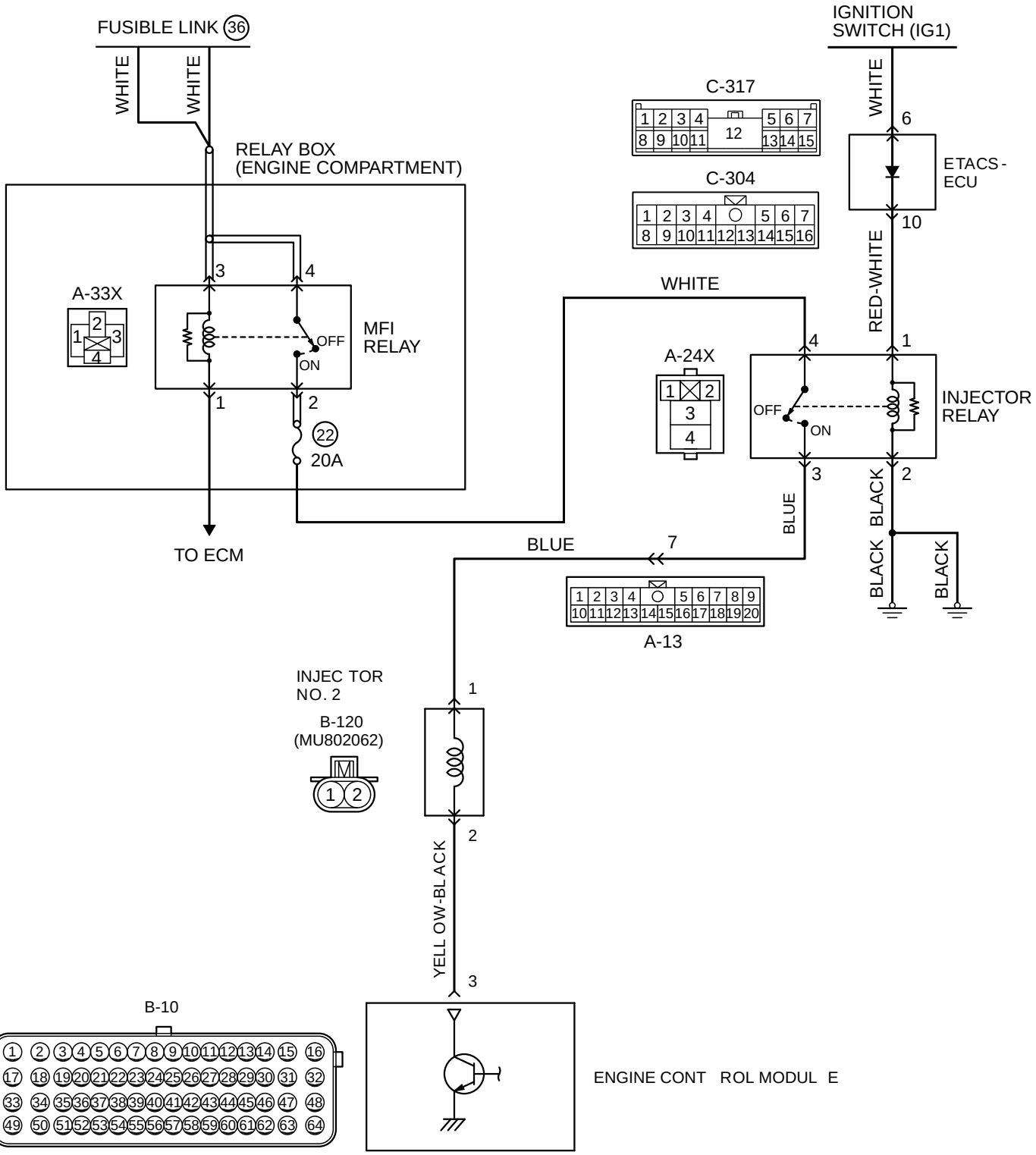
YES: Retry the troubleshooting.

NO: The inspection is complete.

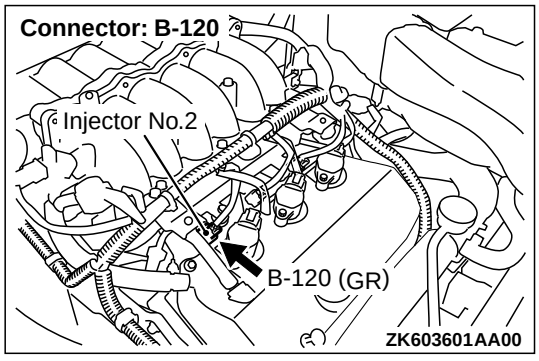
DTC P0202: Injector Circuit Malfunction - Cylinder 2

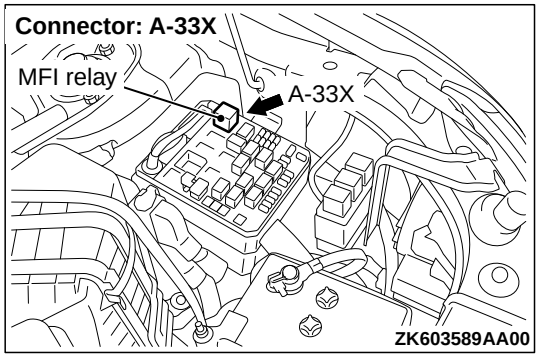
M11310100210USA0000010000

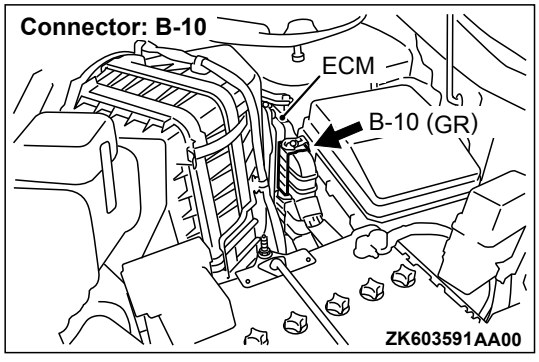
INJECTOR CIRCUIT-CYLINDER 2

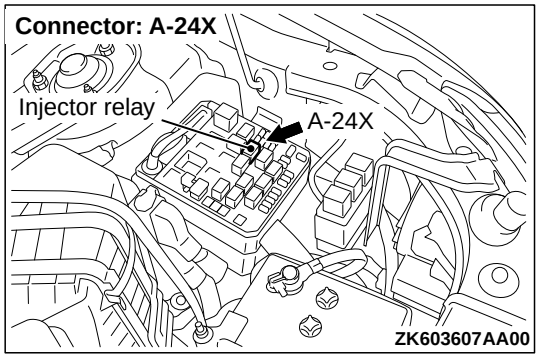


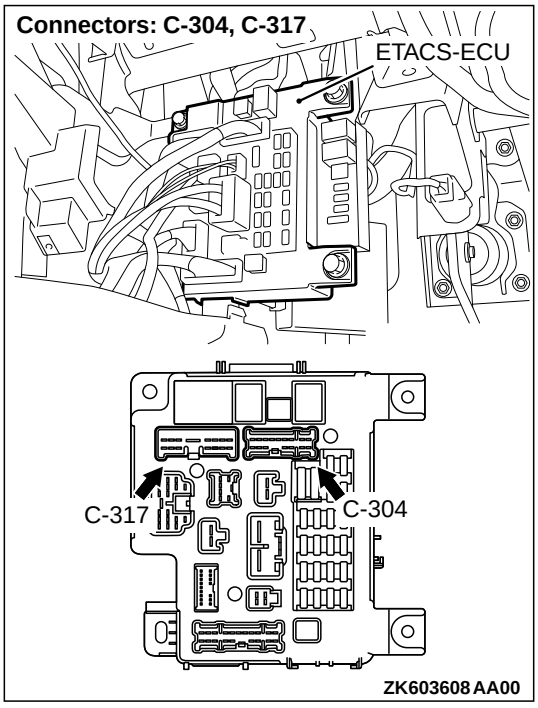
ZK602844 AA00

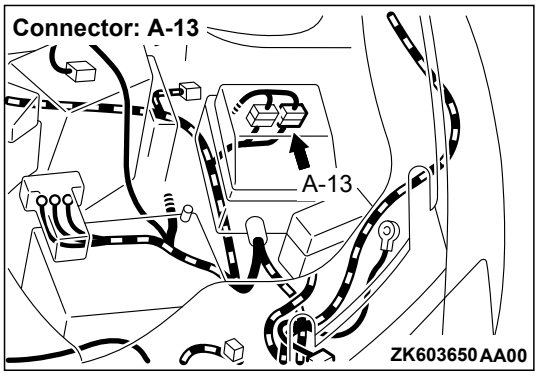












CIRCUIT OPERATION

- The injector power is supplied from the injector relay (terminal No. 3).
- The ECM controls the injector by turning the power transistor in the ECM "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 ECM.

DESCRIPTIONS OF MONITOR METHODS

The ECM detects open circuit and short malfunction.

MONITOR EXECUTION
Continuous

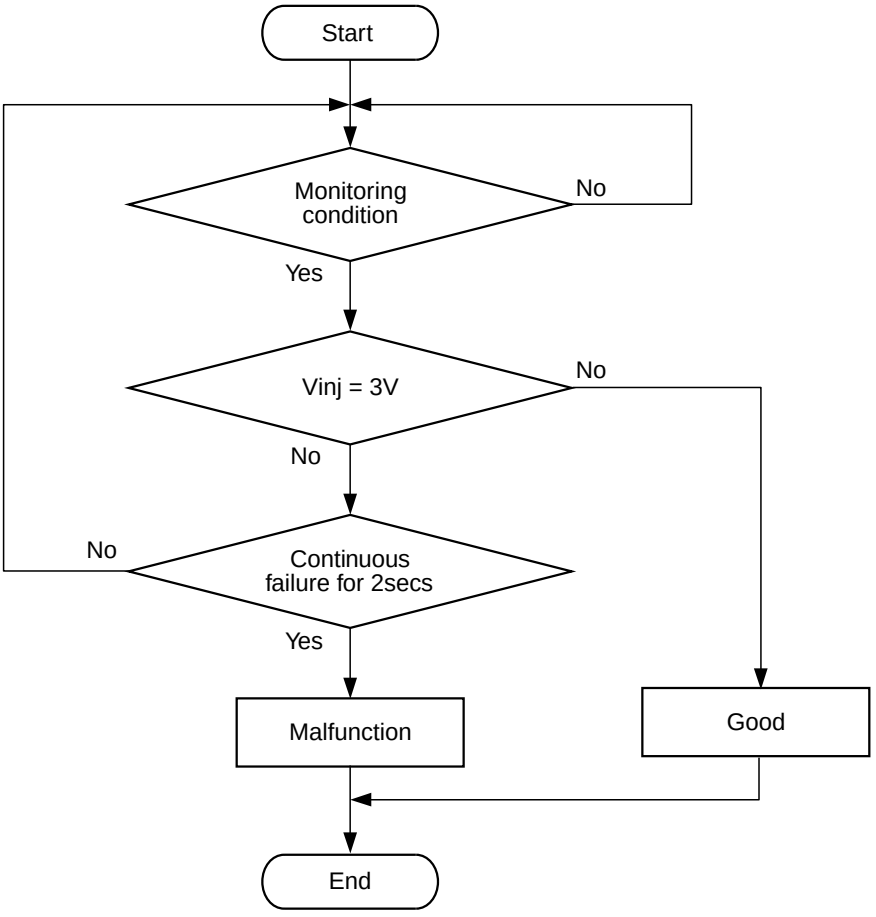
MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

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



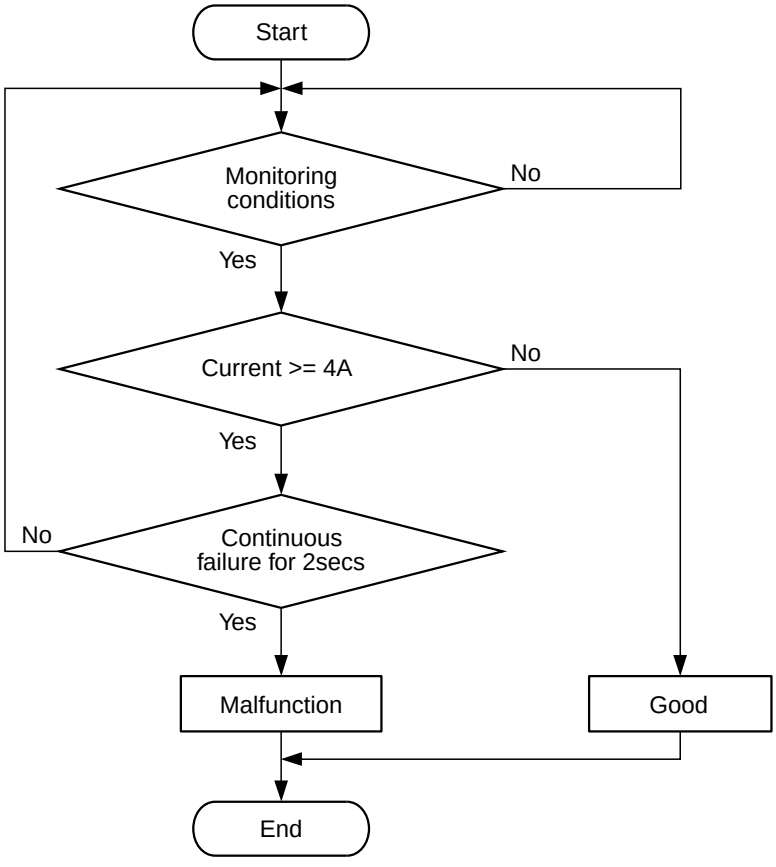
ZK603735AA00

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



ZK603736 AA00

Check Condition
- Engine is running.

Judgement Criterion
- The coil current is 4 ampere or more with the injector driving.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)
- No. 2 cylinder injector failed.
- Connector damage.
- Harness damage.
- ECM failed.

OBD-II DRIVE CYCLE PATTERN

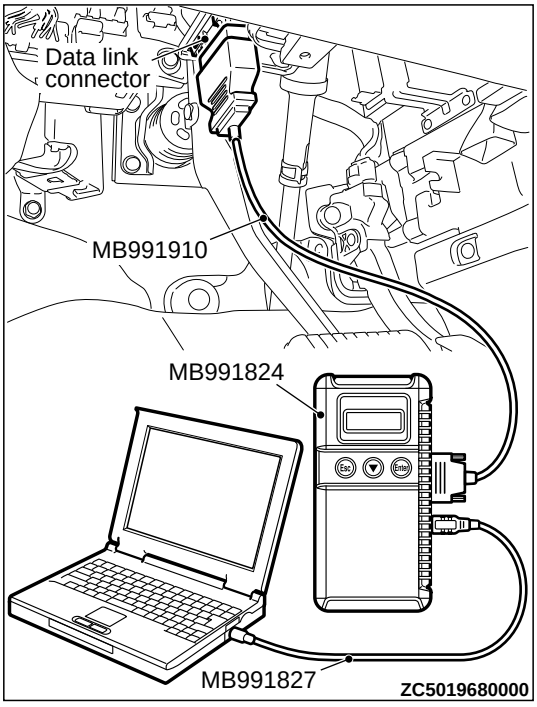
Refer to Diagnostic Function - OBD-II Drive Cycle - Pattern 24 P.13Ab-8.

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
- MB992110: Power Plant ECU Check Harness

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.00-15.

NO: Go to Step 2.

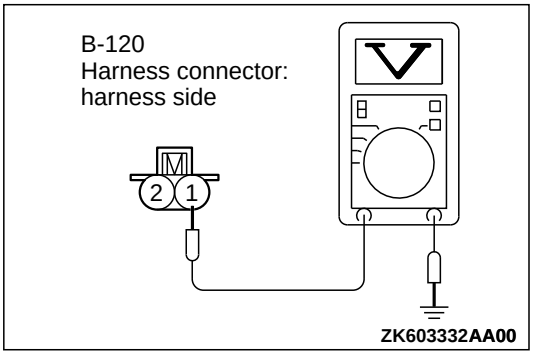
STEP 2. Check the for harness connector B-120 at No. 1 cylinder injector and B-10 at the ECM for damage.

Q:Is the harness connector in good condition?

YES: Go to Step 3.

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

STEP 3. Measure the power supply voltage at the injector connector B-120.



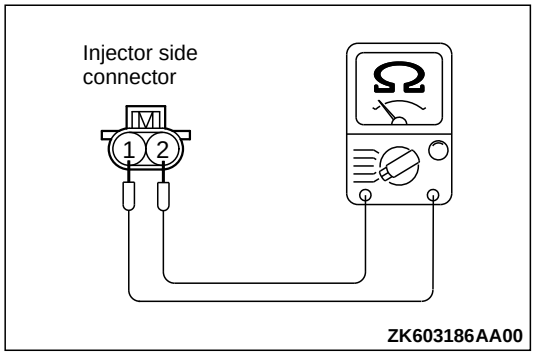
(1) Disconnect the intermediate connector B-120 (terminal No. 1) and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal No. 1 and ground.
- Voltage should be battery positive voltage.

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

Q:Is the measured resistance battery positive voltage?

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 injector relay connector A-24X (terminal No. 3) and injector connector B-120 (terminal No. 1) because of open circuit. Then go to Step 7.



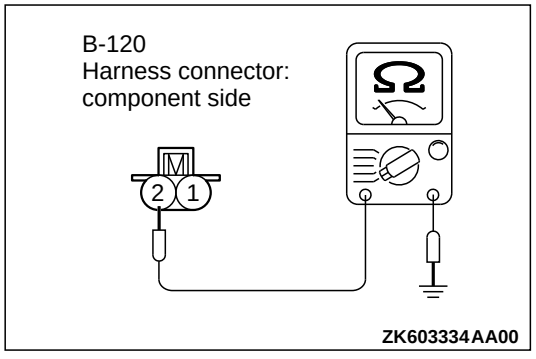
STEP 4. Check the No. 2 cylinder injector.

(1) Disconnect the No. 2 cylinder injector connector B-120.
(2) Measure the resistance between injector side connector terminal No. 1 and No. 2.
Standard value: 10.5 - 13.5 ohms [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 5.
NO: Replace the No. 2 cylinder injector. Then go to Step 7.

STEP 5. Check for harness between the injector connector B-120 and the ECM connector B-10.

(1) Disconnect the injector connector B-120 and the ECM connector B-10.
(2) Measure the resistance between injector connector B-120 (terminal No. 2) and the ECM connector B-10 (terminal No. 3).
▪Should be less than 2 ohms.
(3) Measure the continuity between the intermediate connector B-120 (terminal No. 2) and ground.
▪Not continuity.



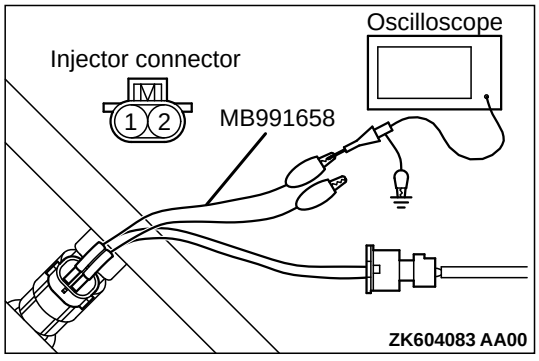
Q:Is the connector wire in good condition?
YES: Go to Step 6.
NO: Repair it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 7.

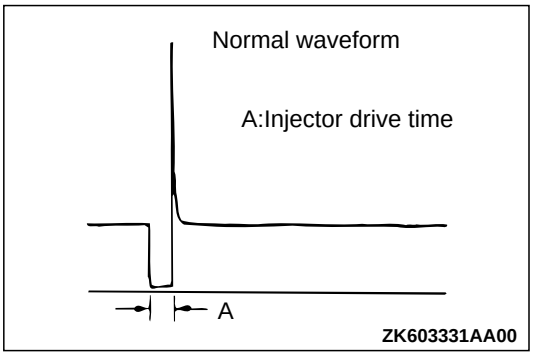
STEP 6. Using the oscilloscope, check the No.2 cylinder injector.

(1) Disconnect the No. 2 cylinder injector connector B-120 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 ECM side connector, disconnect all ECM connectors. Connect the check harness special tool (MB992110) between the separated connectors. Then connect an oscilloscope probe to the check harness connector terminal No. 3.

(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.00-15.

NO: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. 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. 13Ab-8.

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

Q:Is DTC P0202 set?

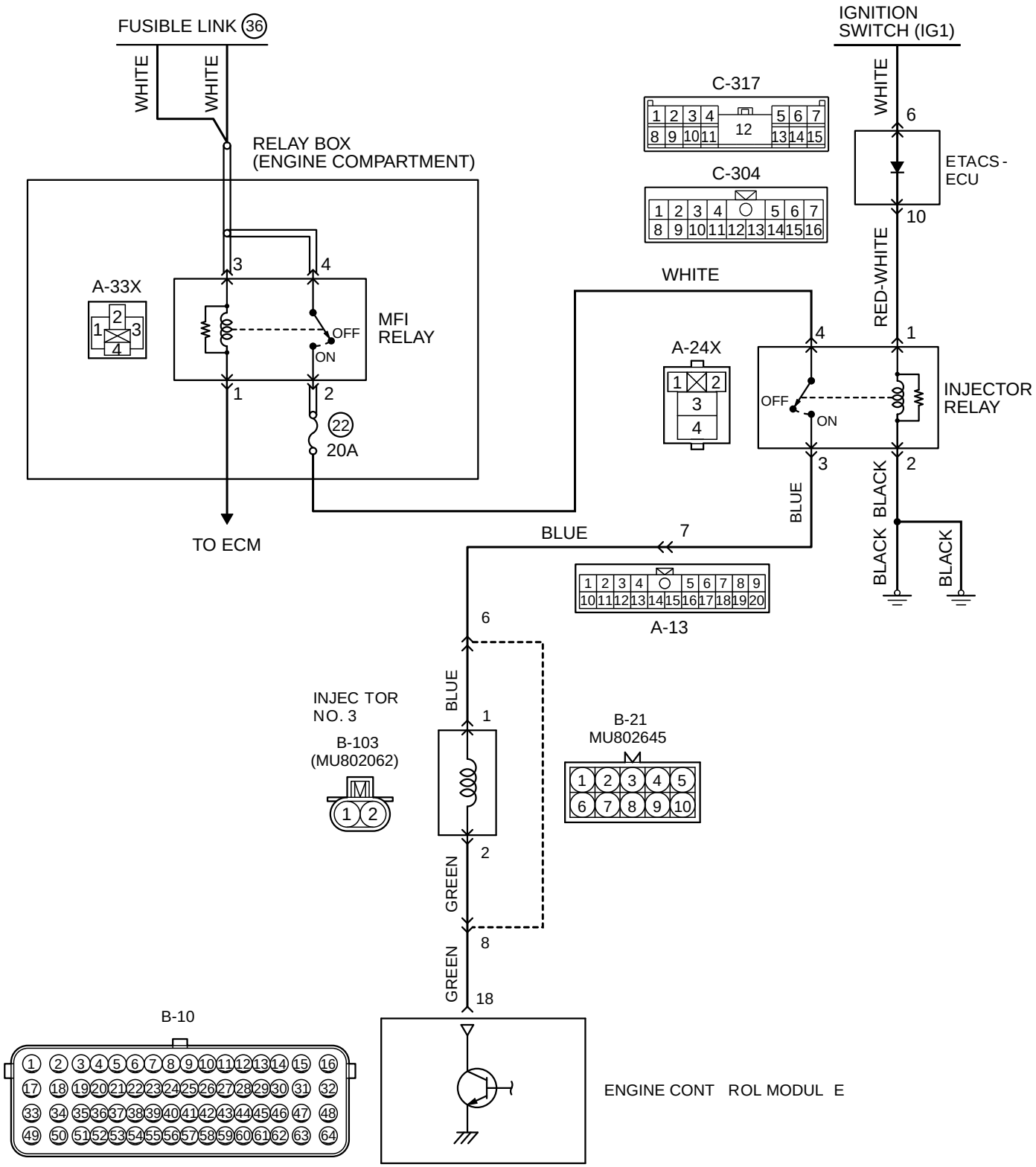
YES: Retry the troubleshooting.

NO: The inspection is complete.

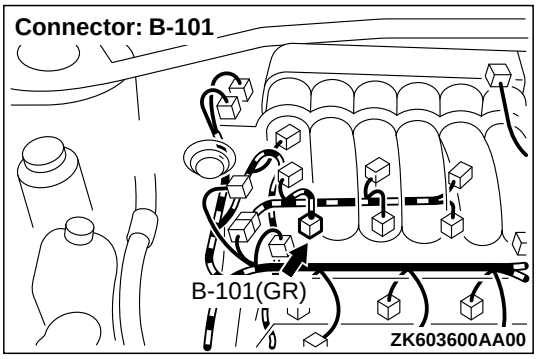
DTC P0203: Injector Circuit Malfunction - Cylinder 3

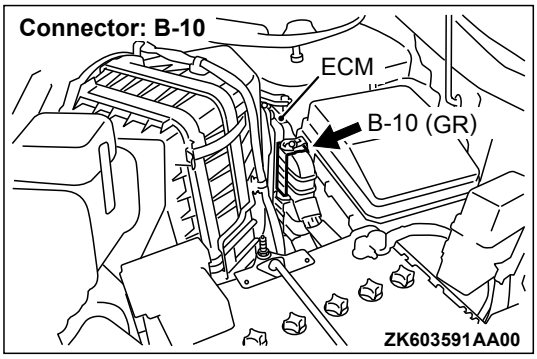
M11310100211USA0000010000

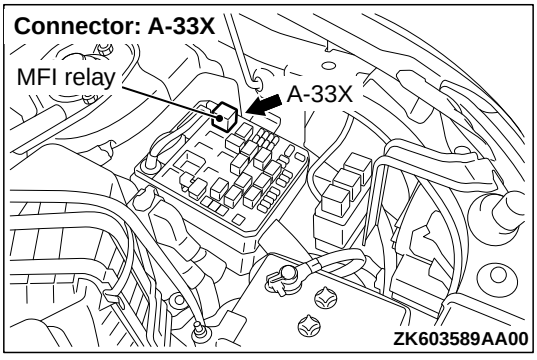
INJECTOR CIRCUIT-CYLINDER 3

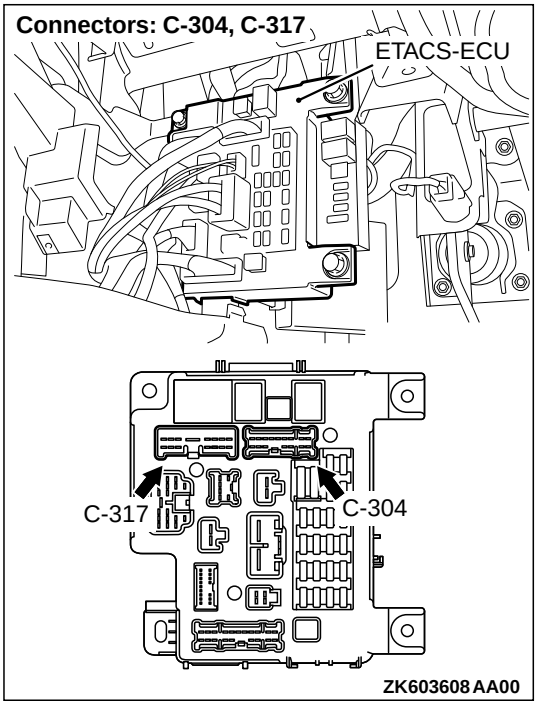


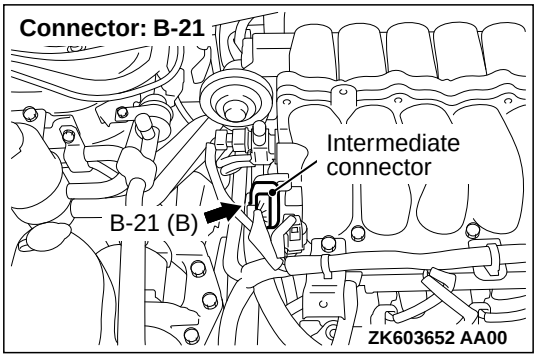
ZK602845 AA00

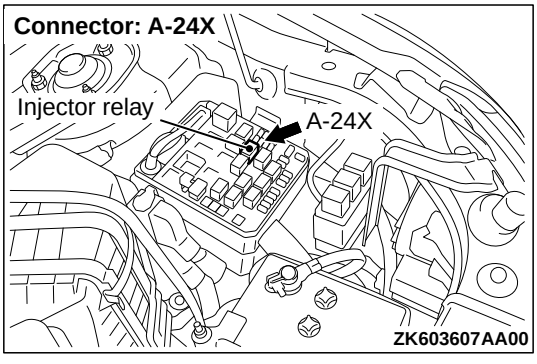


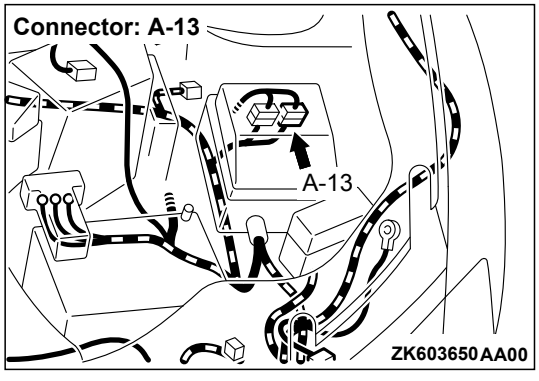












CIRCUIT OPERATION

- The injector power is supplied from the injector relay (terminal No. 3).
- The ECM controls the injector by turning the power transistor in the ECM "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 ECM.

DESCRIPTIONS OF MONITOR METHODS

The ECM 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)

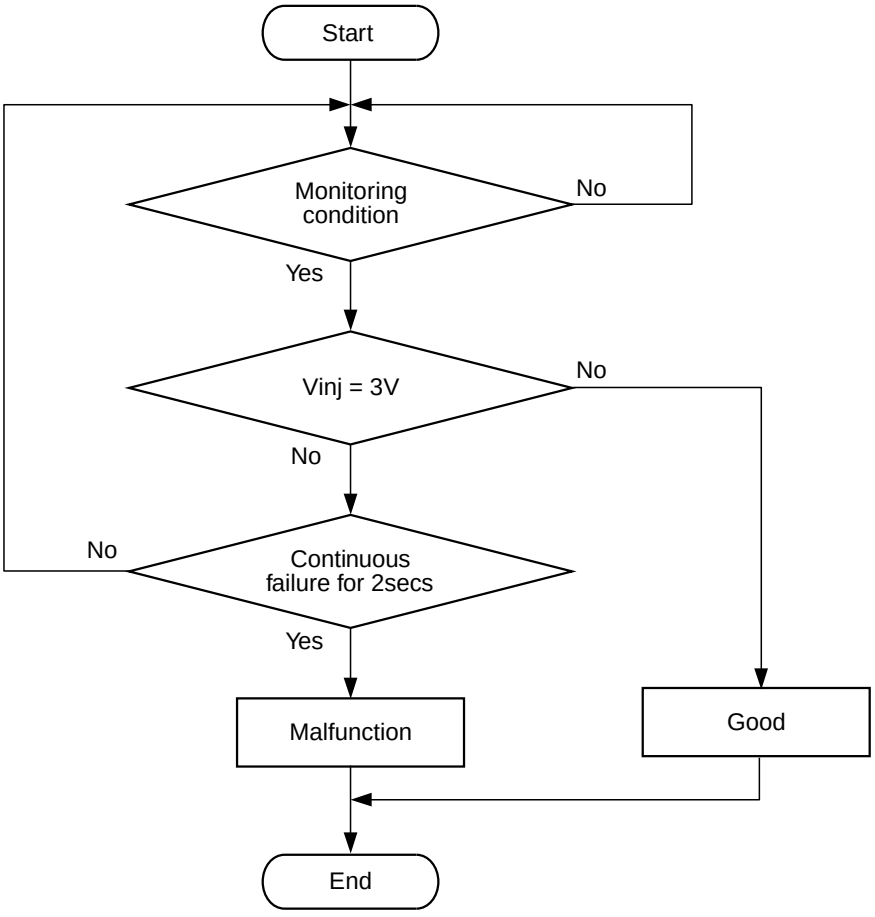
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS <Circuit continuity - open circuit and shorted low>

Logic Flow Chart



ZK603735AA00

Check Condition

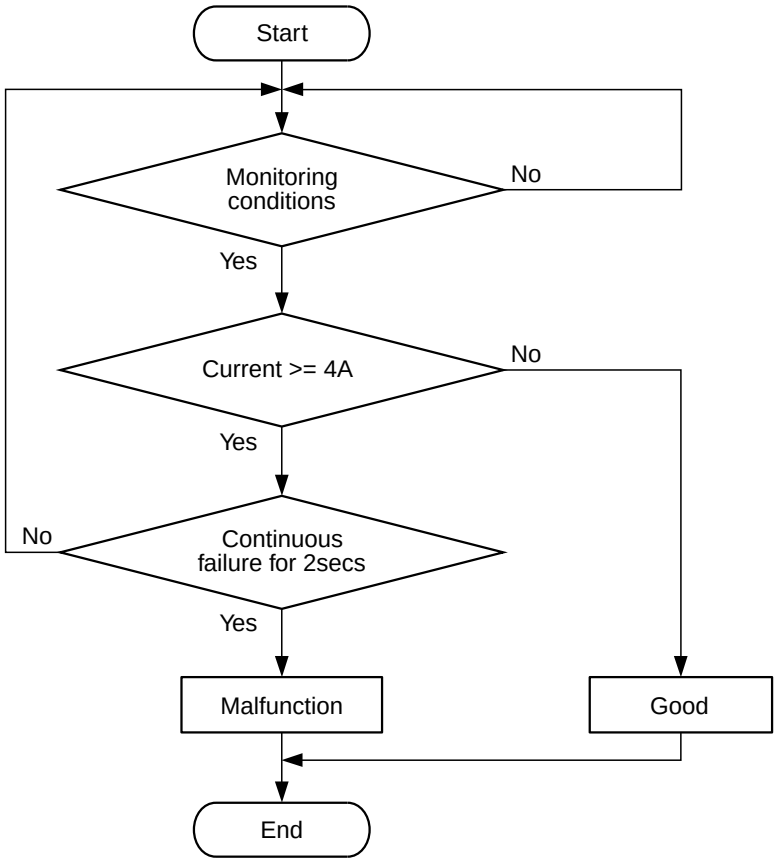
- Engine is running.

Judgement Criterion

- The supply voltage is 3 volts or less without the injector driving.

DTC SET CONDITIONS <Circuit continuity - shorted high>

Logic Flow Chart



ZK603736 AA00

Check Condition
- Engine is running.

Judgement Criterion
- The coil current is 4 ampere or more with the injector driving.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)
- No. 3 cylinder injector failed.
- Connector damage.
- Harness damage.
- ECM failed.

OBD-II DRIVE CYCLE PATTERN

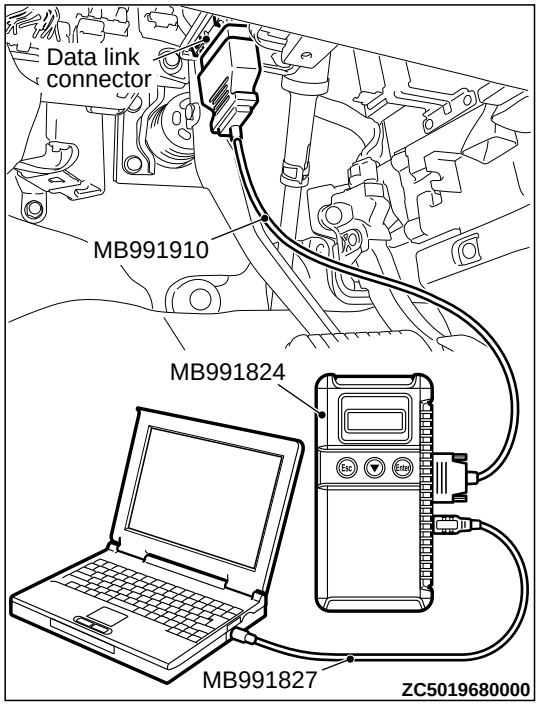
Refer to Diagnostic Function - OBD-II Drive Cycle - Pattern 24 P.13Ab-8.

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
- MB992110: Power Plant ECU Check Harness

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.00-15.

NO: Go to Step 2.

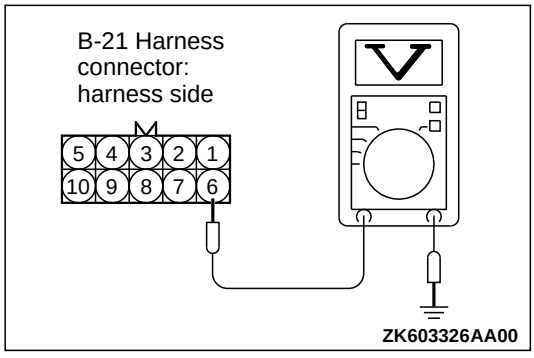
STEP 2. Check for harness connector B- 21 at the intermediate connector and b-10 at the ECM connector for damage.

Q:Is the harness connector in good condition?

YES: Go to Step 3.

NO: Repair it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 10.

STEP 3. Measure the injector supply voltage at the intermediate connector harness B-21 and ground.



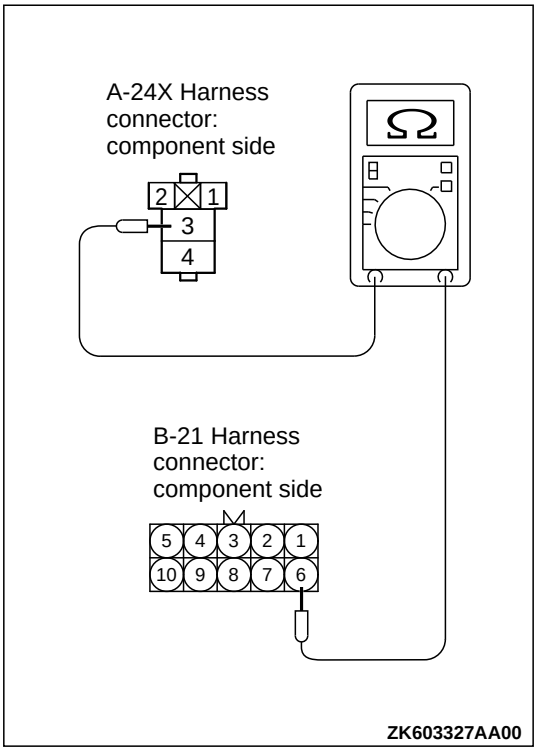
(1) Disconnect the intermediate connector B-21 and measure at the female connector side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal No. 6 and ground.
- Voltage should be battery positive voltage.

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

Q:Is the measured resistance battery positive voltage?

YES: Go to Step 5.

NO: Go to Step 4.



STEP 4. Check for harness between the injector relay connector A-24X and the intermediate connector B-21.

(1) Disconnect the injector relay connector A-24X and the intermediate connector B-21.

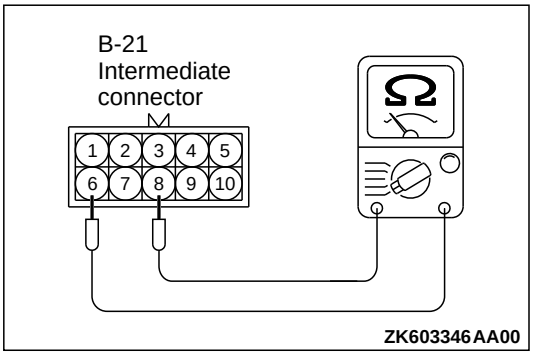
(2) Measure the resistance injector relay connector A-24X (terminal No. 3) and the intermediate connector B-21 (terminal No. 6).

- Should be less than 2 ohms.

Q:Is the harness wire in good condition?

YES: Go to Step 9.

NO: Repair it. Then go to Step 10.



STEP 5. Check the No. 3 cylinder injector resistance at intermediate connector B-21.

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

(2) Measure the resistance between terminal No. 6 and No. 8.

- Resistance should be between 10.5 and 13.5 ohms.

Q:Is the measured resistance between 10.5 and 13.5 ohms?

YES: Go to Step 8.

NO: Go to Step 6.

STEP 6. Check the harness connector B-103 at No. 3 cylinder injector for damage.

Remove the intake manifold.

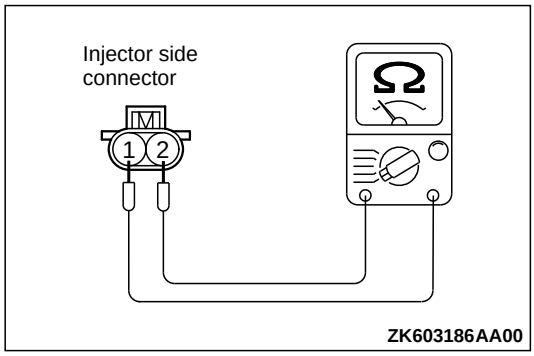
Q:Is the harness connector in good condition?

YES: Go to Step 7.

NO: Repair it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 10.

STEP 7. Check the No. 3 cylinder injector B-103.

(1) Disconnect the No. 3 cylinder injector connector B-103.



(2) Measure the resistance between injector side connector terminal No. 1 and No. 2.

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

Q:Is the measured resistance between 10.5 and 13.5 ohms [at 20°C (68°F)]?

YES:

Repair harness wire between the intermediate connector B-21 (terminal No. 6) and the injector connector B-103 (terminal No. 1) and harness wire between injector connector B-103 (terminal No. 2) and intermediate connector B-21 (terminal No. 8) because of open circuit or short circuit to ground or harness damage.

Then go to Step 10.

NO: Replace the No. 3 cylinder injector. Then go to Step 10.

STEP 8. Check for harness between the intermediate connector B-21and the ECM connector B-10.

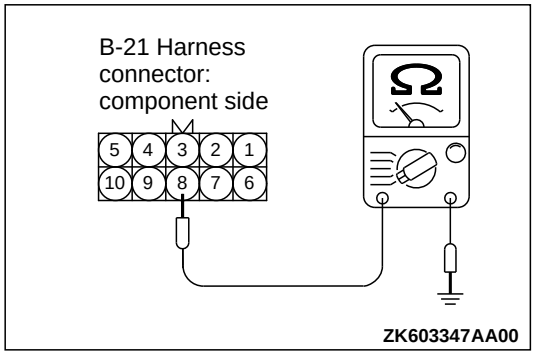
(1) Disconnect the intermediate connector B-21 and the ECM connector B-10.

(2) Measure the resistance between the intermediate connector B-21 (terminal No. 8) and the ECM connector B-10 (terminal No. 18).

- Should be less than 2 ohms.

(3) Measure the continuity between the intermediate connector B-21 (terminal No. 8) and ground.

- Not continuity



Q:Is the harness wire in good condition?

YES: Go to Step 9.

NO: Repair it. Refer to GROUP 00E, Harness Connector Inspection P.13Aa-17. Then go to Step 10.

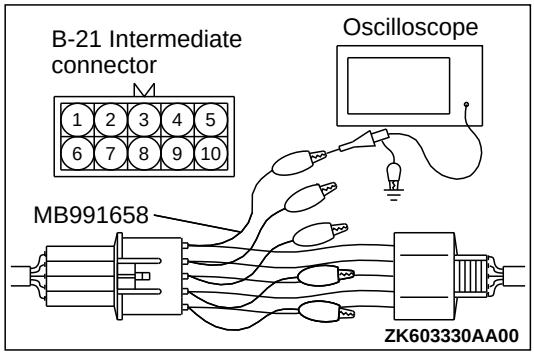
STEP 9. Using the oscilloscope, check the No. 3 cylinder injector.

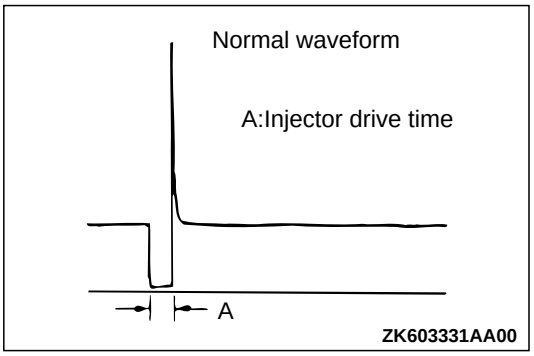
(1) Disconnect the intermediate connector B-21 and connect the test harness MB991658 between the separated connectors.

(2) Connect the oscilloscope probe to injector intermediate connector terminal to No. 8.

NOTE: When measuring with the ECM side connector, disconnect all ECM connectors. Connect the check harness special tool (MB992110) between the separated connectors. Then connect an oscilloscope probe to the check harness connector terminal No. 18.

(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.00-15.

NO: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. 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. 13Ab-8.

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

Q:Is DTC P0203 set?

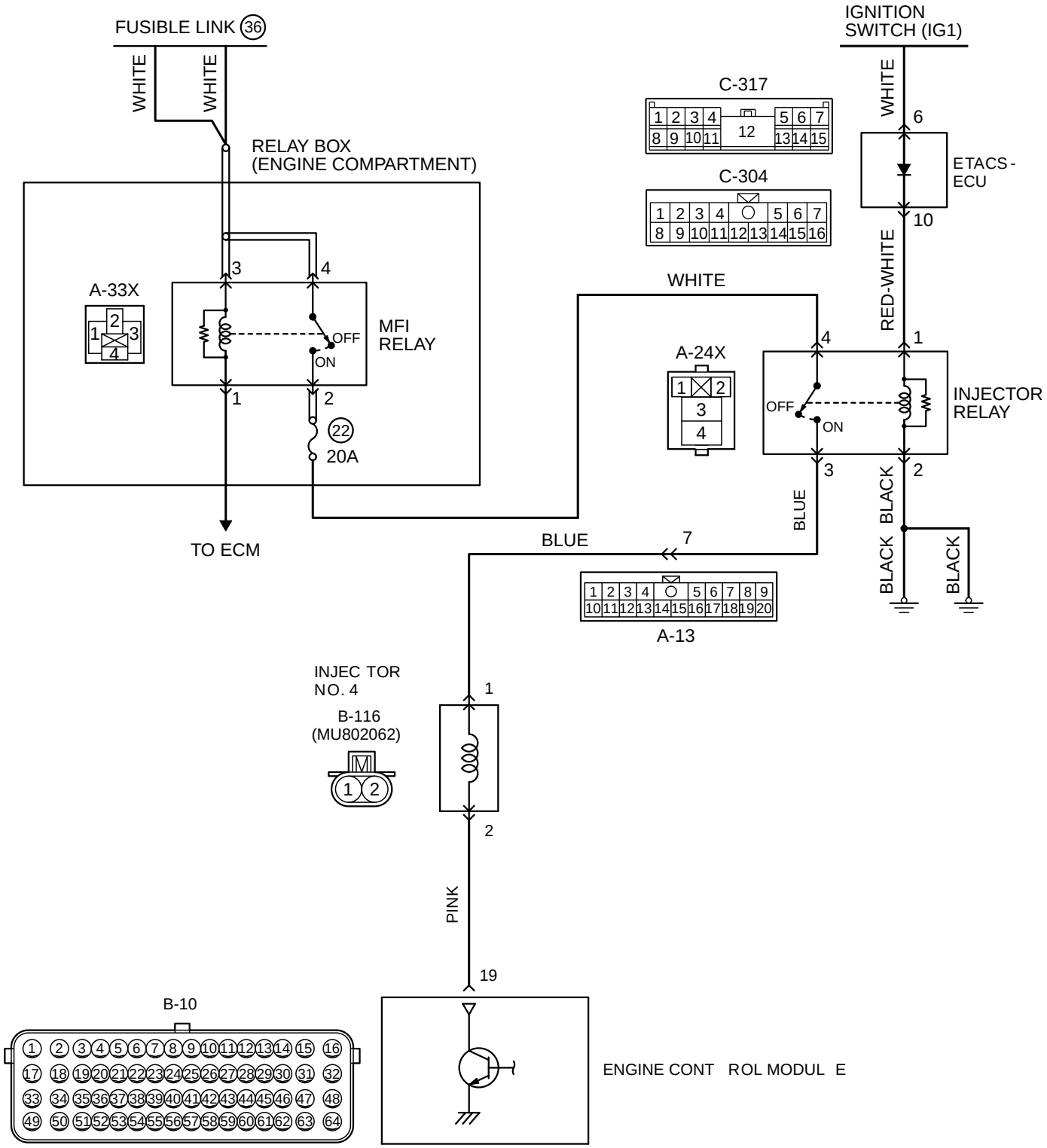
YES: Retry the troubleshooting.

NO: The inspection is complete.

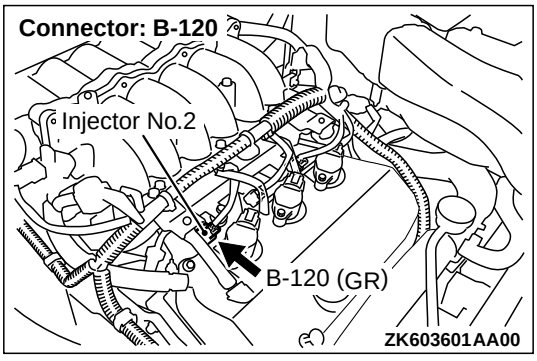
DTC P0204: Injector Circuit Malfunction - Cylinder 4

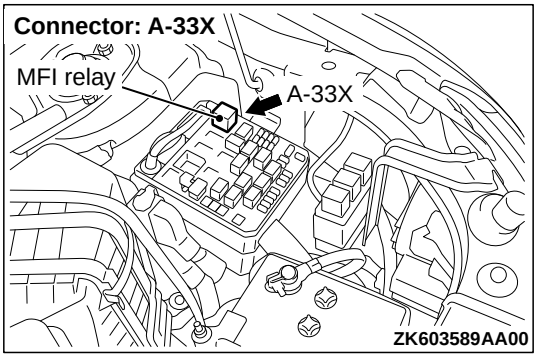
M11310100212USA0000010000

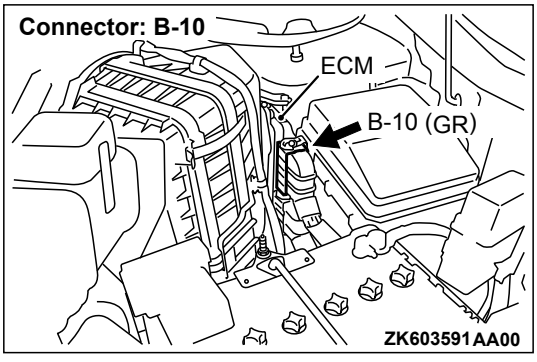
INJECTOR CIRCUIT-CYLINDER 4

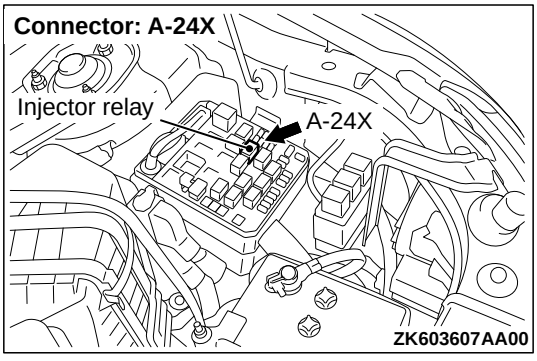


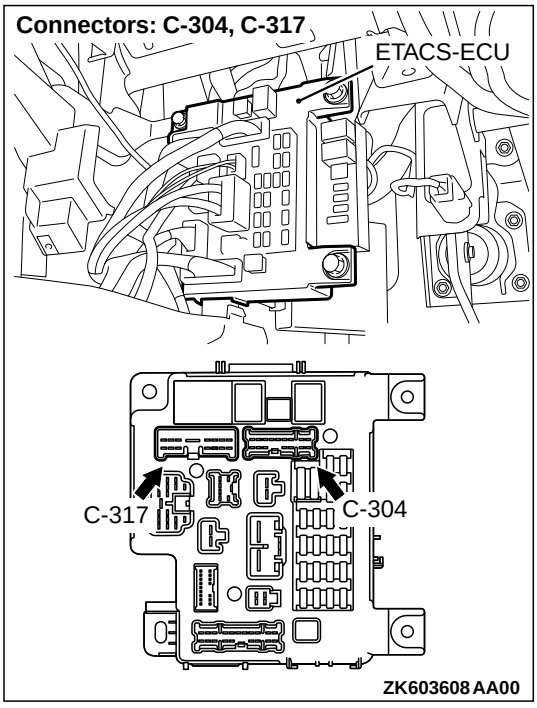
ZK602846 AA00

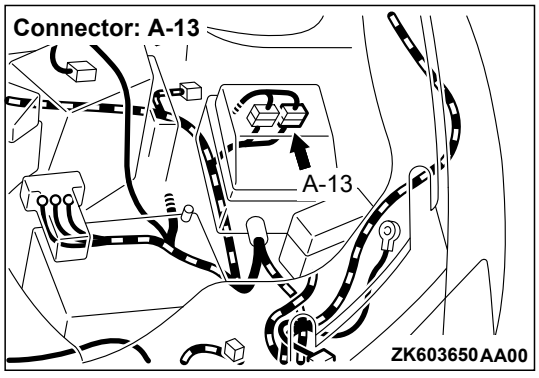












CIRCUIT OPERATION

- The injector power is supplied from the injector relay (terminal No. 3).
- The ECM controls the injector by turning the power transistor in the ECM "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 ECM.

DESCRIPTIONS OF MONITOR METHODS

The ECM detects open circuit and short malfunction.

MONITOR EXECUTION
Continuous

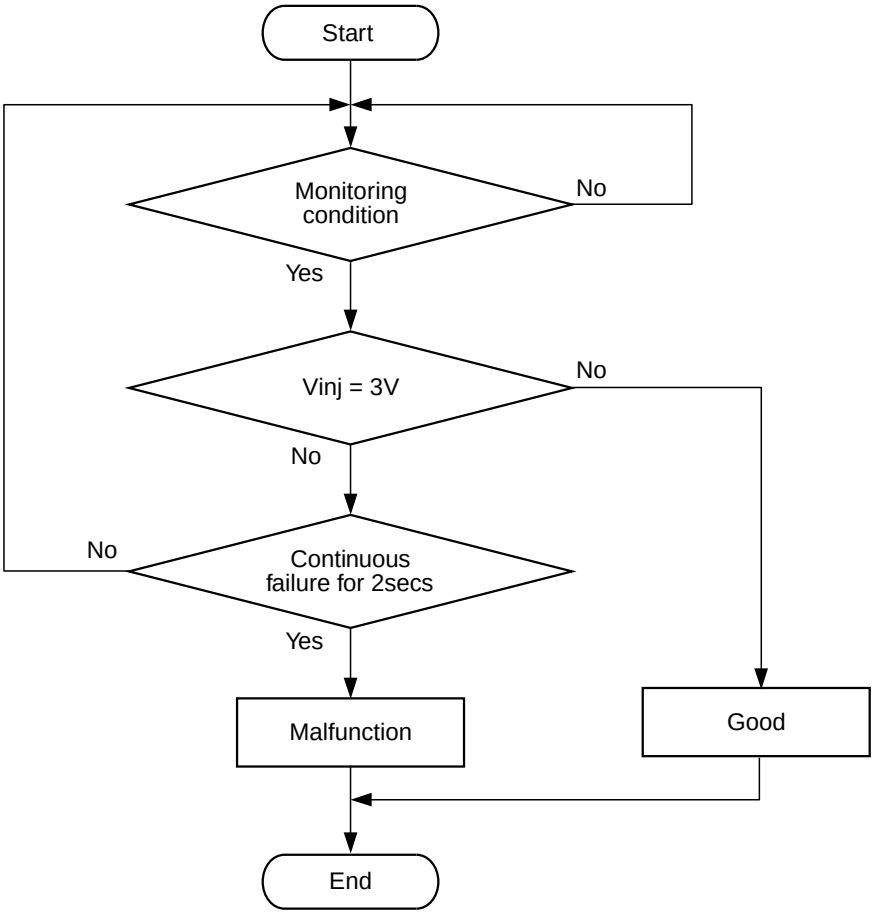
MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

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



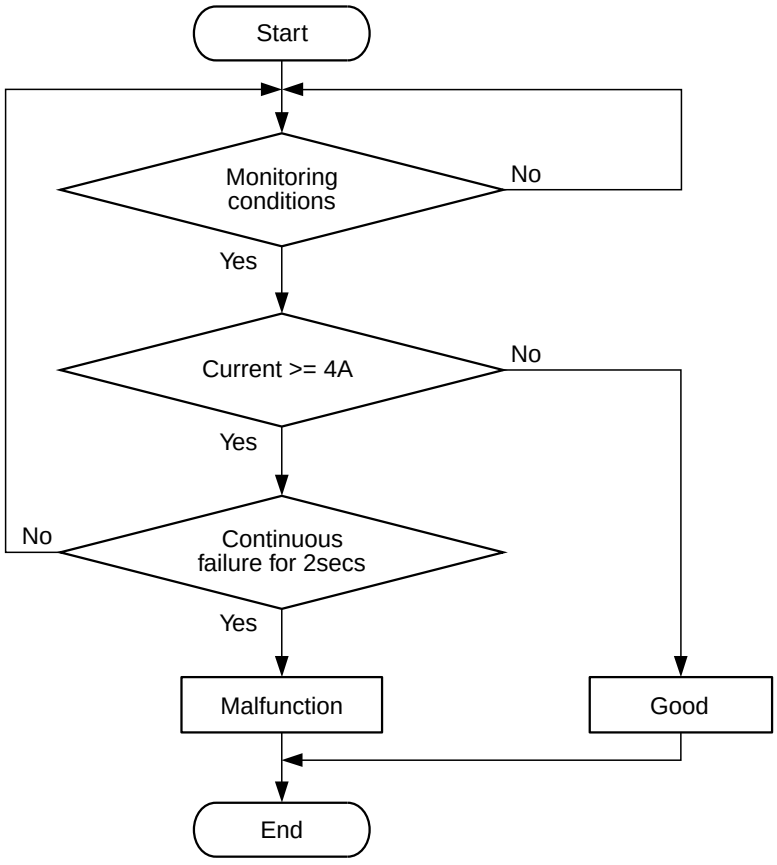
ZK603735AA00

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



ZK603736 AA00

Check Condition
- Engine is running.

Judgement Criterion
- The coil current is 4 ampere or more with the injector driving.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)
- No. 4 cylinder injector failed.
- Connector damage.
- Harness damage.
- ECM failed.

OBD-II DRIVE CYCLE PATTERN

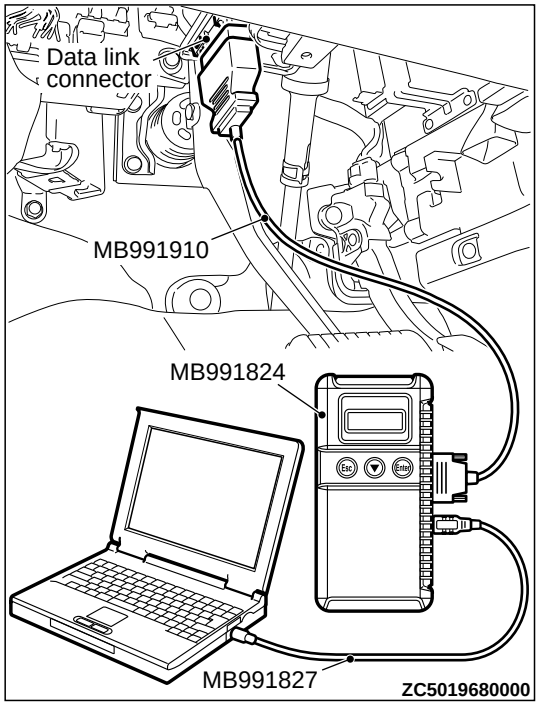
Refer to Diagnostic Function - OBD-II Drive Cycle - Pattern 24 P.13Ab-8.

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
- MB992110: Power Plant ECU Check Harness

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.00-15.

NO: Go to Step 2.

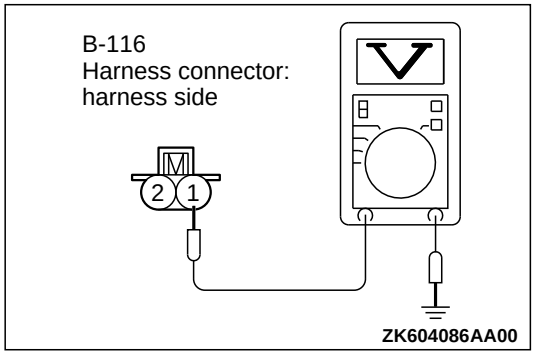
STEP 2. Check the for harness connector B-116 at No. 4 cylinder injector and B-10 at the ECM for damage.

Q:Is the harness connector in good condition?

YES: Go to Step 3.

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

STEP 3. Measure the power supply voltage at the injector connector B-116.



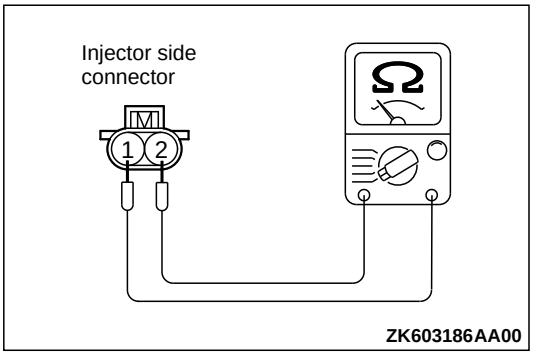
(1) Disconnect the intermediate connector B-116 (terminal No. 1) and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal No. 1 and ground.
- Voltage should be battery positive voltage.

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

Q:Is the measured resistance battery positive voltage?

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 injector relay connector A-24X (terminal No. 3) and injector connector B-116 (terminal No. 1) because of open circuit. Then go to Step 7.



STEP 4. Check the No. 4 cylinder injector.

(1) Disconnect the No. 4 cylinder injector connector B-116.

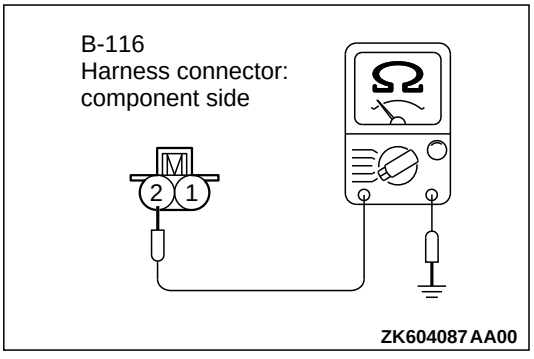
(2) Measure the resistance between injector side connector terminal No. 1 and No. 2.

Standard value: 10.5 - 13.5 ohms [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 5.

NO: Replace the No. 4 cylinder injector. Then go to Step 7.



STEP 5. Check for harness between the injector connector B-116 and the ECM connector B-10.

(1) Disconnect the injector connector B-116 and the ECM connector B-10.

(2) Measure the resistance between injector connector B-116 (terminal No. 2) and the ECM connector B-10 (terminal No. 19).

- Should be less than 2 ohms.

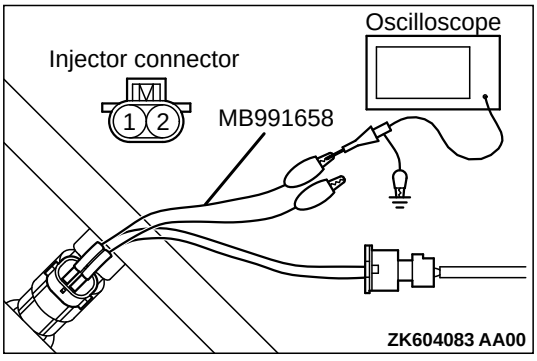
(3) Measure the continuity between the intermediate connector B-116 (terminal No. 2) and ground.

- Not continuity.

Q:Is the connector wire in good condition?

YES: Go to Step 6.

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



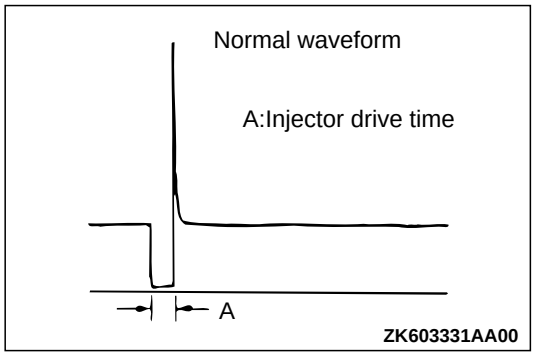
STEP 6. Using the oscilloscope, check the No. 4 cylinder injector.

(1) Disconnect the No. 4 cylinder injector connector B-116 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 ECM side connector, disconnect all ECM connectors. Connect the check harness special tool (MB992110) between the separated connectors. Then connect an oscilloscope probe to the check harness connector terminal No. 19.

(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.00-15.

NO: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. 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. 13Ab-8.

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

Q:Is DTC P0204 set?

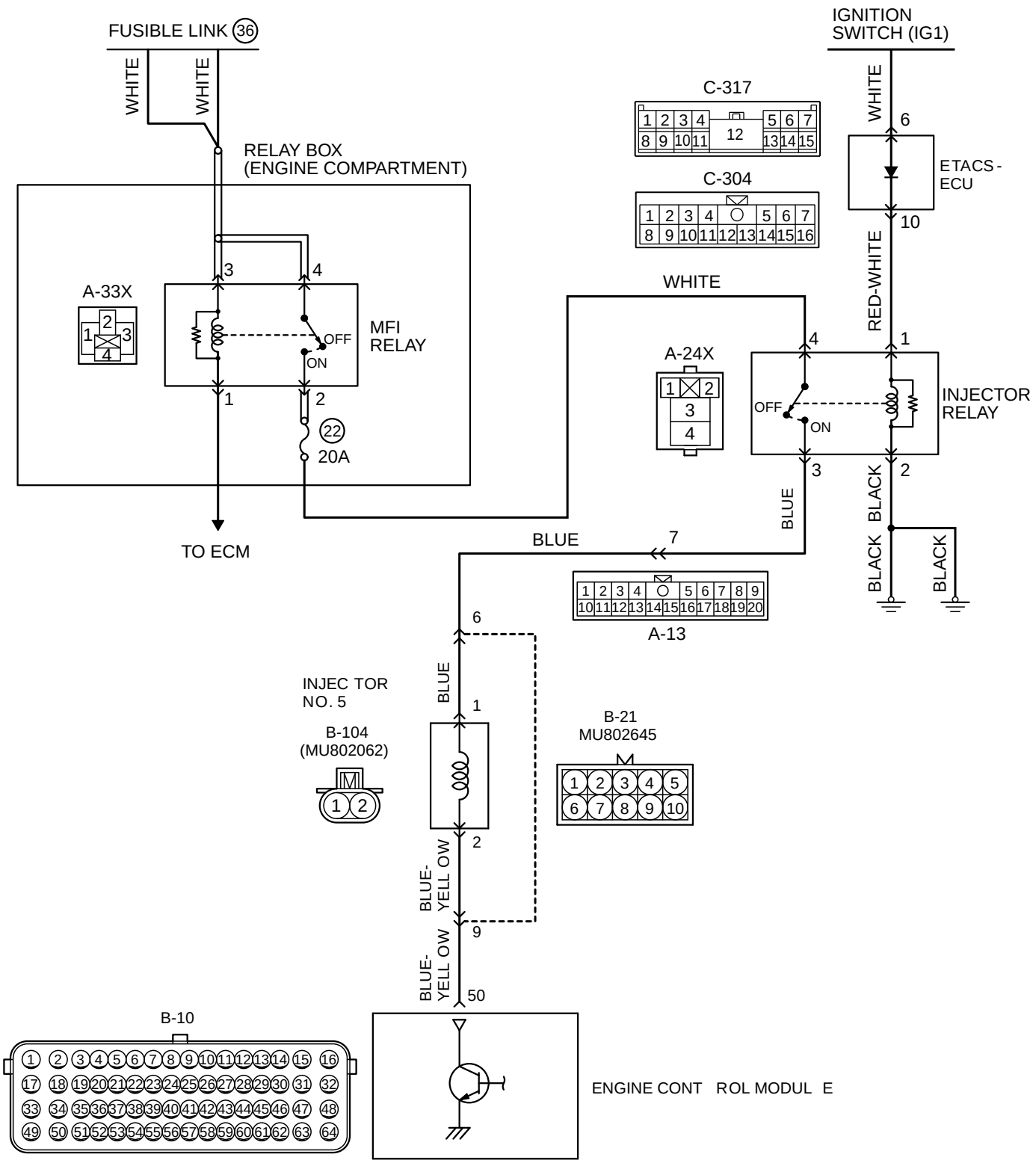
YES: Retry the troubleshooting.

NO: The inspection is complete.

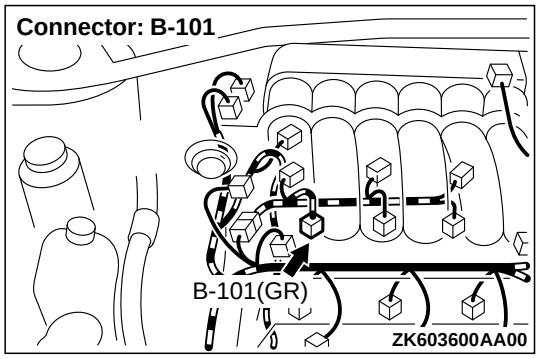
DTC P0205: Injector Circuit Malfunction - Cylinder 5

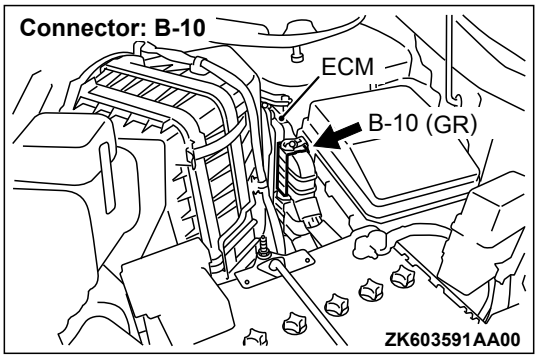
M11310100213USA0000010000

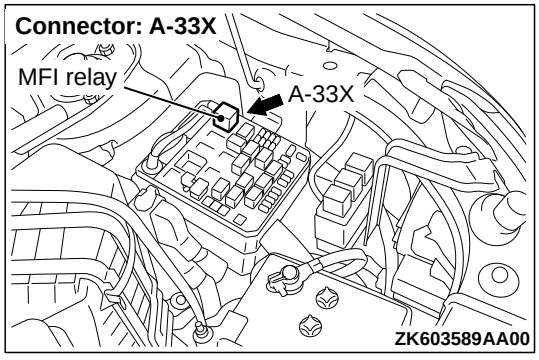
INJECTOR CIRCUIT-CYLINDER 5

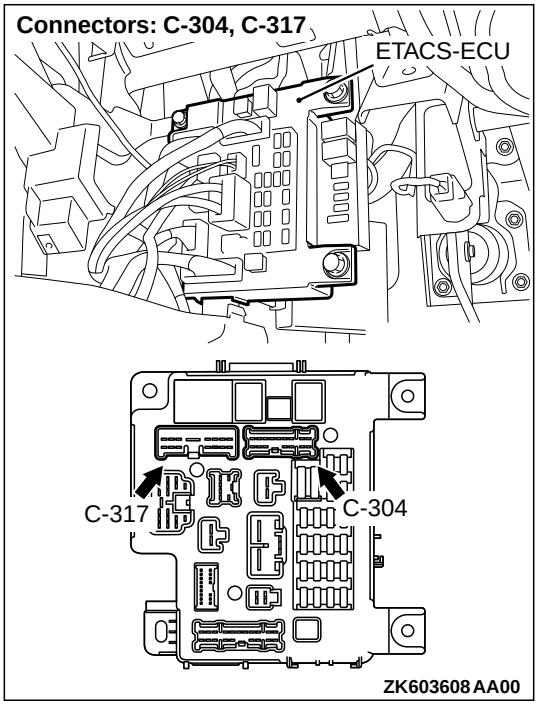


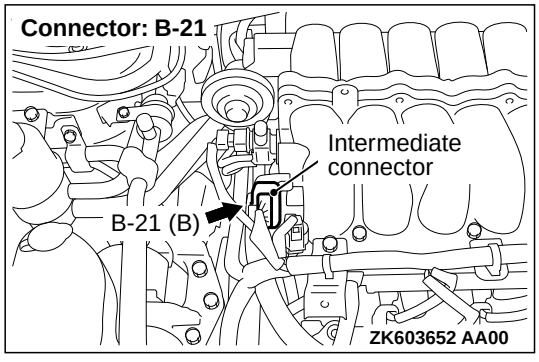
ZK602847AA00

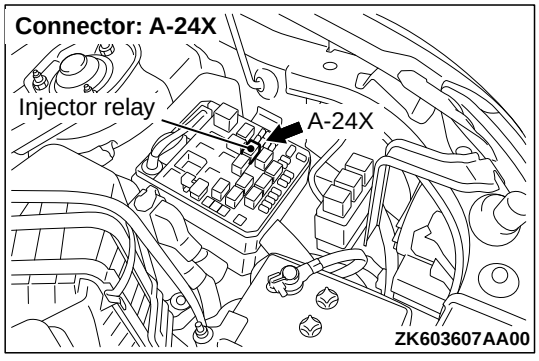


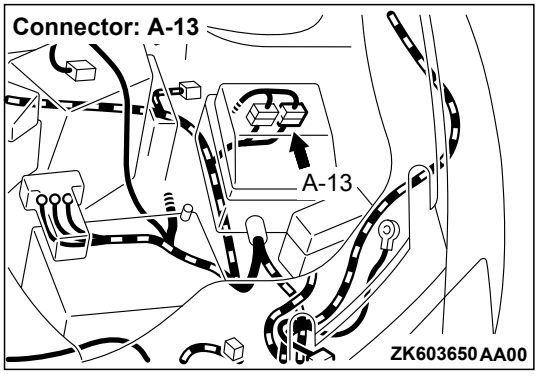












CIRCUIT OPERATION

- The injector power is supplied from the injector relay (terminal No. 3).
- The ECM controls the injector by turning the power transistor in the ECM "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 ECM.

DESCRIPTIONS OF MONITOR METHODS

The ECM detects open circuit and short malfunction.

MONITOR EXECUTION
Continuous

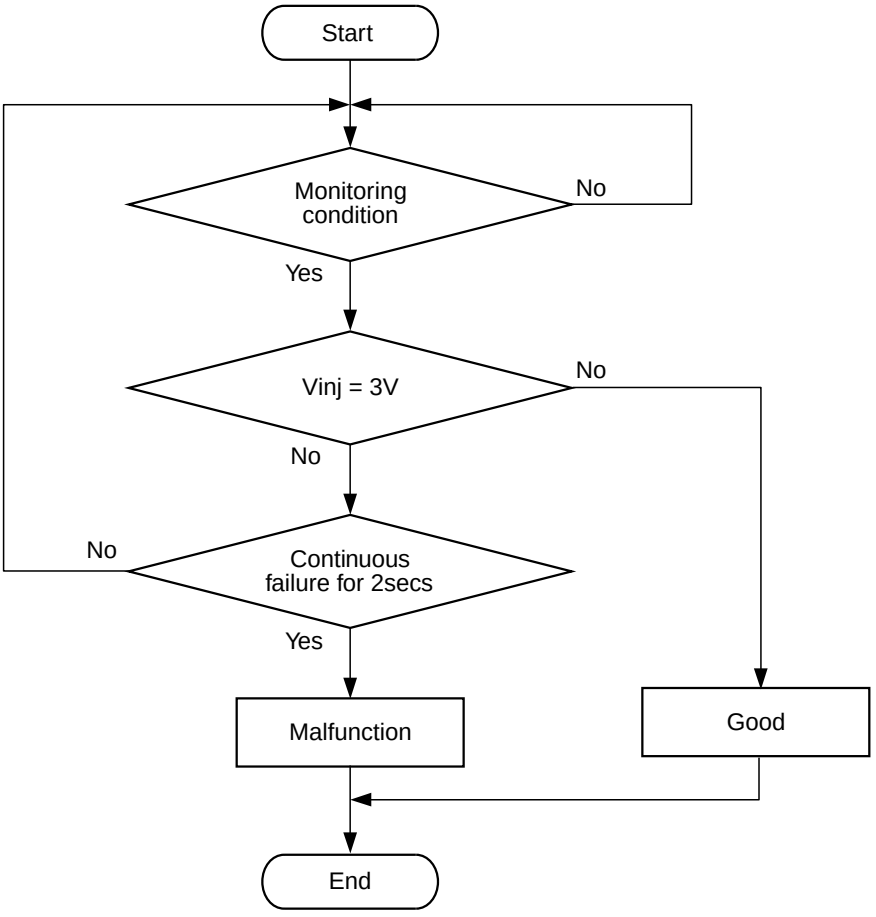
MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

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



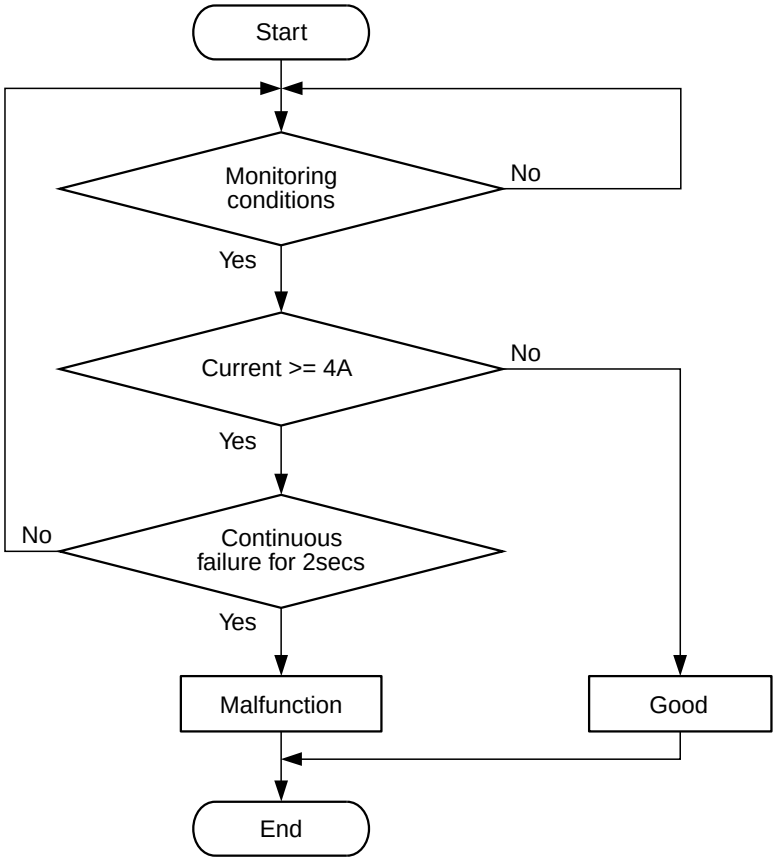
ZK603735AA00

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



ZK603736 AA00

Check Condition
- Engine is running.

Judgement Criterion
- The coil current is 4 ampere or more with the injector driving.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)
- No. 5 cylinder injector failed.
- Connector damage.
- Harness damage.
- ECM failed.

OBD-II DRIVE CYCLE PATTERN

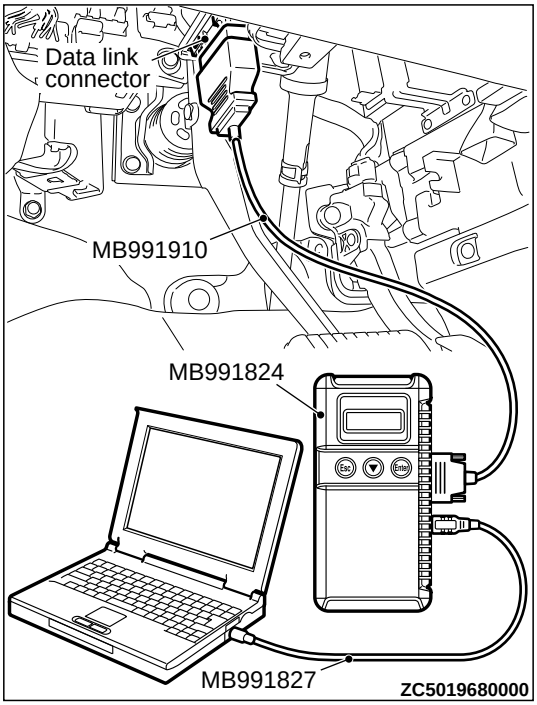
Refer to Diagnostic Function - OBD-II Drive Cycle - Pattern 24 P.13Ab-8.

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
- MB992110: Power Plant ECU Check Harness

STEP 1. Using scan tool MB991958, check actuator test item 5: No. 5 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 5, No. 5 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.00-15.

NO: Go to Step 2.

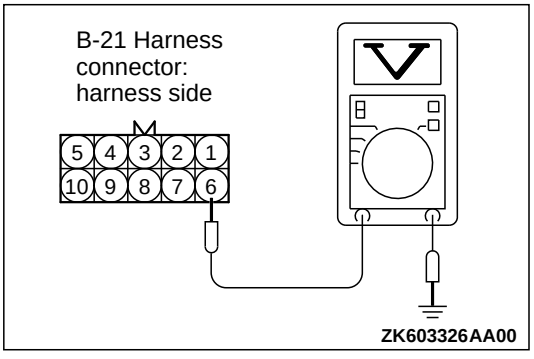
STEP 2. Check for harness connector B- 21 at the intermediate connector and B-10 at the ECM for damage.

Q:Is the harness connector in good condition?

YES: Go to Step 3.

NO: Repair it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 10.

STEP 3. Measure the injector supply voltage at the intermediate connector harness B-21 and ground.



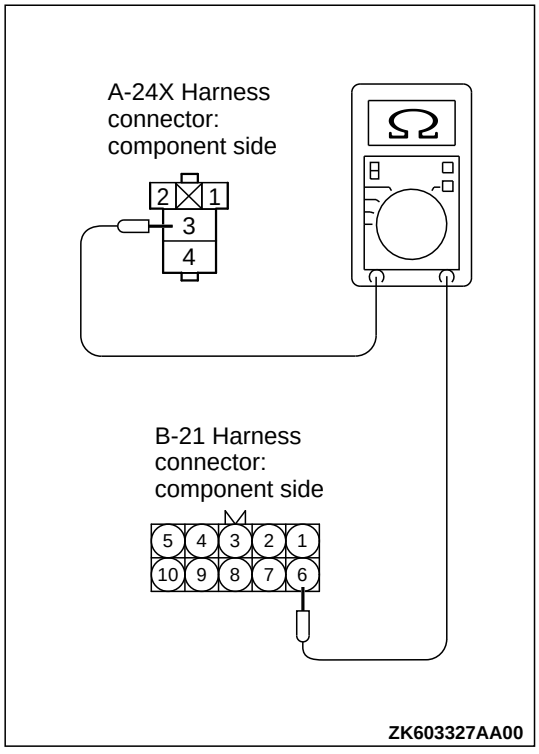
(1) Disconnect the intermediate connector B-21 and measure at the female connector side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal No. 6 and ground.
- Voltage should be battery positive voltage.

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

Q:Is the measured resistance battery positive voltage?

YES: Go to Step 5.

NO: Go to Step 4.



STEP 4. Check for harness between the injector relay connector A-24X and the intermediate connector B-21.

(1) Disconnect the injector relay connector A-24X and the intermediate connector B-21.

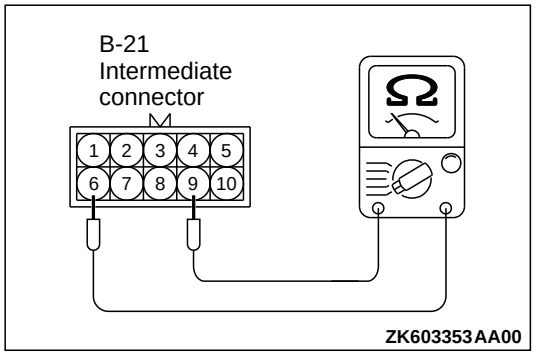
(2) Measure the resistance injector relay connector A-24X (terminal No. 3) and the intermediate connector B-21 (terminal No. 6).

- Should be less than 2 ohms.

Q:Is the harness wire in good condition?

YES: Go to Step 9.

NO: Repair it. Then go to Step 10.



STEP 5. Check the No. 5 cylinder injector resistance at intermediate connector B-21.

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

(2) Measure the resistance between terminal No. 6 and No. 9.

- Resistance should be between 10.5 and 13.5 ohms.

Q:Is the measured resistance between 10.5 and 13.5 ohms?

YES: Go to Step 8.

NO: Go to Step 6.

STEP 6. Check the harness connector B-104 at No. 5 cylinder injector for damage.

Remove the intake manifold.

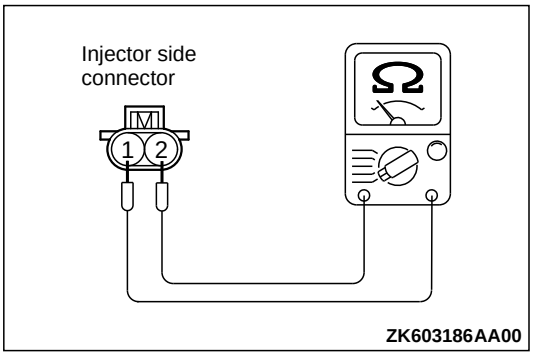
Q:Is the harness connector in good condition?

YES: Go to Step 7.

NO: Repair it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 10.

STEP 7. Check the No. 5 cylinder injector B-104.

(1) Disconnect the No. 5 cylinder injector connector B-104.



(2) Measure the resistance between injector side connector terminal No. 1 and No. 2.

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

Q:Is the measured resistance between 10.5 and 13.5 ohms [at 20°C (68°F)]?

YES:

Repair harness wire between the intermediate connector B-21 (terminal No. 6) and the injector connector B-104 (terminal No. 1) and harness wire between injector connector B-104 (terminal No. 2) and intermediate connector B-21 (terminal No. 9) because of open circuit or short circuit to ground or harness damage.

Then go to Step 10.

NO: Replace the No. 5 cylinder injector. Then go to Step 10.

STEP 8. Check for harness between the intermediate connector B-21and the ECM connector B-10.

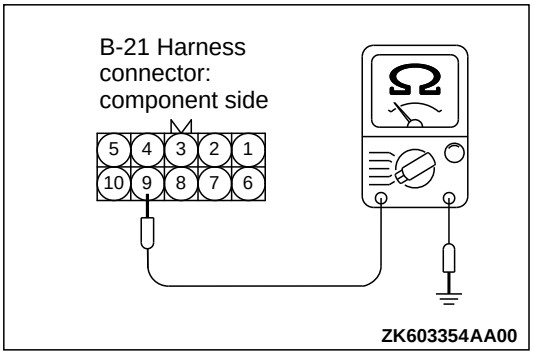
(1) Disconnect the intermediate connector B-21 and the ECM connector B-10.

(2) Measure the resistance between the intermediate connector B-21 (terminal No. 9) and the ECM connector B-10 (terminal No. 50).

- Should be less than 2 ohms.

(3) Measure the continuity between the intermediate connector B-21 (terminal No. 9) and ground.

- Not continuity



Q:Is the harness wire in good condition?

YES: Go to Step 9.

NO: Repair it. Refer to GROUP 00E, Harness Connector Inspection P.13Aa-17. Then go to Step 10.

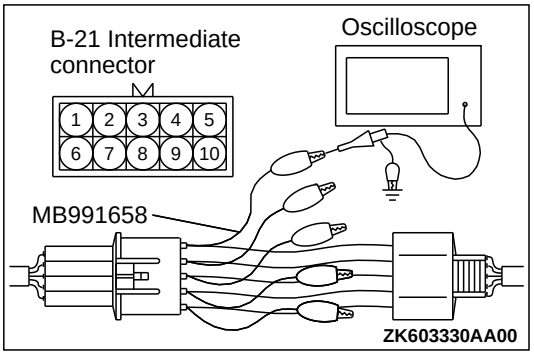
STEP 9. Using the oscilloscope, check the No. 5 cylinder injector.

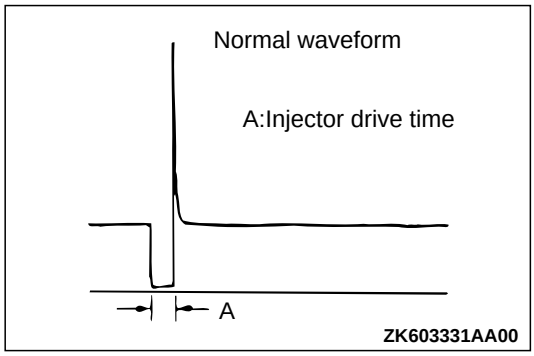
(1) Disconnect the intermediate connector B-21 and connect the test harness MB991658 between the separated connectors.

(2) Connect the oscilloscope probe to injector intermediate connector terminal to No. 9.

NOTE: When measuring with the ECM side connector, disconnect all ECM connectors. Connect the check harness special tool (MB992110) between the separated connectors. Then connect an oscilloscope probe to the check harness connector terminal No. 50.

(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.00-15.

NO: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. 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. 13Ab-8.

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

Q:Is DTC P0205 set?

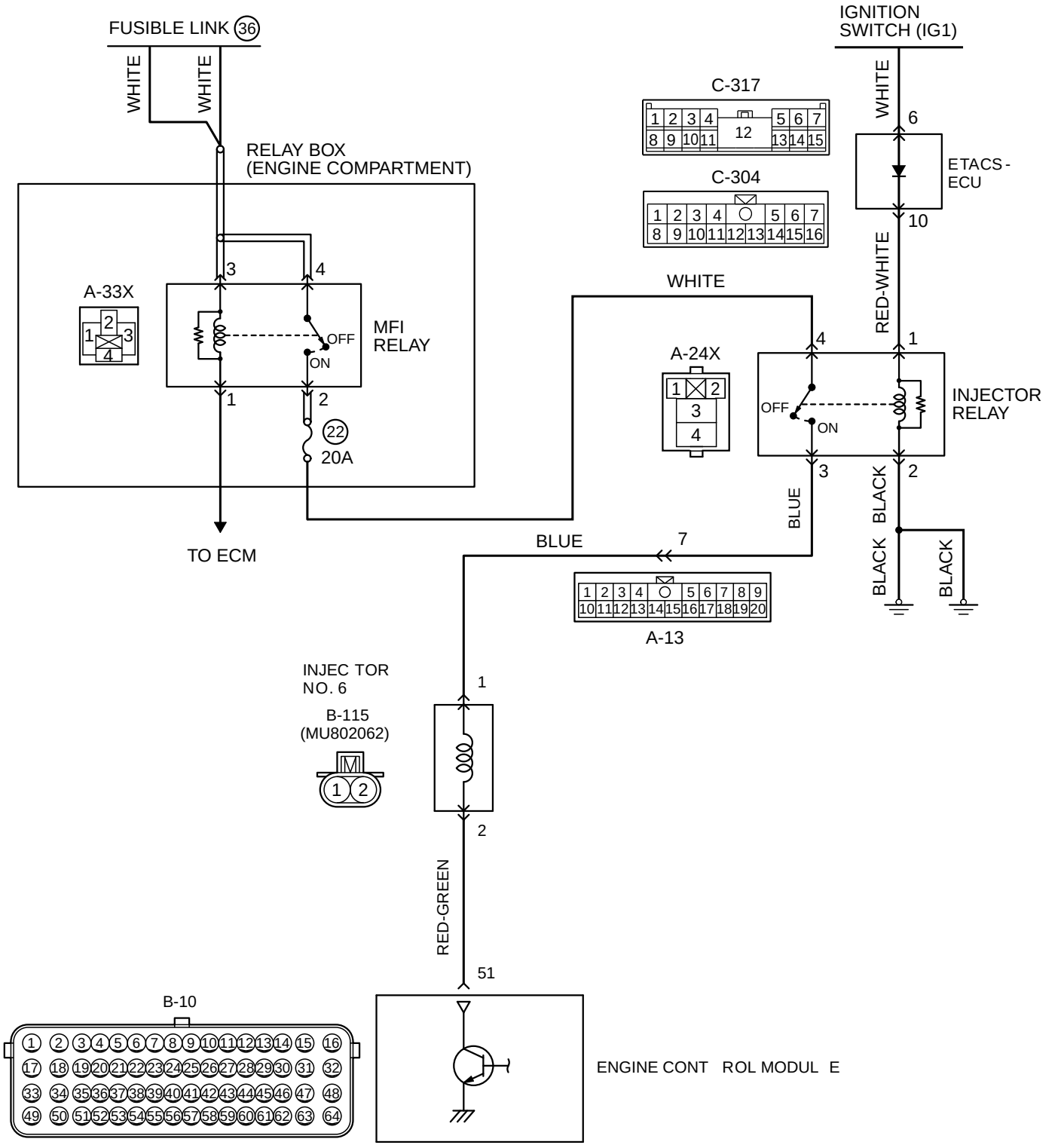
YES: Retry the troubleshooting.

NO: The inspection is complete.

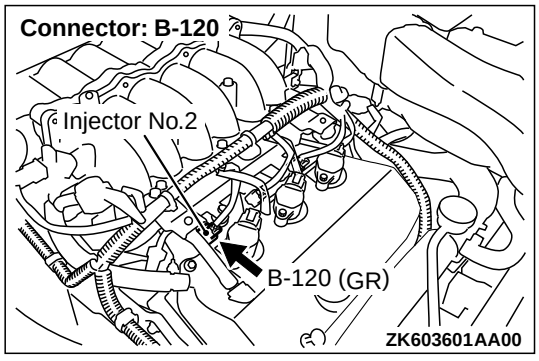
DTC P0206: Injector Circuit Malfunction - Cylinder 6

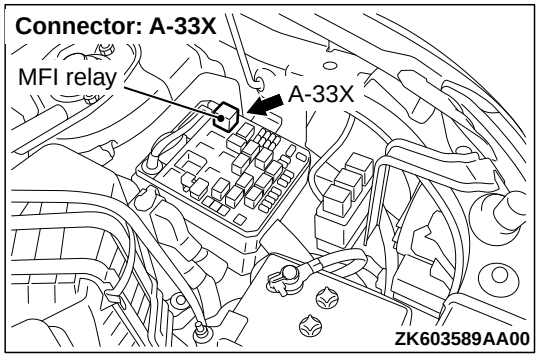
M11310100214USA0000010000

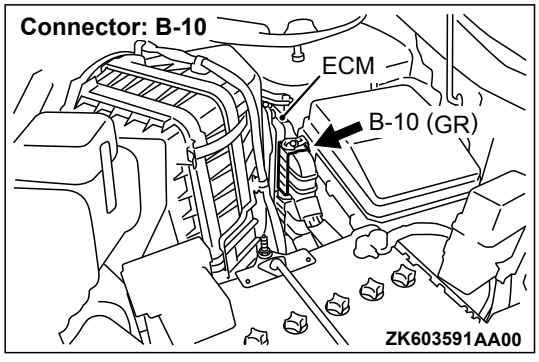
INJECTOR CIRCUIT-CYLINDER 6

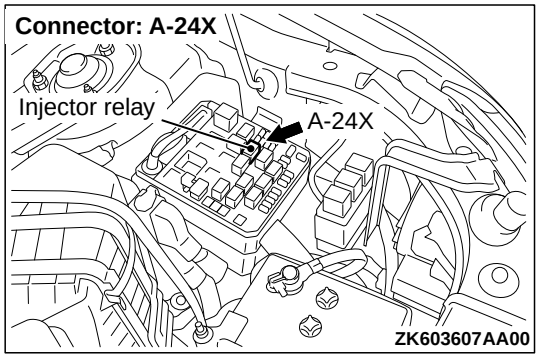


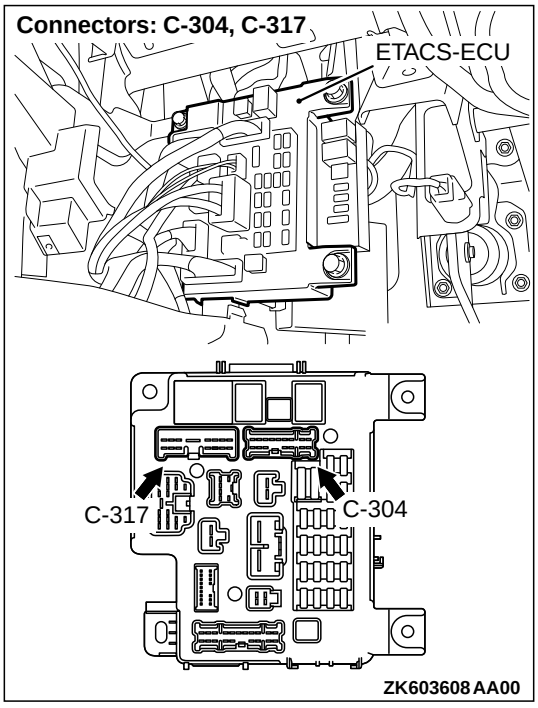
ZK602848 AA00

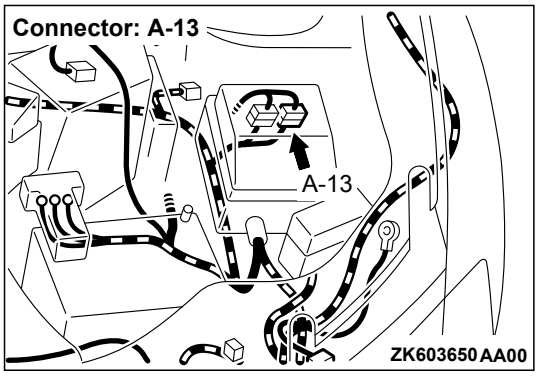












CIRCUIT OPERATION

- The injector power is supplied from the injector relay (terminal No. 3).
- The ECM controls the injector by turning the power transistor in the ECM "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 ECM.

DESCRIPTIONS OF MONITOR METHODS

The ECM detects open circuit and short malfunction.

MONITOR EXECUTION
Continuous

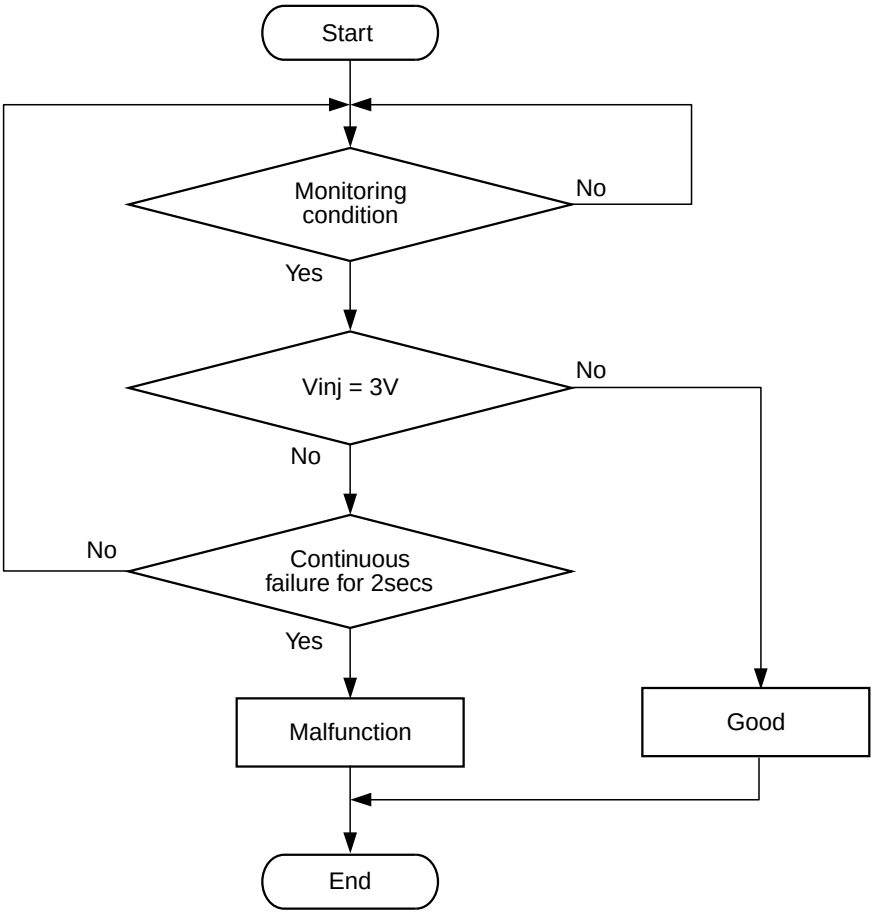
MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

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



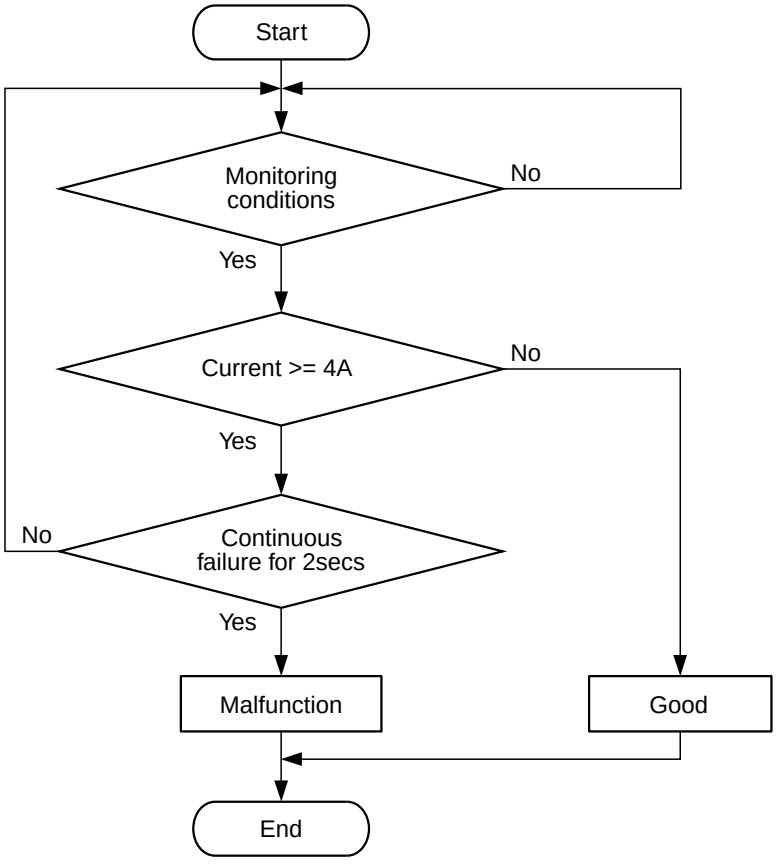
ZK603735AA00

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



ZK603736 AA00

Check Condition
- Engine is running.

Judgement Criterion
- The coil current is 4 ampere or more with the injector driving.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)
- No. 6 cylinder injector failed.
- Connector damage.
- Harness damage.
- ECM failed.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function - OBD-II Drive Cycle - Pattern 24 P.13Ab-8.

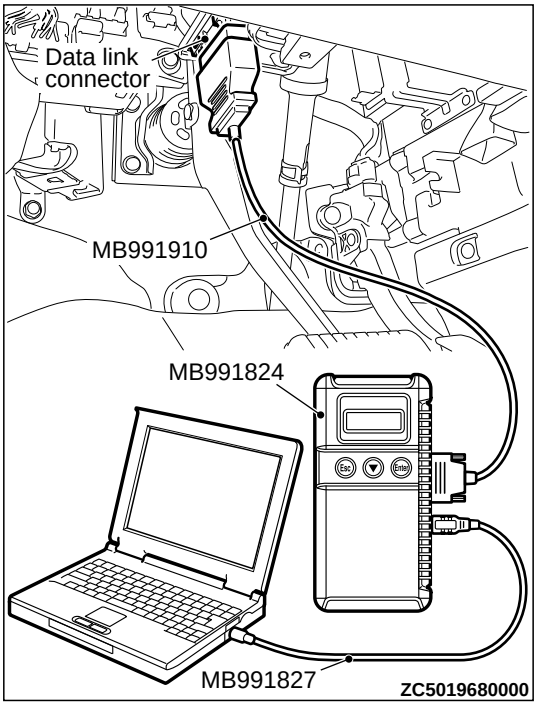
DIAGNOSIS

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
- MB992110: Power Plant ECU Check Harness

STEP 1. Using scan tool MB991958, check actuator test item 6: No. 6 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 6, No. 6 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.00-15.

NO: Go to Step 2.

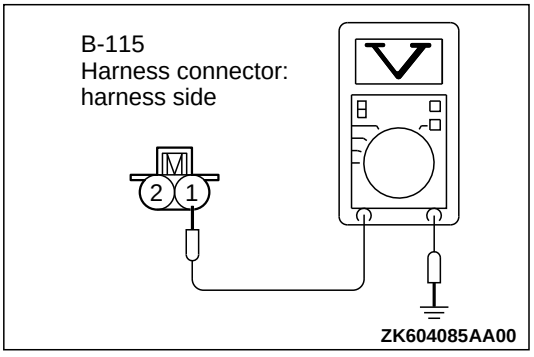
STEP 2. Check the for harness connector B-115 at No. 6 cylinder injector and B-10 at the ECM for damage.

Q:Is the harness connector in good condition?

YES: Go to Step 3.

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

STEP 3. Measure the power supply voltage at the injector connector B-115.



(1) Disconnect the intermediate connector B-115 (terminal No. 1) 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.

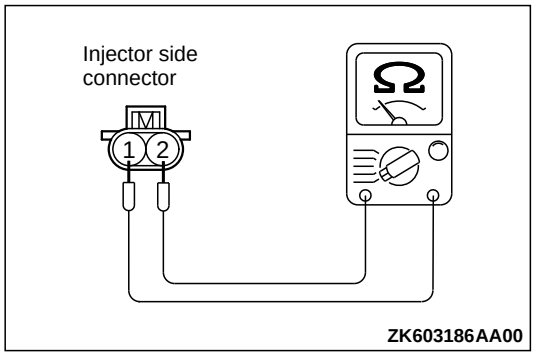
Q:Is the measured resistance battery positive voltage?

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-24X (terminal No. 3) and injector connector B-115 (terminal No. 1) because of open circuit. Then go to Step 7.

STEP 4. Check the No. 6 cylinder injector.

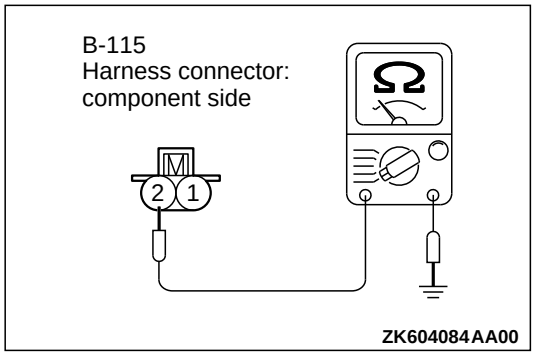
(1) Disconnect the No. 6 cylinder injector connector B-115.



(2) Measure the resistance between injector side connector terminal No. 1 and No. 2.
Standard value: 10.5 - 13.5 ohms [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 5.
NO: Replace the No. 6 cylinder injector. Then go to Step 7.

STEP 5. Check for harness between the injector connector B-115 and the ECM connector B-10.
(1) Disconnect the injector connector B-115 and the ECM connector B-10.
(2) Measure the resistance between injector connector B-115 (terminal No. 2) and the ECM connector B-10 (terminal No. 51).
- Should be less than 2 ohms.

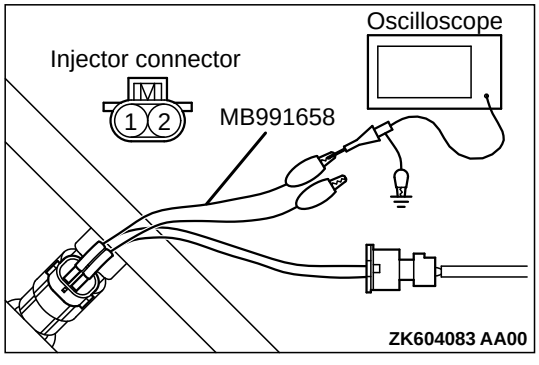


(3) Measure the continuity between the intermediate connector B-115 (terminal No. 2) and ground.
- Not continuity.

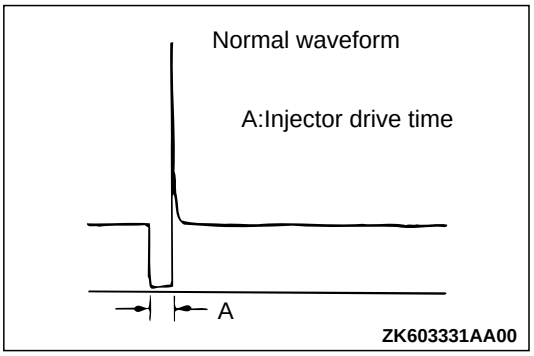
Q:Is the connector wire in good condition?
YES: Go to Step 6.
NO: Repair it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 7.

STEP 6. Using the oscilloscope, check the No. 6 cylinder injector.
(1) Disconnect the No. 6 cylinder injector connector B-115 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 ECM side connector, disconnect all ECM connectors. Connect the check harness special tool (MB992110) between the separated connectors. Then connect an oscilloscope probe to the check harness connector terminal No. 51.



(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.00-15.

NO: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. 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. 13Ab-8.

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

Q:Is DTC P0206 set?

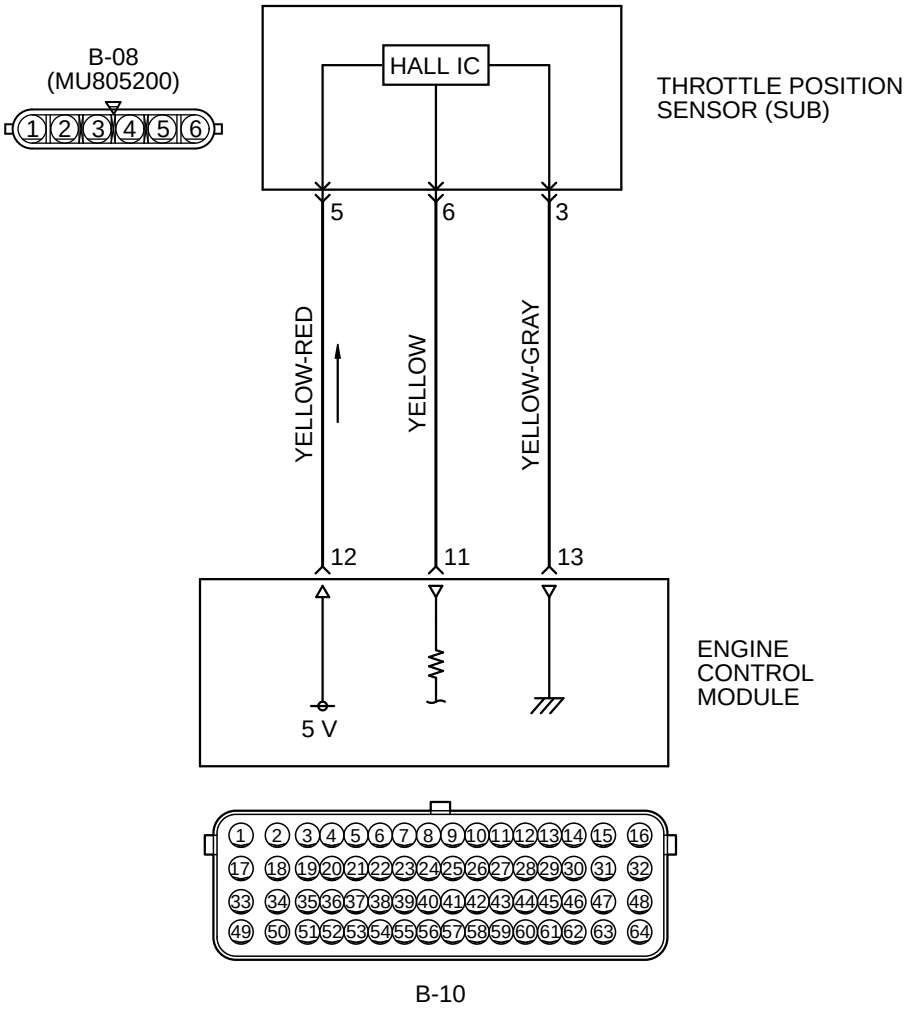
YES: Retry the troubleshooting.

NO: The inspection is complete.

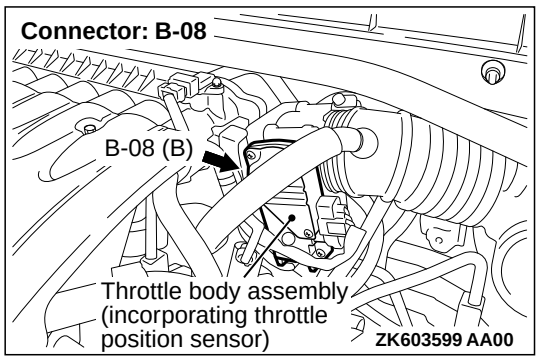
DTC P0222: Throttle Position Sensor (Sub) Circuit Low Input

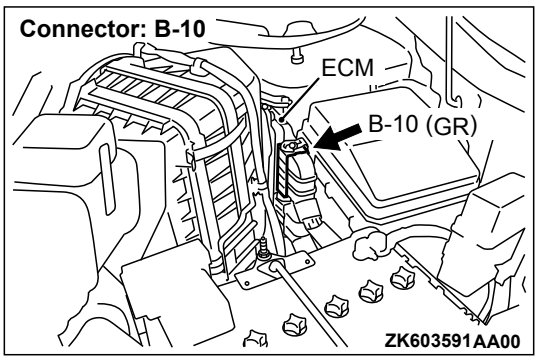
M11310100215USA0000010000

THROTTLE POSITION SENSOR (SUB) CIRCUIT



ZK602849AA00





CIRCUIT OPERATION

- A 5-volt power supply is applied on the throttle position sensor (sub) power terminal (terminal No. 5) from the ECM (terminal No. 12).
  The ground terminal (terminal No. 3) is grounded with ECM (terminal No. 13).

TECHNICAL DESCRIPTION

- The throttle position sensor (sub) outputs voltage which corresponds to the throttle valve opening angle.
- The ECM 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)

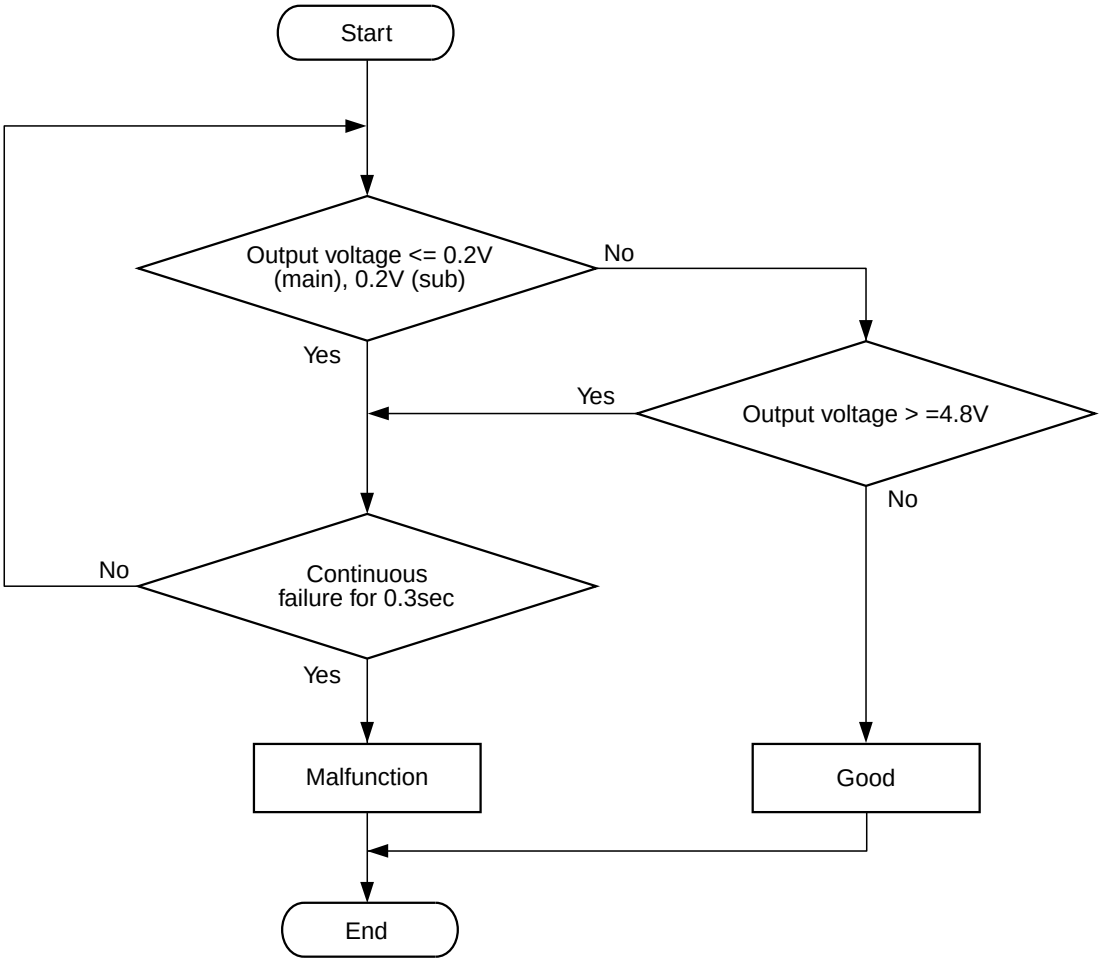
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



ZK603749 AA00

Check Condition
- Ignition switch is "ON" position.

Judgement Criterion
- Throttle position sensor (sub) output voltage should be 0.2 volt or less for 0.3 second.

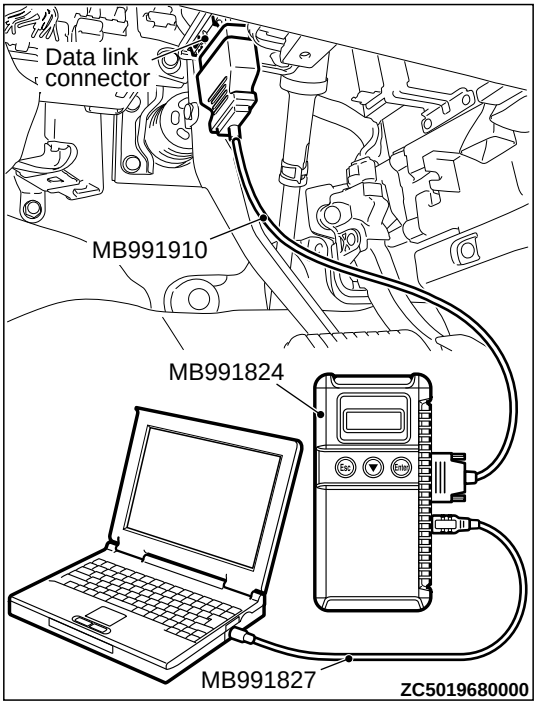
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)
- Throttle position sensor failed.
- Connector damage
- Harness damage
- ECM failed.

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
- MB991658: Test Harness



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 4.0 volts or more when the throttle valve is fully closed with your finger.
  - Output voltage should be 1.0 volt or less 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.00-15.

NO: Go to Step 2.

STEP 2. Check harness connector B-08 at the throttle position sensor and harness connector B-10 at for damage.

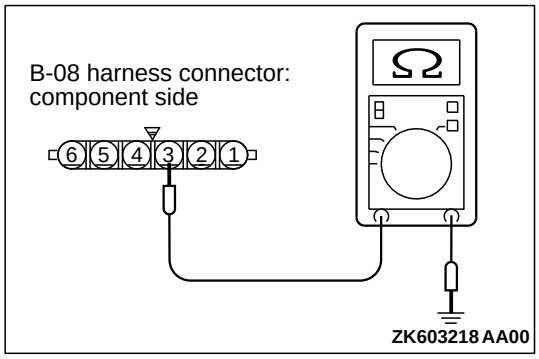
Q:Is the harness connector in good condition?

YES: Go to Step 3.

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

STEP 3. Measure the sensor supply voltage at throttle position sensor harness side connector B-08.

(1) Disconnect the connector B-08 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.

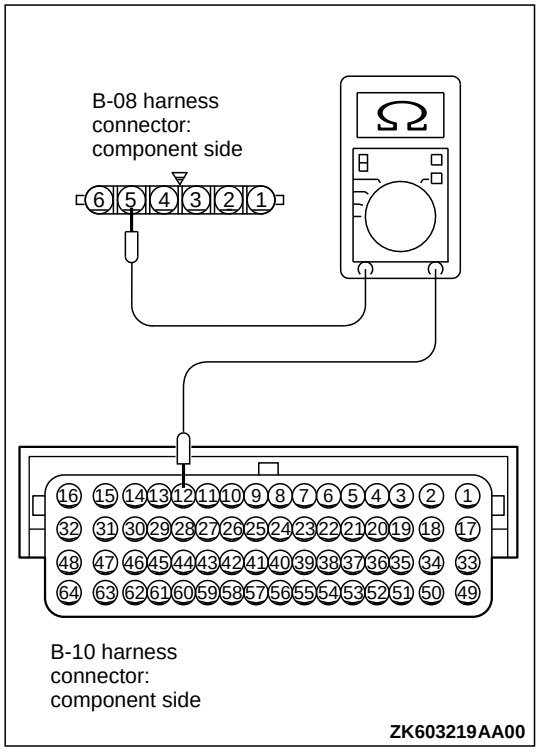
(4) Turn the ignition switch to the "LOCK" (OFF) position.

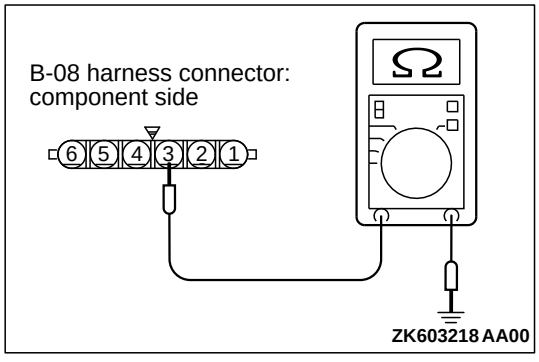
Q:Is the measured voltage between 4.9 and 5.1 volts?
YES: Go to Step 5.
NO: Go to Step 4.

STEP 4. Check for open circuit and harness damage and short circuit to ground between the throttle position sensor connector B-08 and the ECM connector B-10.

(1) Disconnect the throttle position sensor connector B-08 and the ECM connector B-10.

(2) Measure the resistance between the throttle position sensor connector B-08 (terminal No. 5) and the ECM connector B-10 (terminal No. 12).
- Should be less than 2 ohms.





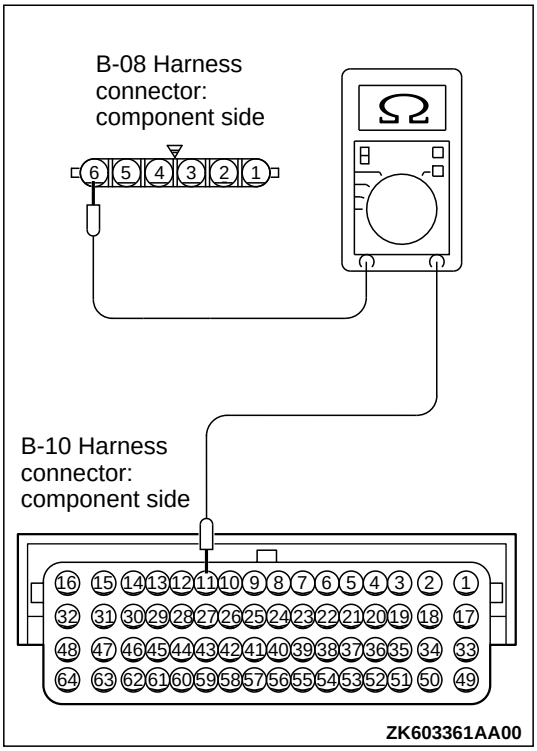
(3) Check for the throttle position sensor connector B-08 (terminal No. 5) and ground.
- Not continuity.

Q:Is the harness wire in good condition?
YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to step 8.
NO: Repair it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 8.

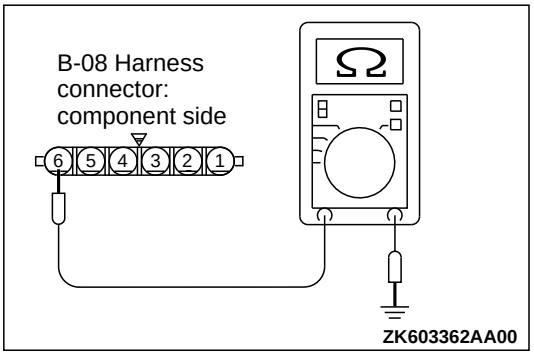
STEP 5. Check for open circuit and short circuit to ground and harness damage between the throttle position sensor connector B-08 and ECM connector B-10.

(1) Disconnect the throttle position sensor connector B-08 and the ECM connector B-10.

(2) Measure the resistance between the throttle position sensor connector B-08 (terminal No. 6) and the ECM connector B-10 (terminal No. 11).
- Should be less than 2 ohms.



(3) Check for the throttle position sensor connector B-08 (terminal No. 6) and ground.
- Not continuity.



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 4.0 volts or more when the throttle valve is fully closed with your finger.
- Output voltage should be 1.0 volt or less 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.00-15.

NO: Go to Step 7.

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 P0222 set?

YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. 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 P0222 set?

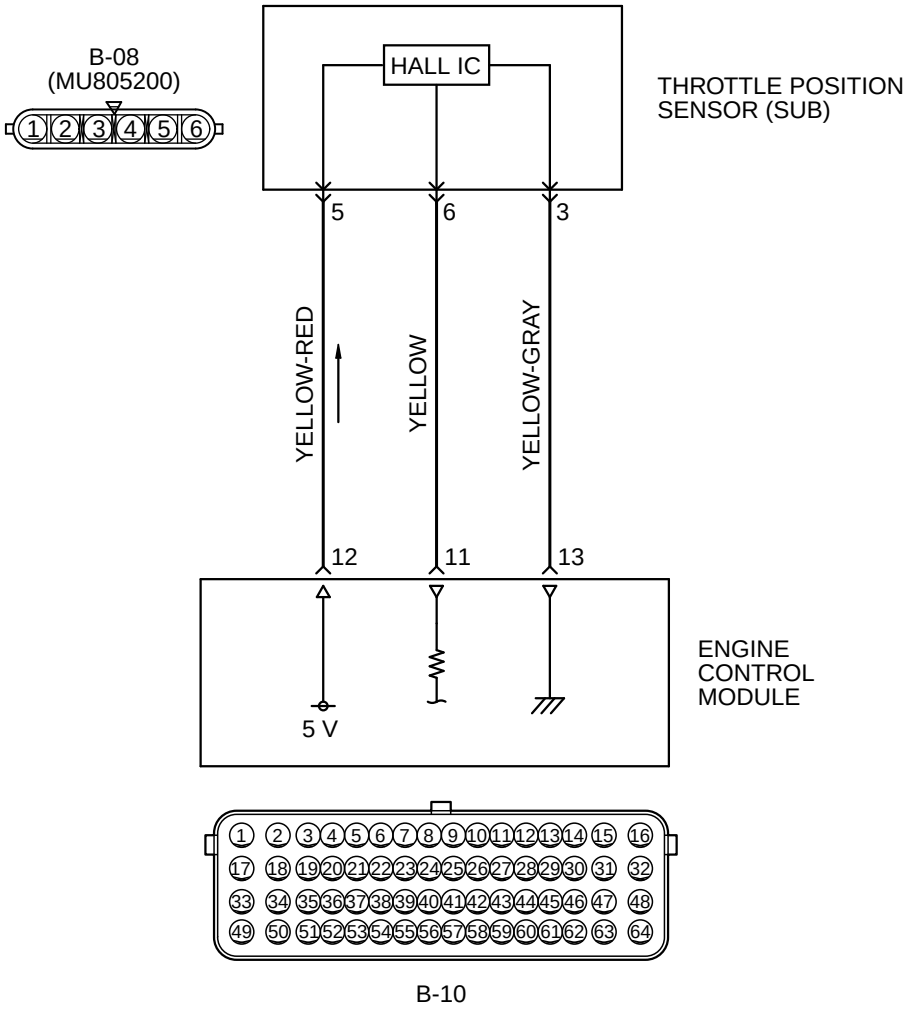
YES: Retry the troubleshooting.

NO: The inspection is complete.

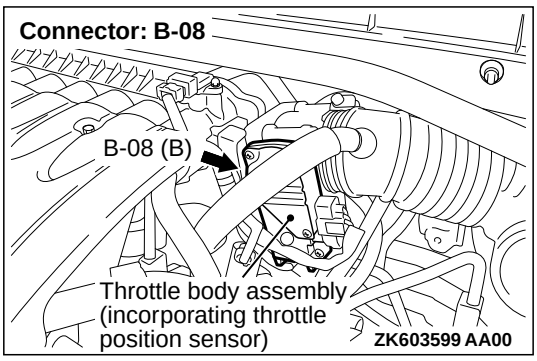
DTC P0223: Throttle Position Sensor (Sub) Circuit High Input

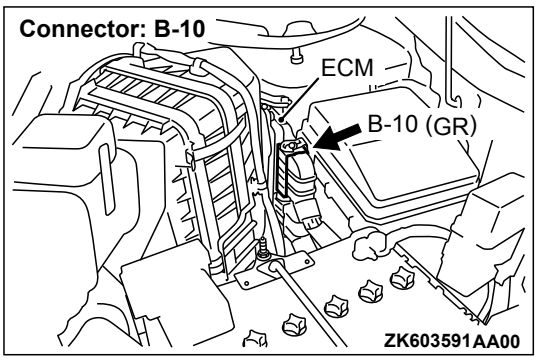
M11310100216USA0000010000

THROTTLE POSITION SENSOR (SUB) CIRCUIT



ZK602849AA00





CIRCUIT OPERATION

- A 5-volt power supply is applied on the throttle position sensor (sub) power terminal (terminal No. 5) from the ECM (terminal No. 12).
  The ground terminal (terminal No. 3) is grounded with ECM (terminal No. 13).

TECHNICAL DESCRIPTION

- The throttle position sensor (sub) outputs voltage which corresponds to the throttle valve opening angle.
- The ECM 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)

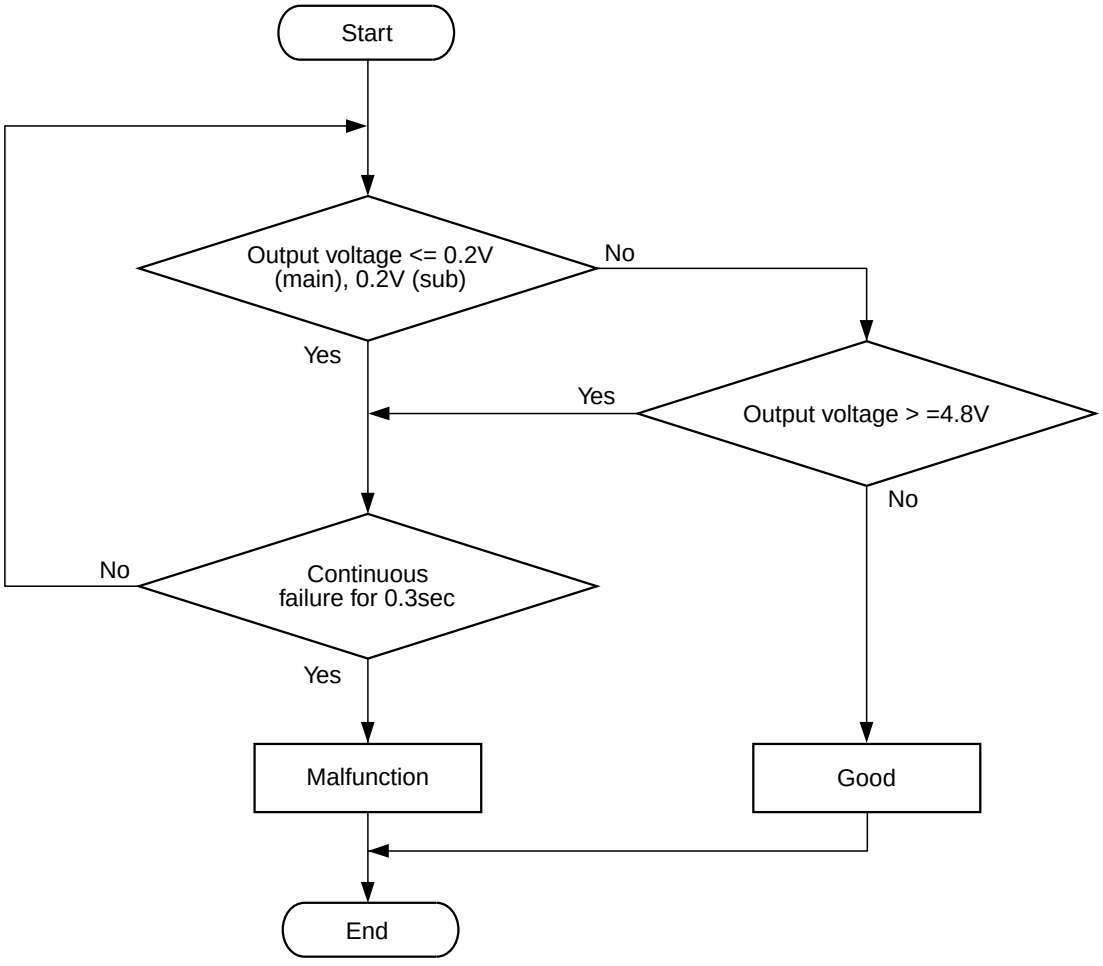
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



ZK603749 AA00

Check Condition
- Ignition switch is "ON" position.

Judgement Criterion
- Throttle position sensor (sub) output voltage should be 4.8 volts or more for 0.3 second.

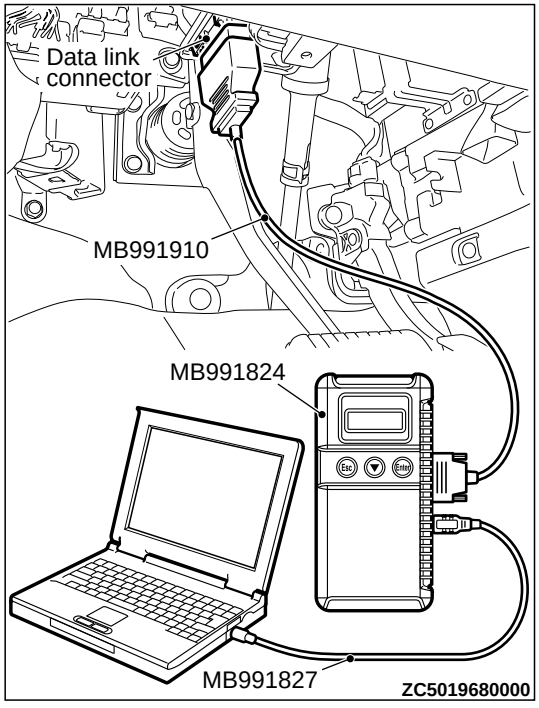
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)
- Throttle position sensor failed.
- Harness damage
- Connector damage
- ECM failed.

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
- MB991658: Test Harness



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 4.0 volts or more when the throttle valve is fully closed with your finger.
  - Output voltage should be 1.0 volt or less 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.00-15.

NO: Go to Step 2.

STEP 2. Check harness connector B-08 at the throttle position sensor and harness connector B-10 at the ECM for damage.

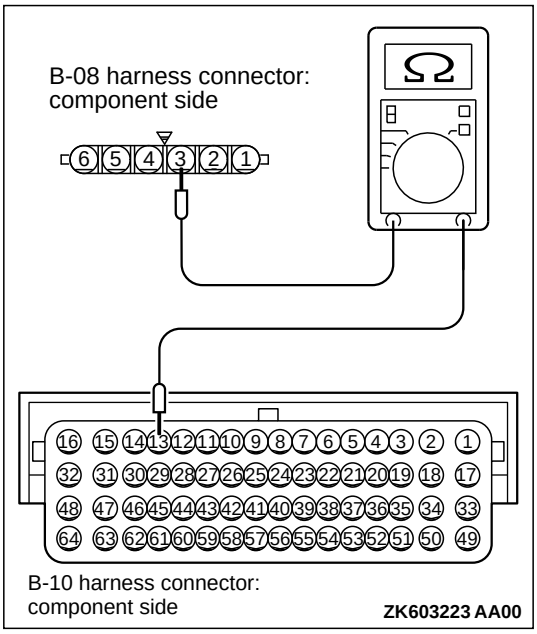
Q:Is the harness connector in good condition?

YES: Go to Step 3.

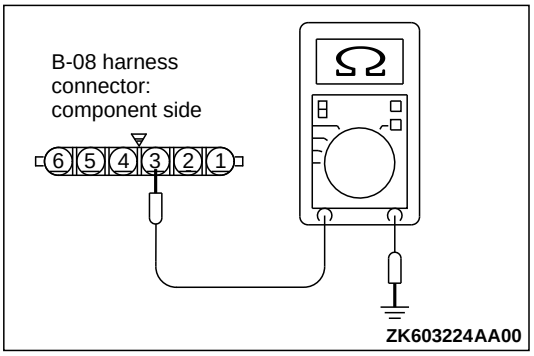
NO: Repair it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 6.

STEP 3. Check for open circuit and harness damage between the throttle position sensor connector B-08 and ECM connector B-10.

(1) Disconnect the throttle position sensor connector B-08 and the ECM connector B-10.



(2) Measure the resistance between the throttle position sensor connector B-08 (terminal No. 3) and the ECM connector B-10 (terminal No. 13).
- Should be less than 2 ohms.



(3) Check for the throttle position sensor connector B-08 (terminal No. 3) and ground.
- Not continuity.

Q:Is the harness wire in good condition?
YES: Go to Step 4.
NO: Repair it. Then go to Step 6.

STEP 4. 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 4.0 volts or more when the throttle valve is fully closed with your finger.
- Output voltage should be 1.0 volt or less 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.00-15.
NO: Go to Step 5.

STEP 5. 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 ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 6.
NO: The inspection is complete.

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 P0223 set?
YES: Retry the troubleshooting.
NO: The inspection is complete.

DTC P0300: Random/Multiple Cylinder Misfire Detected

M11310100217USA0000010000

TECHNICAL DESCRIPTION
- If a misfire occurs while the engine is running, the engine speed changes for an instant.
- The ECM 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

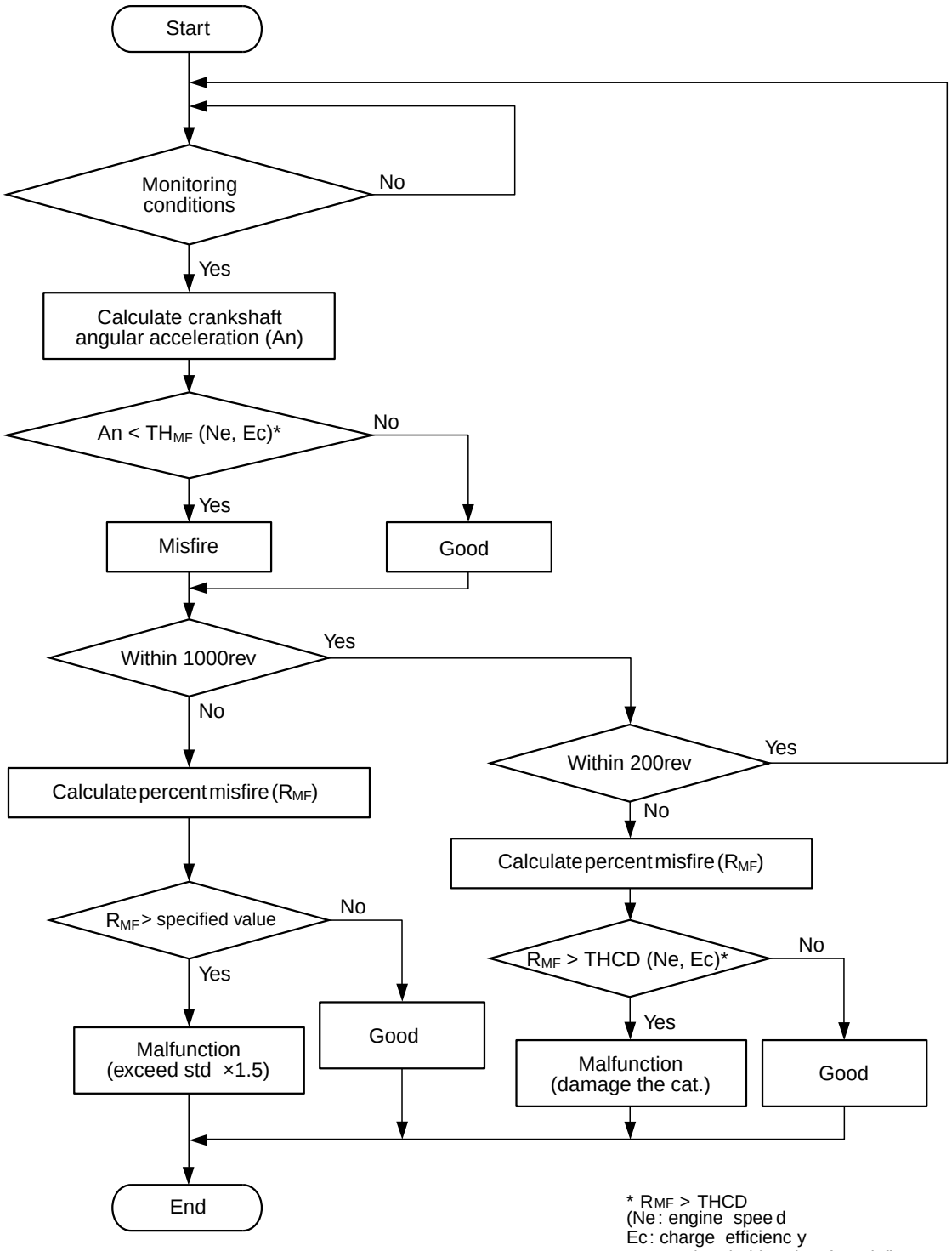
MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

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



* RMF > THCD
(Ne: engine speed
Ec: charge efficiency
THMF: Threshold value for misfire
THCD: Threshold value for catalyst damage)

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Check Conditions
- Engine speed is between 440 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 -0.06 V/10 ms to +0.06 V/10 ms.

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 15 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.13Ab-8.

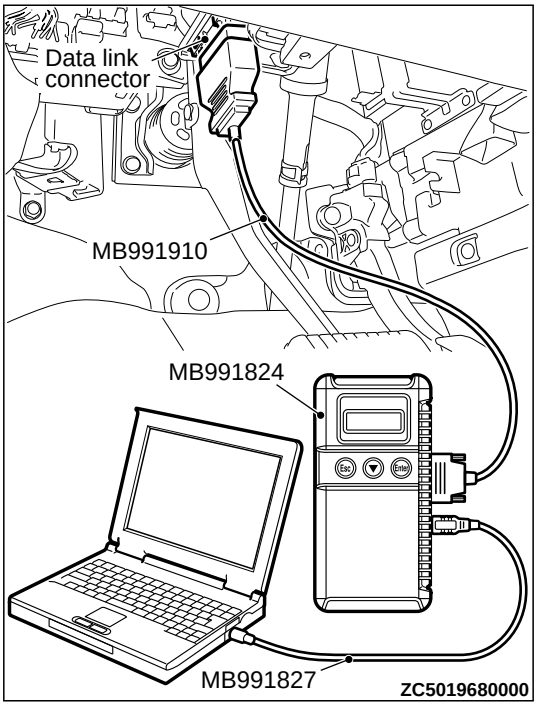
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)
- Ignition system related part(s) failed.
- Poor crankshaft position sensor.
- Incorrect air/fuel ratio.
- Spark plug failed.
- Low compression pressure.
- Skipping of timing belt teeth.
- EGR valve (stopper motor) failed.
- ECM 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
  - MB992110: Power Plant ECU Check Harness

STEP 1. Check the EGR system
Refer to GROUP 17, Emission Control System - Exhaust Gas Recirculation (EGR) System - General Information P.17c-13.

Q:Are there any abnormalities?
YES: Replace the EGR valve (stopper motor). Then go to Step 9.
NO: Go to Step 2.



STEP 2. 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.

Q:Is the sensor operating properly?

YES: Go to Step 3.
NO: Refer to, DTC P0335 - Crankshaft Position Sensor Circuit Malfunction P.13Ab-433.

STEP 3. Using scan tool MB991958, check data list item 26 <bank 1> and 27 <bank2>: 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<bank 1> and 27 <bank2>, 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.

Q:Is the specification normal?

YES: Go to Step 4.
NO: Refer to, DTC P0171 - System too Lean (bank 1) P.13Ab-293, DTC P0172 - System too Rich (bank 1) P.13Ab-300, DTC P0174 - System too Lean (bank 2) P.13Ab-304, DTC P0175 - System too Rich (bank 2) P.13Ab-311.

STEP 4. Using scan tool MB991958, check data list item 28 <bank 1> and 29 <bank2>: 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<bank 1> and 29 <bank2>, Short-Term Fuel Trim.
- The fuel trim should be between -7.4 and 7.4 percent when the engine is 2,500 r/min (during closed loop) after the engine is warmed.

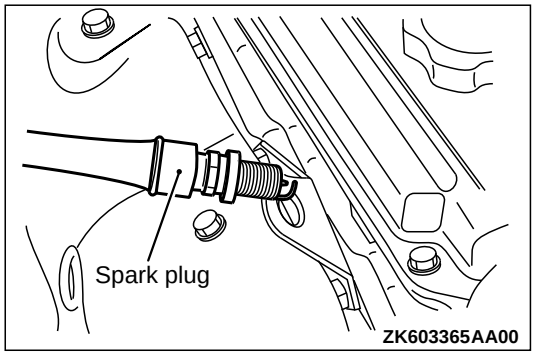
Q:Is the specification normal?

YES: Go to Step 5.
NO: Refer to, DTC P0171 - System too Lean (bank 1) P.13Ab-293, DTC P0172 - System too Rich (bank 1) P.13Ab-300, DTC P0174 - System too Lean (bank 2) P.

13Ab-304, DTC P0175 - System too Rich (bank 2) P. 13Ab-311.

STEP 5. Check the each ignition coil spark.

(1) Remove the intake manifold.
(2) Remove the ignition coil.
(3) Remove the spark plug and connect to the ignition coil.
(4) Ground the spark plug side electrode securely.
- When the engine is cranked, the spark plug should spark.



Q:Did it spark?

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

STEP 6. Check the spark plugs.

Refer to GROUP 16, Ignition System - On-vehicle Service - Spark Plug Check And Cleaning P.16c-4.

Q:Is the spark plug normal?

YES: Refer to, INSPECTION PROCEDURE 24 - Ignition Circuit System P.13Ab-826.
NO: Replace the faulty spark plug. Then go to Step 9.

STEP 7. 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 it. Then go to Step 9.
NO: Go to Step 8.

STEP 8. Check the trouble symptoms.

(1) Carry out a test drive with the drive cycle pattern. Refer to Pattern 15 P.13Ab-8.
(2) Check the diagnostic trouble code (DTC).

Q:Is DTC P0300 set?

YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 9.
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.00-15.

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 15 P. 13Ab-8.
(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

M11310100218USA0000010000

TECHNICAL DESCRIPTION

- If a misfire occurs while the engine is running, the engine speed changes for an instant.
- The ECM 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)

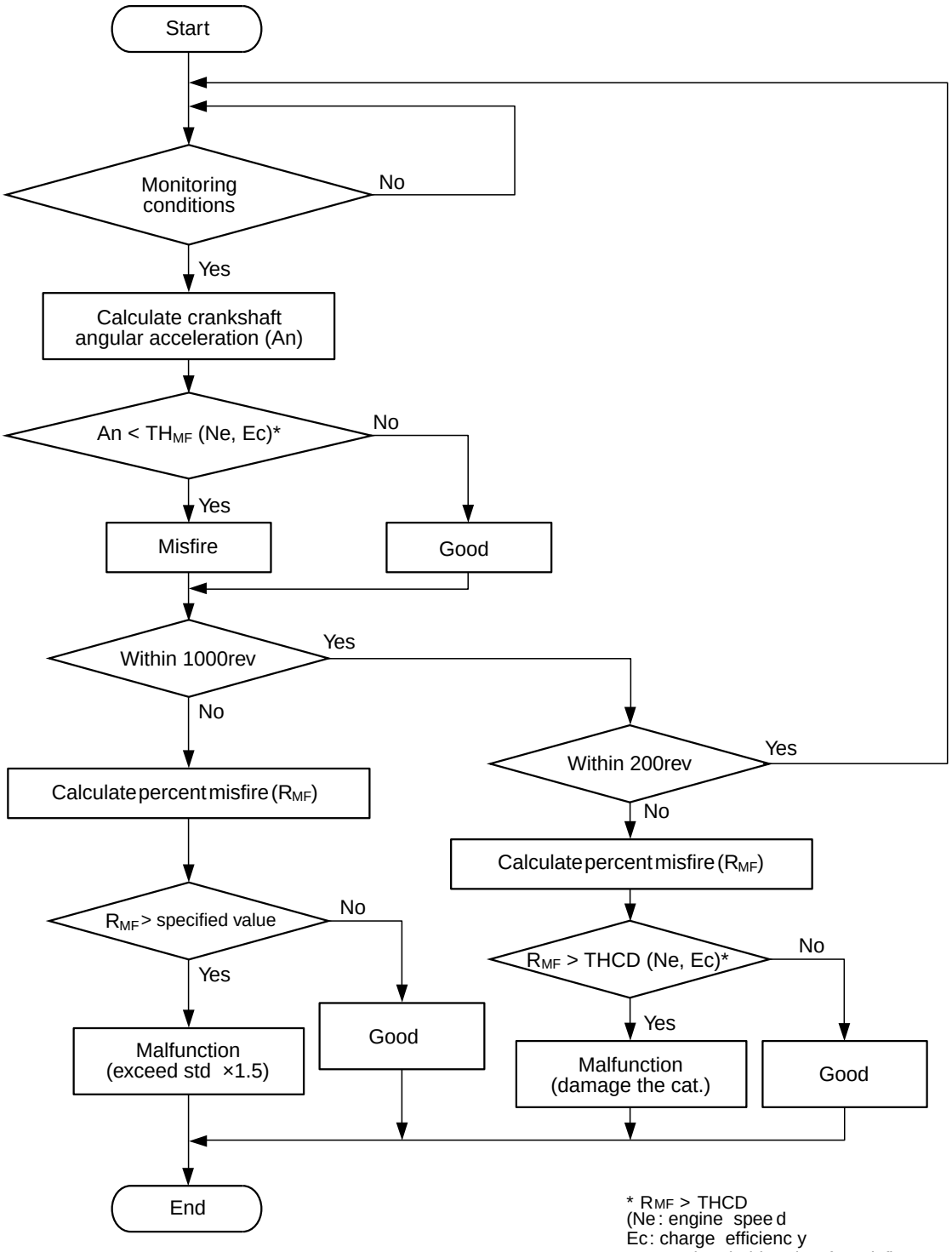
- Not applicable

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



* RMF > THCD
(Ne: engine speed
Ec: charge efficiency
THMF: Threshold value for misfire
THCD: Threshold value for catalyst damage)

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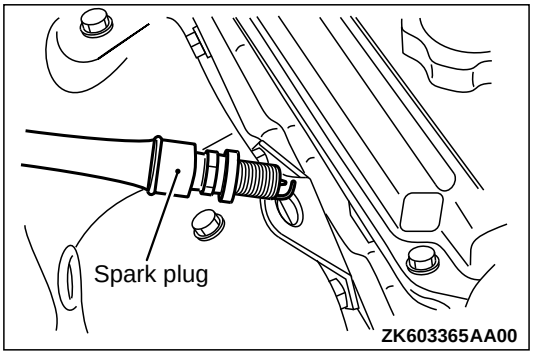
Check Conditions
- Engine speed is between 440 and 6,500 r/min.
- Engine coolant temperature is higher than -10°C (14°F).
- Barometric pressure is higher than 76 kPa (22.4 in.Hg).
- Volumetric efficiency is at between 30 and 60 percent.
- Adaptive learning is complete for the vane which generates a crankshaft 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.

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 15 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.13Ab-8.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)
- Spark plug failed.
- Ignition system related part(s) failed.
- Low compression pressure.
- ECM failed.



DIAGNOSIS

STEP 1. Check the No. 1 cylinder ignition coil spark.
(1) Remove the No. 1 cylinder intake manifold.
(2) Remove the No. 1 cylinder ignition coil.
(3) Remove the spark plug and connect to the No.1 cylinder ignition coil.
(4) Ground the spark plug side electrode securely.
- When the engine is cranked, the spark plug should spark.

Q:Did it spark?
YES: Go to Step 3.
NO: Go to Step 2.

STEP 2. Check the No. 1 cylinder spark plugs.
Refer to GROUP 16, Ignition System - On-vehicle Service - Spark Plug Check And Cleaning P.16c-4.

Q:Is the spark plug normal?
YES: Refer to, INSPECTION PROCEDURE 24 - Ignition Circuit System P.13Ab-826.
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: 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. 13Ab-8.
(2) Check the diagnostic trouble code (DTC).

Q:Is DTC P0301 set?
YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. 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.00-15.

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. 13Ab-8.
(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

M11310100219USA0000010000

TECHNICAL DESCRIPTION
- If a misfire occurs while the engine is running, the engine speed changes for an instant.
- The ECM 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

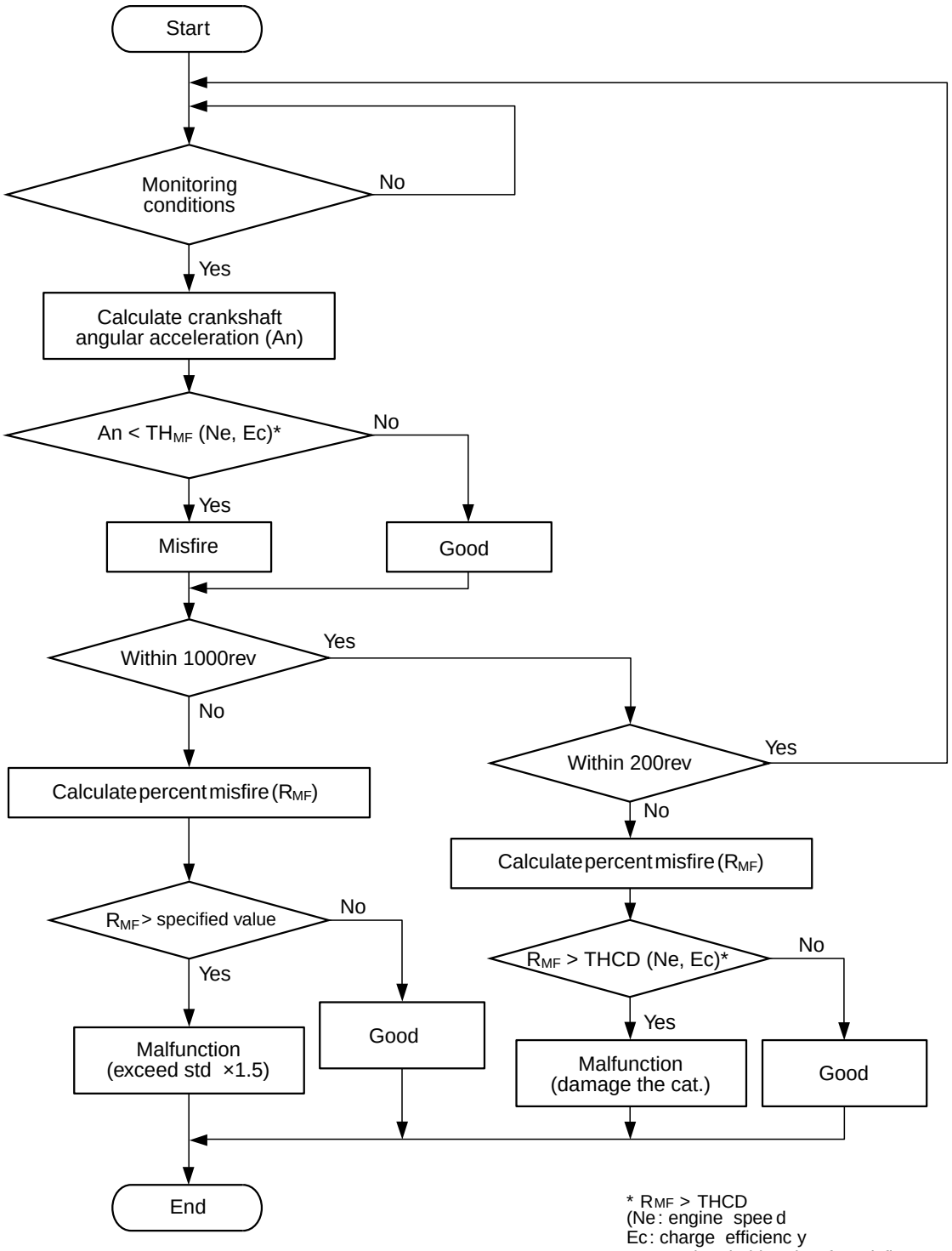
MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

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



* RMF > THCD
(Ne: engine speed
Ec: charge efficiency
THMF: Threshold value for misfire
THCD: Threshold value for catalyst damage)

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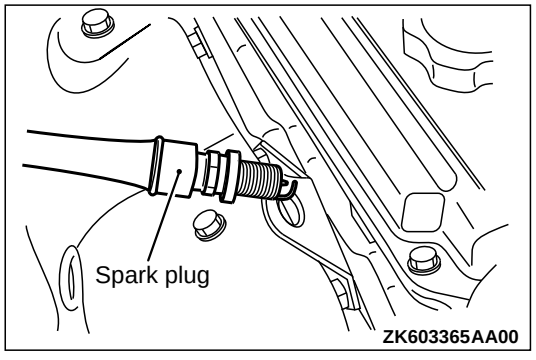
Check Conditions
- Engine speed is between 440 and 6,500 r/min.
- Engine coolant temperature is higher than -10°C (14°F).
- Barometric pressure is higher than 76 kPa (22.4 in.Hg).
- Volumetric efficiency is at between 30 and 60 percent.
- Adaptive learning is complete for the vane which generates a crankshaft 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.

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 15 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.13Ab-8.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)
- Spark plug failed.
- Ignition system related part(s) failed.
- Low compression pressure.
- ECM failed.



DIAGNOSIS

STEP 1. Check the No. 2 cylinder ignition coil spark.
(1) Remove the No. 2 cylinder ignition coil.
(2) Remove the No. 2 cylinder spark plug and connect to the ignition coil.
(3) Ground the No. 2 cylinder spark plug side electrode securely.
- When the engine is cranked, the spark plug should spark.

Q:Did it spark?
YES: Go to Step 3.
NO: Go to Step 2.

STEP 2. Check the No. 2 cylinder spark plugs.
Refer to GROUP 16, Ignition System - On-vehicle Service - Spark Plug Check And Cleaning P.16c-4.

Q:Is the spark plug normal?
YES: Refer to, INSPECTION PROCEDURE 24 - Ignition Circuit System P.13Ab-826.
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.00E-2.

Q:Are there any abnormalities?

YES: 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. 13Ab-8.
(2) Check the diagnostic trouble code (DTC).

Q:Is DTC P0302 set?
YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. 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.00-15.

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. 13Ab-8.
(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

M11310100220USA0000010000

TECHNICAL DESCRIPTION
- If a misfire occurs while the engine is running, the engine speed changes for an instant.
- The ECM 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

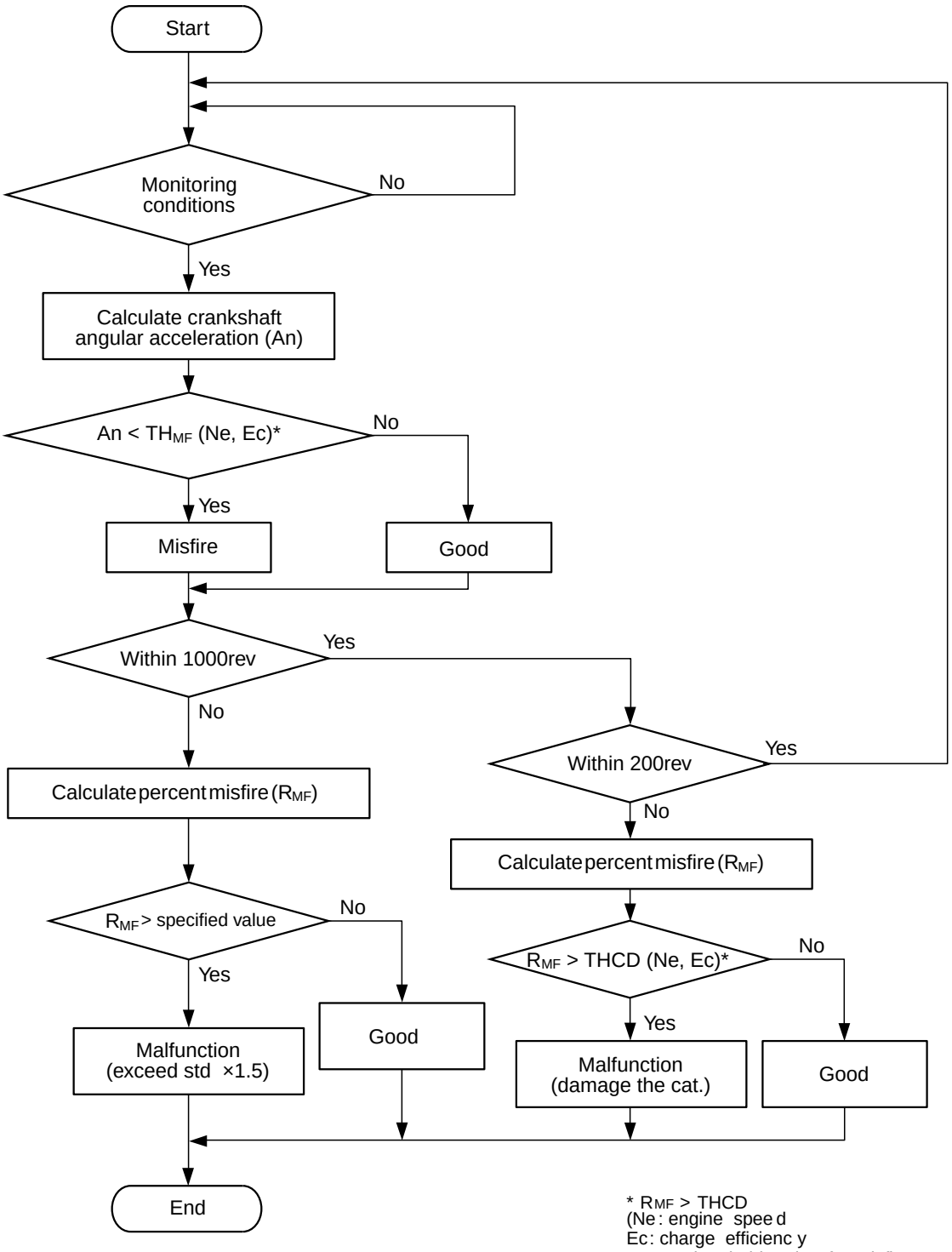
MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

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



* RMF > THCD
(Ne: engine speed
Ec: charge efficiency
THMF: Threshold value for misfire
THCD: Threshold value for catalyst damage)

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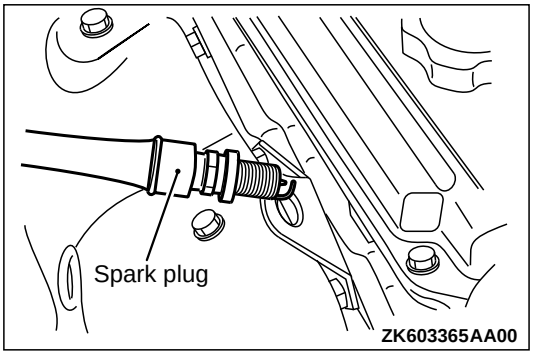
Check Conditions
- Engine speed is between 440 and 6,500 r/min.
- Engine coolant temperature is higher than -10°C (14°F).
- Barometric pressure is higher than 76 kPa (22.4 in.Hg).
- Volumetric efficiency is at between 30 and 60 percent.
- Adaptive learning is complete for the vane which generates a crankshaft 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.

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 15 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.13Ab-8.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)
- Spark plug failed.
- Ignition system related part(s) failed.
- Low compression pressure.
- ECM failed.



DIAGNOSIS

STEP 1. Check the No. 3 cylinder ignition coil spark.
(1) Remove the No. 3 cylinder intake manifold.
(2) Remove the No. 3 cylinder ignition coil.
(3) Remove the spark plug and connect to the No.3 cylinder ignition coil.
(4) Ground the spark plug side electrode securely.
- When the engine is cranked, the spark plug should spark.

Q:Did it spark?
YES: Go to Step 3.
NO: Go to Step 2.

STEP 2. Check the No. 3 cylinder spark plugs.
Refer to GROUP 16, Ignition System - On-vehicle Service - Spark Plug Check And Cleaning P.16c-4.

Q:Is the spark plug normal?
YES: Refer to, INSPECTION PROCEDURE 24 - Ignition Circuit System P.13Ab-826.
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: 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. 13Ab-8.
(2) Check the diagnostic trouble code (DTC).

Q:Is DTC P0302 set?
YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. 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.00-15.

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. 13Ab-8.
(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

M11310100221USA0000010000

TECHNICAL DESCRIPTION
- If a misfire occurs while the engine is running, the engine speed changes for an instant.
- The ECM 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

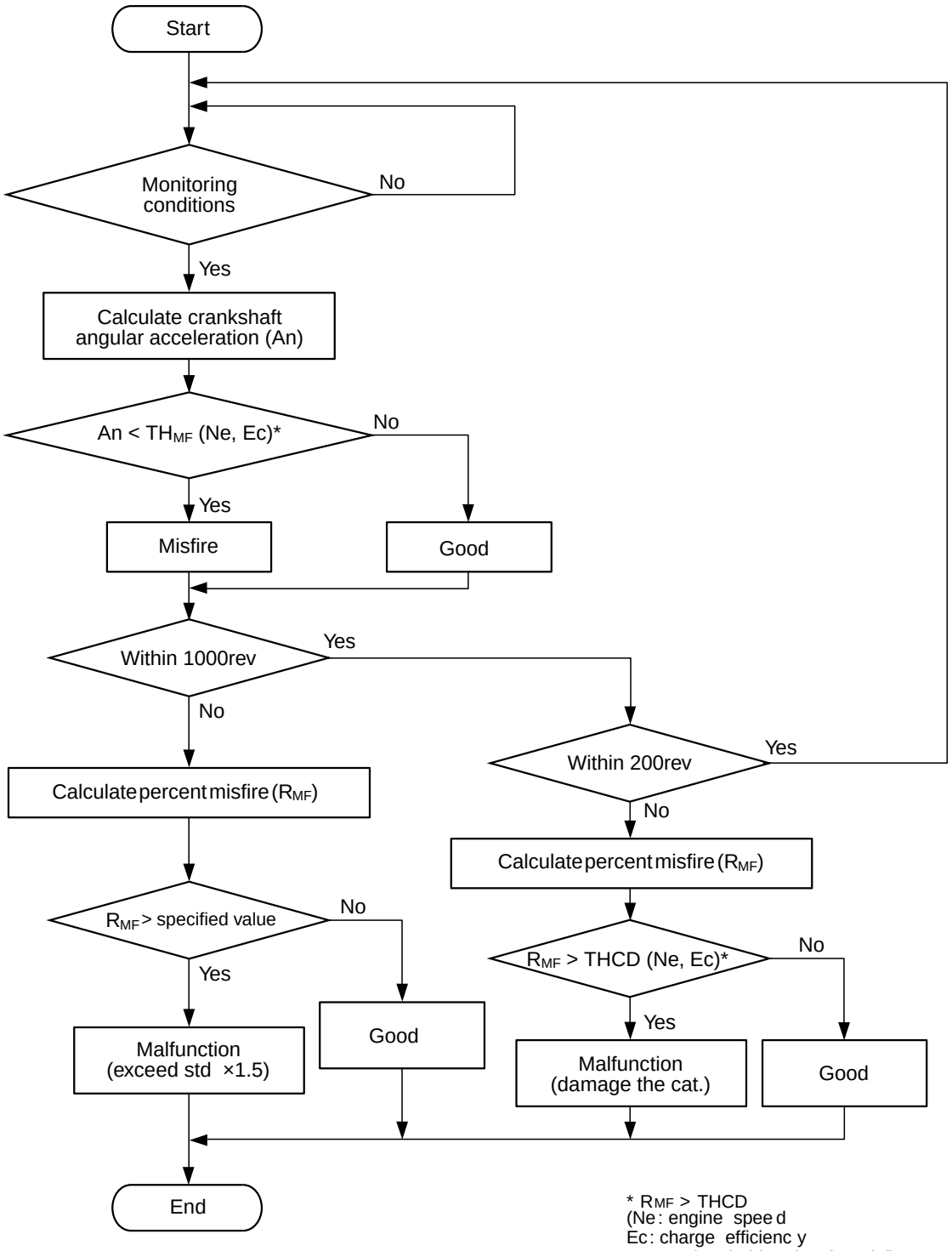
MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

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



* RMF > THCD
(Ne: engine speed
Ec: charge efficiency
THMF: Threshold value for misfire
THCD: Threshold value for catalyst damage)

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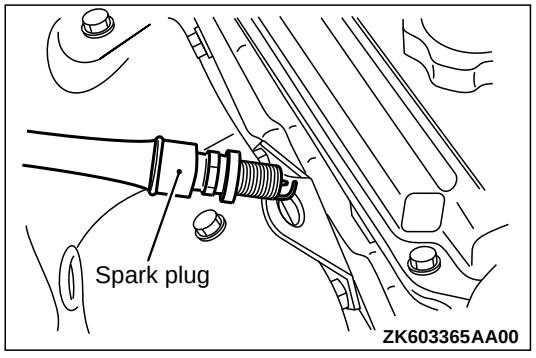
Check Conditions
- Engine speed is between 440 and 6,500 r/min.
- Engine coolant temperature is higher than -10°C (14°F).
- Barometric pressure is higher than 76 kPa (22.4 in.Hg).
- Volumetric efficiency is at between 30 and 60 percent.
- Adaptive learning is complete for the vane which generates a crankshaft 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.

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 15 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.13Ab-8.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)
- Spark plug failed.
- Ignition system related part(s) failed.
- Low compression pressure.
- ECM failed.



DIAGNOSIS

STEP 1. Check the No. 4 cylinder ignition coil spark.
(1) Remove the No. 4 cylinder ignition coil.
(2) Remove the No. 4 cylinder spark plug and connect to the ignition coil.
(3) Ground the No.4 cylinder spark plug side electrode securely.
- When the engine is cranked, the spark plug should spark.

Q:Did it spark?
YES: Go to Step 3.
NO: Go to Step 2.

STEP 2. Check the No. 4 cylinder spark plugs.
Refer to GROUP 16, Ignition System - On-vehicle Service - Spark Plug Check And Cleaning P.16c-4.

Q:Is the spark plug normal?
YES: Refer to, INSPECTION PROCEDURE 24 - Ignition Circuit System P.13Ab-826.
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: 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. 13Ab-8.
(2) Check the diagnostic trouble code (DTC).

Q:Is DTC P0304 set?
YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. 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.00-15.

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. 13Ab-8.
(2) Check the diagnostic trouble code (DTC).

Q:Is DTC P0304 set?
YES: Retry the troubleshooting.
NO: The inspection is complete.

DTC P0305: Cylinder 5 Misfire Detected

M11310100222USA0000010000

TECHNICAL DESCRIPTION
- If a misfire occurs while the engine is running, the engine speed changes for an instant.
- The ECM 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

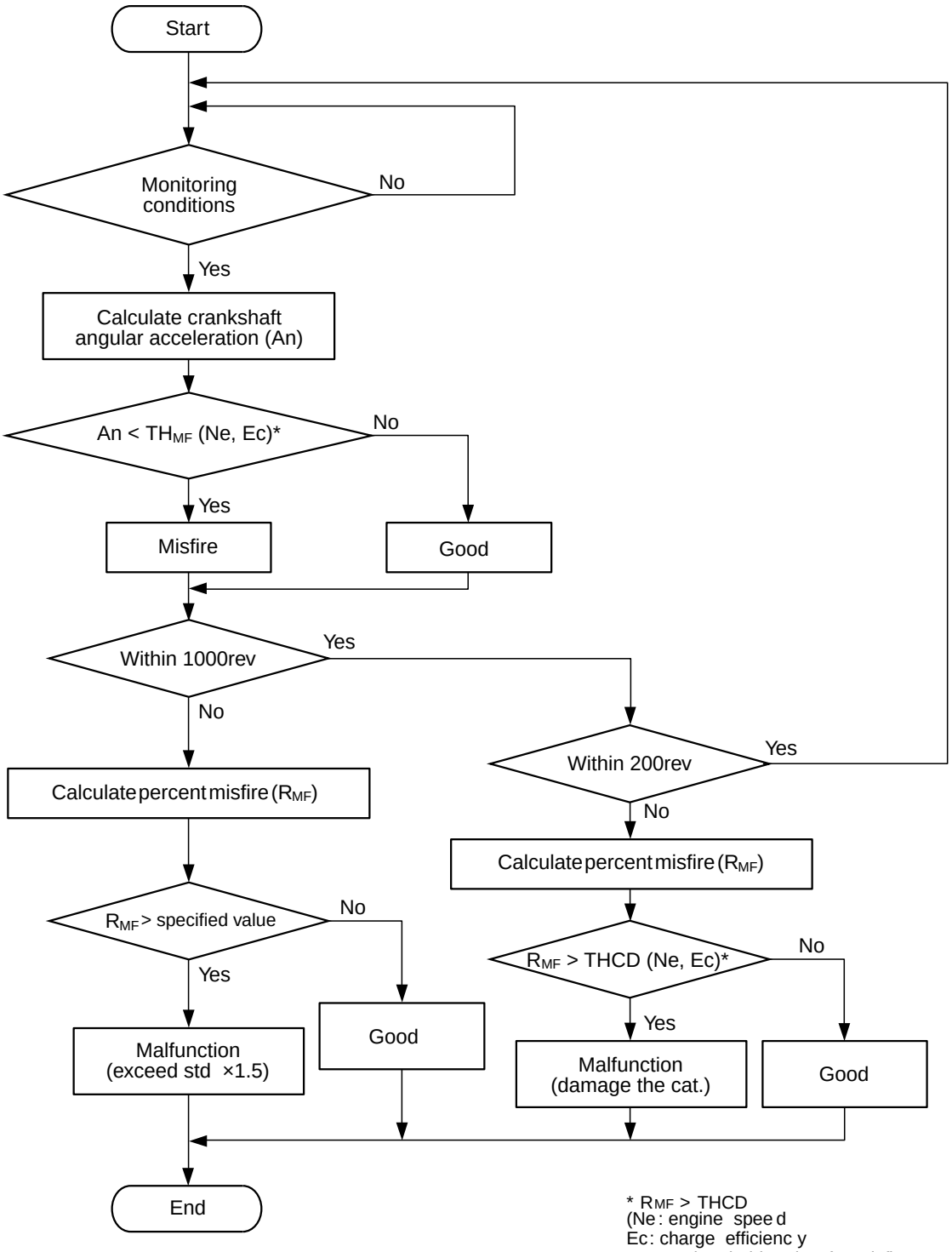
MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

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



* RMF > THCD
(Ne: engine speed
Ec: charge efficiency
THMF: Threshold value for misfire
THCD: Threshold value for catalyst damage)

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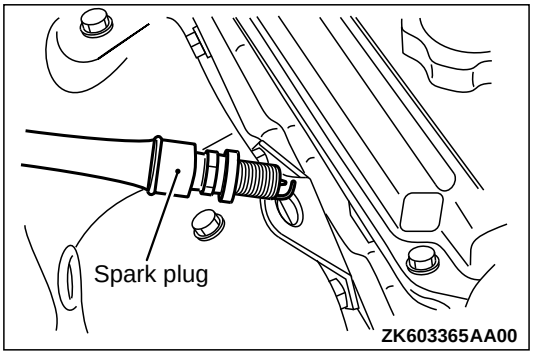
Check Conditions
- Engine speed is between 440 and 6,500 r/min.
- Engine coolant temperature is higher than -10°C (14°F).
- Barometric pressure is higher than 76 kPa (22.4 in.Hg).
- Volumetric efficiency is at between 30 and 60 percent.
- Adaptive learning is complete for the vane which generates a crankshaft 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.

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 15 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.13Ab-8.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)
- Spark plug failed.
- Ignition system related part(s) failed.
- Low compression pressure.
- ECM failed.



DIAGNOSIS

STEP 1. Check the No. 5 cylinder ignition coil spark.
(1) Remove the No. 5 cylinder intake manifold.
(2) Remove the No. 5 cylinder ignition coil.
(3) Remove the No. 5 cylinder spark plug and connect to the ignition coil.
(4) Ground the spark plug side electrode securely.
- When the engine is cranked, the spark plug should spark.

Q:Did it spark?
YES: Go to Step 3.
NO: Go to Step 2.

STEP 2. Check the No. 5 cylinder spark plugs.
Refer to GROUP 16, Ignition System - On-vehicle Service - Spark Plug Check And Cleaning P.16c-4.

Q:Is the spark plug normal?
YES: Refer to, INSPECTION PROCEDURE 24 - Ignition Circuit System P.13Ab-826.
NO: Replace the No. 5 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: 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. 13Ab-8.
(2) Check the diagnostic trouble code (DTC).

Q:Is DTC P0305 set?
YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. 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.00-15.

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. 13Ab-8.
(2) Check the diagnostic trouble code (DTC).

Q:Is DTC P0305 set?
YES: Retry the troubleshooting.
NO: The inspection is complete.

DTC P0306: Cylinder 6 Misfire Detected

M11310100223USA0000010000

TECHNICAL DESCRIPTION
- If a misfire occurs while the engine is running, the engine speed changes for an instant.
- The ECM 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

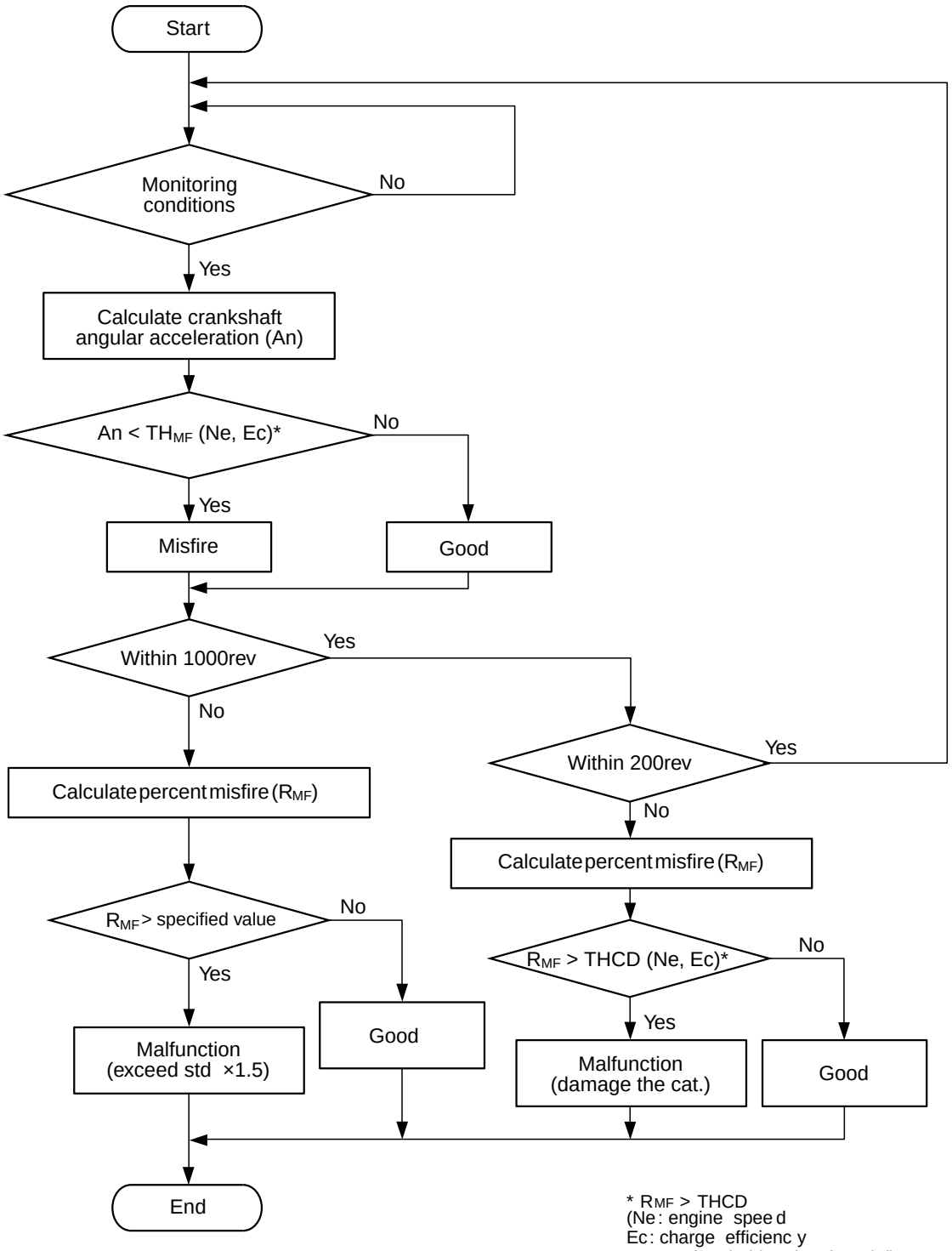
MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

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



* RMF > THCD
(Ne: engine speed
Ec: charge efficiency
THMF: Threshold value for misfire
THCD: Threshold value for catalyst damage)

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Check Conditions
- Engine speed is between 440 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.

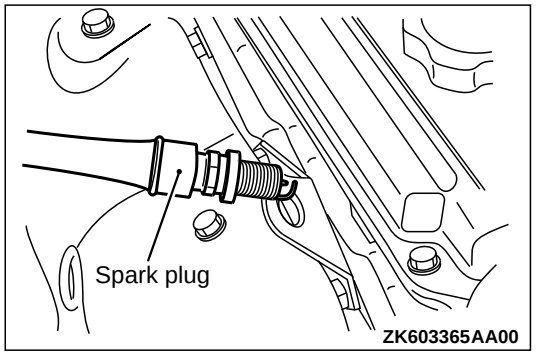
Judgement Criteria (change in the angular acceleration of the crankshaft is used for misfire detection).
- Misfire has occurred more frequently than allowed during the last 200 revolutions [when the catalyst temperature is higher than 1,000°C (1,832°F)].

or
- Misfire has occurred in 15 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.13Ab-8.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)
- Spark plug failed.
- Ignition system related part(s) failed.
- Low compression pressure.
- ECM failed.



DIAGNOSIS

STEP 1. Check the No. 6 cylinder ignition coil spark.

(1) Remove the No. 6 cylinder ignition coil.
(2) Remove the No. 6 cylinder spark plug and connect to the No. 6 cylinder ignition coil.
(3) Ground the spark plug side electrode securely.
- When the engine is cranked, the spark plug should spark.

Q:Did it spark?

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

STEP 2. Check the No. 6 cylinder spark plugs.

Refer to GROUP 16, Ignition System - On-vehicle Service - Spark Plug Check And Cleaning P.16c-4.

Q:Is the spark plug normal?

YES: Refer to, INSPECTION PROCEDURE 24 - Ignition Circuit System P.13Ab-826.
NO: Replace the No. 6 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: 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. 13Ab-8.
(2) Check the diagnostic trouble code (DTC).

Q:Is DTC P0306 set?

YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. 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.00-15.

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. 13Ab-8.
(2) Check the diagnostic trouble code (DTC).

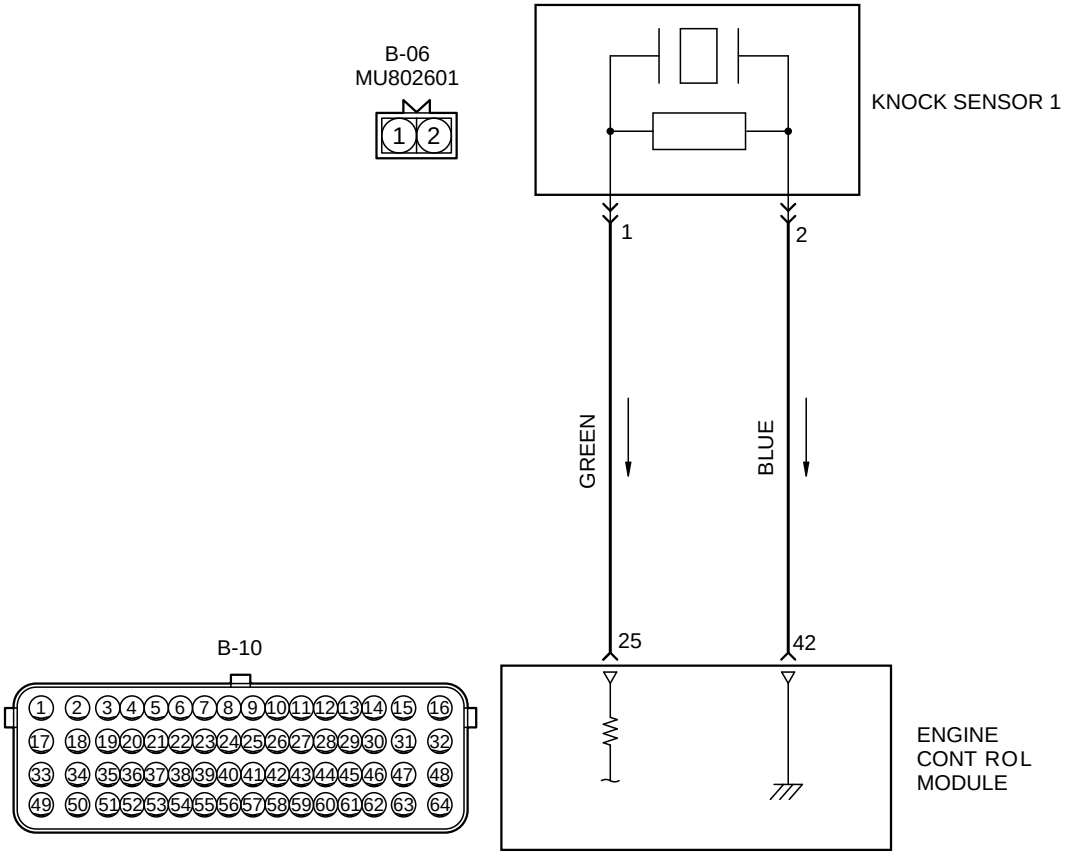
Q:Is DTC P0306 set?

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

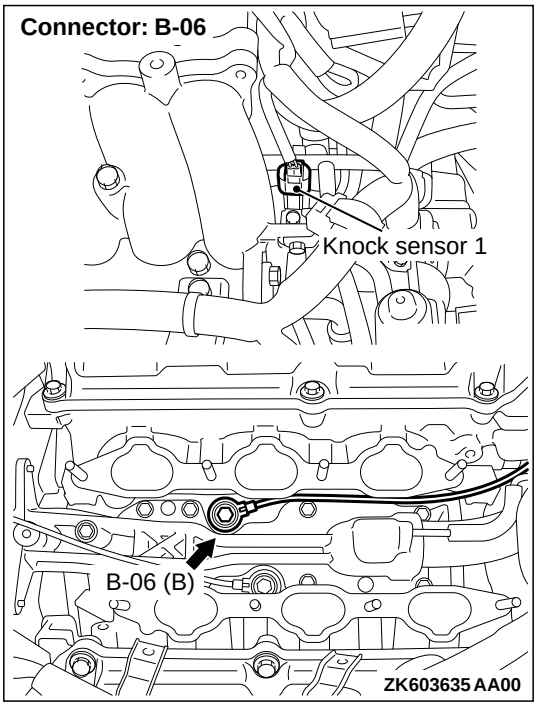
DTC P0326: Knock Sensor Circuit Performance (Bank 1)

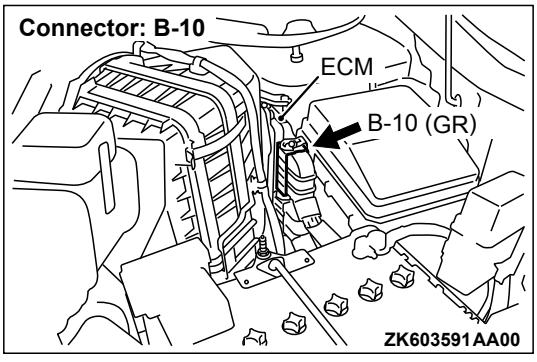
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KNOCK SENSOR 1 CIRCUIT



ZK602866 AA00





CIRCUIT OPERATION

- The knock sensor (terminal No. 1) sends a signal voltage to the ECM (terminal No. 25).
- The ground terminal (terminal No. 2) is grounded with ECM (terminal No. 42)

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 ECM checks whether the voltage output changes.

DTC SET CONDITIONS

Check Conditions

- 2 seconds or more have passed since the engine starting sequence was completed.
- Engine speed is higher than 3,000 r/min.
- Volumetric efficiency is 40 percent or higher.

Judgement Criterion

- Knock sensor 1 output voltage (knock sensor peak voltage in each 1/3 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 1 failed.
- Harness damage.
- Connector damage.
- ECM 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 the knock sensor 1 and harness connector B-10 at ECM 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 4.

STEP 2. Check for harness damage between knock sensor 1 connector B-06 and ECM connector B-10.

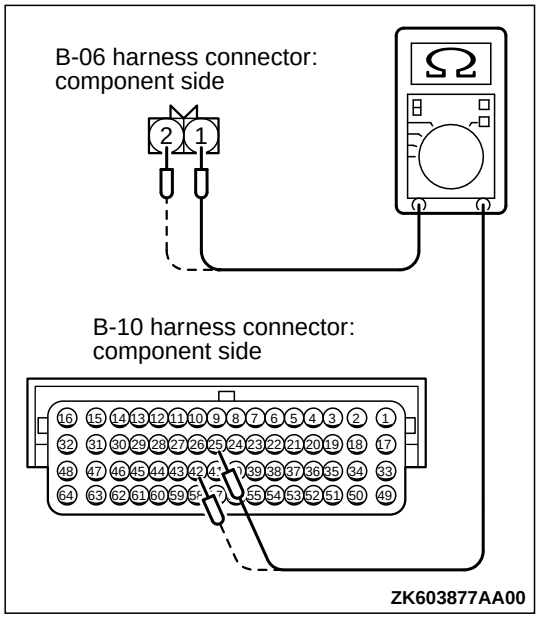
(1) Disconnect the connector B-06 and B-10 measure at the harness side.

(2) Measure the resistance between connector B-06 and connector B-10.

a. Knock sensor 1 connector B-06 (terminal No. 1) and ECM connector B-10 (terminal No. 25).

b. Knock sensor 1 connector B-06 (terminal No. 2) and ECM connector B-10 (terminal No. 42).

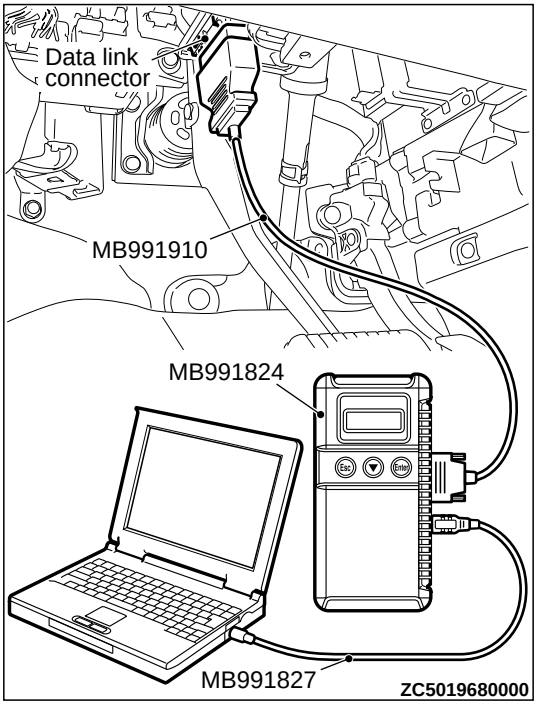
- Should be less than 2 ohms.



Q:Is the measured resistance less than 2 ohms?

YES: Then go to Step 3.

NO: Repair it. Then go to Step 4.



STEP 3. Replace the knock sensor 1.

(1) Replace the knock sensor 1.

⚠ 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.

(2) Connect scan tool MB991958 to the data link connector.
(3) Turn the ignition switch to the "ON" position.
(4) Erase the DTC.
(5) Test drive under the following conditions:
- Engine speed: 3,000 - 5,000 r/min
- Engine load: 40 % or more
- Drive a minimum of 3 seconds after the above conditions have been met.

(6) After completing the test drive, read the DTC.
(7) Turn the ignition switch to the "LOCK" (OFF) position.

Q:Is DTC P0326 set?

YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8.
NO: The inspection is complete.

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

(1) Turn the ignition switch to the "ON" position.
(2) Test drive under the following conditions:
- Engine speed: 3,000 - 5,000 r/min
- Engine load: 40 % or more
- Drive a minimum of 3 seconds after the above conditions have been met.

(3) After completing the test drive, read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

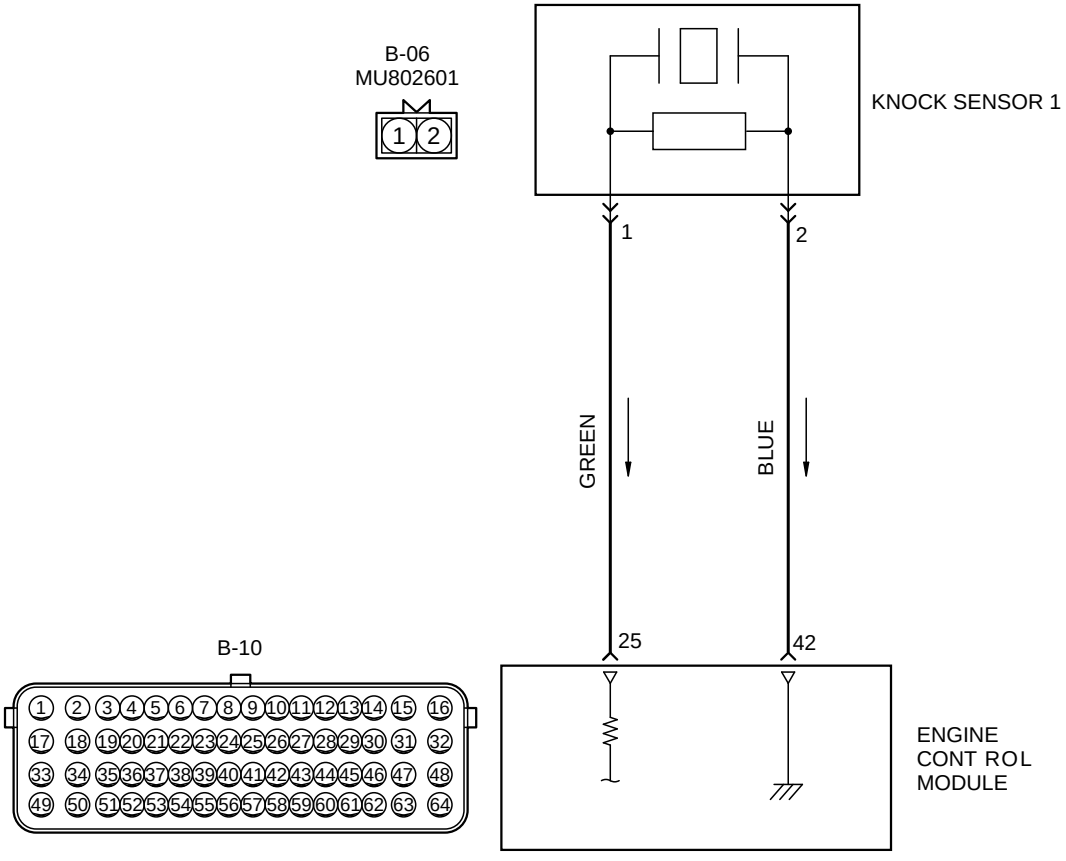
Q:Is DTC P0326 set?

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

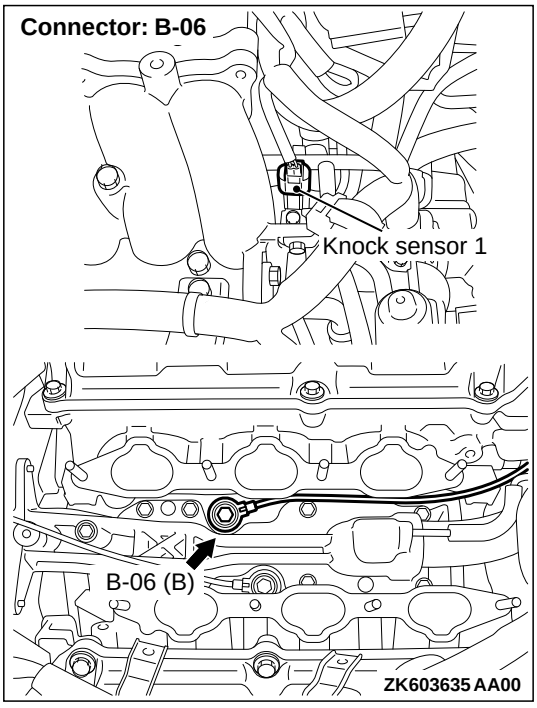
DTC P0327: Knock Sensor Circuit Low (Bank 1)

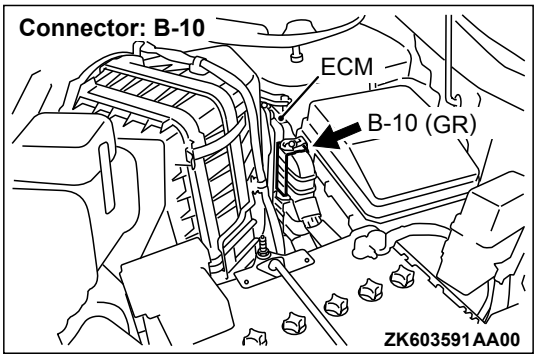
M11310100368USA0000010000

KNOCK SENSOR 1 CIRCUIT



ZK602866 AA00





CIRCUIT OPERATION

- The knock sensor (terminal No. 1) sends a signal voltage to the ECM (terminal No. 25).
- The ground terminal (terminal No. 2) is grounded with ECM (terminal No. 42).

TECHNICAL DESCRIPTION

- The ECM applies 5 V from the ground terminal side to judge a malfunction in the knock sensor circuit.
- The ECM judges whether the knock sensor signal circuit has a short circuit to the ground or an open circuit by checking the input voltage from the knock sensor.
- When the knock sensor output voltage is below the reference voltage, it is judged that a malfunction exists.

DTC SET CONDITIONS

Check Conditions

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

Judgement Criterion

- Knock sensor 1 output voltage has continued to be lower than 0.5 volt for 2 seconds.

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

- Knock sensor 1 failed.
- Harness damage.
- Connector damage.
- ECM 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

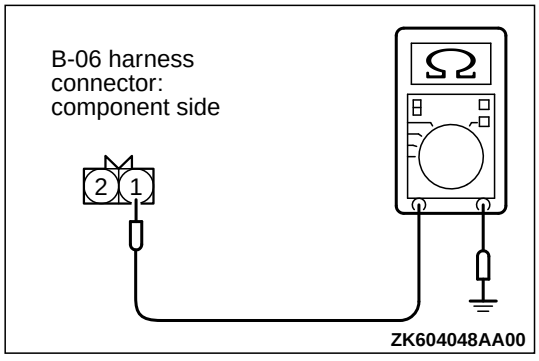
STEP 1. Check harness connector B-06 at the knock sensor 1 and harness connector B-10 at ECM for damage.

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 4.

STEP 2. Check for short circuit to ground between knock sensor 1 connector B-06 and ECM connector B-10.



(1) Disconnect the connector B-06 and B-10 measure at the harness side.
- Knock sensor 1 output voltage has continued to be lower than 0.5 volt for 2 seconds.

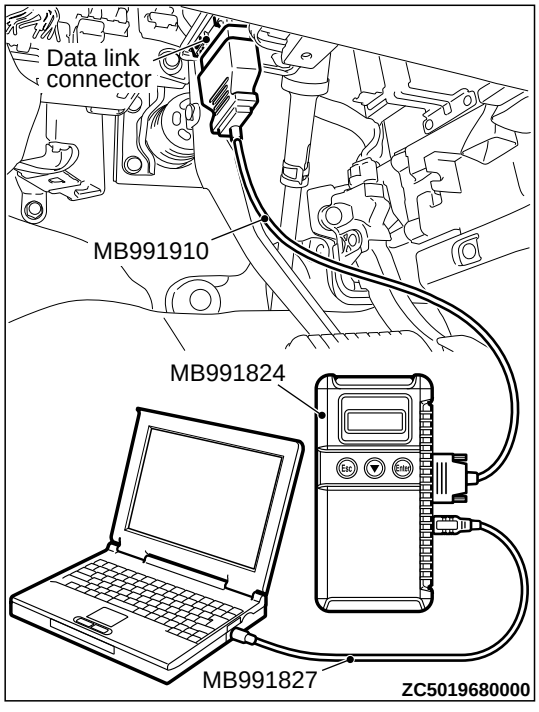
(2) Check for the continuity between connector B-06 (terminal No. 1) and ground.
- Not continuity.

Q:Is the harness wire in good condition?

YES: Then go to Step 3.

NO: Repair it. Then go to Step 4.

STEP 3. Replace the knock sensor 1.



(1) Replace the knock sensor 1.

⚠ 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.

(2) Connect scan tool MB991958 to the data link connector.
(3) Turn the ignition switch to the "ON" position.
(4) Erase the DTC.
(5) Start the engine, and leave it idling for more than 2 seconds. Then stop the engine.
(6) After completing the test drive, read the DTC.
(7) Turn the ignition switch to the "LOCK" (OFF) position.

Q:Is DTC P0327 set?

YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8.

NO: The inspection is complete.

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

(1) Turn the ignition switch to the "ON" position.
(2) Start the engine, and leave it idling for more than 2 seconds. Then stop the engine.
(3) After completing the test drive, read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

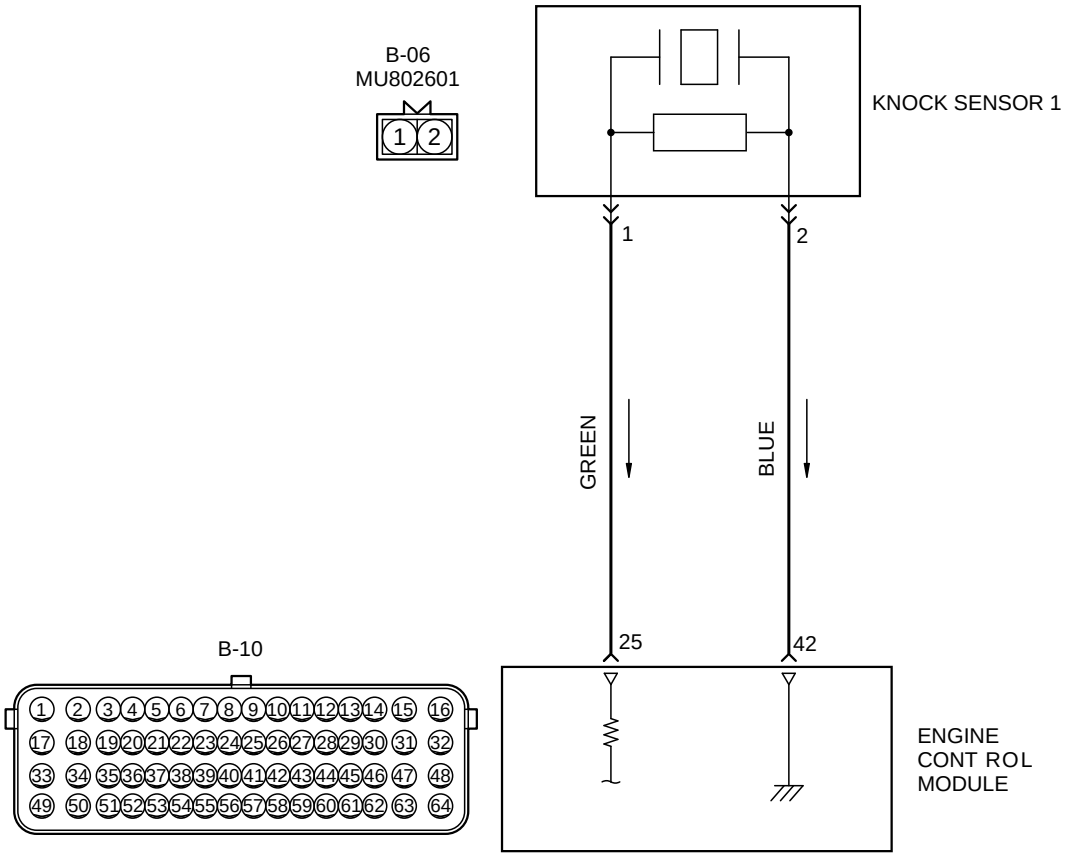
Q:Is DTC P0327 set?

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

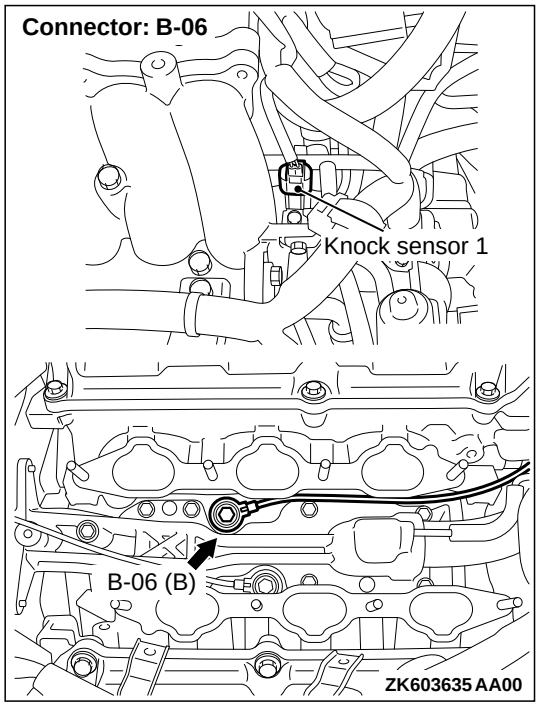
DTC P0328: Knock Sensor Circuit High (Bank 1)

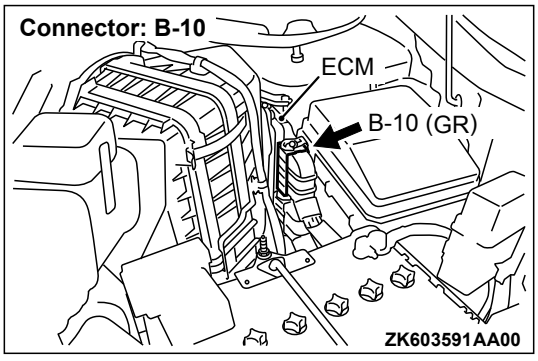
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KNOCK SENSOR 1 CIRCUIT



ZK602866 AA00





CIRCUIT OPERATION

- The knock sensor (terminal No. 1) sends a signal voltage to the ECM (terminal No. 25).
- The ground terminal (terminal No. 2) is grounded with ECM (terminal No. 42).

TECHNICAL DESCRIPTION

- The ECM applies 5 V from the ground terminal side to judge a malfunction in the knock sensor circuit.
- The ECM judges whether the knock sensor signal circuit has a short circuit to the battery (or the other power supply), by checking the input voltage from the knock sensor.
- When the knock sensor output voltage is above the reference voltage, it is judged that a malfunction exists.

DTC SET CONDITIONS

Check Conditions

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

Judgement Criterion

- Knock sensor 1 output voltage has continued to be higher than 2.25 volts for 2 seconds.

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

- Knock sensor 1 failed.
- Harness damage.
- Connector damage.
- ECM 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

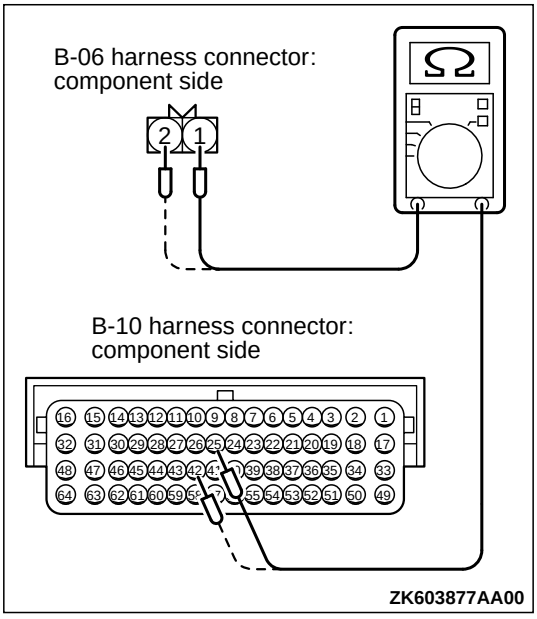
STEP 1. Check harness connector B-06 at the knock sensor and harness connector B-10 at ECM for damage.

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 4.

STEP 2. Check for harness damage between knock sensor 1 connector B-06 and ECM connector B-10.

(1) Disconnect the connector B-06 and B-10 measure at the harness side.
(2) Measure the resistance between connector B-06 and connector B-10.
a Knock sensor 1 connector B-06 (terminal No. 1) and ECM connector B-10 (terminal No. 25).
b Knock sensor 1 connector B-06 (terminal No. 2) and ECM connector B-10 (terminal No. 42).
▪Should be less than 2 ohms.



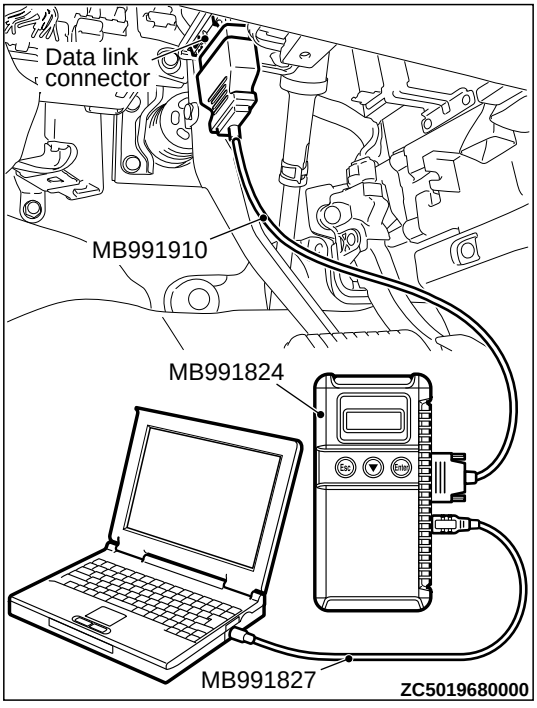
Q:Is the measured resistance less than 2 ohms?
YES: Then go to Step 3.
NO: Repair it. Then go to Step 4.

STEP 3. Replace the knock sensor 1.

(1) Replace the knock sensor 1.

⚠ 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.

(2) Connect scan tool MB991958 to the data link connector.
(3) Turn the ignition switch to the "ON" position.
(4) Erase the DTC.
(5) Start the engine, and leave it idling for more than 2 seconds. Then stop the engine.
(6) After completing the test drive, read the DTC.
(7) Turn the ignition switch to the "LOCK" (OFF) position.



Q:Is DTC P0328 set?
YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8.
NO: The inspection is complete.

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

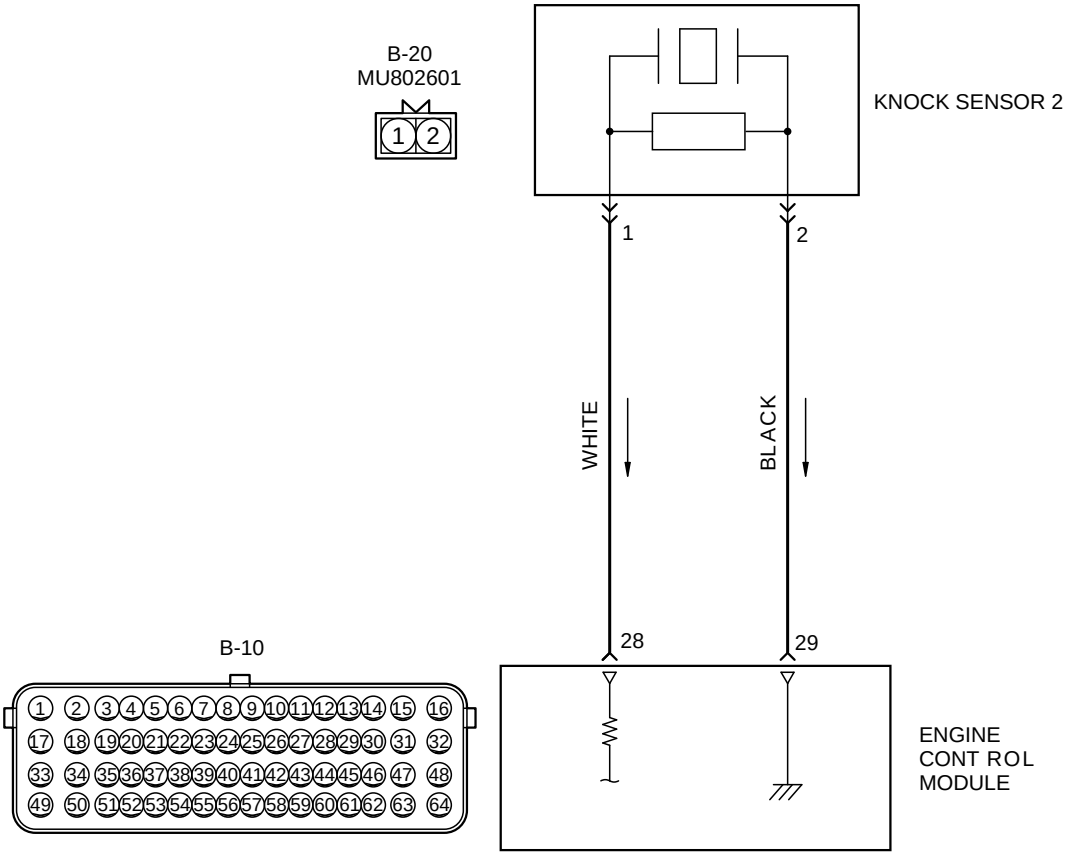
(1) Turn the ignition switch to the "ON" position.
(2) Start the engine, and leave it idling for more than 2 seconds. Then stop the engine.
(3) After completing the test drive, read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q:Is DTC P0328 set?
YES: Retry the troubleshooting.
NO: The inspection is complete.

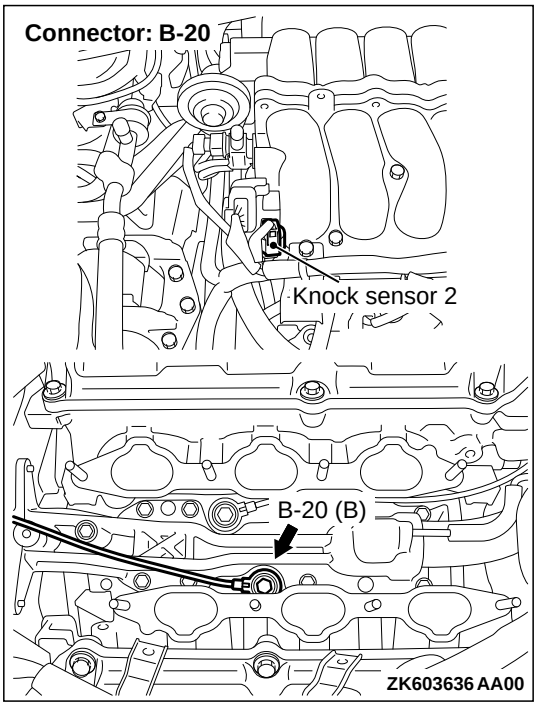
DTC DTC P0331: Knock Sensor Circuit Performance (Bank 2)

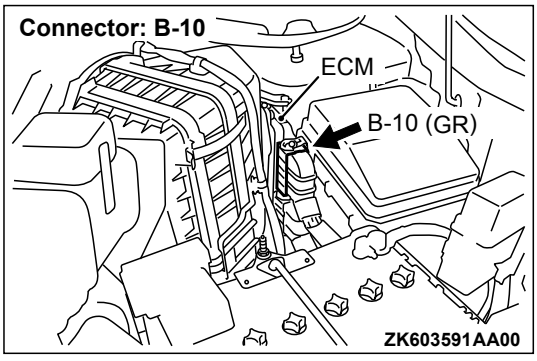
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KNOCK SENSOR 2 CIRCUIT



ZK602867 AA00





CIRCUIT OPERATION

- The knock sensor (terminal No. 1) sends a signal voltage to the ECM (terminal No. 28).
- The ground terminal (terminal No. 2) is grounded with ECM (terminal No. 29)

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 ECM checks whether the voltage output changes.

DTC SET CONDITIONS

Check Conditions

- 2 seconds or more have passed since the engine starting sequence was completed.
- Engine speed is higher than 3,000 r/min.
- Volumetric efficiency is 40 percent or higher.

Judgement Criterion

- Knock sensor 2 output voltage (knock sensor peak voltage in each 1/3 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 2 failed.
- Harness damage.
- Connector damage.
- ECM 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-20 at the knock sensor 2 and harness connector B-10 at ECM 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 4.

STEP 2. Check for harness damage between knock sensor 2 connector B-20 and ECM connector B-10.

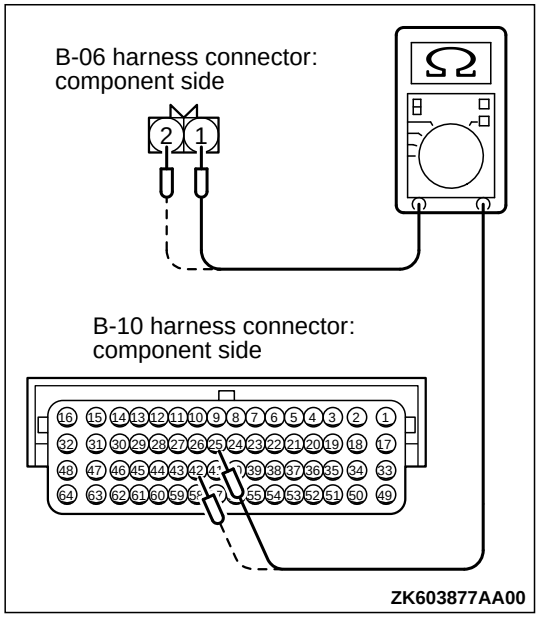
(1) Disconnect the connector B-20 and B-10 measure at the harness side.

(2) Measure the resistance between connector B-20 and connector B-10.

a. Knock sensor 1 connector B-20 (terminal No. 1) and ECM connector B-10 (terminal No. 28).

b. Knock sensor 1 connector B-20 (terminal No. 2) and ECM connector B-10 (terminal No. 29).

- Should be less than 2 ohms.



Q:Is the measured resistance less than 2 ohms?

YES: Then go to Step 3.

NO: Repair it. Then go to Step 4.

STEP 3. Replace the knock sensor 2.

(1) Replace the knock sensor 2.

⚠ 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.

(2) Connect scan tool MB991958 to the data link connector.

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

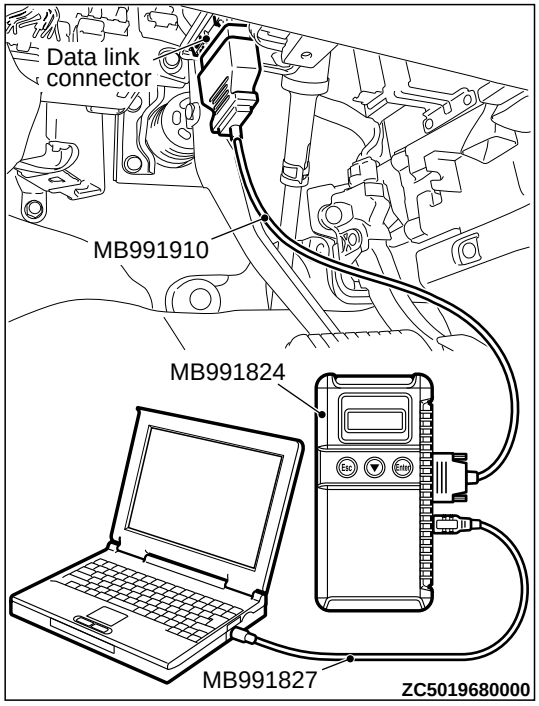
(4) Erase the DTC.

(5) Test drive under the following conditions:

- Engine speed: 3,000 - 5,000 r/min
- Engine load: 40 % or more
- Drive a minimum of 3 seconds after the above conditions have been met.

(6) After completing the test drive, read the DTC.

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



Q:Is DTC P0331 set?

YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8.

NO: The inspection is complete.

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

(1) Turn the ignition switch to the "ON" position.
(2) Test drive under the following conditions:
- Engine speed: 3,000 - 5,000 r/min
- Engine load: 40 % or more
- Drive a minimum of 3 seconds after the above conditions have been met.

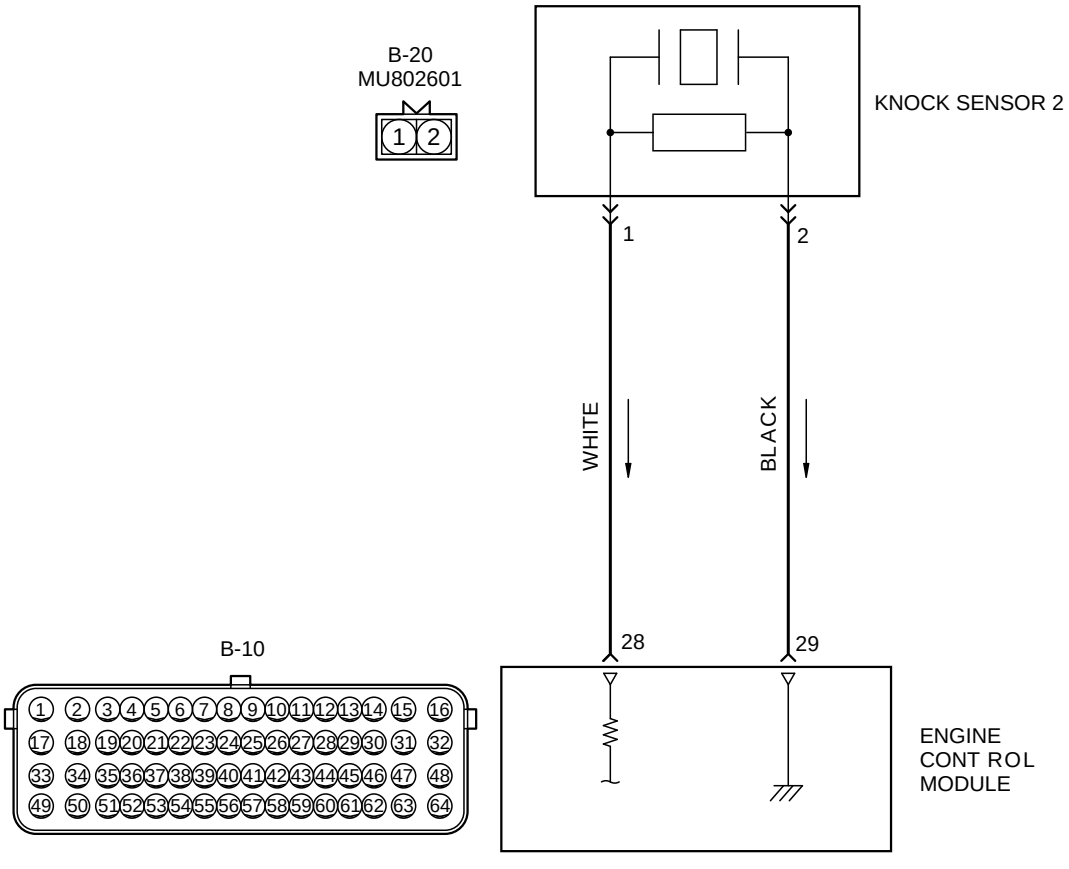
(3) After completing the test drive, read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q:Is DTC P0331 set?
YES: Retry the troubleshooting.
NO: The inspection is complete.

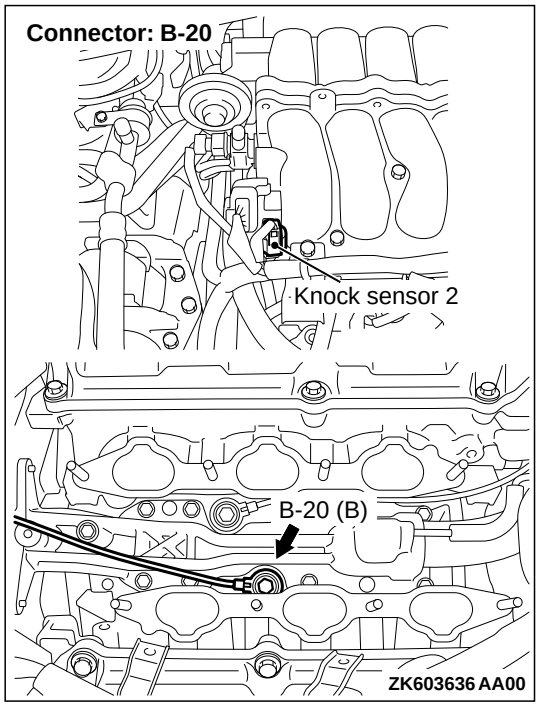
DTC P0332: Knock Sensor Circuit Low (Bank 2)

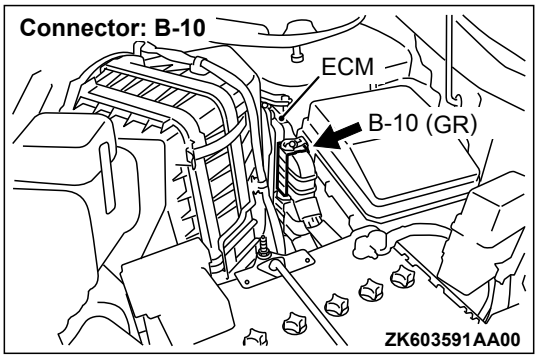
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KNOCK SENSOR 2 CIRCUIT



ZK602867 AA00





CIRCUIT OPERATION

- The knock sensor (terminal No. 1) sends a signal voltage to the ECM (terminal No. 28).
- The ground terminal (terminal No. 2) is grounded with ECM (terminal No. 29).

TECHNICAL DESCRIPTION

- The ECM applies 5 V from the ground terminal side to judge a malfunction in the knock sensor circuit.
- The ECM judges whether the knock sensor signal circuit has a short circuit to the ground or an open circuit by checking the input voltage from the knock sensor.
- When the knock sensor output voltage is below the reference voltage, it is judged that a malfunction exists.

DTC SET CONDITIONS

Check Condition

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

Judgement Criterion

- Knock sensor 2 output voltage has continued to be lower than 0.5 volt for 2 seconds.

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

- Knock sensor 2 failed.
- Harness damage.
- Connector damage.
- ECM failed.

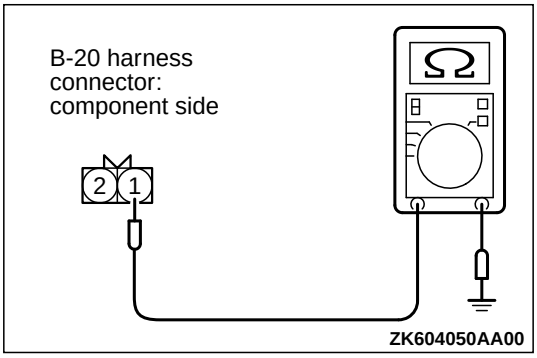
DIAGNOSIS

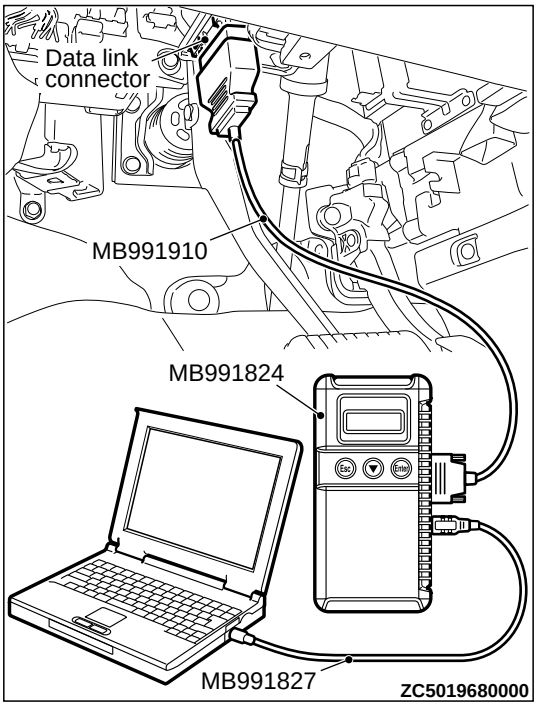
Required Special Tools:

- 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-20 at the knock sensor 2 and harness connector B-10 at ECM 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 4.

STEP 2. Check for short circuit to ground between knock sensor 2 connector B-20 and ECM connector B-10.

(1) Disconnect the connector B-20 and B-10 measure at the harness side.
(2) Check for the continuity between connector B-20 (terminal No. 1) and ground.
- Not continuity.

Q:Is the harness wire in good condition?
YES: Go to Step 3.
NO: Repair it. Then go to Step 4.

STEP 3. Replace the knock sensor 2.

(1) Replace the knock sensor 2.

⚠ 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.

(2) Connect scan tool MB991958 to the data link connector.
(3) Turn the ignition switch to the "ON" position.
(4) Erase the DTC.
(5) Start the engine, and leave it idling for more than 2 seconds. Then stop the engine.
(6) After completing the test drive, read the DTC.
(7) Turn the ignition switch to the "LOCK" (OFF) position.

Q:Is DTC P0332 set?
YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8.
NO: The inspection is complete.

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

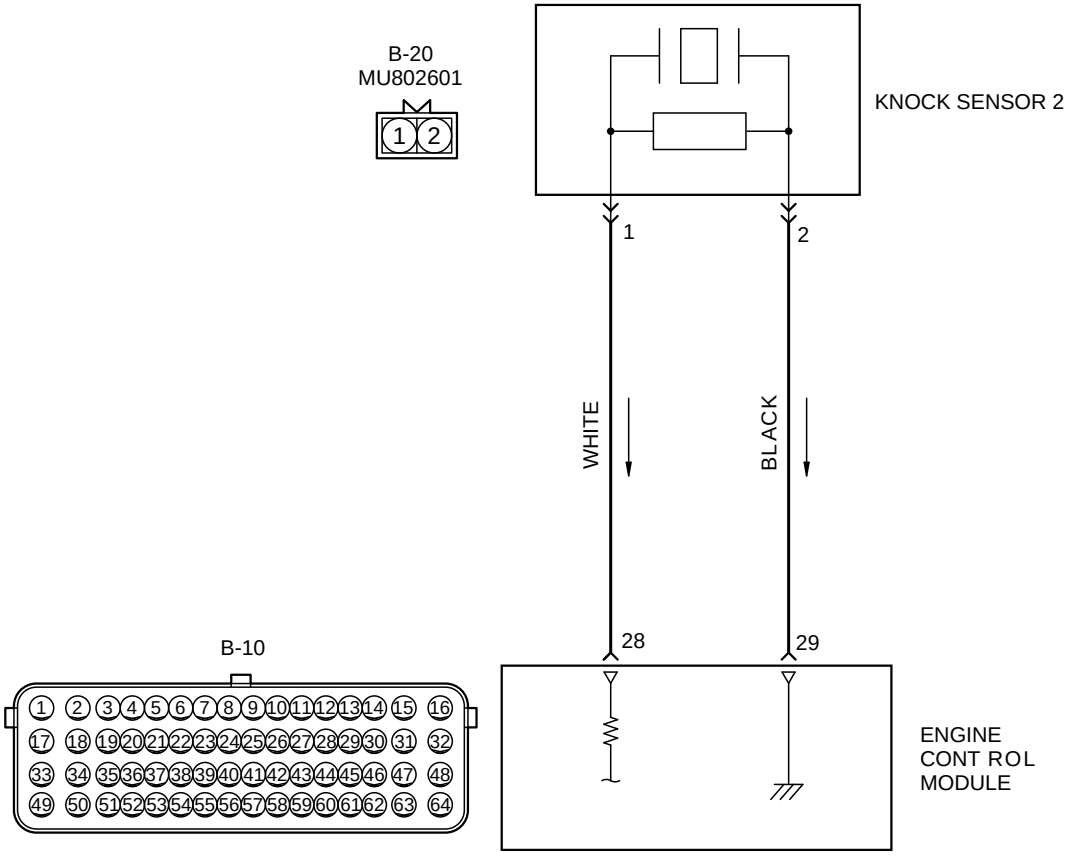
(1) Turn the ignition switch to the "ON" position.
(2) Start the engine, and leave it idling for more than 2 seconds. Then stop the engine.
(3) After completing the test drive, read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q:Is DTC P0332 set?
YES: Retry the troubleshooting.
NO: The inspection is complete.

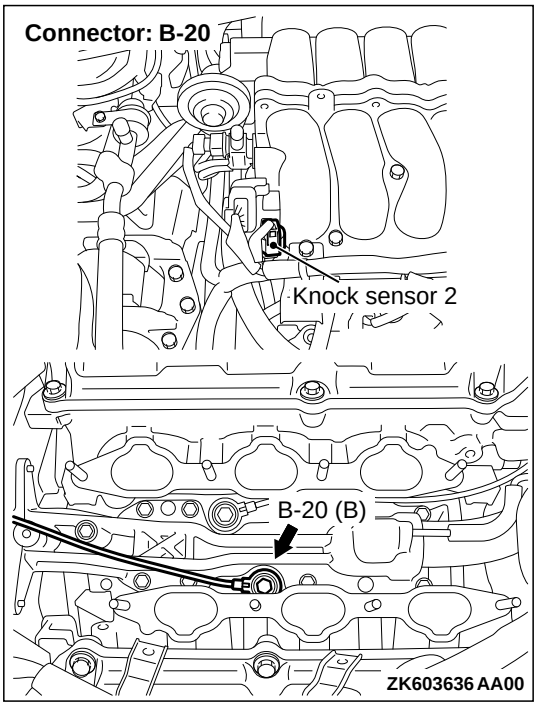
DTC DTC P0333: Knock Sensor Circuit High (Bank 2)

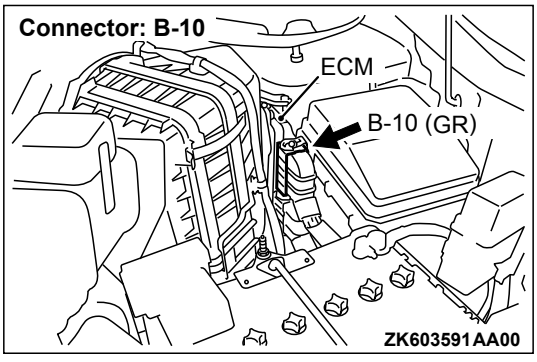
M11310100372USA0000010000

KNOCK SENSOR 2 CIRCUIT



ZK602867 AA00





CIRCUIT OPERATION

- The knock sensor (terminal No. 1) sends a signal voltage to the ECM (terminal No. 28).
- The ground terminal (terminal No. 2) is grounded with ECM (terminal No. 29).

TECHNICAL DESCRIPTION

- The ECM applies 5 V from the ground terminal side to judge a malfunction in the knock sensor circuit.
- The ECM judges whether the knock sensor signal circuit has a short circuit to the ground or an open circuit by checking the input voltage from the knock sensor.
- When the knock sensor output voltage is below the reference voltage, it is judged that a malfunction exists.

DTC SET CONDITIONS

Check Conditions

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

Judgement Criterion

- Knock sensor 2 output voltage has continued to be higher than 2.25 volts for 2 seconds.

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

- Knock sensor 2 failed.
- Harness damage.
- Connector damage.
- ECM 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-20 at the knock sensor 2 and harness connector B-10 at ECM 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 4.

STEP 2. Check for harness damage between knock sensor 2 connector B-20 and ECM connector B-10.

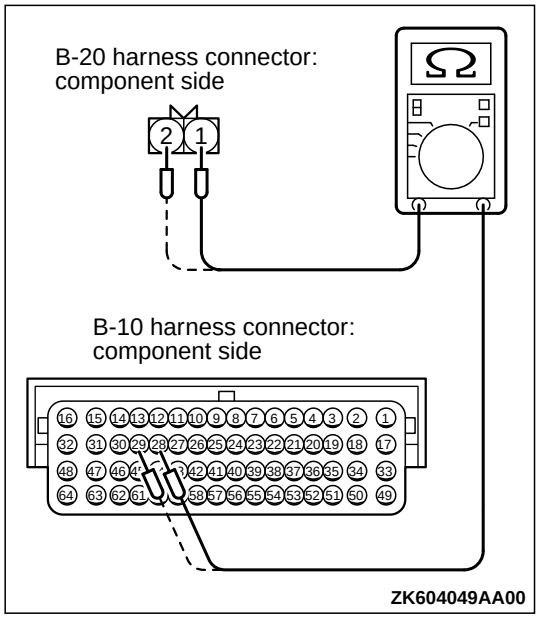
(1) Disconnect the connector B-20 and B-10 measure at the harness side.

(2) Measure the resistance between connector B-20 and connector B-10.

a. Knock sensor 1 connector B-20 (terminal No. 1) and ECM connector B-10 (terminal No. 28).

b. Knock sensor 1 connector B-20 (terminal No. 2) and ECM connector B-10 (terminal No. 29).

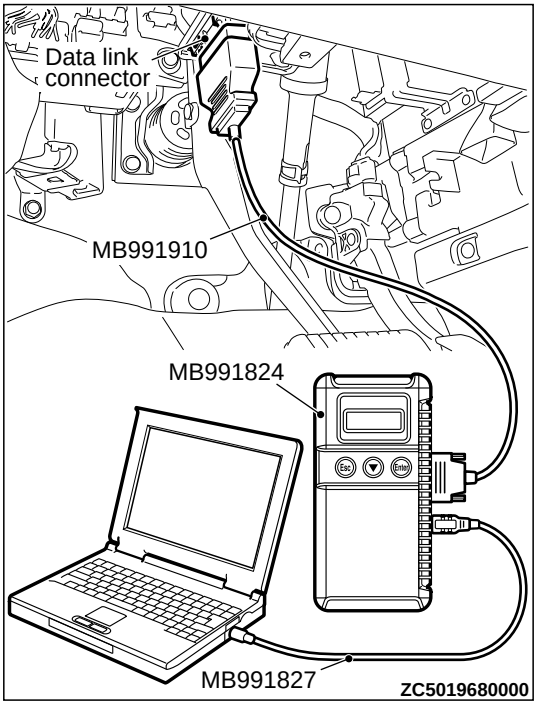
- Should be less than 2 ohms.



Q:Is the measured resistance less than 2 ohms?

YES: Then go to Step 3.

NO: Repair it. Then go to Step 4.



STEP 3. Replace the knock sensor 2.

(1) Replace the knock sensor 2.

⚠ 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.

(2) Connect scan tool MB991958 to the data link connector.
(3) Turn the ignition switch to the "ON" position.
(4) Erase the DTC.
(5) Start the engine, and leave it idling for more than 2 seconds. Then stop the engine.
(6) After completing the test drive, read the DTC.
(7) Turn the ignition switch to the "LOCK" (OFF) position.

Q:Is DTC P0333 set?

YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8.

NO: The inspection is complete.

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

(1) Turn the ignition switch to the "ON" position.
(2) Start the engine, and leave it idling for more than 2 seconds. Then stop the engine.
(3) After completing the test drive, read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q:Is DTC P0333 set?

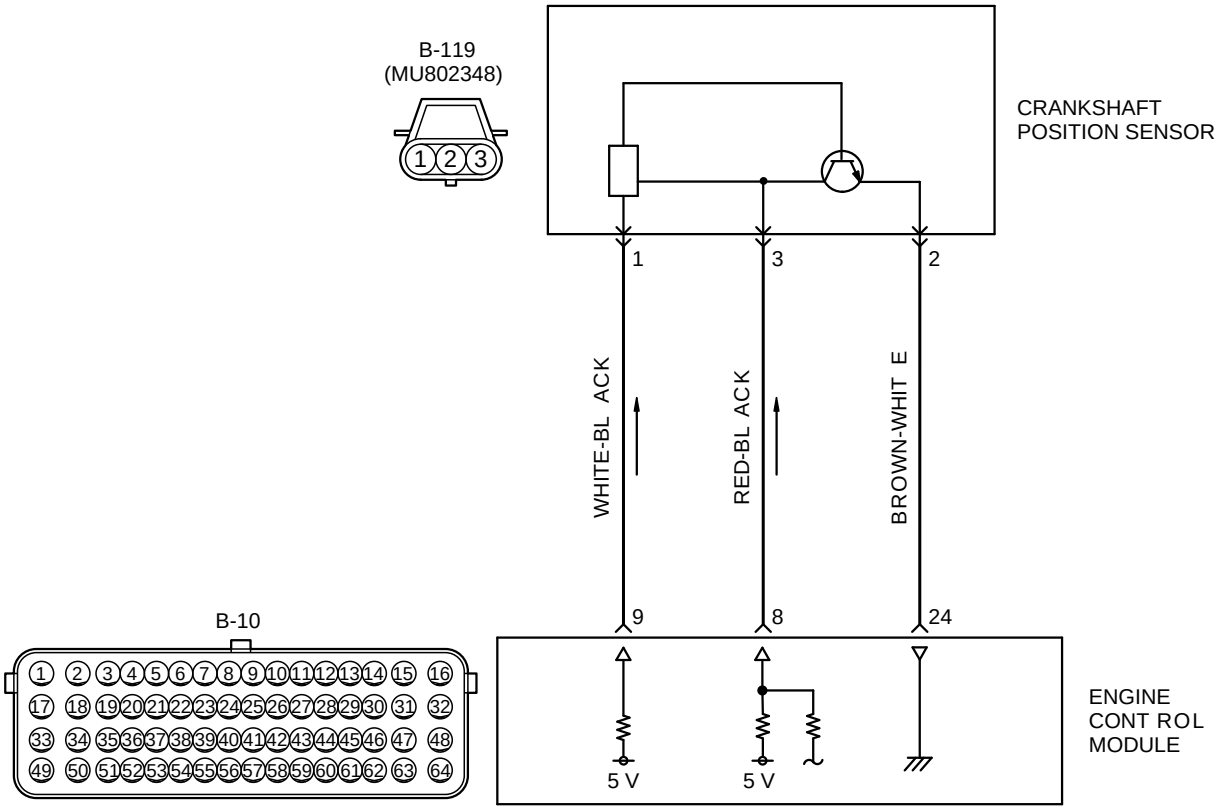
YES: Retry the troubleshooting.

NO: The inspection is complete.

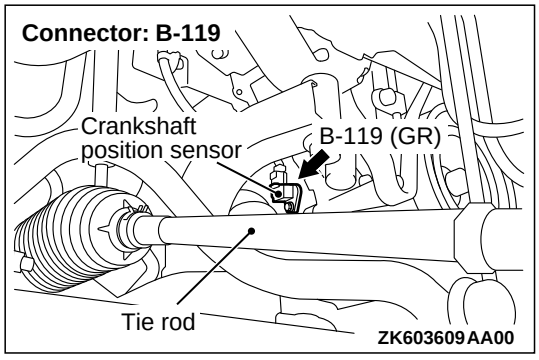
DTC P0335: Crankshaft Position Sensor Circuit

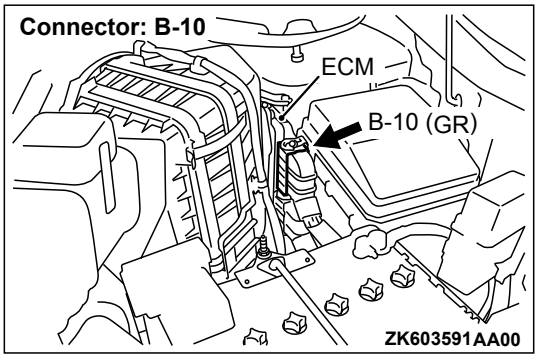
M11310100225USA0000010000

CRANKSHAFT POSITION SENSOR CIRCUIT



ZK602850AA00





CIRCUIT OPERATION

- The crankshaft position sensor power is supplied from the ECM (terminal No. 9).
- Terminal No. 1 of the crankshaft position sensor is grounded with ECM (terminal No. 24).
- A 5-volt voltage is applied on the crankshaft position sensor output terminal (terminal No. 3) from the ECM (terminal No. 8). 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 ECM.
- When the engine is running, the crankshaft position sensor outputs a pulse signal.
- The ECM 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)

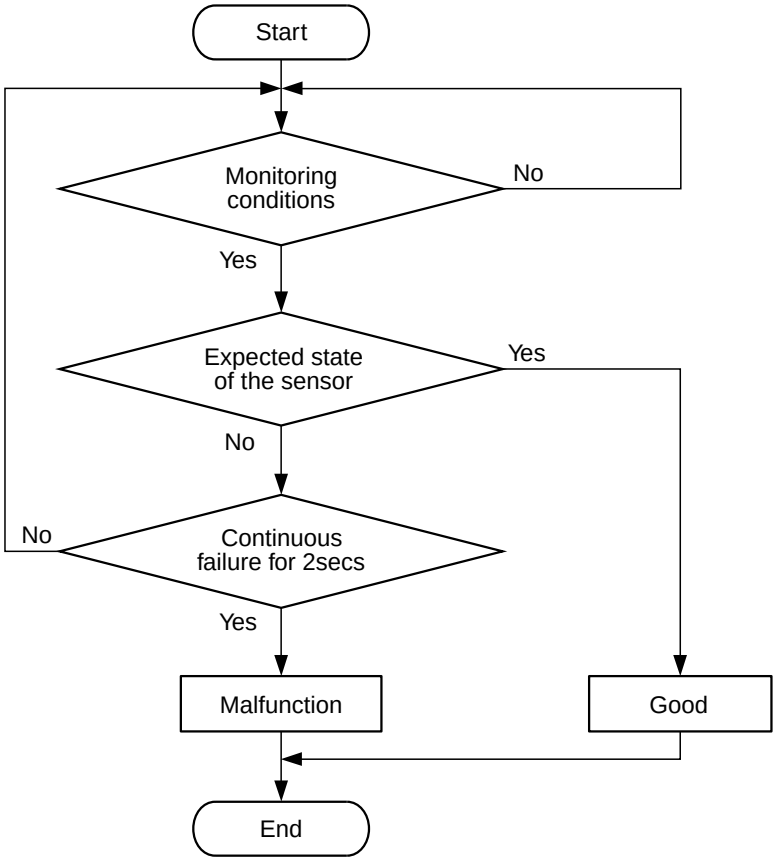
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS <Range/Performance problem - Alignment>

Logic Flow Chart



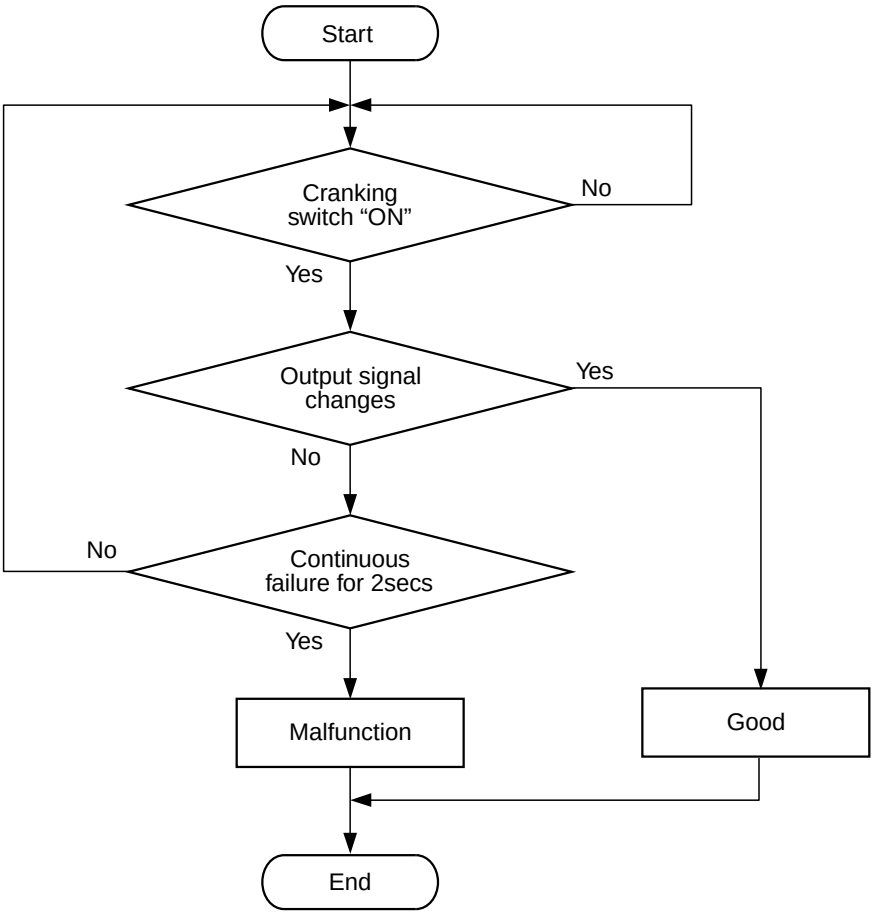
ZK603752 AA00

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.

DTC SET CONDITIONS <Range/Performance problem - Circuit continuity>

Logic Flow Chart



ZK603753AA00

Check Condition

- Engine is being cranked.

Judgement Criterion

- Crankshaft position sensor output voltage has not changed (no pulse signal is input) for 2 seconds.

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

- Crankshaft position sensor failed.
- Connector damage
- Harness damage
- ECM failed.

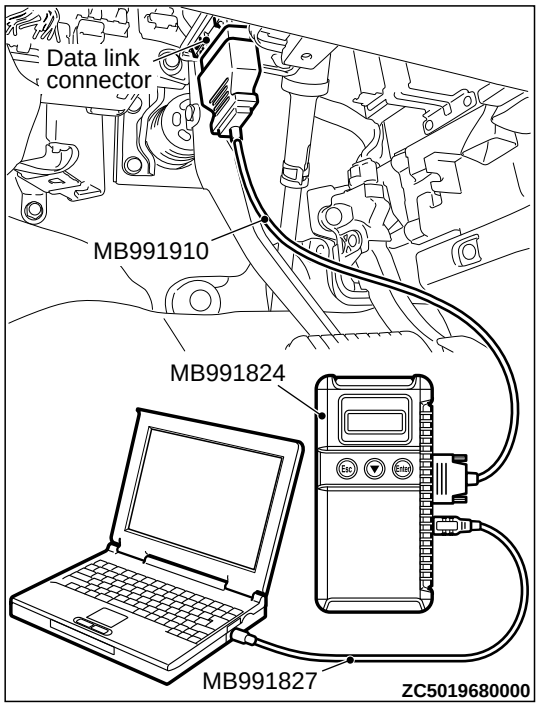
OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function - OBD-II Drive Cycle - Pattern 24 P.13Ab-8.

DIAGNOSIS

Required Special Tools:

- Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A
- MB991709: Test Harness



▪MB992110: Power Plant ECU Check Harness

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.00-15.

NO: Go to Step 2.

STEP 2. Check harness connector B-119 at the crankshaft position and harness connector B-10 at the sensor for damage.

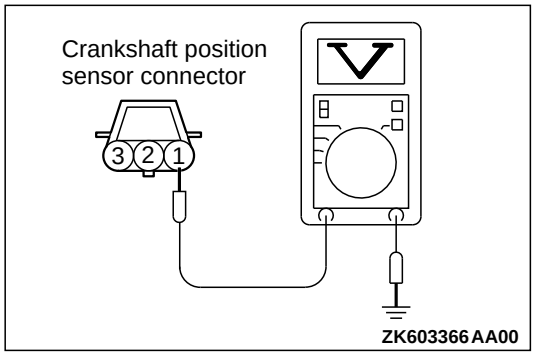
Q:Is the harness connector in good condition?

YES: Go to Step 3.

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

STEP 3. Measure the sensor supply voltage at crankshaft position sensor 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 between 4.9 and 5.1 volts.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

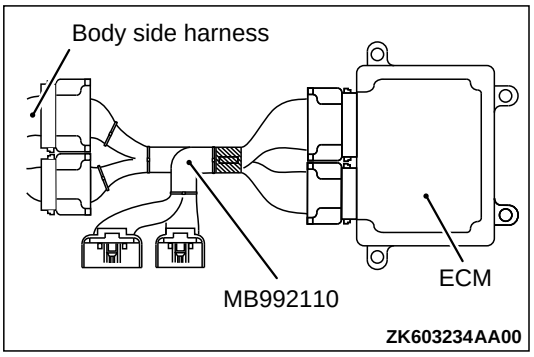


Q:Is the measured voltage between 4.9 and 5.1 volts?

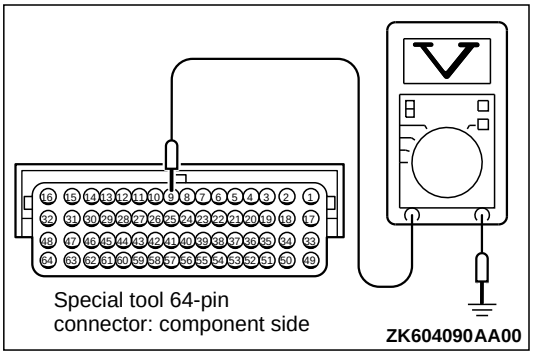
YES: Go to Step 6.

NO: Go to Step 4.

STEP 4. Measure the sensor supply voltage at ECM connector B-10 by using power plant ECU check harness special tool MB992110.



(1) Disconnect all ECM connectors. Connect the power plant ECU check harness special tool MB992110 between the separated connectors.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal No. 9 and ground.
- Voltage should be between 4.9 and 5.1 volts.



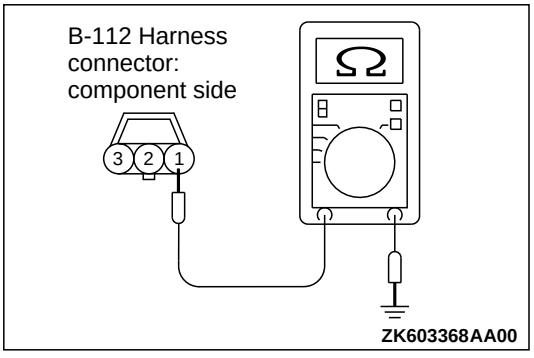
(4) Turn the ignition switch to the "LOCK" (OFF) position.

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

YES: Repair harness wire between the crankshaft position sensor connector B-119 (terminal No. 1) and the ECM connector B-10 (terminal No. 9) because of open circuit or harness damage. Then go to Step 9.

NO: Go to Step 5.

STEP 5. Check for short circuit to ground between the crankshaft position sensor connector B-119 and the ECM connector B-10.



(1) Disconnect the crankshaft position sensor connector B-119 and the ECM connector B-10.
(2) Check for the crankshaft position sensor connector B-119 (terminal No. 1) and ground.
- Not continuity.

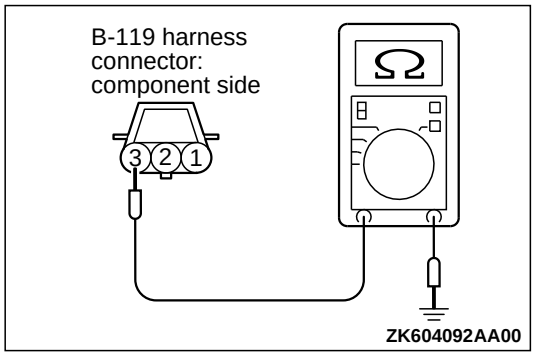
Q:Is the harness wire in good condition?

YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to step 9.

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

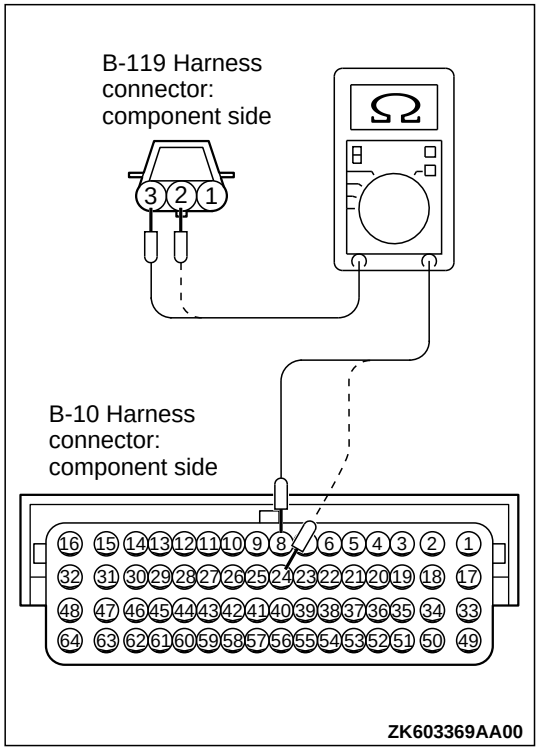
STEP 6. Check for open circuit and short circuit to ground between the crankshaft position sensor connector B-119 and the ECM connector B-10.

(1) Disconnect the crankshaft position sensor connector B-119 and the ECM connector B-10.



(2) Measure the resistance between the crankshaft sensor connector B-119 and the ECM connector B-10.
- Should be less than 2 ohms.

a Connector B-119 (terminal No. 3) and Connector B-10 (terminal No. 8).
b Connector B-119 (terminal No. 2) and Connector B-10 (terminal No. 24).



(3) Check for the crankshaft position sensor connector B-119 (terminal No. 3) and ground.
- Not continuity.

Q:Is the harness wire in good condition?
YES: Go to Step 7.
NO: Repair it. Then go to Step 9.

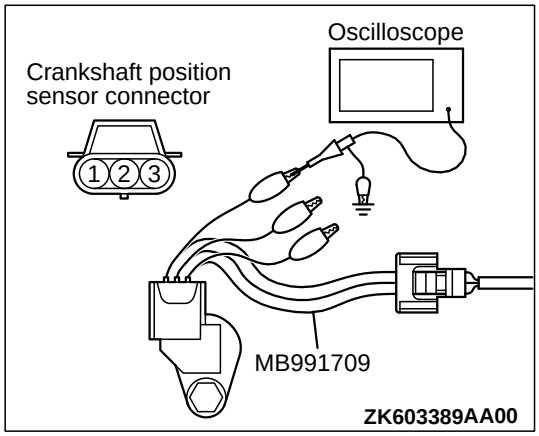
STEP 7. Using the oscilloscope, check the crankshaft position sensor.

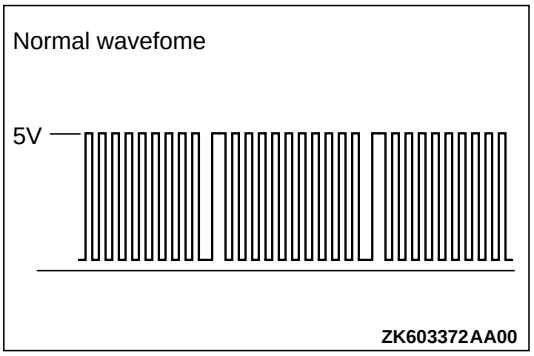
(1) Disconnect the crankshaft position sensor connector B-119, and connect the test harness special tool (MB991709) between the separated connectors.

(2) Connect the oscilloscope probe to crankshaft position sensor connector terminal No. 3.

NOTE: When measuring with the ECM side connector, disconnect all ECM connectors. Connect the check harness special tool (MB992110) between the separated connectors. then connector the oscilloscope probe to the check harness connector terminal No. 8.

(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 8.

NO: Repair the crankshaft position sensor. Then go to Step 9.

STEP 8. 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. 13B-6.

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

Q:Is DTC P0335 set?

YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 9.

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.00-15.

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 24 P. 13Ab-8.

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

Q:Is DTC P0335 set?

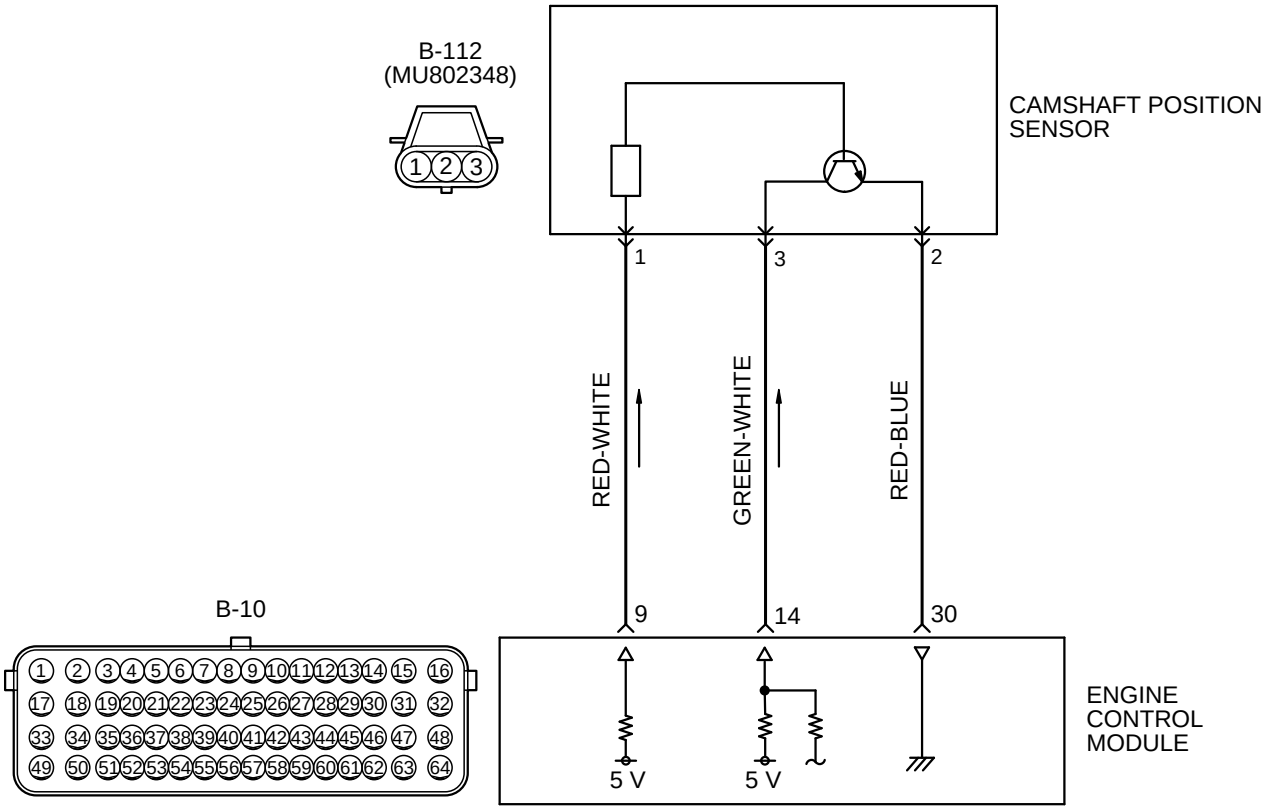
YES: Retry the troubleshooting.

NO: The inspection is complete.

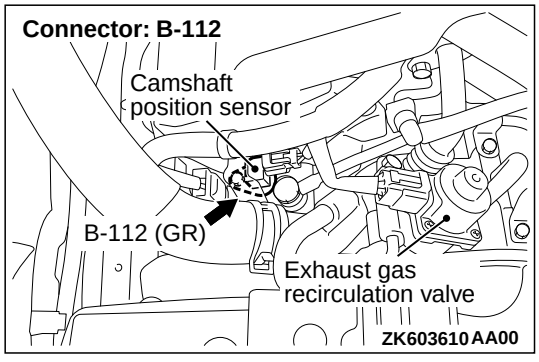
DTC P0340: Camshaft Position Sensor Circuit

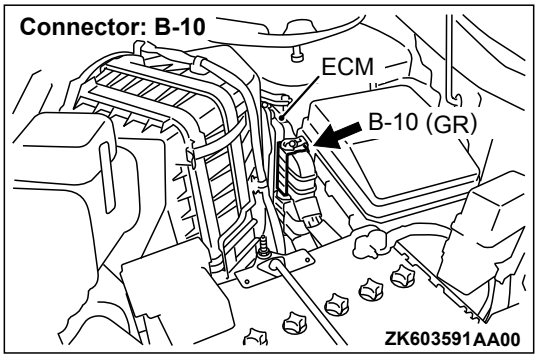
M11310100226USA0000010000

CAMSHAFT POSITION SENSOR CIRCUIT



ZK602851 AA00





CIRCUIT OPERATION

- The camshaft position sensor power is supplied from the ECM (terminal No. 9).
- Terminal No. 2 of the camshaft position sensor is grounded with ECM (terminal No. 30).
- A 5-volt voltage is applied on the camshaft position sensor output terminal (terminal No. 3) from the ECM (terminal No. 14). 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 ECM.
- When the engine is running, the camshaft position sensor outputs a pulse signal.
- The ECM 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)

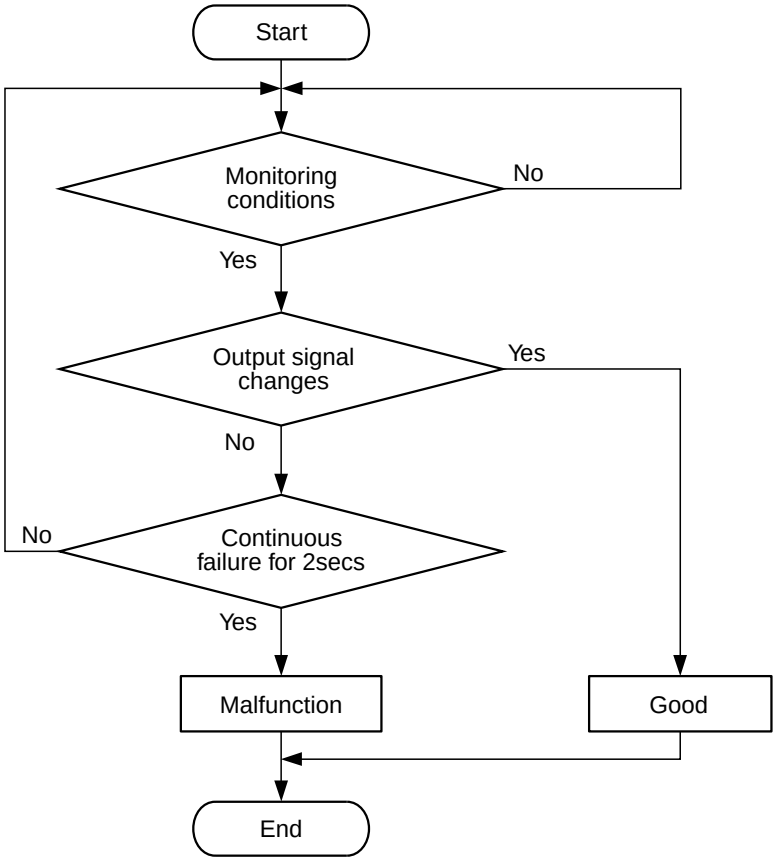
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS <Range/Performance problem - Alignment>

Logic Flow Chart



ZK603760 AA00

DTC SET CONDITIONS

Check Condition

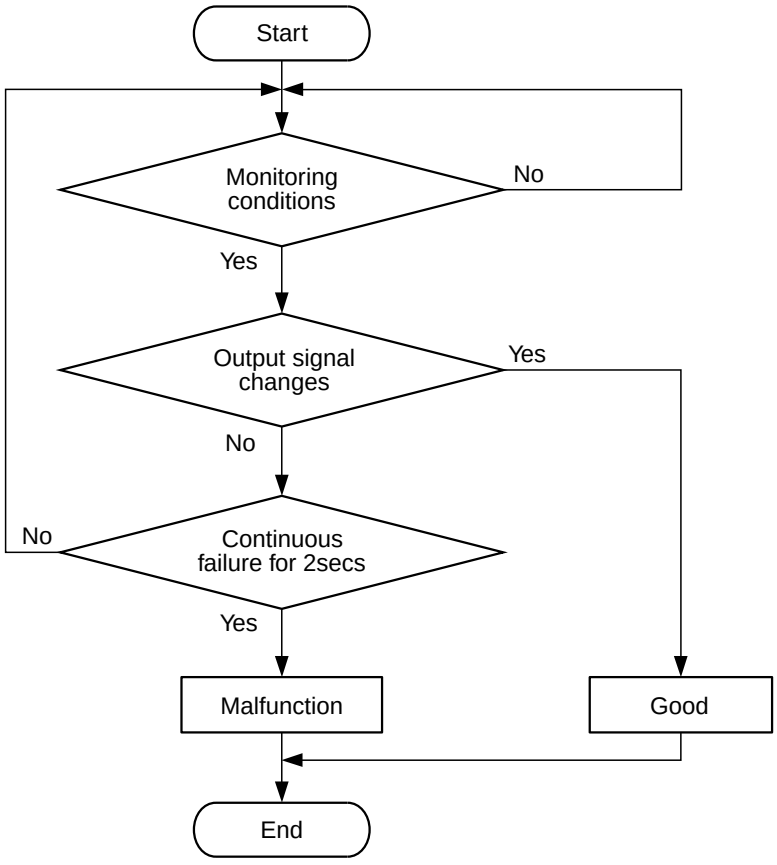
- Engine speed is higher than 50 r/min.

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.

DTC SET CONDITIONS <Range/Performance problem - Circuit continuity>

Logic Flow Chart



ZK603760 AA00

Check Condition

- Engine speed is higher than 500 r/min.

Judgement Criterion

- Camshaft position sensor output voltage has not changed (no pulse signal is input) for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function - OBD-II Drive Cycle - Pattern 24 P.13Ab-8.

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

- Crankshaft position sensor failed.
- Camshaft position sensing cylinder failed.
- Connector damage
- Harness damage
- ECM failed.

DIAGNOSIS

Required Special Tools:

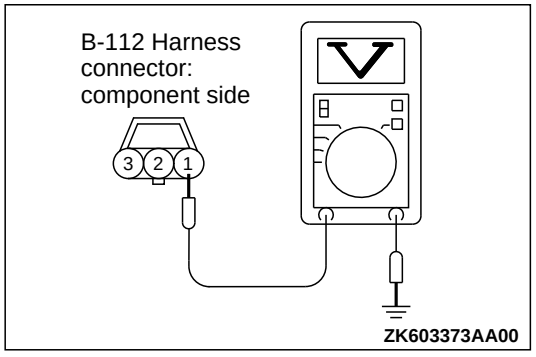
- MB991709: Test Harness
- MB992110: Power Plant ECU Check Harness

STEP 1. Check harness connector B-112 at camshaft position sensor and harness connector B-10 at for damage.

Q:Is the harness connector in good condition?
YES: Go to Step 2.
NO: Repair it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 9.

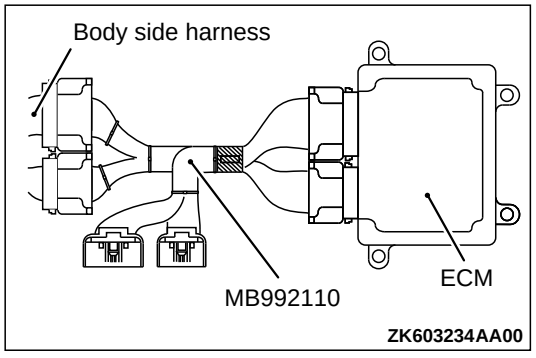
STEP 2. Measure the sensor supply voltage at camshaft position sensor connector B-112.
(1) Disconnect the connector B-112 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal No. 1 and ground.
- Voltage should be between 4.9 and 5.1 volts.

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



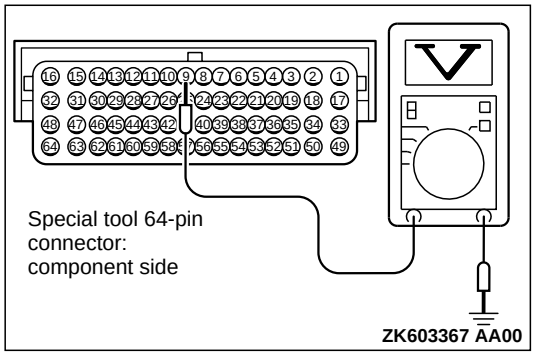
Q:Is the measured voltage between 4.9 and 5.1 volts?
YES: Go to Step 5.
NO: Go to Step 3.

STEP 3. Measure the sensor supply voltage at ECM connector B-10 by using power plant ECU check harness special tool MB992110.
(1) Disconnect all ECM connectors. Connect the power plant ECU check harness special tool MB992110 between the separated connectors.
(2) Turn the ignition switch to the "ON" position.



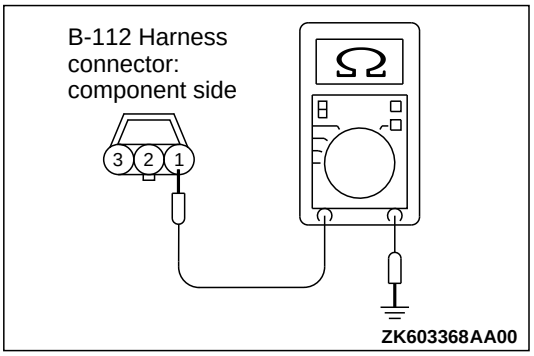
(3) Measure the voltage between terminal No. 9 and ground.
- Voltage should be between 4.9 and 5.1 volts.

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



Q:Is the measured voltage between 4.9 and 5.1 volts?
YES: Repair harness wire between the camshaft position sensor connector B-112 (terminal No. 1) and the ECM connector B-10 (terminal No. 9) because of open circuit or harness damage. Then go to step 6.
NO: Go to Step 4.

STEP 4. Check for short circuit to ground between the crankshaft position sensor connector B-112 and the ECM connector B-10.
(1) Disconnect the crankshaft position sensor connector B-112 and the ECM connector B-10.



(2) Check for the crankshaft position sensor connector B-112 (terminal No. 1) and ground.
- Not continuity.

Q:Is the harness wire in good condition?
YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to step 9.
NO: Repair it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 9.

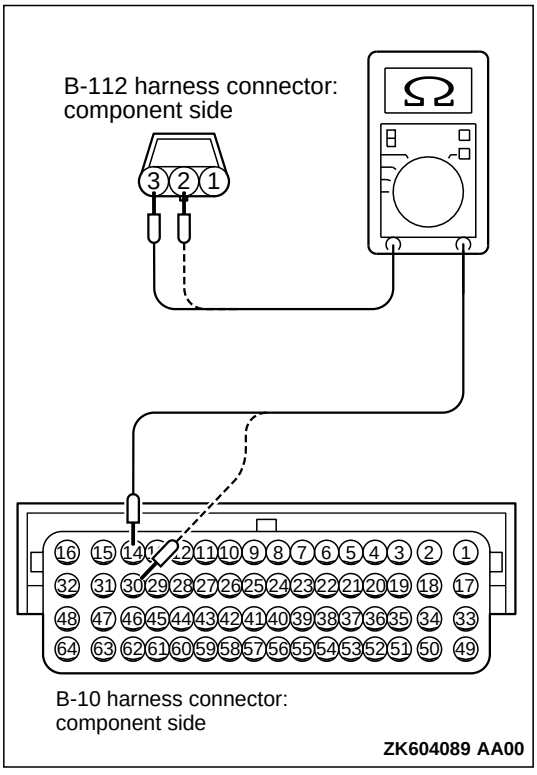
STEP 5. Check for open circuit and short circuit to ground between the crankshaft position sensor connector B-112 and the ECM connector B-10.

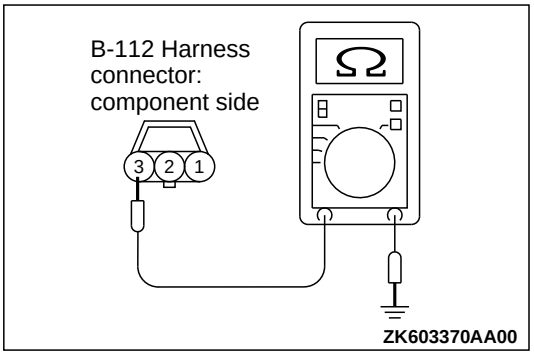
(1) Disconnect the crankshaft position sensor connector B-112 and the ECM connector B-10.

(2) Measure the resistance between the crankshaft sensor connector B-112 and the ECM connector B-10.
- Should be less than 2 ohms.

a Connector B-112 (terminal No. 3) and Connector B-10 . (terminal No. 14).

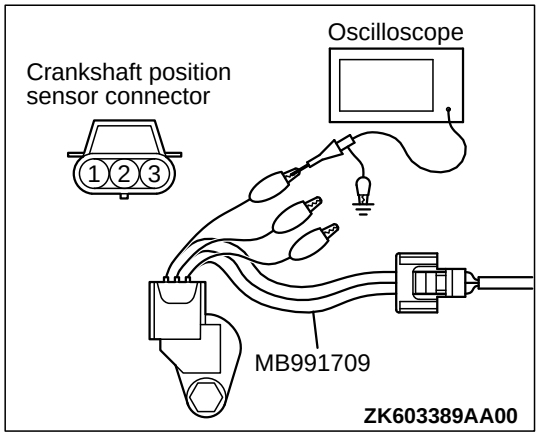
b Connector B-112 (terminal No. 2) and Connector B-10 . (terminal No. 30).

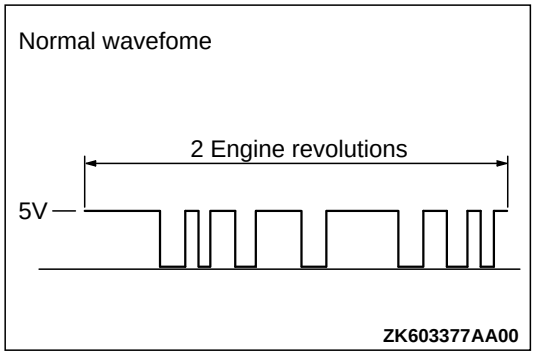




(3) Check for the crankshaft position sensor connector B-112 (terminal No. 3) and ground.
- Not continuity.

Q:Is the harness wire in good condition?
YES: Go to Step 6.
NO: Repair it. Then go to Step 9.





STEP 6. Using the oscilloscope, check the camshaft position sensor.

(1) Disconnect the camshaft position sensor connector B-112, 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. 3.

NOTE: When measuring with the ECM side connector, disconnect all ECM connectors. Connect the check harness special tool (MB992110) between the separated connectors. then connector the oscilloscope probe to the check harness connector terminal No. 14.

(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 8.

NO: Go to Step 7.

STEP 7. 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 8.

NO: Repair it. Then go to Step 8.

STEP 8. 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. 13B-6.

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

Q:Is DTC P0340 set?

YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 9.

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.00-15.

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 24 P. 13Ab-8.

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

Q:Is DTC P0340 set?
YES: Retry the troubleshooting.
NO: The inspection is complete.

DTC P0401: Exhaust Gas Recirculation Flow Insufficient Detected

M11310100227USA0000010000

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 ECM 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)

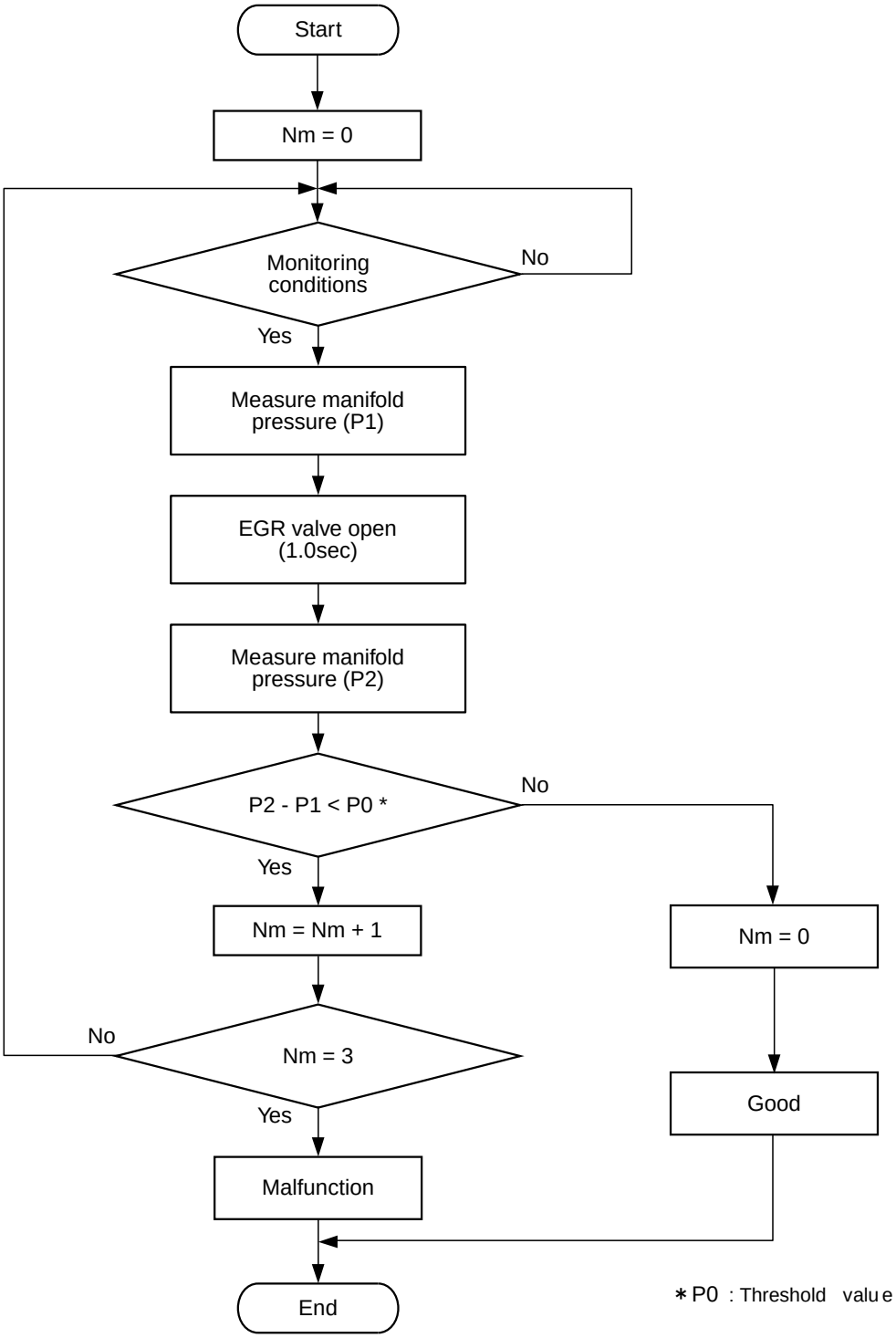
- EGR stepper motor monitor

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
- Manifold absolute pressure sensor
- Accelerator pedal position sensor

DTC SET CONDITIONS

Logic Flow Chart



AK603766 AA00

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 960 and 1,500 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 30 km/h (19 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.
- The throttle valve is closed.
- Volumetric efficiency is lower than 22 percent.
- The PCM monitors for this condition for 3 cycles of 1.8 seconds each during the drive cycle.

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.13Ab-8.

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, or connector damage.
- Manifold absolute pressure sensor failed.
- ECM failed.

DIAGNOSIS

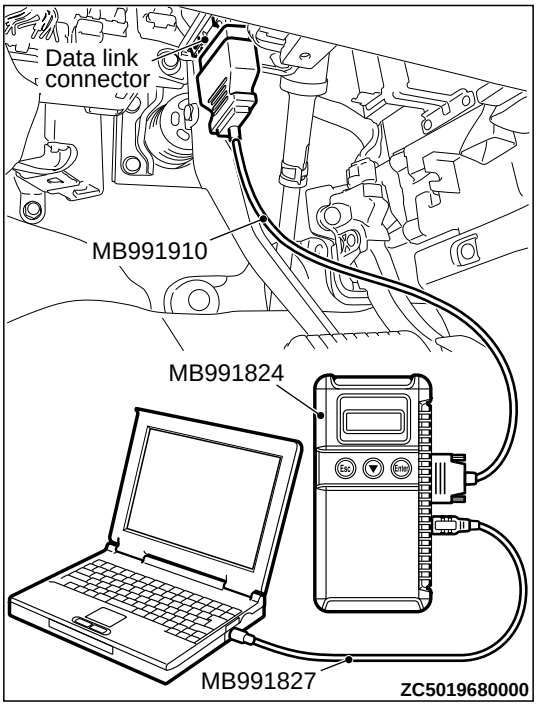
Required Special Tools:
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A

STEP 1. Using scan tool MB991958, check data list item 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 2.

NO: Refer to DTC P0106 - Manifold Absolute Pressure Sensor Circuit Range/Performance Problem P.13Ab-126, DTC P0107 - Manifold Absolute Pressure Sensor Circuit Low Input P.13Ab-132, DTC P0108 - Manifold Absolute Pressure Sensor Circuit High Input P.13Ab-138.

STEP 2. Check the EGR system

Refer to GROUP 17, Emission Control System - Exhaust Gas Recirculation (EGR) System - General Information P.17c-13.

Q:Are there any abnormalities?
YES: Repair it. Then go to Step 4.
NO: Go to Step 3.

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 3 P. 13Ab-8.
(2) Check the diagnostic trouble code (DTC).

Q:Is DTC P0401 set?
YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. 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.00-15.

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 3 P. 13Ab-8.
(2) Check the diagnostic trouble code (DTC).

Q:Is DTC P0401 set?
YES: Retry the troubleshooting.
NO: The inspection is complete.

DTC P0421: Warm Up Catalyst Efficiency Below Threshold (bank 1)

M11310100229USA0000010000

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 ECM 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

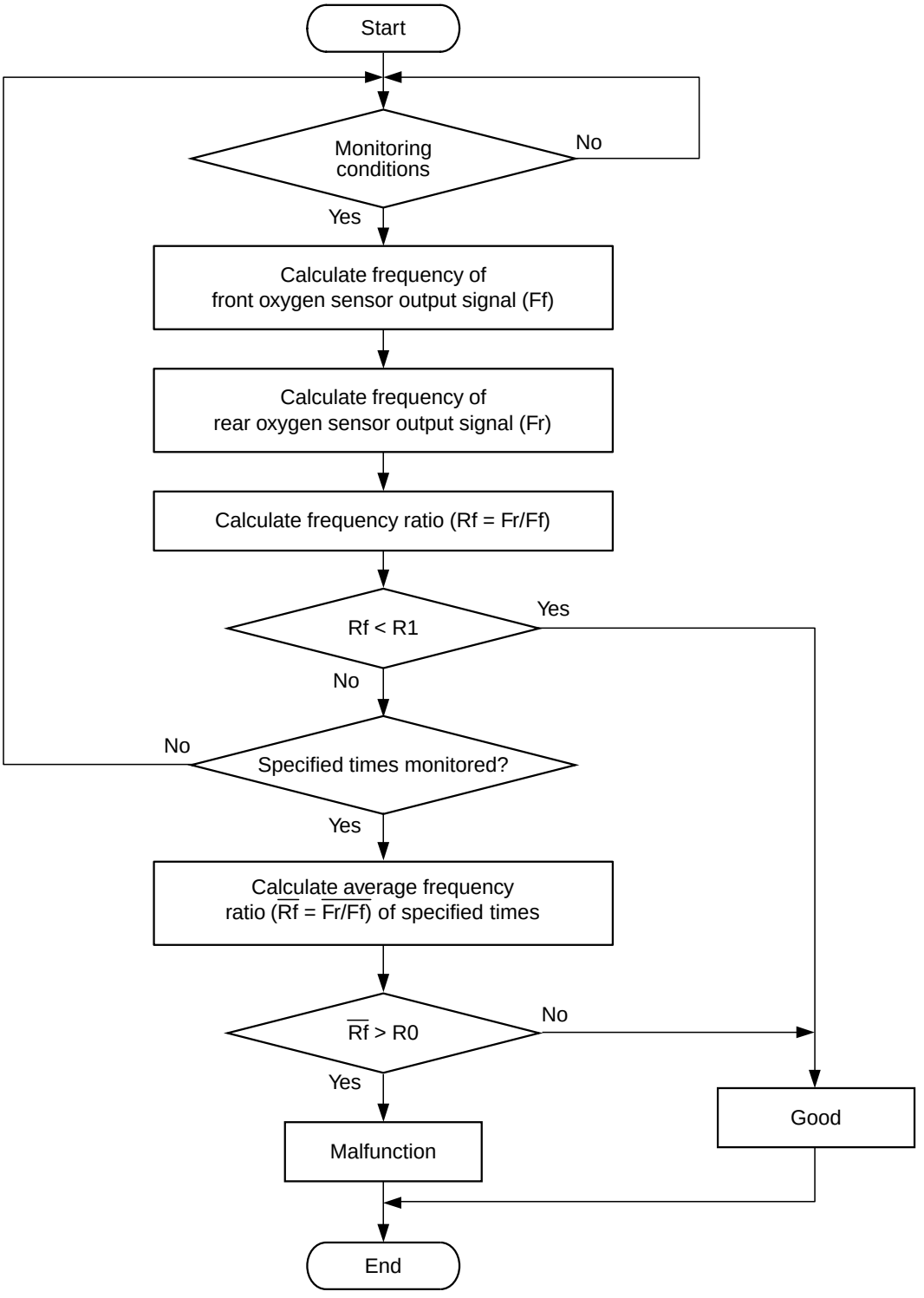
Sensor (The sensor below is determined to be normal)

- 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



AK603767 AA00

Check Conditions
- Engine speed is lower than 3,000 r/min.
- Accelerator pedal is open.
- Mass airflow is between 10 and 35 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 3 cycles of 12 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
- When the monitoring for 12 seconds is carried out 5 times, the frequency ratio of rear and front is 0.7 or more.

OBD-II DRIVE CYCLE PATTERN
Refer to Diagnostic Function - OBD-II Drive Cycle - Pattern 4 P.13Ab-8.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)
- Catalytic converter deteriorated (Exhaust 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. Replace the right bank side catalytic converter.
(1) Replace the catalytic converter.
(2) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function - OBD-II Drive Cycle - Pattern 4 P. 13Ab-8.
(3) Check the diagnostic trouble code (DTC).

Q:Is DTC P0421 set?
YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8.
NO: The inspection is complete.

DTC P0431: Warm Up Catalyst Efficiency Below Threshold (bank 2)

M11310100230USA0000010000

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 ECM 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)

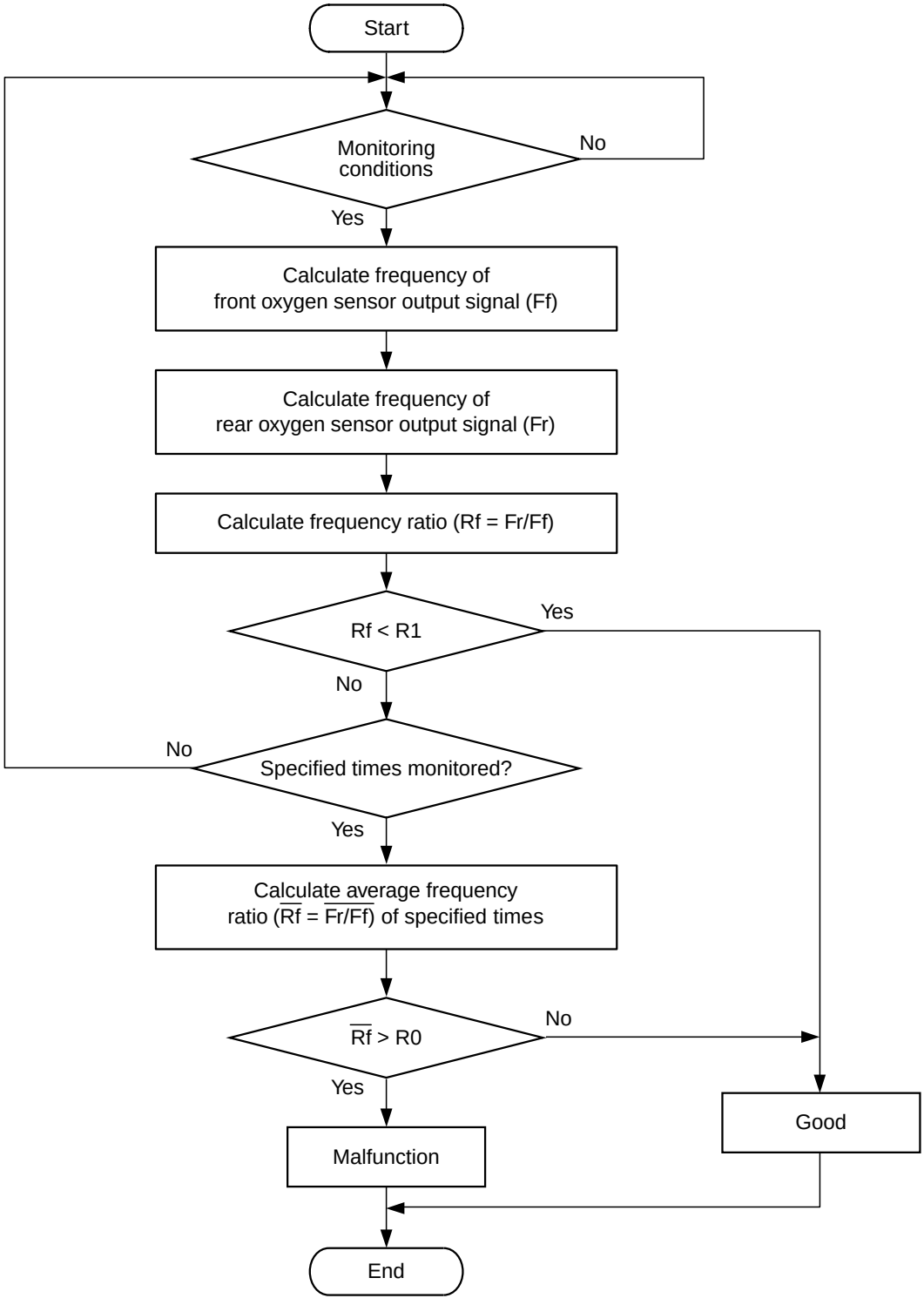
- Heated oxygen sensor (front) monitor
- Heated oxygen sensor (rear) monitor
- Heated oxygen sensor heater (front) monitor
- Heated oxygen sensor heater (rear) monitor
- Misfire monitor
- Fuel system monitor
- Air/fuel ratio feedback monitor

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



AK603767 AA00

Check Conditions

- Engine speed is lower than 3,000 r/min.
- Accelerator pedal is open.
- Mass airflow is between 10 and 35 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 3 cycles of 12 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
- When the monitoring for 12 seconds is carried out 5 times, the frequency ratio of rear and front is 0.7 or more.

OBD-II DRIVE CYCLE PATTERN
Refer to Diagnostic Function - OBD-II Drive Cycle - Pattern 4 P.13Ab-8.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)
- Catalytic converter deteriorated (Exhaust leak).

DIAGNOSIS

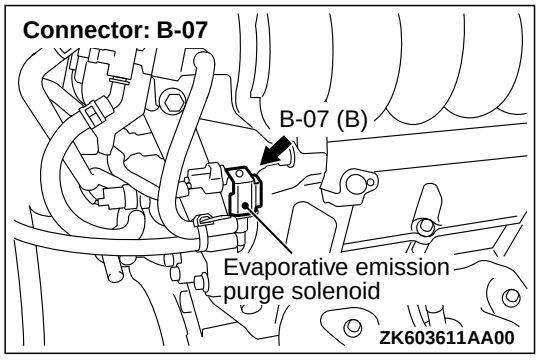
Required Special Tools:
- MB991958: Scan tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A

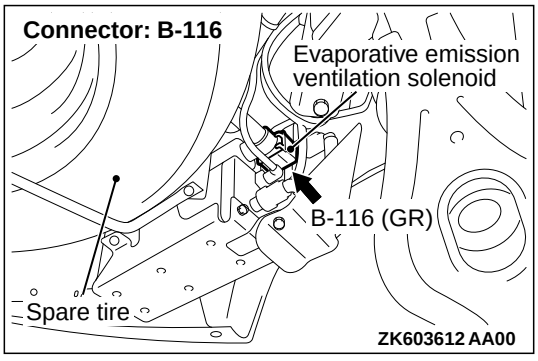
STEP 1. Replace the left bank side catalytic converter.
(1) Replace the catalytic converter.
(2) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function - OBD-II Drive Cycle - Pattern 4 P. 13Ab-8.
(3) Check the diagnostic trouble code (DTC).

Q:Is DTC P0431 set?
YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8.
NO: The inspection is complete.

DTC P0441: Evaporative Emission Control System Incorrect Purge Flow

M11310100231USA0000010000





TECHNICAL DESCRIPTION

- ECM detects a stuck open condition of evaporative emission purge solenoid valve and a stuck closed condition of evaporative emission ventilation solenoid valve by pressure change in fuel tank.
- Stuck open evaporative emission purge solenoid valve is judged through monitoring leak of evaporative emission system.
- Stuck closed evaporative emission ventilation solenoid valve 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)

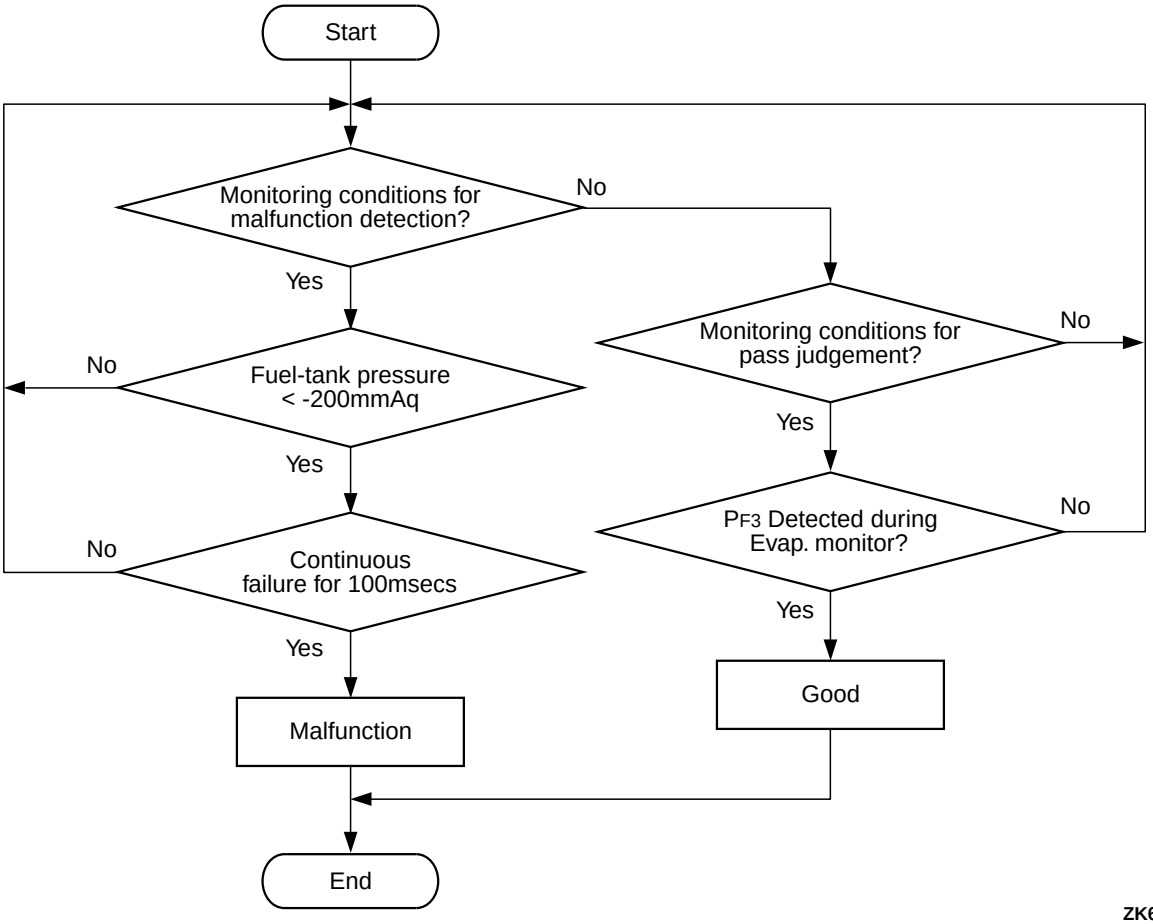
- Fuel tank pressure sensor monitor

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITION

Logic Flow Chart



ZK603768AA00

Check Conditions

- ON duty cycle of the evaporative emission purge solenoid is 0 percent.
- Engine is running.
- 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 -2 kPa (-0.59 in.Hg) or less for 0.1 second.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function - OBD-II Drive Cycle - Pattern 5 P.13Ab-8.

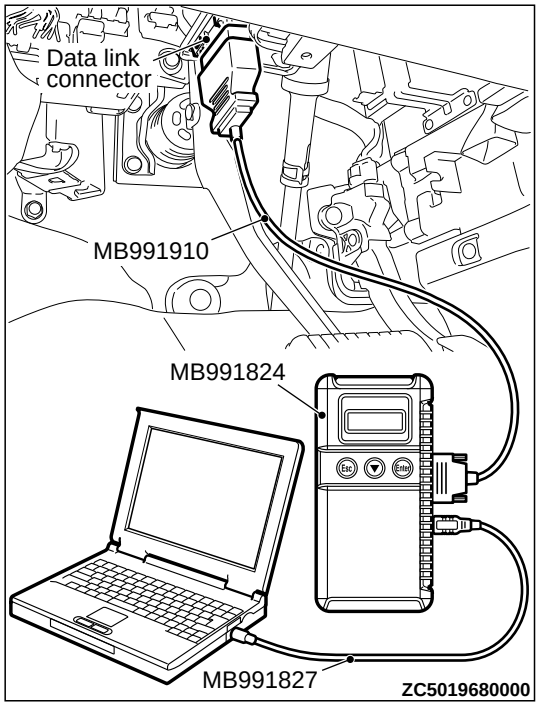
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Evaporative emission purge solenoid failed.
- Evaporative emission ventilation solenoid failed.
- ECM failed.
- Purge line or vapor line seal is leaking.

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 P0451 set?

YES: Refer to DTC P0451 - Evaporative Emission Control System Pressure Sensor Range/Performance P.13Ab-495.
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 1,500 and 3,500 millivolts.

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

Q:Is the fuel tank pressure between 1,500 and 3,500 millivolts?

YES: Go to Step 3.
NO: Refer to DTC P0451 - Evaporative Emission Control System Pressure Sensor Range/Performance P.13Ab-495.

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 6.

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 6.

STEP 5. Check the trouble symptoms.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function - OBD-II Drive Cycle - Pattern 5 P. 13Ab-8.
(2) Check the diagnostic trouble code (DTC).

Q:Is DTC P0441 set?

YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 6.
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.00-15.

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 5 P. 13Ab-8.
(2) Read the diagnostic trouble code.

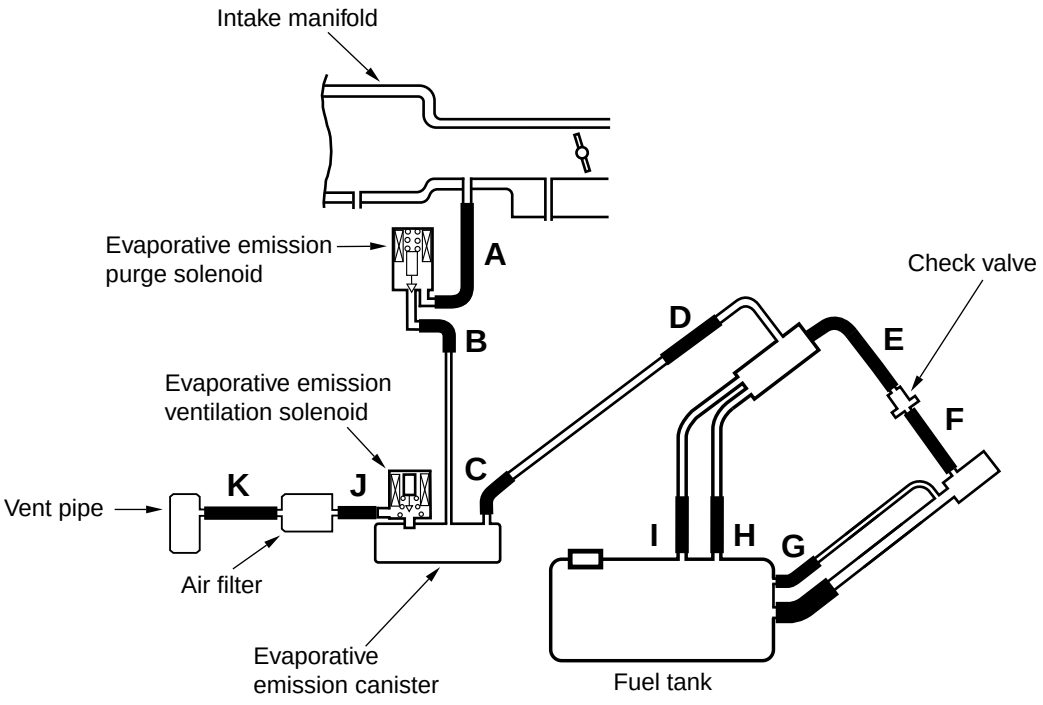
Q:Is DTC P0441 set?

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

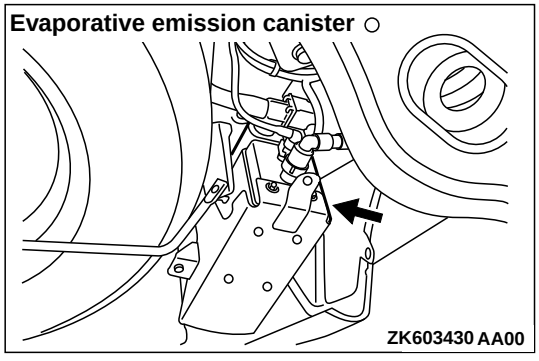
DTC P0442: Evaporative Emission Control System Leak Detected (Small Leak)

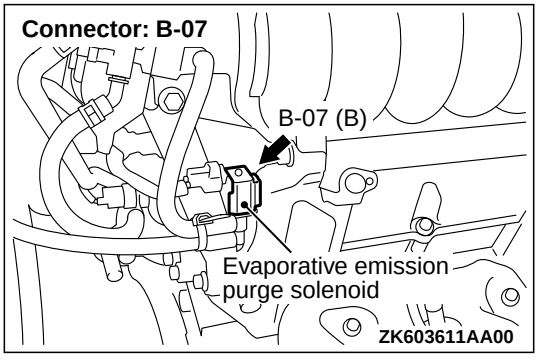
M11310100404USA0000010000

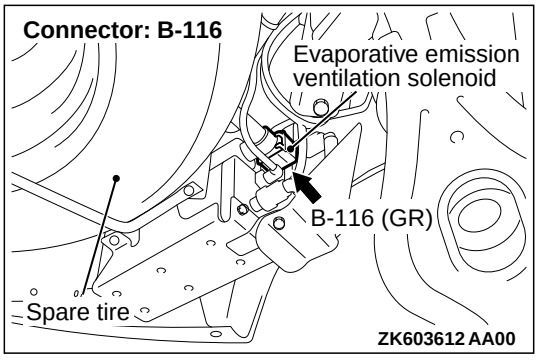
System diagram



ZK603429 AA00







TECHNICAL DESCRIPTION

- The ECM monitors the Evaporative Emission (EVAP) System pressure.
- The ECM 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 ECM 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

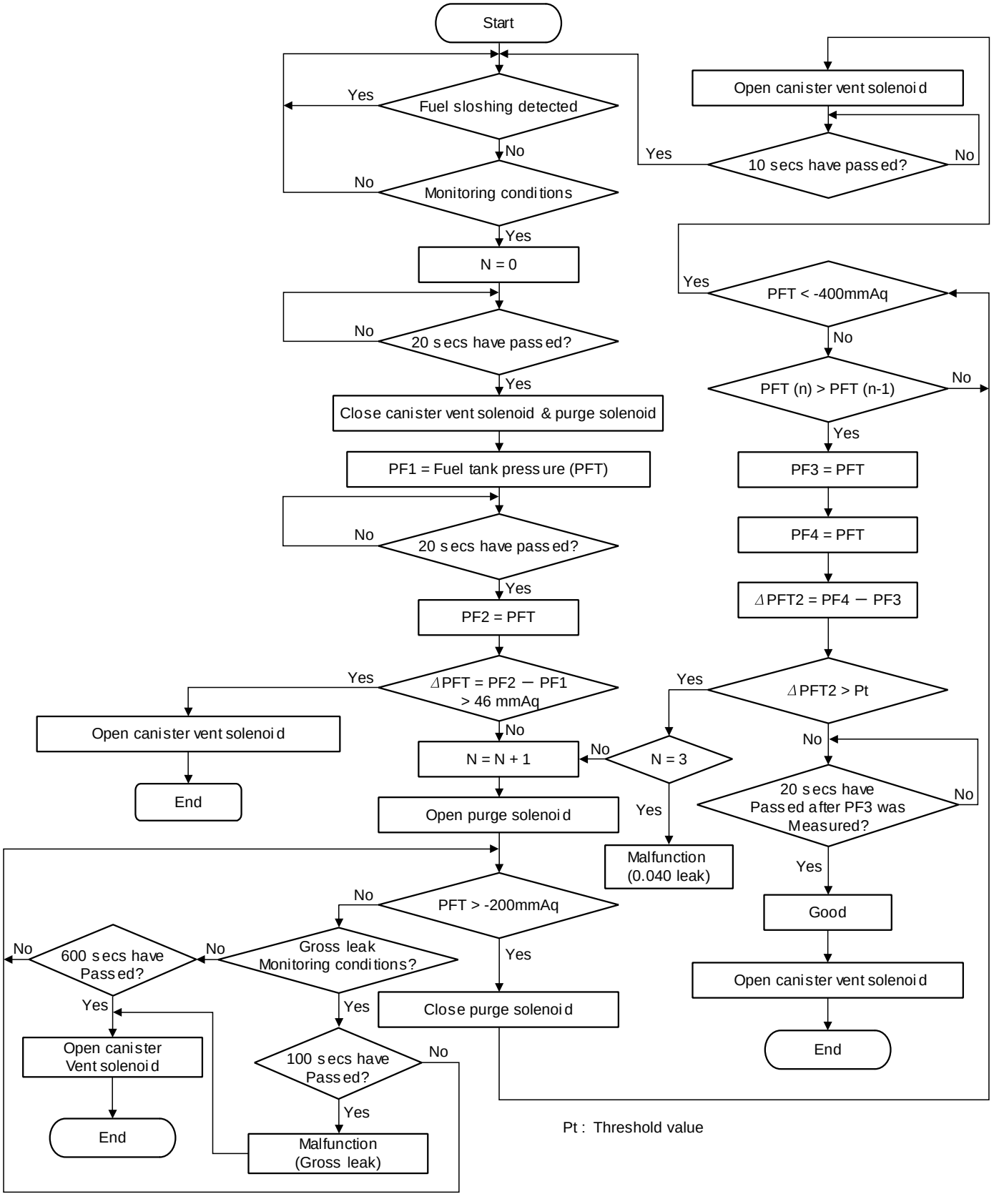
Sensor (The sensors below are determined to be normal)

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

DTC SET CONDITIONS

Logic Flow Chart <0.04 in leak monitor>

Logic Flow Chart



ZK603431AA00

Check Conditions
Remaining fuel amount is 15 - 40 percent of capacity (fuel level sensor output signal voltage is 1.4 - 2.4 volts).

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.

Conditions B: For Test to Run
- The fuel 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 oil pressure is less than 2 MPa (290 psi).
- 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 20 km/h (12.4 mph).

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.

Judgement Criteria
- Internal pressure of the fuel tank has changed more than 977 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.

Check Conditions
Remaining fuel amount is 40 - 85 percent of capacity (fuel level sensor output voltage is 2.4 - 3.7 volts).

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.

Conditions B: For Test to Run
- The fuel 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.

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.

Judgement Criteria
- 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.

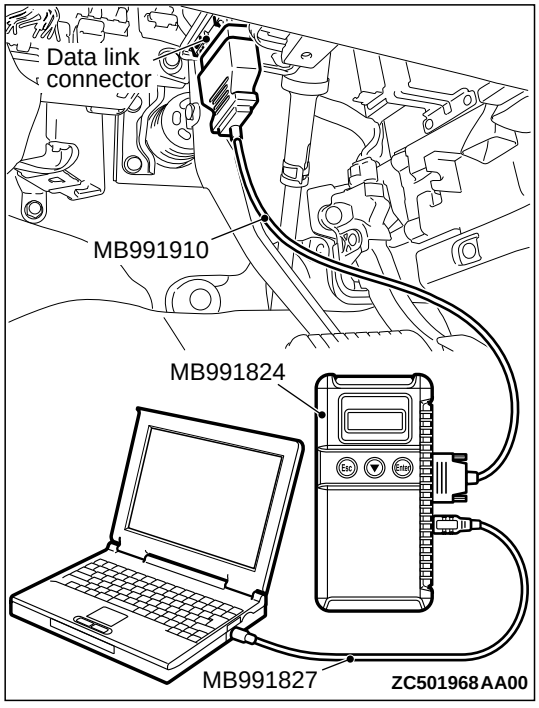
OBD-II DRIVE CYCLE PATTERN
Refer to Diagnostic Function - OBD-II Drive Cycle - Pattern 5 P.13Ab-8.

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 ECM will automatically increase the engine speed to 1,600 r/min or greater. Check that the transaxle is set to "P" position.**

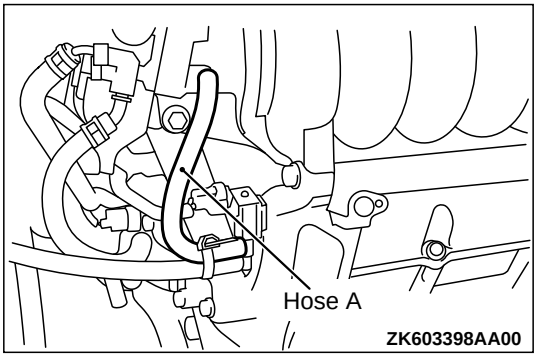
(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Erase the DTCs using scan tool MB991958.
(4) Check that the fuel cap is securely closed (Tighten until three clicks are heard).
(5) Start the engine.
(6) Select "System Test."
(7) Select "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.13Ab-44. 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.

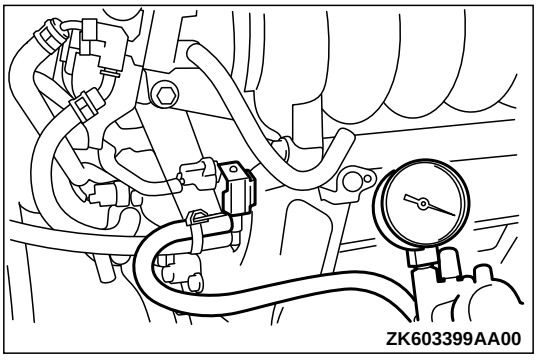
NO <"Evap Leak Mon. Discontinued. Retest again from the first" is displayed on scan tool MB991958.>: The EVAP monitor has been interrupted during the test. Turn the ignition switch to the "LOCK" (OFF) position once, and repeat the monitoring from Step 1.



STEP 2. Check for leaks in evaporative emission hose A.
Use a hand vacuum pump to check the hose A.

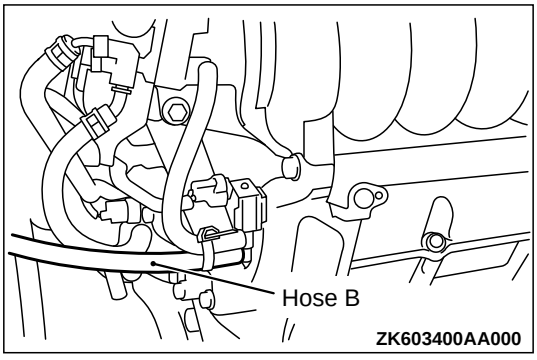
Q:Do the hose hold vacuum?
YES: Go to Step 3.
NO: Replace the hose. Then go to Step 14.

STEP 3. Check the evaporative emission purge solenoid for leaks.
(1) Disconnect the hose A from the evaporative emission purge solenoid.
(2) Connect the hose of the hand vacuum pump to the intake manifold side nipple of the evaporative emission purge solenoid.
(3) Use the hand vacuum pump to confirm that the evaporative emission purge solenoid holds vacuum.
(4) Connect the hose A to the evaporative emission purge solenoid.



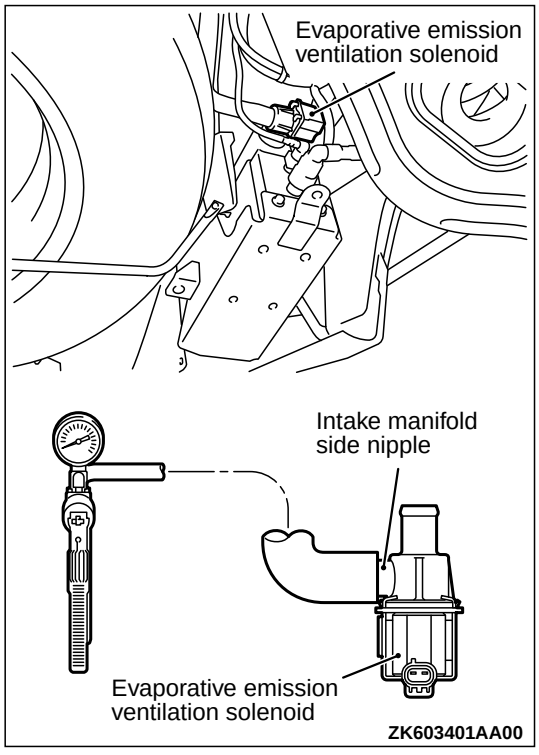
Q:Does the evaporative emission purge solenoid hold vacuum?
YES: Go to Step 4.
NO: Replace the evaporative emission purge solenoid. Then go to Step 14.

STEP 4. Check for leaks in evaporative emission B.
Use a hand vacuum pump to check the hose B.



Q:Do the hose hold vacuum?
YES: Go to Step 5.
NO: Replace any damaged hose. Then go to Step 14.

STEP 5. Using scan tool MB991958, check actuator test item 15: Evaporative emission ventilation solenoid.
(1) Remove the canister cover.
(2) Remove the evaporative emission ventilation solenoid. Do not disconnect the connector.



(3) Connect the hose of the hand vacuum pump to the canister side nipple of the evaporative emission ventilation solenoid.
(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.

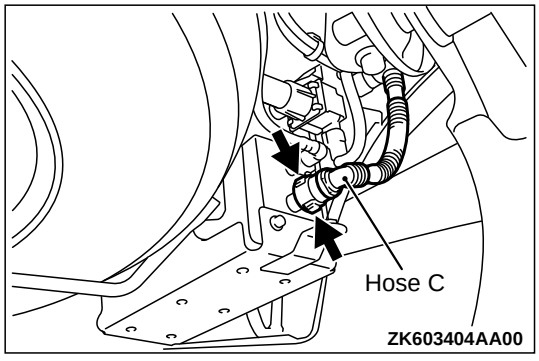
(6) Turn the ignition switch to the "LOCK" (OFF) position.
(7) Disconnect the hand vacuum pump, and reinstall the evaporative emission ventilation solenoid.
(8) Reinstall the canister cover.

Q:Did the evaporative emission ventilation solenoid hold vacuum?

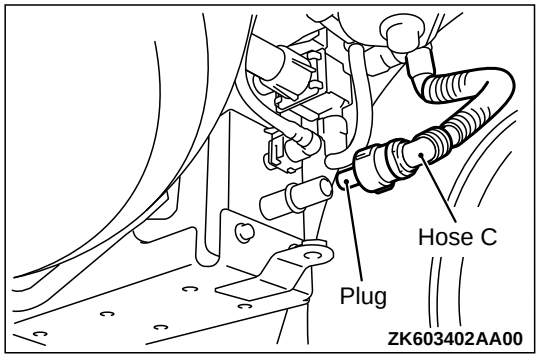
YES: Go to Step 6.

NO: Replace the evaporative emission ventilation solenoid (Refer to GROUP 17, Evaporative emission canister and fuel tank pressure relief valve removal and installation P.17c-18). Then go to Step 14.

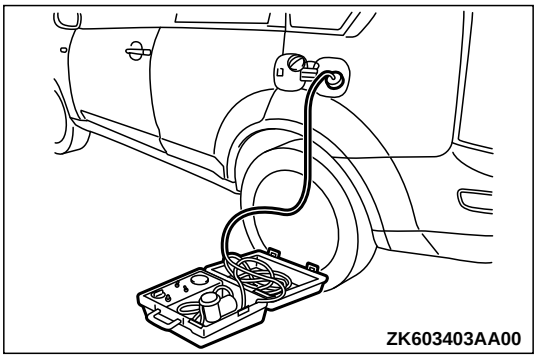
STEP 6. Pressure test the evaporative emission system lines from hoses C to I.



(1) Disconnect hose C from the canister while holding the release buttons indicated in the illustration pressed by fingers.



(2) Plug the disconnected end of hose C.
(3) 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.
(4) Remove the fuel cap.


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(5) Connect the evaporative emission system pressure pump (Miller number 6872A) to the fuel tank filler tube by using fuel tank adapter (MLR-8382).
(6) 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.

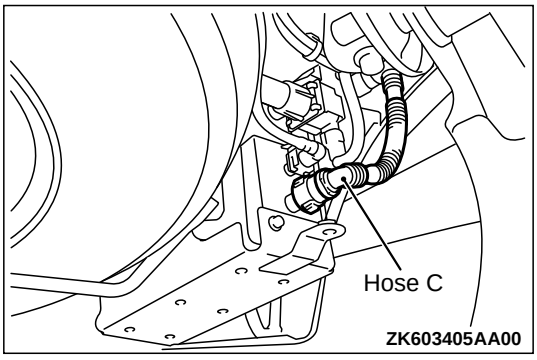
(7) Remove the evaporative emission system pressure pump (Miller number 6872A) and the fuel tank adapter (MLR-8382), and reinstall the fuel cap.
(8) Connect hose C to the evaporative emission canister.

Q:Is the evaporative emission system line free of leaks?
YES: Go to Step 12.
NO: Go to Step 7.

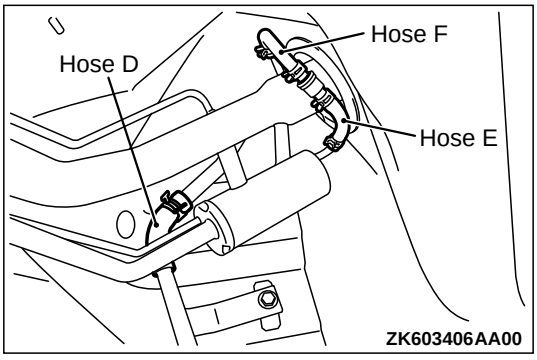
STEP 7. Check for leaks in evaporative emission hoses C through F.

Use a hand vacuum pump to test each hose from hose C to hose F.

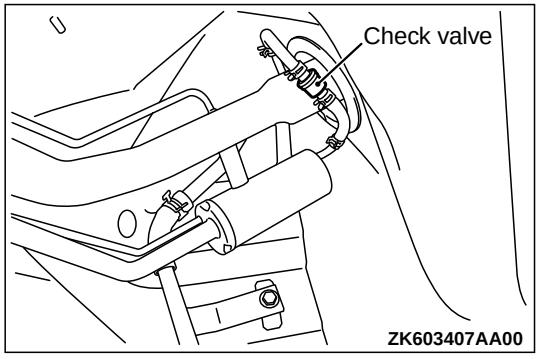
Q:Do the hoses hold vacuum?
YES: Go to Step 8.
NO: Replace any damaged hose. Then go to Step 14.



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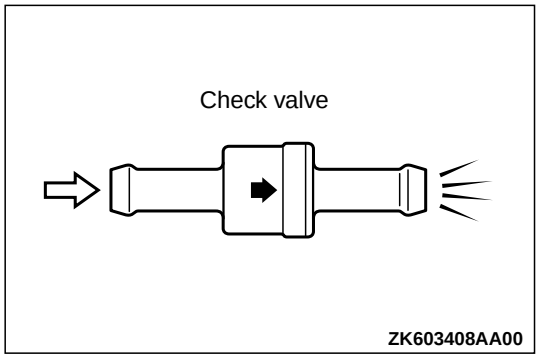


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STEP 8. Test check valve.

(1) Check valve is a one-way check valve.



(2) Check valve should allow air to flow in only one direction.

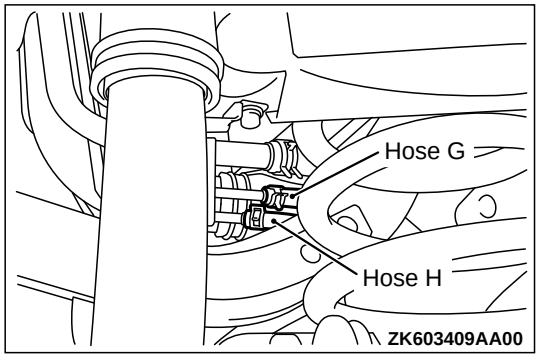
Q:Does check valve allow air to pass in one direction only?

YES: Go to Step 9.

NO: Replace check valve, and reinstall the fuel tank filler tube protector (Refer to GROUP 13B, Fuel Tank <FWD> P.13B-13or Fuel Tank <AWD> P.13B-18). Then go to Step 14.

STEP 9. Check for leaks in evaporative emission hoses G and H.

Use a hand vacuum pump to test each hose G and H.



Q:Do the hoses hold vacuum?

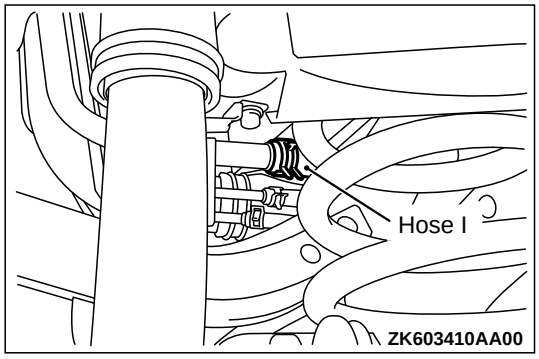
YES: Go to Step 10.

NO: Replace any damaged hose. Then go to Step 14.

STEP 10. Check for leaks in evaporative emission hose I.

(1) Remove the fuel tank assembly (Refer to GROUP 13B, Fuel Tank <FWD> P.13B-13or Fuel Tank <AWD> P.13B-18).

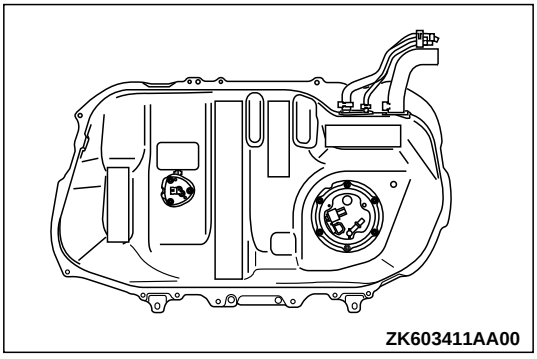
(2) Use the hand vacuum pump to check the hose I.

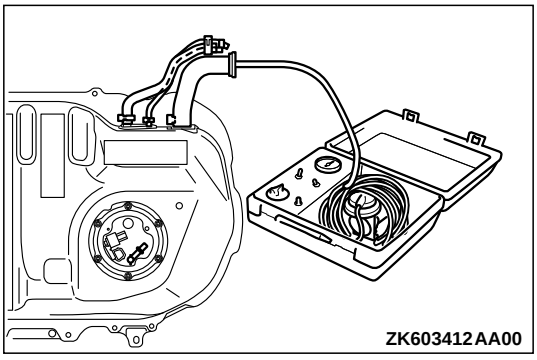


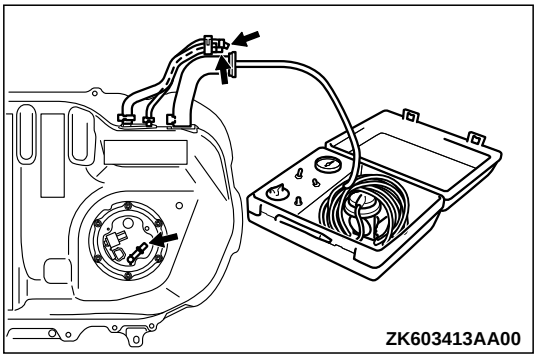
Q:Do the hose hold vacuum?

YES: Go to Step 11.

NO: Replace the hose and reinstall the fuel tank assembly (Refer to GROUP 13B, Fuel Tank <FWD> P.13B-13or Fuel Tank <AWD> P.13B-18). Then go to Step 14.


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ZK603412AA00


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STEP 11. 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.

(2) Connect the evaporative emission system pressure pump (Miller number 6872A) to the fuel filler hose.

(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.

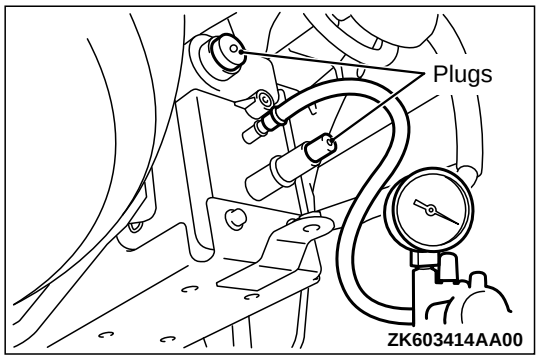
(5) In the pressurized state, check for leaks by applying a soapy water solution to each section and look for bubbles.

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 13B, Fuel Tank <FWD> P.13B-13or Fuel Tank <AWD> P.13B-18). Then go to Step 14.

YES <When there is a leak from the fuel tank.>: Replace the fuel tank (Refer to GROUP 13B, Fuel Tank <FWD> P.13B-13or Fuel Tank <AWD> P.13B-18). Go to Step 14

NO: When there is no leak, reinstall the fuel tank (Refer to GROUP 13B, Fuel Tank <FWD> P.13B-13or Fuel Tank <AWD> P.13B-18). Then go to Step 13.



STEP 12. Check the evaporative emission canister for vacuum leaks.

(1) Connect a hand vacuum pump to the evaporative emission canister and plug the other nipples.
(2) Apply a pressure on the hand vacuum pump, and confirm that air is maintained.
(3) Disconnect the hand vacuum pump and remove the plugs.

Q:Is the evaporative emission canister in good condition?

YES: Go to Step 13.

NO: Replace the evaporative emission canister (Refer to GROUP 17, Evaporative Emission Canister and Fuel Tank Pressure Relief Valve P.17c-18). Then go to Step 14.

STEP 13. Using scan tool MB991958, check the evaporative emission system monitor test.

⚠ CAUTION

- **During this test, the ECM automatically increases the engine speed to 1,600 r/min or greater. Check that the transaxle is set to "P" position.**

(1) Turn the ignition switch to the "ON" position.
(2) Erase the DTCs using scan tool MB991958.
(3) Check that the fuel cap is securely closed (Tighten until three clicks are heard).
(4) Start the engine.
(5) Select "System Test."
(6) Select "Evap Leak Mon."
(7) During the test, keep the accelerator pedal at the idle position.
(8) 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".
(9) Turn the ignition switch to the "LOCK" (OFF) position.

Q:Is "Evap Leak Mon. Completed. Test Failed and DTCs Set" displayed on scan tool MB991958?

YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 14.

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 14.

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 14. 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.13Ab-8).
(2) Read the DTC.

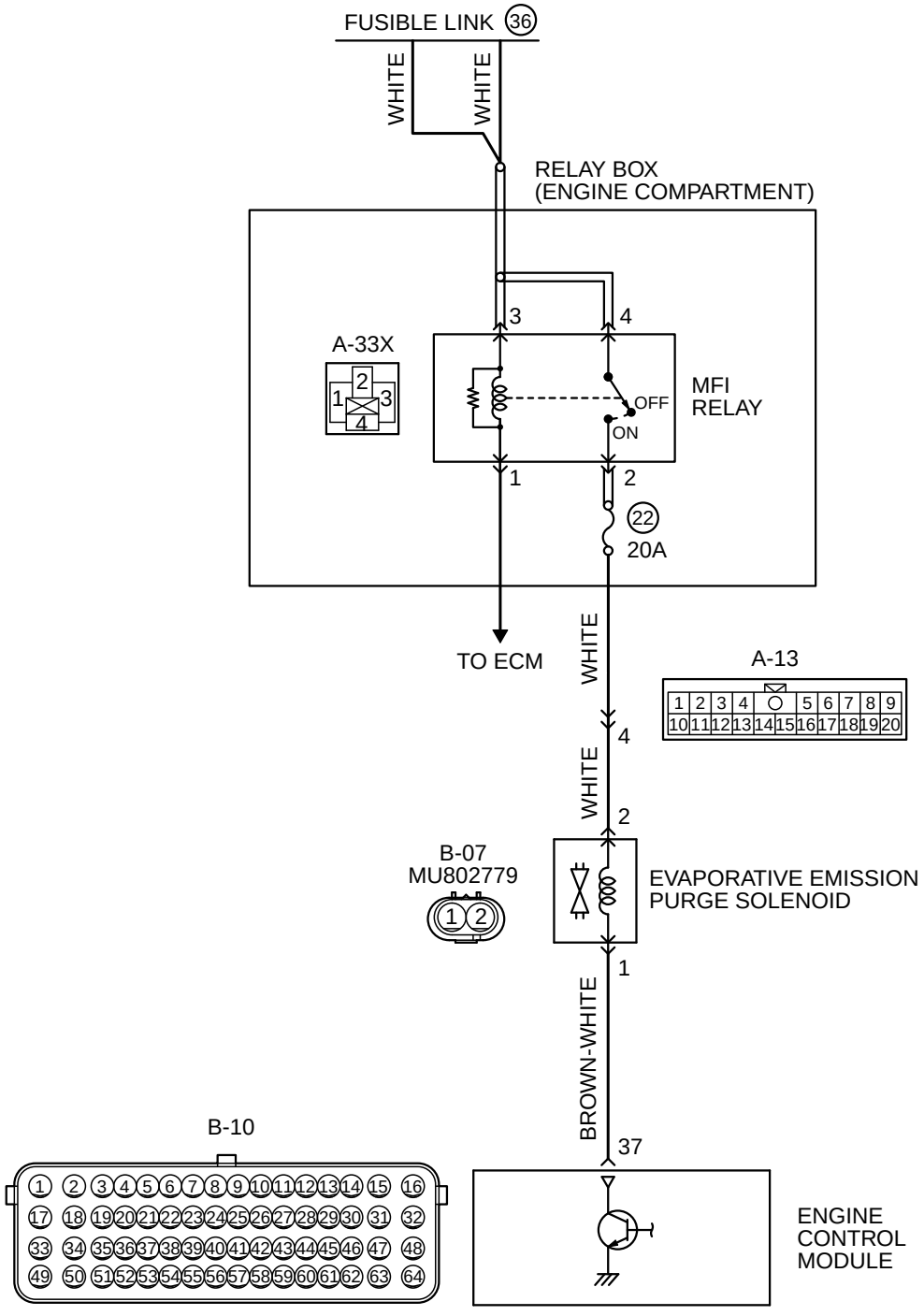
Q:Is DTC P0442 set?

YES: Repeat the troubleshooting.
NO: The procedure is complete.

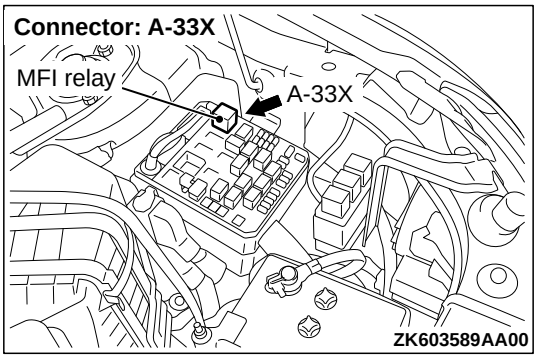
DTC P0443: Evaporative Emission Control System Purge Control Valve Circuit

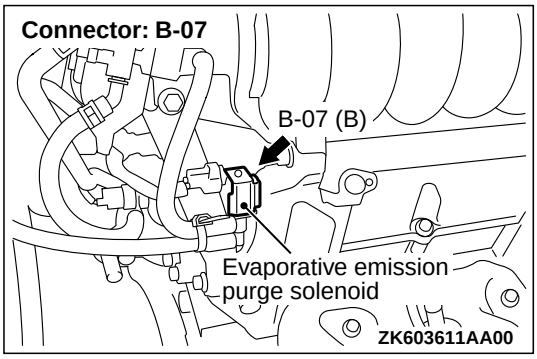
M11310100232USA0000010000

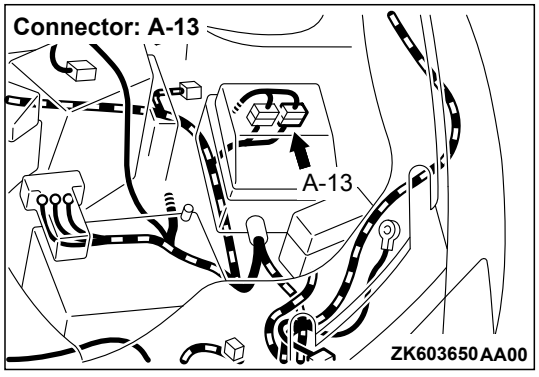
EVAPORATIVE EMISSION PURGE SOLENOID CIRCUIT

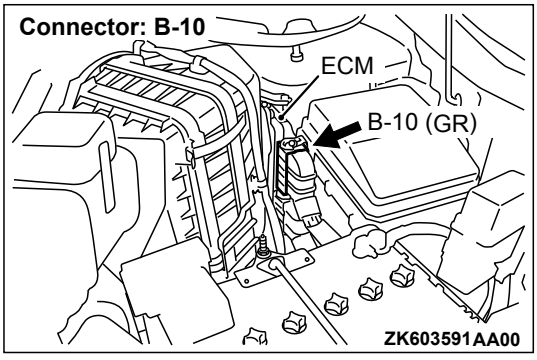


ZK602852 AA00









CIRCUIT OPERATION

- The evaporative emission purge solenoid power is supplied from the MFI relay (terminal No. 2).
- The ECM controls ground evaporative emission purge solenoid by turning the power transistor in the ECM "ON" and "OFF".

TECHNICAL DESCRIPTION

- To judge if there is open circuit in the evaporative emission purge solenoid drive circuit, the ECM 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)

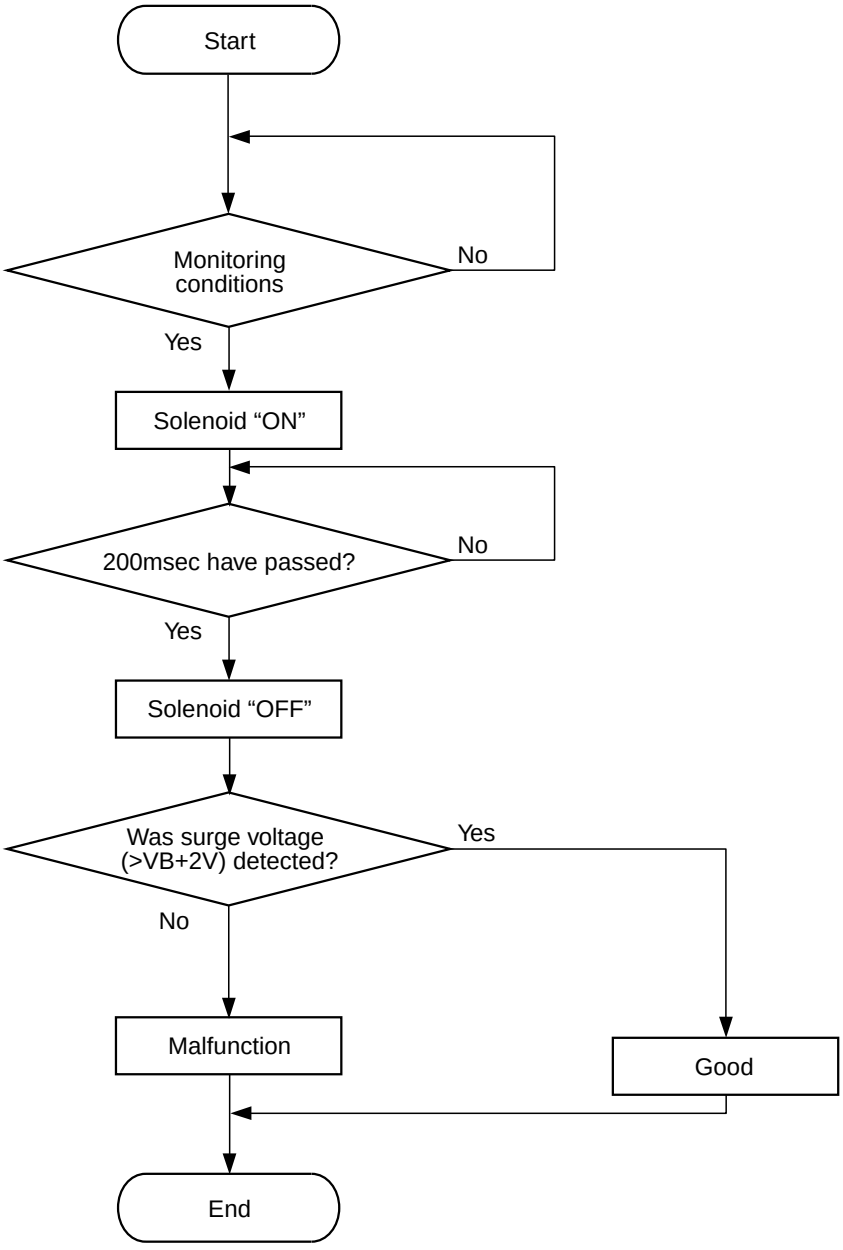
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS <Circuit continuity - During normal operation>

Logic Flow Chart



ZK604093 AA00

Check Conditions

- Engine is being cranked.
- Battery positive voltage is between 10 and 16.5 volts.

Judgement Criteria

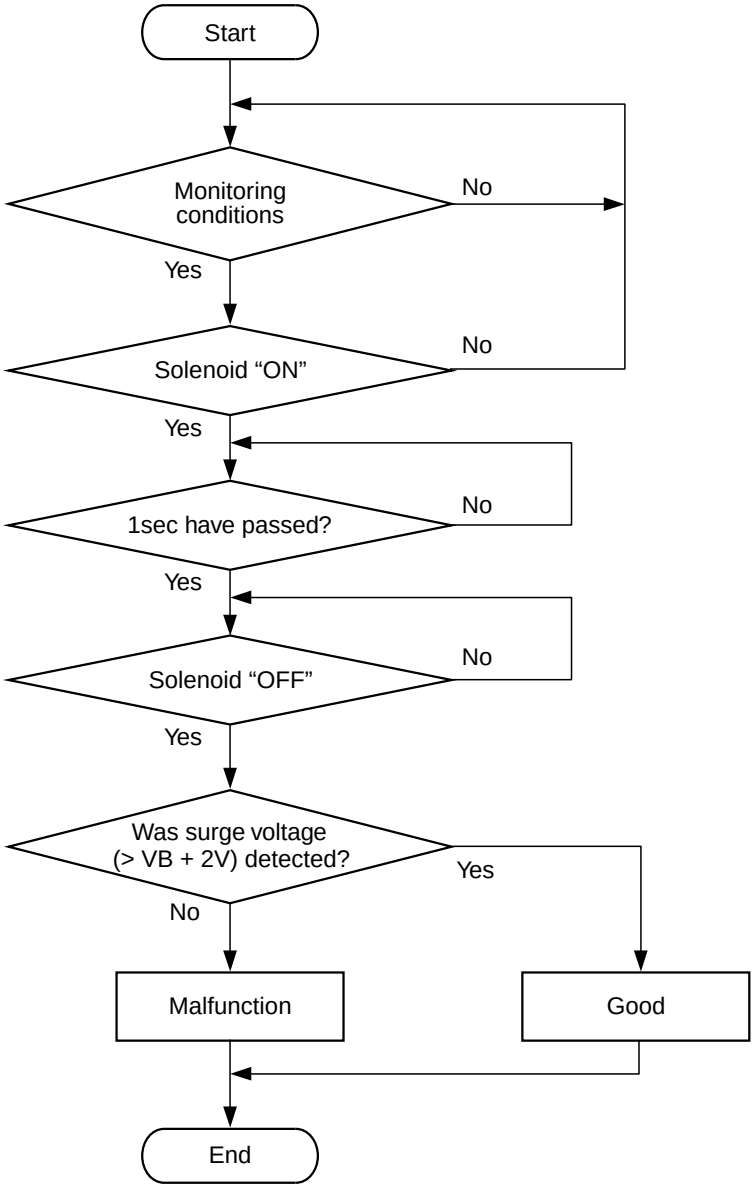
- The evaporative emission purge solenoid coil surge voltage (battery positive voltage + 2 volts) is not detected for 0.2 second.
- The PCM monitors for this condition once during the drive cycle.

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.

DTC SET CONDITIONS <Circuit continuity - During normal operation>

Logic Flow Chart



ZK603769AA00

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

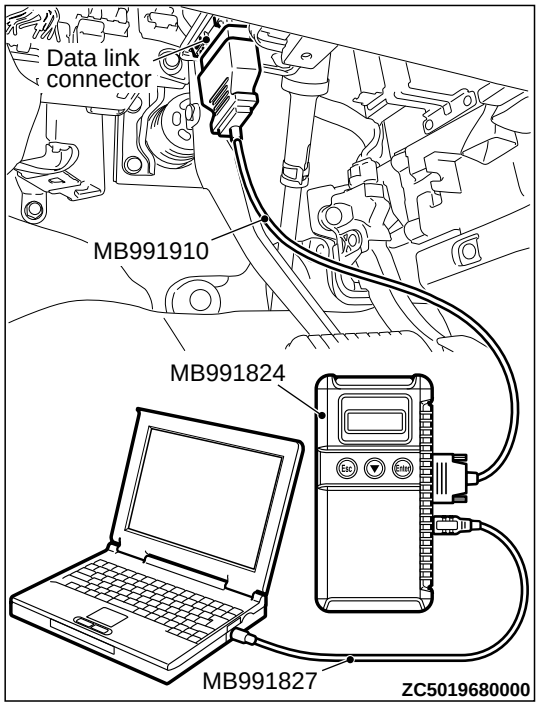
- The evaporative emission purge solenoid coil surge voltage (battery positive voltage + 2 volts) is not detected for 1 second after the evaporative emission purge solenoid is turned off.

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

- Evaporative emission purge solenoid failed.
- Harness damage
- Connector damage
- ECM failed.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function - OBD-II Drive Cycle - Pattern 24 P.13Ab-8.



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 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 to Cope with Intermittent Malfunctions P.00-15.

NO: Go to Step 2.

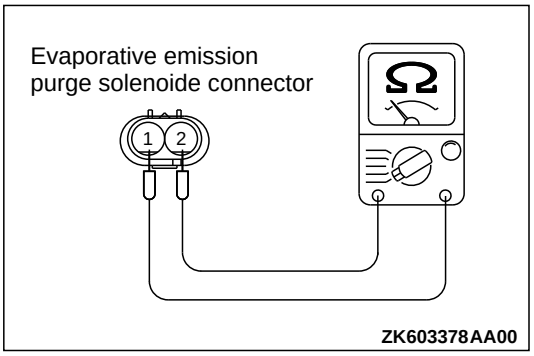
STEP 2. Check harness connector A-33X at the MFI relay and harness connector B-07 at the evavorative emission purge solenoid and harness connector B-10 at the ECM for damage.

Q:Is the harness connector in good condition?

YES: Go to Step 3.

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

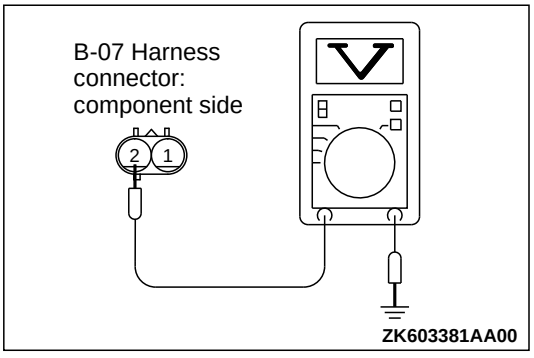
STEP 3. Check the evaporative emission purge solenoid.



(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: 22 - 26 Ω [at 20°C (68°F)]

Q:Is the measured resistance between 22 and 26 ohms [at 20°C (68°F)]?
YES: Go to Step 4.
NO: Replace the evaporative emission purge solenoid. Then go to Step 7.

STEP 4. Measure the power supply voltage at the evaporative emission purge solenoid connector B-07.

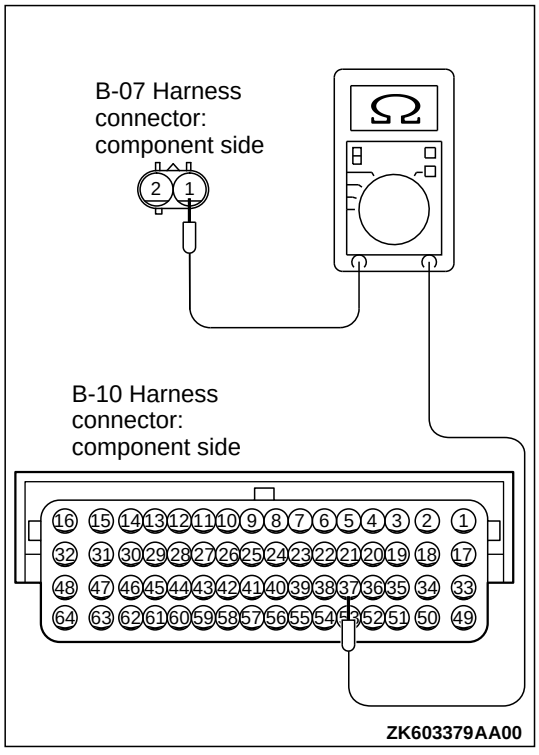


(1) Disconnect the evaporative emission purge solenoid connector B-07 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal No. 2 and ground.
▪Voltage should be battery positive voltage.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

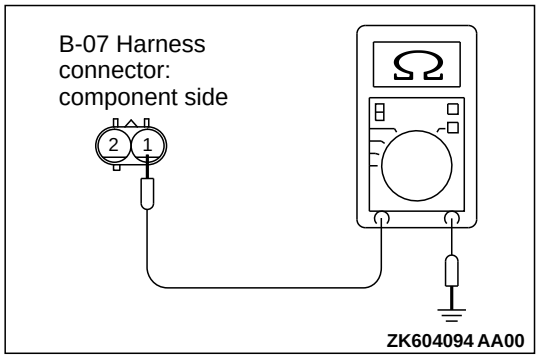
Q:Is the measured voltage between 4.9 and 5.1 volts?
YES: Go to Step 5.
NO: Repair it. Then go to Step 7.

STEP 5. Check for open circuit and short circuit to ground and harness damage between the evaporative emission purge solenoid connector B-07 and the ECM connector B-10.

(1) Disconnect the evaporative emission purge solenoid connector B-07 and the ECM connector B-10.



(2) Measure the evaporative emission purge solenoid connector B-07 (terminal No. 1) and the ECM connector B-10 (terminal No. 37).
- Should be less than 2 ohms.



(3) Check for the evaporative emission purge solenoid connector B-07 (terminal No. 1) and ground.
- Not continuity.

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. 13Ab-8.
(2) Check the diagnostic trouble code (DTC).

Q:Is DTC P0443 set?
YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. 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.00-15.

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. 13Ab-8.

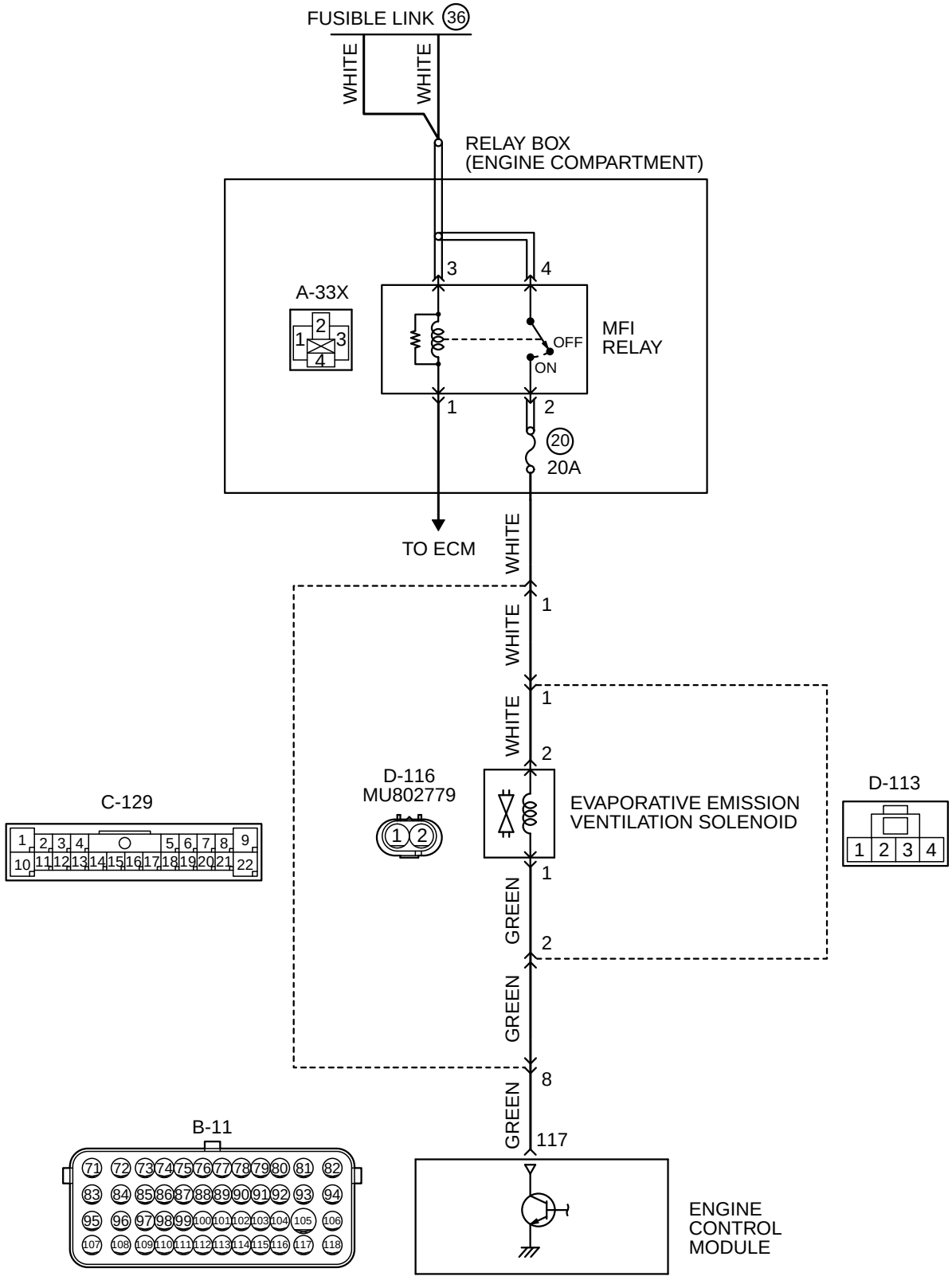
(2) Check the diagnostic trouble code (DTC).

Q:Is DTC P0443 set?
YES: Retry the troubleshooting.
NO: The inspection is complete.

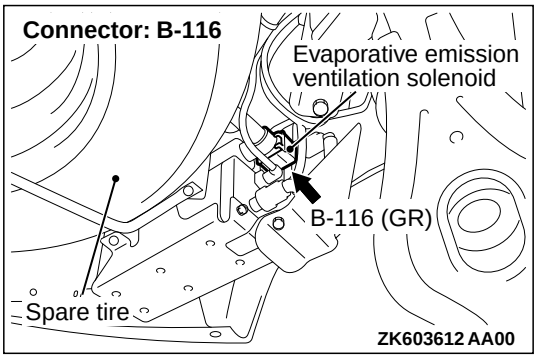
DTC P0446: Evaporative Emission Control System Vent Control Circuit

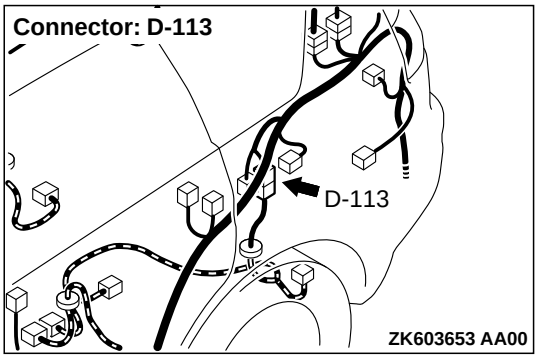
M11310100233USA0000010000

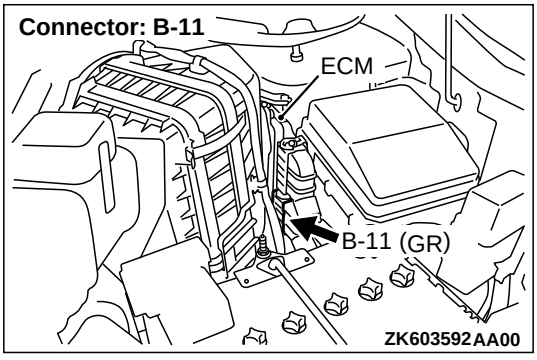
EVAPORATIVE EMISSION VENTILATION SOLENOID CIRCUIT

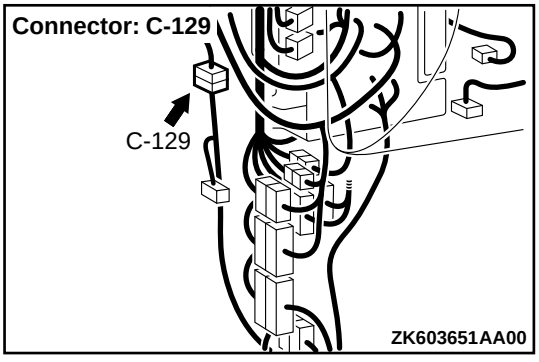


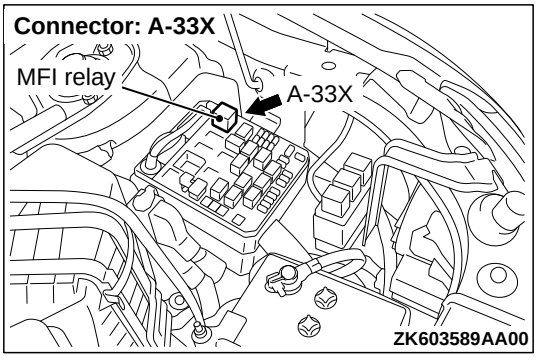
ZK602853 AA00











CIRCUIT OPERATION

- The evaporative emission ventilation solenoid power is supplied from the MFI relay (terminal No. 2).
- The ECM controls the evaporative emission ventilation solenoid ground by turning the power transistor in the ECM ON and OFF.

TECHNICAL DESCRIPTION

- To judge if there is open circuit in the evaporative emission ventilation solenoid drive circuit, ECM measures the surge voltage of the evaporative emission ventilation solenoid coil.
- The ECM drives the evaporative emission ventilation solenoid. After the solenoid is turned off, the ECM 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)

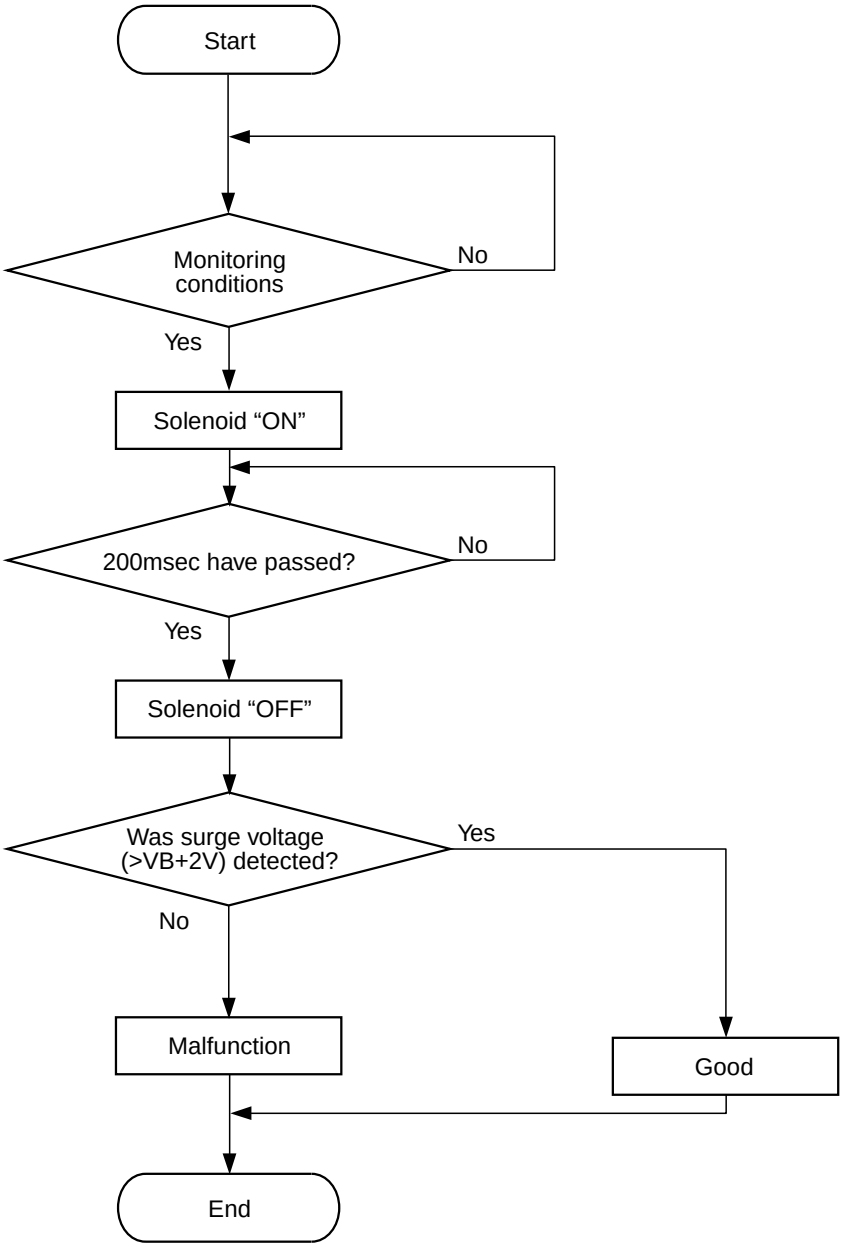
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS <Circuit continuity - During cranking>

Logic Flow Chart



ZK604093 AA00

Check Conditions

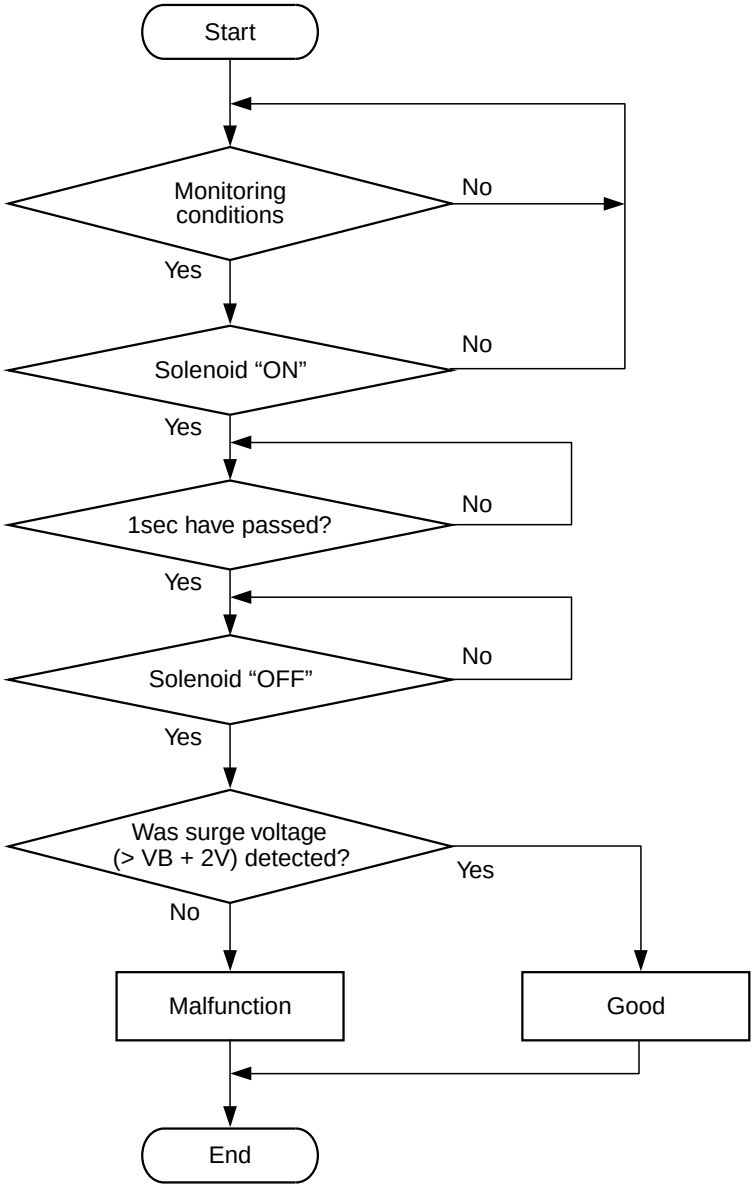
- Engine is being cranked.
- Battery positive voltage is between 10 and 16.5 volts.

Judgement Criteria

- The evaporative emission ventilation solenoid coil surge voltage (battery positive voltage + 2 volts) is not detected for 0.2 second.
- The ECM monitors for this condition once during the drive cycle.

DTC SET CONDITIONS <Circuit continuity - During normal operation>

Logic Flow Chart



ZK603769AA00

Check Conditions

- Battery positive voltage is 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.13Ab-8.

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

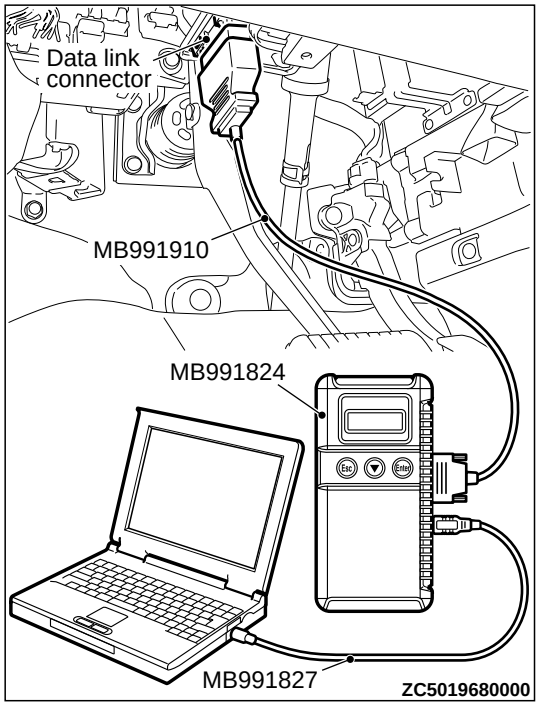
- Evaporative emission ventilation solenoid failed.
- Harness damage
- Connector damage

- ECM 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 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.00-15.

NO: Go to Step 2.

STEP 2. Check harness connector A-33X at the MFI relay connector and harness connector B-11 at the ECM for damage.

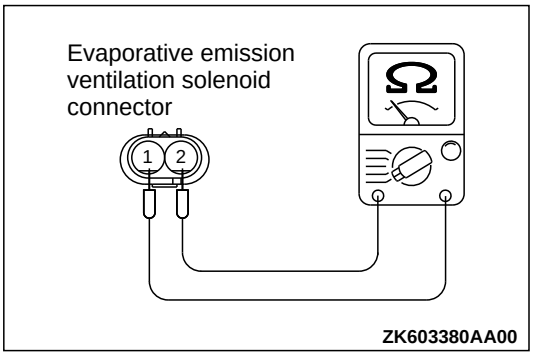
Q:Is the harness connector in good condition?

YES: Go to Step 3.

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

STEP 3. Check the evaporative emission ventilation solenoid.

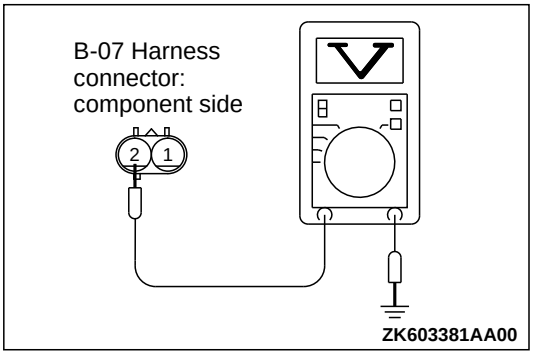
(1) Disconnect the evaporative emission ventilation solenoid connector D-116.



(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)]

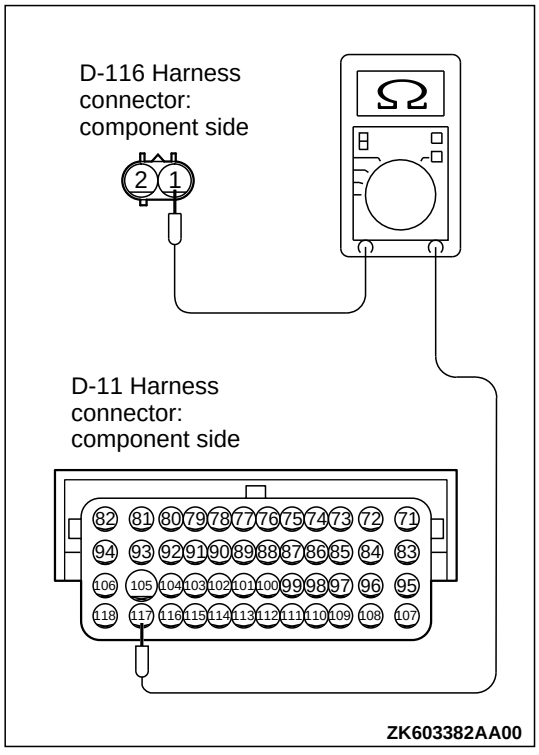
Q:Is the measured resistance between 17 and 21 ohms [at 20°C (68°F)]?
YES: Go to Step 4.
NO: Replace it. Then go to Step 7.

STEP 4. Measure the power supply voltage at the evaporative emission ventilation solenoid connector D-116.
(1) Disconnect the evaporative emission ventilation solenoid connector D-116 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.

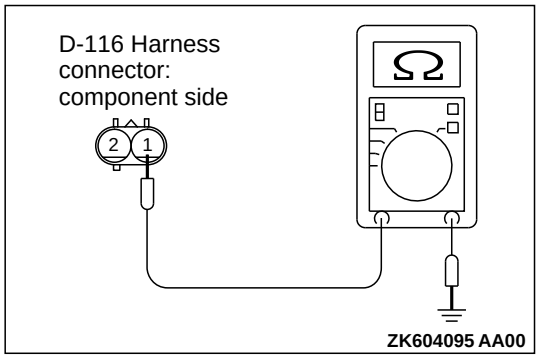


Q:Is the measured voltage battery positive voltage?
YES: Go to Step 5.
NO: Repair it. Then go to Step 7.

STEP 5. Check for open cicuit and short circuit to ground and harness damage between the evaporative emission ventilation solenoid connector D-116 and the ECM connector B-11.
(1) Disconnect the evaporative emission ventilation solenoid connector D-116 and the ECM connector B-11.



(2) Measure the evaporative emission ventilation solenoid connector D-116 (terminal No. 1) and the ECM connector B-11 (terminal No. 117).
- Should be less than 2 ohms.



(3) Check for the evaporative emission ventilation solenoid connector D-116 (terminal No. 1) and ground.
- Not continuity.

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. 13Ab-8.
(2) Check the diagnostic trouble code (DTC).

Q:Is DTC P0446 set?
YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. 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.00-15.

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. 13Ab-8.

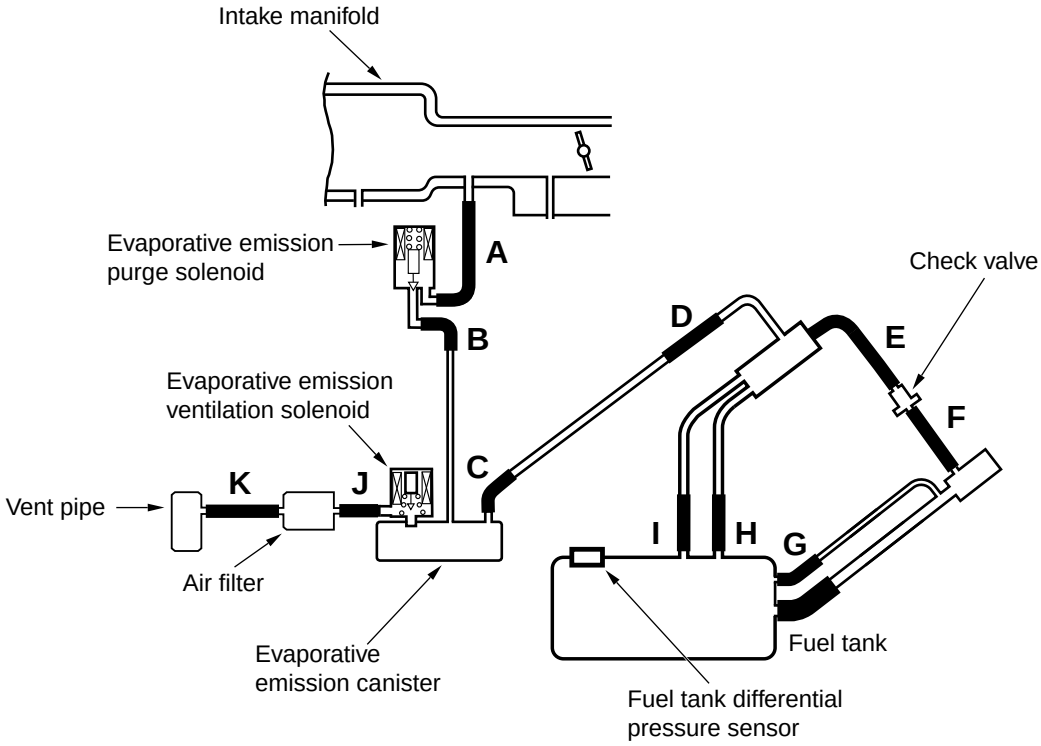
(2) Check the diagnostic trouble code (DTC).

Q:Is DTC P0446 set?
YES: Retry the troubleshooting.
NO: The inspection is complete.

DTC P0450: Evaporative Emission Control System Pressure Sensor Malfunction

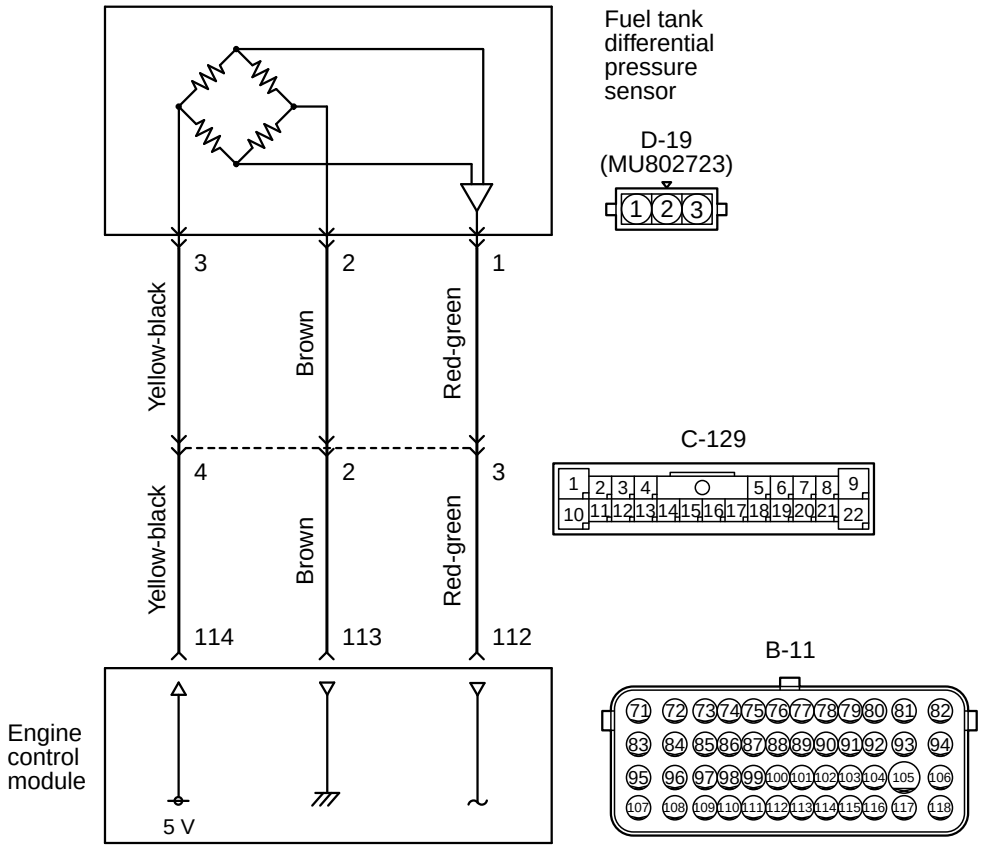
M11310100405USA0000010000

System diagram

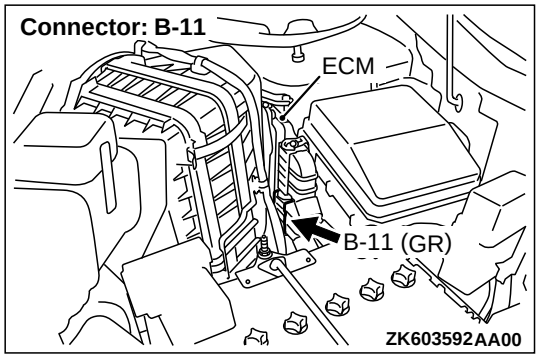


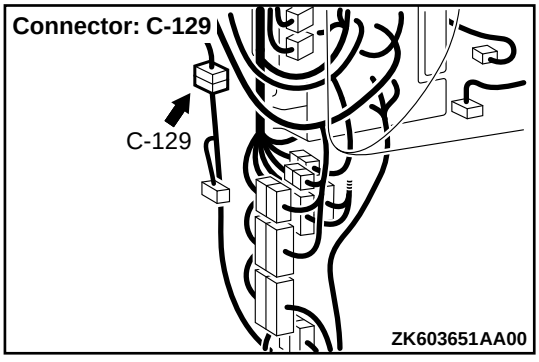
ZK603432 AA00

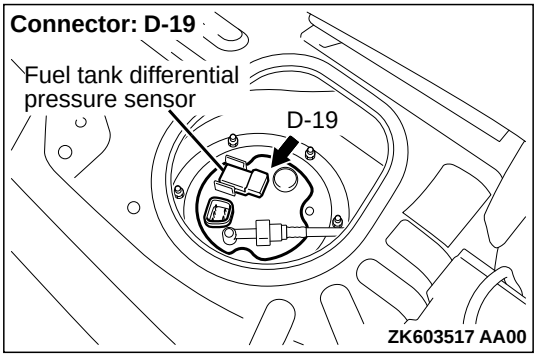
Fuel Tank Differential Pressure Sensor Circuit



ZK603433AA00







CIRCUIT OPERATION

- The ECM (terminal No. 114) supplies a 5-volt reference signal to the fuel tank differential pressure sensor (terminal No. 3). The fuel tank differential pressure sensor (terminal No. 2) is grounded through the ECM (terminal No. 113).
- The fuel tank differential pressure sensor (terminal No. 1) returns a voltage signal to the ECM (terminal No. 112) that is proportional to the pressure in the fuel tank.

TECHNICAL DESCRIPTION

- The ECM monitors the fuel tank differential pressure sensor output voltage.
- The ECM 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

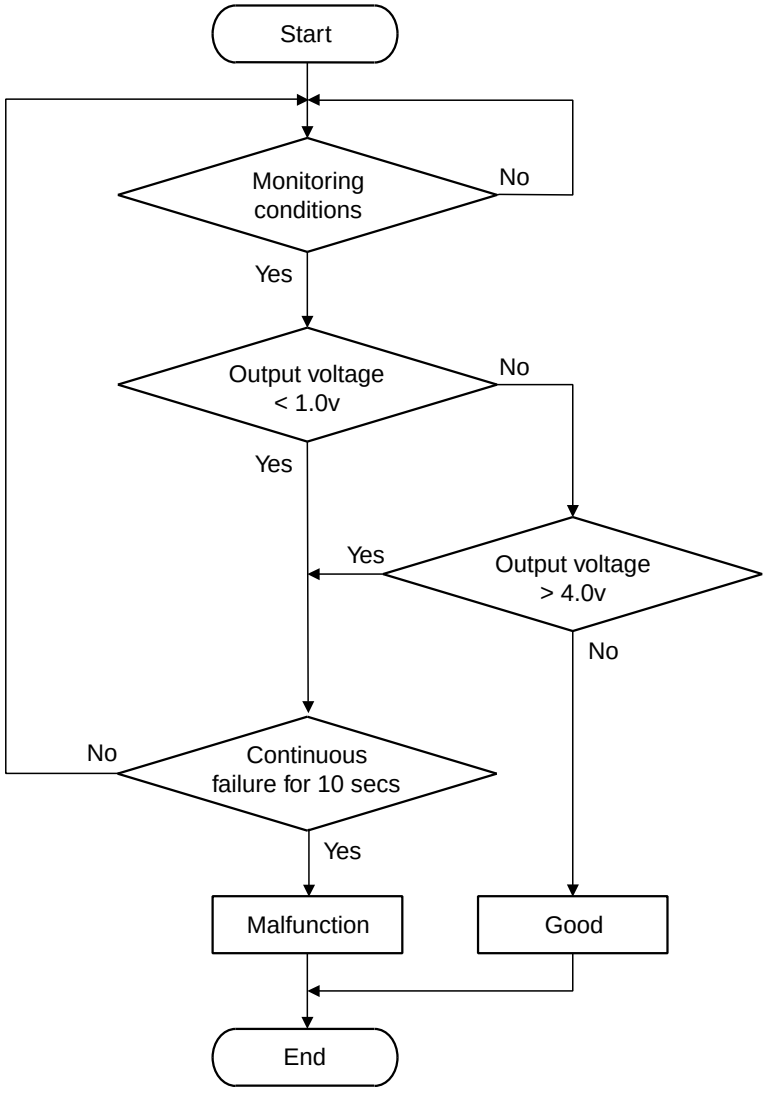
Sensor (The sensors below are determined to be normal)

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

DTC SET CONDITIONS

Logic Flow Chart

Logic Flow Chart



AK603434AA00

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.

Judgement Criteria

- 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.

Judgement Criteria

- 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.13Ab-8.

TROUBLESHOOTING HINTS (THE MOST LIKELY CAUSES FOR THIS CODE TO BE SET ARE:)

- Connector damage.

- Harness damage.
- Fuel tank differential pressure sensor failed.
- ECM failed.

OVERVIEW OF TROUBLESHOOTING

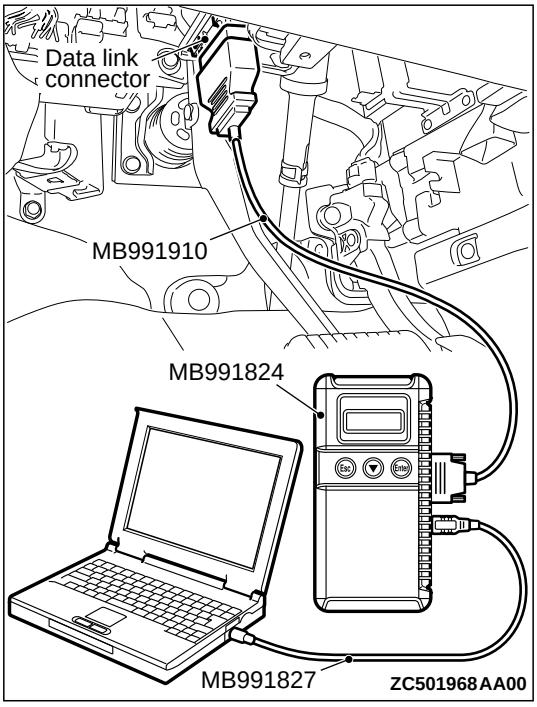
- DTC P0450 can be set by a faulty fuel tank differential pressure sensor or related circuit, or ECM failure.
- To check for system blockage, do a performance test which uses a mechanical vacuum gauge and scan tool MB991958 set on the fuel tank differential pressure sensor (TANK PRS SNSR 73). The mechanical 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
- MB992110: Power Plant ECU Check Harness

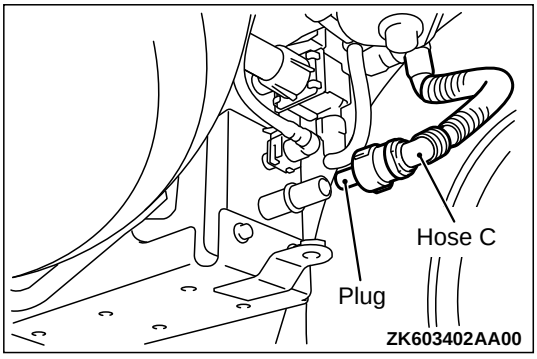
STEP 1. Using scan tool MB991958, check data list item 52: Fuel Tank Differential Pressure Sensor.



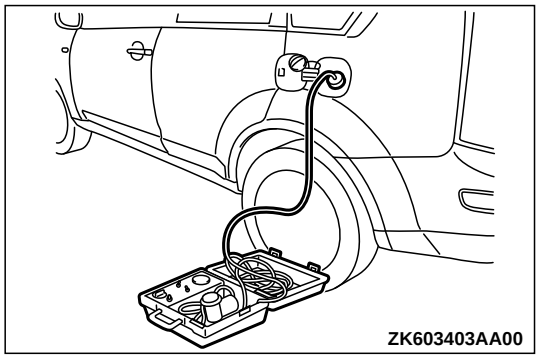
CAUTION

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 C 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 2050 to 2950 mV.


ZK603403AA00

(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.

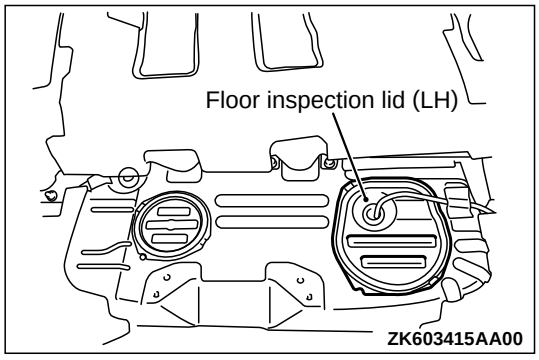
(7) Turn the ignition switch to the "LOCK" (OFF) position. Then disconnect scan tool MB991958.
(8) Remove the evaporative emission system pressure pump (Miller number 6872A) and the fuel tank adapter (MLR-8382), and reinstall the fuel cap.
(9) Connect hose C to the evaporative emission canister.

Q:Is the fuel tank pressure between 2,050 and 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.00-15).
NO: Go to Step 2.

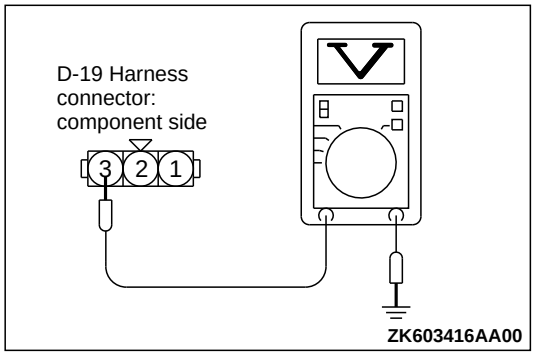
STEP 2. Check harness connector B-11 at ECM and harness connector D-19 at fuel tank differential pressure sensor for damage.

Q:Is the harness connector in good condition?
YES: Then 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. Measure the 5-volt reference signal at fuel tank differential pressure sensor connector D-19.
(1) Remove the second seat assembly (Refer to GROUP 52A, Second Seat Assembly P.52A-21).
(2) Remove the floor inspection lid (LH).
(3) Disconnect fuel tank differential pressure sensor connector D-19.
(4) Turn the ignition switch to the "ON" position.



ZK603415AA00

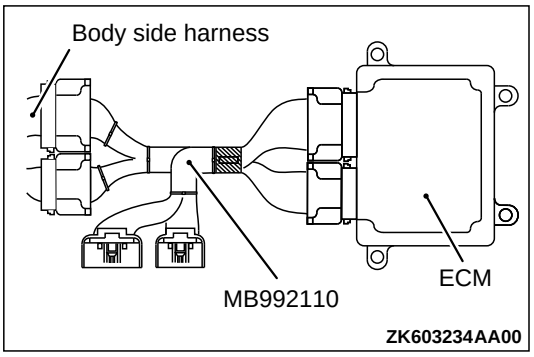


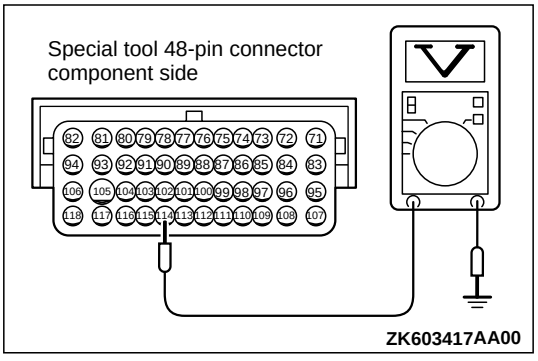
ZK603416AA00

(5) Measure the voltage between terminal 3 and ground.
- The voltage should measure between 4.9 and 5.1 volts.

(6) 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. Measure the 5-volt reference signal at ECM connector B-11 by using check harness special tool MB992110.

(1) Disconnect all ECM connectors. Connect the power plant ECU check harness special tool MB992110 between the separated connectors.
(2) Turn the ignition switch to the "ON" position.
(3) Remove the fuel cap.
(4) Measure the voltage between terminal 114 and ground.
- The voltage should measure between 2.0 and 3.0 volts.

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

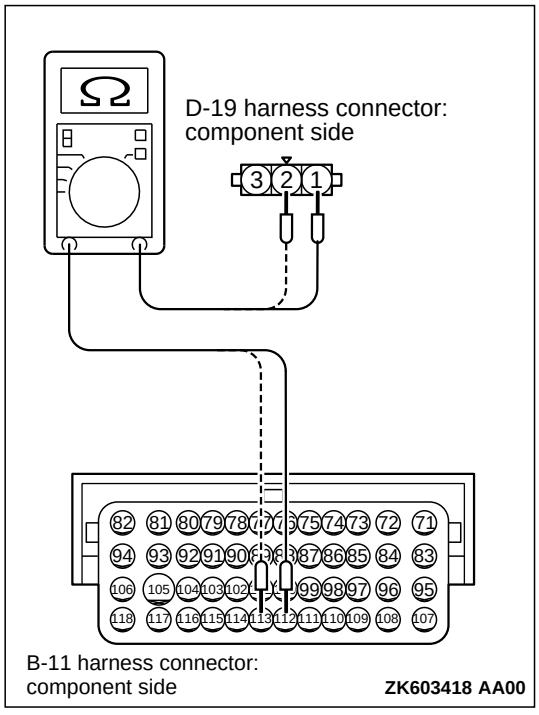
Q:Is the measured voltage between 2.0 and 3.0 volts?

YES: Check harness connector C-129 at intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness connector Inspection P. 00E-2. If intermediate connector C-129 is in good condition, repair it because of harness damage fuel tank differential pressure sensor connector D-19 (terminal No. 3) and ECM connector B-11 (terminal No. 114). Then go to Step 7.

NO: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 7.

STEP 5. Check the harness wire between ECM connector B-11 and fuel tank differential pressure sensor connector D-19 for damage.

(1) Disconnect the connector B-11 and D-19 measure at the harness side.



(2) Measure the resistance between connector B-11 and connector D-19.
 a Connector B-11 (terminal No. 112) and connector D-19 . (terminal No. 1).
 b Connector B-11 (terminal No. 113) and connector D-19 . (terminal No. 2).
  ▪Should be less than 2 ohms.

Q:Is the measured resistance less than 2 ohms?
YES: Go to Step 6.
NO: Repair the damaged harness wires. Then go to Step 7.

STEP 6. Replace the fuel tank differential pressure sensor.
(1) Replace the fuel tank differential pressure sensor.
(2) Carry out test drive with the drive cycle pattern. Refer to Diagnostic Function. OBD-II Drive Cycle. Pattern 5 P. 13Ab-8.
(3) Check the diagnostic trouble code (DTC).

Q:Is DTC P0450 set?
YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 7.
NO: The inspection is complete.

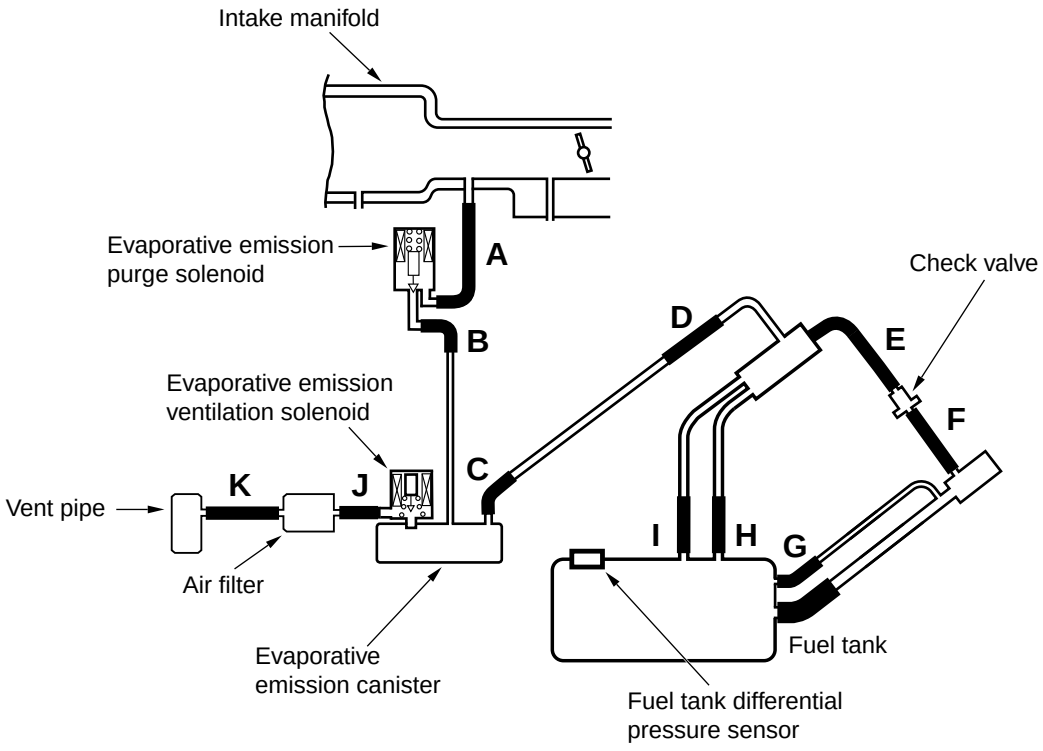
STEP 7. Perform the OBD-II drive cycle.
(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function - OBD-II Drive Cycle - Pattern 5 P. 13Ab-8.
(2) Check the diagnostic trouble code (DTC).

Q:Is DTC P0450 set?
YES: Repeat the troubleshooting.
NO: The procedure is complete.

DTC P0451: Evaporative Emission Control System Pressure Sensor Range/ Performance

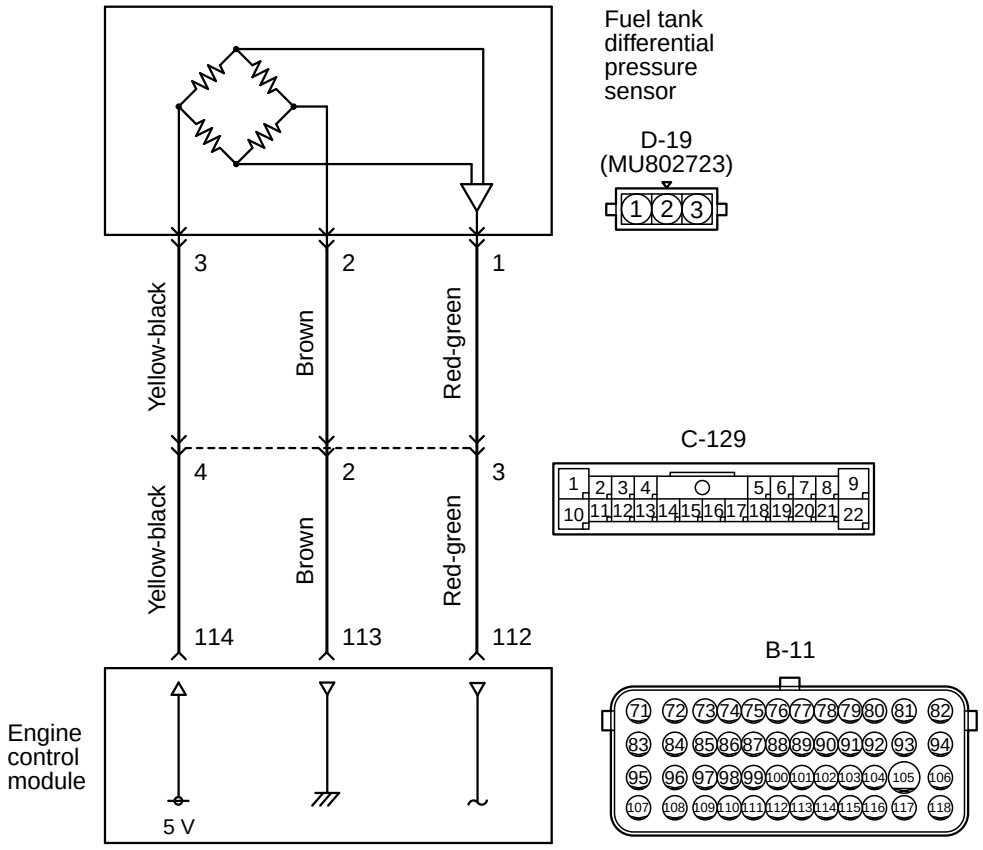
M11310100406USA0000010000

System diagram

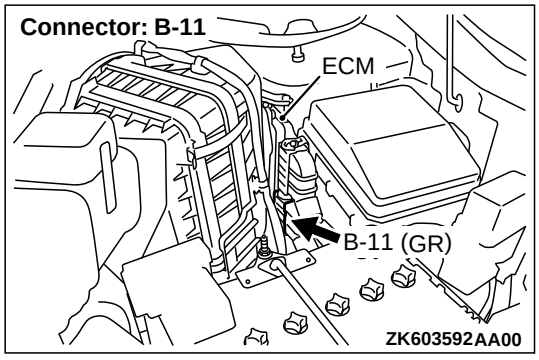


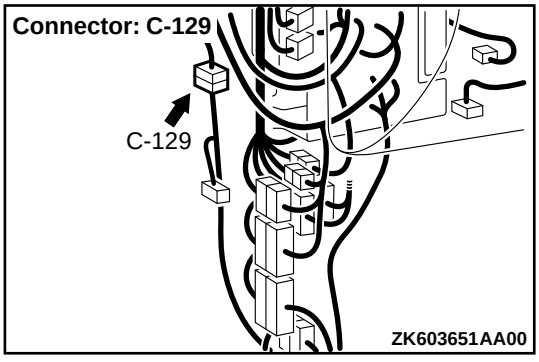
ZK603432AA00

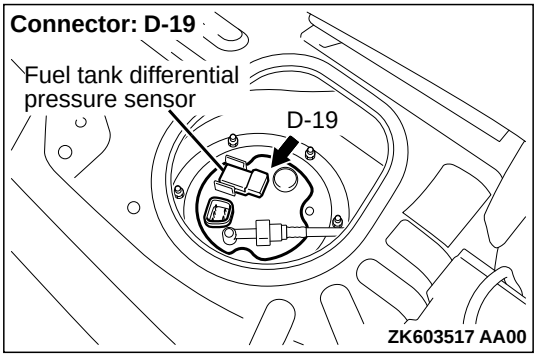
Fuel Tank Differential Pressure Sensor Circuit



ZK603433AA00







CIRCUIT OPERATION

- The ECM (terminal No. 114) supplies a 5-volt reference signal to the fuel tank differential pressure sensor (terminal No. 3). The fuel tank differential pressure sensor (terminal No. 2) is grounded through the ECM (terminal No. 113).
- The fuel tank differential pressure sensor (terminal No. 1) returns a voltage signal to the ECM (terminal No. 112) that is proportional to the pressure in the fuel tank.

TECHNICAL DESCRIPTION

- The ECM monitors the fuel tank differential pressure sensor signal voltage.
- The ECM 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

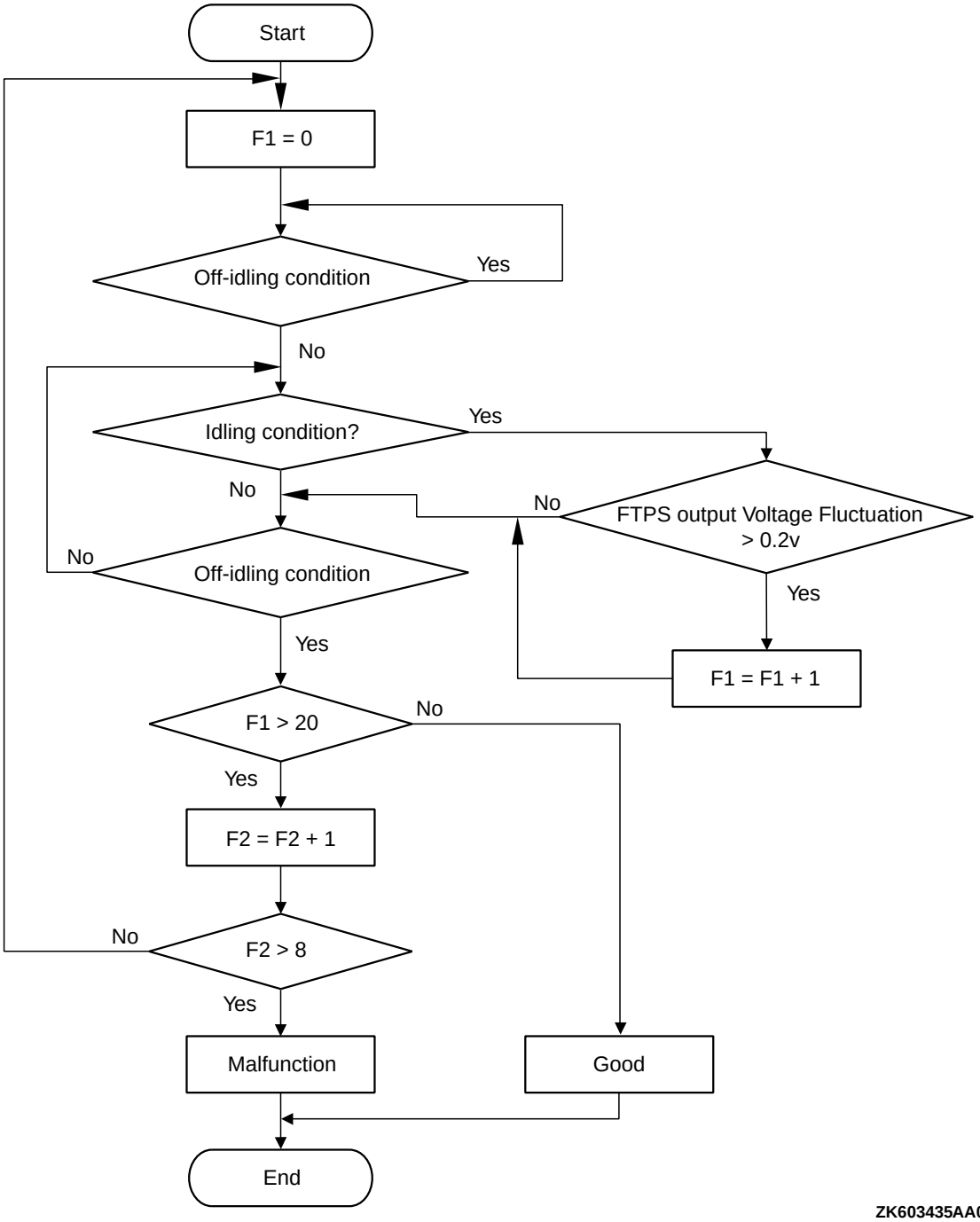
Sensor (The sensors below are determined to be normal)

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

DTC SET CONDITIONS

Logic Flow Chart

Logic Flow Chart



ZK603435AA00

Check Conditions

- Throttle valve is closed.
- Vehicle speed is 1.5 km/h (0.93 mph) or less.

Judgement 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.

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

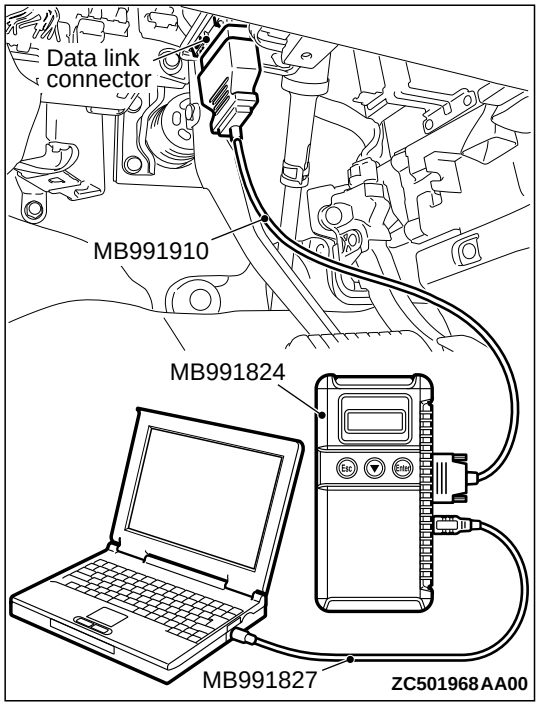
Refer to Diagnostic Function - OBD-II Drive Cycle - Pattern 16 P.13Ab-8.

TROUBLESHOOTING HINTS (THE MOST LIKELY CAUSES FOR THIS CODE TO BE SET ARE:)
- Connector damage.
- Harness damage.
- Fuel tank differential pressure sensor failed.
- ECM failed.

OVERVIEW OF TROUBLESHOOTING
- DTC P0451 can be set by a faulty fuel tank differential pressure sensor or related circuit, or ECM 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
- MB992110: Power Plant ECU Check Harness

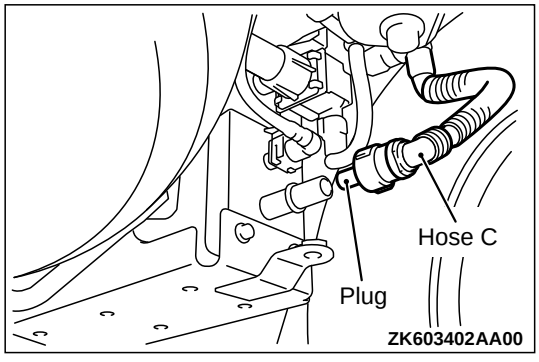


STEP 1. Using scan tool MB991958, check data list item 52: Fuel Tank Differential Pressure Sensor.

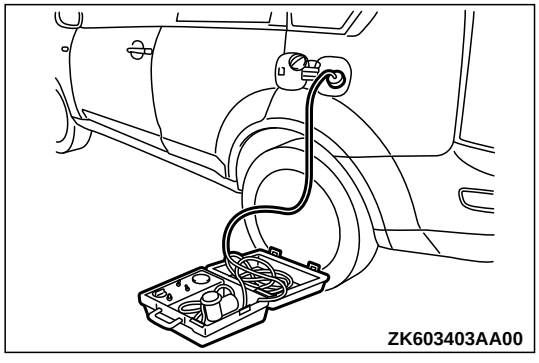
⚠ CAUTION

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 C 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 2050 to 2950 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 C to the evaporative emission canister.

Q:Is the fuel tank pressure between 2,050 and 2,950 mV?

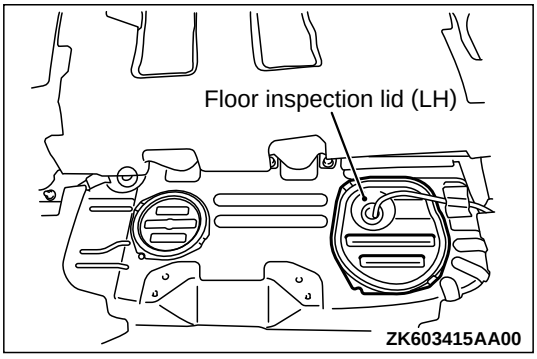
YES: It can be assumed that this malfunction is intermittent (Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points - How to Cope with Intermittent Malfunctions P.00-15).

NO: Go to Step 2.

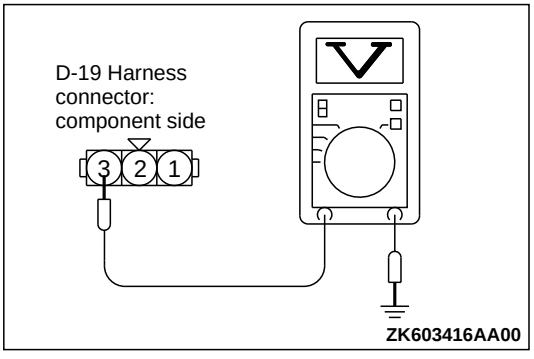
STEP 2. Check harness connector B-11 at ECM and harness connector D-19 at fuel tank differential pressure sensor for damage.

Q:Is the harness connector in good condition?
YES: Then 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. Measure the 5-volt reference signal at fuel tank differential pressure sensor connector D-19.



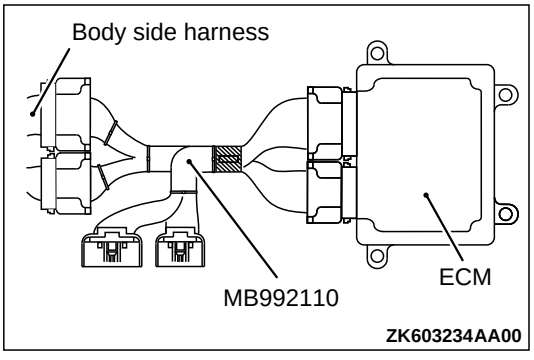
(1) Remove the second seat assembly (Refer to GROUP 52A, Second Seat Assembly P.52A-21).
(2) Remove the floor inspection lid (LH).
(3) Disconnect fuel tank differential pressure sensor connector D-19.
(4) Turn the ignition switch to the "ON" position.



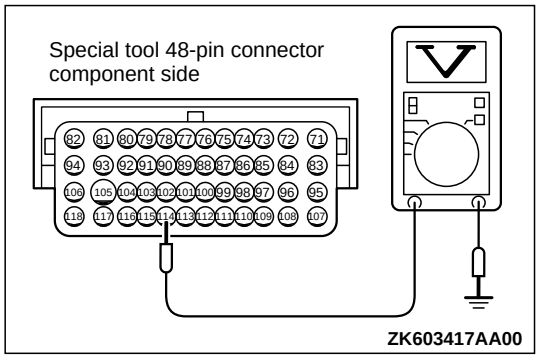
(5) Measure the voltage between terminal 3 and ground.
▪The voltage should measure between 4.9 and 5.1 volts.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q:Is the measured voltage between 4.9 and 5.1 volts?
YES: Go to Step 5.
NO: Go to Step 4.

STEP 4. Measure the 5-volt reference signal at ECM connector B-11 by using check harness special tool MB992110.



(1) Disconnect all ECM connectors. Connect the power plant ECU check harness special tool MB992110 between the separated connectors.
(2) Turn the ignition switch to the "ON" position.
(3) Remove the fuel cap.



(4) Measure the voltage between terminal 114 and ground.
- The voltage should measure between 2.0 and 3.0 volts.

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

Q:Is the measured voltage between 2.0 and 3.0 volts?

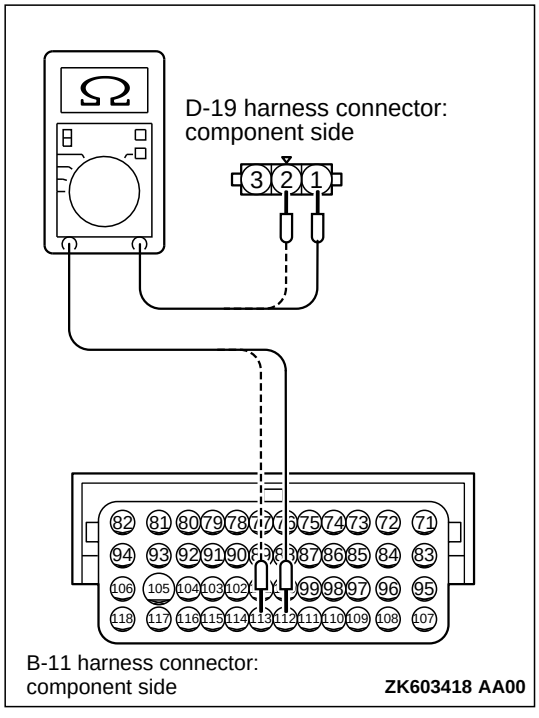
YES: Check harness connector C-129 at intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness connector Inspection P. 00E-2. If intermediate connector C-129 is in good condition, repair it because of harness damage fuel tank differential pressure sensor connector D-19 (terminal No. 3) and ECM connector B-11 (terminal No. 114). Then go to Step 7.

NO: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 7.

STEP 5. Check the harness wire between ECM connector B-11 and fuel tank differential pressure sensor connector D-19 for damage.

(1) Disconnect the connector B-11 and D-19 measure at the harness side.

(2) Measure the resistance between connector B-11 and connector D-19.
- a Connector B-11 (terminal No. 112) and connector D-19 . (terminal No. 1).
- b Connector B-11 (terminal No. 113) and connector D-19 . (terminal No. 2).
  - Should be less than 2 ohms.



Q:Is the measured resistance less than 2 ohms?

YES: Go to Step 6.

NO: Repair the damaged harness wires. Then go to Step 7.

STEP 6. Replace the fuel tank differential pressure sensor.

(1) Replace the fuel tank differential pressure sensor.

(2) Carry out test drive with the drive cycle pattern. Refer to Diagnostic Function. OBD-II Drive Cycle. Pattern 16 P. 13Ab-8.

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

Q:Is DTC P0451 set?

YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 7.
NO: The inspection is complete.

STEP 7. 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 16 P. 13Ab-8.
(2) Check the diagnostic trouble code (DTC).

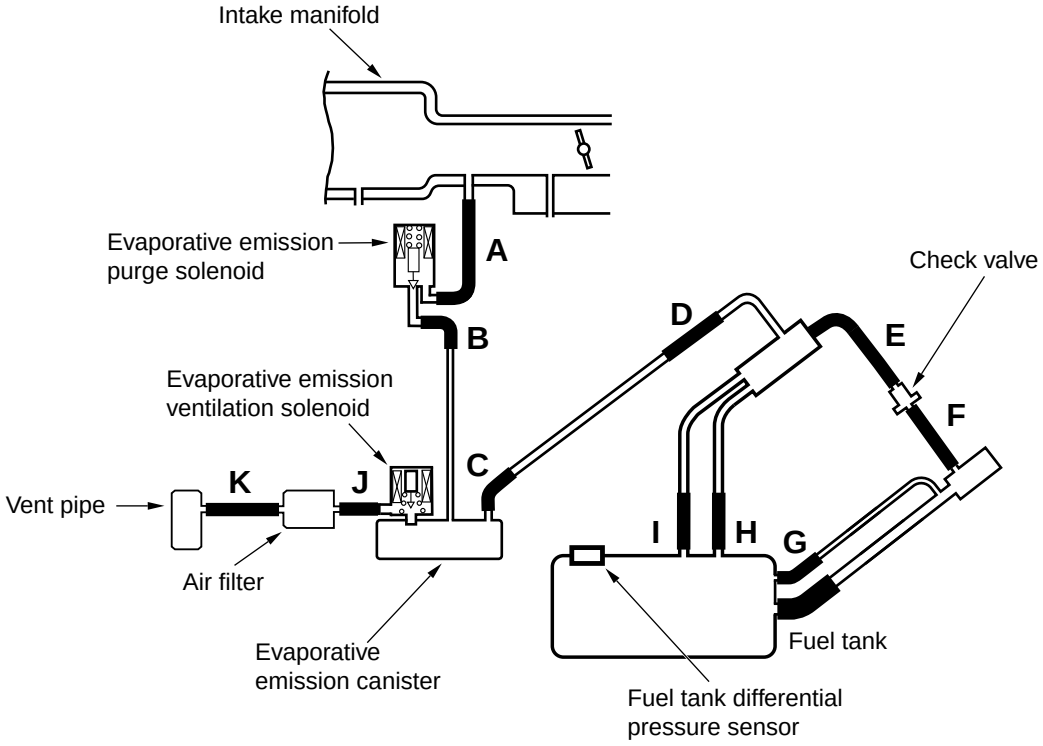
Q:Is DTC P0451 set?

YES: Repeat the troubleshooting.
NO: The procedure is complete.

DTC P0452: Evaporative Emission Control System Pressure Sensor Low Input

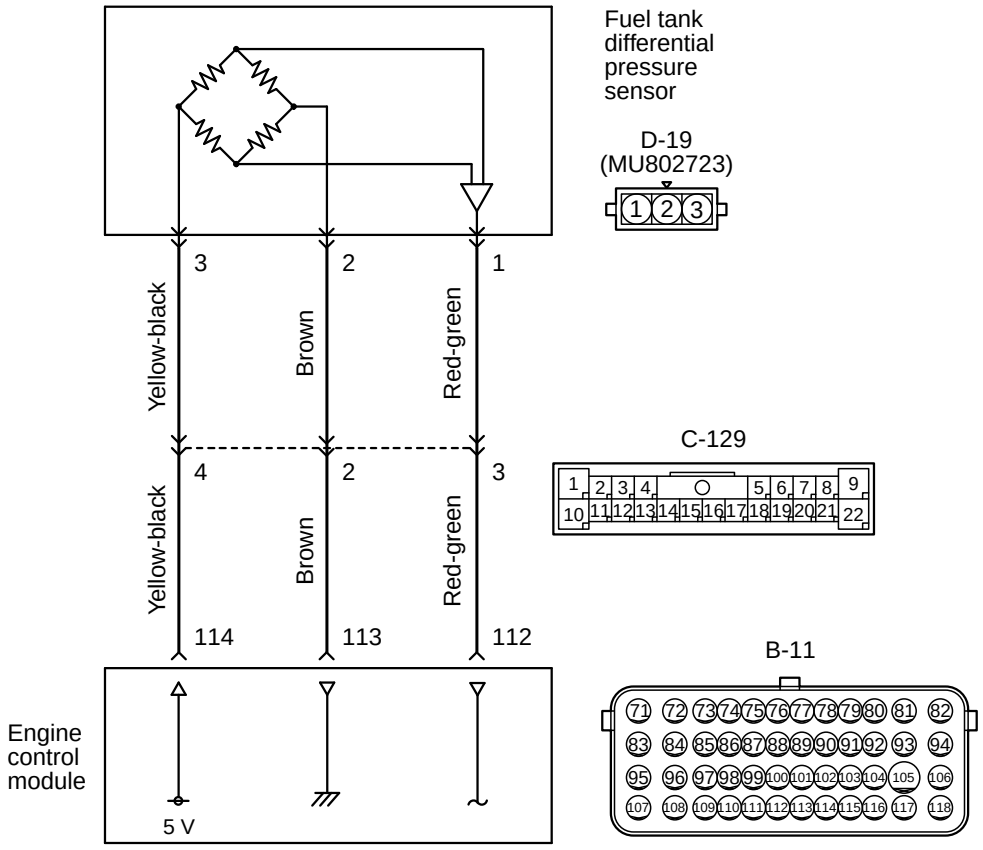
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System diagram

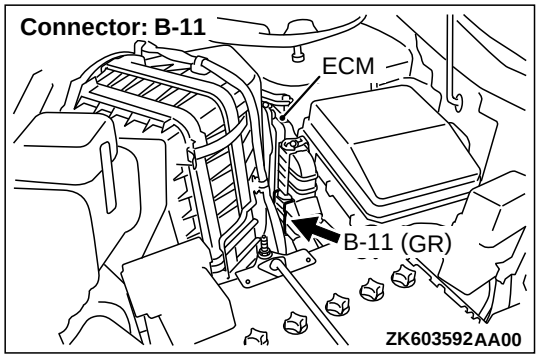


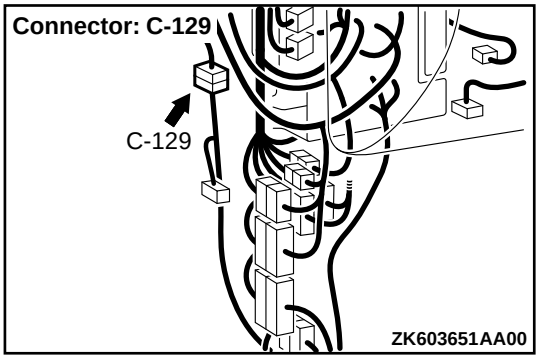
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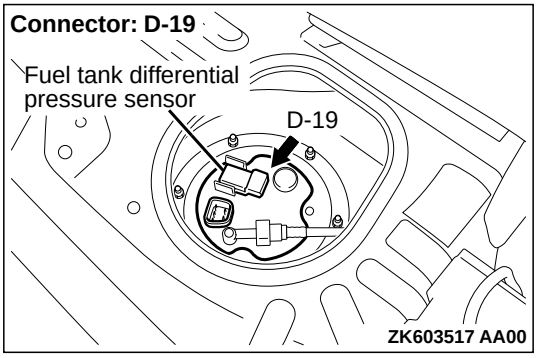
Fuel Tank Differential Pressure Sensor Circuit



ZK603433AA00







CIRCUIT OPERATION

- The ECM (terminal No. 114) supplies a 5-volt reference signal to the fuel tank differential pressure sensor (terminal No. 3). The fuel tank differential pressure sensor (terminal No. 2) is grounded through the ECM (terminal No. 113).
- The fuel tank differential pressure sensor (terminal No. 1) returns a voltage signal to the ECM (terminal No. 112) that is proportional to the pressure in the fuel tank.

TECHNICAL DESCRIPTION

- The ECM monitors the fuel tank differential pressure sensor output voltage.
- The ECM 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

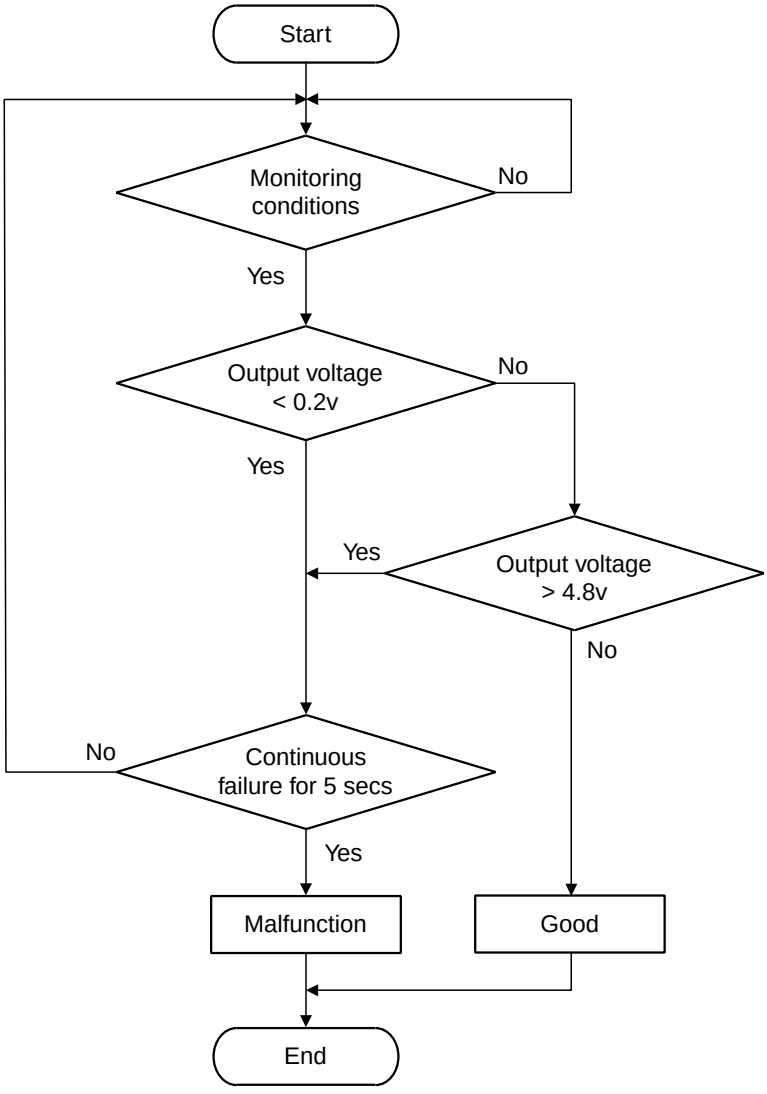
Sensor (The sensors below are determined to be normal)

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

DTC SET CONDITIONS

Logic Flow Chart

Logic Flow Chart



ZK603436AA00

Check Conditions

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

Judgement Criteria

- 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 24 P.13Ab-8.

TROUBLESHOOTING HINTS (THE MOST LIKELY CAUSES FOR THIS CODE TO BE SET ARE:)

- Connector damage.
- Harness damage.
- Fuel tank differential pressure sensor failed.
- ECM failed.

OVERVIEW OF TROUBLESHOOTING

- DTC P0452 can be set by a faulty fuel tank differential pressure sensor or related circuit, or ECM 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

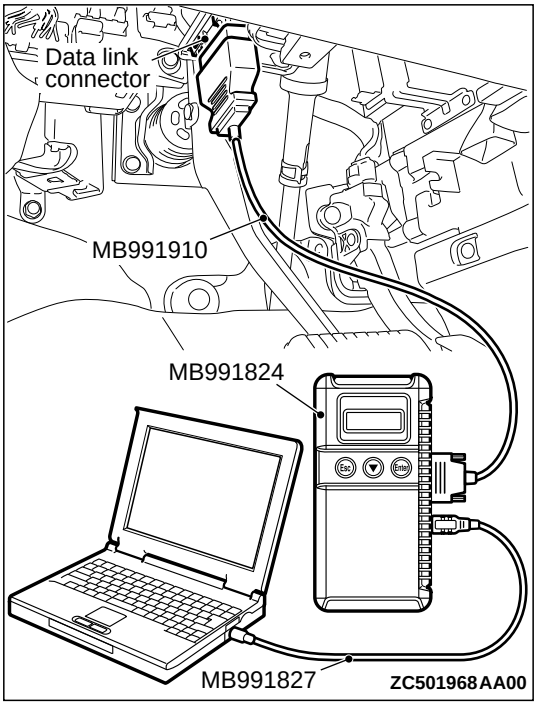
Required Special Tools:
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A
- MB992110: Power Plant ECU Check Harness

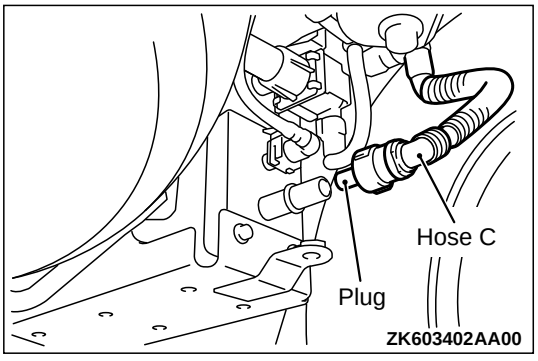
STEP 1. Using scan tool MB991958, check data list item 52: Fuel Tank Differential Pressure Sensor.

⚠ CAUTION

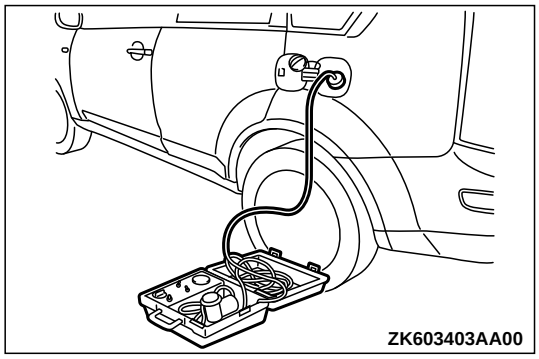
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.





(2) Disconnect hose C 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 2050 to 2950 mV.


ZK603403AA00

(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.

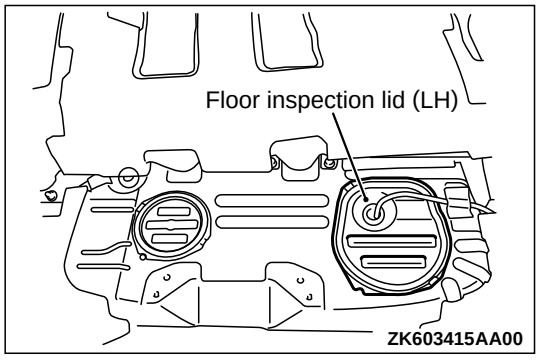
(7) Turn the ignition switch to the "LOCK" (OFF) position. Then disconnect scan tool MB991958.
(8) Remove the evaporative emission system pressure pump (Miller number 6872A) and the fuel tank adapter (MLR-8382), and reinstall the fuel cap.
(9) Connect hose C to the evaporative emission canister.

Q:Is the fuel tank pressure between 2,050 and 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.00-15).
NO: Go to Step 2.

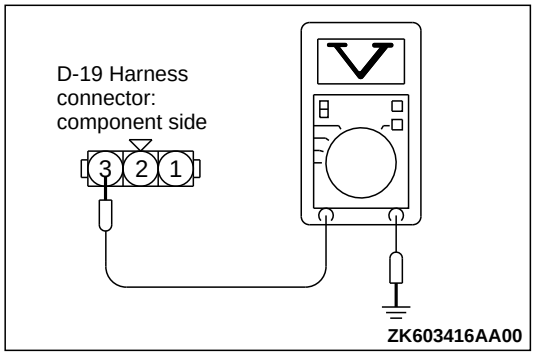
STEP 2. Check harness connector B-11 at ECM and harness connector D-19 at fuel tank differential pressure sensor for damage.

Q:Is the harness connector in good condition?
YES: Then 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. Measure the 5-volt reference signal at fuel tank differential pressure sensor connector D-19.
(1) Remove the second seat assembly (Refer to GROUP 52A, Second Seat Assembly P.52A-21).
(2) Remove the floor inspection lid (LH).
(3) Disconnect fuel tank differential pressure sensor connector D-19.
(4) Turn the ignition switch to the "ON" position.



ZK603415AA00



ZK603416AA00

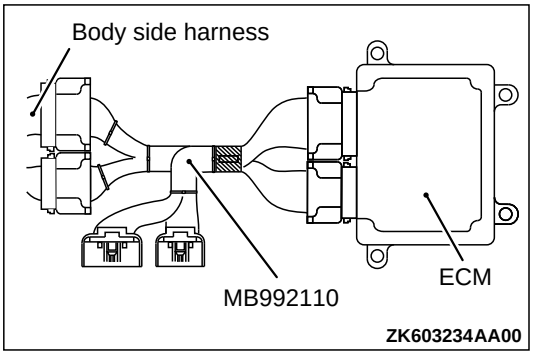
(5) Measure the voltage between terminal 3 and ground.
- The voltage should measure between 4.9 and 5.1 volts.

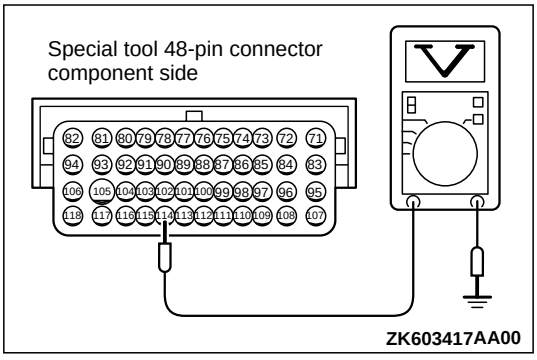
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q:Is the measured voltage between 4.9 and 5.1 volts?
YES: Go to Step 6.
NO: Go to Step 4.

STEP 4. Measure the 5-volt reference signal at ECM connector B-11 by using check harness special tool MB992110.

(1) Disconnect all ECM connectors. Connect the power plant ECU check harness special tool MB992110 between the separated connectors.
(2) Turn the ignition switch to the "ON" position.
(3) Remove the fuel cap.





(4) Measure the voltage between terminal 114 and ground.
- The voltage should measure between 2.0 and 3.0 volts.

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

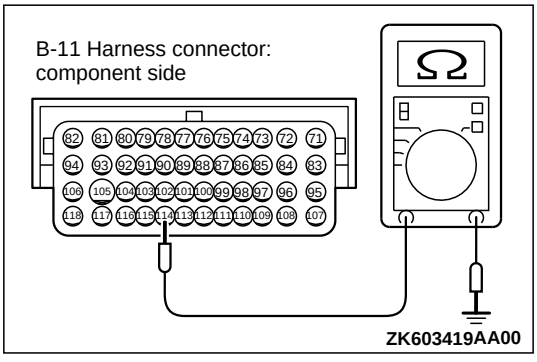
Q:Is the measured voltage between 2.0 and 3.0 volts?

YES: Check harness connector C-129 at intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness connector Inspection P. 00E-2. If intermediate connector C-129 is in good condition, repair it because of harness damage fuel tank differential pressure sensor connector D-19 (terminal No. 3) and ECM connector B-11 (terminal No. 114). Then go to Step 8.

NO: Go to Step 5.

STEP 5. Check for short circuit to ground between fuel tank differential pressure sensor connector D-19 and ECM connector B-11.

(1) Disconnect the connector D-19 and B-11 measure at the harness side.
(2) Check for the continuity between connector B-11 (terminal No. 114) and ground.
- Not continuity.



Q:Is the harness wire in good condition?

YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 8.

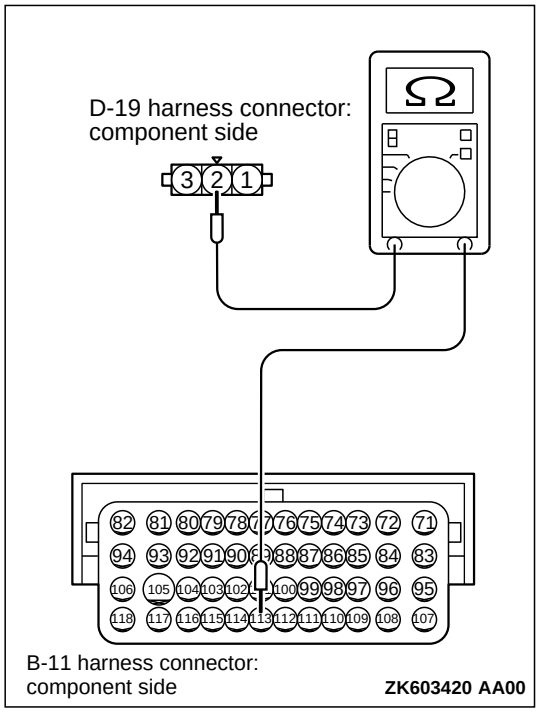
NO: Check harness connector C-129 at intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness connector Inspection P. 00E-2. If intermediate connector C-129 is in good condition, repair it because of open circuit or harness damage fuel tank differential pressure sensor connector

D-19 (terminal No. 3) and ECM connector B-11 (terminal No. 114). Then go to Step 8.

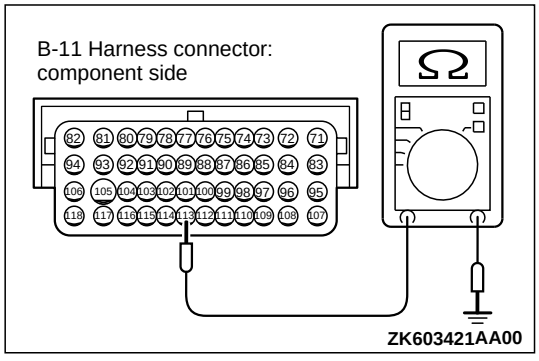
STEP 6. Check for open circuit or short circuit to ground or harness damage between fuel tank differential pressure sensor connector D-19 and ECM connector B-11.

(1) Disconnect the connector D-19 and B-11 measure at the harness side.

(2) Measure the resistance between connector D-19 (terminal No. 2) and connector B-11 (terminal No. 113).
- Should be less than 2 ohms.



(3) Check for the continuity between connector B-11 (terminal No. 113) and ground.
- Not continuity.



Q:Is the harness connector in good condition?

YES: Then go to Step 7.

NO: Repair it. Then go to Step 8.

STEP 7. Replace the fuel tank differential pressure sensor.

(1) Replace the fuel tank differential pressure sensor.

(2) Carry out test drive with the drive cycle pattern. Refer to Diagnostic Function. OBD-II Drive Cycle. Pattern 24 P. 13Ab-8.

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

Q:Is DTC P0452 set?

YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 8.

NO: The inspection is complete.

STEP 8. 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 24 P. 13Ab-8.

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

Q:Is DTC P0452 set?

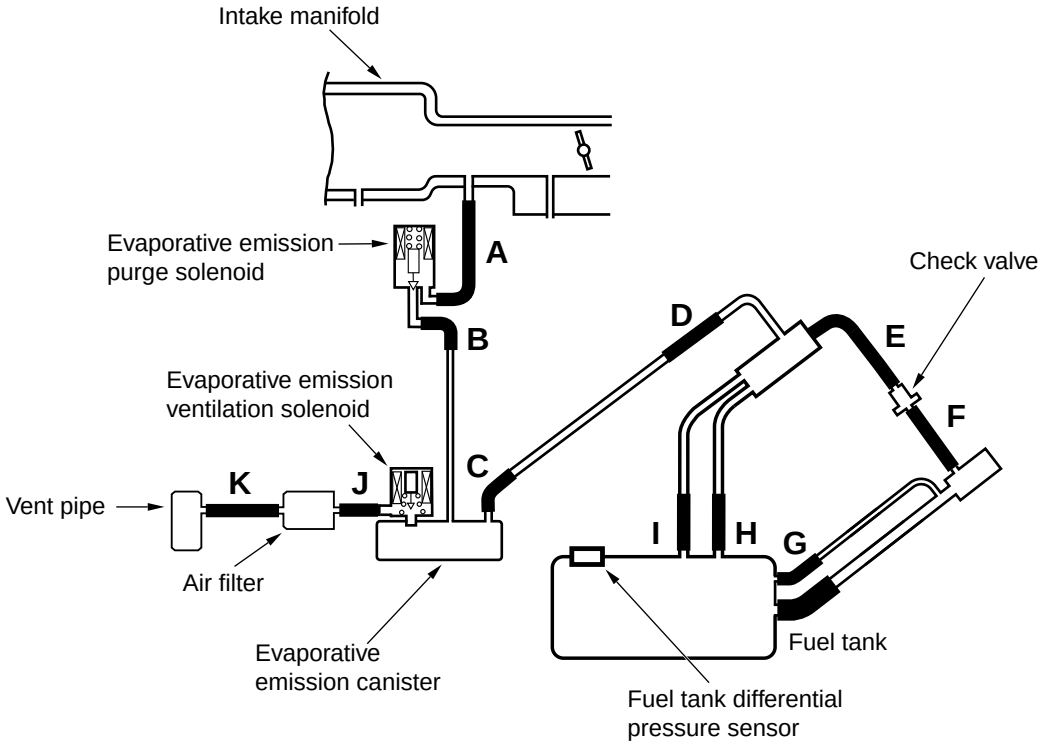
YES: Repeat the troubleshooting.

NO: The procedure is complete.

DTC P0453: Evaporative Emission Control System Pressure Sensor High Input

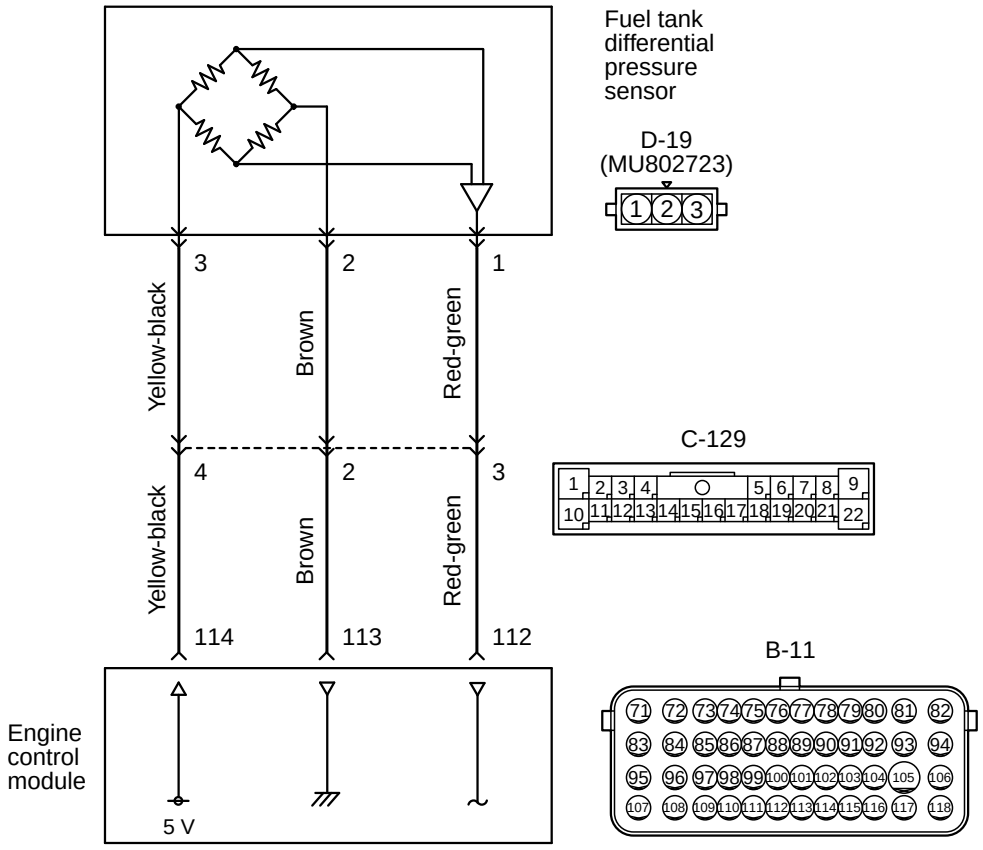
M11310100408USA0000010000

System diagram

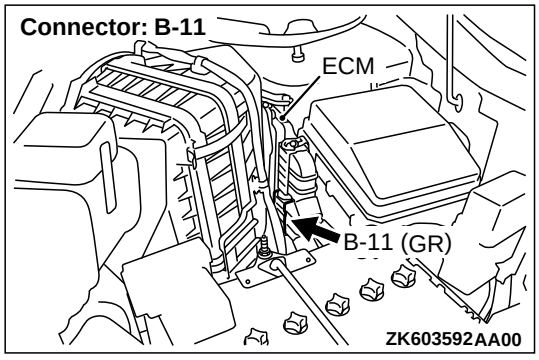


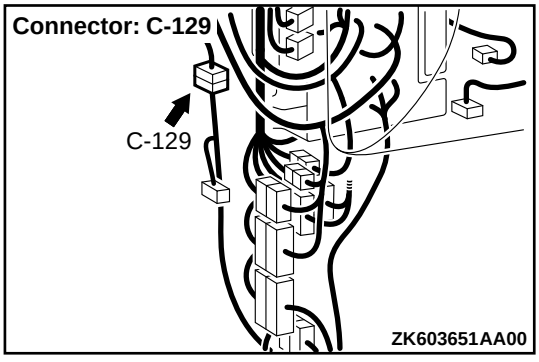
ZK603432AA00

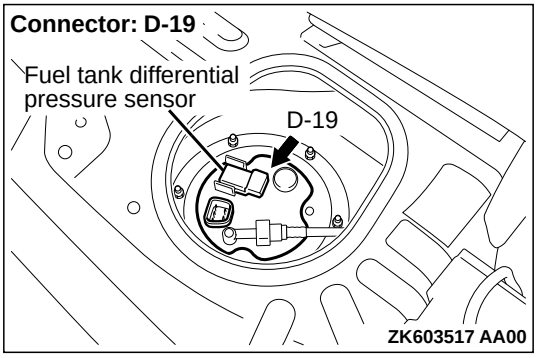
Fuel Tank Differential Pressure Sensor Circuit



ZK603433AA00







CIRCUIT OPERATION

- The ECM (terminal No. 114) supplies a 5-volt reference voltage to the fuel tank differential pressure sensor (terminal No. 3). The ECM (terminal No. 113) supplies a ground to the fuel tank differential pressure sensor (terminal No. 2).
- The ECM (terminal No. 112) receives a voltage signal proportional to the pressure in the fuel tank from the fuel tank differential pressure sensor (terminal No. 1).

TECHNICAL DESCRIPTION

- To determine whether the fuel tank differential pressure sensor is defective, the ECM monitors the fuel tank differential pressure sensor output voltage.
- The ECM 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

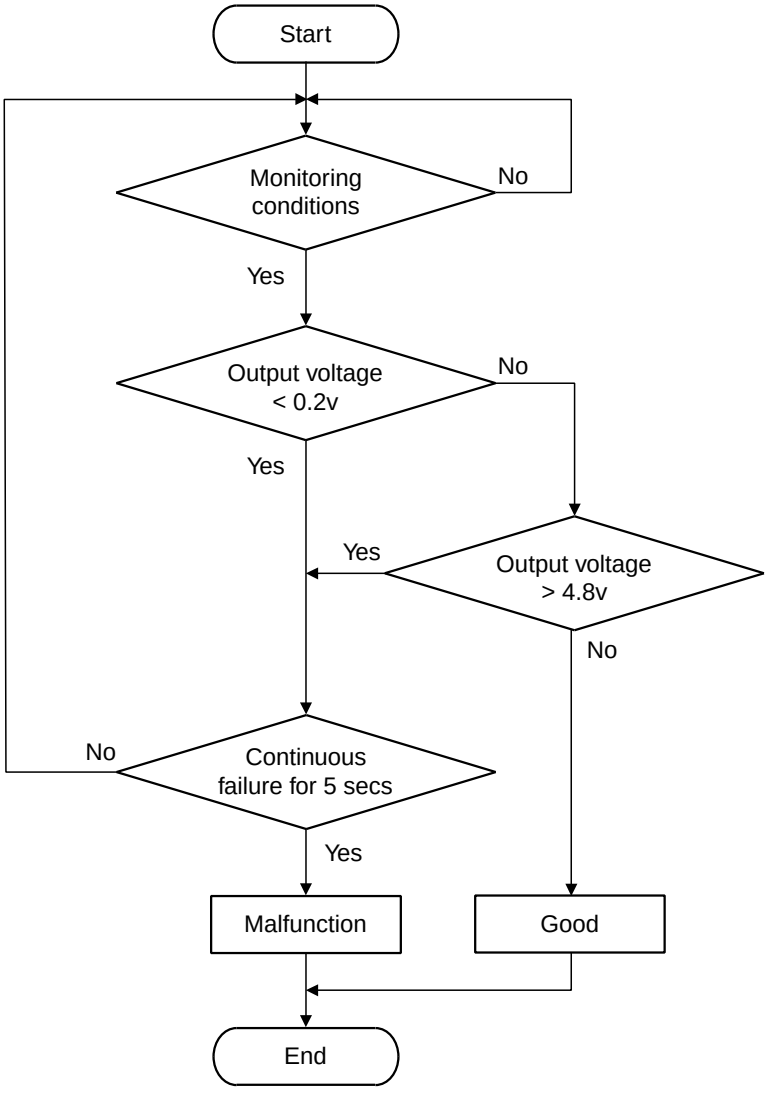
Sensor (The sensors below are determined to be normal)

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

DTC SET CONDITIONS

Logic Flow Chart

Logic Flow Chart



ZK603436AA00

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 percent or less when the engine is started.

Judgement Criteria

- The fuel tank differential pressure sensor output voltage remains 4.8 volts or greater for 5 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function - OBD-II Drive Cycle - Pattern 24 P.13Ab-8.

TROUBLESHOOTING HINTS (THE MOST LIKELY CAUSES FOR THIS CODE TO BE SET ARE:)

- Connector damage.
- Harness damage.
- Fuel tank differential pressure sensor failed.
- ECM failed.

OVERVIEW OF TROUBLESHOOTING

- DTC P0453 can be set by a faulty fuel tank differential pressure sensor or related circuit, or ECM 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 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:

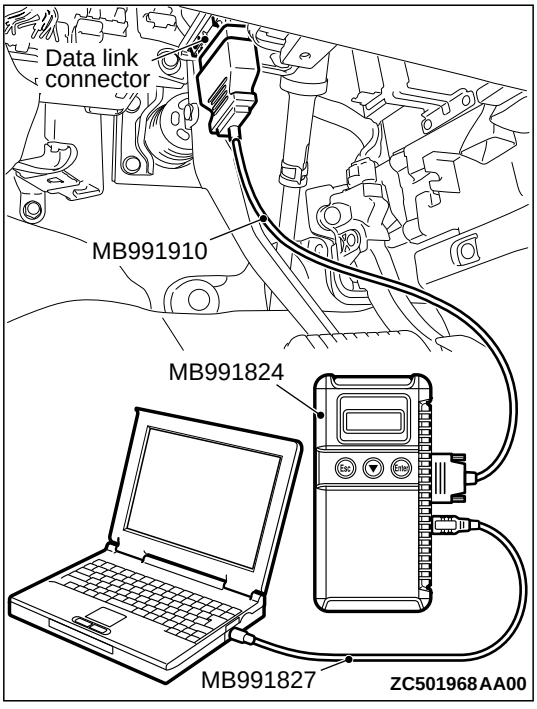
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A

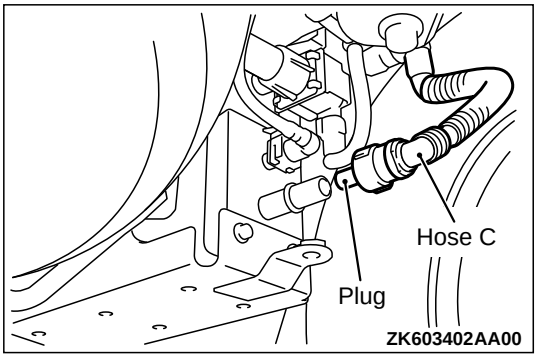
STEP 1. Using scan tool MB991958, check data list item 52: Fuel Tank Differential Pressure Sensor.

⚠ CAUTION

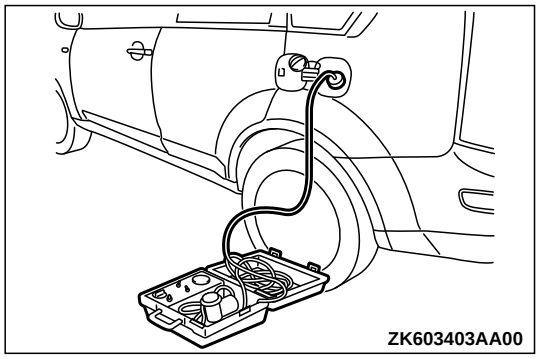
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.





(2) Disconnect hose C 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 2050 to 2950 mV.


ZK603403AA00

(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 C to the evaporative emission canister.

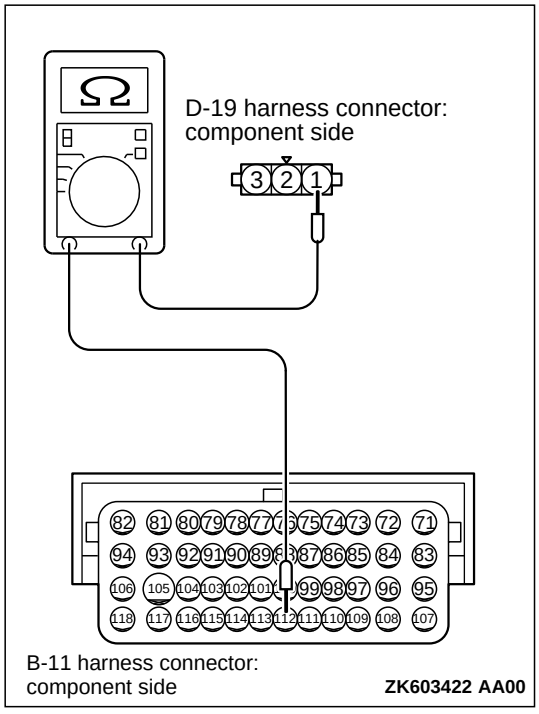
Q:Is the fuel tank pressure between 2,050 and 2,950 mV?
YES: It can be assumed that this malfunction is intermittent (Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points - How to Cope with Intermittent Malfunctions P.00-15).
NO: Go to Step 2.

STEP. 2 Check harness connector B-11 at ECM and harness connector D-19 at fuel tank differential pressure sensor for damage.

Q:Is the harness connector in good condition?
YES: Then go to Step 3.
NO: Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 5.

STEP 3. Check for open circuit or harness damage between fuel tank differential pressure sensor connector D-19 and ECM connector B-11.

(1) Disconnect the connector D-19 and B-11 measure at the harness side.
(2) Measure the resistance between connector D-19 (terminal No. 1) and connector B-11 (terminal No. 112).
- Should be less than 2 ohms.



ZK603422 AA00

Q:Is the measured resistance less than 2 ohms?
YES: Go to Step 4.
NO: Repair it. Then Go to Step 5.

STEP 4. Replace the fuel tank differential pressure sensor.

(1) Replace the fuel tank differential pressure sensor.

(2) Carry out test drive with the drive cycle pattern. Refer to Diagnostic Function. OBD-II Drive Cycle. Pattern 24 P. 13Ab-8.
(3) Check the diagnostic trouble code (DTC).

Q:Is DTC P0453 set?
YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 5.
NO: The inspection is complete.

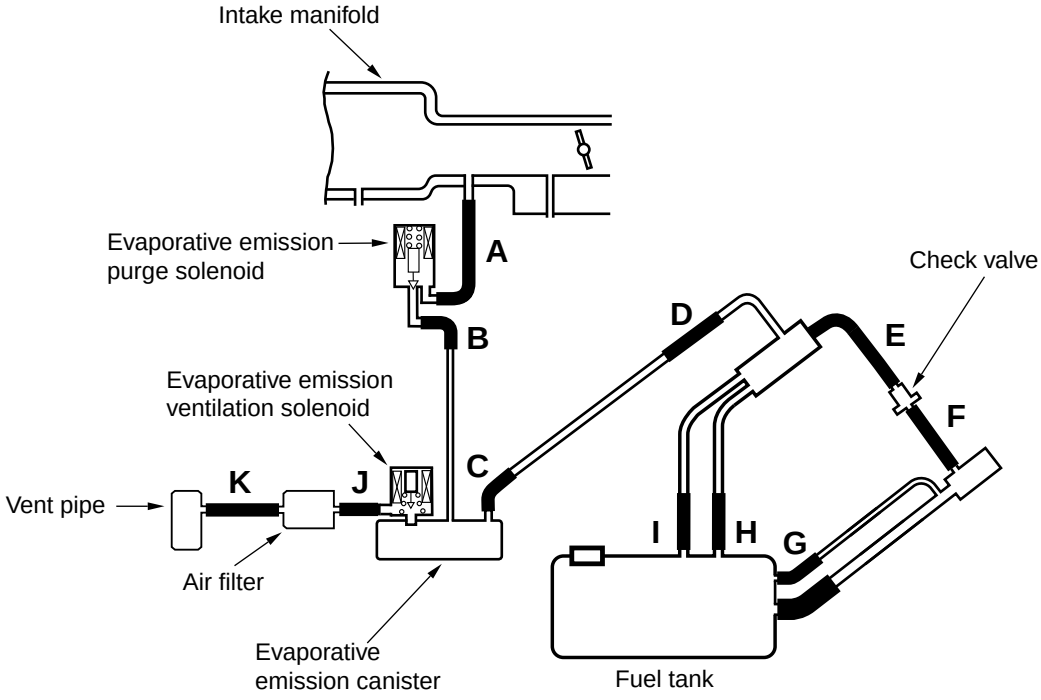
STEP 5. Perform the OBD-II drive cycle.
(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function - OBD-II Drive Cycle - Pattern 24 P. 13Ab-8.
(2) Check the diagnostic trouble code (DTC).

Q:Is DTC P0453 set?
YES: Repeat the troubleshooting.
NO: The procedure is complete.

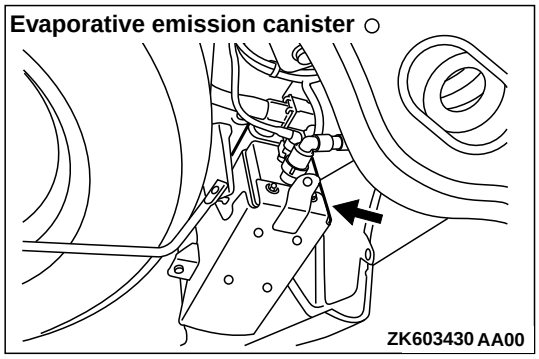
DTC P0455: Evaporative Emission Control System Leak Detected (Gross Leak)

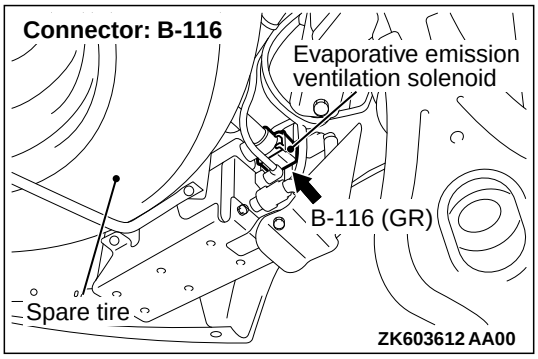
M11310100409USA0000010000

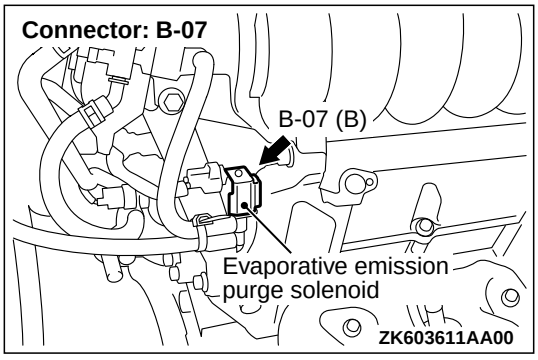
System diagram



ZK603429AA00







TECHNICAL DESCRIPTION

- The fuel tank may be under a slight pressure or vacuum depending on the state of the Evaporative Emission (EVAP) System. The ECM monitors and responds to these pressure/vacuum changes. If the pressure/vacuum varies from the specified range, the ECM will set DTC P0455.
- The ECM 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 ECM 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

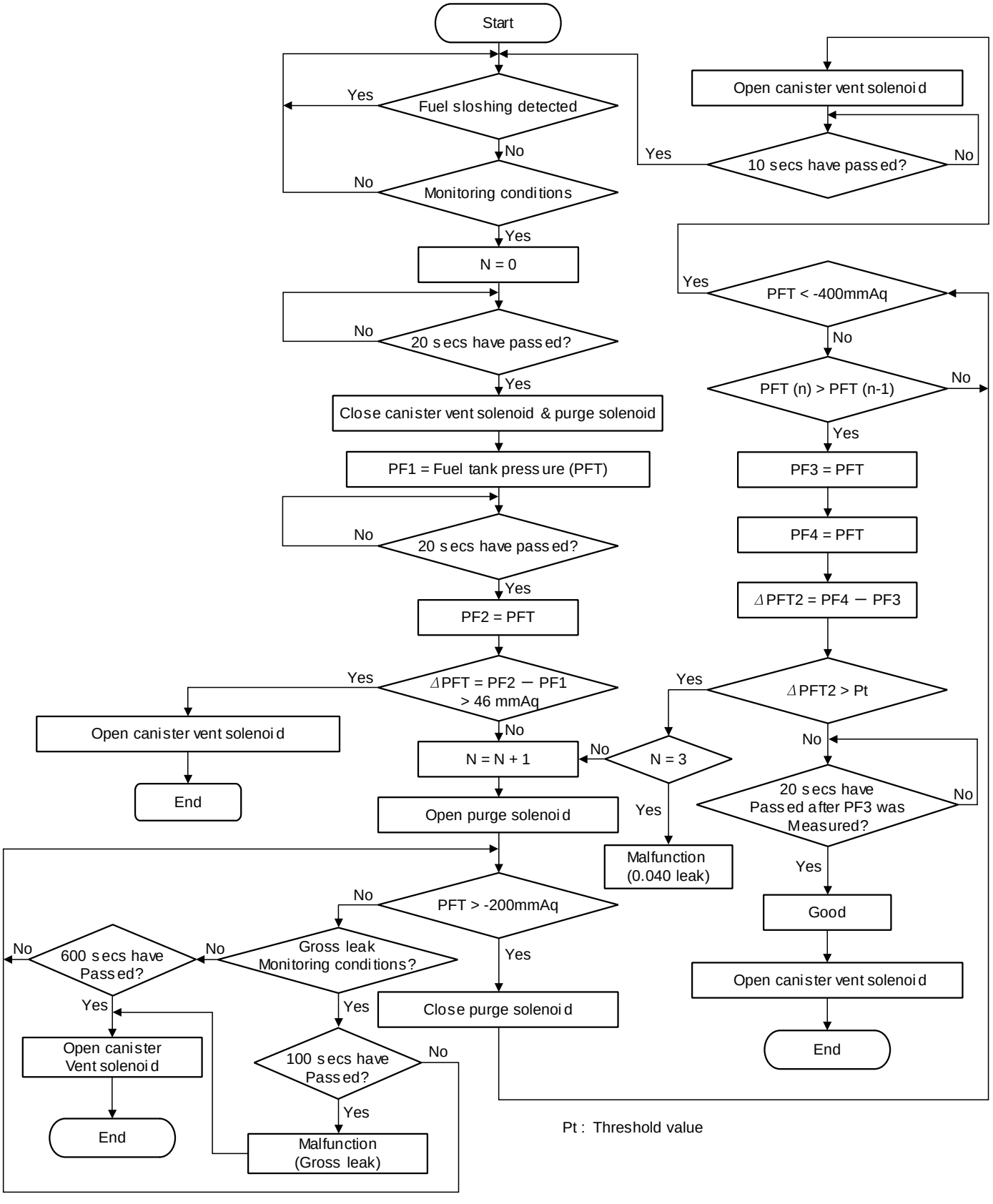
Sensor (The sensors below are determined to be normal)

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

DTC SET CONDITIONS

Logic Flow Chart <0.04 in leak monitor>

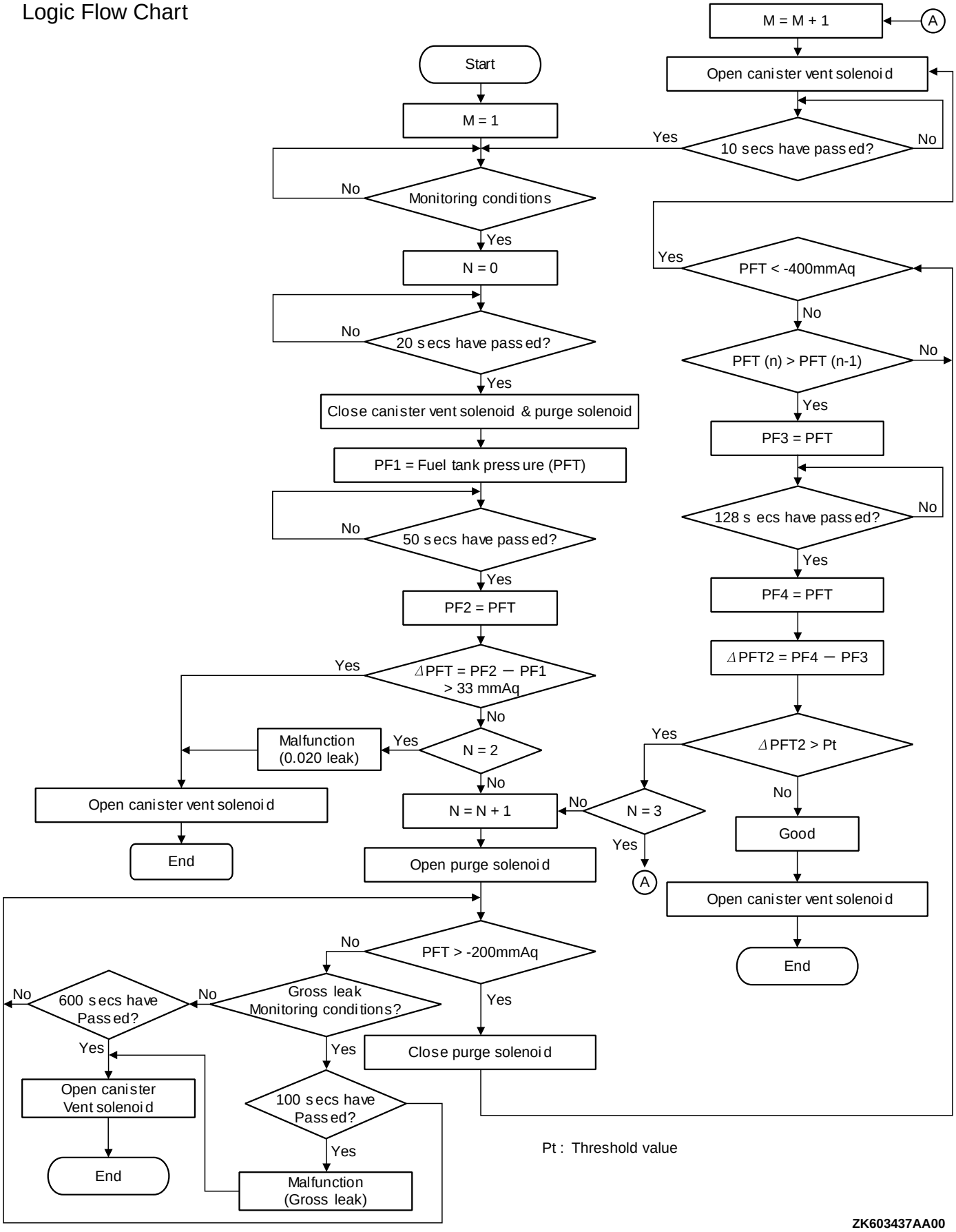
Logic Flow Chart



ZK603431AA00

Logic Flow Chart <0.02 in leak monitor>

Logic Flow Chart



ZK603437AA00

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 1,600 r/min.
- Barometric pressure is greater than 76 kPa (11 psi).
- Volumetric efficiency is between 20 and 70 percent.
- The fuel 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.

Judgement Criteria
- 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.

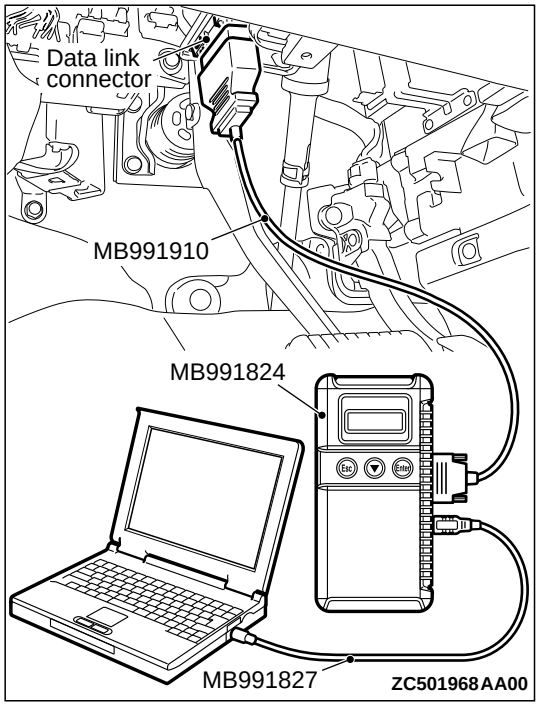
OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function - OBD-II Drive Cycle - Pattern 5 P.13Ab-8.

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 ECM will automatically increase the engine speed to 1,600 r/min or greater. Check that the transaxle is set to "P" position.**

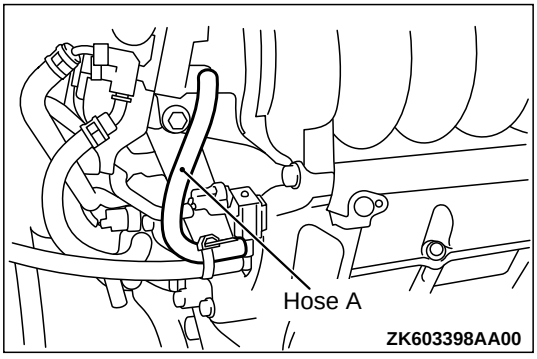
(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Erase the DTCs using scan tool MB991958.
(4) Check that the fuel cap is securely closed (Tighten until three clicks are heard).
(5) Start the engine.
(6) Select "System Test."
(7) Select "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.13Ab-44. 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.



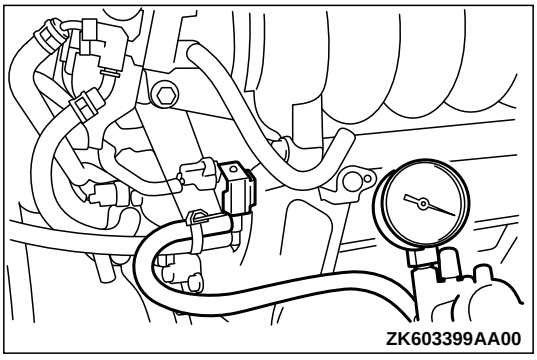
STEP 2. Check for leaks in evaporative emission hose A.

Use a hand vacuum pump to check the hose A.

Q:Do the hose hold vacuum?

YES: Go to Step 3.

NO: Replace the hose. Then go to Step 14.



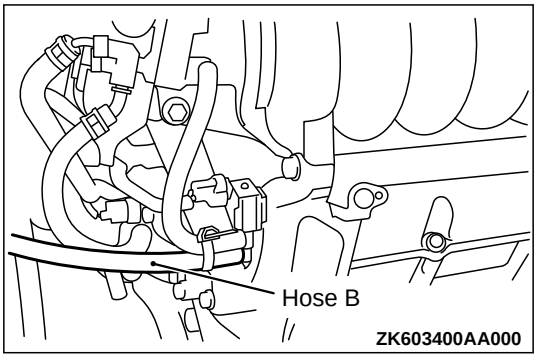
STEP 3. Check the evaporative emission purge solenoid for leaks.

(1) Disconnect the hose A from the evaporative emission purge solenoid.
(2) Connect the hose of the hand vacuum pump to the intake manifold side nipple of the evaporative emission purge solenoid.
(3) Use the hand vacuum pump to confirm that the evaporative emission purge solenoid holds vacuum.
(4) Connect the hose A to the evaporative emission purge solenoid.

Q:Does the evaporative emission purge solenoid hold vacuum?

YES: Go to Step 4.

NO: Replace the evaporative emission purge solenoid. Then go to Step 14.



STEP 4. Check for leaks in evaporative emission B.

Use a hand vacuum pump to check the hose B.

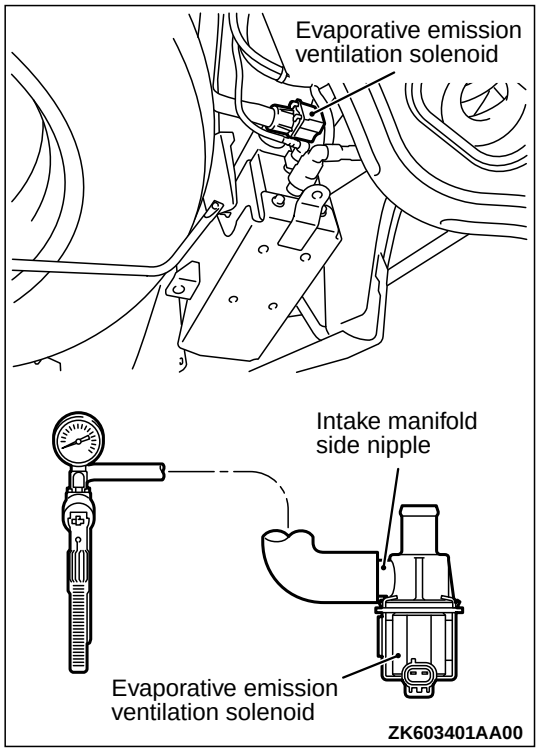
Q:Do the hose hold vacuum?

YES: Go to Step 5.

NO: Replace any damaged hose. Then go to Step 14.

STEP 5. Using scan tool MB991958, check actuator test item 15: Evaporative emission ventilation solenoid.

(1) Remove the canister cover.
(2) Remove the evaporative emission ventilation solenoid. Do not disconnect the connector.



(3) Connect the hose of the hand vacuum pump to the canister side nipple of the evaporative emission ventilation solenoid.
(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.

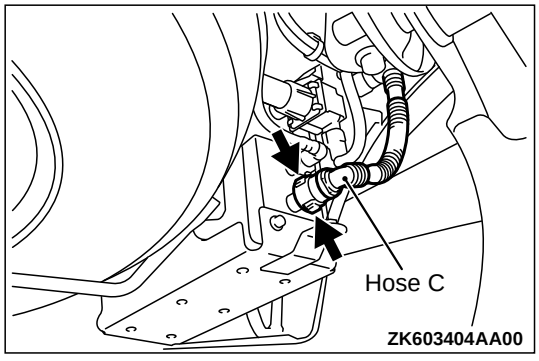
(6) Turn the ignition switch to the "LOCK" (OFF) position.
(7) Disconnect the hand vacuum pump, and reinstall the evaporative emission ventilation solenoid.
(8) Reinstall the canister cover.

Q:Did the evaporative emission ventilation solenoid hold vacuum?

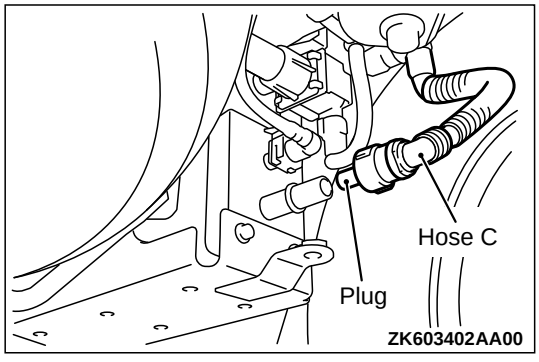
YES: Go to Step 6.

NO: Replace the evaporative emission ventilation solenoid (Refer to GROUP 17, Evaporative emission canister and fuel tank pressure relief valve removal and installation P.17c-18). Then go to Step 14.

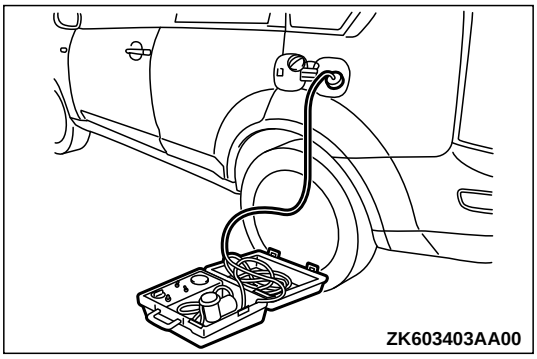
STEP 6. Pressure test the evaporative emission system lines from hoses C to I.



(1) Disconnect hose C from the canister while holding the release buttons indicated in the illustration pressed by fingers.



(2) Plug the disconnected end of hose C.
(3) 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.
(4) Remove the fuel cap.



(5) Connect the evaporative emission system pressure pump (Miller number 6872A) to the fuel tank filler tube by using fuel tank adapter (MLR-8382).
(6) Pressure test the system to determine whether any leaks are present.

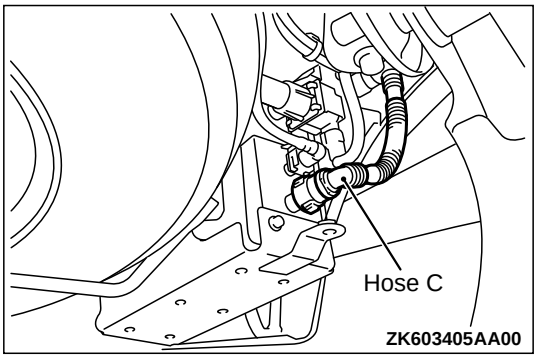
NOTE: The "Pressure test" in this procedure refers to the I/M240 Simulation Test. The eight steps of this test are described in the manufacturer's instructions for the evaporative emission system pressure pump, Miller number 6872A.

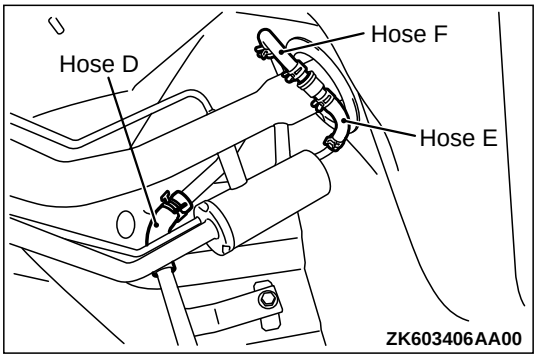
(7) Remove the evaporative emission system pressure pump (Miller number 6872A) and the fuel tank adapter (MLR-8382), and reinstall the fuel cap.
(8) Connect hose C to the evaporative emission canister.

Q:Is the evaporative emission system line free of leaks?
YES: Go to Step 12.
NO: Go to Step 7.

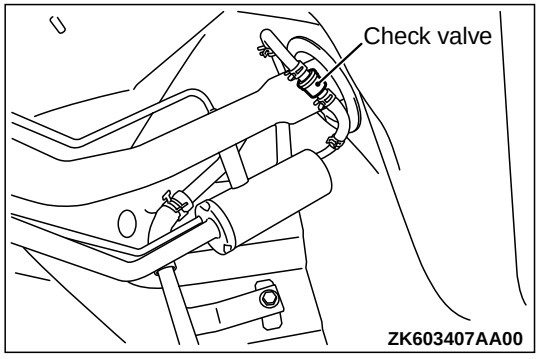
STEP 7. Check for leaks in evaporative emission hoses C through F.

Use a hand vacuum pump to test each hose from hose C to hose F.



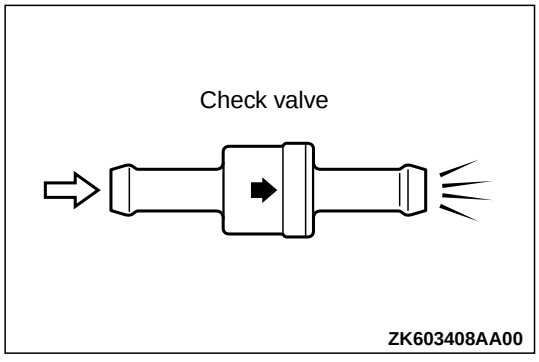


Q:Do the hoses hold vacuum?
YES: Go to Step 8.
NO: Replace any damaged hose. Then go to Step 14.



STEP 8. Test check valve.

(1) Check valve is a one-way check valve.



(2) Check valve should allow air to flow in only one direction.

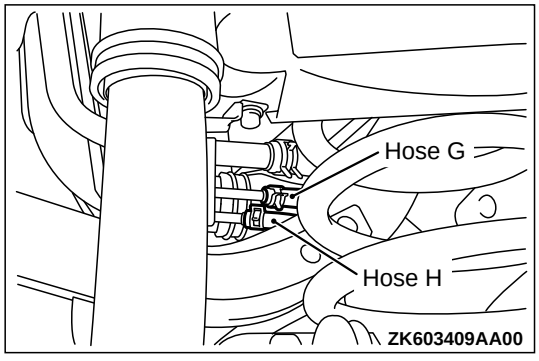
Q:Does check valve allow air to pass in one direction only?

YES: Go to Step 9.

NO: Replace check valve, and reinstall the fuel tank filler tube protector (Refer to GROUP 13B, Fuel Tank <FWD> P.13B-13or Fuel Tank <AWD> P.13B-18). Then go to Step 14.

STEP 9. Check for leaks in evaporative emission hoses G and H.

Use a hand vacuum pump to test each hose G and H.



Q:Do the hoses hold vacuum?

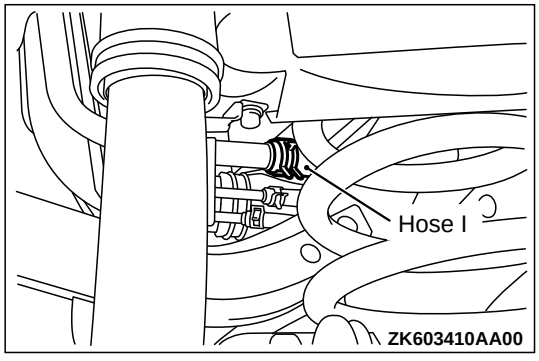
YES: Go to Step 10.

NO: Replace any damaged hose. Then go to Step 14.

STEP 10. Check for leaks in evaporative emission hose I.

(1) Remove the fuel tank assembly (Refer to GROUP 13B, Fuel Tank <FWD> P.13B-13or Fuel Tank <AWD> P.13B-18).

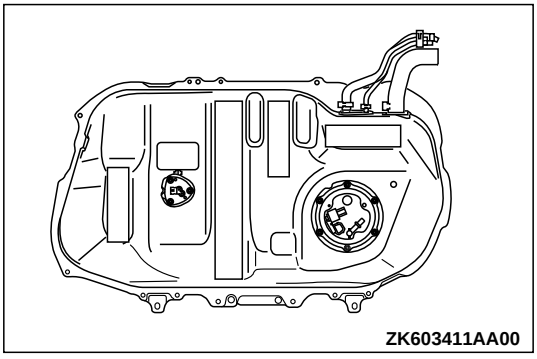
(2) Use the hand vacuum pump to check the hose I.

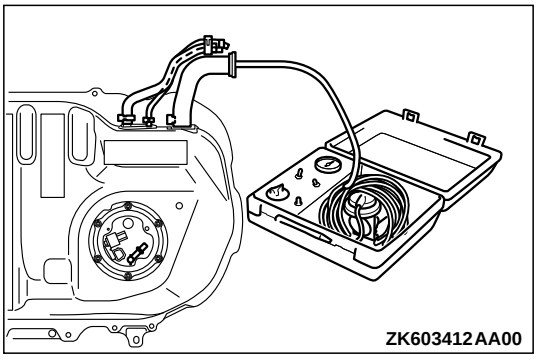


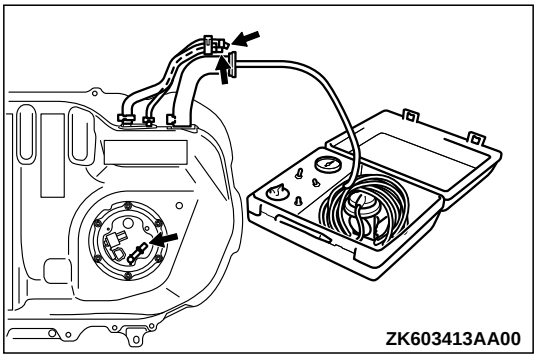
Q:Do the hose hold vacuum?

YES: Go to Step 11.

NO: Replace the hose and reinstall the fuel tank assembly (Refer to GROUP 13B, Fuel Tank <FWD> P.13B-13or Fuel Tank <AWD> P.13B-18). Then go to Step 14.


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ZK603412AA00


ZK603413AA00

STEP 11. 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.

(2) Connect the evaporative emission system pressure pump (Miller number 6872A) to the fuel filler hose.

(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.

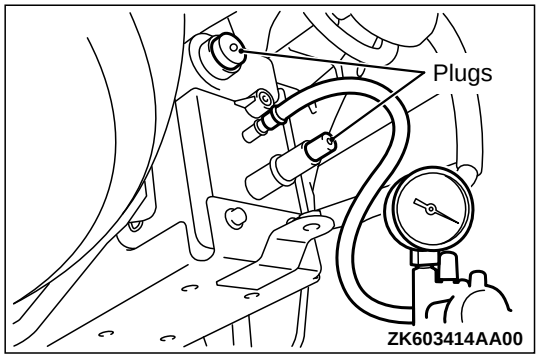
(5) In the pressurized state, check for leaks by applying a soapy water solution to each section and look for bubbles.

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 13B, Fuel Tank <FWD> P.13B-13or Fuel Tank <AWD> P.13B-18). Then go to Step 14.

YES <When there is a leak from the fuel tank.>: Replace the fuel tank (Refer to GROUP 13B, Fuel Tank <FWD> P.13B-13or Fuel Tank <AWD> P.13B-18). Go to Step 14

NO: When there is no leak, reinstall the fuel tank (Refer to GROUP 13B, Fuel Tank <FWD> P.13B-13or Fuel Tank <AWD> P.13B-18). Then go to Step 13.



STEP 12. Check the evaporative emission canister for vacuum leaks.

(1) Connect a hand vacuum pump to the evaporative emission canister and plug the other nipples.
(2) Apply a pressure on the hand vacuum pump, and confirm that air is maintained.
(3) Disconnect the hand vacuum pump and remove the plugs.

Q:Is the evaporative emission canister in good condition?

YES: Go to Step 13.

NO: Replace the evaporative emission canister (Refer to GROUP 17, Evaporative Emission Canister and Fuel Tank Pressure Relief Valve P.17c-18). Then go to Step 14.

STEP 13. Using scan tool MB991958, check the evaporative emission system monitor test.

⚠ CAUTION

- **During this test, the ECM automatically increases the engine speed to 1,600 r/min or greater. Check that the transaxle is set to "P" position.**

(1) Turn the ignition switch to the "ON" position.
(2) Erase the DTCs using scan tool MB991958.
(3) Check that the fuel cap is securely closed (Tighten until three clicks are heard).
(4) Start the engine.
(5) Select "System Test."
(6) Select "Evap Leak Mon."
(7) During the test, keep the accelerator pedal at the idle position.
(8) 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".
(9) Turn the ignition switch to the "LOCK" (OFF) position.

Q:Is "Evap Leak Mon. Completed. Test Failed and DTCs Set" displayed on scan tool MB991958?

YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 14.

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 14.

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 14. 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.13Ab-8).

(2) Read the DTC.

Q:Is DTC P0455 set?

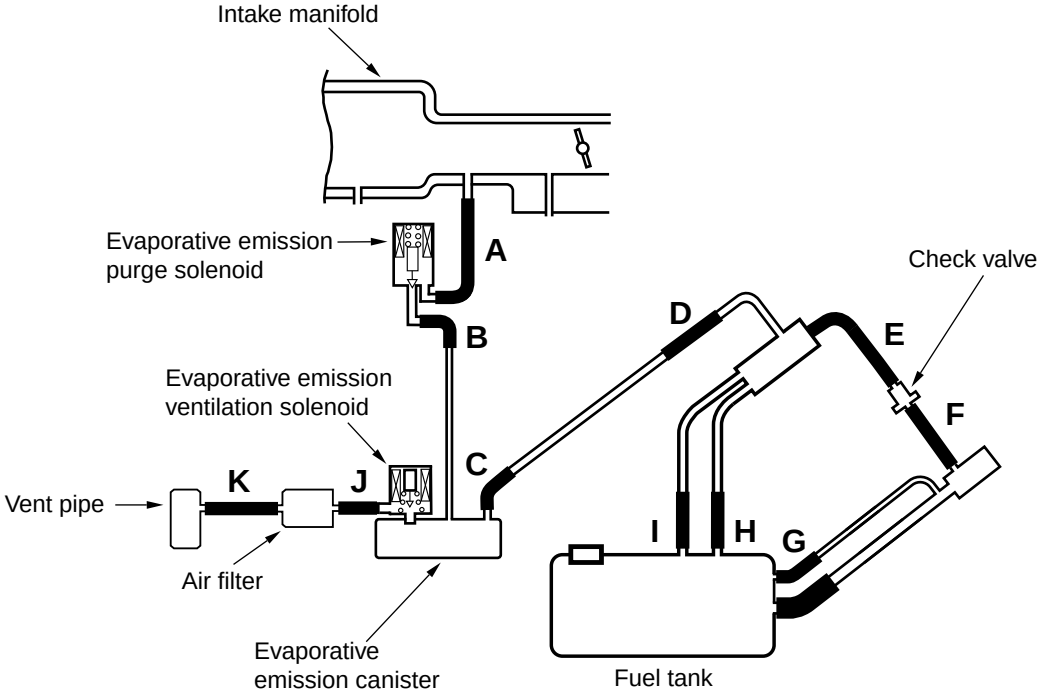
YES: Repeat the troubleshooting.

NO: The procedure is complete.

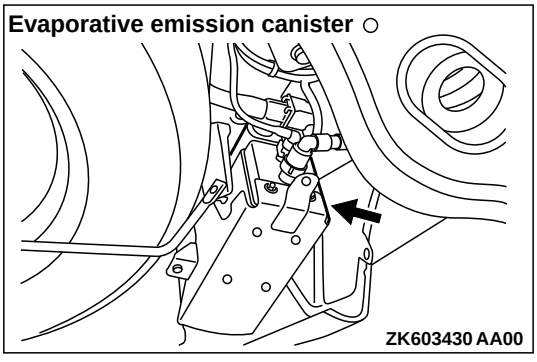
DTC P0456: Evaporative Emission Control System Leak Detected (Very Small Leak)

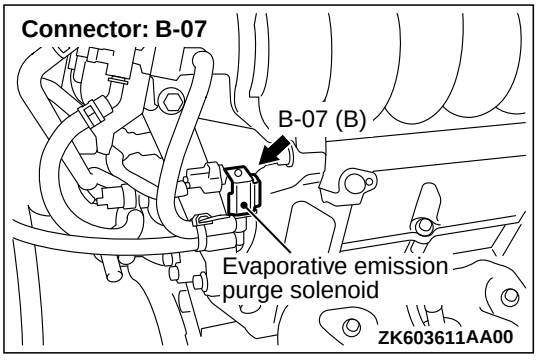
M11310100410USA0000010000

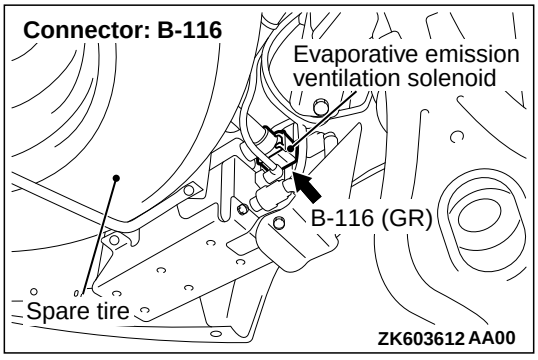
System diagram



ZK603429 AA00







TECHNICAL DESCRIPTION

- The ECM monitors the Evaporative Emission (EVAP) System pressure.
- The ECM 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 ECM 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

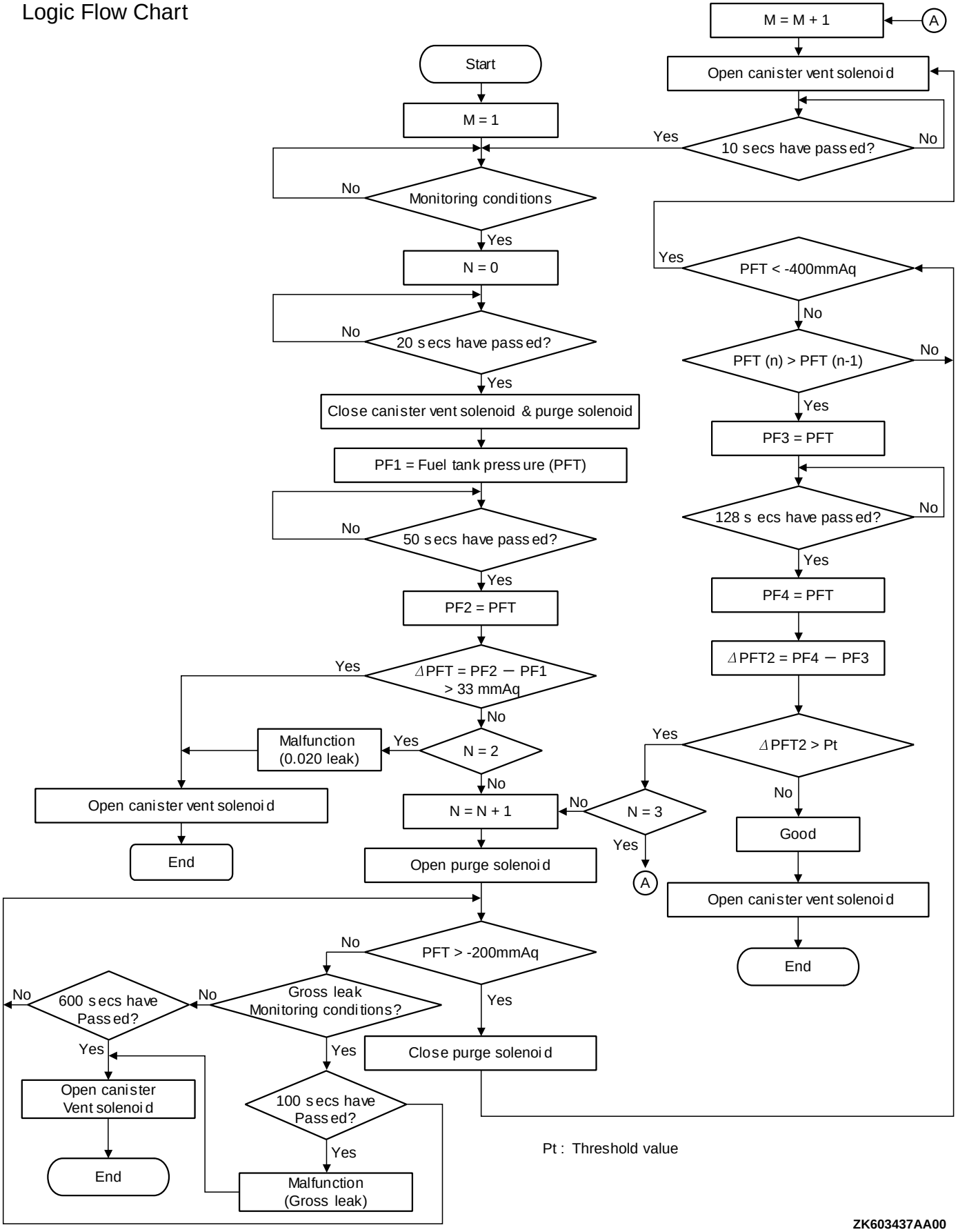
Sensor (The sensors below are determined to be normal)

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

DTC SET CONDITIONS

Logic Flow Chart <0.02 in leak monitor>

Logic Flow Chart



ZK603437AA00

Check Conditions

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.

Conditions B: For Test to Run
- Barometric pressure is greater than 76 kPa (11 psi).
- The fuel temperature is 33°C (91°F) or less.
- Fuel tank differential pressure sensor output voltage is 1 to 4 volts.

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.

Judgement Criteria
- 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.

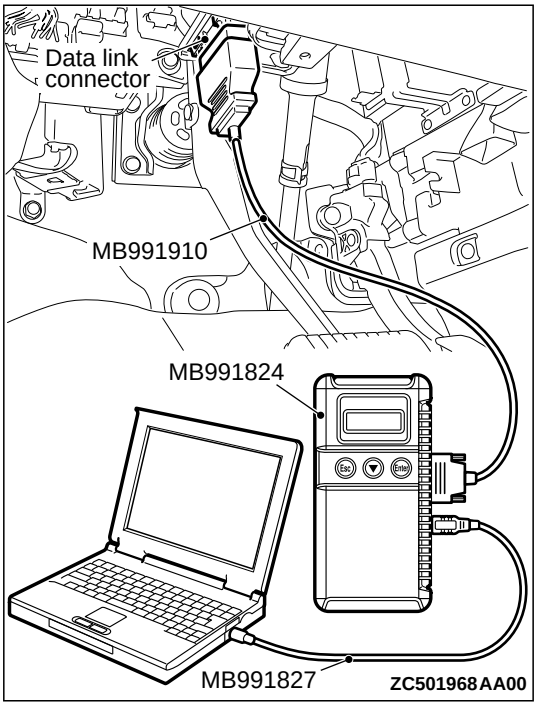
OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function - OBD-II Drive Cycle - Pattern 6 P.13Ab-8.

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 ECM will automatically increase the engine speed to 1,600 r/min or greater. Check that the transaxle is set to "P" position.**

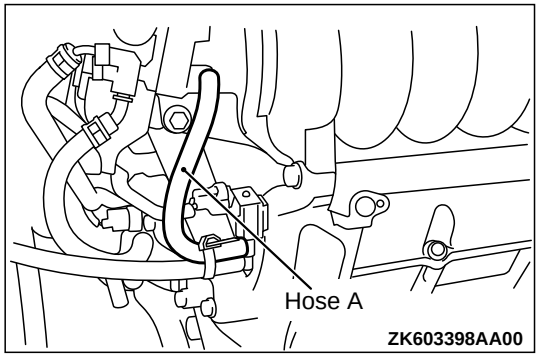
(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Erase the DTCs using scan tool MB991958.
(4) Check that the fuel cap is securely closed (Tighten until three clicks are heard).
(5) Start the engine.
(6) Select "System Test."
(7) Select "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.13Ab-44. 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.

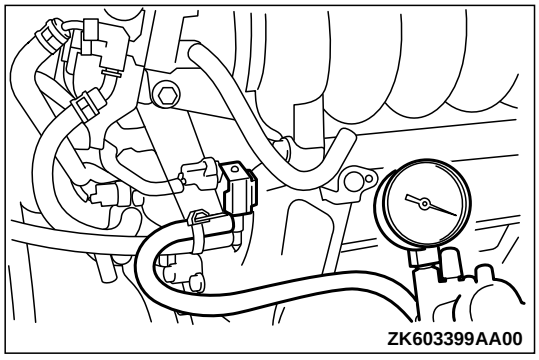
NO <"Evap Leak Mon. Discontinued. Retest again from the first" is displayed on scan tool MB991958.>: The EVAP monitor has been interrupted during the test. Turn the ignition switch to the "LOCK" (OFF) position once, and repeat the monitoring from Step 1.



STEP 2. Check for leaks in evaporative emission hose A.
Use a hand vacuum pump to check the hose A.

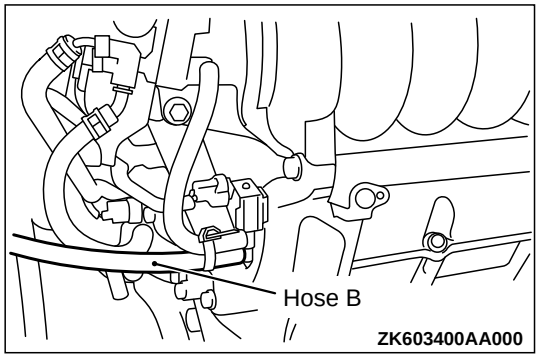
Q:Do the hose hold vacuum?
YES: Go to Step 3.
NO: Replace the hose. Then go to Step 14.

STEP 3. Check the evaporative emission purge solenoid for leaks.
(1) Disconnect the hose A from the evaporative emission purge solenoid.
(2) Connect the hose of the hand vacuum pump to the intake manifold side nipple of the evaporative emission purge solenoid.
(3) Use the hand vacuum pump to confirm that the evaporative emission purge solenoid holds vacuum.
(4) Connect the hose A to the evaporative emission purge solenoid.



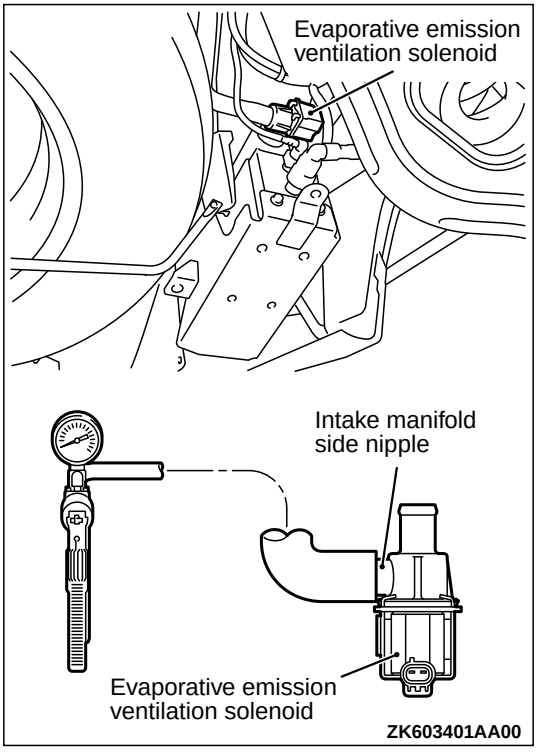
Q:Does the evaporative emission purge solenoid hold vacuum?
YES: Go to Step 4.
NO: Replace the evaporative emission purge solenoid. Then go to Step 14.

STEP 4. Check for leaks in evaporative emission B.
Use a hand vacuum pump to check the hose B.



Q:Do the hose hold vacuum?
YES: Go to Step 5.
NO: Replace any damaged hose. Then go to Step 14.

STEP 5. Using scan tool MB991958, check actuator test item 15: Evaporative emission ventilation solenoid.
(1) Remove the canister cover.
(2) Remove the evaporative emission ventilation solenoid. Do not disconnect the connector.

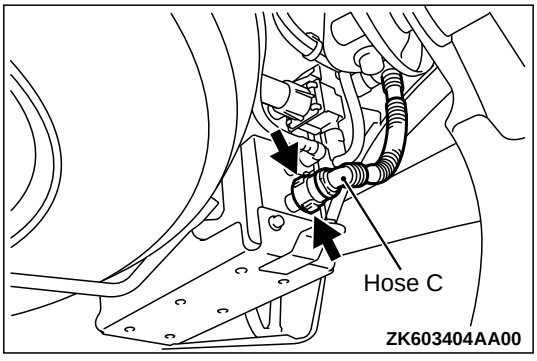


(3) Connect the hose of the hand vacuum pump to the canister side nipple of the evaporative emission ventilation solenoid.
(4) Turn the ignition switch to the "ON" position.
(5) Set scan tool MB991958 to actuator test mode.
- Item 15: Evaporative Emission Ventilation Solenoid.
  - While the evaporative emission ventilation solenoid is energized, operate the hand vacuum pump and confirm that the solenoid holds vacuum.

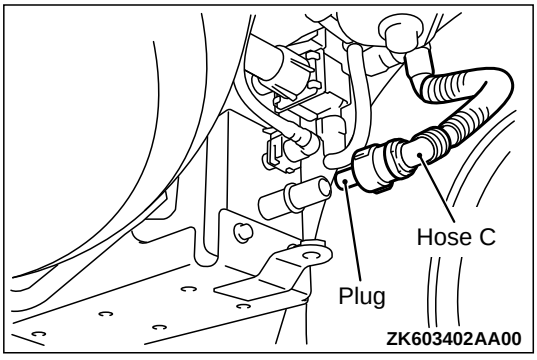
(6) Turn the ignition switch to the "LOCK" (OFF) position.
(7) Disconnect the hand vacuum pump, and reinstall the evaporative emission ventilation solenoid.
(8) Reinstall the canister cover.

Q:Did the evaporative emission ventilation solenoid hold vacuum?
YES: Go to Step 6.
NO: Replace the evaporative emission ventilation solenoid (Refer to GROUP 17, Evaporative emission canister and fuel tank pressure relief valve removal and installation P.17c-18). Then go to Step 14.

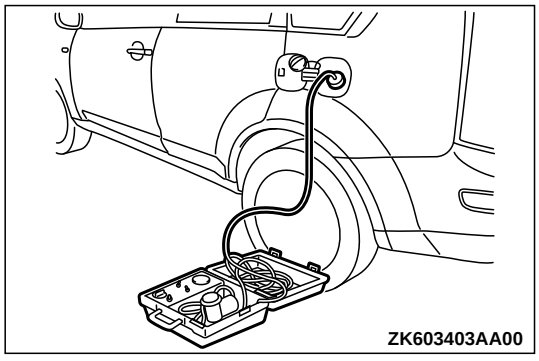
STEP 6. Pressure test the evaporative emission system lines from hoses C to I.



(1) Disconnect hose C from the canister while holding the release buttons indicated in the illustration pressed by fingers.



(2) Plug the disconnected end of hose C.
(3) 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.
(4) Remove the fuel cap.



(5) Connect the evaporative emission system pressure pump (Miller number 6872A) to the fuel tank filler tube by using fuel tank adapter (MLR-8382).
(6) Pressure test the system to determine whether any leaks are present.

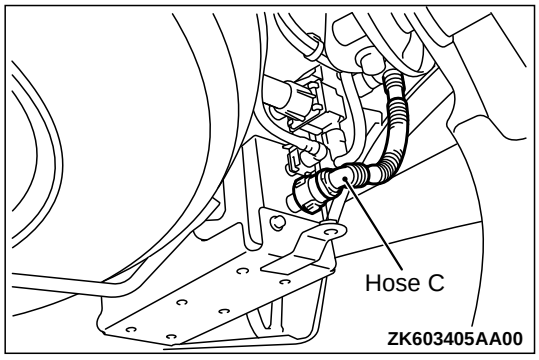
NOTE: The "Pressure test" in this procedure refers to the I/M240 Simulation Test. The eight steps of this test are described in the manufacturer's instructions for the evaporative emission system pressure pump, Miller number 6872A.

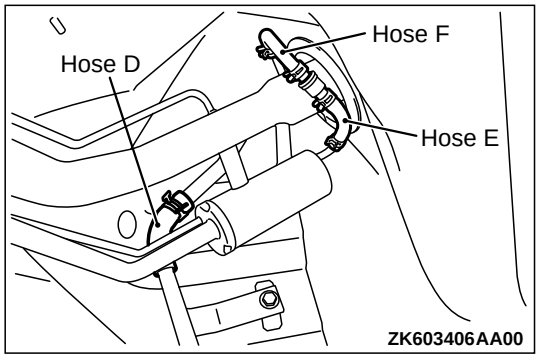
(7) Remove the evaporative emission system pressure pump (Miller number 6872A) and the fuel tank adapter (MLR-8382), and reinstall the fuel cap.
(8) Connect hose C to the evaporative emission canister.

Q:Is the evaporative emission system line free of leaks?
YES: Go to Step 12.
NO: Go to Step 7.

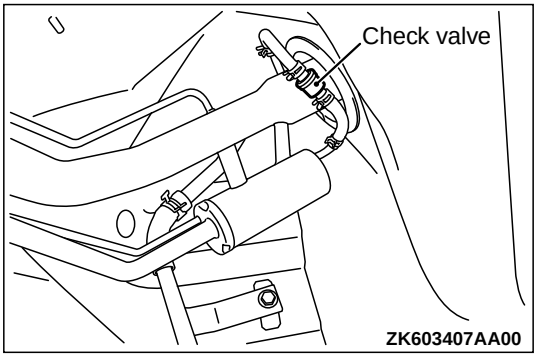
STEP 7. Check for leaks in evaporative emission hoses C through F.

Use a hand vacuum pump to test each hose from hose C to hose F.



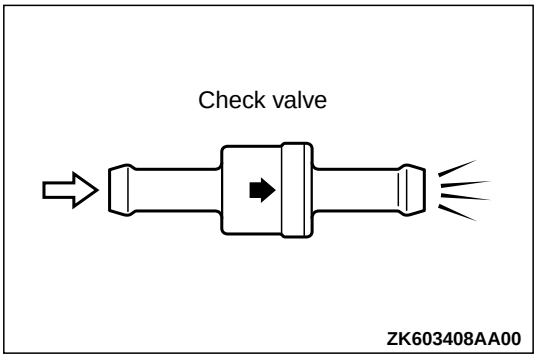


Q:Do the hoses hold vacuum?
YES: Go to Step 8.
NO: Replace any damaged hose. Then go to Step 14.



STEP 8. Test check valve.

(1) Check valve is a one-way check valve.



(2) Check valve should allow air to flow in only one direction.

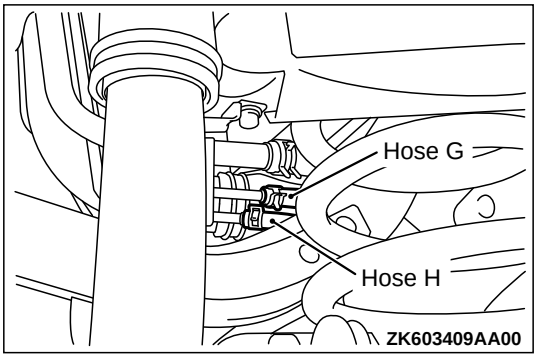
Q:Does check valve allow air to pass in one direction only?

YES: Go to Step 9.

NO: Replace check valve, and reinstall the fuel tank filler tube protector (Refer to GROUP 13B, Fuel Tank <FWD> P.13B-13or Fuel Tank <AWD> P.13B-18). Then go to Step 14.

STEP 9. Check for leaks in evaporative emission hoses G and H.

Use a hand vacuum pump to test each hose G and H.



Q:Do the hoses hold vacuum?

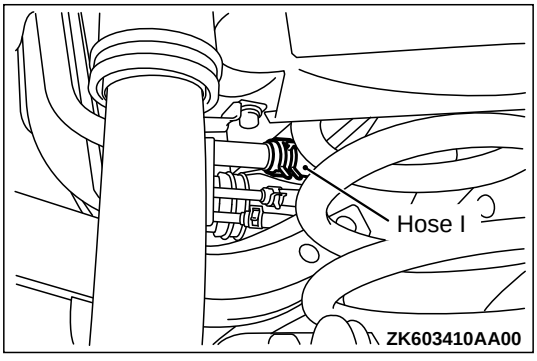
YES: Go to Step 10.

NO: Replace any damaged hose. Then go to Step 14.

STEP 10. Check for leaks in evaporative emission hose I.

(1) Remove the fuel tank assembly (Refer to GROUP 13B, Fuel Tank <FWD> P.13B-13or Fuel Tank <AWD> P.13B-18).

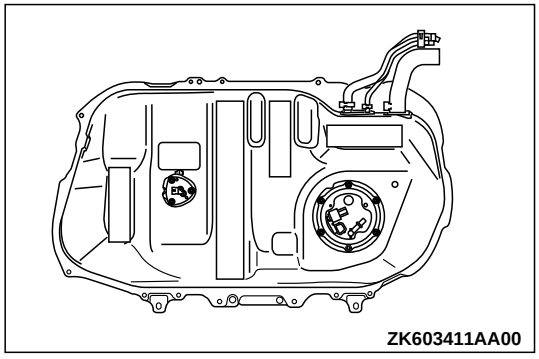
(2) Use the hand vacuum pump to check the hose I.

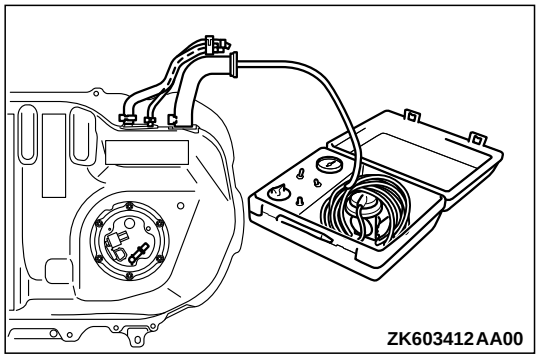


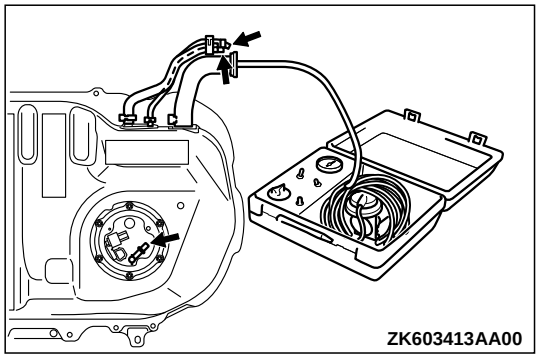
Q:Do the hose hold vacuum?

YES: Go to Step 11.

NO: Replace the hose and reinstall the fuel tank assembly (Refer to GROUP 13B, Fuel Tank <FWD> P.13B-13or Fuel Tank <AWD> P.13B-18). Then go to Step 14.


ZK603411AA00


ZK603412AA00


ZK603413AA00

STEP 11. 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.

(2) Connect the evaporative emission system pressure pump (Miller number 6872A) to the fuel filler hose.

(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.

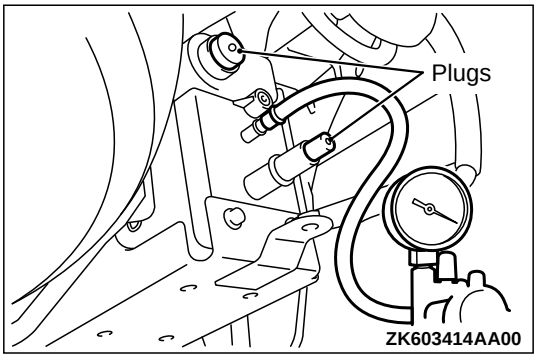
(5) In the pressurized state, check for leaks by applying a soapy water solution to each section and look for bubbles.

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 13B, Fuel Tank <FWD> P.13B-13or Fuel Tank <AWD> P.13B-18). Then go to Step 14.

YES <When there is a leak from the fuel tank.>: Replace the fuel tank (Refer to GROUP 13B, Fuel Tank <FWD> P.13B-13or Fuel Tank <AWD> P.13B-18). Go to Step 14

NO: When there is no leak, reinstall the fuel tank (Refer to GROUP 13B, Fuel Tank <FWD> P.13B-13or Fuel Tank <AWD> P.13B-18). Then go to Step 13.



STEP 12. Check the evaporative emission canister for vacuum leaks.

(1) Connect a hand vacuum pump to the evaporative emission canister and plug the other nipples.
(2) Apply a pressure on the hand vacuum pump, and confirm that air is maintained.
(3) Disconnect the hand vacuum pump and remove the plugs.

Q:Is the evaporative emission canister in good condition?

YES: Go to Step 13.

NO: Replace the evaporative emission canister (Refer to GROUP 17, Evaporative Emission Canister and Fuel Tank Pressure Relief Valve P.17c-18). Then go to Step 14.

STEP 13. Using scan tool MB991958, check the evaporative emission system monitor test.

⚠ CAUTION

- **During this test, the ECM automatically increases the engine speed to 1,600 r/min or greater. Check that the transaxle is set to "P" position.**

(1) Turn the ignition switch to the "ON" position.
(2) Erase the DTCs using scan tool MB991958.
(3) Check that the fuel cap is securely closed (Tighten until three clicks are heard).
(4) Start the engine.
(5) Select "System Test."
(6) Select "Evap Leak Mon."
(7) During the test, keep the accelerator pedal at the idle position.
(8) 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".
(9) Turn the ignition switch to the "LOCK" (OFF) position.

Q:Is "Evap Leak Mon. Completed. Test Failed and DTCs Set" displayed on scan tool MB991958?

YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 14.

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 14.

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 14. 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.13Ab-8).
(2) Read the DTC.

Q:Is DTC P0456 set?

YES: Repeat the troubleshooting.
NO: The procedure is complete.

DTC P0461: Fuel Level Sensor <FWD> or Fuel Level Sensor (main) <AWD> Circuit Range/Performance

M11310100234USA0000010000

TECHNICAL DESCRIPTION

- The fuel level sensor converts the rest of the fuel to a voltage and seconds it to the combination meter.
- The combination meter sends the data regarding the rest of the fuel to the ECM.
- The ECM checks whether this data is within a specified range.

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)

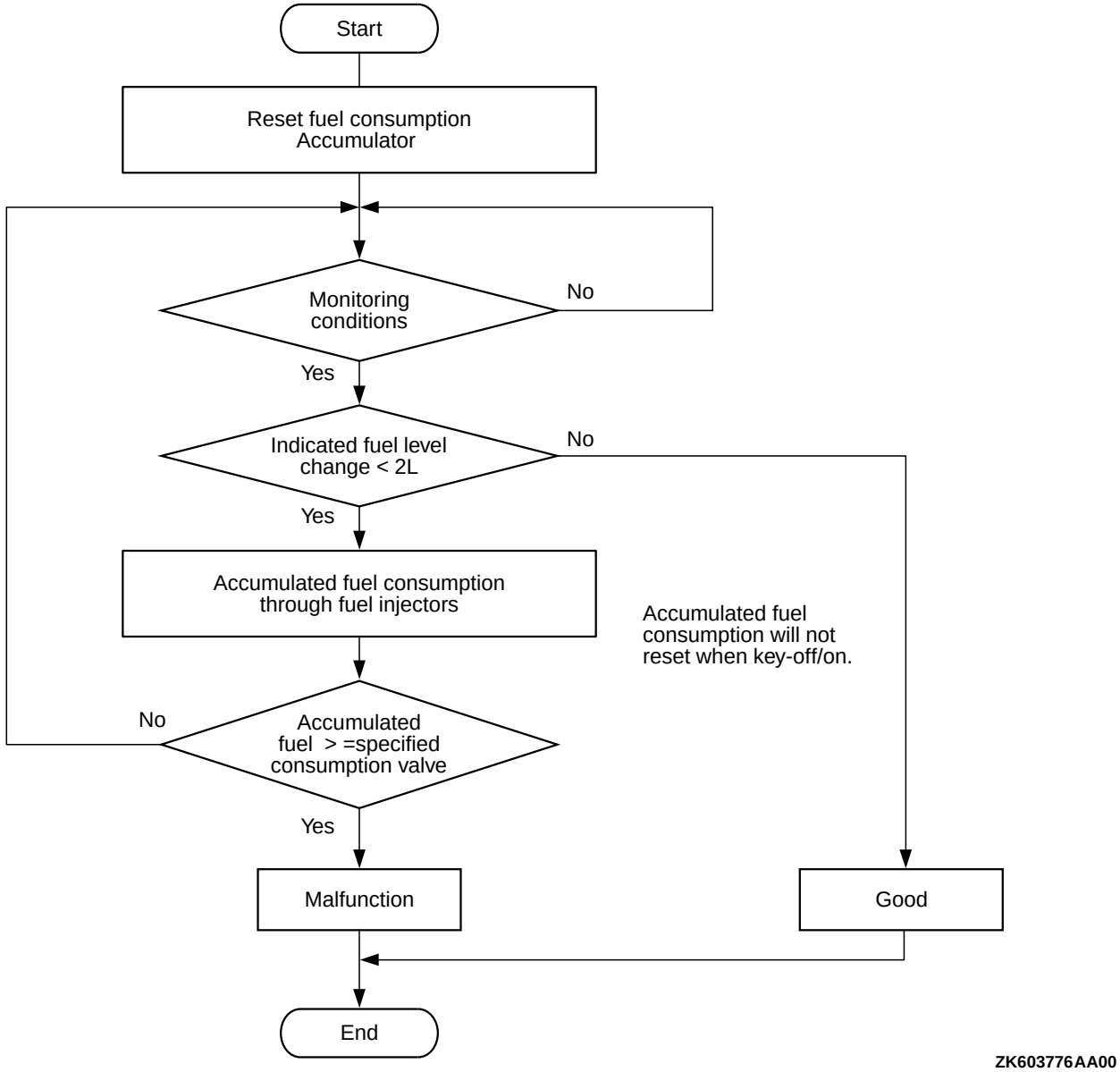
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



ZK603776AA00

Check Condition, Judgement Criterion

- When the fuel consumption calculated from the operation time of the injector amounts to 30 liters (7.8 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:)

- Combination meters assembly failed.
- Fuel level sensor (main) failed.
- ECM failed.

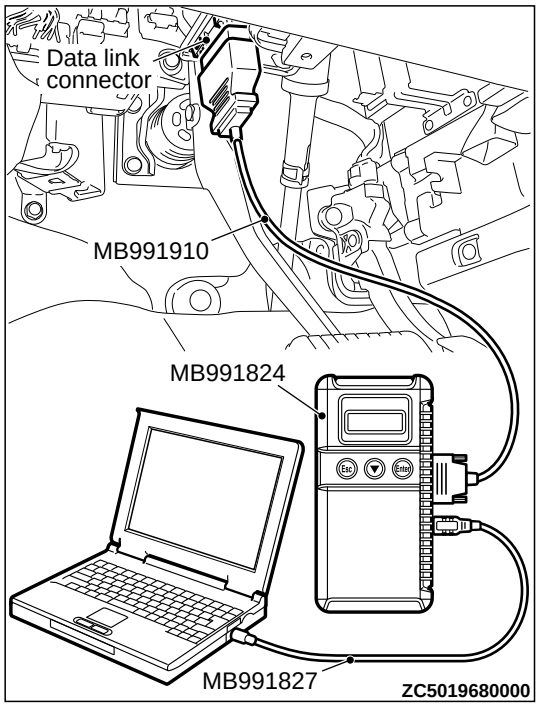
OBD-II DRIVE CYCLE PATTERN

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.13Ab-8.

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.00-15.
NO: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 6.

STEP 4. 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.13Ab-8.

Q:Is the fuel pump module normal?
YES: Go to Step 5.
NO: Replace the fuel pump module. 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.00-15.
NO: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. 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 P0462: Fuel Level Sensor Circuit Low Input

M11310100235USA0000010000

TECHNICAL DESCRIPTION
- The fuel level sensor converts the rest of the fuel to a voltage and sends it to the combination meter.
- The combination meter sends the data regarding the rest of the fuel to the ECM.
- The ECM 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

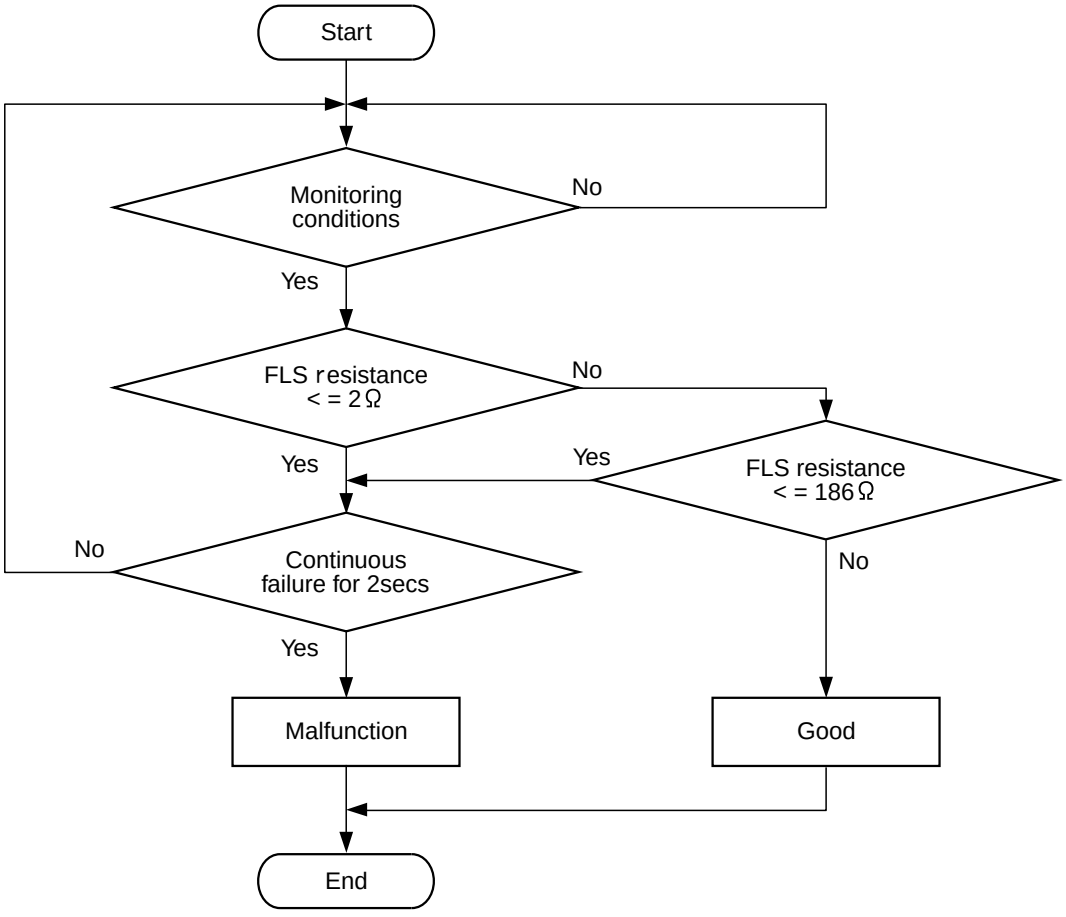
MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

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



ZK603777AA00

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 lower than 2 ohms for 2 seconds.

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

- Fuel level sensor failed.
- Combination meters assembly failed.
- Connector damage
- Harness damage
- ECM failed.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function - OBD-II Drive Cycle - Pattern 24 P.13Ab-8.

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 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.13Ab-8.

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 24 P. 13Ab-8.
(2) Check the diagnostic trouble code (DTC).

Q:Is DTC P0462 set?
YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. 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.00-15.

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. 13Ab-8.
(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

M11310100236USA0000010000

TECHNICAL DESCRIPTION
- The fuel level sensor converts the rest of the fuel to a voltage and sends it to the combination meter.
- The combination meter sends the data regarding the rest of the fuel to the ECM.
- The ECM checks whether this data is within a specified range.

DESCRIPTIONS OF MONITOR METHODS
An open circuit is detected while monitoring the fuel level sensor output.

MONITOR EXECUTION
Continuous

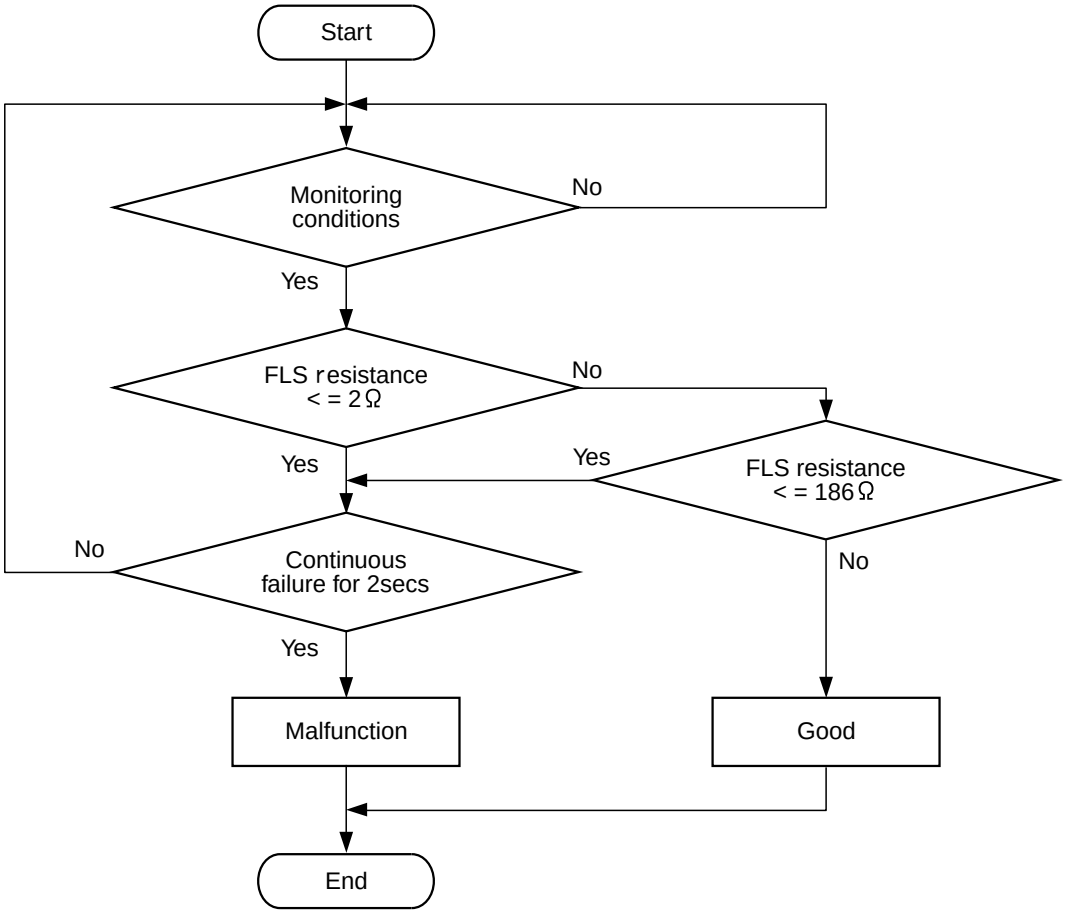
MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

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



ZK603777AA00

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 higher than 186 ohms for 2 seconds.

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

- Fuel level sensor failed.
- Combination meters assembly failed.
- Connector damage
- Harness damage
- ECM failed.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function - OBD-II Drive Cycle - Pattern 24 P.13Ab-8.

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 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.54Ab-40.

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 24 P. 13Ab-8.

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

Q:Is DTC P0463 set?

YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. 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.00-15.

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. 13Ab-8.

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

Q:Is DTC P0463 set?

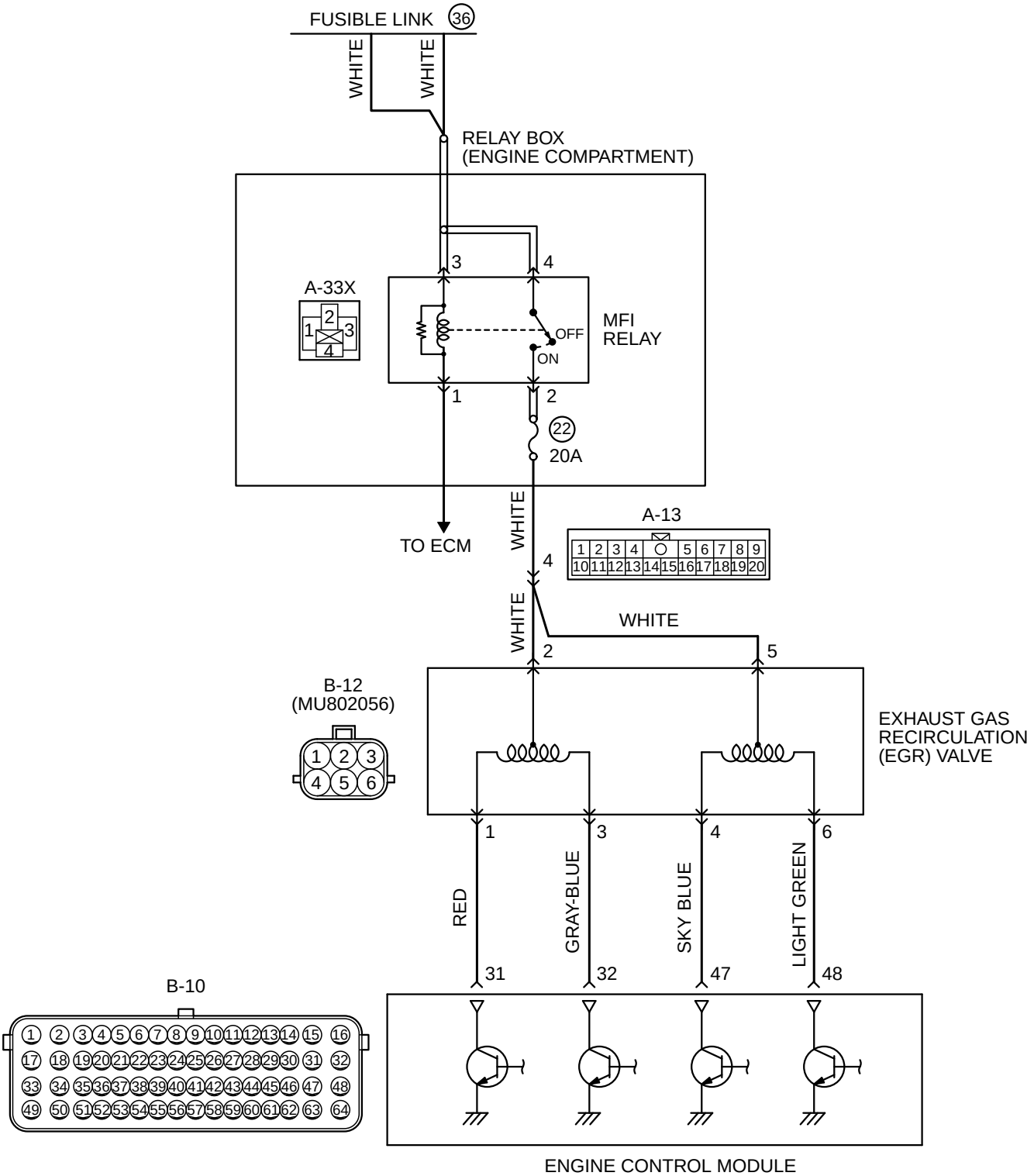
YES: Retry the troubleshooting.

NO: The inspection is complete.

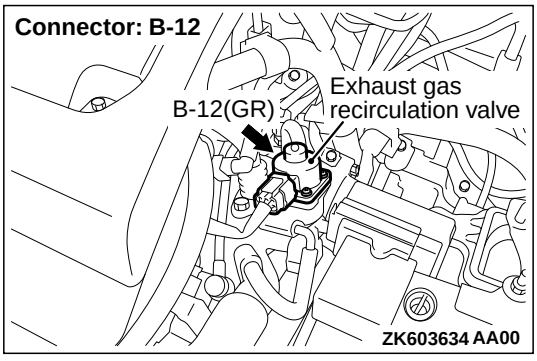
DTC P0489: EGR Valve (Stepper Motor) Circuit Malfunction (Ground Short)

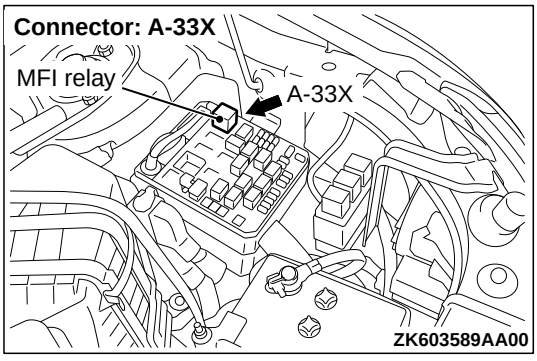
M11310100373USA0000010000

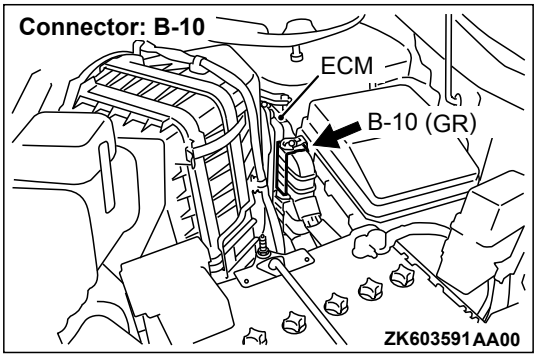
EGR VALVE CIRCUIT

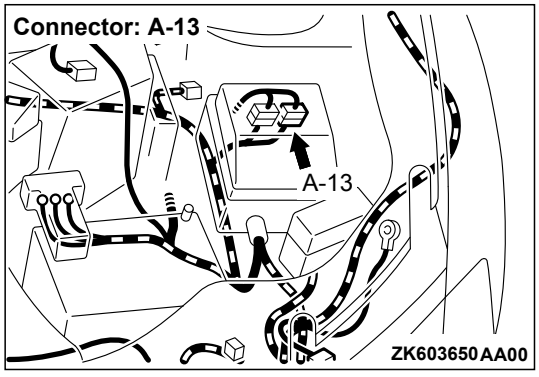


ZK602865 AA00









CIRCUIT OPERATION

- The EGR valve power is supplied from the MFI relay (terminal No. 2).
- The ECM (terminals No. 31, No. 32, No. 47, No. 48) drives the stepper motor by sequentially turning "ON" the power transistors in the ECM and providing ground to the EGR valve (terminal No. 1, No. 3, No. 4, No. 6).

TECHNICAL DESCRIPTION

The ECM checks whether a short circuit to the ground or an open circuit exists or not by measuring the EGR valve (stepper motor) drive circuit voltage when the current is not flowing through the coils of the EGR valve (stepper motor).

DESCRIPTIONS OF MONITOR METHODS

When the EGR valve (stepper motor) drive circuit voltage is under the specified range, it is judged that a malfunction exists.

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)

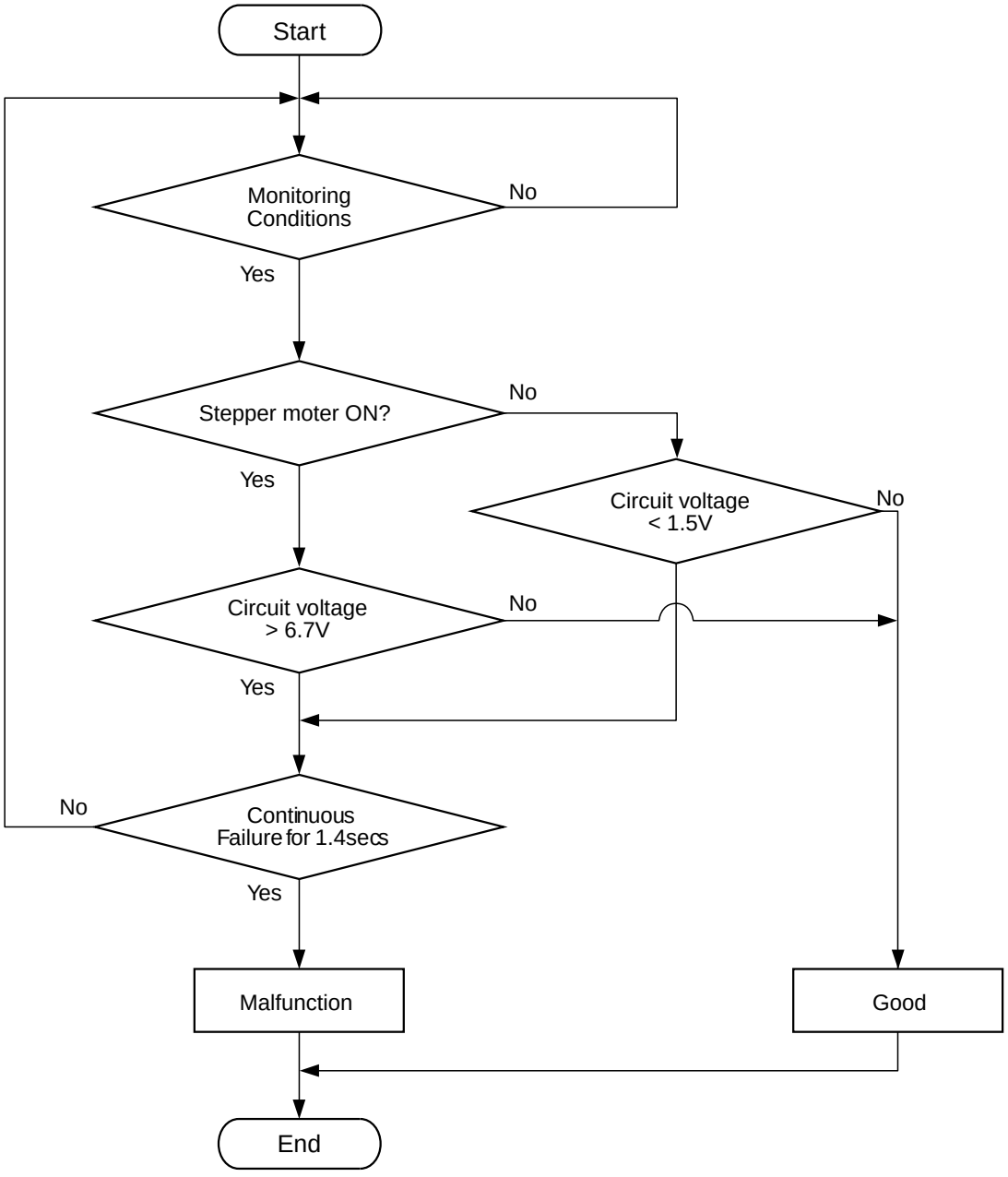
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



ZK604052 AA00

Check Conditions

- Ignition switch is "ON" position.
- Battery positive voltage is at between 10 and 16.5 volts.

Judgement Criterion

- When the EGR valve is de-energized, the ECM voltage should be 1.5 volts or less for 1.4 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function - OBD-II Drive Cycle - Pattern 3 P.13Ab-8.

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

- EGR valve (stepper motor) failed.

- Harness damage.
- Connector damage.
- ECM 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 Set

STEP 1. Check harness connector B-12 at EGR valve and harness connector B-10 at ECM 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. Measure the EGR valve motor coil resistance.

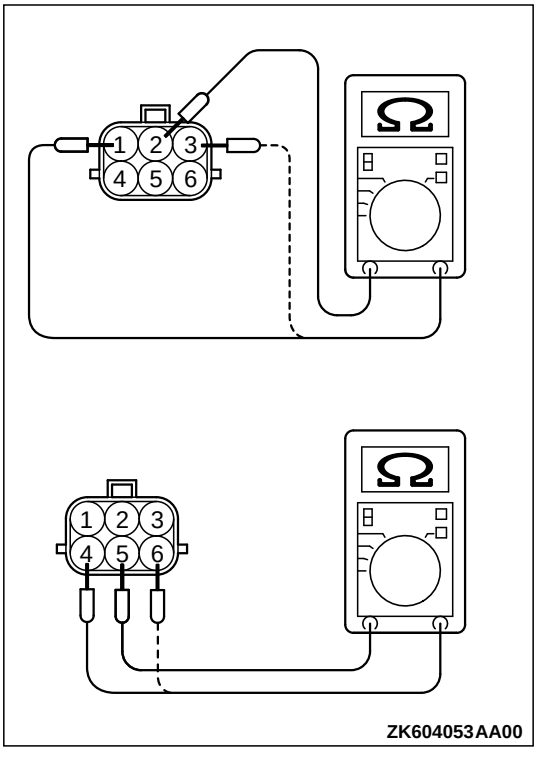
(1) Disconnect the EGR valve connector B-12.

(2) Measure the resistance between EGR valve connector terminal No. 2 and either terminal No. 1 or terminal No. 3.

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. 4 or terminal No. 6.

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)]?

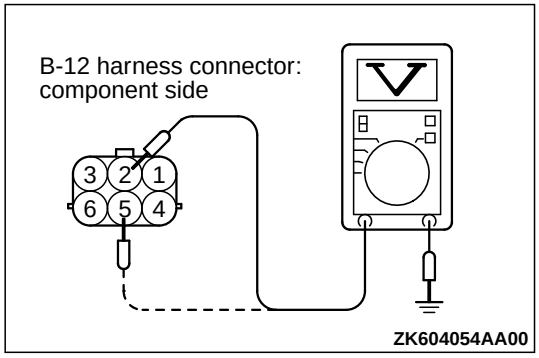
YES: Go to Step 3.

NO: Replace the EGR valve. Then go to Step 6.

STEP 3. Measure the power supply voltage at EGR valve motor harness side connector B-12.

(1) Disconnect the connector B-12 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.

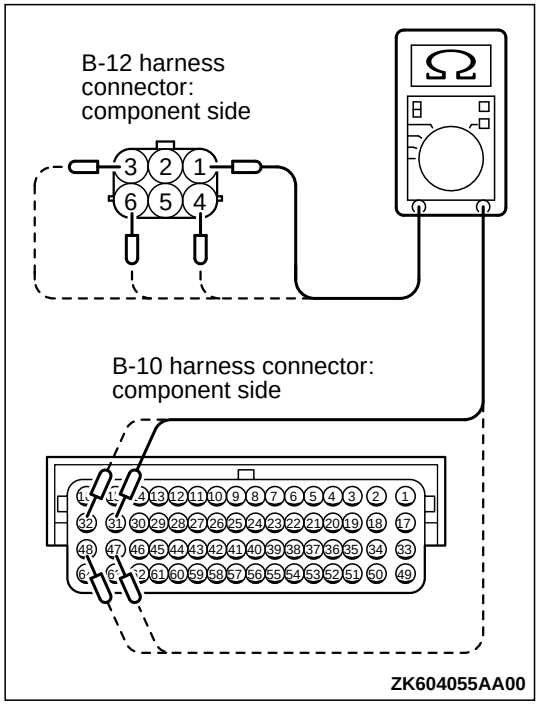
(4) Turn the ignition switch to the "LOCK" (OFF) position.

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

YES: Go to Step 4.

NO: Repair harness wire between MFI relay connector A-33X (terminal No. 2) and EGR valve connector B-12 (terminal No. 2, No. 5) because of open circuit or short circuit to ground. Then go to Step 6.

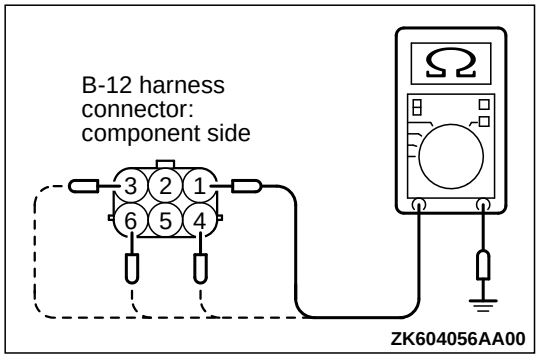
STEP 4. Check for open circuit and short circuit to ground and harness damage between EGR valve connector B-12 and ECM connector B-10.



(1) Disconnect the connector B-12 and B-10 measure at the harness side.

(2) Measure the resistance between connector B-12 and connector B-10.
- a Connector B-12 (terminal No. 1) and connector B-10 (terminal No. 31).
- b Connector B-12 (terminal No. 3) and connector B-10 (terminal No. 32).
- c Connector B-12 (terminal No. 4) and connector B-10 (terminal No. 47).
- d Connector B-12 (terminal No. 6) and connector B-10 (terminal No. 48).

Should be less than 2 ohms.



(3) Check for the continuity between connector B-12 and ground.
- a Connector B-12 (terminal No. 1) and ground.
- b Connector B-12 (terminal No. 3) and ground.
- c Connector B-12 (terminal No. 4) and ground.
- d Connector B-12 (terminal No. 6) and ground.

Not continuity.

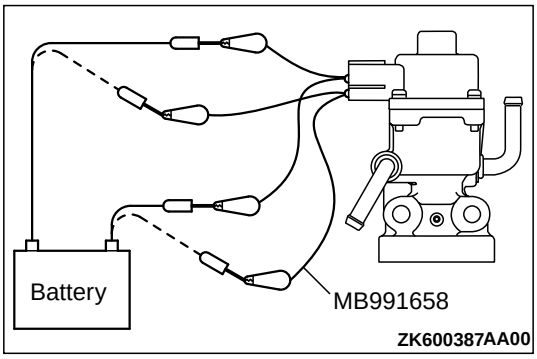
Q:Is the harness wire in good condition?

YES: Then go to Step 5.

NO: Repair it. Then go to Step 6.

STEP 5. 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: 23 ± 6 N·m [17 ± 4 ft·lb]

Q:Is the EGR valve operating properly?

YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8.

NO: Replace the EGR valve. 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 3 P. 13Ab-8.
(2) Check the diagnostic trouble code (DTC).

Q:Is DTC P0489 set?

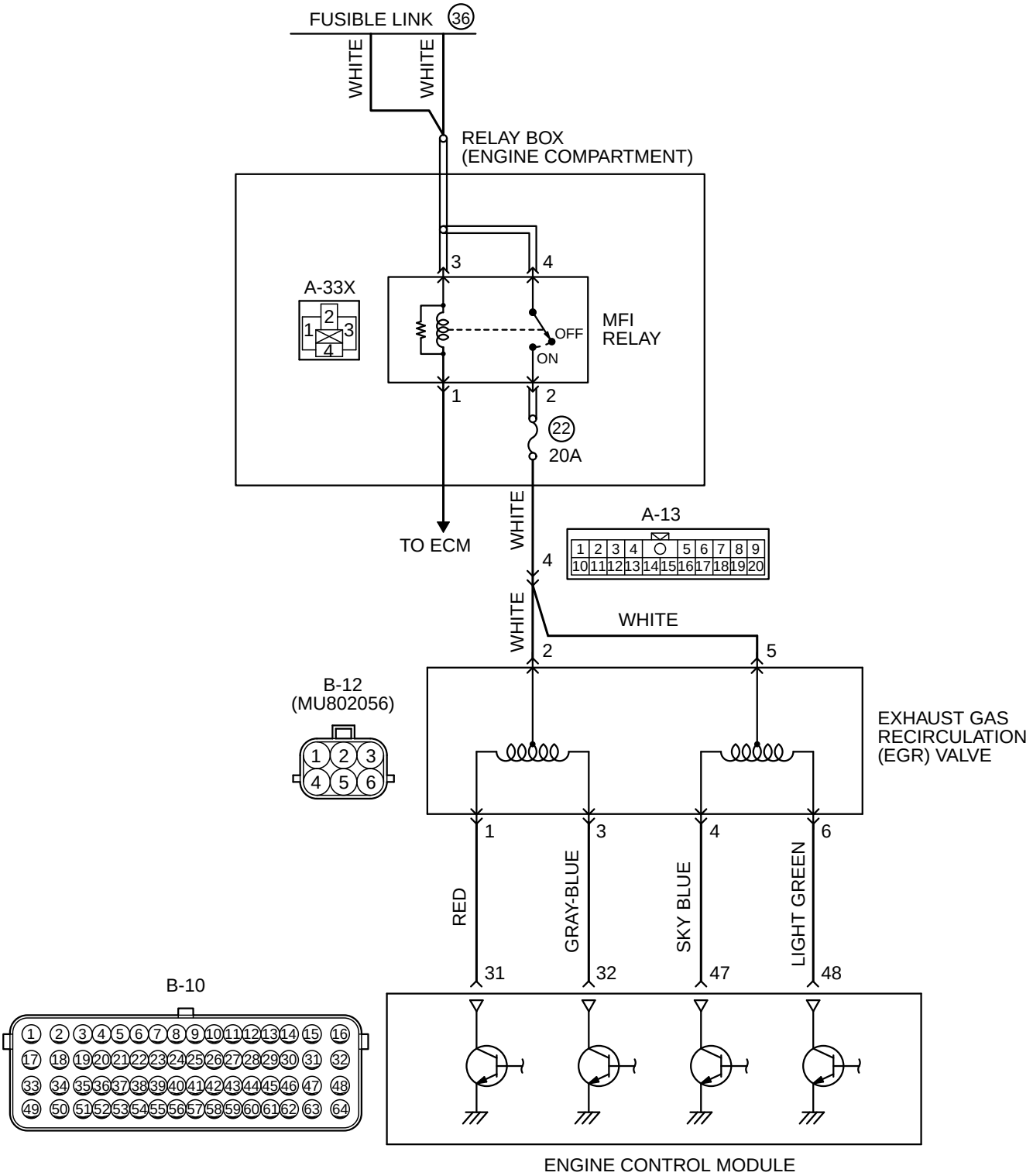
YES: Retry the troubleshooting.

NO: The inspection is complete.

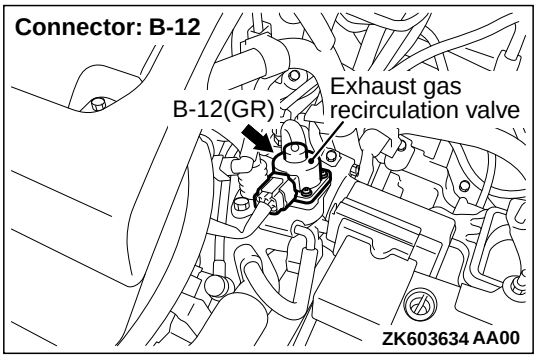
DTC P0490: EGR Value (Stepper Motor) Circuit Malfunction (Battery Short)

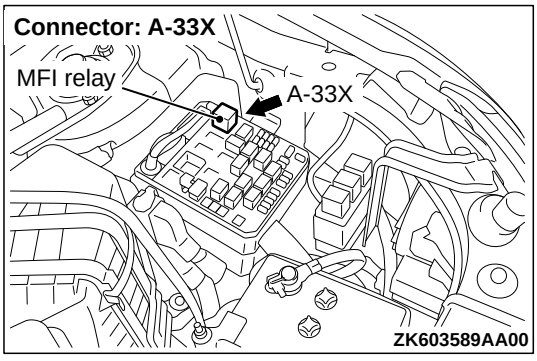
M11310100374USA0000010000

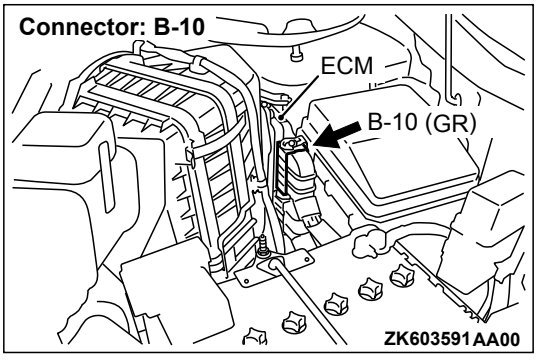
EGR VALVE CIRCUIT

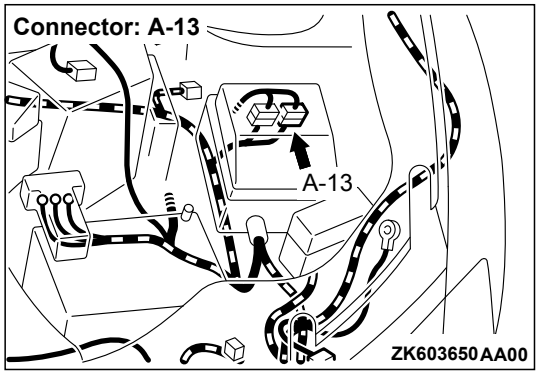


ZK602865 AA00









CIRCUIT OPERATION

- The EGR valve power is supplied from the MFI relay (terminal No. 2).
- The ECM (terminals No. 31, No. 32, No. 47, No. 48) drives the stepper motor by sequentially turning "ON" the power transistors in the ECM and providing ground to the EGR valve (terminal No. 1, No. 3, No. 4, No. 6).

TECHNICAL DESCRIPTION

The ECM checks whether a short circuit to the power supply exists or not by measuring the EGR valve (stepper motor) drive circuit voltage when the current not flowing through the coils of the EGR valve (stepper motor).

DESCRIPTIONS OF MONITOR METHODS

When the EGR valve (stepper motor) drive circuit voltage is over the specified range, it is judged that a malfunction exists.

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)

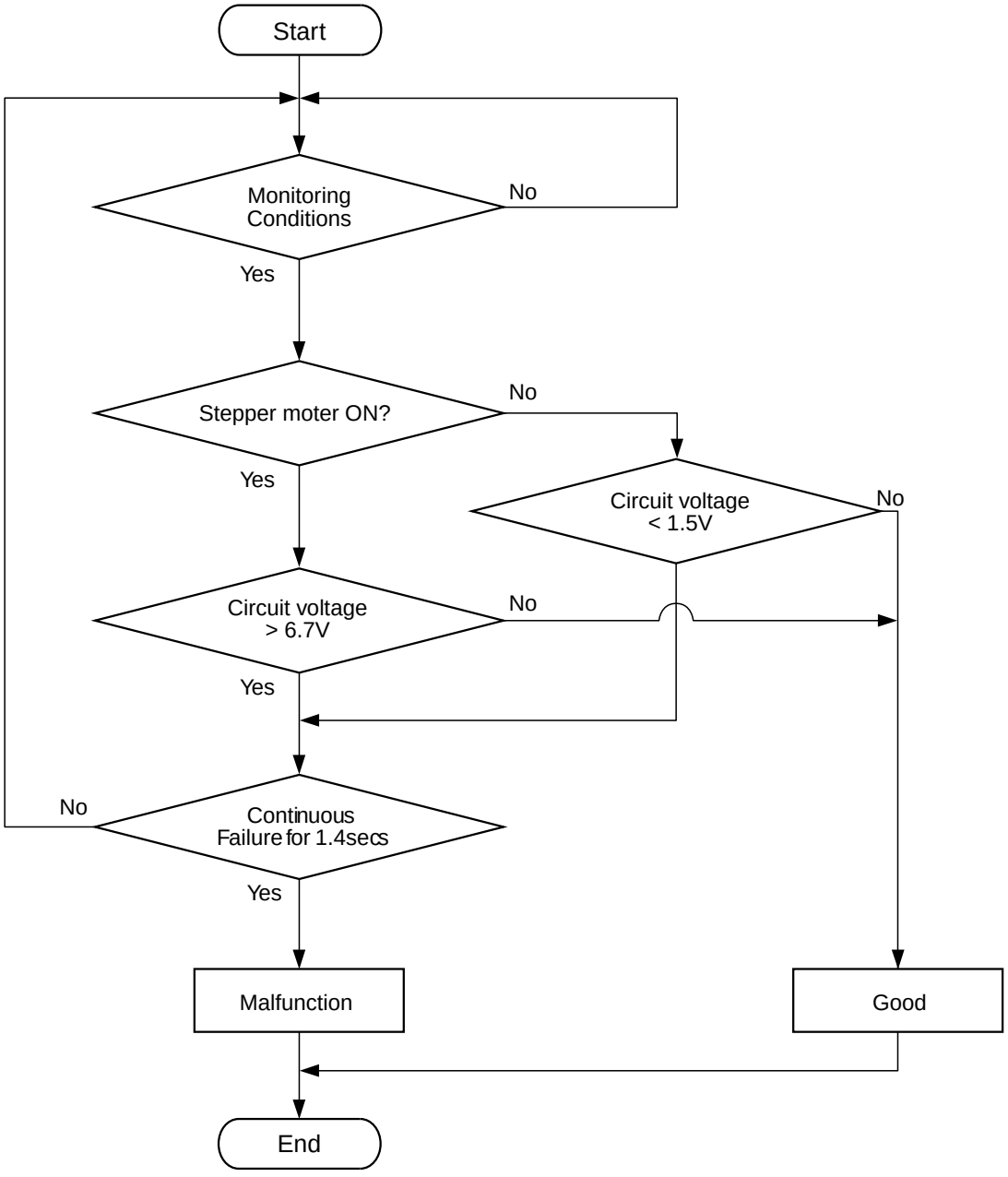
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



ZK604052 AA00

Check Conditions

- Ignition switch is "ON" position.
- Battery positive voltage is at between 10 and 16.5 volts.

Judgement Criterion

- When the EGR valve is energized, the ECM voltage should be 6.7 volts or more for 1.4 seconds..

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function - OBD-II Drive Cycle - Pattern 3 P.13Ab-8.

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

- EGR valve (stepper motor) failed.

- Harness damage.
- Connector damage.
- ECM failed.

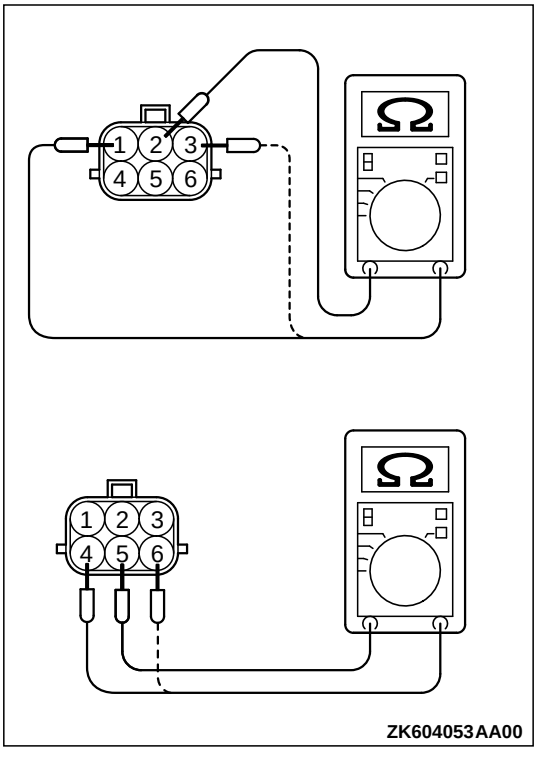
DIAGNOSIS

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 Set

STEP 1. Check harness connector B-12 at EGR valve and harness connector B-10 at ECM 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. Measure the EGR valve motor coil resistance.
(1) Disconnect the EGR valve connector B-12.
(2) Measure the resistance between EGR valve connector terminal No. 2 and either terminal No. 1 or terminal No. 3.
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. 4 or terminal No. 6.
Standard value: 20 - 24 Ω [at 20°C (68°F)]

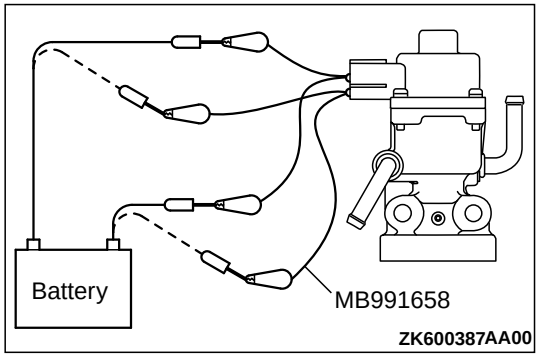


Q:Is the measured resistance between 20 and 24 ohms [at 20°C (68°F)]?
YES: Go to Step 3.
NO: Replace the EGR valve. Then go to Step 5.

STEP 3. Check for short circuit to power supply between EGR valve connector B-12 and ECM connector B-10.

Q:Is the harness wire in good condition?
YES: Then go to Step 4.
NO: Repair it. Then go to Step 5.

STEP 4. 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: 23 ± 6 N·m [17 ± 4 ft·lb]

Q:Is the EGR valve operating properly?
YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 5.
NO: Replace the EGR valve. 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 3 P. 13Ab-8.
(2) Check the diagnostic trouble code (DTC).

Q:Is DTC P0490 set?
YES: Retry the troubleshooting.
NO: The inspection is complete.

DTC P0506: Idle Control Sytem RPM Lower Than Expected

M11310100238USA0000010000

TECHNICAL DESCRIPTION
- The amount of air taken in during idling is regulated by the opening and closing of the throttle valve.
- The ECM 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

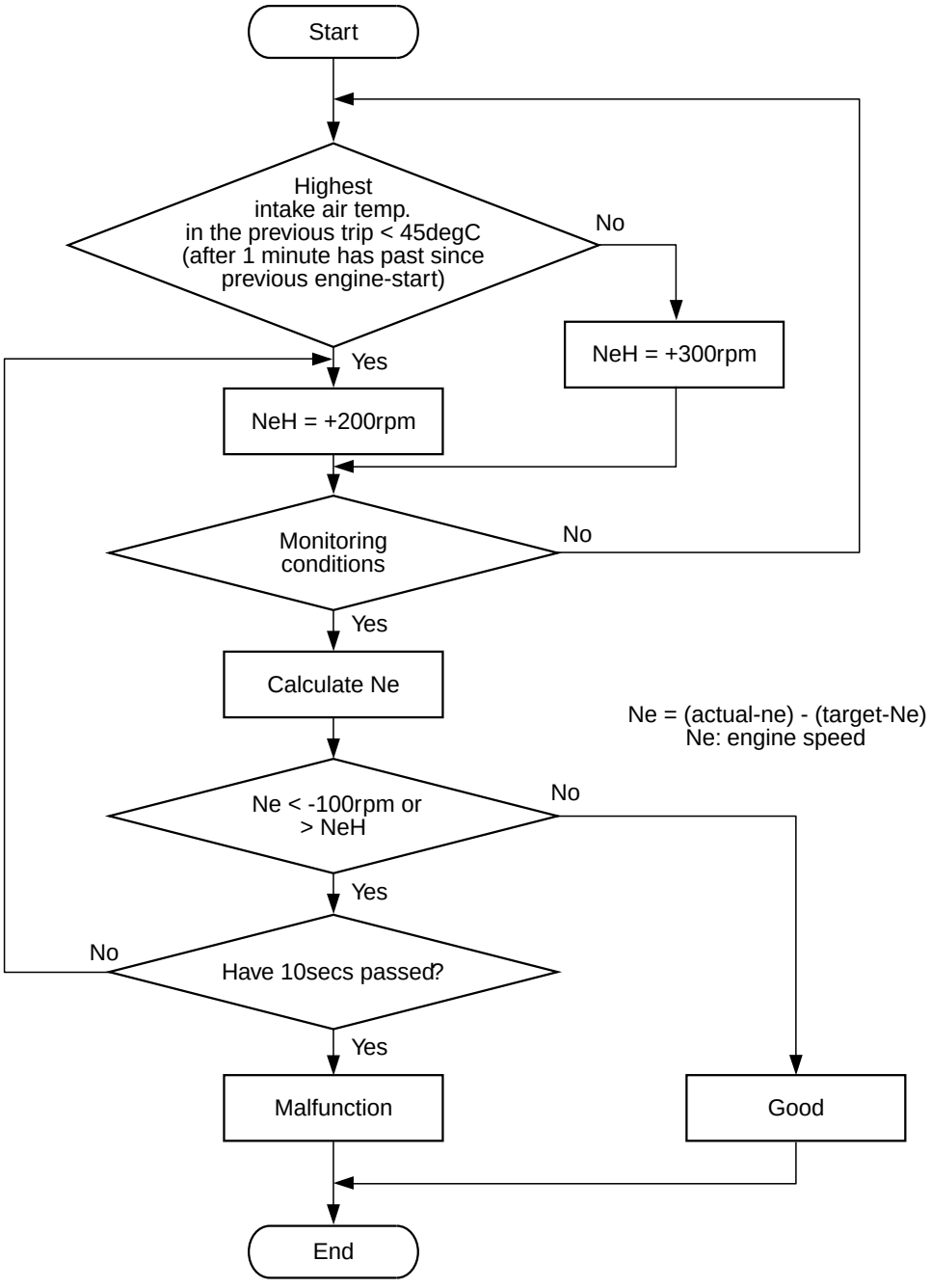
MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

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



ZK603778AA00

Check Conditions

- Under the closed loop idle speed control.
- The engine coolant temperature is more than 41°C (105°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.

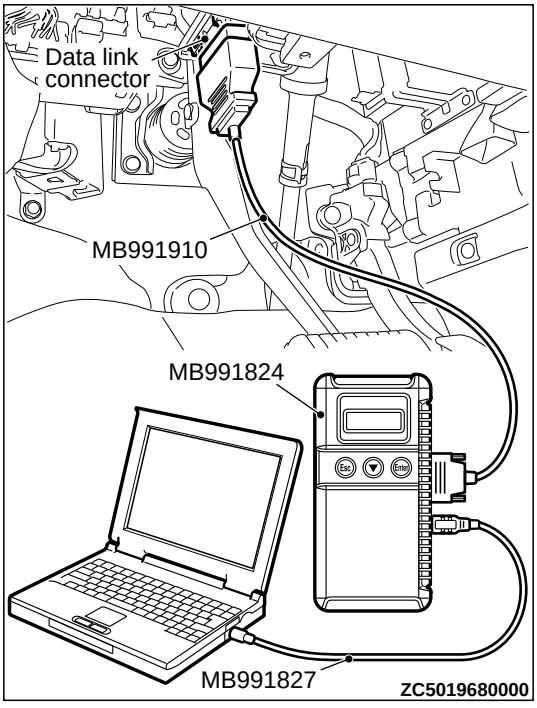
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)
- Throttle valve area is dirty.

OBD-II DRIVE CYCLE PATTERN
Refer to Diagnostic Function - OBD-II Drive Cycle - Pattern 20 P.13Ab-8.

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 the diagnostic trouble code other than P0506 set?
YES: Refer to Diagnostic Trouble Code Chart P.13Ab-44.
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.13Aa-16. 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. 13Ab-8.
(3) Check the diagnostic trouble code (DTC).

Q:Is DTC P0506 set?
YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. 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. 13Ab-8.
(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

M11310100239USA0000010000

TECHNICAL DESCRIPTION
- The amount of air taken in during idling is regulated by the opening and closing of the throttle valve.
- The ECM 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

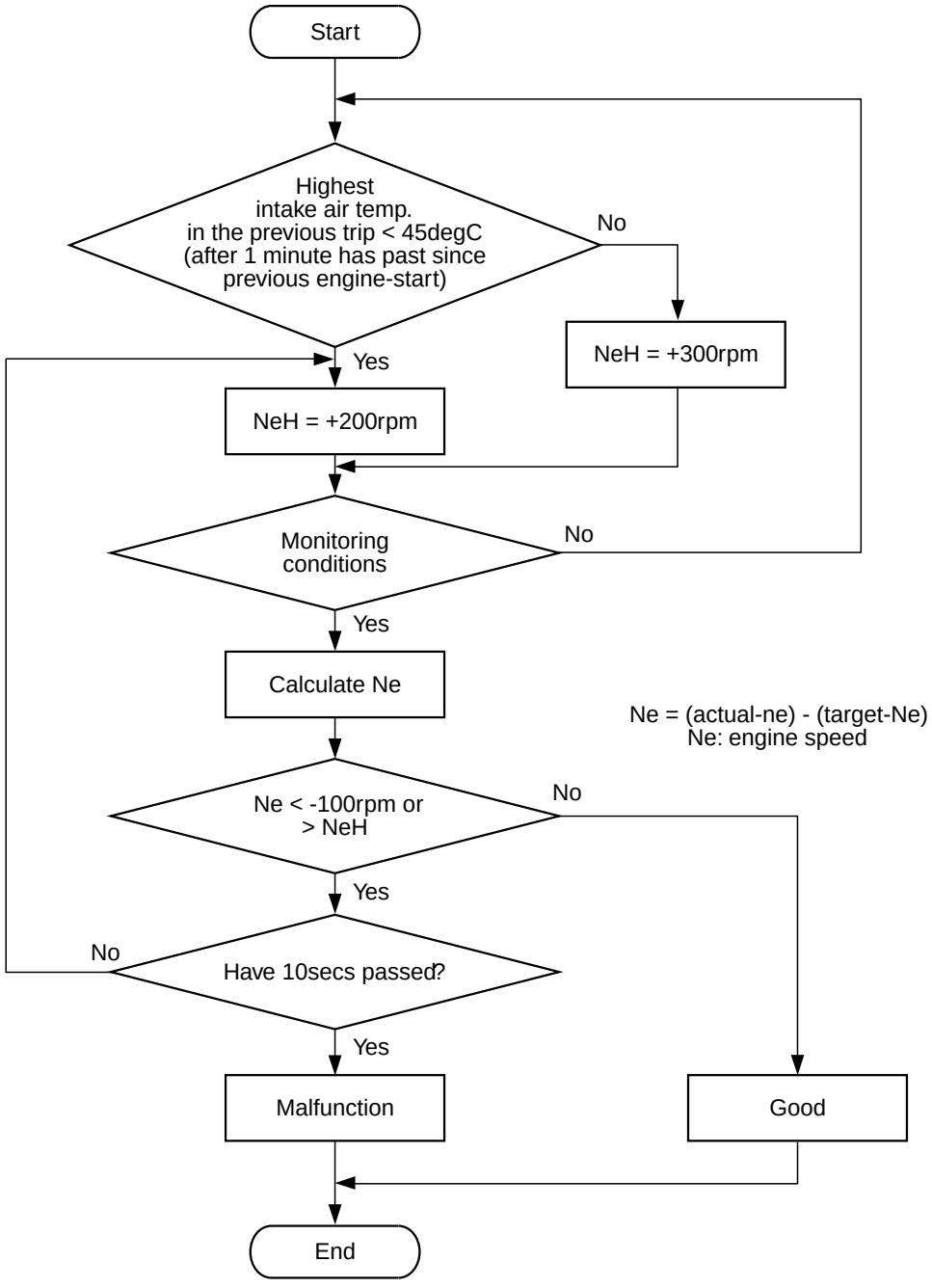
MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

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



ZK603778AA00

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 41°C (105°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 step.

Judgement Criterion

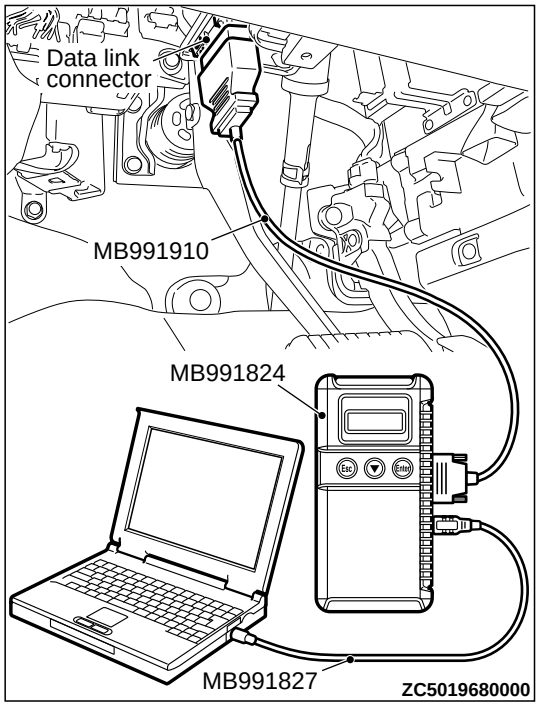
- Actual idle speed has continued to be higher than the target idle speed by 200 r/min (300 r/min*) or more for 12 seconds.
  *: Specs in parentheses are applicable if the maximum air temperature during the previous operation was more than 45°C (113°F).

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

- Intake system vacuum leak.
- Throttle body assy failed.
- ECM failed.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function - OBD-II Drive Cycle - Pattern 20 P.13Ab-8.



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 the diagnostic trouble code other than P0507 set?

YES: Refer to Diagnostic Trouble Code Chart P.13Ab-44.
NO: Go to Step 2.

STEP 2. Check the intake system vacuum leak.

Q:Are there any abnormalities?

YES: Repair 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. 13Ab-8.
(3) Check the diagnostic trouble code (DTC).

Q:Is DTC P0507 set?
YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. 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. 13Ab-8.
(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

M11310100240USA0000010000

TECHNICAL DESCRIPTION
- ECM monitors the communication condition with the immobilizer-ECU. When an abnormality in communication is found, ECM prevents engine start.

DTC SET CONDITIONS

Check Condition
- Ignition switch: ON

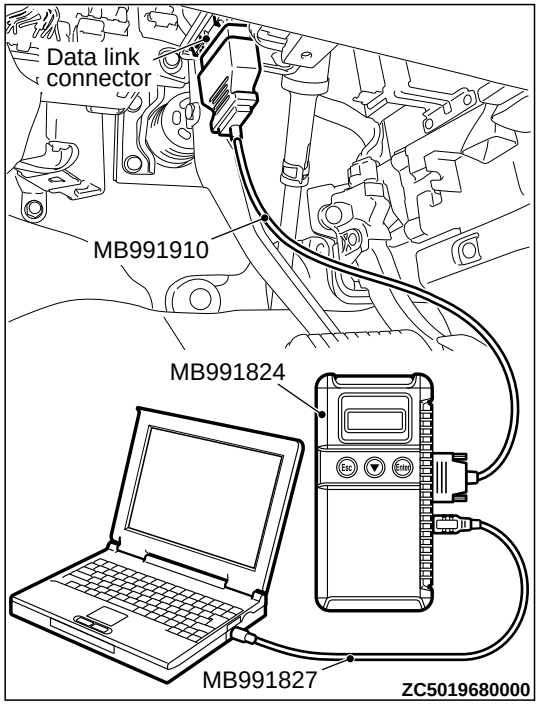
Judgment Criterion
- When the communication error between ECM and the immobilizer-ECU continues for 2 seconds or more.

or
- When it was different in the encrypted code sent from immobilizer-ECU and operation result by ECM.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)
- Malfunction of CAN system.
- Malfunction of immobilizer system.
- ECM 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 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, diagnose CAN bus line.

(1) Turn the ignition switch to the "ON" position.
(2) Diagnose CAN bus line.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q:Is the CAN bus line normal?

YES: Go to Step 3.
NO: Repair the CAN bus line. Refer to GROUP 54D, Can Bus Diagnostics Table P.54D-189. Then go to Step 4.

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

(1) Turn the ignition switch to the "ON" position.
(2) Read the immobilizer-DTC.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q:Is the immobilizer-DTC set?

YES: Refer to GROUP 42B, Diagnosis - Diagnostic Trouble Code Chart <Vehicles with KOS> P.42B-18or GROUP 42C, diagnosis - Diagnostic Trouble Code Chart <Vehicles with WCM> P.42C-11.
NO: Go to Step 4.

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

(1) Turn the ignition switch to the "ON" position.
(2) After the DTC has been deleted, read the DTC again.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q:Is DTC P0606 set?

YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP

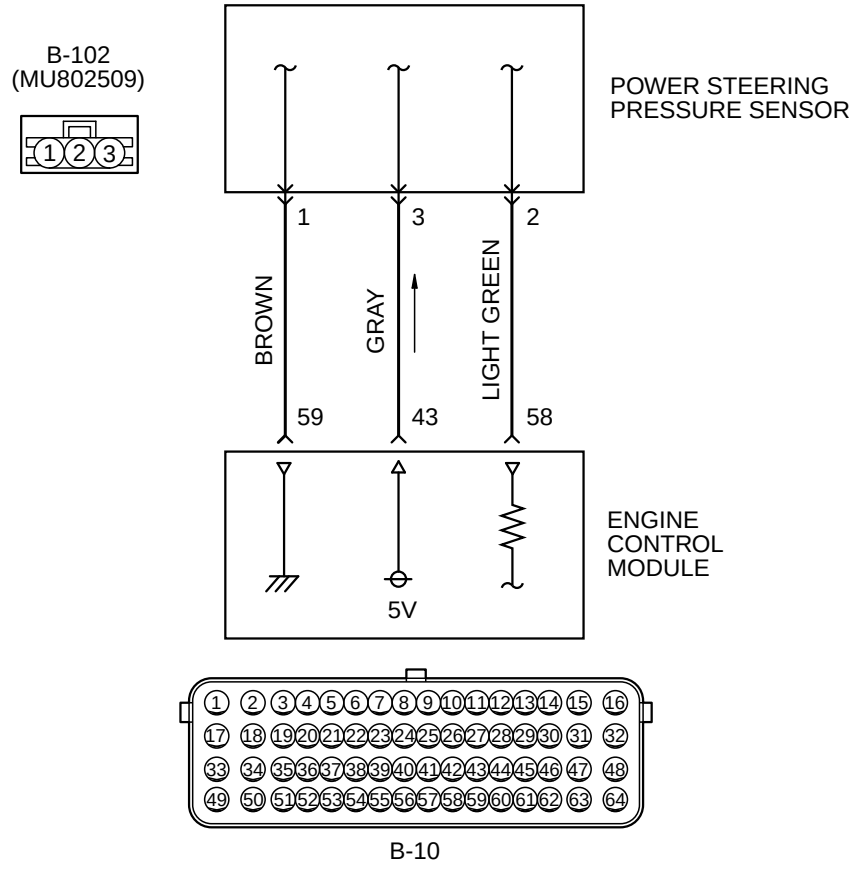
42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8.

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.00-15.

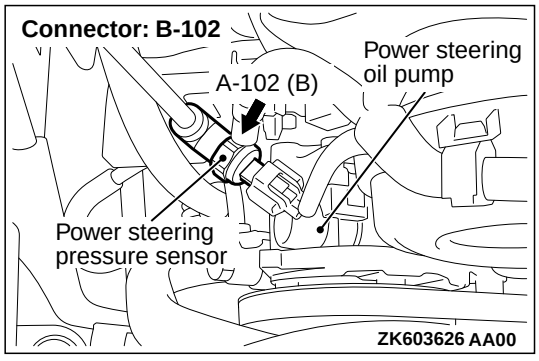
DTC P0551: Power Steering Pressure Sensor Circuit Range/Performance

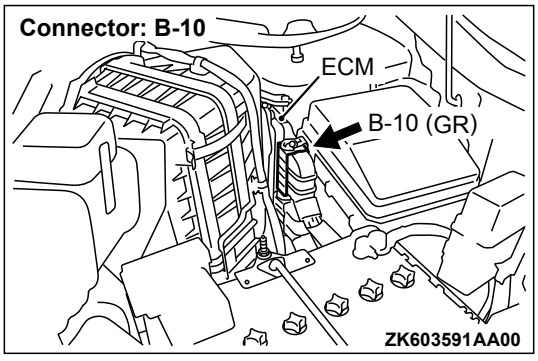
M11310100420USA0000010000

POWER STEERING PRESSURE SENSOR CIRCUIT



ZK602854 AA00





CIRCUIT OPERATION

- A 5-volt voltage is supplied to the power steering pressure sensor power terminal (terminal No. 3) from the ECM (terminal No. 43).
- The ground terminal (terminal No. 1) is grounded with the ECM (terminal No. 59).
- A voltage that is proportional to the power steering pressure is sent to the ECM (terminal No. 58) from the power steering pressure sensor output terminal (terminal No. 2).

TECHNICAL DESCRIPTION

- The power steering pressure sensor outputs a voltage which corresponds to the power steering pressure.
- The ECM checks whether this voltage is within a specified range.

DESCRIPTIONS OF MONITOR METHODS

Power steering pressure sensor output stays high 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)

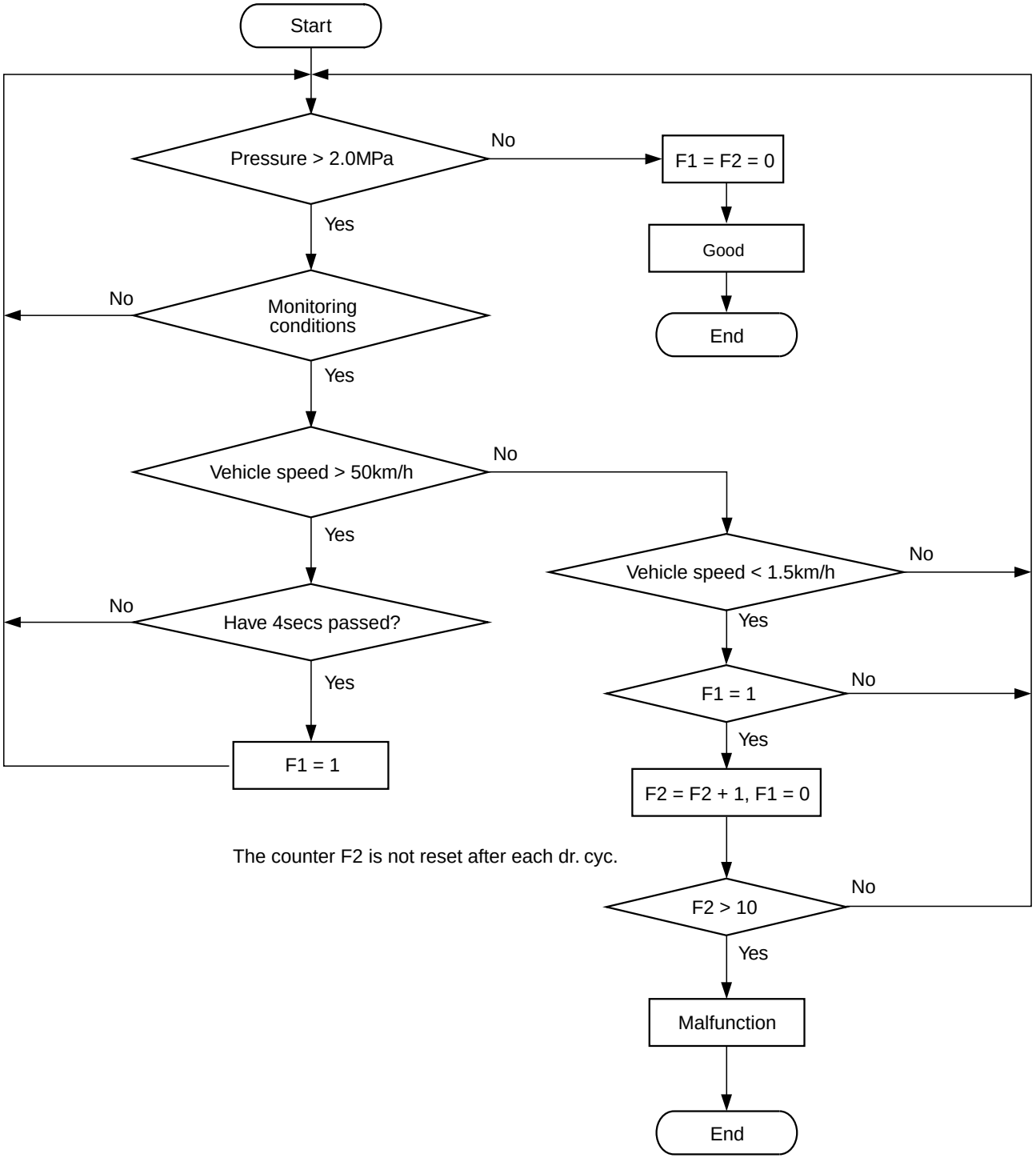
- Not applicable

Sensor (The sensor below is determined to be normal)

- Engine coolant temperature sensor

DTC SET CONDITIONS

Logic Flow Chart



ZK603779AA00

Check Conditions

- Engine coolant temperature is higher than 7°C (45° 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.

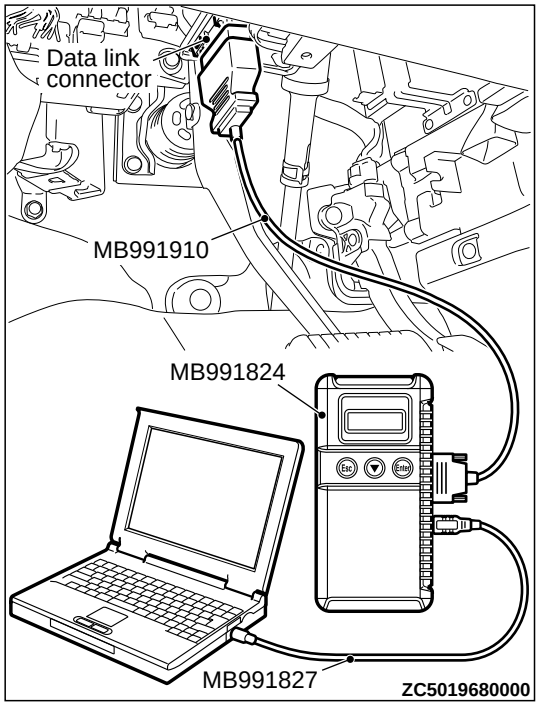
Judgement Criterion
- Power steering pressure is continues to be 2.0 MPa (290 psi) or higher.

OBD-II DRIVE CYCLE PATTERN
None.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)
- Connector damage.
- Harness damage.
- Power steering pressure sensor failed.
- ECM 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 24: Power Steering 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.

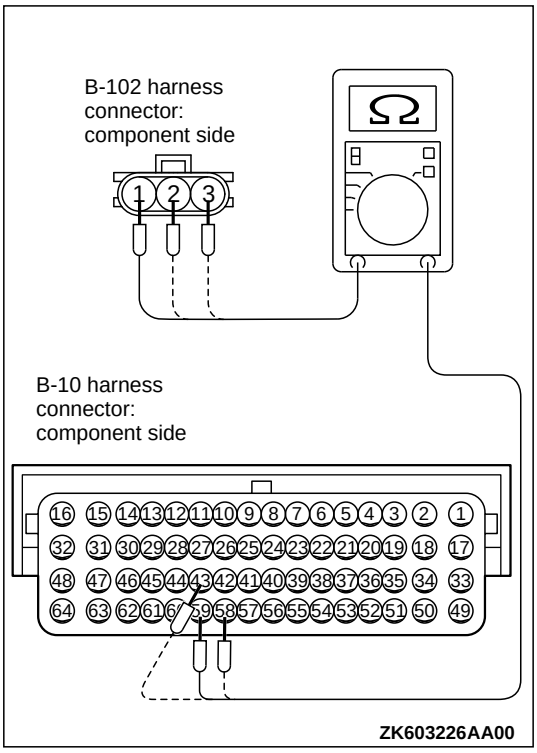
(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991958 to the data reading mode for item24, Power Steering Pressure sensor.
- If the steering wheel is not turned while idling, voltage should be between 400 and 1,000 mV.
- If the steering wheel is turned while idling, voltage should be between 3,000 and 4,000 mV.

(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.00-15.
NO: Go to Step 2.

STEP 2. Check harness connector B-102 at power steering pressure switch and harness connector B-10 at ECM for damage.

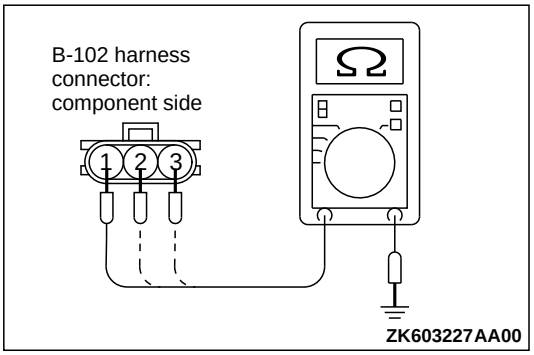
Q:Is the harness connector in good condition?
YES: Go to Step 3.
NO: Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 6.



STEP 3. Check for open circuit and harness damage between power steering pressure sensor connector B-102 and ECM connector B-10.

(1) Disconnect the connector B-102 and B-10 measure at the harness side.
(2) Measure the resistance between B-102 connector and B-10 connector.
 a Connector B-102 (terminal No. 1) and connector B-10 . (terminal No. 59).
 b Connector B-102 (terminal No. 2) and connector B-10 . (terminal No. 58).
 c Connector B-102 (terminal No. 3) and connector B-10 . (terminal No. 43).
 ▪Should be less than 2 ohms.

Q:Is the measured resistance less than 2 ohms?
YES: Then go to Step 4.
NO: Repair it. Then go to Step 6.



STEP 4. Check for short circuit to ground between power steering pressure sensor connector B-102 and ECM connector B-10.

(1) Disconnect the connector B-102 and B-10 measure at the harness side.
(2) Check for the continuity between B-102 connector and ground.
 a Connector B-102 (terminal No. 1) and ground.
 .
 b Connector B-102 (terminal No. 2) and ground.
 .
 c Connector B-102 (terminal No. 3) and ground.
 .
 ▪Not continuity.

Q:Is the harness wire in good condition?
YES: Then go to Step 5.
NO: Repair it. Then go to Step 6.

STEP 5. Replace the power steering pressure sensor.

(1) Replace the power steering pressure sensor.
(2) Check data list.
(3) Start the engine and run at idle.
(4) Set scan tool MB991958 to the data reading mode for item 24, Power Steering Pressure sensor.
 ▪If the steering wheel is not turned while idling, voltage should be between 400 and 1,000 mV.

- If the steering wheel is turned while idling, voltage should be between 3,000 and 4,000 mV.

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

Q:Is the sensor operating properly?

YES: The inspection is complete.

NO: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8..

STEP 6. Using scan tool MB991958, check data list item 24: Power Steering Pressure sensor.

(1) Start the engine and run at idle.

(2) Set scan tool MB991958 to the data reading mode for item 24, Power Steering Pressure sensor.

- If the steering wheel is not turned while idling, voltage should be between 400 and 1,000 mV.
- If the steering wheel is turned while idling, voltage should be between 3,000 and 4,000 mV.

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

Q:Is the sensor operating properly?

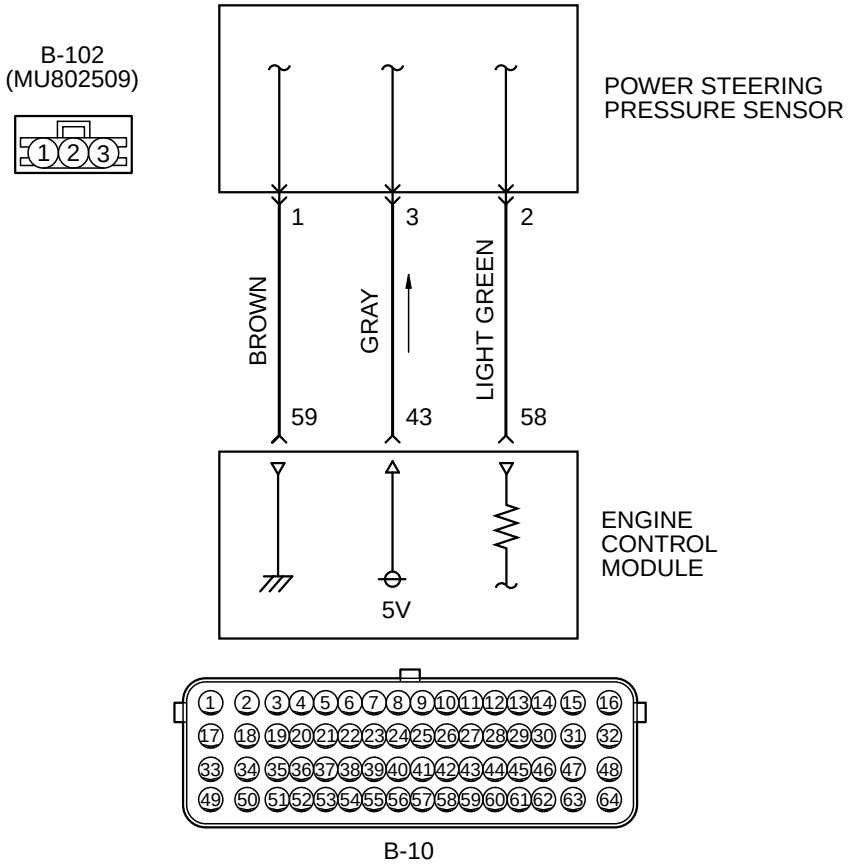
YES: The inspection is complete.

NO: Retry the troubleshooting.

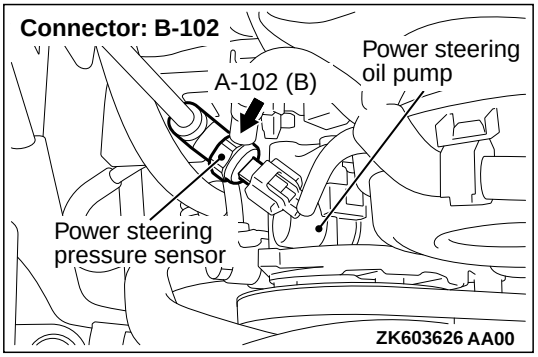
DTC P0552: Power Steering Pressure Circuit Low Input

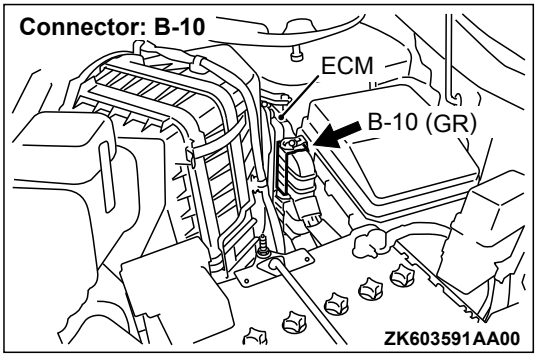
M11310100375USA0000010000

POWER STEERING PRESSURE SENSOR CIRCUIT



ZK602854 AA00





CIRCUIT OPERATION

- A 5-volt voltage is supplied to the power steering pressure sensor power terminal (terminal No. 3) from the ECM (terminal No. 43).
- The ground terminal (terminal No. 1) is grounded with the ECM (terminal No. 59).
- A voltage that is proportional to the power steering pressure is sent to the ECM (terminal No. 58) from the power steering pressure sensor output terminal (terminal No. 2).

TECHNICAL DESCRIPTION

- The power steering pressure sensor outputs a voltage which corresponds to the power steering pressure.
- The ECM checks whether this voltage is within a specified range.

DESCRIPTIONS OF MONITOR METHODS

Power steering 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)

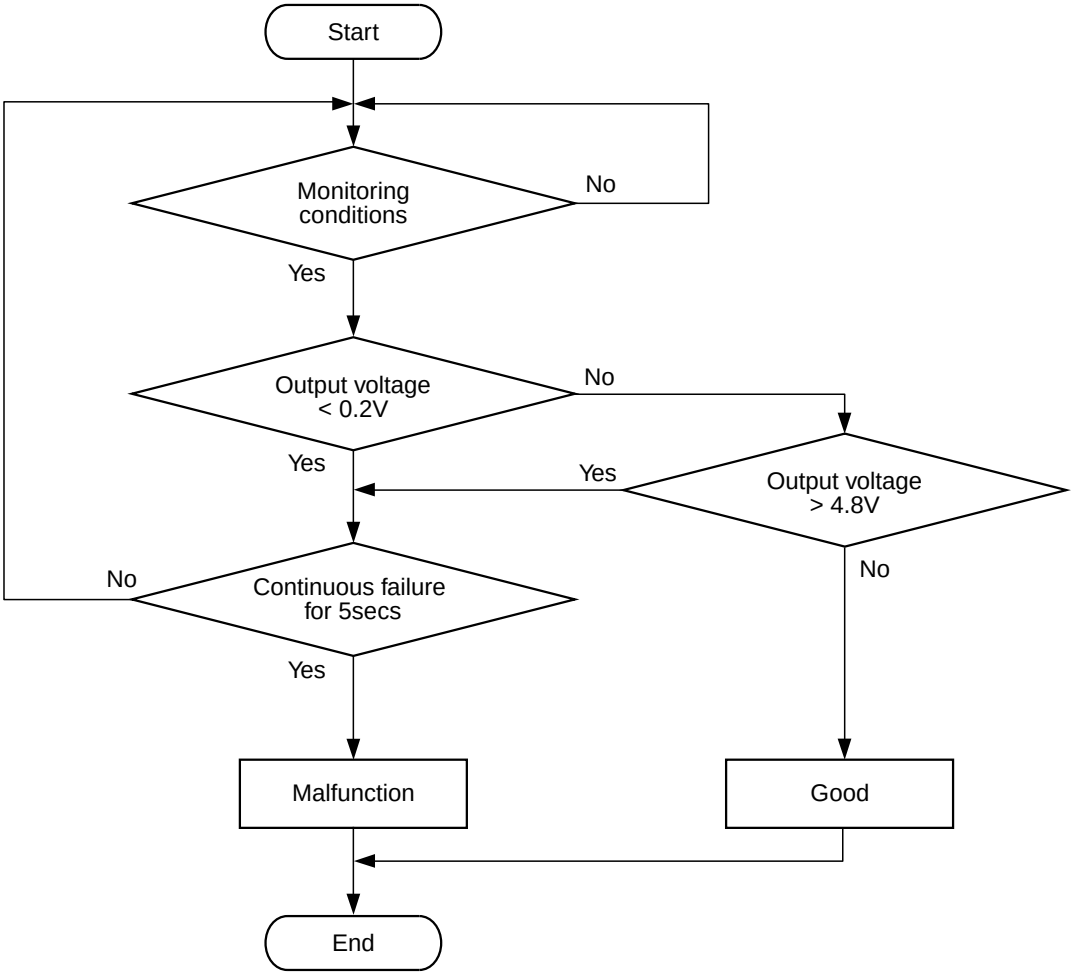
- Not applicable

Sensor (The sensor below is determined to be normal)

- Engine coolant temperature sensor

DTC SET CONDITIONS

Logic Flow Chart



ZK603784AA00

Check Condition

- More than 2 seconds have passed since the engine starting sequence was completed.

Judgement Criterion

- Power steering pressure sensor output voltage has continued to be 0.2 volt or less for 5 seconds.

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

- Connector damage.
- Harness damage.
- Power steering pressure sensor failed.
- ECM failed.

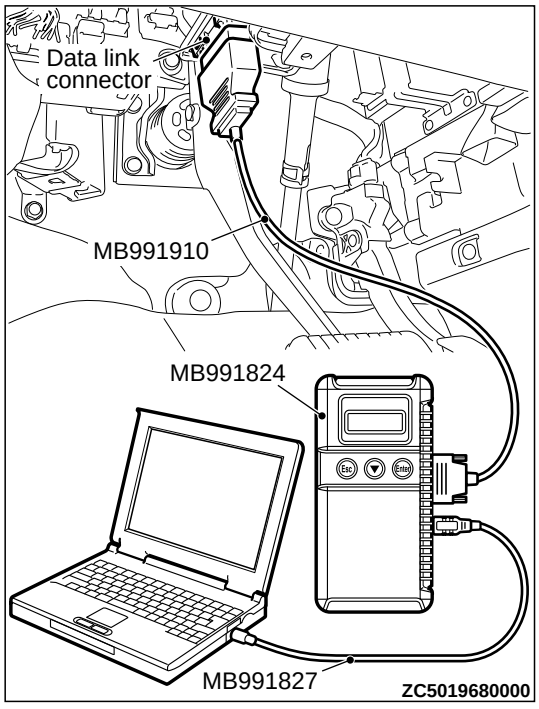
OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function - OBD-II Drive Cycle - Pattern 24 P.13Ab-8.

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 24: Power Steering 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 24, Power Steering Pressure sensor.
- If the steering wheel is not turned while idling, voltage should be between 400 and 1,000 mV.
- If the steering wheel is turned while idling, voltage should be between 3,000 and 4,000 mV.

(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.00-15.

NO: Go to Step 2.

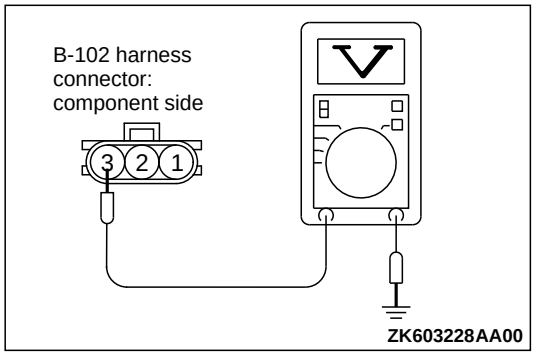
STEP 2. Check harness connector B-102 at the power steering pressure sensor and harness connector B-10 at PCM for damage.

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. Measure the power supply voltage at power steering pressure sensor connector B-102.



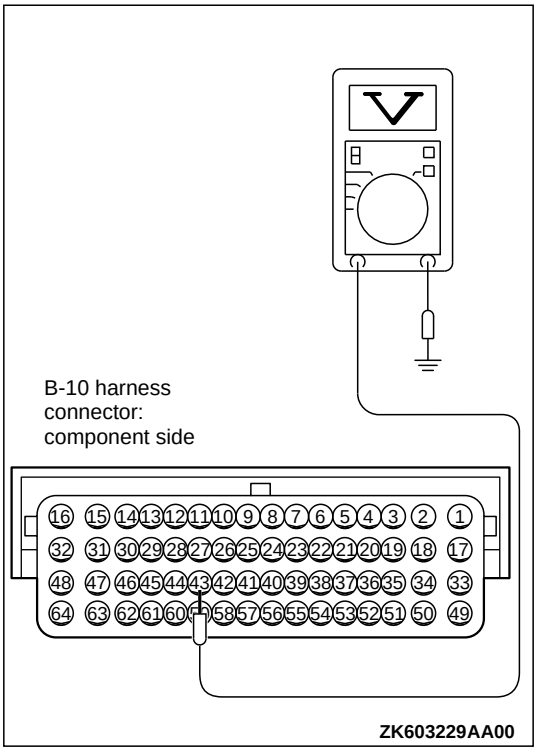
(1) Disconnect the connector B-102 measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal No. 3 and ground.
- Voltage should be between 4.9 and 5.1 volts.

(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. Measure the power supply voltage at ECM connector B-10.

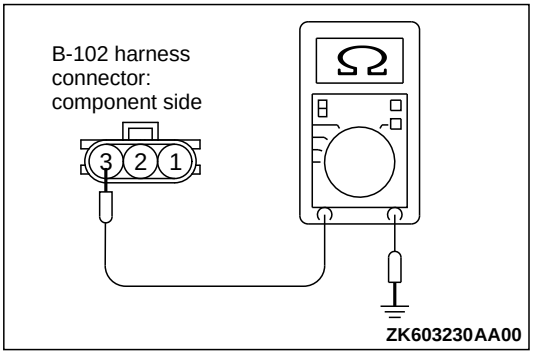
(1) Disconnect the connector B-10 measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal No. 43 and ground.
- Voltage should be between 4.9 and 5.1 volts.

(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 5.

NO: Repair harness wire between power steering pressure sensor connector B-102 (terminal No. 3) and ECM connector B-10 (terminal No. 43) because of open circuit or harness damage. Then Go to Step 8.



STEP 5. Check for short circuit to ground between power steering pressure sensor connector B-102 and ECM connector B-10.

(1) Disconnect the connector B-102 and B-10 measure at the harness side.
(2) Check for the continuity between connector B-102 (terminal No. 3) and ground.
- Not continuity.

Q:Is the harness wire in good condition?

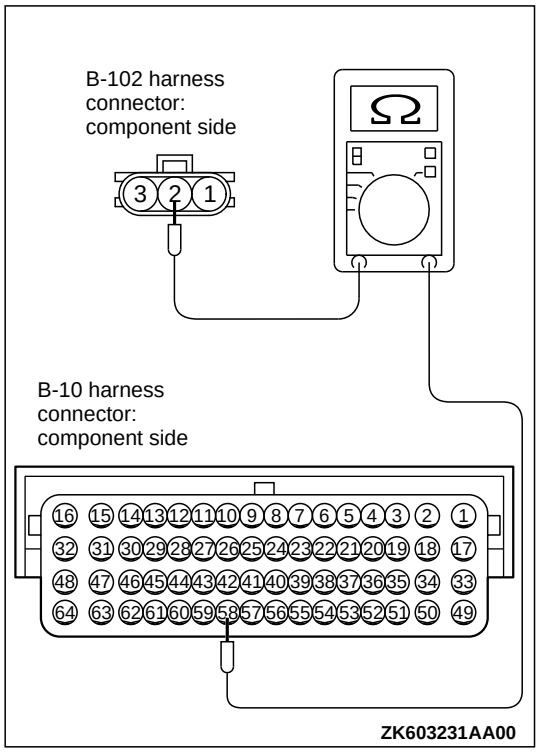
YES: Then go to Step 6.

NO: Repair it. Then go to Step 8.

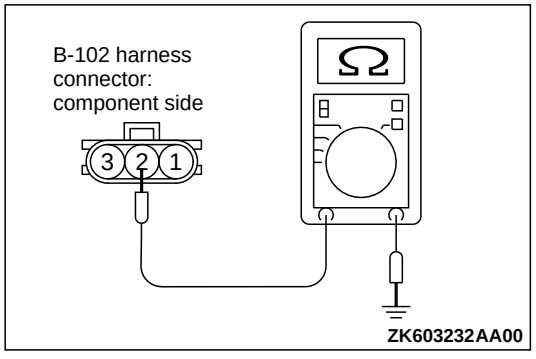
STEP 6. Check for open circuit and short circuit to ground and harness damage between power steering pressure sensor connector B-102 and ECM connector B-10.

(1) Disconnect the connector B-102 and B-10 measure at the harness side.

(2) Measure the resistance between connector B-102 (terminal No. 2) and connector B-10 (terminal No. 58).
- Should be less than 2 ohms.



(3) Check for the continuity between connector B-102 (terminal No. 2) and ground.
- Not continuity.



Q:Is the harness wire in good condition?

YES: Then go to Step 8.

NO: Repair it. Then go to Step 8.

STEP 7. Replace the power steering pressure sensor.

(1) Replace the power steering pressure sensor.

(2) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function. OBD-II Drive Cycle. Pattern 24 P. 13Ab-8.

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

Q:Is DTC P0552 set?

YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. 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 24 P. 13Ab-8.

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

Q:Is DTC P0552 set?

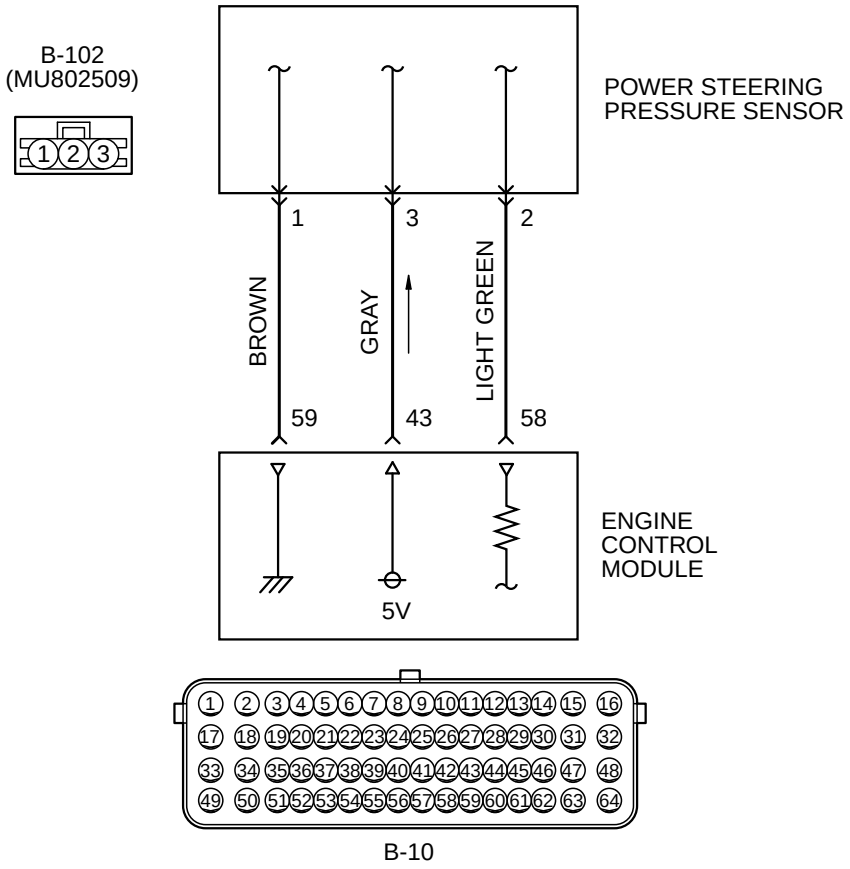
YES: Retry the troubleshooting.

NO: The inspection is complete.

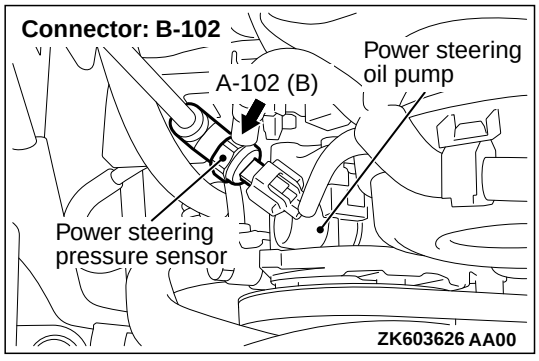
DTC P0553: Power Steering Pressure Circuit High Input

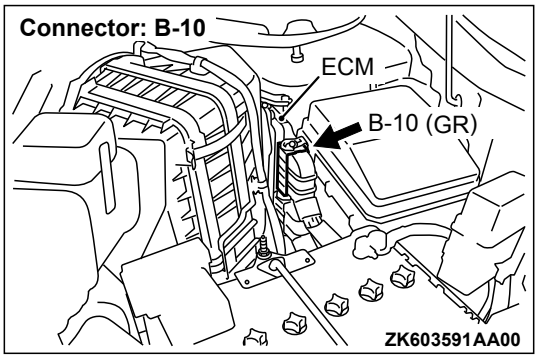
M113101003 76USA0000010000

POWER STEERING PRESSURE SENSOR CIRCUIT



ZK602854 AA00





CIRCUIT OPERATION

- A 5-volt voltage is supplied to the power steering pressure sensor power terminal (terminal No. 3) from the ECM (terminal No. 43).
- The ground terminal (terminal No. 1) is grounded with the ECM (terminal No. 59).
- A voltage that is proportional to the power steering pressure is sent to the ECM (terminal No. 58) from the power steering pressure sensor output terminal (terminal No. 2).

TECHNICAL DESCRIPTION

- The power steering pressure sensor outputs a voltage which corresponds to the power steering pressure.
- The ECM checks whether this voltage is within a specified range.

DESCRIPTIONS OF MONITOR METHODS

Power steering 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)

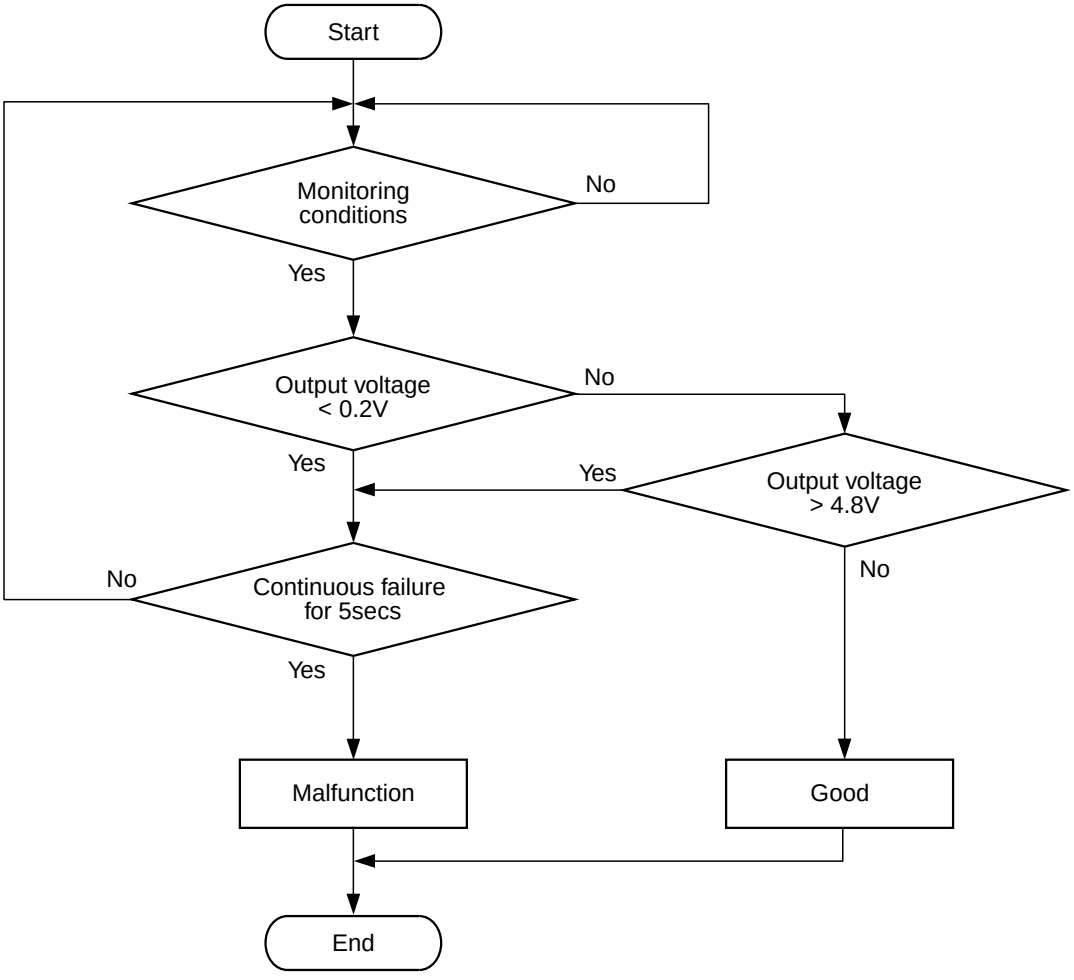
- Not applicable

Sensor (The sensor below is determined to be normal)

- Engine coolant temperature sensor

DTC SET CONDITIONS

Logic Flow Chart



ZK603784AA00

Check Condition

- More than 2 seconds have passed since the engine starting sequence was completed.

Judgement Criterion

- Power steering pressure sensor output voltage has continued to be 4.8 volts or higher for 5 seconds.

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

- Connector damage.
- Harness damage.
- Power steering pressure sensor failed.
- ECM failed.

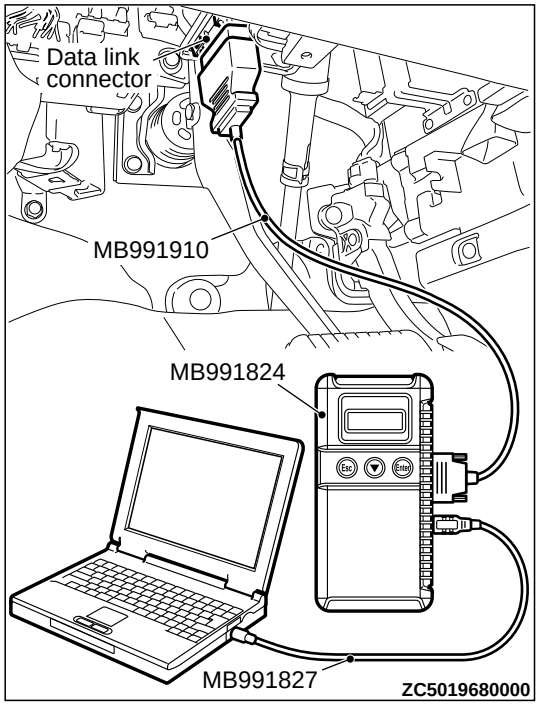
OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function - OBD-II Drive Cycle - Pattern 24 P.13Ab-8.

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 24: Power Steering 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 24, Power Steering Pressure sensor.
  - If the steering wheel is not turned while idling, voltage should be between 400 and 1,000 mV.
  - If the steering wheel is turned while idling, voltage should be between 3,000 and 4,000 mV
(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.00-15.

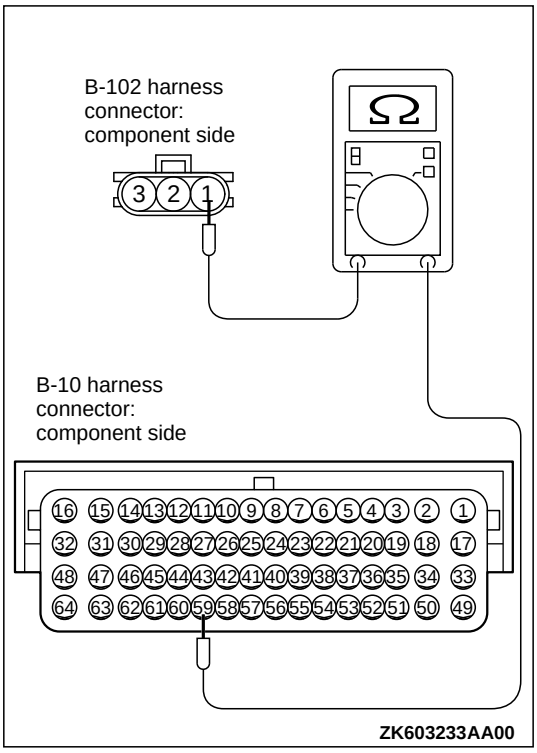
NO: Go to Step 2.

STEP 2. Check harness connector B-102 at the power steering pressure sensor and harness connector B-10 at ECM for damage.

Q:Is the harness connector in good condition?

YES: Go to Step 3.

NO: Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 5.



STEP 3. Check for open circuit and harness damage between power steering pressure sensor connector B-102 and ECM connector B-10.

(1) Disconnect the connector B-102 and B-10 measure at the harness side.
(2) Measure the resistance between connector B-102 (terminal No. 1) and connector B-10 (terminal No. 59).
- Should be less than 2 ohms.

Q:Is the measured resistance less than 2 ohms?

YES: Go to Step 4.
NO: Repair it. Then Go to Step 5.

STEP 4. Replace the power steering pressure sensor.

(1) Replace the power steering pressure sensor.
(2) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function - OBD-II Drive Cycle - Pattern 24 P. 13Ab-8.
(3) Check the diagnostic trouble code (DTC).

Q:Is DTC P0553 set?

YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 5.
NO: The inspection is complete.

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. 13Ab-8.
(2) Check the diagnostic trouble code (DTC).

Q:Is DTC P0553 set?

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

DTC P0603: EEP ROM Malfunction

M11310100243USA0000010000

TECHNICAL DESCRIPTION

- ECM stored the information such as the idle learned value and so on in the memory of ECM.

DESCRIPTIONS OF MONITOR METHODS

To check whether the information such as the idle learned value and so on is stored in the memory of ECM.

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)

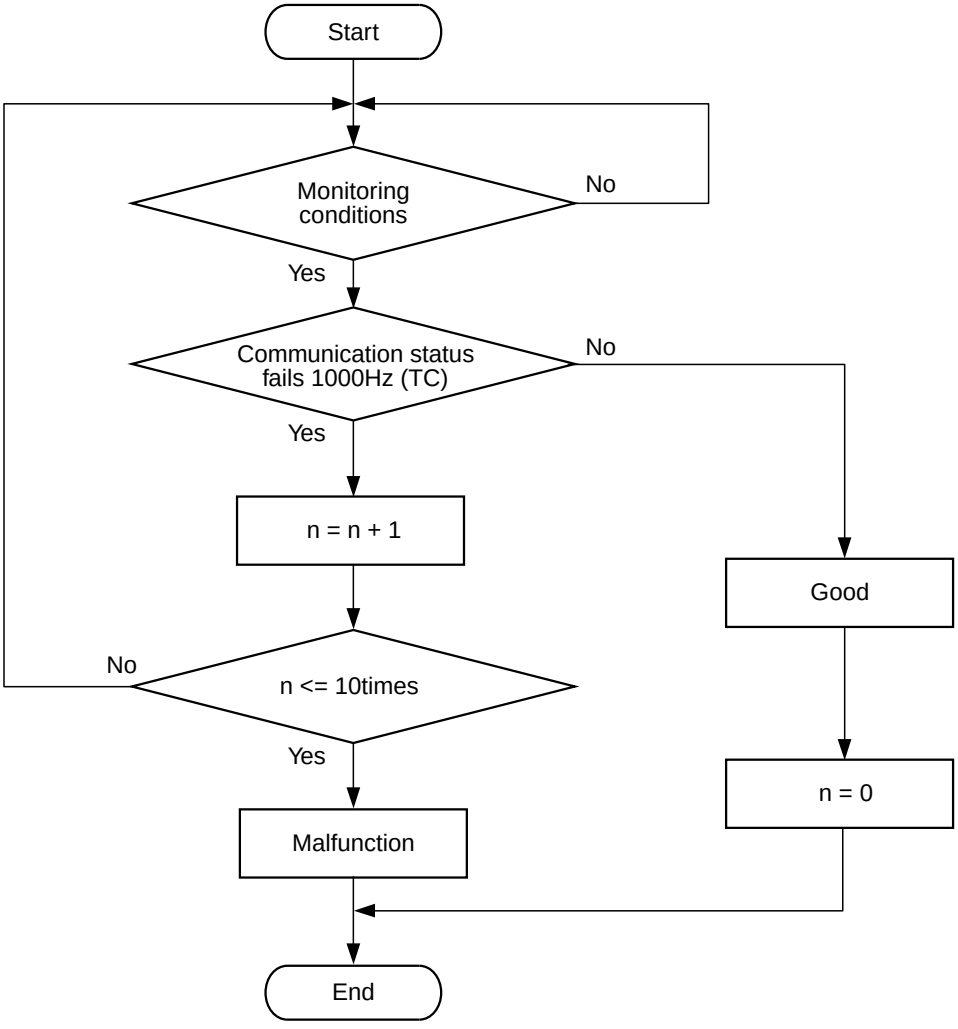
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



ZK603786AA00

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.

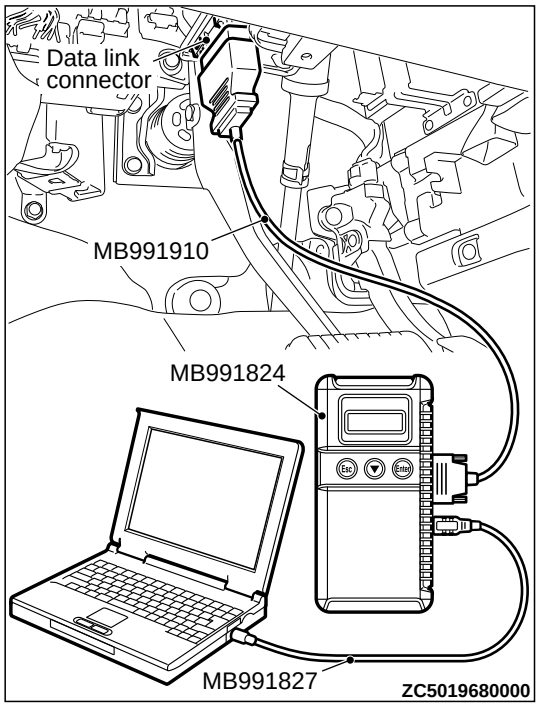
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- ECM 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 P0603 set?

YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-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.00-15.

DTC P0606: Engine Control Module Main Processor Malfunction

M11310100244USA0000010000

TECHNICAL DESCRIPTION

▪Throttle actuator control module processor checks the ECM 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.

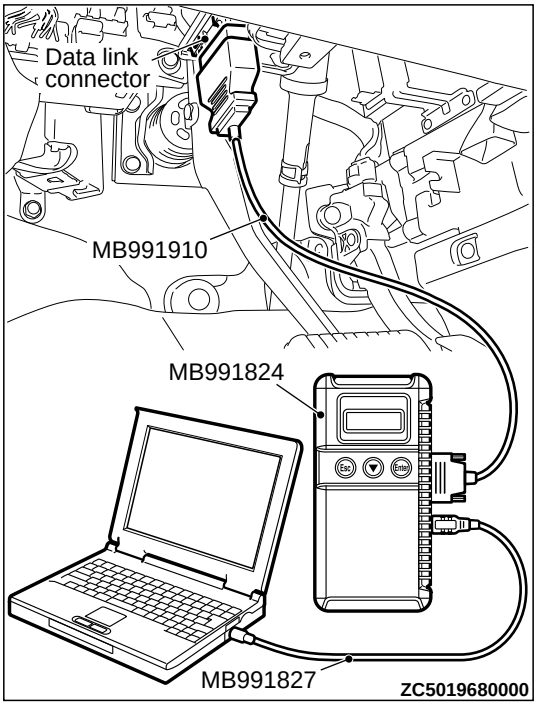
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

▪ECM 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?

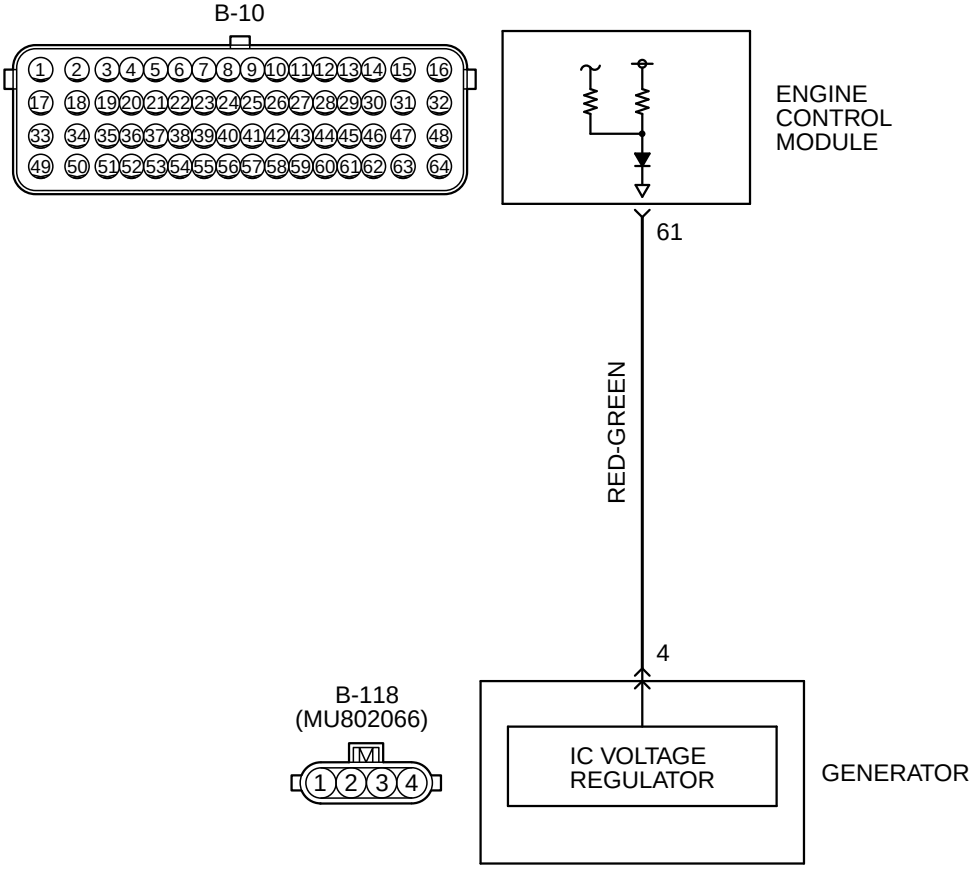
YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8.

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.00-15.

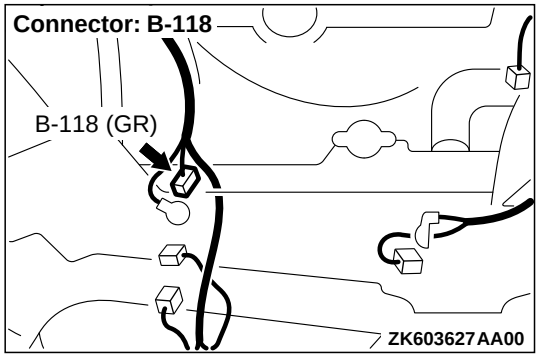
DTC P0622: Generator FR Terminal Circuit Malfunction

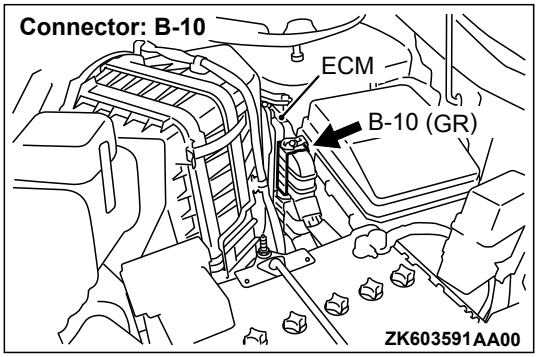
M11310100245USA0000010000

GENERATOR CIRCUIT



ZK602855 AA00





CIRCUIT OPERATION

- The ECM (terminal No. 61) apply a battery positive 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 ECM.
- The ECM detects the generator output with the input signal, and controls the idle air control motor according to the generator output.

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.
- Connector damage.
- Harness damage.
- ECM 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
  - MB992110: Power Plant ECU Check Harness

STEP 1. Check harness connector B-10 at ECM connector for damage.

Q:Is the harness connector in good condition?

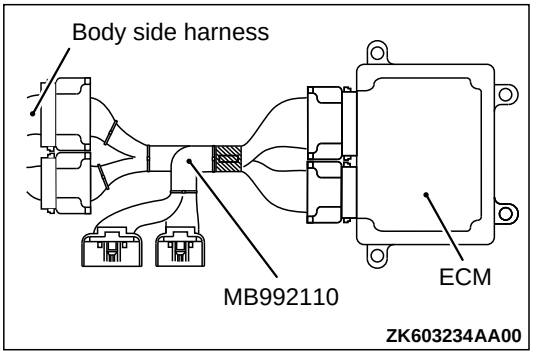
YES: Go to Step 2.

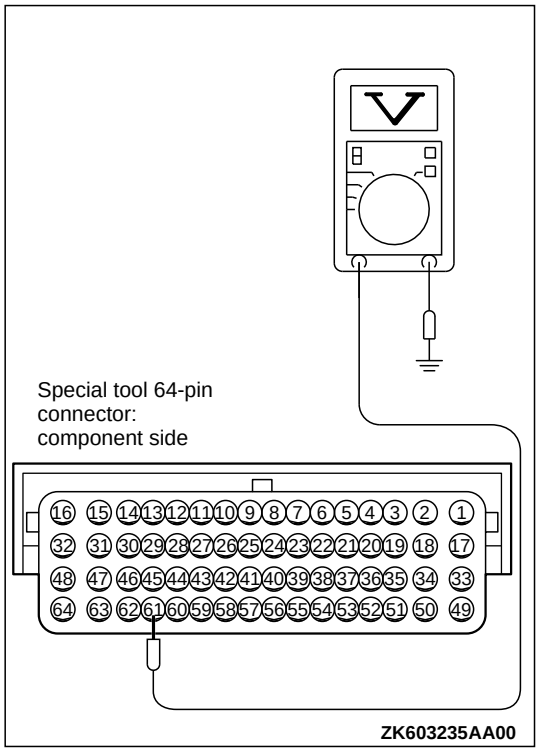
NO: Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 8.

STEP 2. Measure the voltage at ECM connector B-10 by using power plant ECU check harness special tool MB992110.

(1) Disconnect all ECM connectors. Connect the power plant ECU check harness special tool MB992110 between the separated connectors.

(2) Start the engine and run at idle.





(3) Measure the voltage between terminal No. 61 and ground.

NOTE: 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.

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.

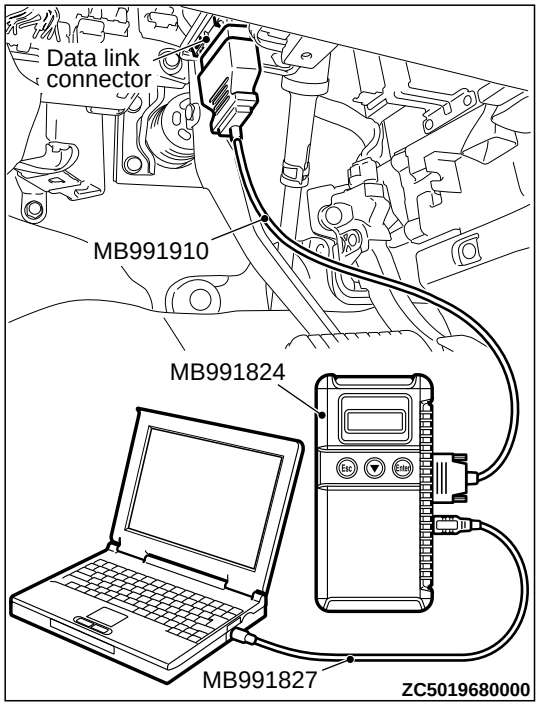
(4) Turn the ignition switch to the "LOCK" (OFF) position.

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 ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 8.

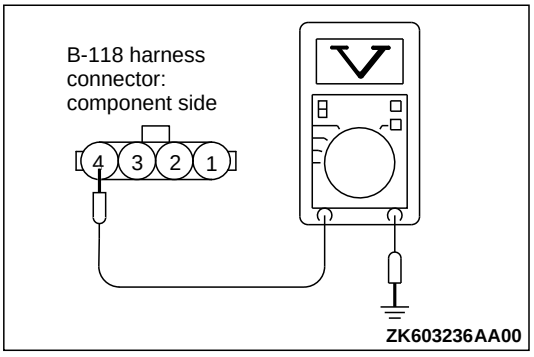
NO: It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points - How to Cope with Intermittent Malfunctions P.00-15.

STEP 4. Check harness connector B-118 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-118.

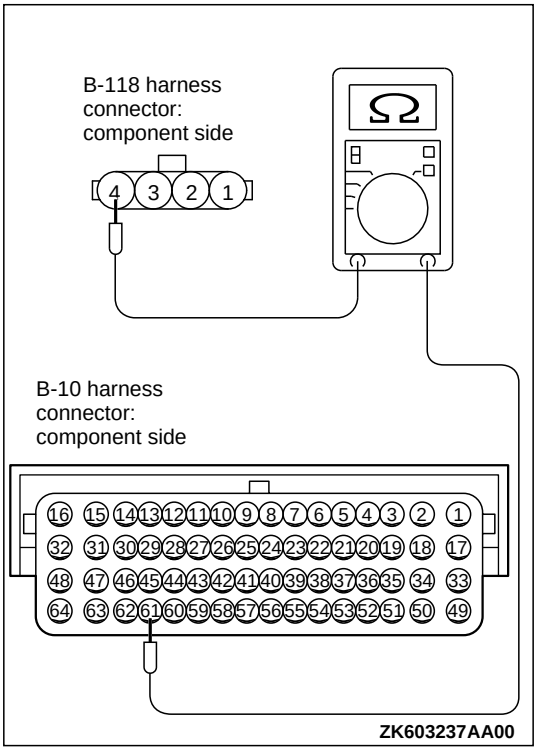
(1) Disconnect the connector B-118 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal No. 4 and ground.
- Voltage should measure battery positive voltage.

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

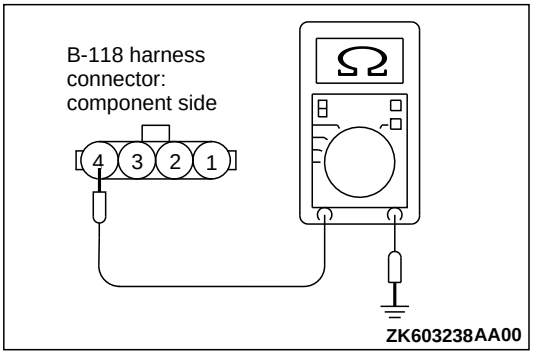
Q:Is battery positive voltage (approximately 12 volts) present?

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-118 and ECM connector B-10.



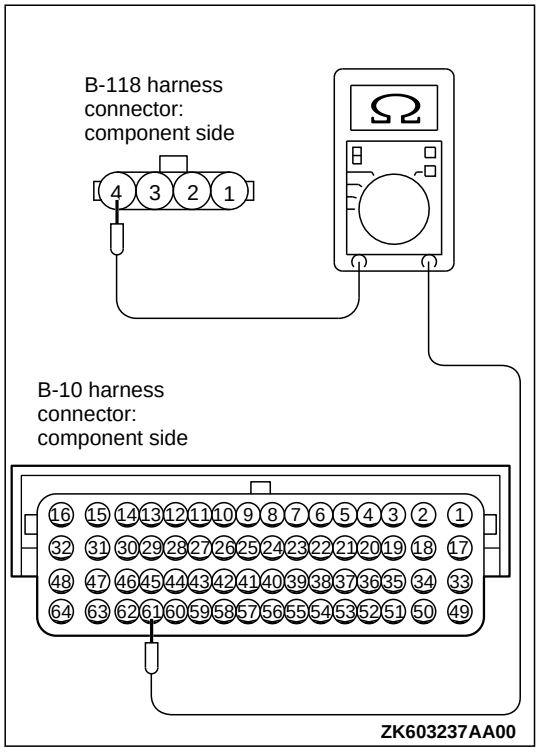
(1) Disconnect the connector B-118 and B-10 measure at the harness side.
(2) Measure the resistance between connector B-118 (terminal No. 4) and connector B-10 (terminal No. 61).
- Should be less than 2 ohms.



(3) Check for the continuity between connector B-118 (terminal No. 4) and ground.
- Not continuity.

Q:Is the harness wire in good condition?

YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 8.
NO: Repair it. Then go to Step 8.



STEP 7. Check for harness damage between generator connector B-118 and ECM connector B-10.

(1) Disconnect the connector B-118 and B-10 measure at the harness side.
(2) Measure the resistance between connector B-102 (terminal No. 4) and connector B-10 (terminal No. 61).
- Should be less than 2 ohms.

Q:Is the measured resistance less than 2 ohms?

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).

(1) Start the engine and run at idle.
(2) Read the DTC.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q:Is DTC P0622 set?

YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8.
NO: The inspection is complete.

DTC P0630: Vehicle Identification Number (VIN) Malfunction

M11310100246USA0000010000

TECHNICAL DESCRIPTION

- The Vehicle Identification Number (VIN) is stored in the ECM by the vehicle manufacturer.

DESCRIPTIONS OF MONITOR METHODS

The ECM checks whether the VIN is being entered or not.

MONITOR EXECUTION

Continuous

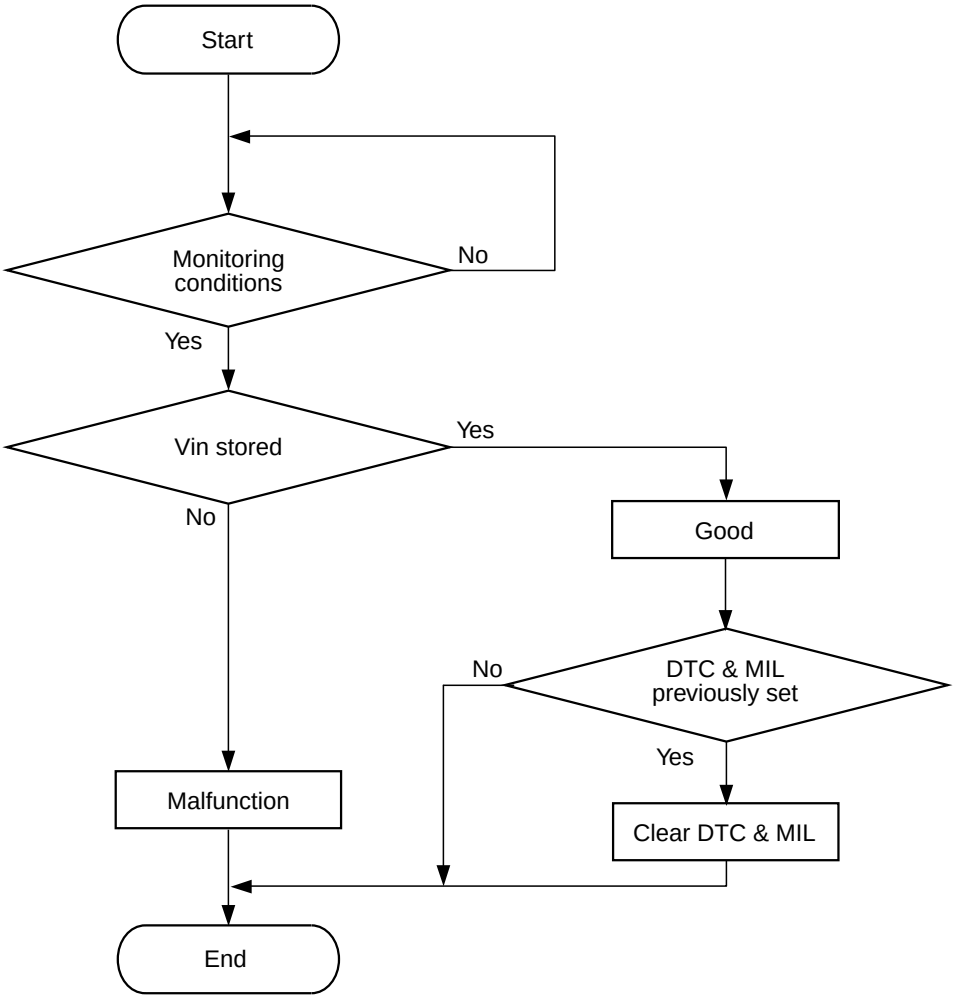
MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

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



ZK603789 AA00

Check Conditions
- Ignition switch is in "ON" position.
- EEP ROM is normal.

Judgement Criterion
- VIN (current) has not been written.

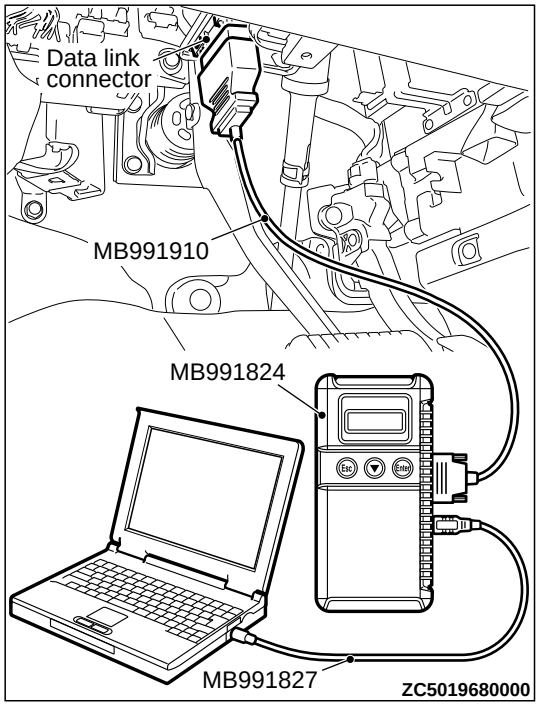
OBD-II DRIVE CYCLE PATTERN

None.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)
- ECM 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 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 ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-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.00-15.

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 ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8.
NO: The inspection is complete.

DTC P0638: Throttle Actuator Control Motor Circuit Range/Performance Problem

M11310100247USA0000010000

THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE PROBLEM CIRCUIT

- Refer to DTC P2101 - Throttle Actuator Control Motor Circuit P.13Ab-694.

CIRCUIT OPERATION

- Refer to DTC P2101 - Throttle Actuator Control Motor Circuit P.13Ab-694.

TECHNICAL DESCRIPTION

- ECM 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 0.2 and 4.8 volts.
- Drop of throttle position sensor (main) output voltage per 100 milliseconds is more than 0.04 volt.

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 0.4 second.

Check Conditions

- Battery positive voltage is higher than 8.3 volts.
- Throttle position sensor (main) output voltage is between 0.2 and 4.8 volts.
- Drop of throttle position sensor (main) output voltage per 100 milliseconds is more than 0.04 volt.
- Target throttle position sensor (main) output voltage is 1.5 volts or lower.

Judgement Criteria

- Difference between throttle position sensor (main) output voltage and target throttle position sensor (main) voltage is 0.6 volt or higher for 0.4 second.
- 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 0.2 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.

Check Condition

- Battery positive voltage is higher than 8.3 volts.

Judgement Criterion

- Throttle position sensor (main) default opening learnt value is higher than 4 volts or higher.

OBD-II DRIVE CYCLE PATTERN

None.

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

- Throttle actuator control motor failed.
- Connector damage.
- Harness damage.
- ECM 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-08 at throttle actuator control motor and harness connector B-10 at ECM for damage.

Q:Is the harness connector in good condition?

YES: Go to Step 2.

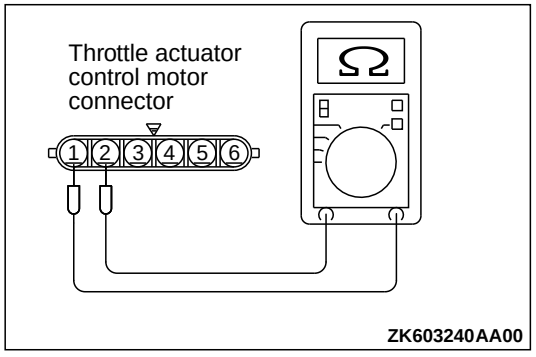
NO: Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 5.

STEP 2. Check the throttle actuator control motor.

(1) Disconnect the connector B-08.

(2) Measure the resistance between throttle actuator control motor side connector terminal No. 1 and No. 2.

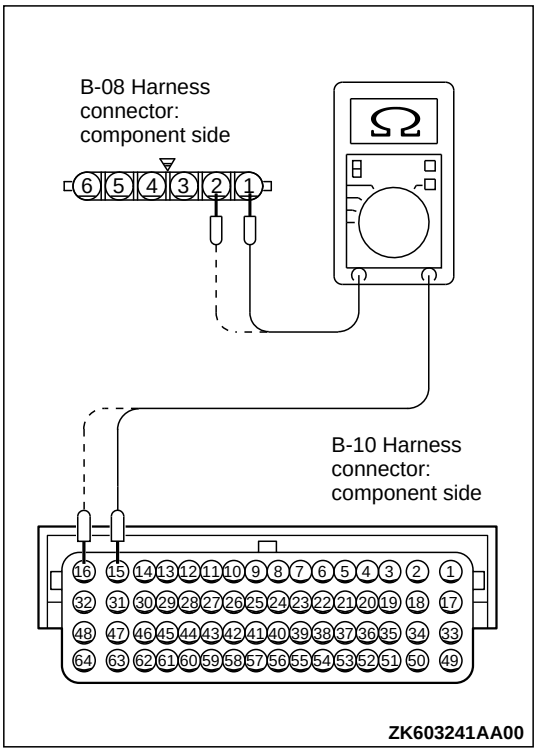
Standard value: 0.3 - 80 Ω [at 20°C (68°F)]



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 5.

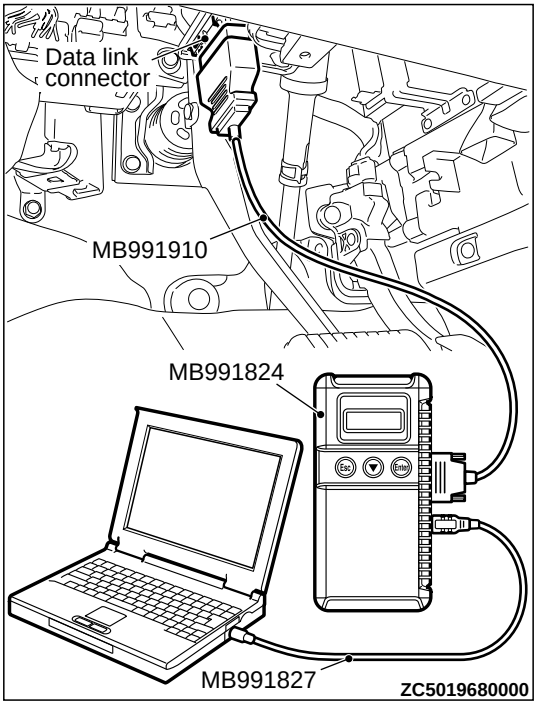


STEP 3. Check for harness damage between throttle actuator control motor connector B-08 and ECM connector B-10.

(1) Disconnect the connector B-08 and B-10 measure at the harness side.
(2) Measure the resistance between B-08 connector and B-10 connector.
  a Connector B-08 (terminal No. 1) and connector B-10 . (terminal No. 15).
  b Connector B-08 (terminal No. 2) and connector B-10 . (terminal No. 16).
  ▪Should be less than 2 ohms.

Q:Is the measured resistance less than 2 ohms?

YES: Then go to Step 4.
NO: Repair it. Then go to Step 5.



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) 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 ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. 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.00-15.

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 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

M11310100248USA0000010000

TECHNICAL DESCRIPTION
- ECM 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 Condition
- Battery positive voltage is higher than 6.3 volts.

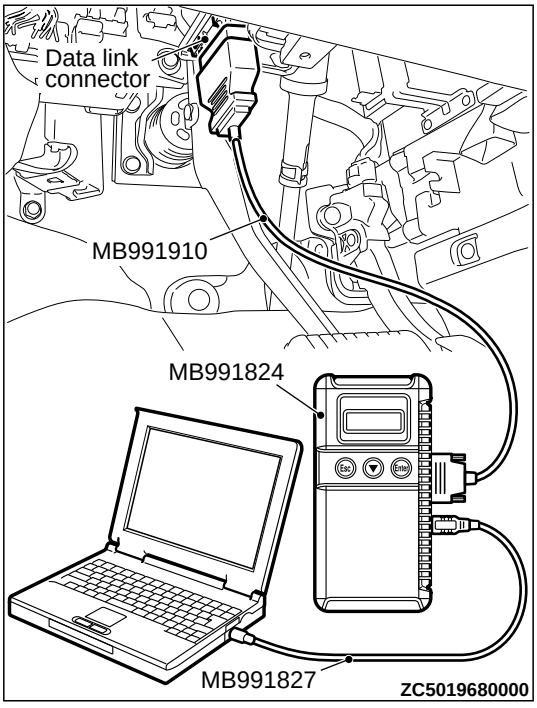
Judgement Criterion
- Throttle position sensor power voltage should be 4.1 volts or less for 0.3 second.

OBD-II DRIVE CYCLE PATTERN
None.

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

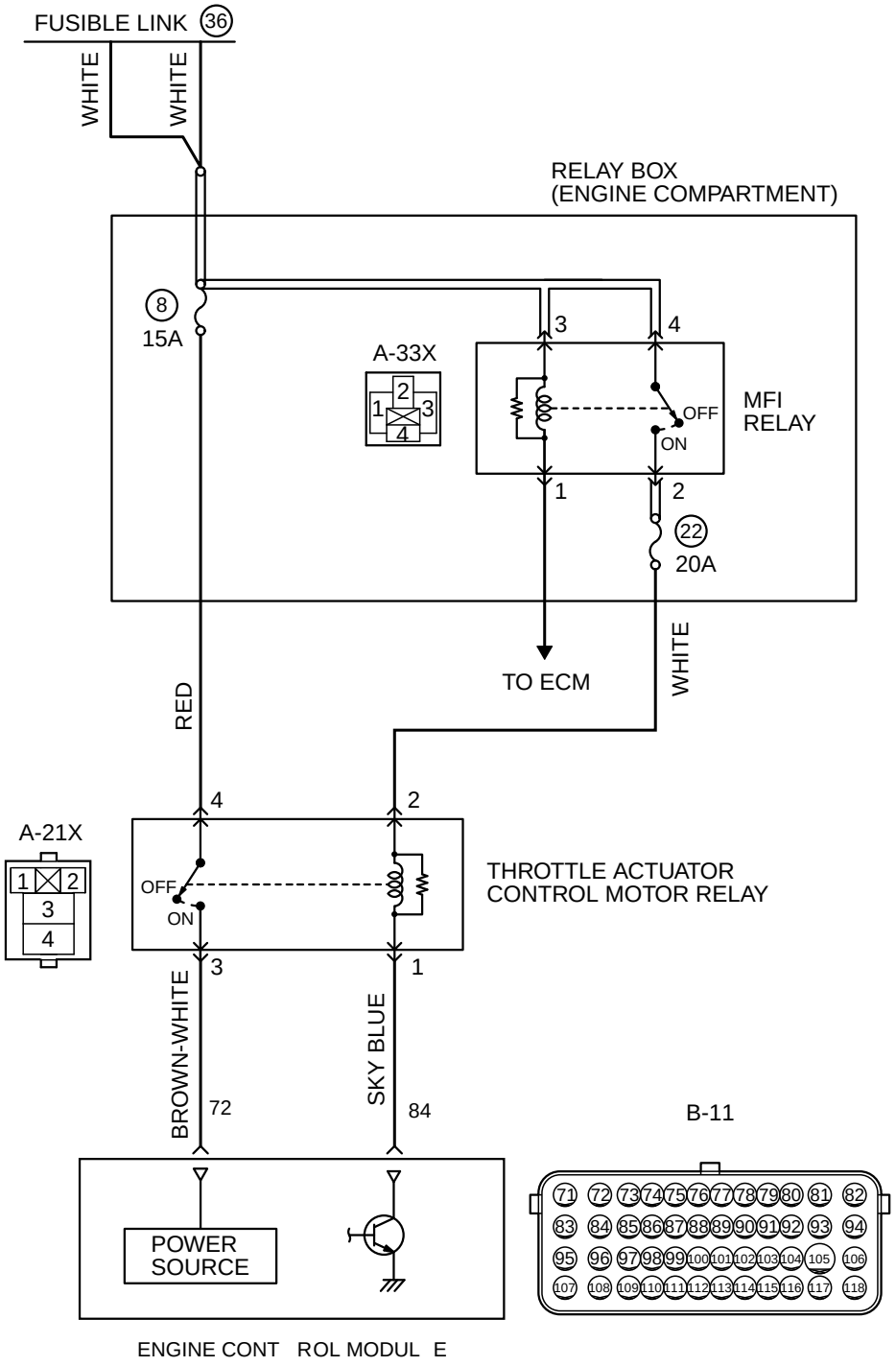
YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8.

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.00-15.

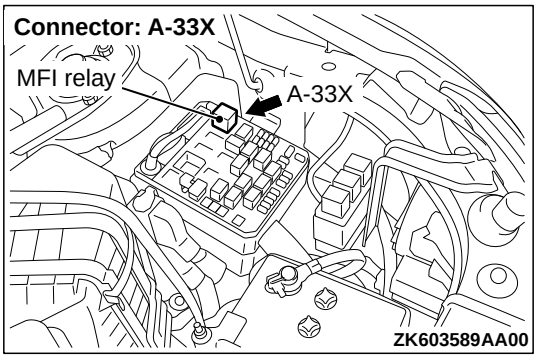
DTC P0657: Throttle Actuator Control Motor Relay Circuit Malfunction

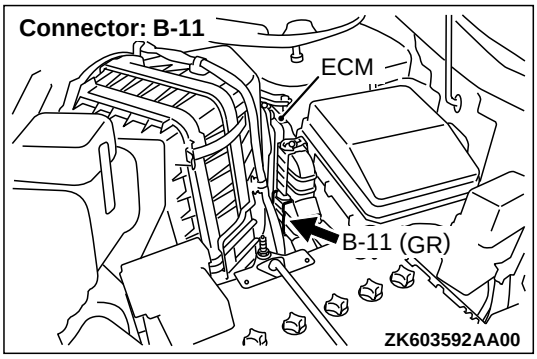
M11310100249USA0000010000

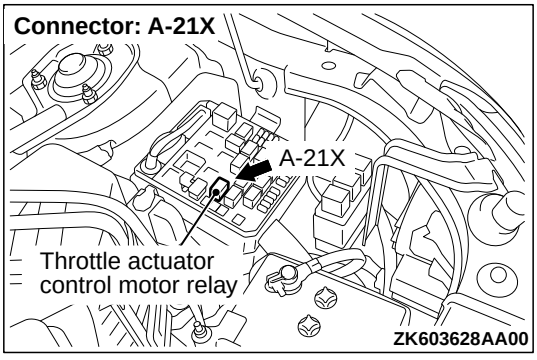
THROTTLE ACTUATOR CONTROL MOTOR RELAY CIRCUIT



ZK602856 AA00







CIRCUIT OPERATION

- Battery positive voltage is applied to the throttle actuator control motor relay terminal (terminal No. 4).
- Battery positive voltage is applied to the throttle actuator control motor relay terminal (terminal No. 2) from the MFI relay (terminal No. 2).
- ECM (terminal No. 84) 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. 3) to the ECM (terminal No. 72).

TECHNICAL DESCRIPTION

- When the ignition switch ON signal is input into the ECM, the ECM turns ON the throttle actuator control motor relay.

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 system should be 6.0 volts or less for 0.35 seconds.

OBD-II DRIVE CYCLE PATTERN

None.

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

- Malfunction of throttle actuator control motor relay.
- Connector damage.
- Harness damage.
- ECM 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 A-21X at throttle actuator control motor relay and harness connector B-10 at ECM for damage.

Q:Is the harness connector in good condition?

YES: Go to Step 2.

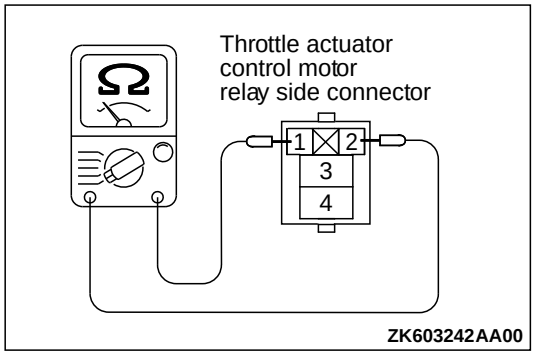
NO: Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 7.

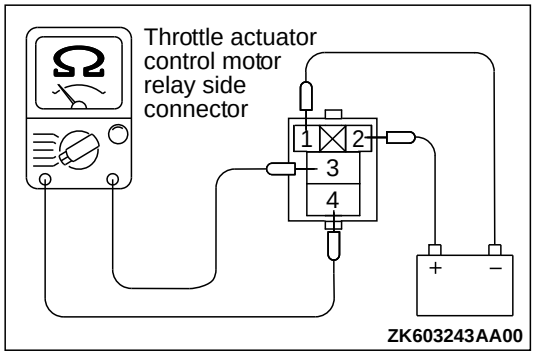
STEP 2. Check the throttle actuator control motor relay.

(1) Remove the throttle actuator control motor relay.

(2) Check for continuity between the throttle actuator control motor relay terminal No. 1 and No. 2.

- 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. 1 to the negative battery terminal.

(4) Check the continuity between the throttle actuator control motor relay terminal No. 3 and No. 4 while connecting and disconnecting the jumper wire at the negative battery terminal.

- Should be less than 2 ohms. (Negative battery terminal connected.)
- Should be open loop. (Negative battery terminal disconnected.)

(5) Install the throttle actuator control motor relay.

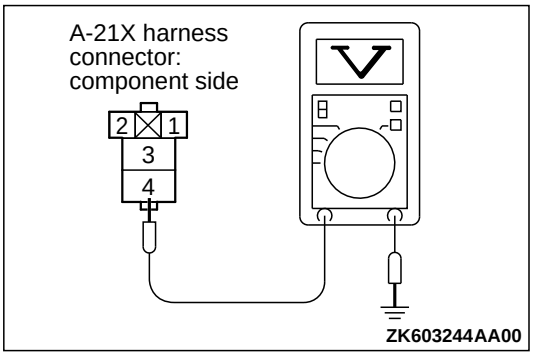
Q:Is the measured resistance normal?

YES: Go to Step 3.

NO: Replace the throttle actuator control motor relay. Then go to Step 7.

STEP 3. Measure the power supply voltage at throttle actuator control motor relay harness side connector A-21X

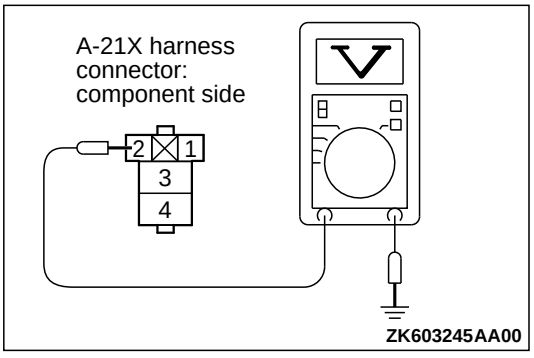
(1) Disconnect the connector A-21X and measure at the harness side.



(2) Measure the voltage between terminal No. 4 and ground.
- Voltage should be battery positive voltage.

Q:Is battery positive voltage (approximately 12 volts) present?
YES: Go to Step 4.
NO: Repair it because of open circuit between relay box (fuse No. 2) and throttle actuator control motor relay connector A-21X (terminal No. 4). Then go to Step 7.

STEP 4. Measure the power supply voltage at throttle actuator control motor relay harness side connector A-21X.



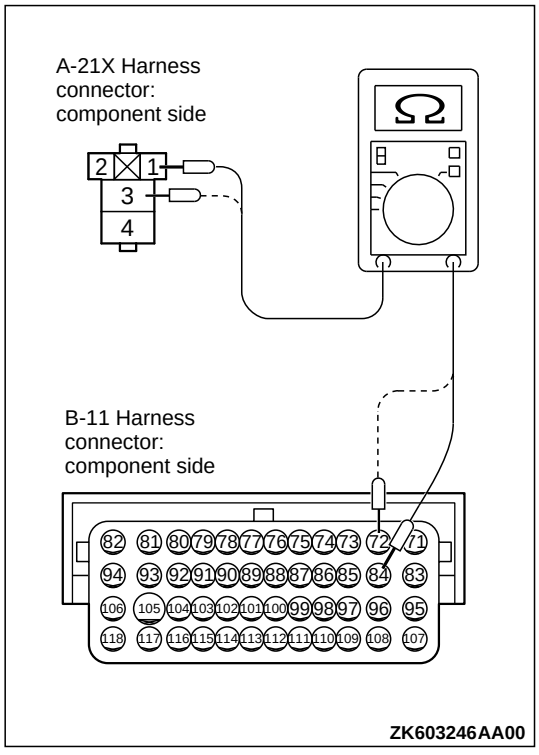
(1) Disconnect the connector A-21X and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal No. 2 and ground.
- Voltage should be battery positive voltage.

(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: Repair it because of open circuit or harness damage between relay box (fuse No. 22) and throttle actuator control motor relay connector A-21X (terminal No. 2). Then go to Step 7.

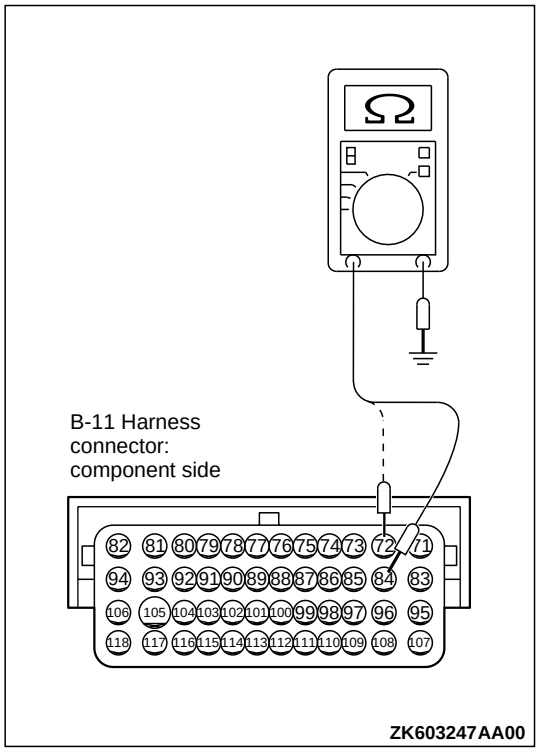
STEP 5. Check for open circuit and short circuit to ground and harness damage between throttle actuator control motor relay connector A-21X and ECM connector B-11.

(1) Disconnect the connector A-21X and B-11 measure at the harness side.



(2) Measure the resistance between connector A-21X and connector B-11.
- a Connector A-21X (terminal No. 1) and connector B-11 . (terminal No. 84).
- b Connector A-21X (terminal No. 3) and connector B-11 . (terminal No. 72).

▪Should be less than 2 ohms.



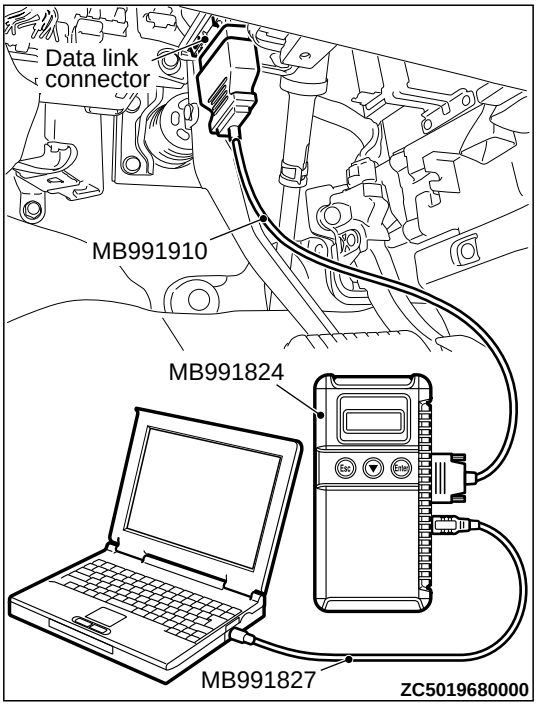
(3) Check for the continuity between connector B-11 and ground.
- a Connector B-11 (terminal No. 72) and ground.
.
- b Connector B-11 (terminal No. 84) and ground.
.

▪Not continuity.

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 MB991502, read the diagnostic trouble code (DTC).

⚠ CAUTION

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

(1) Connect scan tool MB991502 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 ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. 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.00-15.

STEP 7. Using scan tool MB991502, read the diagnostic trouble code (DTC).

(1) Disconnect the connector B-22 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.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q:Is DTC P0657 set?

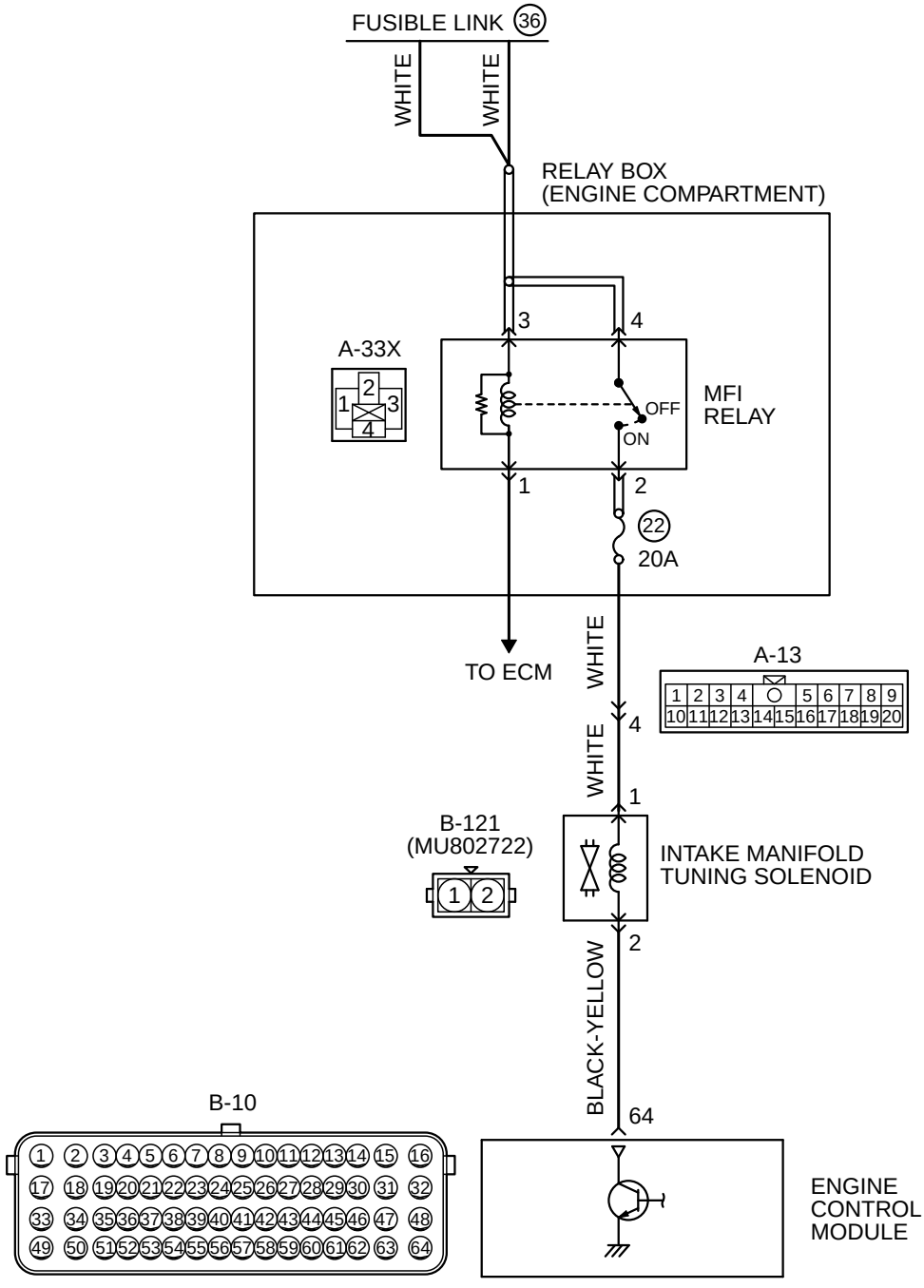
YES: Retry the troubleshooting.

NO: The inspection is complete.

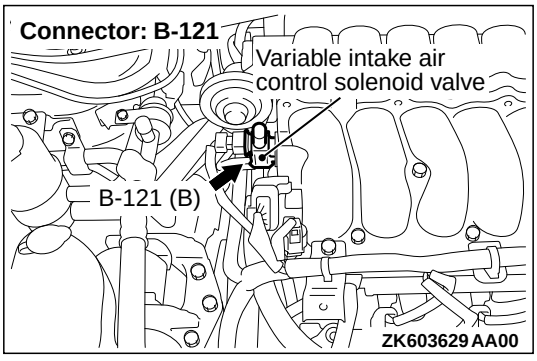
DTC P0660: Intake Manifold Tuning Solenoid Circuit

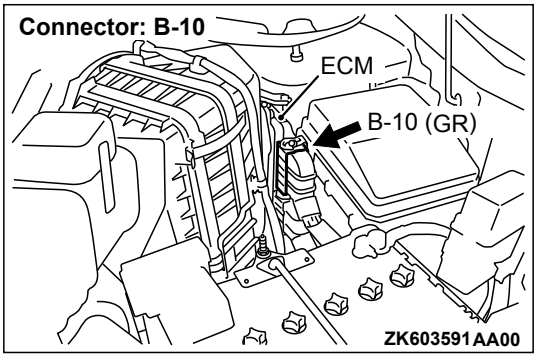
M11310100250USA0000010000

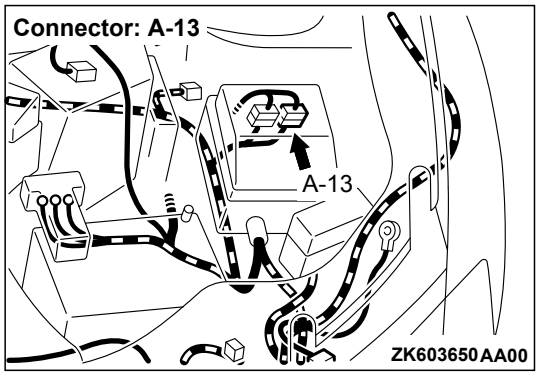
INTAKE MANIFOLD TUNING SOLENOID CIRCUIT

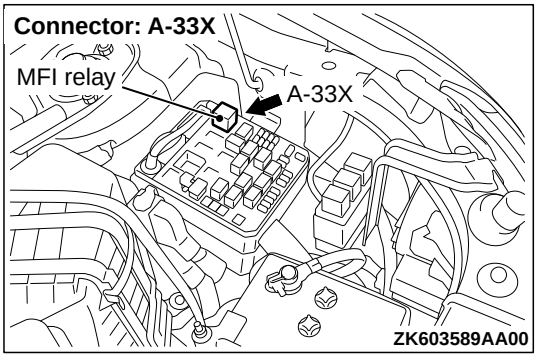


ZK602857AA00









CIRCUIT OPERATION

- Power to the intake air tuning solenoid power is supplied from the MFI relay (terminal No. 2).
- The ECM controls ground intake air tuning solenoid by turning the power transistor in the ECM "ON" and "OFF".

TECHNICAL DESCRIPTION

- To judge if there is open circuit in the intake air tuning solenoid drive circuit, ECM measures the surge voltage of the intake air tuning solenoid coil.

DTC SET CONDITIONS

Check Conditions

- 1 seconds or more have elapsed from previous monitoring.
- Battery positive voltage is between 10 and 16.5 V.
- 1 seconds or more have passed since the engine starting sequence was completed.
- Intake air tuning solenoid continues to be ON for 1 seconds or longer.

Judgement Criterion

- The intake air tuning solenoid coil surge voltage is not detected for 1 second after the intake air tuning solenoid is turned OFF.
- The ECM drives the intake air tuning solenoid. After the solenoid is turned off, the ECM will check if the solenoid coil produces a surge voltage of 2 volts or more.

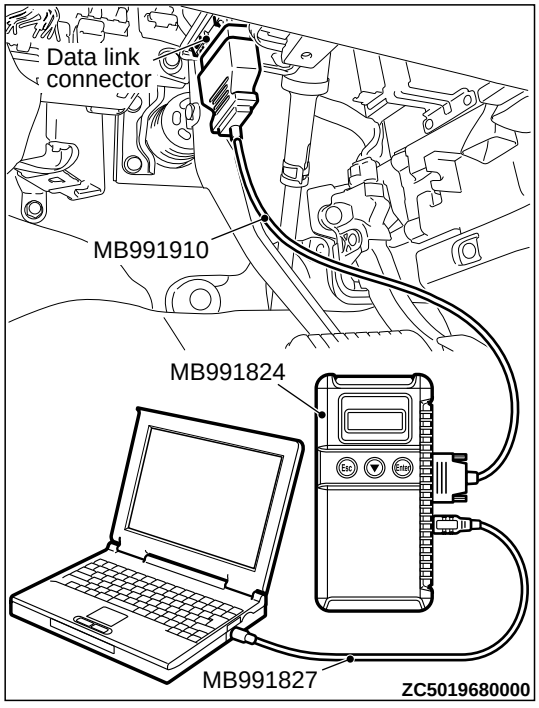
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Intake air tuning solenoid failed.
- Connector damage.
- Harness damage.
- ECM failed.

DIAGNOSIS

Required Special Tools:
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991911: Main Harness B

STEP 1. Using scan tool MB991958, check actuator test item 21: Intake Manifold Tuning 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 21, Intake manifold tuning solenoid.
  - An operation sound should be heard and vibration should be felt when the intake manifold tuning 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.00-15.

NO: Go to Step 2.

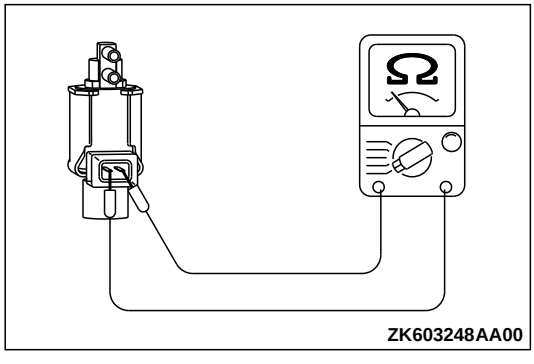
STEP 2. Check connector B-121 at the intake manifold tuning solenoid and harness connector B-10 at ECM for damage.

Q:Is the 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 manifold tuning solenoid.

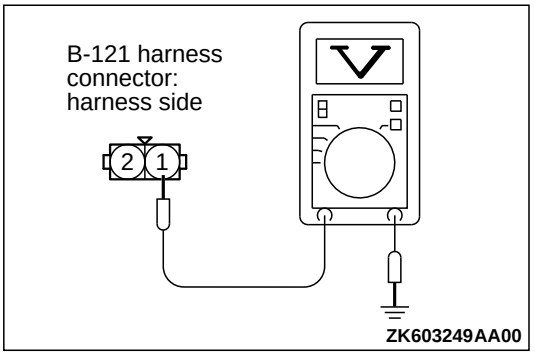


(1) Disconnect the intake manifold tuning solenoid connector B-127.
(2) Measure the resistance between intake manifold tuning solenoid side connector terminal No. 1 and No. 2.
  Standard value: 29 - 35 Ω [at 20°C (68°F)]

Q:Is the resistance between 29 and 35 ohms [at 20°C (68°F)]?

YES: Go to Step 4.

NO: Replace the intake manifold tuning solenoid. Then go to Step 6.



STEP 4. Measure the power supply voltage at intake manifold tuning solenoid harness side connector B-121.

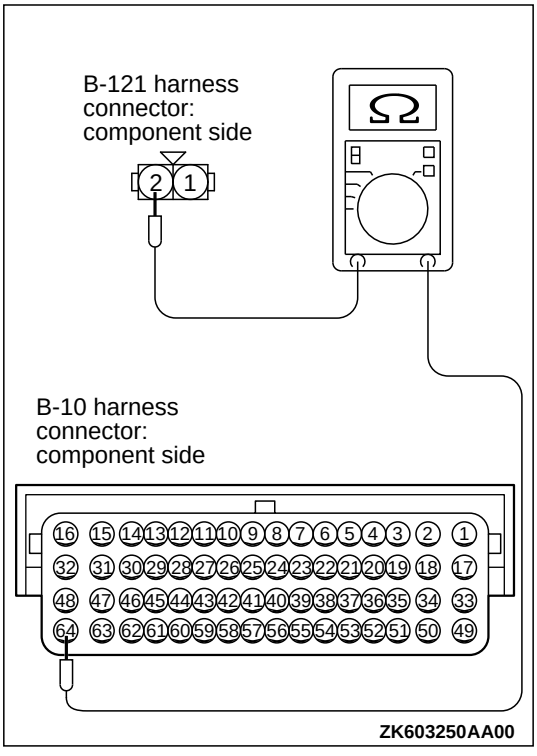
(1) Disconnect the connector B-121 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal No. 1 and ground.
- Voltage should be battery positive voltage.

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

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

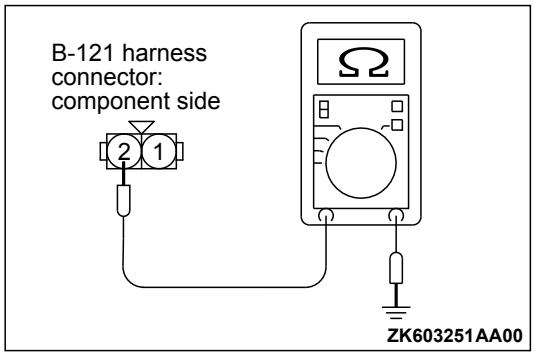
YES: Go to Step 5.

NO: Repair it because of open circuit or harness damage between relay box (fuse No. 22) and intake manifold tuning solenoid connector B-121 (terminal No. 1). Then go to Step 6.



STEP 5. Check for open circuit and short circuit to ground and harness damage between intake manifold tuning solenoid connector B-121 and ECM connector B-10.

(1) Disconnect the connector B-121 and B-10 measure at the harness side.
(2) Measure the resistance between connector B-121 (terminal No. 2) and connector B-10 (terminal No. 64).
- Should be less than 2 ohms.



(3) Check for the continuity between connector B-121 (terminal No. 2) and ground.
- Not continuity.

Q:Is the harness wire in good condition?
YES: Go to Step 6.
NO: Repair it. Then go to Step 6.

STEP 6. Using scan tool MB991958, check actuator test item 21: Intake manifold tuning Solenoid.
(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool MB991958 to the actuator test mode for item 21, Intake manifold tuning solenoid.
- An operation sound should be heard and vibration should be felt when the intake manifold tuning solenoid is operated.

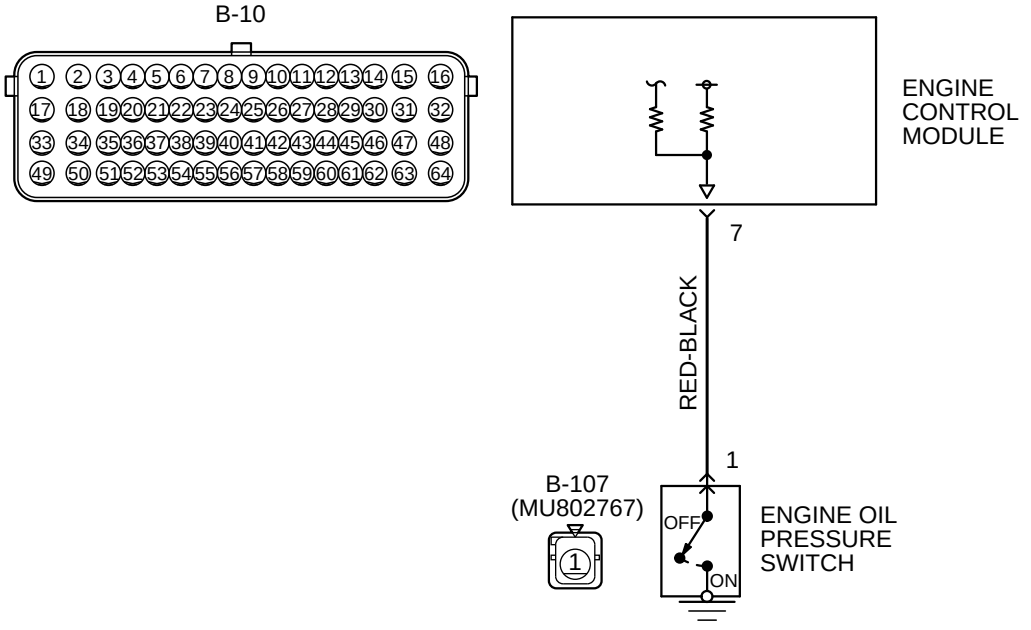
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q:Is the solenoid operating properly?
YES: The inspection is complete.
NO: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8.

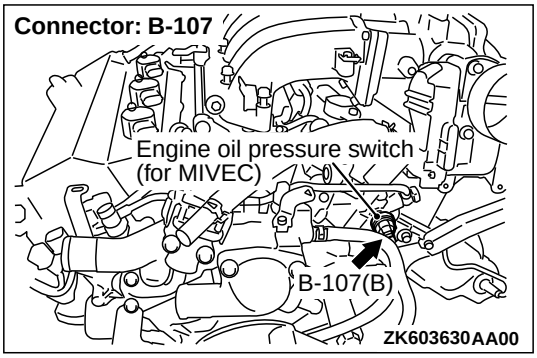
DTC P1020: Mitsubishi Innovative Valve Timing Electronic Control System (MIVEC) Performance Problem

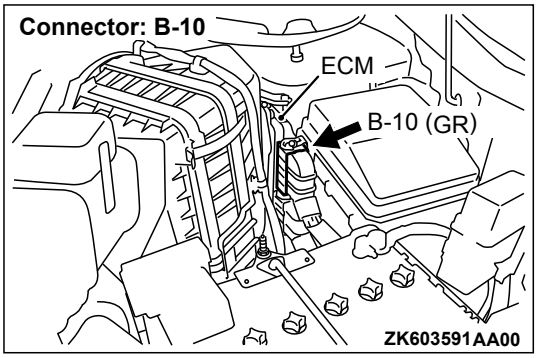
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ENGINE OIL PRESSURE SWITCH CIRCUIT



ZK602858AA00





CIRCUIT OPERATION

- A battery positive voltage is applied to the engine oil pressure switch output terminal (terminal No. 1) from the ECM (terminal No. 36) via the resistor in the ECM.

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 ECM.

- 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.
- The ECM checks whether the engine oil pressure switch "OFF" or "ON" during driving.

DESCRIPTIONS OF MONITOR METHODS

Compare engine oil pressure switch status with engine operating 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)

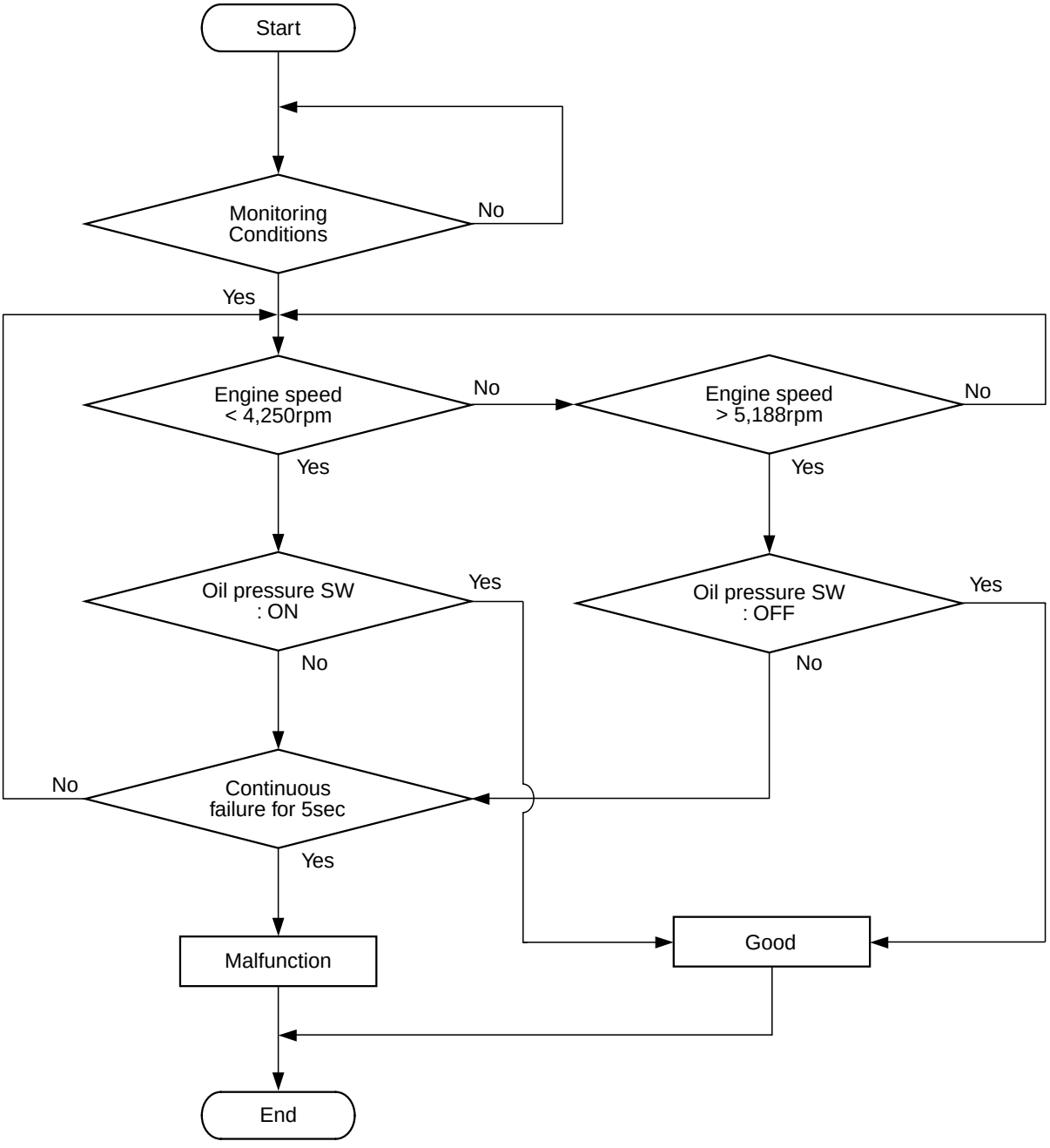
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



AK603799 AA00

Check Conditions

- Engine speed is less than 4,250 r/min.
- Engine coolant temperature is 77°C or more.
- Battery voltage is between 10 and 16.5 V.
- 30 seconds or more have passed since the engine starting sequence was completed.

Judgment Criterion

- Engine oil pressure switch has been OFF for 5 seconds.

Check Conditions

- Engine speed is more than 5,188 r/min.
- Engine coolant temperature is 77°C or more.
- Battery voltage is between 10 and 16.5 V.
- 30 seconds or more have passed since the engine starting sequence was completed.

Judgment Criterion
- Engine oil pressure switch has been ON for 5 seconds.

OBD-II DRIVE CYCLE PATTERN
Refer to Diagnostic Function - OBD-II Drive Cycle - Pattern 21 P.13Ab-8.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)
- Connector damage.
- Harness damage.
- Engine oil pressure switch failed.
- Engine oil control valve failed.
- ECM failed.

DIAGNOSIS

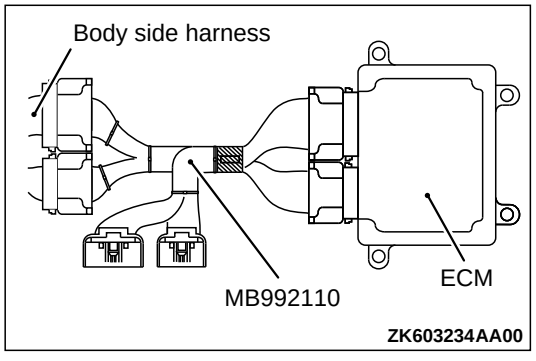
Required Special Tools:
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A
- MB992110: Power Plant ECU Check Harness

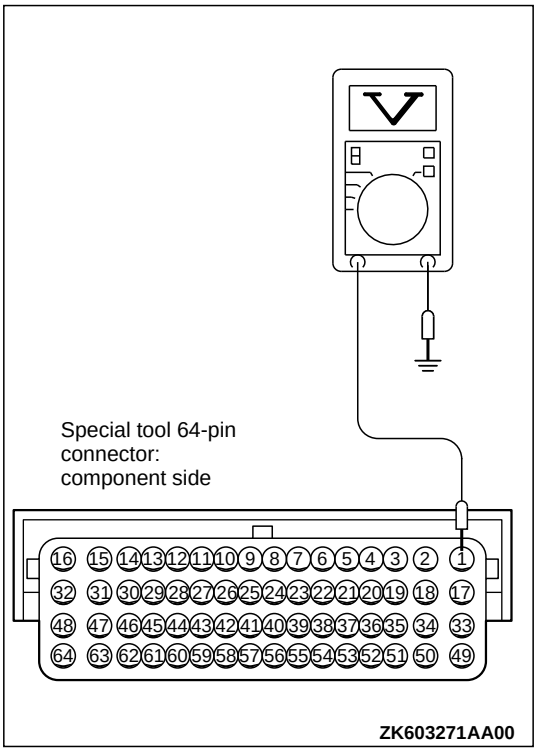
STEP 1. Check harness connector B-106 at engine oil pressure switch and harness connector B-10 at ECM for damage.

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 power supply voltage at ECM connector B-10 by using power plant ECU check harness special tool MB992110.

(1) Disconnect all ECM connectors. Connect the power plant ECU check harness special tool MB992110 between the separated connectors.
(2) Start the engine and run at idle.





(3) Measure the voltage between terminal No. 7 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 5,200 r/min.

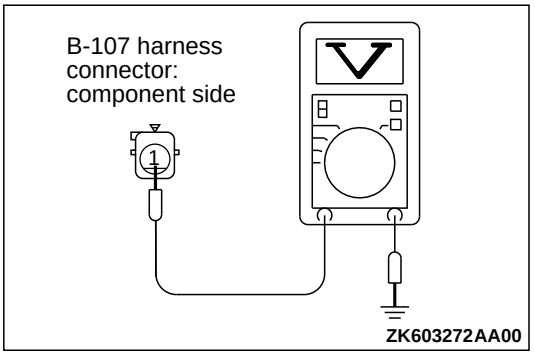
(4) Turn the ignition switch to the "LOCK" (OFF) position.

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.00-15.

NO: Go to Step 3.

STEP 3. Measure the power supply voltage at engine oil pressure switch connector B-107.



(1) Disconnect the connector B-107 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.

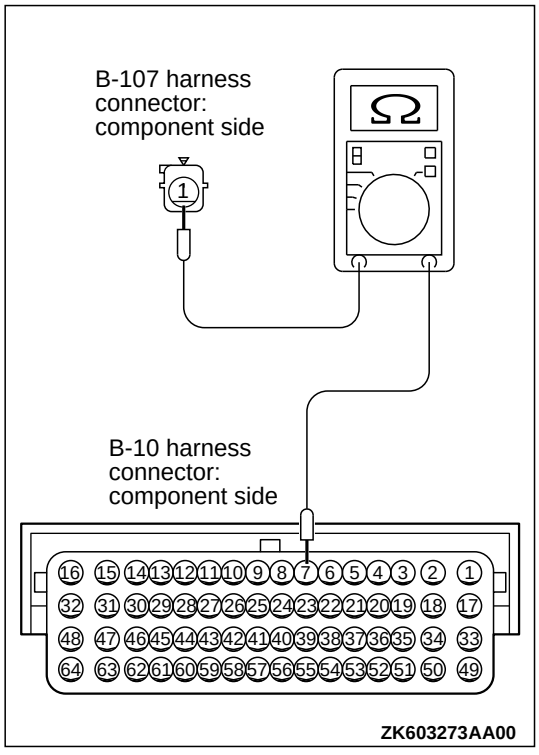
Q:Is battery positive voltage (approximately 12 volts) present?

YES: Go to Step 5.

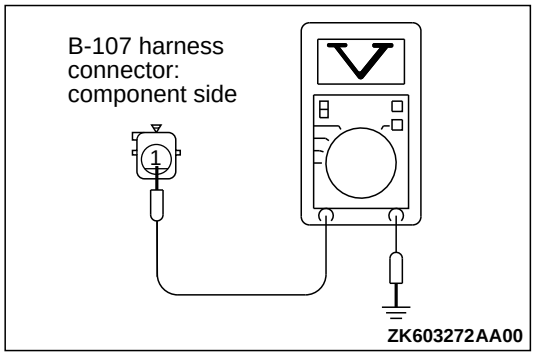
NO: Go to Step 4.

STEP 4. Check for open circuit and short circuit to ground between engine oil pressure switch connector B-107 and ECM connector B-10.

(1) Disconnect the connector B-107 and B-10 measure at the harness side.



(2) Measure the resistance between connector B-107 (terminal No. 1) and connector B-10 (terminal No. 7).
- Should be less than 2 ohms.



(3) Check for the continuity between connector B-107 (terminal No. 1) and ground.
- Not continuity.

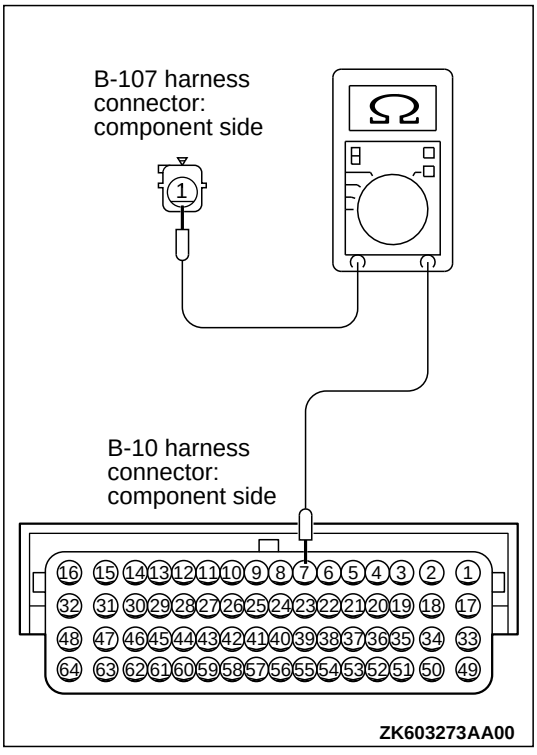
Q:Is the harness wire in good condition?

YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 7.

NO: Repair it. Then go to Step 8.

STEP 5. Check for harness damage between engine oil pressure switch connector B-107 and ECM connector B-10.

(1) Disconnect the connector B-107 and B-10 measure at the harness side.



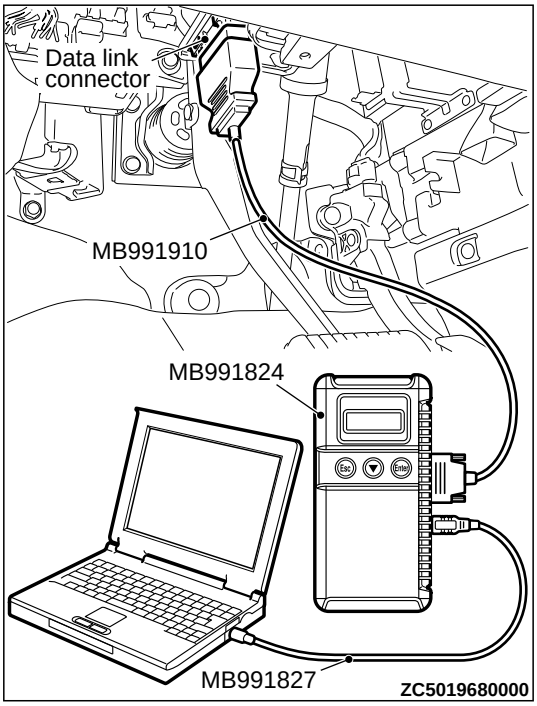
(2) Measure the resistance between B-107 connector (terminal No. 1) and B-10 (terminal No. 7) connector.
- Should be less than 2 ohms.

Q:Is the measured resistance less than 2 ohms?
YES: Then go to Step 6.
NO: Repair it. Then go to Step 8.

STEP 6. Using scan tool MB991958, check data item 98: 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.
- An operation sound should be heard and vibration should be felt when the right bank engine oil control valve is operated.

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

Q:Is the right bank engine oil control valve operating properly?
YES: Then go to Step 7.
NO: Replace the engine oil control valve. Then go to Step 8.

STEP 7. Replace the engine oil pressure switch

(1) Carry out test drive with the drive cycle pattern. Refer to Diagnostic Function - OBD-II Drive Cycle - Pattern 21 P. 13Ab-8.
(2) Check the diagnostic trouble code (DTC).

Q:Is DTC P1020 set?

YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 8.
NO: The Inspection is complete.

STEP 8. 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. 13Ab-8.
(2) Check the diagnostic trouble code (DTC).

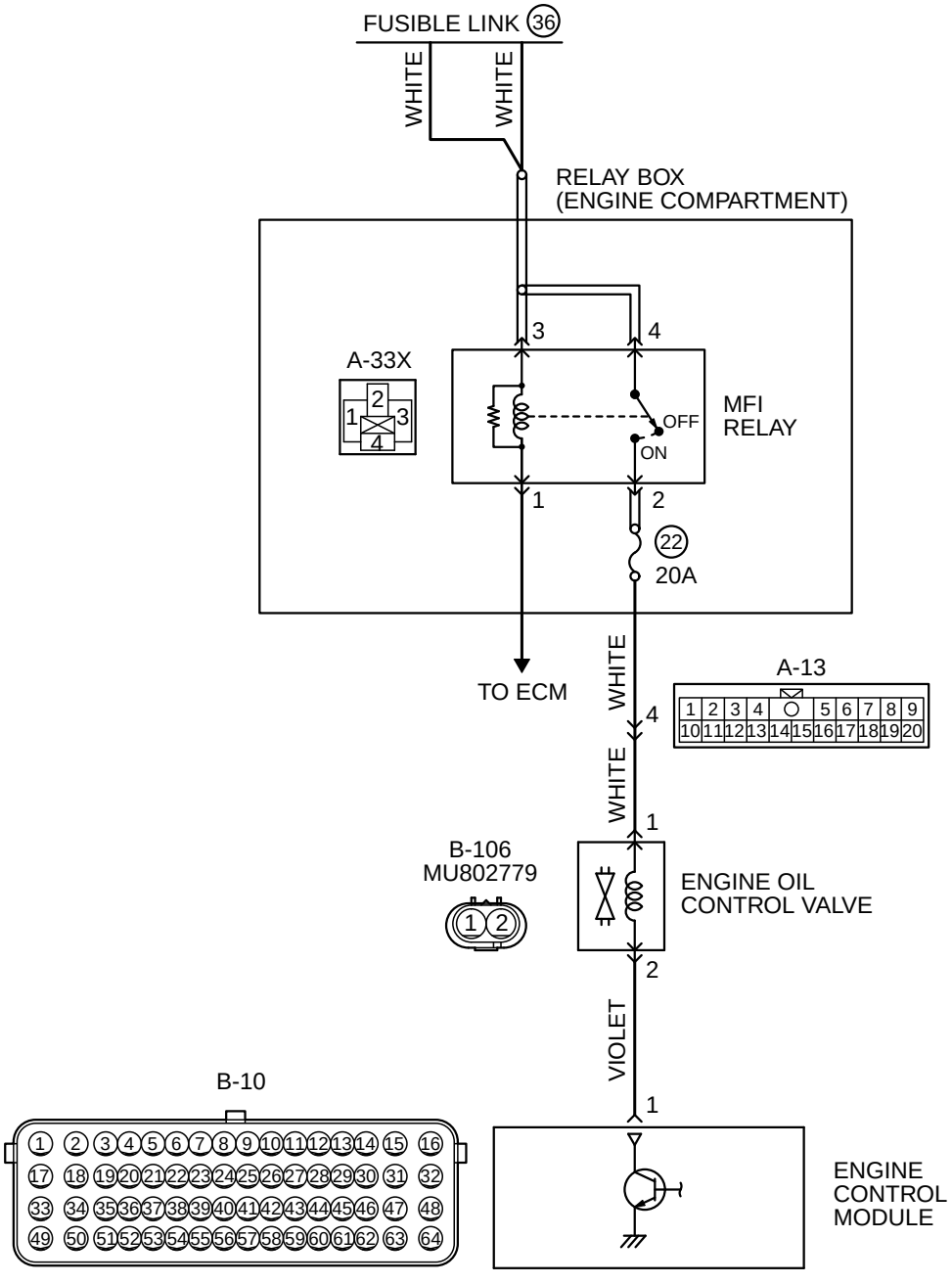
Q:Is DTC P1020 set?

YES: Retry the trouble shooting.
NO: The Inspection is complete.

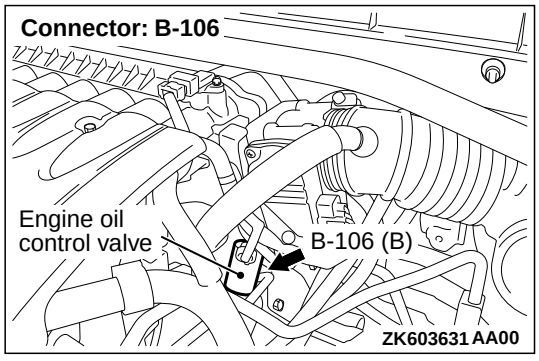
DTC P1021: Engine Oil Control Valve Circuit

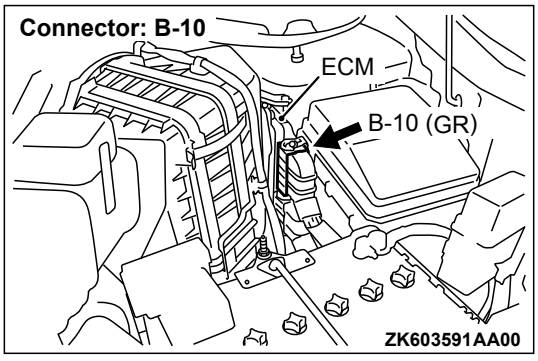
M11310100252USA0000010000

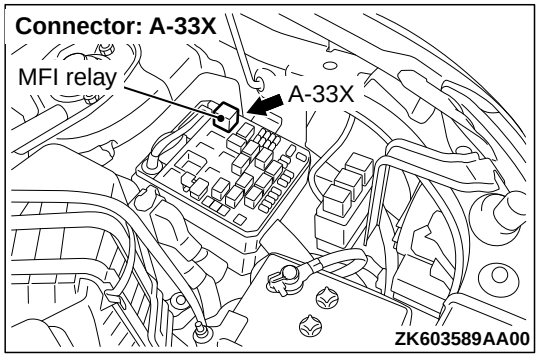
ENGINE OIL CONTROL VALVE CIRCUIT

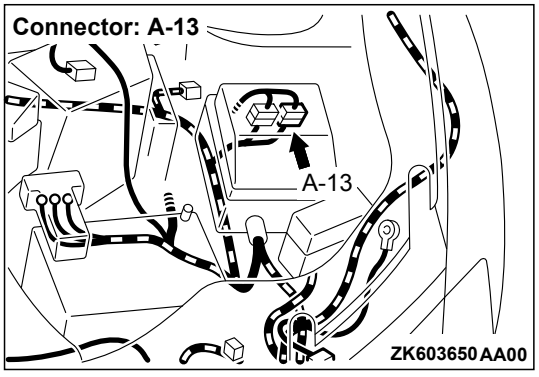


ZK602859AA00









CIRCUIT OPERATION

- The engine oil control valve power is supplied from the MFI relay (terminal No. 2).
- The ECM controls ground engine oil control valve by turning the power transistor in the ECM "ON" and "OFF".

TECHNICAL DESCRIPTION

- The engine oil pressure switches the cams to operate the MIVEC system in the low-speed or high-speed mode in accordance with the signals from the ECM.

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)

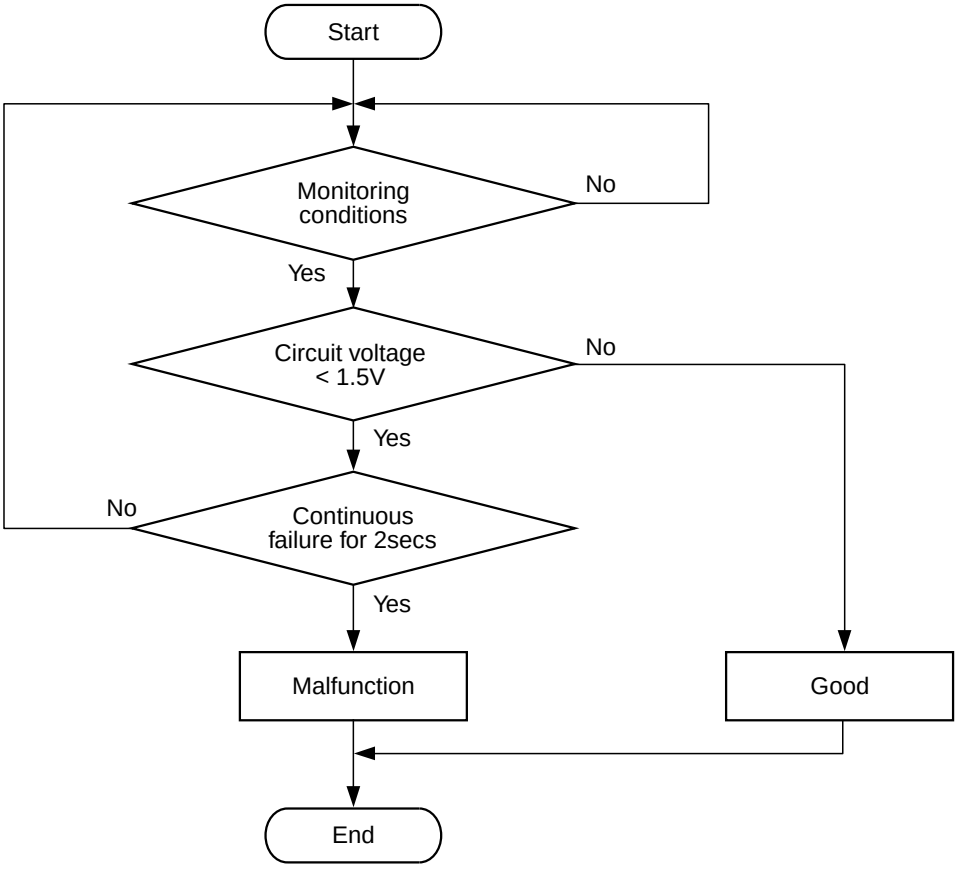
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



ZK603802AA00

Check Conditions

- Ignition switch: "ON"
- Right bank engine oil control valve is OFF.
- Battery positive voltage is between10 and 16.5 volts.
- 0.1 seconds has elapsed after the above mentioned conditions have been met.

Judgment Criterion

- The ECM terminal voltage of right bank engine oil 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.13Ab-8.

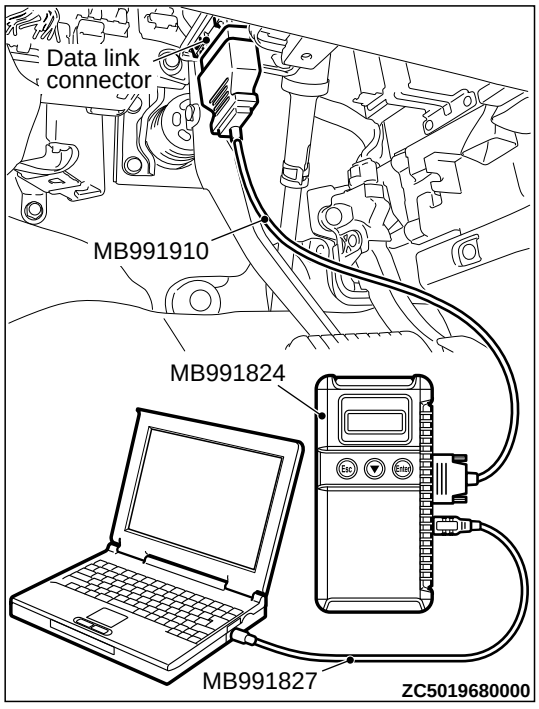
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Connector damage.
- Harness damage.
- Engine oil control valve failed.
- ECM 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 item 98: 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.

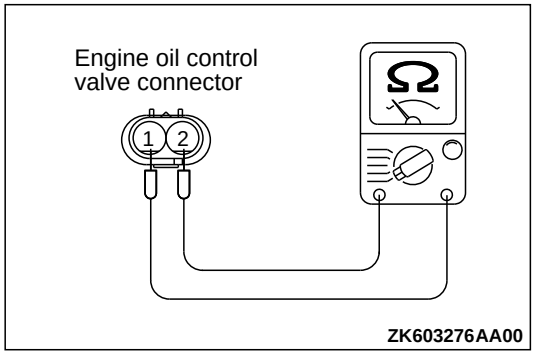
(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991958 to the data reading mode for item 98, Engine oil control valve.
▪An operation sound should be heard and vibration should be felt when the right bank engine oil control valve is operated.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q:Is the engine oil control valve 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.00-15.
NO: Then go to Step 2.

STEP 2. Check harness connector B-106 engine oil control valve and harness connector B-10 at ECM for damage.

Q:Is the harness connector in good condition?
YES: Go to Step 3.
NO: Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 7.

STEP 3. Check the right bank engine oil control valve.

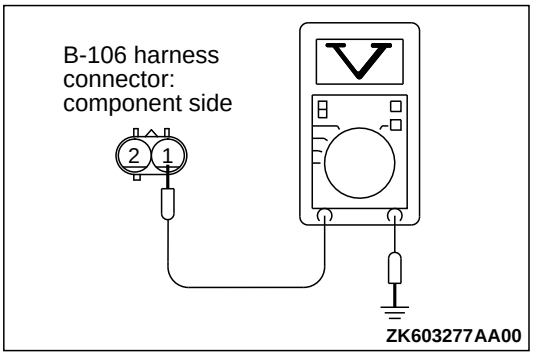


(1) Disconnect the engine oil control valve connector B-106.
(2) Measure the resistance between engine oil control valve side connector terminal No. 1 and No. 2.
Standard value: 6.9 - 7.9 Ω [at 20°C (68°F)]

Q:Is the measured resistance between 6.9 and 7.9 ohms [at 20°C (68°F)]?
YES: Go to Step 4.
NO: Replace the right bank engine oil control valve. Then go to Step 7.

STEP 4. Measure the power supply voltage at right bank engine oil control valve harness side 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. 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?

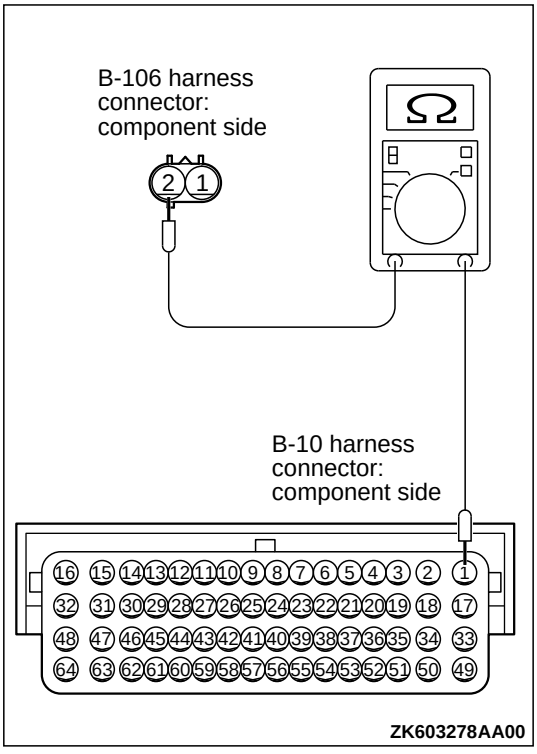
YES: Go to Step 5.

NO: Repair it because of open circuit or harness damage between relay box (fuse No. 22) and engine oil control valve connector B-106 (terminal No. 1). Then go to Step 7.

STEP 5. Check for open circuit and short circuit to ground and harness damage between engine oil control valve connector B-106 and ECM connector B-10.

(1) Disconnect the connector B-106 and B-10 measure at the harness side.

(2) Measure the resistance between connector B-106 (terminal No. 2) and connector B-10 (terminal No. 1).
- Should be less than 2 ohms.

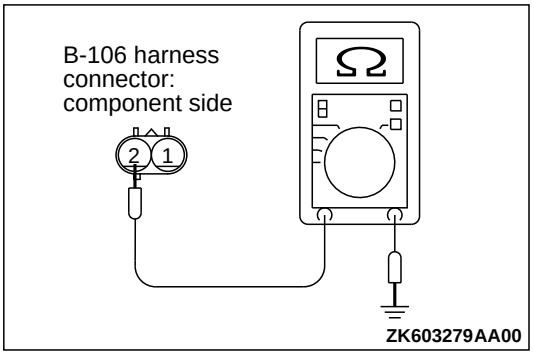


(3) Check for the continuity between connector B-106 (terminal No. 2) and ground.
- Not continuity.

Q:Is the harness wire in good condition?

YES: Then go to Step 6.

NO: Repair it. Then go to Step 7.



STEP 6. 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 24 P. 13Ab-8.

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

Q:Is DTC P1021 set?

YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. 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.00-15.

STEP 7. 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 24 P. 13Ab-8.

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

Q:Is DTC P1021 set?

YES: Retry the troubleshooting.

NO: The inspection is complete.

DTC P1231: Active Stability Control Plausibility

M11310100377USA0000010000

TECHNICAL DESCRIPTION

- Checks for an abnormal signal of active stability control (ASC) via the CAN communication.

DTC SET CONDITIONS

Check Condition

- Ignition switch is "ON" position.

Judgment Criterion

- A torque demand signal from the active stability control is not normal.

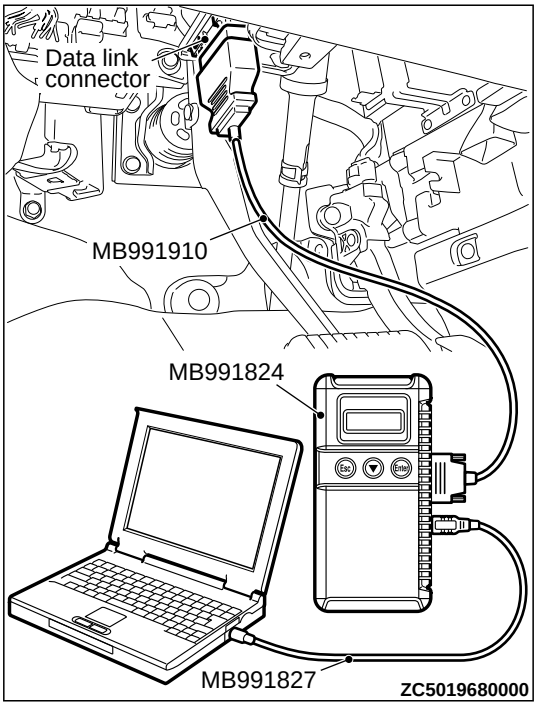
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Active stability control system failed.
- ECM 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 the DTC P1231 set?

YES: Go to Step 2.
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.00-15.

STEP 2. Using scan tool MB991958, read the diagnostic trouble code (DTC).

(1) Turn the ignition switch to the "ON" position.
(2) After the DTC has been deleted, read the ABS-DTC or ASC-DTC.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q:Is the ABS-DTC or ASC-DTC set?

YES: Refer to GROUP 35B, Anti-lock Braking System - Diagnostic Trouble Code Chart P.35B-9. Refer to GROUP 35C, Active Stability Control System - Diagnostic Trouble Code Chart P.35C-11.
NO: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8.

DTC P1232: Fail Safe System

M11310100378USA0000010000

TECHNICAL DESCRIPTION

- To judge whether fail-safe control can be performed, check that power supply to the throttle actuator control motor circuit can be stopped by turning the throttle actuator control motor relay to OFF position momentarily.

DTC SET CONDITIONS

Check Condition

- Ignition switch is "ON" position.

Judgment Criterion

- Power supply to the throttle valve control motor cannot be shut down (though power supply is stopped).

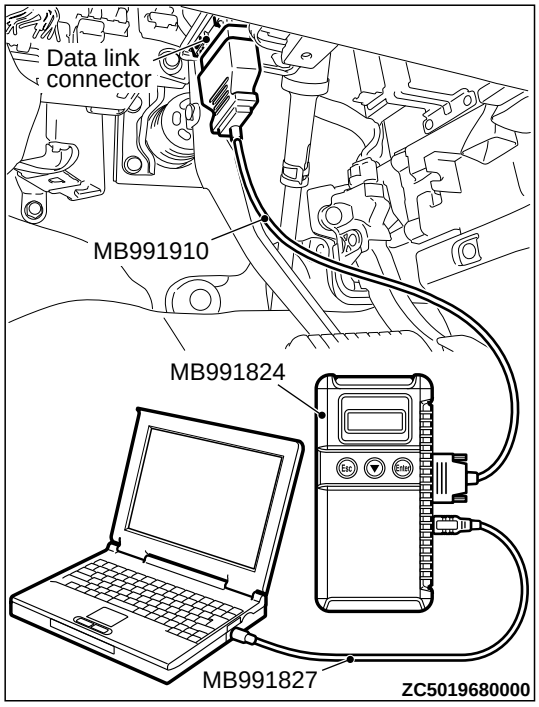
TROUBLESHOOTING HINTS (The most likely causes for

this code to be set are:)
- Throttle actuator control motor relay circuit failed.
- ECM 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 the DTC P1232 set?

YES: Go to Step 2.
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.00-15.

STEP 2. Using scan tool MB991958, read the diagnostic trouble code (DTC).

(1) Turn the ignition switch to the "ON" position.
(2) After the DTC has been deleted, read the DTC again.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q:Is DTC P0657 set?

YES: Refer to DTC P0657 - Throttle actuator control motor relay circuit malfunction P.13Ab-601.
NO: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8.

DTC P1233: Throttle Position Sensor (main) Plausibility

M11310100379USA0000010000

TECHNICAL DESCRIPTION

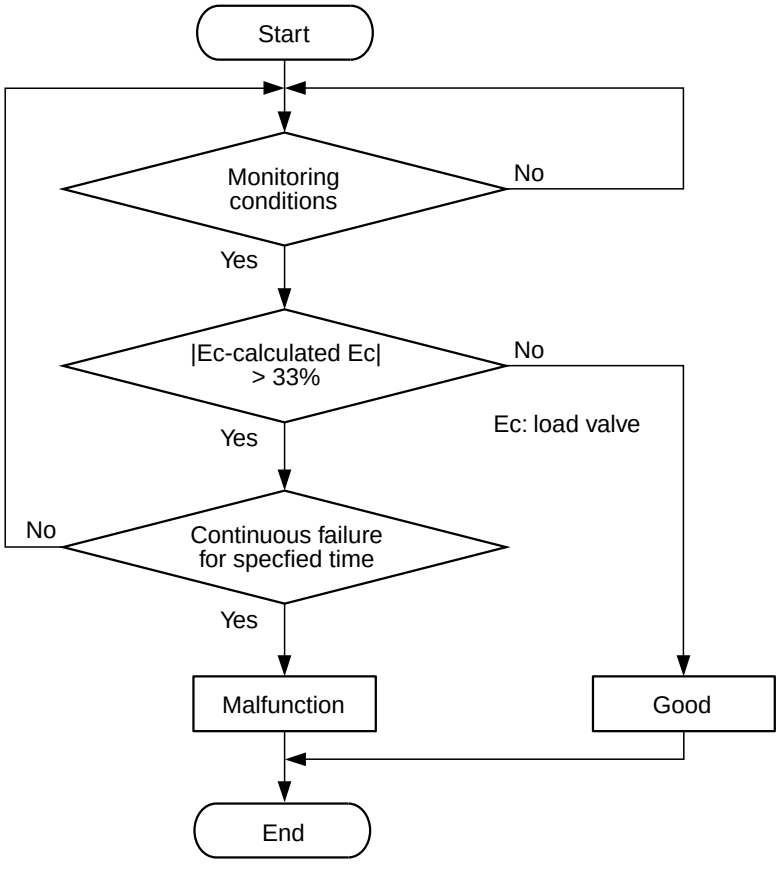
Compare the actual measurement of volumetric efficiency by a mass airflow sensor signal with volumetric efficiency estimated from a throttle position sensor (main) signal.

MONITOR EXECUTION

Continuous

DTC SET CONDITIONS

Logic Flow Chart



ZK604062 AA00

Check Conditions

- The difference between the actual volumetric efficiency and the volumetric efficiency estimated by the (main) throttle position sensor is 0 % or more. Or, the volumetric efficiency is 60 % or less.

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

- The engine speed is between 750 and 3,000 r/min. Or, the (main) throttle position sensor output voltage is 3 volts or more.

Judgment Criterion

- For 0.4 second, the difference between the actual volumetric efficiency and the volumetric efficiency estimated by the (main) throttle position sensor is 33 % or more.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function - OBD-II Drive Cycle Pattern 17 P.13Ab-8.

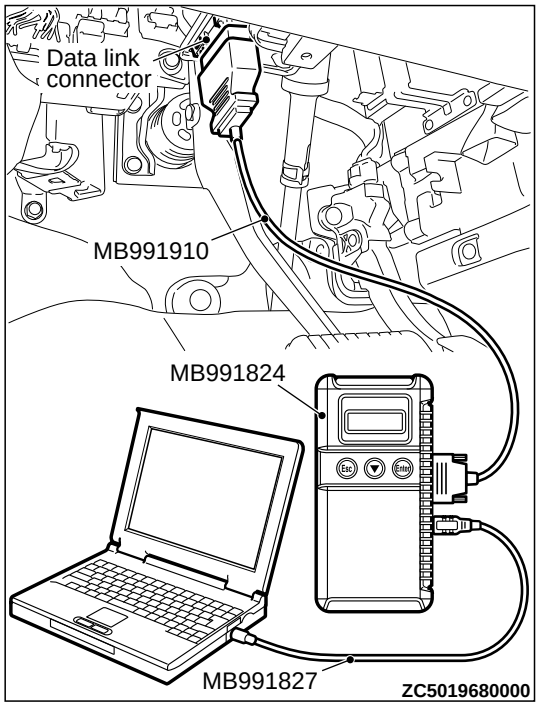
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Throttle position sensor (main) system failed.
- Intake system vacuum leak.
- ECM 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 the diagnostic trouble code other than P1233 set?

YES: Refer to, Diagnostic Trouble Code Chart P.13Ab-44.
NO: Go to Step 2.

STEP 2. Using scan tool MB991958, check data list item 13: Throttle Position Sensor (main).

(1) Turn the ignition switch to the "ON" position.
(2) Detach the intake air hose at the throttle body.
(3) Disconnect the connector of the throttle position sensor.
(4) Use test harness special tool (MB991658) to connect only terminals No. 3, No. 4, No. 5, and No. 6.

(5) 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.

(6) 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.00-15.
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 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 17 P. 13Ab-8.
(2) Check the diagnostic trouble code (DTC).

Q:Is DTC P1233 set?
YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. 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.00-15.

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 17 P. 13Ab-8.
(2) Check the diagnostic trouble code (DTC).

Q:Is DTC P1233 set?
YES: Replace the troubleshooting.
NO: The procedure is complete.

DTC P1234: Throttle Position Sensor (Sub) Plausibility

M11310100380USA0000010000

TECHNICAL DESCRIPTION
Compare the actual measurement of volumetric efficiency by a mass airflow sensor signal with volumetric efficiency estimated from a throttle position sensor (sub) signal.

MONITOR EXECUTION
Continuous

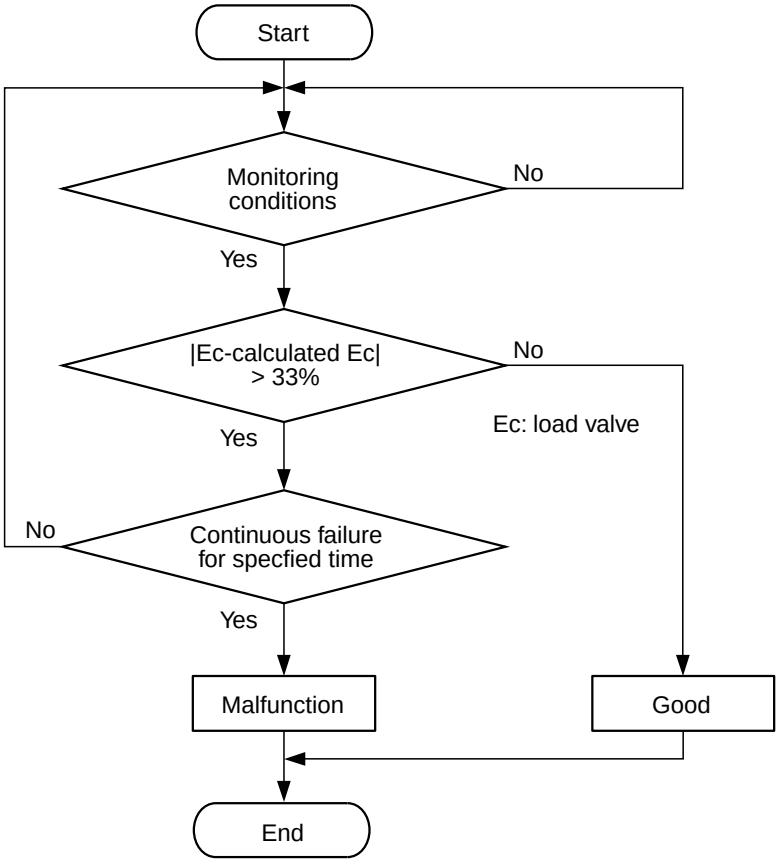
MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

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



ZK604062 AA00

Check Conditions
- The difference between the actual volumetric efficiency and the volumetric efficiency estimated by the (sub) throttle position sensor is 0 % or more. Or, the volumetric efficiency is 60 % or less.
- The engine speed is between 750 and 3000r/min. Or, the (sub) throttle position sensor output voltage is 3 volts or more.

Judgment Criterion
- For 0.4 second, the difference between the actual volumetric efficiency and the volumetric efficiency estimated by the (sub) throttle position sensor is 33 % or more.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function - OBD-II Drive Cycle Pattern 17 P.13Ab-8.

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

- Throttle position sensor (sub) system failed.
- Intake system vacuum leak.
- ECM 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).

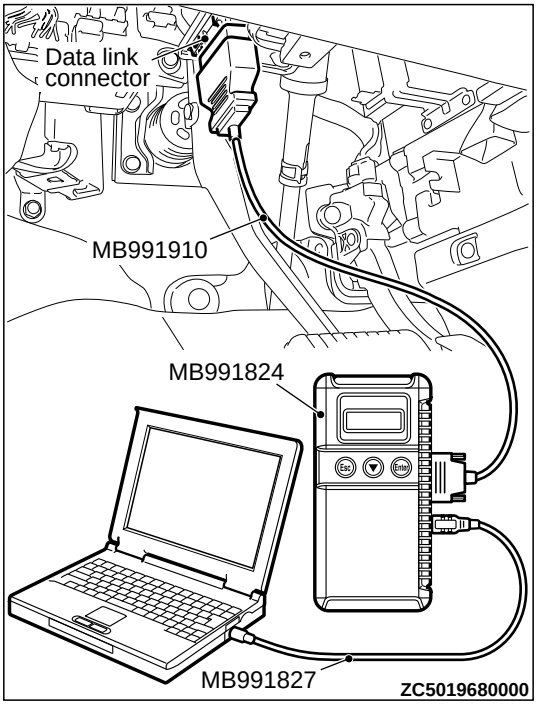
⚠ CAUTION

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 the diagnostic trouble code other than P1234 set?

YES: Refer to, Diagnostic Trouble Code Chart P.13Ab-44.
NO: Go to Step 2.



STEP 2. Using scan tool MB991958, check data list item 15: Throttle Position Sensor (sub).

(1) Turn the ignition switch to the "ON" position.
(2) Detach the intake air hose at the throttle body.
(3) Disconnect the connector of the throttle position sensor.
(4) Use test harness special tool (MB991658) to connect only terminals No. 3, No. 4, No. 5, and No. 6.
(5) Set scan tool MB991958 to the data reading mode for item 15, Throttle Position Sensor (sub).
   - Output voltage should be 4.0 volts or more when the throttle valve is fully closed with your finger.
   - Output voltage should be 1.0 volt or less when the throttle valve is fully open with your finger.

(6) 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.00-15.
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 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 17 P. 13Ab-8.
(2) Check the diagnostic trouble code (DTC).

Q:Is DTC P1234 set?
YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. The 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.00-15.

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 17 P. 13Ab-8.
(2) Check the diagnostic trouble code (DTC).

Q:Is DTC P1234 set?
YES: Replace the troubleshooting.
NO: The procedure is complete.

DTC P1235: Mass Airflow Sensor Plausibility

M11310100381USA0000010000

TECHNICAL DESCRIPTION
Compare the actual measurement of volumetric efficiency by a mass airflow sensor signal with volumetric efficiency estimated from a throttle position sensor (main or sub) signal.

MONITOR EXECUTION
Continuous

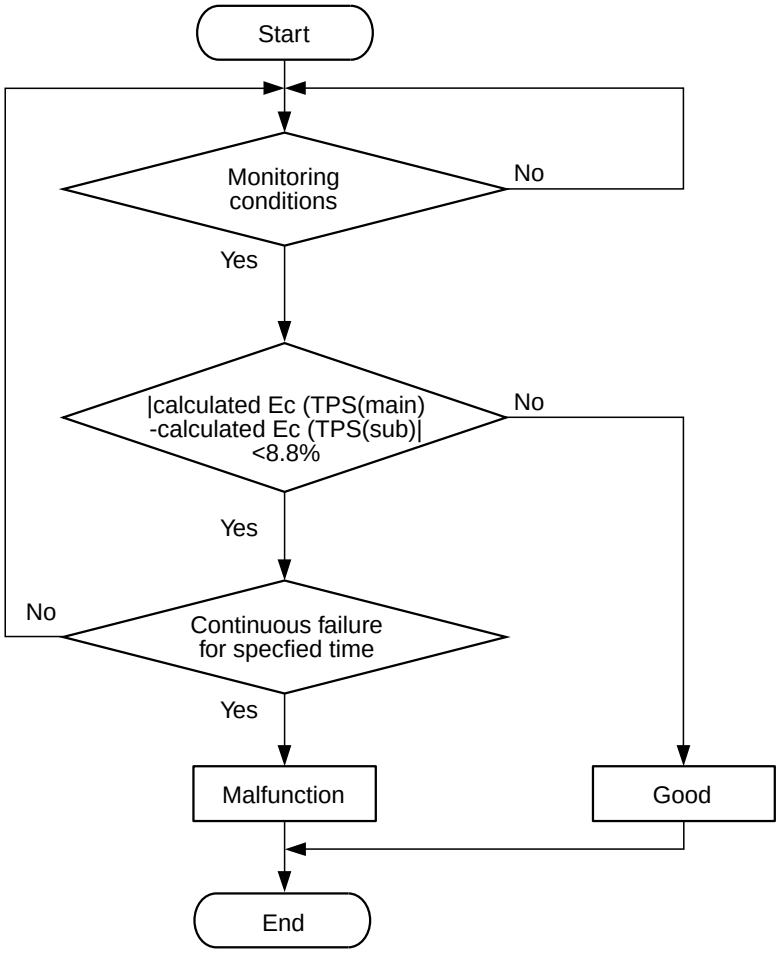
MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

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



ZK604063 AA00

Check Conditions

- The plausibility error of the (main) throttle position sensor is detected.
- The plausibility error of the (sub) throttle position sensor is detected.

Judgment Criterion

- For 0.36 second, the difference between the volumetric efficiency estimated by the (main) throttle position sensor and the volumetric efficiency estimated by the (sub) throttle position sensor is 8.8 % or less.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function - OBD-II Drive Cycle Pattern 17 P.13Ab-8.

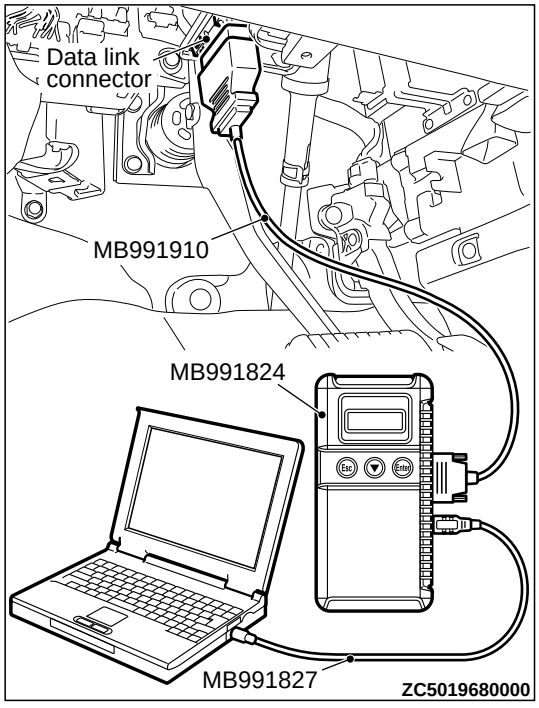
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Mass airflow sensor system failed.
- ECM 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 the diagnostic trouble code other than P1235 set?

YES: Refer to, Diagnostic Trouble Code Chart P.13Ab-44.
NO: Go to Step 2.

STEP 2. Using scan tool MB991958, check data list item 10: Mass Airflow Sensor.

(1) Start the engine and run at idle.
(2) Set scan tool MB991958 to the data reading mode for item 10, Mass Airflow Sensor.
(3) 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 1,350 and 1,670 millivolts.
- When the engine is revved, the mass airflow rate should increase according to the increase in engine speed.

(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 P0101 - Mass Airflow Circuit Range/ Performance Problem P.13Ab-108, DTC P0102 - Mass Airflow Circuit Low Input P.13Ab-115, DTC P0103 - Mass Airflow Circuit High Input P.13Ab-121.

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 17 P. 13Ab-8.
(2) Check the diagnostic trouble code (DTC).

Q:Is DTC P1235 set?

YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. 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.00-15.

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 17 P. 13Ab-8.
(2) Check the diagnostic trouble code (DTC).

Q:Is DTC P1235 set?

YES: Replace the troubleshooting.
NO: The procedure is complete.

DTC P1236: A/D Converter

M11310100382USA0000010000

TECHNICAL DESCRIPTION

Monitors whether input voltage from the accelerator pedal position sensor (sub) is normally converted into a digital signal in the engine control module.

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.

Judgment Criterion
- When the input voltage from the (sub) accelerator pedal position sensor is periodically 0 V for 0.45 second, the digital value of the input voltage indicates 0.2 V or more.

OBD-II DRIVE CYCLE PATTERN

None.

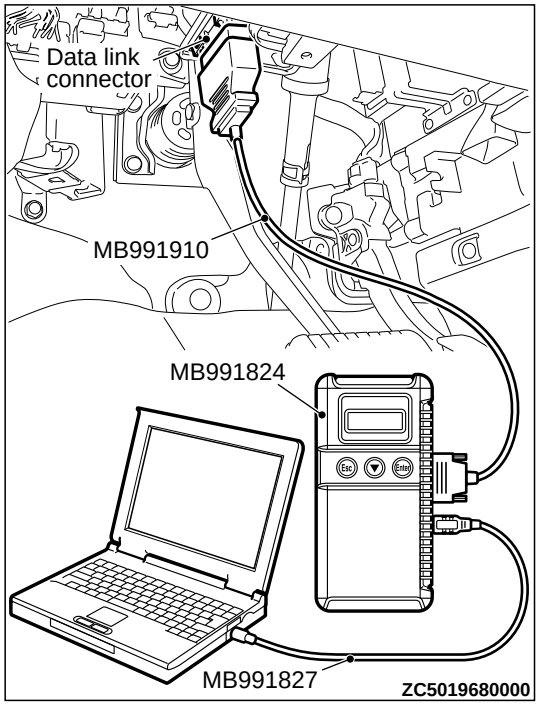
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- ECM 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 P1236 set?

YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-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.00-15.

DTC P1237: Accelerator Pedal Position Sensor Plausibility

M11310100383USA0000010000

TECHNICAL DESCRIPTION

Compare the output value of the accelerator pedal position sensor (main) with that of the accelerator pedal position sensor (sub).

MONITOR EXECUTION

Continuous

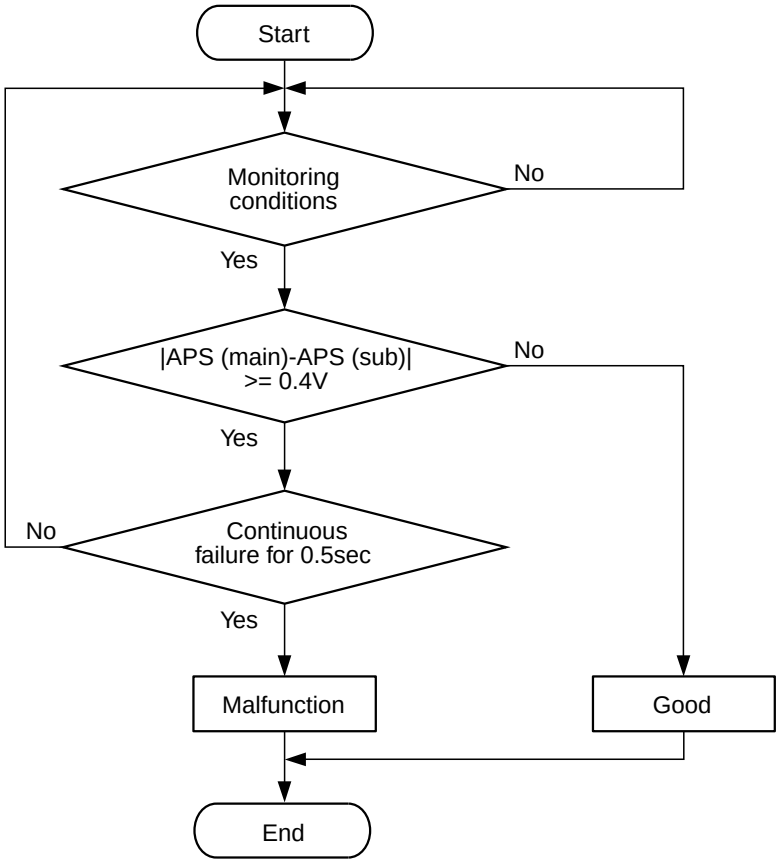
MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

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



ZK604064 AA00

Check Condition

- Change of accelerator pedal position sensor (sub) output voltage per 40 milliseconds is lower than 0.06 volt.

Judgment Criterion

- Voltage obtained with the formula given below is 0.4 volt or higher for 0.5 second: accelerator pedal position sensor (main) output voltage - accelerator pedal position sensor (sub) output voltage.

OBD-II DRIVE CYCLE PATTERN

None.

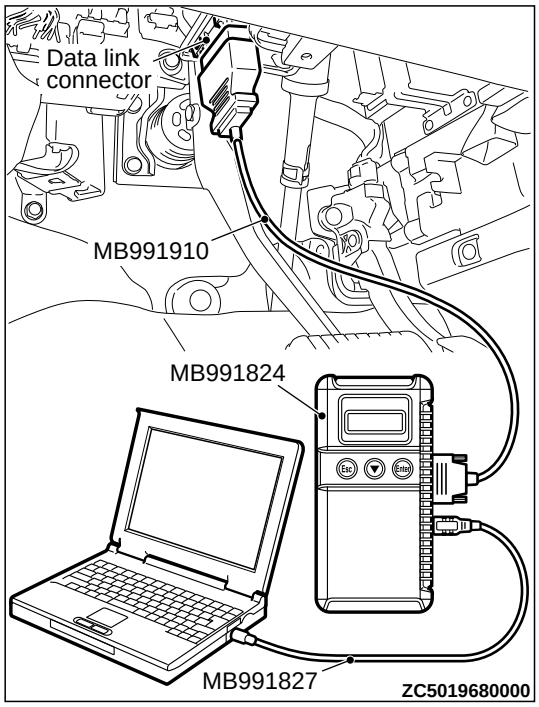
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Accelerator pedal position sensor failed.
- ECM 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 the diagnostic trouble code other than P1237 set?

YES: Refer to, Diagnostic Trouble Code Chart P.13Ab-44.
NO: Go to Step 2.

STEP 2. 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 .
 a Item 11: Accelerator pedal position sensor (main)
 .
 b Item 12: Accelerator pedal position sensor (sub)
 .
(3) 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 go to Step 4.

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

(1) Turn the ignition switch to the "ON" position.
(2) After the DTC has been deleted, read the DTC again.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q:Is DTC P1237 set?

YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. 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.00-15.

STEP 4. Using scan tool MB991958, read the diagnostic trouble code (DTC).
(1) Turn the ignition switch to the "ON" position.
(2) Read the DTC.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q:Is DTC P1237 set?
YES: Replace the troubleshooting.
NO: The procedure is complete.

DTC P1238: Mass Airflow Sensor Plausibility (Torque Monitor)

M11310100384USA0000010000

TECHNICAL DESCRIPTION
Compare the actual measurement of volumetric efficiency by a mass airflow sensor signal with volumetric efficiency estimated from a throttle position sensor (main or sub) signal.

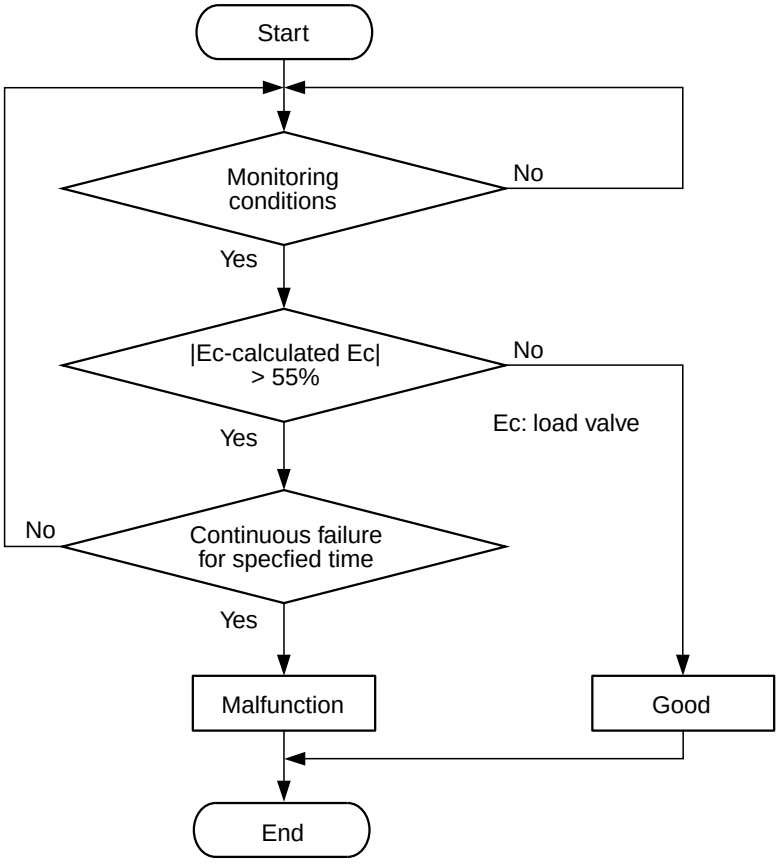
MONITOR EXECUTION
Continuous

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



ZK604065 AA00

Check Conditions
- The difference between the actual volumetric efficiency and the volumetric efficiency estimated by the (main) throttle position sensor is 0 % or more. Or, the volumetric efficiency is 60 % or less.
- Engine speed is 750 r/min or higher.

Judgment Criterion
- For 0.5 second, the difference between the actual volumetric efficiency and the volumetric efficiency estimated by the (main) throttle position sensor is 35 % or more.

Check Condition
- The difference between the actual volumetric efficiency and the volumetric efficiency estimated by the (sub) throttle position sensor is 0% or more. Or, the volumetric efficiency is 60% or less.
- Engine speed is 750 r/min or higher.

Judgment Criterion
- For 0.5 second, the difference between the actual volumetric efficiency and the volumetric efficiency estimated by the (sub) throttle position sensor is 35 % or more.

OBD-II DRIVE CYCLE PATTERN

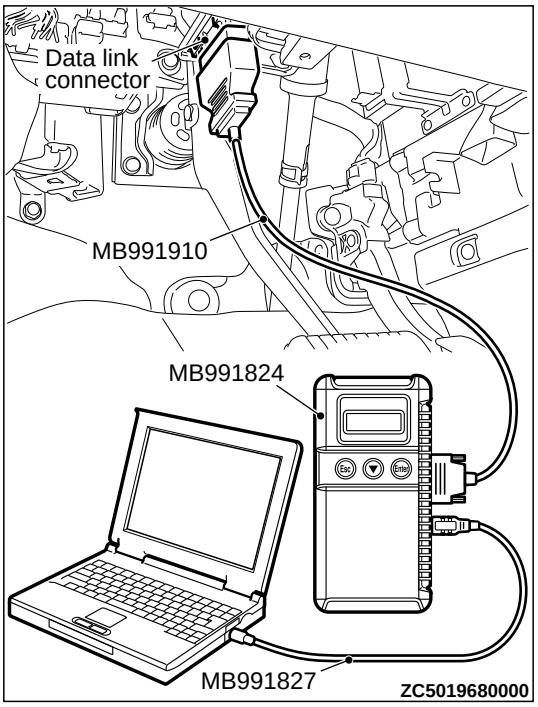
Refer to Diagnostic Function - OBD-II Drive Cycle Pattern 17 P.13Ab-8.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)
- Mass airflow sensor system failed.
- ECM 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 the diagnostic trouble code other than P1238 set?

YES: Refer to, Diagnostic Trouble Code Chart P.13Ab-44.
NO: Go to Step 2.

STEP 2. Using scan tool MB991958, check data list item 10: Mass Airflow Sensor.

(1) Start the engine and run at idle.
(2) Set scan tool MB991958 to the data reading mode for item 10, Mass Airflow Sensor.
(3) 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 1,350 and 1,670 millivolts.
- When the engine is revved, the mass airflow rate should increase according to the increase in engine speed.

(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 P0101 - Mass Airflow Circuit Range/ Performance Problem P.13Ab-108, DTC P0102 - Mass Airflow Circuit Low Input P.13Ab-115, DTC P0103 - Mass Airflow Circuit High Input P.13Ab-121.

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 17 P. 13Ab-8.
(2) Check the diagnostic trouble code (DTC).

Q:Is DTC P1238 set?

YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. 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.00-15.

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 17 P. 13Ab-8.
(2) Check the diagnostic trouble code (DTC).

Q:Is DTC P1238 set?

YES: Replace the troubleshooting.
NO: The procedure is complete.

DTC P1239: Engine RPM Plausibility

M11310100385USA0000010000

TECHNICAL DESCRIPTION

Compares the actual engine speed calculated from the crankshaft position sensor signal cycle with the estimated engine speed calculated from the number of the crankshaft position sensor signal pulses after a lapse of the specified time.

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)

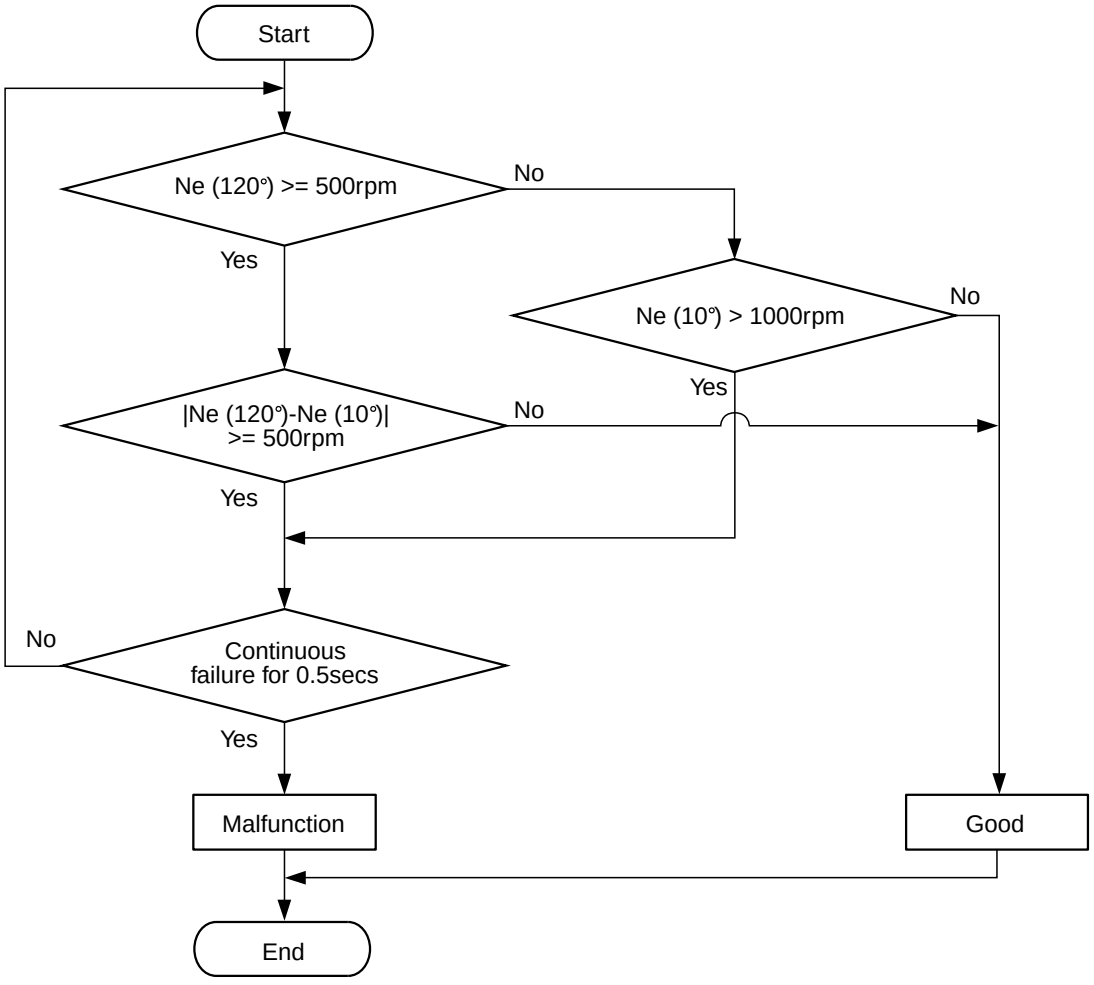
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



ZK604066 AA00

Check Condition

- The engine speed monitored with a 120 degree-cycle pulse is 500 r/min or more.

Judgment Criterion

- The difference between the engine speed monitored with a 120 degree-cycle pulse and the engine speed monitored with a 10 degree-cycle pulse is 500 r/min or more.

Check Condition

- The engine speed monitored with a 120 degree-cycle pulse is 500 r/min or less.

Judgment Criterion

- The engine speed monitored with a 10 degree-cycle pulse is 1,000 r/min or more.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function - OBD-II Drive Cycle Pattern 24 P.13Ab-8.

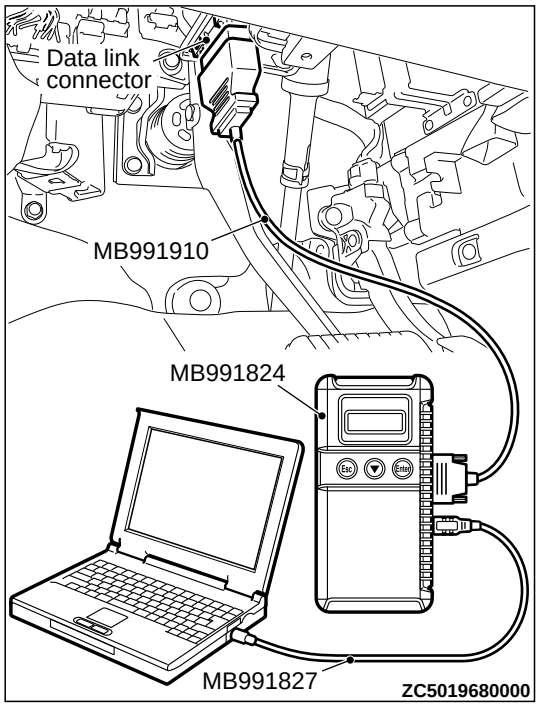
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Crankshaft position sensor system failed.
- ECM 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 the diagnostic trouble code other than P1239 set?

YES: Refer to, Diagnostic Trouble Code Chart P.13Ab-44.
NO: Go to Step 2.

STEP 2. Using scan tool MB991958, read the diagnostic trouble code (DTC).

(1) Turn the ignition switch to the "ON" position.
(2) After the DTC has been deleted, read the DTC again.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q:Is DTC P1239 set?

YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. 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.00-15.

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 17 P. 13Ab-8.
(2) Check the diagnostic trouble code (DTC).

Q:Is DTC P1239 set?
YES: Retry the troubleshooting.
NO: The inspection is complete.

DTC P1240: Ignition Angle

M11310100386USA0000010000

TECHNICAL DESCRIPTION
Checks for an abnormal ignition timing retard angle demand signal from the active stability control (ASC).

DTC SET CONDITIONS

Check Condition
- Ignition switch is "ON" position.

Judgment Criterion
- The ignition timing retard angle demand signal is not normal.

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

DIAGNOSIS

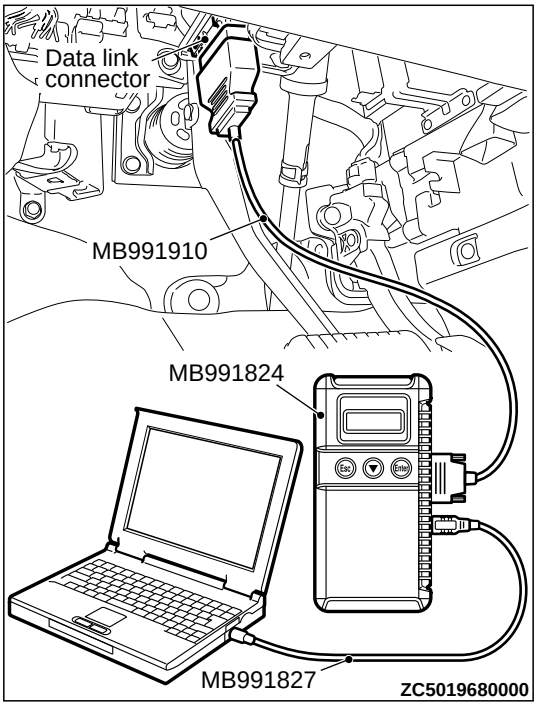
Required Special Tools:
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
- MB991824: V.C.I.
- MB991827: USB Cable
- MB991910: Main Harness A

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 the ABS-DTC or ASC-DTC set?
YES: Refer to GROUP 35B, Anti-lock Braking System - Diagnostic Trouble Code Chart P.35B-9Refer to GROUP 35C, Active Stability Control System - Diagnostic Trouble Code Chart P.35C-11.
NO: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8.

DTC P1241: Torque Monitoring

M11310100387USA0000010000

TECHNICAL DESCRIPTION

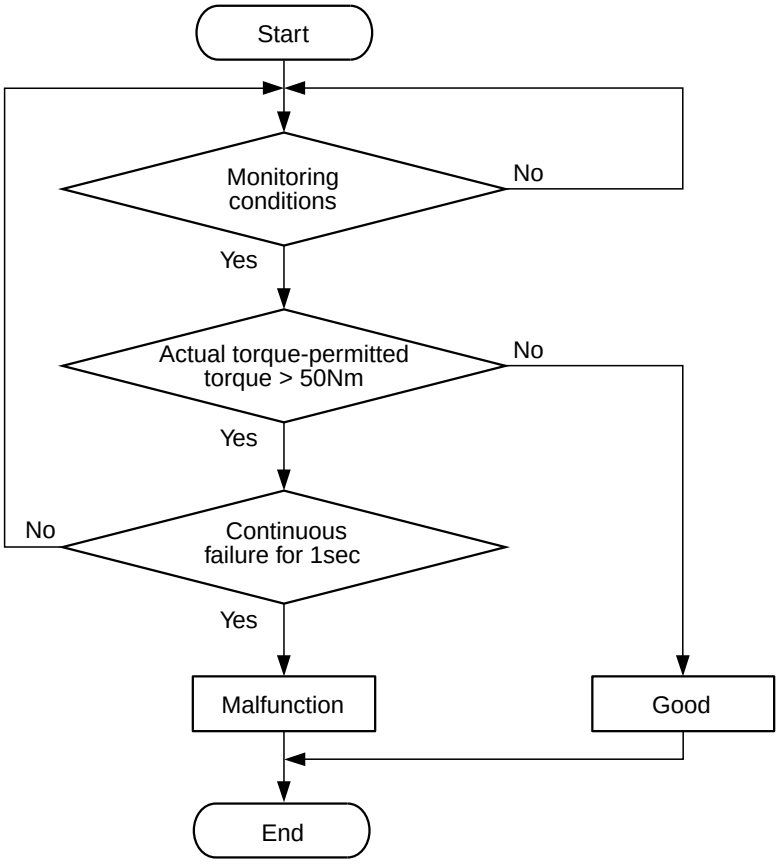
Compares the actual torque signal computed from a mass air flow sensor signal with the driver demand torque signal computed from an accelerator pedal position sensor signal.

MONITOR EXECUTION

Continuous

DTC SET CONDITIONS

Logic Flow Chart



ZK604067 AA00

Check Conditions

- Engine speed is 500 r/min or higher.
- Volumetric efficiency is 16 percent or higher.

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
- For 1 second, the difference between the actual torque signal and the requested torque signal is 50Nm (37 ft-lb).

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function - OBD-II Drive Cycle - Pattern 17 P.13Ab-8.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)
- Throttle actuator control motor failed.
- Connector damage.
- Harness damage.
- Vacuum leak.
- ECM failed

DIAGNOSIS

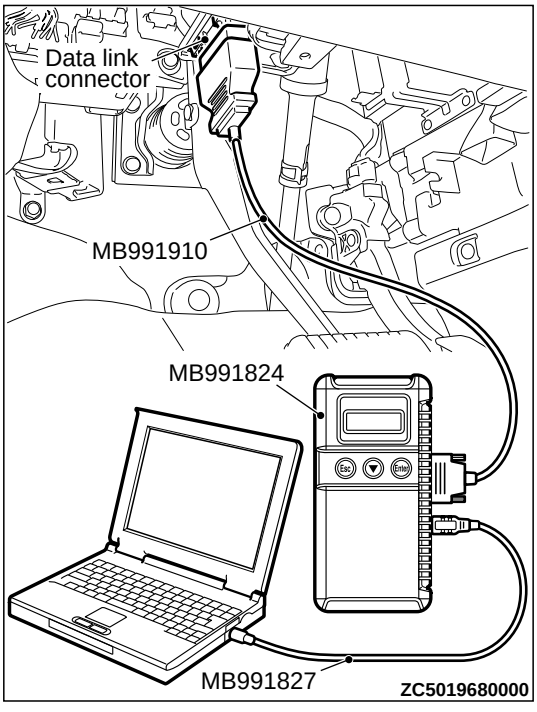
Required Special Tools:
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A

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 the diagnostic trouble code other than P1241 set?

YES: Refer to, Diagnostic Trouble Code Chart P.13Ab-44.
NO: Go to Step 2.

STEP 2. Using scan tool MB991958, check data list.

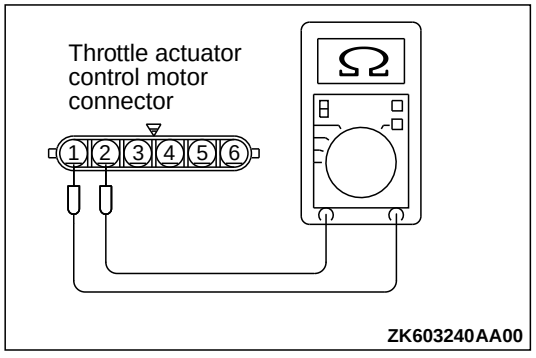
(1) Turn the ignition switch to the "ON" position.
(2) Check the following items in the data list. Refer to Data List Reference Table P.13Ab-837.
  a Item 10: Mass Airflow Sensor.
  b Item 11: Accelerator Pedal Position Sensor (main).
  c Item 12: Accelerator Pedal Position Sensor (sub).
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q:Are they operating properly?
YES: Go to Step 3.
NO: Repair or replace it. Then go to Step 8.

STEP 3. Check harness connector B-08 at throttle actuator control motor and harness connector B-10 at ECM 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.

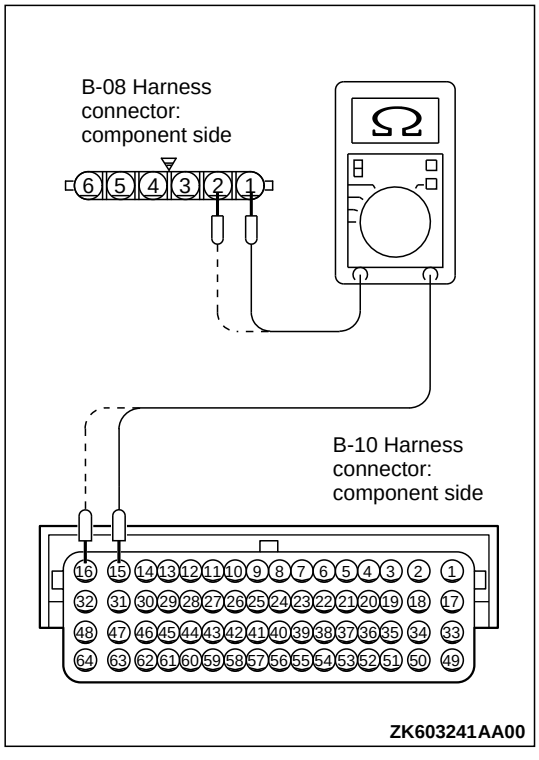
STEP 4. Check the throttle actuator control motor.



(1) Disconnect the connector B-08.
(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°C)]

Q:Is the measured resistance between 0.3 and 80 ohms [at 20°C (68°C)?
YES: Go to Step 5.
NO: Replace the throttle body assembly. Then go Step 8.

STEP 5. Check for harness damage between throttle actuator control motor connector B-08 and ECM connector B-10.



(1) Disconnect the connector B-08 and B-10 measure at the harness side.
(2) Measure the resistance between B-08 connector and B-10 connector.
a. Connector B-08 (terminal No. 1) and connector B-10 (terminal No. 15).
b. Connector B-08 (terminal No. 2) and connector B-10 (terminal No. 16).
- Should be less than 2 ohms.

Q:Is the measured resistance less than 2 ohms?
YES: Then go to Step 6.
NO: Repair it. Then go to Step 8.

STEP 6. Check for intake system vacuum leak.

Q:Are there any abnormalities?
YES: Repair it. Then go to Step 8.

NO: Go to Step 7.

STEP 7. Check the trouble symptoms.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function - OBD-II Drive Cycle Pattern 17 P. 13Ab-8.
(2) Check the diagnostic trouble code (DTC).

Q:Is DTC P1241 set?

YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. 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.00-15.

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 17 P. 13Ab-8.
(2) Check the diagnostic trouble code (DTC).

Q:Is DTC P1241 set?

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

DTC P1242: Fail Safe Control Monitor

M11310100388USA0000010000

TECHNICAL DESCRIPTION

Monitors the engine speed during fail-safe control.

DTC SET CONDITIONS

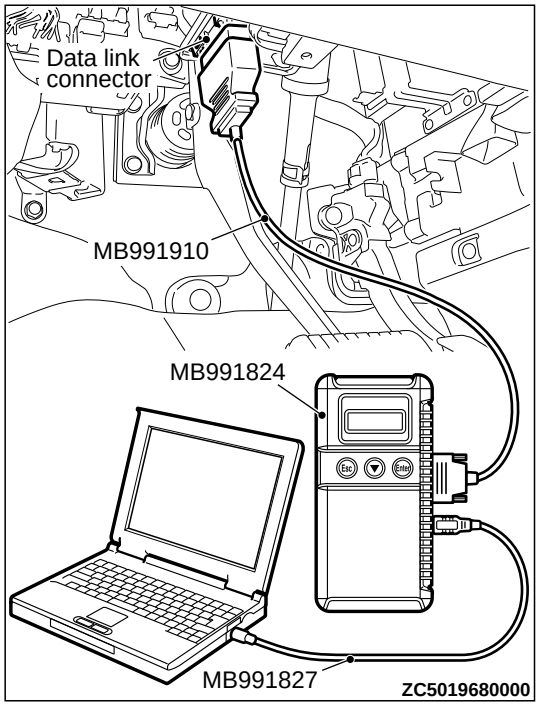
Check Condition
- During fail safe cotrol.

Judgment Criterion
- The engine speed is higher than assumed.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)
- ECM 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 the diagnostic trouble code other than P1242 set?

YES: Refer to, Diagnostic Trouble Code Chart P.13Ab-44.
NO: Go to Step 2.

STEP 2. Using scan tool MB991958, read the diagnostic trouble code (DTC).

(1) Turn the ignition switch to the "LOCK" (OFF) position.
(2) After the DTC has been deleted, read the DTC again.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q:Is DTC P1242 set?

YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-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.00-15.

DTC P1243: Inquiry/Response Error

M11310100389USA0000010000

TECHNICAL DESCRIPTION

Monitors the computation function of the engine control module.

DTC SET CONDITIONS

Check Condition
- Ignition switch is "ON" position.

Judgment Criterion
- ECM can not calculate input data.

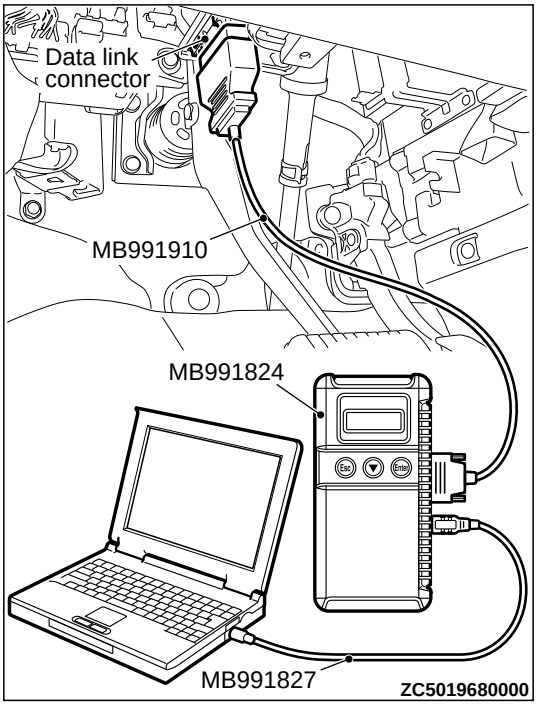
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- ECM 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 P1243 set?

YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-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.00-15.

DTC P1244: RAM Test For All Area

M11310100390USA0000010000

TECHNICAL DESCRIPTION

Monitors the computation function of the engine control module periodically.

DTC SET CONDITIONS

Check Condition
- Ignition switch is "ON" position.

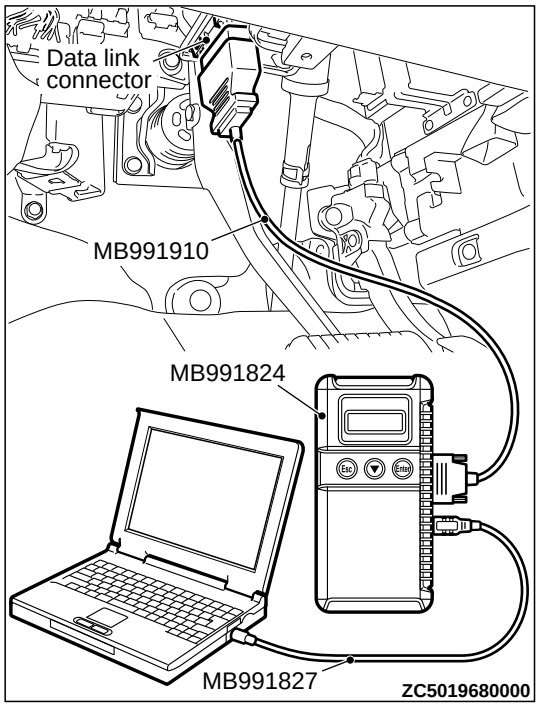
Judgment Criterion
- All RAM data of ECM are defect.

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

- ECM 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 P1244 set?

YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-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.00-15.

DTC P1245: Cycle RAM Test (Engine)

M11310100391USA0000010000

TECHNICAL DESCRIPTION

Monitors the computation function of the engine control module periodically.

DTC SET CONDITIONS

Check Condition
▪Ignition switch is "ON" position.

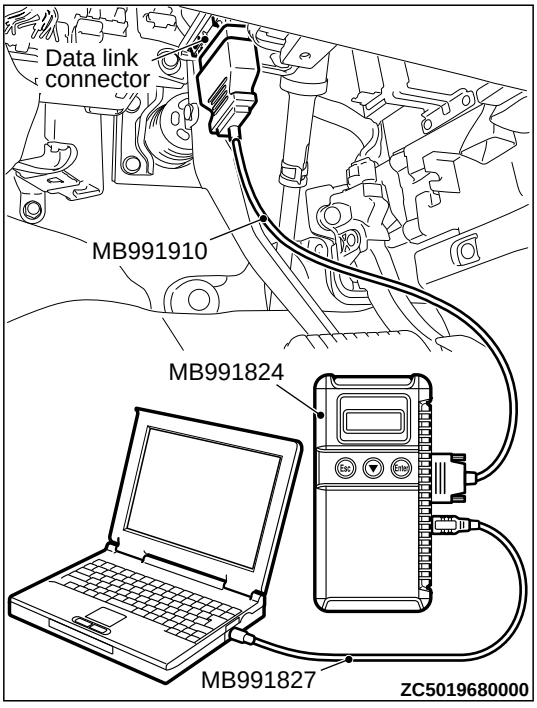
Judgment Criterion
▪RAM data (engine) is defect.

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

▪ECM 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 P1245 set?

YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-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.00-15.

DTC P1246: Communication Error

M11310100392USA0000010000

TECHNICAL DESCRIPTION

Monitors periodically whether the computation function of the engine control module is normal.

DTC SET CONDITIONS

Check Condition
- Ignition switch is "ON" position.

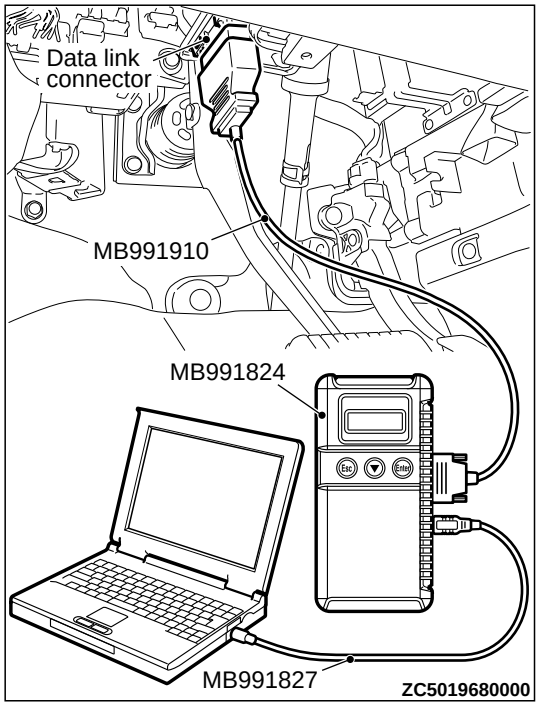
Judgment Criterion
- ECM could not calculate input data.

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

- ECM 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 P1246 set?

YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-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.00-15.

DTC P1247: A/T Plausibility

M11310100393USA0000010000

TECHNICAL DESCRIPTION

Checks for an abnormal signal of transmission control module.

DTC SET CONDITIONS

Check Condition

- Ignition switch is "ON" position.

Judgment Criterion

- A torque demand signal from TCM is not normal.

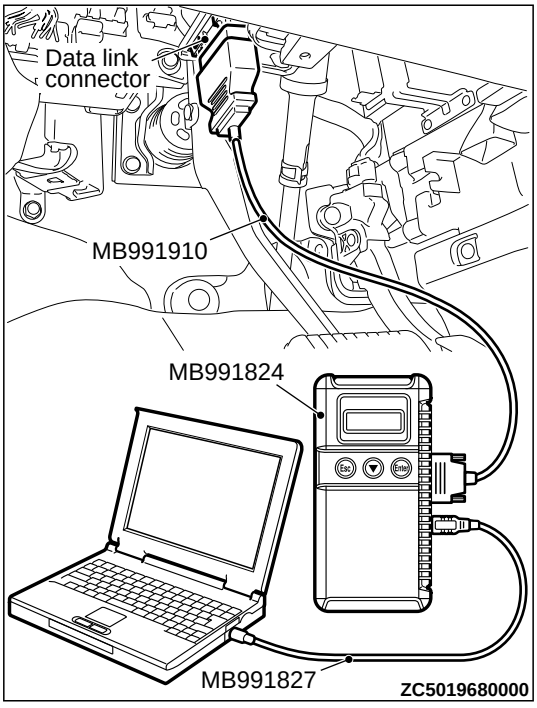
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Automatic transaxle system failed.
- ECM 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 A/T-DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q:Is the A/T-DTC set?

YES: Refer to GROUP 23A, Automatic Transaxle - Diagnostic Trouble Code Chart P.23A-22.
NO: Go to Step 2.

STEP 2. Using scan tool MB991958, read the diagnostic trouble code (DTC).

(1) Turn the ignition switch to the "LOCK" (OFF) position.
(2) After the DTC has been deleted, read the DTC again.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q:Is DTC P1247 set?

YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-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.00-15.

DTC P1248: AWD Plausibility <AWD>

M11310100394USA0000010000

TECHNICAL DESCRIPTION

Checks for an abnormal signal of AWD-ECU.

DTC SET CONDITIONS

Check Condition

- Ignition switch is "ON" position.

Judgment Criterion

- The torque reduction requested signal from AWD-ECU is abnormal.

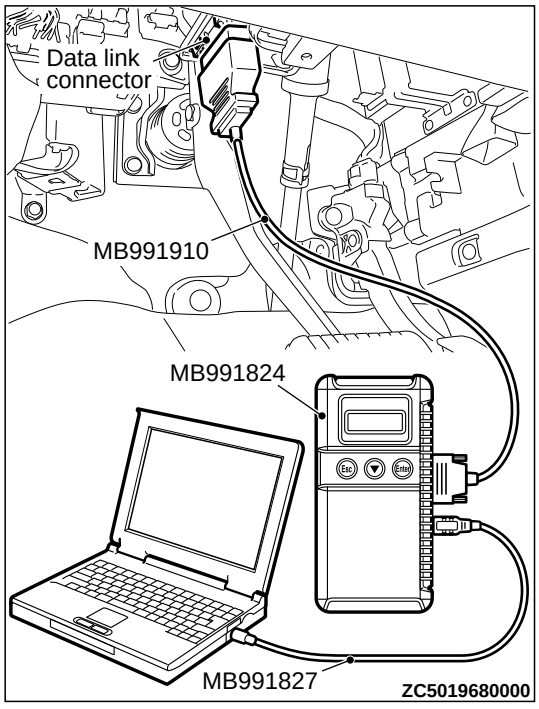
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- AWD system failed.
- ECM 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 A/T-DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q:Is the electronic control AWD-DTC set?

YES: Refer to GROUP 27C, Electronic Control AWD - Diagnostic Trouble Code Chart P.27C-94.
NO: Go to Step 2.

STEP 2. Using scan tool MB991958, read the diagnostic trouble code (DTC).

(1) Turn the ignition switch to the "ON" position.
(2) After the DTC has been deleted, read the DTC again.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

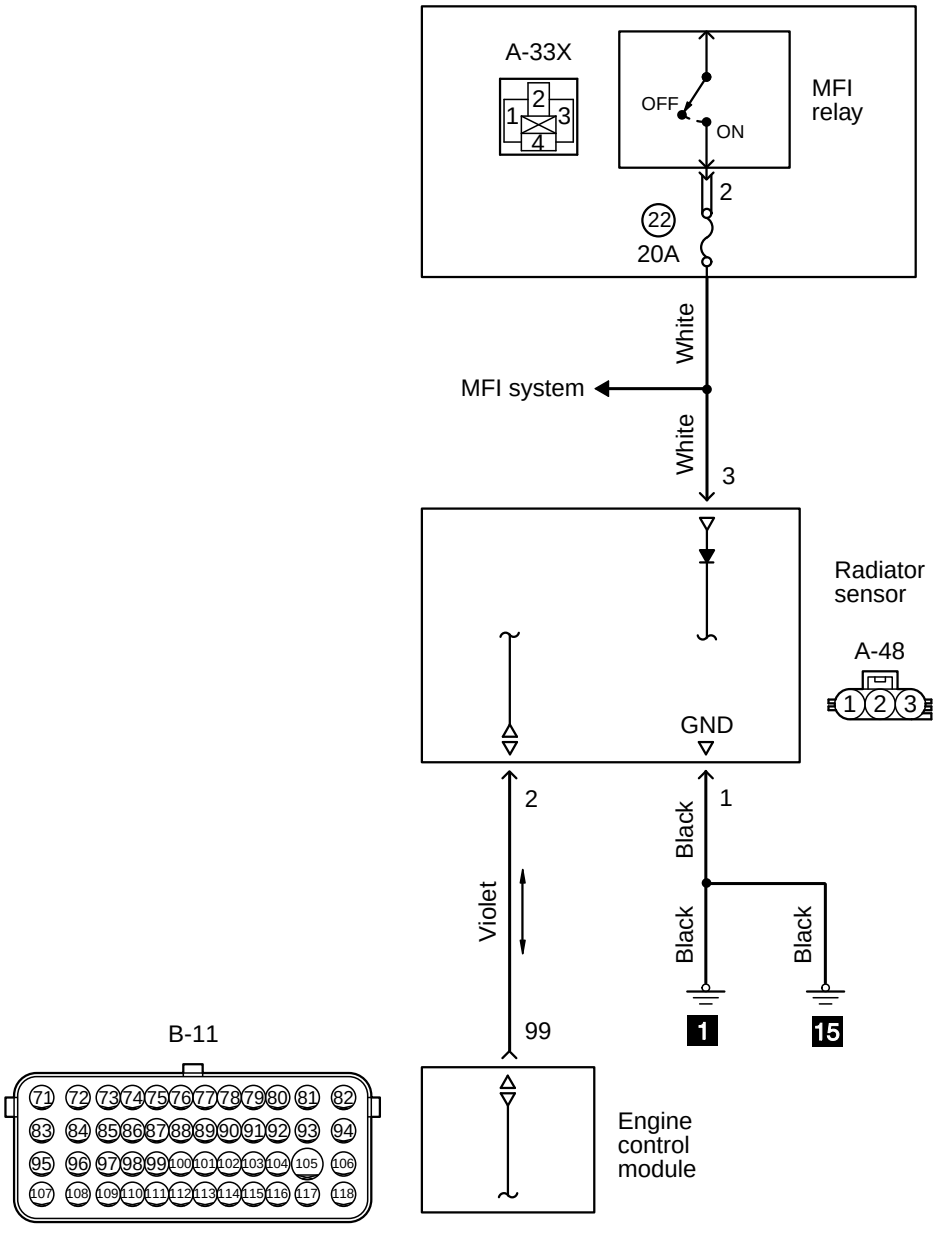
Q:Is DTC P1247 set?

YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-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.00-15.

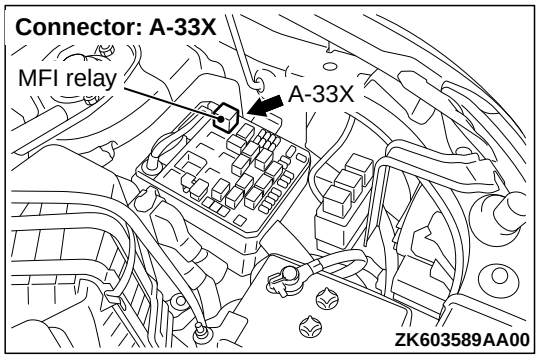
DTC P1540: LIN Communication Check by ECM (Sending Message to Radiator Sensor) <California>/DTC P1541: LIN Communication Check by ECM (Receiving Message from Radiator Sensor) <California>

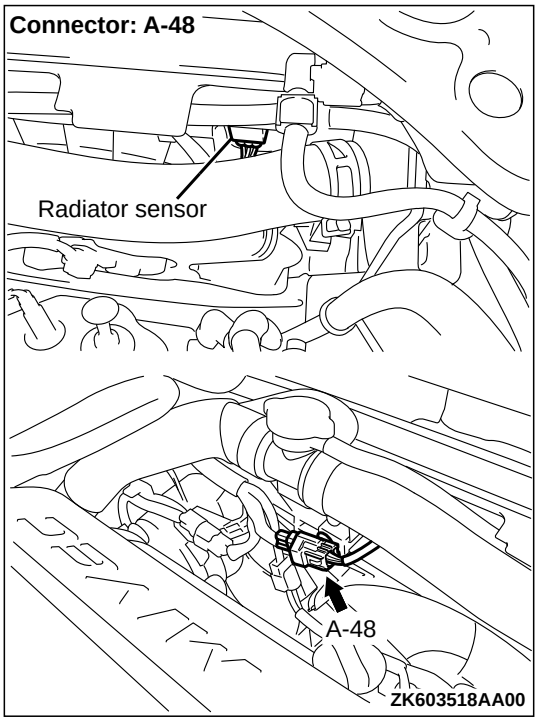
M11310100411USA0000010000

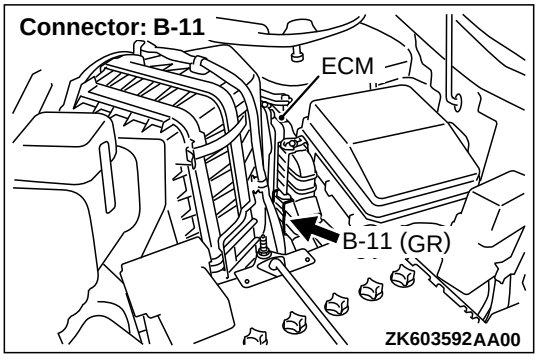
Radiator Sensor Circuit



ZK603438 AA00







CIRCUIT OPERATION

- The battery voltage is applied from the MFI relay 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 ECM (terminal No. 99).

TECHNICAL DESCRIPTION

- The ECM 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)

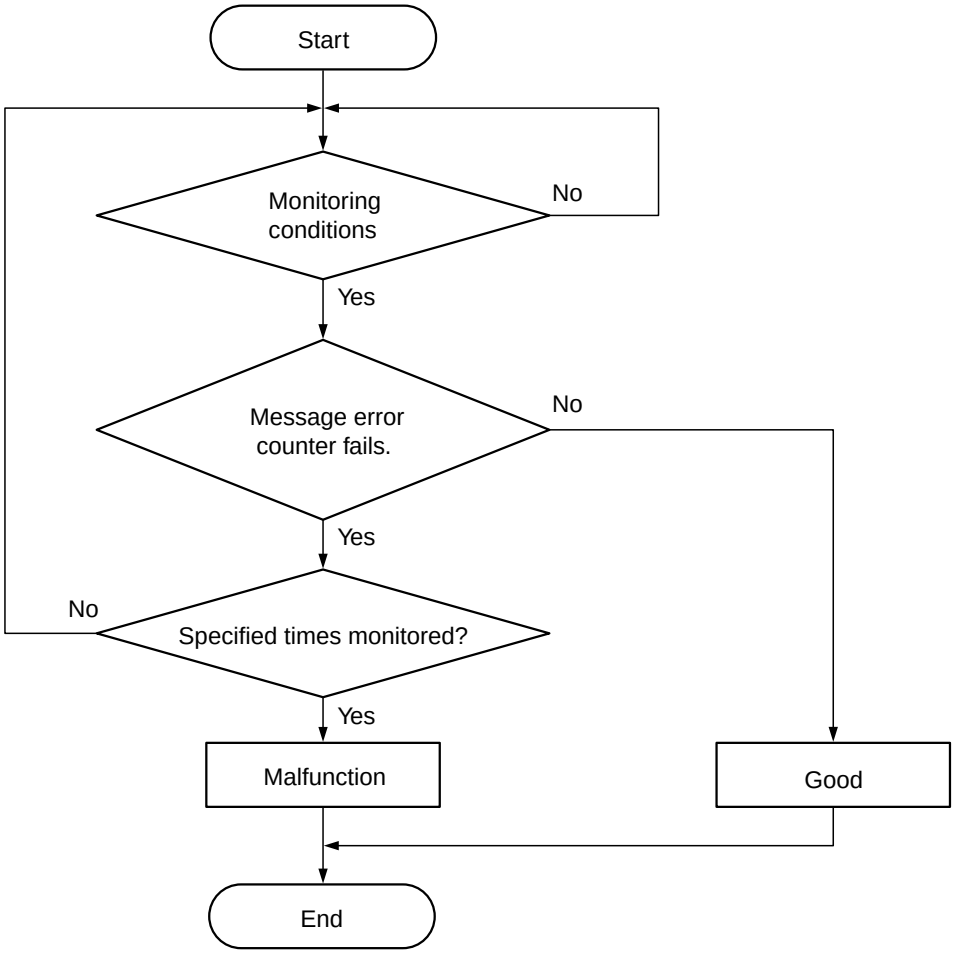
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



ZK603439AA00

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

- The radiator sensor cannot receive the data from the ECM <When P1540 is set>.
- The ECM cannot receive the data from the radiator sensor <When P1541 is set>.

OBD-II DRIVE CYCLE PATTERN

- None.

TROUBLESHOOTING HINTS (THE MOST LIKELY CAUSES FOR THIS CODE TO BE SET ARE:)

- Tampering of the DOR radiator
- Battery failed.
- Connector damage.
- Harness damage.
- ECM 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. 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. 54Aa-2.

STEP. 2 Check harness connector A-48 at radiator sensor and harness connector B-11 at ECM for damage.

Q:Is the harness connector in good condition?

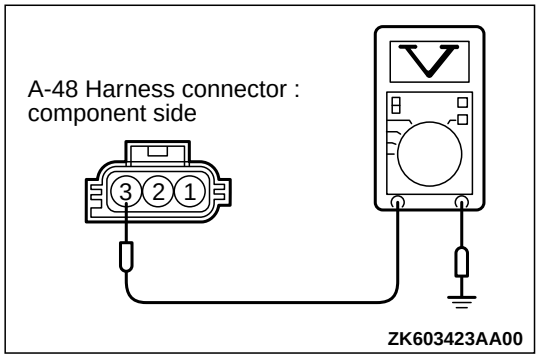
YES: Go to Step 3.

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

STEP 3. Measure the supply voltage at radiator sensor connector A-48.

(1) Disconnect radiator sensor harness connector A-48.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between harness connector A-48 (terminal No. 3) and ground.
- The voltage should equal battery positive voltage.

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



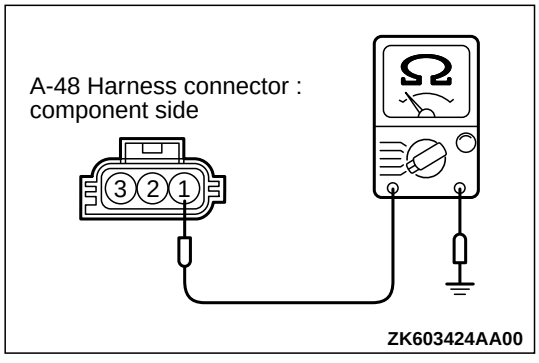
Q:Is the measured voltage battery positive voltage?

YES: Go to Step 4.

NO: Repair harness wire between MFI relay connector A-33X (terminal No. 2) and radiator sensor connector A-48 (terminal No. 3) because of harness damage. Then go to Step 7.

STEP 4. Check for open circuit or harness damage between radiator sensor connector A-48 and ground.

(1) Disconnect the connector A-48 measure at the harness side.
(2) Measure the resistance between connector A-48 (terminal No. 1) and ground.
- Should be less than 2 ohms.



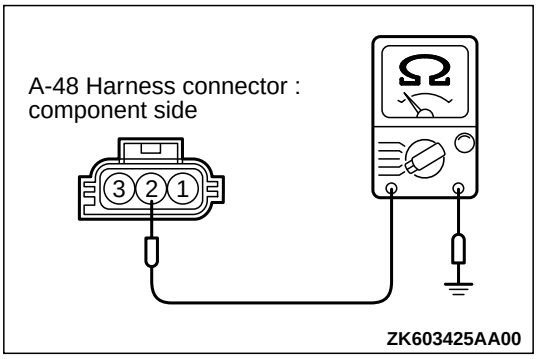
Q:Is the measured resistance less than 2 ohms?

YES: Go to Step 5.

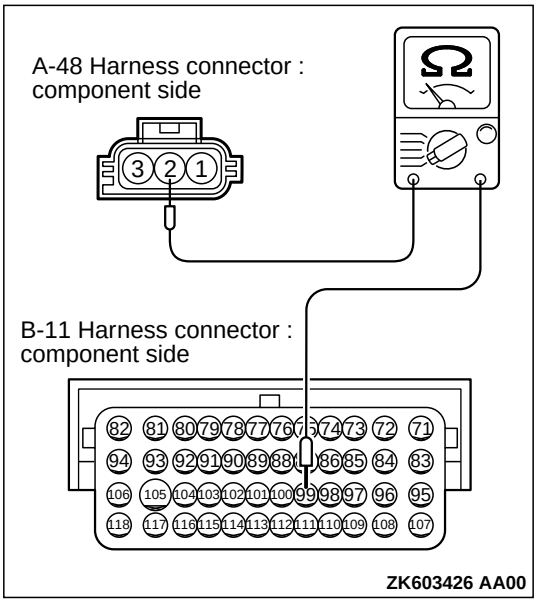
NO: Repair it. Then go to Step 7.

STEP 5. Check for short circuit to ground or open circuit between radiator sensor connector A-48 and ECM connector B-11.

(1) Disconnect the connector A-48 and B-11 measure at the harness side.



(2) Check for the continuity between A-48 (terminal No. 2) connector and ground.
- Not continuity.



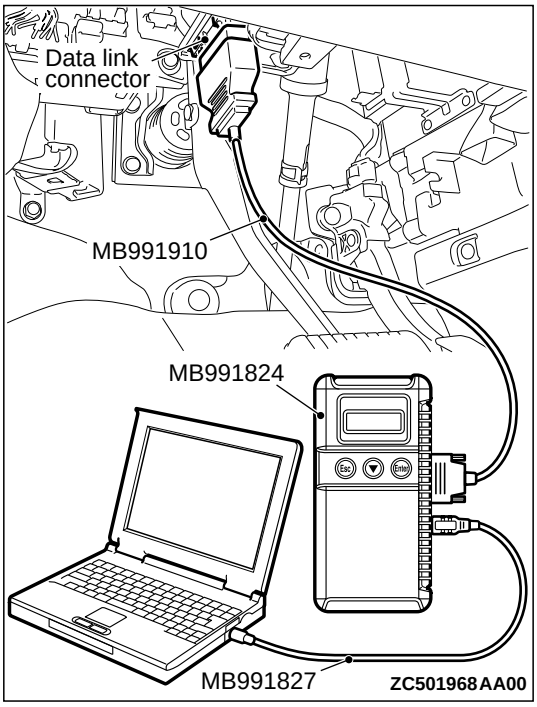
(3) Measure the resistance between connector A-48 (terminal No. 2) and connector B-11 (terminal No. 99).
- Should be less than 2 ohms.

Q:Is the harness wire in good condition?
YES: Go to Step 6.
NO: Repair it. Then go to Step 7.

STEP 6. Replace the DOR radiator.
(1) Replace the DOR radiator.

⚠ 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.

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



Q:Is DTC P1540 or P1541 set?
YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. 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.00-15.

STEP 7. Using scan tool MB991958, read the diagnostic trouble code (DTC).
(1) Turn the ignition switch to the "ON" position.
(2) Read the DTC.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q:Is DTC P1540 or P1541 set?
YES: Repeat the troubleshooting.
NO: The procedure is complete.

DTC P1543: DOR Tampering Monitor (Temperature Check After Thermostat Open) <California>

M11310100412USA0000010000

RADIATOR SENSOR CIRCUIT
Refer to P.13Ab-658.

CIRCUIT OPERATION
Refer to P.13Ab-658.

MONITOR EXECUTION
- Once per driving cycle

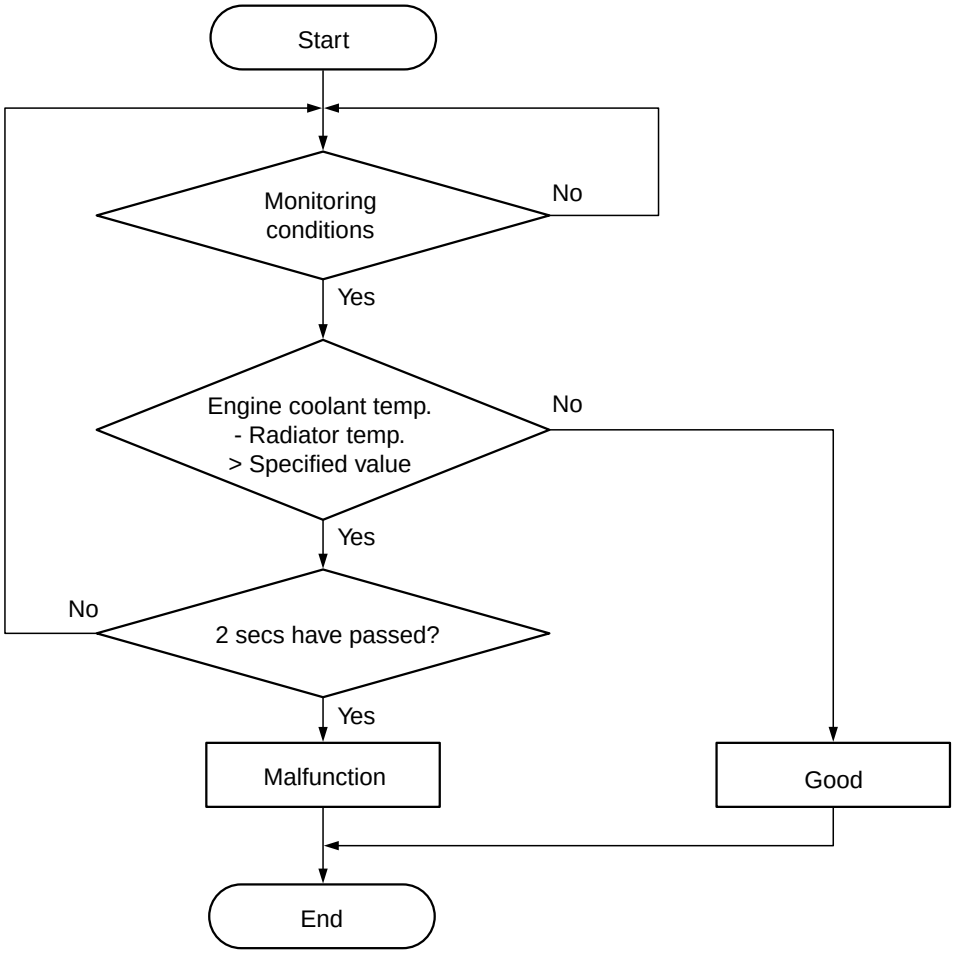
MONITOR EXECUTION CONDITIONS (OTHER MONITOR AND SENSOR)

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



ZK603440AA00

Check Condition

- Battery positive voltage is higher than 11 volts.
- Intake air temperature is between 0°C (32°F) to 40° C (104°F) when the engine is started.
- Engine coolant temperature is between 0°C (32°F) to 40°C (104°F) when the engine is started.
- The engine coolant temperature - intake air temperature is 5°C (41°F) or less when the engine is started.
- 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 1,438 r/min or more for 10 minutes.
  2. The engine load is 31 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.13Ab-8.

TROUBLESHOOTING HINTS (THE MOST LIKELY CAUSES FOR THIS CODE TO BE SET ARE:)

- Tampering of the DOR radiator
- Engine coolant is insufficient.
- Thermostat failed.
- Water pump failed.
- ECM 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 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.14-21).

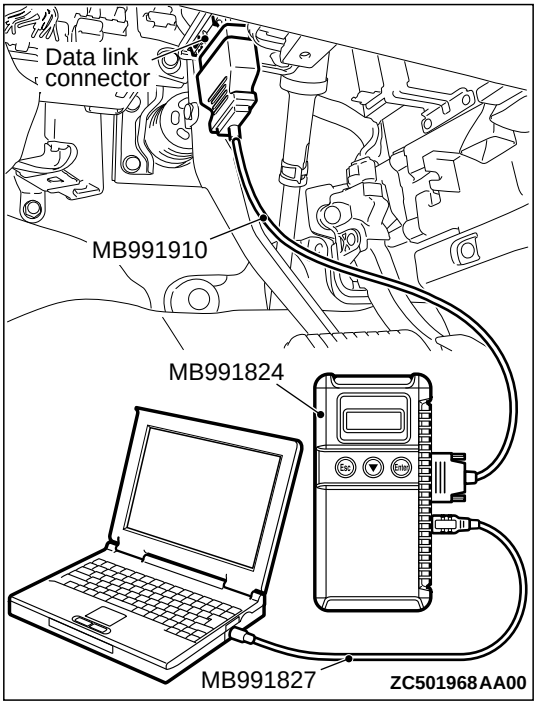
Q:Is the check result normal?
YES: Go to Step 3.
NO: Repair it. Then go to Step 6.

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) Replace the DOR radiator.

⚠ 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.

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

Q:Is DTC P1543 set?

YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 6.
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.00-15.

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. 13Ab-8.
(2) Check the diagnostic trouble code (DTC).

Q:Is DTC P1543 set?

YES: Repeat the troubleshooting.
NO: The procedure is complete.

DTC P1544: DOR Tampering Monitor (Temperature Check Before Thermostat Open) <California>

M11310100413USA0000010000

RADIATOR SENSOR CIRCUIT
Refer to P.13Ab-658.

CIRCUIT OPERATION
Refer to P.13Ab-658.

MONITOR EXECUTION
- Once per driving cycle

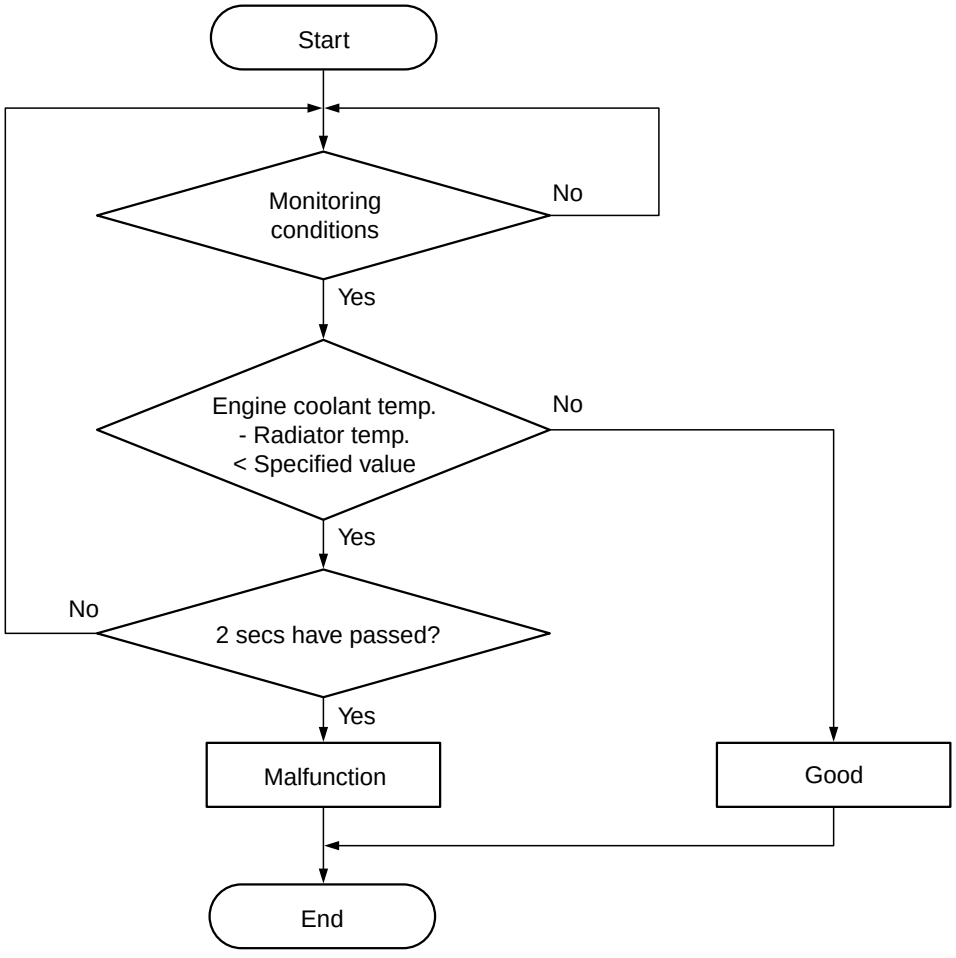
MONITOR EXECUTION CONDITIONS (OTHER MONITOR AND SENSOR)

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



ZK603441AA00

Check Condition

- Battery positive voltage is higher than 11 volts.
- Intake air temperature is between 0°C (32°F) to 40° C (104°F) when the engine is started.
- Engine coolant temperature is between 0°C (32°F) to 40°C (104°F) when the engine is started.
- The engine coolant temperature - intake air temperature is 5°C (41°F) or less when the engine is started.
- Vehicle speed is lower than 1.5 km/h (1 mph).

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.13Ab-8.

TROUBLESHOOTING HINTS (THE MOST LIKELY CAUSES FOR THIS CODE TO BE SET ARE:)

- Tampering of the DOR radiator
- Thermostat failed.
- ECM 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 thermostat.
- Thermostat inspection (Refer to GROUP 14, Thermostat inspection P.14-21).

Q:Is the check result normal?
YES: Go to Step 2.
NO: Repair it. Then go to Step 4.

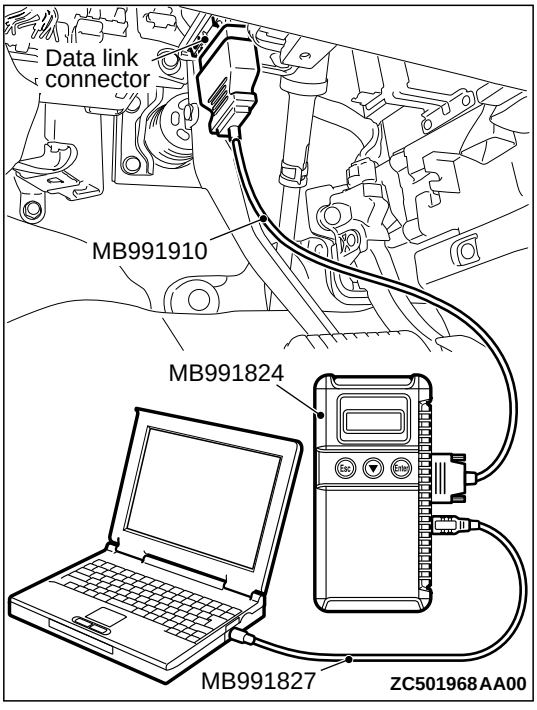
STEP 2. DOR radiator sensor installation check.
- Check that the sensor is installed securely and operates normally.

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) Replace the DOR radiator.

⚠ 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.

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



Q:Is DTC P1544 set?
YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. 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.00-15.

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. 13Ab-8.
(2) Check the diagnostic trouble code (DTC).

Q:Is DTC P1544 set?
YES: Repeat the troubleshooting.

NO: The procedure is complete.

DTC P1545: DOR Tampering Monitor (Temperature Change After Thermostat Open) <California>

M11310100414USA0000010000

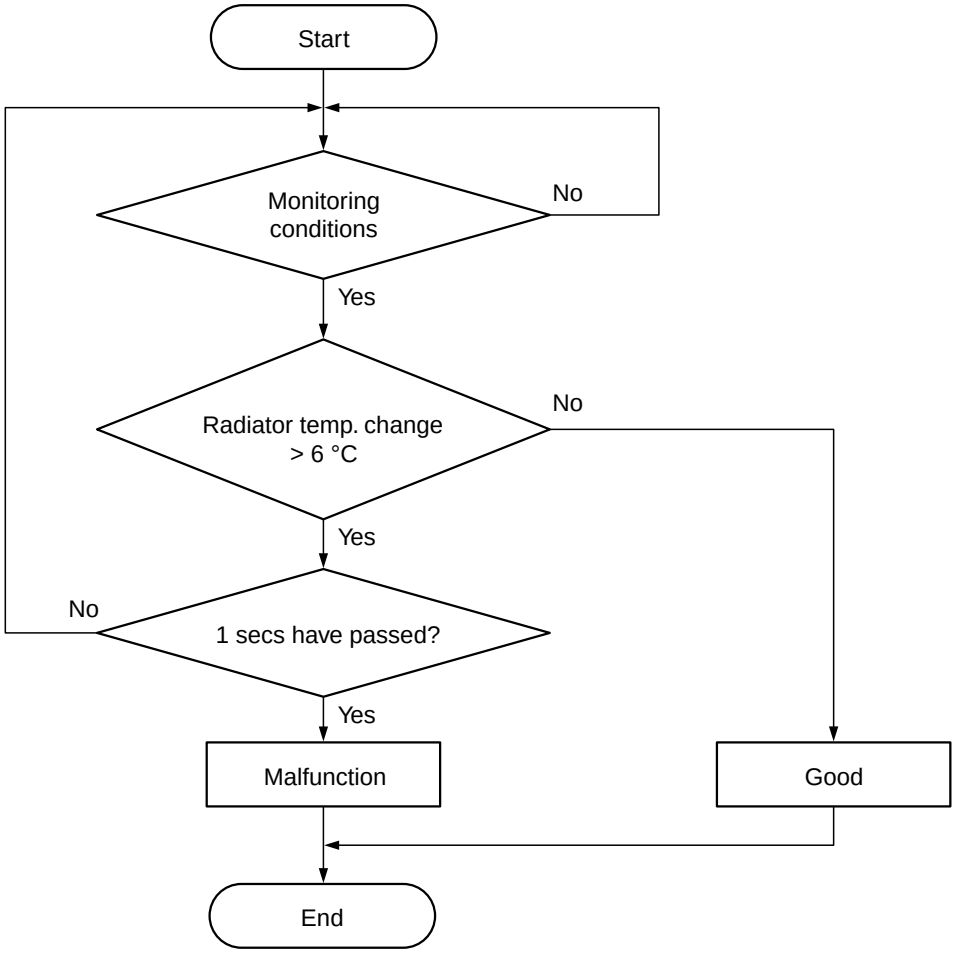
RADIATOR SENSOR CIRCUIT
Refer to P.13Ab-658.

CIRCUIT OPERATION
Refer to P.13Ab-658.

MONITOR EXECUTION
- Continuous

DTC SET CONDITIONS

Logic Flow Chart



ZK603442AA00

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
- Battery positive voltage is higher than 11 volts.
- Intake air temperature is between 0°C (32°F) to 40°C (104°F) when the engine is started.
- Engine coolant temperature is between 0°C (32°F) to 40°C (104°F) when the engine is started.
- The engine coolant temperature - intake air temperature is 5°C (41°F) or less when the engine is started.
- 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.13Ab-8.

TROUBLESHOOTING HINTS (THE MOST LIKELY CAUSES FOR THIS CODE TO BE SET ARE:)
- Tampering of the DOR radiator
- ECM failed.

DIAGNOSIS

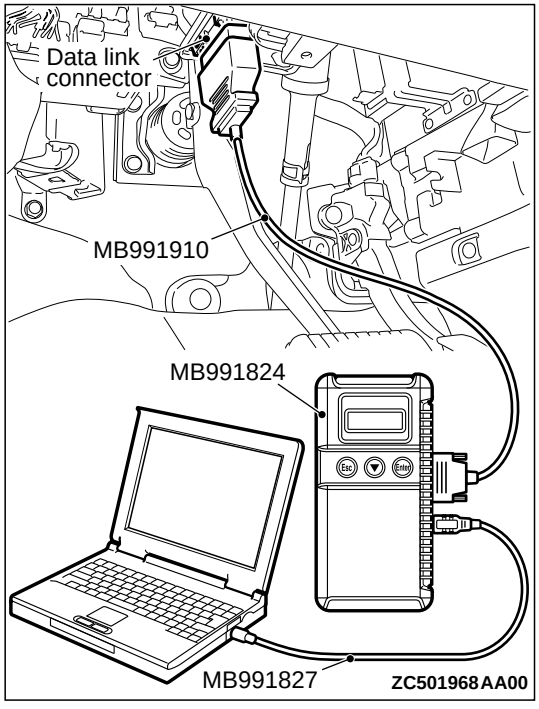
Required Special Tools:
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A

STEP 1. 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) Replace the DOR radiator.

⚠ 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.

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

Q:Is DTC P1545 set?

YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. 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.00-15.

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. 13Ab-8.
(2) Check the diagnostic trouble code (DTC).

Q:Is DTC P1545 set?

YES: Repeat the troubleshooting.

NO: The procedure is complete.

DTC P1546: DOR Tampering Monitor (Temperature Check at Cold Start) <California>

M11310100415USA0000010000

RADIATOR SENSOR CIRCUIT

Refer to P.13Ab-658.

CIRCUIT OPERATION

Refer to P.13Ab-658.

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)

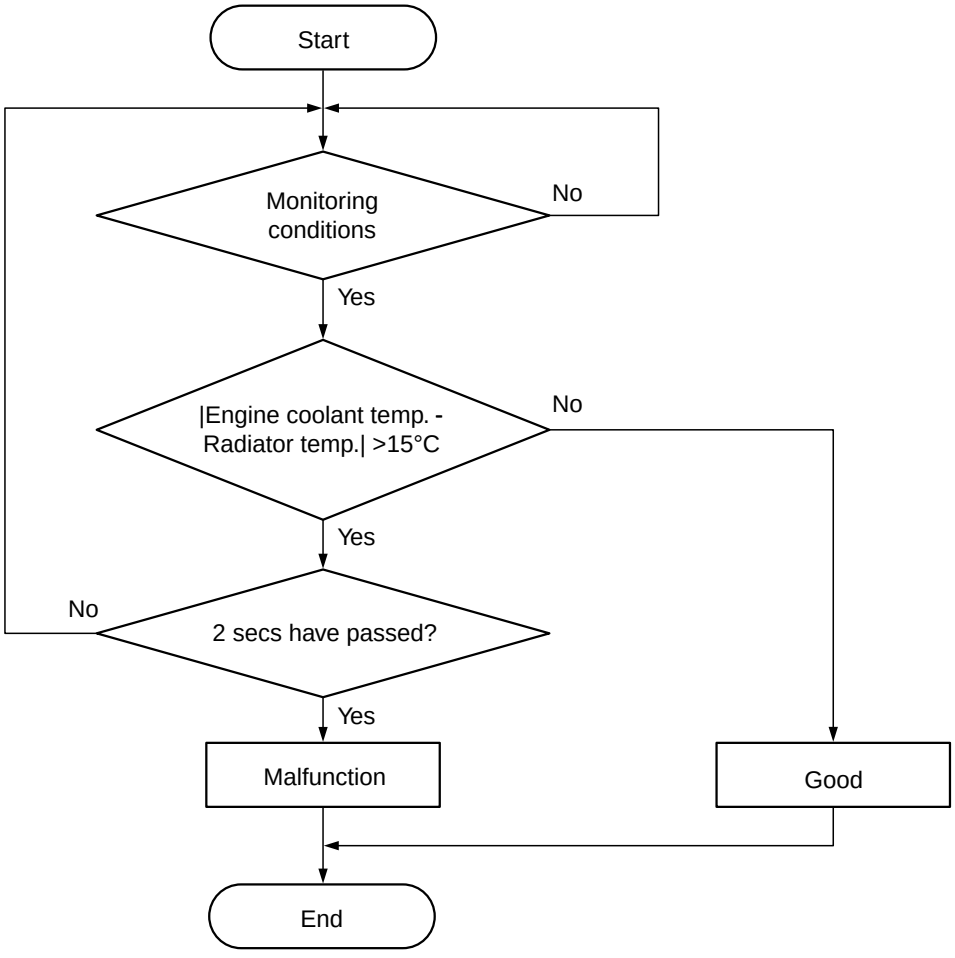
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



ZK603443AA00

Check Condition

- Battery positive voltage is higher than 11 volts.
- Intake air temperature is between 0°C (32°F) to 40° C (104°F) when the engine is started.
- Engine coolant temperature is between 0°C (32°F) to 40°C (104°F) when the engine is started.
- The engine coolant temperature - intake air temperature is 5°C (41°F) or less when the engine is started.

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.13Ab-8.

TROUBLESHOOTING HINTS (THE MOST LIKELY CAUSES FOR THIS CODE TO BE SET ARE:)

- Tampering of the DOR radiator
- ECM failed.

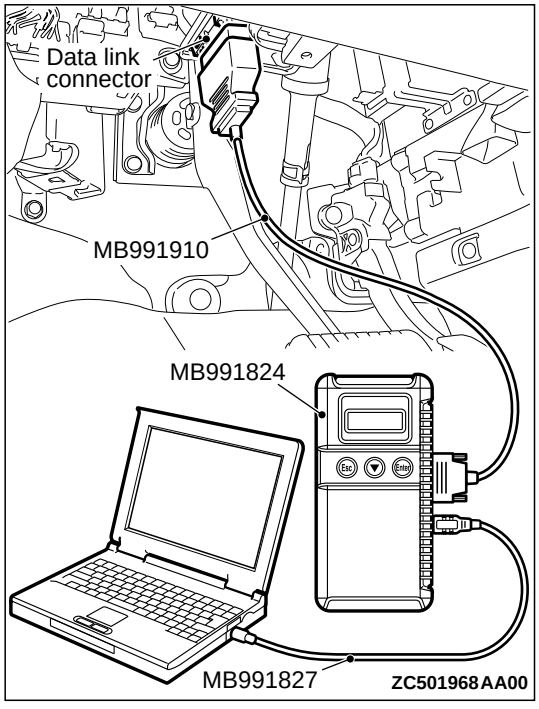
DIAGNOSIS

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. 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) Replace the DOR radiator.

⚠ 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.

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

Q:Is DTC P1546 set?
YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. 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.00-15.

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. 13Ab-8.
(2) Check the diagnostic trouble code (DTC).

Q:Is DTC P1546 set?
YES: Repeat the troubleshooting.
NO: The procedure is complete.

DTC P1547: DOR Tampering Monitor (Rationality Check) <California>

M11310100416USA0000010000

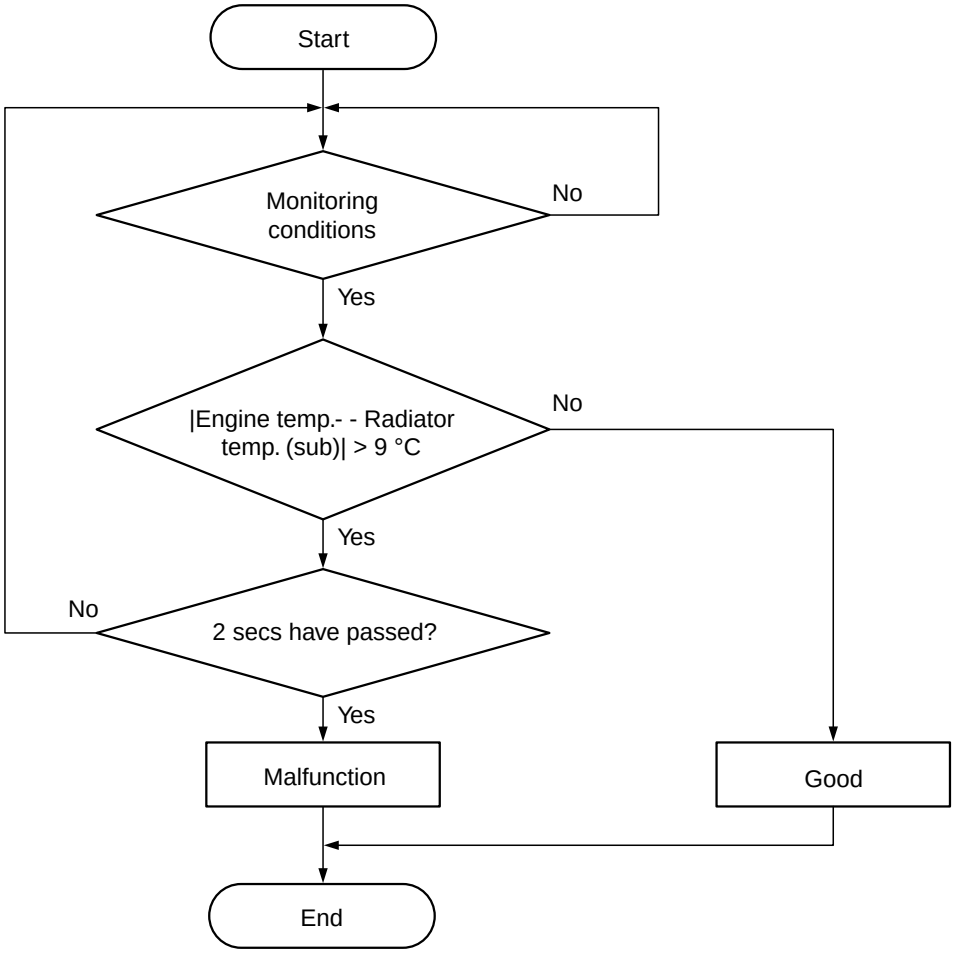
RADIATOR SENSOR CIRCUIT
Refer to P.13Ab-658.

CIRCUIT OPERATION
Refer to P.13Ab-658.

MONITOR EXECUTION
- Once per driving cycle

DTC SET CONDITIONS

Logic Flow Chart



ZK603444AA00

Check Condition
- Battery positive voltage is higher than 11 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

- Intake air temperature is between 0°C (32°F) to 40° C (104°F) when the engine is started.

- Engine coolant temperature is between 0°C (32°F) to 40°C (104°F) when the engine is started.
- The engine coolant temperature - intake air temperature is 5°C (41°F) or less when the engine is started.
- 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 1,438 r/min or more for 10 minutes.
  2. The engine load is 31 percent or more.

Judgement Criteria

- The temperature difference between thermistor 1 and thermistor 2 is 9°C (48°F) or more.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function - OBD-II Drive Cycle - Pattern 18 P.13Ab-8.

TROUBLESHOOTING HINTS (THE MOST LIKELY CAUSES FOR THIS CODE TO BE SET ARE:)

- Tampering of the DOR radiator
- ECM 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. 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) Replace the DOR radiator.

⚠ CAUTION

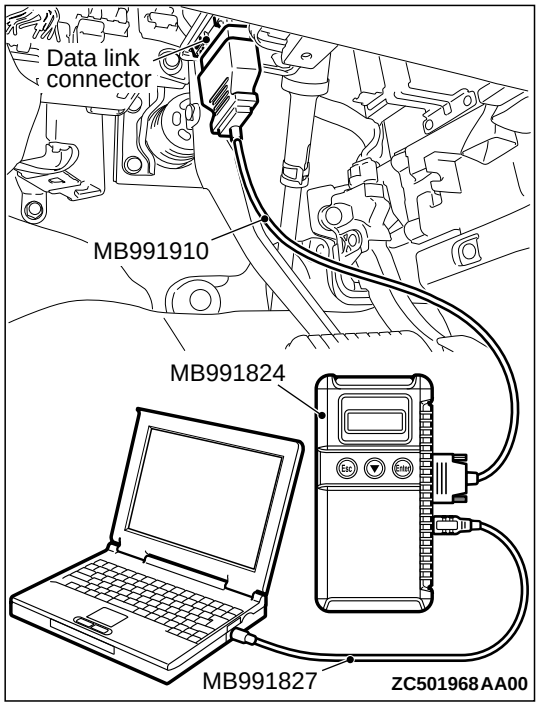
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

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

Q:Is DTC P1547 set?

YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. 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.00-15.



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. 13Ab-8.

(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) <California>

M11310100417USA0000010000

RADIATOR SENSOR CIRCUIT

Refer to P.13Ab-658.

CIRCUIT OPERATION

Refer to P.13Ab-658.

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)

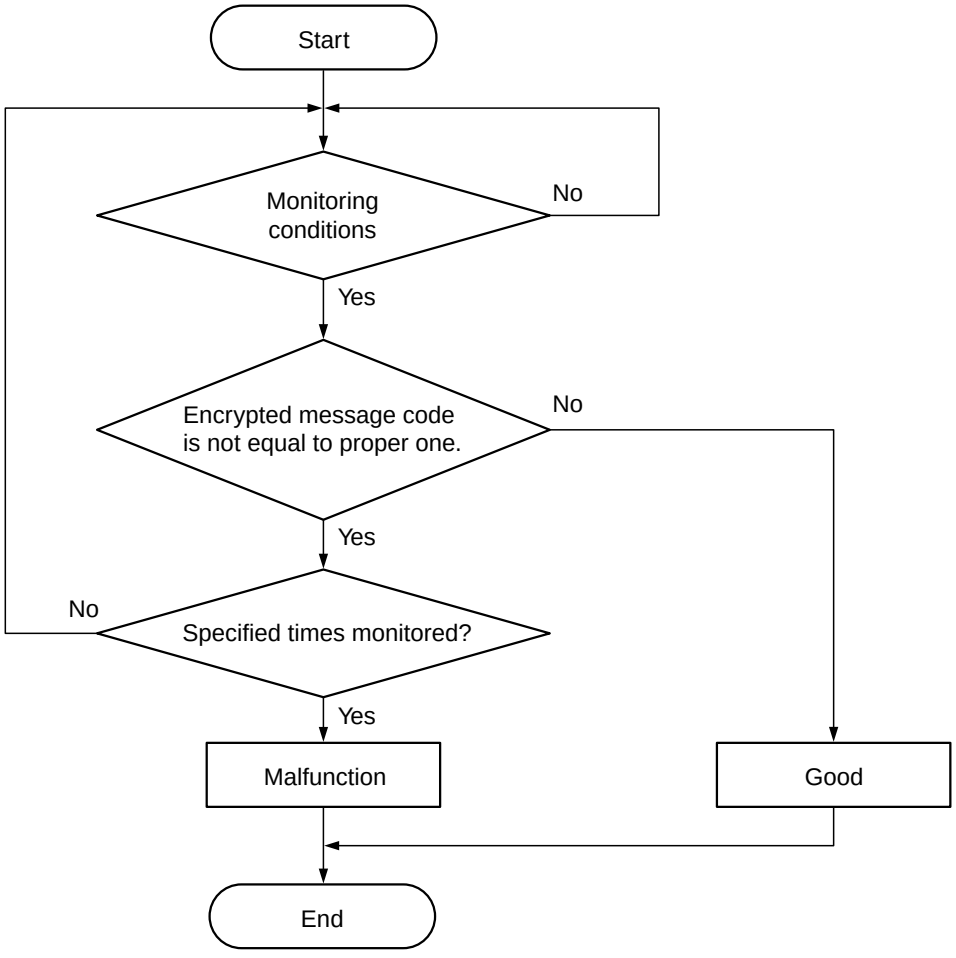
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



ZK603445AA00

Check Condition
- Battery positive voltage is higher than 11 volts
- Engine coolant between -30°C (-22°F) and 110°C (230°F)

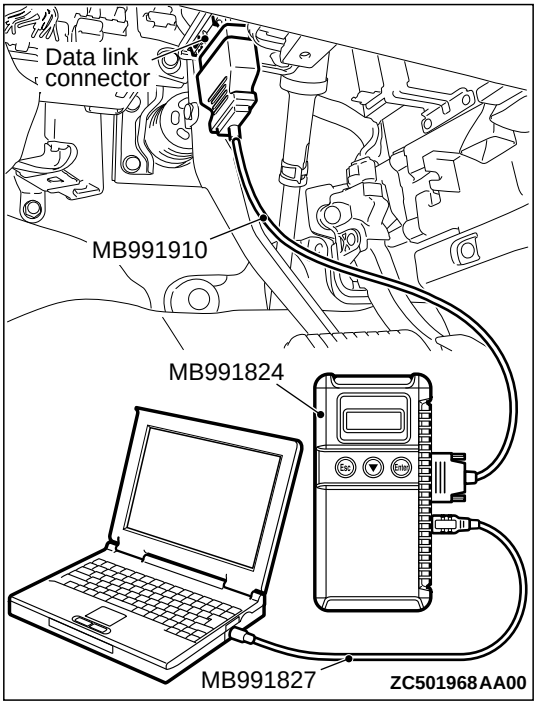
Judgement Criteria
- Communication error

OBD-II DRIVE CYCLE PATTERN
- None.

TROUBLESHOOTING HINTS (THE MOST LIKELY CAUSES FOR THIS CODE TO BE SET ARE:)
- Radiator sensor failed.
- ECM 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 DOR radiator.

(1) Replace the DOR radiator.

⚠ 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.

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

Q:Is DTC P1580 set?

YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 2.

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.00-15.

STEP 2. Using scan tool MB991958, read the diagnostic trouble code (DTC).

(1) Turn the ignition switch to the "ON" position.
(2) Read the DTC.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q:Is DTC P1580 set?

YES: Repeat the troubleshooting.

NO: The procedure is complete.

DTC P1590: TCM to ECM Communication Error in Torque Reduction Request

M11310100419USA0000010000

TECHNICAL DESCRIPTIONS OF MONITOR METHODS

The ECM checks whether the errors in data communications sent by the TCM exist 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

Check Condition

- Ignition switch is "ON" position.

Judgment Criterion

- ECM detects an error in communication between ECM and TCM.

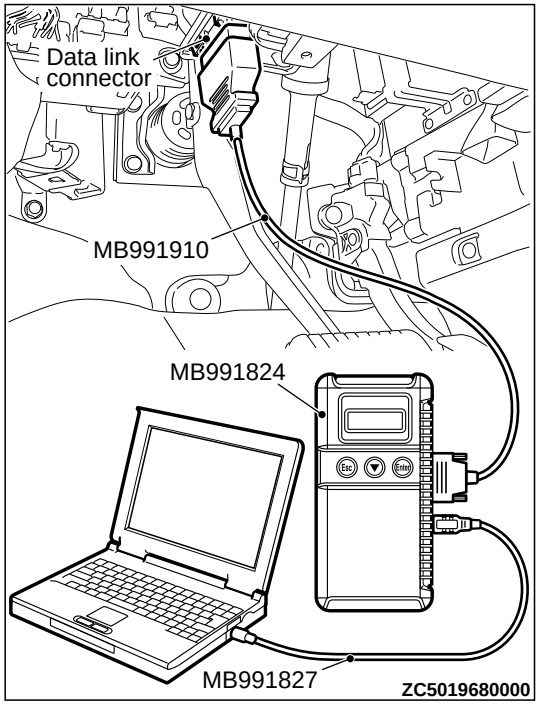
OBD-II DRIVE CYCLE PATTERN

None.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)
- CAN line harness damage or connector damage.
- ECM 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 54D, Can Bus Diagnostics Table P.54D-189.

STEP 2. Using scan tool MB991958, read the diagnostic trouble code (DTC).

(1) Turn the ignition switch to the "ON" position.
(2) Read the DTC.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q:Is DTC P1590 set?

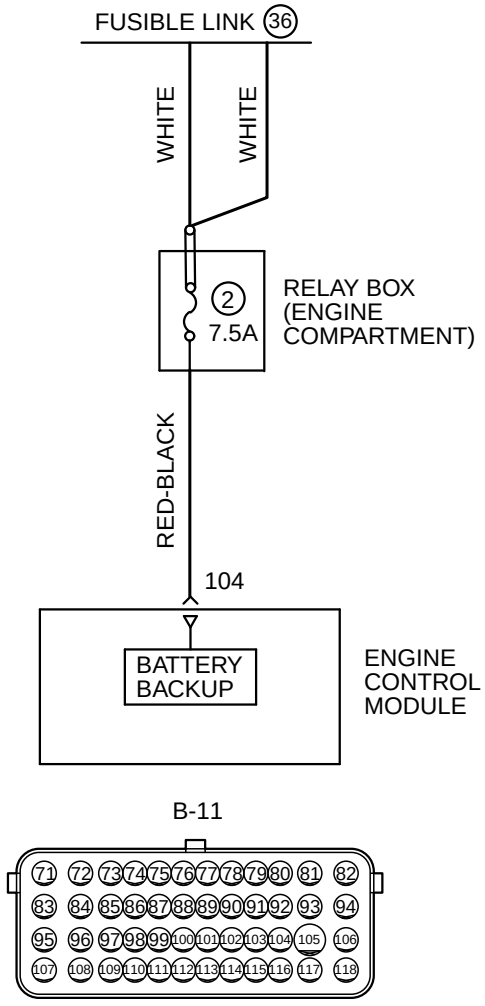
YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8.

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.00-15.

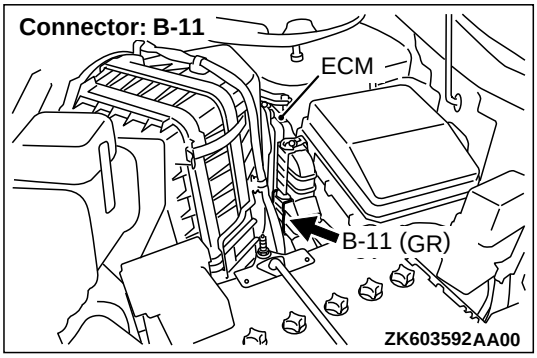
DTC P1603: Battery Backup Line Malfunction

M11310100258USA0000010000

BATTERY BACKUP CIRCUIT



ZK602860AA00



TECHNICAL DESCRIPTION

The ECM 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

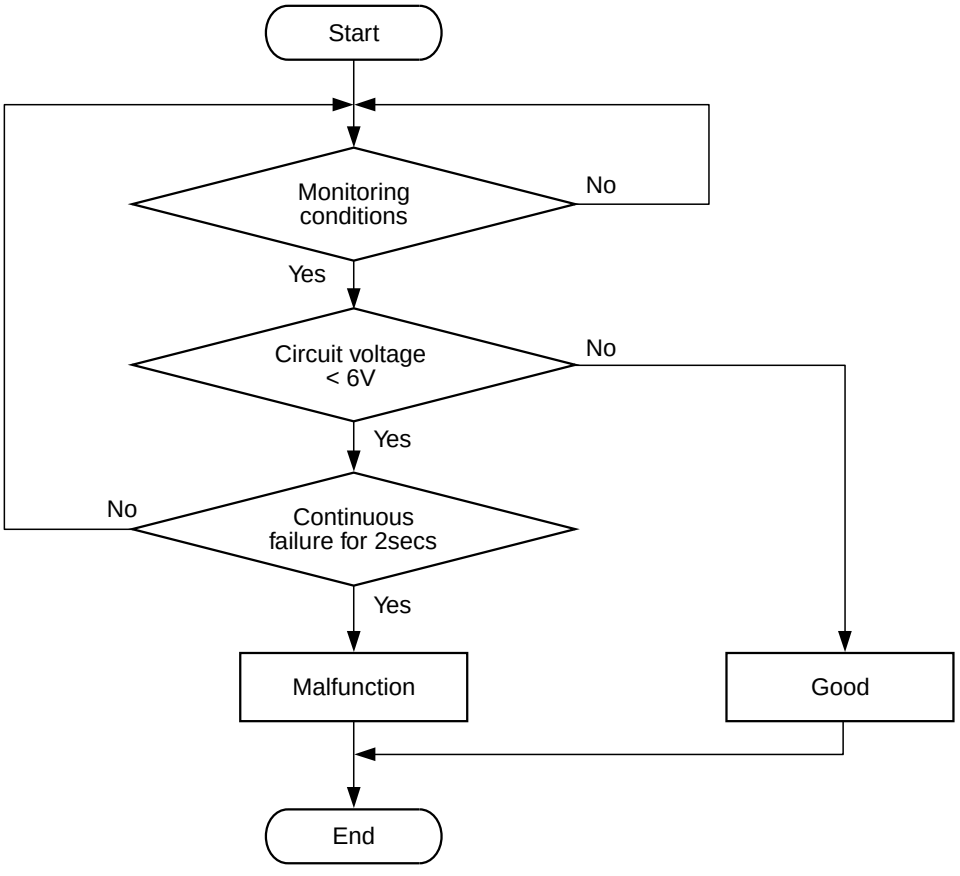
Battery backup line voltage is under specified value.

MONITOR EXECUTION

Continuous

DTC SET CONDITIONS

Logic Flow Chart



ZK603806AA00

Check Conditions

- Engine starting sequence was completed.
- Battery positive voltage is higher than 10 volts.

Judgement Criterion

- Battery backup line voltage has continued to be 6 volts or lower for 2 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

OBD-II DRIVE CYCLE PATTERN

None.

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

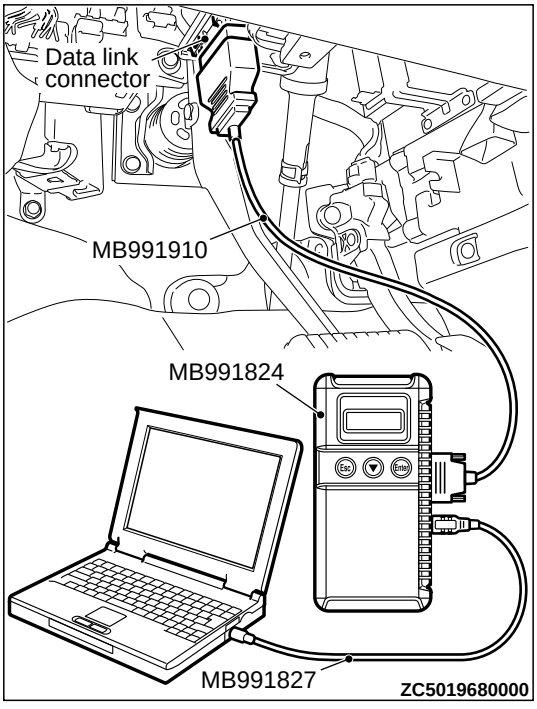
- Connector damage.

- Harness damage.
- ECM 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
- MB992110: Power Plant ECU Check Harness

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



⚠ CAUTION

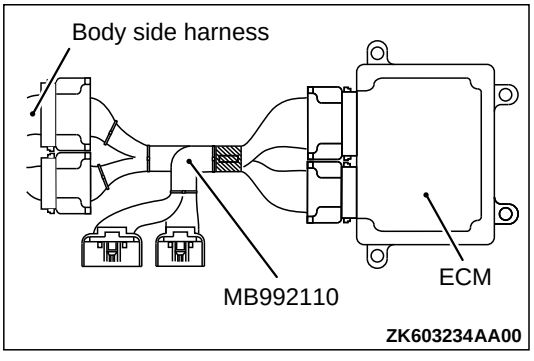
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

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

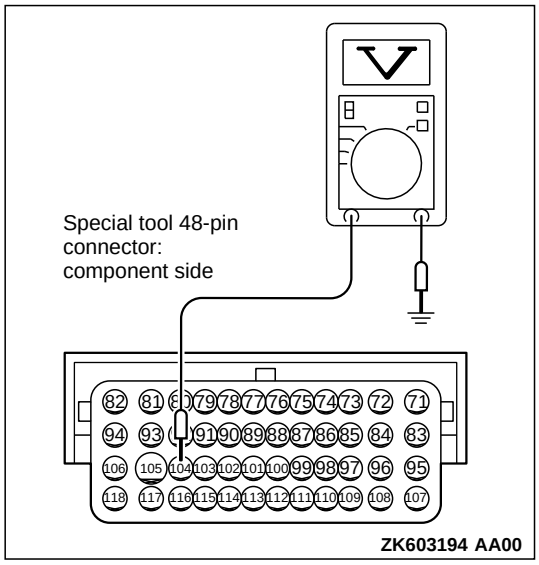
Q:Is DTC P1603 set?

YES: Go to Step 2.
NO: The inspection is complete.

STEP 2. Measure the backup power supply voltage at ECM connector B-11 by using power plant ECU check harness special tool MB992110.



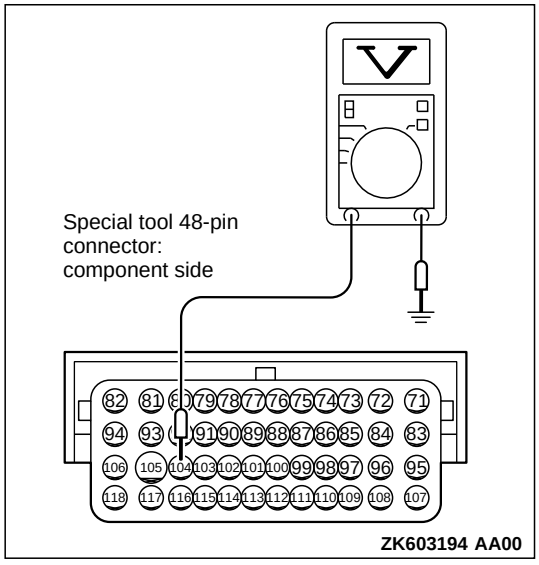
(1) Disconnect all ECM connectors. Connect the power plant ECU check harness special tool MB992110 between the separated connectors.



(2) Measure the voltage between terminal No. 104 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 ECM harness side connector B-11.



(1) Disconnect the ECM connector B-11 and measure at the harness side.
(2) Measure the voltage between terminal No. 104 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 ECM connector B-11 (terminal No. 104) because of open circuit or short circuit to ground. Then go to Step 6.

STEP 4. Check harness connector B-11 at ECM for damage.

Q:Is the harness connector in good condition?
YES: Repair harness wire between battery and ECM connector B-11 (terminal No. 104) 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-11 at ECM for damage.

Q:Is the harness connector in good condition?
YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. 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).
(1) Turn the ignition switch to the "ON" position.
(2) Read the DTC.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q:Is DTC P1603 set?
YES: Retry the troubleshooting.
NO: The inspection is complete.

DTC P1676: Variant Coding

M11310100395USA0000010000

TECHNICAL DESCRIPTION
- The ECM performs proper engine control based on vehicle information entered.
- A vehicle identification number (VIN) is entered at a plant before shipment. This diagnosis code occurs when no vehicle information is entered during ECM replacement.

MONITOR EXECUTION
Continuous

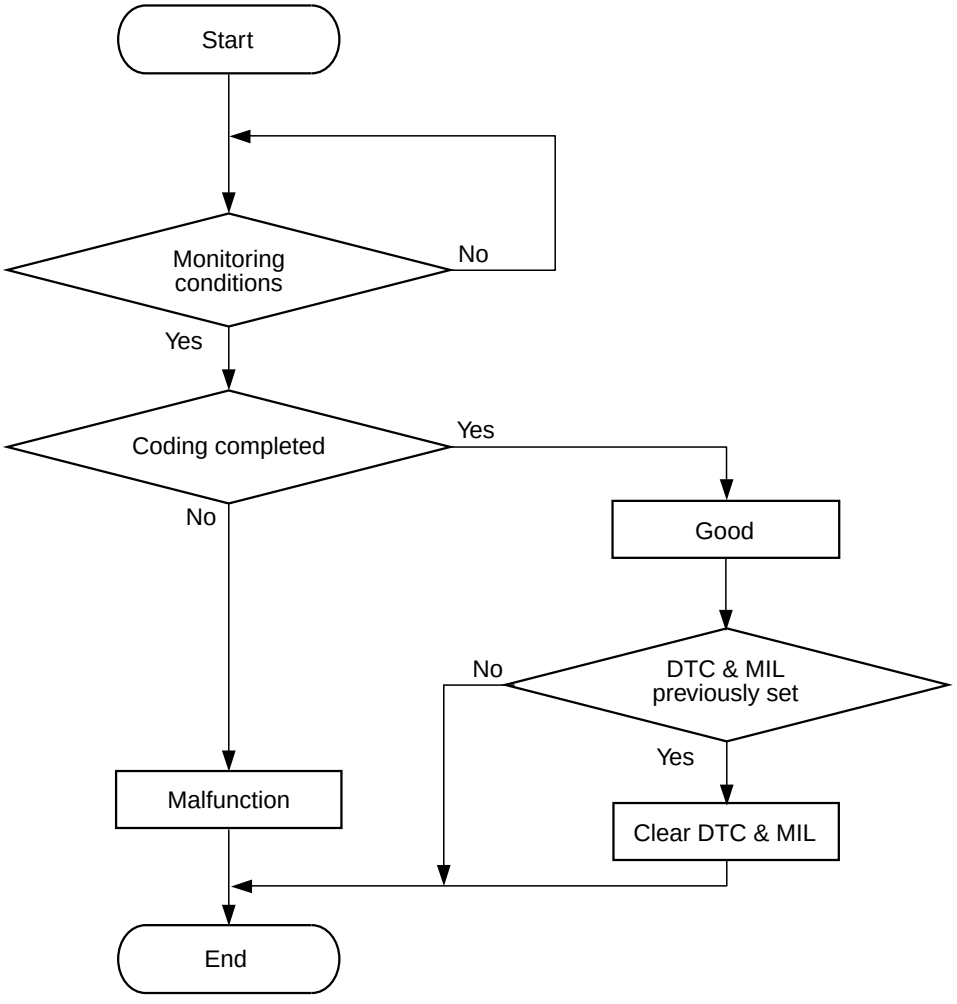
MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

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



ZK604068 AA00

Check Condition
- Ignition switch is "ON" position.

Judgment Criterion
- Vehicle information is not entered into the ECM.

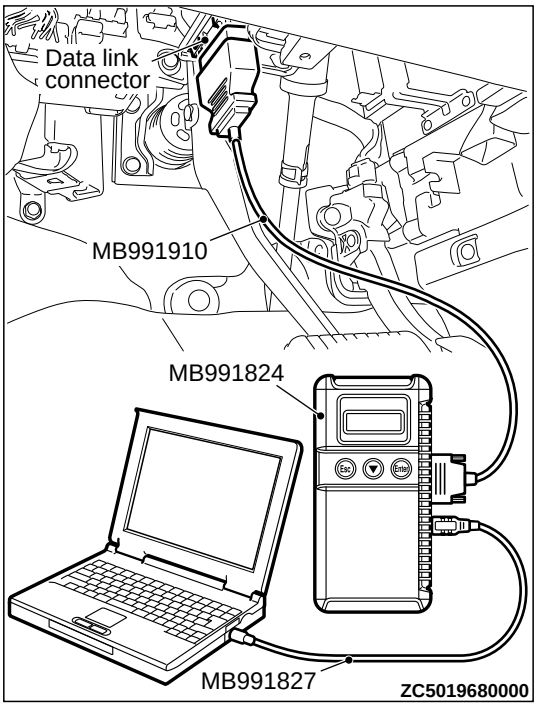
or
- The tester write area of EEP ROM is not normal.

OBD-II DRIVE CYCLE PATTERN
None.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)
- ECM 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 A/T-DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q:Is DTC P1676 set?

YES: Replace the ECM with one into which vehicle information is correctly entered.
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.00-15.

DTC P2066: Fuel Level Sensor (sub) Circuit Range/Performance

M11310100259USA0000010000

TECHNICAL DESCRIPTION

- The fuel level sensor convents the rest of the fuel to a voltage and sends it to the combination meter.
- The combination meter sends the data regarding the rest of the fuel to the ECM.
- The ECM checks whether this data is within a specified range.

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)

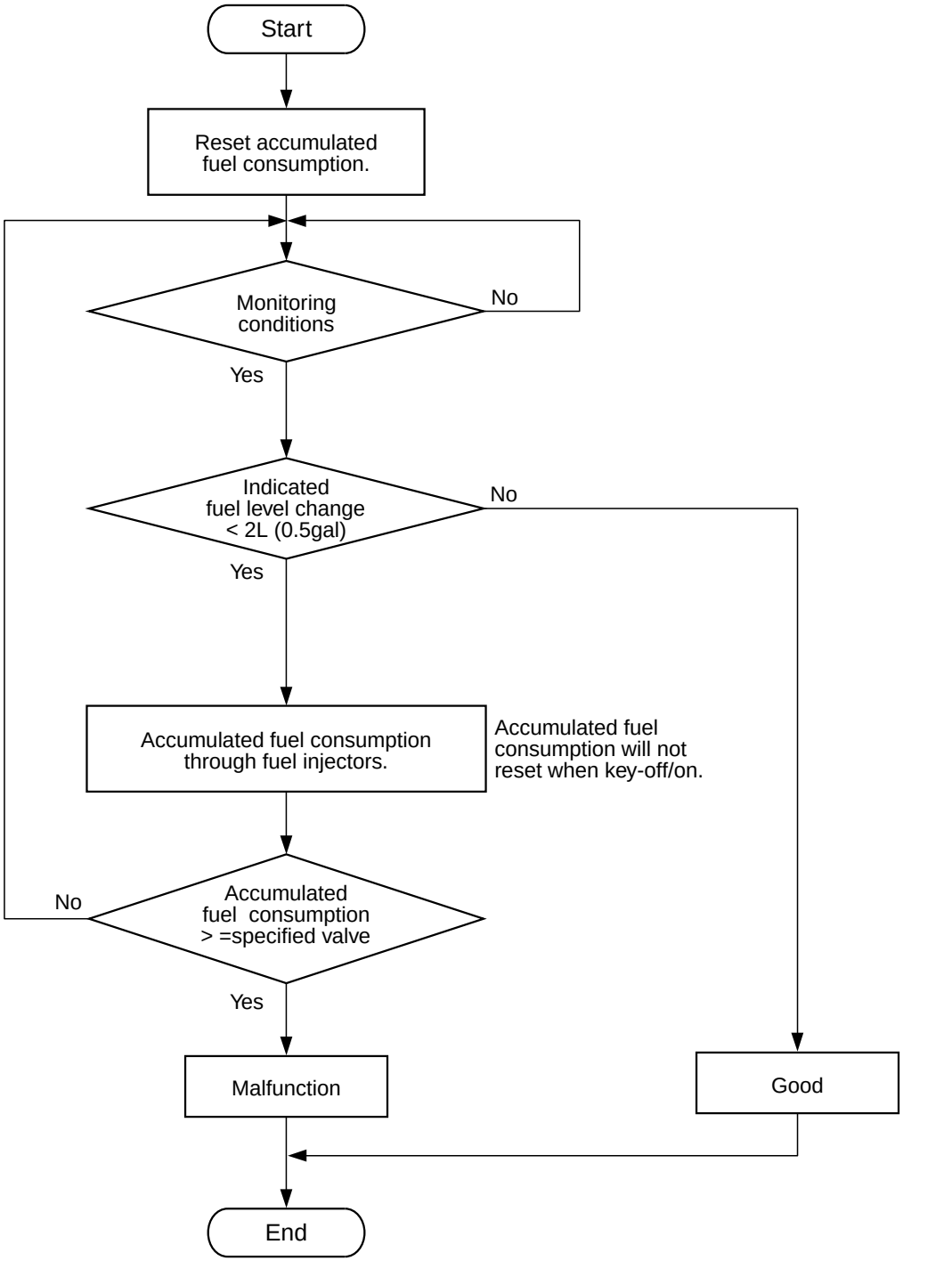
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



ZK600946AA00

Check Condition, Judgement Criterion

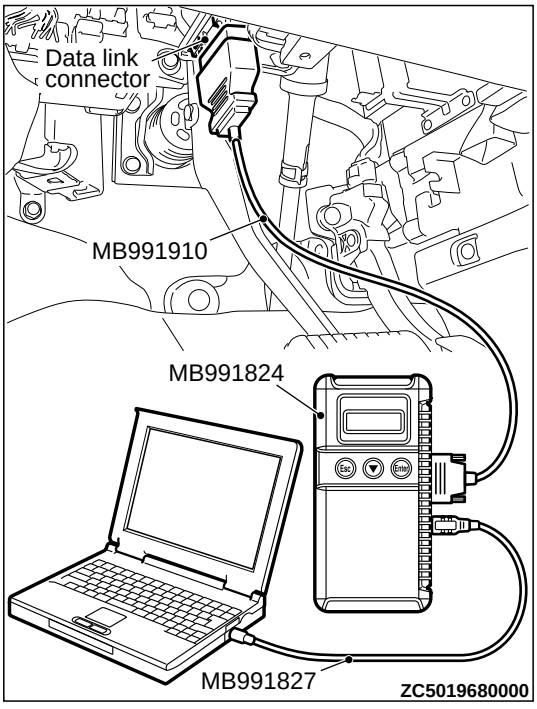
- When the fuel consumption calculated from the operation time of the injector amounts to 20 litters <FWD> or 30 litters <AWD> (7.8 gal), the diversity of the amount of fuel in tank calculated from the fuel level sensor is 2 litters (0.5 gal) or less.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)
- Fuel pump module or fuel level sensor (sub) failed.
- ECM 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 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 Meters Assembly - Symptom Chart P.54Ab-40.

STEP 3. Check the trouble symptoms.
Check that the fuel gauge operates correctly.

Q:Does the fuel gauge operates 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.00-15.
NO: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. 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.54Ab-67.

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 operates 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.00-15.
NO: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 6.

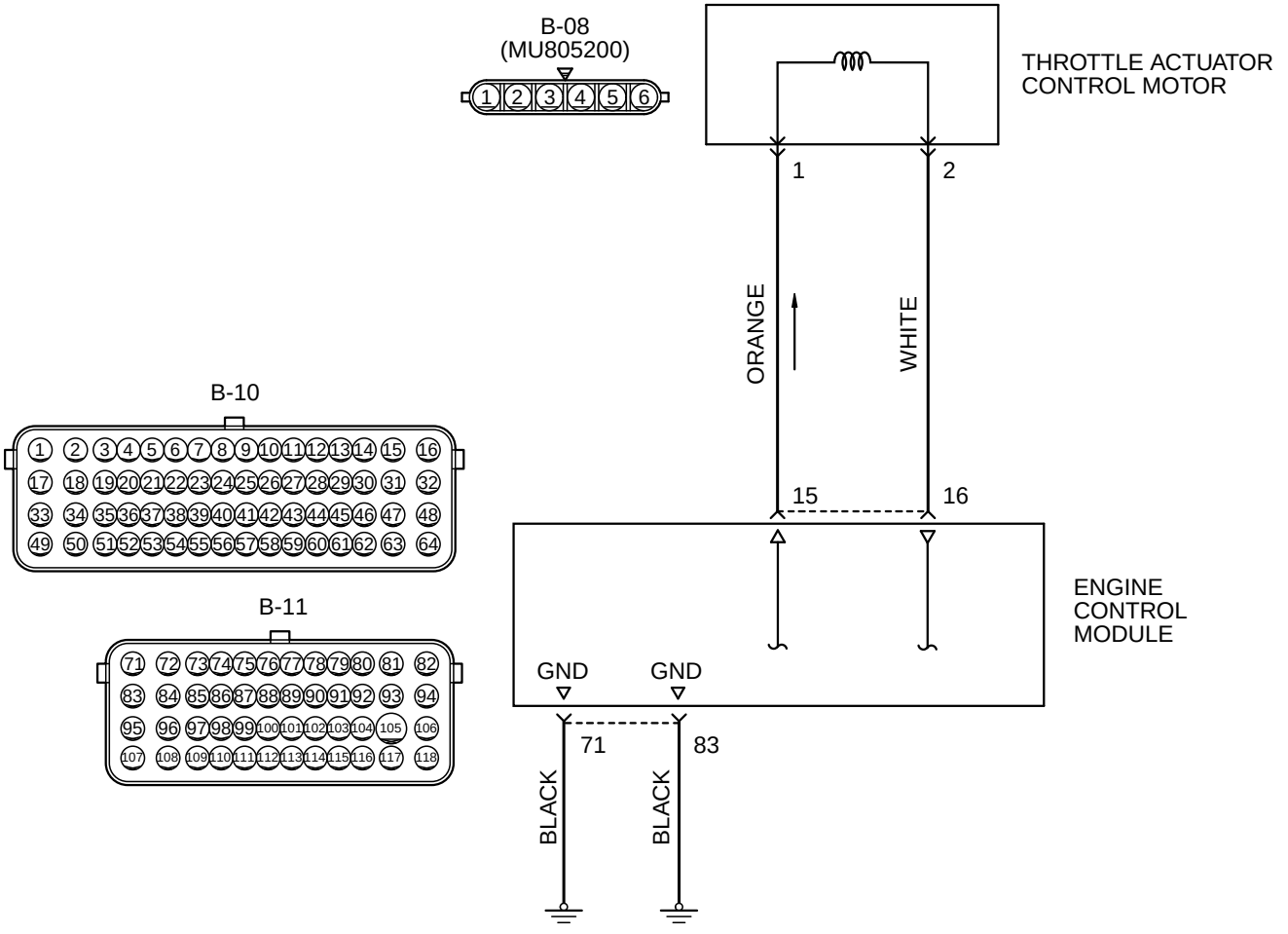
STEP 6. Check the trouble symptoms.
Check that the fuel gauge operates correctly.

Q:Does the fuel gauge operates correctly?
YES: The inspection is complete.
NO: Retry the troubleshooting.

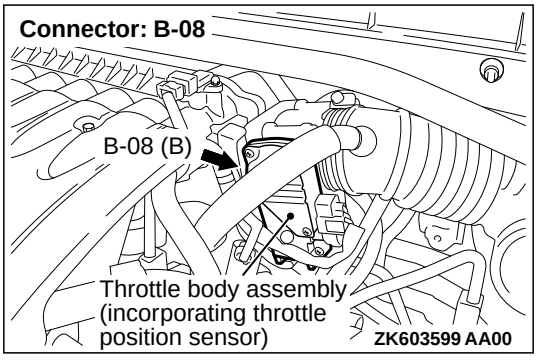
DTC P2100: Throttle Actuator Control Motor Circuit (Open)

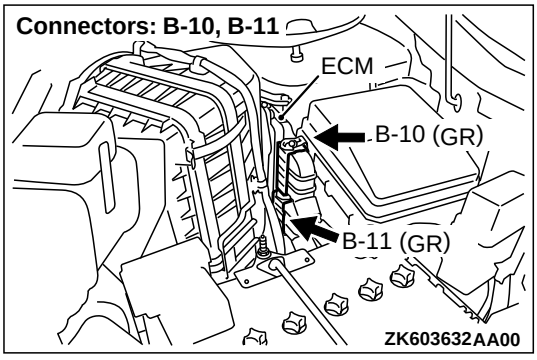
M11310100260USA0000010000

THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT



ZK602861 AA00





CIRCUIT OPERATION
- Controls the current that is applied from the ECM (terminals No. 15, No. 16) to the throttle actuator control motor (terminals No. 1, No. 2).

TECHNICAL DESCRIPTION
- ECM 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 Conditions
- 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.
- The drive duty of the throttle actuator control motor is 100% or less.

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 0.1 volt or more.
- The proposed output voltage minus the output voltage of the (sub) throttle position sensor becomes 0.1 volt or more.
- The drive duty of the throttle actuator control motor is 100% or less.

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 0.4 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 0.4 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.
- Connector damage.
- Harness damage.
- ECM failed.

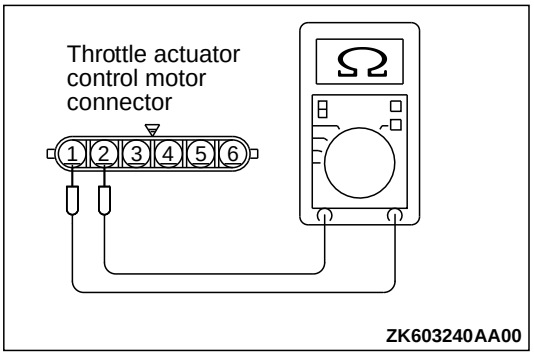
DIAGNOSIS

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-08 at throttle actuator control motor and harness connector B-10, B-11 at ECM 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.

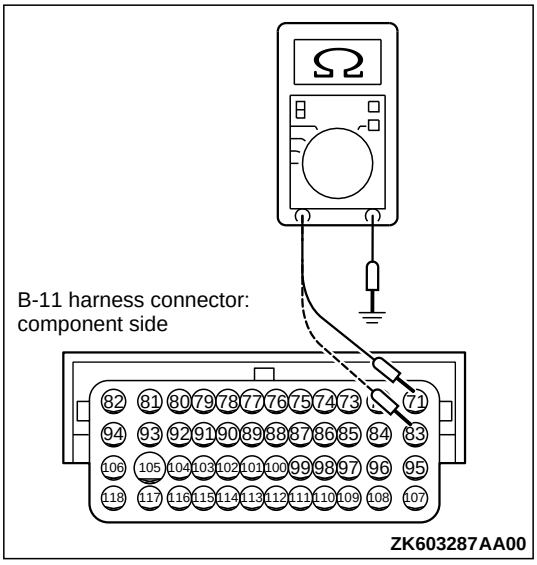
STEP 2. Check the throttle actuator control motor.



(1) Disconnect the connector B-08.
(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)]

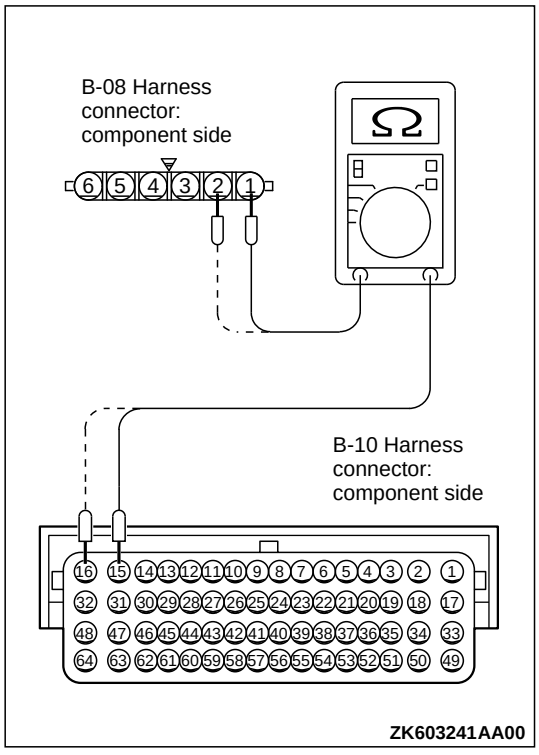
Q:Is the measured resistance between 0.3 and 80 ohms [at 20°C (68°F)]?
YES: Go to Step 3.
NO: Replace the throttle body assembly. Then go to Step 6.

STEP 3. Check the continuity at ECM harness side connector B-11.



(1) Disconnect the connector B-11 and measure at the harness side.
(2) Measure the continuity between terminals No. 71, No. 83 and ground.
▪Should be less than 2 ohms.

Q:Does continuity exist?
YES: Go to Step 4.
NO: Repair harness wire between ECM connector B-11 (terminals No. 71, No. 83) and ground because of open circuit or harness damage. Then go to Step 6.

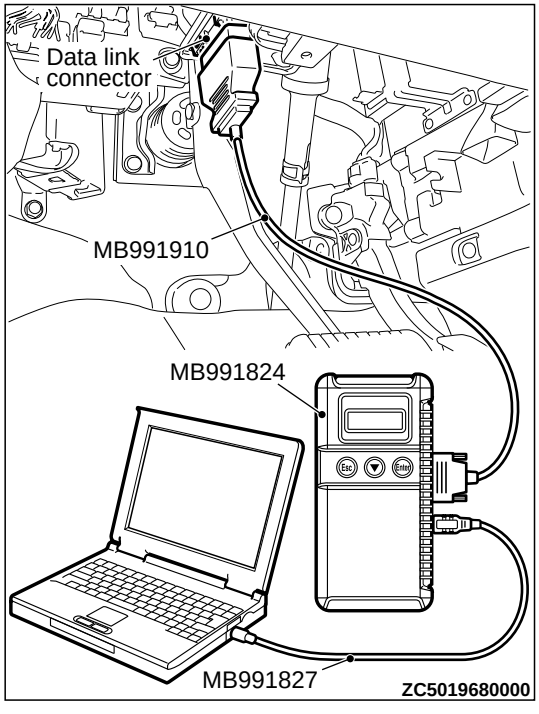


STEP 4. Check for harness damage between throttle actuator control motor connector B-08 and ECM connector B-10.

(1) Disconnect the connector B-08 and B-10 measure at the harness side.
(2) Measure the resistance between B-08 connector and B-10 connector.
  a Connector B-08 (terminal No. 1) and connector B-10 . terminal No. 15).
  b Connector B-08 (terminal No. 2) and connector B-10 . (terminal No. 16).
    ▪Should be less than 2 ohms.

Q:Is the measured resistance less than 2 ohms?

YES: Then go to Step 5.
NO: Repair it. Then go to Step 6.



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

Q:Is DTC P2100 set?

YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 6.
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.00-15.

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.

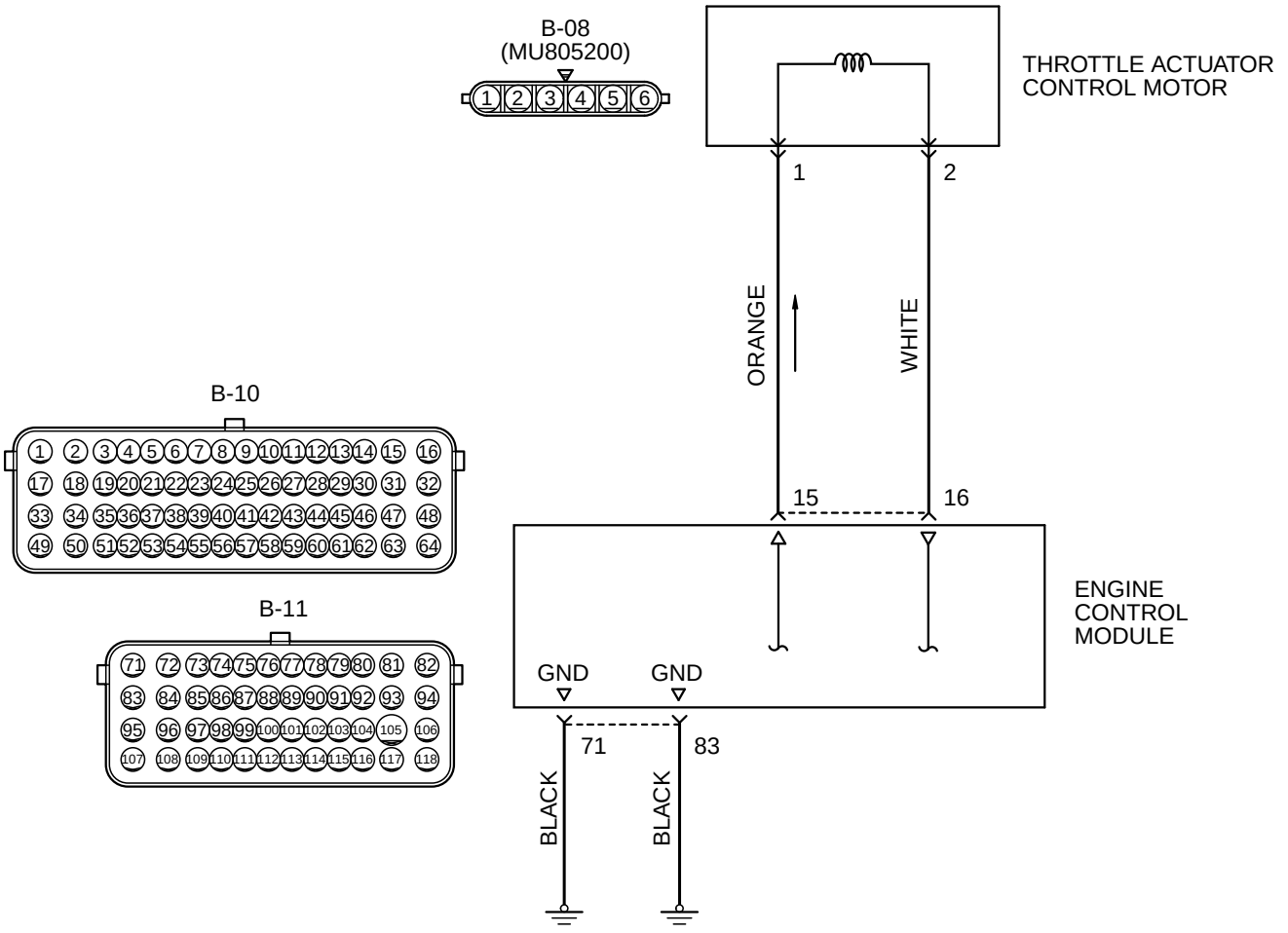
(3) After the DTC has been deleted, read the DTC again.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q:Is DTC P2100 set?
YES: Retry the troubleshooting.
NO: The inspection is complete.

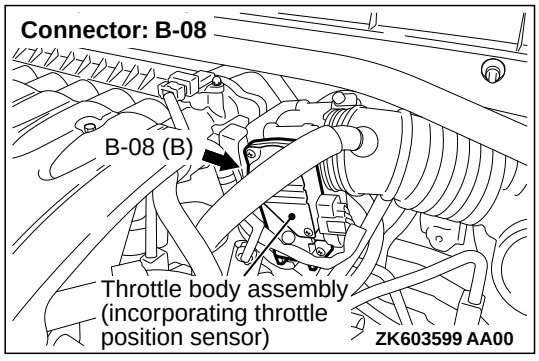
DTC P2101: Throttle Actuator Control Motor Magneto Malfunction

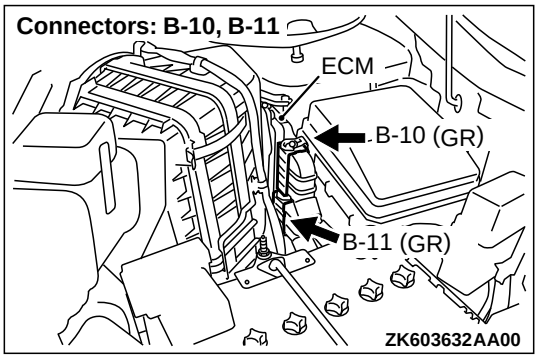
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THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT



ZK602861 AA00





CIRCUIT OPERATION
- Controls the current that is applied from the ECM (terminals No. 15, No. 16) to the throttle actuator control motor (terminals No. 1, No. 2).

TECHNICAL DESCRIPTION
- ECM 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 it self.

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 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.
- Connector damage.
- Harness damage.
- ECM failed.

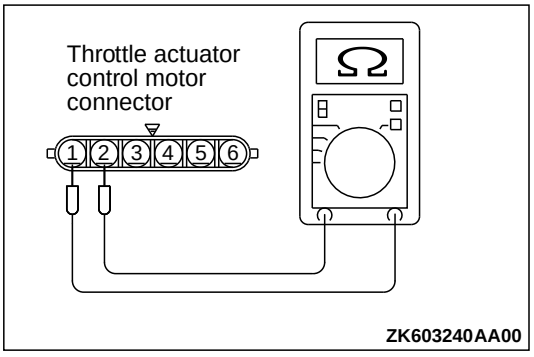
DIAGNOSIS

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-08 at throttle actuator control motor and harness connector B-10 at ECM 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.



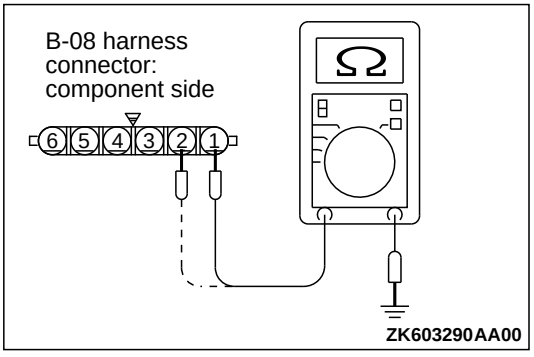
STEP 2. Check the throttle actuator control motor.

(1) Disconnect the connector B-08.
(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 5.



STEP 3. Check for short circuit to ground between throttle actuator control motor connector B-08 and ECM connector B-10.

(1) Disconnect the connector B-08 and B-10 measure at the harness side.
(2) Check for the continuity between B-08 connector and ground.
a Connector B-08 (terminal No. 1) and ground.
b Connector B-08 (terminal No. 2) and ground.
▪Not continuity.

Q:Is the harness wire in good condition?

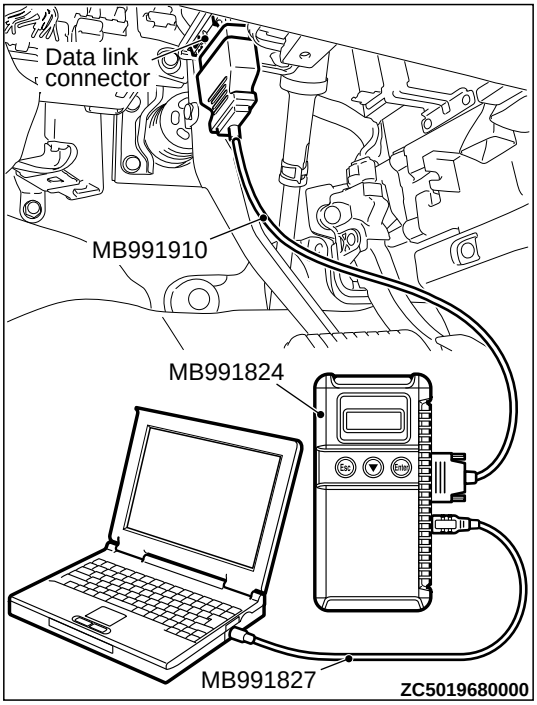
YES: Then go to Step 4.
NO: Repair it. Then go to Step 5.

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



Q:Is DTC P2101 set?

YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. 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.00-15.

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 DTC has been deleted, read the DTC again.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

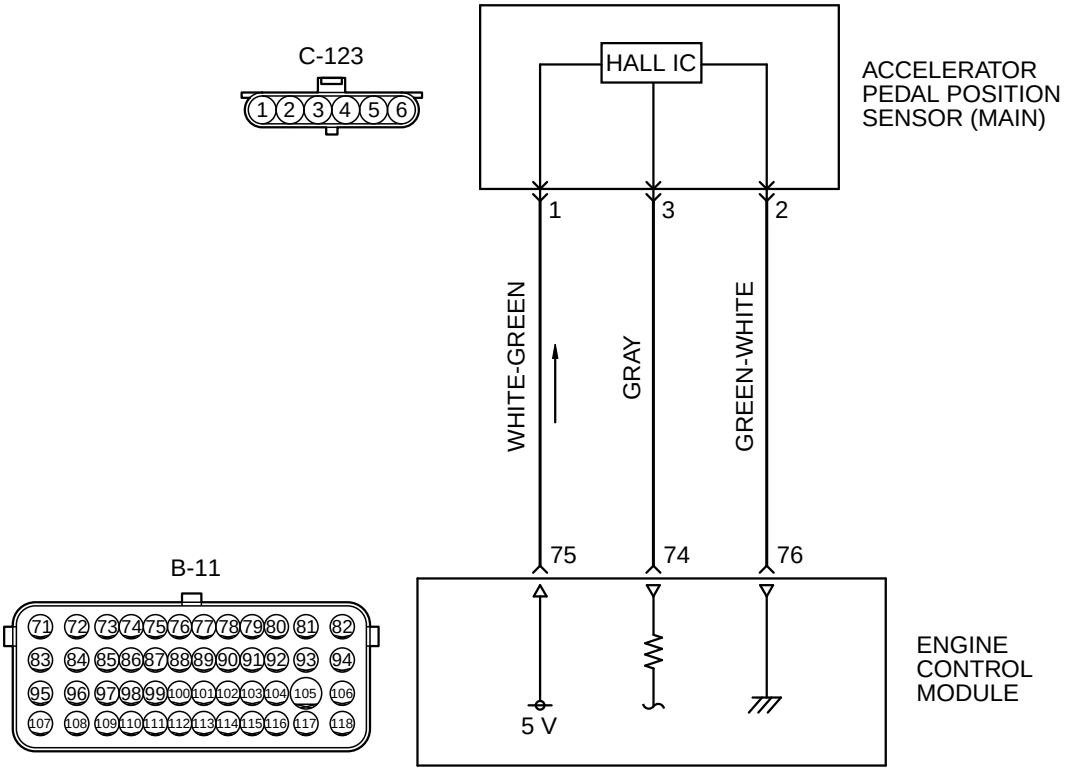
Q:Is DTC P2101 set?

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

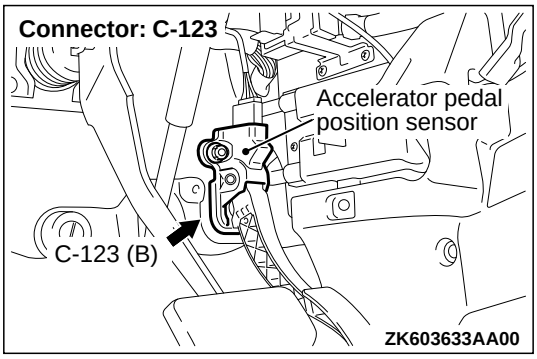
DTC P2122: Accelerator Pedal Position Sensor (main) Circuit Low Input

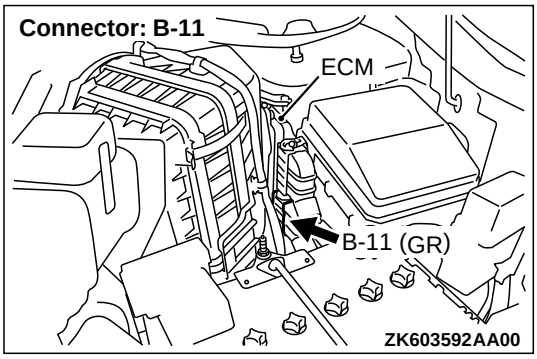
M11310100262USA0000010000

ACCELERATOR PEDAL POSITION SENSOR (MAIN) CIRCUIT



ZK602862 AA00





CIRCUIT OPERATION

- A 5-volt power supply is applied on the accelerator pedal position sensor (main) power terminal (terminal No. 1) from the ECM (terminal No. 75). The ground terminal (terminal No. 2) is grounded with ECM (terminal No. 76).

TECHNICAL DESCRIPTION

- The accelerator pedal position sensor (main) outputs voltage which corresponds to the accelerator pedal depression.
- The ECM 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.

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)

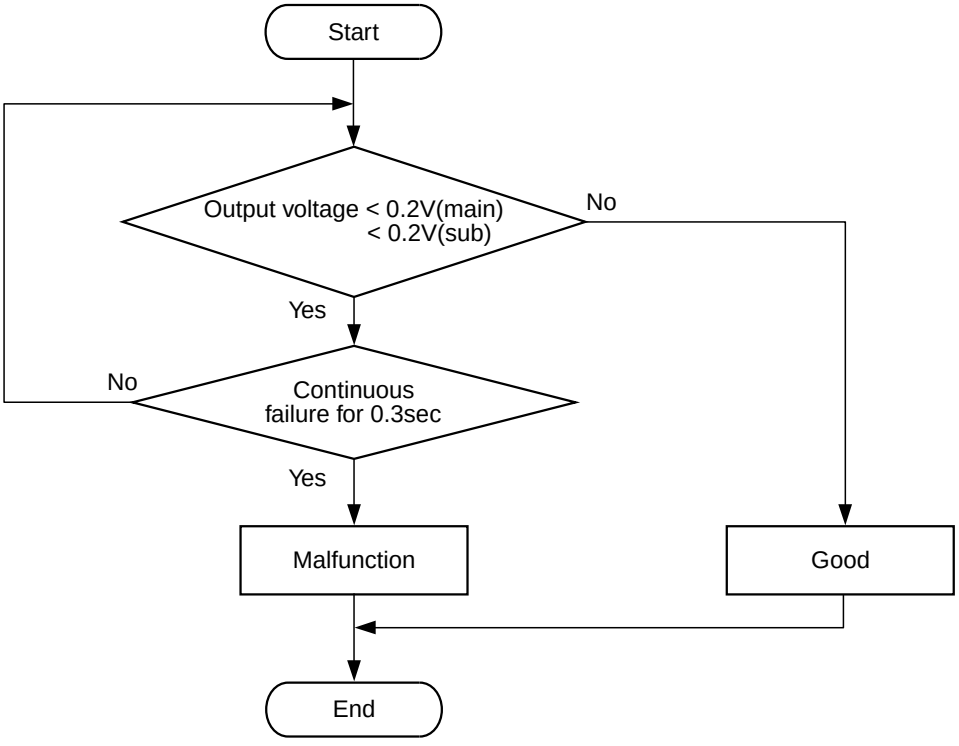
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



ZK603810AA00

Check Condition
- Ignition switch is "ON" position.

Judgement Criterion
- Accelerator pedal position sensor (main) output voltage is 0.2 volt or less for 0.3 second.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)
- Accelerator pedal position sensor failed.
- Connector damage.
- Harness damage.
- ECM failed.

OBD-II DRIVE CYCLE PATTERN

None.

DIAGNOSIS

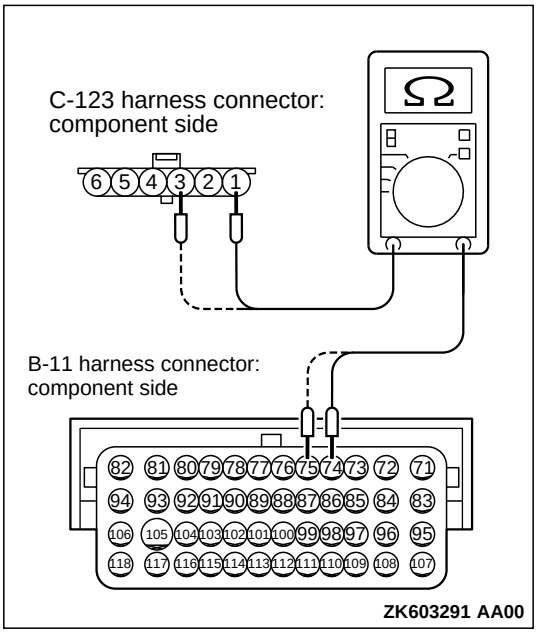
Required Special Tools:
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A

STEP 1. Check harness connector C-123 at accelerator pedal position sensor and harness connector B-11 at ECM for damage.

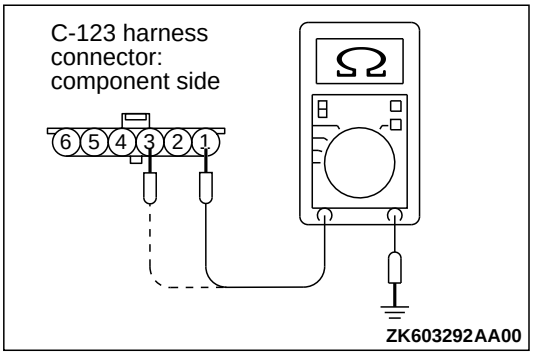
Q:Is the harness connector in good condition?

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

STEP 2. Check for open circuit or short circuit to ground or harness damage between accelerator pedal position sensor connector C-123 and ECM connector B-11.

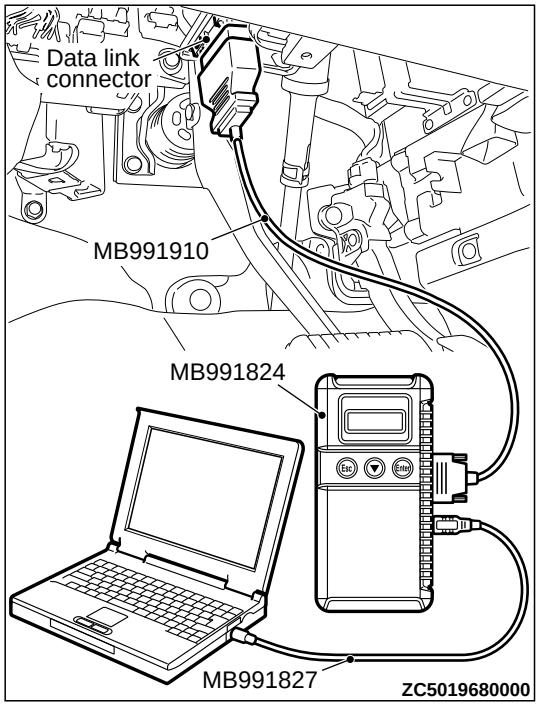


(1) Disconnect the connector C-123 and B-11 measure at the harness side.
(2) Measure the resistance between connector C-123 and connector B-11.
  a Connector C-123 (terminal No. 1) and connector B-11 . (terminal No. 75).
  b Connector C-123 (terminal No. 3) and connector B-11 . (terminal No. 74).
    ▪Should be less than 2 ohms.



(3) Check for the continuity between connector C-123 and ground.
  a Connector C-123 (terminal No. 1) and ground.
  .
  b Connector C-123 (terminal No. 3) and ground.
  .
    ▪Not continuity.

Q:Is the harness wire in good condition?
YES: Go to Step 3.
NO: Repair it. Then go to Step 4.



STEP 3. 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 0.9 and 1.1 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: Go to Step 4.

NO: Replace the accelerator pedal position sensor. Then go to Step 4.

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

Q:Is DTC P2122 set?

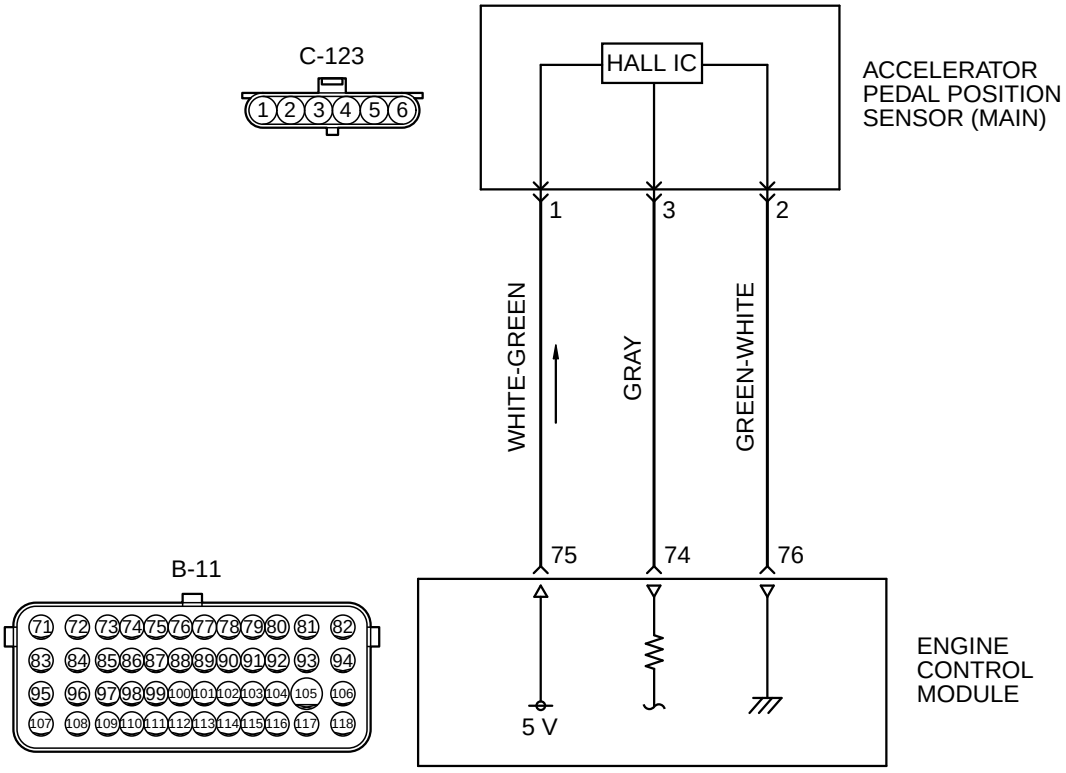
YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8.

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.00-15.

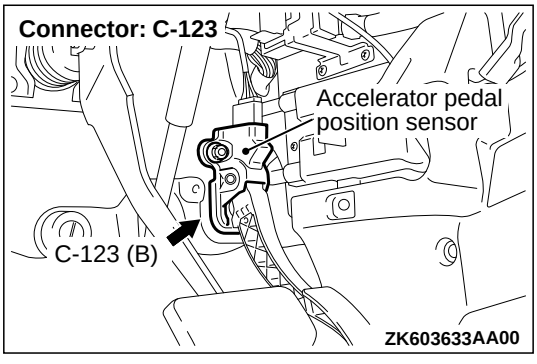
DTC P2123: Accelerator Pedal Position Sensor (main) Circuit High Input

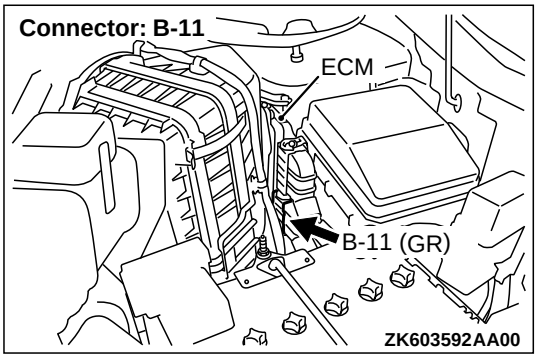
M11310100263USA0000010000

ACCELERATOR PEDAL POSITION SENSOR (MAIN) CIRCUIT



ZK602862AA00





CIRCUIT OPERATION

- A 5-volt power supply is applied on the accelerator pedal position sensor (main) power terminal (terminal No. 1) from the ECM (terminal No. 75). The ground terminal (terminal No. 2) is grounded with ECM (terminal No. 76).

TECHNICAL DESCRIPTION

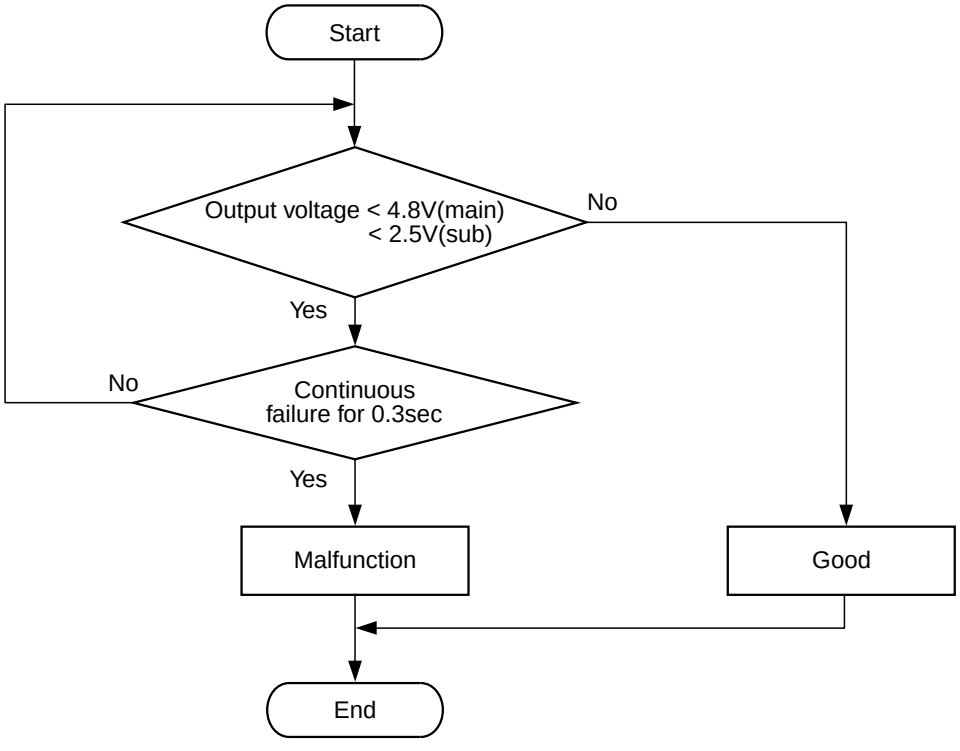
- The accelerator pedal position sensor (main) outputs voltage which corresponds to the accelerator pedal depression.
- The ECM checks whether the voltage is within a specified range.

DESCRIPTIONS OF MONITOR METHODS

Accelerator pedal position sensor (main) output voltage is out of specified range.

DTC SET CONDITIONS

Logic Flow Chart



ZK603812AA00

Check Condition

- Ignition switch is "ON" position.

Judgement Criterion

- Accelerator pedal position sensor (main) output voltage should be 4.8 volts or higher for 0.3 second.

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

OBD-II DRIVE CYCLE PATTERN

None.

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

- Accelerator pedal position sensor failed.
- Connector damage.
- Harness damage.
- ECM 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 C-123 at accelerator pedal position sensor and harness connector B-11 at ECM for damage.

Q:Is the harness connector in good condition?

YES: Go to Step 2.

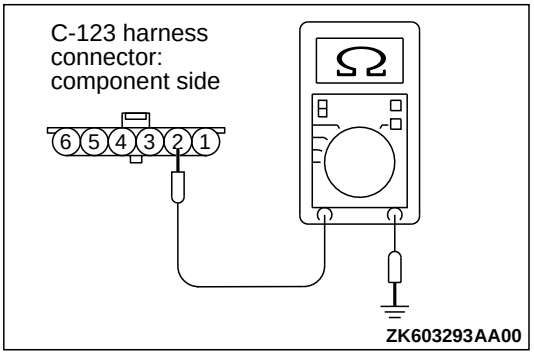
NO: Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 4.

STEP 2. Check the continuity at accelerator pedal position sensor harness side connector C-123.

(1) Disconnect the connector C-123 and measure at the harness side.

(2) Measure the continuity between terminal No. 2 and ground.

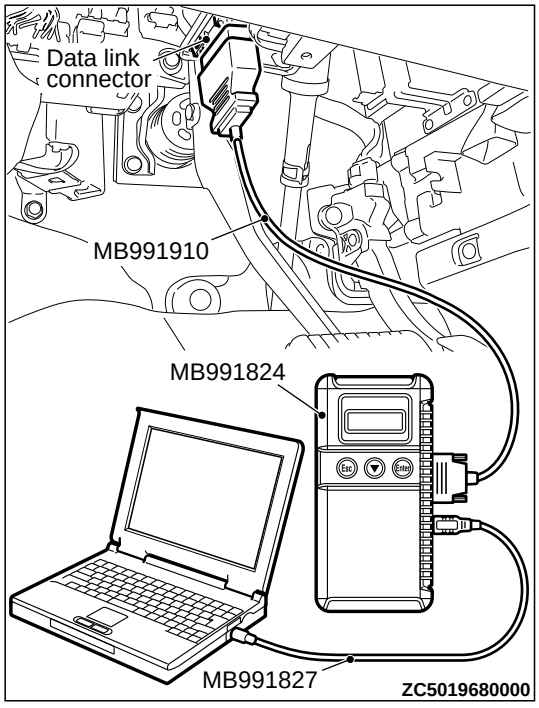
- Should be less than 2 ohms.



Q:Does continuity exist?

YES: Go to Step 3.

NO: Repair it. Then go to Step 4.



STEP 3. 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 0.9 and 1.1 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: Go to Step 4.

NO: Replace the accelerator pedal position sensor. Then go to Step 4.

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

Q:Is DTC P2123 set?

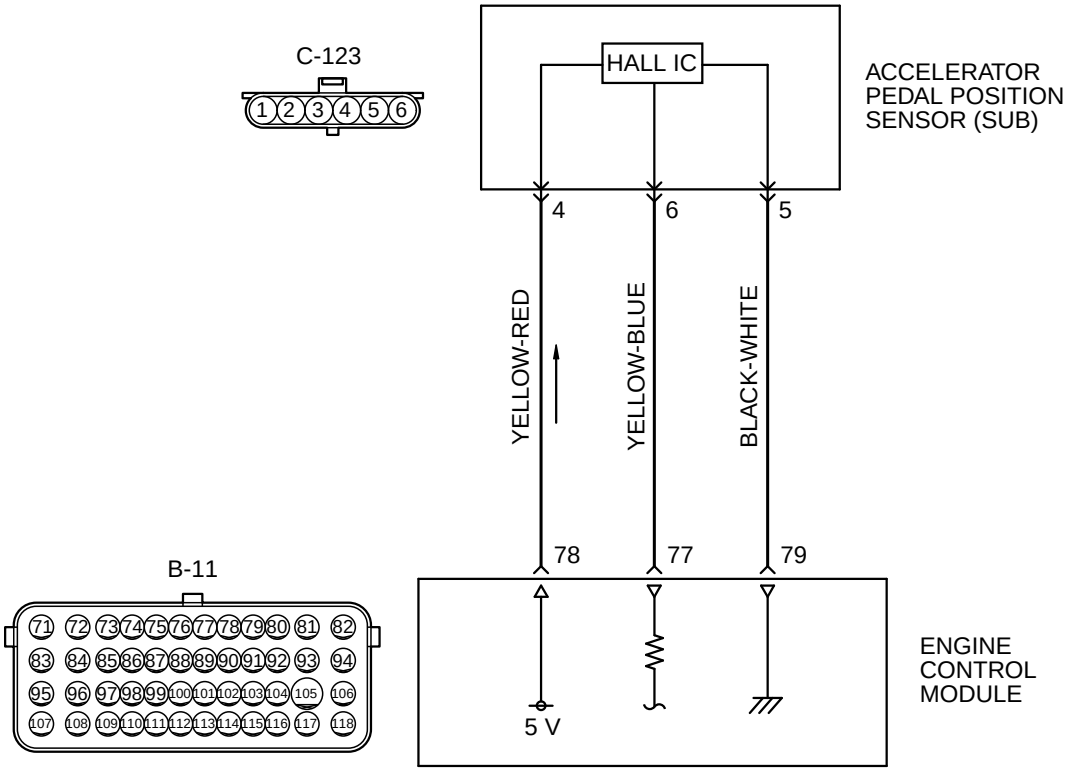
YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8.

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.00-15.

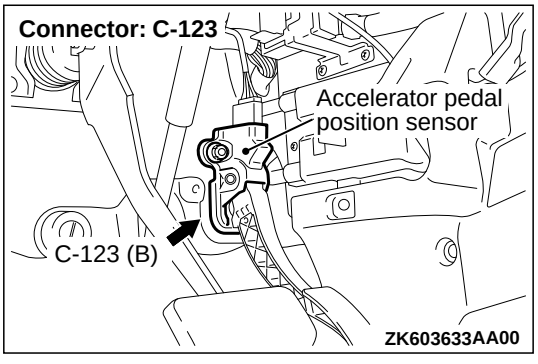
DTC P2127: Accelerator Pedal Position Sensor (sub) Circuit Low Input

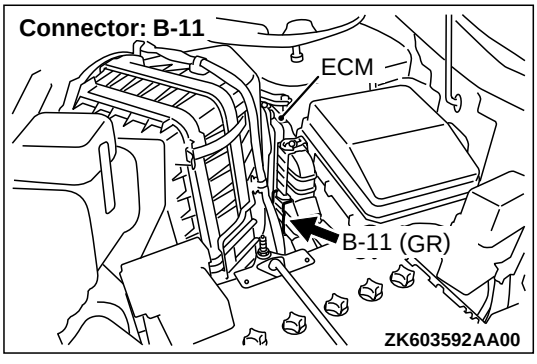
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ACCELERATOR PEDAL POSITION SENSOR (SUB) CIRCUIT



ZK602863 AA00





CIRCUIT OPERATION

- A 5-volt power supply is applied on the accelerator pedal position sensor (sub) power terminal (terminal No. 4) from the ECM (terminal No. 78).
  The ground terminal (terminal No. 5) is grounded with ECM (terminal No. 79).

TECHNICAL DESCRIPTION

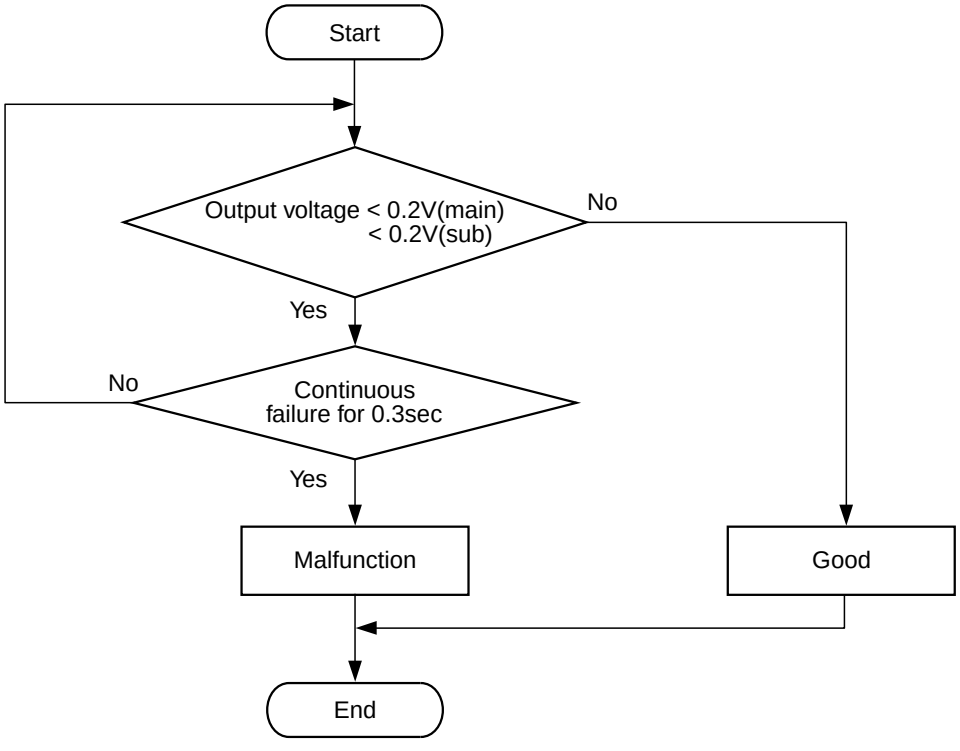
- The accelerator pedal position sensor (sub) outputs voltage which corresponds to the accelerator pedal depression.
- The ECM checks whether the voltage is within a specified range.

DESCRIPTIONS OF MONITOR METHODS

Accelerator pedal position sensor (sub) output voltage is out of specified range.

DTC SET CONDITIONS

Logic Flow Chart



ZK603810AA00

Check Condition

- Ignition switch is "ON" position.

Judgement Criterion

- Accelerator pedal position sensor (sub) output voltage is 0.2 volt or less for 0.3 second.

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

OBD-II DRIVE CYCLE PATTERN

None.

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

- Accelerator pedal position sensor failed.
- Connector damage.
- Harness damage.
- ECM 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 C-123 at accelerator pedal position sensor and harness connector B-11 at ECM 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 4.

STEP 2. Check for open circuit or short circuit to ground or harness damage between accelerator pedal position sensor connector C-123 and ECM connector B-11.

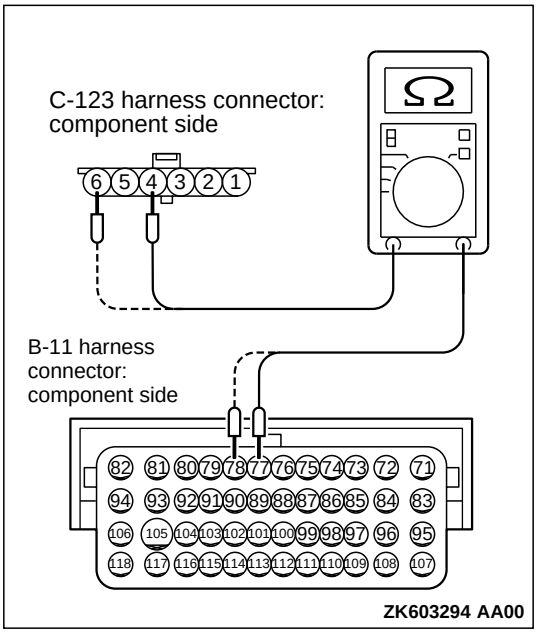
(1) Disconnect the connector C-123 and B-11 measure at the harness side.

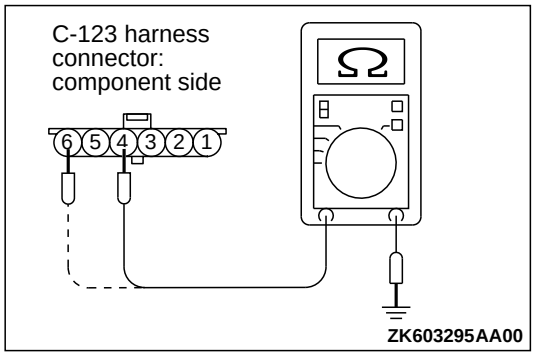
(2) Measure the resistance between connector C-123 and connector B-11.

a. Connector C-123 (terminal No. 4) and connector B-11 (terminal No. 78).

b. Connector C-123 (terminal No. 6) and connector B-11 (terminal No. 77).

- Should be less than 2 ohms.





(3) Check for the continuity between connector C-123 and ground.
a Connector C-123 (terminal No. 4) and ground.
.
b Connector C-123 (terminal No. 6) and ground.
.
▪Not continuity.

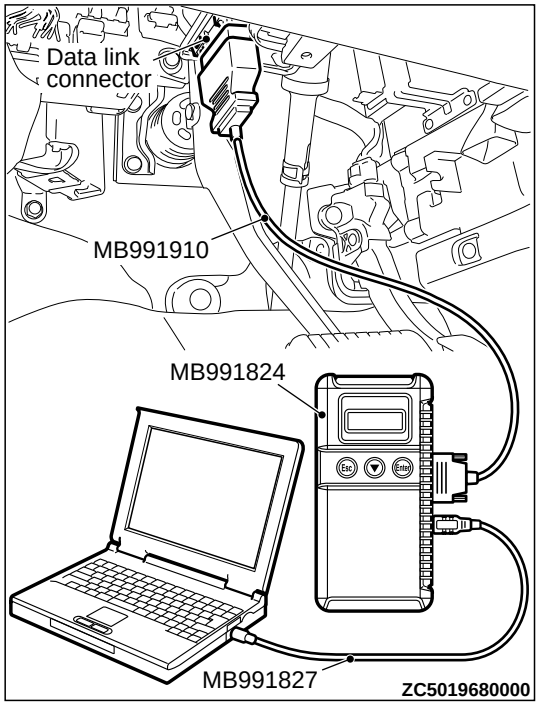
Q:Is the harness wire in good condition?
YES: Go to Step 3.
NO: Repair it. Then go to Step 4.

STEP 3. 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 0.4 and 0.6 volts when foot is released from accelerator pedal.
▪Output voltage is 2.0 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: Go to Step 4.
NO: Replace the accelerator pedal position sensor. Then go to Step 4.

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

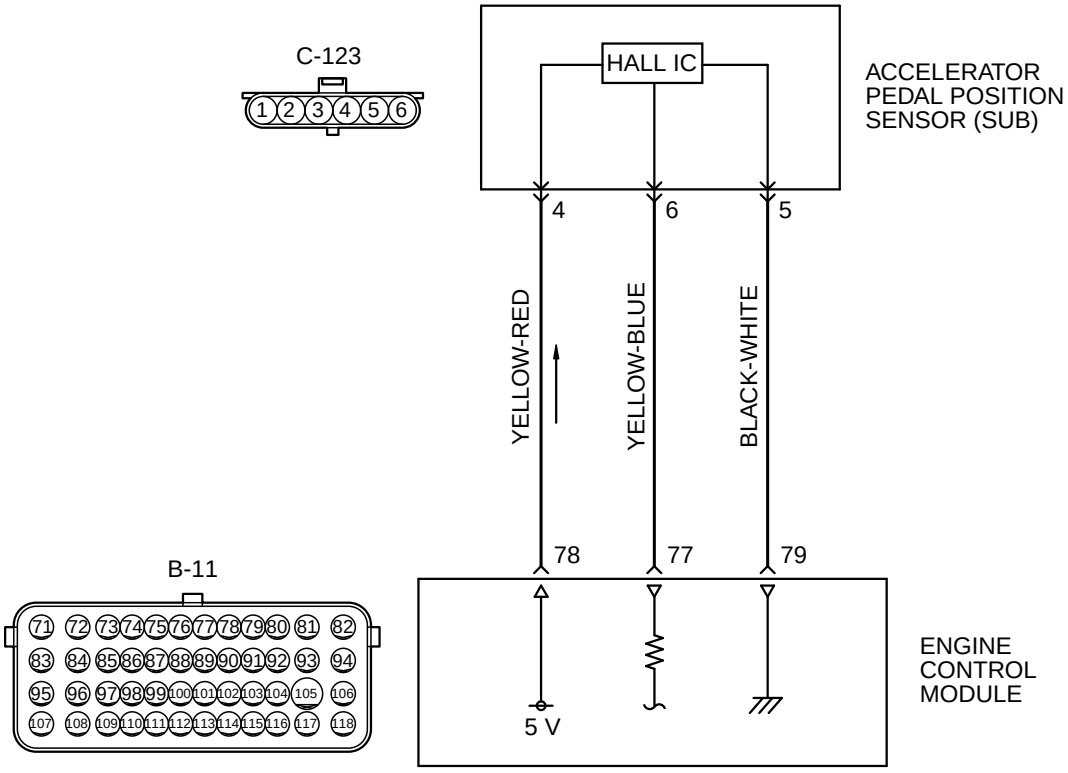
(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the DTC again.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q:Is DTC P2127 set?
YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-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.00-15.

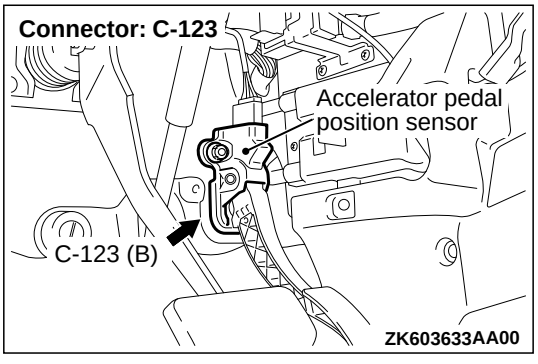
DTC P2128: Accelerator Pedal Position Sensor (Sub) Circuit High Input

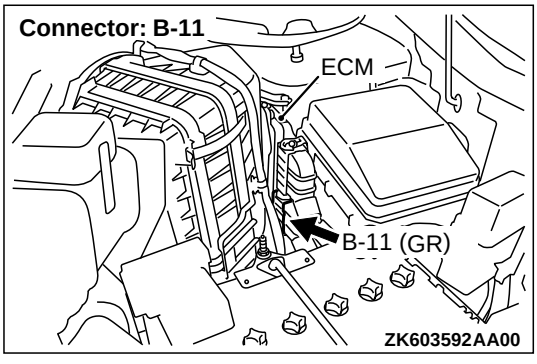
M11310100265USA0000010000

ACCELERATOR PEDAL POSITION SENSOR (SUB) CIRCUIT



ZK602863 AA00





CIRCUIT OPERATION

- A 5-volt power supply is applied on the accelerator pedal position sensor (sub) power terminal (terminal No. 4) from the ECM (terminal No. 78).
  The ground terminal (terminal No. 5) is grounded with ECM (terminal No. 79).

TECHNICAL DESCRIPTION

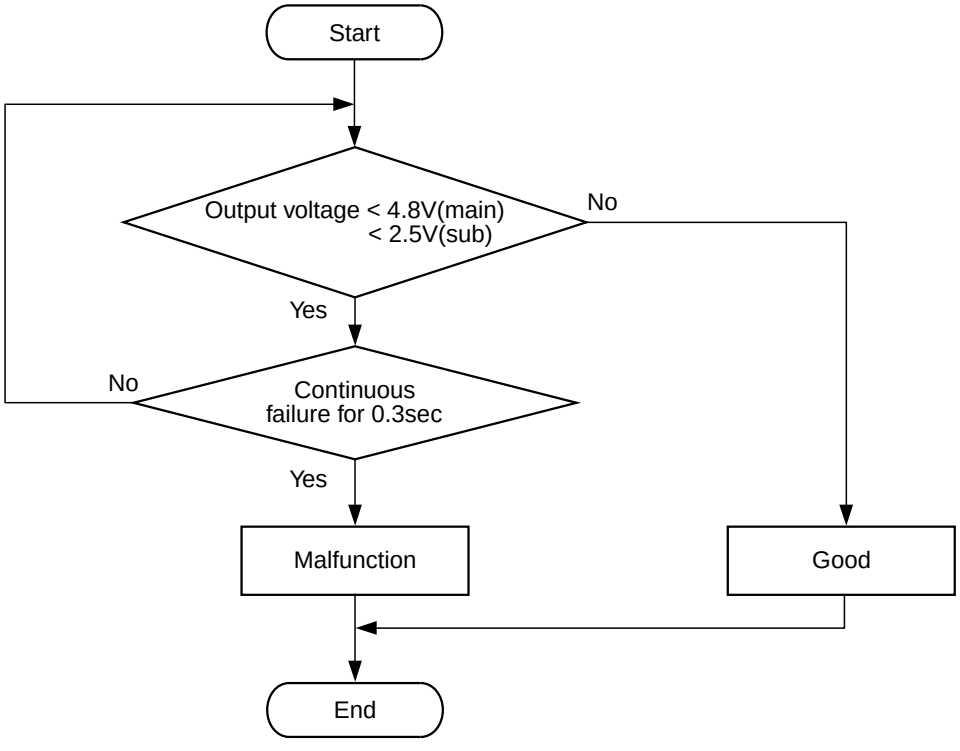
- The accelerator pedal position sensor (sub) outputs voltage which corresponds to the accelerator pedal depression.
- The ECM checks whether the voltage is within a specified range.

DESCRIPTIONS OF MONITOR METHODS

Accelerator pedal position sensor (sub) output voltage is out of specified range.

DTC SET CONDITIONS

Logic Flow Chart



ZK603812AA00

Check Condition

- Ignition switch is "ON" position.

Judgement Criterion

- Accelerator pedal position sensor (sub) output voltage is 2.5 volts or higher for 0.3 second.

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

OBD-II DRIVE CYCLE PATTERN

None.

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

- Accelerator pedal position sensor failed.
- Connector damage.
- Harness damage.
- ECM 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 C-123 at accelerator pedal position sensor and harness connector B-11 at ECM for damage.

Q:Is the harness connector in good condition?

YES: Go to Step 2.

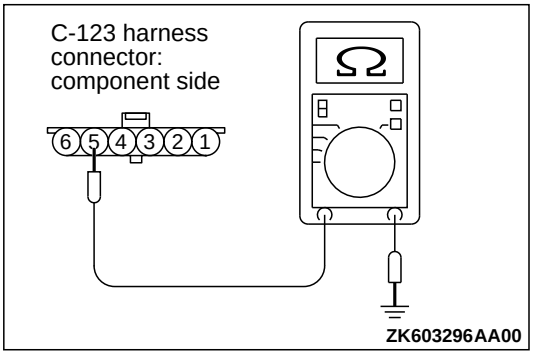
NO: Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 4.

STEP 2. Check the continuity at accelerator pedal position sensor harness side connector C-123.

(1) Disconnect the connector C-123 and measure at the harness side.

(2) Measure the continuity between terminal No. 5 and ground.

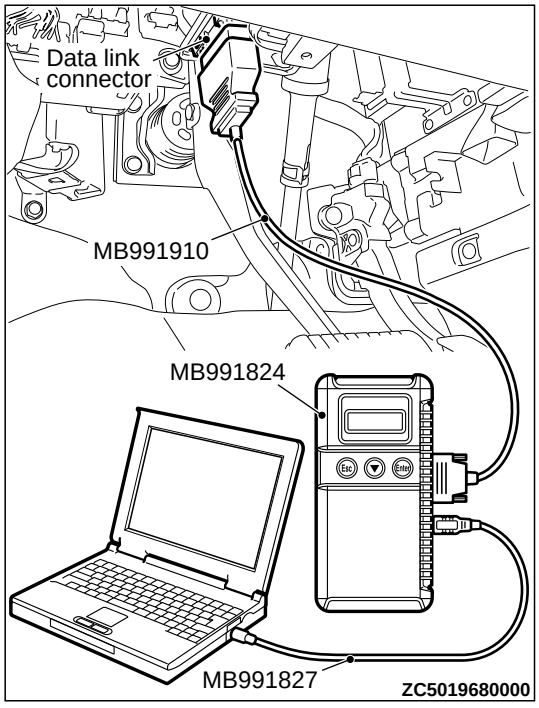
- Should be less than 2 ohms.



Q:Does continuity exist?

YES: Go to Step 3.

NO: Repair it. Then go to Step 4.



STEP 3. 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 0.4 and 0.6 volts when foot is released from accelerator pedal.
- Output voltage is 2.0 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: Go to Step 4.

NO: Replace the accelerator pedal position sensor. Then go to Step 4.

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

Q:Is DTC P2128 set?

YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-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.00-15.

DTC P2135: Throttle Position Sensor (Main and Sub) Range/Performance Problem

M11310100266USA0000010000

THROTTLE POSITION SENSOR (MAIN AND SUB) RANGE/PERFORMANCE PROBLEM CIRCUIT

- Refer to DTC P0122 - Throttle Position Sensor (Main) Circuit P.13Ab-174.
- Refer to DTC P0222 - Throttle Position Sensor (Sub) Circuit P.13Ab-181.

CIRCUIT OPERATION

- Refer to DTC P0122 - Throttle Position Sensor (Main) Circuit P.13Ab-174.
- Refer to DTC P0222 - Throttle Position Sensor (Sub) Circuit P.13Ab-181.

TECHNICAL DESCRIPTION

- ECM 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 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)

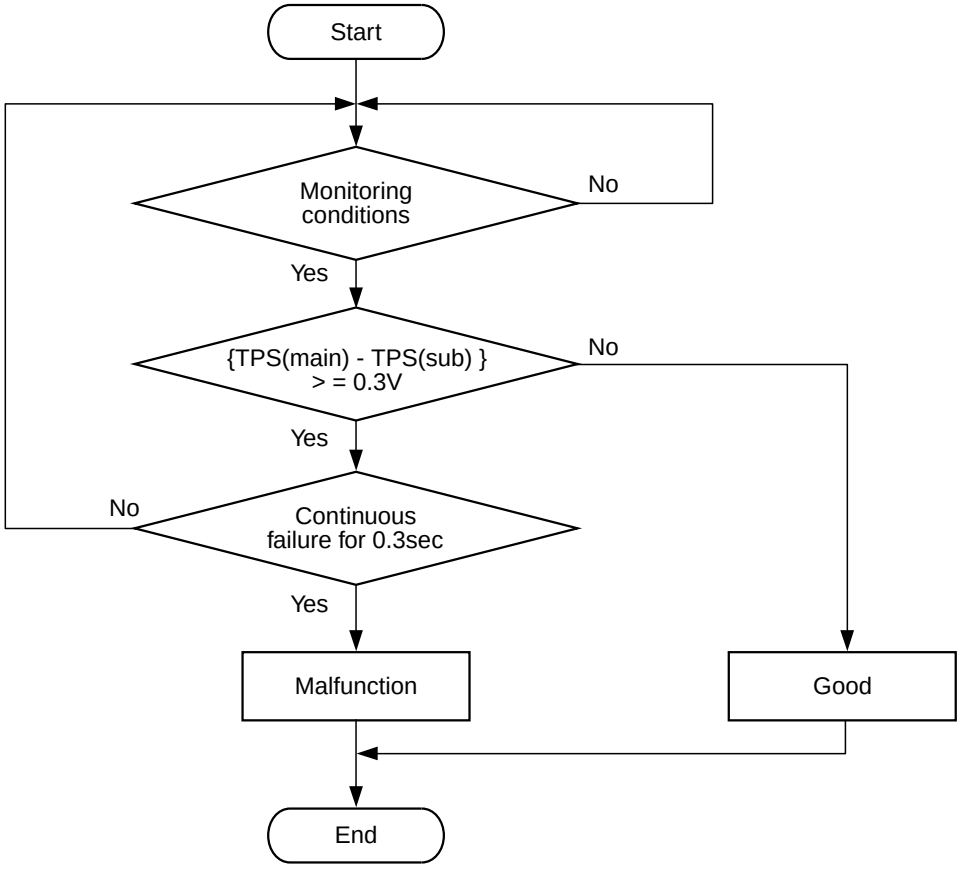
- Mass airflow sensor

MONITOR EXECUTION

Continuous

DTC SET CONDITIONS <Range/Performance problem -relation between main and sub>

Logic Flow Chart



ZK6003817AA00

Check Conditions

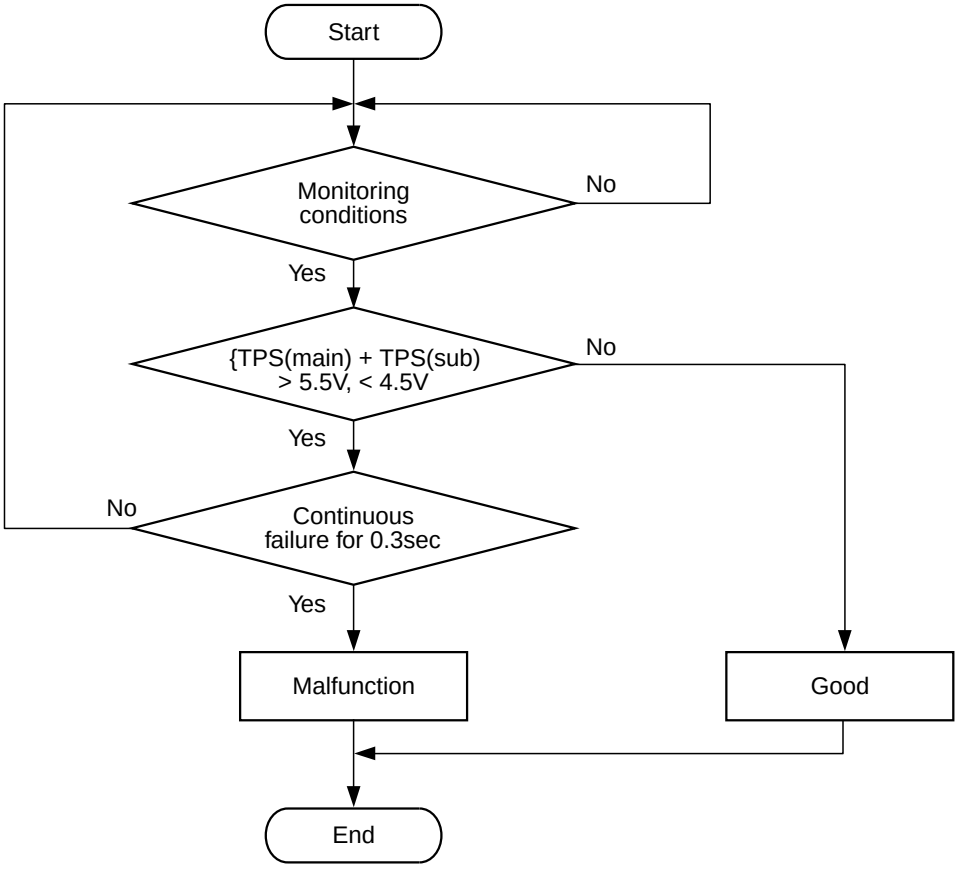
- Throttle position sensor (main) output voltage is between 0.2 and 4.8 volts.
- Throttle position sensor (sub) output voltage is between 0.2 and 4.8 volts.

Judgement Criterion

- For 0.4 second, the sum of the output voltage of the (main and sub) throttle position sensors is 4.5V or less, or 5.5V or more.

DTC SET CONDITIONS <Range/Performance problem -relation between main and sub>

Logic Flow Chart



ZK6003818AA00

Check Conditions

- The target opening degree of the throttle valve is 0.9V or less.
- Throttle position sensor (main) output voltage is between 0.2 and 4.8 volts.
- Throttle position sensor (sub) output voltage is between 0.2 and 4.8 volts.
- Battery positive voltage is higher than 8.3 volts.

Judgement Criterion

- Voltage obtained with the formula given below is 0.3 volt or higher for 0.3 second: throttle position sensor (main) output voltage - throttle position sensor (sub) output voltage]

OBD-II DRIVE CYCLE PATTERN

None.

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

- Throttle position sensor failed.
- Connector damage.
- Harness damage.
- ECM 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-08 at throttle position sensor and harness connector B-10 at ECM 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 4.

STEP 2. Check for harness damage between throttle position sensor connector B-08 and ECM connector B-10.

(1) Disconnect the connector B-08 and B-10 measure at the harness side.

(2) Measure the resistance between connector B-08 and connector B-10.

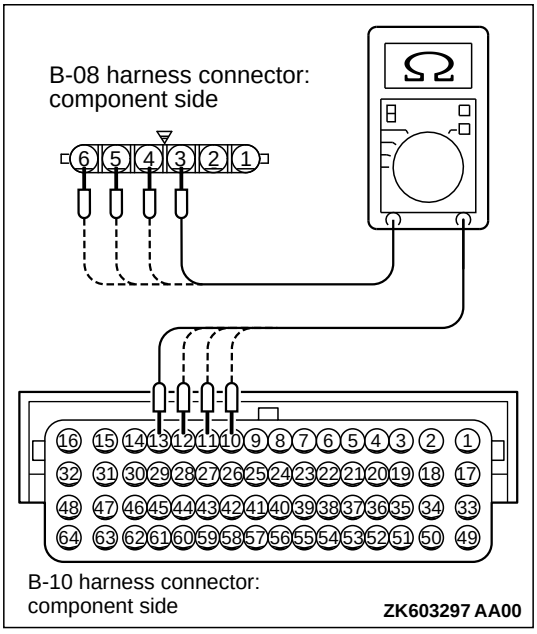
a Connector B-08 (terminal No. 3) and connector B-10 (terminal No. 13).

b Connector B-08 (terminal No. 4) and connector B-10 (terminal No. 10).

c Connector B-08 (terminal No. 5) and connector B-10 (terminal No. 12).

d Connector B-08 (terminal No. 6) and connector B-10 (terminal No. 11).

- Should be less than 2 ohms.



Q:Is the measured resistance less than 2 ohms?

YES: Go to Step 3.

NO: Repair it. Then go to Step 4.

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.

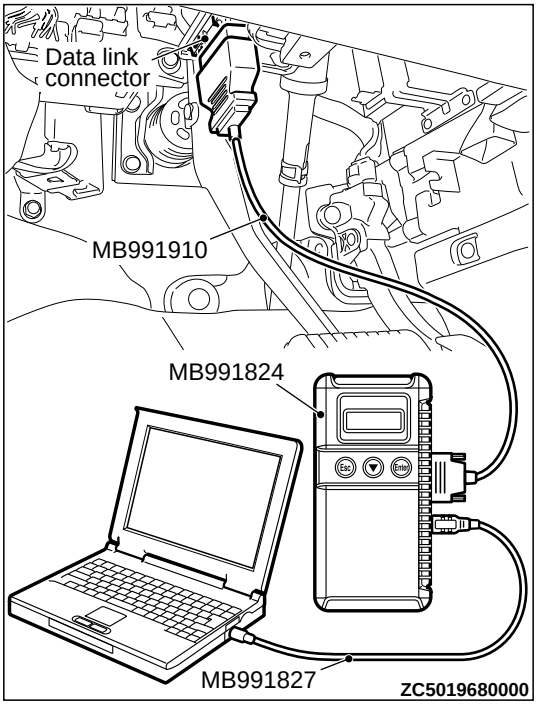
(2) Turn the ignition switch to the "ON" position.

(3) Check the following items in the data list. Refer to Data List Reference Table P.13Ab-837.

a Item 13: Throttle Position Sensor (main).

b Item 15: Throttle Position Sensor (sub).

(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 go to Step 4.

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 again.
(3) Depress the accelerator pedal fully for a few seconds.
(4) Turn the ignition switch to the "LOCK" (OFF) position.
(5) Check the DTC.

Q:Is DTC P2135 set?
YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-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.00-15.

DTC P2138: Accelerator Pedal Position Sensor (main and sub) Circuit Range/ Performance Problem

M11310100267USA0000010000

ACCELERATOR PEDAL POSITION SENSOR (MAIN AND SUB) RANGE/PERFORMANCE CIRCUIT

- Refer to DTC P2122 - Accelerator Pedal Position Sensor (Main) Circuit P.13Ab-697.
- Refer to DTC P2127 - Accelerator Pedal Position Sensor (Sub) Circuit P.13Ab-706.

CIRCUIT OPERATION

- Refer to DTC P2122 - Accelerator Pedal Position Sensor (Main) Circuit P.13Ab-697.
- Refer to DTC P2127 - Accelerator Pedal Position Sensor (Sub) Circuit P.13Ab-706.

TECHNICAL DESCRIPTION

- ECM 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)

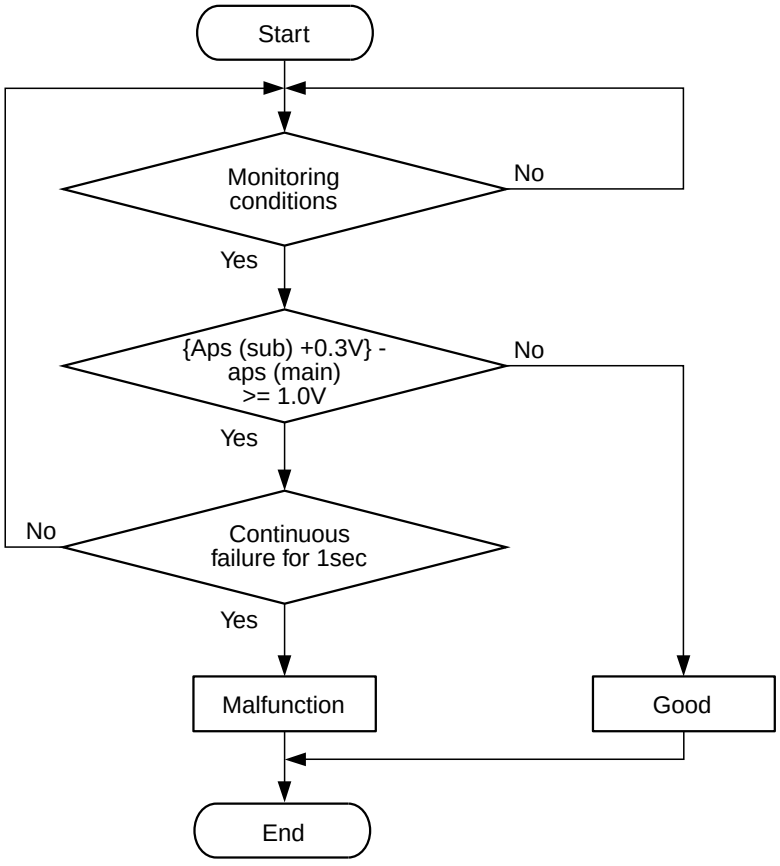
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS Range/Performance problem -relation between main and sub

Logic Flow Chart



ZK603819 AA00

Check Conditions

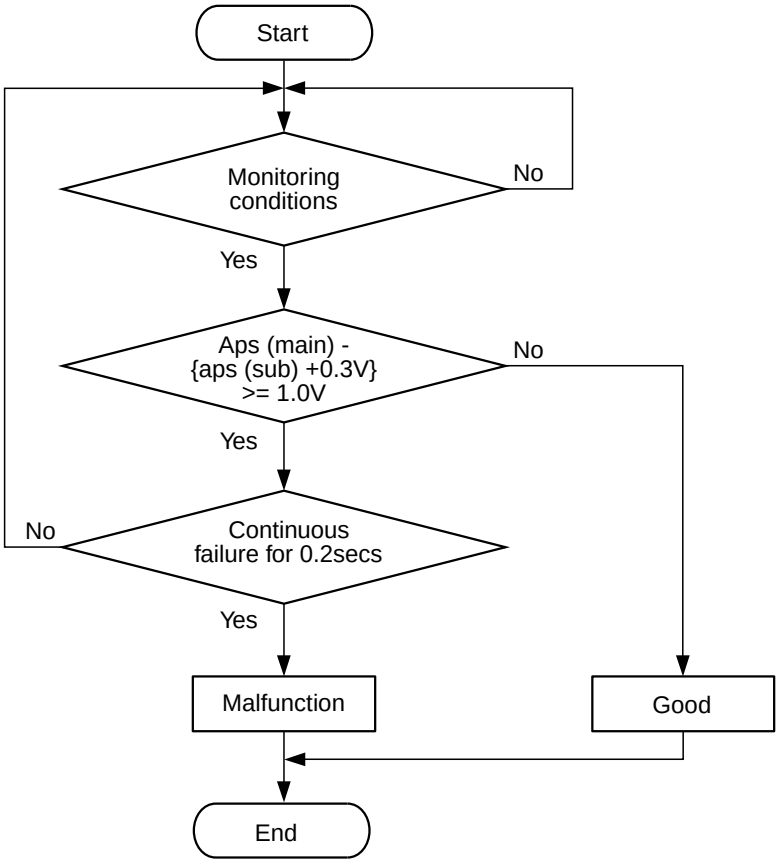
- Ignition switch is "ON" position.
- Change of accelerator pedal position sensor (sub) output voltage per 25 milliseconds is lower than 0.06 volt.

Judgement Criterion

- Voltage obtained with the formula given below is 0.39 volt or higher for 0.3 second: [accelerator pedal position sensor (sub) output voltage +0.3 volt] - accelerator pedal position sensor (main) output voltage.

DTC SET CONDITIONS Range/Performance problem -relation between main and sub

Logic Flow Chart



ZK603820AA00

Check Conditions

- Ignition switch is "ON" position.
- Change of accelerator pedal position sensor (sub) output voltage per 25 milliseconds is lower than 0.06 volt.

Judgement Criterion

- Voltage obtained with the formula given below is 0.39 volt or higher for 0.2 second: [accelerator pedal position sensor (main) output voltage - accelerator pedal position sensor (sub) output voltage].

OBD-II DRIVE CYCLE PATTERN

None.

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

- Accelerator pedal position sensor failed.
- Connector damage.
- Harness damage.
- ECM 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

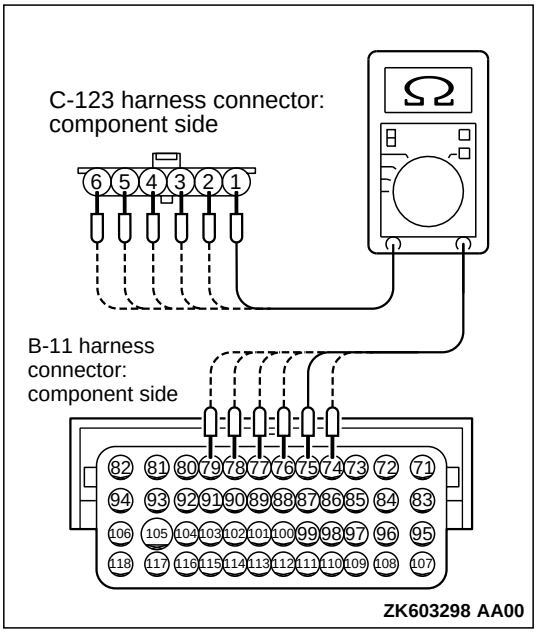
STEP 1. Check harness connector C-123 at accelerator pedal position sensor and harness connector B-11 at ECM for damage.

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 4.

STEP 2. Check for harness damage between accelerator pedal position sensor connector C-123 and ECM connector B-11.



(1) Disconnect the connector C-123 and B-11 measure at the harness side.

(2) Measure the resistance between connector C-123 and connector B-11.

a Connector C-123 (terminal No. 1) and connector B-11 (terminal No. 75).

b Connector C-123 (terminal No. 2) and connector B-11 (terminal No. 76).

c Connector C-123 (terminal No. 3) and connector B-11 (terminal No. 74).

d Connector C-123 (terminal No. 4) and connector B-11 (terminal No. 78).

e Connector C-123 (terminal No. 5) and connector B-11 (terminal No. 79).

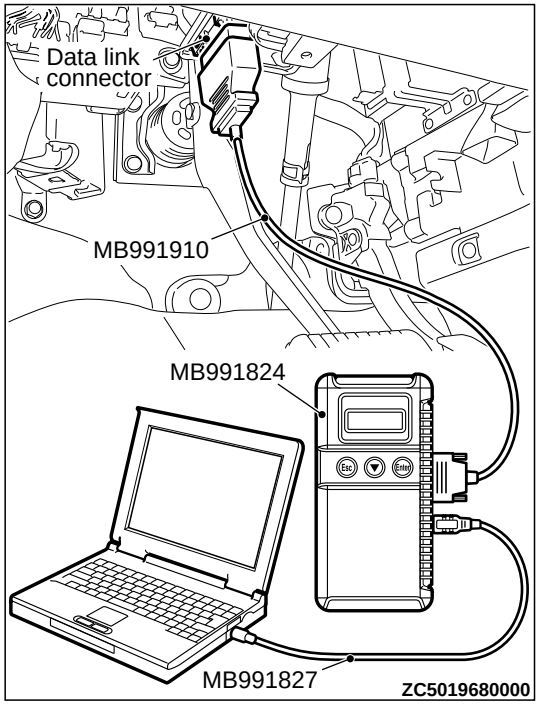
f Connector C-123 (terminal No. 6) and connector B-11 (terminal No. 77).

- Should be less than 2 ohms.

Q:Is the measured resistance less than 2 ohms?

YES: Go to Step 3.

NO: Repair it. Then go to Step 4.



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.13Ab-837.
  a Item 11: Accelerator Pedal Position Sensor (main).
  .
  b Item 12: Accelerator Pedal Position Sensor (sub).
  .
(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 go to Step 4.

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

(1) Turn the ignition switch to the "ON" position.
(2) After the DTC has been deleted, read the DTC again.
(3) 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: Heated Oxygen Sensor Inactive (bank 1, sensor 1)

M11310100268USA0000010000

TECHNICAL DESCRIPTION

- The ECM effects air/fuel ratio feedback control in accordance with the signals from the right bank heater oxygen sensor (front).
- If the right bank heated oxygen sensor (front) has deteriorated, corrections will be made by the right bank heated oxygen sensor (rear).
- DTC P2195 becomes stored in memory if a failure is detected in the right bank heated oxygen sensor (front).

DESCRIPTIONS OF MONITOR METHODS

Right bank heated oxygen sensor (front) output voltage does not cross lean/rich criteria (about 0.5 volt) within specified period.

MONITOR EXECUTION

Continuous

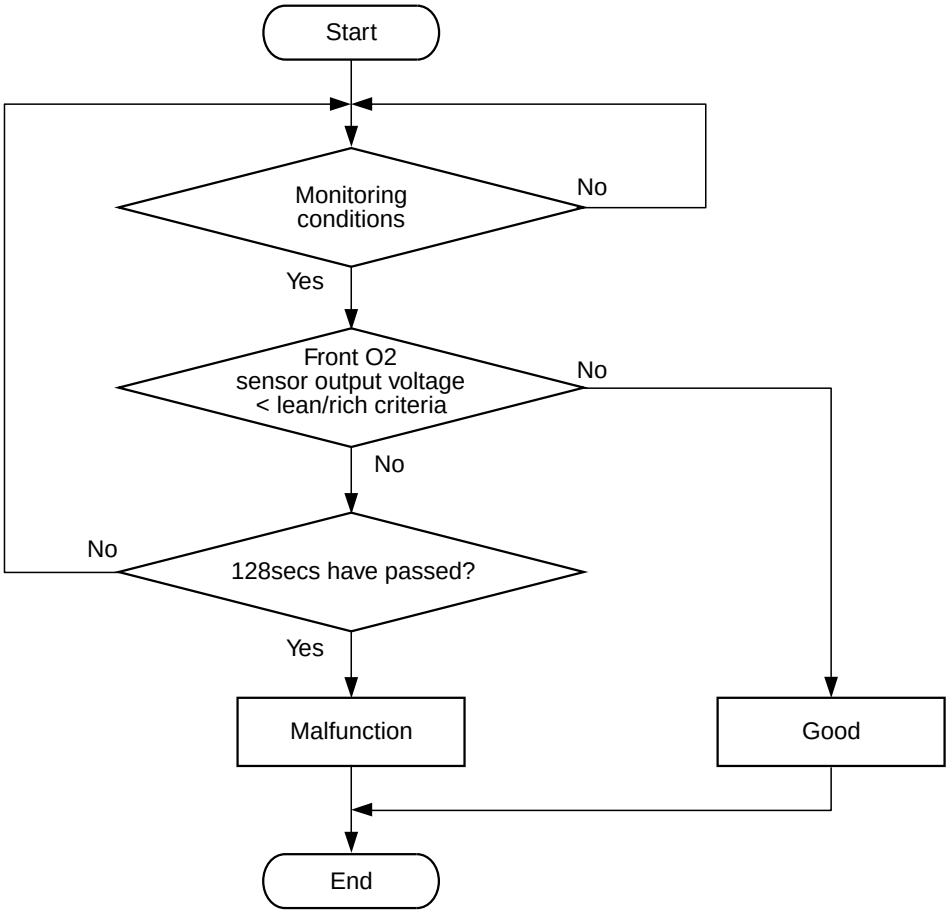
MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

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



ZK603821AA00

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)

Judgment Criterion

- Right bank heated oxygen sensor (front) output voltage is less than lean/rich criteria (about 0.5 volt) for 128 seconds.

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

- Right bank heated oxygen sensor (front) deteriorated.
- Connector damage.
- Harness damage.
- ECM failed.

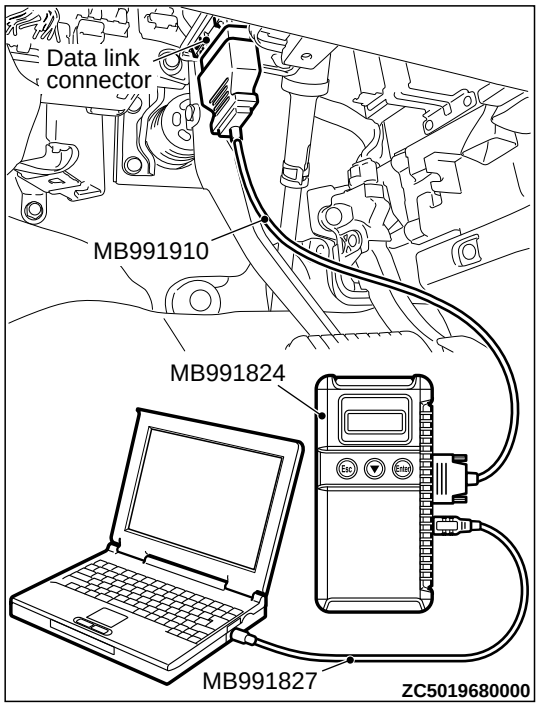
OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function - OBD-II Drive Cycle - Pattern 23 P.13Ab-8.

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 AC: Heated Oxygen Sensor Bank 1, Sensor 1 (right 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, Heated Oxygen Sensor Bank 1, Sensor 1 (right 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 or less 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: Replace it. 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. 13Ab-8.
(2) Check the diagnostic trouble code (DTC).

Q:Is DTC P2195 set?

YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. 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.00-15.

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. 13Ab-8.
(2) Check the diagnostic trouble code (DTC).

Q:Is DTC P2195 set?
YES: Retry the troubleshooting.
NO: The inspection is complete.

DTC P2197: Heated Oxygen Sensor Inactive (bank 2, sensor 1)

M11310100269USA0000010000

TECHNICAL DESCRIPTION

- The ECM effects air/fuel ratio feedback control in accordance with the signals from the left bank heater oxygen sensor (front).
- If the left bank heated oxygen sensor (front) has deteriorated, corrections will be made by the left bank heated oxygen sensor (rear).
- DTC P2197 becomes stored in memory if a failure is detected in the left bank heated oxygen sensor (front).

DESCRIPTIONS OF MONITOR METHODS

Left bank 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)

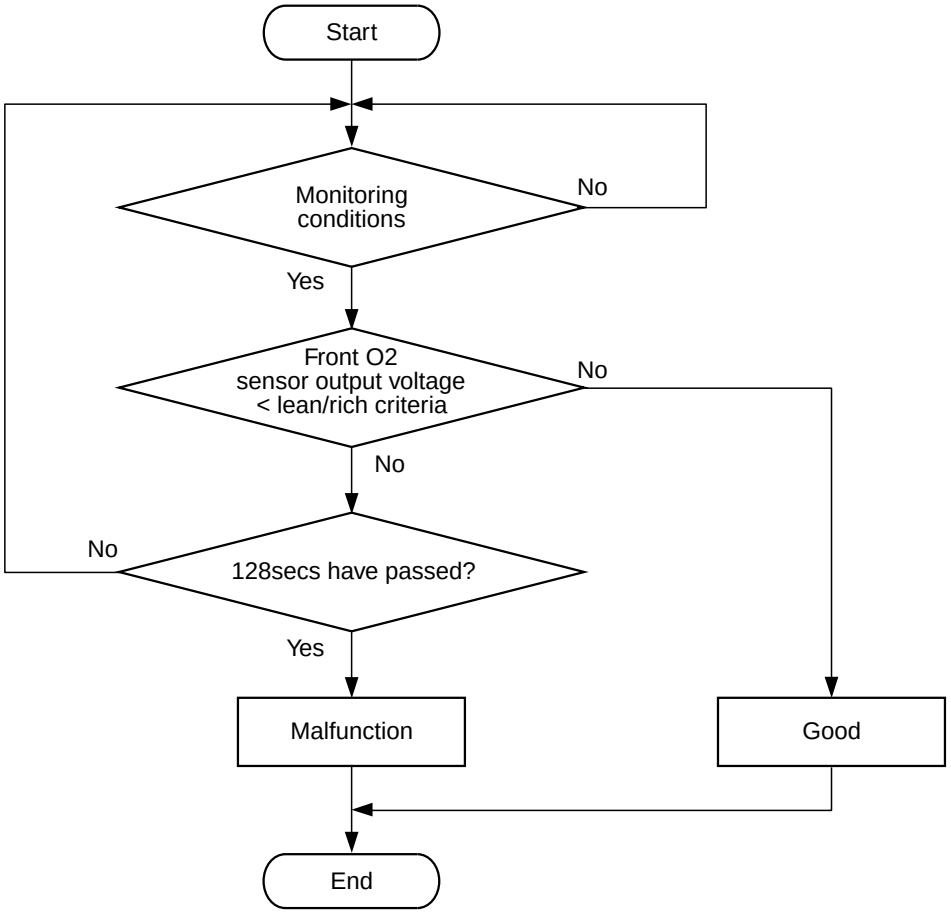
- Heated oxygen sensor (front) monitor
- Misfire monitor

Sensor (The sensor below is determined to be normal)

- Engine coolant temperature sensor
- Intake air temperature sensor

DTC SET CONDITIONS

Logic Flow Chart



ZK603821AA00

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)

Judgment Criterion

- Left bank heated oxygen sensor (front) output voltage is less than lean/rich criteria (about 0.5 volt) for 128 seconds.

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

- Left bank heated oxygen sensor (front) deteriorated.
- Connector damage.
- Harness damage.
- ECM failed.

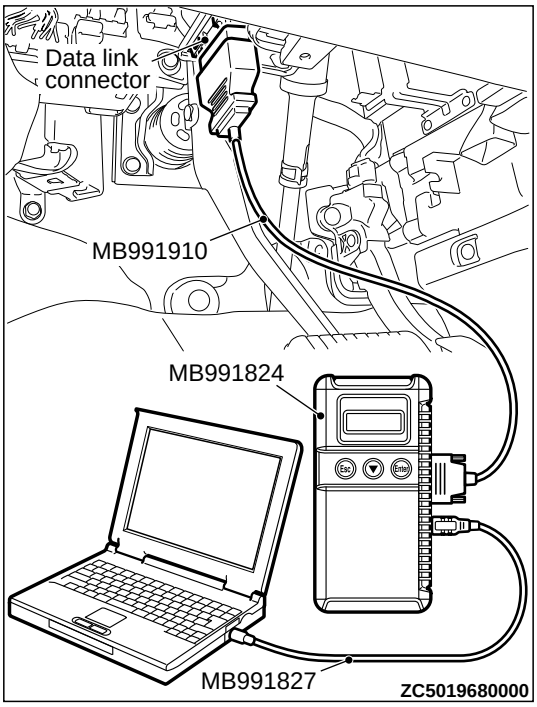
OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function - OBD-II Drive Cycle - Pattern 23 P.13Ab-8.

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 AE: Heated Oxygen Sensor Bank 2, Sensor 1 (left 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, Heated Oxygen Sensor Bank 2, Sensor 1 (left 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 or less 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: Replace it. 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. 13Ab-8.
(2) Check the diagnostic trouble code (DTC).

Q:Is DTC P2197 set?

YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. 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.00-15.

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. 13Ab-8.
(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

M11310100270USA0000010000

TECHNICAL DESCRIPTION

- The barometric pressure sensor outputs a voltage which corresponds to the barometric pressure.
- The ECM 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)

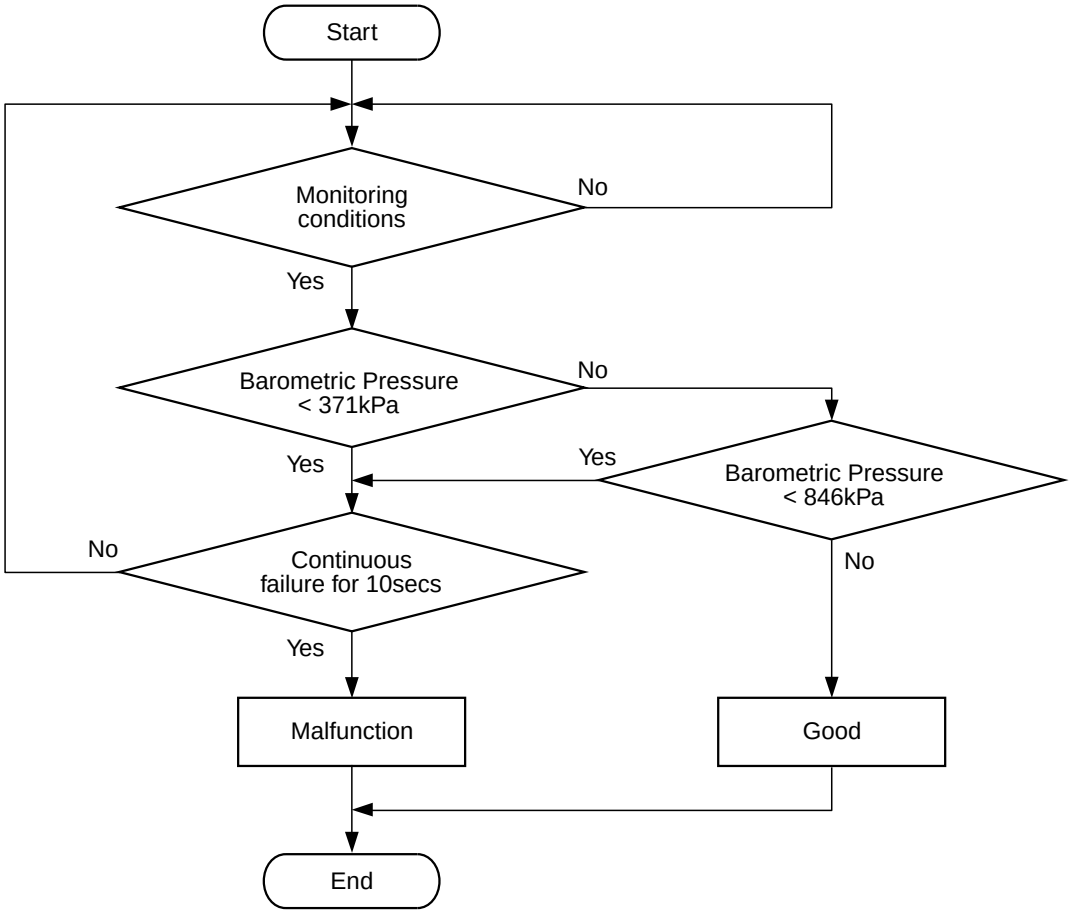
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



ZK603823AA00

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 feet above sea level) for 10 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function - OBD-II Drive Cycle - Pattern 24 P.13Ab-8.

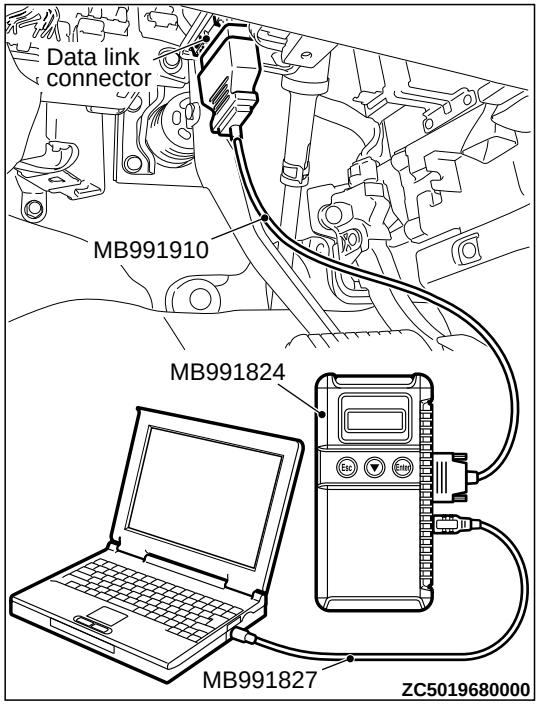
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- ECM 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. 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. 13Ab-8.
(4) Check the diagnosis trouble code (DTC).

Q:Is DTC P02228 set?

YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-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.00-15.

DTC P2229: Barometric Pressure Circuit High Input

M11310100271USA0000010000

TECHNICAL DESCRIPTION

- The barometric pressure sensor outputs a voltage which corresponds to the barometric pressure.
- The ECM 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)

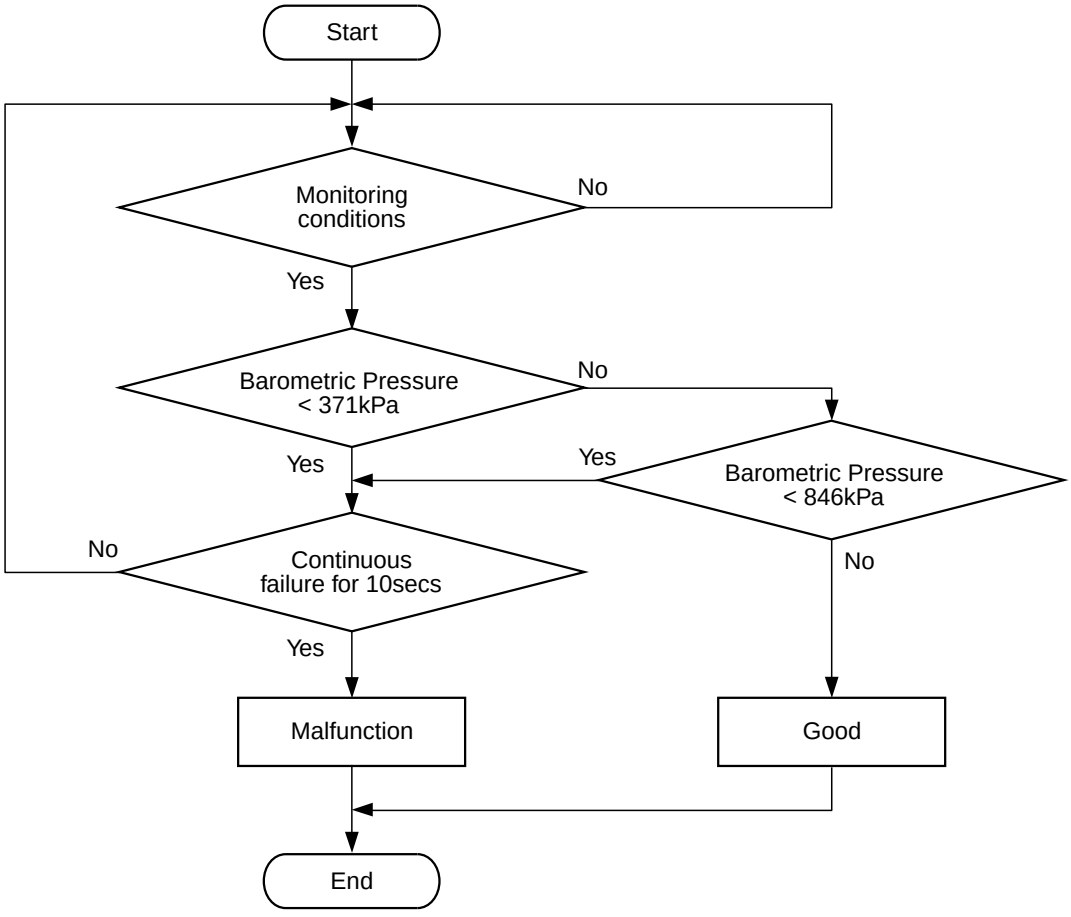
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



ZK603823AA00

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.13Ab-8.

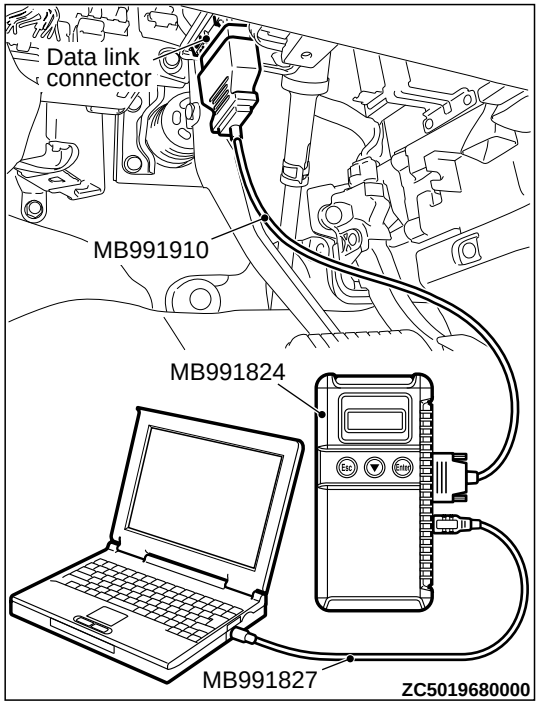
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- ECM 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. 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. 13Ab-8.
(4) Check the diagnosis trouble code (DTC).

Q:Is DTC P02229 set?

YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-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.00-15.

DTC P2252: Heated Oxygen Sensor Offset Circuit Low Voltage

M11310100272USA0000010000

TECHNICAL DESCRIPTION

- The ECM applies an offset voltage of 0.5 volt to the heated oxygen sensor.
- The ECM 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)

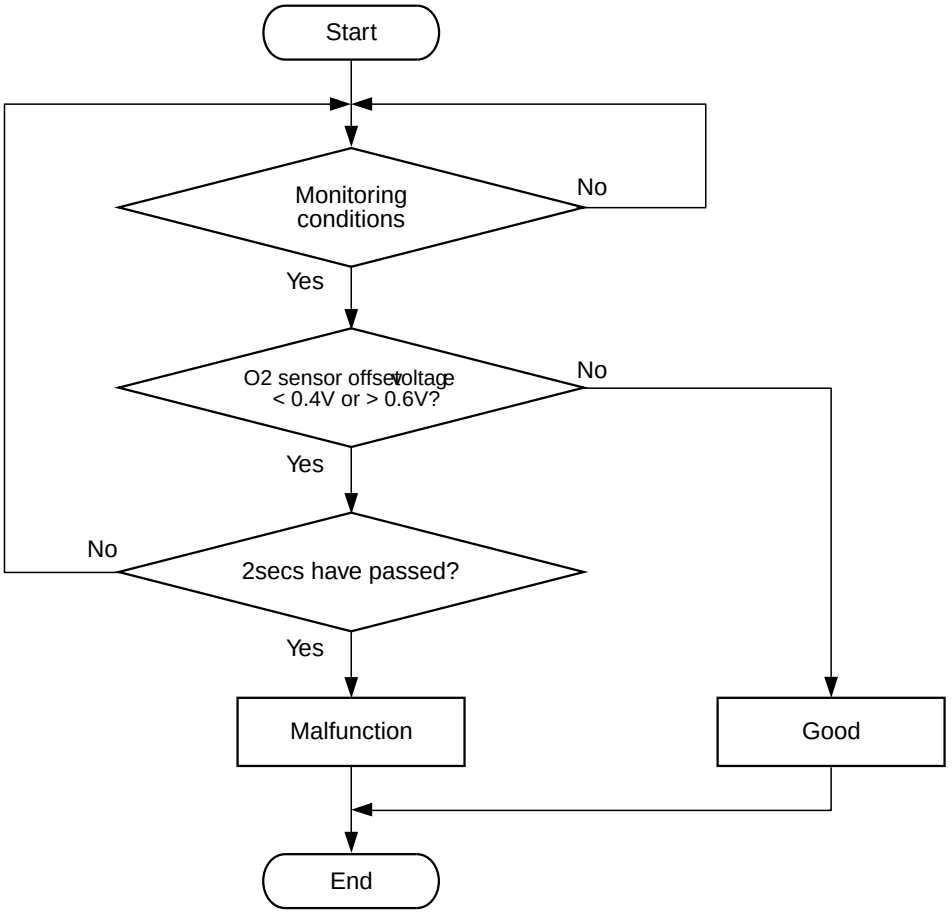
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITION

Logic Flow Chart



ZK603824AA00

Check Condition

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

Judgement Criterion

- Heated oxygen sensor offset voltage is lower than 0.4 volt for 2 seconds.

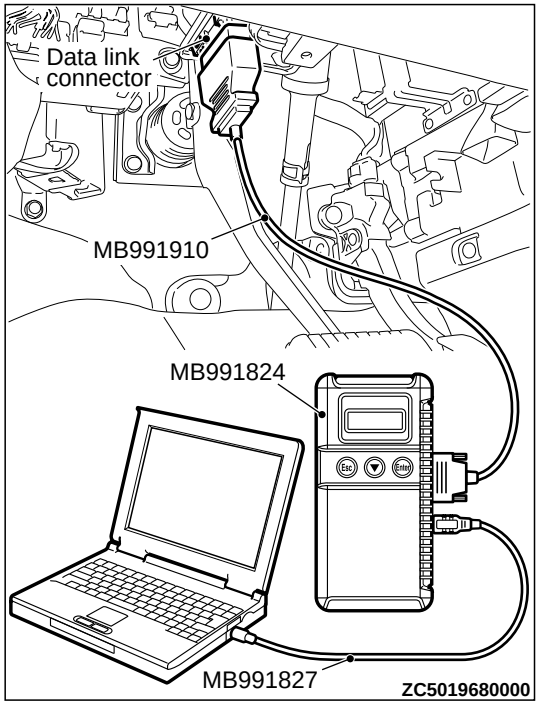
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- ECM failed.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnosis Function - OBD-II Drive Cycle - Pattern 24 P.13Ab-8.

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. 13Ab-8.
(4) Check the diagnosis trouble code (DTC).

Q:Is DTC P02252 set?

YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-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.00-15.

DTC P2253: Heated Oxygen Sensor Offset Circuit High Voltage

M11310100273USA0000010000

TECHNICAL DESCRIPTION

- The ECM applies an offset voltage of 0.5 volt to the heated oxygen sensor.
- The ECM check 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)

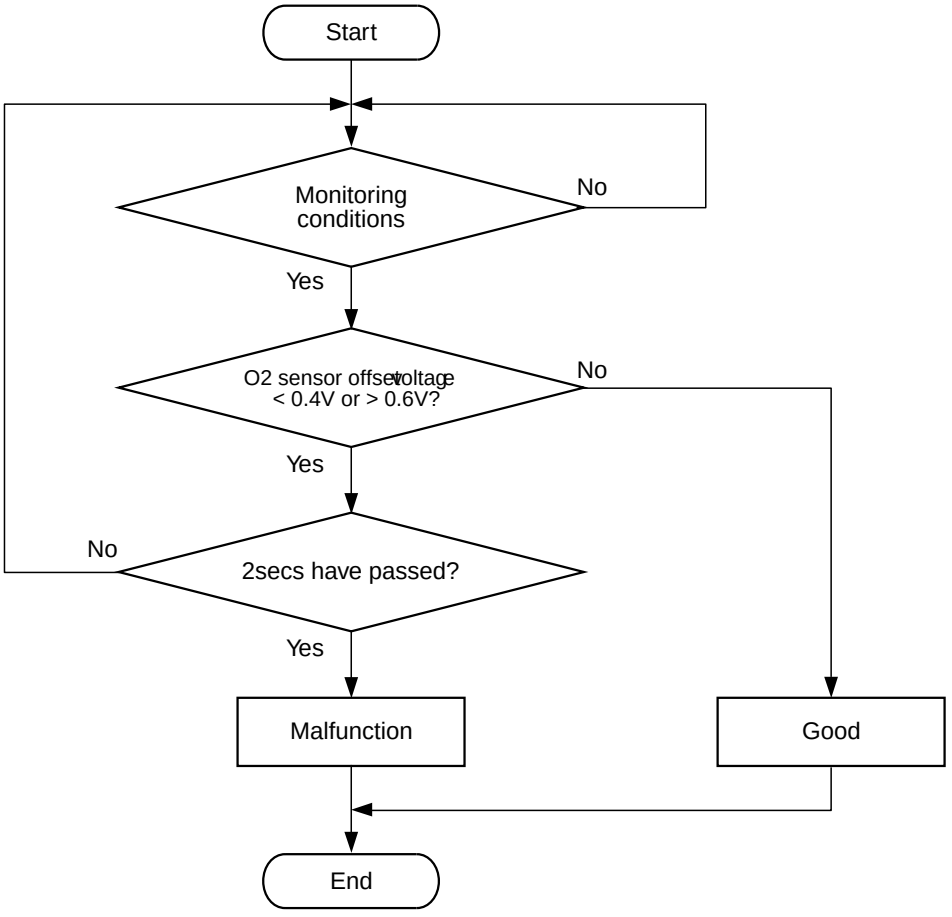
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



ZK603824AA00

Check Condition

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

Judgement Criterion

- Heated oxygen sensor offset voltage is higher than 0.6 volt for 2 seconds.

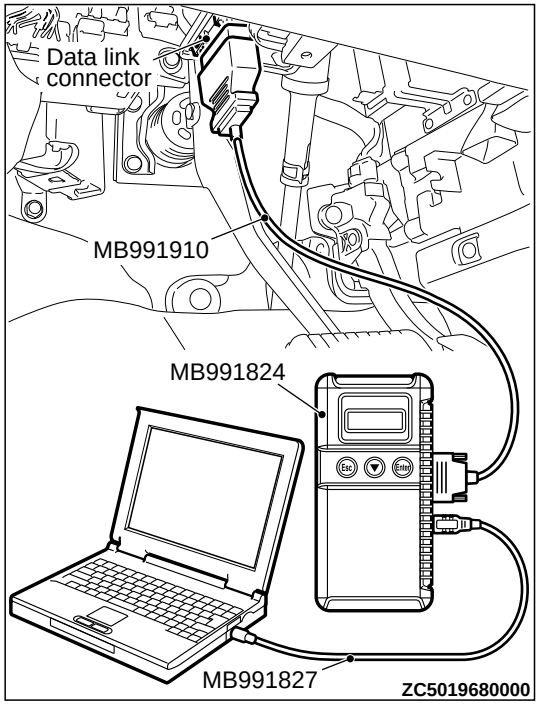
OBD-II DRIVE CYCLE PATTERN

Refer to Diagnosis Function - OBD-II Drive Cycle - Pattern 24 P.13Ab-8.

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

- ECM failed.

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. 13Ab-8.
(4) Check the diagnosis trouble code (DTC).

Q:Is DTC P02253 set?

YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-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.00-15.

DTC P2423: HC adsorber (HC trap catalyst) efficiency below threshold

M11310100396USA0000010000

TECHNICAL DESCRIPTION

After the fuel cut-off during the deceleration, the rich control is performed. Depending on the point of time when the catalyst releases Oxygen which is temporarily absorbed by the lean control, the HC adsorber (HC trap catalyst) within center exhaust pipe is judged on its deterioration in performance.

DESCRIPTIONS OF MONITOR METHODS

When the difference in the s witching time into the rich control is below the specified time between the heated (rear) oxygen sensor and the center exhaust pipe heated oxygen sensor, it is judged that a malfunction exists.

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)

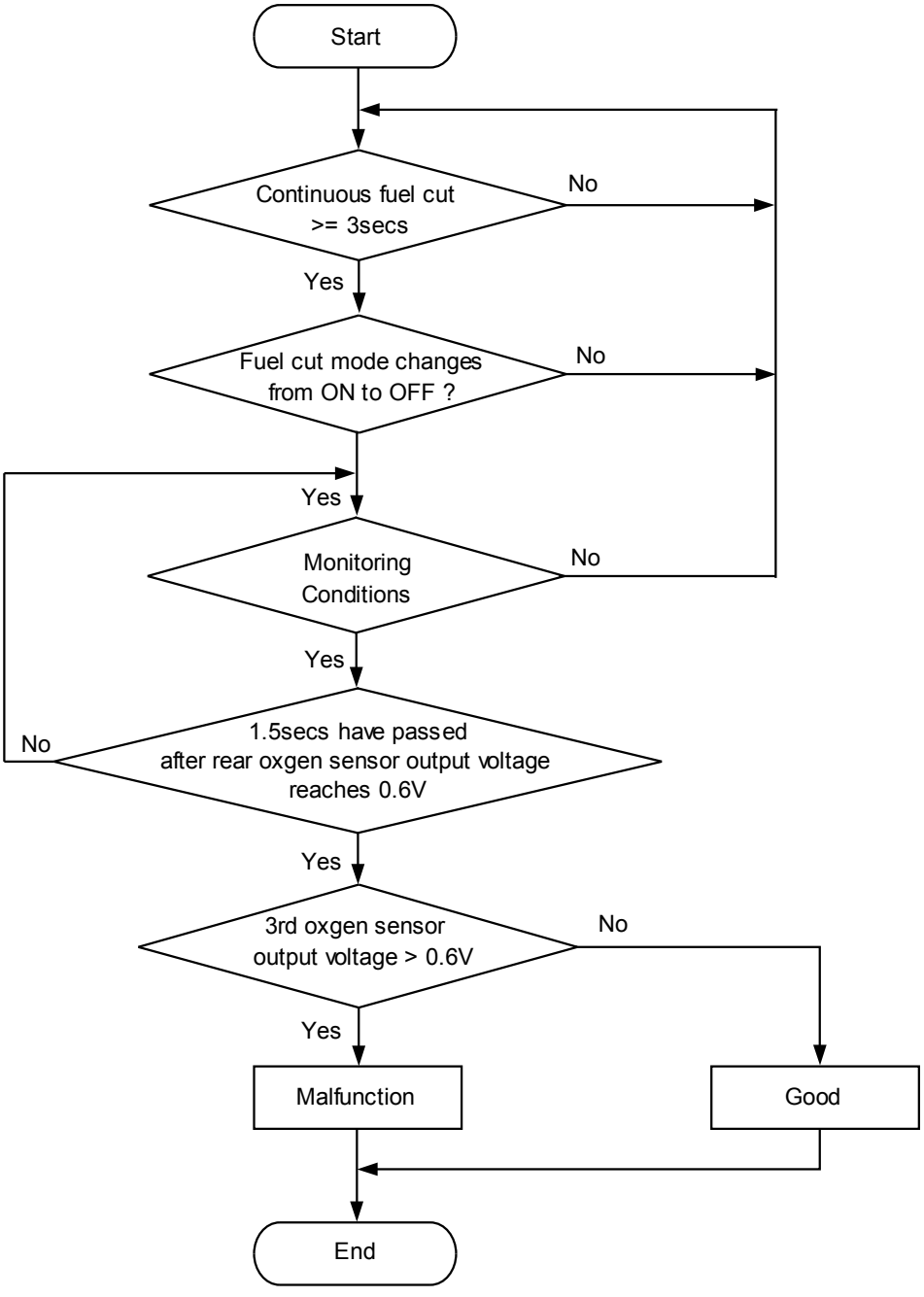
- Heated oxygen sensor (front) monitor
- Heated oxygen sensor (rear) monitor
- Center exhaust pipe heated oxygen sensor monitor
- Heated oxygen sensor heater (front) monitor
- Heated oxygen sensor heater (rear) monitor
- Center exhaust pipe heated oxygen sensor heater monitor
- Misfire monitor
- Fuel 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



ZK604057 AA00

Check Conditions

- Engine speed is lower than 1,313 r/min.
- Volumetric efficiency is lower than 20 percent.
- The throttle valve is closed.
- Barometric pressure is higher than 76 kPa (22.4 in.Hg).
- Intake air temperature is higher than -10°C (14°F).
- The cumulative mass airflow is higher than 2,900 g

- The fuel shut-off mode continues for 3 seconds or more.
- After the fuel shut-off mode is terminated, the output voltage of the center exhaust pipe heated oxygen sensor is0.2 V or less for 5 seconds.

Judgment Criterion
- After the output voltage of the rear heated oxygen sensor reaches 0.6 V, the output voltage of the center exhaust pipe heated oxygen sensor reaches 0.6 V within 1.5 seconds.

OBD-II DRIVE CYCLE PATTERN
Refer to Diagnostic Function - OBD-II Drive Cycle - Pattern 11 P.13Ab-8.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)
- HC trap catalyst deterioration within center exhaust pipe.
- ECM 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 center exhaust pipe.
(1) Replace the center exhaust pipe.
(2) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function - OBD-II Drive Cycle - Pattern 11 P. 13Ab-8.
(3) Check the diagnostic trouble code (DTC).

Q:Is DTC P2423 set?
YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8.
NO: The inspection is complete.

DTC P2567: LIN Communication Check by Radiator Sensor (Thermistor Error) <California>

M11310100418USA0000010000

RADIATOR SENSOR CIRCUIT
Refer to P.13Ab-658.

CIRCUIT OPERATION
Refer to P.13Ab-658.

MONITOR EXECUTION
- Continuous

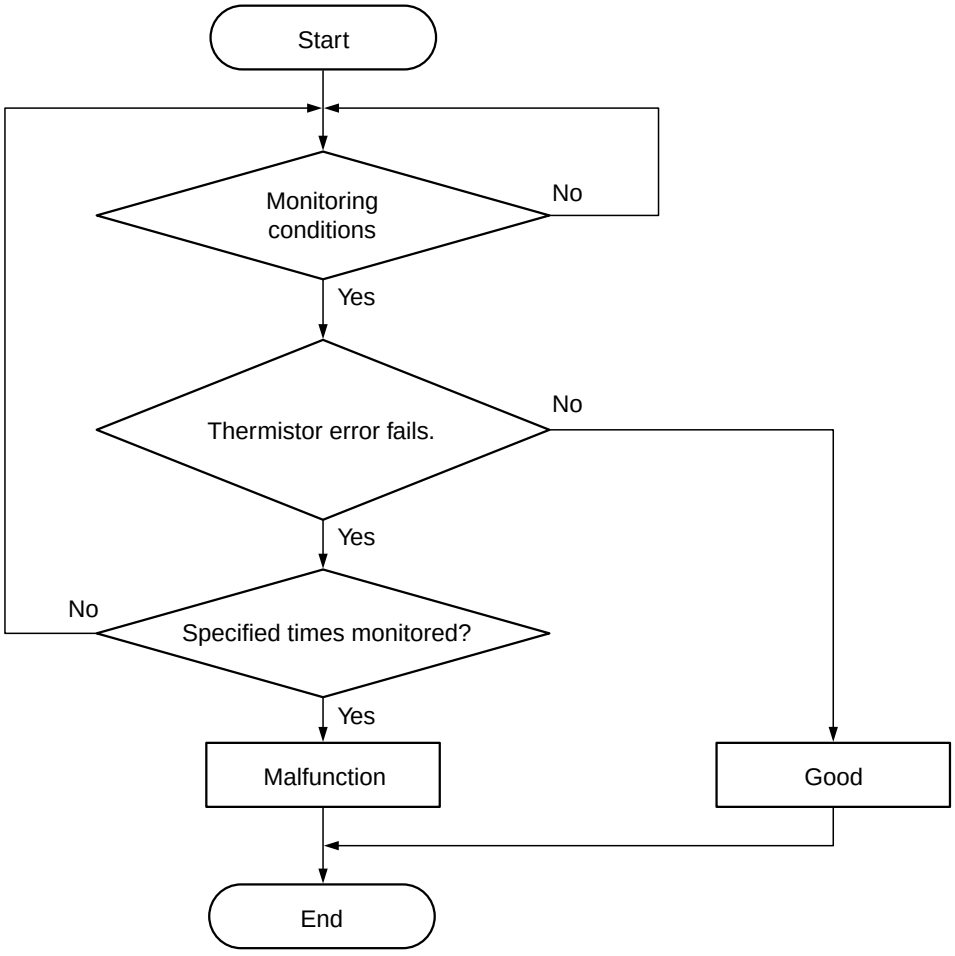
MONITOR EXECUTION CONDITIONS (OTHER MONITOR AND SENSOR)

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



ZK603446AA00

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

OBD-II DRIVE CYCLE PATTERN

- None.

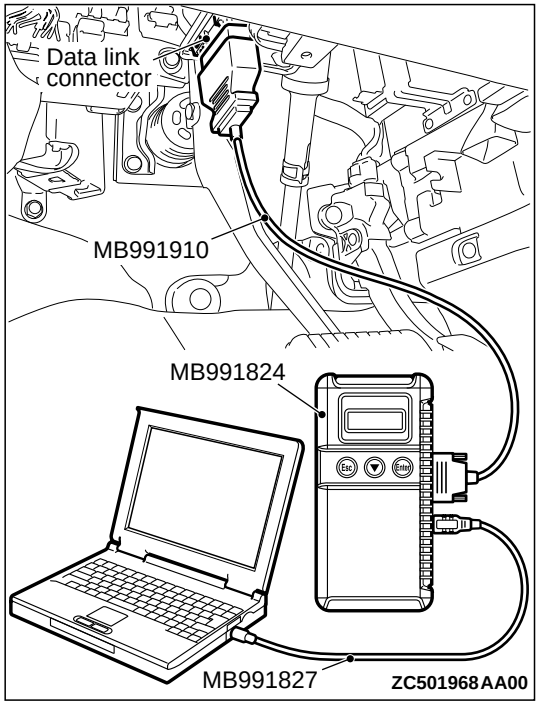
TROUBLESHOOTING HINTS (THE MOST LIKELY CAUSES FOR THIS CODE TO BE SET ARE:)

- Radiator sensor failed.
- ECM 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 DOR radiator.

(1) Replace the DOR radiator.

⚠ 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.

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

Q:Is DTC P2567 set?

YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 2.
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.00-15.

STEP 2. Using scan tool MB991958, read the diagnostic trouble code (DTC).

(1) Turn the ignition switch to the "ON" position.
(2) Read the DTC.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q:Is DTC P2567 set?

YES: Repeat the troubleshooting.
NO: The procedure is complete.

DTC U0001: Bus Off

M11310100397USA0000010000

⚠ CAUTION

- **If the ECM output the DTC U0001, 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 Criterion

- Bus off error detected

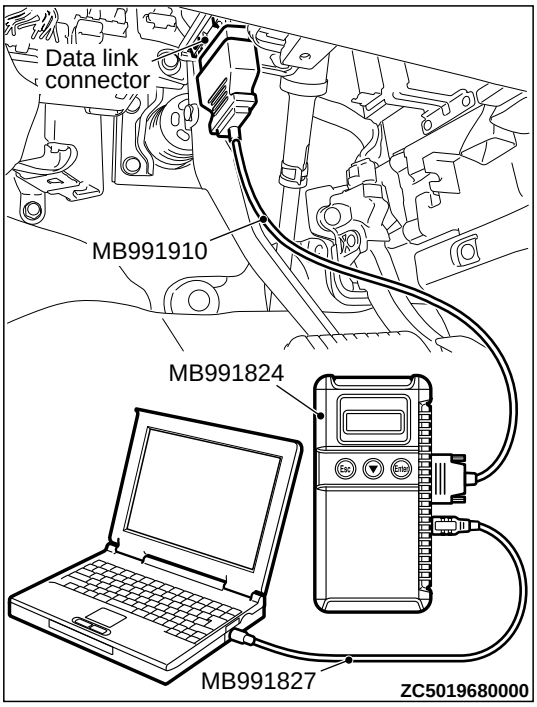
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- CAN line 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

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: 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.00-15.
NO: Repair the CAN bus line. Refer to GROUP 54D, Can bus Diagnostics Table P.54D-10. Then go to Step 2.

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

Q:Is DTC U0001 set?

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

DTC U0101: Transmission Control Module Time-Out

M113101003 98USA0000010000

⚠ CAUTION

- **If the ECM output the DTC U0101, 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 TCM for the specified time. (TCM detect communication error with ECM.)

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

- After 4 seconds have passed since the ignition switch was turned to "ON" position.
- Battery positive voltage is between 10 and 16.5 volts.

Judgement Criterion

- Unable to receive TCM signals through the CAN bus line 4 seconds.

OBD-II DRIVE CYCLE PATTERN

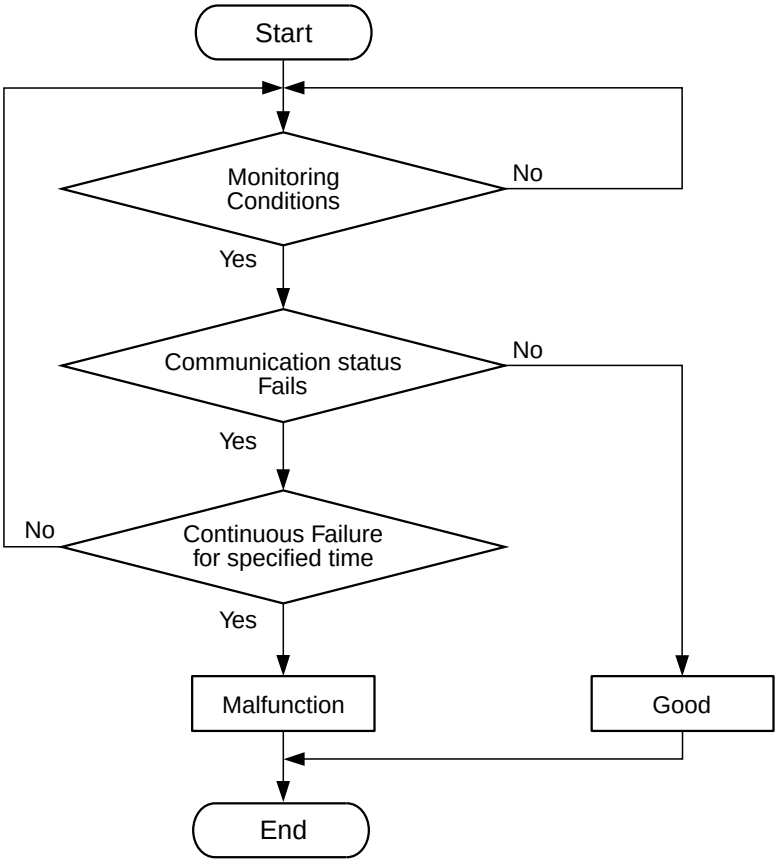
None.

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

- CAN line harness damage or connector damage.

DTC SET CONDITIONS

Logic Flow Chart

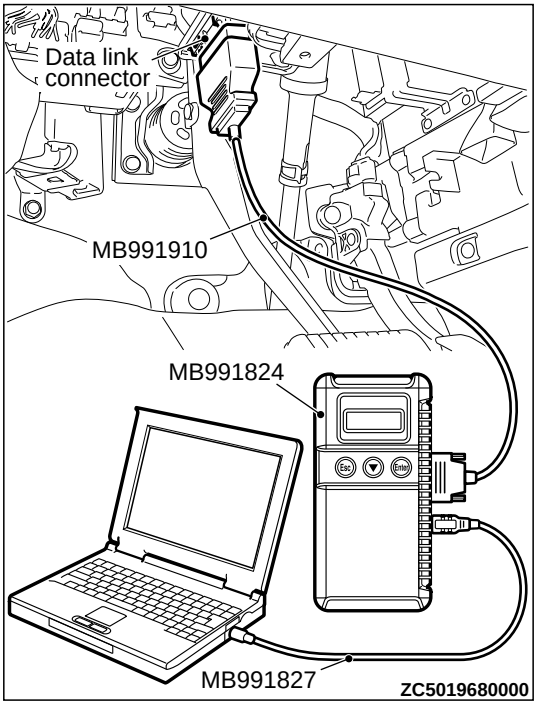


ZK604051AA00

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: 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.00-15.

NO: Repair the CAN bus line. Refer to GROUP 54D, Can bus Diagnostics Table P.54D-10. Then go to Step 2.

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

Q:Is DTC U0101 set?

YES: Retry the troubleshooting.

NO: The inspection is complete.

DTC U0114: AWD-ECU Time-Out

M11310100399USA0000010000

⚠ CAUTION

- **If the ECM output the DTC U0114, 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

- After 2 seconds have passed since the ignition switch was turned to "ON" position.
- Battery positive voltage is 10 volts or higher.

Judgement Criterion

- Unable to receive AWD-ECU signals through the CAN bus line for 4 seconds.

COMMENT

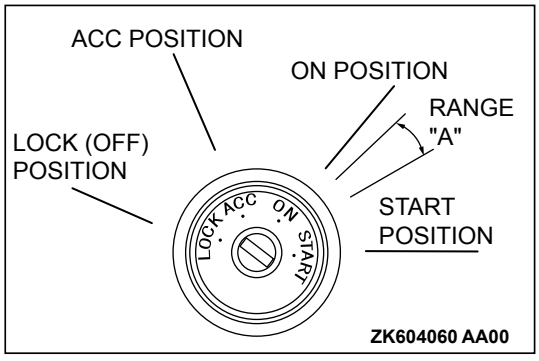
Current Trouble

- Some of the possible causes are a harness or connector damage between the ECM and the ABS-ECU/ASC-ECU on the CAN bus line, a failure in the ABS-ECU/ASC-ECU power supply system, a failure in the ABS-ECU/ASC-ECU, or a failure in the ECM.

Past Trouble

- Proceed to troubleshoot based on a harness or connector damage on the CAN bus line between the ECM ABS-ECU/ASC-ECU and ABS-ECU/ASC-ECU, and a failure in the ABS-ECU/ASC-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.00-15).

⚠ 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, ECM stores DTC U0121 (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.00-15. 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 54D, CAN bus line Diagnostics Flow P.54D-10).

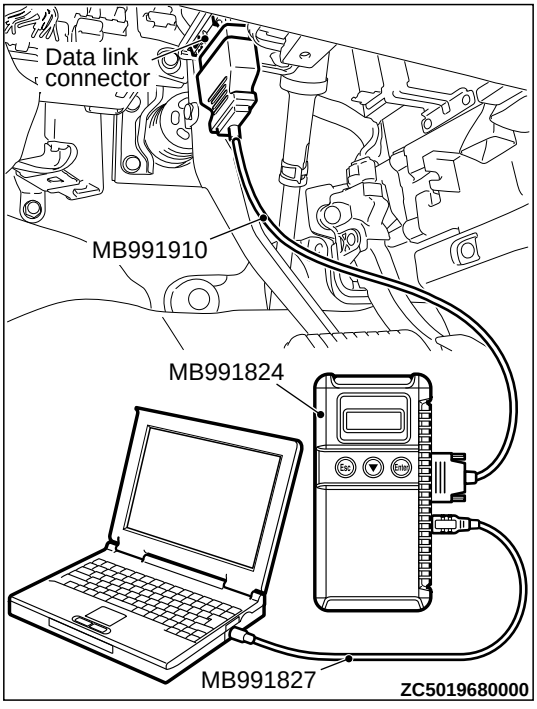
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- CAN line 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



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: 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.00-15.

NO: Repair the CAN bus line. Refer to GROUP 54D, Can bus Diagnostics Table P.54D-10. Then go to Step 2.

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

Q:Is DTC U0114 set?

YES: Retry the troubleshooting.

NO: The inspection is complete.

DTC U0121: ABS-ECU/ASC-ECU Time-Out

M11310100400USA0000010000

⚠ CAUTION

- **If the ECM output the DTC U0121, 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.
- After 2 seconds have passed since the ignition switch was turned to "ON" position.

Judgement Criterion

- Unable to receive ABS-ECU/ASC-ECU signals through the CAN bus line for 4 seconds.

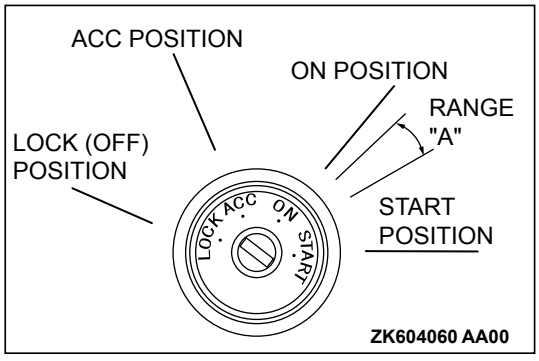
COMMENT

Current Trouble

- Some of the possible causes are a harness or connector damage between the ECM and the ABS-ECU/ASC-ECU on the CAN bus line, a failure in the ABS-ECU/ASC-ECU power supply system, a failure in the ABS-ECU/ASC-ECU, or a failure in the ECM.

Past Trouble
- Proceed to troubleshoot based on a harness or connector damage on the CAN bus line between the ECM ABS-ECU/ASC-ECU and ABS-ECU/ASC-ECU, and a failure in the ABS-ECU/ASC-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.00-15).

⚠ CAUTION



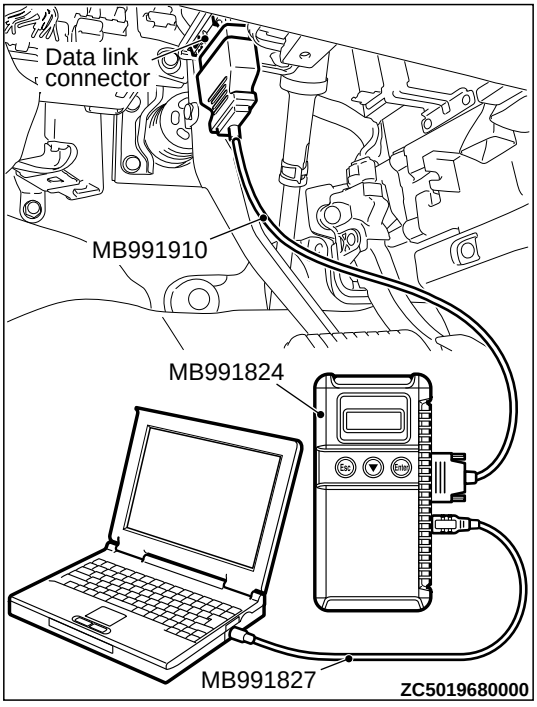
When the ignition key is maintained within the range "A" (i.e., the ignition switch IG2 is in OFF position but the cranking does not start) for more than 1 second, ECM stores DTC U0121 (the past trouble).

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.00-15. 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 54D, CAN bus line Diagnostics Flow P.54D-10).

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



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: 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.00-15.

NO: Repair the CAN bus line. Refer to GROUP 54D, Can bus Diagnostics Table P.54D-10. Then go to Step 2.

STEP 2. Using scan tool MB991958, read the diagnostic trouble code (DTC).

(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 U0121 set?

YES: Retry the troubleshooting.

NO: The inspection is complete.

DTC U0141: ETACS-ECU Time-Out

M11310100401USA0000010000

⚠ CAUTION

- **If the ECU output the DTC U0141, 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 ETACS-ECU for the specified time. (ETACS-ECU also detect communication error with ECM.)

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)

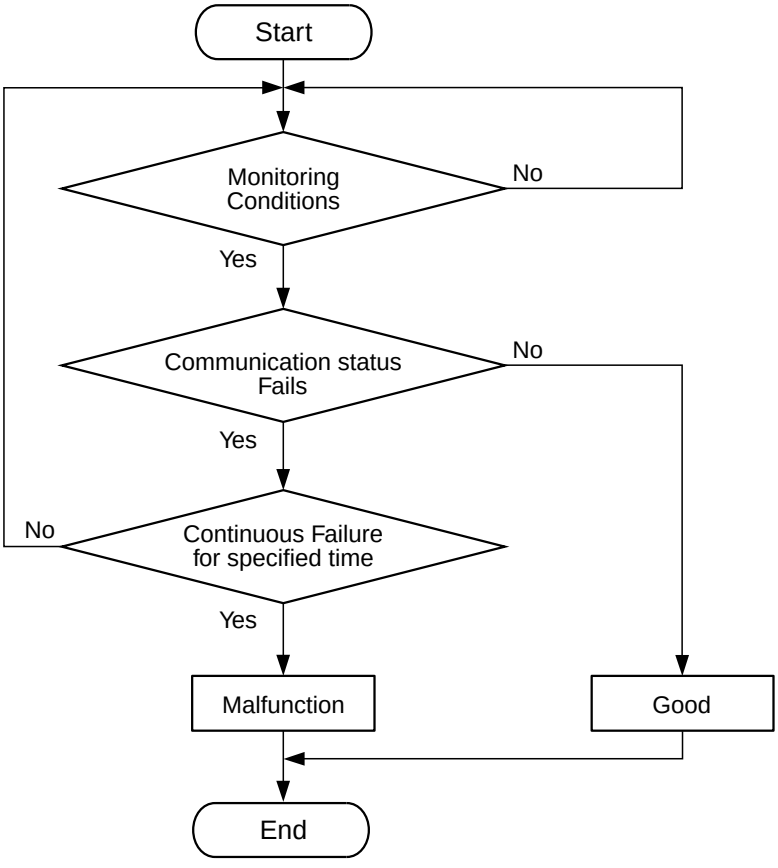
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



ZK604051AA00

Check Conditions

- After 4 seconds have passed since the ignition switch was turned to "ON" position.
- Battery positive voltage is between 10 and 16.5 volts.

Judgement Criterion

- Unable to receive ETACS-ECU signals through the CAN bus line for 4 seconds.

COMMENT

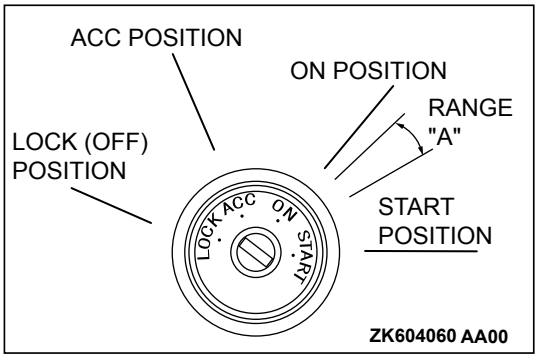
Current Trouble

- Some of the possible causes are a harness or connector damage between the ECM 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 ECM.

Past Trouble

- Proceed to troubleshoot based on a harness or connector damage on the CAN bus line between the ECM 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. 00-15).

⚠ CAUTION



ZK604060 AA00

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, ECM stores DTC U0141 (the past trouble).

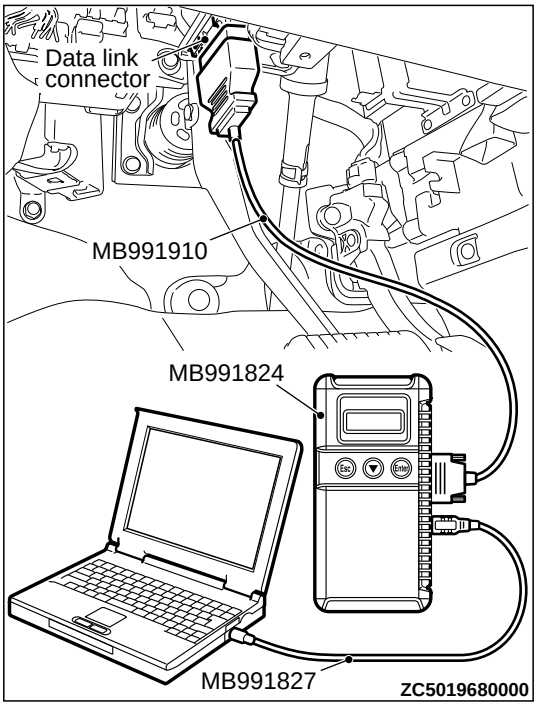
NOTE: If a malfunction occurred in the past, a failure cannot be discovered through the MB991958 CAN bus diagnosis even if there might be a problem with the CAN bus. In this case, refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points - How to Cope with Intermittent Malfunctions P.00-15. 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 54D, CAN bus line Diagnostics Flow P.54D-10).

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.

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: 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.00-15.

NO: Repair the CAN bus line. Refer to GROUP 54D, Can bus Diagnostics Table P.54D-10. Then go to Step 2.

STEP 2. Using scan tool MB991958, read the diagnostic trouble code (DTC).

(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 U0141 set?

YES: Retry the troubleshooting.

NO: The inspection is complete.

DTC U0167: KOS-ECU/WCM Communication Error

M11310100402USA0000010000

⚠ CAUTION

- **If the ECM output the DTC U0167, 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

- After 2 seconds have passed since the ignition switch was turned to "ON" position.
- Battery positive voltage is 8 volts or higher.

Judgement Criterion

- Unable to receive KOS-ECU/WCM (immobilizer-ECU) signals through the CAN bus line.

COMMENT

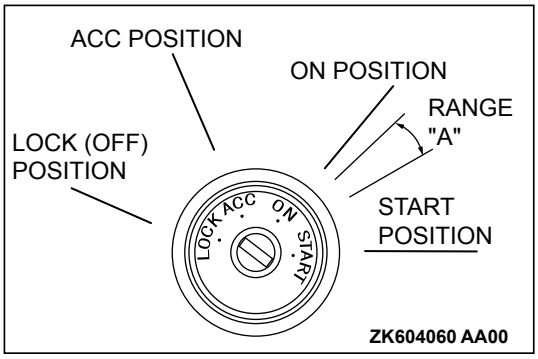
Current Trouble

- Some of the possible causes are a harness or connector damage between the ECM and the KOS-ECU/WCM on the CAN bus line, a failure in the KOS-ECU/WCM power supply system, a failure in the KOS-ECU/WCM, or a failure in the ECM.

Past Trouble

- Proceed to troubleshoot based on a harness or connector damage on the CAN bus line between the ECM and KOS-ECU/WCM, and a failure in the KOS-ECU/WCM 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.00-15).

⚠ 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, ECM stores DTC U0167 (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.00-15. 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 54D, CAN bus line Diagnostics Flow P.54D-10).

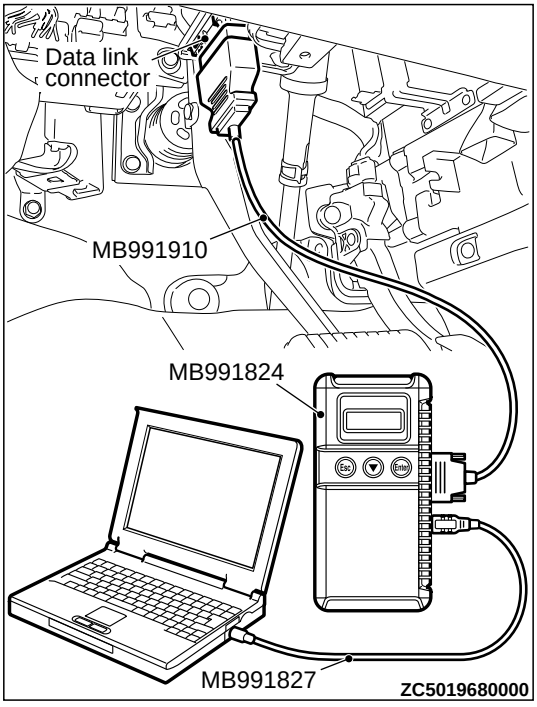
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- CAN line 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



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: 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.00-15.

NO: Repair the CAN bus line. Refer to GROUP 54D, Can bus Diagnostics Table P.54D-10. Then go to Step 2.

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

Q:Is DTC U0167 set?

YES: Retry the troubleshooting.

NO: The inspection is complete.

DTC U1180: Combination Meter Time-Out

M11310100403USA0000010000

⚠ CAUTION

- **If the ECM output the DTC U1180, 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. (combination meter also detect communication error with ECM.)

MONITOR EXECUTION

Continuous

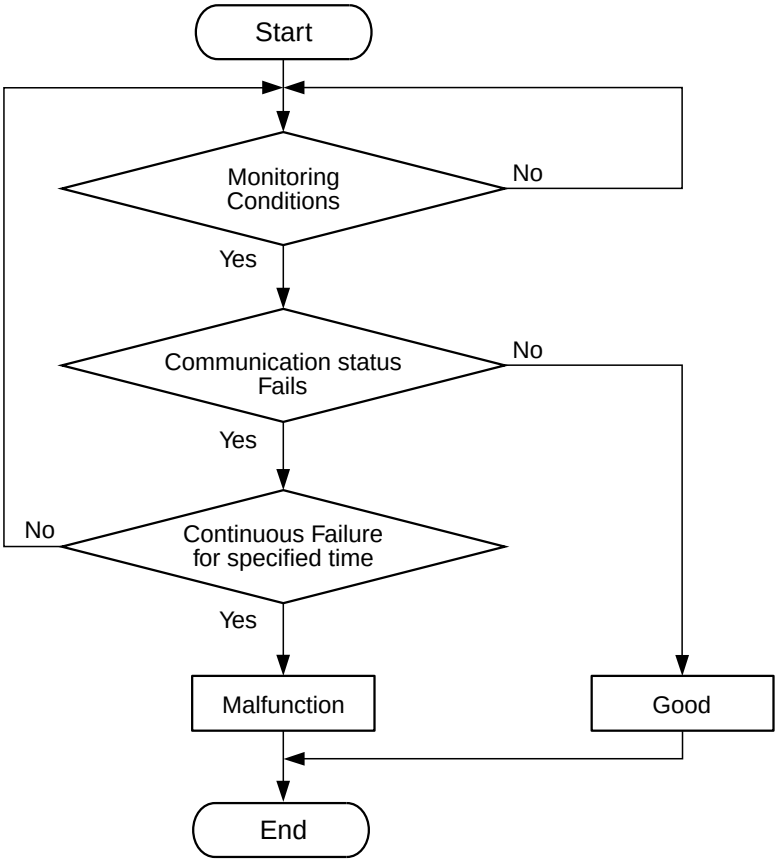
MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

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



ZK604051AA00

Check Conditions

- After 4 seconds have passed since the ignition switch was turned to "ON" position.
- Battery positive voltage is between 10 and 16.5 volts.

Judgement Criterion

- The communication between the Meter-ECU andthe ETACS-ECU has been down through the CAN bus line for 4 seconds.

OBD-II DRIVE CYCLE PATTERN

None.

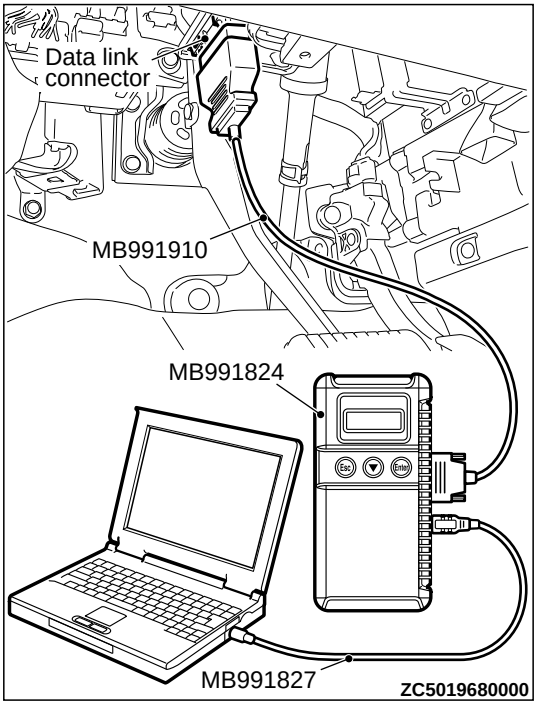
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- CAN line harness damage or connector damage.

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: 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.00-15.

NO: Repair the CAN bus line. Refer to GROUP 54D, Can bus Diagnostics Table P.54D-10. Then go to Step 2.

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

Q:Is DTC U1180 set?

YES: Retry the troubleshooting.

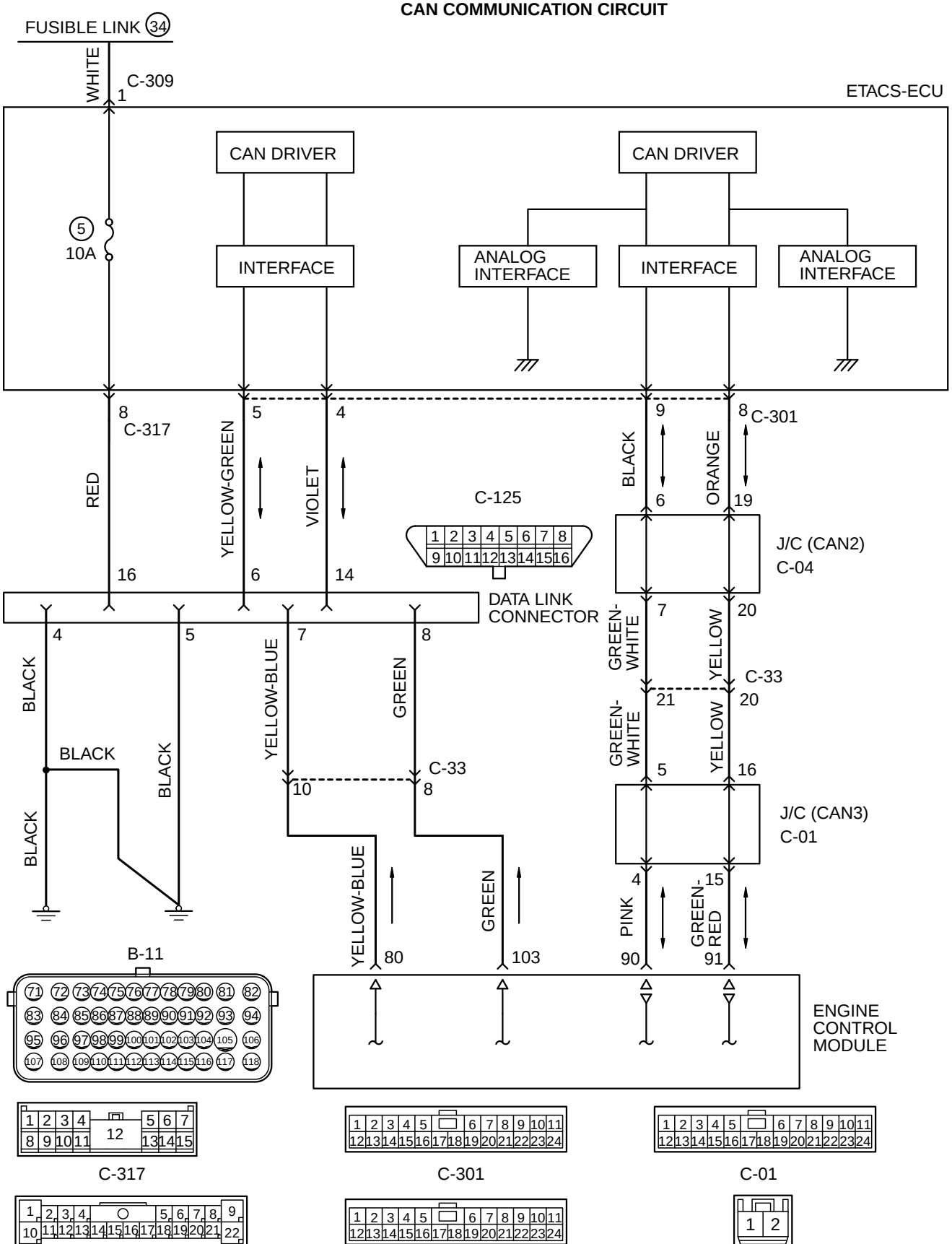
NO: The inspection is complete.

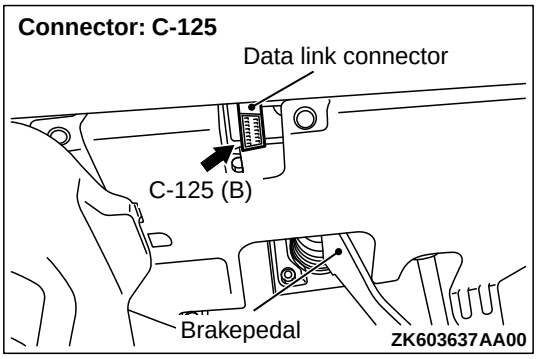
SYMPTOM PROCEDURES

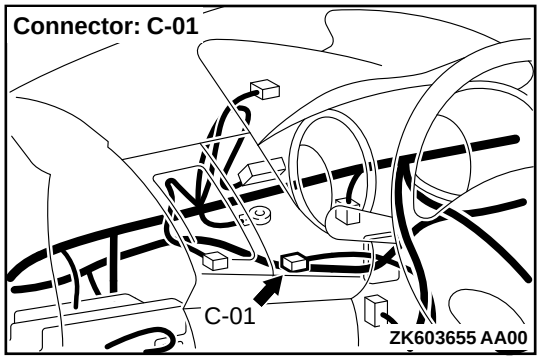
INSPECTION PROCEDURE 1: Scan Tool Communication with ECM Is Not Possible.

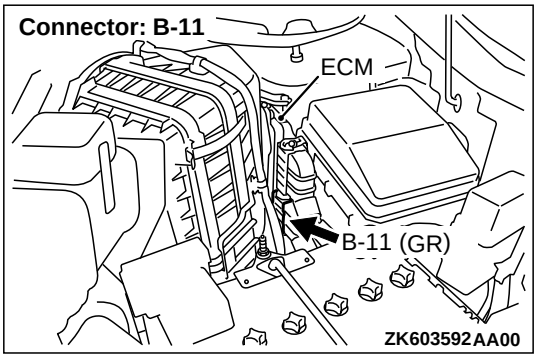
M11310100081USA0000010001

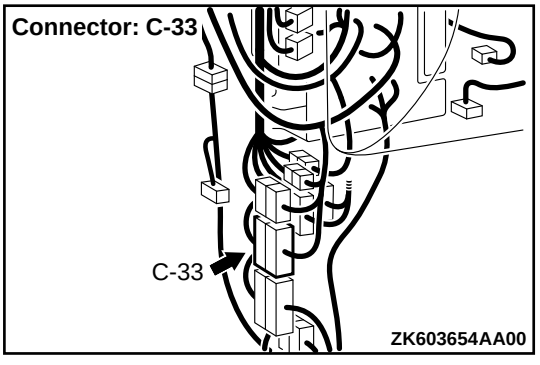
CAN COMMUNICATION CIRCUIT

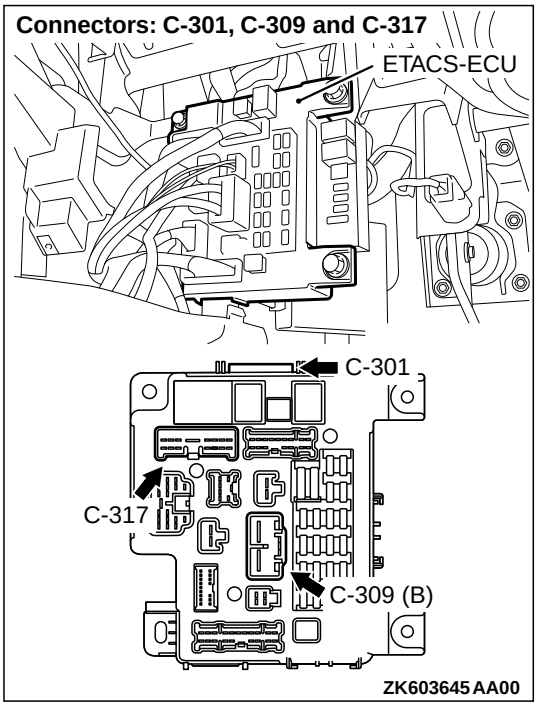


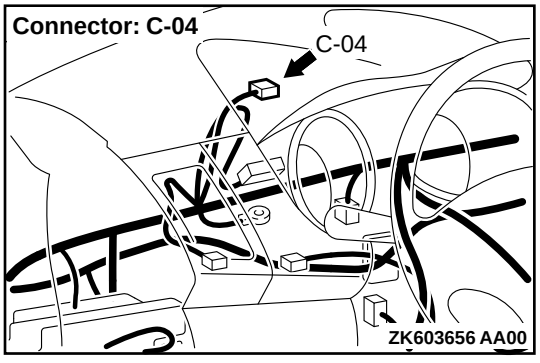












CIRCUIT OPERATION

- Battery voltage is applied to the diagnosis connector (terminal No. 16).
- The diagnosis connector (terminal No. 4 and No. 5) is grounded to the vehicle body.

COMMENT

- When the communication between M.U.T.-III and ECM is impossible, it can be suspected that the CAN bus line, power supply circuit of the diagnosis connector, and/or grounding circuit are defective.
- Communication can not be achieved either, if a wrong vehicle type is selected on M.U.T.-III.

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

- Malfunction of the data link connector.
- Open/short circuit or poor contact in the data link connector.
- Malfunction of the CAN communication.
- Malfunction of the scan tool.
- Malfunction of the ECM.

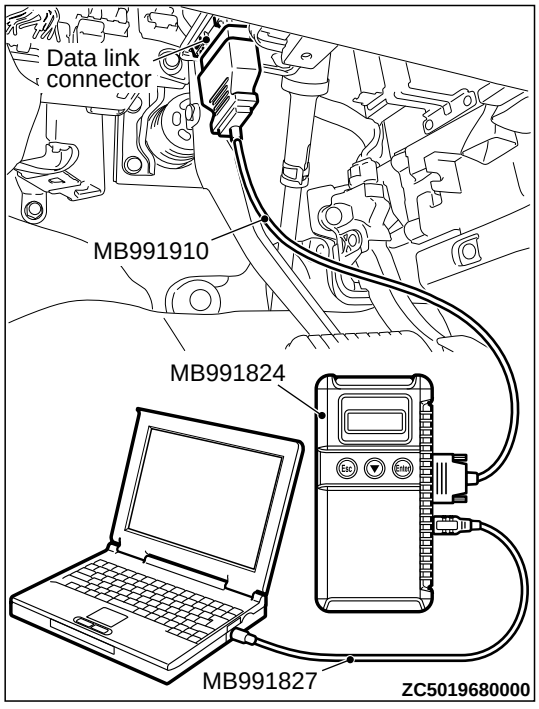
DIAGNOSIS

Required Special Tools:

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

STEP 1. Check the vehicle communication interface (V.C.I.) MB991824 operations.

(1) Connect the Scan tool to the data link connector.
(2) When the power of V.C.I. is turned to ON, the indicator lamp of the V.C.I. illuminates in green.
- The indicator lamp of the V.C.I. illuminates in green.



Q:Is the indicator lamp of the V.C.I. illuminates in green?

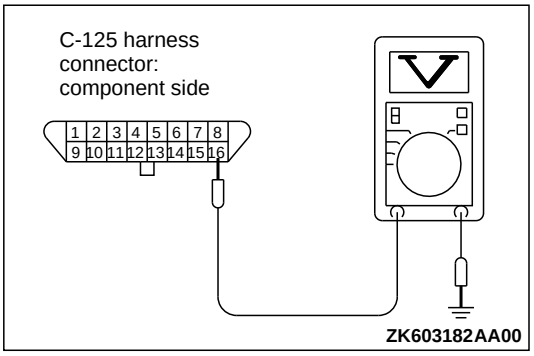
YES: Go to Step 2.
NO: Use scan tool, perform CAN bus line diagnosis.

STEP 2. Measure the battery positive voltage.

(1) Measure the battery positive voltage during cranking.
- The voltage should be 8 volts or more.

Q:Is the measured voltage 8 volts or more?

YES: Go to Step 3.
NO: Check the battery. Refer to GROUP 54A, Battery - Battery Check P.54Aa-2. Then confirm that the malfunction symptom is eliminated.



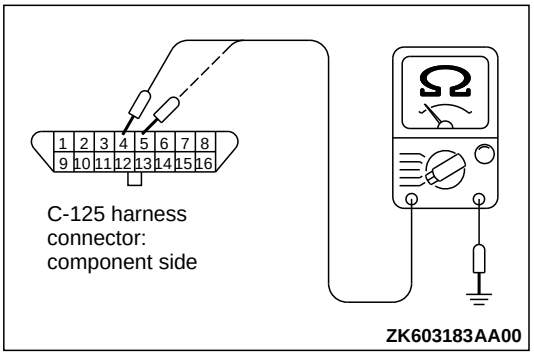
STEP 3. Measure the power supply voltage at data link connector C-125.

(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 4.

NO: Repair an open circuit between ETACS-ECU connector C-317 (terminal No. 8) and data link connector C-125 (terminal No. 16). Then confirm that the malfunction symptom is eliminated.



STEP 4. Check the continuity at data link connector C-125.

(1) Check for the continuity between terminal No. 4, No. 5 and ground.
- Should be less than 2 ohms.

Q:Does continuity exist?

YES: Check and 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: 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.

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CIRCUIT OPERATION
- The combination meter causes the malfunction indicator lamp (SERVICE ENGINE SOON or Check Engine Lamp) to illuminate for 5 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

STEP 1. 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.00-15.

NO: Replace the combination meter.

INSPECTION PROCEDURE 3: The Malfunction Indicator Lamp (SERVICE ENGINE SOON or Check Engine Lamp) Remains Illuminated and Never Goes Out.

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COMMENT

- In cases such as the above, the cause is probably that the ECM is detecting a problem in a sensor or actuator, or that one of the malfunctions listed below has probably occurred.

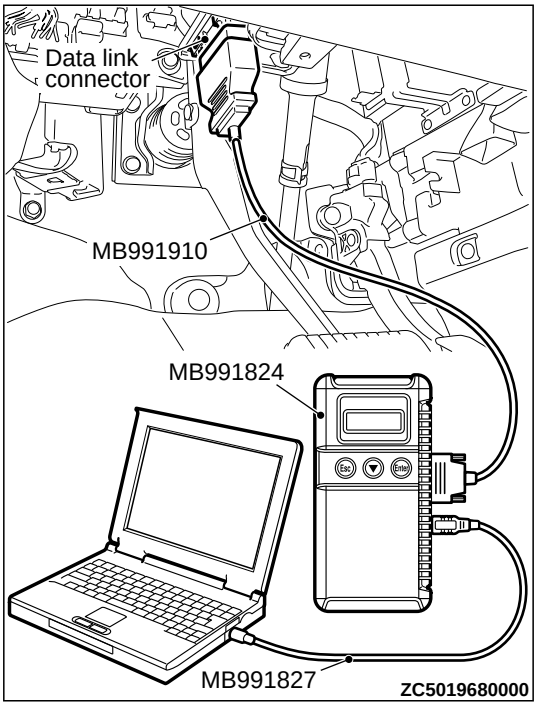
TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Short in 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 any DTC set?

YES: Refer to Diagnostic Trouble Code Chart P.13Ab-44.
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 5 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.00-15.
NO: Replace the combination meter.

INSPECTION PROCEDURE 4: Cranks, Won't Start

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Cranks, Won't Start Circuit

- Refer to Ignition circuit P.13Ab-826.

CIRCUIT OPERATION

- Refer to Ignition circuit P.13Ab-826.

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.

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

- Malfunction of the immobilizer system.

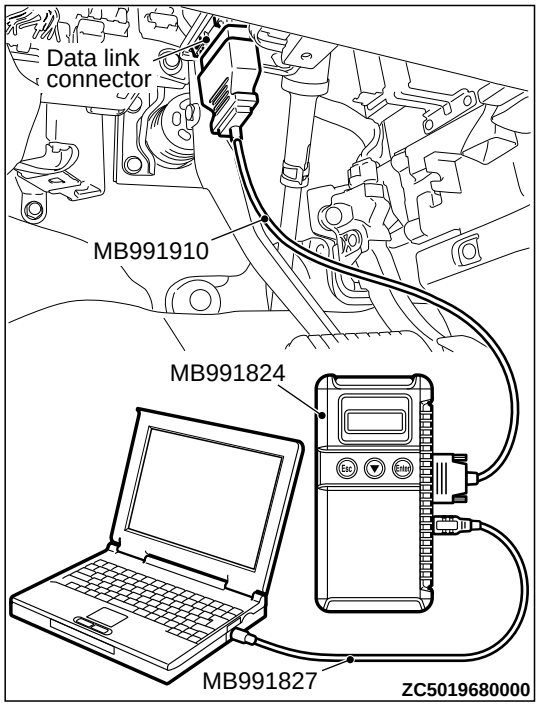
- Malfunction of the fuel pump system.
- Malfunction of the ignition system.
- Malfunction of the injector system.
- Poor compression
- Contaminated fuel.
- Malfunction of the ECM.

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 after cranking the engine for at least 2 sec.
(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.13Ab-44.
NO: Go to Step 2.

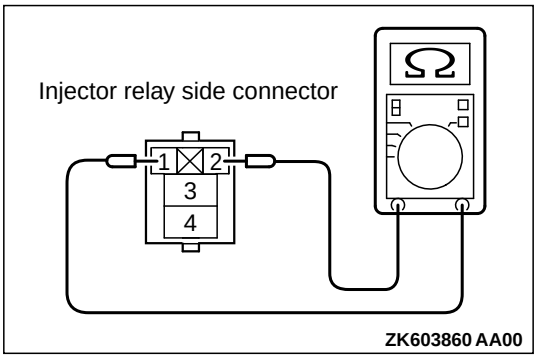
STEP 2. Check harness connector A-24X at injector relay for damage.

Q:Is the connector in good condition?

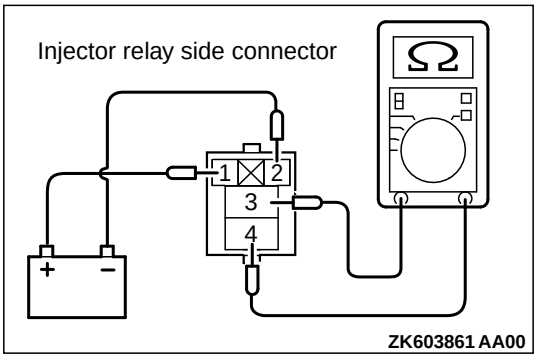
YES: Go to Step 3.
NO: Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.

STEP 3. Check the injector relay.

(1) Remove the injector relay.



(2) Check for continuity between the injector relay terminals No. 1 and No. 2.
- There should be continuity. (approximately 2 ohms)



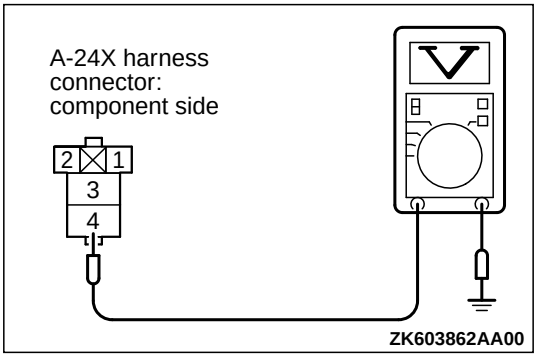
(3) Use jumper wires to connect injector relay terminal No. 1 to the positive battery terminal and terminal No. 2 to the negative battery terminal.
(4) Check for continuity between the injector relay terminals No. 3 and No. 4 while connecting and disconnecting the jumper wire at the negative battery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

(5) Install the MFI relay.

Q:Is the measured resistance within the specified range?
YES: Go to Step 4.
NO: Replace the injector relay. Then confirm that the malfunction symptom is eliminated.

STEP 4. Measure the power supply voltage at injector relay harness side connector A-24X.

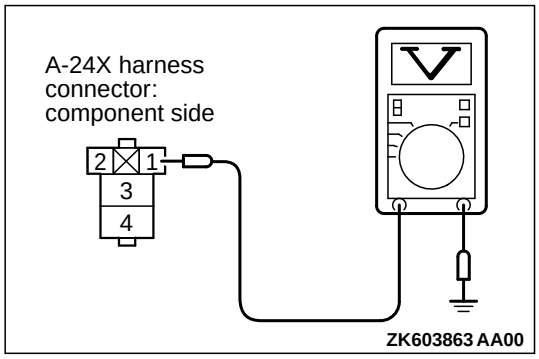
(1) Disconnect the connector A-24X and measure at the harness side.
(2) Measure the voltage between terminal No. 4 and ground.
- Voltage should measure battery positive voltage.



Q:Is battery positive voltage (approximately 12 volts) present?
YES: Go to Step 5.
NO: Repair harness wire between MFI relay connector A-33X (terminal No. 2) and injector relay connector A-24X (terminal No. 4) because of open circuit or harness damage. Then confirm that the malfunction symptom is eliminated.

STEP 5. Measure the power supply voltage at injector relay harness side connector A-24X.

(1) Disconnect the connector A-24X 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?

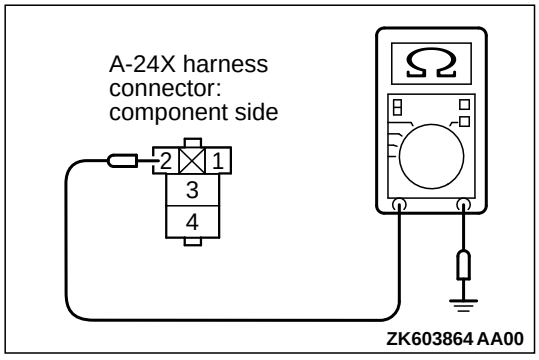
YES: Go to Step 6.

NO: Repair harness wire between ETACS-ECU connector C-304 (terminal No. 10) and injector relay connector A-24X (terminal No. 1) because of open circuit or harness damage. Then confirm that the malfunction symptom is eliminated.

STEP 6. Check for continuity at injector relay harness side connector A-24X.

(1) Disconnect the connector A-24X and measure at the harness side.

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



Q:Does continuity exist?

YES: Go to Step 7.

NO: Repair harness wire between injector relay connector A-24X (terminal No. 2) and ground because of open circuit or harness damage. 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 in the data List. Refer to Data List Reference Table P.13Ab-837.
- Item 01: Power Supply Voltage (at cranking).

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

Q:Are they 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 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.13Ab-857.
- Item 09: Fuel pump.

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

Q:Is the actuator operating properly?

YES: Go to Step 9.

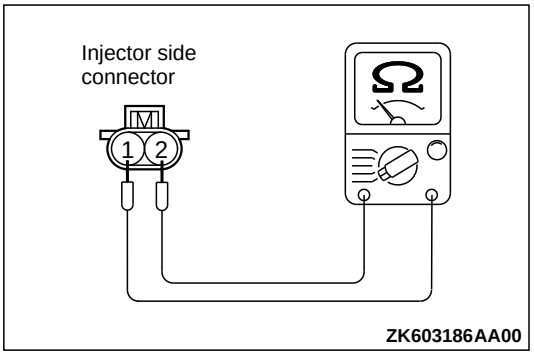
NO: Repair or replace it. Then confirm that the malfunction symptom is eliminated.

STEP 9. Check the fuel pressure.

Refer to Fuel Pressure Test P.13Aa-17.

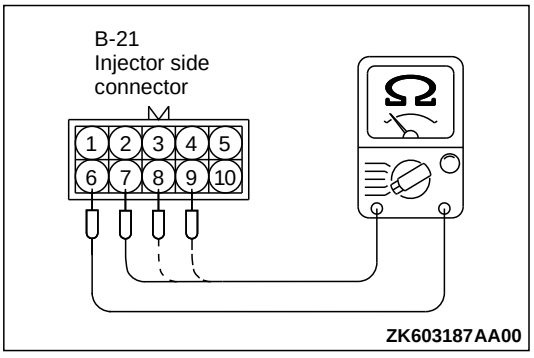
Q:Is the fuel pressure normal?
YES: Go to Step 10.
NO: Check the following items, and repair or replace the defective items.
- Insufficient fuel pump discharge.
- Fuel pump filter clogged.

STEP 10. Check the left bank injector resistance.
(1) Disconnect the left bank injector connector B-115, B-116, B-120.
(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)]



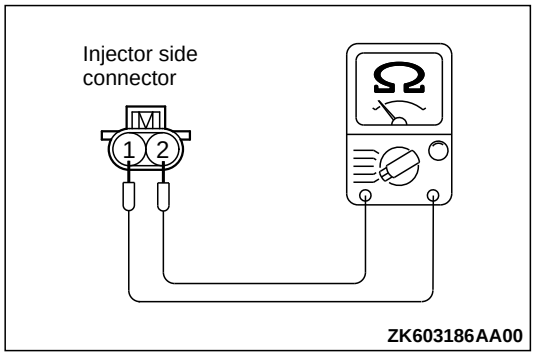
Q:Is the measured resistance between 10.5 and 13.5 ohms [at 20°C (68°F)]?
YES: Go to Step 11.
NO: Replace the faulty injector. Then confirm that the malfunction symptom is eliminated.

STEP 11. Check the right bank injector resistance at intermediate connector B-21.
(1) Disconnect the intermediate connector B-21.
(2) Measure the resistance between each male connector side terminal.
a Measure the resistance between terminal No. 6 and No. 7 at No. 1 cylinder injector.
b Measure the resistance between terminal No. 6 and No. 8 at No. 3 cylinder injector.
c Measure the resistance between terminal No. 6 and No. 9 at No. 5 cylinder injector.
- Resistance should be between 10.5 and 13.5 ohms [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 14.
NO: Go to Step 12.

STEP 12. Check the right bank injector resistance.
(1) Remove the intake manifold.
(2) Disconnect the right bank injector connector, which deviates from the standard value at Step 11.



(3) 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 13.
NO: Replace the injector. Then confirm that the malfunction symptom is eliminated.

STEP 13. Check harness connector B-101, B-103, B-104 at right bank injector for damage.
(1) Check the injector connector, which deviates from the standard value at Step 11.

Q:Is the harness connector in good condition?
YES: Repair harness wire between injector intermediate connector and right bank injector connector because of harness damage. Then confirm that the malfunction symptom is eliminated.
NO: Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.

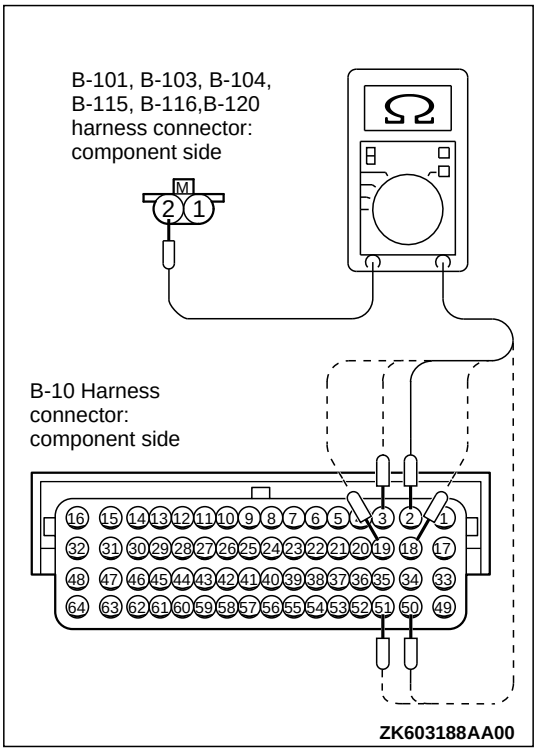
STEP 14. Check harness connector B-21 at intermediate connector for damage.

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 confirm that the malfunction symptom is eliminated.

STEP 15. Check harness connector B-10 at ECM and harness connector B-115, B-116, B-120 at left bank injector 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 confirm that the malfunction symptom is eliminated.

STEP 16. Check for harness damage between injector connector and ECM connector.
(1) Disconnect the injector connector and ECM connector.



(2) Measure the resistance between injector connector and ECM connector.
a. Injector connector B-101 (terminal No. 2) and ECM connector B-10 (terminal No. 2) at No. 1 cylinder injector.
b. Injector connector B-120 (terminal No. 2) and ECM connector B-10 (terminal No. 3) at No. 2 cylinder injector.
c. Injector connector B-103 (terminal No. 2) and ECM connector B-10 (terminal No. 18) at No. 3 cylinder injector.
d. Injector connector B-116 (terminal No. 2) and ECM connector B-10 (terminal No. 19) at No. 4 cylinder injector.
e. Injector connector B-104 (terminal No. 2) and ECM connector B-10 (terminal No. 50) at No. 5 cylinder injector.
f. Injector connector B-115 (terminal No. 2) and ECM connector B-10 (terminal No. 51) at No. 6 cylinder injector.
- Should be less than 2 ohms.

Q:Is the measured resistance less than 2 ohms?
YES: Go to Step 17.
NO: Repair it. Then confirm that the malfunction symptom is eliminated.

STEP 17. Check the ignition system.
(1) Connect the timing light to terminal No. 1 of the ignition coil connector B-01, B-04, B-05, B-15, B-18 or B-19 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 18.
NO: Refer to INSPECTION PROCEDURE 24 - Ignition Circuit System P.13Ab-826.

STEP 18. Check the spark plugs.
Refer to GROUP 16, Ignition System - On-vehicle service - Spark Plug Check P.16c-4.

Q:Are there any abnormalities?
YES: Replace the spark plug. Then confirm that the malfunction symptom is eliminated.
NO: Go to Step 19.

STEP 19. Check the ignition coil.
(1) Remove the intake manifold.
(2) Refer to GROUP 16, Ignition System - On-vehicle service - Ignition Coil Check P.16c-3.

Q:Are there any abnormalities?
YES: Replace the ignition coil. Then confirm that the malfunction symptom is eliminated.
NO: Go to Step 20.

STEP 20. Check the compression pressure.
Refer to GROUP 11A, On-vehicle service - Compression Pressure Check P.11A-17.

Q:Is the compression pressure normal?
YES: Go to Step 21.
NO: Repair it. Then confirm that the malfunction symptom is eliminated.

STEP 21. Check the ignition timing.
(1) Check the ignition timing at cranking.
Standard value: 5° BTDC ± 3°

Q:Is the ignition timing normal?
YES: Check the following items, and repair or replace the defective items.
a Check if the injectors are clogged.
.
b Check if fuel is contaminated.
.
Then confirm that the malfunction symptom is eliminated.
NO: Check for installed conditions of the timing belt.
Then confirm that the malfunction symptom is eliminated.

INSPECTION PROCEDURE 5: Starts Up and Dies.

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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.

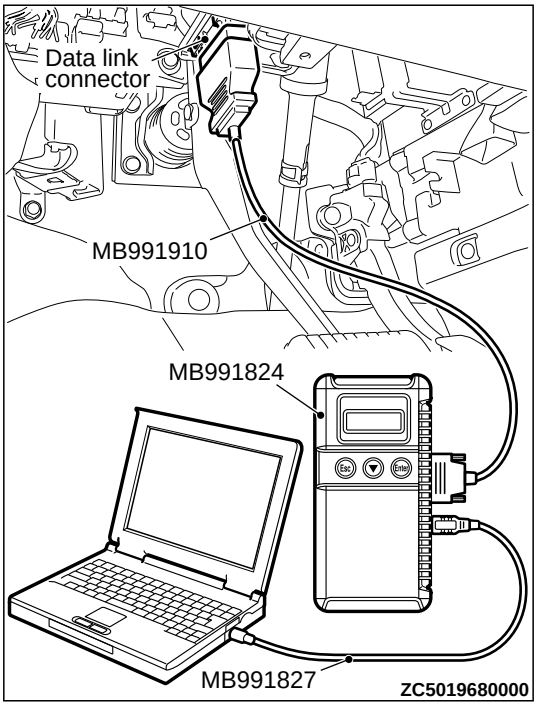
TROUBLESHOOTING HINTS (The most likely causes for this case:)
- Malfunction of the fuel pump system.
- Malfunction of the ignition system.
- Malfunction of the injector system.
- Poor compression
- Malfunction of the EGR system
- Contaminated fuel.
- Malfunction of the ECM.

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 EGR valve sounds during initialization.

Q:Is the initialization sound heard in the EGR valve?
YES: Go to Step 2.
NO: Refer to GROUP 17, Emission Control - EGR Valve (Stepper Motor) Check P.17c-14.



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 DTC set?

YES: Refer to Diagnostic Trouble Code Chart P.13Ab-44.
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.13Ab-837.
 a Item 06: Engine Coolant Temperature Sensor.
 .
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q:Is the sensor 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 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.13Ab-857.
 a Item 01: Power Supply Voltage (at Cranking)
 .
 b Item 09: Fuel Pump.
 .
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q:Is the actuator operating properly?

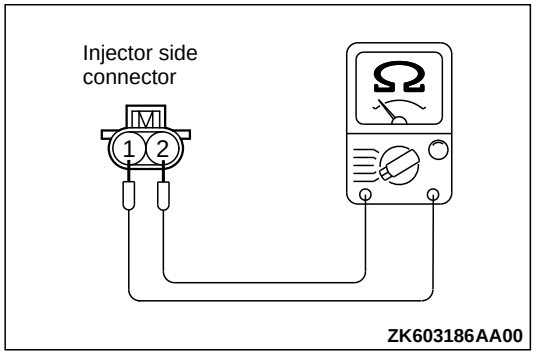
YES: Go to Step 5.
NO: Repair or replace it. Then confirm that the malfunction symptom is eliminated.

STEP 5. Check the ignition timing.

(1) Check the ignition timing at cranking.
 Standard value: 5° BTDC ± 3°

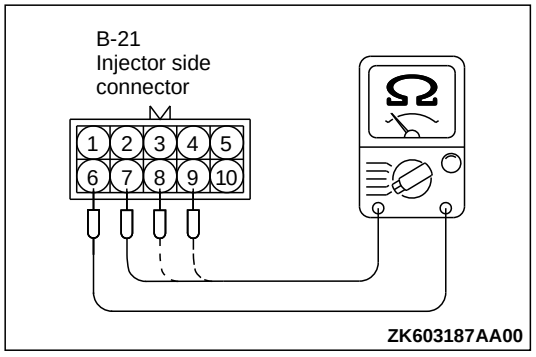
Q:Is the ignition timing normal?
YES: Go to Step 6.
NO: Check for installed conditions of the timing belt. Then confirm that the malfunction symptom is eliminated.

STEP 6. Check the left bank injector resistance.
(1) Disconnect the left bank injector connector B-115, B-116, B-120.
(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)]



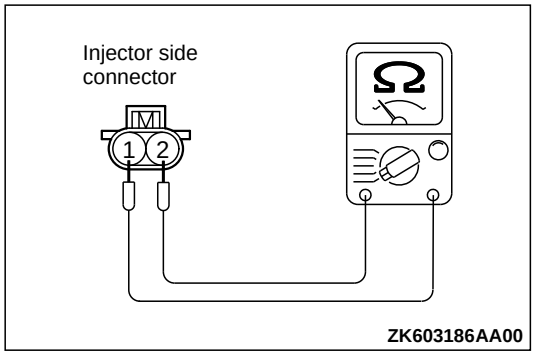
Q:Is the measured resistance between 10.5 and 13.5 ohms [at 20°C (68°F)]?
YES: Go to Step 7.
NO: Replace the faulty injector. Then confirm that the malfunction symptom is eliminated.

STEP 7. Check the right bank injector resistance at intermediate connector B-21.
(1) Disconnect the intermediate connector B-21.
(2) Measure the resistance between each male connector side terminal.
a. Measure the resistance between terminal No. 6 and No. 7 at No. 1 cylinder injector.
b. Measure the resistance between terminal No. 6 and No. 8 at No. 3 cylinder injector.
c. Measure the resistance between terminal No. 6 and No. 9 at No. 5 cylinder injector.
- Resistance should be between 10.5 and 13.5 ohms [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: Go to Step 8.

STEP 8. Check the right bank injector resistance.
(1) Remove the intake manifold.
(2) Disconnect the right bank injector connector, which deviates from the standard value at Step 7.
(3) 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 9.
NO: Replace the injector. Then confirm that the malfunction symptom is eliminated.

STEP 9. Check harness connector B-101, B-103, B-104 at right bank injector for damage.

(1) Check the injector connector, which deviates from the standard value at Step 7.

Q:Is the harness connector in good condition?

YES: Repair harness wire between injector intermediate connector and right bank injector connector because of harness damage. Then confirm that the malfunction symptom is eliminated.

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 harness connector B-21 at intermediate connector 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 harness connector B-115, B-116, B-120 at left bank injector for damage.

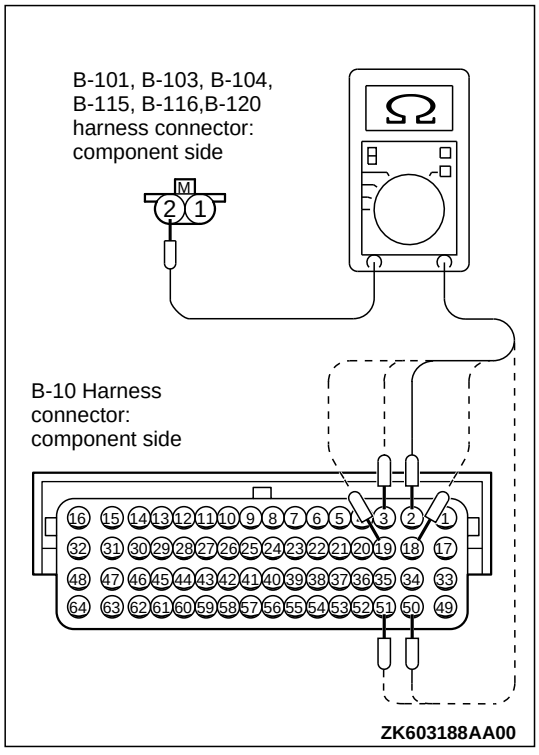
Q:Is the harness connector in good condition?

YES: Go to Step 12.

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

STEP 12. Check for harness damage between injector connector and ECM connector.

(1) Disconnect the injector connector and ECM connector.



(2) Measure the resistance between injector connector and ECM connector.
a. Injector connector B-101 (terminal No. 2) and ECM connector B-10 (terminal No. 2) at No. 1 cylinder injector.
b. Injector connector B-120 (terminal No. 2) and ECM connector B-10 (terminal No. 3) at No. 2 cylinder injector.
c. Injector connector B-103 (terminal No. 2) and ECM connector B-10 (terminal No. 18) at No. 3 cylinder injector.
d. Injector connector B-116 (terminal No. 2) and ECM connector B-10 (terminal No. 19) at No. 4 cylinder injector.
e. Injector connector B-104 (terminal No. 2) and ECM connector B-10 (terminal No. 50) at No. 5 cylinder injector.
f. Injector connector B-115 (terminal No. 2) and ECM connector B-10 (terminal No. 51) at No. 6 cylinder injector.

Q:Is the measured resistance less than 2 ohms?
YES: Go to Step 13.
NO: Repair it. Then confirm that the malfunction symptom is eliminated.

STEP 13. 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 14.
NO: Check for installed conditions of the timing belt. Then confirm that the malfunction symptom is eliminated.

STEP 14. Check the spark plugs.
Refer to GROUP 16, Ignition System - On-vehicle service - Spark Plug Check P.16c-4.

Q:Are there any abnormalities?
YES: Replace the spark plug. Then confirm that the malfunction symptom is eliminated.
NO: Go to Step 15.

STEP 15. Check the ignition coil.
(1) Remove the intake manifold.
(2) Refer to GROUP 16, Ignition System - On-vehicle service - Ignition Coil Check P.16c-3.

Q:Are there any abnormalities?
YES: Replace the ignition coil. Then confirm that the malfunction symptom is eliminated.
NO: Go to Step 16.

STEP 16. Check the compression pressure.
Refer to GROUP 11A, On-vehicle service - Compression Pressure Check P.11A-17.

Q:Is the compression pressure normal?

YES: Check the following items, and repair or replace the defective items.
a Check fuel lines for clogging.
.
b Check if fuel is contaminated.
.
c Check if the injectors are clogged.
.
Then confirm that the malfunction symptom is eliminated.
NO: Repair it. Then confirm that the malfunction symptom is eliminated.

INSPECTION PROCEDURE 6: Hard Starting

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COMMENT
- In cases such as the above, the cause is usually either weak spark, improper air-fuel mixture or low compression.

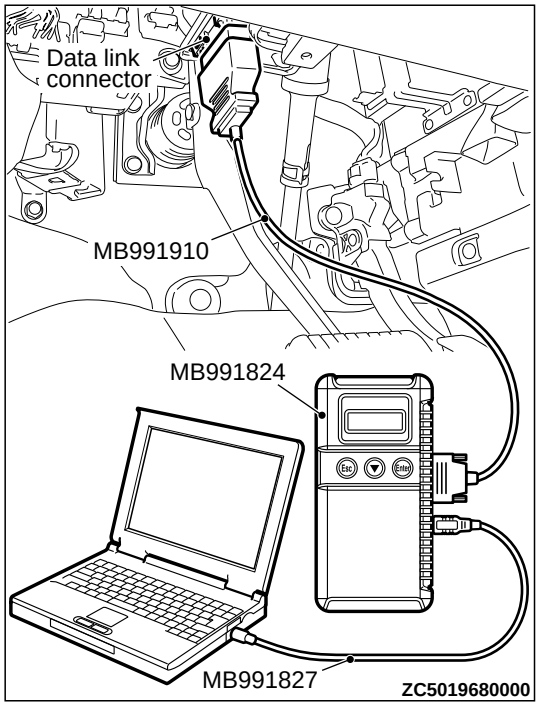
TROUBLESHOOTING HINTS (The most likely causes for this case:)
- Malfunction of the fuel pump system.
- Malfunction of the ignition system.
- Malfunction of the injector system.
- Poor compression
- Malfunction of the EGR system
- Contaminated fuel.
- Malfunction of the ECM.

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 EGR valve sounds during initialization.

Q:Is the initialization sound heard in the EGR valve?
YES: Go to Step 2.
NO: Refer to GROUP 17, Emission Control - EGR Valve (Stepper Motor) Check P.17c-14.



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 the "LOCK" (OFF) position.

Q:Is any DTC set?

YES: Refer to Diagnostic Trouble Code Chart P.13Ab-44.
NO: Go to Step 3.

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

(1) Turn the ignition switch the "ON" position.
(2) Check the following items in the data list. Refer to Data List Reference Table P.13Ab-837.
a Item 01: Power Supply Voltage (at Cranking)
.
b Item 06: Engine Coolant Temperature Sensor.
.
(3) Turn the ignition switch the "LOCK" (OFF) position.

Q:Is the sensor operating properly?

YES: Go to Step 4.
NO: Repair or Replace. Then confirm that the malfunction symptom is eliminated.

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.13Ab-857.
a Item 09: 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. Then confirm that the malfunction symptom is eliminated.

STEP 5. Check the ignition timing.

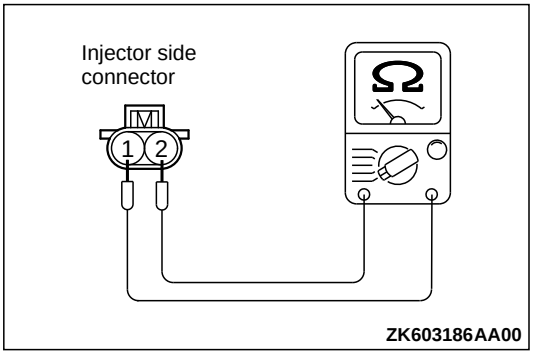
(1) Check the ignition timing at cranking.
Standard value: 5° BTDC ± 3°

Q:Is the ignition timing normal?
YES: Go to Step 6.
NO: Check for installed conditions of the timing belt. Then confirm that the malfunction symptom is eliminated.

STEP 6. Check the fuel pressure.
Refer to Fuel Pressure Test P.13Aa-17.

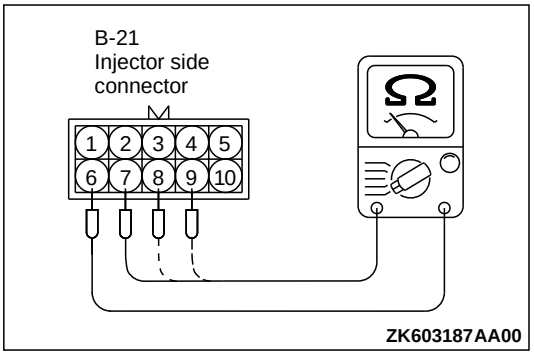
Q:Is the fuel pressure normal?
YES: Go to Step 7.
NO: Check the following items, and repair or replace the defective items.
- Insufficient fuel pump discharge.
- Fuel pump filter clogged.

STEP 7. Check the left bank injector resistance.
(1) Disconnect the left bank injector connector B-115, B-116, B-120.
(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)]



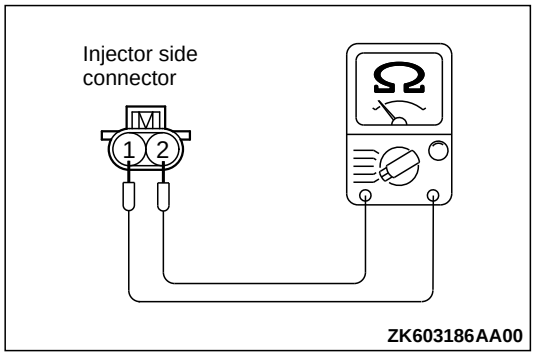
Q:Is the measured resistance between 10.5 and 13.5 ohms [at 20°C (68°F)]?
YES: Go to Step 8.
NO: Replace the faulty injector. Then confirm that the malfunction symptom is eliminated.

STEP 8. Check the right bank injector resistance at intermediate connector B-21.
(1) Disconnect the intermediate connector B-21.
(2) Measure the resistance between each male connector side terminal.
a Measure the resistance between terminal No. 6 and No. 7 at No. 1 cylinder injector.
b Measure the resistance between terminal No. 6 and No. 8 at No. 3 cylinder injector.
c Measure the resistance between terminal No. 6 and No. 9 at No. 5 cylinder injector.
- Resistance should be between 10.5 and 13.5 ohms [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 11.
NO: Go to Step 9.

STEP 9. Check the right bank injector resistance.
(1) Remove the intake manifold.
(2) Disconnect the right bank injector connector, which deviates from the standard value at Step 8.



(3) 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 10.
NO: Replace the injector. Then confirm that the malfunction symptom is eliminated.

STEP 10. Check harness connector B-101, B-103, B-104 at right bank injector for damage.
(1) Check the injector connector, which deviated from the standard value listed in Step 8.

Q:Is the harness connector in good condition?
YES: Repair harness wire between injector intermediate connector and right bank injector connector because of harness damage. Then confirm that the malfunction symptom is eliminated.
NO: Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.

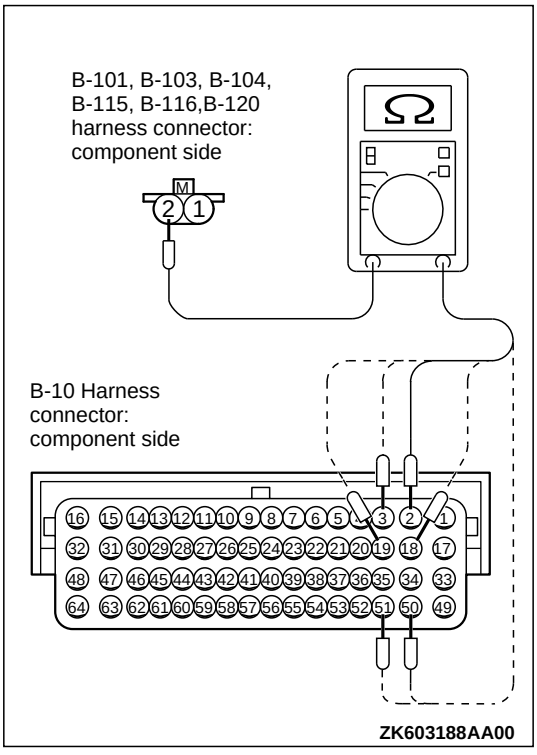
STEP 11. Check harness connector B-21 at the intermediate connector for damage.

Q:Is the harness connector in good condition?
YES: Go to Step 12.
NO: Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.

STEP 12. Check harness connector B-10 at ECM and harness connector B-115, B-116, B-120 at the left bank injector 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 confirm that the malfunction symptom is eliminated.

STEP 13. Check for harness damage between injector connector and ECM connector.
(1) Disconnect the injector connector and ECM connector.



(2) Measure the resistance between injector connector and ECM connector.
a. Injector connector B-101 (terminal No. 2) and ECM connector B-10 (terminal No. 2) at No. 1 cylinder injector.
b. Injector connector B-120 (terminal No. 2) and ECM connector B-10 (terminal No. 3) at No. 2 cylinder injector.
c. Injector connector B-103 (terminal No. 2) and ECM connector B-10 (terminal No. 18) at No. 3 cylinder injector.
d. Injector connector B-116 (terminal No. 2) and ECM connector B-10 (terminal No. 19) at No. 4 cylinder injector.
e. Injector connector B-104 (terminal No. 2) and ECM connector B-10 (terminal No. 50) at No. 5 cylinder injector.
f. Injector connector B-115 (terminal No. 2) and ECM connector B-10 (terminal No. 51) at No. 6 cylinder injector.

Q:Is the measured resistance less than 2 ohms?
YES: Go to Step 14.
NO: Repair it. Then confirm that the malfunction symptom is eliminated.

STEP 14. Check the ignition system.
(1) Connect the timing light to terminal No. 3 of the ignition coil connector B-01, B-04, B-05, B-15, B-18 or B-19 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 15.
NO: Refer to INSPECTION PROCEDURE 24 - Ignition Circuit System P.13Ab-826.

STEP 15. Check the spark plugs.
Refer to GROUP 16, Ignition System - On-vehicle service - Spark Plug Check P.16c-4.

Q:Are there any abnormalities?
YES: Replace the spark plug. Then confirm that the malfunction symptom is eliminated.
NO: Go to Step 16.

STEP 16. Check the ignition coil.
(1) Remove the intake manifold.
(2) Refer to GROUP 16, Ignition System - On-vehicle service - Ignition Coil Check P.16c-3.

Q:Are there any abnormalities?
YES: Replace the ignition coil. Then confirm that the malfunction symptom is eliminated.
NO: Go to Step 17.

STEP 17. Check the compression pressure.
Refer to GROUP 11A, On-vehicle service - Compression Pressure Check P.11A-17.

Q:Is the compression pressure normal?
YES: Check the following items, and repair or replace the defective items.
a Check if fuel is contaminated.
.
b Check if the injectors are clogged.
.
Then confirm that the malfunction symptom is eliminated.
NO: Repair it. Then confirm that the malfunction symptom is eliminated.

INSPECTION PROCEDURE 7: Unstable Idle (rough idle, hunting).

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COMMENT
- In cases such as the above, the cause is probably the air/fuel mixture. Other systems affecting idle quality include the ignition system and compression.

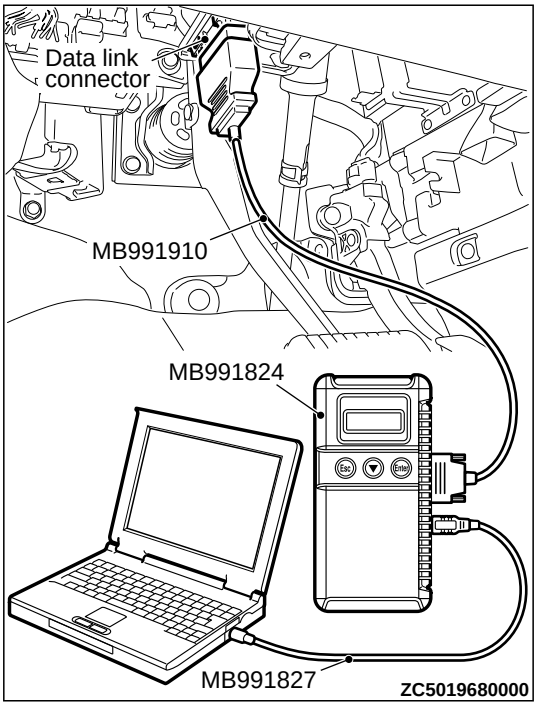
TROUBLESHOOTING HINTS (The most likely causes for this case:)
- Malfunction of the fuel pump system.
- Malfunction of the ignition system.
- Malfunction of the injector system.
- Poor compression
- Malfunction of the purge control system
- Malfunction of the EGR system
- Improper operation of the PCV valve.
- Malfunction of the charging system.
- Vacuum leak.
- Contaminated fuel.
- Malfunction of the ECM.

DIAGNOSIS

Required Special Tools:
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A
  - MB992110: Power Plant ECU Check Harness

STEP 1. Check if the EGR valve sounds during initialization.

Q:Is the initialization sound heard in the EGR valve?
YES: Go to Step 2.
NO: Refer to GROUP 17, Emission Control - EGR Valve (Stepper Motor) Check P.17c-14.



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 any DTC set?

YES: Refer to Diagnostic Trouble Code Chart P.13Ab-44.
NO: Go to Step 3.

STEP 3. Using scan tool MB991958, check actuator test items 1, 2, 3, 4, 5, 6: 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.13Ab-857.
 a Item 01: Injector.
 b Item 10: Evaporative emission purge solenoid
(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. 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.13Ab-837.
 a Item 05: Intake Air Temperature Sensor.
 b Item 06: Engine Coolant Temperature Sensor.
 c Item 10: Mass Airflow Sensor
 d Item 76: A/C Switch
(3) 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.

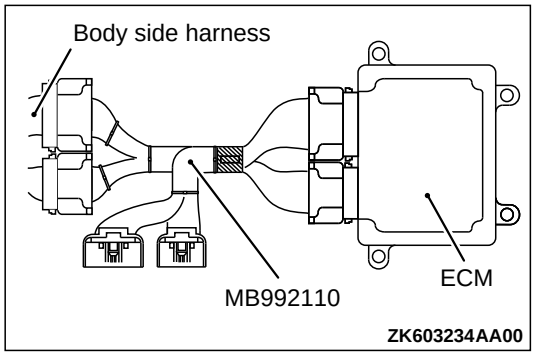
STEP 5. Check the fuel pressure.
Refer to Fuel Pressure Test P.13Aa-17.

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 ignition timing.
Refer to GROUP 11A, On-vehicle Service - Ignition Timing Check P.11A-14.

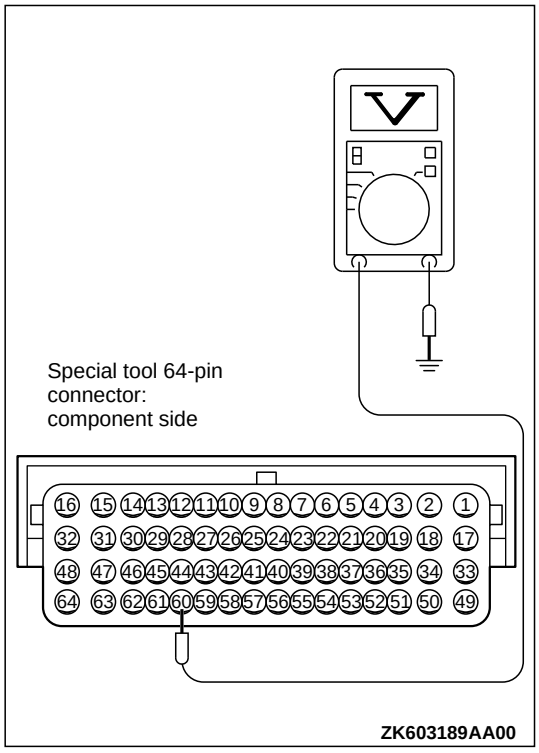
Q:Is the ignition timing normal?
YES: Go to Step 7.
NO: Check for installed conditions of the timing belt. Then confirm that the malfunction symptom is eliminated.

STEP 7. Measure the voltage at ECM connector B-10 by using check harness special tool MB992110.



(1) Disconnect all ECM connectors. Connect the check harness special tool MB992110 between the separated connectors.
(2) Start the engine and run at idle.

NOTE: 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.



(3) Measure the voltage between terminal No. 60 and ground.
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 harness measured voltage within the specified range?
YES: Go to Step 8.
NO: Replace the generator. Then confirm that the malfunction symptom is eliminated.

STEP 8. Check the spark plugs.
Refer to GROUP 16, Ignition System - On-vehicle service - Spark Plug Check P.16c-4.

Q:Are there any abnormalities?
YES: Replace the spark plug. Then confirm that the malfunction symptom is eliminated.
NO: Go to Step 9.

STEP 9. Check the ignition coil.
(1) Remove the intake manifold.
(2) Refer to GROUP 16, Ignition System - On-vehicle service - Ignition Coil Check P.16c-3.

Q:Are there any abnormalities?
YES: Replace the ignition coil. Then confirm that the malfunction symptom is eliminated.
NO: Go to Step 10.

STEP 10. Check the compression pressure.
Refer to GROUP 11A, On-vehicle service - Compression Pressure Check P.11A-17.

Q:Is the compression pressure normal?
YES: Go to Step 11.
NO: Repair it. Then confirm that the malfunction symptom is eliminated.

STEP 11. Check the positive crankcase ventilation valve.
Refer to GROUP 17, Emission Control System - Positive Crankcase Ventilation Check P.17c-8.

Q:Is the positive crankcase ventilation valve?
YES: Go to Step 12.
NO: Repair it. Then confirm that the malfunction symptom is eliminated.

STEP 12. Check the purge control system.
Refer to GROUP 17, Emission Control System - Purge Control System Check (Purge Flow Check) P.17c-11.

Q:Is the purge control system normal?
YES: Check the following items, and repair or replace the defective items.
a Vacuum leak.
.
b Check if fuel is contaminated.
.
c Check if the injectors are clogged.
.
Then confirm that the malfunction symptom is eliminated.
NO: Repair it. Then confirm that the malfunction symptom is eliminated.

INSPECTION PROCEDURE 8: Idle speed is high (improper idle speed).

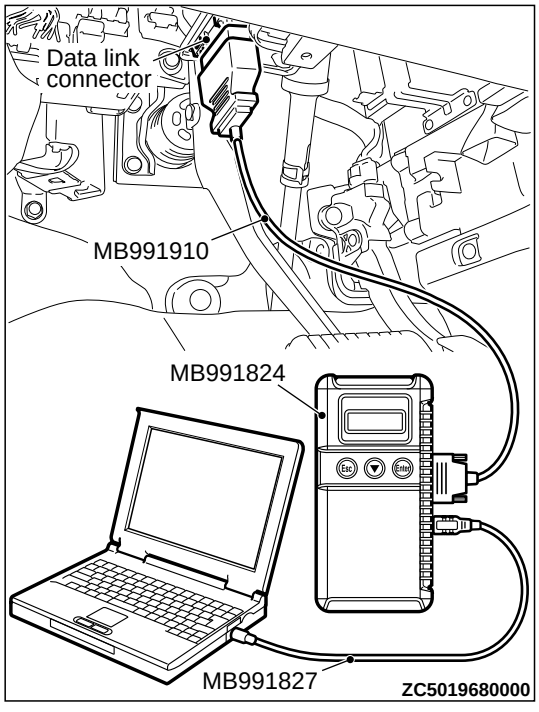
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COMMENT

- 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 engine coolant temperature sensor signal.
- Malfunction of the accelerator pedal position sensor (main) signal.
- Malfunction of the accelerator pedal position sensor (sub) signal.
- Malfunction of the A/C switch signal.
- Malfunction of the power steering pressure sensor signal.
- Malfunction of the purge control system.
- Malfunction of the ECM.



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 any DTC set?

YES: Refer to Diagnostic Trouble Code Chart P.13Ab-44.
NO: Go to Step 2.

STEP 2. 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.13Ab-837.
a Item 06: Engine Coolant Temperature Sensor.
.

b Item 11: Accelerator pedal position sensor (main)

c Item 12: Accelerator pedal position sensor (sub)

d Item 76: A/C switch

e Item 24: Power steering pressure sensor

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

Q:Is the sensor operating properly?
YES: Refer to GROUP 17, Emission Control System - Evaporative Emission Purge Solenoid Check P.17c-12.
NO: Repair or replace it. Then confirm that the malfunction symptom is eliminated.

INSPECTION PROCEDURE 9: Idle Speed Is Low (improper idle speed).

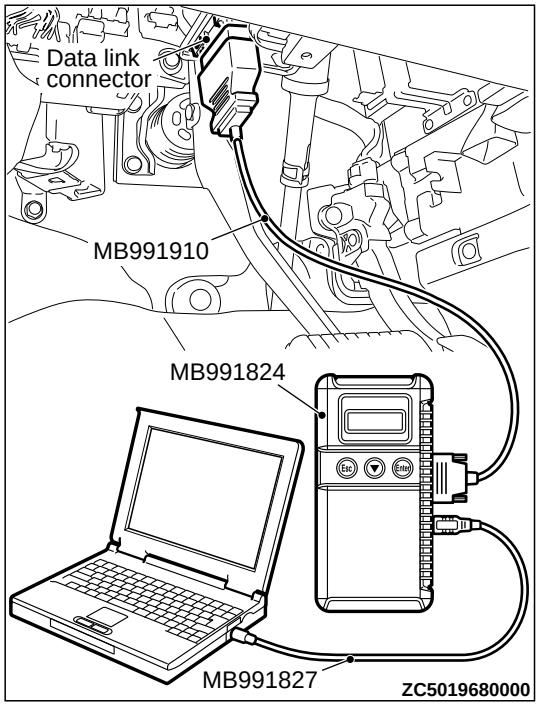
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COMMENT
- In cases such as the above, the cause is probably that the intake air volume during idle is too small.

TROUBLESHOOTING HINTS (The most likely causes for this case:)
- Malfunction of the engine coolant temperature sensor signal.
- Malfunction of the torque converter.
- Malfunction of the ECM.

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 any DTC set?

YES: Refer to Diagnostic Trouble Code Chart P.13Ab-44.
NO: Go to Step 2.

STEP 2. 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.13Ab-837.
a Item 06: Engine Coolant Temperature Sensor.
.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q:Is the sensor operating properly?

YES: Refer to GROUP 23A, Automatic Transaxle Diagnosis - Torque Converter Stall Test P.23A-21.
NO: Repair or replace it. Then confirm that the malfunction symptom is eliminated.

INSPECTION PROCEDURE 10: When the engine is cold, it stalls at idle (die out).

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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 fuel pump system.
- Malfunction of the ignition system.
- Poor compression
- Malfunction of the EGR system
- Improper operation of the PCV valve.
- Improper engine oil viscosity
- Malfunction of the ECM.

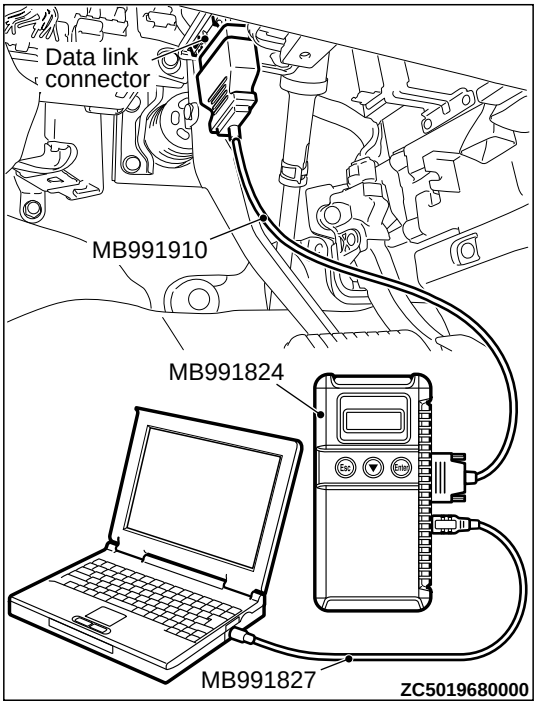
DIAGNOSIS

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 EGR valve sounds during initialization.

Q:Is the initialization sound heard in the EGR valve?
YES: Go to Step 2.
NO: Refer to GROUP 17, Emission Control - EGR Valve (Stepper Motor) Check P.17c-14.

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 any DTC set?
YES: Refer to Diagnostic Trouble Code Chart P.13Ab-44.
NO: Go to Step 3.

STEP 3. Using scan tool MB991958, check actuator test items 1, 2, 3, 4, 5, 6: 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.13Ab-857.
a Item 01: Injector.
.
(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. 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.13Ab-837.
a Item 06: 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.
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 for installed conditions of the timing belt. Then confirm that the malfunction symptom is eliminated.

STEP 6. Check the fuel pressure.
Refer to Fuel Pressure Test P.13Aa-17.

Q:Is the fuel pressure normal?
YES: Go to Step 7.
NO: Repair or replace it. Then confirm that the malfunction symptom is eliminated.

STEP 7. Check the spark plugs.
Refer to GROUP 16, Ignition System - On-vehicle service - Spark Plug Check P.16c-4.

Q:Are there any abnormalities?
YES: Replace the spark plug. Then confirm that the malfunction symptom is eliminated.
NO: Go to Step 8.

STEP 8. Check the ignition coil.
(1) Remove the intake manifold.
(2) Refer to GROUP 16, Ignition System - On-vehicle service - Ignition Coil Check P.16c-3.

Q:Are there any abnormalities?
YES: Replace the ignition coil. Then confirm that the malfunction symptom is eliminated.
NO: Go to Step 9.

STEP 9. Check the compression pressure.
Refer to GROUP 11A, On-vehicle service - Compression Pressure Check P.11A-17.

Q:Is the compression pressure normal?
YES: Check the engine oil viscosity. Then confirm that the malfunction symptom is eliminated.
NO: Repair it. Then confirm that the malfunction symptom is eliminated.

INSPECTION PROCEDURE 11: When the Engine Is Hot, It Stalls at Idle (die out).

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COMMENT

- In cases such as the above, the ignition system, air/fuel mixture 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 fuel pump system.
- Malfunction of the ignition system.
- Poor compression
- Malfunction of the EGR system
- Improper operation of the PCV valve.
- Vacuum leak.
- Malfunction of the ECM.

DIAGNOSIS

Required Special Tools:

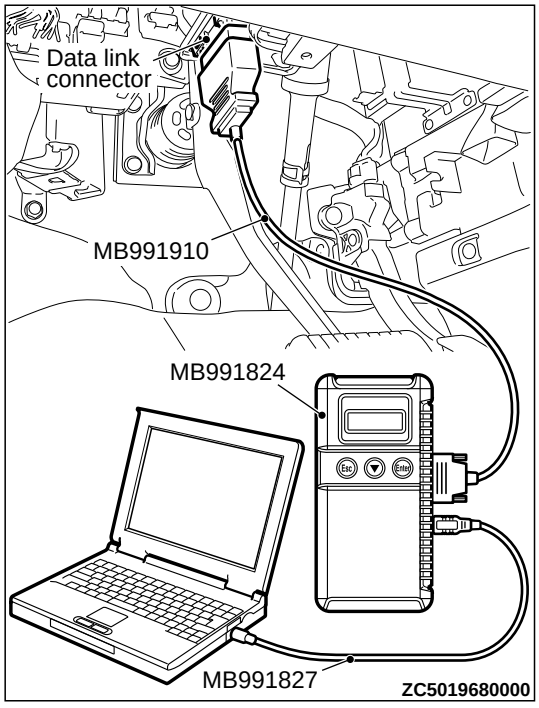
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A

STEP 1. Check if the EGR valve sounds during initialization.

Q:Is the initialization sound heard in the EGR valve?

YES: Go to Step 2.

NO: Refer to GROUP 17, Emission Control - EGR Valve (Stepper Motor) Check P.17c-14.



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 any DTC set?

YES: Refer to Diagnostic Trouble Code Chart P.13Ab-44.
NO: Go to Step 3.

STEP 3. Using scan tool MB991958, check actuator test items 1, 2, 3, 4, 5, 6: 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.13Ab-857.
a Item 01: Injector.
.
(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. 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.13Ab-837.
a Item 05: Intake Air Temperature Sensor.
.
b Item 06: Engine Coolant Temperature Sensor.
.
c Item 13: Throttle position sensor (main).
.
(3) 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. Check the fuel pressure.
Refer to Fuel Pressure Test P.13Aa-17.

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 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 7.
NO: Check for installed conditions of the timing belt. Then confirm that the malfunction symptom is eliminated.

STEP 7. Check the spark plugs.
Refer to GROUP 16, Ignition System - On-vehicle service - Spark Plug Check P.16c-4.

Q:Are there any abnormalities?
YES: Replace the spark plug. Then confirm that the malfunction symptom is eliminated.
NO: Go to Step 8.

STEP 8. Check the ignition coil.
(1) Remove the intake manifold.
(2) Refer to GROUP 16, Ignition System - On-vehicle service - Ignition Coil Check P.16c-3.

Q:Are there any abnormalities?
YES: Replace the ignition coil. Then confirm that the malfunction symptom is eliminated.
NO: Go to Step 9.

STEP 9. Check the compression pressure.
Refer to GROUP 11A, On-vehicle service - Compression Pressure Check P.11A-17.

Q:Is the compression pressure normal?
YES: Go to Step 10.
NO: Repair it. Then confirm that the malfunction symptom is eliminated.

STEP 10. Check the positive crankcase ventilation valve.
Refer to GROUP 17, Emission Control System - Positive Crankcase Ventilation Check P.17c-19.

Q:Is the positive crankcase ventilation valve?
YES: Go to Step 11.
NO: Repair it. Then confirm that the malfunction symptom is eliminated.

STEP 11. Engine stall reproduction test.

Q:Is it easy to reproduce the engine stall?
YES: Check the following items, and repair or replace the defective items.

a Vacuum leak.
b Check if fuel is contaminated.
c Check if the injectors are clogged.
d Check if the foreign materials (water, kerosene, etc.) got into fuel.

Then confirm that the malfunction symptom is eliminated.

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 ECM or PCM power supply voltage.

Then confirm that the malfunction symptom is eliminated.

INSPECTION PROCEDURE 12: The Engine Stalls when Accelerating (pass out).

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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:)

- Malfunction of the ignition system.
- Malfunction of the purge control system.
- Malfunction of the EGR system
- Improper operation of the PCV valve.
- Vacuum leak.
- Malfunction of the ECM.

DIAGNOSIS

Required Special Tools:

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

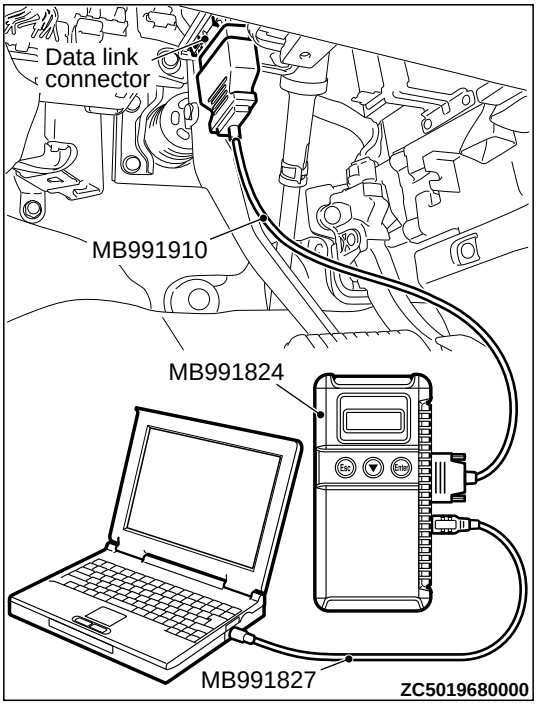
STEP 1. Check if the EGR valve sounds during initialization.

Q:Is the initialization sound heard in the EGR valve?

YES: Go to Step 2.

NO: Refer to GROUP 17, Emission Control - EGR Valve (Stepper Motor) Check P.17c-14.

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 any DTC set?

YES: Refer to Diagnostic Trouble Code Chart P.13Ab-44.
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.13Ab-857.
 a Item 08: Evaporative Emission Purge Solenoid.
 .
(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. Check the spark plugs.

Refer to GROUP 16, Ignition System - On-vehicle service - Spark Plug Check P.16c-4.

Q:Are there any abnormalities?

YES: Replace the spark plug. Then confirm that the malfunction symptom is eliminated.
NO: Go to Step 5.

STEP 5. Check the ignition coil.

(1) Remove the intake manifold.
(2) Refer to GROUP 16, Ignition System - On-vehicle service - Ignition Coil Check P.16c-3.

Q:Are there any abnormalities?

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

NO: Go to Step 6.

STEP 6. Check the positive crankcase ventilation valve.
Refer to GROUP 17, Emission Control System - Positive Crankcase Ventilation Check P.17c-8.

Q:Is the positive crankcase ventilation valve?
YES: Check the following items, and repair or replace the defective items.
a Vacuum leak.
.
Then confirm that the malfunction symptom is eliminated.
NO: Repair it. Then confirm that the malfunction symptom is eliminated.

INSPECTION PROCEDURE 13: The engine stalls when decelerating.

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COMMENT
- Abnormal air/fuel ratio or other similar defects due to insufficient intake air volume and defective EGR system is suspected to be the causes.

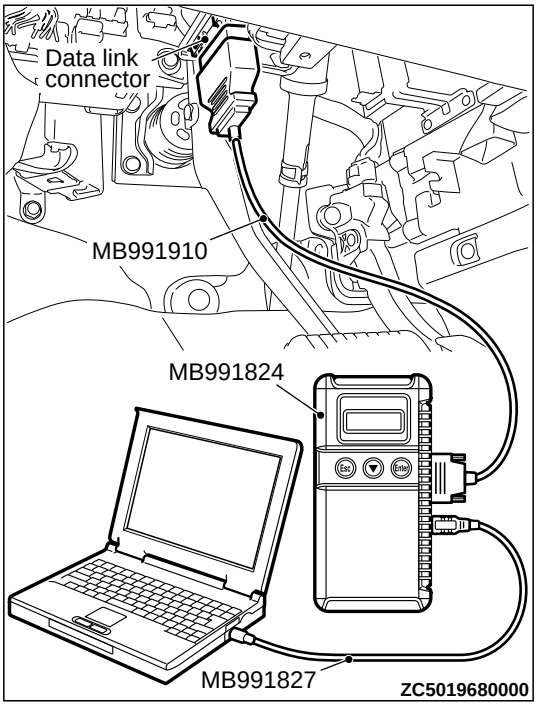
TROUBLESHOOTING HINTS (The most likely causes for this case:)
- Malfunction of the ignition system.
- Malfunction of the purge control system.
- Malfunction of the EGR system.
- Malfunction of the ECM.

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 EGR valve sounds during initialization.

Q:Is the initialization sound heard in the EGR valve?
YES: Go to Step 2.
NO: Refer to GROUP 17, Emission Control - EGR Valve (Stepper Motor) Check P.17c-14.



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 any DTC set?

YES: Refer to Diagnostic Trouble Code Chart P.13Ab-44.
NO: Go to Step 3.

STEP 3. Engine stall reproduction test.

Q:Does the engine stall during the decrease in engine speed after running?

YES: Go to Step 5.
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 item in the actuator test. Refer to Actuator Test Reference Table P.13Ab-857.
 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 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.13Ab-837.
 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 6.
NO: Repair or replace it. Then confirm that the malfunction symptom is eliminated.

STEP 6. Check the spark plugs.
Refer to GROUP 16, Ignition System - On-vehicle service - Spark Plug Check P.16c-4.

Q:Are there any abnormalities?
YES: Replace the spark plug. Then confirm that the malfunction symptom is eliminated.
NO: Check the ignition coil. Refer to GROUP 16, Ignition System - Then confirm that the malfunction symptom is eliminated.

INSPECTION PROCEDURE 14: Hesitation, sag, stumble, Poor acceleration or Surge.

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COMMENT
- Defective ignition system, abnormal air/fuel ratio, poor compression pressure, etc. are suspected.

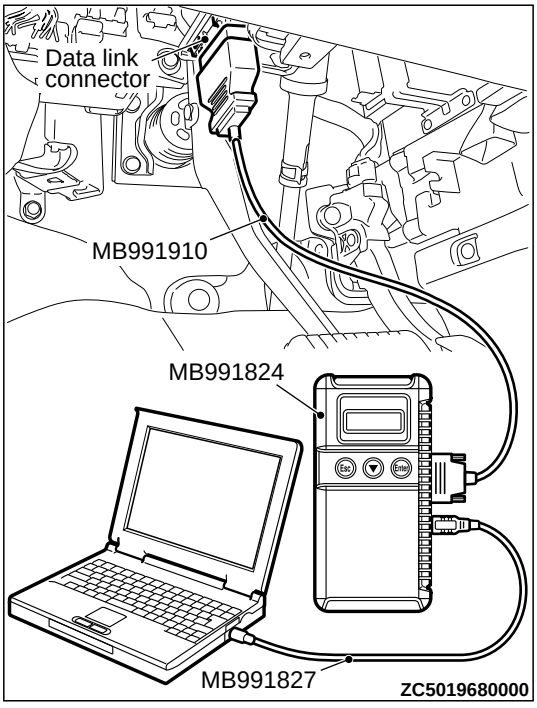
TROUBLESHOOTING HINTS (The most likely causes for this case:)
- Malfunction of the fuel pump system.
- Malfunction of the ignition system.
- Poor compression.
- Malfunction of the EGR system.
- Improper operation of the PCV valve.
- Vacuum leak.
- Clogged air cleaner.
- Clogged exhaust system.
- Increased resistance to the transmission drive
- Malfunction of the ECM.

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 EGR valve sounds during initialization.

Q:Is the initialization sound heard in the EGR valve?
YES: Go to Step 2.
NO: Refer to GROUP 17, Emission Control - EGR Valve (Stepper Motor) Check P.17c-14.



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 any DTC set?

YES: Refer to Diagnostic Trouble Code Chart P.13Ab-44.
NO: Go to Step 3.

STEP 3. Using scan tool MB991958, check actuator test items 1, 2, 3, 4, 5, 6: Injector.

(1) Turn the ignition switch to the "ON" position.
(2) Test Reference Table P.13Ab-857.
  a Item 01: Injector.
  .
  b Item 103: Variable intake air solenoid
  .
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q:Are thy operating properly?

YES: Go to Step 4.
NO: Repair or replace it. Then confirm that the malfunction symptom is eliminated.

STEP 4. 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 5.
NO: Check for installed conditions of the timing belt. Then confirm that the malfunction symptom is eliminated.

STEP 5. Using scan tool MB991958, check data list and actuator test.

(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.13Ab-837.
  a Item 05: Intake Air Temperature Sensor.
  .

b Item 06: Engine Coolant Temperature Sensor.
.
c Item 13: Throttle Position Sensor (main).
.
d Item 15: Throttle Position Sensor (sub).
.
e Item 11: Accelerator Pedal Position Sensor (main).
.
f 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 6.
NO: Repair or replace it. Then confirm that the malfunction symptom is eliminated.

STEP 6. Check the fuel pressure.
Refer to Fuel Pressure Test P.13Aa-17.

Q:Is the fuel pressure normal?
YES: Go to Step 7.
NO: Repair or replace it. Then confirm that the malfunction symptom is eliminated.

STEP 7. Check the spark plugs.
Refer to GROUP 16, Ignition System - On-vehicle service - Spark Plug Check P.16c-4.

Q:Are there any abnormalities?
YES: Replace the spark plug. Then confirm that the malfunction symptom is eliminated.
NO: Go to Step 8.

STEP 8. Check the ignition coil.
(1) Remove the intake manifold.
(2) Refer to GROUP 16, Ignition System - On-vehicle service - Ignition Coil Check P.16c-3.

Q:Are there any abnormalities?
YES: Replace the ignition coil. Then confirm that the malfunction symptom is eliminated.
NO: Go to Step 9.

STEP 9. Check the positive crankcase ventilation valve.
Refer to GROUP 17, Emission Control System - Positive Crankcase Ventilation Check P.17c-8.

Q:Is the positive crankcase ventilation valve?
YES: Check the following items, and repair or replace the defective items.
a Vacuum leak.
.
b Clogged air cleaner.
.
c Clogged exhaust system.
.

d Check if fuel is contaminated.
.
e Check if the injectors are clogged.
.
f Check if the foreign materials (water, kerosene, etc.) got into
. fuel.
g Increased resistance to the transmission drive
.
Then confirm that the malfunction symptom is eliminated.
NO: Repair it. Then confirm that the malfunction symptom is eliminated.

INSPECTION PROCEDURE 15: Acceleration shock.

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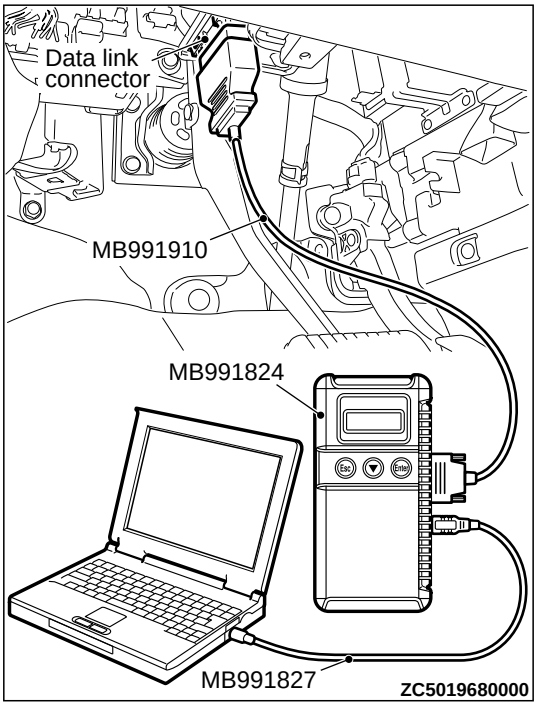
COMMENT
- There may be an ignition leak accompanying the increase in the spark plug demand voltage during acceleration.

TROUBLESHOOTING HINTS (The most likely causes for this case:)
- Malfunction of the ignition system.
- Malfunction of the ECM.

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 any DTC set?

YES: Refer to Diagnostic Trouble Code Chart P.13Ab-44.
NO: Go to Step 2.

STEP 2. Check the spark plugs.
Refer to GROUP 16, Ignition System - On-vehicle service - Spark Plug Check P.16c-4.

Q:Are there any abnormalities?
YES: Replace the spark plug. Then confirm that the malfunction symptom is eliminated.
NO: Go to Step 3.

STEP 3. Check the ignition coil.
(1) Remove the intake manifold.
(2) Refer to GROUP 16, Ignition System - On-vehicle service - Ignition Coil Check P.16c-3.

Q:Are there any abnormalities?
YES: Replace the ignition coil. Then confirm that the malfunction symptom is eliminated.
NO: Check for occurrence of ignition leak. Then confirm that the malfunction symptom is eliminated.

INSPECTION PROCEDURE 16: Knocking

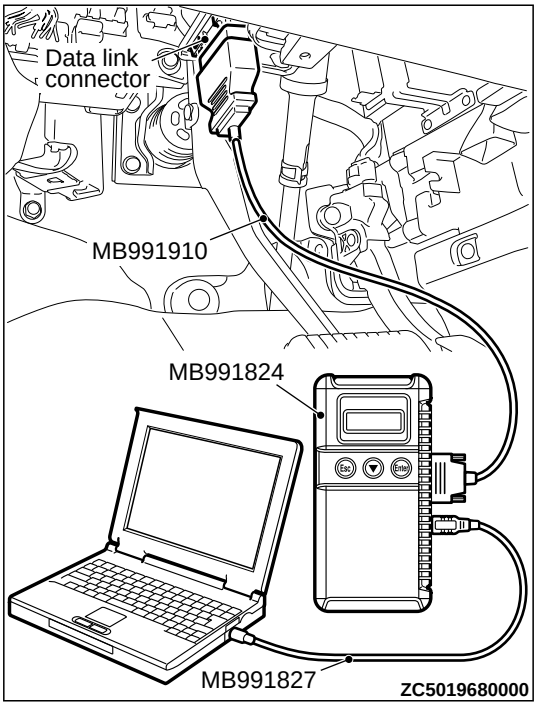
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COMMENT
- Incases such as the above, the cause is probably that the detonation control is defective or the heat value of the spark plug is inappropriate.

TROUBLESHOOTING HINTS (The most likely causes for this case:)
- Defective knock sensor.
- Incorrect heat value of the spark plug.
- Poor compression.
- Malfunction of the ECM.

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 any DTC set?

YES: Refer to Diagnostic Trouble Code Chart P.13Ab-44.
NO: Go to Step 2.

STEP 2. 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.13Ab-837.
a Item 32: Knock retard.
.
(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 P0326 - Knock Sensor Circuit range/performance problem (Bank1) P.13Ab-413, DTC P327 - Knock Sensor Circuit Low Input (Bank1) P.13Ab-417, DTC P328 - Knock Sensor Circuit High Input (Bank1) P.13Ab-420, DTC P0331 - Knock Sensor Circuit Rnge/performance problem (Bank1) P.13Ab-423, DTC P332 - Knock Sensor Circuit Low Input (Bank1) P.13Ab-426, DTC P333 - Knock Sensor Circuit High Input (Bank1) P.13Ab-429.

STEP 3. Check the spark plugs.

Refer to GROUP 16, Ignition System - On-vehicle service - Spark Plug Check P.16c-4.

Q:Are there any abnormalities?

YES: Replace the spark plug. Then confirm that the malfunction symptom is eliminated.
NO: Go to Step 4.

STEP 4. Check the compression pressure.

Refer to GROUP 11A, On-vehicle service - Compression Pressure Check P.11A-17.

Q:Is the compression pressure normal?
YES: Check the following items, and repair or replace the defective items.
a Check if fuel is contaminated.
.
b 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 17: Too high CO and HC concentration when idling

M11310100298USA0000010000

COMMENT
- Abnormal air/fuel ratio is suspected.

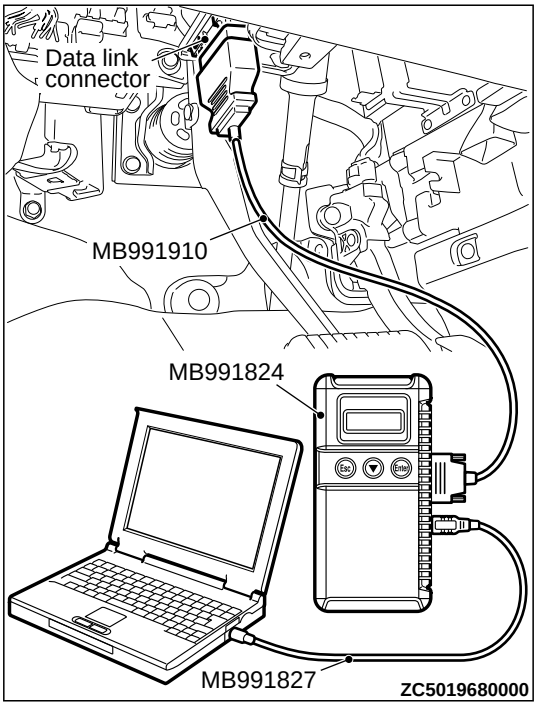
TROUBLESHOOTING HINTS (The most likely causes for this case:)
- Malfunction of the fuel pump system.
- Malfunction of the ignition system.
- Poor compression.
- Malfunction of the EGR system.
- Improper operation of the PCV valve.
- Malfunction of the ECM.

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 EGR valve sounds during initialization.

Q:Is the initialization sound heard in the EGR valve?
YES: Go to Step 2.
NO: Refer to GROUP 17, Emission Control - EGR Valve (Stepper Motor) Check P.17c-14.



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 any DTC set?

YES: Refer to Diagnostic Trouble Code Chart P.13Ab-44.
NO: Go to Step 3.

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 for installed conditions of the timing belt. 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 in the data list. Refer to Data List Reference Table P.13Ab-837.
 a Item 06: Engine Coolant Temperature Sensor.
 .
 b Item 05: Intake Air Temperature Sensor.
 .
(3) 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. Check the fuel pressure.

Refer to Fuel Pressure Test P.13Aa-17.

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 spark plugs.
Refer to GROUP 16, Ignition System - On-vehicle service - Spark Plug Check P.16c-4.

Q:Are there any abnormalities?
YES: Replace the spark plug. Then confirm that the malfunction symptom is eliminated.
NO: Go to Step 7.

STEP 7. Check the ignition coil.
(1) Remove the intake manifold.
(2) Refer to GROUP 16, Ignition System - On-vehicle service - Ignition Coil Check P.16c-3.

Q:Are there any abnormalities?
YES: Replace the ignition coil. Then confirm that the malfunction symptom is eliminated.
NO: Go to Step 8.

STEP 8. Check the compression pressure.
Refer to GROUP 11A, On-vehicle service - Compression Pressure Check P.11A-17.

Q:Is the compression pressure normal?
YES: Go to Step 9.
NO: Repair it. Then confirm that the malfunction symptom is eliminated.

STEP 9. Check the positive crankcase ventilation valve.
Refer to GROUP 17, Emission Control System - Positive Crankcase Ventilation Check P.17c-8.

Q:Is the positive crankcase ventilation valve?
YES: Go to Step 10.
NO: Repair it. Then confirm that the malfunction symptom is eliminated.

STEP 10. Check the purge control system.
Refer to GROUP 17, Emission Control System - Purge Control System Check (Purge Flow Check) P.17c-11.

Q:Is the purge control system normal?
YES: Check the following items, and repair or replace the defective items.
a Check if the injectors are clogged.
.
Then confirm that the malfunction symptom is eliminated.
NO: Repair it. Then confirm that the malfunction symptom is eliminated.

INSPECTION PROCEDURE 18: Transient, Mass Emission Tailpipe Test Failure.

M11310100299USA0000010000

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.

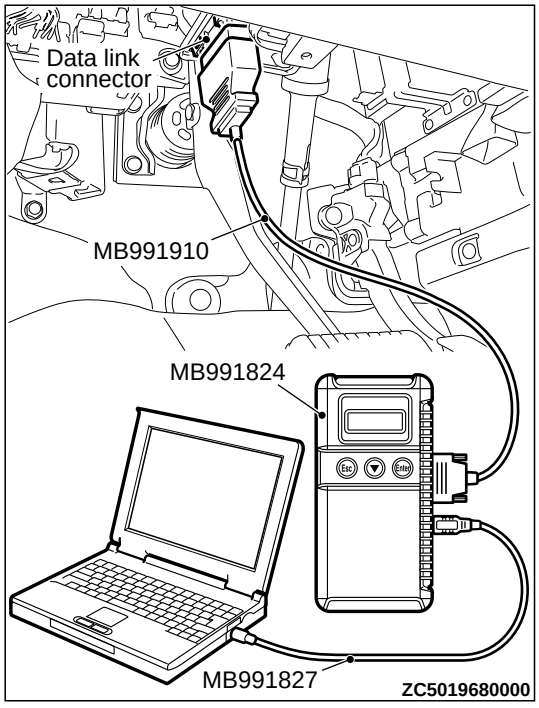
Q:Was the exhaust gas checked with engine warmed sufficiently?
YES: Go to Step 2.
NO: Check it again after enough warm up.

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.

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.13Ab-49.



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 any DTC set?

YES: Refer to Diagnostic Trouble Code Chart P.13Ab-44.
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.

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.13Ab-837.
 a Item 06: Engine Coolant Temperature Sensor.
 b Item 05: Intake Air Temperature Sensor.
 c Item AC: Heated Oxygen Sensor Bank 1, Sensor 1 (right front)
 d Item AE: Heated Oxygen Sensor Bank 2, Sensor 1 (left front)
 e 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 data list item AD: Heated oxygen sensor bank 1, sensor 2 (right rear).

(1) Start the engine and run at idle.
(2) Set scan tool MB991958 to the data reading mode for item AD, Heated Oxygen Sensor bank 1, sensor 2 (right 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.

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

Q:Is the sensor operating properly?

YES: Go to Step 8.
NO: Refer to, P0137 - Heated Oxygen Sensor Circuit Low Voltage (bank 1, sensor 2) P.13Ab-217, DTC P0138 - Heated Oxygen Sensor Circuit High Voltage (bank 1, sensor 2) P.13Ab-222, DTC P0139 - Heated Oxygen Sensor Circuit Slow Response (bank 1, sensor 2) P.13Ab-226, DTC P0140 - Heated Oxygen Sensor Circuit No Activity Detected (bank 1, sensor 2) P.13Ab-230.

STEP 8. Using scan tool MB991958, check data list item AF: Heated oxygen sensor bank 2, sensor 2 (left rear).

(1) Start the engine and run at idle.
(2) Set scan tool MB991958 to the data reading mode for item AF, Heated Oxygen Sensor bank 2, sensor 2 (left rear).
a Transaxle: "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.

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

Q:Is the sensor operating properly?

YES: Go to Step 9.
NO: Refer to, P0157 - Heated Oxygen Sensor Circuit Low Voltage (bank 2, sensor 2) P.13Ab-275, DTC P0158 - Heated Oxygen Sensor Circuit High Voltage (bank 2, sensor 2) P.13Ab-280, DTC P0159 - Heated Oxygen Sensor Circuit Slow Response (bank 2, sensor 2) P.13Ab-284, DTC P0160 - Heated Oxygen Sensor Circuit No Activity Detected (bank 2, sensor 2) P.13Ab-288.

STEP 9. Check the EGR system.

Refer to GROUP 17, Emission Control System - General Description (EGR System) P.17c-13.

Q:Is the EGR system normal?

YES: Go to Step 10.

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

STEP 10. Check harness connector B-25, B-26, B-29 at the left bank injector for damage.
Refer to Fuel Pressure Test P.13Aa-17.

Q:Is the fuel pressure normal?
YES: Go to Step 11.
NO: Repair or replace it. Then confirm that the malfunction symptom is eliminated.

STEP 11. Check the spark plugs.
Refer to GROUP 16, Ignition System - On-vehicle service - Spark Plug Check P.16c-4.

Q:Are there any abnormalities?
YES: Replace the spark plug. Then confirm that the malfunction symptom is eliminated.
NO: Go to Step 12.

STEP 12. Check the ignition coil.
(1) Remove the intake manifold.
(2) Refer to GROUP 16, Ignition System - On-vehicle service - Ignition Coil Check P.16c-3.

Q:Are there any abnormalities?
YES: Replace the ignition coil. Then confirm that the malfunction symptom is eliminated.
NO: Go to Step 13.

STEP 13. Check the compression pressure.
Refer to GROUP 11A, On-vehicle service - Compression Pressure Check P.11A-17.

Q:Is the compression pressure normal?
YES: Go to Step 14.
NO: Repair it. Then confirm that the malfunction symptom is eliminated.

STEP 14. Check the positive crankcase ventilation valve.
Refer to GROUP 17, Emission Control System - Positive Crankcase Ventilation Check P.17c-8.

Q:Is the positive crankcase ventilation valve?
YES: Go to Step 15.
NO: Repair it. Then confirm that the malfunction symptom is eliminated.

STEP 15. Check the purge control system.
Refer to GROUP 17, Emission Control System - Purge Control System Check (Purge Flow Check) P.17c-11.

Q:Is the purge control system normal?
YES: Check the following items, and repair or replace the defective items.
a Check if the injectors are clogged.
.
Then confirm that the malfunction symptom is eliminated.

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

STEP 16. Check the following items.

(1) Check the following items.

a Check the injectors for fuel leakage.

.

Q:Are there any abnormalities?

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

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

INSPECTION PROCEDURE 19: Purge Flow Test of the Evaporative Emission Canister Failure.

M11310100300USA0000010000

COMMENT

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

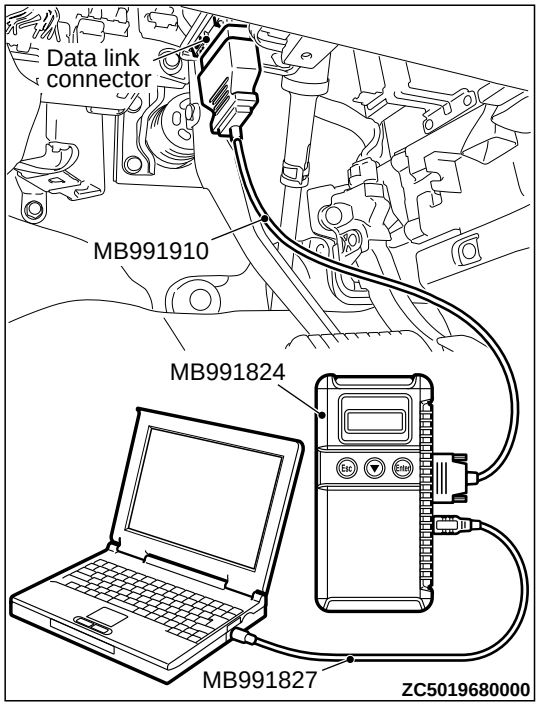
TROUBLESHOOTING HINTS (The most likely causes for this case:)

- 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 any DTC set?

YES: Refer to Diagnostic Trouble Code Chart P.13Ab-44.
NO: Refer to GROUP 17, Emission Control System - Purge Control System Check (Purge Flow Check) P.17c-11.

INSPECTION PROCEDURE 20: Pressure Test of the Evaporative System Failure

M11310100301USA0000010000

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.17c-12.

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.17c-19.

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.

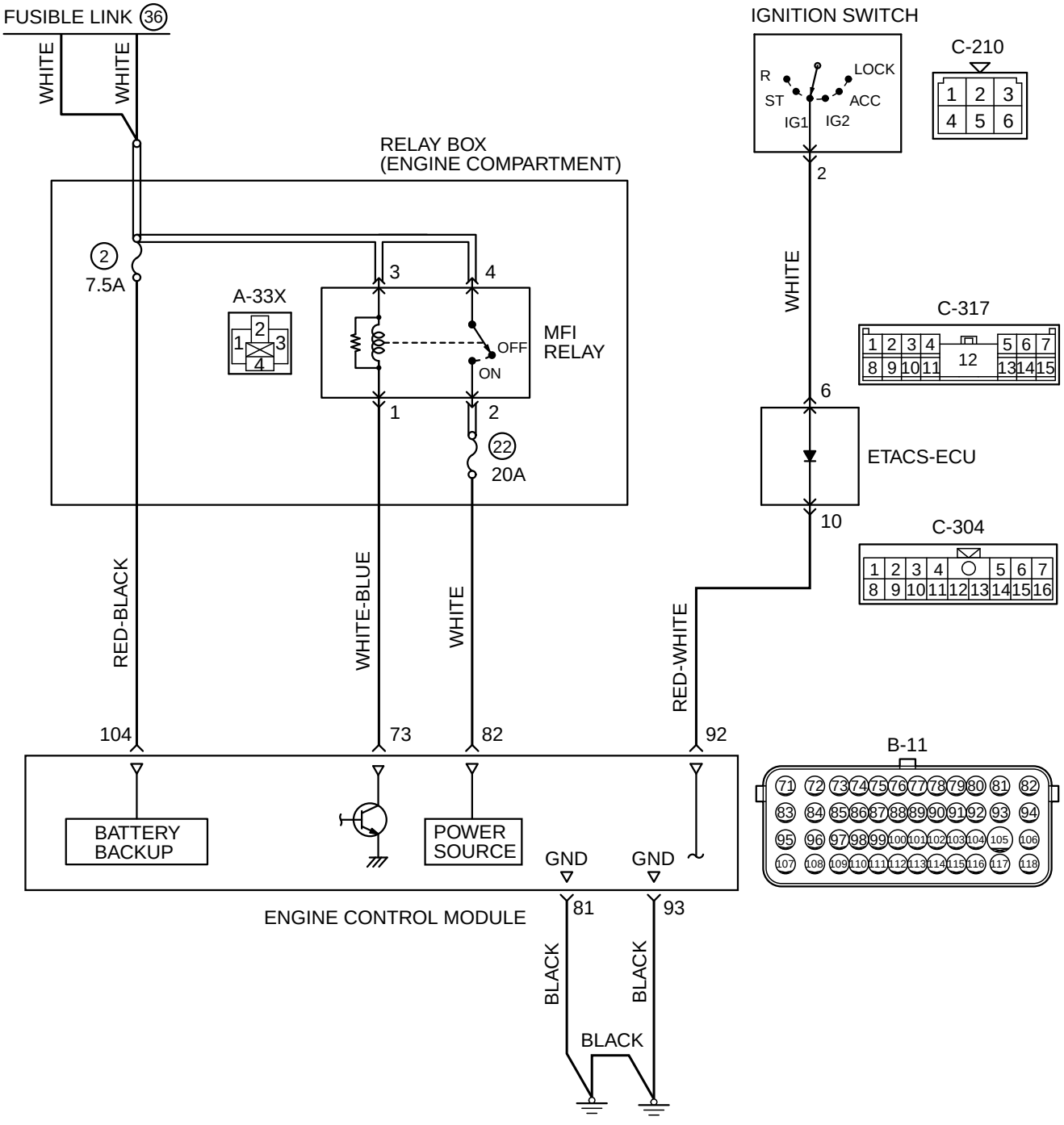
Then confirm that the malfunction symptom is eliminated.

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

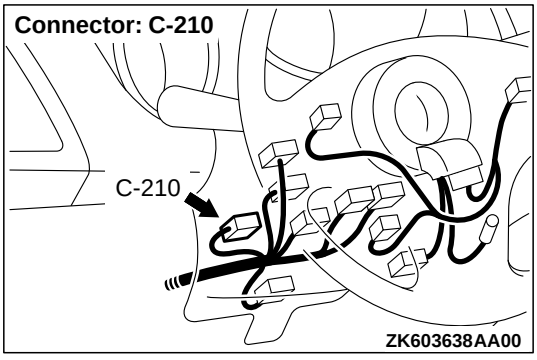
INSPECTION PROCEDURE 21: Power supply system and ignition switch - IG system.

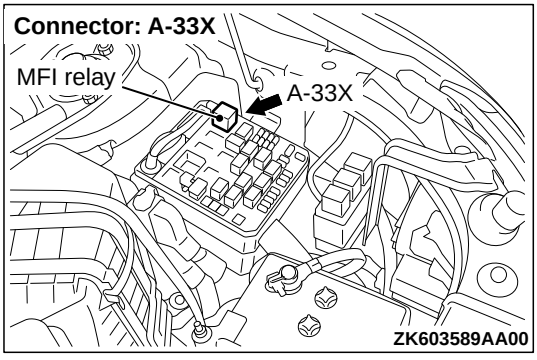
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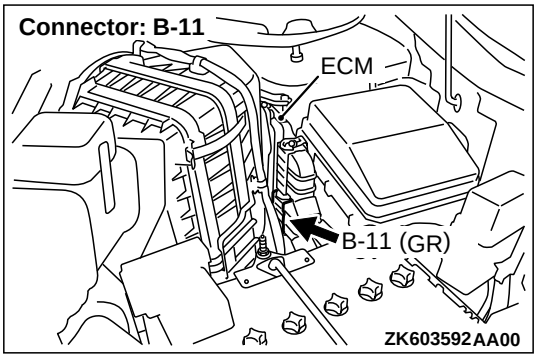
POWER SUPPLY AND IGNITION SWITCH-IG CIRCUIT

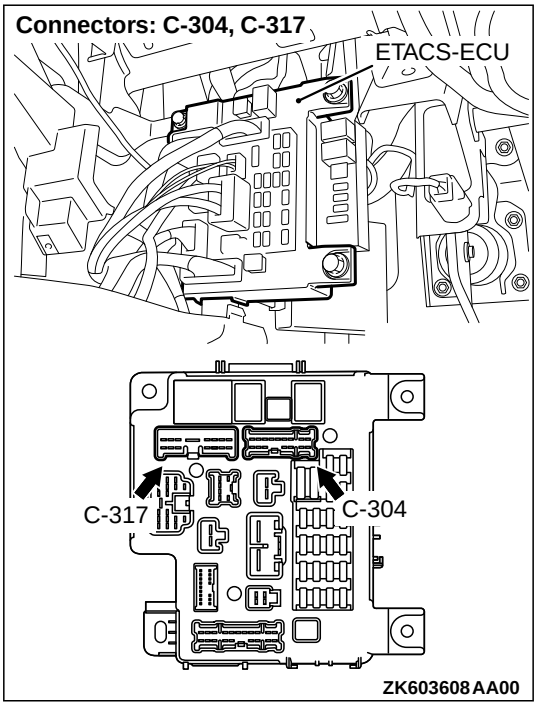


ZK602870 AA00









CIRCUIT OPERATION

- Battery positive voltage is applied to the MFI relay (terminals No. 3, No. 4).
- When the ignition switch is turned to the "ON" position, battery positive voltage is applied to the ECM (terminal No. 92). When battery positive voltage is applied, the ECM turns the power transistor in the ECM "ON" and grounds the MFI relay coil. With this, the MFI relay turns "ON" the battery positive voltage is supplied to the ECM (terminals No. 82) from the MFI relay (terminal No. 2).
- A battery positive voltage is constantly supplied to the ECM (terminal No. 104) as the backup power.
- The ECM (terminals No. 81, No. 93) is grounded to the vehicle body.

COMMENT

- When the ignition switch "ON" signal is input into the ECM via ETACS-ECU, the ECM turns "ON" the MFI relay. This causes battery positive voltage to be supplied to the ECM, sensor and actuator.

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 circuit or short-circuit harness wire.
- Malfunction of the ECM.

DIAGNOSIS

STEP 1. Check harness connector A-33X at MFI relay and harness connector B-11 at ECM for damage.

Q:Is the connector in good condition?

YES: Go to Step 2.

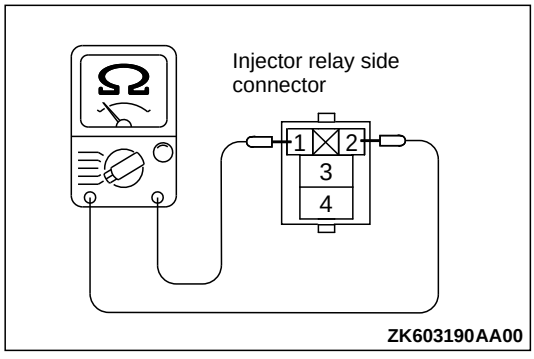
NO: Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.

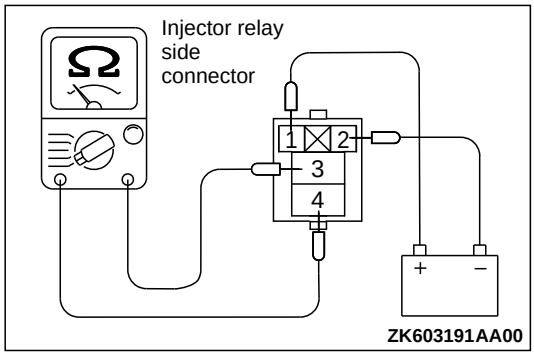
STEP 2. Check the MFI relay.

(1) Remove the MFI relay.

(2) Check for continuity between the MFI relay terminals No. 1 and No. 3.

- There should be continuity. (approximately 2 ohms)





(3) Use jumper wires to connect MFI relay terminal No. 1 to the positive battery terminal and terminal No. 3 to the negative battery terminal.

(4) Check for continuity between the MFI relay terminals No. 2 and No. 4 while connecting and disconnecting the jumper wire at the negative battery terminal.

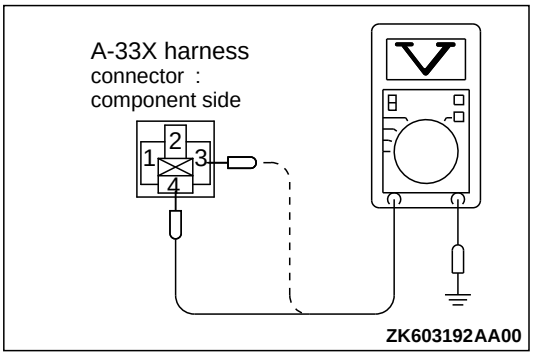
- Should be less than 2 ohms. (Negative battery terminal connected)
- Should be open loop. (Negative battery terminal disconnected)

(5) Install the MFI relay.

Q:Is the measured resistance within the specified range?

YES: Go to Step 3.

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



STEP 3. Measure the power supply voltage at MFI relay harness side connector A-33X.

(1) Disconnect the connector A-33X and measure at the harness side.
(2) Measure the voltage between terminals No. 3, No. 4 and ground.
- Voltage should be battery positive voltage.

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

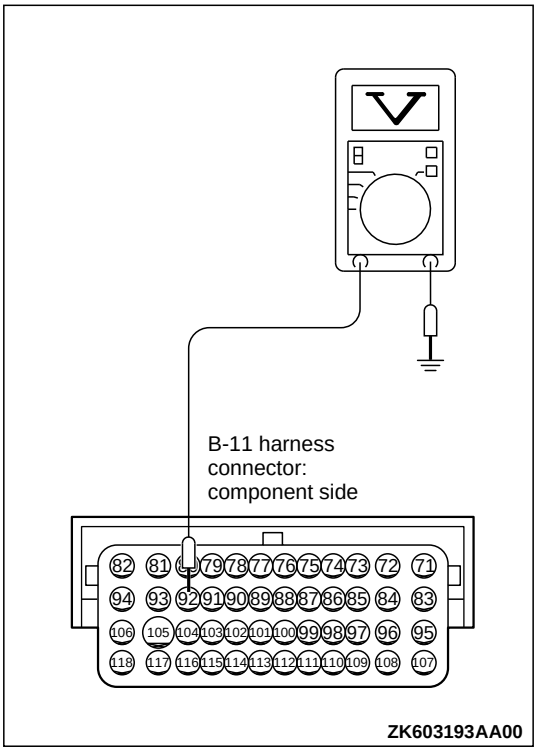
YES: Go to Step 4.

NO: Repair harness wire between fusible link (36) and MFI relay connector A-33X (terminal No. 1, No. 2) because of open circuit. Then confirm that the malfunction symptom is eliminated.

STEP 4. Measure the ignition switch-IG signal voltage at ECM harness side connector B-11.

(1) Disconnect the connector B-11 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal No. 92 and ground.
- Voltage should be battery positive voltage.

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



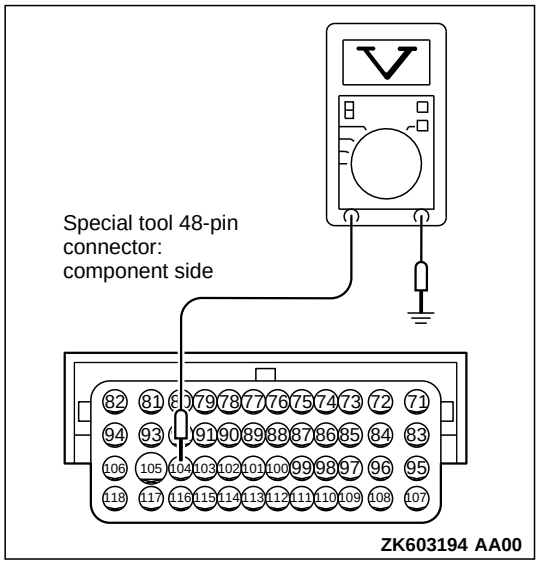
Q:Is battery positive voltage (approximately 12 volts) present?

YES: Go to Step 5.

NO: Check harness connectors C-304 and C-317 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-210 (terminal No. 2) and ECM connector B-11 (terminal No. 92) because of open circuit. Then confirm that the malfunction symptom is eliminated.

STEP 5. Measure the backup power supply voltage at ECM harness side connector B-11.

(1) Disconnect the connector B-11 and measure at the harness side.

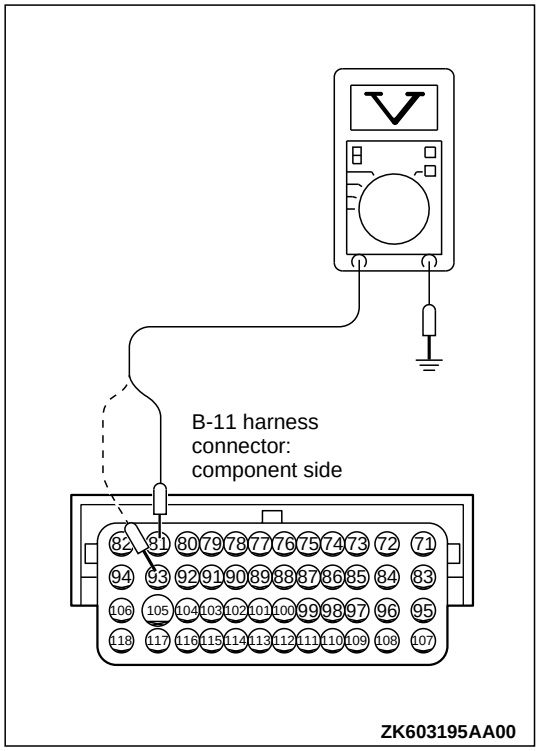


(2) Measure the voltage between terminal No. 104 and ground.
- Voltage should be battery positive voltage.

Q:Is battery positive voltage (approximately 12 volts) present?
YES: Go to Step 6.
NO: Repair harness wire between relay box (2) and ECM connector B-11 (terminal No. 104) because of short circuit. Then confirm that the malfunction symptom is eliminated.

STEP 6. Check for continuity at ECM M/T or PCM A/T harness side connector B-11.

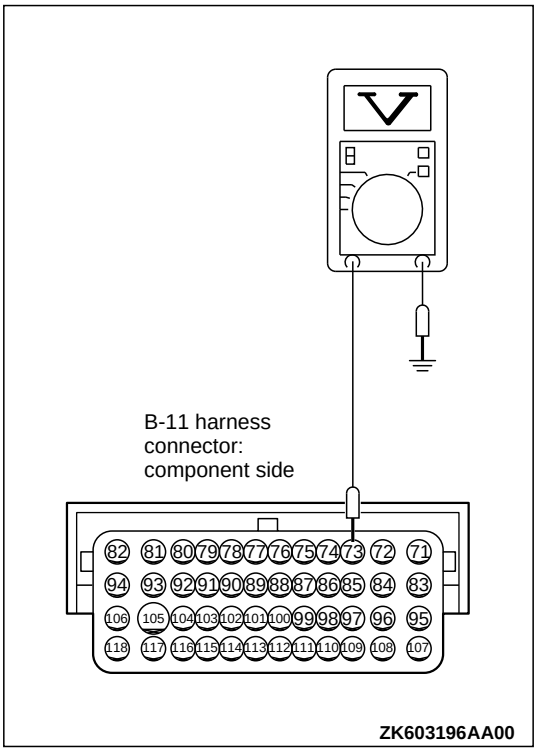
(1) Disconnect the connector B-11 and measure at the harness side.
(2) Check for the continuity between terminals (No. 81, No. 93) and ground.
- Should be less than 2 ohms.



Q:Does continuity exist?
YES: Go to Step 7.
NO: Repair harness wire between ECM connector B-11 (terminal No. 81, No. 93) and ground because of open circuit and harness damage. Then confirm that the malfunction symptom is eliminated.

STEP 7. Measure the power supply voltage at ECM harness side connector B-11.

(1) Disconnect the connector B-11 and measure at the harness side.

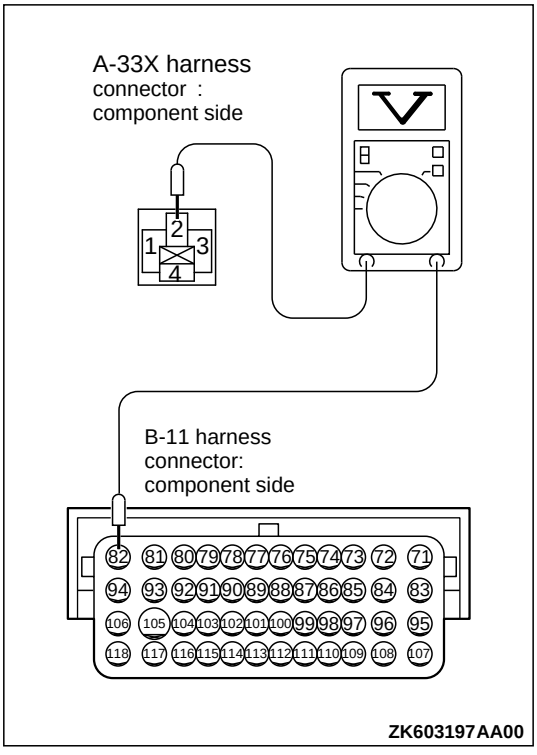


(2) Measure the voltage between terminal No. 73 and ground.
- Voltage should be battery positive voltage.

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

YES: Go to Step 8.

NO: Repair harness wire between MFI relay connector and ECM A-33X (terminal No. 1) connector B-11 (terminal No. 73) because of open circuit. Then confirm that the malfunction symptom is eliminated.



STEP 8. Check for open circuit and harness damage between MFI relay connector A-33X (terminal No. 2) and ECM connector B-11 (terminal No. 82).

(1) Disconnect the connector A-33X and B-11 measure at the harness side.

(2) Measure the resistance between connector A-33X (terminal No. 2) and connector B-11 (terminal No. 82).
- Should be less than 2 ohms.

Q:Is the harness wire in good condition?

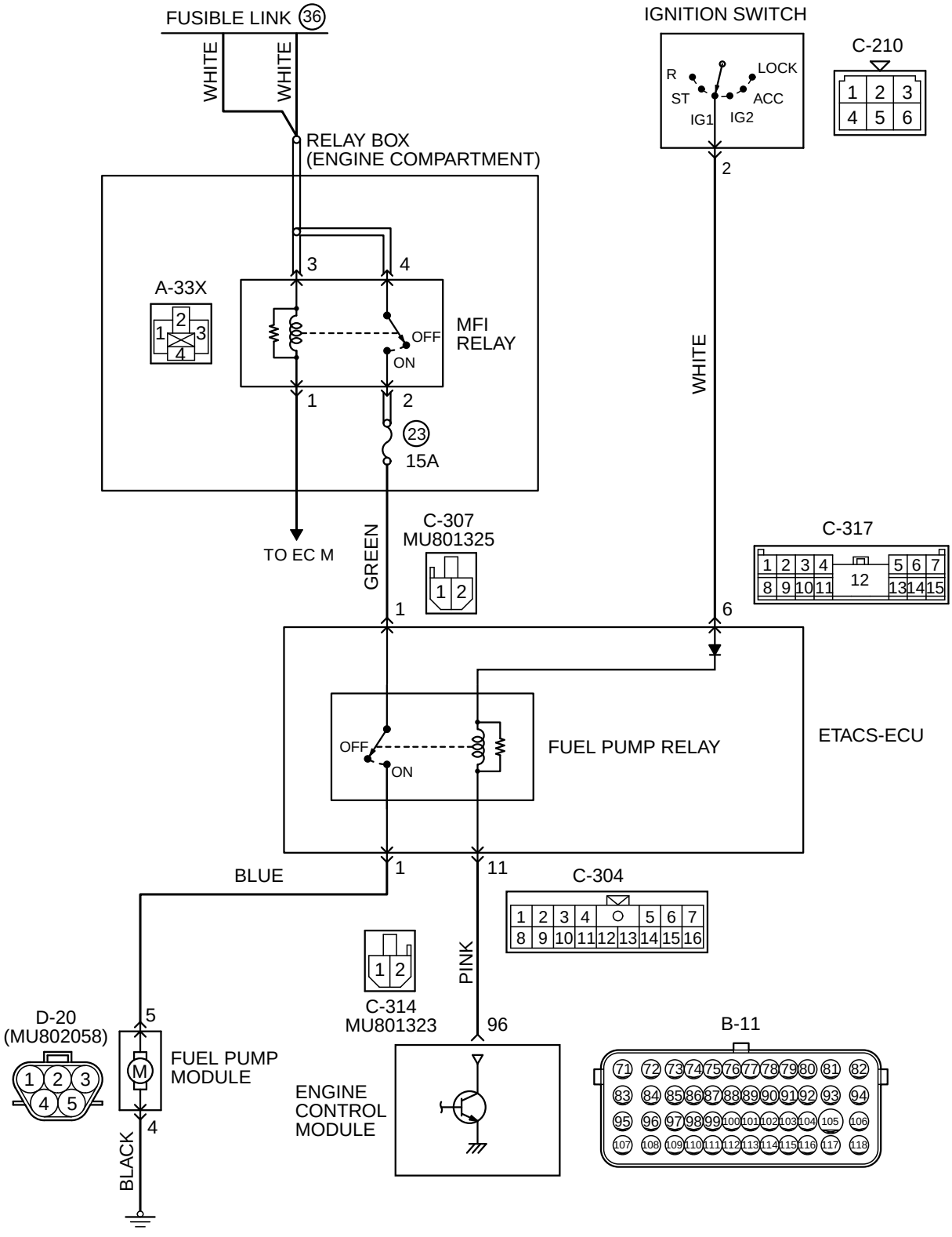
YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8.Then confirm that the malfunction symptom is eliminated.

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

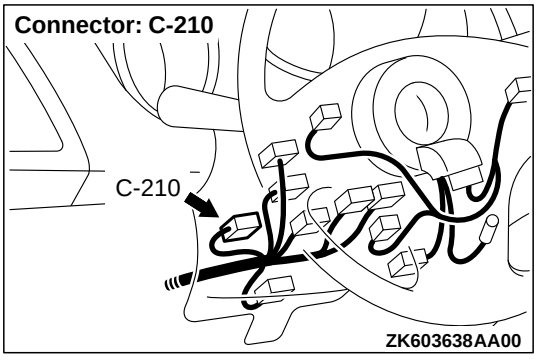
INSPECTION PROCEDURE 22: Fuel pump system.

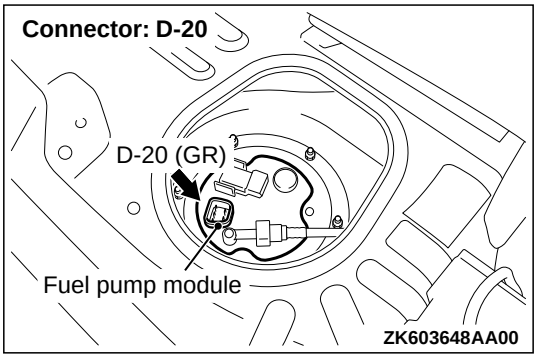
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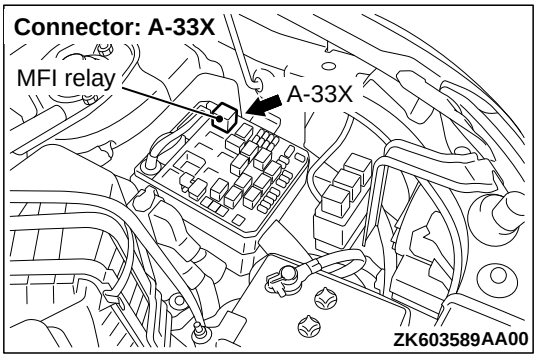
FUEL PUMP CIRCUIT

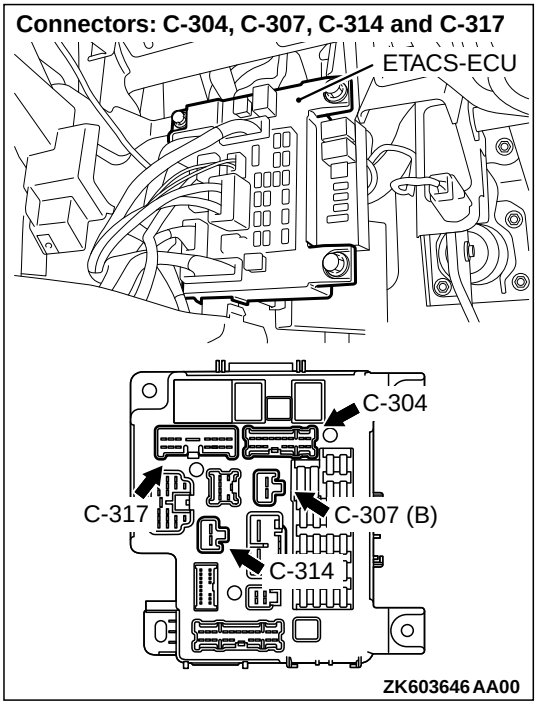


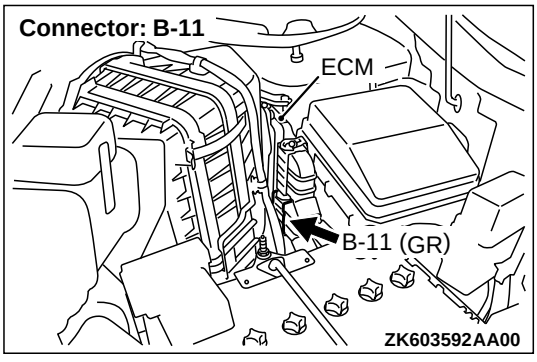
ZK602871 AA00











CIRCUIT OPERATION

- The fuel pump drive power is supplied from MFI relay (terminal No. 2) to fuel pump relay (C-307 ETACS-ECU connector terminal No. 1) in the ETACS-ECU.
- The battery positive voltage is applied by the ignition switch to the fuel pump coil (C-317 ETACS-ECU connector terminal No. 6) in the ETACS-ECU. The ECM turns "ON" the relay by turning "ON" the power transistor in the unit so as to conduct power to the fuel pump relay coil (via the C-304 ETACS-ECU connector terminal No. 11).
- When the fuel pump relay is turned "ON", the battery positive voltage will be supplied from the fuel pump relay (C-314 ETACS-ECU connector terminal No. 1) to the fuel pump.

COMMENT

- When the ignition switch ON signal is inputted into the ECM, the ECM turns ON the fuel pump relay. This causes the battery voltage to be supplied to the fuel pump.

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 ECM.

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 C-304, C-307, C314 and C-317 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 fuel pump relay.

Refer to Fuel Pump Relay Continuity Check P.13Aa-17.

Q:Is the measured resistance normal?

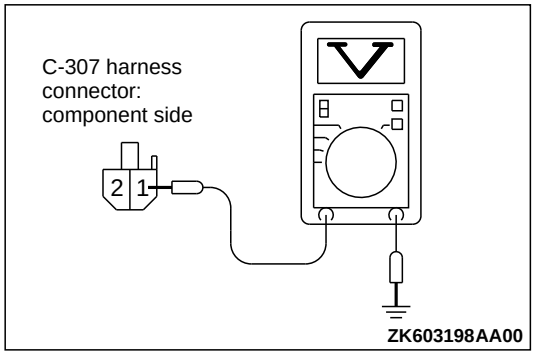
YES: Go to Step 3.

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

STEP 3. Measure the power supply voltage at ETACS-ECU harness side connector C-307.

(1) Disconnect the connector C-307 and measure at the harness side.

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



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

YES: Go to Step 4.

NO: Repair harness wire between relay box and ETACS-ECU connector C-307 (terminal No. 1) because of open circuit. Then confirm that the malfunction symptom is eliminated.

STEP 4. Check connector D-20 at fuel pump for damage.

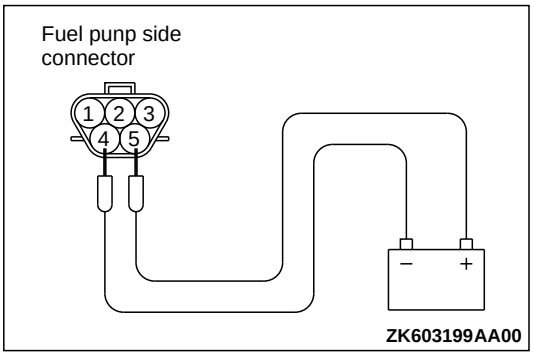
Q:Is the connector in good condition?

YES: Go to Step 5.

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

STEP 5. Check the fuel pump operation.

(1) Disconnect fuel pump connector D-20.

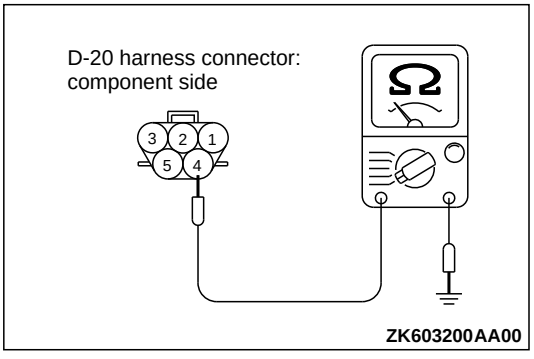


(2) Use jumper wires to connect fuel pump connector terminal No. 5 to the positive battery terminal and terminal No. 4 to the negative battery terminal.
- An operating sound of the fuel pump should be heard.

Q:Is the fuel pump operating properly?
YES: Go to Step 6.
NO: Replace the fuel pump. Then confirm that the malfunction symptom is eliminated.

STEP 6. Check for continuity at fuel pump harness side connector D-20.

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

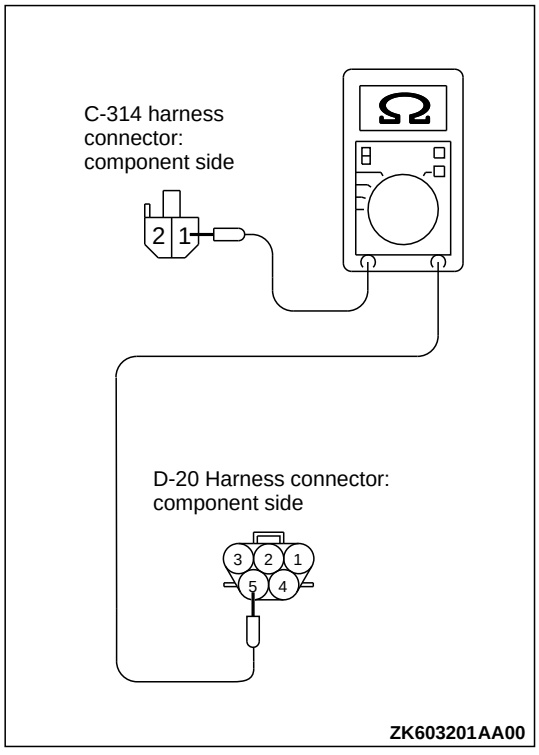


(2) Check for the continuity between terminal No. 4 and ground.
- Should be less than 2 ohms.

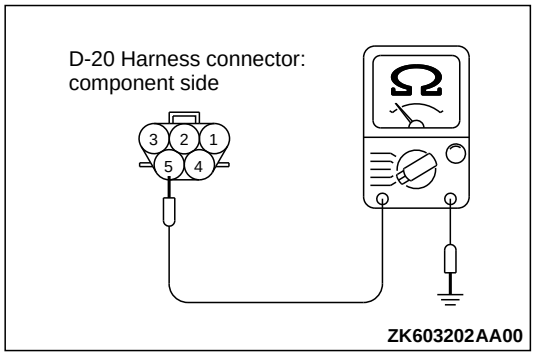
Q:Does continuity exist?
YES: Go to Step 7.
NO: Repair harness wire between fuel pump connector D-20 (terminal No. 4) and ground because of open circuit or harness damage. Then confirm that the malfunction symptom is eliminated.

STEP 7. Check for open circuit and short circuit to ground and harness damage between ETACS-ECU connector C-314 (terminal No. 1) and fuel pump connector D-20 (terminal No. 5).

(1) Disconnect the connector C-314 and D-20 measure at the harness side.



(2) Measure the resistance between connector C-314 (terminal No. 1) and connector D-20 (terminal No. 5).
- Should be less than 2 ohms.



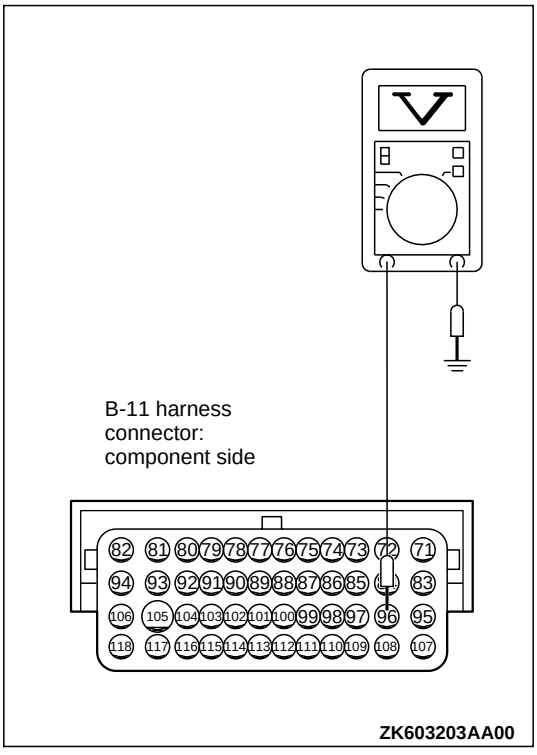
(3) Check for the continuity between connector D-20 (terminal No. 5) and ground.
- Not continuity.

Q:Is the harness wire in good condition?
YES: Go to Step 8.
NO: Repair it. Then confirm that the malfunction symptom is eliminated.

STEP 8. Check connector B-11 at ECM for damage.

Q:Is the 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. Measure the power supply voltage at ECM connector B-11.
(1) Disconnect the connector B-11 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.



(3) Measure the voltage between terminal No. 96 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?

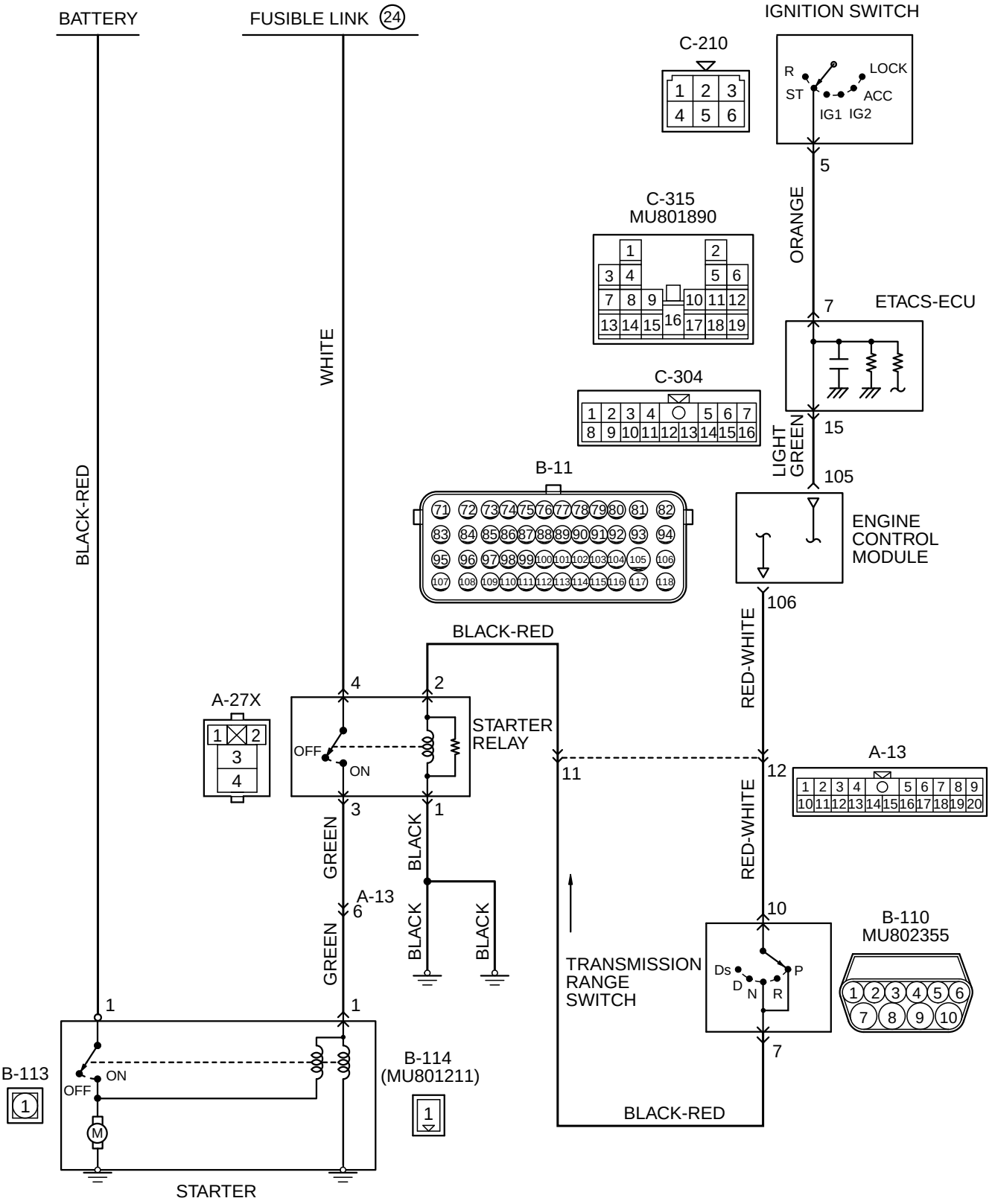
YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8.

NO: Repair harness wire between ETACS-ECU connector C-304 (terminal No. 11) and ECM connector B-11 (terminal No. 96) because of open circuit. Then confirm that the malfunction symptom is eliminated.

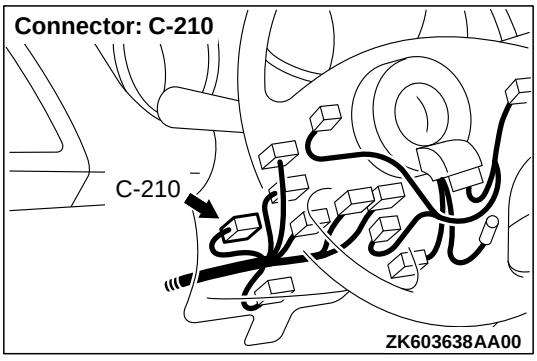
INSPECTION PROCEDURE 23: Ignition Switch-ST System and Transmission Range Switch System

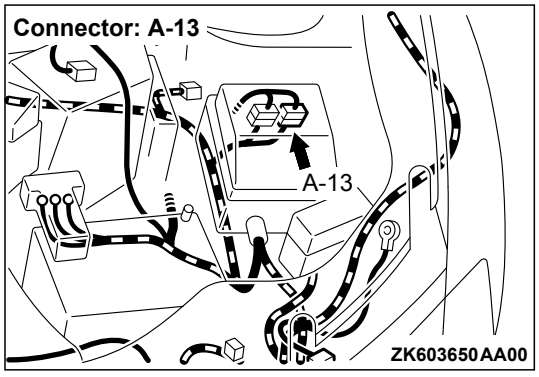
M11310100307USA0000010001

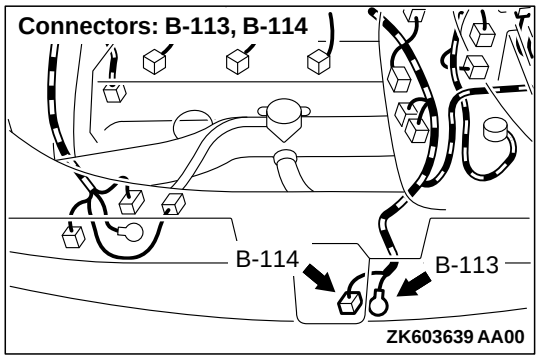
STARTING SYSTEM CIRCUIT

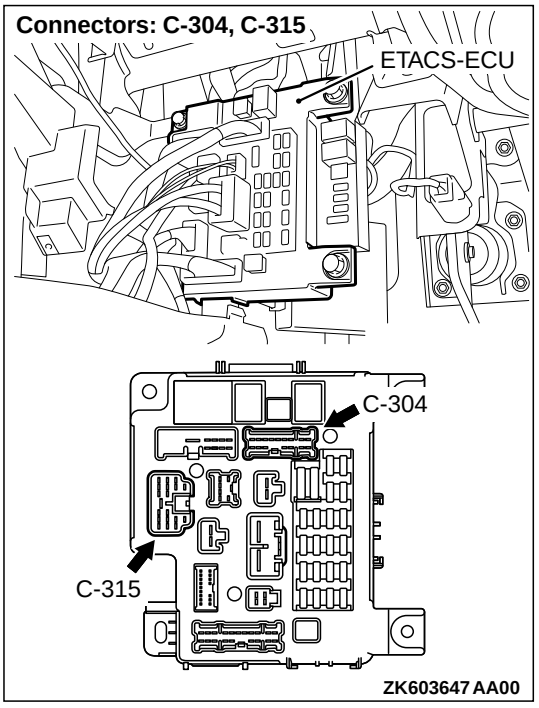


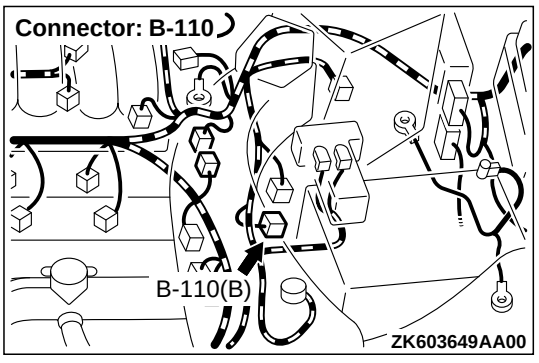
ZK602872 AA00

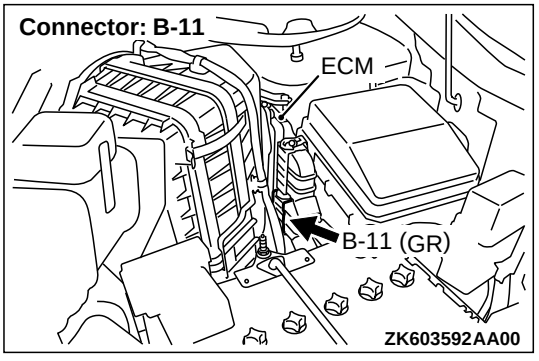

Connector: C-210
C-210
ZK603638AA00

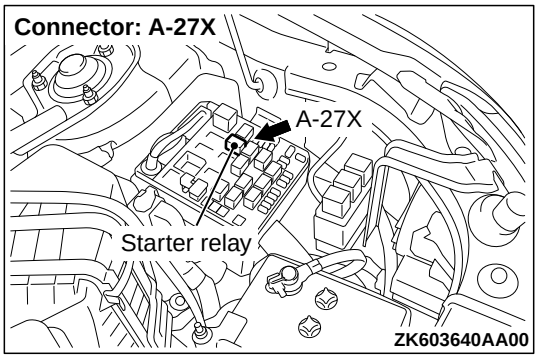

Connector: A-13
A-13
ZK603650AA00


Connectors: B-113, B-114
B-114
B-113
ZK603639 AA00


Connectors: C-304, C-315
ETACS-ECU
C-304
C-315
ZK603647 AA00


Connector: B-110
B-110(B)
ZK603649AA00


Connector: B-11
ECM
B-11 (GR)
ZK603592AA00



CIRCUIT OPERATION

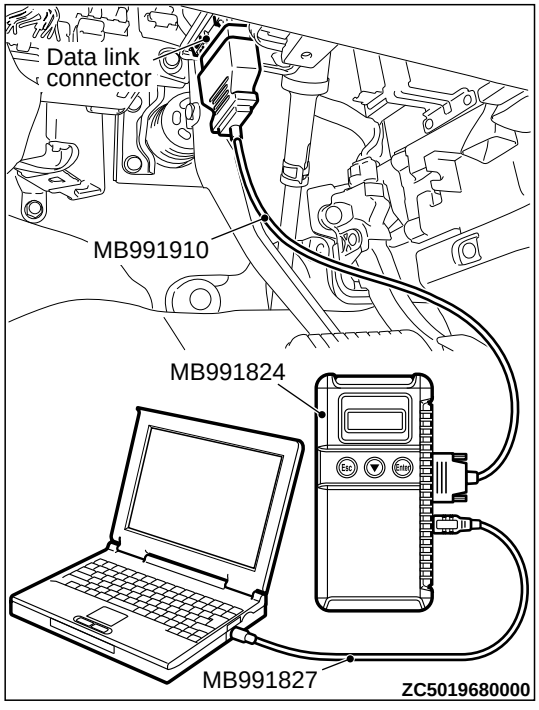
- If the selector lever is moved to "P" or "N" range and the ignition switch is turned to "START" position, battery positive voltage is supplied to starter relay coil. With this, the starter relay turns "ON" the battery positive voltage is supplied to the starter motor (terminal No. 1) from the battery.

COMMENT

- Faulty starting system and the related circuit are suspected to be the causes.

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

- Battery failed
- Malfunction of the starter motor relay.
- Malfunction of the starter motor.
- Open circuit or short circuit in the starting system or the related circuit or poor contact in the connectors
- Malfunction of the transmission range switch.
- Malfunction of the ECM



DIAGNOSIS

STEP 1. 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.13Ab-837.
 a Item 79: Cranking signal.
 .
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q:Is the sensor operating properly?

YES: Go to Step 2.
NO: Repair harness wire between ETACS-ECU connector C-304 (terminal No. 15) and ECM connector (terminal No. 105) because of open circuit. Then confirm that the malfunction symptom is eliminated.

STEP 2. Check harness connector B-110 at transmission range switch and harness connector B-10 at ECM for damage.

Q:Is the 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 transmission range switch.

Refer to GROUP 23A, On-vehicle Service - Essential Service - Transmission Range Switch Continuity Check P.23A-157.

Q:Are there any abnormalities?

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

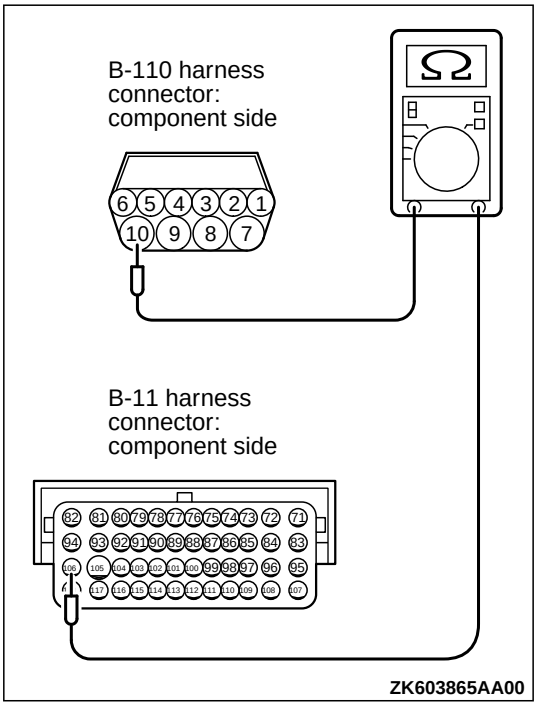
NO: Go to Step 4.

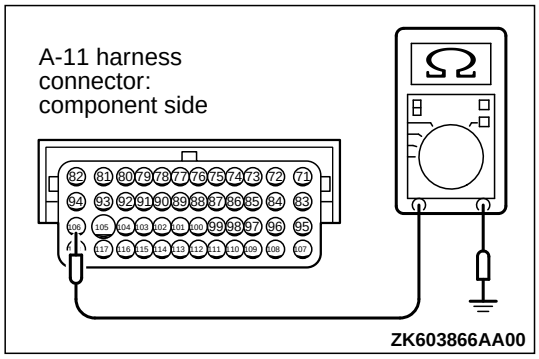
STEP 4. Check for open circuit or short circuit to ground or harness damage between transmission range switch connector B-110 and ECM connector B-11.

(1) Disconnect the connector B-110 and B-11 measure at the harness side.

(2) Measure the resistance between connector B-110 (terminal No. 10) and connector B-11 (terminal No. 106).

- Should be less than 2 ohms.





(3) Check for the continuity between connector B-11 (terminal No. 106) and ground.
- Not continuity.

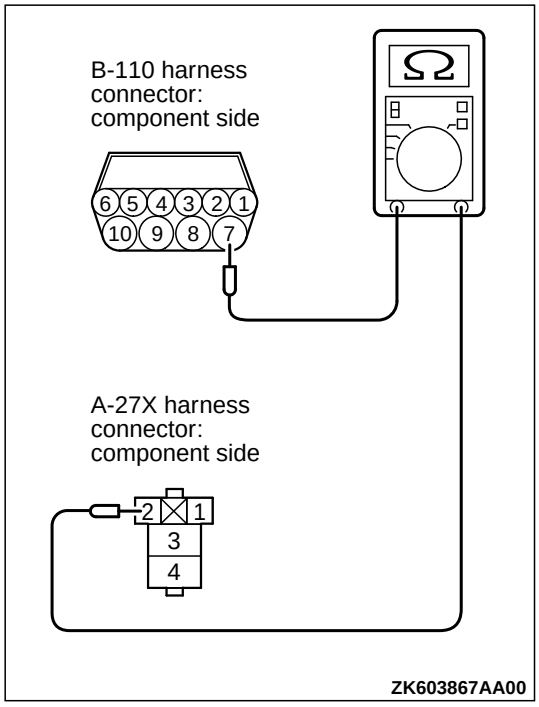
Q:Is the harness wire in good condition?
YES: Then go to Step 5.
NO: Repair it. Then confirm that the malfunction symptom is eliminated.

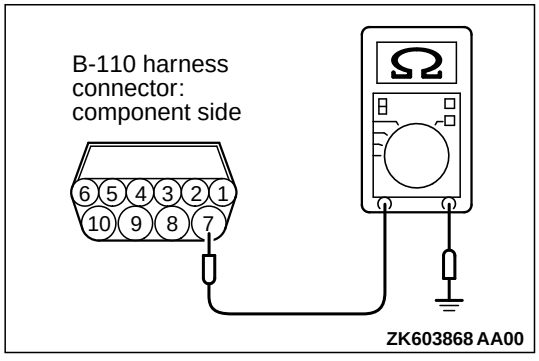
STEP 5. Check harness connector A-27X at starter relay.

Q:Is the connector in good condition?
YES: Then go to Step 6.
NO: Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.

STEP 6. Check for open circuit or short circuit to ground or harness damage between transmission range switch connector B-110 and starter relay connector A-27X.

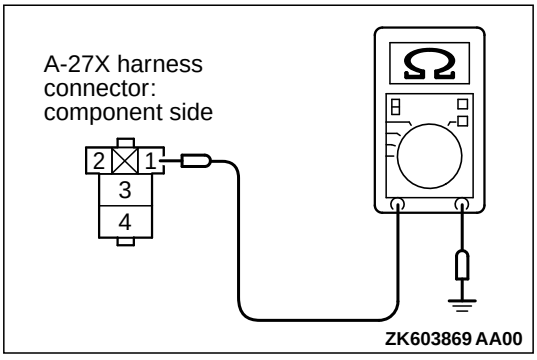
(1) Disconnect the connector B-110 and A-27X measure at the harness side.
(2) Measure the resistance between connector B-110 (terminal No. 7) and connector A-27X (terminal No. 2).
- Should be less than 2 ohms.





(3) Check for the continuity between connector B-110 (terminal No. 7) and ground.
- Not continuity.

Q:Is the harness wire in good condition?
YES: Then go to Step 7.
NO: Repair it. Then confirm that the malfunction symptom is eliminated.



STEP 7. Check for open circuit or harness damage between starter relay connector A-27X and ground.

(1) Disconnect the connector A-27X and ground at the harness side.

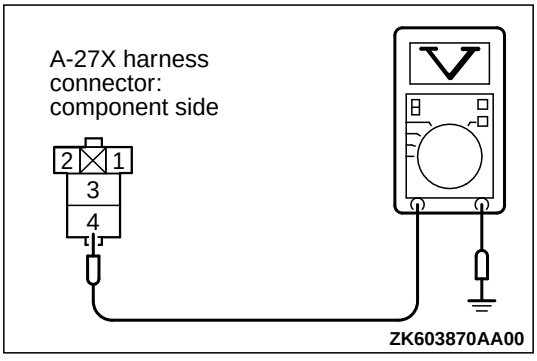
(2) Measure the resistance between connector A-27X (terminal No. 1) and ground.

- Should be less than 2 ohms.

Q:Is the measured resistance less than 2 ohms?

YES: Then go to Step 8.

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



STEP 8. Measure the power supply voltage at starter relay connector A-27X.

(1) Disconnect the connector A-27X measure at the harness side.

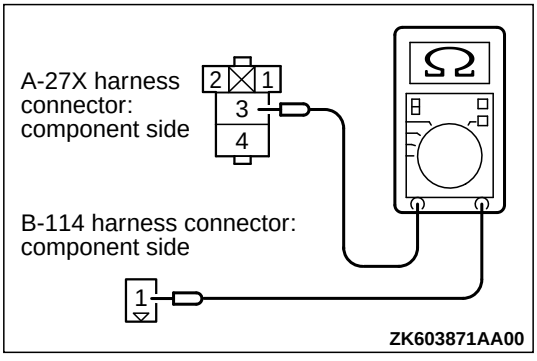
(2) Measure the voltage between terminal No. 4 and ground.

- 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 starter relay connector A-27X (terminal No. 4) and fusible link (24) because of open circuit. Then confirm that the malfunction symptom is eliminated.

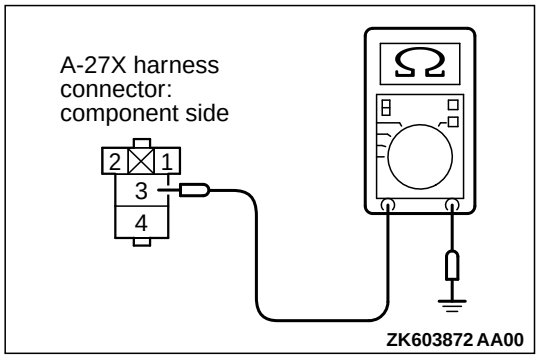


STEP 9. Check for open circuit or short circuit to ground or harness damage between starter relay connector A-27X and starter motor connector B-114.

(1) Disconnect the connector A-27X and B-114 measure at the harness side.

(2) Measure the resistance between connector A-27X (terminal No. 3) and connector B-114 (terminal No. 1).

- Should be less than 2 ohms.



(3) Check for the continuity between connector A-27X (terminal No. 3) and ground.
- Not continuity.

Q:Is the harness wire in good condition?

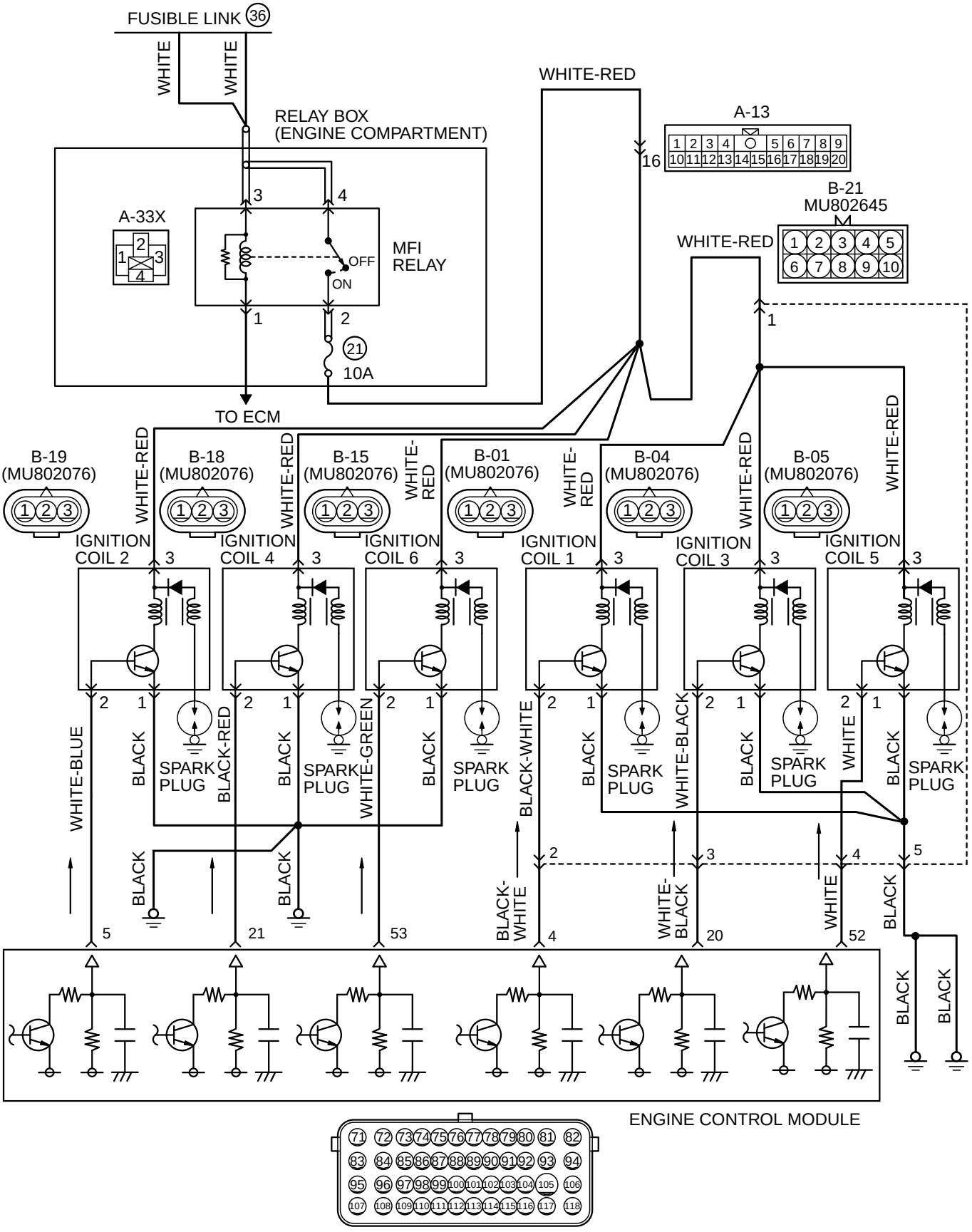
YES: Replace the starter motor. Then confirm that the malfunction symptom is eliminated.

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

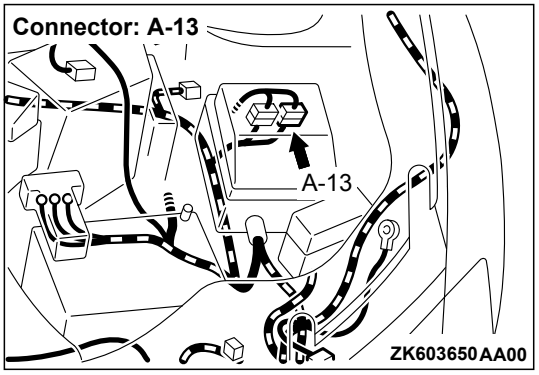
INSPECTION PROCEDURE 24: Ignition Circuit System.

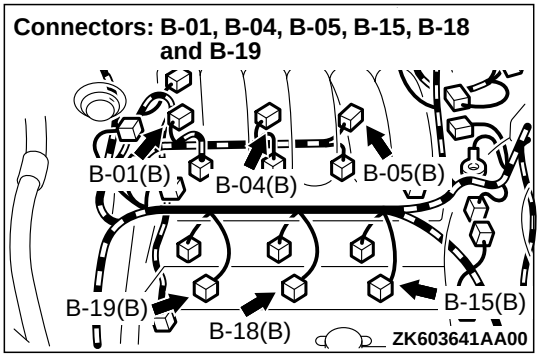
M11310100308USA0000010000

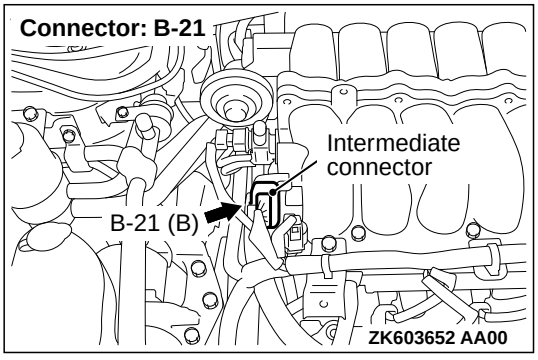
IGNITION CIRCUIT

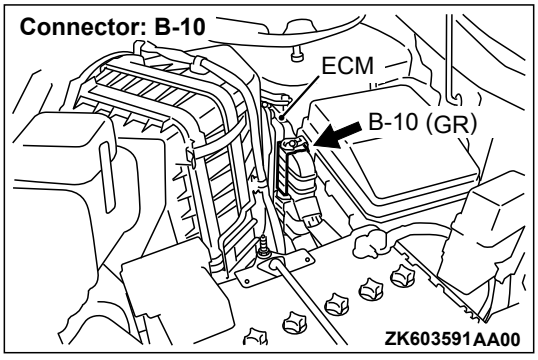


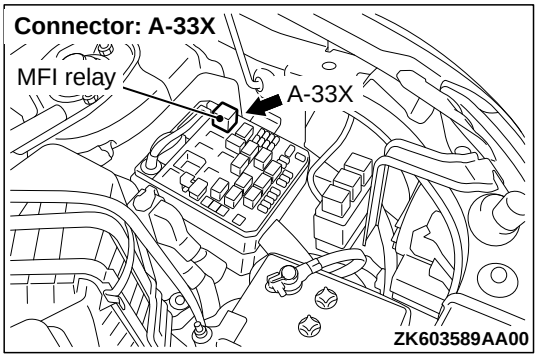
ZK602873AA00











CIRCUIT OPERATION

- The battery positive voltage is applied from the MFI relay to the ignition coil (terminal No.3) and is grounded to the vehicle body via the ignition coil (terminal No.1).
- A power voltage of 12 V is applied to the ignition coil (terminal No. 3) from the ECM (terminal No. 4, No. 5, No. 20, No. 21, No. 52 and No. 53).

COMMENT

- When the ECM turn the power transistor in the unit to OFF, the battery positive voltage is applied to the power transistor in the ignition coil, resulting that the power transistor is ON. And, when the ECM turns the power transistor in the unit to ON, the power transistor in the ignition coil will be turned OFF.
- When the power transistor in the ignition coil is turned to ON with any signal from the ECM, the primary voltage will be applied through the ignition coil.When the power transistor in the ignition coil is turned OFF, the primary current is blocked and high voltage is generated in the secondary coil.

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

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

DIAGNOSIS

STEP 1. Check the ignition coil.

(1) Remove the intake manifold.

(2) Refer to GROUP 16, Ignition System - On-vehicle service - Ignition Coil Check P.16c-3.

Q:Are there any abnormalities?

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

NO: Go to Step 2.

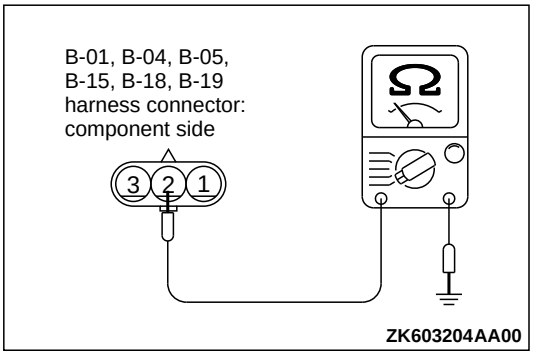
STEP 2. Check harness connectors harness connector B-10 at ECM and harness connector A-33X at MFI relay and B-01, B-04, B-05, B-15, B-18, B-19 at ignition coil for damage.

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. Check the continuity at ignition coil connectors B-01, B-04, B-05, B-15, B-18, B-19.



(1) Disconnect the connector B-01, B-04, B-05, B-15, B-18 and B-19 measure at the harness side.

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

- Should be less than 2 ohms.

Q:Does continuity exist?

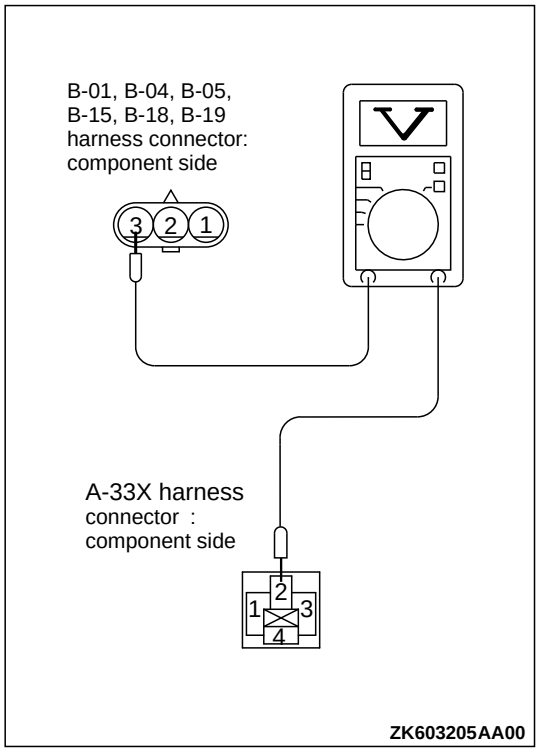
YES: Go to Step 4.

NO: Check the connector B-21 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 coil connector ignition coil connectors B-01, B-04, B-05, B-15, B-18 and B-19 (terminal No. 2) and ground because of open circuit or harness damage. Then confirm that the malfunction symptom is eliminated.

STEP 4. Check for open circuit and harness damage between MFI relay connector and ignition coil connector.

NOTE: Check harness after checking intermediate connectors A-13 and B-21. If intermediate connectors are damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection. Then confirm that the malfunction symptom is eliminated.

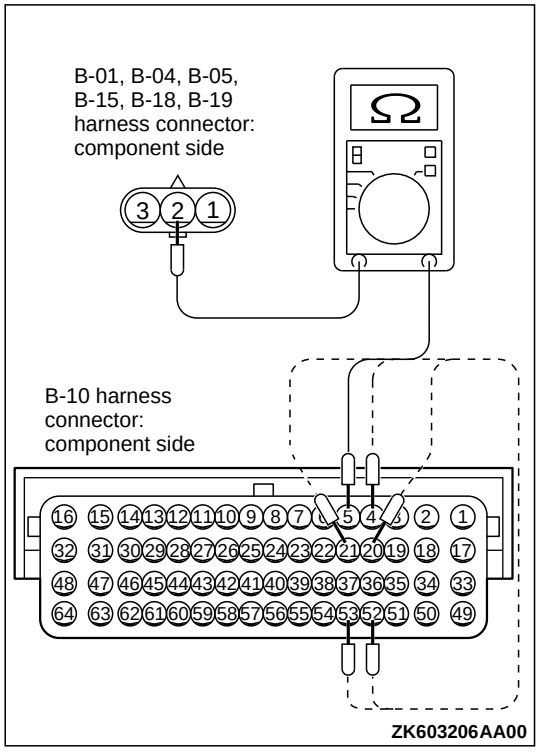
(1) Disconnect the MFI relay connector and ignition coil connector.



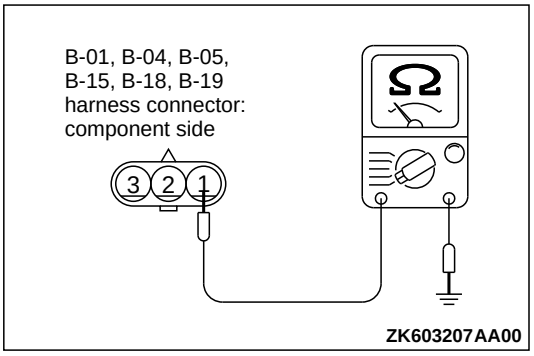
(2) Measure the resistance between MFI relay connector and ignition coil connector.
a. MFI relay connector A-33X (terminal No. 2) and ignition coil connector B-01 (terminal No. 3) at ignition coil 1.
b. MFI relay connector A-33X (terminal No. 2) and ignition coil connector B-19 (terminal No. 3) at ignition coil 2.
c. MFI relay connector A-33X (terminal No. 2) and ignition coil connector B-04 (terminal No. 3) at ignition coil 3.
d. MFI relay connector A-33X (terminal No. 2) and ignition coil connector B-18 (terminal No. 3) at ignition coil 4.
e. MFI relay connector A-33X (terminal No. 2) and ignition coil connector B-05 (terminal No. 3) at ignition coil 5.
f. MFI relay connector A-33X (terminal No. 2) and ignition coil connector B-15 (terminal No. 3) at ignition coil 6.
- Should be less than 2 ohms.

Q:Is the measured resistance less than 2 ohms?
YES: Go to Step 5.
NO: Repair it. Then confirm that the malfunction symptom is eliminated.

STEP 5. Check for open circuit and harness damage between ignition coil connector and ECM connector.
NOTE: Check harness after checking intermediate connector B-21. If intermediate connector is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection. Then confirm that the malfunction symptom is eliminated.
(1) Disconnect the ignition coil connector and ECM connector.
(2) Measure the resistance between ignition coil connector and ECM connector.
a. Ignition coil connector B-01 (terminal No. 2) and ECM connector B-10 (terminal No. 4) at ignition coil 1.
b. Ignition coil connector B-19 (terminal No. 2) and ECM connector B-10 (terminal No. 5) at ignition coil 2.
c. Ignition coil connector B-04 (terminal No. 2) and ECM connector B-10 (terminal No. 20) at ignition coil 3.
d. Ignition coil connector B-18 (terminal No. 2) and ECM connector B-10 (terminal No. 21) at ignition coil 4.
e. Ignition coil connector B-05 (terminal No. 2) and ECM connector B-10 (terminal No. 52) at ignition coil 5.
f. Ignition coil connector B-15 (terminal No. 2) and ECM connector B-10 (terminal No. 53) at ignition coil 6.
- Should be less than 2 ohms.



Q:Is the measured resistance less than 2 ohms?
YES: Go to Step 6.
NO: Repair it. Then confirm that the malfunction symptom is eliminated.



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

NOTE: Check harness after checking intermediate connectors A-13 and B-21. If intermediate connectors are damaged, repair or replace it.

Refer to GROUP 00E, Harness Connector Inspection. Then confirm that the malfunction symptom is eliminated.

(1) Disconnect the ignition coil connector and ECM connector.

(2) Check for the continuity between ignition coil connector and ground.

a Ignition coil connector B-01 (terminal No. 1) and ground at ignition coil 1.

b Ignition coil connector B-19 (terminal No. 1) and ground at ignition coil 2.

c Ignition coil connector B-04 (terminal No. 1) and ground at ignition coil 3.

d Ignition coil connector B-18 (terminal No. 1) and ground at ignition coil 4.

e Ignition coil connector B-05 (terminal No. 1) and ground at ignition coil 5.

f Ignition coil connector B-15 (terminal No. 1) and ground at ignition coil 6.

▪Not continuity.

Q:Is the harness wire in good condition?

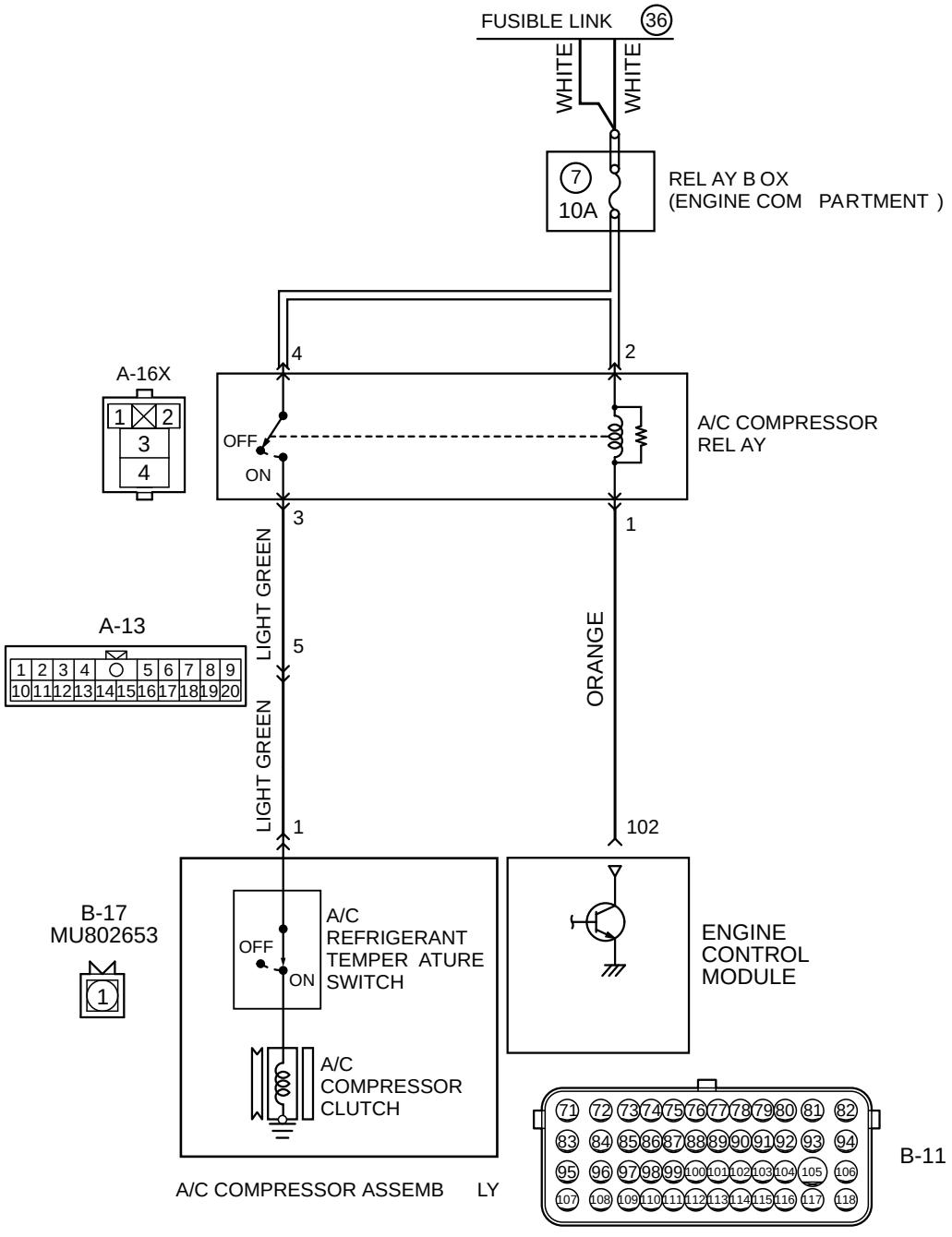
YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8.

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

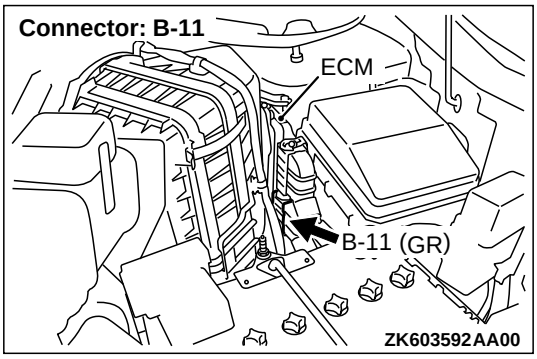
INSPECTION PROCEDURE 25: A/C system.

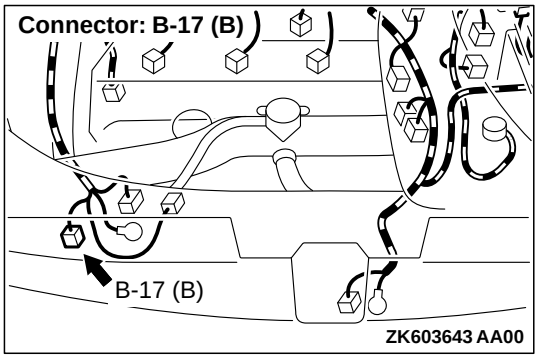
M11310100309USA0000010000

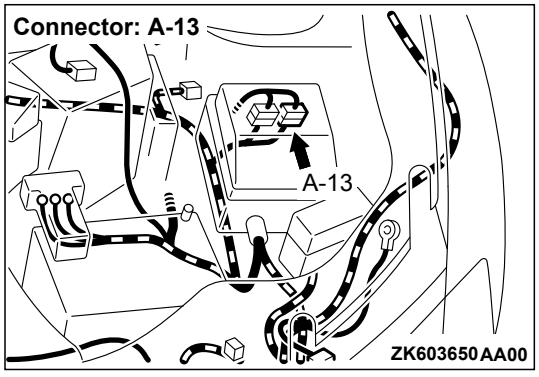
A/C COMPRESSOR RELAY CIRCUIT

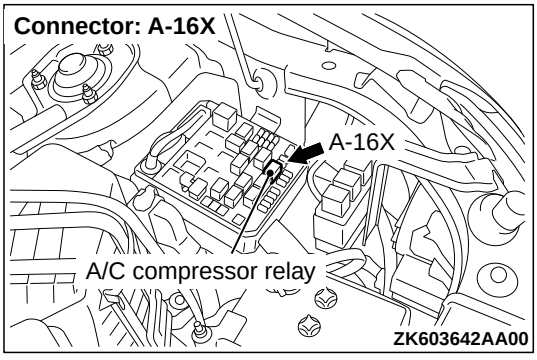


ZK602874AA00









CIRCUIT OPERATION

- When the A/C switch ON signal is input into the ECM, the ECM turns ON the A/C compressor relay. This causes battery positive voltage to be supplied to the A/C compressor and the magnet latch actuates.

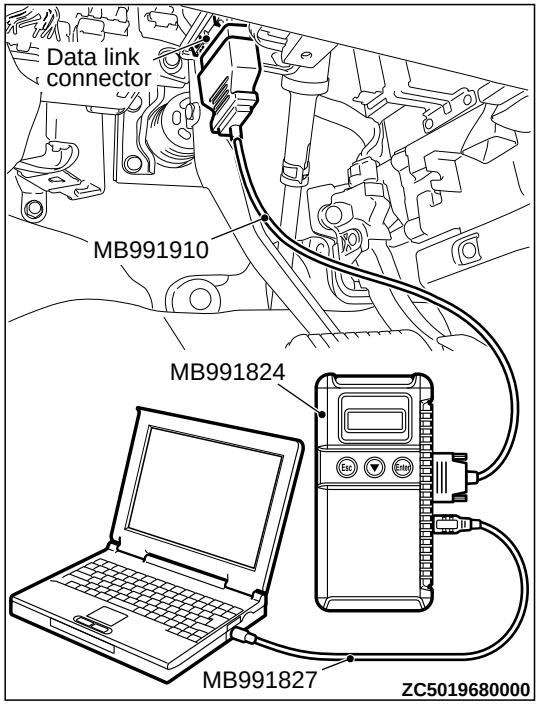
COMMENT

- When the A/C is "ON" the ECM turns "ON" the power transistor in the ECM. The ECM delays A/C engagement momentarily while it increases idle r/min. Then the A/C compressor clutch relay coil will be energized.
  With this, the A/C compressor clutch relay turns "ON", and the A/C compressor clutch operates.

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

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

DIAGNOSIS



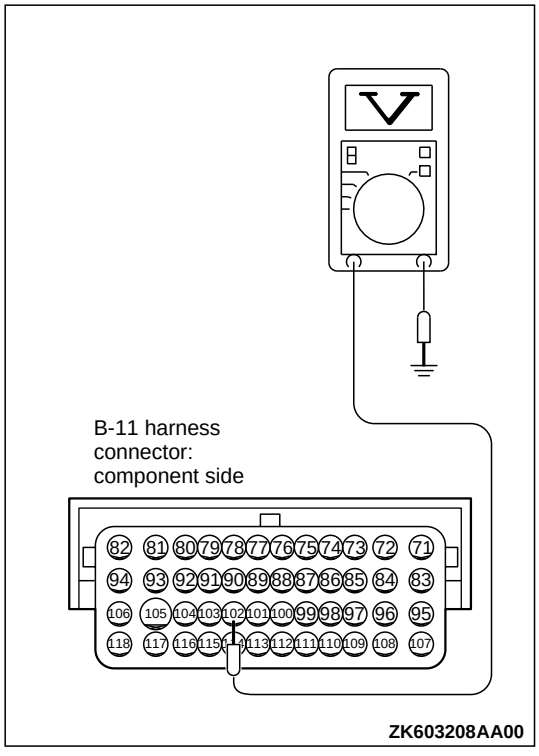
STEP 1. Using scan tool MB991958, check data list item.

⚠ 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.13Ab-837.
a Item 93: A/C compressor relay.
.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q:Are they operating properly?
YES: Go to Step 2.
NO: Repair or replace it. Then confirm that the malfunction symptom is eliminated.



STEP 2. Check the circuit at ECM connector B-11.

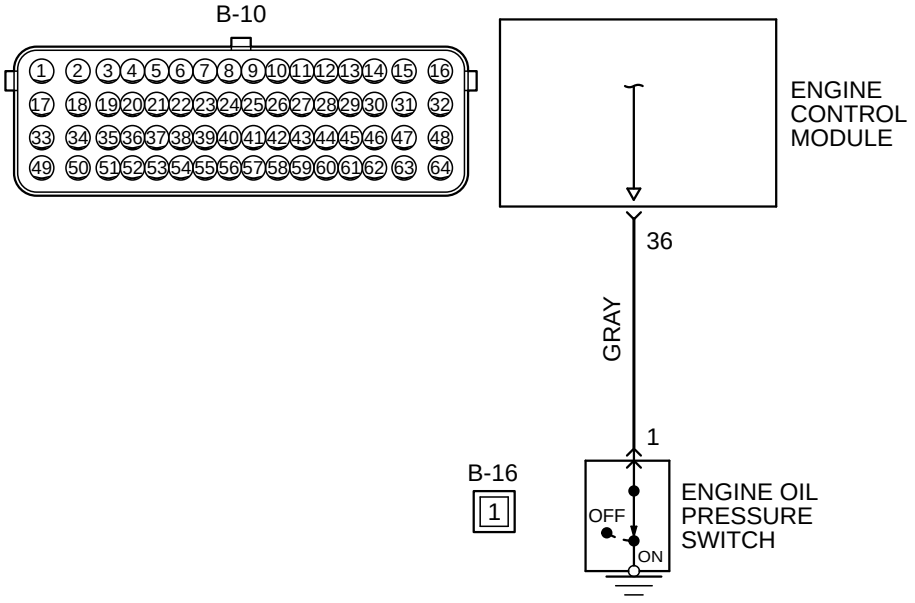
(1) Disconnect the connectors B-11 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal No. 102 and ground.
▪Voltage should be battery positive voltage.
(4) Using a jumper wire, connect terminal No. 102 to ground.
▪A/C compressor 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 ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8.
NO: Refer to GROUP 55A, Manual A/C Diagnosis - Heater, Air Conditioning and Ventilation Diagnostic Troubleshooting Strategy P.55A-5, or GROUP 55B, Auto A/C Diagnosis - Automatic A/C Troubleshooting Strategy P.55B-4.

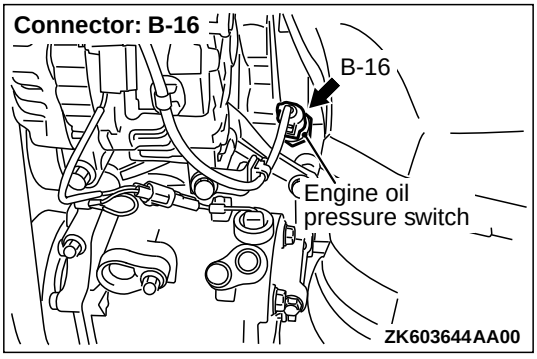
INSPECTION PROCEDURE 26: Engine oil pressure switch System.

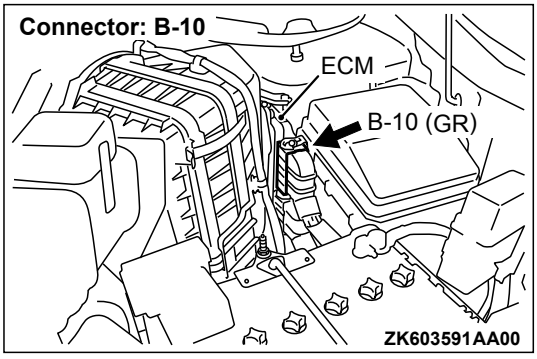
M11310100331USA0000010000

ENGINE OIL PRESSURE SWITCH CIRCUIT



ZK602875 AA00





CIRCUIT OPERATION

- Battery voltage is applied to the oil pressure switch (terminal No. 1) from the engine-ECU (terminal No. 36).

COMMENT

- Detect the engine oil pressure conditions and enter the result into the ECM. After starting the engine if the oil pressure rises to higher than the given pressure, the engine oil pressure switch turns OFF. Under this condition the ECM sends the command of turning off the oil warning lamp to the combination meter via CAN.

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

- Engine oil pressure switch failed.
- Improper connector contact, open circuit or short-circuit harness wire.
- ECM 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-16 at engine oil pressure switch and harness connector B-10 at ECM for damage.

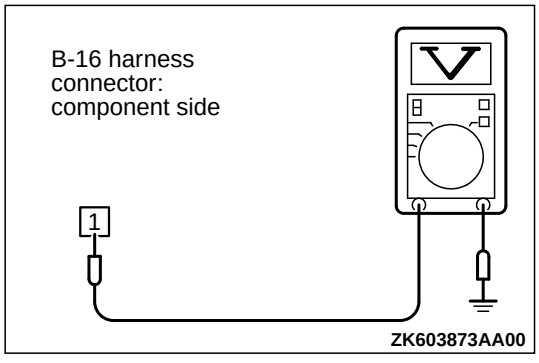
Q:Is the harness connector in good condition?

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. Measure the power supply voltage at engine oil pressure switch connector B-16.

(1) Disconnect the connector B-16 measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal No. 1 and ground.
  - The voltage should equal battery positive voltage.
(4) Turn the ignition switch to the "LOCK" (OFF) position.



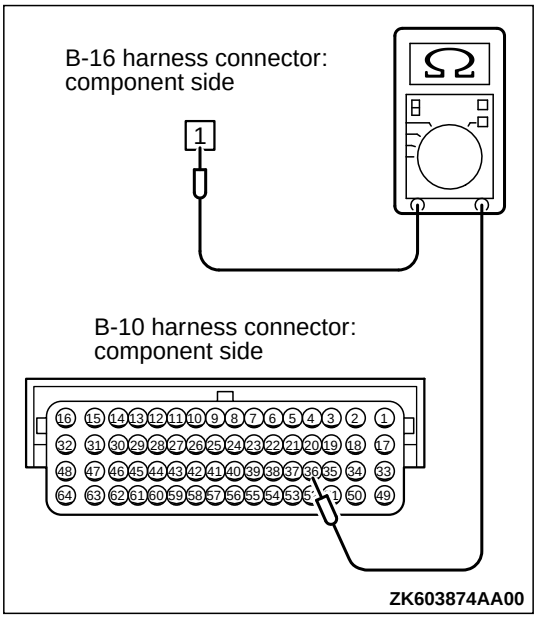
Q:Is battery positive voltage (approximately 12 volts) present?

YES: Go to Step 5.

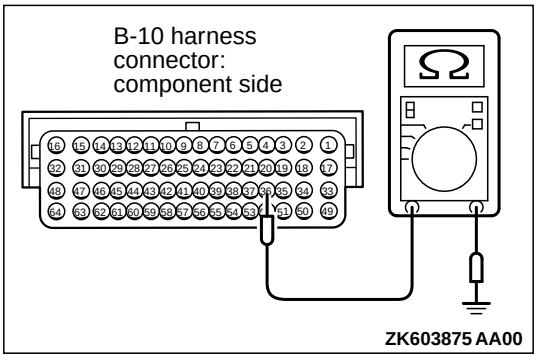
NO: Go to Step 3.

STEP 3. Check for open circuit or short circuit to ground or harness damage between engine oil pressure switch connector B-16 and ECM connector B-10.

(1) Disconnect the connector B-16 and B-10 measure at the harness side.



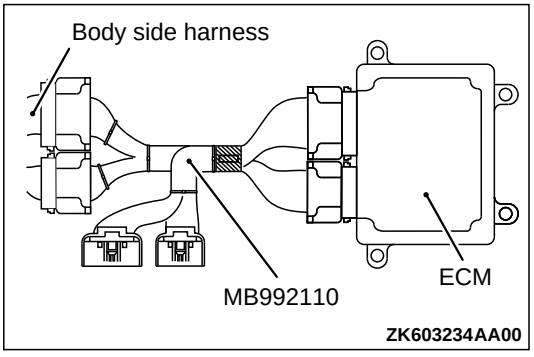
(2) Measure the resistance between connector B-16 (terminal No. 1) and connector B-10 (terminal No. 36).
- Should be less than 2 ohms.



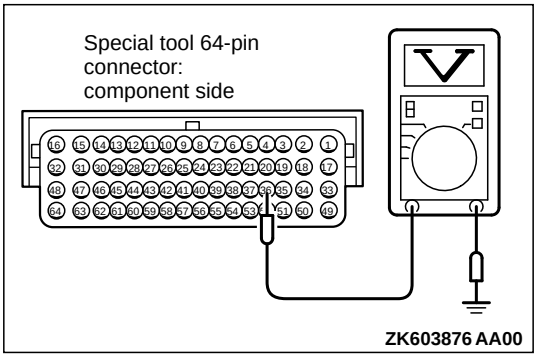
(3) Check for the continuity between connector B-10 (terminal No. 36) and ground.
- Not continuity.

Q:Is the harness wire in good condition?
YES: Then go to Step 4.
NO: Repair it. Then confirm that the malfunction symptom is eliminated.

STEP 4. Measure the voltage at ECM connector B-10 by using power plant ECU check harness special tool MB992110.



(1) Disconnect all ECM connectors. Connect the power plant ECU check harness special tool MB992110 between the separated connectors.



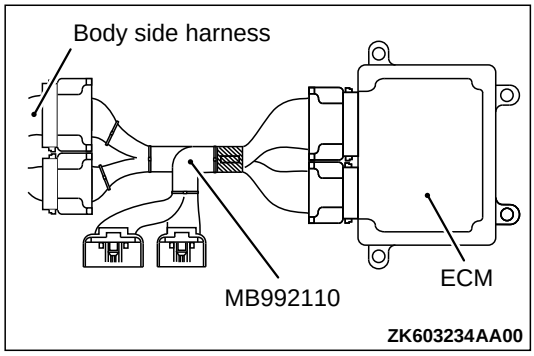
(2) Measure the voltage between terminal No. 36 and ground.
OK:
1 V or less (ignition switch: ON)
System voltage (during idling)

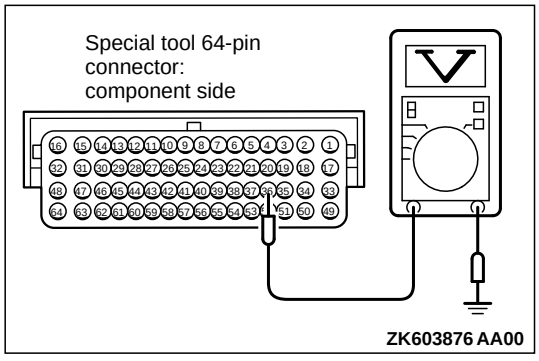
Q:
YES: It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points - How to Cope with Intermittent Malfunctions P.00-15.

NO: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8.

STEP 5. Measure the voltage at ECM connector B-10 by using power plant ECU check harness special tool MB992110.

(1) Disconnect all ECM connectors. Connect the power plant ECU check harness special tool MB992110 between the separated connectors.





(2) Measure the voltage between terminal No. 36 and ground.
OK:
1 V or less (ignition switch: ON)
System voltage (during idling)

Q:

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.00-15.

NO: Replace the engine oil pressure switch. Then confirm that the malfunction symptom is eliminated.

DATA LIST REFERENCE TABLE

M11310100004USA0000010000

⚠ 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. 25	P. 13Ab-831
			▪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. 25	P. 13Ab-831
			▪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.		
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 ▪Transaxele: "P" range	Engine is idling	1,350 - 1,670 mV	-	-
				2,500 r/min	1,620 - 2,020 mV		
				Engine is revved	Increase in response to 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	2.0 - 6.0 g/s	-	-
				2,500 r/min	6.0 - 14.0 g/s		
				Engine is revved	Increases in response to revving		
APP sensor (main)	11	Accelerator pedal position sensor (main)	Ignition switch: "ON"	Release the accelerator pedal	900 - 1,100 mV	Code No. P2122, P2123	P. 13Ab-697, P. 13Ab-702
				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 (main)	BE	Accelerator pedal position sensor (main)	Ignition switch: "ON"	Release the accelerator pedal	18 - 22%	Code No. P2122, P2123	P. 13Ab-697, P. 13Ab-702
				Depress the accelerator pedal gradually	Increases in response to the pedal depression stroke		
				Depress the accelerator pedal fully	80% or more		
APP sensor (sub)	12	Accelerator pedal position sensor (sub)	Ignition switch: "ON"	Release the accelerator pedal	400 - 600 mV	Code No. P2127, P2128	P. 13Ab-706, P. 13Ab-710
				Depress the accelerator pedal gradually	Increases in response to the pedal depression stroke		

M.U.T.-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
				Depress the accelerator pedal fully	2,000 mV or more		
APP sensor (sub)	BF	Accelerator pedal position sensor (sub)	Ignition switch: "ON"	Release the accelerator pedal	8 - 12%	Code No. P2127, P2128	P. 13Ab -706, P. 13Ab -710
				Depress the accelerator pedal gradually	Increases in response to the pedal depression stroke		
				Depress the accelerator pedal fully	40% or more		
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. 13Ab -727, P. 13Ab -729
				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	ON	-	-
				Release the brake pedal	OFF		
Calculated load value	73	Calculated load value	Engine: warming up	Engine is idling	14 - 24%	-	-
				2,500 r/min	11 - 21%		
Closed throttle position signal	84	Closed throttle position signal	Ignition switch: "ON"	Release the accelerator pedal	ON	-	-

M.U.T.-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
				Depress the accelerator pedal	OFF		
Cranking signal	79	Cranking signal (ignition switch-ST)	Ignition switch: "ON"	Engine: stopped	OFF	Procedure No. 23	P. 13Ab-819
				Engine: cranking	ON		
Crankshaft position sensor	02	Crankshaft position sensor	▪Engine: cranking ▪Tachometer: connected		Engine speeds displayed on the scan tool and tachometer are identical.	Code No.P0335	P. 13Ab-433
			Engine: idling	Engine coolant temperature is -20°C (-4° F)	1,300- 1,500 r/min		
				Engine coolant temperature is 0°C (32°F)	1,200 - 1,400 r/min		
				Engine coolant temperature is 20°C (68°F)	1,200 - 1,400 r/min		
				Engine coolant temperature is 40°C (104°F)	1,060 - 1,260 r/min		
				Engine coolant temperature is 80°C (176°F)	550 - 750 r/min		
ECT sensor	06	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. 13Ab-158, P. 13Ab-163, P. 13Ab-168
				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)		

DATA LIST REFERENCE TABLE

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. P0489, P0490	P. 13Ab -549, P. 13Ab -555
				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	-	-
Fan duty	47	Fan motor duty	Engine: warming up ▪The duty ratio of the fan motor driving is shown.		0 - 100% (Display range)	-	-
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	Fuel control system status (bank 1)	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 system status (bank 2)	106	Fuel control system status (bank 2)	Engine: warming up	2,500 r/min	CL: Using O2S	-	-
				When engine is suddenly revved	OL: DRV condition		
Fuel tank differential PRS. SNSR	52	Fuel tank differential pressure sensor	▪Ignition switch: "ON" ▪Fuel cap removal		1,500 - 3,500 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. 13Ab-316, P. 13Ab-321, P. 13Ab-326
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)	80 - 120 ms	-	-
				When engine coolant temperature is 20°C (68°F)	30 - 50 ms		
				When engine coolant temperature is 80°C (176°F)	8 - 16 ms		
		Injectors*3	▪Engine coolant temperature: 80 - 95°C (176 - 203°F) ▪Lights, electric cooling fan and all accessories: "OFF"*4 ▪Transaxle: "P" range	Engine is idling	1.5 - 3.5 ms		
				2,500 r/min	1.2 - 3.2 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	05	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. 13Ab-143, P. 13Ab-148, P. 13Ab-152
				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)	68	Idle speed control learned value (A/C OFF)	Ignition switch: "ON" ▪ Indicates the leaning value to compensate for the opening angle of idling speed control (opening angle of throttle valve). ▪ The negative side shows "close" side, while the positive side shows "open" side.		-1 to 2.4 L/s (Display range)	-	-
ISC learned value (A/C ON)	69	Idle speed control learned value (A/C ON)	Ignition switch: "ON" ▪ Indicates the leaning value to compensate for the opening angle of idling speed control (opening angle of throttle valve) with the air conditioner turned ON. ▪ The negative side shows "close" side, while the positive side shows "open" side.		-1 to 2.4 L/s (Display range)	-	-
Knock retard	32	Knock retard	Engine: warming up, sudden racing		According to acceleration, knock retard is increased.	-	-
Learned knock retard	33	Knock control learned value	Ignition switch: "ON"		0 - 100 % (Display range)	-	-

M.U.T.-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
			▪The learning value is shown, which compensates the ignition time based on the knock sensor. ▪"0%" means "retard angle" and "100%" means "advance angle".				
Long term fuel trim (bank 1)	26	Long - term fuel tirm (bank 1)	Engine: warming up, 2,500 r/min without any load (during closed loop)		- 12.5 to 12.5%	Code No. P0171, P0172	P. 13Ab-293, P. 13Ab-300
Long term fuel trim (bank 2)	27	Long - term fuel tirm (bank 2)	Engine: warming up, 2,500 r/min without any load (during closed loop)		- 12.5 to 12.5%	Code No. P0174, P0175	P. 13Ab-304, P. 13Ab-311
MAP sensor	08	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. 13Ab-126, P. 13Ab-132, P. 13Ab-138
				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		
Neutral switch	87	Neutral switch	Ignition switch: "ON"	Shift lever: "P" or "N"	ON	-	-

M.U.T.-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
				Shift lever: "R" or "D"	OFF		
Normally closed brake switch	89	Normally closed brake switch	Ignition switch: "ON"	Depress the brake pedal	ON	-	-
				Release the brake pedal	OFF		
Oil control valve	98	Engine oil control valve	Engine: warming up	Engine is idling	OFF	-	-
				5,000 r/min	ON		
Oxygen sensor (bank1 sensor1)	AC	Heated oxygen sensor bank 1, sensor 1 (right 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. 13Ab-196, P. 13Ab-202, P. 13Ab-206, P. 13Ab-210, P. 13Ab-721
				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 ECM)	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	Heated oxygen sensor bank 1, sensor 2 (right rear)	Engine: warming up	▪Transaxle: 2nd ▪Drive with wide open throttle ▪Engine: 3,500 r/min or more	0.6 - 1.0V	Code No. P0137, P0138, P0139, P0140	P. 13Ab-217, P. 13Ab-222, P. 13Ab-226, P. 13Ab-230

M.U.T.-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
Oxygen sensor (bank1 sensor3)	B1	Heated oxygen sensor bank 1, sensor 3 (Center exhaust pipe) <California>	Engine: warming up	▪Transaxle: 2nd ▪Drive with wide open throttle ▪Engine: 3,500 r/min or more	0.6 - 1.0 V	Code No. P0143, P0144, P0145, P0146	P. 13Ab-235, P. 13Ab-240, P. 13Ab-244, P. 13Ab-248
Oxygen sensor (bank2 sensor1)	AE	Heated oxygen sensor bank 2, sensor 1 (left 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 - 1.0 V (After several seconds have elapsed)	Code No. P0151, P0152, P0153, P0154, P2197	P. 13Ab-253, P. 13Ab-259, P. 13Ab-263, P. 13Ab-268, P. 13Ab-724
				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 ECM	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	Heated oxygen sensor bank 2, sensor 2 (left rear)	Engine: warming up	▪Transaxle: 2nd ▪Drive with wide open throttle ▪Engine: 3,500 r/min or more	0.6 - 1.0V	Code No. P0157, P0158, P0159, P0160	P. 13Ab-275, P. 13Ab-280, P. 13Ab-284, P. 13Ab-288
Power steering pressure	24	Power steering fluid pressure sensor	Engine: warming up, idling	Steering wheel stationary	400 - 1,000 mV	Code No.P0551, P0552, P0553	P. 13Ab-568, P. 13Ab-574, P. 13Ab-580
				Steering wheel turning	Voltage rises		
				Full lock	3,000 - 4,000 mV		

M.U.T.-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
Power supply voltage	01	Power supply voltage	Ignition switch: "ON"		Battery positive voltage	Procedure No. 21	P. 13Ab-807
Radiator sensor temperature 1	111	Radiator sensor temperature 1	Ignition switch: "ON"	Approximately the same as the engine coolant temperature in the radiator		Code No.P1543, P1544, P1545, P1546, P1547	P. 13Ab-663, P. 13Ab-666, P. 13Ab-669, P. 13Ab-671, P. 13Ab-674
Radiator sensor temperature 2	112	Radiator sensor temperature 2	Ignition switch: "ON"	Approximately the same as the engine coolant temperature in the radiator		Code No.P1543, P1544, P1545, P1546, P1547	P. 13Ab-663, P. 13Ab-666, P. 13Ab-669, P. 13Ab-671, P. 13Ab-674
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.	Fully close the throttle valve with your finger	0 - 5%	-	-
				Fully open the throttle valve with your finger	88% or more		

M.U.T.-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
			▪Ignition switch: "ON"				
Short term fuel trim (bank 1)	28	Short-term fuel trim (bank 1)	Engine: warming up, 2,500 r/min without any load (during closed loop)		- 7.4 to 7.4%	Code No. P0171, P0172	P. 13Ab-293, P. 13Ab-300
Short term fuel trim (bank 2)	29	Short-term fuel trim (bank 2)	Engine: warming up, 2,500 r/min without any load (during closed loop)		- 7.4 to 7.4%	Code No. P0174, P0175	P. 13Ab-304, P. 13Ab-311
Spark advance	16	Ignition timing advance	▪Engine: warming up ▪Timing light is set (to check actual ignition timing) ▪Transaxle: "P" range	Engine is idling	2 - 18 °CA (BTDC)	-	-
				2,500 r/min	31 - 43 °CA (BTDC)		
Starter relay	102	Starter relay	Ignition switch: "ON"	Engine: stopped	OFF	-	-
				Engine: cranking	ON		
Target EGR	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)	-	-
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)	-	-
Target idle speed	03	Target idle speed	Engine: idling	Engine coolant temperature is -20°C (-4°F)	1,300 - 1,500 r/min	-	-
				Engine coolant temperature is 0°C (32°F)	1,200 - 1,400 r/min		

M.U.T.-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
				Engine coolant temperature is 20°C (68°F)	1,200 - 1,400 r/min		
				Engine coolant temperature is 40°C (104°F)	1,060 - 1,260 r/min		
				Engine coolant temperature is 80°C (176°F)	550 - 750 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)	13	Throttle position sensor (main)	▪Remove the intake air hose at the throttle body ▪Disconnect the throttle position sensor connector, and then connect terminals 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. 13Ab -174, P. 13Ab -181
				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 vise		
				Shift lever: "N" → "D"			

M.U.T.-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
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	6 - 14%	Code No. P0122, P0123	P. 13Ab-174, P. 13Ab-181
				Fully open the throttle valve with your finger	80% or more		
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.			-	-
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 terminals No. 3, No. 4, No. 5 and No. 6 with the use of the special tool: MB991658.	Fully close the throttle valve with your finger	4,000 mV or more	Code No. P0222, P0223	P. 13Ab-377, P. 13Ab-384
				Fully open the throttle valve with your finger	1,000 mV or less		

M.U.T.-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
			▪Ignition switch: "ON"				
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	6 - 14%	Code No. P0222, P0223	P. 13Ab-377, P. 13Ab-384
				Fully open the throttle valve with your finger	80% or more		
Variable intake solenoid	103	Intake manifold tuning solenoid	Engine warning up	Engine is idling	ON	-	-
				4,000 r/min	OFF	-	-
Vehicle speed	04	Vehicle speed	Drive at 40 km/h (25 mph).		Approximately 40 km/h (25 mph)	-	-

GENERAL SCAN TOOL (GST) MODE 01 REFERENCE TABLE

M11310100310USA0000010000

The purpose of this service is to allow access to current emission-related data values, including analog inputs and outputs, digital inputs and outputs, and system status information.
The request for information includes a parameter identification (PID) value that indicates the on-board system the specific information requested.
The ECM 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		
	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		

PARAMETER IDENTIFICATION (PID)	DESCRIPTION	COMMON EXAMPLE OF GENERAL SCAN TOOL DISPLAY	INSPECTION CONDITION	NORMAL CONDITION
	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.	
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

PARAMETER IDENTIFICATION (PID)	DESCRIPTION	COMMON EXAMPLE OF GENERAL SCAN TOOL DISPLAY	INSPECTION CONDITION	NORMAL CONDITION
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.	
		SHRTFT12: xxx.x%	Engine: warming up, 2,500 r/min without any load (during closed loop)	-25 to 25%
16	Bank 1 - Sensor 3	O2S13: x.xxx V	See M.U.T.-III item No. B1.	
		SHRTFT13: xxx.x%	Engine: warming up, 2,500 r/min without any load (during closed loop)	-25 to 25%
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.	
		SHRTFT22: xxx.x%	Engine: warming up, 2,500 r/min without any load (during closed loop)	-25 to 25%
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.	
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.	

PARAMETER IDENTIFICATION (PID)	DESCRIPTION	COMMON EXAMPLE OF GENERAL SCAN TOOL DISPLAY	INSPECTION CONDITION	NORMAL CONDITION
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 (-13.3 to 13.3 in.H2O)
33	Barometric Pressure	BARO: xxx kPa (xx.x inHg)	See M.U.T.-III item No. BB.	
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		

PARAMETER IDENTIFICATION (PID)	DESCRIPTION	COMMON EXAMPLE OF GENERAL SCAN TOOL DISPLAY	INSPECTION CONDITION	NORMAL CONDITION
	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		
	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

M11310100005USA0000010000

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

ACTUATOR TEST REFERENCE TABLE

M.U.T.-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	DRIVE CONTENTS	INSPECTION REQUIRMENT	NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE 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. 25	P. 13Ab-831
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. 13Ab-473
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. 13Ab-481
FUEL PUMP	09	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. 22	P. 13Ab-813
Ignition timing 5 BTDC	11*	Basic ignition timing	Set to ignition timing adjustment mode	▪Engine: idling ▪Connect timing light	5°BTDC	-	-

M.U.T.-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	DRIVE CONTENTS	INSPECTION REQUIRMENT	NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFEREC E PAGE
Injector	01	Injectors	Specified injector is stopped	Engine: warm up, idle (cut the fuel supply to each injector in turn and check cylinders which don't affect idling.)	Idle condition is changed by stopping selected cylinder: this can cause an unstable condition and the engine may stall.	Code No. P0201, P0202, P0203, P0204, P0205, P0206	P. 13Ab-332, P. 13Ab-340, P. 13Ab-347, P. 13Ab-355, P. 13Ab-362, P. 13Ab-370
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. 13Ab-620
PWM Radiator fan	14	Radiator fan, A/C condenser fan	Drive the fan motor	Ignition switch: "ON"	Radiator fan and A/C condenser fan rotate.	-	-
Variable intake solenoid	21	Intake manifold tuning solenoid	Solenoid valve turns from OFF or ON.	Engine: idling	The Intake manifold tuning solenoid valve is operated.	Code No. P0660	P. 13Ab-607

CHECK AT THE ENGINE CONTROL MODULE (ECM)

M11310100006USA0000010000

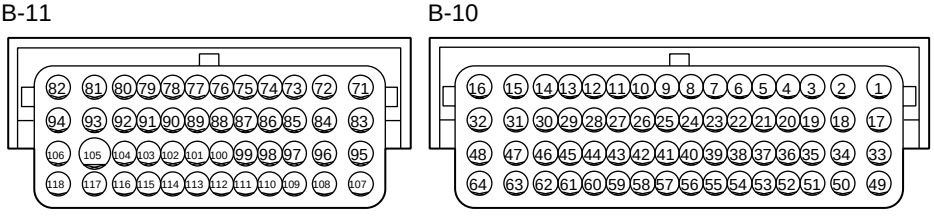
1. Disconnect the ECM connectors B-10 and B-11, and connect check harness special tool MB992110 between the ECM connectors.
2. Measure the voltage between each check harness connector terminal and check harness connector ground terminal (No. 25 or No. 29).

TERMINAL VOLTAGE CHECK CHART

*NOTE: *1: The average voltage through an analog voltmeter is described in this service manual (because the average voltage would be not constantly 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 is no problem for checks.*

Check Harness Special Tool MB992110 Connector Terminal Arrangement



ZK603613 AA00

TERMINAL NO.	INSPECTION ITEM	INSPECTION CONDITION (ENGINE CONDITION)	NORMAL CONDITION
1	Engine oil control valve	Engine: warming up, idling	B+
		Engine: 5,000 r/min	1 V or less → 4.0 - 10 V*1 (After a few seconds pass)
2	No. 1 injector	▪Engine: warming up, idling ▪Suddenly depress the accelerator pedal	From 9 - 14 V*1 momentarily drops slightly
3	No. 2 injector		
18	No. 3 injector		
19	No. 4 injector		
50	No. 5 injector		
51	No. 6 injector		
4	Ignition coil No. 1 (ignition power transistor	Engine: 3,000 r/min	0.3 - 3.0 V*1
5	Ignition coil No. 2 (ignition power transistor		
20	Ignition coil No. 3 (ignition power transistor		
21	Ignition coil No. 4 (ignition power transistor		
52	Ignition coil No. 5 (ignition power transistor		
53	Ignition coil No. 6 (ignition power transistor		
6	Starter active signal	Engine: cranking	B+
		Engine: idling	1V or less
7	Engine oil pressure switch (for MIVEC)	Engine: warming up, idling	1V or less
		Engine: 5,000 r/min	B+

TERMINAL NO.	INSPECTION ITEM	INSPECTION CONDITION (ENGINE CONDITION)		NORMAL CONDITION
8	Crankshaft position sensor	Engine: cranking		0.4 - 4.0 V*1
		Engine: idling		2.0 - 3.0 V*1
9	Sensor supplied voltage	Ignition switch: "ON"		4.9 - 5.1 V
10	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
11	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	4 V or more
			Fully open the throttle valve with your finger	1 V or less
12	Power supply voltage applied to throttle position sensor	Ignition switch: "ON"		4.9 - 5.1 V
14	Camshaft position sensor	Engine: cranking		0.4 - 4.0 V*1
		Engine: idling		2.5 - 3.9 V*1

TERMINAL NO.	INSPECTION ITEM	INSPECTION CONDITION (ENGINE CONDITION)		NORMAL CONDITION
15	Throttle actuator control motor (+)	Ignition switch: "ON" Accelerator pedal: fully opened → fully closed		Decreases slightly (Approximately 2 V) from battery voltage.
16	Throttle actuator control motor (-)	Ignition switch: "ON" Accelerator pedal: fully closed → fully opened		Decreases slightly (Approximately 2 V) from battery voltage.
26	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
31	EGR valve (stepper motor coil <A>)	Ignition switch: "LOCK" (OFF) → "ON"		5 - 8 V*1(changes about three seconds repeatedly)
32	EGR valve (stepper motor coil <B>)			
47	EGR valve (stepper motor coil <C>)			
48	EGR valve (stepper motor coil <D>)			
33	Right bank 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)
34	Left bank 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)
35	Left bank heated oxygen sensor heater (rear)	Engine warming up, idling (15 seconds after starting engine)		1 V or less
		Engine: revving		B+
36	Engine oil pressure switch (for warning lamp)	Ignition switch: "ON"		0 - 0.1 V
		Engine: idling		B+

TERMINAL NO.	INSPECTION ITEM	INSPECTION CONDITION (ENGINE CONDITION)		NORMAL CONDITION
37	Evaporative emission purge solenoid	Ignition switch: "ON"		B+
		Engine: warming up, 3,000 r/min (with 3 minutes after the engine starting sequence is completed)		Voltage drops
38	Left bank heated oxygen sensor (front)	Engine: warming up, 2,500 r/min		0.5 ⇔ 1.4 V (changes repeatedly)
39	Left bank heated oxygen sensor (front) offset	Ignition switch: "ON"		0.4 - 0.6 V
40	Left bank heated oxygen sensor (rear)	▪Transaxlle: 2nd ▪Drive with wide open throttle ▪Engine: 3,500 r/min or more		1.0 - 1.5 V
41	Left bank heated oxygen sensor (rear) offset voltage	Ignition switch: "ON"		0.4 - 0.6 V
43	Power supply voltage applied to power steering pressure sensor	Ignition switch: "ON"		4.9 - 5.1 V
44	Power supply voltage applied to manifold absolute pressure sensor	Ignition switch: "ON"		4.9 - 5.1 V
45	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
49	Right bank heated oxygen sensor heater (rear)	Engine warming up, idling (15 seconds after starting engine)		1 V or less
		Engine: revving		B+
54	Right bank heated oxygen sensor (front)	Engine: warming up, 2,500 r/min		0.5 ⇔ 1.4 V (changes repeatedly)
55	Right bank heated oxygen sensor (rear) offset voltage	Ignition switch: "ON"		0.4 - 0.6 V
56	Right bank heated oxygen sensor (rear)	▪Transaxlle: 2nd ▪Drive with wide open throttle ▪Engine: 3,500 r/min or more		1.0 - 1.5 V

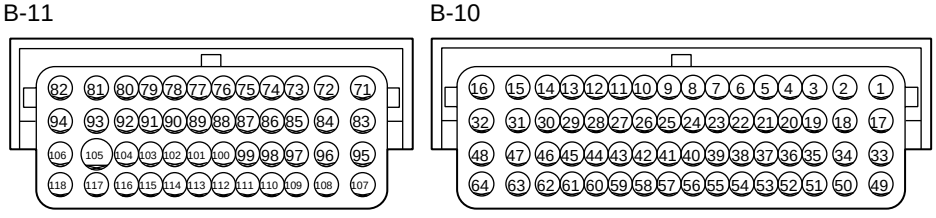
TERMINAL NO.	INSPECTION ITEM	INSPECTION CONDITION (ENGINE CONDITION)		NORMAL CONDITION
57	Right bank heated oxygen sensor (rear) offset voltage	Ignition switch: "ON"		0.4 - 0.6 V
58	Power steering pressure sensor	Engine: warming up, idling	When steering wheel is not turned	0.4 - 1.0 V
			When steering wheel is turned	Voltage increases
			When the steering wheel is turned fully	3.0 - 4.0 V
60	Generator G terminal	▪Engine: warming up, idling ▪Radiator fan: stopped ▪Headlight: OFF to ON*2 ▪Stop light: OFF to ON ▪Rear defogger switch: OFF to ON		Voltage increases
61	Generator FR terminal	▪Engine: warming up, idling ▪Radiator fan: stopped ▪Headlight: OFF to ON*2 ▪Stop light: OFF to ON ▪Rear defogger switch: OFF to ON		Voltage drops
62	Generator L terminal	Ignition switch: "ON"		0.5 - 2.0 V
		Engine: idling		B+
64	Intake manifold tuning solenoid	Engine: idling		1 V or less
		Engine: 4,000 r/min		B+
72	Power supply voltage applied to throttle actuator control motor	Ignition switch: "ON"		B+
73	MFI relay (power supply)	Ignition switch: "LOCK" (OFF)		B+
		Ignition switch: "ON"		1 V or less
74	Accelerator pedal position sensor (main)	Ignition switch: "ON"	Release the accelerator pedal	0.9 - 1.1 V
			Depress the accelerator pedal fully	4 V or more
75	Power supply voltage applied to accelerator pedal position sensor (main)	Ignition switch: "ON"		4.9 - 5.1 V
77	Accelerator pedal position sensor (sub)	Ignition switch: "ON"	Release the accelerator pedal	0.4 - 0.6 V
			Depress the accelerator pedal fully	2 V or more

TERMINAL NO.	INSPECTION ITEM	INSPECTION CONDITION (ENGINE CONDITION)		NORMAL CONDITION
78	Power supply voltage applied to accelerator pedal position sensor (sub)	Ignition switch: "ON"		4.9 - 5.1 V
82	Power supply	Ignition switch: "ON"		B+
84	Throttle actuator control motor relay	Ignition switch: "ON" → "LOCK" (OFF)		1 V or less → B+ → 1 V or less
87	Mass airflow sensor	Engine: revving		Voltage increases in response to revving
89	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
92	Ignition switch-IG	Ignition switch: "ON"		B+
96	Fuel pump relay	Ignition switch: "ON"		B+
		Engine: idling		1.0 V or less
101	Center exhaust pipe heated oxygen sensor	▪Transaxlle: 2nd ▪Drive with wide open throttle ▪Engine: 3,500 r/min or more		1.0 - 1.5 V
102	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
104	Backup power supply	Ignition switch: "LOCK" (OFF)		B+
105	Ignition switch-ST	Ignition switch: cranking		8 V or more
106	Starter relay	Engine: cranking		B+
		Engine: idling		1 V or more
112	Fuel tank differential pressure sensor	▪Ignition switch: "ON" ▪Fuel cap removal		1.5 - 3.5 V
114	Power supply voltage applied to fuel tank differential pressure sensor	Ignition switch: "ON"		4.9 - 5.1 V

TERMINAL NO.	INSPECTION ITEM	INSPECTION CONDITION (ENGINE CONDITION)		NORMAL CONDITION
115	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
116	Center exhaust pipe heated oxygen sensor earth offset voltage	Ignition switch: "ON"		0.4 - 0.6 V
117	Evaporative emission ventilation solenoid	Ignition switch: "ON"		B+
		Carry out the actuator test to drive the solenoid valve.		1 V or less (Approximately 6 seconds)
118	Center exhaust pipe heated oxygen sensor heater	Engine warming up, idling (15 seconds after starting engine)		1V or less
		Engine: revving		B+

TERMINAL RESISTANCE AND CONTINUITY CHECK

ECM Harness side Connector Terminal Arrangement



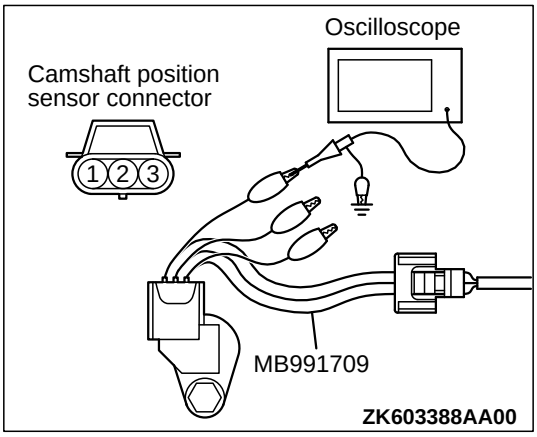
ZK603614 AA00

TERMINAL NO.	INSPECTION ITEM	NORMAL CONDITION (INSPECTION CONDITION)
1 - 82	Engine oil control valve	6.9 - 7.9 Ω [at 20°C (68°F)]
15 - 16	Throttle actuator control motor	0.3 - 80 Ω [at 20°C (68°F)]
26 - 27	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)]

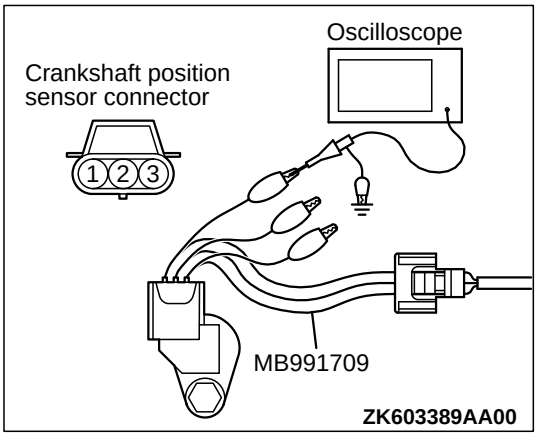
TERMINAL NO.	INSPECTION ITEM	NORMAL CONDITION (INSPECTION CONDITION)
		0.48 - 0.68 kΩ [when engine coolant temperature is 60°C (140°F)]
		0.26 - 0.36 kΩ [when engine coolant temperature is 80°C (176°F)]
31 - 82	EGR valve (A)	20 - 24 Ω [at 20°C (68°F)]
32 - 82	EGR valve (B)	
47 - 82	EGR valve (C)	
48 - 82	EGR valve (D)	
33 - 82	Right bank heated oxygen sensor heater (front)	4.5 - 8.0 Ω [at 20°C (68°F)]
34 - 82	Left bank heated oxygen sensor heater (front)	4.5 - 8.0 Ω [at 20°C (68°F)]
35 - 82	Left bank heated oxygen sensor heater (rear)	11 - 18 Ω [at 20°C (68°F)]
37 - 82	Evaporative emission purge solenoid	22 - 26 Ω [at 20°C (68°F)]
49 - 82	Left bank heated oxygen sensor heater (rear)	11 - 18 Ω [at 20°C (68°F)]
64 - 82	Intake manifold tuning solenoid	29 - 35 Ω [at 20°C (68°F)]
81 - Body ground	ECM ground	Continuity (2 Ω or less)
93 - Body ground		
82 - 117	Evaporative emission ventilation solenoid	17 - 21 Ω [at 20°C (68°F)]
88 - 89	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)]
118 - 82	Center exhaust pipe heated oxygen sensor heater	4.5 - 8.0 Ω [at 20°C (68°F)]

INSPECTION PROCEDURE USING AN OSCILLOSCOPE

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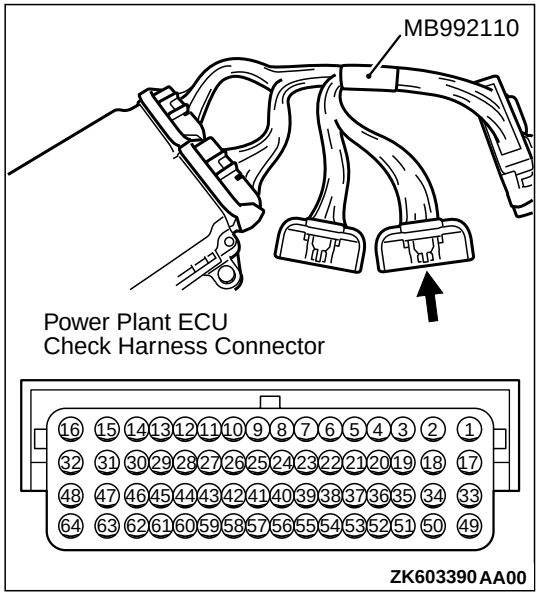
CAMSHAFT POSITION SENSOR AND CRANKSHAFT POSITION SENSOR



Required Special Tools:
- MB991709: Test Harness
- MB992110: Power Plant ECU Check Harness

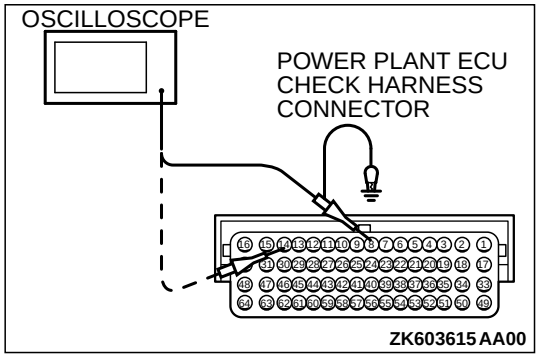
Measurement Method

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. 3.
3. Disconnect the crankshaft position sensor connector, and connect the test harness special tool (MB991709) between the separated connector.
4. Connect the oscilloscope probe to crankshaft position sensor connector terminal No. 3.



Alternate method

1. Disconnect all ECM connectors. Connect the check harness special tool (MB992110) between the separated connectors.

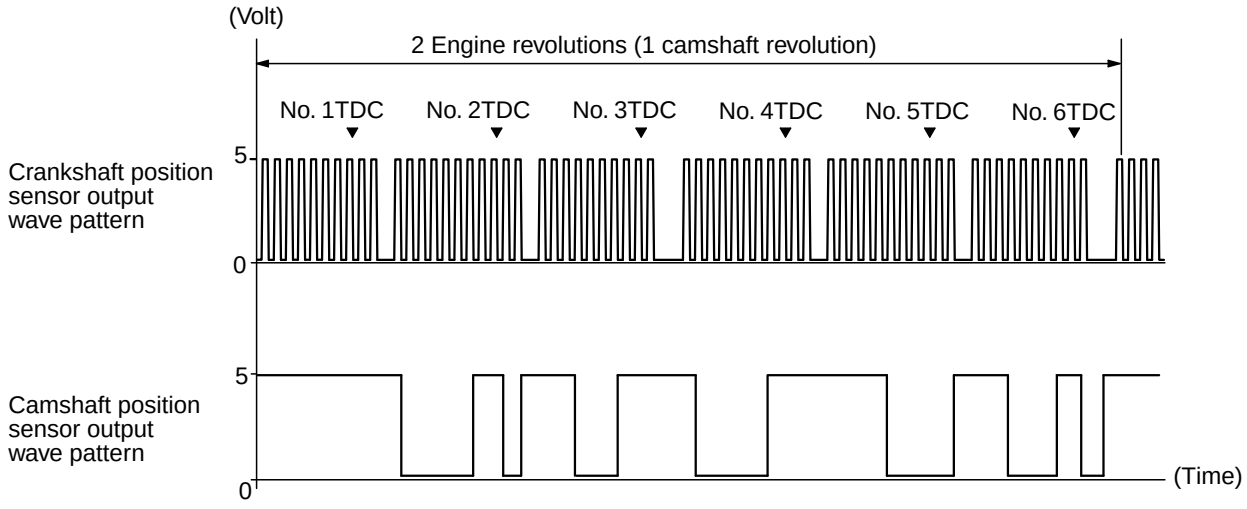


2. Connect the oscilloscope to check harness terminal No. 14. (Check the camshaft position sensor signal wave pattern.)
3. Connect the oscilloscope to check harness terminal No. 8. (Check the crankshaft position sensor signal wave pattern.)

Standard Wave Pattern

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

Standard wave pattern



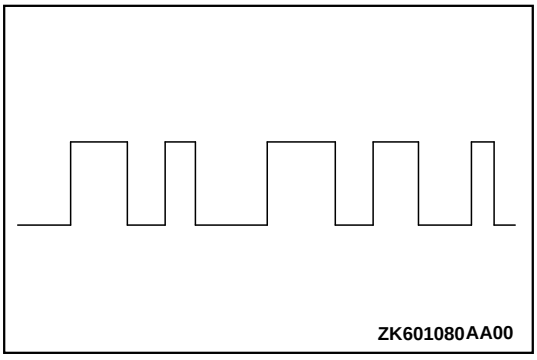
TDC: Top dead center

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Wave Pattern Observation Points

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

Examples of Abnormal Wave Patterns



ZK601080AA00

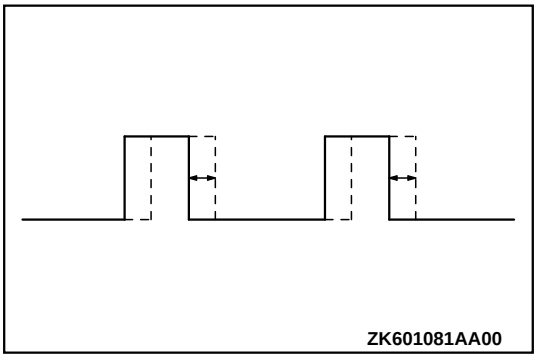
Example 1

Cause of problem

- Sensor interface malfunction.

Wave pattern characteristics

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



ZK601081AA00

Example 2

Cause of problem

- Loose timing belt.
- Abnormality in sensor disc.

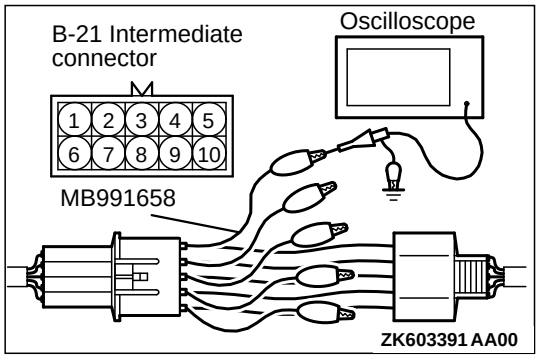
Wave pattern characteristics

- Wave pattern is displaced to the left or right.

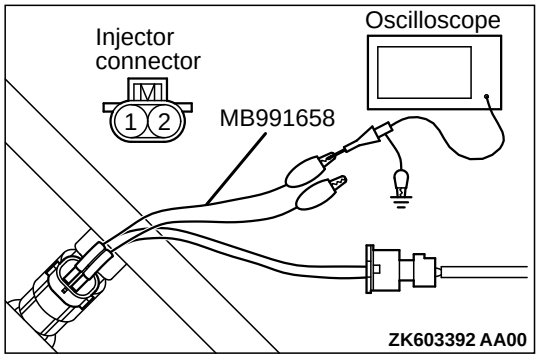
INJECTOR

Required Special Tools:
- MB991658: Test Harness
- MB992110: Power Plant ECU Check Harness

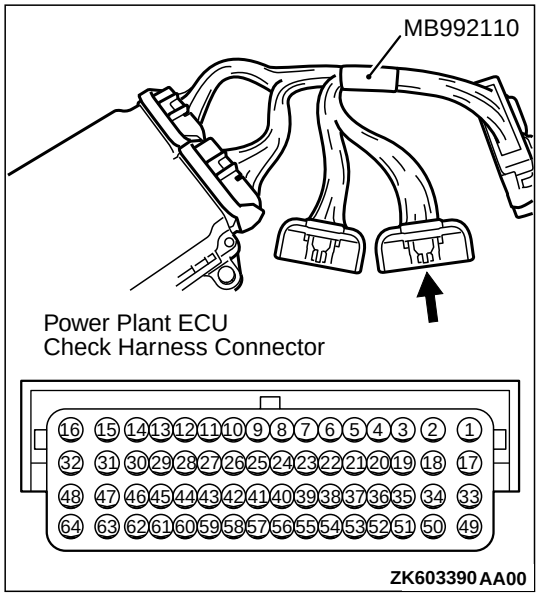
Measurement Method



Measure at the right bank (number 1, 3, 5 cylinders)
1. Disconnect the intermediate connector B-21, and connect the test harness special tool (MB991658) between the separated connector.
2. Connect the oscilloscope probe to each intermediate connector B-21 terminal to analyze each cylinder:
   - Terminal No. 7 for the number 1 cylinder
   - Terminal No. 8 for the number 3 cylinder
   - Terminal No. 9 for the number 5 cylinder



Measure at the right bank (number 2, 4, 6 cylinders)
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.

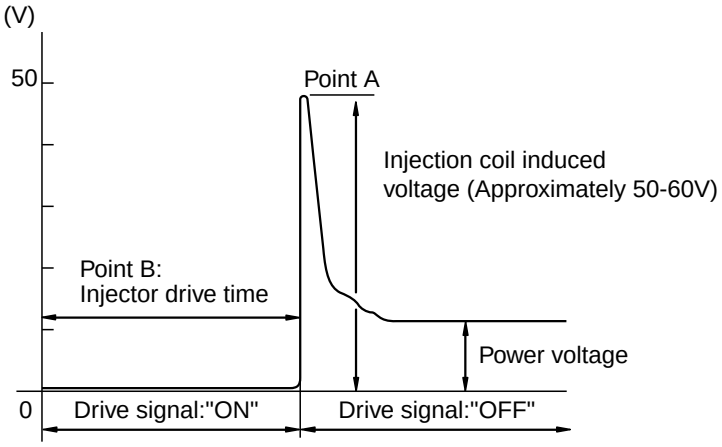


Alternate method
1. Disconnect all ECM connectors. Connect the check harness special tool (MB992110) between the separated connectors.
2. Connect the oscilloscope probe to each check harness connector terminal to analyze each cylinder:
   - Terminal No. 2 for the number 1 cylinder.
   - Terminal No. 3 for the number 2 cylinder.
   - Terminal No. 18 for the number 3 cylinder.
   - Terminal No. 19 for the number 4 cylinder.
   - Terminal No. 50 for the number 5 cylinder.
   - Terminal No. 51 for the number 6 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



ZK603395 AA00

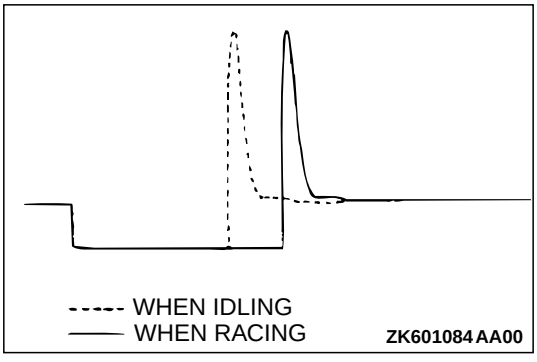
Wave Pattern Observation Points

Point A: Height of injector coil induced voltage.

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

Point B: Injector drive time

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

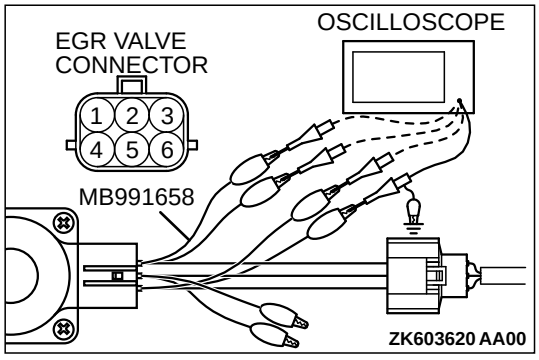


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EGR VALVE (STEPPER MOTOR)

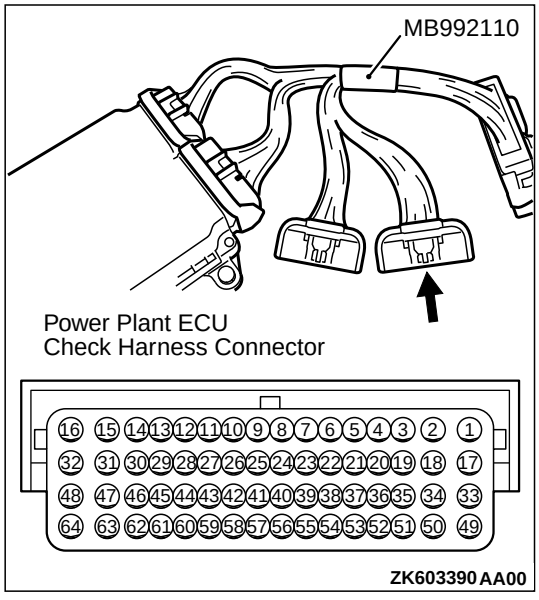
Required Special Tools:

- MB991658: Test Harness
- MB992110: Power Plant ECU Check Harness



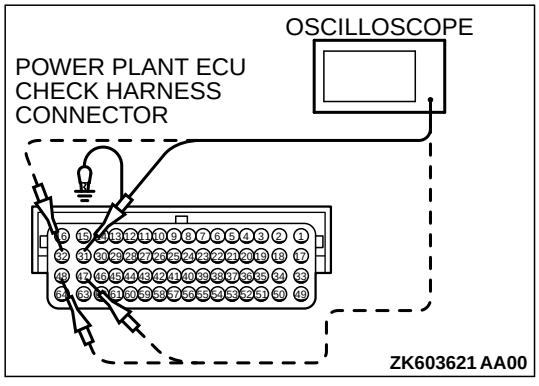
Measurement Method

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 ECM connectors. Connect the check harness special tool (MB992110 between the separated connectors.

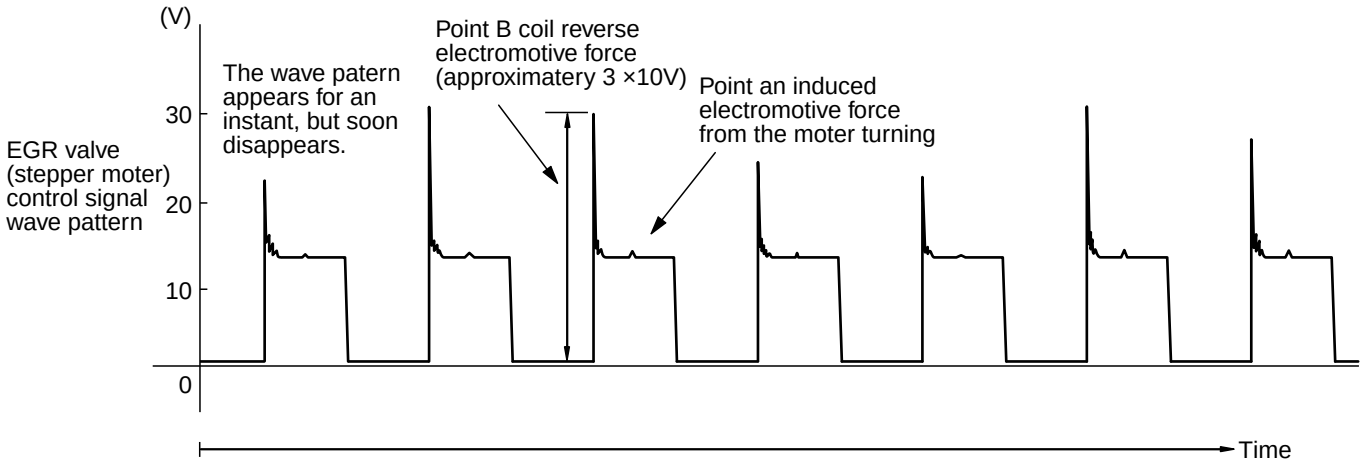


2. Connect the oscilloscope probe to check harness terminal No. 31, No. 32, No. 47 and No. 48.

Standard Wave Pattern

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

Standard wave pattern



ZK603396AA00

Wave Pattern Observation Points

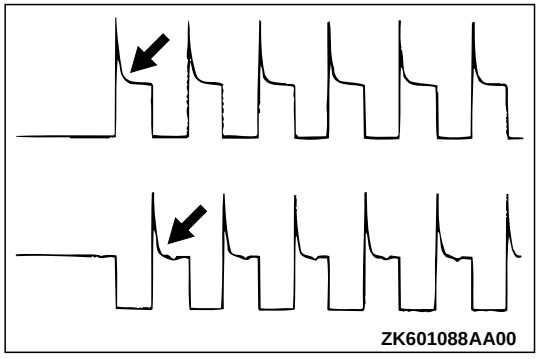
1. Check that the standard wave pattern appears when the EGR valve is operating.

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


ZK601088AA00

Examples of Abnormal Wave Patterns

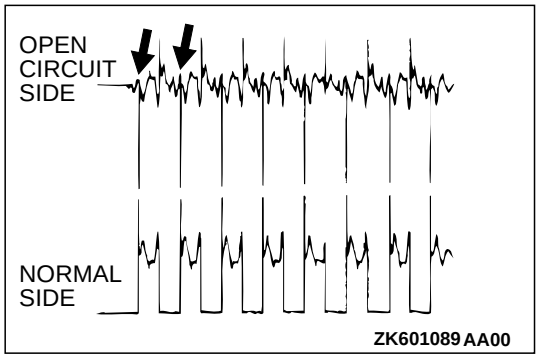
Example 1

Cause of problem

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

Wave pattern characteristics

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



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Example 2

Cause of problem

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

Wave pattern characteristics

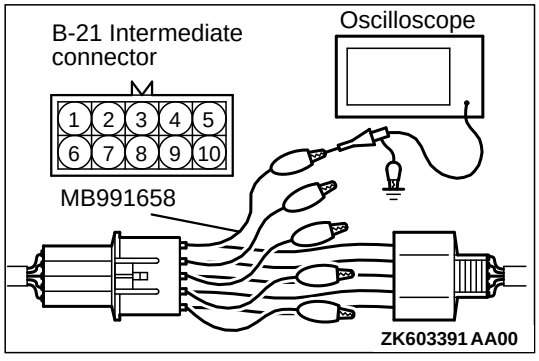
- Current is not supplied to the motor coil on the open circuit side. (Voltage does not drop to 0 volt.) Furthermore, the induced electromotive force wave pattern at the normal side is slightly different from the normal wave pattern.

IGNITION COIL AND IGNITION POWER TRANSISTOR

Required Special Tools:

- MB991658: Test Harness
- MB992110: Power Plant ECU Check Harness

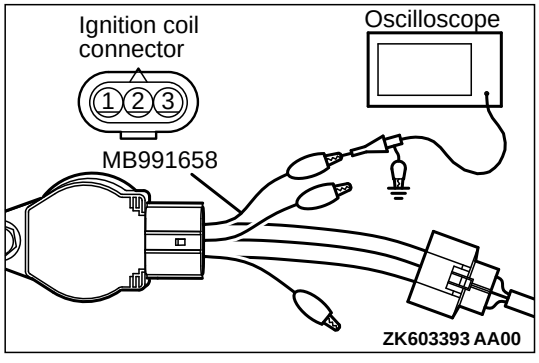
Measurement Method



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Measure at the right bank (number 1, 3, 5 cylinders)

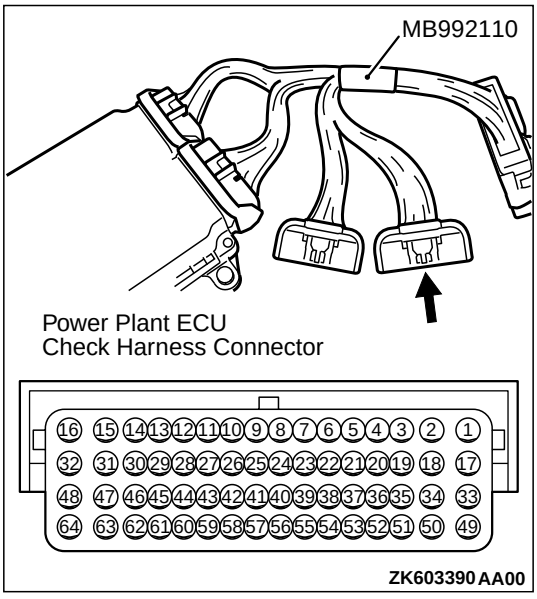
1. Disconnect the intermediate connector B-21, and connect the test harness special tool (MB991658) between the separated connector.
2. Connect the oscilloscope probe to each intermediate connector B-21 terminal to analyze each cylinder:
   - Terminal No. 2 for the number 1 cylinder.
   - Terminal No. 3 for the number 3 cylinder.
   - Terminal No. 4 for the number 5 cylinder.



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

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



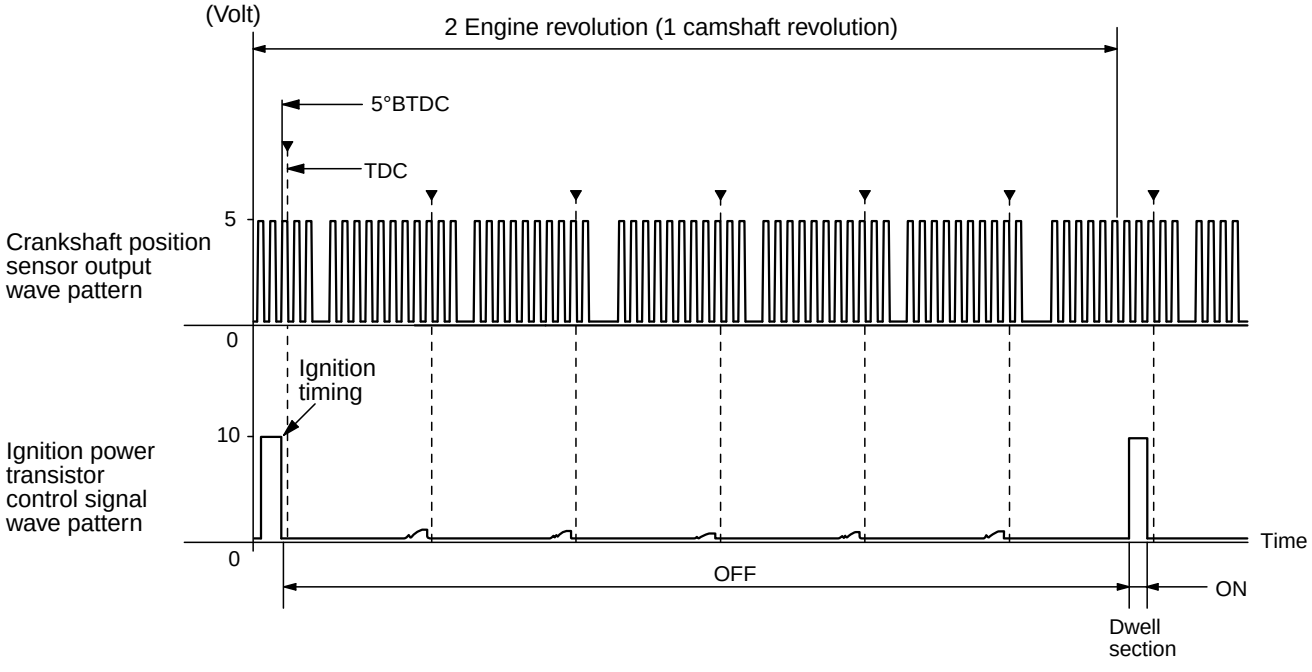
Alternate method

1. Disconnect all ECM connectors. Connect the check harness special tool (MB992110) between the separated connectors.
2. Connect the oscilloscope probe to each check harness connector terminal to analyze each cylinder:
   - Terminal No. 4 for the number 1 cylinder.
   - Terminal No. 5 for the number 2 cylinder.
   - Terminal No. 20 for the number 3 cylinder.
   - Terminal No. 21 for the number 4 cylinder.
   - Terminal No. 52 for the number 5 cylinder.
   - Terminal No. 53 for the number 6 cylinder.

Standard Wave Pattern

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

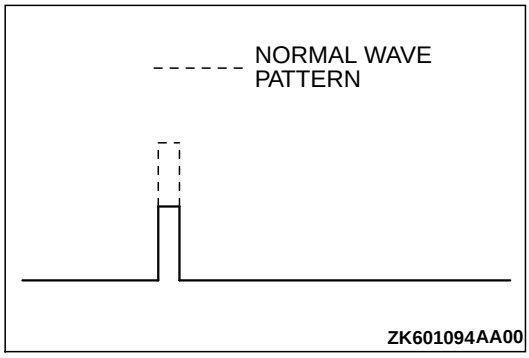
Standard wave pattern



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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