GROUP 13A

MULTIPORT FUEL INJECTION (MFI)

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GENERAL INFORMATION

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The Multiport Fuel Injection System consists of sensors which detect the engine conditions, the ENGINE CONTROL MODULE (ECM) which controls the system based on signals from these sensors, and actuators which operate under the control of the ECM.
The ECM carries out activities such as fuel injection control, idle air control, and ignition timing control.
In addition, the ECM is equipped with several diagnostic test modes which simplify troubleshooting when a problem develops.

FUEL INJECTION CONTROL

The injector drive times and injection timing are controlled so that the optimum air/fuel mixture is supplied to the engine to correspond to the continually-changing engine operation conditions.
A single injector is mounted at the intake port of each cylinder. Fuel is sent under pressure from the fuel tank to the fuel injectors by the fuel pump, with the pressure being regulated by the fuel pressure regulator. The regulated fuel is distributed to each of the injectors.
Fuel injection is normally carried out once for each cylinder for every two rotations of the crankshaft. The firing order is 1-3-2. Each cylinder has a dedicated fuel injector. This is called multiport.
The ECM provides a richer air/fuel mixture by carrying out "open-loop" control when the engine is cold or operating under high load conditions in order to maintain engine performance. In addition, when the engine is under normal operating temperature after warming-up, the ECM controls the air/fuel mixture by using the heated oxygen sensor signal to carry out "closed-loop" control. The closed-loop control achieves the theoretical air/fuel mixture ratio where the catalytic converter can obtain the maximum cleaning performance.

THROTTLE VALVE OPENING CONTROL

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

IDLE AIR CONTROL

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

IGNITION TIMING CONTROL

The ignition power transistor located in the ignition primary circuit turns ON and OFF to control the primary current flow to the ignition coil. This controls the ignition timing to provide the optimum ignition timing with respect to the engine operating conditions. The ignition timing is determined by the ECM from engine speed, intake air volume, engine coolant temperature, and atmospheric pressure.

DIAGNOSTIC TEST MODE

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

OTHER CONTROL FUNCTIONS

Fuel Pump Control

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

A/C Compressor Clutch Relay Control

- Turns the compressor clutch of the A/C ON and OFF.

Engine Oil Control Valve Control

- The ECM carries out the duty control of the engine oil control valve according to the operation condition. This varies the phase angle of the camshaft to optimize the valve timing.

Generator Output Current Control

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

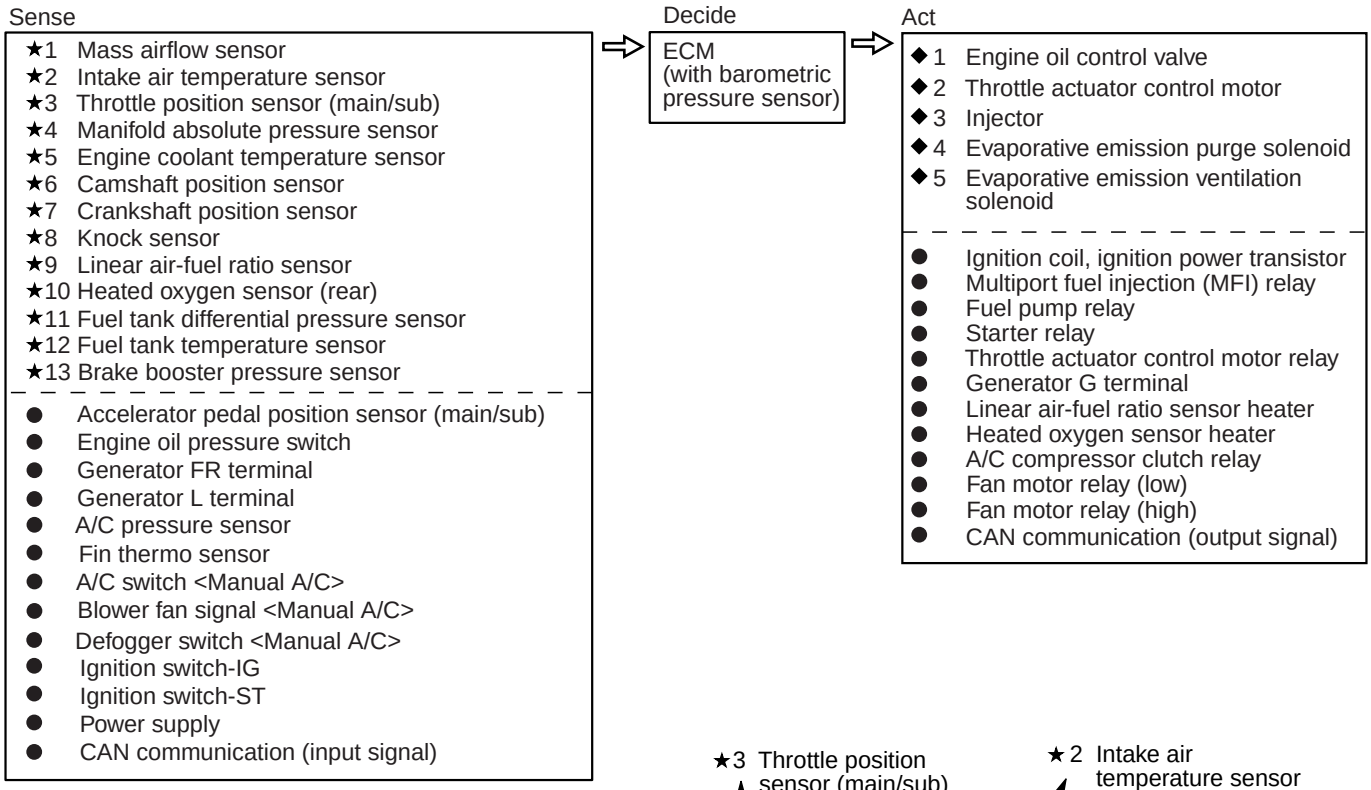
Fan Motor Control

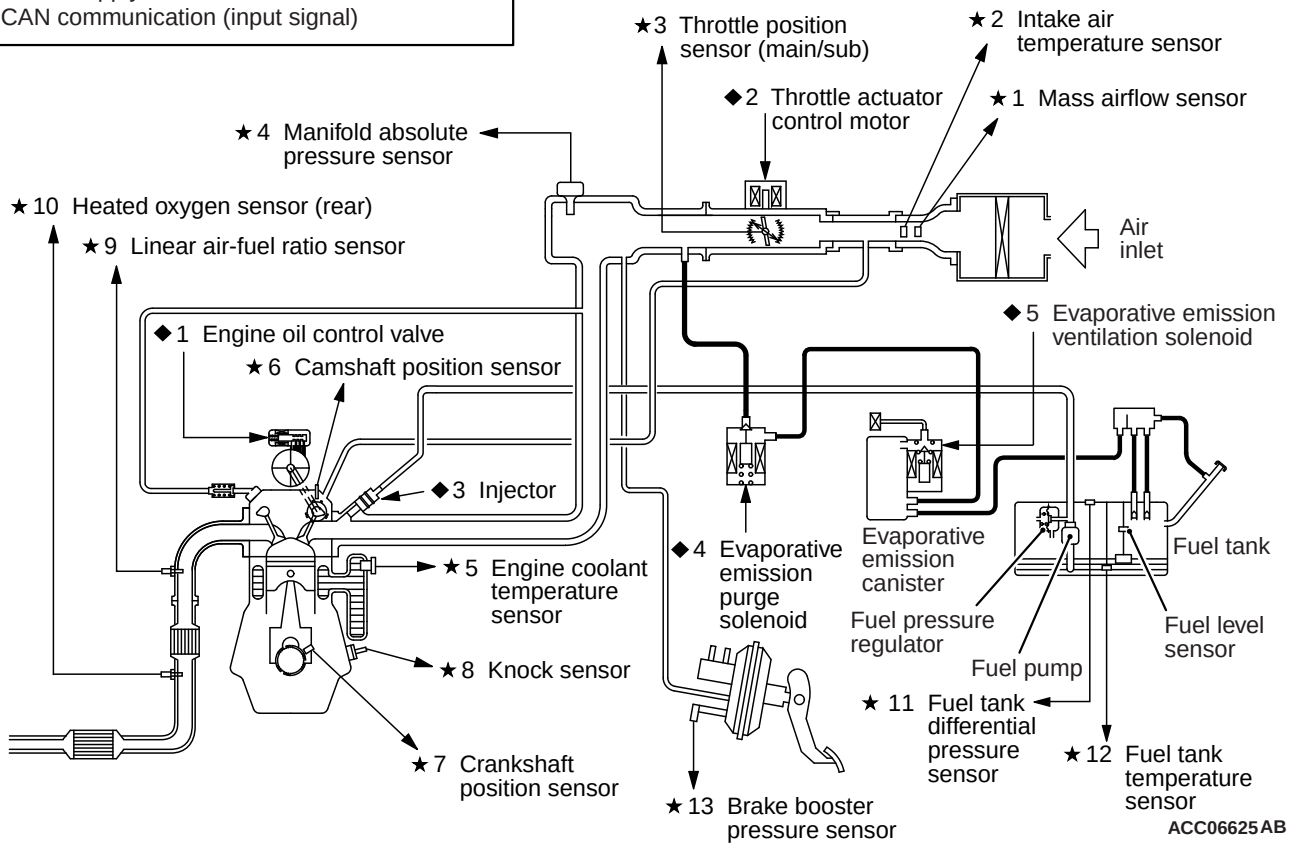
- The revolutions of the cooling fan is controlled in response to the engine coolant temperature and vehicle speed.

Evaporative Emission Purge Control

- (Refer to GROUP 17, Emission Control – Evaporative Emission Control System – General Information P.17-53.)

MULTIPORT FUEL INJECTION (MFI) SYSTEM DIAGRAM





NOTE: For the vacuum routing, refer to GROUP 17, Emission Control – Vacuum Hoses – Vacuum Hose Routing P.17-50.

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GENERAL SPECIFICATIONS

M1131000202038

ITEMS		SPECIFICATIONS
Throttle body	Throttle bore mm (in.)	40 (1.6)
	Throttle position sensor	Hall element type
	Throttle actuator control motor	DC motor type, having brushes
Engine control module (ECM)	Identification model No.	E6T80077 <M/T> E6T80078 <CVT>
Sensors	Mass airflow sensor	Heat sensitizing type
	Barometric pressure sensor	Semiconductor diffused pressure type
	Intake air temperature sensor	Thermistor type
	Engine coolant temperature sensor	Thermistor type
	Linear air-fuel ratio sensor	Zirconia type
	Heated oxygen sensor	Zirconia type
	Accelerator pedal position sensor	Electromagnetic induction type
	Camshaft position sensor	Magneto resistance element type
	Crankshaft position sensor	Magneto resistance element type
	Knock sensor	Piezoelectric element type
	Manifold absolute pressure sensor	Piezo resistive semiconductor type
	Fin thermo sensor	Thermistor type
	A/C pressure sensor	Semiconductor type
	Brake booster pressure sensor	Semiconductor type
	Fuel tank differential pressure sensor	Piezo resistive semiconductor type
	Fuel tank temperature sensor	Thermistor type
Actuators	Multiport fuel injection (MFI) relay	Contact switch type
	Fuel pump relay	Contact switch type
	Throttle actuator control motor relay	Contact switch type
	Starter relay	Contact switch type
	Fan motor relay	Contact switch type
	A/C compressor clutch relay	Contact switch type
	Injector type and number	Electromagnetic type, 3
	Injector identification mark	KMN230B
	Engine oil control valve	Duty cycle type solenoid valve
	Evaporative emission purge solenoid	Duty cycle type solenoid valve
	Evaporative emission ventilation solenoid	ON/OFF type solenoid valve

SERVICE SPECIFICATIONS

M1131000303395

ITEMS		STANDARD VALUE
Fuel pressure kPa (psi)		Approximately 324 (47) at curb idle
Intake air temperature sensor resistance kΩ	–20°C (–4°F)	13 – 18
	0°C (32°F)	5.3 – 6.7
	20°C (68°F)	2.3 – 3.0
	80°C (176°F)	0.30 – 0.45
Engine coolant temperature sensor resistance kΩ	–20°C (–4°F)	14 – 17
	[0°C (32°F)]	(5.1 – 6.5)
	20°C (68°F)	2.1 – 2.7
	[40°C (104°F)]	(0.9 – 1.3)
	[60°C (140°F)]	(0.48 – 0.68)
	80°C (176°F)	0.26 – 0.36
Heated oxygen sensor output voltage V		0.6 – 1.0
Linear air-fuel ratio sensor heater resistance Ω		2.3 – 4.2 [at 20°C (68°F)]
Heated oxygen sensor heater resistance Ω	Rear	4.5 – 8.0 [at 20°C (68°F)]
Injector coil resistance Ω		10.5 – 13.5 [at 20°C (68°F)]
Throttle actuator control motor coil resistance Ω		0.3 – 100 [at 20°C (68°F)]
Engine oil control valve coil resistance Ω		6.9 – 7.9 [at 20°C (68°F)]

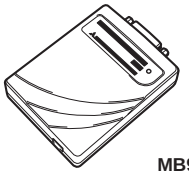
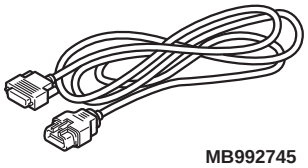
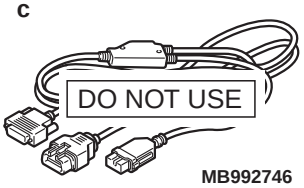
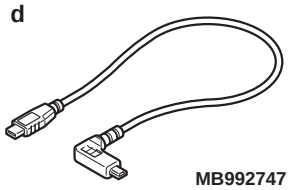
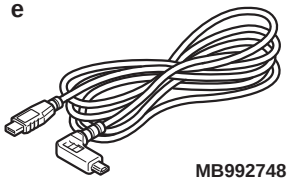
SEALANT AND ADHESIVE

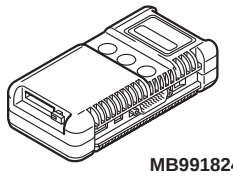
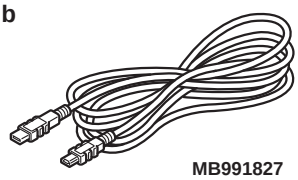
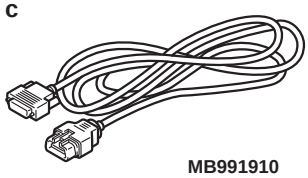
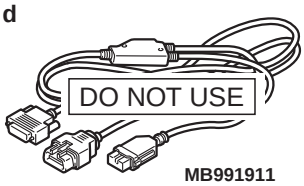
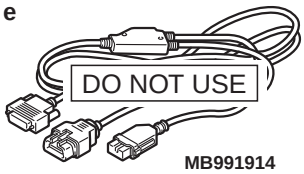
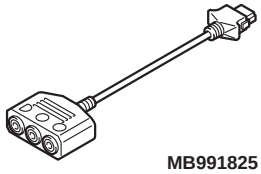
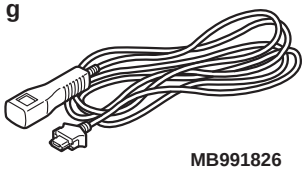
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ITEM	SPECIFIED SEALANT
Engine coolant temperature sensor threaded portion	LOCTITE 262, Three bond 1324N or equivalent

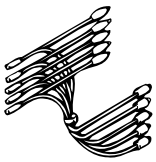
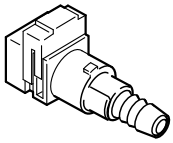
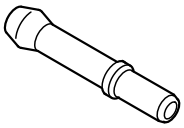
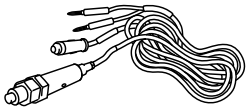
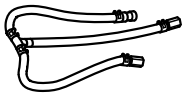
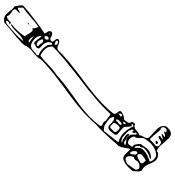
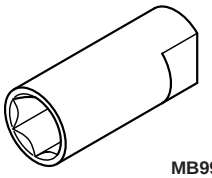
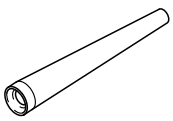
SPECIAL TOOLS

M1131000604247

Tool	Tool number and name	Supersession	Application
a  MB992744 b  MB992745 c  MB992746 d  MB992747 e  MB992748 ACB05421AB	a. MB992744 b. MB992745 c. MB992746 d. MB992747 e. MB992748 a. Vehicle communication interface-Lite (V.C.I.-Lite) b. V.C.I.-Lite main harness A (for vehicles with CAN communication) c. V.C.I.-Lite main harness B (for vehicles without CAN communication) d. V.C.I.-Lite USB cable short e. V.C.I.-Lite USB cable long	-	• Reading diagnostic trouble code • MFI system inspection

Tool	Tool number and name	Supersession	Application
a  MB991824 b  MB991827 c  MB991910 d  DO NOT USE MB991911 e  DO NOT USE MB991914 f  MB991825 g  MB991826 MB991958	MB991958 a: MB991824 b: MB991827 c: MB991910 d: MB991911 e: MB991914 f: MB991825 g: MB991826 M.U.T.-III sub assembly a: Vehicle Communication Interface (V.C.I.) b: M.U.T.-III USB Cable c: M.U.T.-III Main Harness A (Vehicles with CAN communication system) d: M.U.T.-III Main Harness B (Vehicles without CAN communication system) e: M.U.T.-III Main Harness C (for Chrysler models only) f: M.U.T.-III Measurement Adapter g: M.U.T.-III Trigger Harness	MB991824-KIT *NOTE: g: MB991826 M.U.T.-III Trigger Harness is not necessary when pushing V.C.I. ENTER key.*	⚠ **CAUTION** **For vehicles with CAN communication, use M.U.T.-III main harness A to send simulated vehicle speed. If you connect M.U.T.-III main harness B instead, the CAN communication does not function correctly.** • Reading diagnostic trouble code • MFI system inspection • Measurement of fuel pressure
	MB991709 Test harness	MB991709-01	Inspection using an oscilloscope

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Tool	Tool number and name	Supersession	Application
 MB991658	MB991658 Test harness	Tool not available	• Inspection using an oscilloscope • Inspection of throttle position sensor • Inspection of heated oxygen sensor • Inspection of engine oil control valve
 MB992049	MB992049	MB992049-01	Measurement of fuel pressure
 MB992001	MB992001	Hose adaptor	Measurement of fuel pressure
 MB991981	MB991981 Fuel pressure gauge set	Tool not available	Measurement of fuel pressure
 MB992076	MB992076	Injector test set	Measurement of fuel pressure
	MD998709	Hose adapter	Measurement of fuel pressure
 MB992042	MB992042 Engine coolant temperature sensor wrench	–	Removal and installation of the engine coolant temperature sensor
 B992106	MB992106 O-ring installer	–	Installation of O-ring on fuel injector injection nozzle side

MULTIPORT FUEL INJECTION (MFI) DIAGNOSIS

TROUBLESHOOTING STRATEGY

M1131150002821

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

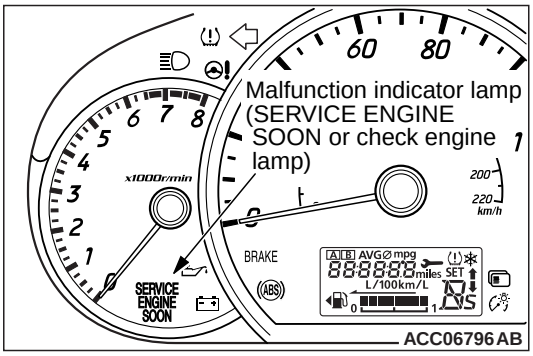
Use these steps to plan your diagnostic strategy. If you follow them carefully, you will be sure to have exhausted most of the possible ways to find an MFI fault.

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.00-13.
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, store 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 stored again, carry out an inspection with appropriate diagnostic trouble code procedures.
9. If DTC is not stored 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.00-13.
10. After repairs are completed, conduct a road test duplicating the complaint set conditions to confirm the malfunction has been corrected.
11. Erase the permanent DTC. (Refer to Diagnostic Function – Permanent DTC for the procedures of erasing the permanent DTC P.13A-10.)

    NOTE: This is carried out to prevent the failure to pass the Inspection and Maintenance (I/M) test in the states checking whether the permanent DTC is stored or not.

DIAGNOSTIC FUNCTION

M1131155505068



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 or blinks 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.

When the ignition switch is in the ON position, the indicator lamp should be illuminated. When the engine starts, the indicator lamp should be extinguished.

NOTE: When the Transaxle Control Module (TCM) detects malfunctions related to the CVT, 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
P0010	Engine oil control valve circuit
P0011	Variable valve timing system target error
P0016	Crankshaft/camshaft position sensor phase problem
P0031	Linear air-fuel ratio sensor heater control circuit low
P0032	Linear air-fuel ratio sensor heater control circuit high
P0037	Heated oxygen sensor (rear) heater control circuit low
P0038	Heated oxygen sensor (rear) heater control circuit high
P0053	Linear air-fuel ratio sensor heater resistance
P0068*1	Mass airflow sensor plausibility
P0069	Abnormal correlation between manifold absolute pressure sensor and barometric pressure sensor
P0102*1	Mass airflow circuit low input
P0103*1	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*1	Intake air temperature circuit range/performance problem
P0112*1	Intake air temperature circuit low input
P0113*1	Intake air temperature circuit high input
P0116*1	Engine coolant temperature circuit range/performance problem
P0117*1	Engine coolant temperature circuit low input
P0118*1	Engine coolant temperature circuit high input
P0121*1	Throttle position sensor (main) plausibility
P0122*1	Throttle position sensor (main) circuit low input
P0123*1	Throttle position sensor (main) circuit high input
P0125*1	Insufficient coolant temperature for closed loop fuel control
P0128	Coolant thermostat (coolant temperature below thermostat regulating temperature)
P0130	Linear air-fuel ratio sensor circuit
P0131	Linear air-fuel ratio sensor circuit low voltage
P0132	Linear air-fuel ratio sensor circuit high voltage
P0133	Linear air-fuel ratio sensor circuit slow response
P0134	Linear air-fuel ratio sensor circuit no activity detected
P0137	Heated oxygen sensor (rear) circuit low voltage
P0138	Heated oxygen sensor (rear) circuit high voltage
P0139	Heated oxygen sensor (rear) circuit slow response
P0140	Heated oxygen sensor (rear) circuit no activity detected

DTC	ITEM
P0171	System too lean
P0172	System too rich
P0181	Fuel tank temperature sensor circuit range/performance
P0182	Fuel tank temperature sensor circuit low input
P0183	Fuel tank temperature sensor circuit high input
P0221*1	Throttle position sensor (sub) plausibility
P0222*1	Throttle position sensor (sub) circuit low input
P0223*1	Throttle position sensor (sub) circuit high input
P0261	Injector circuit low input – cylinder 1
P0262	Injector circuit high input – cylinder 1
P0264	Injector circuit low input – cylinder 2
P0265	Injector circuit high input – cylinder 2
P0267	Injector circuit low input – cylinder 3
P0268	Injector circuit high input – cylinder 3
P0300*2	Random/multiple cylinder misfire detected
P0301*2	Cylinder 1 misfire detected
P0302*2	Cylinder 2 misfire detected
P0303*2	Cylinder 3 misfire detected
P0327	Knock sensor circuit low
P0328	Knock sensor circuit high
P0335*1	Crankshaft position sensor circuit
P0340*1	Camshaft position sensor circuit
P0421	Warm up catalyst efficiency below threshold
P0441	Evaporative emission control system incorrect purge flow
P0442	Evaporative emission control system leak detected (small leak)
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)
P0458	Evaporative emission control system purge control valve circuit low input
P0459	Evaporative emission control system purge control valve circuit high input
P0461	Fuel level sensor circuit range/performance
P0462	Fuel level sensor circuit low input
P0463	Fuel level sensor circuit high input
P0498	Evaporative emission control system canister vent solenoid circuit low input
P0499	Evaporative emission control system canister vent solenoid circuit high input

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DTC	ITEM
P0500*1	Vehicle speed sensor malfunction <M/T>
P0506	Idle control system RPM lower than expected
P0507	Idle control system RPM higher than expected
P0602*1	Control module programming error
P0606*1	Engine control module main processor malfunction
P060B*1	Internal control module A/D processing performance problem
P060D*1	Internal control module accelerator pedal position performance problem
P061A*1	Internal control module torque performance problem
P061C*1	Internal control module engine RPM performance problem
P062F*1	Internal control module EEPROM error
P0630*1	Vehicle Identification Number (VIN) malfunction
P0638*1	Throttle actuator control motor circuit range/ performance
P0642*1	Throttle position sensor power supply
P0657*1	Throttle actuator control motor relay circuit malfunction
P1238*1	Mass airflow sensor plausibility (torque monitor)
P1506	Idle control system RPM lower than expected at low temperature
P1507	Idle control system RPM higher than expected at low temperature
P1590*1	TCM to ECM communication error in torque reduction request <CVT>
P1603*1	Battery backup circuit malfunction
P2096	Post catalyst fuel trim system too lean
P2097	Post catalyst fuel trim system too rich
P2100*1	Throttle actuator control motor circuit (open)
P2101*1	Throttle actuator control motor magneto malfunction
P2122*1	Accelerator pedal position sensor (main) circuit low input
P2123*1	Accelerator pedal position sensor (main) circuit high input
P2127*1	Accelerator pedal position sensor (sub) circuit low input
P2128*1	Accelerator pedal position sensor (sub) circuit high input
P2135*1	Throttle position sensor (main and sub) range/performance problem
P2138*1	Accelerator pedal position sensor (main and sub) range/performance problem
P2228*1	Barometric pressure circuit low input
P2229*1	Barometric pressure circuit high input
P2237	Linear air-fuel ratio sensor positive current control circuit/open
P2243	Linear air-fuel ratio sensor reference voltage circuit/open
P2251	Linear air-fuel ratio sensor negative current control circuit/open
P2252	Heated oxygen sensor offset circuit low voltage
P2253	Heated oxygen sensor offset circuit high voltage

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DTC	ITEM
U0101*1	TCM time-out <CVT>
U0121	ASC-ECU time-out <M/T>
U0155*1	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 "*1" 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: The codes marked with a "*2" in the diagnostic trouble code number column have the following two conditions for illuminating the Malfunction Indicator Lamp (SERVICE ENGINE SOON or Check Engine Lamp).*

- In case that the misfire causing the damaged catalyst is detected, the Malfunction Indicator Lamp (SERVICE ENGINE SOON or Check Engine Lamp) will flash until the condition is corrected. If the system detects the same malfunction after the next engine start, and then the condition is corrected, the Malfunction Indicator Lamp (SERVICE ENGINE SOON or Check Engine Lamp) will illuminate.
- In case that the misfire deteriorating the exhaust gas is detected, the Malfunction Indicator Lamp (SERVICE ENGINE SOON or Check Engine Lamp) is illuminated when the same malfunction is redetected after the next engine start.

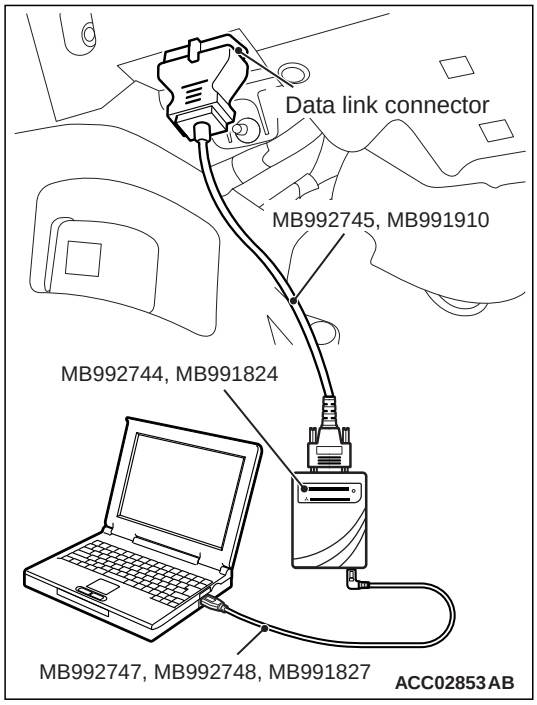
NOTE: Even if the malfunction is not detected when the ECM monitors the malfunction three consecutive times after the Malfunction Indicator Lamp (SERVICE ENGINE SOON or Check Engine Lamp) illuminates, turn off the Malfunction Indicator Lamp (SERVICE ENGINE SOON or Check Engine Lamp) when the engine starts next time.*

**: In this case, "one time" in monitoring the malfunction means the period from the time of the current engine start to the time of the next engine start. "One time" in monitoring the misfire or the fuel system malfunction means the time when the operating conditions (such as the engine speed or the engine coolant temperature) becomes similar operating conditions of the first detected malfunction.*

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

Required Special Tools:

- MB992744: Vehicle communication interface-Lite (V.C.I.-Lite)
- MB992745: V.C.I.-Lite main harness A
- MB992747: V.C.I.-Lite USB cable short
- MB992748: V.C.I.-Lite USB cable long
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicles Communication Interface (V.C.I.)
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A (Vehicles with CAN communication system)



⚠ CAUTION

To prevent damage to scan tool (M.U.T.-III), always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool (M.U.T.-III).

1. Ensure that the ignition switch is at the "LOCK" (OFF) position.
2. Start up the personal computer.
3. Connect special tool MB992747/M992748 or special tool MB991827 to special tool MB992744 or special tool MB991824 and the personal computer.
4. Connect special tool MB992745 or special tool MB991910 to special tool MB992744 or special tool MB991824.
5. Connect special tool MB992745 or special tool MB991910 to the data link connector.

   NOTE: When the special tool MB992745 is connected to the data link connector, the special tool MB992744 indicator light will be illuminated in a green color.
6. Turn the power switch of special tool MB991824 to the "ON" position. <When using the special tool MB991824>

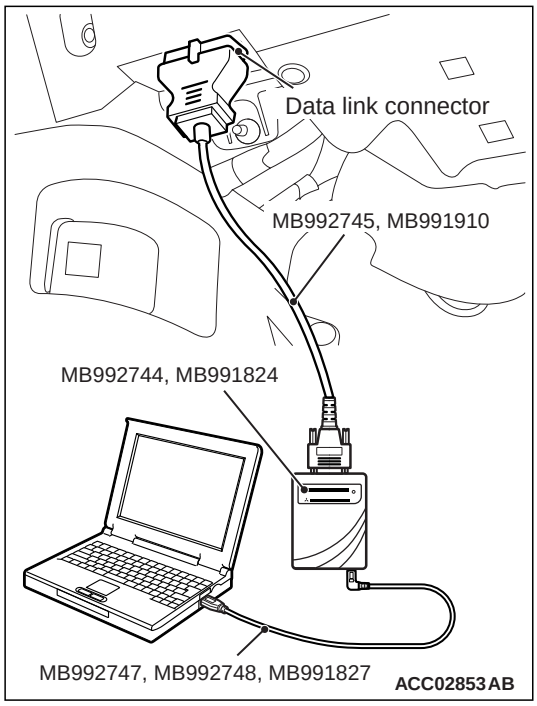
   NOTE: When special tool MB991824 is energized, special tool MB991824 indicator light will be illuminated in a green color.
7. Start the M.U.T.-III system on the personal computer.

NOTE: Disconnecting scan tool (M.U.T.-III) 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:

- MB992744: Vehicle communication interface-Lite (V.C.I.-Lite)
- MB992745: V.C.I.-Lite main harness A
- MB992747: V.C.I.-Lite USB cable short
- MB992748: V.C.I.-Lite USB cable long
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicles Communication Interface (V.C.I.)
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A (Vehicles with CAN communication system)



⚠ CAUTION

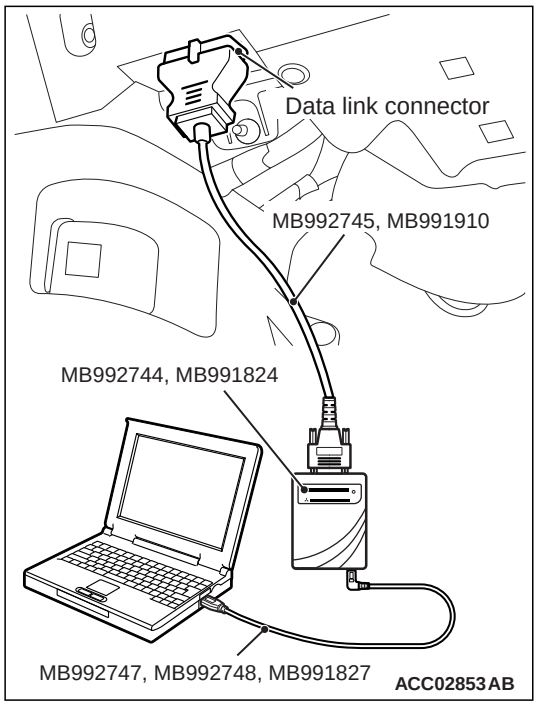
To prevent damage to scan tool (M.U.T.-III), always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool (M.U.T.-III).

1. Connect scan tool (M.U.T.-III) 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 stored, it is shown.
9. Choose "Erase DTCs" to erase the DTC.

HOW TO READ DATA LIST

Required Special Tools:

- MB992744: Vehicle communication interface-Lite (V.C.I.-Lite)
- MB992745: V.C.I.-Lite main harness A
- MB992747: V.C.I.-Lite USB cable short
- MB992748: V.C.I.-Lite USB cable long
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicles Communication Interface (V.C.I.)
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A (Vehicles with CAN communication system)



⚠ CAUTION

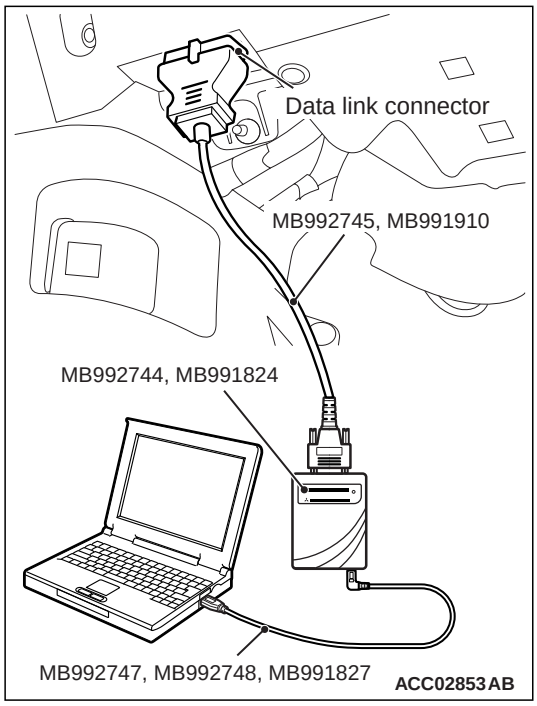
To prevent damage to scan tool (M.U.T.-III), always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool (M.U.T.-III).

1. Connect scan tool (M.U.T.-III) 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:

- MB992744: Vehicle communication interface-Lite (V.C.I.-Lite)
- MB992745: V.C.I.-Lite main harness A
- MB992747: V.C.I.-Lite USB cable short
- MB992748: V.C.I.-Lite USB cable long
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicles Communication Interface (V.C.I.)
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A (Vehicles with CAN communication system)



⚠ CAUTION

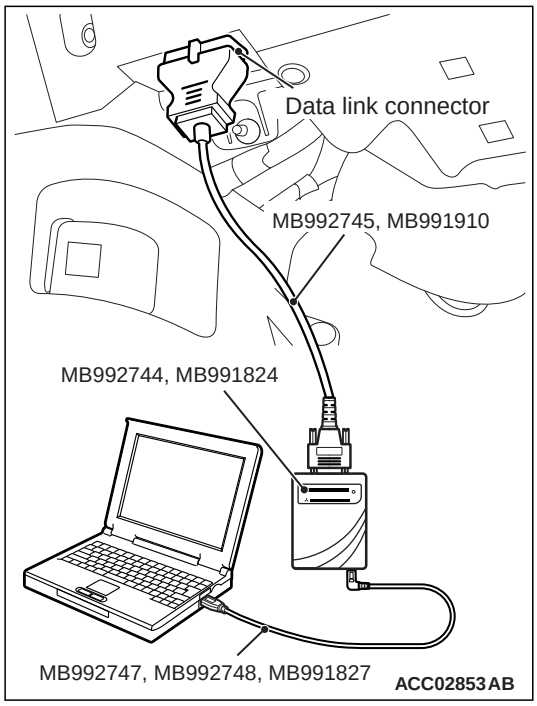
To prevent damage to scan tool (M.U.T.-III), always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool (M.U.T.-III).

1. Connect scan tool (M.U.T.-III) 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:

- MB992744: Vehicle communication interface-Lite (V.C.I.-Lite)
- MB992745: V.C.I.-Lite main harness A
- MB992747: V.C.I.-Lite USB cable short
- MB992748: V.C.I.-Lite USB cable long
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicles Communication Interface (V.C.I.)
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A (Vehicles with CAN communication system)



⚠ CAUTION

To prevent damage to scan tool (M.U.T.-III), always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool (M.U.T.-III).

1. Connect scan tool (M.U.T.-III) 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.

HOW TO READ PROVISIONAL DIAGNOSTIC TROUBLE CODES

Required Special Tools:

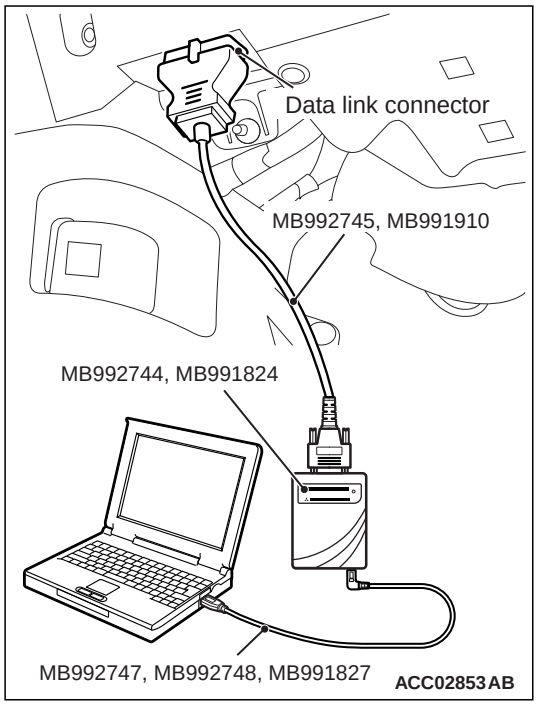
- MB992744: Vehicle communication interface-Lite (V.C.I.-Lite)
- MB992745: V.C.I.-Lite main harness A
- MB992747: V.C.I.-Lite USB cable short
- MB992748: V.C.I.-Lite USB cable long
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicles Communication Interface (V.C.I.)
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A (Vehicles with CAN communication system)

If detecting the malfunction during the first drive cycle, the ECM temporarily stores the diagnostic trouble code as the provisional diagnostic trouble code. If detecting the same malfunction during the next drive cycle, the ECM determines that the malfunction exists. The ECM outputs the diagnostic trouble code. On Scan Tool MB991958, it is possible to display the stored provisional diagnostic trouble code which the ECM had detected during the first drive cycle. This makes it possible to confirm in one drive cycle whether the malfunction could happen again after the repair.

CONFIRMATION METHOD

⚠ CAUTION

To prevent damage to scan tool (M.U.T.-III), always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool (M.U.T.-III).



1. Connect scan tool (M.U.T.-III) 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 "Special Function" from MFI Screen.
8. Select "Provisional DTCs" from Special Function Screen.

PERMANENT DTC

The permanent DTC(PDTC) is stored in the EEPROM of the engine control module (ECM) as the permanent status, which checks that the malfunction of the emission related components/ the system has not been repaired yet. When detecting the malfunction necessary to illuminate the malfunction indicator lamp (SERVICE ENGINE SOON or Check Engine Lamp), the ECM illuminates the MIL and stores the appropriate DTC as the permanent DTC in the EEPROM concurrently. The usual DTC is stored in the EEPROM aside from this. The ECM can store up to 6 PDTCs. The ECM, therefore, cannot store the 7th and subsequent PDTCs. If the temporary malfunction causes the malfunction indicator lamp to be illuminated and then the reinstatement during the subsequent driving causes it to be extinguished, the PDTC is erased. Also if the ECM checks that the DTC malfunction is fixed during the driving after the DTC repair is completed, the PDTC is erased. The permanent DTC, however, is not erased by disconnecting the battery terminal or erasing with the scan tool (M.U.T-III). The permanent DTC can be erased if all readiness statuses are erased or not completed at the time of reprogramming the ECM. If must be erased while the vehicle is repaired, the PDTC can be erased by the procedures shown below. If must be erased because of the failure to pass the Inspection and Maintenance (I/M) test, the permanent DTC can also be erased by the following procedure:

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PROCEDURES FOR ERASING PERMANENT DTC

1. Check that the DTC is not stored. If the DTC is stored, perform the DTC troubleshooting, then repair the DTC.

   NOTE: The order of Step 2 and 3 can be exchanged.
2. Drive the vehicle at least once under the conditions satisfying all the following requirements:
   - The total driving (engine running) time must be more than 10 consecutive minutes.
   - More than 30 seconds of idling must be included in the driving
   - More than 5 consecutive minutes of driving at more than 40 km/h (25 mph) must be included in the driving.
3. Drive the vehicle at least two times in the drive cycle pattern suitable for the permanent DTC. (Refer to OBD-II DRIVE CYCLE for the drive cycle pattern.) If the DTC does not have the drive cycle pattern, start and stop the engine. Wait 15 seconds or more to start again after the stop. Repeat at least 2 times.
4. Restart and stop the engine.
5. Check that the permanent DTC is erased. If the permanent DTC is not erased, check the DTC or the provisional DTC. If the malfunction code is stored, repair the DTC. Try to erase the permanent DTC again (from Step 1 to 5). If the malfunction code is not stored, the drive cycle pattern (Step 3) monitoring the malfunction can possibly be insufficient.

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	A/F Sensor Monitor Bank 1 – Sensor 1 Rich/Lean Switching frequency	ECM monitors the deteriorated condition of the linear air-fuel ratio sensor by checking the rich/lean switching frequency of the linear air-fuel ratio sensor.	× 1 count
02	08	Oxygen Sensor Monitor Bank 1 – Sensor 2 Maximum Sensor Voltage for Test Cycle	ECM checks the output voltage of the heated oxygen sensor (rear) in order to monitor whether the heated oxygen sensor (rear) outputs the rich signal.	× 0.122mV
	82	Oxygen Sensor Monitor Bank 1 – Sensor 2 Output Voltage change	ECM checks the output voltage of the heated oxygen sensor (rear) in order to monitor whether the 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 heated oxygen sensor (rear) in order to monitor the response of the 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 heated oxygen sensor (rear) in order to monitor the response of the 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 by the output frequency ratio between linear air-fuel ratio sensor and heated oxygen sensor (rear).	× 0.0039

ON-BOARD DIAGNOSTIC MONITOR ID	STANDARDIZED / MANUFACTURER DEFIND TEST ID	MONITORING ITEM	SIMPLE TECHNICAL DESCRIPTION	CONVERSION COEFFICIENT IN USING GENERAL SCAN TOOL
35	89	VVT Monitor Bank 1 Cam Phase Angle Deviation (between target and actual position)	ECM monitors the deviation between the intake camshaft target phase angle and the intake camshaft actual phase angle.	× 0.01°
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
41	86	A/F Sensor Heater Monitor Bank1 – Sensor1 Heater Monitoring Current	ECM checks the amperage of the linear air-fuel ratio sensor heater.	× 0.001 A

ON-BOARD DIAGNOSTIC MONITOR ID	STANDARDIZED / MANUFACTURER DEFIND TEST ID	MONITORING ITEM	SIMPLE TECHNICAL DESCRIPTION	CONVERSION COEFFICIENT IN USING GENERAL SCAN TOOL
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
	0C	Mis-Fire Cylinder 3 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

*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.

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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 "*1", a diagnostic trouble code is recorded on the first detection of the malfunction. 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 ECM records the engine operating condition when the diagnostic trouble code is stored. 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 trouble-shooting. 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 detected.

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

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

ITEM NO.	M.U.T.-III SCAN TOOL DISPLAY	DATA ITEM	UNIT or STATE
1	Odometer	Odometer	km or mile
2	Ignition cycle (Warm up cycle)	Ignition cycle (Warm up cycle)	–
4	Accumulated minute	Accumulated minute*	min

*NOTE: *: Accumulated time of current malfunction from time point when malfunction is detected.*

Freeze Frame Data (OBD) for M.U.T.-III

ITEM NO.	M.U.T.-III SCAN TOOL DISPLAY	DATA ITEM	UNIT or STATE
AA	Airflow sensor	Mass airflow sensor	g/s
AB	TP sensor (main)	Throttle position sensor (main)	%
BB	Barometric pressure sensor	Barometric pressure sensor	kPa or in.Hg
BC	Relative TP sensor	Relative throttle position sensor	%
BD	TP sensor (sub)	Throttle position sensor (sub)	%
BE	APP sensor (main)	Accelerator pedal position sensor (main)	%
BF	APP sensor (sub)	Accelerator pedal position sensor (sub)	%
C0	Fuel system status (bank1)	Fuel control system status	• Open loop
			• Closed loop
			• Open loop-drive condition
			• Open loop-DTC set
			• Closed loop-O2 (rear) failed
C1*	Fuel system status (bank 2)	Fuel control system status (bank 2)	N/A
C2	Calculated load value	Calculated load value	%
C3	ECT sensor	Engine coolant temperature sensor	°C or °F
C4	Short term fuel trim (bank 1)	Short-term fuel trim	%
C5*	Short term fuel trim (bank 3)	Short-term fuel trim (bank 3)	****
C6	Long term fuel trim (bank 1)	Long-term fuel trim	%
C7*	Long term fuel trim (bank 3)	Long-term fuel trim (bank 3)	****
CC	MAP sensor	Manifold absolute pressure sensor	kPa or in.Hg
CD	Crankshaft position sensor	Crankshaft position sensor	r/min
CE	Vehicle speed	Vehicle speed	km/h or mph
CF	Spark advance	Spark advance	°CA
D0	Intake air temperature sensor 1	Intake air temperature sensor	°C or °F
D1	Time since engine running	Time since engine running	sec
D6	EVAP. emission purge SOL. duty	Evaporative emission purge solenoid duty	%
D7	Fuel level gauge	Fuel level gauge	%
D8	Power supply voltage	Power supply voltage	V
D9	Absolute load value	Absolute load value	%

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ITEM NO.	M.U.T.-III SCAN TOOL DISPLAY	DATA ITEM	UNIT or STATE
DA	Target equivalence ratio	Target equivalence ratio	–
DB	Intake air temperature sensor 1	Intake air temperature sensor (ambient air temperature)	°C or °F
DC	Throttle actuator	Throttle actuator control motor	%
DD	Relative APP sensor	Relative accelerator pedal position sensor	%
242	Fuel tank differential PRS.SNSR	Fuel tank differential pressure sensor	Pa

*NOTE: *: Data items are displayed on scan tool display, but the in-line 4 engine is not applicable and its data is displayed as "N/A" or "****".*

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	
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	
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	
EVAP_VP	32	See M.U.T.-III Item No. 242	
BARO	33	See M.U.T.-III Item No. BB	
VPWR	42	See M.U.T.-III Item No. D8	
LOAD_ABS	43	See M.U.T.-III Item No. D9	
EQ_RAT	44	See M.U.T.-III Item No. DA	
TP_R	45	See M.U.T.-III Item No. BC	
AAT	46	See M.U.T.-III Item No. DB	
TP_B	47	See M.U.T.-III Item No. BD	
APP_D	49	See M.U.T.-III Item No. BE	
APP_E	4A	See M.U.T.-III Item No. BF	
TAC_PCT	4C	See M.U.T.-III Item No. DC	
APP_R	5A	See M.U.T.-III Item No. DD	

OBD- II DRIVE CYCLE

All kinds of diagnostic trouble codes (DTCs) can be monitored by carrying out a short drive according to the following 22 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 been 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 diagnostic trouble code (DTC) is not output before driving the OBD-II drive cycle. Erase the DTC if it has been output.

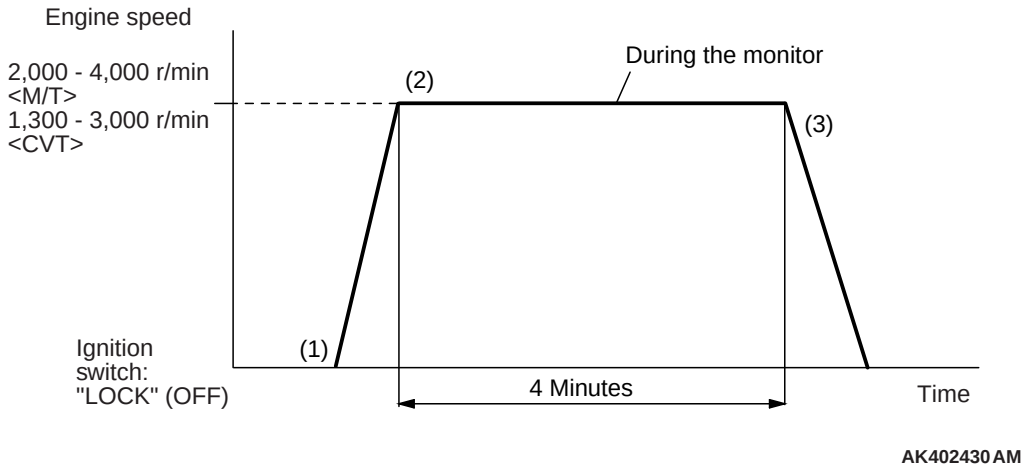
NOTE: Drive cycle patterns are not established for Vehicle speed sensor monitor (DTC P0500) and Fuel level sensor monitor (DTC P0461). Please reference the M.U.T. data list to judge whether these monitor items are normal.

DRIVE CYCLE PATTERN LIST

MONITOR ITEM	DIAGNOSTIC TROUBLE CODE (DTC)	PATTERN
Linear air-fuel ratio sensor monitor <Readiness test item>	P0133	1
Heated oxygen sensor (rear) feedback control system monitor	P2096, P2097	
Linear air-fuel ratio sensor heater monitor <Readiness test item>	P0031	2
Heated oxygen sensor heater monitor <Readiness test item>	P0037	
Linear air-fuel ratio sensor heater monitor	P0032	
Heated oxygen sensor heater monitor	P0038	
Catalytic converter monitor <Readiness test item>	P0421	3
Evaporative emission system leak monitor (small leak and gross leak) <Readiness test item>	P0442, P0455	4
Evaporative purge system monitor	P0441	
Fuel tank pressure sensor monitor	P0450	
Evaporative emission system leak monitor (very small leak) <Readiness test item>	P0456	5
Manifold absolute pressure (MAP) sensor monitor	P0106, P0107	6
Intake air temperature sensor monitor	P0111	7
Engine coolant temperature sensor monitor	P0116, P0125	8
Thermostat monitor	P0128	9
Heated oxygen sensor (rear) monitor <Readiness test item>	P0139	10
Air fuel ratio feedback monitor	–	11
Heated oxygen sensor (rear) monitor <Readiness test item>	P0140	12

MONITOR ITEM	DIAGNOSTIC TROUBLE CODE (DTC)	PATTERN
Fuel tank temperature sensor monitor	P0181	13
Misfire monitor	P0300, P0301, P0302, P0303	14
Fuel tank pressure sensor monitor	P0451	15
Throttle position sensor plausibility monitor	P0121, P0221	16
Mass airflow sensor plausibility monitor	P0068, P1238	
Torque monitor	P061A	
Idle speed control system monitor	P0506, P0507	17
Idle speed control system monitor	P1506, P1507	18
Variable valve timing system (MIVEC) monitor	P0010, P0011, P0016	19
Fuel trim monitor	P0171, P0172	20
Linear air-fuel ratio sensor heater monitor <Readiness test item>	P0053	21
Heated oxygen sensor monitor	P0137	
Linear air-fuel ratio sensor monitor	P0130, P0131, P0132, P0134, P2237, P2243, P2251	
Mass airflow sensor monitor	P0102, P0103	22
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	P0138, P2252, P2253	
Fuel tank temperature sensor monitor	P0182, P0183	
Injector monitor	P0261, P0262, P0264, P0265, P0267, P0268	
Knock sensor monitor	P0327, P0328	
Crankshaft position sensor monitor	P0335	
Camshaft position sensor monitor	P0340	
Evaporative emission purge solenoid monitor	P0458, P0459	
Evaporative emission ventilation solenoid monitor	P0498, P0499	
Fuel tank pressure sensor monitor	P0452, P0453	
Fuel level sensor monitor	P0462, P0463	
Engine RPM plausibility monitor	P061C	
Barometric pressure sensor monitor	P2228, P2229	

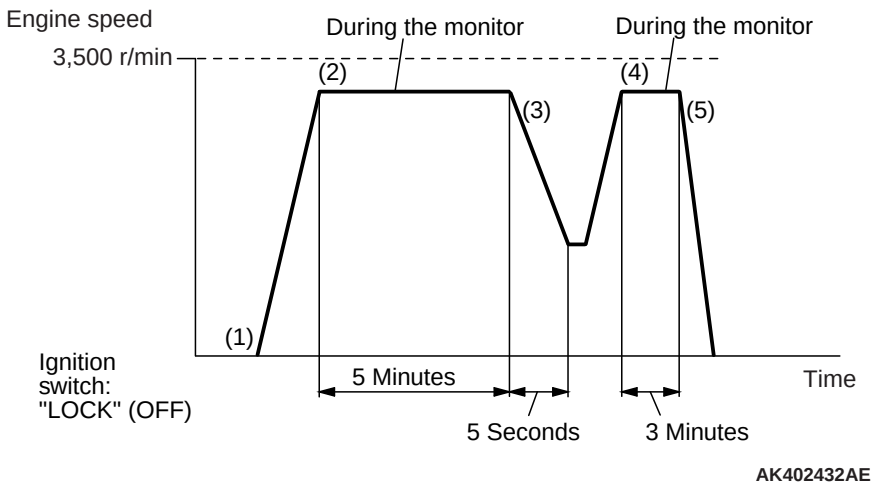
PATTERN 1

Drive cycle pattern	
Inspection conditions	• Engine coolant temperature: More than 76°C (169°F) • Condition of CVT: 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 2,000 r/min, less than 4,000 r/min <M/T> • Engine speed: More than 1,300 r/min, less than 3,000 r/min <CVT> • Engine load: More than 22 %, less than 65 % • Without rapid accelerator pedal movement 3. Stop the vehicle in a 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.

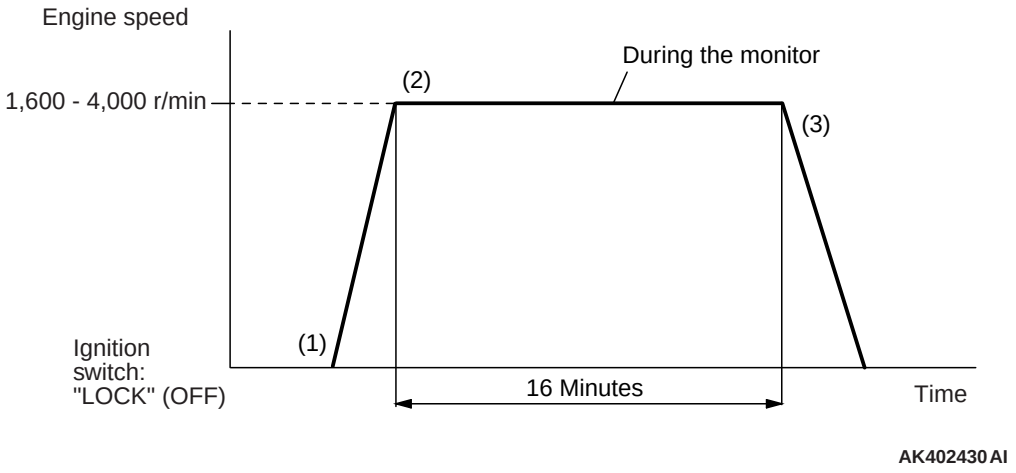
PATTERN 2

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 0°C (32°F) • Intake air temperature: More than −10°C (14°F) • Barometric pressure: More than 76 kPa (22.4 in.Hg) • Condition of CVT: 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 6 g/sec, less than 45 g/sec <M/T> • Airflow rate: More than 10 g/sec, less than 45 g/sec <CVT> • Accelerator pedal: Except full close • Without rapid accelerator pedal movement 3. Release the accelerator pedal for 5 seconds. 4. Drive the vehicle for 3 minutes at the following conditions. (During the monitor) • Engine speed: Less than 3,500 r/min • Airflow rate: More than 6 g/sec, less than 45 g/sec <M/T> • Airflow rate: More than 10 g/sec, less than 45 g/sec <CVT> • Accelerator pedal: Except full close • Without rapid accelerator pedal movement *NOTE: When the system is normal, the monitor is completed earlier.* 5. Stop the vehicle in a 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 4

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 (140°F) • Intake air temperature: More than 5°C (41°F), less than 45°C (113°F) • Barometric pressure: More than 76 kPa (22.4 in.Hg) • Fuel temperature: Less than 36°C (97°F) • Condition of CVT: 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 20 km/h (12 mph) • Airflow rate: More than 12 g/sec • The ratio between the manifold absolute pressure and the barometric pressure is 0.85 or less. • 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 vehicle in a 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.

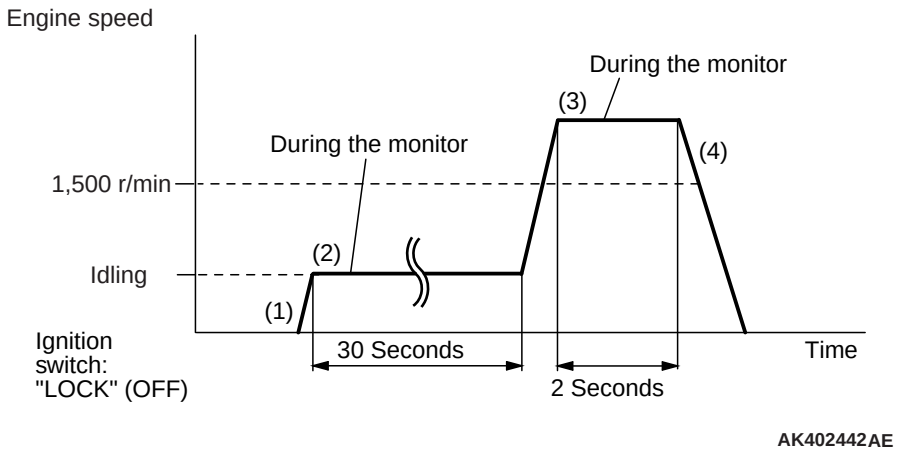
PATTERN 5

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 −10°C (14°F) • Barometric pressure: More than 76 kPa (22.4 in.Hg) • Fuel temperature: Less than 33°C (91°F)

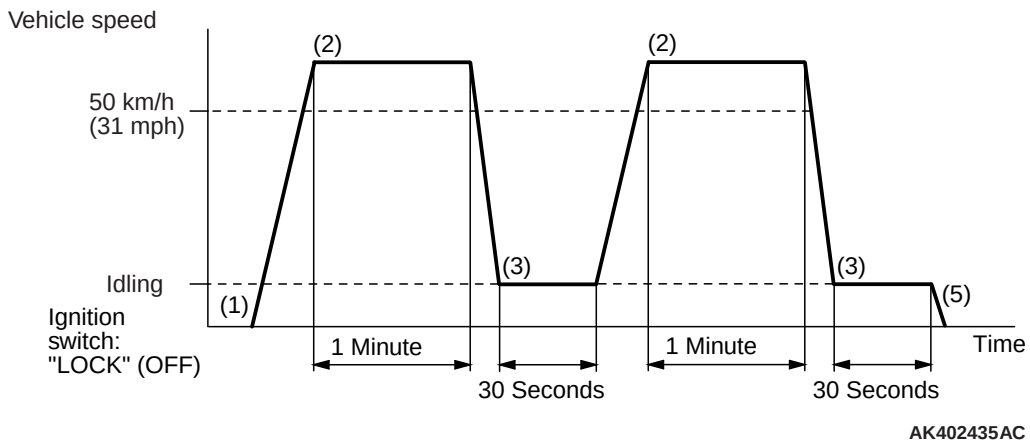
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Test procedure	1. Start the engine with all the accessories switched OFF. 2. Let the engine idle for 16 minutes. (During the monitor) *NOTE: When the system is normal, the monitor is completed earlier.* 3. Turn the ignition switch to "LOCK" (OFF) position. 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.

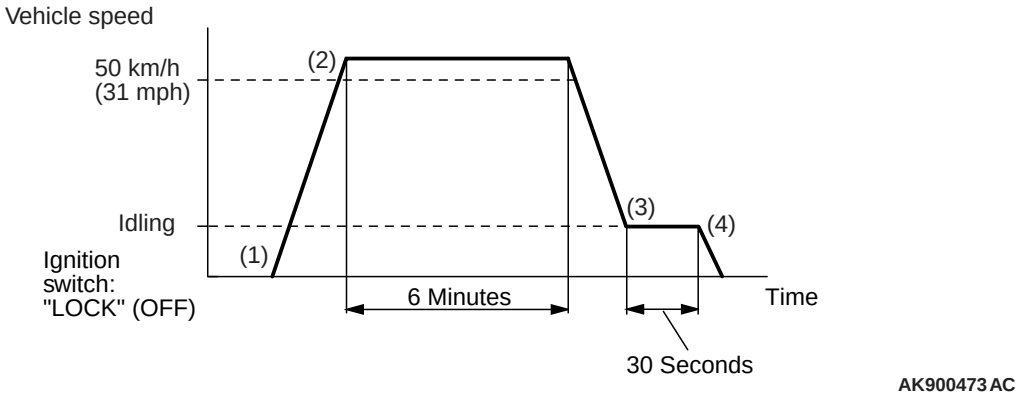
PATTERN 6

Drive cycle pattern	
Inspection conditions	• Engine coolant temperature at engine start: More than 0°C (32°F) • Condition of CVT: 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 1,500 r/min • Engine load: More than 20 % • Throttle position sensor output voltage: More than 3.5 volts 4. Stop the vehicle in a 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 7

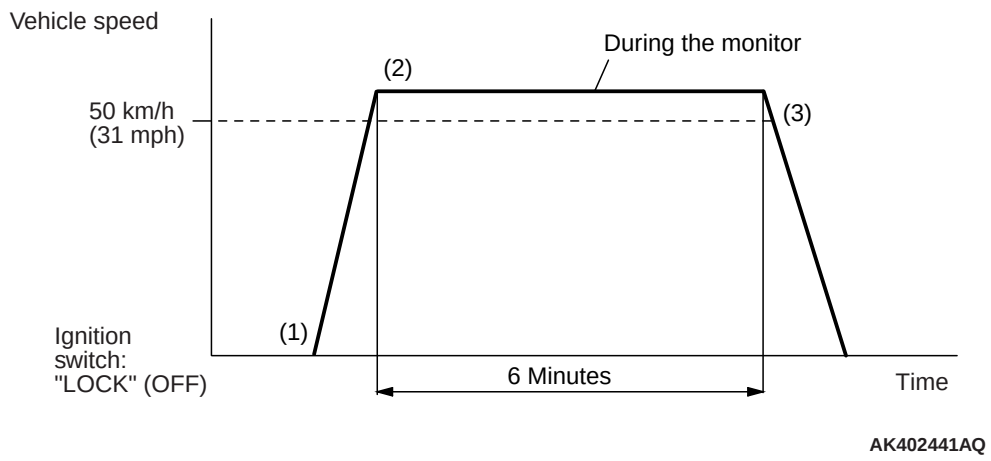
Drive cycle pattern	
Inspection conditions	• Engine coolant temperature: More than 76°C (169°F) • Condition of CVT: Selector lever "D" range
Test procedure	1. Start the engine with all the accessories switched OFF. 2. Drive the vehicle at more than 50 km/h (31 mph) for 1 minute. 3. Stop the vehicle in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

PATTERN 8

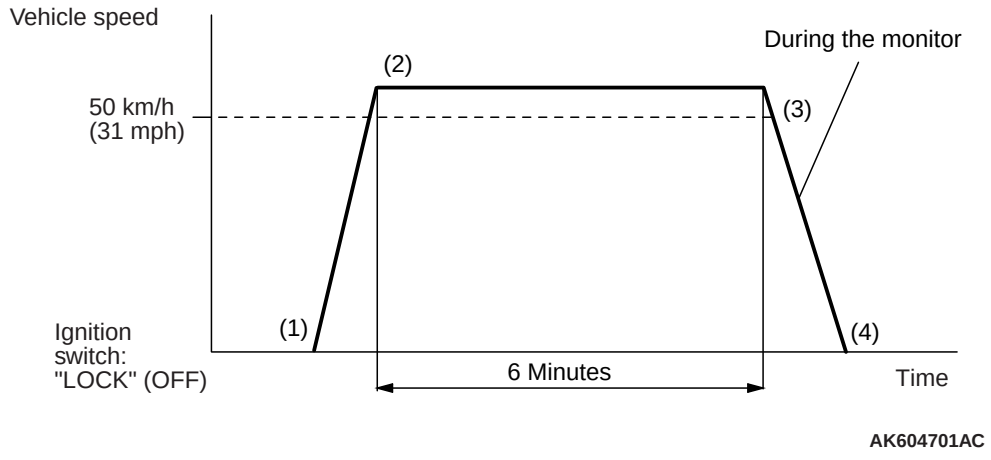
Drive cycle pattern	
Inspection conditions	• Engine coolant temperature at engine start: More than 0°C (32°F) • Intake air temperature: Less than 60°C (140°F) • Engine coolant temperature: More than 40°C (104°F) • Condition of CVT: Selector lever "D" range
Test procedure	1. Start the engine with all the accessories switched OFF. 2. Drive the vehicle for 6 minutes at the following condition. • Vehicle speed: More than 50 km/h (31 mph) • Air flow rate: More than 12 g/sec • Except fuel cut 3. Stop the vehicle in a safe place and let the engine idle for 30 seconds. 4. Turn the ignition switch to "LOCK" (OFF) position. 5. Confirm that the diagnostic trouble code (DTC) is not output.

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PATTERN 9

Drive cycle pattern	 AK402441AQ
Inspection conditions	• Engine coolant temperature at engine start: More than –10°C (14°F), less than 60°C (140°F) • Intake air temperature: More than –10°C (14°F) • Dropping of intake air temperature since engine start: Less than 10°C (18°F) • Condition of CVT: 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 conditions. (During the monitor) • Vehicle speed: More than 50 km/h (31 mph) • Air flow rate: More than 10 g/sec *NOTE: The system is normal if engine coolant temperature will rise more than 77°C (171°F) within 6 minutes.* 3. Stop the vehicle in a 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.

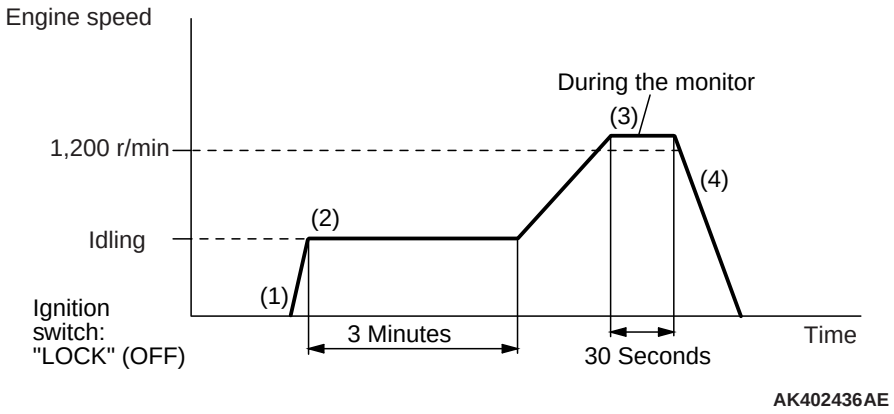
PATTERN 10

Drive cycle pattern	 AK604701AC
Inspection conditions	• Engine coolant temperature: More than 76°C (169°F) • Intake air temperature: More than –10°C (14°F) • Barometric pressure: More than 76 kPa (22.4 in.Hg) • Condition of CVT: Selector lever "D" range

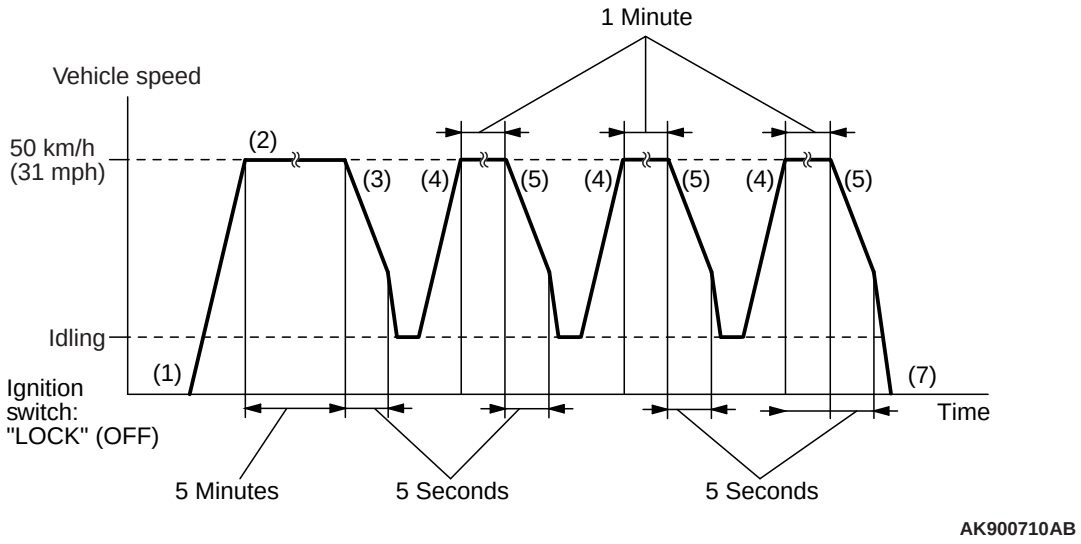
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Test procedure	1. Start the engine with all the accessories switched OFF. 2. Drive the vehicle at 50 km/h (31 mph) for 6 minutes. 3. Release the accelerator pedal for 10 seconds then stop the vehicle in a safe place. (During the monitor) 4. Turn the ignition switch to "LOCK" (OFF) position. 5. Start the engine and do Steps 1 to 4 again. *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.* 6. Confirm that the diagnostic trouble code (DTC) is not output.

PATTERN 11

Drive cycle pattern	
Inspection conditions	• Engine coolant temperature: More than 0°C (32°F) • Condition of CVT: 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 1,200 r/min • Engine load: More than 30 % • Throttle position sensor output: Less than 3.0 volts • Except fuel cut 4. Stop the vehicle in a safe place and turn the ignition switch to "LOCK" (OFF) position. 5. Confirm that the diagnostic trouble code (DTC) is not output.

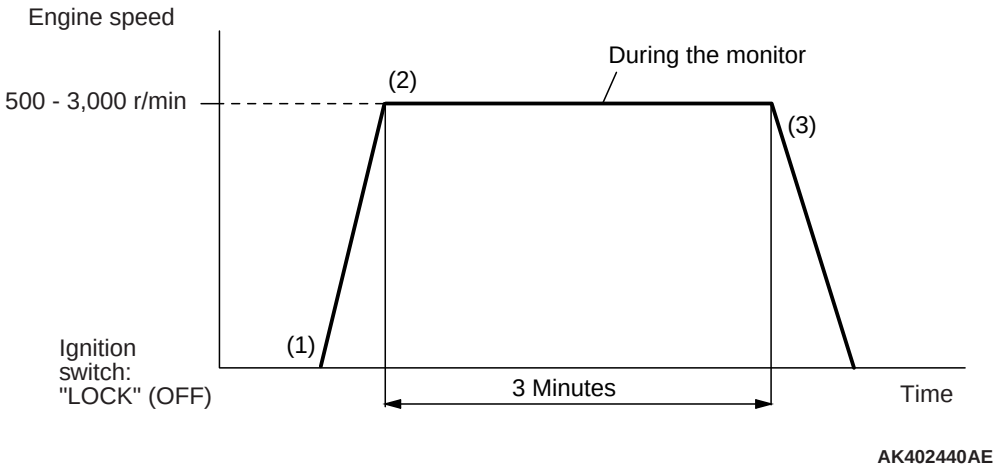
PATTERN 12

Drive cycle pattern	
Inspection conditions	• Engine coolant temperature: More than 76°C (169°F) • Condition of CVT: 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 vehicle in a safe place. 4. Increase the speed of the vehicle to 50 km/h (31 mph) under the following conditions, and then drive the vehicle for 1 minute. • Engine speed: More than 1,500 r/min • Engine load: More than 40 % 5. Release the accelerator pedal for 5 seconds then stop the vehicle in a safe place. 6. Repeat Steps 4 and 5 for 2 times. 7. Stop the vehicle in a safe place and turn the ignition switch to "LOCK" (OFF) position. 8. Start the engine and do Steps 1 to 7 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.* 9. Confirm that the diagnostic trouble code (DTC) is not output.

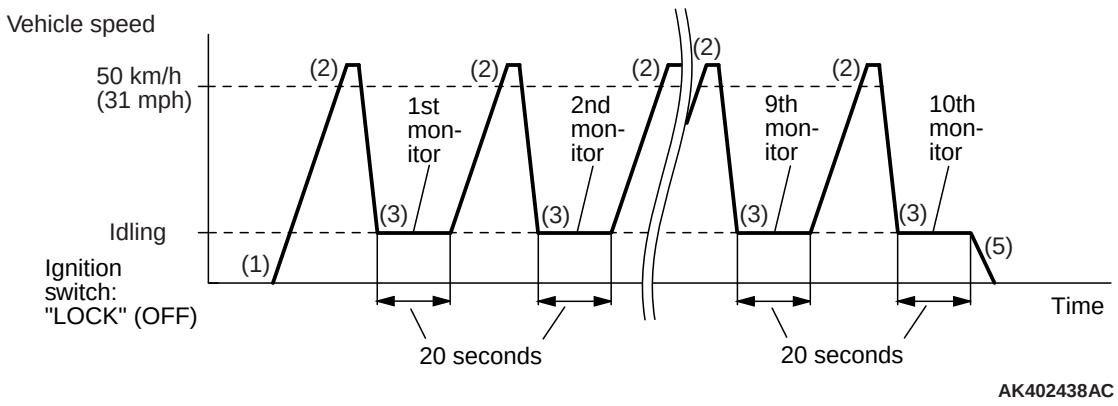
PATTERN 13

Inspection conditions	• Engine coolant temperature at engine start: More than –10°C (14°F), less than 36°C (97°F) • Difference between engine coolant temperature and intake air temperature at engine start: Less than 5°C (9°F) • Condition of CVT: 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 the vehicle in a 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.

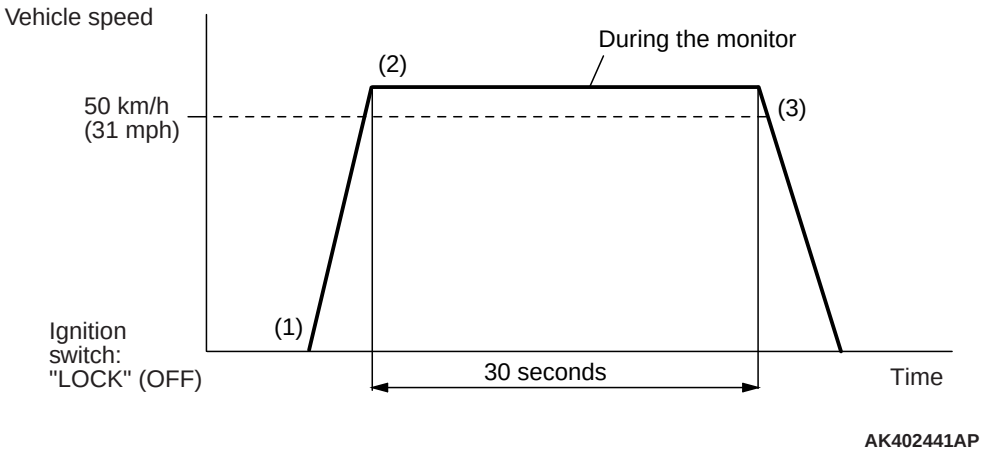
PATTERN 14

Drive cycle pattern	
Inspection conditions	• Engine coolant temperature: More than –10°C (14°F) • Barometric pressure: More than 76 kPa (22.4 in.Hg) • Condition of CVT: 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 20 % • Without rapid accelerator pedal change • Except fuel cut 3. Stop the vehicle in a 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 condition	Condition of CVT: 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). 3. Stop the vehicle in a 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 in a 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 16

Drive cycle pattern	
Inspection conditions	• Engine coolant temperature: More than 20°C (68°F) • Condition of CVT: 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 in a safe place and turn the ignition switch to "LOCK" (OFF) position. 4. Start the engine and do Steps 1 to 3 again. 5. Confirm that the diagnostic trouble code (DTC) is not output.

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PATTERN 17

Inspection conditions	• Engine coolant temperature: More than 41°C (106°F) • Intake air temperature: More than –10°C (14°F) • Barometric pressure: More than 76 kPa (22.4 in.Hg)
Test procedure	1. Start the engine with all the accessories switched OFF. 2. Let the engine idle for 1 minute. (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 18

Inspection conditions	• Engine coolant temperature: More than 7°C (45°F), less than 41°C (106°F) • Intake air temperature: More than –10°C (14°F) • Barometric pressure: More than 76 kPa (22.4 in.Hg)
Test procedure	1. Start the engine with all the accessories switched OFF. 2. Let the engine idle for 1 minute. (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 19

Inspection condition	Engine coolant temperature: More than 77°C (171°F), less than 87°C (189°F)
Test procedure	1. Start the engine with all the accessories switched OFF. 2. Drive the engine at 1,200 – 1,500 r/min for 30 seconds. (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 condition	Engine coolant temperature: More than 76°C (169°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 21

Inspection conditions	• Intake air temperature: More than –10°C (14°F) • Engine coolant temperature: More than 0°C (32°F)
Test procedure	1. Start the engine with all the accessories switched OFF. 2. Let the engine idle for 6 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 22

Inspection conditions	• Engine coolant temperature: More than 0°C (32°F) <Manifold absolute pressure sensor monitor> • Fuel amount at engine start: Less than 80 % <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. Start the engine and do Steps 1 to 3 again. 5. 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 stored again 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 stored 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 stored.

- Catalyst: P0421
- Evaporative system: P0442, P0455, P0456
- Linear air-fuel ratio sensor: P0133
- Linear air-fuel ratio sensor heater: P0031, P0053
- Heated oxygen sensor: P0139, P0140
- Heated oxygen sensor heater: P0037

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

M1131153001065

The control is carried out, which keeps the safety driving by the preset control logic when the diagnostic trouble code is stored. The diagnostic trouble code having the fail-safe function is as follows.

DTC	DIAGNOSTIC ITEM	FAIL-SAFE AND BACKUP FUNCTION
P0010	Engine oil control valve circuit	V.V.T. phase angle (intake) becomes most retarded angle.
P0068	Mass airflow sensor plausibility	Fuel control is carried out using throttle opening degree and engine speed in accordance with preset map.
P0102	Mass airflow circuit low input	Fuel control is carried out using throttle opening degree and engine speed in accordance with preset map.
P0103	Mass airflow circuit high input	Fuel control is carried out using throttle opening degree and engine speed in accordance with preset map.
P0106	Manifold absolute pressure circuit range/performance problem	Control as if the intake manifold vacuum pressure is 101 kPa (29.8 in.Hg).
P0107	Manifold absolute pressure circuit low input	Control as if the intake manifold vacuum pressure is 101 kPa (29.8 in.Hg).
P0108	Manifold absolute pressure circuit high input	Control as if the intake manifold vacuum pressure is 101 kPa (29.8 in.Hg).
P0111	Intake air temperature circuit range/performance problem	Control as if the intake air temperature is 25°C (77°F).
P0112	Intake air temperature circuit low input	Control as if the intake air temperature is 25°C (77°F).
P0113	Intake air temperature circuit high input	Control as if the intake air temperature is 25°C (77°F).
P0116	Engine coolant temperature circuit range/performance problem	Control as if the engine coolant temperature is 80°C (176°F).
P0117	Engine coolant temperature circuit low input	Control as if the engine coolant temperature is 80°C (176°F).
P0118	Engine coolant temperature circuit high input	Control as if the engine coolant temperature is 80°C (176°F).
P0121	Throttle position sensor (main) plausibility	• Throttle opening degree is restricted. • Throttle opening degree position is in default position if throttle position sensor (sub) fails.
P0122	Throttle position sensor (main) circuit low input	• Throttle opening degree is restricted. • Throttle opening degree position is in default position if throttle position sensor (sub) fails.

DTC	DIAGNOSTIC ITEM	FAIL-SAFE AND BACKUP FUNCTION
P0123	Throttle position sensor (main) circuit high input	• Throttle opening degree is restricted. • Throttle opening degree position is in default position if throttle position sensor (sub) fails.
P0125	Insufficient coolant temperature for closed loop fuel control	Control as if the engine coolant temperature is 80°C (176°F).
P0130	Linear air-fuel ratio sensor circuit	Does not control air-fuel ratio closed loop.
P0131	Linear air-fuel ratio sensor circuit low voltage	Does not control air-fuel ratio closed loop.
P0132	Linear air-fuel ratio sensor circuit high voltage	Does not control air-fuel ratio closed loop.
P0134	Linear air-fuel ratio sensor circuit no activity detected	• Does not control air-fuel ratio closed loop. • Control linear air-fuel ratio sensor heater off.
P0221	Throttle position sensor (sub) plausibility	• Throttle opening degree is restricted. • Throttle opening degree position is in default position if throttle position sensor (main) fails.
P0222	Throttle position sensor (sub) circuit low input	• Throttle opening degree is restricted. • Throttle opening degree position is in default position if throttle position sensor (main) fails.
P0223	Throttle position sensor (sub) circuit high input	• Throttle opening degree is restricted. • Throttle opening degree position is in default position if throttle position sensor (main) fails.
P0300	Random/multiple cylinder misfire detected	The supply of fuel to the misfiring cylinder can possibly be cut.
P0301	Cylinder 1 misfire detected	The supply of fuel to the misfiring cylinder can possibly be cut.
P0302	Cylinder 2 misfire detected	The supply of fuel to the misfiring cylinder can possibly be cut.
P0303	Cylinder 3 misfire detected	The supply of fuel to the misfiring cylinder can possibly be cut.
P0327	Knock sensor circuit low	Fix the ignition timing with an allowance against knock.
P0328	Knock sensor circuit high	Fix the ignition timing with an allowance against knock.
P0340	Camshaft position sensor circuit	• Engine runs in learned pattern until engine stops. • Does not control variable valve timing (V.V.T.).
P0513	Immobilizer malfunction	Engine start is prohibited.

DTC	DIAGNOSTIC ITEM	FAIL-SAFE AND BACKUP FUNCTION
P0532	A/C pressure sensor circuit low input	Control as if the A/C refrigerant is 0.063 MPa.
P0533	A/C pressure sensor circuit high input	Control as if the A/C refrigerant is 0.063 MPa.
P0537	Fin thermo sensor circuit low input	Control as if the evaporator surface temperature is -6.4 °C (20.5 °F).
P0538	Fin thermo sensor circuit high input	Control as if the evaporator surface temperature is -6.4 °C (20.5 °F).
P0604	Internal control module random access memory (RAM) error	• Microcomputer is reset or • Throttle opening degree position is in default position.
P0606	Engine control module main processor malfunction	Throttle opening degree position is in default position.
P060B	Internal control module A/D processing performance problem	Throttle opening degree position is in default position.
P060D	Internal control module accelerator pedal position performance problem	Throttle opening degree position is in default position.
P061A	Internal control module torque performance problem	Throttle opening degree position is in default position.
P061C	Internal control module engine RPM performance problem	Throttle opening degree position is in default position.
P061F	Internal control module throttle actuator controller performance problem	Microcomputer is reset.
P0622	Generator FR terminal circuit malfunction	Prohibits generator output suppression control against current consumers. (Operates as a normal generator.)
P0638	Throttle actuator control motor circuit range/performance	Throttle opening degree position is in default position.
P0642	Throttle position sensor power supply	Throttle opening degree position is in default position.
P0657	Throttle actuator control motor relay circuit malfunction	Throttle opening degree position is in default position.
P1231	Active stability control plausibility <Vehicles with ASC>	Torque requested by active stability control (ASC) is ignored.
P1238	Mass airflow sensor plausibility (torque monitor)	Throttle opening degree position is in default position.
P1240	Ignition angle	Ignition retard is not carried out.
P1242	Fail safe control monitor	Throttle opening degree position is in default position.
P1243	Inquiry/response error	Microcomputer is reset.
P1247	CVT plausibility <CVT>	Torque requested by TCM is ignored.
P1590	TCM to ECM communication error in torque reduction request <CVT>	Engine output is restricted.

DTC	DIAGNOSTIC ITEM	FAIL-SAFE AND BACKUP FUNCTION
P1603	Battery backup circuit malfunction	All diagnostic trouble codes are stored once failure judgment is completed.
P2100	Throttle actuator control motor circuit (open)	Throttle opening degree position is in default position.
P2101	Throttle actuator control motor magneto malfunction	Throttle opening degree position is in default position.
P2122	Accelerator pedal position sensor (main) circuit low input	• Throttle opening degree is restricted. • Throttle opening degree position is in default position if accelerator pedal position sensor (sub) fails.
P2123	Accelerator pedal position sensor (main) circuit high input	• Throttle opening degree is restricted. • Throttle opening degree position is in default position if accelerator pedal position sensor (sub) fails.
P2127	Accelerator pedal position sensor (sub) circuit low input	• Throttle opening degree is restricted. • Throttle opening degree position is in default position if accelerator pedal position sensor (main) fails.
P2128	Accelerator pedal position sensor (sub) circuit high input	• Throttle opening degree is restricted. • Throttle opening degree position is in default position if accelerator pedal position sensor (main) fails.
P2135	Throttle position sensor (main and sub) range/performance problem	Throttle opening degree position is in default position.
P2138	Accelerator pedal position sensor (main and sub) range/performance problem	• Throttle opening degree is restricted. • Throttle opening degree position is in default position if accelerator pedal position sensor (sub) fails.
P2228	Barometric pressure circuit low input	Control as if the barometric pressure is 101 kPa (29.8 in.Hg).
P2229	Barometric pressure circuit high input	Control as if the barometric pressure is 101 kPa (29.8 in.Hg).
P2237	Linear air-fuel ratio sensor positive current control circuit/open	Does not control air-fuel ratio closed loop.
P2243	Linear air-fuel ratio sensor reference voltage circuit/open	• Does not control air-fuel ratio closed loop. • Controls linear air-fuel ratio sensor heater off.
P2251	Linear air-fuel ratio sensor negative current control circuit/open	• Does not control air-fuel ratio closed loop. • Controls linear air-fuel ratio sensor heater off.
P2253	Heated oxygen sensor offset circuit high voltage	Does not control air-fuel ratio closed loop.
U0167	Immobilizer communication error	Engine start is prohibited.
U0415	Invalid data received from ASC-ECU	Torque requested by active stability control (ASC) is ignored.

DIAGNOSTIC TROUBLE CODE CHART

M1131151006688

⚠ *WARNING*

When touching the throttle valve, surely shut off the driving circuits of the throttle valve. In the event that the throttle valve is operated, a finger might be injured as the result of being caught by the throttle valve.

⚠ CAUTION

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

DTC	DIAGNOSTIC ITEM	REFERENCE PAGE
P0010	Engine oil control valve circuit	P.13A-55
P0011	Variable valve timing system target error	P.13A-59
P0016	Crankshaft/camshaft position sensor phase problem	P.13A-62
P0031	Linear air-fuel ratio sensor heater control circuit low	P.13A-65
P0032	Linear air-fuel ratio sensor heater control circuit high	P.13A-69
P0037	Heated oxygen sensor (rear) heater control circuit low	P.13A-72
P0038	Heated oxygen sensor (rear) heater control circuit high	P.13A-76
P0053	Linear air-fuel ratio sensor heater resistance	P.13A-79
P0068*1	Mass airflow sensor plausibility	P.13A-82
P0069	Abnormal correlation between manifold absolute pressure sensor and barometric pressure sensor	P.13A-85
P0102*1	Mass airflow circuit low input	P.13A-89
P0103*1	Mass airflow circuit high input	P.13A-94
P0106	Manifold absolute pressure circuit range/performance problem	P.13A-98
P0107	Manifold absolute pressure circuit low input	P.13A-104
P0108	Manifold absolute pressure circuit high input	P.13A-109
P0111*1	Intake air temperature circuit range/performance problem	P.13A-113
P0112*1	Intake air temperature circuit low input	P.13A-117
P0113*1	Intake air temperature circuit high input	P.13A-120
P0116*1	Engine coolant temperature circuit range/performance problem	P.13A-124
P0117*1	Engine coolant temperature circuit low input	P.13A-128
P0118*1	Engine coolant temperature circuit high input	P.13A-131
P0121*1	Throttle position sensor (main) plausibility	P.13A-135
P0122*1	Throttle position sensor (main) circuit low input	P.13A-139
P0123*1	Throttle position sensor (main) circuit high input	P.13A-143

DTC	DIAGNOSTIC ITEM	REFERENCE PAGE
P0125*1	Insufficient coolant temperature for closed loop fuel control	P.13A-147
P0128	Coolant thermostat (coolant temperature below thermostat regulating temperature)	P.13A-152
P0130	Linear air-fuel ratio sensor circuit	P.13A-155
P0131	Linear air-fuel ratio sensor circuit low voltage	P.13A-158
P0132	Linear air-fuel ratio sensor circuit high voltage	P.13A-161
P0133	Linear air-fuel ratio sensor circuit slow response	P.13A-165
P0134	Linear air-fuel ratio sensor circuit no activity detected	P.13A-169
P0137	Heated oxygen sensor (rear) circuit low voltage	P.13A-172
P0138	Heated oxygen sensor (rear) circuit high voltage	P.13A-177
P0139	Heated oxygen sensor (rear) circuit slow response	P.13A-180
P0140	Heated oxygen sensor (rear) circuit no activity detected	P.13A-183
P0171	System too lean	P.13A-187
P0172	System too rich	P.13A-194
P0181	Fuel tank temperature sensor circuit range/performance	P.13A-199
P0182	Fuel tank temperature sensor circuit low input	P.13A-203
P0183	Fuel tank temperature sensor circuit high input	P.13A-205
P0221*1	Throttle position sensor (sub) plausibility	P.13A-209
P0222*1	Throttle position sensor (sub) circuit low input	P.13A-213
P0223*1	Throttle position sensor (sub) circuit high input	P.13A-217
P0261	Injector circuit low input – cylinder 1	P.13A-221
P0262	Injector circuit high input – cylinder 1	P.13A-224
P0264	Injector circuit low input – cylinder 2	P.13A-227
P0265	Injector circuit high input – cylinder 2	P.13A-230
P0267	Injector circuit low input – cylinder 3	P.13A-233
P0268	Injector circuit high input – cylinder 3	P.13A-236
P0300	Random/multiple cylinder misfire detected	P.13A-239
P0301	Cylinder 1 misfire detected	P.13A-244
P0302	Cylinder 2 misfire detected	P.13A-247
P0303	Cylinder 3 misfire detected	P.13A-251
P0327	Knock sensor circuit low	P.13A-255
P0328	Knock sensor circuit high	P.13A-258
P0335*1	Crankshaft position sensor circuit	P.13A-260

DTC	DIAGNOSTIC ITEM	REFERENCE PAGE
P0340*1	Camshaft position sensor circuit	P.13A-267
P0421	Warm up catalyst efficiency below threshold	P.13A-273
P0441	Evaporative emission control system incorrect purge flow	P.13A-275
P0442	Evaporative emission control system leak detected (small leak)	P.13A-279
P0450	Evaporative emission control system pressure sensor malfunction	P.13A-289
P0451	Evaporative emission control system pressure sensor range/performance	P.13A-293
P0452	Evaporative emission control system pressure sensor low input	P.13A-299
P0453	Evaporative emission control system pressure sensor high input	P.13A-305
P0455	Evaporative emission control system leak detected (gross leak)	P.13A-310
P0456	Evaporative emission control system leak detected (very small leak)	P.13A-320
P0458	Evaporative emission control system purge control valve circuit low input	P.13A-329
P0459	Evaporative emission control system purge control valve circuit high input	P.13A-333
P0461	Fuel level sensor circuit range/performance	P.13A-336
P0462	Fuel level sensor circuit low input	P.13A-339
P0463	Fuel level sensor circuit high input	P.13A-341
P0498	Evaporative emission control system canister vent solenoid circuit low input	P.13A-344
P0499	Evaporative emission control system canister vent solenoid circuit high input	P.13A-347
P0500*1	Vehicle speed sensor malfunction <M/T>	P.13A-350
P0506	Idle control system RPM lower than expected	P.13A-352
P0507	Idle control system RPM higher than expected	P.13A-355
P0513	Immobilizer malfunction	P.13A-358<Vehicles without KOS>, P.13A-359<Vehicles with KOS>,
P0532	A/C pressure sensor circuit low input	P.13A-361
P0533	A/C pressure sensor circuit high input	P.13A-365
P0537	Fin thermo sensor circuit low input	P.13A-367
P0538	Fin thermo sensor circuit high input	P.13A-369
P0557	Brake booster pressure sensor circuit low input	P.13A-372
P0558	Brake booster pressure sensor circuit high input	P.13A-376
P0602*1	Control module programming error	P.13A-378
P0604	Internal control module random access memory (RAM) error	P.13A-380
P0606*1	Engine control module main processor malfunction	P.13A-381

DTC	DIAGNOSTIC ITEM	REFERENCE PAGE
P060B*1	Internal control module A/D processing performance problem	P.13A-384
P060D*1	Internal control module accelerator pedal position performance problem	P.13A-385
P061A*1	Internal control module torque performance problem	P.13A-388
P061C*1	Internal control module engine RPM performance problem	P.13A-393
P061F*1	Internal control module throttle actuator controller performance problem	P.13A-396
P0622	Generator FR terminal circuit malfunction	P.13A-397
P062F*1	Internal control module EEPROM error	P.13A-399
P0630*1	Vehicle Identification Number (VIN) malfunction	P.13A-401
P0638*1	Throttle actuator control motor circuit range/ performance	P.13A-404
P0642*1	Throttle position sensor power supply	P.13A-406
P0657*1	Throttle actuator control motor relay circuit malfunction	P.13A-407
P1231	Active stability control plausibility	P.13A-411
P1238*1	Mass airflow sensor plausibility (torque monitor)	P.13A-413
P1240	Ignition angle	P.13A-416
P1242	Fail safe control monitor	P.13A-417
P1243	Inquiry/response error	P.13A-418
P1247	CVT plausibility <CVT>	P.13A-419
P1506	Idle control system RPM lower than expected at low temperature	P.13A-420
P1507	Idle control system RPM higher than expected at low temperature	P.13A-423
P1590*1	TCM to ECM communication error in torque reduction request <CVT>	P.13A-426
P1603*1	Battery backup circuit malfunction	P.13A-429
P2096	Post catalyst fuel trim system too lean	P.13A-432
P2097	Post catalyst fuel trim system too rich	P.13A-435
P2100*1	Throttle actuator control motor circuit (open)	P.13A-438
P2101*1	Throttle actuator control motor magneto malfunction	P.13A-441
P2122*1	Accelerator pedal position sensor (main) circuit low input	P.13A-443
P2123*1	Accelerator pedal position sensor (main) circuit high input	P.13A-447
P2127*1	Accelerator pedal position sensor (sub) circuit low input	P.13A-450
P2128*1	Accelerator pedal position sensor (sub) circuit high input	P.13A-454
P2135*1	Throttle position sensor (main and sub) range/performance problem	P.13A-457
P2138*1	Accelerator pedal position sensor (main and sub) range/performance problem	P.13A-464

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DTC	DIAGNOSTIC ITEM	REFERENCE PAGE
P2228*1	Barometric pressure circuit low input	P.13A-470
P2229*1	Barometric pressure circuit high input	P.13A-472
P2237	Linear air-fuel ratio sensor positive current control circuit/open	P.13A-474
P2243	Linear air-fuel ratio sensor reference voltage circuit/open	P.13A-477
P2251	Linear air-fuel ratio sensor negative current control circuit/open	P.13A-480
P2252	Heated oxygen sensor offset circuit low voltage	P.13A-483
P2253	Heated oxygen sensor offset circuit high voltage	P.13A-486
U0101*1	TCM time-out <CVT>	P.13A-489
U0121	ASC-ECU time-out	P.13A-493
U0131	Electric power steering-ECU time-out	P.13A-497
U0141	ETACS-ECU time-out	P.13A-499
U0155	Combination meter time-out	P.13A-502
U0164	A/C-ECU time-out <Automatic A/C>	P.13A-506
U0167	Immobilizer communication error <Vehicles with KOS>	P.13A-508
U0168	KOS&OSS-ECU time-out <Vehicles with KOS>	P.13A-510
U0415	Invalid data received from ASC-ECU	P.13A-513

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 "*1", the diagnostic trouble code is recorded on the first detection of the malfunction.*

SYMPTOM CHART

M1131151504342

⚠ *WARNING*

When touching the throttle valve, surely shut off the driving circuits of the throttle valve. In the event that the throttle valve is operated, a finger might be injured as the result of being caught by the throttle valve.

⚠ CAUTION

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

NOTE: When the racing (2,000 to 5,000 r/min or more) continues on the vehicle stopped with no load during the specified time or more, the increase in the engine speed might be limited. This comes from the engine protection and control functions and is not a malfunction.

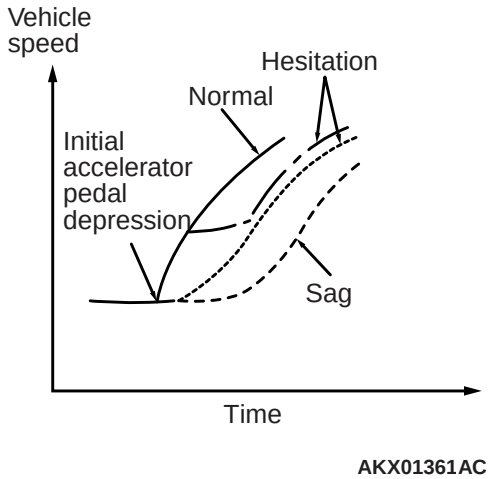
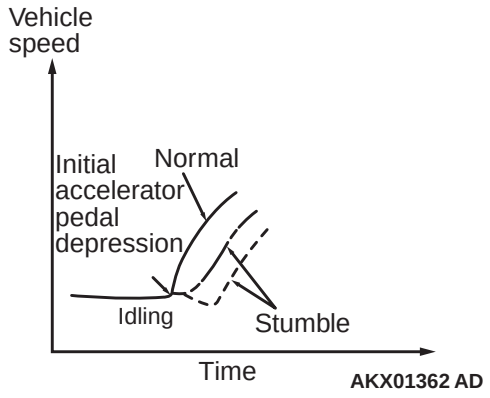
TROUBLE SYMPTOMS		INSPECTION PROCEDURE	REFERENCE PAGE
Communication with scan tool is impossible	Communication with ECM is not possible	1	P.13A-515
Malfunction Indicator Lamp (SERVICE ENGINE SOON or Check Engine Lamp) and related parts	The Malfunction Indicator Lamp (SERVICE ENGINE SOON or Check Engine Lamp) does not illuminate right after the ignition switch is turned to the "ON" position	2	P.13A-517
	The Malfunction Indicator Lamp (SERVICE ENGINE SOON or Check Engine Lamp) remains illuminated and never goes out	3	P.13A-518
Starting	Cranks, won't start	4	P.13A-519
	Starts up and dies	5	P.13A-522
	Hard starting	6	P.13A-525
Idling stability (improper idling)	Unstable idle (rough idle, hunting)	7	P.13A-528
	Idle speed is high (improper idle speed)	8	P.13A-531
	Idle speed is low (improper idle speed)	9	P.13A-532 <M/T>, P.13A-533 <CVT>
Idling stability (engine stalls)	When the engine is cold, it stalls at idle (die out)	10	P.13A-534
	When the engine is hot, it stalls at idle (die out)	11	P.13A-536
	The engine stalls when accelerating (pass out)	12	P.13A-539
	The engine stalls when decelerating	13	P.13A-541

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TROUBLE SYMPTOMS		INSPECTION PROCEDURE	REFERENCE PAGE
Driving	Hesitation, sag, stumble, poor acceleration or surge	14	P.13A-542
	Acceleration shock	15	P.13A-545
	Knocking	16	P.13A-547
Dieseling (run-on)		17	P.13A-548
Too high CO and HC concentration when idling		18	P.13A-548
IM240 test failure	Transient, mass emission tailpipe test failure	19	P.13A-551
	Purge flow test of the evaporative emission canister failure	20	P.13A-554
	Pressure test of the evaporative system failure	21	P.13A-555
Power supply system and ignition switch-IG system		22	P.13A-556
Fuel pump system		23	P.13A-560
Ignition switch-ST system and starter relay system <M/T>		24	P.13A-564
Ignition switch-ST system and starter relay system <CVT>		25	P.13A-570
Ignition circuit system		26	P.13A-577
A/C switch system <Manual A/C>		27	P.13A-580
A/C compressor relay system		28	P.13A-582
Fan control relay system		29	P.13A-584
Blower fan signal system <Manual A/C>		30	P.13A-590
Defogger switch system <Manual A/C>		31	P.13A-592
Brake monitoring switch system		32	P.13A-595
Engine oil pressure switch system		33	P.13A-597

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.

ITEMS		SYMPTOM
Idling stability	Hunting	Engine speed doesn't remain constant; changes at idle.
	Rough idle	Usually, a judgment 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". 
	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".

TSB Revision

DIAGNOSTIC TROUBLE CODE PROCEDURES

DTC P0010: Engine Oil Control Valve Circuit

CIRCUIT OPERATION

- The engine oil control valve power is supplied from the MFI relay terminal.
- The ECM controls ground engine oil control valve by turning the power transistor in the ECM "ON" and "OFF".

TECHNICAL DESCRIPTION

- The engine oil control valve changes the phase angle to operate the MIVEC system in the advance or the retard side in accordance with signals from the ECM.

DESCRIPTIONS OF MONITOR METHODS

Engine oil control valve circuit current is out of 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)

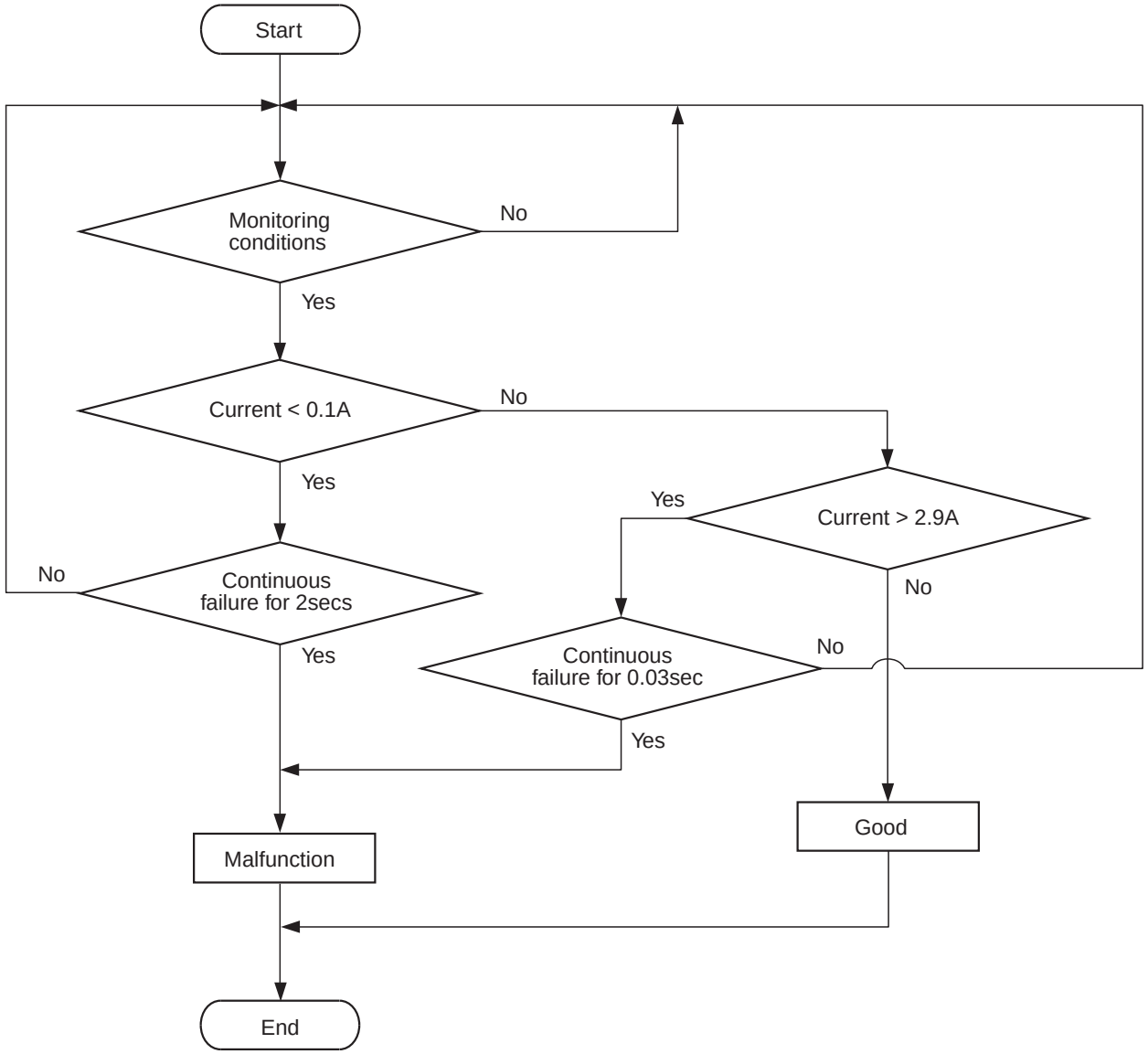
- Not applicable

Sensor (The sensor below is determined to be normal)

- Camshaft position sensor
- Crankshaft position sensor
- Engine coolant temperature sensor
- Throttle position sensor
- Engine oil control valve

DTC SET CONDITIONS

Logic Flow Chart



ACD00279

Check Conditions
- Ignition switch is "ON" position.
- Battery positive voltage is between 10 and 16.5 volts.
- ON duty cycle of the engine oil control valve circuit is more than 20 percent.

Judgment Criterion
- The ECM terminal current of engine oil control valve circuit is less than 0.1 ampere for 2 seconds.

Check Conditions
- Ignition switch is "ON" position.
- Battery positive voltage is between 10 and 16.5 volts.

Judgment Criterion
- The ECM terminal current of engine oil control valve circuit is more than 2.9 amperes for 0.03 second.

FAIL-SAFE AND BACKUP FUNCTION
- V.V.T. phase angle (intake) becomes most retarded angle.

Check Conditions
- Ignition switch is "ON" position.

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OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 19 P.13A-10.

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

- Engine oil control valve failed.
- Open or shorted engine oil control valve circuit, or harness damage, or connector damage.
- ECM failed.

DIAGNOSIS

Required Special Tools:

- MB992744: Vehicle communication interface-Lite (V.C.I.-Lite)
- MB992745: V.C.I.-Lite main harness A
- MB992747: V.C.I.-Lite USB cable short
- MB992748: V.C.I.-Lite USB cable long
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicles Communication Interface (V.C.I.)
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A (Vehicles with CAN communication system)

STEP 1. Using scan tool (M.U.T.-III), check actuator test item 17: Engine Oil Control Valve.

⚠ CAUTION

To prevent damage to scan tool (M.U.T.-III), always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool (M.U.T.-III).

(1) Connect scan tool (M.U.T-III). Refer to HOW TO CONNECT THE SCAN TOOL (M.U.T.-III) P.13A-10.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool (M.U.T.-III) to the actuator test mode for item 17, Engine Oil Control Valve.
  - An operation sound should be heard and vibration should be felt when the engine oil control valve is operated.
(4) 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.00-13.

NO : Go to Step 2.

STEP 2. Check the engine oil control valve.

(1) Disconnect the engine oil control valve connector, and measure at engine oil control valve side.
(2) Measure the resistance between engine oil control valve side connector terminals.

Standard value: 6.9 – 7.9 Ω [at 20°C (68°F)]

Q: Is the measured resistance between 6.9 and 7.9 Ω [at 20°C (68°F)]?

YES : Go to Step 3.
NO : Replace the engine oil control valve. Then go to Step 8.

STEP 3. Measure the power supply voltage at engine oil control valve harness side connector.

(1) Disconnect the connector and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal OCV line 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 or replace the connector(s), or check and repair the harness of open circuit, and short circuit in power supply line between MFI relay connector and oil control valve connector. Then go to Step 8.

STEP 4. Measure the power supply voltage at ECM connector by backprobing.

(1) Do not disconnect the connector.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal OCV and ground by backprobing.
- 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 or replace the connector(s), or check and repair the harness of open circuit, and damage in OCV line between oil control valve connector and ECM connector. Then go to Step 8.

STEP 5. Check of damage in power supply line between MFI relay connector and engine oil control valve connector.

Q: Is the harness wire in good condition?

YES : Go to Step 6.
NO : Repair it. Then go to Step 8.

STEP 6. Check of damage in OCV line between engine oil control valve connector and ECM connector.

Q: Is the harness wire in good condition?

YES : Go to Step 7.
NO : Repair it. Then go to Step 8.

STEP 7. Using scan tool (M.U.T.-III), check actuator test item 17: Engine Oil Control Valve.

(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool (M.U.T.-III) to the actuator test mode for item 17, Engine Oil Control Valve.
- An operation sound should be heard and vibration should be felt when the engine oil control valve is operated.

(3) 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.00-13.
NO : Replace the ECM (Refer to, Removal and Installation P.13A-656). Then go to Step 8.

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 19 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0010 stored?

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

DTC P0011: Variable Valve Timing System Target Error

TECHNICAL DESCRIPTION

- The ECM checks the variable valve timing system for malfunction.

DESCRIPTIONS OF MONITOR METHODS

The difference between the actual intake valve opening timing and the intake valve target opening timing 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)

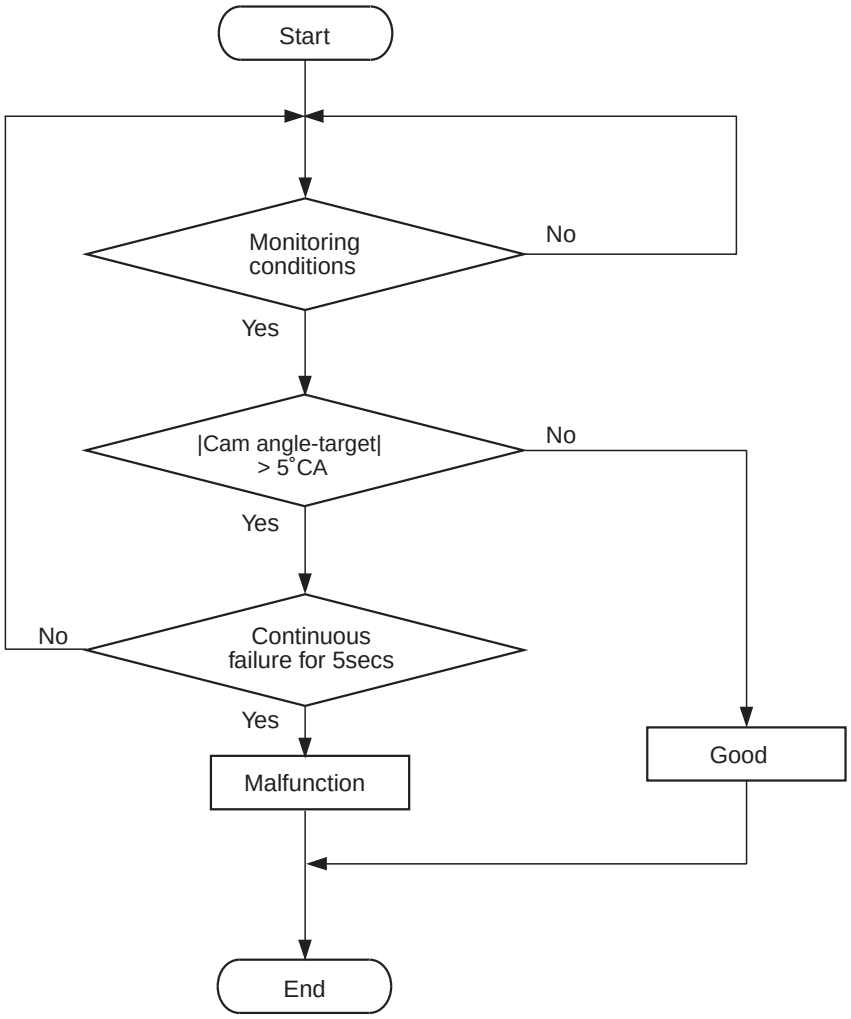
- Not applicable

Sensor (The sensor below is determined to be normal)

- Camshaft position sensor
- Crankshaft position sensor
- Engine coolant temperature sensor
- Throttle position sensor
- Engine oil control valve

DTC SET CONDITIONS

Logic Flow Chart



Cam angle: Intake valve open timing (intake side)
Exhaust valve close timing (exhaust side)

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Check Conditions

- More than 20 seconds have passed since the engine starting sequence was completed.
- Engine speed is more than 1,188 r/min.
- Engine coolant temperature is more than 76°C (169°F).

Judgment Criterion

- The difference between the actual intake valve opening timing and the intake valve target opening timing is more than 5 degrees for 5 seconds.

FAIL-SAFE AND BACKUP FUNCTION

- None

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 19 P.13A-10.

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

- Engine oil control valve failed.
- Oil passage of variable valve timing control system clogged.
- Intake variable valve timing sprocket operation mechanism stuck.

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- ECM failed.

DIAGNOSIS

Required Special Tools:

- MB992744: Vehicle communication interface-Lite (V.C.I.-Lite)
- MB992745: V.C.I.-Lite main harness A
- MB992747: V.C.I.-Lite USB cable short
- MB992748: V.C.I.-Lite USB cable long
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicles Communication Interface (V.C.I.)
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A (Vehicles with CAN communication system)

STEP 1. Using scan tool (M.U.T.-III), read the diagnostic trouble code (DTC).

⚠ CAUTION

To prevent damage to scan tool (M.U.T.-III), always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool (M.U.T.-III).

(1) Connect scan tool (M.U.T-III). Refer to HOW TO CONNECT THE SCAN TOOL (M.U.T.-III) P.13A-10.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool (M.U.T.-III), read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the diagnostic trouble code other than P0011 stored?

YES : Refer to, Diagnostic Trouble Code Chart P.13A-47.
NO : Go to Step 2.

STEP 2. Check the engine oil control valve.

Refer to Engine Oil Control Valve Check P.13A-649.

Q: Is the engine oil control valve normal?

YES : Go to Step 3.
NO : Replace the engine oil control valve. Then go to Step 6.

STEP 3. Check variable valve timing sprocket operation mechanism for being stuck.

Refer to GROUP 11B, Timing Chain – Inspection P.11B-36.

Q: Is the check result normal?

YES : Go to Step 4.
NO : Repair it. Then go to Step 6.

STEP 4. Check oil passage of variable valve timing control system for being clogged.

Q: Is the check result normal?

YES : Go to Step 5.
NO : Repair it. Then go to Step 6.

STEP 5. Check the trouble symptoms.

(1) Carry out test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 19 P.13A-10.

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

Q: Is DTC P0011 stored?

YES : Replace the ECM (Refer to, Removal and Installation P.13A-656). 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.00-13.

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 19 P.13A-10.

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

Q: Is DTC P0011 stored?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0016: Crankshaft/camshaft Position Sensor Phase Problem

TECHNICAL DESCRIPTION

- The ECM checks the variable valve timing system for malfunction.

DESCRIPTIONS OF MONITOR METHODS

The open timing of the intake valve is faster or slower 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)

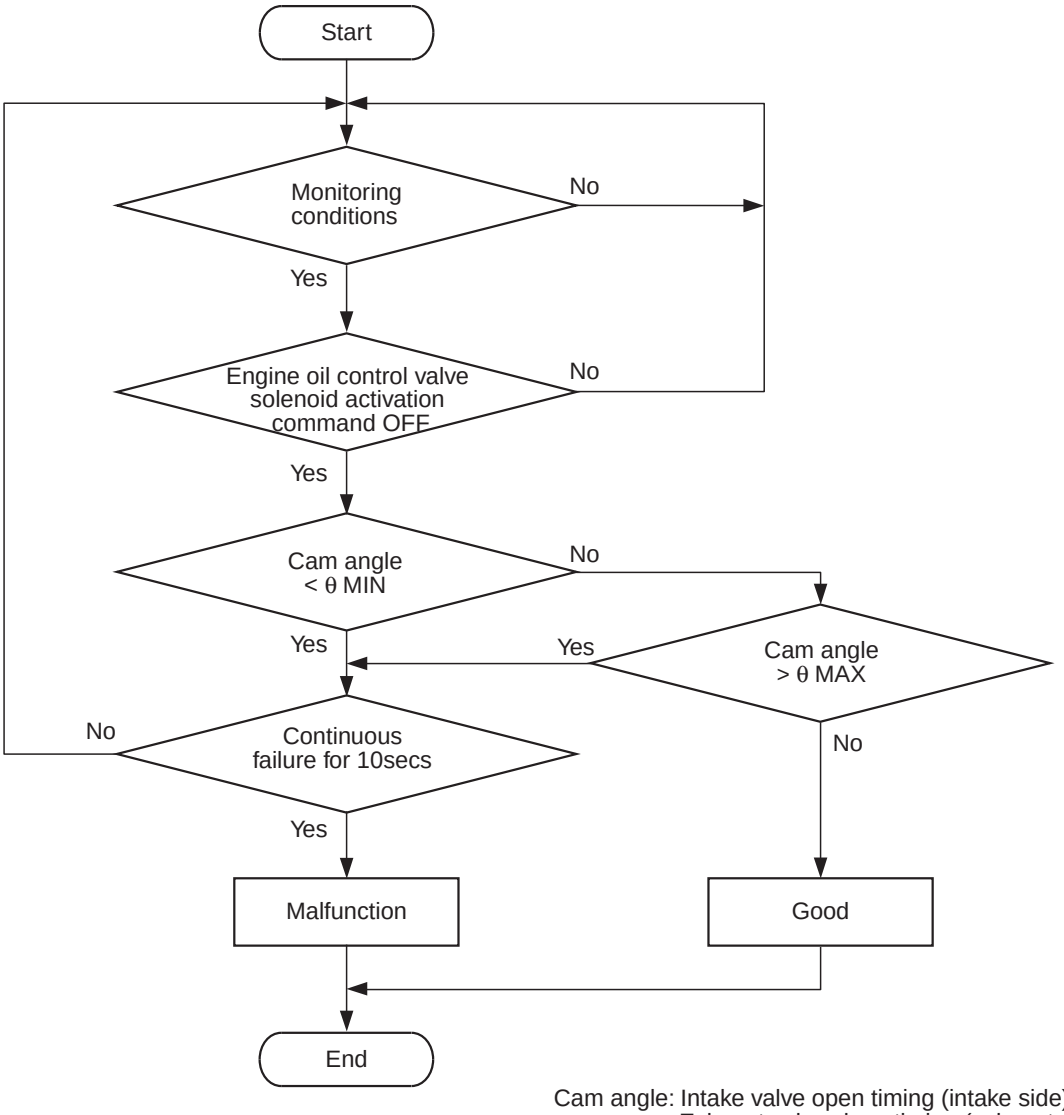
- Not applicable

Sensor (The sensor below is determined to be normal)

- Camshaft position sensor
- Crankshaft position sensor
- Engine coolant temperature sensor
- Throttle position sensor
- Engine oil control valve

DTC SET CONDITIONS

Logic Flow Chart



Cam angle: Intake valve open timing (intake side)
Exhaust valve close timing (exhaust side)
θ MAX : Maximum threshold value
θ MIN : Minimum threshold value

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Check Conditions

- Engine speed is between 594 r/min and 1,500 r/min.
- Engine coolant temperature is between 20°C (68°F) and 88°C (190°F).
- Intake engine oil control valve is "OFF".
- 1 second has passed after the above mentions have been met.

Judgment Criterion

- The open timing of the intake valve is less than 0 degree (ATDC) for 10 seconds.

or

- The open timing of the intake valve is more than 20 degrees (ATDC) for 10 seconds.

FAIL-SAFE AND BACKUP FUNCTION

- None

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 19 P.13A-10.

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

- Timing chain in out of place.
- Intake variable valve timing sprocket tooth coming off.
- Intake engine oil control valve failed.

DIAGNOSIS

Required Special Tools:

- MB992744: Vehicle communication interface-Lite (V.C.I.-Lite)
- MB992745: V.C.I.-Lite main harness A
- MB992747: V.C.I.-Lite USB cable short
- MB992748: V.C.I.-Lite USB cable long
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicles Communication Interface (V.C.I.)
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A (Vehicles with CAN communication system)

STEP 1. Check the engine oil control valve.

Refer to, Engine oil control valve checkP.13A-649.

Q: Is the engine oil control valve normal?

YES : Go to Step 2.

NO : Replace the intake engine oil control valve. Then initialize the learning value for the elongation of the timing chain. Refer to GROUP 00, Precautions Before Service – Timing Chain Learned Value Reset P.00-42. Then go to Step 3.

STEP 2. Check timing mark on the timing chain.

Q: Is timing chain in out of place?

YES : Repair it. Then initialize the learning value for the elongation of the timing chain. Refer to GROUP 00, Precautions Before Service – Timing Chain Learned Value Reset P.00-42. Then go to Step 3.

NO : Initialize the learning value for the elongation of the timing chain. Refer to GROUP 00, Precautions Before Service – Timing Chain Learned Value Reset P.00-42. 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 19 P.13A-10.

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

Q: Is DTC P0016 stored?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0031: Linear Air-Fuel Ratio Sensor Heater Control Circuit Low

CIRCUIT OPERATION

- Power is supplied from the MFI relay to the linear air-fuel ratio sensor heater.
- The ECM terminal LHFL controls continuity to the linear air-fuel ratio 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

Linear air-fuel ratio 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)

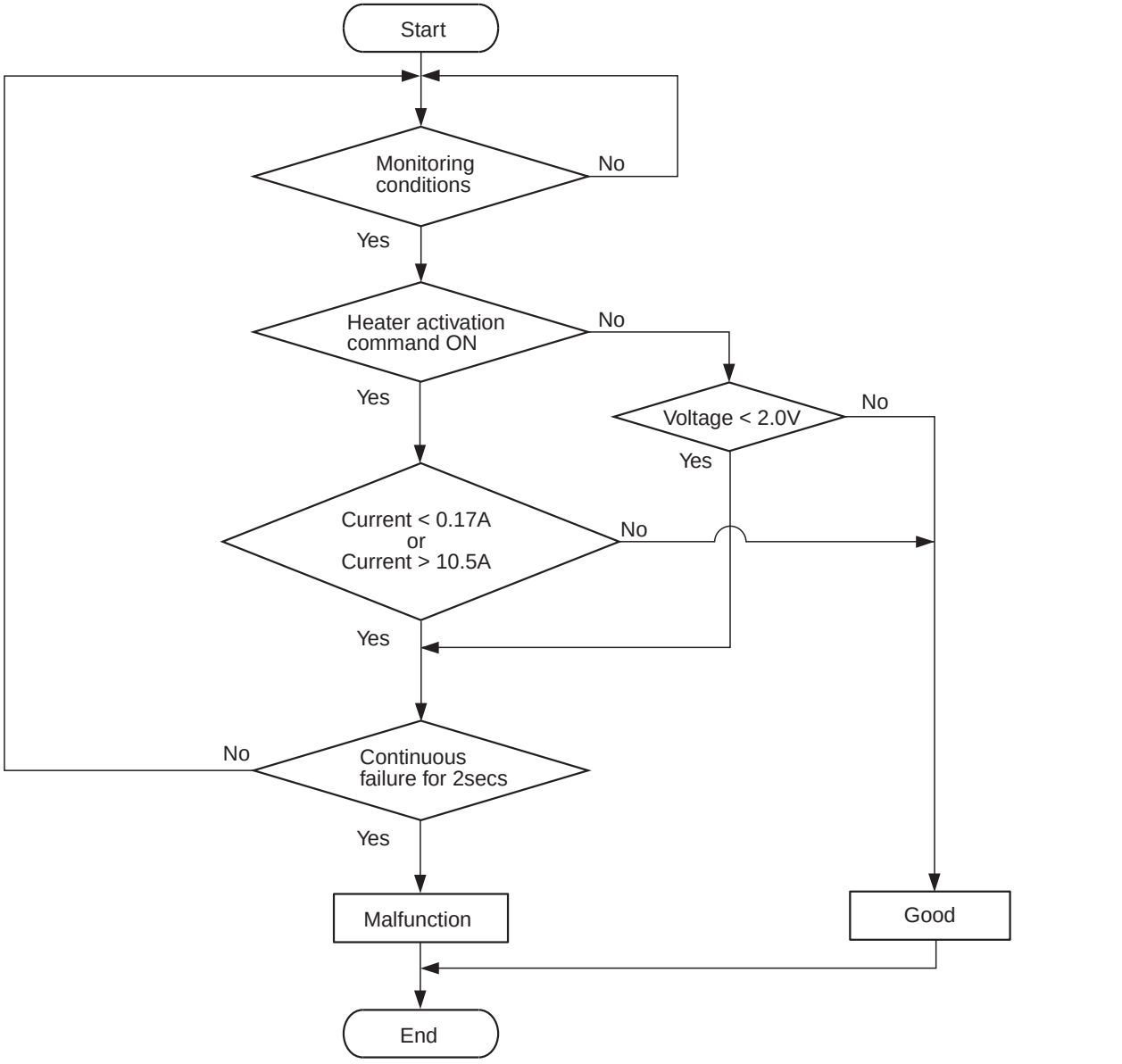
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



Check Conditions

- More than 2 seconds have passed since the engine starting sequence was completed.
- While the linear air-fuel ratio sensor heater is on.
- Battery positive voltage is between 11 and 16.5 volts.

Judgment Criterion

- The linear air-fuel ratio sensor heater current has continued to be lower than average 0.17 ampere for 2 seconds.

Check Conditions

- More than 2 seconds have passed since the engine starting sequence was completed.
- While the linear air-fuel ratio sensor heater is off.
- Battery positive voltage is between 11 and 16.5 volts.

Judgment Criterion

- The linear air-fuel ratio sensor heater voltage has continued to be lower than average 2.0 volts for 2 seconds.

FAIL-SAFE AND BACKUP FUNCTION

- None

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OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 2 P.13A-10.

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

- Open or shorted linear air-fuel ratio sensor heater circuit, harness damage or connector damage.
- Linear air-fuel ratio sensor heater failed.
- ECM failed.

DIAGNOSIS

STEP 1. Check the linear air-fuel ratio sensor.

(1) Disconnect the linear air-fuel ratio sensor connector.
(2) Measure the resistance between linear air-fuel ratio sensor connector terminal power supply line and terminal LHFL line.

Standard value: 2.3 – 4.2 ohms [at 20°C (68°F)]

Q: Is the measured resistance between 2.3 and 4.2 ohms [at 20°C (68°F)]?

YES : Go to Step 2.
NO : Replace the linear air-fuel ratio sensor. Then go to Step 7.

STEP 2. Measure the power supply voltage at linear air-fuel ratio sensor harness side connector.

(1) Disconnect the linear air-fuel ratio sensor connector and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal power supply line 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 3.
NO : Repair or replace the connector(s), or check and repair the harness of open circuit and short to ground in power supply line between MFI relay connector and linear air-fuel ratio sensor connector. Then go to Step 7.

STEP 3. Measure the power supply voltage at ECM connector by backprobing.

(1) Do not disconnect the connector.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal LHFL and ground by backprobing.
- 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 or replace the connector(s), or check and repair the harness of open circuit and short to ground in LHFL line between linear air-fuel ratio sensor connector and ECM connector. Then go to Step 7.

STEP 4. Check of harness damage in power supply line between MFI relay connector and linear air-fuel ratio sensor connector.

Q: Is the harness wire in good condition?

YES : Go to Step 5.
NO : Repair the connector(s) or wiring harness. Then go to Step 7.

STEP 5. Check of harness damage in LHFL line between linear air-fuel ratio sensor connector and ECM connector.

Q: Is the harness wire in good condition?

YES : Go to Step 6.
NO : Repair the connector(s) or wiring harness. 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 2 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0031 stored?

YES : Replace the ECM (Refer to, Removal and Installation P.13A-656). 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.00-13.

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 2 P.13A-10.

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

Q: Is DTC P0031 stored?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0032: Linear Air-Fuel Ratio Sensor Heater Control Circuit High

CIRCUIT OPERATION

- Power is supplied from the MFI relay to the linear air-fuel ratio sensor heater.
- The ECM terminal LHFL controls continuity to the linear air-fuel ratio 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

Linear air-fuel ratio sensor heater 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)

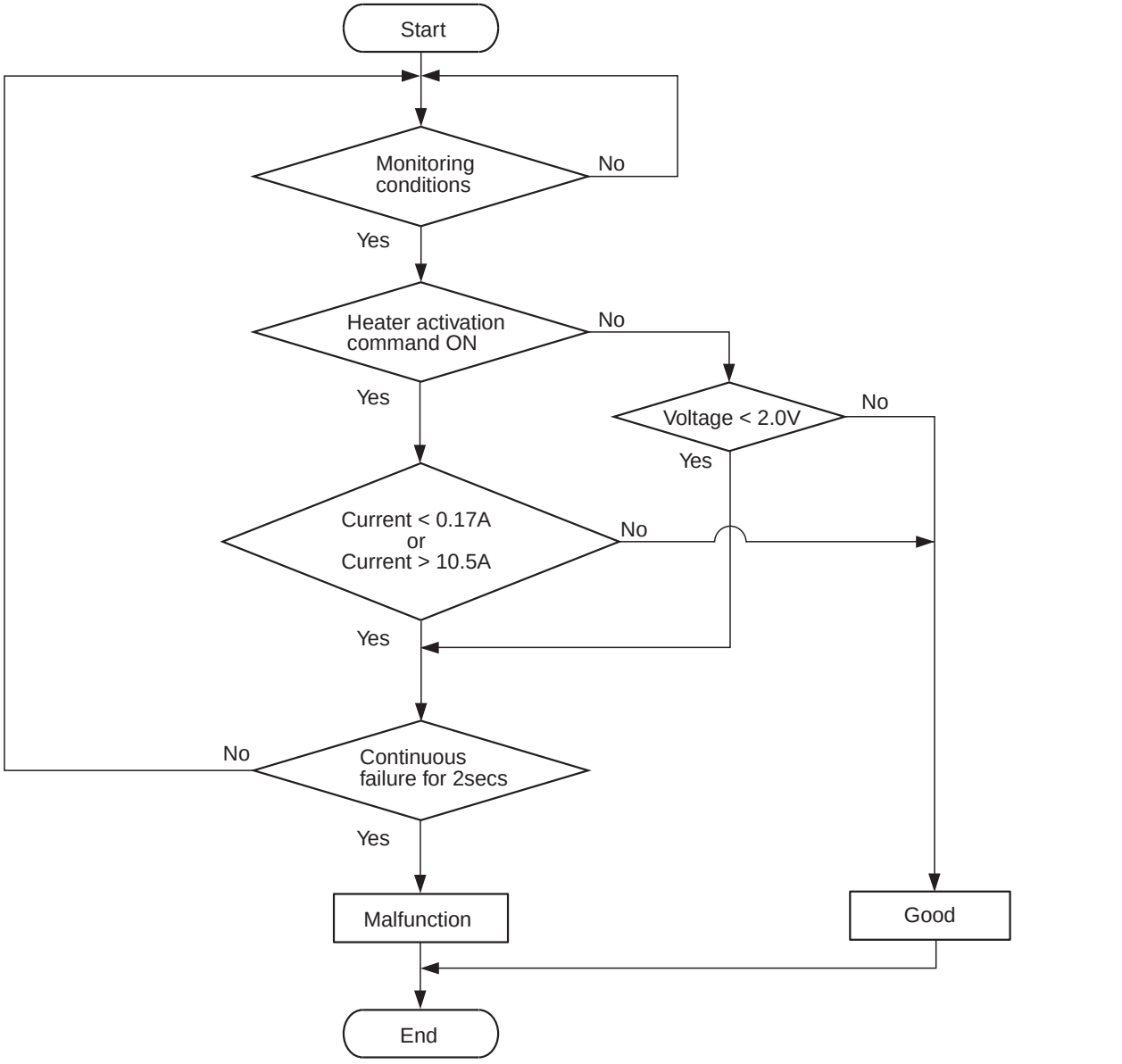
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



Check Conditions

- More than 2 seconds have passed since the engine starting sequence was completed.
- While the linear air-fuel ratio sensor heater is on.
- Battery positive voltage is between 11 and 16.5 volts.

Judgment Criterion

- The linear air-fuel ratio sensor heater current has continued to be higher than average 10.5 amperes for 2 seconds.

FAIL-SAFE AND BACKUP FUNCTION

- None

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 2 P.13A-10.

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

- Shorted linear air-fuel ratio sensor heater circuit or connector damage.
- Linear air-fuel ratio sensor heater failed.
- ECM failed.

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DIAGNOSIS

STEP 1. Check the linear air-fuel ratio sensor.

(1) Disconnect the linear air-fuel ratio sensor connector.
(2) Measure the resistance between linear air-fuel ratio sensor connector terminal power supply line and terminal LHFL line.

Standard value: 2.3 – 4.2 ohms [at 20°C (68°F)]

Q: Is the measured resistance between 2.3 and 4.2 ohms [at 20°C (68°F)]?

YES : Go to Step 2.
NO : Replace the linear air-fuel ratio sensor. Then go to Step 5.

STEP 2. Check of short circuit to power supply in power supply line between MFI relay connector and linear air-fuel ratio sensor connector.

Q: Is the harness wire in good condition?

YES : Go to Step 3.
NO : Repair the connector(s) or wiring harness. Then go to Step 5.

STEP 3. Check of short circuit to power supply in LHFL line between linear air-fuel ratio sensor connector and ECM connector.

Q: Is the harness wire in good condition?

YES : Go to Step 4.
NO : Repair the connector(s) or wiring harness. 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 2 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0032 stored?

YES : Replace the ECM (Refer to, Removal and Installation P.13A-656). 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.00-13.

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 2 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0032 stored?

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

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DTC P0037: Heated Oxygen Sensor (rear) Heater Control Circuit Low

CIRCUIT OPERATION

- Power is supplied from the MFI relay to the heated oxygen sensor (rear) heater.
- The ECM terminal OHRL controls continuity to the 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

Heated oxygen sensor (rear) 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)

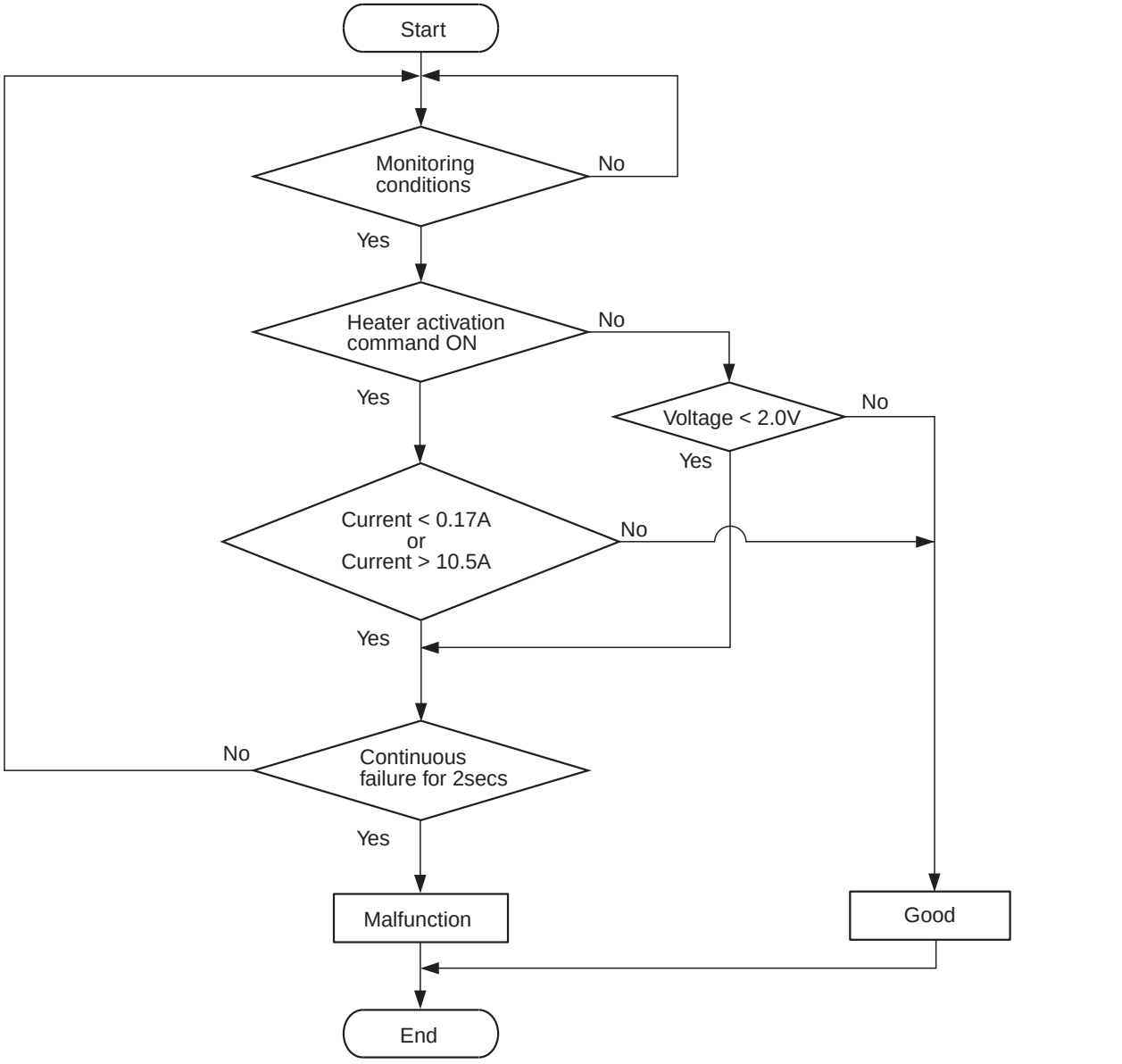
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



Check Conditions

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

Judgment Criterion

- The heated oxygen sensor (rear) heater current is less than 0.17 ampere for 2 seconds.

Check Conditions

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

Judgment Criterion

- The heated oxygen sensor (rear) heater voltage is less than 2.0 volts for 2 seconds.

FAIL-SAFE AND BACKUP FUNCTION

- None

TSB Revision

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 2 P.13A-10.

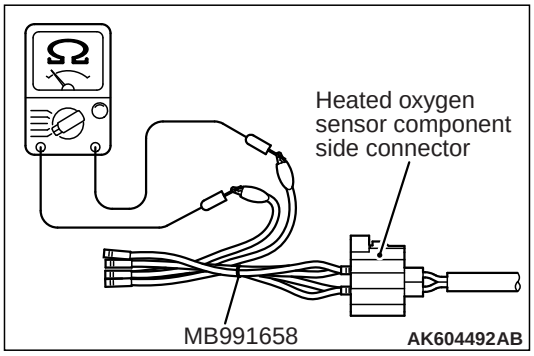
TROUBLESHOOTING HINTS (The most likely causes for this code to be stored are:)

- Open or shorted heated oxygen sensor (rear) heater circuit, harness damage or connector damage.
- Heated oxygen sensor (rear) heater failed.
- ECM failed.

DIAGNOSIS

Required Special Tools:

- MB992744: Vehicle communication interface-Lite (V.C.I.-Lite)
- MB992745: V.C.I.-Lite main harness A
- MB992747: V.C.I.-Lite USB cable short
- MB992748: V.C.I.-Lite USB cable long
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicles Communication Interface (V.C.I.)
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A (Vehicles with CAN communication system)
- MB991658: Test Harness



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

(1) Disconnect heated oxygen sensor (rear) connector and connect test harness special tool, MB991658, to the connector on the heated oxygen sensor (rear) side.

(2) Measure the resistance between heated oxygen sensor connector terminal power supply line and terminal OHRL line.

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

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

YES : Go to Step 2.

NO : Replace the heated oxygen sensor (rear). Then go to Step 7.

STEP 2. Measure the power supply voltage at heated oxygen sensor (rear) harness side connector.

(1) Disconnect the connector and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal power supply line 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 3.
NO : Repair or replace the connector(s), or check and repair the harness of open circuit and short to ground in power supply line between MFI relay connector and heated oxygen sensor (rear) connector. Then go to Step 7.

STEP 3. Measure the power supply voltage at ECM connector by backprobing.

(1) Do not disconnect the connector.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal OHRL and ground by backprobing.
- 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 or replace the connector(s), or check and repair the harness of open circuit and short to ground in power supply line between heated oxygen sensor (rear) connector and ECM connector. Then go to Step 7.

STEP 4. Check of harness damage in power supply line between MFI relay connector and heated oxygen sensor (rear) connector.

Q: Is the harness wire in good condition?

YES : Go to Step 5.
NO : Repair the connector(s) or wiring harness. Then go to Step 7.

STEP 5. Check of harness damage in OHRL line between heated oxygen sensor (rear) connector and ECM connector.

Q: Is the harness wire in good condition?

YES : Go to Step 6.
NO : Repair the connector(s) or wiring harness. 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 2 P.13A-10.

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

Q: Is DTC P0037 stored?

YES : Replace the ECM (Refer to, Removal and Installation P.13A-656). 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.00-13.

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 2 P.13A-10.

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

Q: Is DTC P0037 stored?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0038: Heated Oxygen Sensor (rear) Heater Control Circuit High

CIRCUIT OPERATION

- Power is supplied from the MFI relay to the heated oxygen sensor (rear) heater.
- The ECM terminal OHRL controls continuity to the 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

Heated oxygen sensor (rear) heater 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)

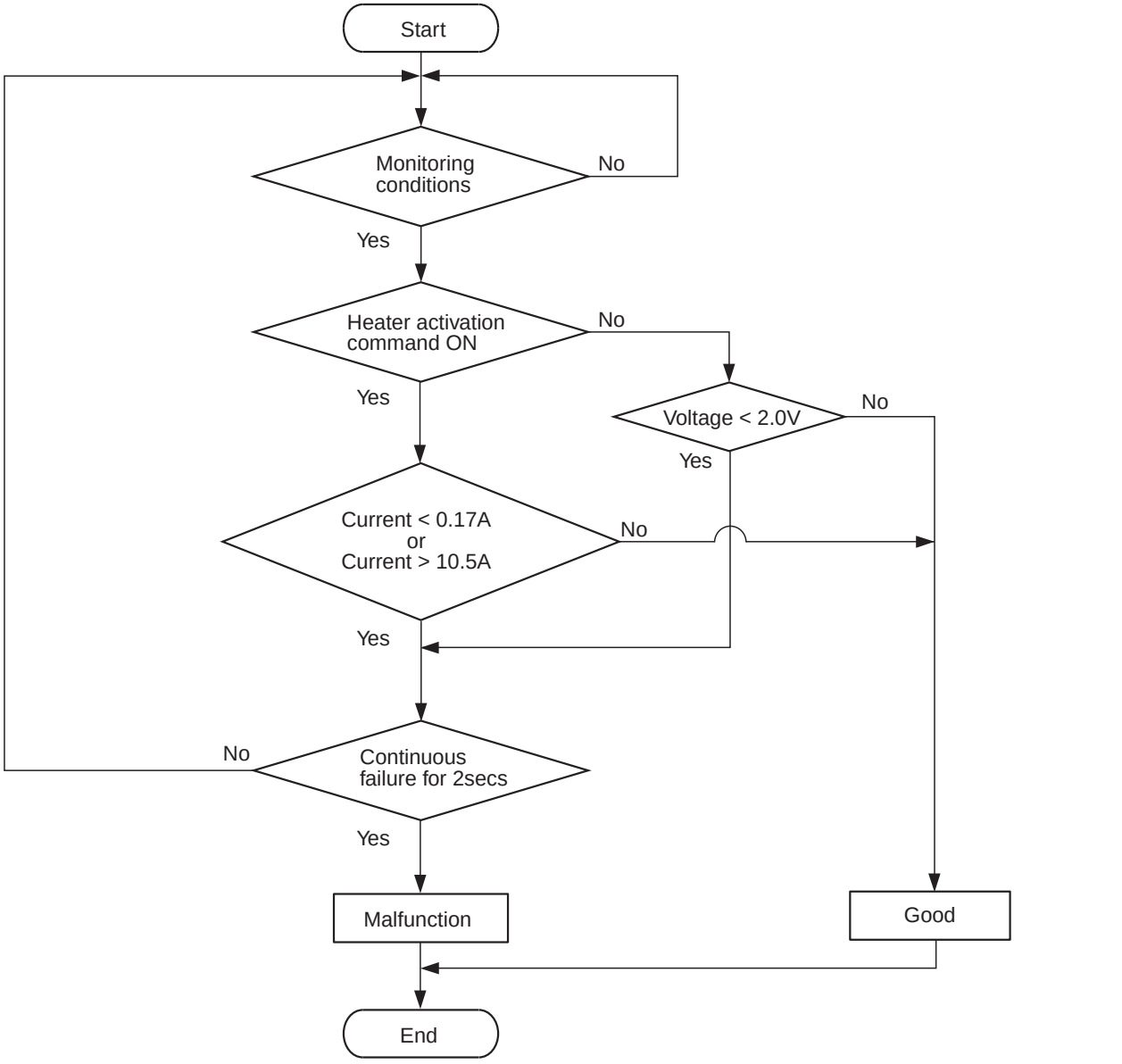
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



Check Conditions

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

Judgment Criterion

- The heated oxygen sensor (rear) heater current is more than 10.5 amperes for 2 seconds.

FAIL-SAFE AND BACKUP FUNCTION

- None

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 2 P.13A-10.

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

- Shorted heated oxygen sensor (rear) heater circuit or connector damage.
- Heated oxygen sensor (rear) heater failed.
- ECM failed.

TSB Revision

DIAGNOSIS

Required Special Tools:

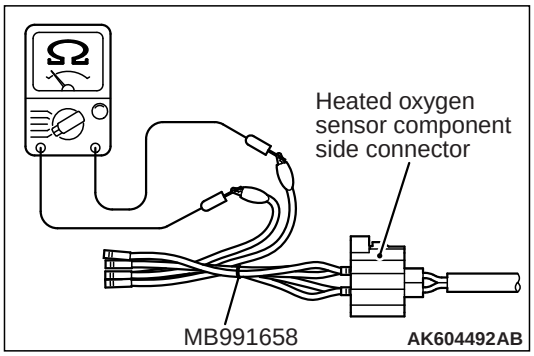
- MB992744: Vehicle communication interface-Lite (V.C.I.-Lite)
- MB992745: V.C.I.-Lite main harness A
- MB992747: V.C.I.-Lite USB cable short
- MB992748: V.C.I.-Lite USB cable long
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicles Communication Interface (V.C.I.)
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A (Vehicles with CAN communication system)
- MB991658: Test Harness

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

(1) Disconnect heated oxygen sensor (rear) connector and connect test harness special tool, MB991658, to the connector on the heated oxygen sensor (rear) side.

(2) Measure the resistance between heated oxygen sensor connector terminal power supply line and terminal OHRL line.

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



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

YES : Go to Step 2.

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

STEP 2. Check of short circuit to power supply in power supply line between MFI relay connector and heated oxygen sensor (rear) connector.

Q: Is the harness wire in good condition?

YES : Go to Step 3.

NO : Repair the connector(s) or wiring harness. Then go to Step 5.

STEP 3. Check of short circuit to power supply in OHRL line between heated oxygen sensor (rear) connector and ECM connector.

Q: Is the harness wire in good condition?

YES : Go to Step 4.

NO : Repair the connector(s) or wiring harness. 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 2 P.13A-10.

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

Q: Is DTC P0038 stored?

YES : Replace the ECM (Refer to, Removal and Installation P.13A-656). 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.00-13.

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 2 P.13A-10.

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

Q: Is DTC P0038 stored?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0053: Linear Air-Fuel Ratio Sensor Heater Resistance

CIRCUIT OPERATION

- Power is supplied from the MFI relay to the linear air-fuel ratio sensor heater.
- The ECM terminal LHFL controls continuity to the linear air-fuel ratio 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

Linear air-fuel ratio sensor heater 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)

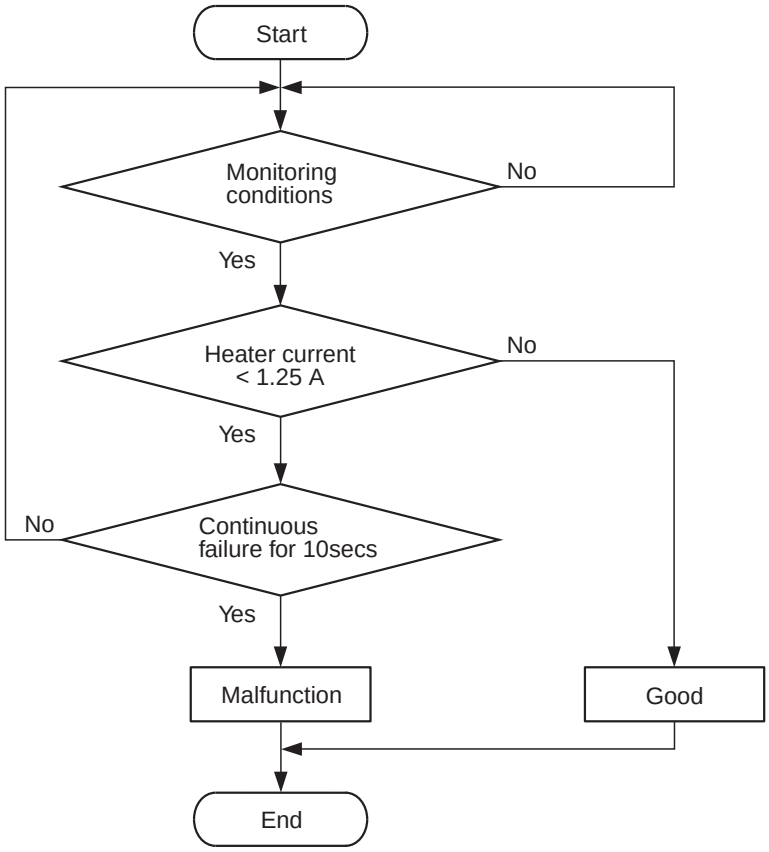
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



AK900351

Check Conditions

- More than 60 – 308 seconds have passed since the engine starting sequence was completed.
- While the linear air-fuel ratio sensor heater is on.
- Battery positive voltage is between 11 and 16.5 volts.
- Intake air temperature is more than –10°C (14°F).
- On duty cycle of the linear air-fuel ratio sensor heater is between 3 and 97 percent.

Judgment Criterion

- The linear air-fuel ratio sensor heater current has continued to be lower than average 1.25 ampere for 10 seconds.

FAIL-SAFE AND BACKUP FUNCTION

- None

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 21 P.13A-10.

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

- Linear air-fuel ratio sensor circuit harness damage or connector damage.
- Linear air-fuel ratio sensor heater failed.
- ECM failed.

TSB Revision

DIAGNOSIS

STEP 1. Check the linear air-fuel ratio sensor.

(1) Disconnect the linear air-fuel ratio sensor connector.
(2) Measure the resistance between linear air-fuel ratio sensor connector terminal power supply line and terminal LHFL line.

Standard value: 2.3 – 4.2 ohms [at 20°C (68°F)]

Q: Is the measured resistance between 2.3 and 4.2 ohms [at 20°C (68°F)]?

YES : Go to Step 2.
NO : Replace the linear air-fuel ratio sensor. Then go to Step 5.

STEP 2. Check of harness damage in power supply line between MFI relay connector and linear air-fuel ratio sensor connector.

Q: Is the harness wire in good condition?

YES : Go to Step 3.
NO : Repair the connector(s) or wiring harness. Then go to Step 5.

STEP 3. Check of harness damage in LHFL line between linear air-fuel ratio sensor connector and ECM connector.

Q: Is the harness wire in good condition?

YES : Go to Step 4.
NO : Repair the connector(s) or wiring harness. 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 21 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0053 stored?

YES : Replace the ECM (Refer to, Removal and Installation P.13A-656). 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.00-13.

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 21 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0053 stored?

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

TSB Revision

DTC P0068: Mass Airflow Sensor Plausibility

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)

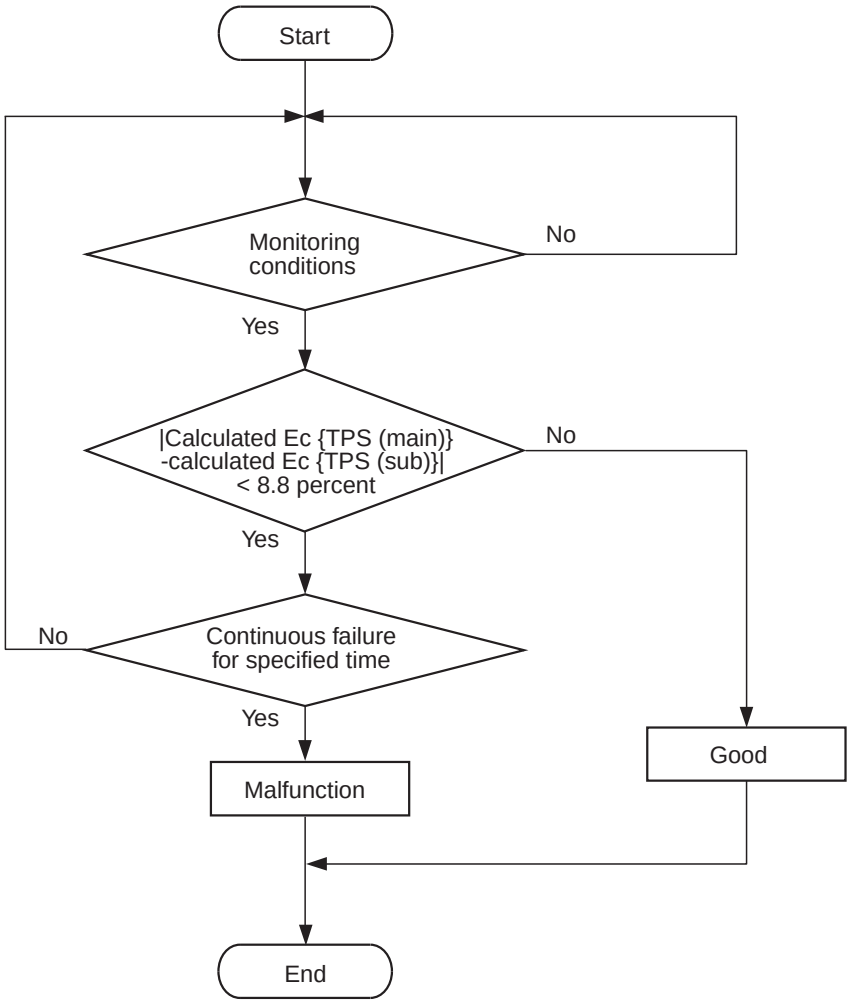
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



AK800586

Check Conditions

- The plausibility error of the throttle position sensor (main) is detected.
- The plausibility error of the throttle position sensor (sub) is detected.

Judgment Criterion

- For 0.36 second, the difference between the volumetric efficiency estimated by the throttle position sensor (main) and the volumetric efficiency estimated by the throttle position sensor (sub) is less than 8.8 percent.

FAIL-SAFE AND BACKUP FUNCTION

- Fuel control is carried out using throttle opening degree and engine speed in accordance with preset map.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle Pattern 16P.13A-10.

TSB Revision

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

- Mass airflow sensor system failed.
- Intake system vacuum leak.
- There is some foreign matter around mass airflow sensor.
- ECM failed.

DIAGNOSIS

Required Special Tools:

- MB992744: Vehicle communication interface-Lite (V.C.I.-Lite)
- MB992745: V.C.I.-Lite main harness A
- MB992747: V.C.I.-Lite USB cable short
- MB992748: V.C.I.-Lite USB cable long
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicles Communication Interface (V.C.I.)
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A (Vehicles with CAN communication system)

STEP 1. Using scan tool (M.U.T.-III), read the diagnostic trouble code (DTC).

⚠ CAUTION

To prevent damage to scan tool (M.U.T.-III), always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool (M.U.T.-III).

(1) Connect scan tool (M.U.T-III). Refer to HOW TO CONNECT THE SCAN TOOL (M.U.T.-III) P.13A-10.
(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 P0068 stored?

YES : Refer to, Diagnostic Trouble Code Chart P.13A-47.
NO : Go to Step 2.

STEP 2. Check for intake system vacuum leak.

Q: Are there any abnormalities?

YES : Repair it. Then go to Step 6.
NO : Go to Step 3.

STEP 3. Check for foreign matter being around the mass airflow sensor.

Q: Are there any foreign matter?

YES : Repair it. Then go to Step 6.
NO : Go to Step 4.

STEP 4. Using scan tool (M.U.T.-III), 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 760 and 1,080 millivolts.
- When the engine is revved, the output voltage 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 5.
NO : Refer to, DTC P0102 – Mass Airflow Circuit Low Input P.13A-89, DTC P0103 – Mass Airflow Circuit High Input P.13A-94.

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 16 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0068 stored?

YES : Replace the ECM (Refer to, Removal and Installation P.13A-656). 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.00-13.

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 16 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0068 stored?

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

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

TECHNICAL DESCRIPTION

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

TSB Revision

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)

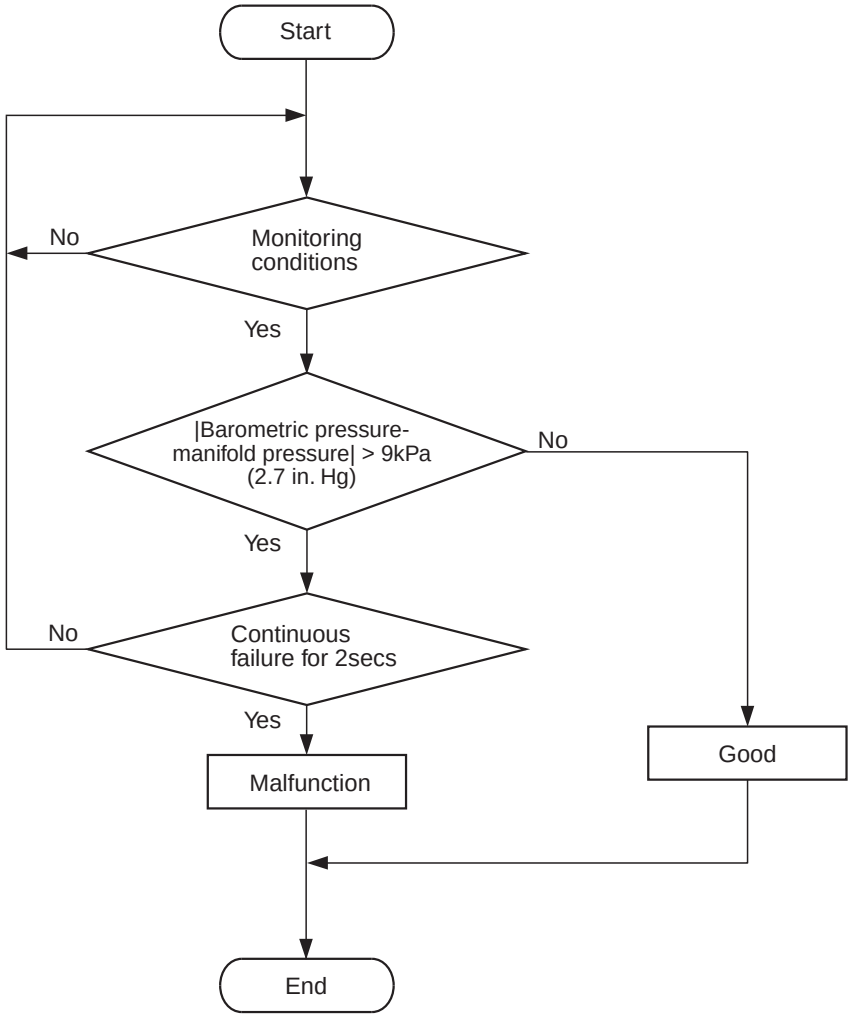
- Not applicable

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

DTC SET CONDITIONS

Logic Flow Chart



AK704095

Check Conditions

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

Judgment Criterion

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

FAIL-SAFE AND BACKUP FUNCTION

- None

OBD-II DRIVE CYCLE PATTERN

None.

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

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

TSB Revision

DIAGNOSIS

Required Special Tools:

- MB992744: Vehicle communication interface-Lite (V.C.I.-Lite)
- MB992745: V.C.I.-Lite main harness A
- MB992747: V.C.I.-Lite USB cable short
- MB992748: V.C.I.-Lite USB cable long
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicles Communication Interface (V.C.I.)
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A (Vehicles with CAN communication system)

STEP 1. Using scan tool (M.U.T.-III), read the diagnostic trouble code (DTC).

⚠ CAUTION

To prevent damage to scan tool (M.U.T.-III), always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool (M.U.T.-III).

(1) Connect scan tool (M.U.T-III). Refer to HOW TO CONNECT THE SCAN TOOL (M.U.T.-III) P.13A-10.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool (M.U.T.-III), read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

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

YES : Refer to, Diagnostic Trouble Code Chart P.13A-47.
NO : Go to Step 2.

STEP 2. Using scan tool (M.U.T.-III), check data list item 8: Manifold Absolute Pressure Sensor.

(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool (M.U.T.-III) 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.
  - Warm up the engine. When the engine is idling, 22 – 42 kPa (6.5 – 12.4 in.Hg).
  - When the engine is suddenly revved, manifold absolute pressure varies.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 3.
NO : Refer to, DTC P0106 – Manifold Absolute Pressure Circuit Range/Performance Problem P.13A-98, DTC P0107 – Manifold Absolute Pressure Circuit Low Input P.13A-104, DTC P0108 – Manifold Absolute Pressure Circuit High Input P.13A-109.

TSB Revision

STEP 3. Using scan tool (M.U.T.-III), 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 (M.U.T.-III), read the DTC.
(7) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC P0069 stored?

YES : Replace the ECM (Refer to, Removal and Installation P.13A-656). 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.00-13.

STEP 4. Using scan tool (M.U.T.-III), 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 (M.U.T.-III), read the DTC.
(7) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC P0069 stored?

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

DTC P0102: Mass Airflow Circuit Low Input

CIRCUIT OPERATION

- The mass airflow sensor power is supplied from the MFI relay, and the ground is provided on the ECM terminal AFSE.
- Sensor reference voltage (5-volt voltage) is applied to the mass airflow sensor terminal from the ECM terminal AFS5.
- A voltage that is according to the mass airflow rate is sent to the ECM terminal AFS from the mass airflow sensor output terminal.

TECHNICAL DESCRIPTION

- While the engine is running, the mass airflow sensor outputs electric current which corresponds to the mass airflow rate.
- The ECM converts the electric current into the voltage and checks whether the voltage is within a specified range while the engine is running.

DESCRIPTIONS OF MONITOR METHODS

Mass airflow sensor output voltage is out of specified range.

MONITOR EXECUTION

Continuous

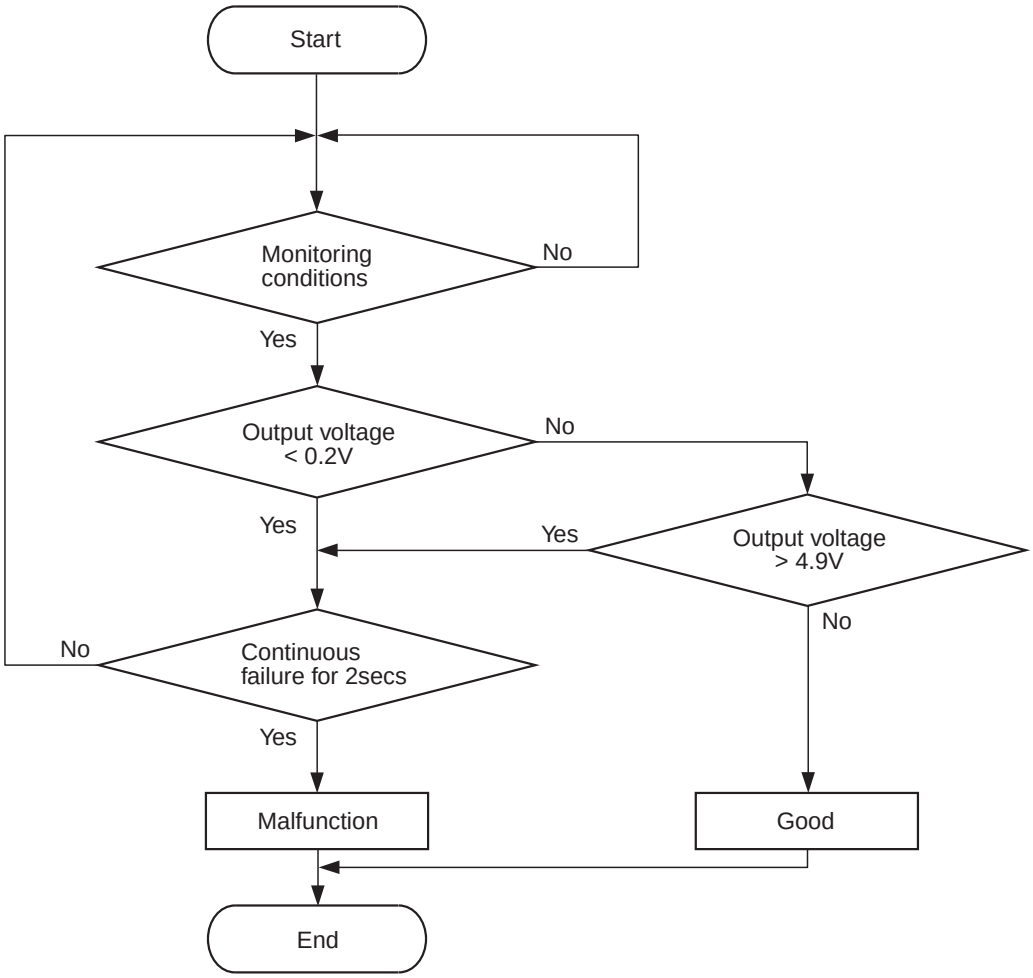
MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

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



AK604310

Check Condition
- More than 3 seconds have passed since the ignition switch was turned to "ON" position.

Judgment Criterion
- Mass airflow sensor output voltage is less than 0.2 volt (corresponding to an air flow rate of 0 g/sec) for 2 seconds.

FAIL-SAFE AND BACKUP FUNCTION
- Fuel control is carried out using throttle opening degree and engine speed in accordance with preset map.

OBD-II DRIVE CYCLE PATTERN
Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 22 P.13A-10.

TSB Revision

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

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

DIAGNOSIS

Required Special Tools:

- MB992744: Vehicle communication interface-Lite (V.C.I.-Lite)
- MB992745: V.C.I.-Lite main harness A
- MB992747: V.C.I.-Lite USB cable short
- MB992748: V.C.I.-Lite USB cable long
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicles Communication Interface (V.C.I.)
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A (Vehicles with CAN communication system)

STEP 1. Using scan tool (M.U.T.-III), check data list item 10: Mass Airflow Sensor.

⚠ CAUTION

To prevent damage to scan tool (M.U.T.-III), always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool (M.U.T.-III).

(1) Connect scan tool (M.U.T-III). Refer to HOW TO CONNECT THE SCAN TOOL (M.U.T.-III) P.13A-10.
(2) Start the engine and run at idle.
(3) Set scan tool (M.U.T-III) 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 760 and 1,080 millivolts.
  - When the engine is revved, the output voltage 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.00-13.
NO : Go to Step 2.

STEP 2. Measure the power supply voltage at mass airflow sensor harness side connector.

(1) Disconnect the mass airflow sensor connector and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal power supply line 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 3.
NO : Repair or replace the connector(s), or check and repair the harness of open circuit and short to ground in power supply line between MFI relay connector and mass airflow sensor connector. Then go to Step 9.

STEP 3. Measure the sensor voltage at mass airflow sensor harness side connector.

(1) Disconnect the mass airflow sensor connector and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal AFS5 line 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 of open circuit and short circuit to ground in AFS5 line between mass airflow sensor connector and ECM connector.

Q: Is the harness wire in good condition?

YES : Replace the ECM (Refer to, Removal and Installation P.13A-656). Then go to Step 9.
NO : Repair the connector(s) or wiring harness. Then go to Step 9.

STEP 5. Measure the sensor output voltage at ECM by backprobing.

(1) Do not disconnect the connector.
(2) Start the engine.
(3) Measure the voltage between terminal AFS and ground by backprobing.
- When the engine is revved, voltage should be increase in response to revving.

Q: Is the measured voltage normal?

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

TSB Revision

STEP 6. Check of open circuit and short circuit to ground in AFS line between mass airflow sensor connector and ECM connector.

Q: Is the harness wire in good condition?

YES : Go to Step 7.
NO : Repair the connector(s) or wiring harness. Then go to Step 9.

STEP 7. 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 22 P.13A-10.
(3) Check the diagnostic trouble code (DTC).

Q: Is DTC P0102 stored?

YES : Replace the ECM (Refer to, Removal and Installation P.13A-656). Then go to Step 9.
NO : The inspection is complete.

STEP 8. Using scan tool (M.U.T.-III), check data list item 10: Mass Airflow Sensor.

(1) Start the engine and run at idle.
(2) Set scan tool (M.U.T.-III) 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 760 and 1,080 millivolts.
- When the engine is revved, the output voltage 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 : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-13.
NO : Replace the ECM (Refer to, Removal and Installation P.13A-656). Then go to Step 9.

STEP 9. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 22 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0102 stored?

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

DTC P0103: Mass Airflow Circuit High Input

CIRCUIT OPERATION

- The mass airflow sensor power is supplied from the MFI relay, and the ground is provided on the ECM terminal AFSE.
- Sensor reference voltage (5-volt voltage) is applied to the mass airflow sensor terminal from the ECM terminal AFS5.
- A voltage that is according to the mass airflow rate is sent to the ECM terminal AFS from the mass airflow sensor output terminal.

TECHNICAL DESCRIPTION

- While the engine is running, the mass airflow sensor outputs electric current which corresponds to the mass airflow rate.
- The ECM converts the electric current into the voltage and checks whether the voltage is within a specified range while the engine is running.

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)

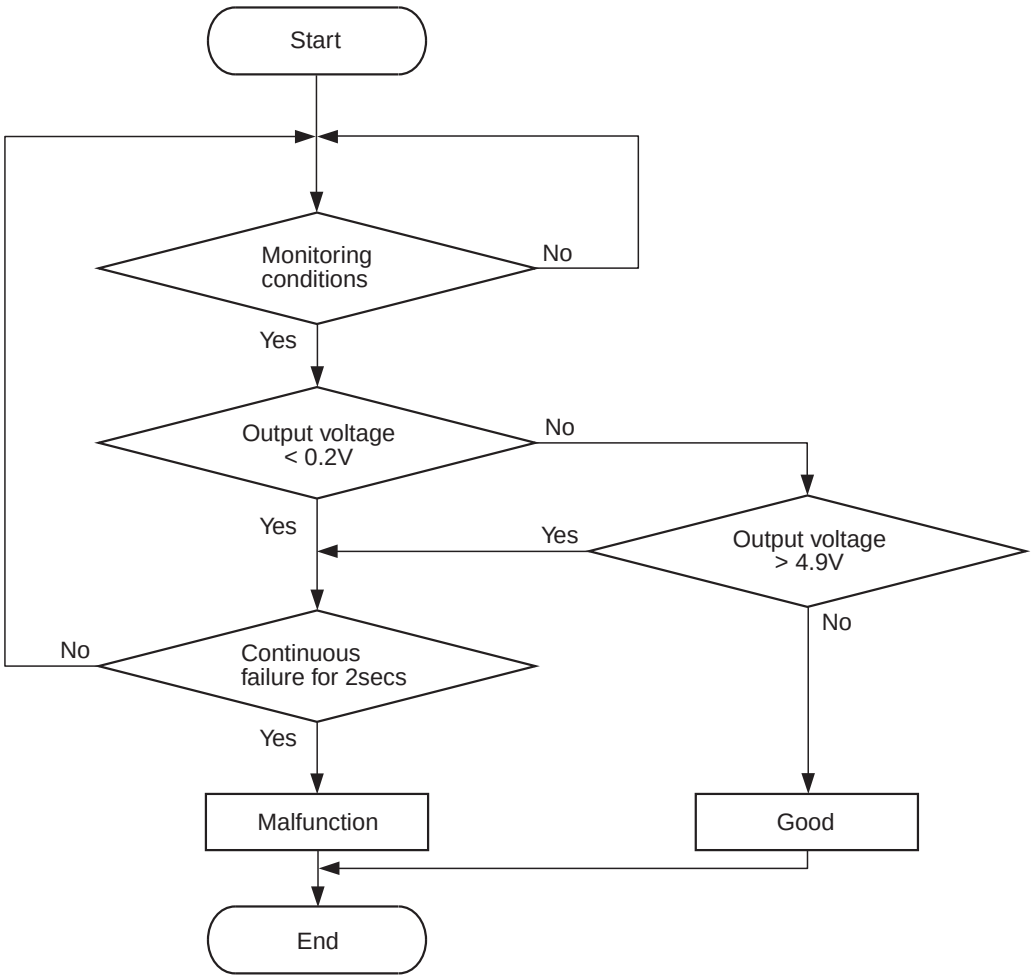
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



AK604310

Check Condition

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

Judgment Criterion

- Mass airflow sensor output voltage is more than 4.9 volts (corresponding to an air flow rate of 152 g/sec) for 2 seconds.

FAIL-SAFE AND BACKUP FUNCTION

- Fuel control is carried out using throttle opening degree and engine speed in accordance with preset map.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 22 P.13A-10.

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

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

DIAGNOSIS

Required Special Tools:

- MB992744: Vehicle communication interface-Lite (V.C.I.-Lite)
- MB992745: V.C.I.-Lite main harness A
- MB992747: V.C.I.-Lite USB cable short
- MB992748: V.C.I.-Lite USB cable long
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicles Communication Interface (V.C.I.)
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A (Vehicles with CAN communication system)

STEP 1. Using scan tool (M.U.T.-III), check data list item 10: Mass Airflow Sensor.

⚠ CAUTION

To prevent damage to scan tool (M.U.T.-III), always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool (M.U.T.-III).

(1) Connect scan tool (M.U.T-III). Refer to HOW TO CONNECT THE SCAN TOOL (M.U.T.-III) P.13A-10.
(2) Start the engine and run at idle.
(3) Set scan tool (M.U.T.-III) 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 760 and 1,080 millivolts.
  - When the engine is revved, the output voltage 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.00-13.
NO : Go to Step 2.

STEP 2. Check the continuity at mass airflow sensor harness side connector.

(1) Disconnect the mass airflow sensor connector and measure at the harness side.
(2) Check for the continuity between terminal AFSE line and ground.
  - Continuity (2 ohms or less)

Q: Does continuity exist?

YES : Go to Step 5.
NO : Go to Step 3.

STEP 3. Check of open circuit in AFSE line between mass airflow sensor connector and ECM connector.

Q: Is the harness wire in good condition?

YES : Go to Step 4.

NO : Repair the connector(s) or wiring harness. Then go to Step 6.

STEP 4. Using scan tool (M.U.T.-III), check data list item 10: Mass Airflow Sensor.

(1) Start the engine and run at idle.
(2) Set scan tool (M.U.T.-III) 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 760 and 1,080 millivolts.
- When the engine is revved, the output voltage 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 : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-13.

NO : Replace the ECM (Refer to, Removal and Installation P.13A-656). 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 22 P.13A-10.
(3) Check the diagnostic trouble code (DTC).

Q: Is DTC P0103 stored?

YES : Replace the ECM (Refer to, Removal and Installation P.13A-656). 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 22 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0103 stored?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0106: Manifold Absolute Pressure Circuit Range/Performance Problem

CIRCUIT OPERATION

- A 5-volt voltage is supplied to the manifold absolute pressure sensor power terminal from the ECM terminal 5V. The manifold absolute pressure sensor ground terminal is grounded with ECM terminal SENG.
- A voltage that is proportional to the intake manifold pressure is sent to the ECM terminal MAP from the manifold absolute pressure sensor output terminal.

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)

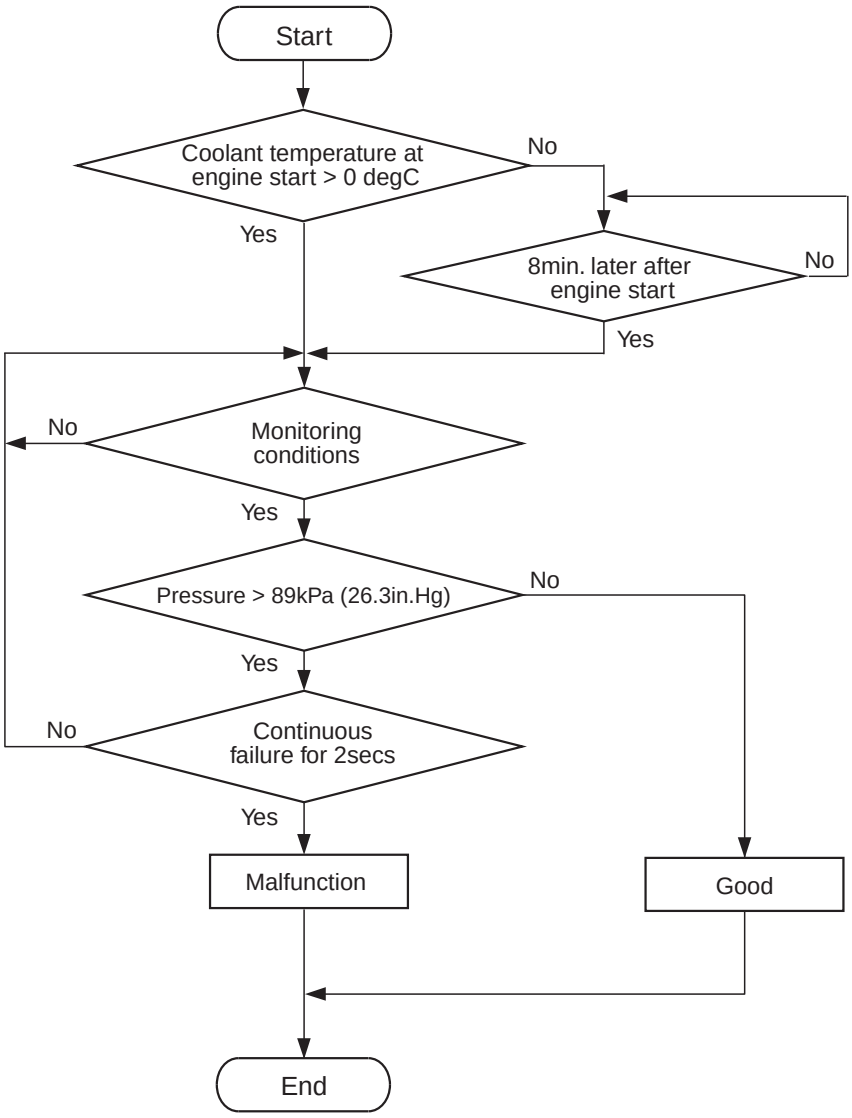
- Not applicable

Sensor (The sensor below is determined to be normal)

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

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

Logic Flow Chart



ACC07130

Check Conditions

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

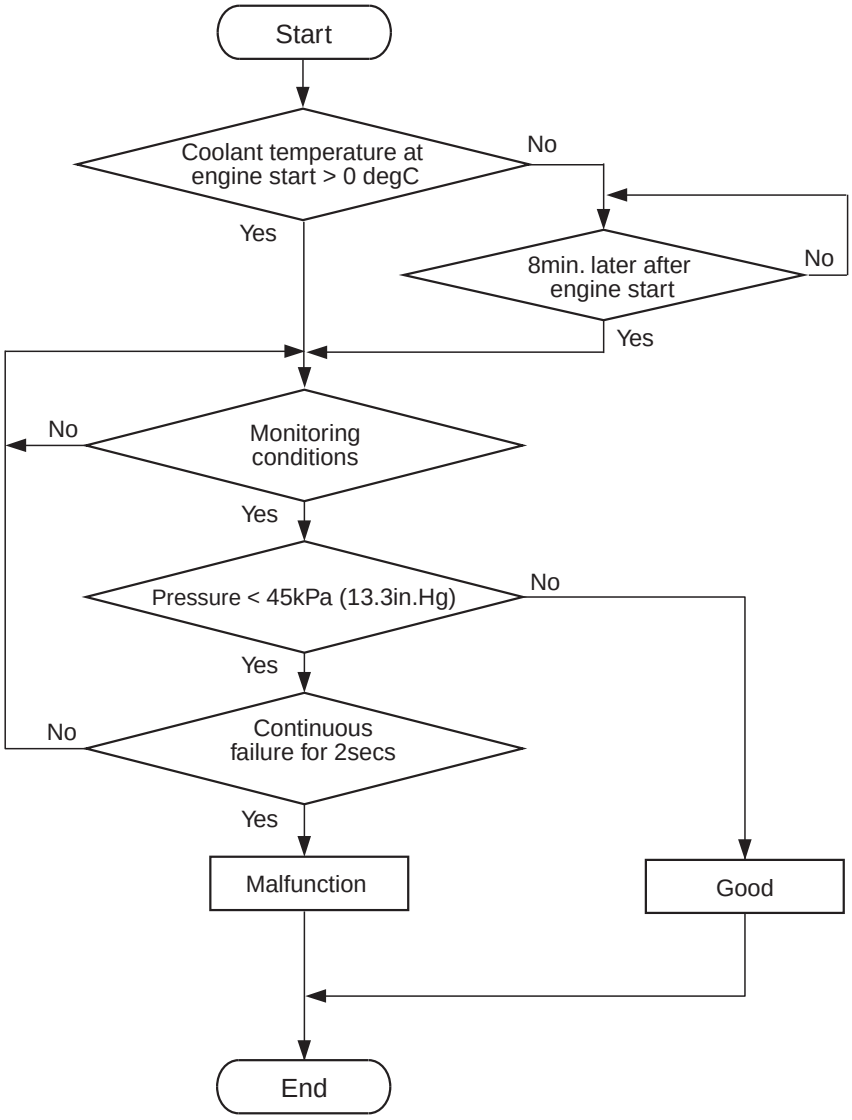
Judgment Criterion

- Manifold absolute pressure sensor output voltage is more than 3.5 volts [corresponding to a manifold absolute pressure of 89 kPa (26.3 in.Hg)] for 2 seconds.

TSB Revision

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

Logic Flow Chart



ACC07131

Check Conditions

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

Judgment Criterion

- Manifold absolute pressure sensor output voltage is less than 1.8 volts [corresponding to a manifold absolute pressure of 45 kPa (13.3 in.Hg)] for 2 seconds.

FAIL-SAFE AND BACKUP FUNCTION

- Control as if the intake manifold vacuum pressure is 101 kPa (29.8 in.Hg)

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 6 P.13A-10.

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

- Manifold absolute pressure sensor failed.

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- Harness damage.
- Connector damage.
- ECM failed.

DIAGNOSIS

Required Special Tools:

- MB992744: Vehicle communication interface-Lite (V.C.I.-Lite)
- MB992745: V.C.I.-Lite main harness A
- MB992747: V.C.I.-Lite USB cable short
- MB992748: V.C.I.-Lite USB cable long
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicles Communication Interface (V.C.I.)
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A (Vehicles with CAN communication system)

STEP 1. Using scan tool (M.U.T.-III), check data list item 8: Manifold Absolute Pressure Sensor.

⚠ CAUTION

To prevent damage to scan tool (M.U.T.-III), always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool (M.U.T.-III).

(1) Connect scan tool (M.U.T-III). Refer to HOW TO CONNECT THE SCAN TOOL (M.U.T.-III) P.13A-10.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool (M.U.T.-III) 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.
  - Warm up the engine. When the engine is idling, 22 – 42 kPa (6.5 – 12.4 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.00-13.
NO : Go to Step 2.

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

(1) Do not disconnect the manifold absolute pressure sensor connector.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal MAP line and ground by backprobing.
- When altitude is 0 m (0 foot), voltage should be between 3.8 and 4.2 volts.
- When altitude is 600 m (1,969 feet), voltage should be between 3.5 and 3.9 volts.
- When altitude is 1,200 m (3,937 feet), voltage should be between 3.3 and 3.7 volts.
- When altitude is 1,800 m (5,906 feet), voltage should be between 3.0 and 3.4 volts.

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

Q: Is the measured voltage normal?

YES : Go to Step 7.
NO : Go to Step 3.

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

(1) Do not disconnect the manifold absolute pressure sensor connector.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 5V line and ground by backprobing.
- Voltage should be between 4.9 and 5.1 volts.

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

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

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

STEP 4. Check of harness damage in 5V line between manifold absolute pressure sensor connector and ECM connector.

Q: Is the harness wire in good condition?

YES : Go to Step 8.
NO : Repair it. Then go to Step 9.

STEP 5. Measure the ground voltage at manifold absolute pressure sensor connector by backprobing.

(1) Do not disconnect the manifold absolute pressure sensor connector.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal SENG and ground by backprobing.
- Voltage should be 0.5 volt or less.

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

Q: Is the measured voltage 0.5 volt or less?

YES : Replace the manifold absolute pressure sensor. Then go to Step 9.
NO : Go to Step 6.

STEP 6. Check of harness damage in SENG line between manifold absolute pressure sensor connector and ECM connector.

Q: Is the harness wire in good condition?

YES : Go to Step 8.
NO : Repair it. Then go to Step 9.

STEP 7. Measure the sensor output voltage at ECM connector by backprobing.

(1) Do not disconnect the connector.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal MAP and ground.
- When altitude is 0 m (0 foot), voltage should be between 3.8 and 4.2 volts.
- When altitude is 600 m (1,969 feet), voltage should be between 3.5 and 3.9 volts.
- When altitude is 1,200 m (3,937 feet), voltage should be between 3.3 and 3.7 volts.
- When altitude is 1,800 m (5,906 feet), voltage should be between 3.0 and 3.4 volts.

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

Q: Is the measured voltage normal?

YES : Go to Step 8.
NO : Repair or replace the connector(s), or check and repair the harness of damage in MAP line between manifold absolute pressure sensor connector and ECM connector. Then go to Step 9.

STEP 8. Using scan tool (M.U.T.-III), check data list item 8: Manifold Absolute Pressure Sensor.

(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool (M.U.T.-III) 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.
- Warm up the engine. When the engine is idling, 22 – 42 kPa (6.5 – 12.4 in.Hg).
- When the engine is suddenly revved, manifold absolute pressure varies.

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

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-13.

NO : Replace the ECM (Refer to, Removal and Installation P.13A-656). Then go to Step 9.

STEP 9. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 6 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0106 stored?

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

DTC P0107: Manifold Absolute Pressure Circuit Low Input

CIRCUIT OPERATION

- A 5-volt voltage is supplied to the manifold absolute pressure sensor power terminal from the ECM terminal 5V. The manifold absolute pressure sensor ground terminal is grounded with ECM terminal SENG.
- A voltage that is proportional to the intake manifold pressure is sent to the ECM terminal MAP from the manifold absolute pressure sensor output terminal.

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

TSB Revision

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

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

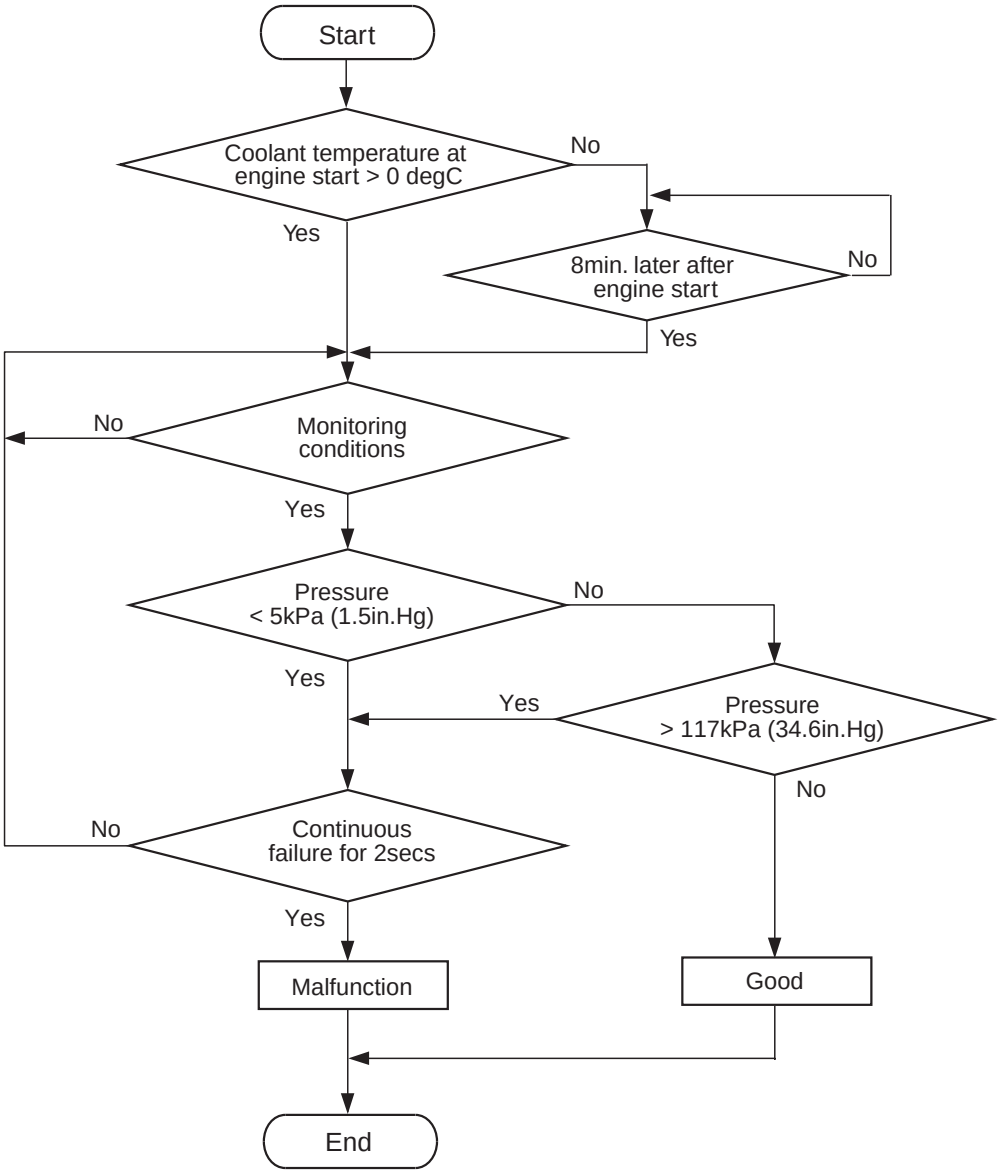
- Not applicable

Sensor (The sensor below is determined to be normal)

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

DTC SET CONDITIONS

Logic Flow Chart



ACC07143

Check Conditions

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

TSB Revision

Judgment Criterion

- Manifold absolute pressure sensor output voltage is less than 0.2 volt [corresponding to a manifold absolute pressure of 5 kPa (1.5 in.Hg)] for 2 seconds.

FAIL-SAFE AND BACKUP FUNCTION

- Control as if the intake manifold vacuum pressure is 101 kPa (29.8 in.Hg).

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 6 P.13A-10.

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

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

DIAGNOSIS

Required Special Tools:

- MB992744: Vehicle communication interface-Lite (V.C.I.-Lite)
- MB992745: V.C.I.-Lite main harness A
- MB992747: V.C.I.-Lite USB cable short
- MB992748: V.C.I.-Lite USB cable long
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicles Communication Interface (V.C.I.)
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A (Vehicles with CAN communication system)

STEP 1. Using scan tool (M.U.T.-III), check data list item 8: Manifold Absolute Pressure Sensor.

⚠ CAUTION

To prevent damage to scan tool (M.U.T.-III), always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool (M.U.T.-III).

(1) Connect scan tool (M.U.T-III). Refer to HOW TO CONNECT THE SCAN TOOL (M.U.T.-III) P.13A-10.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool (M.U.T.-III) 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.
- Warm up the engine. When the engine is idling, 22 – 42 kPa (6.5 – 12.4 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.00-13.
NO : Go to Step 2.

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

(1) Do not disconnect the manifold absolute pressure sensor connector.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 5V line and ground by backprobing.
- Voltage should be between 4.9 and 5.1 volts.

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

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

YES : Go to Step 5.
NO : Go to Step 3.

STEP 3. Measure the sensor supply voltage at ECM connector by backprobing.

(1) Do not disconnect the connector.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 5V and ground by backprobing.
- Voltage should be between 4.9 and 5.1 volts.

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

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

YES : Repair or replace the connector(s), or check and repair the harness of open circuit in 5V line between manifold absolute pressure sensor connector and ECM connector. Then go to Step 8.
NO : Go to Step 4.

STEP 4. Check of short circuit to ground in 5V line between manifold absolute pressure sensor connector and ECM connector.

Q: Is the harness wire in good condition?

YES : Go to Step 7.
NO : Repair the connector(s) or wiring harness. Then go to Step 8.

STEP 5. Measure the sensor output voltage at ECM connector by backprobing.

(1) Do not disconnect the connector.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal No. 45 and ground by backprobing.
- When altitude is 0 m (0 foot), voltage should be between 3.8 and 4.2 volts.
- When altitude is 600 m (1,969 feet), voltage should be between 3.5 and 3.9 volts.
- When altitude is 1,200 m (3,937 feet), voltage should be between 3.3 and 3.7 volts.
- When altitude is 1,800 m (5,906 feet), voltage should be between 3.0 and 3.4 volts.

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

Q: Is the measured voltage normal?

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

STEP 6. Check of open circuit and short circuit to ground in MAP line between manifold absolute pressure sensor connector and ECM connector.

Q: Is the harness wire in good condition?

YES : Replace the manifold absolute pressure sensor. Then go to Step 8.
NO : Repair the connector(s) or wiring harness. Then go to Step 8.

STEP 7. Using scan tool (M.U.T.-III), check data list item 8: Manifold Absolute Pressure Sensor.

(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool (M.U.T.-III) 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.
- Warm up the engine. When the engine is idling, 22 – 42 kPa (6.5 – 12.4 in.Hg).
- When the engine is suddenly revved, manifold absolute pressure varies.

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

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-13.

NO : Replace the ECM (Refer to, Removal and Installation P.13A-656). Then go to Step 8.

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 6 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0107 stored?

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

DTC P0108: Manifold Absolute Pressure Circuit High Input

CIRCUIT OPERATION

- A 5-volt voltage is supplied to the manifold absolute pressure sensor power terminal from the ECM terminal 5V. The manifold absolute pressure sensor ground terminal is grounded with ECM terminal SENG.
- A voltage that is proportional to the intake manifold pressure is sent to the ECM terminal MAP from the manifold absolute pressure sensor output terminal.

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

TSB Revision

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

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

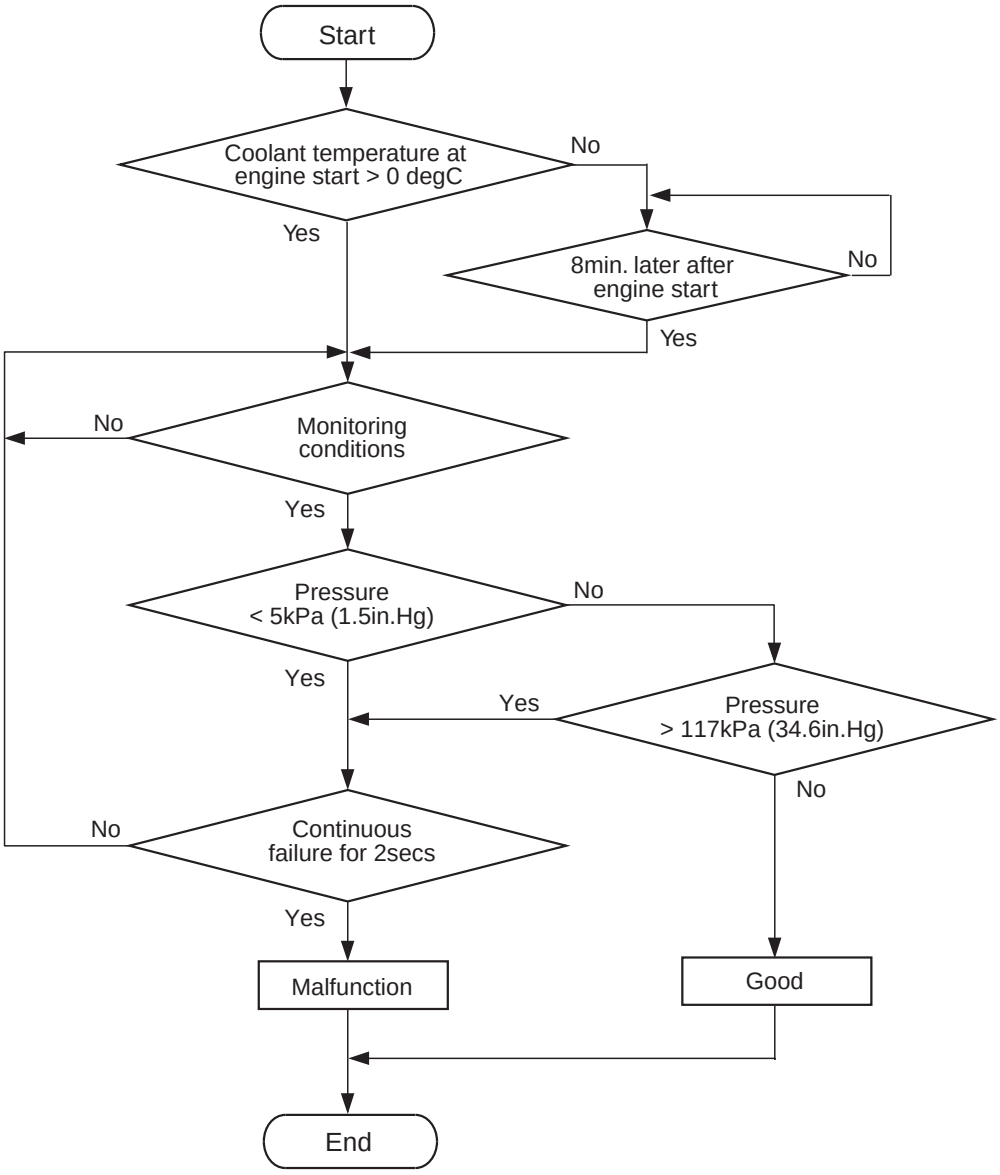
- Not applicable

Sensor (The sensor below is determined to be normal)

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

DTC SET CONDITIONS

Logic Flow Chart



ACC07143

Check Condition

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

Judgment Criterion

- Manifold absolute pressure sensor output voltage is more than 4.6 volts [corresponding to a manifold absolute pressure of 117 kPa (34.6 in.Hg)] for 2 seconds.

TSB Revision

FAIL-SAFE AND BACKUP FUNCTION

- Control as if the intake manifold vacuum pressure is 101 kPa (29.8 in.Hg).

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 22 P.13A-10.

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

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

DIAGNOSIS

Required Special Tool:

- 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 (M.U.T.-III), check data list item 8: Manifold Absolute Pressure Sensor.

⚠ CAUTION

To prevent damage to scan tool (M.U.T.-III), always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool (M.U.T.-III).

(1) Connect scan tool (M.U.T-III). Refer to HOW TO CONNECT THE SCAN TOOL (M.U.T.-III) P.13A-10.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool (M.U.T.-III) 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.
  - Warm up the engine. When the engine is idling, 22 – 42 kPa (6.5 – 12.4 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.00-13.
NO : Go to Step 2.

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

(1) Do not disconnect the manifold absolute pressure sensor connector.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal SENG line and ground by backprobing.
- Voltage should be 0.5 volt or less.

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

Q: Is the measured voltage 0.5 volt or less?

YES : Go to Step 5.
NO : Go to Step 3.

STEP 3. Check of open circuit in SENG line between manifold absolute pressure sensor connector and ECM connector.

Q: Is the harness wire in good condition?

YES : Go to Step 4.
NO : Repair the connector(s) or wiring harness. Then go to Step 5.

STEP 4. Using scan tool (M.U.T.-III), 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.
- Warm up the engine. When the engine is idling, 22 – 42 kPa (6.5 – 12.4 in.Hg).
- When the engine is suddenly revved, manifold absolute pressure varies.

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

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-13.
NO : Replace the ECM (Refer to, Removal and Installation P.13A-656). 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 22 P.13A-10.

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

Q: Is DTC P0108 stored?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0111: Intake Air Temperature Circuit Range/Performance Problem

CIRCUIT OPERATION

- Approximately 5 volts are applied to the intake air temperature sensor output terminal from the ECM terminal ATS via the resistor in the ECM. The ground terminal is grounded with ECM terminal AFSE.
- 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)

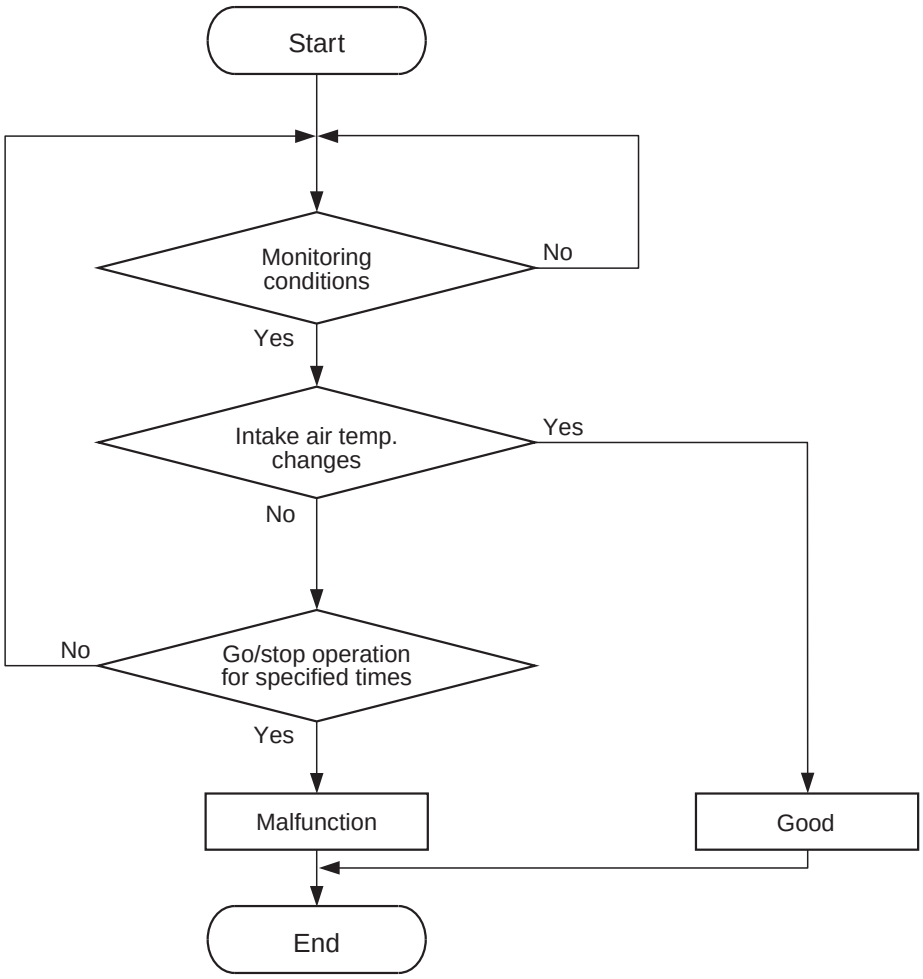
- Not applicable

Sensor (The sensor below is determined to be normal)

- Engine coolant temperature sensor

DTC SET CONDITIONS

Logic Flow Chart



AK604314

Check Conditions

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

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

  Stop[*2]:
  - Vehicle speed is less than 1.5 km/h (1.0 mph) lasting 30 seconds or more.

Judgment Criterion

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

FAIL-SAFE AND BACKUP FUNCTION

- Control as if the intake air temperature is 25°C (77°F).

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 7 P.13A-10.

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

- Intake air temperature sensor failed.
- Harness damage or connector damage.
- ECM failed.

TSB Revision

DIAGNOSIS

Required Special Tools:

- MB992744: Vehicle communication interface-Lite (V.C.I.-Lite)
- MB992745: V.C.I.-Lite main harness A
- MB992747: V.C.I.-Lite USB cable short
- MB992748: V.C.I.-Lite USB cable long
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicles Communication Interface (V.C.I.)
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A (Vehicles with CAN communication system)

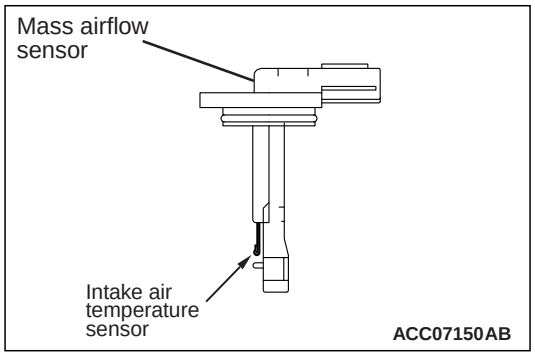
STEP 1. Using scan tool (M.U.T.-III), check data list item 5: Intake Air Temperature Sensor.

⚠ CAUTION

To prevent damage to scan tool (M.U.T.-III), always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool (M.U.T.-III).

(1) Connect scan tool (M.U.T-III). Refer to HOW TO CONNECT THE SCAN TOOL (M.U.T.-III) P.13A-10.
(2) Remove the mass airflow sensor from the air intake hose.
(3) Turn the ignition switch to the "ON" position.
(4) Set scan tool (M.U.T.-III) 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.00-13.
NO : Go to Step 2.

STEP 2. Check the intake air temperature sensor.

Refer to Intake Air Temperature Sensor Check P.13A-645.

Q: Is the measured resistance at the standard value?

YES : Go to Step 3.
NO : Replace the mass airflow sensor. Then go to Step 7.

STEP 3. Check the continuity at intake air temperature sensor harness side connector.

(1) Disconnect the mass airflow sensor connector and measure at the harness side.
(2) Check for the continuity between terminal AFSE line and ground.
- Continuity (2 ohms or less)

Q: Does continuity exist?

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

STEP 4. Check of harness damage in AFSE line between intake air temperature sensor connector and ECM connector.

Q: Is the harness wire in good condition?

YES : Go to Step 6.
NO : Repair the connector(s) or wiring harness. Then go to Step 7.

STEP 5. Check of harness damage in ATS line between intake air temperature sensor connector and ECM connector.

Q: Is the harness wire in good condition?

YES : Go to Step 6.
NO : Repair the connector(s) or wiring harness. Then go to Step 7.

STEP 6. Using scan tool (M.U.T.-III), check data list item 5: Intake Air Temperature Sensor.

(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool (M.U.T.-III) 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 : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-13.
NO : Replace the ECM (Refer to, Removal and Installation P.13A-656). 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 7 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0111 stored?

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

TSB Revision

DTC P0112: Intake Air Temperature Circuit Low Input

CIRCUIT OPERATION

- Approximately 5 volts are applied to the intake air temperature sensor output terminal from the ECM terminal ATS via the resistor in the ECM. The ground terminal is grounded with ECM terminal AFSE.
- 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)

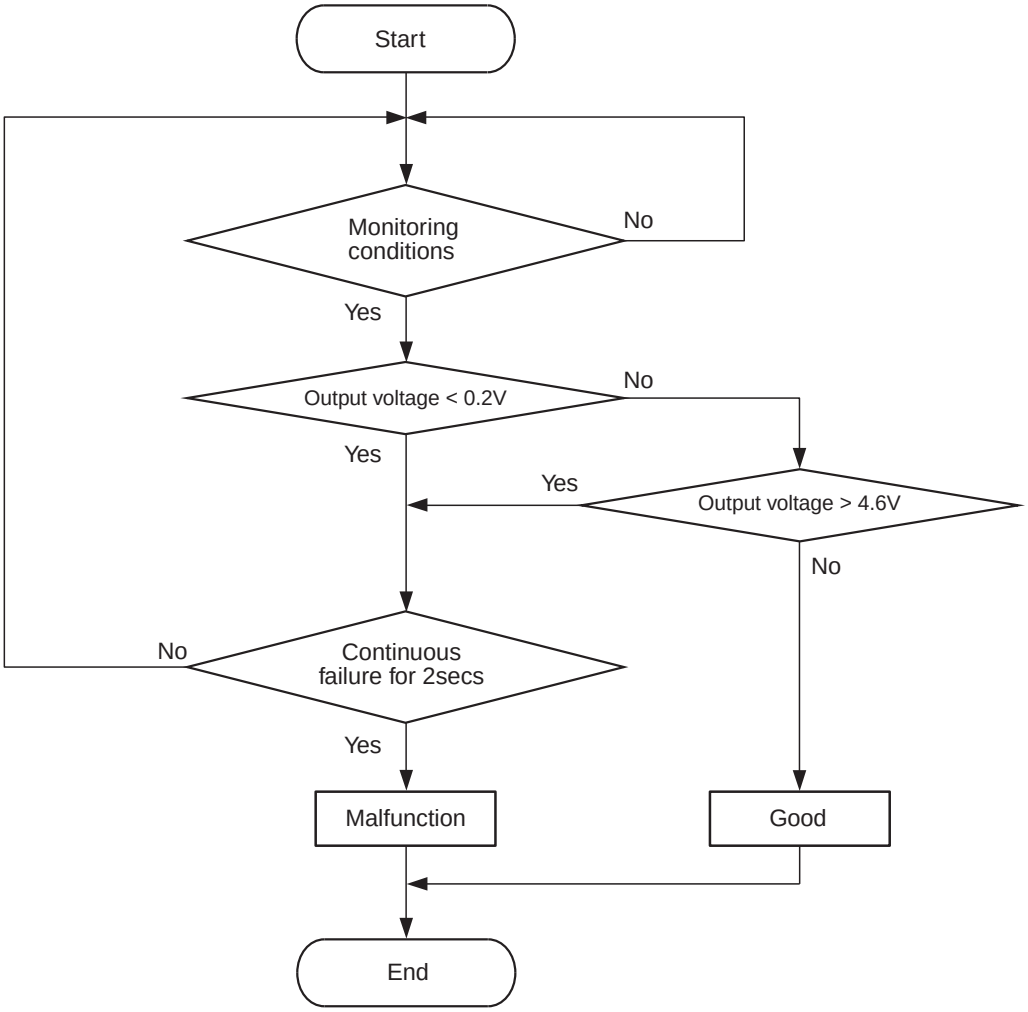
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



AK604315

Check Condition

- More than 2 seconds have passed since the engine starting sequence was completed.

Judgment Criterion

- Intake air temperature sensor output voltage is less than 0.2 volt [corresponding to an intake air temperature of 115°C (239°F) or more] for 2 seconds.

FAIL-SAFE AND BACKUP FUNCTION

- Control as if the intake air temperature is 25°C (77°F).

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 22 P.13A-10.

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

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

DIAGNOSIS

Required Special Tools:

- MB992744: Vehicle communication interface-Lite (V.C.I.-Lite)

TSB Revision

- MB992745: V.C.I.-Lite main harness A
- MB992747: V.C.I.-Lite USB cable short
- MB992748: V.C.I.-Lite USB cable long
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicles Communication Interface (V.C.I.)
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A (Vehicles with CAN communication system)

STEP 1. Using scan tool (M.U.T.-III), check data list item 5: Intake Air Temperature Sensor.

⚠ CAUTION

To prevent damage to scan tool (M.U.T.-III), always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool (M.U.T.-III).

(1) Connect scan tool (M.U.T-III). Refer to HOW TO CONNECT THE SCAN TOOL (M.U.T.-III) P.13A-10.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool (M.U.T.-III) to the data reading mode for item 5, Intake Air Temperature Sensor.
  - The intake air temperature and temperature shown with the scan tool (M.U.T.-III) 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.00-13.
NO : Go to Step 2.

STEP 2. Check the intake air temperature sensor.

Refer to Intake Air Temperature Sensor Check P.13A-645.

Q: Is the measured resistance at the standard value?

YES : Go to Step 3.
NO : Replace the mass airflow sensor. Then go to Step 5.

STEP 3. Check of short circuit to ground in ATS line between intake air temperature sensor connector and ECM connector.

Q: Is the harness wire in good condition?

YES : Go to Step 4.
NO : Repair the connector(s) or wiring harness. Then go to Step 5.

STEP 4. Using scan tool (M.U.T.-III), check data list item 5: Intake Air Temperature Sensor.

(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool (M.U.T.-III) 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 : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-13.

NO : Replace the ECM (Refer to, Removal and Installation P.13A-656). 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 22 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0112 stored?

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

DTC P0113: Intake Air Temperature Circuit High Input

CIRCUIT OPERATION

- Approximately 5 volts are applied to the intake air temperature sensor output terminal from the ECM terminal ATS via the resistor in the ECM. The ground terminal is grounded with ECM terminal AFSE.
- 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

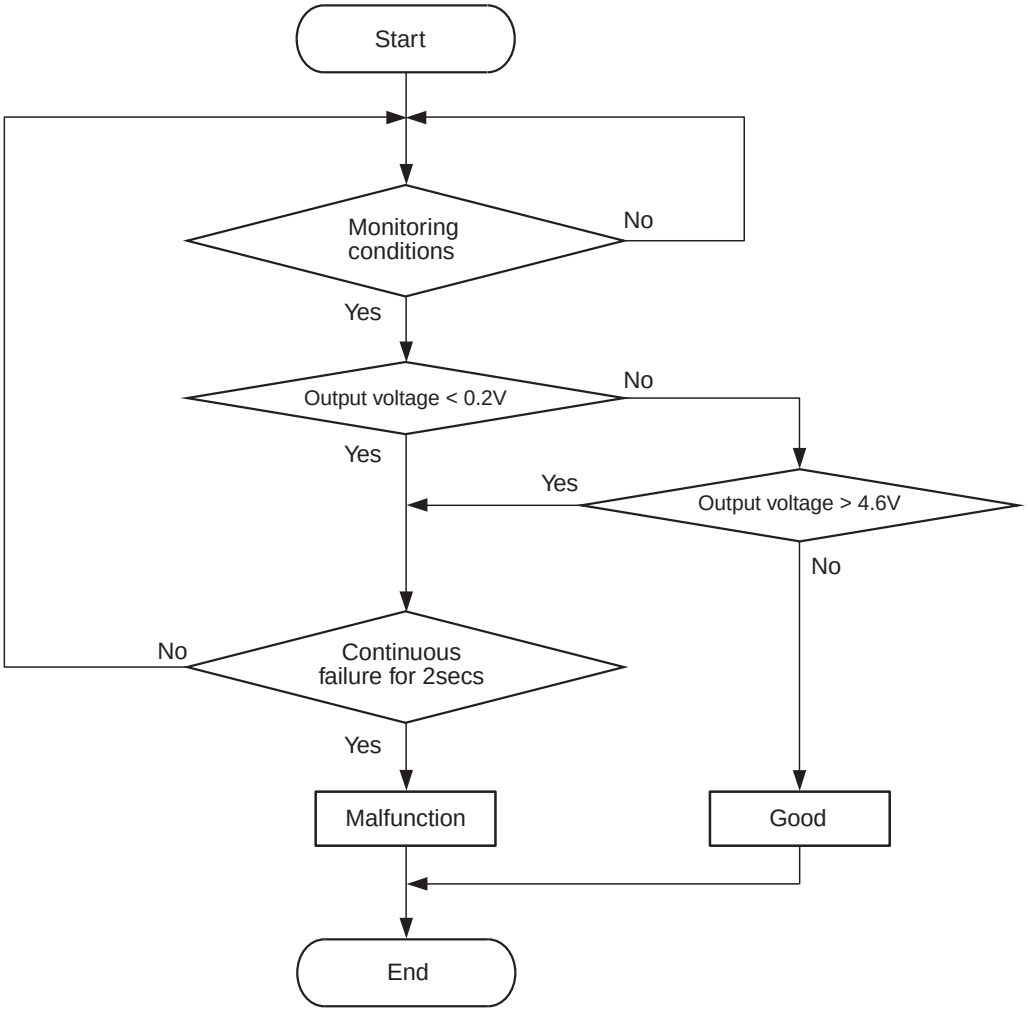
MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

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



AK604315

Check Condition

- More than 2 seconds have passed since the engine starting sequence was completed.

Judgment Criterion

- Intake air temperature sensor output voltage is more than 4.6 volts [corresponding to an intake air temperature of –40°C (–40°F) or less] for 2 seconds.

FAIL-SAFE AND BACKUP FUNCTION

- Control as if the intake air temperature is 25°C (77°F).

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 22 P.13A-10.

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

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

DIAGNOSIS

Required Special Tools:

- MB992744: Vehicle communication interface-Lite (V.C.I.-Lite)
- MB992745: V.C.I.-Lite main harness A
- MB992747: V.C.I.-Lite USB cable short
- MB992748: V.C.I.-Lite USB cable long
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicles Communication Interface (V.C.I.)
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A (Vehicles with CAN communication system)

STEP 1. Using scan tool (M.U.T.-III), check data list item 5: Intake Air Temperature Sensor.

⚠ CAUTION

To prevent damage to scan tool (M.U.T.-III), always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool (M.U.T.-III).

(1) Connect scan tool (M.U.T-III). Refer to HOW TO CONNECT THE SCAN TOOL (M.U.T.-III) P.13A-10.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool (M.U.T.-III) to the data reading mode for item 5, Intake Air Temperature Sensor.
  - The intake air temperature and temperature shown with the scan tool (M.U.T.-III) 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.00-13.
NO : Go to Step 2.

STEP 2. Check the intake air temperature sensor.

Refer to Intake Air Temperature Sensor Check P.13A-645.

Q: Is the measured resistance at the standard value?

YES : Go to Step 3.
NO : Replace the mass airflow sensor. Then go to Step 8.

STEP 3. Measure the sensor supply voltage at intake air temperature sensor harness side connector.

(1) Disconnect the mass airflow sensor connector and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal ATS line and ground.
  - Voltage should be between 4.5 and 4.9 volts.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

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

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

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STEP 4. Measure the sensor supply voltage at ECM connector by backprobing.

(1) Do not disconnect the connector.
(2) Disconnect the mass airflow sensor connector.
(3) Turn the ignition switch to the "ON" position.
(4) Measure the voltage between terminal ATS line and ground.
- Voltage should be between 4.5 and 4.9 volts.

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

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

YES : Repair or replace the connector(s), or check and repair the harness of open circuit in ATS line between airflow sensor connector and ECM connector. Then go to Step 8.
NO : Go to Step 7.

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

(1) Disconnect the mass airflow sensor connector and measure at the harness side.
(2) Check for the continuity between terminal AFSE line and ground.
- Continuity (2 ohms or less)

Q: Does continuity exist?

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

STEP 6. Check of open circuit in AFSE line between mass airflow sensor connector and ECM connector.

Q: Is the harness wire in good condition?

YES : Go to Step 7.
NO : Repair the connector(s) or wiring harness. Then go to Step 8.

STEP 7. Using scan tool (M.U.T.-III), check data list item 5: Intake Air Temperature Sensor.

(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool (M.U.T.-III) 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 : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-13.
NO : Replace the ECM (Refer to, Removal and Installation P.13A-656). Then go to Step 8.

STEP 8. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 22 P.13A-10.

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

Q: Is DTC P0113 stored?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0116: Engine Coolant Temperature Circuit Range/Performance Problem

CIRCUIT OPERATION

- 5-volt voltage is applied to the engine coolant temperature sensor output terminal from the ECM terminal WTS via the resistor in the ECM. The ground terminal is grounded with ECM terminal SENG.
- 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 does not change for specified period when engine coolant temperature sensor output voltage at engine start is over 0°C (32°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)

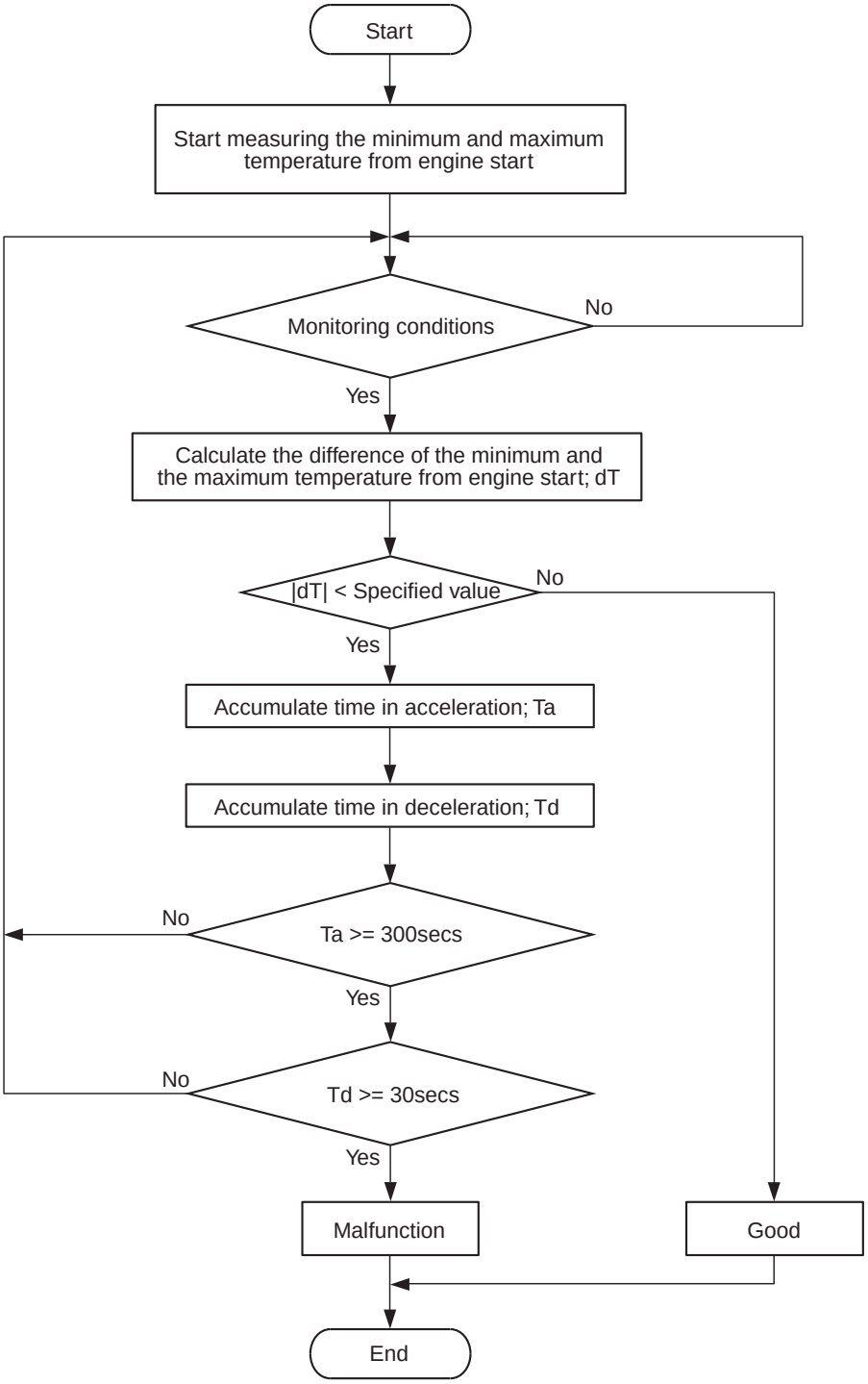
- Not applicable

Sensor (The sensor below is determined to be normal)

- Mass airflow sensor
- Intake air temperature sensor

DTC SET CONDITIONS

Logic Flow Chart



AKB00471

TSB Revision

Check Conditions
- Engine coolant temperature was more than 60°C (140°F) when the engine started.
- The accumulation is more than 300 seconds during the acceleration having the mass airflow rate of 12 g/sec or more.
- The accumulation is more than 30 seconds during the deceleration having the mass airflow rate of 9 g/sec or less.

Judgment Criteria
- Engine coolant temperature fluctuates within 1°C (1.8°F) after 330 seconds 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 less than -10°C (14°F) and is more than 60°C (140°F).
  2. During fuel shut-off operation.

Check Conditions
- Engine coolant temperature is between 0°C (32°F) and 60°C (140°F) when the engine started.
- The accumulation is more than 300 seconds during the acceleration having the mass airflow rate of 12 g/sec or more.
- The accumulation is more than 30 seconds during the deceleration having the mass airflow rate of 9 g/sec or less.

Judgment Criteria
- Engine coolant temperature fluctuates within 3°C (5.4°F) after 330 seconds 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 less than -10°C (14°F) and is more than 60°C (140°F).
  2. During fuel shut-off operation.

FAIL-SAFE AND BACKUP FUNCTION
- Control as if the engine coolant temperature is 80°C (176°F).

OBD-II DRIVE CYCLE PATTERN
Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 8 P.13A-10.

TROUBLESHOOTING HINTS (The most likely causes for this code to be stored are:)
- Engine coolant temperature sensor failed.
- Harness damage or connector damage.
- ECM failed.

DIAGNOSIS
Required Special Tools:
- MB992744: Vehicle communication interface-Lite (V.C.I.-Lite)
- MB992745: V.C.I.-Lite main harness A
- MB992747: V.C.I.-Lite USB cable short
- MB992748: V.C.I.-Lite USB cable long
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicles Communication Interface (V.C.I.)
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A (Vehicles with CAN communication system)

STEP 1. Using scan tool (M.U.T.-III), check data list item 6: Engine Coolant Temperature Sensor.

⚠ CAUTION

To prevent damage to scan tool (M.U.T.-III), always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool (M.U.T.-III).

(1) Connect scan tool (M.U.T-III). Refer to HOW TO CONNECT THE SCAN TOOL (M.U.T.-III) P.13A-10.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool (M.U.T.-III) 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.00-13.
NO : Go to Step 2.

STEP 2. Check the engine coolant temperature sensor.

Refer to Engine Coolant Temperature Sensor Check P.13A-646.

Q: Is the engine coolant temperature sensor normal?

YES : Go to Step 3.
NO : Replace the engine coolant temperature sensor. Then go to Step 7.

STEP 3. Check the continuity at engine coolant temperature sensor harness side connector.

(1) Disconnect the connector and measure at the harness side.
(2) Check for the continuity between terminal SENG line and ground.
- Continuity (2 ohms or less)

Q: Does continuity exist?

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

STEP 4. Check of damage in SENG line between engine coolant temperature sensor connector and ECM connector.

Q: Is the harness wire in good condition?

YES : Go to Step 6.
NO : Repair the connector(s) or wiring harness. Then go to Step 7.

STEP 5. Check of damage in WTS line between engine coolant temperature sensor connector and ECM connector.

Q: Is the harness wire in good condition?

YES : Go to Step 6.
NO : Repair the connector(s) or wiring harness. Then go to Step 7.

STEP 6. Using scan tool (M.U.T.-III), check data list item 6: Engine Coolant Temperature Sensor.

(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool (M.U.T.-III) 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 : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-13.
NO : Replace the ECM (Refer to, Removal and Installation P.13A-656). 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 8 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0116 stored?

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

DTC P0117: Engine Coolant Temperature Circuit Low Input

CIRCUIT OPERATION

- 5-volt voltage is applied to the engine coolant temperature sensor output terminal from the ECM terminal WTS via the resistor in the ECM. The ground terminal is grounded with ECM terminal SENG.
- 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

TSB Revision

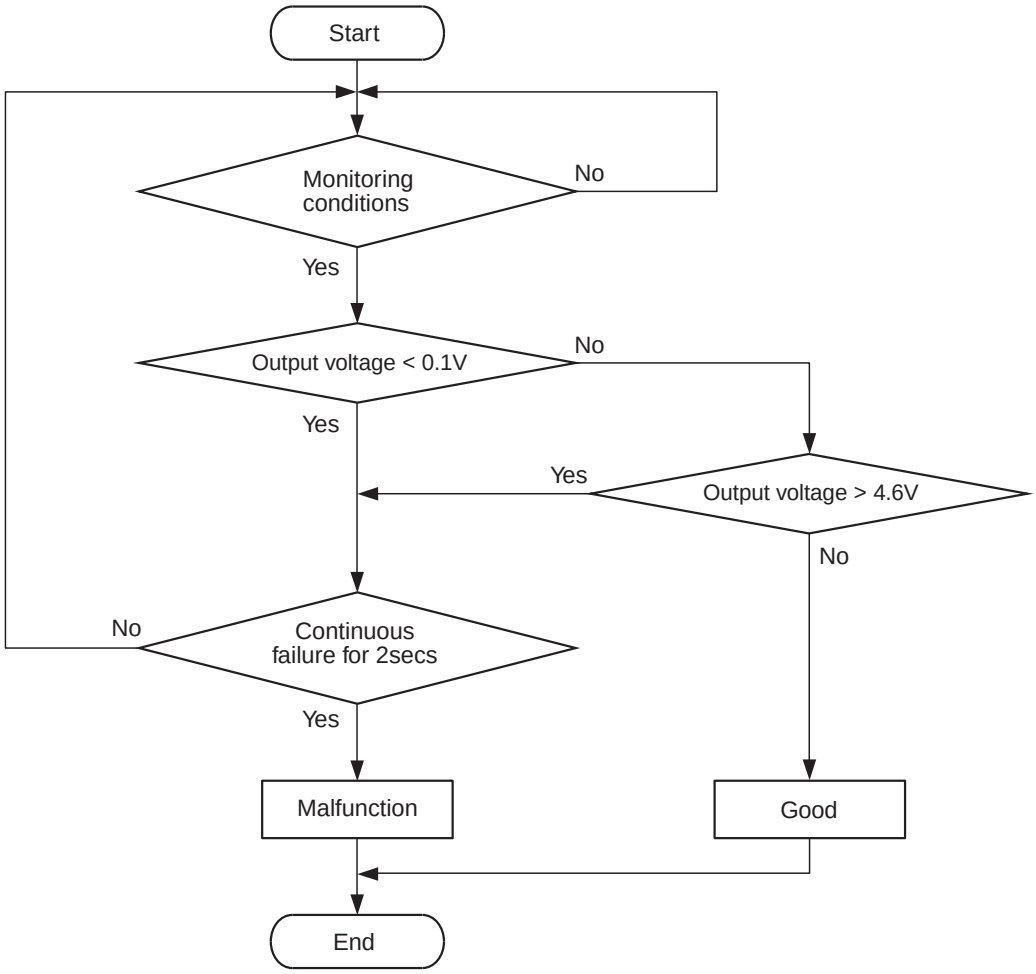
MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)
- Not applicable

Sensor (The sensor below is determined to be normal)
- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



AK604317

Check Condition
- More than 2 seconds have passed since the engine starting sequence was completed.

Judgment Criterion
- Engine coolant temperature sensor output voltage is less than 0.1 volt for 2 seconds.

FAIL-SAFE AND BACKUP FUNCTION
- Control as if the engine coolant temperature is 80°C (176°F).

OBD-II DRIVE CYCLE PATTERN
Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 22 P.13A-10.

TSB Revision

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

- Engine coolant temperature sensor failed.
- Shorted engine coolant temperature sensor circuit, or connector damage.
- ECM failed.

DIAGNOSIS

Required Special Tools:

- MB992744: Vehicle communication interface-Lite (V.C.I.-Lite)
- MB992745: V.C.I.-Lite main harness A
- MB992747: V.C.I.-Lite USB cable short
- MB992748: V.C.I.-Lite USB cable long
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicles Communication Interface (V.C.I.)
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A (Vehicles with CAN communication system)

STEP 1. Using scan tool (M.U.T.-III), check data list item 6: Engine Coolant Temperature Sensor.

⚠ CAUTION

To prevent damage to scan tool (M.U.T.-III), always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool (M.U.T.-III).

(1) Connect scan tool (M.U.T-III). Refer to HOW TO CONNECT THE SCAN TOOL (M.U.T.-III) P.13A-10.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool (M.U.T.-III) 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.00-13.
NO : Go to Step 2.

STEP 2. Check the engine coolant temperature sensor.

Refer to Engine Coolant Temperature Sensor Check P.13A-646.

Q: Is the engine coolant temperature sensor normal?

YES : Go to Step 3.
NO : Replace the engine coolant temperature sensor. Then go to Step 5.

STEP 3. Check of short circuit to ground in WTS line between engine coolant temperature sensor connector and ECM connector.

Q: Is the harness wire in good condition?

YES : Go to Step 4.
NO : Repair the connector(s) or wiring harness. Then go to Step 5.

STEP 4. Using scan tool (M.U.T.-III), check data list item 6: Engine Coolant Temperature Sensor.

(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool (M.U.T.-III) 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 : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-13.
NO : Replace the ECM (Refer to, Removal and Installation P.13A-656). 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 22 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0117 stored?

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

DTC P0118: Engine Coolant Temperature Circuit High Input

CIRCUIT OPERATION

- 5-volt voltage is applied to the engine coolant temperature sensor output terminal from the ECM terminal WTS via the resistor in the ECM. The ground terminal is grounded with ECM terminal SENG.
- 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

TSB Revision

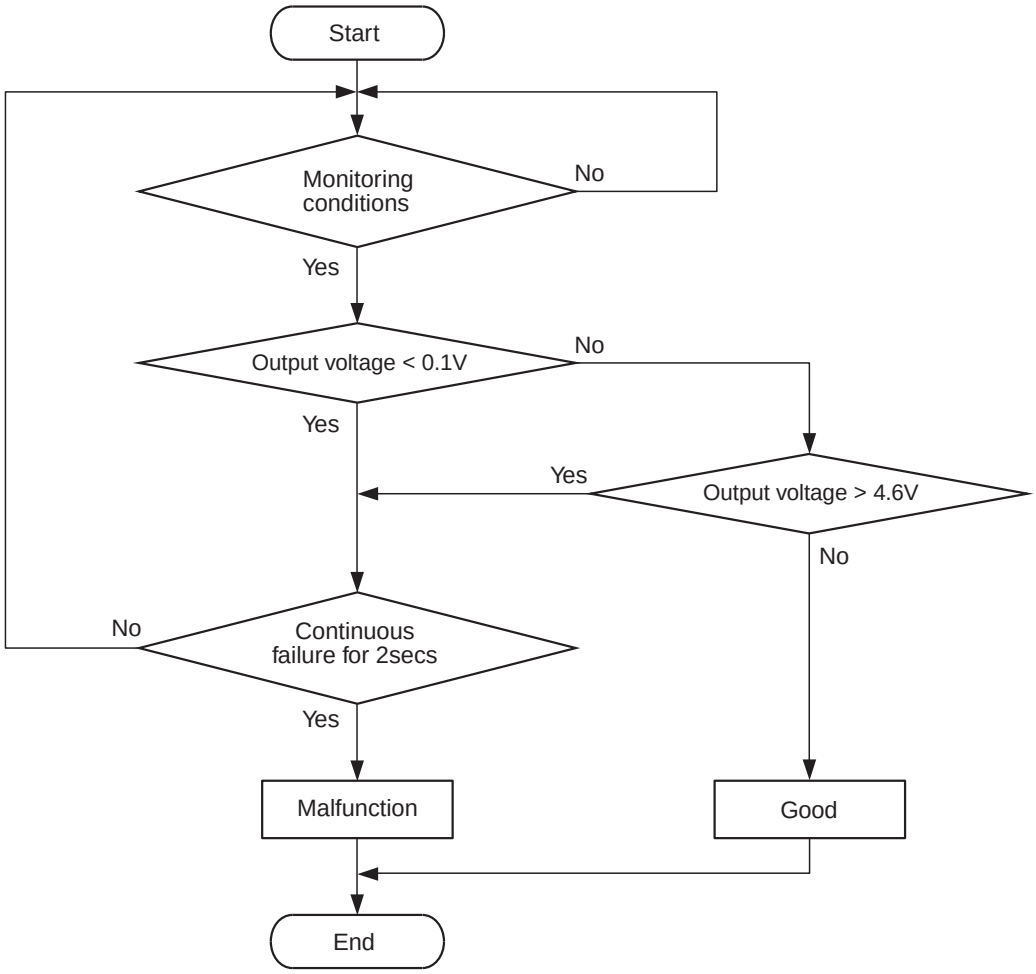
MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)
- Not applicable

Sensor (The sensor below is determined to be normal)
- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



AK604317

Check Condition
- More than 2 seconds have passed since the engine starting sequence was completed.

Judgment Criterion
- Engine coolant temperature sensor output voltage is more than 4.6 volts for 2 seconds.

FAIL-SAFE AND BACKUP FUNCTION
- Control as if the engine coolant temperature is 80°C (176°F).

OBD-II DRIVE CYCLE PATTERN
Refer to Diagnostic Function–OBD-II Drive Cycle–Pattern 22 P.13A-10.

TSB Revision

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

- Engine coolant temperature sensor failed.
- Open engine coolant temperature sensor circuit, or connector damage.
- ECM failed.

DIAGNOSIS

Required Special Tools:

- MB992744: Vehicle communication interface-Lite (V.C.I.-Lite)
- MB992745: V.C.I.-Lite main harness A
- MB992747: V.C.I.-Lite USB cable short
- MB992748: V.C.I.-Lite USB cable long
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicles Communication Interface (V.C.I.)
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A (Vehicles with CAN communication system)

STEP 1. Using scan tool (M.U.T.-III), check data list item 6: Engine Coolant Temperature Sensor.

⚠ CAUTION

To prevent damage to scan tool (M.U.T.-III), always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool (M.U.T.-III).

(1) Connect scan tool (M.U.T-III). Refer to HOW TO CONNECT THE SCAN TOOL (M.U.T.-III) P.13A-10.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool (M.U.T.-III) 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.00-13.
NO : Go to Step 2.

STEP 2. Check the engine coolant temperature sensor.

Refer to Engine Coolant Temperature Sensor Check P.13A-646.

Q: Is the engine coolant temperature sensor normal?

YES : Go to Step 3.
NO : Replace the engine coolant temperature sensor. Then go to Step 8.

STEP 3. Measure the sensor supply voltage at engine coolant temperature sensor harness side connector.
(1) Disconnect the connector and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal WTS line and ground.
- Voltage should be between 4.5 and 4.9 volts.

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

Q: Is the measured voltage between 4.5 and 4.9 volts?
YES : Go to Step 5.
NO : Go to Step 4.

STEP 4. Measure the sensor supply voltage at ECM connector by backprobing.
(1) Do not disconnect the connector.
(2) Disconnect the engine coolant temperature sensor connector.
(3) Turn the ignition switch to the "ON" position.
(4) Measure the voltage between terminal WTS and ground by backprobing.
- Voltage should be between 4.5 and 4.9 volts.

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

Q: Is the measured voltage between 4.5 and 4.9 volts?
YES : Repair or replace the connector(s), or check and repair the harness of open circuit in WTS line between engine coolant temperature sensor connector and ECM connector. Then go to Step 8.
NO : Go to Step 7.

STEP 5. Check the continuity at engine coolant temperature sensor harness side connector.
(1) Disconnect the connector and measure at the harness side.
(2) Check for the continuity between terminal SENG and ground.
- Continuity (2 ohms or less)

Q: Does continuity exist?
YES : Go to Step 7.
NO : Go to Step 6.

STEP 6. Check of open circuit in SENG line between engine coolant temperature sensor connector and ECM connector.

Q: Is the harness wire in good condition?
YES : Go to Step 7.
NO : Repair the connector(s) or wiring harness. Then go to Step 8.

STEP 7. 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 : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-13.

NO : Replace the ECM (Refer to, Removal and Installation P.13A-656). Then go to Step 8.

STEP 8. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 22 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0118 stored?

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

DTC P0121: Throttle Position Sensor (main) Plausibility

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

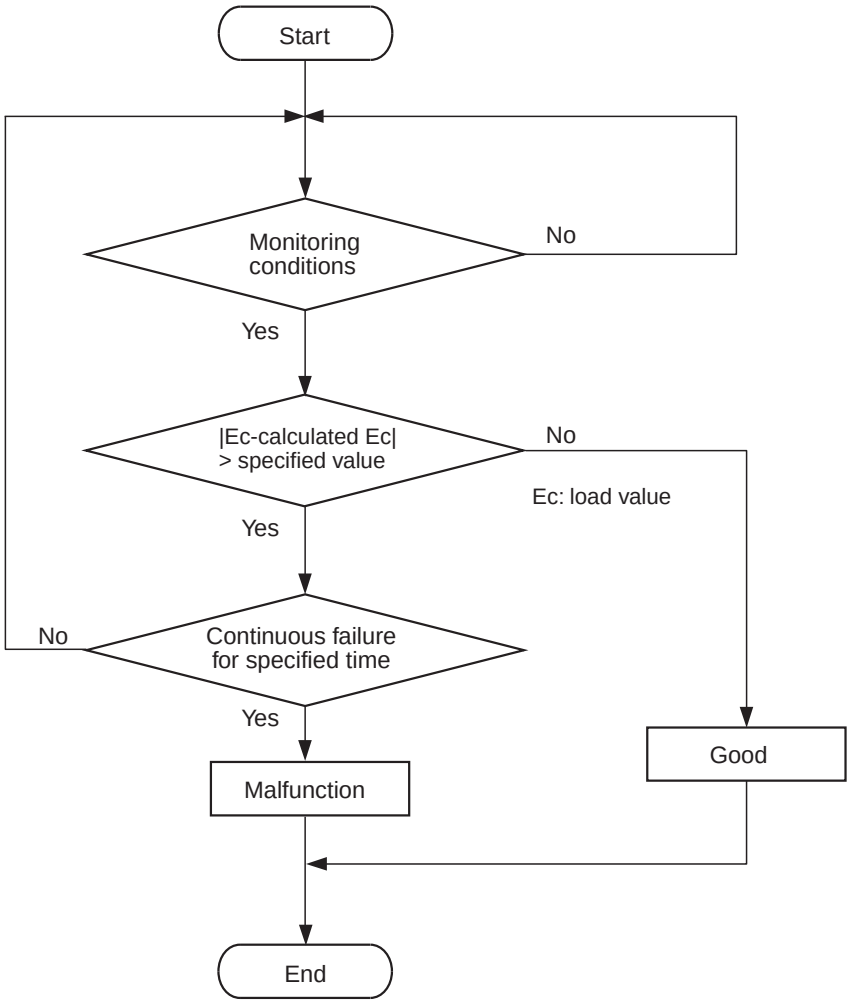
MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

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



AK604351

Check Conditions

- The volumetric efficiency estimated by the throttle position sensor (main) subtracted from the actual volumetric efficiency is more than 0 percent. Or, the volumetric efficiency is less than 60 percent.
- The engine speed is more than 750 r/min.

Judgment Criterion

- For 0.4 second, the difference between the actual volumetric efficiency and the volumetric efficiency estimated by the throttle position sensor (main) is more than 33 percent.
- For 0.4 second, the volumetric efficiency estimated by the throttle position sensor (main) and the volumetric efficiency estimated by the throttle position sensor (main) is more than 8.8 percent.

FAIL-SAFE AND BACKUP FUNCTION

- Throttle opening degree is restricted.
- Throttle opening degree position is in default position if throttle position sensor (sub) fails.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle Pattern 16 P.13A-10.

TSB Revision

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

- Throttle position sensor (main) system failed.
- Intake system vacuum leak.
- There is some foreign matter around mass air-flow sensor.
- ECM failed.

DIAGNOSIS

Required Special Tools:

- MB992744: Vehicle communication interface-Lite (V.C.I.-Lite)
- MB992745: V.C.I.-Lite main harness A
- MB992747: V.C.I.-Lite USB cable short
- MB992748: V.C.I.-Lite USB cable long
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicles Communication Interface (V.C.I.)
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A (Vehicles with CAN communication system)
- MB991658: Test Harness

STEP 1. Using scan tool (M.U.T.-III), read the diagnostic trouble code (DTC).

⚠ CAUTION

To prevent damage to scan tool (M.U.T.-III), always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool (M.U.T.-III).

(1) Connect scan tool (M.U.T-III). Refer to HOW TO CONNECT THE SCAN TOOL (M.U.T.-III) P.13A-10.
(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 P0121 stored?

YES : Refer to Diagnostic Trouble Code Chart P.13A-47.
NO : Go to Step 2.

STEP 2. Using scan tool (M.U.T.-III), check data list item 13: Throttle Position Sensor (main).

(1) Detach the intake air hose at the throttle body.
(2) Disconnect the connector of the electronic-controlled throttle valve.
(3) Use test harness special tool (MB991658) to connect only terminals No. 3, No. 4, No. 5, and No. 6.
(4) Turn the ignition switch to the "ON" position.
(5) Set scan tool (M.U.T-III) to the data reading mode for item 13, Throttle Position Sensor (main).
- Output voltage should be between 300 and 700 millivolts when the throttle valve is fully closed with your finger.
- Output voltage should be between 4,000 and 4,800 millivolts 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 : Go to Step 3.
NO : Refer to, DTC P0122 – Throttle Position Sensor (main) Circuit Low Input P.13A-139, DTC P0123 – Throttle Position Sensor (main) Circuit High Input P.13A-143.

STEP 3. Check for intake system vacuum leak.

Q: Are there any abnormalities?

YES : Repair it. Then go to Step 6.
NO : Go to Step 4.

STEP 4. Check for foreign matter being around the mass airflow sensor.

Q: Are there any foreign matter?

YES : Repair it. Then go to Step 6.
NO : Go to Step 5.

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 17 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0121 stored?

YES : Replace the ECM (Refer to, Removal and Installation P.13A-656). 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.00-13.

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 16 P.13A-10.

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

Q: Is DTC P0121 stored?

YES : Retry the troubleshooting.

NO : The inspection is complete.

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

CIRCUIT OPERATION

- A 5-volt power supply is applied on the throttle position sensor (main) power terminal from the ECM terminal TPS5.
- A voltage that is according to the throttle opening angle is sent to the ECM terminal TPSM from the throttle position sensor (main) output terminal.
- The throttle position sensor (main) ground terminal is grounded with ECM terminal TPSE.

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)

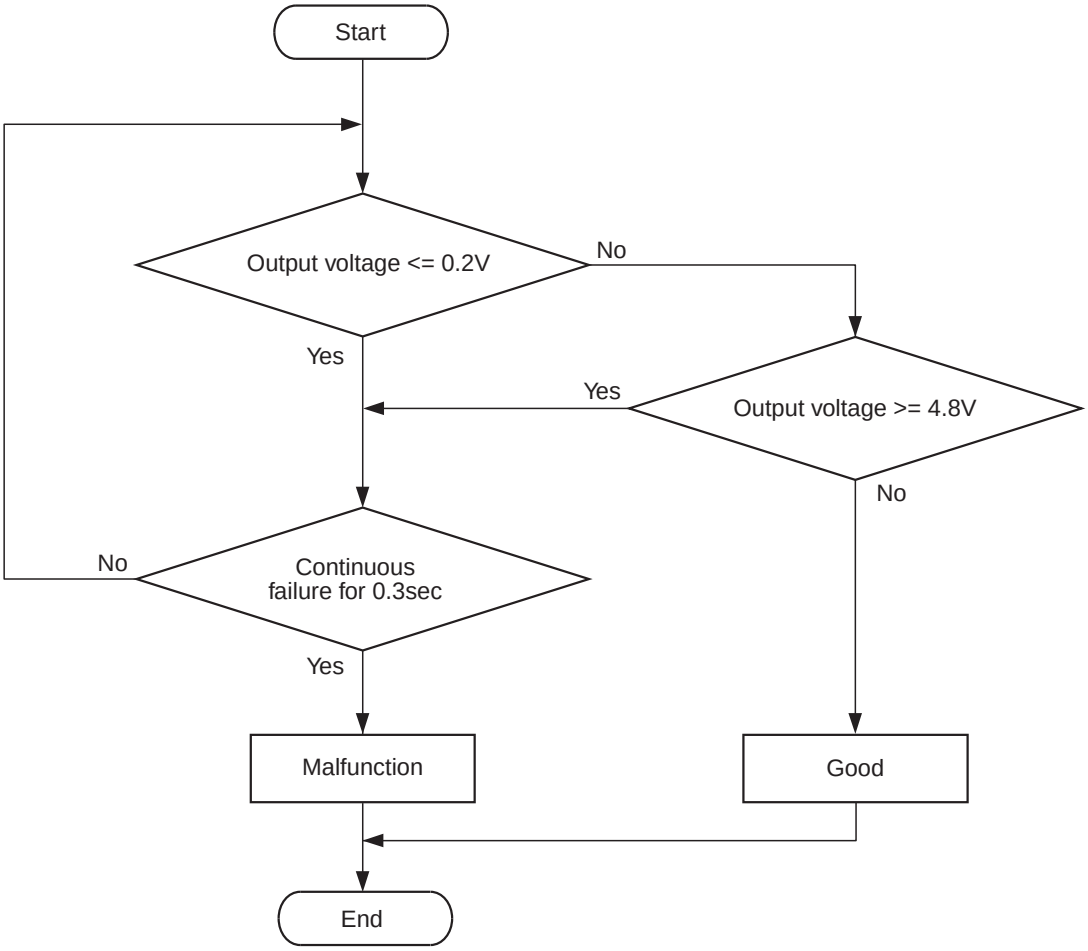
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



AK604318

Check Condition
- Ignition switch is "ON" position.

Judgment Criterion
- Throttle position sensor (main) output voltage is less than 0.2 volt for 0.3 second.

FAIL-SAFE AND BACKUP FUNCTION
- Throttle opening degree is restricted.
- Throttle opening degree position is in default position if throttle position sensor (sub) fails.

OBD-II DRIVE CYCLE PATTERN
None.

TROUBLESHOOTING HINTS (The most likely causes for this code to be stored are:)
- Throttle position sensor failed.
- Shorted throttle position sensor (main) circuit, harness damage, or connector damage.
- ECM failed.

TSB Revision

DIAGNOSIS

Required Special Tools:

- MB992744: Vehicle communication interface-Lite (V.C.I.-Lite)
- MB992745: V.C.I.-Lite main harness A
- MB992747: V.C.I.-Lite USB cable short
- MB992748: V.C.I.-Lite USB cable long
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicles Communication Interface (V.C.I.)
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A (Vehicles with CAN communication system)
- MB991658: Test Harness

STEP 1. Using scan tool (M.U.T.-III), check data list item 13: Throttle Position Sensor (main).

⚠ CAUTION

To prevent damage to scan tool (M.U.T.-III), always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool (M.U.T.-III).

(1) Connect scan tool (M.U.T-III). Refer to HOW TO CONNECT THE SCAN TOOL (M.U.T.-III) P.13A-10.
(2) Detach the intake air hose at the throttle body.
(3) Disconnect the connector of the electronic-controlled throttle valve.
(4) Use test harness special tool (MB991658) to connect only terminals No. 3, No. 4, No. 5, and No. 6.
(5) Turn the ignition switch to the "ON" position.
(6) Set scan tool MB991958 to the data reading mode for item 13, Throttle Position Sensor (main).
  - Output voltage should be between 300 and 700 millivolts when the throttle valve is fully closed with your finger.
  - Output voltage should be between 4,000 and 4,800 millivolts 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.00-13.
NO : Go to Step 2.

STEP 2. Check of damage in TPS5 line between electronic-controlled throttle valve connector and ECM connector.

Q: Is the harness wire in good condition?

YES : Go to Step 3.
NO : Repair the connector(s) or wiring harness. Then go to Step 6.

TSB Revision

STEP 3. Check of short circuit to ground and damage in TPSM line between electronic-controlled throttle valve connector and ECM connector.

Q: Is the harness wire in good condition?

YES : Go to Step 4.

NO : Repair the connector(s) or wiring harness. Then go to Step 6.

STEP 4. Using scan tool (M.U.T.-III), check data list item 13: Throttle Position Sensor (main).

(1) Detach the intake air hose at the throttle body.
(2) Disconnect the connector of the electronic-controlled throttle valve.
(3) Use test harness special tool (MB991658) to connect only terminals No. 3, No. 4, No. 5, and No. 6.
(4) Turn the ignition switch to the "ON" position.
(5) Set scan tool (M.U.T.-III) to the data reading mode for item 13, Throttle Position Sensor (main).
- Output voltage should be between 300 and 700 millivolts when the throttle valve is fully closed with your finger.
- Output voltage should be between 4,000 and 4,800 millivolts 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.00-13.

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 P0122 stored?

YES : Replace the ECM (Refer to, Removal and Installation P.13A-656). Then go to Step 6.

NO : The inspection is complete.

STEP 6. Using scan tool (M.U.T.-III), 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 P0122 stored?

YES : Retry the troubleshooting.

NO : The inspection is complete.

TSB Revision

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

CIRCUIT OPERATION

- A 5-volt power supply is applied on the throttle position sensor (main) power terminal from the ECM terminal TPS5.
- A voltage that is according to the throttle opening angle is sent to the ECM terminal TPSM from the throttle position sensor (main) output terminal.
- The throttle position sensor (main) ground terminal is grounded with ECM terminal TPSE.

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)

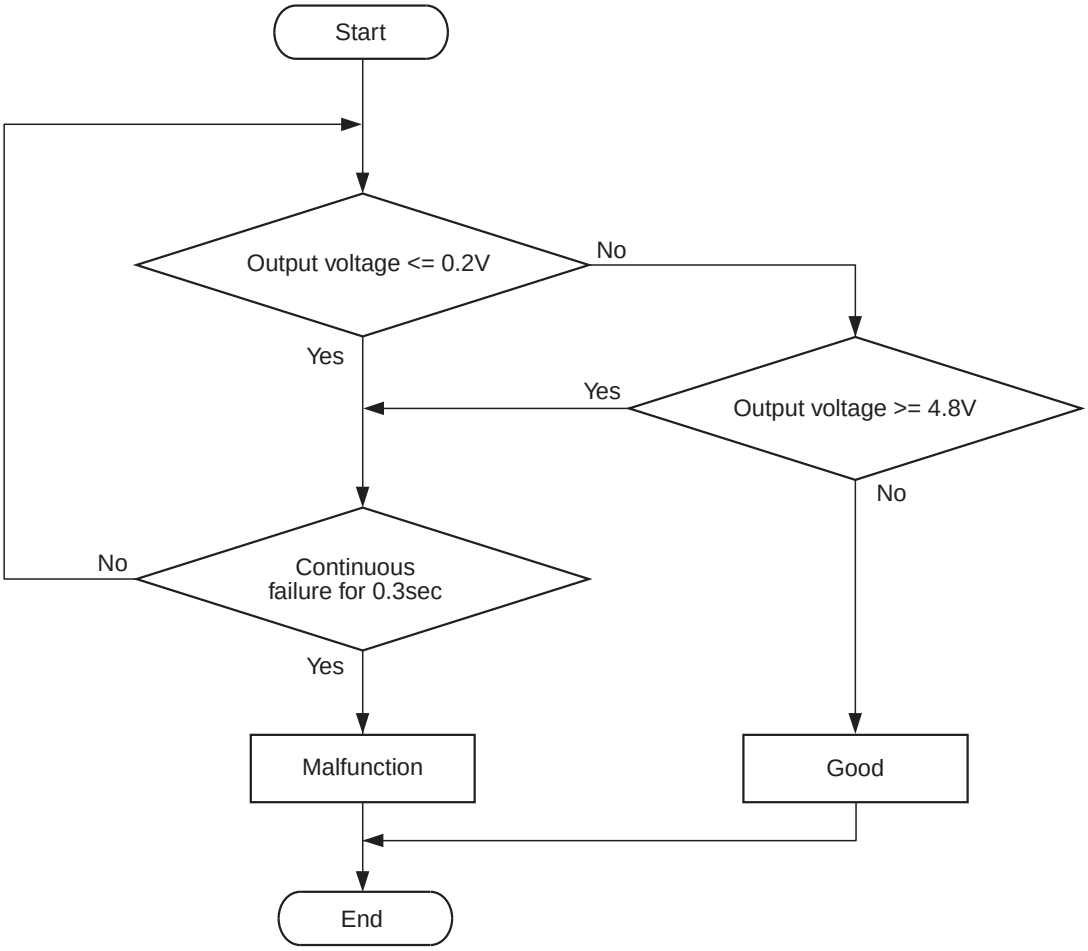
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



AK604318

Check Condition
- Ignition switch is "ON" position.

Judgment Criterion
- Throttle position sensor (main) output voltage is more than 4.8 volts for 0.3 second.

FAIL-SAFE AND BACKUP FUNCTION
- Throttle opening degree is restricted.
- Throttle opening degree position is in default position if throttle position sensor (sub) fails.

OBD-II DRIVE CYCLE PATTERN
None.

TROUBLESHOOTING HINTS (The most likely causes for this code to be stored are:)
- Throttle position sensor failed.
- Open or shorted throttle position sensor (main) circuit, harness damage or connector damage.
- ECM failed.

DIAGNOSIS

Required Special Tools:
- MB992744: Vehicle communication interface-Lite (V.C.I.-Lite)

TSB Revision

- MB992745: V.C.I.-Lite main harness A
- MB992747: V.C.I.-Lite USB cable short
- MB992748: V.C.I.-Lite USB cable long
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicles Communication Interface (V.C.I.)
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A (Vehicles with CAN communication system)
- MB991658: Test Harness

STEP 1. Using scan tool (M.U.T.-III), check data list item 13: Throttle Position Sensor (main).

⚠ CAUTION

To prevent damage to scan tool (M.U.T.-III), always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool (M.U.T.-III).

(1) Connect scan tool (M.U.T-III). Refer to HOW TO CONNECT THE SCAN TOOL (M.U.T.-III) P.13A-10.
(2) Detach the intake air hose at the throttle body.
(3) Disconnect the connector of the electronic-controlled throttle valve.
(4) Use test harness special tool (MB991658) to connect only terminals No. 3, No. 4, No. 5, and No. 6.
(5) Turn the ignition switch to the "ON" position.
(6) Set scan tool MB991958 to the data reading mode for item 13, Throttle Position Sensor (main).
  - Output voltage should be between 300 and 700 millivolts when the throttle valve is fully closed with your finger.
  - Output voltage should be between 4,000 and 4,800 millivolts 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.00-13.
NO : Go to Step 2.

STEP 2. Measure the sensor supply voltage at electronic-controlled throttle valve harness side connector.

(1) Disconnect the connector and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal TPS5 line 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 4.
NO : Go to Step 3.

STEP 3. Check of open circuit and short circuit to ground in TPS5 line between electronic-controlled throttle valve connector and ECM connector.

Q: Is the harness wire in good condition?

YES : Go to Step 6.

NO : Repair the connector(s) or wiring harness. Then go to Step 10.

STEP 4. Check the continuity at electronic-controlled throttle valve harness side connector.

(1) Disconnect the connector and measure at the harness side.
(2) Check for the continuity between terminal TPSE line and ground.
- Continuity (2 ohms or less)

Q: Does continuity exist?

YES : Go to Step 7.

NO : Go to Step 5.

STEP 5. Check of open circuit and damage in TPSE line between electronic-controlled throttle valve connector and ECM connector.

Q: Is the harness wire in good condition?

YES : Go to Step 6.

NO : Repair the connector(s) or wiring harness. Then go to Step 10.

STEP 6. Using scan tool (M.U.T.-III), check data list item 13: Throttle Position Sensor (main).

(1) Detach the intake air hose at the throttle body.
(2) Disconnect the connector of the electronic-controlled throttle valve.
(3) Use test harness special tool (MB991658) to connect only terminals No. 3, No. 4, No. 5, and No. 6.
(4) Turn the ignition switch to the "ON" position.
(5) Set scan tool (M.U.T.-III) to the data reading mode for item 13, Throttle Position Sensor (main).
- Output voltage should be between 300 and 700 millivolts when the throttle valve is fully closed with your finger.
- Output voltage should be between 4,000 and 4,800 millivolts 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.00-13.

NO : Replace the ECM (Refer to, Removal and Installation P.13A-656). Then go to Step 10.

STEP 7. Check of damage in TPS5 line between electronic-controlled throttle valve connector and ECM connector.

Q: Is the harness wire in good condition?

YES : Go to Step 8.
NO : Repair the connector(s) or wiring harness. Then go to Step 10.

STEP 8. Check of open circuit and damage in TPSM line between electronic-controlled throttle valve connector and ECM connector.

Q: Is the harness wire in good condition?

YES : Go to Step 9.
NO : Repair the connector(s) or wiring harness. Then go to Step 10.

STEP 9. 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 stored?

YES : Replace the ECM (Refer to, Removal and Installation P.13A-656). Then go to Step 10.
NO : The inspection is complete.

STEP 10. Using scan tool (M.U.T.-III), 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 P0123 stored?

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

DTC P0125: Insufficient Coolant Temperature for Closed Loop Fuel Control

CIRCUIT OPERATION

- 5-volt voltage is applied to the engine coolant temperature sensor output terminal from the ECM terminal WTS via the resistor in the ECM. The ground terminal is grounded with ECM terminal SENG.
- 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 closed loop enable temperature within specified period when engine coolant temperature sensor output voltage at engine start is under 0°C (32°F).

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)

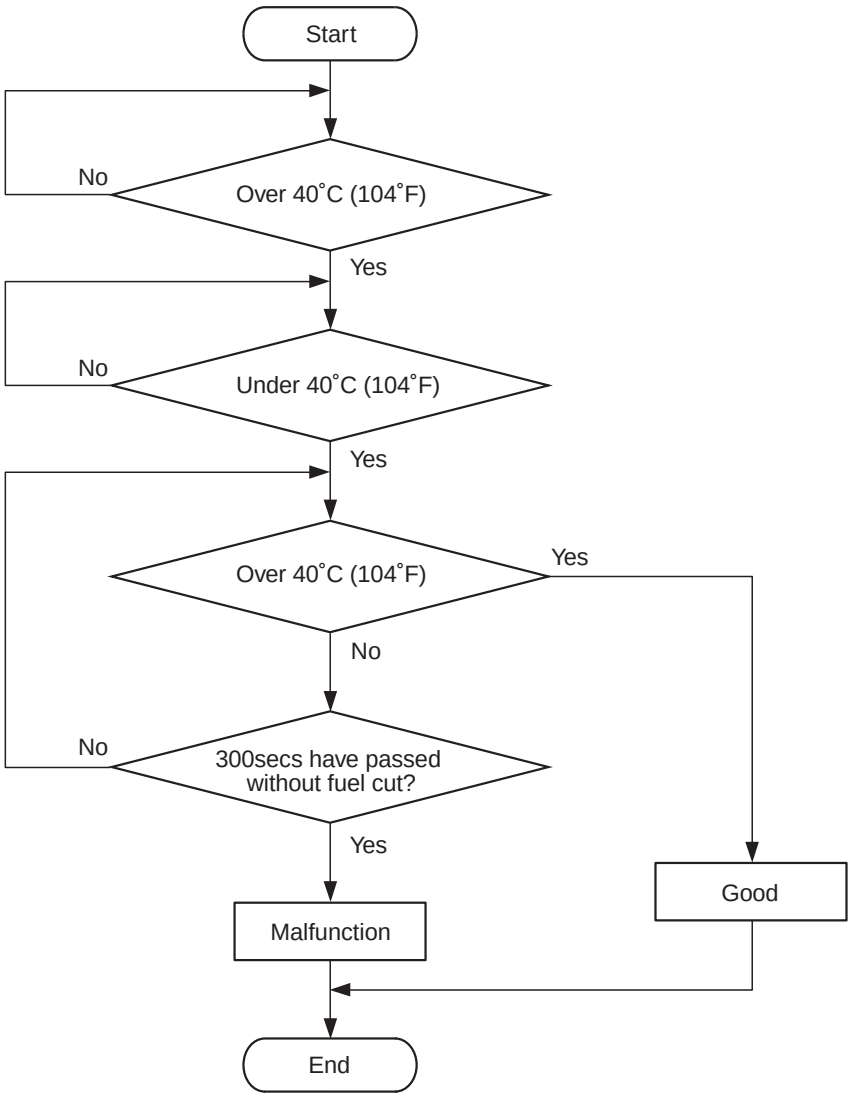
- Mass airflow sensor
- Intake air temperature sensor

MONITOR EXECUTION

Continuous

DTC SET CONDITIONS <Range/Performance problem – drift>

Logic Flow Chart



AK900355

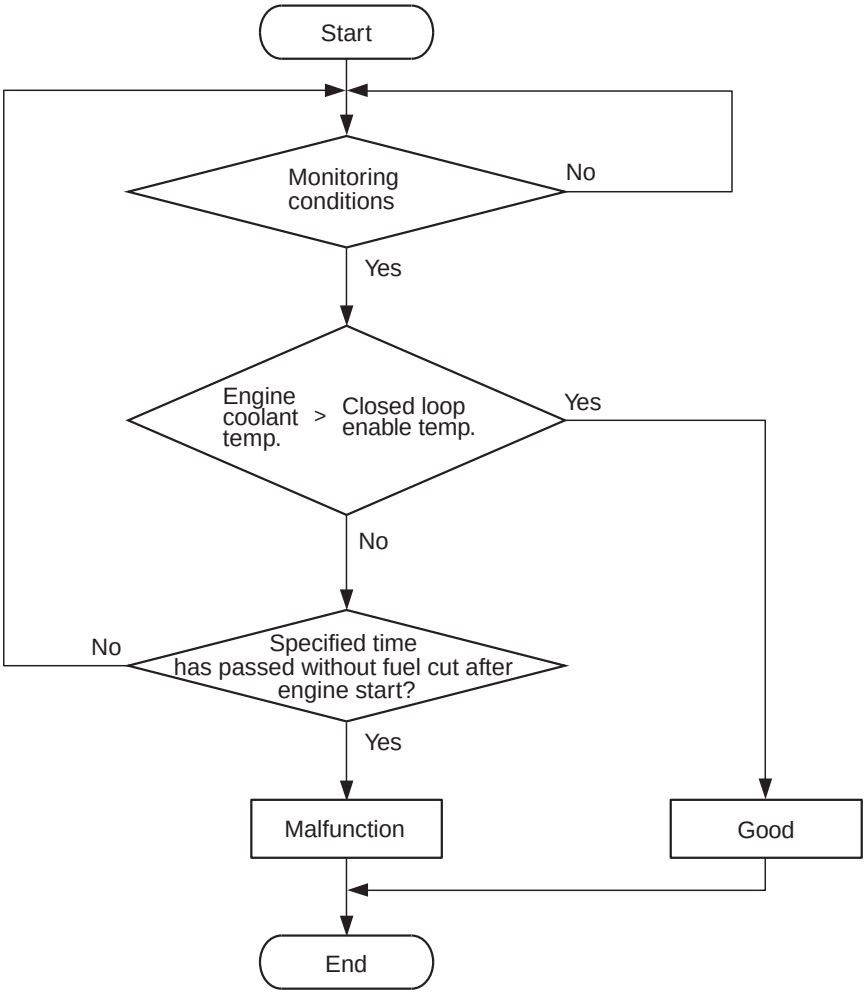
TSB Revision

Check Conditions, Judgment Criteria

- Engine coolant temperature decreases from more than 40°C (104°F) to less than 40°C (104°F).
- Then the engine coolant temperature is less than 40°C (104°F) for 5 minutes.
- However, time is not counted when fuel is shut off.

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

Logic Flow Chart



AK900354

Check Conditions, Judgment Criteria

- About 90 – 300 seconds have passed for the engine coolant temperature to rise to about 0°C (32°F) after starting sequence was completed.
- However, time is not counted when fuel is shut off.

FAIL-SAFE AND BACKUP FUNCTION

- Control as if the engine coolant temperature is 80°C (176°F).

TSB Revision

OBD-II DRIVE CYCLE PATTERN

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

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

- Engine coolant temperature sensor failed.
- Harness damage in engine coolant temperature sensor circuit or connector damage.
- ECM failed.

DIAGNOSIS

Required Special Tools:

- MB992744: Vehicle communication interface-Lite (V.C.I.-Lite)
- MB992745: V.C.I.-Lite main harness A
- MB992747: V.C.I.-Lite USB cable short
- MB992748: V.C.I.-Lite USB cable long
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicles Communication Interface (V.C.I.)
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A (Vehicles with CAN communication system)

STEP 1. Using scan tool (M.U.T.-III), 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 (M.U.T.-III). Refer to HOW TO CONNECT THE SCAN TOOL (M.U.T.-III) P.13A-10.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool (M.U.T.-III) 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.00-13.

NO : Go to Step 2.

STEP 2. Measure the sensor output voltage at engine coolant temperature sensor connector by backprobing.

(1) Do not disconnect the connector.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal WTS line and ground by backprobing.
- When engine coolant temperature is –20°C (–4°F), voltage should be between 3.9 and 4.5 volts.
- When engine coolant temperature is 0°C (32°F), voltage should be between 3.2 and 3.8 volts.
- When engine coolant temperature is 20°C (68°F), voltage should be between 2.3 and 2.9 volts.
- When engine coolant temperature is 40°C (104°F), voltage should be between 1.3 and 1.9 volts.
- When engine coolant temperature is 60°C (140°F), voltage should be between 0.7 and 1.3 volts.
- When engine coolant temperature is 80°C (176°F), voltage should be between 0.3 and 0.9 volt.

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

Q: Is the measured voltage within the specified range?

YES : Go to Step 3.
NO : Go to Step 4.

STEP 3. Using scan tool (M.U.T.-III), check data list item 6: Engine Coolant Temperature Sensor.

(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool (M.U.T-III) 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 : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-13.
NO : Replace the ECM (Refer to, Removal and Installation P.13A-656). Then go to Step 9.

STEP 4. Measure the sensor supply voltage at engine coolant temperature sensor harness side connector.

(1) Disconnect the connector and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal WTS line and ground.
- Voltage should be between 4.5 and 4.9 volts.

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

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

YES : Go to Step 5.
NO : Replace the ECM (Refer to, Removal and Installation P.13A-656). Then go to Step 9.

TSB Revision

STEP 5. Check the continuity at engine coolant temperature sensor harness side connector.
(1) Disconnect the connector and measure at the harness side.
(2) Check for the continuity between terminal SENG and ground.
- Continuity (2 ohms or less)

Q: Does continuity exist?
YES : Go to Step 7.
NO : Go to Step 6.

STEP 6. Check of damage in SENG line between engine coolant temperature sensor connector and ECM connector.

Q: Is the harness wire in good condition?
YES : Replace the ECM (Refer to, Removal and Installation P.13A-656). Then go to Step 9.
NO : Repair it. Then go to Step 9.

STEP 7. Check the engine coolant temperature sensor.
Refer to Engine Coolant Temperature Sensor Check P.13A-646.

Q: Is the engine coolant temperature sensor normal?
YES : Go to Step 8.
NO : Replace the engine coolant temperature sensor. Then go to Step 9.

STEP 8. Check of damage in WTS line between engine coolant temperature sensor connector and ECM connector.

Q: Is the harness wire in good condition?
YES : Replace the ECM (Refer to, Removal and Installation P.13A-656). Then go to Step 9.
NO : Repair it. Then go to Step 9.

STEP 9. Test the OBD-II drive cycle.
(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 8 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0125 stored?
YES : Retry the troubleshooting.
NO : The inspection is complete.

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

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.

TSB Revision

MONITOR EXECUTION

Once per driving cycle

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

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

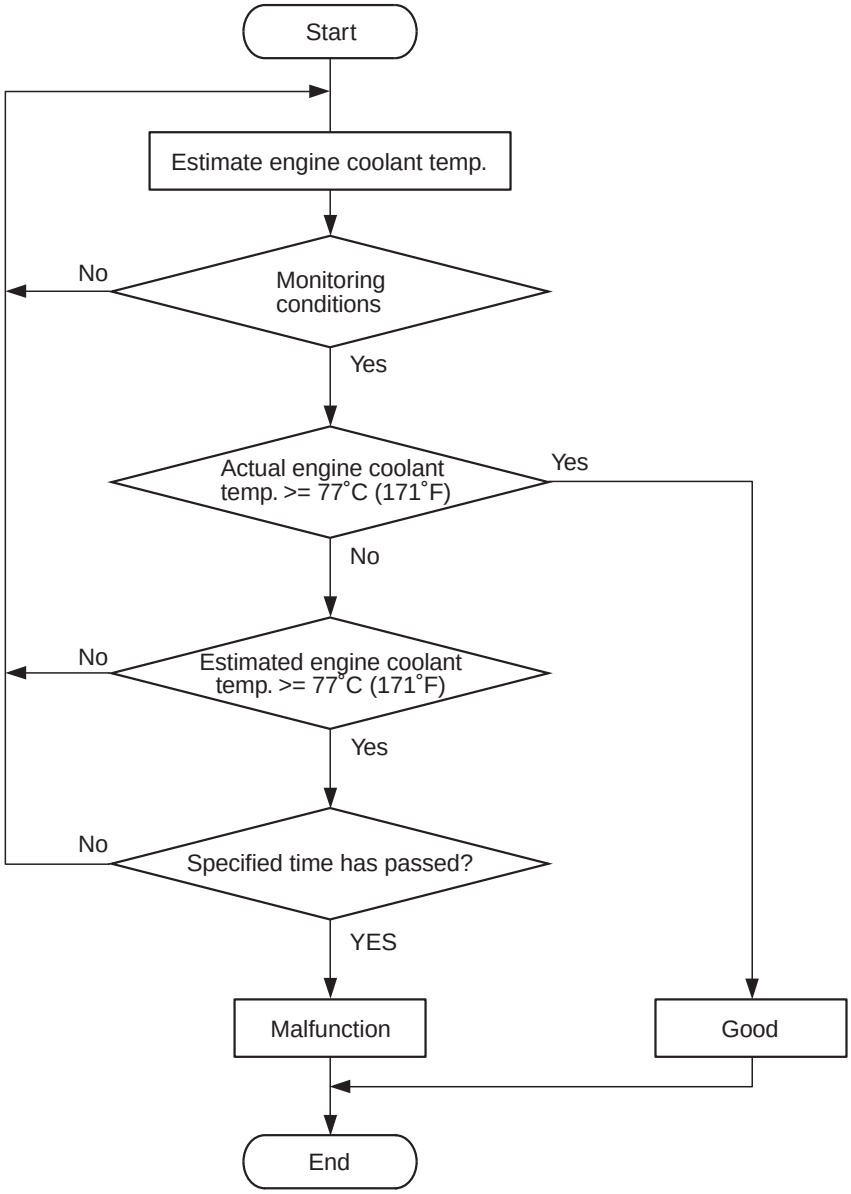
- Vehicle speed sensor monitor <M/T>

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



AK900356

TSB Revision

Check Conditions

- Engine coolant temperature is between –10°C (14°F) and 60°C (140°F) when the engine is started.
- Intake air temperature is more than –10°C (14°F).
- The intake air temperature subtracted from the intake air temperature when the engine is started is less than 10°C (18°F).
- The total time when the amount of intake air is small is less than the specified time.

Judgment Criterion

- After the estimated engine coolant temperature rises above 77°C (171°F), the actual engine coolant temperature is less than 77°C (171°F) even though the specified time has passed.

FAIL-SAFE AND BACKUP FUNCTION

- None

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 9 P.13A-10.

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

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

DIAGNOSIS

Required Special Tools:

- MB992744: Vehicle communication interface-Lite (V.C.I.-Lite)
- MB992745: V.C.I.-Lite main harness A
- MB992747: V.C.I.-Lite USB cable short
- MB992748: V.C.I.-Lite USB cable long
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicles Communication Interface (V.C.I.)
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A (Vehicles with CAN communication system)

STEP 1. Check the cooling system.

Refer to GROUP 14, Engine Cooling Diagnosis P.14-2.

Q: Is the cooling system normal?

YES : Replace the ECM (Refer to, Removal and Installation P.13A-656). Then go to Step 2.

NO : Repair it. Then go to Step 2.

STEP 2. Test the OBD-II drive cycle.

(1) Carry out test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 9 P.13A-10.

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

Q: Is DTC P0128 stored?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0130: Linear Air-Fuel Ratio Sensor Circuit

TECHNICAL DESCRIPTION

- The ECM effects air/fuel ratio feedback control in accordance with the signals from the linear air-fuel ratio sensor.
- If the linear air-fuel ratio sensor has deteriorated, corrections will be made by the heated oxygen sensor (rear).

DESCRIPTIONS OF MONITOR METHODS

- If the air-fuel ratio detection signal has an abnormality although the linear air-fuel ratio sensor is sufficiently ready to operate, the DTC is stored as a 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)

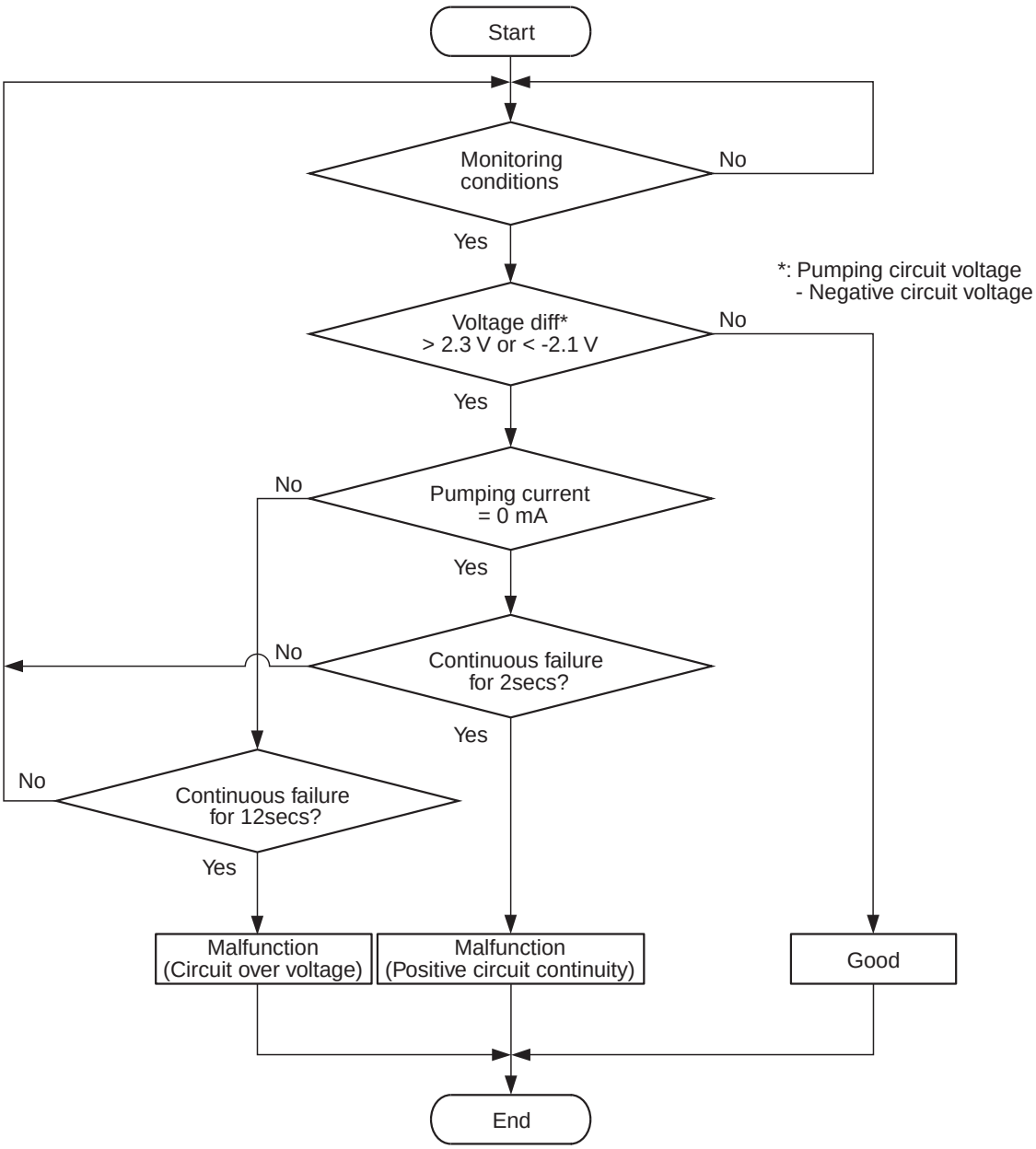
- Linear air-fuel ratio sensor heater monitor
- Misfire monitor
- Fuel system monitor

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



AK900360

Check Conditions

- Battery positive voltage is between 10 and 16.5 volts.
- More than 60 – 308 seconds have passed since the engine starting sequence was completed.

Judgment Criteria

- The negative circuit voltage subtracted from the pumping circuit voltage is be lower than –2.1 volts or higher than 2.3 volts for 12 seconds.
- The pumping current is be lower than 0 milli ampere or higher than 0 milli ampere for 12 seconds.

FAIL-SAFE AND BACKUP FUNCTION

- Does not control air-fuel ratio closed loop.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 21 P.13A-10.

TSB Revision

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

- Linear air-fuel ratio sensor failed.
- Connector damage.
- ECM failed.

DIAGNOSIS

Required Special Tools:

- MB992744: Vehicle communication interface-Lite (V.C.I.-Lite)
- MB992745: V.C.I.-Lite main harness A
- MB992747: V.C.I.-Lite USB cable short
- MB992748: V.C.I.-Lite USB cable long
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicles Communication Interface (V.C.I.)
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A (Vehicles with CAN communication system)

STEP 1. Test the OBD-II drive cycle.

⚠ CAUTION

To prevent damage to scan tool (M.U.T.-III), always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool (M.U.T.-III).

(1) Connect scan tool (M.U.T-III). Refer to HOW TO CONNECT THE SCAN TOOL (M.U.T.-III) P.13A-10.
(2) Turn the ignition switch to the "ON" position and delete the DTC.
(3) Carry out the test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 21 P.13A-10.
(4) Check the diagnostic trouble code (DTC).

Q: Is DTC P0130 stored?

YES : 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.00-13.

STEP 2. Replace the linear air-fuel ratio sensor.

(1) Replace the linear air-fuel ratio sensor.
(2) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 21 P.13A-10.
(3) Check the diagnostic trouble code (DTC).

Q: Is DTC P0130 stored?

YES : Replace the ECM (Refer to, Removal and Installation P.13A-656). Then go to Step 3.
NO : The inspection is complete.

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 21 P.13A-10.

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

Q: Is DTC P0130 stored?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0131: Linear Air-Fuel Ratio Sensor Circuit Low Voltage

CIRCUIT OPERATION

The linear air-fuel ratio sensor and the ECM are connected by the following three lines to detect the air-fuel ratio.

- The line between the linear air-fuel ratio sensor connector terminal and the ECM terminal LPFL detects the air-fuel ratio.
- The auxiliary line between the linear air-fuel ratio sensor connector terminal and the ECM terminal LSFL detects the air-fuel ratio.
- The line between the linear air-fuel ratio sensor connector terminal and the ECM terminal LEFL is connected to ground.

TECHNICAL DESCRIPTION

- The ECM effects air/fuel ratio feedback control in accordance with the signals from the linear air-fuel ratio sensor.
- If the linear air-fuel ratio sensor has deteriorated, corrections will be made by the heated oxygen sensor (rear).

DESCRIPTIONS OF MONITOR METHODS

- If one of the three line voltages is excessively low or if all the three line voltages are excessively low, the DTC is stored as a 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)

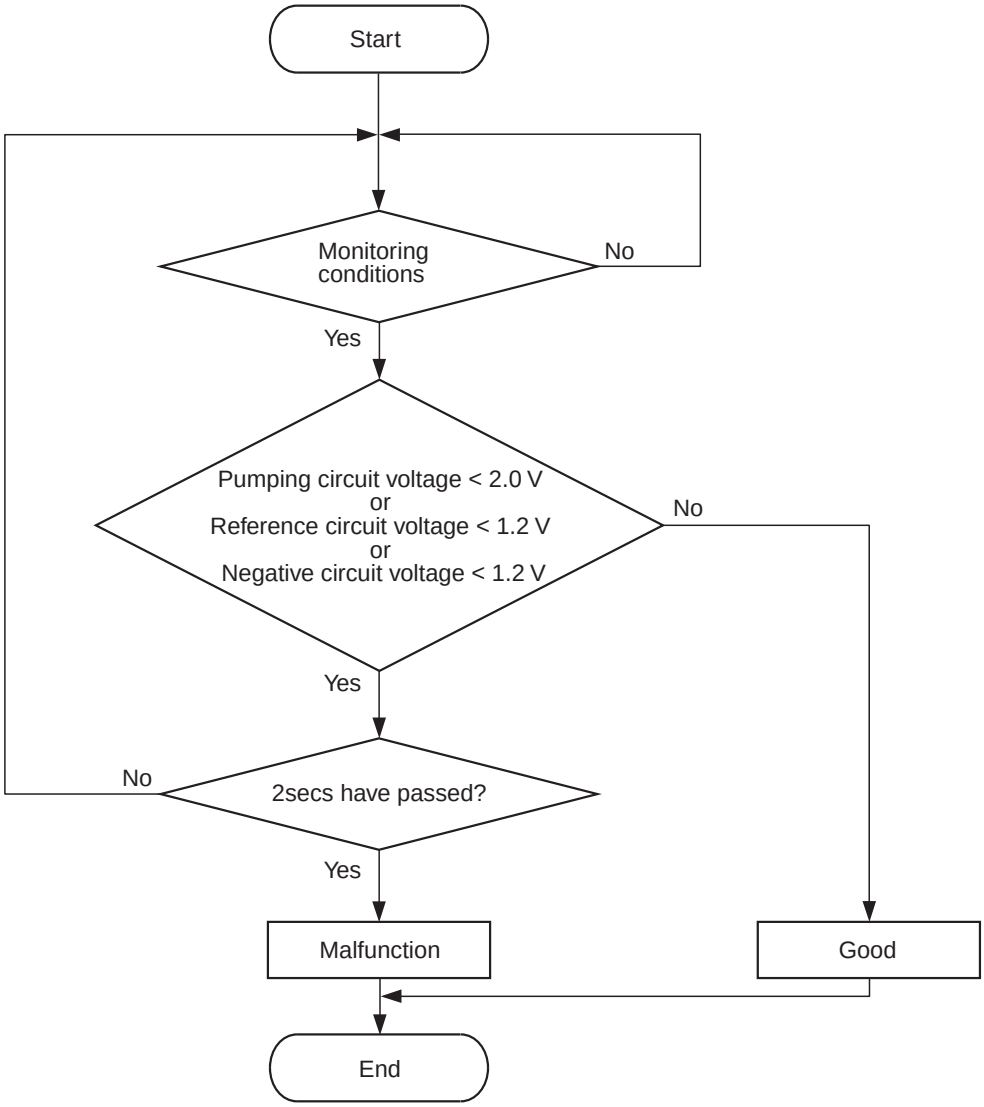
- Linear air-fuel ratio sensor heater monitor
- Misfire monitor
- Fuel system monitor

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



AK900357

Check Conditions

- Battery positive voltage is between 10 and 16.5 volts.
- More than 0 – 128 seconds have passed since the engine starting sequence was completed.

Judgment Criterion

- The pumping circuit voltage is be lower than 2 volts for 2 seconds.

or

- The reference circuit voltage is be lower than 1.2 volt for 2 seconds.

or

- The negative circuit voltage is be lower than 1.2 volt for 2 seconds.

FAIL-SAFE AND BACKUP FUNCTION

- Does not control air-fuel ratio closed loop.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnosis Function – OBD-II Drive Cycle – Pattern 21 P.13A-10.

TSB Revision

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

- Linear air-fuel ratio sensor failed.
- Shorted linear air-fuel ratio sensor circuit, or connector damage.
- ECM failed.

DIAGNOSIS

Required Special Tools:

- MB992744: Vehicle communication interface-Lite (V.C.I.-Lite)
- MB992745: V.C.I.-Lite main harness A
- MB992747: V.C.I.-Lite USB cable short
- MB992748: V.C.I.-Lite USB cable long
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicles Communication Interface (V.C.I.)
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A (Vehicles with CAN communication system)

STEP 1. Check of short circuit to ground in LSFL line between linear air-fuel ratio sensor connector and ECM connector.

Q: Is the harness wire in good condition?

YES : Go to Step 2.
NO : Repair the connector(s) or wiring harness. Then go to Step 6.

STEP 2. Check of short circuit to ground in LPFL line between linear air-fuel ratio sensor connector and ECM connector.

Q: Is the harness wire in good condition?

YES : Go to Step 3.
NO : Repair the connector(s) or wiring harness. Then go to Step 6.

STEP 3. Check of short circuit to ground in LEFL line between linear air-fuel ratio sensor connector and ECM connector.

Q: Is the harness wire in good condition?

YES : Go to Step 4.
NO : Repair the connector(s) or wiring harness. Then go to Step 6.

STEP 4. Test the OBD-II drive cycle.

⚠ CAUTION

To prevent damage to scan tool (M.U.T.-III), always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool (M.U.T.-III).

(1) Connect scan tool (M.U.T-III). Refer to HOW TO CONNECT THE SCAN TOOL (M.U.T.-III) P.13A-10.
(2) Turn the ignition switch to the "ON" position and delete the DTC.
(3) Carry out the test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 21 P.13A-10.
(4) Check the diagnostic trouble code (DTC).

Q: Is DTC P0131 stored?

YES : 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.00-13.

STEP 5. Replace the linear air-fuel ratio sensor.

(1) Replace the linear air-fuel ratio sensor.
(2) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 21 P.13A-10.
(3) Check the diagnostic trouble code (DTC).

Q: Is DTC P0131 stored?

YES : Replace the ECM (Refer to, Removal and Installation P.13A-656). 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 21 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0131 stored?

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

DTC P0132: Linear Air-Fuel Ratio Sensor Circuit High Voltage

CIRCUIT OPERATION

The linear air-fuel ratio sensor and the ECM are connected by the following three lines to detect the air-fuel ratio.

- The line between the linear air-fuel ratio sensor connector terminal and the ECM terminal LPFL detects the air-fuel ratio.
- The auxiliary line between the linear air-fuel ratio sensor connector terminal and the ECM terminal LSFL detects the air-fuel ratio.
- The line between the linear air-fuel ratio sensor connector terminal and the ECM terminal LEFL is connected to ground.

TSB Revision

TECHNICAL DESCRIPTION

- The ECM effects air/fuel ratio feedback control in accordance with the signals from the linear air-fuel ratio sensor.
- If the linear air-fuel ratio sensor has deteriorated, corrections will be made by the heated oxygen sensor (rear).

DESCRIPTIONS OF MONITOR METHODS

- If one of the three line voltages is excessively high or if all the three line voltages are excessively high, the DTC is stored as a 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)

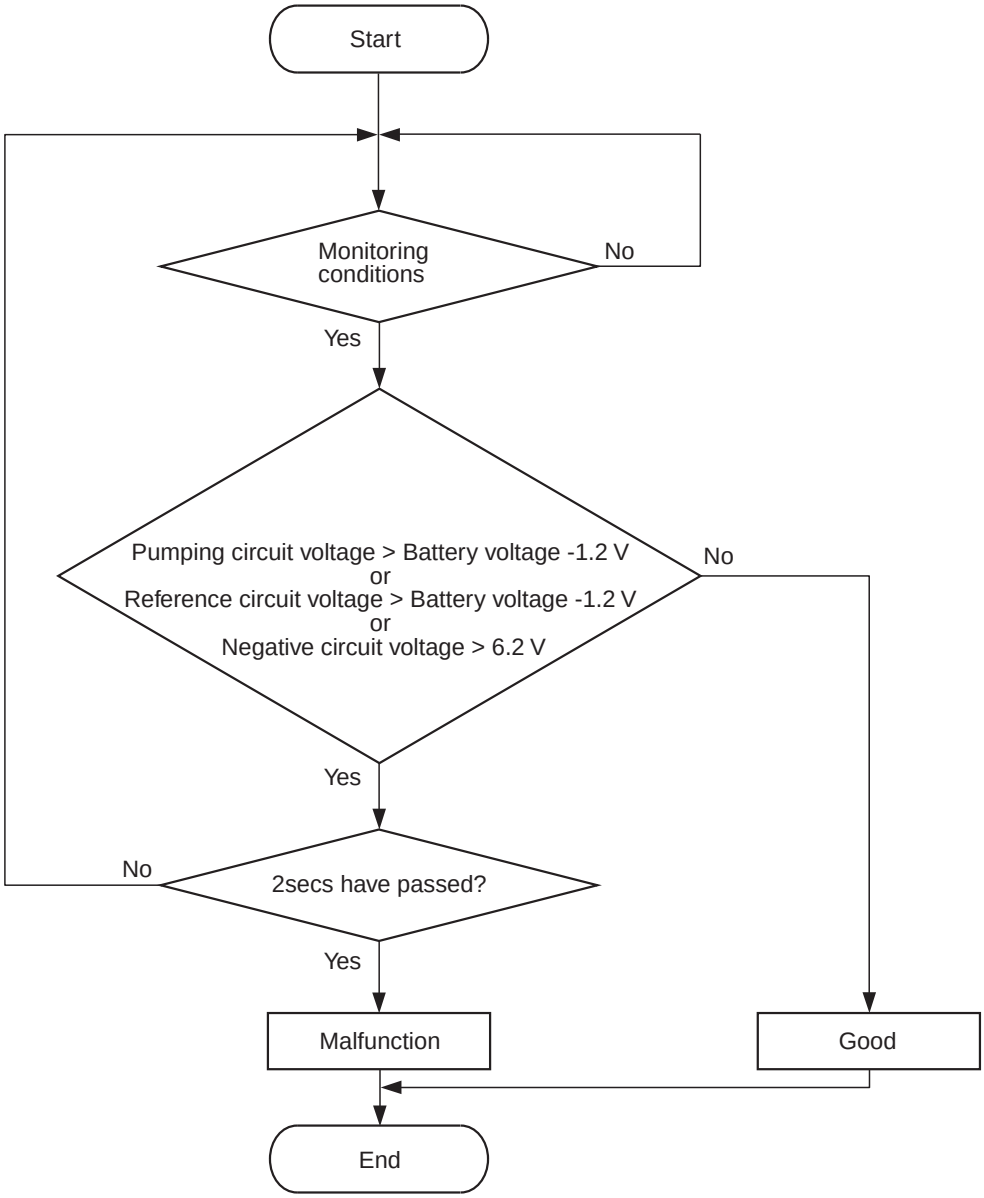
- Linear air-fuel ratio sensor heater monitor
- Misfire monitor
- Fuel system monitor

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



AK900358

Check Conditions

- Battery positive voltage is between 10 and 16.5 volts.
- More than 0 – 128 seconds have passed since the engine starting sequence was completed.

Judgment Criterion

- The pumping circuit voltage is higher than the battery positive voltage from which you subtract 1.2 volt for 2 seconds.

or

- The reference circuit voltage is higher than battery positive voltage from which you subtract 1.2 volt for 2 seconds.

or

- The negative circuit voltage is be higher than 6.2 volts for 2 seconds.

FAIL-SAFE AND BACKUP FUNCTION

- Does not control air-fuel ratio closed loop.

TSB Revision

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnosis Function – OBD-II Drive Cycle – Pattern 21 P.13A-10.

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

- Linear air-fuel ratio sensor failed.
- Shorted linear air-fuel ratio sensor circuit, or connector damage.
- ECM failed.

DIAGNOSIS

Required Special Tools:

- MB992744: Vehicle communication interface-Lite (V.C.I.-Lite)
- MB992745: V.C.I.-Lite main harness A
- MB992747: V.C.I.-Lite USB cable short
- MB992748: V.C.I.-Lite USB cable long
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicles Communication Interface (V.C.I.)
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A (Vehicles with CAN communication system)

STEP 1. Check of short circuit to power supply in LSFL line between linear air-fuel ratio sensor connector and ECM connector.

Q: Is the harness wire in good condition?

YES : Go to Step 2.
NO : Repair the connector(s) or wiring harness. Then go to Step 6.

STEP 2. Check of short circuit to power supply in LPFL line between linear air-fuel ratio sensor connector and ECM connector.

Q: Is the harness wire in good condition?

YES : Go to Step 3.
NO : Repair the connector(s) or wiring harness. Then go to Step 6.

STEP 3. Check of short circuit to power supply in LEFL line between linear air-fuel ratio sensor connector and ECM connector.

Q: Is the harness wire in good condition?

YES : Go to Step 4.
NO : Repair the connector(s) or wiring harness. Then go to Step 6.

STEP 4. Test the OBD-II drive cycle.

⚠ CAUTION

To prevent damage to scan tool (M.U.T.-III), always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool (M.U.T.-III).

(1) Connect scan tool (M.U.T-III). Refer to HOW TO CONNECT THE SCAN TOOL (M.U.T.-III) P.13A-10.
(2) Turn the ignition switch to the "ON" position and delete the DTC.
(3) Carry out the test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 21 P.13A-10.
(4) Check the diagnostic trouble code (DTC).

Q: Is DTC P0132 stored?

YES : 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.00-13.

STEP 5. Replace the linear air-fuel ratio sensor.

(1) Replace the linear air-fuel ratio sensor.
(2) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 21 P.13A-10.
(3) Check the diagnostic trouble code (DTC).

Q: Is DTC P0132 stored?

YES : Replace the ECM (Refer to, Removal and Installation P.13A-656). 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 21 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0132 stored?

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

DTC P0133: Linear Air-Fuel Ratio Sensor Circuit Slow Response

TECHNICAL DESCRIPTION

- The ECM effects air/fuel ratio feedback control in accordance with the signals from the linear air-fuel ratio sensor.
- If the linear air-fuel ratio sensor has deteriorated, corrections will be made by the heated oxygen sensor (rear).

DESCRIPTIONS OF MONITOR METHODS

- If the response speed of the linear air-fuel ratio sensor to the change in the air-fuel ratio is too slow, the DTC is stored as the linear air-fuel ratio sensor deterioration.

TSB Revision

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)

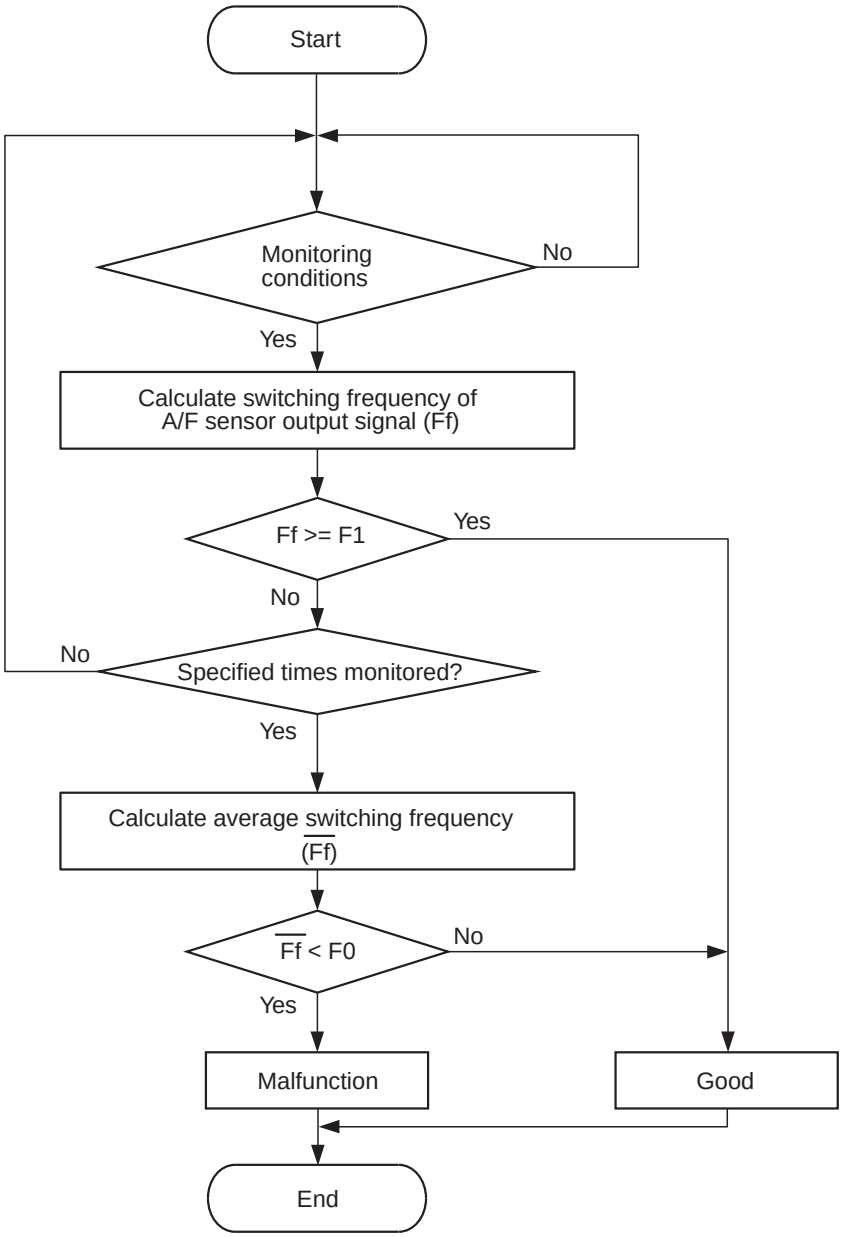
- Linear air-fuel ratio sensor heater monitor
- Misfire monitor
- Fuel system monitor

Sensor (The sensor below is determined to be normal)

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

DTC SET CONDITIONS

Logic Flow Chart



F0, F1: Threshold valve

AK900412

Check Conditions

- Engine speed is between 2,000 and 4,000 r/min <M/T> or 1,250 and 3,000 r/min <CVT>.
- Volumetric efficiency is between 22 and 65 percent.
- Engine coolant temperature is more than 60°C (140°F).
- Under the closed loop air/fuel control.
- The accelerator pedal is depressed.
- Short-term fuel trim is between –25 and +25 percent.
- More than 3 seconds have passed after the above mentioned conditions have been met.
- During the drive cycle, the ECM performs monitoring with the accumulated total time of 10 seconds, 5 times.

TSB Revision

Judgment Criteria
- The average frequency is less than 8 times.
- The frequency is less than 16 times.

FAIL-SAFE AND BACKUP FUNCTION
- None

OBD-II DRIVE CYCLE PATTERN
Refer to Diagnosis Function – OBD-II Drive Cycle – Pattern 1 P.13A-10.

TROUBLESHOOTING HINTS (The most likely causes for this code to be stored are:)
- Linear air-fuel ratio sensor failed.
- Connector damage.

DIAGNOSIS

Required Special Tools:
- MB992744: Vehicle communication interface-Lite (V.C.I.-Lite)
- MB992745: V.C.I.-Lite main harness A
- MB992747: V.C.I.-Lite USB cable short
- MB992748: V.C.I.-Lite USB cable long
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicles Communication Interface (V.C.I.)
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A (Vehicles with CAN communication system)

STEP 1. Check harness connector at linear air-fuel ratio sensor and harness connector 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 3.

STEP 2. Test the OBD-II drive cycle.

⚠ CAUTION

To prevent damage to scan tool (M.U.T.-III), always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool (M.U.T.-III).

(1) Connect scan tool (M.U.T-III). Refer to HOW TO CONNECT THE SCAN TOOL (M.U.T.-III) P.13A-10.
(2) Turn the ignition switch to the "ON" position and delete the DTC.
(3) Carry out the test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 1 P.13A-10.
(4) Check the diagnostic trouble code (DTC).

Q: Is DTC P0133 stored?

YES : Replace the linear air-fuel ratio sensor. 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.00-13.

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 1 P.13A-10.

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

Q: Is DTC P0133 stored?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0134: Linear Air-Fuel Ratio Sensor Circuit No Activity Detected

CIRCUIT OPERATION

The linear air-fuel ratio sensor and the ECM are connected by the following three lines to detect the air-fuel ratio.

- The line between the linear air-fuel ratio sensor connector terminal and the ECM terminal LPFL detects the air-fuel ratio.
- The auxiliary line between the linear air-fuel ratio sensor connector terminal and the ECM terminal LSFL detects the air-fuel ratio.
- The line between the linear air-fuel ratio sensor connector terminal and the ECM terminal LEFL is connected to ground.

TECHNICAL DESCRIPTION

- The ECM effects air/fuel ratio feedback control in accordance with the signals from the linear air-fuel ratio sensor.
- If the linear air-fuel ratio sensor has deteriorated, corrections will be made by the heated oxygen sensor (rear).

DESCRIPTIONS OF MONITOR METHODS

- The linear air-fuel ratio sensor is heated by the linear air-fuel ratio sensor heater or the exhaust gas. If the linear air-fuel ratio sensor remains not activated although being under the conditions where it can sufficiently be activated, the DTC is stored as a 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)

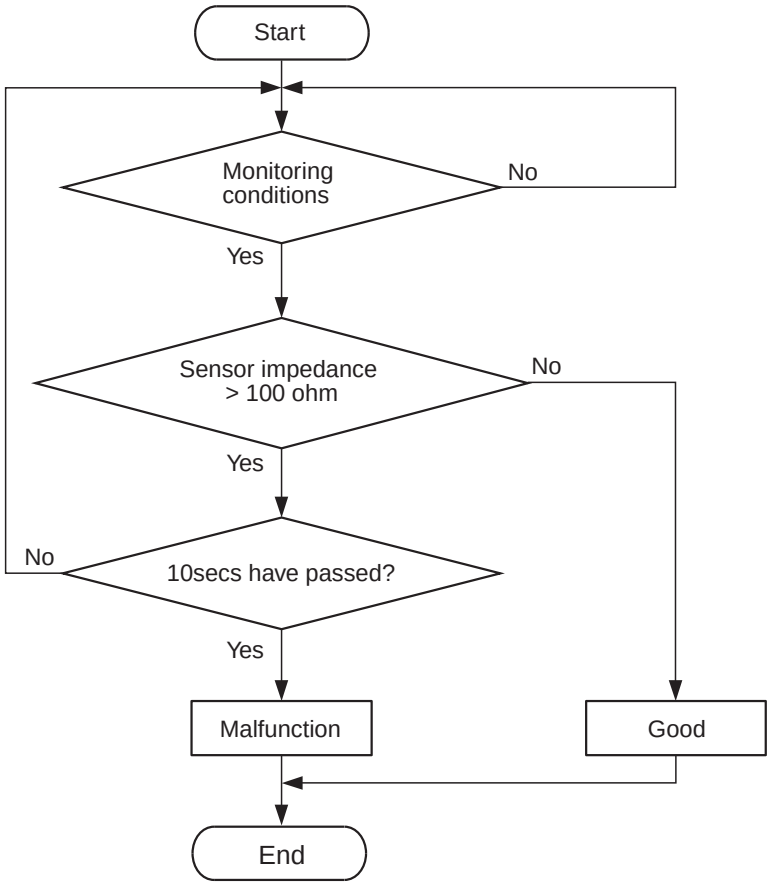
- Linear air-fuel ratio sensor heater monitor
- Misfire monitor
- Fuel system monitor

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



AK900361

Check Conditions

- Battery positive voltage is between 10 and 16.5 volts.
- More than 60 – 308 seconds have passed since the engine starting sequence was completed.

Judgment Criterion

- The sensor impedance is be higher than 100 ohms for 10 seconds.

FAIL-SAFE AND BACKUP FUNCTION

- Does not control air-fuel ratio closed loop.
- Control linear air-fuel ratio sensor heater off.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnosis Function – OBD-II Drive Cycle – Pattern 21 P.13A-10.

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

- Linear air-fuel ratio sensor failed.
- Open linear air-fuel ratio sensor circuit, harness damage or connector damage.

DIAGNOSIS

Required Special Tools:

- MB992744: Vehicle communication interface-Lite (V.C.I.-Lite)
- MB992745: V.C.I.-Lite main harness A
- MB992747: V.C.I.-Lite USB cable short
- MB992748: V.C.I.-Lite USB cable long

TSB Revision

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicles Communication Interface (V.C.I.)
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A (Vehicles with CAN communication system)

STEP 1. Check of open circuit and harness damage in LSFL line between linear air-fuel ratio sensor connector and ECM connector.

Q: Is the harness wire in good condition?

YES : Go to Step 2.
NO : Repair the connector(s) or wiring harness. Then go to Step 4.

STEP 2. Check of open circuit and harness damage in LEFL line between linear air-fuel ratio sensor connector and ECM connector.

Q: Is the harness wire in good condition?

YES : Go to Step 3.
NO : Repair the connector(s) or wiring harness. Then go to Step 4.

STEP 3. Test the OBD-II drive cycle.

⚠ CAUTION
To prevent damage to scan tool (M.U.T.-III), always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool (M.U.T.-III).

(1) Connect scan tool (M.U.T-III). Refer to HOW TO CONNECT THE SCAN TOOL (M.U.T.-III) P.13A-10.
(2) Turn the ignition switch to the "ON" position and delete the DTC.
(3) Carry out the test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 21 P.13A-10.
(4) Check the diagnostic trouble code (DTC).

Q: Is DTC P0134 stored?

YES : Replace the linear air-fuel ratio sensor. 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.00-13.

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 21 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0134 stored?

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

TSB Revision

DTC P0137: Heated Oxygen Sensor (rear) Circuit Low Voltage

CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the ECM terminal O2RL from the output terminal of the heated oxygen sensor (rear).
- Ground terminal of the heated oxygen sensor (rear) is grounded with ECM terminal ORLE.
- The ECM applies an offset voltage of 0.5 volt to ground terminal of the heated oxygen sensor (rear).

TECHNICAL DESCRIPTION

- The output signal of the linear air-fuel ratio sensor is compensated by the output signal of the heated oxygen sensor (rear).
- The ECM checks for the heated oxygen sensor (rear) output voltage.

DESCRIPTIONS OF MONITOR METHODS

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)

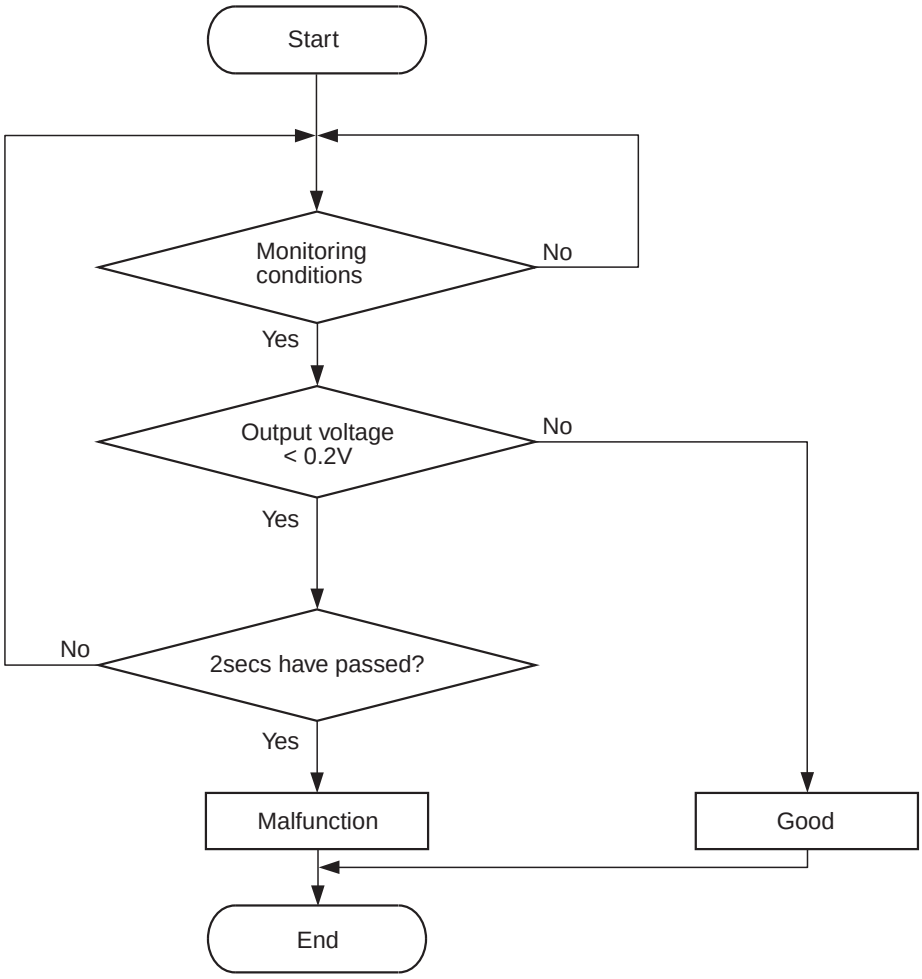
- Linear air-fuel ratio sensor monitor
- Linear air-fuel ratio sensor heater monitor
- Heated oxygen sensor heater (rear) monitor
- Heated oxygen sensor offset voltage monitor

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



AK604321

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.
- More than 65 – 335 seconds have passed since the engine starting sequence was completed.

Judgment Criterion

- Heated oxygen sensor (rear) output voltage is less than 0.2 volt for 2 seconds.

FAIL-SAFE AND BACKUP FUNCTION

- None

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 21 P.13A-10.

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

- Heated oxygen sensor (rear) failed.
- Open or shorted circuit in heated oxygen sensor (rear) output line or harness damage.
- Open circuit in heated oxygen sensor (rear) ground line or harness damage.
- Connector damage.
- ECM failed.

TSB Revision

DIAGNOSIS

Required Special Tools:

- MB992744: Vehicle communication interface-Lite (V.C.I.-Lite)
- MB992745: V.C.I.-Lite main harness A
- MB992747: V.C.I.-Lite USB cable short
- MB992748: V.C.I.-Lite USB cable long
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicles Communication Interface (V.C.I.)
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A (Vehicles with CAN communication system)
- MB991658: Test Harness

STEP 1. Using scan tool (M.U.T.-III), check data list item AD: Heated Oxygen Sensor (rear).

⚠ CAUTION

To prevent damage to scan tool (M.U.T.-III), always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool (M.U.T.-III).

(1) Connect scan tool (M.U.T-III). Refer to HOW TO CONNECT THE SCAN TOOL (M.U.T.-III) P.13A-10.
(2) Start the engine and run at idle.
(3) Set scan tool (M.U.T-III) to the data reading mode for item AD, Heated Oxygen Sensor (rear).
  a. Transaxle: 2nd (CVT: B range) speed
  b. Drive with wide open throttle
  c. Engine: 3,500 r/min or more
    - 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.00-13.
NO : Go to Step 2.

STEP 2. Measure the sensor output voltage at heated oxygen sensor (rear) connector by backprobing.

(1) Do not disconnect the heated oxygen sensor (rear) connector.
(2) Start the engine and run at idle.
(3) Measure the voltage between terminal O2RL line and ground by backprobing under the following driving.
  a. Transaxle: 2nd speed (CVT: B range)
  b. Drive with wide open throttle
  c. Engine: 3,500 r/min or more
    - The output voltage should be between 1.1 and 1.5 volts.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the measured voltage within the specified range?

YES : Go to Step 3.
NO : Go to Step 4.

STEP 3. Measure the sensor output voltage at ECM connector by backprobing.

(1) Do not disconnect the connector.
(2) Start the engine and run at idle.
(3) Measure the voltage between terminal O2RL and ground by backprobing under the following driving.
  a. Transaxle: 2nd speed (CVT: B range)
  b. Drive with wide open throttle
  c. Engine: 3,500 r/min or more
    - The output voltage should be between 1.1 and 1.5 volts.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the measured voltage between 1.1 and 1.5 volts?

YES : Go to Step 8.
NO : Repair or replace the connector(s), or check and repair the harness of open circuit and damage in O2RL line between heated oxygen sensor (rear) connector and ECM connector. Then go to Step 9.

STEP 4. Measure the sensor offset voltage at heated oxygen sensor (rear) harness side connector.

(1) Disconnect the heated oxygen sensor (rear) connector and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal ORLE line and ground.
  - Voltage should be between 0.4 and 0.6 volt.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the measured voltage between 0.4 and 0.6 volt?

YES : Go to Step 5.
NO : Repair or replace the connector(s), or check and repair the harness of open circuit in ORLE line between heated oxygen sensor (rear) connector and ECM connector. Then go to Step 9.

TSB Revision

STEP 5. Check of harness damage in ORLE line between heated oxygen sensor (rear) connector and ECM connector.

Q: Is the harness wire in good condition?

YES : Go to Step 6.

NO : Repair the connector(s) or wiring harness. Then go to Step 9.

STEP 6. Check of short circuit to ground in O2RL line between heated oxygen sensor (rear) connector and ECM connector.

Q: Is the harness wire in good condition?

YES : Go to Step 7.

NO : Repair the connector(s) or wiring harness. Then go to Step 9.

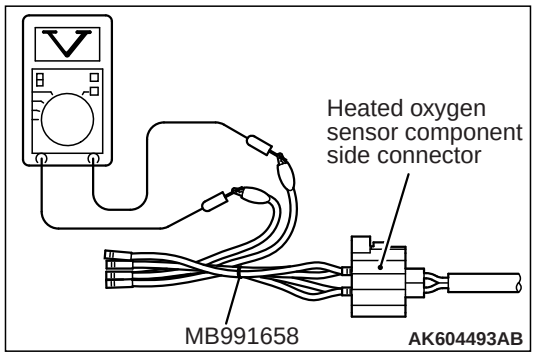
STEP 7. Check the heated oxygen sensor (rear).

(1) Disconnect the heated oxygen sensor (rear) connector and connect test harness special tool MB991658 to the connector on the heated oxygen sensor (rear) side.
(2) Warm up the engine until engine coolant temperature reaches 80°C (176°F) or higher.
(3) Drive at 50 km/h (31mph) or more for 10 minutes.
(4) Connect a digital voltage meter between terminal O2RL line and terminal ORLE line.
(5) Measure the output voltage of heated oxygen sensor under the following driving.
- Transaxle: 2nd speed (CVT: B range)
- Drive with wide open throttle
- Engine: 3,500 r/min or more

Standard value: 0.6 – 1.0 V

NOTE: If the temperature of sensing area does not reach the high temperature [of approximately 400°C (752°F) or more] even though the heated oxygen sensor is normal, the output voltage would be possibly low in spite of the rich air-fuel ratio.

NOTE: When the vehicle is driven with high loads, the temperature of the sensing area of the heated oxygen sensor is sufficiently high. Thus, it is not necessary to apply the voltage to the heater.



Q: Is the measured voltage between 0.6 and 1.0 volt?

YES : Go to Step 8.

NO : Replace the heated oxygen sensor (rear). Then go to Step 9.

STEP 8. Using scan tool (M.U.T.-III), check data list item AD: Heated Oxygen Sensor (rear).

(1) Start the engine and run at idle.
(2) Set scan tool (M.U.T.-III) to the data reading mode for item AD, Heated Oxygen Sensor (rear).
  a. Transaxle: 2nd speed (CVT: B range)
  b. Drive with wide open throttle
  c. Engine: 3,500 r/min or more
    - The output voltage should be between 0.6 and 1.0 volt.
(3) 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.00-13.

NO : Replace the ECM (Refer to, Removal and Installation P.13A-656). Then go to Step 9.

STEP 9. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 21 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0137 stored?

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

DTC P0138: Heated Oxygen Sensor (rear) Circuit High Voltage

CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the ECM terminal O2RL from the output terminal of the heated oxygen sensor (rear).
- Ground terminal of the heated oxygen sensor (rear) is grounded with ECM terminal ORLE.
- The ECM applies an offset voltage of 0.5 volt to ground terminal of the heated oxygen sensor (rear).

TECHNICAL DESCRIPTION

- The output signal of the linear air-fuel ratio sensor is compensated by the output signal of the heated oxygen sensor (rear).
- The ECM checks for the heated oxygen sensor (rear) output voltage.

DESCRIPTIONS OF MONITOR METHODS

Heated oxygen sensor (rear) output voltage is over specified range.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

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

- Linear air-fuel ratio sensor monitor
- Linear air-fuel ratio sensor heater monitor
- Heated oxygen sensor heater (rear) monitor
- Heated oxygen sensor offset voltage monitor

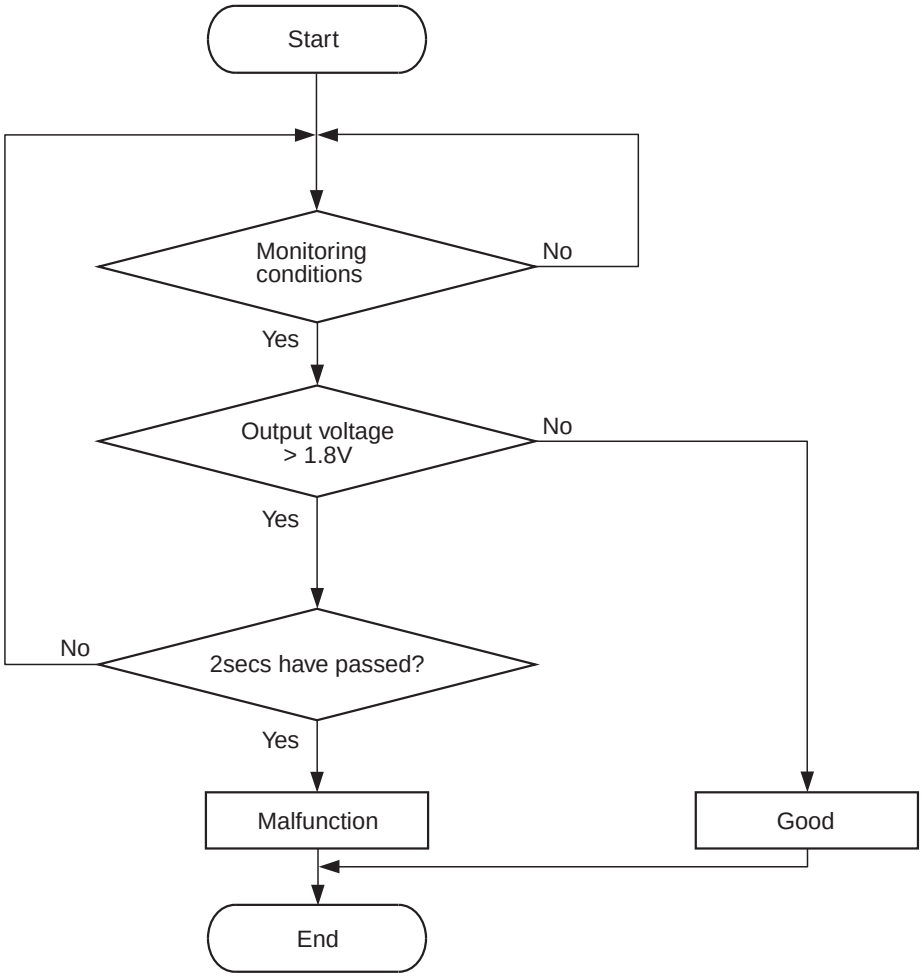
Sensor (The sensor below is determined to be normal)

- Mass airflow sensor

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

DTC SET CONDITIONS

Logic Flow Chart



AK604322

Check Conditions

- More than 2 seconds have passed since the engine starting sequence was completed.
- Heated oxygen sensor offset voltage is between 0.4 and 0.6 volt.

Judgment Criterion

- Heated oxygen sensor (rear) output voltage is more than 1.8 volts for 2 seconds.

FAIL-SAFE AND BACKUP FUNCTION

- None

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 22 P.13A-10.

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

- Short circuit in heated oxygen sensor (rear) output line.
- Connector damage.
- ECM failed.

TSB Revision

DIAGNOSIS

Required Special Tools:

- MB992744: Vehicle communication interface-Lite (V.C.I.-Lite)
- MB992745: V.C.I.-Lite main harness A
- MB992747: V.C.I.-Lite USB cable short
- MB992748: V.C.I.-Lite USB cable long
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicles Communication Interface (V.C.I.)
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A (Vehicles with CAN communication system)
- MB991658: Test Harness

STEP 1. Using scan tool (M.U.T.-III), check data list item AD: Heated Oxygen Sensor (rear).

⚠ CAUTION

To prevent damage to scan tool (M.U.T.-III), always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool (M.U.T.-III).

(1) Connect scan tool (M.U.T-III). Refer to HOW TO CONNECT THE SCAN TOOL (M.U.T.-III) P.13A-10.
(2) Start the engine and run at idle.
(3) Set scan tool (M.U.T-III) to the data reading mode for item AD, Heated Oxygen Sensor (rear).
  a. Transaxle: 2nd (CVT: B range) speed
  b. Drive with wide open throttle
  c. Engine: 3,500 r/min or more
    - 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.00-13.
NO : Go to Step 2.

STEP 2. Check of short circuit to power supply in O2RL line between heated oxygen sensor (rear) connector and ECM connector.

Q: Is the harness wire in good condition?

YES : Go to Step 3.
NO : Repair the connector(s) or wiring harness. Then go to Step 4.

STEP 3. Using scan tool (M.U.T.-III), check data list item AD: Heated Oxygen Sensor (rear).

(1) Start the engine and run at idle.
(2) Set scan tool (M.U.T.-III) to the data reading mode for item AD, Heated Oxygen Sensor (rear).
  a. Transaxle: 2nd speed (CVT: B range)
  b. Drive with wide open throttle
  c. Engine: 3,500 r/min or more
    - 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 : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-13.
NO : Replace the ECM (Refer to Removal and Installation P.13A-656). 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 22 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0138 stored?

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

DTC P0139: Heated Oxygen Sensor (rear) Circuit Slow Response

CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the ECM terminal O2RL from the output terminal of the heated oxygen sensor (rear).
- Ground terminal of the heated oxygen sensor (rear) is grounded with ECM terminal ORLE.
- The ECM applies an offset voltage of 0.5 volt to ground terminal of the heated oxygen sensor (rear).

TECHNICAL DESCRIPTION

- The output signal of the linear air-fuel ratio sensor is compensated by the output signal of the heated oxygen sensor (rear).
- The ECM checks for the heated oxygen sensor (rear) output voltage.

DESCRIPTIONS OF MONITOR METHODS

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)

- Linear air-fuel ratio sensor monitor
- Linear air-fuel ratio sensor heater monitor
- Heated oxygen sensor heater (rear) monitor
- Heated oxygen sensor offset voltage monitor

Sensor (The sensor below is determined to be normal)

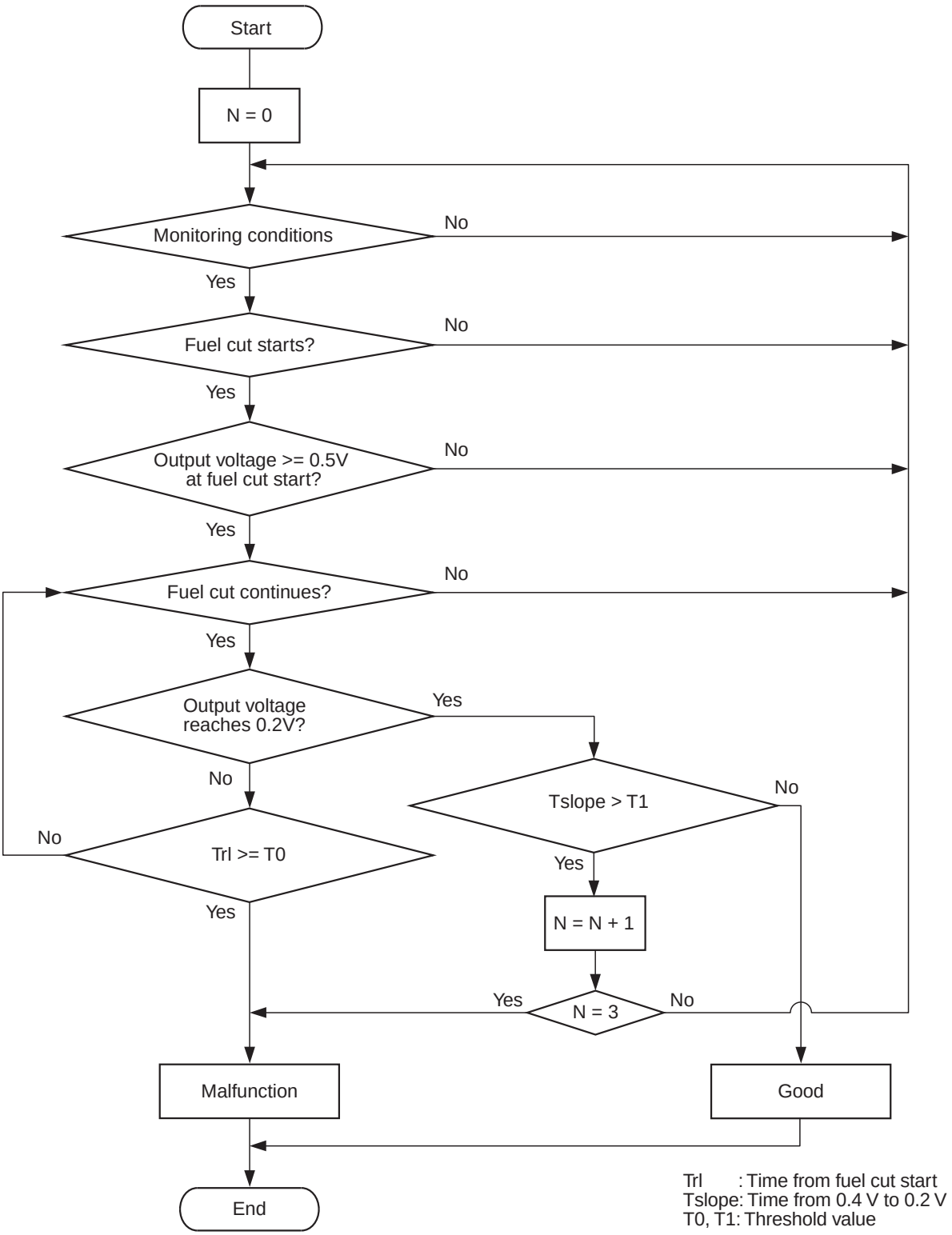
- Mass airflow sensor

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

DTC SET CONDITIONS

Logic Flow Chart



AK900362

TSB Revision

Check Conditions
- Engine coolant temperature is more than 76°C (169°F).
- The linear air-fuel ratio sensor is active.
- The cumulative mass airflow sensor output is more than 901 g.
- Fuel is being shut off.
- Heated oxygen sensor (rear) output voltage is more than 0.5 volt when fuel cut is started.
- It has been taking more than 180 seconds since the drive signal of the heated oxygen sensor (rear) heater was turned on.
- Barometric pressure is higher than 76 kPa (22.4 in.Hg).
- Sum of Air flow rate accumulated during open loop operation and subtracted during fuel cut or closed loop operation is less than 200 g.
- Sum of Air flow rate accumulated during fuel cut before heated oxygen sensor (rear) drops below 0.5 volt (adopted only for slope monitor) is more than 1.5 g.

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

Check Conditions
- Engine coolant temperature is higher than 76°C (169°F).
- The linear air-fuel ratio sensor is active.
- The cumulative mass airflow sensor output is higher than 901 g.
- Fuel is being shut off.
- The heated oxygen sensor (rear) output voltage is higher than 0.5 volt when fuel cut is started.
- It has been taking more than 180 seconds since the drive signal of the heated oxygen sensor (rear) heater was turned on.
- Barometric pressure is higher than 76 kPa (22.4 in.Hg).
- The ECM monitors for this condition for 3 cycles of 0.3 second each during drive cycles.
- Sum of Air flow rate accumulated during open loop operation and subtracted during fuel cut or closed loop operation is less than 200 g.
- Sum of Air flow rate accumulated during fuel cut before heated oxygen sensor (rear) drops below 0.5 volt (adopted only for slope monitor) is more than 1.5 g.

Judgment Criteria
- The heated oxygen sensor (rear) output voltage does not reach 0.2 volt for 0.5 second from 0.4 volt while fuel is being shut off.
- The ECM monitors for this condition once during the drive cycle.

NOTE: Monitoring stops after fuel has been shut off for more than 80 seconds.

FAIL-SAFE AND BACKUP FUNCTION
- None

OBD-II DRIVE CYCLE PATTERN
Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 10 P.13A-10.

TROUBLESHOOTING HINTS (The most likely causes for this code to be stored are:)
- Heated oxygen sensor (rear) deteriorated.
- Connector damage.
- ECM failed.

DIAGNOSIS

Required Special Tool:
- MB992744: Vehicle communication interface-Lite (V.C.I.-Lite)
- MB992745: V.C.I.-Lite main harness A
- MB992747: V.C.I.-Lite USB cable short
- MB992748: V.C.I.-Lite USB cable long
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicles Communication Interface (V.C.I.)
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A (Vehicles with CAN communication system)

STEP 1. Using scan tool (M.U.T.-III), check data list item AD: Heated Oxygen Sensor (rear).

⚠ CAUTION

To prevent damage to scan tool (M.U.T.-III), always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool (M.U.T.-III).

(1) Connect scan tool (M.U.T-III). Refer to HOW TO CONNECT THE SCAN TOOL (M.U.T.-III) P.13A-10.
(2) Start the engine and run at idle.
(3) Set scan tool (M.U.T-III) to the data reading mode for item AD, Heated Oxygen Sensor (rear).
(4) Warm up the engine.
- After increasing the output voltage 0.5 volt or more by the engine revving, finish it. Then confirm that the output voltage reduces to 0.2 volt or less within 6 seconds.

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

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-13.
NO : Replace the heated oxygen sensor (rear). Then go to Step 2.

STEP 2. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 10 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0139 stored?

YES : Refer to DTC P0137 – Heated Oxygen Sensor (rear) Circuit Low Voltage P.13A-172, DTC P0138 – Heated Oxygen Sensor (rear) Circuit High Voltage P.13A-177.
NO : The inspection is complete.

DTC P0140: Heated Oxygen Sensor (rear) Circuit No Activity Detected

CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the ECM terminal O2RL from the output terminal of the heated oxygen sensor (rear).
- Ground terminal of the heated oxygen sensor (rear) is grounded with ECM terminal ORLE.
- The ECM applies an offset voltage of 0.5 volt to ground terminal of the heated oxygen sensor (rear).

TECHNICAL DESCRIPTION

- The output signal of the linear air-fuel ratio sensor is compensated by the output signal of the heated oxygen sensor (rear).
- The ECM checks for the heated oxygen sensor (rear) output voltage.

DESCRIPTIONS OF MONITOR METHODS

Heated oxygen sensor (rear) output voltage does not change during specified go/stop operations including fuel cut are repeated.

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MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

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

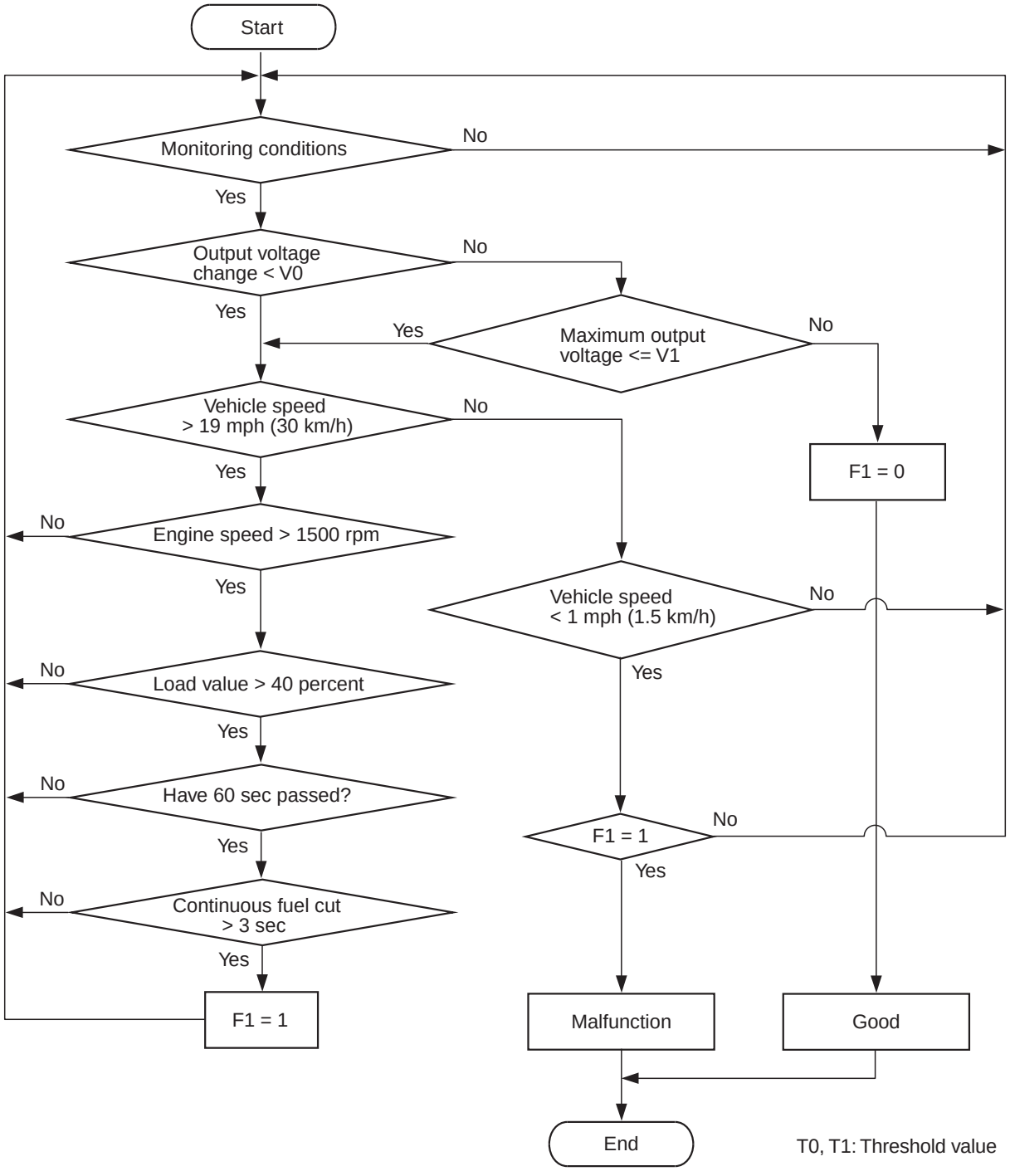
- Linear air-fuel ratio sensor monitor
- Linear air-fuel ratio sensor heater monitor
- Heated oxygen sensor heater (rear) monitor
- Heated oxygen sensor offset voltage monitor

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



ACC07265

Check Conditions

- Engine coolant temperature is more than 76°C (169°F).
- The linear air-fuel ratio sensor is active.
- The cumulative mass airflow sensor output is more than 901 g.
- Repeat 1 time or more: drive[*1], stop[*2].
  Drive[*1]:

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- Engine speed is more than 1,500 r/min.
- Volumetric efficiency is more than 40 percent.
- Vehicle speed is more than 30 km/h (19 mph).
- A total of more than 60 seconds have passed with the above mentioned conditions, and more than 3 seconds have passed with the fuel shut off.

Stop*2:

- Vehicle speed is less than 1.5 km/h (1 mph).

Judgment Criterion

- Change in the output voltage of the heated oxygen sensor (rear) is less than 0.313 volt.

or

- The maximum output voltage of the heated oxygen sensor (rear) is less than 0.508 volt.

NOTE: Monitoring stops after fuel has been shut off for more than 80 seconds.

FAIL-SAFE AND BACKUP FUNCTION

- None

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 12 P.13A-10.

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

- Heated oxygen sensor (rear) deteriorated.
- Connector damage.
- ECM failed.

DIAGNOSIS

Required Special Tool:

- MB992744: Vehicle communication interface-Lite (V.C.I.-Lite)
- MB992745: V.C.I.-Lite main harness A
- MB992747: V.C.I.-Lite USB cable short
- MB992748: V.C.I.-Lite USB cable long
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicles Communication Interface (V.C.I.)
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A (Vehicles with CAN communication system)

STEP 1. Using scan tool (M.U.T.-III), check data list item AD: Heated Oxygen Sensor (rear).

⚠ CAUTION

To prevent damage to scan tool (M.U.T.-III), always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool (M.U.T.-III).

(1) Connect scan tool (M.U.T-III). Refer to HOW TO CONNECT THE SCAN TOOL (M.U.T.-III) P.13A-10.
(2) Start the engine and run at idle.
(3) Set scan tool (M.U.T-III) to the data reading mode for item AD, Heated Oxygen Sensor (rear).
  a. Transaxle: 2nd (CVT: B range) speed
  b. Drive with wide open throttle
  c. Engine: 3,500 r/min or more
    - 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.00-13.
NO : Replace the heated oxygen sensor (rear). Then go to Step 2.

STEP 2. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 12 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0140 stored?

YES : Refer to DTC P0137 – Heated Oxygen Sensor (rear) Circuit Low Voltage P.13A-172, DTC P0138 – Heated Oxygen Sensor (rear) Circuit High Voltage P.13A-177.
NO : The inspection is complete.

DTC P0171: System too Lean

Fuel Trim Circuit

- Refer to, DTC P0261 – Injector Circuit Low input - Cylinder 1 P.13A-221, DTC P0264 – Injector Circuit Low Input - Cylinder 2 P.13A-227, DTC P0267 – Injector Circuit Low Input - Cylinder 3 P.13A-233.

CIRCUIT OPERATION

- Refer to, DTC P0261 – Injector Circuit Low input - Cylinder 1 P.13A-221, DTC P0264 – Injector Circuit Low Input - Cylinder 2 P.13A-227, DTC P0267 – Injector Circuit Low Input - Cylinder 3 P.13A-233.

TECHNICAL DESCRIPTION

- If a malfunction occurs in the fuel system, the fuel trim value becomes too large.

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- The ECM checks whether the fuel trim value is within a specified range.

DESCRIPTIONS OF MONITOR METHODS

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)

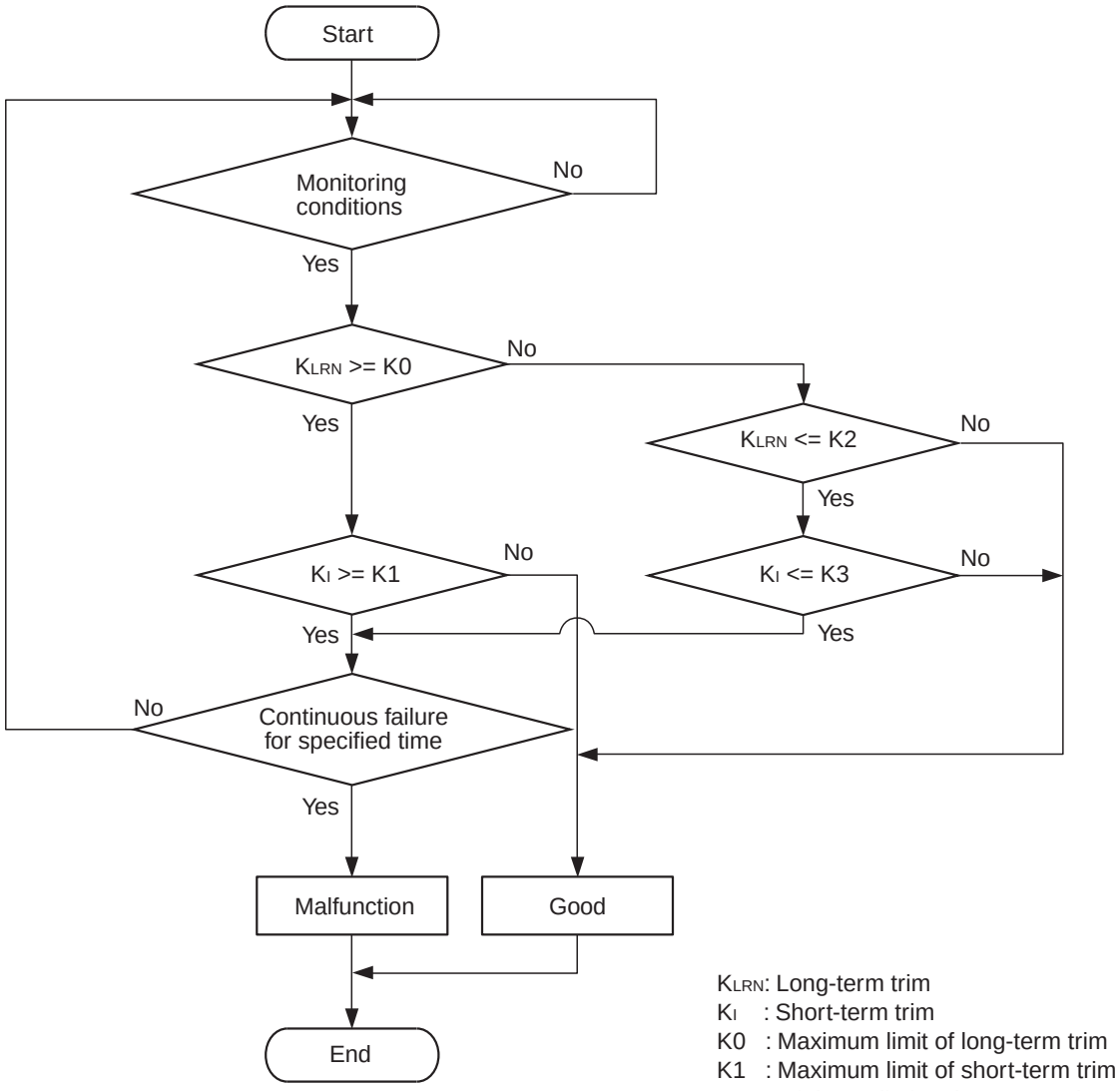
- Misfire monitor

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



AK703881

Check Conditions

- Engine coolant temperature is less than 100°C (212°F) when the engine is started.
- Intake air temperature is less than 60°C (140°F) when the engine is started.
- Under the closed loop air/fuel ratio control.
- Engine coolant temperature is more than 76°C (169°F).
- Mass airflow sensor output is more than 6 g/sec.

Judgment Criterion

- Long-term fuel trim is more than +12.5 percent for 5 seconds.

or

- Short-term fuel trim is more than +7.0 percent for 5 seconds.

Check Conditions

- Engine coolant temperature is less than 100°C (212°F) when the engine is started.
- Intake air temperature is less than 60°C (140°F) when the engine is started.
- Under the closed loop air/fuel ratio control.
- Engine coolant temperature is more than 76°C (169°F).
- Mass airflow sensor output is less than 6 g/sec.

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Judgment Criterion
- Long-term fuel trim is more than +12.5 percent for 5 seconds.

or
- Short-term fuel trim is more than +12.1 percent for 5 seconds.

Check Conditions
- Engine coolant temperature is more than 100°C (212°F) when the engine is started.
- Intake air temperature is more than 60°C (140°F) when the engine is started.
- Under the closed loop air/fuel ratio control.
- Engine coolant temperature is more than 76°C (169°F).
- Mass airflow sensor output is more than 6 g/sec.

Judgment Criterion
- Long-term fuel trim is more than +12.5 percent for 5 seconds.

or
- Short-term fuel trim is more than +17.2 percent for 5 seconds.

Check Conditions
- Engine coolant temperature is more than 100°C (212°F) when the engine is started.
- Intake air temperature is more than 60°C (140°F) when the engine is started.
- Under the closed loop air/fuel ratio control.
- Engine coolant temperature is more than 76°C (169°F).
- Mass airflow sensor output is less than 6 g/sec.

Judgment Criterion
- Long-term fuel trim is more than +12.5 percent for 5 seconds.

or
- Short-term fuel trim is more than +22.3 percent for 5 seconds.

Check Conditions
- Engine coolant temperature is more than 76°C (169°F).
- Under the closed loop air/fuel ratio control.

Judgment Criterion
- Long-term fuel trim is +12.5 percent for 2 seconds.

or
- Short-term fuel trim is +25.0 percent for 2 seconds.

FAIL-SAFE AND BACKUP FUNCTION
- None

OBD-II DRIVE CYCLE PATTERN
Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 20 P.13A-10.

TROUBLESHOOTING HINTS (The most likely causes for this code to be stored are:)
- Mass airflow sensor failed.
- Injector failed.
- Incorrect fuel pressure.
- Air drawn in from gaps in gasket, seals, etc.
- Engine coolant temperature sensor failed.
- Intake air temperature sensor failed.
- Barometric pressure sensor failed.
- Manifold absolute pressure sensor failed.
- Exhaust leak.
- Use of incorrect or contaminated fuel.
- Harness damage in injector circuit or connector damage.
- ECM failed.

DIAGNOSIS
Required Special Tools:
- MB992744: Vehicle communication interface-Lite (V.C.I.-Lite)
- MB992745: V.C.I.-Lite main harness A
- MB992747: V.C.I.-Lite USB cable short
- MB992748: V.C.I.-Lite USB cable long
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicles Communication Interface (V.C.I.)
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A (Vehicles with CAN communication system)

STEP 1. Check for exhaust leak.

Q: Are there any abnormalities?

YES : Repair it. Then go to Step 12.
NO : Go to Step 2.

STEP 2. Check for intake system vacuum leak.

Q: Are there any abnormalities?

YES : Repair it. Then go to Step 12.
NO : Go to Step 3.

STEP 3. Using scan tool (M.U.T.-III), check data list item 10: Mass Airflow Sensor.

⚠ CAUTION
To prevent damage to scan tool (M.U.T.-III), always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool (M.U.T.-III).

(1) Connect scan tool (M.U.T-III). Refer to HOW TO CONNECT THE SCAN TOOL (M.U.T.-III) P.13A-10.
(2) Start the engine and run at idle.
(3) Set scan tool (M.U.T-III) 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 760 and 1,080 millivolts.
- When 2,500 r/min, between 1,130 and 1,530 millivolts.

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

Q: Is the sensor operating properly?

YES : Go to Step 4.
NO : Refer to, DTC P0102 – Mass Airflow Circuit Low Input P.13A-89, DTC P0103 – Mass Airflow Circuit High Input P.13A-94.

STEP 4. Using scan tool (M.U.T.-III), check data list item 5: Intake Air Temperature Sensor.

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

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

Q: Is the sensor operating properly?

YES : Go to Step 5.
NO : Refer to, DTC P0111 – Intake Air Temperature Circuit Range/Performance Problem P.13A-113, DTC P0112 – Intake Air Temperature Circuit Low Input P.13A-117, DTC P0113 – Intake Air Temperature Circuit High Input P.13A-120.

STEP 5. Using scan tool (M.U.T.-III), check data list item 6: Engine Coolant Temperature Sensor.

(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool (M.U.T.-III) to the data reading mode for item 6, Engine Coolant Temperature Sensor.
- The engine coolant temperature and temperature shown with the scan tool should approximately match.

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

Q: Is the sensor operating properly?

YES : Go to Step 6.
NO : Refer to, DTC P0116 – Engine Coolant Temperature Circuit Range/Performance Problem P.13A-124, DTC P0117 – Engine Coolant Temperature Circuit Low Input P.13A-128, DTC P0118 – Engine Coolant Temperature Circuit High Input P.13A-131.

STEP 6. Using scan tool (M.U.T.-III), check data list item 8: Manifold Absolute Pressure Sensor.

(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool (M.U.T.-III) 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.
- Warm up the engine. When the engine is idling, 22 – 42 kPa (6.5 – 12.4 in.Hg).
- When the engine is suddenly revved, manifold absolute pressure varies.

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

Q: Is the sensor operating properly?

YES : Go to Step 7.
NO : Refer to, DTC P0106 – Manifold Absolute Pressure Circuit Range/Performance Problem P.13A-98, DTC P0107 – Manifold Absolute Pressure Circuit Low Input P.13A-104, DTC P0108 – Manifold Absolute Pressure Circuit High Input P.13A-109.

STEP 7. Check the injector.

- Injector check (Refer to P.13A-648).

Q: Is the measured resistance normal?

YES : Go to Step 8.
NO : Replace the faulty injector. Then go to Step 12.

STEP 8. Check of harness damage between injector connector and ECM connector.

a. Check the harness wire in INJ1 line between injector connector and ECM connector at No. 1 cylinder injector.
b. Check the harness wire in INJ2 line between injector connector and ECM connector at No. 2 cylinder injector.
c. Check the harness wire in INJ3 line between injector connector and ECM connector at No. 3 cylinder injector.

Q: Are the harness wires in good condition?

YES : Go to Step 9.
NO : Repair the connector(s) or wiring harness. Then go to Step 12.

STEP 9. Check the fuel pressure.

Refer to, Fuel Pressure Test P.13A-639.

Q: Is the fuel pressure normal?

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

STEP 10. Check for entry of foreign matter (water, diesel fuel, etc.) into fuel.

Q: Are there any abnormalities?

YES : Replace the fuel. Then go to Step 12.
NO : Go to Step 11.

STEP 11. Replace the injector.

(1) Replace the injector.
(2) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 20 P.13A-10.
(3) Check the diagnostic trouble code (DTC).

Q: Is DTC P0171 stored?

YES : Replace the ECM (Refer to, Removal and Installation P.13A-656). Then go to Step 12.
NO : The inspection is complete.

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 20 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0171 stored?

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

DTC P0172: System too Rich

Fuel Trim Circuit

- Refer to, DTC P0261 – Injector Circuit Low input - Cylinder 1 P.13A-221, DTC P0264 – Injector Circuit Low Input - Cylinder 2 P.13A-227, DTC P0267 – Injector Circuit Low Input - Cylinder 3 P.13A-233.

CIRCUIT OPERATION

- Refer to, DTC P0261 – Injector Circuit Low input - Cylinder 1 P.13A-221, DTC P0264 – Injector Circuit Low Input - Cylinder 2 P.13A-227, DTC P0267 – Injector Circuit Low Input - Cylinder 3 P.13A-233.

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

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)

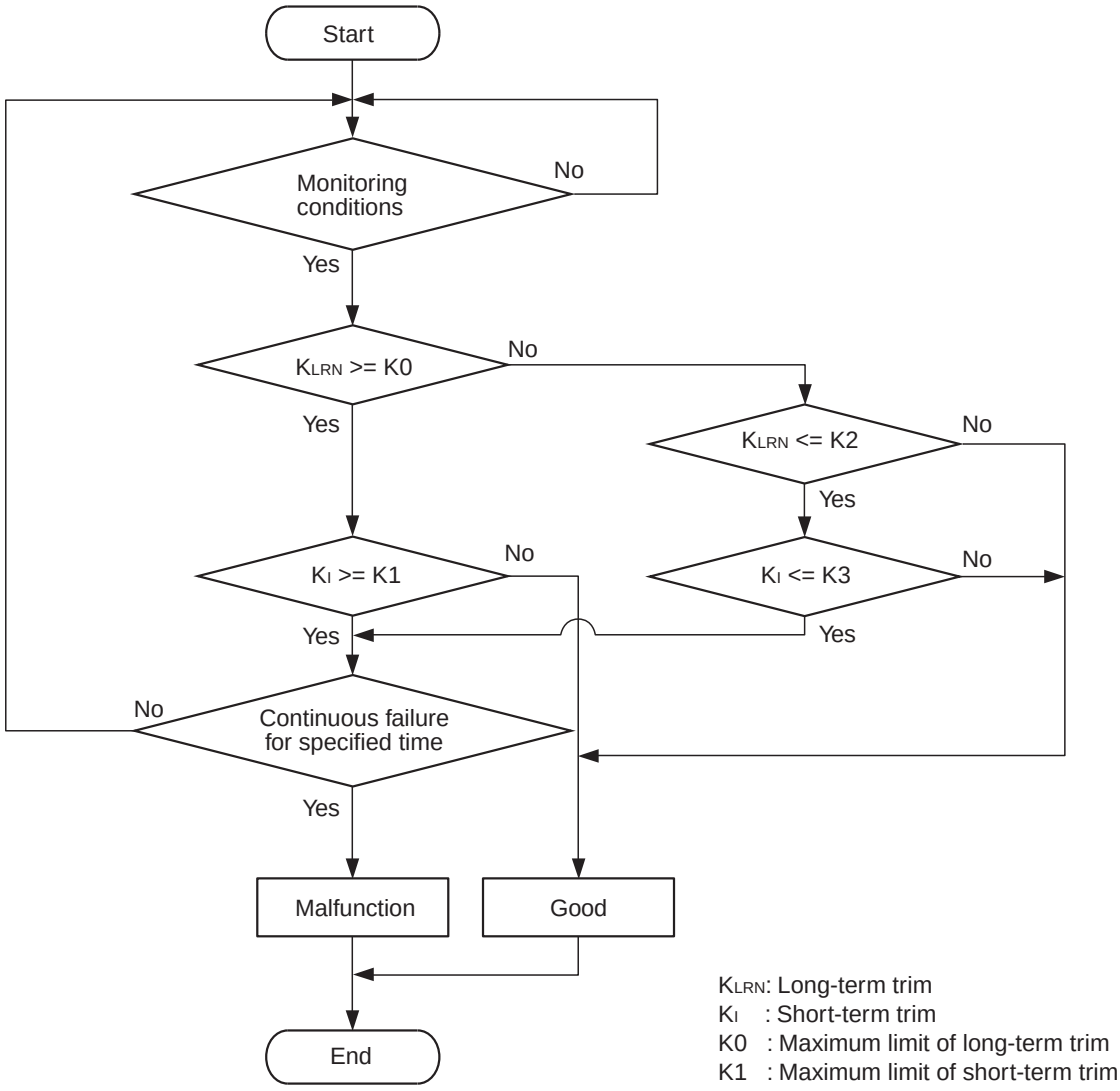
- Misfire monitor

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



AK703881

Check Conditions

- Under the closed loop air/fuel ratio control.
- Engine coolant temperature is more than 76°C (169°F).
- Mass airflow sensor output is more than 6 g/sec.

Judgment Criterion

- Long-term fuel trim is less than −12.5 percent for 5 seconds.

or

- Short-term fuel trim is less than −10.2 percent for 5 seconds.

Check Conditions

- Under the closed loop air/fuel ratio control.
- Engine coolant temperature is more than 76°C (169°F).
- Mass airflow sensor output is less than 6 g/sec.

Judgment Criterion

- Long-term fuel trim is less than −12.5 percent for 5 seconds.

or

- Short-term fuel trim is less than −15.2 percent for 5 seconds.

TSB Revision

Check Conditions
- Engine coolant temperature is more than 76°C (169°F).
- Under the closed loop air/fuel ratio control.

Judgment Criterion
- Long-term fuel trim is –12.5 percent for 2 seconds.

or
- Short-term fuel trim is –25.0 percent for 2 seconds.

FAIL-SAFE AND BACKUP FUNCTION
- None

OBD-II DRIVE CYCLE PATTERN
Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 20 P.13A-10.

TROUBLESHOOTING HINTS (The most likely causes for this code to be stored are:)
- Mass airflow sensor failed.
- Injector failed.
- Incorrect fuel pressure.
- Engine coolant temperature sensor failed.
- Intake air temperature sensor failed.
- Barometric pressure sensor failed.
- Manifold absolute pressure sensor failed.
- ECM failed.

DIAGNOSIS
Required Special Tools:
- MB992744: Vehicle communication interface-Lite (V.C.I.-Lite)
- MB992745: V.C.I.-Lite main harness A
- MB992747: V.C.I.-Lite USB cable short
- MB992748: V.C.I.-Lite USB cable long
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicles Communication Interface (V.C.I.)
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A (Vehicles with CAN communication system)

STEP 1. Using scan tool (M.U.T.-III), check data list item 10: Mass Airflow Sensor.

⚠ CAUTION
To prevent damage to scan tool (M.U.T.-III), always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool (M.U.T.-III).

(1) Connect scan tool (M.U.T-III). Refer to HOW TO CONNECT THE SCAN TOOL (M.U.T.-III) P.13A-10.
(2) Start the engine and run at idle.
(3) Set scan tool (M.U.T-III) 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 760 and 1,080 millivolts.
  - When 2,500 r/min, between 1,130 and 1,530 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 P0102 – Mass Airflow Circuit Low Input P.13A-89, DTC P0103 – Mass Airflow Circuit High Input P.13A-94.

STEP 2. Using scan tool (M.U.T.-III), check data list item 5: Intake Air Temperature Sensor.

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

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

Q: Is the sensor operating properly?

YES : Go to Step 3.
NO : Refer to, DTC P0111 – Intake Air Temperature Circuit Range/Performance Problem P.13A-113, DTC P0112 – Intake Air Temperature Circuit Low Input P.13A-117, DTC P0113 – Intake Air Temperature Circuit High Input P.13A-120.

STEP 3. Using scan tool (M.U.T.-III), check data list item 6: Engine Coolant Temperature Sensor.

(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool (M.U.T.-III) to the data reading mode for item 6, Engine Coolant Temperature Sensor.
- The engine coolant temperature and temperature shown with the scan tool should approximately match.

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

Q: Is the sensor operating properly?

YES : Go to Step 4.
NO : Refer to, DTC P0116 – Engine Coolant Temperature Circuit Range/Performance Problem P.13A-124, DTC P0117 – Engine Coolant Temperature Circuit Low Input P.13A-128, DTC P0118 – Engine Coolant Temperature Circuit High Input P.13A-131.

STEP 4. Using scan tool (M.U.T.-III), check data list item 8: Manifold Absolute Pressure Sensor.

(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool (M.U.T.-III) 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.
- Warm up the engine. When the engine is idling, 22 – 42 kPa (6.5 – 12.4 in.Hg).
- When the engine is suddenly revved, manifold absolute pressure varies.

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

Q: Is the sensor operating properly?

YES : Go to Step 5.
NO : Refer to, DTC P0106 – Manifold Absolute Pressure Circuit Range/Performance Problem P.13A-98, DTC P0107 – Manifold Absolute Pressure Circuit Low Input P.13A-104, DTC P0108 – Manifold Absolute Pressure Circuit High Input P.13A-109.

STEP 5. Check the injector.

- Injector check (Refer to P.13A-648).

Q: Is the measured resistance normal?

YES : Go to Step 6.
NO : Replace the faulty injector. Then go to Step 8.

STEP 6. Check the fuel pressure.

Refer to, Fuel Pressure Test P.13A-639.

Q: Is the fuel pressure normal?

YES : Go to Step 7.
NO : Repair it. Then go to Step 8.

STEP 7. Replace the injector.

(1) Replace the injector.
(2) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 20 P.13A-10.
(3) Check the diagnostic trouble code (DTC).

Q: Is DTC P0172 stored?

YES : Replace the ECM (Refer to, Removal and Installation P.13A-656). 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 20 P.13A-10.

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

Q: Is DTC P0172 stored?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0181: Fuel Tank Temperature Sensor Circuit Range/Performance

CIRCUIT OPERATION

- 5-volt voltage is applied to the fuel tank temperature sensor output terminal from the ECM terminal F/TM 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 sensor ground terminal 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)

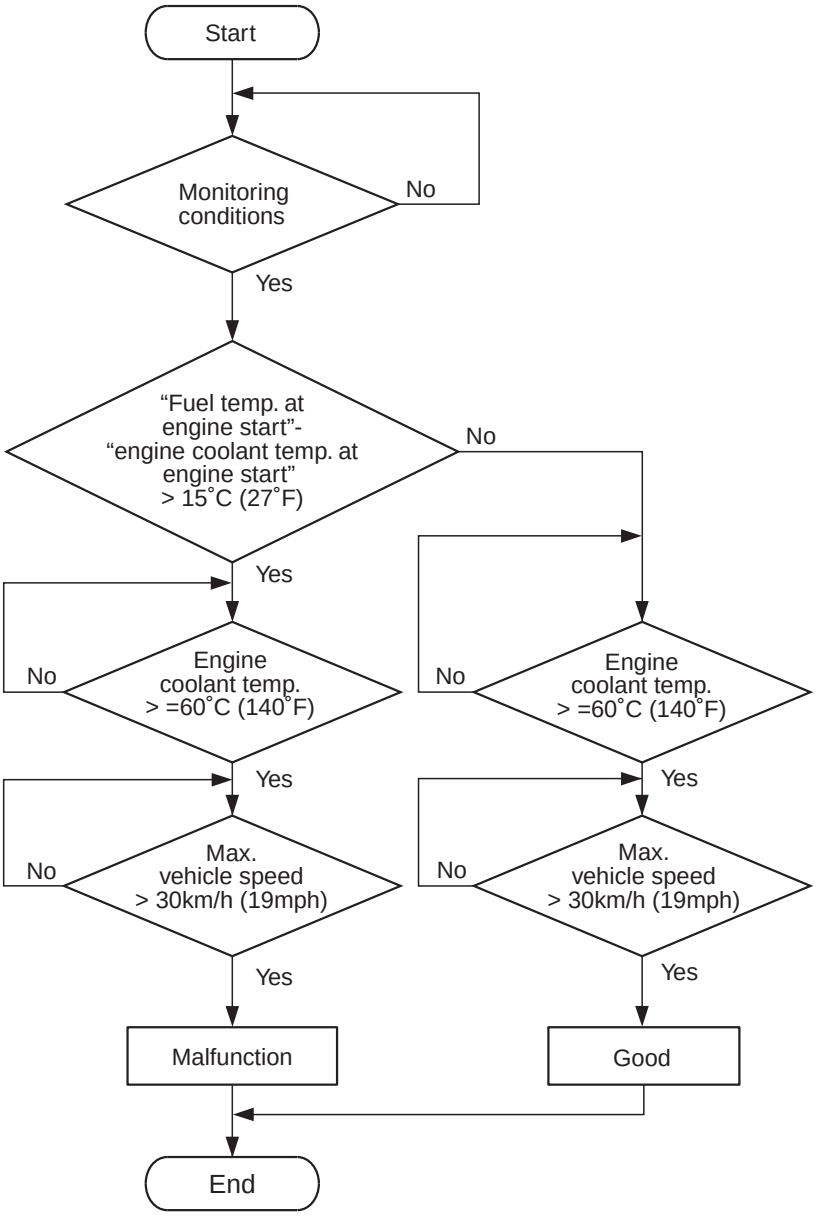
- Not applicable

Sensor (The sensor below is determined to be normal)

- Engine coolant temperature sensor
- Intake air temperature sensor

DTC SET CONDITIONS

Logic Flow Chart



AK700114

Check Conditions

- When the engine is started, the intake air temperature subtracted from the engine coolant temperature is less than 5°C (9°F).
- 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 more than 60°C (140°F).
- Maximum vehicle speed is more than 30 km/h (19 mph) after the engine starting sequence was completed.

Judgment Criterion

- When the engine is started, the engine coolant temperature subtracted from the fuel tank temperature is more than 15°C (27°F).

TSB Revision

FAIL-SAFE AND BACKUP FUNCTION

- None

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 13 P.13A-10.

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

- Fuel tank temperature sensor failed.
- Fuel tank temperature sensor circuit harness damage or 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

STEP 1. Using scan tool (M.U.T.-III), check data list item 53: Fuel Tank Temperature Sensor.

⚠ CAUTION
To prevent damage to scan tool (M.U.T.-III), always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool (M.U.T.-III).

(1) Connect scan tool (M.U.T-III). Refer to HOW TO CONNECT THE SCAN TOOL (M.U.T.-III) P.13A-10.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool (M.U.T.-III) 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.00-13.
NO : Go to Step 2.

STEP 2. Check the fuel tank temperature sensor.

(1) Disconnect the fuel pump module connector.
(2) Measure the resistance between terminal F/TM line and terminal ground line of the fuel pump module.

Standard value: 0.43 – 12.3 kΩ [at -10 to 70 °C (14 to 158 °F)]

Q: Is the measured resistance between 0.43 and 12.3 kΩ?

YES : Go to Step 3.
NO : Replace the fuel pump module. Then go to Step 6.

STEP 3. Check the continuity at fuel pump module harness side connector.

(1) Disconnect the fuel pump module connector and measure at the harness side.
(2) Check for the continuity between terminal ground line and ground.
- Continuity (2 ohms or less)

Q: Does continuity exist?

YES : Go to Step 4.
NO : Repair or replace the connector(s), or check and repair the harness of damage in ground line between fuel pump module connector and body ground. Then go to Step 6.

STEP 4. Check of harness damage in F/TM line between fuel pump module connector and ECM connector.

Q: Is the harness wire in good condition?

YES : Go to Step 5.
NO : Repair the connector(s) or wiring harness. Then go to Step 6.

STEP 5. Using scan tool (M.U.T.-III), check data list item 53: Fuel Tank Temperature Sensor.

(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool (M.U.T.-III) 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.

(3) 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.00-13.
NO : Replace the ECM (Refer to, Removal and Installation P.13A-656). 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 13 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0181 stored?

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

DTC P0182: Fuel Tank Temperature Sensor Circuit Low Input

CIRCUIT OPERATION

- 5-volt voltage is applied to the fuel tank temperature sensor output terminal from the ECM terminal F/TM 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 sensor ground terminal 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)

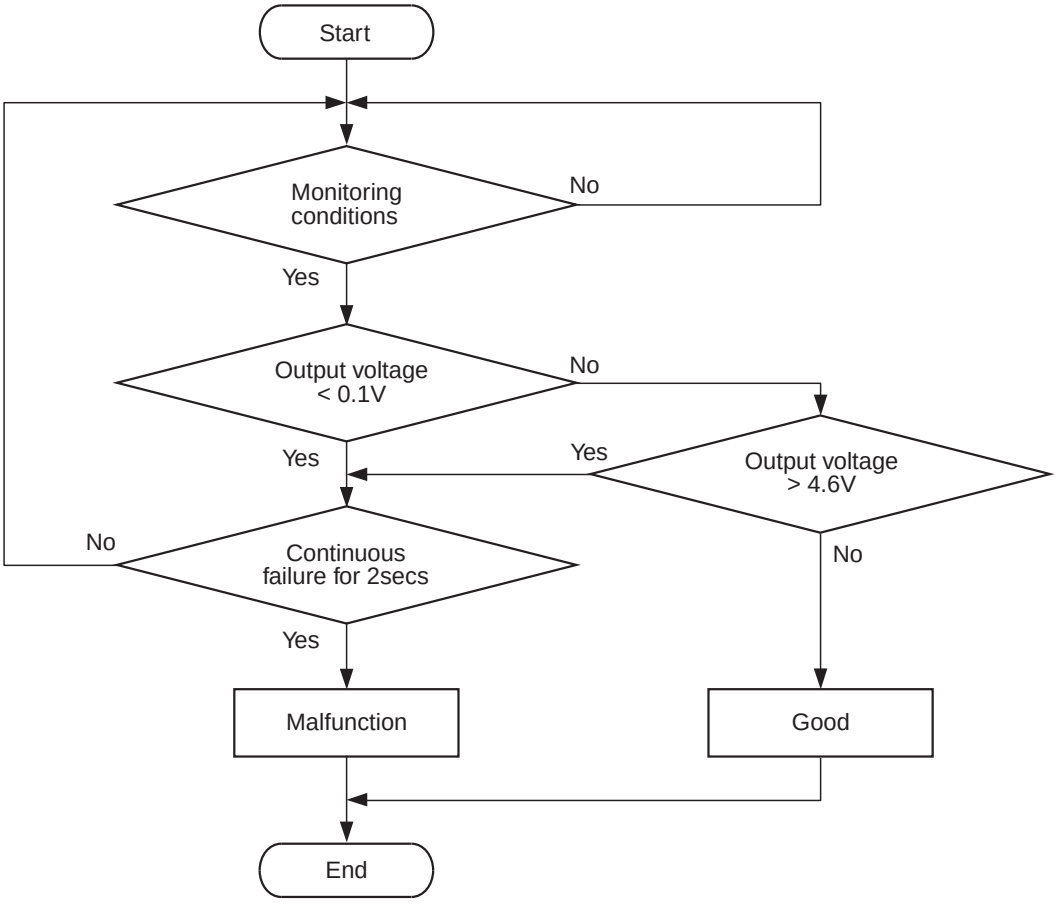
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



AK700478

TSB Revision

Check Condition

- More than 2 seconds have passed since the engine starting sequence was completed.

Judgment Criterion

- Fuel tank temperature sensor output voltage is less than 0.1 volt for 2 seconds.

FAIL-SAFE AND BACKUP FUNCTION

- None

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 22 P.13A-10.

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

- Fuel tank temperature sensor failed.
- Shorted fuel tank temperature sensor circuit or connector damage.
- ECM failed.

DIAGNOSIS

Required Special Tools:

- MB992744: Vehicle communication interface-Lite (V.C.I.-Lite)
- MB992745: V.C.I.-Lite main harness A
- MB992747: V.C.I.-Lite USB cable short
- MB992748: V.C.I.-Lite USB cable long
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicles Communication Interface (V.C.I.)
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A (Vehicles with CAN communication system)

STEP 1. Using scan tool (M.U.T.-III), check data list item 53: Fuel Tank Temperature Sensor.

⚠ CAUTION

To prevent damage to scan tool (M.U.T.-III), always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool (M.U.T.-III).

(1) Connect scan tool (M.U.T-III). Refer to HOW TO CONNECT THE SCAN TOOL (M.U.T.-III) P.13A-10.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool (M.U.T.-III) 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.00-13.
NO : Go to Step 2.

STEP 2. Check the fuel tank temperature sensor.
(1) Disconnect the fuel pump module connector.
(2) Measure the resistance between terminal F/TM line and terminal ground line of the fuel pump module.

Standard value: 0.43 – 12.3 kΩ [at -10 to 70 °C (14 to 158 °F)]

Q: Is the measured resistance between 0.43 and 12.3 kΩ?
YES : Go to Step 3.
NO : Replace the fuel pump module. Then go to Step 5.

STEP 3. Check of short circuit to ground in F/TM line between fuel pump module connector and ECM connector.

Q: Is the harness wire in good condition?
YES : Go to Step 4.
NO : Repair the connector(s) or wiring harness. Then go to Step 5.

STEP 4. Using scan tool (M.U.T.-III), check data list item 53: Fuel Tank Temperature Sensor.
(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool (M.U.T.-III) 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.

(3) 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.00-13.
NO : Replace the ECM (Refer to, Removal and Installation P.13A-656). 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 22 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0182 stored?
YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0183: Fuel Tank Temperature Sensor Circuit High Input

CIRCUIT OPERATION

- 5-volt voltage is applied to the fuel tank temperature sensor output terminal from the ECM terminal F/TM 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 sensor ground terminal is grounded to the vehicle body.

TSB Revision

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

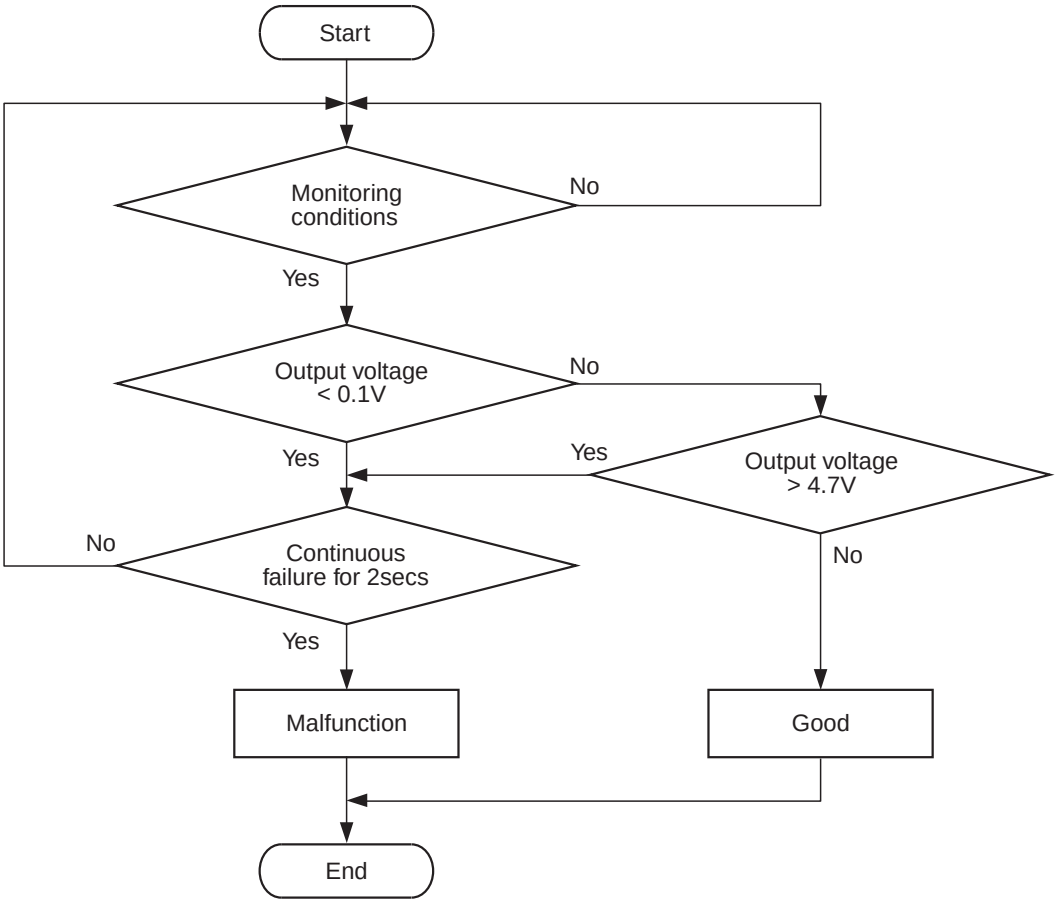
Fuel tank temperature sensor output voltage is out of specified range.

MONITOR EXECUTION

Continuous

DTC SET CONDITIONS

Logic Flow Chart



ACD00280

Check Condition

- More than 2 seconds have passed since the engine starting sequence was completed.

Judgment Criterion

- Fuel tank temperature sensor output voltage is more than 4.7 volts 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

FAIL-SAFE AND BACKUP FUNCTION

- None

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 22 P.13A-10.

TSB Revision

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

- Fuel tank temperature sensor failed.
- Open fuel tank temperature sensor circuit, 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
- MB992110: Power Plant ECU Check Harness

STEP 1. Using scan tool (M.U.T.-III), check data list item 53: Fuel Tank Temperature Sensor.

⚠ CAUTION

To prevent damage to scan tool (M.U.T.-III), always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool (M.U.T.-III).

(1) Connect scan tool (M.U.T-III). Refer to HOW TO CONNECT THE SCAN TOOL (M.U.T.-III) P.13A-10.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool (M.U.T.-III) 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.00-13.
NO : Go to Step 2.

STEP 2. Check the fuel tank temperature sensor.

(1) Disconnect the fuel pump module connector.
(2) Measure the resistance between terminal F/TM line and terminal ground line of the fuel pump module.

Standard value: 0.43 – 12.3 kΩ [at -10 to 70 °C (14 to 158 °F)

Q: Is the measured resistance between 0.43 and 12.3 kΩ?

YES : Go to Step 3.
NO : Replace the fuel pump module. Then go to Step 7.

STEP 3. Measure the sensor supply voltage at fuel pump module harness side connector.

(1) Disconnect the fuel pump module connector and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal F/TM line and ground.
- Voltage should be between 4.5 and 4.9 volts.

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

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

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

STEP 4. Measure the sensor supply voltage at ECM connector by backprobing.

(1) Do not disconnect the connector.
(2) Disconnect the fuel pump module connector.
(3) Turn the ignition switch to the "ON" position.
(4) Measure the voltage between terminal F/TM line and ground by backprobing.
- Voltage should be between 4.5 and 4.9 volts.

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

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

YES : Repair or replace the connector(s), or check and repair the harness of open circuit in F/TM line between fuel pump module connector and ECM connector. Then go to Step 7.
NO : Go to Step 5.

STEP 5. Check the continuity at fuel pump module harness side connector.

(1) Disconnect the fuel pump module connector and measure at the harness side.
(2) Check for the continuity between terminal ground line and ground.
- Continuity (2 ohms or less)

Q: Does continuity exist?

YES : Go to Step 6.
NO : Repair or replace the connector(s), or check and repair the harness of open circuit in F/TM line between fuel pump module connector and body ground. Then go to Step 7.

STEP 6. Using scan tool (M.U.T.-III), check data list item 53: Fuel Tank Temperature Sensor.

(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool (M.U.T.-III) 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.

(3) 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.00-13.

NO : Replace the ECM (Refer to, Removal and Installation P.13A-656). 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 22 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0183 stored?

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

DTC P0221: Throttle Position Sensor (sub) Plausibility

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

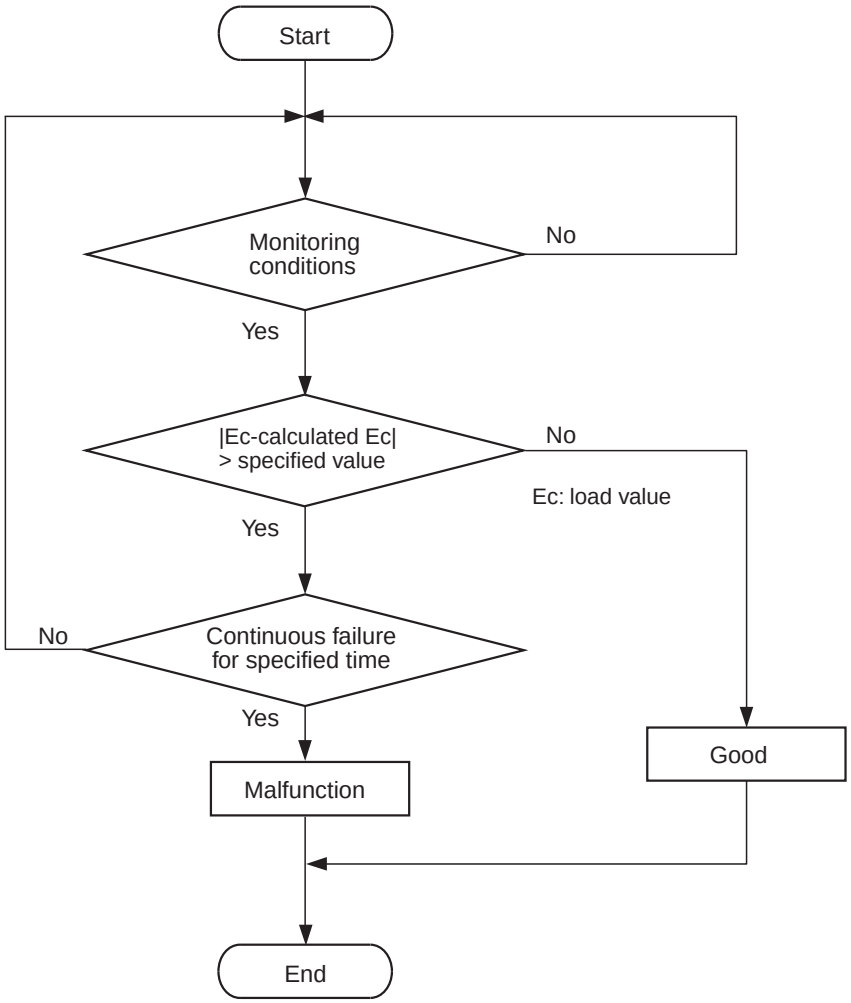
MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

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



AK604351

Check Conditions

- The volumetric efficiency estimated by the throttle position sensor (sub) subtracted from the actual volumetric efficiency is more than 0 percent. Or, the volumetric efficiency is less than 60 percent.
- The engine speed is more than 750 r/min.

Judgment Criterion

- For 0.4 second, the difference between the actual volumetric efficiency and the volumetric efficiency estimated by the throttle position sensor (sub) is more than 33 percent.
- For 0.4 second, the volumetric efficiency estimated by the throttle position sensor (main) and the volumetric efficiency estimated by the throttle position sensor (main) is more than 8.8 percent.

FAIL-SAFE AND BACKUP FUNCTION

- Throttle opening degree is restricted.
- Throttle opening degree position is in default position if throttle position sensor (main) fails.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle Pattern 16 P.13A-10.

TSB Revision

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

- Throttle position sensor (sub) system failed.
- Intake system vacuum leak.
- There is some foreign matter around mass air-flow sensor.
- ECM failed.

DIAGNOSIS

Required Special Tools:

- MB992744: Vehicle communication interface-Lite (V.C.I.-Lite)
- MB992745: V.C.I.-Lite main harness A
- MB992747: V.C.I.-Lite USB cable short
- MB992748: V.C.I.-Lite USB cable long
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicles Communication Interface (V.C.I.)
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A (Vehicles with CAN communication system)
- MB991658: Test Harness

STEP 1. Using scan tool (M.U.T.-III), read the diagnostic trouble code (DTC).

⚠ CAUTION

To prevent damage to scan tool (M.U.T.-III), always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool (M.U.T.-III).

(1) Connect scan tool (M.U.T-III). Refer to HOW TO CONNECT THE SCAN TOOL (M.U.T.-III) P.13A-10.
(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 P0121 stored?

YES : Refer to Diagnostic Trouble Code Chart P.13A-47.
NO : Go to Step 2.

STEP 2. Using scan tool (M.U.T.-III), check data list item 15: Throttle Position Sensor (sub).

(1) Detach the intake air hose at the throttle body.
(2) Disconnect the connector of the electronic-controlled throttle valve.
(3) Use test harness special tool (MB991658) to connect only terminals No. 3, No. 4, No. 5, and No. 6.
(4) Turn the ignition switch to the "ON" position.
(5) Set scan tool MB991958 to the data reading mode for item 15, Throttle Position Sensor (sub).
- Output voltage should be between 4,300 and 4,700 millivolts when the throttle valve is fully closed with your finger.
- Output voltage should be between 200 and 600 millivolts 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 : Go to Step 3.
NO : Refer to, DTC P0222 – Throttle Position Sensor (sub) Circuit Low Input P.13A-213, DTC P0223 – Throttle Position Sensor (sub) Circuit High Input P.13A-217.

STEP 3. Check for intake system vacuum leak.

Q: Are there any abnormalities?

YES : Repair it. Then go to Step 6.
NO : Go to Step 4.

STEP 4. Check for foreign matter being around the mass airflow sensor.

Q: Are there any foreign matter?

YES : Repair it. Then go to Step 6.
NO : Go to Step 5.

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 17 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0221 stored?

YES : Replace the ECM (Refer to, Removal and Installation P.13A-656). 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.00-13.

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 16 P.13A-10.

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

Q: Is DTC P0221 stored?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0222: Throttle Position Sensor (sub) Circuit Low Input

CIRCUIT OPERATION

- A 5-volt power supply is applied on the throttle position sensor (sub) power terminal from the ECM terminal TPS5.
- A voltage that is according to the throttle opening angle is sent to the ECM terminal TPSS from the throttle position sensor output terminal.
- The throttle position sensor (sub) ground terminal is grounded with ECM terminal TPSE.

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)

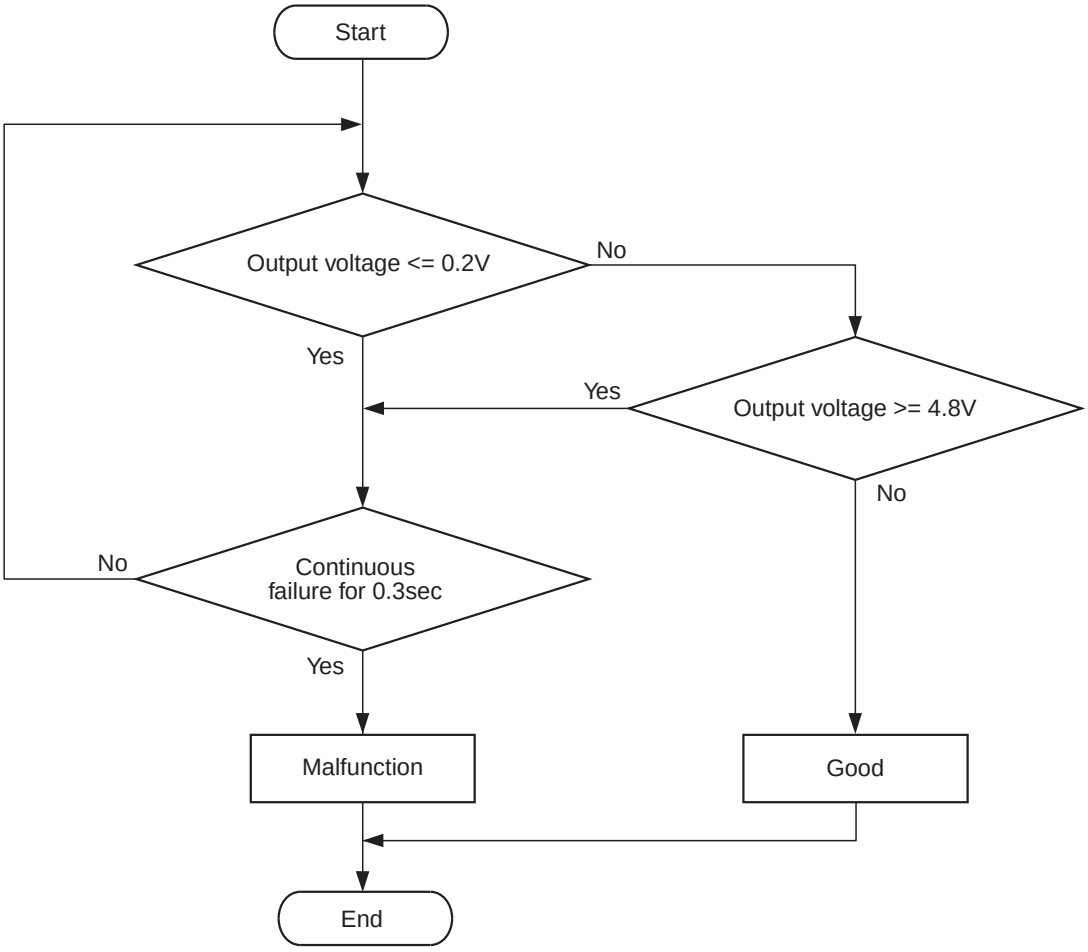
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



AK604318

Check Condition
- Ignition switch is "ON" position.

Judgment Criterion
- Throttle position sensor (sub) output voltage is less than 0.2 volt for 0.3 second.

FAIL-SAFE AND BACKUP FUNCTION
- Throttle opening degree is restricted.
- Throttle opening degree position is in default position if throttle position sensor (main) fails.

OBD-II DRIVE CYCLE PATTERN
None.

TROUBLESHOOTING HINTS (The most likely causes for this code to be stored are:)
- Throttle position sensor failed.
- Open or shorted throttle position sensor (sub) circuit, harness damage, or connector damage.
- ECM failed.

DIAGNOSIS

Required Special Tools:
- MB992744: Vehicle communication interface-Lite (V.C.I.-Lite)

TSB Revision

- MB992745: V.C.I.-Lite main harness A
- MB992747: V.C.I.-Lite USB cable short
- MB992748: V.C.I.-Lite USB cable long
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicles Communication Interface (V.C.I.)
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A (Vehicles with CAN communication system)
- MB991658: Test Harness

STEP 1. Using scan tool (M.U.T.-III), check data list item 15: Throttle Position Sensor (sub).

⚠ CAUTION

To prevent damage to scan tool (M.U.T.-III), always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool (M.U.T.-III).

(1) Connect scan tool (M.U.T-III). Refer to HOW TO CONNECT THE SCAN TOOL (M.U.T.-III) P.13A-10.
(2) Detach the intake air hose at the throttle body.
(3) Disconnect the connector of the electronic-controlled throttle valve.
(4) Use test harness special tool (MB991658) to connect only terminals No. 3, No. 4, No. 5, and No. 6.
(5) Turn the ignition switch to the "ON" position.
(6) Set scan tool MB991958 to the data reading mode for item 15, Throttle Position Sensor (sub).
  - Output voltage should be between 4,300 and 4,700 millivolts when the throttle valve is fully closed with your finger.
  - Output voltage should be between 200 and 600 millivolts 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.00-13.
NO : Go to Step 2.

STEP 2. Measure the sensor supply voltage at electronic-controlled throttle valve harness side connector.

(1) Disconnect the connector and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal TPS5 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. Check of open circuit and short circuit to ground in TPS5 line between electronic-controlled throttle valve connector and ECM connector.

Q: Is the harness wire in good condition?

YES : Go to Step 4.

NO : Repair the connector(s) or wiring harness. Then go to Step 8.

STEP 4. Using scan tool (M.U.T.-III), check data list item 15: Throttle Position Sensor (sub).

(1) Detach the intake air hose at the throttle body.
(2) Disconnect the connector of the electronic-controlled throttle valve.
(3) Use test harness special tool (MB991658) to connect only terminals No. 3, No. 4, No. 5, and No. 6.
(4) Turn the ignition switch to the "ON" position.
(5) Set scan tool (M.U.T.-III) to the data reading mode for item 15, Throttle Position Sensor (sub).
- Output voltage should be between 4,300 and 4,700 millivolts when the throttle valve is fully closed with your finger.
- Output voltage should be between 200 and 600 millivolts 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.00-13.

NO : Replace the ECM (Refer to, Removal and Installation P.13A-656). Then go to Step 8.

STEP 5. Check of harness damage in TPS5 line between electronic-controlled throttle valve connector and ECM connector.

Q: Is the harness wire in good condition?

YES : Go to Step 6.

NO : Repair the connector(s) or wiring harness. Then go to Step 8.

STEP 6. Check of open circuit, short circuit to ground and harness damage in TPSS line between electronic-controlled throttle valve connector and ECM connector.

Q: Is the harness wire in good condition?

YES : Go to Step 7.

NO : Repair the connector(s) or wiring harness. Then go to Step 8.

STEP 7. Replace the throttle body assembly.
(1) Replace the throttle body assembly.
(2) Turn the ignition switch to the "ON" position.
(3) After the DTC has been deleted, read the DTC again.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC P0222 stored?

YES : Replace the ECM (Refer to, Removal and Installation P.13A-656). Then go to Step 8.
NO : The inspection is complete.

STEP 8. Using scan tool (M.U.T.-III), 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 P0222 stored?

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

DTC P0223: Throttle Position Sensor (sub) Circuit High Input

CIRCUIT OPERATION

- A 5-volt power supply is applied on the throttle position sensor (sub) power terminal from the ECM terminal TPS5.
- A voltage that is according to the throttle opening angle is sent to the ECM terminal TPSS from the throttle position sensor output terminal.
- The throttle position sensor (sub) ground terminal is grounded with ECM terminal TPSE.

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)

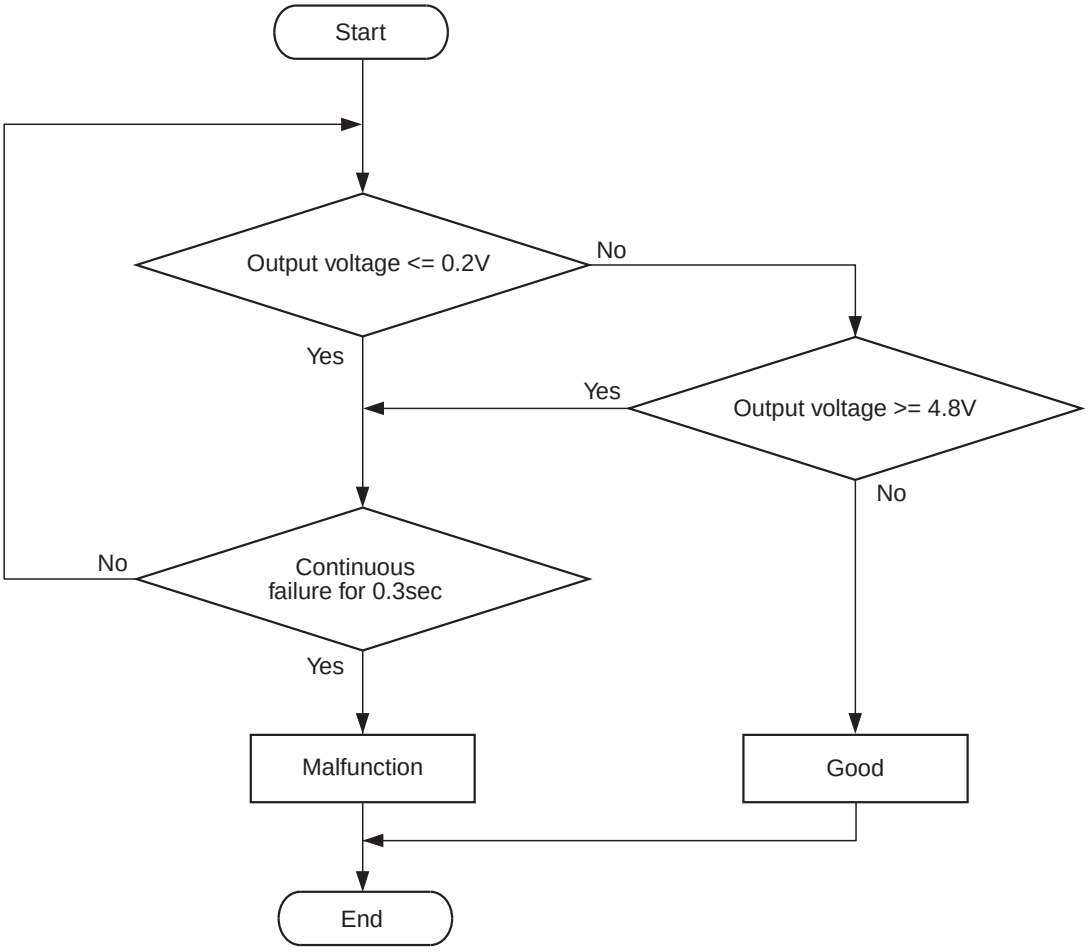
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



AK604318

Check Condition
- Ignition switch is "ON" position.

Judgment Criterion
- Throttle position sensor (sub) output voltage is more than 4.8 volts for 0.3 second.

FAIL-SAFE AND BACKUP FUNCTION
- Throttle opening degree is restricted.
- Throttle opening degree position is in default position if throttle position sensor (main) fails.

OBD-II DRIVE CYCLE PATTERN
None.

TROUBLESHOOTING HINTS (The most likely causes for this code to be stored are:)
- Throttle position sensor failed.
- Open throttle position sensor (sub) circuit, harness damage, or connector damage.
- ECM failed.

DIAGNOSIS

Required Special Tools:
- MB992744: Vehicle communication interface-Lite (V.C.I.-Lite)

TSB Revision

- MB992745: V.C.I.-Lite main harness A
- MB992747: V.C.I.-Lite USB cable short
- MB992748: V.C.I.-Lite USB cable long
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicles Communication Interface (V.C.I.)
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A (Vehicles with CAN communication system)
- MB991658: Test Harness

STEP 1. Using scan tool (M.U.T.-III), check data list item 15: Throttle Position Sensor (sub).

⚠ CAUTION

To prevent damage to scan tool (M.U.T.-III), always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool (M.U.T.-III).

(1) Connect scan tool (M.U.T-III). Refer to HOW TO CONNECT THE SCAN TOOL (M.U.T.-III) P.13A-10.
(2) Detach the intake air hose at the throttle body.
(3) Disconnect the connector of the electronic-controlled throttle valve.
(4) Use test harness special tool (MB991658) to connect only terminals No. 3, No. 4, No. 5, and No. 6.
(5) Turn the ignition switch to the "ON" position.
(6) Set scan tool (M.U.T.-III) to the data reading mode for item 15, Throttle Position Sensor (sub).
  - Output voltage should be between 4,300 and 4,700 millivolts when the throttle valve is fully closed with your finger.
  - Output voltage should be between 200 and 600 millivolts 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.00-13.
NO : Go to Step 2.

STEP 2. Check the continuity at electronic-controlled throttle valve harness side connector.

(1) Disconnect the connector and measure at the harness side.
(2) Check for the continuity between terminal TPSE line and ground.
  - Continuity (2 ohms or less)

Q: Does continuity exist?

YES : Go to Step 5.
NO : Go to Step 3.

STEP 3. Check of open circuit and harness damage in TPSE line between electronic-controlled throttle valve connector and ECM connector.

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 (M.U.T.-III), check data list item 15: Throttle Position Sensor (sub).

(1) Detach the intake air hose at the throttle body.
(2) Disconnect the connector of the electronic-controlled throttle valve.
(3) Use test harness special tool (MB991658) to connect only terminals No. 3, No. 4, No. 5, and No. 6.
(4) Turn the ignition switch to the "ON" position.
(5) Set scan tool (M.U.T.-III) to the data reading mode for item 15, Throttle Position Sensor (sub).
- Output voltage should be between 4,300 and 4,700 millivolts when the throttle valve is fully closed with your finger.
- Output voltage should be between 200 and 600 millivolts 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.00-13.
NO : Replace the ECM (Refer to, Removal and Installation P.13A-656). Then go to Step 6.

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 stored?

YES : Replace the ECM (Refer to, Removal and Installation P.13A-656). Then go to Step 6.
NO : The inspection is complete.

STEP 6. Using scan tool (M.U.T.-III), 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 P0223 stored?

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

TSB Revision

DTC P0261: Injector Circuit Low Input - Cylinder 1

CIRCUIT OPERATION
- The injector power is supplied from the injector relay.
- 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.

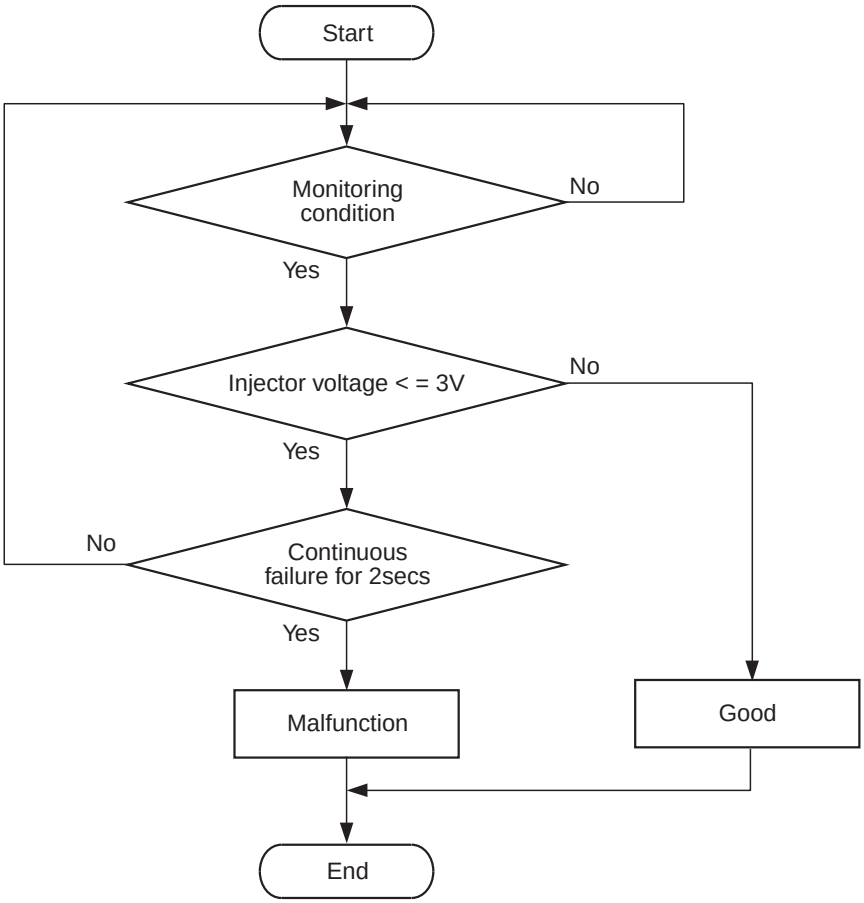
MONITOR EXECUTION
Continuous

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

Logic Flow Chart <Circuit continuity – open circuit and shorted low>



AK700479

Check Condition
- Engine is running.

Judgment Criterion
- The supply voltage is less than 3 volts without the injector driving for 2 seconds.

FAIL-SAFE AND BACKUP FUNCTION

- None

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 22 P.13A-10.

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

- No. 1 cylinder injector failed.
- Open or shorted No. 1 cylinder injector circuit, harness damage or connector damage.
- ECM failed.

DIAGNOSIS

Required Special Tools:

- MB992744: Vehicle communication interface-Lite (V.C.I.-Lite)
- MB992745: V.C.I.-Lite main harness A
- MB992747: V.C.I.-Lite USB cable short
- MB992748: V.C.I.-Lite USB cable long
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicles Communication Interface (V.C.I.)
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A (Vehicles with CAN communication system)

STEP 1. Using scan tool (M.U.T.-III), check actuator test item 1: Injectors.

⚠ CAUTION

To prevent damage to scan tool (M.U.T.-III), always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool (M.U.T.-III).

(1) Connect scan tool (M.U.T-III). Refer to HOW TO CONNECT THE SCAN TOOL (M.U.T.-III) P.13A-10.
(2) Start the engine and run at idle.
(3) Warm up the engine to normal operating temperature: 80°C to 95°C (176°F to 203°F).
(4) Set scan tool (M.U.T.-III) to the actuator testing mode for item 1 Injectors.
  - 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.00-13.
NO : Go to Step 2.

STEP 2. Check No. 1 cylinder injector itself.

- Injector check (Refer to P.13A-648).

Q: Is the measured resistance normal?

YES : Go to Step 3.
NO : Replace the No. 1 cylinder injector. Then go to Step 7.

STEP 3. Measure the power supply voltage at No. 1 cylinder injector harness side connector.

(1) Disconnect the No.1 cylinder injector connector and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between power supply line terminal 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 or replace the connector(s), or check and repair the harness of open circuit, and short circuit in power supply line between MFI relay connector and No. 1 cylinder injector connector. Then go to Step 7.

STEP 4. Check of damage in power supply line between MFI relay connector and No. 1 cylinder injector connector.

Q: Is the harness wire in good condition?

YES : Go to Step 5.
NO : Repair the connector(s) or wiring harness. Then go to Step 7.

STEP 5. Check of open circuit, short circuit, and damage in INJ1 line between No. 1 cylinder injector connector and ECM connector.

Q: Is the harness wire in good condition?

YES : Go to Step 6.
NO : Repair the connector(s) or wiring harness. Then go to Step 7.

STEP 6. Using the oscilloscope, check the No. 1 cylinder injector.

- Engine: Idling
- Transmission: Neutral <M/T>, P range <CVT>
- Voltage between terminal INJ1 and ground.

OK: Waveforms should be displayed on inspection procedure using an oscilloscope (Refer to P.13A-628).

Q: Is the wave pattern 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.00-13.
NO : Replace the ECM (Refer to, Removal and Installation P.13A-656). 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 22 P.13A-10.

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

Q: Is DTC P0261 stored?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0262: Injector Circuit High Input - Cylinder 1

CIRCUIT OPERATION

- The injector power is supplied from the injector relay.
- 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 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)

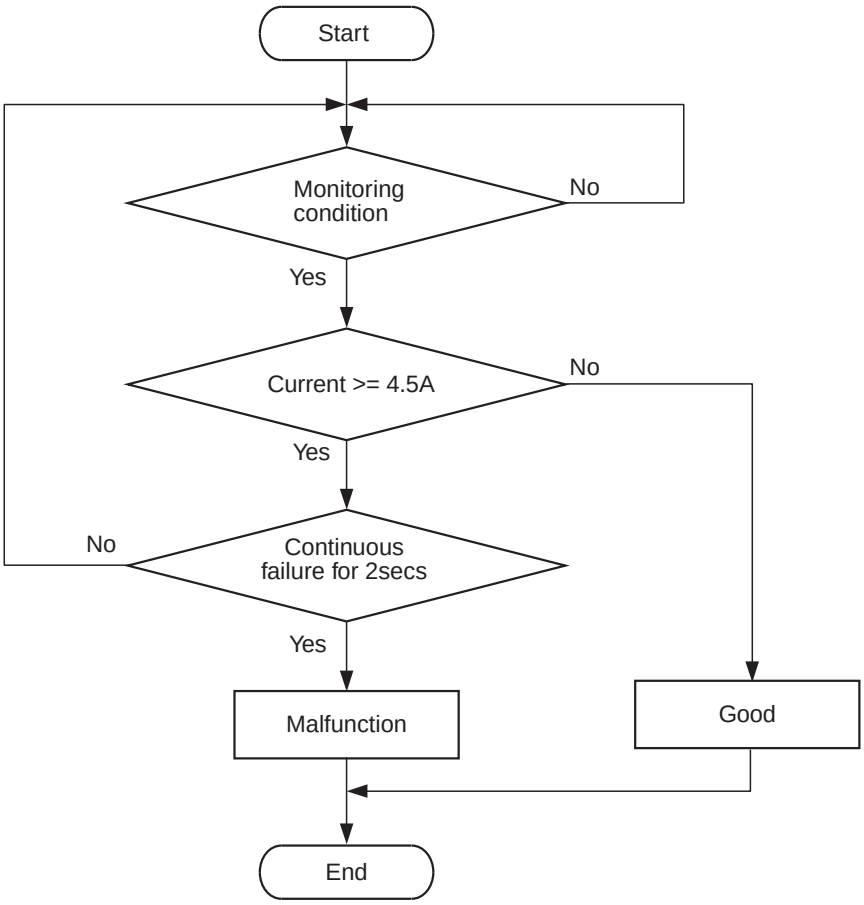
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart <Circuit continuity – shorted high>



AK604332

Check Condition

- Engine is running.

Judgment Criterion

- The coil current is more than 4.5 amperes with the injector driving for 2 seconds.

FAIL-SAFE AND BACKUP FUNCTION

- None

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 22 P.13A-10.

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

- No. 1 cylinder injector failed.
- Open or shorted No. 1 cylinder injector circuit, harness damage or connector damage.
- ECM failed.

DIAGNOSIS

Required Special Tools:

- MB992744: Vehicle communication interface-Lite (V.C.I.-Lite)
- MB992745: V.C.I.-Lite main harness A
- MB992747: V.C.I.-Lite USB cable short
- MB992748: V.C.I.-Lite USB cable long
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicles Communication Interface (V.C.I.)

TSB Revision

- MB991827: M.U.T.-III USB Cable
- MB991910: M.U.T.-III Main Harness A (Vehicles with CAN communication system)

STEP 1. Using scan tool (M.U.T.-III), check actuator test item 1: Injectors.

⚠ CAUTION

To prevent damage to scan tool (M.U.T.-III), always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool (M.U.T.-III).

(1) Connect scan tool (M.U.T-III). Refer to HOW TO CONNECT THE SCAN TOOL (M.U.T.-III) P.13A-10.
(2) Start the engine and run at idle.
(3) Warm up the engine to normal operating temperature: 80°C to 95°C (176°F to 203°F).
(4) Set scan tool (M.U.T.-III) to the actuator testing mode for item 1 Injectors.
- 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.00-13.
NO : Go to Step 2.

STEP 2. Check No. 1 cylinder injector itself.

- Injector check (Refer to P.13A-648).

Q: Is the measured resistance normal?

YES : Go to Step 3.
NO : Replace the No. 1 cylinder injector. Then go to Step 5.

STEP 3. Check of short to power supply in INJ1 line between No. 1 cylinder injector connector and ECM connector.

Q: Is the harness wire in good condition?

YES : Go to Step 4.
NO : Repair the connector(s) or wiring harness. Then go to Step 5.

STEP 4. Using the oscilloscope, check the No. 1 cylinder injector.

- Engine: Idling
- Transmission: Neutral <M/T>, P range <CVT>
- Voltage between terminal INJ1 and ground.

OK: Waveforms should be displayed on inspection procedure using an oscilloscope (Refer to P.13A-628).

Q: Is the wave pattern 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.00-13.

NO : Replace the ECM (Refer to, Removal and Installation P.13A-656). 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 22 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0262 stored?

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

DTC P0264: Injector Circuit Low Input - Cylinder 2

CIRCUIT OPERATION

- The injector power is supplied from the injector relay.
- 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)

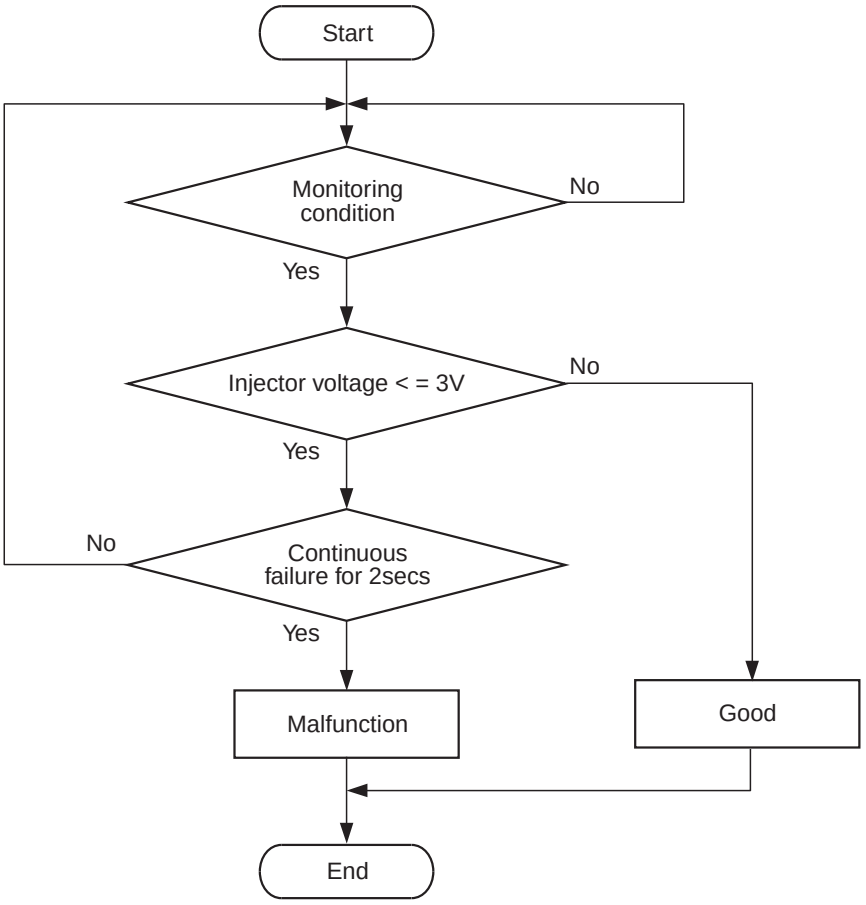
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart <Circuit continuity – open circuit and shorted low>



AK700479

Check Condition

- Engine is running.

Judgment Criterion

- The supply voltage is less than 3 volts without the injector driving for 2 seconds.

FAIL-SAFE AND BACKUP FUNCTION

- None

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 22 P.13A-10.

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

- No. 2 cylinder injector failed.
- Open or shorted No. 2 cylinder injector circuit, harness damage or connector damage.
- ECM failed.

DIAGNOSIS

Required Special Tools:

- MB992744: Vehicle communication interface-Lite (V.C.I.-Lite)
- MB992745: V.C.I.-Lite main harness A
- MB992747: V.C.I.-Lite USB cable short
- MB992748: V.C.I.-Lite USB cable long
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicles Communication Interface (V.C.I.)

TSB Revision

- MB991827: M.U.T.-III USB Cable
- MB991910: M.U.T.-III Main Harness A (Vehicles with CAN communication system)

STEP 1. Using scan tool (M.U.T.-III), check actuator test item 1: Injectors.

⚠ CAUTION

To prevent damage to scan tool (M.U.T.-III), always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool (M.U.T.-III).

(1) Connect scan tool (M.U.T-III). Refer to HOW TO CONNECT THE SCAN TOOL (M.U.T.-III) P.13A-10.
(2) Start the engine and run at idle.
(3) Warm up the engine to normal operating temperature: 80°C to 95°C (176°F to 203°F).
(4) Set scan tool (M.U.T.-III) to the actuator testing mode for item 1 Injectors.
- 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.00-13.
NO : Go to Step 2.

STEP 2. Check No. 2 cylinder injector itself.

- Injector check (Refer to P.13A-648).

Q: Is the measured resistance normal?

YES : Go to Step 3.
NO : Replace the No. 2 cylinder injector. Then go to Step 7.

STEP 3. Measure the power supply voltage at No. 2 cylinder injector harness side connector.

(1) Disconnect the No.1 cylinder injector connector and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between power supply line terminal 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 or replace the connector(s), or check and repair the harness of open circuit, and short circuit in power supply line between MFI relay connector and No. 2 cylinder injector connector. Then go to Step 7.

STEP 4. Check of damage in power supply line between MFI relay connector and No. 2 cylinder injector connector.

Q: Is the harness wire in good condition?

YES : Go to Step 5.
NO : Repair the connector(s) or wiring harness. Then go to Step 7.

STEP 5. Check of open circuit, short circuit, and damage in INJ2 line between No. 2 cylinder injector connector and ECM connector.

Q: Is the harness wire in good condition?

YES : Go to Step 6.
NO : Repair the connector(s) or wiring harness. Then go to Step 7.

STEP 6. Using the oscilloscope, check the No. 2 cylinder injector.

- Engine: Idling
- Transmission: Neutral <M/T>, P range <CVT>
- Voltage between terminal INJ2 and ground.

OK: Waveforms should be displayed on inspection procedure using an oscilloscope (Refer to P.13A-628).

Q: Is the wave pattern 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.00-13.
NO : Replace the ECM (Refer to, Removal and Installation P.13A-656). 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 22 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0264 stored?

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

DTC P0265: Injector Circuit High Input - Cylinder 2

CIRCUIT OPERATION

- The injector power is supplied from the injector relay.
- 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 short malfunction.

TSB Revision

MONITOR EXECUTION
Continuous

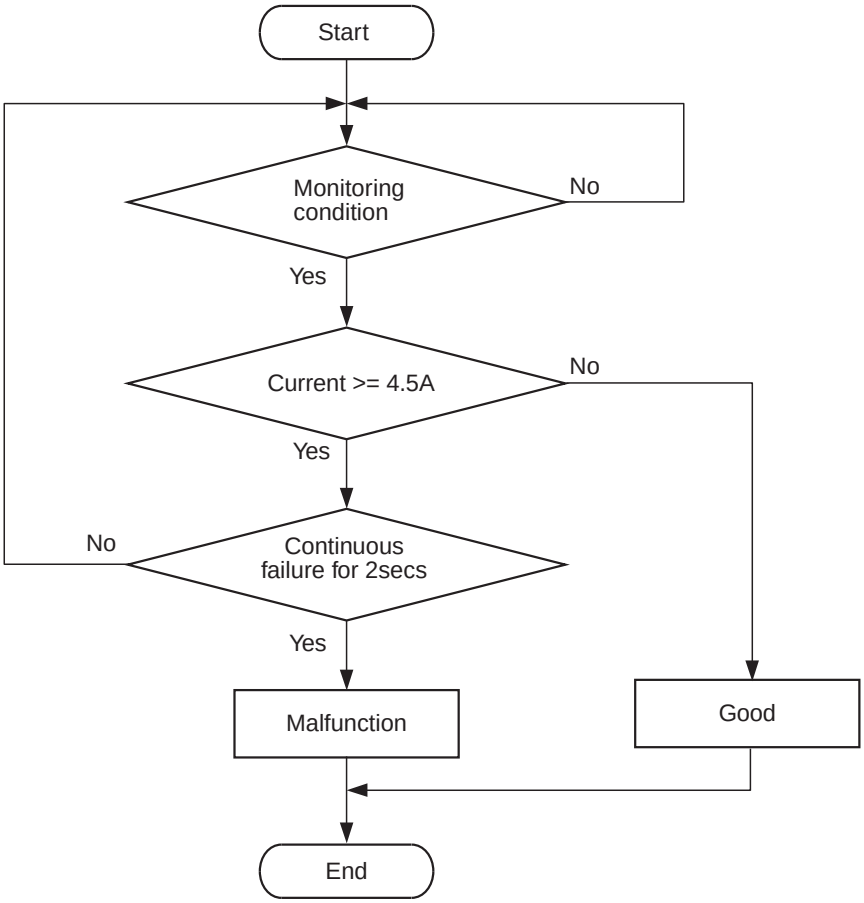
MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

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 <Circuit continuity – shorted high>



AK604332

Check Condition
- Engine is running.

Judgment Criterion
- The coil current is more than 4.5 amperes with the injector driving for 2 seconds.

FAIL-SAFE AND BACKUP FUNCTION
- None

OBD-II DRIVE CYCLE PATTERN
Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 22 P.13A-10.

TROUBLESHOOTING HINTS (The most likely causes for this code to be stored are:)
- No. 2 cylinder injector failed.
- Open or shorted No. 2 cylinder injector circuit, harness damage or connector damage.
- ECM failed.

TSB Revision

DIAGNOSIS

Required Special Tools:

- MB992744: Vehicle communication interface-Lite (V.C.I.-Lite)
- MB992745: V.C.I.-Lite main harness A
- MB992747: V.C.I.-Lite USB cable short
- MB992748: V.C.I.-Lite USB cable long
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicles Communication Interface (V.C.I.)
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A (Vehicles with CAN communication system)

STEP 1. Using scan tool (M.U.T.-III), check actuator test item 1: Injectors.

⚠ CAUTION

To prevent damage to scan tool (M.U.T.-III), always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool (M.U.T.-III).

(1) Connect scan tool (M.U.T-III). Refer to HOW TO CONNECT THE SCAN TOOL (M.U.T.-III) P.13A-10.
(2) Start the engine and run at idle.
(3) Warm up the engine to normal operating temperature: 80°C to 95°C (176°F to 203°F).
(4) Set scan tool (M.U.T.-III) to the actuator testing mode for item 1 Injectors.
  - 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.00-13.
NO : Go to Step 2.

STEP 2. Check No. 2 cylinder injector itself.

- Injector check (Refer to P.13A-648).

Q: Is the measured resistance normal?

YES : Go to Step 3.
NO : Replace the No. 2 cylinder injector. Then go to Step 5.

STEP 3. Check of short to power supply in INJ2 line between No. 2 cylinder injector connector and ECM connector.

Q: Is the harness wire in good condition?

YES : Go to Step 4.
NO : Repair the connector(s) or wiring harness. Then go to Step 5.

STEP 4. Using the oscilloscope, check the No. 2 cylinder injector.

- Engine: Idling
- Transmission: Neutral <M/T>, P range <CVT>
- Voltage between terminal INJ2 and ground.

OK: Waveforms should be displayed on inspection procedure using an oscilloscope (Refer to P.13A-628).

Q: Is the wave pattern 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.00-13.

NO : Replace the ECM (Refer to, Removal and Installation P.13A-656). 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 22 P.13A-10.

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

Q: Is DTC P0265 stored?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0267: Injector Circuit Low Input - Cylinder 3

CIRCUIT OPERATION

- The injector power is supplied from the injector relay.
- 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)

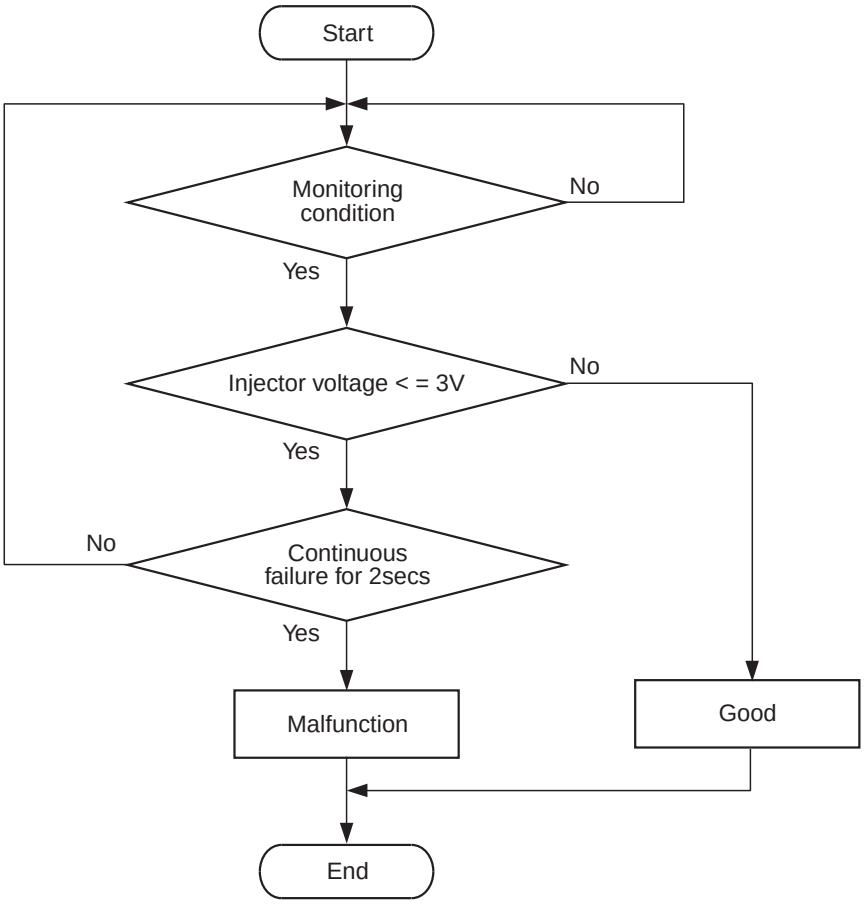
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart <Circuit continuity – open circuit and shorted low>



AK700479

Check Condition

- Engine is running.

Judgment Criterion

- The supply voltage is less than 3 volts without the injector driving for 2 seconds.

FAIL-SAFE AND BACKUP FUNCTION

- None

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 22 P.13A-10.

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

- No. 3 cylinder injector failed.
- Open or shorted No. 3 cylinder injector circuit, harness damage or connector damage.
- ECM failed.

DIAGNOSIS

Required Special Tools:

- MB992744: Vehicle communication interface-Lite (V.C.I.-Lite)
- MB992745: V.C.I.-Lite main harness A
- MB992747: V.C.I.-Lite USB cable short
- MB992748: V.C.I.-Lite USB cable long
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicles Communication Interface (V.C.I.)

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- MB991827: M.U.T.-III USB Cable
- MB991910: M.U.T.-III Main Harness A (Vehicles with CAN communication system)

STEP 1. Using scan tool (M.U.T.-III), check actuator test item 1: Injectors.

⚠ CAUTION

To prevent damage to scan tool (M.U.T.-III), always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool (M.U.T.-III).

(1) Connect scan tool (M.U.T-III). Refer to HOW TO CONNECT THE SCAN TOOL (M.U.T.-III) P.13A-10.
(2) Start the engine and run at idle.
(3) Warm up the engine to normal operating temperature: 80°C to 95°C (176°F to 203°F).
(4) Set scan tool (M.U.T.-III) to the actuator testing mode for item 1 Injectors.
- 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.00-13.
NO : Go to Step 2.

STEP 2. Check No. 3 cylinder injector itself.

- Injector check (Refer to P.13A-648).

Q: Is the measured resistance normal?

YES : Go to Step 3.
NO : Replace the No. 3 cylinder injector. Then go to Step 7.

STEP 3. Measure the power supply voltage at No. 3 cylinder injector harness side connector.

(1) Disconnect the No.1 cylinder injector connector and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between power supply line terminal 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 or replace the connector(s), or check and repair the harness of open circuit, and short circuit in power supply line between MFI relay connector and No. 3 cylinder injector connector. Then go to Step 7.

STEP 4. Check of damage in power supply line between MFI relay connector and No. 3 cylinder injector connector.

Q: Is the harness wire in good condition?

YES : Go to Step 5.
NO : Repair the connector(s) or wiring harness. Then go to Step 7.

STEP 5. Check of open circuit, short circuit, and damage in INJ3 line between No. 3 cylinder injector connector and ECM connector.

Q: Is the harness wire in good condition?

YES : Go to Step 6.
NO : Repair the connector(s) or wiring harness. Then go to Step 7.

STEP 6. Using the oscilloscope, check the No. 3 cylinder injector.

- Engine: Idling
- Transmission: Neutral <M/T>, P range <CVT>
- Voltage between terminal INJ3 and ground.

OK: Waveforms should be displayed on inspection procedure using an oscilloscope (Refer to P.13A-628).

Q: Is the wave pattern 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.00-13.
NO : Replace the ECM (Refer to, Removal and Installation P.13A-656). 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 22 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0264 stored?

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

DTC P0268: Injector Circuit High Input - Cylinder 3

CIRCUIT OPERATION

- The injector power is supplied from the injector relay.
- 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 short malfunction.

TSB Revision

MONITOR EXECUTION
Continuous

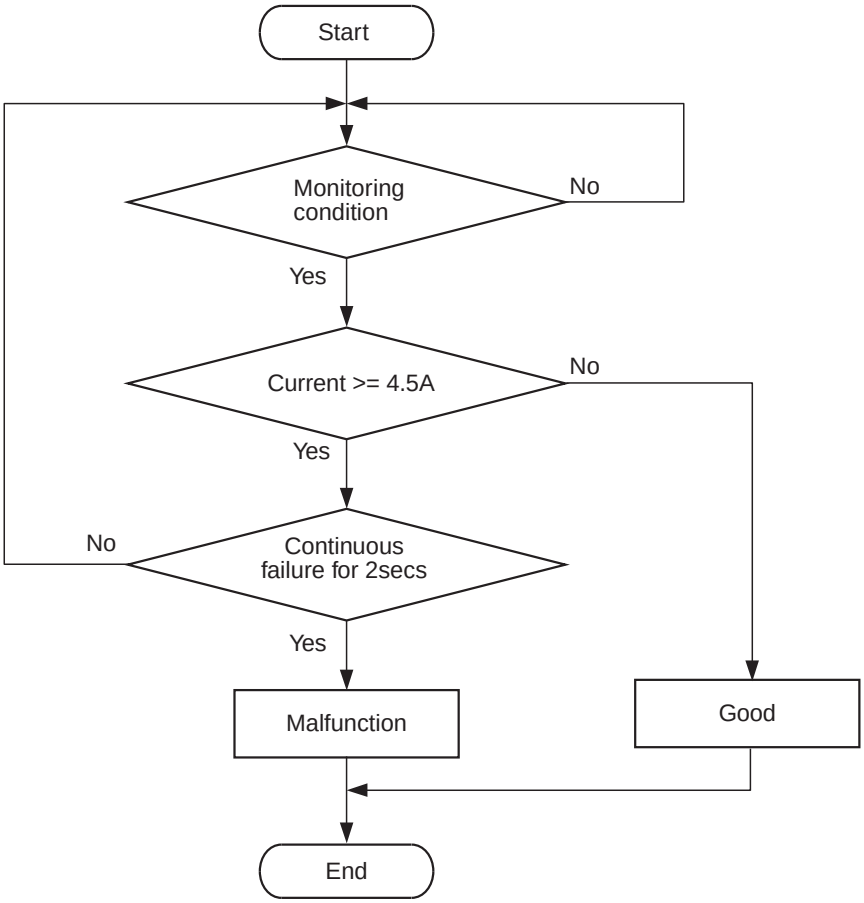
MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

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 <Circuit continuity – shorted high>



AK604332

Check Condition
- Engine is running.

Judgment Criterion
- The coil current is more than 4.5 amperes with the injector driving for 2 seconds.

FAIL-SAFE AND BACKUP FUNCTION
- None

OBD-II DRIVE CYCLE PATTERN
Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 22 P.13A-10.

TROUBLESHOOTING HINTS (The most likely causes for this code to be stored are:)
- No. 3 cylinder injector failed.
- Open or shorted No. 3 cylinder injector circuit, harness damage or connector damage.
- ECM failed.

TSB Revision

DIAGNOSIS

Required Special Tools:

- MB992744: Vehicle communication interface-Lite (V.C.I.-Lite)
- MB992745: V.C.I.-Lite main harness A
- MB992747: V.C.I.-Lite USB cable short
- MB992748: V.C.I.-Lite USB cable long
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicles Communication Interface (V.C.I.)
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A (Vehicles with CAN communication system)

STEP 1. Using scan tool (M.U.T.-III), check actuator test item 1: Injectors.

⚠ CAUTION

To prevent damage to scan tool (M.U.T.-III), always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool (M.U.T.-III).

(1) Connect scan tool (M.U.T-III). Refer to HOW TO CONNECT THE SCAN TOOL (M.U.T.-III) P.13A-10.
(2) Start the engine and run at idle.
(3) Warm up the engine to normal operating temperature: 80°C to 95°C (176°F to 203°F).
(4) Set scan tool (M.U.T.-III) to the actuator testing mode for item 1 Injectors.
  - 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.00-13.
NO : Go to Step 2.

STEP 2. Check No. 3 cylinder injector itself.

- Injector check (Refer to P.13A-648).

Q: Is the measured resistance normal?

YES : Go to Step 3.
NO : Replace the No. 3 cylinder injector. Then go to Step 5.

STEP 3. Check of short to power supply in INJ3 line between No. 3 cylinder injector connector and ECM connector.

Q: Is the harness wire in good condition?

YES : Go to Step 4.
NO : Repair the connector(s) or wiring harness. Then go to Step 5.

STEP 4. Using the oscilloscope, check the No. 3 cylinder injector.

- Engine: Idling
- Transmission: Neutral <M/T>, P range <CVT>
- Voltage between terminal INJ3 and ground.

OK: Waveforms should be displayed on inspection procedure using an oscilloscope (Refer to P.13A-628).

Q: Is the wave pattern 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.00-13.

NO : Replace the ECM (Refer to, Removal and Installation P.13A-656). 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 22 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0268 stored?

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

DTC P0300: Random/Multiple Cylinder Misfire Detected

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)

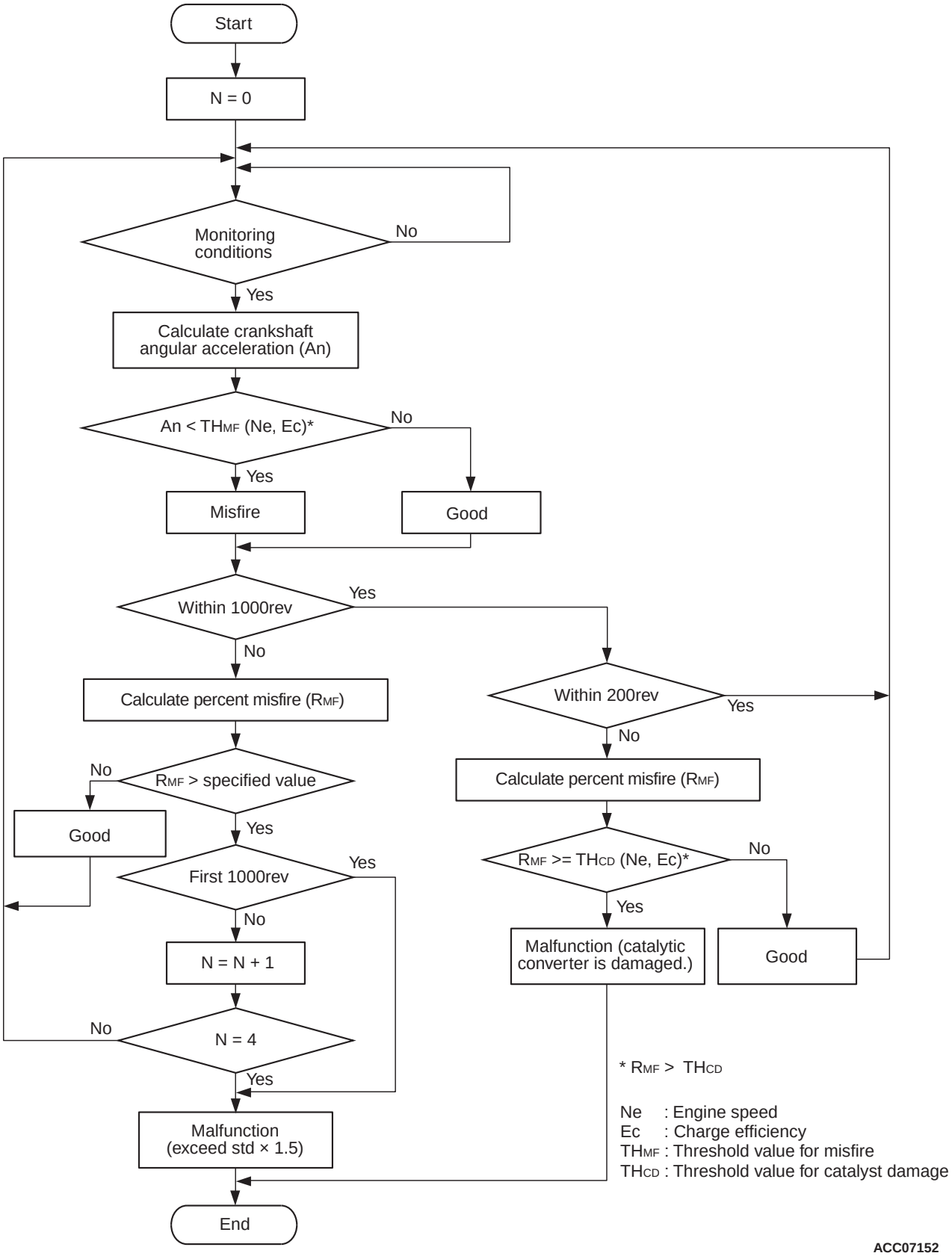
- Not applicable

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



TSB Revision

Check Conditions

- Engine speed is between 438 and 6,594 r/min.
- Engine coolant temperature is more than –10°C (14°F). (However, 20°C (68°F) when the engine coolant temperature at engine start is –10°C (14°F) or less).
- Barometric pressure is more than 76 kPa (22.4 in.Hg).
- The engine load is with in the positive torque load.
- Adaptive learning is complete for the vane which generates a crankshaft position signal.
- While the engine is running, excluding rough road driving <M/T> sudden acceleration/deceleration and fuel shut-off operation.

Judgment Criterion (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 more than 1,000°C (1,832°F)].

or

- Misfire has occurred more than in 2.0 percent of the first 1,000 revolutions (corresponding to 1.5 times the limit of emission standard).

or

- After the first 1,000 revolutions, the following criterion is satisfied 4 times cumulatively.
- Misfire counts per 1,000 revolutions exceeds in 2.0 percent (corresponding to 1.5 times the limit of emission standard).

FAIL-SAFE AND BACKUP FUNCTION

- The supply of fuel to the misfiring cylinder can possibly be cut.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 14 P.13A-10.

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

- Included air due to lack of fuel.
- Ignition system related part(s) failed.
- Poor crankshaft position sensor.
- Incorrect air/fuel ratio.
- Low compression pressure.
- Skipping of timing chain teeth.
- EGR system and EGR valve failed.
- ECM failed.

DIAGNOSIS

Required Special Tools:

- MB992744: Vehicle communication interface-Lite (V.C.I.-Lite)
- MB992745: V.C.I.-Lite main harness A
- MB992747: V.C.I.-Lite USB cable short
- MB992748: V.C.I.-Lite USB cable long
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicles Communication Interface (V.C.I.)
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A (Vehicles with CAN communication system)

STEP 1. Check whether air is included due to the lack of fuel or not.

- Check whether users have experienced the lack of fuel or not.

Q: Has the user ever experienced the lack of fuel?

YES : Erase the diagnostic trouble codes to finish the check.
NO : Go to Step 2.

STEP 2. Using scan tool (M.U.T.-III), check data list item 2: Crankshaft Position Sensor.

⚠ CAUTION

To prevent damage to scan tool (M.U.T.-III), always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool (M.U.T.-III).

(1) Connect scan tool (M.U.T-III). Refer to HOW TO CONNECT THE SCAN TOOL (M.U.T.-III) P.13A-10.
(2) Start the engine and run at idle.
(3) Set scan tool (M.U.T-III) 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 : Go to Step 3.
NO : Refer to, DTC P0335 – Crankshaft Position Sensor Circuit P.13A-260.

STEP 3. Using scan tool (M.U.T-III), check data list item 26: Long-Term Fuel Trim.

(1) Start the engine and run at idle.
(2) Set scan tool (M.U.T-III) to the data reading mode for item 26, Long-Term Fuel Trim.
- The fuel trim should be between –10 and +10 percent when the engine is 2,500 r/min (during closed loop) after the engine is warmed.

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

Q: Is the specification normal?

YES : Go to Step 4.
NO : Refer to, DTC P0171 – System too Lean P.13A-187, DTC P0172 – System too Rich P.13A-194.

STEP 4. Using scan tool (M.U.T-III), check data list item 28: Short-Term Fuel Trim.

(1) Start the engine and run at idle.
(2) Set scan tool (M.U.T-III) to the data reading mode for item 28, Short-Term Fuel Trim.
- The fuel trim should be between –25 and +25 percent when the engine is 2,500 r/min (during closed loop) after the engine is warmed.

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

Q: Is the specification normal?

YES : Go to Step 5.
NO : Refer to, DTC P0171 – System too Lean P.13A-187, DTC P0172 – System too Rich P.13A-194.

STEP 5. Visual check of ignition spark.

(1) Remove the spark plug and install it to the ignition coil.
(2) Connect the ignition coil connector.
(3) Disconnect all injector connector.
(4) At the engine start, check each spark plug produces a 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.16-28.

Q: Is the spark plug normal?

YES : Refer to, Symptom Procedures 26 – Ignition Circuit System P.13A-577.
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 chain teeth.
   b. Check compression.
   c. EGR valve failed.

Q: Are there any abnormalities?

YES : Repair or replace 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 Diagnostic Function – OBD-II Drive Cycle – Pattern 14 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0300 stored?

YES : Replace the ECM (Refer to, Removal and Installation P.13A-656). 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.00-13.

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 14 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0300 stored?

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

TSB Revision

DTC P0301: Cylinder 1 Misfire Detected

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)

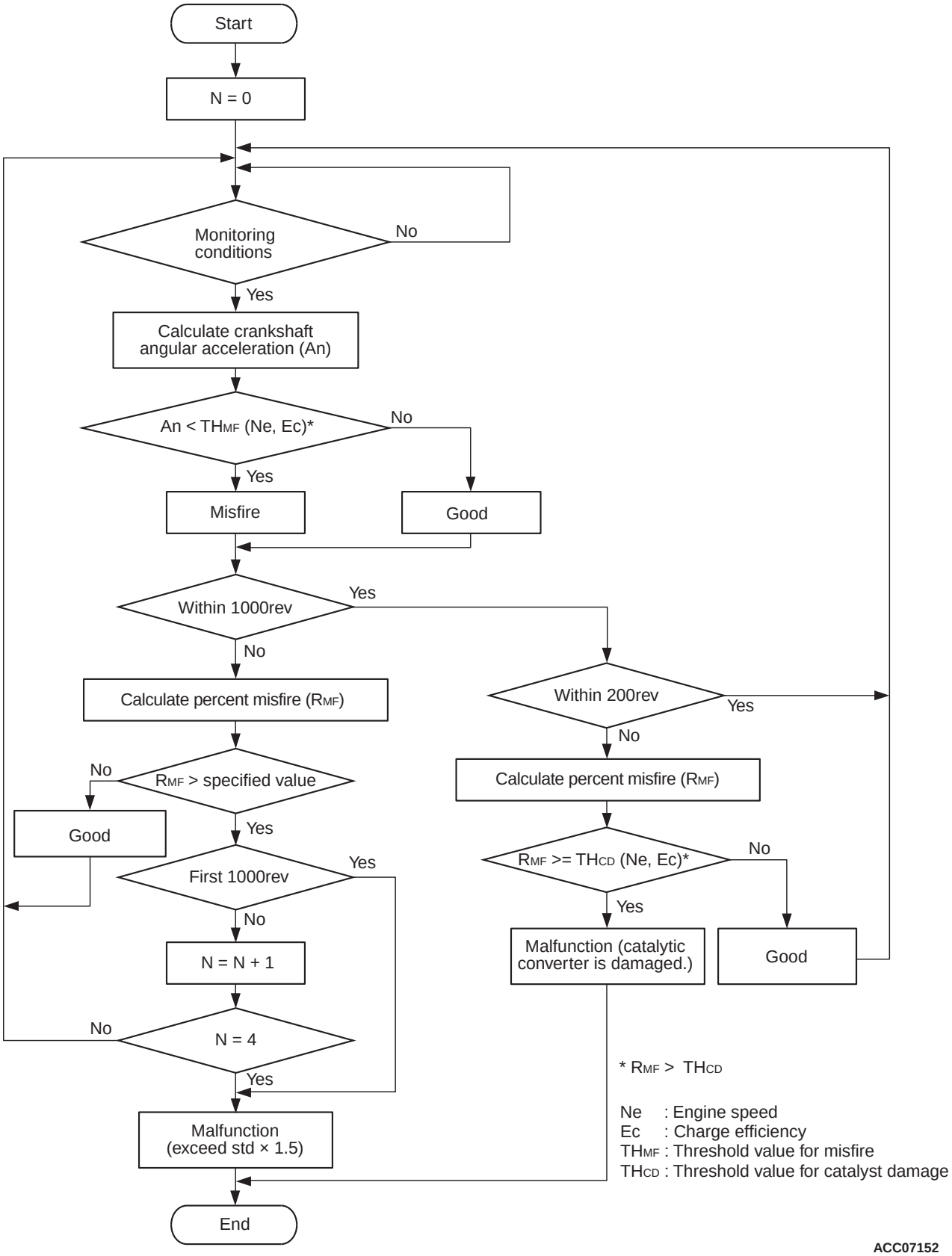
- Not applicable

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



TSB Revision

Check Conditions

- Engine speed is between 438 and 6,594 r/min.
- Engine coolant temperature is more than −10°C (14°F). (However, 20°C (68°F) when the engine coolant temperature at engine start is −10°C (14°F) or less).
- Barometric pressure is more than 76 kPa (22.4 in.Hg).
- The engine load is with in the positive torque load.
- Adaptive learning is complete for the vane which generates a crankshaft position signal.
- While the engine is running, excluding rough road driving <M/T> sudden acceleration/deceleration and fuel shut-off operation.

Judgment Criterion (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 more than 1,000°C (1,832°F)].

or

- Misfire has occurred more than in 2.0 percent of the first 1,000 revolutions (corresponding to 1.5 times the limit of emission standard).

or

- After the first 1,000 revolutions, the following criterion is satisfied 4 times cumulatively.
- Misfire counts per 1,000 revolutions exceeds in 2.0 percent (corresponding to 1.5 times the limit of emission standard).

FAIL-SAFE AND BACKUP FUNCTION

- The supply of fuel to the misfiring cylinder can possibly be cut.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 14 P.13A-10.

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

- Ignition system related part(s) failed.
- Low compression pressure.
- ECM failed.

DIAGNOSIS

Required Special Tools:

- MB992744: Vehicle communication interface-Lite (V.C.I.-Lite)
- MB992745: V.C.I.-Lite main harness A
- MB992747: V.C.I.-Lite USB cable short
- MB992748: V.C.I.-Lite USB cable long
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicles Communication Interface (V.C.I.)
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A (Vehicles with CAN communication system)

STEP 1. Visual check on ignition spark of No. 1 cylinder.

(1) Remove the spark plug and install it to the ignition coil.
(2) Connect the ignition coil connector.
(3) Disconnect all injector connector.
(4) At the engine start, check spark plug produces a spark.

Q: Did it spark?

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

STEP 2. Check the No. 1 cylinder spark plug.
Refer to GROUP 16, Ignition System – On-vehicle Service – Spark Plug Check And Cleaning P.16-28.

Q: Is the spark plug normal?
YES : Refer to, Symptom Procedures 26 – Ignition Circuit System P.13A-577.
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-16.

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 14 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0301 stored?
YES : Replace the ECM (Refer to, Removal and Installation P.13A-656). 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.00-13.

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.13A-10.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0301 stored?
YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0302: Cylinder 2 Misfire Detected

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

TSB Revision

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

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

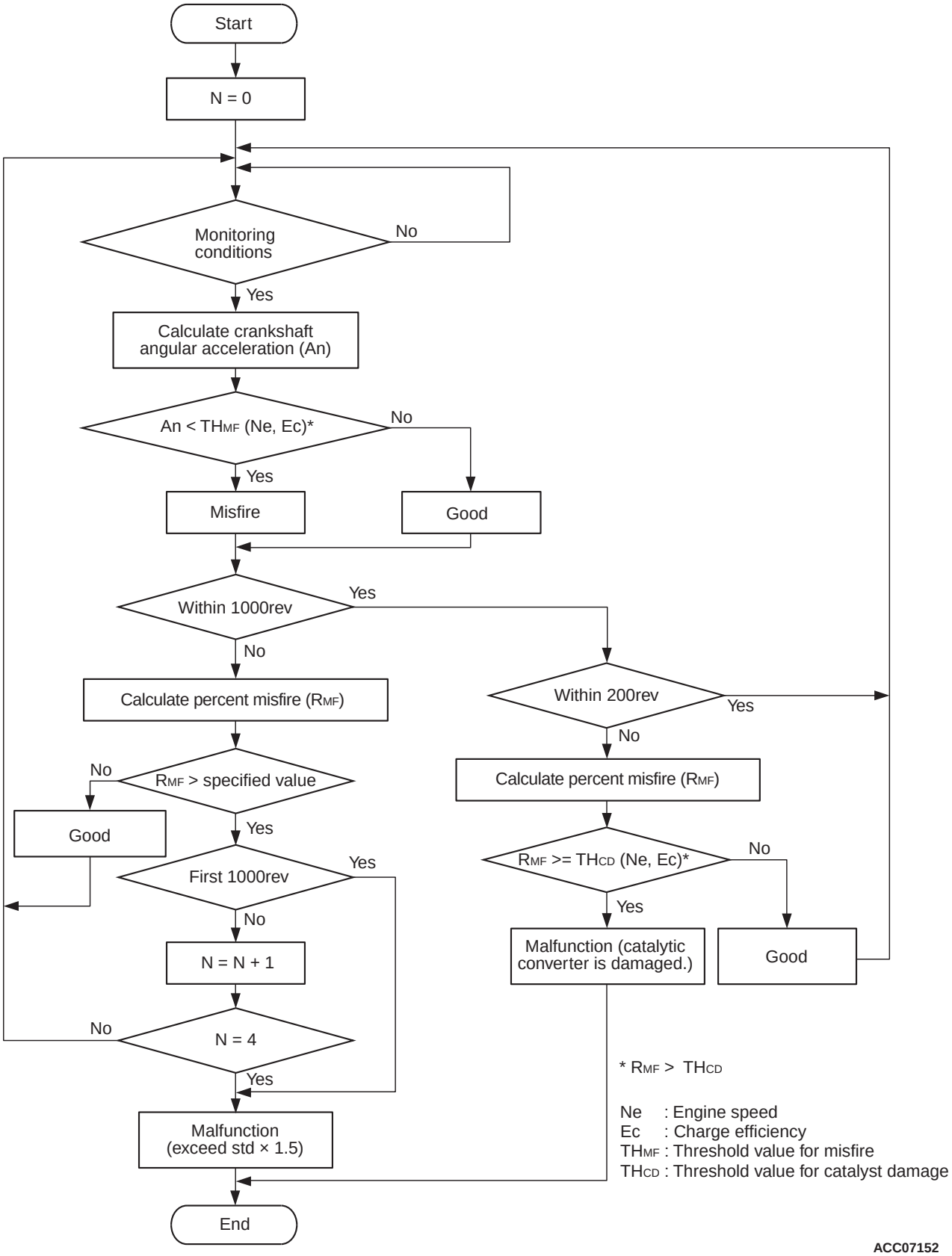
- Not applicable

Sensor (The sensor below is determined to be normal)

- 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



TSB Revision

Check Conditions

- Engine speed is between 438 and 6,594 r/min.
- Engine coolant temperature is more than −10°C (14°F). (However, 20°C (68°F) when the engine coolant temperature at engine start is −10°C (14°F) or less).
- Barometric pressure is more than 76 kPa (22.4 in.Hg).
- The engine load is with in the positive torque load.
- Adaptive learning is complete for the vane which generates a crankshaft position signal.
- While the engine is running, excluding rough road driving <M/T> sudden acceleration/deceleration and fuel shut-off operation.

Judgment Criterion (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 more than 1,000°C (1,832°F)].

or

- Misfire has occurred more than in 2.0 percent of the first 1,000 revolutions (corresponding to 1.5 times the limit of emission standard).

or

- After the first 1,000 revolutions, the following criterion is satisfied 4 times cumulatively.
- Misfire counts per 1,000 revolutions exceeds in 2.0 percent (corresponding to 1.5 times the limit of emission standard).

FAIL-SAFE AND BACKUP FUNCTION

- The supply of fuel to the misfiring cylinder can possibly be cut.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 14 P.13A-10.

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

- Ignition system related part(s) failed.
- Low compression pressure.
- ECM failed.

DIAGNOSIS

Required Special Tools:

- MB992744: Vehicle communication interface-Lite (V.C.I.-Lite)
- MB992745: V.C.I.-Lite main harness A
- MB992747: V.C.I.-Lite USB cable short
- MB992748: V.C.I.-Lite USB cable long
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicles Communication Interface (V.C.I.)
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A (Vehicles with CAN communication system)

STEP 1. Visual check on ignition spark of No. 2 cylinder.

(1) Remove the spark plug and install it to the ignition coil.
(2) Connect the ignition coil connector.
(3) Disconnect all injector connector.
(4) At the engine start, check spark plug produces a spark.

Q: Did it spark?

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

STEP 2. Check the No. 2 cylinder spark plug.
Refer to GROUP 16, Ignition System – On-vehicle Service – Spark Plug Check And Cleaning P.16-28.

Q: Is the spark plug normal?
YES : Refer to, Symptom Procedures 26 – Ignition Circuit System P.13A-577.
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-16.

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 14 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0302 stored?
YES : Replace the ECM (Refer to, Removal and Installation P.13A-656). 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.00-13.

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.13A-10.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0302 stored?
YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0303: Cylinder 3 Misfire Detected

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

TSB Revision

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

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

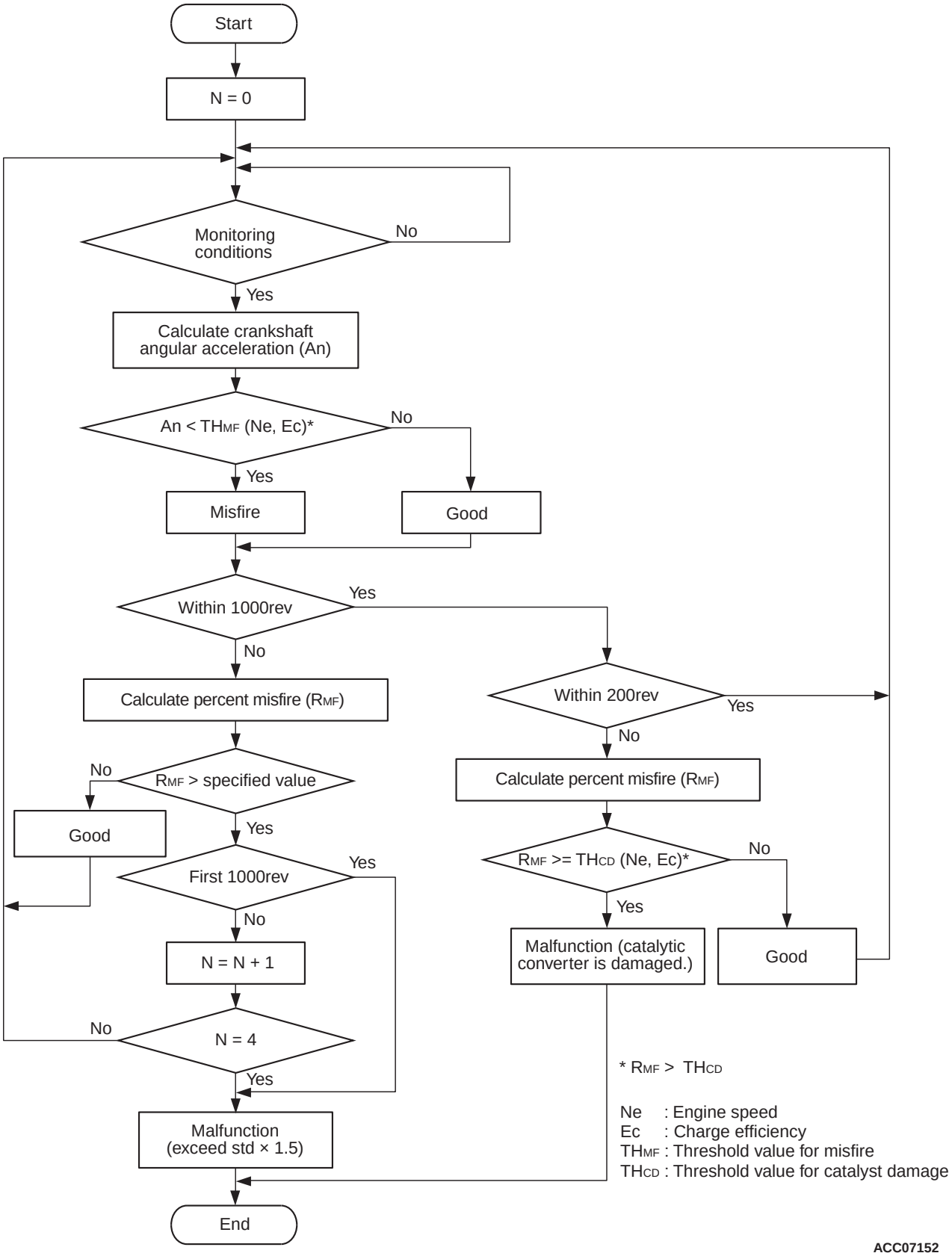
- Not applicable

Sensor (The sensor below is determined to be normal)

- 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



TSB Revision

Check Conditions
- Engine speed is between 438 and 6,594 r/min.
- Engine coolant temperature is more than −10°C (14°F). (However, 20°C (68°F) when the engine coolant temperature at engine start is −10°C (14°F) or less).
- Barometric pressure is more than 76 kPa (22.4 in.Hg).
- The engine load is with in the positive torque load.
- Adaptive learning is complete for the vane which generates a crankshaft position signal.
- While the engine is running, excluding rough road driving <M/T> sudden acceleration/deceleration and fuel shut-off operation.

Judgment Criterion (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 more than 1,000°C (1,832°F)].

or
- Misfire has occurred more than in 2.0 percent of the first 1,000 revolutions (corresponding to 1.5 times the limit of emission standard).

or
- After the first 1,000 revolutions, the following criterion is satisfied 4 times cumulatively.
- Misfire counts per 1,000 revolutions exceeds in 2.0 percent (corresponding to 1.5 times the limit of emission standard).

FAIL-SAFE AND BACKUP FUNCTION
- The supply of fuel to the misfiring cylinder can possibly be cut.

OBD-II DRIVE CYCLE PATTERN
Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 14 P.13A-10.

TROUBLESHOOTING HINTS (The most likely causes for this code to be stored are:)
- Ignition system related part(s) failed.
- Low compression pressure.
- ECM failed.

DIAGNOSIS

Required Special Tools:
- MB992744: Vehicle communication interface-Lite (V.C.I.-Lite)
- MB992745: V.C.I.-Lite main harness A
- MB992747: V.C.I.-Lite USB cable short
- MB992748: V.C.I.-Lite USB cable long
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicles Communication Interface (V.C.I.)
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A (Vehicles with CAN communication system)

STEP 1. Visual check on ignition spark of No. 3 cylinder.
(1) Remove the spark plug and install it to the ignition coil.
(2) Connect the ignition coil connector.
(3) Disconnect all injector connector.
(4) At the engine start, check spark plug produces a spark.

Q: Did it spark?

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

STEP 2. Check the No. 3 cylinder spark plug.
Refer to GROUP 16, Ignition System – On-vehicle Service – Spark Plug Check And Cleaning P.16-28.

Q: Is the spark plug normal?
YES : Refer to, Symptom Procedures 26 – Ignition Circuit System P.13A-577.
NO : Replace the No. 3 cylinder spark plug. Then go to Step 5.

STEP 3. Check the compression.
Refer to GROUP 11A, On-vehicle Service – Compression Pressure Check P.11A-16.

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 14 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0303 stored?
YES : Replace the ECM (Refer to, Removal and Installation P.13A-656). 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.00-13.

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.13A-10.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0303 stored?
YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0327: Knock Sensor Circuit Low

CIRCUIT OPERATION
- The knock sensor signal terminal sends a signal voltage to the ECM terminal K/S.
- The knock sensor ground terminal is grounded with ECM terminal K/SE.

TECHNICAL DESCRIPTION
- The knock sensor converts the vibration of the cylinder block into a voltage and outputs it.
- The ECM checks whether the voltage is within a specified range.

DESCRIPTIONS OF MONITOR METHODS
Knock sensor output voltage is out of specified range.

MONITOR EXECUTION
Continuous

TSB Revision

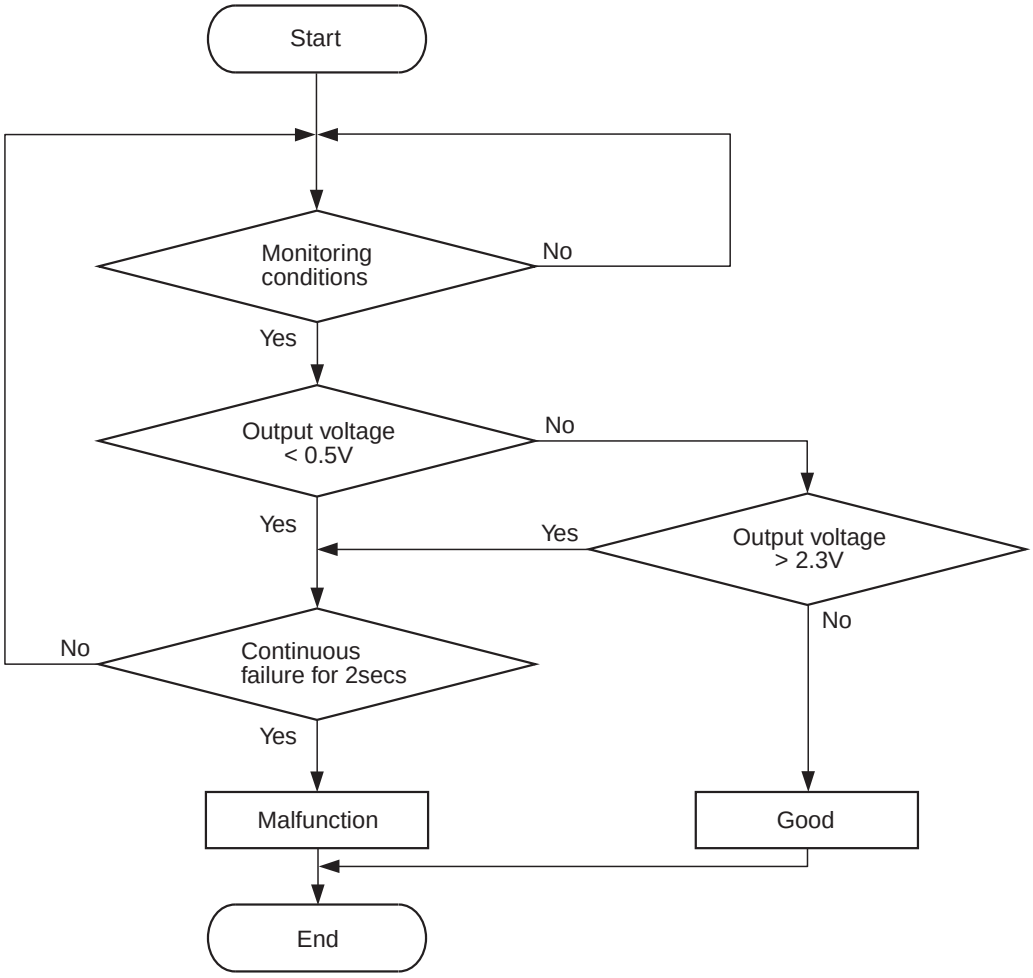
MONITOR EXECUTIONS (Other monitor and Sensor)

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



AK704271

Check Condition
- More than 2 seconds have passed since the engine starting sequence was completed.

Judgment Criterion
- Knock sensor output voltage is less than 0.5 volt for 2 seconds.

FAIL-SAFE AND BACKUP FUNCTION
- Fix the ignition timing with an allowance against knock.

OBD-II DRIVE CYCLE PATTERN
Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 22 P.13A-10.

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

- Knock sensor failed.
- Open or shorted knock sensor circuit, harness damage or connector damage.
- ECM failed.

DIAGNOSIS

Required Special Tools:

- MB992744: Vehicle communication interface-Lite (V.C.I.-Lite)
- MB992745: V.C.I.-Lite main harness A
- MB992747: V.C.I.-Lite USB cable short
- MB992748: V.C.I.-Lite USB cable long
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicles Communication Interface (V.C.I.)
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A (Vehicles with CAN communication system)

STEP 1. Check of open circuit and harness damage in K/SE line between knock sensor connector and ECM connector.

Q: Is the harness wire in good condition?

YES : Go to Step 2.
NO : Repair the connector(s) or wiring harness. Then go to Step 4.

STEP 2. Check of open circuit, short circuit to ground and harness damage in K/S line between knock sensor connector and ECM connector.

Q: Is the harness wire in good condition?

YES : Go to Step 3.
NO : Repair the connector(s) or wiring harness. Then go to Step 4.

STEP 3. Replace the knock sensor.

(1) Replace the knock sensor.
(2) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 22 P.13A-10.
(3) Check the diagnostic trouble code (DTC).

Q: Is DTC P0327 stored?

YES : Replace the ECM (Refer to, Removal and Installation P.13A-656). 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 22 P.13A-10.

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

Q: Is DTC P0327 stored?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0328: Knock Sensor Circuit High

CIRCUIT OPERATION

- The knock sensor signal terminal sends a signal voltage to the ECM terminal K/S.
- The knock sensor ground terminal is grounded with ECM terminal K/SE.

TECHNICAL DESCRIPTION

- The knock sensor converts the vibration of the cylinder block into a voltage and outputs it.
- The ECM checks whether the voltage is within a specified range.

DESCRIPTIONS OF MONITOR METHODS

Knock sensor output voltage is out of specified range.

MONITOR EXECUTION

Continuous

MONITOR EXECUTIONS (Other monitor and Sensor)

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

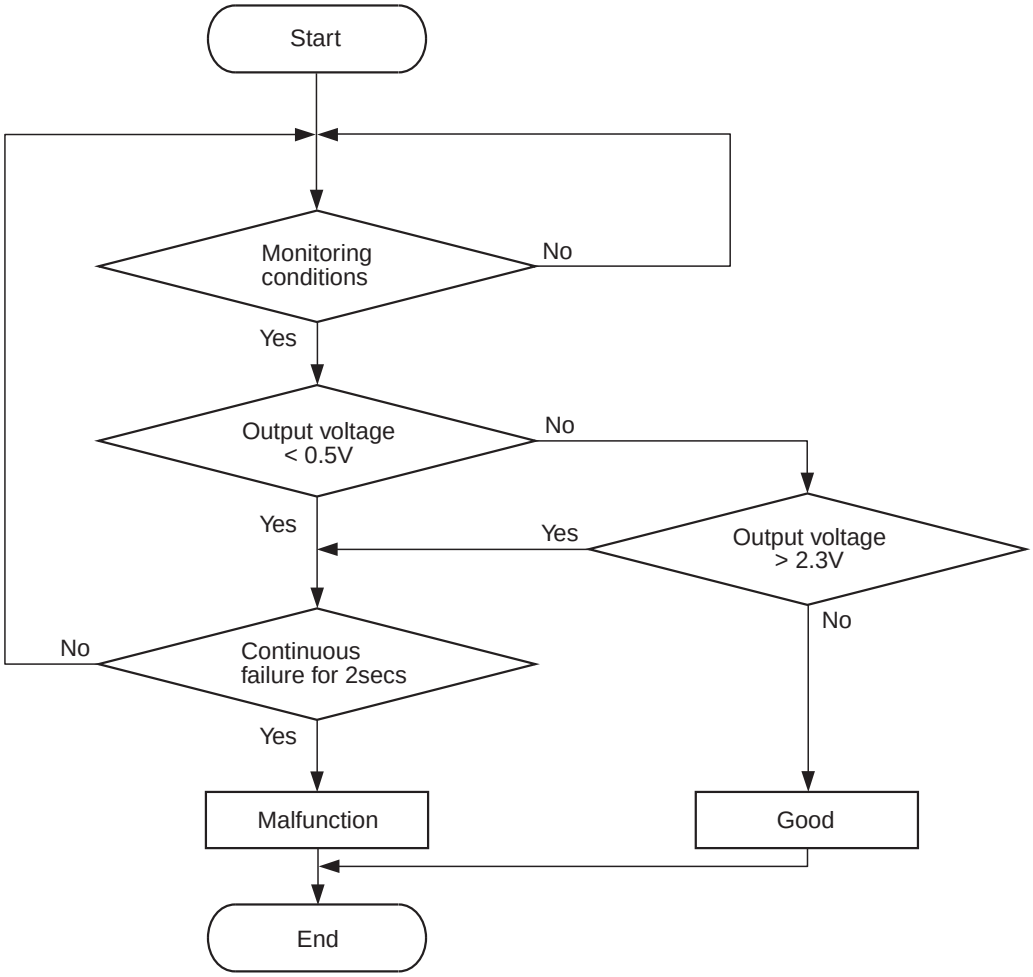
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



AK704271

Check Condition

- More than 2 seconds have passed since the engine starting sequence was completed.

Judgment Criterion

- Knock sensor output voltage is more than 2.3 volts for 2 seconds.

FAIL-SAFE AND BACKUP FUNCTION

- Fix the ignition timing with an allowance against knock.

OBD-II DRIVE CYCLE PATTERN

- Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 22 P.13A-10

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

- Shorted knock sensor circuit or connector damage.
- ECM failed.

DIAGNOSIS

Required Special Tools:

- MB992744: Vehicle communication interface-Lite (V.C.I.-Lite)

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- MB992745: V.C.I.-Lite main harness A
- MB992747: V.C.I.-Lite USB cable short
- MB992748: V.C.I.-Lite USB cable long
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicles Communication Interface (V.C.I.)
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A (Vehicles with CAN communication system)

STEP 1. Check of short circuit to power supply in K/S line between knock sensor connector and ECM connector.

Q: Is the harness wire in good condition?

YES : Go to Step 2.
NO : Repair the connector(s) or wiring harness. Then go to Step 4.

STEP 2. Check of short circuit to power supply in K/SE line between knock sensor connector and ECM connector.

Q: Is the harness wire in good condition?

YES : Go to Step 3.
NO : Repair the connector(s) or wiring harness. 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 22 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0328 stored?

YES : Replace the ECM (Refer to, Removal and Installation P.13A-656). 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.00-13.

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 22 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0328 stored?

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

DTC P0335: Crankshaft Position Sensor Circuit

CIRCUIT OPERATION

- The crankshaft position sensor power is supplied from the ECM terminal 5V.
- Ground terminal of the crankshaft position sensor is grounded with ECM terminal DGND.

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- A 5-volt voltage is applied on the crankshaft position sensor output terminal from the ECM terminal SGT. 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)

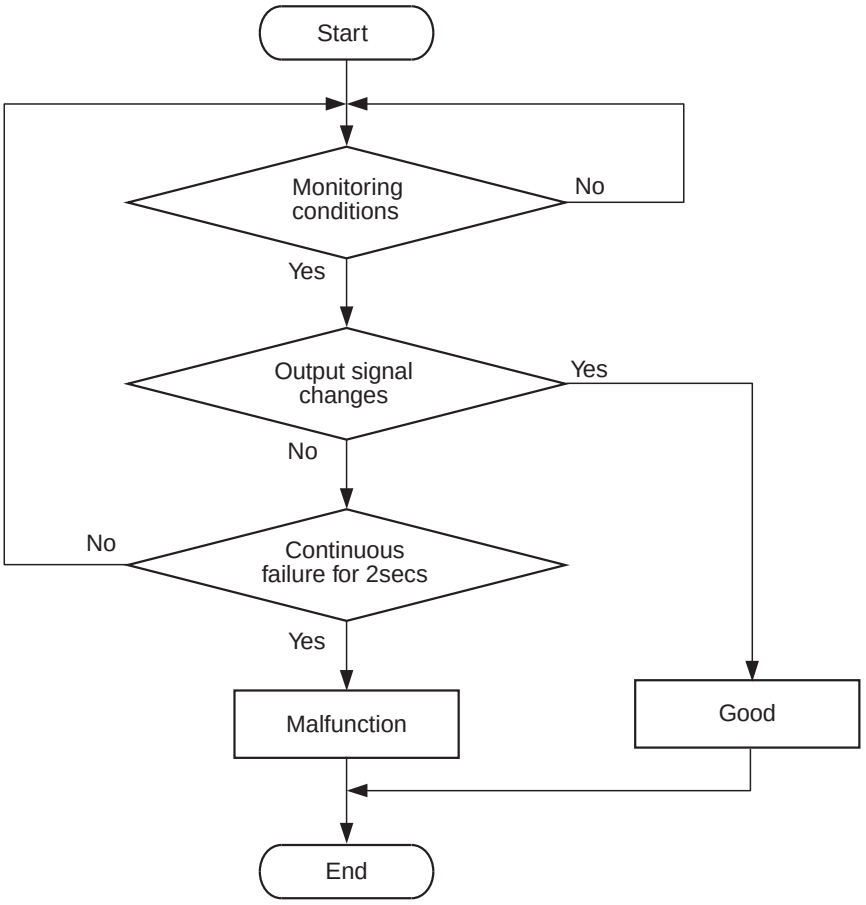
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS <Circuit continuity>

Logic Flow Chart



AK604334

Check Condition or

- Engine is being cranked.

TSB Revision

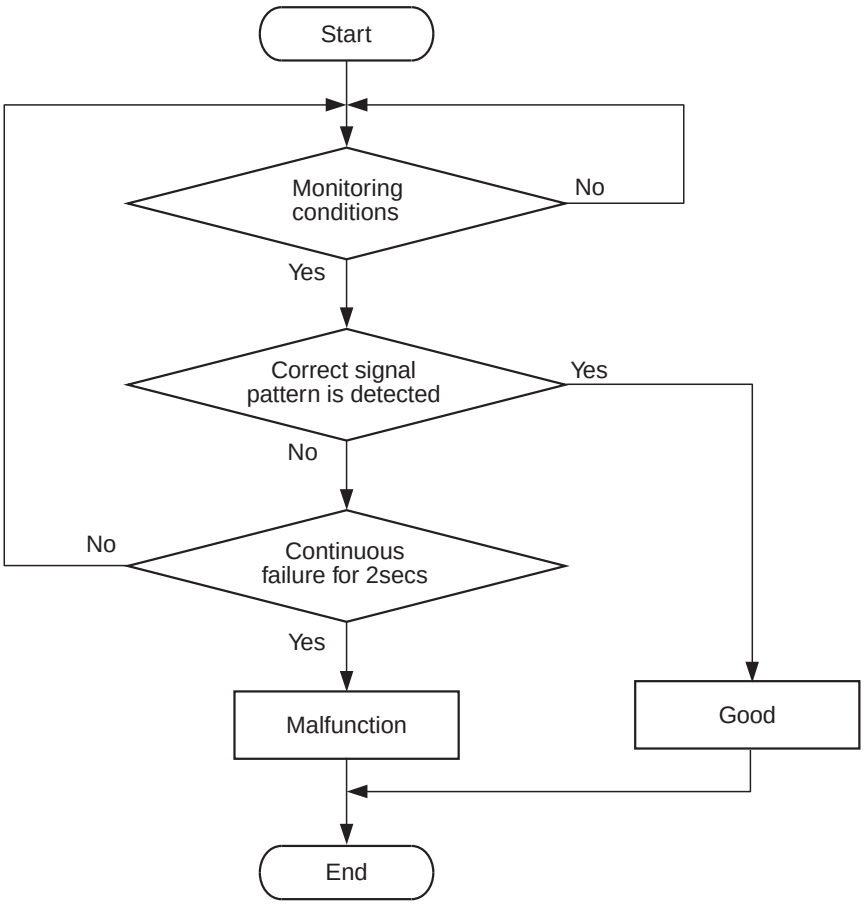
- Engine speed is more than 500 r/min excluding during cranking.

Judgment Criterion

- Crankshaft position sensor output voltage does not change (no pulse signal is input) for 2 seconds.

DTC SET CONDITIONS <Range/Performance problem – alignment>

Logic Flow Chart



AK705067

Check Condition

- Engine is being cranked.

or

- Engine speed is more than 500 r/min excluding during cranking.

Judgment Criterion

- Normal signal pattern is not inputted for cylinder identification from the crankshaft position sensor signal and camshaft position sensor signal for 2 seconds.

FAIL-SAFE AND BACKUP FUNCTION

- None

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 22 P.13A-10.

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

- Crankshaft position sensor failed.
- Open or shorted crankshaft position sensor circuit, harness damage or connector damage.
- Crankshaft position sensing ring failed.
- ECM failed.

DIAGNOSIS

Required Special Tools:

- MB992744: Vehicle communication interface-Lite (V.C.I.-Lite)
- MB992745: V.C.I.-Lite main harness A
- MB992747: V.C.I.-Lite USB cable short
- MB992748: V.C.I.-Lite USB cable long
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicles Communication Interface (V.C.I.)
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A (Vehicles with CAN communication system)
- MB991709: Test Harness

STEP 1. Using scan tool (M.U.T.-III), check data list item 2: Crankshaft Position Sensor.

⚠ CAUTION

To prevent damage to scan tool (M.U.T.-III), always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool (M.U.T.-III).

(1) Connect scan tool (M.U.T-III). Refer to HOW TO CONNECT THE SCAN TOOL (M.U.T.-III) P.13A-10.
(2) Start the engine and run at idle.
(3) Set scan tool (M.U.T.-III) 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.00-13.
NO : Go to Step 2.

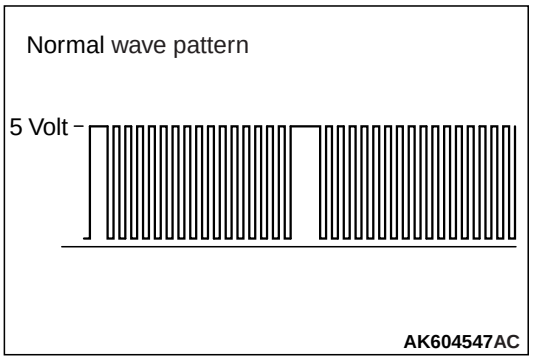
STEP 2. Using the oscilloscope, check the crankshaft position sensor.

(1) Disconnect the crankshaft position sensor connector and connect the test harness special tool MB991709 between the separated connectors. (All terminals should be connected.)
(2) Connect the oscilloscope probe to terminal SGT line of the crankshaft position sensor connector.

NOTE: When checking with the ECM side connector, connect the oscilloscope probe to the ECM connector terminal SGT by backprobing.

(3) Start the engine and run at idle.
(4) Check the wave pattern.
- The wave pattern should show a pattern similar to the illustration.

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



Q: Is the wave pattern normal?

YES : Go to Step 13.
NO : Go to Step 3.

STEP 3. Measure the sensor supply voltage at crankshaft position sensor harness side connector.

(1) Disconnect the crankshaft position sensor connector and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 5V line 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 by backprobing.

(1) Do not disconnect the connector.
(2) Disconnect the crankshaft position sensor connector.
(3) Turn the ignition switch to the "ON" position.
(4) Measure the voltage between terminal SGT and ground by backprobing.
- Voltage should be between 4.9 and 5.1 volts.

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

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

YES : Repair or replace the connector(s), or check and repair the harness of open circuit in SGT line between crankshaft position sensor connector and ECM connector. Then go to Step 14.
NO : Go to Step 5.

TSB Revision

STEP 5. Check of short circuit to ground in SGT line between crankshaft position sensor connector and ECM connector.

Q: Is the harness wire in good condition?

YES : Go to Step 13.
NO : Repair the connector(s) or wiring harness. Then go to Step 14.

STEP 6. Measure the sensor supply voltage at crankshaft position sensor harness side connector.

(1) Disconnect the crankshaft position sensor connector and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 5V line 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? present?

YES : Go to Step 8.
NO : Go to Step 7.

STEP 7. Check of open circuit and short circuit to ground in 5V line between crankshaft position sensor connector and ECM connector.

Q: Is the harness wire in good condition?

YES : Go to Step 13.
NO : Repair the connector(s) or wiring harness. Then go to Step 14.

STEP 8. Check the continuity at crankshaft position sensor harness side connector.

(1) Disconnect the crankshaft position sensor connector and measure at the harness side.
(2) Check for the continuity between terminal DGND line and ground.
- Continuity (2 ohms or less)

Q: Does continuity exist?

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

STEP 9. Check of open circuit and harness damage in DGND line between crankshaft position sensor connector and ECM connector.

Q: Is the harness wire in good condition?

YES : Go to Step 13.
NO : Repair the connector(s) or wiring harness. Then go to Step 14.

STEP 10. Check of harness damage in 5V line between ECM connector and crankshaft position sensor connector.

Q: Is the harness wire in good condition?

YES : Go to Step 11.
NO : Repair the connector(s) or wiring harness. Then go to Step 14.

STEP 11. Check of harness damage in SGT line between crankshaft position sensor connector and ECM connector.

Q: Is the harness wire in good condition?

YES : Replace the crankshaft position sensor. Then go to Step 12.
NO : Repair the connector(s) or wiring harness. Then go to Step 14.

STEP 12. 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.13A-10.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0335 stored?

YES : Replace the crankshaft sensing ring. Then go to Step 14.
NO : The inspection is complete.

STEP 13. Using scan tool (M.U.T.-III), check data list item 2: Crankshaft Position Sensor.

(1) Start the engine and run at idle.
(2) Set scan tool (M.U.T.-III) to the data reading mode for item 2, Crankshaft Position Sensor.
- The tachometer and engine speed indicated on the scan tool should match.

(3) 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.00-13.
NO : Replace the ECM (Refer to, Removal and Installation P.13A-656). Then go to Step 14.

STEP 14. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 22 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0335 stored?

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

TSB Revision

DTC P0340: camshaft position sensor Circuit

CIRCUIT OPERATION

- The camshaft position sensor power is supplied from the ECM terminal 5V.
- Ground terminal of the camshaft position sensor is grounded with ECM terminal DGND.
- A 5-volt voltage is applied on the camshaft position sensor output terminal from the ECM terminal SGC. The camshaft position sensor generates a pulse signal when the output terminal is opened and grounded.

TECHNICAL DESCRIPTION

- The camshaft position sensor detects the position of the intake camshaft and inputs the pulse signal to the ECM.
- In response to the camshaft position sensor signal and the crankshaft sensor signal, the ECM detects the compression top dead center of the No. 1 cylinder.
- Also, in response to the camshaft position sensor signal, the ECM controls variable valve timing (V.V.T.).

DESCRIPTIONS OF MONITOR METHODS

- camshaft position sensor signal does not change.
- camshaft position sensor signal is not normal pattern.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

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

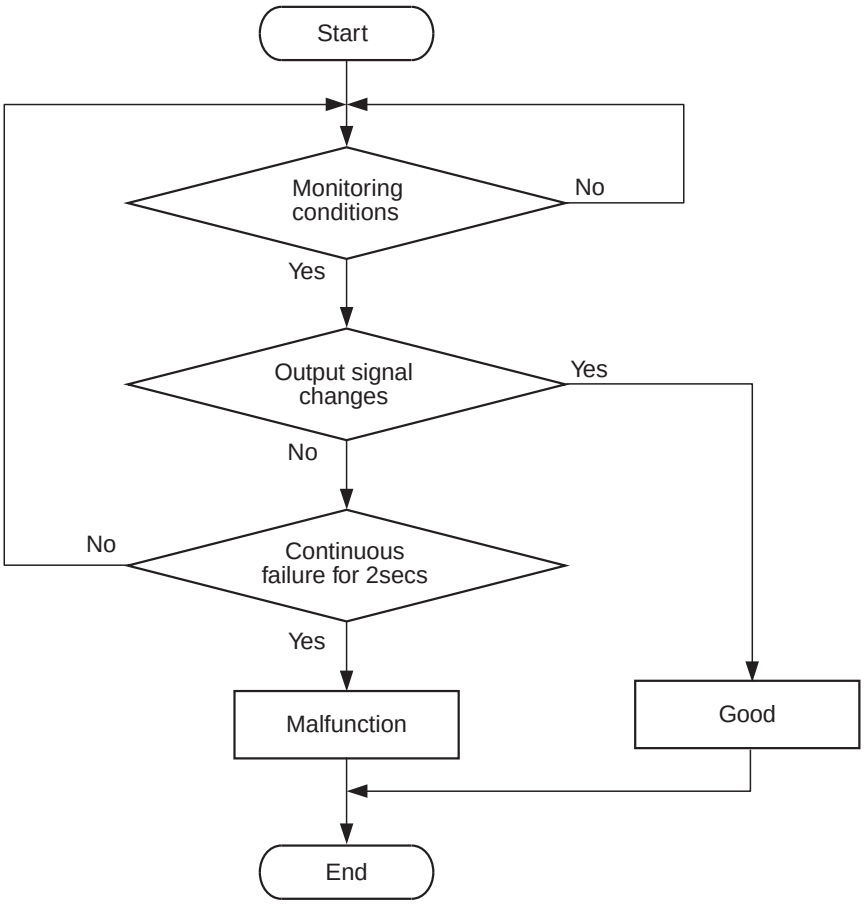
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS <Circuit continuity>

Logic Flow Chart



AK604334

Check Condition

- Engine is being cranked.

or

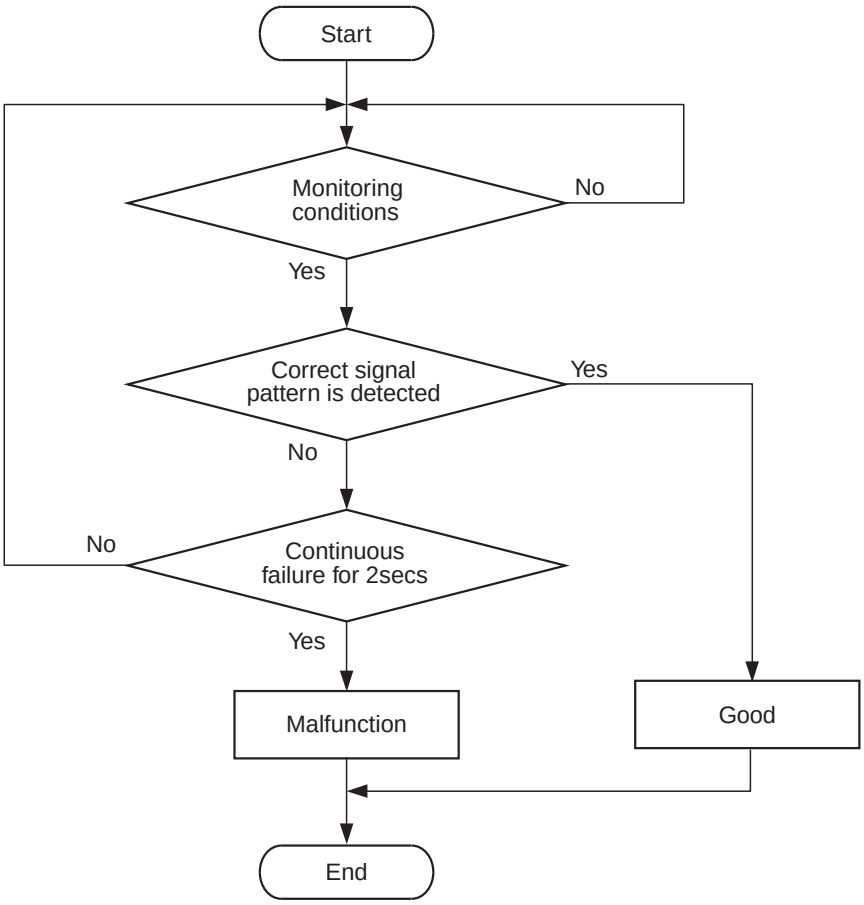
- Engine speed is more than 500 r/min excluding during cranking.

Judgment Criterion

- camshaft position sensor output voltage does not change (no pulse signal is input) for 2 seconds.

DTC SET CONDITIONS <Range/Performance problem – alignment>

Logic Flow Chart



AK705067

Check Condition

- Engine is being cranked.

or

- Engine speed is more than 500 r/min excluding during cranking.

Judgment Criterion

- Normal signal pattern is not inputted for cylinder identification from the crankshaft position sensor signal and camshaft position sensor signal for 2 seconds.

FAIL-SAFE AND BACKUP FUNCTION

- Engine runs in learned pattern until engine stops.
- Does not control variable valve timing (V.V.T.).

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 22 P.13A-10.

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

- camshaft position sensor failed.
- Open or shorted camshaft position sensor circuit, harness damage or connector damage.
- Intake camshaft failed.
- ECM failed.

DIAGNOSIS

Required Special Tools:

- MB992744: Vehicle communication interface-Lite (V.C.I.-Lite)
- MB992745: V.C.I.-Lite main harness A
- MB992747: V.C.I.-Lite USB cable short

TSB Revision

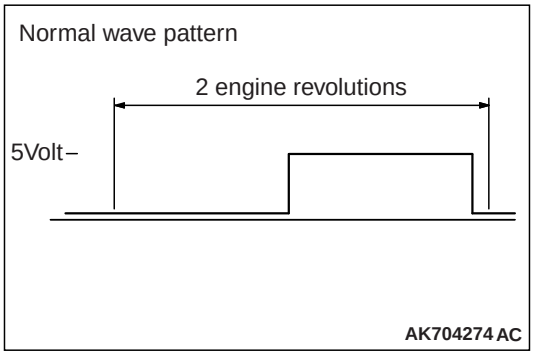
- MB992748: V.C.I.-Lite USB cable long
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicles Communication Interface (V.C.I.)
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A (Vehicles with CAN communication system)
- MB991709: Test Harness

STEP 1. Using the oscilloscope, check the camshaft position sensor.

(1) Disconnect the camshaft position sensor connector, 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 SGC.

NOTE: When checking with the ECM side connector, connect the oscilloscope probe to the ECM connector terminal SGC by backprobing.

(3) Start the engine and run at idle.
(4) Check the wave pattern.
  - The wave pattern should show a pattern similar to the illustration.
(5) Turn the ignition switch to the "LOCK" (OFF) position.



Q: Is the wave pattern normal?

YES : Go to Step 12.
NO : Go to Step 2.

STEP 2. Measure the sensor supply voltage at camshaft position sensor harness side connector.

(1) Disconnect the connector and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal SGC line 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 by backprobing.

(1) Do not disconnect the connector.
(2) Disconnect the camshaft position sensor connector.
(3) Turn the ignition switch to the "ON" position.
(4) Measure the voltage between terminal SGC and ground by backprobing.
- Voltage should be between 4.9 and 5.1 volts.

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

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

YES : Repair or replace the connector(s), or check and repair the harness of open circuit in SGC line between camshaft position sensor connector and ECM connector. Then go to Step 13 .
NO : Go to Step 4.

STEP 4. Check of short circuit to ground in SGC line between camshaft position sensor connector and ECM connector.

Q: Is the harness wire in good condition?

YES : Go to Step 12.
NO : Repair the connector(s) or wiring harness. Then go to Step 13.

STEP 5. Measure the sensor supply voltage at camshaft position sensor harness side connector.

(1) Disconnect the connector and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 5V line 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? present?

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

STEP 6. Check of open circuit and short circuit to ground in 5V line between camshaft position sensor connector and ECM connector.

Q: Is the harness wire in good condition?

YES : Go to Step 12.
NO : Repair the connector(s) or wiring harness. Then go to Step 13.

STEP 7. Check the continuity at camshaft position sensor harness side connector.

(1) Disconnect the connector and measure at the harness side.
(2) Check for the continuity between terminal DGND line and ground.
- Continuity (2 ohms or less).

Q: Does continuity exist?

YES : Go to Step 9.
NO : Go to Step 8.

STEP 8. Check of open circuit and harness damage in DGND line between camshaft position sensor connector and ECM connector B-26.

Q: Is the harness wire in good condition?

YES : Go to Step 12.
NO : Repair it. Then go to Step 13.

STEP 9. Check of harness damage in 5V line between ECM connector and camshaft position sensor connector.

Q: Is the harness wire in good condition?

YES : Go to Step 10.
NO : Repair the connector(s) or wiring harness. Then go to Step 13.

STEP 10. Check of harness damage in SGC line between camshaft position sensor connector and ECM connector.

Q: Is the harness wire in good condition?

YES : Go to Step 11.
NO : Repair it. Then go to Step 13.

STEP 11. Check the intake camshaft position sensing portion.

Q: Is the intake camshaft position sensing portion in good condition?

YES : Replace the camshaft position sensor. Then go to Step 13.
NO : Replace the intake camshaft. Then go to Step 13.

STEP 12. 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.13A-10.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0340 stored?

YES : Replace the ECM (Refer to, Removal and Installation P.13A-656). Then go to Step 13.
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.00-13.

TSB Revision

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.13A-10.

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

Q: Is DTC P0340 stored?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0421: Warm Up Catalyst Efficiency Below Threshold

TECHNICAL DESCRIPTION

- The signal from the heated oxygen sensor (rear) differs from the linear air-fuel ratio sensor, because the catalytic converter purifies exhaust gas. When the catalytic converter has deteriorated, the signal from the linear air-fuel ratio sensor becomes similar to the heated oxygen sensor (rear).
- The ECM compares the output of the linear air-fuel ratio sensor and heated oxygen sensor (rear) signals.

DESCRIPTIONS OF MONITOR METHODS

Linear air-fuel ratio sensor and heated oxygen sensor (rear) 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)

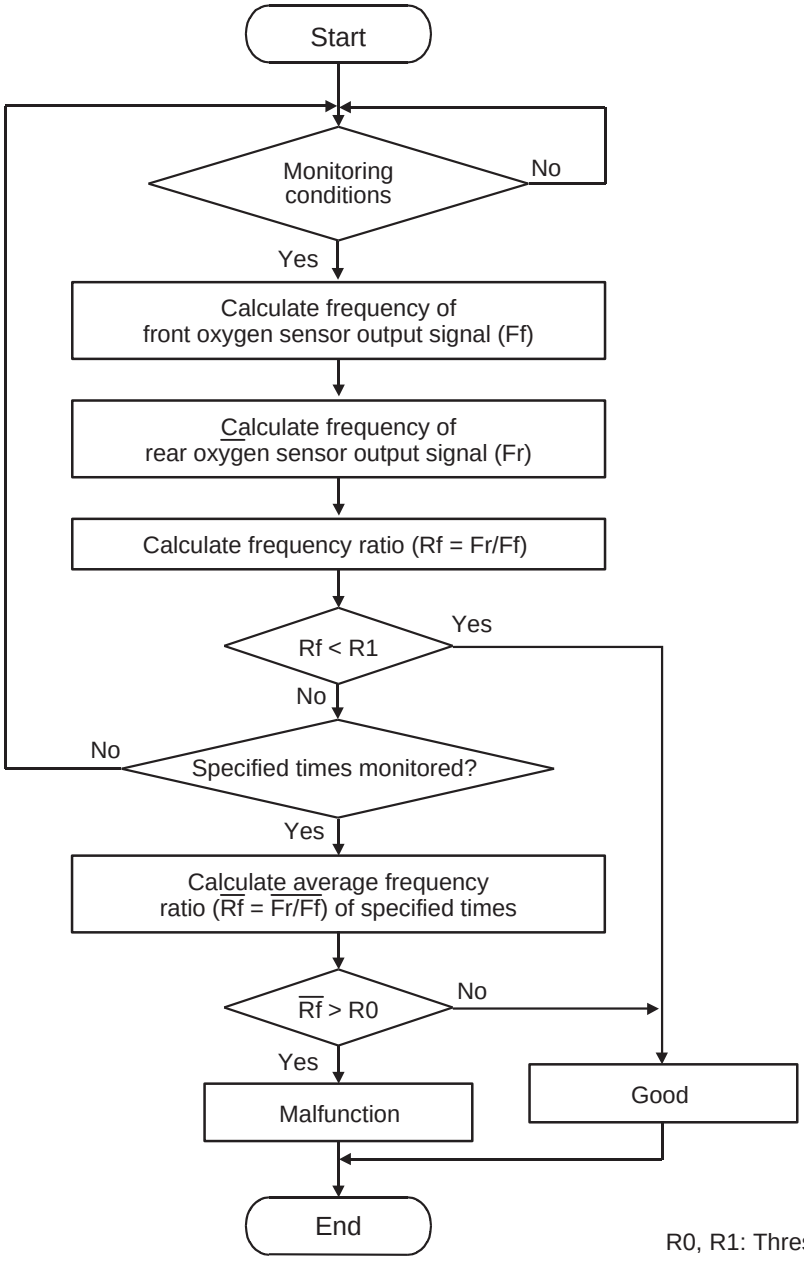
- Linear air-fuel ratio sensor monitor
- Heated oxygen sensor (rear) monitor
- Linear air-fuel ratio sensor heater monitor
- Heated oxygen sensor heater (rear) monitor
- Heated oxygen sensor offset voltage monitor
- Misfire monitor
- Fuel system monitor
- Heated oxygen sensor (rear) feedback control 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



ACC07077

Check Conditions

- Engine speed is less than 4,250 r/min <M/T> or 3,500 r/min <CVT>.
- Accelerator pedal is depressed.
- Mass airflow rate is between 6 and 45 g/sec <M/T> or 10 and 45 g/sec <CVT>.
- More than 3 seconds have passed after the above-mentioned three conditions have been met.
- Intake air temperature is more than –10°C (14°F).
- Barometric pressure is more than 76 kPa (22.4 in.Hg).
- Under the closed loop air/fuel ratio control.
- Vehicle speed is more than 1.5 km/h (1.0 mph).
- The ECM monitors the maximum 5 times <M/T> or 3 times <CVT> per drive cycle under these conditions.
- Short-term fuel trim is between –25 percent and +25 percent.

TSB Revision

- The cumulative mass airflow is more than 901 g.
- The linear air-fuel ratio sensor rich/lean switching frequency is more than 8 times.

Judgment Criterion

- When the monitoring for 10 seconds is carried out 5 times, the frequency ratio of heated oxygen sensor (rear) and linear air-fuel ratio sensor signals is more than the specified value.

  NOTE: The specified value varies depending on the average air flow rate.

FAIL-SAFE AND BACKUP FUNCTION

- None

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 3 P.13A-10.

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

- Catalytic converter deteriorated.
- Heated oxygen sensor failed.
- Exhaust leak.
- ECM failed.

DIAGNOSIS

Required Special Tools:

- MB992744: Vehicle communication interface-Lite (V.C.I.-Lite)
- MB992745: V.C.I.-Lite main harness A
- MB992747: V.C.I.-Lite USB cable short
- MB992748: V.C.I.-Lite USB cable long
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicles Communication Interface (V.C.I.)
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A (Vehicles with CAN communication system)

STEP 1. Replace the 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 3 P.13A-10.
(3) Check the diagnostic trouble code (DTC).

Q: Is DTC P0421 stored?

YES : Replace the ECM (Refer to, Removal and Installation P.13A-656).
NO : The inspection is complete.

DTC P0441: Evaporative Emission Control System Incorrect Purge Flow

TECHNICAL DESCRIPTION

- ECM detects a stuck open condition of evaporative emission purge solenoid and a stuck closed condition of evaporative emission ventilation solenoid by pressure change in fuel tank.
- Stuck open evaporative emission purge solenoid is judged through monitoring leak of evaporative emission system.
- Stuck closed evaporative emission ventilation solenoid is judged after 20 seconds from end of monitoring leak of evaporative emission system, or of usual operation of evaporative emission purge solenoid from ON to OFF.

DESCRIPTIONS OF MONITOR METHODS

Fuel tank pressure decreases largely during purge-cut.

MONITOR EXECUTION
Continuous

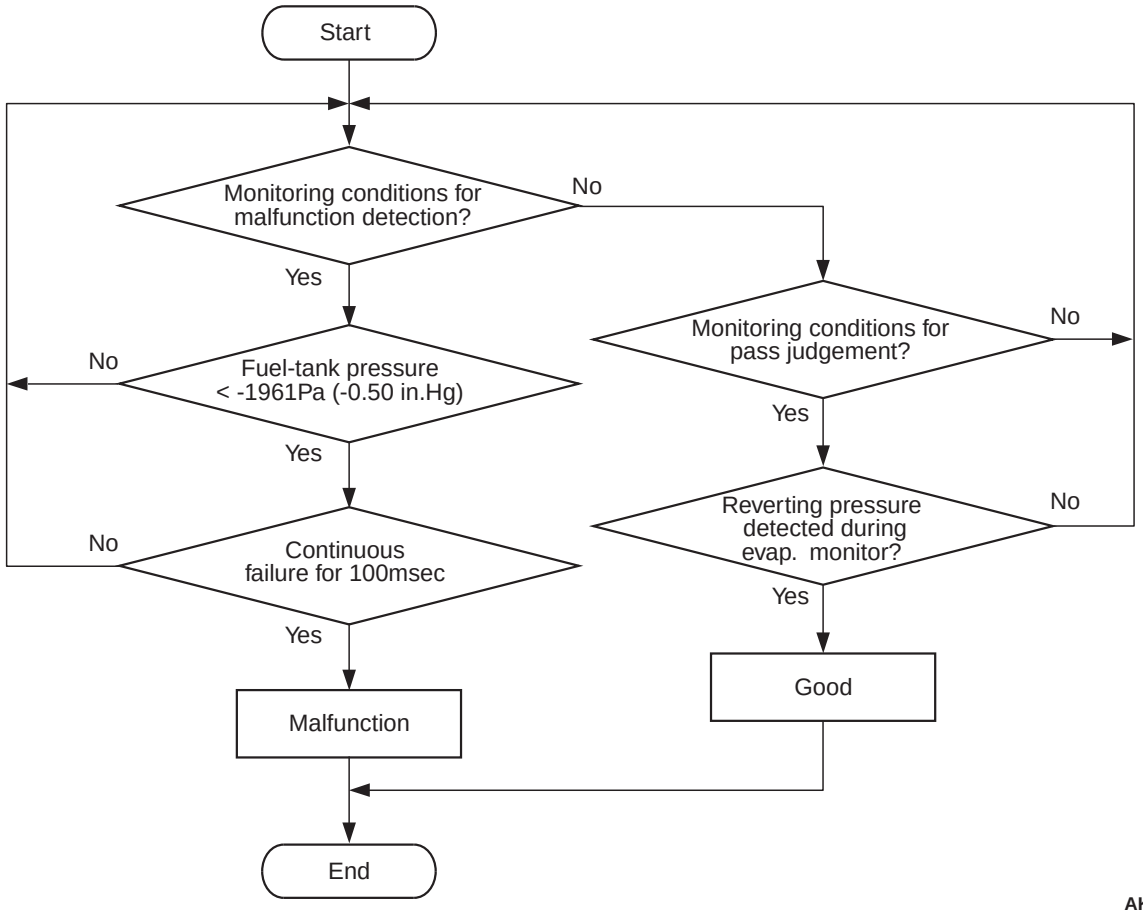
MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)
- Fuel tank pressure sensor monitor

Sensor (The sensor below is determined to be normal)
- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



AK802469

Check Conditions
- Engine is running.
- ON duty cycle of the evaporative emission purge solenoid is 0 percent.
- 20 seconds have passed since the duty cycle of the evaporative emission purge solenoid has turned to 0 percent.

Judgment Criterion
- The pressure in the fuel tank is less than –1961 Pa (–0.58 in.Hg) for 0.1 second.

FAIL-SAFE AND BACKUP FUNCTION
- None

OBD-II DRIVE CYCLE PATTERN
Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 4 P.13A-10.

TROUBLESHOOTING HINTS (The most likely causes for this code to be stored are:)
- Evaporative emission purge solenoid failed.

TSB Revision

- Evaporative emission ventilation solenoid failed.
- Fuel tank differential pressure sensor circuit related part(s) failed.

DIAGNOSIS

Required Special Tools:

- MB992744: Vehicle communication interface-Lite (V.C.I.-Lite)
- MB992745: V.C.I.-Lite main harness A
- MB992747: V.C.I.-Lite USB cable short
- MB992748: V.C.I.-Lite USB cable long
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicles Communication Interface (V.C.I.)
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A (Vehicles with CAN communication system)

STEP 1. Using scan tool (M.U.T.-III), read the diagnostic trouble code (DTC).

⚠ CAUTION

To prevent damage to scan tool (M.U.T.-III), always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool (M.U.T.-III).

(1) Connect scan tool (M.U.T-III). Refer to HOW TO CONNECT THE SCAN TOOL (M.U.T.-III) P.13A-10.
(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 stored?

YES : Refer to, DTC P0451 – Evaporative Emission Control System Pressure Sensor Range/Performance P.13A-293.
NO : Go to Step 2.

STEP 2. Using scan tool (M.U.T.-III), 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 (M.U.T-III) to the data reading mode for item 52, Fuel Tank Differential Pressure Sensor.
  - The output voltage should be between 1,500 and 3,500 millivolts.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the output voltage 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.13A-293.

STEP 3. Using scan tool (M.U.T-III), check actuator test item 10: Evaporative Emission Purge Solenoid.

(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool (M.U.T-III) 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 (M.U.T-III), check actuator test item 15: Evaporative Emission Ventilation Solenoid.

(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool (M.U.T-III) 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 4 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0441 stored?

YES : Replace the ECM (Refer to, Removal and Installation P.13A-656). 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 4 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

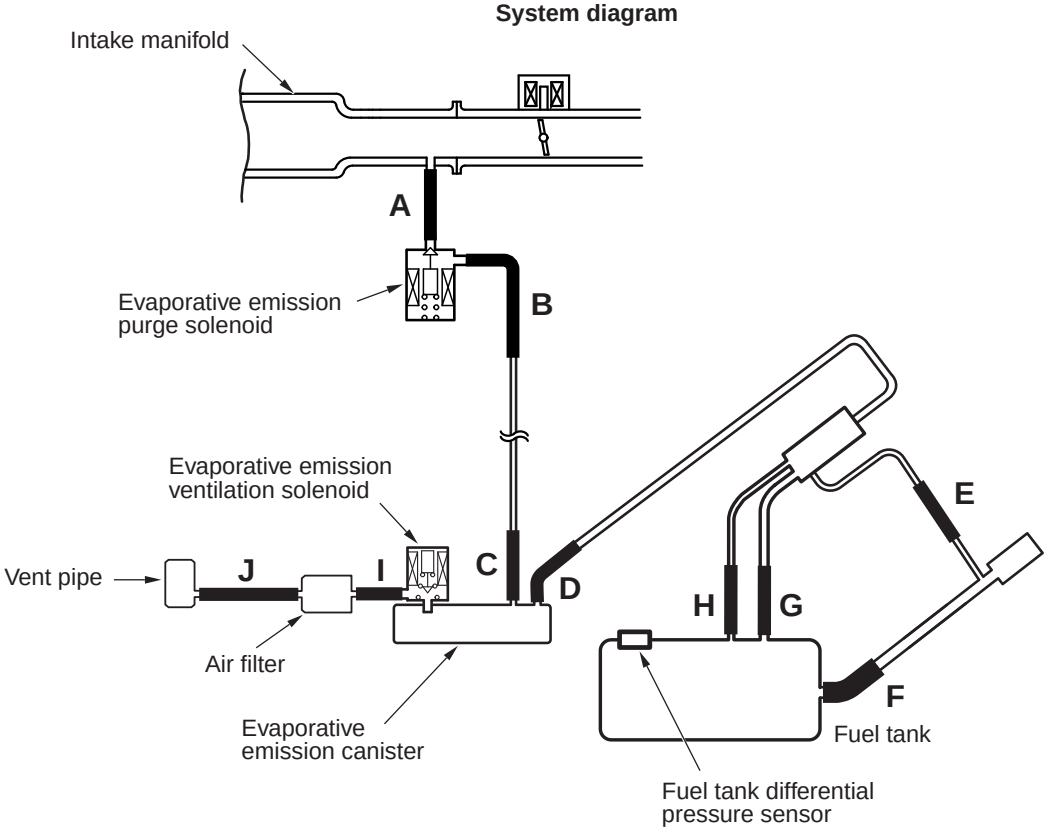
Q: Is DTC P0441 stored?

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

TSB Revision

DTC P0442: Evaporative Emission Control System Leak Detected (small leak)

System diagram



ACC07273AB

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 set in memory for the item monitored below)

- Evaporative emission purge system monitor
- Evaporative emission purge solenoid monitor
- Evaporative emission ventilation solenoid monitor
- Fuel temperature sensor monitor
- Fuel tank differential pressure sensor monitor
- Fuel level sensor monitor

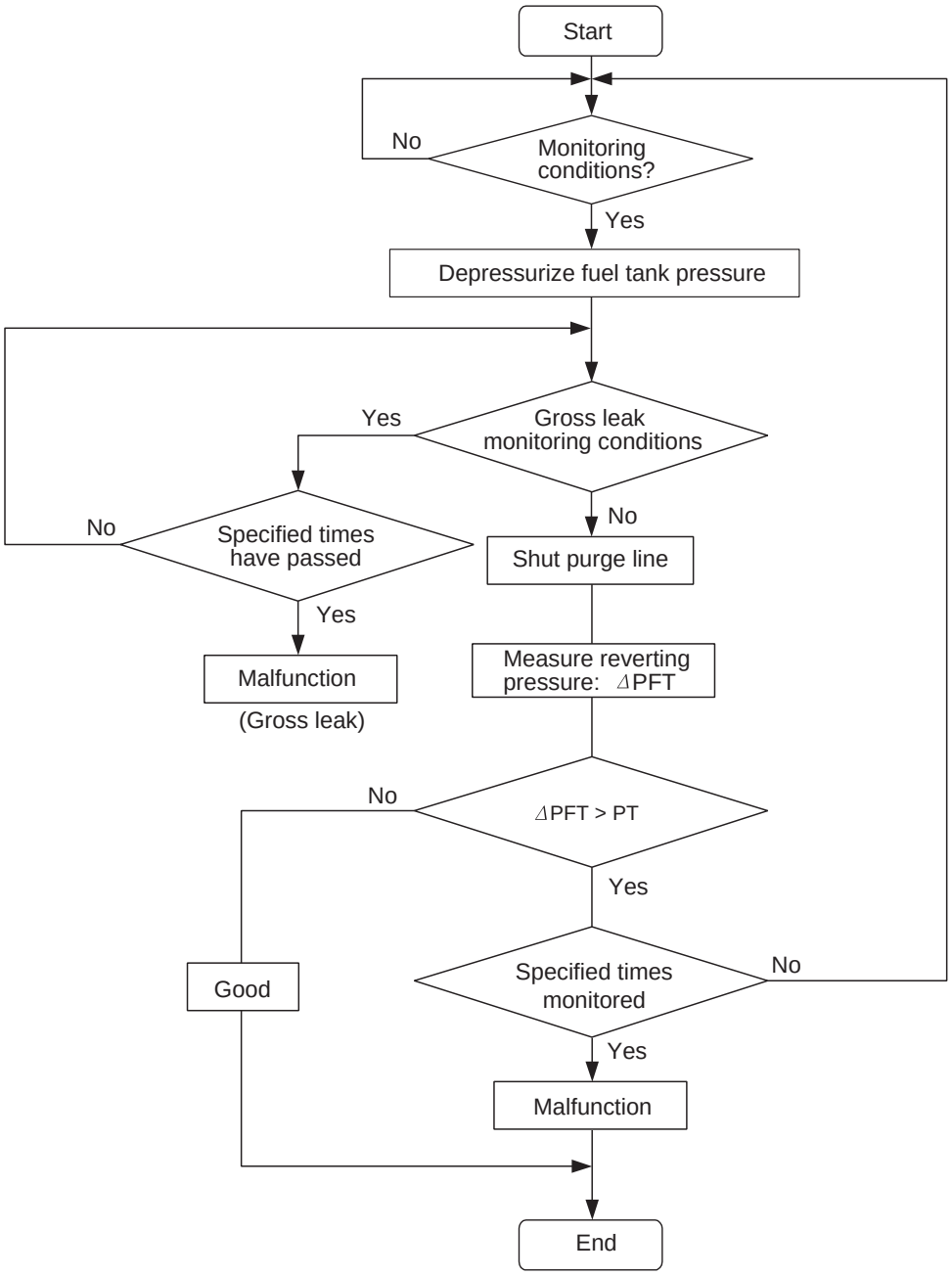
Sensor (The sensors below are determined to be normal)

- Mass airflow sensor
- Engine coolant temperature sensor

- Intake air temperature sensor
- Barometric pressure sensor

DTC SET CONDITIONS

Logic Flow Chart (Monitor Sequence)



AK704743

Check Conditions

- Amount of remaining fuel is 15 – 85 percent of capacity when the engine is started.
- Engine coolant temperature is less than 36°C (97°F) when the engine is started.
- Intake air temperature is less than 36°C (97°F) when the engine is started.
- Engine coolant temperature is more than 20°C (68°F).
- Intake air temperature is more than –10°C (14°F).
- Fuel temperature is less than 36°C (97°F).

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- When the evaporative emission purge solenoid and evaporative emission ventilation solenoid are closed, the change of the pressure in the fuel tank is less than 324 Pa (0.09 in.Hg).
- Barometric pressure is more than 76 kPa (22.4 in.Hg).
- Fuel tank differential pressure sensor output voltage is between 1.0 and 4.0 volts.
- At least 10 seconds have passed since the last monitor was complete.
- Monitoring time: 10 – 14 minutes

Judgment Criterion

- Internal pressure of the fuel tank has changed more than 1,824 Pa (0.53 in.Hg) in 88 seconds after the tank and vapor lines 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.*

FAIL-SAFE AND BACKUP FUNCTION

- None

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 4 P.13A-10.

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:

- MB992744: Vehicle communication interface-Lite (V.C.I.-Lite)
- MB992745: V.C.I.-Lite main harness A
- MB992747: V.C.I.-Lite USB cable short
- MB992748: V.C.I.-Lite USB cable long
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicles Communication Interface (V.C.I.)
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A (Vehicles with CAN communication system)

STEP 1. Using scan tool (M.U.T.-III), check the evaporative emission system monitor test.

⚠ CAUTION

- **To prevent damage to scan tool (M.U.T.-III), always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool (M.U.T.-III).**
- **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 Neutral <M/T> or "P" position <CVT>.**

(1) Connect scan tool (M.U.T-III). Refer to HOW TO CONNECT THE SCAN TOOL (M.U.T.-III) P.13A-10.
(2) Turn the ignition switch to the "ON" position.
(3) Erase the DTCs using scan tool (M.U.T-III).
(4) Check that the fuel cap is securely closed (Tighten until three clicks are heard).
(5) Start the engine.
(6) Select "Special Function".
(7) Select "Evap Leak Monitor".
(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 (M.U.T-III) will change from "NO" to "YES".
(10) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is "Evap Leak was detected." displayed on scan tool (M.U.T-III)?

YES : A malfunction has been detected during the monitor test. Refer to the Diagnostic Trouble Code Chart and diagnose any other DTCs that are set P.13A-47. If no other DTC's have been set, go to Step 2.

NO <"Evap Leak Monitor test passed." is displayed on scan tool (M.U.T-III).> : 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 Monitor discontinued. Once turn the IG off then retest again from the beginning." is displayed on scan tool (M.U.T-III).> : The EVAP monitor has been interrupted during the test. Turn the ignition switch to the "LOCK" (OFF) position once, and repeat the monitoring from (1).

STEP 2. Check the evaporative emission purge solenoid for leaks.

Refer to GROUP 17, Emission Control – Evaporative Emission Control System – Evaporative Emission Purge Solenoid Check P.17-56.

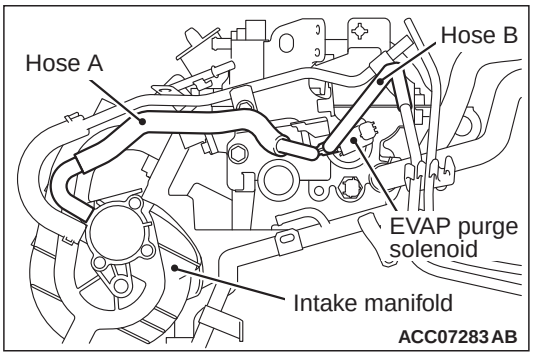
Q: Does the evaporative emission purge solenoid hold pressure?

YES : Go to Step 3.

NO : Replace the evaporative emission purge solenoid. Then go to Step 13.

STEP 3. Check for leaks in evaporative emission hose A and hose B.

Use a hand vacuum pump to check hose A and hose B.



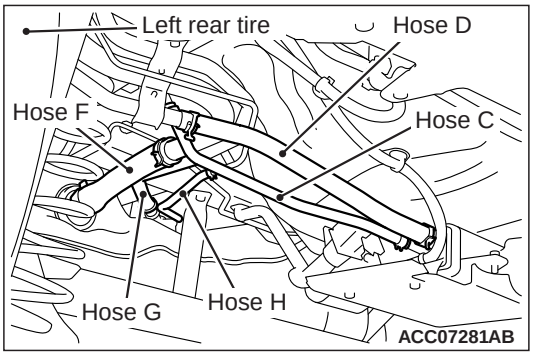
Q: Do the hoses and chamber hold vacuum?

YES : Go to Step 4.

NO : Replace any damaged hose or chamber. Then go to Step 13.

STEP 4. Check for leaks in evaporative emission hose C.

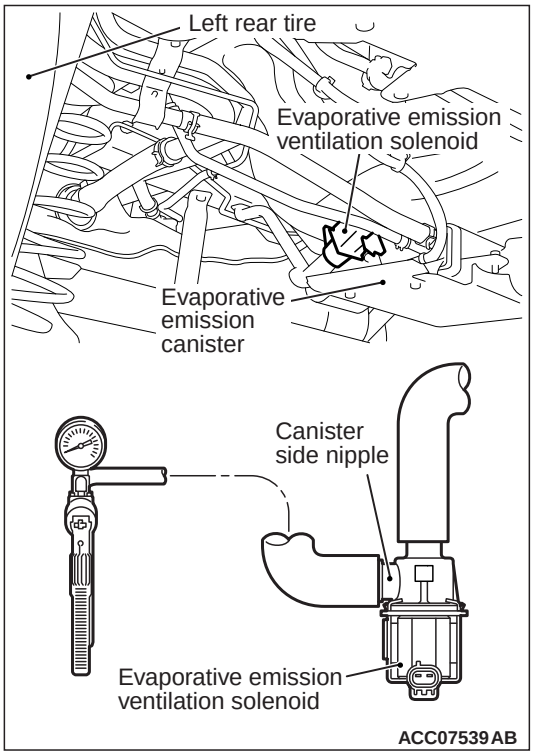
Use a hand vacuum pump to check hose C.



Q: Does hose C hold vacuum?

YES : Go to Step 5.

NO : Replace any damaged hose. Then go to Step 13.



STEP 5. Using scan tool (M.U.T-III), check actuator test item 15: Evaporative Emission Ventilation Solenoid.

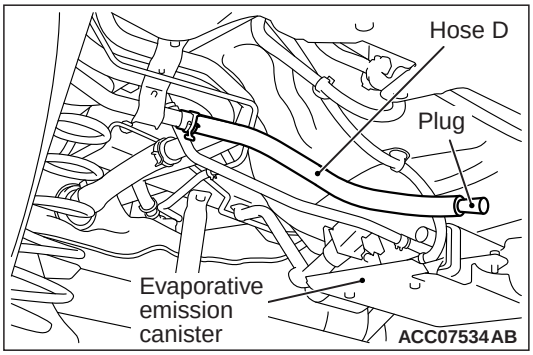
(1) Remove the evaporative emission ventilation solenoid. Do not disconnect the connector.
(2) Connect the hose of the hand vacuum pump to the canister side nipple of the evaporative emission ventilation solenoid.
(3) Turn the ignition switch to the "ON" position.
(4) Set scan tool (M.U.T-III) to actuator testing mode for 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.

(5) Turn the ignition switch to the "LOCK" (OFF) position.
(6) Disconnect the hand vacuum pump, and reinstall the evaporative emission ventilation solenoid.

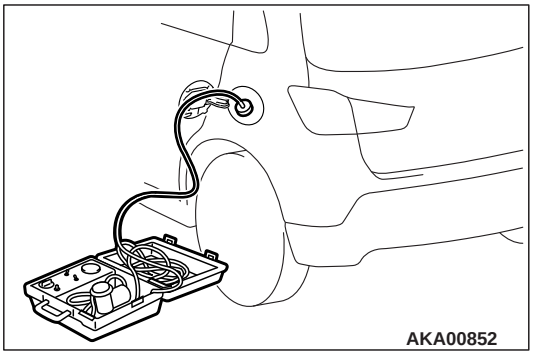
Q: Did the evaporative emission ventilation solenoid hold vacuum?

YES : Go to Step 6.
NO : Replace the evaporative emission ventilation solenoid Then go to Step 13.

STEP 6. Perform the pressure test on the evaporative emission system.



(1) Disconnect hose D from the EVAP emission canister.
(2) Plug the disconnected end of hose D.
(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.

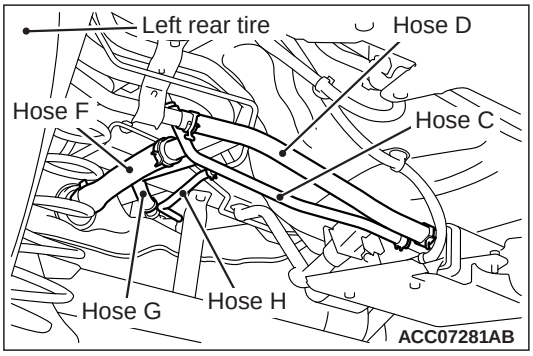
NOTE: The "Pressure test" in this procedure refers to the I/M240 Simulation Test. The eight steps of this test are described in the manufacturer's instructions for the evaporative emission system pressure pump, Miller number 6872A.

(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 D to the evaporative emission canister.

Q: Is the evaporative emission system line free of leaks?

YES : Go to Step 11.
NO : Go to Step 7.

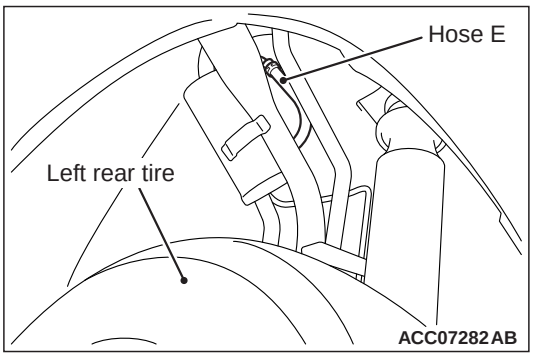
STEP 7. Check for leaks in evaporative emission hose D.



Use a hand vacuum pump to check hose D.

Q: Does hose D hold vacuum?

YES : Go to Step 8.
NO : Replace any damaged hose. Then go to Step 13.



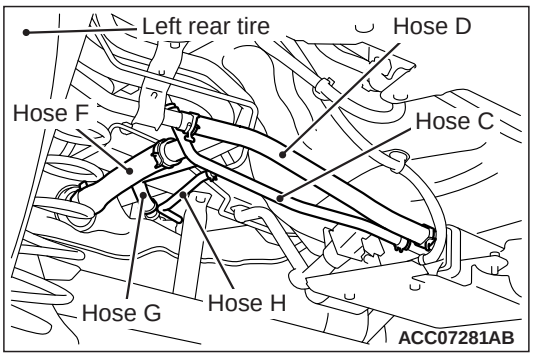
STEP 8. Check for leaks in evaporative emission hose E.

(1) Use a hand vacuum pump to check hose E.

Q: Does hose E hold vacuum?

YES : Go to Step 9.

NO : Replace any damaged hose and reinstall the fuel tank assembly. Then go to Step 13.



STEP 9. Check for leaks in evaporative emission hoses F, G and H.

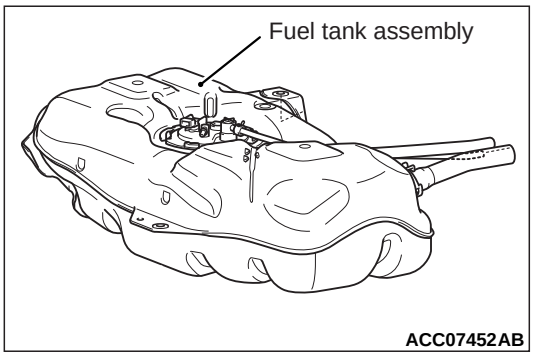
(1) Drain the fuel from the fuel tank.

(2) Use a hand vacuum pump to check each hose F, G and H.

Q: Do the hoses hold vacuum?

YES : Go to Step 10.

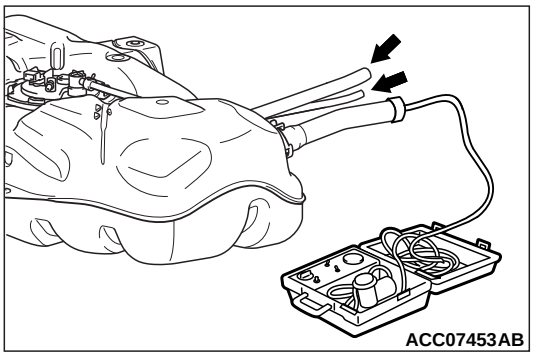
NO : Replace any damaged hose. Then go to Step 13.



STEP 10. 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.


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(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.

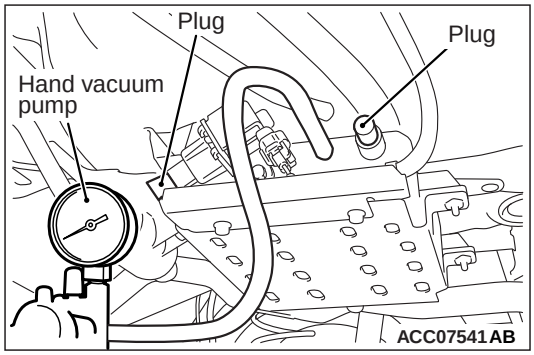
Q: Are any leaks found?

YES <When there is a leak from the attachment points of the fuel pump module, fuel tank differential pressure sensor, fuel level sensor or leveling valve.> : Repair or replace the leaked parts and check again that there are no leaks. Then reinstall the fuel tank. Then go to Step 13.

YES <When there is a leak from the fuel tank.> : Replace the fuel tank. Then go to Step 13.

NO : When there is no leak, reinstall the fuel tank. Then go to Step 12.

STEP 11. Check the evaporative emission canister for vacuum leaks.



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(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 12.

NO : Replace the evaporative emission canister. Then go to Step 13.

STEP 12. Using scan tool (M.U.T-III), 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 Neutral <M/T> or "P" position <CVT>.**

(1) Turn the ignition switch to the "ON" position.
(2) Erase the DTCs using scan tool (M.U.T-III).
(3) Check that the fuel cap is securely closed (Tighten until three clicks are heard).
(4) Start the engine.
(5) Select "Special Function".
(6) Select "Evap Leak Monitor".
(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 (M.U.T-III) will change from "NO" to "YES".
(9) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is "Evap Leak was detected." displayed on scan tool (M.U.T-III)?

YES : Replace the ECM (Refer to, Removal and Installation P.13A-656). Then go to Step 13.

NO <"Evap Leak Monitor test passed." is displayed on scan tool (M.U.T-III).> : The evaporative emission system is working properly at this time. Go to Step 13 .

NO <"Evap Leak Monitor discontinued. Once turn the IG off then retest again from the beginning." is displayed on scan tool (M.U.T-III).> : The EVAP monitor has been interrupted during the test. Turn the ignition switch to the "LOCK" (OFF) position once, and repeat the monitoring from (1).

STEP 13. Test the OBD-II drive cycle.

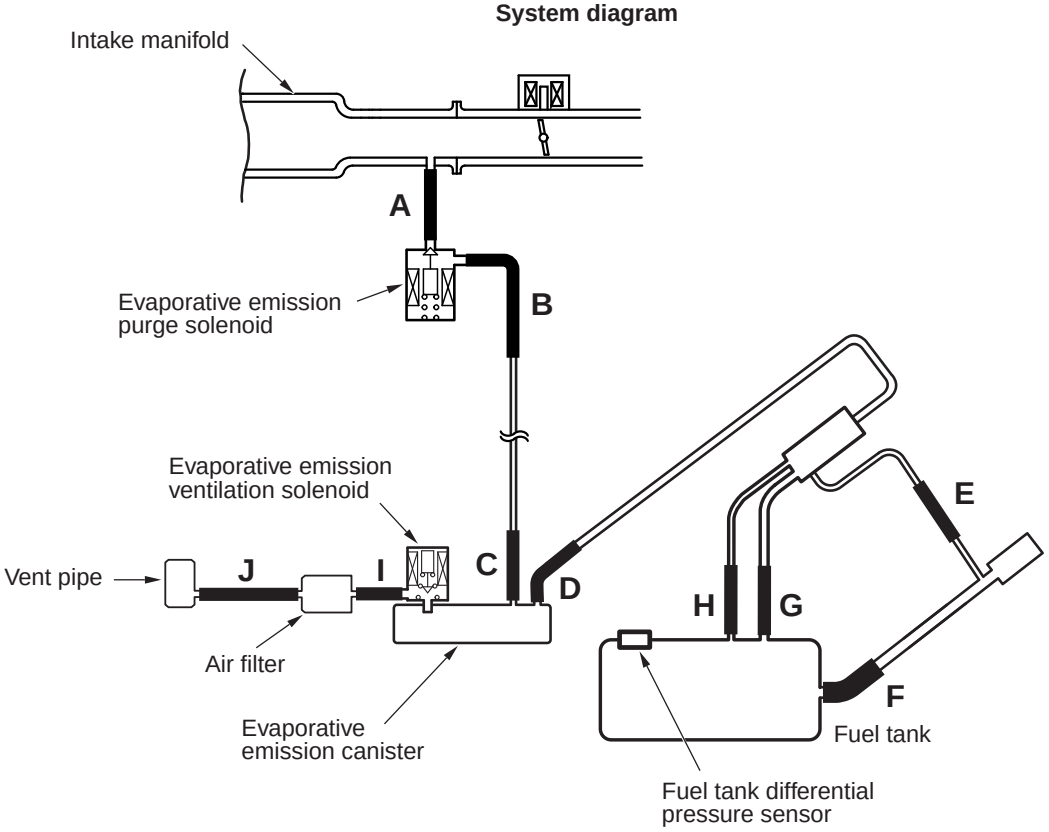
(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 4 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0442 set?

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

DTC P0450: Evaporative Emission Control System Pressure Sensor Malfunction

System diagram



ACC07273AB

CIRCUIT OPERATION

- The ECM terminal FPR5 supplies a 5 volts reference signal to the fuel tank differential pressure sensor terminal. The fuel tank differential pressure sensor terminal is grounded through the ECM terminal FPRE&ACTE.
- The fuel tank differential pressure sensor terminal returns a voltage signal to the ECM terminal F/PR 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 evaporative emission 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
- Fuel temperature sensor monitor
- Fuel level sensor monitor

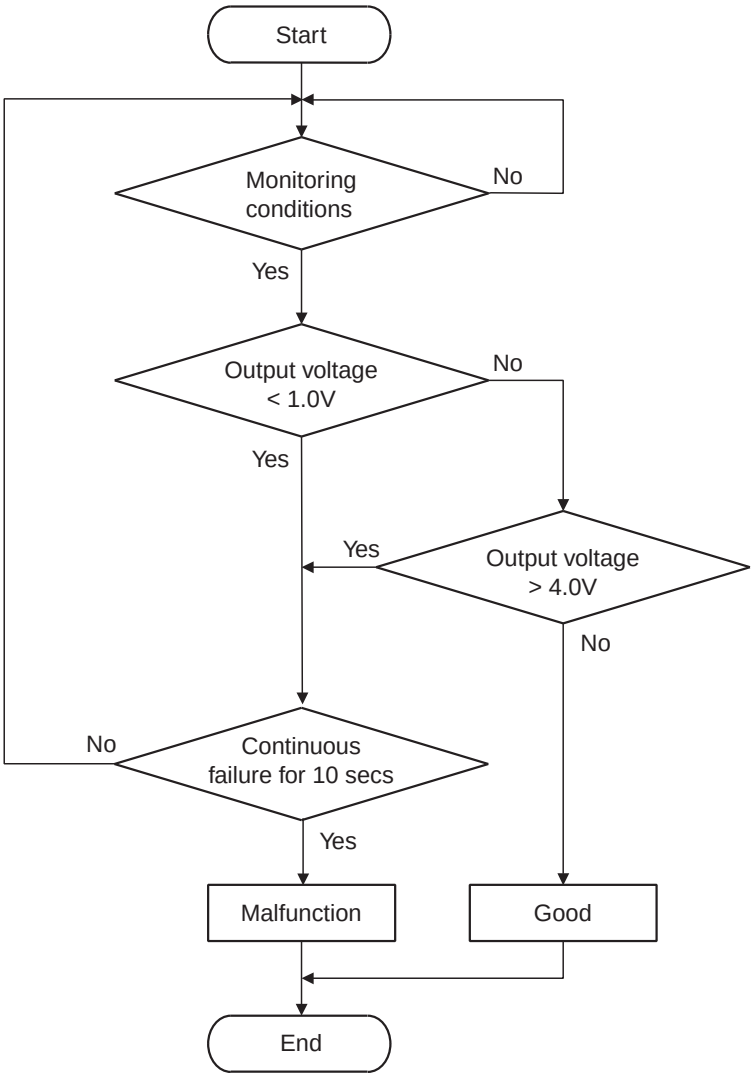
Sensor (The sensors below are determined to be normal)

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

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DTC SET CONDITIONS

Logic Flow Chart (Monitor Sequence)



AK704950

Check Conditions
- Intake air temperature is more than 5°C (41°F).

Judgment Criterion
- When the evaporative emission purge solenoid is off, the fuel tank differential pressure sensor output voltage is less than 1.0 volt for 10 seconds.

Check Conditions
- Intake air temperature is between 5°C (41°F) and 45°C (113°F).
- The air flow ratio is 12 g/ sec or more.
- The ratio between the manifold absolute pressure and the barometric pressure is 0.85 or less.

Judgment Criterion
- When the evaporative emission purge solenoid is fully operational (100 percent ratio), the fuel tank differential pressure sensor output voltage is more than 4.0 volts for 10 seconds.

TROUBLESHOOTING HINTS (THE MOST LIKELY CAUSES FOR THIS CODE TO BE STORED ARE:)
- Fuel tank differential pressure sensor failed.

FAIL-SAFE AND BACKUP FUNCTION
- None

OBD-II DRIVE CYCLE PATTERN
Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 4 P.13A-10.

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- Fuel tank differential pressure sensor circuit harness damage or connector damage.
- ECM failed.

DIAGNOSIS

Required Special Tools:

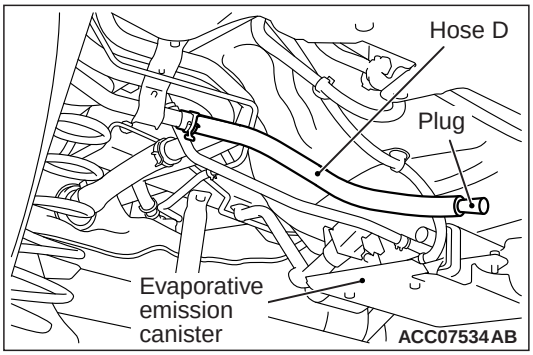
- MB992744: Vehicle communication interface-Lite (V.C.I.-Lite)
- MB992745: V.C.I.-Lite main harness A
- MB992747: V.C.I.-Lite USB cable short
- MB992748: V.C.I.-Lite USB cable long
- MB991958 Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicles Communication Interface (V.C.I.)
  - MB991827 M.U.T.-III USB Cable
  - MB991910 M.U.T.-III Main Harness A (Vehicles with CAN communication system)

STEP 1. Using scan tool (M.U.T.-III), check data list item 52: Fuel Tank Differential Pressure Sensor.

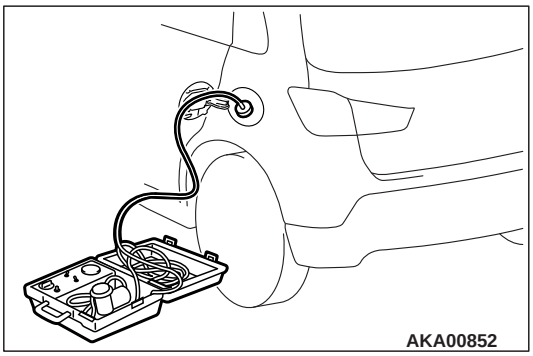
⚠ CAUTION

To prevent damage to scan tool (M.U.T.-III), always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool (M.U.T.-III).

(1) Connect scan tool (M.U.T-III). Refer to HOW TO CONNECT THE SCAN TOOL (M.U.T.-III) P.13A-10.



(2) Disconnect the hose D from the evaporative emission canister.
(3) Plug the disconnected end of hose D.
(4) Turn the ignition switch to the "ON" position.
(5) Remove the fuel cap.
(6) Set scan tool (M.U.T.-III) to the data reading mode for item 52, Fuel Tank Differential Pressure Sensor.
  - Output voltage should be between 1,500 and 3,500 millivolts.



(7) 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.
(8) Turn the ignition switch to the "LOCK" (OFF) position.
(9) Remove the evaporative emission system pressure pump (Miller number 6872A) and the fuel tank adapter (MLR-8382), and reinstall the fuel cap.
(10) Connect hose D to the evaporative emission canister.

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.00-13.

NO : Go to Step 2.

STEP 2. Measure the sensor supply voltage at fuel tank differential pressure sensor connector by backprobing.
(1) Do not disconnect the connector.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal FPR5 line and ground by backprobing.
- Voltage should be between 4.9 and 5.1 volts.

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

Q: Is the measured voltage between 4.9 and 5.1 volts?
YES : Go to Step 4.
NO : Go to Step 3.

STEP 3. Check of harness damage in FPR5 line between fuel tank differential pressure sensor connector and ECM connector.

Q: Is the harness wire in good condition?
YES : Go to Step 7.
NO : Repair the connector(s) or wiring harness. Then go to Step 8.

STEP 4. Measure the ground voltage at fuel tank differential pressure sensor connector by backprobing.
(1) Do not disconnect the connector.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal FPRE&ACTE line and ground by backprobing.
- Voltage should be 0.5 volt or less.

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

Q: Is the measured voltage 0.5 volt or less?
YES : Go to Step 6.
NO : Go to Step 5.

STEP 5. Check of harness damage in FPRE&ACTE line between fuel tank differential pressure sensor connector and ECM connector.

Q: Is the harness wire in good condition?
YES : Go to Step 7.
NO : Repair the connector(s) or wiring harness. Then go to Step 8.

STEP 6. Check of harness damage in F/PR line between fuel tank differential pressure sensor connector and ECM connector.

Q: Is the harness wire in good condition?
YES : Go to Step 7.
NO : Repair the connector(s) or wiring harness. 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 4 P.13A-10.
(3) Check the diagnostic trouble code (DTC).

Q: Is DTC P0450 stored?

YES : Replace the ECM (Refer to, Removal and Installation P.13A-656). Then go to Step 8.
NO : The inspection is complete.

STEP 8. Test the OBD-II drive cycle.

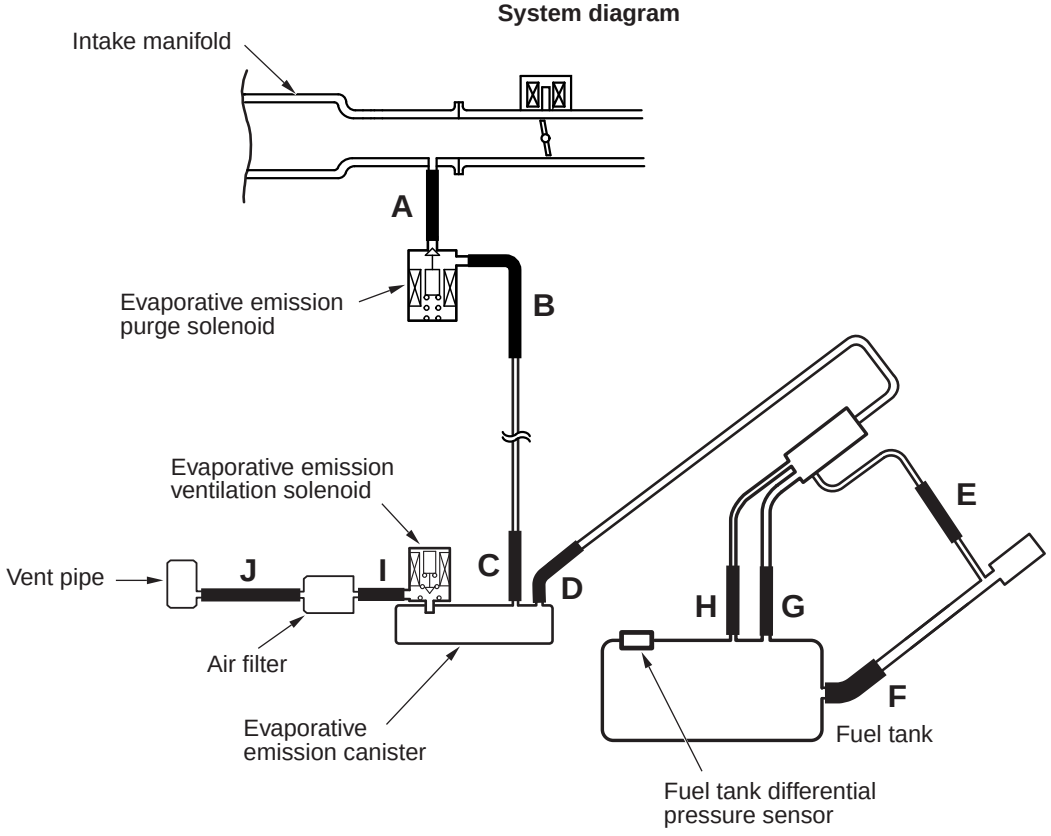
(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 4 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0450 stored?

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

DTC P0451: Evaporative Emission Control System Pressure Sensor Range/Performance

System diagram



ACC07273AB

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CIRCUIT OPERATION

- The ECM terminal FPR5 supplies a 5 volts reference signal to the fuel tank differential pressure sensor terminal. The fuel tank differential pressure sensor terminal is grounded through the ECM terminal FPRE&ACTE.
- The fuel tank differential pressure sensor terminal returns a voltage signal to the ECM terminal F/PR 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)

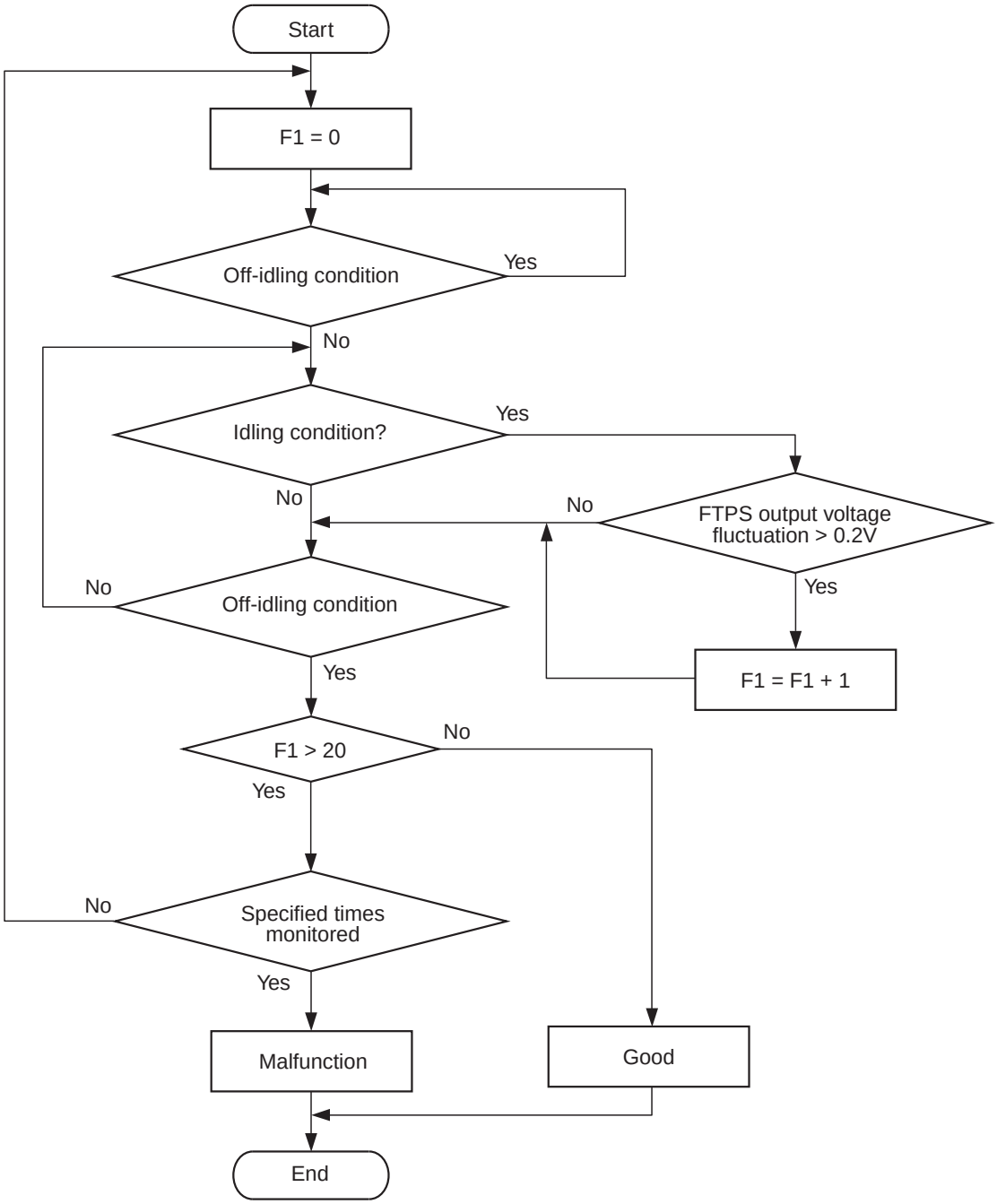
- Evaporative emission purge solenoid monitor
- Evaporative emission ventilation solenoid monitor
- Fuel temperature sensor monitor
- Fuel level sensor monitor

Sensor (The sensors below are determined to be normal)

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

DTC SET CONDITIONS

Logic Flow Chart (Monitor Sequence)



AK705072

Check Conditions

- Accelerator pedal is not depressed.
- Vehicle speed is less than 1.5 km/h (1 mph).

  NOTE: The conditions for deviating from idling operation are as follows:

- *Vehicle speed is more than 50 km/h (31 mph).*

Judgment Criteria

- The drastic pressure fluctuation is detected 20 times or more per engine idling, which is that the fuel tank differential pressure sensor output voltage is 0.2 volt or more.

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- The condition described above is consecutively detected 4 times under the normal driving conditions.

  NOTE: If the number of sudden pressure fluctuations does not reach 20 times during any one period of engine idling, or if the ignition switch is turned OFF, the counter will reset to 0.

FAIL-SAFE AND BACKUP FUNCTION

- None

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 15 P.13A-10.

TROUBLESHOOTING HINTS (THE MOST LIKELY CAUSES FOR THIS CODE TO BE STORED ARE:)

- Fuel tank differential pressure sensor failed.
- Fuel tank differential pressure sensor circuit harness damage or connector damage.
- ECM failed.

DIAGNOSIS

Required Special Tools:

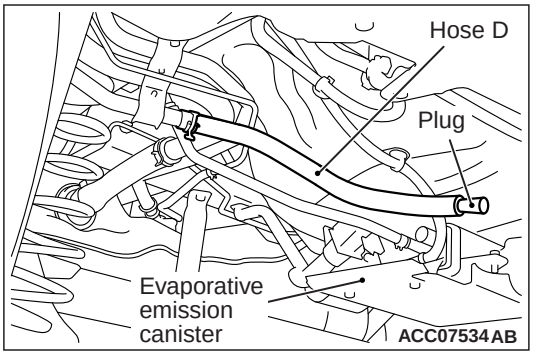
- MB992744: Vehicle communication interface-Lite (V.C.I.-Lite)
- MB992745: V.C.I.-Lite main harness A
- MB992747: V.C.I.-Lite USB cable short
- MB992748: V.C.I.-Lite USB cable long
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicles Communication Interface (V.C.I.)
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A (Vehicles with CAN communication system)

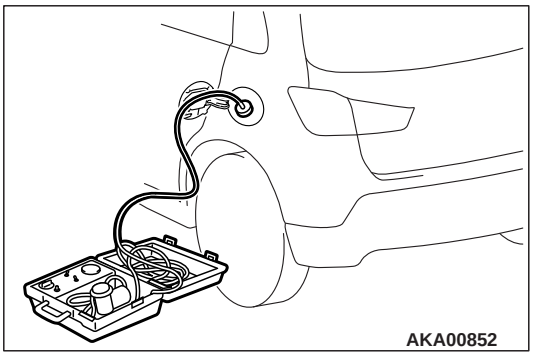
STEP 1. Using scan tool (M.U.T.-III), check data list item 52: Fuel Tank Differential Pressure Sensor.

⚠ CAUTION

To prevent damage to scan tool (M.U.T.-III), always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool (M.U.T.-III).

(1) Connect scan tool (M.U.T-III). Refer to HOW TO CONNECT THE SCAN TOOL (M.U.T.-III) P.13A-10.
(2) Disconnect the hose D from the evaporative emission canister.
(3) Plug the disconnected end of hose D.
(4) Turn the ignition switch to the "ON" position.
(5) Remove the fuel cap.
(6) Set scan tool (M.U.T.-III) to the data reading mode for item 52, Fuel Tank Differential Pressure Sensor.
- Output voltage should be between 1,500 and 3,500 millivolts.





(7) 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.

(8) Turn the ignition switch to the "LOCK" (OFF) position.
(9) Remove the evaporative emission system pressure pump (Miller number 6872A) and the fuel tank adapter (MLR-8382), and reinstall the fuel cap.
(10) Connect hose D to the evaporative emission canister.

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.00-13.
NO : Go to Step 2.

STEP 2. Measure the sensor supply voltage at fuel tank differential pressure sensor connector by backprobing.

(1) Do not disconnect the connector.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal FPR5 line and ground by backprobing.
- Voltage should be between 4.9 and 5.1 volts.

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

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

YES : Go to Step 4.
NO : Go to Step 3.

STEP 3. Check of harness damage in FPR5 line between fuel tank differential pressure sensor connector and ECM connector.

Q: Is the harness wire in good condition?

YES : Go to Step 7.
NO : Repair the connector(s) or wiring harness. Then go to Step 8.

STEP 4. Measure the ground voltage at fuel tank differential pressure sensor connector by backprobing.

(1) Do not disconnect the fuel tank differential pressure sensor connector.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal FPRE&ACTE line and ground by backprobing.
- Voltage should be 0.5 volt or less.

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

Q: Is the measured voltage 0.5 volt or less?

YES : Go to Step 6.
NO : Go to Step 5.

STEP 5. Check of harness damage in FPRE&ACTE line between fuel tank differential pressure sensor connector and ECM connector.

Q: Is the harness wire in good condition?

YES : Go to Step 7.
NO : Repair the connector(s) or wiring harness. Then go to Step 8.

STEP 6. Check of harness damage in F/PR line between fuel tank differential pressure sensor connector and ECM connector.

Q: Is the harness wire in good condition?

YES : Go to Step 7.
NO : Repair the connector(s) or wiring harness. 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 15 P.13A-10.
(3) Check the diagnostic trouble code (DTC).

Q: Is DTC P0451 stored?

YES : Replace the ECM (Refer to, Removal and Installation P.13A-656). 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 15 P.13A-10.

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

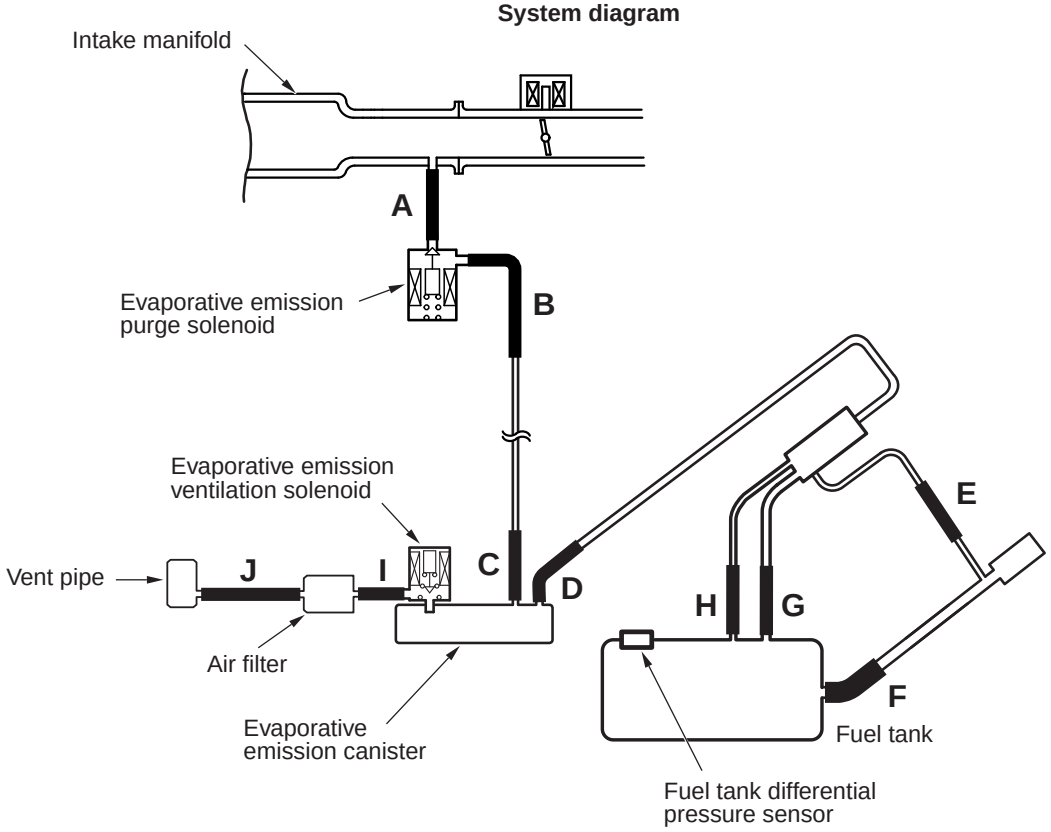
Q: Is DTC P0451 stored?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0452: Evaporative Emission Control System Pressure Sensor Low Input

System diagram



ACC07273AB

CIRCUIT OPERATION

- The ECM terminal FPR5 supplies a 5 volts reference signal to the fuel tank differential pressure sensor terminal. The fuel tank differential pressure sensor terminal is grounded through the ECM terminal FPRE&ACTE.
- The fuel tank differential pressure sensor terminal returns a voltage signal to the ECM terminal F/PR 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

Fuel tank differential pressure sensor output voltage is out of specified range.

MONITOR EXECUTION

Continuous

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MONITOR EXECUTION CONDITIONS (OTHER MONITOR AND SENSOR)

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

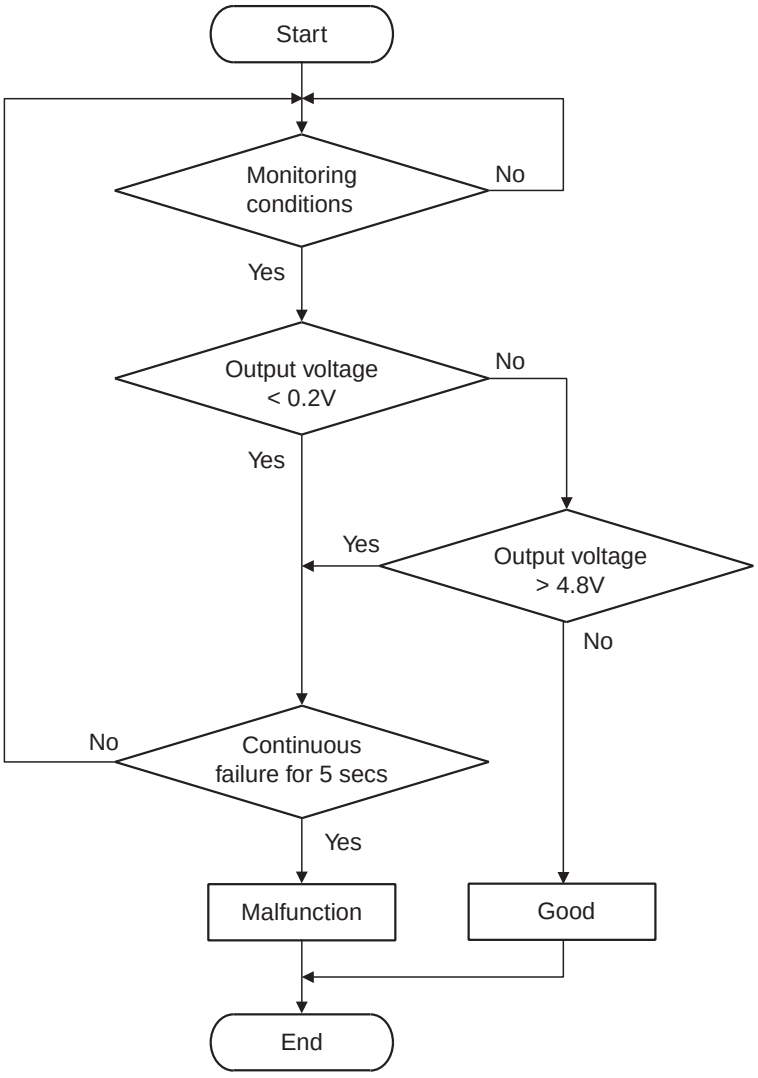
- Evaporative emission purge solenoid monitor
- Evaporative emission ventilation solenoid monitor
- Fuel temperature sensor monitor
- Fuel level sensor monitor

Sensor (The sensors below are determined to be normal)

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

DTC SET CONDITIONS

Logic Flow Chart (Monitor Sequence)



AK704952

Check Condition

- More than 2 seconds have passed since the engine starting sequence was completed.

Judgment Criterion

- The fuel tank differential pressure sensor output voltage is less than 0.2 volt for 5 seconds.

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FAIL-SAFE AND BACKUP FUNCTION

- None

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 22 P.13A-10.

TROUBLESHOOTING HINTS (THE MOST LIKELY CAUSES FOR THIS CODE TO BE STORED ARE:)

- Fuel tank differential pressure sensor failed.
- Open or shorted fuel tank differential pressure sensor circuit or connector damage.
- ECM failed.

DIAGNOSIS

Required Special Tools:

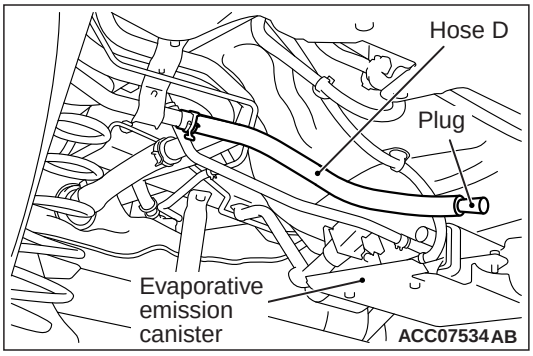
- MB992744: Vehicle communication interface-Lite (V.C.I.-Lite)
- MB992745: V.C.I.-Lite main harness A
- MB992747: V.C.I.-Lite USB cable short
- MB992748: V.C.I.-Lite USB cable long
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicles Communication Interface (V.C.I.)
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A (Vehicles with CAN communication system)

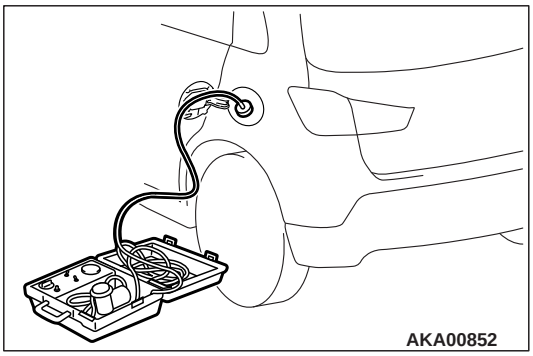
STEP 1. Using scan tool (M.U.T.-III), check data list item 52: Fuel Tank Differential Pressure Sensor.

⚠ CAUTION

To prevent damage to scan tool (M.U.T.-III), always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool (M.U.T.-III).

(1) Connect scan tool (M.U.T-III). Refer to HOW TO CONNECT THE SCAN TOOL (M.U.T.-III) P.13A-10.
(2) Disconnect the hose D from the evaporative emission canister.
(3) Plug the disconnected end of hose D.
(4) Turn the ignition switch to the "ON" position.
(5) Remove the fuel cap.
(6) Set scan tool (M.U.T.-III) to the data reading mode for item 52, Fuel Tank Differential Pressure Sensor.
- Output voltage should be between 1,500 and 3,500 millivolts.





(7) 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.
(8) Turn the ignition switch to the "LOCK" (OFF) position.
(9) Remove the evaporative emission system pressure pump (Miller number 6872A) and the fuel tank adapter (MLR-8382), and reinstall the fuel cap.
(10) Connect hose D to the evaporative emission canister.

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.00-13.
NO : Go to Step 2.

STEP 2. Measure the sensor supply voltage at fuel tank differential pressure sensor connector by backprobing.

(1) Do not disconnect the fuel tank differential pressure sensor connector.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal FPR5 line and ground by backprobing.
- Voltage should be between 4.9 and 5.1 volts.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

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

YES : Go to Step 5.
NO : Go to Step 3.

STEP 3. Measure the sensor supply voltage at ECM by backprobing.

(1) Do not disconnect the connector.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal FPR5 line and ground by backprobing.
- Voltage should be between 4.9 and 5.1 volts.

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

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

YES : Repair or replace the connector(s), or check and repair the harness of open circuit in FPR5 line between fuel tank differential pressure sensor connector and ECM connector. Then go to Step 8.
NO : Go to Step 4.

STEP 4. Check of short circuit to ground in FPR5 line between fuel tank differential pressure sensor connector and ECM connector.

Q: Is the harness wire in good condition?

YES : Go to Step 7.
NO : Repair the connector(s) or wiring harness. Then go to Step 8.

STEP 5. Measure the sensor output voltage at ECM connector by backprobing.

(1) Do not disconnect the connector.
(2) Turn the ignition switch to the "ON" position.
(3) Remove the fuel cap.
(4) Measure the voltage between terminal F/PR and ground by backprobing.
- Voltage should be between 1.5 and 3.5 volts.

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

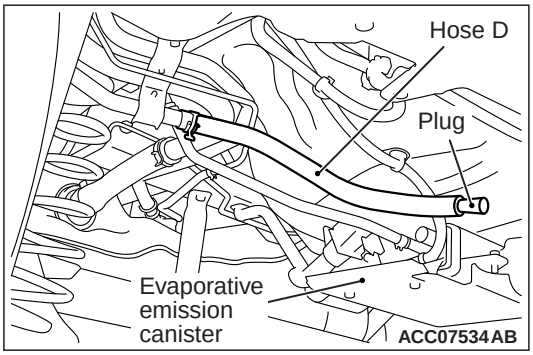
Q: Is the measured voltage normal?

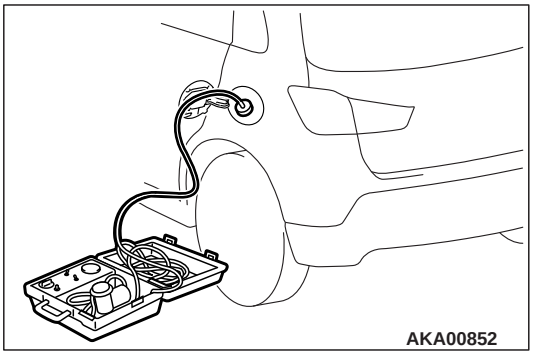
YES : Go to Step 7.
NO : Go to Step 6.

STEP 6. Check of open circuit and short circuit to ground between fuel tank differential pressure sensor connector and ECM connector.

Q: Is the harness wire in good condition?

YES : Replace the fuel tank differential pressure sensor. Then go to Step 8.
NO : Repair the connector(s) or wiring harness. Then go to Step 8.





STEP 7. Using scan tool (M.U.T.-III), check data list item 52: Fuel Tank Differential Pressure Sensor.

(1) Disconnect the hose D from the evaporative emission canister.
(2) Plug the disconnected end of hose D.
(3) Turn the ignition switch to the "ON" position.
(4) Remove the fuel cap.
(5) Set scan tool (M.U.T.-III) to the data reading mode for item 52, Fuel Tank Differential Pressure Sensor.
- Output voltage should be between 1,500 and 3,500 millivolts.

(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.
(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 D to the evaporative emission canister.

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.00-13.
NO : Replace the ECM (Refer to, Removal and Installation P.13A-656). Then go to Step 8.

STEP 8. Test the OBD-II drive cycle.

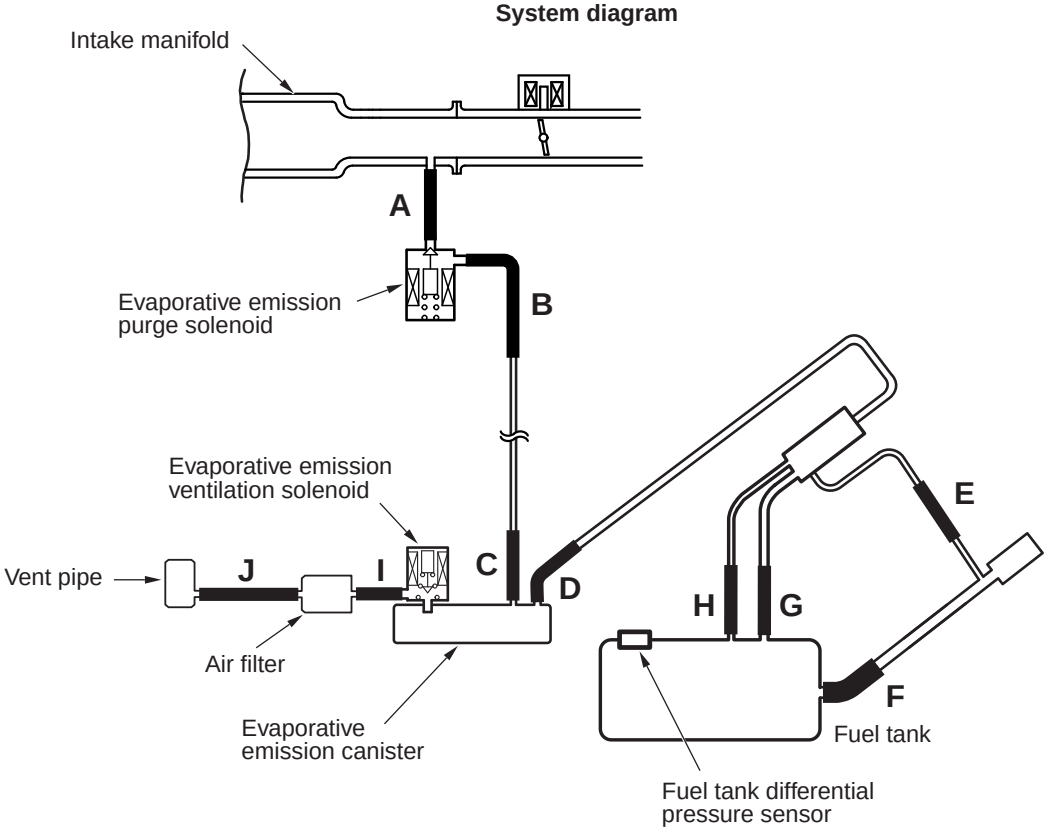
(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 22 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0452 stored?

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

DTC P0453: Evaporative Emission Control System Pressure Sensor High Input

System diagram



ACC07273AB

CIRCUIT OPERATION

- The ECM terminal FPR5 supplies a 5 volts reference signal to the fuel tank differential pressure sensor terminal. The fuel tank differential pressure sensor terminal is grounded through the ECM terminal FPRE&ACTE.
- The fuel tank differential pressure sensor terminal returns a voltage signal to the ECM terminal F/PR that is proportional to the pressure in the fuel tank.

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 stored under some fuel and driving conditions regardless of the fuel pressure sensor output voltage when the fuel system is clogged.

DESCRIPTIONS OF MONITOR METHODS

Fuel tank differential 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)

- Evaporative emission purge solenoid monitor
- Evaporative emission ventilation solenoid monitor
- Fuel temperature sensor monitor
- Fuel level sensor monitor

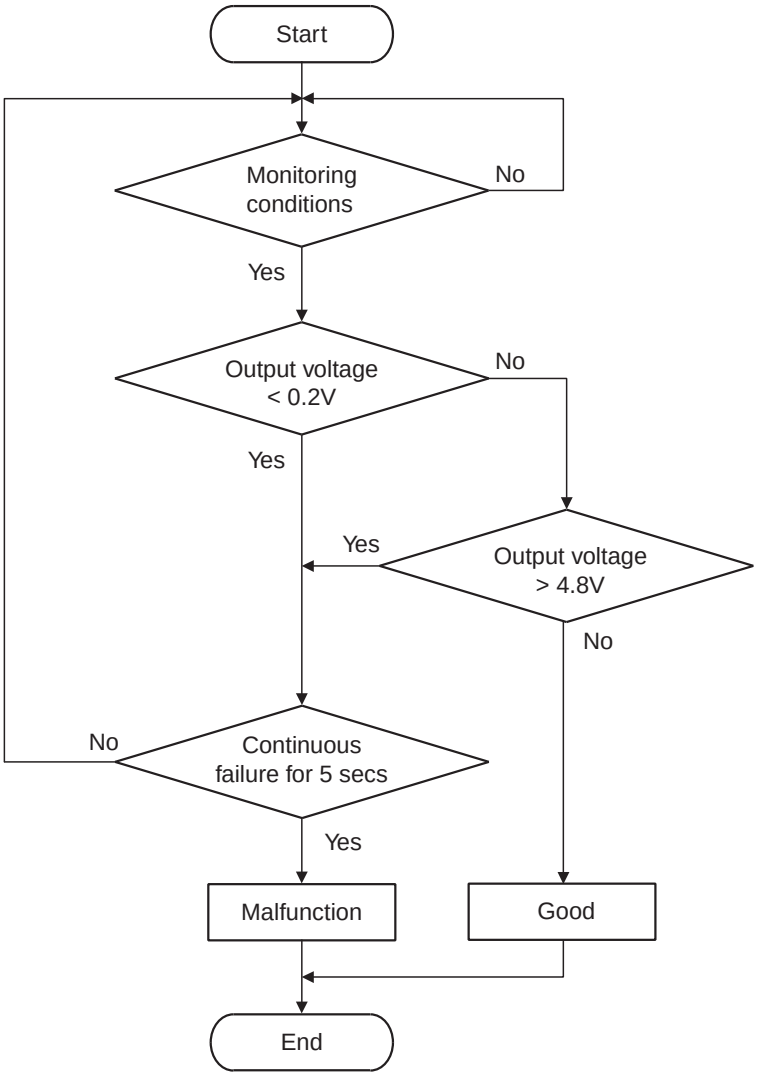
Sensor (The sensors below are determined to be normal)

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

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DTC SET CONDITIONS

Logic Flow Chart (Monitor Sequence)



AK704952

Check Conditions

- More than 2 seconds have passed since the engine starting sequence was completed.
- Remaining fuel level is less than 80 percent when the engine is started.
- The maximum barometric pressure subtracted from the current barometric pressure is less than 4 kPa (1.2 in.Hg)*.
  *: Activated only when the following two conditions have been met.
- Amount of remaining fuel is more than 65 percent of capacity when the engine is started.
- Item temperature is more than 36°C (97°F).

Judgment Criterion

- The fuel tank differential pressure sensor output voltage is more than 4.8 volts for 5 seconds.

FAIL-SAFE AND BACKUP FUNCTION

- None

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OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 22 P.13A-10.

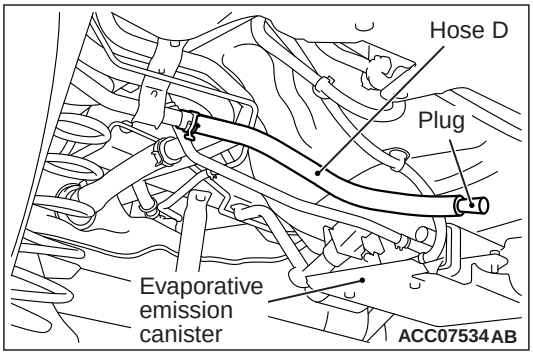
TROUBLESHOOTING HINTS (THE MOST LIKELY CAUSES FOR THIS CODE TO BE STORED ARE:)

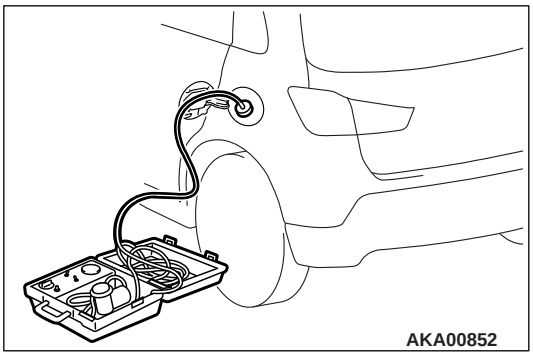
- Fuel tank differential pressure sensor failed.
- Open fuel tank differential pressure sensor circuit or connector damage.
- ECM failed.

DIAGNOSIS

Required Special Tools:

- MB992744: Vehicle communication interface-Lite (V.C.I.-Lite)
- MB992745: V.C.I.-Lite main harness A
- MB992747: V.C.I.-Lite USB cable short
- MB992748: V.C.I.-Lite USB cable long
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicles Communication Interface (V.C.I.)
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A (Vehicles with CAN communication system)





STEP 1. Using scan tool (M.U.T.-III), check data list item 52: Fuel Tank Differential Pressure Sensor.

⚠ CAUTION

To prevent damage to scan tool (M.U.T.-III), always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool (M.U.T.-III).

(1) Connect scan tool (M.U.T-III). Refer to HOW TO CONNECT THE SCAN TOOL (M.U.T.-III) P.13A-10.
(2) Disconnect the hose D from the evaporative emission canister.
(3) Plug the disconnected end of hose D.
(4) Turn the ignition switch to the "ON" position.
(5) Remove the fuel cap.
(6) Set scan tool (M.U.T.-III) to the data reading mode for item 52, Fuel Tank Differential Pressure Sensor.
- Output voltage should be between 1,500 and 3,500 millivolts.

(7) 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.

(8) Turn the ignition switch to the "LOCK" (OFF) position.
(9) Remove the evaporative emission system pressure pump (Miller number 6872A) and the fuel tank adapter (MLR-8382), and reinstall the fuel cap.
(10) Connect hose D to the evaporative emission canister.

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.00-13.
NO : Go to Step 2.

STEP 2. Measure the ground voltage at fuel tank differential pressure sensor connector by backprobing.

(1) Do not disconnect the connector.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal FPRE&ACTE line and ground by backprobing.
- Voltage should be 0.5 volt or less.

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

Q: Is the measured voltage 0.5 volt or less?

YES : Replace the fuel tank differential pressure sensor. Then go to Step 5.
NO : Go to Step 3.

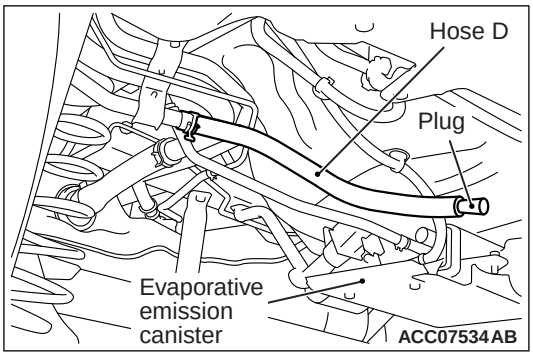
STEP 3. Check of open circuit in FPRE&ACTE line between fuel tank differential pressure sensor connector and ECM connector.

Q: Is the harness wire in good condition?

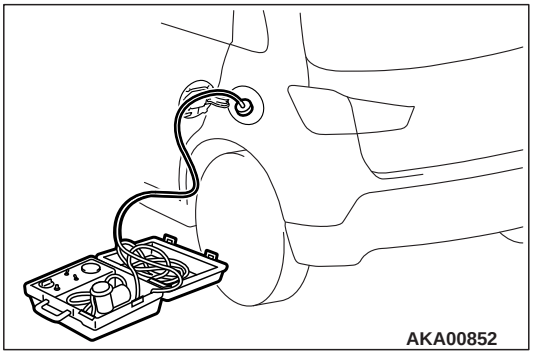
YES : Go to Step 4.

NO : Repair the connector(s) or wiring harness. Then go to Step 5.

STEP 4. Using scan tool (M.U.T.-III), check data list item 52: Fuel Tank Differential Pressure Sensor.



(1) Disconnect hose D from the evaporative emission canister, and plug the hose.
(2) Turn the ignition switch to the "ON" position.
(3) Remove the fuel cap.
(4) Set scan tool (M.U.T.-III) to the data reading mode for item 52, Fuel Tank Differential Pressure Sensor.
- Output voltage should be between 1,500 and 3,500 millivolts.



(5) 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.

(6) Turn the ignition switch to the "LOCK" (OFF) position.
(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 D to the evaporative emission canister.

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.00-13.

NO : Replace the ECM (Refer to, Removal and Installation P.13A-656). 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 22 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

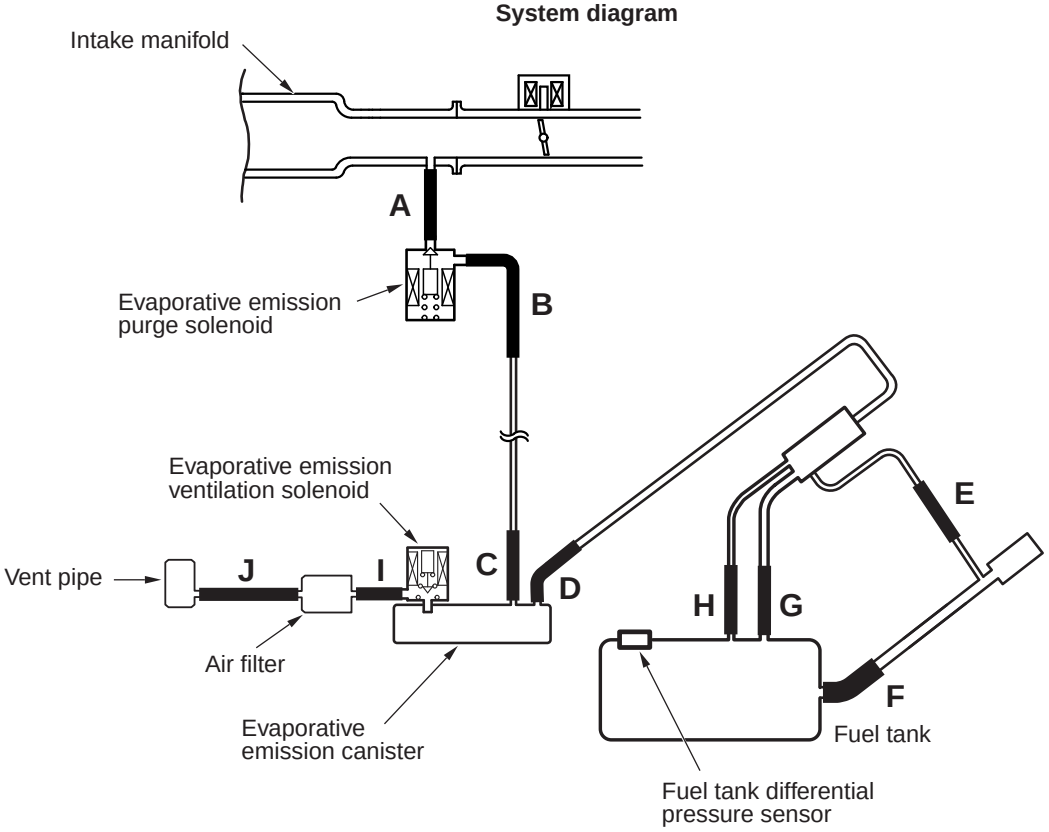
Q: Is DTC P0453 stored?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0455: Evaporative Emission Control System Leak Detected (gross leak)

System diagram



ACC07273AB

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

Continuous

MONITOR EXECUTION CONDITIONS (OTHER MONITOR AND SENSOR)

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

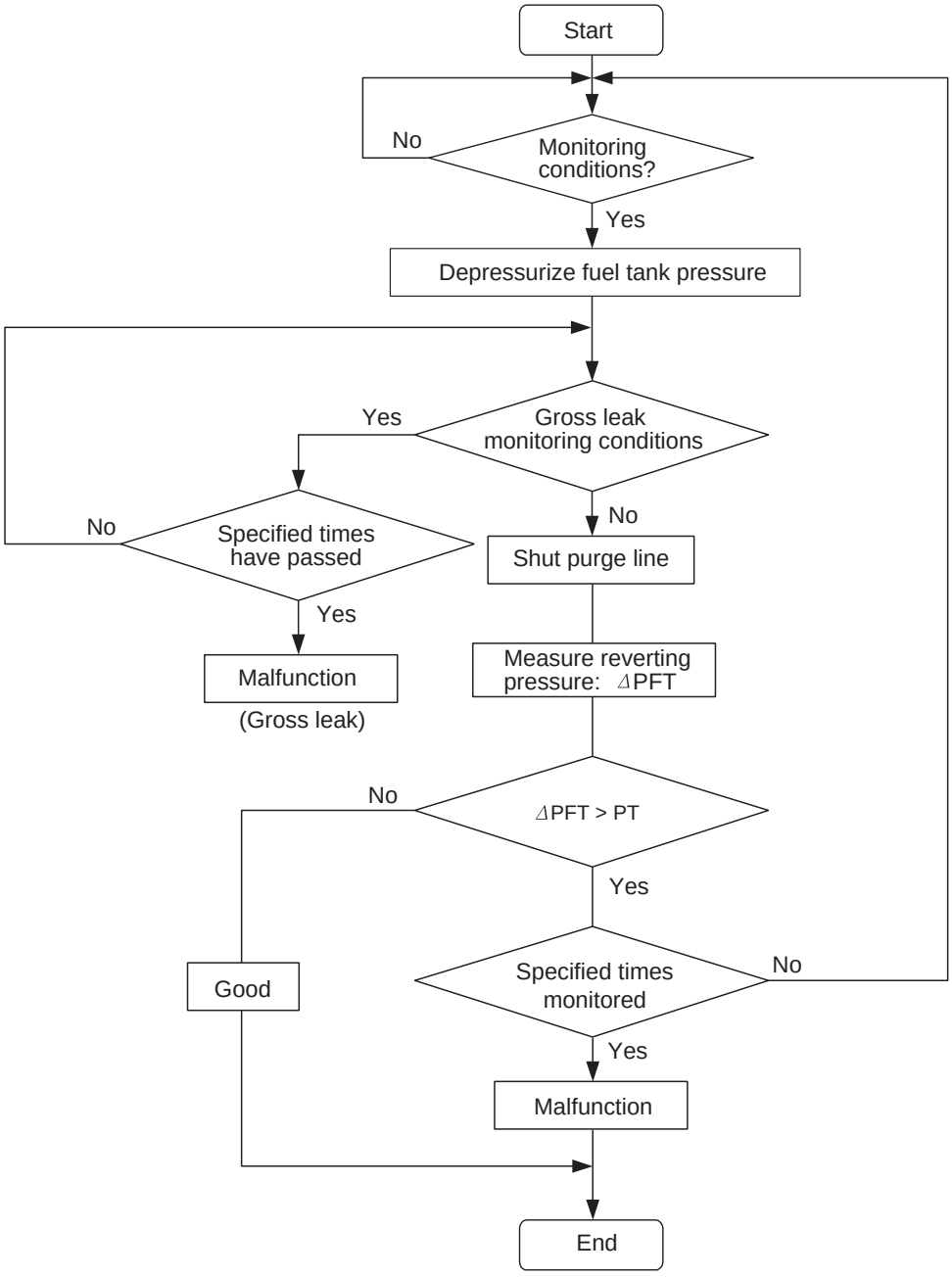
- Not applicable

Sensor (The sensors below are determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart (Monitor Sequence)



AK704743

Check Conditions

- Amount of remaining fuel is 15 – 85 percent of capacity when the engine is started.
- Engine coolant temperature is less than 36°C (97°F) when the engine is started.
- Engine coolant temperature is more than 20°C (68°F).
- Intake air temperature is less than 36°C (97°F) when the engine is started.
- The air flow ratio is 12 g/ sec or more.
- The ratio between the manifold absolute pressure and the barometric pressure is 0.85 or less.
- When the evaporative emission purge solenoid and evaporative emission ventilation solenoid are closed, the change of the pressure in the fuel tank is less than 324 Pa (0.09 in.Hg).
- Barometric pressure is more than 76 kPa (22.4 in.Hg).
- Intake air temperature is more than 5°C (41°F).

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- Fuel temperature is less than 36°C (97°F).
- Fuel tank differential pressure sensor output voltage is between 1.0 and 4.0 volts.
- At least 10 seconds have passed since the last monitor was complete.
- Monitoring time: 120 – 150 seconds

Judgment Criterion

- The fuel tank internal pressure is more than –1961 Pa (–0.58 in.Hg) after the evaporative emission purge solenoid has been driven when the fuel tank and vapor line were closed.

FAIL-SAFE AND BACKUP FUNCTION

- None

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 4 P.13A-10.

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:

- MB992744: Vehicle communication interface-Lite (V.C.I.-Lite)
- MB992745: V.C.I.-Lite main harness A
- MB992747: V.C.I.-Lite USB cable short
- MB992748: V.C.I.-Lite USB cable long
- MB991958 Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicles Communication Interface (V.C.I.)
  - MB991827 M.U.T.-III USB Cable
  - MB991910 M.U.T.-III Main Harness A (Vehicles with CAN communication system)

STEP 1. Using scan tool (M.U.T.-III), check the evaporative emission system monitor test.

⚠ CAUTION

- **To prevent damage to scan tool (M.U.T.-III), always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool (M.U.T.-III).**
- **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 Neutral <M/T> or "P" position <CVT>.**

(1) Connect scan tool (M.U.T-III). Refer to HOW TO CONNECT THE SCAN TOOL (M.U.T.-III) P.13A-10.
(2) Turn the ignition switch to the "ON" position.
(3) Erase the DTCs using scan tool (M.U.T-III).
(4) Check that the fuel cap is securely closed (Tighten until three clicks are heard).
(5) Start the engine.
(6) Select "Special Function".
(7) Select "Evap Leak Monitor".
(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 (M.U.T-III) will change from "NO" to "YES".
(10) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is "Evap Leak was detected." displayed on scan tool (M.U.T-III)?

YES : A malfunction has been detected during the monitor test. Refer to the Diagnostic Trouble Code Chart and diagnose any other DTCs that are set P.13A-47. If no other DTC's have been set, go to Step 2.

NO <"Evap Leak Monitor test passed." is displayed on scan tool (M.U.T-III).> : 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 Monitor discontinued. Once turn the IG off then retest again from the beginning." is displayed on scan tool (M.U.T-III).> : The EVAP monitor has been interrupted during the test. Turn the ignition switch to the "LOCK" (OFF) position once, and repeat the monitoring from (1).

STEP 2. Check the evaporative emission purge solenoid for leaks.

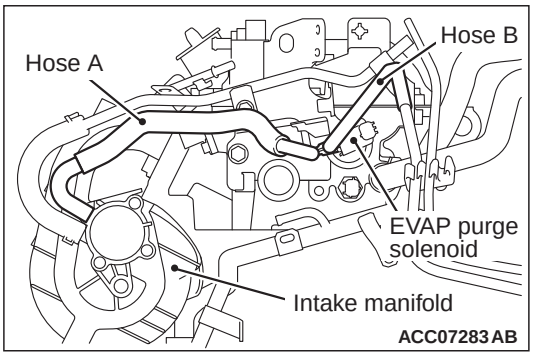
Refer to GROUP 17, Emission Control – Evaporative Emission Control System – Evaporative Emission Purge Solenoid Check P.17-56.

Q: Does the evaporative emission purge solenoid hold pressure?

YES : Go to Step 3.

NO : Replace the evaporative emission purge solenoid. Then go to Step 13.

STEP 3. Check for leaks in evaporative emission hose A and hose B.



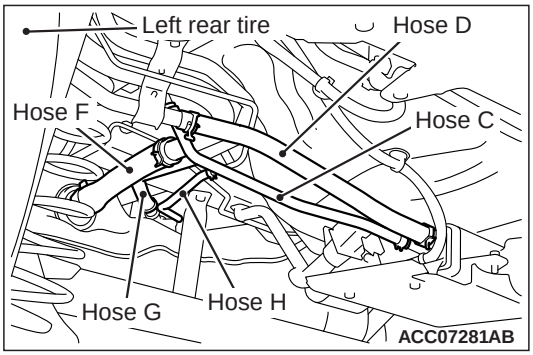
Use a hand vacuum pump to check hose A and hose B.

Q: Do the hoses hold vacuum?

YES : Go to Step 4.

NO : Replace any damaged hose or chamber. Then go to Step 13.

STEP 4. Check for leaks in evaporative emission hose C.

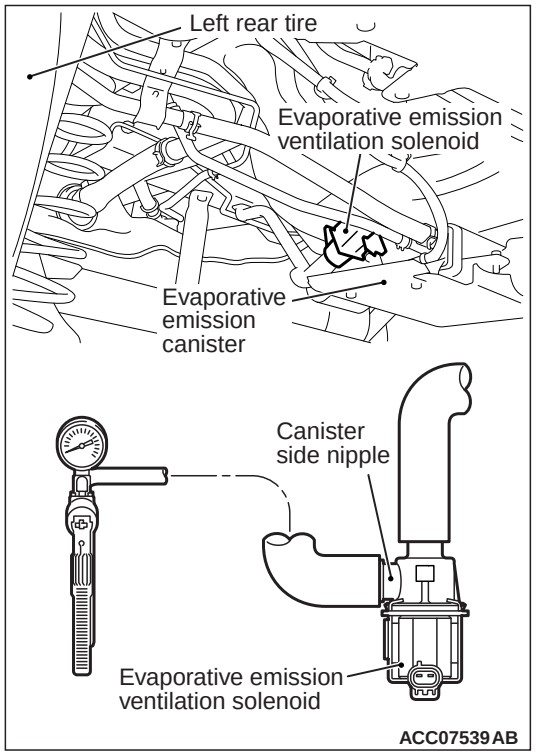


Use a hand vacuum pump to check hose C.

Q: Does hose C hold vacuum?

YES : Go to Step 5.

NO : Replace any damaged hose. Then go to Step 13.



STEP 5. Using scan tool (M.U.T-III), check actuator test item 15: Evaporative Emission Ventilation Solenoid.

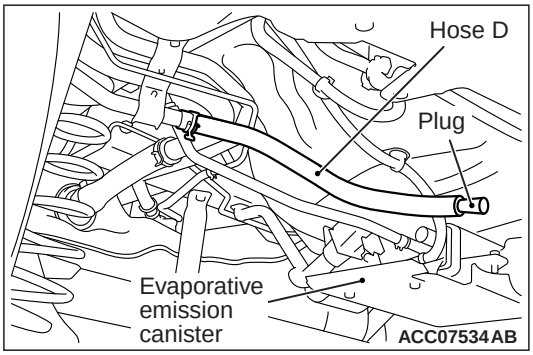
(1) Remove the evaporative emission ventilation solenoid. Do not disconnect the connector.
(2) Connect the hose of the hand vacuum pump to the evaporative emission canister side nipple of the evaporative emission ventilation solenoid.
(3) Turn the ignition switch to the "ON" position.
(4) Set scan tool (M.U.T-III) to actuator testing mode for 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.

(5) Turn the ignition switch to the "LOCK" (OFF) position.
(6) Disconnect the hand vacuum pump, and reinstall the evaporative emission ventilation solenoid.

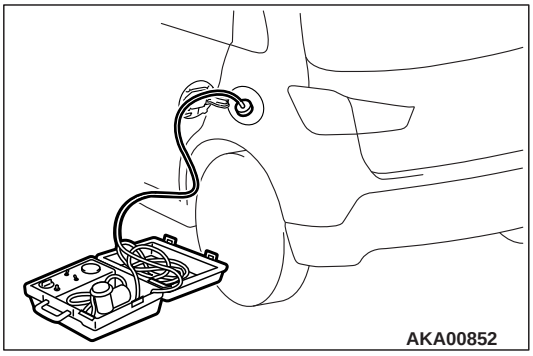
Q: Did the evaporative emission ventilation solenoid hold vacuum?

YES : Go to Step 6.
NO : Replace the evaporative emission ventilation solenoid. Then go to Step 13.

STEP 6. Perform the pressure test on the evaporative emission system.



(1) Disconnect hose D from the evaporative emission canister.
(2) Plug the disconnected end of hose D.
(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.

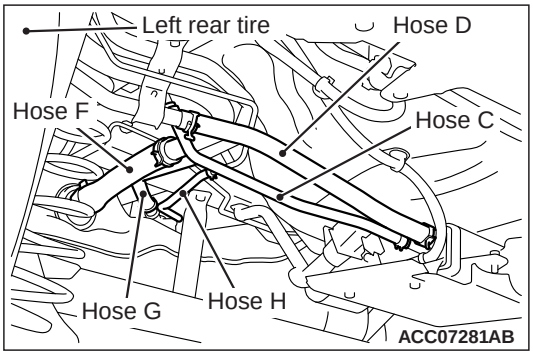
NOTE: The "Pressure test" in this procedure refers to the I/M240 Simulation Test. The eight steps of this test are described in the manufacturer's instructions for the evaporative emission system pressure pump, Miller number 6872A.

(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 D to the evaporative emission canister.

Q: Is the evaporative emission system line free of leaks?

YES : Go to Step 11.
NO : Go to Step 7.

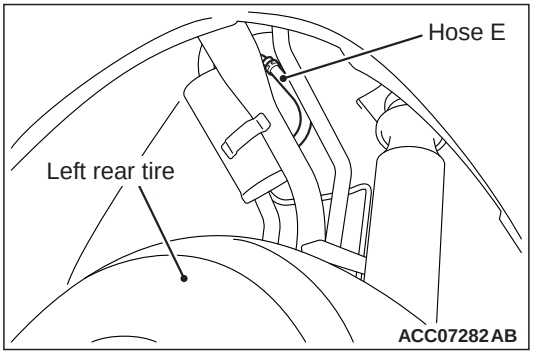
STEP 7. Check for leaks in evaporative emission hose D.



Use a hand vacuum pump to check hose D.

Q: Does hose D hold vacuum?

YES : Go to Step 8.
NO : Replace any damaged hose. Then go to Step 13.



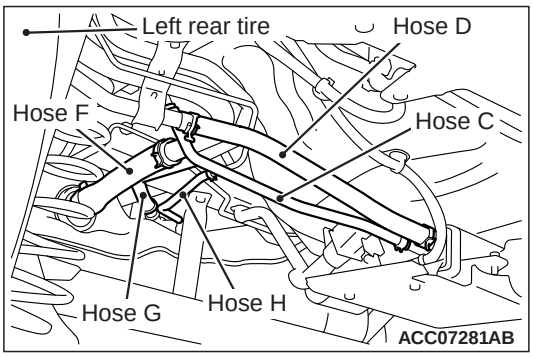
STEP 8. Check for leaks in evaporative emission hose E.

(1) Use a hand vacuum pump to check each hose E.

Q: Does hose E hold vacuum?

YES : Go to Step 9.

NO : Replace any damaged hose and reinstall the fuel tank assembly. Then go to Step 13.



STEP 9. Check for leaks in evaporative emission hoses F, G and H.

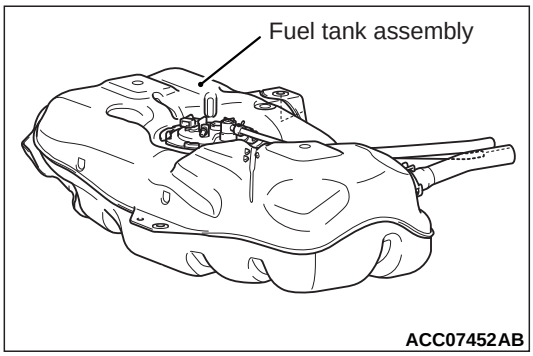
(1) Drain the fuel from the fuel tank.

(2) Use a hand vacuum pump to check each hose F, G and H.

Q: Do the hoses hold vacuum?

YES : Go to Step 10.

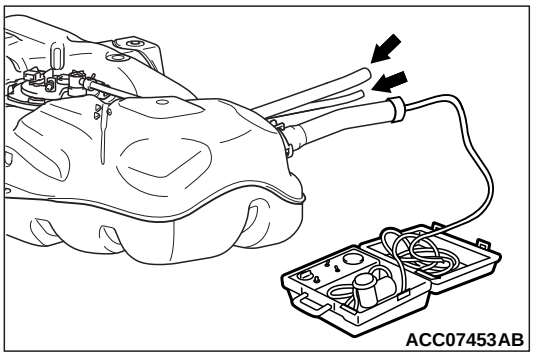
NO : Replace any damaged hose. Then go to Step 13.



STEP 10. 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.

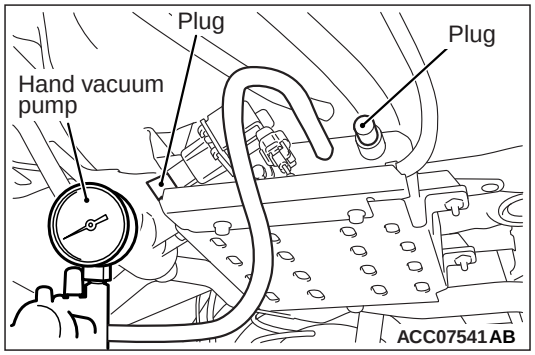
Q: Are any leaks found?

YES <When there is a leak from the attachment points of the fuel pump module, fuel tank differential pressure sensor, fuel level sensor or leveling valve.> : Repair or replace the leaked parts and check again that there are no leaks. Then reinstall the fuel tank. Then go to Step 13.

YES <When there is a leak from the fuel tank.> : Replace the fuel tank. Then go to Step 13.

NO : When there is no leak, reinstall the fuel tank. Then go to Step 12.

STEP 11. 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 12.

NO : Replace the evaporative emission canister. Then go to Step 13.

STEP 12. Using scan tool (M.U.T-III), 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 Neutral <M/T> or "P" position <CVT>.**

(1) Turn the ignition switch to the "ON" position.
(2) Erase the DTCs using scan tool (M.U.T-III).
(3) Check that the fuel cap is securely closed (Tighten until three clicks are heard).
(4) Start the engine.
(5) Select "Special Function".
(6) Select "Evap Leak Monitor".
(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 (M.U.T-III) will change from "NO" to "YES".
(9) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is "Evap Leak was detected." displayed on scan tool (M.U.T-III)?

YES : Replace the ECM (Refer to, Removal and Installation P.13A-656). Then go to Step 13.

NO <"Evap Leak Monitor test passed" is displayed on scan tool (M.U.T-III).> : The evaporative emission system is working properly at this time. Go to Step 13 .

NO <"Evap Leak Monitor discontinued. Once turn the IG off then retest again from the beginning." is displayed on scan tool (M.U.T-III).> : The EVAP monitor has been interrupted during the test. Turn the ignition switch to the "LOCK" (OFF) position once, and repeat the monitoring from (1).

STEP 13. Test the OBD-II drive cycle.

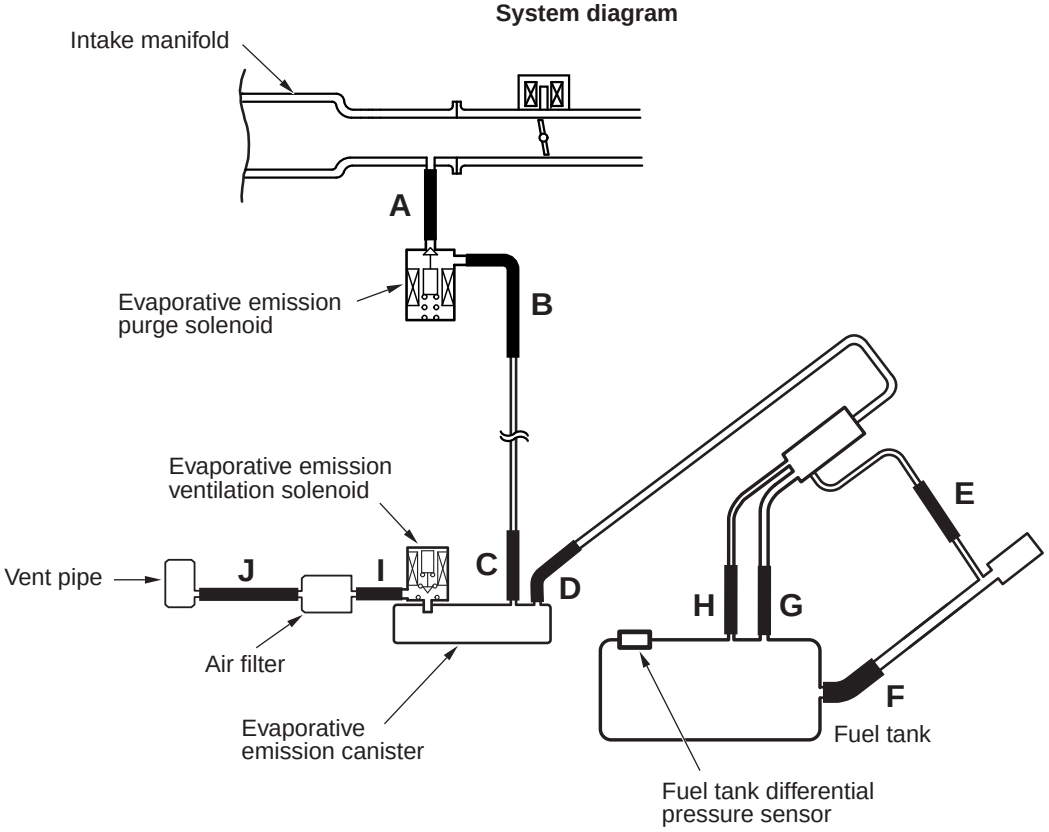
(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 4 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0455 set?

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

DTC P0456: Evaporative Emission Control System Leak Detected (very small leak)

System diagram



ACC07273AB

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 set in memory for the item monitored below)

- Evaporative emission purge system monitor
- Evaporative emission purge solenoid monitor
- Evaporative emission ventilation solenoid monitor
- Fuel temperature sensor monitor
- Fuel tank differential pressure sensor monitor
- Fuel level sensor monitor

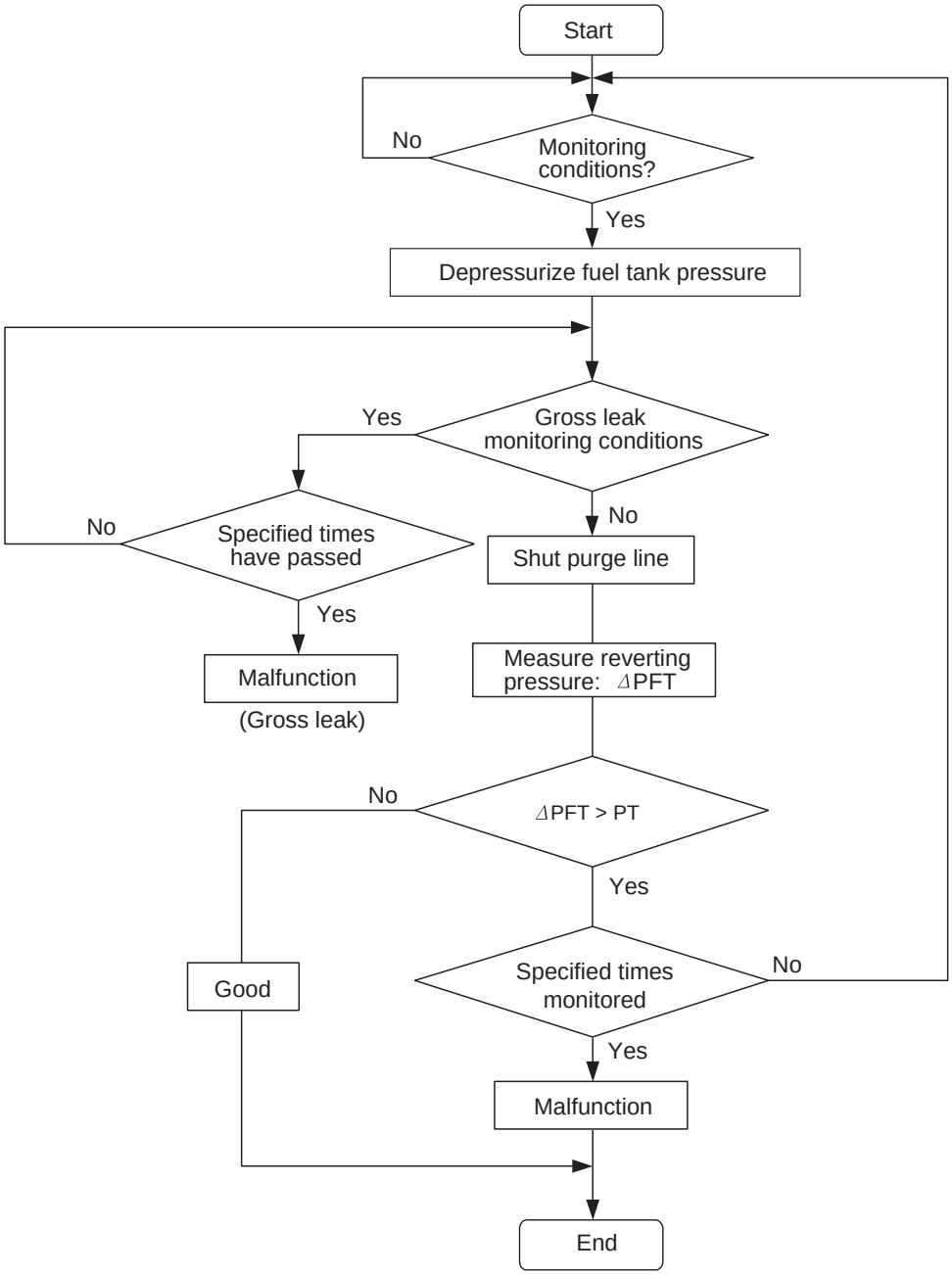
Sensor (The sensors below are determined to be normal)

- Mass airflow sensor
- Engine coolant temperature sensor

- Intake air temperature sensor
- Barometric pressure sensor

DTC SET CONDITIONS

Logic Flow Chart (Monitor Sequence)



AK704743

Check Conditions

- Engine coolant temperature is less than 36°C (97°F) when the engine is started.
- Intake air temperature is less than 36°C (97°F) when the engine is started.
- Amount of remaining fuel is 40 – 85 percent of
- Engine coolant temperature is more than 20°C (68°F).
- When the evaporative emission purge solenoid and evaporative emission ventilation solenoid are closed, the change of the pressure in the fuel tank is less than 324 Pa (0.09 in.Hg).
capacity when the engine is started.

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- Barometric pressure is more than 76 kPa (22.4 in.Hg).
- Intake air temperature is more than −10°C (14°F).
- Fuel temperature is less than 33°C (91°F).
- Fuel tank differential pressure sensor output voltage is between 1.0 and 4.0 volts.
- At least 10 seconds have passed since the last monitor was complete.
- Monitoring time: 10 – 14 minutes

Judgment Criterion

- In case the amount of change in the pressure that is monitored for a given length of time inside the tank is beyond the specified value after sealing off the fuel tank and the vapor line.

  NOTE: The specified value varies depending on the fuel temperature and fuel level.

FAIL-SAFE AND BACKUP FUNCTION

- None

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 5 P.13A-10.

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:

- MB992744: Vehicle communication interface-Lite (V.C.I.-Lite)
- MB992745: V.C.I.-Lite main harness A
- MB992747: V.C.I.-Lite USB cable short
- MB992748: V.C.I.-Lite USB cable long
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicles Communication Interface (V.C.I.)
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A (Vehicles with CAN communication system)

STEP 1. Using scan tool (M.U.T.-III), check the evaporative emission system monitor test.

⚠ CAUTION

- **To prevent damage to scan tool (M.U.T.-III), always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool (M.U.T.-III).**
- **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 Neutral <M/T> or "P" position <CVT>.**

(1) Connect scan tool (M.U.T-III). Refer to HOW TO CONNECT THE SCAN TOOL (M.U.T.-III) P.13A-10.
(2) Turn the ignition switch to the "ON" position.
(3) Erase the DTCs using scan tool (M.U.T-III).
(4) Check that the fuel cap is securely closed (Tighten until three clicks are heard).
(5) Start the engine.
(6) Select "Special Function."
(7) Select "Evap Leak Monitor."
(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 (M.U.T-III) will change from "NO" to "YES".
(10) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is "Evap Leak was detected." displayed on scan tool (M.U.T-III)?

YES : A malfunction has been detected during the monitor test. Refer to the Diagnostic Trouble Code Chart and diagnose any other DTCs that are set P.13A-47. If no other DTCs have been set, go to Step 2.

NO <"Evap Leak Monitor test passed." is displayed on scan tool (M.U.T-III).> : 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 Monitor discontinued. Once turn the IG off then retest again from the beginning." is displayed on scan tool (M.U.T-III).> : The EVAP monitor has been interrupted during the test. Turn the ignition switch to the "LOCK" (OFF) position once, and repeat the monitoring from (1).

STEP 2. Check the evaporative emission purge solenoid for leaks.

Refer to GROUP 17, Emission Control – Evaporative Emission Control System – Evaporative Emission Purge Solenoid Check P.17-56.

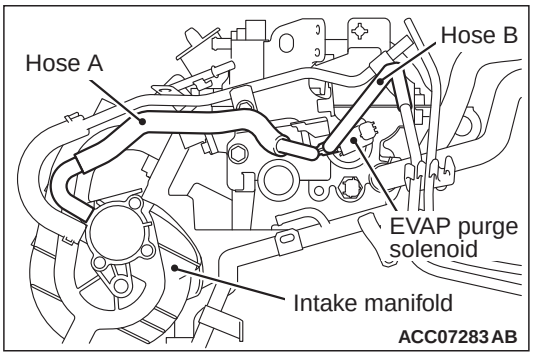
Q: Does the evaporative emission purge solenoid hold pressure?

YES : Go to Step 3.

NO : Replace the evaporative emission purge solenoid. Then go to Step 13.

STEP 3. Check for leaks in evaporative emission hose A and hose B.

Use a hand vacuum pump to check hose A and hose B.



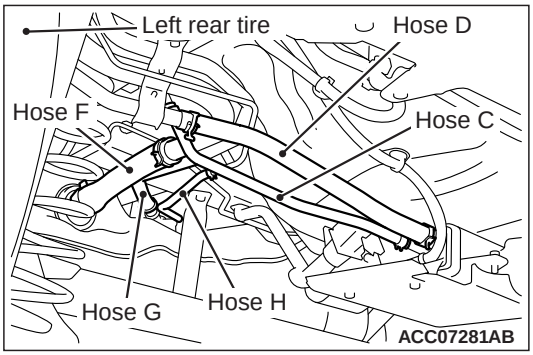
Q: Do the hoses hold vacuum?

YES : Go to Step 4.

NO : Replace any damaged hose or chamber. Then go to Step 13.

STEP 4. Check for leaks in evaporative emission hose C.

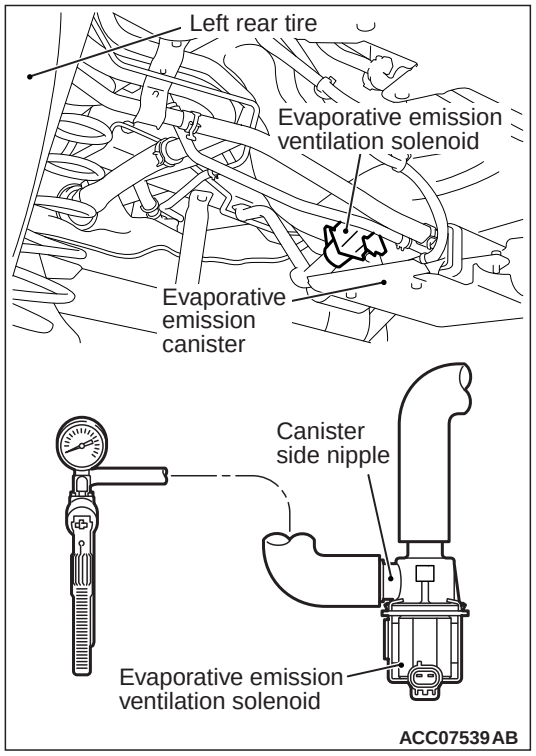
Use a hand vacuum pump to check hose C.



Q: Does hose C hold vacuum?

YES : Go to Step 5.

NO : Replace any damaged hose. Then go to Step 13.



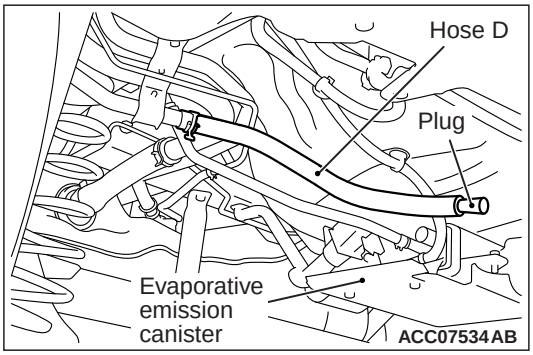
STEP 5. Using scan tool (M.U.T-III), check actuator test item 15: Evaporative Emission Ventilation Solenoid.

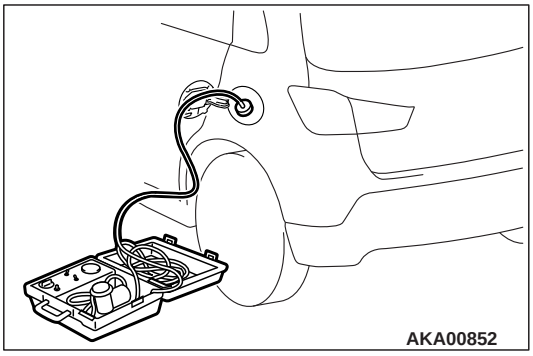
(1) Remove the evaporative emission ventilation solenoid. Do not disconnect the connector.
(2) Connect the hose of the hand vacuum pump to the canister side nipple of the evaporative emission ventilation solenoid.
(3) Turn the ignition switch to the "ON" position.
(4) Set scan tool (M.U.T-III) to actuator testing mode for 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.

(5) Turn the ignition switch to the "LOCK" (OFF) position.
(6) Disconnect the hand vacuum pump, and reinstall the evaporative emission ventilation solenoid.

Q: Did the evaporative emission ventilation solenoid hold vacuum?

YES : Go to Step 6.
NO : Replace the evaporative emission ventilation solenoid. Then go to Step 13.





STEP 6. Perform the pressure test on the evaporative emission system.

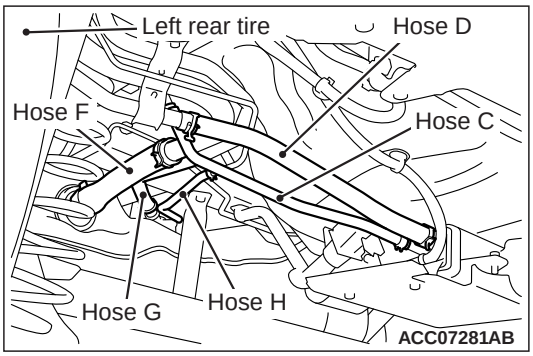
(1) Disconnect hose D from the evaporative emission canister.
(2) Install hose D after having installed plug from evaporative emission canister in a nipple part of illustration so that there is not a leak.
(3) Confirm that the evaporative emission system pressure pump (Miller number 6872A) is operating 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 D to the evaporative emission canister.

Q: Is the evaporative emission system line free of leaks?

YES : Go to Step 11.
NO : Go to Step 7.

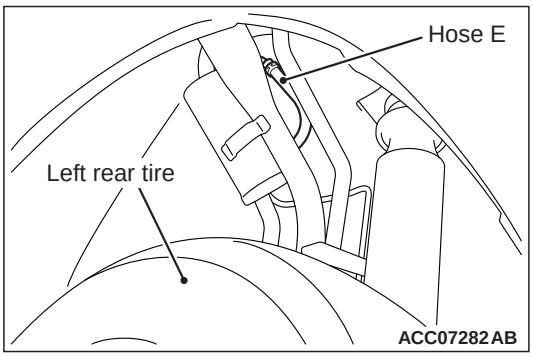


STEP 7. Check for leaks in evaporative emission hose D.

Use a hand vacuum pump to check hose D.

Q: Does hose D hold vacuum?

YES : Go to Step 8.
NO : Replace any damaged hose. Then go to Step 13.



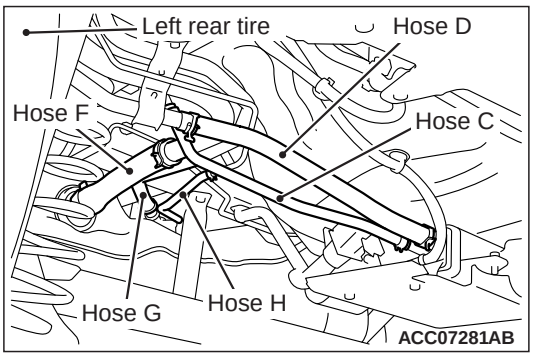
STEP 8. Check for leaks in evaporative emission hose E.

(1) Use a hand vacuum pump to check each hose E.

Q: Does hose E hold vacuum?

YES : Go to Step 9.

NO : Replace any damaged hose and reinstall the fuel tank assembly. Then go to Step 13.



STEP 9. Check for leaks in evaporative emission hoses F, G and H.

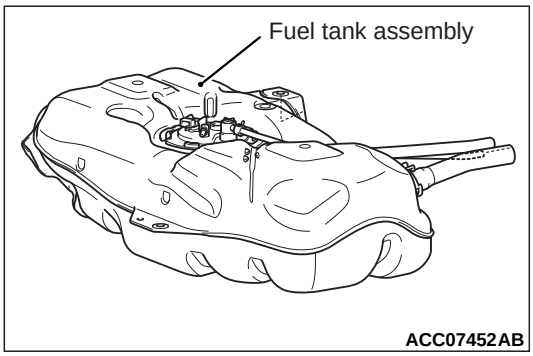
(1) Drain the fuel from the fuel tank.

(2) Use a hand vacuum pump to check hose F, G and H.

Q: Do the hoses hold vacuum?

YES : Go to Step 10.

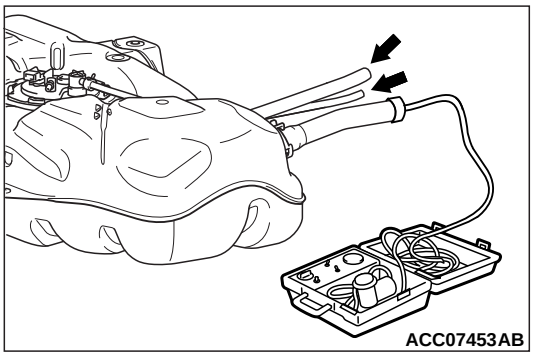
NO : Replace any damaged hose. Then go to Step 13.



STEP 10. 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.

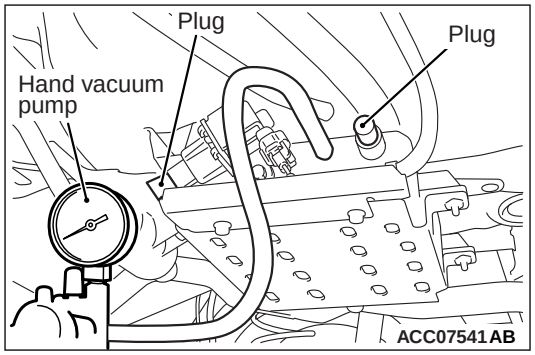
Q: Are any leaks found?

YES <When there is a leak from the attachment points of the fuel pump module, fuel tank differential pressure sensor, fuel level sensor or leveling valve.> : Repair or replace the leaked parts and check again that there are no leaks. Then reinstall the fuel tank. Then go to Step 13.

YES <When there is a leak from the fuel tank.> : Replace the fuel tank. Then go to Step 13.

NO : When there is no leak, reinstall the fuel tank. Then go to Step 12.

STEP 11. 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 12.

NO : Replace the evaporative emission canister. Then go to Step 13.

STEP 12. Using scan tool (M.U.T-III), 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 Neutral <M/T> or "P" position <CVT>.**

(1) Turn the ignition switch to the "ON" position.
(2) Erase the DTCs using scan tool (M.U.T-III).
(3) Check that the fuel cap is securely closed (Tighten until three clicks are heard).
(4) Start the engine.
(5) Select "Special Function".
(6) Select "Evap Leak Monitor".
(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 (M.U.T-III) will change from "NO" to "YES".
(9) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is "Evap Leak was detected." displayed on scan tool (M.U.T-III)?

YES : Replace the ECM (Refer to, Removal and Installation P.13A-656). Then go to Step 13.
NO <"Evap Leak Monitor test passed" is displayed on scan tool (M.U.T-III).> : The evaporative emission system is working properly at this time. Go to Step 13 .
NO <"Evap Leak Monitor discontinued. Once turn the IG off then retest again from the beginning." is displayed on scan tool (M.U.T-III).> : The EVAP monitor has been interrupted during the test. Turn the ignition switch to the "LOCK" (OFF) position once, and repeat the monitoring from (1).

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 5 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0456 set?

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

DTC P0458: Evaporative Emission Control System Purge Control Valve Circuit Low Input

CIRCUIT OPERATION

- The evaporative emission purge solenoid power is supplied from the MFI relay.
- The ECM controls ground evaporative emission purge solenoid by turning the power transistor in the ECM "ON" and "OFF".

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TECHNICAL DESCRIPTION

- In response to a signal from the ECM, the evaporative emission purge solenoid valve controls the flow rate of the purge air to be introduced into the intake manifold.

DESCRIPTIONS OF MONITOR METHODS

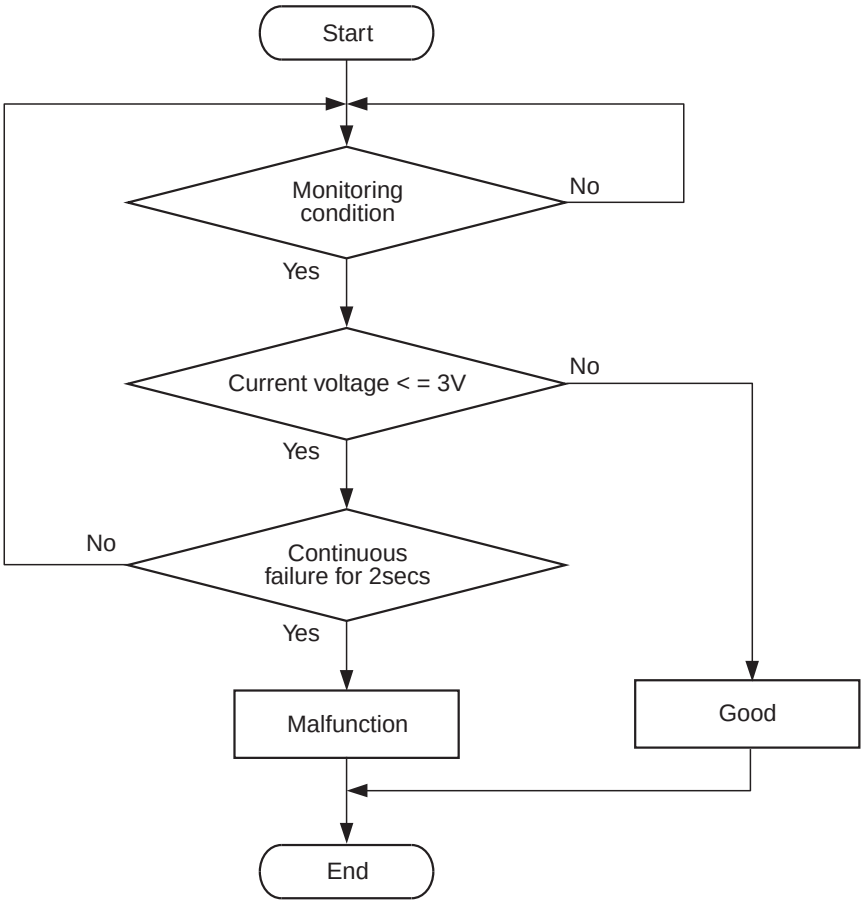
The ECM detects open circuit and short malfunction.

MONITOR EXECUTION

Continuous

DTC SET CONDITIONS

Logic Flow Chart <Circuit continuity – open circuit and shorted low>



ACC07078

Check Conditions

- Engine is running.

Judgment Criterion

- The supply voltage is less than 3 volts without the evaporative emission purge solenoid driving for 2 seconds.

FAIL-SAFE AND BACKUP FUNCTION

- None

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

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 22 P.13A-10.

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

- Evaporative emission purge solenoid failed.

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- Open or shorted evaporative emission purge solenoid circuit, harness damage or connector damage.
- ECM failed.

DIAGNOSIS

Required Special Tools:

- MB992744: Vehicle communication interface-Lite (V.C.I.-Lite)
- MB992745: V.C.I.-Lite main harness A
- MB992747: V.C.I.-Lite USB cable short
- MB992748: V.C.I.-Lite USB cable long
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicles Communication Interface (V.C.I.)
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A (Vehicles with CAN communication system)

STEP 1. Using scan tool (M.U.T.-III), check actuator test item 10: Evaporative Emission Purge Solenoid.

⚠ CAUTION

To prevent damage to scan tool (M.U.T.-III), always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool (M.U.T.-III).

(1) Connect scan tool (M.U.T-III). Refer to HOW TO CONNECT THE SCAN TOOL (M.U.T.-III) P.13A-10.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool (M.U.T.-III) 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.00-13.
NO : Go to Step 2.

STEP 2. Check the evaporative emission purge solenoid.

(1) Disconnect connector, and measure at solenoid side.
(2) Measure the resistance between evaporative emission purge solenoid side connector terminals.

Standard value: 30 – 34 Ω [at 20°C (68°F)]

Q: Is the measured resistance between 30 and 34 Ω [at 20°C (68°F)]?

YES : Go to Step 3.
NO : Replace the evaporative emission purge solenoid. Then go to Step 8.

STEP 3. Measure the power supply voltage at evaporative emission purge solenoid harness side connector.

(1) Disconnect the evaporative emission purge solenoid connector and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal power supply line 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 or replace the connector(s), or check and repair the harness of open circuit, and short circuit in power supply line between evaporative emission purge solenoid connector and engine control relay connector. Then go to Step 8.

STEP 4. Measure the power supply voltage at ECM connector.

(1) Disconnect connector, and measure at harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal PURG 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 or replace the connector(s), or check and repair the harness of open circuit, and short circuit in PURG line between evaporative emission purge solenoid connector and ECM connector. Then go to Step 8.

STEP 5. Check of damage in PURG line between evaporative emission purge solenoid connector and ECM connector.

Q: Is the harness wire in good condition?

YES : Go to Step 6.
NO : Repair the connector(s) or wiring harness. Then go to Step 8.

STEP 6. Check of damage in power supply line between evaporative emission purge solenoid connector and MFI relay connector.

Q: Is the harness wire in good condition?

YES : Go to Step 7.
NO : Repair the connector(s) or wiring harness. Then go to Step 8.

STEP 7. Using scan tool (M.U.T.-III), check actuator test item 10: Evaporative Emission Purge Solenoid.

(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool (M.U.T.-III) 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 : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-13.

NO : Replace the ECM (Refer to, Removal and Installation P.13A-656).Then go to Step 8.

STEP 8. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 22 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0458 stored?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0459: Evaporative Emission Control System Purge Control Valve Circuit High Input

CIRCUIT OPERATION

- The evaporative emission purge solenoid power is supplied from the MFI relay.
- The ECM controls ground evaporative emission purge solenoid by turning the power transistor in the ECM "ON" and "OFF".

TECHNICAL DESCRIPTION

- In response to a signal from the ECM, the evaporative emission purge solenoid valve controls the flow rate of the purge air to be introduced into the intake manifold.

DESCRIPTIONS OF MONITOR METHODS

The ECM detects 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)

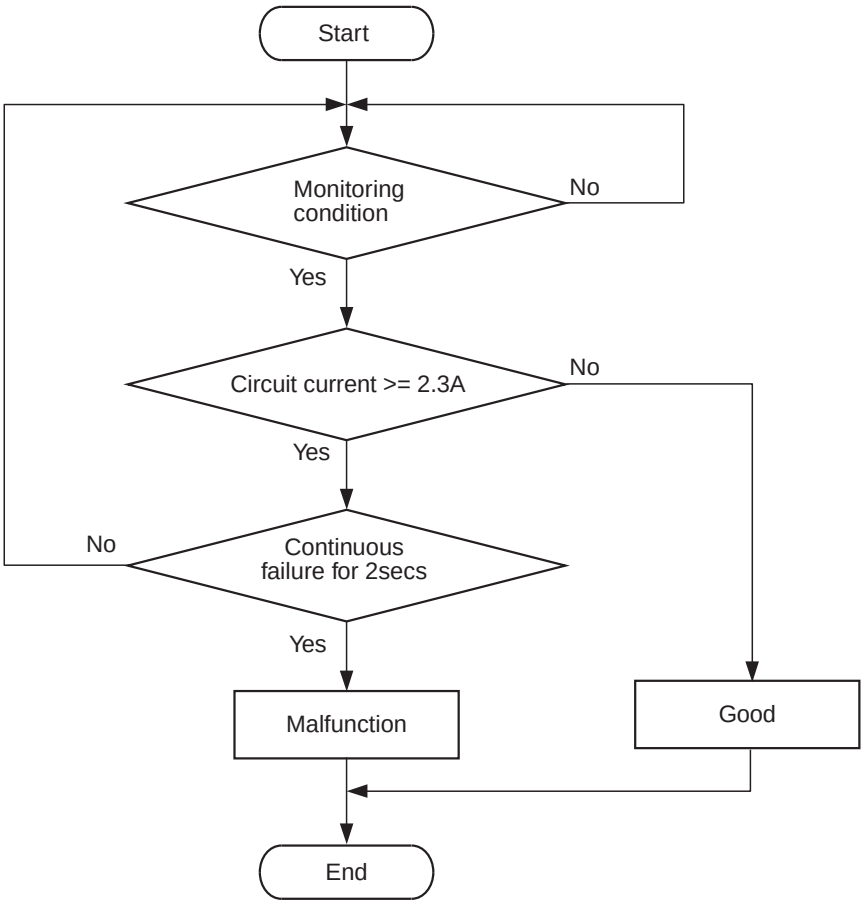
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart <Circuit continuity – shorted high>



Check Conditions
- Engine is running.

Judgment Criterion
- The coil current is more than 2.3 amperes with the evaporative emission purge solenoid driving for 2 seconds.

FAIL-SAFE AND BACKUP FUNCTION
- None

OBD-II DRIVE CYCLE PATTERN
Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 22 P.13A-10.

TROUBLESHOOTING HINTS (The most likely causes for this code to be stored are:)
- Evaporative emission purge solenoid failed.
- Open or shorted evaporative emission purge solenoid circuit, harness damage or connector damage.
- ECM failed.

DIAGNOSIS

Required Special Tools:
- MB992744: Vehicle communication interface-Lite (V.C.I.-Lite)
- MB992745: V.C.I.-Lite main harness A
- MB992747: V.C.I.-Lite USB cable short
- MB992748: V.C.I.-Lite USB cable long
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)

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- MB991824: Vehicles Communication Interface (V.C.I.)
- MB991827: M.U.T.-III USB Cable
- MB991910: M.U.T.-III Main Harness A (Vehicles with CAN communication system)

STEP 1. Using scan tool (M.U.T.-III), check actuator test item 10: Evaporative Emission Purge Solenoid.

⚠ CAUTION

To prevent damage to scan tool (M.U.T.-III), always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool (M.U.T.-III).

(1) Connect scan tool (M.U.T-III). Refer to HOW TO CONNECT THE SCAN TOOL (M.U.T.-III) P.13A-10.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool (M.U.T.-III) 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.00-13.
NO : Go to Step 2.

STEP 2. Check the evaporative emission purge solenoid.

(1) Disconnect connector, and measure at solenoid side.
(2) Measure the resistance between evaporative emission purge solenoid side connector terminals.

Standard value: 30 – 34 Ω [at 20°C (68°F)]

Q: Is the measured resistance between 30 and 34 Ω [at 20°C (68°F)]?

YES : Go to Step 3.
NO : Replace the evaporative emission purge solenoid. Then go to Step 5.

STEP 3. Check of short to power supply in PURG line between evaporative emission purge solenoid connector and ECM connector.

Q: Is the harness wire in good condition?

YES : Go to Step 4.
NO : Repair the connector(s) or wiring harness. Then go to Step 5.

STEP 4. Using scan tool (M.U.T.-III), check actuator test item 10: Evaporative Emission Purge Solenoid.

(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool (M.U.T.-III) 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 : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-13.

NO : Replace the ECM (Refer to, Removal and Installation P.13A-656).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 22 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0459 stored?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0461: Fuel Level Sensor Circuit Range/Performance

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

Detect malfunction if change of fuel level sensor output voltage is small when sum of fuel injection is large.

MONITOR EXECUTION

Continuous

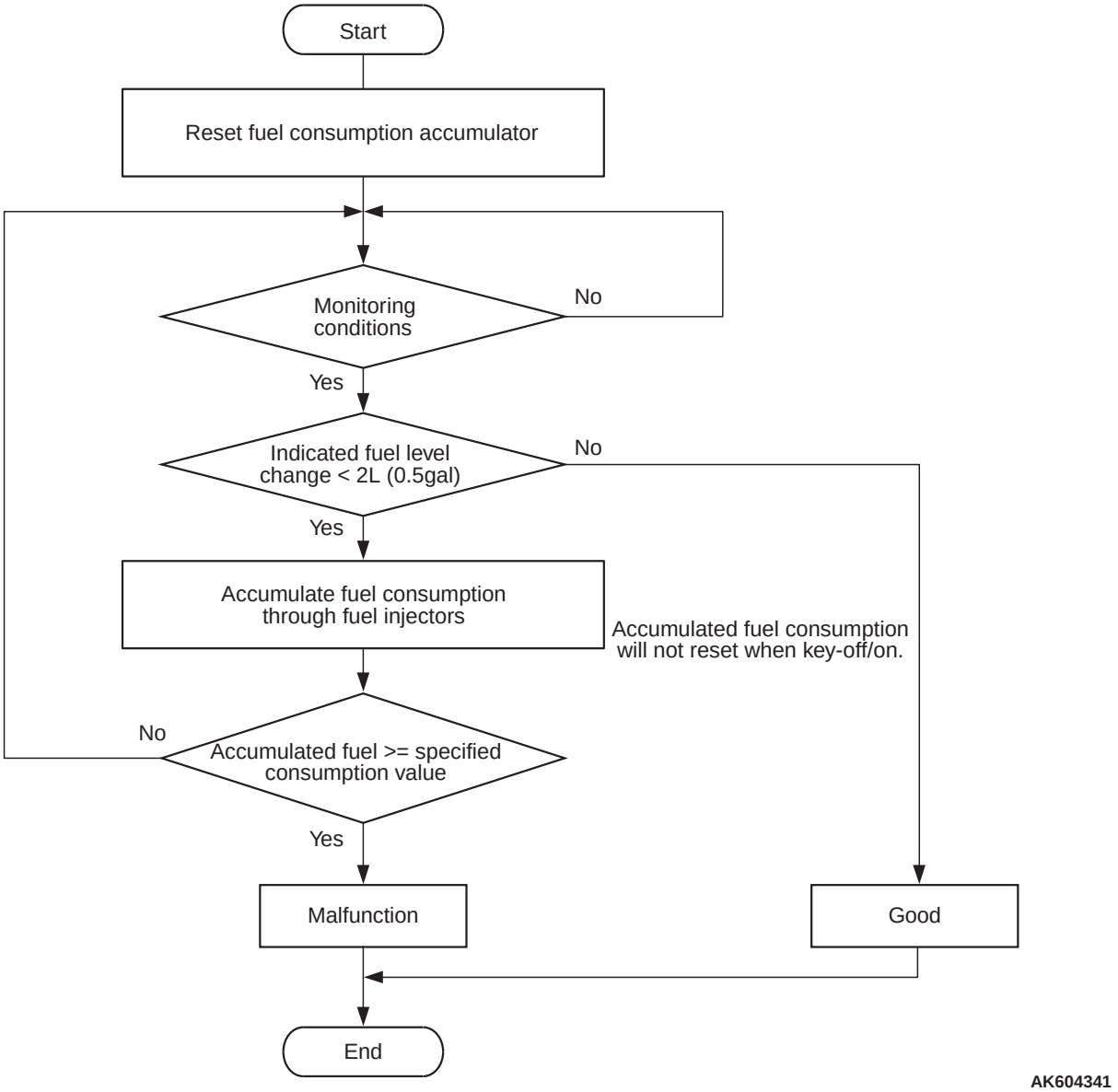
MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

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



Check Condition, Judgment Criterion

- When the fuel consumption calculated from the operation time of the injector amounts to 10 liters*, the diversity of the amount of fuel in tank calculated from the fuel level sensor is less than 2 liters (0.5 gal).

*NOTE: *: 95 percent of the fuel tank level is equivalent to 20 liters.*

NOTE: Not reset after each drive cycle.

FAIL-SAFE AND BACKUP FUNCTION

- None

OBD-II DRIVE CYCLE PATTERN

None.

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

- Combination meter assembly failed.
- Fuel level sensor failed.
- ECM failed.

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DIAGNOSIS

Required Special Tools:

- MB992744: Vehicle communication interface-Lite (V.C.I.-Lite)
- MB992745: V.C.I.-Lite main harness A
- MB992747: V.C.I.-Lite USB cable short
- MB992748: V.C.I.-Lite USB cable long
- MB991958 Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicles Communication Interface (V.C.I.)
  - MB991827 M.U.T.-III USB Cable
  - MB991910 M.U.T.-III Main Harness A (Vehicles with CAN communication system)

STEP 1. Using scan tool (M.U.T.-III), read the combination meter diagnostic trouble code (DTC).

⚠ CAUTION

To prevent damage to scan tool (M.U.T.-III), always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool (M.U.T.-III).

(1) Connect scan tool (M.U.T-III). Refer to HOW TO CONNECT THE SCAN TOOL (M.U.T.-III) P.13A-10.
(2) Turn the ignition switch to the "ON" position.
(3) Read the combination meter-DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the combination meter-DTC stored?

YES : Refer to GROUP 54A, Combination Meter – Diagnostic Trouble Code Chart P.54A-18.
NO : Go to Step 2.

STEP 2. Using scan tool (M.U.T.-III), 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 P0461 stored?

YES : Replace the ECM (Refer to, Removal and Installation P.13A-656). 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.00-13.

STEP 3. Using scan tool (M.U.T.-III), 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 P0461 stored?

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

TSB Revision

DTC P0462: Fuel Level Sensor Circuit Low Input

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)

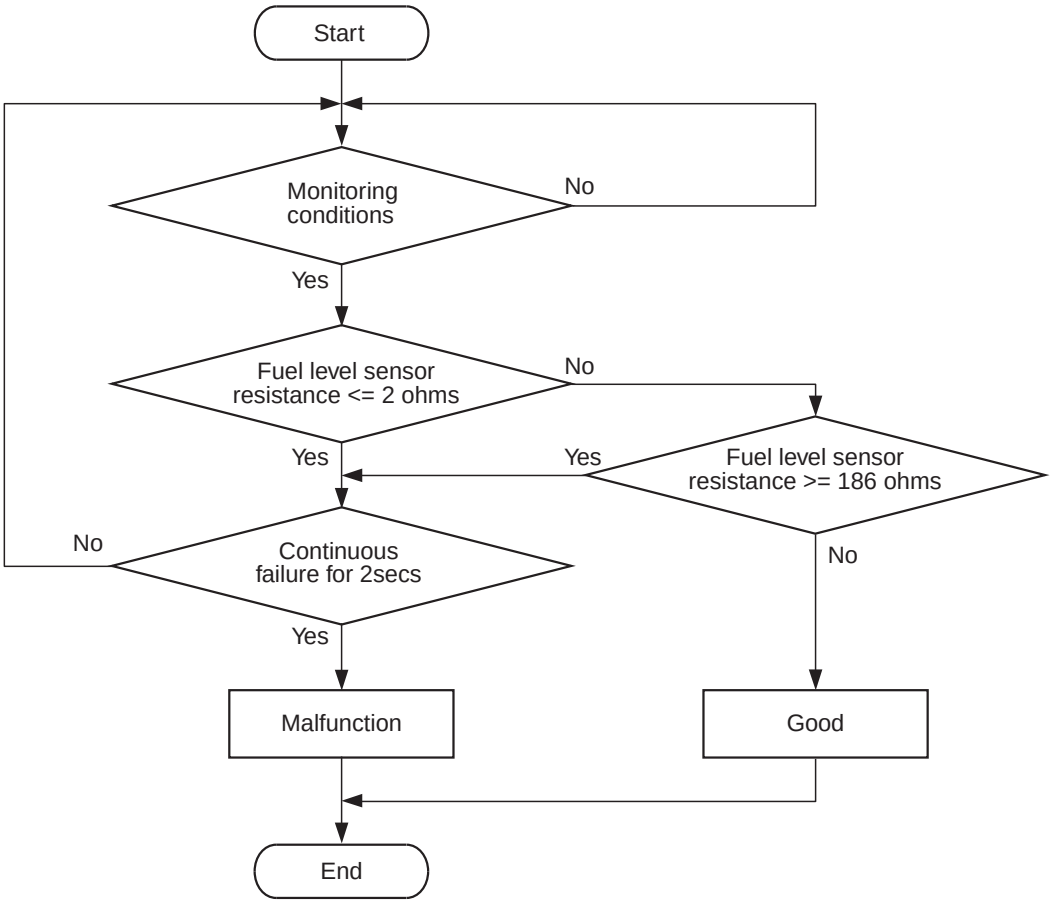
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



AK604342

Check Conditions

- Battery positive voltage is between 11 and 16.5 volts.
- More than 2 seconds have passed since the engine staring sequence was completed.

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Judgment Criterion
- Fuel level sensor resistance is less than 2 ohms for 2 seconds.

FAIL-SAFE AND BACKUP FUNCTION
- None

OBD-II DRIVE CYCLE PATTERN
Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 22 P.13A-10.

TROUBLESHOOTING HINTS (The most likely causes for this code to be stored are:)
- Fuel level sensor failed.
- Combination meter assembly failed.
- Connector damage.
- Harness damage.
- ECM failed.

DIAGNOSIS

Required Special Tools:
- MB992744: Vehicle communication interface-Lite (V.C.I.-Lite)
- MB992745: V.C.I.-Lite main harness A
- MB992747: V.C.I.-Lite USB cable short
- MB992748: V.C.I.-Lite USB cable long
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicles Communication Interface (V.C.I.)
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A (Vehicles with CAN communication system)

STEP 1. Using scan tool (M.U.T.-III), read the combination meter diagnostic trouble code (DTC).

⚠ CAUTION
To prevent damage to scan tool (M.U.T.-III), always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool (M.U.T.-III).

(1) Connect scan tool (M.U.T-III). Refer to HOW TO CONNECT THE SCAN TOOL (M.U.T.-III) P.13A-10.
(2) Turn the ignition switch to the "ON" position.
(3) Read the combination meter-DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the combination meter-DTC stored?

YES : Refer to GROUP 54A, Combination Meter – Diagnostic Trouble Code Chart P.54A-18.
NO : Go to Step 2.

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 22 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0462 stored?

YES : Replace the ECM (Refer to, Removal and Installation P.13A-656). 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.00-13.

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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 22 P.13A-10.

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

Q: Is DTC P0462 stored?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0463: Fuel Level Sensor Circuit High Input

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)

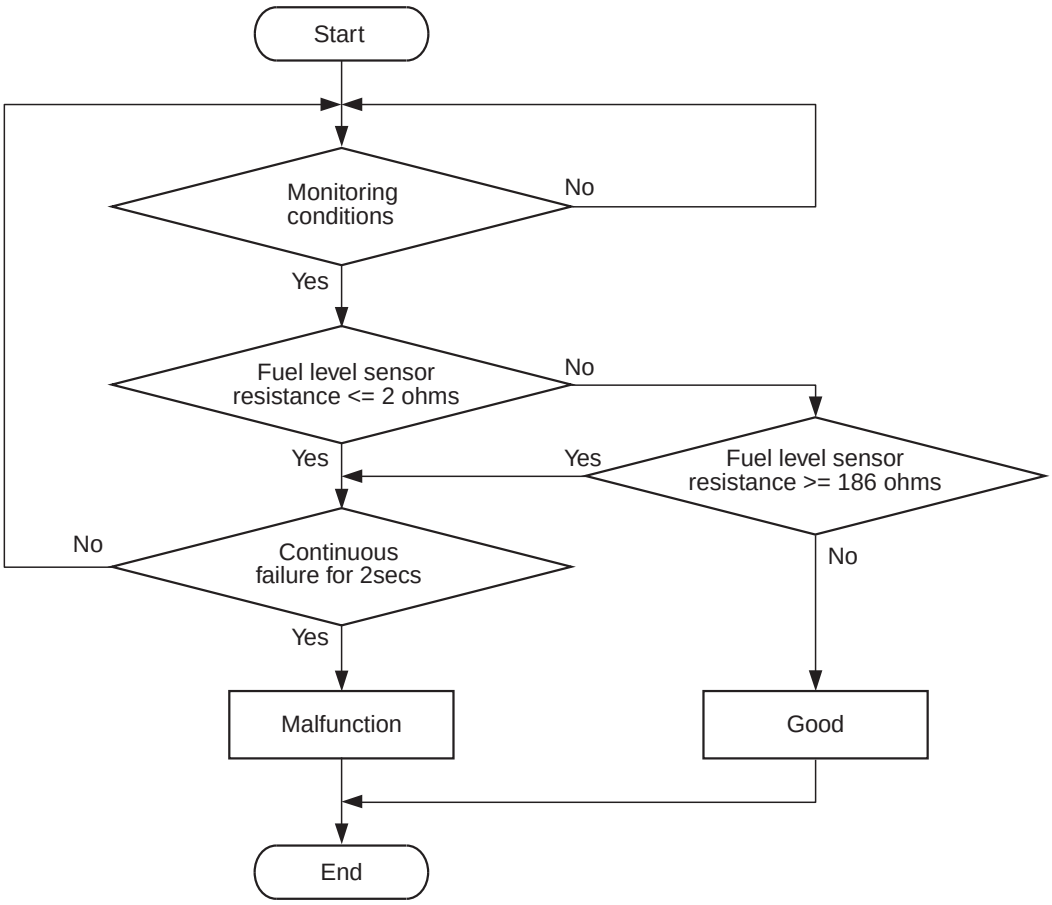
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



AK604342

Check Conditions

- Battery positive voltage is between 11 and 16.5 volts.
- More than 2 seconds have passed since the engine staring sequence was completed.

Judgment Criterion

- Fuel level sensor resistance is more than 186 ohms for 2 seconds.

FAIL-SAFE AND BACKUP FUNCTION

- None

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 22 P.13A-10.

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

- Fuel level sensor failed.
- Combination meter assembly failed.
- Connector damage.
- Harness damage.
- ECM failed.

DIAGNOSIS

Required Special Tools:

- MB992744: Vehicle communication interface-Lite (V.C.I.-Lite)
- MB992745: V.C.I.-Lite main harness A
- MB992747: V.C.I.-Lite USB cable short
- MB992748: V.C.I.-Lite USB cable long
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicles Communication Interface (V.C.I.)
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A (Vehicles with CAN communication system)

STEP 1. Using scan tool (M.U.T.-III), read the combination meter diagnostic trouble code (DTC).

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(1) Connect scan tool (M.U.T-III). Refer to HOW TO CONNECT THE SCAN TOOL (M.U.T.-III) P.13A-10.
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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 22 P.13A-10.
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Q: Is DTC P0463 stored?

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