

## GROUP 13Ab

# MULTIPOINT FUEL INJECTION (MFI) DIAGNOSIS

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## TROUBLESHOOTING STRATEGY

M113115000063

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

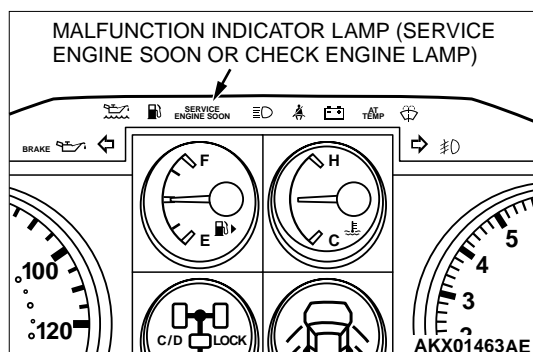
Use these steps to plan your diagnostic strategy. If you follow them carefully, you will be sure to have exhausted most of the possible ways to find an MFI fault.

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 Malfunction P.00-6.
5. If you can verify the condition but there are no DTCs, or the system cannot communicate with the scan tool, refer to the trouble symptom classification table.
6. If there is a DTC, record the number of the code, then erase the code from the memory using the scan tool.
7. Reconfirm the malfunction symptom and carry out a test drive with the drive cycle pattern.
8. If DTC is set again, carry out an inspection with the diagnostic trouble code procedures of that code.
9. If DTC is not set again, the malfunction is intermittent. For information on how to cope with intermittent malfunctions, refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to cope with Intermittent Malfunction P.00-6.
10. After repairs are completed, conduct a road test duplicating the complaint set conditions to confirm the malfunction has been corrected.

**NOTE:** If the powertrain control module (PCM) is replaced, Immobilizer Encrypted Code Registration should be carried out, Refer to GROUP 54A, Ignition Switch – On-vehicle Service – Immobilizer Encrypted Code Registration P.54A-22.

## TROUBLE CODE DIAGNOSIS

M1131150500381



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

Among the on-board diagnostic items, a Service Engine Soon/Malfunction Indicator Lamp illuminates to notify the driver of an emission control malfunction.

However, when an irregular signal returns to normal and the powertrain control module judges that it has returned to normal, the Malfunction Indicator Lamp (SERVICE ENGINE SOON or Check Engine Lamp) is switched off.

Moreover, when the ignition switch is turned off, the lamp is switched off. Even if the ignition switch is turned on again, the lamp does not illuminate until the malfunction is detected.

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

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

<b>DTC NO.</b>	<b>ITEMS</b>
-	Powertrain control module (PCM) malfunction
P0101*	Volume airflow circuit range/performance problem
P0102*	Volume airflow circuit low input
P0106*	Barometric pressure circuit range/performance problem
P0107*	Barometric pressure circuit low input
P0108*	Barometric pressure circuit high input
P0111*	Intake air temperature circuit range/performance problem
P0112*	Intake air temperature circuit low input
P0113*	Intake air temperature circuit high input
P0116*	Engine coolant temperature circuit range/performance problem
P0117*	Engine coolant temperature circuit low input
P0118*	Engine coolant temperature circuit high input
P0122*	Throttle position sensor (main) circuit low input
P0123*	Throttle position sensor (main) circuit high input
P0125*	Insufficient coolant temperature for closed loop fuel control
P0128	Coolant thermostat (Coolant temperature below thermostat regulating temperature)
P0130	Heated oxygen sensor circuit (bank 1 sensor 1)
P0131	Heated oxygen sensor circuit low voltage (bank 1 sensor 1)
P0132	Heated oxygen sensor circuit high voltage (bank 1 sensor 1)
P0133	Heated oxygen sensor circuit slow response (bank 1 sensor 1)
P0134*	Heated oxygen sensor circuit no activity detected (bank 1 sensor 1)
P0135	Heated oxygen sensor heater circuit (bank 1 sensor 1)
P0136	Heated oxygen sensor circuit (bank 1 sensor 2)
P0137	Heated oxygen sensor circuit low voltage (bank 1 sensor 2)
P0138	Heated oxygen sensor circuit high voltage (bank 1 sensor 2)
P0139	Heated oxygen sensor circuit slow response (bank 1 sensor 2)
P0141	Heated oxygen sensor heater circuit (bank 1 sensor 2)
P0150	Heated oxygen sensor circuit (bank 2 sensor 1)
P0151	Heated oxygen sensor circuit low voltage (bank 2 sensor 1)
P0152	Heated oxygen sensor circuit high voltage (bank 2 sensor 1)
P0153	Heated oxygen sensor circuit slow response (bank 2 sensor 1)
P0154	Heated oxygen sensor circuit no activity detected (bank 2 sensor 1)
P0155	Heated oxygen sensor heater circuit (bank 2 sensor 1)
P0156	Heated oxygen sensor circuit (bank 2 sensor 2)
P0157	Heated oxygen sensor circuit low voltage (bank 2 sensor 2)
P0158	Heated oxygen sensor circuit high voltage (bank 2 sensor 2)
P0159	Heated oxygen sensor circuit slow response (bank 2 sensor 2)
P0161	Heated oxygen sensor heater circuit (bank 2 sensor 2)
P0171	System too lean (bank 1)

<b>DTC NO.</b>	<b>ITEMS</b>
P0172	System too rich (bank 1)
P0174	System too lean (bank 2)
P0175	System too rich (bank 2)
P0181	Fuel tank temperature sensor circuit range/performance
P0182	Fuel tank temperature sensor circuit low input
P0183	Fuel tank temperature sensor circuit high input
P0201	Injector circuit – cylinder 1
P0202	Injector circuit – cylinder 2
P0203	Injector circuit – cylinder 3
P0204	Injector circuit – cylinder 4
P0205	Injector circuit – cylinder 5
P0206	Injector circuit – cylinder 6
P0222*	Throttle position sensor (sub) circuit low input
P0223*	Throttle position sensor (sub) circuit high input
P0300	Random/multiple cylinder misfire detected
P0301	Cylinder 1 misfire detected
P0302	Cylinder 2 misfire detected
P0303	Cylinder 3 misfire detected
P0304	Cylinder 4 misfire detected
P0305	Cylinder 5 misfire detected
P0306	Cylinder 6 misfire detected
P0335*	Crankshaft position sensor circuit
P0340*	Camshaft position sensor circuit
P0401	Exhaust gas recirculation flow insufficient detected
P0403	Exhaust gas recirculation control circuit
P0421	Warm up catalyst efficiency below threshold (bank 1)
P0431	Warm up catalyst efficiency below threshold (bank 2)
P0441	Evaporative emission system incorrect purge flow
P0442	Evaporative emission system leak detected (Small leak)
P0443	Evaporative emission system purge control valve circuit
P0446	Evaporative emission system vent control circuit
P0451	Evaporative emission system pressure sensor range/performance
P0452	Evaporative emission system pressure sensor low input
P0453	Evaporative emission system pressure sensor high input
P0455	Evaporative emission system leak detected (Gross leak)
P0456	Evaporative emission system leak detected (Very small leak)
P0461	Fuel level sensor circuit range/performance
P0500	Vehicle speed sensor malfunction
P0513	Immobilizer malfunction
P0551	Power steering pressure sensor circuit range/performance

<b>DTC NO.</b>	<b>ITEMS</b>
P0554	Power steering pressure sensor circuit intermittent
P0606*	Powertrain control module main processor malfunction
P0638*	Throttle actuator control motor circuit range/ performance
P0642*	Throttle position sensor power supply
P0657*	Throttle actuator control motor relay circuit malfunction
P0660	Intake manifold tuning circuit malfunction
P0705	Transmission range switch circuit malfunction (RPNDL input)
P0712	Transmission fluid temperature sensor circuit low input
P0713	Transmission fluid temperature sensor circuit high input
P0715	Input/Turbine speed sensor circuit
P0720	Output speed sensor circuit
P0731	Gear 1 incorrect ratio
P0732	Gear 2 incorrect ratio
P0733	Gear 3 incorrect ratio
P0734	Gear 4 incorrect ratio
P0735	Gear 5 incorrect ratio
P0736	Gear R incorrect ratio
P0741	Torque converter clutch circuit performance or stuck off
P0742	Torque converter clutch circuit stuck on
P0743	Torque converter clutch circuit electrical
P0753	Shift solenoid "A" electrical
P0758	Shift solenoid "B" electrical
P0763	Shift solenoid "C" electrical
P0768	Shift solenoid "D" electrical
P0773	Shift solenoid "E" electrical
P1400	Manifold differential pressure sensor circuit malfunction
P1601*	Communication malfunction (between PCM and throttle actuator control module)
P1603*	Battery backup circuit malfunction
P1751	A/T control relay malfunction
P2100*	Throttle actuator control motor circuit (open)
P2101*	Throttle actuator control motor magneto malfunction
P2102*	Throttle actuator control motor circuit (shorted low)
P2103*	Throttle actuator control motor circuit (shorted high)
P2108*	Throttle actuator control processor malfunction
P2121*	Accelerator pedal position sensor (main) circuit range/performance problem
P2122*	Accelerator pedal position sensor (main) circuit low input
P2123*	Accelerator pedal position sensor (main) circuit high input
P2126*	Accelerator pedal position sensor (sub) circuit range/performance problem
P2127*	Accelerator pedal position sensor (sub) circuit low input

DTC NO.	ITEMS
P2128*	Accelerator pedal position sensor (sub) circuit high input
P2135*	Throttle position sensor (main and sub) range/performance problem
P2138*	Accelerator pedal position sensor (main and sub) range/performance problem

*NOTE: If the Malfunction Indicator Lamp (SERVICE ENGINE SOON or Check Engine Lamp) illuminates because of a malfunction of the powertrain control module (PCM), transmission between scan tool MUT-II (MB991502) and the PCM is impossible. In this case, the diagnostic trouble code cannot be read.*

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

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

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

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

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

## HOW TO READ AND ERASE DIAGNOSTIC TROUBLE CODE

### Required Special Tool:

- MB991502: Scan Tool (MUT-II)

### **⚠ CAUTION**

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

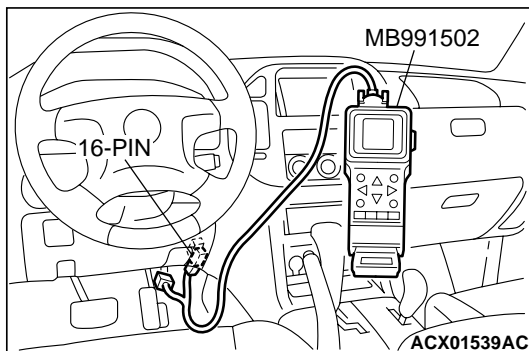
*NOTE: If Battery positive voltage is low, diagnostic trouble codes may not be output. Be sure to check the battery and charging system before continuing.*

*NOTE: If battery cable is disconnected or if the powertrain control module (PCM) connector is disconnected, the diagnostic trouble codes will be erased. Do not disconnect the battery cable or PCM connector until the diagnostic trouble codes have been recorded.*

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

1. Connect scan tool MB991502 to the data link connector.
2. Turn the ignition switch to the "ON" position.
3. Read the diagnostic trouble codes for MFI.
4. Refer to the DIAGNOSTIC TROUBLE CODE CHART.

[P.13Ab-22](#)



5. Turn the ignition switch to the "LOCK" (OFF) position and then back to "ON" again.
6. Erase the diagnostic trouble code(s) using MUT-II screen prompts.
7. Confirm that the diagnostic trouble code output is normal.
8. Turn the ignition switch to the "LOCK" (OFF) position.
9. Disconnect scan tool MB991502 from the data link connector.

### **PROVISIONAL DTCs [MUT-II OBD-II Test Mode - Results (Mode 5)]**

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

### **MODE 6 REFERENCE TABLE**

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

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

TEST ID	MONITORING ITEM	SIMPLE TECHNICAL DESCRIPTION	INDICATION OF SCAN TOOL	CONVERSION COEFFICIENT IN USING GENERAL SCAN TOOL
01	Catalyst monitor (Bank 1)	PCM monitors the deterioration of catalyst at right bank side by the output frequency ratio between right bank heated oxygen sensor (front) and right bank heated oxygen sensor (rear).	Catalyst Frequency Ratio Bank 1 Test Result and Limit Value (max.)	× 0.0039
02	Catalyst monitor (Bank 2)	PCM monitors the deterioration of catalyst at left bank side by the output frequency ratio between left bank heated oxygen sensor (front) and left bank heated oxygen sensor (rear).	Catalyst Frequency Ratio Bank 2 Test Result and Limit Value (max.)	× 0.0039
03	EGR monitor	PCM monitors the operation of EGR system by the pressure difference of intake manifold between before and after introduction of EGR using the manifold differential pressure sensor.	EGR Monitor Pressure Value Test Result and Limit Value (min.) kPa	× 0.43 kPa
06	Evaporation leak monitor (Small leak)	PCM monitors the leak of fuel evaporation gas by the reduction of vacuum in tank after appointed time using the fuel tank differential pressure sensor after making the fuel tank and the fuel line vacuum.	EVAP Leak Mon. 1 mm Pressure Value Test Result and Limit Value (max.) kPa	× 0.032 kPa
07	Evaporation leak monitor (Gross leak)	PCM monitors the leak of fuel evaporation gas by checking whether the pressure can be reduced (the amount of pressure reduction) using the fuel tank differential pressure sensor after sealing the fuel tank and the fuel line.	EVAP Leak Mon. Gross Pressure Value Test Result and Limit Value (min.) kPa	× 0.032 kPa
08	Evaporation leak monitor (Very small leak)	PCM monitors the leak of fuel evaporation gas by the reduction of vacuum in tank after appointed time using the fuel tank differential pressure sensor after making the fuel tank and the fuel line vacuum.	EVAP Leak Mon. 0.5 mm Pressure Value Test Result and Limit Value (max.) kPa	× 0.032 kPa
09	Heated oxygen sensor monitor (Rich/Lean Switching) (Bank 1 Sensor 1)	PCM monitors the deteriorated condition of the heated oxygen sensor by checking the lean/rich Switching frequency of the heater oxygen sensor.	HO2S B1 SENSOR 1 Rich/Lean Switching Count Test Result and Limit Value (min.)	×1 count



<b>TEST ID</b>	<b>MONITORING ITEM</b>	<b>SIMPLE TECHNICAL DESCRIPTION</b>	<b>INDICATION OF SCAN TOOL</b>	<b>CONVERSION COEFFICIENT IN USING GENERAL SCAN TOOL</b>
0A	Heated oxygen sensor monitor (Rich/Lean Switching) (Bank 2 Sensor 1)	PCM monitors the deteriorated condition of the heated oxygen sensor by checking the lean/rich Switching frequency of the heater oxygen sensor.	HO2S B2 SENSOR 1 Rich/Lean Switching Count Test Result and Limit Value (min.)	× 1count
0B	Heated oxygen sensor monitor (Voltage) (Bank 1 Sensor 2)	PCM checks the output voltage of the heated oxygen sensor (rear) in order to monitor whether the heated oxygen sensor output is stuck.	HO2S B1 SENSOR2 Change in Volt Test Result and Limit Value (min.)	× 19.5mV
0C	Heated oxygen sensor monitor (Voltage) (Bank 2 Sensor 2)	PCM checks the output voltage of the heated oxygen sensor (rear) in order to monitor whether the heated oxygen sensor output is stuck.	HO2S B2 SENSOR 2 Change in Volt Test Result and Limit Value (min.)	× 19.5mV

*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.*

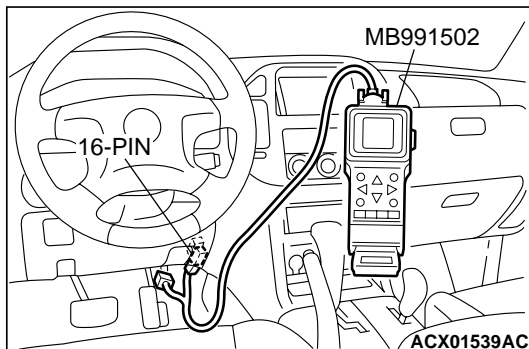
### **DIAGNOSTIC BY DIAGNOSTIC TEST MODE II (INCREASED SENSITIVITY)**

**Required Special Tool:**

- MB991502: Scan Tool (MUT-II)

**⚠ CAUTION**

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



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

1. Connect scan tool MB991502 to the data link connector.
2. Turn the ignition switch to the "ON" position.
3. Change the diagnostic test mode of the powertrain control module to DIAGNOSTIC TEST MODE II (INCREASED SENSITIVITY).

4. Road test the vehicle.
5. Read the diagnostic trouble code and repair the malfunctioning part.
6. Turn the ignition switch to the "LOCK" (OFF) position.
7. Disconnect scan tool MB991502 from the data link connector.

### INSPECTION USING SCAN TOOL MB991502, DATA LIST AND ACTUATOR TESTING

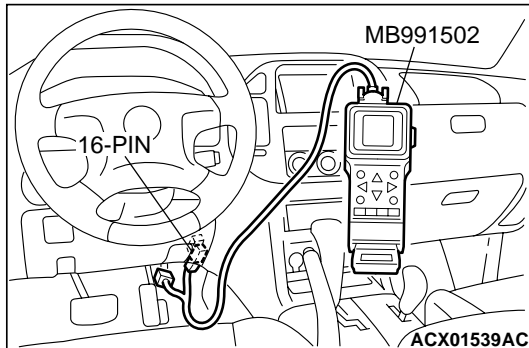
#### Required Special Tool:

- MB991502: Scan Tool (MUT-II)

#### **CAUTION**

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

1. Connect scan tool MB991502 to the data link connector.
2. Turn the ignition switch to the "ON" position.
3. Carry out inspection by means of the data list and the actuator test function. If there is an abnormality, check and repair the chassis harnesses and components. Refer to Data List Reference Table [P.13Ab-29](#).  
Refer to Actuator Test Reference Table [P.13Ab-42](#).
4. Re-check using scan tool MB991502 and check to be sure that the abnormal input and output have returned to normal because of the repairs.
5. Erase the diagnostic trouble code(s).
6. Turn the ignition switch to the "LOCK" (OFF) position.
7. Disconnect scan tool MB991502 from the data link connector.
8. Start the engine again and do a test drive to confirm that the problem is eliminated.



### ON-BOARD DIAGNOSTICS

The powertrain control module (PCM) monitors the input/output signals (some signals all the time and others under specified conditions) of the PCM. When a malfunction continues for a specified time or longer after the irregular signal is initially monitored, the PCM judges that a malfunction has occurred. After the PCM first detects a malfunction, a diagnostic trouble code is recorded when the engine is restarted and the same malfunction is re-detected. However, for items marked with a "\*", a diagnostic trouble code is recorded on the first detection of the malfunction. There are 121 diagnostic items. The diagnostic results can be read out with a scan tool. Since memorization of the diagnostic trouble codes is backed up directly by the battery, the diagnostic results are memorized even if the ignition key is turned off. The diagnostic trouble codes will, however, be erased when the battery terminal or the PCM connector is disconnected. In addition, the diagnostic trouble code can also be erased by turning the ignition switch to ON and sending the diagnostic trouble code erase signal from scan tool MUT-II (MB991502) to the PCM.

*NOTE: If the sensor connector is disconnected with the ignition switch turned on, the diagnostic trouble code is memorized. In this case, send the diagnostic trouble code erase signal to the PCM in order to erase the diagnostic memory. The 121 diagnostic items are all indicated sequentially from the smallest code number. The PCM records the engine operating condition when the diagnostic trouble code is set. This data is called "Freeze-frame" data. This data can be read by using the scan tool, and can then be used in simulation tests for troubleshooting. Data items are as follows:*

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

<b>DATA</b>	<b>UNIT</b>
Engine coolant temperature	°C or °F
Engine speed	r/min
Vehicle speed	km/h or mph
Long-term fuel trim (long-term fuel trim)	%
Short-term fuel trim (short-term fuel trim)	%
Fuel system status	<ul style="list-style-type: none"> <li>• Open loop</li> <li>• Closed loop</li> <li>• Open loop-drive condition</li> <li>• Open loop-DTC set</li> <li>• Closed loop-O<sub>2</sub> (rear) failed</li> </ul>
Calculated load value	%
Diagnostic trouble code during data recording	-

### **OBD- II DRIVE CYCLE**

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

** CAUTION**

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

*NOTE: Check that the diagnosis trouble code (DTC) is not output before traveling in the drive cycle pattern. Erase the DTC if it has been output.*

**DRIVE CYCLE PATTERN LIST**

<b>PROCEDURE</b>	<b>MONITOR ITEM</b>		<b>DIAGNOSTIC TROUBLE CODE (DTC)</b>
1	Evaporative emission system leak monitor		P0441, P0442, P0451, P0452, P0453, P0455, P0456
2	Fuel trim monitor		P0171, P0172, P0174, P0175
3	Catalytic converter monitor		P0421, P0431
4	Heated oxygen sensor monitor		P0133, P0139, P0153, P0159
5	Exhaust gas recirculation (EGR) system monitor		P0401
6	Other monitor	Main components	P0134, P0154, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0506, P0507, P1400
		Sensors and switches	P0101, P0102, P0106, P107, P0108, P0111, P0112, P0113, P0116, P0117, P0118, P0125, P0181, P0182, P0183, P0335, P0340, P0461
		Wire breakage and short circuit	P0130, P0131, P0132, P0135, P0136, P0137, P0138, P0141, P0150, P0151, P0152, P0155, P0156, P0157, P0158, P0161, P0201, P0202, P0203, P0204, P0205, P0206, P0403, P0443, P0446

**PROCEDURE 1**

<b>EVAPORATIVE EMISSION SYSTEM LEAK MONITOR</b>	
DTC	P0441, P0442, P0451, P0452, P0453, P0455, P0456
Drive cycle pattern	<p>This monitor [from start to ignition switch "LOCK" (OFF) position] will be completed while traveling with the following drive cycle pattern. It will take 8 minutes. You must complete this drive twice.</p> <p><i>NOTE: Vehicle speed and throttle opening angle should be within the shaded range.</i></p>
Inspection conditions	<ul style="list-style-type: none"> <li>• Engine coolant temperature: 45°C (113°F) or less (The engine is stopped before the test drive is started)</li> <li>• Atmospheric temperature: 5 – 45°C (41 – 113°F)</li> <li>• Condition of A/T: Selector lever D range</li> </ul>
Test procedure	<ol style="list-style-type: none"> <li>1. Engine: start</li> <li>2. Accelerate until the vehicle speed is 89 – 97 km/h (55 – 60 mph).</li> <li>3. Travel for 200 seconds or more while keeping the vehicle speed at 89 – 97 km/h (55 – 60 mph).</li> <li>4. While keeping the accelerator pedal opening degree constant, keep the vehicle speed at 89 – 97 km/h (55 – 60 mph) and travel for 150 seconds or more. (During monitor)</li> <li>5. Return the vehicle to the shop, then turn the ignition switch to "LOCK" (OFF) position.</li> <li>6. Confirm that the diagnostic trouble code (DTC) is not output.</li> <li>7. If DTC P0441 is output, refer to GROUP 13A, DTC P0441 – Evaporative Emission System Incorrect Purge Flow <a href="#">P.13Ac-404</a>. If DTC P0442 is output, refer to GROUP 13A, DTC P0442 – Evaporative Emission System Leak Detected (Small Leak) <a href="#">P.13Ac-406</a>. If DTC P0451 is output, refer to GROUP 13A, DTC P0451 – Evaporative Emission System Pressure Sensor Range/performance <a href="#">P.13Ac-436</a>. If DTC P0452 is output, refer to GROUP 13A, DTC P0452 – Evaporative Emission System Pressure Sensor Low Input <a href="#">P.13Ac-452</a>. If DTC P0453 is output, refer to GROUP 13A, DTC P0453 – Evaporative Emission System Pressure Sensor High Input <a href="#">P.13Ac-467</a>. If DTC P0455 is output, refer to GROUP 13A, DTC P0455 – Evaporative Emission System Leak Detected (Gross Leak) <a href="#">P.13Ac-482</a>. If DTC P0456 is output, refer to GROUP 13A, DTC P0456 – Evaporative Emission System Leak Detected (Very Small Leak) <a href="#">P.13Ac-499</a>.</li> </ol>

PROCEDURE 2

FUEL TRIM MONITOR	
DTC	P0171, P0172, P0174, P0175
Drive cycle pattern	<p>This monitor [from start to ignition switch "LOCK" (OFF) position] will be completed while traveling with the following drive cycle pattern. It will take 35 minutes. You must complete this drive twice.</p> <p><i>NOTE: Vehicle speed and throttle opening angle should be within the shaded range.</i></p>
Inspection conditions	<ul style="list-style-type: none"> <li>• Engine coolant temperature: 80 – 97°C (176 – 207°F)</li> <li>• Atmospheric temperature: –10 – 60°C (14 – 140°F)</li> <li>• Condition of A/T: Selector lever D range</li> </ul>
Test procedure	<ol style="list-style-type: none"> <li>1. Engine: start</li> <li>2. Accelerate until the vehicle speed is 89 – 97 km/h (55 – 60 mph).</li> <li>3. Travel for 30 minutes or more while keeping the vehicle speed at 89 – 97 km/h (55 – 60 mph). (M/T: 5th speed) Carry out one gradual deceleration/acceleration returning to 89 – 97 km/h (55 – 60 mph) within 120 seconds. (During monitor)</li> <li>4. Return the vehicle to the shop, then turn the ignition switch to "LOCK" (OFF) position.</li> <li>5. Confirm that the diagnostic trouble code (DTC) is not output.</li> <li>6. If DTC P0171 is output, refer to GROUP 13A, DTC P0171 – System too lean (Bank1) <a href="#">P.13Ac-273.</a> If DTC P0172 is output, refer to GROUP 13A, DTC P0172 – System too rich (Bank1) <a href="#">P.13Ac-280.</a> If DTC P0174 is output, refer to GROUP 13A, DTC P0174 – System too lean (Bank2) <a href="#">P.13Ac-284.</a> If DTC P0175 is output, refer to GROUP 13A, DTC P0175 – System too rich (Bank2) <a href="#">P.13Ac-291.</a></li> </ol>

PROCEDURE 3

CATALYTIC CONVERTER MONITOR	
DTC	P0421, P0431
Drive cycle pattern	<p>This monitor [from start to ignition switch "LOCK" (OFF) position] will be completed while traveling with the following drive cycle pattern. It will take 20 minutes. You must complete this drive twice.</p> <p><i>NOTE: Vehicle speed and throttle opening angle should be within the shaded range.</i></p>
Inspection conditions	<ul style="list-style-type: none"> <li>• Atmospheric temperature: <math>-10^{\circ}\text{C}</math> (<math>14^{\circ}\text{F}</math>) or more</li> <li>• A/C switch: OFF</li> <li>• Condition of A/T: Selector lever D range</li> </ul>
Test procedure	<ol style="list-style-type: none"> <li>1. Engine: start</li> <li>2. Accelerate until the vehicle speed is 72 km/h (45 mph).</li> <li>3. Travel for 300 seconds or more while keeping the vehicle speed at 72 – 97 km/h (45 – 60 mph).</li> <li>4. Decelerate until the vehicle speed is within 56 – 64 km/h (35 – 40 mph).</li> <li>5. While keeping the accelerator pedal opening degree constant, keep the vehicle speed at 56 – 64 km/h (35 – 40 mph) and travel for 90 seconds or more. (During monitor)</li> <li>6. Fully close the throttle and decelerate, and keep the deceleration state for 10 seconds. Then, quickly accelerate until the vehicle speed reaches 56 – 64 km/h (35 – 40 mph). Then, repeat steps 5 and 6, and complete six monitor sessions.</li> <li>7. Return the vehicle to the shop, then turn the ignition switch to "LOCK" (OFF) position.</li> <li>8. Confirm that the diagnostic trouble code (DTC) is not output.</li> <li>9. If DTC P0421 is output, refer to GROUP 13A, DTC P0421 – Warm Up Catalyst Efficiency Below Threshold (Bank 1) <a href="#">P.13Ac-398</a>. If DTC P0431 is output, refer to GROUP 13A, DTC P0431 – Warm Up Catalyst Efficiency Below Threshold (Bank 2) <a href="#">P.13Ac-401</a>.</li> </ol>

PROCEDURE 4

HEATED OXYGEN SENSOR MONITOR	
DTC	P0133, P0139, P0153, P0159
Drive cycle pattern	<p>This monitor [from start to ignition switch "LOCK" (OFF) position] will be completed while traveling with the following drive cycle pattern. It will take 5 minutes. You must complete this drive twice.</p> <p><i>NOTE: Vehicle speed and throttle opening angle should be within the shaded range.</i></p>
Inspection conditions	<ul style="list-style-type: none"> <li>• Engine coolant temperature: 80°C (176°F) or more</li> <li>• Atmospheric temperature: -10°C (14°F) or more</li> <li>• Condition of A/T: Selector lever D range</li> </ul>
Test procedure	<ol style="list-style-type: none"> <li>1. Engine: start</li> <li>2. Accelerate until the vehicle speed is 56 – 64 km/h (35 – 40 mph).</li> <li>3. While keeping the accelerator pedal opening degree constant, keep the vehicle speed at 56 – 64 km/h (35 – 40 mph) and travel for 120 seconds or more. (During monitor)</li> <li>4. Return the vehicle to the shop, then turn the ignition switch to "LOCK" (OFF) position.</li> <li>5. Confirm that the diagnostic trouble code (DTC) is not output.</li> <li>6. If DTC P0133 is output, refer to GROUP 13A, DTC P0133 – O<sub>2</sub> Sensor Circuit Slow Response (Bank 1 Sensor 1) <a href="#">P.13Ac-130</a>. If DTC P0139 is output, refer to GROUP 13A, DTC P0139 – O<sub>2</sub> Sensor Circuit Slow Response (Bank 1 Sensor 2) <a href="#">P.13Ac-176</a>. If DTC P0153 is output, refer to GROUP 13A, DTC P0153 – O<sub>2</sub> Sensor Circuit Slow Response (Bank 2 Sensor 1) <a href="#">P.13Ac-214</a>. If DTC P0159 is output, refer to GROUP 13A, DTC P0159 – O<sub>2</sub> Sensor Circuit Slow Response (Bank 2 Sensor 2) <a href="#">P.13Ac-260</a>.</li> </ol>



PROCEDURE 5

**EXHAUST GAS RECIRCULATION (EGR) SYSTEM MONITOR**

DTC	P0401
Drive cycle pattern	<p>This monitor [from start to ignition switch "LOCK" (OFF) position] will be completed while traveling with the following drive cycle pattern. It will take 10 minutes. You must complete this drive twice.</p> <p><i>NOTE: Vehicle speed and throttle opening angle should be within the shaded range.</i></p>
Inspection conditions	<ul style="list-style-type: none"> <li>• Engine coolant temperature: 80°C (176°F) or more</li> <li>• Atmospheric temperature: 5°C (41°F) or more</li> <li>• A/C switch: OFF</li> <li>• Condition of A/T: Selector lever D range</li> </ul>
Test procedure	<ol style="list-style-type: none"> <li>1. Engine: start</li> <li>2. Accelerate until the vehicle speed is 56 – 64 km/h (35 – 40 mph).</li> <li>3. Travel for 20 seconds or more while keeping the vehicle speed at 56 – 64 km/h (35 – 40 mph).</li> <li>4. Fully close the throttle from an engine speed of 2,000 – 3,000 r/min, and while keeping the clutch engaged, decelerate to approximately 900 r/min without applying the brakes. Do not steer the handle or turn the light ON/OFF during this time. (During monitor)</li> <li>5. Accelerate until the vehicle speed reaches 56 – 64 km/h (35 – 40 mph), and travel for 20 seconds or more. Then, repeat steps 4 and 5 and complete 8 monitor sessions.</li> <li>6. Return the vehicle to the shop, then turn the ignition switch to "LOCK" (OFF) position.</li> <li>7. Confirm that the diagnostic trouble code (DTC) is not output.</li> <li>8. If DTC P0401 is output, refer to GROUP 13A, DTC P0401 – Exhaust Gas Recirculation Flow Insufficient detected <a href="#">P.13Ac-388</a>.</li> </ol>

**PROCEDURE 6**

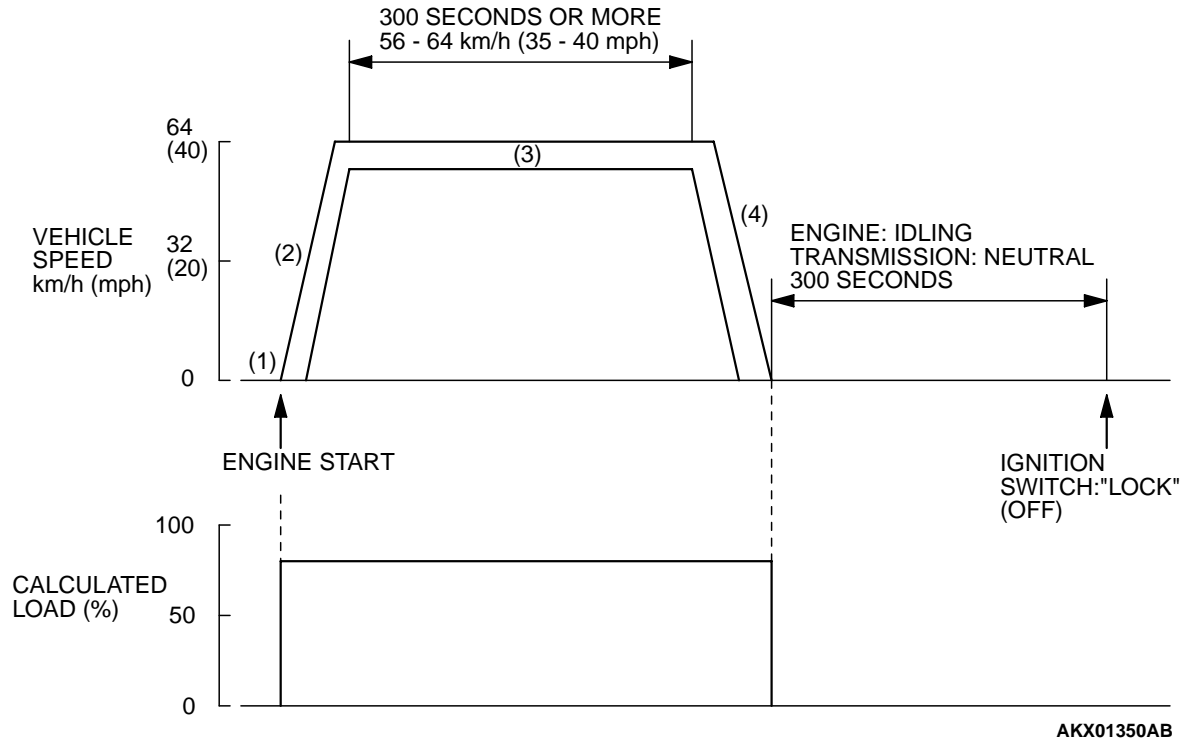
<b>OTHER MONITOR (Main components, sensors and switches, wire breakage and short circuit)</b>	
DTC	<ul style="list-style-type: none"><li>• Main components: P0134, P0154, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0506, P0507, P1400</li><li>• Sensors and switches: P0101, P0102, P0106, P0107, P0108, P0111, P0112, P0113, P0116, P0117, P0118, P0122, P0123, P0125, P0181, P0182, P0183, P0335, P0340, P0461</li><li>• Wire breakage and short circuit: P0130, P0131, P0132, P0135, P0136, P0137, P0138, P0141, P0150, P0151, P0152, P0155, P0156, P0157, P0158, P0161, P0201, P0202, P0203, P0204, P0205, P0206, P0403, P0443, P0446</li></ul>

**OTHER MONITOR (Main components, sensors and switches, wire breakage and short circuit)**

Drive cycle pattern

This monitor [from start to ignition switch "LOCK" (OFF) position] will be completed while traveling with the following drive cycle pattern. It will take 10 minutes. You must complete this drive twice.

*NOTE: Drive according to the graph below.*



Inspection conditions

- Engine coolant temperature: 80°C (176°F) or more
- Atmospheric temperature: 5°C (41°F) or more
- Condition of A/T: Selector lever D range

Test procedure

1. Engine: start
2. Accelerate until the vehicle speed is 56 – 64 km/h (35 – 40 mph), and travel for 300 seconds or more.
3. Return the vehicle to the shop.
4. After stopping the vehicle, continue idling for 300 seconds, and then turn the ignition switch to the "LOCK" (OFF) position. Moreover, the vehicle should be set to the following conditions for idling.
  - A/C switch: OFF
  - Lights and all accessories: OFF
  - Transmission: P range
  - Steering wheel: Straightforward position
5. Confirm that the diagnostic trouble code (DTC) is not output.
6. If a DTC is displayed, refer to Diagnostic Trouble Code Chart [P.13Ab-22](#).

## READINESS TEST STATUS

### PURPOSE

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

### OVERVIEW

The PCM monitors the following main diagnosis items and records whether the evaluation was completed or is incomplete. The Readiness codes were established for the I/M programs, thereby confirming that the vehicle was not tampered with by erasing the diagnostic trouble code(s) (DTC's) before I/M testing. The Readiness and DTC codes can be reset by disconnecting the battery or by erasing the codes with a scan tool. For this reason all Readiness codes must read "Complete" before I/M testing.

When the monitors run and complete, the MUT-II will record the Readiness Code as " Complete " (General Scan Tools record as " Ready "). When the vehicle is operating normally and the OBD-II Drive Cycle is carried out, Readiness Code will set as " Complete " on the first drive cycle. If during the first drive cycle a fault is detected then, a second drive is required before the Readiness Code will " Complete. " If the fault is still there, then a DTC will set.

- Catalyst: P0421, P0431
- Evaporative system: P0442, P0455, P0456
- Heated oxygen sensor: P0133, P0153
- Heated oxygen sensor heater: P0135, P0141, P0155, P0161
- EGR system: P0401

After the Readiness is "Complete," the technician is assured that any DTC's associated with that 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 DTC's.

*NOTE: After a repair is made for a DTC the technician should drive the OBD-II drive cycle checking that the MUT-II records all Readiness as "Complete".*

## FAIL-SAFE FUNCTION REFERENCE TABLE

M1131153000170

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

<b>MALFUNCTION ITEM</b>	<b>CONTROL CONTENTS DURING MALFUNCTION</b>
Volume airflow sensor	<ul style="list-style-type: none"> <li>• Uses the throttle position sensor signal and engine speed signal (crankshaft position sensor signal) for basic injector drive time and basic ignition timing from the pre-set mapping.</li> <li>• Fixes the IAC motor in the appointed position so idle air control is not performed.</li> </ul>
Intake air temperature sensor	Controls as if the intake air temperature is 25°C (77°F).
Engine coolant temperature sensor	Controls as if the engine coolant temperature is 80°C (176°F). (This control will be continued until the ignition switch is turned to " LOCK " (OFF) position even though the sensor signal returns to normal.)
Camshaft position sensor	Injects fuel simultaneously into all cylinders. (After the ignition switch is turned to " ON " position, the No.1 cylinder top dead center is not detected at all.)
Barometric pressure sensor	Controls as if the barometric pressure is 101 kPa (30 in.Hg).
Knock sensor	Switches the ignition timing from ignition timing for high octane to ignition timing for standard octane fuel.
Heated oxygen sensor <front>	Air/fuel ratio closed loop control is not performed.

<b>MALFUNCTION ITEM</b>	<b>CONTROL CONTENTS DURING MALFUNCTION</b>
Heated oxygen sensor <rear>	Performs the closed loop control of the air/fuel ratio by using only the signal of the heated oxygen sensor (front) installed on the front side of the catalytic converter.
Misfire detection	The PCM stops supplying fuel to the cylinder with the highest misfiring rate if a misfiring that could damage the catalytic converter is detected.
Accelerator pedal position sensor (main)	<ul style="list-style-type: none"> <li>• Detects the amount of the accelerator pedal travel through the use of the accelerator pedal position sensor (sub) signal, but rendering it only as being approximately one-half the normal opening angle.</li> <li>• Prohibits the operation of the auto-cruise control.</li> <li>• Cuts off fuel when the engine speed exceeds 3,000 r/min.</li> <li>• Suppresses the engine output by stopping the electronically controlled throttle valve system if the accelerator pedal position sensor (sub) is also malfunctioning.</li> </ul>
Accelerator pedal position sensor (sub)	<ul style="list-style-type: none"> <li>• Detects the amount of the accelerator pedal travel through the use of the accelerator pedal position sensor (main) signal, but rendering it only as being approximately one-half the normal opening angle.</li> <li>• Prohibits the operation of the auto-cruise control.</li> <li>• Cuts off fuel when the engine speed exceeds 3,000 r/min.</li> <li>• Suppresses the engine output by stopping the electronically controlled throttle valve system if the accelerator pedal position sensor (main) is also malfunctioning.</li> </ul>
Throttle position sensor (main)	<ul style="list-style-type: none"> <li>• Controls the throttle valve position through the use of the throttle position sensor (sub) signal.</li> <li>• Renders the amount of accelerator pedal travel as being approximately one-half the normal opening angle.</li> <li>• Prohibits the operation of the engine speed feedback control.</li> <li>• Prohibits the operation of the auto-cruise control.</li> <li>• Cuts off fuel when the engine speed exceeds 3,000 r/min.</li> <li>• Suppresses the engine output by stopping the electronically controlled throttle valve system if the throttle position sensor (sub) is also malfunctioning.</li> </ul>
Throttle position sensor (sub)	<ul style="list-style-type: none"> <li>• Controls the throttle valve position through the use of the throttle position sensor (main) signal.</li> <li>• Renders the amount of accelerator pedal travel as being approximately one-half the normal opening angle.</li> <li>• Prohibits the operation of the auto-cruise control.</li> <li>• Cuts off fuel when the engine speed exceeds 3,000 r/min.</li> <li>• Prohibits the idle speed control from learning.</li> <li>• Suppresses the engine output by stopping the electronically controlled throttle valve system if the throttle position sensor (main) is also malfunctioning.</li> </ul>
Throttle valve position feedback	<ul style="list-style-type: none"> <li>• Suppresses the engine output by stopping the electronically controlled throttle valve system.</li> <li>• Prohibits the operation of the auto-cruise control.</li> <li>• Prohibits the operation of the engine speed feedback control.</li> </ul>

<b>MALFUNCTION ITEM</b>	<b>CONTROL CONTENTS DURING MALFUNCTION</b>
Throttle actuator control motor	<ul style="list-style-type: none"> <li>• Suppresses the engine output by stopping the electronically controlled throttle valve system.</li> <li>• Prohibits the operation of the auto-cruise control.</li> <li>• Prohibits the operation of the engine speed feedback control.</li> </ul>
Throttle actuator control computer	<ul style="list-style-type: none"> <li>• Suppresses the engine output by stopping the electronically controlled throttle valve system.</li> <li>• Prohibits the operation of the auto-cruise control.</li> <li>• Prohibits the operation of the engine speed feedback control.</li> </ul>
Communication between throttle actuator control computer and engine control computer	<ul style="list-style-type: none"> <li>• Renders the amount of accelerator pedal travel as being approximately one-half the normal opening angle.</li> <li>• Prohibits the operation of the auto-cruise control.</li> <li>• Prohibits the operation of the engine speed feedback control.</li> <li>• Cuts off fuel when the engine speed exceeds 3,000 r/min.</li> </ul>

## DIAGNOSTIC TROUBLE CODE CHART

M1131151000367

<b>DTC NO.</b>	<b>DIAGNOSTIC ITEM</b>	<b>REFERENCE PAGE</b>
P0101*	Volume airflow circuit range/performance problem	<a href="#">P.13Ac-2</a>
P0102*	Volume airflow circuit low input	<a href="#">P.13Ac-9</a>
P0106*	Barometric pressure circuit range/performance problem	<a href="#">P.13Ac-17</a>
P0107*	Barometric pressure circuit low input	<a href="#">P.13Ac-22</a>
P0108*	Barometric pressure circuit high input	<a href="#">P.13Ac-35</a>
P0111*	Intake air temperature circuit range/performance problem	<a href="#">P.13Ac-44</a>
P0112*	Intake air temperature circuit low input	<a href="#">P.13Ac-50</a>
P0113*	Intake air temperature circuit high input	<a href="#">P.13Ac-54</a>
P0116*	Engine coolant temperature circuit range/performance problem	<a href="#">P.13Ac-60</a>
P0117*	Engine coolant temperature circuit low input	<a href="#">P.13Ac-70</a>
P0118*	Engine coolant temperature circuit high input	<a href="#">P.13Ac-74</a>
P0122*	Throttle position sensor (main) circuit low input	<a href="#">P.13Ac-81</a>
P0123*	Throttle position sensor (main) circuit high input	<a href="#">P.13Ac-89</a>
P0125*	Insufficient coolant temperature for closed loop fuel control	<a href="#">P.13Ac-95</a>
P0128	Coolant thermostat (coolant temperature below thermostat regulating temperature)	<a href="#">P.13Ac-104</a>
P0130	Heated oxygen sensor circuit (bank 1 sensor 1)	<a href="#">P.13Ac-105</a>
P0131	Heated oxygen sensor circuit low voltage (bank 1 sensor 1)	<a href="#">P.13Ac-120</a>
P0132	Heated oxygen sensor circuit high voltage (bank 1 sensor 1)	<a href="#">P.13Ac-126</a>
P0133	Heated oxygen sensor circuit slow response (bank 1 sensor 1)	<a href="#">P.13Ac-130</a>
P0134*	Heated oxygen sensor circuit no activity detected (bank 1 sensor 1)	<a href="#">P.13Ac-133</a>
P0135	Heated oxygen sensor heater circuit (bank 1 sensor 1)	<a href="#">P.13Ac-141</a>

**MULTIPOINT FUEL INJECTION (MFI) DIAGNOSIS  
DIAGNOSTIC TROUBLE CODE CHART**

**13Ab-23**

<b>DTC NO.</b>	<b>DIAGNOSTIC ITEM</b>	<b>REFERENCE PAGE</b>
P0136	Heated oxygen sensor circuit (bank 1 sensor 2)	<a href="#">P.13Ac-151</a>
P0137	Heated oxygen sensor circuit low voltage (bank 1 sensor 2)	<a href="#">P.13Ac-166</a>
P0138	Heated oxygen sensor circuit high voltage (bank 1 sensor 2)	<a href="#">P.13Ac-172</a>
P0139	Heated oxygen sensor circuit slow response (bank 1 sensor 2)	<a href="#">P.13Ac-176</a>
P0141	Heated oxygen sensor heater circuit (bank 1 sensor 2)	<a href="#">P.13Ac-179</a>
P0150	Heated oxygen sensor circuit (bank 2 sensor 1)	<a href="#">P.13Ac-189</a>
P0151	Heated oxygen sensor circuit low voltage (bank 2 sensor 1)	<a href="#">P.13Ac-204</a>
P0152	Heated oxygen sensor circuit high voltage (bank 2 sensor 1)	<a href="#">P.13Ac-210</a>
P0153	Heated oxygen sensor circuit slow response (bank 2 sensor 1)	<a href="#">P.13Ac-214</a>
P0154*	Heated oxygen sensor circuit no activity detected (bank 2 sensor 1)	<a href="#">P.13Ac-217</a>
P0155	Heated oxygen sensor heater circuit (bank 2 sensor 1)	<a href="#">P.13Ac-225</a>
P0156	Heated oxygen sensor circuit (bank 2 sensor 2)	<a href="#">P.13Ac-235</a>
P0157	Heated oxygen sensor circuit low voltage (bank 2 sensor 2)	<a href="#">P.13Ac-250</a>
P0158	Heated oxygen sensor circuit high voltage (bank 2 sensor 2)	<a href="#">P.13Ac-256</a>
P0159	Heated oxygen sensor circuit slow response (bank 2 sensor 2)	<a href="#">P.13Ac-260</a>
P0161	Heated oxygen sensor heater circuit (bank 2 sensor 2)	<a href="#">P.13Ac-263</a>
P0171	System too lean (bank 1)	<a href="#">P.13Ac-273</a>
P0172	System too rich (bank 1)	<a href="#">P.13Ac-280</a>
P0174	System too lean (bank 2)	<a href="#">P.13Ac-284</a>
P0175	System too rich (bank 2)	<a href="#">P.13Ac-291</a>
P0181	Fuel tank temperature sensor circuit range/performance	<a href="#">P.13Ac-296</a>
P0182	Fuel tank temperature sensor circuit low input	<a href="#">P.13Ac-305</a>
P0183	Fuel tank temperature sensor circuit high input	<a href="#">P.13Ac-310</a>
P0201	Injector circuit-Cylinder 1	<a href="#">P.13Ac-318</a>
P0202	Injector circuit-Cylinder 2	<a href="#">P.13Ac-318</a>
P0203	Injector circuit-Cylinder 3	<a href="#">P.13Ac-318</a>
P0204	Injector circuit-Cylinder 4	<a href="#">P.13Ac-318</a>
P0205	Injector circuit-Cylinder 5	<a href="#">P.13Ac-318</a>
P0206	Injector circuit-Cylinder 6	<a href="#">P.13Ac-318</a>
P0222*	Throttle position sensor (sub) circuit low input	<a href="#">P.13Ac-330</a>
P0223*	Throttle position sensor (sub) circuit high input	<a href="#">P.13Ac-338</a>
P0300	Random/multiple cylinder misfire detected	<a href="#">P.13Ac-344</a>
P0301	Cylinder 1 misfire detected	<a href="#">P.13Ac-349</a>
P0302	Cylinder 2 misfire detected	<a href="#">P.13Ac-349</a>
P0303	Cylinder 3 misfire detected	<a href="#">P.13Ac-349</a>
P0304	Cylinder 4 misfire detected	<a href="#">P.13Ac-349</a>

DTC NO.	DIAGNOSTIC ITEM	REFERENCE PAGE	
P0305	Cylinder 5 misfire detected	<a href="#">P.13Ac-349</a>	
P0306	Cylinder 6 misfire detected	<a href="#">P.13Ac-349</a>	
P0325	Knock sensor circuit	<a href="#">P.13Ac-354</a>	
P0335*	Crankshaft position sensor circuit	<a href="#">P.13Ac-360</a>	
P0340*	Camshaft position sensor circuit	<a href="#">P.13Ac-377</a>	
P0401	Exhaust gas recirculation flow insufficient detected	<a href="#">P.13Ac-388</a>	
P0403	Exhaust gas recirculation control circuit	<a href="#">P.13Ac-390</a>	
P0421	Warm up catalyst efficiency below threshold (bank 1)	<a href="#">P.13Ac-398</a>	
P0431	Warm up catalyst efficiency below threshold (bank 2)	<a href="#">P.13Ac-401</a>	
P0441	Evaporative emission system incorrect purge flow	<a href="#">P.13Ac-404</a>	
P0442	Evaporative emission system leak detected (Small leak)	<a href="#">P.13Ac-406</a>	
P0443	Evaporative emission system purge control valve circuit	<a href="#">P.13Ac-419</a>	
P0446	Evaporative emission system vent control	<a href="#">P.13Ac-427</a>	
P0451	Evaporative emission system pressure sensor range/performance	<a href="#">P.13Ac-436</a>	
P0452	Evaporative emission system pressure sensor low input	<a href="#">P.13Ac-452</a>	
P0453	Evaporative emission system pressure sensor high input	<a href="#">P.13Ac-467</a>	
P0455	Evaporative emission system leak detected (Gross leak)	<a href="#">P.13Ac-482</a>	
P0456	Evaporative emission system leak detected (Very small leak)	<a href="#">P.13Ac-499</a>	
P0461	Fuel level sensor circuit range/performance	<a href="#">P.13Ac-511</a>	
P0500	Vehicle speed sensor malfunction	<ul style="list-style-type: none"> <li>• A/T DTC No. 29 (Vehicle speed sensor system: Short circuit/open circuit)</li> </ul>	<a href="#">P.23Ab-31</a>
P0513	Immobilizer malfunction		<a href="#">P.13Ac-518</a>
P0551	Power steering pressure sensor circuit range/performance		<a href="#">P.13Ac-519</a>
P0554	Power steering pressure sensor circuit intermittent		<a href="#">P.13Ac-527</a>
P0606*	Powertrain control module main processor malfunction		<a href="#">P.13Ac-532</a>
P0638*	Throttle actuator control motor circuit range/ performance problem		<a href="#">P.13Ac-532</a>
P0642*	Throttle position sensor power supply		<a href="#">P.13Ac-537</a>
P0657*	Throttle actuator control motor relay circuit malfunction		<a href="#">P.13Ac-538</a>
P0660	Intake manifold tuning circuit malfunction		<a href="#">P.13Ac-549</a>
P0705	Transmission range switch circuit malfunction (PRNDL input)	<ul style="list-style-type: none"> <li>• A/T DTC No. 27 (Transmission range switch system: Open circuit)</li> <li>• A/T DTC No. 28 (Transmission range switch system: Short circuit)</li> </ul>	<a href="#">P.23Ab-31</a>
P0712	Transmission fluid temperature sensor low input	<ul style="list-style-type: none"> <li>• A/T DTC No. 16 (Transmission fluid temperature sensor system: Short circuit)</li> </ul>	<a href="#">P.23Ab-31</a>
P0713	Transmission fluid temperature sensor high input	<ul style="list-style-type: none"> <li>• A/T DTC No. 15 (Transmission fluid temperature sensor system: Open circuit)</li> </ul>	<a href="#">P.23Ab-31</a>



<b>DTC NO.</b>	<b>DIAGNOSTIC ITEM</b>		<b>REFERENCE PAGE</b>
P0715	Input/turbine speed sensor circuit	• A/T DTC No. 22 (Input shaft speed sensor system: Short circuit/Open circuit)	<a href="#">P.23Ab-31</a>
P0720	Output speed sensor circuit	• A/T DTC No. 23 (Output shaft speed sensor system: Short circuit/Open circuit)	<a href="#">P.23Ab-31</a>
P0731	Gear 1 incorrect	• A/T DTC No. 41 (1st gear incorrect ratio)	<a href="#">P.23Ab-31</a>
P0732	Gear 2 incorrect	• A/T DTC No. 42 (2nd gear incorrect ratio)	<a href="#">P.23Ab-31</a>
P0733	Gear 3 incorrect	• A/T DTC No. 43 (3rd gear incorrect ratio)	<a href="#">P.23Ab-31</a>
P0734	Gear 4 incorrect	• A/T DTC No. 44 (4th gear incorrect ratio)	<a href="#">P.23Ab-31</a>
P0735	Gear 5 incorrect	• A/T DTC No. 45 (5th gear incorrect ratio)	<a href="#">P.23Ab-31</a>
P0736	Gear R incorrect	• A/T DTC No. 46 (Reverse gear incorrect ratio)	<a href="#">P.23Ab-31</a>
P0741	Torque converter clutch circuit performance or stuck off	• A/T DTC No. 52 (Torque converter clutch solenoid system: Defective system)	<a href="#">P.23Ab-31</a>
P0742	Torque converter clutch circuit stuck on	• A/T DTC No. 53 (Torque converter clutch solenoid system: Lock-up stuck on)	<a href="#">P.23Ab-31</a>
P0743	Torque converter clutch circuit electrical	• A/T DTC No. 36 (Torque converter clutch solenoid system: Short circuit/Open circuit)	<a href="#">P.23Ab-31</a>
P0753	Shift solenoid "A" electrical	• A/T DTC No. 31 (Low and reverse solenoid valve system: Short circuit/Open circuit)	<a href="#">P.23Ab-31</a>
P0758	Shift solenoid "B" electrical	• A/T DTC No. 32 (Underdrive solenoid valve system: Short circuit/Open circuit)	<a href="#">P.23Ab-31</a>
P0763	Shift solenoid "C" electrical	• A/T DTC No. 33 (Second solenoid valve system: Short circuit/Open circuit)	<a href="#">P.23Ab-31</a>
P0768	Shift solenoid "D" electrical	• A/T DTC No. 34 (Overdrive solenoid valve system: Short circuit/Open circuit)	<a href="#">P.23Ab-31</a>
P0773	Shift solenoid "E" electrical	• A/T DTC No. 35 (Reduction solenoid valve system: Short circuit/Open circuit)	<a href="#">P.23Ab-31</a>
P1400	Manifold differential pressure sensor circuit malfunction		<a href="#">P.13Ac-557</a>
P1601*	Communication malfunction (between PCM and throttle actuator control module)		<a href="#">P.13Ac-566</a>
P1603*	Battery backup circuit malfunction		<a href="#">P.13Ac-567</a>
P1751	A/T control relay malfunction	• A/T DTC No. 54 (A/T control relay system: Short circuit to ground /open circuit)	<a href="#">P.23Ab-31</a>
P2100*	Throttle actuator control motor circuit (open )		<a href="#">P.13Ac-571</a>
P2101*	Throttle actuator control motor magneto malfunction		<a href="#">P.13Ac-577</a>
P2102*	Throttle actuator control motor circuit(shorted low)		<a href="#">P.13Ac-582</a>
P2103*	Throttle actuator control motor circuit (shorted high)		<a href="#">P.13Ac-587</a>
P2108*	Throttle actuator control processor malfunction		<a href="#">P.13Ac-593</a>
P2121*	Accelerator pedal position sensor (main) circuit range/performance problem		<a href="#">P.13Ac-594</a>
P2122*	Accelerator pedal position sensor (main) circuit low input		<a href="#">P.13Ac-600</a>

DTC NO.	DIAGNOSTIC ITEM	REFERENCE PAGE
P2123*	Accelerator pedal position sensor (main) circuit high input	<a href="#">P.13Ac-607</a>
P2126*	Accelerator pedal position sensor (sub) circuit range/performance problem	<a href="#">P.13Ac-613</a>
P2127*	Accelerator pedal position sensor (sub) circuit low input	<a href="#">P.13Ac-619</a>
P2128*	Accelerator pedal position sensor (sub) circuit high input	<a href="#">P.13Ac-628</a>
P2135*	Throttle position sensor (main and sub)range/performance problem	<a href="#">P.13Ac-634</a>
P2138*	Accelerator pedal position sensor (main and sub)range/performance problem	<a href="#">P.13Ac-638</a>

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

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

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

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

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

## SYMPTOM CHART

M1131151500373

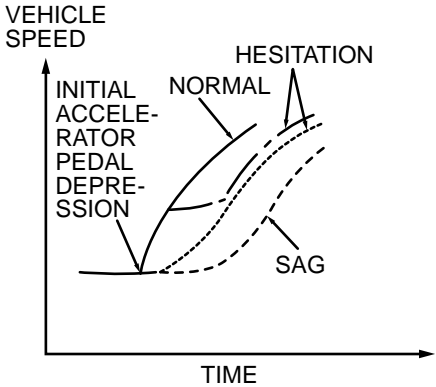
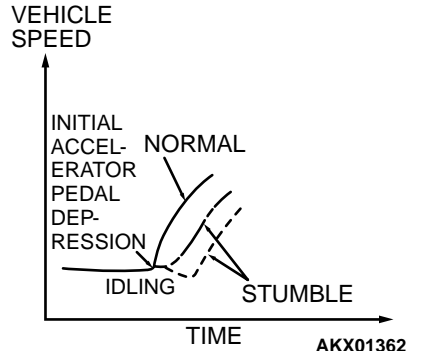
**NOTE:** Check that the PCM ground circuit is normal before checking for the cause of the problem.

TROUBLE SYMPTOMS		INSPECTION PROCEDURE	REFERENCE PAGE
Communication with scan tool is impossible	Communication with all systems is not possible	1	<a href="#">P.13Ad-2</a>
	Communication with PCM only is not possible	2	<a href="#">P.13Ad-5</a>
Malfunction Indicator Lamp (SERVICE ENGINE SOON or Check Engine Lamp) and related parts	The Malfunction Indicator Lamp (SERVICE ENGINE SOON or Check Engine Lamp) does not illuminate right after the ignition switch is turned to the "ON" position	3	<a href="#">P.13Ad-8</a>
	The Malfunction Indicator Lamp (SERVICE ENGINE SOON or Check Engine Lamp) remains illuminated and never goes out	4	<a href="#">P.13Ad-14</a>
Starting	Cranks, won't start	5	<a href="#">P.13Ad-18</a>
	Starts up and dies	6	<a href="#">P.13Ad-23</a>
	Hard starting	7	<a href="#">P.13Ad-30</a>
Idling stability (improper idling)	Unstable idle (rough idle, hunting)	8	<a href="#">P.13Ad-35</a>
	Idle speed is high (improper idle speed)	9	<a href="#">P.13Ad-39</a>
	Idle speed is low (improper idle speed)	10	<a href="#">P.13Ad-40</a>

TROUBLE SYMPTOMS		INSPECTION PROCEDURE	REFERENCE PAGE
Idling stability (engine stalls)	When the engine is cold, it stalls at idle (die out)	11	<a href="#">P.13Ad-41</a>
	When the engine is hot, it stalls at idle (die out)	12	<a href="#">P.13Ad-43</a>
	The engine stalls when accelerating (pass out)	13	<a href="#">P.13Ad-47</a>
	The engine stalls when decelerating	14	<a href="#">P.13Ad-48</a>
Driving	Hesitation, sag or stumble	15	<a href="#">P.13Ad-49</a>
	Acceleration shock	16	<a href="#">P.13Ad-52</a>
	Deceleration shock	17	<a href="#">P.13Ad-53</a>
	Poor acceleration	18	<a href="#">P.13Ad-54</a>
	Surge	19	<a href="#">P.13Ad-57</a>
	Knocking	20	<a href="#">P.13Ad-60</a>
Dieseling (Run-on)		21	<a href="#">P.13Ad-61</a>
Too high CO and HC concentration when idling		22	<a href="#">P.13Ad-61</a>
IM240 test failure	Transient, mass emission tailpipe test failure	23	<a href="#">P.13Ad-63</a>
	Purge flow test of the evaporative emission canister failure	24	<a href="#">P.13Ad-69</a>
	Pressure test of the evaporative system failure	25	<a href="#">P.13Ad-69</a>
Improper idle speed when the A/C is operating (A/C switch 2 signal)		26	<a href="#">P.13Ad-70</a>
A/C condenser fan is inoperative		27	<a href="#">P.13Ad-73</a>
Power supply system and ignition switch-IG system		28	<a href="#">P.13Ad-75</a>
Fuel pump system		29	<a href="#">P.13Ad-85</a>
Ignition switch – ST system and transmission range switch system		30	<a href="#">P.13Ad-95</a>
Ignition circuit system		31	<a href="#">P.13Ad-99</a>
A/C system		32	<a href="#">P.13Ad-107</a>
Accelerator pedal position switch system		33	<a href="#">P.13Ad-110</a>

**PROBLEM SYMPTOMS TABLE (FOR YOUR INFORMATION)**

ITEMS		SYMPTOM
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 judgement can be based upon the movement of the tachometer pointer, and the vibration transmitted to the steering wheel, shift lever, body, etc.
	Incorrect idle speed	The engine doesn't idle at the usual 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 or while it is being used.
Driving	Hesitation Sag	<p>"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".</p>  <p style="text-align: right;">AKX01361AB</p>
	Poor acceleration	Poor acceleration is inability to obtain an acceleration corresponding to the degree of throttle opening, even though acceleration is smooth. The inability to reach maximum speed.
	Stumble	<p>Engine speed increase is delayed when the accelerator pedal is initially depressed for acceleration.</p>  <p style="text-align: right;">AKX01362</p>
	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 usually work aloud. It sounds like a hammer striking the cylinder walls. It adversely affects driving.
	Stopping	Run on ("Dieseling")

## DATA LIST REFERENCE TABLE

**⚠ CAUTION**

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

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

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

*NOTE: \*1: In a new vehicle [driven approximately 500 km (311 mile) or less], the volume airflow sensor output frequency is sometimes 10% higher than the standard frequency.*

*NOTE: \*2: The injector drive time represents the time when the cranking speed is at 250 r/min or below when the power supply voltage is 11 volts.*

*NOTE: \*3: In a new vehicle [driven approximately 500 km (311 mile) or less], the injector drive time is sometimes 10% longer than the standard time.*

*NOTE: \*4: Disconnect the throttle actuator control motor connector, and then delete the diagnosis code that was recorded during the inspection with the use of the MB991502 scan tool after the inspection has been completed.*

*NOTE: \*5: Applicable to GST*

MUT-II SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT	NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE	
A/C RELAY	49	A/C compressor clutch relay	Engine: warming up, idling	OFF	Procedure No. 32	<a href="#">P.13Ad-107</a>	
			Engine: warming up, idling	A/C compressor clutch is not operating			OFF
			A/C compressor clutch is operating	ON			
A/C SWITCH	28	A/C switch	Engine: warming up, idling	OFF	Procedure No. 32	<a href="#">P.13Ad-107</a>	
			Engine: warming up, idling	A/C compressor clutch is not operating			OFF
			A/C compressor clutch is operating	ON			

MUT-II SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
APP SNS (MAIN)	78	Accelerator pedal position sensor (main)	Ignition switch: ON	Release the accelerator pedal	905 – 1,165 mV	Code No. P2121, P2122, P2123	<a href="#">P.13Ac-594</a> , <a href="#">P.13Ac-600</a> , <a href="#">P.13Ac-607</a>
				Depress the accelerator pedal gradually	Increases in response to the pedal depression stroke		
				Depress the accelerator pedal fully	4,035 mV or more		
APP SNSR (SUB)	77	Accelerator pedal position sensor (sub)	Ignition switch: ON	Release the accelerator peda	905 – 1,165 mV	Code No. P2126, P2127, P2128	<a href="#">P.13Ac-613</a> , <a href="#">P.13Ac-619</a> , <a href="#">P.13Ac-628</a>
				Depress the accelerator pedal gradually	Increases in response to the pedal depression stroke		
				Depress the accelerator pedal fully	4,035 mV or more		
BARO SENSOR	25	Barometric pressure sensor	Ignition switch: "ON"	At altitude of 0 m (0 ft)	101 kPa (29.8 in.Hg)	Code No. P0106, P0107, P0108	<a href="#">P.13Ac-17</a> , <a href="#">P.13Ac-22</a> , <a href="#">P.13Ac-35</a>
				At altitude of 600 m (1969 ft)	95 kPa (28.1 in.Hg)		
				At altitude of 1,200 m (3937 ft)	88 kPa (26.0 in.Hg)		
				At altitude of 1,800 m (5906 ft)	81 kPa (23.9 in.Hg)		
BATT VOLTAGE	16	Battery voltage (power supply)	Ignition switch: "ON"		Battery positive voltage	Procedure No. 28	<a href="#">P.13Ad-75</a>

**MULTIPOINT FUEL INJECTION (MFI) DIAGNOSIS  
DATA LIST REFERENCE TABLE**

**13Ab-31**

MUT-II SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
CKP SENSOR	22	Crankshaft position sensor	<ul style="list-style-type: none"> <li>Engine: cranking</li> <li>Tachometer: connected</li> </ul>		Engine speeds displayed on the scan tool and tachometer are identical.	Code No. P0335	<a href="#">P.13Ac-360</a>
			Engine: idling	Engine coolant temperature is -20°C (-40°F)	1,300 – 1,500 r/min		
				Engine coolant temperature is 0°C (32°F)	1,300 – 1,500 r/min		
				Engine coolant temperature is 20°C (68°F)	1,300 – 1,500 r/min		
				Engine coolant temperature is 40°C (104°F)	1,040 – 1,240 r/min		
				Engine coolant temperature is 80°C (176°F)	600 – 800 r/min		
CKP SENSOR 2	38	Crankshaft position sensor	<ul style="list-style-type: none"> <li>Engine: cranking (at less than 2,000 r/min)</li> <li>Tachometer: connected</li> </ul>		The speeds indicated by the scan tool and tachometer match.	Code No. P0335	<a href="#">P.13Ac-360</a>
CRANK. SIGNAL	18	Ignition switch crank signal	Ignition switch: "ON"	Engine: stopped	OFF	Procedure No. 30	<a href="#">P.13Ad-95</a>
				Engine: cranking	ON		
ECT SENSOR	21	Engine coolant temperature sensor	Ignition switch: "ON" or with engine running	Engine coolant temperature is -20°C (-4°F)	-20°C (-4°F)	Code No. P0116, P0117, P0118	<a href="#">P.13Ac-60</a> , <a href="#">P.13Ac-70</a> , <a href="#">P.13Ac-74</a>
				Engine coolant temperature is 0°C (32°F)	0°C (32°F)		
				Engine coolant temperature is 20°C (68°F)	20°C (68°F)		
				Engine coolant temperature is 40°C (104°F)	40°C (104°F)		
				Engine coolant temperature is 80°C (176°F)	80°C (176°F)		

MUT-II SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
ECT SENSOR	21*5	Engine coolant temperature sensor	Ignition switch: "ON" or with engine running	Engine coolant temperature is -20°C (-4°F)	-20°C (-4°F)	Code No. P0116, P0117, P0118	<a href="#">P.13Ac-60</a> , <a href="#">P.13Ac-70</a> , <a href="#">P.13Ac-74</a>
				Engine coolant temperature is 0°C (32°F)	0°C (32°F)		
				Engine coolant temperature is 20°C (68°F)	20°C (68°F)		
				Engine coolant temperature is 40°C (104°F)	40°C (104°F)		
				Engine coolant temperature is 80°C (176°F)	80°C (176°F)		
EGR STEP. MTR.	68	EGR valve (stepper motor)	<ul style="list-style-type: none"> <li>• Engine coolant temperature: 80 – 95 °C (176 – 203°F)</li> <li>• Lights and all accessories : "OFF"</li> <li>• Transmission: "P" range</li> </ul>	Engine is idling	0 – 5 STEP	Code No. P0403	<a href="#">P.13Ac-390</a>
				2,500 r/min	0 – 10 STEP		
ENGINE LOAD	37	Engine load (volumetric efficiency)	<ul style="list-style-type: none"> <li>• Engine coolant temperature : 80 – 95 °C (176 – 203 °F)</li> <li>• Lights, electric cooling fan and all accessories : "OFF"</li> <li>• Transmission: "P" range</li> </ul>	Engine is idling	15 – 35%	-	-
				2,500 r/min	15 – 35%		
				Racing	Volumetric efficiency increases according to amount of revving.		
ENGINE LOAD 2	87*5	Calculated load value	Engine: warming up	Engine is idling	12 – 27%	-	-
				2,500 r/min	12 – 25%		



**MULTIPOINT FUEL INJECTION (MFI) DIAGNOSIS  
DATA LIST REFERENCE TABLE**

**13Ab-33**

MUT-II SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
ENGINE SPEED	22*5	Crankshaft position sensor *2	<ul style="list-style-type: none"> <li>• Engine: cranking</li> <li>• Tachometer: connected</li> </ul>		Engine speeds displayed on the scan tool and tachometer are identical.	Code No. P0335	<a href="#">P.13Ac-360</a>
			Engine: idling	Engine coolant temperature is -20°C (-4°F)	1,300 – 1,500 r/min		
				Engine coolant temperature is 0°C (32°F)	1,300 – 1,500 r/min		
				Engine coolant temperature is 20°C (68°F)	1,300 – 1,500 r/min		
				Engine coolant temperature is 40°C (104°F)	1,040 – 1,240 r/min		
				Engine coolant temperature is 80°C (176°F)	600 – 800 r/min		
FUEL TEMP	4A	Fuel tank temperature sensor	In cooled srateignittion switch: "ON"		Approximatel y the same as the outdoor temperature	Code No. P0181, P0182, P0183	<a href="#">P.13Ac-296</a> , <a href="#">P.13Ac-305</a> , <a href="#">P.13Ac-310</a>
HO2S BANK1 S1	39	Heated oxygen sensor bank 1, sensor 1 (right front)	Engine: Warming up (Air/fuel mixture is made leaner when decelerating, and is made richer when revving.)	When the engine is running at 4,000 r/min, decelerate suddenly.	200 mV or less	Code No. P0130, P0131, P0132, P0133, P0134	<a href="#">P.13Ac-105</a> , <a href="#">P.13Ac-120</a> , <a href="#">P.13Ac-126</a> , <a href="#">P.13Ac-130</a> , <a href="#">P.13Ac-133</a>
				When engine is suddenly raced.	600 – 1,000 mV		
			Engine: Warming up (the heated oxygen sensor signal is used to check the air/fuel mixture ratio, and control condition is also checked by the PCM.)	Engine is idling 2500 r/min	Voltage changes repeatedly between 400 mV or less and 600 – 1,000 mV.		

MUT-II SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
HO2S BANK1 S1	A1*5	Heated oxygen sensor bank 1, sensor 1 (right front)	Engine: Warming up (Air/fuel mixture is made leaner when decelerating, and is made richer when revving.)	When the engine is running at 4,000 r/min, decelerate suddenly.	0.2 V or less	Code No. P0130, P0131, P0132, P0133, P0134	P.13Ac-105, P.13Ac-120, P.13Ac-126, P.13Ac-130, P.13Ac-133
				When engine is suddenly raced.	0.6 – 1 V		
			Engine: Warming up (the heated oxygen sensor signal is used to check the air/fuel mixture ratio, and control condition is also checked by the PCM.)	Engine is idling 2500 r/min	Voltage changes repeatedly between 0.4 V or less and 0.6 – 1 V.		
HO2S BANK1 S2	69	Heated oxygen sensor bank 1, sensor 2 (right rear)	Engine: warming up	Revving	0 and 600 – 1,000 mV alternate.	Code No. P0136, P0137, P0138, P0139	P.13Ac-151, P.13Ac-166, P.13Ac-172, P.13Ac-176
HO2S BANK1 S2	A2*5	Heated oxygen sensor bank 1, sensor 2 (right rear)	Engine: warming up	Revving	0 and 0.6 – 1 V alternate.	Code No. P0136, P0137, P0138, P0139	P.13Ac-151, P.13Ac-166, P.13Ac-172, P.13Ac-176
HO2S BANK2 S1	11	Heated oxygen sensor bank 2, sensor 1 (left front)	Engine: Warming up (air/fuel mixture is made leaner when decelerating, and is made richer when revving.)	When the engine is running at 4000 r/min, decelerate suddenly.	200 mV or less	Code No. P0150, P0151, P0152, P0153, P0154	P.13Ac-189, P.13Ac-204, P.13Ac-210, P.13Ac-214, P.13Ac-217
				When engine is suddenly raced.	600 – 1,000 mV		
			Engine: Warming up (the heated oxygen sensor signal is used to check the air/fuel mixture ratio, and control condition is also checked by the PCM)	Engine is idling 2,500 r/min	Voltage changes repeatedly between 400 mV or less and 600 – 1,000 mV.		

**MULTIPOINT FUEL INJECTION (MFI) DIAGNOSIS  
DATA LIST REFERENCE TABLE**

**13Ab-35**

MUT-II SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
HO2S BANK2 S1	A3*5	Heated oxygen sensor bank 2, sensor 1 (left front)	Engine: Warming up (air/fuel mixture is made leaner when decelerating, and is made richer when revving.)	When the engine is running at 4,000 r/min, decelerate suddenly.	0.2 V or less	Code No. P0150, P0151, P0152, P0153, P0154	P.13Ac-189, P.13Ac-204, P.13Ac-210, P.13Ac-214, P.13Ac-217
				When engine is suddenly raced.	0.6 – 1 V		
			Engine: Warming up (the heated oxygen sensor signal is used to check the air/fuel mixture ratio, and control condition is also checked by the PCM)	Engine is idling 2500 r/min	Voltage changes repeatedly between 0.4 V or less and 0.6 – 1 V.		
HO2S BANK2 S2	59	Heated oxygen sensor bank 2, sensor 2 (left rear)	Engine: warming up	Revving	0 and 600 – 1,000 mV alternate.	Code No. P0156, P0157, P0158, P0159	P.13Ac-235, P.13Ac-250, P.13Ac-256, P.13Ac-260
HO2S BANK2 S2	A4*5	Heated oxygen sensor bank 2, sensor 2 (left rear)	Engine: warming up	Revving	0 and 0.6 – 1 V alternate.	Code No. P0156, P0157, P0158, P0159	P.13Ac-235, P.13Ac-250, P.13Ac-256, P.13Ac-260
IAT SENSOR	13	Intake air temperature sensor	Ignition switch: "ON" or with engine running	Intake air temperature is -20°C (-4°F)	-20°C (-4°F)	Code No. P0111, P0112, P0113	P.13Ac-44, P.13Ac-50, P.13Ac-54
				Intake air temperature is 0°C (32°F)	0°C (32°F)		
				Intake air temperature is 20°C (68°F)	20°C (68°F)		
				Intake air temperature is 40°C (104°F)	40°C (104°F)		
				Intake air temperature is 80°C (176°F)	80°C (176°F)		

MUT-II SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
IAT SENSOR	13 <sup>*5</sup>	Intake air temperature sensor	Ignition switch: "ON" or with engine running	Intake air temperature is -20°C (-4°F)	-20°C (-4°F)	Code No. P0111, P0112, P0113	<a href="#">P.13Ac-44</a> , <a href="#">P.13Ac-50</a> , <a href="#">P.13Ac-54</a>
				Intake air temperature is 0°C (32°F)	0°C (32°F)		
				Intake air temperature is 20°C (68°F)	20°C (68°F)		
				Intake air temperature is 40°C (104°F)	40°C (104°F)		
				Intake air temperature is 80°C (176°F)	80°C (176°F)		
IG. TIMING ADV	44	Ignition coils and ignition power transistor	<ul style="list-style-type: none"> <li>Engine: warming up</li> <li>Timing light is set (to check actual ignition timing)</li> </ul>	Engine is idling	2 – 18° BTDC	-	-
				2,500 r/min	27 – 47° BTDC		
IG. TIMING ADV	44 <sup>*5</sup>	Ignition coils and ignition power transistor	<ul style="list-style-type: none"> <li>Engine: warming up</li> <li>Timing light is set (to check actual ignition timing)</li> </ul>	Engine is idling	2 – 18 deg	-	-
				2,500 r/min	27 – 47 deg		

**MULTIPOINT FUEL INJECTION (MFI) DIAGNOSIS  
DATA LIST REFERENCE TABLE**

**13Ab-37**

MUT-II SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
INJECTOR BNK1	47	Injectors bank 1 (right)* <sup>2</sup>	Engine: cranking	When engine coolant temperature is 0 °C (32 °F)	100 – 160 mS	-	-
				When engine coolant temperature is 20 °C (68 °F)	37 – 67 mS		
				When engine coolant temperature is 80 °C (176 °F)	9.5 – 11.5 mS		
		Injectors bank 1 (right)* <sup>3</sup>	<ul style="list-style-type: none"> <li>• Engine coolant temperature : 80 – 95°C (176 – 203°F)</li> <li>• Lights, electric cooling fan and all accessories : OFF</li> <li>• Transmission: "P" range</li> </ul>	Engine is idling	2.2 – 3.4 mS		
				2,500 r/min	2.0 – 3.2 mS		
				When engine is suddenly revved	Increases		
	INJECTOR BNK2	41	Injectors bank 2 (left)* <sup>2</sup>	Engine: cranking	When engine coolant temperature is 0°C (32°F)	100 – 160 mS	-
When engine coolant temperature is 20°C (68°F)					37 – 67 mS		
When engine coolant temperature is 80°C (176°F)					9.5 – 11.5 mS		
Injectors bank 2 (left)* <sup>3</sup>			<ul style="list-style-type: none"> <li>• Engine coolant temperature : 80 – 95°C (176 – 203°F)</li> <li>• Lights, electric cooling fan and all accessories : OFF</li> <li>• Transmission: "P" range</li> </ul>	Engine is idling	2.2 – 3.4mS		
				2,500 r/min	2.0 – 3.2mS		
				When engine is suddenly revved	Increases		

MUT-II SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
LONG TRIM B1	81 <sup>*5</sup>	Long-term fuel trim (trim) bank 1	Engine: warming up, 2,500 r/min without any load (during closed loop)		-12.5 – 12.5%	Code No. P0171, P0172	<a href="#">P.13Ac-273</a> , <a href="#">P.13Ac-280</a>
LONG TRIM B2	83 <sup>*5</sup>	Long-term fuel trim (trim) bank 2	Engine: warming up, 2,500 r/min without any load (during closed loop)		-12.5 – 12.5%	Code No. P0174, P0175	<a href="#">P.13Ac-284</a> , <a href="#">P.13Ac-291</a>
MDP SENSOR	95	Manifold differential pressure sensor	Engine: warming up, idling		20.6 – 34.0 kPa (6.1 – 10.0 in.Hg)	Code No. P1400	<a href="#">P.13Ac-557</a>
PSP SWITCH	27	Power steering pressure switch	Engine: idling	Steering wheel stationary	OFF	Code No. P0551	<a href="#">P.13Ac-519</a>
				Steering wheel turning	ON		
SHORT TRIM B1	82 <sup>*5</sup>	Short-term fuel trim (trim) bank 1	Engine: warming up, 2,500 r/min without any load (during closed loop)		-12.5 – 12.5%	Code No. P0171, P0172	<a href="#">P.13Ac-273</a> , <a href="#">P.13Ac-280</a>
SHORT TRIM B2	84 <sup>*5</sup>	Short-term fuel trim (trim) bank 2	Engine: warming up, 2,500 r/min without any load (during closed loop)		-12.5 – 12.5%	Code No. P0174, P0175	<a href="#">P.13Ac-284</a> , <a href="#">P.13Ac-291</a>
SYS. STATUS B1	88 <sup>*5</sup>	Fuel control system status bank 1 (right)	Engine: warming up	2,500 r/min	Closed loop	Code No. P0134	<a href="#">P.13Ac-133</a>
				When engine is suddenly revved	Open loop – drive condition		
SYS. STATUS B2	89 <sup>*5</sup>	Fuel control system status bank 2 (left)	Engine: warming up	2,500 r/min	Closed loop	Code No. P0154	<a href="#">P.13Ac-217</a>
				When engine is suddenly revved	Open loop – drive condition		
TANK PRS. SNSR	73	Fuel tank differential pressure sensor	<ul style="list-style-type: none"> <li>Ignition switch: "ON"</li> <li>Fuel cap removal</li> </ul>		-3.3 – 3.3 kPa (-0.97 – 0.97 in.Hg)	-	-

**MULTIPOINT FUEL INJECTION (MFI) DIAGNOSIS  
DATA LIST REFERENCE TABLE**

**13Ab-39**

MUT-II SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT	NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE	
TP SNSR (MAIN)	79	Throttle position sensor (main)*4	<ul style="list-style-type: none"> <li>• Remove the intake air hose at the throttle body</li> <li>• Disconnect the throttle position sensor, and then connect terminal numbers No. 1, No. 2, No. 3 and No. 4 with the use of the special tool: MB991348.</li> <li>• Ignition switch: ON</li> </ul>	Fully close the throttle valve with your finger	200 – 800 mV	Code No. P0122, P0123	<a href="#">P.13Ac-81</a> , <a href="#">P.13Ac-89</a>
				Fully open the throttle valve with your finger	3,800 – 4,900 mV		
				No load	450 – 1,000 mV		
				A/C switch: "OFF" → "ON"	Voltage rises		
			<ul style="list-style-type: none"> <li>• A/C switch: "OFF"</li> <li>• Shift lever: "N" → "D"</li> </ul>				
TP LEARN MID	9A	Throttle position sensor (main) mid opening learning value	Ignition switch: ON	500 – 2,000 mV	Code No. P0122, P0123	<a href="#">P.13Ac-81</a> , <a href="#">P.13Ac-89</a>	

MUT-II SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE	
TP SNSR (SUB)	14	Throttle position sensor (sub)* <sup>4</sup>	<ul style="list-style-type: none"> <li>Remove the intake air hose at the throttle body</li> <li>Disconnect the throttle position sensor, and then connect terminal numbers No. 1, No. 2, No. 3 and No. 4 with the use of the special tool: MB991348.</li> <li>Ignition switch: ON</li> </ul>	Fully close the throttle valve with your finger	2,200 – 2,800 mV	Code No. P0222, P0223	P.13Ac-330, P.13Ac-338	
				Fully open the throttle valve with your finger	3,800 – 4,900 mV			
TP SNSR (MAIN)	8A* <sup>5</sup>	Throttle position sensor (main)* <sup>4</sup>	<ul style="list-style-type: none"> <li>Remove the intake air hose at the throttle body</li> <li>Disconnect the throttle position sensor, and then connect terminal numbers No. 1, No. 2, No. 3 and No. 4 with the use of the special MB991348 tool.</li> <li>Ignition switch: ON</li> </ul>	Fully close the throttle valve with your finger	0 – 10 %	Code No. P0122, P0123	P.13Ac-81, P.13Ac-89	
				Fully open the throttle valve with your finger	80 – 100 %			
				No load				450 – 1,000 mV
				A/C switch: "OFF" → "ON"				Voltage rises
				<ul style="list-style-type: none"> <li>A/C switch: "OFF"</li> <li>Shift lever: "N" → "D"</li> </ul>				
VAF RESET SIG	34	Volume airflow sensor reset signal	Engine: warming up	Engine is idling 2,500 r/min	ON OFF	-	-	



**MULTIPOINT FUEL INJECTION (MFI) DIAGNOSIS  
DATA LIST REFERENCE TABLE**

**13Ab-41**

MUT-II SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT	NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE	
VAF SENSOR	12	Volume airflow sensor (mass airflow rate)* <sup>1</sup>	<ul style="list-style-type: none"> <li>• Engine coolant temperature : 80 – 95°C (176 – 203°F)</li> <li>• Lights, electric cooling fan and all accessories : "OFF"</li> <li>• Transmission: "P" range</li> </ul>	Engine is idling	17 – 43 HZ	-	-
				2,500 r/min	64 – 104 Hz		
				Engine is revved	Frequency (or air flow volume) increases in response to revving		
VAF SENSOR	12* <sup>5</sup>	Volume airflow sensor (mass airflow rate)* <sup>1</sup>	<ul style="list-style-type: none"> <li>• Engine coolant temperature : 80 – 95°C (176 – 203°F)</li> <li>• Lights, electric cooling fan and all accessories : "OFF"</li> <li>• Transmission: "P" range</li> </ul>	Engine is idling	3.5 – 7.5 gm/s	-	-
				2,500 r/min	13.6 – 19.6 gm/s)		
				Engine is revved	Frequency (or air flow volume) increases in response to revving		

## ACTUATOR TEST REFERENCE TABLE

M1131152500246

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

MUT-II SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	DRIVE CONTENTS	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
BASIC TIMING	17*	Basic ignition timing	Set to ignition timing adjustment mode	<ul style="list-style-type: none"> <li>Engine: idling</li> <li>Connect timing light</li> </ul>		5°BTDC	-	-
EVAP PURG SOL	08	Evaporative emission purge solenoid	Solenoid valve turns from OFF to ON.	Ignition switch: "ON"		Clicks when solenoid valve is driven.	Code No. P0443	P.13Ac-419
EVAP VENT	29	Evaporative emission ventilation solenoid	Solenoid valve turns from OFF to ON.	Ignition switch: "ON"		Clicks when solenoid valve is driven.	Code No. P0446	P.13Ac-427
FUEL PUMP	07	Fuel pump	Fuel pump operates and fuel is recirculated	Ignition switch: "ON"	Pinch the return hose with fingers to feel the pulse of the fuel being recirculated	Pulse is felt	Procedure No. 29	P.13Ad-85
					Listen near the fuel tank for the sound of fuel pump operation	Sound of operation is heard		
INT. AIR MTR	11	Intake manifold tuning	Solenoid valve turns from OFF to ON.	Ignition switch: "ON"		Clicks when solenoid valve is driven	Code No. P0660	P.13Ac-549
NO. 1 INJECTOR	01	Injectors	Cut fuel to No. 1 injector	Engine: warm, idle (cut the fuel supply to each injector in turn and check cylinders which don't affect idling.)		Idling condition becomes different (becomes unstable)	Code No. P0201, P0202, P0203, P0204, P0205, P0206	P.13Ac-318
NO. 2 INJECTOR	02		Cut fuel to No. 2 injector					
NO. 3 INJECTOR	03		Cut fuel to No. 3 injector					
NO. 4 INJECTOR	04		Cut fuel to No. 4 injector					
NO. 5 INJECTOR	05		Cut fuel to No. 5 injector					
NO. 6 INJECTOR	06		Cut fuel to No. 6 injector					
RADIAT. FAN LO	21	A/C condenser fan	Drive the fan motor	Ignition switch: "ON"		A/C condenser fan rotate	Procedure No. 27	P.13Ad-73

# CHECK AT THE POWERTRAIN CONTROL MODULE (PCM)

M1131153600138

## TERMINAL VOLTAGE CHECK CHART

PCM Connector Terminal Arrangement

1	2			3	4	31	32			33	34	61	62			63	64	91	92			93	94	95	121	122			123	124														
5	6	7	8	9	10	11	12	13	35	36	37	38	39	40	41	42	43	65	66	67	68	69	70	71	72	73	96	97	98	99	100	101	102	103	104	125	126	127	128	129	130	131	132	133
14	15	16	17	18	19	20	44	45	46	47	48	49	50	51	74	75	76	77	78	79	80	81	82	105	106	107	108	109	110	111	112	134	135	136	137	138	139	140	141					
21	22	23	24	25	26	27	52	53	54	55	56	57	58	83	84	85	86	87	88	89	113	114	115	116	117	118	119	120	142	143	144								145	146				

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TERMINAL NO.	INSPECTION ITEM	INSPECTION CONDITION (ENGINE CONDITION)	NORMAL CONDITION
1	No. 1 injector	<ul style="list-style-type: none"> <li>Engine: warming up, idling</li> <li>Suddenly depress the accelerator pedal</li> </ul>	From 11 – 14 V momentarily drops slightly
5	No. 2 injector		
14	No. 3 injector		
21	No. 4 injector		
2	No. 5 injector		
6	No. 6 injector		
3	EGR valve (Stepper motor coil <A1>)	Ignition switch: "OFF" → "ON"	5 – 8 V (changes about three seconds repeatedly)
12	EGR valve (Stepper motor coil <A2>)		
19	EGR valve (Stepper motor coil <B1>)		
26	EGR valve (Stepper motor coil <B2>)		
4	Intake manifold tuning solenoid	Engine: idling	1 V or less
		Engine: 4,500 r/min	B+
7	Malfunction indicator lamp (SERVICE ENGINE SOON or check engine lamp)	Ignition switch: "OFF" → "ON"	1 V or less → 9 – 13 V (after several seconds have elapsed)
8	A/C compressor clutch relay	<ul style="list-style-type: none"> <li>Engine: idling</li> <li>A/C switch: OFF → ON (A/C compressor is operating)</li> </ul>	B+ → 1 V or less as A/C clutch cycles
10	Left bank heated oxygen sensor heater (front)	Engine: warming up, idling (15 seconds after starting engine)	9 – 11 V
		Engine: Revving	9 – 11 V → B+ (momentarily)

TERMINAL NO.	INSPECTION ITEM	INSPECTION CONDITION (ENGINE CONDITION)	NORMAL CONDITION	
11	Evaporative emission ventilation solenoid	Ignition switch: "ON"	B+	
		Carry out the actuator test to drive the solenoid valve.	For approximately Six seconds 1 V or less	
15	Throttle actuator control motor relay	Ignition switch: "OFF"	B+	
		Ignition switch: "ON"	1 V or less	
16	Fuel pump relay	Ignition switch: "ON"	B+	
		Engine: idling	1 V or less	
17	Condenser fan relay	Condenser fan is not operating	B+	
		Condenser fan is running operating	1 V or less	
18	Left bank heated oxygen sensor heater (rear)	Engine: warming up, idling	1 V or less	
		Engine: Revving	B+	
23	Evaporative emission purge solenoid	Ignition switch: "ON"	B+	
		Engine: warm, 3,000 r/min (duty cycle)	Approximately 9 V	
24	Right bank heated oxygen sensor heater (rear)	Engine: warming up, idling	1 V or less	
		Engine: Revving	B+	
25	Right bank heated oxygen sensor heater (front)	Engine: warming up, idling (15 seconds after starting engine)	9 – 11 V	
		Engine: Revving	9 – 11 V → B+ (momentarily)	
31	Ignition coil – No. 1, No. 4 (ignition power transistor)	Engine: 3,000 r/min	0.3 – 3.0 V	
35	Ignition coil – No. 2, No. 5 (ignition power transistor)			
44	Ignition coil – No. 3, No. 6 (ignition power transistor)			
34	Power supply	Ignition switch: "ON"	B+	
43				
34	Volume airflow sensor reset signal	Engine: idling	1 V or less	
		Engine: 3,000 r/min	6 – 9 V	
38	Accelerator pedal position switch	Ignition switch: "ON"	closed throttle	0 – 1 V
			Open throttle slightly	4 V or more
47	Power steering pressure switch	Engine: warming up, idling	When steering wheel is stationary	B+
			When steering wheel is turned	1V or less
50	Ignition switch-IG	Ignition switch: "ON"	B+	

<b>TERMINAL NO.</b>	<b>INSPECTION ITEM</b>	<b>INSPECTION CONDITION (ENGINE CONDITION)</b>		<b>NORMAL CONDITION</b>
51	Ignition switch-ST	Engine: cranking		8 V or more
57	MFI relay (power supply)	Ignition switch: "OFF"		B+
		Ignition switch: "ON"		1 V or less
58	Backup power supply	Ignition switch: "OFF"		B+
63	Volume airflow sensor	Engine: idling		2.2 – 3.2 V
		Engine: 2,500 r/min		
69	A/C switch	Engine: idling	Turn the A/C switch OFF	1 V or less
			Turn the A/C switch ON (A/C compressor is operating)	B+
70	Crankshaft position sensor	Engine: cranking		0.4 – 4.0 V
		Engine: idling		1.5 – 2.5 V
71	Camshaft position sensor	Engine: cranking		0.4 – 3.0 V
		Engine: idling		0.5 – 2.0 V
78	A/C switch 2	Engine: idling Outside air temperature: 25°C or more	when A/C is MAX. COOL condition (when the load by A/C is high)	B+
			when A/C is MAX. HOT condition (when the load by A/C is low)	0 – 3 V
79	Vehicle speed sensor	<ul style="list-style-type: none"> <li>• Ignition switch: "ON"</li> <li>• Move the vehicle slowly forward</li> </ul>		0 ⇔ 8 -12 V (changes repeatedly)
81	Fuel tank temperature sensor	Ignition switch: "ON"	When fuel tank temperature is 0°C (32°F)	2.7 – 3.1 V
			When fuel tank temperature is 20°C (68°F)	2.1 – 2.5 V
			When fuel tank temperature is 40°C (104°F)	1.6 – 2.0 V
			When fuel tank temperature is 80°C (176°F)	0.8 – 1.2 V
82	Fuel tank differential pressure sensor	Engine: idling		1.2 – 3.8 V
87	Tachometer signal	Engine: 3,000 r/min		0.3 – 3.0 V
92	Power supply voltage applied to accelerator pedal position sensor (main)	Ignition switch: ON		4.5 – 5.5 V
97	Sensor supplied voltage	Ignition switch: "ON"		4.5 – 5.5 V

TERMINAL NO.	INSPECTION ITEM	INSPECTION CONDITION (ENGINE CONDITION)		NORMAL CONDITION
98	Engine coolant temperature sensor	Ignition switch: "ON"	When engine coolant temperature is -20°C (-4°F)	3.9 – 4.5 V
			When engine coolant temperature is 0°C (32°F)	3.2 – 3.8 V
			When engine coolant temperature is 20°C (68°F)	2.3 – 2.9 V
			When engine coolant temperature is 40°C (104°F)	1.3 – 1.9 V
			When engine coolant temperature is 60°C (140°F)	0.7 – 1.3 V
			When engine coolant temperature is 80°C (176°F)	0.3 – 0.9 V
99	Intake air temperature sensor	Ignition switch: "ON"	When Intake air temperature is -20°C (-4°F)	3.8 – 4.4 V
			When Intake air temperature is 0°C (32°F)	3.2 – 3.8 V
			When Intake air temperature is 20°C (68°F)	2.3 – 2.9 V
			When Intake air temperature is 40°C (104°F)	1.5 – 2.1 V
			When Intake air temperature is 60°C (140°F)	0.8 – 1.4 V
			When Intake air temperature is 80°C (176°F)	0.4 – 1.0 V
100	Barometric pressure sensor	Ignition switch: "ON"	When altitude is 0 m (0 ft)	3.7 – 4.3 V
			When altitude is 600 m (1,969 ft)	3.4 – 4.0 V
			When altitude is 1,200 m (3,937 ft)	3.2 – 3.8 V
			When altitude is 1,800 m (5,906 ft)	2.9 – 3.5 V
101	Manifold differential pressure sensor	Engine: idling	0.8 – 2.4 V	
		<ul style="list-style-type: none"> <li>• Engine: idling</li> <li>• Revving (momentary wide open throttle)</li> </ul>	Rises from 0.8 – 2.4 V suddenly	
106	Power supply voltage applied to throttle position sensor	Ignition switch: ON		4.5 – 5.5 V
107	Accelerator pedal position sensor (sub)	Ignition switch: ON	Release the accelerator pedal	0.905 – 1.165 V
			Depress the accelerator pedal fully	4.035 V or more
108	Left bank heated oxygen sensor (front)	Engine: warming up, 2,500 r/min (check using a digital voltmeter)		0 ↔ 0.8 V (changes repeatedly)

<b>TERMINAL NO.</b>	<b>INSPECTION ITEM</b>	<b>INSPECTION CONDITION (ENGINE CONDITION)</b>	<b>NORMAL CONDITION</b>	
109	Right bank heated oxygen sensor (front)	Engine: warming up, 2,500 r/min (check using a digital voltmeter)	0 ⇔ 0.8 V (changes repeatedly)	
113	Throttle position sensor (sub)	<ul style="list-style-type: none"> <li>• Remove the intake air hose at the throttle body</li> <li>• Disconnect the throttle position sensor, and then connect terminal numbers No. 1, No. 2, No. 3 and No. 4 with the use of the special tool: MB991348.</li> <li>• Ignition switch: ON</li> </ul>	Fully close the throttle valve with your finger	2.2 – 2.8 V
			Fully open the throttle valve with your finger	3.8 – 4.9 V
114	Accelerator pedal position sensor (main)	Ignition switch: ON	Release the accelerator pedal	0.905 – 1.165 V
			Depress the accelerator pedal fully	4.035 V or more
115	Throttle position sensor (main)	<ul style="list-style-type: none"> <li>• Remove the intake air hose at the throttle body</li> <li>• Disconnect the throttle position sensor, and then connect terminal numbers No. 1, No. 2, No. 3 and No. 4 with the use of the special tool: MB991348.</li> <li>• Ignition switch: ON</li> </ul>	Fully close the throttle valve with your finger	0.2 – 0.8 V
			Fully open the throttle valve with your finger	3.8 – 4.9 V
116	Left bank heated oxygen sensor (rear)	<ul style="list-style-type: none"> <li>• Engine: warming up</li> <li>• Revving</li> </ul>	0 and 0.6 – 1.0 V alternates	
117	Right bank heated oxygen sensor (rear)	<ul style="list-style-type: none"> <li>• Engine: warming up</li> <li>• Revving</li> </ul>	0 and 0.6 – 1.0 V alternates	

TERMINAL NO.	INSPECTION ITEM	INSPECTION CONDITION (ENGINE CONDITION)	NORMAL CONDITION
132	Power supply voltage applied to throttle actuator control motor	Ignition switch: ON	B+
133	Throttle actuator control motor (+)	<ul style="list-style-type: none"> <li>Ignition switch: ON</li> <li>Accelerator pedal: fully opened → fully closed</li> </ul>	Decreases slightly (approx. 2V) from battery voltage.
141	Throttle actuator control motor (-)	<ul style="list-style-type: none"> <li>Ignition switch: ON</li> <li>Accelerator pedal: fully closed → fully opened</li> </ul>	Decreases slightly (approx. 2V) from battery voltage.

### TERMINAL RESISTANCE AND CONTINUITY CHECK

PCM Harness Side Connector Terminal Arrangement

124	123			122	121	95	94	93		92	91	64	63		62	61	34	33			32	31	4	3			2	1																	
133	132	131	130	129	128	127	126	125	104	103	102	101	100	99	98	97	96	73	72	71	70	69	68	67	66	65	43	42	41	40	39	38	37	36	35	13	12	11	10	9	8	7	6	5	
141	140	139	138	137	136		135	134	112	111	110		109	108	107		106	105	82	81	80	79	78	77	76	75	74	51	50	49	48	47	46	45	44	20	19		18	17	16		15	14	
146	145			144			143	142	120	119	118		117	116	115		114	113	89	88		87	86	85		84	83	58	57		56	55	54		53	52	27	26		25	24	23		22	21

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TERMINAL NO.	INSPECTION ITEM	NORMAL CONDITION (INSPECTION CONDITION)
1 – 34	No. 1 injector	13 – 16 Ω [at 20°C (68°F)]
5 – 34	No. 2 injector	
14 – 34	No. 3 injector	
21 – 34	No. 4 injector	
2 – 34	No. 5 injector	
6 – 34	No. 6 injector	
10 – 34	Left bank heated oxygen sensor heater (front)	4.5 – 8.0 Ω [at 20°C (68°F)]
25 – 34	Right bank heated oxygen sensor heater (front)	4.5 – 8.0 Ω [at 20°C (68°F)]
4 – 34	Intake manifold tuning solenoid	29 – 35 Ω [at 20°C (68°F)]
3 – 34	Stepper motor coil (A1)	20 – 24 Ω [at 20°C (68°F)]
12 – 34	Stepper motor coil (A2)	
19 – 34	Stepper motor coil (B1)	
26 – 34	Stepper motor coil (B2)	
18 – 34	Left bank heated oxygen sensor heater (rear)	11 – 18 Ω [at 20°C (68°F)]
24 – 34	Right bank heated oxygen sensor heater (rear)	11 – 18 Ω [at 20°C (68°F)]



<b>TERMINAL NO.</b>	<b>INSPECTION ITEM</b>	<b>NORMAL CONDITION (INSPECTION CONDITION)</b>
23 – 34	Evaporative emission purge solenoid	30 – 34 $\Omega$ [at 20°C (68°F)]
11 – 34	Evaporative emission ventilation solenoid	17 – 21 $\Omega$ [at 20°C (68°F)]
33 – Body ground	PCM ground	Continuity (0 $\Omega$ )
42 – Body ground	PCM ground	
144 – Body ground	PCM ground	
145 – Body ground	PCM ground	
98 – 96	Engine coolant temperature sensor	14 – 17 k $\Omega$ [when engine coolant temperature is –20°C (–4°F)]
		5.1 – 6.5 k $\Omega$ [when engine coolant temperature is 0°C (32°F)]
		2.1 – 2.7 k $\Omega$ [when engine coolant temperature is 20°C (68°F)]
		0.9 – 1.3 k $\Omega$ [when engine coolant temperature is 40°C (104°F)]
		0.48 – 0.68 k $\Omega$ [when engine coolant temperature is 60°C (140°F)]
		0.26 – 0.36 k $\Omega$ [when engine coolant temperature is 80°C (176°F)]
99 – 88	Intake air temperature sensor	13 – 17 k $\Omega$ [when intake air temperature is –20°C (–4°F)]
		5.3 – 6.7 k $\Omega$ [when intake air temperature is 0°C (32°F)]
		2.3 – 3.0 k $\Omega$ [when intake air temperature is 20°C (68°F)]
		1.0 – 1.5 k $\Omega$ [when intake air temperature is 40°C (104°F)]
		0.56 – 0.76 k $\Omega$ [when intake air temperature is 60°C (140°F)]
		0.30 – 0.42 k $\Omega$ [when intake air temperature is 80°C (176°F)]
133 – 141	Throttle actuator control motor	0.3 – 100 $\Omega$ [at 20°C (68°F)]

# INSPECTION PROCEDURE USING AN OSCILLOSCOPE

M1131154500338

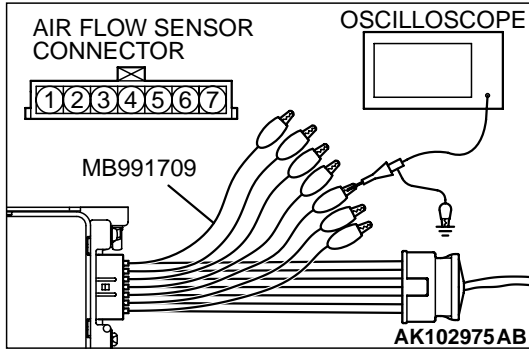
## VOLUME AIRFLOW SENSOR

### Required Special Tool:

- MB991709: Test Harness

### Measurement Method

1. Disconnect the volume airflow sensor connector, and connect the test harness special tool (MB991709) in between. (All terminals should be connected.)
2. Connect the oscilloscope probe to volume airflow sensor connector terminal No. 3.



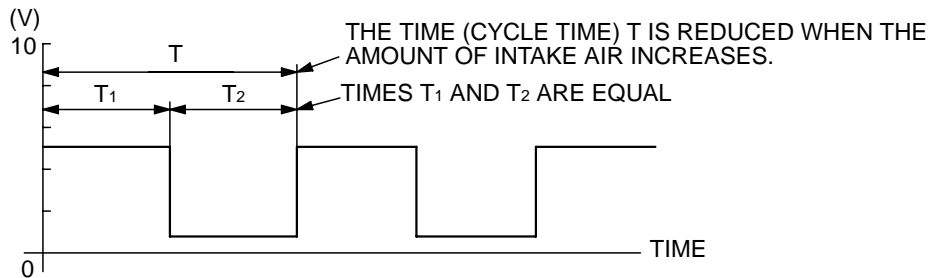
### Alternate method (Test harness not available)

1. Connect the oscilloscope probe to PCM terminal No. 63.

### Standard Wave Pattern

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

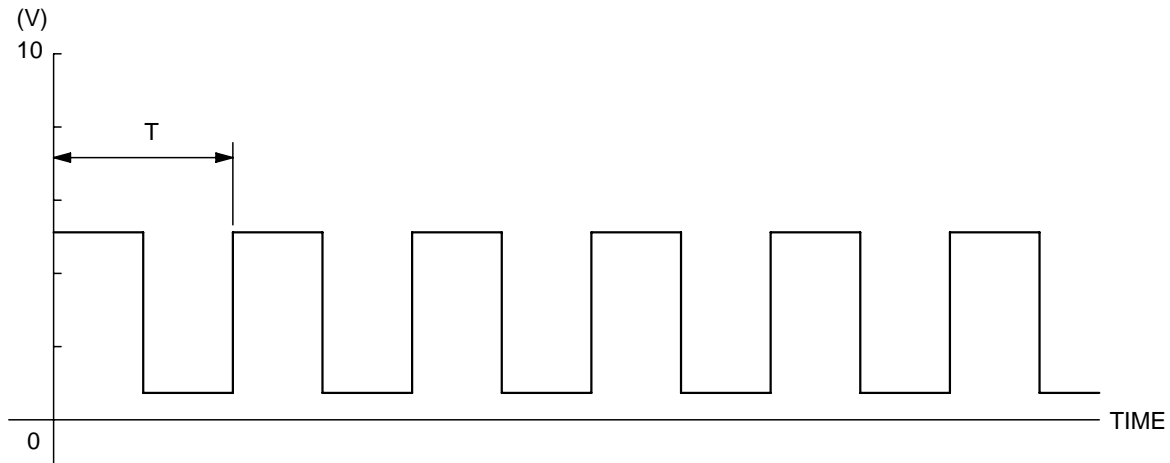
Standard wave pattern



AKX01595AB

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

Standard wave pattern



AKX01596 AB

### Wave Pattern Observation Points

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

### Examples of Abnormal Wave Patterns

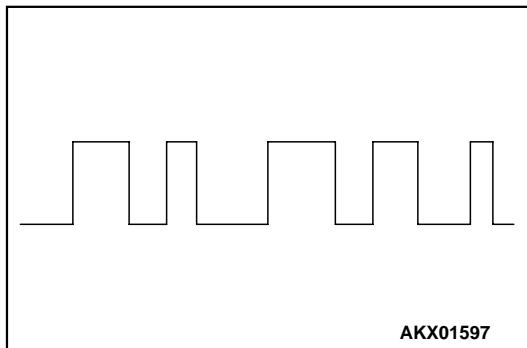
#### Example 1

Cause of problem

- Sensor interface malfunction.

Wave pattern characteristics

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



#### Example 2

Cause of problem

- Damaged rectifier or vortex generation column.

Wave pattern characteristics

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

**CAMSHAFT POSITION SENSOR AND  
CRANKSHAFT POSITION SENSOR**

**Required Special Tools:**

- MB991348: Test Harness
- MD998478: Test Harness

**Measurement Method**

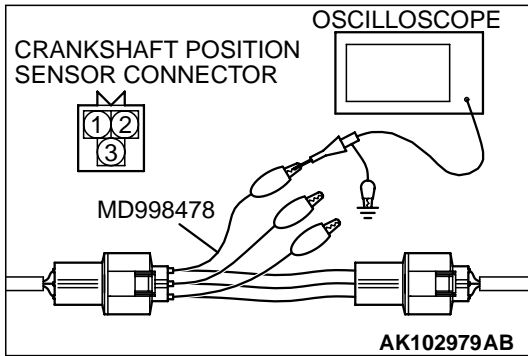
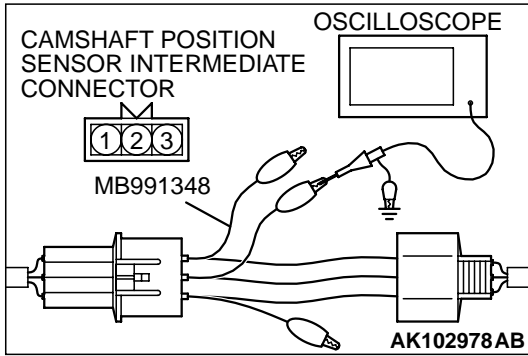
1. Disconnect the camshaft position sensor intermediate connector, and connect the test harness special tool (MB991348) in between. (All terminals should be connected.)
2. Connect the oscilloscope probe to camshaft position sensor intermediate connector terminal No. 2.
3. Disconnect the crankshaft position sensor connector, and connect the test harness special tool (MD998478) in between.
4. Connect the oscilloscope probe to crankshaft position sensor connector terminal No. 2 (black clip of special tool).

**Alternate method (Test harness not available)**

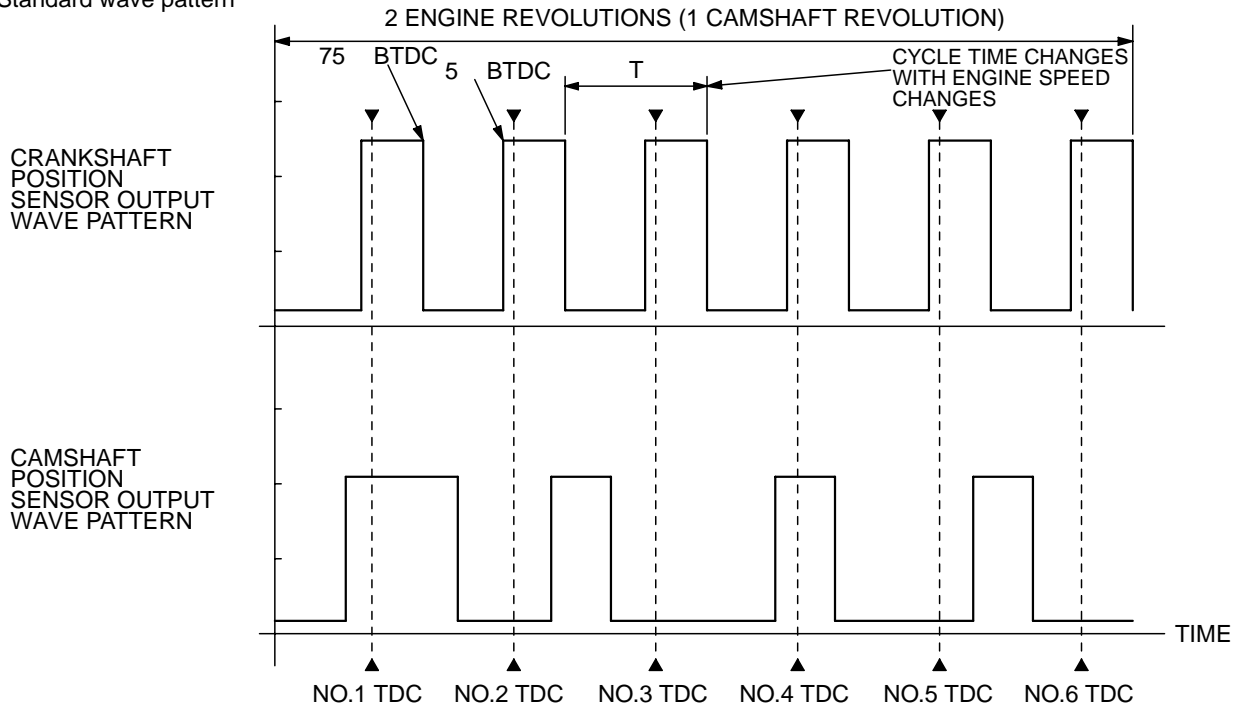
1. Connect the oscilloscope probe to PCM terminal No. 71. (Check the camshaft position sensor signal wave pattern.)
2. Connect the oscilloscope probe to PCM terminal No. 70. (Check the crankshaft position sensor signal wave pattern.)

**Standard Wave Pattern**

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



Standard wave pattern



TDC: TOP DEAD CENTER

AKX01600 AB

**Wave Pattern Observation Points**

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

**Examples of Abnormal Wave Patterns**

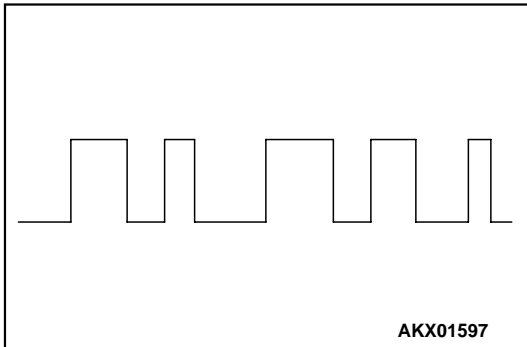
**Example 1**

Cause of problem

- Sensor interface malfunction.

Wave pattern characteristics

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



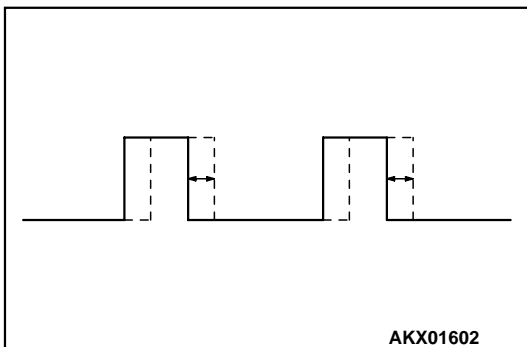
**Example 2**

Cause of problem

- Loose timing belt.
- Abnormality in sensor disc.

Wave pattern characteristics

- Wave pattern is displaced to the left or right.



**INJECTOR**

**Required Special Tools:**

- MD998474: Test Harness

**Measurement Method**

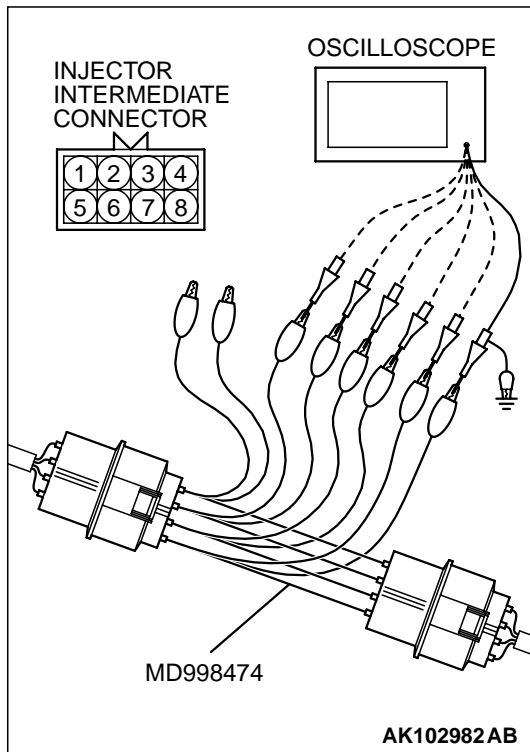
1. Disconnect the injector intermediate connector, and connect the test harness special tool (MD998474) in between.
2. Connect the oscilloscope probe to each injector intermediate connector terminal to analyze each cylinder:
  - Terminal No. 3 (green clip of special tool) for the number 1 cylinder
  - Terminal No. 2 (white clip) for the number 2 cylinder
  - Terminal No. 1 (blue clip) for the number 3 cylinder
  - Terminal No. 7 (yellow clip) for the number 4 cylinder
  - Terminal No. 6 (red clip) for the number 5 cylinder
  - Terminal No. 5 (black clip) for the number 6 cylinder

**Alternate method (Test harness not available)**

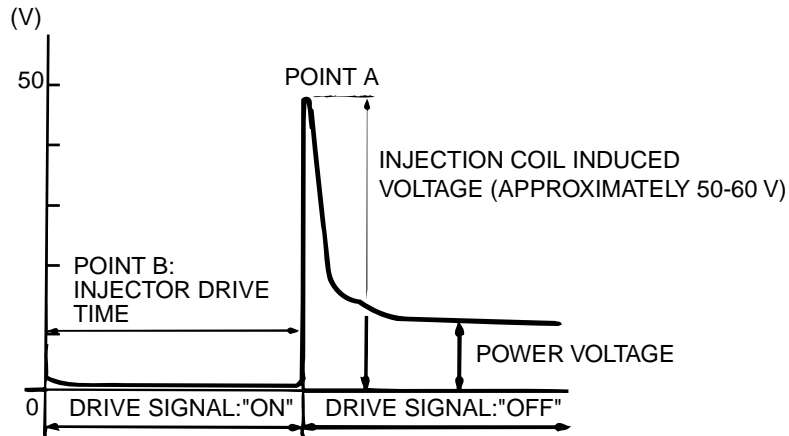
1. Connect the oscilloscope probe to PCM terminal No. 1. (When checking the number 1 cylinder.)
2. Connect the oscilloscope probe to PCM terminal No. 5. (When checking the number 2 cylinder.)
3. Connect the oscilloscope probe to PCM terminal No. 14. (When checking the number 3 cylinder.)
4. Connect the oscilloscope probe to PCM terminal No. 21. (When checking the number 4 cylinder.)
5. Connect the oscilloscope probe to PCM terminal No. 2. (When checking the number 5 cylinder.)
6. Connect the oscilloscope probe to PCM terminal No. 6. (When checking the number 6 cylinder.)

**Standard Wave Pattern**

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



Standard wave pattern

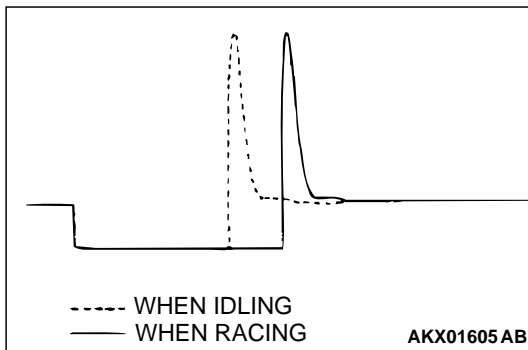


AKX01604 AB

**Wave Pattern Observation Points**

Point A: Height of injector coil induced voltage.

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



Point B: Injector drive time

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

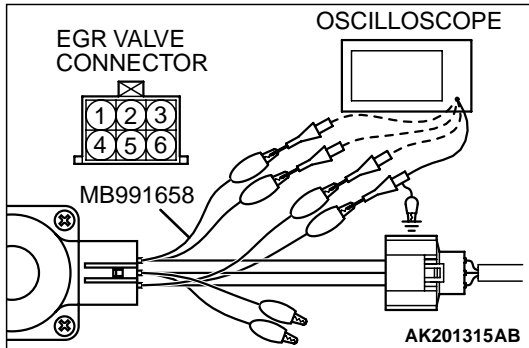
**EGR VALVE (STEPPER MOTOR)**

**Required Special Tool:**

- MB991658: Test Harness

**Measurement Method**

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



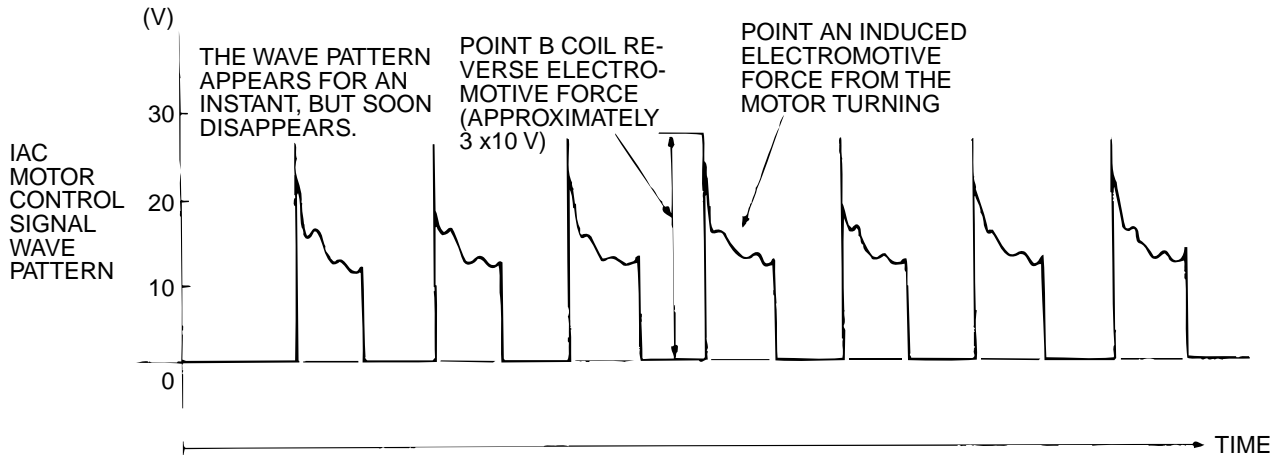
**Alternate method (Test harness not available)**

1. Connect the oscilloscope probe to PCM terminals No. 3, No. 12, No. 19 and No. 26.

**Standard Wave Pattern**

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

Standard wave pattern



AKX01607 AB

**Wave Pattern Observation Points**

1. Check that the standard wave pattern appears when the EGR valve is operating.
- Point A: Presence or absence of induced electromotive force from the motor turning. (Refer to abnormal wave pattern.)

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



Point B: Height of coil back electromotive force

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

### Examples of Abnormal Wave Patterns

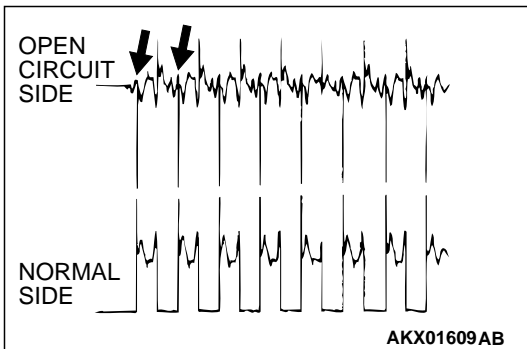
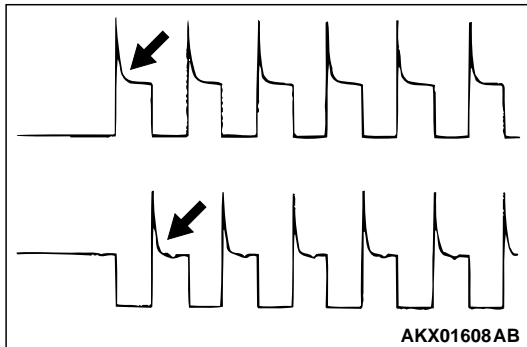
#### Example 1

Cause of problem

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

Wave pattern characteristics

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



#### Example 2

Cause of problem

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

Wave pattern characteristics

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

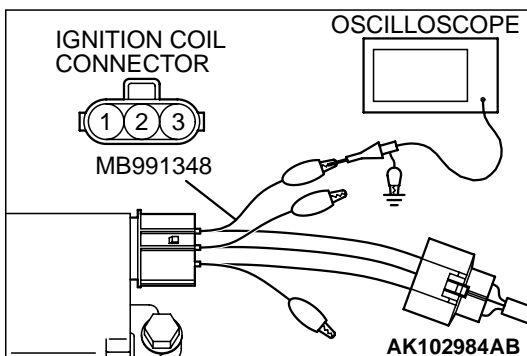
## IGNITION COIL AND IGNITION POWER TRANSISTOR

### Required Special Tool:

- MB991348: Test Harness Set

### Measurement Method

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



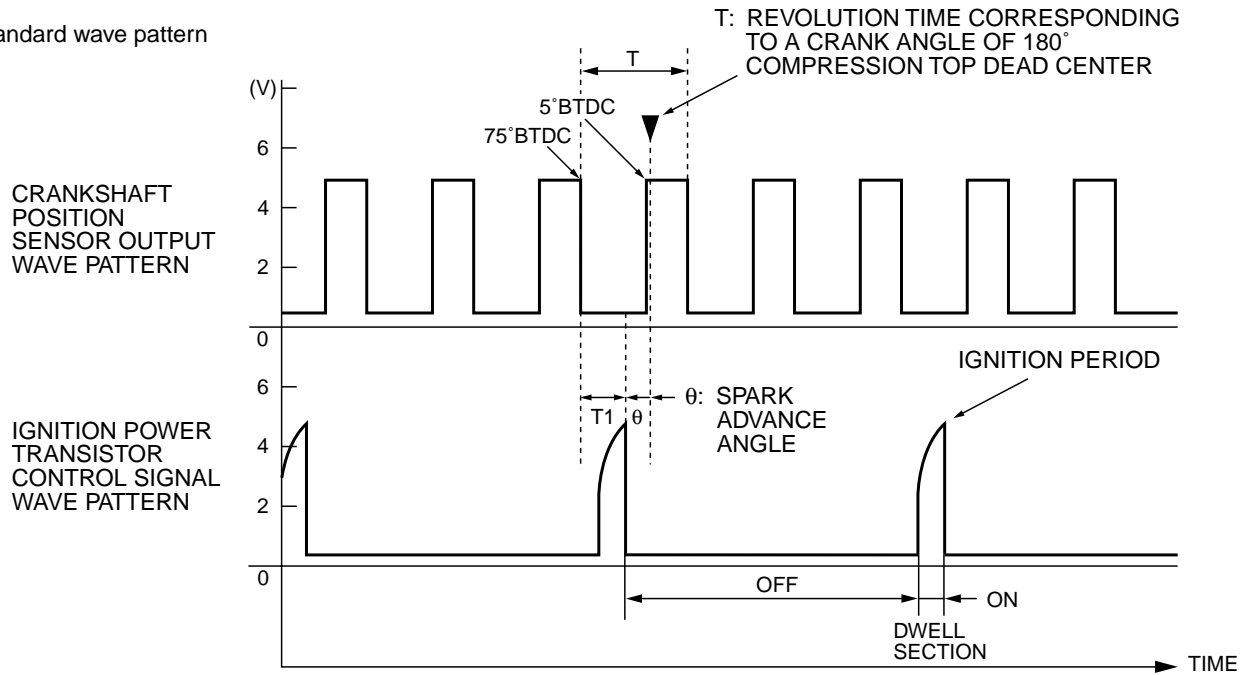
### Alternate method (Test harness not available)

Connect the oscilloscope probe to PCM terminals No. 31 (for number 1 – number 4), terminal No. 35 (for number 2 – number 5), terminal No. 44 (for number 3 – number 6) respectively.

Standard Wave Pattern

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

Standard wave pattern



T1: TIME COMPUTED BY THE PCM

AK201316AB

Wave Pattern Observation Points

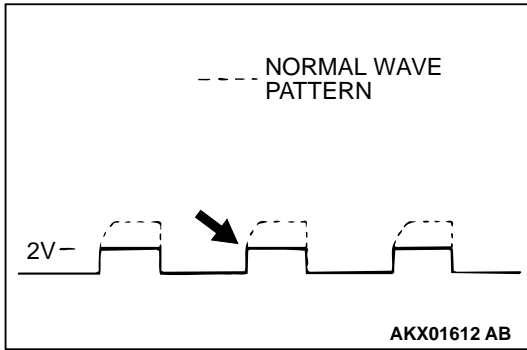
Point: Condition of wave pattern build-up section and maximum voltage (Refer to abnormal wave pattern examples 1 and 2.)

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

**Examples of Abnormal Wave Patterns**

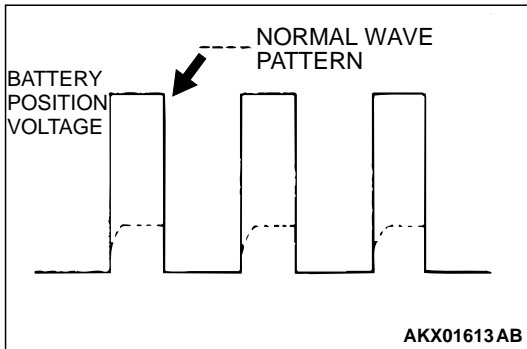
**Example 1 (Wave pattern during engine cranking)**

- Cause of problem  
Open-circuit in ignition primary circuit
- Wave pattern characteristics  
Top-right part of the build-up section cannot be seen, and voltage value is approximately 2 volts too low.



**Example 2 (Wave pattern during engine cranking)**

- Cause of problem  
Malfunction in ignition power transistor
- Wave pattern characteristics  
Power voltage results when the ignition power transistor is ON.



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## NOTES