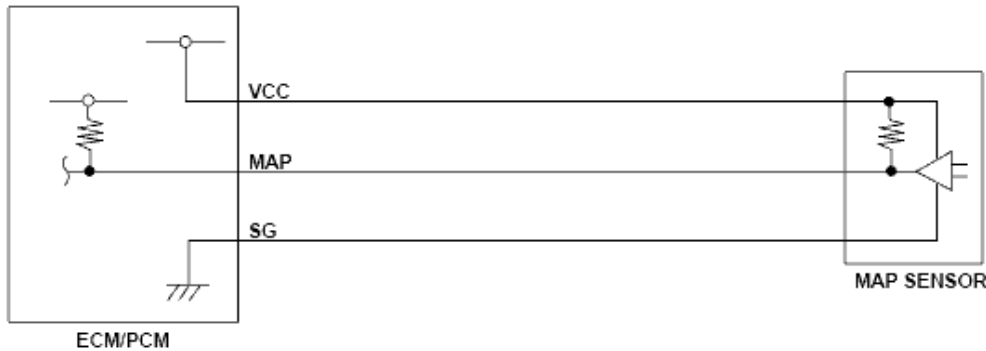
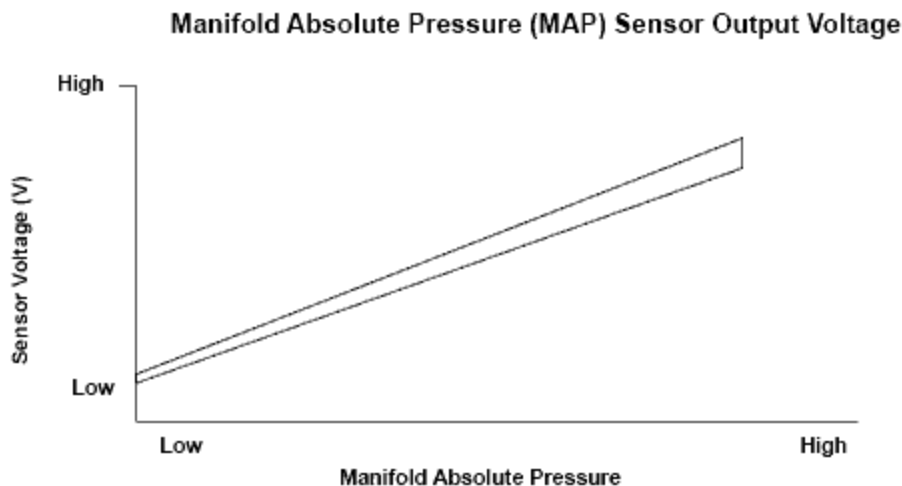


2007 ENGINE PERFORMANCE

Advanced Diagnostics - TL

DTC P0107 (3): ADVANCED DIAGNOSTICS**DTC P0107: MANIFOLD ABSOLUTE PRESSURE (MAP) SENSOR CIRCUIT LOW VOLTAGE**

P0106-9601

Fig. 1: Manifold Absolute Pressure (MAP) Sensor (Low Voltage) - Circuit Diagram

P0107-9671

Fig. 2: Manifold Absolute Pressure (MAP) Sensor Output Voltage Graph**General Description**

The manifold absolute pressure (MAP) sensor senses manifold absolute pressure (vacuum) and converts it into electrical signals. The MAP sensor outputs low signal voltage at high-vacuum (throttle valve closed) and high signal voltage at low-vacuum (throttle valve wide open).

If a signal voltage from the MAP sensor is a set value or less, the engine control module (ECM)/powertrain control module (PCM) detects a malfunction and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
Sequence	None
Duration	2 seconds or more
DTC Type	One drive cycle, MIL ON
OBD Status	N/A

Enable Conditions**ENABLE CONDITIONS**

Condition	
Ignition switch	ON
No active DTCs	P0108

Malfunction Threshold

The MAP sensor output voltage is 0.23 V or less for at least 2 seconds.

Diagnosis Details**Conditions for illuminating the MIL**

When a malfunction is detected, the MIL comes on and the DTC and the freeze frame data are stored in the ECM/PCM memory.

Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

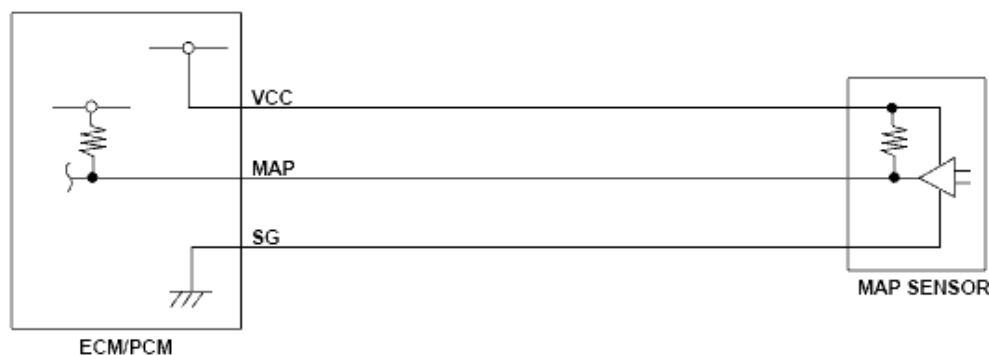
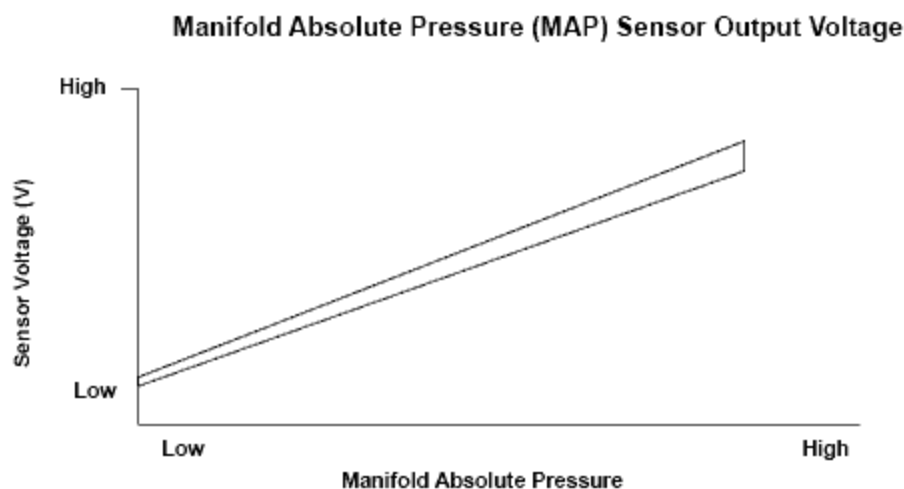
DTC P0108 (3): ADVANCED DIAGNOSTICS**DTC P0108: MANIFOLD ABSOLUTE PRESSURE (MAP) SENSOR CIRCUIT HIGH VOLTAGE**

Fig. 3: Manifold Absolute Pressure (MAP) Sensor (High Voltage) - Circuit Diagram

P0107-9871

Fig. 4: Manifold Absolute Pressure (MAP) Sensor Output Voltage Graph**General Description**

The manifold absolute pressure (MAP) sensor senses manifold absolute pressure (vacuum) and converts it into electrical signals. The MAP sensor outputs low signal voltage at high-vacuum (throttle valve closed) and high signal voltage at low-vacuum (throttle valve wide open). If a signal voltage from the MAP sensor is a set value or more, the engine control module (ECM)/powertrain control module (PCM) detects a malfunction and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status**MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS**

Execution	Continuous
Sequence	None
Duration	2 seconds or more
DTC Type	One drive cycle, MIL ON
OBD Status	N/A

Enable Conditions**ENABLE CONDITIONS**

Condition	
Ignition switch	ON
No active DTCs	P0107

Malfunction Threshold

The MAP sensor output voltage is 4.49 V or more for at least 2 seconds.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected, the MIL comes on and the DTC and the freeze frame data are stored in the ECM/PCM memory.

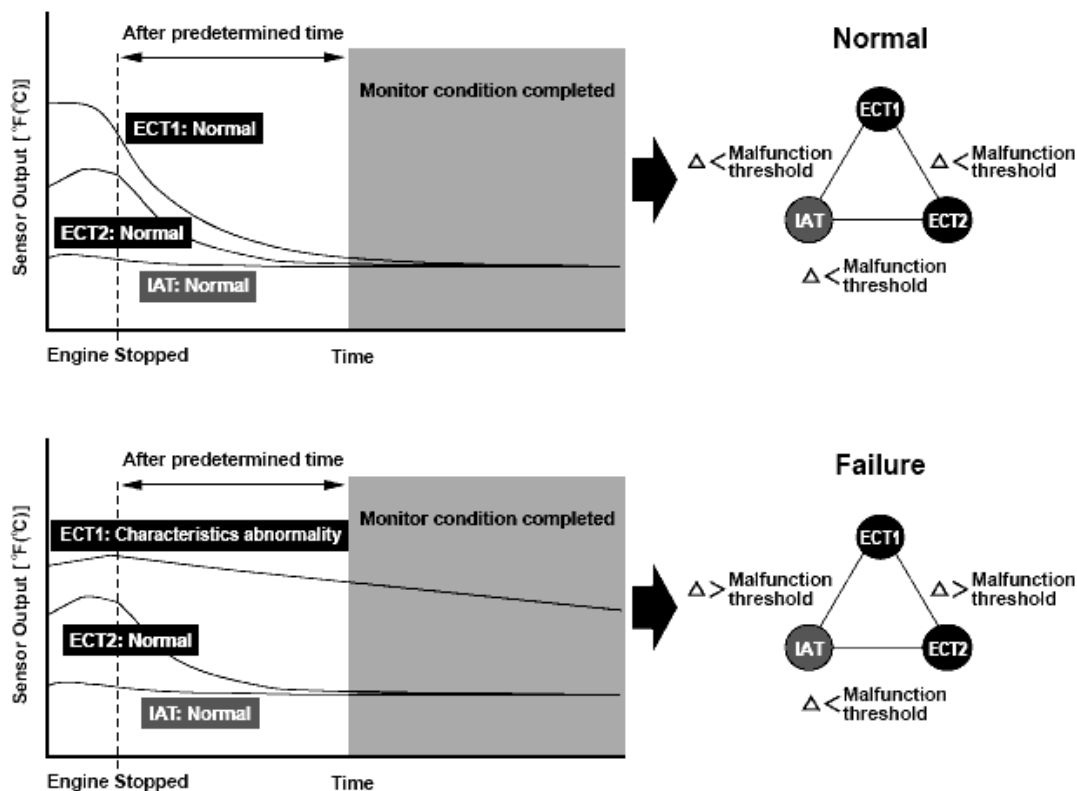
Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P0111 (10): ADVANCED DIAGNOSTICS

DTC P0111: INTAKE AIR TEMPERATURE (IAT) SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM



P0111-0570

Fig. 5: Intake Air Temperature (IAT) Sensor Performance Graph

General Description

Two engine coolant temperature sensors and one intake air temperature sensor are used by the engine control module (ECM)/powertrain control module (PCM).

When the engine is stopped and enough time has passed, the temperature of the engine will equal the ambient temperature. When an inappropriate temperature is detected after comparing the temperature

readings of each sensor, a malfunction in the corresponding sensor is detected and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Once per driving cycle
Sequence	None
Duration	10 seconds or more
DTC Type	Two drive cycles, MIL ON
OBD Status	N/A

Enable Conditions

ENABLE CONDITIONS

Condition	Minimum	Maximum
Engine off time	6 hours	-
No active DTCs	P0112, P0113, P0116, P0117, P0118, P0125, P1116, P2183, P2184, P2185, P2610	

Malfunction Threshold

A malfunction is detected if these three conditions are present after the engine and the ignition switch have been off for at least 6 hours:

- When the temperature difference between the IAT and ECT1 is 76°F (24°C)^{*2}, 89°F (32°C)^{*1} or more.
- When the temperature difference between the IAT and ECT2 is 95°F (35°C)^{*1}, 97°F (36°C)^{*2} or more.
- When the temperature difference between the ECT2 and ECT1 is 120°F (49°C)^{*2}, 125°F (52°C)^{*1} or more.

*1: J32A3 engine

*2: J35A8 engine

Driving Pattern

1. Turn the ignition off, and wait at least 6 hours.
2. Start the engine, and let it idle for at least 10 seconds.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected during the first drive cycle, a Temporary DTC is stored in the ECM/PCM memory. If the malfunction recurs during the next (second) drive cycle, the MIL comes on and the DTC and the freeze frame data are stored.

Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, the Temporary DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

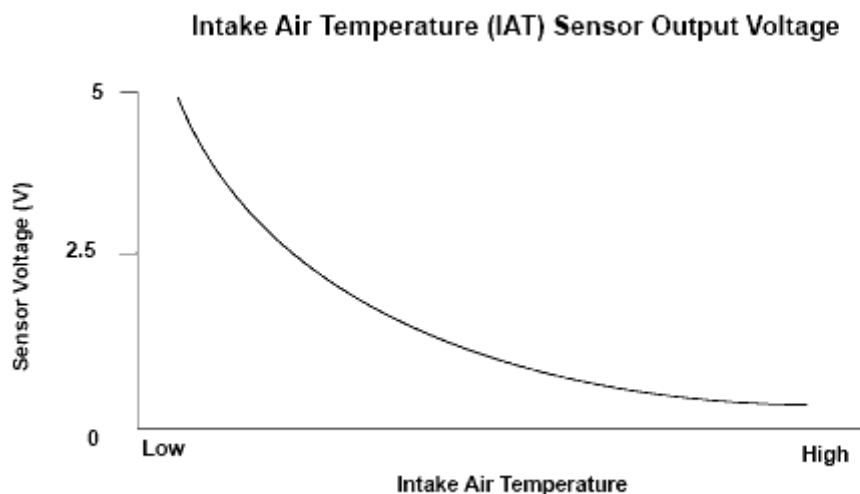
DTC P0112 (10): ADVANCED DIAGNOSTICS

DTC P0112: INTAKE AIR TEMPERATURE (IAT) SENSOR CIRCUIT LOW VOLTAGE



P0112-9801

Fig. 6: Intake Air Temperature (IAT) Sensor (Low Voltage) - Circuit Diagram



P0112-9871

Fig. 7: Intake Air Temperature (IAT) Sensor Output Voltage Graph

General Description

The intake air temperature (IAT) sensor is a thermistor that detects intake air temperature, and it is used for A/F feedback control to compensate for the atmospheric density fluctuations that accompany changes in intake air temperature. The IAT sensor resistance varies depending on temperature. The output voltage and the sensor resistance increase as the intake air temperature decreases. Conversely, the output voltage and the sensor resistance decrease as the intake air temperature increases. If the IAT sensor output voltage is excessively low, the engine control module (ECM)/powertrain control module (PCM) detects a malfunction and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status**MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS**

Execution	Continuous
Sequence	None
Duration	2 seconds or more
DTC Type	One drive cycle, MIL ON
OBD Status	N/A

Enable Conditions**ENABLE CONDITIONS**

Condition	
Ignition switch	ON
No active DTCs	P0113

Malfunction Threshold

The IAT sensor output voltage is 0.08 V or less for at least 2 seconds.

Diagnosis Details**Conditions for illuminating the MIL**

When a malfunction is detected, the MIL comes on and the DTC and the freeze frame data are stored in the ECM/PCM memory.

Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

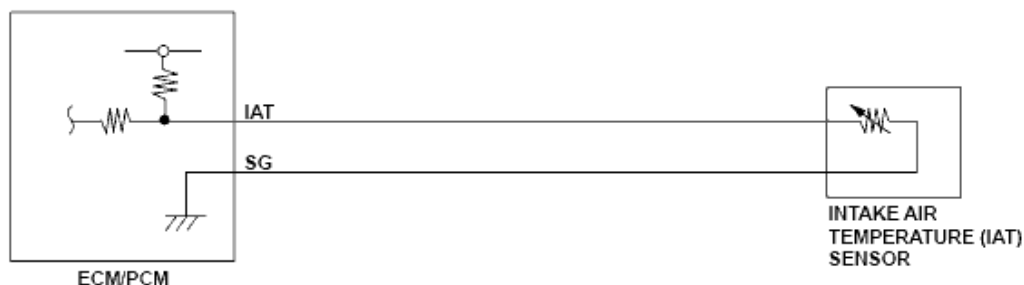
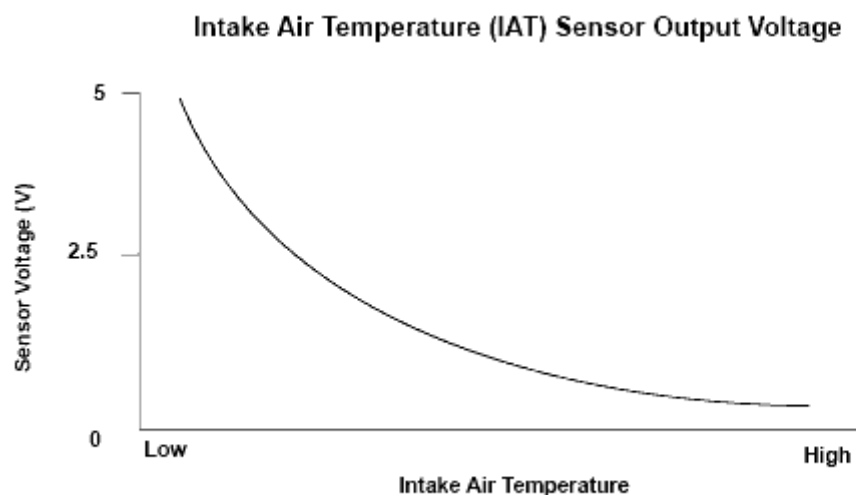
DTC P0113 (10): ADVANCED DIAGNOSTICS**DTC P0113: INTAKE AIR TEMPERATURE (IAT) SENSOR CIRCUIT HIGH VOLTAGE**

Fig. 8: Intake Air Temperature (IAT) Sensor (High Voltage) - Circuit Diagram

P0112-9871

Fig. 9: Intake Air Temperature (IAT) Sensor Output Voltage Graph**General Description**

The intake air temperature (IAT) sensor is a thermistor that detects intake air temperature, and it is used for A/F feedback control to compensate for the atmospheric density fluctuations that accompany changes in intake air temperature.

The IAT sensor resistance varies depending on temperature. The output voltage and the sensor resistance increase as the intake air temperature decreases. Conversely, the output voltage and the sensor resistance decrease as the intake air temperature increases. If the IAT sensor output voltage is excessively high, the engine control module (ECM)/powertrain control module (PCM) detects a malfunction and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status**MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS**

Execution	Continuous
Sequence	None
Duration	2 seconds or more
DTC Type	One drive cycle, MIL ON
OBD Status	N/A

Enable Conditions**ENABLE CONDITIONS**

Condition	
Ignition switch	ON
No active DTCs	P0112

Malfunction Threshold

The IAT sensor output voltage is 4.92 V or more for at least 2 seconds.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected, the MIL comes on and the DTC and the freeze frame data are stored in the ECM/PCM memory.

Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P0116 (86): ADVANCED DIAGNOSTICS

DTC P0116: ENGINE COOLANT TEMPERATURE (ECT) SENSOR 1 CIRCUIT RANGE/PERFORMANCE PROBLEM

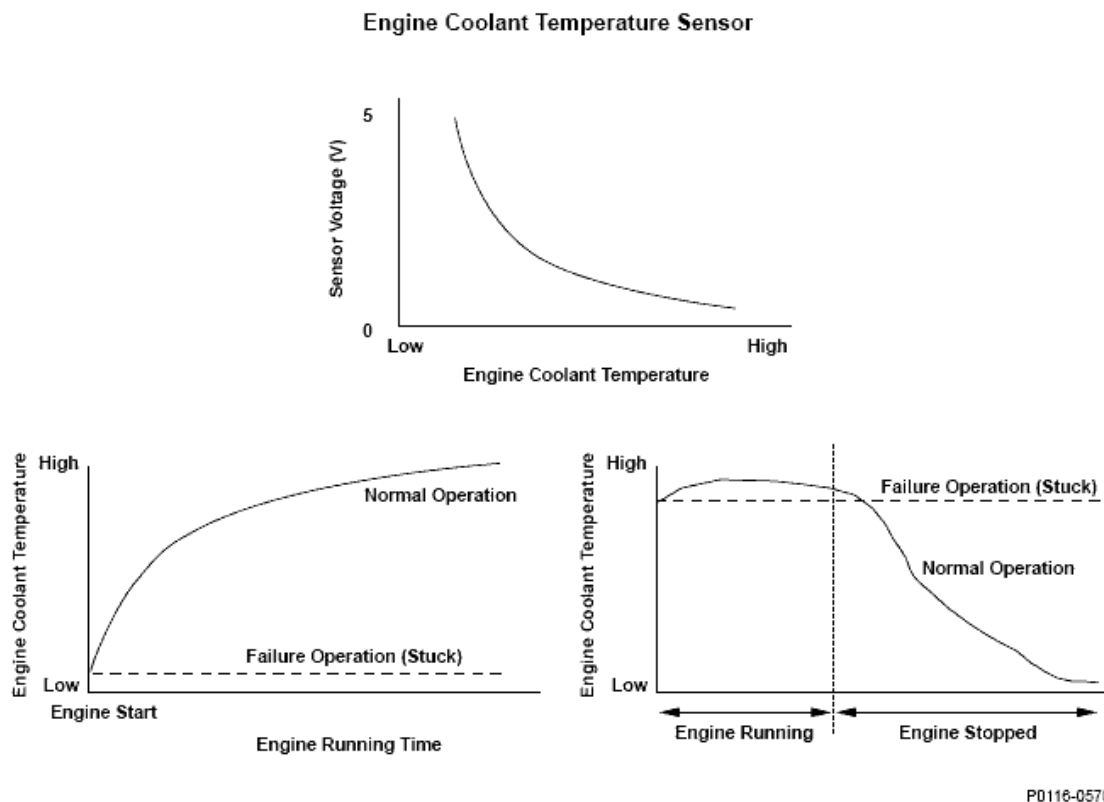


Fig. 10: Engine Coolant Temperature (ECT) Sensor Performance Graph

General Description

The engine control module (ECM)/powertrain control module (PCM) supplies voltage to the engine coolant temperature (ECT) signal circuit (about 5 V) through a pull-up resistor. As the engine coolant cools, ECT sensor 1 resistance increases, and the ECM/PCM detects a high signal voltage. As the engine coolant warms, ECT sensor 1 resistance decreases, and the ECM/PCM detects a low signal voltage.

If the ECT sensor 1 output voltage after driving a set time after starting the engine does not reach a set temperature, or when the difference between the ECT sensor 1 output voltage when driving and the output voltage of the ECT sensor 1 after the engine is stopped a set time does not change a certain amount, a malfunction is detected and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Once per driving cycle
Sequence	None
Duration	10 minutes or more
DTC Type	Two drive cycles, MIL ON
OBD Status	N/A

Enable Conditions

ENABLE CONDITIONS

Condition	Minimum	Maximum
Elapsed time after starting the engine	10 seconds	-
Fuel feedback	Other than during fuel cut-off operation	
No active DTCs	P0107, P0108, P0117, P0118, P0134, P0135, P0154, P0155, P0171, P0172, P0174, P0175, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0335, P0339, P0340, P0344, P0401, P0404, P0443, P0496, P0497, P0506, P0507, P0627, P1077, P1078, P1128, P1129, P1172, P1174, P145C, P2195, P2197, P2227, P2228, P2229, P2237, P2238, P2240, P2241, P2243, P2245, P2247, P2249, P2251, P2252, P2254, P2255, P2413, P2610, P2627, P2628, P2630, P2631, P2646, P2647, P2648, P2649	
Others	With a completely cooled engine (one that has been off for at least 6 hours): Judgment is made after the engine has been run for at least 10 minutes, turned off for at least 10 seconds, then started and run again for at least 10 seconds.	
	With a partially cooled engine (one that has been off for less than 6 hours): Judgment is made after the engine has been run for at least 10 minutes, turned off for at least 150 ⁽²⁾ , 180 ⁽¹⁾ minutes, then started and run again for at least 10 seconds.	
(1) J32A3 engine		
(2) J35A8 engine		

Malfunction Threshold

Malfunction determination 1:

With a completely cooled engine (one that has been off for at least 6 hours):

When the change in coolant temperature after 10 minutes or more of running time is 50 °F (10 °C) or less, a malfunction is detected.

Malfunction determination 2:

With a partially cooled engine (one that has been off for less than 6 hours):

When the difference between the coolant temperature after 10 minutes or more of running time minus the coolant temperature after the engine has been off for 150^{*2}, 180^{*1} minutes and then run for 10 seconds is 50 °F (10 °C) or less, a malfunction is detected.

Driving Pattern

- With a completely cooled engine (one that has been off for at least 6 hours).
 1. Start the engine, and let it idle for at least 10 minutes.
 2. Turn off the ignition for 10 seconds, then restart the engine and let it idle for at least 10 seconds.
- With a partially cooled engine (one that has been off for less than 6 hours).
 1. Start the engine, and let it idle for at least 10 minutes.
 2. Turn off the ignition for 150^{*2}, 180^{*1} minutes, then restart the engine and let it idle for at least 10 seconds.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected during the first drive cycle, a Temporary DTC is stored in the ECM/PCM memory. If the malfunction recurs during the next (second) drive cycle, the MIL comes on and the DTC and the freeze frame data are stored.

Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, the Temporary DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

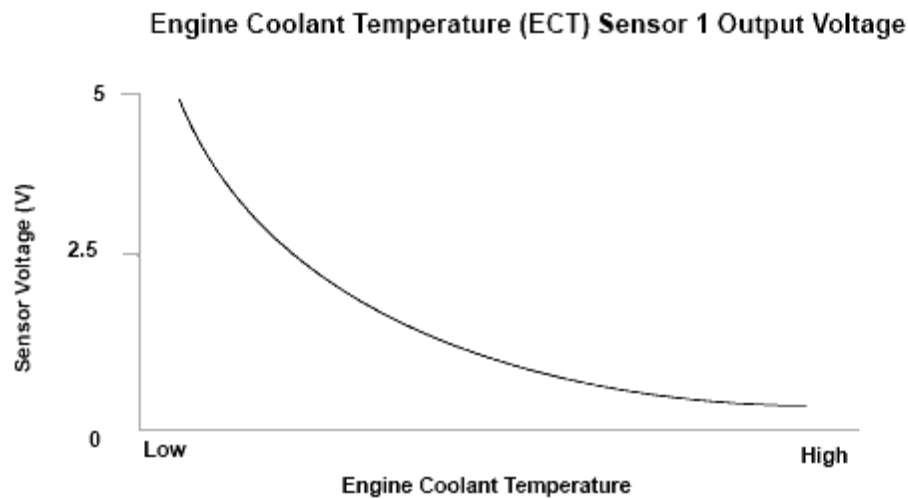
DTC P0117 (6): ADVANCED DIAGNOSTICS

DTC P0117: ENGINE COOLANT TEMPERATURE (ECT) SENSOR 1 CIRCUIT LOW VOLTAGE



P0116-0601

Fig. 11: Engine Coolant Temperature (ECT) Sensor 1 (Low Voltage) - Circuit Diagram



P0116-0571

Fig. 12: Engine Coolant Temperature (ECT) Sensor 1 Output Voltage Graph

General Description

The engine coolant temperature (ECT) sensor 1 is used for the air fuel ratio feedback control, the ignition timing control, the idle speed control, and other functions. The ECT sensor 1 resistance varies depending on the engine coolant temperature. As the engine coolant cools, the ECT sensor 1 resistance increases, and the engine control module (ECM)/powertrain control module (PCM) detects a high signal voltage. As the engine coolant warms, the ECT sensor 1 resistance decreases, and the ECM/PCM detects a low signal voltage. If the ECT sensor 1 output voltage is less than a set value when the engine coolant temperature is high, the ECM/PCM detects a malfunction and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
Sequence	None
Duration	2 seconds or more
DTC Type	One drive cycle, MIL ON
OBD Status	N/A

Enable Conditions

ENABLE CONDITIONS

Condition	
Ignition switch	ON
No active DTCs	P0118

Malfunction Threshold

The ECT sensor 1 output voltage is 0.08 V or less for at least 2 seconds.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected, the MIL comes on and the DTC and the freeze frame data are stored in the ECM/PCM memory.

Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

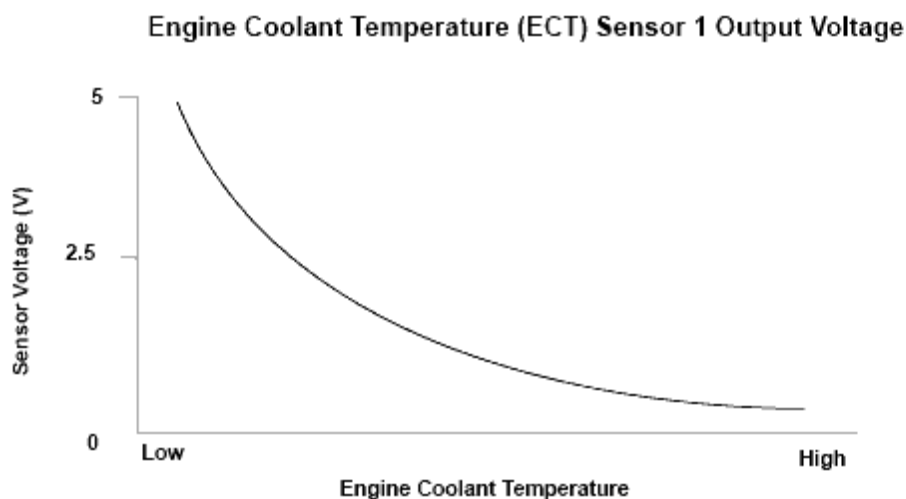
DTC P0118 (6): ADVANCED DIAGNOSTICS

DTC P0118: ENGINE COOLANT TEMPERATURE (ECT) SENSOR 1 CIRCUIT HIGH VOLTAGE



P0118-0801

Fig. 13: Engine Coolant Temperature (ECT) Sensor 1 (High Voltage) - Circuit Diagram



P0118-0571

Fig. 14: Engine Coolant Temperature (ECT) Sensor 1 Output Voltage Graph

General Description

The engine coolant temperature (ECT) sensor 1 is used for air fuel ratio feedback control, ignition timing control, idle speed control, and other functions. The ECT sensor 1 resistance varies depending on the engine

coolant temperature. As the engine coolant cools, the ECT sensor 1 resistance increases, and the engine control module (ECM)/powertrain control module (PCM) detects a high signal voltage. As the engine coolant warms, the ECT sensor 1 resistance decreases, and the ECM/PCM detects a low signal voltage. If the ECT sensor 1 output voltage is more than a set value when the engine coolant temperature is low, the ECM/PCM detects a malfunction and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
Sequence	None
Duration	2 seconds or more
DTC Type	One drive cycle, MIL ON
OBD Status	N/A

Enable Conditions

ENABLE CONDITIONS

Condition	
Ignition switch	ON
No active DTCs	P0117

Malfunction Threshold

The ECT sensor 1 output voltage is 4.92 V or more for at least 2 seconds.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected, the MIL comes on and the DTC and the freeze frame data are stored in the ECM/PCM memory.

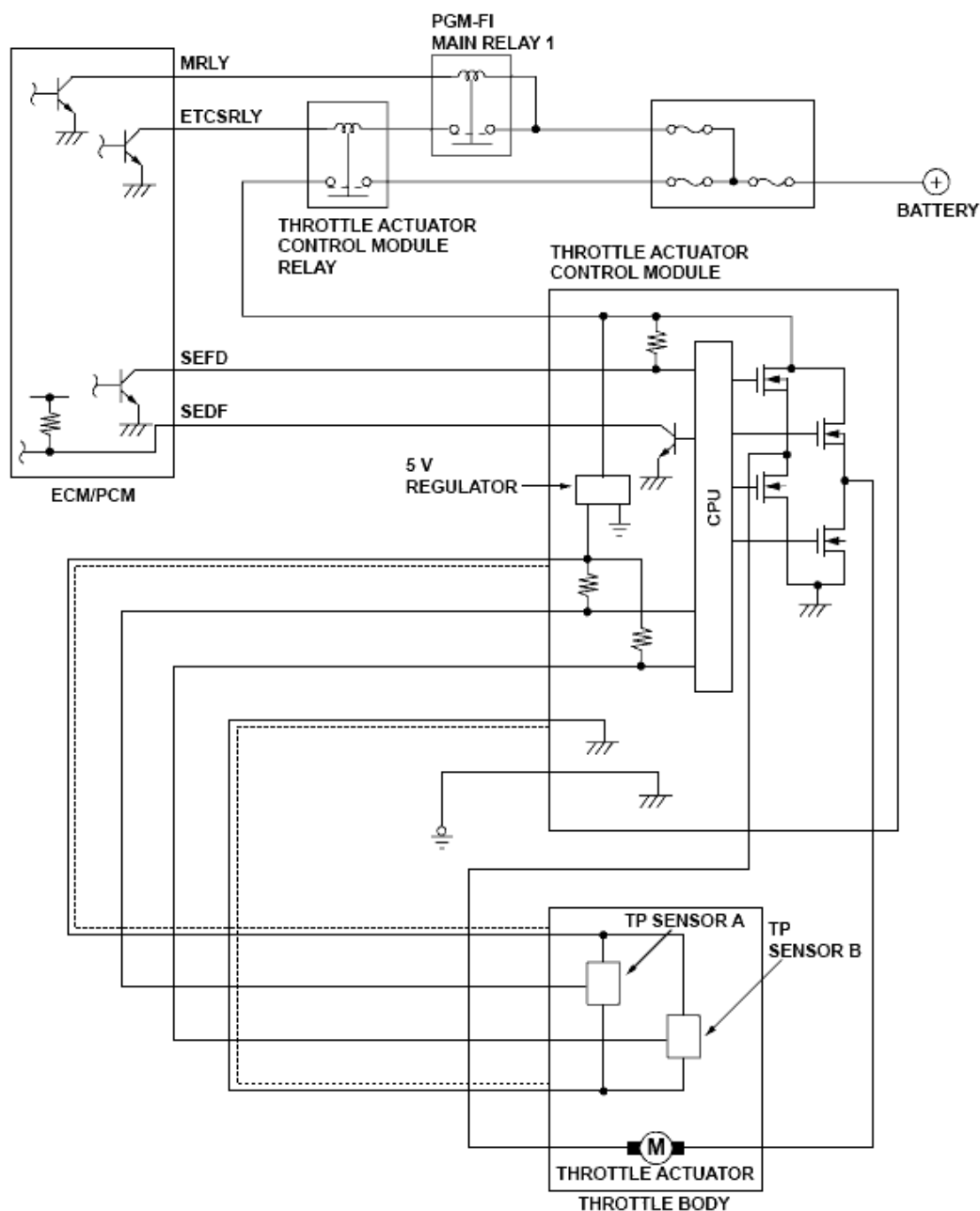
Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P0122 (7): ADVANCED DIAGNOSTICS

DTC P0122: THROTTLE POSITION (TP) SENSOR A CIRCUIT LOW VOLTAGE



P0122-0702

Fig. 15: Throttle Position (TP) Sensor A (Low Voltage) - Circuit Diagram

General Description

Throttle position (TP) sensor A is a semiconductor type, and it is attached to the throttle body and shaft to determine throttle valve position.

The throttle valve position signal from TP sensor A is transmitted to the throttle actuator control module for target position feedback control, then to the engine control module (ECM)/powertrain control module (PCM) as an actual throttle valve position signal.

If the signal from TP sensor A is a fixed value or less for a set time, the throttle actuator control module detects a malfunction and sends the malfunction data to the ECM/PCM. When the ECM/PCM receives the

malfunction data from the throttle actuator control module, the ECM/PCM detects a TP sensor A malfunction and stores a DTC.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
Sequence	None
Duration	0.2 second or more
DTC Type	One drive cycle, MIL ON
OBD Status	N/A

Enable Conditions

ENABLE CONDITIONS

Condition	
State of the engine	Running
No active DTCs	P0123, P2101, P2108, P2118, P2135, P2176, U0107

Malfunction Threshold

The TP sensor A output voltage is 0.3 V or less for at least 0.2 second.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected, the MIL comes on and the DTC and the freeze frame data are stored in the ECM/PCM memory.

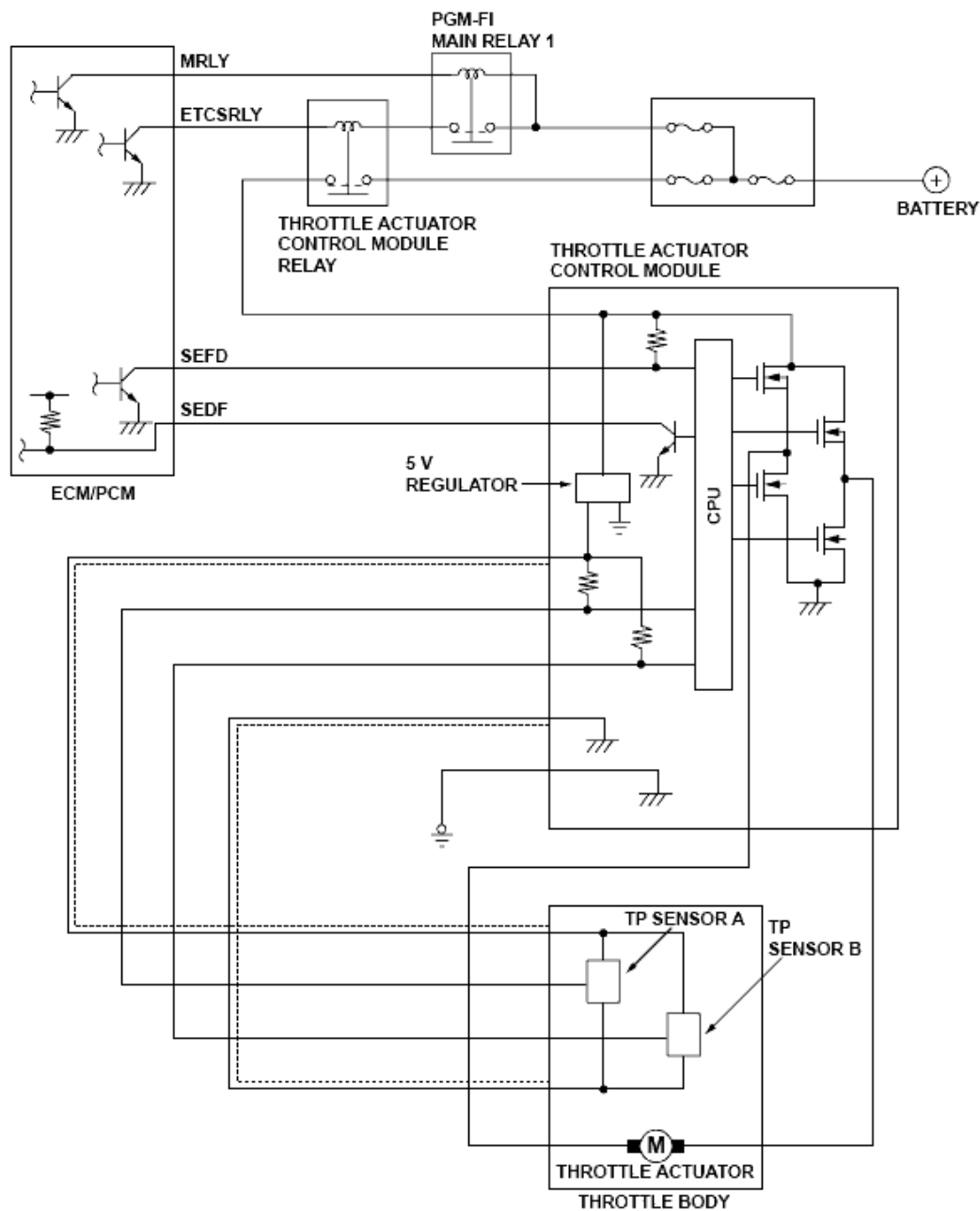
Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P0123 (7): ADVANCED DIAGNOSTICS

DTC P0123: THROTTLE POSITION (TP) SENSOR A CIRCUIT HIGH VOLTAGE



P0122-0702

Fig. 16: Throttle Position (TP) Sensor A (High Voltage) - Circuit Diagram

General Description

Throttle position (TP) sensor A is a semiconductor type, and it is attached to the throttle body and shaft to determine throttle valve position.

The throttle valve position signal from TP sensor A is transmitted to the throttle actuator control module for target position feedback control, then to the engine control module (ECM)/powertrain control module (PCM) as an actual throttle valve position signal.

If the signal from TP sensor A is a fixed value or more for a set time, the throttle actuator control module detects a malfunction and sends the malfunction data to the ECM/PCM. When the ECM/PCM receives the

malfunction data from the throttle actuator control module, the ECM/PCM detects a TP sensor A malfunction and stores a DTC.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
Sequence	None
Duration	0.2 second or more
DTC Type	One drive cycle, MIL ON
OBD Status	N/A

Enable Conditions

ENABLE CONDITIONS

Condition	
State of the engine	Running
No active DTCs	P0122, P2101, P2108, P2118, P2135, P2176, U0107

Malfunction Threshold

The TP sensor A output voltage is 4.8 V or more for at least 0.2 second.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected, the MIL comes on and the DTC and the freeze frame data are stored in the ECM/PCM memory.

Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P0125 (86): ADVANCED DIAGNOSTICS

DTC P0125: ENGINE COOLANT TEMPERATURE (ECT) SENSOR 1 MALFUNCTION/SLOW RESPONSE

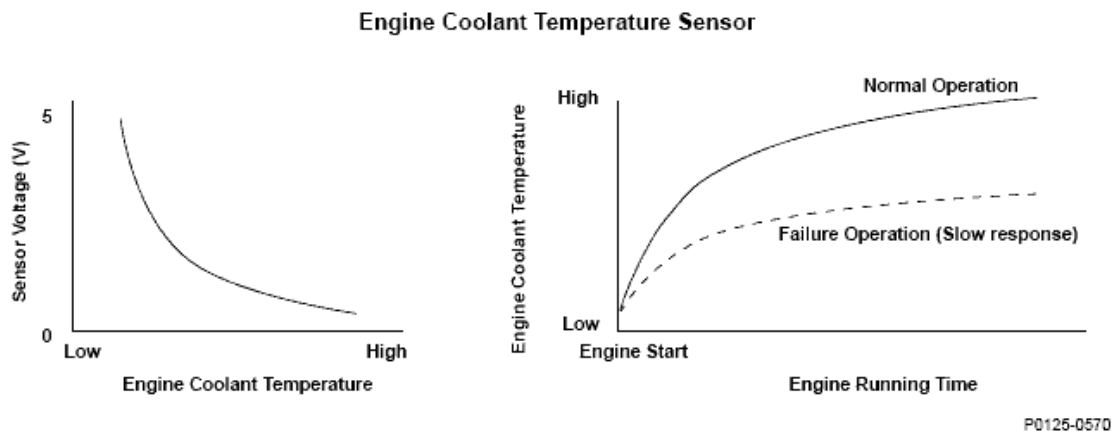


Fig. 17: Engine Coolant Temperature (ECT) Sensor 1 Malfunction Graph

General Description

The engine control module (ECM)/powertrain control module (PCM) supplies voltage to the engine coolant temperature (ECT) signal circuit (about 5 V) through a pull-up resistor. As the engine coolant cools, the ECT sensor 1 resistance increases, and the ECM/PCM detects a high signal voltage. As the engine coolant warms, the ECT sensor 1 resistance decreases, and the ECM/PCM detects a low signal voltage. If the ECT sensor 1 output voltage does not reach a specified temperature at which closed-loop control for stoichiometric air/fuel ratio starts within a set time, depending on the initial coolant temperature after starting the engine, the ECM/PCM detects a malfunction and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Once per driving cycle
Sequence	None
Duration	20 minutes or less
DTC Type	Two drive cycles, MIL ON
OBD Status	PASSED/FAILED/NOT COMPLETED (STILL TESTING)

Enable Conditions

ENABLE CONDITIONS

Condition	Minimum	Maximum
Initial engine coolant temperature	-	11 °F (-12 °C)
Fuel feedback	Other than during fuel cut-off operation	
No active DTCs	P0107, P0108, P0111, P0112, P0113, P0117, P0118, P0134, P0135, P0154, P0155, P0171, P0172, P0174, P0175, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0335, P0339, P0340, P0344, P0401, P0404, P0443, P0496, P0497, P0506, P0507, P0627, P1077, P1078, P1128, P1129, P1172, P1174, P145C, P2195, P2197, P2227, P2228, P2229, P2237, P2238, P2240, P2241, P2243, P2245, P2247, P2249, P2251, P2252, P2254, P2255, P2413, P2627, P2628, P2630, P2631, P2646, P2647, P2648, P2649	

Malfunction Threshold

The engine running time before the engine coolant temperature reaches 98°F (36°C), based on the initial engine coolant temperatures, is as follows.

ENABLE CONDITIONS

Initial engine coolant temperature	-24°F (-31°C)	11°F (-12°C)
Engine running time	300 seconds or more	60 seconds or more

Driving Pattern

1. Start the engine at an engine coolant temperature as specified under Enable Conditions.
2. Let the engine idle for at least 20 minutes.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected during the first drive cycle with the ECT and IAT at engine start-up within the specified temperature range, a Temporary DTC is stored in the ECM/PCM memory. If the malfunction recurs during the next (second) drive cycle with the ECT and IAT at engine start-up within the specified temperature range, the MIL comes on and the DTC and the freeze frame data are stored.

Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

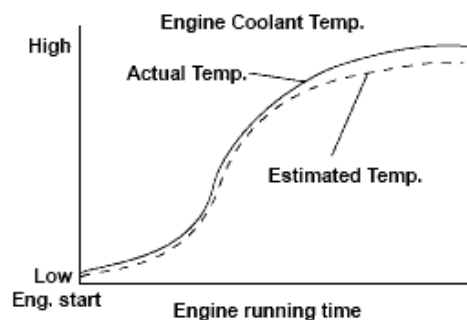
The MIL, the DTC, the Temporary DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P0128 (87): ADVANCED DIAGNOSTICS

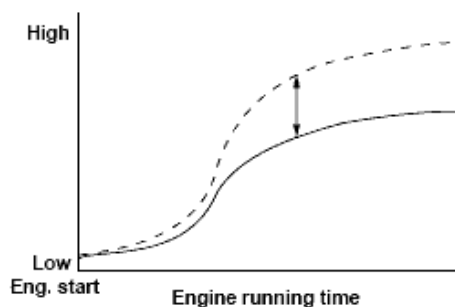
DTC P0128: COOLING SYSTEM MALFUNCTION

Engine Coolant Temperature of Engine Block (ECT 1)

Normal Operation

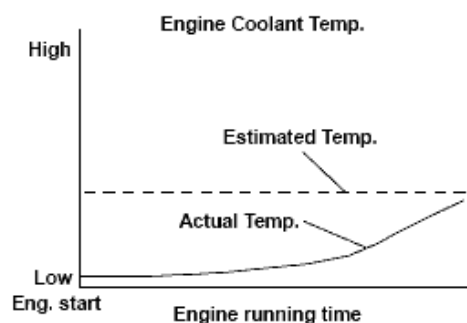


System Failure

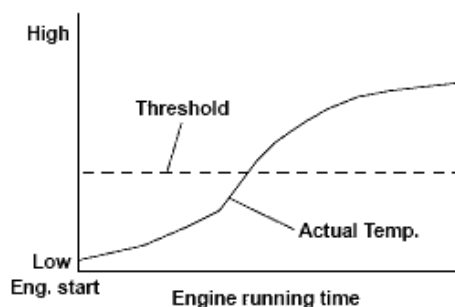


Engine Coolant Temperature of Radiator (ECT 2)

Normal Operation



System Failure



P0128-0570

Fig. 18: Cooling System - Operation Diagram

General Description

The thermostat is closed when the engine coolant temperature is low, and it stops the circulation of engine coolant to speed engine warm up. When the engine coolant temperature increases, the thermostat opens and circulates engine coolant to control its temperature. When the engine coolant temperature decreases, the opening area of the thermostat is reduced to regulate the engine coolant temperature. If the thermostat sticks open, engine warm up is delayed, and exhaust emissions are adversely affected. The engine control module (ECM)/powertrain control module (PCM) measures the rise in the coolant temperature after the engine starts at the engine block and at the radiator, and it estimates the characteristics of the engine coolant temperature by calculations based on those two temperatures and the driving conditions. When ECT 2 immediately increases from the starting value, it is defined as the thermostat stuck open. When ECT 2 does not increase to the specified value, it is defined as a thermostat malfunction.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Once per driving cycle
Sequence	None
Duration	Depending on driving conditions
DTC Type	Two drive cycles, MIL ON

OBD Status	PASSED/FAILED/NOT COMPLETED (STILL TESTING)
------------	---

Enable Conditions**ENABLE CONDITIONS**

Condition	Minimum	Maximum
Engine off time	6 hours	-
Initial engine coolant temperature (ECT 1)	19°F (-7°C) ⁽³⁾	123°F (50°C)
	20°F (-6°C) ⁽⁴⁾	
Initial engine coolant temperature (ECT 2)	19°F (-7°C) ⁽³⁾	-
	20°F (-6°C) ⁽⁴⁾	
Initial intake air temperature	19°F (-7°C) ⁽³⁾	-
	20°F (-6°C) ⁽⁴⁾	
The difference between initial intake air temperature and current intake air temperature	-	1°F (1°C) ⁽¹⁾
		3°F (2°C) ⁽²⁾
No active DTCs	P0107, P0108, P0111, P0112, P0113, P0116, P0117, P0118, P0122, P0123, P0125, P0134, P0135, P0154, P0155, P0171, P0172, P0174, P0175, P0222, P0223, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0335, P0339, P0340, P0344, P0401, P0404, P0443, P0496, P0497, P0506, P0507, P0627, P1077, P1078, P1116, P1128, P1129, P1172, P1174, P145C, P2101, P2108, P2118, P2122, P2123, P2127, P2128, P2135, P2138, P2176, P2183, P2184, P2185, P2195, P2197, P2227, P2228, P2229, P2237, P2238, P2240, P2241, P2243, P2245, P2247, P2249, P2251, P2252, P2254, P2255, P2413, P2610, P2627, P2628, P2630, P2631, P2646, P2647, P2648, P2649, U0107	
(1) Intake air temperature decrease judgement when there is no driving record of 25 mph (40 km/h) in this drive cycle.		
(2) Intake air temperature decrease judgement when there is a driving record of 25 mph (40 km/h) in this drive cycle.		
(3) J32A3 engine		
(4) J35A8 engine		

Malfunction Threshold**Malfunction determination 1:**

If the difference between the current measured coolant temperature at the radiator (ECT 2) and the initial coolant temperature at the radiator (ECT 2) is at least 49°F (9°C)^{*1}, 51°F (11°C)^{*2} when the calculated coolant temperature at the engine (ECT 1) reaches 159°F (71°C), a malfunction is detected (thermostat stuck open); or if the coolant temperature at the radiator (ECT 2) only reaches 68°F (20°C), a malfunction is detected (thermostat malfunction).

Malfunction determination 2:

When the calculated engine coolant temperature (ECT 1) reaches 158°F (70°C) before the measured engine coolant temperature (ECT 1) reaches 158°F (70°C), a malfunction is detected.

Driving Pattern

1. Start the engine under the conditions specified under Enable Conditions.
2. Drive the vehicle at a speed between 15 - 75 mph (24 - 120 km/h) for at least 10 minutes.
 - Drive the vehicle in this manner only if the traffic regulations and ambient conditions allow.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected during the first drive cycle with the ECT and IAT at engine start-up within the specified temperature range, a Temporary DTC is stored in the ECM/PCM memory. If the malfunction recurs during the next (second) drive cycle with the ECT and IAT at engine start-up within the specified temperature range, the MIL comes on and the DTC and the freeze frame data are stored.

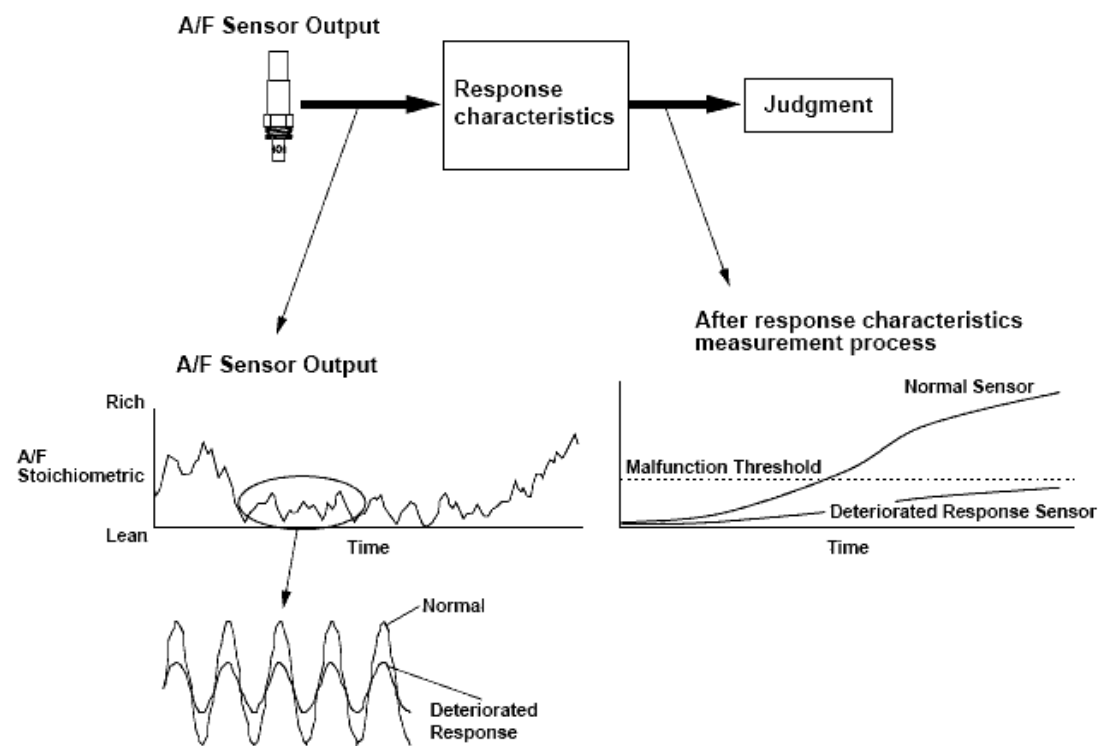
Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, the Temporary DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P0133 (157): ADVANCED DIAGNOSTICS (J32A3)

**DTC P0133: REAR AIR/FUEL RATIO (A/F) SENSOR (BANK 1, SENSOR 1)
MALFUNCTION/SLOW RESPONSE (J32A3)**



P0133-0570

Fig. 19: Rear Air/Fuel Ratio Sensor (Bank 1, Sensor 1) Signal Output (J32A3)

General Description (J32A3)

The rear air/fuel ratio (A/F) sensor (bank 1, sensor 1) has a linear signal output in relation to the oxygen concentration. The powertrain control module (PCM) computes the air/fuel ratio from the rear A/F sensor output voltage and uses fuel feedback control to improve exhaust emissions. The PCM measures the response characteristics against the rear A/F sensor output, and if the average inversion cycle time is less than the specified value, it detects a deteriorated response and stores a DTC.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status (J32A3)

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Once per driving cycle
Sequence	None
Duration	7.5 seconds or more
DTC Type	Two drive cycles, MIL ON
OBD Status	PASSED/FAILED/EXECUTING/OUT OF (TEST) CONDITION

Enable Conditions (J32A3)

ENABLE CONDITIONS

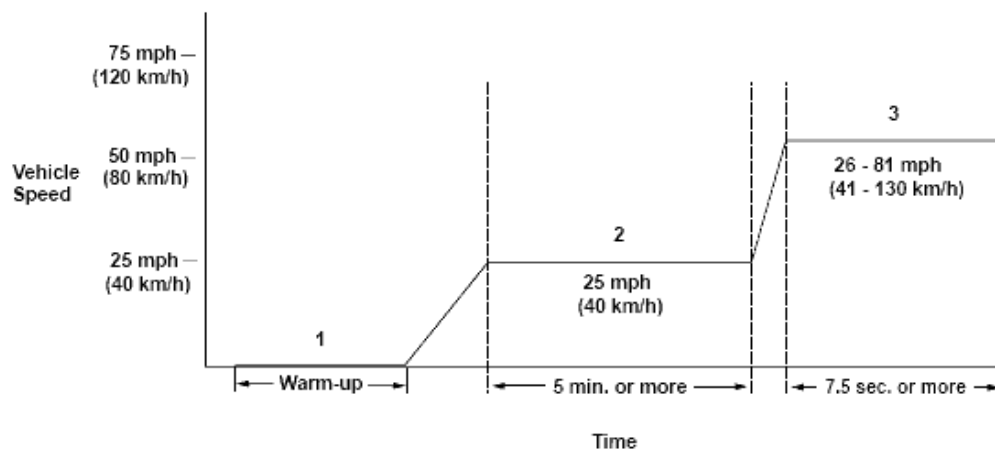
Condition	Minimum	Maximum
Engine coolant temperature	156°F (69°C)	-
Intake air temperature	8°F (-13°C)	-
Engine speed	1,250 rpm	2,185 rpm
	1,250 rpm	47 kPa (13.8 in.Hg, 350

MAP value	2,000 rpm	mmHg) 27 kPa (7.9 in.Hg, 200 mmHg)	73 kPa (21.6 in.Hg, 550 mmHg)
Vehicle speed		33 mph (52 km/h)	-
Fuel trim		0.73	1.47
Fuel feedback		Closed loop at stoichiometric	
Monitoring priority		P0456, P0457, P0497	
No active DTCs		P0107, P0108, P0112, P0113, P0117, P0118, P0134, P0135, P0171, P0172, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0335, P0339, P0340, P0344, P0401, P0404, P0443, P0496, P0497, P0627, P1077, P1078, P1128, P1129, P1172, P145C, P2195, P2227, P2228, P2229, P2237, P2238, P2243, P2245, P2251, P2252, P2413, P2627, P2628, P2646, P2647, P2648, P2649, P2A00	
Other		Without excessive load change	

Malfunction Threshold (J32A3)

The average of up to 28 periods of the rear A/F sensor (bank 1, sensor 1) inversion cycle is at least 7.5 seconds.

Driving Pattern (J32A3)



P0133-0850

Fig. 20: Vehicle Speed Driving Pattern

1. Start the engine. Hold the engine speed at 3,000 rpm without load (in Park or neutral) until the radiator fan comes on.
 2. Drive the vehicle at a steady speed up to 25 mph (40 km/h), for at least 5 minutes.
 3. Then, drive immediately at a steady speed between 26 - 81 mph (41 - 130 km/h) for at least 7.5 seconds.
- If the EVAP monitor runs instead of the HO2S monitor, turn the engine off, then restart it, and the HO2S monitor will restart.

- Drive the vehicle in this manner only if the traffic regulations and ambient conditions allow.

Diagnosis Details (J32A3)

Conditions for illuminating the MIL (J32A3)

When a malfunction is detected during the first drive cycle, a Temporary DTC is stored in the PCM memory. If the malfunction recurs during the next (second) drive cycle, the MIL comes on and the DTC and the freeze frame data are stored.

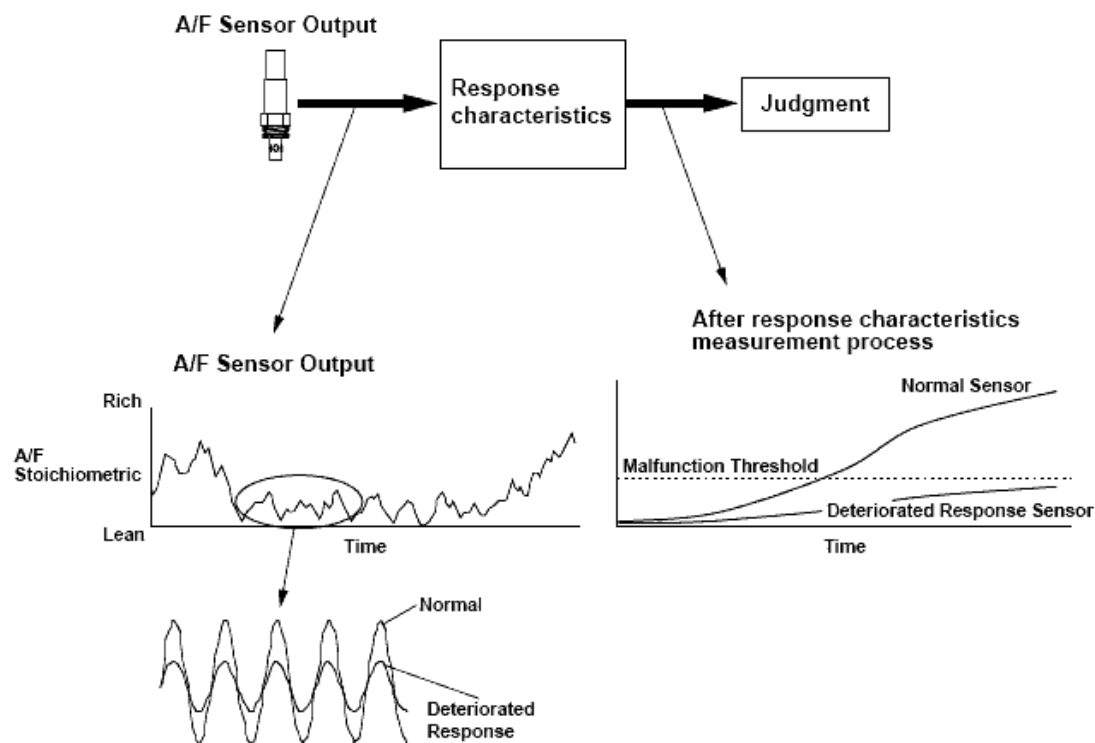
Conditions for clearing the MIL (J32A3)

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, the Temporary DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P0133 (157): ADVANCED DIAGNOSTICS (J35A8)

DTC P0133: REAR AIR/FUEL RATIO (A/F) SENSOR (BANK 1, SENSOR 1) MALFUNCTION/SLOW RESPONSE (J35A8)



P0133-0570

Fig. 21: Rear Air/Fuel Ratio Sensor (Bank 1, Sensor 1) Heater System Malfunction Determination (J35A8)

General Description (J35A8)

The rear air/fuel ratio (A/F) sensor (bank 1, sensor 1) has a linear signal output in relation to the oxygen concentration. The engine control module (ECM)/powertrain control module (PCM) computes the air/fuel ratio from the rear A/F sensor output voltage and uses fuel feedback control to improve exhaust emissions. The ECM/PCM measures the response characteristics against the rear A/F sensor output, and if the average inversion cycle time is less than the specified value, it detects a deteriorated response and stores a DTC.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status (J35A8)

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Once per driving cycle
Sequence	None
Duration	6.8 seconds or more
DTC Type	Two drive cycles, MIL ON
OBD Status	PASSED/FAILED/EXECUTING/OUT OF (TEST) CONDITION

Enable Conditions (J35A8)

ENABLE CONDITIONS

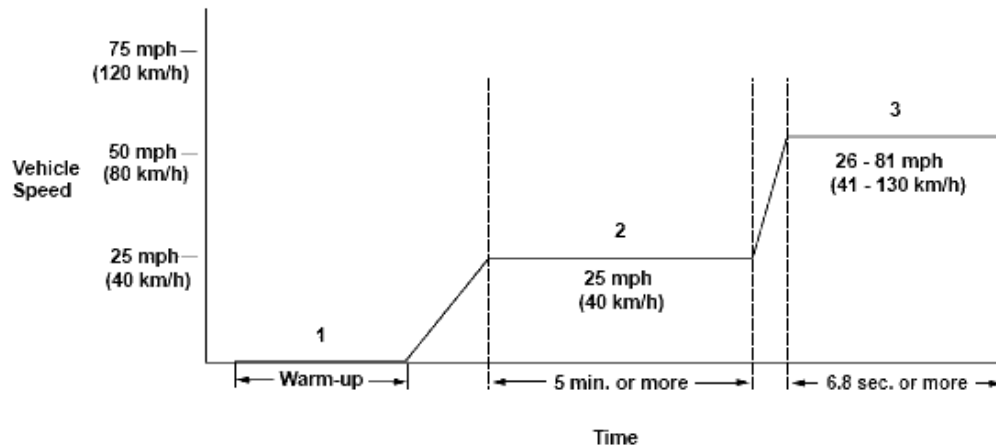
Condition		Minimum	Maximum
Engine coolant temperature		156°F (69°C)	-
Intake air temperature		8°F (-13°C)	-
Engine speed	A/T	1,250 rpm	2,200 rpm
	M/T		2,500 rpm
MAP value	1,250 rpm	47 kPa (13.8 in.Hg, 350 mmHg)	69 kPa (20.4 in.Hg, 520 mmHg) ⁽¹⁾
			73 kPa (21.6 in.Hg, 550 mmHg) ⁽²⁾
	2,000 rpm	27 kPa (7.9 in.Hg, 200 mmHg)	69 kPa (20.4 in.Hg, 520 mmHg) ⁽¹⁾
			73 kPa (21.6 in.Hg, 550 mmHg) ⁽²⁾
Vehicle speed		33 mph (52 km/h)	-
Fuel trim		0.73	1.47
Fuel feedback		Closed loop at stoichiometric	
Monitoring priority		P0456, P0457, P0497	
No active DTCs		P0107, P0108, P0112, P0113, P0117, P0118, P0134, P0135, P0171, P0172, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0335, P0339, P0340, P0344, P0401, P0404, P0443, P0496, P0497, P0627, P1077, P1078, P1128, P1129, P1172, P145C, P2195, P2227, P2228, P2229, P2237, P2238, P2243, P2245, P2251, P2252, P2413, P2627, P2628, P2646, P2647, P2648, P2649, P2A00	
Other		Without excessive load change	

(1) A/T model

(2) M/T model

Malfunction Threshold (J35A8)

The average of up to 11 periods of the rear A/F sensor (bank 1, sensor 1) inversion cycle is at least 6.8 seconds.

Driving Pattern (J35A8)

P0133-0651

Fig. 22: Vehicle Speed Driving Pattern

1. Start the engine. Hold the engine speed at 3,000 rpm without load (in Park or neutral) until the radiator fan comes on.
 2. Drive the vehicle at a steady speed up to 25 mph (40 km/h), for at least 5 minutes.
 3. Then, drive immediately at a steady speed between 26 - 81 mph (41 - 130 km/h) for at least 6.8 seconds.
- If the EVAP monitor runs instead of the HO2S monitor, turn the engine off, then restart it, and the HO2S monitor will restart.
 - Drive the vehicle in this manner only if the traffic regulations and ambient conditions allow.

Diagnosis Details (J35A8)**Conditions for illuminating the MIL (J35A8)**

When a malfunction is detected during the first drive cycle, a Temporary DTC is stored in the ECM/PCM memory. If the malfunction recurs during the next (second) drive cycle, the MIL comes on and the DTC and the freeze frame data are stored.

Conditions for clearing the MIL (J35A8)

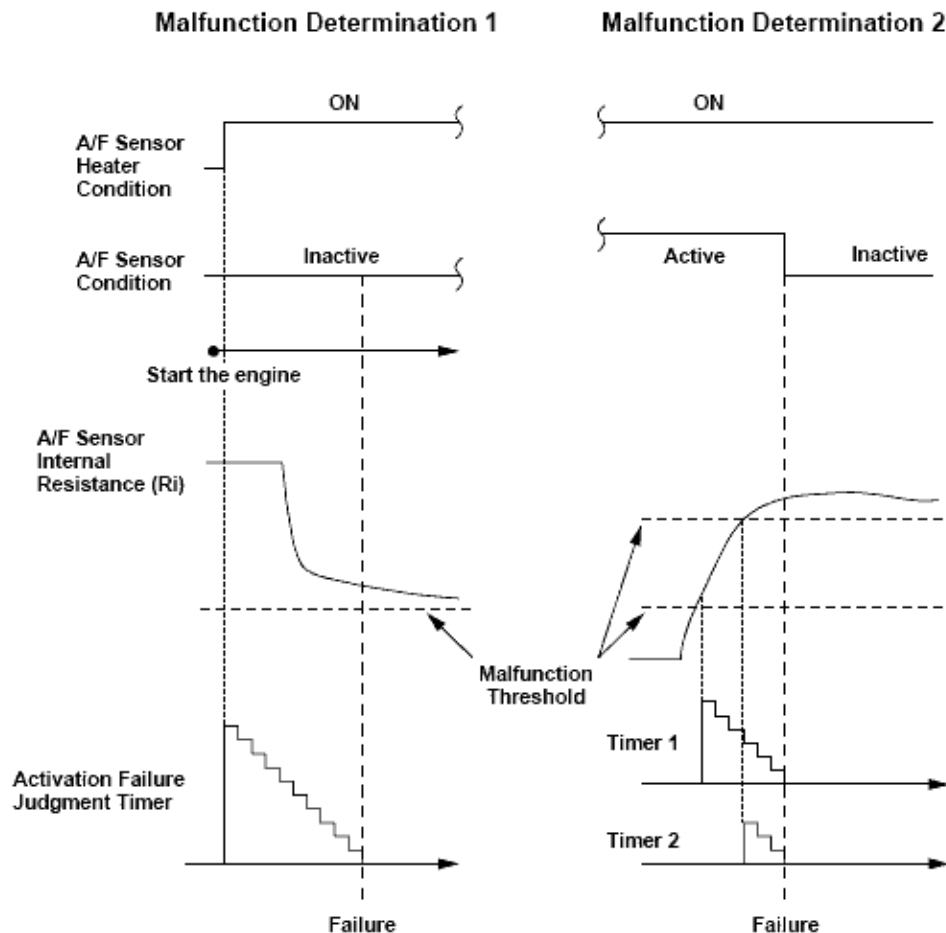
The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, the Temporary DTC, and the freeze frame data can be cleared by using the scan tool

Clear command or by disconnecting the battery.

DTC P0134 (151): ADVANCED DIAGNOSTICS

DTC P0134: REAR AIR/FUEL RATIO (A/F) SENSOR (BANK 1, SENSOR 1) HEATER SYSTEM MALFUNCTION



P0134-0870

Fig. 23: Rear Air/Fuel Ratio Sensor (Bank 1, Sensor 1) Heater System Malfunction Determination

General Description

The rear air/fuel ratio (A/F) sensor (bank 1, sensor 1) is activated by warming the element with the heater and by maintaining it at a steady high temperature to accurately calculate the air/fuel (A/F) ratio. The rear A/F sensor does not become active when the element is not properly heated due to a heater malfunction, and the exhaust emissions deteriorate. The engine control module (ECM)/powertrain control module (PCM) monitors the rear A/F sensor internal resistance.

1. When the rear A/F sensor does not activate within a set time after the rear A/F sensor heater starts to warm up (with high rear A/F sensor internal resistance), a malfunction of the rear A/F sensor heater is detected, and a DTC is stored.
2. When the rear A/F sensor heater cycles ON and OFF within a set time, and the resistance remains high when the heater is ON, a malfunction in the rear A/F sensor heater is detected, and a DTC is

stored.

Because the effect on engine control differs according to the rear A/F sensor internal resistance, there are two types of malfunction detection threshold levels. When either one is reached, a malfunction is detected.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
Sequence	None
Duration	40 seconds or more
DTC Type	Two drive cycles, MIL ON
OBD Status	PASSED/FAILED/NOT COMPLETED (STILL TESTING)

Enable Conditions

ENABLE CONDITIONS

Condition	Minimum	Maximum
Battery voltage	10.5 V	-
Fuel feedback	Other than during fuel cut-off operation	
No active DTCs	P0135, P1172, P2195, P2237, P2238, P2243, P2245, P2251, P2252, P2627, P2628	

Malfunction Threshold

Malfunction determination 1

The rear A/F sensor (bank 1, sensor 1) internal resistance value is 110 ohms or more for at least 40 seconds right after the engine starts.

Malfunction determination 2

- The rear A/F sensor (bank 1, sensor 1) internal resistance value is 110 ohms or more for at least 15 seconds.
- The rear A/F sensor (bank 1, sensor 1) internal resistance value is 200 ohms or more for at least 1 second.

Driving Pattern

Start the engine, then let it idle for at least 1 minute.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected during the first drive cycle, a Temporary DTC is stored in the ECM/PCM memory. If the malfunction recurs during the next (second) drive cycle, the MIL comes on and the DTC and the freeze frame data are stored.

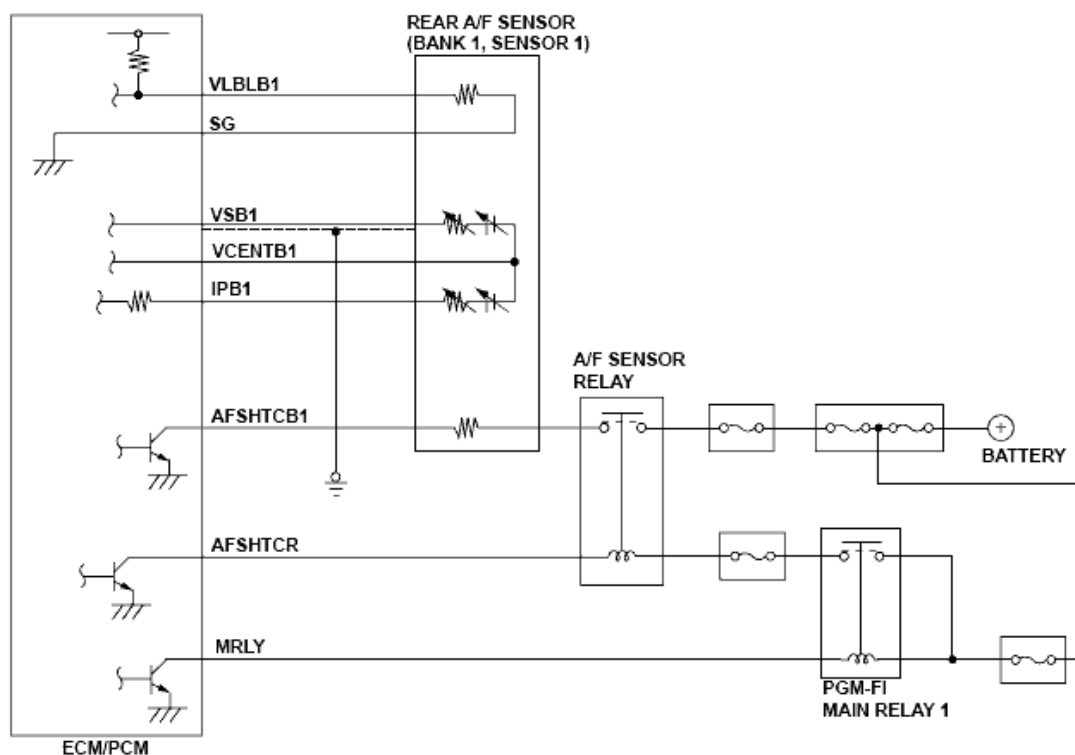
Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, the Temporary DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P0135 (151): ADVANCED DIAGNOSTICS

DTC P0135: REAR AIR/FUEL RATIO (A/F) SENSOR (BANK 1, SENSOR 1) HEATER CIRCUIT MALFUNCTION



P0135-0703

Fig. 24: Rear Air/Fuel Ratio Sensor (Bank 1, Sensor 1) Heater - Circuit Diagram

General Description

The rear air/fuel ratio (A/F) sensor (bank 1, sensor 1) is installed in the exhaust manifold, and it detects oxygen content in the exhaust gas. The rear A/F sensor outputs voltage to the engine control module (ECM)/powertrain control module (PCM). The ECM/PCM controls fuel injection time by comparing the target air/fuel ratio with the rear A/F sensor signal. The sensor includes the VS cell, the pump cell, the atmospheric reference cavity, the diffusion layer, and the heater, and it enables overall feedback control. The heater is controlled by the ECM/PCM and is energized when the sensor element temperature is low. It heats the sensor to stabilize the detection of oxygen content. The ECM/PCM monitors the rear A/F sensor heater output (return check). A malfunction is detected if the return signals do not meet the command value (for heater activation) in the ECM/PCM for a set time, and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
Sequence	None
Duration	2 seconds or more
DTC Type	One drive cycle, MIL ON
OBD Status	PASSED/FAILED/NOT COMPLETED (STILL TESTING)

Enable Conditions**ENABLE CONDITIONS**

Condition	
State of the engine	Running
Other	During rear A/F sensor heater operation

Malfunction Threshold

One of these conditions must be met for at least 2 seconds.

- No return signal "HIGH" is detected when the ECM/PCM output duty is less than 20%.
- Return signal does not change when the ECM/PCM output duty is more than 20% and less than 80%.
- No return signal "LOW" is detected when the ECM/PCM output duty is more than 80%.

Driving Pattern

Start the engine. Hold the engine speed at 3,000 rpm without load (in Park or neutral) until the radiator fan comes on, then let it idle.

Diagnosis Details**Conditions for illuminating the MIL**

When a malfunction is detected, the MIL comes on and the DTC and the freeze frame data are stored in the ECM/PCM memory.

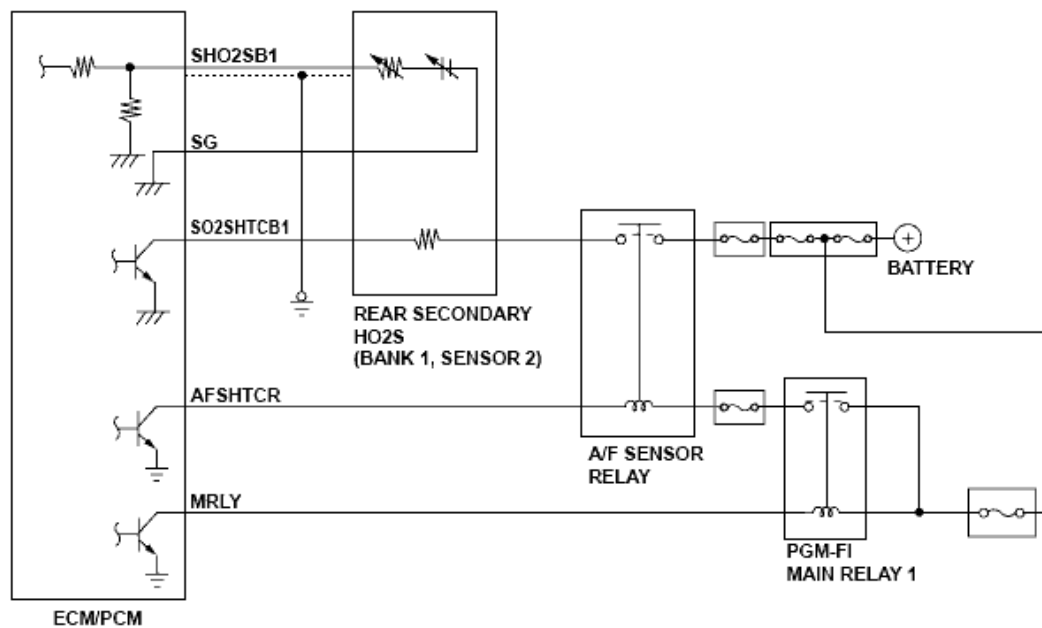
Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

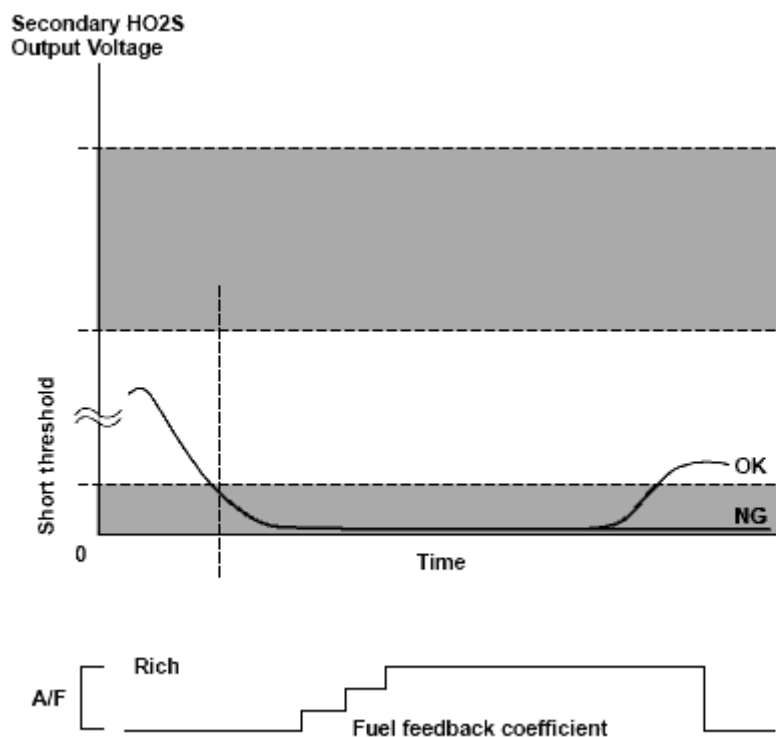
DTC P0137 (161): ADVANCED DIAGNOSTICS

DTC P0137: REAR SECONDARY HEATED OXYGEN SENSOR (SECONDARY HO₂S (BANK 1, SENSOR 2)) CIRCUIT LOW VOLTAGE



P0137-0702

Fig. 25: Rear Secondary Heated Oxygen Sensor (Secondary HO2S (Bank 1, Sensor 2)) Low Voltage - Circuit Diagram



P0137-0570

Fig. 26: Rear Secondary Heated Oxygen Sensor Output Voltage Graph

General Description

The rear secondary heated oxygen sensor (HO2S) (bank 1, sensor 2) detects the oxygen content in the exhaust gas downstream of the three way catalytic converter (TWC) during stoichiometric air/fuel ratio

feedback control. The rear secondary HO2S controls the air/fuel ratio from the rear A/F sensor output voltage so that the TWC efficiency is optimized. After current is applied to the rear secondary HO2S heater, if the rear secondary HO2S output continues low (lean) during feedback control, a malfunction is detected and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
Sequence	None
Duration	40 seconds or more
DTC Type	Two drive cycles, MIL ON
OBD Status	PASSED/FAILED/EXECUTING/OUT OF (TEST) CONDITION

Enable Conditions

ENABLE CONDITIONS

Condition	Minimum	Maximum
Elapsed time that secondary HO2S activity is not monitored after starting the engine	20 seconds	-
Engine coolant temperature	156°F (69°C)	-
Intake air temperature	8°F (-13°C)	-
Fuel trim	0.73	1.47
Fuel feedback	Closed loop	
No active DTCs	P0107, P0108, P0112, P0113, P0117, P0118, P0133, P0134, P0135, P0141, P0171, P0172, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0340, P0344, P0401, P0404, P0443, P0496, P0497, P0627, P1077, P1078, P1128, P1129, P1172, P145C, P2195, P2237, P2238, P2243, P2245, P2251, P2252, P2413, P2627, P2628, P2646, P2647, P2648, P2649, P2A00	
Other	Other than at idle	

Malfunction Threshold

The rear secondary HO2S output voltage is 0.05 V or less for at least 40 seconds.

Driving Pattern

1. Start the engine. Let it idle until the radiator fan comes on.
2. Then, drive immediately at a steady engine speed between 1,500 - 3,000 rpm for at least 1 minute.
 - Drive the vehicle in this manner only if the traffic regulations and ambient conditions allow.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected during the first drive cycle, a Temporary DTC is stored in the ECM/PCM

memory. If the malfunction recurs during the next (second) drive cycle, the MIL comes on and the DTC and the freeze frame data are stored.

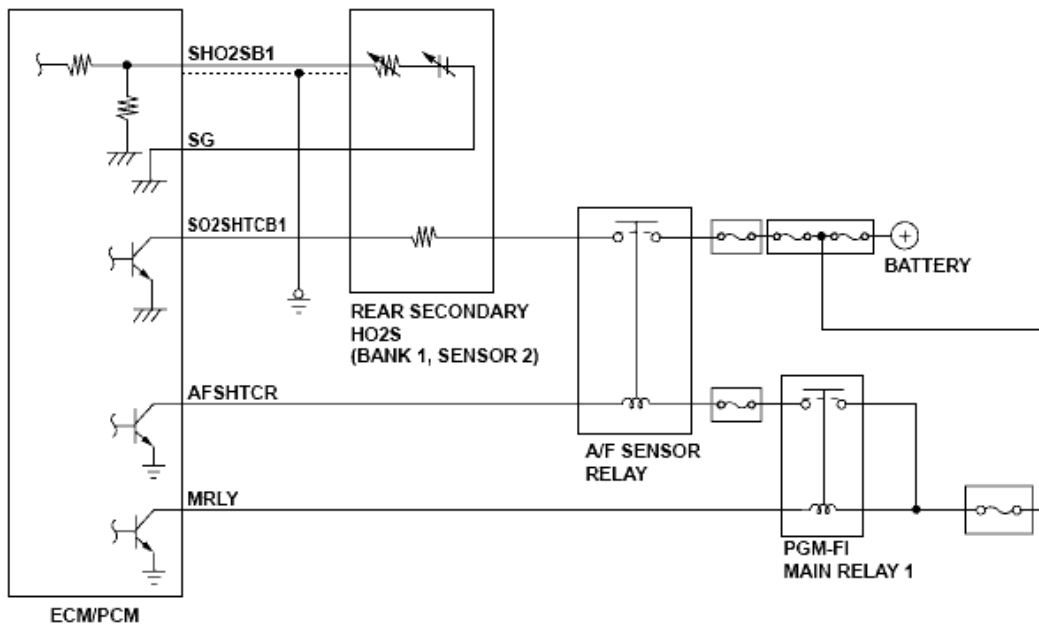
Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, the Temporary DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

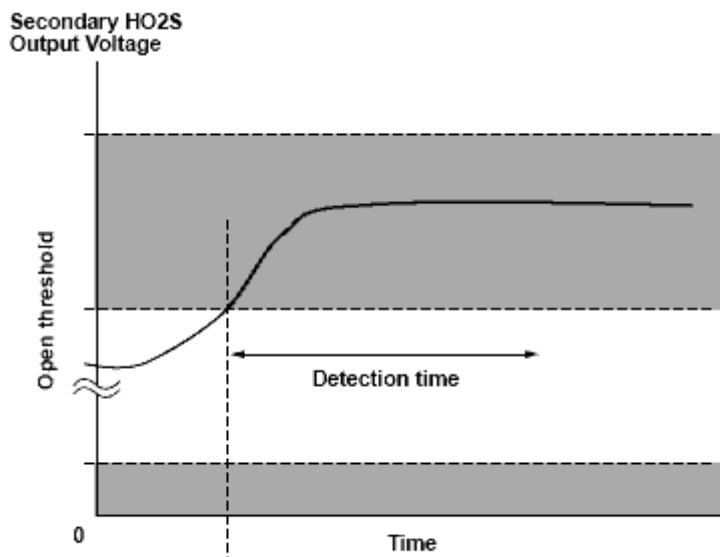
DTC P0138 (161): ADVANCED DIAGNOSTICS

DTC P0138: REAR SECONDARY HEATED OXYGEN SENSOR (SECONDARY HO2S (BANK 1, SENSOR 2)) CIRCUIT HIGH VOLTAGE



P0137-0702

Fig. 27: Rear Secondary Heated Oxygen Sensor (Secondary HO2S (Bank 1, Sensor 2)) High Voltage - Circuit Diagram



P0138-0570

Fig. 28: Rear Secondary Heated Oxygen Sensor Output Voltage Graph

General Description

The rear secondary heated oxygen sensor (HO2S) (bank 1, sensor 2) detects the oxygen content in the exhaust gas downstream of the three way catalytic converter (TWC) during stoichiometric air/fuel ratio feedback control. The rear secondary HO2S controls the air/fuel ratio from the rear A/F sensor output voltage to optimize TWC efficiency. After current is applied to the rear secondary HO2S heater, if the rear secondary HO2S output continues high (rich) exceeding the upper limit used during feedback control, a malfunction is detected and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
Sequence	None
Duration	5 seconds or more
DTC Type	Two drive cycles, MIL ON
OBD Status	PASSED/FAILED/EXECUTING/OUT OF (TEST) CONDITION

Enable Conditions

ENABLE CONDITIONS

Condition	Minimum	Maximum
Elapsed time that secondary HO2S activity is not monitored after starting the engine	20 seconds	-
Engine coolant temperature	156°F (69°C)	-
Intake air temperature	8°F (-13°C)	-
Fuel trim	0.73	1.47
Fuel feedback	Closed loop	

No active DTCs	P0107, P0108, P0112, P0113, P0117, P0118, P0133, P0134, P0135, P0141, P0171, P0172, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0340, P0344, P0401, P0404, P0443, P0496, P0497, P0627, P1077, P1078, P1128, P1129, P1172, P145C, P2195, P2237, P2238, P2243, P2245, P2251, P2252, P2413, P2627, P2628, P2646, P2647, P2648, P2649, P2A00
Other	Other than at idle

Malfunction Threshold

The rear secondary HO2S output voltage is 1.270 V or more for at least 5 seconds.

Driving Pattern

1. Start the engine. Let it idle until the radiator fan comes on.
2. Then, drive immediately at a steady engine speed between 1,500 - 3,000 rpm for at least 1 minute.
 - Drive the vehicle in this manner only if the traffic regulations and ambient conditions allow.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected during the first drive cycle, a Temporary DTC is stored in the ECM/PCM memory. If the malfunction recurs during the next (second) drive cycle, the MIL comes on and the DTC and the freeze frame data are stored.

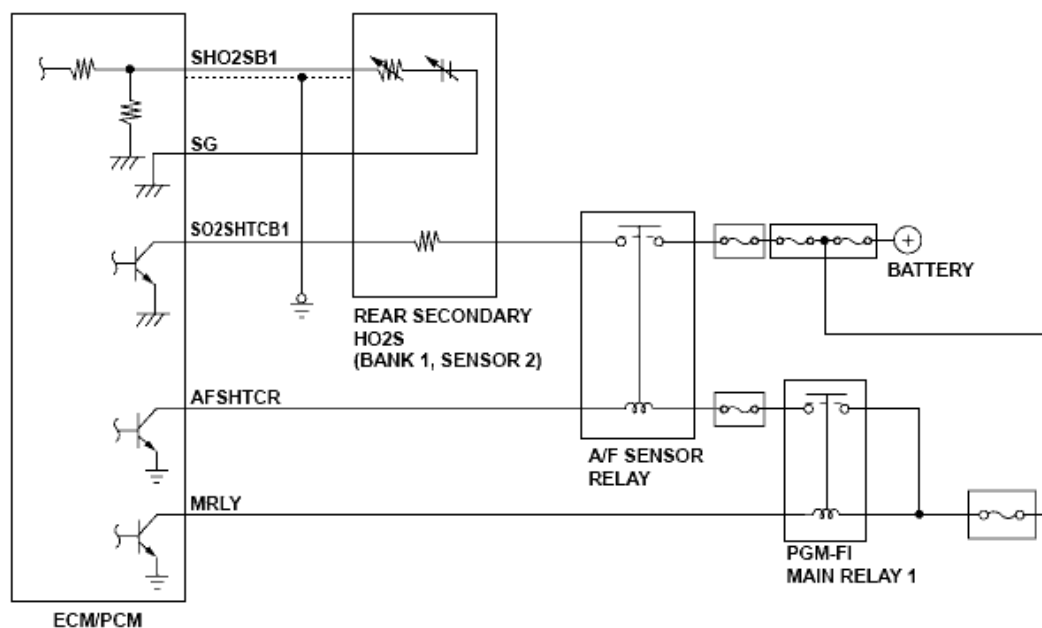
Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, the Temporary DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

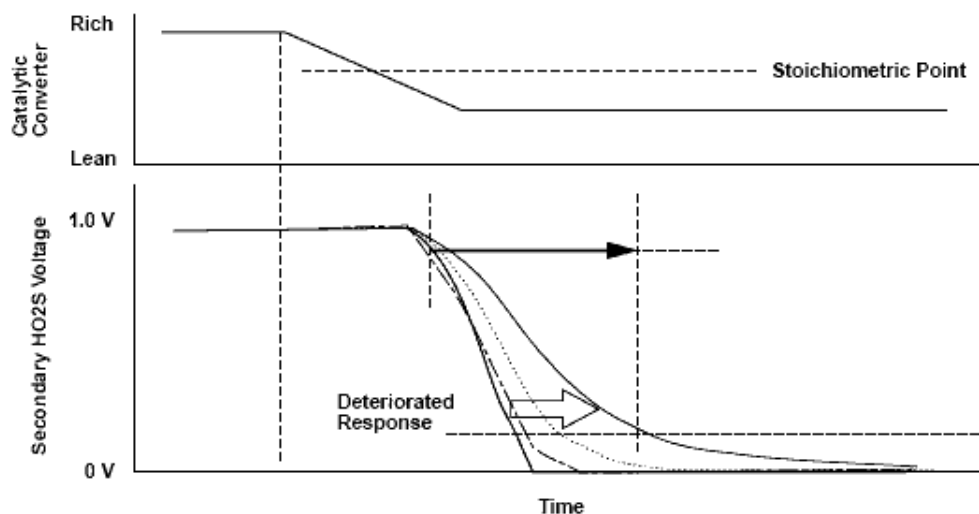
DTC P0139 (161): ADVANCED DIAGNOSTICS

DTC P0139: REAR SECONDARY HEATED OXYGEN SENSOR (SECONDARY HO2S (BANK 1, SENSOR 2)) CIRCUIT SLOW RESPONSE



P0137-0702

Fig. 29: Rear Secondary Heated Oxygen Sensor (Secondary HO2S (Bank 1, Sensor 2)) - Circuit Diagram



P0139-0570

Fig. 30: Rear Secondary Heated Oxygen Sensor Output Voltage Graph

General Description

The rear secondary heated oxygen sensor (HO2S) (bank 1, sensor 2) detects the oxygen content in the exhaust gas downstream of the three way catalytic converter (TWC) during stoichiometric air/fuel ratio feedback control. The rear secondary HO2S controls the air/fuel ratio with the rear A/F sensor output voltage to optimize TWC efficiency.

If the response time of the rear secondary HO2S becomes longer than the specified time after current to the secondary HO2S heater is applied, a malfunction is detected and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status**MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS**

Execution	Once per driving cycle
Sequence	None
Duration	20.7 ⁽²⁾ , 23.4 ⁽¹⁾ seconds or less
DTC Type	Two drive cycles, MIL ON
OBD Status	PASSED/FAILED/EXECUTING/OUT OF (TEST) CONDITION
(1) J32A3 engine	
(2) J35A8 engine	

Enable Conditions**ENABLE CONDITIONS**

Condition	Minimum	Maximum
Elapsed time that secondary HO2S activity is not monitored after starting the engine	20 seconds	-
Elapsed time after fuel cut-off	-	150 seconds
Engine coolant temperature	156°F (69°C)	-
Intake air temperature	8°F (-13°C)	-
Engine speed	1,200 rpm ⁽¹⁾	2,000 rpm ⁽¹⁾
	1,250 rpm *1	2,050 rpm *1
	1,600 rpm ⁽²⁾	2,300 rpm ⁽²⁾
MAP value	22 kPa (6.3 in.Hg, 160 mmHg)	66 kPa (19.6 in.Hg, 500 mmHg) *2
		73 kPa (21.6 in.Hg, 550 mmHg) *1
Vehicle speed	30 mph (48 km/h)	-
Fuel trim	0.73	1.47
Fuel feedback	Closed loop	
No active DTCs	P0107, P0108, P0111, P0112, P0113, P0117, P0118, P0133, P0134, P0135, P0137, P0138, P0141, P0171, P0172, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0335, P0339, P0340, P0344, P0401, P0404, P0443, P0496, P0497, P0627, P1077, P1078, P1128, P1129, P1172, P145C, P2195, P2237, P2238, P2243, P2245, P2251, P2252, P2270, P2271, P2413, P2627, P2628, P2646, P2647, P2648, P2649, P2A00	
(1) J35A8 engine, A/T model		
(2) J35A8 engine, M/T model		

Malfunction Threshold

1. When the rear secondary HO2S output drops to the response deterioration judgment threshold value

and the response characteristics measurement is finished.

MALFUNCTION THRESHOLD

MIN	0.77 seconds
MAX	2.00 ^{*2} , 4.35 ^{*1} seconds

2. The voltage does not drop to the response deterioration judgment threshold value after a predetermined time (2.00^{*2} , 4.35^{*1} seconds) has elapsed.

Driving Pattern

1. Start the engine. Let it idle until the radiator fan comes on.
2. Then, drive immediately at a steady speed of 35 mph (57 km/h) or more for at least 20.7^{*2} , 23.4^{*1} seconds.
 - Drive the vehicle in this manner only if the traffic regulations and ambient conditions allow.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected during the first drive cycle, a Temporary DTC is stored in the ECM/PCM memory. If the malfunction recurs during the next (second) drive cycle, the MIL comes on and the DTC and the freeze frame data are stored.

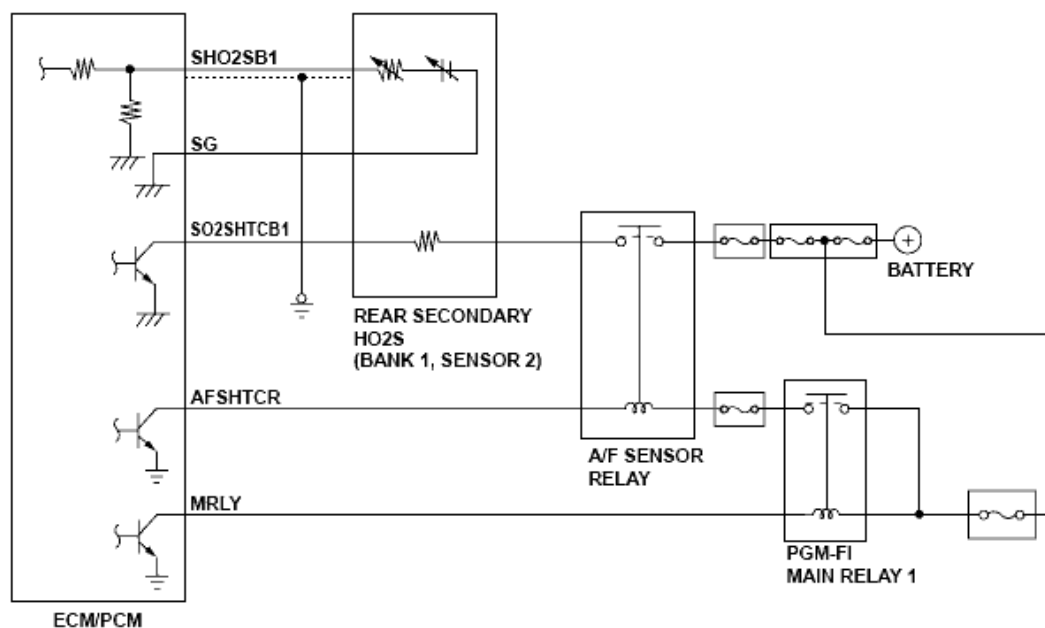
Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, the Temporary DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P0141 (163): ADVANCED DIAGNOSTICS

DTC P0141: REAR SECONDARY HEATED OXYGEN SENSOR (SECONDARY HO2S (BANK 1, SENSOR 2)) HEATER CIRCUIT MALFUNCTION



P0137-0702

Fig. 31: Rear Secondary Heated Oxygen Sensor (Secondary HO2S (Bank 1, Sensor 2)) Heater - Circuit Diagram

General Description

A heater for the zirconia element is embedded in the rear secondary heated oxygen sensor (rear secondary HO2S (bank 1, sensor 2)), and it is controlled by the engine control module (ECM)/powertrain control module (PCM). When activated, it heats the sensor to stabilize and speed up the detection of oxygen content when the exhaust gas temperature is cold. If the rear secondary HO2S heater draws more or less than a specified amperage, the ECM/PCM detects a malfunction and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
Sequence	None
Duration	5 seconds or more
DTC Type	One drive cycle, MIL ON
OBD Status	PASSED/FAILED/NOT COMPLETED (STILL TESTING)

Enable Conditions

ENABLE CONDITIONS

Condition	Minimum	Maximum
Battery voltage (IGP terminal of ECM/PCM)	10.5 V	16 V
State of the engine	Running	
No active DTCs	P0117, P0118	

Malfunction Threshold

The rear secondary HO₂S heater output is 0.38 A or less, or 3.33 A or more, for at least 5 seconds when the heater is on.

Driving Pattern

1. Start the engine. Let it idle until the radiator fan comes on.
2. Drive the vehicle at a steady speed of 35 mph (57 km/h) or more for at least 5 seconds.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected, the MIL comes on and the DTC and the freeze frame data are stored in the ECM/PCM memory.

Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P0153 (163): ADVANCED DIAGNOSTICS (J32A3)

DTC P0153: FRONT AIR/FUEL RATIO (A/F) SENSOR (BANK 2, SENSOR 1) MALFUNCTION/SLOW RESPONSE (J32A3)

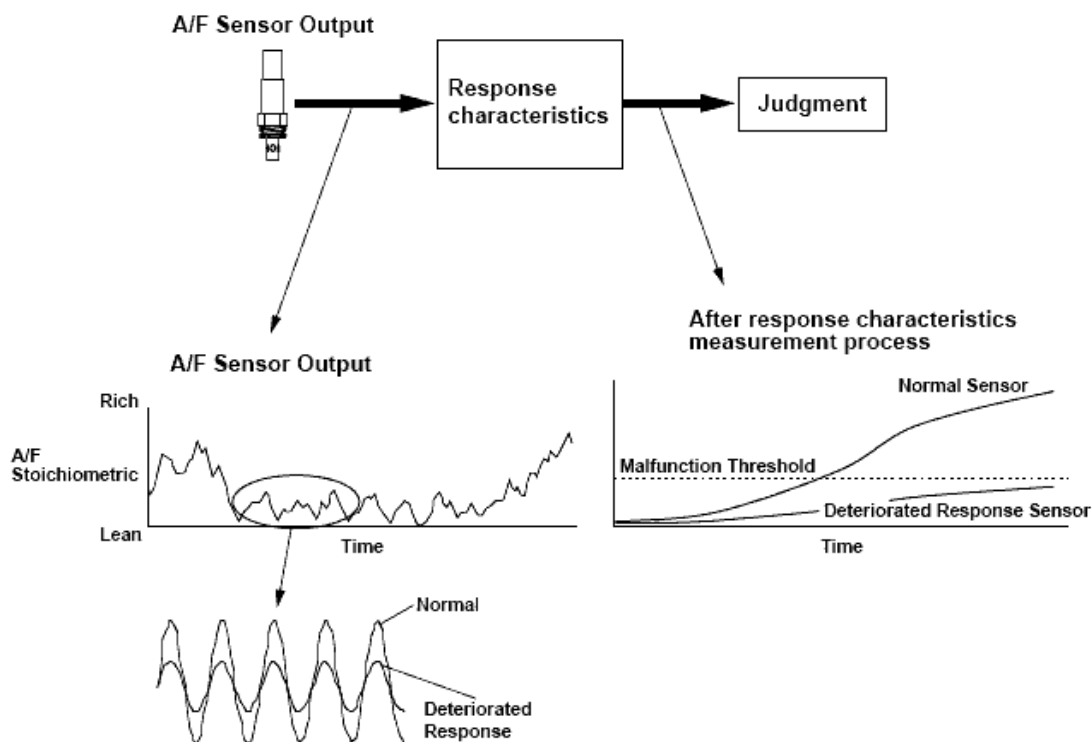


Fig. 32: Front Air/Fuel Ratio Sensor (Bank 2, Sensor 1) Signal Output (J32A3)**General Description (J32A3)**

The front air/fuel ratio (A/F) sensor (bank 2, sensor 1) has a linear signal output in relation to the oxygen concentration. The powertrain control module (PCM) computes the air/fuel ratio from the front A/F sensor output voltage and uses fuel feedback control to improve exhaust emissions. The PCM measures the response characteristics against the front A/F sensor output, and if the accumulated value within the specified time is less than the specified value, it detects a deteriorated response and stores a DTC.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status (J32A3)**MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS**

Execution	Once per driving cycle
Sequence	None
Duration	7.5 seconds or more
DTC Type	Two drive cycles, MIL ON
OBD Status	PASSED/FAILED/EXECUTING/OUT OF (TEST) CONDITION

Enable Conditions (J32A3)**ENABLE CONDITIONS**

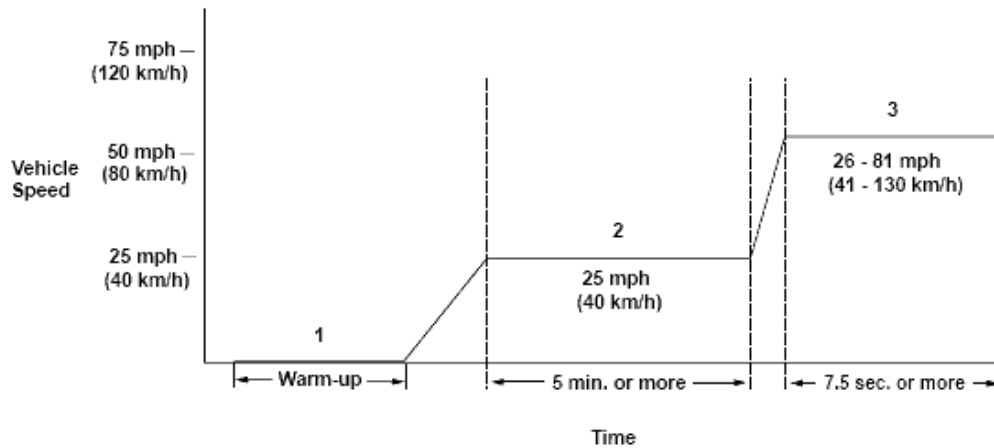
Condition		Minimum	Maximum
Engine coolant temperature		156°F (69°C)	-
Intake air temperature		8°F (-13°C)	-
Engine speed		1,250 rpm	2,185 rpm
MAP value	1,250 rpm	47 kPa (13.8 in.Hg, 350 mmHg)	73 kPa (21.6 in.Hg, 550 mmHg)
	2,000 rpm	27 kPa (7.9 in.Hg, 200 mmHg)	
Vehicle speed		33 mph (52 km/h)	-
Fuel trim		0.73	1.47
Fuel feedback		Closed loop at stoichiometric	
Monitoring priority		P0456, P0457, P0497	
No active DTCs		P0107, P0108, P0112, P0113, P0117, P0118, P0154, P0155, P0174, P0175, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0335, P0339, P0340, P0344, P0401, P0404, P0443, P0496, P0497, P0627, P1077, P1078, P1128, P1129, P1174, P145C, P2197, P2227, P2228, P2229, P2240, P2241, P2247, P2249, P2254, P2255, P2413, P2630, P2631, P2646, P2647, P2648, P2649, P2A03	
Other		Without excessive load change	

Malfunction Threshold (J32A3)

The average of up to 28 periods of the front A/F sensor (bank 2, sensor 1) inversion cycle is at least 7.5

seconds.

Driving Pattern (J32A3)



P0133-0850

Fig. 33: Vehicle Speed Driving Pattern

1. Start the engine. Hold the engine speed at 3,000 rpm without load (in Park or neutral) until the radiator fan comes on.
2. Drive the vehicle at a steady speed up to 25 mph (40 km/h), for at least 5 minutes.
3. Then, drive immediately at a steady speed between 26 - 81 mph (41 - 130 km/h) for at least 7.5 seconds.
 - If the EVAP monitor runs instead of the HO2S monitor, turn the engine off, then restart it, and the HO2S monitor will restart.
 - Drive the vehicle in this manner only if the traffic regulations and ambient conditions allow.

Diagnosis Details (J32A3)

Conditions for illuminating the MIL (J32A3)

When a malfunction is detected during the first drive cycle, a Temporary DTC is stored in the PCM memory. If the malfunction recurs during the next (second) drive cycle, the MIL comes on and the DTC and the freeze frame data are stored.

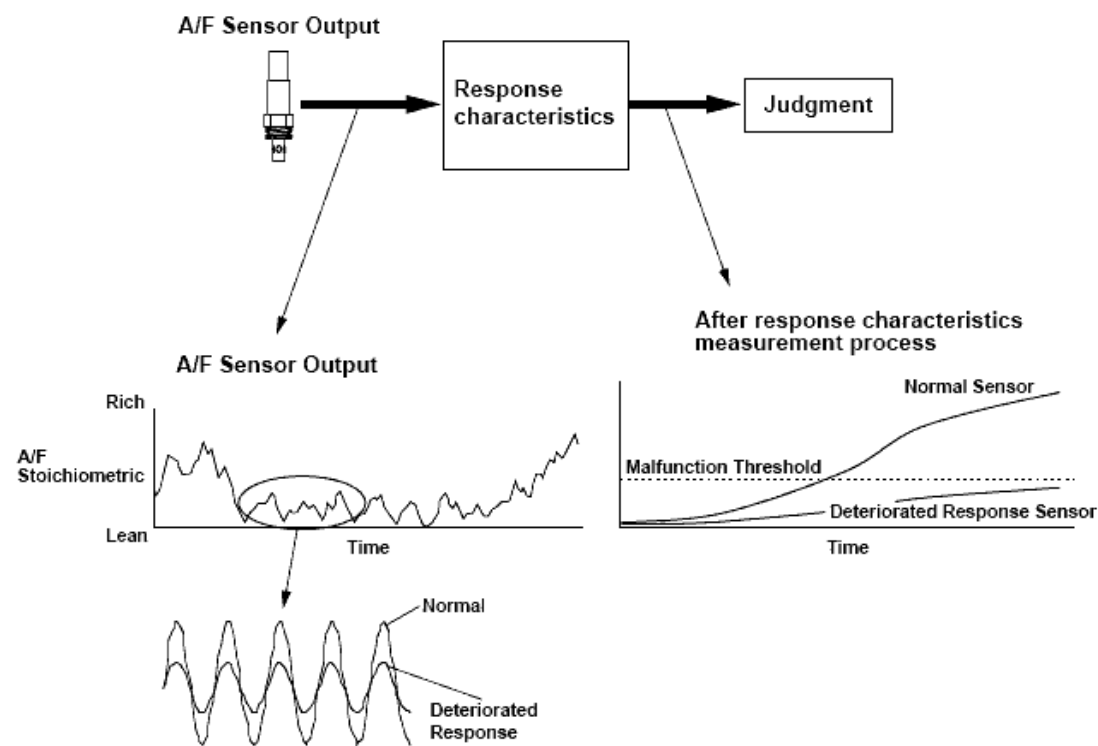
Conditions for clearing the MIL (J32A3)

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, the Temporary DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P0153 (158): ADVANCED DIAGNOSTICS (J35A8)

DTC P0153: FRONT AIR/FUEL RATIO (A/F) SENSOR (BANK 2, SENSOR 1) MALFUNCTION/SLOW RESPONSE (J35A8)



P0133-0570

Fig. 34: DTC P0153 Front Air/Fuel Ratio Sensor (Bank 2, Sensor 1) Signal Output (J35A8)

General Description (J35A8)

The front air/fuel ratio (A/F) sensor (bank 2, sensor 1) has a linear signal output in relation to the oxygen concentration. The engine control module (ECM)/powertrain control module (PCM) computes the air/fuel ratio from the front A/F sensor output voltage and uses fuel feedback control to improve exhaust emissions. The ECM/PCM measures the response characteristics against the front A/F sensor output, and if the accumulated value within the specified time is less than the specified value, it detects a deteriorated response and stores a DTC.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status (J35A8)

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Once per driving cycle
Sequence	None
Duration	6.8 seconds or more
DTC Type	Two drive cycles, MIL ON
OBD Status	PASSED/FAILED/EXECUTING/OUT OF (TEST) CONDITION

Enable Conditions (J35A8)

ENABLE CONDITIONS

Condition	Minimum	Maximum
Engine coolant temperature	156°F (69°C)	-
Intake air temperature	8°F (-13°C)	-
A/T		2,200 rpm

Engine speed	M/T	1,250 rpm	2,500 rpm
MAP value	1,250 rpm	47 kPa (13.8 in.Hg, 350 mmHg)	69 kPa (20.4 in.Hg, 520 mmHg) ⁽¹⁾
			73 kPa (21.6 in.Hg, 550 mmHg) ⁽²⁾
	2,000 rpm	27 kPa (7.9 in.Hg, 200 mmHg)	69 kPa (20.4 in.Hg, 520 mmHg) ⁽¹⁾
			73 kPa (21.6 in.Hg, 550 mmHg) ⁽²⁾
Vehicle speed		33 mph (52 km/h)	-
Fuel trim		0.73	1.47
Fuel feedback		Closed loop at stoichiometric	
Monitoring priority		P0456, P0457, P0497	
No active DTCs		P0107, P0108, P0112, P0113, P0117, P0118, P0154, P0155, P0174, P0175, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0335, P0339, P0340, P0344, P0401, P0404, P0443, P0496, P0497, P0627, P1077, P1078, P1128, P1129, P1174, P145C, P2197, P2227, P2228, P2229, P2240, P2241, P2247, P2249, P2254, P2255, P2413, P2630, P2631, P2646, P2647, P2648, P2649, P2A03	
Other		Without excessive load change	
(1) A/T model			
(2) M/T model			

Malfunction Threshold (J35A8)

The average of up to 11 periods of the front A/F sensor (bank 2, sensor 1) inversion cycle is at least 6.8 seconds.

Driving Pattern (J35A8)

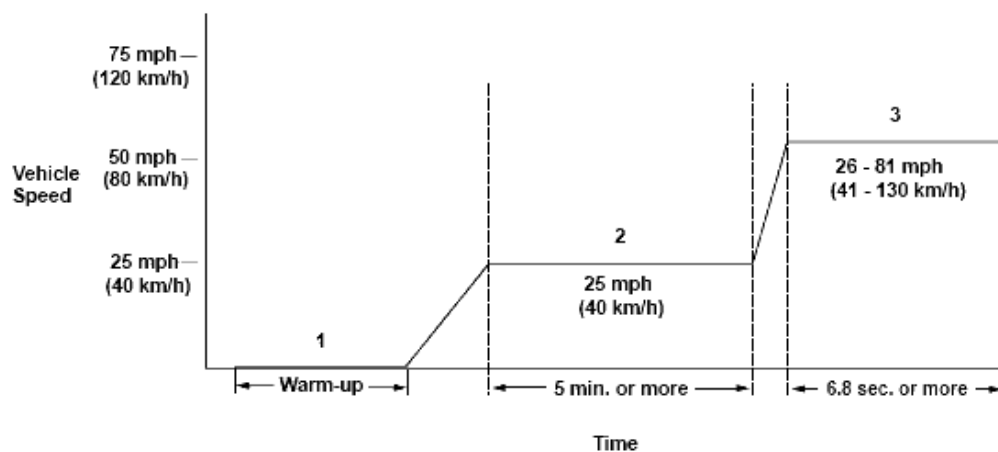


Fig. 35: Vehicle Speed Driving Pattern

1. Start the engine. Hold the engine speed at 3,000 rpm without load (in Park or neutral) until the radiator fan comes on.
2. Drive the vehicle at a steady speed up to 25 mph (40 km/h), for at least 5 minutes.
3. Then, drive immediately at a steady speed between 26 - 81 mph (41 - 130 km/h) for at least 6.8 seconds.
 - If the EVAP monitor runs instead of the HO2S monitor, turn the engine off, then restart it, and the HO2S monitor will restart.
 - Drive the vehicle in this manner only if the traffic regulations and ambient conditions allow.

Diagnosis Details (J35A8)**Conditions for illuminating the MIL (J35A8)**

When a malfunction is detected during the first drive cycle, a Temporary DTC is stored in the ECM/PCM memory. If the malfunction recurs during the next (second) drive cycle, the MIL comes on and the DTC and the freeze frame data are stored.

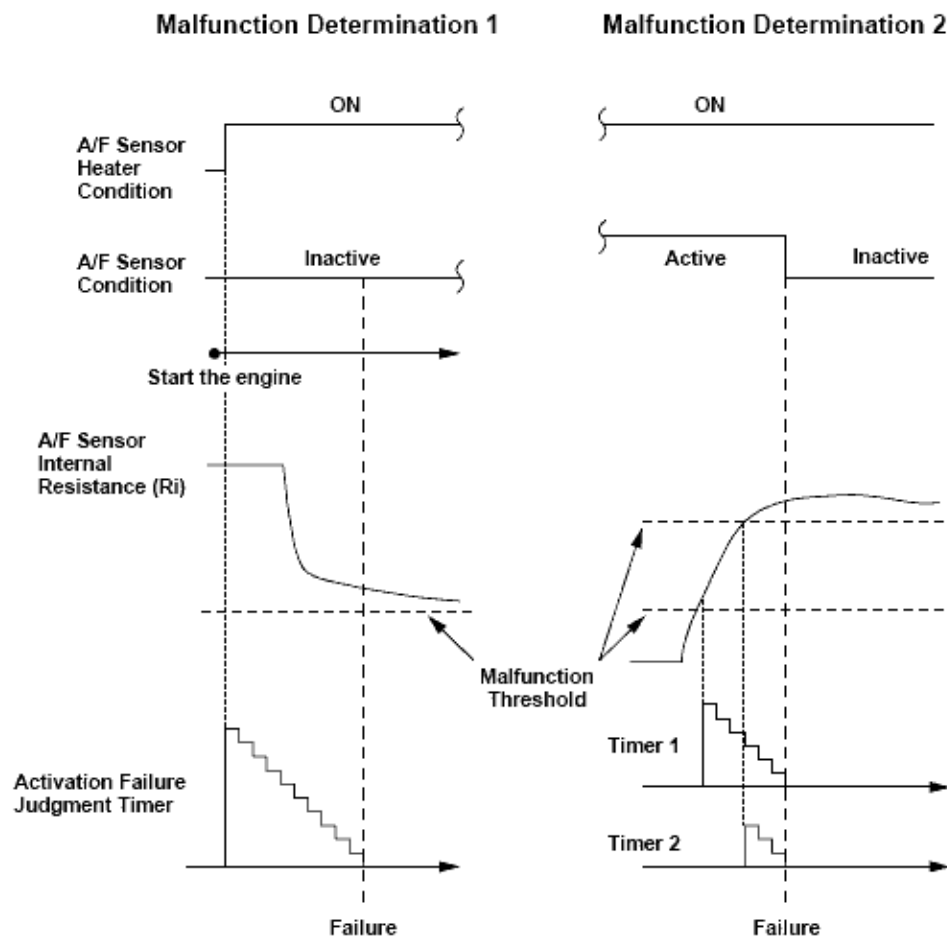
Conditions for clearing the MIL (J35A8)

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, the Temporary DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P0154 (152): ADVANCED DIAGNOSTICS

DTC P0154: FRONT AIR/FUEL RATIO (A/F) SENSOR (BANK 2, SENSOR 1) HEATER SYSTEM MALFUNCTION



P0134-0670

Fig. 36: Front Air/Fuel Ratio (A/F) Sensor (Bank 2, Sensor 1) Heater System Malfunction Determination

General Description

The front air/fuel ratio (A/F) sensor (bank 2, sensor 1) is activated by warming the element with the heater and by maintaining it at a steady high temperature to accurately calculate the air/fuel (A/F) ratio. The front A/F sensor does not become active when the element is not properly heated due to a heater malfunction, and the exhaust emissions deteriorate. The engine control module (ECM)/powertrain control module (PCM) monitors the front A/F sensor internal resistance.

1. When the front A/F sensor does not activate within a set time after the front A/F sensor heater starts to warm up (with high front A/F sensor internal resistance), a malfunction of the front A/F sensor heater is detected, and a DTC is stored.
2. When the front A/F sensor heater cycles ON and OFF within a set time, and the resistance remains high when the heater is ON, a malfunction in the front A/F sensor heater is detected, and a DTC is stored.

Because the effect on engine control differs according to the front A/F sensor internal resistance, there are two types of malfunction detection threshold levels. When either one is reached, a malfunction is detected.

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
Sequence	None
Duration	40 seconds or more
DTC Type	Two drive cycles, MIL ON
OBD Status	PASSED/FAILED/NOT COMPLETED (STILL TESTING)

Enable Conditions**ENABLE CONDITIONS**

Condition	Minimum	Maximum
Battery voltage	10.5 V	-
Fuel feedback	Other than during fuel cut-off operation	
No active	DTCs P0155, P1174, P2197, P2240, P2241, P2247, P2249, P2254, P2255, P2630, P26315	

Malfunction Threshold**Malfunction determination 1**

The front A/F sensor (bank 2, sensor 1) heater internal resistance value is 110 ohms or more for at least 40 seconds right after the engine starts.

Malfunction determination 2

- The front A/F sensor (bank 2, sensor 1) heater internal resistance value is 110 ohms or more for at least 15 seconds.
- The front A/F sensor (bank 2, sensor 1) heater internal resistance value is 200 ohms or more for at least 1 second.

Driving Pattern

Start the engine, and let it idle for at least 1 minute.

Diagnosis Details**Conditions for illuminating the MIL**

When a malfunction is detected during the first drive cycle, a Temporary DTC is stored in the ECM/PCM memory. If the malfunction recurs during the next (second) drive cycle, the MIL comes on and the DTC and the freeze frame data are stored.

Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, the Temporary DTC, and the freeze frame data can be cleared by using the scan tool

Clear command or by disconnecting the battery.

DTC P0155 (152): ADVANCED DIAGNOSTICS

DTC P0155: FRONT AIR/FUEL RATIO (A/F) SENSOR (BANK 2, SENSOR 1) HEATER CIRCUIT MALFUNCTION

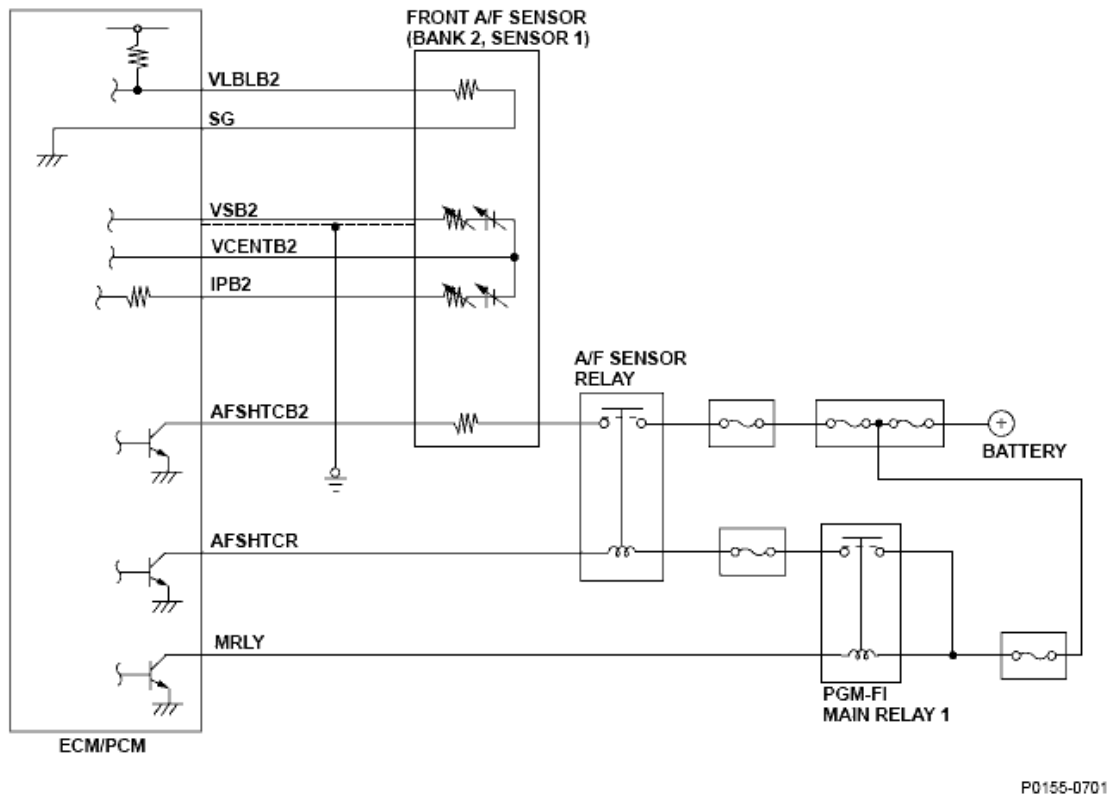


Fig. 37: Front Air/Fuel Ratio (A/F) Sensor (Bank 2, Sensor 1) Heater - Circuit Diagram

General Description

The front air/fuel ratio (A/F) sensor (bank 2, sensor 1) is installed in the exhaust manifold, and it detects oxygen content in the exhaust gas. The front A/F sensor outputs voltage to the engine control module (ECM)/powertrain control module (PCM). The ECM/PCM controls fuel injection duration by comparing the target air/fuel ratio with the front A/F sensor signal. The sensor includes the VS cell, the pump cell, the atmospheric reference cavity, the diffusion layer, and the heater, and it enables overall feedback control. The heater is controlled by the ECM/PCM and is energized when the sensor element temperature is low. It heats the sensor to stabilize the detection of oxygen content. The ECM/PCM monitors the front A/F sensor heater output (return check). A malfunction is detected if the return signals do not meet the command value (for heater activation) in the ECM/PCM for a set time, and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
Sequence	None
Duration	2 seconds or more

DTC Type	One drive cycle, MIL ON
OBD Status	PASSED/FAILED/NOT COMPLETED (STILL TESTING)

Enable Conditions**ENABLE CONDITIONS**

Condition	
State of the engine	Running
Other	During front A/F sensor heater operation

Malfunction Threshold

One of these conditions must be met for at least 2 seconds.

- No return signal "HIGH" is detected when the ECM/PCM output duty is less than 20%.
- Return signal does not change when the ECM/PCM output duty is more than 20% and less than 80%.
- No return signal "LOW" is detected when the ECM/PCM output duty is more than 80%.

Driving Pattern

Start the engine. Hold the engine speed at 3,000 rpm without load (in Park or neutral) until the radiator fan comes on, then let it idle.

Diagnosis Details**Conditions for illuminating the MIL**

When a malfunction is detected, the MIL comes on and the DTC and the freeze frame data are stored in the ECM/PCM memory.

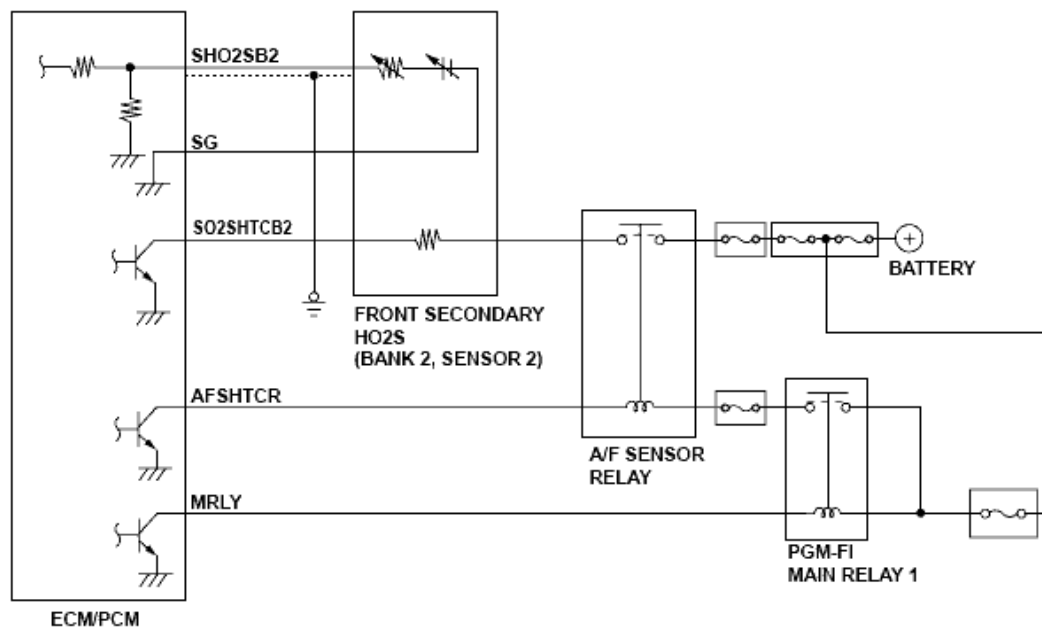
Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

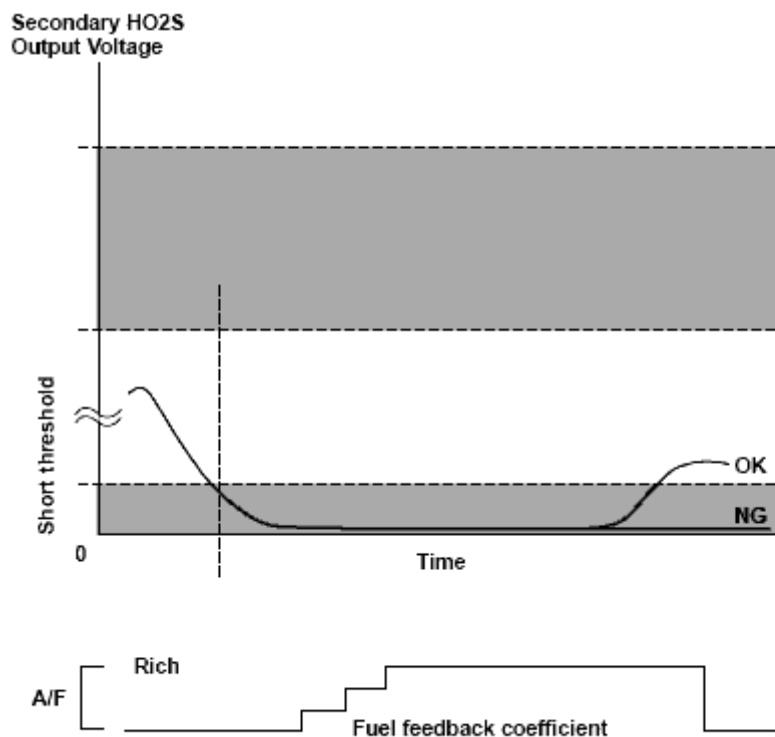
DTC P0157 (162): ADVANCED DIAGNOSTICS

DTC P0157: FRONT SECONDARY HEATED OXYGEN SENSOR (SECONDARY HO2S (BANK 2, SENSOR 2)) CIRCUIT LOW VOLTAGE



P0157-0701

Fig. 38: Front Secondary Heated Oxygen Sensor (Secondary HO2S (Bank 2, Sensor 2)) Low Voltage - Circuit Diagram



P0137-0570

Fig. 39: Front Secondary Heated Oxygen Sensor Output Voltage Graph

General Description

The front secondary heated oxygen sensor (HO2S) (bank 2, sensor 2) detects the oxygen content in the exhaust gas downstream of the three way catalytic converter (TWC) during stoichiometric air/fuel ratio

feedback control. The front secondary HO2S controls the air/fuel ratio from the front A/F sensor output voltage so that the TWC efficiency is optimized. After current is applied to the front secondary HO2S heater, if the front secondary HO2S sensor output continues low (lean) during feedback control, a malfunction is detected and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
Sequence	None
Duration	40 seconds or more
DTC Type	Two drive cycles, MIL ON
OBD Status	PASSED/FAILED/EXECUTING/OUT OF (TEST) CONDITION

Enable Conditions

ENABLE CONDITIONS

Condition	Minimum	Maximum
Elapsed time that secondary HO2S activity is not monitored after starting the engine	20 seconds	-
Engine coolant temperature	156°F (69°C)	-
Intake air temperature	8°F (-13°C)	-
Fuel trim	0.73	1.47
Fuel feedback	Closed loop	
No active DTCs	P0107, P0108, P0112, P0113, P0117, P0118, P0153, P0154, P0155, P0161, P0174, P0175, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0340, P0344, P0401, P0404, P0443, P0496, P0497, P0627, P1077, P1078, P1128, P1129, P1174, P145C, P2197, P2240, P2241, P2247, P2249, P2254, P2255, P2413, P2630, P2631, P2646, P2647, P2648, P2649, P2A03	
Other	Other than at idle	

Malfunction Threshold

The front secondary HO2S output voltage is 0.05 V or less for at least 40 seconds.

Driving Pattern

1. Start the engine. Let it idle until the radiator fan comes on.
2. Then, drive immediately at a steady engine speed between 1,500 - 3,000 rpm for at least 1 minute.
 - Drive the vehicle in this manner only if the traffic regulations and ambient conditions allow.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected during the first drive cycle, a Temporary DTC is stored in the ECM/PCM

memory. If the malfunction recurs during the next (second) drive cycle, the MIL comes on and the DTC and the freeze frame data are stored.

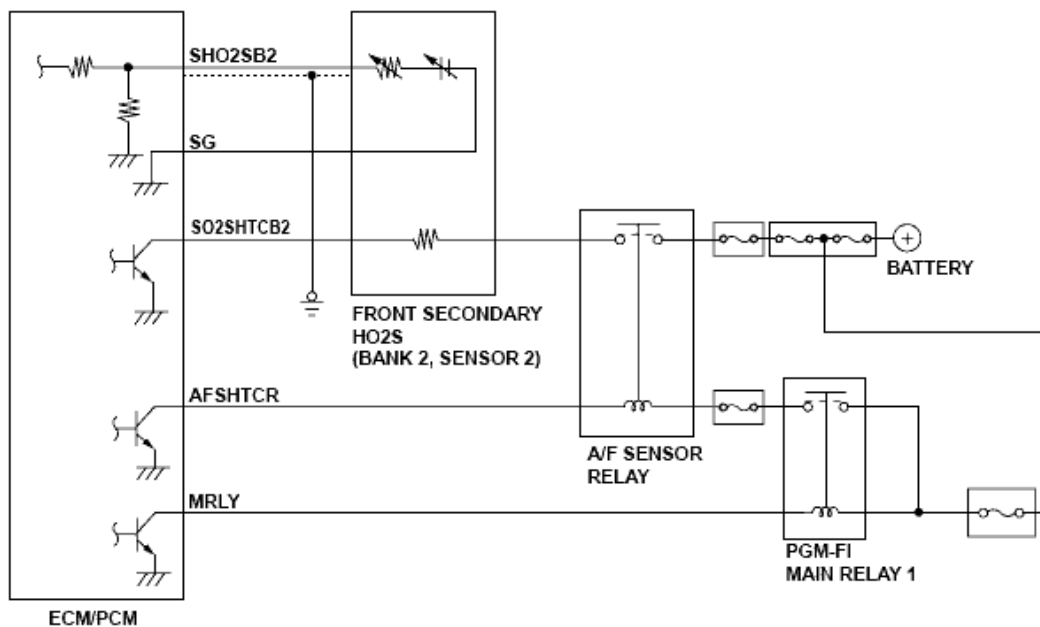
Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, the Temporary DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

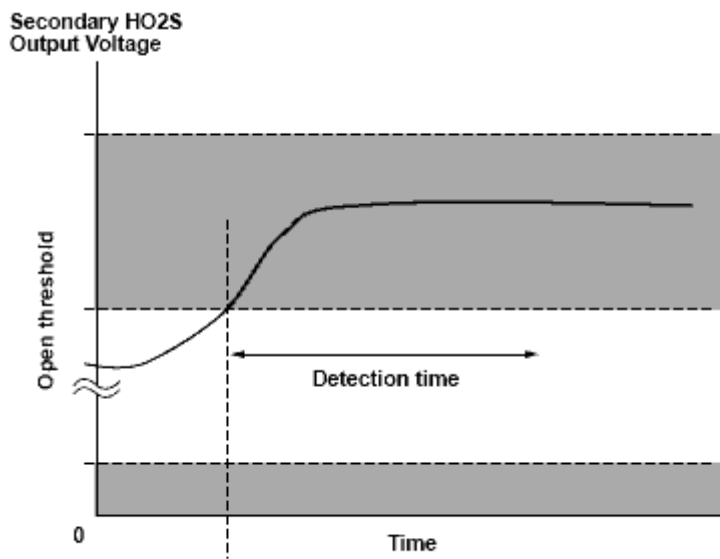
DTC P0158 (162): ADVANCED DIAGNOSTICS

DTC P0158: FRONT SECONDARY HEATED OXYGEN SENSOR (SECONDARY HO2S (BANK 2, SENSOR 2)) CIRCUIT HIGH VOLTAGE



P0157-0701

Fig. 40: Front Secondary Heated Oxygen Sensor (Secondary HO2S (Bank 2, Sensor 2)) High Voltage - Circuit Diagram



P0138-0570

Fig. 41: Front Secondary Heated Oxygen Sensor Output Voltage Graph

General Description

The front secondary heated oxygen sensor (HO2S) (bank 2, sensor 2) detects the oxygen content in the exhaust gas downstream of the three way catalytic converter (TWC) during stoichiometric air/fuel ratio feedback control. The front secondary HO2S controls the air/fuel ratio from the front A/F sensor output voltage to optimize TWC efficiency.

After current is applied to the front secondary HO2S heater, if the front secondary HO2S sensor output continues to exceed the upper limit used during feedback control, a malfunction is detected and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
Sequence	None
Duration	5 seconds or more
DTC Type	Two drive cycles, MIL ON
OBD Status	PASSED/FAILED/EXECUTING/OUT OF (TEST) CONDITION

Enable Conditions

ENABLE CONDITIONS

Condition	Minimum	Maximum
Elapsed time that secondary HO2S activity is not monitored after starting the engine	20 seconds	-
Engine coolant temperature	156°F (69°C)	-
Intake air temperature	8°F (-13°C)	-
Fuel trim	0.73	1.47

Fuel feedback	Closed loop
No active DTCs	P0107, P0108, P0112, P0113, P0117, P0118, P0153, P0154, P0155, P0161, P0174, P0175, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0340, P0344, P0401, P0404, P0443, P0496, P0497, P0627, P1077, P1078, P1128, P1129, P1174, P145C, P2197, P2240, P2241, P2247, P2249, P2254, P2255, P2413, P2630, P2631, P2646, P2647, P2648, P2649, P2A03
Other	Other than at idle

Malfunction Threshold

The front secondary HO2S output voltage is 1.270 V or more for at least 5 seconds.

Driving Pattern

1. Start the engine. Let it idle until the radiator fan comes on.
2. Then, drive immediately at a steady engine speed between 1,500 - 3,000 rpm for at least 1 minute.
 - Drive the vehicle in this manner only if the traffic regulations and ambient conditions allow.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected during the first drive cycle, a Temporary DTC is stored in the ECM/PCM memory. If the malfunction recurs during the next (second) drive cycle, the MIL comes on and the DTC and the freeze frame data are stored.

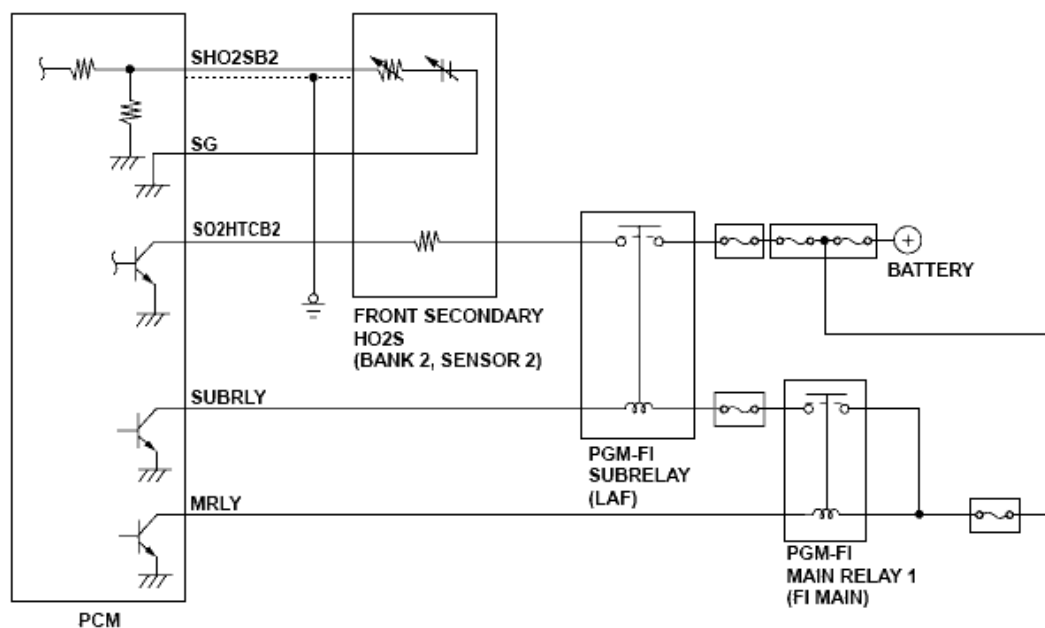
Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, the Temporary DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

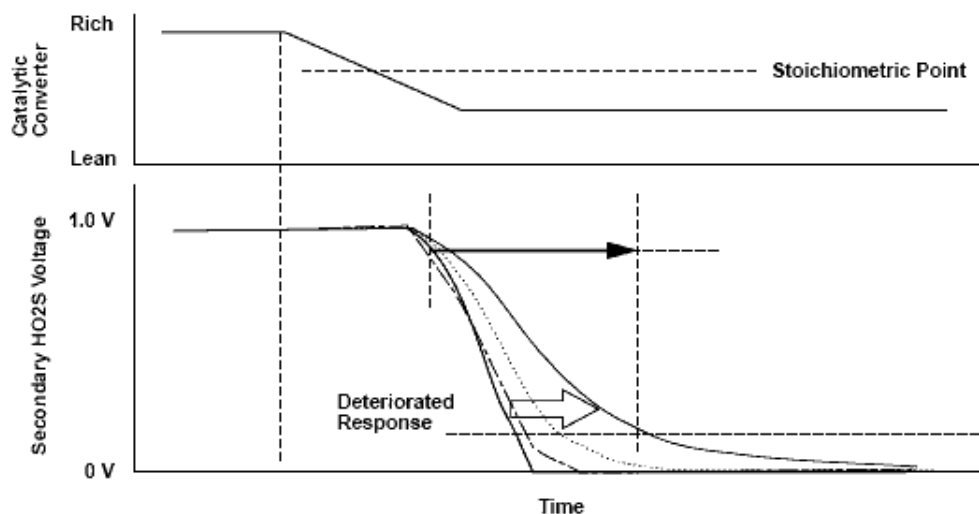
DTC P0159 (162): ADVANCED DIAGNOSTICS

DTC P0159: FRONT SECONDARY HEATED OXYGEN SENSOR (SECONDARY HO2S (BANK 2, SENSOR 2)) CIRCUIT SLOW RESPONSE



P0157-0700

Fig. 42: Front Secondary Heated Oxygen Sensor (Secondary HO2S (Bank 2, Sensor 2)) - Circuit Diagram



P0139-0570

Fig. 43: Front Secondary Heated Oxygen Sensor Voltage Graph

General Description

The front secondary heated oxygen sensor (HO2S) (bank 2, sensor 2) detects the oxygen content in the exhaust gas downstream of the three way catalytic converter (TWC) during stoichiometric air/fuel ratio feedback control. The front secondary HO2S controls the air/fuel ratio with the front A/F sensor output voltage to optimize TWC efficiency.

If the response time of the front secondary HO2S becomes longer than the specified time after current to the secondary HO2S heater is applied, a malfunction is detected and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status**MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS**

Execution	Once per driving cycle
Sequence	None
Duration	20.7 ⁽²⁾ , 23.4 ⁽¹⁾ seconds or less
DTC Type	Two drive cycles, MIL ON
OBD Status	PASSED/FAILED/EXECUTING/OUT OF (TEST) CONDITION
(1) J32A3 engine	
(2) J35A8 engine	

Enable Conditions**ENABLE CONDITIONS**

TABLE CONDITIONS		
Condition	Minimum	Maximum
Elapsed time that secondary HO2S activity is not monitored after starting the engine	20 seconds	-
Elapsed time after fuel cut-off	-	150 seconds
Engine coolant temperature	156°F (69°C)	-
Intake air temperature	8°F (-13°C)	-
Engine speed	1,200 rpm ⁽¹⁾	2,000 rpm ⁽¹⁾
	1,250 rpm ^{*1}	2,050 rpm ^{*1}
	1,600 rpm ⁽²⁾	2,300 rpm ⁽²⁾
MAP value	22 kPa (6.3 in.Hg, 160 mmHg)	66 kPa (19.6 in.Hg, 500 mmHg) ^{*2}
		73 kPa (21.6 in.Hg, 550 mmHg) ^{*1}
Vehicle speed	30 mph (48 km/h)	-
Fuel trim	0.73	1.47
Fuel feedback	Closed loop	
No active DTCs	P0107, P0108, P0111, P0112, P0113, P0117, P0118, P0153, P0154, P0155, P0157, P0158, P0161, P0174, P0175, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0340, P0344, P0401, P0404, P0443, P0496, P0497, P0627, P1077, P1078, P1128, P1129, P1174, P145C, P2197, P2240, P2241, P2247, P2249, P2254, P2255, P2272, P2273, P2413, P2630, P2631, P2646, P2647, P2648, P2649, P2A03	
(1) J35A8 engine, A/T model		
(2) J35A8 engine, M/T model		

Malfunction Threshold

1. When the front secondary HO2S output drops to the response deterioration judgment threshold value

and the response characteristics measurement is finished.

MALFUNCTION THRESHOLD

MIN	0.77 seconds
MAX	4.58 ^{*2} , 16.00 ^{*1} seconds

2. The voltage does not drop to the response deterioration judgment threshold value after a predetermined time (2.00^{*2} , 4.35^{*1} seconds) has elapsed.

Driving Pattern

1. Start the engine. Let it idle until the radiator fan comes on.
2. Then, drive immediately at a steady speed of 35 mph (57 km/h) or more for at least 20.7^{*2} , 23.4^{*1} seconds.
 - Drive the vehicle in this manner only if the traffic regulations and ambient conditions allow.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected during the first drive cycle, a Temporary DTC is stored in the ECM/PCM memory. If the malfunction recurs during the next (second) drive cycle, the MIL comes on and the DTC and the freeze frame data are stored.

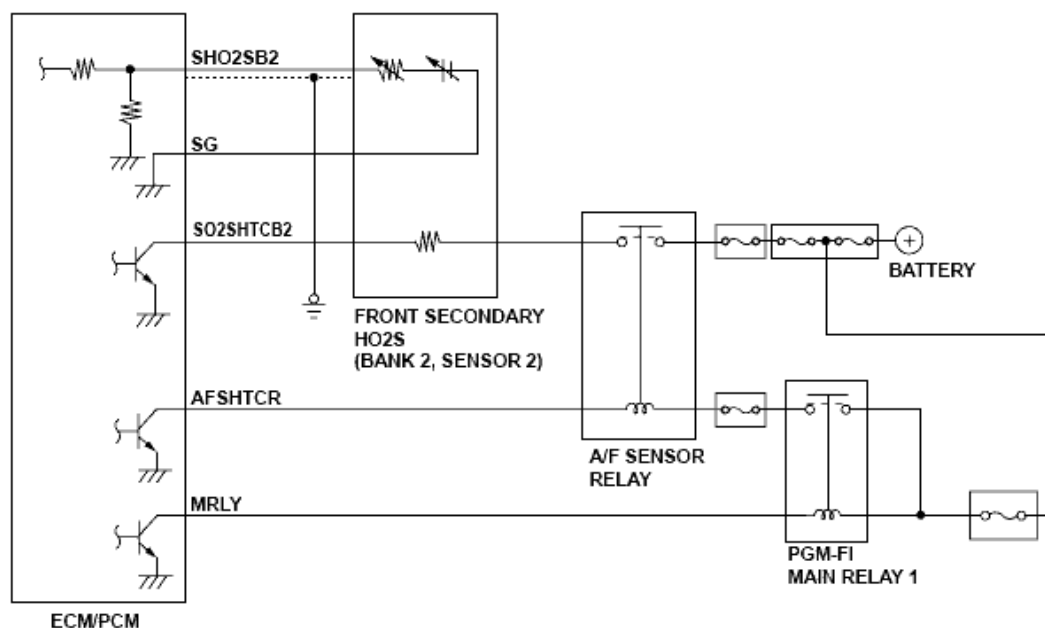
Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, the Temporary DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P0161 (164): ADVANCED DIAGNOSTICS

DTC P0161: FRONT SECONDARY HEATED OXYGEN SENSOR (SECONDARY HO2S (BANK 2, SENSOR 2)) HEATER CIRCUIT MALFUNCTION



P0157-0701

Fig. 44: Front Secondary Heated Oxygen Sensor (Secondary HO2S) (Bank 2, Sensor 2) Heater - Circuit Diagram

General Description

A heater for the zirconia element is embedded in the front secondary heated oxygen sensor (front secondary HO2S (bank 2, sensor 2)) and is controlled by the engine control module (ECM)/powertrain control module (PCM). When activated, it heats the sensor to stabilize and speed up the detection of oxygen content when the exhaust gas temperature is cold. If the front secondary HO2S heater draws more or less than a specified amperage, the ECM/PCM detects a malfunction and stores a DTC.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
Sequence	None
Duration	5 seconds or more
DTC Type	One drive cycle, MIL ON
OBD Status	PASSED/FAILED/NOT COMPLETED (STILL TESTING)

Enable Conditions

ENABLE CONDITIONS

Condition	Minimum	Maximum
Battery voltage (IGP terminal of ECM/PCM)	10.5 V	16 V
State of the engine	Running	
No active DTCs	P0117, P0118	

Malfunction Threshold

The front secondary HO₂S heater output is 0.38 A or less, or 3.33 A or more, for at least 5 seconds when the heater is on.

Driving Pattern

1. Start the engine. Let it idle until the radiator fan comes on.
2. Drive the vehicle at a steady speed of 35 mph (57 km/h) or more for at least 5 seconds.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected, the MIL comes on and the DTC and the freeze frame data are stored in the ECM/PCM memory.

Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P0171 (153): ADVANCED DIAGNOSTICS

DTC P0171: REAR BANK (BANK 1) FUEL SYSTEM TOO LEAN

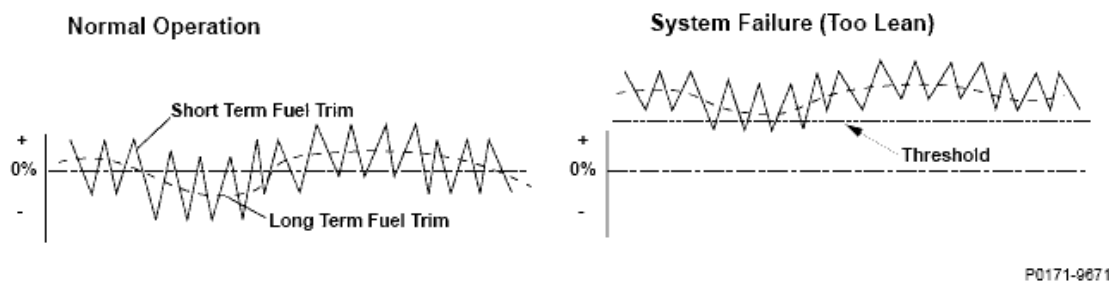


Fig. 45: Rear Bank (Bank 1) Fuel System Too Lean Air Fuel Ratio

General Description

The engine control module (ECM)/powertrain control module (PCM) detects the oxygen content in the exhaust gas from the rear air/fuel ratio (A/F) sensor (bank 1, sensor 1) signal voltage, and it uses fuel feedback control to maintain the optimal air/fuel ratio. The air/fuel ratio coefficient for correcting the amount of injected fuel is the short term fuel trim. The ECM/PCM varies short term fuel trim continuously to keep the air/fuel ratio close to the stoichiometric ratio for all driving conditions. Long term fuel trim is computed from short term fuel trim and is used to regulate long term deviation from the stoichiometric air/fuel ratio, which occurs when fuel metering components deteriorate with age or system failures occur. In addition, long term fuel trim is stored in the ECM/PCM memory and is used to determine when fuel metering components malfunction. When long term fuel trim is higher than normal, which is about 1.0 (0%), the amount of injected fuel must be increased, and when lower than normal, it must be decreased. If long term fuel trim is higher than normal (too lean), a malfunction in the fuel metering components is detected

and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Once per driving cycle ⁽¹⁾
Sequence	None
Duration	Every 7 seconds
DTC Type	Two drive cycles, MIL ON
OBD Status	N/A
(1) The malfunction judgment is cleared when it is judged as normal under the same driving conditions in which the malfunction was detected.	

Enable Conditions

ENABLE CONDITIONS

Condition	Minimum	Maximum
Engine coolant temperature	156°F (69°C)	-
Intake air temperature	32°F (0°C)	-
Engine speed	580 rpm ⁽¹⁾ , ⁽²⁾	4,000 rpm
	650 rpm ⁽³⁾	
MAP value	18 kPa (5.2 in.Hg, 130 mmHg) ⁽³⁾	-
	22 kPa (6.3 in.Hg, 160 mmHg) ⁽²⁾	
	22 kPa (6.5 in.Hg, 165 mmHg) ⁽¹⁾	
Fuel feedback	Closed loop	
Monitoring priority	P0420, P0430, P0456, P0457	
No active DTCs	P0107, P0108, P0112, P0113, P0117, P0118, P0134, P0135, P0137, P0138, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0335, P0339, P0401, P0404, P0443, P0496, P0497, P0627, P1077, P1078, P1128, P1129, P1172, P145C, P2195, P2227, P2228, P2229, P2237, P2238, P2243, P2245, P2251, P2252, P2270, P2271, P2413, P2627, P2628, P2646, P2647, P2648, P2649	
(1) J32A3 engine		
(2) J35A8 engine, A/T model		
(3) J35A8 engine, M/T model		

Malfunction Threshold

Long term fuel trim is higher than 1.188 (+18.8%).

Driving Pattern

1. Start the engine. Hold the engine speed at 3,000 rpm without load (in Park or neutral) until the radiator fan comes on.

2. Then, drive at a steady speed between 15 - 75 mph (24 - 120 km/h) for at least 15 minutes, and watch the long term fuel trim. If the long term fuel trim stays at about 1.0, the vehicle is OK or it is a very minor problem. If a significant fault is still present, the long term fuel trim will move up or down while driving.
 - When freeze frame data is stored, drive the vehicle under those conditions instead of Driving Pattern 2.
 - If the EVAP monitor runs instead of the HO2S monitor, turn the engine off, then restart it, and the HO2S monitor will restart.
 - After clearing the DTC by disconnecting the battery or using the scan tool, extend Driving Pattern 2 to 40 minutes or longer to allow time for long term fuel trim to recover.
 - Drive the vehicle in this manner only if the traffic regulations and ambient conditions allow.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected during the first drive cycle, a Temporary DTC is stored in the ECM/PCM memory. If the malfunction recurs during the next (second) drive cycle, the MIL comes on and the DTC and the freeze frame data are stored.

Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive drive cycles in which the engine conditions are similar to the first time the malfunction was detected.

The MIL, the DTC, the Temporary DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P0172 (153): ADVANCED DIAGNOSTICS

DTC P0172: REAR BANK (BANK 1) FUEL SYSTEM TOO RICH

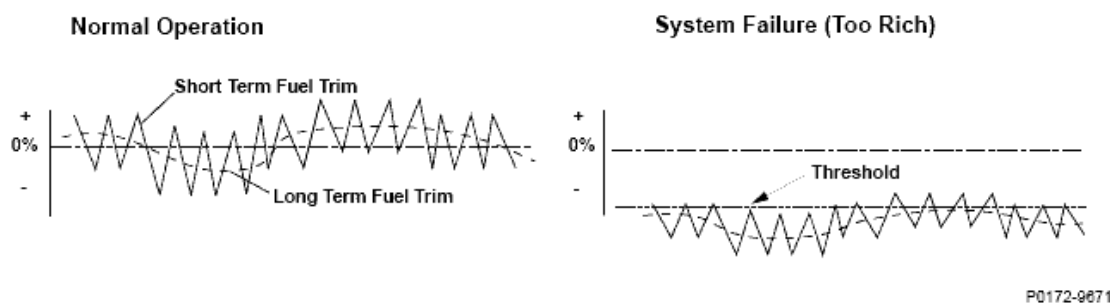


Fig. 46: Rear Bank (Bank 1) Fuel System Too Rich Air Fuel Ratio

General Description

The engine control module (ECM)/powertrain control module (PCM) detects the oxygen content in the exhaust gas from the rear air/fuel ratio (A/F) sensor (bank 1, sensor 1) signal voltage, and it uses fuel feedback control to maintain the optimal air/fuel ratio. The air/fuel ratio coefficient for correcting the amount of injected fuel is the short term fuel trim. The ECM/PCM varies short term fuel trim continuously

to keep the air/fuel ratio close to the stoichiometric ratio for all driving conditions. Long term fuel trim is computed from short term fuel trim and is used to regulate long term deviation from the stoichiometric air/fuel ratio, which occurs when fuel metering components deteriorate with age or system failures occur. In addition, long term fuel trim is stored in the ECM/PCM memory and is used to determine when fuel metering components malfunction. When long term fuel trim is higher than normal, which is about 1.0 (0%), the amount of injected fuel must be increased, and when lower than normal, it must be decreased. If long term fuel trim is lower than normal (too rich), a malfunction in the fuel metering components is detected and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Once per driving cycle ⁽¹⁾
Sequence	None
Duration	12.58 seconds
DTC Type	Two drive cycles, MIL ON
OBD Status	N/A
(1) The malfunction judgment is cleared when it is judged as normal under the same driving conditions in which the malfunction was detected.	

Enable Conditions

ENABLE CONDITIONS

Condition	Minimum	Maximum
Engine coolant temperature	156°F (69°C)	-
Intake air temperature	32°F (0°C)	-
Engine speed	580 rpm ⁽¹⁾ , ⁽²⁾	4,000 rpm
	650 rpm ⁽³⁾	
MAP value	18 kPa (5.2 in.Hg, 130 mmHg) ⁽³⁾	-
	22 kPa (6.3 in.Hg, 160 mmHg) ⁽²⁾	
	22 kPa (6.5 in.Hg, 165 mmHg) ⁽¹⁾	
Fuel feedback	Closed loop	
Monitoring priority	P0420, P0430, P0456, P0457	
No active DTCs	P0107, P0108, P0112, P0113, P0117, P0118, P0134, P0135, P0137, P0138, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0335, P0339, P0401, P0404, P0443, P0496, P0497, P0627, P1077, P1078, P1128, P1129, P1172, P145C, P2195, P2227, P2228, P2229, P2237, P2238, P2243, P2245, P2251, P2252, P2270, P2271, P2413, P2627, P2628, P2646, P2647, P2648, P2649	
(1) J32A3 engine		
(2) J35A8 engine, A/T model		
(3) J35A8 engine, M/T model		

Malfunction Threshold

Long term fuel trim is lower than 0.844 (-15.6%).

Driving Pattern

1. Start the engine. Hold the engine speed at 3,000 rpm without load (in Park or neutral) until the radiator fan comes on.
 2. Then, drive at a steady speed between 15 - 75 mph (24 - 120 km/h) for at least 15 minutes, and watch the long term fuel trim. If the long term fuel trim stays at about 1.0, the vehicle is OK or it is a very minor problem. If a significant fault is still present, the long term fuel trim will move up or down while driving.
- When freeze frame data is stored, drive the vehicle under those conditions instead of Driving Pattern 2.
 - If the EVAP monitor runs instead of the HO2S monitor, turn the engine off, then restart it, and the HO2S monitor will restart.
 - After clearing the DTC by disconnecting the battery or using the scan tool, extend Driving Pattern 2 to 40 minutes or longer to allow time for long term fuel trim to recover.
 - Drive the vehicle in this manner only if the traffic regulations and ambient conditions allow.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected during the first drive cycle, a Temporary DTC is stored in the ECM/PCM memory. If the malfunction recurs during the next (second) drive cycle, the MIL comes on and the DTC and the freeze frame data are stored.

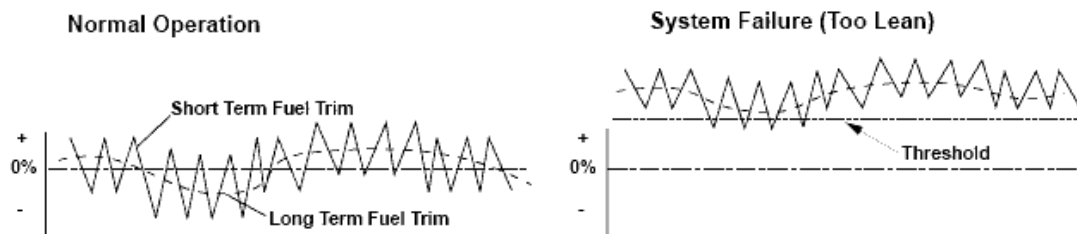
Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive drive cycles in which the engine conditions are similar to the first time the malfunction was detected.

The MIL, the DTC, the Temporary DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P0174 (154): ADVANCED DIAGNOSTICS

DTC P0174: FRONT BANK (BANK 2) FUEL SYSTEM TOO LEAN



P0171-9871

Fig. 47: Front Bank (Bank 2) Fuel System Too Lean Air Fuel Ratio

General Description

The engine control module (ECM)/powertrain control module (PCM) detects the oxygen content in the exhaust gas from the front air/fuel ratio (A/F) sensor (bank 2, sensor 1) signal voltage, and it uses fuel feedback control to maintain the optimal air/fuel ratio. The air/fuel ratio coefficient for correcting the amount of injected fuel is the short term fuel trim. The ECM/PCM varies short term fuel trim continuously to keep the air/fuel ratio close to the stoichiometric ratio for all driving conditions. Long term fuel trim is computed from short term fuel trim and is used to regulate long term deviation from the stoichiometric air/fuel ratio, which occurs when fuel metering components deteriorate with age or system failures occur. In addition, long term fuel trim is stored in the ECM/PCM memory and is used to determine when fuel metering components malfunction. When long term fuel trim is higher than normal, which is about 1.0 (0%), the amount of injected fuel must be increased, and when lower than normal, it must be decreased. If long term fuel trim is higher than normal (too lean), a malfunction in the fuel metering components is detected and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Once per driving cycle ⁽¹⁾
Sequence	None
Duration	Every 7 seconds
DTC Type	Two drive cycles, MIL ON
OBD Status	N/A
(1) The malfunction judgment is cleared when it is judged as normal under the same driving conditions in which the malfunction was detected.	

Enable Conditions

ENABLE CONDITIONS

Condition	Minimum	Maximum
Engine coolant temperature	156°F (69°C)	-
Intake air temperature	32°F (0°C)	-
Engine speed	580 rpm ⁽¹⁾ , ⁽²⁾	4,000 rpm
	650 rpm ⁽³⁾	
MAP value	18 kPa (5.2 in.Hg, 130 mmHg) ⁽³⁾	-
	22 kPa (6.3 in.Hg, 160 mmHg) ⁽²⁾	
	22 kPa (6.5 in.Hg, 165 mmHg) ⁽¹⁾	
Fuel feedback	Closed loop	
Monitoring priority	P0420, P0430, P0456, P0457	
No active DTCs	P0107, P0108, P0112, P0113, P0117, P0118, P0154, P0155, P0157, P0158, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0335, P0339, P0401, P0404, P0443, P0496, P0497, P0627, P1077, P1078, P1128, P1129, P1174, P145C, P2197, P2227, P2228, P2229, P2240, P2241, P2247, P2249, P2254, P2255, P2272, P2273, P2413, P2630, P2631, P2646, P2647, P2648, P2649	

(1) J32A3 engine

J35A8 engine, A/T model

(2)

(3) J35A8 engine, M/T model

Malfunction Threshold

Long term fuel trim is higher than 1.188 (+18.8%).

Driving Pattern

1. Start the engine. Hold the engine speed at 3,000 rpm without load (in Park or neutral) until the radiator fan comes on.
 2. Then, drive at a steady speed between 15 - 75 mph (24 - 120 km/h) for at least 15 minutes, and watch the long term fuel trim. If the long term fuel trim stays at about 1.0, the vehicle is OK or it is a very minor problem. If a significant fault is still present, the long term fuel trim will move up or down while driving.
- When freeze frame data is stored, drive the vehicle under those conditions instead of Driving Pattern 2.
 - If the EVAP monitor runs instead of the HO2S monitor, turn the engine off, then restart it, and the HO2S monitor will restart.
 - After clearing the DTC by disconnecting the battery or using the scan tool, extend Driving Pattern 2 to 40 minutes or longer to allow time for long term fuel trim to recover.
 - Drive the vehicle in this manner only if the traffic regulations and ambient conditions allow.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected during the first drive cycle, a Temporary DTC is stored in the ECM/PCM memory. If the malfunction recurs during the next (second) drive cycle, the MIL comes on and the DTC and the freeze frame data are stored.

Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive drive cycles in which the engine conditions are similar to the first time the malfunction was detected.

The MIL, the DTC, the Temporary DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P0175 (154): ADVANCED DIAGNOSTICS

DTC P0175: FRONT BANK (BANK 2) FUEL SYSTEM TOO RICH

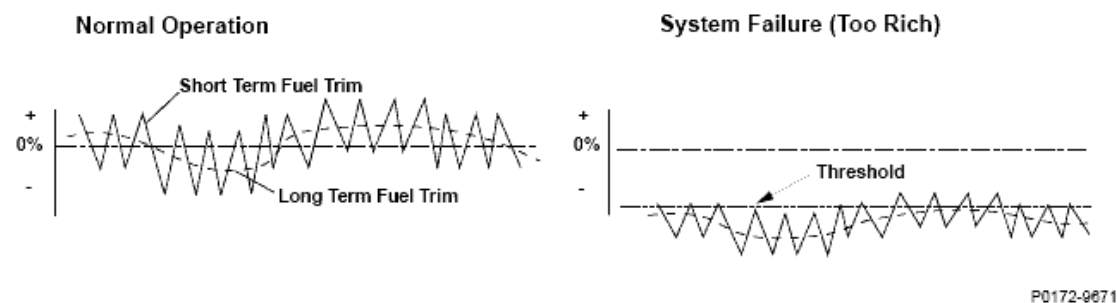


Fig. 48: Front Bank (Bank 2) Fuel System Too Rich Air Fuel Ratio

General Description

The engine control module (ECM)/powertrain control module (PCM) detects the oxygen content in the exhaust gas from the front air/fuel ratio (A/F) sensor (bank 2, sensor 1) signal voltage, and it uses fuel feedback control to maintain the optimal air/fuel ratio. The air/fuel ratio coefficient for correcting the amount of injected fuel is the short term fuel trim. The ECM/PCM varies short term fuel trim continuously to keep the air/fuel ratio close to the stoichiometric ratio for all driving conditions. Long term fuel trim is computed from short term fuel trim and is used to regulate long term deviation from the stoichiometric air/fuel ratio, which occurs when fuel metering components deteriorate with age or system failures occur. In addition, long term fuel trim is stored in the ECM/PCM memory and is used to determine when fuel metering components malfunction. When long term fuel trim is higher than normal, which is about 1.0 (0%), the amount of injected fuel must be increased, and when lower than normal, it must be decreased. If long term fuel trim is lower than normal (too rich), a malfunction in the fuel metering components is detected and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Once per driving cycle ⁽¹⁾
Sequence	None
Duration	12.58 seconds
DTC Type	Two drive cycles, MIL ON
OBD Status	N/A
(1) The malfunction judgment is cleared when it is judged as normal under the same driving conditions in which the malfunction was detected.	

Enable Conditions

ENABLE CONDITIONS

Condition	Minimum	Maximum
Engine coolant temperature	156°F (69°C)	-
Intake air temperature	32°F (0°C)	-
Engine speed	580 rpm ⁽¹⁾ , ⁽²⁾	4,000 rpm
	650 rpm ⁽³⁾	
MAP value	18 kPa (5.2 in.Hg, 130 mmHg) ⁽³⁾	-
	22 kPa (6.3 in.Hg, 160 mmHg) ⁽²⁾	

	22 kPa (6.5 in.Hg, 165 mmHg) ⁽¹⁾
Fuel feedback	Closed loop
Monitoring priority	P0420, P0430, P0456, P0457
No active DTCs	P0107, P0108, P0112, P0113, P0117, P0118, P0154, P0155, P0157, P0158, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0335, P0339, P0401, P0404, P0443, P0496, P0497, P0627, P1077, P1078, P1128, P1129, P1174, P145C, P2197, P2227, P2228, P2229, P2240, P2241, P2247, P2249, P2254, P2255, P2272, P2273, P2413, P2630, P2631, P2646, P2647, P2648, P2649
(1) J32A3 engine (2) J35A8 engine, A/T model (3) J35A8 engine, M/T model	

Malfunction Threshold

Long term fuel trim is lower than 0.844 (-15.6%).

Driving Pattern

1. Start the engine. Hold the engine speed at 3,000 rpm without load (in Park or neutral) until the radiator fan comes on.
 2. Then, drive at a steady speed between 15 - 75 mph (24 - 120 km/h) for at least 15 minutes, and watch the long term fuel trim. If the long term fuel trim stays at about 1.0, the vehicle is OK or it is a very minor problem. If a significant fault is still present, the long term fuel trim will move up or down while driving.
- When freeze frame data is stored, drive the vehicle under those conditions instead of Driving Pattern 2.
 - If the EVAP monitor runs instead of the HO2S monitor, turn the engine off, then restart it, and the HO2S monitor will restart.
 - After clearing the DTC by disconnecting the battery or using the scan tool, extend Driving Pattern 2 to 40 minutes or longer to allow time for long term fuel trim to recover.
 - Drive the vehicle in this manner only if the traffic regulations and ambient conditions allow.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected during the first drive cycle, a Temporary DTC is stored in the ECM/PCM memory. If the malfunction recurs during the next (second) drive cycle, the MIL comes on and the DTC and the freeze frame data are stored.

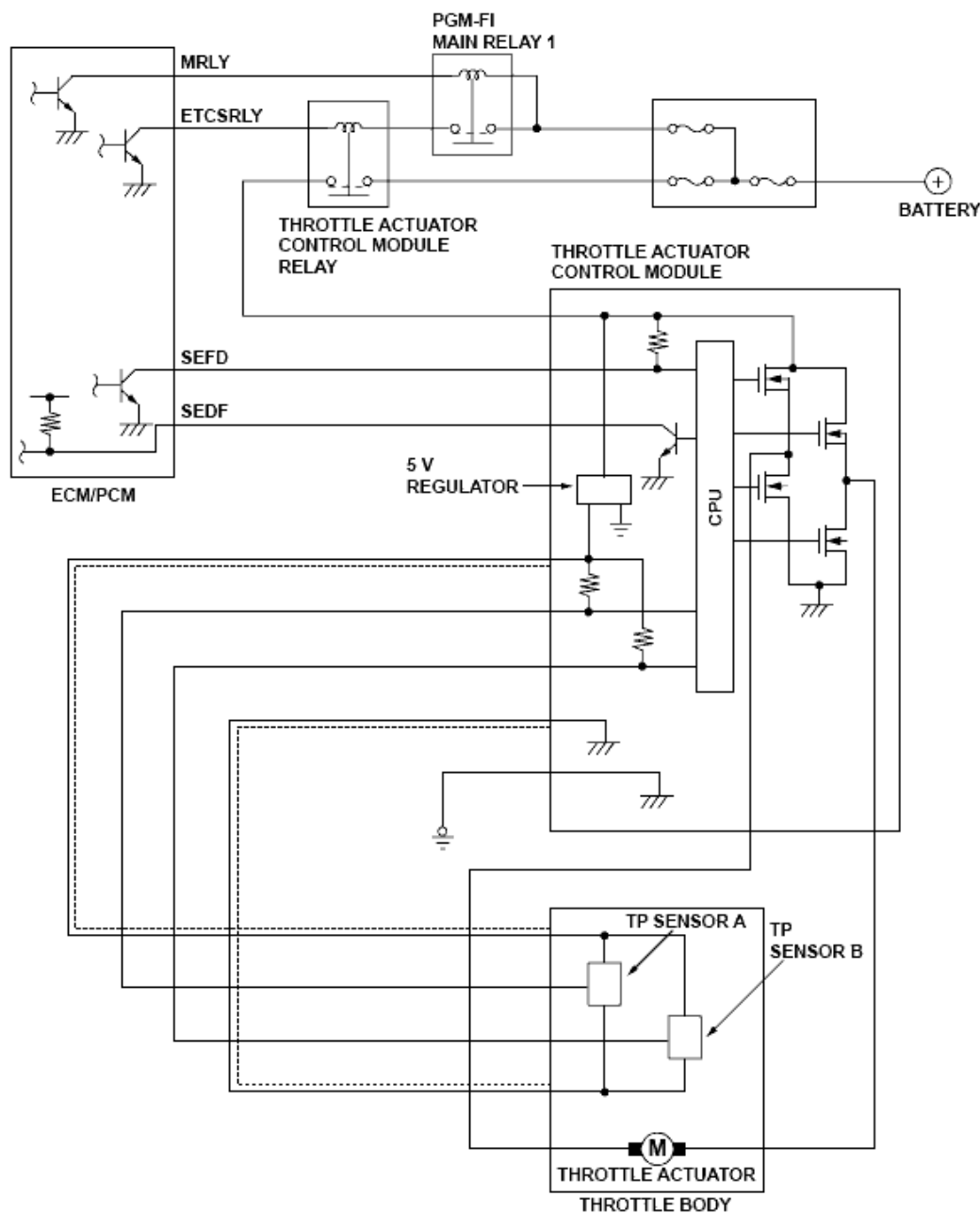
Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive drive cycles in which the engine conditions are similar to the first time the malfunction was detected.

The MIL, the DTC, the Temporary DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P0222 (7): ADVANCED DIAGNOSTICS

DTC P0222: THROTTLE POSITION (TP) SENSOR B CIRCUIT LOW VOLTAGE



P0122-0702

Fig. 49: Throttle Position (TP) Sensor B (Low Voltage) - Circuit Diagram

General Description

Throttle position (TP) sensor B is a semiconductor type, and it is attached to the throttle body and shaft to determine throttle valve position.

The throttle valve position signal from TP sensor B is transmitted to the throttle actuator control module for target position feedback control, then to the engine control module (ECM)/powertrain control module (PCM) as an actual throttle valve position signal.

If the signal from TP sensor B is a fixed value or less for a set time, the throttle actuator control module detects a malfunction and sends the malfunction data to the ECM/PCM. When the ECM/PCM receives the malfunction data from the throttle actuator control module, the ECM/PCM detects a TP sensor B malfunction and stores a DTC.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
Sequence	None
Duration	0.2 second or more
DTC Type	One drive cycle, MIL ON
OBD Status	N/A

Enable Conditions

ENABLE CONDITIONS

Condition	
State of the engine	Running
No active DTCs	P0223, P2101, P2108, P2118, P2135, P2176, U0107

Malfunction Threshold

The TP sensor B output voltage is 0.3 V or less for at least 0.2 second.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected, the MIL comes on and the DTC and the freeze frame data are stored in the ECM/PCM memory.

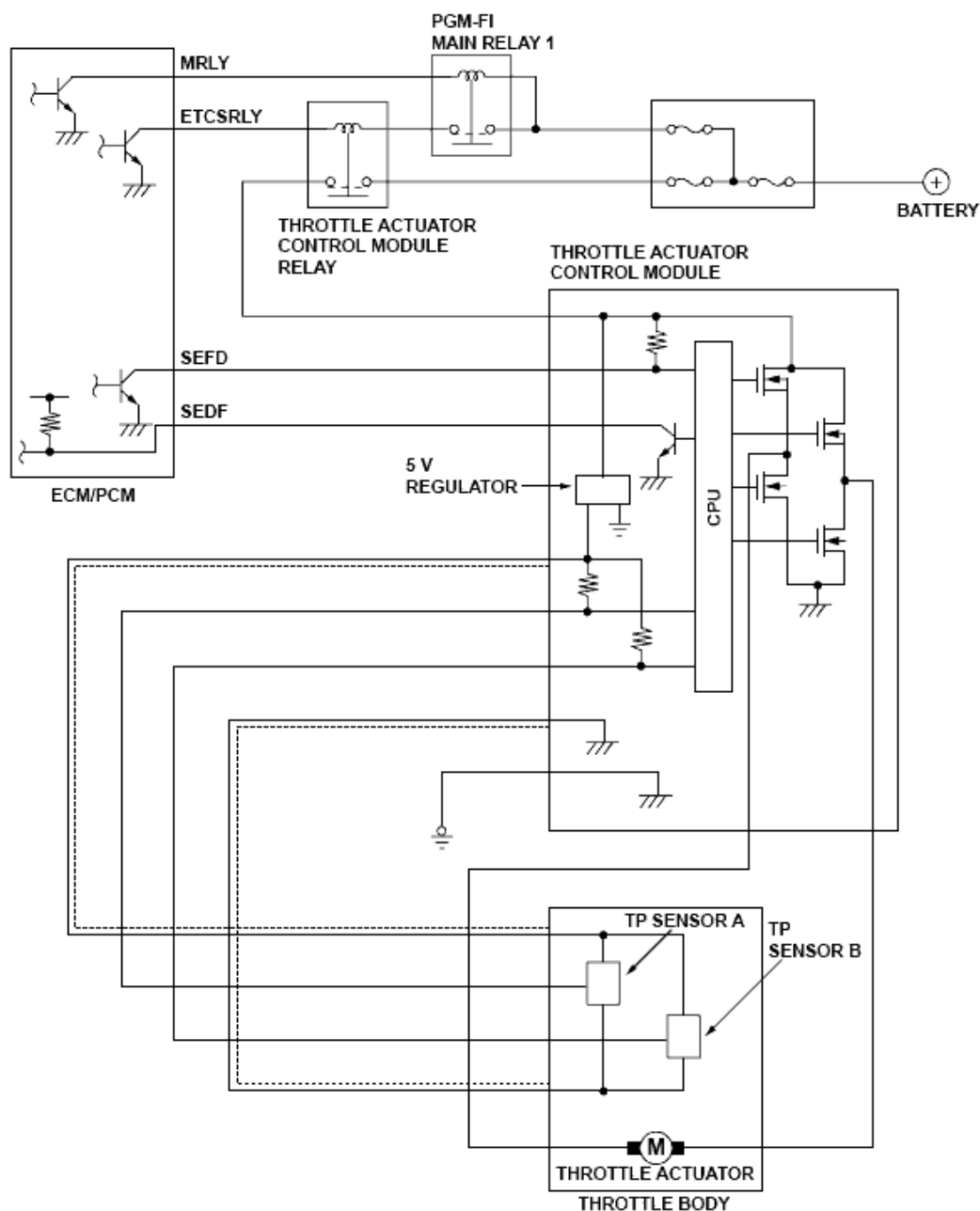
Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P0223 (7): ADVANCED DIAGNOSTICS

DTC P0223: THROTTLE POSITION (TP) SENSOR B CIRCUIT HIGH VOLTAGE



P0122-0702

Fig. 50: Throttle Position (TP) Sensor B (High Voltage) - Circuit Diagram

General Description

Throttle position (TP) sensor B is a semiconductor type, and it is attached to the throttle body and shaft to determine throttle valve position.

The throttle valve position signal from TP sensor B is transmitted to the throttle actuator control module for target position feedback control, then to the engine control module (ECM)/powertrain control module (PCM) as an actual throttle valve position signal.

If the signal from TP sensor B is a fixed value or more for a set time, the throttle actuator control module detects a malfunction and sends the malfunction data to the ECM/PCM. When the ECM/PCM receives the

malfunction data from the throttle actuator control module, the ECM/PCM detects a TP sensor B malfunction and stores a DTC.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
Sequence	None
Duration	0.2 second or more
DTC Type	One drive cycle, MIL ON
OBD Status	N/A

Enable Conditions

ENABLE CONDITIONS

Condition	
State of the engine	Running
No active DTCs	P0222, P2101, P2108, P2118, P2135, P2176, U0107

Malfunction Threshold

The TP sensor B output voltage is 4.8 V or more for at least 0.2 second.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected, the MIL comes on and the DTC and the freeze frame data are stored in the ECM/PCM memory.

Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P0300 (77): ADVANCED DIAGNOSTICS

DTC P0300: RANDOM MISFIRE DETECTED

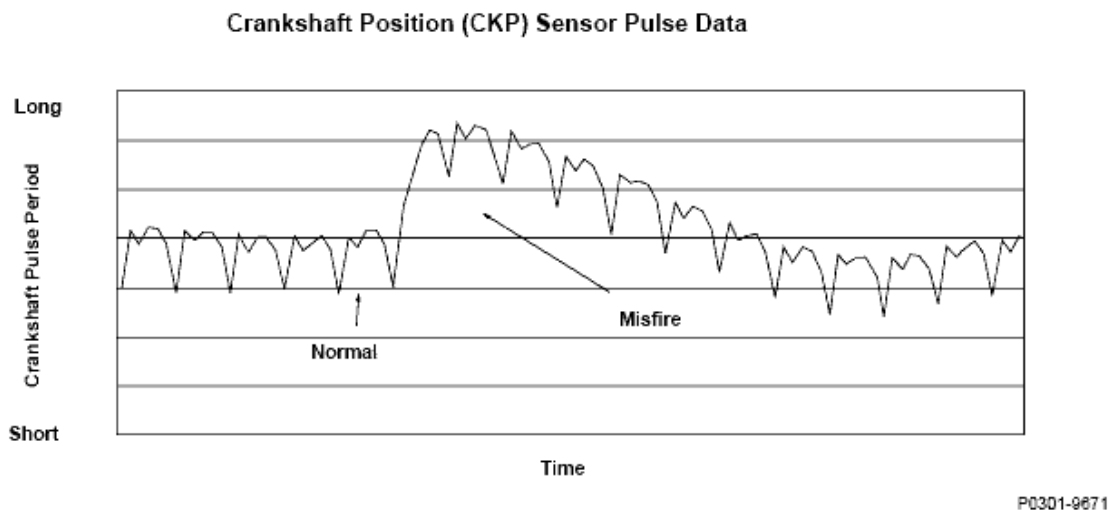


Fig. 51: Crankshaft Position Sensor Pulse Data

General Description

The crankshaft vibrates slightly when each cylinder fires. If a misfire occurs, the crankshaft rotation speed changes rapidly. The engine control module (ECM)/powertrain control module (PCM) monitors the crankshaft rotation speed based on the output pulses from the crankshaft position (CKP) sensor. By monitoring changes in the crankshaft rotation speed, the ECM/PCM counts the number of misfires and determines which cylinder is misfiring. If more than one DTC from P0301 through P0306 has been stored while misfires in multiple cylinders are detected, a malfunction is detected and a DTC is stored.

There are two types of misfire detection.

Type 1 (1 drive cycle): When the number of misfires per 200 engine revolutions reaches the level that damages the three way catalyst (TWC), a DTC is stored and the MIL blinks. When the misfire ceases, the MIL remains on steady instead of blinking.

Type 2 (2 drive cycles): When the number of misfires per 1,000 engine revolutions reaches the level that affects FTP mode exhaust emissions, a DTC is stored and the MIL comes on.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution		Continuous
Sequence		None
Duration	Type 1	Every 200 rpm
	Type 2	Every 1,000 rpm
DTC Type		Two drive cycles, MIL ON
OBD Status		PASSED/FAILED/EXECUTING/OUT OF (TEST) CONDITION

Enable Conditions

ENABLE CONDITIONS

Condition	Minimum	Maximum

Engine coolant temperature		14°F (-10°C) ⁽¹⁾	-
		68°F (20°C) ⁽²⁾	
Engine speed		500 rpm	6,800 rpm
MAP value ⁽³⁾	500 rpm	19 kPa (5.7 in.Hg, 143 mmHg) ⁽⁶⁾	-
		23 kPa (6.7 in.Hg, 170 mmHg) ⁽⁵⁾	
		23 kPa (6.8 in.Hg, 172 mmHg) ⁽⁴⁾	
	2,000 rpm	20 kPa (5.8 in.Hg, 146 mmHg) ⁽⁶⁾	-
		22 kPa (6.5 in.Hg, 165 mmHg) ⁽⁵⁾	
	2,500 rpm	22 kPa (6.5 in.Hg, 163 mmHg) ⁽⁴⁾	-
Fuel feedback		Other than during fuel cut-off operation	
No active DTCs		P0107, P0108, P0117, P0118, P0122, P0123, P0222, P0223, P0335, P0339, P0385, P0389, P1128, P1129, P2227, P2228, P2229	
Other		Test-drive on a flat road to avoid misdetection	
(1) When starting the engine at an engine coolant temperature of more than 14 °F (-10 °C).			
(2) When starting the engine at an engine coolant temperature of 14 °F (-10 °C) or less.			
(3) Varies with driving conditions.			
(4) J32A3 engine			
(5) J35A8 engine, A/T model			
(6) J35A8 engine, M/T model			

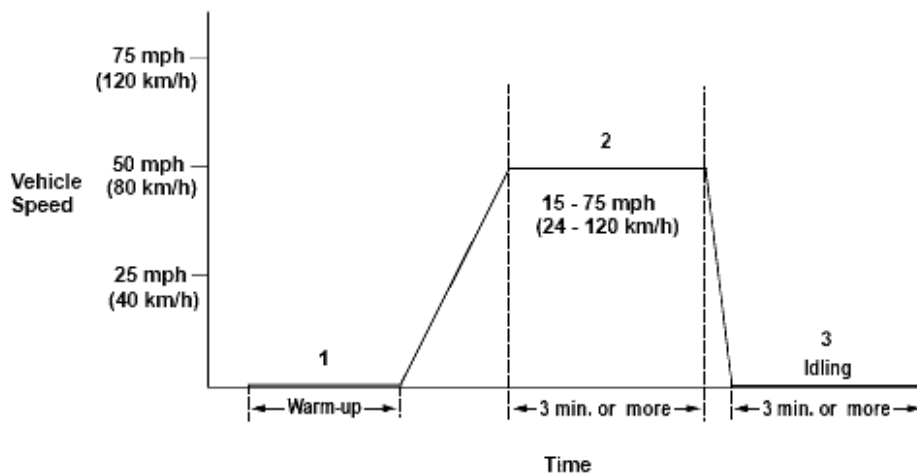
Malfunction Threshold

The number of misfires versus engine revolutions is equal to or greater than the values in the table.

MALFUNCTION THRESHOLD

Misfire Type	The number of engine revolutions	The number of misfires
Misfire Type 1 (Severe)	Per 200 revolutions	27 - 90 ⁽²⁾ , 29 - 82 ^{*1} times ⁽¹⁾
Misfire Type 2 (Light)	Per 1,000 revolutions	61 ^{*3} , 62 ^{*1} , 63 ^{*2} times
(1) Depending on engine speed and load.		
(2) J35A8 engine		

Driving Pattern



P0301-0350

Fig. 52: Vehicle Speed Driving Pattern

1. Start the engine. Hold the engine speed at 3,000 rpm without load (in Park or neutral) until the radiator fan comes on.
 2. Drive the vehicle at a speed between 15 - 75 mph (24 - 120 km/h) for at least 3 minutes.
 3. Stop the vehicle, and let the engine idle for at least 3 minutes.
- When freeze frame data is stored, drive the vehicle under those conditions instead of Driving Patterns 2 or 3.
 - When you have difficulty duplicating the DTC because of road conditions and traffic situations, repeat the driving pattern several times.
 - Drive the vehicle in this manner only if the traffic regulations and ambient conditions allow.

Diagnosis Details

Conditions for illuminating the MIL

Misfire Type 1: Under high rpm or high load conditions: The MIL blinks once per second if a type 1 misfire (catalyst damaging) occurs, and a Temporary DTC is stored. If the type 1 misfire ceases, the MIL goes off. If a type 1 misfire occurs during the next (second) drive cycle, the MIL blinks at the first misfire occurrence, and the DTC and the freeze frame data are stored. The MIL remains on steady if the type 1 misfire ceases.

Under normal driving conditions: The MIL blinks once per second if a type 1 misfire occurs a third time, and a Temporary DTC is stored. If a type 1 misfire occurs during the next (second) drive cycle, the MIL blinks during the third type 1 misfire occurrence, and the DTC and the freeze frame data are stored. If the type 1 misfire ceases, the MIL remains on steady.

Misfire Type 2: When a type 2 misfire (emission-related but not severe enough to immediately damage the TWC) occurs within the first 1,000 engine revolutions after engine start-up, a Temporary DTC is stored. If a type 2 misfire occurs after the first 1,000 engine revolutions after engine start-up, a Temporary DTC is stored during the fourth type 2 misfire occurrence.

If a type 2 misfire occurs during the next (second) drive cycle, the MIL comes on, and the DTC and the freeze frame data are stored.

Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive drive cycles in which the engine conditions are similar to the first time the malfunction was detected.

The MIL, the DTC, the Temporary DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P0301 (71), P0302 (72), P0303 (73), P0304 (74), P0305 (75), P0306 (76): ADVANCED DIAGNOSTICS

DTC P0301: NO. 1 CYLINDER MISFIRE DETECTED; DTC P0302: NO. 2 CYLINDER MISFIRE DETECTED; DTC P0303: NO. 3 CYLINDER MISFIRE DETECTED; DTC P0304: NO. 4 CYLINDER MISFIRE DETECTED; DTC P0305: NO. 5 CYLINDER MISFIRE DETECTED; DTC P0306: NO. 6 CYLINDER MISFIRE DETECTED

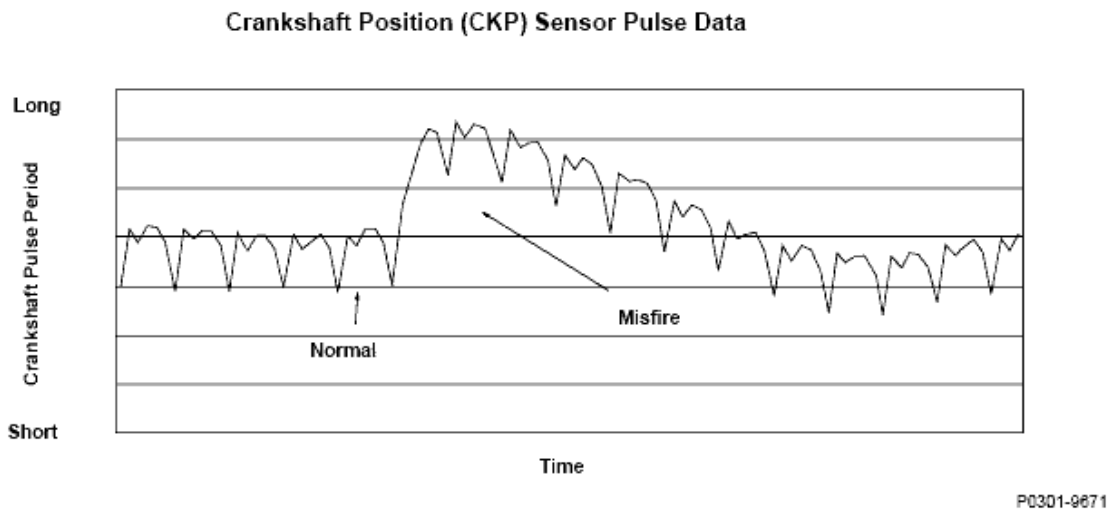


Fig. 53: Crankshaft Position Sensor Pulse Data

General Description

The crankshaft vibrates slightly when each cylinder fires. If a misfire occurs, the crankshaft rotation speed changes rapidly. The engine control module (ECM)/powertrain control module (PCM) monitors engine misfiring based on the output pulses from the crankshaft position (CKP) sensor, counts the number of misfires, and determines which cylinder is misfiring. If a misfire is detected, a DTC is stored.

There are two types of misfire detection.

Type 1 (1 drive cycle): When the number of misfires per 200 engine revolutions reaches the level that damages the three way catalyst (TWC), a DTC is stored and the MIL blinks. When the misfire ceases, the MIL remains on steady instead of blinking.

Type 2 (2 drive cycles): When the number of misfires per 1,000 engine revolutions reaches the level that affects FTP mode exhaust emissions, a DTC is stored and the MIL comes on.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous	
Sequence	None	
Duration	Type 1	Every 200 rpm
	Type 2	Every 1,000 rpm
DTC Type	Two drive cycles, MIL ON	
OBD Status	PASSED/FAILED/EXECUTING/OUT OF (TEST) CONDITION	

Enable Conditions**ENABLE CONDITIONS**

Condition		Minimum	Maximum
Engine coolant temperature		14°F (-10°C) ⁽¹⁾	-
		68°F (20°C) ⁽²⁾	
Engine speed		500 rpm	6,800 rpm
MAP value ⁽³⁾	500 rpm	19 kPa (5.7 in.Hg, 143 mmHg) ⁽⁶⁾	-
		23 kPa (6.7 in.Hg, 170 mmHg) ⁽⁵⁾	
		23 kPa (6.8 in.Hg, 172 mmHg) ⁽⁴⁾	
	2,000 rpm	20 kPa (5.8 in.Hg, 146 mmHg) ⁽⁶⁾	-
		22 kPa (6.5 in.Hg, 165 mmHg) ⁽⁵⁾	
	2,500 rpm	22 kPa (6.5 in.Hg, 163 mmHg) ⁽⁴⁾	-
Fuel feedback		Other than during fuel cut-off operation	
No active		DTCs P0107, P0108, P0117, P0118, P0122, P0123, P0222, P0223, P0335, P0339, P0385, P0389, P1128, P1129, P2227, P2228, P2229	
Other		Test-drive on a flat road to avoid misdetection	
(1) When starting the engine at an engine coolant temperature of more than 14°F (-10°C).			
(2) When starting the engine at an engine coolant temperature of 14°F (-10°C) or less.			
(3) Varies with driving conditions.			
(4) J32A3 engine			
(5) J35A8 engine, A/T model			
(6) J35A8 engine, M/T model			

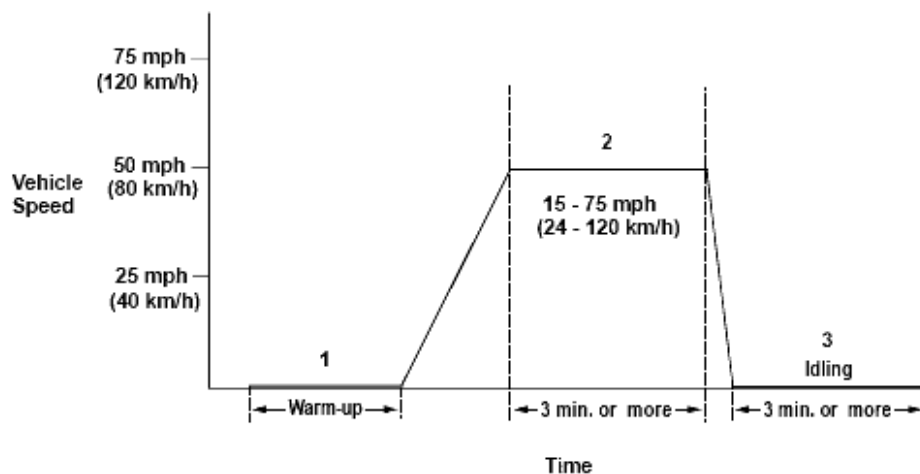
Malfunction Threshold

The number of misfires versus engine revolutions is equal to or greater than the values in the table.

MALFUNCTION THRESHOLD

Misfire Type	The number of engine revolutions	The number of misfires
Misfire Type 1 (Severe)	Per 200 revolutions	27 - 90 ⁽²⁾ , 29 - 82 ^{*1} times ⁽¹⁾
Misfire Type 2 (Light)	Per 1,000 revolutions	61 ^{*3} , 62 ^{*1} , 63 ^{*2} times

(1) Depending on engine speed and load.
(2) J35A8 engine

Driving Pattern

P0301-0350

Fig. 54: Vehicle Speed Driving Pattern

1. Start the engine. Hold the engine speed at 3,000 rpm without load (in Park or neutral) until the radiator fan comes on.
 2. Drive the vehicle at a speed between 15 - 75 mph (24 - 120 km/h) for at least 3 minutes.
 3. Stop the vehicle, and let the engine idle for at least 3 minutes.
- When freeze frame data is stored, drive the vehicle under those conditions instead of Driving Patterns 2 or 3.
 - When you have difficulty duplicating the DTC because of road conditions and traffic situations, repeat the driving pattern several times.
 - Drive the vehicle in this manner only if the traffic regulations and ambient conditions allow.

Diagnosis Details**Conditions for illuminating the MIL**

Misfire Type 1: Under high rpm or high load conditions: The MIL blinks once per second if a type 1 misfire (catalyst damaging) occurs, and a Temporary DTC is stored. If the type 1 misfire ceases, the MIL goes off. If a type 1 misfire occurs during the next (second) drive cycle, the MIL blinks at the first misfire occurrence, and the DTC and the freeze frame data are stored. The MIL remains on steady if the type 1 misfire ceases.

Under normal driving conditions: The MIL blinks once per second if a type 1 misfire occurs a third time,

and a Temporary DTC is stored. If a type 1 misfire occurs during the next (second) drive cycle, the MIL blinks during the third type 1 misfire occurrence, and the DTC and the freeze frame data are stored. If the type 1 misfire ceases, the MIL remains on steady.

Misfire Type 2: When a type 2 misfire (emission-related but not severe enough to immediately damage the TWC) occurs within the first 1,000 engine revolutions after engine start-up, a Temporary DTC is stored. If a type 2 misfire occurs after the first 1,000 engine revolutions after engine start-up, a Temporary DTC is stored during the fourth type 2 misfire occurrence.

If a type 2 misfire occurs during the next (second) drive cycle, the MIL comes on, and the DTC and the freeze frame data are stored.

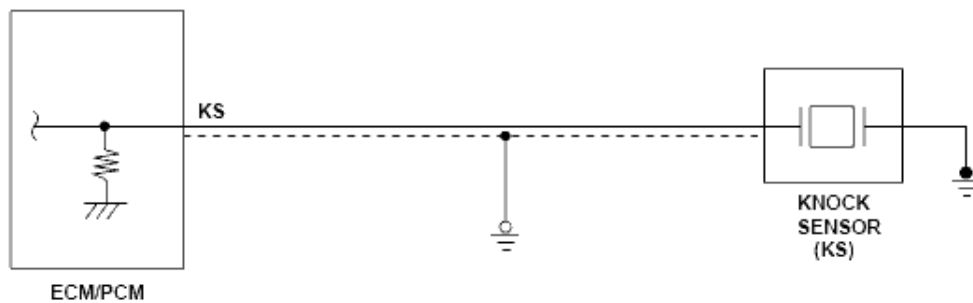
Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive drive cycles in which the engine conditions are similar to the first time the malfunction was detected.

The MIL, the DTC, the Temporary DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P0325 (23): ADVANCED DIAGNOSTICS

DTC P0325: KNOCK SENSOR CIRCUIT MALFUNCTION



P0325-0302

Fig. 55: Knock Sensor (KS) Circuit Diagram

General Description

The knock sensor is mounted on the engine block and detects engine knocking. The vibrations caused by the knocking are converted into electrical signals through the piezo ceramic element. The engine control module (ECM)/powertrain control module (PCM) controls the ignition timing based on the electrical signals. If the signals from the knock sensor do not vary for a set time, the ECM/PCM detects a malfunction and stores a DTC.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
Sequence	None
Duration	5 seconds or more

DTC Type	One drive cycle, MIL ON
OBD Status	PASSED/FAILED/NOT COMPLETED (STILL TESTING)

Enable Conditions**ENABLE CONDITIONS**

Condition	Minimum	Maximum
Engine speed	2,000 rpm	-
Engine coolant temperature	140°F (60°C)	-
No active DTCs	P0117, P0118	

Malfunction Threshold

No signals from the knock sensor are detected for at least 5 seconds.

Driving Pattern

1. Start the engine. Hold the engine speed at 3,000 rpm without load (in Park or neutral) until the radiator fan comes on.
2. Hold the engine speed at 3,000 - 4,000 rpm for at least 10 seconds.

Diagnosis Details**Conditions for illuminating the MIL**

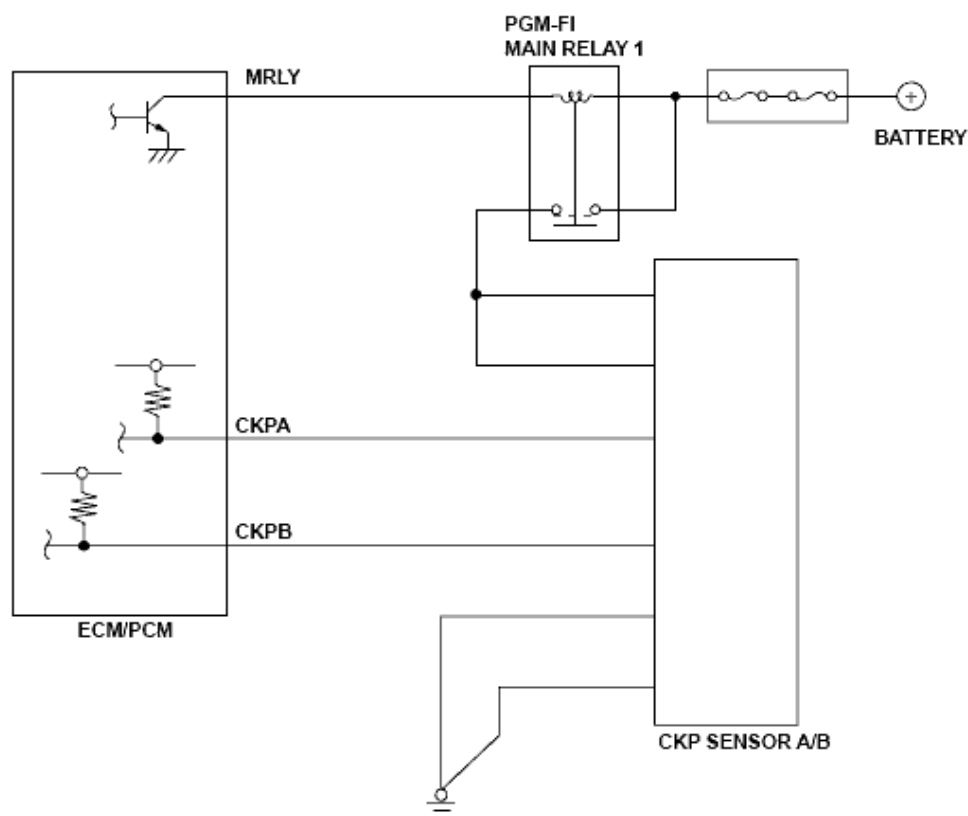
When a malfunction is detected, the MIL comes on and the DTC and the freeze frame data are stored in the ECM/PCM memory.

Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P0335 (4): ADVANCED DIAGNOSTICS**DTC P0335: CRANKSHAFT POSITION (CKP) SENSOR A NO SIGNAL**



P0335-0700

Fig. 56: Crankshaft Position Sensor A - Circuit Diagram

General Description

Crankshaft position (CKP) sensor A consists of a rotor and a semiconductor device that detects rotor position. When the engine starts, the rotor turns and the magnetic flux in the semiconductor device changes. The changes of magnetic flux are converted into pulsing signals to the engine control module (ECM)/powertrain control module (PCM). CKP sensor A detects injection/ignition timing for each cylinder and engine speed.

If no pulsing signals from CKP sensor A are detected, a malfunction is detected and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
Sequence	None
Duration	-
DTC Type	One drive cycle, MIL ON
OBD Status	N/A

Enable Conditions

ENABLE CONDITIONS

Condition	

State of the engine	Running
No active DTCs	P0385, P0389

Malfunction Threshold

No signals from CKP sensor A are detected while signals from CKP sensor B are detected 127 times in succession.

Diagnosis Details**Conditions for illuminating the MIL**

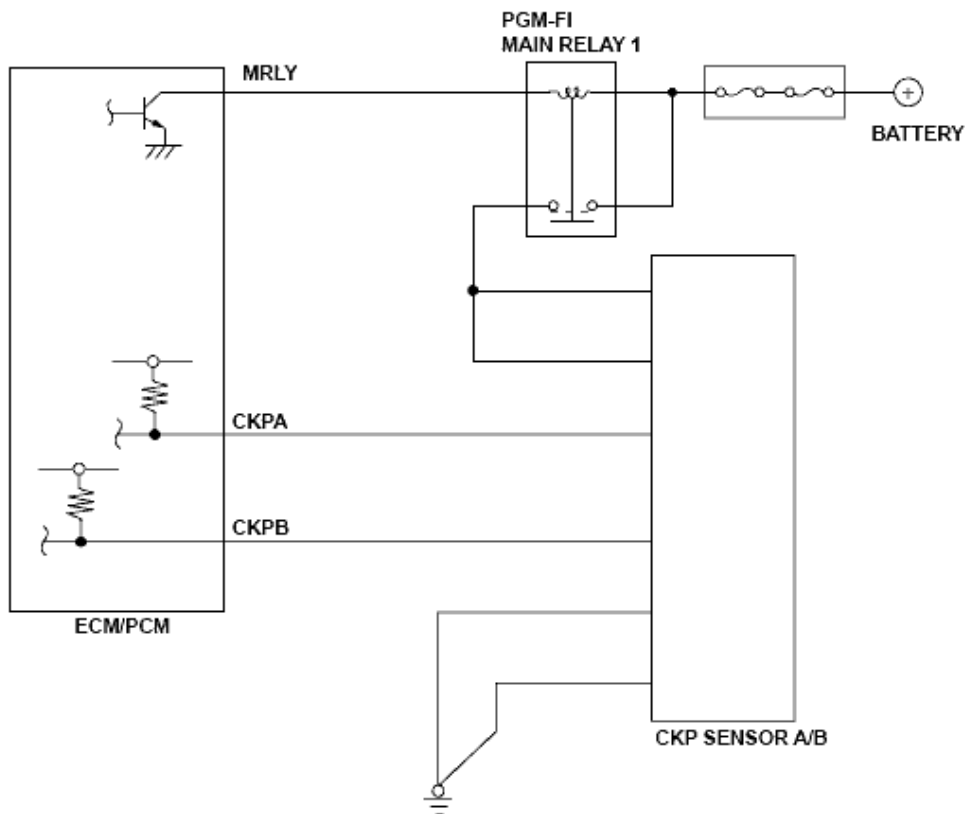
When a malfunction is detected, the MIL comes on and the DTC and the freeze frame data are stored in the ECM/PCM memory.

Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P0339 (4): ADVANCED DIAGNOSTICS**DTC P0339: CRANKSHAFT POSITION (CKP) SENSOR A CIRCUIT INTERMITTENT INTERRUPTION**



P0335-0700

Fig. 57: Crankshaft Position Sensor A - Circuit Diagram

General Description

Crankshaft position (CKP) sensor A consists of a rotor and a semiconductor that detects rotor position. When the engine starts, the rotor turns and the magnetic flux in the semiconductor changes. The changes of magnetic flux are converted into pulsing signals to the engine control module (ECM)/powertrain control module (PCM). CKP sensor A detects injection/ignition timing for each cylinder and engine speed.

If an abnormal amount of pulsing signals are detected from CKP sensor A, a malfunction is detected and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
Sequence	None
Duration	-
DTC Type	One drive cycle, MIL ON
OBD Status	N/A

Enable Conditions

ENABLE CONDITIONS

Condition	

State of the engine

Running

Malfunction Threshold

Other than 22 pulses are detected during intervals between reference pulses for each crankshaft revolution. This condition has been detected at least 30 times.

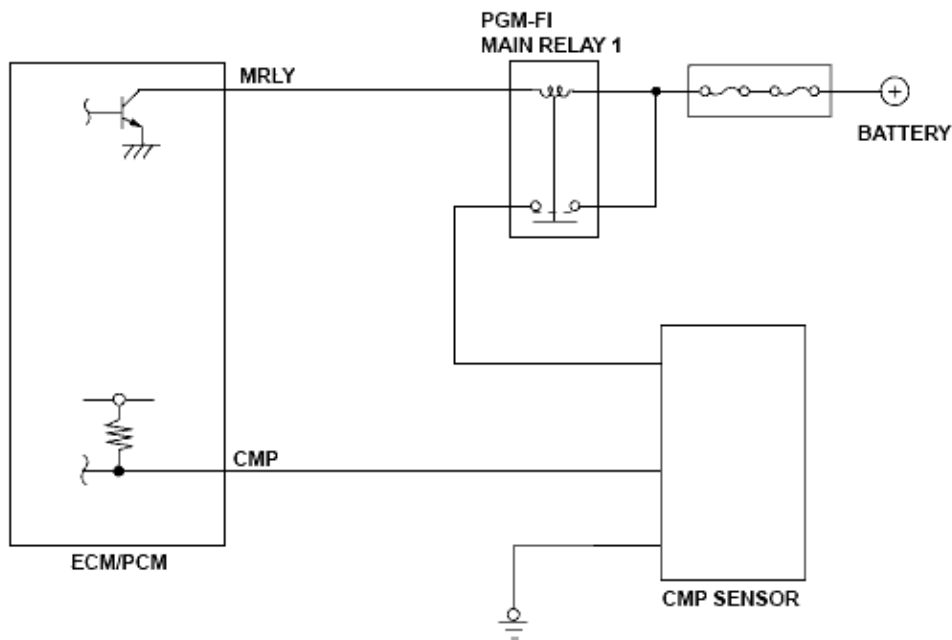
Diagnosis Details**Conditions for illuminating the MIL**

When a malfunction is detected, the MIL comes on and the DTC and the freeze frame data are stored in the ECM/PCM memory.

Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P0340 (9): ADVANCED DIAGNOSTICS**DTC P0340: CAMSHAFT POSITION (CMP) SENSOR NO SIGNAL**

P0340-0702

Fig. 58: Camshaft Position Sensor - Circuit Diagram**General Description**

The camshaft position (CMP) sensor detects the intake camshaft timing and sends pulsing signals to the

engine control module (ECM)/powertrain control module (PCM). The ECM/PCM determines the camshaft position according to the signals from the crankshaft position (CKP) sensor and the CMP sensor. If no pulsing signals are detected from the CMP sensor, a malfunction is detected and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
Sequence	None
Duration	-
DTC Type	One drive cycle, MIL ON
OBD Status	N/A

Enable Conditions

ENABLE CONDITIONS

Condition	
State of the engine	Running
No active DTCs	P0335, P0339, P0344

Malfunction Threshold

No signals from CMP sensor A are detected while signals from the CKP sensor are detected 352 times in succession.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected, the MIL comes on and the DTC and the freeze frame data are stored in the ECM/PCM memory.

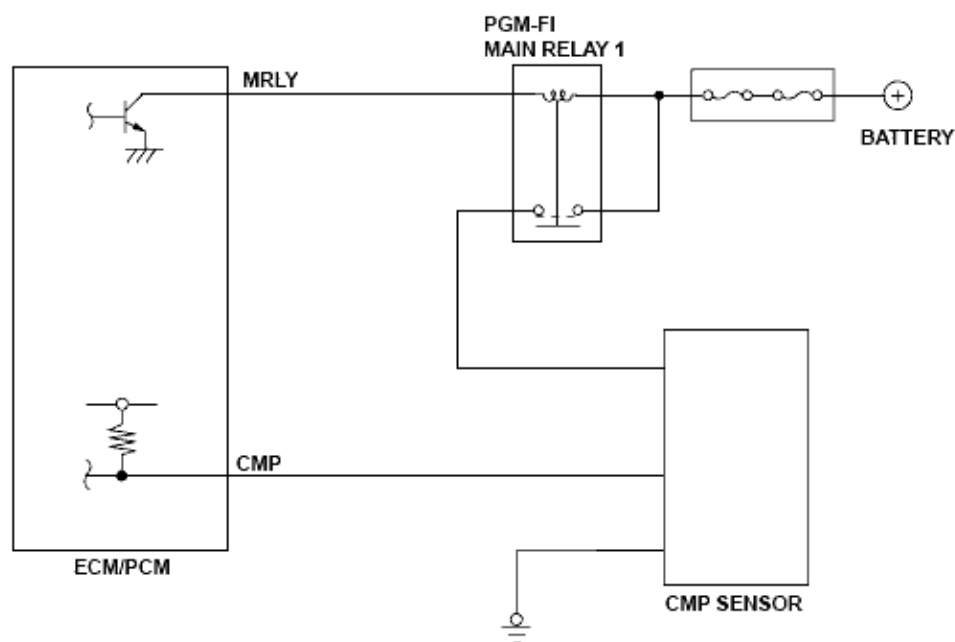
Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P0344 (9): ADVANCED DIAGNOSTICS

DTC P0344: CAMSHAFT POSITION (CMP) SENSOR CIRCUIT INTERMITTENT INTERRUPTION



P0340-0702

Fig. 59: Camshaft Position Sensor - Circuit Diagram

General Description

The camshaft position (CMP) sensor detects the intake camshaft timing and sends pulsing signals to the engine control module (ECM)/powertrain control module (PCM). The ECM/PCM determines the camshaft position according to the signals from the crankshaft position (CKP) sensor and the CMP sensor. If the number of pulsing signals from the CMP sensor during intervals between the CKP standard pulses is more or less than the proper number, a malfunction is detected and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
Sequence	None
Duration	-
DTC Type	One drive cycle, MIL ON
OBD Status	N/A

Enable Conditions

ENABLE CONDITIONS

Condition	
State of the engine	Running
No active DTCs	P0335, P0339, P0340

Malfunction Threshold

More or less than two CMP sensor pulses are detected during intervals between the CKP standard pulses. This condition occurs at least 30 times.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected, the MIL comes on and the DTC and the freeze frame data are stored in the ECM/PCM memory.

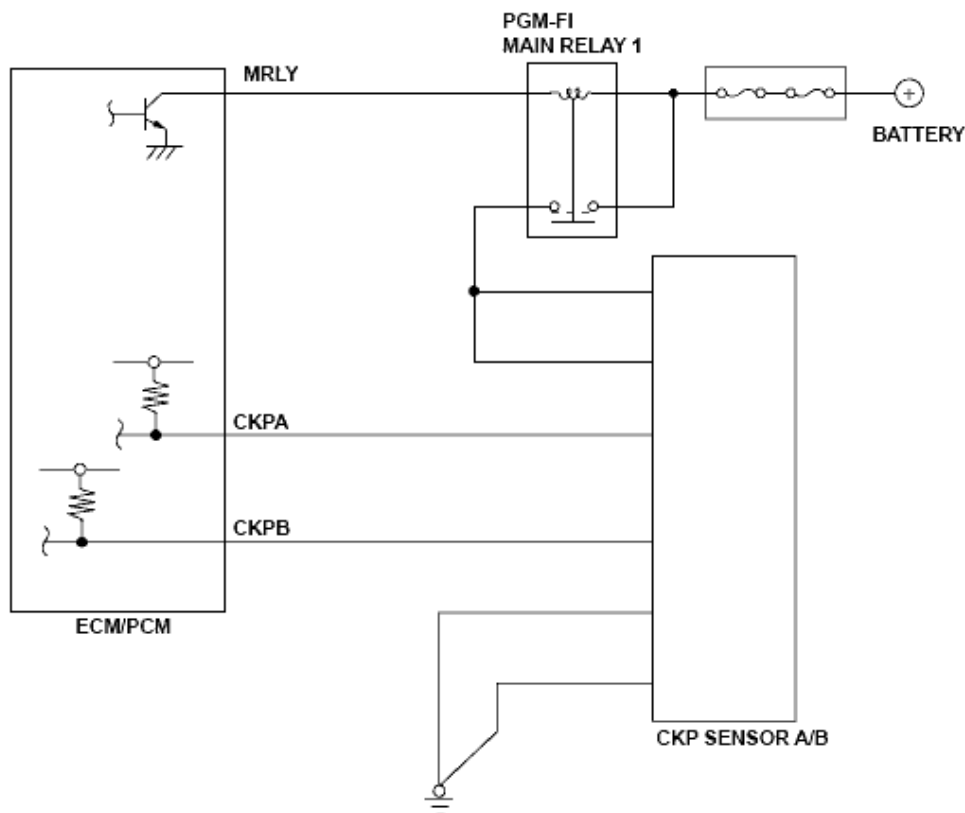
Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P0385 (54): ADVANCED DIAGNOSTICS

DTC P0385: CRANKSHAFT POSITION (CKP) SENSOR B NO SIGNAL



P0335-0700

Fig. 60: Crankshaft Position Sensor B - Circuit Diagram

General Description

Crankshaft position (CKP) sensor B consists of a rotor and a semiconductor that detects rotor position. When the engine starts, the rotor turns and the magnetic flux in the semiconductor changes. The changes of magnetic flux are converted into pulsing signals to the engine control module (ECM)/powertrain control

module (PCM). CKP sensor B detects injection/ignition timing for each cylinder and engine speed.

If no pulsing signals are detected from CKP sensor B, a malfunction is detected and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
Sequence	None
Duration	-
DTC Type	One drive cycle, MIL ON
OBD Status	N/A

Enable Conditions

ENABLE CONDITIONS

Condition	
State of the engine	Running
No active DTCs	P0335, P0339

Malfunction Threshold

No signals from CKP sensor B are detected while signals from CKP sensor A are detected 352 times in succession.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected, the MIL comes on and the DTC and the freeze frame data are stored in the ECM/PCM memory.

Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P0389 (54): ADVANCED DIAGNOSTICS

DTC P0389: CRANKSHAFT POSITION (CKP) SENSOR B CIRCUIT INTERMITTENT INTERRUPTION

State of the engine

Running

Malfunction Threshold

Other than 22 pulses are detected during intervals between reference pulses for each crankshaft revolution. This condition has been detected at least 30 times.

Diagnosis Details**Conditions for illuminating the MIL**

When a malfunction is detected, the MIL comes on and the DTC and the freeze frame data are stored in the ECM/PCM memory.

Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

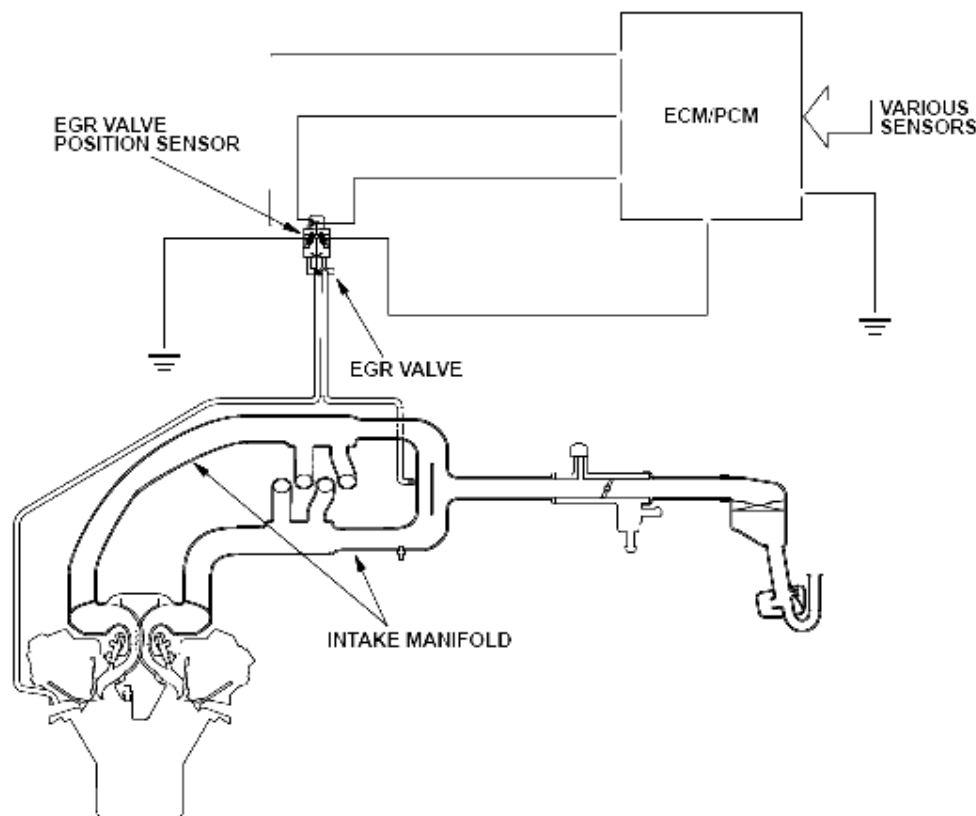
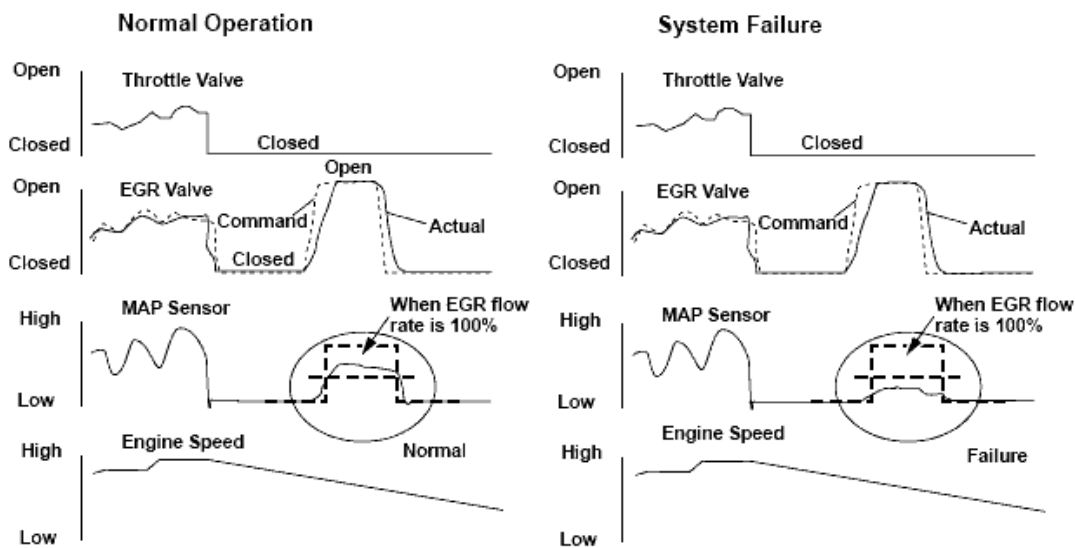
DTC P0401 (80): ADVANCED DIAGNOSTICS**DTC P0401: EXHAUST GAS RECIRCULATION (EGR) INSUFFICIENT FLOW**

Fig. 62: Exhaust Gas Recirculation Insufficient Flow Diagram

P0401-0371

Fig. 63: Exhaust Gas Recirculation Valve Normal Operation And System Failure Diagram**General Description**

The exhaust gas recirculation (EGR) valve, which is controlled by the engine control module (ECM)/powertrain control module (PCM), is opened and the exhaust gas flows from the exhaust manifold through the EGR valve and the intake manifold and the EGR passage. The exhaust gas is circulated into the air/fuel mixture and the mixture is drawn into the combustion chamber to lower combustion temperatures, thus reducing oxides of nitrogen (NOx) emissions.

The EGR flow is inspected as follows. The EGR valve is closed during deceleration with the throttle valve fully closed. Then the ECM/PCM fully opens the EGR valve. After a set time, the ECM/PCM computes the ratio of the present EGR flow to the normal EGR flow by monitoring the fluctuation of the intake manifold pressure between when the EGR valve is fully opened and when it is fully closed. If the EGR flow rate is lower than normal, a malfunction is detected and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status**MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS**

Execution	Once per driving cycle
Sequence	"EGR valve insufficient lift" P0404, P2413 is OK
Duration	3 seconds or more
DTC Type	Two drive cycles, MIL ON
OBD Status	PASSED/FAILED/EXECUTING/OUT OF (TEST) CONDITION

Enable Conditions**ENABLE CONDITIONS**

Condition	Minimum	Maximum
Engine coolant temperature	156°F (69°C)	-

Engine speed	1,100 rpm ⁽²⁾	2,400 rpm ⁽³⁾
		2,750 rpm ⁽⁴⁾
	1,240 rpm ⁽¹⁾	2,400 rpm ⁽¹⁾
MAP value	12 kPa (3.6 in.Hg, 90 mmHg) ⁽²⁾	-
	14 kPa (4.0 in.Hg, 100 mmHg) ⁽¹⁾	
Vehicle speed	30 mph (48 km/h)	-
Battery voltage	10.5 V	-
Throttle position	Fully closed	
Fuel feedback	During deceleration	
No active DTCs	P0107, P0108, P0112, P0113, P0117, P0118, P0122, P0123, P0134, P0135, P0154, P0155, P0222, P0223, P0335, P0339, P0404, P0406, P0443, P0496, P0497, P0506, P0507, P1077, P1078, P1128, P1129, P1172, P1174, P145C, P2101, P2108, P2118, P2122, P2123, P2127, P2128, P2135, P2138, P2176, P2195, P2197, P2227, P2228, P2229, P2237, P2238, P2240, P2241, P2243, P2245, P2247, P2249, P2251, P2252, P2254, P2255, P2279, P2413, P2627, P2628, P2630, P2631, P2646, P2647, P2648, P2649	
(1) J32A3 engine		
(2) J35A8 engine		
(3) J35A8 engine, A/T model		
(4) J35A8 engine, M/T model		

Malfunction Threshold

The ratio of the current EGR flow to the normal EGR flow is 15% or less.

The difference between the MAP value before and after the Enable Conditions are met is no more than the values in the table. The change in pressure should occur for at least 3 seconds.

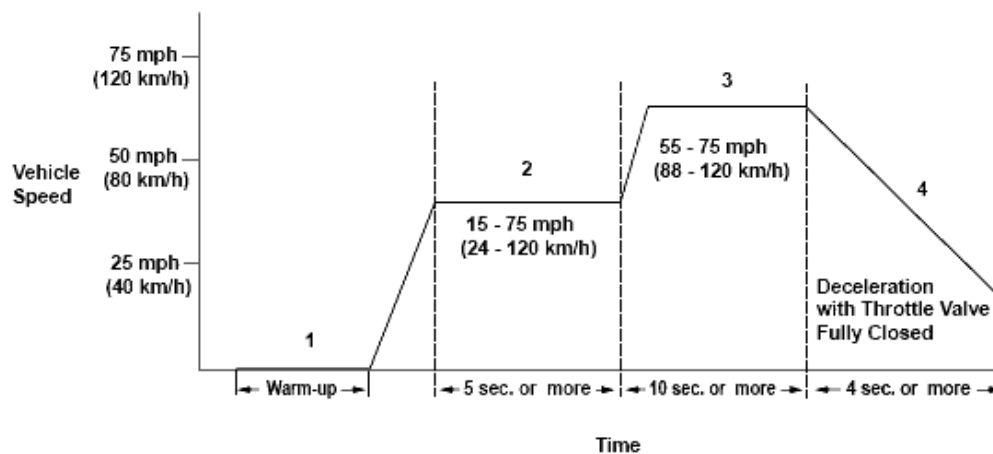
MALFUNCTION THRESHOLD

Engine speed	Barometric pressure	
	52 kPa (15.4 in.Hg, 392 mmHg)	102 kPa (30.0 in.Hg, 760 mmHg)
1,100 rpm	7 kPa (2.2 in.Hg, 56 mmHg) ^{*1}	17 kPa (5.1 in.Hg, 131 mmHg) ^{*1}
	8 kPa (2.5 in.Hg, 65 mmHg) ^{*2}	14 kPa (4.2 in.Hg, 107 mmHg) ^{*2}
2,100 rpm ^{*2}	4 kPa (1.2 in.Hg, 32 mmHg)	12 kPa (3.5 in.Hg, 55 mmHg)
2,200 rpm ^{*1}	4 kPa (1.2 in.Hg, 32 mmHg)	7 kPa (2.1 in.Hg, 63 mmHg)

Confirmation Procedure with the HDS

Do the EGR TEST in the INSPECTION MENU with the HDS.

Driving Pattern



P0401-0350

Fig. 64: DTC P0401 Vehicle Speed Driving Pattern

1. Start the engine. Hold the engine speed at 3,000 rpm without load (in Park or neutral) until the radiator fan comes on.
 2. Drive the vehicle at a speed between 15 - 75 mph (24 - 120 km/h) for at least 5 seconds.
 3. Then, drive at a steady speed between 55 - 75 mph (88 - 120 km/h) for at least 10 seconds.
 4. Decelerate with the throttle valve fully closed for at least 4 seconds.
- Drive the vehicle in this manner only if the traffic regulations and ambient conditions allow.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected during the first drive cycle, a Temporary DTC is stored in the ECM/PCM memory. If the malfunction recurs during the next (second) drive cycle, the MIL comes on and the DTC and the freeze frame data are stored.

Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, the Temporary DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P0404 (12): ADVANCED DIAGNOSTICS

DTC P0404: EXHAUST GAS RECIRCULATION (EGR) VALVE CIRCUIT RANGE/PERFORMANCE PROBLEM

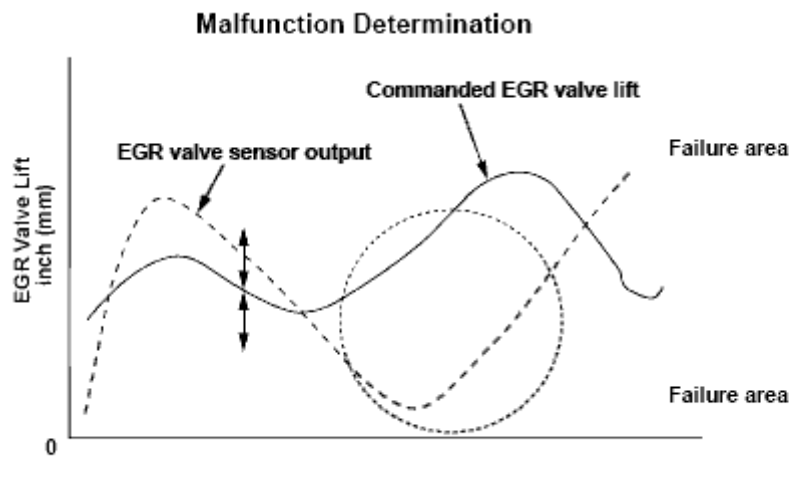


Fig. 65: Exhaust Gas Recirculation Valve Lift Graph

General Description

The exhaust gas recirculation (EGR) valve, which is controlled by the engine control module (ECM)/powertrain control module (PCM), is opened and the exhaust gas flows from the exhaust manifold through the EGR valve and the intake manifold and the EGR passage. The exhaust gas is circulated into the air/fuel mixture and the mixture is drawn into the combustion chamber to lower combustion temperatures, thus reducing oxides of nitrogen (NO_x) emissions.

A sensor (lift sensor) is built into the EGR valve and detects the amount of valve lift. The command value for the target valve lift is stored in the ECM/PCM so that exhaust gas recirculation can be optimized according to driving conditions.

Comparing this command value with the lift sensor output signal value, the ECM/PCM controls the EGR valve to make the amount of actual valve lift equal to the command value.

If the lift sensor output (actual valve lift) is greater than the commanded valve lift, an abnormality in the EGR valve or the lift sensor output is determined.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Once per driving cycle
Sequence	None
Duration	5 seconds or more
DTC Type	Two drive cycles, MIL ON
OBD Status	PASSED/FAILED/EXECUTING/OUT OF (TEST) CONDITION

Enable Conditions

ENABLE CONDITIONS

Condition	Minimum	Maximum
Engine speed	-	4,400 rpm ⁽¹⁾

		4,600 rpm ⁽²⁾
Battery voltage	10.5 V	-
Commanded EGR valve lift	0.012 in. (0.3 mm)	-
No active DTCs	P0107, P0108, P0112, P0113, P0117, P0118, P0134, P0135, P0154, P0155, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0335, P0339, P0401, P0406, P1128, P1129, P1172, P1174, P2195, P2197, P2237, P2238, P2240, P2241, P2243, P2245, P2247, P2249, P2251, P2252, P2254, P2255, P2627, P2628, P2630, P2631	
(1) J32A3 engine		
(2) J35A8 engine		

Malfunction Threshold

The difference between the command value of the amount of EGR valve lift in the ECM/PCM and the actual amount of valve lift is 0.041 in. (1.020 mm) or more for at least 5 seconds.

Confirmation Procedure with the HDS

Do the EGR TEST in the INSPECTION MENU with the HDS.

Driving Pattern

1. Start the engine. Hold the engine speed at 3,000 rpm without load (in Park or neutral) until the radiator fan comes on.
2. Drive the vehicle at a speed between 15 - 75 mph (24 - 120 km/h) for at least 5 seconds.
 - Drive the vehicle in this manner only if the traffic regulations and ambient conditions allow.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected during the first drive cycle, a Temporary DTC is stored in the ECM/PCM memory. If the malfunction recurs during the next (second) drive cycle, the MIL comes on and the DTC and the freeze frame data are stored.

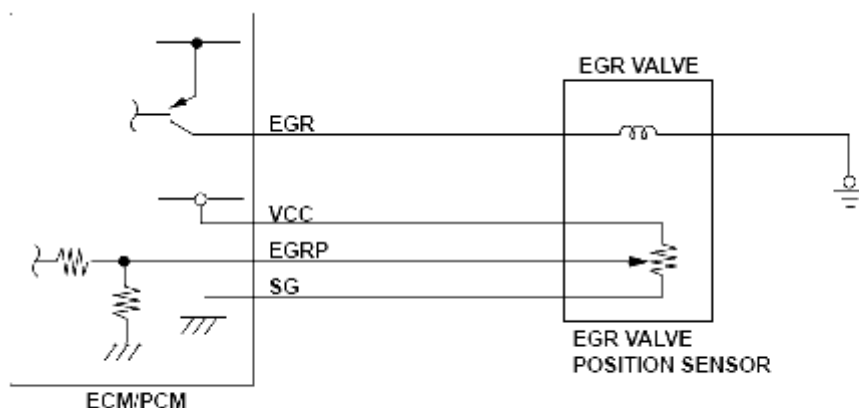
Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, the Temporary DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P0406 (12): ADVANCED DIAGNOSTICS

DTC P0406: EXHAUST GAS RECIRCULATION (EGR) VALVE POSITION SENSOR CIRCUIT HIGH VOLTAGE



PC401-0501

Fig. 66: Exhaust Gas Recirculation Valve Position Sensor (High Voltage) - Circuit Diagram

General Description

The exhaust gas recirculation (EGR) system reduces oxides of nitrogen (NO_x). NO_x is generated by high combustion temperatures. The EGR system lowers peak combustion temperature by recirculating inert exhaust gas into the air/fuel mixture, thus reducing NO_x emissions. To determine the optimal amount of recirculating exhaust gas, depending on driving conditions, a command value (the amount of valve lift) is stored in the engine control module (ECM)/powertrain control module (PCM). The EGR valve position sensor indicates the amount of valve lift, and the ECM/PCM controls the EGR valve so that the amount of actual valve lift equals the command value by comparing the command value and the actual amount of valve lift.

If EGR valve position sensor output voltage is not within a specified value, a malfunction is detected and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
Sequence	None
Duration	2 seconds or more
DTC Type	One drive cycle, MIL ON
OBD Status	N/A

Enable Conditions

ENABLE CONDITIONS

Condition	
State of the engine	Running

Malfunction Threshold

The EGR valve position sensor output voltage is 4.88 V or more for at least 2 seconds.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected, the MIL comes on and the DTC and the freeze frame data are stored in the ECM/PCM memory.

Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P0420 (165): ADVANCED DIAGNOSTICS

DTC P0420: REAR BANK CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1)

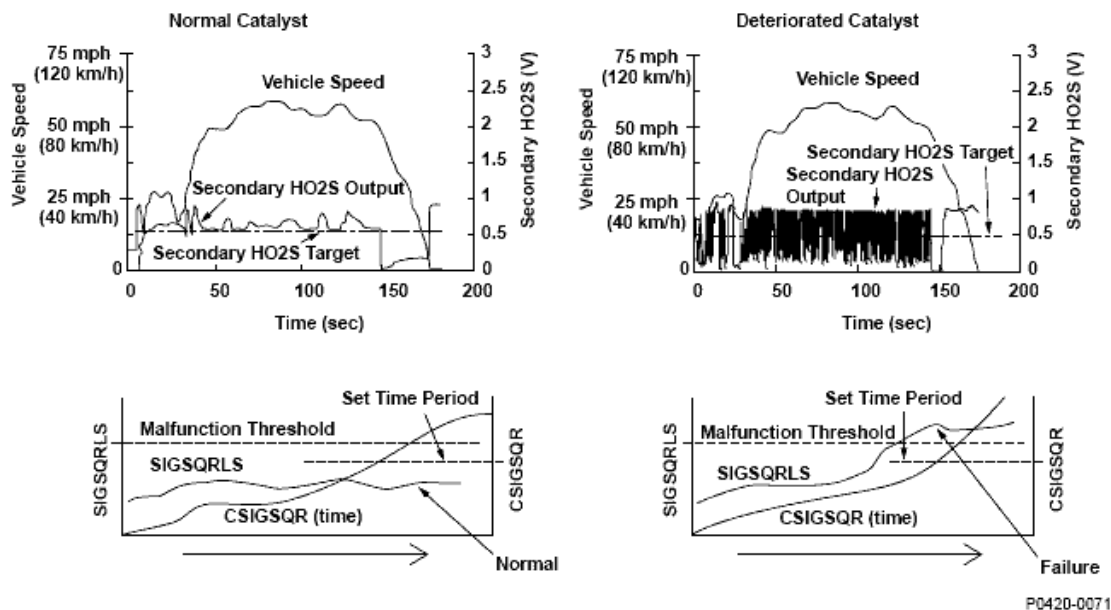


Fig. 67: Rear Bank Catalyst System Efficiency Below Threshold (Bank 1) Graph

General Description

The three way catalytic converter (TWC) converts hydrocarbons (HC), carbon monoxide (CO), and oxides of nitrogen (NO_x) in the exhaust gas to water vapor, carbon dioxide (CO₂), and dinitrogen (N₂).

The TWC efficiency does not depend entirely on engine conditions or the deterioration level of the TWC. It can be optimized by stabilizing the secondary HO2S output.

If the TWC deteriorates, the air/fuel ratio downstream of the TWC (the secondary HO2S output) often differs from the target secondary HO2S output, and the status is represented by the parameter (SIGSQRLS).

Therefore, if the SIGSQRLS exceeds a specified value for a set time, a malfunction is detected and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status**MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS**

Execution	Once per driving cycle
Sequence	None
Duration	102 seconds or more
DTC Type	Two drive cycles, MIL ON
OBD Status	PASSED/FAILED/EXECUTING/OUT OF (TEST) CONDITION

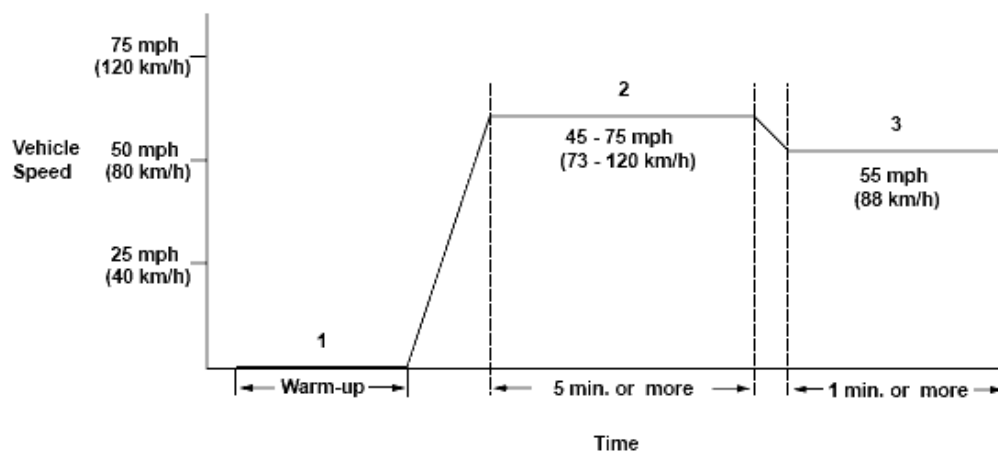
Enable Conditions**ENABLE CONDITIONS**

Condition	Minimum	Maximum
Engine coolant temperature	156°F (69°C)	-
Intake air temperature	8°F (-13°C)	-
Estimated TWC temperature	932°F (500°C)	-
Engine speed	1,150 rpm ⁽¹⁾	2,185 rpm ⁽¹⁾
	1,200 rpm ⁽²⁾	2,200 rpm ⁽²⁾
	1,600 rpm ⁽³⁾	2,500 rpm ⁽³⁾
MAP value	22 kPa (6.3 in.Hg, 160 mmHg)	69 kPa (20.4 in.Hg, 520 mmHg) (2)
		73 kPa (21.6 in.Hg, 550 mmHg) (1), (3)
Vehicle speed	4 mph (5 km/h)	-
Fuel trim	0.73	1.47
Fuel feedback	Closed loop	
Monitoring priority	P0456, P0457, P0497	
No active DTCs	P0107, P0108, P0112, P0113, P0117, P0118, P0133, P0134, P0135, P0137, P0138, P0139, P0141, P0171, P0172, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0335, P0339, P0340, P0344, P0401, P0404, P0443, P0496, P0497, P0627, P1077, P1078, P1128, P1129, P1172, P145C, P2195, P2227, P2228, P2229, P2237, P2238, P2243, P2245, P2251, P2252, P2270, P2271, P2413, P2627, P2628, P2646, P2647, P2648, P2649, P2A00	
(1) J32A3 engine		
(2) J35A8 engine, A/T model		
(3) J35A8 engine, M/T model		

Malfunction Threshold

The number of detections is 816 (CTAGLT67) or more.

Driving Pattern



P0420-0350

Fig. 68: Vehicle Speed Driving Pattern

1. Start the engine. Hold the engine speed at 3,000 rpm without load (in Park or neutral) until the radiator fan comes on.
 2. Drive the vehicle at a speed between 45 - 75 mph (73 - 120 km/h) for at least 5 minutes, to warm up the TWC.
 3. Set a vehicle speed of 55 mph (88 km/h) on the cruise control, and drive for at least 1 minute.
- Drive the vehicle in this manner only if the traffic regulations and ambient conditions allow.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected during the first drive cycle, a Temporary DTC is stored in the ECM/PCM memory. If the malfunction recurs during the next (second) drive cycle, the MIL comes on and the DTC and the freeze frame data are stored.

Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, the Temporary DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P0430 (166): ADVANCED DIAGNOSTICS

DTC P0430: FRONT BANK CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 2)

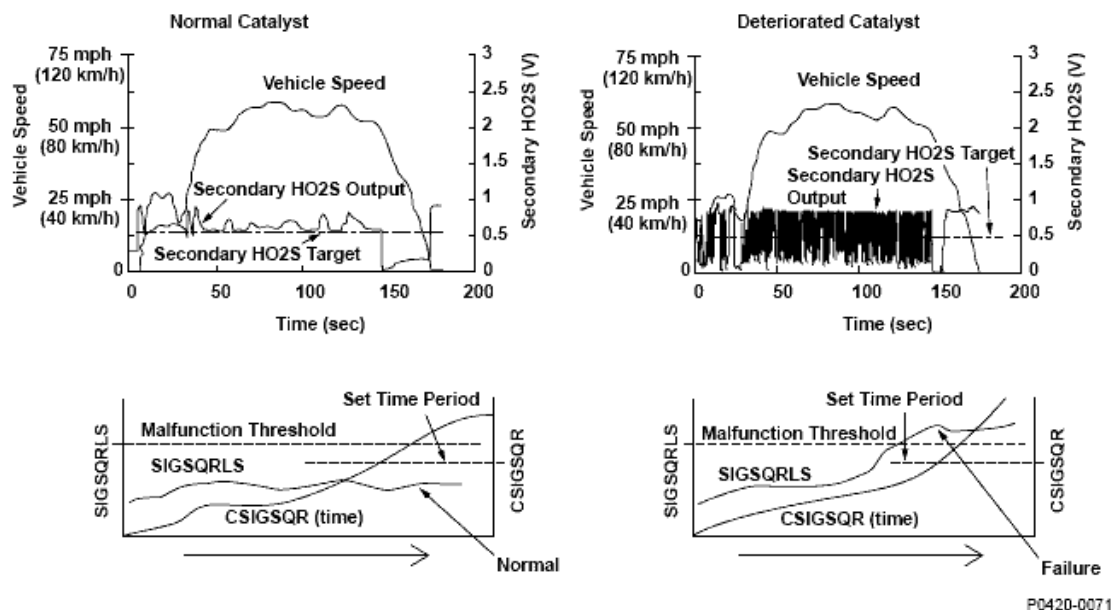


Fig. 69: Front Bank Catalyst System Efficiency Below Threshold (Bank 2) Graph

General Description

The three way catalytic converter (TWC) converts hydrocarbons (HC), carbon monoxide (CO), and oxides of nitrogen (NO_x) in the exhaust gas to water vapor, carbon dioxide (CO₂), and dinitrogen (N₂).

The TWC efficiency does not depend entirely on engine conditions or the deterioration level of the TWC. It can be optimized by stabilizing the secondary HO₂S output.

If the TWC deteriorates, the air/fuel ratio downstream of the TWC (the secondary HO₂S output) often differs from the target secondary HO₂S output, and the status is represented by the parameter (SIGSQRLS).

Therefore, if the SIGSQRLS exceeds a specified value for a set time, a malfunction is detected and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Once per driving cycle
Sequence	None
Duration	102 seconds or more
DTC Type	Two drive cycles, MIL ON
OBD Status	PASSED/FAILED/EXECUTING/OUT OF (TEST) CONDITION

Enable Conditions

ENABLE CONDITIONS

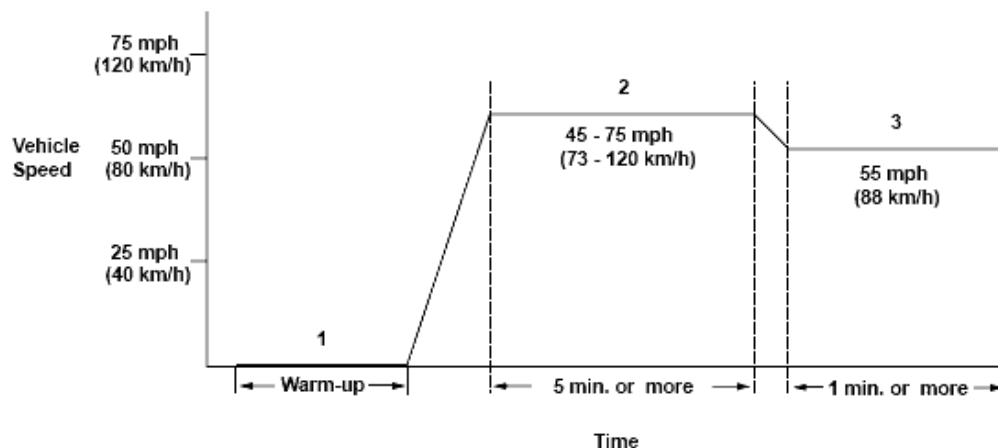
Condition	Minimum	Maximum
Engine coolant temperature	156°F (69°C)	-
Intake air temperature	8°F (-13°C)	-
Estimated TWC temperature	932°F (500°C)	-

Engine speed	1,150 rpm ⁽¹⁾	2,185 rpm ⁽¹⁾
	1,200 rpm ⁽²⁾	2,200 rpm ⁽²⁾
	1,600 rpm ⁽³⁾	2,500 rpm ⁽³⁾
MAP value	22 kPa (6.3 in.Hg, 160 mmHg)	69 kPa (20.4 in.Hg, 520 mmHg) (2)
		73 kPa (21.6 in.Hg, 550 mmHg) (1), (3)
Vehicle speed	4 mph (5 km/h)	-
Fuel trim	0.73	1.47
Fuel feedback	Closed loop	
Monitoring priority	P0456, P0457, P0497	
No active DTCs	P0107, P0108, P0112, P0113, P0117, P0118, P0153, P0154, P0155, P0157, P0158, P0159, P0161, P0174, P0175, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0335, P0339, P0340, P0344, P0401, P0404, P0443, P0496, P0497, P0627, P1077, P1078, P1128, P1129, P1174, P145C, P2197, P2227, P2228, P2229, P2240, P2241, P2247, P2249, P2254, P2255, P2272, P2273, P2413, P2630, P2631, P2646, P2647, P2648, P2649, P2A03	
(1) J32A3 engine		
(2) J35A8 engine, A/T model		
(3) J35A8 engine, M/T model		

Malfunction Threshold

The number of detections is 768*², 784*^{1, 3} (CTAGLT68) or more.

Driving Pattern



P0420-0350

Fig. 70: Vehicle Speed Driving Pattern

1. Start the engine. Hold the engine speed at 3,000 rpm without load (in Park or neutral) until the

radiator fan comes on.

2. Drive the vehicle at a speed between 45 - 75 mph (73 - 120 km/h) for at least 5 minutes, to warm up the TWC.
 3. Set a vehicle speed of 55 mph (88 km/h) on the cruise control, and drive for at least 1 minute.
- Drive the vehicle in this manner only if the traffic regulations and ambient conditions allow.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected during the first drive cycle, a Temporary DTC is stored in the ECM/PCM memory. If the malfunction recurs during the next (second) drive cycle, the MIL comes on and the DTC and the freeze frame data are stored.

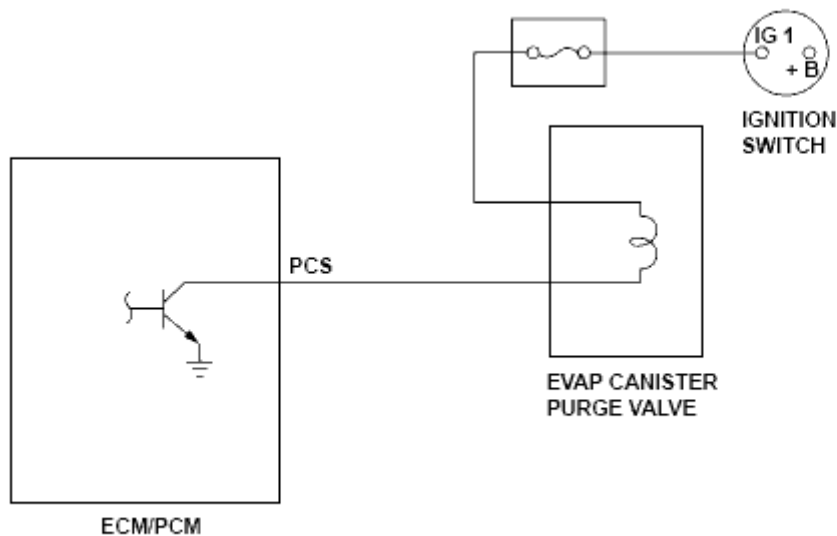
Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, the Temporary DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P0443 (92): ADVANCED DIAGNOSTICS

DTC P0443: EVAPORATIVE EMISSION (EVAP) CANISTER PURGE VALVE CIRCUIT MALFUNCTION



P0443-0501

Fig. 71: Evaporative Emission Canister Purge Valve - Circuit Diagram

General Description

The evaporative emission (EVAP) canister purge valve is attached to the vacuum port between the EVAP

canister and the intake manifold. The engine control module (ECM)/powertrain control module (PCM) does not turn on the EVAP canister purge valve when the engine coolant temperature is 149 °F (65 °C) or less. The ECM/PCM adjusts the amount of fuel vapor sent to the engine by controlling the EVAP canister purge valve duty cycle.

When the return signal does not change according to the EVAP canister purge valve output for a set time, the ECM/PCM detects a malfunction, and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
Sequence	None
Duration	5 seconds or more
DTC Type	One drive cycle, MIL ON
OBD Status	PASSED/FAILED/NOT COMPLETED (STILL TESTING)

Enable Conditions

ENABLE CONDITIONS

Condition	Minimum	Maximum
Battery voltage	10.1 V	-
EVAP canister purge valve output duty	2 %	98 %
State of the engine	Running	

Malfunction Threshold

The return signal does not change according to the EVAP canister purge valve output for at least 5 seconds.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected, the MIL comes on and the DTC and the freeze frame data are stored in the ECM/PCM memory.

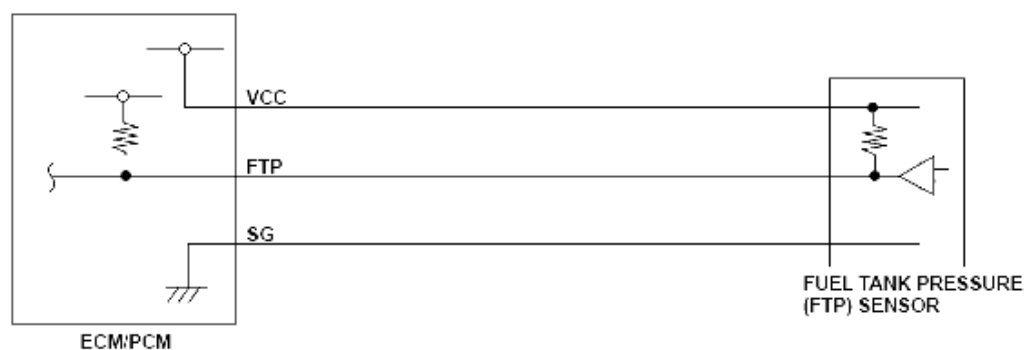
Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

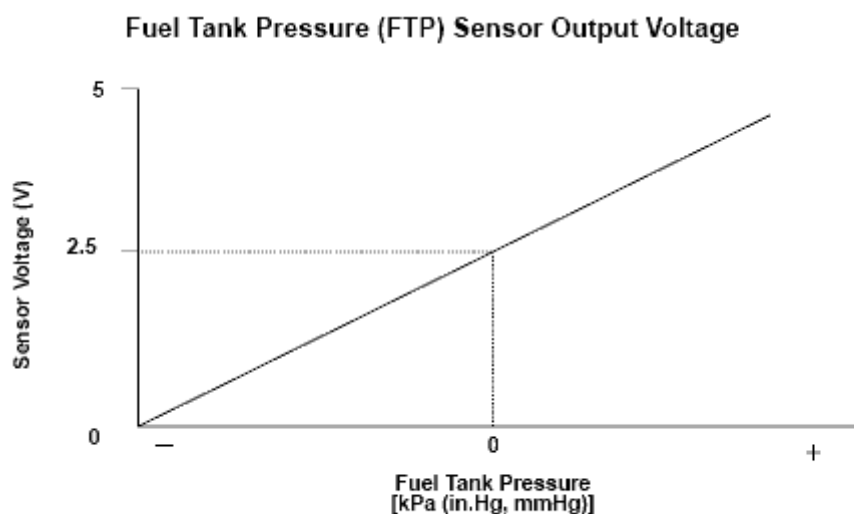
The MIL, the DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P0451 (91): ADVANCED DIAGNOSTICS

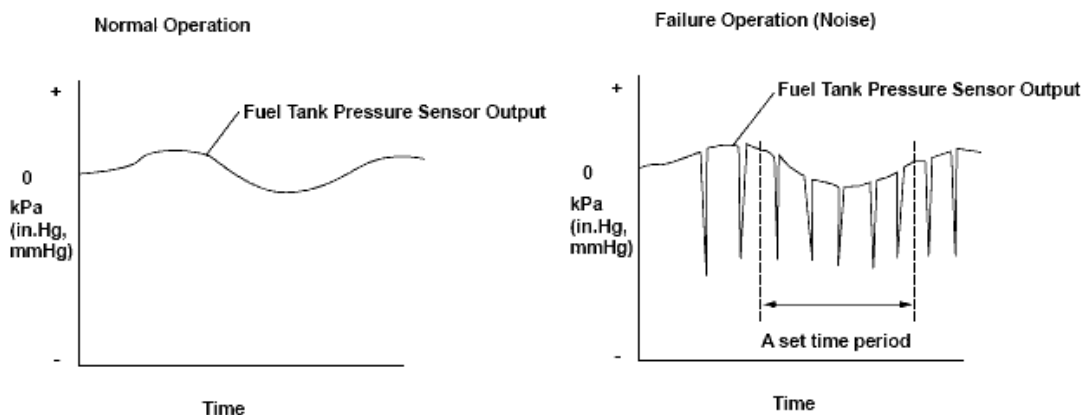
DTC P0451: FUEL TANK PRESSURE (FTP) SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM



P0452-0301

Fig. 72: Fuel Tank Pressure Sensor Circuit Diagram

P0451-0670

Fig. 73: Fuel Tank Pressure Sensor Output Voltage Graph

P0451-0071

Fig. 74: Fuel Tank Pressure Sensor Normal Operation And System Failure Graph**General Description**

The fuel tank pressure (FTP) sensor is installed on the evaporative emission (EVAP) canister. The FTP sensor is used to detect leaks in the EVAP system. The engine control module (ECM)/powertrain control

module (PCM) monitors the FTP sensor output voltage. The FTP sensor output voltage rises as the fuel tank pressure increases. Conversely, the FTP sensor output voltage drops as the fuel tank pressure decreases. Rapid changes in the FTP sensor output voltage due to electrical noise or an intermittent open during the EVAP leak detection may cause incorrect leak detection, so abnormal output is monitored.

If the FTP sensor output voltage changes a specified number of times within a set time, the ECM/PCM detects a malfunction and stores a DTC.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Once per driving cycle
Sequence	None
Duration	20 seconds or more
DTC Type	Two drive cycles, MIL ON
OBD Status	PASSED/FAILED/NOT COMPLETED (STILL TESTING)

Enable Conditions

ENABLE CONDITIONS

Condition	Minimum	Maximum
Elapsed time after starting the engine	2 seconds	-
Throttle position	Fully closed	
No active DTCs	P0122, P0123, P0222, P0223, P0452, P0453, P2101, P2108, P2118, P2122, P2123, P2127, P2128, P2135, P2138, P2176, U0107	

Malfunction Threshold

The FTP sensor output fluctuates by 0.3 kPa (0.1 in.Hg, 2 mmHg) or more at least five times within 3 seconds.

Driving Pattern

Start the engine in a cold condition, and let it idle for at least 20 seconds.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected during the first drive cycle, a Temporary DTC is stored in the ECM/PCM memory. If the malfunction recurs during the next (second) drive cycle, the MIL comes on and the DTC and the freeze frame data are stored.

Conditions for clearing the MIL

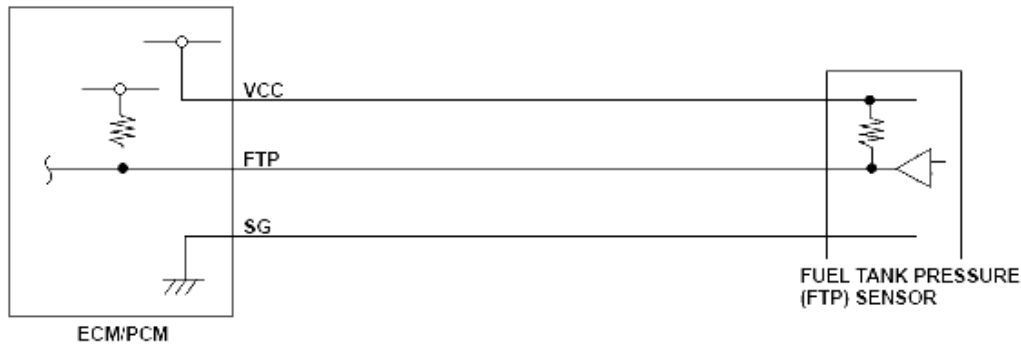
The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, the Temporary DTC, and the freeze frame data can be cleared by using the scan tool

Clear command or by disconnecting the battery.

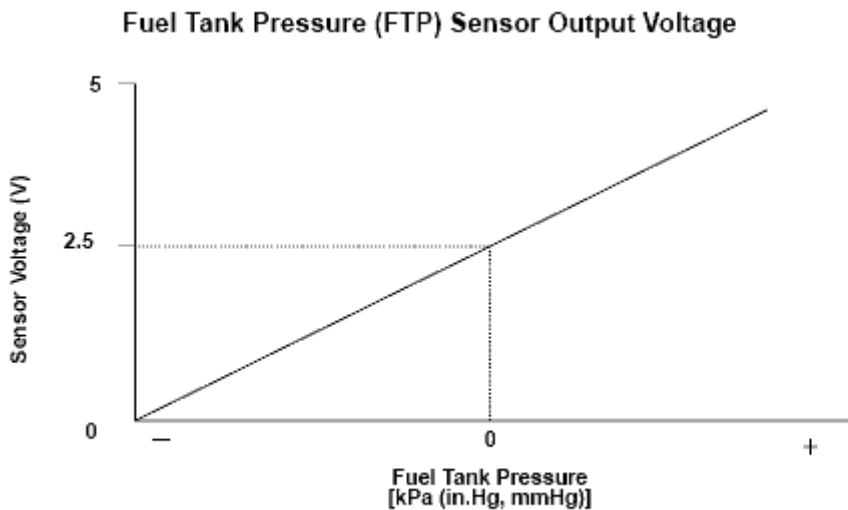
DTC P0452 (91): ADVANCED DIAGNOSTICS

DTC P0452: FUEL TANK PRESSURE (FTP) SENSOR CIRCUIT LOW VOLTAGE



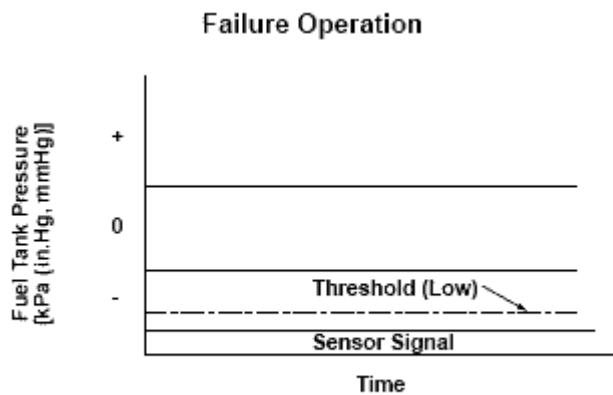
P0452-0301

Fig. 75: Fuel Tank Pressure Sensor (Low Voltage) - Circuit Diagram



P0451-0670

Fig. 76: Fuel Tank Pressure Sensor Output Voltage Graph



P0452-0670

Fig. 77: Fuel Tank Pressure Sensor Failure Operation Graph**General Description**

The fuel tank pressure (FTP) sensor is installed on the evaporative emission (EVAP) canister and detects the fuel tank pressure. The FTP sensor is used to detect leaks in the EVAP system.

The engine control module (ECM)/powertrain control module (PCM) monitors the FTP sensor output voltage. The FTP sensor output voltage rises as the fuel tank pressure increases. Conversely, the FTP sensor output voltage drops as the fuel tank pressure decreases. If the FTP sensor output voltage does not reach a target value within a set time after starting the engine in a cold condition, the ECM/PCM detects a malfunction and stores a DTC.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status**MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS**

Execution	Once per driving cycle
Sequence	None
Duration	3 seconds or more
DTC Type	Two drive cycles, MIL ON
OBD Status	PASSED/FAILED/NOT COMPLETED (STILL TESTING)

Enable Conditions**ENABLE CONDITIONS**

Condition	Minimum	Maximum
Elapsed time after starting the engine	2 seconds	-
Other	At idle	

Malfunction Threshold

The output from the fuel tank pressure sensor is less than -7 kPa (-2.1 in.Hg, -55 mmHg) for at least 3 seconds.

Driving Pattern

Start the engine in a cold condition, and let it idle until the radiator fan comes on.

Diagnosis Details**Conditions for illuminating the MIL**

When a malfunction is detected during the first drive cycle, a Temporary DTC is stored in the ECM/PCM memory. If the malfunction recurs during the next (second) drive cycle, the MIL comes on and the DTC and the freeze frame data are stored.

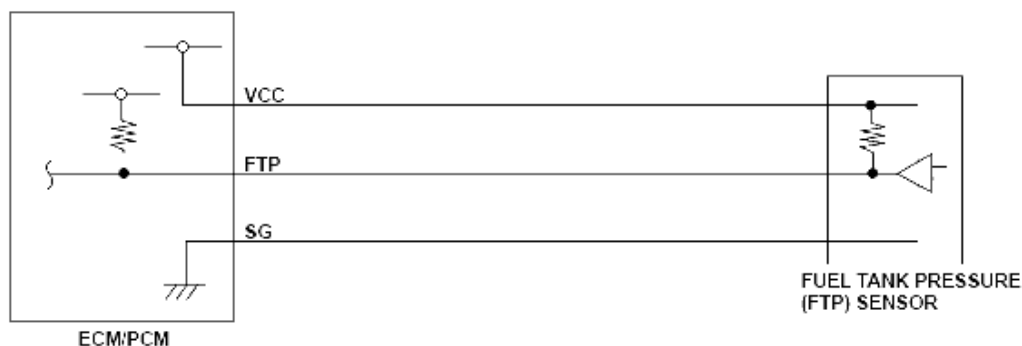
Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, the Temporary DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

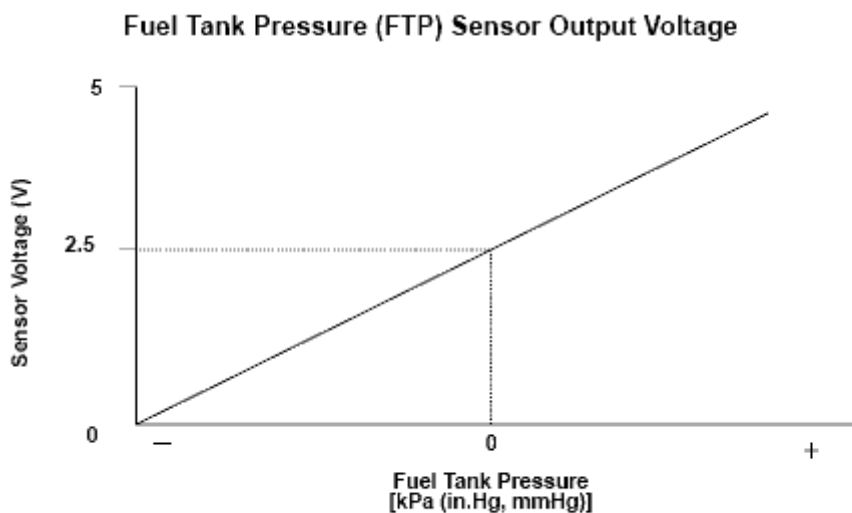
DTC P0453 (91): ADVANCED DIAGNOSTICS

DTC P0453: FUEL TANK PRESSURE (FTP) SENSOR CIRCUIT HIGH VOLTAGE



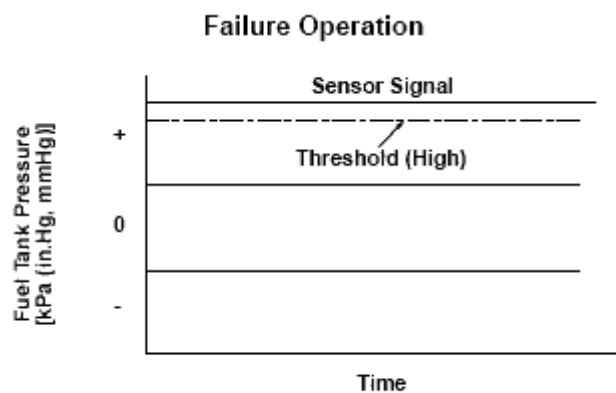
P0452-0301

Fig. 78: Fuel Tank Pressure Sensor (High Voltage) - Circuit Diagram



P0451-0070

Fig. 79: Fuel Tank Pressure Sensor Output Voltage Graph



P0453-0870

Fig. 80: Fuel Tank Pressure Sensor Failure Operation Graph**General Description**

The fuel tank pressure (FTP) sensor is installed on the evaporative emission (EVAP) canister and detects the fuel tank pressure. The FTP sensor is used to detect leaks in the EVAP system.

The engine control module (ECM)/powertrain control module (PCM) monitors the FTP sensor output voltage. The FTP sensor output voltage rises as the fuel tank pressure increases. Conversely, the FTP sensor output voltage drops as the fuel tank pressure decreases. If the FTP sensor output voltage is higher than a target value for a set time after starting the engine in a cold condition, the ECM/PCM detects a malfunction and stores a DTC.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status**MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS**

Execution	Once per driving cycle
Sequence	None
Duration	3 seconds or more
DTC Type	Two drive cycles, MIL ON
OBD Status	PASSED/FAILED/NOT COMPLETED (STILL TESTING)

Enable Conditions**ENABLE CONDITIONS**

Condition	Minimum	Maximum
Elapsed time after starting the engine	2 seconds	-
Other	At idle	

Malfunction Threshold

The output from the fuel tank pressure sensor is more than 8 kPa (2.2 in.Hg, 55 mmHg) for at least 3 seconds.

Driving Pattern

Start the engine in a cold condition, and let it idle until the radiator fan comes on.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected during the first drive cycle, a Temporary DTC is stored in the ECM/PCM memory. If the malfunction recurs during the next (second) drive cycle, the MIL comes on and the DTC and the freeze frame data are stored.

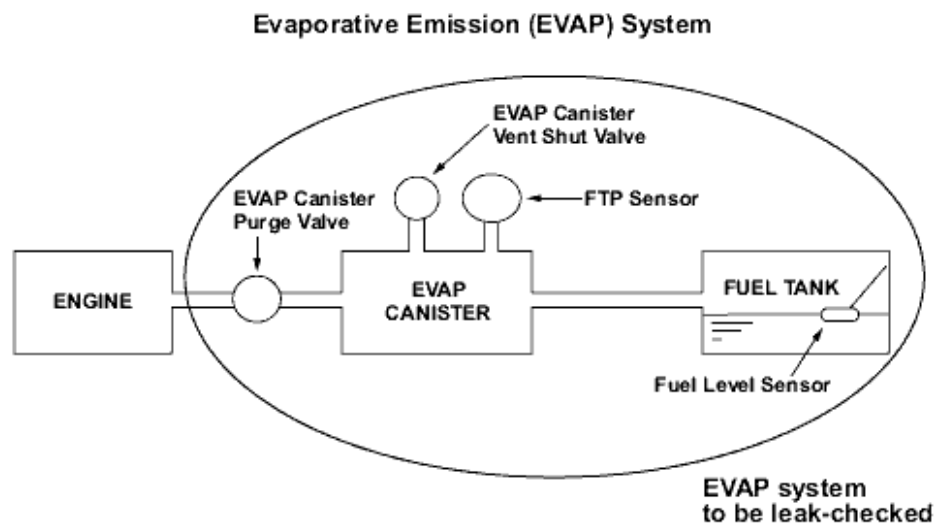
Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, the Temporary DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P0455 (90): ADVANCED DIAGNOSTICS

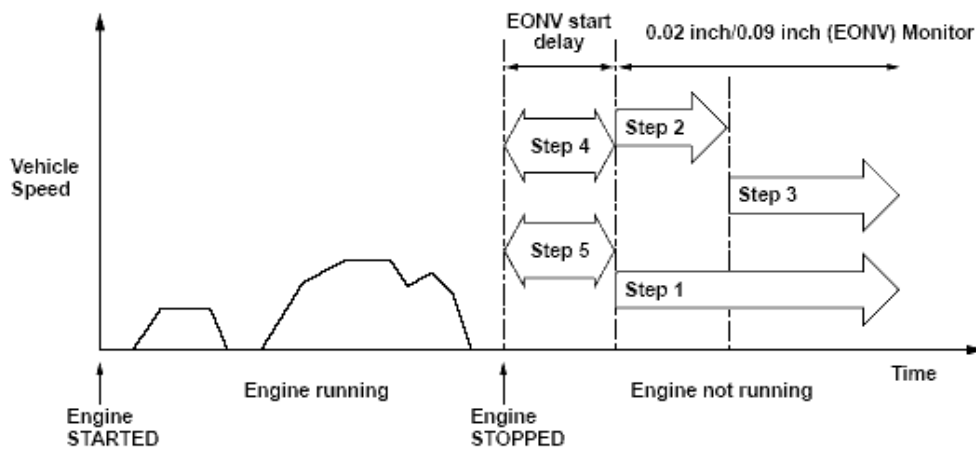
DTC P0455: EVAPORATIVE EMISSION (EVAP) SYSTEM LARGE LEAK DETECTED



P0442-0570

Fig. 81: Evaporative Emission System Diagram

Diagnosis Execution



P0455-0770

Fig. 82: Evaporative Emission System Diagnosis Execution

General Description

The evaporative emission (EVAP) leak detection system uses an engine off natural vacuum (EONV) method. The EONV method detects leakage from the change in fuel tank pressure via the fuel tank pressure (FTP) sensor with the engine off.

Here is an overview of the malfunction detection for the EONV method:

Step 1: Judgement of detection of 0.09 inch leak as normal operation

Step 2: Judgement of detection of 0.02 inch leak as normal operation

Step 3: Detection of 0.02 inch leak

Step 4: Detection of atmospheric pressure failure

Step 5: Flickering of the FTP sensor

< Step 1, 2 and 3 proceed simultaneously. Step 4 and 5 proceed simultaneously. >

Step 1:

After the engine has stopped, the engine control module (ECM)/powertrain control module (PCM) monitors the variation of the FTP sensor output to detect "no 0.09 inch leak" depending on the variation of the pressure inside the fuel tank.

- If the variation of the pressure is less than a specified value and continues for a specified duration, it is identified as a "0.09 inch leak" and the diagnosis completes.
- If the variation of the pressure is more than a specified value before a specified duration has passed, it is defined as "no 0.09 inch leak", the judgement of detection of a 0.09 inch leak is completed, and it goes to 0.02 inch leak monitor.

Step 2:

After the engine has stopped, the ECM/PCM monitors the variation of the FTP sensor output to detect "no 0.02 inch leak" depending on the variation corresponding to the increasing pressure inside the fuel tank.

- If "no 0.02 inch leak" is detected, it is identified as normal; the diagnosis is complete.
- If the pressure inside the fuel tank does not increase a specified value or more within a specified duration, it goes to step 3.

Step 3:

The ECM/PCM continues to monitor the FTP sensor output to detect "no 0.02 inch leak" depending on the variation corresponding to the decreasing pressure inside the fuel tank. until the detection completes.

- If a "0.02 inch leak" is detected, it is identified as a malfunction; the diagnosis is complete.
- If "no leakage" is detected, it is identified as normal; the diagnosis is complete.
- If the pressure is not atmospheric pressure or less when the detection is completed, that data is stored and the diagnosis is complete.

Step 4:

After the engine has stopped, the ECM/PCM monitors the variation of the FTP sensor output to detect atmospheric pressure, after keeping the canister vent opened for a specified duration to stabilize the pressure inside the fuel tank.

- If the pressure inside the fuel tank after a specified duration has not reached a specified value from the sensor zero point, a canister vent blockage is detected.

Step 5:

After the engine has stopped, the ECM/PCM monitors the variation of the FTP sensor output to detect FTP sensor electrical noise failure, after keeping the canister vent opened for a specified time to stabilize the pressure inside the fuel tank.

- If the deviation of pressure inside the fuel tank and an average value after a specified duration has exceeded a specified value for more than a specified duration, an FTP sensor electrical noise failure is detected.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status**MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS**

Execution	Once per driving cycle
Sequence	None
Duration	36 minutes, 37 seconds or less
DTC Type	Two drive cycles, MIL ON
OBD Status	N/A

Enable Conditions

ENABLE CONDITIONS

Condition	Minimum	Maximum
Elapsed time before starting the engine	6 hours	-
Initial condition A ⁽¹⁾	-	18°F (10°C)
Initial condition B ⁽²⁾	-	18°F (10°C)
Initial engine coolant temperature	40°F (5°C)	95°F (35°C)
Initial intake air temperature	40°F (5°C)	95°F (35°C)
Barometric pressure	76 kPa (22.5 in.Hg, 569 mmHg)	-
Battery voltage	10.5 V	-
No active DTCs	P0111, P0112, P0113, P0116, P0117, P0118, P0125, P0443, P0451, P0452, P0453, P0496, P0497, P0498, P0499, P0685, P1116, P1454, P145C, P2227, P2228, P2229, P2422, P2610	
Others	Other than when there is excessive vapor generation (fuel level is not full)	
	Avoid abrupt acceleration, deceleration, and turns	
	Test-drive on a flat road to avoid misdetection	
	No refueling is required	
(1) The initial intake air temperature minus the current intake air temperature		
(2) The initial engine coolant temperature minus the initial intake air temperature		

Malfunction Threshold

The variation of pressure inside the fuel tank is 0.03 kPa (0.009 in.Hg, 0.24 mmHg) or more.

Confirmation Procedure with the HDS

Do the EVAP FUNCTION TEST in the INSPECTION MENU with the HDS.

Driving Pattern

1. After the vehicle has been left for an appropriate amount of time as specified, with the engine coolant temperature and intake air temperature within the specified range, start the engine.
 2. Warm up the engine at idle until the radiator fan comes on.
 3. Drive the vehicle immediately at a speed between 45 - 75 mph (72 - 120 km/h) for at least 20 minutes.
 4. After stopping the engine, turn the ignition switch off, and leave the vehicle for 37 minutes or more (EONV executes).
- Drive the vehicle in this manner only if the traffic regulations and ambient conditions allow.

Diagnosis Details**Conditions for illuminating the MIL**

When a malfunction is detected during the first drive cycle with the ECT and IAT at engine start-up within the specified temperature range, a Temporary DTC is stored in the ECM/PCM memory. If the malfunction recurs during the next (second) drive cycle with the ECT and IAT at engine start-up within the specified

temperature range, the MIL comes on and the DTC and the freeze frame data are stored.

Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, the Temporary DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P0456 (90): ADVANCED DIAGNOSTICS

DTC P0456: EVAPORATIVE EMISSION (EVAP) SYSTEM VERY SMALL LEAK DETECTED

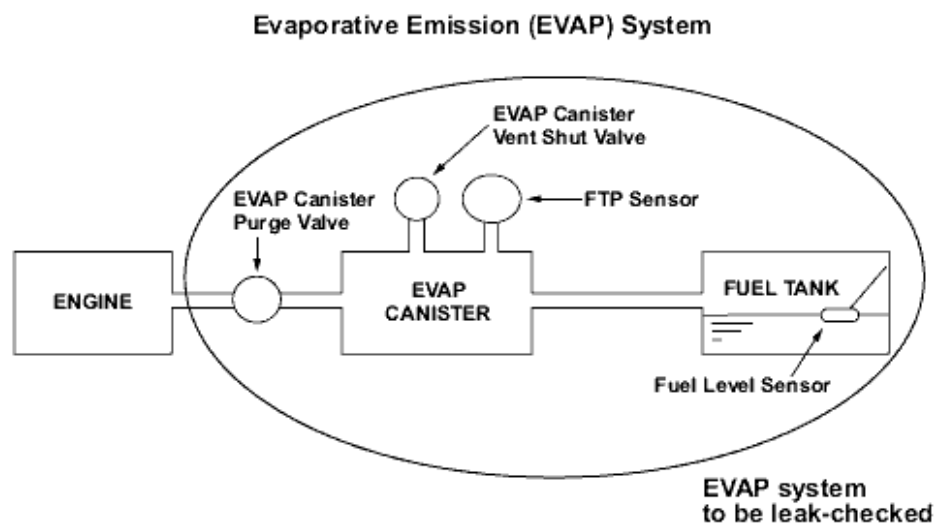


Fig. 83: Evaporative Emission System Diagram

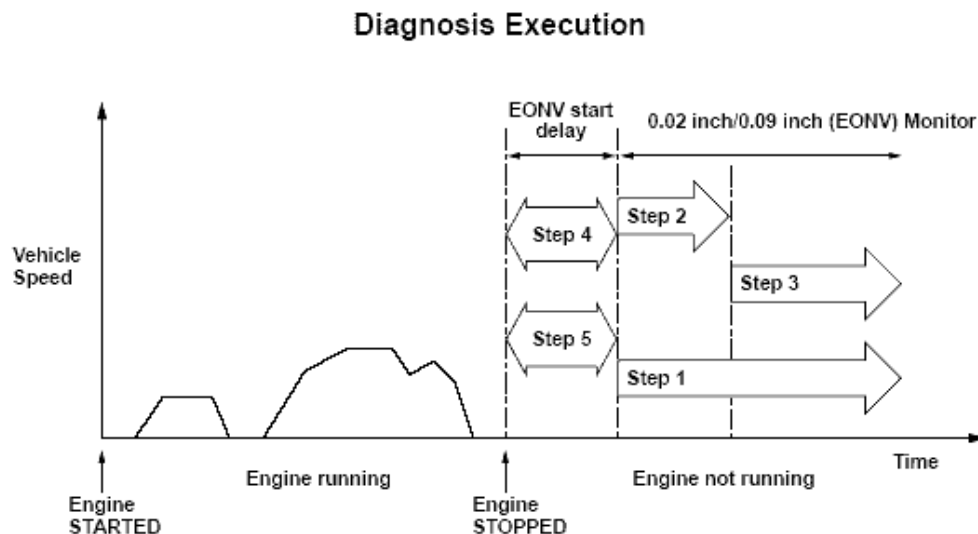


Fig. 84: Evaporative Emission System Diagnosis Execution

General Description

The evaporative emission (EVAP) leak detection system uses an engine off natural vacuum (EONV) method. The EONV method detects leakage from the change in fuel tank pressure via the fuel tank pressure (FTP) sensor with the engine off.

Here is an overview of the malfunction detection for the EONV method:

Step 1: Judgement of detection of 0.09 inch leak as normal operation

Step 2: Judgement of detection of 0.02 inch leak as normal operation

Step 3: Detection of 0.02 inch leak

Step 4: Detection of atmospheric pressure failure

Step 5: Flickering of the FTP sensor

< Step 1, 2 and 3 proceed simultaneously. Step 4 and 5 proceed simultaneously. >

Step 1:

After the engine has stopped, the engine control module (ECM)/powertrain control module (PCM) monitors the variation of the FTP sensor output to detect "no 0.09 inch leak" depending on the variation of the pressure inside the fuel tank.

- If the variation of the pressure is less than a specified value and continues for a specified duration, it is identified as a "0.09 inch leak" and the diagnosis completes.
- If the variation of the pressure is more than a specified value before a specified duration has passed, it is defined as "no 0.09 inch leak", the judgement of detection of a 0.09 inch leak is completed, and it goes to 0.02 inch leak monitor.

Step 2:

After the engine has stopped, the ECM/PCM monitors the variation of the FTP sensor output to detect "no 0.02 inch leak" depending on the variation corresponding to the increasing pressure inside the fuel tank.

- If "no 0.02 inch leak" is detected, it is identified as normal; the diagnosis is complete.
- If the pressure inside the fuel tank does not increase a specified value or more within a specified duration, it goes to step 3.

Step 3:

The ECM/PCM continues to monitor the FTP sensor output to detect "no 0.02 inch leak" depending on the variation corresponding to the decreasing pressure inside the fuel tank. until the detection completes.

- If a "0.02 inch leak" is detected, it is identified as a malfunction; the diagnosis is complete.
- If "no leakage" is detected, it is identified as normal; the diagnosis is complete.
- If the pressure is not atmospheric pressure or less when the detection is completed, that data is stored and the diagnosis is complete.

Step 4:

After the engine has stopped, the ECM/PCM monitors the variation of the FTP sensor output to detect atmospheric pressure, after keeping the canister vent opened for a specified duration to stabilize the pressure inside the fuel tank.

- If the pressure inside the fuel tank after a specified duration has not reached a specified value from the sensor zero point, a canister vent blockage is detected.

Step 5:

After the engine has stopped, the ECM/PCM monitors the variation of the FTP sensor output to detect FTP sensor electrical noise failure, after keeping the canister vent opened for a specified time to stabilize the pressure inside the fuel tank.

- If the deviation of pressure inside the fuel tank and an average value after a specified duration has exceeded a specified value for more than a specified duration, an FTP sensor electrical noise failure is detected.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status**MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS**

Execution	Once per driving cycle
Sequence	P0455, P0457, P0497 are judged as OK
Duration	At least 11 minutes, 37 seconds but not more than 36 minutes, 37 seconds
DTC Type	Two drive cycles, MIL ON
OBD Status	N/A

Enable Conditions**ENABLE CONDITIONS**

Condition	Minimum	Maximum
Elapsed time before starting the engine	6 hours	-
Initial condition A ⁽¹⁾	-	18°F (10°C)
Initial condition B ⁽²⁾	-	18°F (10°C)
Initial engine coolant temperature	40°F (5°C)	95°F (35°C)
Initial intake air temperature	40°F (5°C)	95°F (35°C)
Barometric pressure	76 kPa (22.5 in.Hg, 569 mmHg)	-
Battery voltage	10.5 V	-
No active DTCs	P0111, P0112, P0113, P0116, P0117, P0118, P0125, P0443, P0451, P0452, P0453, P0496, P0497, P0498, P0499, P0685, P1116, P1454, P145C, P2227, P2228, P2229, P2422, P2610	
Others	Other than when there is excessive vapor generation (fuel level is not full)	
	Avoid abrupt acceleration, deceleration, and turns	
	Test-drive on a flat road to avoid misdetection	

No refueling is required

- | |
|--|
| (1) The initial intake air temperature minus the current intake air temperature
(2) The initial engine coolant temperature minus the initial intake air temperature |
|--|

Malfunction Threshold

- The misalignment of zero point pressure inside the fuel tank is 0.6 kPa (0.1 in.Hg, 5 mmHg) or more.
- The output from the FTP sensor flickering is 3.04 seconds or more.
- The variation of pressure inside the fuel tank after phase 1 is 0.3 kPa (0.1 in.Hg, 2.8 mmHg) or more (depending on fuel level and barometric pressure).
- The sum of the variations of pressure inside the fuel tank after phase 1 and phase 2 is 10 kPa (3.1 in.Hg, 80 mmHg) or less (depending on fuel level and barometric pressure).
- The barometric pressure is stable for at least 29 minutes, 55 seconds.

Confirmation Procedure with the HDS

Do the EVAP FUNCTION TEST in the INSPECTION MENU with the HDS.

Driving Pattern

1. After the vehicle has been left for an appropriate amount of time as specified, with the engine coolant temperature and intake air temperature within the specified range, start the engine.
 2. Warm up the engine at idle until the radiator fan comes on.
 3. Drive the vehicle immediately at a speed between 45 - 75 mph (72 - 120 km/h) for at least 20 minutes.
 4. After stopping the engine, turn the ignition switch off, and leave the vehicle for 37 minutes or more (EONV executes).
- Drive the vehicle in this manner only if the traffic regulations and ambient conditions allow.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected during the first drive cycle with the ECT and IAT at engine start-up within the specified temperature range, a Temporary DTC is stored in the ECM/PCM memory. If the malfunction recurs during the next (second) drive cycle with the ECT and IAT at engine start-up within the specified temperature range, the MIL comes on and the DTC and the freeze frame data are stored.

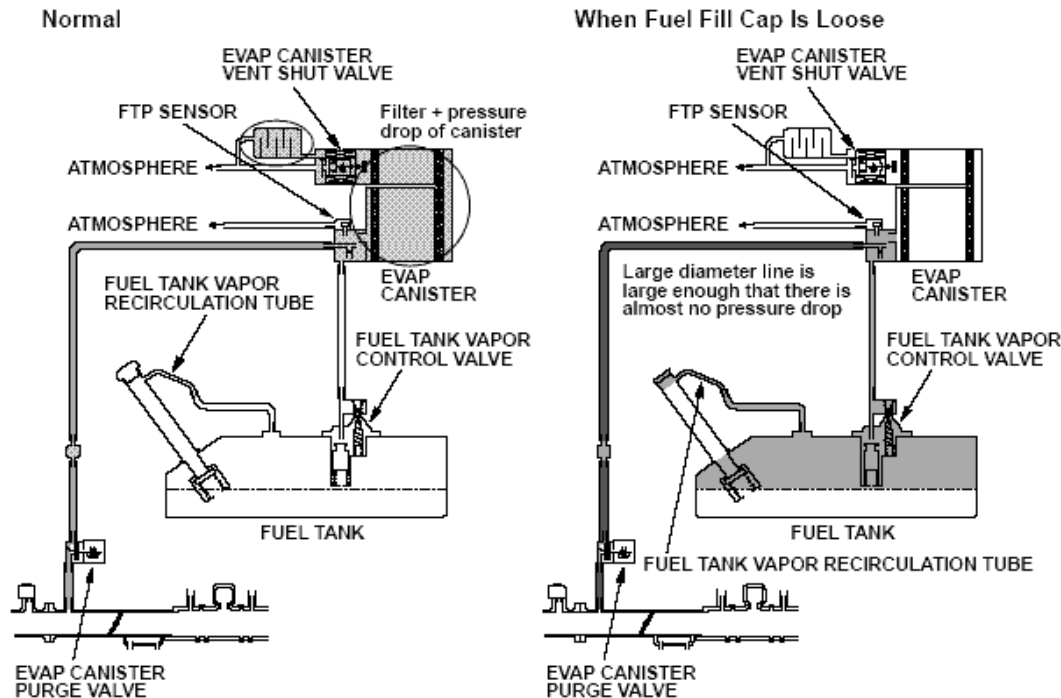
Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, the Temporary DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

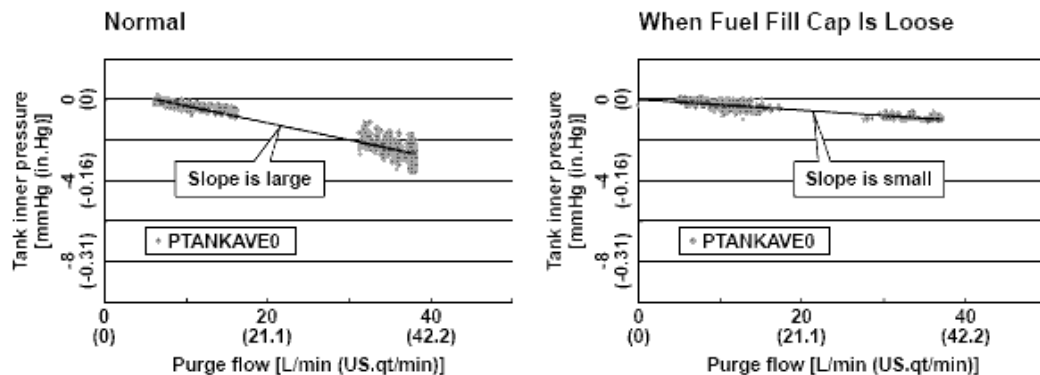
DTC P0457 (90): ADVANCED DIAGNOSTICS

DTC P0457: EVAPORATIVE EMISSION (EVAP) SYSTEM LEAK DETECTED/FUEL FILL CAP LOOSE OR MISSING



P0457-0770

Fig. 85: Evaporative Emission System Malfunction Detection



P0457-0771

Fig. 86: Evaporative Emission System Purge Flow Chart

General Description

When the fuel fill cap is installed properly, the purge flow occurs due to the airflow resistance of the canister, and tank pressure will be reduced.

When the fuel fill cap is loosened, the fuel tank pressure will not decrease even when the airflow resistance decreases and the purge flow occurs, because air is being exhausted from the tank to the atmosphere.

By examining the fuel tank pressure with less purge flow area and the fuel tank pressure with more purge flow area, and using the above characteristics, a loose fuel fill cap is detected.

The engine control module (ECM)/powertrain control module (PCM) calculates the relationship of the purge flow and fuel tank pressure (FTP) sensor, and when the slope of the decreasing fuel tank pressure to the purge flow increase is small, a loose fuel fill cap is detected.

< Above failure detection is normally operated during purge >

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
Sequence	P0455 or P0456 are judged as NG
Duration	12 seconds or more
DTC Type	One drive cycle, MIL OFF
OBD Status	N/A

Enable Conditions

ENABLE CONDITIONS

Condition	Minimum	Maximum
Engine coolant temperature before EVAP purge control starts	149°F (65°C)	-
Vehicle speed	2 mph (2 km/h)	-
Barometric pressure	76 kPa (22.5 in.Hg, 569 mmHg)	-
Battery voltage	10.5 V	-
Low purge flow side detection	5 l/min (5.3 US qt/min, 4.4 lmp qt/min)	10 l/min (10.5 US qt/min, 8.7 lmp qt/min)
High purge flow side detection	35 l/min (37.0 US qt/min, 30.8 lmp qt/min)	-
Fuel trim	0.73	1.47
Fuel feedback	Closed loop at stoichiometric	
Duration of redetection implementation permission	Every 54.6 minutes	
No active DTCs	P0107, P0108, P0117, P0118, P0134, P0135, P0154, P0155, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0335, P0339, P0443, P0451, P0452, P0453, P0496, P0497, P0498, P0499, P1128, P1129, P1172, P1174, P1454, P145C, P2195, P2197, P2227, P2228, P2229, P2237, P2238, P2240, P2241, P2243, P2245, P2247, P2249, P2251, P2252, P2254, P2255, P2422, P2627, P2628, P2630, P2631, P2647, U0073, U0155	
Others	Other than when there is excessive vapor generation (fuel level is not full)	
	Avoid abrupt acceleration, deceleration, and turns	
	Test-drive on a flat road to avoid misdetection	
	No refueling is required	

Malfunction Threshold

The output from the fuel cap monitor is 0.028 or more for at least 12 seconds (when there is no NG

judgment history in this drive cycle).

Confirmation Procedure with the HDS

Do the EVAP FUNCTION TEST in the INSPECTION MENU with the HDS.

Driving Pattern

1. Start the engine. Hold the engine speed at 3,000 rpm without load (in Park or neutral) until the radiator fan comes on.
2. Let the engine idle for at least 12 seconds.
3. Drive the vehicle immediately at a speed between 45 - 75 mph (72 - 120 km/h) for at least 12 minutes.
 - Drive the vehicle in this manner only if the traffic regulations and ambient conditions allow.

Diagnosis Details

Conditions for illuminating the fuel fill cap caution

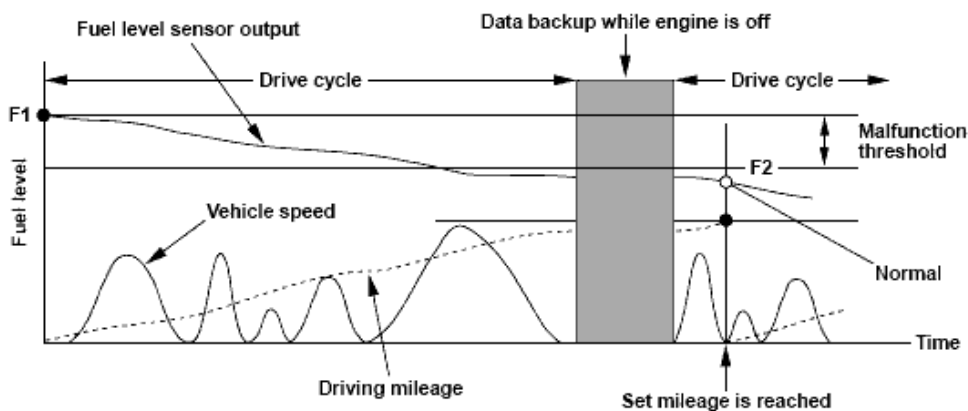
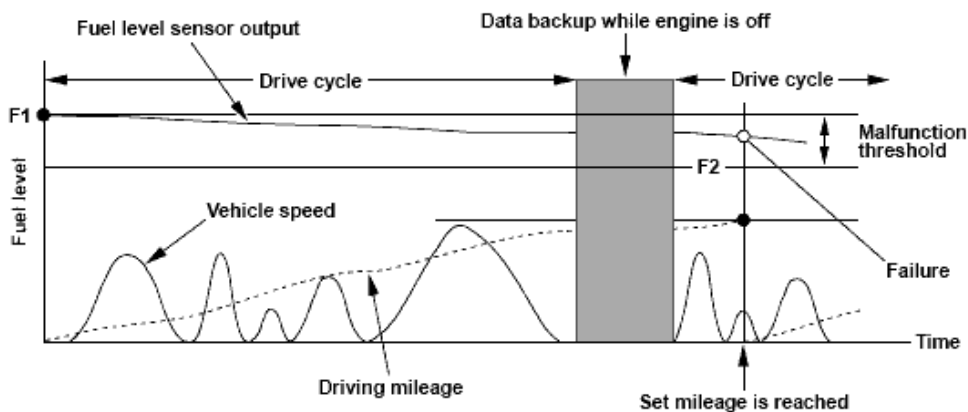
1. When a loose fuel fill cap is judged by this detection, the fuel fill cap caution is displayed. At this time, a DTC is not stored.
2. When the first drive cycle leak judgement (temporary DTC stored) is detected at a 0.02 inch leak or a 0.09 inch leak, the fuel fill cap caution is displayed when the ignition is turned on the next time.

Conditions for clearing the fuel fill cap caution

1. When the fuel fill cap caution is displayed by the first drive cycle leak judgement (temporary DTC stored) at a 0.02 inch leak or a 0.09 inch leak, the fuel fill cap caution goes out when the next failure occurs (second drive cycle) and P0457 is stored. (MIL illuminates)
2. When no leak is judged by a 0.02 inch leak or a 0.09 inch leak after the fuel fill cap caution is displayed, the fuel fill cap caution goes out when the ignition is turned on the next time. (P0457 is not stored at this time)
3. When driven three times without this failure detected and a 0.02 inch leak or a 0.09 inch leak detection is not done after the fuel fill cap caution is displayed, the fuel fill cap caution goes out. (P0457 is not stored at this time)
4. Use the Clear command of scan tool to erase the caution. The caution is erased when the MIL is illuminated.

DTC P0461 (121): ADVANCED DIAGNOSTICS

DTC P0461: FUEL LEVEL SENSOR (FUEL GAUGE SENDING UNIT) CIRCUIT RANGE/PERFORMANCE PROBLEM

Normal**Malfunction**

P0461-0370

Fig. 87: Fuel Level Sensor Normal And Malfunction Graph**General Description**

The fuel level sensor is incorporated with the fuel pump and installed in the fuel tank. Using a built-in potentiometer and float, it converts the movement of the float into electrical signals that correspond to the fuel level, and it indicates the amount of fuel in the fuel tank. If the engine control module (ECM)/powertrain control module (PCM) receives no change in the fuel level sensor output after driving for a specified number of miles, it detects a malfunction and stores a DTC.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status**MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS**

Execution	Once per driving cycle
Sequence	None
Duration	-
DTC Type	One drive cycle, MIL OFF
OBD Status	N/A

Enable Conditions**ENABLE CONDITIONS**

Condition	Minimum	Maximum
Mileage	125 miles (200 km)	-
No active DTCs	P0462, P0463, U0073, U0155	
Others	Avoid driving and stopping on a steep road	

Malfunction Threshold

The change in the fuel level sensor output is 3.5% or less.

Driving Pattern

Drive for the specified mileage under Enable Conditions without refueling (turning the ignition switch off is acceptable).

- Drive the vehicle in this manner only if the traffic regulations and ambient conditions allow.

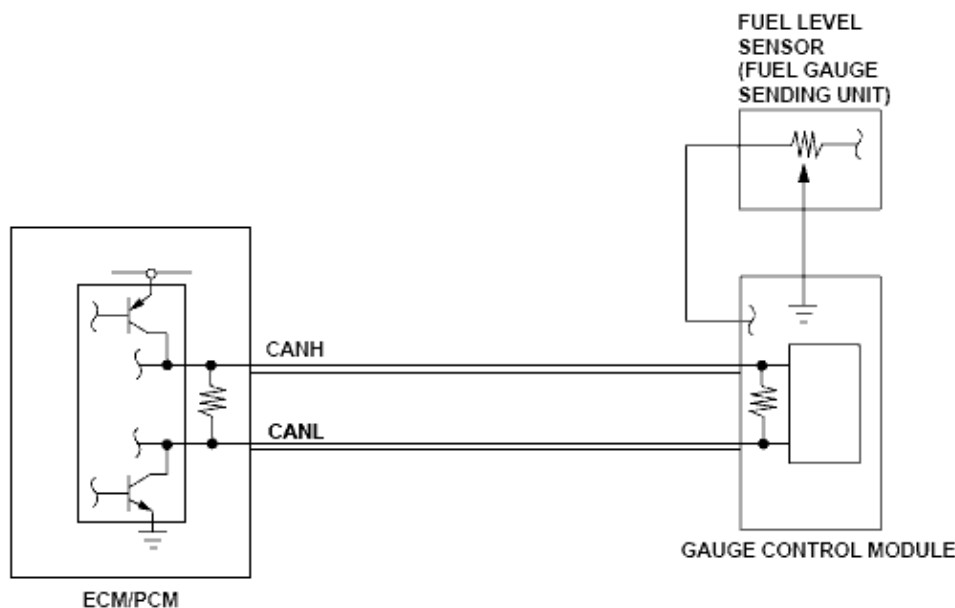
Diagnosis Details**Conditions for illuminating the indicator**

When a malfunction is detected, the DTC and the freeze frame data are stored in the ECM/PCM memory. The MIL does not come on.

Conditions for clearing the DTC

The DTC and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P0462 (121): ADVANCED DIAGNOSTICS**DTC P0462: FUEL LEVEL SENSOR (FUEL GAUGE SENDING UNIT) CIRCUIT LOW VOLTAGE**



P0462-0802

Fig. 88: Fuel Level Sensor (Low Voltage) - Circuit Diagram

General Description

The fuel level sensor (fuel gauge sending unit) is incorporated into the fuel pump and installed in the fuel tank. Using a built-in potentiometer and float, it converts the movement of the float to electrical signals as an output that corresponds to fuel level variations in the fuel tank. The fuel level, which is indicated by the gauge control module, is sent to the engine control module (ECM)/powertrain control module (PCM) via the controller area network (CAN). If the ECM/PCM detects a signal from the fuel level sensor (fuel gauge sending unit) below a predetermined value for a set time or more, it detects a malfunction and stores a DTC.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
Sequence	None
Duration	5 seconds or more
DTC Type	One drive cycle, MIL OFF
OBD Status	N/A

Enable Conditions

ENABLE CONDITIONS

Condition	
Ignition switch	ON
No active DTCs	P0463, U0073, U0155

Malfunction Threshold

The fuel level sensor (fuel gauge sending unit) output voltage is 0.10 V or less for at least 5 seconds.

Diagnosis Details

Conditions for illuminating the indicator

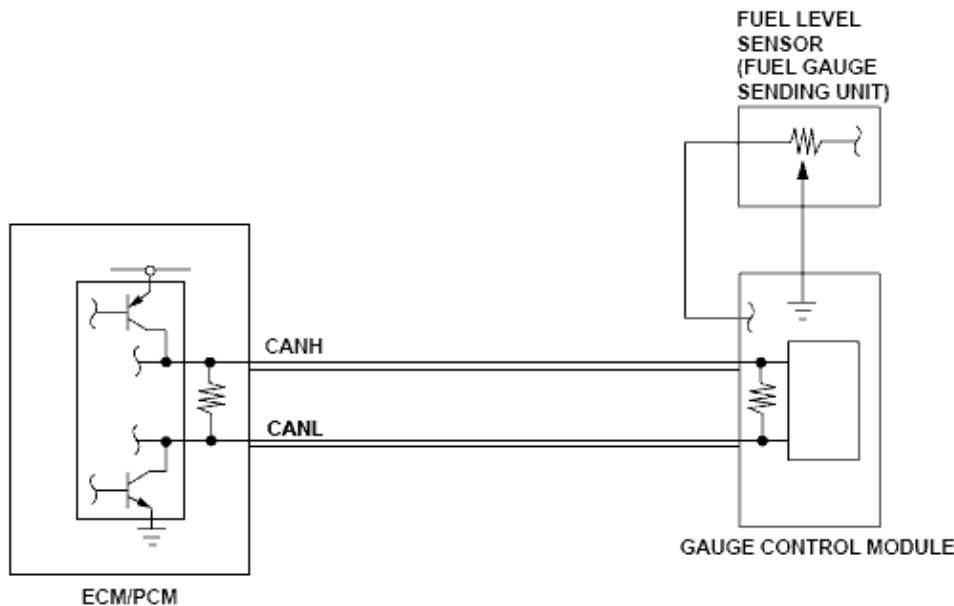
When a malfunction is detected, the DTC and the freeze frame data are stored in the ECM/PCM memory. The MIL does not come on.

Conditions for clearing the DTC

The DTC and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P0463 (121): ADVANCED DIAGNOSTICS

DTC P0463: FUEL LEVEL SENSOR (FUEL GAUGE SENDING UNIT) CIRCUIT HIGH VOLTAGE



P0462-0802

Fig. 89: Fuel Level Sensor (High Voltage) - Circuit Diagram

General Description

The fuel level sensor (fuel gauge sending unit) is incorporated into the fuel pump and installed in the fuel tank. Using a built-in potentiometer and float, it converts the movement of the float to electrical signals as an output that corresponds to fuel level variations in the fuel tank. The fuel level, which is indicated by the gauge control module, is sent to the engine control module (ECM)/powertrain control module (PCM) via the controller area network (CAN). If the ECM/PCM detects a signal from the fuel level sensor (fuel gauge sending unit) above a predetermined value for a set time or more, it detects a malfunction and stores a DTC.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
-----------	------------

Sequence	None
Duration	5 seconds or more
DTC Type	One drive cycle, MIL OFF
OBD Status	N/A

Enable Conditions

ENABLE CONDITIONS

Condition	
Ignition switch	ON
No active DTCs	P0462, U0073, U0155

Malfunction Threshold

The fuel level sensor (fuel gauge sending unit) voltage is 4.92 V or more for at least 5 seconds.

Diagnosis Details

Conditions for illuminating the indicator

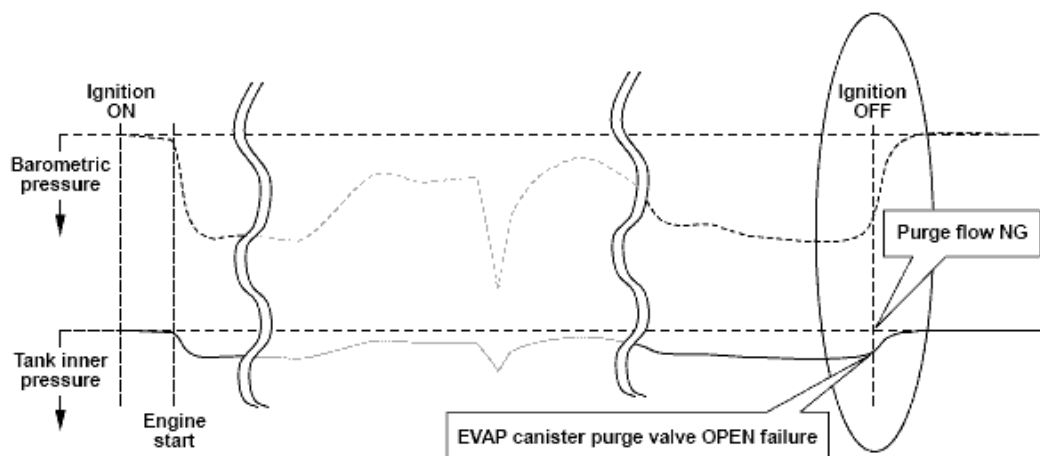
When a malfunction is detected, the DTC and the freeze frame data are stored in the ECM/PCM memory. The MIL does not come on.

Conditions for clearing the DTC

The DTC and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P0496 (92): ADVANCED DIAGNOSTICS

DTC P0496: EVAPORATIVE EMISSION (EVAP) SYSTEM HIGH PURGE FLOW



P0496-0770

Fig. 90: Evaporative Emission System High Purge Flow

General Description

The fuel (vapor) vaporized in the fuel tank is stored in the canister temporarily and introduced in the engine through the evaporative emission (EVAP) canister purge valve. The engine control module (ECM)/powertrain control module (PCM) controls the amount of vapor introduced in the engine by repeatedly switching the power of the EVAP canister purge valve at a constant frequency according to the condition of the engine.

< STEP 1 >

The EVAP canister purge valve opens normally (EVAP canister purge valve OPEN OK) and detects that the purge flow is normal when the pulse of the EVAP canister purge valve drive cycle is transmitted to fuel tank pressure (FTP) sensor by the purge flow (pulse method).

OK determination: Pulse exists (P145C OK)

- P0497 Purge flow OK
- P0496 EVAP canister purge valve stuck Open OK

NG determination: No pulse (P145C NG)

- Either purge flow P0497 abnormality or P0496 EVAP canister purge valve OPEN failure.
- In this case, classify the failure part according to < STEP 2 >.

< STEP 2 >

If there is no pulse, it is determined as either no purge flow or the EVAP canister purge valve is stuck OPEN: When the FTP sensor fluctuates from negative pressure to atmospheric pressure after the ignition is turned off: P0496 EVAP canister purge valve stuck OPEN

When there is no fluctuation of the FTP sensor: P0497 purge flow NG

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Once per driving cycle
Sequence	P145C is judged as OK
Duration	-
DTC Type	Two drive cycles, MIL ON
OBD Status	N/A

Enable Conditions

ENABLE CONDITIONS

Condition	Minimum	Maximum
Low load duration time	10 seconds	-
Wait for stability after the ignition is turned off	10 seconds	-
Engine coolant temperature before EVAP purge control starts	149°F (65°C)	-

No active DTCs

P0107, P0108, P0117, P0118, P0134, P0135, P0154, P0155, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0335, P0339, P0443, P0451, P0452, P0453, P0498, P0499, P0685, P1128, P1129, P1172, P1174, P1454, P2195, P2197, P2227, P2228, P2229, P2237, P2238, P2240, P2241, P2243, P2245, P2247, P2249, P2251, P2252, P2254, P2255, P2422, P2627, P2628, P2630, P2631

Malfunction Threshold

The output from the EVAP canister purge valve is 0.2 kPa (0.07 in.Hg, 2 mmHg) or more for at least 10 seconds.

Confirmation Procedure with the HDS

Do the EVAP FUNCTION TEST in the INSPECTION MENU with the HDS.

Driving Pattern

1. Start the engine. Hold the engine speed at 3,000 rpm without load (in Park or neutral) until the radiator fan comes on.
2. Let the engine idle for at least 77 seconds.
3. Turn off the ignition for at least 10 seconds.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected during the first drive cycle, a Temporary DTC is stored in the ECM/PCM memory. If the malfunction recurs during the next (second) drive cycle, the MIL comes on and the DTC and the freeze frame data are stored.

Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, the Temporary DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P0497 (90): ADVANCED DIAGNOSTICS

DTC P0497: EVAPORATIVE EMISSION (EVAP) SYSTEM LOW PURGE FLOW

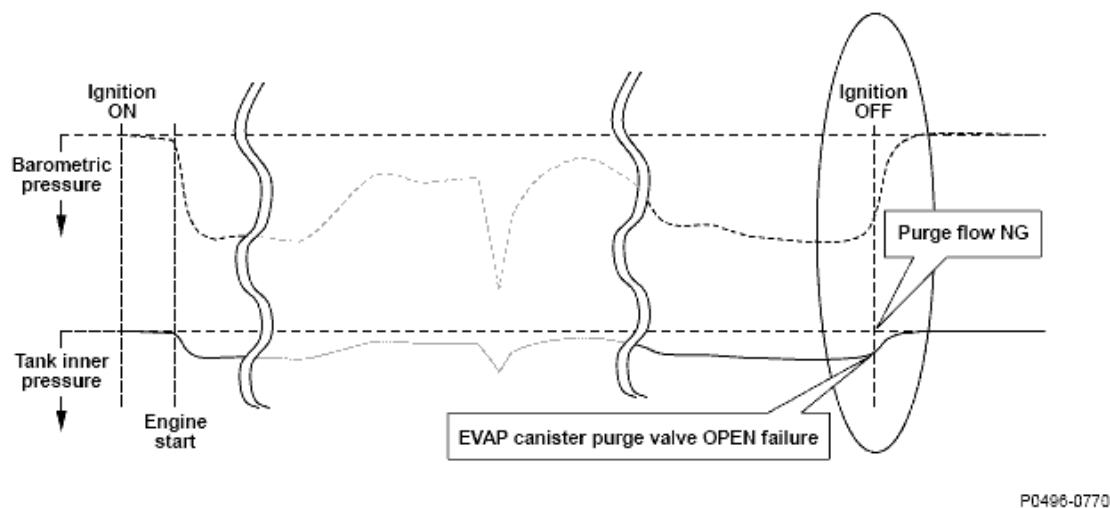


Fig. 91: Evaporative Emission System Low Purge Flow

General Description

The fuel (vapor) vaporized in the fuel tank is stored in the canister temporarily and introduced in the engine through the evaporative emission (EVAP) canister purge valve. The engine control module (ECM)/powertrain control module (PCM) controls the amount of vapor introduced in the engine by repeatedly switching the power of the EVAP canister purge valve at a constant frequency according to the condition of the engine.

< STEP 1 >

The EVAP canister purge valve opens normally (EVAP canister purge valve OPEN OK) and detects that the purge flow is normal when the pulse of the EVAP canister purge valve drive cycle is transmitted to fuel tank pressure (FTP) sensor by the purge flow (pulse method).

OK determination: Pulse exists (P145C OK)

- P0497 Purge flow OK
- P0496 EVAP canister purge valve stuck Open OK

NG determination: No pulse (P145C NG)

- Either purge flow P0497 abnormality or P0496 EVAP canister purge valve OPEN failure.
- In this case, classify the failure part according to < STEP 2 >.

< STEP 2 >

If there is no pulse, it is determined as either no purge flow or the EVAP canister purge valve is stuck OPEN:

When the FTP sensor fluctuates from negative pressure to atmospheric pressure after the ignition is turned off: P0496 EVAP canister purge valve stuck OPEN

When there is no fluctuation of the FTP sensor: P0497 purge flow NG

Monitor Execution, Sequence, Duration, DTC Type, OBD Status**MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS**

Execution	Once per driving cycle
Sequence	P145C is judged as OK
Duration	-
DTC Type	Two drive cycles, MIL ON
OBD Status	N/A

Enable Conditions**ENABLE CONDITIONS**

Condition	Minimum	Maximum
Low load duration time	10 seconds	-
Wait for stability after the ignition is turned off	10 seconds	-
Engine coolant temperature before EVAP purge control starts	149°F (65°C)	-
No active DTCs	P0107, P0108, P0117, P0118, P0134, P0135, P0154, P0155, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0335, P0339, P0443, P0451, P0452, P0453, P0496, P0498, P0499, P0685, P1128, P1129, P1172, P1174, P1454, P2195, P2197, P2227, P2228, P2229, P2237, P2238, P2240, P2241, P2243, P2245, P2247, P2249, P2251, P2252, P2254, P2255, P2422, P2627, P2628, P2630, P2631	

Malfunction Threshold

The output from the fuel tank pressure sensor is 0.2 kPa (0.07 in.Hg, 2 mmHg) or less for at least 10 seconds.

Confirmation Procedure with the HDS

Do the EVAP FUNCTION TEST in the INSPECTION MENU with the HDS.

Driving Pattern

1. Start the engine. Hold the engine speed at 3,000 rpm without load (in Park or neutral) until the radiator fan comes on.
2. Let the engine idle for at least 77 seconds.
3. Turn off the ignition for at least 10 seconds.

Diagnosis Details**Conditions for illuminating the MIL**

When a malfunction is detected during the first drive cycle, a Temporary DTC is stored in the ECM/PCM memory. If the malfunction recurs during the next (second) drive cycle, the MIL comes on and the DTC and the freeze frame data are stored.

Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, the Temporary DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P0498 (117): ADVANCED DIAGNOSTICS

DTC P0498: EVAPORATIVE EMISSION (EVAP) CANISTER VENT SHUT VALVE CONTROL CIRCUIT LOW VOLTAGE

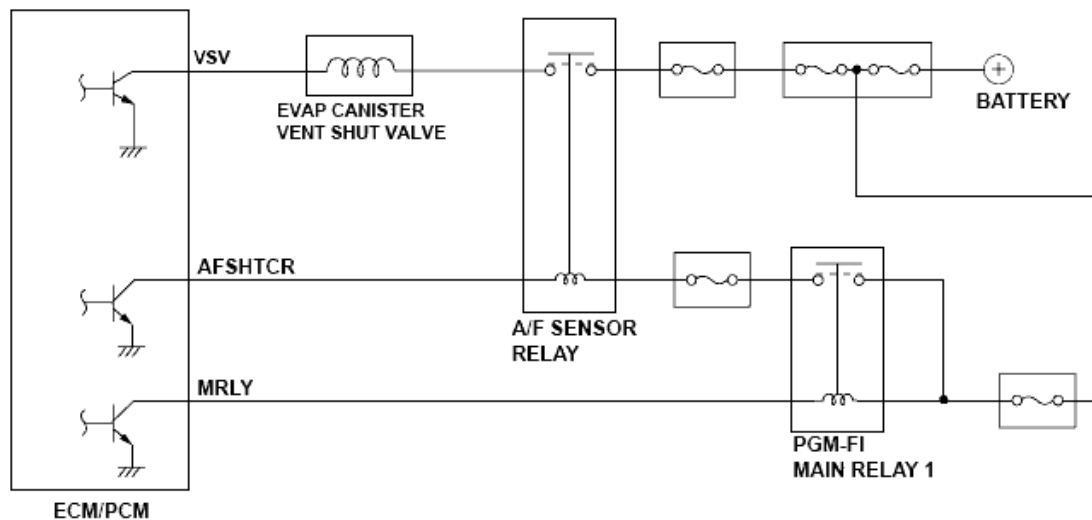


Fig. 92: Evaporative Emission Canister Vent Shut Valve Control (Low Voltage) - Circuit Diagram

General Description

The evaporative emission (EVAP) canister vent shut valve is attached to the EVAP canister to control the venting of the EVAP canister to atmosphere.

The EVAP canister vent shut valve is open (open to atmosphere) when the VSV signal is OFF. If the return signal is "OFF" when the engine control module (ECM)/powertrain control module (PCM) outputs the "ON" signal to the EVAP canister vent shut valve, the ECM/PCM detects a malfunction and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
Sequence	None
Duration	5 seconds or more
DTC Type	One drive cycle, MIL ON
OBD Status	N/A

Enable Conditions

ENABLE CONDITIONS

Condition	Minimum	Maximum
Battery voltage	10.1 V	-
State of the engine	Running	
No active DTCs	P0499	

Malfunction Threshold

The return signal is "Low" for at least 5 seconds when the ECM/PCM outputs the "ON" signal to the EVAP canister vent shut valve.

Confirmation Procedure with the HDS

Do the EVAP CVS ON in the INSPECTION MENU with the HDS.

Diagnosis Details**Conditions for illuminating the MIL**

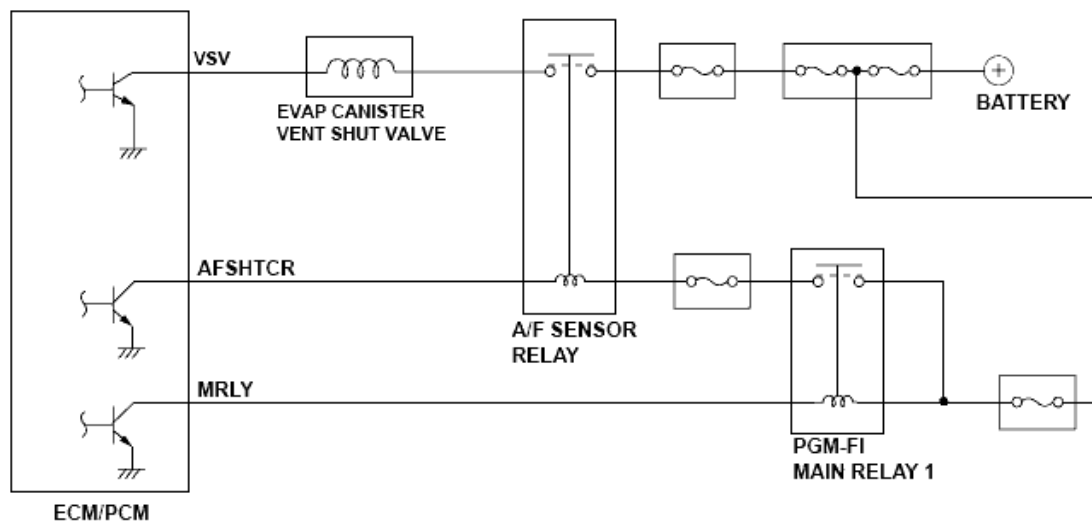
When a malfunction is detected, the MIL comes on and the DTC and the freeze frame data are stored in the ECM/PCM memory.

Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P0499 (117): ADVANCED DIAGNOSTICS**DTC P0499: EVAPORATIVE EMISSION (EVAP) CANISTER VENT SHUT VALVE CONTROL CIRCUIT HIGH VOLTAGE**



P0498-0704

Fig. 93: Evaporative Emission Canister Vent Shut Valve Control (High Voltage) - Circuit Diagram

General Description

The evaporative emission (EVAP) canister vent shut valve is attached to the EVAP canister to control the venting of the EVAP canister to atmosphere.

The EVAP canister vent shut valve is open (open to atmosphere) when the VSV signal is OFF. If the return signal is "ON" when the engine control module (ECM)/powertrain control module (PCM) outputs the "OFF" signal to the EVAP canister vent shut valve, the ECM/PCM detects a malfunction and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
Sequence	None
Duration	5 seconds or more
DTC Type	One drive cycle, MIL ON
OBD Status	N/A

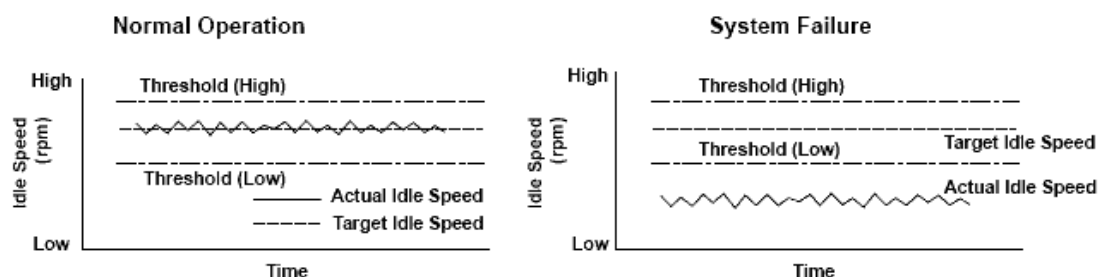
Enable Conditions

ENABLE CONDITIONS

Condition	Minimum	Maximum
Battery voltage	10.1 V	-
State of the engine	Running	
No active DTCs	P0498	

Malfunction Threshold

The return signal is "ON" for at least 5 seconds when the ECM/PCM outputs the "Low" signal to the EVAP canister vent shut valve.



P0506-0371

Fig. 95: Idle Control System Normal Operation And System Failure Graph

General Description

A target idle speed that meets the engine operating conditions (coolant temperature, A/C ON or OFF, etc.) is stored in the engine control module (ECM)/powertrain control module (PCM). The ECM/PCM monitors and controls the idle speed so that the actual idle speed is equal to the target idle speed. If the actual idle speed varies beyond a specified value from the target speed over a certain period of time, the ECM/PCM detects a malfunction in the idle speed control system and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Once per driving cycle
Sequence	None
Duration	20 seconds or more
DTC Type	Two drive cycles, MIL ON
OBD Status	PASSED/FAILED/EXECUTING/OUT OF (TEST) CONDITION

Enable Conditions

ENABLE CONDITIONS

Condition	Minimum	Maximum
Engine coolant temperature	156°F (69°C)	-
Intake air temperature	32°F (0°C)	-
Battery voltage	10.5 V	-
Fuel trim	0.73	1.47
Fuel feedback	Closed loop	
Throttle position	Fully closed	
No active DTCs	P0107, P0108, P0112, P0113, P0117, P0118, P0122, P0123, P0171, P0172, P0174, P0175, P0222, P0223, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0401, P0404, P0443, P0496, P0497, P1128, P1129, P145C, P2101, P2108, P2118, P2122, P2123, P2127, P2128, P2135, P2138, P2176, P2413, P2646, P2647, P2648, P2649, U0107	
Other	The engine is under no load	

Malfunction Threshold

The actual idle speed is at least 100 rpm less than the target idle speed for at least 20 seconds.

Driving Pattern

1. Start the engine. Hold the engine speed at 3,000 rpm without load (in Park or neutral) until the radiator fan comes on.
2. Let the engine idle for at least 20 seconds.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected during the first drive cycle, a Temporary DTC is stored in the ECM/PCM memory. If the malfunction recurs during the next (second) drive cycle, the MIL comes on and the DTC and the freeze frame data are stored.

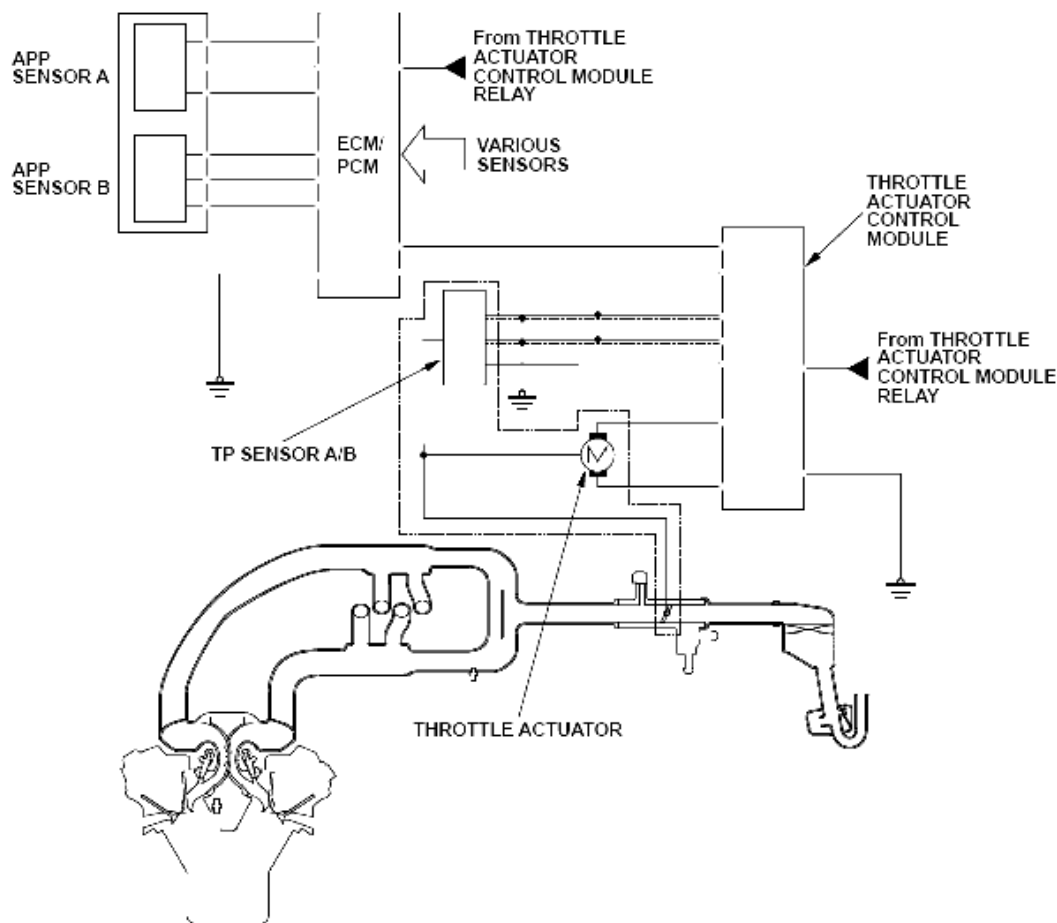
Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, the Temporary DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

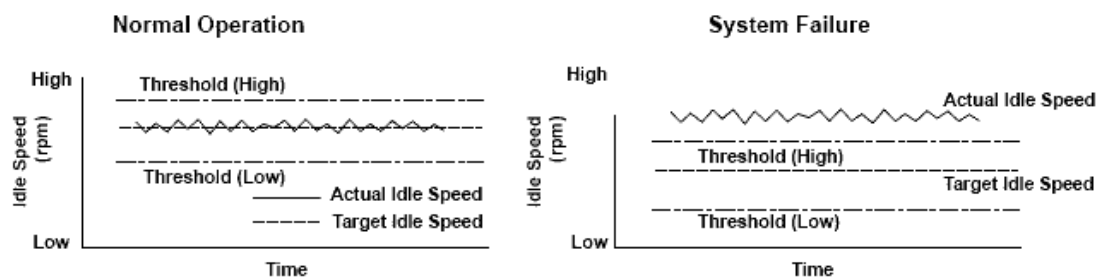
DTC P0507 (14): ADVANCED DIAGNOSTICS

DTC P0507: IDLE CONTROL SYSTEM RPM HIGHER THAN EXPECTED



P0506-0475

Fig. 96: Idle Control System Diagram - RPM Higher Than Expected



P0507-0370

Fig. 97: Idle Control System Normal Operation And System Failure Graph

General Description

A target idle speed that meets the engine operating conditions (coolant temperature, A/C ON or OFF, etc.) is stored in the engine control module (ECM)/powertrain control module (PCM). The ECM/PCM monitors and controls the idle speed so that the actual idle speed is equal to the target idle speed. If the actual idle speed varies beyond a specified value from the target speed over a certain period of time, the ECM/PCM detects a malfunction in the idle speed control system and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Once per driving cycle
Sequence	None
Duration	20 seconds or more
DTC Type	Two drive cycles, MIL ON
OBD Status	PASSED/FAILED/EXECUTING/OUT OF (TEST) CONDITION

Enable Conditions**ENABLE CONDITIONS**

Condition	Minimum	Maximum
Engine coolant temperature	156°F (69°C)	-
Intake air temperature	32°F (0°C)	-
Battery voltage	10.5 V	-
Fuel trim	0.73	1.47
Fuel feedback	Closed loop	
Throttle position	Fully closed	
No active DTCs	P0107, P0108, P0112, P0113, P0117, P0118, P0122, P0123, P0171, P0172, P0174, P0175, P0222, P0223, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0401, P0404, P0443, P0496, P0497, P1128, P1129, P145C, P2101, P2108, P2118, P2122, P2123, P2127, P2128, P2135, P2138, P2176, P2413, P2646, P2647, P2648, P2649, U0107	
Other	The engine is under no load	

Malfunction Threshold

The actual idle speed is at least 200 rpm greater than the target idle speed for at least 20 seconds.

Driving Pattern

1. Start the engine. Hold the engine speed at 3,000 rpm without load (in Park or neutral) until the radiator fan comes on.
2. Let the engine idle for at least 20 seconds.

Diagnosis Details**Conditions for illuminating the MIL**

When a malfunction is detected during the first drive cycle, a Temporary DTC is stored in the ECM/PCM memory. If the malfunction recurs during the next (second) drive cycle, the MIL comes on and the DTC and the freeze frame data are stored.

Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, the Temporary DTC, and the freeze frame data can be cleared by using the scan tool

The alternator is driven by the engine, and it generates electricity to supply the necessary power to the electrical system and to charge the battery. The alternator voltage target values of 14.5 V and 12.5 V are achieved by switching the alternator control mode (controlled by the engine control module

(ECM)/powertrain control module (PCM)). The alternator output signal is sent to the ECM/PCM, and it varies according to the battery's state of charge, the electrical load, and engine speed.

When the IGP (power source) terminal voltage is a set value or less for a set time, the ECM/PCM detects a malfunction and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
Sequence	None
Duration	60 seconds or more
DTC Type	One drive cycle, MIL OFF
OBD Status	N/A

Enable Conditions

ENABLE CONDITIONS

Condition	Minimum	Maximum
Engine speed	500 rpm	-

Malfunction Threshold

The IGP terminal voltage is 11.0 V or less for at least 60 seconds.

Diagnosis Details

Conditions for illuminating the indicator

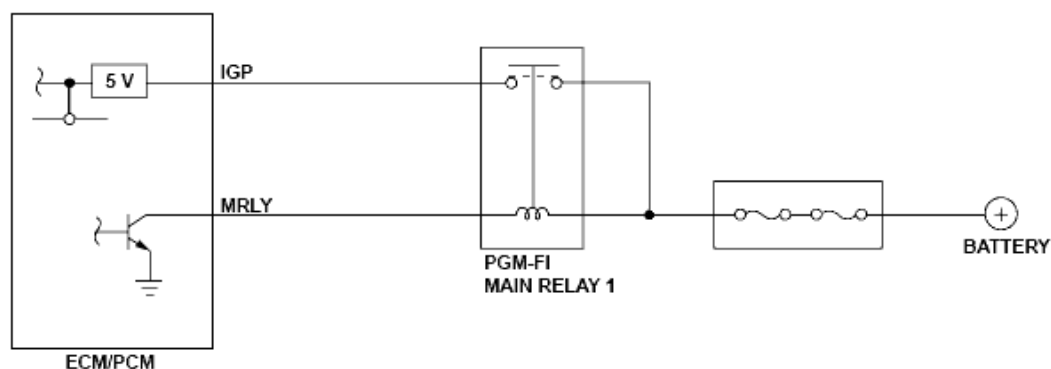
When a malfunction is detected, the DTC and the freeze frame data are stored in the ECM/PCM memory. The MIL does not come on.

Conditions for clearing the DTC

The DTC and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P0563 (34): ADVANCED DIAGNOSTICS

DTC P0563: ENGINE CONTROL MODULE (ECM)/POWERTRAIN CONTROL MODULE (PCM) POWER SOURCE CIRCUIT UNEXPECTED VOLTAGE



P0563-0701

Fig. 99: Powertrain Control Module Power Source - Circuit Diagram

General Description

If there is a short to ground in the harness between the engine control module (ECM)/powertrain control module (PCM) and PGM-FI main relay 1, PGM-FI main relay 1 stays ON even though the ignition switch is OFF, and the ECM/PCM remains active. However, the engine is not running because the power for the gauges, the ignition, and the fuel pump is turned OFF by the ignition switch.

When the ECM/PCM operates for a set time after the ignition switch is turned OFF, a malfunction is detected and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
Sequence	None
Duration	5 seconds or more
DTC Type	One drive cycle, MIL OFF
OBD Status	N/A

Enable Conditions

ENABLE CONDITIONS

Condition	Minimum	Maximum
Battery voltage (IGP terminal of ECM/PCM)	10.1 V	-

Malfunction Threshold

The ECM/PCM operates for at least 5 seconds after the ignition switch is turned OFF.

Diagnosis Details

Conditions for illuminating the indicator

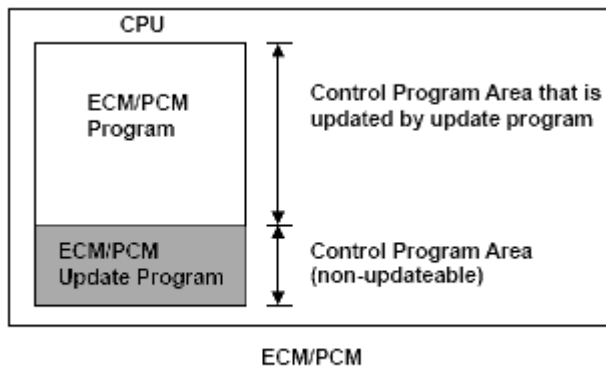
When a malfunction is detected, the DTC and the freeze frame data are stored in the ECM/PCM memory. The MIL does not come on.

Conditions for clearing the DTC

The DTC and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P0602 (196): ADVANCED DIAGNOSTICS

DTC P0602: ENGINE CONTROL MODULE (ECM)/POWERTRAIN CONTROL MODULE (PCM) PROGRAMMING ERROR



P0602-0570

Fig. 100: Powertrain Control Module Program

General Description

The engine control module (ECM)/powertrain control module (PCM) is equipped with an update program to update its control program. The programs in the CPU of the ECM/PCM are classified as an ECM/PCM program (update-capable program) and a program for the update function (non-updateable program). The program update only updates the ECM/PCM program.

When the ECM/PCM power is turned off during an update, the power for the update function is lost, and the update process stops. When the program update is stopped before it is completed, the ECM/PCM stores a DTC that indicates the update is not finished.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
Sequence	None
Duration	1 second or less
DTC Type	One drive cycle, MIL ON
OBD Status	N/A

Enable Conditions

ENABLE CONDITIONS

Condition	
Ignition switch	ON

Malfunction Threshold

The ECM/PCM program update is stops before it is finished for at most 1 second.

Diagnosis Details

Conditions for illuminating the MIL

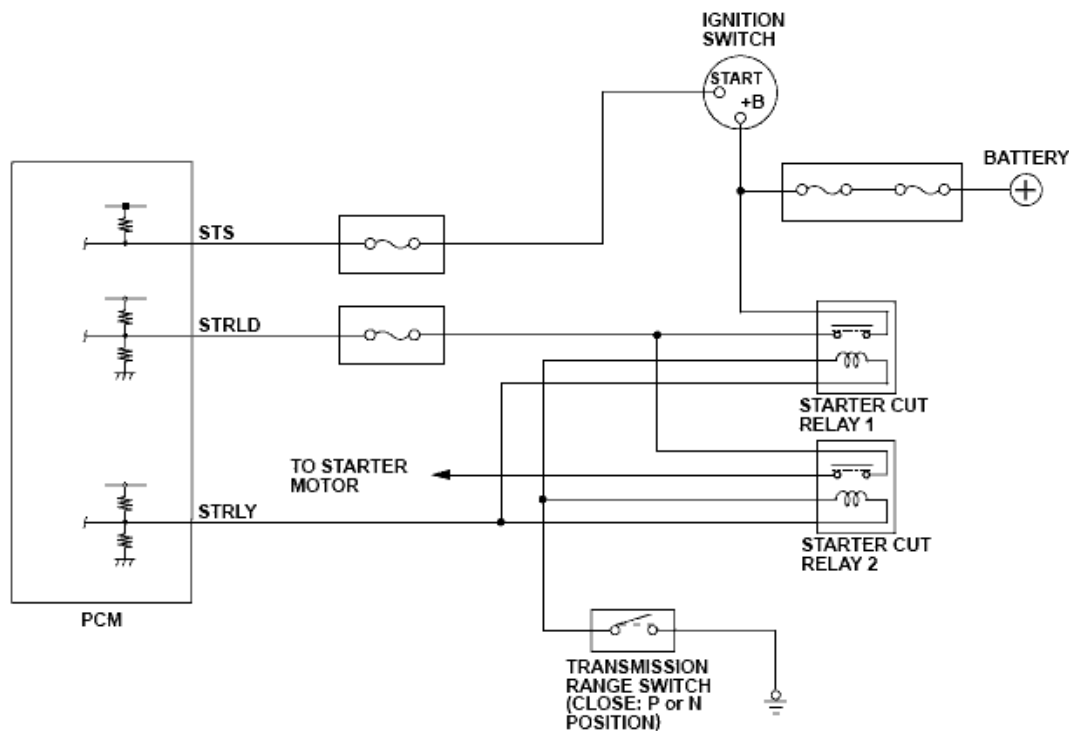
When the ECM/PCM program is not written in the ECM/PCM, the DTC is stored in the ECM/PCM memory.

Conditions for clearing the MIL

The DTC will be cleared when the ECM/PCM program update is complete.

DTC P0615 (198): ADVANCED DIAGNOSTICS

DTC P0615: STARTER RELAY STRLD CIRCUIT MALFUNCTION



P0615-0700

Fig. 101: Starter Relay STRLD Malfunction - Circuit Diagram

General Description

A starter switch inhibit system prevents the starter from working during engine rotation to prevent damage to the starter pinion gear.

If the ignition switch is switched to START (III) position mistakenly while the engine is running, the powertrain control module (PCM) prevents the starter from working according to the engine rotation information and the output (STRLY) signal of the starter cut relay is switched to LOW.

In this system, two starter cut relays are connected in series (starter cut relay 1, starter cut relay 2) to prevent the starter cut relay to continue rotation by the ON malfunction of the starter.

Also a diagnosis line (STRLD) is used to monitor voltage in the middle of starter cut relay 1 and starter cut relay 2. The PCM detects an OPEN malfunction an ON malfunction of starter cut relay 1, and an ON malfunction of starter cut relay 2, according to the information.

If the voltage of the diagnosis line (STRLD) input does not exceed upper and lower limit for a specified duration when the ignition switch is at the START (III) position and the output of the starter cut relay (STRLY) is HIGH (starter ON), an OPEN malfunction of the diagnosis line is detected.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
Sequence	None
Duration	0.8 second or more
DTC Type	One drive cycle, MIL ON
OBD Status	N/A

Enable Conditions

ENABLE CONDITIONS

Condition	
Ignition switch	ON

Malfunction Threshold

The diagnosis line (STRLD) input voltage is between 2.4 V to 2.6 V for at least 0.8 second.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected, the MIL comes on and the DTC and the freeze frame data are stored in the PCM memory.

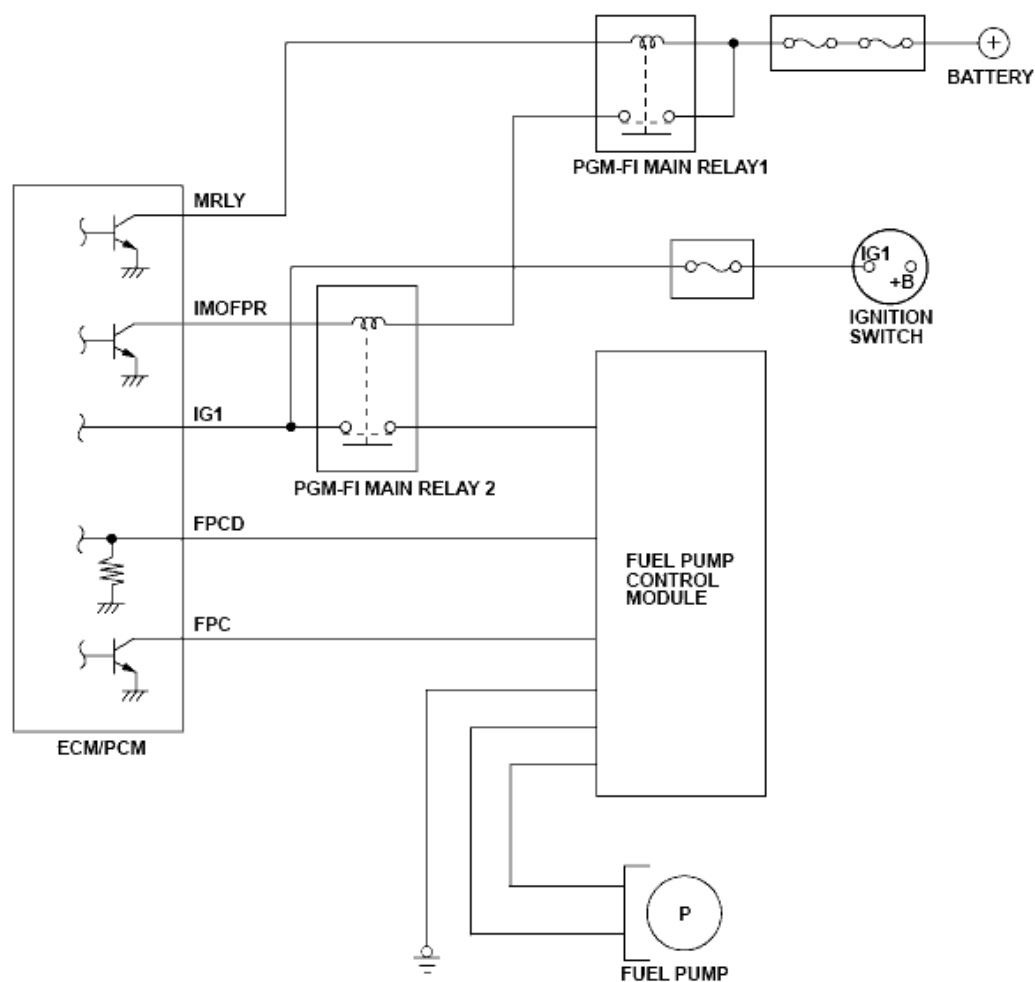
Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P0627 (169) ADVANCED DIAGNOSTICS (J35A8)

DTC P0627: FUEL PUMP CONTROL MODULE SYSTEM MALFUNCTION (J35A8)



P0827-0701

Fig. 102: Fuel Pump Control Module System - Circuit Diagram (J35A8)

General Description (J35A8)

The fuel pump control module system monitors the voltage applied to the fuel pump in response to the duty signal from the engine control module (ECM)/powertrain control module (PCM). When the voltage applied to the fuel pump is normal, the fuel pump control module system outputs a high diagnosis signal, and when the voltage applied is abnormal, it outputs a low signal. The ECM/PCM monitors this diagnosis signal whenever the engine is running.

When the diagnosis signal from the fuel pump control module system is low for a set time or more, the ECM/PCM detects a malfunction and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status (J35A8)

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
Sequence	None
Duration	2 seconds or more
DTC Type	One drive cycle, MIL ON
OBD Status	N/A

Enable Conditions (J35A8)

ENABLE CONDITIONS

Condition	
State of the engine	Running

Malfunction Threshold (J35A8)

The diagnosis signal is low for at least 2 seconds.

Diagnosis Details (J35A8)

Conditions for illuminating the MIL (J35A8)

When a malfunction is detected, the MIL comes on and the DTC and the freeze frame data are stored in the ECM/PCM memory.

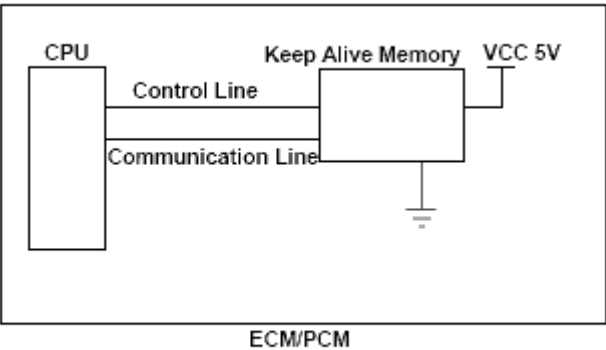
Conditions for clearing the MIL (J35A8)

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P062F (131): ADVANCED DIAGNOSTICS

DTC P062F: ENGINE CONTROL MODULE (ECM)/POWERTRAIN CONTROL MODULE (PCM) INTERNAL CONTROL MODULE KEEP ALIVE MEMORY (KAM) ERROR



P0603-0570

Fig. 103: Engine Control Module (ECM) And Powertrain Control Module (PCM) Internal Control Module - Communication Diagram

General Description

The engine control module (ECM)/powertrain control module (PCM) is equipped with a keep-alive memory. The data (control learn data, etc.) for powertrain control and information (vehicle identification number (VIN), etc.) related to the vehicle control is stored in the keep alive memory, so that it can be

maintained even when power is not supplied to the ECM/PCM, such as when the battery is disconnected. When power is restored to the ECM/PCM, the CPU retrieves the stored information from the keep-alive memory, but when the data retrieval process is not finished normally, a malfunction is detected and a DTC is stored.

The CPU writes data to the keep-alive memory from the CPU: Control related data is written when the ignition is turned on, and vehicle information when commanded from the HDS.

If the data writing process is not completed normally, a malfunction is detected and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
Sequence	None
Duration	1 second or more
DTC Type	One drive cycle, MIL ON
OBD Status	N/A

Enable Conditions

ENABLE CONDITIONS

Condition	
Ignition switch	ON

Malfunction Threshold

A malfunction is detected whenever the keep alive data retrieval and writing process is not completed normally.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected, the MIL comes on and the DTC and the freeze frame data are stored in the ECM/PCM memory.

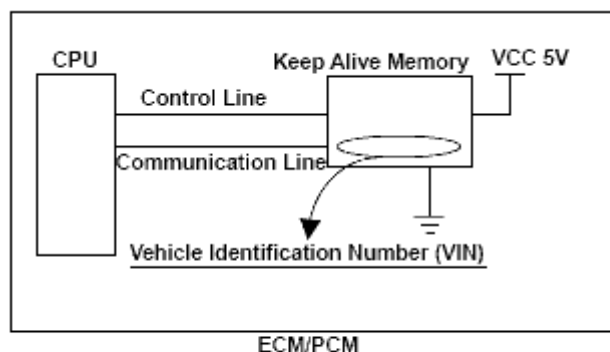
Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P0630 (139): ADVANCED DIAGNOSTICS

DTC P0630: VIN NOT PROGRAMMED OR MISMATCH



P0630-0570

Fig. 104: Vehicle Identification Number Output Program**General Description**

The engine control module (ECM)/powertrain control module (PCM) stores a vehicle identification number (VIN) in the keep alive memory and outputs the VIN according to the command from the HDS.

The VIN for each vehicle is registered to the ECM/PCM using the HDS. The registered VIN is read by the CPU from the keep-alive memory after the ignition is turned on or after the Clear command is executed.

If the VIN is not registered in the keep-alive memory when the ignition is turned on or when the Clear command is executed, it is detected as a VIN unregistered condition and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status**MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS**

Execution	Continuous
Sequence	None
Duration	1 second or less
DTC Type	One drive cycle, MIL ON
OBD Status	N/A

Enable Conditions**ENABLE CONDITIONS**

Condition	
Ignition switch	ON
No active DTCs	P062F

Malfunction Threshold

The VIN is not registered in the keep-alive memory in the ECM/PCM.

Diagnosis Details**Conditions for illuminating the MIL**

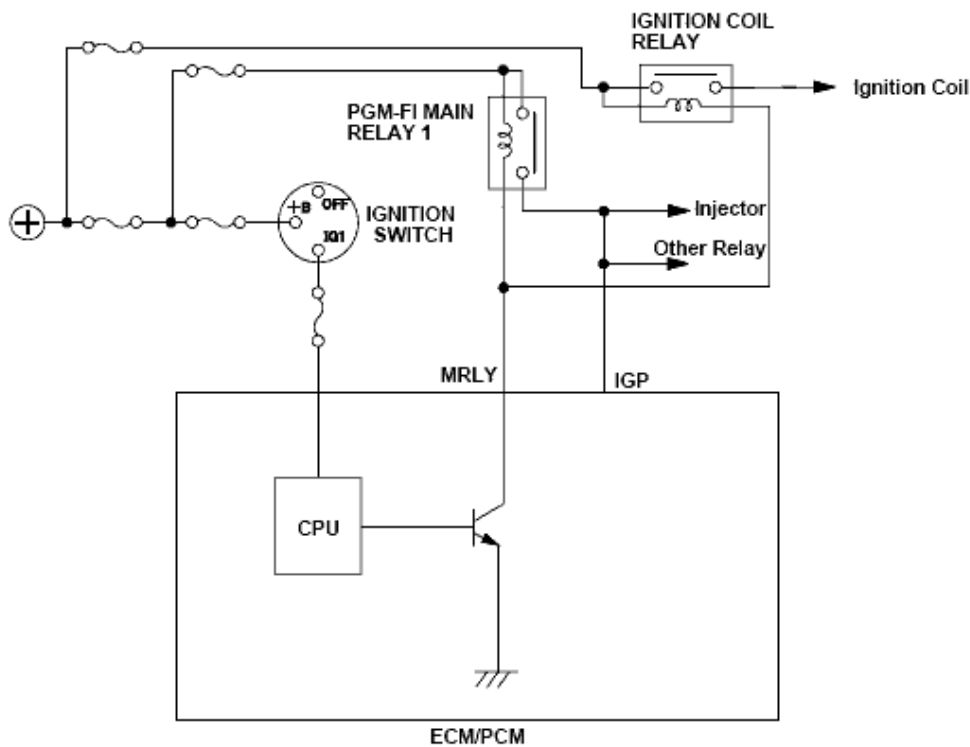
When a malfunction is detected, the MIL comes on and the DTC and the freeze frame data are stored in the ECM/PCM memory.

Conditions for clearing the MIL

When the VIN registration is completed, MIL is cleared.

DTC P0685 (135): ADVANCED DIAGNOSTICS

DTC P0685: POWERTRAIN CONTROL MODULE (PCM) INTERNAL CIRCUIT MALFUNCTION (POWER CONTROL CIRCUIT)



P0685-0701

Fig. 105: Powertrain Control Module Power Control Circuit Diagram

General Description

After the ignition switch is turned off, the engine control module (ECM)/powertrain control module (PCM) does not shut down immediately. After finishing a predetermined process according to the request of each device and system, the power supply is automatically disconnected (self shut-down function). The ECM/PCM power is disconnected by controlling PGM-FI main relay 1.

During a normal ECM/PCM shut down, the shut down process is executed by the CPU, PGM-FI main relay 1 is turned off, and the voltage to the ECM/PCM is turned off to shut down the ECM/PCM. When the voltage to the ECM/PCM is turned off and the ECM/PCM shuts down without the normal shut down procedure, a malfunction in the PGM-FI main relay 1 control circuit is detected and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
Sequence	None
Duration	1 second or less
DTC Type	Two drive cycles, MIL ON
OBD Status	N/A

Enable Conditions**ENABLE CONDITIONS**

Condition	Minimum	Maximum
Engine speed	400 rpm	-

Malfunction Threshold

The ECM/PCM is shut down without the normal shut down procedure.

Diagnosis Details**Conditions for illuminating the MIL**

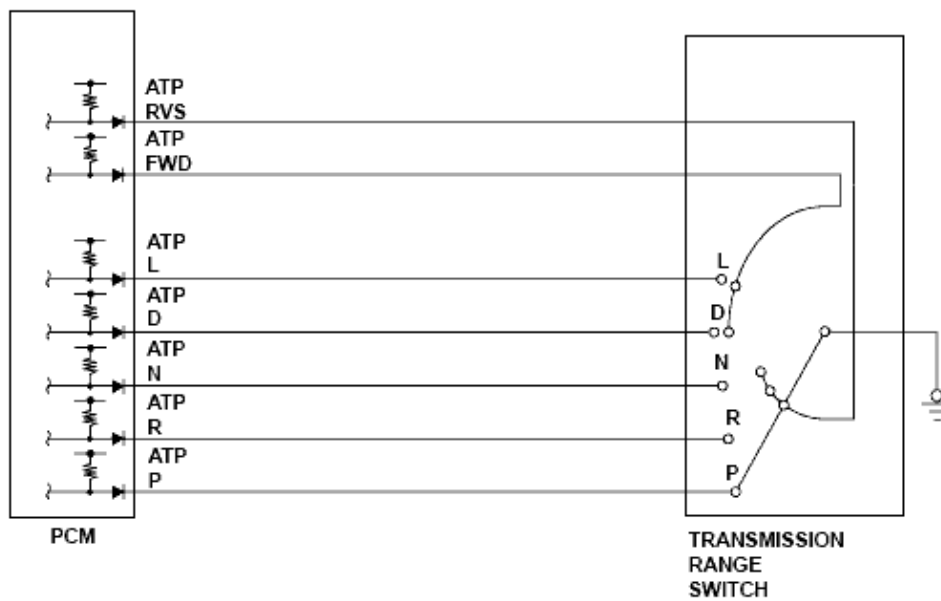
When a malfunction is detected during the first drive cycle, a Temporary DTC is stored in the ECM/PCM memory. If the malfunction recurs during the next (second) drive cycle, the MIL comes on and the DTC and the freeze frame data are stored.

Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive drive cycles in which the engine conditions are similar to the first time the malfunction was detected.

The MIL, the DTC, the Temporary DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P0705 (5): ADVANCED DIAGNOSTICS**DTC P0705: SHORT IN TRANSMISSION RANGE SWITCH CIRCUIT (MULTIPLE SHIFT-POSITION INPUT)**



P0705-0703

Fig. 106: Transmission Range Switch Circuit Diagram**TRANSMISSION RANGE SWITCH CONTACT POINT INPUT MATRIX**

Shift lever position	Input per switch						
	P	R	N	D	L	FWD	RVS
P	o	X	X	X	X	X	o
R	X	o	X	X	X	X	o
N	X	X	o	X	X	X	o
D	X	X	X	o	X	o	X
L	X	X	X	X	o	o	X

o: Closed X: Open

General Description

The transmission range switch is attached to the control shaft. Operating the shift lever makes the control shaft rotate via the shift cable. The A/T gear position indicator indicates which position is selected according to the Low/High signal combinations which vary based on the control shaft rotational angle. The control shaft changes the position of the transmission range switch, activates the manual valve, and switches hydraulic pressure to shift the transmission through forward/neutral/reverse. The transmission range switch signal is used to determine the shift schedule. The voltage is 12 V (High) at the powertrain control module (PCM) input terminal when each transmission range switch position is open, and it is 0 V (Low) when each switch is closed. If the PCM detects multiple switch inputs instead of the correct switch input for the selected range at that time, it detects a malfunction and stores a DTC.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status**MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS**

Execution	Continuous
Sequence	None
Duration	1 second or more

DTC Type	One drive cycle, MIL ON, D indicator blinks
OBD Status	PASSED/FAILED/NOT COMPLETED (STILL TESTING)

Enable Conditions

ENABLE CONDITIONS

Condition	Minimum	Maximum
Battery voltage	11.0 V	-

Malfunction Threshold

Case 1

The PCM detects the selected range switch input and another range switch input simultaneously for at least 1 second.

Case 2

The PCM detects the P, R, or N range switch input and the FWD switch input simultaneously for at least 1 second.

Case 3

The PCM detects the D or L range switch input and the RVS switch input simultaneously for at least 1 second.

Driving Pattern

Start the engine, and then place the shift lever in each position for at least 1 second.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected, the MIL comes on and the DTC and the freeze frame data are stored in the PCM memory.

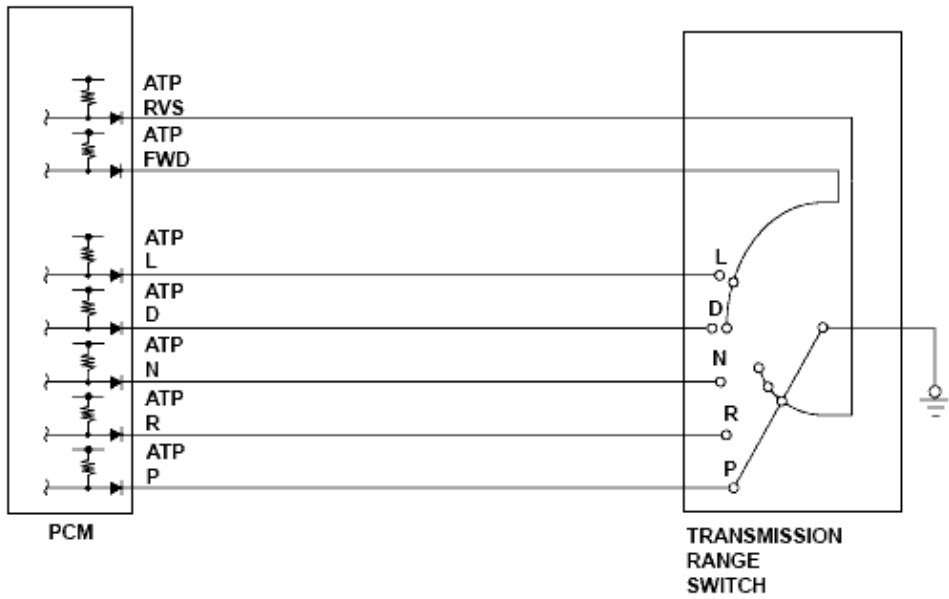
Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P0706 (6): ADVANCED DIAGNOSTICS

DTC P0706: OPEN IN TRANSMISSION RANGE SWITCH CIRCUIT



P0705-0703

Fig. 107: Transmission Range Switch Circuit Diagram

TRANSMISSION RANGE SWITCH CONTACT POINT INPUT MATRIX

Shift lever position	Input per switch						
	P	R	N	D	L	FWD	RVS
P	o	X	X	X	X	X	o
R	X	o	X	X	X	X	o
N	X	X	o	X	X	X	o
L	X	X	X	o	X	o	X
S	X	X	X	X	o	o	X

o: Closed X: Open

General Description

The transmission range switch is attached to the control shaft. Operating the shift lever makes the control shaft rotate via the shift cable. The A/T gear position indicator indicates which position is selected according to the Low/High signal combinations which vary based on the control shaft rotational angle. The control shaft changes the position of the transmission range switch, activates the manual valve, and switches hydraulic pressure to shift the transmission through forward/neutral/reverse. The transmission range switch signal is used to determine the shift schedule. The voltage is 12 V (High) at the powertrain control module (PCM) input terminal when each transmission range switch position is open, and it is 0 V (Low) when each switch is closed. If the FWD switch stays open while the vehicle repeatedly accelerates to a specified vehicle speed and then stops despite being in the D position, the PCM detects a malfunction in the transmission range switch (open) and stores a DTC.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
Sequence	None

Duration	Depending on the driving pattern
DTC Type	Two drive cycles, MIL ON, D indicator OFF
OBD Status	PASSED/FAILED/NOT COMPLETED (STILL TESTING)

Enable Conditions

ENABLE CONDITIONS

Condition	Minimum	Maximum
Battery voltage	11.0 V	-
No active DTCs	P0705, P0721, P0722	

Malfunction Threshold

No FWD position signal is detected when the vehicle speed changes from 6 mph (10 km/h) --> 25 mph (40 km/h) --> 6 mph (10 km/h) in the D or L position.

Driving Pattern

1. Start the engine, and accelerate to 25 mph (40 km/h) or more in D or L position, then slow down to 6 mph (10 km/h).
2. Stop the vehicle, turn the ignition switch OFF, and repeat step 1.
 - Drive the vehicle in this manner only if the traffic regulations and ambient conditions allow.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected during the first drive cycle, a Temporary DTC is stored in the PCM memory. If the malfunction recurs during the next (second) drive cycle, the MIL comes on and the DTC and the freeze frame data are stored.

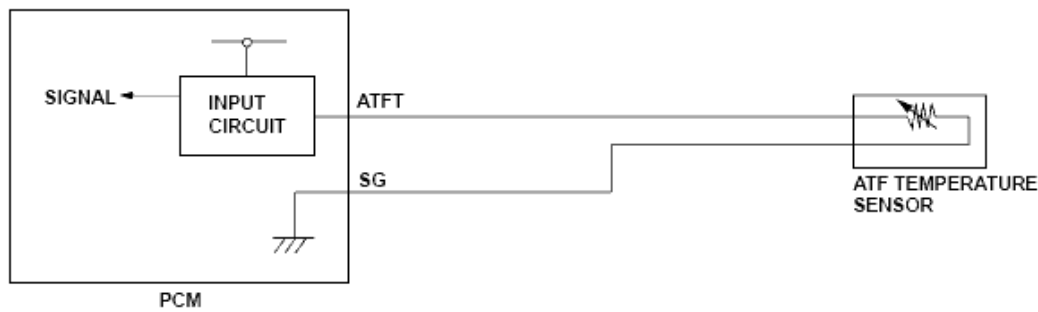
Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

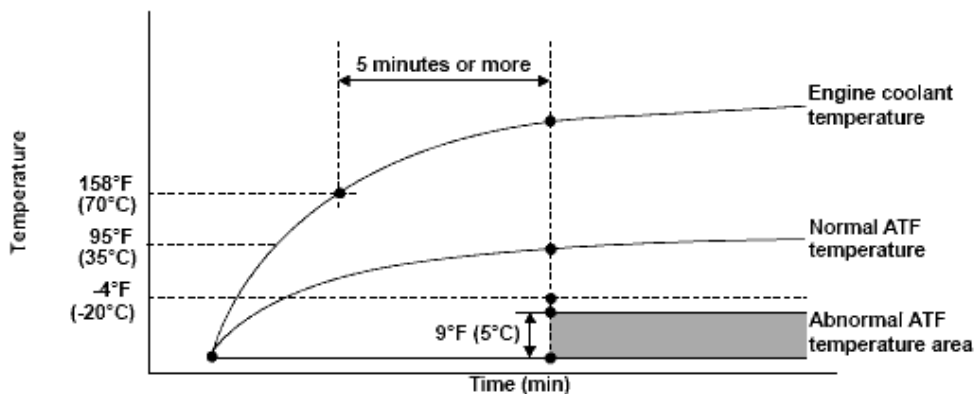
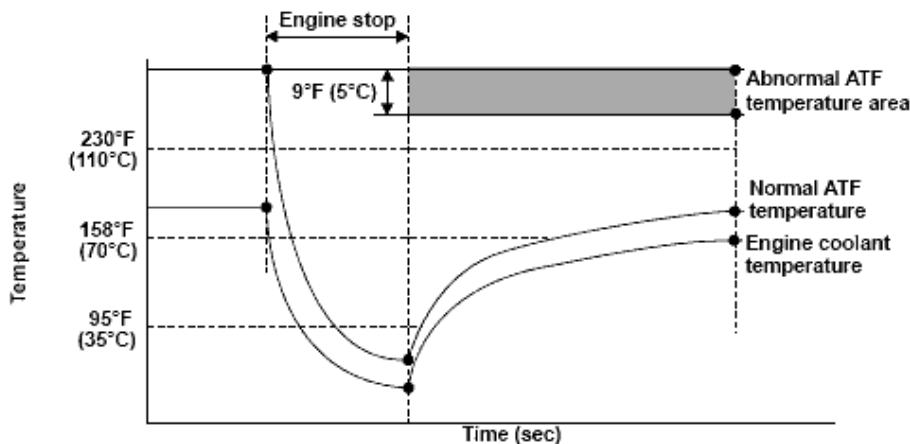
The MIL, the DTC, the Temporary DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P0711 (28): ADVANCED DIAGNOSTICS

DTC P0711: PROBLEM IN ATF TEMPERATURE SENSOR CIRCUIT



P0711-0301

Fig. 108: ATF Temperature Sensor Circuit Diagram**1. Stuck at the low temperature****2. Stuck at the high temperature**

P0711-0370

Fig. 109: ATF Temperature Sensor Operation Diagram**General Description**

The ATF temperature sensor is a thermistor type sensor whose resistance changes according to the change in ATF temperature. The powertrain control module (PCM) sends a 5 V reference voltage to the grounded sensor through a pull-up resistor. When the ATF temperature is low, the sensor resistance increases and the PCM detects a high signal voltage. As the ATF temperature rises, the sensor resistance decreases and the PCM detects a low signal voltage.

If the ATF temperature sensor signal does not change, the PCM detects a malfunction and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Once per driving cycle
Sequence	None
Duration	5 minutes or more ⁽¹⁾
	20 seconds or more ⁽²⁾
DTC Type	One drive cycle, MIL OFF, D indicator blinks
OBD Status	PASSED/FAILED/NOT COMPLETED (STILL TESTING)
(1) Stuck at Low temperature is detected.	
(2) Stuck at High temperature is detected.	

Enable Conditions

1. Stuck at Low temperature

ENABLE CONDITIONS

Condition	Minimum	Maximum
Engine coolant temperature	158°F (70°C)	-
Initial engine coolant temperature	-	95°F (35°C)
ATF temperature	-	-4 °F (-20°C)
Vehicle speed	19 mph (30 km/h)	-
Battery voltage	11.0 V	-
Throttle position	4.0 °	-
No active DTCs	P0116, P0117, P0118, P0712, P0713, P0721, P0722	
Other	After the engine coolant temperature reaches the set value, both the vehicle speed and the throttle position meet the conditions for 5 minutes or more	

2. Stuck at High temperature

ENABLE CONDITIONS

Condition	Minimum	Maximum
Engine coolant temperature	158°F (70°C)	-
Previous engine coolant temperature when the ignition switch was turned OFF	158°F (70°C)	-
Present engine coolant temperature when the ignition switch is turned ON	-	95°F (35°C)
ATF temperature	230°F (110°C)	-
Battery voltage	11.0 V	-
No active DTCs	P0116, P0117, P0118, P0712, P0713, P0721, P0722	

Malfunction Threshold

1. Stuck at Low temperature

The ATF temperature rise is 9°F (5°C) or less after the ignition switch is turned ON, and the current ATF temperature is -4°F (-20°C) or less.

2. Stuck at High temperature

The ATF temperature drop is -9°F (-5°C) or less after the ignition switch is turned ON, and the current ATF temperature is 230°F (110°C) or more for at least 20 seconds.

Driving Pattern

1. Stuck at Low temperature

Start the engine with engine coolant temperature at 95°F (35°C) or less, and warm up the engine until the engine coolant temperature reaches 158°F (70°C) or more. Then drive the vehicle at a speed of 19 mph (30 km/h) or more with the throttle position at 4.0° or more for at least 5 minutes.

2. Stuck at High temperature

Turn off the engine with the engine coolant temperature at 158°F (70°C) or more. Restart the engine after the engine coolant temperature drops to 95°F (35°C) or less, and warm up the engine until the engine coolant temperature reaches 158°F (70°C).

- Drive the vehicle in this manner only if the traffic regulations and ambient conditions allow.

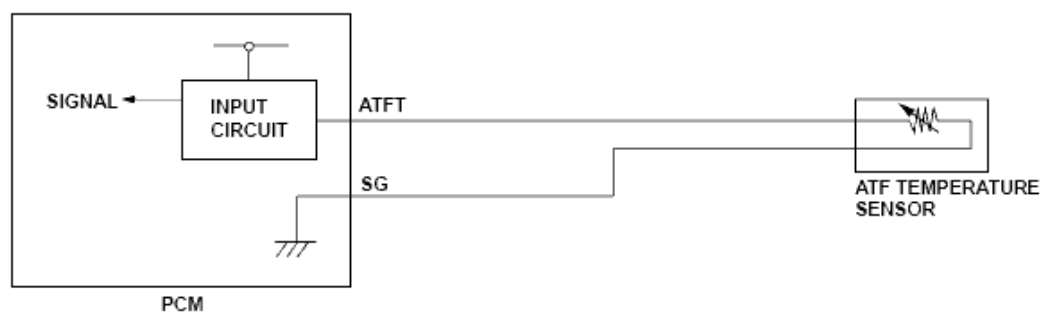
Diagnosis Details**Conditions for illuminating the indicator**

When a malfunction is detected, the D indicator blinks, and the DTC and the freeze frame data are stored in the PCM memory. The MIL does not come on.

Conditions for clearing the DTC

The DTC and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P0712 (28): ADVANCED DIAGNOSTICS**DTC P0712: SHORT IN ATF TEMPERATURE SENSOR CIRCUIT**



P0711-0301

Fig. 110: ATF Temperature Sensor Circuit Diagram**General Description**

The ATF temperature sensor is a thermistor type sensor whose resistance changes according to the change in ATF temperature. The powertrain control module (PCM) sends a 5 V reference voltage to the grounded sensor through a pull-up resistor. When the ATF temperature is low, the sensor resistance increases and the PCM detects a high signal voltage. As the ATF temperature rises, the sensor resistance decreases and the PCM detects a low signal voltage.

When the ATF temperature sensor signal voltage to the PCM is under the specification, indicating that the temperature is above the specification (a short to ground), a malfunction is detected and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status**MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS**

Execution	Continuous
Sequence	None
Duration	10 seconds or more
DTC Type	One drive cycle, MIL OFF, D indicator blinks
OBD Status	PASSED/FAILED/NOT COMPLETED (STILL TESTING)

Enable Conditions**ENABLE CONDITIONS**

Condition	Minimum	Maximum
Battery voltage	11.0 V	-
No active DTCs	P0711, P0713	

Malfunction Threshold

The output voltage from the ATF temperature sensor is 0.07 V or less for at least 10 seconds.

Driving Pattern

Start the engine, shift to P position, and wait for at least 10 seconds.

- Drive the vehicle in this manner only if the traffic regulations and ambient conditions allow.

Diagnosis Details

Conditions for illuminating the indicator

When a malfunction is detected, the D indicator blinks, and the DTC and the freeze frame data are stored in the PCM memory. The MIL does not come on.

Conditions for clearing the DTC

The DTC and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P0713 (28): ADVANCED DIAGNOSTICS

DTC P0713: OPEN IN ATF TEMPERATURE SENSOR CIRCUIT

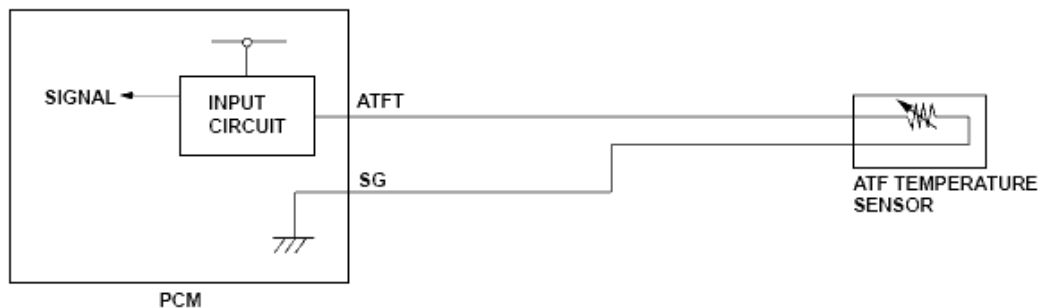


Fig. 111: ATF Temperature Sensor Circuit Diagram

General Description

The ATF temperature sensor is a thermistor type sensor whose resistance changes according to the change in ATF temperature. The powertrain control module (PCM) sends a 5 V reference voltage to the grounded sensor through a pull-up resistor. When the ATF temperature is low, the sensor resistance increases and the PCM detects a high signal voltage. As the ATF temperature rises, the sensor resistance decreases and the PCM detects a low signal voltage.

When the ATF temperature sensor signal voltage to the PCM is above the specification, indicating that the temperature is under the specification (open), a malfunction is detected and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
Sequence	None
Duration	10 seconds or more
DTC Type	One drive cycle, MIL OFF, D indicator blinks
OBD Status	PASSED/FAILED/NOT COMPLETED (STILL TESTING)

Enable Conditions

ENABLE CONDITIONS

Condition	Minimum	Maximum
Battery voltage	11.0 V	-
No active DTCs	P0711, P0712	

Malfunction Threshold

The output voltage from the ATF temperature sensor is 4.93 V or more for at least 10 seconds.

Driving Pattern

Start the engine, shift to P position, and wait for at least 10 seconds.

- Drive the vehicle in this manner only if the traffic regulations and ambient conditions allow.

Diagnosis Details**Conditions for illuminating the indicator**

When a malfunction is detected, the D indicator blinks, and the DTC and the freeze frame data are stored in the PCM memory. The MIL does not come on.

Conditions for clearing the DTC

The DTC and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

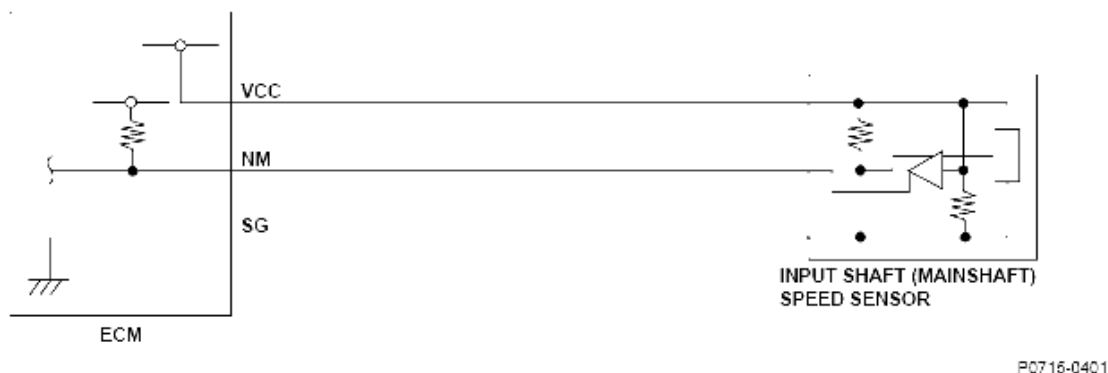
DTC P0715 (123): ADVANCED DIAGNOSTICS (M/T)**DTC P0715: INPUT SHAFT (MAINSHAFT) SPEED SENSOR CIRCUIT MALFUNCTION (M/T MODEL)**

Fig. 112: Input Shaft (Mainshaft) Speed Sensor Malfunction - Circuit Diagram (M/T Model)

General Description

The input shaft (mainshaft) speed sensor is attached to the transmission housing to sense input shaft (mainshaft) revolutions. The engine control module (ECM) determines the vehicle speed according to the signal from the input shaft (mainshaft) speed sensor for the control units. If no signal from the input shaft

(mainshaft) speed sensor is received for a set time, the ECM detects a malfunction and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
Sequence	None
Duration	20 seconds or more
DTC Type	One drive cycle, MIL OFF
OBD Status	N/A

Enable Conditions

ENABLE CONDITIONS

Condition	Minimum	Maximum
Engine coolant temperature	157°F (69°C)	-
Engine speed	1,000 rpm	-
Battery voltage	10.0 V	-
No active DTCs	P0117, P0118, P0122, P0123, P0222, P0223, P1683, P1684, P2101, P2108, P2118, P2122, P2123, P2127, P2128, P2135, P2138, P2552, P2176, U0107	

Malfunction Threshold

No signal from the input shaft (mainshaft) speed sensor is detected for at least 20 seconds.

Diagnosis Details

Conditions for illuminating the indicator

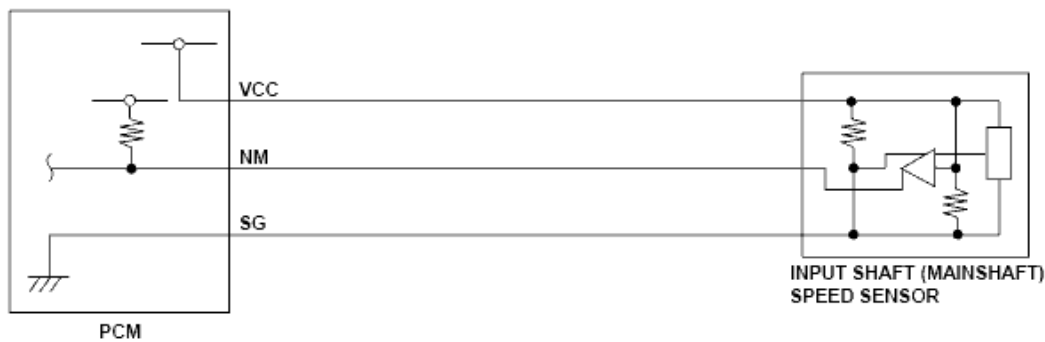
When a malfunction is detected, the DTC and the freeze frame data are stored in the ECM memory. The MIL does not come on.

Conditions for clearing the DTC

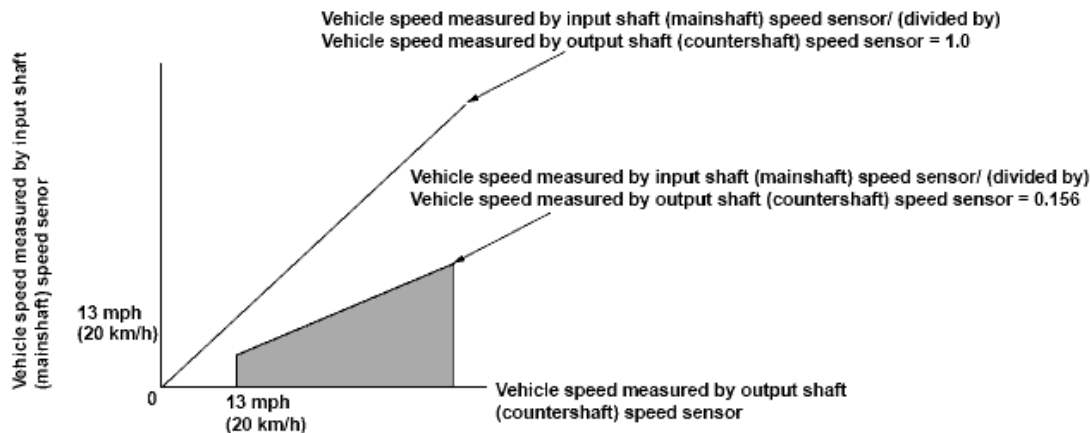
The DTC and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P0716 (15): ADVANCED DIAGNOSTICS

DTC P0716: PROBLEM IN INPUT SHAFT (MAINSHAFT) SPEED SENSOR CIRCUIT



P0716-0402

Fig. 113: Input Shaft Speed Sensor Circuit Diagram**Failure Area**

P0716-0470

Fig. 114: Vehicle Speed Failure Area Graph**General Description**

The input shaft (mainshaft) speed sensor is attached to the outside of the transmission housing. The input shaft (mainshaft) speed sensor generates a pulsing signal according to the speed of the input shaft (mainshaft) idler gear on the input shaft (mainshaft). Using that signal, the powertrain control module (PCM) determines the speed of the input shaft (mainshaft). If no pulses occur with the input shaft (mainshaft) rotating, the PCM detects a malfunction that may be caused by an open, a temporary open, or a short to ground. Based on the velocity ratio measured by the output shaft (countershaft) speed sensor and the input shaft (mainshaft) speed sensor, a malfunction is detected and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status**MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS**

Execution	Continuous
Sequence	None
Duration	10 seconds or more
DTC Type	One drive cycle, MIL ON, D indicator blinks
OBD Status	PASSED/FAILED/NOT COMPLETED (STILL TESTING)

Enable Conditions**ENABLE CONDITIONS**

Condition	Minimum	Maximum
Engine speed	500 rpm	-
Vehicle speed	13 mph (20 km/h)	-
Battery voltage	11.0 V	-
Shift lever position	D or L	
No active DTCs	P0705, P0706, P0717, P0721, P0722, P0962, P0963, P0966, P0967, P0970, P0971, P0973, P0974, P0976, P0977, P0979, P0980, P0982, P0983	
Others	Not during shifting	
	Not when the shift lever is being shifted	
	No electrical noise in the output shaft (countershaft) speed sensor output circuit	
	Except 1st gear	

Malfunction Threshold

The vehicle speed measured by the input shaft (mainshaft) speed sensor/(divided by) the vehicle speed measured by the output shaft (countershaft) speed sensor is less than 0.156 for at least 10 seconds.

Driving Pattern

Start the engine, and drive the vehicle at a speed of 13 mph (20 km/h) or more for at least 10 seconds.

- Drive the vehicle in this manner only if the traffic regulations and ambient conditions allow.

Diagnosis Details**Conditions for illuminating the MIL**

When a malfunction is detected, the MIL comes on and the DTC and the freeze frame data are stored in the PCM memory.

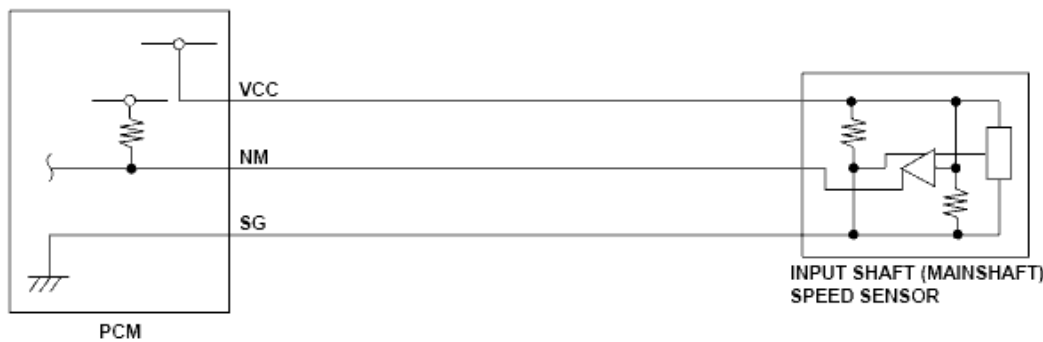
Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

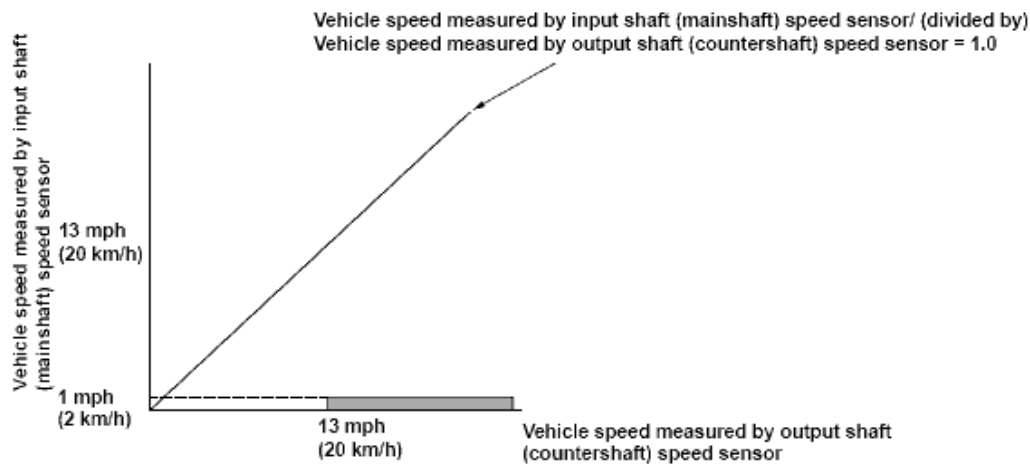
The MIL, the DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P0717 (15): ADVANCED DIAGNOSTICS

DTC P0717: PROBLEM IN INPUT SHAFT (MAINSHAFT) SPEED SENSOR CIRCUIT (NO SIGNAL INPUT)



P0716-0402

Fig. 115: Input Shaft Speed Sensor Circuit Diagram**Failure Area**

P0717-0470

Fig. 116: Vehicle Speed Graph**General Description**

The input shaft (mainshaft) speed sensor is attached to the outside of the transmission housing. The input shaft (mainshaft) speed sensor generates a pulsing signal according to the speed of the input shaft (mainshaft) idler gear on the input shaft (mainshaft). Using that signal, the powertrain control module (PCM) determines the speed of the input shaft (mainshaft). If no pulses occur with the input shaft (mainshaft) rotating, the PCM detects a malfunction that may be caused by an open, a temporary open, or a short to ground. Based on the correlation between the vehicle speed measured by the output shaft (countershaft) speed sensor and the input shaft (mainshaft) speed sensor, a malfunction is detected and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status**MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS**

Execution	Continuous
Sequence	None
Duration	10 seconds or more
DTC Type	One drive cycle, MIL ON, D indicator blinks

OBD Status	PASSED/FAILED/NOT COMPLETED (STILL TESTING)
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Enable Conditions

ENABLE CONDITIONS

Condition	Minimum	Maximum
Engine speed	500 rpm	-
Vehicle speed	13 mph (20 km/h)	-
Battery voltage	11.0 V	-
Shift lever position	D or L	
No active DTCs	P0705, P0706, P0716, P0721, P0722, P0962, P0963, P0966, P0967, P0970, P0971, P0973, P0974, P0976, P0977, P0979, P0980, P0982, P0983	
Others	Not during shifting	
	Not when the shift lever is being shifted	
	No electrical noise in the output shaft (countershaft) speed sensor output circuit	
	Except 1st gear	

Malfunction Threshold

When the vehicle speed measured by the output shaft (countershaft) speed sensor is 13 mph (20 km/h) or more, the vehicle speed measured by the input shaft (mainshaft) speed sensor is 1 mph (2 km/h) or less for at least 10 seconds.

Driving Pattern

Start the engine, and drive the vehicle at a speed of 13 mph (20 km/h) or more for at least 10 seconds.

- Drive the vehicle in this manner only if the traffic regulations and ambient conditions allow.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected, the MIL comes on and the DTC and the freeze frame data are stored in the PCM memory.

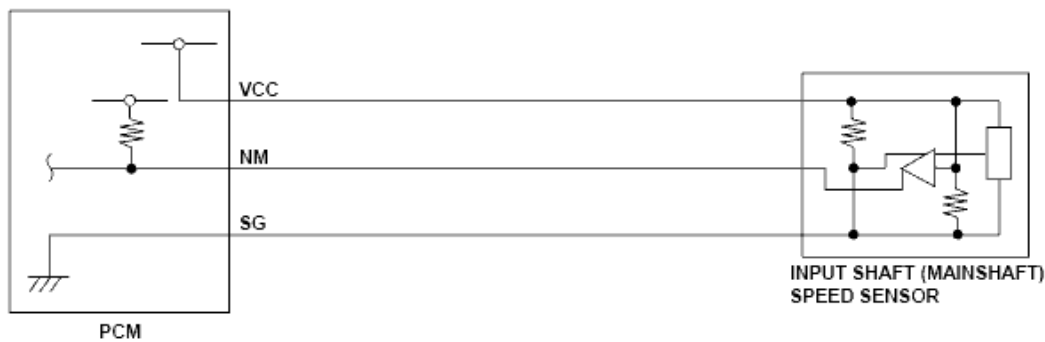
Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

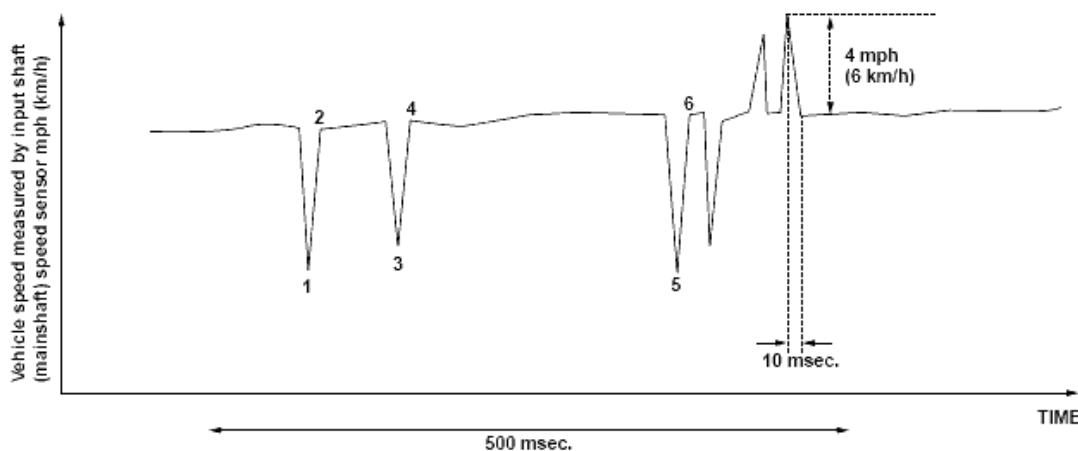
DTC P0718 (15): ADVANCED DIAGNOSTICS

DTC P0718: INPUT SHAFT (MAINSHAFT) SPEED SENSOR INTERMITTENT FAILURE



P0716-0402

Fig. 117: Input Shaft Speed Sensor - Circuit Diagram



P0718-0470

Fig. 118: Vehicle Speed Graph

General Description

The input shaft (mainshaft) speed sensor is attached to the outside of the transmission housing. The input shaft (mainshaft) speed sensor generates a pulsing signal according to the speed of the input shaft (mainshaft) idler gear on the input shaft (mainshaft). Using that signal, the powertrain control module (PCM) determines the speed of the input shaft (mainshaft). If no pulses occur with the input shaft (mainshaft) rotating, the PCM detects a malfunction that may be caused by an open, a temporary open, or a short to ground. Based on the fluctuation of the vehicle speed measured by the input shaft (mainshaft) speed sensor, a malfunction is detected and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
Sequence	None
Duration	500 milliseconds
DTC Type	Two drive cycles, MIL ON, D indicator blinks
OBD Status	PASSED/FAILED/NOT COMPLETED (STILL TESTING)

Enable Conditions

ENABLE CONDITIONS

Condition	Minimum	Maximum
Vehicle speed	13 mph (20 km/h)	-
Battery voltage	11.0 V	-
No active DTCs	P0716, P0717, P0721, P0722	
Others	Not during shifting	
	Not when an output shaft (countershaft) speed sensor intermittent failure is detected	

Malfunction Threshold

The fluctuation of the vehicle speed measured by the input shaft (mainshaft) speed sensor in 10 milliseconds is 4 mph (6km/h) or more, and it fluctuates at least six times within 500 milliseconds.

Driving Pattern

Start the engine, and drive the vehicle at a speed of 13 mph (20 km/h) or more so it shifts from 1st to 5th in D position.

- Drive the vehicle in this manner only if the traffic regulations and ambient conditions allow.

Diagnosis Details**Conditions for illuminating the MIL**

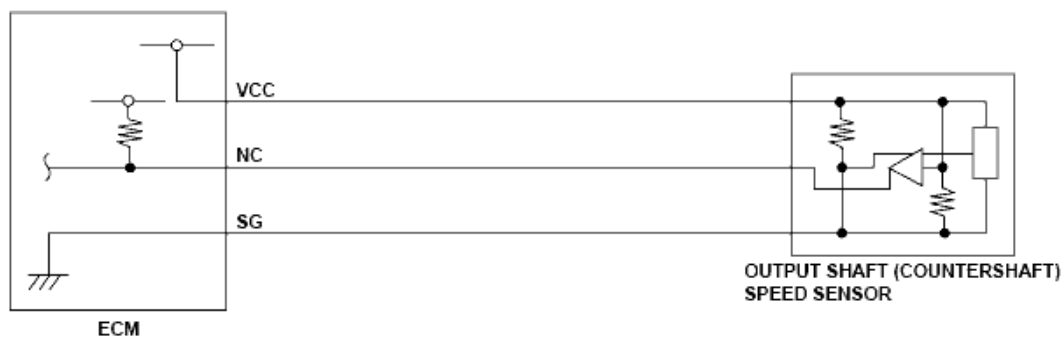
When a malfunction is detected during the first drive cycle, a Temporary DTC is stored in the PCM memory. If the malfunction recurs during the next (second) drive cycle, the MIL comes on and the DTC and the freeze frame data are stored.

Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, the Temporary DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P0720 (122): ADVANCED DIAGNOSTICS (M/T)**DTC P0720: OUTPUT SHAFT (COUNTERSHAFT) SPEED SENSOR CIRCUIT MALFUNCTION (M/T MODEL)**



P0720-0402

Fig. 119: DTC P0720 Output Shaft (Countershaft) Speed Sensor Malfunction - Circuit Diagram (M/T Model)

General Description

The output shaft (countershaft) speed sensor is attached to the transmission housing to sense output shaft (countershaft) revolutions. The engine control module (ECM) determines the vehicle speed according to the signal from the output shaft (countershaft) speed sensor to the control units. If no signal from the output shaft (countershaft) speed sensor is received for a set time, the ECM detects a malfunction and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
Sequence	None
Duration	5 seconds or more
DTC Type	One drive cycle, MIL ON
OBD Status	PASSED/FAILED/NOT COMPLETED (STILL TESTING)

Enable Conditions

ENABLE CONDITIONS

Condition	Minimum	Maximum
Engine speed	-	4,000 rpm
Battery voltage	10.0 V	-

Malfunction Threshold

No signal from the output shaft (countershaft) speed sensor is detected for at least 5 seconds.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected, the MIL comes on and the DTC and the freeze frame data are stored in the ECM memory.

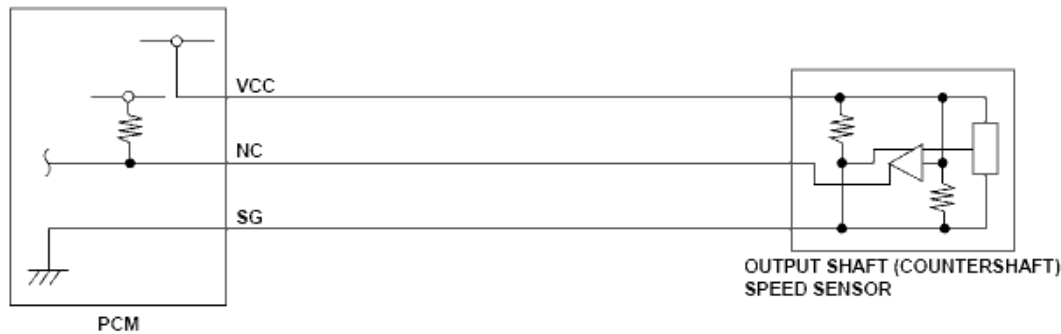
Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P0721 (9): ADVANCED DIAGNOSTICS

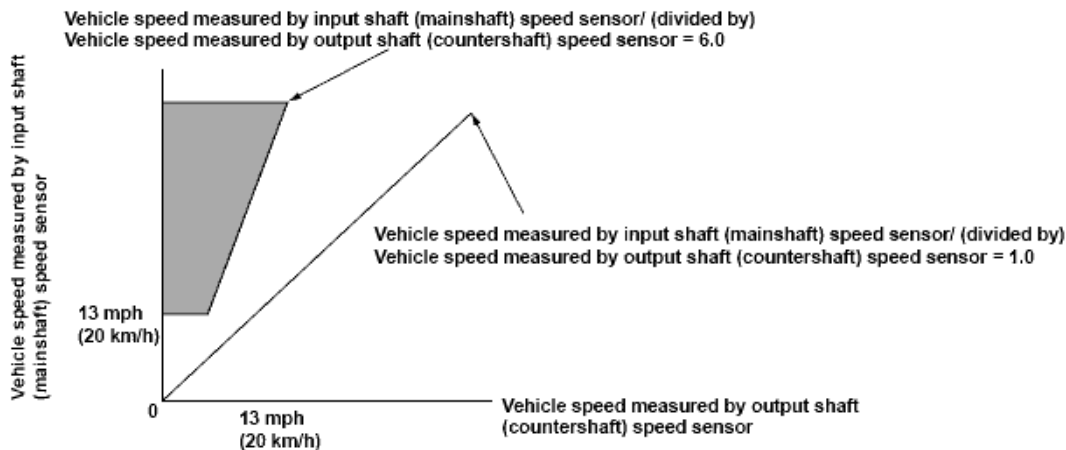
DTC P0721: PROBLEM IN OUTPUT SHAFT (COUNTERSHAFT) SPEED SENSOR CIRCUIT



P0721-0402

Fig. 120: Output Shaft Speed Sensor - Circuit Diagram

Failure Area



P0721-0470

Fig. 121: Vehicle Speed Graph

General Description

The output shaft (countershaft) speed sensor is attached to the outside of the transmission housing. The output shaft (countershaft) speed sensor generates a pulsing signal according to the speed of the park gear on the output shaft (countershaft). Using that signal, the powertrain control module (PCM) determines the speed of the output shaft (countershaft). If pulse dropouts occur with the output shaft (countershaft) rotating, the PCM detects a malfunction that may be caused by an open, a temporary open, or a short to ground. Based on the velocity ratio measured by the input shaft (mainshaft) speed sensor and the output shaft (countershaft) speed sensor, a malfunction is detected and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status**MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS**

Execution	Continuous
Sequence	None
Duration	10 seconds or more
DTC Type	One drive cycle, MIL ON, D indicator blinks
OBD Status	PASSED/FAILED/NOT COMPLETED (STILL TESTING)

Enable Conditions**ENABLE CONDITIONS**

Condition	Minimum	Maximum
Engine speed	500 rpm	-
Vehicle speed	13 mph (20 km/h)	-
Battery voltage	11.0 V	-
Shift lever position	D or L	
No active DTCs	P0705, P0706, P0716, P0717, P0722, P0962, P0963, P0966, P0967, P0970, P0971, P0973, P0974, P0976, P0977, P0979, P0980, P0982, P0983	
Others	Not during shifting	
	Not when the shift lever is being shifted	
	No electrical noise in the input shaft (mainshaft) speed sensor output circuit	
	Except 1st gear	

Malfunction Threshold

The vehicle speed measured by the input shaft (mainshaft) speed sensor/(divided by) the vehicle speed measured by the output shaft (countershaft) speed sensor is greater than 6.0 for at least 10 seconds.

Driving Pattern

Start the engine, and drive the vehicle at a speed of 13 mph (20 km/h) or more for at least 10 seconds.

- Drive the vehicle in this manner only if the traffic regulations and ambient conditions allow.

Diagnosis Details**Conditions for illuminating the MIL**

When a malfunction is detected, the MIL comes on and the DTC and the freeze frame data are stored in the PCM memory.

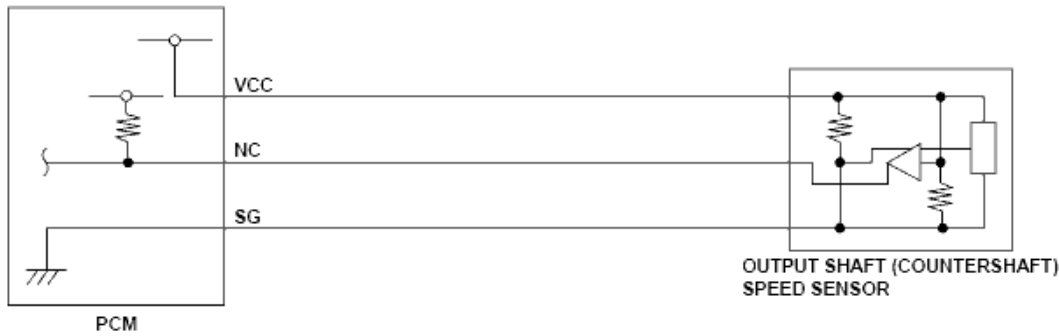
Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

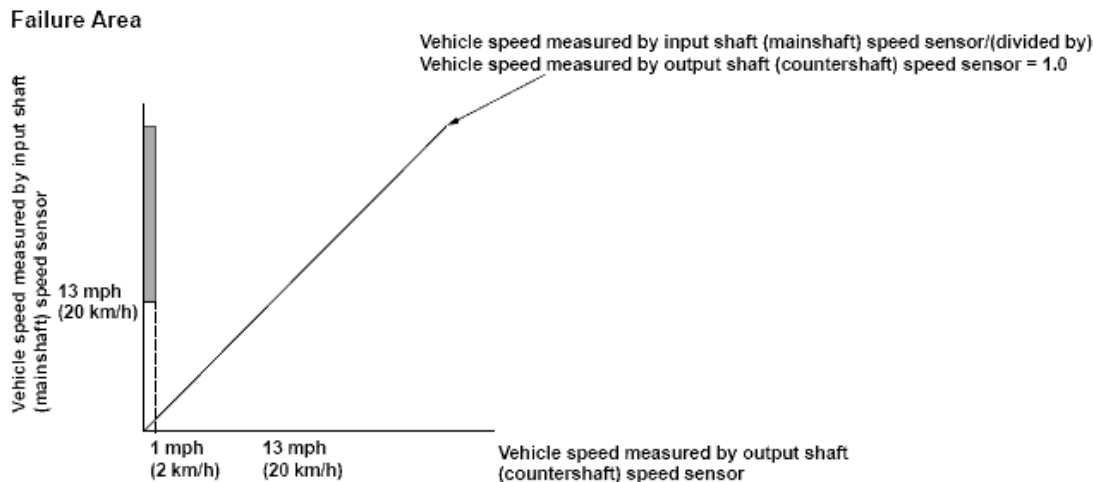
DTC P0722 (9): ADVANCED DIAGNOSTICS

DTC P0722: PROBLEM IN OUTPUT SHAFT (COUNTERSHAFT) SPEED SENSOR CIRCUIT (NO SIGNAL INPUT)



P0721-0402

Fig. 122: Output Shaft Speed Sensor Circuit Diagram



P0722-0470

Fig. 123: Vehicle Speed Graph

General Description

The output shaft (countershaft) speed sensor is attached to the outside of the transmission housing. The output shaft (countershaft) speed sensor generates a pulsing signal according to the speed of the park gear on the output shaft (countershaft). Using that signal, the powertrain control module (PCM) determines the speed of the output shaft (countershaft). If pulse dropouts occur with the output shaft (countershaft) rotating, the PCM detects a malfunction that may be caused by an open, a temporary open, or a short to ground. Based on the correlation between the vehicle speed measured by the output shaft (countershaft) speed sensor and the input shaft (mainshaft) speed sensor, a malfunction is detected and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
Sequence	None
Duration	10 seconds or more
DTC Type	One drive cycle, MIL ON, D indicator blinks
OBD Status	PASSED/FAILED/NOT COMPLETED (STILL TESTING)

Enable Conditions**ENABLE CONDITIONS**

Condition	Minimum	Maximum
Engine speed	500 rpm	-
Vehicle speed	13 mph (20 km/h)	-
Battery voltage	11.0 V	-
Shift lever position	D or L	
No active DTCs	P0705, P0706, P0716, P0717, P0721, P0962, P0963, P0966, P0967, P0970, P0971, P0973, P0974, P0976, P0977, P0979, P0980, P0982, P0983	
Others	Not during shifting	
	Not when the shift lever is being shifted	
	No electrical noise in the input shaft (mainshaft) speed sensor output circuit	
	Except 1st gear	

Malfunction Threshold

When the vehicle speed measured by the input shaft (mainshaft) speed sensor is 13 mph (20 km/h) or more, the vehicle speed measured by the output shaft (countershaft) speed sensor is 1 mph (2 km/h) or less for at least 10 seconds.

Driving Pattern

Start the engine, and drive the vehicle at a speed of 13 mph (20 km/h) or more for at least 10 seconds.

- Drive the vehicle in this manner only if the traffic regulations and ambient conditions allow.

Diagnosis Details**Conditions for illuminating the MIL**

When a malfunction is detected, the MIL comes on and the DTC and the freeze frame data are stored in the PCM memory.

Conditions for clearing the MIL

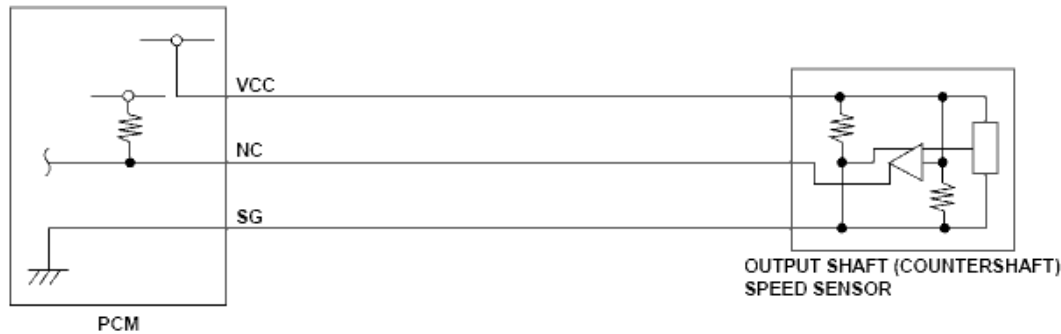
The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by

disconnecting the battery.

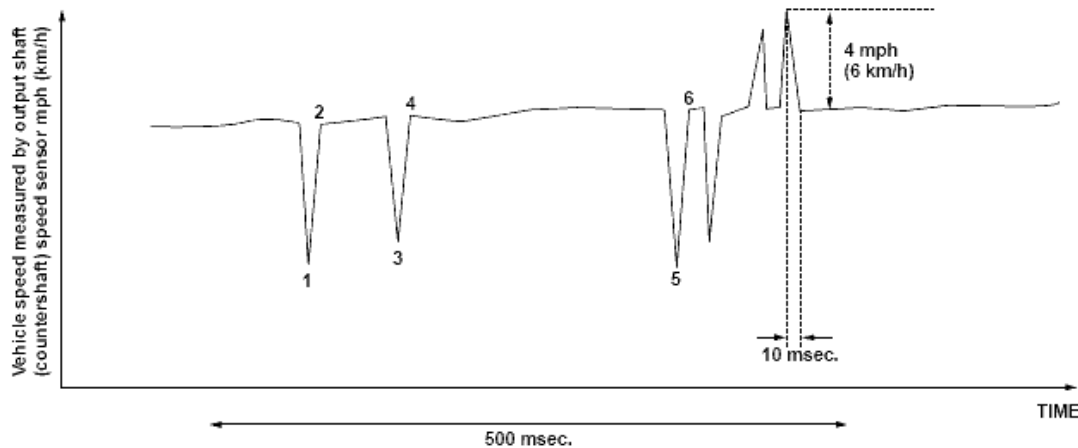
DTC P0723 (9): ADVANCED DIAGNOSTICS

DTC P0723: OUTPUT SHAFT (COUNTERSHAFT) SPEED SENSOR INTERMITTENT FAILURE



P0721-0402

Fig. 124: Output Shaft Speed Sensor - Circuit Diagram



P0723-0470

Fig. 125: Vehicle Speed Graph

General Description

The output shaft (countershaft) speed sensor is attached to the outside of the transmission housing. The output shaft (countershaft) speed sensor generates a pulsing signal according to the speed of the park gear on the output shaft (countershaft). Using that signal, the powertrain control module (PCM) determines the speed of the output shaft (countershaft). If pulse dropouts occur with the output shaft (countershaft) rotating, the PCM detects a malfunction that may be caused by an open, a temporary open, or a short to ground. Based on the fluctuation of the vehicle speed measured by the output shaft (countershaft) speed sensor, a malfunction is detected and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
Sequence	None

Duration	500 milliseconds
DTC Type	Two drive cycles, MIL ON, D indicator blinks
OBD Status	PASSED/FAILED/NOT COMPLETED (STILL TESTING)

Enable Conditions

ENABLE CONDITIONS

Condition	Minimum	Maximum
Vehicle speed	13 mph (20 km/h)	-
Battery voltage	11.0 V	-
No active DTCs	P0721, P0722	
Others	Not during shifting	
	Not when an input shaft (mainshaft) speed sensor intermittent failure is detected	

Malfunction Threshold

The fluctuation of the vehicle speed measured by the output shaft (countershaft) speed sensor in 10 milliseconds is 4 mph (6km/h) or more, and it fluctuates at least six times within 500 milliseconds.

Driving Pattern

Start the engine, and drive the vehicle at a speed of 13 mph (20 km/h) or more so it shifts from 1st to 5th in D position.

- Drive the vehicle in this manner only if the traffic regulations and ambient conditions allow.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected during the first drive cycle, a Temporary DTC is stored in the PCM memory. If the malfunction recurs during the next (second) drive cycle, the MIL comes on and the DTC and the freeze frame data are stored.

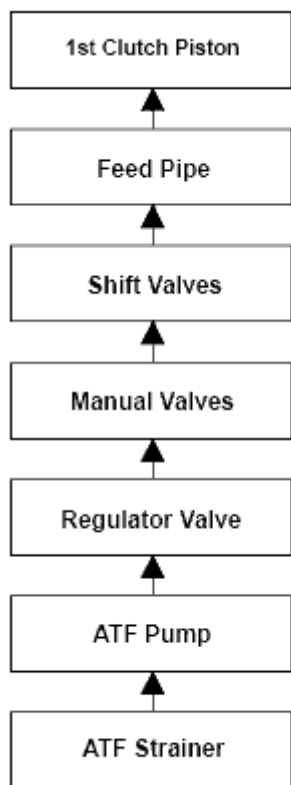
Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, the Temporary DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P0731 (64): ADVANCED DIAGNOSTICS

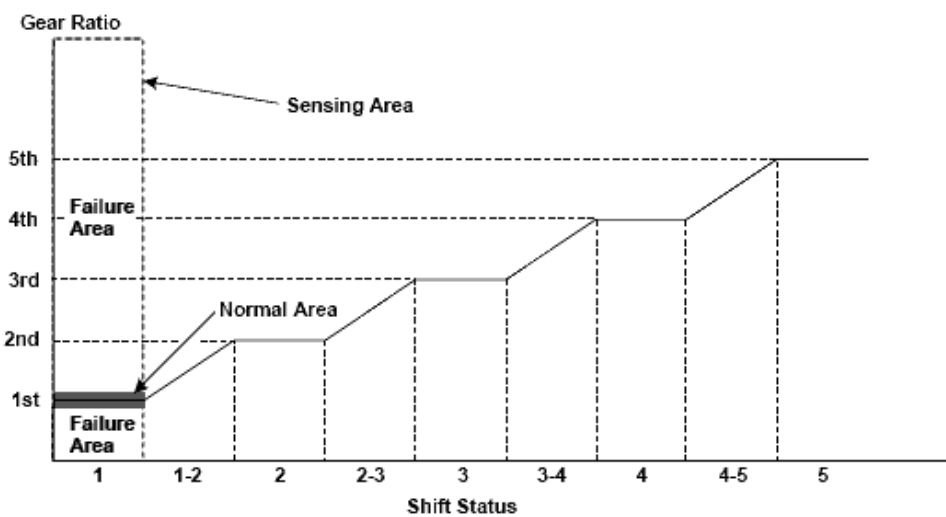
DTC P0731: PROBLEM IN 1ST CLUTCH AND 1ST CLUTCH HYDRAULIC CIRCUIT (1ST GEAR INCORRECT RATIO)



P0731-0370

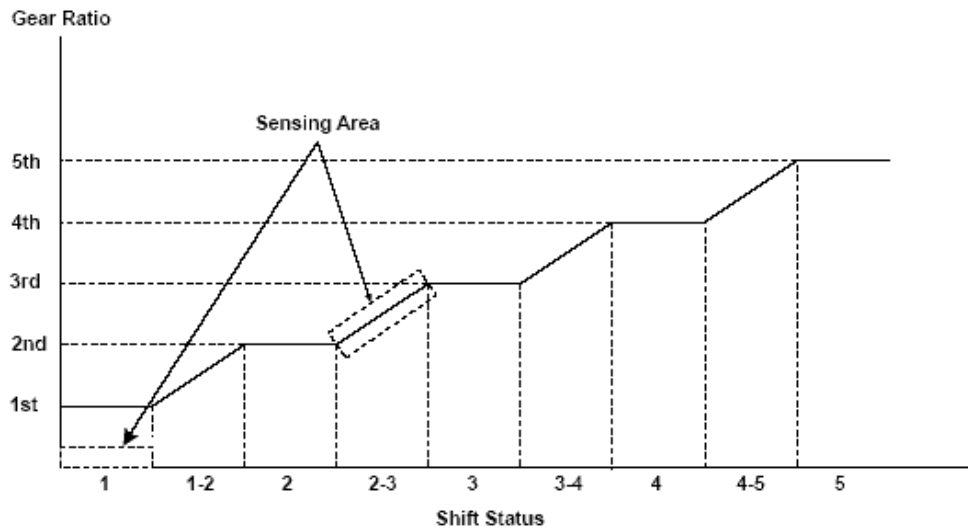
Fig. 126: 1st Clutch And 1st Clutch Hydraulic Circuit Diagram

SYMPTOM 1



P0731-0570

Fig. 127: Gear Ratio VS Shift Status Graph

SYMPTOM 2

P0731-0571

Fig. 128: Gear Ratio VS Shift Status Graph**General Description**

To engage 1st gear, line pressure is supplied to the 1st clutch piston, engaging the 1st clutch, and the secondary shaft and the secondary shaft 1st gear are connected and revolve together. Hydraulic pressure is supplied to the 1st clutch through the ATF strainer --> the ATF pump --> the regulator valve --> the manual valve --> the shift valves --> the feed pipe --> 1st clutch piston. (A shift valve failure in the supply route above is detected by the malfunction detection of each shift solenoid valve.) The powertrain control module (PCM) computes the ratio of the input shaft (mainshaft) speed to the output shaft (countershaft) speed. When the ratio is not the 1st gear ratio, it is detected as a malfunction of the hydraulic circuit or the 1st clutch, and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status**MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS**

Execution	Continuous
Sequence	None
Duration	12 seconds or more (Symptom 1) Depending on the driving pattern (Symptom 2)
DTC Type	Two drive cycles, MIL OFF, D indicator blinks
OBD Status	PASSED/FAILED/NOT COMPLETED (STILL TESTING)

Enable Conditions**ENABLE CONDITIONS**

Condition	Minimum	Maximum
Battery voltage	11.0 V	-
Engine speed	1,000 rpm ⁽¹⁾	-

Vehicle speed	8 mph (12 km/h) ⁽¹⁾	-
Throttle position	10 % ⁽¹⁾	-
Shift lever position	D	
State of the engine	Running ⁽²⁾	
No active DTCs	P0116, P0117, P0118, P0705, P0706, P0716, P0717, P0718, P0721, P0722, P0723, P0732, P0733, P0734, P0735, P0746, P0747, P0751, P0752, P0756, P0757, P0761, P0762, P0776, P0777, P0796, P0797, P0962, P0963, P0966, P0967, P0970, P0971, P0973, P0974, P0976, P0977, P0979, P0980, P0982, P0983, P1743, P1744, P1745, P1780	
(1) Symptom 1		
(2) Symptom 2		

Malfunction Threshold

One of these symptoms occurs.

Symptom 1

The actual gear ratio must match one of these conditions for at least 12 seconds with the 1st gear command.

- Actual gear ratio is greater than the 1st gear ratio by a factor of 1.2.
- Actual gear ratio is less than the 1st gear ratio by a factor of 0.75.

Symptom 2

The actual gear position is neutral for at least 3 seconds, and then the transmission up-shifted from 2nd to 3rd, even though 1st gear shift is commanded.

Driving Pattern

Symptom 1

Start the engine, shift to the D position, and drive the vehicle at a speed of 8 mph (12 km/h) or more for at least 12 seconds in 1st gear.

Symptom 2 (When the vehicle does not start at 1st gear)

1. Start the engine.
2. Shift to the D position, and press the accelerator pedal about 3% for at least 5 seconds.
3. Release the accelerator pedal until the engine speed drops 1,000 rpm or less.
4. Drive the vehicle so that the transmission shifts from 2nd to 3rd gear.
 - Drive the vehicle in this manner only if the traffic regulations and ambient conditions allow.

Diagnosis Details

Conditions for illuminating the MIL

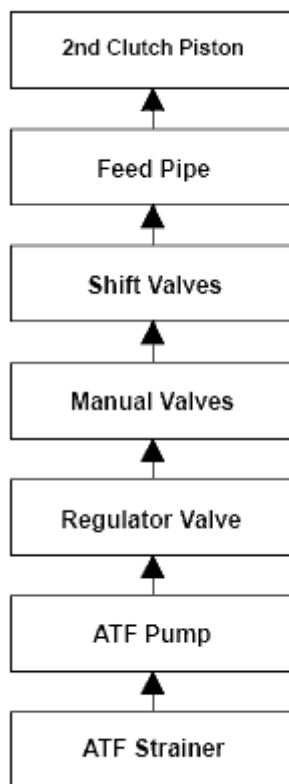
When a malfunction is detected during the first drive cycle, a Temporary DTC is stored in the PCM memory. If the malfunction recurs during the next (second) drive cycle, the DTC and the freeze frame data are stored. The MIL does not come on.

Conditions for clearing the MIL

The DTC, the Temporary DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

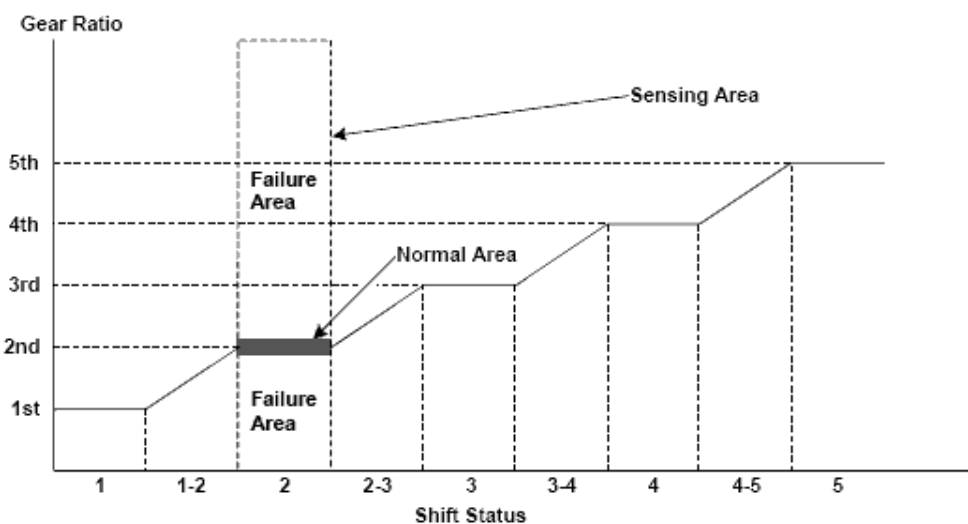
DTC P0732 (64): ADVANCED DIAGNOSTICS

DTC P0732: PROBLEM IN 2ND CLUTCH AND 2ND CLUTCH HYDRAULIC CIRCUIT (2ND GEAR INCORRECT RATIO)



P0732-0370

Fig. 129: 2nd Clutch And 2nd Clutch Hydraulic Diagnosis Work Flow



P0732-0371

Fig. 130: Gear Ratio VS Shift Status Graph

General Description

To engage 2nd gear, line pressure is supplied to the 2nd clutch piston, engaging the 2nd clutch, and the secondary shaft and the secondary shaft 2nd gear are connected and revolve together. Hydraulic pressure is supplied to the 2nd clutch through the ATF strainer --> the ATF pump --> the regulator valve --> the manual valve --> the shift valves --> the feed pipe --> 2nd clutch piston. (A shift valve failure in the supply route above is detected by the malfunction detection of each shift solenoid valve.) The powertrain control module (PCM) computes the ratio of the input shaft (mainshaft) speed to the output shaft (countershaft) speed. When the ratio is not the 2nd gear ratio, it is detected as a malfunction of the hydraulic circuit or the 2nd clutch, and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
Sequence	None
Duration	12 seconds or more
DTC Type	Two drive cycles, MIL OFF, D indicator blinks
OBD Status	PASSED/FAILED/NOT COMPLETED (STILL TESTING)

Enable Conditions

ENABLE CONDITIONS

Condition	Minimum	Maximum
Engine speed	1,000 rpm	-
Vehicle speed	8 mph (12 km/h)	-
Battery voltage	11.0 V	-
Shift lever		

position	D
No active DTCs	P0116, P0117, P0118, P0705, P0706, P0716, P0717, P0718, P0721, P0722, P0723, P0731, P0733, P0734, P0735, P0746, P0747, P0751, P0752, P0756, P0757, P0761, P0762, P0776, P0777, P0796, P0797, P0962, P0963, P0966, P0967, P0970, P0971, P0973, P0974, P0976, P0977, P0979, P0980, P0982, P0983, P1743, P1744, P1745, P1780

Malfunction Threshold

The actual gear ratio must match one of these conditions for at least 12 seconds with the 2nd gear command.

- Actual gear ratio is greater than the 2nd gear ratio by a factor of 1.2.
- Actual gear ratio is less than the 2nd gear ratio by a factor of 0.75.

Driving Pattern

Start the engine, shift to the D position, and drive the vehicle at a speed of 8 mph (12 km/h) or more for at least 12 seconds in 2nd gear.

- Drive the vehicle in this manner only if the traffic regulations and ambient conditions allow.

Diagnosis Details

Conditions for illuminating the MIL

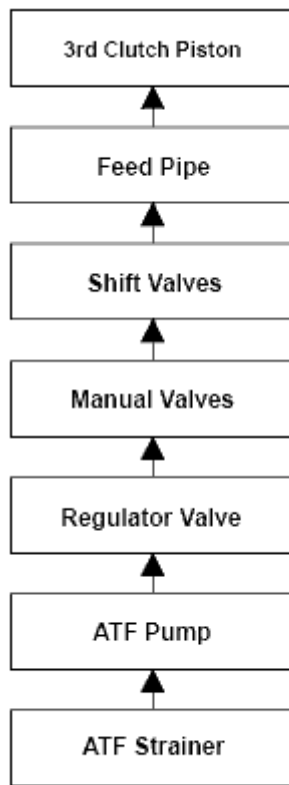
When a malfunction is detected during the first drive cycle, a Temporary DTC is stored in the PCM memory. If the malfunction recurs during the next (second) drive cycle, the DTC and the freeze frame data are stored. The MIL does not come on.

Conditions for clearing the MIL

The DTC, the Temporary DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

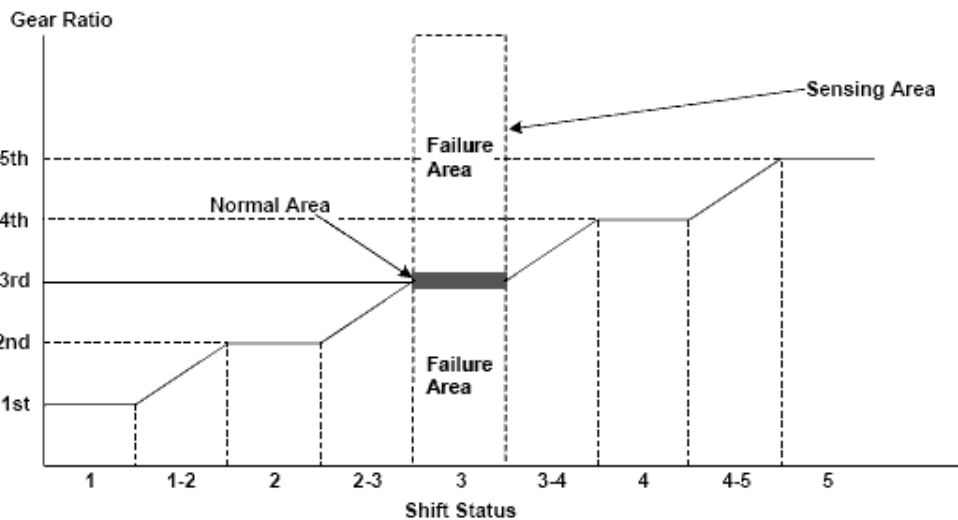
DTC P0733 (64): ADVANCED DIAGNOSTICS

DTC P0733: PROBLEM IN 3RD CLUTCH AND 3RD CLUTCH HYDRAULIC CIRCUIT (3RD GEAR INCORRECT RATIO)



P0733-0370

Fig. 131: 3rd Clutch And 3rd Clutch Hydraulic Work Flow



P0733-0371

Fig. 132: Gear Ratio VS Shift Status Graph

General Description

To engage 3rd gear, line pressure is supplied to the 3rd clutch piston, the 3rd clutch is engaged, and the output shaft (countershaft) and the output shaft (countershaft) 3rd gear are connected and revolve together. Hydraulic pressure is supplied to the 3rd clutch through the ATF strainer --> the ATF pump --> the regulator valve --> the manual valve --> the shift valves --> the feed pipe --> 3rd clutch piston. (The shift valve failure

in the supply route above is detected by the malfunction detection of each shift solenoid valve.) The powertrain control module (PCM) computes the ratio of the input shaft (mainshaft) speed to the output shaft (countershaft) speed. When the ratio is not the 3rd gear ratio, it is detected as a malfunction of the hydraulic circuit or the 3rd clutch, and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
Sequence	None
Duration	12 seconds or more
DTC Type	Two drive cycles, MIL OFF, D indicator blinks
OBD Status	PASSED/FAILED/NOT COMPLETED (STILL TESTING)

Enable Conditions

ENABLE CONDITIONS

Condition	Minimum	Maximum
Engine speed	1,000 rpm	-
Vehicle speed	8 mph (12 km/h)	-
Battery voltage	11.0 V	-
Shift lever position	D	
No active DTCs	P0116, P0117, P0118, P0705, P0706, P0716, P0717, P0718, P0721, P0722, P0723, P0731, P0732, P0734, P0735, P0746, P0747, P0751, P0752, P0756, P0757, P0761, P0762, P0776, P0777, P0796, P0797, P0962, P0963, P0966, P0967, P0970, P0971, P0973, P0974, P0976, P0977, P0979, P0980, P0982, P0983, P1743, P1744, P1745, P1780	

Malfunction Threshold

The actual gear ratio must match one of these conditions for at least 12 seconds with the 3rd gear command.

- Actual gear ratio is greater than the 3rd gear ratio by a factor of 1.2.
- Actual gear ratio is less than the 3rd gear ratio by a factor of 0.75.

Driving Pattern

Start the engine, shift to the D position, and drive the vehicle at a speed of 8 mph (12 km/h) or more for at least 12 seconds in 3rd gear.

- Drive the vehicle in this manner only if the traffic regulations and ambient conditions allow.

Diagnosis Details

Conditions for illuminating the MIL

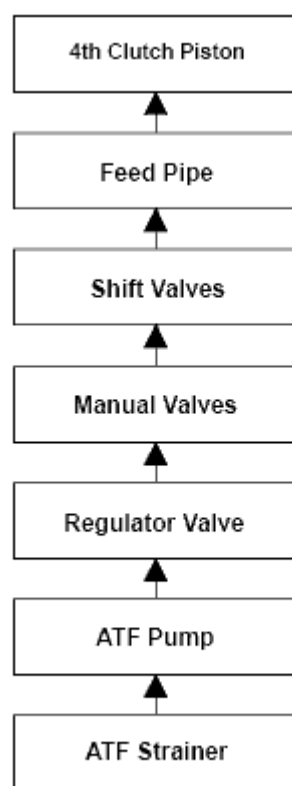
When a malfunction is detected during the first drive cycle, a Temporary DTC is stored in the PCM memory. If the malfunction recurs during the next (second) drive cycle, the DTC and the freeze frame data are stored. The MIL does not come on.

Conditions for clearing the MIL

The DTC, the Temporary DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

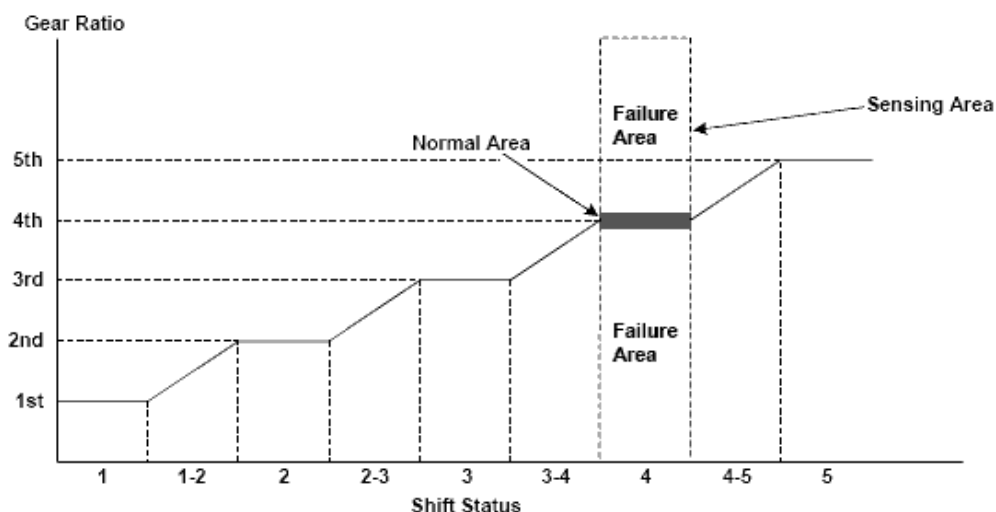
DTC P0734 (64): ADVANCED DIAGNOSTICS

DTC P0734: PROBLEM IN 4TH CLUTCH AND 4TH CLUTCH HYDRAULIC CIRCUIT (4TH GEAR INCORRECT RATIO)



P0734-0370

Fig. 133: 4th Clutch And 4th Clutch Hydraulic Work Flow



P0734-0371

Fig. 134: Gear Ratio VS Shift Status Graph**General Description**

To engage 4th gear, line pressure is supplied to the 4th clutch piston, engaging the 4th clutch, and the input shaft (mainshaft) and the input shaft (mainshaft) 4th gear are connected and revolve together. Hydraulic pressure is supplied to the 4th clutch through the ATF strainer --> the ATF pump --> the regulator valve --> the manual valve --> the shift valves --> the feed pipe --> 4th clutch piston. (A shift valve failure in the supply route above is detected by the malfunction detection of each shift solenoid valve.) The powertrain control module (PCM) computes the ratio of the input shaft (mainshaft) speed to the output shaft (countershaft) speed. When the ratio is not the 4th gear ratio, it is detected as a malfunction of the hydraulic circuit or the 4th clutch, and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status**MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS**

Execution	Continuous
Sequence	None
Duration	12 seconds or more
DTC Type	Two drive cycles, MIL OFF, D indicator blinks
OBD Status	PASSED/FAILED/NOT COMPLETED (STILL TESTING)

Enable Conditions**ENABLE CONDITIONS**

Condition	Minimum	Maximum
Engine speed	1,000 rpm	-
Vehicle speed	8 mph (12 km/h)	-
Battery voltage	11.0 V	-
Shift lever		

position	D
No active DTCs	P0116, P0117, P0118, P0705, P0706, P0716, P0717, P0718, P0721, P0722, P0723, P0731, P0732, P0733, P0735, P0746, P0747, P0751, P0752, P0756, P0757, P0761, P0762, P0776, P0777, P0796, P0797, P0962, P0963, P0966, P0967, P0970, P0971, P0973, P0974, P0976, P0977, P0979, P0980, P0982, P0983, P1743, P1744, P1745, P1780

Malfunction Threshold

The actual gear ratio must match one of these conditions for at least 12 seconds with the 4th gear command.

- Actual gear ratio is greater than the 4th gear ratio by a factor of 1.2.
- Actual gear ratio is less than the 4th gear ratio by a factor of 0.75.

Driving Pattern

Start the engine, shift to the D position, and drive the vehicle at a speed of 8 mph (12 km/h) or more for at least 12 seconds in 4th gear.

- Drive the vehicle in this manner only if the traffic regulations and ambient conditions allow.

Diagnosis Details

Conditions for illuminating the MIL

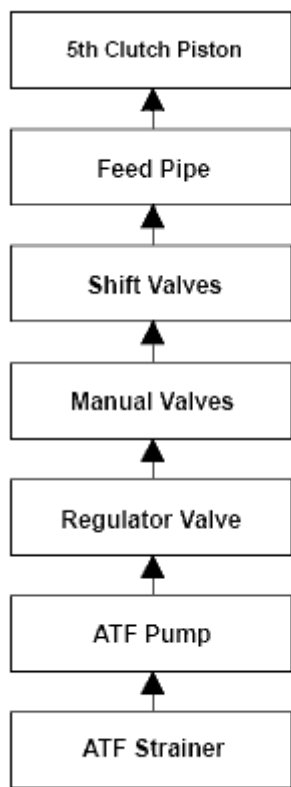
When a malfunction is detected during the first drive cycle, a Temporary DTC is stored in the PCM memory. If the malfunction recurs during the next (second) drive cycle, the DTC and the freeze frame data are stored. The MIL does not come on.

Conditions for clearing the MIL

The DTC, the Temporary DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

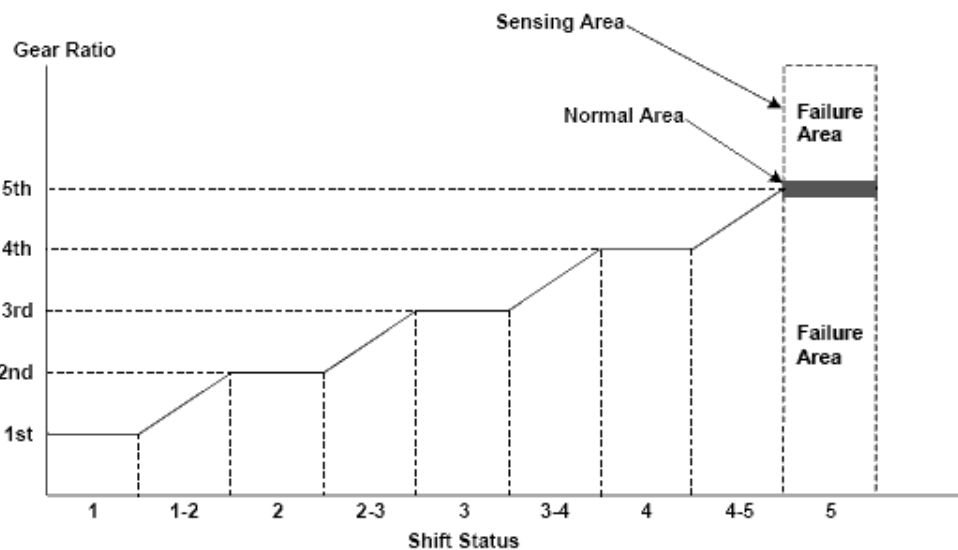
DTC P0735 (64): ADVANCED DIAGNOSTICS

DTC P0735: PROBLEM IN 5TH CLUTCH AND 5TH CLUTCH HYDRAULIC CIRCUIT (5TH GEAR INCORRECT RATIO)



P0735-0370

Fig. 135: 5th Clutch And 5th Clutch Hydraulic Work Flow



P0735-0371

Fig. 136: Gear Ratio VS Shift Status Graph

General Description

To engage 5th gear, line pressure is supplied to the 5th clutch piston, engaging the 5th clutch, and the input shaft (mainshaft) and the input shaft (mainshaft) 5th gear are connected and revolve together. Hydraulic pressure is supplied to the 5th clutch through the ATF strainer --> the ATF pump --> the regulator valve --> the manual valve --> the shift valves --> the feed pipe --> 5th clutch piston. (A shift valve failure in the

supply route above is detected by the malfunction detection of each shift solenoid valve.) The powertrain control module (PCM) computes the ratio of the input shaft (mainshaft) speed to the output shaft (countershaft) speed. When the ratio is not the 5th gear ratio, it is detected as a malfunction of the hydraulic circuit or the 5th clutch, and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
Sequence	None
Duration	12 seconds or more
DTC Type	Two drive cycles, MIL OFF, D indicator blinks
OBD Status	PASSED/FAILED/NOT COMPLETED (STILL TESTING)

Enable Conditions

ENABLE CONDITIONS

Condition	Minimum	Maximum
Engine speed	1,000 rpm	-
Vehicle speed	8 mph (12 km/h)	-
Battery voltage	11.0 V	-
Shift lever position	D	
No active DTCs	P0116, P0117, P0118, P0705, P0706, P0716, P0717, P0718, P0721, P0722, P0723, P0731, P0732, P0733, P0734, P0746, P0747, P0751, P0752, P0756, P0757, P0761, P0762, P0776, P0777, P0796, P0797, P0962, P0963, P0966, P0967, P0970, P0971, P0973, P0974, P0976, P0977, P0979, P0980, P0982, P0983, P1743, P1744, P1745, P1780	

Malfunction Threshold

The actual gear ratio must match one of these conditions for at least 12 seconds with the 5th gear command.

- Actual gear ratio is greater than the 5th gear ratio by a factor of 1.2.
- Actual gear ratio is less than the 5th gear ratio by a factor of 0.75.

Driving Pattern

Start the engine, shift to the D position, and drive the vehicle at a speed of 8 mph (12 km/h) or more for at least 12 seconds in 5th gear.

- Drive the vehicle in this manner only if the traffic regulations and ambient conditions allow.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected during the first drive cycle, a Temporary DTC is stored in the PCM memory. If the malfunction recurs during the next (second) drive cycle, the DTC and the freeze frame data are stored. The MIL does not come on.

Conditions for clearing the MIL

The DTC, the Temporary DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P0741 (40): ADVANCED DIAGNOSTICS

DTC P0741: TORQUE CONVERTER CLUTCH HYDRAULIC CIRCUIT STUCK OFF

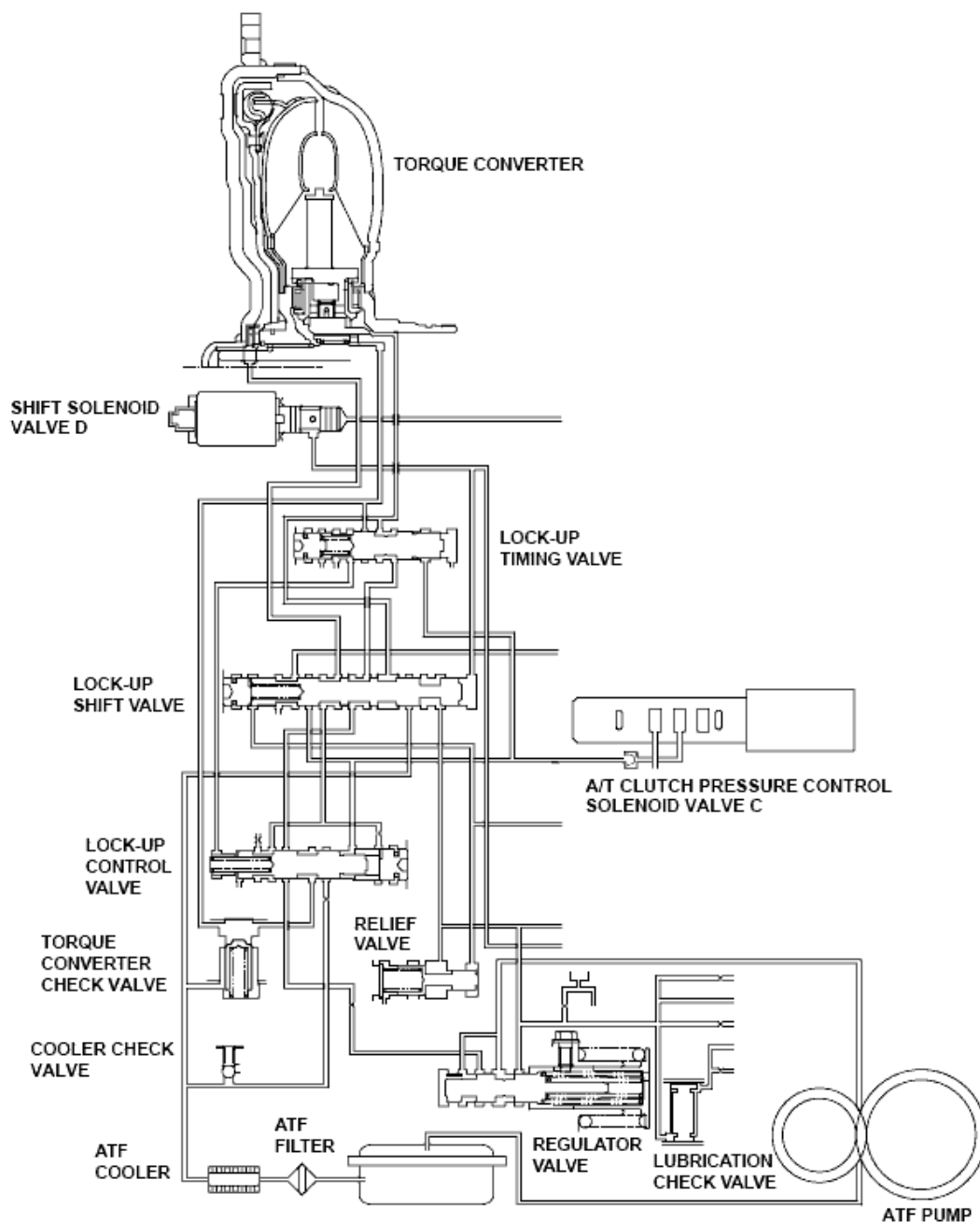


Fig. 137: Torque Converter Clutch Hydraulic System Diagram**DTC P0741 TORQUE CONVERTER CLUTCH HYDRAULIC CIRCUIT STUCK OFF**

Torque converter clutch operation		A/T clutch pressure control solenoid valve C	
		ON (100 %)	OFF (0 %)
Shift solenoid valve D	ON (12 V)	Torque converter clutch: maximum duty	Torque converter clutch OFF
	OFF (0 V)	Torque converter clutch OFF	Torque converter clutch OFF

General Description

The power transfer capacity of the torque converter clutch is controlled by the balance of automatic transmission fluid (ATF) supply to and discharge from the torque converter. When hydraulic pressure is applied internally, the torque converter clutch turns ON, and when hydraulic pressure is applied from the back pressure side, the torque converter clutch turns OFF. As the hydraulic pressure from the internal pressure side increases, the power transfer capacity of the torque converter clutch increases. The direction of hydraulic pressure supply is switched by shift solenoid valve D and the lock-up shift valve. ATF is supplied from the internal pressure side to shift solenoid valve D when the signal from the powertrain control module (PCM) is ON (12 V), and ATF is supplied from the back pressure side when it is OFF (0 V). The balance of internal pressure and back pressure is controlled by A/T clutch pressure control solenoid valve C, the lock-up control valve, and the lock-up timing valve. A/T clutch pressure control solenoid valve C maximizes the power transfer capacity of the torque converter clutch when the signal from the PCM is ON (1 A), and it minimizes the power transfer capacity of the torque converter clutch when the signal from the PCM is OFF (0 A). If the ratio of engine speed and input shaft (mainshaft) speed is not about 1:1 while the PCM is issuing the command to turn shift solenoid valve D and A/T clutch pressure control solenoid valve C ON, the PCM detects a faulty lock-up control system and stores a DTC.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status**MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS**

Execution	Once per driving cycle		
Sequence	None		
Duration	22 seconds or more		
DTC Type	Two drive cycles, MIL OFF, D indicator blinks		
OBD Status	PASSED/FAILED/NOT COMPLETED (STILL TESTING)		

Enable Conditions**ENABLE CONDITIONS**

Condition	Minimum	Maximum
Engine coolant temperature	158°F (70°C)	212°F (100°C)
Battery voltage	11.0 V	-
Shift status	5th	
Torque converter clutch	During controlling operation	

No active DTCs	P0116, P0117, P0118, P0122, P0123, P0705, P0706, P0716, P0717, P0718, P0721, P0722, P0723, P0746, P0747, P0751, P0752, P0756, P0757, P0761, P0762, P0766, P0767, P0776, P0777, P0796, P0797, P0962, P0963, P0966, P0967, P0970, P0971, P0973, P0974, P0976, P0977, P0979, P0980, P0982, P0983, P1780
Other	When both the vehicle speed and the throttle position are in Enable Range P0741-0770

Malfunction Threshold

The ratio of the engine revolutions to the transmission input pulses does not reach about 100% for at least 22 seconds.

Driving Pattern

1. Start the engine. Hold the engine speed at 3,000 rpm without load (in Park or neutral) until the radiator fan comes on.
2. Drive the vehicle at a constant speed of 60 mph (96 km/h) for at least 22 seconds.
 - Drive the vehicle in this manner only if the traffic regulations and ambient conditions allow.

Diagnosis Details

Conditions for illuminating the MIL

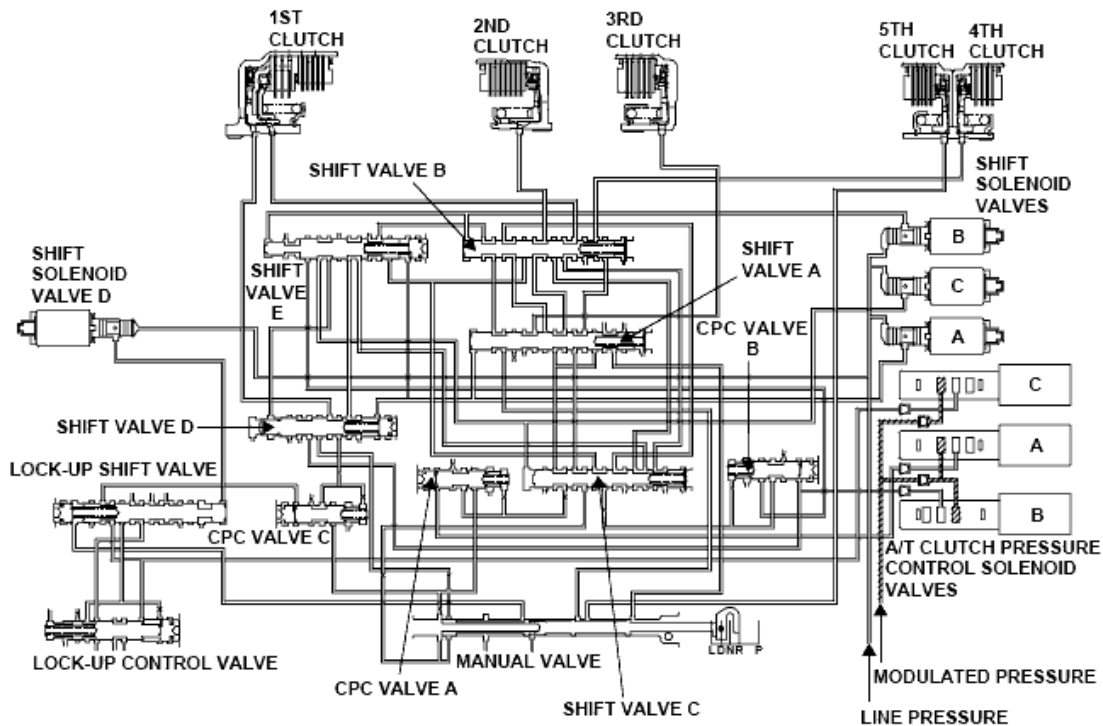
When a malfunction is detected during the first drive cycle, a Temporary DTC is stored in the PCM memory. If the malfunction recurs during the next (second) drive cycle, the DTC and the freeze frame data are stored. The MIL does not come on.

Conditions for clearing the MIL

The DTC, the Temporary DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

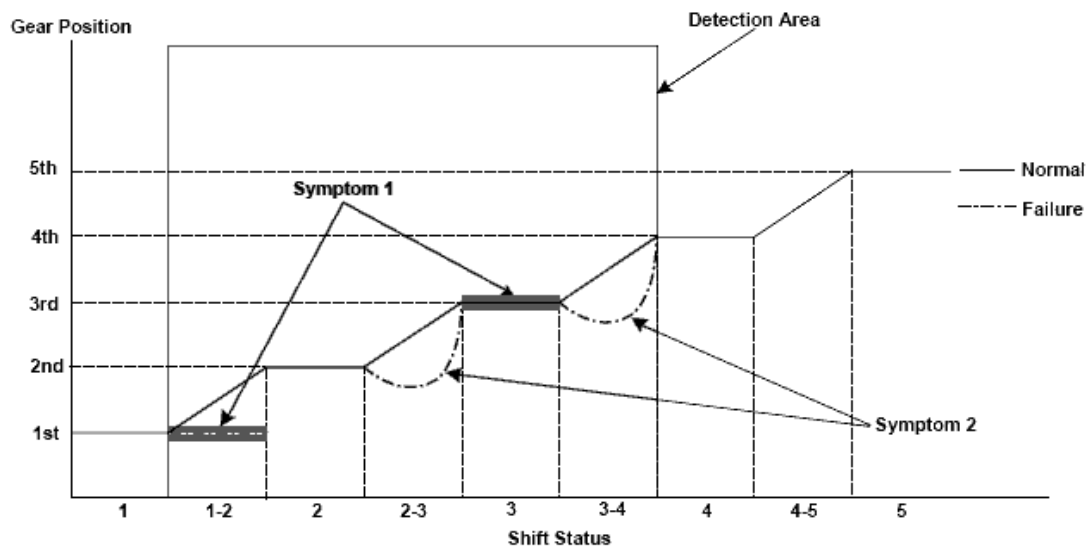
DTC P0746 (76): ADVANCED DIAGNOSTICS

DTC P0746: A/T CLUTCH PRESSURE CONTROL SOLENOID VALVE A STUCK OFF



P0747-0774

Fig. 138: A/T Clutch Pressure Control Solenoid Valve A - Operation Diagram



P0746-0571

Fig. 139: Gear Position VS Shift Status Graph

Shift solenoid valve Clutch		In gear	1st	1st-2nd	2nd	2nd-3rd	3rd	3rd-4th	4th	4th-5th	5th
	A	OFF	OFF	ON	ON	ON	ON	ON	OFF	OFF	OFF
	B	ON	ON	ON	ON	ON	OFF	OFF	OFF	OFF	ON
	C	OFF	ON	ON	OFF	ON	ON	OFF	OFF	ON	ON
	D	OFF	OFF	OFF/ON	OFF/ON	OFF/ON	OFF/ON	OFF/ON	OFF/ON	OFF/ON	OFF/ON
1st Clutch		CPC C	LINE	LINE	LINE	LINE	LINE	LINE	LINE	LINE	LINE
2nd Clutch		CPC A		CPC A	LINE	CPC A		CPC C			
3rd Clutch				CPC B		CPC B	LINE	CPC B			
4th Clutch								CPC A	LINE	CPC A	
5th Clutch										CPC B	LINE

CPC: Clutch Pressure Control pressure

Fig. 140: Shift Solenoid Valve Output (D Position)**General Description**

A/T clutch pressure control solenoid valve A is installed in the transmission housing. A/T clutch pressure control solenoid valve A is operated by the powertrain control module (PCM) and converts the modulated pressure to A/T clutch pressure control solenoid A pressure, which operates CPC valve A. Line pressure is modulated to clutch pressure control A pressure (CPC A pressure) by CPC valve A and the CPC valve A spring. A signal from the PCM is output to the proper gear clutch, determined by the gear schedule, to supply the proper CPC pressure according to the driving conditions. When the current from the PCM is high (ON), A/T clutch pressure control solenoid valve A operates and the CPC valve A pressure increases. When the current from the PCM is low (OFF), A/T clutch pressure control solenoid valve A turns off and CPC valve A pressure decreases. The PCM monitors the input shaft (mainshaft) speed and the output shaft (countershaft) speed at the gear change determined by the shift schedule. When an improper gear ratio is output compared to the predetermined gear ratio, an A/T clutch pressure control solenoid valve A OFF failure is detected and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status**MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS**

Execution	Continuous
Sequence	None
Duration	Depending on the driving pattern
DTC Type	Two drive cycles, MIL ON, D indicator blinks
OBD Status	PASSED/FAILED/NOT COMPLETED (STILL TESTING)

Enable Conditions**ENABLE CONDITIONS**

Condition	Minimum	Maximum
Battery voltage	11.0 V	-
Engine coolant temperature	50°F (10°C)	-
ATF temperature	-4°F (-20°C)	-
Vehicle speed	5 mph (9 km/h)	-
Accelerator pedal position	-	6.0 %/ 20 milliseconds (Not fully

variation	closed) ⁽¹⁾
Shift lever position	D
No active DTCs	P0122, P0123, P0705, P0716, P0717, P0718, P0721, P0722, P0723, P0747, P0751, P0752, P0756, P0757, P0761, P0762, P0766, P0767, P0776, P0777, P0796, P0797, P0842, P0843, P0847, P0848, P0962, P0963, P0966, P0967, P0970, P0971, P0973, P0974, P0976, P0977, P0979, P0980, P0982, P0983, P1743, P1744, P1745, P1780
(1) Symptom 2	

Malfunction Threshold

One of these symptom occurs.

- Drive in 3rd gear with a record that symptom 1 occurred.
- Symptom 2 occurs.

MALFUNCTION THRESHOLD (SYMPTOM 1)

Symptom	Gear position commanded by the PCM	Actual gear position
1	1st --> 2nd gear upshift	Held in 1st gear

MALFUNCTION THRESHOLD (Symptom 2)

Symptom	Gear position commanded by the PCM	Actual gear position
2-A	2nd --> 3rd gear upshift	The engine speed flares
2-B	3rd --> 4th gear upshift	The engine speed flares

Driving Pattern

Start the engine, and accelerate the vehicle until the transmission shifts into 5th gear in the D position.

- Drive the vehicle in this manner only if the traffic regulations and ambient conditions allow.

Diagnosis Details

Conditions for illuminating the MIL

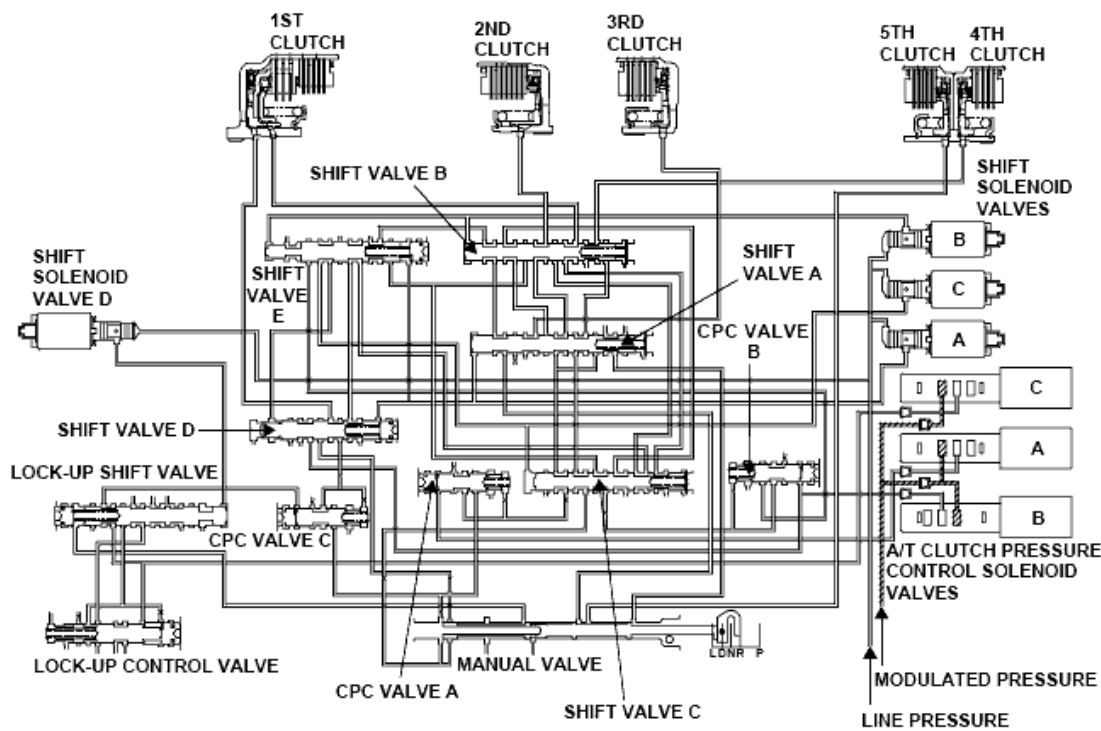
When a malfunction is detected during the first drive cycle, a Temporary DTC is stored in the PCM memory. If the malfunction recurs during the next (second) drive cycle, the MIL comes on and the DTC and the freeze frame data are stored.

Conditions for clearing the MIL

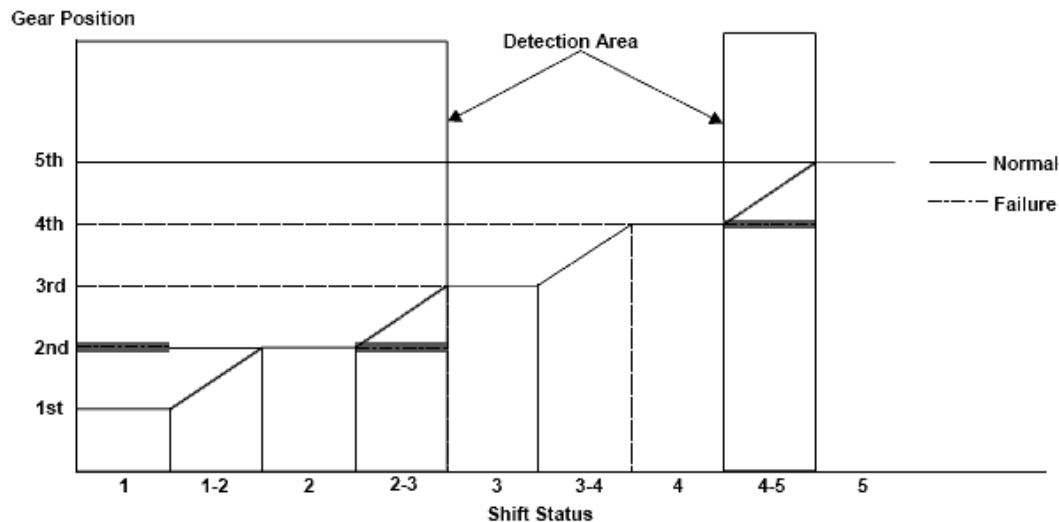
The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, the Temporary DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P0747 (76): ADVANCED DIAGNOSTICS

DTC P0747: A/T CLUTCH PRESSURE CONTROL SOLENOID VALVE A STUCK ON

P0747-0774

Fig. 141: A/T Clutch Pressure Control Solenoid Valve A - Operation Diagram

P0747-0571

Fig. 142: Gear Position VS Shift Status Graph

Shift solenoid valve Clutch		In gear	1st	1st-2nd	2nd	2nd-3rd	3rd	3rd-4th	4th	4th-5th	5th
	A	OFF	OFF	ON	ON	ON	ON	ON	OFF	OFF	OFF
	B	ON	ON	ON	ON	ON	OFF	OFF	OFF	OFF	ON
	C	OFF	ON	ON	OFF	ON	ON	OFF	OFF	ON	ON
	D	OFF	OFF	OFF/ON	OFF/ON	OFF/ON	OFF/ON	OFF/ON	OFF/ON	OFF/ON	OFF/ON
1st Clutch		CPC C	LINE	LINE	LINE	LINE	LINE	LINE	LINE	LINE	LINE
2nd Clutch		CPC A		CPC A	LINE	CPC A		CPC C			
3rd Clutch				CPC B		CPC B	LINE	CPC B			
4th Clutch								CPC A	LINE	CPC A	
5th Clutch										CPC B	LINE

CPC: Clutch Pressure Control pressure

Fig. 143: Shift Solenoid Valve Output (D Position)**General Description**

A/T clutch pressure control solenoid valve A is installed in the transmission housing. A/T clutch pressure control solenoid valve A is operated by the powertrain control module (PCM) and converts the modulated pressure to A/T clutch pressure control solenoid A pressure, which operates CPC valve A. Line pressure is modulated to clutch pressure control A pressure (CPC A pressure) by CPC valve A and the CPC valve A spring. A signal from the PCM is output to the proper gear clutch, determined by the gear schedule, to supply the proper CPC pressure according to the driving conditions. When the current from the PCM is high (ON), A/T clutch pressure control solenoid valve A operates and the CPC valve A pressure increases. When the current from the PCM is low (OFF), A/T clutch pressure control solenoid valve A turns off and CPC valve A pressure decreases. The PCM monitors the input shaft (mainshaft) speed and the output shaft (countershaft) speed at the gear change determined by the shift schedule. When an improper gear ratio is output compared to the predetermined gear ratio, an A/T clutch pressure control solenoid valve A ON failure is detected and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status**MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS**

Execution	Continuous
Sequence	None
Duration	20 seconds
DTC Type	Two drive cycles, MIL ON, D indicator blinks
OBD Status	PASSED/FAILED/NOT COMPLETED (STILL TESTING)

Enable Conditions**ENABLE CONDITIONS**

Condition	Minimum	Maximum
Engine coolant temperature	50°F (10°C)	-
ATF temperature	-4°F (-20°C)	-
Vehicle speed	5 mph (9 km/h)	-
Battery voltage	11.0 V	-
Shift lever position	D	

No active DTCs

P0122, P0123, P0705, P0716, P0717, P0718, P0721, P0722, P0723, P0746, P0751, P0752, P0756, P0757, P0761, P0762, P0766, P0767, P0776, P0777, P0796, P0797, P0842, P0843, P0847, P0848, P0962, P0963, P0966, P0967, P0970, P0971, P0973, P0974, P0976, P0977, P0979, P0980, P0982, P0983, P1743, P1744, P1745, P1780

Malfunction Threshold

One of these conditions occurs.

- The transmission is held in 2nd gear against the 2nd --> 3rd gear upshift command though there is no record of being neutral when the 1st gear shift is commanded for as long as 20 seconds.
- The transmission is held in 4th gear against the 4th --> 5th gear upshift command though there is no record of being neutral when the 1st gear shift is commanded for as long as 20 seconds.

Driving Pattern

Start the engine, and accelerate the vehicle until the transmission shifts into 5th gear in the D position.

- Drive the vehicle in this manner only if the traffic regulations and ambient conditions allow.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected during the first drive cycle, a Temporary DTC is stored in the PCM memory. If the malfunction recurs during the next (second) drive cycle, the MIL comes on and the DTC and the freeze frame data are stored.

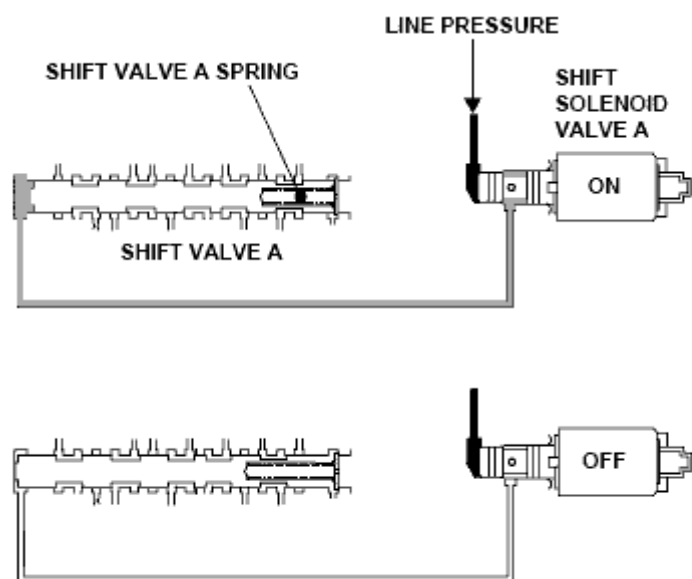
Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, the Temporary DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

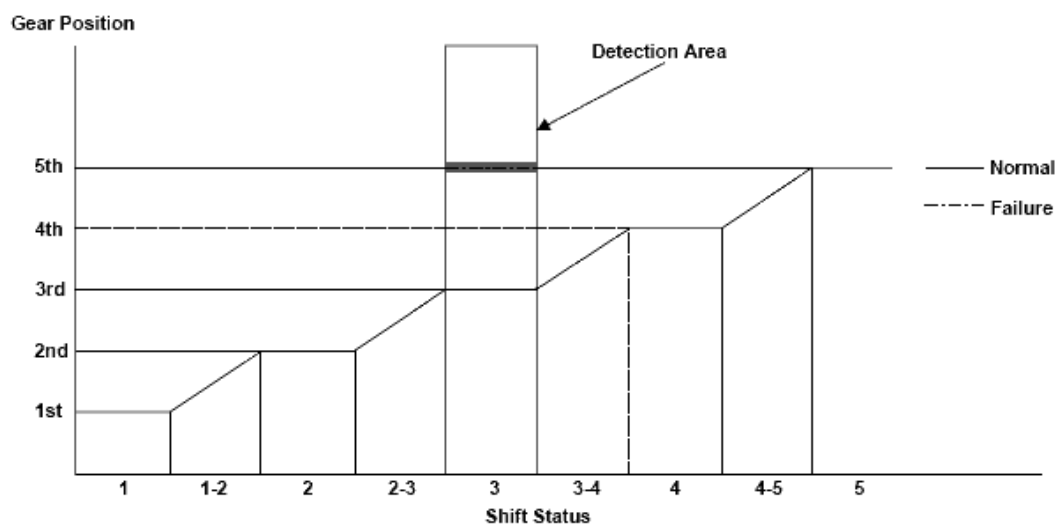
DTC P0751 (70): ADVANCED DIAGNOSTICS

DTC P0751: SHIFT SOLENOID VALVE A STUCK OFF



P0751-0571

Fig. 144: Shift Solenoid Valve A - Operation Diagram



P0751-0570

Fig. 145: Gear Position VS Shift Status Graph

Shift solenoid valve Gear position	Shift solenoid valve A	Shift solenoid valve B	Shift solenoid valve C	Shift solenoid valve D
Park	OFF	ON	OFF	ON
Reverse	ON	ON	OFF	ON
Neutral	OFF	ON	OFF	OFF
1st	OFF	ON	ON	OFF
1st - 2nd	ON	ON	ON	OFF/ON
2nd	ON	ON	OFF	OFF/ON
2nd - 3rd	ON	ON	ON	OFF/ON
3rd	ON	OFF	ON	OFF/ON
3rd - 4th	ON	OFF	OFF	OFF/ON
4th	OFF	OFF	OFF	OFF/ON
4th - 5th	OFF	OFF	ON	OFF/ON
5th	OFF	ON	ON	OFF/ON

Fig. 146: Shift Solenoid Valve Driving Signal Combination Table

General Description

Shift solenoid valve A is installed in the transmission housing. It is controlled by the ON/OFF signal from the powertrain control module (PCM) to apply line pressure to shift valve A. The signal from the PCM is output to apply clutch pressure control pressure to the proper gear change clutch according to the gear change schedule. When the signal to shift solenoid valve A from the PCM is ON, and line pressure is applied to shift valve A, it operates against the shift valve A spring. When the signal to shift solenoid valve A from the PCM is OFF, and line pressure is discharged, shift valve A is inactive. The PCM monitors the input shaft (mainshaft) speed and the output shaft (countershaft) speed at the gear change determined by the shift schedule. When an improper gear ratio is output compared to the predetermined gear change mode, a shift solenoid valve A OFF failure is detected and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
Sequence	None
Duration	1.5 seconds or more
DTC Type	Two drive cycles, MIL ON, D indicator blinks
OBD Status	PASSED/FAILED/NOT COMPLETED (STILL TESTING)

Enable Conditions

ENABLE CONDITIONS

Condition	Minimum	Maximum
Vehicle speed	5 mph (9 km/h)	-
Battery voltage	11.0 V	-
Shift lever	D	

position	
No active DTCs	P0122, P0123, P0705, P0716, P0717, P0718, P0721, P0722, P0723, P0746, P0747, P0752, P0756, P0757, P0761, P0762, P0766, P0767, P0776, P0777, P0796, P0797, P0842, P0843, P0847, P0848, P0962, P0963, P0966, P0967, P0970, P0971, P0973, P0974, P0976, P0977, P0979, P0980, P0982, P0983, P1743, P1744, P1745, P1780

Malfunction Threshold

The transmission is held in 5th gear against the 3rd gear command for at least 1.5 seconds.

Driving Pattern

Start the engine, and accelerate the vehicle until the transmission shifts into 5th gear in the D position.

- Drive the vehicle in this manner only if the traffic regulations and ambient conditions allow.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected during the first drive cycle, a Temporary DTC is stored in the PCM memory. If the malfunction recurs during the next (second) drive cycle, the MIL comes on and the DTC and the freeze frame data are stored.

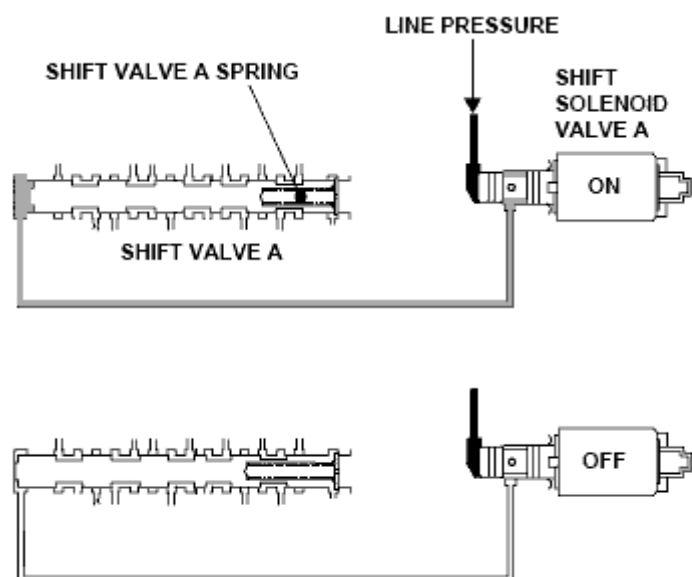
Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, the Temporary DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

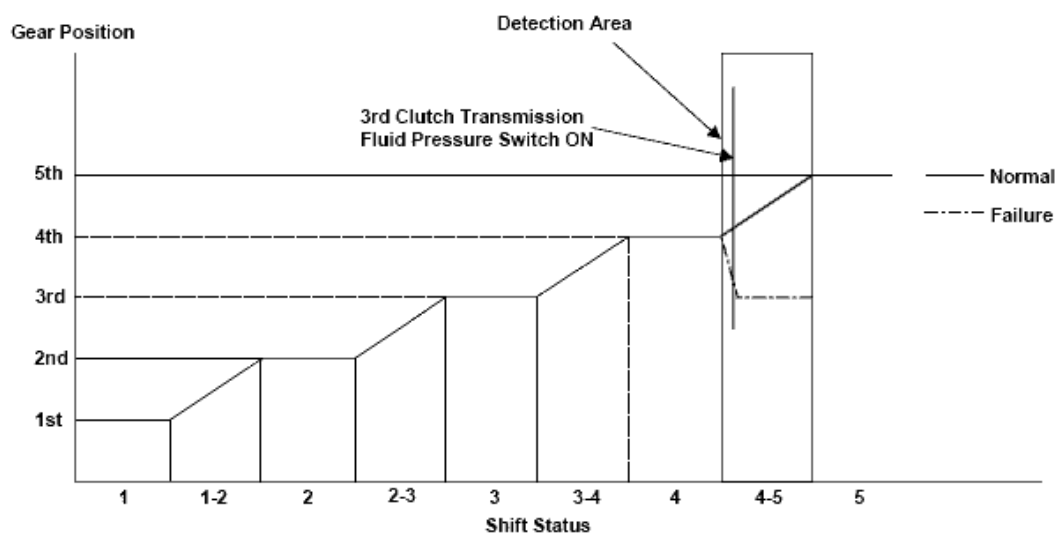
DTC P0752 (70): ADVANCED DIAGNOSTICS

DTC P0752: SHIFT SOLENOID VALVE A STUCK ON



P0751-0571

Fig. 147: Shift Solenoid Valve A - Operation Diagram



P0752-0570

Fig. 148: Gear Position VS Shift Status Graph

Shift solenoid valve Gear position	Shift solenoid valve A	Shift solenoid valve B	Shift solenoid valve C	Shift solenoid valve D
Park	OFF	ON	OFF	ON
Reverse	ON	ON	OFF	ON
Neutral	OFF	ON	OFF	OFF
1st	OFF	ON	ON	OFF
1st - 2nd	ON	ON	ON	OFF/ON
2nd	ON	ON	OFF	OFF/ON
2nd - 3rd	ON	ON	ON	OFF/ON
3rd	ON	OFF	ON	OFF/ON
3rd - 4th	ON	OFF	OFF	OFF/ON
4th	OFF	OFF	OFF	OFF/ON
4th - 5th	OFF	OFF	ON	OFF/ON
5th	OFF	ON	ON	OFF/ON

Fig. 149: Shift Solenoid Valve Driving Signal Combination Table**General Description**

Shift solenoid valve A is installed in the transmission housing. It is controlled by the ON/OFF signal from the powertrain control module (PCM) to apply line pressure to shift valve A. The signal from the PCM is output to apply clutch pressure control pressure to the proper gear change clutch according to the gear change schedule. When the signal to shift solenoid valve A from the PCM is OFF, and line pressure is discharged, shift valve A is inactive. When the signal to shift solenoid valve A from the PCM is ON, and line pressure is applied to shift valve A, it operates against the shift valve A spring. The PCM monitors the transmission fluid switch at the speed change stage determined by the shift schedule. When the wrong transmission fluid switch is turned on for a given speed change mode, a shift solenoid valve turn-on malfunction is detected and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status**MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS**

Execution	Continuous
Sequence	None
Duration	Depending on the driving pattern
DTC Type	Two drive cycles, MIL ON, D indicator blinks
OBD Status	PASSED/FAILED/NOT COMPLETED (STILL TESTING)

Enable Conditions**ENABLE CONDITIONS**

Condition	Minimum	Maximum
Battery voltage	11.0 V	-
Shift lever position	D	
	P0122, P0123, P0705, P0716, P0717, P0718, P0721, P0722, P0723, P0746, P0747,	

No active
DTCs

P0751, P0756, P0757, P0761, P0762, P0766, P0767, P0776, P0777, P0796, P0797,
P0842, P0843, P0847, P0848, P0962, P0963, P0966, P0967, P0970, P0971, P0973,
P0974, P0976, P0977, P0979, P0980, P0982, P0983, P1743, P1744, P1745, P1780

Malfunction Threshold

The 3rd clutch transmission fluid switch is ON against the 4th --> 5th gear upshift command for at least 11 seconds.

Driving Pattern

Start the engine, and accelerate the vehicle until the transmission shifts into 5th gear in the D position.

- Drive the vehicle in this manner only if the traffic regulations and ambient conditions allow.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected during the first drive cycle, a Temporary DTC is stored in the PCM memory. If the malfunction recurs during the next (second) drive cycle, the MIL comes on and the DTC and the freeze frame data are stored.

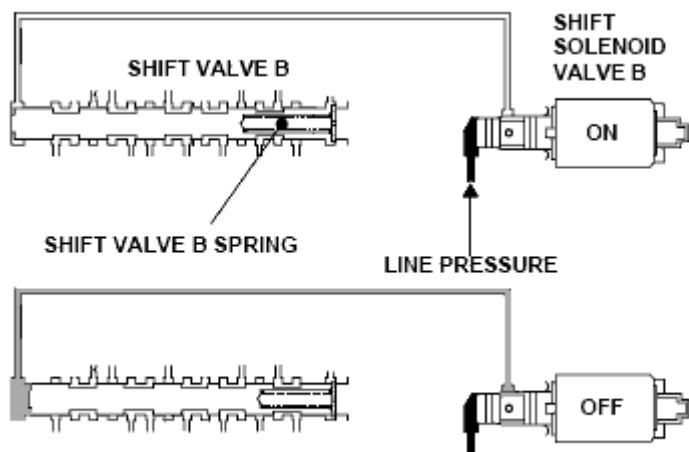
Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, the Temporary DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

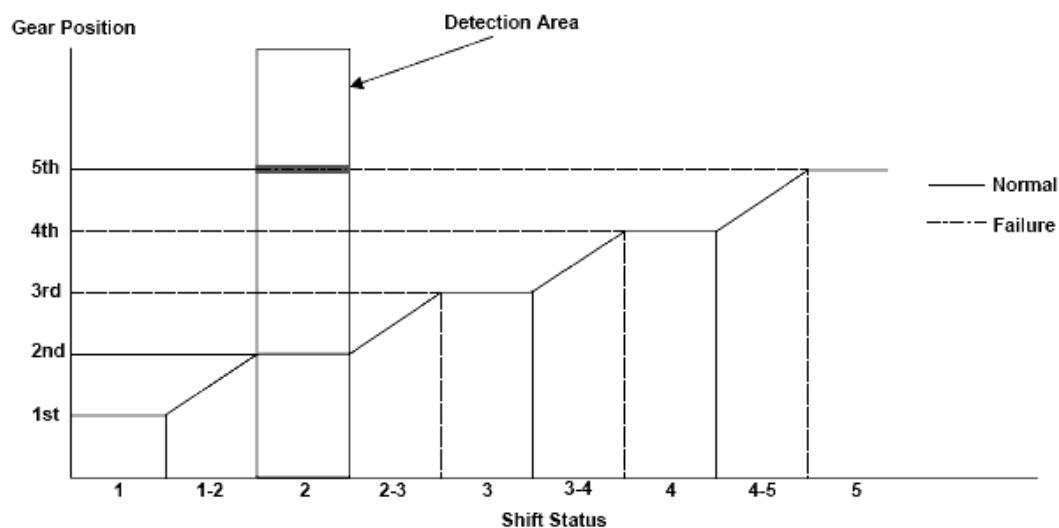
DTC P0756 (71): ADVANCED DIAGNOSTICS

DTC P0756: SHIFT SOLENOID VALVE B STUCK OFF



P0756-0571

Fig. 150: Shift Solenoid Valve B - Operation Diagram



P0756-0570

Fig. 151: Gear Position VS Shift Status Graph

Shift solenoid valve Gear position	Shift solenoid valve A	Shift solenoid valve B	Shift solenoid valve C	Shift solenoid valve D
Park	OFF	ON	OFF	ON
Reverse	ON	ON	OFF	ON
Neutral	OFF	ON	OFF	OFF
1st	OFF	ON	ON	OFF
1st - 2nd	ON	ON	ON	OFF/ON
2nd	ON	ON	OFF	OFF/ON
2nd - 3rd	ON	ON	ON	OFF/ON
3rd	ON	OFF	ON	OFF/ON
3rd - 4th	ON	OFF	OFF	OFF/ON
4th	OFF	OFF	OFF	OFF/ON
4th - 5th	OFF	OFF	ON	OFF/ON
5th	OFF	ON	ON	OFF/ON

Fig. 152: Shift Solenoid Valve Driving Signal Combination Table**General Description**

Shift solenoid valve B is installed in the transmission housing. It is controlled by the ON/OFF signal from the powertrain control module (PCM) to apply line pressure to shift valve B. The signal from the PCM is output to apply clutch pressure control pressure to the proper gear change clutch according to the gear change schedule. When the signal to shift solenoid valve B from the PCM is ON, and line pressure is discharged, shift valve B is inactive. When the signal to shift solenoid valve B from the PCM is OFF, and line pressure is applied to shift valve B, it operates against the shift valve B spring. The PCM monitors the input shaft (mainshaft) speed and the output shaft (countershaft) speed at the gear change determined by the shift schedule. When an improper gear ratio is output compared to the predetermined gear change mode, a shift solenoid valve B OFF failure is detected and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
Sequence	None
Duration	1.5 seconds or more
DTC Type	Two drive cycles, MIL ON, D indicator blinks
OBD Status	PASSED/FAILED/NOT COMPLETED (STILL TESTING)

Enable Conditions**ENABLE CONDITIONS**

Condition	Minimum	Maximum
Vehicle speed	5 mph (9 km/h)	-
Battery voltage	11.0 V	-
Shift lever position	D	
No active DTCs	P0122, P0123, P0705, P0716, P0717, P0718, P0721, P0722, P0723, P0746, P0747, P0751, P0752, P0757, P0761, P0762, P0766, P0767, P0776, P0777, P0796, P0797, P0842, P0843, P0847, P0848, P0962, P0963, P0966, P0967, P0970, P0971, P0973, P0974, P0976, P0977, P0979, P0980, P0982, P0983, P1743, P1744, P1745, P1780	

Malfunction Threshold

The transmission is held in 4th gear against the 2nd gear command for at least 1.5 seconds.

Driving Pattern

Start the engine, and accelerate the vehicle until the transmission shifts into 5th gear in the D position.

- Drive the vehicle in this manner only if the traffic regulations and ambient conditions allow.

Diagnosis Details**Conditions for illuminating the MIL**

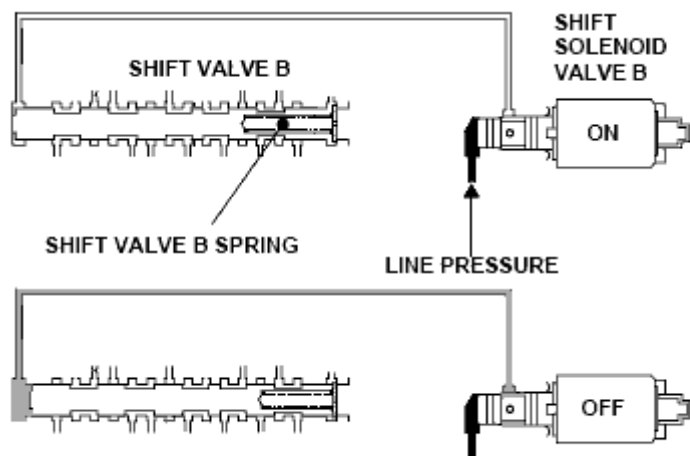
When a malfunction is detected during the first drive cycle, a Temporary DTC is stored in the PCM memory. If the malfunction recurs during the next (second) drive cycle, the MIL comes on and the DTC and the freeze frame data are stored.

Conditions for clearing the MIL

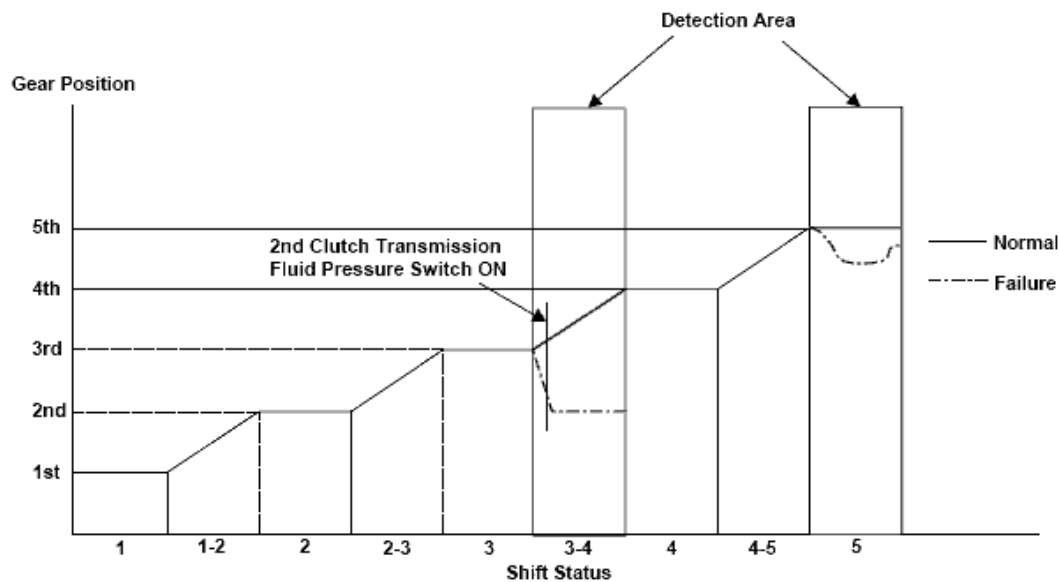
The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, the Temporary DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P0757 (71): ADVANCED DIAGNOSTICS

DTC P0757: SHIFT SOLENOID VALVE B STUCK ON

P0756-0571

Fig. 153: Shift Solenoid Valve B - Operation Diagram

P0757-0570

Fig. 154: Gear Position VS Shift Status Graph

Shift solenoid valve Gear position	Shift solenoid valve A	Shift solenoid valve B	Shift solenoid valve C	Shift solenoid valve D
Park	OFF	ON	OFF	ON
Reverse	ON	ON	OFF	ON
Neutral	OFF	ON	OFF	OFF
1st	OFF	ON	ON	OFF
1st - 2nd	ON	ON	ON	OFF/ON
2nd	ON	ON	OFF	OFF/ON
2nd - 3rd	ON	ON	ON	OFF/ON
3rd	ON	OFF	ON	OFF/ON
3rd - 4th	ON	OFF	OFF	OFF/ON
4th	OFF	OFF	OFF	OFF/ON
4th - 5th	OFF	OFF	ON	OFF/ON
5th	OFF	ON	ON	OFF/ON

Fig. 155: Shift Solenoid Valve Driving Signal Combination Table

General Description

Shift solenoid valve B is installed in the transmission housing. It is controlled by the ON/OFF signal from the powertrain control module (PCM) to apply line pressure to shift valve B. The signal from the PCM is output to apply clutch pressure control pressure to the proper gear change clutch according to the gear change schedule. When the signal to shift solenoid valve B from the PCM is ON, and line pressure is discharged, shift valve B is inactive. When the signal to shift solenoid valve B from the PCM is OFF, and line pressure is applied to shift valve B, it operates against the shift valve B spring. When the wrong gear ratio is output for a given speed change mode, or when the wrong transmission fluid pressure switch is turned-on, a shift solenoid valve turn-on malfunction is detected and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
Sequence	None
Duration	Depending on the driving pattern
DTC Type	Two drive cycles, MIL ON, D indicator blinks
OBD Status	PASSED/FAILED/NOT COMPLETED (STILL TESTING)

Enable Conditions

ENABLE CONDITIONS

Condition	Minimum	Maximum
Vehicle speed	5 mph (9 km/h)	-
Battery voltage	11.0 V	-
Torque converter slip	96 %	110 %

ratio	
Shift lever position	D
No active DTCs	P0122, P0123, P0705, P0716, P0717, P0718, P0721, P0722, P0723, P0746, P0747, P0751, P0752, P0756, P0761, P0762, P0766, P0767, P0776, P0777, P0796, P0797, P0842, P0843, P0847, P0848, P0962, P0963, P0966, P0967, P0970, P0971, P0973, P0974, P0976, P0977, P0979, P0980, P0982, P0983, P1743, P1744, P1745, P1780

Malfunction Threshold

One of these conditions occurs:

- The 2nd clutch transmission fluid switch is ON against the 3rd --> 4th gear upshift command for at least 11 seconds.
- After the 3rd --> 4th gear upshift command is output, it is neutral for 2 seconds or more when the 5th gear shift command is output, though there is no history of being neutral.

Driving Pattern

Start the engine, and accelerate the vehicle until the transmission shifts into 5th gear in the D position.

- Drive the vehicle in this manner only if the traffic regulations and ambient conditions allow.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected during the first drive cycle, a Temporary DTC is stored in the PCM memory. If the malfunction recurs during the next (second) drive cycle, the MIL comes on and the DTC and the freeze frame data are stored.

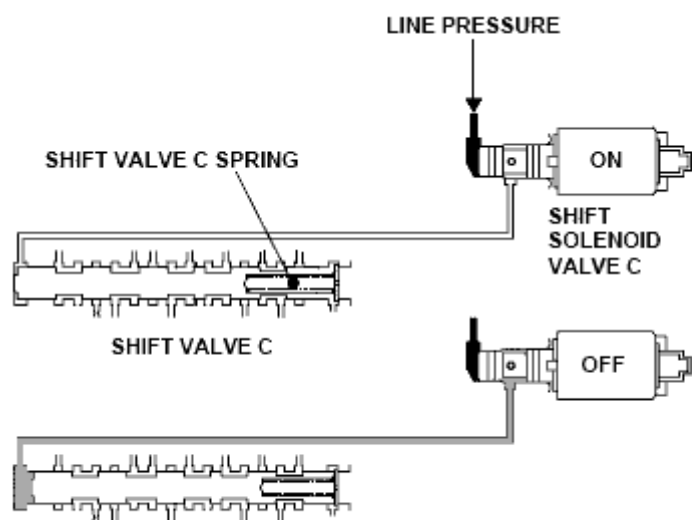
Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, the Temporary DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

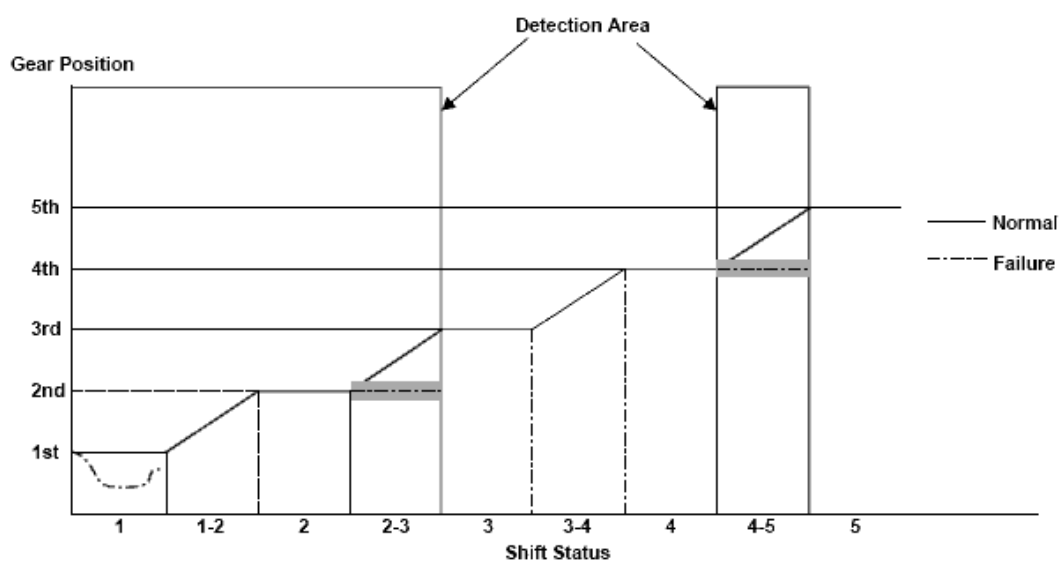
DTC P0761 (72): ADVANCED DIAGNOSTICS

DTC P0761: SHIFT SOLENOID VALVE C STUCK OFF



P0761-0571

Fig. 156: Shift Solenoid Valve C - Operation Diagram



P0761-0570

Fig. 157: Gear Position VS Shift Status Graph

Shift solenoid valve Gear position	Shift solenoid valve A	Shift solenoid valve B	Shift solenoid valve C	Shift solenoid valve D
Park	OFF	ON	OFF	ON
Reverse	ON	ON	OFF	ON
Neutral	OFF	ON	OFF	OFF
1st	OFF	ON	ON	OFF
1st - 2nd	ON	ON	ON	OFF/ON
2nd	ON	ON	OFF	OFF/ON
2nd - 3rd	ON	ON	ON	OFF/ON
3rd	ON	OFF	ON	OFF/ON
3rd - 4th	ON	OFF	OFF	OFF/ON
4th	OFF	OFF	OFF	OFF/ON
4th - 5th	OFF	OFF	ON	OFF/ON
5th	OFF	ON	ON	OFF/ON

Fig. 158: Shift Solenoid Valve Driving Signal Combination Table

General Description

Shift solenoid valve C is installed in the transmission housing. It is controlled by the ON/OFF signal from the powertrain control module (PCM) to apply line pressure to shift valve C. The signal from the PCM is output to apply clutch pressure control pressure to the proper gear change clutch according to the gear change schedule. When the signal to shift solenoid valve C from the PCM is ON, and line pressure is discharged, shift valve C is inactive. When the signal to shift solenoid valve C from the PCM is OFF, and line pressure is applied to shift valve C, it operates against the shift valve C spring. The PCM monitors the input shaft (mainshaft) speed and the output shaft (countershaft) speed at the gear change determined by the shift schedule. When an improper gear ratio is output compared to the predetermined gear change mode, a shift solenoid valve C OFF failure is detected and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
Sequence	None
Duration	20 seconds
DTC Type	Two drive cycles, MIL ON, D indicator blinks
OBD Status	PASSED/FAILED/NOT COMPLETED (STILL TESTING)

Enable Conditions

ENABLE CONDITIONS

Condition	Minimum	Maximum
Engine coolant temperature	50°F (10°C)	-
ATF temperature	-4°F (-20°C)	-
Vehicle speed	5 mph (9 km/h)	-
Battery voltage	11.0 V	-
Shift lever position	D	

No active DTCs

P0122, P0123, P0705, P0716, P0717, P0718, P0721, P0722, P0723, P0746, P0747, P0751, P0752, P0756, P0757, P0762, P0766, P0767, P0776, P0777, P0796, P0797, P0842, P0843, P0847, P0848, P0962, P0963, P0966, P0967, P0970, P0971, P0973, P0974, P0976, P0977, P0979, P0980, P0982, P0983, P1743, P1744, P1745, P1780

Malfunction Threshold

One of these symptoms occurred with the history that the actual gear position was neutral when the 1st gear shift is commanded:

- The transmission is held in 2nd gear against the 2nd --> 3rd gear upshift command for at least 17 seconds.
- The transmission is held in 4th gear against the 4th --> 5th gear upshift command for at least 17 seconds.

Driving Pattern

Start the engine, and accelerate the vehicle until the transmission shifts into 5th gear in the D position.

- Drive the vehicle in this manner only if the traffic regulations and ambient conditions allow.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected during the first drive cycle, a Temporary DTC is stored in the PCM memory. If the malfunction recurs during the next (second) drive cycle, the MIL comes on and the DTC and the freeze frame data are stored.

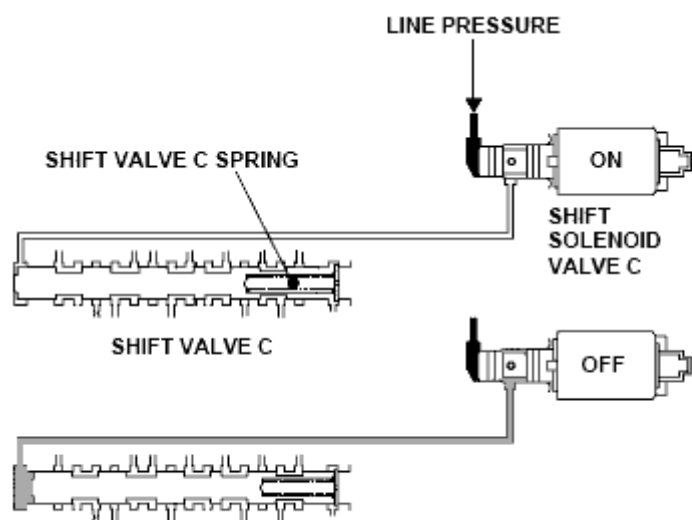
Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, the Temporary DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

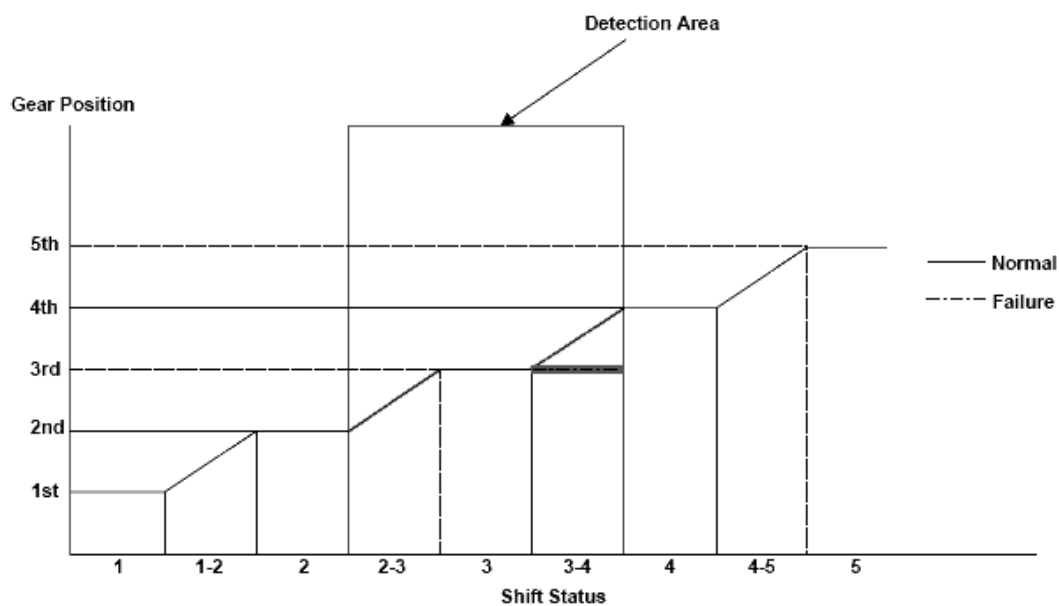
DTC P0762 (72): ADVANCED DIAGNOSTICS

DTC P0762: SHIFT SOLENOID VALVE C STUCK ON



P0761-0571

Fig. 159: Shift Solenoid Valve C - Operation Diagram



P0762-0570

Fig. 160: Gear Position VS Shift Status Graph

Shift solenoid valve Gear position	Shift solenoid valve A	Shift solenoid valve B	Shift solenoid valve C	Shift solenoid valve D
Park	OFF	ON	OFF	ON
Reverse	ON	ON	OFF	ON
Neutral	OFF	ON	OFF	OFF
1st	OFF	ON	ON	OFF
1st - 2nd	ON	ON	ON	OFF/ON
2nd	ON	ON	OFF	OFF/ON
2nd - 3rd	ON	ON	ON	OFF/ON
3rd	ON	OFF	ON	OFF/ON
3rd - 4th	ON	OFF	OFF	OFF/ON
4th	OFF	OFF	OFF	OFF/ON
4th - 5th	OFF	OFF	ON	OFF/ON
5th	OFF	ON	ON	OFF/ON

Fig. 161: Shift Solenoid Valve Driving Signal Combination Table

General Description

Shift solenoid valve C is installed in the transmission housing. It is controlled by the ON/OFF signal from the powertrain control module (PCM) to apply line pressure to shift valve C. The signal from the PCM is output to apply clutch pressure control pressure to the proper gear change clutch according to the gear change schedule. When the signal to shift solenoid valve C from the PCM is ON, and line pressure is discharged, shift valve C is inactive. When the signal to shift solenoid valve C from the PCM is OFF, and line pressure is applied to shift valve C, it operates against the shift valve C spring. The PCM monitors the input shaft (mainshaft) speed and the output shaft (countershaft) speed at the gear change determined by the shift schedule. When an improper gear ratio is output compared to the predetermined gear change mode, a shift solenoid valve C ON failure is detected and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
Sequence	None
Duration	20 seconds
DTC Type	Two drive cycles, MIL ON, D indicator blinks
OBD Status	PASSED/FAILED/NOT COMPLETED (STILL TESTING)

Enable Conditions

ENABLE CONDITIONS

Condition	Minimum	Maximum
Engine coolant temperature	50°F (10°C)	-
ATF temperature	-4°F (-20°C)	-
Vehicle speed	5 mph (9 km/h)	-
Battery voltage	11.0 V	-
Shift lever position	D	

No active DTCs

P0122, P0123, P0705, P0716, P0717, P0718, P0721, P0722, P0723, P0746, P0747, P0751, P0752, P0756, P0757, P0761, P0766, P0767, P0776, P0777, P0796, P0797, P0842, P0843, P0847, P0848, P0962, P0963, P0966, P0967, P0970, P0971, P0973, P0974, P0976, P0977, P0979, P0980, P0982, P0983, P1743, P1744, P1745, P1780

Malfunction Threshold

The transmission is held in 3rd gear against the 3rd --> 4th gear upshift command for as long as 20 seconds, without records that the gear change time was short when the 2nd --> 3rd gear upshift were commanded.

Driving Pattern

Start the engine, and accelerate the vehicle until the transmission shifts into 5th gear in the D position.

- Drive the vehicle in this manner only if the traffic regulations and ambient conditions allow.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected during the first drive cycle, a Temporary DTC is stored in the PCM memory. If the malfunction recurs during the next (second) drive cycle, the MIL comes on and the DTC and the freeze frame data are stored.

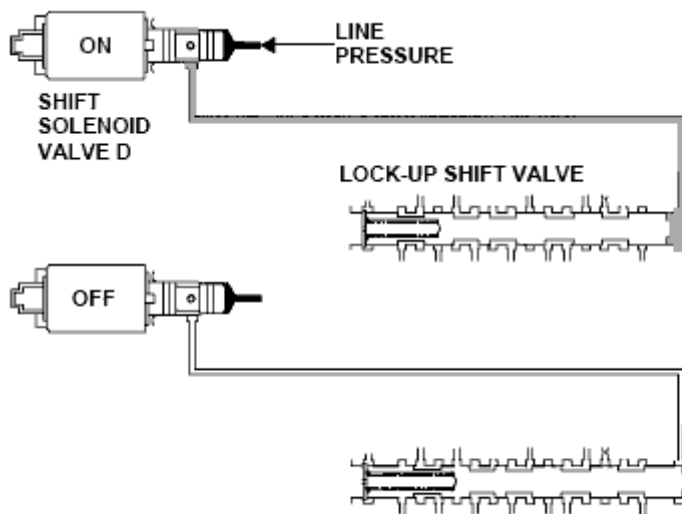
Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, the Temporary DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

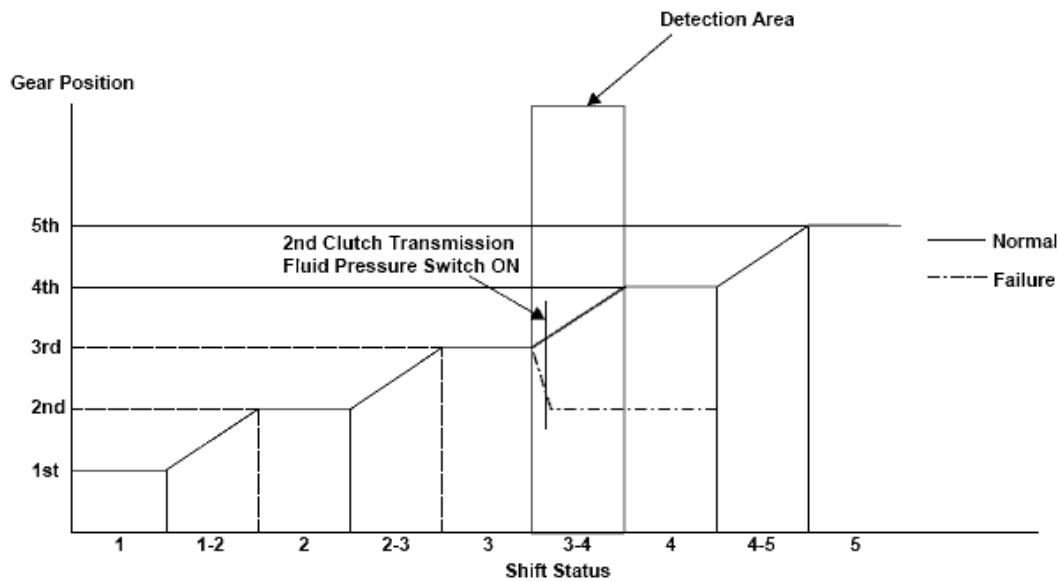
DTC P0766 (73): ADVANCED DIAGNOSTICS

DTC P0766: SHIFT SOLENOID VALVE D STUCK OFF



P0766-0571

Fig. 162: Shift Solenoid Valve D - Operation Diagram



P0766-0570

Fig. 163: Gear Position VS Shift Status Graph

Shift solenoid valve Gear position	Shift solenoid valve A	Shift solenoid valve B	Shift solenoid valve C	Shift solenoid valve D
Park	OFF	ON	OFF	ON
Reverse	ON	ON	OFF	ON
Neutral	OFF	ON	OFF	OFF
1st	OFF	ON	ON	OFF
1st - 2nd	ON	ON	ON	OFF/ON
2nd	ON	ON	OFF	OFF/ON
2nd - 3rd	ON	ON	ON	OFF/ON
3rd	ON	OFF	ON	OFF/ON
3rd - 4th	ON	OFF	OFF	OFF/ON
4th	OFF	OFF	OFF	OFF/ON
4th - 5th	OFF	OFF	ON	OFF/ON
5th	OFF	ON	ON	OFF/ON

Fig. 164: Shift Solenoid Valve Driving Signal Combination Table

General Description

Shift solenoid valve D is installed in the transmission housing. It is controlled by the ON/OFF signal from the powertrain control module (PCM) to apply line pressure to lock-up shift valve. The signal from the PCM is output to apply clutch pressure control pressure to the proper gear change clutch according to the gear change schedule. When the signal to shift solenoid valve D from the PCM is ON, and line pressure is applied to the lock-up shift valve, it operates against the lock-up shift valve spring. When the signal to shift solenoid valve D from the PCM is OFF, and line pressure is discharged, the lock-up shift valve is inactive. The PCM monitors the input shaft (mainshaft) speed and the output shaft (countershaft) speed at the gear change determined by the shift schedule. When an improper gear ratio is output compared to the predetermined gear change mode, a shift solenoid valve D OFF failure is detected and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
Sequence	None
Duration	11 seconds or more (symptom 1)
	3 seconds or more (symptom 2-A, 2-B)
DTC Type	Two drive cycles, MIL ON, D indicator blinks
OBD Status	PASSED/FAILED/NOT COMPLETED (STILL TESTING)

Enable Conditions

ENABLE CONDITIONS

Condition	Minimum	Maximum
Battery voltage	11.0 V	-
Vehicle speed	-	6 mph (9 km/h) ⁽²⁾

Shift lever position	D ⁽¹⁾
	R ⁽²⁾
Torque converter clutch	During controlling operation ⁽¹⁾
No active DTCs	P0122, P0123, P0705, P0716, P0717, P0718, P0721, P0722, P0723, P0746, P0747, P0751, P0752, P0756, P0757, P0761, P0762, P0767, P0776, P0777, P0796, P0797, P0842, P0843, P0847, P0848, P0962, P0963, P0966, P0967, P0970, P0971, P0973, P0974, P0976, P0977, P0979, P0980, P0982, P0983, P1743, P1744, P1745, P1780
(1) Symptom 1	
(2) Symptom 2	

Malfunction Threshold

One of these symptoms occurs.

MALFUNCTION THRESHOLD (SYMPTOM 1)

Symptom	Gear position commanded by the PCM	Actual gear position
1	3rd --> 4th gear upshift	Turn on the 2nd clutch transmission fluid switch

MALFUNCTION THRESHOLD (SYMPTOM 2)

Symptom	Gear position commanded by the PCM	Actual gear position
2-A	Reverse gear in-gear	Neutral
2-B	Driving in Reverse gear	Neutral

Driving Pattern

Start the engine, and accelerate the vehicle until the transmission shifts into 5th gear in the D position.

- Drive the vehicle in this manner only if the traffic regulations and ambient conditions allow.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected during the first drive cycle, a Temporary DTC is stored in the PCM memory. If the malfunction recurs during the next (second) drive cycle, the MIL comes on and the DTC and the freeze frame data are stored.

Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, the Temporary DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P0767 (73): ADVANCED DIAGNOSTICS

DTC P0767: SHIFT SOLENOID VALVE D STUCK ON

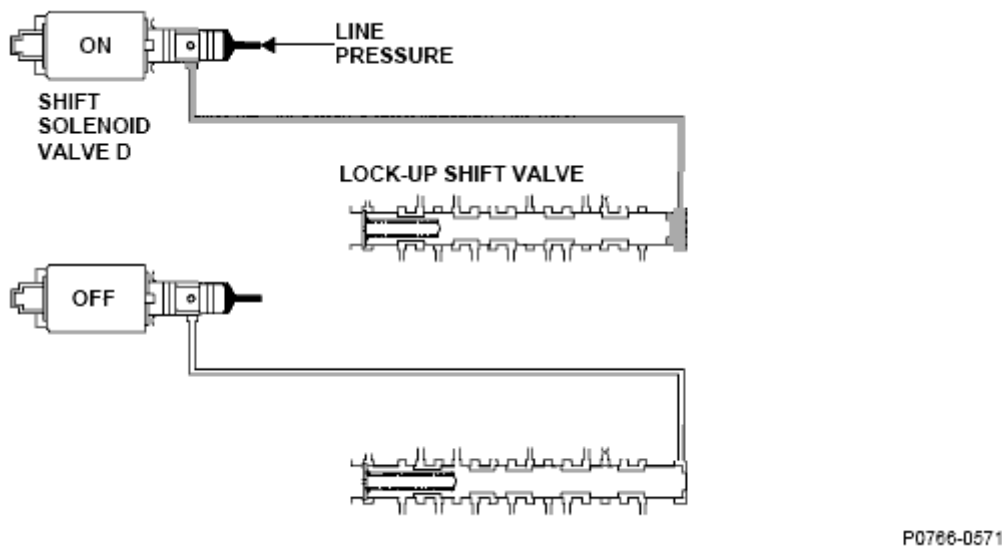


Fig. 165: Shift Solenoid Valve D - Operation Diagram

Shift solenoid valve Gear position	Shift solenoid valve A	Shift solenoid valve B	Shift solenoid valve C	Shift solenoid valve D
Park	OFF	ON	OFF	ON
Reverse	ON	ON	OFF	ON
Neutral	OFF	ON	OFF	OFF
1st	OFF	ON	ON	OFF
1st - 2nd	ON	ON	ON	OFF/ON
2nd	ON	ON	OFF	OFF/ON
2nd - 3rd	ON	ON	ON	OFF/ON
3rd	ON	OFF	ON	OFF/ON
3rd - 4th	ON	OFF	OFF	OFF/ON
4th	OFF	OFF	OFF	OFF/ON
4th - 5th	OFF	OFF	ON	OFF/ON
5th	OFF	ON	ON	OFF/ON

Fig. 166: Shift Solenoid Valve Driving Signal Combination Table

General Description

Shift solenoid valve D is installed in the transmission housing. It is controlled by the ON/OFF signal from the powertrain control module (PCM) to apply line pressure to the lock-up shift valve. The signal from the PCM is output to apply clutch pressure control pressure to the proper gear change clutch according to the gear change schedule. When the signal to shift solenoid valve D from the PCM is OFF, and line pressure is discharged, the lock-up shift valve is inactive. When the signal to shift solenoid valve D from the PCM is ON, and line pressure is applied to lock-up shift valve, it operates against the lock-up shift valve spring. The PCM monitors the input shaft (mainshaft) speed and the output shaft (countershaft) speed at the gear change

determined by the shift schedule. When an improper gear ratio is output compared to the predetermined gear change mode, a shift solenoid valve D ON failure is detected and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
Sequence	None
Duration	3 seconds or more
DTC Type	Two drive cycles, MIL ON, D indicator blinks
OBD Status	PASSED/FAILED/NOT COMPLETED (STILL TESTING)

Enable Conditions

ENABLE CONDITIONS

Condition	Minimum	Maximum
Battery voltage	11.0 V	-
Vehicle speed	-	6 mph (9 km/h)
Shift lever position	D	
No active DTCs	P0122, P0123, P0716, P0717, P0718, P0721, P0722, P0723, P0746, P0747, P0751, P0752, P0756, P0757, P0761, P0762, P0766, P0776, P0777, P0796, P0797, P0842, P0843, P0847, P0848, P0962, P0963, P0966, P0967, P0970, P0971, P0973, P0974, P0976, P0977, P0979, P0980, P0982, P0983, P1743, P1744, P1745, P1780	

Malfunction Threshold

One of these conditions occurs.

- The actual gear position is neutral for at least 3 seconds when 1st gear in-gear is commanded, though there is no record of being in neutral when reverse gear in-gear is commanded.
- The actual gear position is neutral for at least 3 seconds though 1st gear in-gear is commanded and reverse drive occurred during this driving cycle.

Driving Pattern

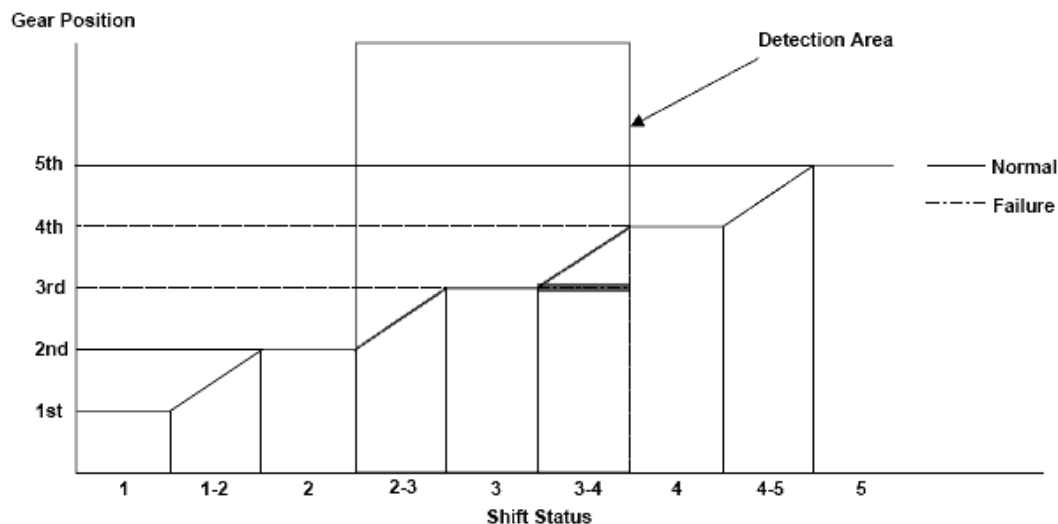
Start the engine, and accelerate the vehicle until the transmission shifts into 5th gear in the D position.

- Drive the vehicle in this manner only if the traffic regulations and ambient conditions allow.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected during the first drive cycle, a Temporary DTC is stored in the PCM memory. If the malfunction recurs during the next (second) drive cycle, the MIL comes on and the DTC and the freeze frame data are stored.



P0776-0571

Fig. 168: Gear Position VS Shift Status Graph

Shift solenoid valve Clutch		In gear	1st	1st-2nd	2nd	2nd-3rd	3rd	3rd-4th	4th	4th-5th	5th
	A	OFF	OFF	ON	ON	ON	ON	ON	OFF	OFF	OFF
	B	ON	ON	ON	ON	ON	OFF	OFF	OFF	OFF	ON
	C	OFF	ON	ON	OFF	ON	ON	OFF	OFF	ON	ON
	D	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
1st Clutch		CPC C	LINE	LINE	LINE	LINE	LINE	LINE	LINE	LINE	LINE
2nd Clutch		CPC A		CPC A	LINE	CPC A		CPC C			
3rd Clutch				CPC B		CPC B	LINE	CPC B			
4th Clutch								CPC A	LINE	CPC A	
5th Clutch										CPC B	LINE

CPC: Clutch Pressure Control pressure

Fig. 169: Hydraulic Pressure Supply To Clutch By Shift Solenoid Valve Output (D Position)**General Description**

A/T clutch pressure control solenoid valve B is installed in the transmission housing. A/T clutch pressure control solenoid valve B is operated by the powertrain control module (PCM) and converts modulated pressure to A/T clutch pressure control solenoid B pressure, which operates CPC valve B. Line pressure is modulated to clutch pressure control B pressure (CPC B pressure) by CPC valve B and the CPC valve B spring. A signal from the PCM is output to the proper gear clutch, determined by the gear schedule, to supply the proper CPC pressure according to the driving conditions. When the current from the PCM is low (OFF), A/T clutch pressure control solenoid valve B operates and the CPC valve B pressure increases. When the current from the PCM is high (ON), A/T clutch pressure control solenoid valve B turns off and the CPC valve B pressure decreases. The PCM monitors the input shaft (mainshaft) speed and the output shaft (countershaft) speed at the gear change determined by the shift schedule. When an improper gear ratio is output compared to the predetermined gear change mode, an A/T clutch pressure control solenoid valve B OFF failure is detected and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
Sequence	None
Duration	20 seconds
DTC Type	Two drive cycles, MIL ON, D indicator blinks
OBD Status	PASSED/FAILED/NOT COMPLETED (STILL TESTING)

Enable Conditions**ENABLE CONDITIONS**

Condition	Minimum	Maximum
Engine coolant temperature	50°F (10°C)	-
ATF temperature	-4°F (-20°C)	-
Vehicle speed	5 mph (8 km/h)	-
Battery voltage	11.0 V	-
Shift lever position	D	
No active DTCs	P0122, P0123, P0705, P0716, P0717, P0718, P0721, P0722, P0723, P0746, P0747, P0751, P0752, P0756, P0757, P0761, P0762, P0766, P0767, P0777, P0796, P0797, P0842, P0843, P0847, P0848, P0962, P0963, P0966, P0967, P0970, P0971, P0973, P0974, P0976, P0977, P0979, P0980, P0982, P0983, P1743, P1744, P1745, P1780	

Malfunction Threshold

The transmission is held in 3rd gear against the 3rd --> 4th gear upshift command for as long as 20 seconds, with records that the gear change time was short when the 2nd --> 3rd gear upshift was commanded.

Driving Pattern

Start the engine, and accelerate the vehicle until the transmission shifts into 5th gear in the D position.

- Drive the vehicle in this manner only if the traffic regulations and ambient conditions allow.

Diagnosis Details**Conditions for illuminating the MIL**

When a malfunction is detected during the first drive cycle, a Temporary DTC is stored in the PCM memory. If the malfunction recurs during the next (second) drive cycle, the MIL comes on and the DTC and the freeze frame data are stored.

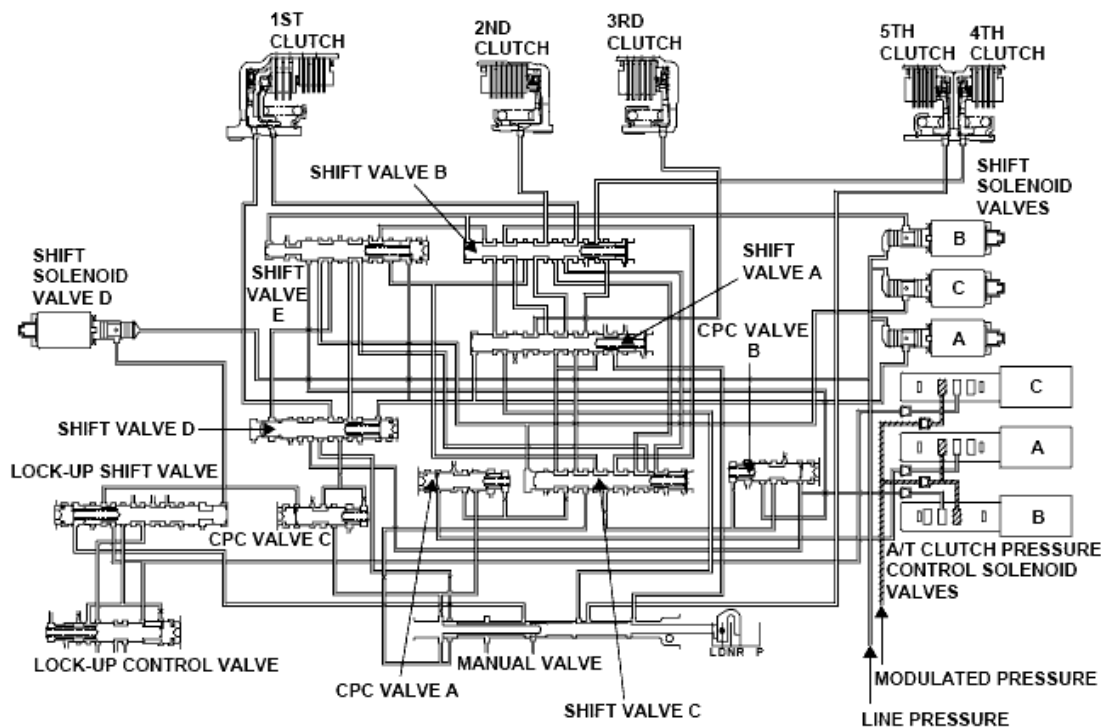
Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, the Temporary DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

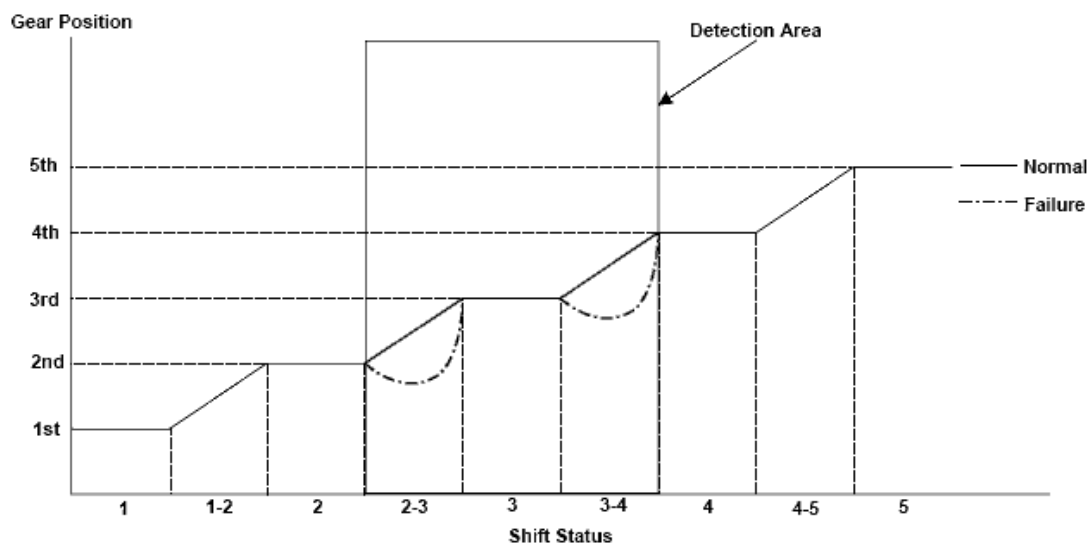
DTC P0777 (77): ADVANCED DIAGNOSTICS

DTC P0777: A/T CLUTCH PRESSURE CONTROL SOLENOID VALVE B STUCK ON



P0747-0774

Fig. 170: A/T Clutch Pressure Control Solenoid Valve B - Operation Diagram



P0777-0571

Fig. 171: Gear Position VS Shift Status Graph

Shift solenoid valve Clutch		In gear	1st	1st-2nd	2nd	2nd-3rd	3rd	3rd-4th	4th	4th-5th	5th
	A	OFF	OFF	ON	ON	ON	ON	ON	OFF	OFF	OFF
	B	ON	ON	ON	ON	ON	OFF	OFF	OFF	OFF	ON
	C	OFF	ON	ON	OFF	ON	ON	OFF	OFF	ON	ON
	D	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
1st Clutch		CPC C	LINE	LINE	LINE	LINE	LINE	LINE	LINE	LINE	LINE
2nd Clutch		CPC A		CPC A	LINE	CPC A		CPC C			
3rd Clutch				CPC B		CPC B	LINE	CPC B			
4th Clutch								CPC A	LINE	CPC A	
5th Clutch										CPC B	LINE

CPC: Clutch Pressure Control pressure

Fig. 172: Hydraulic Pressure Supply To Clutch By Shift Solenoid Valve Output (D Position)**General Description**

A/T clutch pressure control solenoid valve B is installed in the transmission housing. A/T clutch pressure control solenoid B is operated by the powertrain control module (PCM) and converts modulated pressure to A/T clutch pressure control solenoid B pressure, which operates CPC valve B. Line pressure is modulated to clutch pressure control B pressure (CPC B pressure) by CPC valve B and the CPC valve B spring. A signal from the PCM is output to the proper gear clutch, determined by the gear schedule, to supply the proper CPC pressure according to the driving conditions. When the current from the PCM is low (OFF), A/T clutch pressure control solenoid valve B operates and the CPC valve B pressure increases. When the current from the PCM is high (ON), A/T clutch pressure control solenoid valve B turns off and the CPC valve B pressure decreases. The PCM monitors the input shaft (mainshaft) speed and the output shaft (countershaft) speed at the gear change determined by the shift schedule. When an improper gear ratio is output compared to the predetermined gear change mode, an A/T clutch pressure control solenoid valve B ON failure is detected and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status**MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS**

Execution	Continuous
Sequence	None
Duration	Depending on the driving pattern
DTC Type	Two drive cycles, MIL ON, D indicator blinks
OBD Status	PASSED/FAILED/NOT COMPLETED (STILL TESTING)

Enable Conditions**ENABLE CONDITIONS**

Condition	Minimum	Maximum
Engine coolant temperature	50°F (10°C)	-
ATF temperature	-4°F (-20°C)	-
Vehicle speed	5 mph (8 km/h)	-
Battery voltage	11.0 V	-
Accelerator pedal position	-	6 %/20 milliseconds (Not fully

variation	closed)
Shift lever position	D
No active DTCs	P0122, P0123, P0705, P0716, P0717, P0718, P0721, P0722, P0723, P0746, P0747, P0751, P0752, P0756, P0757, P0761, P0762, P0766, P0767, P0776, P0796, P0797, P0842, P0843, P0847, P0848, P0962, P0963, P0966, P0967, P0970, P0971, P0973, P0974, P0976, P0977, P0979, P0980, P0982, P0983, P1743, P1744, P1745, P1780

Malfunction Threshold

The engine speed flares during 2nd - 3rd and 3rd - 4th upshifts for at least 0.5 second.

Driving Pattern

Start the engine, and accelerate the vehicle until the transmission shifts into 5th gear in the D position.

- Drive the vehicle in this manner only if the traffic regulations and ambient conditions allow.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected during the first drive cycle, a Temporary DTC is stored in the PCM memory. If the malfunction recurs during the next (second) drive cycle, the MIL comes on and the DTC and the freeze frame data are stored.

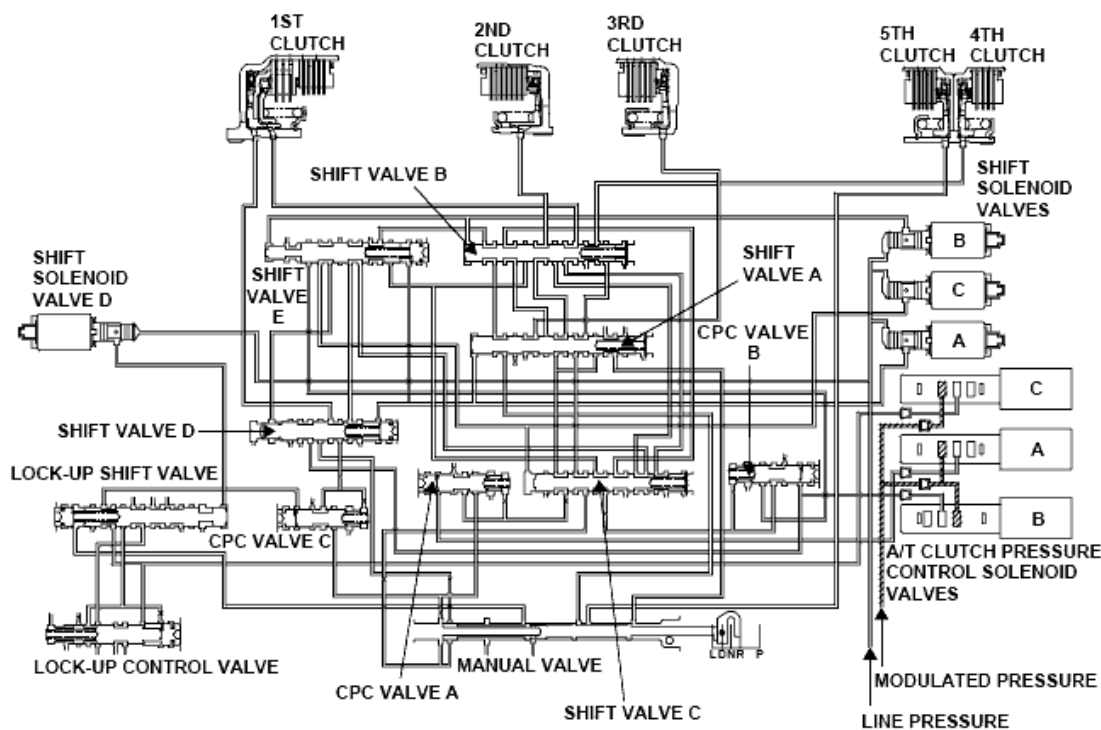
Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, the Temporary DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P0796 (7): ADVANCED DIAGNOSTICS

DTC P0796: A/T CLUTCH PRESSURE CONTROL SOLENOID VALVE C STUCK OFF



P0747-0774

Fig. 173: A/T Clutch Pressure Control Solenoid Valve C - Operation Diagram

Shift solenoid valve Clutch		In gear	1st	1st-2nd	2nd	2nd-3rd	3rd	3rd-4th	4th	4th-5th	5th
	A	OFF	OFF	ON	ON	ON	ON	ON	OFF	OFF	OFF
	B	ON	ON	ON	ON	ON	OFF	OFF	OFF	OFF	ON
	C	OFF	ON	ON	OFF	ON	ON	OFF	OFF	ON	ON
	D	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
1st Clutch	CPC C	LINE	LINE	LINE	LINE	LINE	LINE	LINE	LINE	LINE	LINE
2nd Clutch	CPC A			CPC A	LINE	CPC A		CPC C			
3rd Clutch				CPC B		CPC B	LINE	CPC B			
4th Clutch								CPC A	LINE	CPC A	
5th Clutch										CPC B	LINE

CPC: Clutch Pressure Control pressure

Fig. 174: Hydraulic Pressure Supply To Clutch By Shift Solenoid Valve Output (D Position)

General Description

A/T clutch pressure control solenoid valve C is installed in the transmission housing. A/T clutch pressure control solenoid A is operated by the powertrain control module (PCM) and converts the modulated pressure to A/T clutch pressure control solenoid A pressure, which operates CPC valve A. Line pressure is modulated to clutch pressure control A pressure (CPC A pressure) by CPC valve A and the CPC valve A spring. A signal from the PCM is output to the proper gear clutch, determined by the gear schedule, to supply the proper CPC pressure according to the driving conditions. When the current from the PCM is high (ON), A/T clutch pressure control solenoid valve C operates and the CPC valve A pressure increases. When the current from the PCM is low (OFF), A/T clutch pressure control solenoid valve C turns off and CPC valve A pressure decreases. The PCM monitors the input shaft (mainshaft) speed and the output shaft (countershaft)

speed at the gear change determined by the shift schedule. When an improper gear ratio is output compared to the predetermined gear ratio, an A/T clutch pressure control solenoid valve C OFF failure is detected and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
Sequence	None
Duration	3 seconds or more (symptom 1, 2, 3)
DTC Type	Two drive cycles, MIL ON, D indicator blinks
OBD Status	PASSED/FAILED/NOT COMPLETED (STILL TESTING)

Enable Conditions

ENABLE CONDITIONS

Condition	Minimum	Maximum
Battery voltage	11.0 V	-
Vehicle speed	-	6 mph (9 km/h)
Shift lever position	D, L, R	
No active DTCs	P0122, P0123, P0716, P0717, P0718, P0721, P0722, P0723, P0746, P0747, P0751, P0752, P0756, P0757, P0761, P0762, P0766, P0767, P0776, P0777, P0797, P0842, P0843, P0847, P0848, P0962, P0963, P0966, P0967, P0970, P0971, P0973, P0974, P0976, P0977, P0979, P0980, P0982, P0983, P1743, P1744, P1745, P1780	

Malfunction Threshold

One of these symptom combinations occurs.

- Symptom 1 occurs.
- Symptom 2 occurs after symptom 1 occurs during the same drive cycle.
- Drive in the R position after symptom 2 occurred. (Symptom 3)

MALFUNCTION THRESHOLD (SYMPTOM 1)

Symptom	Gear position commanded by the PCM	Actual gear position
1	1st gear in-gear	Neutral

MALFUNCTION THRESHOLD (SYMPTOM 2)

Symptom	Gear position commanded by the PCM	Actual gear position
2	Reverse gear in-gear	Neutral

Driving Pattern

Start the engine and put the vehicle in 1st gear. Then drive in the R position.

- Drive the vehicle in this manner only if the traffic regulations and ambient conditions allow.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected during the first drive cycle, a Temporary DTC is stored in the PCM memory. If the malfunction recurs during the next (second) drive cycle, the MIL comes on and the DTC and the freeze frame data are stored.

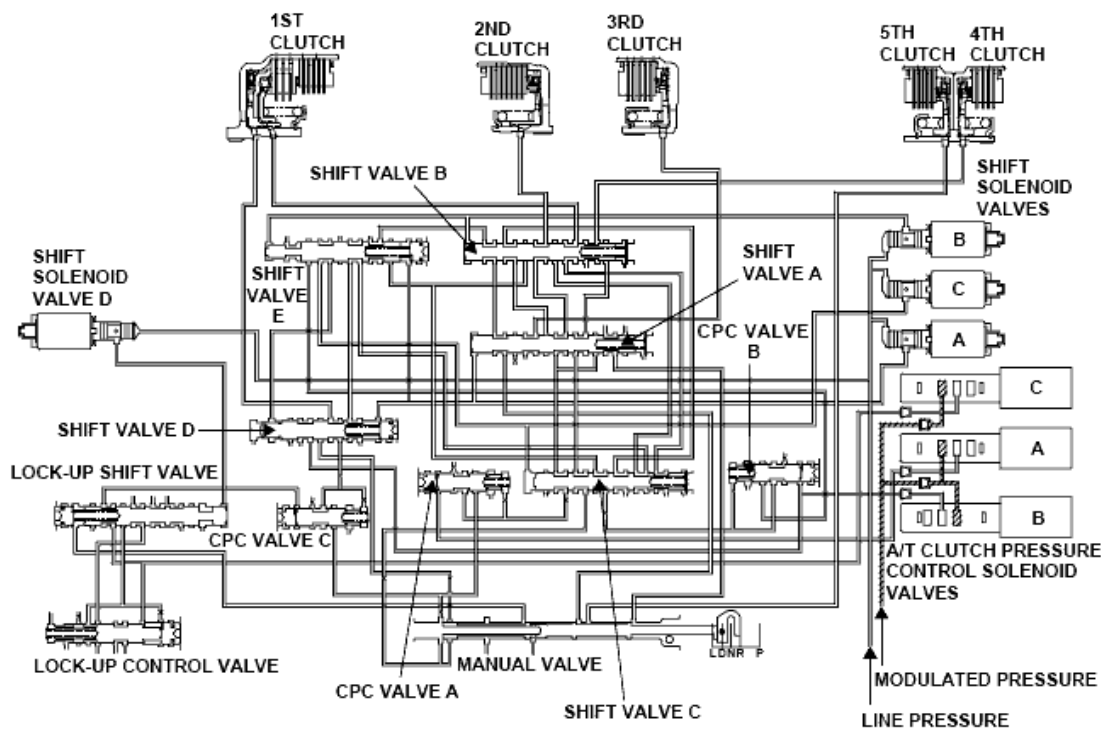
Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, the Temporary DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

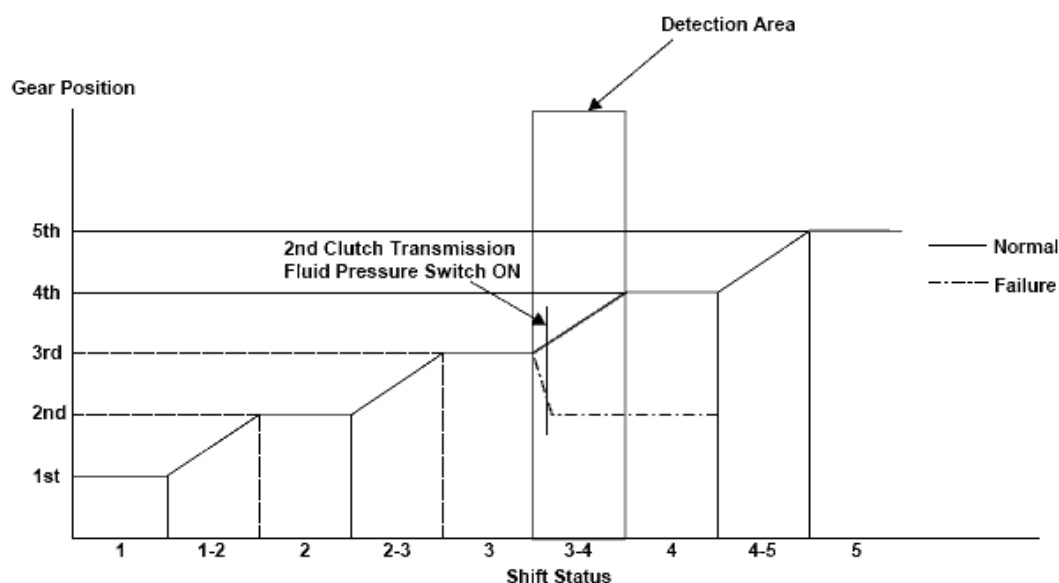
DTC P0797 (78): ADVANCED DIAGNOSTICS

DTC P0797: A/T CLUTCH PRESSURE CONTROL SOLENOID VALVE C STUCK ON



P0747-0774

Fig. 175: A/T Clutch Pressure Control Solenoid Valve C - Operation Diagram



P0766-0570

Fig. 176: Gear Position VS Shift Status Graph

Shift solenoid valve	Clutch	In gear	1st	1st-2nd	2nd	2nd-3rd	3rd	3rd-4th	4th	4th-5th	5th
		A	B	C	D	A	B	C	D	A	B
Shift solenoid valve	A	OFF	OFF	ON	ON	ON	ON	ON	OFF	OFF	OFF
	B	ON	ON	ON	ON	ON	OFF	OFF	OFF	OFF	ON
	C	OFF	ON	ON	OFF	ON	ON	OFF	OFF	ON	ON
	D	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
1st Clutch		CPC C	LINE	LINE	LINE	LINE	LINE	LINE	LINE	LINE	LINE
2nd Clutch		CPC A		CPC A	LINE	CPC A		CPC C			
3rd Clutch				CPC B		CPC B	LINE	CPC B			
4th Clutch								CPC A	LINE	CPC A	
5th Clutch										CPC B	LINE

CPC: Clutch Pressure Control pressure

Fig. 177: Hydraulic Pressure Supply To Clutch By Shift Solenoid Valve Output (D Position)**General Description**

A/T clutch pressure control solenoid valve C is installed in the transmission housing. A/T clutch pressure control solenoid A is operated by the powertrain control module (PCM) and converts the modulated pressure to A/T clutch pressure control solenoid A pressure, which operates CPC valve A. Line pressure is modulated to clutch pressure control A pressure (CPC A pressure) by CPC valve A and the CPC valve A spring. A signal from the PCM is output to the proper gear clutch, determined by the gear schedule, to supply the proper CPC pressure according to the driving conditions. When the current from the PCM is high (ON), A/T clutch pressure control solenoid valve C operates and the CPC valve A pressure increases. When the current from the PCM is low (OFF), A/T clutch pressure control solenoid valve C turns off and CPC valve A pressure decreases. The PCM monitors the transmission fluid pressure switch at the gear change determined by the shift schedule. When the wrong transmission fluid pressure switch is turned on, an A/T clutch pressure control solenoid valve C turn-on malfunction is detected and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
Sequence	None
Duration	20 seconds
DTC Type	Two drive cycles, MIL ON, D indicator blinks
OBD Status	PASSED/FAILED/NOT COMPLETED (STILL TESTING)

Enable Conditions**ENABLE CONDITIONS**

Condition	Minimum	Maximum
Battery voltage	11.0 V	-
Shift lever position	D	
No active DTCs	P0122, P0123, P0705, P0716, P0717, P0718, P0721, P0722, P0723, P0746, P0747, P0751, P0752, P0756, P0757, P0761, P0762, P0766, P0767, P0776, P0777, P0796, P0842, P0843, P0847, P0848, P0962, P0963, P0966, P0967, P0970, P0971, P0973, P0974, P0976, P0977, P0979, P0980, P0982, P0983, P1743, P1744, P1745, P1780	

Malfunction Threshold

The 2nd clutch transmission fluid switch is ON against the 3rd --> 4th gear upshift command for as long as 20 seconds.

Driving Pattern

Start the engine, and accelerate the vehicle until the transmission shifts into 5th gear in the D position.

- Drive the vehicle in this manner only if the traffic regulations and ambient conditions allow.

Diagnosis Details**Conditions for illuminating the MIL**

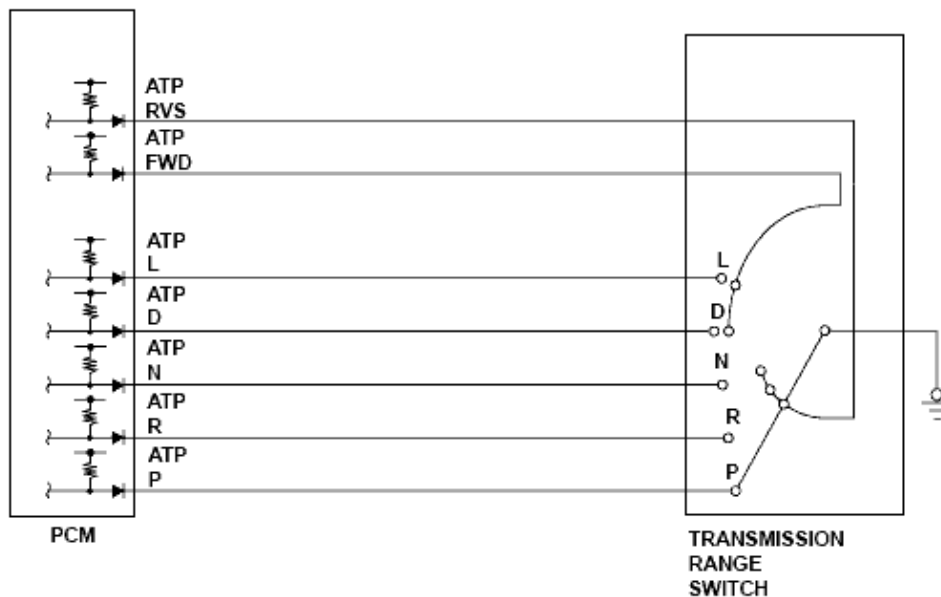
When a malfunction is detected during the first drive cycle, a Temporary DTC is stored in the PCM memory. If the malfunction recurs during the next (second) drive cycle, the MIL comes on and the DTC and the freeze frame data are stored.

Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, the Temporary DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P0812 (65): ADVANCED DIAGNOSTICS

DTC P0812: OPEN IN TRANSMISSION RANGE SWITCH ATP R SWITCH CIRCUIT

P0705-0703

Fig. 178: Transmission Range Switch ATP R Switch Circuit Diagram**SHIFT LEVER POSITION REFERENCE**

Shift lever position	Input per switch						
	P	R	N	D	L	FWD	RVS
P	o	X	X	X	X	X	o
R	X	o	X	X	X	X	o
N	X	X	o	X	X	X	o
D	X	X	X	o	X	o	X
L	X	X	X	X	o	o	X

o: Closed X: Open

General Description

The transmission range switch is attached to the control shaft. Operating the shift lever makes the control shaft rotate via the shift cable. The A/T gear position indicator indicates which position is selected according to the Low/High signal combinations which vary based on the control shaft rotational angle. The control shaft changes the position of the transmission range switch, activates the manual valve, and switches hydraulic pressure to shift the transmission through forward/neutral/reverse. The transmission range switch signal is used to determine the shift schedule. The voltage is 12 V (High) at the powertrain control module (PCM) input terminal when each transmission range switch position is open, and it is 0 V (Low) when each switch is closed. If the R switch is OPEN with the shift lever in the R position, the PCM detects a switch OPEN failure and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status**MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS**

Execution	Continuous

Sequence	None
Duration	Depending on the driving pattern
DTC Type	Two drive cycles, MIL ON, D indicator blinks
OBD Status	PASSED/FAILED/NOT COMPLETED (STILL TESTING)

Enable Conditions

ENABLE CONDITIONS

Condition	Minimum	Maximum
Battery voltage	11.0 V	-
Engine speed	1,000 rpm	-
Shift lever position	R	
No active DTCs	P0705, P0716, P0717, P0721, P0722, P1717	

Malfunction Threshold

The RVS signal is detected but the R signal is not detected for at least 2 seconds.

Driving Pattern

1. Start the engine, shift to the R position, and drive the vehicle at a speed of 3 mph (5 km/h) or less for at least 2 seconds.
2. Drive the vehicle at a speed of 3 mph (5 km/h) or more for at least 2 seconds in the R position.
 - Drive the vehicle in this manner only if the traffic regulations and ambient conditions allow.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected during the first drive cycle, a Temporary DTC is stored in the PCM memory. If the malfunction recurs during the next (second) drive cycle, the MIL comes on and the DTC and the freeze frame data are stored.

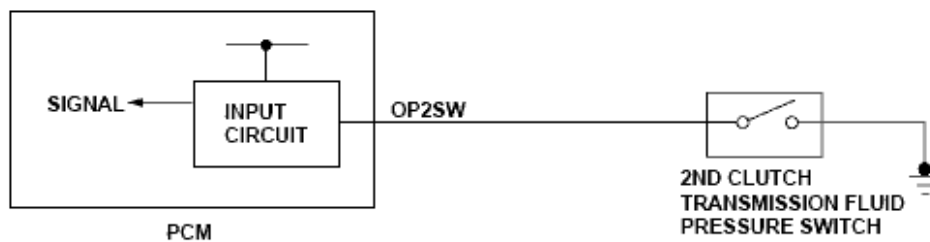
Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, the Temporary DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

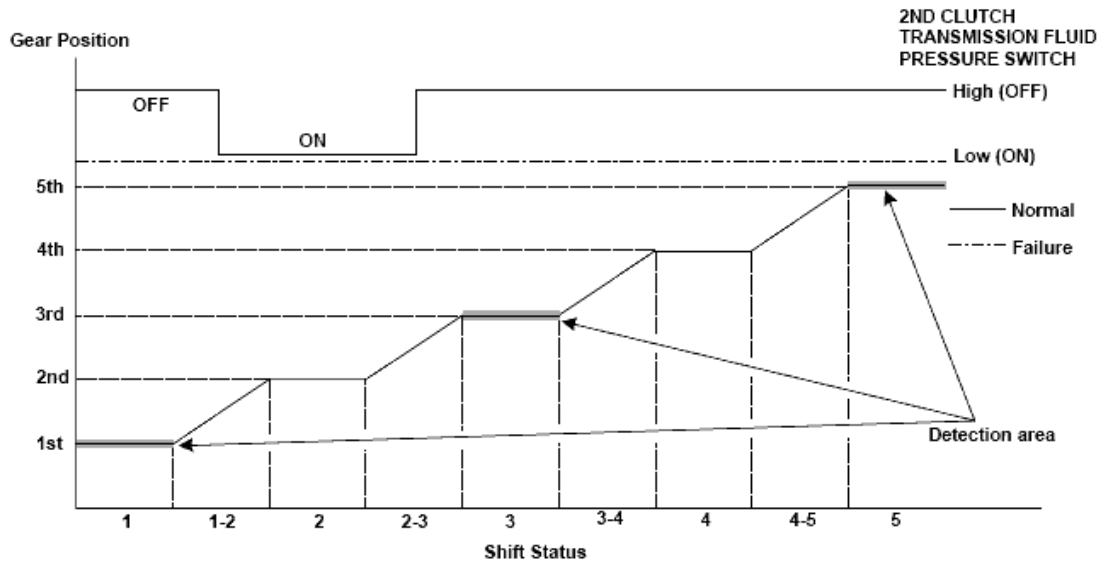
DTC P0842 (25): ADVANCED DIAGNOSTICS

DTC P0842: SHORT IN 2ND CLUTCH TRANSMISSION FLUID PRESSURE SWITCH CIRCUIT, OR 2ND CLUTCH TRANSMISSION FLUID PRESSURE SWITCH STUCK ON



P0842-0601

Fig. 179: 2nd Clutch Transmission Fluid Pressure Switch - Circuit Diagram



P0842-0670

Fig. 180: Gear Position VS Shift Status Graph

General Description

The 2nd clutch transmission fluid pressure switch is installed in the hydraulic pressure circuit to the 2nd clutch. When hydraulic pressure is supplied to the 2nd clutch, the switch is turned ON. When hydraulic pressure is not supplied to the 2nd clutch, the switch is turned OFF. The signal from the 2nd clutch transmission fluid pressure switch is input to the powertrain control module (PCM). The PCM detects the hydraulic pressure supply conditions at the gear change to 2nd gear (1st --> 2nd, 3rd --> 2nd) to reduce the shock that occurs at the gear change.

If the 2nd clutch transmission fluid pressure switch is ON while driving the vehicle with the speed ratio of the output shaft (countershaft) to the input shaft (mainshaft) other than the 2nd ratio, the PCM detects a 2nd clutch transmission fluid pressure switch failure and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
Sequence	None
Duration	2 seconds or more
DTC Type	One drive cycle, MIL ON, D indicator blinks

OBD Status	PASSED/FAILED/NOT COMPLETED (STILL TESTING)
------------	---

Enable Conditions

ENABLE CONDITIONS

Condition	Minimum	Maximum
Battery voltage	11.0 V	-
No active DTCs	P0122, P0123, P0705, P0716, P0717, P0721, P0722, P0746, P0747, P0751, P0752, P0756, P0757, P0761, P0762, P0766, P0767, P0776, P0777, P0796, P0797, P0843, P0847, P0848, P0962, P0963, P0966, P0967, P0970, P0971, P0973, P0974, P0976, P0977, P0979, P0980, P0982, P0983, P1743, P1744, P1745, P1780	
Others	Not during shifting	

Malfunction Threshold

The input signal from the 2nd clutch transmission fluid pressure switch to the PCM is low when driving in 1st gear, 3rd gear, or 5th gear.

Driving Pattern

Start the engine, and drive the vehicle in the D position and 3rd gear for at least 2 seconds.

- Drive the vehicle in this manner only if the traffic regulations and ambient conditions allow.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected, the MIL comes on and the DTC and the freeze frame data are stored in the PCM memory.

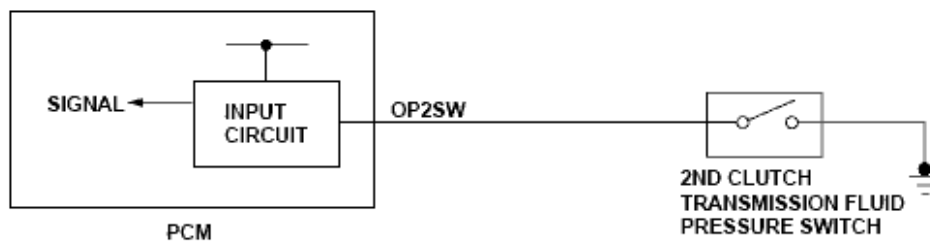
Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

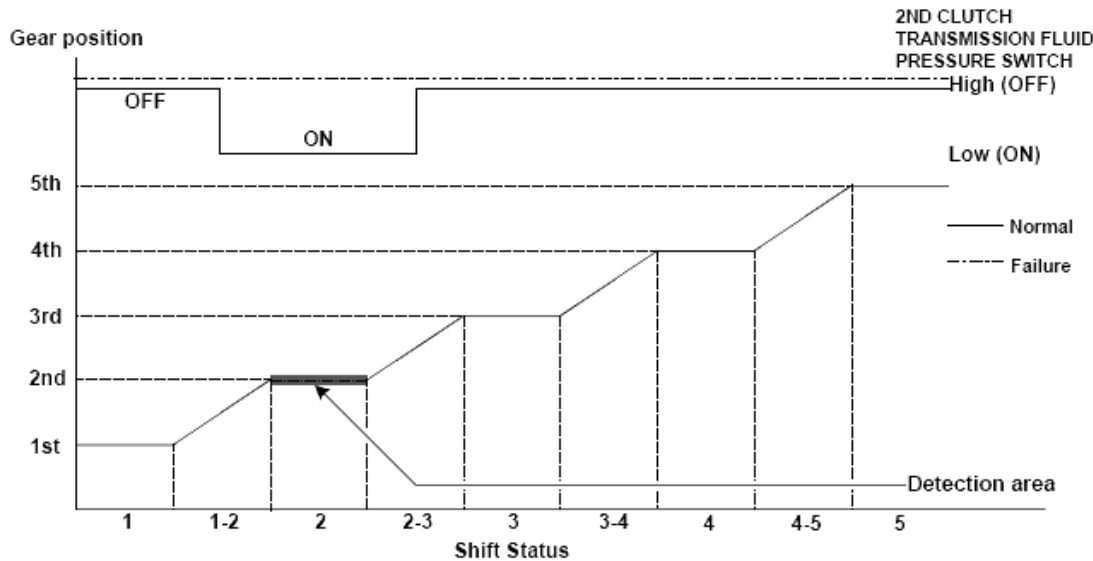
DTC P0843 (25): ADVANCED DIAGNOSTICS

DTC P0843: OPEN IN 2ND CLUTCH TRANSMISSION FLUID PRESSURE SWITCH CIRCUIT, OR 2ND CLUTCH TRANSMISSION FLUID PRESSURE SWITCH STUCK OFF



P0842-0801

Fig. 181: 2nd Clutch Transmission Fluid Pressure Switch - Circuit Diagram



P0843-0370

Fig. 182: Gear Position VS Shift Status Graph

General Description

The 2nd clutch transmission fluid pressure switch is installed in the hydraulic pressure circuit to the 2nd clutch. When hydraulic pressure is supplied to the 2nd clutch, the switch is turned ON. When hydraulic pressure is not supplied to the 2nd clutch, the switch is turned OFF. The signal from the 2nd clutch transmission fluid pressure switch is input to the powertrain control module (PCM). The PCM detects the hydraulic pressure supply conditions at the gear change to 2nd gear (1st --> 2nd, 3rd --> 2nd) to reduce the shock that occurs at the gear change. If the 2nd clutch transmission fluid pressure switch is OFF while the rotation speed ratio of the input/output pulses is that of 2nd gear, the PCM detects a malfunction in the 2nd clutch transmission fluid pressure switch and stores a DTC.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
Sequence	None
Duration	2 seconds or more
DTC Type	One drive cycle, MIL ON, D indicator blinks
OBD Status	PASSED/FAILED/NOT COMPLETED (STILL TESTING)

Enable Conditions**ENABLE CONDITIONS**

Condition	Minimum	Maximum
Battery voltage	11.0 V	-
No active DTCs	P0122, P0123, P0705, P0716, P0717, P0721, P0722, P0746, P0747, P0751, P0752, P0756, P0757, P0761, P0762, P0766, P0767, P0776, P0777, P0796, P0797, P0842, P0847, P0848, P0962, P0963, P0966, P0967, P0970, P0971, P0973, P0974, P0976, P0977, P0979, P0980, P0982, P0983, P1743, P1744, P1745, P1780	
Others	Not during shifting	

Malfunction Threshold

The input signal from the 2nd clutch transmission fluid pressure switch to the PCM is high when driving in 2nd gear.

Driving Pattern

Start the engine, and drive the vehicle in the D position and 2nd gear for at least 2 seconds.

- Drive the vehicle in this manner only if the traffic regulations and ambient conditions allow.

Diagnosis Details**Conditions for illuminating the MIL**

When a malfunction is detected, the MIL comes on and the DTC and the freeze frame data are stored in the PCM memory.

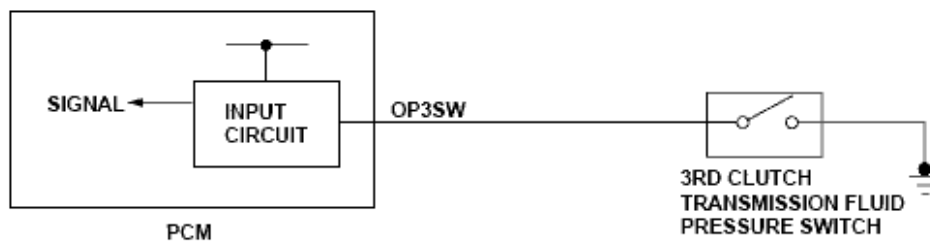
Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

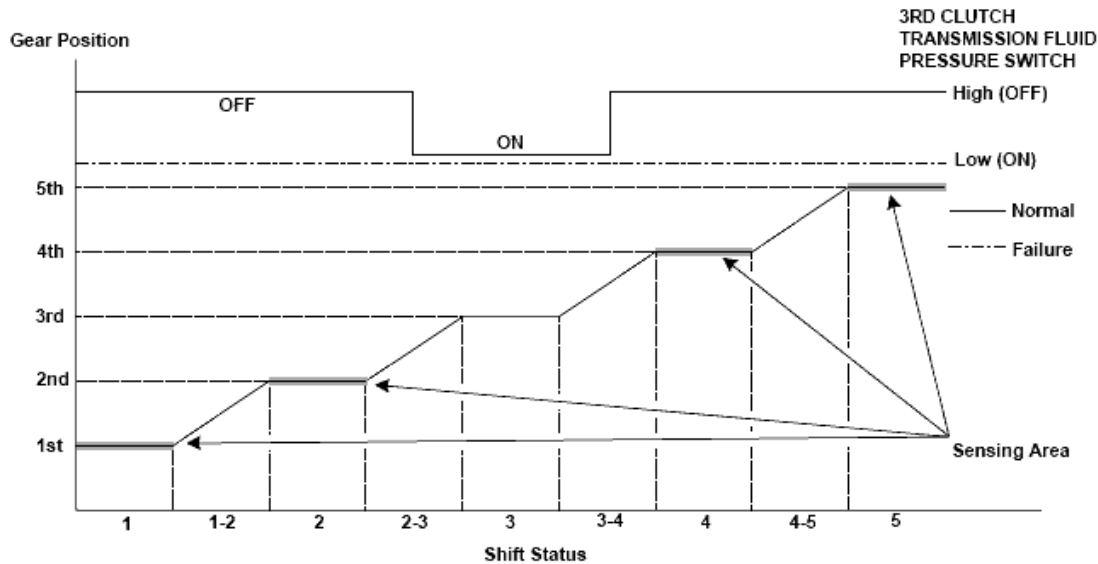
DTC P0847 (26): ADVANCED DIAGNOSTICS

DTC P0847: SHORT IN 3RD CLUTCH TRANSMISSION FLUID PRESSURE SWITCH CIRCUIT, OR 3RD CLUTCH TRANSMISSION FLUID PRESSURE SWITCH STUCK ON



P0847-0601

Fig. 183: 3rd Clutch Transmission Fluid Pressure Switch - Circuit Diagram



P0847-0670

Fig. 184: Gear Position VS Shift Status Graph

General Description

The 3rd clutch transmission fluid pressure switch is installed in the hydraulic pressure circuit to the 3rd clutch. When hydraulic pressure is supplied to the 3rd clutch, the switch is turned ON. When hydraulic pressure is not supplied to the 3rd clutch, the switch is turned OFF. The signal from the 3rd clutch transmission fluid pressure switch is input to the powertrain control module (PCM). The PCM detects the hydraulic pressure supply conditions at the gear change to 3rd gear (2nd --> 3rd, 4th --> 3rd) to reduce the shock that occurs at the gear change.

If the 3rd clutch transmission fluid pressure switch is ON while driving, and the speed ratio of the output shaft (countershaft) to the input shaft (mainshaft) is other than the 3rd ratio, the PCM detects a 3rd clutch transmission fluid pressure switch failure, and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
Sequence	None
Duration	2 seconds or more
DTC Type	One drive cycle, MIL ON, D indicator blinks

OBD Status	PASSED/FAILED/NOT COMPLETED (STILL TESTING)
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Enable Conditions

ENABLE CONDITIONS

Condition	Minimum	Maximum
Battery voltage	11.0 V	-
No active DTCs	P0116, P0117, P0118, P0122, P0123, P0705, P0716, P0717, P0721, P0722, P0746, P0747, P0751, P0752, P0756, P0757, P0761, P0762, P0766, P0767, P0776, P0777, P0796, P0797, P0842, P0843, P0848, P0962, P0963, P0966, P0967, P0970, P0971, P0973, P0974, P0976, P0977, P0979, P0980, P0982, P0983, P1743, P1744, P1745, P1780	
Other	Not during shifting	

Malfunction Threshold

The input signal from the 3rd clutch transmission fluid pressure switch to the PCM is low when driving in 1st gear, 2nd gear, 4th gear or 5th gear.

Driving Pattern

Start the engine, and drive the vehicle in the D position and 4th gear for at least 2 seconds.

- Drive the vehicle in this manner only if the traffic regulations and ambient conditions allow.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected, the MIL comes on and the DTC and the freeze frame data are stored in the PCM memory.

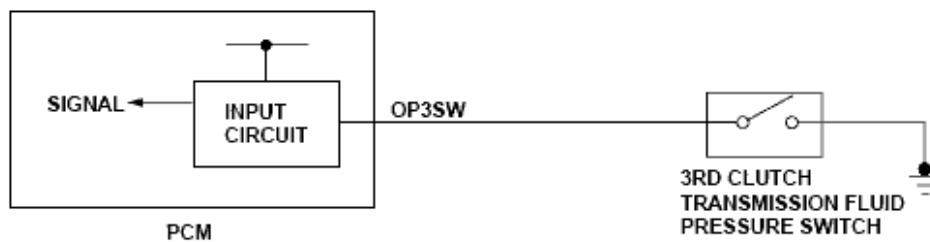
Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

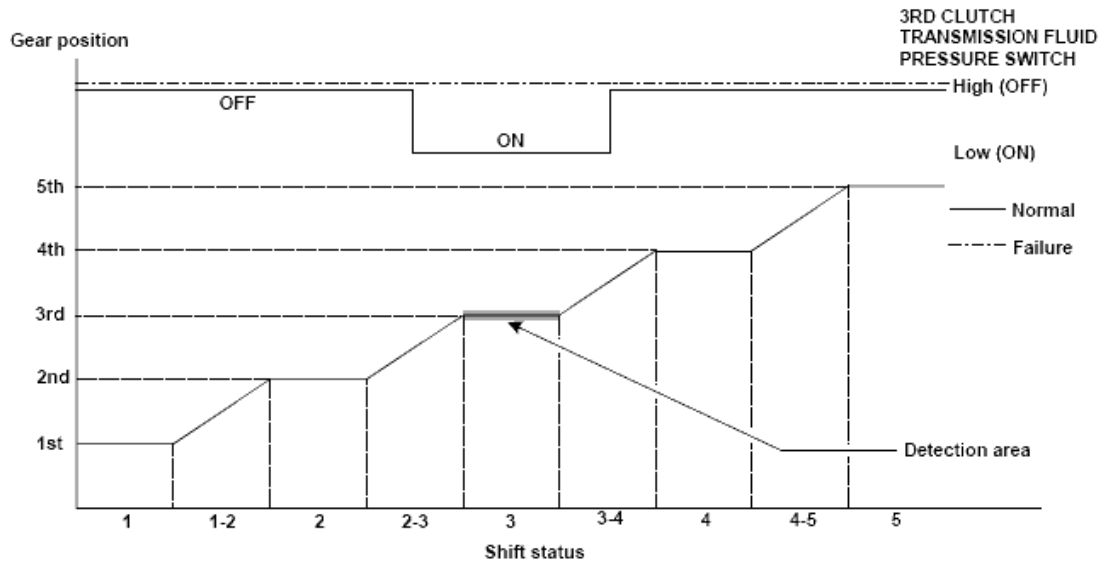
DTC P0848 (26): ADVANCED DIAGNOSTICS

DTC P0848: OPEN IN 3RD CLUTCH TRANSMISSION FLUID PRESSURE SWITCH CIRCUIT, OR 3RD CLUTCH TRANSMISSION FLUID PRESSURE SWITCH STUCK OFF



P0847-0801

Fig. 185: 3rd Clutch Transmission Fluid Pressure Switch Circuit Diagram



P0848-0370

Fig. 186: Gear Position VS Shift Status Graph

General Description

The 3rd clutch transmission fluid pressure switch is installed in the hydraulic pressure circuit to the 3rd clutch. When hydraulic pressure is supplied to the 3rd clutch, the switch is turned ON. When hydraulic pressure is not supplied to the 3rd clutch, the switch is turned OFF. The signal from the 3rd clutch transmission fluid pressure switch is input to the powertrain control module (PCM). The PCM detects the hydraulic pressure supply conditions at the gear change to 3rd gear (2nd --> 3rd, 4th --> 3rd) to reduce the shock that occurs at the gear change. If the 3rd clutch transmission fluid pressure switch is OFF while the rotation speed ratio of the input/output pulses is that of 3rd gear, the PCM detects a malfunction in the 3rd clutch transmission fluid pressure switch and stores a DTC.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
Sequence	None
Duration	2 seconds or more
DTC Type	One drive cycle, MIL ON, D indicator blinks
OBD Status	PASSED/FAILED/NOT COMPLETED (STILL TESTING)

Enable Conditions**ENABLE CONDITIONS**

Condition	Minimum	Maximum
Battery voltage	11.0 V	-
No active DTCs	P0116, P0117, P0118, P0122, P0123, P0705, P0716, P0717, P0721, P0722, P0746, P0747, P0751, P0752, P0756, P0757, P0761, P0762, P0766, P0767, P0776, P0777, P0796, P0797, P0842, P0843, P0847, P0962, P0963, P0966, P0967, P0970, P0971, P0973, P0974, P0976, P0977, P0979, P0980, P0982, P0983, P1743, P1744, P1745, P1780	

Malfunction Threshold

The input signal from the 3rd clutch transmission fluid pressure switch to the PCM is high when driving in 3rd gear.

Driving Pattern

Start the engine, and drive the vehicle in the D position and 3rd gear for at least 2 seconds.

- Drive the vehicle in this manner only if the traffic regulations and ambient conditions allow.

Diagnosis Details**Conditions for illuminating the MIL**

When a malfunction is detected, the MIL comes on and the DTC and the freeze frame data are stored in the PCM memory.

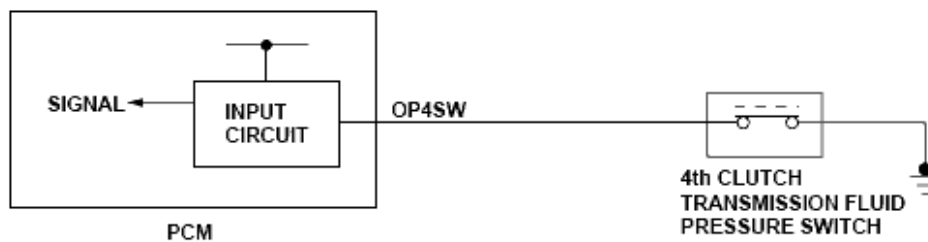
Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

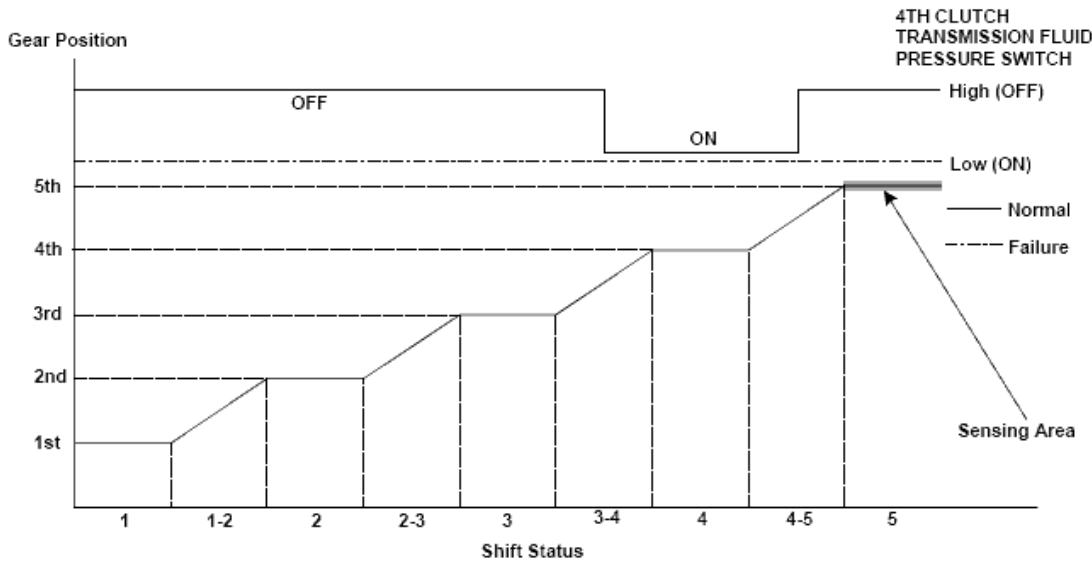
DTC P0872 (27): ADVANCED DIAGNOSTICS

DTC P0872: SHORT IN 4TH CLUTCH TRANSMISSION FLUID PRESSURE SWITCH CIRCUIT, OR 4TH CLUTCH TRANSMISSION FLUID PRESSURE SWITCH STUCK ON



P0872-0301

Fig. 187: 4th Clutch Transmission Fluid Pressure Switch Circuit Diagram



P0872-0370

Fig. 188: Gear Position VS Shift Status Graph

General Description

The 4th clutch transmission fluid pressure switch is installed in the hydraulic pressure circuit to the 4th clutch. When hydraulic pressure is supplied to the 4th clutch, the switch is turned ON. When hydraulic pressure is not supplied to the 4th clutch, the switch is turned OFF. The signal from the 4th clutch transmission fluid pressure switch is input to the powertrain control module (PCM). The PCM detects the hydraulic pressure supply conditions at the gear change to 4th gear (3rd --> 4th, 5th --> 4th) to reduce the shock that occurs at the gear change.

If the 4th clutch transmission fluid pressure switch is ON while driving, and the speed ratio of the output shaft (countershaft) to input shaft (mainshaft) is other than 4th gear (the ratio is Neutral or 5th), the PCM detects a 4th clutch transmission fluid pressure switch failure and stores DTC.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
Sequence	None
Duration	2 seconds or more
DTC Type	One drive cycle, MIL OFF, D indicator blinks

OBD Status	PASSED/FAILED/NOT COMPLETED (STILL TESTING)
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Enable Conditions**ENABLE CONDITIONS**

Condition	Minimum	Maximum
Battery voltage	11.0 V	-
No active DTCs	P0116, P0117, P0118, P0122, P0123, P0705, P0716, P0717, P0721, P0722, P0746, P0747, P0751, P0752, P0756, P0757, P0761, P0762, P0766, P0767, P0776, P0777, P0796, P0797, P0842, P0843, P0847, P0848, P0962, P0963, P0966, P0967, P0970, P0971, P0973, P0974, P0976, P0977, P0979, P0980, P0982, P0983, P1743, P1744, P1745, P1780	

Malfunction Threshold

The input signal from the 4th clutch transmission fluid pressure switch to the PCM is low when driving in 5th gear.

Driving Pattern

Start the engine, and drive the vehicle in the D position and 5th gear for at least 2 seconds.

- Drive the vehicle in this manner only if the traffic regulations and ambient conditions allow.

Diagnosis Details**Conditions for illuminating the indicator**

When a malfunction is detected, the D indicator blinks, and the DTC and the freeze frame data are stored in the PCM memory. The MIL does not come on.

Conditions for clearing the DTC

The DTC and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P0873 (27): ADVANCED DIAGNOSTICS

DTC P0873: OPEN IN 4TH CLUTCH TRANSMISSION FLUID PRESSURE SWITCH CIRCUIT, OR 4TH CLUTCH TRANSMISSION FLUID PRESSURE SWITCH STUCK OFF

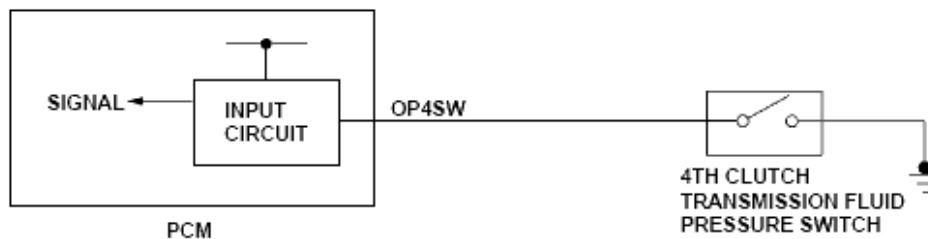
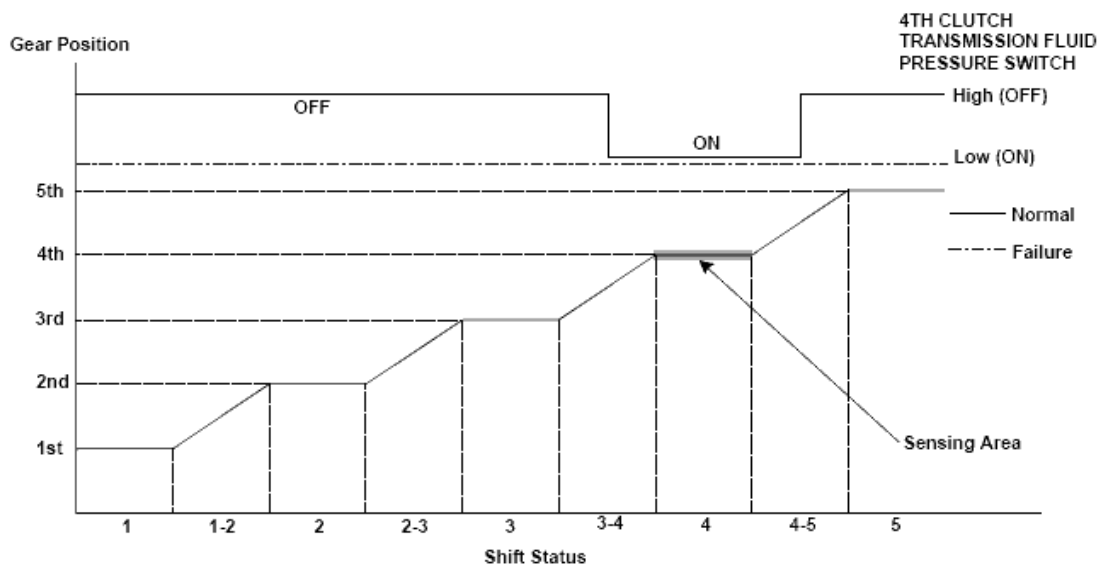


Fig. 189: 4th Clutch Transmission Fluid Pressure Switch Circuit Diagram

P0673-0370

Fig. 190: Gear Position VS Shift Status Graph**General Description**

The 4th clutch transmission fluid pressure switch is installed in the hydraulic pressure circuit to the 4th clutch. When hydraulic pressure is supplied to the 4th clutch, the switch is turned ON. When hydraulic pressure is not supplied to the 4th clutch, the switch is turned OFF. The signal from the 4th clutch transmission fluid pressure switch is input to the powertrain control module (PCM). The PCM detects the hydraulic pressure supply conditions at the gear change to 4th gear (3rd --> 4th, 5th --> 4th) to reduce the shock that occurs at the gear change. If the 4th clutch transmission fluid pressure switch is OFF while driving with the rotation speed ratio of the input/output pulses in 4th gear, the PCM detects a 4th clutch transmission fluid pressure switch failure and stores a DTC.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status**MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS**

Execution	Continuous
Sequence	None
Duration	2 seconds or more
DTC Type	One drive cycle, MIL OFF, D indicator blinks
OBD Status	PASSED/FAILED/NOT COMPLETED (STILL TESTING)

Enable Conditions**ENABLE CONDITIONS**

Condition	Minimum	Maximum
Battery voltage	11.0 V	-
	P0116, P0117, P0118, P0122, P0123, P0705, P0716, P0717, P0721, P0722, P0746, P0747, P0751, P0752, P0756, P0757, P0761, P0762, P0766, P0767, P0776, P0777,	

No active
DTCs

P0796, P0797, P0842, P0843, P0847, P0848, P0962, P0963, P0966, P0967, P0970, P0971, P0973, P0974, P0976, P0977, P0979, P0980, P0982, P0983, P1743, P1744, P1745, P1780

Malfunction Threshold

The input signal from the 4th clutch transmission fluid pressure switch to the PCM is high when driving in 4th gear.

Driving Pattern

Start the engine, and drive the vehicle in the D position and 4th gear for at least 2 seconds.

- Drive the vehicle in this manner only if the traffic regulations and ambient conditions allow.

Diagnosis Details

Conditions for illuminating the indicator

When a malfunction is detected, the D indicator blinks, and the DTC and the freeze frame data are stored in the PCM memory. The MIL does not come on.

Conditions for clearing the DTC

The DTC and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P0957 (24): ADVANCED DIAGNOSTICS

DTC P0957: SHORT IN TRANSMISSION GEAR SELECTION SWITCH CIRCUIT, OR TRANSMISSION GEAR SELECTION SWITCH STUCK ON

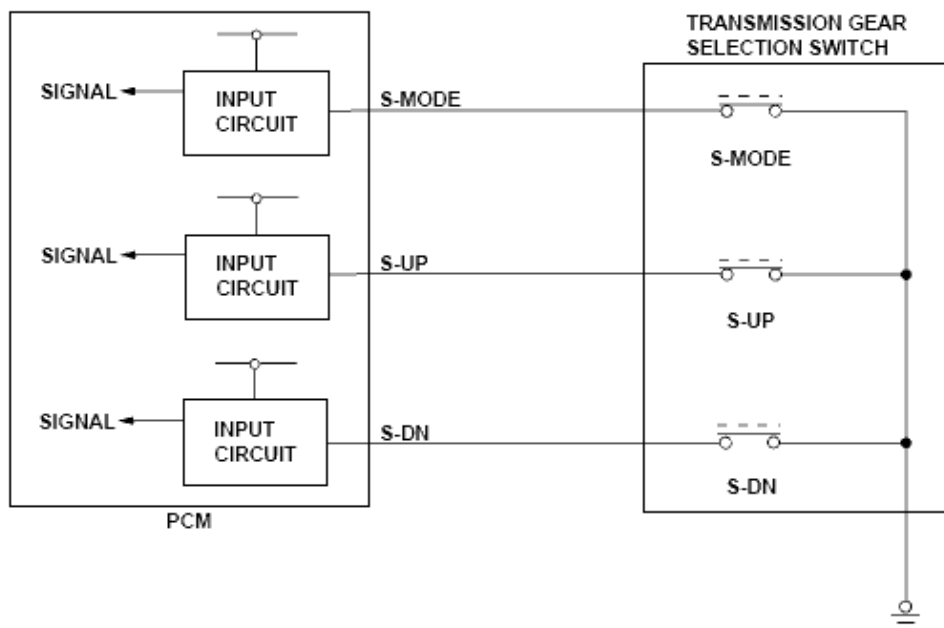


Fig. 191: Transmission Gear Selection Switch Circuit Diagram

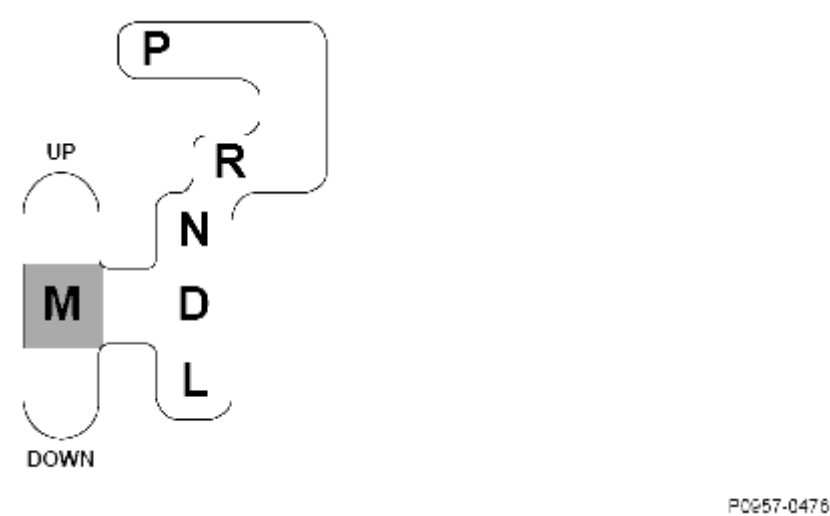


Fig. 192: Transmission Gear Shift Selection Position

General Description

When the shift lever is move to the M position (the sequential sportshift mode is selected), the upshift switch and the downshift switch can be used. When the shift lever is moved toward the upshift switch, an upshift is executed, and when the shift lever is moved toward the downshift switch, a downshift is executed. The sequential sportshift mode switch signal, the upshift switch signal, and the downshift switch signal are grounded when turned on and opened when turned off.

When the sequential sportshift mode switch of the powertrain control module (PCM) is turned on in the P, R, N, or L position, a malfunction of the transmission gear selection switch is detected and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
Sequence	None
Duration	10 seconds or more
DTC Type	One drive cycle, MIL ON, D indicator blinks
OBD Status	PASSED/FAILED/NOT COMPLETED (STILL TESTING)

Enable Conditions

ENABLE CONDITIONS

Condition	Minimum	Maximum
Battery voltage	11.0 V	-
No active DTCs	P0705, P0706	

Malfunction Threshold

When the sequential sportshift mode switch signal is turned on in the P, R, N, or L position for 10 seconds or more.

Driving Pattern

Start the engine, shift to P position, and wait for at least 10 seconds.

- Drive the vehicle in this manner only if the traffic regulations and ambient conditions allow.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected, the MIL comes on and the DTC and the freeze frame data are stored in the PCM memory.

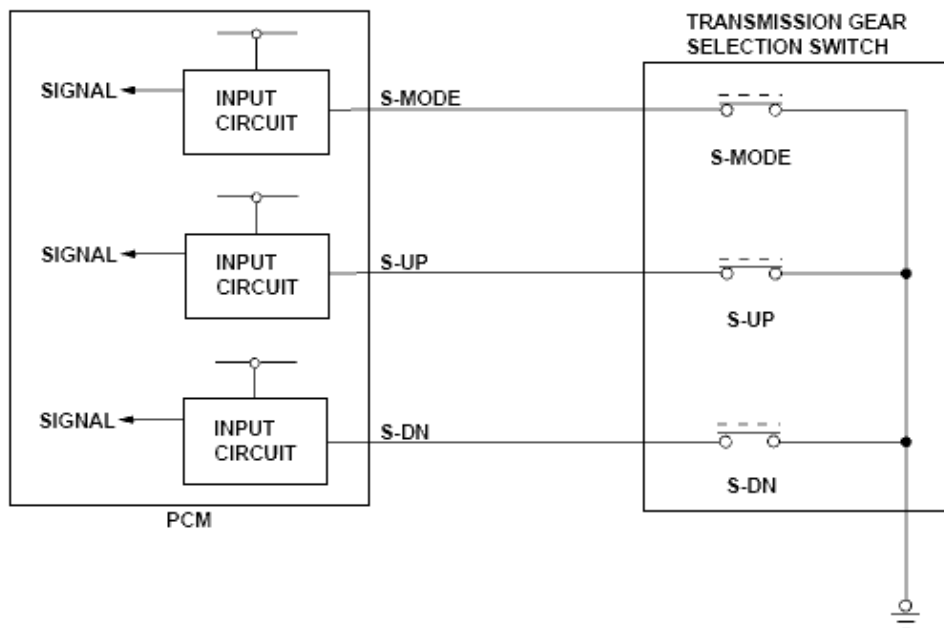
Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

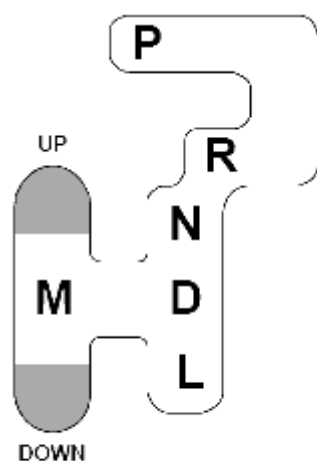
DTC P0958 (24): ADVANCED DIAGNOSTICS

DTC P0958: OPEN IN TRANSMISSION GEAR SELECTION SWITCH CIRCUIT, OR TRANSMISSION GEAR SELECTION SWITCH STUCK OFF



P0957-0401

Fig. 193: Transmission Gear Selection Switch Circuit Diagram



PC0258-0476

Fig. 194: Transmission Gear Shift Selection Position

General Description

When the shift lever is moved to the M position (the sequential sportshift mode is selected), the upshift switch and the downshift switch can be used. When the shift lever is moved toward the upshift switch, an upshift is executed, and when the shift lever is moved toward the downshift switch, a downshift is executed. The sequential sportshift mode switch signal, the upshift switch signal, and the downshift switch signal are grounded when turned on and opened when turned off.

When there are upshift switch or downshift switch inputs while the sequential sportshift mode switch signal is turned off in the D position of the powertrain control module (PCM), a malfunction of the transmission gear selection switch is detected and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
Sequence	None
Duration	Depending on the driving pattern
DTC Type	One drive cycle, MIL ON, D indicator blinks
OBD Status	PASSED/FAILED/NOT COMPLETED (STILL TESTING)

Enable Conditions

ENABLE CONDITIONS

Condition	Minimum	Maximum
Battery voltage	11.0 V	-
No active DTCs	P0705, P0706	

Malfunction Threshold

Upshift switch and downshift switch inputs are counted 2 times or more when the sequential sportshift mode switch signal is turned off in the D position.

Driving Pattern

Start the engine, switch the shift lever to sequential sportshift mode, and operate the upshift and downshift switches 2 times or more.

- Drive the vehicle in this manner only if the traffic regulations and ambient conditions allow.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected, the MIL comes on and the DTC and the freeze frame data are stored in the PCM memory.

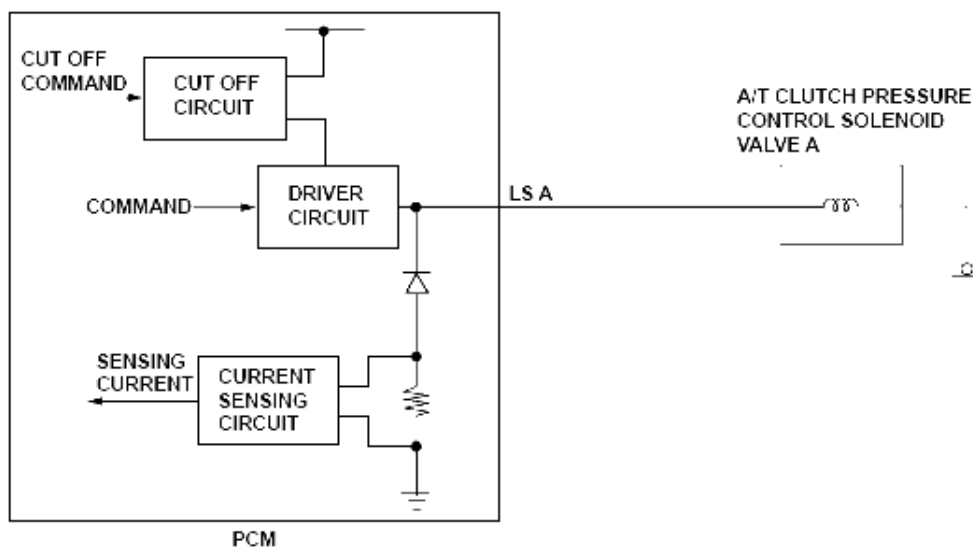
Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

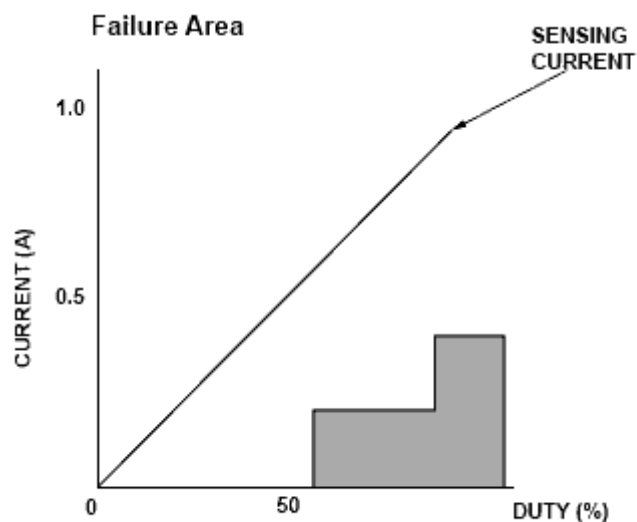
DTC P0962 (16): ADVANCED DIAGNOSTICS

DTC P0962: PROBLEM IN A/T CLUTCH PRESSURE CONTROL SOLENOID VALVE A CIRCUIT



P0962-0302

Fig. 195: A/T Clutch Pressure Control Solenoid Valve A Circuit Diagram



P0962-0370

Fig. 196: A/T Clutch Pressure Control Solenoid Valve A Current Graph**General Description**

A/T clutch pressure control solenoid valve A is used for clutch pressure control. A spool in A/T clutch pressure control solenoid valve A pushes a valve according to the duty cycle that is controlled by the powertrain control module (PCM) so the hydraulic pressure is proportional to the current. The PCM measures the current flowing through A/T clutch pressure control solenoid valve A and uses feedback control to compensate for the difference between the actual current and the commanded one. If the measured current for the PCM output duty cycle is not within a specified range (open or short), a malfunction is detected and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status**MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS**

Execution	Continuous
Sequence	None
Duration	1 second or more
DTC Type	One drive cycle, MIL ON, D indicator blinks
OBD Status	PASSED/FAILED/NOT COMPLETED (STILL TESTING)

Enable Conditions**ENABLE CONDITIONS**

Condition	Minimum	Maximum
Battery voltage	11.0 V	-
No active DTCs	P0963, P0966, P0967, P0970, P0971	

Malfunction Threshold

The measured current for the PCM's command value is as specified here for at least 1 second.

MALFUNCTION THRESHOLD

Duty (%)	Current (A)	Failure mode
57 - 89	Less than 0.2	Low Input
More than 89	Less than 0.4	Low Input

Driving Pattern

Start the engine, and wait for at least 1 second.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected, the MIL comes on and the DTC and the freeze frame data are stored in the PCM memory.

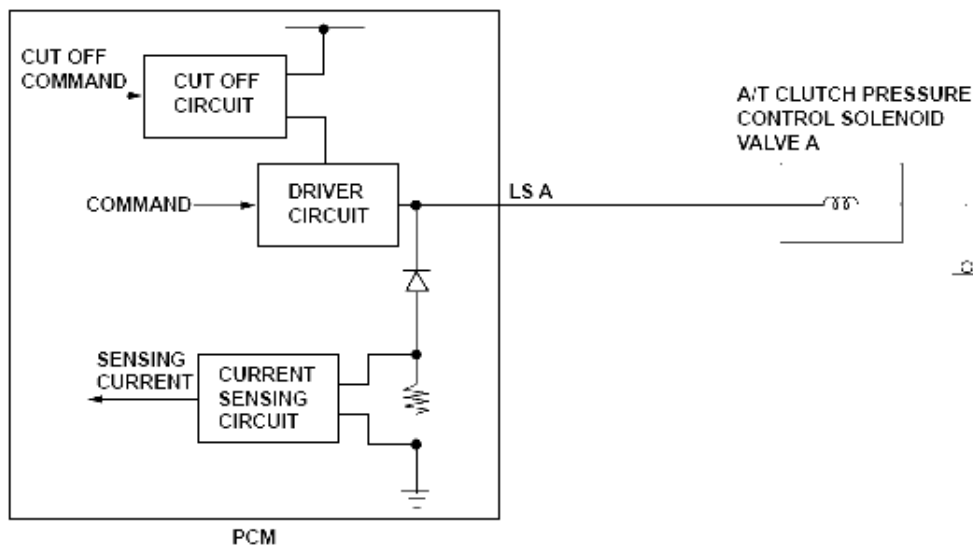
Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

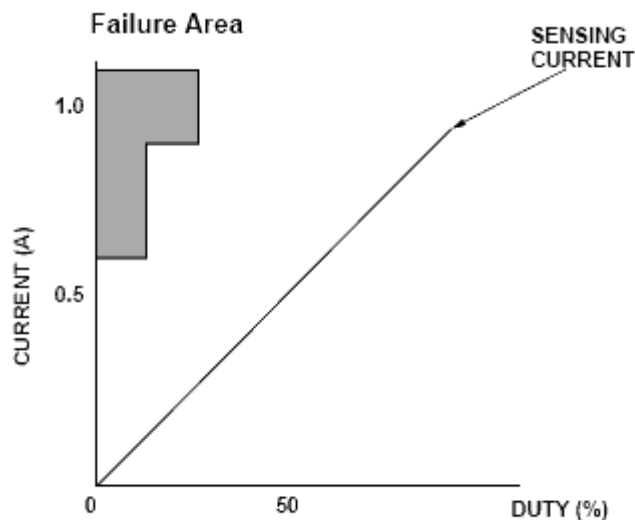
DTC P0963 (16): ADVANCED DIAGNOSTICS

DTC P0963: PROBLEM IN A/T CLUTCH PRESSURE CONTROL SOLENOID VALVE A



P0962-0302

Fig. 197: A/T Clutch Pressure Control Solenoid Valve A Circuit Diagram



P0963-0370

Fig. 198: A/T Clutch Pressure Control Solenoid Valve A Current Graph

General Description

A/T clutch pressure control solenoid valve A is used for clutch pressure control. A spool in A/T clutch pressure control solenoid valve A pushes a valve according to the duty cycle that is controlled by the powertrain control module (PCM) so the hydraulic pressure is proportional to the current. The PCM measures the current flowing through A/T clutch pressure control solenoid valve A and uses feedback control to compensate for the difference between the actual current and the commanded one. If the measured current for the PCM output duty cycle is not within a specified range (open or short), a malfunction is detected and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
Sequence	None
Duration	1 second or more
DTC Type	One drive cycle, MIL ON, D indicator blinks
OBD Status	PASSED/FAILED/NOT COMPLETED (STILL TESTING)

Enable Conditions

ENABLE CONDITIONS

Condition	Minimum	Maximum
Battery voltage	11.0 V	-
No active DTCs	P0962, P0966, P0967, P0970, P0971	

Malfunction Threshold

The measured current for the PCM's command value is as specified here for at least 1 second.

MALFUNCTION THRESHOLD

Duty (%)	Current (A)	Failure mode
Less than 13	More than 0.6	High Input
13 - 27	More than 0.9	High Input

Driving Pattern

Start the engine, and wait for at least 1 second.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected, the MIL comes on and the DTC and the freeze frame data are stored in the PCM memory.

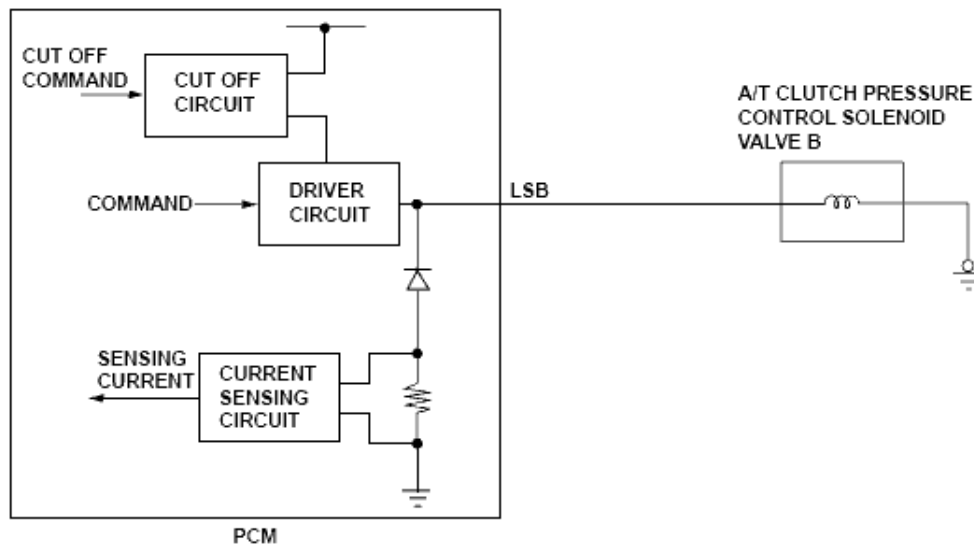
Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

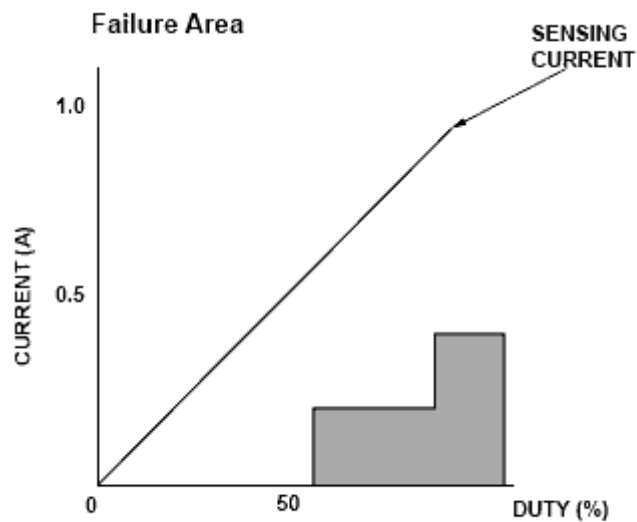
DTC P0966 (23): ADVANCED DIAGNOSTICS

DTC P0966: PROBLEM IN A/T CLUTCH PRESSURE CONTROL SOLENOID VALVE B CIRCUIT



P0966-0302

Fig. 199: A/T Clutch Pressure Control Solenoid Valve B Circuit Diagram



P0962-0370

Fig. 200: A/T Clutch Pressure Control Solenoid Valve B Current Graph**General Description**

A/T clutch pressure control solenoid valve B is used for clutch pressure control. A spool in A/T clutch pressure control solenoid valve B pushes a valve according to the duty cycle that is controlled by the powertrain control module (PCM) so the hydraulic pressure is proportional to the current. The PCM measures the current flowing through A/T clutch pressure control solenoid valve B and uses feedback control to compensate for the difference between the actual current and the commanded one. If the measured current for the PCM output duty cycle is not within a specified range (open or short), a malfunction is detected and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status**MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS**

Execution	Continuous
Sequence	None
Duration	1 second or more
DTC Type	One drive cycle, MIL ON, D indicator blinks
OBD Status	PASSED/FAILED/NOT COMPLETED (STILL TESTING)

Enable Conditions**ENABLE CONDITIONS**

Condition	Minimum	Maximum
Battery voltage	11.0 V	-
No active DTCs	P0962, P0963, P0967, P0970, P0971	

Malfunction Threshold

The measured current for the PCM's command value is as specified here for at least 1 second.

MALFUNCTION THRESHOLD

Duty (%)	Current (A)	Failure mode
57 - 89	Less than 0.2	Low Input
More than 89	Less than 0.4	Low Input

Driving Pattern

Start the engine, and wait for at least 1 second.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected, the MIL comes on and the DTC and the freeze frame data are stored in the PCM memory.

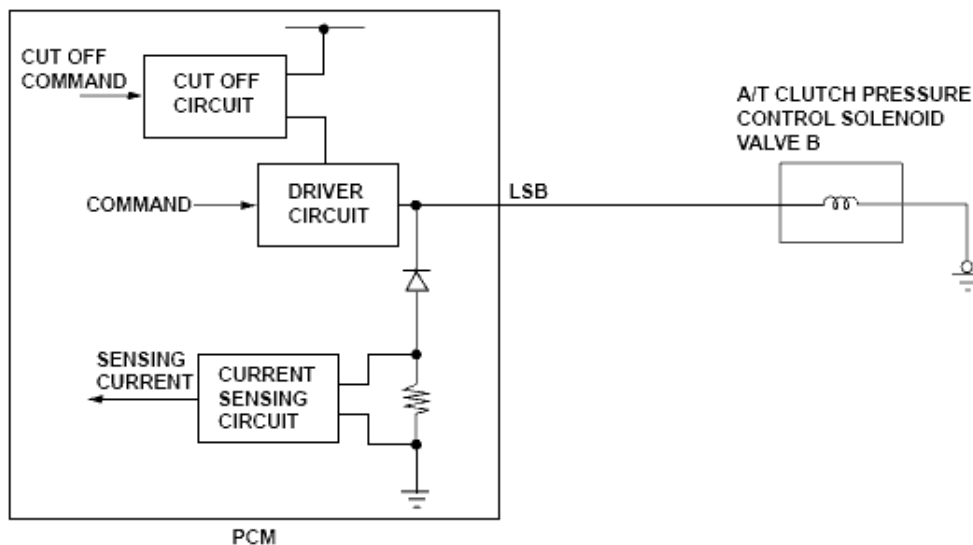
Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

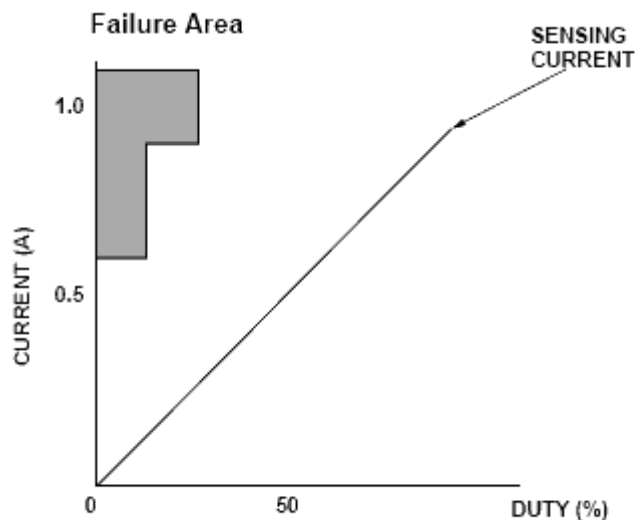
DTC P0967 (23): ADVANCED DIAGNOSTICS

DTC P0967: PROBLEM IN A/T CLUTCH PRESSURE CONTROL SOLENOID VALVE B



P0966-0302

Fig. 201: A/T Clutch Pressure Control Solenoid Valve B Circuit Diagram



P0963-0370

Fig. 202: A/T Clutch Pressure Control Solenoid Valve B Current Graph

General Description

A/T clutch pressure control solenoid valve B is used for clutch pressure control. A spool in A/T clutch pressure control solenoid valve B pushes a valve according to the duty cycle that is controlled by the powertrain control module (PCM) so the hydraulic pressure is proportional to the current. The PCM measures the current flowing through A/T clutch pressure control solenoid valve B and uses feedback control to compensate for the difference between the actual current and the commanded one. If the measured current for the PCM output duty cycle is not within a specified range (open or short), a malfunction is detected and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
Sequence	None
Duration	1 second or more
DTC Type	One drive cycle, MIL ON, D indicator blinks
OBD Status	PASSED/FAILED/NOT COMPLETED (STILL TESTING)

Enable Conditions

ENABLE CONDITIONS

Condition	Minimum	Maximum
Battery voltage	11.0 V	-
No active DTCs	P0962, P0963, P0966, P0970, P0971	

Malfunction Threshold

The measured current for the PCM's command value is as specified here for at least 1 second.

MALFUNCTION THRESHOLD

Duty (%)	Current (A)	Failure mode
Less than 13	More than 0.6	High Input
13 - 27	More than 0.9	High Input

Driving Pattern

Start the engine, and wait for at least 1 second.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected, the MIL comes on and the DTC and the freeze frame data are stored in the PCM memory.

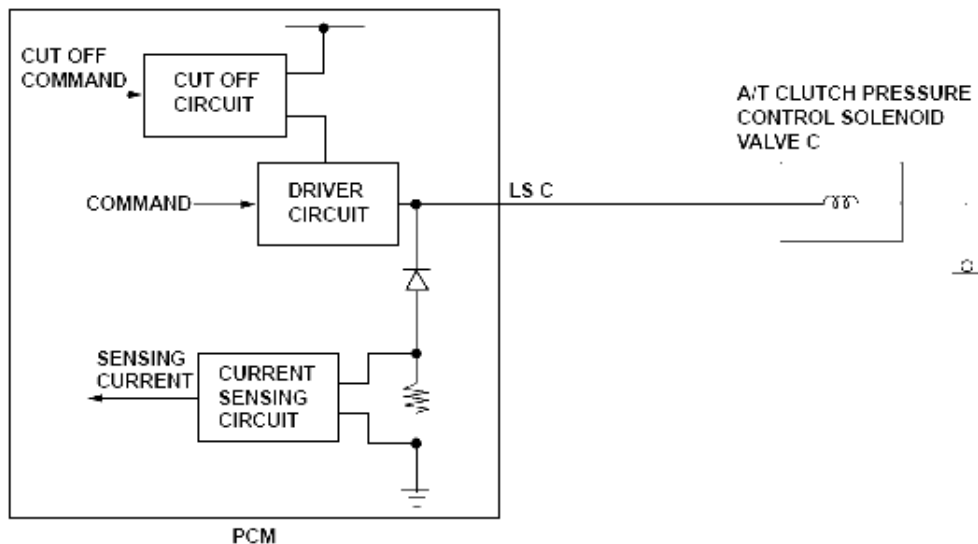
Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

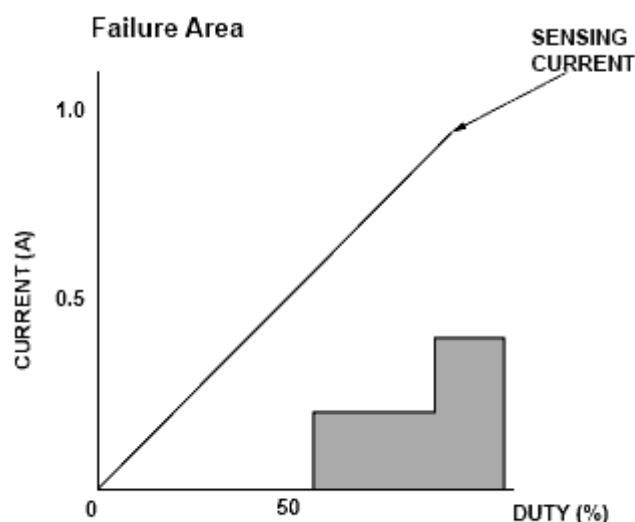
DTC P0970 (29): ADVANCED DIAGNOSTICS

DTC P0970: PROBLEM IN A/T CLUTCH PRESSURE CONTROL SOLENOID VALVE C CIRCUIT



P0970-0302

Fig. 203: A/T Clutch Pressure Control Solenoid Valve C - Circuit Diagram



P0962-0370

Fig. 204: A/T Clutch Pressure Control Solenoid Valve B Current Graph**General Description**

A/T clutch pressure control solenoid valve C is used for clutch pressure control and lock-up control. A spool in A/T clutch pressure control solenoid valve C pushes a valve according to the duty cycle that is controlled by the powertrain control module (PCM) so the hydraulic pressure is proportional to the current. The PCM measures the current flowing through A/T clutch pressure control solenoid valve C and uses feedback control to compensate for the difference between the actual current and the commanded one. If the measured current for the PCM output duty cycle is not within a specified range (open or short), a malfunction is detected and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status**MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS**

Execution	Continuous
Sequence	None
Duration	1 second or more
DTC Type	One drive cycle, MIL ON, D indicator blinks
OBD Status	PASSED/FAILED/NOT COMPLETED (STILL TESTING)

Enable Conditions**ENABLE CONDITIONS**

Condition	Minimum	Maximum
Battery voltage	11.0 V	-
No active DTCs	P0962, P0963, P0966, P0967, P0971	

Malfunction Threshold

The measured current for the PCM's command value is as specified here for at least 1 second.

MALFUNCTION THRESHOLD

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Duty (%)	Current (A)	Failure mode
57 - 89	Less than 0.2	Low Input
More than 89	Less than 0.4	Low Input

Driving Pattern

Start the engine, and wait for at least 1 second.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected, the MIL comes on and the DTC and the freeze frame data are stored in the PCM memory.

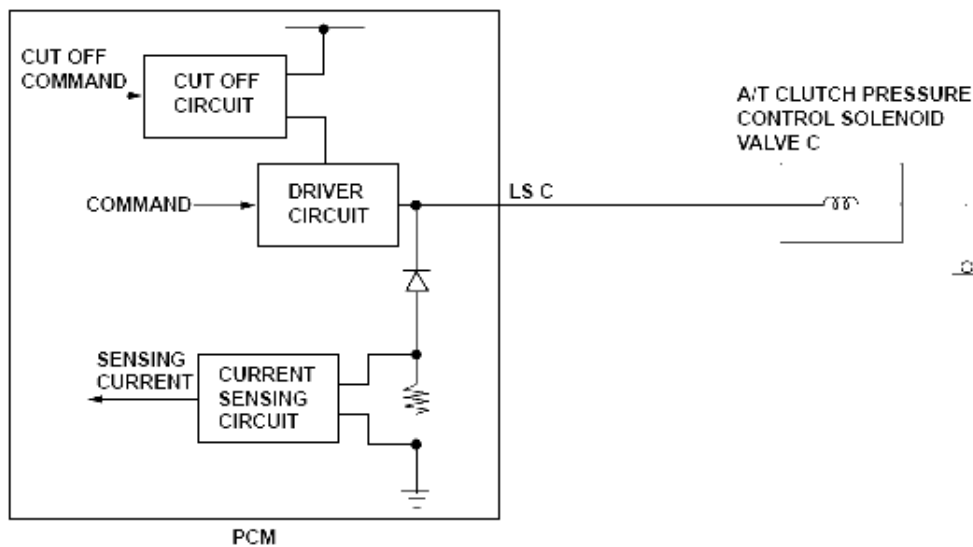
Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

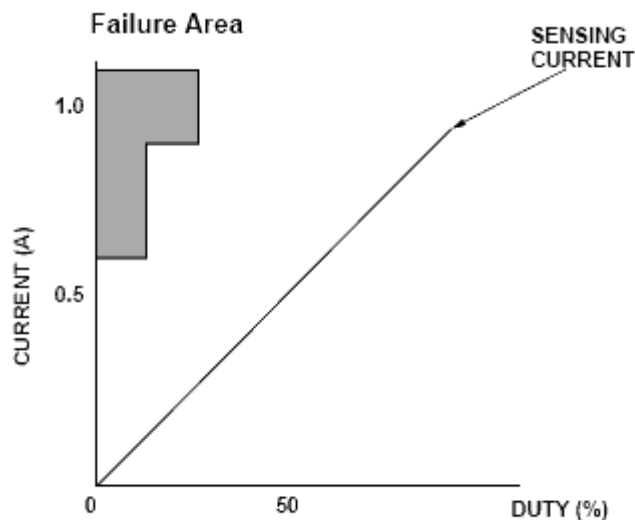
DTC P0971 (29): ADVANCED DIAGNOSTICS

DTC P0971: PROBLEM IN A/T CLUTCH PRESSURE CONTROL SOLENOID VALVE C



P0970-0302

Fig. 205: A/T Clutch Pressure Control Solenoid Valve C - Circuit Diagram



P0963-0370

Fig. 206: A/T Clutch Pressure Control Solenoid Valve C Current Graph

General Description

A/T clutch pressure control solenoid valve C is used for clutch pressure control and lock-up control. A spool in A/T clutch pressure control solenoid valve C pushes a valve according to the duty cycle that is controlled by the powertrain control module (PCM) so the hydraulic pressure is proportional to the current. The PCM measures the current flowing through A/T clutch pressure control solenoid valve C and uses feedback control to compensate for the difference between the actual current and the commanded one. If the measured current for the PCM output duty cycle is not within a specified range (open or short), a malfunction is detected and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
Sequence	None
Duration	1 second or more
DTC Type	One drive cycle, MIL ON, D indicator blinks
OBD Status	PASSED/FAILED/NOT COMPLETED (STILL TESTING)

Enable Conditions

ENABLE CONDITIONS

Condition	Minimum	Maximum
Battery voltage	11.0 V	-
No active DTCs	P0962, P0963, P0966, P0967, P0970	

Malfunction Threshold

The measured current for the PCM's command value is as specified here for at least 1 second.

MALFUNCTION THRESHOLD

Duty (%)	Current (A)	Failure mode
Less than 13	More than 0.6	High Input
13 - 27	More than 0.9	High Input

Driving Pattern

Start the engine, and wait for at least 1 second.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected, the MIL comes on and the DTC and the freeze frame data are stored in the PCM memory.

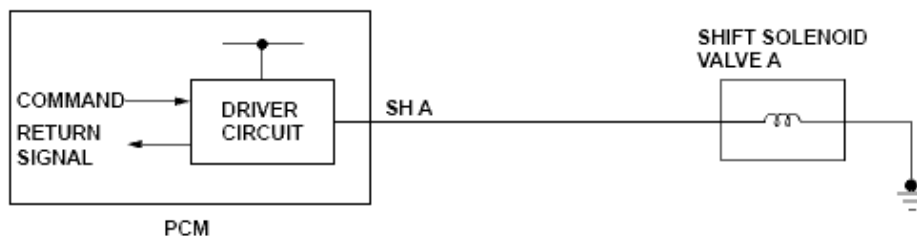
Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P0973 (7): ADVANCED DIAGNOSTICS

DTC P0973: SHORT IN SHIFT SOLENOID VALVE A CIRCUIT



P0753-9801

Fig. 207: Short In Shift Solenoid Valve A - Circuit Diagram

Shift solenoid valve Gear position	Shift solenoid valve A	Shift solenoid valve B	Shift solenoid valve C	Shift solenoid valve D
Park	OFF	ON	OFF	ON
Reverse	ON	ON	OFF	ON
Neutral	OFF	ON	OFF	OFF
1st	OFF	ON	ON	OFF
1st - 2nd	ON	ON	ON	OFF/ON
2nd	ON	ON	OFF	OFF/ON
2nd - 3rd	ON	ON	ON	OFF/ON
3rd	ON	OFF	ON	OFF/ON
3rd - 4th	ON	OFF	OFF	OFF/ON
4th	OFF	OFF	OFF	OFF/ON
4th - 5th	OFF	OFF	ON	OFF/ON
5th	OFF	ON	ON	OFF/ON

Fig. 208: Shift Solenoid Valve Driving Signal Combination Table

General Description

When shift solenoid valves A and D are turned ON, the hydraulic pressure circuit opens. When shift solenoid valves B and C are turned OFF, the hydraulic pressure circuit opens. The hydraulic pressure circuit supplies/discharges hydraulic pressure to/from each clutch according to the combination of the ON/OFF status of those valves and the shift valves. The powertrain control module (PCM) commands the driver circuit to turn on the shift solenoid valve. The circuit diagnoses malfunctions such as a circuit short or open, and sends back a return signal during the PCM's command. A malfunction is detected when the return signal does not match the PCM command to turn ON the shift solenoid valve, and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
Sequence	None
Duration	1 second or more
DTC Type	One drive cycle, MIL ON, D indicator blinks
OBD Status	PASSED/FAILED/NOT COMPLETED (STILL TESTING)

Enable Conditions

ENABLE CONDITIONS

Condition	Minimum	Maximum
Battery voltage	11.0 V	-
No active DTCs	P0974, P0982, P0983	

Malfunction Threshold

The return signal does not match the command to turn ON shift solenoid valve A for at least 1 second.

Driving Pattern

Start the engine, shift to the R position, and wait for at least 1 second.

- Drive the vehicle in this manner only if the traffic regulations and ambient conditions allow.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected, the MIL comes on and the DTC and the freeze frame data are stored in the PCM memory.

Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P0974 (7): ADVANCED DIAGNOSTICS

DTC P0974: OPEN IN SHIFT SOLENOID VALVE A CIRCUIT

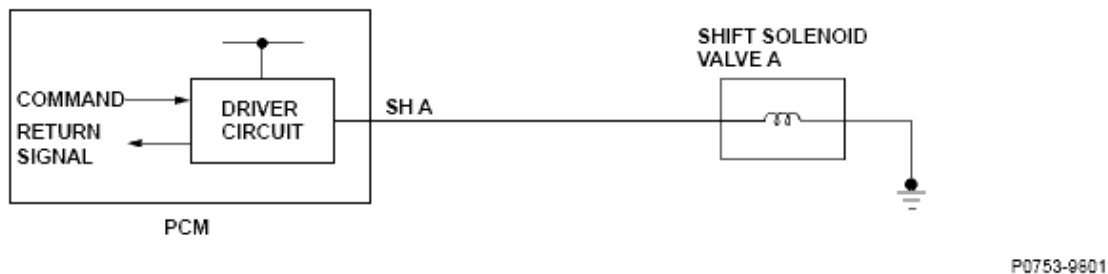


Fig. 209: Shift Solenoid Valve A - Circuit Diagram

Shift solenoid valve Gear position	Shift solenoid valve A	Shift solenoid valve B	Shift solenoid valve C	Shift solenoid valve D
Park	OFF	ON	OFF	ON
Reverse	ON	ON	OFF	ON
Neutral	OFF	ON	OFF	OFF
1st	OFF	ON	ON	OFF
1st - 2nd	ON	ON	ON	OFF/ON
2nd	ON	ON	OFF	OFF/ON
2nd - 3rd	ON	ON	ON	OFF/ON
3rd	ON	OFF	ON	OFF/ON
3rd - 4th	ON	OFF	OFF	OFF/ON
4th	OFF	OFF	OFF	OFF/ON
4th - 5th	OFF	OFF	ON	OFF/ON
5th	OFF	ON	ON	OFF/ON

Fig. 210: Shift Solenoid Valve Driving Signal Combination Table**General Description**

When shift solenoid valves A and D are turned ON, the hydraulic pressure circuit opens. When shift solenoid valves B and C are turned OFF, the hydraulic pressure circuit opens. The hydraulic pressure circuit supplies/discharges hydraulic pressure to/from each clutch according to the combination of the ON/OFF status of those valves and the shift valves. The powertrain control module (PCM) commands the driver circuit to turn on the shift solenoid valve. The circuit diagnoses malfunctions such as a circuit short or open, and sends back a return signal during the PCM's command. A malfunction is detected when the return signal does not match the PCM command to turn OFF the shift solenoid valve, and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status**MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS**

Execution	Continuous
Sequence	None
Duration	1 second or more
DTC Type	One drive cycle, MIL ON, D indicator blinks
OBD Status	PASSED/FAILED/NOT COMPLETED (STILL TESTING)

Enable Conditions**ENABLE CONDITIONS**

Condition	Minimum	Maximum
Battery voltage	11.0 V	-
No active DTCs	P0973, P0982, P0983	

Malfunction Threshold

The return signal does not match the command to turn OFF shift solenoid valve A for at least 1 second.

Driving Pattern

Start the engine, shift to the P position, and wait for at least 1 second.

Diagnosis Details**Conditions for illuminating the MIL**

When a malfunction is detected, the MIL comes on and the DTC and the freeze frame data are stored in the PCM memory.

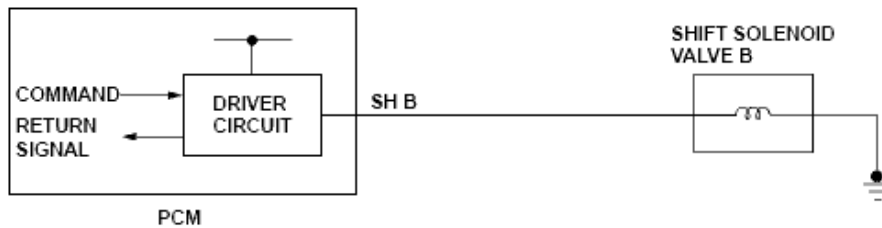
Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P0976 (8): ADVANCED DIAGNOSTICS

DTC P0976: SHORT IN SHIFT SOLENOID VALVE B CIRCUIT



P0758-0201

Fig. 211: Shift Solenoid Valve B - Circuit Diagram

Shift solenoid valve Gear position	Shift solenoid valve A	Shift solenoid valve B	Shift solenoid valve C	Shift solenoid valve D
Park	OFF	ON	OFF	ON
Reverse	ON	ON	OFF	ON
Neutral	OFF	ON	OFF	OFF
1st	OFF	ON	ON	OFF
1st - 2nd	ON	ON	ON	OFF/ON
2nd	ON	ON	OFF	OFF/ON
2nd - 3rd	ON	ON	ON	OFF/ON
3rd	ON	OFF	ON	OFF/ON
3rd - 4th	ON	OFF	OFF	OFF/ON
4th	OFF	OFF	OFF	OFF/ON
4th - 5th	OFF	OFF	ON	OFF/ON
5th	OFF	ON	ON	OFF/ON

Fig. 212: Shift Solenoid Valve Driving Signal Combination Table

General Description

When shift solenoid valves A and D are turned ON, the hydraulic pressure circuit opens. When shift solenoid valves B and C are turned OFF, the hydraulic pressure circuit opens. The hydraulic pressure circuit supplies/discharges hydraulic pressure to/from each clutch according to the combination of the ON/OFF status of those valves and the shift valves. The powertrain control module (PCM) commands the driver circuit to turn on the shift solenoid valve. The circuit diagnoses malfunctions such as a circuit short or open, and sends back a return signal during the PCM's command. A malfunction is detected when the return signal does not match the PCM command to turn ON the shift solenoid valve, and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
Sequence	None
Duration	1 second or more
DTC Type	One drive cycle, MIL ON, D indicator blinks

OBD Status	PASSED/FAILED/NOT COMPLETED (STILL TESTING)
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Enable Conditions

ENABLE CONDITIONS

Condition	Minimum	Maximum
Battery voltage	11.0 V	-
No active DTCs	P0977, P0979, P0980	

Malfunction Threshold

The return signal does not match the command to turn ON shift solenoid valve B for at least 1 second.

Driving Pattern

Start the engine, shift to the P position, and wait for at least 1 second.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected, the MIL comes on and the DTC and the freeze frame data are stored in the PCM memory.

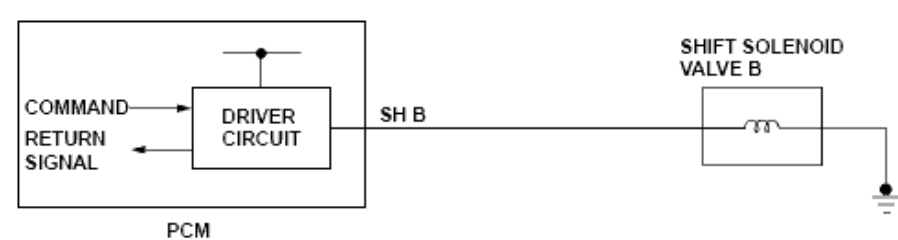
Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P0977 (8): ADVANCED DIAGNOSTICS

DTC P0977: OPEN IN SHIFT SOLENOID VALVE B CIRCUIT



P0758-0201

Fig. 213: Shift Solenoid Valve B - Circuit Diagram

Shift solenoid valve Gear position	Shift solenoid valve A	Shift solenoid valve B	Shift solenoid valve C	Shift solenoid valve D
Park	OFF	ON	OFF	ON
Reverse	ON	ON	OFF	ON
Neutral	OFF	ON	OFF	OFF
1st	OFF	ON	ON	OFF
1st - 2nd	ON	ON	ON	OFF/ON
2nd	ON	ON	OFF	OFF/ON
2nd - 3rd	ON	ON	ON	OFF/ON
3rd	ON	OFF	ON	OFF/ON
3rd - 4th	ON	OFF	OFF	OFF/ON
4th	OFF	OFF	OFF	OFF/ON
4th - 5th	OFF	OFF	ON	OFF/ON
5th	OFF	ON	ON	OFF/ON

Fig. 214: Shift Solenoid Valve Driving Signal Combination Table

General Description

When shift solenoid valves A and D are turned ON, the hydraulic pressure circuit opens. When shift solenoid valves B and C are turned OFF, the hydraulic pressure circuit opens. The hydraulic pressure circuit supplies/discharges hydraulic pressure to/from each clutch according to the combination of the ON/OFF status of those valves and the shift valves. The powertrain control module (PCM) commands the driver circuit to turn on the shift solenoid valve. The circuit diagnoses malfunctions such as a circuit short or open, and sends back a return signal during the PCM's command. A malfunction is detected when the return signal does not match the PCM command to turn OFF the shift solenoid valve, and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
Sequence	None
Duration	1 second or more
DTC Type	One drive cycle, MIL ON, D indicator blinks
OBD Status	PASSED/FAILED/NOT COMPLETED (STILL TESTING)

Enable Conditions

ENABLE CONDITIONS

Condition	Minimum	Maximum
Battery voltage	11.0 V	-
No active DTCs	P0976, P0979, P0980	

Malfunction Threshold

The return signal does not match the command to turn OFF shift solenoid valve B for at least 1 second.

Driving Pattern

Start the engine, drive the vehicle so that it shifts from 1st to 4th gear in the D position, then drive the vehicle in 3rd or 4th gear for at least 1 second.

- Drive the vehicle in this manner only if the traffic regulations and ambient conditions allow.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected, the MIL comes on and the DTC and the freeze frame data are stored in the PCM memory.

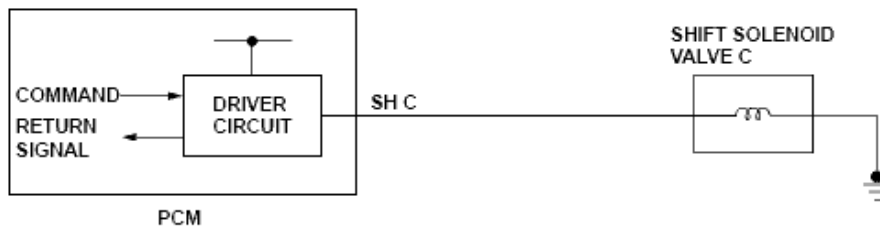
Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P0979 (22): ADVANCED DIAGNOSTICS

DTC P0979: SHORT IN SHIFT SOLENOID VALVE C CIRCUIT



P0763-0201

Fig. 215: Shift Solenoid Valve C - Circuit Diagram

Shift solenoid valve Gear position	Shift solenoid valve A	Shift solenoid valve B	Shift solenoid valve C	Shift solenoid valve D
Park	OFF	ON	OFF	ON
Reverse	ON	ON	OFF	ON
Neutral	OFF	ON	OFF	OFF
1st	OFF	ON	ON	OFF
1st - 2nd	ON	ON	ON	OFF/ON
2nd	ON	ON	OFF	OFF/ON
2nd - 3rd	ON	ON	ON	OFF/ON
3rd	ON	OFF	ON	OFF/ON
3rd - 4th	ON	OFF	OFF	OFF/ON
4th	OFF	OFF	OFF	OFF/ON
4th - 5th	OFF	OFF	ON	OFF/ON
5th	OFF	ON	ON	OFF/ON

Fig. 216: Shift Solenoid Valve Driving Signal Combination Table**General Description**

When shift solenoid valves A and D are turned ON, the hydraulic pressure circuit opens. When shift solenoid valves B and C are turned OFF, the hydraulic pressure circuit opens. The hydraulic pressure circuit supplies/discharges hydraulic pressure to/from each clutch according to the combination of the ON/OFF status of those valves and the shift valves. The powertrain control module (PCM) commands the driver circuit to turn on the shift solenoid valve. The circuit diagnoses malfunctions such as a circuit short or open, and sends back a return signal during the PCM's command. A malfunction is detected when the return signal does not match the PCM command to turn ON the shift solenoid valve, and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status**MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS**

Execution	Continuous
Sequence	None
Duration	1 second or more
DTC Type	One drive cycle, MIL ON, D indicator blinks
OBD Status	PASSED/FAILED/NOT COMPLETED (STILL TESTING)

Enable Conditions**ENABLE CONDITIONS**

Condition	Minimum	Maximum
Battery voltage	11.0 V	-
No active DTCs	P0976, P0977, P0980	

Malfunction Threshold

The return signal does not match the command to turn ON shift solenoid valve C for at least 1 second.

Driving Pattern

Start the engine, and drive the vehicle in 1st gear in the D position for at least 1 second.

- Drive the vehicle in this manner only if the traffic regulations and ambient conditions allow.

Diagnosis Details**Conditions for illuminating the MIL**

When a malfunction is detected, the MIL comes on and the DTC and the freeze frame data are stored in the PCM memory.

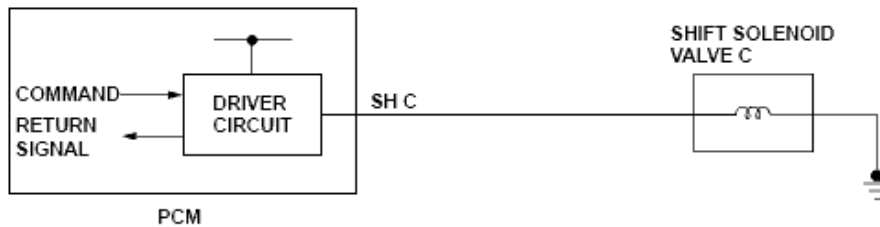
Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P0980 (22): ADVANCED DIAGNOSTICS

DTC P0980: OPEN IN SHIFT SOLENOID VALVE C CIRCUIT



P0763-0201

Fig. 217: In Shift Solenoid Valve C - Circuit Diagram

Shift solenoid valve Gear position	Shift solenoid valve A	Shift solenoid valve B	Shift solenoid valve C	Shift solenoid valve D
Park	OFF	ON	OFF	ON
Reverse	ON	ON	OFF	ON
Neutral	OFF	ON	OFF	OFF
1st	OFF	ON	ON	OFF
1st - 2nd	ON	ON	ON	OFF/ON
2nd	ON	ON	OFF	OFF/ON
2nd - 3rd	ON	ON	ON	OFF/ON
3rd	ON	OFF	ON	OFF/ON
3rd - 4th	ON	OFF	OFF	OFF/ON
4th	OFF	OFF	OFF	OFF/ON
4th - 5th	OFF	OFF	ON	OFF/ON
5th	OFF	ON	ON	OFF/ON

Fig. 218: Shift Solenoid Valve Driving Signal Combination Table

General Description

When shift solenoid valves A and D are turned ON, the hydraulic pressure circuit opens. When shift solenoid valves B and C are turned OFF, the hydraulic pressure circuit opens. The hydraulic pressure circuit supplies/discharges hydraulic pressure to/from each clutch according to the combination of the ON/OFF status of those valves and the shift valves. The powertrain control module (PCM) commands the driver circuit to turn on the shift solenoid valve. The circuit diagnoses malfunctions such as a circuit short or open, and sends back a return signal during the PCM's command. A malfunction is detected when the return signal does not match the PCM command to turn OFF the shift solenoid valve, and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
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Sequence	None
Duration	1 second or more
DTC Type	One drive cycle, MIL ON, D indicator blinks
OBD Status	PASSED/FAILED/NOT COMPLETED (STILL TESTING)

Enable Conditions

ENABLE CONDITIONS

Condition	Minimum	Maximum
Battery voltage	11.0 V	-
No active DTCs	P0976, P0977, P0979	

Malfunction Threshold

The return signal does not match the command to turn OFF shift solenoid valve C for at least 1 second.

Driving Pattern

Start the engine, shift to the P position, and wait for at least 1 second.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected, the MIL comes on and the DTC and the freeze frame data are stored in the PCM memory.

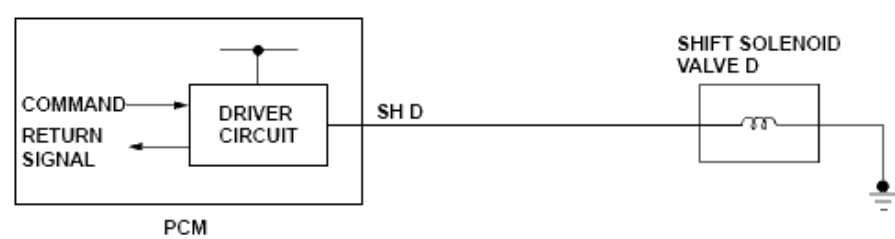
Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P0982 (60): ADVANCED DIAGNOSTICS

DTC P0982: SHORT IN SHIFT SOLENOID VALVE D CIRCUIT



P0768-0201

Fig. 219: Shift Solenoid Valve D - Circuit Diagram

Shift solenoid valve Gear position	Shift solenoid valve A	Shift solenoid valve B	Shift solenoid valve C	Shift solenoid valve D
Park	OFF	ON	OFF	ON
Reverse	ON	ON	OFF	ON
Neutral	OFF	ON	OFF	OFF
1st	OFF	ON	ON	OFF
1st - 2nd	ON	ON	ON	OFF/ON
2nd	ON	ON	OFF	OFF/ON
2nd - 3rd	ON	ON	ON	OFF/ON
3rd	ON	OFF	ON	OFF/ON
3rd - 4th	ON	OFF	OFF	OFF/ON
4th	OFF	OFF	OFF	OFF/ON
4th - 5th	OFF	OFF	ON	OFF/ON
5th	OFF	ON	ON	OFF/ON

Fig. 220: Shift Solenoid Valve Driving Signal Combination Table

General Description

When shift solenoid valves A and D are turned ON, the hydraulic pressure circuit opens. When shift solenoid valves B and C are turned OFF, the hydraulic pressure circuit opens. The hydraulic pressure circuit supplies/discharges hydraulic pressure to/from each clutch according to the combination of the ON/OFF status of those valves and the shift valves. The powertrain control module (PCM) commands the driver circuit to turn on the shift solenoid valve. The circuit diagnoses malfunctions such as a circuit short or open, and sends back a return signal during the PCM's command. A malfunction is detected when the return signal does not match the PCM command to turn ON the shift solenoid valve, and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
Sequence	None
Duration	1 second or more
DTC Type	One drive cycle, MIL ON, D indicator blinks
OBD Status	PASSED/FAILED/NOT COMPLETED (STILL TESTING)

Enable Conditions

ENABLE CONDITIONS

Condition	Minimum	Maximum
Battery voltage	11.0 V	-
No active DTCs	P0973, P0974, P0983	

Malfunction Threshold

The return signal does not match the command to turn ON shift solenoid valve D for at least 1 second.

Driving Pattern

Start the engine, shift to the P position, and wait for at least 1 second.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected, the MIL comes on and the DTC and the freeze frame data are stored in the PCM memory.

Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P0983 (60): ADVANCED DIAGNOSTICS

DTC P0983: OPEN IN SHIFT SOLENOID VALVE D CIRCUIT

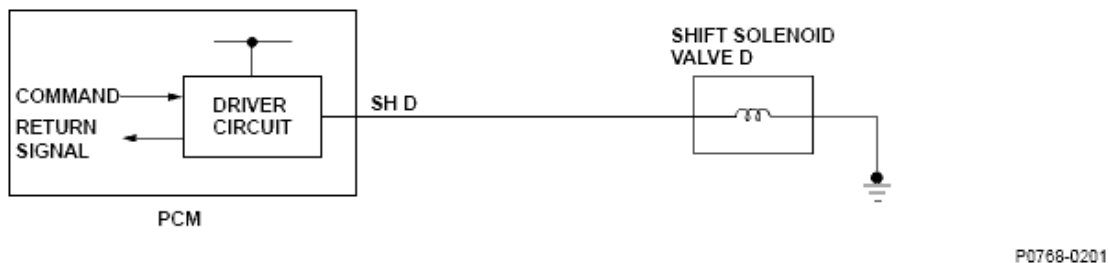


Fig. 221: Shift Solenoid Valve D - Circuit Diagram

Shift solenoid valve Gear position	Shift solenoid valve A	Shift solenoid valve B	Shift solenoid valve C	Shift solenoid valve D
Park	OFF	ON	OFF	ON
Reverse	ON	ON	OFF	ON
Neutral	OFF	ON	OFF	OFF
1st	OFF	ON	ON	OFF
1st - 2nd	ON	ON	ON	OFF/ON
2nd	ON	ON	OFF	OFF/ON
2nd - 3rd	ON	ON	ON	OFF/ON
3rd	ON	OFF	ON	OFF/ON
3rd - 4th	ON	OFF	OFF	OFF/ON
4th	OFF	OFF	OFF	OFF/ON
4th - 5th	OFF	OFF	ON	OFF/ON
5th	OFF	ON	ON	OFF/ON

Fig. 222: Shift Solenoid Valve Driving Signal Combination Table

General Description

When shift solenoid valves A and D are turned ON, the hydraulic pressure circuit opens. When shift solenoid valves B and C are turned OFF, the hydraulic pressure circuit opens. The hydraulic pressure circuit supplies/discharges hydraulic pressure to/from each clutch according to the combination of the ON/OFF status of those valves and the shift valves. The powertrain control module (PCM) commands the driver circuit to turn on the shift solenoid valve. The circuit diagnoses malfunctions such as a circuit short or open, and sends back a return signal during the PCM's command. A malfunction is detected when the return signal does not match the PCM command to turn OFF the shift solenoid valve, and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
Sequence	None
Duration	1 second or more
DTC Type	One drive cycle, MIL ON, D indicator blinks
OBD Status	PASSED/FAILED/NOT COMPLETED (STILL TESTING)

Enable Conditions

ENABLE CONDITIONS

Condition	Minimum	Maximum
Battery voltage	11.0 V	-
No active DTCs	P0973, P0974, P0982	

Malfunction Threshold

The return signal does not match the command to turn OFF shift solenoid valve D for at least 1 second.

Driving Pattern

Start the engine, shift to the N position, and wait for at least 1 second.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected, the MIL comes on and the DTC and the freeze frame data are stored in the PCM memory.

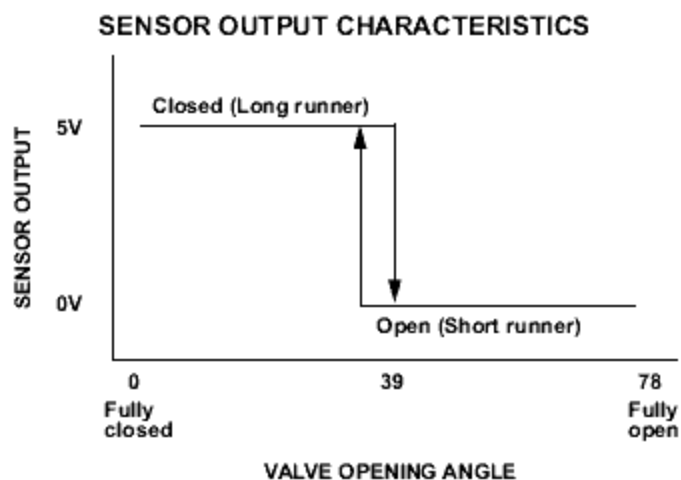
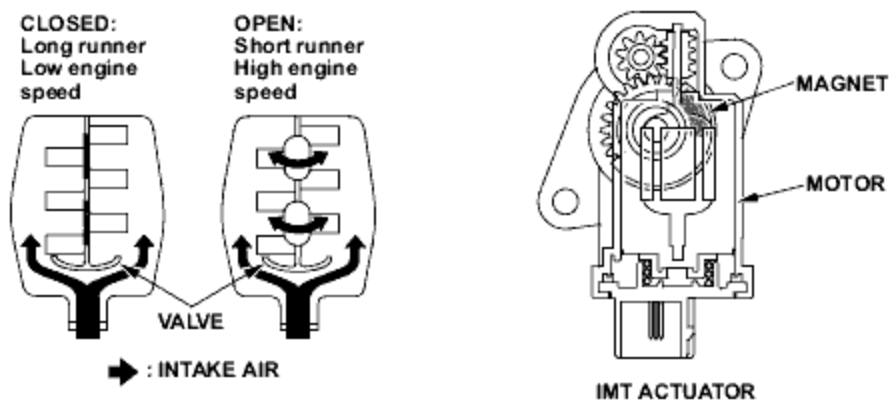
Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P1077 (106): ADVANCED DIAGNOSTICS

DTC P1077: INTAKE MANIFOLD TUNING (IMT) VALVE STUCK IN HIGH RPM POSITION



P1077-0572

Fig. 223: Intake Manifold Tuning (IMT) Valve Stuck (High RPM Position) - Operation Diagram

General Description

The intake manifold tuning (IMT) system controls engine output by selecting either long or short intake runner lengths. The system consists of the IMT valve, the IMT actuator, and the engine control module (ECM)/powertrain control module (PCM). The IMT actuator is attached to the intake manifold and it includes the motor and the Hall-effect-IC position sensing unit. The ECM/PCM actuates the motor, which operates the IMT valve. When the IMT valve is closed, the long runner is selected, increasing torque at low engine speed. When the IMT valve is open, the short runner is selected, increasing torque at high engine speed. A Hall-effect-IC position sensing unit is integrated with the motor to provide precise open/close feedback to the ECM/PCM. The IMT actuator sends a long runner return signal to the ECM/PCM when the IMT valve is closed, and it sends a short runner return signal when the IMT valve is open.

If the ECM/PCM receives no closed return signal when it sends a close command, or if it receives no open return signal when sending an open command to the IMT actuator, for a specified time, it detects a malfunction and stores a DTC.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Once per driving cycle
-----------	------------------------

Sequence	None
Duration	2 ⁽¹⁾ , 7 ⁽²⁾ seconds or more
DTC Type	Two drive cycles, MIL ON
OBD Status	PASSED/FAILED/NOT COMPLETED (STILL TESTING)
(1) J32A3 engine	
(2) J35A8 engine	

Enable Conditions

ENABLE CONDITIONS

Condition	Minimum	Maximum
Intake air temperature	5°F (-15°C)	-
Engine speed	-	3,800 rpm
Battery voltage	10.5 V	-
No active DTCs	P0107, P0108, P0112, P0113, P0117, P0118, P0563, P1128, P1129, P2227, P2228, P2229	

Malfunction Threshold

When the ECM/PCM sends a close (long runner) command, no long runner return signal is received for at least 2*¹, 7*² seconds.

Driving Pattern

1. Start the engine. Let it idle until the radiator fan comes on.
2. Let the engine idle for at least 2*¹, 7*² seconds.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected during the first drive cycle, a Temporary DTC is stored in the ECM/PCM memory. If the malfunction recurs during the next (second) drive cycle, the MIL comes on and the DTC and the freeze frame data are stored.

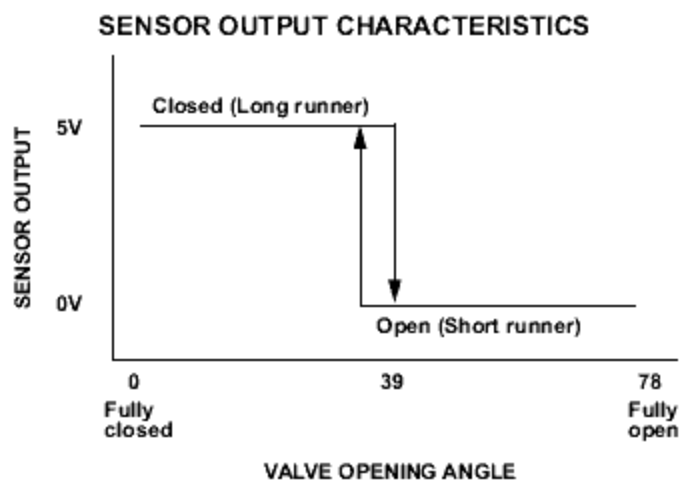
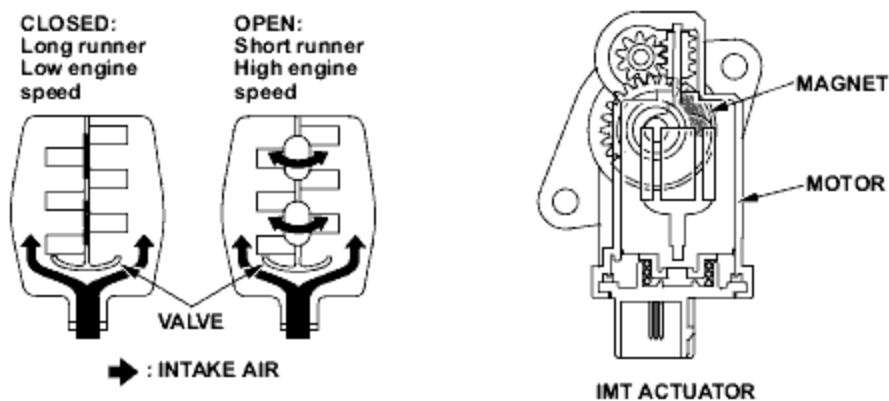
Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, the Temporary DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P1078 (106): ADVANCED DIAGNOSTICS

DTC P1078: INTAKE MANIFOLD TUNING (IMT) VALVE STUCK IN LOW RPM POSITION



P1077-0572

Fig. 224: Intake Manifold Tuning (IMT) Valve Stuck (Low RPM Position) - Operation Diagram

General Description

The intake manifold tuning (IMT) system controls engine output by selecting either long or short intake runner lengths. The system consists of the IMT valve, the IMT actuator, and the engine control module (ECM)/powertrain control module (PCM). The IMT actuator is attached to the intake manifold and it includes the motor and the Hall-effect-IC position sensing unit. The ECM/PCM actuates the motor, which operates the IMT valve. When the IMT valve is closed, the long runner is selected, increasing torque at low engine speed. When the IMT valve is open, the short runner is selected, increasing torque at high engine speed. A Hall-effect-IC position sensing unit is integrated with the motor to provide precise open/close feedback to the ECM/PCM. The IMT actuator sends a long runner return signal to the ECM/PCM when the IMT valve is closed, and it sends a short runner return signal when the IMT valve is open.

If the ECM/PCM receives no closed return signal when it sends a close command, or if it receives no open return signal when sending an open command to the IMT actuator, for a specified time, it detects a malfunction and stores a DTC.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Once per driving cycle
-----------	------------------------

Sequence	None
Duration	2 ⁽¹⁾ , 3 ⁽²⁾ seconds or more
DTC Type	Two drive cycles, MIL ON
OBD Status	PASSED/FAILED/NOT COMPLETED (STILL TESTING)
(1) J32A3 engine	
(2) J35A8 engine	

Enable Conditions

ENABLE CONDITIONS

Condition	Minimum	Maximum
Intake air temperature	5°F (-15°C)	-
Engine speed	4,000 rpm	-
Battery voltage	10.5 V	-
No active DTCs	P0107, P0108, P0112, P0113, P0117, P0118, P0563, P1128, P1129, P2227, P2228, P2229	

Malfunction Threshold

When the ECM/PCM sends an open (short runner) command, no short runner return signal is received for at least 2*¹, 3*² seconds.

Driving Pattern

1. Start the engine. Let it idle until the radiator fan comes on.
2. Hold the engine speed to 4,000 rpm or more for at least 2*¹, 3*² seconds.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected during the first drive cycle, a Temporary DTC is stored in the ECM/PCM memory. If the malfunction recurs during the next (second) drive cycle, the MIL comes on and the DTC and the freeze frame data are stored.

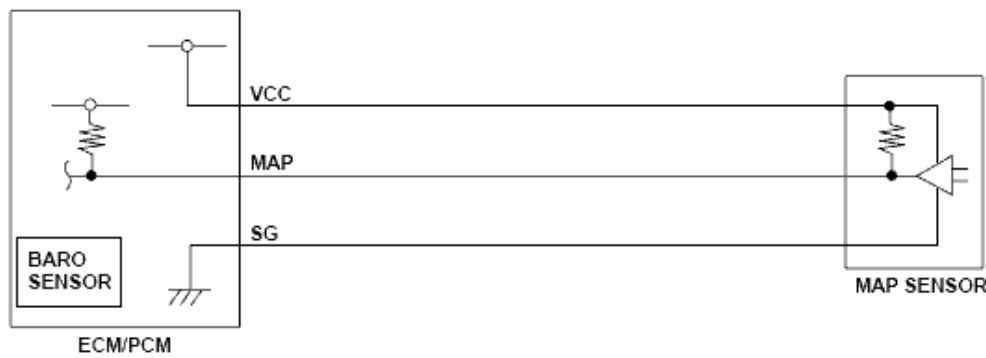
Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, the Temporary DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

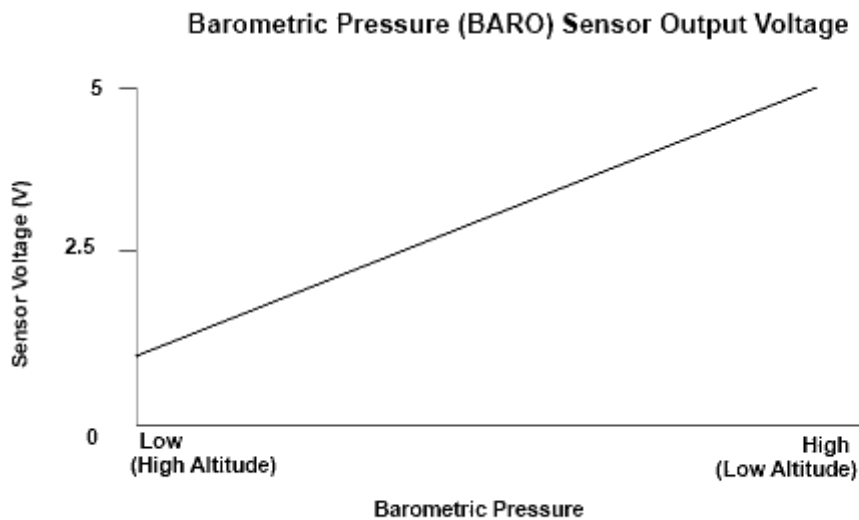
DTC P1109 (13): ADVANCED DIAGNOSTICS

DTC P1109: BAROMETRIC PRESSURE (BARO) SENSOR CIRCUIT OUT OF RANGE-HIGH



P1107-9602

Fig. 225: Barometric Pressure (BARO) Sensor - Circuit Diagram



P1106-9671

Fig. 226: Barometric Pressure (BARO) Sensor Output Voltage Graph

General Description

The barometric pressure (BARO) sensor is built into the engine control module (ECM)/powertrain control module (PCM), and it monitors atmospheric pressure. The ECM/PCM estimates appropriate intake airflow from the manifold absolute pressure (MAP) sensor output voltage and BARO sensor output voltage. When BARO sensor output voltage is within the specified range, a malfunction is detected and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
Sequence	None
Duration	2 seconds or more
DTC Type	One drive cycle, MIL ON
OBD Status	N/A

Enable Conditions

ENABLE CONDITIONS

Condition	
Ignition switch	ON
No active DTCs	P2228, P2229

Malfunction Threshold

The BARO sensor output voltage is between 3.59 V to 4.49 V for at least 2 seconds.

Diagnosis Details**Conditions for illuminating the MIL**

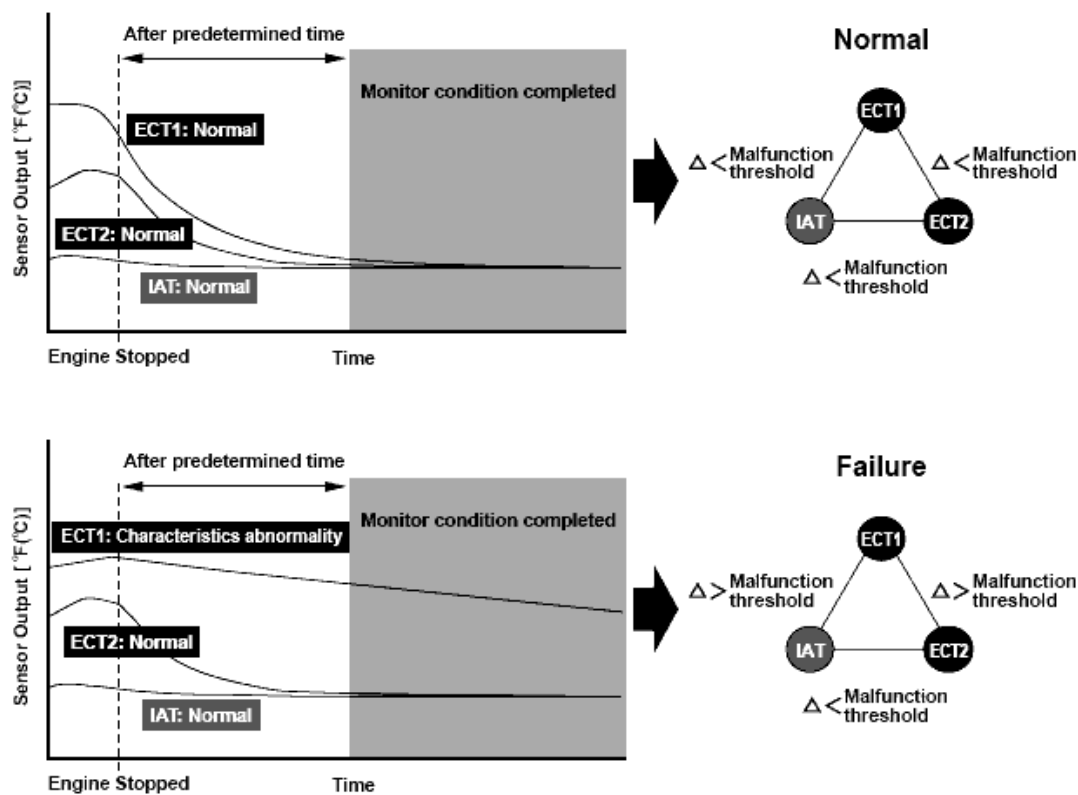
When a malfunction is detected, the MIL comes on and the DTC and the freeze frame data are stored in the ECM/PCM memory.

Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P1116 (86): ADVANCED DIAGNOSTICS**DTC P1116: ENGINE COOLANT TEMPERATURE (ECT) SENSOR 1 CIRCUIT PERFORMANCE PROBLEM**



P0111-0570

Fig. 227: Engine Coolant Temperature (ECT) Sensor Performance Graph

General Description

Two engine coolant temperature sensors and one intake air temperature sensor are used by the engine control module (ECM)/powertrain control module (PCM).

When the engine is stopped and enough time has passed, the temperature of the engine will equal the ambient temperature. When an inappropriate temperature is detected after comparing the temperature readings of each sensor, a malfunction in the corresponding sensor is detected and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Once per driving cycle
Sequence	None
Duration	10 seconds or more
DTC Type	Two drive cycles, MIL ON
OBD Status	N/A

Enable Conditions

ENABLE CONDITIONS

Condition	Minimum	Maximum
Engine off time	6 hours	-
No active DTCs	P0111, P0112, P0113, P0116, P0117, P0118, P0125, P2183, P2184, P2185, P2610	

Malfunction Threshold

A malfunction is detected if these three conditions are present after the engine and the ignition switch have been off for at least 6 hours before restarting the engine.

- When the temperature difference between the IAT and ECT1 is 76°F (24°C)^{*2}, 89°F (32°C)^{*1} or more.
- When the temperature difference between the IAT and ECT2 is 95°F (35°C)^{*1}, 97°F (36°C)^{*2} or more.
- When the temperature difference between the ECT2 and ECT1 is 120°F (49°C)^{*2}, 125°F (52°C)^{*1} or more.

*1: J32A3 engine

*2: J35A8 engine

Driving Pattern

1. Turn the ignition off, and wait at least 6 hours.
2. Start the engine, and let it idle for at least 10 seconds.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected during the first drive cycle, a Temporary DTC is stored in the ECM/PCM memory. If the malfunction recurs during the next (second) drive cycle, the MIL comes on and the DTC and the freeze frame data are stored.

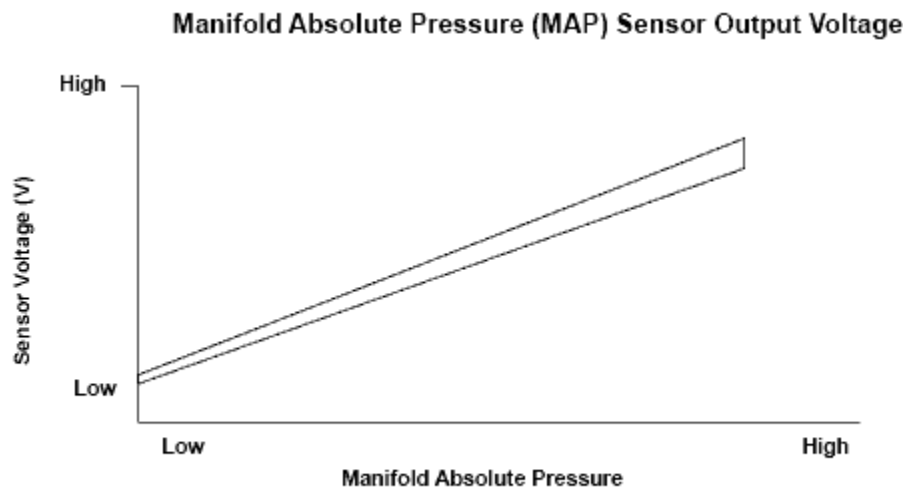
Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, the Temporary DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

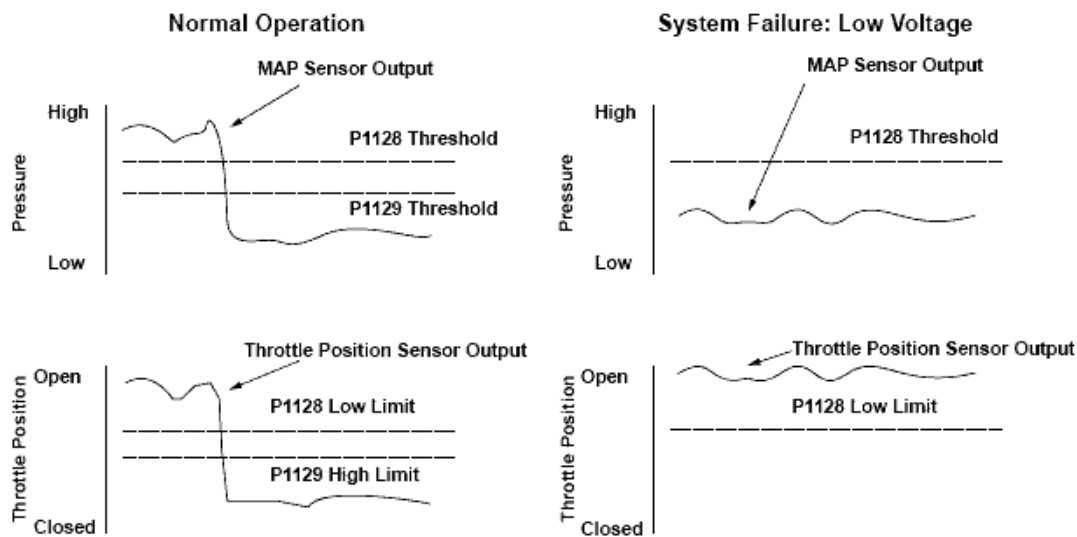
DTC P1128 (5): ADVANCED DIAGNOSTICS

DTC P1128: MANIFOLD ABSOLUTE PRESSURE (MAP) SENSOR SIGNAL LOWER THAN EXPECTED



P0107-9671

Fig. 228: Manifold Absolute Pressure (MAP) Sensor Output Voltage Graph



P1128-9771

Fig. 229: Manifold Absolute Pressure (MAP) Sensor Normal Operation And Low Voltage Graph

General Description

The manifold absolute pressure (MAP) sensor senses manifold absolute pressure (vacuum) and converts it into electrical signals. The MAP sensor outputs low signal voltage at high-vacuum (idling) and high signal voltage at low-vacuum (throttle valve wide open).

The engine control module (ECM)/powertrain control module (PCM) compares a predetermined MAP value at a given throttle position and manifold absolute pressure to the output voltage value of the MAP sensor.

If the MAP sensor outputs lower voltage than expected, the ECM/PCM detects a malfunction and stores a DTC.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Once per driving cycle
Sequence	None
Duration	2 seconds or more
DTC Type	Two drive cycles, MIL ON
OBD Status	PASSED/FAILED/NOT COMPLETED (STILL TESTING)

Enable Conditions**ENABLE CONDITIONS**

Condition		Minimum	Maximum
Engine coolant temperature		156°F (69°C)	-
Engine speed		1,100 rpm ⁽²⁾	-
		1,200 rpm ⁽¹⁾	
Vehicle speed		15 mph (24 km/h)	-
Throttle position	1,000 rpm	12.4 °(2)	-
	1,100 rpm	13.5 °(1)	-
	3,000 rpm	26.0 °(1)	-
		27.0 °(2)	-
Fuel feedback		Other than during fuel cut-off operation	
No active DTCs		P0107, P0108, P0117, P0118, P0122, P0123, P0171, P0172, P0174, P0175, P0222, P0223, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0401, P0404, P0506, P0507, P0627, P1077, P1078, P1129, P2101, P2108, P2118, P2122, P2123, P2127, P2128, P2135, P2138, P2176, P2227, P2228, P2229, P2279, P2413, P2646, P2647, P2648, P2649, U0107	
(1) J32A3 engine			
(2) J35A8 engine			

Malfunction Threshold

The MAP sensor output is 33 kPa (9.8 in.Hg, 249 mmHg)*, ^{*2}, 36 kPa (10.9 in.Hg, 277 mmHg)*, ^{*1} or less for at least 2 seconds when atmospheric pressure is 52 kPa (15.4 in.Hg, 392 mmHg)^{*2}, 61 kPa (18.1 in.Hg, 460 mmHg)^{*1}.

*: Depending on atmospheric pressure.

Driving Pattern

1. Start the engine. Hold the engine speed at 3,000 rpm without load (in Park or neutral) until the radiator fan comes on.
2. Drive the vehicle at a speed of 15 mph (24 km/h) or more with a throttle position as specified under Enable Conditions for at least 2 seconds.

- Drive the vehicle in this manner only if the traffic regulations and ambient conditions allow.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected during the first drive cycle, a Temporary DTC is stored in the ECM/PCM memory. If the malfunction recurs during the next (second) drive cycle, the MIL comes on and the DTC and the freeze frame data are stored.

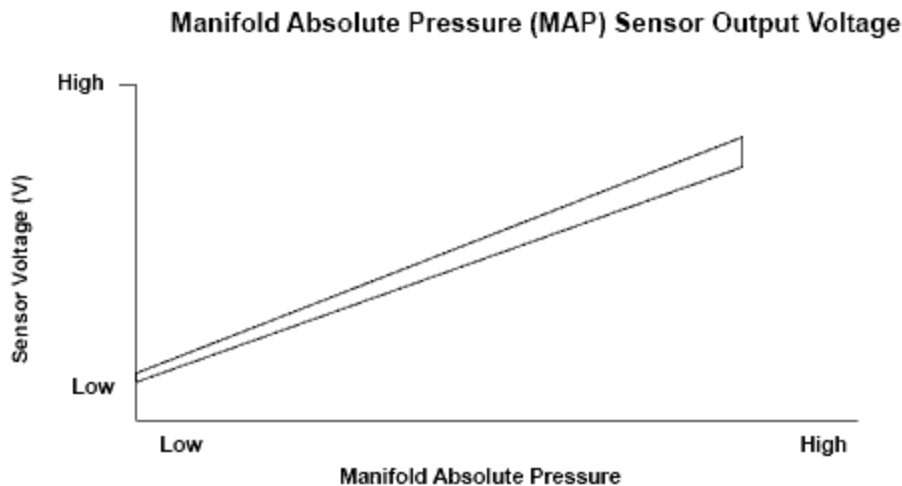
Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, the Temporary DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P1129 (5): ADVANCED DIAGNOSTICS

DTC P1129: MANIFOLD ABSOLUTE PRESSURE (MAP) SENSOR SIGNAL HIGHER THAN EXPECTED



P0107-9671

Fig. 230: Manifold Absolute Pressure (MAP) Sensor Output Voltage Graph

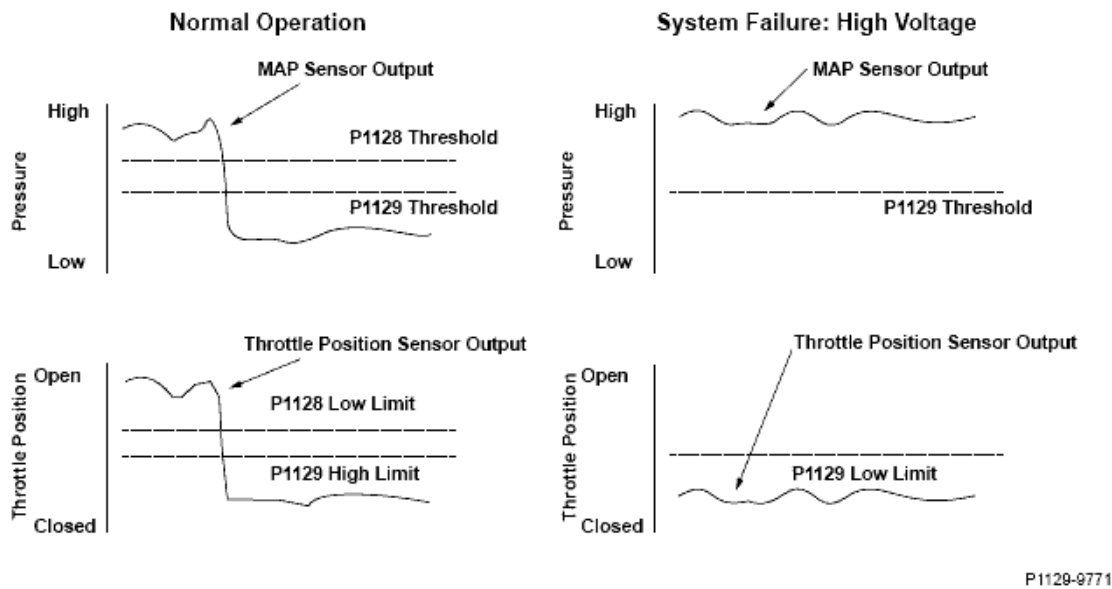


Fig. 231: Manifold Absolute Pressure (MAP) Sensor Normal Operation And High Voltage

General Description

The manifold absolute pressure (MAP) sensor senses manifold absolute pressure (vacuum) and converts it into electrical signals. The MAP sensor outputs low signal voltage at high-vacuum (throttle valve closed) and high signal voltage at low-vacuum (throttle valve wide open).

The engine control module (ECM)/powertrain control module (PCM) compares a predetermined MAP value at a given throttle position and manifold absolute pressure to the output voltage value of the MAP sensor.

If the MAP sensor outputs high voltage during fuel cut-off operation for deceleration with the throttle valve fully closed, which should make the manifold absolute pressure lower, the ECM/PCM detects a malfunction and stores a DTC.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Once per driving cycle
Sequence	None
Duration	2 seconds or more
DTC Type	Two drive cycles, MIL ON
OBD Status	PASSED/FAILED/NOT COMPLETED (STILL TESTING)

Enable Conditions

ENABLE CONDITIONS

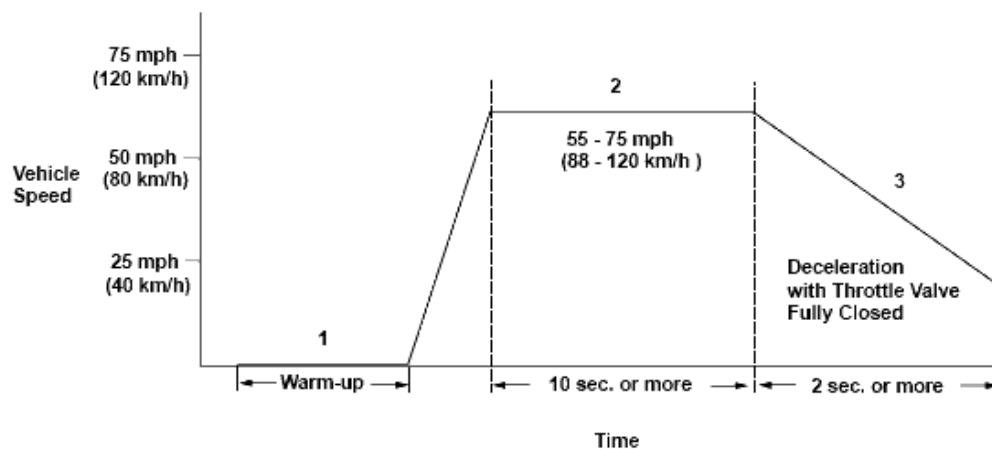
Condition	Minimum	Maximum
Elapsed time after the VTEC system changes	2 seconds	-
Engine coolant temperature	156°F (69°C)	-
Engine speed	1,100 rpm ⁽²⁾	5,900 rpm

	1,200 rpm ⁽¹⁾	
Vehicle speed	15 mph (24 km/h)	-
Fuel feedback	During deceleration	
Throttle position	Fully closed	
No active DTCs	P0107, P0108, P0112, P0113, P0117, P0118, P0122, P0123, P0171, P0172, P0174, P0175, P0222, P0223, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0401, P0404, P0443, P0496, P0497, P0506, P0507, P0627, P1077, P1078, P1128, P145C, P2101, P2108, P2118, P2122, P2123, P2127, P2128, P2135, P2138, P2176, P2413, P2646, P2647, P2648, P2649, U0107	
(1) J32A3 engine		
(2) J35A8 engine		

Malfunction Threshold

The MAP sensor output is 37 kPa (10.9 in.Hg, 277 mmHg) or more for at least 2 seconds.

Driving Pattern



P1128-0050

Fig. 232: Vehicle Speed Driving Pattern

1. Start the engine. Hold the engine speed at 3,000 rpm without load (in Park or neutral) until the radiator fan comes on.
2. Drive the vehicle at a steady speed between 55 - 75 mph (88 - 120 km/h) for at least 10 seconds.
3. Then, decelerate with the throttle valve fully closed for at least 2 seconds.
 - Drive the vehicle in this manner only if the traffic regulations and ambient conditions allow.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected during the first drive cycle, a Temporary DTC is stored in the ECM/PCM memory. If the malfunction recurs during the next (second) drive cycle, the MIL comes on and the DTC and the freeze frame data are stored.

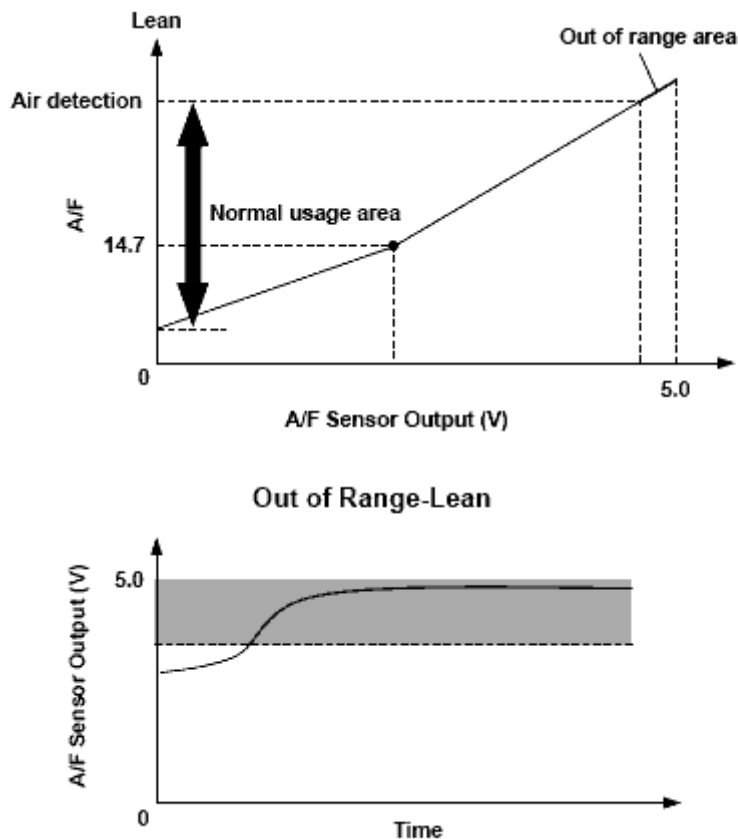
Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, the Temporary DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P1172 (157): ADVANCED DIAGNOSTICS

DTC P1172: REAR AIR/FUEL RATIO (A/F) SENSOR (BANK 1, SENSOR 1) CIRCUIT OUT OF RANGE HIGH



P1172-0570

Fig. 233: Rear Air/Fuel Ratio (A/F) Sensor (Bank 1, Sensor 1) Circuit Diagram

General Description

If a malfunction causes the rear air/fuel ratio sensor (bank 1, sensor 1) signal to the engine control module (ECM)/powertrain control module (PCM) to deviate from the normal control area, the rear air/fuel ratio (A/F) sensor may still become active after the engine starts, but the air/fuel feedback does not start normally and the emissions deteriorate. When the rear A/F sensor output is out of the normal range and this condition continues after the rear A/F sensor is active, the ECM/PCM detects a malfunction and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
Sequence	None
Duration	7 seconds or more
DTC Type	Two drive cycles, MIL ON
OBD Status	PASSED/FAILED/EXECUTING/OUT OF (TEST) CONDITION

Enable Conditions**ENABLE CONDITIONS**

Condition	
No active DTCs	P0107, P0108, P0117, P0118, P0134, P0135, P0171, P0172, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0335, P0339, P0443, P0496, P0497, P0627, P1128, P1129, P145C, P2195, P2237, P2238, P2243, P2245, P2251, P2252, P2627, P2628

Malfunction Threshold

A malfunction is detected when the rear A/F sensor (bank 1, sensor 1) output voltage is 4.7 V or more.

Driving Pattern

Start the engine. Hold the engine speed at 3,000 rpm without load (in Park or neutral) until the radiator fan comes on, then let it idle.

Diagnosis Details**Conditions for illuminating the MIL**

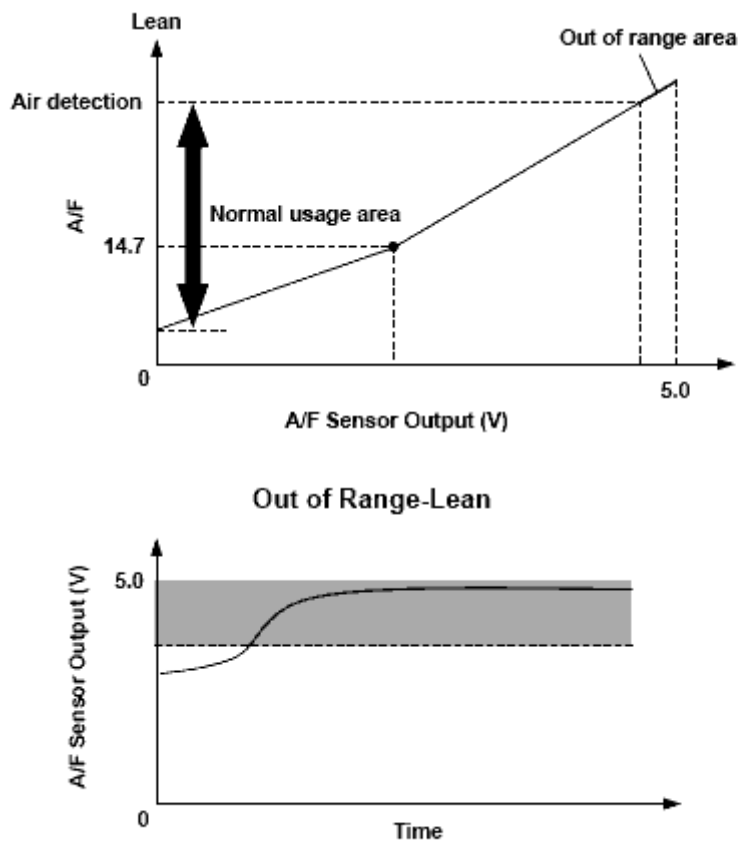
When a malfunction is detected during the first drive cycle, a Temporary DTC is stored in the ECM/PCM memory. If the mal-function recurs during the next (second) drive cycle, the MIL comes on and the DTC and the freeze frame data are stored.

Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, the Temporary DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P1174 (158): ADVANCED DIAGNOSTICS**DTC P1174: FRONT AIR/FUEL RATIO (A/F) SENSOR (BANK 2, SENSOR 1) CIRCUIT OUT OF RANGE HIGH**



P1172-0570

Fig. 234: Front Air/Fuel Ratio (A/F) Sensor (Bank 2, Sensor 1) Circuit Out Of Range High Circuit Diagram

General Description

If a malfunction causes the front air/fuel ratio sensor (bank 2, sensor 1) signal to the engine control module (ECM)/powertrain control module (PCM) to deviate from the normal control area, the front air/fuel ratio (A/F) sensor may still become active after the engine starts, but the air/fuel feedback does not start normally and the emissions deteriorate. When the front A/F sensor output is out of the normal range and this condition continues after the front A/F sensor is active, the ECM/PCM detects a malfunction and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
Sequence	None
Duration	7 seconds or more
DTC Type	Two drive cycles, MIL ON
OBD Status	PASSED/FAILED/EXECUTING/OUT OF (TEST) CONDITION

Enable Conditions

ENABLE CONDITIONS

--	--

Condition	
No active DTCs	P0107, P0108, P0117, P0118, P0154, P0155, P0174, P0175, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0335, P0339, P0443, P0496, P0497, P0627, P1128, P1129, P145C, P2197, P2240, P2241, P2247, P2249, P2254, P2255, P2630, P2631

Malfunction Threshold

A malfunction is detected when the front A/F sensor (bank 2, sensor 1) output voltage is 4.7 V or more.

Driving Pattern

Start the engine. Hold the engine speed at 3,000 rpm without load (in Park or neutral) until the radiator fan comes on, then let it idle.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected during the first drive cycle, a Temporary DTC is stored in the ECM/PCM memory. If the mal-function recurs during the next (second) drive cycle, the MIL comes on and the DTC and the freeze frame data are stored.

Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, the Temporary DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P1297 (20): ADVANCED DIAGNOSTICS

DTC P1297: ELECTRICAL LOAD DETECTOR (ELD) CIRCUIT LOW VOLTAGE

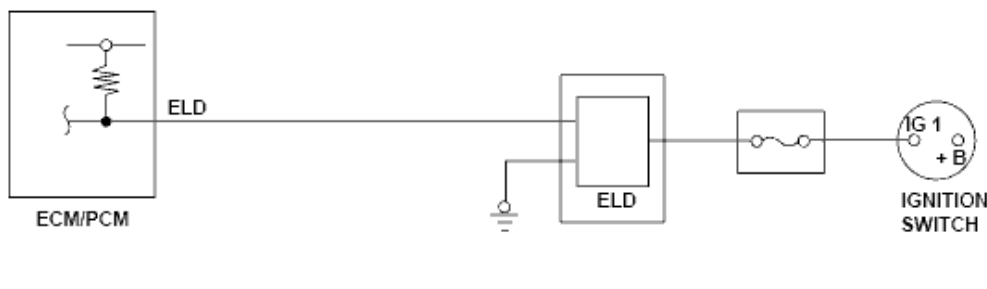


Fig. 235: Electrical Load Detector (ELD) Circuit Low Voltage - Circuit Diagram

General Description

The electrical load detector (ELD) is built into the under-hood fuse/relay box. It monitors the current fed to the ignition switch and sends a signal to the engine control module (ECM)/powertrain control module (PCM). If the ELD output voltage is extremely low, a malfunction is detected and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status**MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS**

Execution	Continuous
Sequence	None
Duration	5 seconds or more
DTC Type	One drive cycle, MIL OFF
OBD Status	N/A

Enable Conditions**ENABLE CONDITIONS**

Condition	Minimum	Maximum
Battery voltage	10.0 V	-
Ignition switch	ON	
No active DTCs	P1298	

Malfunction Threshold

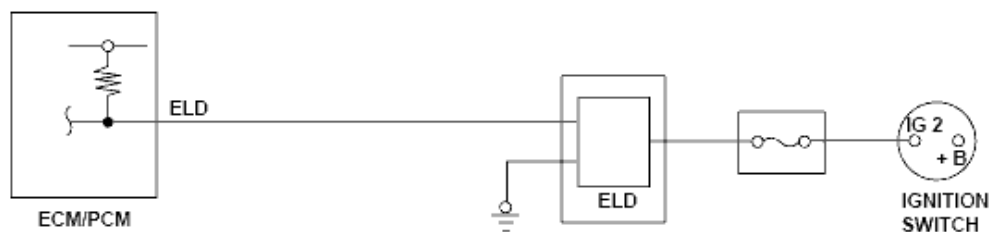
The ELD output voltage is 0.27 V or less for at least 5 seconds.

Diagnosis Details**Conditions for illuminating the indicator**

When a malfunction is detected, the DTC and the freeze frame data are stored in the ECM/PCM memory. The MIL does not come on.

Conditions for clearing the DTC

The DTC and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P1298 (20): ADVANCED DIAGNOSTICS**DTC P1298: ELECTRICAL LOAD DETECTOR (ELD) CIRCUIT HIGH VOLTAGE**

P1297-0302

Fig. 236: Electrical Load Detector (ELD) High Voltage - Circuit Diagram**General Description**

The electrical load detector (ELD) is built into the under-hood fuse/relay box. It monitors the current fed to the ignition switch and sends a signal to the engine control module (ECM)/powertrain control module (PCM). If the ELD output voltage is extremely high, a malfunction is detected and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
Sequence	None
Duration	5 seconds or more
DTC Type	One drive cycle, MIL OFF
OBD Status	N/A

Enable Conditions

ENABLE CONDITIONS

Condition	Minimum	Maximum
Battery voltage	10.0 V	-
Ignition switch	ON	
No active DTCs	P1297	

Malfunction Threshold

The ELD output voltage is 4.95 V or more for at least 5 seconds.

Diagnosis Details

Conditions for illuminating the indicator

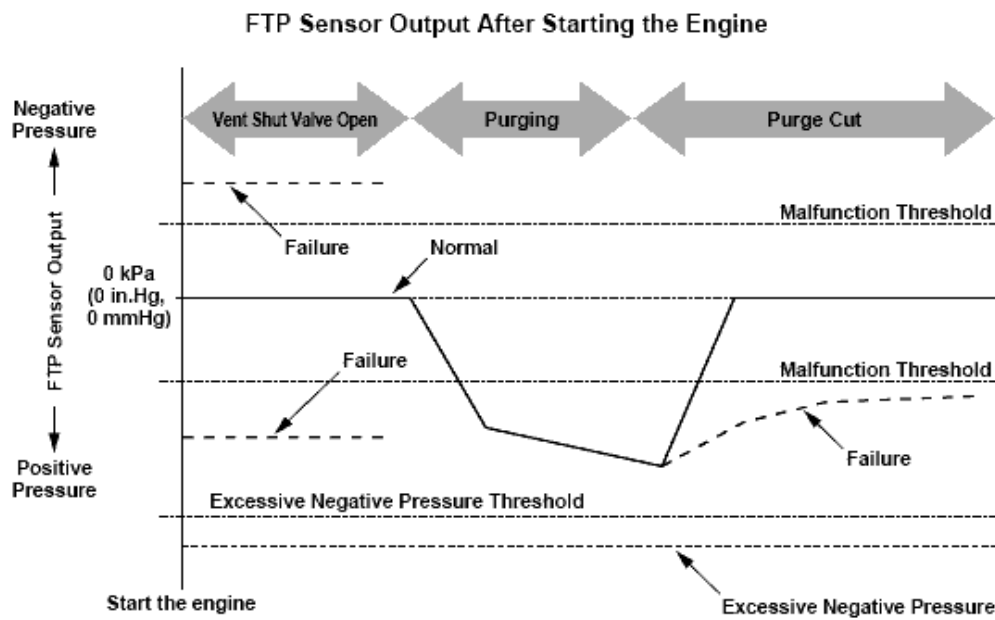
When a malfunction is detected, the DTC and the freeze frame data are stored in the ECM/PCM memory. The MIL does not come on.

Conditions for clearing the DTC

The DTC and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P1454 (54): ADVANCED DIAGNOSTICS

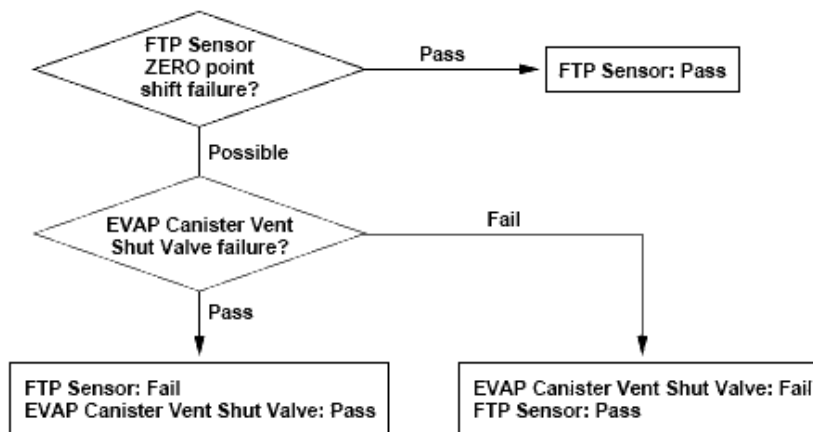
DTC P1454: FUEL TANK PRESSURE (FTP) SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM



P1454-0570

Fig. 237: Fuel Tank Pressure (FTP) Sensor Performance Problem Graph

Malfunction Judgment Flowchart of FTP Sensor and EVAP Canister Vent Shut Valve



P1454-0371

Fig. 238: Malfunction Judgment Flow Chart

General Description

The fuel tank pressure is about 0 kPa (0 in.Hg, 0 mmHg) when starting a cold engine. When the fuel tank pressure (FTP) sensor output value is out of a specified range and the engine control module (ECM)/powertrain control module (PCM) judges that there's no other cause [no evaporative emission (EVAP) canister vent shut valve failure, etc.] of the FTP sensor zero point shift, the ECM/PCM detects an FTP sensor malfunction.

However, if the FTP sensor output when starting the engine is a prescribed negative value or less (excessive negative pressure is detected), the malfunction judgment should be done as follows because it is difficult to distinguish the FTP sensor zero point shift (P1454) from the EVAP canister vent shut valve failure (P2422).

1. If either Temporary DTC P1454 or P2422 is not stored, the ECM/PCM stores both DTCs.
2. If both P1454 and P2422 Temporary DTCs are stored and an excessive negative pressure is detected, both P1454 and P2422 DTCs are stored.
3. If either Temporary DTC P1454 or P2422 is stored and an excessive negative pressure is detected, the ECM/PCM stores the DTC of the temporary DTC that was stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Once per driving cycle
Sequence	P0452, P0453, P2422 are judged as OK
Duration	8 seconds or more
DTC Type	Two drive cycles, MIL ON
OBD Status	PASSED/FAILED/NOT COMPLETED (STILL TESTING)

Enable Conditions

ENABLE CONDITIONS

Condition	Minimum	Maximum
Elapsed time after starting the engine	10 seconds	-
No active DTCs	P0107, P0108, P0117, P0118, P0134, P0135, P0154, P0155, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0335, P0339, P0443, P0451, P0452, P0453, P0496, P0497, P0498, P0499, P1128, P1129, P1172, P1174, P145C, P2195, P2197, P2227, P2228, P2229, P2237, P2238, P2240, P2241, P2243, P2245, P2247, P2249, P2251, P2252, P2254, P2255, P2422, P2627, P2628, P2630, P2631	
Others	The EVAP canister vent shut valve has not been closing	
	Stopping the purge control	

Malfunction Threshold

- The FTP sensor output fluctuates by 0.7 kPa (0.2 in.Hg, 5 mmHg) or more, or -0.7 kPa (-0.2 in.Hg, -5 mmHg) or less, for at least 8 seconds.
- The FTP sensor output value is -1.3 kPa (-0.3 in.Hg, -10 mmHg) or less for at least 8 seconds.

Confirmation Procedure with the HDS

Do the EVAP CVS ON in the INSPECTION MENU with the HDS.

Driving Pattern

Start the engine, and let it idle until the radiator fan comes on.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected during the first drive cycle, a Temporary DTC is stored in the ECM/PCM

memory. If the malfunction recurs during the next (second) drive cycle, the MIL comes on and the DTC and the freeze frame data are stored.

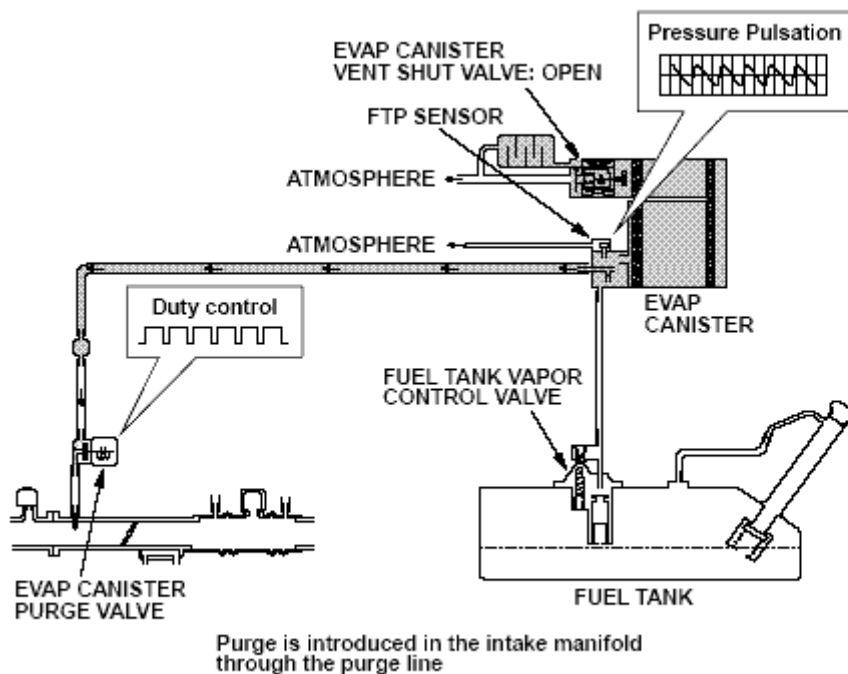
Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, the Temporary DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P145C (90): ADVANCED DIAGNOSTICS

DTC P145C: EVAPORATIVE EMISSION (EVAP) SYSTEM PURGE FLOW MALFUNCTION



P145C-0770

Fig. 239: Evaporative Emission (EVAP) Purge Flow Malfunction System Diagram

General Description

The fuel (vapor) vaporized in the fuel tank is stored in the canister temporarily and introduced in the engine through the evaporative emission (EVAP) canister purge valve. The engine control module (ECM)/powertrain control module (PCM) controls the amount of vapor introduced in the engine by repeatedly switching the power of the EVAP canister purge valve at a constant frequency according to the condition of the engine.

< STEP 1 >

The EVAP canister purge valve opens normally (EVAP canister purge valve OPEN OK) and detects that the purge flow is normal when the pulse of the EVAP canister purge valve drive cycle is transmitted to fuel tank pressure (FTP) sensor by the purge flow (pulse method).

OK determination: Pulse exists (P145C OK)

- P0497 Purge flow OK
- P0496 EVAP canister purge valve stuck Open OK

NG determination: No pulse (P145C NG)

- Either purge flow P0497 abnormality or P0496 EVAP canister purge valve OPEN failure.
- In this case, classify the failure part according to < STEP 2 >.

< STEP 2 >

If there is no pulse, it is determined as either no purge flow or the EVAP canister purge valve is stuck OPEN:

When the FTP sensor fluctuates from negative pressure to atmospheric pressure after the ignition is turned off: P0496 EVAP canister purge valve stuck OPEN

When there is no fluctuation of the FTP sensor: P0497 purge flow NG

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Once per driving cycle
Sequence	None
Duration	31 seconds or more
DTC Type	Two drive cycles, MIL ON
OBD Status	N/A

Enable Conditions

ENABLE CONDITIONS

Condition	Minimum	Maximum
Low load duration time	10 seconds	-
Engine coolant temperature before EVAP purge control starts	149°F (65°C)	-
MAP value	-	54 kPa (16.1 in.Hg, 410 mmHg)
Battery voltage	10.5 V	-
EVAP canister purge valve Duty	30 %	80 %
Fuel trim	0.73	1.47
Fuel feedback	Closed loop at stoichiometric	
No active DTCs	P0101, P0102, P0103, P0107, P0108, P0117, P0118, P0134, P0135, P0300, P0301, P0302, P0303, P0304, P0335, P0339, P0443, P0451, P0452, P0453, P0496, P0498, P0499, P1128, P1129, P1157, P1172, P1454, P2195, P2227, P2228, P2229, P2238, P2252, P2422	

Malfunction Threshold

The pulse method from the fuel tank pressure sensor is 0.20% or less for at least 31 seconds.

Confirmation Procedure with the HDS

Do the EVAP FUNCTION TEST in the INSPECTION MENU with the HDS.

Driving Pattern

1. Start the engine. Hold the engine speed at 3,000 rpm without load (in Park or neutral) until the radiator fan comes on.
2. Let the engine idle for at least 77 seconds.
3. Turn off the ignition for at least 10 seconds.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected during the first drive cycle, a Temporary DTC is stored in the ECM/PCM memory. If the malfunction recurs during the next (second) drive cycle, the MIL comes on and the DTC and the freeze frame data are stored.

Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, the Temporary DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P1549 (34): ADVANCED DIAGNOSTICS

DTC P1549: CHARGING SYSTEM HIGH VOLTAGE

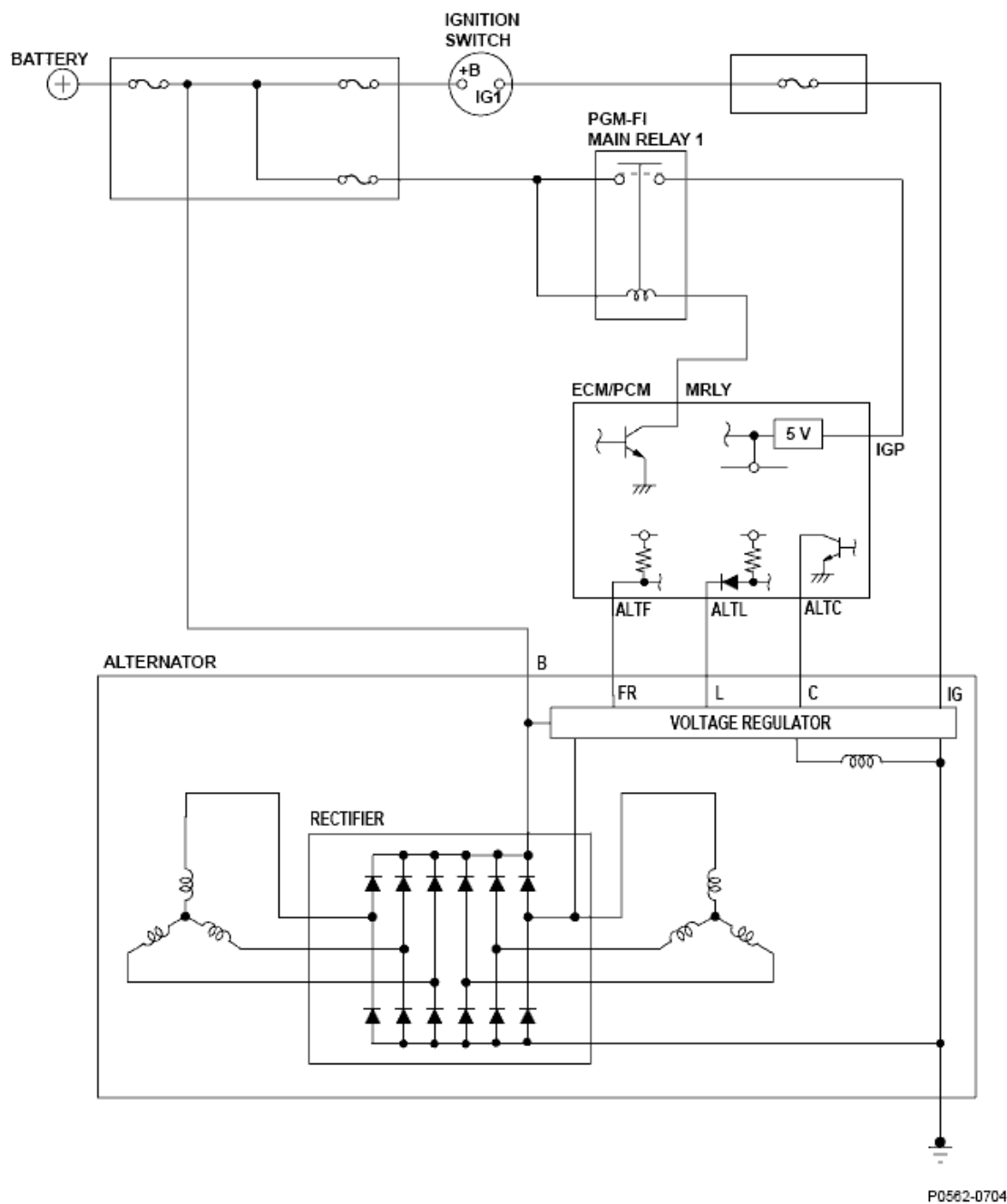


Fig. 240: Charging (High Voltage) - Circuit Diagram

General Description

The alternator is driven by the engine, and it generates electricity to supply the necessary power to the electrical system and to charge the battery. The alternator voltage target values of 14.5 V and 12.5 V are achieved by switching the alternator control mode (controlled by the engine control module (ECM)/powertrain control module (PCM)). The alternator output signal is sent to the ECM/PCM, and it varies according to the battery's state of charge, the electrical load, and the engine speed. When the IGP terminal voltage of the ECM/PCM is a set value or more for a set time, a malfunction is detected and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
Sequence	None
Duration	60 seconds or more
DTC Type	One drive cycle, MIL OFF
OBD Status	N/A

Enable Conditions**ENABLE CONDITIONS**

Condition	Minimum	Maximum
Engine speed	500 rpm	-

Malfunction Threshold

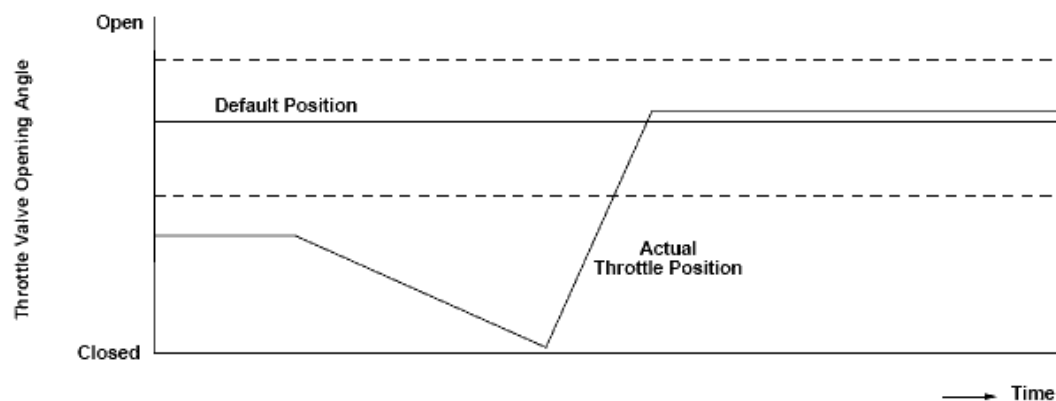
The IGP terminal voltage is 16.0 V or more for at least 60 seconds.

Diagnosis Details**Conditions for illuminating the indicator**

When a malfunction is detected, the DTC and the freeze frame data are stored in the ECM/PCM memory. The MIL does not come on.

Conditions for clearing the DTC

The DTC and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P1683 (40): ADVANCED DIAGNOSTICS**DTC P1683: THROTTLE VALVE DEFAULT POSITION SPRING PERFORMANCE PROBLEM**

P1683-0370

Fig. 241: Throttle Valve Default Position Spring Performance Problem Graph**General Description**

The electronic throttle control system (ETCS) controls the throttle valve opening. The system is composed of the throttle actuator, the throttle valve, throttle position (TP) sensors A and B, the throttle actuator control module, the throttle actuator control module relay, the accelerator pedal position (APP) sensor, and the engine control module (ECM)/powertrain control module (PCM).

The throttle valve default position spring is attached to the throttle valve gear. It opens the throttle valve to improve starting performance in cold conditions, or to retain minimum running performance in case of an electronic throttle control system failure.

If the throttle valve does not return to the default position when the throttle actuator control module moves the throttle actuator to the default position from the fully closed position, a malfunction is detected and the malfunction data is transmitted to the ECM/PCM. When the ECM/PCM receives the malfunction data from the throttle actuator control module, the ECM/PCM detects a malfunction in the throttle valve default position spring, and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Once per driving cycle
Sequence	None
Duration	2.5 seconds or more
DTC Type	One drive cycle, MIL ON
OBD Status	N/A

Enable Conditions

ENABLE CONDITIONS

Condition	Minimum	Maximum
Engine coolant temperature	158°F (70°C)	-
Battery voltage	6.0 V	-
Ignition switch	OFF	
No active DTCs	P0117, P0118, P2101, P2108, P2118, P2135, P2176, U0107	

Malfunction Threshold

Instead of being in the default position, the throttle valve position is more than +5 ° from the fully closed position or less than +3 ° from the fully closed position, for at least 2.5 seconds.

Driving Pattern

1. Start the engine. Hold the engine speed at 3,000 rpm without load (in Park or neutral) until the radiator fan comes on, then let it idle.
2. Turn the ignition switch OFF.
3. Turn the ignition switch ON.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected, the MIL comes on and the DTC and the freeze frame data are stored in the ECM/PCM memory.

Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P1684 (40): ADVANCED DIAGNOSTICS

DTC P1684: THROTTLE VALVE RETURN SPRING PERFORMANCE PROBLEM

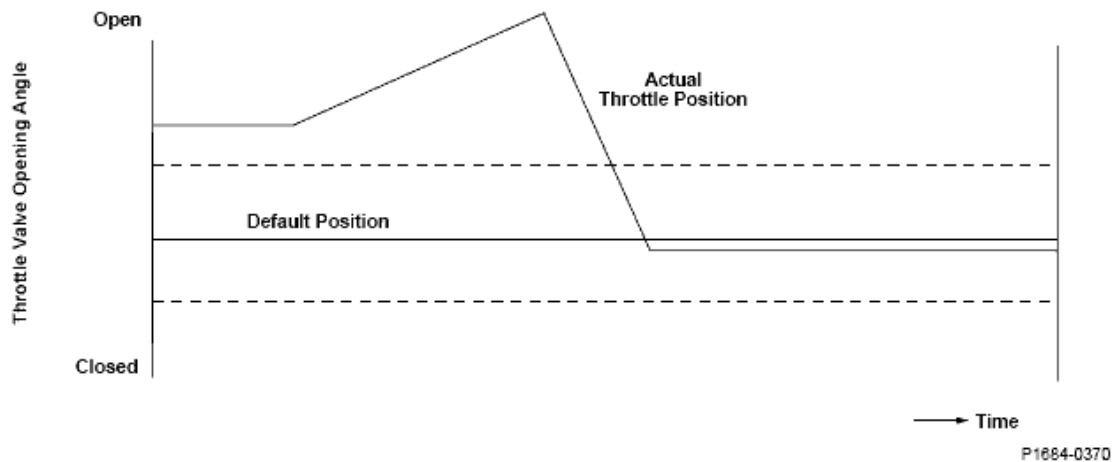


Fig. 242: Throttle Valve Return Spring Performance Problem Graph

General Description

The electronic throttle control system (ETCS) controls the throttle valve opening. The system is composed of the throttle actuator, the throttle valve, throttle position (TP) sensors A and B, the throttle actuator control module, the throttle actuator control module relay, the accelerator pedal position (APP) sensor, and the engine control module (ECM)/powertrain control module (PCM).

The throttle valve return spring is attached to the throttle valve gear to return the throttle valve to the default position. If the throttle valve does not return to the default position when the throttle actuator control module moves the throttle actuator to the default position from the middle position, a malfunction is detected and the malfunction data is transmitted to the ECM/PCM. When the ECM/PCM receives the malfunction data from the throttle actuator control module, the ECM/PCM detects a malfunction in the throttle valve return spring and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Once per driving cycle
Sequence	None
Duration	2.5 seconds or more

DTC Type	One drive cycle, MIL ON
OBD Status	N/A

Enable Conditions**ENABLE CONDITIONS**

Condition	Minimum	Maximum
Engine coolant temperature	158°F (70°C)	-
Battery voltage	6.0 V	-
Ignition switch	OFF	
No active DTCs	P0117, P0118, P2101, P2108, P2118, P2135, P2176, U0107	

Malfunction Threshold

The throttle valve opening angle is 17° or more, or 11° or less, for at least 2.5 seconds.

Driving Pattern

1. Start the engine. Hold the engine speed at 3,000 rpm without load (in Park or neutral) until the radiator fan comes on, then let it idle.
2. Turn the ignition switch OFF.
3. Turn the ignition switch ON.

Diagnosis Details**Conditions for illuminating the MIL**

When a malfunction is detected, the MIL comes on and the DTC and the freeze frame data are stored in the ECM/PCM memory.

Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P16BB (116): ADVANCED DIAGNOSTICS**DTC P16BB: ALTERNATOR B TERMINAL CIRCUIT LOW VOLTAGE**



General Description

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
Sequence	None
Duration	60 seconds or more
DTC Type	One drive cycle, MIL OFF
OBD Status	N/A

Enable Conditions**ENABLE CONDITIONS**

Condition	Minimum	Maximum
Engine speed	500 rpm	3,000 rpm
Alternator control mode	14.5 V mode	

Malfunction Threshold

The IGP terminal voltage is 12.0 V or less, and the alternator power generation amount is within 1.0% to 50.0% for at least 60 seconds.

Driving Pattern

1. Start the engine.
2. Maintain an engine speed of 500 rpm to 3,000 rpm.
3. Turn on the headlights (high beam) and rear window defogger.

Diagnosis Details**Conditions for illuminating the indicator**

When a malfunction is detected, the DTC and the freeze frame data are stored in the ECM/PCM memory. The MIL does not come on.

Conditions for clearing the DTC

The DTC and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P16BC (116): ADVANCED DIAGNOSTICS**DTC P16BC: ALTERNATOR FR TERMINAL CIRCUIT/IGP CIRCUIT LOW VOLTAGE**



General Description

When the engine speed is a specified value, the IGP terminal voltage is below a set value when the alternator is in the 14.5 V mode, and the alternator power generation amount is a set range or less, and this condition continues more than a set time, the ECM/PCM detects a malfunction and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status**MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS**

Execution	Continuous
Sequence	None
Duration	60 seconds or more
DTC Type	One drive cycle, MIL OFF
OBD Status	N/A

Enable Conditions**ENABLE CONDITIONS**

Condition	Minimum	Maximum
Engine speed	500 rpm	3,000 rpm
Alternator control mode	14.5 V mode	

Malfunction Threshold

The IGP terminal voltage is 12.0 V or less, and the alternator power generation amount is 0.5% or less for at least 60 seconds.

Driving Pattern

1. Start the engine.
2. Maintain an engine speed of 500 rpm to 3,000 rpm.
3. Turn on the headlights (high beam) and rear window defogger.

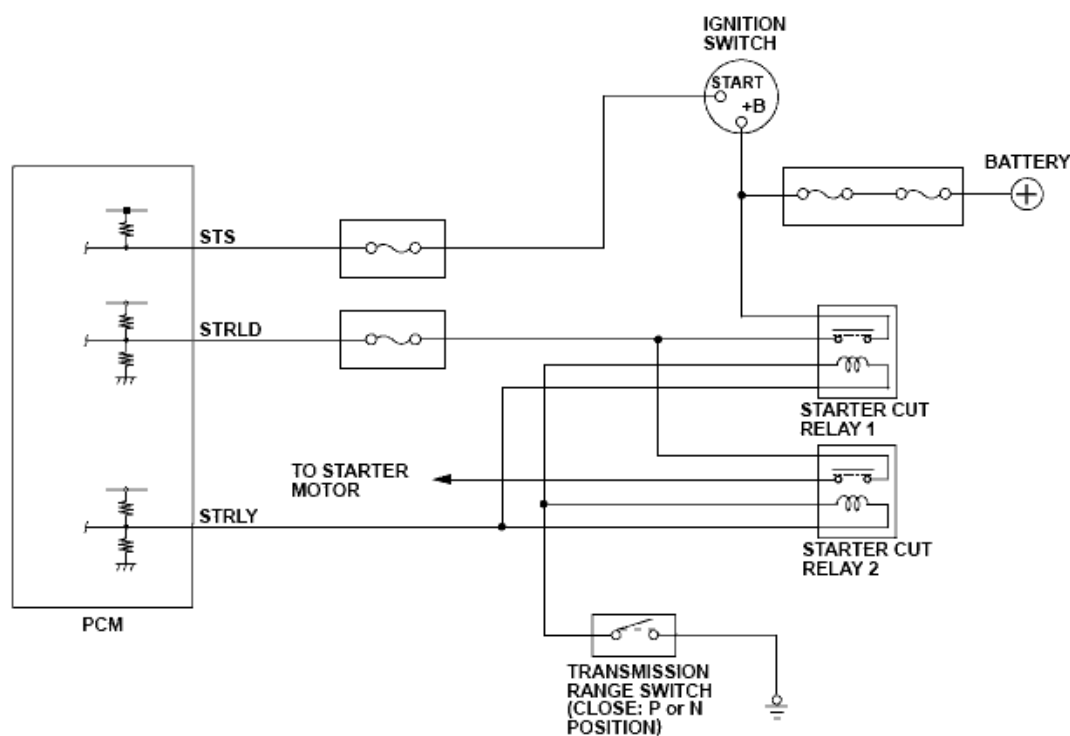
Diagnosis Details**Conditions for illuminating the indicator**

When a malfunction is detected, the DTC and the freeze frame data are stored in the ECM/PCM memory. The MIL does not come on.

Conditions for clearing the DTC

The DTC and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P16BD (198): ADVANCED DIAGNOSTICS**DTC P16BD: STARTER CUT RELAY 2 MALFUNCTION**



P0615-0700

Fig. 245: Starter Cut Relay 2 Malfunction - Circuit Diagram

General Description

To prevent the starter from continuing to rotate due to a switching failure of the starter cut relay, two starter cut relays are connected in series.

When the input voltage of the STRLD terminal drops to a set voltage even when the starter cut relay output (STRLY) is turned off, the powertrain control module (PCM) detects a malfunction of starter cut relay 2 (ST CUT) and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
Sequence	None
Duration	5 seconds or more
DTC Type	One drive cycle, MIL OFF
OBD Status	N/A

Enable Conditions

ENABLE CONDITIONS

Condition	
State of the engine	Running
Starter switch	OFF
No active DTCs	P16BE

Malfunction Threshold

The terminal voltage of the STRLD drops to 2.2 V for at least 5 seconds when the starter cut relay output is turned off.

Diagnosis Details

Conditions for illuminating the indicator

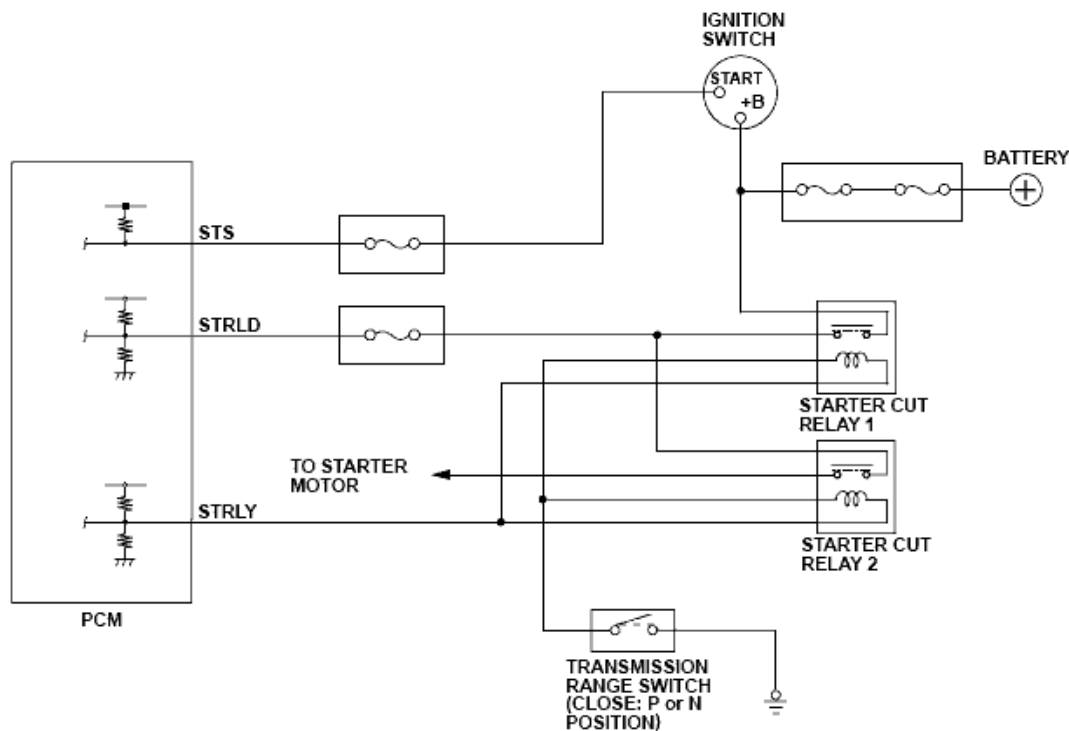
When a malfunction is detected, the DTC and the freeze frame data are stored in the PCM memory. The MIL does not come on.

Conditions for clearing the DTC

The DTC and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P16BE (198): ADVANCED DIAGNOSTICS

DTC P16BE: STARTER CUT RELAY 1 MALFUNCTION



P0615-0700

Fig. 246: Starter Cut Relay 1 Malfunction - Circuit Diagram

General Description

To prevent the starter from continuing to rotate due to a switching failure of the starter cut relay, two starter cut relays are connected in series.

When the input voltage of the STRLD terminal exceeds a set voltage even when the starter cut relay output

(STRLY) is turned off, the powertrain control module (PCM) detects a starter cut relay 1 turn on switching failure and a DTC is stored. When the starter is turned on, but the STRLD terminal input voltage does not exceed the upper or lower limit, a simultaneous failure of both starter cut relays or the STRLD open circuit is detected.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
Sequence	None
Duration	5 seconds or more ⁽¹⁾ , 0.8 second or more ⁽²⁾
DTC Type	One drive cycle, MIL OFF
OBD Status	N/A
(1) Starter cut relay turn on switching failure	
(2) STRLD open circuit failure	

Enable Conditions

ENABLE CONDITIONS

Condition	
State of the engine	Running
Starter switch	OFF*, ON**
No active DTCs	P16BD

Malfunction Threshold

One of these conditions occurs.

- The terminal voltage of the STRLD exceeds 3.0 V for at least 5 seconds when the starter cut relay output is turned off.
- The terminal voltage of the STRLD is 2.4 V to 2.6 V for at least 0.8 second when the starter cut relay output is turned on.

Diagnosis Details

Conditions for illuminating the indicator

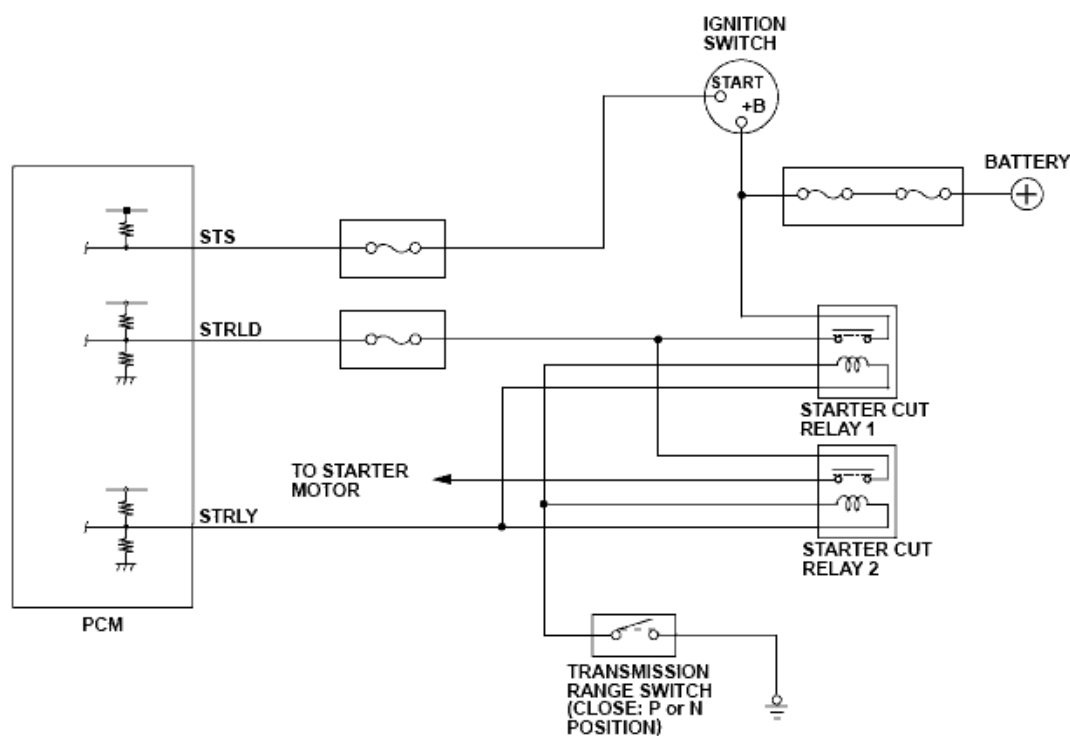
When a malfunction is detected, the DTC and the freeze frame data are stored in the PCM memory. The MIL does not come on.

Conditions for clearing the DTC

The DTC and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P16BF (198): ADVANCED DIAGNOSTICS

DTC P16BF: STARTER CUT RELAY STRLY CIRCUIT MALFUNCTION



P0615-0700

Fig. 247: Starter Cut Relay Strly Malfunction - Circuit Diagram

General Description

The powertrain control module (PCM) compares the signal of the drive command to the starter and the return signal from the starter cut relay. When the signal of the drive command to the starter and the return signal from the starter cut relay do not coincide for a set time or more, the PCM detects a malfunction and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
Sequence	None
Duration	5 seconds or more
DTC Type	One drive cycle, MIL OFF
OBD Status	N/A

Enable Conditions

ENABLE CONDITIONS

Condition	
Ignition switch	ON

Malfunction Threshold

The signal of the drive command from the PCM to the starter and the return signal from the starter cut relay do not coincide for at least 5 seconds.

Diagnosis Details

Conditions for illuminating the indicator

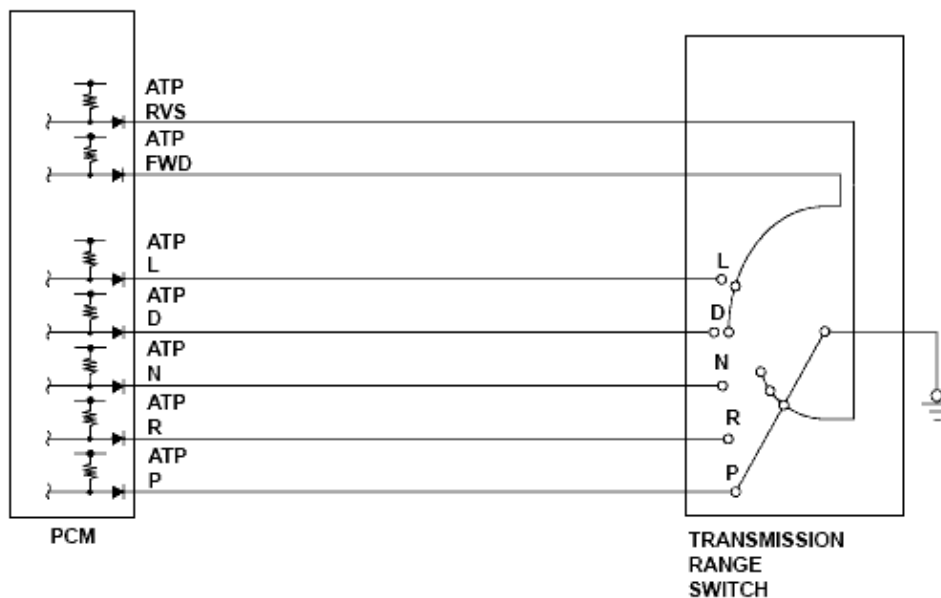
When a malfunction is detected, the DTC and the freeze frame data are stored in the PCM memory. The MIL does not come on.

Conditions for clearing the DTC

The DTC and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P1717 (62): ADVANCED DIAGNOSTICS

DTC P1717: OPEN IN TRANSMISSION RANGE SWITCH ATP RVS SWITCH CIRCUIT



P0705-0703

Fig. 248: Transmission Range Switch ATP RVS Switch Circuit Diagram

SHIFT LEVER POSITION REFERENCE

Shift lever position	Input per switch						
	P	R	N	D	L	FWD	RVS
P	o	X	X	X	X	X	o
R	X	o	X	X	X	X	o
N	X	X	o	X	X	X	o
D	X	X	X	o	X	o	X
L	X	X	X	X	o	o	X

o: Closed X: Open

General Description

The transmission range switch is attached to the control shaft. Operating the shift lever makes the control

shaft rotate via the shift cable. The A/T gear position indicator indicates which position is selected according to the Low/High signal combinations which vary based on the control shaft rotational angle. The control shaft changes the position of the transmission range switch, activates the manual valve, and switches hydraulic pressure to shift the transmission through forward/neutral/reverse. The transmission range switch signal is used to determine the shift schedule. The voltage is 12 V (High) at the powertrain control module (PCM) input terminal when each transmission range switch position is open, and it is 0 V (Low) when each switch is closed. If the RVS switch is OPEN with the shift lever in the R position while shifting between the P, R, and N positions, the PCM detects a RVS switch OPEN failure and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
Sequence	None
Duration	2 seconds or more
DTC Type	One drive cycle, MIL ON, D indicator blinks
OBD Status	PASSED/FAILED/NOT COMPLETED (STILL TESTING)

Enable Conditions

ENABLE CONDITIONS

Condition	Minimum	Maximum
Battery voltage	11.0 V	-
No active DTCs	P0705, P0812	

Malfunction Threshold

No RVS signal is detected with the shift lever in R position while shifting between the P, R, and N positions.

Driving Pattern

1. Start the engine, and shift to P, R, and N positions.
2. Shift to R position, and wait for at least 2 seconds.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected, the MIL comes on and the DTC and the freeze frame data are stored in the PCM memory.

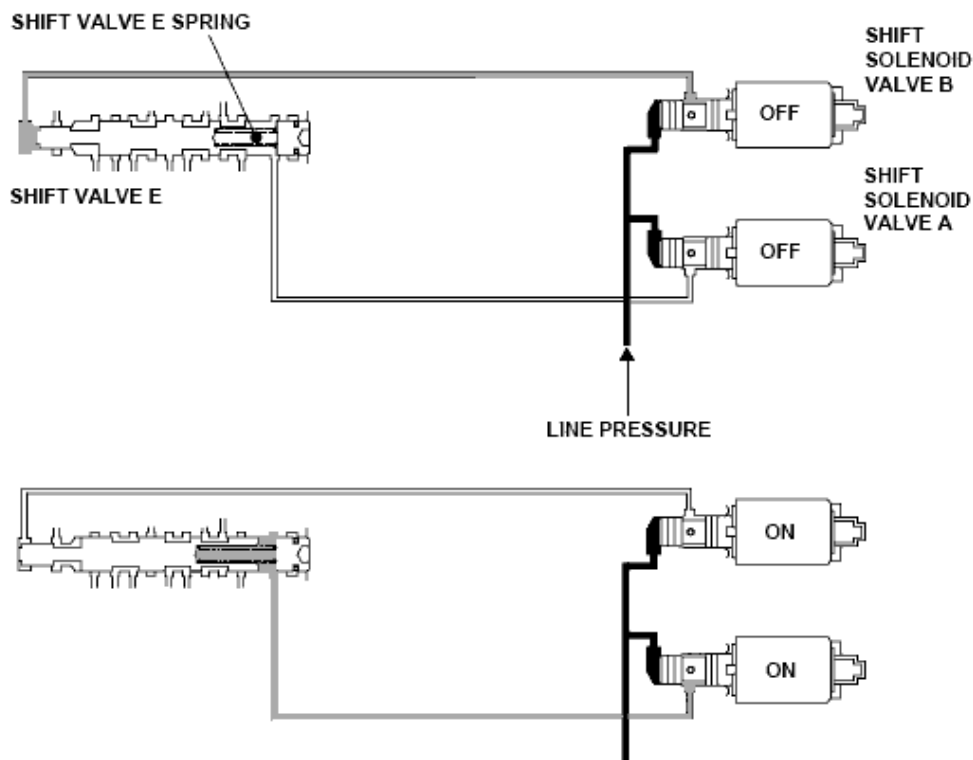
Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

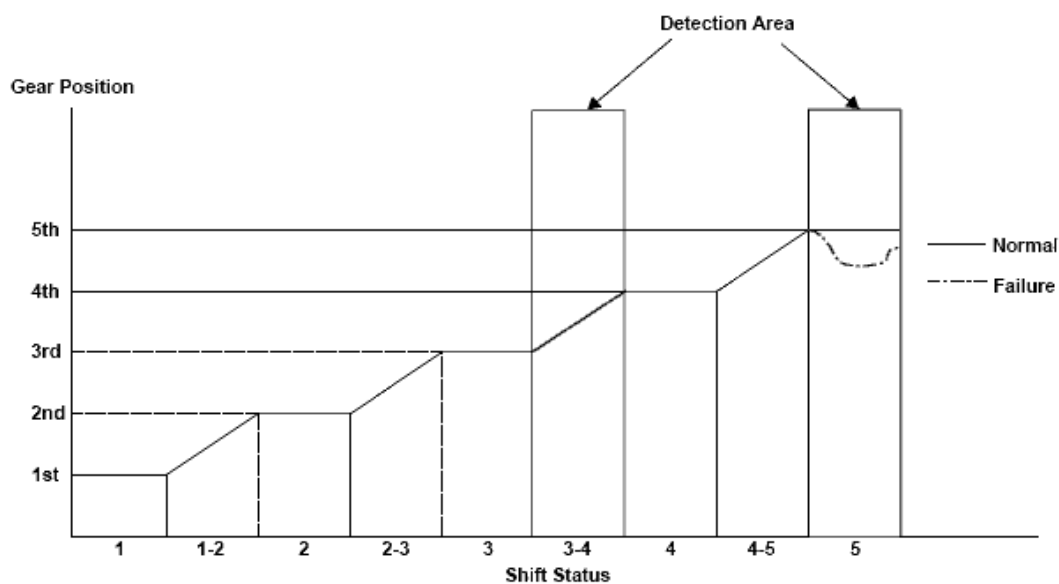
DTC P1743 (45): ADVANCED DIAGNOSTICS

DTC P1743: PROBLEM IN SHIFT CONTROL SYSTEM; SHIFT VALVE E STUCK OFF



P1743-0571

Fig. 249: Shift Control System Diagram



P1743-0570

Fig. 250: Gear Position VS Shift Status Graph

Shift solenoid valve Clutch		In gear	1st	1st-2nd	2nd	2nd-3rd	3rd	3rd-4th	4th	4th-5th	5th
	A	OFF	OFF	ON	ON	ON	ON	ON	OFF	OFF	OFF
	B	ON	ON	ON	ON	ON	OFF	OFF	OFF	OFF	ON
	C	OFF	ON	ON	OFF	ON	ON	OFF	OFF	ON	ON
	D	OFF	OFF	OFF/ON	OFF/ON	OFF/ON	OFF/ON	OFF/ON	OFF/ON	OFF/ON	OFF/ON
1st Clutch		CPC C	LINE	LINE	LINE	LINE	LINE	LINE	LINE	LINE	LINE
2nd Clutch		CPC A		CPC A	LINE	CPC A		CPC C			
3rd Clutch				CPC B		CPC B	LINE	CPC B			
4th Clutch								CPC A	LINE	CPC A	
5th Clutch										CPC B	LINE

CPC: Clutch Pressure Control pressure

Fig. 251: Shift Solenoid Valve Output Reference Chart (D Position)**General Description**

Shift valve E is incorporated in the control circuit of the transmission. It is controlled by pressure from shift solenoid valve B, and it is locked by the line pressure. It switches off when shift solenoid valve B turns off and shift solenoid valve A turns on. The PCM monitors the mainshaft speed and the countershaft speed at the gear change determined by the shift schedule. When an improper gear ratio is output compared to the predetermined gear change mode, a shift valve E OFF failure is detected and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status**MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS**

Execution	Continuous
Sequence	None
Duration	Depending on the driving pattern
DTC Type	Two drive cycles, MIL OFF, D indicator blinks
OBD Status	PASSED/FAILED/NOT COMPLETED (STILL TESTING)

Enable Conditions**ENABLE CONDITIONS**

Condition	Minimum	Maximum
Vehicle speed	5 mph (9 km/h)	-
Battery voltage	11.0 V	-
Torque converter slip ratio	96 %	110 %
Shift lever position	D	
No active DTCs	P0122, P0123, P0705, P0716, P0717, P0718, P0721, P0722, P0723, P0746, P0747, P0751, P0752, P0756, P0757, P0761, P0762, P0766, P0767, P0776, P0777, P0796, P0797, P0842, P0843, P0847, P0848, P0962, P0963, P0966, P0967, P0970, P0971, P0973, P0974, P0976, P0977, P0979, P0980, P0982, P0983, P1743, P1745	

Malfunction Threshold

The transmission is neutral against the 5th gear shift command for at least 2 seconds, without records that the engine speed flares when upshifting to 3rd - 4th.

Driving Pattern

Start the engine, and accelerate the vehicle until the transmission shifts into 5th gear in the D position.

- Drive the vehicle in this manner only if the traffic regulations and ambient conditions allow.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected during the first drive cycle, a Temporary DTC is stored in the PCM memory. If the malfunction recurs during the next (second) drive cycle, the DTC and the freeze frame data are stored. The MIL does not come on.

Conditions for clearing the MIL

The DTC, the Temporary DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P1744 (45): ADVANCED DIAGNOSTICS

DTC P1744: PROBLEM IN SHIFT CONTROL SYSTEM; SHIFT VALVE E STUCK ON

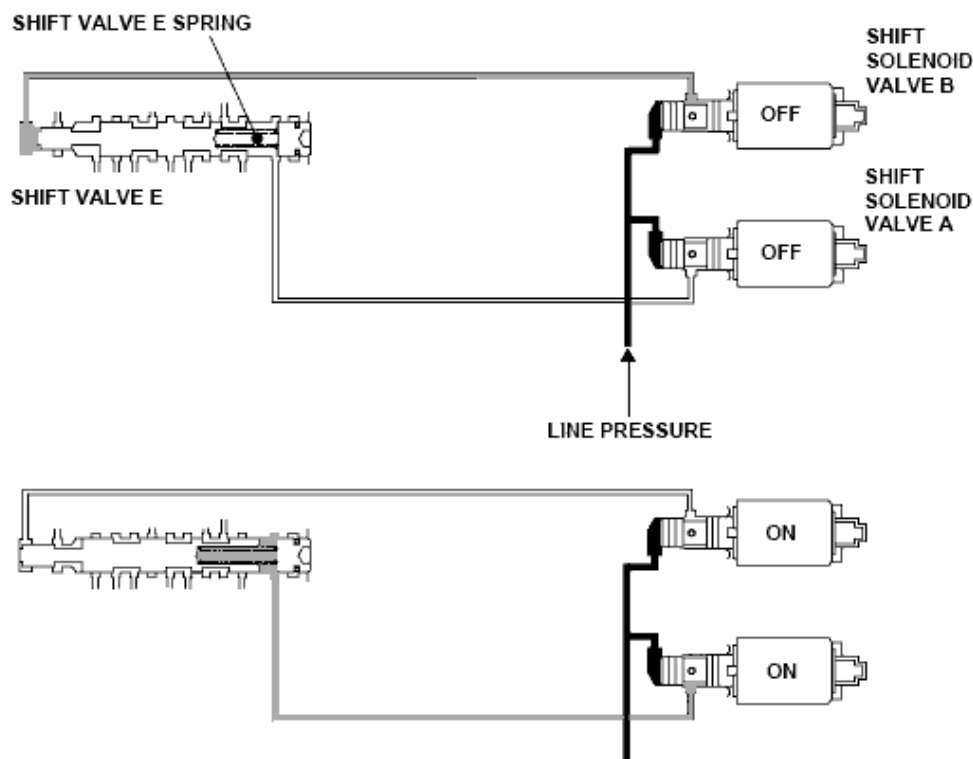
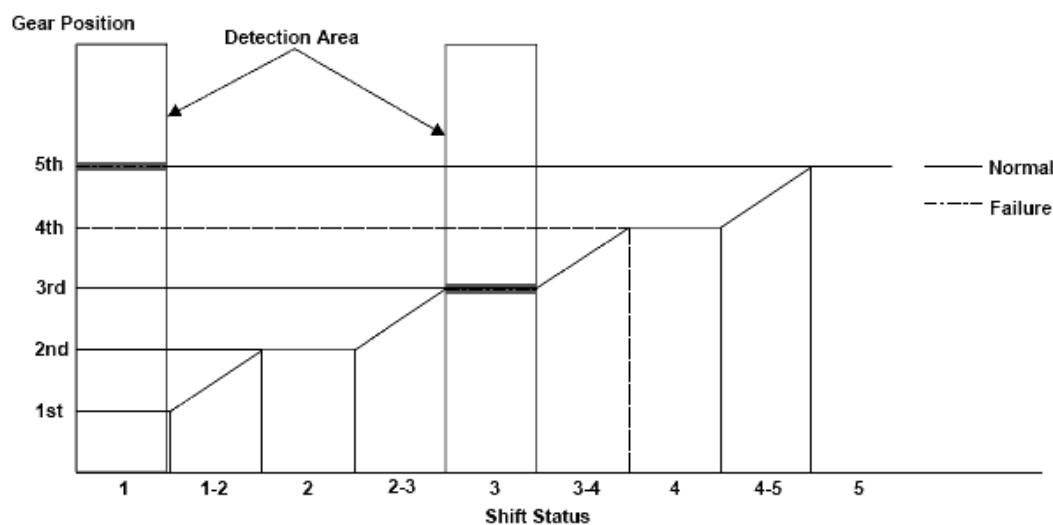


Fig. 252: Shift Control System Diagram

P1744-0571

Fig. 253: Gear Position VS Shift Status Graph

Shift solenoid valve Clutch		In gear	1st	1st-2nd	2nd	2nd-3rd	3rd	3rd-4th	4th	4th-5th	5th
	A	OFF	OFF	ON	ON	ON	ON	ON	OFF	OFF	OFF
	B	ON	ON	ON	ON	ON	OFF	OFF	OFF	OFF	ON
	C	OFF	ON	ON	OFF	ON	ON	OFF	OFF	ON	ON
	D	OFF	OFF	OFF/ON	OFF/ON	OFF/ON	OFF/ON	OFF/ON	OFF/ON	OFF/ON	OFF/ON
1st Clutch		CPC C	LINE	LINE	LINE	LINE	LINE	LINE	LINE	LINE	LINE
2nd Clutch		CPC A		CPC A	LINE	CPC A		CPC C			
3rd Clutch				CPC B		CPC B	LINE	CPC B			
4th Clutch								CPC A	LINE	CPC A	
5th Clutch										CPC B	LINE

CPC: Clutch Pressure Control pressure

Fig. 254: Shift Solenoid Valve Output Reference Chart (D Position)**General Description**

Shift valve E is incorporated in the control circuit of the transmission. It is controlled by pressure from shift solenoid valve B, and it is locked by the line pressure. It switches off when shift solenoid valve B turns off and shift solenoid valve A turns on. The PCM monitors the mainshaft speed and the countershaft speed at the gear change determined by the shift schedule. When an improper gear ratio is output compared to the predetermined gear change mode, a shift valve E ON failure is detected and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status**MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS**

Execution	Continuous
Sequence	None
Duration	Depending on the driving pattern

DTC Type	Two drive cycles, MIL OFF, D indicator blinks
OBD Status	PASSED/FAILED/NOT COMPLETED (STILL TESTING)

Enable Conditions**ENABLE CONDITIONS**

Condition	Minimum	Maximum
Vehicle speed	5 mph (9 km/h)	-
Battery voltage	11.0 V	-
Shift lever position	D	
No active DTCs	P0122, P0123, P0705, P0716, P0717, P0718, P0721, P0722, P0723, P0746, P0747, P0751, P0752, P0756, P0757, P0761, P0762, P0766, P0767, P0776, P0777, P0796, P0797, P0842, P0843, P0847, P0848, P0962, P0963, P0966, P0967, P0970, P0971, P0973, P0974, P0976, P0977, P0979, P0980, P0982, P0983, P1743, P1745	

Malfunction Threshold

- The transmission is held in 5th gear against the 1st gear shift command for at least 1.5 seconds.
- After driving the vehicle in 3rd gear in the D position for at least 1.5 seconds.

Driving Pattern

Start the engine, and accelerate the vehicle until the transmission shifts into 5th gear in the D position.

- Drive the vehicle in this manner only if the traffic regulations and ambient conditions allow.

Diagnosis Details**Conditions for illuminating the MIL**

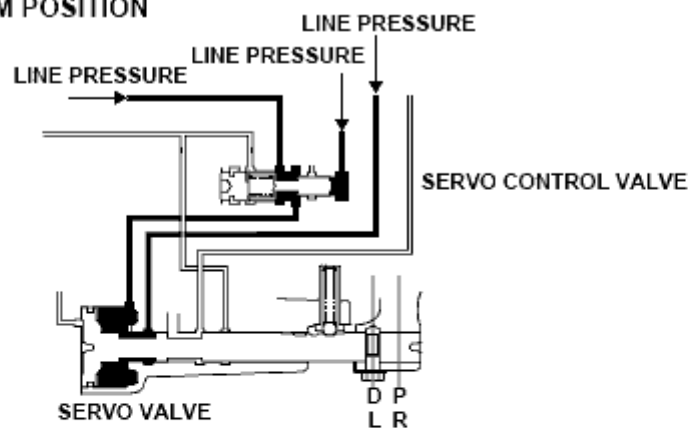
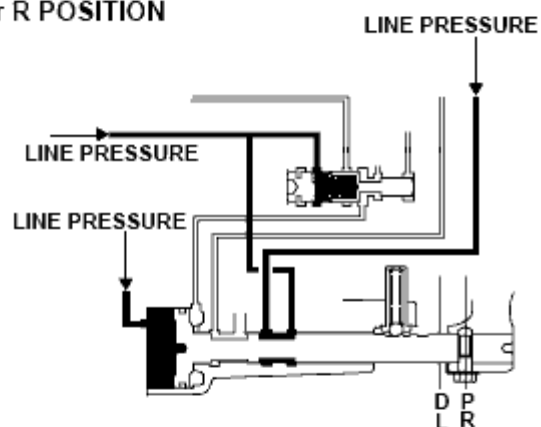
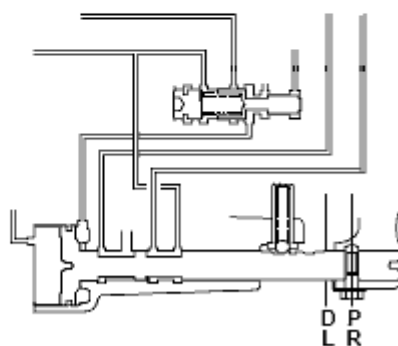
When a malfunction is detected during the first drive cycle, a Temporary DTC is stored in the PCM memory. If the malfunction recurs during the next (second) drive cycle, the DTC and the freeze frame data are stored. The MIL does not come on.

Conditions for clearing the MIL

The DTC, the Temporary DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

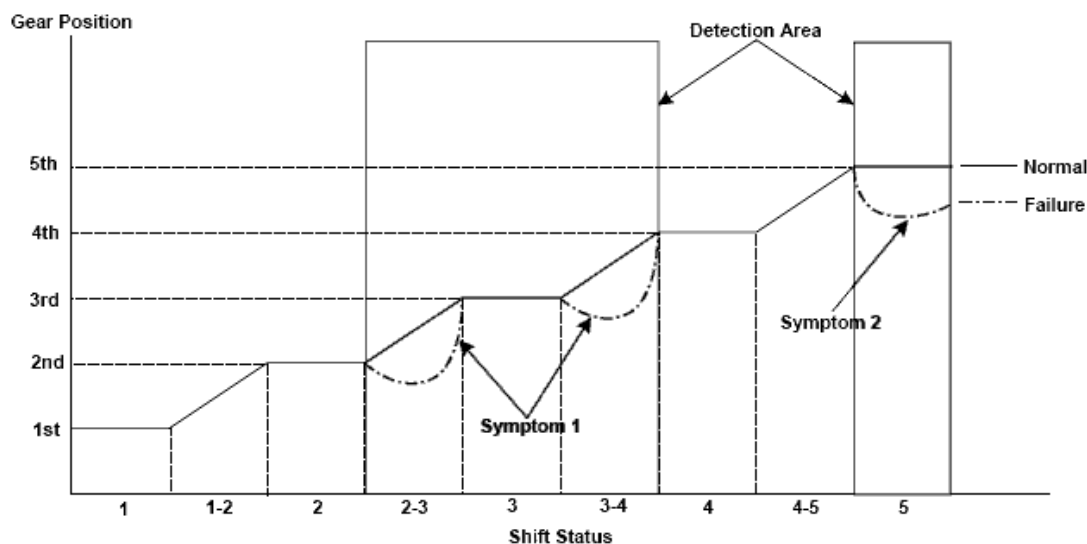
DTC P1745 (45): ADVANCED DIAGNOSTICS

DTC P1745: PROBLEM IN SHIFT CONTROL SYSTEM; SERVO CONTROL VALVE STUCK OFF OR SERVO VALVE STUCK OFF

D, L, or M POSITION**P or R POSITION****N POSITION**

P1745-0772

Fig. 255: Shift Control System Diagram



P1745-0571

Fig. 256: Gear Position VS Shift Status Graph

Shift solenoid valve Clutch		In gear	1st	1st-2nd	2nd	2nd-3rd	3rd	3rd-4th	4th	4th-5th	5th
	A	OFF	OFF	ON	ON	ON	ON	ON	OFF	OFF	OFF
	B	ON	ON	ON	ON	ON	OFF	OFF	OFF	OFF	ON
	C	OFF	ON	ON	OFF	ON	ON	OFF	OFF	ON	ON
	D	OFF	OFF	OFF/ON	OFF/ON	OFF/ON	OFF/ON	OFF/ON	OFF/ON	OFF/ON	OFF/ON
1st Clutch		CPC C	LINE	LINE	LINE	LINE	LINE	LINE	LINE	LINE	LINE
2nd Clutch		CPC A		CPC A	LINE	CPC A		CPC C			
3rd Clutch				CPC B		CPC B	LINE	CPC B			
4th Clutch								CPC A	LINE	CPC A	
5th Clutch										CPC B	LINE

CPC: Clutch Pressure Control pressure

Fig. 257: Shift Solenoid Valve Output Reference Chart (D Position)**General Description**

The servo control valve and the servo valve are incorporated into the control circuit of the transmission. The servo control valve and the servo valve operate when the shift lever is in the D, L, or M position due to line pressure and turn off when the shift lever is in the P, R, or N position.

The PCM monitors the mainshaft speed and the countershaft speed at the gear change determined by the shift schedule. When an improper gear ratio is output compared to the predetermined gear change mode, a servo control valve OFF or servo valve OFF failure is detected and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status**MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS**

Execution	Continuous
Sequence	None
	0.5 second or more (symptom 1-A, 1-B)

Duration	2.0 seconds or more (symptom 2)
DTC Type	Two drive cycles, MIL OFF, D indicator blinks
OBD Status	PASSED/FAILED/NOT COMPLETED (STILL TESTING)

Enable Conditions

ENABLE CONDITIONS

Condition	Minimum	Maximum
Engine coolant temperature	50°F (10°C) ⁽¹⁾	-
ATF temperature	-4°F (-20°C) ⁽¹⁾	-
Vehicle speed	5 mph (9 km/h)	-
Battery voltage	11.0 V	-
Torque converter slip ratio	96 %	110 %
Accelerator pedal position variation	-	6 %/20 milliseconds (Not fully closed) ⁽¹⁾
Shift lever position	D	
No active DTCs	P0122, P0123, P0705, P0716, P0717, P0718, P0721, P0722, P0723, P0746, P0747, P0751, P0752, P0756, P0757, P0761, P0762, P0766, P0767, P0776, P0777, P0796, P0797, P0842, P0843, P0847, P0848, P0962, P0963, P0966, P0967, P0970, P0971, P0973, P0974, P0976, P0977, P0979, P0980, P0982, P0983, P1743, P1744	
(1) Symptom 1		

Malfunction Threshold

One of these symptoms occurs:

MALFUNCTION THRESHOLD (SYMPTOM 1)

Symptom	Gear position commanded by the PCM	Actual gear position
1-A	2nd --> 3rd gear upshift	The engine speed flares when upshifting to 2nd - 3rd
1-B	3rd --> 4th gear upshift	The engine speed flares when upshifting to 3rd - 4th

MALFUNCTION THRESHOLD (SYMPTOM 2)

Symptom	Gear position commanded by the PCM	Actual gear position
2	Driving in 5th gear	Neutral

Driving Pattern

Start the engine, and accelerate the vehicle until the transmission shifts into 5th gear in the D position.

- Drive the vehicle in this manner only if the traffic regulations and ambient conditions allow.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected during the first drive cycle, a Temporary DTC is stored in the PCM memory. If the malfunction recurs during the next (second) drive cycle, the DTC and the freeze frame data are stored. The MIL does not come on.

Conditions for clearing the MIL

The DTC, the Temporary DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P1780 (49): ADVANCED DIAGNOSTICS**DTC P1780: PROBLEM IN SHIFT CONTROL SYSTEM****General Description**

When the powertrain control module (PCM) detects a mechanical malfunction in the automatic transmission, the transmission switches to a default mode according to the malfunction, and this DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status**MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS**

Execution	Continuous
Sequence	None
Duration	2 seconds or more
DTC Type	Two drive cycles, MIL ON, D indicator blinks
OBD Status	PASSED/FAILED/NOT COMPLETED (STILL TESTING)

Enable Conditions**ENABLE CONDITIONS**

Condition	Minimum	Maximum
Battery voltage	11.0 V	-
No active DTCs	P0122, P0123, P0705, P0716, P0717, P0718, P0721, P0722, P0723, P0746, P0747, P0751, P0752, P0756, P0757, P0761, P0762, P0766, P0767, P0776, P0777, P0796, P0797, P0842, P0843, P0847, P0848, P0962, P0963, P0966, P0967, P0970, P0971, P0973, P0974, P0976, P0977, P0979, P0980, P0982, P0983	

Malfunction Threshold

The AT control is switched to the default mode due to a mechanical malfunction.

Driving Pattern

Start the engine, and accelerate the vehicle until the transmission shifts into 5th gear in the D position.

- Drive the vehicle in this manner only if the traffic regulations and ambient conditions allow.

Diagnosis Details**Conditions for illuminating the MIL**

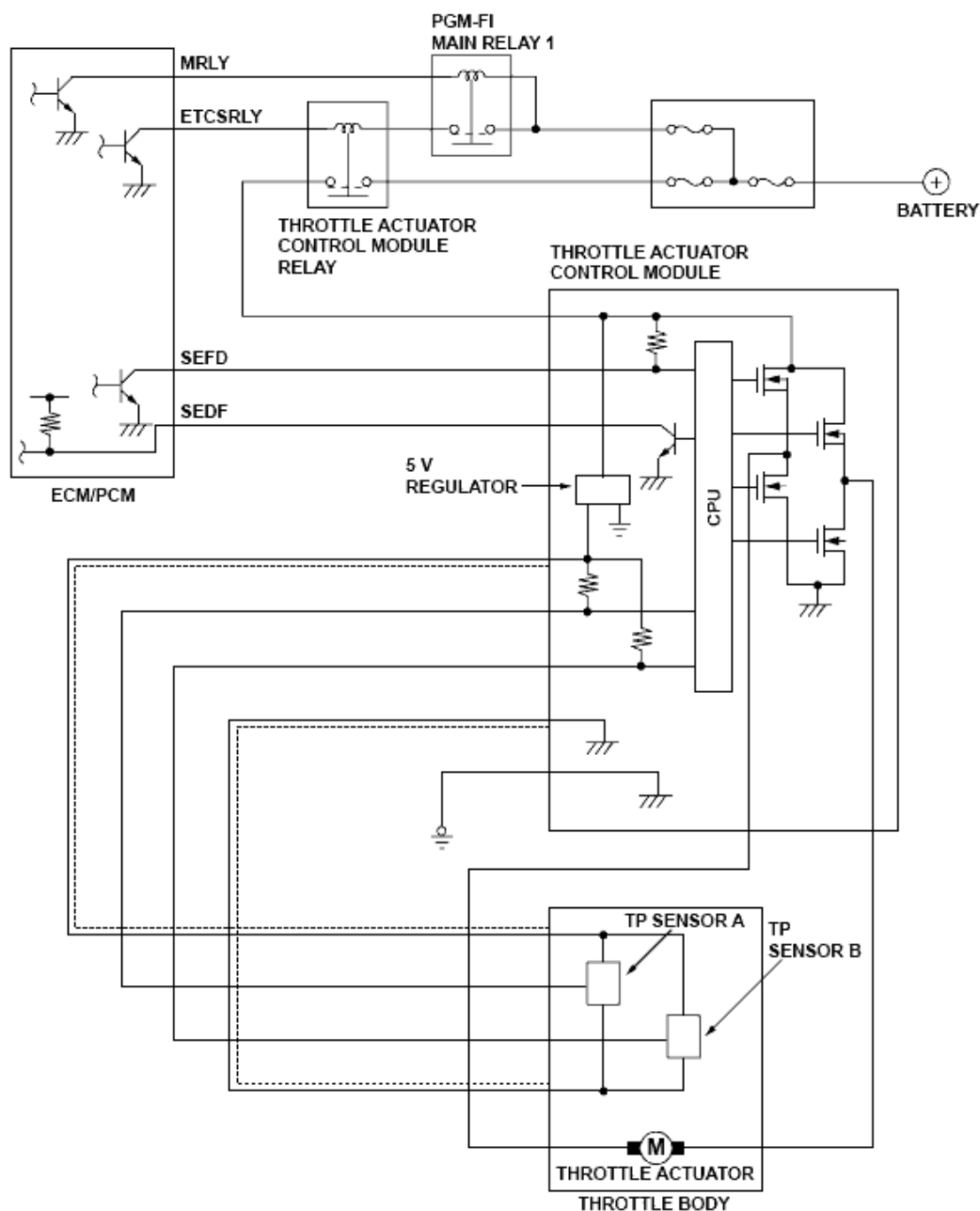
When a malfunction is detected during the first drive cycle, a Temporary DTC is stored in the PCM memory. If the malfunction recurs during the next (second) drive cycle, the MIL comes on and the DTC and the freeze frame data are stored.

Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, the Temporary DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P2101 (40): ADVANCED DIAGNOSTICS**DTC P2101: THROTTLE ACTUATOR SYSTEM MALFUNCTION**



P0122-0702

Fig. 258: Throttle Actuator System Malfunction - Circuit Diagram

General Description

The electronic throttle control system (ETCS) controls the throttle valve opening. The system is composed of the throttle actuator, the throttle valve, throttle position (TP) sensors A and B, the throttle actuator control module, the throttle actuator control module relay, the accelerator pedal position (APP) sensor, and the engine control module (ECM)/powertrain control module (PCM).

The APP sensor is operated via the throttle cable to determine the accelerator opening value when the driver presses the accelerator pedal. The accelerator pedal opening value is converted to a signal in the APP sensor and transmitted to the ECM/PCM to compute the target position. The target position signal is then transmitted to the throttle actuator control module.

The throttle actuator control module determines the throttle valve target position according to the signal received and operates the throttle actuator to move the throttle valve to the target position. The actual throttle valve position is determined by TP sensor A installed in the throttle body.

The throttle actuator control module compares the throttle valve target opening angle and the actual throttle valve opening angle from TP sensor A, and when the difference exceeds the specification, the throttle actuator control module transmits the malfunction data to the ECM/PCM. When the ECM/PCM receives the malfunction data from the throttle actuator control module, the ECM/PCM detects the malfunction of the throttle actuator system and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
Sequence	None
Duration	0.25 second or more ⁽¹⁾ , 0.5 second or more ⁽²⁾
DTC Type	One drive cycle, MIL ON
OBD Status	N/A
(1) Throttle valve closed direction	
(2) Throttle valve open direction	

Enable Conditions

ENABLE CONDITIONS

Condition	Minimum	Maximum
Battery voltage	6.0 V	-
Ignition switch	ON	
No active DTCs	P2108, P2118, P2135, P2176, U0107	

Malfunction Threshold

One of the conditions in this table must be met for at least 0.25 second* (0.5 second**).

MALFUNCTION THRESHOLD

Throttle valve target position	Difference between the throttle valve target position and the actual throttle valve position
2°	4° or more
6°	5.4° or more
10°	5.7° or more
15°	6° or more
90°	6° or more

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected, the MIL comes on and the DTC and the freeze frame data are stored in the

ECM/PCM memory.

Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P2108 (40): ADVANCED DIAGNOSTICS

DTC P2108: THROTTLE ACTUATOR CONTROL MODULE PROBLEM

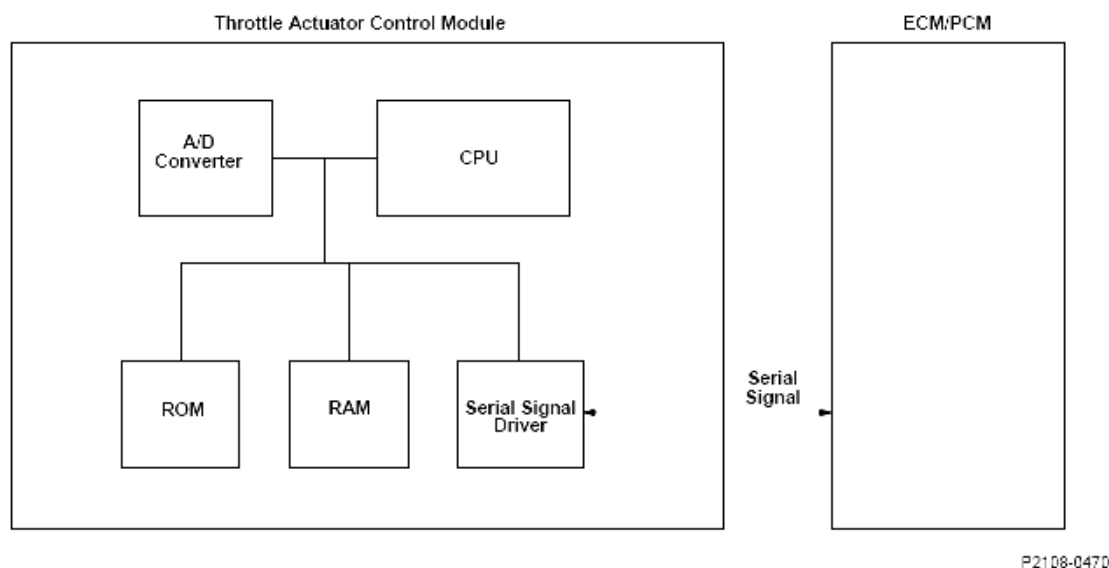


Fig. 259: Throttle Actuator Control Module - Communication Diagram

General Description

The electronic throttle control system controls the throttle valve opening. The system is composed of the throttle actuator, the throttle valve, throttle position (TP) sensors A and B, the throttle actuator control module, the throttle actuator control module relay, the accelerator pedal position (APP) sensor, and the engine control module (ECM)/powertrain control module (PCM). The APP sensor is operated via the throttle cable to determine the accelerator opening value when the driver presses the accelerator pedal. The accelerator pedal opening value is converted to a signal in the APP sensor and transmitted to the ECM/PCM to compute the target position. The target position signal is then transmitted to the throttle actuator control module.

The throttle actuator control module determines the throttle valve target position according to the signal received and operates the throttle actuator to move the throttle valve to the target position. The actual throttle valve position is determined by TP sensor A installed in the throttle body.

The CPU in the throttle actuator control module performs self-diagnosis for the ROM, the RAM, and the A/D converter. If internal data is found to be abnormal, a malfunction is detected and the malfunction data is transmitted to the ECM/PCM. When the ECM/PCM receives the malfunction data from the throttle actuator

control module, the ECM/PCM detects a malfunction in the throttle actuator control module and stores a DTC. When the ECM/PCM monitors the serial signal between the ECM/PCM and the throttle actuator control module and finds disagreement on these signals, the ECM/PCM detects a malfunction and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
Sequence	None
Duration	0.2 seconds or more
DTC Type	One drive cycle, MIL ON
OBD Status	N/A

Enable Conditions

ENABLE CONDITIONS

Condition	Minimum	Maximum
Battery voltage	8.0 V	-
Ignition switch	ON	
No active DTCs	P2101, P2118, P2135, P2176, U0107	

Malfunction Threshold

One of these conditions must be met for at least 0.2 seconds.

- Data read from the ROM is abnormal.
- Data read from the RAM is abnormal.
- The A/D converter standard voltage is not a specified value.
- The serial signals between the ECM/PCM and the throttle actuator control module don't agree.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected, the MIL comes on and the DTC and the freeze frame data are stored in the ECM/PCM memory.

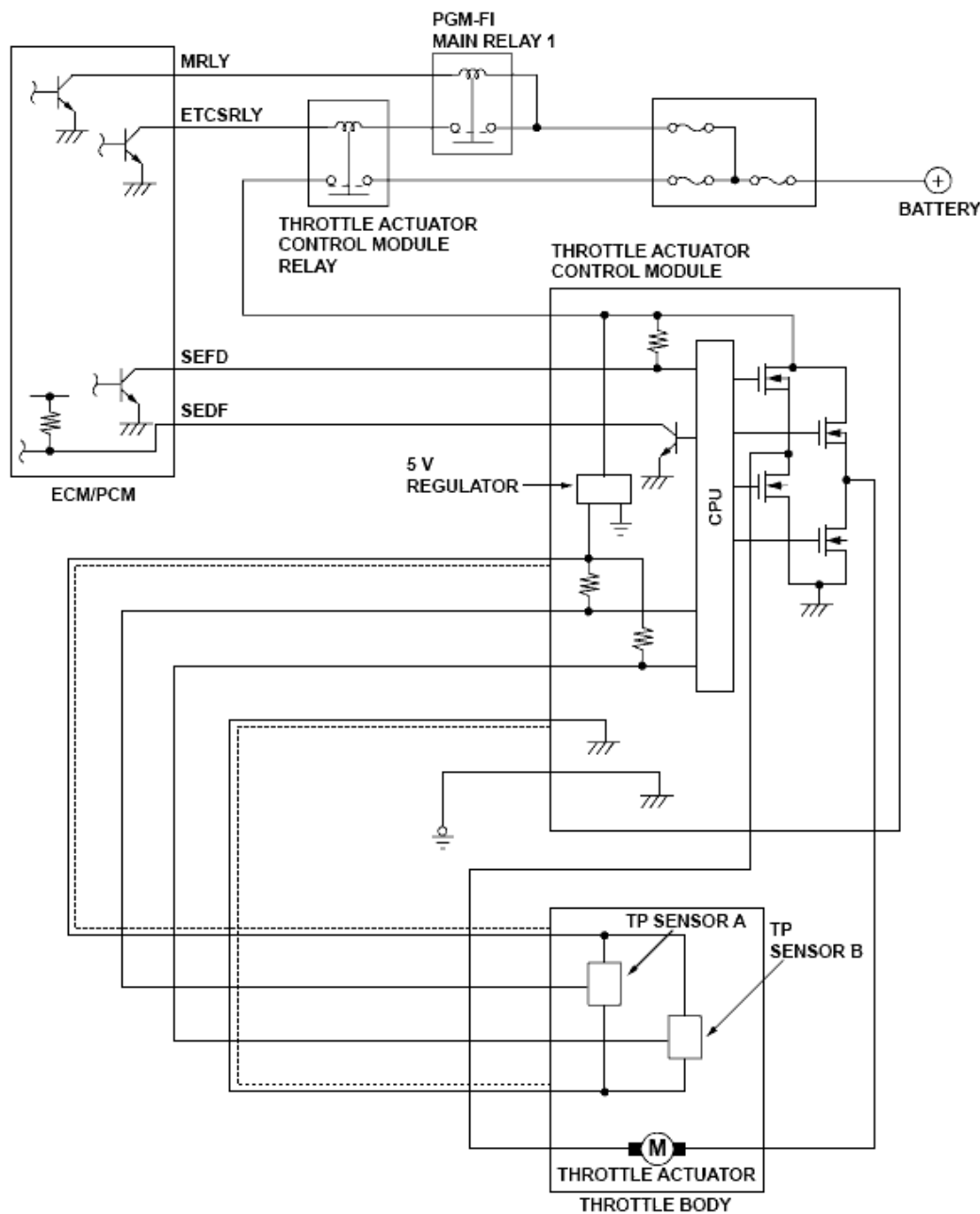
Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P2118 (40): ADVANCED DIAGNOSTICS

DTC P2118: THROTTLE ACTUATOR CURRENT RANGE/PERFORMANCE PROBLEM



P0122-0702

Fig. 260: Throttle Actuator Current Range/Performance - Circuit Diagram

General Description

The electronic throttle control system (ETCS) controls the throttle valve opening. The system is composed of the throttle actuator, the throttle valve, throttle position (TP) sensors A and B, the throttle actuator control module, the throttle actuator control module relay, the accelerator pedal position (APP) sensor, and the engine control module (ECM)/powertrain control module (PCM).

The APP sensor is operated via the throttle cable to determine the accelerator opening value when the driver presses the accelerator pedal. The accelerator pedal opening value is converted to a signal in the APP sensor and transmitted to the ECM/PCM to compute the target position. The target position signal is then transmitted to the throttle actuator control module.

The throttle actuator control module determines the throttle valve target position according to the signal received and operates the throttle actuator to move the throttle valve to the target position. The actual throttle valve position is determined by TP sensor A installed in the throttle body.

When the output voltage to the throttle actuator exceeds the specification for a set time, the throttle actuator control module detects a malfunction and transmits the malfunction data to the ECM/PCM. When the ECM/PCM receives the malfunction data from the throttle actuator control module, the ECM/PCM detects a malfunction of the throttle actuator system and stores a DTC.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
Sequence	None
Duration	0.2 second or more
DTC Type	One drive cycle, MIL ON
OBD Status	N/A

Enable Conditions

ENABLE CONDITIONS

Condition	Minimum	Maximum
Battery voltage	6.0 V	-
Ignition switch	ON	
No active DTCs	P2101, P2108, P2135, P2176, U0107	

Malfunction Threshold

The current flow to the throttle actuator is 16 A or more for at least 0.2 second.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected, the MIL comes on and the DTC and the freeze frame data are stored in the ECM/PCM memory.

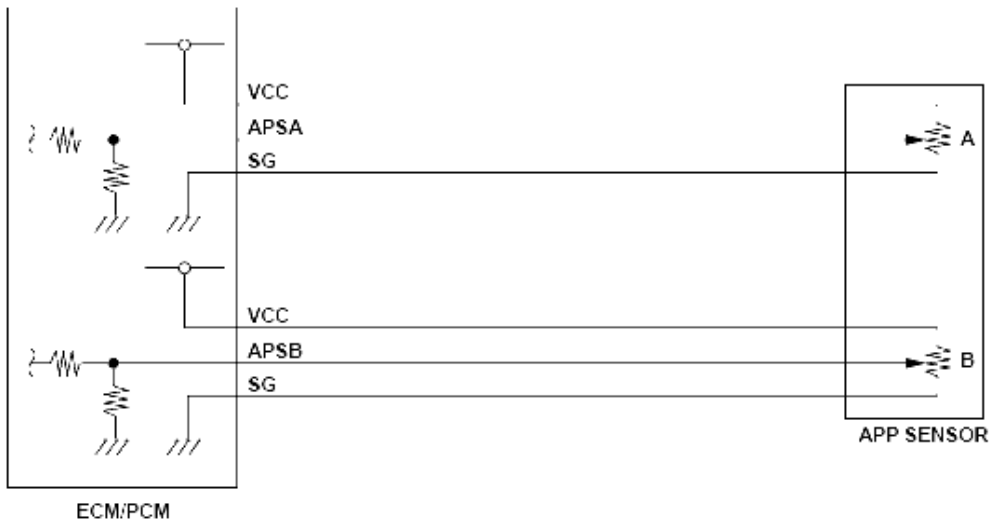
Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P2122 (37): ADVANCED DIAGNOSTICS

DTC P2122: ACCELERATOR PEDAL POSITION (APP) SENSOR A (THROTTLE POSITION SENSOR D) CIRCUIT LOW VOLTAGE



P2122-0401

Fig. 261: Accelerator Pedal Position (APP) Sensor A (Throttle Position Sensor D) Circuit Diagram (Low Voltage)

General Description

Accelerator pedal position (APP) sensor A is a part of the electronic throttle control system, and it is used to convert the position of the accelerator pedal into electrical signals. Based on these signals, the engine control module (ECM)/powertrain control module (PCM) controls the throttle actuator so that the throttle position agrees with the accelerator pedal position. If the signal voltage from APP sensor A is a set value or less, the ECM/PCM detects a malfunction and stores a DTC.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
Sequence	None
Duration	0.2 seconds or more
DTC Type	One drive cycle, MIL ON
OBD Status	N/A

Enable Conditions

ENABLE CONDITIONS

Condition	
Ignition switch	ON
No active DTCs	P2123

Malfunction Threshold

The APP sensor A output voltage is 0.1 V or less for at least 0.2 seconds.

Diagnosis Details

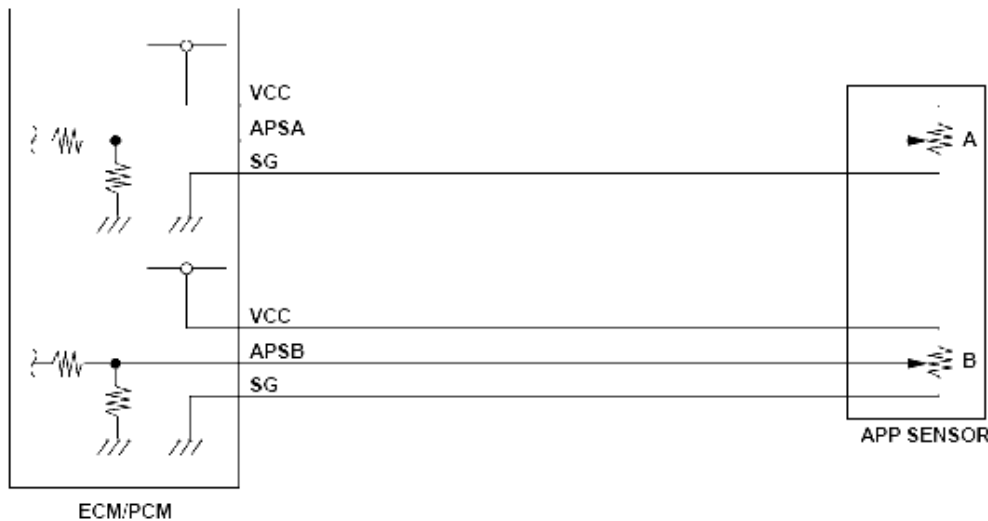
Conditions for illuminating the MIL

When a malfunction is detected, the MIL comes on and the DTC and the freeze frame data are stored in the ECM/PCM memory.

Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P2123 (37): ADVANCED DIAGNOSTICS**DTC P2123: ACCELERATOR PEDAL POSITION (APP) SENSOR A (THROTTLE POSITION SENSOR D) CIRCUIT HIGH VOLTAGE**

P2122-0401

Fig. 262: Accelerator Pedal Position (APP) Sensor A (Throttle Position Sensor D) Circuit Diagram (High Voltage)

General Description

Accelerator pedal position (APP) sensor A is a part of the electronic throttle control system, and it is used to convert the position of the accelerator pedal into electrical signals. Based on these signals, the engine control module (ECM)/powertrain control module (PCM) controls the throttle actuator so that the throttle position agrees with the accelerator pedal position. If the signal voltage from APP sensor A is a set value or more, the ECM/PCM detects a malfunction and stores a DTC.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status**MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS**

Execution	Continuous
Sequence	None

Duration	0.2 seconds or more
DTC Type	One drive cycle, MIL ON
OBD Status	N/A

Enable Conditions**ENABLE CONDITIONS**

Condition	
Ignition switch	ON
No active DTCs	P2122

Malfunction Threshold

The APP sensor A output voltage value is 4.85 V or more for at least 0.2 seconds.

Diagnosis Details**Conditions for illuminating the MIL**

When a malfunction is detected, the MIL comes on and the DTC and the freeze frame data are stored in the ECM/PCM memory.

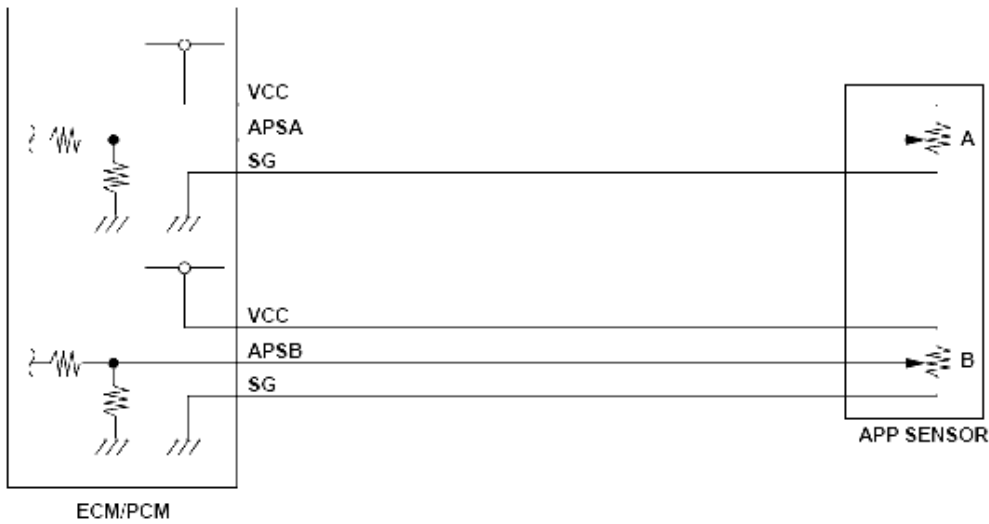
Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P2127 (37)L ADVANCED DIAGNOSTICS

DTC P2127: ACCELERATOR PEDAL POSITION (APP) SENSOR B (THROTTLE POSITION SENSOR E) CIRCUIT LOW VOLTAGE



P2122-0401

Fig. 263: Accelerator Pedal Position (APP) Sensor B (Throttle Position Sensor E) Circuit Diagram (Low Voltage)

General Description

Accelerator pedal position (APP) sensor B is a part of the electronic throttle control system, and it is used to convert the position of the accelerator pedal into electrical signals. Based on these signals, the engine control module (ECM)/powertrain control module (PCM) controls the throttle actuator so that the throttle position agrees with the accelerator pedal position. If the signal voltage from APP sensor B is a set value or less, the ECM/PCM detects a malfunction and stores a DTC.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
Sequence	None
Duration	0.2 seconds or more
DTC Type	One drive cycle, MIL ON
OBD Status	N/A

Enable Conditions

ENABLE CONDITIONS

Condition	
Ignition switch	ON
No active DTCs	P2128

Malfunction Threshold

The APP sensor B output voltage value is 0.1 V or less for at least 0.2 seconds.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected, the MIL comes on and the DTC and the freeze frame data are stored in the ECM/PCM memory.

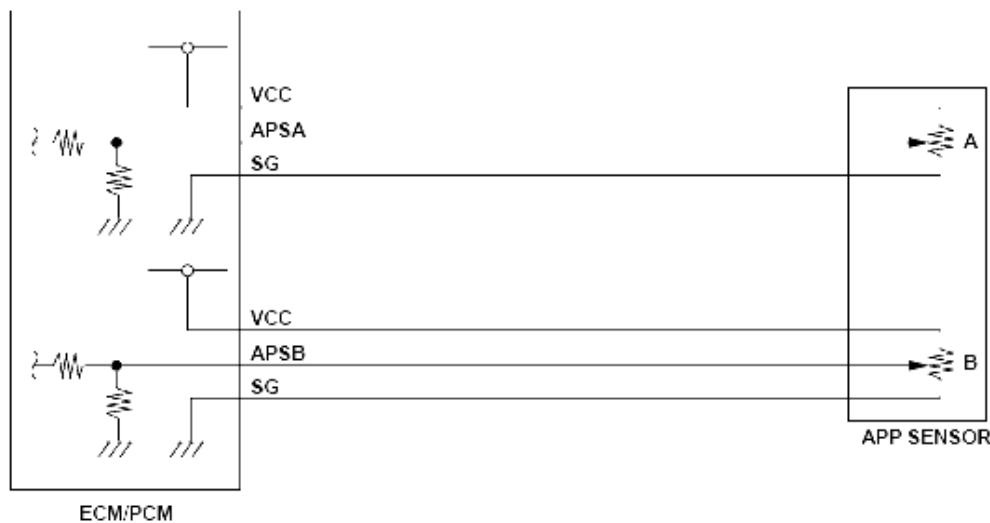
Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P2128 (37): ADVANCED DIAGNOSTICS

DTC P2128: ACCELERATOR PEDAL POSITION (APP) SENSOR B (THROTTLE POSITION SENSOR E) CIRCUIT HIGH VOLTAGE



P2122-0401

Fig. 264: Accelerator Pedal Position (APP) Sensor B (Throttle Position Sensor E) Circuit Diagram (High Voltage)

General Description

Accelerator pedal position (APP) sensor B is a part of the electronic throttle control system, and it is used to convert the position of the accelerator pedal into electrical signals. Based on these signals, the engine control module (ECM)/powertrain control module (PCM) controls the throttle actuator so that the throttle position agrees with the accelerator pedal position. If the signal voltage from APP sensor B is a set value or more, the ECM/PCM detects a malfunction and stores a DTC.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
Sequence	None

Duration	0.2 seconds or more
DTC Type	One drive cycle, MIL ON
OBD Status	N/A

Enable Conditions**ENABLE CONDITIONS**

Condition	
State of the engine	Running
No active DTCs	P2127

Malfunction Threshold

The APP sensor B output voltage value is 4.0 V or more for at least 0.2 seconds.

Diagnosis Details**Conditions for illuminating the MIL**

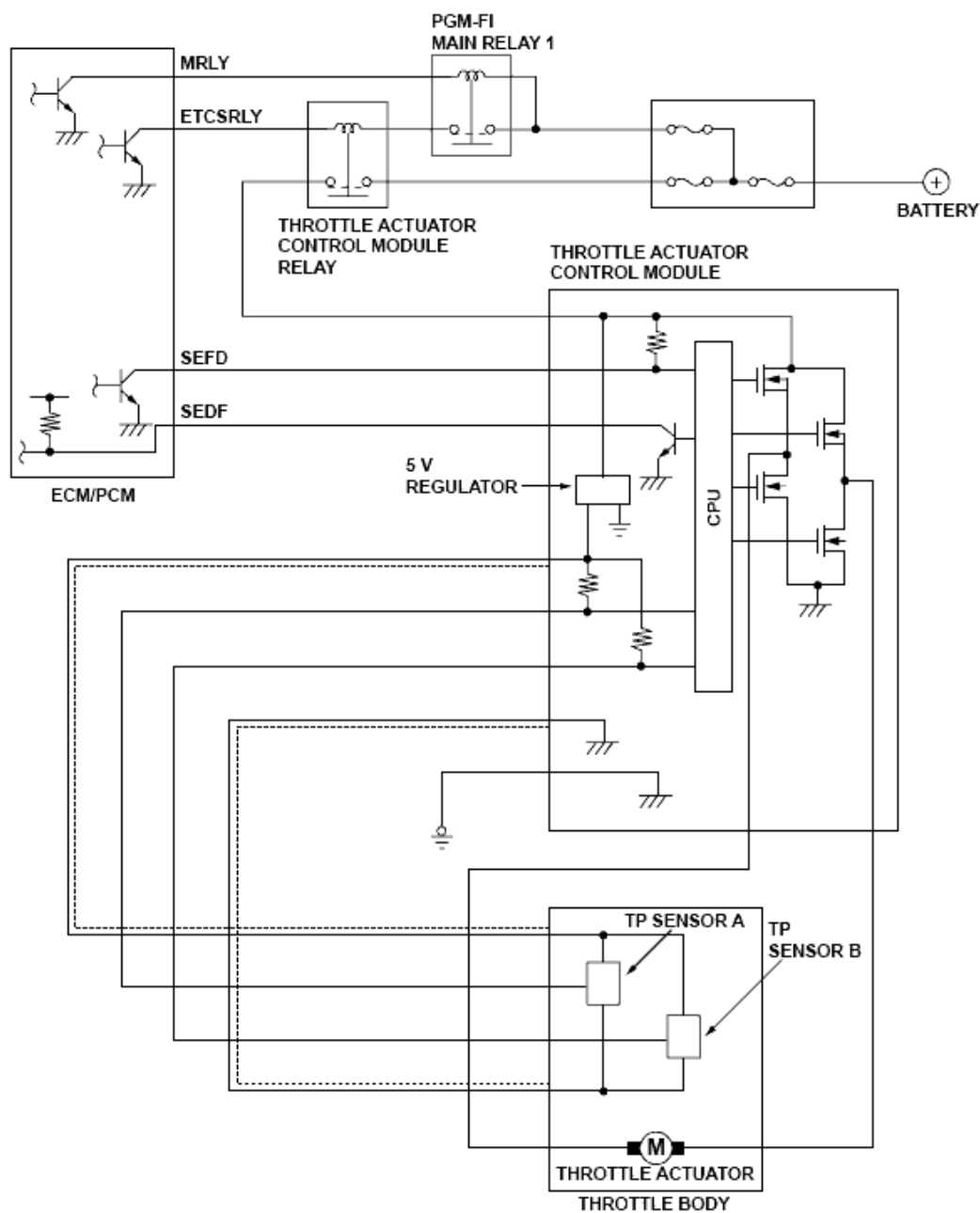
When a malfunction is detected, the MIL comes on and the DTC and the freeze frame data are stored in the ECM/PCM memory.

Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

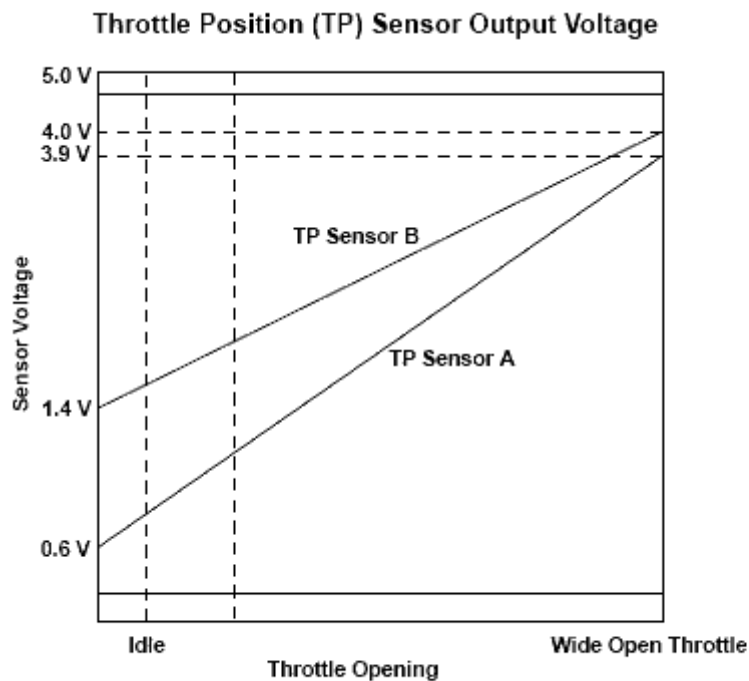
The MIL, the DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P2135 (7): ADVANCED DIAGNOSTICS**DTC P2135: THROTTLE POSITION (TP) SENSOR A/B VOLTAGE INCORRECT CORRELATION**



P0122-0702

Fig. 265: Throttle Position (TP) Sensor A/B Voltage Incorrect Correlation - Circuit Diagram



P2135-0371

Fig. 266: Throttle Position (TP) Sensor Output Voltage Graph

General Description

The electronic throttle control system (ETCS) controls the throttle valve opening. The system is composed of the throttle actuator, the throttle valve, throttle position (TP) sensors A and B, the throttle actuator control module, the throttle actuator control module relay, the accelerator pedal position (APP) sensor, and the engine control module (ECM)/powertrain control module (PCM).

The APP sensor is operated via the throttle cable to determine the accelerator opening value when the driver presses the accelerator pedal. The accelerator pedal opening value is converted to a signal in the APP sensor and transmitted to the ECM/PCM to compute the target position. The target position signal is then transmitted to the throttle actuator control module.

The throttle actuator control module determines the throttle valve target position according to the signal received and operates the throttle actuator to move the throttle valve to the target position. The actual throttle valve position is determined by TP sensor A installed in the throttle body.

The throttle actuator control module compares the voltages and the throttle valve positions of TP sensor A and TP sensor B. If the difference of the voltages or the throttle valve positions is a certain value or less for a set time, the throttle actuator control module detects a malfunction and the malfunction data is transmitted to the ECM/PCM. When the ECM/PCM receives the malfunction data from the throttle actuator control module, the ECM/PCM detects a malfunction in the relationship between TP sensor A and TP sensor B, and stores a DTC.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous

Sequence	None
Duration	0.2 second or more
DTC Type	One drive cycle, MIL ON
OBD Status	N/A

Enable Conditions**ENABLE CONDITIONS**

Condition	Minimum	Maximum
TP sensor B voltage	-	2.3 V
Ignition switch	ON	
No active DTCs	P0122, P0123, P0222, P0223, P2101, P2108, P2118, P2176, U0107	
Other	After the throttle valve fully closed position is registered	

Malfunction Threshold

One of these conditions must be met for at least 0.2 second.

- The difference between the TP sensor A voltage and the TP sensor B voltage is 200 mV (5°) or less.
- The difference between the throttle valve positions that TP sensor A and TP sensor B determined exceeds the value shown in this table.

MALFUNCTION THRESHOLD

Throttle valve position determined by TP sensor A	Difference between TP sensor A and TP sensor B
0°	1.8° or more
83.3°	14.7° or more

Diagnosis Details**Conditions for illuminating the MIL**

When a malfunction is detected, the MIL comes on and the DTC and the freeze frame data are stored in the ECM/PCM memory.

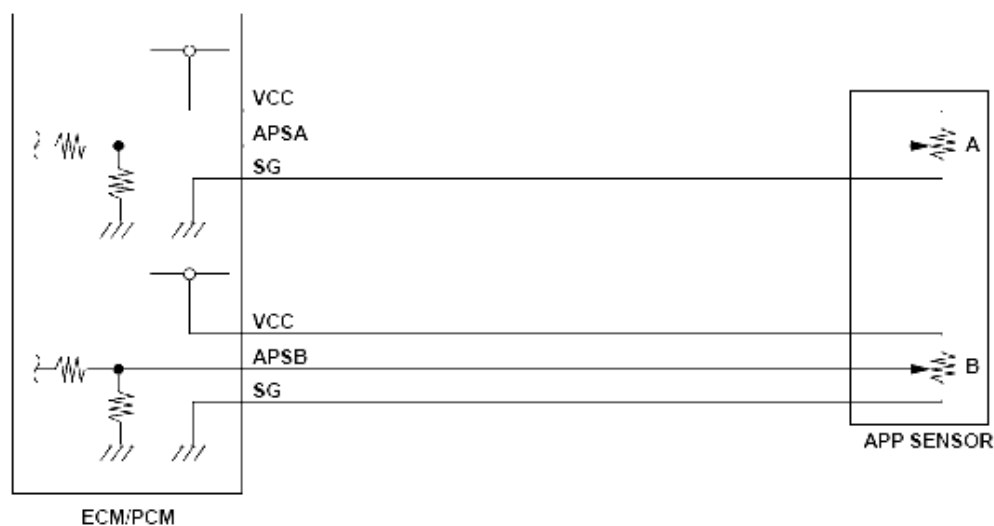
Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

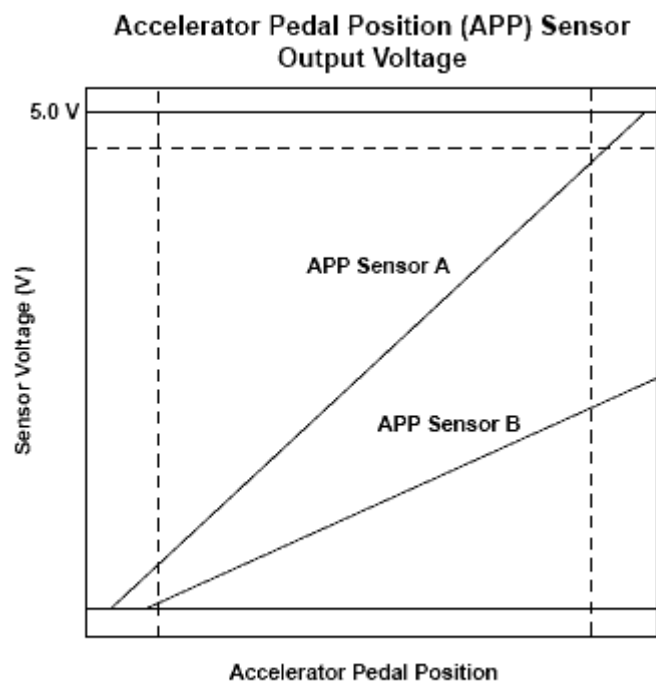
DTC P2138 (37): ADVANCED DIAGNOSTICS

DTC P2138: ACCELERATOR PEDAL POSITION (APP) SENSOR A/B (THROTTLE POSITION SENSOR D/E) INCORRECT VOLTAGE CORRELATION



P2122-0401

Fig. 267: Accelerator Pedal Position (APP) Sensor A/B (Throttle Position Sensor D/E) Incorrect Voltage Correlation - Circuit Diagram



P2138-0371

Fig. 268: Accelerator Pedal Position (APP) Sensor Output Voltage Graph

General Description

Accelerator pedal position (APP) sensor A and accelerator pedal position (APP) sensor B are potentiometers, and they are installed in the engine compartment.

The APP sensors A and B are operated via the throttle cable to determine the accelerator opening value when the driver presses the accelerator pedal. The accelerator pedal opening value is converted to a signal in APP sensors A and B and transmitted to the engine control module (ECM)/powertrain control module

(PCM) to compute the target position. The target position signal is then transmitted to the throttle actuator control module.

APP sensor A is for the primary control, and APP sensor B is a back-up of APP sensor A in case it malfunctions. Both sensors compare their output voltage to each other for malfunction detection.

When the voltage difference of APP sensor B is out of a fixed range for a set period of time, the ECM/PCM detects a malfunction, and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
Sequence	None
Duration	0.3 seconds or more
DTC Type	One drive cycle, MIL ON
OBD Status	N/A

Enable Conditions

ENABLE CONDITIONS

Condition	
Ignition switch	ON
No active DTCs	P2122, P2123, P2127, P2128

Malfunction Threshold

One of these conditions must be met for at least 0.3 seconds.

- If the APP sensor B voltage exceeds the range from 0 V or less to 0.361 V or more when the APP sensor A voltage is 0.361 V.
- If the APP sensor B voltage exceeds the range from 2.319 V or less to 2.681 V or more when the APP sensor A voltage is 4.995 V.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected, the MIL comes on and the DTC and the freeze frame data are stored in the ECM/PCM memory.

Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Once per driving cycle
Sequence	None
Duration	0.7 seconds or more
DTC Type	One drive cycle, MIL ON
OBD Status	N/A

Enable Conditions

ENABLE CONDITIONS

Condition	Minimum	Maximum
Battery voltage	6.0 V	-
Ignition switch	ON	
No active DTCs	P0122, P0123, P0222, P0223, P2101, P2108, P2118, P2135, U0107	
Other	Engine is stopped and ignition switch is not in the ON position	

Malfunction Threshold

Either condition must be met for at least 0.7 seconds.

- The registration of the throttle valve fully closed position is not completed within a predetermined time after the ignition switch is turned ON.
- The registered value of the throttle valve fully closed position is 0.74 V^{*1} , 1.61 V^{*2} , or more, or 0.49 V^{*1} , 1.37 V^{*2} , or less.

*1: TP sensor A

*2: TP sensor B

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected, the MIL comes on and the DTC and the freeze frame data are stored in the ECM/PCM memory.

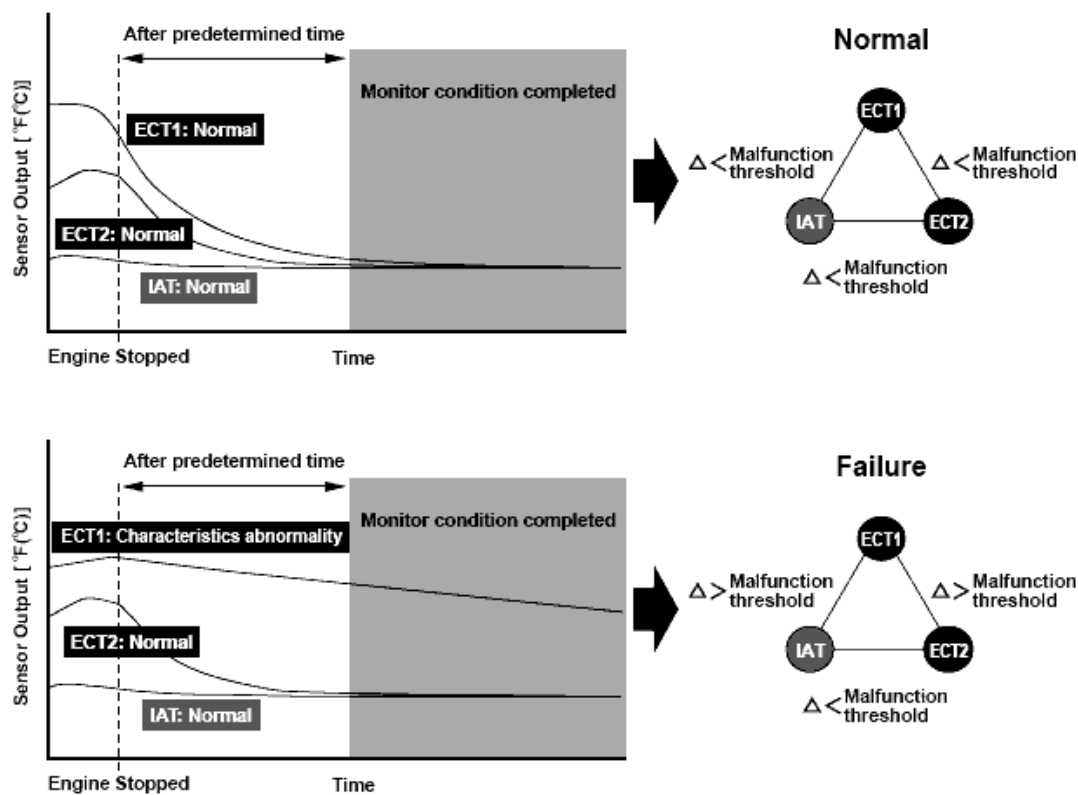
Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P2183 (192): ADVANCED DIAGNOSTICS

DTC P2183: ENGINE COOLANT TEMPERATURE (ECT) SENSOR 2 CIRCUIT RANGE/PERFORMANCE PROBLEM



P0111-0570

Fig. 270: Engine Coolant Temperature (ECT) Sensor 2 Circuit Range/Performance

General Description

Two engine coolant temperature sensors and one intake air temperature sensor are used by the engine control module (ECM)/powertrain control module (PCM).

When the engine is stopped and enough time has passed, the temperature of the engine will equal the ambient temperature. When an inappropriate temperature is detected after comparing the temperature readings of each sensor, a malfunction in the corresponding sensor is detected and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Once per driving cycle
Sequence	None
Duration	10 seconds or more
DTC Type	Two drive cycles, MIL ON
OBD Status	N/A

Enable Conditions

ENABLE CONDITIONS

Condition	Minimum	Maximum
Engine off time	6 hours	-
No active DTCs	P0111, P0112, P0113, P0116, P0117, P0118, P0125, P1116, P2184, P2185, P2610	

Malfunction Threshold

A malfunction is detected if these three conditions are present after the engine and the ignition switch have been off for at least 6 hours before restarting the engine.

- When the temperature difference between the IAT and ECT1 is 76°F (24°C)^{*2}, 89°F (32°C)^{*1} or more.
- When the temperature difference between the IAT and ECT2 is 95°F (35°C)^{*1}, 97°F (36°C)^{*2} or more.
- When the temperature difference between the ECT2 and ECT1 is 120°F (49°C)^{*2}, 125°F (52°C)^{*1} or more.

*1: J32A3 engine

*2: J35A8 engine

Driving Pattern

1. Turn the ignition off, and wait at least 6 hours.
2. Start the engine, and let it idle for at least 10 seconds.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected during the first drive cycle, a Temporary DTC is stored in the ECM/PCM memory. If the malfunction recurs during the next (second) drive cycle, the MIL comes on and the DTC and the freeze frame data are stored.

Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, the Temporary DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

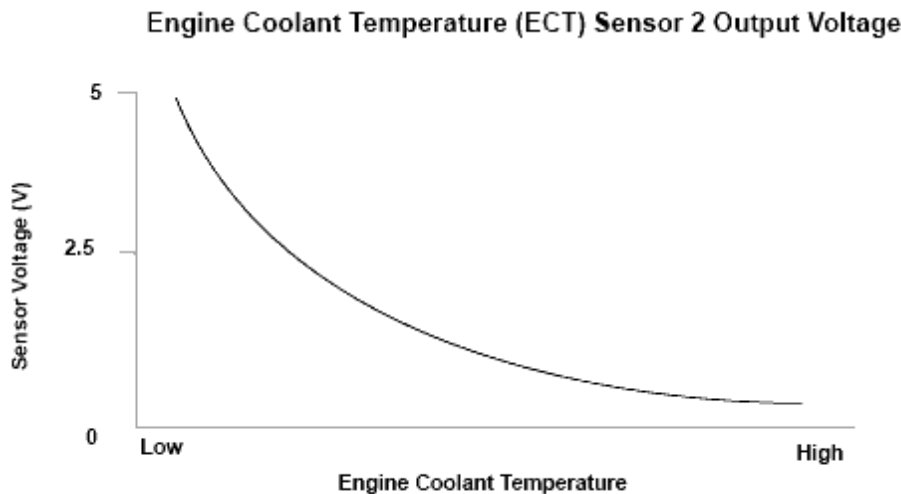
DTC P2184 (192): ADVANCED DIAGNOSTICS

DTC P2184: ENGINE COOLANT TEMPERATURE (ECT) SENSOR 2 CIRCUIT LOW VOLTAGE



P2184-0501

Fig. 271: Engine Coolant Temperature (ECT) Sensor 2 Circuit Diagram (Low Voltage)



P2184-0570

Fig. 272: Engine Coolant Temperature (ECT) Sensor 2 Output Voltage Graph

General Description

Engine coolant temperature (ECT) sensor 2 is a thermistor attached to the radiator. The engine control module (ECM)/powertrain control module (PCM) applies voltage (about 5 V) to the ECT2 signal circuit through a pull up resistor. As the engine coolant temperature cools, ECT sensor 2 resistance increases, and the ECM/PCM detects a high signal voltage. As the engine coolant warms, the sensor resistance decreases, and the ECM/PCM detects a low ECT2 signal voltage.

If the ECT sensor 2 output voltage is less than a set value when the engine coolant temperature is high, the ECM/PCM detects a malfunction and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
Sequence	None
Duration	2 seconds or more
DTC Type	One drive cycle, MIL ON
OBD Status	N/A

Enable Conditions

ENABLE CONDITIONS

Condition	
Ignition switch	ON
No active DTCs	P2185

Malfunction Threshold

The ECT sensor 2 output voltage is 0.08 V or less for at least 2 seconds.

Diagnosis Details**Conditions for illuminating the MIL**

When a malfunction is detected, the MIL comes on and the DTC and the freeze frame data are stored in the ECM/PCM memory.

Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P2185 (192): ADVANCED DIAGNOSTICS**DTC P2185: ENGINE COOLANT TEMPERATURE (ECT) SENSOR 2 CIRCUIT HIGH VOLTAGE**

Fig. 273: Engine Coolant Temperature (ECT) Sensor 2 Circuit Diagram (High Voltage)

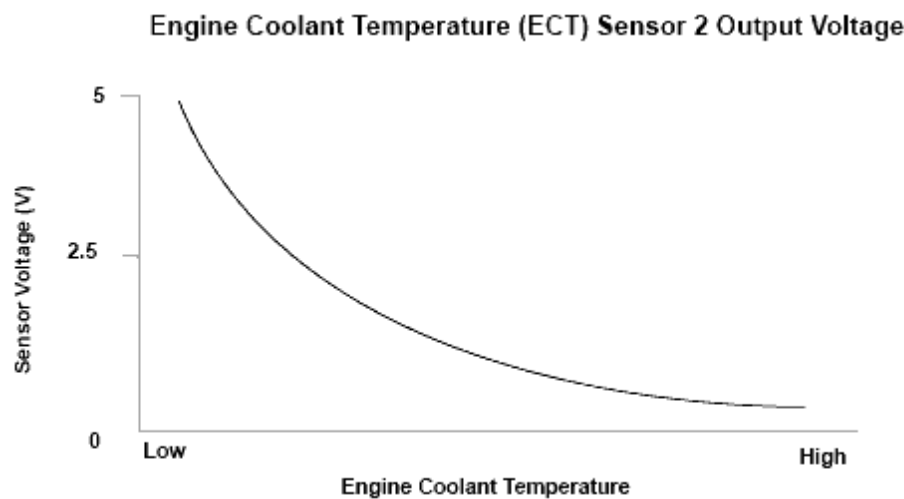


Fig. 274: Engine Coolant Temperature (ECT) Sensor 2 Output Voltage Graph

General Description

Engine coolant temperature (ECT) sensor 2 is a thermistor attached to the radiator. The engine control module (ECM)/powertrain control module (PCM) applies voltage (about 5 V) to the ECT2 signal circuit through a pull up resistor. As the engine coolant temperature cools, ECT sensor 2 resistance increases, and the ECM/PCM detects a high signal voltage. As the engine coolant warms, the sensor resistance decreases, and the ECM/PCM detects a low ECT2 signal voltage.

If the ECT sensor 2 output voltage is more than a set value when the engine coolant temperature is low, the ECM/PCM detects a malfunction and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
Sequence	None
Duration	2 seconds or more
DTC Type	One drive cycle, MIL ON
OBD Status	N/A

Enable Conditions

ENABLE CONDITIONS

Condition	
Ignition switch	ON
No active DTCs	P2184

Malfunction Threshold

The ECT sensor 2 output voltage is 4.92 V or more for at least 2 seconds.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected, the MIL comes on and the DTC and the freeze frame data are stored in the ECM/PCM memory.

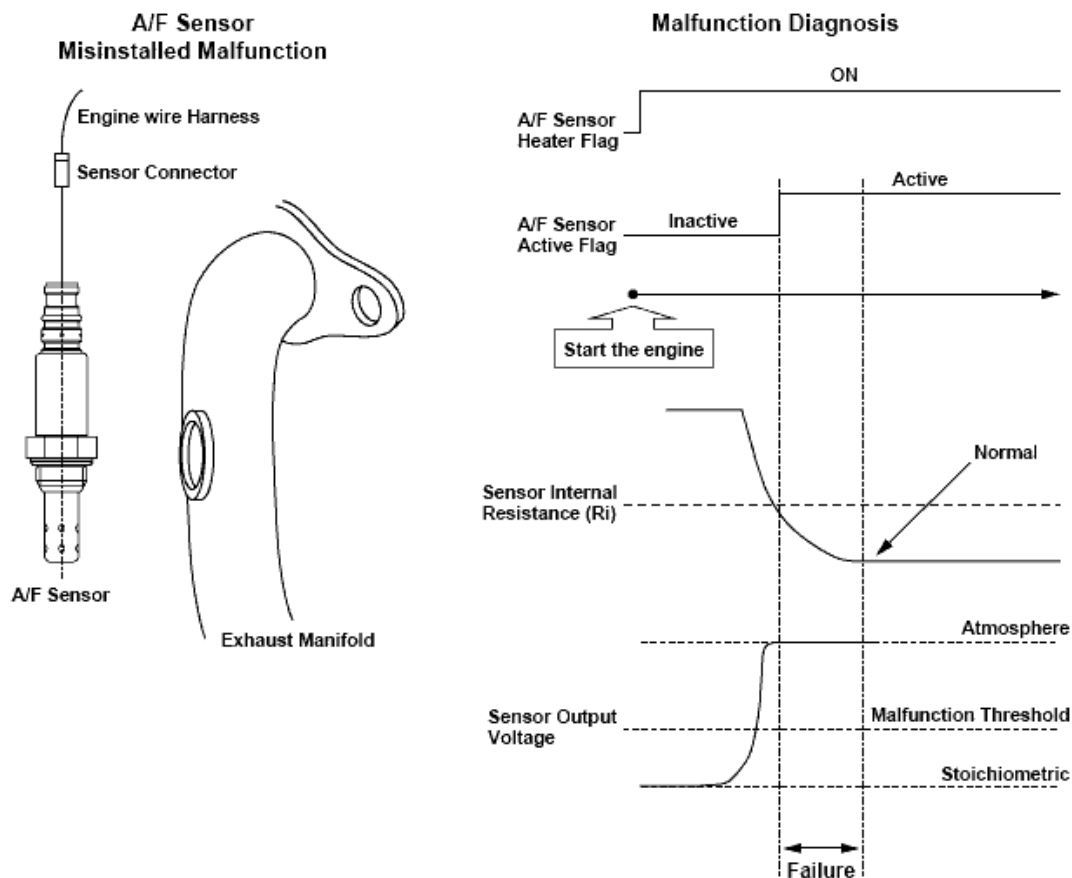
Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P2195 (155): ADVANCED DIAGNOSTICS

DTC P2195: REAR AIR/FUEL RATIO (A/F) SENSOR (BANK 1, SENSOR 1) SIGNAL STUCK LEAN



P2195-0470

Fig. 275: Rear Air/Fuel Ratio (A/F) Sensor (Bank 1, Sensor 1) Signal Stuck Lean

General Description

When the rear air/fuel ratio (A/F) sensor (bank 1, sensor 1) is properly connected to the engine wire harness, but it is not installed in the exhaust pipe, the A/F feedback is not done properly even if the rear A/F sensor is active after starting the engine. Thus, the exhaust emissions increase.

When the rear A/F sensor output stays out of the normal range after the rear A/F sensor becomes active, the engine control module (ECM)/powertrain control module (PCM) detects that the rear A/F sensor is not properly installed and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Once per driving cycle
Sequence	None
Duration	7 seconds or more
DTC Type	Two drive cycles, MIL ON
OBD Status	PASSED/FAILED/NOT COMPLETED (STILL TESTING)

Enable Conditions

ENABLE CONDITIONS

Condition	
Fuel feedback	Other than during fuel cut-off operation
No active DTCs	P0134, P0135, P0171, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0627, P1172, P2237, P2238, P2243, P2245, P2251, P2252, P2627, P2628

Malfunction Threshold

The rear A/F sensor (bank 1, sensor 1) output voltage is 3.48 V or more for at least 7 seconds.

Driving Pattern

Start the engine, then let it idle for at least 2 minutes.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected during the first drive cycle, a Temporary DTC is stored in the ECM/PCM memory. If the malfunction recurs during the next (second) drive cycle, the MIL comes on and the DTC and the freeze frame data are stored.

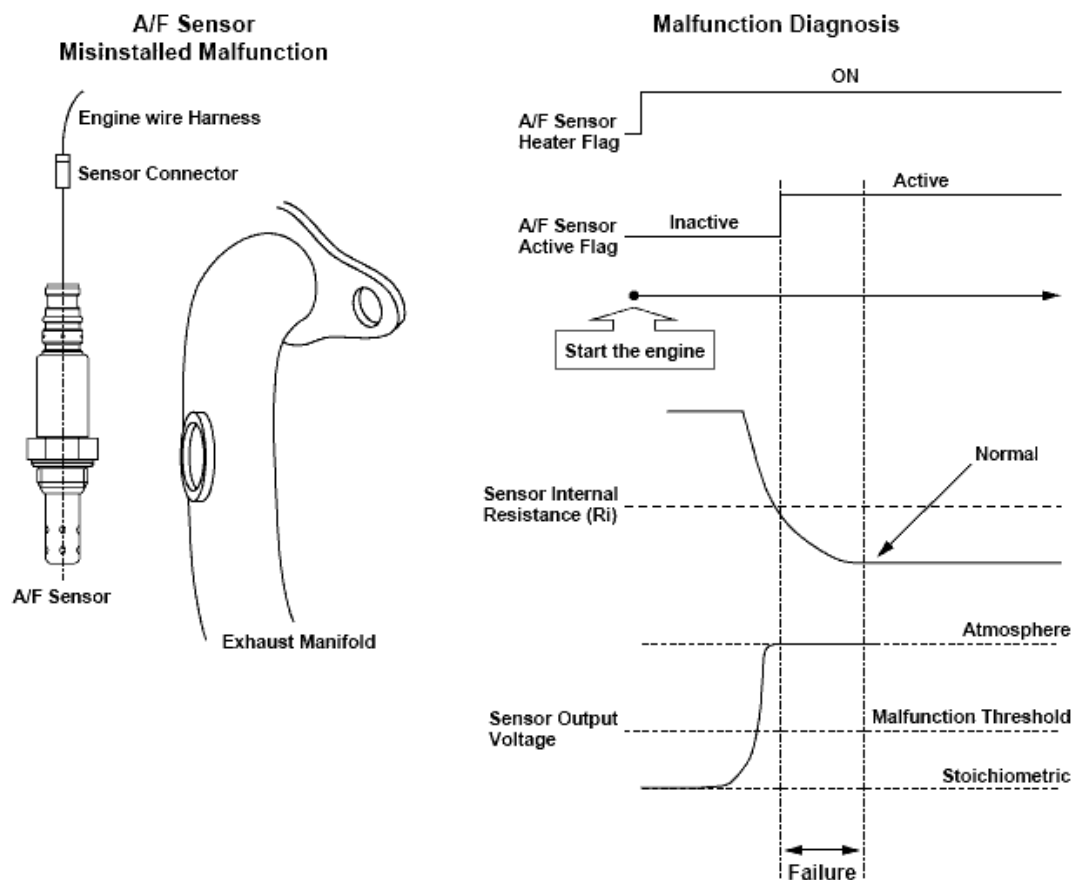
Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, the Temporary DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P2197 (156): ADVANCED DIAGNOSTICS

DTC P2197: FRONT AIR/FUEL RATIO (A/F) SENSOR (BANK 2, SENSOR 1) SIGNAL STUCK LEAN



P2195-0470

Fig. 276: Front Air/Fuel Ratio (A/F) Sensor (Bank 2, Sensor 1) Signal Stuck Lean

General Description

When the front air/fuel ratio (A/F) sensor (bank 2, sensor 1) is properly connected to the engine wire harness, but it is not installed in the exhaust pipe, the A/F feedback is not done properly even if the front A/F sensor is active after starting the engine. Thus, the exhaust emissions increase.

When the front A/F sensor output stays out of the normal range after the front A/F sensor becomes active, the engine control module (ECM)/powertrain control module (PCM) detects that the front A/F sensor is not properly installed and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Once per driving cycle
Sequence	None
Duration	7 seconds or more
DTC Type	Two drive cycles, MIL ON
OBD Status	PASSED/FAILED/NOT COMPLETED (STILL TESTING)

Enable Conditions

ENABLE CONDITIONS

Condition	
Fuel feedback	Other than during fuel cut-off operation
No active DTCs	P0154, P0155, P0174, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0627, P1174, P2240, P2241, P2247, P2249, P2254, P2255, P2630, P2631

Malfunction Threshold

The front A/F sensor (bank 2, sensor 1) output voltage is 3.48 V or more for at least 7 seconds.

Driving Pattern

Start the engine, then let it idle for at least 2 minutes.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected during the first drive cycle, a Temporary DTC is stored in the ECM/PCM memory. If the mal-function recurs during the next (second) drive cycle, the MIL comes on and the DTC and the freeze frame data are stored.

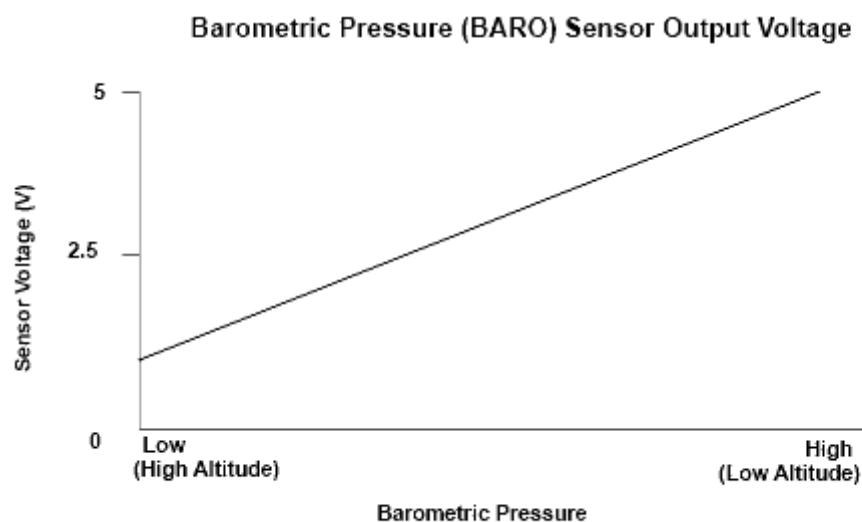
Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, the Temporary DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

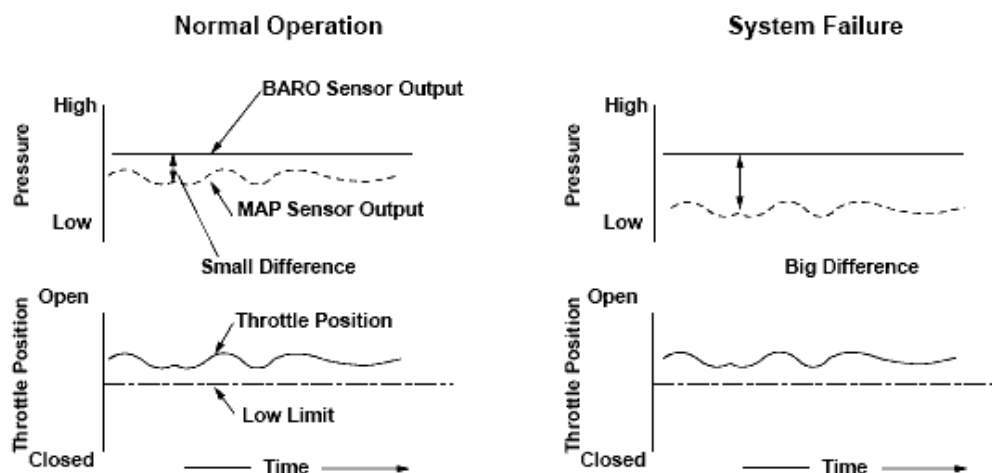
DTC P2227 (13): ADVANCED DIAGNOSTICS

DTC P2227: BAROMETRIC PRESSURE (BARO) SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM



P1108-9671

Fig. 277: Barometric Pressure (BARO) Sensor Output Voltage Graph



P1108-9771

Fig. 278: Barometric Pressure (BARO) Sensor Output Voltage Operation Graph

General Description

The barometric pressure (BARO) sensor is built into the engine control module (ECM)/powertrain control module (PCM) and monitors atmospheric pressure. When the throttle valve is wide open, the manifold absolute pressure (MAP) sensor output is nearly equal to the BARO sensor output. Making use of this characteristic, a malfunction can be detected in the BARO sensor output.

If the throttle position is beyond a value stored in the ECM/PCM that is used to detect "wide-open throttle," and if the difference between the MAP sensor output and the BARO sensor output is equal to or greater than a set value, a malfunction in the BARO sensor output is detected and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Once per driving cycle
-----------	------------------------

Sequence	None
Duration	2.5 seconds or more
DTC Type	Two drive cycles, MIL ON
OBD Status	PASSED/FAILED/NOT COMPLETED (STILL TESTING)

Enable Conditions

ENABLE CONDITIONS

Condition		Minimum	Maximum
Throttle position	1,000 rpm	14°(2)	-
	1,100 rpm	16°(1)	-
	3,000 rpm	29°(1)	-
		30°(2)	-
No active DTCs		P0107, P0108, P0117, P0118, P0122, P0123, P0171, P0172, P0174, P0175, P0222, P0223, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0401, P0404, P0506, P0507, P0627, P1077, P1078, P1128, P1129, P2101, P2108, P2118, P2122, P2123, P2127, P2128, P2135, P2138, P2176, P2228, P2229, P2279, P2413, P2646, P2647, P2648, P2649, U0107	
(1) J32A3 engine			
(2) J35A8 engine			

Malfunction Threshold

The difference between the BARO sensor output and the MAP sensor output is 26 kPa (7.5 in.Hg, 190 mmHg) or more for at least 2.5 seconds.

Driving Pattern

1. Start the engine. Hold the engine speed at 3,000 rpm without load (in Park or neutral) until the radiator fan comes on.
2. Drive the vehicle with the throttle position as specified under Enable Conditions for at least 2.5 seconds.
 - Drive the vehicle in this manner only if the traffic regulations and ambient conditions allow.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected during the first drive cycle, a Temporary DTC is stored in the ECM/PCM memory. If the malfunction recurs during the next (second) drive cycle, the MIL comes on and the DTC and the freeze frame data are stored.

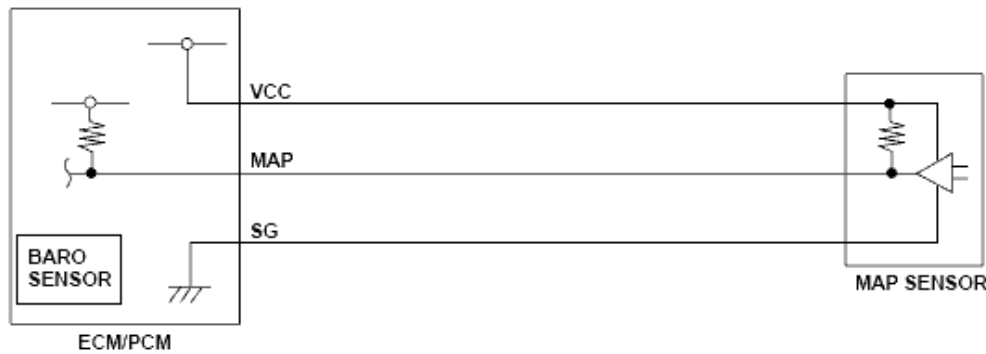
Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, the Temporary DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

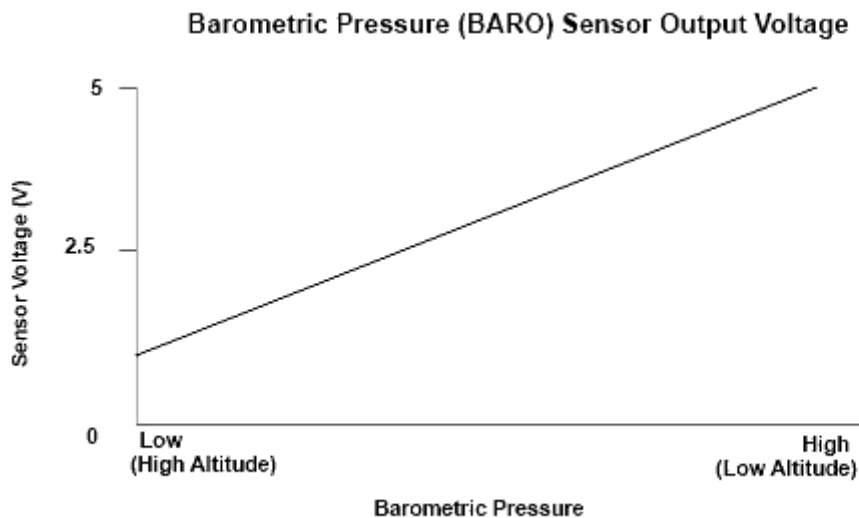
DTC P2228 (13): ADVANCED DIAGNOSTICS

DTC P2228: BAROMETRIC PRESSURE (BARO) SENSOR CIRCUIT LOW VOLTAGE



P1107-9602

Fig. 279: Barometric Pressure (BARO) Sensor Circuit Diagram (Low Voltage)



P1108-9671

Fig. 280: Barometric Pressure (BARO) Sensor Output Voltage Graph

General Description

The barometric pressure (BARO) sensor is built into the engine control module (ECM)/powertrain control module (PCM), and it monitors atmospheric pressure. The ECM/PCM estimates appropriate intake airflow from the manifold absolute pressure (MAP) sensor output voltage and BARO sensor output voltage. If the BARO sensor output voltage is a specified value or less, the ECM/PCM detects a malfunction and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status**MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS**

Execution	Continuous
Sequence	None
Duration	2 seconds or more
DTC Type	One drive cycle, MIL ON
OBD Status	N/A

Enable Conditions**ENABLE CONDITIONS**

Condition	
Ignition switch	ON
No active DTCs	P1109, P2229

Malfunction Threshold

The BARO sensor output voltage is 1.31 V or less for at least 2 seconds.

Diagnosis Details**Conditions for illuminating the MIL**

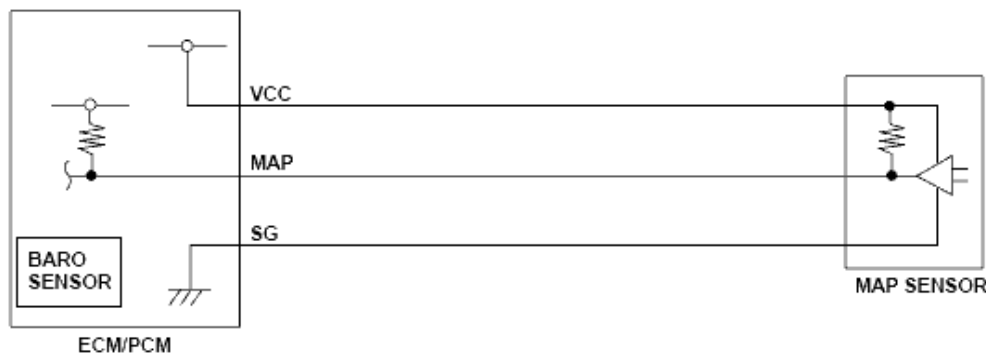
When a malfunction is detected, the MIL comes on and the DTC and the freeze frame data are stored in the ECM/PCM memory.

Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

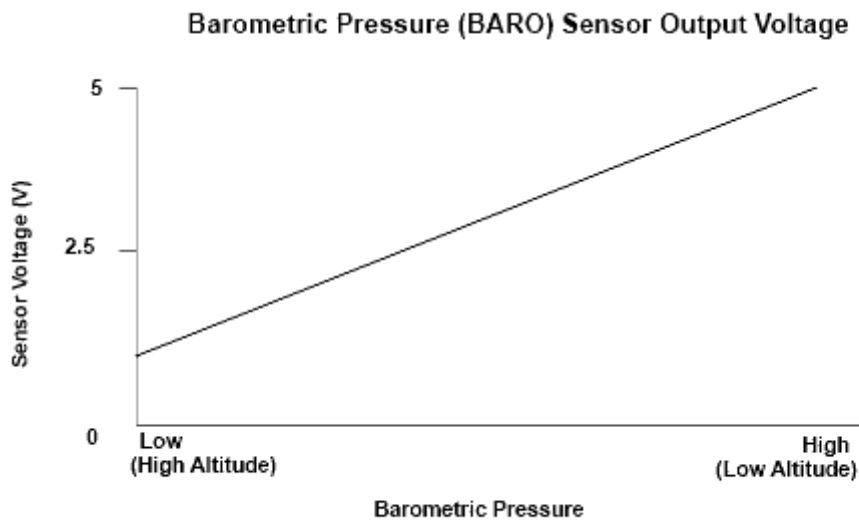
The MIL, the DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P2229 (13): ADVANCED DIAGNOSTICS**DTC P2229: BAROMETRIC PRESSURE (BARO) SENSOR CIRCUIT HIGH VOLTAGE**



P1107-9602

Fig. 281: Barometric Pressure (BARO) Sensor Circuit Diagram (High Voltage)



P1106-9671

Fig. 282: Barometric Pressure (BARO) Sensor Output Voltage Graph

General Description

The barometric pressure (BARO) sensor is built into the engine control module (ECM)/powertrain control module (PCM), and it monitors atmospheric pressure. The ECM/PCM estimates appropriate intake airflow from the manifold absolute pressure (MAP) sensor output voltage and BARO sensor output voltage. If the BARO sensor output voltage is a specified value or more, the ECM/PCM detects a malfunction and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
Sequence	None
Duration	2 seconds or more
DTC Type	One drive cycle, MIL ON
OBD Status	N/A

Enable Conditions

ENABLE CONDITIONS

Condition	
Ignition switch	ON
No active DTCs	P1109, P2228

Malfunction Threshold

The BARO sensor output voltage value is 4.49 V or more for at least 2 seconds.

Diagnosis Details**Conditions for illuminating the MIL**

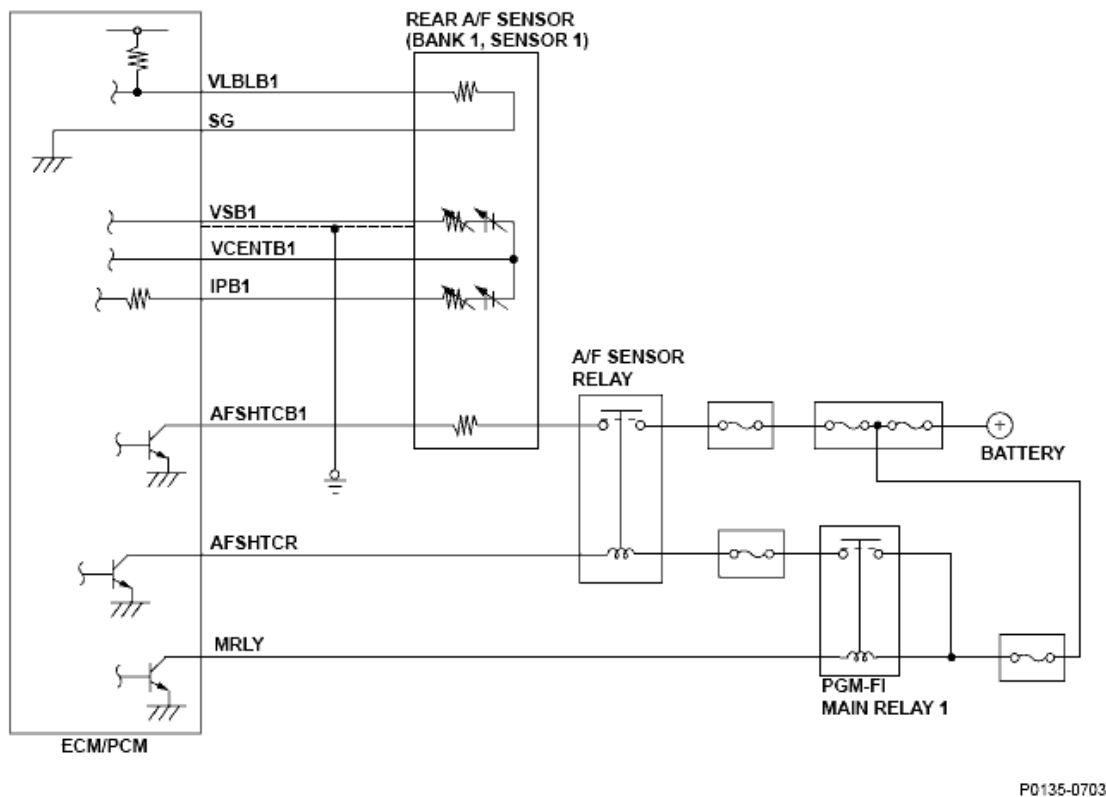
When a malfunction is detected, the MIL comes on and the DTC and the freeze frame data are stored in the ECM/PCM memory.

Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P2237 (155): ADVANCED DIAGNOSTICS**DTC P2237: REAR AIR/FUEL RATIO (A/F) SENSOR (BANK 1, SENSOR 1) IP CIRCUIT HIGH VOLTAGE**



P0135-0703

Fig. 283: Rear Air/Fuel Ratio (A/F) Sensor (Bank 1, Sensor 1) IP Circuit Diagram (High Voltage)

General Description

The rear air/fuel ratio (A/F) sensor (bank 1, sensor 1) is installed in the exhaust manifold and detects oxygen content in the exhaust gas. The rear A/F sensor transmits a signal to the engine control module (ECM)/powertrain control module (PCM). The ECM/PCM controls fuel injection duration by comparing the target air/fuel ratio with the rear A/F sensor signal. The sensor includes the VS cell, the pump cell, the atmospheric reference cavity, the diffusion layer, and the heater, and it enables overall feedback control.

If the IPB1 (pump cell current draw, bank 1) terminal voltage is out of a specified range, the ECM/PCM detects a malfunction and stores a DTC.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
Sequence	None
Duration	15 seconds or more
DTC Type	One drive cycle, MIL ON
OBD Status	PASSED/FAILED/NOT COMPLETED (STILL TESTING)

Enable Conditions

ENABLE CONDITIONS

Condition	Minimum	Maximum
VS1 terminal voltage	3.4 V	4.8 V

No active DTCs	P0135, P2195, P2238, P2243, P2245, P2251, P2252, P2627, P2628
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Malfunction Threshold

The IPB1 terminal voltage is 2.0 V or less, or 5.6 V or more, for at least 15 seconds.

Driving Pattern

Start the engine. Hold the engine speed at 3,000 rpm without load (in Park or neutral) until the radiator fan comes on, then let it idle for 2 minutes.

Diagnosis Details**Conditions for illuminating the MIL**

When a malfunction is detected, the MIL comes on and the DTC and the freeze frame data are stored in the ECM/PCM memory.

Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P2238 (155): ADVANCED DIAGNOSTICS

DTC P2238: REAR AIR/FUEL RATIO (A/F) SENSOR (BANK 1, SENSOR 1) IP CIRCUIT LOW VOLTAGE

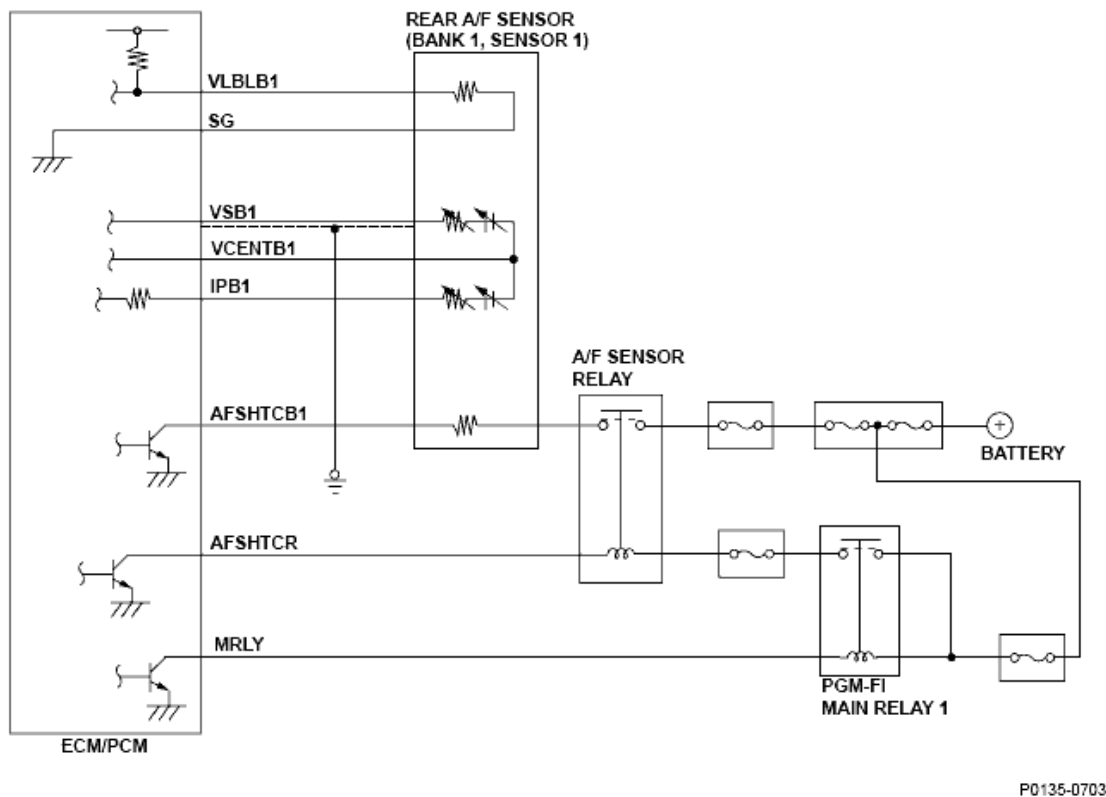


Fig. 284: Rear Air/Fuel Ratio (A/F) Sensor (Bank 1, Sensor 1) IP Circuit Diagram (Low Voltage)

General Description

The rear air/fuel ratio (A/F) sensor (bank 1, sensor 1) is installed in the exhaust manifold and detects oxygen content in the exhaust gas. The rear A/F sensor transmits a signal to the engine control module (ECM)/powertrain control module (PCM). The ECM/PCM controls fuel injection duration by comparing the target air/fuel ratio with the rear A/F sensor signal. The sensor includes the VS cell, the pump cell, the atmospheric reference cavity, the diffusion layer, and the heater, and it enables overall feedback control.

If the IPB1 (pump cell current draw, bank 1) terminal voltage is a specified value or less, the ECM/PCM detects a malfunction and stores a DTC.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
Sequence	None
Duration	5 seconds or more ⁽¹⁾ , 85 seconds or more ⁽²⁾
DTC Type	One drive cycle, MIL ON
OBD Status	PASSED/FAILED/NOT COMPLETED (STILL TESTING)
(1) After the sensor becomes active	
(2) Before the sensor becomes active	

Enable Conditions

ENABLE CONDITIONS

Condition	
State of the engine	Running
No active DTCs	P0135, P2195, P2237, P2243, P2245, P2251, P2252, P2627, P2628

Malfunction Threshold

The IPB1 input terminal voltage is 1.0 V or less for at least 5 seconds*, 85 seconds**.

Driving Pattern

Start the engine. Hold the engine speed at 3,000 rpm without load (in Park or neutral) until the radiator fan comes on, then let it idle for 2 minutes.

Diagnosis Details**Conditions for illuminating the MIL**

When a malfunction is detected, the MIL comes on and the DTC and the freeze frame data are stored in the ECM/PCM memory.

Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P2240 (156): ADVANCED DIAGNOSTICS

DTC P2240: FRONT AIR/FUEL RATIO (A/F) SENSOR (BANK 2, SENSOR 1) IP CIRCUIT HIGH VOLTAGE

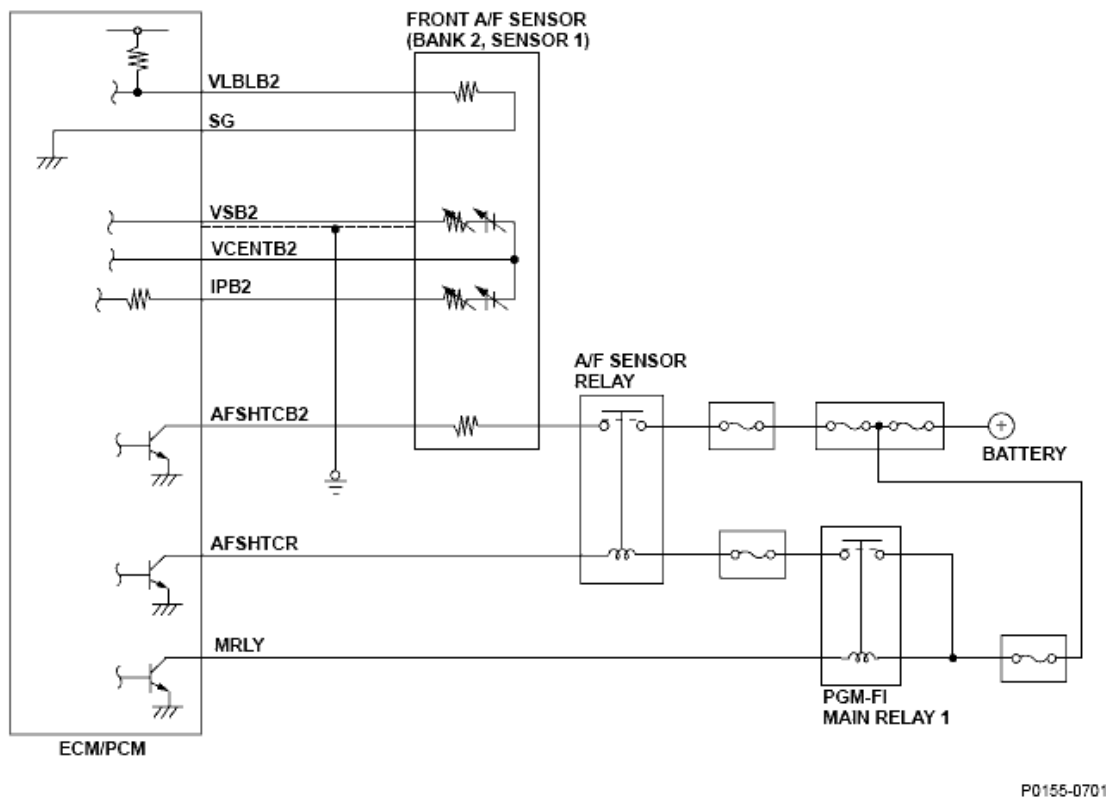


Fig. 285: Front Air/Fuel Ratio (A/F) Sensor (Bank 2, Sensor 1) IP Circuit Diagram (High Voltage)

General Description

The front air/fuel ratio (A/F) sensor (bank 2, sensor 1) is installed in the exhaust manifold and detects oxygen content in the exhaust gas. The front A/F sensor transmits a signal to the engine control module (ECM)/powertrain control module (PCM). The ECM/PCM controls fuel injection duration by comparing the target air/fuel ratio with the front A/F sensor signal. The sensor includes the VS cell, the pump cell, the atmospheric reference cavity, the diffusion layer, and the heater, and it enables overall feedback control.

If the IPB2 (pump cell current draw, bank 2) terminal voltage is out of a specified range, the ECM/PCM detects a malfunction and stores a DTC.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
Sequence	None
Duration	15 seconds or more
DTC Type	One drive cycle, MIL ON
OBD Status	PASSED/FAILED/NOT COMPLETED (STILL TESTING)

Enable Conditions

ENABLE CONDITIONS

Condition	Minimum	Maximum
VS2 terminal voltage	3.4 V	4.8 V

State of the engine	Running
No active DTCs	P0155, P2197, P2241, P2247, P2249, P2254, P2255, P2630, P2631

Malfunction Threshold

The IPB2 terminal voltage is 5.6 V or more, or 2.0 V or less, for at least 15 seconds.

Driving Pattern

Start the engine. Hold the engine speed at 3,000 rpm without load (in Park or neutral) until the radiator fan comes on, then let it idle for 2 minutes.

Diagnosis Details**Conditions for illuminating the MIL**

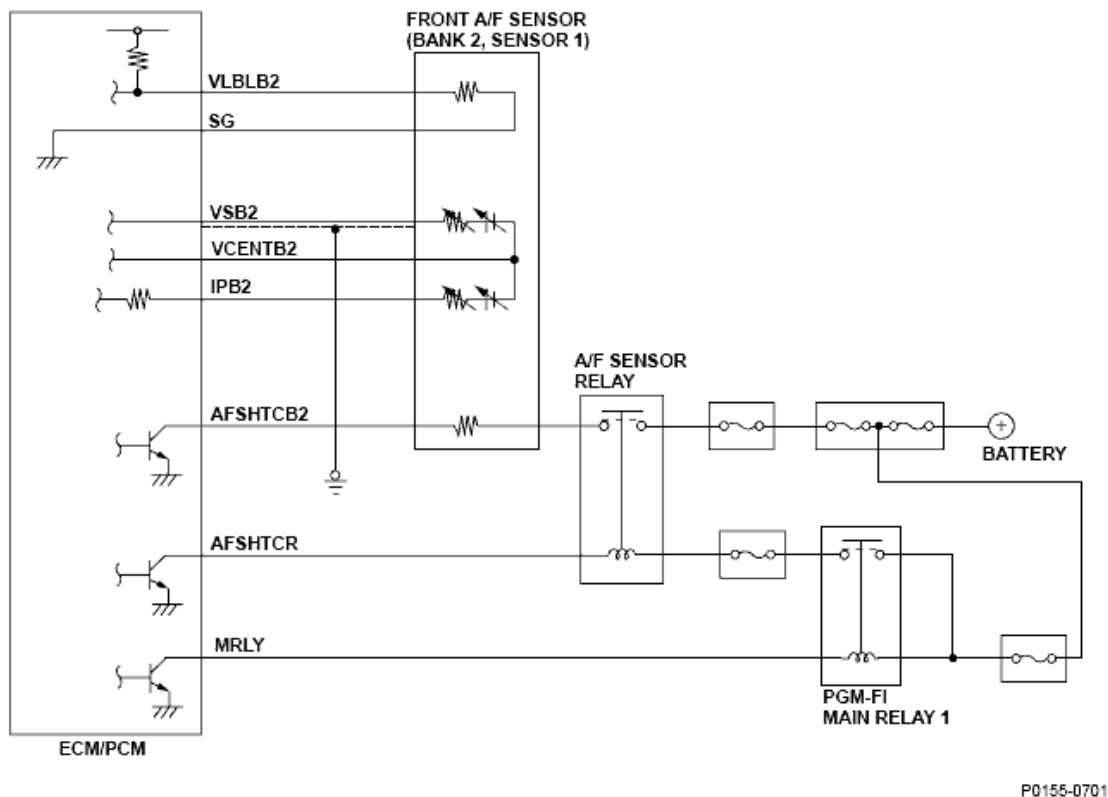
When a malfunction is detected, the MIL comes on and the DTC and the freeze frame data are stored in the ECM/PCM memory.

Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P2241 (156): ADVANCED DIAGNOSTICS**DTC P2241: FRONT AIR/FUEL RATIO (A/F) SENSOR (BANK 2, SENSOR 1) IP CIRCUIT LOW VOLTAGE**



P0155-0701

Fig. 286: Front Air/Fuel Ratio (A/F) Sensor (Bank 2, Sensor 1) IP Circuit Diagram (Low Voltage)

General Description

The front air/fuel ratio (A/F) sensor (bank 2, sensor 1) is installed in the exhaust manifold and detects oxygen content in the exhaust gas. The front A/F sensor transmits a signal to the engine control module (ECM)/powertrain control module (PCM). The ECM/PCM controls fuel injection duration by comparing the target air/fuel ratio with the front A/F sensor signal. The sensor includes the VS cell, the pump cell, the atmospheric reference cavity, the diffusion layer, and the heater, and it enables overall feedback control.

If the IPB2 (pump cell current draw, bank 2) terminal voltage is a specified value or less, the ECM/PCM detects a malfunction and stores a DTC.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
Sequence	None
Duration	5 seconds or more ⁽¹⁾ , 85 seconds or more ⁽²⁾
DTC Type	One drive cycle, MIL ON
OBD Status	PASSED/FAILED/NOT COMPLETED (STILL TESTING)
(1) After the sensor becomes active	
(2) Before the sensor becomes active	

Enable Conditions

ENABLE CONDITIONS

Condition	
State of the engine	Running
No active DTCs	P0155, P2197, P2240, P2247, P2249, P2254, P2255, P2630, P2631

Malfunction Threshold

The IPB2 input terminal voltage is 1.0 V or less for at least 5 seconds*, 85 seconds**.

Driving Pattern

Start the engine. Hold the engine speed at 3,000 rpm without load (in Park or neutral) until the radiator fan comes on, then let it idle for 2 minutes.

Diagnosis Details**Conditions for illuminating the MIL**

When a malfunction is detected, the MIL comes on and the DTC and the freeze frame data are stored in the ECM/PCM memory.

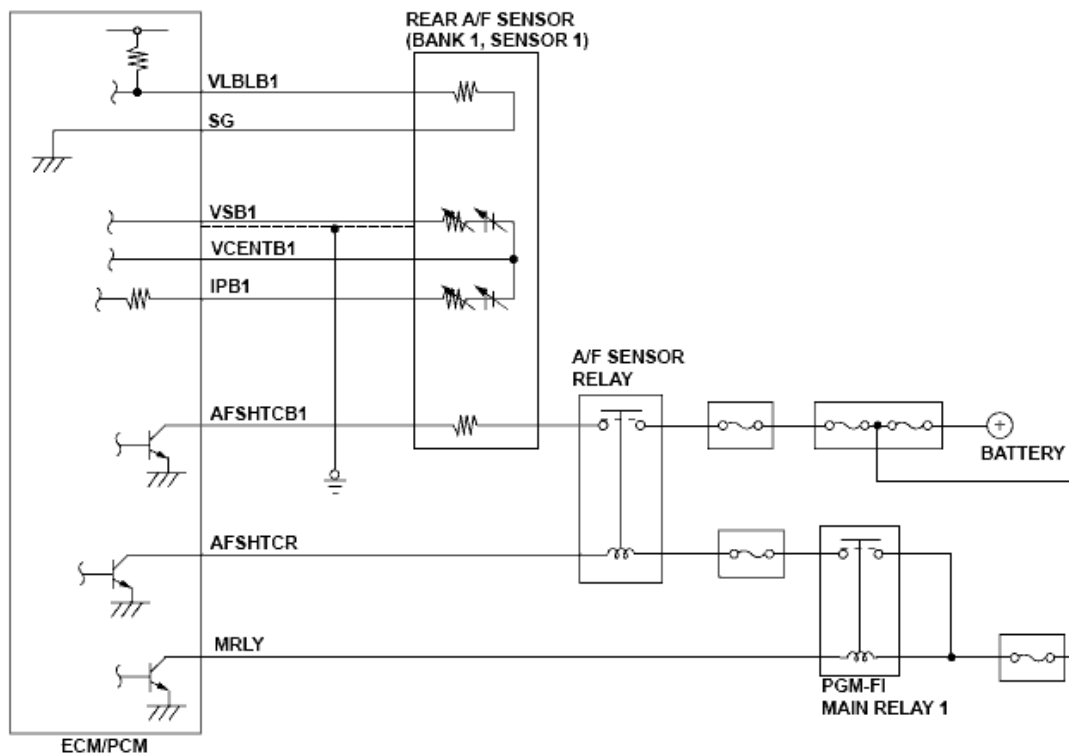
Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

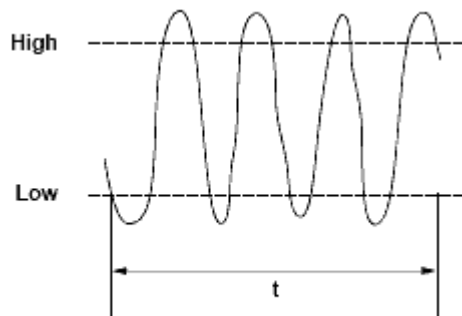
DTC P2243 (155): ADVANCED DIAGNOSTICS

DTC P2243: REAR AIR/FUEL RATIO (A/F) SENSOR (BANK 1, SENSOR 1) VCENT CIRCUIT HIGH VOLTAGE



P0135-0703

Fig. 287: Rear Air/Fuel Ratio (A/F) Sensor (Bank 1, Sensor 1) VCENT Circuit Diagram (High Voltage)



P2243-0370

Fig. 288: Rear Air/Fuel Ratio (A/F) Sensor (Bank 1, Sensor 1) VCENT Circuit Diagram (High Voltage) Graph

General Description

The rear air/fuel ratio (A/F) sensor (bank 1, sensor 1) is installed in the exhaust manifold and detects oxygen content in the exhaust gas. The rear A/F sensor transmits output voltage to the engine control module (ECM)/powertrain control module (PCM). The ECM/PCM controls fuel injection duration by comparing the target air/fuel ratio with the rear A/F sensor signal. The sensor includes the VS cell, the pump cell, the atmospheric reference cavity, the diffusion layer, and the heater, and it enables overall feedback control.

When the VSB1 (sensor cell voltage supply, bank 1) terminal voltage repeatedly fluctuates between the value above the specification and the value below the specification for more than a fixed frequency, the ECM/PCM detects a malfunction and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status**MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS**

Execution	Continuous
Sequence	None
Duration	-
DTC Type	One drive cycle, MIL ON
OBD Status	PASSED/FAILED/NOT COMPLETED (STILL TESTING)

Enable Conditions**ENABLE CONDITIONS**

Condition	
State of the engine	Running
No active DTCs	P0135, P2195, P2237, P2238, P2245, P2251, P2252, P2627, P2628

Malfunction Threshold

The VSB1 terminal voltage repeatedly fluctuates from a value above 4.8 V to a value below 3.4 V, at least 150 times.

Driving Pattern

Start the engine. Hold the engine speed at 3,000 rpm without load (in Park or neutral) until the radiator fan comes on, then let it idle for 2 minutes.

Diagnosis Details**Conditions for illuminating the MIL**

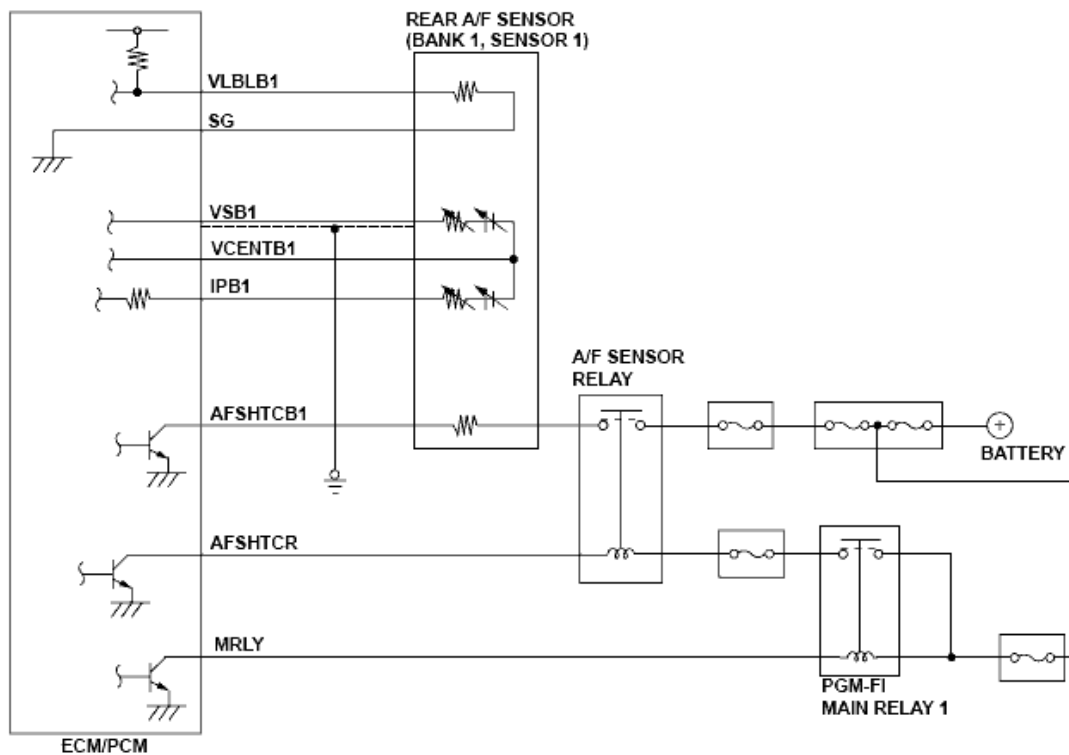
When a malfunction is detected, the MIL comes on and the DTC and the freeze frame data are stored in the ECM/PCM memory.

Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P2245 (155): ADVANCED DIAGNOSTICS**DTC P2245: REAR AIR/FUEL RATIO (A/F) SENSOR (BANK 1, SENSOR 1) VCENT CIRCUIT LOW VOLTAGE**



P0135-0703

Fig. 289: Rear Air/Fuel Ratio (A/F) Sensor (Bank 1, Sensor 1) VCENT Circuit Diagram (Low Voltage)

General Description

The rear air/fuel ratio (A/F) sensor (bank 1, sensor 1) is installed in the exhaust manifold and detects oxygen content in the exhaust gas. The rear A/F sensor transmits a signal to the engine control module (ECM)/powertrain control module (PCM). The ECM/PCM controls fuel injection duration by comparing the target air/fuel ratio with the rear A/F sensor signal. The sensor includes the VS cell, the pump cell, the atmospheric reference cavity, the diffusion layer, and the heater, and it enables overall feedback control.

If the IPB1 (pump cell current draw, bank 1) terminal voltage is a specified value or more, the ECM/PCM detects a malfunction and stores a DTC.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
Sequence	None
Duration	5 seconds or more ⁽¹⁾ , 85 seconds or more ⁽²⁾
DTC Type	One drive cycle, MIL ON
OBD Status	PASSED/FAILED/NOT COMPLETED (STILL TESTING)

(1) After the sensor becomes active

(2) Before the sensor becomes active

Enable Conditions

ENABLE CONDITIONS

Condition	Minimum	Maximum
VSB1 terminal voltage	0.3 V	1.5 V
State of the engine	Running	
No active DTCs	P0135, P2195, P2237, P2238, P2243, P2251, P2252, P2627, P2628	

Malfunction Threshold

The IPB1 input terminal voltage is 1.0 V or less for at least 5 seconds*, 85 seconds**.

Driving Pattern

Start the engine. Hold the engine speed at 3,000 rpm without load (in Park or neutral) until the radiator fan comes on, then let it idle for 2 minutes.

Diagnosis Details**Conditions for illuminating the MIL**

When a malfunction is detected, the MIL comes on and the DTC and the freeze frame data are stored in the ECM/PCM memory.

Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P2247 (156): ADVANCED DIAGNOSTICS

DTC P2247: FRONT AIR/FUEL RATIO (A/F) SENSOR (BANK 2, SENSOR 1) VCENT CIRCUIT HIGH VOLTAGE

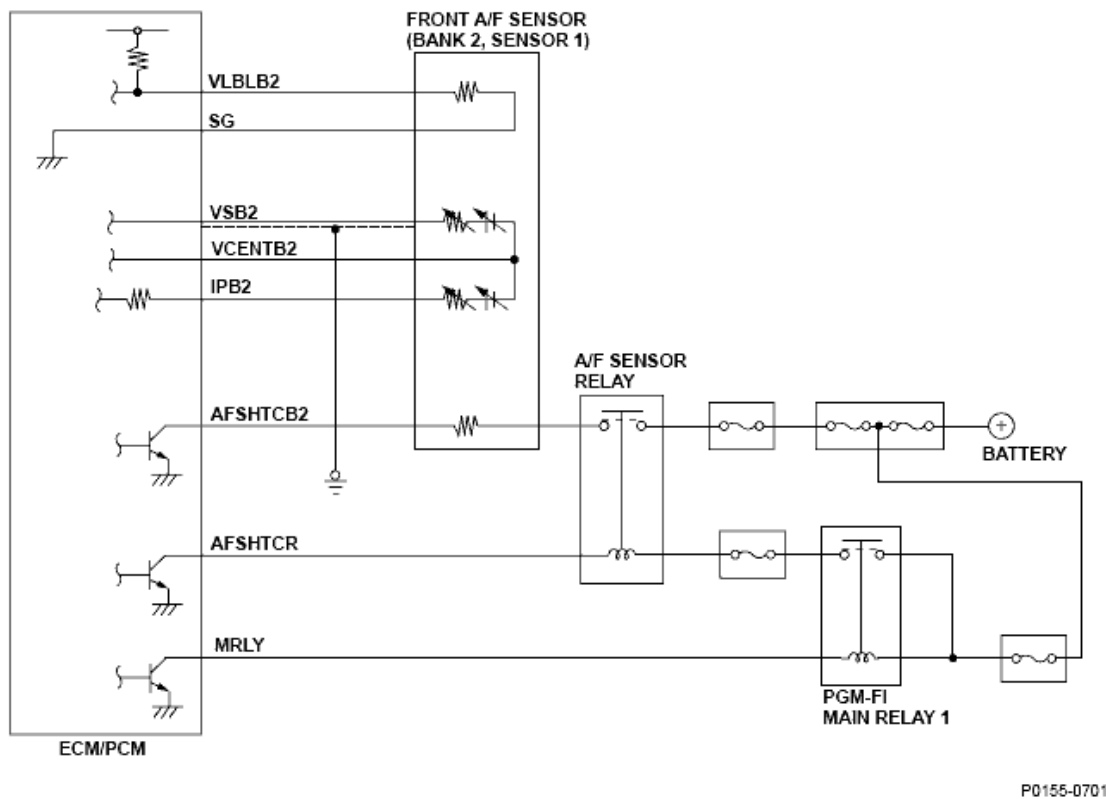


Fig. 290: Front Air/Fuel Ratio (A/F) Sensor (Bank 2, Sensor 1) VCENT Circuit Diagram (High Voltage)

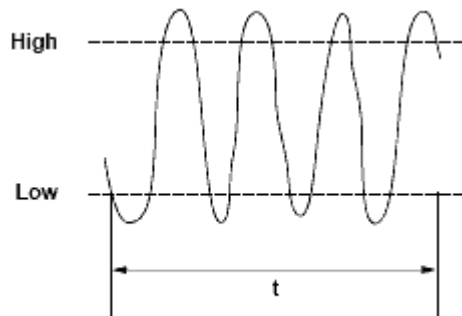


Fig. 291: Front Air/Fuel Ratio (A/F) Sensor (Bank 2, Sensor 1) VCENT Circuit Diagram (High Voltage) Graph

General Description

The front air/fuel ratio (A/F) sensor (bank 2, sensor 1) is installed in the exhaust manifold and detects oxygen content in the exhaust gas. The front A/F sensor transmits output voltage to the engine control module (ECM)/powertrain control module (PCM). The ECM/PCM controls fuel injection duration by comparing the target air/fuel ratio with the front A/F sensor signal. The sensor includes the VS cell, the pump cell, the atmospheric reference cavity, the diffusion layer, and the heater, and it enables overall feedback control.

When the VSB2 (sensor cell voltage supply, bank 2) terminal voltage repeatedly fluctuates between the value above the specification and the value below the specification for more than a fixed frequency, the

ECM/PCM detects a malfunction and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
Sequence	None
Duration	-
DTC Type	One drive cycle, MIL ON
OBD Status	PASSED/FAILED/NOT COMPLETED (STILL TESTING)

Enable Conditions

ENABLE CONDITIONS

Condition	
State of the engine	Running
No active DTCs	P0155, P2197, P2240, P2241, P2249, P2254, P2255, P2630, P2631

Malfunction Threshold

The VSB2 terminal voltage repeatedly fluctuates from a value above 4.8 V to a value below 3.4 V, at least 150 times.

Driving Pattern

Start the engine. Hold the engine speed at 3,000 rpm without load (in Park or neutral) until the radiator fan comes on, then let it idle for 2 minutes.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected, the MIL comes on and the DTC and the freeze frame data are stored in the ECM/PCM memory.

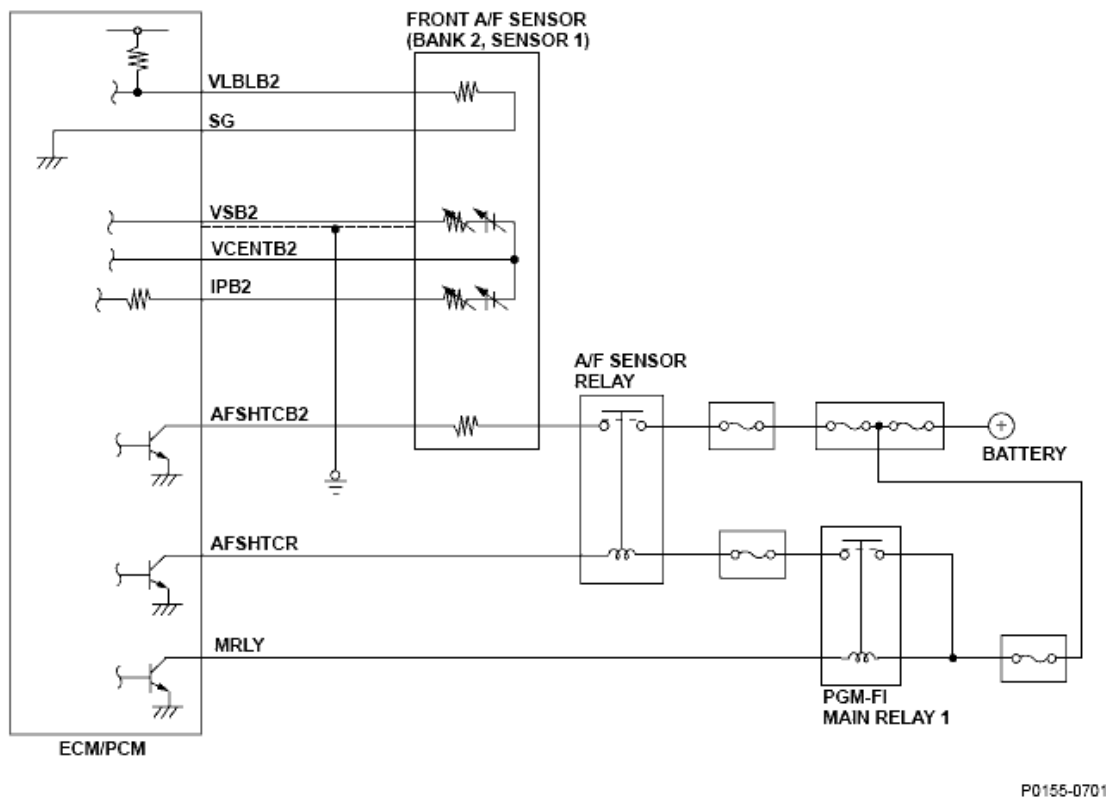
Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P2249 (156): ADVANCED DIAGNOSTICS

DTC P2249: FRONT AIR/FUEL RATIO (A/F) SENSOR (BANK 2, SENSOR 1) VCENT CIRCUIT LOW VOLTAGE



P0155-0701

Fig. 292: Front Air/Fuel Ratio (A/F) Sensor (Bank 2, Sensor 1) VCENT Circuit Diagram (Low Voltage)

General Description

The front air/fuel ratio (A/F) sensor (bank 2, sensor 1) is installed in the exhaust manifold and detects oxygen content in the exhaust gas. The front A/F sensor transmits a signal to the engine control module (ECM)/powertrain control module (PCM). The ECM/PCM controls fuel injection duration by comparing the target air/fuel ratio with the front A/F sensor signal. The sensor includes the VS cell, the pump cell, the atmospheric reference cavity, the diffusion layer, and the heater, and it enables overall feedback control.

If the IPB2 (pump cell current draw, bank 2) terminal voltage is a specified value or more, the ECM/PCM detects a malfunction and stores a DTC.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
Sequence	None
Duration	5 seconds or more ⁽¹⁾ , 85 seconds or more ⁽²⁾
DTC Type	One drive cycle, MIL ON
OBD Status	PASSED/FAILED/NOT COMPLETED (STILL TESTING)

(1) After the sensor becomes active

(2) Before the sensor becomes active

Enable Conditions

ENABLE CONDITIONS

Condition	Minimum	Maximum
VSB2 terminal voltage	0.3 V	1.5 V
State of the engine	Running	
No active DTCs	P0155, P2197, P2240, P2241, P2247, P2254, P2255, P2630, P2631	

Malfunction Threshold

The IPB2 input terminal voltage is 1.0 V or less for at least 5 seconds*, 85 seconds**.

Driving Pattern

Start the engine. Hold the engine speed at 3,000 rpm without load (in Park or neutral) until the radiator fan comes on, then let it idle for 2 minutes.

Diagnosis Details**Conditions for illuminating the MIL**

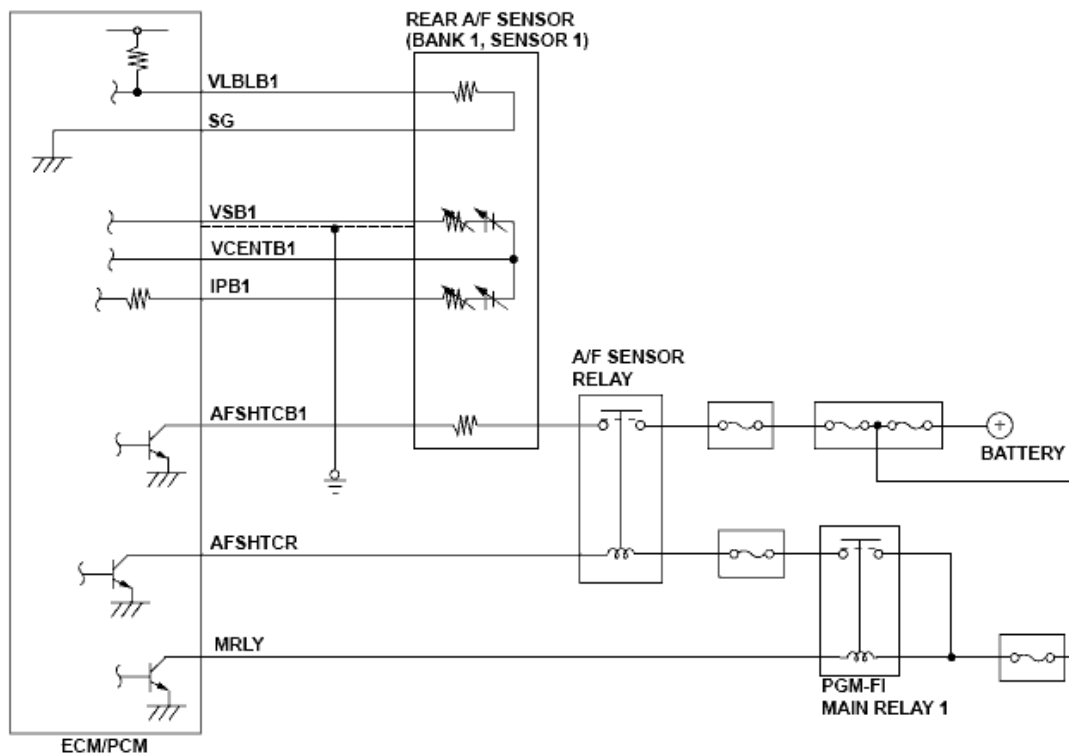
When a malfunction is detected, the MIL comes on and the DTC and the freeze frame data are stored in the ECM/PCM memory.

Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P2251 (155): ADVANCED DIAGNOSTICS**DTC P2251: REAR AIR/FUEL RATIO (A/F) SENSOR (BANK 1, SENSOR 1) VS CIRCUIT HIGH VOLTAGE**



P0135-0703

Fig. 293: Rear Air/Fuel Ratio (A/F) Sensor (Bank 1, Sensor 1) VS Circuit Diagram (High Voltage)

General Description

The rear air/fuel ratio (A/F) sensor (bank 1, sensor 1) is installed in the exhaust manifold and detects oxygen content in the exhaust gas. The rear A/F sensor transmits a signal to the engine control module (ECM)/powertrain control module (PCM). The ECM/PCM controls fuel injection duration by comparing the target air/fuel ratio with the rear A/F sensor signal. The sensor includes the VS cell, the pump cell, the atmospheric reference cavity, the diffusion layer, and the heater, and it enables overall feedback control.

When the VSB1 (sensor cell voltage supply, bank 1) terminal voltage and the ECM/PCM internal signal voltage are more than a specified value for more than a predetermined time, the ECM/PCM detects a malfunction and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
Sequence	None
Duration	5 seconds or more
DTC Type	One drive cycle, MIL ON
OBD Status	PASSED/FAILED/NOT COMPLETED (STILL TESTING)

Enable Conditions

ENABLE CONDITIONS

Condition	

State of the engine	Running
No active DTCs	P0135, P2195, P2237, P2238, P2243, P2245, P2252, P2627, P2628

Malfunction Threshold

The VSB1 terminal voltage is 6.0 V or more, and the ECM/PCM internal signal voltage is 4.6 V or more, for at least 5 seconds.

Driving Pattern

Start the engine. Hold the engine speed at 3,000 rpm without load (in Park or neutral) until the radiator fan comes on, then let it idle for 2 minutes.

Diagnosis Details**Conditions for illuminating the MIL**

When a malfunction is detected, the MIL comes on and the DTC and the freeze frame data are stored in the ECM/PCM memory.

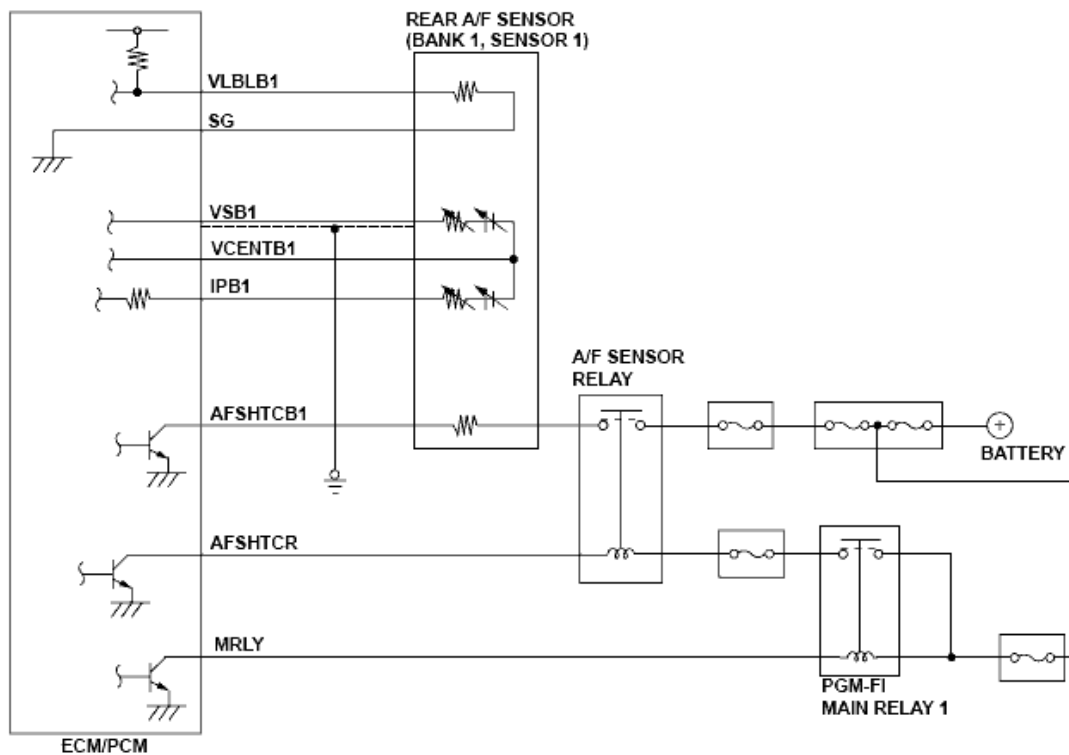
Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P2252 (155): ADVANCED DIAGNOSTICS

DTC P2252: REAR AIR/FUEL RATIO (A/F) SENSOR (BANK 1, SENSOR 1) VS CIRCUIT LOW VOLTAGE



P0135-0703

Fig. 294: Rear Air/Fuel Ratio (A/F) Sensor (Bank 1, Sensor 1) VS Circuit Diagram (Low Voltage)

General Description

The rear air/fuel ratio (A/F) sensor (bank 1, sensor 1) is installed in the exhaust manifold and detects oxygen content in the exhaust gas. The rear A/F sensor transmits a signal to the engine control module (ECM)/powertrain control module (PCM). The ECM/PCM controls fuel injection duration by comparing the target air/fuel ratio with the rear A/F sensor signal. The sensor includes the VS cell, the pump cell, the atmospheric reference cavity, the diffusion layer, and the heater, and it enables overall feedback control.

When the VSB1 (sensor cell voltage supply, bank 1) terminal voltage is less than the specified value and the IPB1 (pump cell current draw, bank 1) terminal voltage is more than the specified value for more than a set time, the ECM/PCM detects a malfunction and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
Sequence	None
Duration	5 seconds or more ⁽¹⁾ , 85 seconds or more ⁽²⁾
DTC Type	One drive cycle, MIL ON
OBD Status	PASSED/FAILED/NOT COMPLETED (STILL TESTING)

(1) After the sensor becomes active

(2) Before the sensor becomes active

Enable Conditions

ENABLE CONDITIONS

Condition	
State of the engine	Running
No active DTCs	P0135, P2195, P2237, P2238, P2243, P2245, P2251, P2627, P2628

Malfunction Threshold

The VSB1 terminal voltage is 0.3 V or less, and the IPB1 terminal voltage is 1.0 V or more, for at least 5 seconds*, 85 seconds**.

Driving Pattern

Start the engine. Hold the engine speed at 3,000 rpm without load (in Park or neutral) until the radiator fan comes on, then let it idle for 2 minutes.

Diagnosis Details**Conditions for illuminating the MIL**

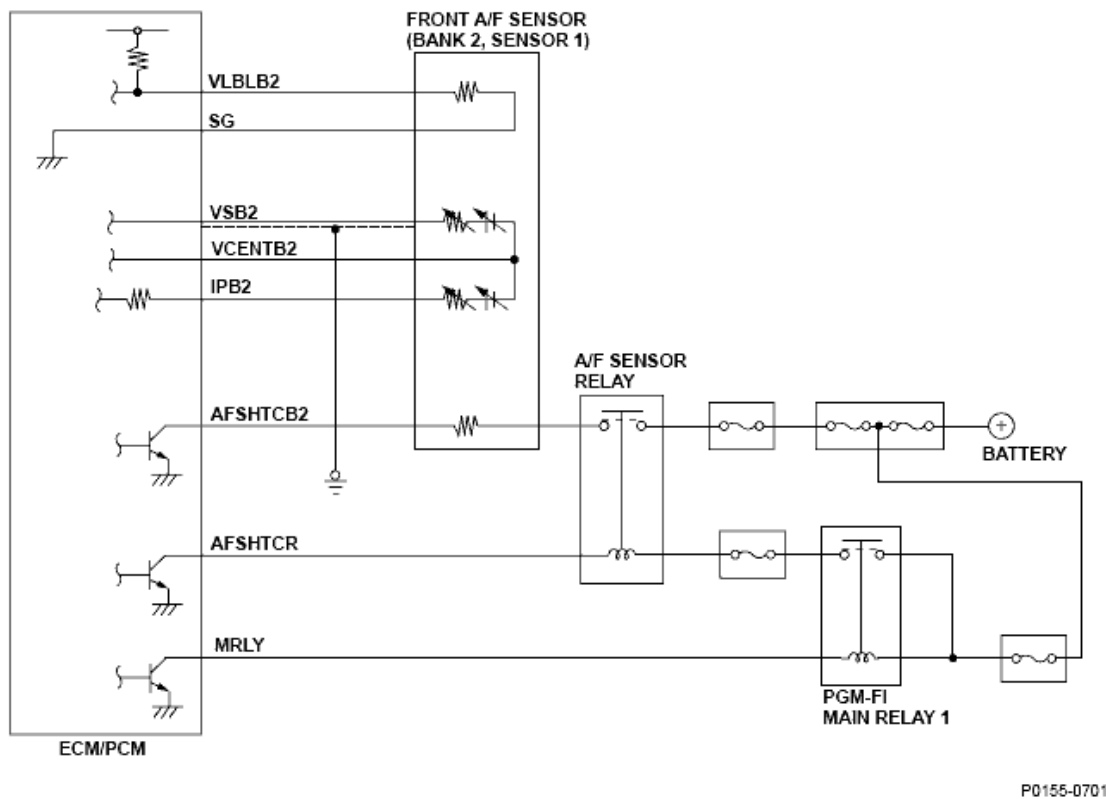
When a malfunction is detected, the MIL comes on and the DTC and the freeze frame data are stored in the ECM/PCM memory.

Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P2254 (156): ADVANCED DIAGNOSTICS**DTC P2254: FRONT AIR/FUEL RATIO (A/F) SENSOR (BANK 2, SENSOR 1) VS CIRCUIT HIGH VOLTAGE**



P0155-0701

Fig. 295: Front Air/Fuel Ratio (A/F) Sensor (Bank 2, Sensor 1) VS Circuit Diagram (High Voltage)

General Description

The front air/fuel ratio (A/F) sensor (bank 2, sensor 1) is installed in the exhaust manifold and detects oxygen content in the exhaust gas. The front A/F sensor transmits a signal to the engine control module (ECM)/powertrain control module (PCM). The ECM/PCM controls fuel injection duration by comparing the target air/fuel ratio with the front A/F sensor signal. The sensor includes the VS cell, the pump cell, the atmospheric reference cavity, the diffusion layer, and the heater, and it enables overall feedback control.

When the VSB2 (sensor cell voltage supply, bank 2) terminal voltage and the ECM/PCM internal signal voltage are more than a specified value for more than a predetermined time, the ECM/PCM detects a malfunction and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
Sequence	None
Duration	5 seconds or more
DTC Type	One drive cycle, MIL ON
OBD Status	PASSED/FAILED/NOT COMPLETED (STILL TESTING)

Enable Conditions

ENABLE CONDITIONS

Condition	

State of the engine	Running
No active DTCs	P0155, P2197, P2240, P2241, P2247, P2249, P2255, P2630, P2631

Malfunction Threshold

The VSB2 terminal voltage is 6.0 V or more, and the ECM/PCM internal signal voltage is 4.6 V or more, for at least 5 seconds.

Driving Pattern

Start the engine. Hold the engine speed at 3,000 rpm without load (in Park or neutral) until the radiator fan comes on, then let it idle for 2 minutes.

Diagnosis Details**Conditions for illuminating the MIL**

When a malfunction is detected, the MIL comes on and the DTC and the freeze frame data are stored in the ECM/PCM memory.

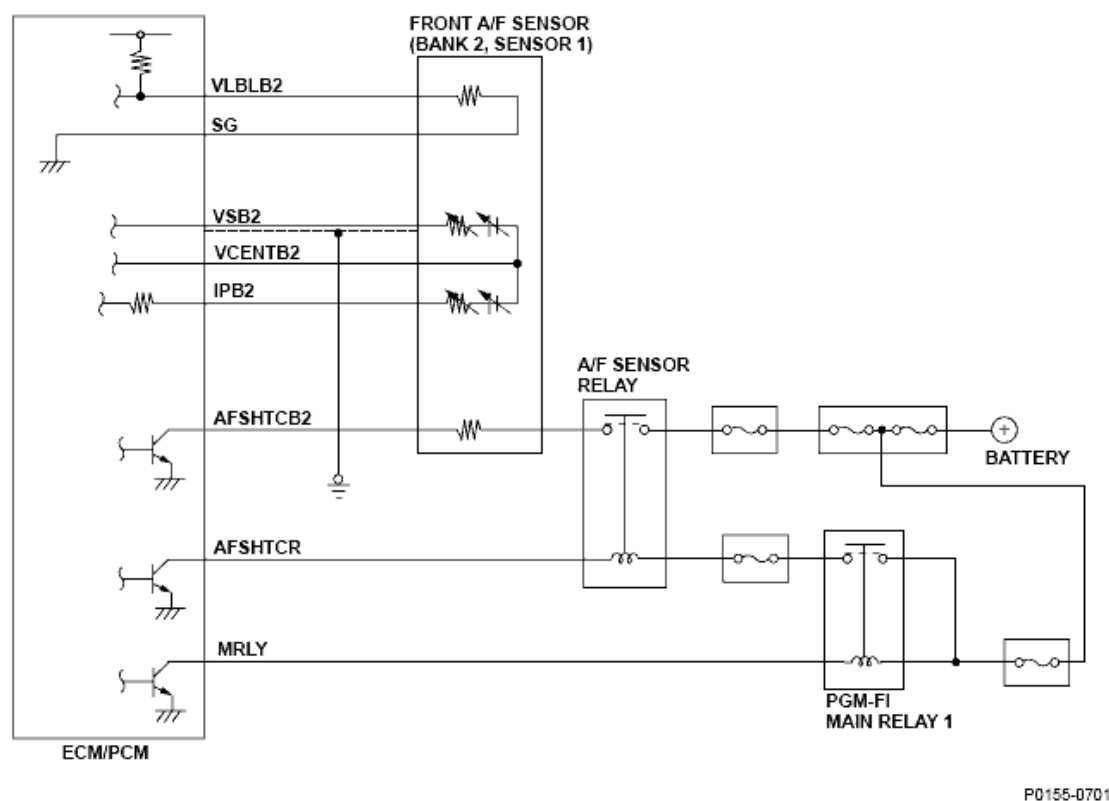
Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P2255 (156): ADVANCED DIAGNOSTICS

DTC P2255: FRONT AIR/FUEL RATIO (A/F) SENSOR (BANK 2, SENSOR 1) VS CIRCUIT LOW VOLTAGE



P0155-0701

Fig. 296: Front Air/Fuel Ratio (A/F) Sensor (Bank 2, Sensor 1) VS Circuit Diagram (Low Voltage)

General Description

The front air/fuel ratio (A/F) sensor (bank 2, sensor 1) is installed in the exhaust manifold and detects oxygen content in the exhaust gas. The front A/F sensor transmits a signal to the engine control module (ECM)/powertrain control module (PCM). The ECM/PCM controls fuel injection duration by comparing the target air/fuel ratio with the front A/F sensor signal. The sensor includes the VS cell, the pump cell, the atmospheric reference cavity, the diffusion layer, and the heater, and it enables overall feedback control.

When the VSB2 (sensor cell voltage supply, bank 2) terminal voltage is less than the specified value and the IPB2 (pump cell current draw, bank 2) terminal voltage is more than the specified value for more than a set time, the ECM/PCM detects a mal-function and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
Sequence	None
Duration	5 seconds or more ⁽¹⁾ , 85 seconds or more ⁽²⁾
DTC Type	One drive cycle, MIL ON
OBD Status	PASSED/FAILED/NOT COMPLETED (STILL TESTING)

(1) After the sensor becomes active

(2) Before the sensor becomes active

Enable Conditions

ENABLE CONDITIONS

Condition	
State of the engine	Running
No active DTCs	P0155, P2197, P2240, P2241, P2247, P2249, P2254, P2630, P2631

Malfunction Threshold

The VSB2 terminal voltage is 0.3 V or less, and the IPB2 terminal voltage is 1.0 V or more, for at least 5 seconds*, 85 seconds**.

Driving Pattern

Start the engine. Hold the engine speed at 3,000 rpm without load (in Park or neutral) until the radiator fan comes on, then let it idle for 2 minutes.

Diagnosis Details**Conditions for illuminating the MIL**

When a malfunction is detected, the MIL comes on and the DTC and the freeze frame data are stored in the ECM/PCM memory.

Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P2270 (161): ADVANCED DIAGNOSTICS

DTC P2270: REAR SECONDARY HEATED OXYGEN SENSOR (SECONDARY HO2S (BANK 1, SENSOR 2)) CIRCUIT SIGNAL STUCK LEAN

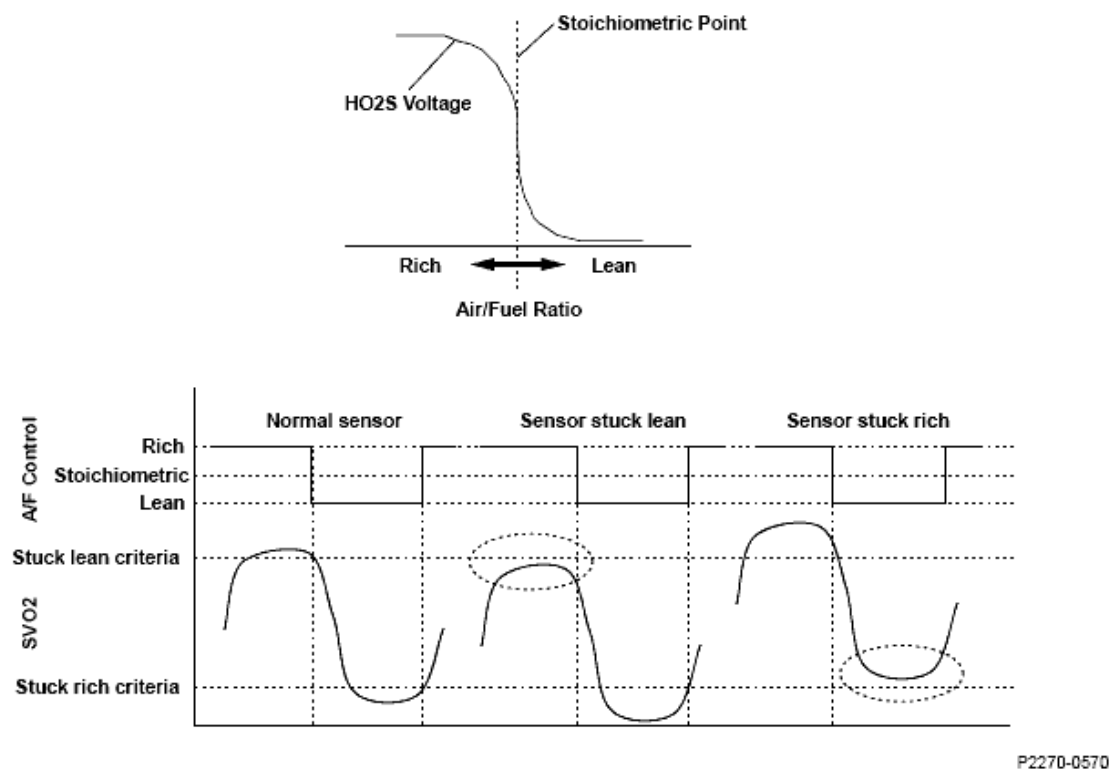


Fig. 297: Rear Secondary Heated Oxygen Sensor (Secondary HO2S (Bank 1, Sensor 2)) Circuit

General Description

The rear secondary HO2S (bank 1, sensor 2) detects the oxygen concentration in the exhaust gas downstream of the three-way catalyst (TWC). The rear sensor output voltage characteristics are similar to the air/fuel ratio (A/F) sensor. The oxygen concentration is detected after the TWC during fuel feedback control using the A/F sensor, and it optimizes the fuel feedback control to maximize the effect of the TWC. If, after current is applied to the rear secondary HO2S heater, the rear secondary HO2S does not fluctuate and the output is stuck within the specified area, a malfunction is detected and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Once per driving cycle
Sequence	None
Duration	36.3 ⁽²⁾ , 39.3 ⁽¹⁾ seconds or less
DTC Type	Two drive cycles, MIL ON
OBD Status	PASSED/FAILED/EXECUTING/OUT OF (TEST) CONDITION
(1) J32A3 engine	
(2) J35A8 engine	

Enable Conditions

ENABLE CONDITIONS

Condition	Minimum	Maximum

Elapsed time that secondary HO2S activity is not monitored after starting the engine	20 seconds	-
Elapsed time after the fuel cut-off	-	150 seconds
Engine coolant temperature	156°F (69°C)	-
Intake air temperature	8°F (-13°C)	-
Engine speed	1,200 rpm ⁽¹⁾	2,000 rpm ⁽¹⁾
	1,250 rpm ^{*1}	2,050 rpm ^{*1}
	1,600 rpm ⁽²⁾	2,300 rpm ⁽²⁾
MAP value	22 kPa (6.3 in.Hg, 160 mmHg)	66 kPa (19.6 in.Hg, 500 mmHg) *2
		73 kPa (21.6 in.Hg, 550 mmHg) *1
Vehicle speed	30 mph (48 km/h)	-
Fuel trim	0.73	1.47
Fuel feedback	Closed loop	
No active DTCs	P0107, P0108, P0111, P0112, P0113, P0117, P0118, P0133, P0134, P0135, P0137, P0138, P0141, P0171, P0172, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0335, P0339, P0340, P0344, P0401, P0404, P0443, P0496, P0497, P0627, P1077, P1078, P1128, P1129, P1172, P145C, P2195, P2237, P2238, P2243, P2245, P2251, P2252, P2413, P2627, P2628, P2646, P2647, P2648, P2649, P2A00	
(1) J35A8 engine, A/T model		
(2) J35A8 engine, M/T model		

Malfunction Threshold

The rear secondary HO2S (bank 1, sensor 2) output voltage is 0.650 V or less.

Driving Pattern

1. Start the engine. Let it idle until the radiator fan comes on.
2. Drive the vehicle at a steady speed of 35 mph (57 km/h) or more for at least 36.3^{*2}, 39.3^{*1} seconds.
 - Drive the vehicle in this manner only if the traffic regulations and ambient conditions allow.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected during the first drive cycle, a Temporary DTC is stored in the ECM/PCM memory. If the malfunction recurs during the next (second) drive cycle, the MIL comes on and the DTC and the freeze frame data are stored.

Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, the Temporary DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P2271 (161): ADVANCED DIAGNOSTICS

DTC P2271: REAR SECONDARY HEATED OXYGEN SENSOR (SECONDARY HO2S (BANK 1, SENSOR 2)) CIRCUIT SIGNAL STUCK RICH

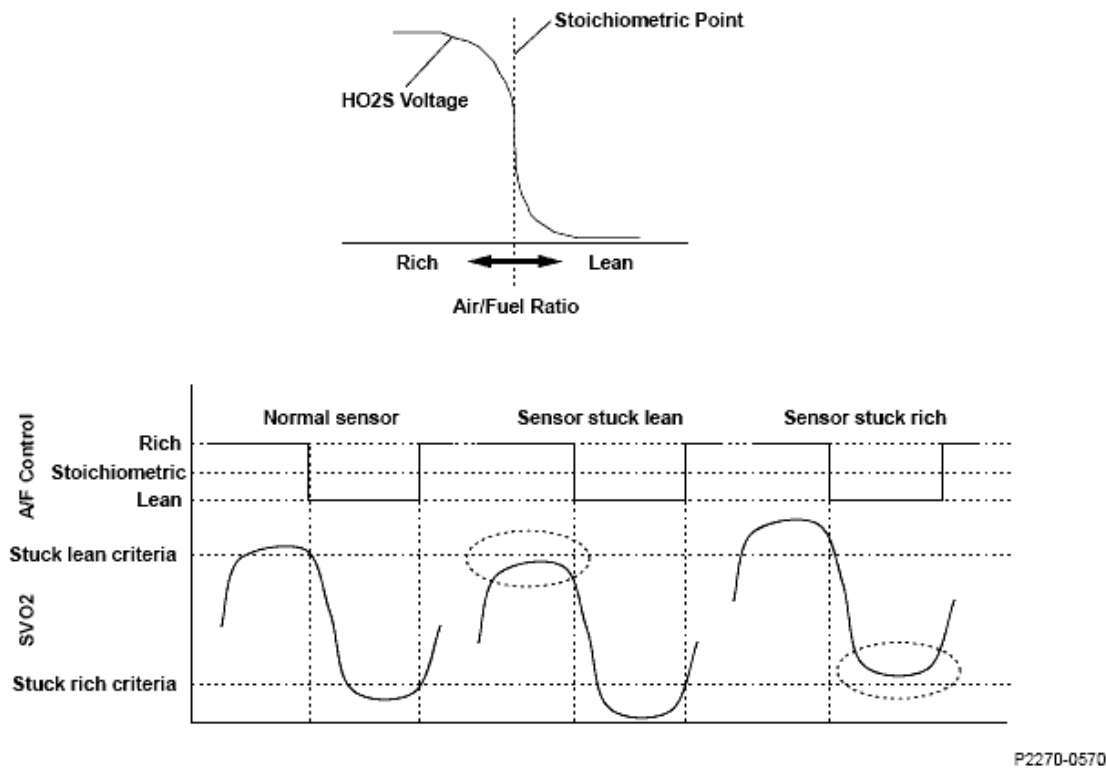


Fig. 298: Rear Secondary Heated Oxygen Sensor (Secondary HO2S (Bank 1, Sensor 2)) Circuit

General Description

The rear secondary HO2S (bank 1, sensor 2) detects the oxygen concentration in the exhaust gas downstream of the three-way catalyst (TWC). The rear sensor output voltage characteristics are similar to the air/fuel ratio (A/F) sensor. The oxygen concentration is detected after the TWC during fuel feedback control using the A/F sensor, and it optimizes the fuel feedback control to maximize the effect of the TWC. If, after current is applied to the rear secondary HO2S heater, the rear secondary HO2S does not fluctuate and the output is stuck within the specified area, a malfunction is detected and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Once per driving cycle
Sequence	None
Duration	36.3 ⁽²⁾ , 39.3 ⁽¹⁾ seconds or less

DTC Type	Two drive cycles, MIL ON
OBD Status	PASSED/FAILED/EXECUTING/OUT OF (TEST) CONDITION
(1) J32A3 engine	
(2) J35A8 engine	

Enable Conditions

ENABLE CONDITIONS

Condition	Minimum	Maximum
Elapsed time that secondary HO2S activity is not monitored after starting the engine	20 seconds	-
Elapsed time after the fuel cut-off	-	150 seconds
Engine coolant temperature	156°F (69°C)	-
Intake air temperature	8°F (-13°C)	-
Engine speed	1,200 rpm ⁽¹⁾	2,000 rpm ⁽¹⁾
	1,250 rpm ^{*1}	2,050 rpm ^{*1}
	1,600 rpm ⁽²⁾	2,300 rpm ⁽²⁾
MAP value	22 kPa (6.3 in.Hg, 160 mmHg)	66 kPa (19.6 in.Hg, 500 mmHg) *2
		73 kPa (21.6 in.Hg, 550 mmHg) *1
Vehicle speed	30 mph (48 km/h)	-
Fuel trim	0.73	1.47
Fuel feedback	Closed loop	
No active DTCs	P0107, P0108, P0111, P0112, P0113, P0117, P0118, P0133, P0134, P0135, P0137, P0138, P0141, P0171, P0172, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0335, P0339, P0340, P0344, P0401, P0404, P0443, P0496, P0497, P0627, P1077, P1078, P1128, P1129, P1172, P145C, P2195, P2237, P2238, P2243, P2245, P2251, P2252, P2270, P2413, P2627, P2628, P2646, P2647, P2648, P2649, P2A00	
(1) J35A8 engine, A/T model		
(2) J35A8 engine, M/T model		

Malfunction Threshold

The rear secondary HO2S (bank 1, sensor 2) output voltage is 0.293 V or more.

Driving Pattern

1. Start the engine. Let it idle until the radiator fan comes on.
2. Drive the vehicle at a steady speed of 35 mph (57 km/h) or more for at least 36.3^{*2}, 39.3^{*1} seconds.

- Drive the vehicle in this manner only if the traffic regulations and ambient conditions allow.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected during the first drive cycle, a Temporary DTC is stored in the ECM/PCM memory. If the malfunction recurs during the next (second) drive cycle, the MIL comes on and the DTC and the freeze frame data are stored.

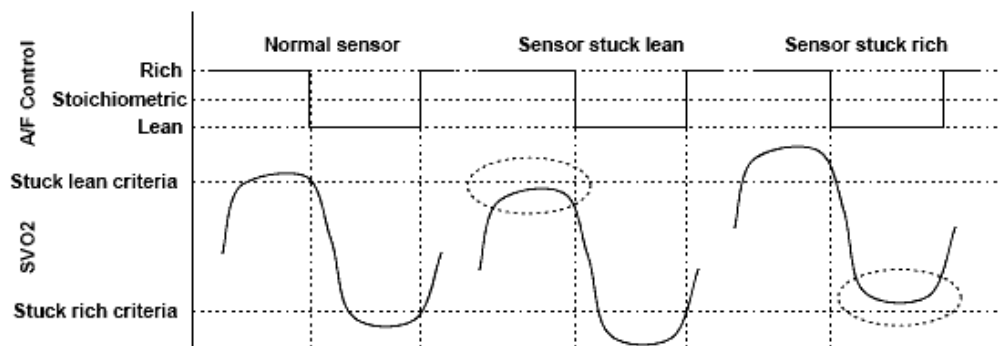
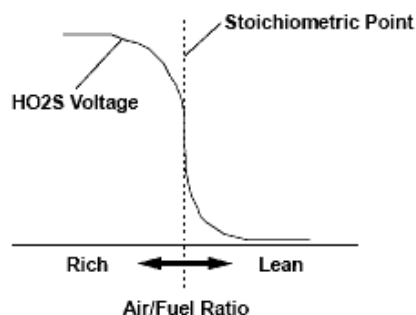
Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, the Temporary DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P2272 (162): ADVANCED DIAGNOSTICS

DTC P2272: FRONT SECONDARY HEATED OXYGEN SENSOR (SECONDARY HO2S (BANK 2, SENSOR 2)) CIRCUIT SIGNAL STUCK LEAN



P2270-0570

Fig. 299: Front Secondary Heated Oxygen Sensor (Secondary HO2S (Bank 2, Sensor 2)) Circuit Signal Stuck Lean

General Description

The front secondary HO2S (bank 2, sensor 2) detects the oxygen concentration in the exhaust gas

downstream of the three-way catalyst (TWC). The front sensor output voltage characteristics are similar to the air/fuel ratio (A/F) sensor. The oxygen concentration is detected after the TWC during fuel feedback control using the A/F sensor, and it optimizes the fuel feedback control to maximize the effect of the TWC. If, after current is applied to the front secondary HO₂S heater, the front secondary HO₂S does not fluctuate and the output is stuck within the specified area, a malfunction is detected and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Once per driving cycle
Sequence	None
Duration	36.3 ⁽²⁾ , 39.3 ⁽¹⁾ seconds or less
DTC Type	Two drive cycles, MIL ON
OBD Status	PASSED/FAILED/EXECUTING/OUT OF (TEST) CONDITION
(1) J32A3 engine	
(2) J35A8 engine	

Enable Conditions

ENABLE CONDITIONS

Condition	Minimum	Maximum
Elapsed time that secondary HO ₂ S activity is not monitored after starting the engine	20 seconds	-
Elapsed time after the fuel cut-off	-	150 seconds
Engine coolant temperature	156°F (69°C)	-
Intake air temperature	8°F (-13°C)	-
Engine speed	1,200 rpm ⁽¹⁾	2,000 rpm ⁽¹⁾
	1,250 rpm ^{*1}	2,050 rpm ^{*1}
	1,600 rpm ⁽²⁾	2,300 rpm ⁽²⁾
MAP value	22 kPa (6.3 in.Hg, 160 mmHg)	66 kPa (19.6 in.Hg, 500 mmHg) *2
		73 kPa (21.6 in.Hg, 550 mmHg) *1
Vehicle speed	30 mph (48 km/h)	-
Fuel trim	0.73	1.47
Fuel feedback	Closed loop	
No active DTCs	P0107, P0108, P0111, P0112, P0113, P0117, P0118, P0153, P0154, P0155, P0157, P0158, P0161, P0174, P0175, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0335, P0339, P0340, P0344, P0401, P0404, P0443, P0496, P0497, P0627, P1077, P1078, P1128, P1129, P1174, P145C, P2197, P2240, P2241, P2247, P2249, P2254, P2255, P2413, P2630, P2631, P2646, P2647, P2648, P2649, P2A03	

(1) J35A8 engine, A/T model

(2) J35A8 engine, M/T model

Malfunction Threshold

The front secondary HO₂S (bank 2, sensor 2) output voltage is 0.650 V or less.

Driving Pattern

1. Start the engine. Let it idle until the radiator fan comes on.
2. Drive the vehicle at a steady speed of 35 mph (57 km/h) or more for at least 36.3^{*2}, 39.3^{*1} seconds.
 - Drive the vehicle in this manner only if the traffic regulations and ambient conditions allow.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected during the first drive cycle, a Temporary DTC is stored in the ECM/PCM memory. If the malfunction recurs during the next (second) drive cycle, the MIL comes on and the DTC and the freeze frame data are stored.

Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, the Temporary DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P2273 (162): ADVANCED DIAGNOSTICS

DTC P2273: FRONT SECONDARY HEATED OXYGEN SENSOR (SECONDARY HO₂S (BANK 2, SENSOR 2)) CIRCUIT SIGNAL STUCK RICH

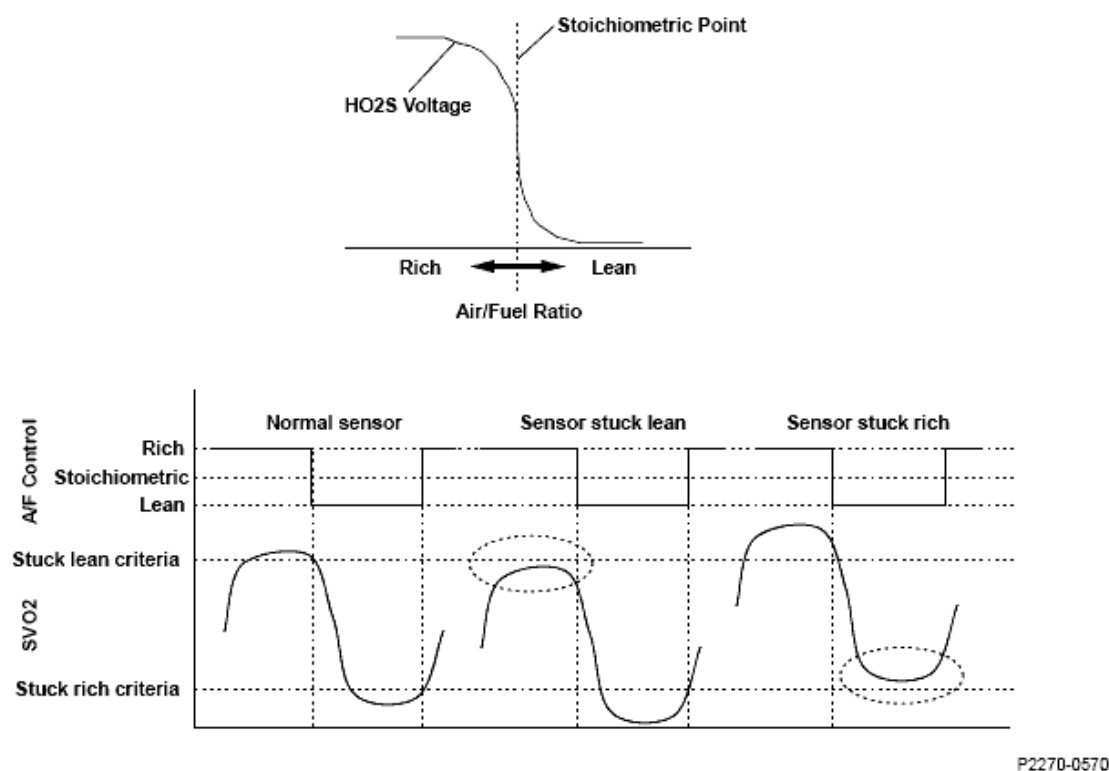


Fig. 300: Front Secondary Heated Oxygen Sensor (Secondary HO2S (Bank 2, Sensor 2)) Circuit Signal Stuck Rich

General Description

The front secondary HO2S (bank 2, sensor 2) detects the oxygen concentration in the exhaust gas downstream of the three-way catalyst (TWC). The front sensor output voltage characteristics are similar to the air/fuel ratio (A/F) sensor. The oxygen concentration is detected after the TWC during fuel feedback control using the A/F sensor, and it optimizes the fuel feedback control to maximize the effect of the TWC. If, after current is applied to the front secondary HO2S heater, the front secondary HO2S does not fluctuate and the output is stuck within the specified area, a malfunction is detected and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Once per driving cycle
Sequence	None
Duration	36.3 ⁽²⁾ , 39.3 ⁽¹⁾ seconds or less
DTC Type	Two drive cycles, MIL ON
OBD Status	PASSED/FAILED/EXECUTING/OUT OF (TEST) CONDITION
(1) J32A3 engine	
(2) J35A8 engine	

Enable Conditions

ENABLE CONDITIONS

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Condition	Minimum	Maximum
Elapsed time that secondary HO2S activity is not monitored after starting the engine	20 seconds	-
Elapsed time after the fuel cut-off	-	150 seconds
Engine coolant temperature	156°F (69°C)	-
Intake air temperature	8°F (-13°C)	-
Engine speed	1,200 rpm ⁽¹⁾	2,000 rpm ⁽¹⁾
	1,250 rpm ^{*1}	2,050 rpm ^{*1}
	1,600 rpm ⁽²⁾	2,300 rpm ⁽²⁾
MAP value	22 kPa (6.3 in.Hg, 160 mmHg)	66 kPa (19.6 in.Hg, 500 mmHg) *2
		73 kPa (21.6 in.Hg, 550 mmHg) *1
Vehicle speed	30 mph (48 km/h)	-
Fuel trim	0.73	1.47
Fuel feedback	Closed loop	
No active DTCs	P0107, P0108, P0111, P0112, P0113, P0117, P0118, P0153, P0154, P0155, P0157, P0158, P0161, P0174, P0175, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0335, P0339, P0340, P0344, P0401, P0404, P0443, P0496, P0497, P0627, P1077, P1078, P1128, P1129, P1174, P145C, P2197, P2240, P2241, P2247, P2249, P2254, P2255, P2272, P2413, P2630, P2631, P2646, P2647, P2648, P2649, P2A03	
(1) J35A8 engine, A/T model		
(2) J35A8 engine, M/T model		

Malfunction Threshold

The front secondary HO2S (bank 2, sensor 2) output voltage is 0.293 V or more.

Driving Pattern

1. Start the engine. Let it idle until the radiator fan comes on.
2. Drive the vehicle at a steady speed of 35 mph (57 km/h) or more for at least 36.3^{*2}, 39.3^{*1} seconds.
 - Drive the vehicle in this manner only if the traffic regulations and ambient conditions allow.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected during the first drive cycle, a Temporary DTC is stored in the ECM/PCM memory. If the malfunction recurs during the next (second) drive cycle, the MIL comes on and the DTC and the freeze frame data are stored.

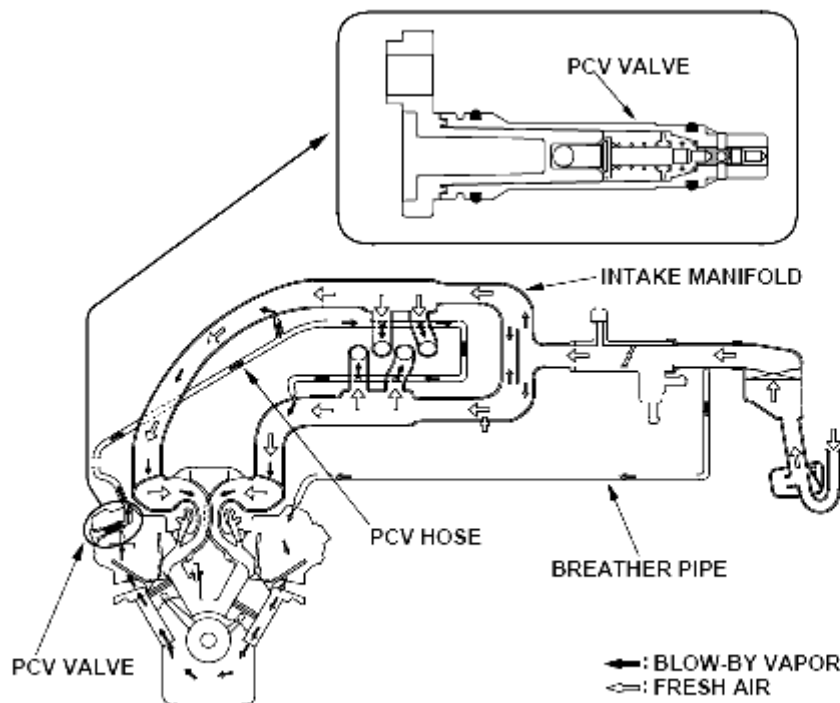
Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, the Temporary DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

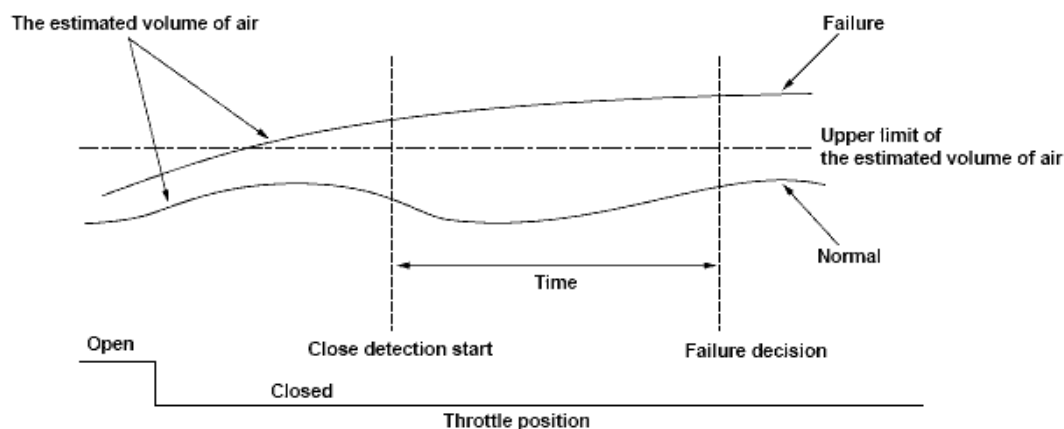
DTC P2279 (109): ADVANCED DIAGNOSTICS

DTC P2279: INTAKE AIR SYSTEM LEAK DETECTED



P2279-0473

Fig. 301: Intake Air System Diagram



P1505-0272

Fig. 302: Intake Air Graph

General Description

The positive crankcase ventilation (PCV) system reduces hydrocarbons (HC). The PCV system recirculates unburned air/fuel mixture (blow-by vapor) into the intake manifold so that it is drawn into the engine and burned, thus reducing HC. If the PCV hose comes off while air is supplied mainly via the idle control system with the throttle closed, the amount of air supplied to the engine is considerably more than the amount of air the idle control system supplies.

The engine control module (ECM)/powertrain control module (PCM) estimates the amount of air supplied to the engine while the throttle valve is fully closed, and if the estimated amount is more than the upper limit, it detects a malfunction and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Once per driving cycle
Sequence	None
Duration	22 seconds or more
DTC Type	Two drive cycles, MIL ON
OBD Status	PASSED/FAILED/NOT COMPLETED (STILL TESTING)

Enable Conditions

ENABLE CONDITIONS

Condition	Minimum	Maximum
Elapsed time after starting the engine	15 seconds	-
Engine coolant temperature	156°F (69°C)	-
Intake air temperature	32°F (0°C)	-
MAP value	-	73 kPa (21.6 in.Hg, 550 mmHg)
Battery voltage	10.5 V	-
Fuel trim	0.73	1.47
Fuel feedback	Closed loop	
No active DTCs	P0107, P0108, P0112, P0113, P0117, P0118, P0122, P0123, P0171, P0172, P0174, P0175, P0222, P0223, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0401, P0404, P0496, P0497, P0627, P1109, P1128, P1129, P145C, P2101, P2108, P2118, P2122, P2123, P2127, P2128, P2135, P2138, P2176, P2227, P2228, P2229, P2413, P2646, P2647, P2648, P2649, U0107	
Other	At idle	

Malfunction Threshold

Either of these conditions is met.

- The estimated volume of intake air is 140 l/min (148.0 US qt/min, 123.2 lmp qt/min)^{*1}, 300 l/min (317.1 US qt/min, 264.0 lmp qt/min)^{*2} or more when the MAP value is 35 kPa (10.3 in.Hg, 260 mmHg)^{*2}, 47 kPa (13.8 in.Hg, 350 mmHg)^{*1}.

- The estimated volume of intake air is 130 l/min (137.4 US qt/min, 114.4 Imp qt/min)^{*1}, 300 l/min (317.1 US qt/min, 264.0 Imp qt/min)^{*2} or more when the MAP value is 48 kPa (14.2 in.Hg, 360 mmHg)^{*2}, 58 kPa (17.0 in.Hg, 430 mmHg)^{*1}.

*1: J32A3 engine

*2: J35A8 engine

Driving Pattern

1. Start the engine. Hold the engine speed at 3,000 rpm without load (in Park or neutral) until the radiator fan comes on.
2. Let the engine idle for at least 22 seconds.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected during the first drive cycle, a Temporary DTC is stored in the ECM/PCM memory. If the malfunction recurs during the next (second) drive cycle, the MIL comes on and the DTC and the freeze frame data are stored.

Conditions for clearing the MIL

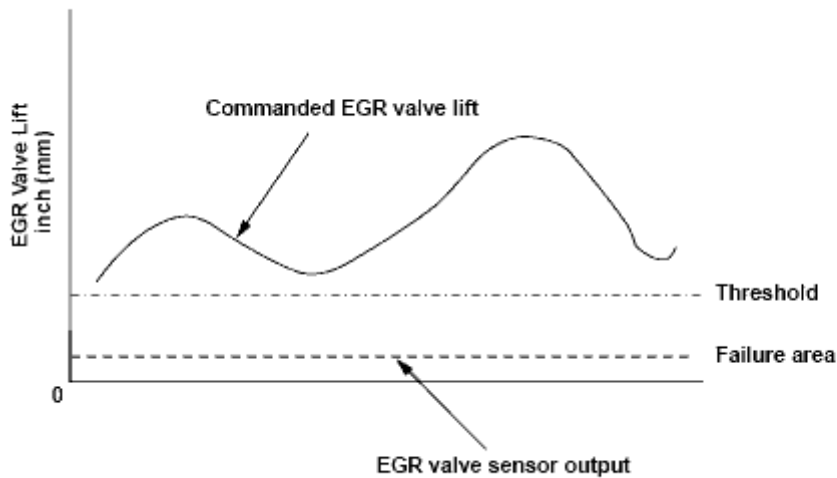
The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, the Temporary DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P2413 (12): ADVANCED DIAGNOSTICS

DTC P2413: EXHAUST GAS RECIRCULATION (EGR) SYSTEM MALFUNCTION

Malfunction Determination



P2413-0370

Fig. 303: Exhaust Gas Recirculation (EGR) System Malfunction Graph

General Description

The exhaust gas recirculation (EGR) valve, which is controlled by the engine control module (ECM)/powertrain control module (PCM), is opened and the exhaust gas flows from the exhaust manifold through the EGR valve and the intake manifold and the EGR passage. The exhaust gas is circulated into the air/fuel mixture and the mixture is drawn into the combustion chamber to lower the combustion temperatures, thus reducing oxides of nitrogen (NOx) emissions.

A sensor (lift sensor) is built into the EGR valve and detects the amount of valve lift. The command value for the target valve lift is stored in the ECM/PCM so that exhaust gas recirculation can be optimized according to driving conditions.

Comparing this command value with the lift sensor output signal value, the ECM/PCM controls the EGR valve to make the amount of actual valve lift equal to the command value.

If the valve sensor output is insufficient for the commanded valve lift, a malfunction is detected.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Once per driving cycle
Sequence	None
Duration	5 seconds or more
DTC Type	Two drive cycles, MIL ON
OBD Status	PASSED/FAILED/EXECUTING/OUT OF (TEST) CONDITION

Enable Conditions

ENABLE CONDITIONS

Condition	Minimum	Maximum

Engine speed	-	4,400 rpm ⁽¹⁾
		4,600 rpm ⁽²⁾
Battery voltage	10.5 V	-
Commanded EGR valve lift	0.040 in. (1.00 mm)	-
No active DTCs	P0107, P0108, P0112, P0113, P0117, P0118, P0134, P0135, P0154, P0155, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0335, P0339, P0401, P0406, P1128, P1129, P1172, P1174, P2195, P2197, P2237, P2238, P2240, P2241, P2243, P2245, P2247, P2249, P2251, P2252, P2254, P2255, P2627, P2628, P2630, P2631	
(1) J32A3 engine		
(2) J35A8 engine		

Malfunction Threshold

If the actual valve lift is 0.006 in. (0.15 mm) or less for at least 5 seconds, the valve is considered stuck closed.

Confirmation Procedure with the HDS

Do the EGR TEST in the INSPECTION MENU with the HDS.

Driving Pattern

1. Start the engine. Hold the engine speed at 3,000 rpm without load (in Park or neutral) until the radiator fan comes on.
2. Drive the vehicle at a speed between 15 - 75 mph (24 - 120 km/h) for at least 5 seconds.
 - Drive the vehicle in this manner only if the traffic regulations and ambient conditions allow.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected during the first drive cycle, a Temporary DTC is stored in the ECM/PCM memory. If the malfunction recurs during the next (second) drive cycle, the MIL comes on and the DTC and the freeze frame data are stored.

Conditions for clearing the MIL

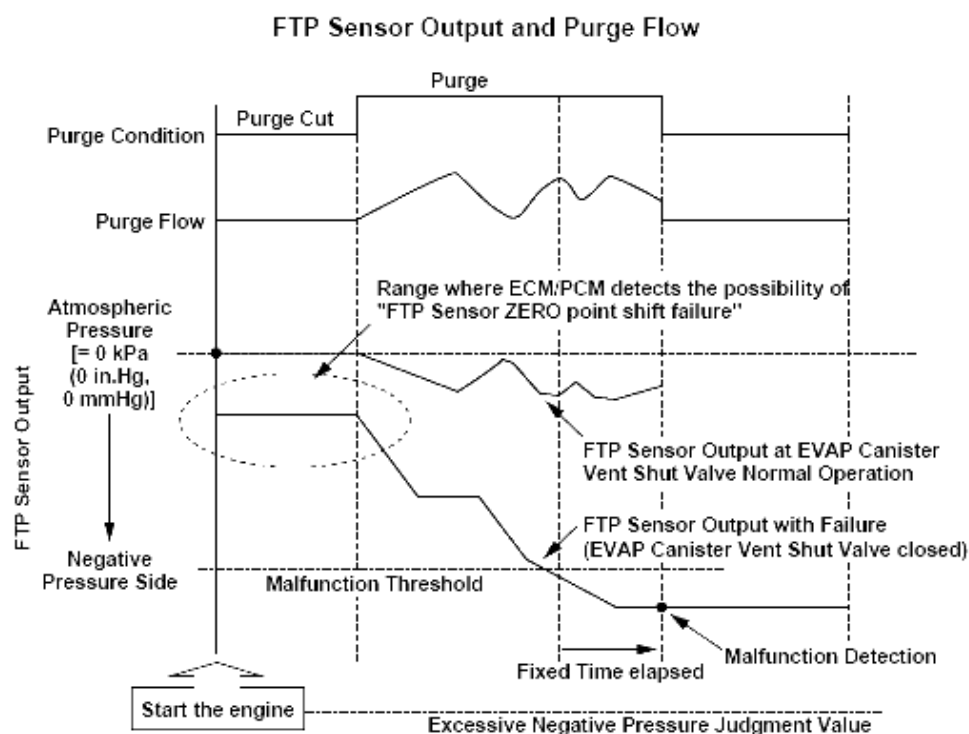
The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, the Temporary DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P2422 (117): ADVANCED DIAGNOSTICS

DTC P2422: EVAPORATIVE EMISSION (EVAP) CANISTER VENT SHUT VALVE CLOSE

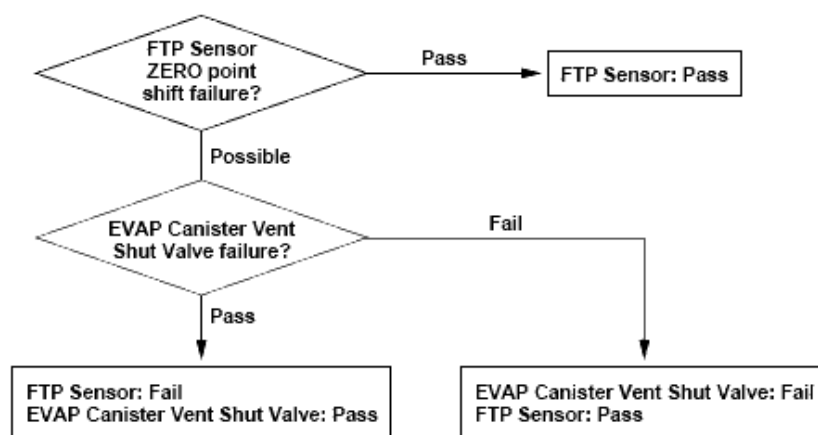
MALFUNCTION



P2422-0371

Fig. 304: FTP Sensor Output And Purge Flow Pattern

Malfunction Judgment Flowchart of FTP Sensor and EVAP Canister Vent Shut Valve



P1454-0371

Fig. 305: Malfunction Judgment Flowchart Of FTP Sensor And EVAP Canister Vent Shut Valve

General Description

The fuel tank pressure (FTP) sensor output indicates about atmospheric pressure 0 kPa (0 in.Hg, 0 mmHg) before purge starts since the evaporative emission (EVAP) canister vent shut valve is normally open (open to the atmosphere). The sensor indicates a negative pressure value (vacuum) during purging.

When the FTP sensor indicates vacuum after starting the engine, there is the possibility of an FTP sensor

zero point shift failure or an EVAP canister vent shut valve stuck closed failure. So the engine control module (ECM)/powertrain control module (PCM) monitors the FTP sensor output after purge starts. The ECM/PCM detects a malfunction of the EVAP canister vent shut valve if the output indicates excessive vacuum.

However, if the fuel tank internal pressure is below the specified value (excessive vacuum is detected) when starting the engine, the malfunction detection should be done as follows because it is difficult to distinguish the FTP sensor range problem (P1454) from the EVAP canister vent shut valve stuck closed (P2422).

1. If neither Temporary DTC (P1454 nor P2422) is stored, both DTCs are stored.
2. If both Temporary DTCs (P1454 and P2422) are stored and excessive vacuum is detected, both DTCs are stored.
3. If either Temporary DTC (P1454 or P2422) is stored and excessive vacuum is detected, the ECM/PCM stores the DTC of the Temporary DTC that was stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Once per driving cycle
Sequence	P0452, P0453 are judged as OK
Duration	1.04 ⁽¹⁾ , 8 ⁽²⁾ seconds or more
DTC Type	Two drive cycles, MIL ON
OBD Status	PASSED/FAILED/NOT COMPLETED (STILL TESTING)
(1) Elapsed time after the FTP sensor output exceeds the malfunction threshold.	
(2) Excessive negative pressure is detected.	

Enable Conditions

ENABLE CONDITIONS

Condition	Minimum	Maximum
Elapsed time after starting the engine ⁽¹⁾	10 seconds	-
Engine coolant temperature ⁽¹⁾	149°F (65°C)	-
Battery voltage	10.5 V	-
Fuel feedback	Closed loop	
No active DTCs	P0101, P0102, P0103, P0107, P0108, P0117, P0118, P0134, P0135, P0300, P0301, P0302, P0303, P0304, P0335, P0339, P0351, P0352, P0353, P0443, P0451, P0452, P0496, P0497, P0498, P0499, P1128, P1129, P1157, P1172, P145C, P2195, P2227, P2228, P2229, P2238, P2252	
Others	The EVAP canister vent shut valve has not been closing	
	Stopping the purge control	
(1) Condition to start the purge control.		

Malfunction Threshold

The output from the fuel tank pressure sensor is -4 kPa (-1.0 in.Hg, -25 mmHg)*, -2 kPa (-0.4 in.Hg, -10 mmHg)** or less for at least 1.04*, 8** seconds.

*: Elapsed time after the FTP sensor output exceeds the malfunction threshold.

**: Excessive negative pressure is detected.

Confirmation Procedure with the HDS

Do the EVAP CVS ON in the INSPECTION MENU with the HDS.

Driving Pattern

Start the engine. Hold the engine speed at 3,000 rpm without load (in Park or neutral) until the radiator fan comes on, then let it idle.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected during the first drive cycle, a Temporary DTC is stored in the ECM/PCM memory. If the malfunction recurs during the next (second) drive cycle, the MIL comes on and the DTC and the freeze frame data are stored.

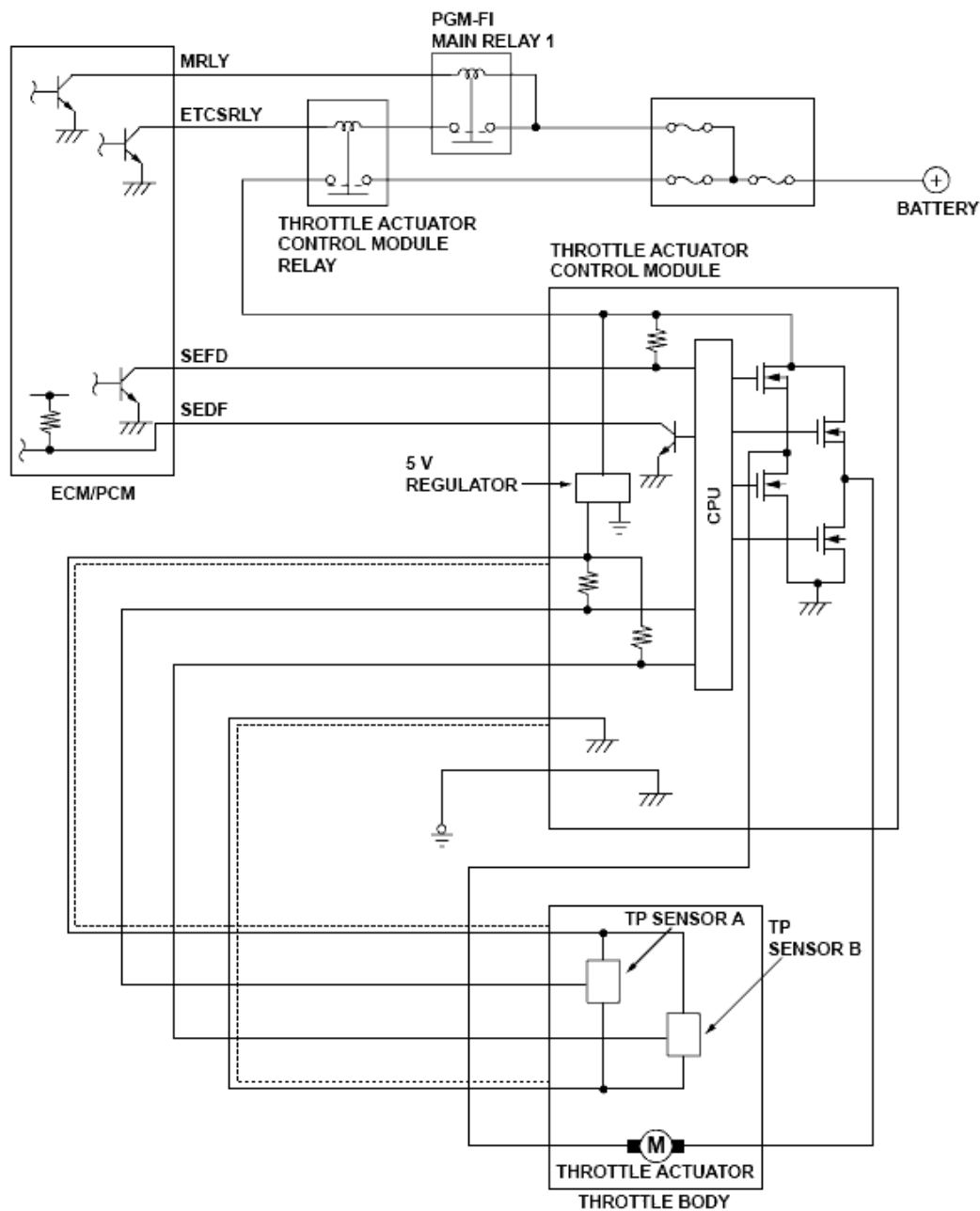
Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, the Temporary DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P2552 (40): ADVANCED DIAGNOSTICS

DTC P2552: THROTTLE ACTUATOR CONTROL MODULE RELAY MALFUNCTION



P0122-0702

Fig. 306: Throttle Actuator Control Module Relay Circuit Diagram

General Description

The electronic throttle control system (ETCS) controls the throttle valve opening. The system is composed of the throttle actuator, the throttle valve, throttle position (TP) sensors A and B, the throttle actuator control module, and the throttle actuator control module relay in the throttle body.

The accelerator pedal position (APP) sensor is operated via the throttle cable to determine the accelerator opening value when the driver presses the accelerator pedal. The accelerator pedal opening value is converted to a signal in the APP sensor, transmitted to the engine control module (ECM)/powertrain control module (PCM), and then transmitted to the throttle actuator control module.

The throttle actuator control module determines the throttle valve target position according to the signal received and operates the throttle actuator to move the throttle valve to the target position. The actual throttle valve position is determined by TP sensors A and B installed in the throttle body.

The ECM/PCM detects the malfunction of the throttle actuator control module relay ON, and a DTC is stored if the serial signal from the throttle actuator control module is input for more than a set time after the throttle actuator control module relay is turned OFF and throttle actuator control module operation is stopped.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Once per driving cycle
Sequence	None
Duration	2.0 seconds or more
DTC Type	One drive cycle, MIL ON
OBD Status	N/A

Enable Conditions

ENABLE CONDITIONS

Condition	Minimum	Maximum
Battery voltage	8.0 V	-
Ignition switch	OFF	
No active DTCs	P1684, P2101, P2108, P2118, P2135, P2176, U0107	

Malfunction Threshold

The serial signal is input from the throttle actuator control module for at least 2.0 seconds after the throttle actuator control module relay is turned OFF.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected, the MIL comes on and the DTC and the freeze frame data are stored in the ECM/PCM memory.

Conditions for clearing the MIL

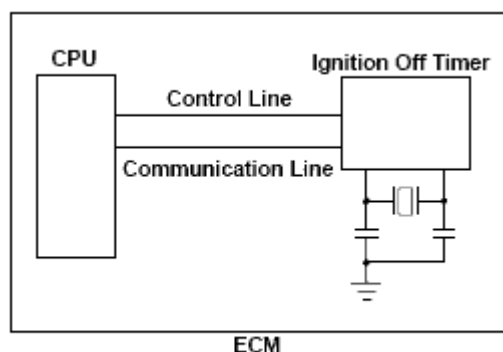
The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P2610 (132): ADVANCED DIAGNOSTICS

DTC P2610: ENGINE CONTROL MODULE (ECM)/POWERTRAIN CONTROL MODULE (PCM)

INTERNAL POWER OFF TIMER MALFUNCTION



P2610-0670

Fig. 307: Engine Control Module (ECM)/Powertrain Control Module (PCM) Circuit Diagram

General Description

The engine control module (ECM)/powertrain control module (PCM) has a built-in engine off timer that measures the duration of time from ignition off to the next ignition on. The measured duration is used for evaporative emission (EVAP) leak detection and temperature assumption of the catalytic converter.

The CPU in the ECM/PCM accesses the engine off timer when reading the measured duration. When the access process fails, a malfunction is detected and a DTC is stored. When an abnormality is found in the read data, a malfunction is detected and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
Sequence	None
Duration	10 seconds or more
DTC Type	One drive cycle, MIL ON
OBD Status	N/A

Enable Conditions

ENABLE CONDITIONS

Condition	
Ignition switch	ON ⁽¹⁾
(1) Ignition switch on when a battery is disconnected and connected again is excluded.	

Malfunction Threshold

The access process to the power off timer fails, or a malfunction is found in the read data for at least 10 seconds.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected, the MIL comes on and the DTC and the freeze frame data are stored in the ECM/PCM memory.

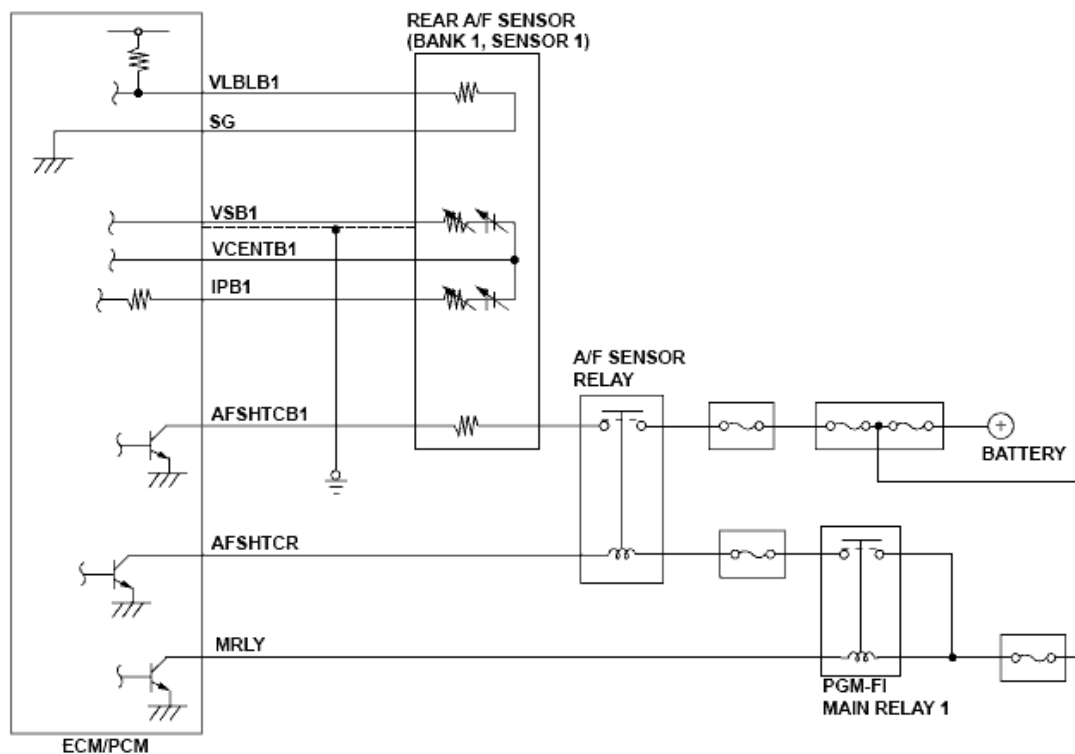
Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P2627 (155): ADVANCED DIAGNOSTICS

DTC P2627: REAR AIR/FUEL RATIO (A/F) SENSOR (BANK 1, SENSOR 1) LABEL CIRCUIT LOW VOLTAGE



P0135-0703

Fig. 308: Rear Air/Fuel Ratio (A/F) Sensor (Bank 1, Sensor 1) LABEL Circuit Diagram (Low Voltage)

General Description

The rear air/fuel ratio (A/F) sensor (bank 1, sensor 1) is installed in the exhaust manifold and detects oxygen content in the exhaust gas. The rear A/F sensor transmits a signal to the engine control module (ECM)/powertrain control module (PCM). The ECM/PCM controls fuel injection duration by comparing the target air/fuel ratio with the rear A/F sensor signal. The sensor includes the VS cell, the pump cell, the atmospheric reference cavity, the diffusion layer, and the heater, and it enables overall feedback control.

The rear A/F sensor (bank 1, sensor 1) has a built-in LABEL resistance to regulate the difference of the sensor characteristics. The ECM/PCM reads the resistance to regulate the difference properly. If the LABEL resistance (VLBLB1 signal voltage) is a set value or less, the ECM/PCM detects a malfunction and stores a DTC.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
Sequence	None
Duration	5 seconds or more
DTC Type	One drive cycle, MIL ON
OBD Status	N/A

Enable Conditions

ENABLE CONDITIONS

Condition	
Ignition switch	ON
No active DTCs	P0135, P2195, P2237, P2238, P2243, P2245, P2251, P2252, P2628

Malfunction Threshold

The VLBLB1 voltage is 0.3 V or less for at least 5 seconds.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected, the MIL comes on and the DTC and the freeze frame data are stored in the ECM/PCM memory.

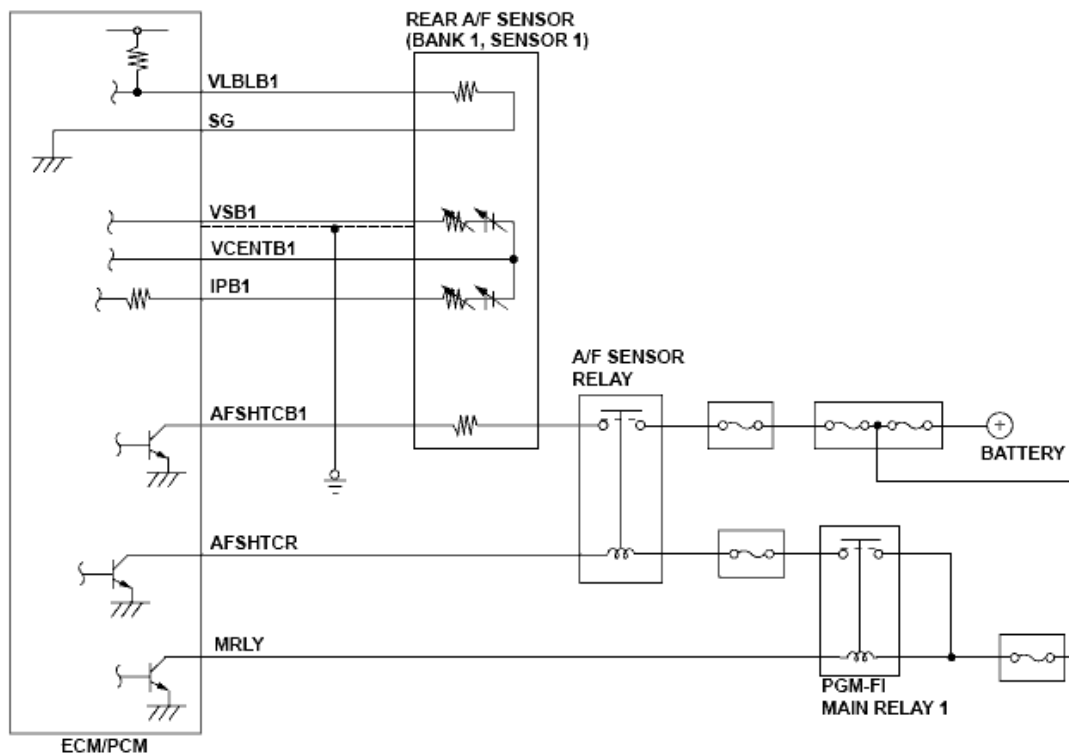
Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P2628 (155): ADVANCED DIAGNOSTICS

DTC P2628: REAR AIR/FUEL RATIO (A/F) SENSOR (BANK 1, SENSOR 1) LABEL CIRCUIT HIGH VOLTAGE



P0135-0703

Fig. 309: Rear Air/Fuel Ratio (A/F) Sensor (Bank 1, Sensor 1) LABEL Circuit Diagram (High Voltage)

General Description

The rear air/fuel ratio (A/F) sensor (bank 1, sensor 1) is installed in the exhaust manifold and detects oxygen content in the exhaust gas. The rear A/F sensor transmits a signal to the engine control module (ECM)/powertrain control module (PCM). The ECM/PCM controls fuel injection duration by comparing the target air/fuel ratio with the rear A/F sensor signal. The sensor includes the VS cell, the pump cell, the atmospheric reference cavity, the diffusion layer, and the heater, and it enables overall feedback control.

The rear A/F sensor (bank 1, sensor 1) has a built-in LABEL resistance to regulate the differences of the sensor characteristics. The ECM/PCM reads the resistance to regulate the difference properly. If the LABEL resistance (VLBLB1 signal voltage) is a set value or more, the ECM/PCM detects a malfunction and stores a DTC.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
Sequence	None
Duration	5 seconds or more
DTC Type	One drive cycle, MIL ON
OBD Status	N/A

Enable Conditions

ENABLE CONDITIONS

Condition	
Ignition switch	ON
No active DTCs	P0135, P2195, P2237, P2238, P2243, P2245, P2251, P2252, P2627

Malfunction Threshold

The VLBLB1 voltage is 4.7 V or more for at least 5 seconds.

Diagnosis Details**Conditions for illuminating the MIL**

When a malfunction is detected, the MIL comes on and the DTC and the freeze frame data are stored in the ECM/PCM memory.

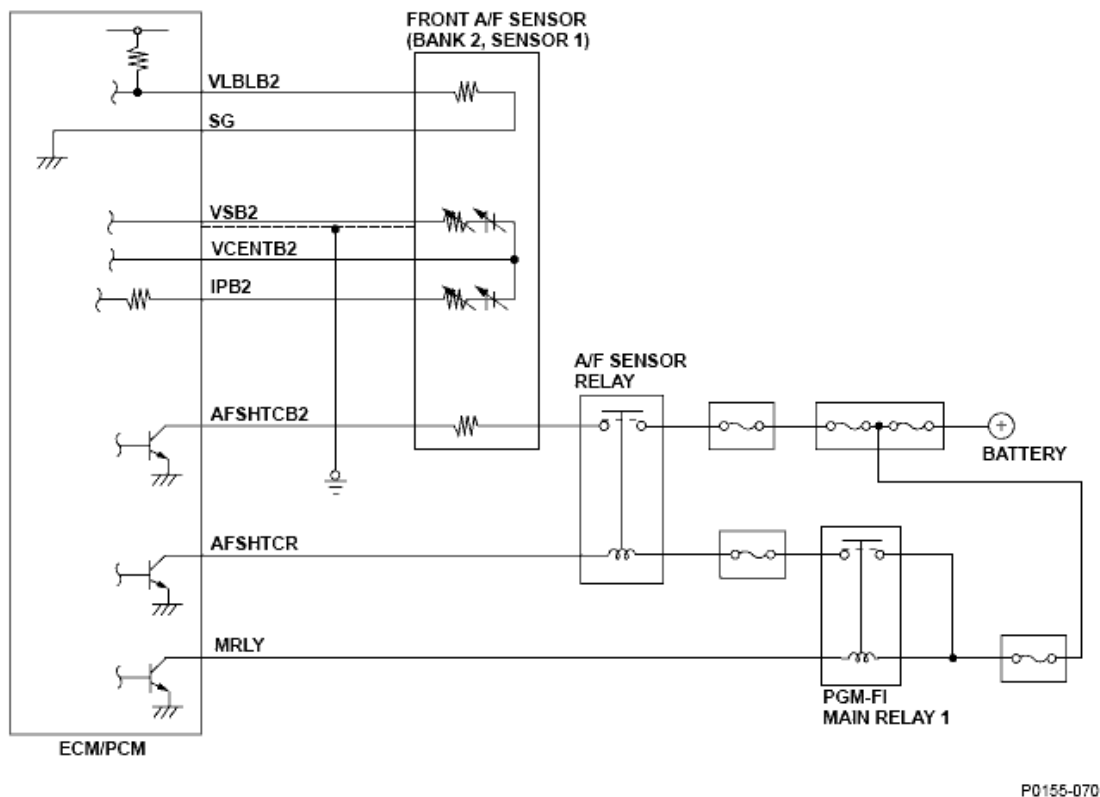
Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P2630 (156): ADVANCED DIAGNOSTICS

DTC P2630: FRONT AIR/FUEL RATIO (A/F) SENSOR (BANK 2, SENSOR 1) LABEL CIRCUIT LOW VOLTAGE



P0155-0701

Fig. 310: Front Air/Fuel Ratio (A/F) Sensor (Bank 2, Sensor 1) LABEL Circuit Diagram (Low Voltage)

General Description

The front air/fuel ratio (A/F) sensor (bank 1, sensor 1) is installed in the exhaust manifold and detects oxygen content in the exhaust gas. The front A/F sensor transmits a signal to the engine control module (ECM)/powertrain control module (PCM). The ECM/PCM controls fuel injection duration by comparing the target air/fuel ratio with the front A/F sensor signal. The sensor includes the VS cell, the pump cell, the atmospheric reference cavity, the diffusion layer, and the heater, and it enables overall feedback control.

The front A/F sensor (bank 1, sensor 1) has a built-in LABEL resistance to regulate the differences of the sensor characteristics. The ECM/PCM reads the resistance to regulate the difference properly. If the LABEL resistance (VLBLB2 signal voltage) is a set value or less, the ECM/PCM detects a malfunction and stores a DTC.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
Sequence	None
Duration	5 seconds or more
DTC Type	One drive cycle, MIL ON
OBD Status	N/A

Enable Conditions

ENABLE CONDITIONS

Condition	
Ignition switch	ON
No active DTCs	P0155, P2197, P2240, P2241, P2247, P2249, P2254, P2255, P2631

Malfunction Threshold

The VLBLB 2 voltage is 0.3 V or less for at least 5 seconds.

Diagnosis Details**Conditions for illuminating the MIL**

When a malfunction is detected, the MIL comes on and the DTC and the freeze frame data are stored in the ECM/PCM memory.

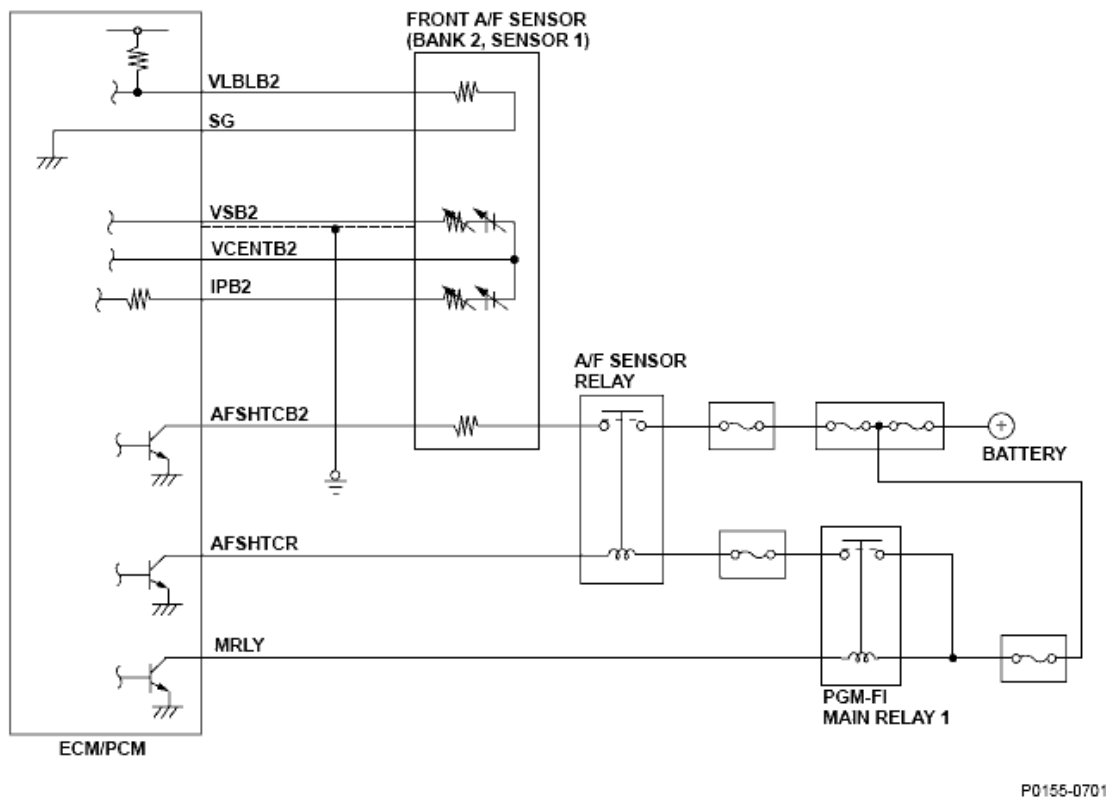
Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P2631 (156): ADVANCED DIAGNOSTICS

DTC P2631: FRONT AIR/FUEL RATIO (A/F) SENSOR (BANK 2, SENSOR 1) LABEL CIRCUIT HIGH VOLTAGE



P0155-0701

Fig. 311: Front Air/Fuel Ratio (A/F) Sensor (Bank 2, Sensor 1) LABEL Circuit Diagram (High Voltage)

General Description

The front air/fuel ratio (A/F) sensor (bank 1, sensor 1) is installed in the exhaust manifold and detects oxygen content in the exhaust gas. The front A/F sensor transmits a signal to the engine control module (ECM)/powertrain control module (PCM). The ECM/PCM controls fuel injection duration by comparing the target air/fuel ratio with the front A/F sensor signal. The sensor includes the VS cell, the pump cell, the atmospheric reference cavity, the diffusion layer, and the heater, and it enables overall feedback control.

The front A/F sensor (bank 1, sensor 1) has a built-in LABEL resistance to regulate the differences of the sensor characteristics. The ECM/PCM reads the resistance to regulate the difference properly. If the LABEL resistance (VLBLB2 signal voltage) is a set value or more, the ECM/PCM detects a malfunction and stores a DTC.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
Sequence	None
Duration	5 seconds or more
DTC Type	One drive cycle, MIL ON
OBD Status	N/A

Enable Conditions

ENABLE CONDITIONS

Condition	
Ignition switch	ON
No active DTCs	P0155, P2197, P2240, P2241, P2247, P2249, P2254, P2255, P2630

Malfunction Threshold

The VLBLB 2 voltage is 4.7 V or more for at least 5 seconds.

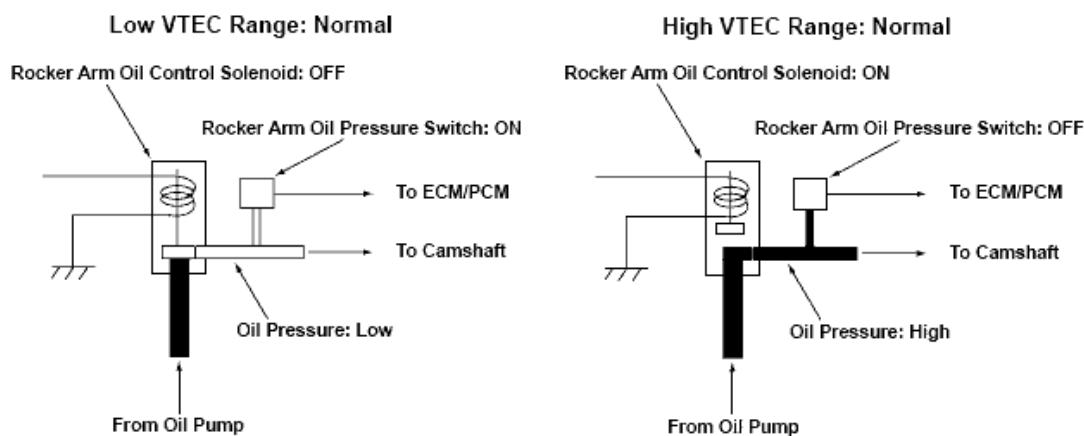
Diagnosis Details**Conditions for illuminating the MIL**

When a malfunction is detected, the MIL comes on and the DTC and the freeze frame data are stored in the ECM/PCM memory.

Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P2646 (22): ADVANCED DIAGNOSTICS (A/T)**DTC P2646: ROCKER ARM OIL PRESSURE SWITCH CIRCUIT LOW VOLTAGE**

P2646-0770

Fig. 312: Rocker Arm Oil Pressure Switch Circuit Diagram (Low Voltage)**LOGIC CHART**

Logic Decision	Rocker Arm Oil Pressure Switch	
	'ON'	'OFF'
Rocker Arm Oil Control Solenoid Command 'ON'	Failure	Normal
Rocker Arm Oil Control Solenoid Command 'OFF'	Normal	Failure

General Description

The VTEC system activates the rocker arm oil control solenoid by command from the engine control module (ECM)/powertrain control module (PCM), and it charges/discharges the hydraulic circuit of the VTEC mechanism that switches valve timing between Low and High. The ECM/PCM monitors oil pressure in the hydraulic circuit of the VTEC mechanism using the rocker arm oil pressure switch downstream of the rocker arm oil control solenoid. If there is a difference between the oil pressure condition in the hydraulic circuit that is determined by the ECM/PCM command and the oil pressure condition that is determined by the status of the rocker arm oil pressure switch, the system is considered faulty, and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Once per driving cycle
Sequence	None
Duration	7 seconds or more
DTC Type	One drive cycle, MIL ON
OBD Status	PASSED/FAILED/NOT COMPLETED (STILL TESTING)

Enable Conditions

ENABLE CONDITIONS

Condition	Minimum	Maximum
Engine coolant temperature	50°F (10°C)	-
Engine speed (High lift cam operation)	4,700 rpm ⁽¹⁾	-
	4,750 rpm ⁽²⁾	
Vehicle speed	7 mph (10 km/h)	-
Battery voltage	10.5 V	-
Gear position	Other than P or N position	
No active DTCs	P2648, P2649	
(1) J32A3 engine		
(2) J35A8 engine		

Malfunction Threshold

When the rocker arm oil control solenoid is ON, the rocker arm oil pressure switch remains ON.

Confirmation Procedure with the HDS

Do the VTEC TEST in the INSPECTION MENU with the HDS.

Driving Pattern

1. Start the engine. Hold the engine speed at 3,000 rpm without load (in Park or neutral) until the radiator fan comes on.
2. Drive the vehicle in a lower gear at 4,700 rpm^{*1}, 4,750 rpm^{*2} or more for at least 7 seconds.

- Drive the vehicle in this manner only if the traffic regulations and ambient conditions allow.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected, the MIL comes on and the DTC and the freeze frame data are stored in the ECM/PCM memory.

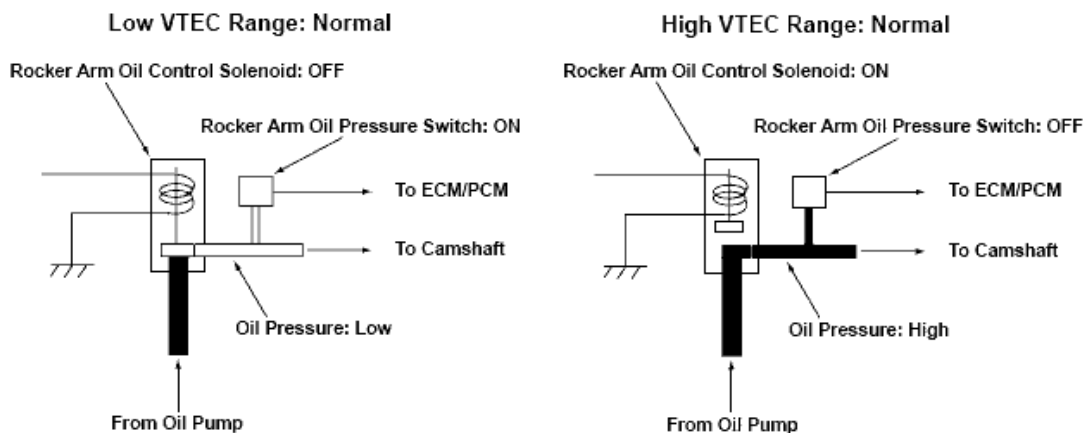
Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P2647 (22): ADVANCED DIAGNOSTICS

DTC P2647: ROCKER ARM OIL PRESSURE SWITCH CIRCUIT HIGH VOLTAGE



P2646-0770

Fig. 313: Rocker Arm Oil Pressure Switch Circuit Diagram (High Voltage)

LOGIC CHART

Logic Decision	Rocker Arm Oil Pressure Switch	
	'ON'	'OFF'
Rocker Arm Oil Control Solenoid Command 'ON'	Failure	Normal
Rocker Arm Oil Control Solenoid Command 'OFF'	Normal	Failure

General Description

The VTEC system activates the rocker arm oil control solenoid by command from the engine control module (ECM)/powertrain control module (PCM), and it charges/discharges the hydraulic circuit of the VTEC mechanism that switches valve timing between Low and High. The ECM/PCM monitors oil pressure in the hydraulic circuit of the VTEC mechanism using the rocker arm oil pressure switch downstream of the rocker arm oil control solenoid. If there is a difference between the oil pressure condition in the hydraulic

circuit that is determined by the ECM/PCM command and the oil pressure condition that is determined by the status of the rocker arm oil pressure switch, the system is considered faulty, and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Once per driving cycle
Sequence	None
Duration	7 seconds or more
DTC Type	One drive cycle, MIL ON
OBD Status	PASSED/FAILED/NOT COMPLETED (STILL TESTING)

Enable Conditions

ENABLE CONDITIONS

Condition	Minimum	Maximum
Battery voltage	10.5 V	-
No active DTCs	P2648, P2649	
Other	At idle	

Malfunction Threshold

Low lift cam operation

When the rocker arm oil control solenoid is OFF, the rocker arm oil pressure switch remains OFF.

Confirmation Procedure with the HDS

Do the VTEC TEST in the INSPECTION MENU with the HDS.

Driving Pattern

Start the engine, and let it idle for at least 7 seconds.

Diagnosis Details

Conditions for illuminating the MIL

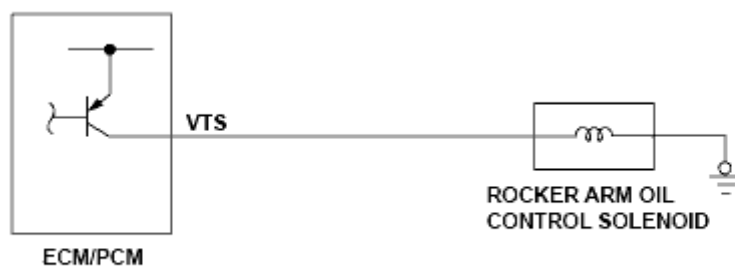
When a malfunction is detected, the MIL comes on and the DTC and the freeze frame data are stored in the ECM/PCM memory.

Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P2648 (21): ADVANCED DIAGNOSTICS

DTC P2648: ROCKER ARM OIL CONTROL SOLENOID CIRCUIT LOW VOLTAGE

P2648-0605

Fig. 314: Rocker Arm Oil Control Solenoid Circuit Diagram (Low Voltage)**General Description**

The VTEC system switches the valve timing by opening and closing the oil passage to the high/low camshaft switching mechanism. The rocker arm oil control solenoid, controlled by the engine control module (ECM)/powertrain control module (PCM), opens and closes the oil passage, which controls VTEC operation.

The intelligent pre-driver drives the rocker arm oil control solenoid by receiving the drive direction output at the CPU in the ECM/PCM. When the rocker arm oil control solenoid output is OFF (low) and this condition continues for a certain time or more in response to the rocker arm oil control solenoid ON (high) drive instruction to the intelligent pre-driver, a malfunction is detected and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status**MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS**

Execution	Continuous
Sequence	None
Duration	1.1 seconds or more
DTC Type	One drive cycle, MIL ON
OBD Status	PASSED/FAILED/NOT COMPLETED (STILL TESTING)

Enable Conditions**ENABLE CONDITIONS**

Condition	Minimum	Maximum
Battery voltage	10.0 V	-
No active DTCs	P2649	

Malfunction Threshold

The return signal is OFF (low) for at least 1.1 seconds when the ECM/PCM outputs the ON (high) signal to the rocker arm oil control solenoid (VTEC solenoid valve).

Driving Pattern

1. Start the engine. Hold the engine speed at 3,000 rpm without load (in Park or neutral) until the

radiator fan comes on.

2. Drive the vehicle in a lower gear at 4,750 rpm or more for at least 7 seconds.
 - Drive the vehicle in this manner only if the traffic regulations and ambient conditions allow.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected, the MIL comes on and the DTC and the freeze frame data are stored in the ECM/PCM memory.

Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P2649 (21): ADVANCED DIAGNOSTICS

DTC P2649: ROCKER ARM OIL CONTROL SOLENOID CIRCUIT HIGH VOLTAGE



P2648-0605

Fig. 315: Rocker Arm Oil Control Solenoid Circuit Diagram (High Voltage)

General Description

The VTEC system switches the valve timing by opening and closing the oil passage to the high/low camshaft switching mechanism. The rocker arm oil control solenoid, controlled by the engine control module (ECM)/powertrain control module (PCM), opens and closes the oil passage, which controls VTEC operation.

The intelligent pre-driver drives the rocker arm oil control solenoid by receiving the driving direction output at the CPU in the ECM/PCM. When the rocker arm oil control solenoid output is ON (high) and this condition continues for a certain time or more in response to the rocker arm oil control solenoid OFF (low) driving instruction to the intelligent pre-driver, a malfunction is detected and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
Sequence	None
Duration	1.1 seconds or more
DTC Type	One drive cycle, MIL ON
OBD Status	PASSED/FAILED/NOT COMPLETED (STILL TESTING)

Enable Conditions

ENABLE CONDITIONS

Condition	Minimum	Maximum
Battery voltage	10.0 V	-
State of the engine	Running	
No active DTCs	P2648	

Malfunction Threshold

The return signal is ON (high) for at least 1.1 seconds when the ECM/PCM outputs the OFF (low) signal to the rocker arm oil control solenoid (VTEC solenoid valve).

Driving Pattern

Start the engine, and let it idle for at least 7 seconds.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected, the MIL comes on and the DTC and the freeze frame data are stored in the ECM/PCM memory.

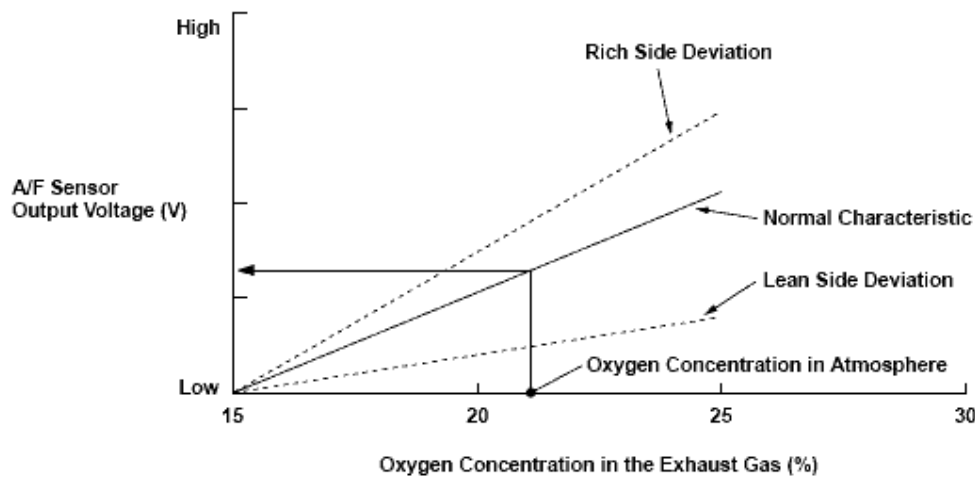
Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P2A00 (157): ADVANCED DIAGNOSTICS

DTC P2A00: REAR AIR/FUEL RATIO (A/F) SENSOR (BANK 1, SENSOR 1) CIRCUIT RANGE/PERFORMANCE PROBLEM



P1164-9871

Fig. 316: Rear Air/Fuel Ratio Graph**General Description**

The rear air/fuel ratio (A/F) sensor (bank 1, sensor 1) has a linear signal output in relation to the oxygen concentration. The engine control module (ECM)/powertrain control module (PCM) computes the air/fuel ratio from the rear A/F sensor output voltage and uses the fuel feedback control to improve exhaust emissions. The ECM/PCM monitors the rear A/F sensor output voltage during deceleration with the throttle fully closed, and if the output voltage deviates greatly from normal oxygen concentration levels, it detects a malfunction and stores a DTC.

* Output to the scan tool exhibits a relationship between the rear A/F sensor output and oxygen concentration, which is opposite to the characteristic shown in the graph. That is, a deviation toward the rich side increases the output voltage and one toward the lean side decreases the output voltage as the stoichiometric ratio is 0.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status**MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS**

Execution	Once per driving cycle
Sequence	None
Duration	5.3 seconds or more
DTC Type	Two drive cycles, MIL ON
OBD Status	PASSED/FAILED/EXECUTING/OUT OF (TEST) CONDITION

Enable Conditions**ENABLE CONDITIONS**

Condition	Minimum	Maximum
Elapsed time after starting the engine	5 seconds	-
Engine coolant temperature	156 °F (69 °C)	-

Intake air temperature	8 °F (-13 °C)	-
Engine speed	-	2,400 rpm
Vehicle speed	30 mph (48 km/h)	-
Fuel feedback	During deceleration	
No active DTCs	P0112, P0113, P0117, P0118, P0122, P0123, P0133, P0134, P0135, P0171, P0172, P0222, P0223, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0443, P0496, P0497, P0627, P1172, P145C, P2101, P2108, P2118, P2122, P2123, P2127, P2128, P2135, P2138, P2176, P2195, P2227, P2228, P2229, P2237, P2238, P2243, P2245, P2251, P2252, P2627, P2628, U0107	

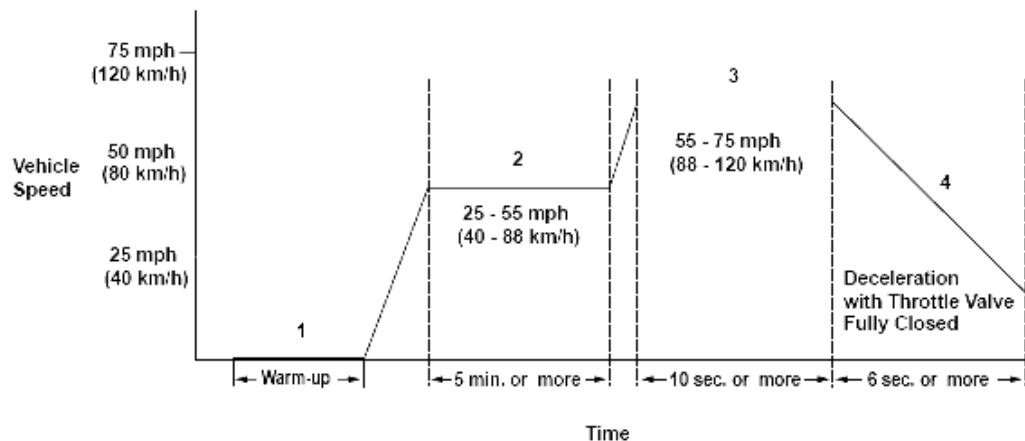
Malfunction Threshold

The rear A/F sensor (bank 1, sensor 1) output voltage is 2.50 V^{*1} , 2.55 V^{*2} or less, or 4.50 V or more.

*1: J32A3 engine

*2: J35A8 engine

Driving Pattern



P2A00-0550

Fig. 317: Driving Pattern

1. Start the engine. Hold the engine speed at 3,000 rpm without load (in Park or neutral) until the radiator fan comes on.
 2. Drive the vehicle at a speed between 25 - 55 mph (40 - 88 km/h) for at least 5 minutes.
 3. Then, drive immediately at a steady speed between 55 - 75 mph (88 - 120 km/h) for at least 10 seconds.
 4. Decelerate with the throttle valve fully closed for at least 6 seconds.
- If the EVAP monitor runs instead of the HO2S monitor, turn the engine off, then restart it, and the HO2S monitor will restart.
 - Drive the vehicle in this manner only if the traffic regulations and ambient conditions allow.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected during the first drive cycle, a Temporary DTC is stored in the ECM/PCM memory. If the malfunction recurs during the next (second) drive cycle, the MIL comes on and the DTC and the freeze frame data are stored.

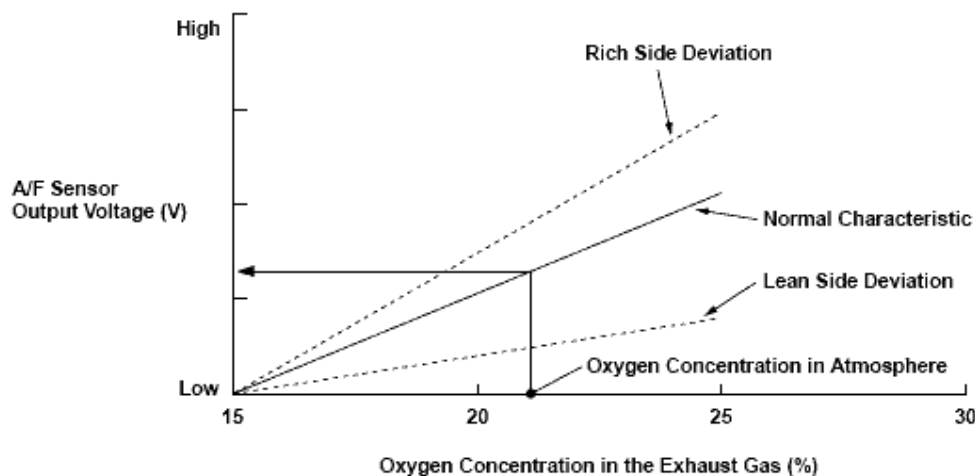
Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, the Temporary DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC P2A03 (158): ADVANCED DIAGNOSTICS

DTC P2A03: FRONT AIR/FUEL RATIO (A/F) SENSOR (BANK 2, SENSOR 1) CIRCUIT RANGE/PERFORMANCE PROBLEM



P1164-9871

Fig. 318: Front Air/Fuel Ratio Graph

General Description

The front air/fuel ratio (A/F) sensor (bank 2, sensor 1) has a linear signal output in relation to the oxygen concentration. The engine control module (ECM)/powertrain control module (PCM) computes the air/fuel ratio from the front A/F sensor output voltage and uses the fuel feedback control to improve exhaust emissions. The ECM/PCM monitors the front A/F sensor output voltage during deceleration with the throttle fully closed, if the output voltage deviates greatly from normal oxygen concentration levels, and it detects a malfunction and stores a DTC.

* Output to the scan tool exhibits a relationship between the front A/F sensor output and oxygen concentration, which is opposite to the characteristic shown in the graph. That is, a deviation toward the rich side increases the output voltage and one toward the lean side decreases the output voltage as the stoichiometric ratio is 0.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Once per driving cycle
Sequence	None
Duration	5.3 seconds or more
DTC Type	Two drive cycles, MIL ON
OBD Status	PASSED/FAILED/EXECUTING/OUT OF (TEST) CONDITION

Enable Conditions**ENABLE CONDITIONS**

Condition	Minimum	Maximum
Elapsed time after starting the engine	5 seconds	-
Engine coolant temperature	156°F (69°C)	-
Intake air temperature	8°F (-13°C)	-
Engine speed	-	2,400 rpm
Vehicle speed	30 mph (48 km/h)	-
Fuel feedback	During deceleration	
No active DTCs	P0112, P0113, P0117, P0118, P0122, P0123, P0153, P0154, P0155, P0174, P0175, P0222, P0223, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0443, P0496, P0497, P0627, P1174, P145C, P2101, P2108, P2118, P2122, P2123, P2127, P2128, P2135, P2138, P2176, P2197, P2227, P2228, P2229, P2240, P2241, P2247, P2249, P2254, P2255, P2630, P2631, U0107	

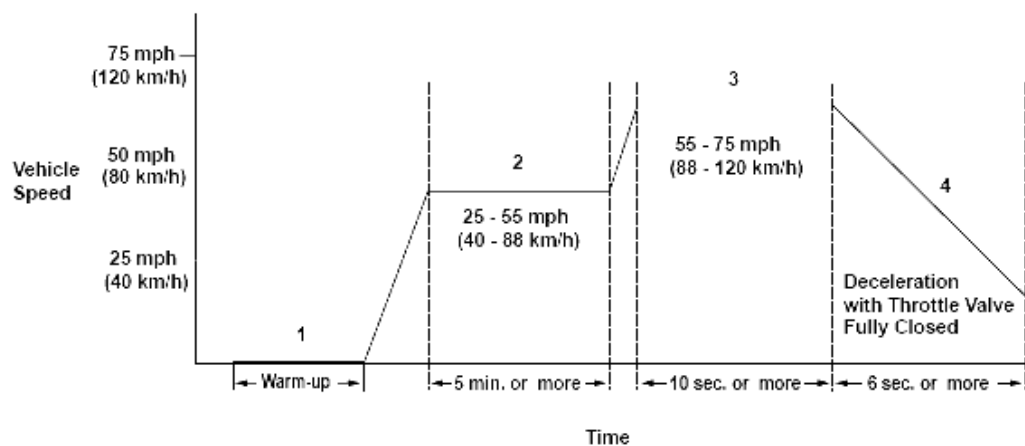
Malfunction Threshold

The front A/F sensor (bank 2, sensor 1) output voltage is 2.50 V^{*1}, 2.55 V^{*2} or less, or 4.50 V or more.

*1: J32A3 engine

*2: J35A8 engine

Driving Pattern



P2A00-0550

Fig. 319: Driving Pattern

1. Start the engine. Hold the engine speed at 3,000 rpm without load (in Park or neutral) until the radiator fan comes on.
 2. Drive the vehicle at a speed between 25 - 55 mph (40 - 88 km/h) for at least 5 minutes.
 3. Then, drive immediately at a steady speed between 55 - 75 mph (88 - 120 km/h) for at least 10 seconds.
 4. Decelerate with the throttle valve fully closed for at least 6 seconds.
- If the EVAP monitor runs instead of the HO2S monitor, turn the engine off, then restart it, and the HO2S monitor will restart.
 - Drive the vehicle in this manner only if the traffic regulations and ambient conditions allow.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected during the first drive cycle, a Temporary DTC is stored in the ECM/PCM memory. If the malfunction recurs during the next (second) drive cycle, the MIL comes on and the DTC and the freeze frame data are stored.

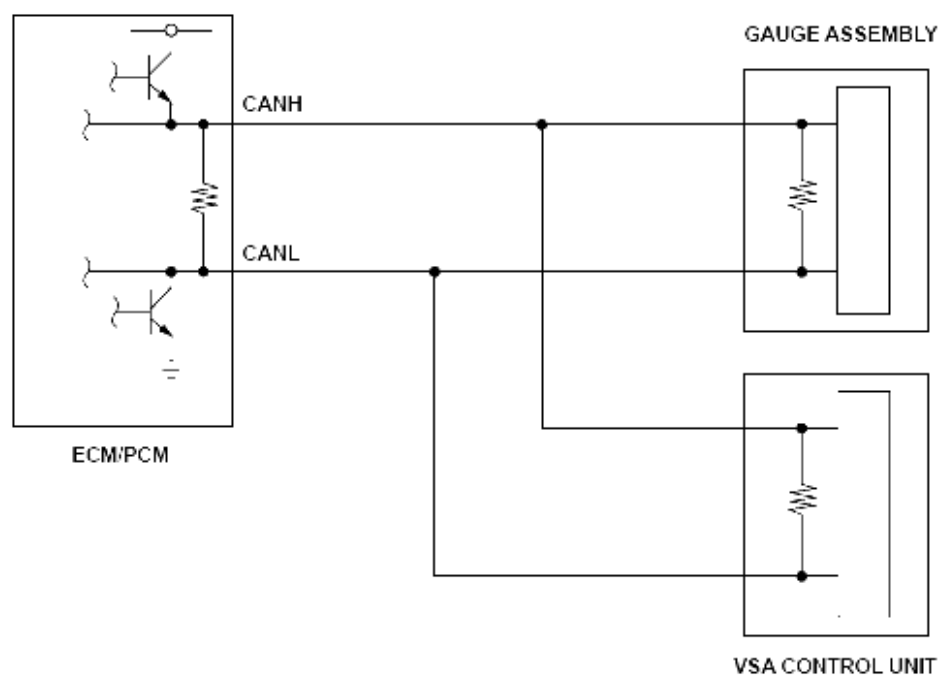
Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, the Temporary DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC U0073 (126): ADVANCED DIAGNOSTICS

DTC U0073: F-CAN MALFUNCTION (BUS-OFF)



U0073-0402

Fig. 320: F-CAN Malfunction (BUS-OFF) - Circuit Diagram

General Description

The controller area network (CAN) transmits/receives pulsing signals to/from the control modules simultaneously by using two signal lines (CANH and CANL).

When the engine control module (ECM)/powertrain control module (PCM) does not receive the signals via the CAN lines for more than a set time, the ECM/PCM detects a malfunction and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
Sequence	None
Duration	1 second or more
DTC Type	One drive cycle, MIL ON
OBD Status	N/A

Enable Conditions

ENABLE CONDITIONS

Condition	Minimum	Maximum
Battery voltage	9.0 V	-

Malfunction Threshold

The ECM/PCM does not receive any signals for at least 1 second.

Diagnosis Details**Conditions for illuminating the MIL**

When a malfunction is detected, the MIL comes on and the DTC and the freeze frame data are stored in the ECM/PCM memory.

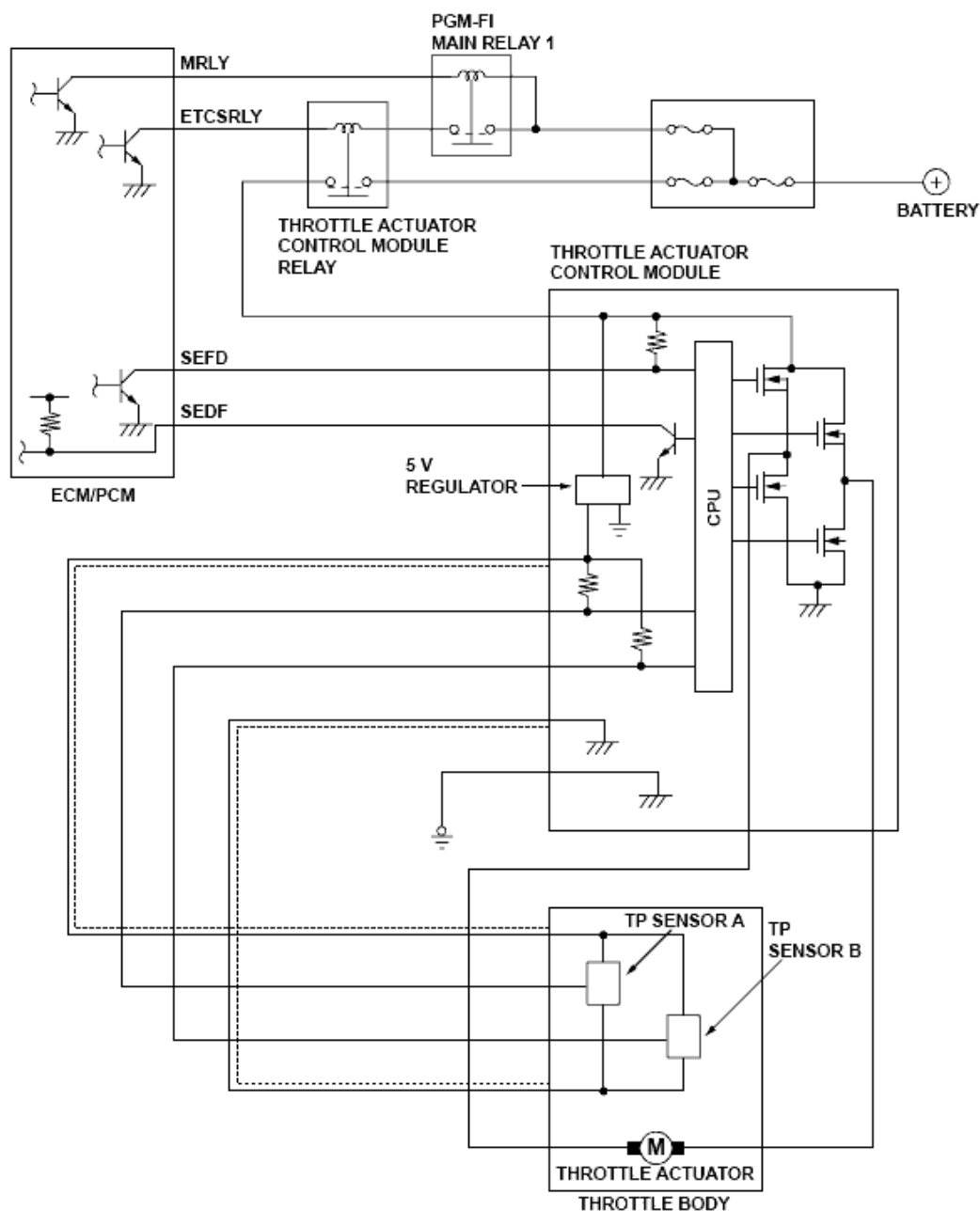
Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC U0107 (30): ADVANCED DIAGNOSTICS

DTC U0107: LOST COMMUNICATION WITH THROTTLE ACTUATOR CONTROL MODULE



P0122-0702

Fig. 321: Lost Communication With Throttle Actuator Control Module - Circuit Diagram

General Description

The engine control module (ECM)/powertrain control module (PCM) uses the serial signal line for two-way communication with the throttle actuator control module.

The ECM/PCM transmits the accelerator pedal position signal to the throttle actuator module, and the throttle actuator control module transmits the actual throttle valve position signal, or a malfunction signal, etc., to the ECM/PCM via this line.

When no serial signals from the throttle actuator control module are received or the serial signals are abnormal for more than a set time, the ECM/PCM detects a malfunction and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status**MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS**

Execution	Continuous
Sequence	None
Duration	0.25 second or more
DTC Type	One drive cycle, MIL ON
OBD Status	N/A

Enable Conditions**ENABLE CONDITIONS**

Condition	Minimum	Maximum
Battery voltage	8.0 V	-
Elapsed time after starting throttle actuator control module	1 second	-
No active DTCs	P2101, P2108, P2118, P2135, P2176	

Malfunction Threshold

One of these conditions mentioned below must be met for at least 0.25 second.

- No serial signals from the throttle actuator control module are detected.
- The serial signals from the throttle actuator control module are abnormal.

Diagnosis Details**Conditions for illuminating the MIL**

When a malfunction is detected, the MIL comes on and the DTC and the freeze frame data are stored in the ECM/PCM memory.

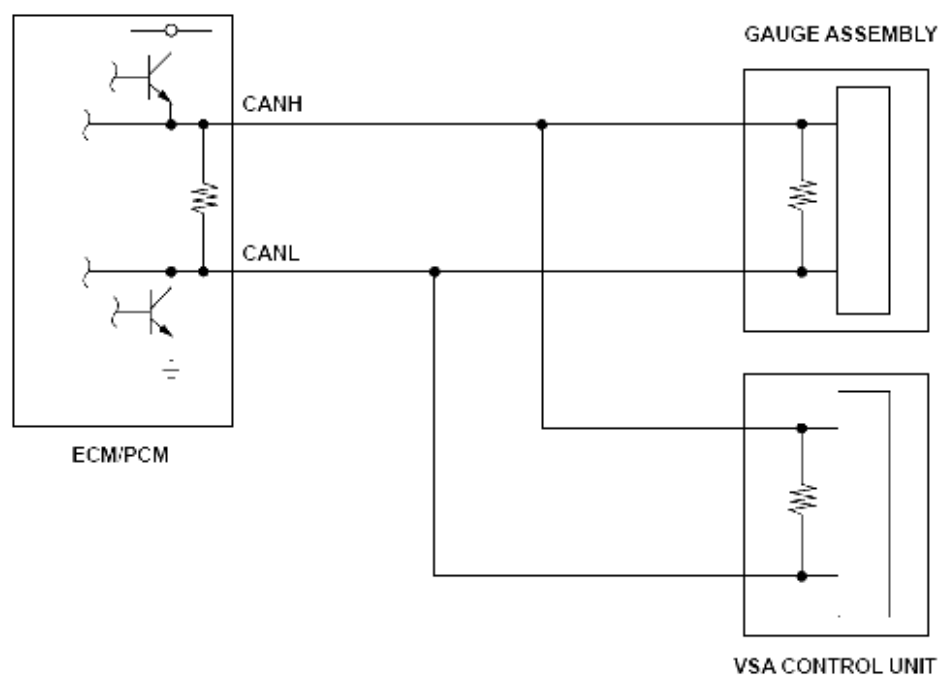
Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC U0122 (126): ADVANCED DIAGNOSTICS

DTC U0122: F-CAN MALFUNCTION (ENGINE CONTROL MODULE (ECM)/POWERTRAIN CONTROL MODULE (PCM)-VSA MODULATOR-CONTROL UNIT)



U0073-0402

Fig. 322: F-CAN Malfunction (Engine Control Module (ECM)/Powertrain Control Module (PCM)-VSA Modulator-Control Unit) - Circuit Diagram

General Description

The controller area network (CAN) transmits/receives pulsing signals to/from the control modules simultaneously by using two signal lines (CANH and CANL).

When the engine control module (ECM)/powertrain control module (PCM) does not receive the signals via the CAN lines for more than a set time, the ECM/PCM detects a malfunction and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status

MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS

Execution	Continuous
Sequence	None
Duration	1 second or more
DTC Type	One drive cycle, MIL OFF
OBD Status	N/A

Enable Conditions

ENABLE CONDITIONS

Condition	Minimum	Maximum
Battery voltage	9.0 V	-

Malfunction Threshold

The ECM/PCM does not receive any signals for at least 1 second.

Diagnosis Details

Conditions for illuminating the indicator

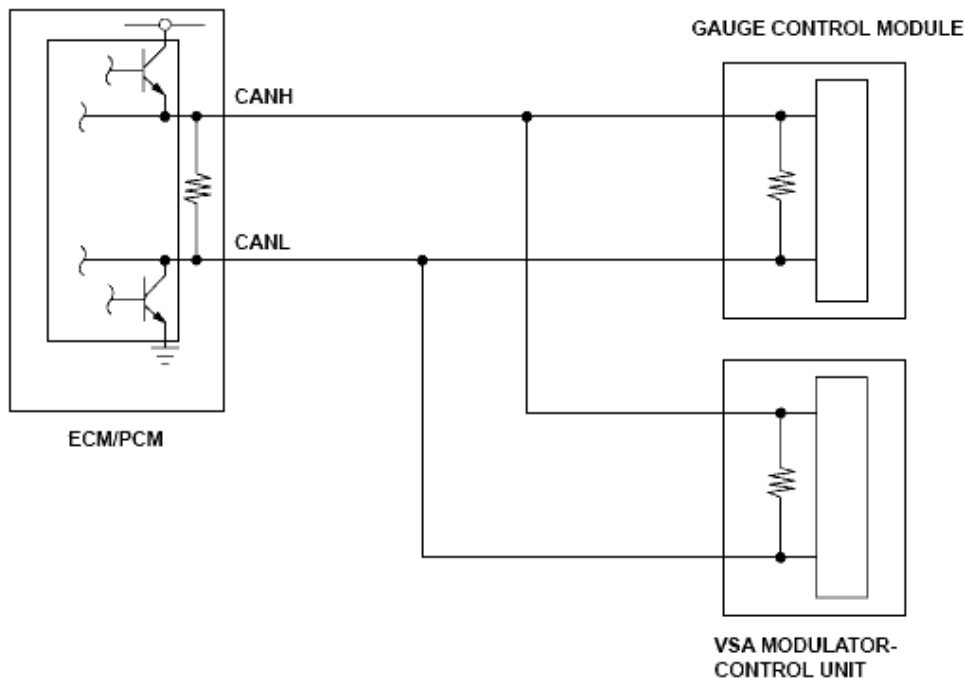
When a malfunction is detected, the DTC and the freeze frame data are stored in the ECM/PCM memory. The MIL does not come on.

Conditions for clearing the DTC

The DTC and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.

DTC U0155 (126): ADVANCED DIAGNOSTICS

DTC U0155: F-CAN MALFUNCTION (ENGINE CONTROL MODULE (ECM)/POWERTRAIN CONTROL MODULE (PCM)-GAUGE CONTROL MODULE)



U0073-0402

Fig. 323: Engine Control Module - Circuit Diagram

General Description

The controller area network (CAN) transmits/receives pulsing signals to/from the control modules simultaneously by using two signal lines (CANH and CANL).

When the engine control module (ECM)/powertrain control module (PCM) does not receive the signals from the gauge control module via the CAN lines for more than a set time, the ECM/PCM detects a malfunction and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type, OBD Status**MONITOR EXECUTION, SEQUENCE, DURATION, DTC TYPE, OBD STATUS**

Execution	Continuous
Sequence	None
Duration	1 second or more
DTC Type	One drive cycle, MIL ON
OBD Status	N/A

Enable Conditions**ENABLE CONDITIONS**

Condition	Minimum	Maximum
Battery voltage	10.0 V	-

Malfunction Threshold

The ECM/PCM does not receive any signals from the gauge control module for at least 1 second.

Diagnosis Details**Conditions for illuminating the MIL**

When a malfunction is detected, the MIL comes on and the DTC and the freeze frame data are stored in the ECM/PCM memory.

Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.

The MIL, the DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.