

2010 ENGINE PERFORMANCE

Engine Controls and Fuel - 2.2L or 2.4L - Equinox & Terrain

DTC P1255 OR P064A

DIAGNOSTIC INSTRUCTIONS

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC DESCRIPTORS

DTC P064A

Fuel Pump Control Module Performance

DTC P1255

Fuel Pump Control Module Driver Over-temperature

CIRCUIT/SYSTEM DESCRIPTION

The engine control module (ECM) supplies voltage to the fuel pump control module when the ECM detects that the ignition is on. The voltage from the ECM to the fuel pump control module remains active for 2 seconds, unless the engine is in crank or run. While this voltage is being received, the fuel pump control module supplies a varying voltage to the fuel tank pump module in order to maintain the desired fuel rail pressure.

CONDITIONS FOR RUNNING THE DTC

The engine is running.

CONDITIONS FOR SETTING THE DTC

The fuel pump control module detects an over-temperature fault.

ACTION TAKEN WHEN THE DTC SETS

DTCs P064A and P1255 are Type A DTCs.

CONDITIONS FOR CLEARING THE DTC

DTCs P064A and P1255 are Type A DTCs.

DIAGNOSTIC AIDS

Using the Failure Records data may help locate an intermittent condition. If you cannot duplicate the DTC, the information in the Failure Records can help determine how many miles since the DTC set. The Fail Counter and Pass Counter can help determine how many ignition cycles that the diagnostic test reported a pass and/or a fail.

REFERENCE INFORMATION

Schematic Reference

Engine Controls Schematics

Connector End View Reference

Component Connector End Views

Description and Operation

Fuel System Description

Electrical Information Reference

- Circuit Testing
- Connector Repairs
- Testing for Intermittent Conditions and Poor Connections
- Wiring Repairs

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References for scan tool information

CIRCUIT/SYSTEM TESTING

1. Verify that DTC P0231, P0232 or P023F are not set.
 - If any of those codes are set, refer to **DTC P0231, P0232, or P023F** .
2. Ensure that the entire undercarriage of the vehicle is clean, especially around the area where the K27 fuel pump control module is located. Clear all codes from the K27 fuel pump control module and test drive the vehicle. Verify that DTC P1255 or P064A do not set.
 - If DTC P1255 or P064A reset, replace the K27 fuel pump control module.

REPAIR PROCEDURES

Perform the **Diagnostic Repair Verification** after completing the diagnostic procedure.

Control Module References for fuel pump control module replacement, setup, and programming

DTC P1400

DIAGNOSTIC INSTRUCTIONS

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC DESCRIPTOR

DTC P1400

Cold Start Emission Reduction Control System

CIRCUIT/SYSTEM DESCRIPTION

The catalytic converter must be warmed to efficiently reduce the emissions. The cold start strategy is to reduce the amount of time it takes to warm the catalytic converter. During a cold start, the engine idle speed is elevated and spark timing is retarded to allow the catalyst to warm quickly. This diagnostic monitors the following to build an exhaust energy model:

- Engine speed
- Spark advance
- Throttle position
- Engine airflow
- Engine coolant temperature
- Engine run time
- Park/Neutral position
- Vehicle speed

The actual model is then compared to the expected exhaust energy model.

CONDITIONS FOR RUNNING THE DTC

- The engine is running, and a cold start has been detected.
- The vehicle speed is less than 2 km/h (1 mph).
- The catalyst temperature is greater than 1,000°C (1,832°F).
- The coolant temperature is greater than 56°C (133°F).
- The engine run time is greater than 18 s.
- The engine is at idle with no input from the accelerator pedal for greater than 5 s.
- DTCs P0101, P0102, P0103, P0106, P0107, P0108, P0112, P0113, P0116, P0117, P0118, P0120, P0121,

P0122, P0123, P0220, P0222, P0223, P0201, P0202, P0203, P0204, P0300, P0335, P0336, P0351, P0352, P0353, P0506, P0507, P0601, P0602, P0603, P0604, P0606, P0607, P062F, P0641, P0651, P1516, P1682, P2101, P2119, P2120, P2122, P2123, P2125, P2127, P2128, P2135, P2138, P2176, P2610 are not set.

- This DTC runs within 15 seconds within the first 2 minutes of start-up. This diagnostic runs once per trip when a cold start has been determined.

CONDITIONS FOR SETTING THE DTC

The actual exhaust energy model does not match the expected exhaust energy model.

ACTION TAKEN WHEN THE DTC SETS

DTC P1400 is a Type A DTC.

CONDITIONS FOR CLEARING THE MIL/DTC

DTC P1400 is a Type A DTC.

DIAGNOSTIC AIDS

Any loading of the engine that lowers engine RPM, such as partial application of the clutch, A/C cycling, etc. during the first 120 seconds of the engine run time may set this DTC.

CIRCUIT/SYSTEM VERIFICATION

1. Allow the engine to cool until the catalyst temperature is less than 500°C (932°F) and the engine coolant is greater than -10°C (+14°F).
2. Idle the engine for greater than 2 minutes.
3. Observe the scan tool DTC information. DTC P1400 should not set.
4. Operate the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records data.

CIRCUIT/SYSTEM TESTING

1. Inspect the air intake system for the following:
 - Modified, damaged, or restricted
 - Dirty or deteriorating air filter element
 - Crankcase ventilation system for correct operation.
 - Water intrusion
 - Vacuum leak and other unmetered air downstream of the MAF sensor
 - Intake manifold leak
2. Inspect the exhaust system for the following:
 - Water intrusion

- Exhaust leak
- Damaged, restricted, modified or enhanced exhaust system.

3. Inspect the engine mechanical for items that could alter the air flow into the combustion chamber.

DTC P1516, P2101, P2119, OR P2176

DIAGNOSTIC INSTRUCTIONS

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC DESCRIPTORS

DTC P1516

Throttle Actuator Control (TAC) Module Throttle Actuator Position Performance

DTC P2101

Throttle Actuator Position Performance

DTC P2119

Throttle Closed Position Performance

DTC P2176

Minimum Throttle Position Not Learned

DIAGNOSTIC FAULT INFORMATION

Circuit	Short to Ground	High Resistance	Open	Short to Voltage	Signal Performance
TAC Motor Control Closed	P1516, P2101, P2176	P1516, P2101, P2176	P1516, P2101, P2176	P1516, P2101, P2176	P1516, P2101, P2176
TAC Motor Control Open	P1516, P2101, P2119, P2176	P1516, P2101, P2176	P1516, P2101, P2176	P1516, P2101, P2176	P1516, P2101, P2176

CIRCUIT/SYSTEM DESCRIPTION

The engine control module (ECM) controls the throttle valve by applying a varying voltage to the control

circuits of the throttle actuator control (TAC) motor. The ECM monitors the duty cycle that is required to actuate the throttle valve. The ECM monitors the throttle position (TP) sensors 1 and 2 to determine the actual throttle valve position.

CONDITIONS FOR RUNNING THE DTC

P1516 and P2101

- The ignition voltage is more than 11 V.
- The system is not in the Battery Save mode.
- The engine is running.
- DTC P0068 is not set.
- DTCs P1516 and P2101 run continuously when the above conditions are met.

P2119

- The ignition is ON.
- The ignition voltage is greater than 11 V.
- The system is in the Battery Save mode.
- DTC P2119 runs continuously when the above conditions are met.

P2176

- The ignition is ON.
- The ignition voltage is greater than 11 V.
- The system is not in the Battery Save mode.
- DTCs P0068, P0121, P0122, P0123, P0222, or P0223 are not set.
- DTC P2176 runs continuously when the above conditions are met.

CONDITIONS FOR SETTING THE DTC

P1516

The indicated throttle position does not match the predicted throttle position for greater than 0.5 s.

P2101

The indicated throttle position does not match the predicted throttle position for greater than 0.3 s.

P2119

The ECM determines that the throttle blade did not return to the rest position within 0.720 s.

P2176

The difference between the predicted and the actual throttle position is greater than a calibrated amount for greater than 1.5 s.

ACTION TAKEN WHEN THE DTC SETS

- DTCs P1516, P2101, and P2176 are type A DTCs.
- DTC P2119 is a type C DTC.

CONDITIONS FOR CLEARING THE MIL/DTC

- DTCs P1516, P2101, and P2176 are type A DTCs.
- DTC P2119 is a type C DTC.

DIAGNOSTIC AIDS

- Inspect for a condition in which the throttle valve may have been held open. For example, ice may have formed in the throttle bore causing the throttle valve not to close.
- A high resistance condition on the throttle position and throttle actuator control circuits could cause a DTC to set.
- A low battery condition may cause a DTC to set.

REFERENCE INFORMATION

Schematic Reference

Engine Controls Schematics

Connector End View Reference

Component Connector End Views

Description and Operation

Throttle Actuator Control (TAC) System Description

Electrical Information Reference

- **Circuit Testing**
- **Connector Repairs**
- **Testing for Intermittent Conditions and Poor Connections**
- **Wiring Repairs**

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References for scan tool information

CIRCUIT/SYSTEM VERIFICATION

NOTE: **A low battery voltage or charging system condition may cause a DTC to set.**

1. Ignition ON, observe the DTC information with a scan tool. DTC P0120, P0122, P0123, P0220, P0222, P0223, P0562, P0621, P0622, or P2135 should not set.
 - If a DTC sets, refer to **Diagnostic Trouble Code (DTC) List - Vehicle** for further diagnosis.
2. Slowly depress the accelerator pedal from the rest position to the wide open throttle position (WOT) and release the pedal. Repeat the procedure several times. DTC P1516, P2101, P2119, or P2176 should not set.
3. Rapidly depress the accelerator pedal from the rest position to the wide open throttle position (WOT) and release the pedal. Repeat the procedure several times. DTC P1516, P2101, P2119, or P2176 should not set.
4. Engine idling, observe the TAC Command parameter with a scan tool. The reading should display greater than 0 %.
5. Operate the vehicle within the Conditions for Running the DTC to verify the DTC does not reset. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records data.

CIRCUIT/SYSTEM TESTING

WARNING: Turn OFF the ignition before inserting fingers into the throttle bore. Unexpected movement of the throttle blade could cause personal injury.

1. Ignition OFF, verify the following conditions do not exist with the Q38 throttle body assembly:
 - A throttle blade that is not in the rest position
 - A throttle blade that is binding open or closed
 - A throttle blade that is free to move open or closed without spring pressure
 - If a condition is found, replace the Q38 throttle body assembly.

NOTE: **Disconnecting the throttle body harness connector may cause additional DTCs to set.**

2. Ignition OFF, disconnect the harness connector at the Q38 throttle body assembly.
3. Ignition ON, verify that a test lamp does not illuminate between each motor control circuit listed below and ground.
 - TAC Motor Control Closed circuit terminal A

- TAC Motor Control Open circuit terminal B
 - If test lamp illuminates, test the motor control circuit for a short to voltage. If the circuit tests normal, replace the K20 ECM.
- 4. Ignition ON, verify that a test lamp does not illuminate between each motor control circuit listed below and B+.
 - TAC Motor Control Closed circuit terminal A
 - TAC Motor Control Open circuit terminal B
 - If the test lamp illuminates, test the motor control circuit for a short to ground. If the circuit tests normal, replace the K20 ECM.
- 5. Ignition OFF, set the DMM to the 40 V scale, select the Min/Max Recording Mode, and set the Peak Min/Max response time to 1 ms.

NOTE:

- **The DMM Min/Max Recording Mode and the response time of 1 ms must be reset after testing each circuit.**
 - **The ignition must be OFF and the ECM completely powered down before testing each circuit.**
- 6. Ignition OFF, measure the voltage using the DMM Min/Max Recording Mode function on each circuit listed below as the ignition is turned ON. The Max voltage should be within 1 V of B+.
 - TAC Motor Control Closed circuit terminal A
 - TAC Motor Control Open circuit terminal B
 - If not within the specified range, test the circuit for an open/high resistance. If the circuit tests normal, replace the K20 ECM.
 - 7. If all circuits and connections test normal, replace the Q38 throttle body assembly.

REPAIR PROCEDURES

Perform the **Diagnostic Repair Verification** after completing the diagnostic procedure.

- **Throttle Body Assembly Replacement**
- **Control Module References** for ECM replacement, programming, and setup

DTC P159F OR P15A0

DIAGNOSTIC INSTRUCTIONS

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provide an overview of each diagnostic category.

DTC DESCRIPTORS

DTC P159F

Fuel Economy Mode Switch Circuit Low Voltage

DTC P15A0

Fuel Economy Mode Switch Circuit High Voltage

DIAGNOSTIC FAULT INFORMATION

Circuit	Short to Ground	High Resistance	Open	Short to Voltage	Signal Performance
Fuel Economy Mode Switch 5 V Reference	P159F	P159F, P15A1	P159F	P15A0	P15A1
Fuel Economy Mode Switch Signal	P159F	P159F	P159F	P15A0	P15A1
Fuel Economy Mode Switch Ground	-	P15A0, P15A1	P15A0	-	P15A1

CIRCUIT DESCRIPTION

The ECM supplies 5 V reference voltage, through the 5 V reference voltage circuit, to the fuel economy mode switch. The 5 V reference voltage causes current to flow through a series of resistors in the switch to the switch ground circuit. The ECM monitors the reference voltage through a discrete fuel economy mode switch signal circuit. When the switch button is momentarily pressed, the switch contacts allow the 5 V reference voltage to by-pass one of the resistors. The ECM detects the resulting voltage drop as a fuel economy mode request and sends a GMLAN message to the transmission control module (TCM) indicating the request. When the TCM receives the request, throttle progressions and transmission shift points are modified to optimize fuel efficiency. The instrument panel cluster (IPC) also receives the fuel economy mode request message from the ECM and illuminates the fuel economy mode indicator lamp. The fuel economy mode switch must be pressed for between 0.094-1.5 s to activate the fuel economy mode. Voltage on the signal wire is normally between 1.45-3.45 V with the switch depressed. When the switch is released, voltage on the signal wire is normally between 3.65-4.45 V.

CONDITIONS FOR RUNNING THE DTC

- Ignition key must be turned to ON.
- DTCs P159F and P15A0 run continuously when the above condition is met.

CONDITIONS FOR SETTING THE DTC

The ECM detects that the voltage on the fuel economy mode switch signal wire is either too low or too high out of range.

ACTION TAKEN WHEN THE DTC SETS

DTCs P159F and P15A0 are Type B DTCs

CONDITIONS FOR CLEARING THE MIL/DTC

DTCs P159F and P15A0 are Type B DTCs

REFERENCE INFORMATION

Schematic Reference

Engine Controls Schematics

Connector End View Reference

Component Connector End Views

Electrical Information Reference

- **Circuit Testing**
- **Connector Repairs**
- **Testing for Intermittent Conditions and Poor Connections**
- **Wiring Repairs**

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References for scan tool information

CIRCUIT/SYSTEM VERIFICATION

1. Ignition ON, observe the scan tool Fuel Economy Mode parameter. The parameter should display Inactive.
2. Ignition ON, command the Fuel Economy ON and OFF with a scan tool. The Fuel Economy Mode parameter should display Active and Inactive as commanded.
3. Operate the vehicle within the Conditions for Running the DTC to verify the DTC does not reset. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records data.

CIRCUIT/SYSTEM TESTING

NOTE: **You must perform the Circuit/System Verification before proceeding with Circuit/System Testing.**

1. Ignition OFF, disconnect the X1 harness connector at the Fuel Economy Mode switch.
2. Test for less than 5 ohms between the ground circuit terminal 1 of the harness connector and ground.
 - If greater than the specified range, test the ground circuit for a open/high resistance and repair as

necessary.

3. Ignition ON, test for 4.8-5.2 V between the 5 V reference circuit terminal 3 of the harness connector and ground.
 - If less than the specified range, test the 5 V reference circuit for a short to ground or an open/high resistance. If the circuit tests normal, replace the K20 ECM.
 - If greater than the specified range, test the 5 V reference circuit for a short to voltage. If the circuit tests normal, replace the K20 ECM.
4. Observe the scan tool Fuel Economy Mode Switch parameter. The parameter should display Circuit Low Voltage.
 - If the parameter does not display the specified value, test the signal circuit for a short to voltage. If the circuit tests normal, replace the K20 ECM.
5. Connect a 3 A fused jumper wire between 5 V reference circuit terminal 3 of the harness connector and signal circuit terminal 4 of the harness connector. Verify the scan tool Fuel Economy Mode Switch parameter displays Circuit High Voltage.
6. If all scan tool parameter displays are normal, test or replace the S87 fuel economy mode switch.

COMPONENT TESTING

1. Disconnect the fuel economy mode switch and measure between the 5 V reference voltage circuit terminal 3 of the switch and signal circuit terminal 4 of the switch for 266-294 ohms with a DMM.
 - If the DMM does not measure between 266-294 ohms, replace the S87 fuel economy mode switch.
2. Measure between the 5 V reference voltage circuit terminal 3 of the switch and the ground circuit terminal 1 of the switch for 1,414-1,562 ohms with a DMM.
 - If the DMM does not measure between 1,414-1,562 ohms, replace the S87 fuel economy mode switch.
3. With the fuel economy mode switch button depressed, measure between the 5 V reference voltage circuit terminal 3 of the switch and the ground circuit terminal 1 of the switch for 486ohms538 ohms with a DMM.
 - If the DMM does not measure between 486-538 ohms, replace the S87 fuel economy mode switch.

REPAIR PROCEDURES

Perform the **Diagnostic Repair Verification** after completing the diagnostic procedure.

- **Fuel Economy Indicator Switch Replacement**
- **Control Module References** for ECM replacement, setup and programming

DTC P15A1

DIAGNOSTIC INSTRUCTIONS

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.

- **Diagnostic Procedure Instructions** provide an overview of each diagnostic category.

DTC DESCRIPTOR

DTC P15A1

Fuel Economy Mode Switch Performance

DIAGNOSTIC FAULT INFORMATION

Circuit	Short to Ground	High Resistance	Open	Short to Voltage	Signal Performance
Fuel Economy Mode Switch 5 V Reference	P159F	P159F, P15A1	P159F	P15A0	P15A1
Fuel Economy Mode Switch Signal	P159F	P159F	P159F	P15A0	P15A1
Fuel Economy Mode Switch Ground	-	P15A0, P15A1	P15A0	-	P15A1

CIRCUIT DESCRIPTION

The ECM supplies 5 V reference voltage, through the 5 V reference voltage circuit, to the fuel economy mode switch. This 5 V reference voltage causes current to flow through a series of resistors in the switch to the switch ground circuit. The ECM monitors the 5 V reference voltage through a discrete fuel economy mode switch signal circuit. When the switch button is momentarily pressed, the switch contacts allow the 5 V reference voltage signal to by-pass one of the resistors. The ECM detects the resulting voltage drop as a fuel economy mode request and sends a GMLAN message to the transmission control module (TCM) indicating the request. When the TCM receives the request, throttle progressions and transmission shift points are modified to optimize fuel efficiency. The instrument panel cluster (IPC) also receives the fuel economy mode request message from the ECM and illuminates the fuel economy mode indicator lamp. The fuel economy mode switch must be pressed for between 0.094-1.5 s to activate the fuel economy mode. Voltage on the signal wire is normally between 1.45-3.45 V with the switch depressed. When the switch is released, voltage on the signal wire is normally between 3.65-4.45 V.

CONDITIONS FOR RUNNING THE DTC

- The ignition key is turned to ON.
- DTC P15A1 runs continuously when the above condition is met.

CONDITIONS FOR SETTING THE DTC

The ECM detects that the voltage on the fuel economy mode switch signal wire is in an indeterminate range.

ACTION TAKEN WHEN THE DTC SETS

DTC P15A1 is a Type B DTC.

CONDITIONS FOR CLEARING THE MIL/DTC

DTC P15A1 is a Type B DTC.

REFERENCE INFORMATION

Schematic Reference

Engine Controls Schematics

Connector End View Reference

Component Connector End Views

Electrical Information Reference

- Circuit Testing
- Connector Repairs
- Testing for Intermittent Conditions and Poor Connections
- Wiring Repairs

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References for scan tool information

CIRCUIT/SYSTEM VERIFICATION

1. If you cannot duplicate the condition, refer to Testing for Intermittent Conditions and Poor Connections .
2. Verify that DTCs P159F and P015A0 are not set.
 - If either or both of the DTCs are set, refer to Powertrain Diagnostic Trouble Code (DTC) Type Definitions .
3. Engine running, observe the DTC information with a scan tool. DTC P15A1 should not set.
4. Operate the vehicle within the Conditions for Running the DTC to verify the DTC does not reset. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records data.

CIRCUIT/SYSTEM TESTING

NOTE: You must perform the Circuit/System Verification before proceeding with Circuit/System Testing.

1. Ignition OFF, disconnect the X1 harness connector at the Fuel Economy Mode switch.
2. Test for less than 5 ohms between the ground circuit terminal 1 of the harness connector and ground.
 - If greater than the specified range, test the ground circuit for a high resistance and repair as necessary.
3. Measure between the 5 V reference voltage circuit terminal 3 of the switch and signal circuit terminal 4 of the switch for 266-294 ohms with a DMM.
 - If the DMM does not measure between 266-294 ohms, replace the S87 fuel economy mode switch.
4. Measure between the 5 V reference voltage circuit terminal 3 of the switch and the ground circuit terminal 1 of the switch for 1,414-1,562 ohms with a DMM.
 - If the DMM does not measure between 1,414-1,562 ohms, replace the S87 fuel economy mode switch.
5. With the fuel economy mode switch button depressed, measure between the 5 V reference voltage circuit terminal 3 of the switch and the ground circuit terminal 1 of the switch for 486-538 ohms with a DMM.
 - If the DMM does not measure between 486-538 ohms, replace the S87 fuel economy mode switch.
6. Disconnect the X2 harness connector at the ECM.
7. Measure the 5 V reference voltage circuit, between terminal 14 of the ECM harness connector and terminal 3 of the fuel economy mode switch harness connector, for less than 5 ohms.
 - If greater than the specified range, repair or replace the 5 V reference voltage circuit as necessary.
8. Measure the signal circuit, between terminal 50 of the ECM harness connector and terminal 4 of the fuel economy mode switch harness connector, for less than 5 ohms.
 - If greater than the specified range, repair or replace the signal circuit as necessary.
9. If all circuits test normal, replace the K20 ECM.

REPAIR PROCEDURES

Perform the **Diagnostic Repair Verification** after completing the diagnostic procedure.

- **Fuel Economy Indicator Switch Replacement**
- **Control Module References** for ECM replacement, setup and programming

DTC P163A

DIAGNOSTIC INSTRUCTIONS

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC DESCRIPTOR

DTC P163A

CIRCUIT/SYSTEM DESCRIPTION

This diagnostic applies to internal microprocessor integrity conditions within the engine control module (ECM) or an out of range high pressure fuel pump actuator current.

CONDITIONS FOR RUNNING THE DTC

- DTCs P0016, P0017, P0090, P0091, P0092, P00C8, P00C9, P00CA, P0112, P0113, P0116, P0117, P0118, P0128, P0192, P0193, P0335, P0336, P0340, P0341, P0365, P0366, P0627-P0629, P1682 are not set.
- The engine is running.
- The ignition voltage is greater than 11 V.
- The low side fuel pressure is greater than 275 kPa (40 psi).
- DTC P163A runs continuously when the conditions are met for greater than 500 mS.

CONDITIONS FOR SETTING THE DTC

The ECM detects a condition with the integrated circuits of the high pressure fuel pump actuator driver module or the ECM detects that the current used to drive the high pressure fuel pump actuator is out of range for greater than 4 s.

ACTION TAKEN WHEN THE DTC SETS

DTC P163A is a Type B DTC.

CONDITIONS FOR CLEARING THE DTC

DTC P163A is a Type B DTC.

REFERENCE INFORMATION

Schematic Reference

Engine Controls Schematics

Connector End View Reference

Component Connector End Views

Description and Operation

Engine Control Module Description

Electrical Information Reference

- Circuit Testing
- Connector Repairs
- Testing for Intermittent Conditions and Poor Connections
- Wiring Repairs

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References for scan tool information

CIRCUIT/SYSTEM TESTING

1. Ignition OFF, disconnect the harness connector at the G18 high pressure fuel pump.

NOTE: **The DMM and test leads must be calibrated to 0 ohms in order to prevent misdiagnosis.**

2. Test for 9-11 ohms at 25°C (77°F) between the low control circuit terminal 1 and the high control circuit terminal 2.
 - If not within the specified range, replace the G18 high pressure fuel pump.
3. Measure the resistance between each terminal and the high pressure fuel pump housing. The DMM should display OL.
 - If less than the specified value, replace the G18 high pressure fuel pump.
4. Ignition ON, verify that a test lamp does not illuminate between the high control circuit terminal 2 and ground and the low control circuit terminal 1 and ground.
 - If the test lamp illuminates, test the appropriate control circuit for a short to voltage. If the circuit tests normal, replace the K20 ECM.
5. Verify that a test lamp does not illuminate between the high control circuit terminal 2 and B+ and the low control circuit terminal 1 and B+.
 - If the test lamp illuminates, test the appropriate control circuit for a short to ground. If the circuit tests normal, replace the K20 ECM.
6. Connect a 3 A fused jumper wire between the high control circuit terminal 2 and ground. The Fuel Pressure Regulator High Control Circuit Open Test Status should transition from Malfunction to OK and the Fuel Pressure Regulator High Control Circuit Low Voltage Test Status should transition from OK to Malfunction.
 - If not the specified value, test the high control circuit for an open/high resistance.
7. Connect a 3 A fused jumper wire between the low control circuit terminal 1 and B+. The Fuel Pressure Regulator Control Circuit Open Test Status should transition from Malfunction to OK and the Fuel Pressure Regulator Control Circuit High Voltage Test Status should transition from OK to Malfunction.
 - If not the specified value, test the low control circuit for an open/high resistance.

8. If all circuits and the high pressure fuel pump test normal, replace the K20 ECM.

REPAIR PROCEDURES

Perform the **Diagnostic Repair Verification** after completing the diagnostic procedure.

- **Fuel Pump Replacement**
- **Control Module References** for engine control module replacement, setup, and programming

DTC P1682

DIAGNOSTIC INSTRUCTIONS

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC DESCRIPTOR

DTC P1682

Ignition 1 Switch Circuit 2

DIAGNOSTIC FAULT INFORMATION

Circuit	Short to Ground	Open/High Resistance	Short to Voltage
Engine Controls Ignition Relay Feedback Signal, Engine Control Module Relay	P1682	P1682	P0690
Ignition 1 Signal, Ignition Main Relay	1	1	2
1. A short to ground or open/high resistance will cause a No Crank condition. 2. A short to voltage will cause the engine to continue to run with ignition OFF.			

TYPICAL SCAN TOOL DATA

Ignition 1 Signal

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Ignition ON, engine OFF, and ignition main and engine control module relays are commanded ON			
Ignition 1 Signal, Ignition Main Relay	0 V	0 V	B+
Engine Controls Ignition Relay Feedback Signal, Engine Control Module Relay	0 V	0 V	B+

CIRCUIT/SYSTEM DESCRIPTION

There are 2 ignition voltage circuits supplied to the engine control module (ECM). The first ignition circuit is provided by the engine controls ignition relay or the engine control module relay, through a fuse. This ignition voltage circuit supplies power to all the internal ECM circuits associated with the throttle actuator control (TAC) operation. The second ignition voltage circuit is supplied by the ignition main relay through a fuse, and is used to power the remaining internal ECM circuits. If the ECM detects a voltage difference between the 2 ignition voltage circuits, DTC P1682 will set.

CONDITIONS FOR RUNNING THE DTC

- The ignition is ON.
- System voltage is more than 6 V.
- The engine control module relay is commanded ON.
- DTC P1682 runs continuously.

CONDITIONS FOR SETTING THE DTC

The ECM detects that the voltage level difference is greater than 3 V between the 2 ignition voltage circuits for less than 1 s.

ACTION TAKEN WHEN THE DTC SETS

DTC P1682 is a Type A DTC.

CONDITIONS FOR CLEARING THE DTC

DTC P1682 is a Type A DTC.

REFERENCE INFORMATION

Schematic Reference

- **Engine Controls Schematics**
- **Power Distribution Schematics**

Connector End View Reference

Component Connector End Views

Electrical Information Reference

- **Circuit Testing**
- **Connector Repairs**
- **Electrical Center Identification Views**

- Probing Electrical Connectors
- Testing for Intermittent Conditions and Poor Connections
- Wiring Repairs

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References for scan tool information

CIRCUIT/SYSTEM VERIFICATION

NOTE: On the scan tool, the engine control module relay is referred to as the engine controls ignition relay.

1. Ignition ON, observe the DTC information with a scan tool. If DTCs P0685, P0689, or P0690 are set, diagnose those DTCs first. DTC P1682 should not set.
2. Ignition ON, observe the scan tool Ignition 1 Voltage signal and the Engine Controls Ignition Relay Feedback Signal parameters. There should be no more than 3 V difference between the two parameters.
3. Operate the vehicle within the Conditions for Running the DTC to verify the DTC does not reset. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records data.

CIRCUIT/SYSTEM TESTING

NOTE: You must perform the Circuit/System Verification before proceeding with Circuit/System Testing.

1. Ignition ON, observe the Ignition 1 Signal and the Engine Controls Ignition Relay Feedback Scan Tool parameters to determine which is more than 3 V lower than the other.

NOTE: The ignition 1 signal is supplied by the ignition main relay. The engine controls ignition relay feedback signal is supplied by the engine control module relay.

2. Ignition OFF, remove the relay that corresponds to the scan tool parameter that is more than 3 V lower.

NOTE: A resistance of 6 ohms or greater in the circuit/underhood fuse block will cause the DTC to set.

3. Connect a 20 A fused jumper wire between B+ and the applicable ignition voltage circuit terminal 30 leading to the K20 ECM. Ignition ON, verify that the applicable scan tool parameter displays between 9-14 V.

- If the applicable scan tool parameter is less than the specified value, test the ignition voltage circuit for an open/high resistance. If the circuit tests normal, replace the K20 ECM.
- 4. Ignition OFF, connect a DMM set to the diode setting between the control circuit terminal 85 and ground. Verify the DMM displays OL.
 - If not the specified value, test the control circuit for a short to ground. If the circuit tests normal, replace the K20 ECM.
- 5. Ignition ON, verify the DMM displays less than 1 V.
 - If not the specified range, test the control circuit for a short to voltage or an open/high resistance. If the circuit tests normal, replace the K20 ECM.
- 6. If all circuits test normal, replace the applicable relay.

REPAIR PROCEDURES

Perform the **Diagnostic Repair Verification** after completing the diagnostic procedure.

- **Relay Replacement (Attached to Wire Harness)** or **Relay Replacement (Within an Electrical Center)**
- **Control Module References** for ECM replacement, setup, and programming

DTC P2122, P2123, P2127, P2128, OR P2138

DIAGNOSTIC INSTRUCTIONS

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC DESCRIPTORS

DTC P2122

Accelerator Pedal Position (APP) Sensor 1 Circuit Low Voltage

DTC P2123

Accelerator Pedal Position (APP) Sensor 1 Circuit High Voltage

DTC P2127

Accelerator Pedal Position (APP) Sensor 2 Circuit Low Voltage

DTC P2128

Accelerator Pedal Position (APP) Sensor 2 Circuit High Voltage

DTC P2138

Accelerator Pedal Position (APP) Sensors 1-2 Not Plausible

DIAGNOSTIC FAULT INFORMATION

Circuit	Short to Ground	High Resistance	Open	Short to Voltage	Signal Performance
Accelerator Pedal Position (APP) Sensor 1 5 V Reference Circuit	P06A3	P2138	P2122	P06A3	P2138
Accelerator Pedal Position (APP) Sensor 1 Signal	P2122	P2138	P2122	P2123, P2138	P2138
Accelerator Pedal Position (APP) Sensor 1 Low Reference	-	P2138	P2123	-	P2138
Accelerator Pedal Position (APP) Sensor 2 5 V Reference Circuit	P0108, P0107, P0697	P2138	P2127	P0106, P0108, P0697	P2138
Accelerator Pedal Position (APP) Sensor 1 Signal	P2127	P2138	P2127	P2138	P2138
Accelerator Pedal Position (APP) Sensor 2 Low Reference	-	P2138	P2128	-	P2138

TYPICAL SCAN TOOL DATA

APP Sensor 1 and 2

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: The engine is operating at idle. Parameter Normal Range: APP Sensor 1 0.88-1.08 V Parameter Normal Range: APP Sensor 2 0.39-0.59 V			
APP Sensor 1 5 V Reference	0.00 V	0.00 V	2-3 V
APP Sensor 1 Signal	0.00 V	0.00 V	4.98 V
APP Sensor 1 Low Reference	-	4.94 V	-
APP Sensor 2 5 V Reference	0.00 V	0.00 V	1.35 V
APP Sensor 2 Signal	0.00 V	0.00 V	2-5 V
APP Sensor 2 Low Reference	-	4.92 V	-

CIRCUIT/SYSTEM DESCRIPTION

The accelerator pedal assembly contains 2 accelerator pedal position (APP) sensors. The APP sensors are mounted to the accelerator pedal assembly and are not serviceable. The APP sensors provide a signal voltage that changes relative to pedal position. The engine control module (ECM) supplies each APP sensor with a 5 V reference circuit, a low reference circuit, and a signal circuit.

Both the APP sensors 1 and 2 signal percentages increase as the pedal is depressed, from approximately 0 percent at rest to above 95 percent when fully depressed.

CONDITIONS FOR RUNNING THE DTC

P2122, P2123, P2127, or P2128

- DTC P06A3 or P0697 are not set.
- The ignition is ON or the engine is operating.
- The ignition voltage is greater than 6 V.
- The ECM is not commanding reduced power.
- The DTCs run continuously when the above conditions are met.

P2138

- DTCs P06A3, P0697, P2122, P2123, P2127, or P2128 are not set.
- The ignition is ON or the engine is operating.
- The ignition voltage is greater than 6 V.
- The ECM is not commanding reduced power.
- The DTC runs continuously when the above conditions are met.

CONDITIONS FOR SETTING THE DTC

P2122

The ECM detects that the APP sensor 1 voltage is less than 0.46 V for less than 1 s.

P2123

The ECM detects that the APP sensor 1 voltage is greater than 4.7 V for less than 1 s.

P2127

The ECM detects that the APP sensor 2 voltage is less than 0.32 V for less than 1 s.

P2128

The ECM detects that the APP sensor 2 voltage is greater than 2.6 V for less than 1 s.

P2138

The ECM detects that APP sensor 1 and APP sensor 2 disagree greater than 10 percent for less than 1 s.

OR

The ECM detects that both APP sensor 1 and APP sensor 2 are 5 percent greater than the learned minimum position for less than 1 s.

ACTION TAKEN WHEN THE DTC SETS

- DTCs P2122, P2123, P2127, P2128, and P2138 are type A DTCs.
- The ECM commands the TAC system to operate in a Reduced Engine Power mode.

CONDITIONS FOR CLEARING THE DTC

DTCs P2122, P2123, P2127, P2128, and P2138 are type A DTCs.

DIAGNOSTIC AIDS

- If a shared 5 V reference circuit is shorted to ground or shorted to a voltage, other 5 V reference circuits may be affected.
- The scan tool 5 V reference parameter should display between 4.8-5.2 V.
- A high resistance condition on the accelerator pedal position circuits could cause a DTC to set.

REFERENCE INFORMATION

Schematic Reference

Engine Controls Schematics

Connector End View Reference

Component Connector End Views

Description and Operation

Throttle Actuator Control (TAC) System Description

Electrical Information Reference

- **Circuit Testing**
- **Connector Repairs**
- **Testing for Intermittent Conditions and Poor Connections**
- **Wiring Repairs**

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References for scan tool information

CIRCUIT/SYSTEM VERIFICATION

1. Ignition ON, observe the DTC information with a scan tool. Verify DTCs P0697 or P06A3 are not set.
 - If a DTC is set, refer to **DTC P0641, P0651, P0697, or P06A3 (ECM)** for further diagnosis.
2. Ignition ON, observe the scan tool Accelerator Pedal Position percentage parameter. The scan tool should display 0 percent.
3. Observe the scan tool APP Sensor 1 and 2 Agree/Disagree parameter while performing the following tests:
 - Rapidly depress the accelerator pedal from the rest position to the wide open throttle position (WOT) and release pedal. Repeat the procedure several times.
 - Slowly depress the accelerator pedal to WOT and then slowly return the pedal to closed throttle. Repeat the procedure several times.

The APP Sensor 1 and 2 Agree/Disagree parameter should display Agree.

4. Observe the DTC information with a scan tool. DTCs P2122, P2123, P2127, P2128, or P2138 should not set.
5. Operate the vehicle within the Conditions for Running the DTC to verify the DTC does not reset. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records data.

CIRCUIT/SYSTEM TESTING

1. Ignition OFF, disconnect the harness connector at the B107 accelerator pedal assembly.
2. Ignition OFF and all vehicle systems OFF. It may take up to 2 minutes for all vehicle systems to power down. Test for less than 5 ohms between the low reference circuit terminals listed below and ground.
 - Low reference circuit terminal 4 or A
 - Low reference circuit terminal 5 or D
 - If greater than the specified range, test the appropriate low reference circuit for a short to voltage, or an open/high resistance. If the circuit tests normal, replace the K20 ECM.
3. Ignition ON, test for 4.8-5.2 V between both 5 V reference circuit terminals listed below and ground.
 - 5 V reference circuit terminal 1 or C
 - 5 V reference circuit terminal 2 or F
 - If less than the specified range, test the appropriate 5 V reference circuit for a short to ground or open/high resistance. If the circuit tests normal, replace the K20 ECM.
 - If greater than the specified range, test the 5 V reference circuit for a short to voltage. If the circuit tests normal, replace the K20 ECM.
4. Verify the appropriate APP sensor voltage parameter is at 0 V.
 - If greater than the specified range, test the appropriate signal circuit terminal listed below for a short to voltage. If the circuit tests normal, replace the K20 ECM.
 - APP sensor 1 signal circuit terminal 3 or E
 - APP sensor 2 signal circuit terminal 6 or B
5. Install a 3 A fused jumper wire between the appropriate signal circuit listed below and the 5 V reference circuit terminal 1. Verify the appropriate APP sensor voltage parameter is greater than 4.8 V.

- APP sensor 1 signal circuit terminal 3 or E
 - APP sensor 2 signal circuit terminal 6 or B
 - If less than the specified range, test the appropriate signal circuit for a short to ground or an open/high resistance. If the circuit tests normal, replace the K20 ECM.
6. If all circuits test normal, replace the B107 accelerator pedal assembly.

REPAIR PROCEDURES

Perform the **Diagnostic Repair Verification** after completing the diagnostic procedure.

- **Accelerator Pedal with Position Sensor Assembly Replacement**
- **Control Module References** for ECM replacement, programming, and setup

DTC P219A

DIAGNOSTIC INSTRUCTIONS

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC DESCRIPTOR

DTC P219A

Air Fuel Imbalance

CIRCUIT/SYSTEM DESCRIPTION

The Air Fuel Imbalance diagnostic detects a rich or lean cylinder to cylinder air/fuel ratio imbalance. The diagnostic monitors the pre-catalyst heated oxygen sensor (HO2S) signal's frequency and amplitude characteristics by calculating an accumulated voltage over a predetermined sample period. An imbalance is indicated when multiple samples of the accumulated voltage are consistently higher than the desired value.

CONDITIONS FOR RUNNING THE DTC

- DTCs P0068, P0101, P0102, P0103, P0106, P0107, P0108, P0116, P0117, P0118, P0121, P0122, P0123, P0128, P0131, P0132, P0133, P0134, P0135, P0137, P0138, P013A-P013B, P013E-P013F, P0140, P0141, P0201-P0204, P0261-P0262, P0264-P0265, P0267-P0268, P0270-P0271, P0300, P0301-P0304, P0442, P0443, P0446, P0449, P0451, P0452, P0453, P0454, P0455, P0496, P1101, P1133, P1248, P1249, P124A, P124B, P1516, P2101, P2119, P2122, P2123, P2127-P2128, P2135, P2138, P2147-P2148, P2150-P2151, P2153-P2154, P2156-P2157, P2176, P219A, P2270, P2271, P2A00 are not set.
- The device control is not active.
- The intrusive diagnostics are not active.

- The engine overspeed protection is not active.
- Reduced power mode, ETC DTC, is not active.
- The traction control is not active.
- The fuel control is in air-fuel Closed Loop.
- The system voltage is more than 10 V, or less than 32 V for more than 4 s.
- The engine coolant temperature (ECT) is greater than -20°C (-4°F).
- The engine speed is greater than 1,100 RPM, but less than 4,000 RPM.
- The mass air flow is greater than 13 g/s, but less than 600 g/s.

CONDITIONS FOR SETTING THE DTC

Multiple samples of the pre-catalyst HO2S accumulated voltage are consistently greater than the desired value.

ACTION TAKEN WHEN THE DTC SETS

DTC P219A is a Type B DTC.

CONDITIONS FOR CLEARING THE MIL/DTC

DTC P219A is a Type B DTC.

DIAGNOSTIC AIDS

- The air fuel imbalance diagnostic is very sensitive to heated oxygen sensor (HO2S) design. A non-OE sensor or an incorrect part number may set a false DTC.
- Monitoring the misfire current counters, or misfire graph, may help to isolate the cylinder that is causing the condition.

REFERENCE INFORMATION

Schematic Reference

Engine Controls Schematics

Connector End View Reference

Component Connector End Views

Electrical Information Reference

- **Circuit Testing**
- **Troubleshooting with a Test Lamp**
- **Testing for Intermittent Conditions and Poor Connections**
- **Wiring Repairs**

- **Connector Repairs**

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References for scan tool information

CIRCUIT/SYSTEM TESTING

1. Read and record the Freeze Frame/Failure Records data taking note of the speed and load at which the DTC set.
2. Diagnose any other DTCs that are set. Refer to **Diagnostic Trouble Code (DTC) List - Vehicle** .
3. With the engine idling and the transmission in the Park or Neutral position, observe the manifold absolute pressure (MAP) sensor parameter. The MAP sensor parameter should be between 20-48 kPa.
 - If the MAP sensor parameter is not between 20-48 kPa, refer to **DTC P0106** .
4. Inspect the air induction system for modified, damaged, leaking, or restricted components.
5. Inspect the crankcase ventilation system for improper operation.
6. Inspect the vacuum hoses for splits, kinks, and improper connections.
7. Test for a restricted, damaged, leaking, or modified exhaust system from the catalytic converter forward. Refer to **Symptoms - Engine Exhaust** .
8. Test the fuel injectors for improper operation. Refer to **Fuel Injector Solenoid Coil Test** .
9. Test for fuel contamination. Refer to **Alcohol/Contaminants-in-Fuel Diagnosis** .
10. Test for excessive fuel in the crankcase due to leaking injectors.
11. Test the ignition system for improper operation. Refer to **Electronic Ignition System Diagnosis** .
12. Test the engine for any mechanical conditions such as sticking valves, lifters, etc., which could alter the flow into the combustion chamber. Refer to **Symptoms - Engine Mechanical** .

REPAIR PROCEDURES

Perform the **Diagnostic Repair Verification** after completing the diagnostic procedure. Verify the repair under the same speed and load as noted in the Freeze Frame/Failure Records data recorded during testing.

DTC P2534

DIAGNOSTIC INSTRUCTIONS

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC DESCRIPTOR

DTC P2534

Ignition 1 Switch Circuit Low Voltage

DIAGNOSTIC FAULT INFORMATION

Circuit	Short to Ground	Open or High Resistance	Short to Voltage	Signal Performance
IGN Voltage	P2534	P2534	-	-

CIRCUIT/SYSTEM DESCRIPTION

The fuel pump control module monitors the ignition voltage circuit in order to determine if the voltage is within the normal operating range.

CONDITIONS FOR RUNNING THE DTC

The engine is running.

CONDITIONS FOR SETTING THE DTC

The FPCM detects that the IGN voltage is less than 6.0 V.

ACTION TAKEN WHEN THE DTC SETS

DTC P2534 is a Type A DTC.

CONDITIONS FOR CLEARING THE DTC

DTC P2534 is a Type A DTC.

REFERENCE INFORMATION

Schematic Reference

Engine Controls Schematics

Connector End View Reference

Component Connector End Views

Description and Operation

Fuel System Description

Electrical Information Reference

- **Circuit Testing**
- **Connector Repairs**
- **Testing for Intermittent Conditions and Poor Connections**
- **Wiring Repairs**

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References for scan tool information

CIRCUIT/SYSTEM TESTING

1. Verify that DTC P0562 is not set.
 - If DTC P0562 is set, refer to **Diagnostic Trouble Code (DTC) List - Vehicle** .
2. Ignition OFF, disconnect the harness connector of the K27 fuel pump control module.
3. Ignition ON, test for greater than 11 V between the IGN voltage circuit terminal 21 and ground.
 - If less than the specified voltage, test the IGN voltage circuit for a short to ground or an open/high resistance. If the circuit tests normal and the CCM/RUN/CRX fuse is open, test the voltage circuit for a short to ground. If the circuit tests normal, test or replace the Run/Crank relay.
4. If all circuits test normal, replace the K27 fuel pump control module.

REPAIR PROCEDURES

Perform the **Diagnostic Repair Verification** after completing the diagnostic procedure.

- **Relay Replacement (Attached to Wire Harness)** or **Relay Replacement (Within an Electrical Center)**
- **Control Module References** for fuel pump control module replacement, setup, and programming

DTC P2544

DIAGNOSTIC INSTRUCTIONS

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for a overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC DESCRIPTORS

DTC P2544

Transmission Torque Request Circuit

DTC P2544

Transmission Torque Request Signal Message Counter Incorrect

CIRCUIT/SYSTEM DESCRIPTION

To improve shift feel, the transmission control module (TCM) is constantly sending the engine control module (ECM) serial data messages with information regarding its request for modifying engine speed or torque. The serial data messages are sent through two circuits which are part of a communication network called the controller area network (CAN). The ECM sets DTC P2544 when it detects a discrepancy in the structure of the message causing the integrity of the message to be questioned.

An intermittent fault in the CAN circuits will cause the ECM to set DTC P2544.

CONDITIONS FOR RUNNING THE DTC

- The engine run time is greater than 0.5 s.
- No other CAN errors are present.

CONDITIONS FOR SETTING THE DTC

The ECM detects that the engine speed and torque modification messages from the TCM are either corrupted or intermittently missing for greater than 4 s.

ACTION TAKEN WHEN THE DTC SETS

- DTC P2544 is a Type B DTC.
- The TCM commands maximum line pressure during shifts, which results in harsh shifts.
- The TCM freezes adaptive functions.

CONDITIONS FOR CLEARING THE DTC

DTC P2544 is a Type B DTC.

REFERENCE INFORMATION

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

CIRCUIT/SYSTEM VERIFICATION

1. DTC P2544 is an informational DTC. Diagnose all other engine control DTCs prior to DTC P2544. Refer to **Diagnostic Trouble Code (DTC) List - Vehicle** .
2. If there are no other engine controls DTCs, diagnosis is accomplished by looking for an intermittent CAN circuit fault. Refer to **Scan Tool Does Not Communicate with High Speed GMLAN Device** .

REPAIR PROCEDURES

Perform the **Diagnostic Repair Verification** after completing the diagnostic procedure.

Control Module References for TCM replacement, setup, and programming.

DTC P2615 OR P2616

DIAGNOSTIC INSTRUCTIONS

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC DESCRIPTORS

DTC P2615

Camshaft Position Signal Output Circuit Low

DTC P2616

Camshaft Position Signal Output Circuit High

DIAGNOSTIC FAULT INFORMATION

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Camshaft Position Sensor Replicated Signal	P2615	-	P2615	-

CIRCUIT/SYSTEM DESCRIPTION

The replicated cam signal is an engine control module (ECM) output that is an electrical duplicate of the cam sensor input. This output goes to the radio for active noise control based on engine speed.

CONDITIONS FOR RUNNING THE DTC

The ignition is ON, engine running.

CONDITIONS FOR SETTING THE DTC

The ECM detects that the commanded state of the driver and the actual state of the control circuit do not match for greater than 5 s.

ACTION TAKEN WHEN THE DTC SETS

DTCs P2615 and P2616 are a Type C DTCs.

CONDITIONS FOR CLEARING THE DTC

DTCs P2615 and P2616 are a Type C DTCs.

REFERENCE INFORMATION

Schematic Reference

Active Noise Cancellation Schematics

Connector End View Reference

Component Connector End Views

Description and Operation

Active Noise Cancellation Description and Operation

Electrical Information Reference

- Circuit Testing
- Connector Repairs
- Testing for Intermittent Conditions and Poor Connections
- Wiring Repairs

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References for scan tool information

CIRCUIT/SYSTEM VERIFICATION

1. Engine Idling, observe the control circuit status parameters listed below with a scan tool:
 - Camshaft Position Signal Output Circuit High Voltage Test Status

- Camshaft Position Signal Output Circuit Low Voltage Test Status

Each parameter should display OK or Not Run.

2. Operate the vehicle within the Conditions for Running the DTC to verify the DTC does not reset. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records data.

CIRCUIT/SYSTEM TESTING

1. Ignition OFF, disconnect the harness connector at the K108 active noise cancellation module.
2. Ignition ON, radio ON, test for 5-7 V between the signal circuit terminal 5 and ground.
 - If less than specified range, test the control circuit for a short to ground or an open/high resistance. If the circuit tests normal, replace the K20 ECM.
 - If greater than specified range, test the control circuit for a short to voltage. If the circuit tests normal, replace the K20 ECM.
3. If all circuits test normal, replace the K108 active noise cancellation module.

REPAIR PROCEDURES

Perform the **Diagnostic Repair Verification** after completing the diagnostic procedure.

Control Module References for ECM or active noise cancellation module replacement, setup, and programming

DTC P2635

DIAGNOSTIC INSTRUCTIONS

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC DESCRIPTOR

DTC P2635

Fuel Pump Flow Performance

DIAGNOSTIC FAULT INFORMATION

Circuit	Short to Ground	Open or High Resistance	Short to Voltage	Signal Performance
Control	P0231	P023F	P0232	P023F, P2635
Low Reference	-	P023F	-	P023F, P2635

CIRCUIT/SYSTEM DESCRIPTION

The engine control module (ECM) supplies voltage to the fuel pump control module when the ECM detects that the ignition is on. The voltage from the ECM to the fuel pump control module remains active for 2 seconds, unless the engine is in crank or run. While this voltage is being received, the fuel pump control module closes the ground switch of the fuel pump and also supplies a varying voltage to the fuel tank pump module in order to maintain the desired fuel rail pressure.

CONDITIONS FOR RUNNING THE DTC

- DTC P018B, P018C, P018D, P0231, P0232, P023F, P064A, P1255 or P06A6 are not active.
- DTC P0641 has not failed this ignition cycle.
- Fuel pump control is enabled and the fuel pump control state is normal.
- The system voltage is greater than 11 V.
- The engine has been running for more than 30 seconds.

CONDITIONS FOR SETTING THE DTC

This DTC sets when the fuel pump control module detects a predetermined fuel pressure performance degradation between the desired fuel rail pressure and the current estimated fuel rail pressure.

ACTION TAKEN WHEN THE DTC SETS

DTC P2635 is a Type B DTC.

CONDITIONS FOR CLEARING THE DTC

DTC P2635 is a Type B DTC.

DIAGNOSTIC AIDS

Using the Failure Records data may help locate an intermittent condition. If you cannot duplicate the DTC, the information in the Failure Records can help determine how many miles since the DTC set. The Fail Counter and Pass Counter can help determine how many ignition cycles that the diagnostic test reported a pass and/or a fail.

REFERENCE INFORMATION

Schematic Reference

Engine Controls Schematics

Connector End View Reference

Component Connector End Views

Description and Operation

Fuel System Description

Electrical Information Reference

- **Circuit Testing**
- **Connector Repairs**
- **Testing for Intermittent Conditions and Poor Connections**
- **Wiring Repairs**

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References for scan tool information

CIRCUIT/SYSTEM TESTING

1. Verify that DTCs P018C, P018D, P0231, P0232, or P023F are not set.
 - If the DTC is set, refer to **Diagnostic Trouble Code (DTC) List - Vehicle**.
2. Ignition OFF, disconnect the harness connector at the G12 fuel pump.
3. Ignition ON, test for less than 5.0 ohms between the G12 fuel pump low reference circuit terminal 2 and ground.
 - If greater than the specified range, test the G12 fuel pump low reference circuit for a high resistance. If the circuit tests normal, replace the K27 fuel pump control module.
4. Ignition OFF, install a test lamp between the control circuit terminal 1 and the low reference circuit terminal 2.
5. Ignition ON, command the Fuel Pump Relay ON and OFF with a scan tool. The test lamp should turn ON and OFF when changing between the commanded states.
 - If the test lamp is always ON, test the control circuit for a short to voltage. If the circuit tests normal, replace the K27 fuel pump control module.
 - If the test lamp is always OFF, test the control circuit for a short to ground or an open/high resistance. If the circuit tests normal, replace the K27 fuel pump control module.
6. Perform the **Fuel System Diagnosis** to verify proper fuel pressure.
 - If the fuel pressure is not normal, replace the G12 fuel pump
7. If all circuits test normal, replace the K27 fuel pump control module.

REPAIR PROCEDURES

Perform the **Diagnostic Repair Verification** after completing the diagnostic procedure.

- **Fuel Tank Fuel Pump Module Replacement**

- **Control Module References** for fuel pump control module replacement, setup, and programming

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