

2010 ENGINE PERFORMANCE**Engine Controls and Fuel - 2.8L, 3.0L, 3.2L, or 3.6L - Camaro****SYMPTOMS - ENGINE CONTROLS****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.

SYMPTOMS DESCRIPTION

Driveability symptoms do not set DTCs. The driveability symptoms are defined below. Certain conditions can cause multiple symptoms. These conditions are listed together. Additional conditions that may only cause certain symptoms are listed separately. Perform the Symptoms Testing before using the Additional Symptoms Tests.

SYMPTOMS DEFINITION**Backfire**

Fuel ignites in the intake manifold or in the exhaust system, making a loud popping noise.

Cuts Out, Misses

A steady pulsation or jerking that follows engine speed, which is usually more pronounced as the engine load increases. This condition is not normally felt above 1500 RPM or 48 km/h (30 mph). The exhaust has a steady spitting sound at idle or at low speed.

Detonation/Spark Knock

A mild to severe ping which usually occurs worse while under acceleration. The engine makes sharp metallic knocks that change with throttle opening.

Dieseling, Run-On

Fuel ignites in the intake manifold or in the exhaust system, making a loud popping noise.

Hard Start

Engine cranks OK, but does not start for a long time. The vehicle does eventually run, or may start but immediately stalls.

Hesitation, Sag, Stumble

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Momentary lack of response as the accelerator is pushed down. This condition can occur at any vehicle speed. This condition is usually more pronounced when first trying to make the vehicle move, as from a stop. This condition may cause the engine to stall in severe conditions.

Lack of Power, Sluggishness, or Sponginess

The engine delivers less than expected power. Little or no increase in speed when the accelerator pedal is pushed down part way.

Poor Fuel Economy

Fuel economy, as measured by an actual road test, is noticeably lower than expected. Also, the fuel economy is noticeably lower than it was on this vehicle at one time, as previously shown by an actual road test.

Poor Fuel Fill Quality

Difficulty when refueling the vehicle.

Rough, Unstable, or Incorrect Idle and Stalling

The engine runs unevenly at idle. If severe, the engine or the vehicle may shake. Engine idle may vary in speed. Either condition may be severe enough to stall the engine.

Surges/Chuggles

Engine power variation under steady throttle or cruise. Feels like the vehicle speeds up and slows down with no change in the accelerator pedal position.

SYMPTOMS VERIFICATION

- The engine control module (ECM) and the malfunction indicator lamp (MIL) are operating correctly.
- There are no DTCs stored.
- The scan tool data is within the normal operating range.
- Bulletins are not available for the current symptom.
- The ECM grounds are clean, tight, and in the correct locations.
- The vehicle tires are correctly inflated and meet original equipment specifications.
- The air filter element is not restricted.
- If equipped, inspect the hydro-carbon (HC) absorber in the air cleaner assembly for ruptures that would leak charcoal into the air intake, contaminating the sensing element of the mass air flow (MAF) sensor.

SYMPTOMS TESTING

1. Test for the following conditions:
 - The fuel system for the following:

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- Correct fuel pressure-Refer to **Fuel System Diagnosis**.
- Fuel injectors that are leaking or improper operation-Refer to **Fuel Injector Solenoid Coil Test**.
- Contaminated or a poor fuel quality condition-Refer to **Alcohol/Contaminants-in-Fuel Diagnosis (with Special Tool)** or **Alcohol/Contaminants-in-Fuel Diagnosis (without Special Tool)**.
- The ignition system for the following:
 - Spark plugs for incorrect heat range or an abnormal condition-Refer to **Spark Plug Inspection**.
 - For diagnosis of coolant or oil fouled spark plugs-Refer to **Loss of Coolant** or **Oil Consumption Diagnosis**.
 - Wet down the secondary ignition system with water from a spray bottle. Wetting down the secondary ignition system may help locate damaged or deteriorated components. Look/listen for arcing or misfiring as the water is applied.
 - Weak spark using the **J 26792** Spark Tester-Refer to **Electronic Ignition System Diagnosis**.
- The operation of the transmission torque converter clutch (TCC)-The scan tool should indicate an engine speed drop when the TCC is commanded ON.
- The operation of the A/C compressor
- Items that can cause an engine to run lean or rich-Refer to **DTC P2177, P2179, P2187, or P2189 (LLT)**.
- The crankshaft position (CKP) sensor for an intermittent condition-Observe the scan tool CKP Resync parameter. The Resync parameter should remain at 0 during all operating conditions, and when moving the related harnesses and connectors between the CKP sensor and the ECM.
- The engine for the following mechanical failures-Refer to **Symptoms - Engine Mechanical**.
 - Excessive oil in the combustion chamber or leaking valve seals
 - Incorrect cylinder compression
 - Sticking or leaking valves
 - Worn camshaft lobes
 - Incorrect valve timing
 - Broken valve springs
 - Excessive carbon buildup in the combustion chambers-Clean the chambers with top engine cleaner. Follow the instructions on the can.
 - Incorrect engine parts
- Vacuum hoses for splits or kinks
- Knock sensor (KS) system for excessive spark retard activity-Observe the Knock Retard parameter for activity greater than 0°.
- The exhaust system components for the following:
 - Physical damage or possible internal failure
 - The three-way catalytic converters for a restriction

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For more information, refer to **Symptoms - Engine Exhaust** .

- Electromagnetic interference (EMI) on an ignition control circuit can cause a misfire condition. You can usually detect EMI with a scan tool by monitoring the engine speed parameter. A sudden increase in the engine speed parameter with little change in actual engine speed indicates that EMI is present. Inspect the high voltage components near the ignition control circuits if a condition exists.
- Inspect the positive crankcase ventilation (PCV) system and all connections for leaks or restrictions.
- Evaporative emission (EVAP) canister purge solenoid that is stuck open
- The engine cooling system for the following conditions:
 - The thermostat is the correct heat range-Refer to **Thermostat Diagnosis** .
 - Proper engine coolant level-Refer to **Cooling System Draining and Filling (LS3, L99 Static Fill)** or **Cooling System Draining and Filling (LLT Static Fill)** or **Cooling System Draining and Filling (GE 47716)** .

2. If the above conditions do not address the symptom, refer to the additional symptoms tests.

ADDITIONAL SYMPTOMS TESTS

Detonation/Spark Knock

Test the engine for an overheating condition. Refer to **Engine Overheating** .

Poor Fuel Economy

Inspect for foreign material accumulation in the throttle bore, and for carbon deposits on the throttle plate and shaft. Also inspect for throttle body tampering.

Rough, Unstable, or Incorrect Idle and Stalling

Inspect the engine mounts. Refer to **Engine Mount Inspection** .

Surges/Chuggles

Test the heated oxygen sensors (HO2S). The HO2S should respond quickly to a change in throttle position. If the HO2S do not respond to different throttle positions, inspect for contamination from fuel, silicon, or the incorrect use of RTV sealant. The sensors may have a white powdery coating and result in a high, but false, signal voltage, which gives a rich exhaust indication. The ECM reduces the amount of fuel delivered to the engine, causing a driveability condition.

Hard Start

- Test the engine coolant temperature (ECT) sensor. Compare the ECT sensor value to the intake air temperature (IAT) sensor value on a cold engine. The ECT and IAT sensor values should be within $\pm 3^{\circ}\text{C}$ (5°F). If the ECT sensor is out of range with the IAT sensor, test the resistance of the ECT sensor. Refer

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to **Temperature Versus Resistance - Engine Coolant Temperature Sensor** for resistance specifications. Replace the ECT sensor if the resistance is not within specification. Refer to **Engine Coolant Temperature Sensor Replacement** . If the sensor is within the specification, test the ECT circuits for a high resistance.

- Test the fuel pump operation. The fuel pump should turn ON for 2 s when the ignition is turned ON. Refer to **Fuel System Diagnosis**.

Hesitation, Sag, Stumble

- Test the fuel pressure. Refer to **Fuel System Diagnosis**.
- Test the generator. Refer to **Symptoms - Engine Electrical** . Repair the charging system if the generator output voltage is less than 9 V or more than 16 V.

Poor Fuel Economy

- Heavy loads being carried or towed
- Acceleration rate too much or too often
- Inspect for foreign material accumulation in the throttle bore, and for carbon deposits on the throttle plate and shaft. Also inspect for throttle body tampering.

POOR FUEL FILL QUALITY

Problem	Causes
DEFINITION: During the fueling process a continual, occasional or no fuel nozzle shut-off condition has occurred.	
Difficult to fill	<ul style="list-style-type: none">• Fuel fill limiter vent valve stuck closed• Evaporative emission (EVAP) canister restricted• EVAP vent valve stuck closed• Hose between canister and canister vent solenoid twisted or kinked if applicable• High fuel temperature• Fuel filler hose is kinked• Faulty dispensing nozzle• Ignition switch ON, vent valve closed
Over fill	<ul style="list-style-type: none">• Fill limiter vent valve stuck open or leaking• Fuel inlet check valve stuck open
Pre-mature shut-off of the fuel dispensing nozzle occurs immediately after engaging dispensing nozzle, tank empty	<ul style="list-style-type: none">• Restricted vapor lines or fuel fill pipe• High fuel temperature• Inlet check valve at tank stuck closed, fill pipe full of fuel• Fuel tank full, gauge not accurate
	<ul style="list-style-type: none">• Kinked, pinched or plugged lines in fuel tank vent system

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Pre-mature shut-off of the fuel dispensing nozzle, more than 1/8 of tank capacity dispensed	<ul style="list-style-type: none">• EVAP vent valve stuck closed or restricted• EVAP canister restricted• Fuel limiting vent valve stuck closed or obstruction at top of fuel tank
Fuel Spitback	<ul style="list-style-type: none">• Restricted EVAP canister• High fuel temperature• Ignition switch ON, EVAP vent valve closed

MALFUNCTION INDICATOR LAMP (MIL) DIAGNOSIS

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.

CIRCUIT/SYSTEM DESCRIPTION

The malfunction indicator lamp (MIL) is located on the instrument panel cluster (IPC). The MIL informs the driver that an emission system fault has occurred and that the engine control system requires service. The engine control module (ECM) monitors the MIL control circuit for conditions that are incorrect for the commanded state of the MIL. For example, a failure condition exists if the ECM detects low voltage when the MIL is commanded OFF, or high voltage when the MIL is commanded ON.

REFERENCE INFORMATION

Schematic Reference

- **Instrument Cluster Schematics**
- **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**

Scan Tool Reference

Control Module References for scan tool information

CIRCUIT/SYSTEM VERIFICATION

NOTE: **Any MIL requesting DTCs that may be set should be diagnosed first.**

1. Ignition ON, command the MIL ON and OFF with a scan tool. The MIL should turn ON and OFF as commanded.
2. Ignition ON, command the MIL ON and OFF with a scan tool while observing the following control circuit status parameters:
 - MIL Control Circuit Low Voltage Test Status
 - MIL Control Circuit Open Test Status
 - MIL Control Circuit High Voltage Test Status

Each parameter should toggle between OK and Not Run or Not Run and OK.

CIRCUIT/SYSTEM TESTING

1. If any other IPC indicators or gauges are inoperative, refer to **Instrument Cluster Gauges Inoperative**.
2. Ignition OFF, disconnect the K20 ECM harness connectors. Ignition ON, the MIL should not illuminate.
 - If the MIL is illuminated, test the MIL control circuit terminal X2-21 for a short to ground. If the circuit tests normal, replace the P16 IPC.
3. Ignition ON, connect a 3 A fused jumper wire between the MIL control circuit terminal X2-21 and ground. The MIL should illuminate.
 - If the MIL does not illuminate, test the MIL control circuit for a short to voltage, or an open/high resistance. If the circuit tests normal, replace the P16 IPC/bulb.
4. If all circuits/connections test normal, replace the K20 ECM.

REPAIR PROCEDURES

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

- **Instrument Cluster Replacement**
- **Control Module References** for ECM replacement, setup, and programming

ENGINE CRANKS BUT DOES NOT RUN

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.

CIRCUIT/SYSTEM DESCRIPTION

This Engine Cranks but Does Not Run diagnostic is an organized approach to identify a condition which causes the engine to crank but not start. This diagnostic directs the technician to the appropriate system diagnosis.

DIAGNOSTIC AIDS

Inspect for any of the following conditions:

- The Immobilizer system is not designed to have the key FOB folded 90 degrees when attempting to start the engine. This may cause an intermittent no start condition. If you receive a customer complaint of an intermittent no start condition, verify that the customer is not folding the key while attempting to start the engine. The fob must be parallel to the key to function properly.
- The engine control module (ECM) uses the camshaft position (CMP) sensors to determine engine speed and position when there is a crankshaft position (CKP) sensor condition.
- The engine will operate with a CKP sensor condition only if the ECM has stored the learned reference position of the camshafts in memory. With a CKP sensor condition in the signal circuit, the engine will go into a limp home mode after a hard restart. The ECM then calculates engine speed from one of the CMP sensors.
- The fuel pump flow control module (FPCM) controls and monitors the operation of the in-tank fuel pump. If the FPCM detects a fault, a DTC sets in the FPCM. The FPCM will then send a serial data message to the engine control module (ECM) requesting the illumination of the malfunction indicator lamp (MIL).
- Insufficient fuel can cause a no start condition. Thoroughly inspect the fuel delivery system for sufficient fuel volume to the fuel injectors. Inspect the fuel supply components for partial blockage or restrictions.
- Fuel injectors with partially blocked and restricted nozzles, or a malfunctioning solenoid, can cause a no start condition. Refer to **Fuel Injector Solenoid Coil Test**.
- There may be fuel spray at the fuel injectors and the indicated fuel pressure may be correct, yet there may not be enough fuel to start the engine. If the fuel injectors and the injector circuit are OK, and fuel spray is detected, the fuel injector ON time may be inadequate. If the engine control module (ECM) receives incorrect inputs from the various information sensors, the fuel delivered by the fuel injectors may be inadequate to start the engine. Check all the engine data parameters with a scan tool and compare the values indicated with the expected values or the values from a known good vehicle.
- Inspect the engine for good secure electrical grounds.
- Water or foreign material in the fuel can cause a no start or engine will not stay running condition. During freezing weather water can freeze inside the fuel system. The engine may start after 30 minutes in a heated repair shop. The malfunction may not recur until parked overnight in freezing temperatures. Extreme weather conditions can cause contaminated fuel to prevent the vehicle from starting.
- A vehicle that starts and runs after being brought to the repair shop for a no start condition, may have an ignition system that is susceptible to moisture. Spray water on the ignition system components and the wiring in order to check for an engine starting or will not stay running concern.

REFERENCE INFORMATION

Schematic Reference

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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

Special Tools

- **CH 48027:** Digital Pressure Gauge
- **J 26792:** Spark Tester
- For equivalent regional tools, refer to Special Tools .

CIRCUIT/SYSTEM VERIFICATION

NOTE: This diagnostic assumes the following:

- The battery is completely charged. Refer to Battery Inspection/Test .
- The engine cranking speed is acceptable. Refer to Engine Cranks Slowly .
- There is adequate fuel in the fuel tank.

1. Attempt to start the engine. Observe the DTC information with a scan tool. Verify that DTC P0116, P0118, P0119, P0335, P0336, P0338, P0513, P0601, P0602, P0603-P0606, P062B, P0627, P0628, P0629, P0633, P0685, P0690, P069E, P1631, P1649, P167D, P1682, P2105, or U0109 does not set.
 - If any of the listed DTCs are set, refer to Diagnostic Trouble Code (DTC) List - Vehicle .
2. Ignition ON, observe the Theft Deterrent parameter with a scan tool. The parameter should display Disabled.
 - If Enabled is displayed, refer to Diagnostic Trouble Code (DTC) List - Vehicle .
3. Test the ignition system for spark. Refer to Electronic Ignition System Diagnosis.

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4. Ignition ON, command the fuel pump ON with a scan tool. You should hear the fuel pump turn ON.
 - If the fuel pump does not turn ON, refer to **Fuel System Diagnosis**.
5. Ignition OFF, install the **CH 48027**: Digital Pressure Gauge.

NOTE:

- The fuel pump may need to be commanded ON a few times, in order to obtain the highest possible fuel pressure.
- Do NOT start the engine for this test.

6. Ignition ON, command an increase in the fuel line pressure with a scan tool. The fuel line pressure should increase to greater than 410 kPa (60 psi) as commanded.
 - If the fuel pressure is not within range, refer to **Fuel System Diagnosis**.
7. Verify that the following conditions do not exist:
 - Disconnect the MAF sensor. The engine control module (ECM) will ignore the MAF sensor and default to the calculated air flow.
 - If disconnecting the MAF sensor corrects the condition and the connections are OK, replace the B75 MAF sensor. Refer to **Mass Airflow Sensor with Intake Air Temperature Sensor Replacement**.
8. Collapsed air intake duct to the throttle body
9. Restricted air filter element
10. Spark plugs for being gas or coolant fouled
11. A skewed engine coolant temperature (ECT) sensor-Refer to **Temperature Versus Resistance - Engine Coolant Temperature Sensor**.
12. Exhaust system restricted-Refer to **Restricted Exhaust**.
13. Fuel contamination-Refer to **Alcohol/Contaminants-in-Fuel Diagnosis (with Special Tool)** or **Alcohol/Contaminants-in-Fuel Diagnosis (without Special Tool)**.
14. Engine mechanical condition, for example, worn timing chain and gears, low compression-Refer to **Symptoms - Engine Mechanical**.
 - If you find any of the above conditions, repair as necessary.

REPAIR PROCEDURES

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

FUEL PUMP ELECTRICAL CIRCUIT DIAGNOSIS

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.

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DIAGNOSTIC FAULT INFORMATION

Circuit	Short to Ground	Open or High Resistance	Short to Voltage	Signal Performance
Fuel Pump High Signal	P0231	P023F	P0232	P023F, P2635
Fuel Pump Low Signal	-	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 two 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.

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 VERIFICATION

Ignition ON, command the fuel pump ON and OFF using the scan tool ECM output control. The fuel pump should turn on and off.

CIRCUIT/SYSTEM TESTING

1. Ignition OFF, disconnect the harness connector at the G12 fuel pump.
2. Connect a test lamp between the control circuit terminal 1 and ground.
3. Ignition ON, command the G12 fuel pump ON and OFF using a scan tool ECM fuel pump output control. The test lamp should turn ON and OFF, as commanded.
 - 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.
4. Ignition OFF, connect a test lamp between the control circuit terminal 1 and the low reference circuit terminal 2.
5. Ignition ON, command the G12 fuel pump ON using a scan tool. The test lamp should illuminate.
 - If the test lamp does not illuminate, test the low reference circuit terminal 1 for a short to voltage or an open/high resistance. If the circuit tests normal, replace the K27 fuel pump control module.
6. If all circuits test normal, replace the G12 fuel pump.

REPAIR PROCEDURES

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

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

FUEL SYSTEM DIAGNOSIS

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.

CIRCUIT/SYSTEM DESCRIPTION

The fuel system is an electronic returnless on-demand design. A returnless fuel system reduces the internal temperature of the fuel tank by not returning hot fuel from the engine to the fuel tank. Reducing the internal temperature of the fuel tank results in lower evaporative emissions.

An electric turbine style fuel pump attaches to the primary fuel pump module inside the fuel tank. The fuel pump supplies fuel through the fuel feed pipe to the high pressure fuel pump. The high pressure fuel pump supplies fuel to a variable-pressure fuel rail. Fuel enters the combustion chamber through precision multi-hole fuel injectors. The high pressure fuel pump, fuel rail pressure, fuel injection timing, and injection duration are

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controlled by the engine control module (ECM).

The primary fuel pump module also contains a primary jet pump and a secondary jet pump. Fuel pump flow loss, caused by vapor expulsion in the pump inlet chamber, is diverted to the primary jet pump and the secondary jet pump through a restrictive orifice located on the pump cover. The primary jet pump fills the reservoir of the primary fuel pump module. The secondary jet pump creates a venturi action which causes the fuel to be drawn from the secondary side of the fuel tank, through the fuel transfer pipe, to the primary side of the fuel tank.

REFERENCE INFORMATION

Description and Operation

Fuel System Description

Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information

Special Tools

- **CH 48027:** Digital Pressure Gauge
- **J 37287:** Fuel Line Shut-off Adapter

CIRCUIT/SYSTEM VERIFICATION

NOTE:

- Repair all fuel system related DTCs before performing this diagnostic.
- Inspect the fuel system for damage or external leaks before proceeding.
- Verify that adequate fuel is in the fuel tank before proceeding.
- The Fuel Pump Enable may need to be commanded ON a few times in order to obtain the highest possible fuel pressure.
- Before proceeding with this test review the User Manual CH 48027-5 for Safety Information and Instructions.

1. Ignition OFF, all accessories OFF, install a **CH 48027:** Gauge. Refer to Fuel Pressure Gauge Installation and Removal .

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NOTE: High fuel pressure readings may result due to hot soak fuel boiling. With the engine OFF, the fuel pressure may increase to the setting of the pressure relief regulator valve, approximately 580 kPa (84 psi).

2. Ignition ON, engine OFF, command the Fuel Pump Enable ON with a scan tool. Verify the fuel pressure is between 276-448 kPa (40-65 psi) and does not decrease more than 34 kPa (5 psi) in 1 min.
3. Engine idling at normal operating temperature, verify the scan tool Fuel Pump Control Module Fuel Pressure Sensor parameter is between 276-324 kPa (40-47 psi).

CIRCUIT/SYSTEM TESTING

NOTE:

- The Fuel Pump Enable may need to be commanded ON a few times in order to obtain the highest possible fuel pressure.
- DO NOT start the engine.
- High fuel pressure readings may result due to hot soak fuel boiling. With the engine OFF, the fuel pressure may increase to the setting of the pressure relief regulator valve, approximately 580 kPa (84 psi).

1. Ignition ON, engine OFF, command the Fuel Pump Enable ON with a scan tool and observe the fuel pressure gauge while the fuel pump is operating. Verify the fuel pressure is between 276-448 kPa (40-65 psi).
 - If the fuel pressure is less than the specified range, test, inspect, and repair the items listed below. If all items test normal, replace the primary fuel pump module.
 - Restricted fuel feed pipe
 - Inspect the harness connectors and the ground circuits of the fuel pump for poor connections.
2. Verify that the fuel pressure does not decrease more than 34 kPa (5 psi) in 1 min.
 - If the fuel pressure decreases more than the specified value, perform the following procedure:
 1. Ignition OFF, relieve the fuel pressure. Refer to **Fuel Pressure Relief**.
 2. Install the **J 37287**: Adapter between the chassis fuel feed hose and the engine compartment fuel feed pipe.
 3. Open the valve on the **J 37287**: Adapter.
 4. Ignition ON, command the Fuel Pump Enable ON with a scan tool and bleed the air from the **CH 48027**: Gauge.
 5. Command the Fuel Pump Enable ON and then OFF with a scan tool.
 6. Close the valve on the **J 37287**: Adapter.
 7. Monitor the fuel pressure for 1 min.
 - If the fuel pressure does not decrease more than 34 kPa (5 psi) within the specified time, replace the primary fuel pump module.
3. Relieve the fuel pressure to 69 kPa (10 psi). Verify that the fuel pressure does not decrease more than 14 kPa (2 psi) in 5 min.
 - If the fuel pressure decreases more than the specified value, replace the primary fuel pump module.

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4. Operate the vehicle within the conditions of the customer's concern while monitoring the fuel pressure with the **CH 48027**: Gauge. The fuel pressure should not drop off during acceleration, cruise or hard cornering.
 - If the fuel pressure drops off, test, inspect, and repair the items listed below. If all items test normal, replace the primary fuel pump module.
 - Restricted fuel feed pipe
 - Inspect the harness connectors and the ground circuits of the fuel pump for poor connections
5. If the fuel system tests normal, refer to **Symptoms - Engine Controls**.

REPAIR PROCEDURES

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

- **Fuel Feed Pipe Replacement**
- **Fuel Line Replacement - Chassis**
- **Fuel Tank Fuel Pump Module Replacement - Right Side**

FUEL INJECTOR SOLENOID COIL TEST

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.

CIRCUIT/SYSTEM DESCRIPTION

The engine control module (ECM) supplies a separate high voltage supply circuit and a high voltage control circuit for each fuel injector. The injector high voltage supply circuit and the high voltage control circuit are both controlled by the ECM. The ECM energizes each fuel injector by grounding the control circuit. The ECM controls each fuel injector with 65 V. This is controlled by a boost capacitor in the ECM. During the 65 V boost phase, the capacitor is discharged through an injector, allowing for initial injector opening. The injector is then held open with 12 V. A fuel injector coil winding resistance that is too high or too low will affect the engine driveability. The fuel injector coil windings are affected by temperature. The resistance of the fuel injector coil windings will increase as the temperature of the fuel injector increases.

REFERENCE INFORMATION

Schematic Reference

Engine Controls Schematics

Electrical Information Reference

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

COMPONENT TESTING

NOTE:

- The resistance test must be performed at the fuel injector or mis-diagnosis will occur.
- The DMM and test leads must be calibrated to 0 ohms in order to prevent mis-diagnosis.

Verify the resistance of each Q17 fuel injector with one of the following methods:

- If the engine coolant temperature (ECT) sensor is between 10-32°C (50-90°F), the resistance of each Q17 fuel injector should be 1.25-1.75 ohms.
 - If not within the specified range, replace the Q17 fuel injector.
- If the ECT sensor is not between 10-32°C (50-90°F), measure and record the resistance of each Q17 fuel injector with a DMM. Subtract the lowest resistance value from the highest resistance value. The difference between the lowest value and the highest value should be equal to or less than 0.45 ohms.
 - If the difference is more than 0.45 ohms, add all of the fuel injector resistance values to obtain a total resistance value. Divide the total resistance value by the number of fuel injectors to obtain an average resistance value. Subtract the lowest individual fuel injector resistance value from the average resistance value. Compute the difference between the highest individual fuel injector resistance value and the average resistance value. Replace the Q17 fuel injector that displays the greatest difference above or below the average.

REPAIR PROCEDURES

Perform the Diagnostic Repair Verification after completing the diagnostic procedure.

Fuel Injector Replacement

ALCOHOL/CONTAMINANTS-IN-FUEL DIAGNOSIS (WITH SPECIAL TOOL)

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.

DESCRIPTION

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Water contamination in the fuel system may cause driveability conditions such as hesitation, stalling, no start, or misfires in one or more cylinders. Water may collect near a single fuel injector at the lowest point in the fuel injection system, and cause a misfire in that cylinder. If the fuel system is contaminated with water, inspect the fuel system components for rust or deterioration.

Ethanol concentrations of greater than 10 percent can cause driveability conditions and fuel system deterioration. Fuel with greater than 10 percent ethanol could result in driveability conditions such as hesitation, lack of power, stalling, or no start. Excessive concentrations of ethanol used in vehicles not designed for it may cause fuel system corrosion, deterioration of rubber components, and fuel filter restriction.

TEST PROCEDURE

1. Test the fuel composition using **J 44175** Fuel Composition Tester and J44175-3 Instruction Manual. See **Special Tools** .
2. If water appears in the fuel sample clean the fuel system, refer to **Fuel System Cleaning** .
3. Subtract 50 from the reading on the DMM in order to obtain the percentage of alcohol in the fuel sample. Refer to the examples in the Fuel Composition Test Examples table.
4. If the fuel sample contains greater than 15 percent ethanol, add fresh, regular gasoline to the vehicle's fuel tank.
5. Test the fuel composition.
6. If testing shows the ethanol percentage is still greater than 15 percent, replace the fuel in the vehicle. Refer to **Fuel Tank Draining** .

Fuel Composition Test Examples

-	Frequency (Hz)	Subtract 50	Ethanol Percent
Example A	50 Hz	-50	0
Example B	65 Hz	-50	15
Example C	129 Hz	-50	79

ALCOHOL/CONTAMINANTS-IN-FUEL DIAGNOSIS (WITHOUT SPECIAL TOOL)

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.

DESCRIPTION

Water contamination in the fuel system may cause driveability conditions such as hesitation, stalling, no start, or misfires in one or more cylinders. Water may collect near a single fuel injector at the lowest point in the fuel rail, and cause a misfire in that cylinder. If the fuel system is contaminated with water, inspect the fuel system components for rust, or deterioration.

Alcohol concentrations greater than 10 percent in the fuel can be detrimental to fuel system components. Alcohol contamination may cause fuel system corrosion, deterioration of rubber components, and subsequent fuel filter restriction. Fuel contaminated with alcohol may cause driveability conditions such as hesitation, lack of power, stalling, or no start. Some types of alcohol are more detrimental to fuel system components than others.

ALCOHOL IN FUEL TESTING PROCEDURE

The fuel sample should be drawn from the bottom of the tank so that any water present in the tank will be detected. The sample should be bright and clear. If alcohol contamination is suspected then use the following procedure to test the fuel quality.

1. Using a 100 ml (3.38 oz) specified cylinder with 1 ml (0.34 oz) graduation marks, fill the cylinder with fuel to the 90 ml (3.04 oz) mark.
2. Add 10 ml (0.34 oz) of water in order to bring the total fluid volume to 100 ml (3.38 oz) and install a stopper.
3. Shake the cylinder vigorously for 10-15 seconds.
4. Carefully loosen the stopper in order to release the pressure.
5. Re-install the stopper and shake the cylinder vigorously again for 10-15 seconds.
6. Put the cylinder on a level surface for approximately 5 minutes in order to allow adequate liquid separation.

If alcohol is present in the fuel, the volume of the lower layer, that now contains both alcohol and water, will be greater than 10 ml (0.37 oz). For example, if the volume of the lower layer is increased to 15 ml (0.51 oz), this indicates at least 5 percent alcohol in the fuel. The actual amount of alcohol may be somewhat more because this procedure does not extract all of the alcohol from the fuel.

PARTICULATE CONTAMINANTS IN FUEL TESTING PROCEDURE

The fuel sample should be drawn from the bottom of the tank so that any contaminants present in the tank will be detected. The sample should be bright and clear. If the sample appears cloudy or contaminated with water as indicated by a water layer at the bottom of the sample, use the following procedure to diagnose the fuel.

1. Using an approved fuel container, draw approximately 0.5 liter (0.53 qt) of fuel.
2. Place the cylinder on a level surface for approximately 5 minutes in order to allow settling of the particulate contamination.

Particulate contamination will show up in various shapes and colors. Sand will typically be identified by a white or light brown crystals. Rubber will appear as black and irregular particles. If particles are found, clean the entire fuel system thoroughly. Refer to **Fuel System Cleaning**.

EVAPORATIVE EMISSION SYSTEM DIAGNOSIS

OPERATING INSTRUCTIONS FOR THE EVAPORATIVE EMISSION SYSTEM TESTER (EEST)

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Vehicle Setup

NOTE: A large difference between the vehicle temperature and shop temperature will seriously affect the accuracy of the tests. Always allow enough time, at least 15 minutes, for the vehicle temperature to adjust to the shop temperature. Refer to Temperature Variation Instructions for more information about vehicle versus shop temperatures.

1. Engine OFF, open the hood. Position a large fan to blow air under the vehicle onto the fuel tank area.
2. Connect the red battery clip from the tester to the positive battery terminal.

NOTE: The vehicle battery must be fully charged for optimum tester performance.

3. Connect the black battery clip from the tester to chassis ground.

FLOWMETER TEST - LEAK DETECTION

1. Open the Nitrogen tank valve and turn the NITROGEN/SMOKE valve on the front control panel to NITROGEN.
2. Connect the hose to the correct test orifice on the bottom front of the tester. For orifice size, refer to the GM Service manual for the vehicle being tested. The vehicle specific information can be found in service procedures for DTCs that relate to evaporative emission (EVAP) system leaks.
3. Press and release the remote switch to activate the tester.
4. Position the sliding red flag on the flowmeter to align with the floating indicator. When the red flag is set, press and release the remote switch to deactivate the tester.
5. Remove the hose from the test orifice and install the hose onto the vehicle. For proper connection location, and the special tool numbers for any adapters that may be required, refer to the service procedures for DTCs that relate to EVAP system leaks.
6. Ignition ON, seal the EVAP system per instructions in the service procedures for DTCs that relate to EVAP system leaks. Most systems can be sealed using a scan tool output control for the EVAP canister vent solenoid valve, other systems require that the vent system be plugged.

NOTE:

- Larger volume fuel tanks, and/or those with lower fuel levels, may require several minutes to fill with nitrogen.
- Static buildup may cause the float indicator to stick. It may be necessary to tap on the flowmeter to free up the float.

7. Press and release the remote switch to activate the nitrogen flow and fill the system.
8. Compare the stable floating indicator position to the red flag.
 - ABOVE the red flag, the result is UNACCEPTABLE, FAIL-Go to Smoke Procedure
 - BELOW the red flag, the result is ACCEPTABLE, PASS-Test complete
9. Press and release the remote switch to deactivate the tester.

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SMOKE PROCEDURE - LOCATE THE LEAK

NOTE: It is not recommended to use the tester in an outside repair bay area because wind and sunlight may affect temperature and your ability to see the smoke.

1. Turn OFF any fans that may cause air movement around or near the vehicle.

NOTE: Completely unwind the nitrogen/smoke hose from the bracket to optimize the tester's performance.

2. Connect the nitrogen/smoke hose to the vehicle as directed in the service procedures. Some vehicles require that the nitrogen/smoke hose be connected at the front of the EVAP system at the EVAP service port. An adapter may be necessary. Other vehicles require the connection be made at the rear of the system using an adapter at the fuel fill cap. Consult the service procedures for DTCs that relate to evaporative emission (EVAP) system leaks for vehicle specific instructions regarding connection location and adapters.
3. Open the nitrogen tank valve and turn the NITROGEN/SMOKE valve on the control panel to SMOKE.

NOTE: The remote switch operates in a push ON, push OFF fashion.

4. Press and release the remote switch to activate the tester and inject smoke into the EVAP system.
5. Verify smoke has filled the EVAP system by opening the system opposite the end where smoke is injected. When injecting smoke at the service port, remove the fuel fill cap, or temporarily leave the EVAP canister vent valve open, until smoke is observed. Then close the system and continue testing. If using a special tool fuel fill cap adapter at the filler neck, vent the system at the service port until smoke is observed then close the system to continue with the test.

NOTE: Inject smoke in less than 2-minute cycles for optimum tester performance.

6. Press and release the remote switch to deactivate the tester.

NOTE: For optimum visual smoke performance, deactivate the smoke flow and allow the system pressure to drop. Allowing the smoke to exit small holes at a low flow rate greatly enhances visibility.

7. Introduce smoke into the system for an additional 60 seconds. Continue introducing smoke at 15-second intervals, as necessary.
8. Using the a high-intensity white light, inspect the entire EVAP system path, and look for the source of the leak indicated by the exiting smoke. Introduce smoke at 15-second intervals, as needed, until leak source is identified.

TEMPERATURE VARIATION INSTRUCTIONS

The Concern

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Ideal circumstances for conducting the EVAP Flowmeter Test require equal temperatures between the nitrogen gas and the vehicle EVAP system. Significant differences in temperature between them can result in a flow or pressure change during testing, causing misleading results. Typically, the Evaporative Emissions System Tester is stored indoors, approximately 21°C (70°F). Vehicles brought in for diagnosis may have an EVAP system at significantly different temperatures -40 to +43°C (-40 to +110°F).

For Example

NOTE: **With no temperature difference between the nitrogen gas and EVAP system, the resulting vehicle EVAP system pressure will remain stable at 13 inches H2O once pressurized, providing no leaks are present.**

When the EVAP Flowmeter Tests are performed with significant differences in temperature between the nitrogen gas and the vehicle EVAP system, the following results can occur:

- An increase in flow during the flowmeter test can be caused by a vehicle's warm EVAP system cooling down.
- A decrease in flow during the flowmeter test can be caused by a vehicle's cool EVAP system warming up.

The Solution

When working on a vehicle with significant temperature differences between the vehicle EVAP system and the nitrogen gas, allow the vehicle EVAP system temperature to stabilize as close as possible to the temperature of the nitrogen gas before conducting the Flowmeter Test.

ELECTRONIC IGNITION SYSTEM DIAGNOSIS

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.

CIRCUIT/SYSTEM DESCRIPTION

The ignition system on this engine uses individual ignition coils and ignition control (IC) circuits for each cylinder. Ignition voltage is supplied to each bank of ignition coils. The engine control module (ECM) controls the ignition system operation. The ECM controls each coil using the IC circuits. The ECM commands the IC circuit low when a spark event is requested. The sequencing and timing are controlled by the ECM.

DIAGNOSTIC AIDS

- The ignition coils for each bank are fused separately. If a fuse opens or the ignition voltage circuit opens between the fuse and the splice, all the ignition coils for one bank of the engine would be inoperative. If the ground circuit opens at the engine block, the ignition coils would be inoperative for one bank of the engine.

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- Inspect the ignition coils for aftermarket devices. An aftermarket device connected to the ignition coil circuits, may cause a condition with the ignition coils.

REFERENCE INFORMATION

Schematic Reference

Engine Controls Schematics

Description and Operation

Electronic Ignition System Description

Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information

Special Tools

- **J 26792** Spark Tester. See Special Tools .
- **J 43244** Relay Puller Pliers. See Special Tools .

CIRCUIT/SYSTEM TESTING

NOTE: **Do not perform this diagnostic procedure if you were not sent here from a misfire DTC or the Engine Cranks but Does Not Run diagnostic.**

1. Ignition OFF, disconnect the harness connector of the T8 ignition coil.
2. Ignition ON, load test for battery voltage between the ignition voltage circuit terminal D and ground.
 - If less than B+, test the ignition voltage circuit for a short to ground or an open/high resistance. If the circuit tests normal and the ignition circuit fuse is open, test all the components connected to the ignition voltage circuit and replace as necessary.
3. Crank or start the engine. Test for 200-400 mV between the appropriate IC circuit terminal C and ground.
 - If less than the specified value, test the IC circuit for a short to ground or an open/high resistance. If the circuit/connection tests normal, replace the K20 ECM.
 - If greater than the specified value, test the IC circuit for a short to voltage. If the circuit/connection tests normal, replace the K20 ECM.

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4. Connect a test lamp between the each of the ground circuits terminal A, and terminal B, and B+. The test lamp should illuminate on each circuit.
 - If the test lamp does not illuminate, test the suspected circuit for an open/high resistance.
5. If all circuits/connections test normal, replace the T8 ignition coil.

REPAIR PROCEDURES

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

- **Ignition Coil Replacement - Bank 1**
- **Ignition Coil Replacement - Bank 2**

INSPECTION/MAINTENANCE SYSTEM CHECK

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.

DESCRIPTION

Several states require that a vehicle pass on-board diagnostic (OBD) system tests and the inspection/maintenance (I/M) emission inspection in order to renew license plates. This is accomplished by viewing the I/M System Status display on a scan tool. Using a scan tool, the technician can observe the I/M System Status in order to verify that the vehicle meets the criteria that complies with the local area requirements. While testing in the I/M System Status mode, some DTCs may occur that are called I/M Test DTCs. An I/M Test DTC is defined as a fault code that is currently commanding the MIL ON, and is stored in non-volatile memory. The intended use of this data is to prevent vehicles from passing I/M inspection without proper repair to the vehicle. These fault codes are not erasable from any scan tool command or erasable by disconnecting power to the controller. The I/M Test DTCs will be supported by all emissions related ECUs such as ECMs, TCMs, FPCMs, etc. An I/M Test DTC will not be stored or erased from the ECU except at the end of trip processing which occurs 5 s after ignition OFF.

CONDITIONS FOR UPDATING THE I/M SYSTEM STATUS

Each system requires at least one, and sometimes several, diagnostic tests. The results of these tests are reported by a diagnostic trouble code (DTC). A system monitor is complete when either all of the DTCs comprising the monitor have Run and Passed, or any one of the DTCs comprising the monitor have illuminated the malfunction indicator lamp (MIL). Once all of the tests are completed, the I/M System Status display will indicate YES in the Completed column.

For example, when the HO2S Heater Status indicates YES, either all of the oxygen sensor heater tests have passed or one of the tests has illuminated the MIL. If the vehicle has four heated oxygen sensors, either all four heater circuit tests have passed or one of the heater circuit tests has illuminated the MIL. The I/M System Status

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will indicate NO under the Completed column when any of the required tests for that system have not run. The following is a list of conditions that would set the I/M System Status indicator to NO:

- The vehicle is new from the factory and has not yet been driven through the necessary drive conditions to complete the tests.
- The battery has been disconnected or discharged below operating voltage.
- The control module power or ground has been interrupted.
- The control module has been reprogrammed.
- The control module DTCs have been cleared as part of a service procedure.

CONDITIONS FOR CLEARING I/M TEST DTCS

1. Only the OBD II System can erase the I/M Test DTC. The OBD II system must determine that the malfunction that caused the I/M Test DTC to be stored is no longer present and is not commanding the MIL. Each of the following represents ways to clear an I/M Test DTC:
 - If the MIL goes out due to 3 passing drive cycles, scan tool code clear is not used, the I/M Test DTC is erased at power down of the last drive cycle.
 - If a scan tool code clear is used to turn OFF the MIL, the I/M Test DTC is not erased, the DTC must PASS and not FAIL. The I/M Test DTC is erased at power down of the drive cycle.
 - If the controller is reflashed/reprogrammed, all I/M Test DTCs are erased.
2. For the OBD II System to run a single drive cycle for clearing an I/M Test DTC, all of the following conditions must occur:
 - Cumulative time of engine run time is greater than 600 s.
 - Cumulative vehicle operation above 41 kPa (25 mph) for over 300 s.
 - Continuous vehicle idle for greater than 30 s.
 - Turn ignition OFF for 5 s and allow the code to clear.

MONITORED EMISSION CONTROL SYSTEMS

The OBD II system monitors all emission control systems that are on-board. Not all vehicles need every possible emission control system. For example, a vehicle may not be equipped with secondary air injection (AIR) or exhaust gas recirculation (EGR). The OBD II regulations require monitoring of the following; if equipped:

- The air conditioning system
- The catalytic converter efficiency
- Comprehensive component monitoring-Emission related inputs and outputs
- The evaporative emission (EVAP) system
- The fuel delivery system
- Heated catalyst monitoring
- Misfire monitoring
- The oxygen sensor system (O2S or HO2S)

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- The oxygen sensor heater system (HO2S heater)

For the specific DTCs required for each system, refer to **Inspection/Maintenance System DTC Table**.

Systems such as misfire and comprehensive components may not be listed in a system status list. These tests run continuously and do not require an I/M System Status indicator.

DIAGNOSTIC AIDS

The I/M System Status display provides an indication of when the control module has completed the required tests. This does not necessarily mean that the test has passed, only that a decision was made. If the diagnostic fails, a DTC will indicate the failure. If a failure indication is present for a DTC associated with one of the I/M regulated systems, it may prevent other required tests from running. For example, a DTC for the control circuit of the EVAP purge solenoid may not be listed in the Inspection/Maintenance System DTC Table because it is a continuous test. If this DTC is set, the Active Tests for the EVAP system may not run.

The I/M System Status information may be useful for a technician to determine if diagnostics have run when verifying repairs.

CIRCUIT/SYSTEM VERIFICATION

Review the I/M System Status indicators. All I/M System Status indicators should report YES, and no I/M Test DTCs should be present.

CIRCUIT/SYSTEM TESTING

NOTE: Many DTC related repairs will instruct the technician to clear the DTC information. Clearing the DTC will reset the I/M System Status indicators to NO. Performing the I/M Complete System Set Procedure will set each of the I/M System Status indicators to YES.

1. Observe the Engine DTC information with a scan tool. Verify no DTCs are present.
 - If a DTC is set that would prevent the I/M System Status tests from completing, diagnose that DTC before continuing. Refer to **Diagnostic Trouble Code (DTC) List - Vehicle**.
2. Review applicable service bulletins for software updates that would prevent the I/M System Status tests from completing.
 - If a control module re-program or other repair is required, perform the **Inspection/Maintenance Complete System Set Procedure**.
3. Observe the I/M System Status indicators.
 - If any I/M System Status indicators report NO, perform the **Inspection/Maintenance Complete System Set Procedure**.
4. Observe the I/M Test DTC information with a scan tool. Verify there are no I/M Test DTCs present.
 - If an I/M Test DTC is set and all of the I/M System Status indicators are Yes, there is no need to perform the Complete System Set Procedure. Diagnose the DTC using the **Diagnostic Trouble Code (DTC) List - Vehicle** and refer to Conditions for Clearing the I/M Test DTCs.

- If an I/M Test DTC is set and the I/M System Status indicators are NO, diagnosis the DTC and perform the **Inspection/Maintenance Complete System Set Procedure**.

INSPECTION/MAINTENANCE COMPLETE SYSTEM SET PROCEDURE

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.

DESCRIPTION

The purpose of the Inspection/Maintenance (I/M) complete system set procedure is to satisfy the enable criteria necessary to execute all of the I/M readiness diagnostics and complete the trips for those particular diagnostics. When all I/M monitored diagnostic tests are completed, the I/M System Status indicators are set to YES. Perform the Inspection/Maintenance (I/M) Complete System Set Procedure if any I/M System Status indicators are set to NO.

CONDITIONS FOR MEETING A COLD START

- The ignition voltage between 10 and 15 V.
- The barometric pressure (BARO) is more than 75 kPa (10.9 psi).
- The engine coolant temperature (ECT) at start-up is less than 42°C (108°F).
- The intake air temperature (IAT) is between 2-32°C (36-90°F).
- The engine is OFF for greater than 6 hours or the following conditions must be met:
 - The start-up IAT minus start-up ECT are within 12°C (22°F).
 - The start-up ECT minus start-up IAT are within 50°C (90°F).
- Fuel level is between 25 and 75 %.

CIRCUIT/SYSTEM VERIFICATION

Review the Inspection/Maintenance (I/M) System Status indicators. All I/M System Status indicators should report YES, and no I/M Test DTCs should be present.

INSPECTION/MAINTENANCE (I/M) SYSTEM SET PROCEDURE

1. Ensure that the vehicle meets the conditions for a cold start listed above.
 - If the EVAP I/M System Status indicator displays NO, perform the EVAP Service bay test if applicable.
2. Turn OFF all accessories; HVAC system, other electrical loads, including aftermarket/add-on equipment, etc., and open the hood.
3. Set the vehicle parking brake and ensure the vehicle is in park for automatic transmission or neutral for

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manual transmission.

4. Start and idle the engine for 2 min.

WARNING: Refer to Road Test Warning .

5. Close the hood, release the parking brake and Accelerate at part throttle to 72-80 km/h (45-50 mph) with this speed maintained until the engine reaches operating temperature, 8-10 min.
6. Continue operation under these conditions for an additional 6 min.
7. Accelerate at part throttle to 90 km/h (55 mph) with this speed maintained for 2 min.
8. Release the accelerator pedal for at least 10 s. This will allow the vehicle to enter the decel fuel cut off.

NOTE: Do NOT touch the accelerator pedal until told to do so. A change in TP Sensor angle or an increase in engine speed may invalidate this portion of the test.

9. Safely stop the vehicle, with the engine in drive for automatic or neutral with the clutch pedal depressed and parking brake applied for manual. Allow the vehicle to idle for 2 min.
10. Shift the vehicle to park for automatic and neutral for manual. Turn OFF the ignition and exit the vehicle. Do NOT disturb the vehicle for 45 min.
11. Observe the Inspection/Maintenance (I/M) System Status with a scan tool. All of the I/M System Status indicators should display YES.
 - If the EVAP I/M System Status indicator displays NO, turn OFF the ignition, ensure that the vehicle meets the conditions for a cold start, and repeat steps 6-11 three more times, or until the EVAP I/M System Status indicator transitions to YES. If the indicator continues to display NO, refer to the Inspection/Maintenance System DTC Table to identify the DTCs that did not run.
 - If any of the I/M System Status indicators display NO, refer to the Inspection/Maintenance System DTC Table for the indicator which did not display YES. The I/M System DTC Table identifies the DTCs associated with each I/M System Status Indicator.

NOTE: An I/M Test DTC will not be stored or erased from the ECU except at the end of trip processing, which occurs 5 s after ignition OFF.

12. Observe the I/M Test DTC information with a scan tool. Verify there are no I/M Test DTCs present.
 - If an I/M Test DTC is set, diagnose the DTC using the Diagnostic Trouble Code (DTC) List - Vehicle and refer to Inspection/Maintenance System Check.
13. Observe the engine DTC information with a scan tool. Verify no DTCs are present.
 - If a DTC is set, diagnose using the Diagnostic Trouble Code (DTC) List - Vehicle . After repairs, perform the Inspection/Maintenance Complete System Set Procedure to verify no further DTCs are set.

INSPECTION/MAINTENANCE SYSTEM DTC TABLE

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System	DTCs Required to Set System Status to YES
If an I/M System Status indicator did NOT update to YES during the <u>Inspection/Maintenance System Check</u> , review each indicator and reference this table to determine each DTC associated with the I/M System Status Indicator. Each DTC listed below has specific conditions that must be met for the diagnostic to run. Included within the conditions are additional DTCs, which if set, may inhibit the DTCs listed below from running. Reviewing and operating the vehicle within the Conditions for Running for each DTC listed below will allow the I/M System Status Indicators to transition to YES.	
Catalyst	<u>DTC P0420 or P0430</u>
EVAP	<ul style="list-style-type: none">• <u>DTC P0442</u>• <u>DTC P0446</u>• <u>DTC P0455 or P0497</u>• <u>DTC P0496</u>
Oxygen Sensor	<ul style="list-style-type: none">• <u>DTC P0130 or P0150</u>• <u>DTC P0131 or P0151</u>• <u>DTC P0132 or P0152</u>• <u>DTC P0133 or P0153 (w/LLT)</u>• <u>DTC P0137, P0138, P0140, P0157, P0158, or P0160</u>• <u>DTC P2096 or P2098</u>• <u>DTC P2097 or P2099</u>• <u>DTC P2232 or P2235</u>• <u>DTC P2270 or P2272</u>• <u>DTC P2271 or P2273</u>
Oxygen Sensor Heater	<ul style="list-style-type: none">• <u>DTC P0030, P0031, P0032, P0036, P0037, P0038, P0050, P0051, P0052, P0056, P0057, or P0058</u>• <u>DTC P0135, P0141, P0155, or P0161</u>