

2012 Buick LaCrosse AWD V6-3.6L

Vehicle > ALL Diagnostic Trouble Codes (DTC) > Testing and Inspection > P Code Charts > P0089

POWERTRAIN MANAGEMENT

DTC P0089, P00C6, P228C, or P228D

Diagnostic Instructions

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

DTC Descriptors

DTC P0089

- Fuel Pressure Regulator Performance

DTC P00C6

- Fuel Rail Pressure Low During Engine Cranking

DTC P228C

- Fuel Pressure Regulator 1 Control Performance - Low Pressure

DTC P228D

- Fuel Pressure Regulator 1 Control Performance - High Pressure

Circuit/System Description

The high fuel pressure necessary for direct injection is supplied by the high pressure fuel pump. The pump is mounted on the rear of the engine and is driven by a three-lobe cam on the Bank 2 exhaust camshaft. This pump also regulates the fuel pressure using an actuator in the form of an internal solenoid-controlled valve. In order to keep the engine running efficiently under all operating conditions, the engine control module (ECM) requests pressure ranging from 2 to 15 MPa (290 to 2176 psi), depending on engine speed and load. Output drivers in the ECM provide the pump control circuit with a 12 V pulse-width modulated (PWM) signal, which regulates fuel pressure by closing and opening the control valve at specific times during pump strokes. This effectively regulates the portion of each pump stroke that is delivered to the fuel rail. When the control solenoid is NOT powered, the pump operates at maximum flow rate. In the event of pump control failure, the high pressure system is protected by a relief valve in the pump that prevents the pressure from exceeding 17.5 MPa (2538 psi).

The fuel rail fuel pressure sensor provides the feedback necessary to the ECM to control the pump and the injectors. This sensor is diagnosed separately from the fuel pressure control system.

The ECM monitors the fuel rail fuel pressure sensor and the high pressure fuel pump actuator to determine if the commanded and actual pressures are within a predetermined range during engine cranking and at all times while the engine is running. The ECM also monitors the fuel pump actuator to make sure it is operating within expected limits.

Conditions for Running the DTC

P0089, P228C, or P228D

- * DTC P0016, P0017, P0018, P0019, P0090, P0091, P0092, P00C8, P00C9, P00CA, P0111, P0112, P0113, P0116, P0117, P0118, P0128, P0192, P0193, P0335, P0336, P0340, P0341, P0345, P0346, P0365, P0366, P0390, P0391, P0627, P0628, or P0629 is not set.
- * The ignition voltage is greater than 8 V.
- * The low side fuel pressure is greater than 275 kPa (40 psi).
- * The engine is running.
- * The DTCs run continuously when the above conditions are met for 10 s.

P00C6

- * DTC P0090, P0091, P0092, P00C8, P00C9, P00CA, P0116, P0117, P0118, P0128, P0192, P0193, P0335, P0336, P0340, P0341, P0345, P0346, P0365, P0366, P0390, P0391, P0627, P0628, P0629 are not set.
- * The ignition voltage is more than 8 V.
- * The engine coolant temperature is less than 65°C (149°F).
- * The low side fuel pressure is greater than 300 kPa (44 psi).

- * The diagnostic runs once for each engine start.

Conditions for Setting the DTC

P0089

The high pressure fuel pump has exceeded its control limits. This condition exists when the high pressure fuel pump actuator command is 0 ° or greater than 240 °. The condition exists for greater than 10 s.

P00C6

The ECM detects that the fuel rail pressure is not rising greater than 3 MPa (435 psi) or has fallen below 2 MPa (290 psi) during engine cranking, depending on initial pressure when cranking begins.

P228C

The actual fuel rail pressure is 3 MPa (435 psi) less than the desired fuel rail pressure. The condition exists for greater than 10 s.

P228D

The actual fuel rail pressure is 3 MPa (435 psi) greater than the desired fuel rail pressure. The condition exists for greater than 10 s.

Action Taken When the DTC Sets

- * DTCs P0089 and P00C6 are Type B DTCs.
- * DTCs P228C and P228D are Type A DTCs.
- * A message center or an indicator displays Reduced Engine Power for P228C and P228D.

Conditions for Clearing the DTC

- * DTCs P0089 and P00C6 are Type B DTCs.
- * DTCs P228C and P228D are Type A DTCs.

Diagnostic Aids

- * A leak in the high pressure fuel system may set a DTC.
- * A faulty valve, plunger, or solenoid in the high pressure fuel pump may set a DTC. High pressure fuel pump damage will most likely be undetectable upon visual inspection.
- * A restricted fuel feed pipe between the high pressure fuel pump and the fuel rail pressure sensor may set a DTC.
- * Any problem with the Bank 2 exhaust cam may set fuel pressure DTCs due to the location and design of the high pressure fuel pump. If DTC P0019 or P0391 are current or in history, a cam control issue may be the root cause.
- * A leaking or restricted fuel injector may set DTC P0089.
- * For DTC P00C6, park the vehicle outdoors overnight and perform a start in the morning.
- * A short to voltage in the crankshaft position signal circuit may set a DTC.
- * As little as 2 ohm on either circuit of the high pressure fuel pump actuator will cause these DTCs to set. Test the circuits of the high pressure fuel pump actuator for a high resistance if you suspect a condition.

Reference Information

Schematic Reference

Engine Controls Schematics (LFX) See: Powertrain Management > Electrical > Engine Controls Schematics

Connector End View Reference

Component Connector End Views See: Vehicle > Connector Views > Connector End Views By Name

Description and Operation

Fuel System Description See: Computers and Control Systems > Components > Fuel System Description

Electrical Information Reference

- * Circuit Testing See: Vehicle > Component Tests and General Diagnostics > Circuit Testing
- * Connector Repairs See: Vehicle > Component Tests and General Diagnostics > Connector Repairs
- * Testing for Intermittent Conditions and Poor Connections See: Vehicle > Component Tests and General Diagnostics > Testing for Intermittent Conditions and Poor Connections

* Wiring Repairs See: Vehicle > Component Tests and General Diagnostics > Wiring Repairs

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions See: A L L Diagnostic Trouble Codes (DTC) > Diagnostic Trouble Code Descriptions > Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References See: Vehicle > Programming and Relearning > Control Module References for scan tool information

Circuit/System Verification

1. Attempt to start and idle the engine.
2. Observe the DTC information with a scan tool. DTCs P0089, P00C6, P228C, and P228D should not set.

◆ If a DTC is set refer to Diagnostic Trouble Code (DTC) List - Vehicle See: A L L Diagnostic Trouble Codes (DTC) > Diagnostic Trouble Code Descriptions > Diagnostic Trouble Code (DTC) List - Vehicle.

3. Engine idling, observe the Fuel Rail Pressure Sensor parameter with a scan tool. The pressure should be approximately 1.9-5.0 MPa (276-725 psi).
4. Command an increase and decrease in Fuel Pressure with a scan tool. Observe the scan tool Fuel Rail Pressure Sensor parameter. The Fuel Rail Pressure Sensor parameter should increase or decrease with each commanded state.

Warning

Road test a vehicle under safe conditions and while obeying all traffic laws. Do not attempt any maneuvers that could jeopardize vehicle control. Failure to adhere to these precautions could lead to serious personal injury and vehicle damage.

5. Road test the vehicle and perform a wide open acceleration from a stop until the transmission shifts into second gear. On manual transmission applications, shift to second gear or stop the test near 7000 RPM. Repeat the test at least three times. DTCs P0089, P228C, and P228D should not set.
6. 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: Circuit/System Verification must be performed first or misdiagnosis may result.

Warning

Road test a vehicle under safe conditions and while obeying all traffic laws. Do not attempt any maneuvers that could jeopardize vehicle control. Failure to adhere to these precautions could lead to serious personal injury and vehicle damage.

1. Road test the vehicle and perform a wide open acceleration from a stop until the transmission shifts into second gear. On manual transmission applications, shift to second gear or stop the test near 7000 RPM. Repeat the test at least three times. Observe the scan tool Fuel Rail Pressure Sensor parameter during the test. Near 7000 RPM the Fuel Rail Pressure Sensor parameter should reach 14-17 MPa (2031-2466 psi).

◆ If not the specified value, replace the G18 high pressure fuel pump.

2. Remove the G18 high pressure fuel pump and visually inspect the lobes on the camshaft for unusual wear.

◆ If the lobes appear normal, replace the G18 high pressure fuel pump.

◆ If the lobes are worn, replace the camshaft.

Component 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 ohm in order to prevent misdiagnosis.

2. Test for 10 ohm plus/minus 1 ohm 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. Test for infinite resistance between each terminal and the G18 high pressure fuel pump housing.

- ◆ If not the specified value, replace the G18 high pressure fuel pump.

Repair Instructions

Perform the Diagnostic Repair Verification See: A L L Diagnostic Trouble Codes (DTC) > Verification Tests > Diagnostic Repair Verification

- * Camshaft Replacement - Left Side See: Camshaft, Engine > Removal and Replacement > Camshaft Replacement - Left Side
- * Fuel Pressure Sensor Replacement - Fuel Injection Fuel Rail (LFW or LFX) See: Fuel Pressure Sensor/Switch > Removal and Replacement > Fuel Pressure Sensor Replacement - Fuel Injection Fuel Rail
- * Fuel Pump Replacement See: Fuel Pump > Removal and Replacement > Fuel Pump Replacement