

Computers and Control Systems: Diagnostic Trouble Code Tests and Associated Procedures

P0010

DTC P0010 or P0011

Diagnostic Instructions

- * Perform the Diagnostic System Check - Vehicle See: Testing and Inspection/Initial Inspection and Diagnostic Overview/Diagnostic Starting Point - Vehicle
- * Strategy Based Diagnosis
- * Diagnostic Procedure Instructions

DTC Descriptors

DTC P0010

- Camshaft Position (CMP) Actuator Solenoid Control Circuit

DTC P0011

- Camshaft Position (CMP) System Performance

Diagnostic Fault Information

Circuit	Short to Ground	High Resistance	Open	Short to Voltage	Signal Performance
CMP Actuator Solenoid High Control	P0010	P0010	P0010	P0010	P0011
CMP Actuator Solenoid Low Reference	—	P0010	P0010	—	—

Circuit/System Description

The camshaft position (CMP) actuator is attached to the camshaft and is hydraulically operated in order to change the angle of the camshaft relative to crankshaft position (CKP). The CMP actuator solenoid is controlled by the control module. The control module sends a pulse width modulated **12-volt** signal to a CMP actuator solenoid. The solenoid controls the amount of engine oil flow to the CMP actuator by extending a pintle within the solenoid. The pintle acts against a spool valve in the CMP actuator mechanism which is attached to the front of the camshaft. As the spool valve is moved, oil is directed to the CMP actuator, which rotates the camshaft. The CMP actuator can change the cam angle a **maximum of 27 degrees**.

Conditions for Running the DTC

P0010

- * The ignition is in Crank or Run.
- * The system voltage is **between 11-18 volts**.
- * DTC P0010 runs continuously when the above conditions are met.

P0011

- * DTC P0010, P0016, P0335, P0336, P0340, or P0341 are not set.
- * The system voltage is **between 11-18 volts**.
- * The engine is running.
- * The engine control module (ECM) has enabled the CMP actuator and commanded **greater than 0 degrees**.
- * DTC P0011 runs continuously when the above conditions are met.

Conditions for Setting the DTC

P0010

The ECM detects that the state of the driver and the state of the circuit do not match. The ECM will detect an open, short to ground, or a short to voltage on the high control circuit or an open on the low reference circuit for **more than 6.25 seconds**.

P0011 (LZ4/LZE w/o NU6)

1. The CMP angle from the ECM is stable. If the CMP angle varies **more than 7.5 cam degrees**, then a stability timer of **2 seconds** must expire before evaluating fail condition.
2. The difference between the desired CMP and the actual CMP angle is **more than 8° for 42 seconds** during a **120-second** sample.

P0011 (LZ4/LZE w/NU6)

1. The CMP angle from the ECM is stable. If the CMP angle varies **more than 7.5 cam degrees**, then a stability timer of **2 seconds** must expire before evaluating fail condition.

- The difference between the desired CMP and the actual CMP angle is **more than 8° for 30 seconds** during a **100-second** sample.

Action Taken When the DTC Sets

DTCs P0010 and P0011 are Type B DTCs.

The CMP actuator is commanded to the home or parked position.

Conditions for Clearing the MIL/DTC

DTCs P0010 and P0011 are Type B DTCs.

Circuit/System Verification

Important: The supply of clean pressurized engine oil to the CMP actuator is essential to CMP actuator performance.

- Observe the engine oil level. The engine oil level should be within operating range. Refer to Capacities - Approximate Fluid.
- Ensure that the vehicle has the correct engine oil and is not old, burnt or contains additives. Refer to Checking Things Under the Hood in Service and Appearance Care within the Owner's Manual.

^ If the vehicle has the incorrect engine oil, is old, burnt, or contains additives then change the oil and filter.

- Test the engine oil pressure for correct operation.
- Allow the engine to reach operating temperature.
- Set the parking brake and place the vehicle in park for automatic, or neutral for manual.
- Observe the CMP variance parameter. The CMP Variance will rise for **1-2 seconds** until the CMP Angle parameter matches the Desired CMP parameter. The CMP Variance should again return to **0 degrees**.

Important: The engine will run rough and may require throttle input to keep running.

- Command the CMP actuator to **20 degrees**. The Desired CMP parameter should match the CMP Angle parameter.

Circuit/System Testing

Important: You must complete the Circuit/System Verification before proceeding with Circuit/System Testing.

DTC P0010

- Ignition OFF, disconnect the CMP actuator solenoid harness connector at the CMP actuator solenoid.
- Test for **less than 1 ohm** of resistance between the low reference circuit and ground.
 - ^ If **greater than 1 ohm**, test the low reference for an open/high resistance. If the circuit tests normal replace the ECM.
- Connect a test lamp between the high control circuit and the low reference circuit.
- Command the CMP actuator solenoid ON and OFF. The test lamp should turn ON and OFF when changing between commanded states.
 - ^ If the test lamp is always ON, test the high control circuit for a short to voltage. If the circuit tests normal replace the ECM.
 - ^ If test lamp is always OFF, test the control circuit for a short to ground, an open/high resistance. If the circuit tests normal replace the ECM.
- If all circuits test normal, test or replace the CMP actuator solenoid.

DTC P0011

- * Test for **less than 1 ohm** of resistance between the low reference circuit and ground.
 - ^ If **greater than 1 ohm**, test the low reference for an open/high resistance. If the circuit tests normal replace the CMP actuator solenoid.
- * Test for **less than 1 ohm** of resistance on the high control circuit and ground.
 - ^ If **greater than 1 ohm**, test the high control circuit for an open/high resistance. If the circuit tests normal replace the CMP actuator solenoid.
- * Inspect the CMP actuator.
- * Inspect the engine timing components.

Component Testing

Static Test

1. Ignition OFF, disconnect the CMP actuator solenoid harness connector at the CMP actuator solenoid.
2. Test for **4.8-5.2 ohms** of resistance between the high control terminal A and the low reference terminal B of the CMP actuator solenoid.

^ If the resistance is not within the specified range, replace the CMP actuator solenoid.

Dynamic Test

Important: Do not allow the solenoid to be energized for more than 2 seconds.

1. Install fused jumper wire between the high control and **12 volts**. Install a jumper wire between the low reference and momentarily connect to ground.
2. Point the CMP actuator solenoid towards a shop towel. Observe the operation of the solenoid immediately extends.

^ If the function does not perform as specified, replace the CMP actuator solenoid.

Repair Instructions

Perform the Diagnostic Repair Verification after completing the diagnostic procedure. See: Verification Tests and Procedures

- * Programming and Relearning See: Testing and Inspection/Programming and Relearning
- * Camshaft Position Actuator Magnet Removal and Camshaft Position Actuator Magnet Installation
- * Timing Chain and Sprockets Replacement for timing chain, sprockets, CMP actuator filter screen, and CMP actuator replacement.