P0016, P0017, P0018, or P0019 Crankshaft Position (CKP) – Intake Camshaft Position (CMP) Correlation

Circuit Description

The camshaft position (CMP) actuator system enables the engine control module (ECM) to change the timing of the camshafts while the engine is operating.The CMP actuator solenoid signal from the ECM is pulse width modulated (PWM). The ECM controls the CMP actuator solenoid duty cycle by controlling the amount of solenoid ON time. The CMP actuator solenoid controls the advance or the retard of each camshaft. The CMP actuator solenoid controls the oil flow that applies the pressure to advance or retard the camshafts.Ignition voltage is supplied directly to the CMP actuator solenoid. The ECM controls the solenoid by grounding the control circuit with a solid state device called a driver. The ECM compares the camshaft position or the camshaft angle, to the position of the crankshaft. If the ECM detects a deviation between the camshaft position target and the crankshaft position, this DTC sets.

DTC Descriptors

This diagnostic procedure supports the following DTCs.

- DTC P0016 Crankshaft Position (CKP) – Intake Camshaft Position (CMP) Correlation Bank 1
- DTC P0017 Crankshaft Position (CKP) – Exhaust Camshaft Position (CMP) Correlation Bank 1
- DTC P0018 Crankshaft Position (CKP) – Intake Camshaft Position (CMP) Correlation Bank 2
- DTC P0019 Crankshaft Position (CKP) – Exhaust Camshaft Position (CMP) Correlation Bank 2

Conditions for Running the DTC

- Before the ECM can report DTC P0016, P0017,P0018, or P0019 failed, DTCs P0010, P0011,P0013, P0014, P0020, P0021, P0023, P0024,P0335, P0336, P0338, P0341, P0342, P0343,P0346, P0347, P0348, P0366, P0367, P0368,P0391, P0392, P0393, P2088, P2089, P2090,P2091,

P2092, P2093, P2094, and P2095 mustrun and pass.
- The engine is operating for more than 5 seconds.
- The engine coolant temperature is between20–90°C (68–194°F).
- The calculated engine oil temperature is less than95°C (203°F).
- DTC P0016, P0017, P0018, and P0019 runcontinuously once the above conditions are metfor more than 1 second.

Conditions for Setting the DTC

1). The ECM detects one of the following conditions: The ECM detects a deviation in therelationship between a camshaft and the crankshaft.
   - A camshaft is too advanced in relationship to the crankshaft.
   - A camshaft is too retarded in relationship to the crankshaft.
2). The condition exists for more than 10 minutes.

Action Taken When the DTC Sets

- The control module illuminates the malfunction indicator lamp (MIL) on the second consecutive ignition cycle that the diagnostic runs and fails.
- The control module records the operating conditions at the time the diagnostic fails. The first time the diagnostic fails, the control module stores this information in the Failure Records.If the diagnostic reports a failure on the second consecutive ignition cycle, the control module records the operating conditions at the time of the failure. The control module writes the operating conditions to the Freeze Frame and updates the Failure Records.

Conditions for Clearing the MIL/DTC

- The control module turns OFF the malfunction indicator lamp (MIL) after 4 consecutive ignition cycles that the diagnostic runs and does not fail.
- A current DTC, Last Test Failed, clears when the diagnostic runs and passes.
- A history DTC clears after 40 consecutive warm-up cycles, if no failures are reported by this or any other emission related diagnostic.
- Clear the MIL and the DTC with a scan tool.

Diagnostic Aids

- Use the J 35616-C Connector Test Adapter Kit for any test that requires probing the ECM harness connector or a component harness connector.
- Inspect the engine for any recent engine mechanical repairs. An incorrectly

installed camshaft, camshaft actuator, camshaft sensor,sensor, or timing chain can cause this DTC to set.

- An actuator that is in the full advance or retard position can cause this DTC to set.
- For an intermittent condition, refer to Intermittent Conditions.

Test Description

The numbers below refer to the step numbers on the diagnostic table.

2. This step determines if there is a condition present.
4. The listed DTCs may cause this DTC to set.
5. Inspect the engine for any recent engine mechanical repairs. An incorrectly installed camshaft or timing chain can cause this DTC to set.

DTC P0016, P0017, P0018, or P0019

Step	Action	Values	Yes	No
Schematic Reference: Engine Controls Schematics on page 6-1196 Connector End View Reference: Engine Control Module (ECM) Connector End Views on page 6-1220 or Engine Controls Connector End Views on page 6-1223				
1	Did you perform the Diagnostic System Check–Engine Controls?	—	Go to Step 2	Go to Diagnostic System Check -Engine Controls on page 6-1234
2	1. Start the engine. 2. Allow the engine to reach the normal operating temperature. 3. Allow the engine to idle for the specified amount of time. 4. Observe the DTC information with a scan tool. Does the scan tool display DTC P0016, P0017, P0018, or P0019 failed this ignition?	10 Minutes	Go to Step 4	Go to Step 3

Step	Action	Values	Yes	No
3	1. Observe the FreezeFrame/Failure Records for this DTC. 2. Turn OFF the ignition for 30 seconds. 3. Start the engine. 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. Did the DTC fail this ignition?	—	Go to Step 4	Go to Diagnostic Aids
4	Observe the DTC Information with a scan tool. Does the scan tool display that DTC P0010, P0013, P0020, P0023, P0335, P0336, P0338, P0341, P0342, P0343, P0346, P0347, P0348, P0366, P0367, P0368, P0391, P0392, P0393, P2088, P2089, P2090, P2091, P2092, P2093, P2094, or P2095 also failed this ignition?	—	Go to Diagnostic Trouble Code (DTC) List on page 6-1246	Go to Step 5
5	Repair one of the following conditions: • For the correct installation of the camshaft sensors. • For the correct installation of the crankshaft sensor. • For a timing chain tensioner condition. • For an incorrectly installed timing chain. • For excessive play in the timing chain. • For a timing chain that jumped teeth. Did you complete the repair?	—	Go to Step 6	—

Step	Action	Values	Yes	No
6	1. Clear the DTCs with a scan tool. 2. Turn OFF the ignition for 30 seconds. 3. Start the engine. 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. Did the DTC fail this ignition?	—	Go to Step 2	Go to Step 7
7	Observe the Capture Info with a scan tool. Are there any DTCs that have not been diagnosed?	—	Go to Diagnostic Trouble Code (DTC) List on page 6-1246	System OK