

Symptom:

P0016-CRANKSHAFT/CAMSHAFT TIMING MISALIGNMENT

When Monitored and Set Condition:

P0016-CRANKSHAFT/CAMSHAFT TIMING MISALIGNMENT

When Monitored: Engine cranking and Engine running

Set Condition: Powertrain Control Module detects an error when the camshaft position is out of phase with the crankshaft position. One trip fault.

POSSIBLE CAUSES

INTERMITTENT CONDITION
 CHECKING INTERMITTENT CMP SIGNAL WITH LAB
 CMP WIRE HARNESS INSPECTION
 TONE WHEEL/PULSE RING INSPECTION
 CKP WIRE HARNESS INSPECTION
 TONE WHEEL/PULSE RING INSPECTION
 INTERMITTENT CKP SIGNAL
 CAMSHAFT POSITION SENSOR
 CRANKSHAFT POSITION SENSOR

TEST	ACTION	APPLICABILITY
1	<p>WARNING: WHEN THE ENGINE IS OPERATING, DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.</p> <p>Ignition on, engine not running. With the DRBIII®, read DTCs and record the related Freeze Frame data. With the DRBIII®, erase DTCs. Start the engine and run until operating temp is reached. (Closed Loop) If the DTC does not reset it may be necessary to take the vehicle on a test drive. Does the DTC reset?</p> <p>Yes → Go To 2</p> <p>No → Refer to the INTERMITTENT CONDITION symptom in the Driveability category. Perform POWERTRAIN VERIFICATION TEST VER - 5 - NGC.</p>	All

P0016-CRANKSHAFT/CAMSHAFT TIMING MISALIGNMENT — Continued

TEST	ACTION	APPLICABILITY
2	<p>Turn the ignition off.</p> <p>With the DRBIII® lab scope probe and the Miller special tool #6801, backprobe the (K44) CMP Signal circuit at the CMP harness connector.</p> <p>WARNING: WHEN THE ENGINE IS OPERATING, DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.</p> <p>Start the engine.</p> <p>Observe the lab scope screen.</p> <p>Are there any irregular or missing signals?</p> <p>Yes → Go To 3</p> <p>No → Go To 6</p>	All
3	<p>Visually inspect the related wire harness. Look for any chafed, pierced, pinched, or partially broken wires.</p> <p>Visually inspect the related wire harness connectors. Look for broken, bent, pushed out, or corroded terminals.</p> <p>Ensure the Crankshaft Position Sensor and the Camshaft Position Sensor are properly installed and the mounting bolt(s) tight.</p> <p>Refer to any TSBs that may apply.</p> <p>Were any of the above conditions present?</p> <p>Yes → Repair as necessary Perform POWERTRAIN VERIFICATION TEST VER - 5 - NGC.</p> <p>No → Go To 4</p>	All
4	<p>Turn the ignition off.</p> <p>Remove the Camshaft Position Sensor.</p> <p>Inspect the Tone Wheel/Pulse Ring for damage, foreign material, or excessive movement.</p> <p>Were any problems found?</p> <p>Yes → Repair or replace the Tone Wheel/Pulse Ring as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 5 - NGC.</p> <p>No → Go To 5</p>	All
5	<p>If there are no possible causes remaining, view repair.</p> <p>Repair</p> <p>Replace the Camshaft Position Sensor.</p> <p>Perform POWERTRAIN VERIFICATION TEST VER - 5 - NGC.</p>	All
6	<p>WARNING: WHEN THE ENGINE IS OPERATING, DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.</p> <p>Start the engine.</p> <p>Gently tap on the Cam Position Sensor and wiggle the Sensor.</p> <p>Ignition on, engine not running.</p> <p>Inspect the Sensor harness connector, PCM harness connector, Sensor connector, and PCM connector for loose, bent, corroded, or pushed out pins/terminals.</p> <p>Inspect the related wire harness and the splices in the (K44) CMP circuits.</p> <p>Did the DTC reset?</p> <p>Yes → Repair the wiring/connector concerns as needed or replace the Camshaft Position Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 5 - NGC.</p> <p>No → Go To 7</p>	All

P0016-CRANKSHAFT/CAMSHAFT TIMING MISALIGNMENT — Continued

TEST	ACTION	APPLICABILITY
7	<p>Turn the ignition off.</p> <p>With the DRBIII® lab scope probe and the Miller special tool #6801, backprobe the (K24) CKP Signal circuit at the CKP harness connector.</p> <p>WARNING: WHEN THE ENGINE IS OPERATING, DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.</p> <p>Start the engine.</p> <p>Observe the lab scope screen.</p> <p>Are there any irregular or missing signals?</p> <p>Yes → Go To 8</p> <p>No → Go To 11</p>	All
8	<p>Visually inspect the related wire harness. Look for any chafed, pierced, pinched, or partially broken wires.</p> <p>Visually inspect the related wire harness connectors. Look for broken, bent, pushed out, or corroded terminals.</p> <p>Ensure the Crankshaft Position Sensor and the Camshaft Position Sensor are properly installed and the mounting bolt(s) tight.</p> <p>Refer to any TSBs that may apply.</p> <p>Were any of the above conditions present?</p> <p>Yes → Repair as necessary Perform POWERTRAIN VERIFICATION TEST VER - 5 - NGC.</p> <p>No → Go To 9</p>	All
9	<p>Turn the ignition off.</p> <p>Remove the Crankshaft Position Sensor.</p> <p>Inspect the Tone Wheel/Flex Plate slots for damage, foreign material, or excessive movement.</p> <p>Were any problems found?</p> <p>Yes → Repair or replace the Tone Wheel/Flex Plate as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 5 - NGC.</p> <p>No → Go To 10</p>	All
10	<p>If there are no possible causes remaining, view repair.</p> <p>Repair</p> <p>Replace the Crankshaft Position Sensor.</p> <p>Perform POWERTRAIN VERIFICATION TEST VER - 5 - NGC.</p>	All

P0016-CRANKSHAFT/CAMSHAFT TIMING MISALIGNMENT — Continued

TEST	ACTION	APPLICABILITY
11	<p>NOTE: The conditions that set this DTC are not present at this time. The following test may help in identifying the intermittent condition.</p> <p>WARNING: WHEN THE ENGINE IS OPERATING, DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.</p> <p>Start the engine. Gently tap on the Crank Position Sensor and wiggle the CKP Sensor. Turn the ignition off. Inspect the Sensor harness connector, PCM harness connector, Sensor connector, and PCM connector for loose, bent, corroded, or pushed out pins/terminals. Inspect the related wire harness and the splices in the (K24) CKP circuits. Were any problems found?</p> <p>Yes → Repair the wiring/connector concerns as needed or replace the Crankshaft Position Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 5 - NGC.</p> <p>No → Test Complete.</p>	All

P2074-MANIFOLD PRESSURE/THROTTLE POSITION CORRELATION - HIGH FLOW/VACUUM LEAK — Continued

TEST	ACTION	APPLICABILITY
5	<p>Turn the ignition off. Disconnect the TP Sensor harness connector. Disconnect the PCM harness connector. CAUTION: DO NOT PROBE THE PCM HARNESS CONNECTORS. PROBING THE PCM HARNESS CONNECTORS WILL DAMAGE THE PCM TERMINALS RESULTING IN POOR TERMINAL TO PIN CONNECTION. INSTALL MILLER SPECIAL TOOL #8815 TO PERFORM DIAGNOSIS. Measure the resistance of the (K6) 5 volt Supply circuit from the TP Sensor harness connector to the appropriate terminal of special tool #8815. Is the resistance below 5.0 ohms?</p> <p>Yes → Go To 6</p> <p>No → Repair the (K6) TP Sensor 5 volt Supply circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5 - NGC.</p>	All
6	<p>Turn the ignition off. Disconnect the TP Sensor harness connector. Disconnect the PCM harness connector. Measure the resistance between ground and the (K6) 5 volt Supply circuit at the TP Sensor harness connector. Is the resistance above 100k ohms?</p> <p>Yes → Go To 7</p> <p>No → Repair the (K6) 5 volt Supply circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5 - NGC.</p>	All
7	<p>Turn the ignition off. Disconnect the TP Sensor harness connector. With the DRBIII®, monitor the TP Sensor voltage. Ignition on, engine not running. Connect a jumper wire between the (K22) TP Signal circuit and the (K4) Sensor ground circuit. Does the TP Sensor voltage change from approximately 4.9 volts to below 0.5 of a volt?</p> <p>Yes → Replace the Throttle Position Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 5 - NGC.</p> <p>No → Go To 8</p>	All
8	<p>Turn the ignition off. Disconnect the TP Sensor harness connector. Disconnect the PCM harness connector. CAUTION: DO NOT PROBE THE PCM HARNESS CONNECTORS. PROBING THE PCM HARNESS CONNECTORS WILL DAMAGE THE PCM TERMINALS RESULTING IN POOR TERMINAL TO PIN CONNECTION. INSTALL MILLER SPECIAL TOOL #8815 TO PERFORM DIAGNOSIS. Measure the resistance of the (K22) TP Signal circuit from the TP Sensor harness connector to the appropriate terminal of special tool #8815. Is the resistance below 5.0 ohms?</p> <p>Yes → Go To 9</p> <p>No → Repair the (K22) TP Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5 - NGC.</p>	All

Symptom:

P2074-MANIFOLD PRESSURE/THROTTLE POSITION CORRELATION - HIGH FLOW/VACUUM LEAK

When Monitored and Set Condition:

P2074-MANIFOLD PRESSURE/THROTTLE POSITION CORRELATION - HIGH FLOW/VACUUM LEAK

When Monitored: Engine Running, during all drive modes.

Set Condition: If vacuum drops below 1.5 Hg with engine RPM greater than 2000 RPM at closed throttle.

POSSIBLE CAUSES
GOOD TRIP EQUAL TO ZERO
VACUUM LEAK
HIGH RESISTANCE IN MAP (K7) 5 VOLT SUPPLY CIRCUIT
RESISTANCE TO GROUND IN MAP (K7) 5 VOLT SUPPLY CIRCUIT
MAP SENSOR
HIGH RESISTANCE IN (K1) MAP SIGNAL CIRCUIT
RESISTANCE TO GROUND IN (K1) MAP SIGNAL CIRCUIT
HIGH RESISTANCE IN (K4) MAP GROUND CIRCUIT
PCM
TP SENSOR OPERATION
HIGH RESISTANCE IN (K6) TP SENSOR 5 VOLT SUPPLY CIRCUIT
RESISTANCE TO GROUND IN (K6) TP SENSOR 5 VOLT SUPPLY CIRCUIT
TP SENSOR
HIGH RESISTANCE IN (K22) TP SIGNAL CIRCUIT
RESISTANCE TO GROUND IN (K22) TP SENSOR SIGNAL CIRCUIT
HIGH RESISTANCE IN TP (K4) SENSOR GROUND CIRCUIT
PCM

P2074-MANIFOLD PRESSURE/THROTTLE POSITION CORRELATION - HIGH FLOW/VACUUM LEAK — Continued

TEST	ACTION	APPLICABILITY
1	<p>NOTE: Diagnose any TP Sensor or MAP Sensor component DTCs before continuing.</p> <p>NOTE: If the P0501 - No Vehicle Speed Signal is set along with this DTC, refer to the P0501 diagnostics before continuing.</p> <p>NOTE: The throttle plate and linkage must be free from binding and carbon build up, ensure the throttle plate is at the idle position, ensure the throttle plate is at the idle position.</p> <p>Ignition on, engine not running.</p> <p>With the DRBIII®, read DTCs and record the related Freeze Frame data.</p> <p>Is the Good Trip Counter displayed and equal to zero?</p> <p>Yes → Go To 2</p> <p>No → Refer to the INTERMITTENT CONDITION symptom in the Driveability category.</p> <p>Perform POWERTRAIN VERIFICATION TEST VER - 5 - NGC.</p>	All
2	<p>NOTE: This code is intended to shut down the engine if a large crack occurs in the intake manifold.</p> <p>NOTE: A large vacuum leak is most likely the cause of this DTC.</p> <p>Inspect the Intake Manifold for leaks and cracks.</p> <p>Inspect the Power Brake Booster for any vacuum leaks.</p> <p>Inspect the PCV system for proper operation or any vacuum leaks.</p> <p>Were any vacuum leaks found?</p> <p>Yes → Repair the vacuum leak as necessary.</p> <p>Perform POWERTRAIN VERIFICATION TEST VER - 5 - NGC.</p> <p>No → Go To 3</p>	All
3	<p>Start the engine.</p> <p>With the DRBIII®, monitor the MAP Sensor voltage.</p> <p>Snap the throttle from wide open throttle to idle several times.</p> <p>Does the MAP Sensor voltage vary from below 2.0 volts at idle to above 3.5 volts?</p> <p>Yes → Go To 4</p> <p>No → Go To 12</p>	All
4	<p>Ignition on, engine not running.</p> <p>With the DRBIII®, monitor the TP Sensor voltage while slowly depressing the throttle pedal from the idle position to the wide open throttle position.</p> <p>Does the voltage start approximately at 0.8 volts and go above 3.5 volts with a smooth transition?</p> <p>Yes → Refer to the INTERMITTENT CONDITION symptom in the Driveability category.</p> <p>Perform POWERTRAIN VERIFICATION TEST VER - 5 - NGC.</p> <p>No → Go To 5</p>	All

P2074-MANIFOLD PRESSURE/THROTTLE POSITION CORRELATION - HIGH FLOW/VACUUM LEAK — Continued

TEST	ACTION	APPLICABILITY
9	<p>Turn the ignition off. Disconnect the TP Sensor harness connector. Disconnect the PCM harness connector. Measure the resistance between ground and the (K22) TP Signal circuit in the TP Sensor harness connector. Is the resistance above 100k ohms?</p> <p>Yes → Go To 10</p> <p>No → Repair the (K22) TP Sensor Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5 - NGC.</p>	All
10	<p>Turn the ignition off. Disconnect the TP Sensor harness connector. Disconnect the PCM harness connector. CAUTION: DO NOT PROBE THE PCM HARNESS CONNECTORS. PROBING THE PCM HARNESS CONNECTORS WILL DAMAGE THE PCM TERMINALS RESULTING IN POOR TERMINAL TO PIN CONNECTION. INSTALL MILLER SPECIAL TOOL #8815 TO PERFORM DIAGNOSIS. Measure the resistance of the (K4) Sensor ground circuit from the TP Sensor harness connector to the appropriate terminal of special tool #8815. Is the resistance below 5.0 ohms?</p> <p>Yes → Go To 11</p> <p>No → Repair the (K4) Sensor Ground circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5 - NGC.</p>	All
11	<p>NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary. If there are no possible causes remaining, view repair.</p> <p>Repair</p> <p>Replace and program the Powertrain Control Module in accordance with the Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 5 - NGC.</p>	All
12	<p>Turn the ignition off. Disconnect the MAP Sensor harness connector. Disconnect the PCM harness connector. CAUTION: DO NOT PROBE THE PCM HARNESS CONNECTORS. PROBING THE PCM HARNESS CONNECTORS WILL DAMAGE THE PCM TERMINALS RESULTING IN POOR TERMINAL TO PIN CONNECTION. INSTALL MILLER SPECIAL TOOL #8815 TO PERFORM DIAGNOSIS. Measure the resistance of the (K7) 5 volt Supply circuit from the MAP Sensor harness connector to the appropriate terminal of special tool #8815. Is the resistance below 5.0 ohms?</p> <p>Yes → Go To 13</p> <p>No → Repair the MAP (K7) 5 volt Supply circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5 - NGC.</p>	All

P2074-MANIFOLD PRESSURE/THROTTLE POSITION CORRELATION - HIGH FLOW/VACUUM LEAK — Continued

TEST	ACTION	APPLICABILITY
13	Turn the ignition off. Disconnect the MAP Sensor harness connector. Disconnect the PCM harness connector. Measure the resistance between ground and the (K7) 5 volt Supply circuit at the MAP Sensor harness connector. Is the resistance above 100k ohms? Yes → Go To 14 No → Repair the short to ground in the (K7) 5 volt Supply circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5 - NGC.	All
14	Turn the ignition off. Disconnect the MAP Sensor harness connector. With the DRBIII®, monitor the MAP Sensor voltage. Ignition on, engine not running. Connect a jumper wire between the (K1) MAP Sensor Signal circuit and the (K4) Sensor ground circuit. Cycle the ignition switch from off to on. With the DRBIII®, monitor the MAP Sensor voltage. Does the DRBIII® display MAP voltage from approximately 4.9 volts to below 0.5 volt? Yes → Replace the MAP Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 5 - NGC. No → Go To 15	All
15	Turn the ignition off. Disconnect the MAP Sensor harness connector. Disconnect the PCM harness connector. CAUTION: DO NOT PROBE THE PCM HARNESS CONNECTORS. PROBING THE PCM HARNESS CONNECTORS WILL DAMAGE THE PCM TERMINALS RESULTING IN POOR TERMINAL TO PIN CONNECTION. INSTALL MILLER SPECIAL TOOL #8815 TO PERFORM DIAGNOSIS. Measure the resistance of the (K1) MAP Signal circuit from the MAP Sensor harness connector to the appropriate terminal of special tool #8815. Is the resistance below 5.0 ohms? Yes → Go To 16 No → Repair the (K1) MAP Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5 - NGC.	All
16	Turn the ignition off. Disconnect the MAP Sensor harness connector. Disconnect the PCM harness connector. Measure the resistance between ground and the (K1) MAP Signal circuit at the MAP Sensor harness connector. Is the resistance above 100k ohms? Yes → Go To 17 No → Repair the (K1) MAP Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5 - NGC.	All

P2074-MANIFOLD PRESSURE/THROTTLE POSITION CORRELATION - HIGH FLOW/VACUUM LEAK — Continued

TEST	ACTION	APPLICABILITY
17	<p>Turn the ignition off. Disconnect the MAP Sensor harness connector. Disconnect the PCM harness connector. CAUTION: DO NOT PROBE THE PCM HARNESS CONNECTORS. PROBING THE PCM HARNESS CONNECTORS WILL DAMAGE THE PCM TERMINALS RESULTING IN POOR TERMINAL TO PIN CONNECTION. INSTALL MILLER SPECIAL TOOL #8815 TO PERFORM DIAGNOSIS. Measure the resistance of the (K4) Sensor ground circuit from the MAP Sensor harness connector to the appropriate terminal of special tool #8815. Is the resistance below 5.0 ohms?</p> <p>Yes → Go To 18</p> <p>No → Repair the (K4) Sensor Ground circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5 - NGC.</p>	All
18	<p>NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary. If there are no possible causes remaining, view repair.</p> <p>Repair</p> <p>Replace and program the Powertrain Control Module in accordance with the Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 5 - NGC.</p>	All