

DTC	P0016	Crankshaft Position - Camshaft Position Correlation (Bank 1 Sensor A)
DTC	P0017	Crankshaft Position - Camshaft Position Correlation (Bank 1 Sensor B)
DTC	P0018	Crankshaft Position - Camshaft Position Correlation (Bank 2 Sensor A)
DTC	P0019	Crankshaft Position - Camshaft Position Correlation (Bank 2 Sensor B)

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DESCRIPTION

In the VVT (Variable Valve Timing) system, the appropriate intake and exhaust valve open and close timing is controlled by the ECM. The ECM performs intake and exhaust valve control by performing the following: 1) controlling the camshaft and camshaft timing oil control valve, and operating the camshaft timing gear; and 2) changing the relative positions of the gaps between the camshaft and crankshaft.

DTC No.	DTC Detection Condition	Trouble Area
P0016	Deviation in crankshaft position sensor signal and VVT sensor 1 (for intake camshaft bank 1) signal (2 trip detection logic)	<ul style="list-style-type: none"> Mechanical system (Timing chain has jumped tooth or chain stretched) ECM
P0017	Deviation in crankshaft position sensor signal and VVT sensor 1 (for exhaust camshaft bank 1) signal (2 trip detection logic)	<ul style="list-style-type: none"> Mechanical system (Timing chain has jumped tooth or chain stretched) ECM
P0018	Deviation in crankshaft position sensor signal and VVT sensor 2 (for intake camshaft bank 2) signal (2 trip detection logic)	<ul style="list-style-type: none"> Mechanical system (Timing chain has jumped tooth or chain stretched) ECM
P0019	Deviation in crankshaft position sensor signal and VVT sensor 2 (for exhaust camshaft bank 2) signal (2 trip detection logic)	<ul style="list-style-type: none"> Mechanical system (Timing chain has jumped tooth or chain stretched) ECM

MONITOR DESCRIPTION

To monitor the correlation of the intake camshaft position and crankshaft position, the ECM checks the VVT learning value while the engine is idling. The VVT learning value is calibrated based on the camshaft position and crankshaft position. The intake valve timing is set to the most retarded angle while the engine is idling. If the VVT learning value is out of the specified range in consecutive driving cycles, the ECM illuminates the MIL and sets the DTC P0016 (bank 1) or P0018 (bank 2).

To monitor the correlation of the exhaust camshaft position and crankshaft position, the ECM checks the VVT learning value while the engine is idling. The VVT learning value is calibrated based on the camshaft position and crankshaft position. The exhaust valve timing is set to the most advanced angle while the engine is idling. If the VVT learning value is out of the specified range in consecutive driving cycles, the ECM illuminates the MIL and sets the DTC P0017 (bank 1) or P0019 (bank 2).

MONITOR STRATEGY

Related DTCs	P0016: Camshaft timing misalignment at idling (bank 1 intake side) P0017: Camshaft timing misalignment at idling (bank 1 exhaust side) P0018: Camshaft timing misalignment at idling (bank 2 intake side) P0019: Camshaft timing misalignment at idling (bank 2 exhaust side)
Required Sensors/Components	VVT actuator
Required Sensors/Components	Camshaft position sensor, Crankshaft position sensor
Frequency of Operation	Once per driving cycle

Duration	Within 1 minute
MIL Operation	2 driving cycles
Sequence of Operation	None

TYPICAL ENABLING CONDITIONS

Monitor runs whenever following DTCs not present	P0011 (VVT system 1 - advanced) P0012 (VVT system 1 - retarded) P0021 (VVT system 2 - advanced) P0022 (VVT system 2 - retarded) P0115 - P0118 (ECT sensor)
VVT feedback mode	Executing
VVT	Maximum advanced or retarded position
Engine RPM	500 to 1,000 rpm

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TYPICAL MALFUNCTION THRESHOLDS

Intake side:

One of following conditions met	-
VVT learning value when camshaft maximum retarded	Less than 18.5°C
VVT learning value when camshaft maximum retarded	More than 43.5°C

Exhaust side:

One of following conditions met	-
VVT learning value when camshaft maximum retarded	Less than 77°C
VVT learning value when camshaft maximum retarded	More than 102°C

WIRING DIAGRAM

Refer to DTC P0335 (see page [ES-207](#)).

INSPECTION PROCEDURE

HINT:

Read freeze frame data using the intelligent tester. Freeze frame data records the engine condition when malfunctions are detected. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, and other data from the time the malfunction occurred.

1	CHECK VALVE TIMING (CHECK FOR LOOSE AND JUMPED TOOTH OF TIMING CHAIN) (See page ES-90)
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Go to step 3

OK

2	REPLACE ECM
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NEXT

Go to step 4

3 ADJUST VALVE TIMING

NEXT

4 CHECK WHETHER DTC OUTPUT RECURS**NOTICE:**

After replacing the ECM or adjusting intake valve timing, confirm that the DTC output does not recur.

- (a) Connect the intelligent tester to the DLC3.
- (b) Turn the ignition switch ON.
- (c) Turn the tester ON.
- (d) Clear DTCs (see page [ES-39](#)).
- (e) Switch the ECM from normal mode to check mode using the tester (see page [ES-42](#)).
- (f) Start the engine and warm it up.
- (g) Allow the engine to idle for 1 minute or more, and then drive the vehicle for 1 minute or more.
- (h) Confirm that no DTC is set, using the tester.

OK:

No DTC output

NEXT

END

ES