

DTC	P0016	Crankshaft Position - Camshaft Position Correlation (Bank 1 Sensor A)
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DTC	P0018	Crankshaft Position - Camshaft Position Correlation (Bank 2 Sensor A)
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DESCRIPTION

Refer to DTC P0335 (See page [ES-182](#)).

DTC No.	DTC Detection Conditions	Trouble Areas
P0016	Deviations in crankshaft and camshaft position sensor1 signals (2 trip detection logic)	<ul style="list-style-type: none"> Mechanical system (Timing chain has jumped tooth or chain stretched) ECM
P0018	Deviations in crankshaft and camshaft position sensor2 signals (2 trip detection logic)	

MONITOR DESCRIPTION

The ECM optimizes the valve timing by using the VVT (Variable Valve Timing) system to control the intake camshaft. The VVT system includes the ECM, the Oil Control Valve (OCV) and the VVT controller. The ECM sends a target duty-cycle control signal to the OCV. This control signal regulates the oil pressure supplied to the VVT controller. The VVT controller can advance or retard the intake camshaft. The ECM calibrates the intake valve timing by setting the intake camshaft to the most retarded angle while the engine is idling. The ECM closes the OCV to retard the cam. The ECM stores this value as the VVT learning value. When the difference between the target and actual intake valve timings is 5°CA (Crankshaft Angle) or less, the ECM stores it.

If the VVT learning value matches the following conditions, the ECM determines the existence of a malfunction in the VVT system, and sets the DTC.

- VVT learning value: Less than 22.5°CA, or more than 45.2°CA.
- Above condition continues for 18 seconds or more.

This DTC indicates that the intake camshaft has been installed toward the crankshaft at an incorrect angle, caused by factors such as the timing chain having jumped a tooth.

This monitor begins to run after the engine has idled for 5 minutes.

MONITOR STRATEGY

Related DTCs	P0016: Camshaft Timing Misalignment at idling
Required Sensors/Components (Main)	VVT actuator
Required Sensors/Components (Related)	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 - advance) P0012 (VVT system 1 - retard) P0021 (VVT system 2 - advance) P0022 (VVT system 2 - retard) P0115 - P0118 (ECT sensor)
Engine RPM	500 to 1,000 rpm

TYPICAL MALFUNCTION THRESHOLDS

Duration of following condition	18 seconds or more
Valve timing when camshaft retarded maximum	Less than 22.5 CA°, or more than 45.2 CA°

WIRING DIAGRAM

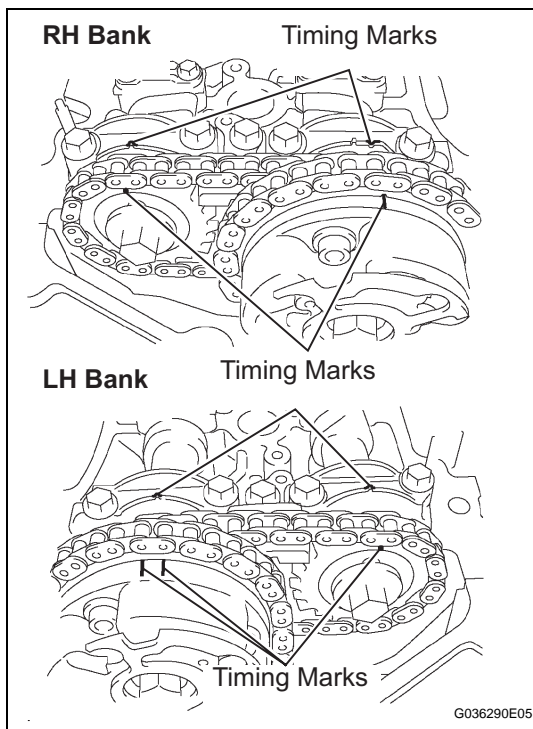
Refer to DTC P0335 (See page [ES-184](#)).

HINT:

Read freeze frame data using an intelligent tester. Freeze frame data record 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.

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CHECK VALVE TIMING (CHECK FOR LOOSE AND A JUMPED TOOTH OF TIMING CHAIN)



- Remove the cylinder head cover (See page [EM-25](#)(For 2WD), [EM-46](#)(For 4WD)).
- Turn the crankshaft pulley, and align its groove with the timing mark "0" of the timing chain cover.
- Check that the timing marks of the camshaft timing gears are aligned with the timing marks of the bearing cap as shown in the illustration. If not, turn the crankshaft 1 revolution (360°) and align the marks as above.

OK:

Timing marks on camshaft timing gears are aligned as shown in illustration.

- Reinstall the cylinder head cover.

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ADJUST VALVE TIMING (REPAIR OR REPLACE TIMING CHAIN)

OK
REPLACE ECM