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

DESCRIPTION

Refer to DTC P0335 (See page ES-173).

DTC No.	DTC Detection Conditions	Trouble Areas
P0016	Deviations in crankshaft and camshaft position sensor signals (2 trip detection logic)	• Mechanical system (Timing chain has jumped tooth or chain stretched) • ECM

MONITOR DESCRIPTION

ES

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 (camshaft timing gear assembly).
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 24°CA, or more than 46°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

The monitor will run whenever these DTCs are not present	P0011, P0012 (VVT system-Advance, Retard), P0115, P0117, P0118 (ECT sensor),
Engine RPM	600 to 1,000 rpm

TYPICAL MALFUNCTION THRESHOLDS

One of the following conditions is met:	Condition 1 or 2
1. VVT learning value at maximum retarded valve timing	Less than 24°CA
2. VVT learning value at maximum retarded valve timing	More than 46°CA

WIRING DIAGRAM

Refer to DTC P0335 (See page ES-175).

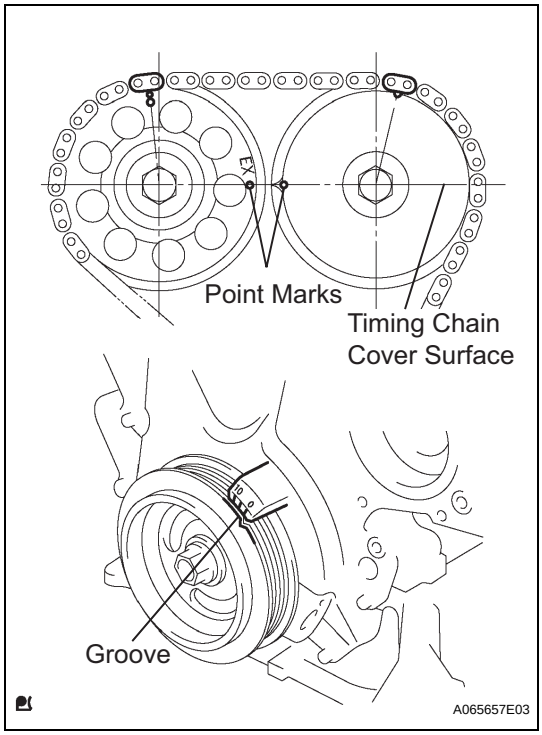
INSPECTION PROCEDURE

HINT:

Read freeze frame data using an intelligent tester or OBD II scan tool. The ECM records vehicle and driving condition information as freeze frame data the moment a DTC is stored. When troubleshooting, freeze frame data can be helpful in determining whether the vehicle was running or stopped, whether the engine was warmed up or not, whether the air/fuel ratio was lean or rich, as well as other data recorded at the time of a malfunction.

ES

1	CHECK VALVE TIMING (CHECK FOR LOOSE AND JUMPED TEETH ON TIMING CHAIN)



(a) Remove the cylinder head cover (See page EM-44).

(b) Turn the crankshaft pulley, then align its groove with the timing mark "0" on the timing chain cover.

(c) Check that the point marks on the camshaft timing gears are aligned with the timing chain cover surface as shown in the illustration.
If not, turn the crankshaft 1 revolution (360°), then align the marks as above.
OK:
Point marks on camshaft timing gears are aligned with timing chain cover surface.

(d) Reinstall the cylinder head cover (See page EM-63).
NOTICE:
After replacing the ECM or adjusting intake valve timing, confirm that the DTC output does not recur.

(e) Confirm that the DTC output does not recur.
(1) Connect an intelligent tester or OBD II scan tool to the DLC3 (Procedure "A").
(2) Turn the ignition switch to ON (Procedure "B").
(3) Turn the tester or scan tool ON (Procedure "C").
(4) Clear DTCs (See page ES-30) (Procedure "D").
(5) If using an intelligent tester, switch the ECM from normal mode to check mode (See page ES-31) (Procedure "E").
(6) Start the engine and warm it up (Procedure "F").
(7) Allow the engine to idle for 1 minute or more, and then drive the vehicle for 1 minute or more (Procedure "G").
(8) If using an OBD II scan tool, turn the ignition switch OFF, and then repeat procedures "F" and "G" above (Procedure "H").
(9) Confirm that no DTC is set, using the tester or scan tool (Procedure "I").

NG → **ADJUST VALVE TIMING**

OK

REPLACE ECM