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

DESCRIPTION

In the VVT (Variable Valve Timing) system, the appropriate intake valve open and close timing is controlled by the ECM. The ECM performs intake 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 Conditions	Trouble Areas
P0016	Deviation in crankshaft and camshaft position sensor signals (2 trip detection logic)	• Mechanical system (Timing chain has jumped tooth or chain stretched) • ECM

ES

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 25°CA, or more than 51°CA.
• Above condition continues for 18 seconds or more.
This DTC indicates that the angle between the intake camshaft and the crankshaft is incorrect due to 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	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 - advance) P0012 (VVT system 1 - retarded) P0115 - P0118 (ECT sensor)
Engine RPM	550 to 1,000 rpm

TYPICAL MALFUNCTION THRESHOLDS

One of following conditions met	-
VVT learning value when camshaft maximum retarded	Less than 27.8°CA
VVT learning value when camshaft maximum retarded	More than 48°CA

WIRING DIAGRAM

Refer to DTC P0335 (see page).

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.

ES

1	CHECK VALVE TIMING (CHECK FOR LOOSE AND JUMPED TOOTH OF TIMING CHAIN) (See page ES-77)

NG ▷ Go to step 3

OK ▽

2	REPLACE ECM

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-35).
(e) Switch the ECM from normal mode to check mode using the tester (see page ES-38).
(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