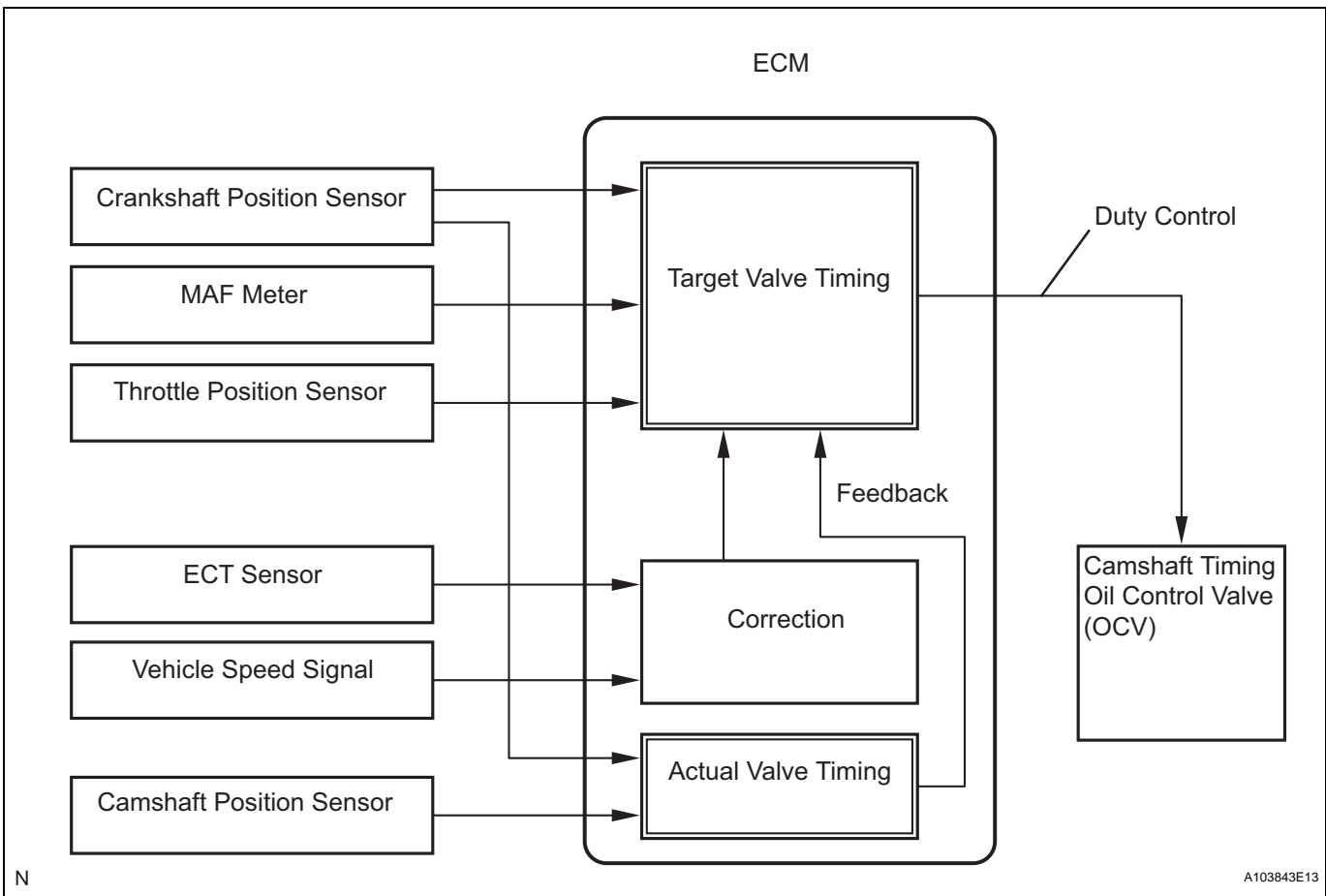


DTC	P0010	Camshaft Position "A" Actuator Circuit (Bank 1)
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DESCRIPTION

The Variable Valve Timing (VVT) system includes the ECM, Oil Control Valve (OCV) and 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. Camshaft timing control is performed according to engine operating conditions such as the intake air volume, throttle valve position and engine coolant temperature. The ECM controls the OCV based on the signals transmitted by several sensors. The VVT controller regulates the intake camshaft angle using oil pressure through the OCV. As a result, the relative positions of the camshaft and crankshaft are optimized, the engine torque and fuel economy improve, and the exhaust emissions decrease under overall driving conditions. The ECM detects the actual intake valve timing using signals from the camshaft and crankshaft position sensors, and performs feedback control. This is how the target intake valve timing is verified by the ECM.

ES



DTC No.	DTC Detection Condition	Trouble Area
P0010	Open or short in Oil Control Valve (OCV) circuit (1 trip detection logic)	<ul style="list-style-type: none"> • Open or short in Oil Control Valve (OCV) circuit • OCV • ECM

MONITOR DESCRIPTION

The ECM optimizes the valve timing using the VVT system to control the intake camshaft. The VVT system includes the ECM, the 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.

After the ECM sends the target duty-cycle signal to the OCV, the ECM monitors the OCV current to establish an actual duty-cycle. The ECM determines the existence of a malfunction and sets the DTC when the actual duty-cycle ratio varies from the target duty-cycle ratio.

MONITOR STRATEGY

Related DTCs	P0010: VVT OCV range check
Required sensors / components (Main)	VVT OCV
Required sensors / components (Related)	-
Frequency of operation	Continuous
Duration	1 second
MIL operation	Immediate
Sequence of operation	None

ES

TYPICAL ENABLING CONDITIONS

Monitor runs whenever these following DTCs not present	None
Battery voltage	11 to 13 V
Target duty ratio for OCV	70% or less
Starter	OFF
Current cut status for OCV	Not cut

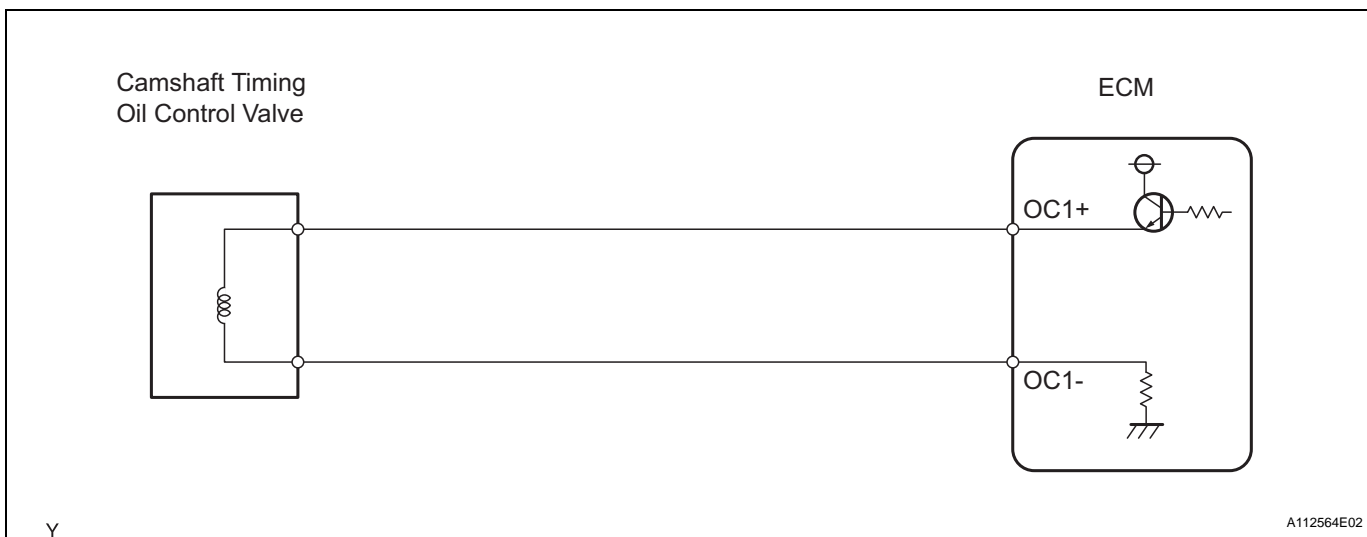
TYPICAL MALFUNCTION THRESHOLDS

Either of following conditions set:	-
OCV duty ratio	100% (always ON) despite target duty ratio being less than 70%
OCV duty ratio when ECM supplies current to OCV	3% or less despite ECM supplying current to the OCV

COMPONENT OPERATING RANGE

VVT OCV duty ratio	3 to 100%
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WIRING DIAGRAM



HINT:

Read freeze frame data using the intelligent tester. Freeze frame data records the engine conditions 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 PERFORM ACTIVE TEST BY INTELLIGENT TESTER (OPERATE OCV)

- (a) Connect the intelligent tester to the DLC3.
- (b) Start the engine and turn the tester ON.
- (c) Warm up the engine.
- (d) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / VVT CTRL B1.
- (e) Check the engine speed while operating the Oil Control Valve (OCV) using the tester.

ES

OK

Tester Operation	Specified Condition
OCV OFF	Normal engine speed
OCV ON	Engine idles roughly or stalls (soon after OCV switched from OFF to ON)

NG → **Go to step 2**

OK

CHECK FOR INTERMITTENT PROBLEMS

2 INSPECT CAMSHAFT TIMING OIL CONTROL VALVE ASSEMBLY (OCV SIGNAL)

Wire Harness Side OCV Connector

OC1- Front View OC1+

OCV Signal Waveform

5V/DIV.

1 msec./DIV.

GND

A094633E22

- (a) Disconnect the C2 OCV connector.
- (b) While idling, check the waveform between the terminals of the C2 OCV connector using an oscilloscope.

Standard voltage

Tester Connection	Specified Condition
OC1+ (C2-2) - OC1- (C2-1)	Correct waveform is as shown

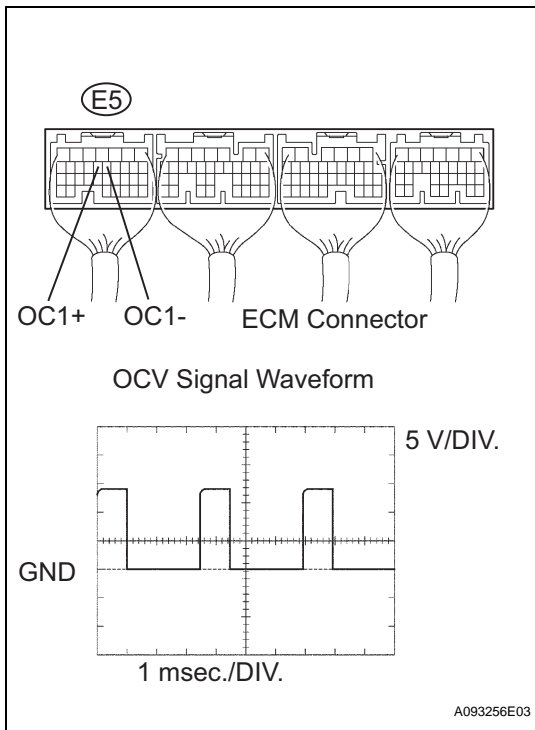
NG → **Go to step 3**

OK

REPLACE CAMSHAFT TIMING OIL CONTROL VALVE ASSEMBLY

3 INSPECT ECM (OCV SIGNAL)

ES



- (a) Inspect the ECM using an oscilloscope.
- (b) While idling, check the waveform between the terminals of the E5 ECM connector.

Standard voltage

Tester Connection	Specified Condition
OC1+ (E5-13) - OC1- (E5-12)	Correct waveform is as shown

NG **REPLACE ECM**

OK

REPAIR OR REPLACE HARNESS OR CONNECTOR