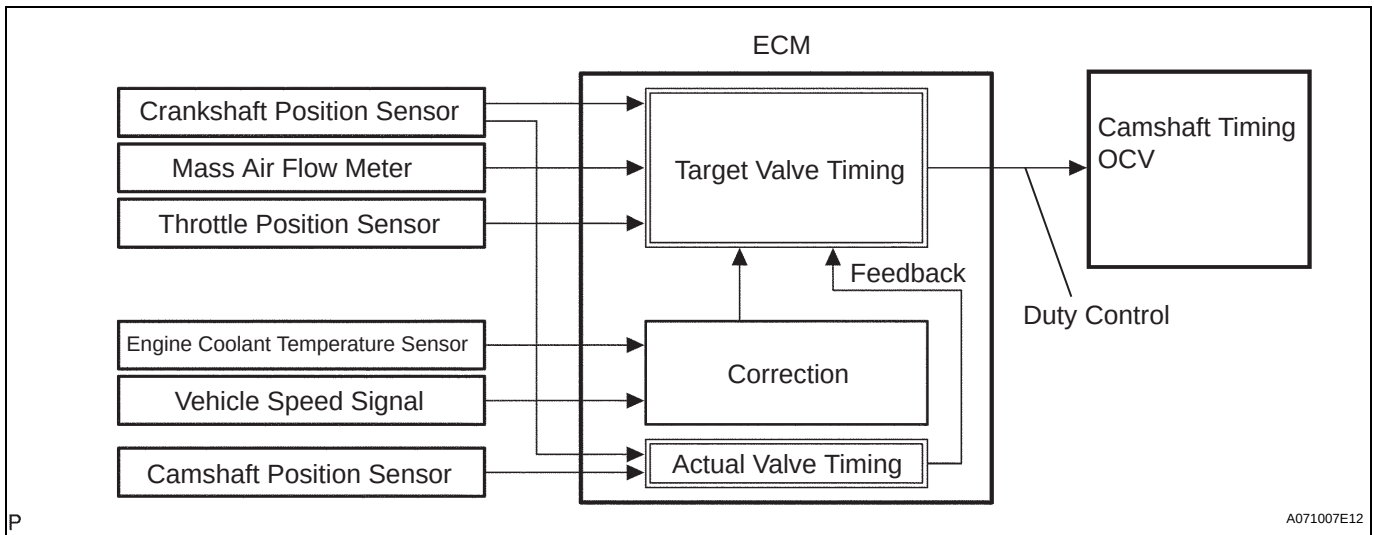


DTC**P0010****Camshaft Position "A" Actuator Circuit (Bank 1)****DESCRIPTION****HINT:**

This DTC relates to the Oil Control Valve (OCV).

The Variable Valve Timing (VVT) system includes the ECM, 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.



DTC No.	DTC Detection Conditions	Trouble Areas
P0010	Open or short in OCV circuit (1 trip detection logic)	- Open or short in 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

ES

Duration	1 second
MIL Operation	Immediate
Sequence of Operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever these DTCs are not present	None
Battery voltage	11 to 13 V
Target duty ratio for the OCV	Less than 70 %
Starter	OFF
Ignition switch	ON
Time after ignition switch OFF to ON	0.5 seconds or more
Current cut status for the OCV	Not cut

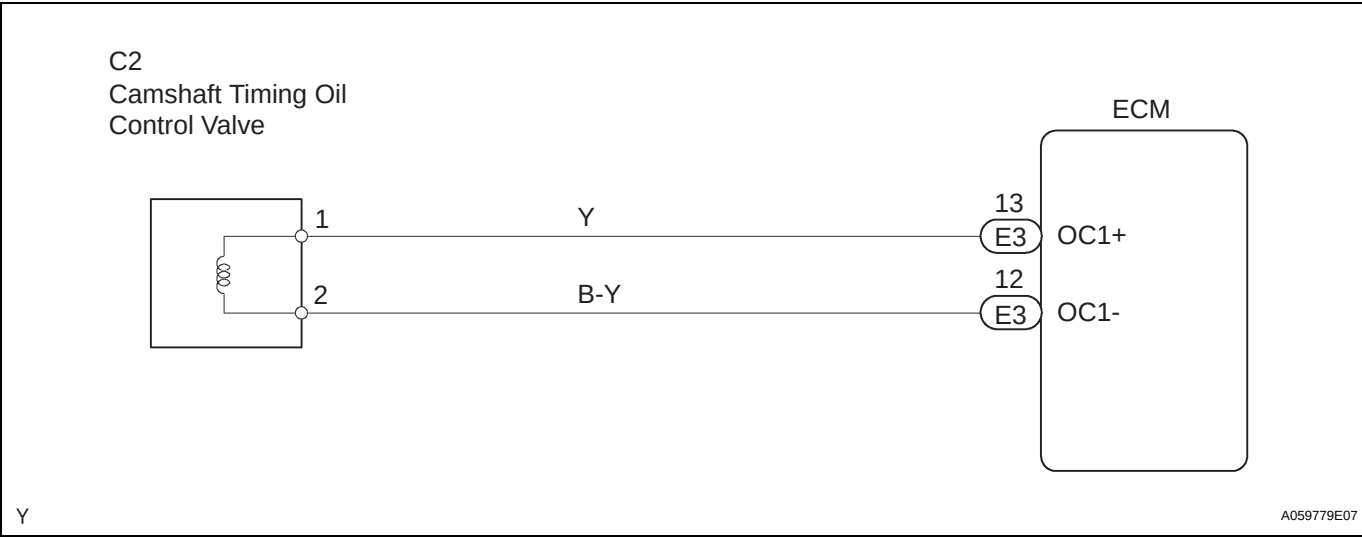
TYPICAL MALFUNCTION THRESHOLDS

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 OCV

COMPONENT OPERATING RANGE

VVT OCV duty ratio	3 to 100 %
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WIRING DIAGRAM



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.

When using intelligent tester:**1 PERFORM ACTIVE TEST BY INTELLIGENT TESTER (OPERATE OCV)**

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

OK

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

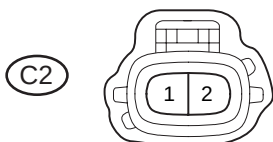
OK

CHECK FOR INTERMITTENT PROBLEMS

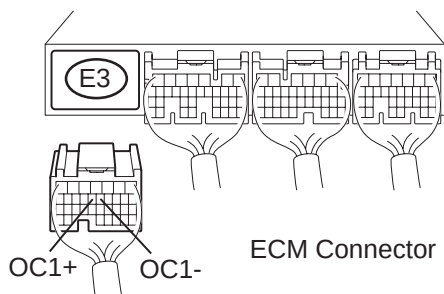
NG

2 CHECK HARNESS AND CONNECTOR (CAMSHAFT TIMING OIL CONTROL VALVE(OCV) - ECM)**Wire Harness Side:**

OCV Connector



Front View



ECM Connector

Y

A130809E02

- (a) Disconnect the C2 OCV connector.
- (b) Disconnect the E3 ECM connector.
- (c) Check the resistance.

Standard resistance (Check for open)

Tester Connections	Specified Conditions
OCV (C2-1) - OC1+ (E3-13)	Below 1 Ω
OCV (C2-2) - OC1- (E3-12)	Below 1 Ω

Standard resistance (Check for short)

Tester Connections	Specified Conditions
OCV (C2-1) or OC1+ (E3-13) - Body ground	10 k Ω or higher
OCV (C2-2) or OC1- (E3-12) - Body ground	10 k Ω or higher

- (d) Reconnect the OCV connector.
- (e) Reconnect the ECM connector.

NG

REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

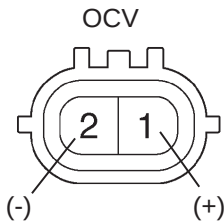
REPLACE ECM

ES

When Using OBD II Scan Tool:

1 INSPECT CAMSHAFT TIMING OIL CONTROL VALVE ASSY

Component Side:



Y

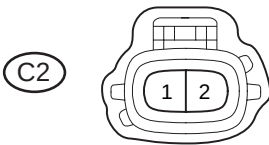
A076968E15

- (a) Disconnect the C2 Oil Control Valve (OCV) connector.
- (b) Apply positive battery voltage between the terminals of the OCV.
- (c) Check the engine speed.
OK:
Rough idling, or the engine stalls.
- (d) Reconnect the OCV connector.

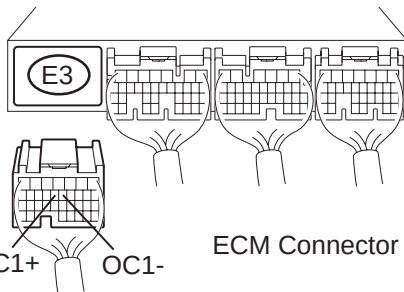
NG**REPLACE CAMSHAFT TIMING OIL CONTROL VALVE ASSEMBLY****OK****2 CHECK HARNESS AND CONNECTOR (CAMSHAFT TIMING OIL CONTROL VALVE(OCV) - ECM)**

Wire Harness Side:

OCV Connector



Front View



ECM Connector

Y

A130809E02

- (a) Disconnect the C2 OCV connector.
- (b) Disconnect the E3 ECM connector.
- (c) Check the resistance.

Standard resistance (Check for open)

Tester Connections	Specified Conditions
OCV (C2-1) - OC1+ (E3-13)	Below 1 Ω
OCV (C2-2) - OC1- (E3-12)	Below 1 Ω

Standard resistance (Check for short)

Tester Connections	Specified Conditions
OCV (C2-1) or OC1+ (E3-13) - Body ground	10 k Ω or higher
OCV (C2-2) or OC1- (E3-12) - Body ground	10 k Ω or higher

- (d) Reconnect the OCV connector.
- (e) Reconnect the ECM connector.

NG**REPAIR OR REPLACE HARNESS OR CONNECTOR****OK****CHECK FOR INTERMITTENT PROBLEMS**