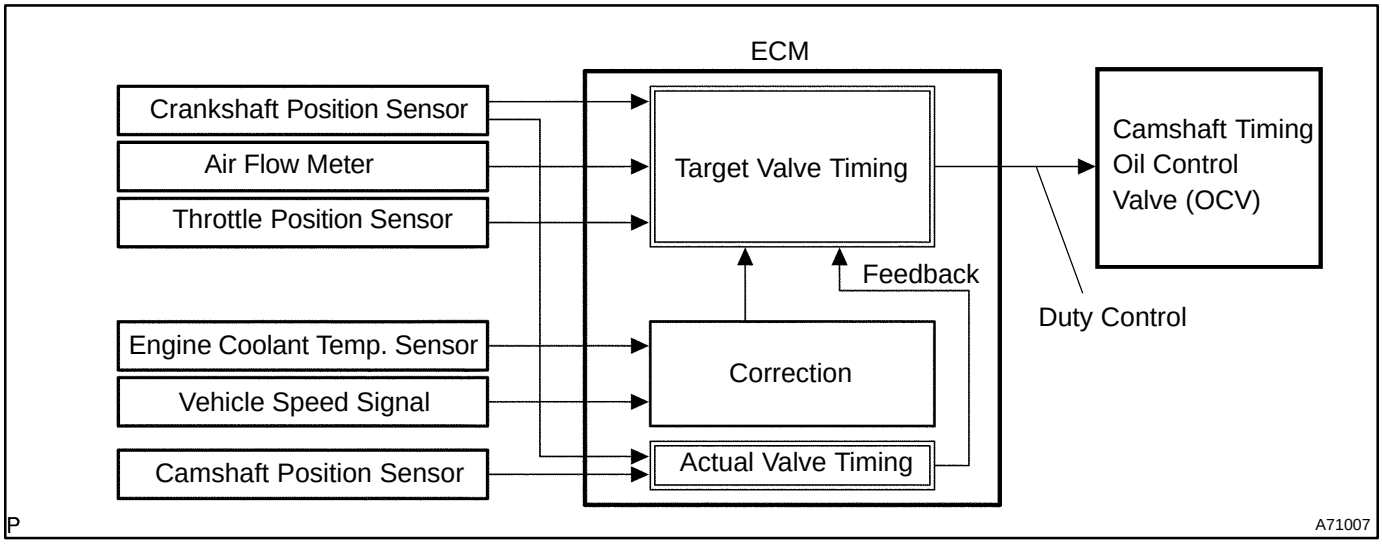
DTC	P0010	CAMSHAFT POSITION "A" ACTUATOR CIRCUIT (BANK 1)

DTC	P0020	CAMSHAFT POSITION "A" ACTUATOR CIRCUIT (BANK 2)

CIRCUIT DESCRIPTION

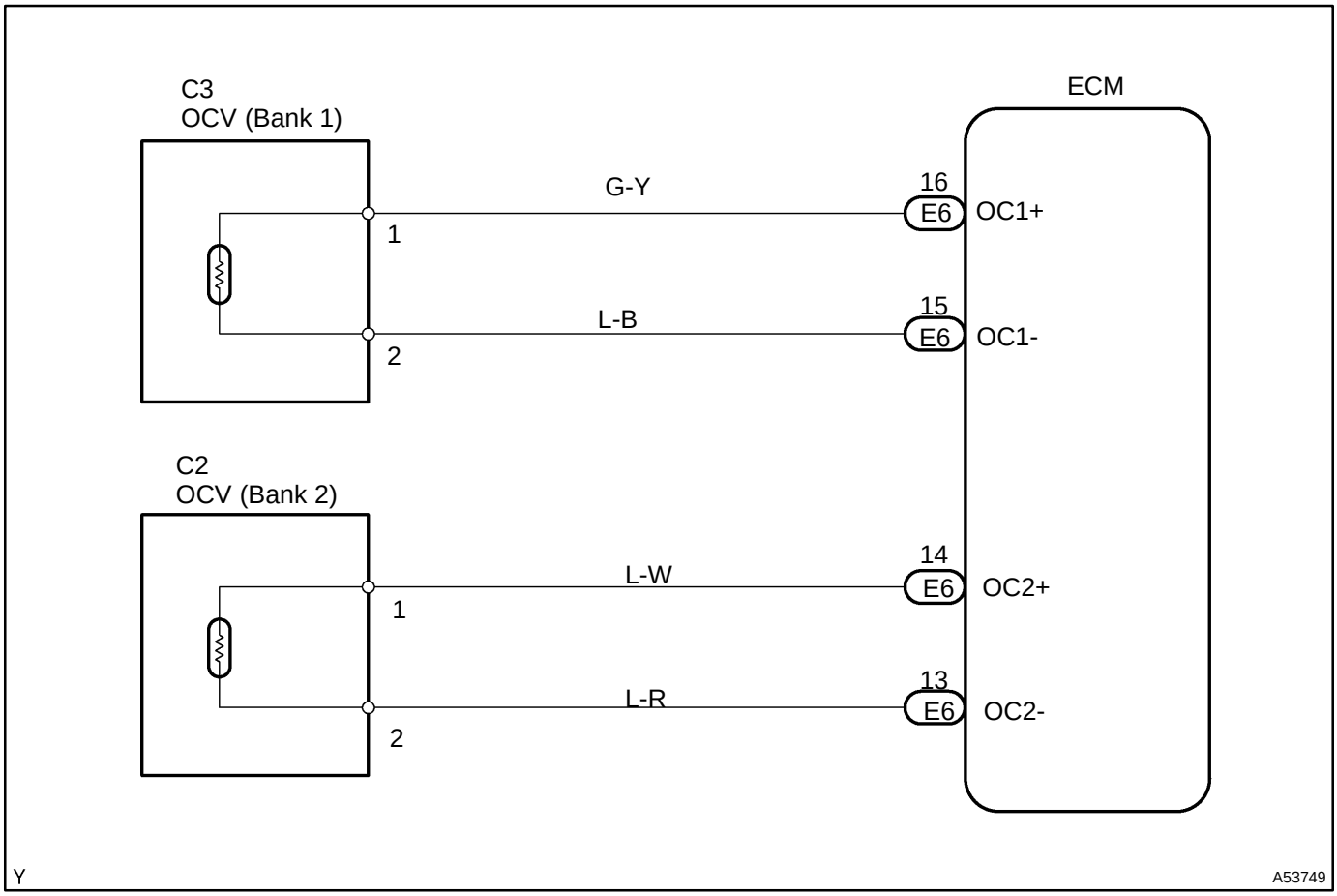
The VVT system controls the intake camshaft to provide the optimal valve timing for every driving condition. This control is performed based on the signals, such conditions as intake air volume, throttle position and engine coolant temperature.

The ECM controls the oil control valve (OCV), based on the signals output from the sensors. The VVT controller regulates the intake camshaft angle using oil pressure through the OCV. As result, the relative position between the camshaft and the crankshaft becomes optimal, and the engine torque improves, fuel economy improves, exhaust emissions decrease under overall driving conditions. Also, the ECM detects the actual valve timing using the signals from the camshaft position sensor and the crankshaft position sensor, and performs feedback control. This is how target valve timing is achieved by the ECM.



DTC No.	DTC Detection Condition	Trouble Area
P0010 P0020	Open or short in oil control valve circuit	• Open or short in oil control valve circuit • Oil control valve • ECM

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

- If DTC P0010 is displayed, check the right bank VVT system circuit.
- If DTC P0020 is displayed, check the left bank VVT system circuit.
- Read freeze frame data using the hand-held tester or the OBD II scan tool, as freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air-fuel ratio was lean or rich, etc. at the time of the malfunction.

Hand-held tester:

1	PERFORM ACTIVE TEST BY HAND-HELD TESTER(OPERATE OCV)

(a) Connect the hand-held tester to the DLC3.
(b) Start the engine and warm it up.
(c) Turn the ignition switch ON and push the hand-held tester main switch ON.
(d) Select the item "DIAGNOSIS/ENHANCED OBD II/ACTIVE TEST/VVT CTRL B1 or VVT CTRL B2".
(e) Check the engine speed when operating the OCV by the hand-held tester.
Standard:

Tester operation	Specified condition
OCV is OFF	Normal engine speed
OCV is ON	Rough idle or engine stall

OK → **CHECK FOR INTERMITTENT PROBLEMS (See page 05-5)**

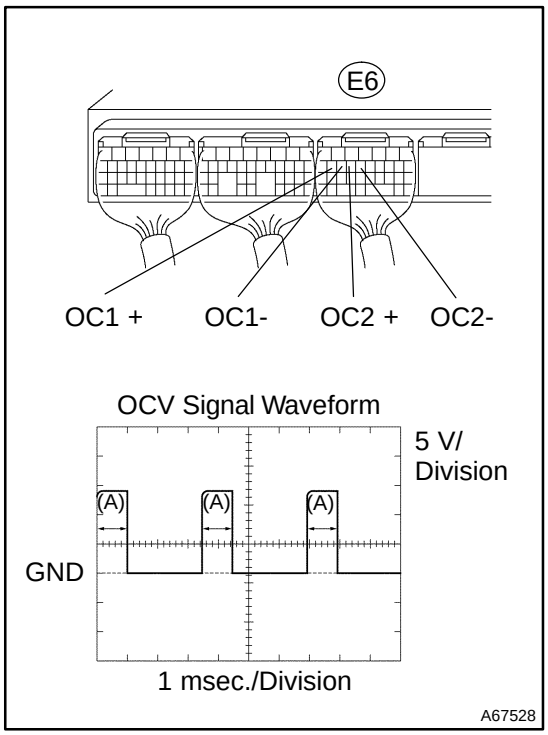
NG

2	INSPECT CAMSHAFT TIMING OIL CONTROL VALVE ASSY(OCV) (See page 10-3)

NG → **REPLACE CAMSHAFT TIMING OIL CONTROL VALVE ASSY**

OK

3	CHECK ECM(OCV SIGNAL)



(a) Inspection using the oscilloscope.
(b) During idling, check the waveform between the terminals of the E6 ECM connector.
Standard:

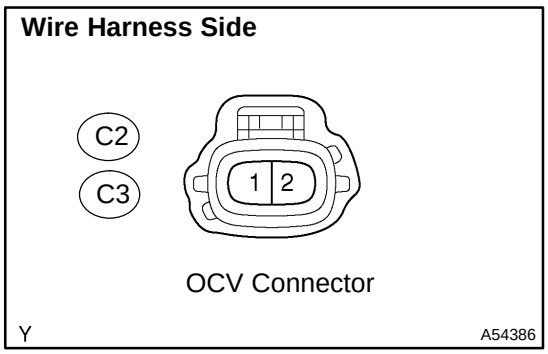
Symbols (Terminal No.)	Specified condition
OC1+ (E6-16) - OC1- (E6-15)	Correct waveform is as shown
OC2+ (E6-14) - OC2- (E6-13)	

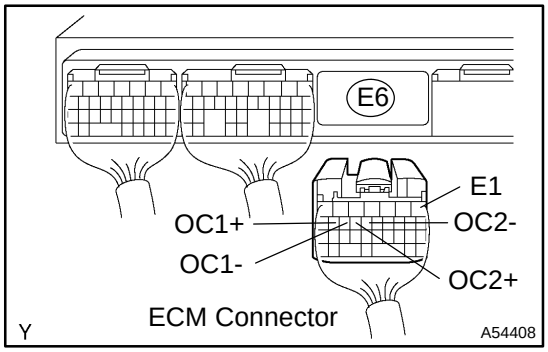
HINT:
The waveform frequency (A) is lengthened as the engine speed becomes higher.

NG → **CHECK AND REPLACE ECM (See page 01-35)**

OK

4	CHECK HARNESS AND CONNECTOR(CAMSHAFT TIMING OIL CONTROL VALVE (OCV) - ECM)





(a) Disconnect the C2 or C3 OCV connector.
(b) Disconnect the E6 ECM connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
OCV (C3-1) - OC1+ (E6-16)	Continuity
OCV (C3-2) - OC1- (E6-15)	
OCV (C2-1) - OC2+ (E6-14)	
OCV (C2-2) - OC2- (E6-13)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
OCV (C3-1) or OC1+ (E6-16) - E1 (E6-1)	No continuity
OCV (C3-1) or OC1- (E6-15) - E1 (E6-1)	
OCV (C2-1) or OC2+ (E6-14) - E1 (E6-1)	
OCV (C2-1) or OC2- (E6-13) - E1 (E6-1)	

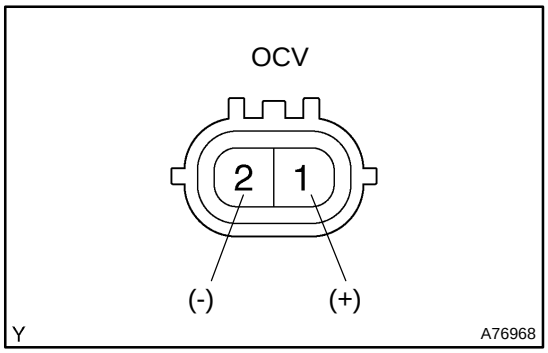
NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK FOR INTERMITTENT PROBLEMS (See page 05-5)

OBDII scan tool (excluding hand-held tester):

1	CHECK CAMSHAFT TIMING OIL CONTROL VALVE ASSY(OPERATE OCV)



(a) Disconnect the C2 or C3 OCV connector.
(b) Apply battery positive voltage between the terminals of the OCV.
(c) Check the engine speed.

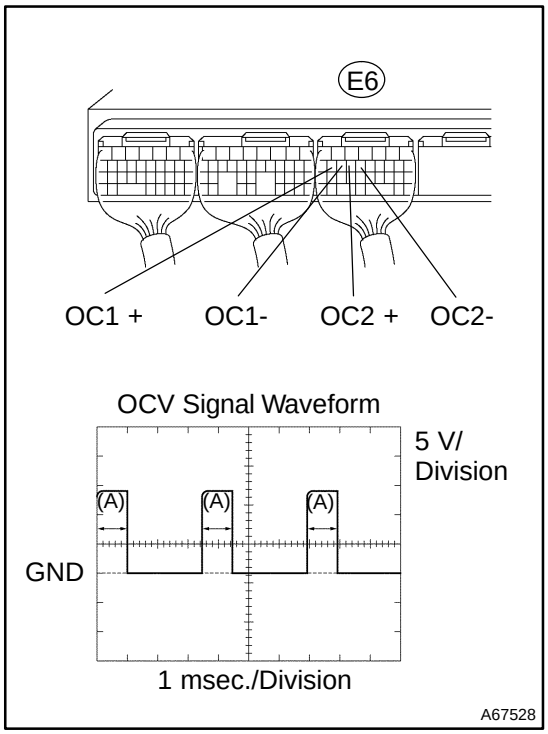
Standard:

Engine speed is rough idle or engine is stalled.

NG → **REPLACE CAMSHAFT TIMING OIL CONTROL VALVE ASSY**

OK

2 CHECK ECM(OCV SIGNAL)



(a) Inspection using the oscilloscope.
(b) During idling, check the waveform between the terminals of the E6 ECM connector.

Standard:

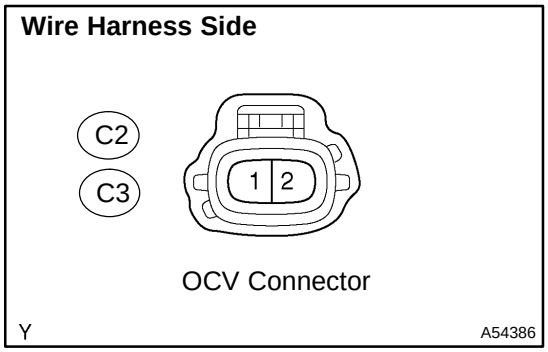
Symbols (Terminal No.)	Specified condition
OC1+ (E6-16) - OC1- (E6-15)	Correct waveform is as shown
OC2+ (E6-14) - OC2- (E6-13)	

HINT:
The waveform frequency (A) is lengthened as the engine speed becomes higher.

NG → **CHECK AND REPLACE ECM (See page 01-35)**

OK

3 CHECK HARNESS AND CONNECTOR(CAMSHAFT TIMING OIL CONTROL VALVE (OCV) - ECM)



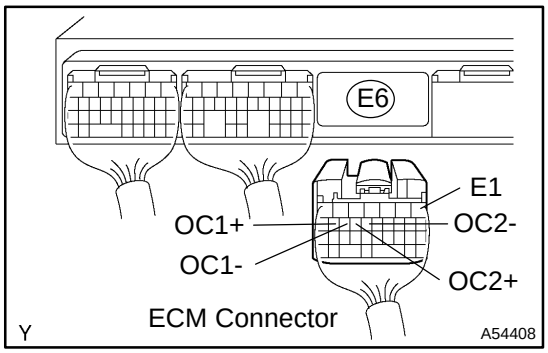
(a) Disconnect the C2 or C3 OCV connector.
(b) Disconnect the E6 ECM connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
OCV (C3-1) - OC1+ (E6-16)	Continuity
OCV (C3-2) - OC1- (E6-15)	
OCV (C2-1) - OC2+ (E6-14)	
OCV (C2-2) - OC2- (E6-13)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
OCV (C3-1) or OC1+ (E6-16) - E1 (E6-1)	No continuity
OCV (C3-1) or OC1- (E6-15) - E1 (E6-1)	
OCV (C2-1) or OC2+ (E6-14) - E1 (E6-1)	
OCV (C2-1) or OC2- (E6-13) - E1 (E6-1)	



NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK FOR INTERMITTENT PROBLEMS (See page 05-5)