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

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

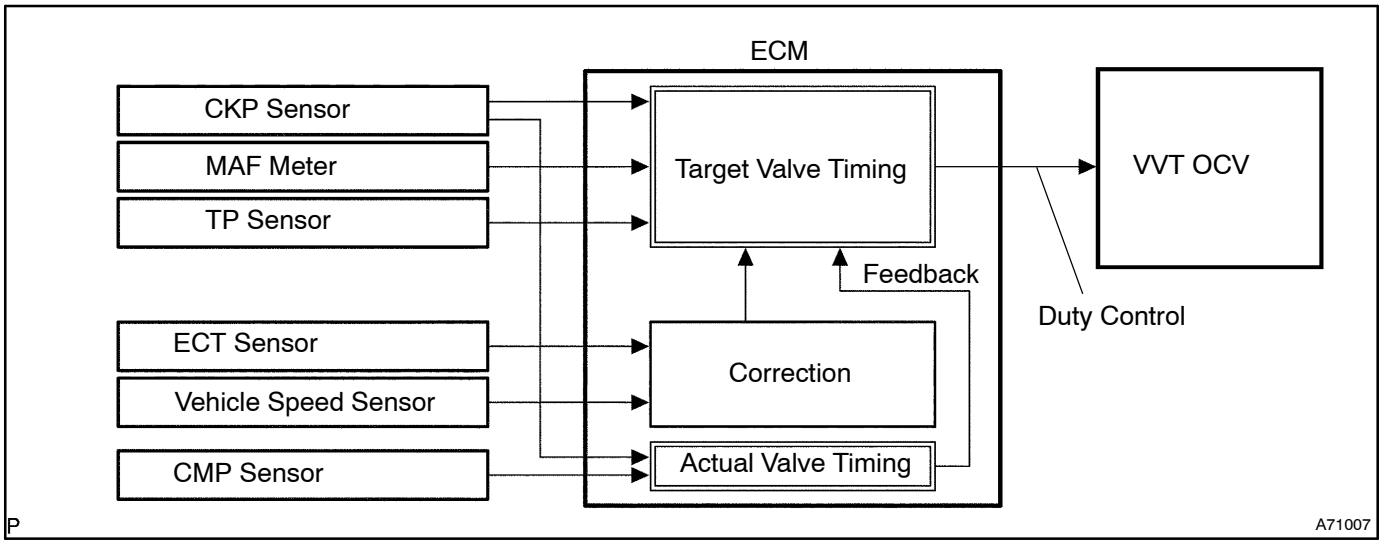
HINT:

- If DTC P0010 is displayed, check the bank 1 Variable Valve Timing Oil Control Valve (VVT OCV).
- If DTC P0020 is displayed, check the bank 2 VVT OCV.
- Bank 1 includes cylinder No. 1, but bank 2 does not. Cylinder No. 1 is located in the front part of the engine, opposite the transmission.

CIRCUIT DESCRIPTION

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

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



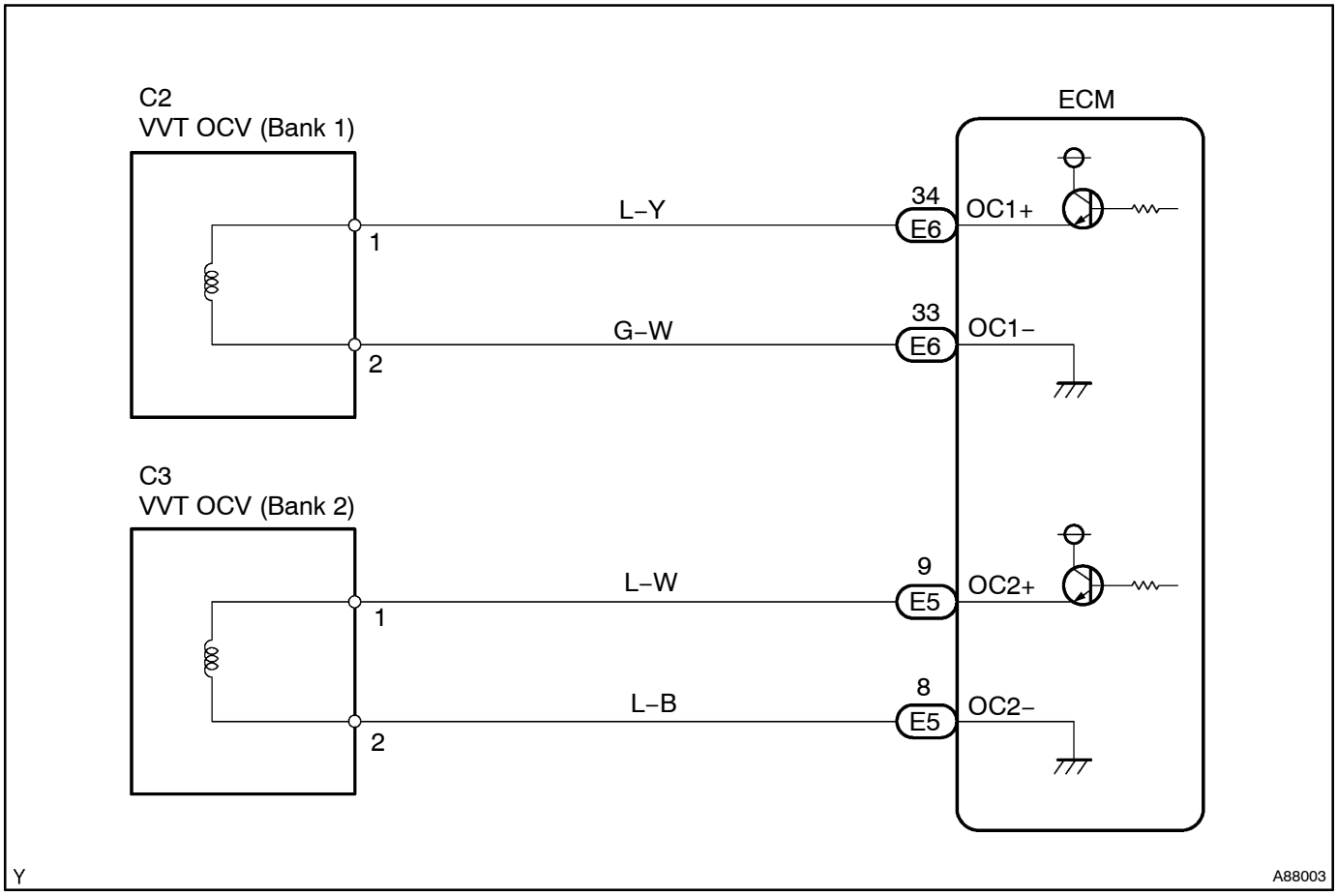
DTC No.	DTC Detection Condition	Trouble Area
P0010 P0020	Open or short in VVT OCV circuit (1 trip detection logic)	• Open or short in VVT OCV circuit • VVT OCV • ECM

MONITOR DESCRIPTION

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 detects a malfunction and sets a DTC when the actual duty–cycle ratio varies from the target duty–cycle ratio.

This monitor runs for 1 second (the first second of engine idle) after the engine is started.

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Read freeze frame data using the Intelligent Tester II. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, 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 (OCV OPERATION)

(a) Connect the Intelligent Tester II to the DLC3.
(b) Start the engine and warm it up.
(c) Turn ON the ignition switch and the Intelligent Tester II main switch.
(d) Enter the following menus: Enter/ Diagnosis/ OBD·MOBD/ Power train/ Engine and ECT/ Active Test/ VVT CTRL B1 (or VVT CTRL B2).
(e) Operate the OCV and check the engine condition at idling.

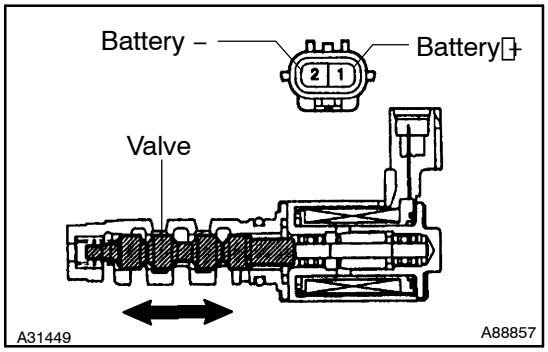
Standard:

Tester Operation	Specified Condition
OCV is OFF	Normal engine RPM
OCV is ON	Rough idle or engine stall

OK → **CHECK FOR INTERMITTENT PROBLEMS (See page 05–11)**

NG

2 CHECK CAMSHAFT TIMING OIL CONTROL VALVE ASSY (OCV) (OPERATION)

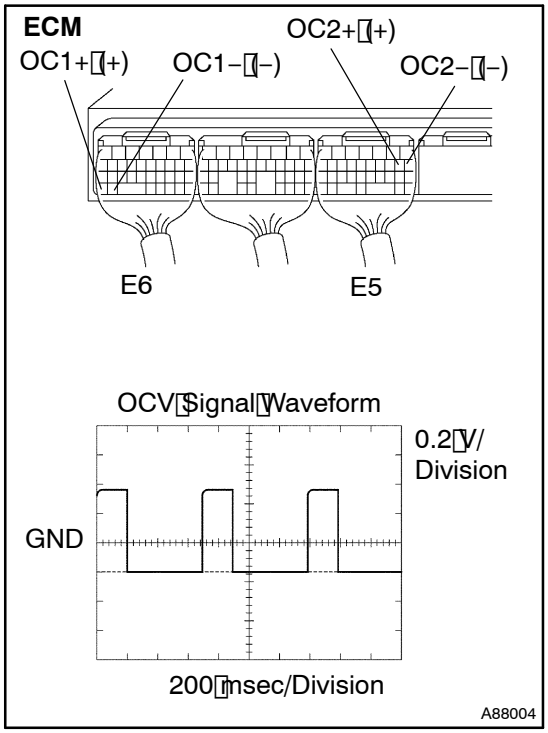


(a) Disconnect the C2 or C3 OCV connector.
(b) Apply battery positive voltage between the terminals of the OCV.
(c) Check the engine RPM.
OK: Rough idle or engine stalled

NG → **REPLACE CAMSHAFT TIMING OIL CONTROL VALVE ASSY (OCV)**

OK

3 INSPECT ECM (OCV SIGNAL)



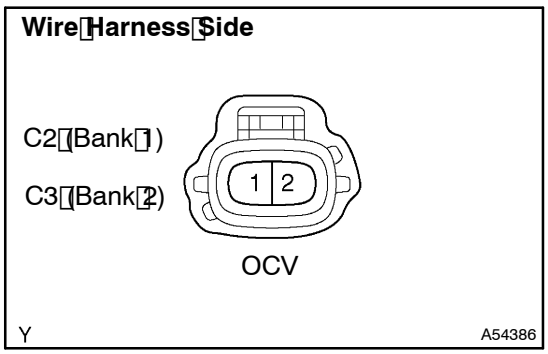
(a) During idling, check the waveform between the specified terminals of the E5 and E6 ECM connectors using an oscilloscope.
Standard:

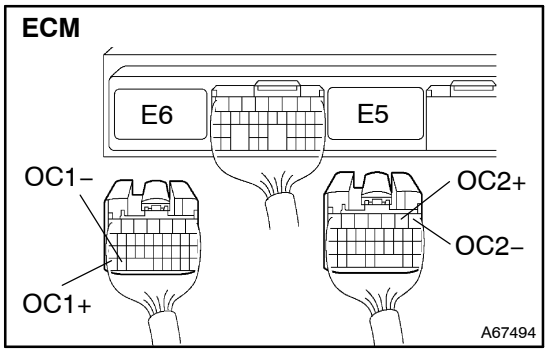
Tester Connection	Specified Condition
E6–34 (OC1+) – E6–33 (OC1–)	Correct waveform is as shown
E5–9 (OC2+) – E5–8 (OC2–)	Correct waveform is as shown

NG → **REPLACE ECM (See page 10–21)**

OK

4 CHECK WIRE HARNESS (OCV – ECM)





(a) Disconnect the C2 or C3 OCV connector.
(b) Disconnect the E6 or E5 ECM connector.
(c) Measure the resistance between the wire harness side connectors.

Standard:

Tester Connection	Specified Condition
C2–1 – E6–34 (OC1+)	Below 1 Ω
C2–2 – E6–33 (OC1–)	Below 1 Ω
C3–1 – E5–9 (OC2+)	Below 1 Ω
C3–2 – E5–8 (OC2–)	Below 1 Ω
C2–1 or E6–34 (OC1+) – Body ground	10 kΩ or higher
C2–2 or E6–33 (OC1–) – Body ground	10 kΩ or higher
C3–1 or E5–9 (OC2+) – Body ground	10 kΩ or higher
C3–2 or E5–8 (OC2–) – Body ground	10 kΩ or higher

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

OK

CHECK FOR INTERMITTENT PROBLEMS (See page 05–11)