DTC	P0011	CAMSHAFT POSITION ”A” –TIMING OVER–ADVANCED OR SYSTEM PERFORMANCE (BANK 1)

DTC	P0012	CAMSHAFT POSITION ”A” –TIMING OVER–RETARDED (BANK 1)

CIRCUIT DESCRIPTION

Refer to DTC P0010 on page 05–63.

DTC No.	DTC Detection Condition	Trouble Area
P0011 P0012	After engine is warmed up, condition (a) or (b) continues at engine speed of 900 to 5,000 rpm: (a) Valve timing does not change from current valve timing (b) Current valve timing is fixed	• Valve timing • Oil control valve • Camshaft timing gear assembly • ECM

MONITOR DESCRIPTION

The ECM optimizes the valve timing using the Variable Valve Timing (VVT) system to control the intake valve 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, applied to the OCV, regulates the oil pressure supplied to the VVT controller. The VVT controller can advance or retard the intake valve camshaft.

Example:

A DTC will be set if: 1) the difference between the target and actual valve timing is more than 5 degrees of the crankshaft angle (CA) and this condition continues for more than 4.5 seconds; or 2) the OCV is forcibly activated 63 times or more.

Advanced cam DTCs are subject to ”1 trip” detection logic.

Retarded cam DTCs are subject to ”2 trip” detection logic.

MONITOR STRATEGY

Related DTCs	P0011: VVT system advance (bank 1) P0012: VVT system retard (bank 1)
Required sensors/components	Main sensors: Camshaft position sensor Related sensors: Engine coolant temperature sensor Crankshaft position sensor
Frequency of operation	Once per driving cycle
Duration	10 seconds
MIL operation	P0011: Immediately P0012: 2 driving cycles
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	See page 05–20
Battery voltage	11 V or more
Engine speed	900 rpm or more, and 5,000 rpm or less
Engine coolant temperature	75°C (167°F) or more, and 100°C (212°F) or less

TYPICAL MALFUNCTION THRESHOLDS

Duration time of the following condition (a) and (b) are met	4.5 seconds or more
(a) Following conditions are met:	1 & 2
1. VVT control status	Feedback
2. Deviation of valve timing (Target valve timing – Actual valve timing)	More than 5°CA
(b) Response of valve timing	1 sec/°CA or more

WIRING DIAGRAM

Refer to DTC P0010 on page 05–63.

INSPECTION PROCEDURE

HINT:

Advanced timing over standard level (Valve timing is out of specified range)	P0011
Retarded timing over (Valve timing is out of specified range)	P0012

- If DTC P0011 or P0012 is displayed, check the VVT system circuit.
- Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine condition when 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.

Hand–held tester:

1	**CHECK VALVE TIMING(CHECK FOR LOOSE AND A JUMPED TOOTH OF TIMING CHAIN) (See page 14–6)**

OK: The match marks of crankshaft pulley and camshaft pulley are aligning.

NG → **ADJUST VALVE TIMING (See page 14–6)**

OK

2	PERFORM ACTIVE TEST BY HAND–HELD TESTER(OPERATE OCV)

(a) Connect the hand–held tester to the DLC3.
(b) Turn the power switch ON (IG).
(c) Turn the hand–held tester ON.
(d) Put the engine in inspection mode (see page 05–1).
(e) Start the engine and warm it up.
(f) Select the item: DIAGNOSIS / ENHANCED OBD II / ENGINE AND ECT / ACTIVE TEST / VVT CTRL B1.
(g) Using the hand–held tester, operate the OCV and check the engine speed.
Standard:

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

NOTICE:
Do not drive the vehicle without deactivating inspection mode, otherwise damaging the transaxle may result.

NG → **Go to step 4**

OK

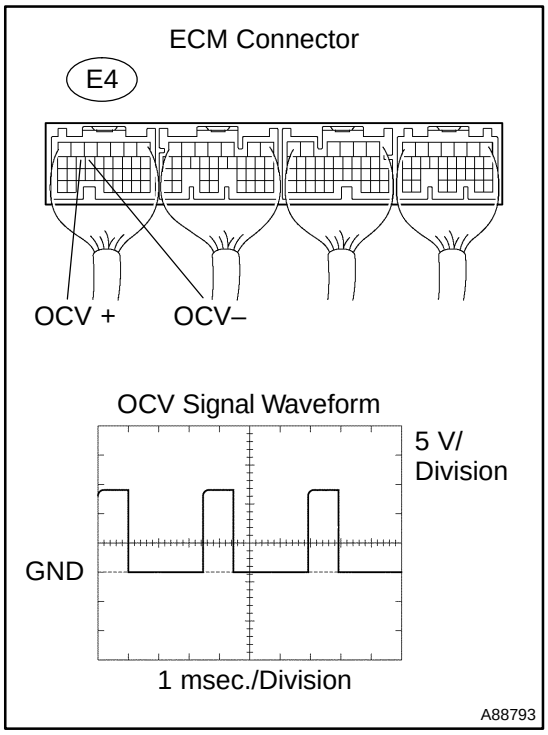
3	CHECK IF DTC OUTPUT RECURS

(a) Clear the DTCs (see page 05–41).
(b) Start the HV main system and warm the engine up.
(c) Drive the vehicle with the shift position in B at vehicle speed of more than 44 mph (70 km/h) approximately for 10 minutes or more.
(d) Read output DTCs using the hand–held tester.
Standard: No DTC output.
HINT:
*: DTC P0011 or P0012 is output when a foreign object in engine oil is caught in some part of the system. These codes will stay registered even if the system returns to normal after a short time. Foreign objects are filtered out by the oil filter.

OK → **VVT SYSTEM OK ***

NG

4	INSPECT ECM(OCV SIGNAL)



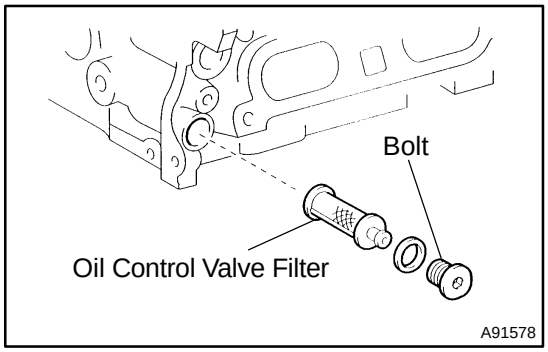
(a) During idling, check the waveform between the specified terminals of the E4 ECM connector using an oscilloscope.
Standard:

Tester Connection	Specified Condition
OCV+ (E4–15) – OCV– (E4–14)	Correct waveform is as shown

NG → **REPLACE ECM (See page 10–24)**

OK

5	INSPECT OIL CONTROL VALVE FILTER (See page 14–124)



(a) Remove the air cleaner inlet, bolt and oil control valve filter.
(b) Check for blockages in the oil control valve filter.
(c) Reinstall the filter, bolt and air cleaner inlet.

NOTICE:
If necessary, clean the filter.
OK: The filter has not clogged.

NG → **REPLACE OIL CONTROL VALVE FILTER**

OK

6	INSPECT CAMSHAFT TIMING OIL CONTROL VALVE ASSY(OCV) (See page 10–5)

OK: OCV has no contamination and moves smoothly.

OK → **Go to step 8**

NG

7	REPLACE CAMSHAFT TIMING OIL CONTROL VALVE ASSY(OCV)

GO

8	INSPECT CAMSHAFT TIMING GEAR ASSY (See page 14–95)

OK → Go to step 10

NG

9	REPLACE CAMSHAFT TIMING GEAR ASSY

GO

10	CHECK IF DTC OUTPUT RECURS

(a) Clear the DTCs (see page 05–41).
(b) Start the HV system, and warm the engine up.
(c) Drive the vehicle with the shift position in B at vehicle speed of more than 44 mph (70 km/h) approximately for 10 minutes or more.
(d) Read output DTCs using the hand–held tester.

OK: No DTC output.

HINT:

*: DTC P0011 or P0012 is output when a foreign object in engine oil is caught in some part of the system. These codes will stay registered even if the system returns to normal after a short time. Foreign objects are filtered out by the oil filter.

OK → VVT SYSTEM OK *

NG

REPLACE ECM (See page 10–24)

OBDII scan tool (excluding hand–held tester):

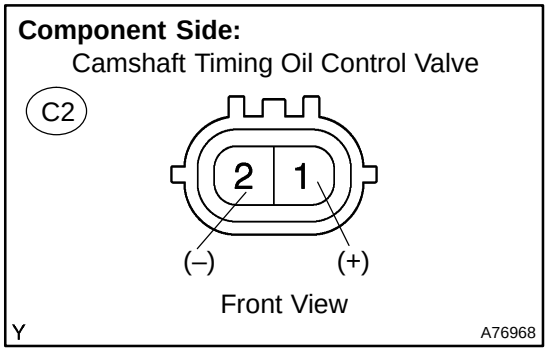
1	CHECK VALVE TIMING(CHECK FOR LOOSE AND A JUMPED TOOTH OF TIMING CHAIN) (See page 14–6)

OK: The match marks of crankshaft pulley and camshaft pulley are aligning.

OK → **ADJUST VALVE TIMING (See page 14–6)**

NG

2	CHECK OPERATION OF OCV



(a) Put the engine in inspection mode.
(b) Start the engine.
(c) Check the engine speed under conditions (1) and (2) below.
  (1) Disconnect the C2 camshaft timing oil control valve connector.
  (2) Apply the positive battery voltage between the terminals of the camshaft timing oil control valve.

Result:

Proceed to	Check (1)	Check (2)
A	Normal engine speed	Rough idle or engine stall
B	Other than above	Other than above

(d) Reconnect the camshaft timing oil control valve connector.

B → **Go to step 4**

A

3	CHECK IF DTC OUTPUT RECURS

(a) Clear the DTCs (see page 05–41).
(b) Start the HV system, and warm the engine up.
(c) Drive the vehicle with the shift position in B at vehicle speed of more than 44 mph (70 km/h) approximately for 10 minutes or more.
(d) Read output DTCs using the OBD II scan tool.

OK: No DTC output.

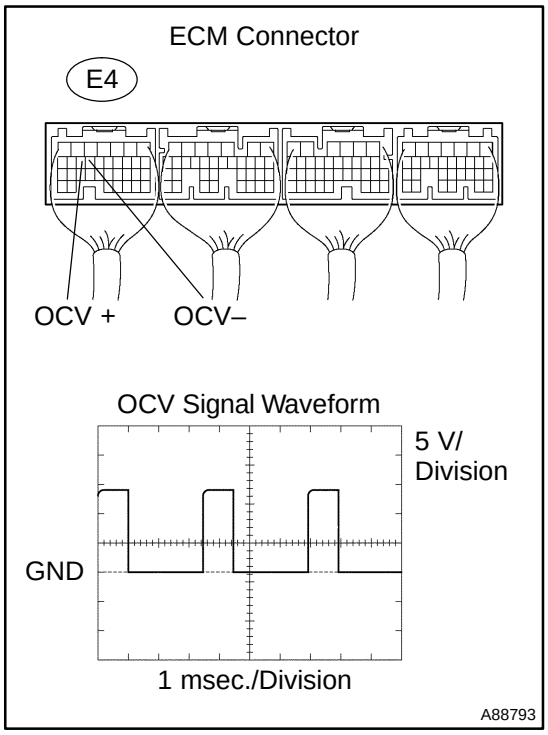
HINT:

*: DTC P0011 or P0012 is output when a foreign object in engine oil is caught in some part of the system. These codes will stay registered even if the system returns to normal after a short time. Foreign objects are filtered out by the oil filter.

OK → **VVT SYSTEM OK ***

NG

4	INSPECT ECM(OCV SIGNAL)



(a) Put the engine in inspection mode.
(b) Start the engine and warm it up.
(c) During idling, check the waveform between the specified terminals of the E4 ECM connector using the oscilloscope.

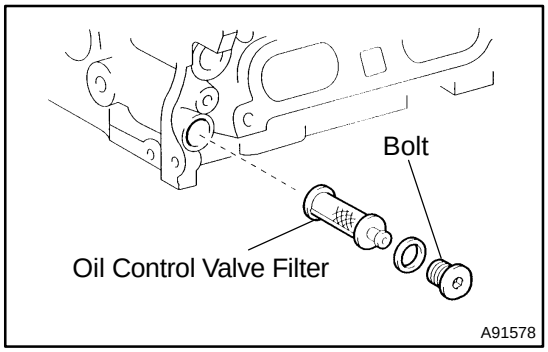
Standard:

Tester Connection	Specified Condition
OCV+ (E4–15) – OCV– (E4–14)	Correct waveform is as shown

NG → **REPLACE ECM (See page 10–24)**

OK

5	INSPECT OIL CONTROL VALVE FILTER (See page 14–124)



(a) Remove the air cleaner inlet, bolt and oil control valve filter.
(b) Check for blockages in the oil control valve filter.
(c) Reinstall the filter, bolt and air cleaner inlet.

NOTICE:

If necessary, clean the filter.

OK: The filter has not clogged.

NG → **REPLACE OIL CONTROL VALVE FILTER**

OK

6	INSPECT CAMSHAFT TIMING OIL CONTROL VALVE ASSY(OCV) (See page 10–5)

OK: OCV has no contamination and moves smoothly.

OK → **Go to step 8**

NG

7	REPLACE CAMSHAFT TIMING OIL CONTROL VALVE ASSY(OCV)

GO

8	INSPECT CAMSHAFT TIMING GEAR ASSY (See page 14–95)

OK: The camshaft timing gear rotate smoothly when applying pressure.

OK	Go to step 10

NG

9	REPLACE CAMSHAFT TIMING GEAR ASSY

GO

10	CHECK IF DTC OUTPUT RECURS

(a) Clear the DTCs (see page 05–41).
(b) Start the HV system, and warm the engine up.
(c) Drive the vehicle with the shift position in B at vehicle speed of more than 44 mph (70 km/h) approximately for 10 minutes or more.
(d) Read output DTCs using the OBD II scan tool.

OK: No DTC output.

HINT:
*: DTC P0011 or P0012 is output when a foreign object in engine oil is caught in some part of the system. These codes will stay registered even if the system returns to normal after a short time. Foreign objects are filtered out by the oil filter.

OK	VVT SYSTEM OK *

NG

REPLACE ECM (See page 10–24)