DTC	P0011/59	CAMSHAFT POSITION "A" – TIMING OVER–ADVANCED OR SYSTEM PERFORMANCE (BANK 1)

DTC	P0012/59	CAMSHAFT POSITION "A" – TIMING OVER–RETARDED (BANK 1)

DTC	P0021/59	CAMSHAFT POSITION "A" – TIMING OVER–ADVANCED OR SYSTEM PERFORMANCE (BANK 2)

DTC	P0022/59	CAMSHAFT POSITION "A" – TIMING OVER–RETARDED (BANK2)

CIRCUIT DESCRIPTION

Refer to DTC P0010/39 on page 05–34.

DTC No.	DTC Detection Condition	Trouble Area
P0011/59 P0021/59	Condition (a) or (b) continues after engine is warmed up and engine speed at 400 to 4,000 rpm (Problem of the advanced OCV.): (a) Valve timing does not change from current valve timing (b) Current valve timing is fixed	• Valve timing • OCV • Camshaft timing gear assy • ECM
P0012/59 P0022/59	Condition (a) or (b) continues after engine is warmed up and engine speed at 400 to 4,000 rpm (Problem of the retarded OCV.): (a) Valve timing does not change from current valve timing (b) Current valve timing is fixed	

WIRING DIAGRAM

Refer to DTC P0010/39 on page 05–34.

INSPECTION PROCEDURE

HINT:

Abnormal bank	Advanced timing over (Valve timing is out of specified range)	Retarded timing over (Valve timing is out of specified range)
Bank 1	P0011/59	P0012/59
Bank 2	P0021/59	P0022/59

- If DTC P0011/59, P0012/59 is displayed, check the right bank VVT system circuit.
- If DTC P0021/59, P0022/59 is displayed, check the left bank VVT system circuit.
- Read freeze frame data using the hand–held tester, 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.

When using hand–held tester:

1	CHECK VALVE TIMING (See page 14–7)

NG → ADJUST VALVE TIMING (See page 14–7)

OK

2	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 / OBD/MOBD / 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

NG → Go to step 4

OK

3	READ OUTPUT DTC(CHECK IF DTC OUTPUT RECURS)

(a) Clear the DTC.
(1) Operating the hand–held tester to erase the codes, or disconnecting the battery terminal or the EFI and ETCS fuses more than 60 sec.
(b) Start and warm up the engine.
(c) Drive the vehicle around for 10 minutes or more.
(d) Read output DTC using the hand–held tester.

Standard: No DTC output.

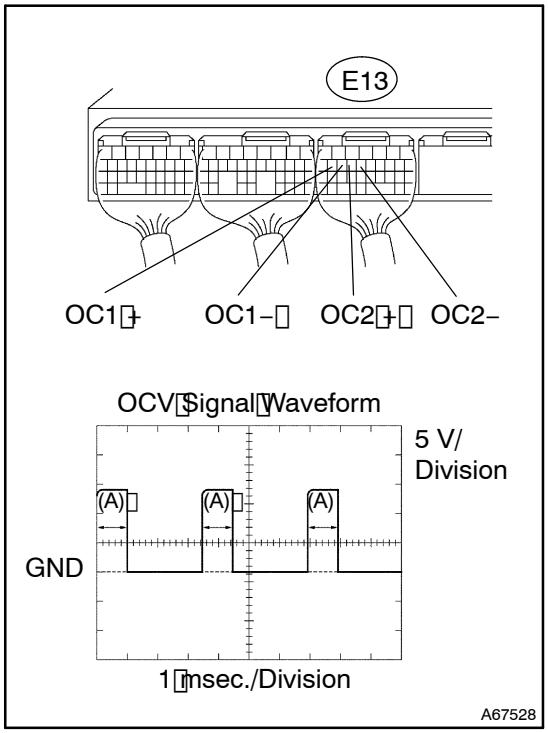
HINT:

*: DTCs P0011/59, P0012/59, P0021/59 or P0022/59 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. These foreign objects are then captured by the oil filter, thus eliminating the source of the problem.

OK → VVT SYSTEM OK *

NG

4	CHECK ECM (OCV SIGNAL)



(a) Inspection using the oscilloscope.
(b) During idling, check the waveform between the terminals of the E13 ECM connector.

Standard:

Symbols (Terminal No.)	Specified condition
OC1+ (E13–16) – OC1– (E13–15)	Correct waveform is as shown
OC2+ (E13–14) – OC2– (E13–13)	

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

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

OK

5	CHECK OIL CONTROL VALVE FILTER

NG → REPLACE OIL CONTROL VALVE FILTER

OK

6	CHECK CAMSHAFT TIMING OIL CONTROL VALVE ASSY (OCV) (See page 10–3)

OK → Go to step 8

NG

7	REPLACE CAMSHAFT TIMING OIL CONTROL VALVE ASSY (OCV)

GO

8	CHECK CAMSHAFT TIMING GEAR ASSY (See page 14–74 or 14–58)

OK → Go to step 10

NG

9	REPLACE CAMSHAFT TIMING GEAR ASSY

GO

10	CHECK FOR BLOCKAGE(OCV, OIL CHECK VALVE AND OIL HOLE)

NG > REPAIR OR REPLACE

OK

11	READ OUTPUT DTC(CHECK IF DTC OUTPUT RECURS)

(a) Clear the DTC.
  (1) Operating the hand–held tester to erase the codes, or disconnecting the battery terminal or the EFI and ETCS fuses more than 60 sec.
(b) Start and warm up the engine.
(c) Drive the vehicle around for 10 minutes or more.
(d) Read output DTC using the hand–held tester.

Standard: No DTC output.

HINT:

*: DTCs P0011/59, P0012/59, P0021/59 or P0022/59 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. These foreign objects are then captured by the oil filter, thus eliminating the source of the problem.

OK > VVT SYSTEM OK *

NG

CHECK AND REPLACE ECM (See page 01–35)

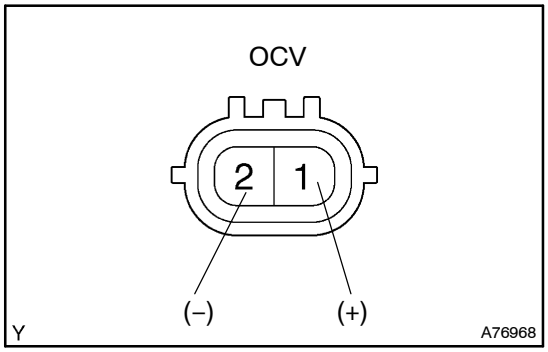
When not using hand–held tester:

1	CHECK VALVE TIMING (See page 14–7)

OK > ADJUST VALVE TIMING (See page 14–7)

NG

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



(a) Start the engine.
(b) Check the engine speed at (1) and (2).
  (1) Disconnect the C23 or C24 OCV connector.
  (2) Apply battery positive voltage between the terminals of the OCV.

Result:

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

B → **Go to step 4**

A

3 READ OUTPUT DTC(CHECK IF DTC OUTPUT RECURS)

(a) Clear the DTC.
  (1) Disconnecting the battery terminal or removing the EFI and ETCS fuses more than 60 sec.
(b) Start and warm up the engine.
(c) Drive the vehicle around for 10 minutes or more.
(d) Read output DTC.

Standard: No DTC output.

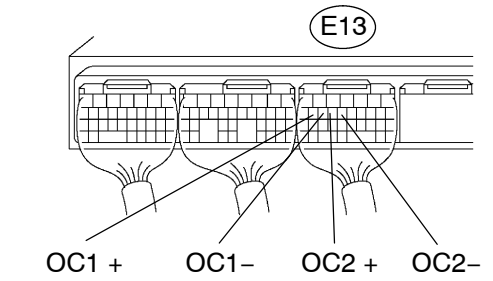
HINT:

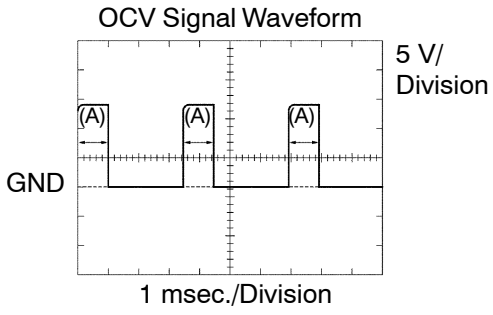
*: DTCs P0011/59, P0012/59, P0021/59 or P0022/59 is output when a foreign object in engine oil is caught in some part of the system. These codes will stay registered even if the system returns to normal after a short time. These foreign objects are then captured by the oil filter, thus eliminating the source of the problem.

OK → **VVT SYSTEM OK ***

NG

4	CHECK ECM(OCV SIGNAL)





(a) Inspection using the oscilloscope.
(b) During idling, check the waveform between the terminals of the E13 ECM connector.

Standard:

Symbols (Terminal No.)	Specified condition
OC1+ (E13–16) – OC1– (E13–15)	Correct waveform is as shown
OC2+ (E13–14) – OC2– (E13–13)	

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

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

OK

5	CHECK OIL CONTROL VALVE FILTER

NG → **REPLACE OIL CONTROL VALVE FILTER**

OK

6	CHECK CAMSHAFT TIMING OIL CONTROL VALVE ASSY(OCV) (See page 10–3)

OK → **Go to step 8**

NG

7	REPLACE CAMSHAFT TIMING OIL CONTROL VALVE ASSY(OCV)

GO

8	CHECK CAMSHAFT TIMING GEAR ASSY (See page 14–74 or 14–58)

OK → **Go to step 10**

NG

9	REPLACE CAMSHAFT TIMING GEAR ASSY

GO

10	CHECK FOR BLOCKAGE (OCV, OIL CHECK VALVE AND OIL HOLE)

NG → REPAIR OR REPLACE

OK

11	READ OUTPUT DTC (CHECK IF DTC OUTPUT RECURS)

(a) Clear the DTC.
  (1) Disconnecting the battery terminal or removing the EFI and ETCS fuses more than 60 sec.
(b) Start and warm up the engine.
(c) Drive the vehicle around for 10 minutes or more.
(d) Read output DTC.

Standard: No DTC output.

HINT:

*: DTCs P0011/59, P0012/59, P0021/59 or P0022/59 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. These foreign objects are then captured by the oil filter, thus eliminating the source of the problem.

OK → VVT SYSTEM OK *

NG

CHECK AND REPLACE ECM (See page 01–35)