DTC	P0014	Camshaft Position "B" - Timing Over-Advanced or System Performance (Bank 1)
DTC	P0015	Camshaft Position "B" - Timing Over-Retarded (Bank 1)
DTC	P0024	Camshaft Position "B" - Timing Over-Advanced or System Performance (Bank 2)
DTC	P0025	Camshaft Position "B" - Timing Over-Retarded (Bank 2)

HINT:
If DTC P0014, P0015, P0024 or P0025 is present, check the VVT (Variable Valve Timing) system.

DESCRIPTION

Refer to DTC P0013 (See page ES-87).

DTC No.	DTC Detection Condition	Trouble Area
P0014 P0024	Advanced cam timing: With warm engine and engine speed of between 500 rpm and 4,000 rpm, all conditions (a), (b) and (c) are met (2 trip detection logic): (a) Difference between target and actual exhaust valve timing is more than 5°CA (Crankshaft Angle) for 4.5 seconds (b) Current exhaust valve timing is fixed (timing changes less than 5°CA in 5 seconds) (c) Variations in VVT controller timing are more than 19°CA of maximum delayed timing (advanced)	• Valve timing • OCV for exhaust camshaft • OCV filter • Exhaust camshaft timing gear assembly • ECM
P0015 P0025	Retarded cam timing: With warm engine and engine speed of between 500 rpm and 4,000 rpm, all conditions (a), (b) and (c) are met (1 trip detection logic): (a) Difference between target and actual exhaust valve timing is more than 5°CA (Crankshaft Angle) for 4.5 seconds (b) Current exhaust valve timing is fixed (timing changes less than 5°CA in 5 seconds) (c) Variations in VVT controller timing are more than 19°CA or less of maximum delayed timing (retarded)	• Valve timing • OCV for exhaust camshaft • OCV filter • Exhaust camshaft timing gear assembly • ECM

MONITOR DESCRIPTION

DTC P0014 and P0024

The ECM compares current valve timing with target valve timing, while the engine is running and after being warmed up, in order to monitor the VVT system on the exhaust side. Valve timing is calculated from the positions of the camshaft and crankshaft. The ECM controls the engine so that current valve timing meets target valve timing. If these timings are not met, the ECM determines this as a malfunction.

DTC P0015 and P0025

The ECM compares current valve timing with target valve timing, while the engine is running and after being warmed up, in order to monitor the VVT system on the exhaust side. Valve timing is calculated from the positions of the camshaft and crankshaft. The ECM controls the engine so that current valve timing meets target valve timing. If these timings are not met, the ECM determines this as a malfunction.

MONITOR STRATEGY

Related DTCs	P0014: Advanced exhaust camshaft timing (bank 1) P0015: Retarded exhaust camshaft timing (bank 1) P0024: Advanced exhaust camshaft timing (bank 2) P0025: Retarded exhaust camshaft timing (bank 2)
Required Sensors / Components (Main)	VVT OCV and VVT Actuator
Required Sensors / Components (Related)	P0014 and P0015: Exhaust camshaft control actuator bank 1 Exhaust OCV bank 1 P0024 and P0025: Exhaust camshaft control actuator bank 2 Exhaust OCV bank 2
Frequency of Operation	Continuously
Duration	Less than 10 seconds
MIL Operation	P0014 and P0024: Immediate P0015 and P0025: 2 driving cycles
Sequence of Operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever these DTCs are not present	None
Battery voltage	11 V or more
Engine RPM	500 to 4000 rpm
Engine coolant temperature	75 to 100°C (167 to 212°F)

TYPICAL MALFUNCTION THRESHOLDS

Advanced camshaft timing:

Valve timing	No change
Valve timing	Advanced position

Retarded camshaft timing:

Valve timing	No change
Valve timing	Retarded position

If the difference between the target and actual camshaft timings is greater than the specified value, the ECM operates the VVT actuator.
Then, the ECM monitors the camshaft timing change for 5 seconds.

WIRING DIAGRAM

Refer to DTC P0013 (See page ES-89).

INSPECTION PROCEDURE

Abnormal bank	Advanced timing over (Valve timing is out of specified range)	Retarded timing over (Valve timing is out of specified range)
Bank 1	P0014	P0015
Bank 2	P0024	P0025

HINT:

- If DTC P0014 or P0015 is displayed, check the bank 1 VVT system circuit.
- Bank 1 refers to the bank that includes cylinder No. 1.
- If DTC P0024 or P0025 is displayed, check the bank 2 VVT system circuit.
- Bank 2 refers to the bank that does not include cylinder No. 1.

- Read freeze frame data using the intelligent tester. 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.

1	CHECK ANY OTHER DTCS OUTPUT (IN ADDITION TO DTC P0014, P0015, P0024 OR P0025)

(a) Connect the intelligent tester to the DLC3.
(b) Turn the ignition switch to the ON position and turn the tester on.
(c) Select the following menu items: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
(d) Read the DTCs.

Result

Display (DTC Output)	Proceed to
P0014, P0015, P0024 or P0025	A
P0014, P0015, P0024 or P0025 and other DTCs	B

HINT:
If any DTCs other than P0014, P0015, P0024 or P0025 are output, troubleshoot those DTCs first.

B → GO TO DTC CHART (See page ES-56)

A

2	PERFORM ACTIVE TEST BY INTELLIGENT TESTER (OPERATE OCV)

(a) Connect the intelligent tester to the DLC3.
(b) Start the engine and turn the tester on.
(c) Warm up the engine.
(d) Select the following menu items on the tester: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / VVT EX B1 or VVT EX B2.
(e) Check the engine speed while operating the Oil Control Valve (OCV) using the tester.

OK

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

NG → Go to step 4

OK

3	CHECK WHETHER DTC OUTPUT RECURS (DTC P0014, P0015, P0024 OR P0025)

(a) Connect the intelligent tester to the DLC3.
(b) Turn the ignition switch to the ON position and turn the tester on.
(c) Clear the DTCs (See page ES-39).

(d) Start the engine and warm it up.
(e) Select the check mode using the tester (See page ES-43).
(f) Drive the vehicle for more than 10 minutes.
(g) Read the DTCs using the tester.
OK:
No DTC output.

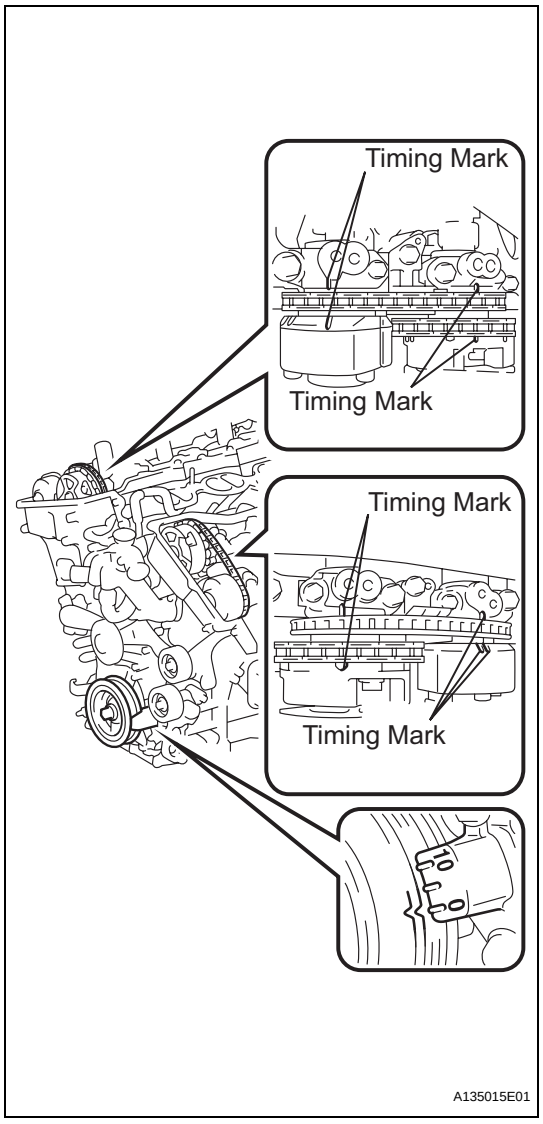
NG → **Go to step 4**

OK

SYSTEM IS OK

ES

4	CHECK VALVE TIMING (CHECK FOR LOOSE AND JUMP TEETH ON TIMING CHAIN)

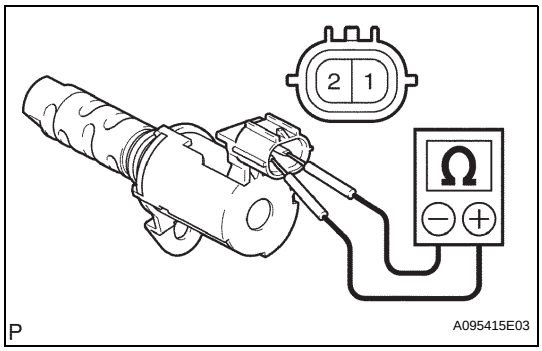


(a) Remove the cylinder head covers RH and LH.
(b) Turn the crankshaft to align the matchmarks of the crankshaft.
(c) Align the notch of the crankshaft pulley to the "0" position.
(d) Check if the matchmarks of the camshaft pulley and camshaft bearing cap align.
(e) Turn the crankshaft clockwise by 360° if the matchmarks do not align. Check if they align once again.
OK:
The matchmarks of the camshaft pulley and the camshaft bearing cap align when the notch of the crankshaft pulley is in the "0" position.

NG → **ADJUST VALVE TIMING**

OK

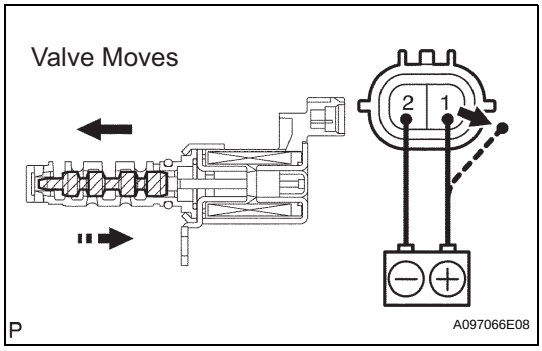
5 INSPECT CAMSHAFT TIMING OIL CONTROL VALVE ASSEMBLY (OCV)



(a) Remove the OCV.
(b) Measure the resistance according to the value(s) in the table below.

Standard resistance

Tester Connection	Condition	Specified Condition
1 - 2	20°C (68°F)	6.9 to 7.9 Ω



(c) Apply positive battery voltage to terminal 1 and negative battery voltage to terminal 2. Check the valve operation.

OK:

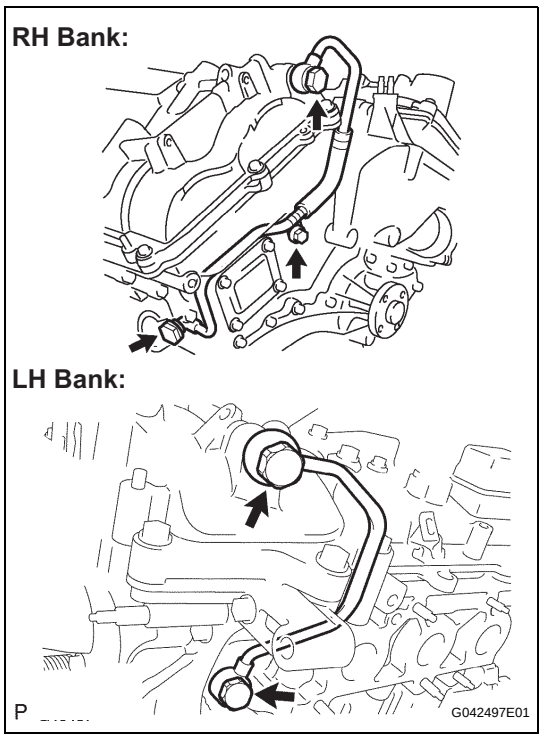
Valve moves quickly.

(d) Reinstall the OCV.

NG → **REPLACE CAMSHAFT TIMING OIL CONTROL VALVE ASSEMBLY (See page ES-486)**

OK

6 CHECK OIL PIPE AND OIL CONTROL VALVE FILTER



(a) Remove the oil pipe No. 1 or oil pipe assembly.
(b) Remove the oil control valve filter.
(c) Check that the filter and pipe are not clogged.

OK:

The filter and pipe are not clogged.

NG → **CLEAN OIL CONTROL VALVE FILTER AND PIPE**

OK

7	REPLACE CAMSHAFT TIMING GEAR ASSEMBLY

NEXT

8	CHECK WHETHER DTC OUTPUT RECURS

(a) Connect the intelligent tester to the DLC3.
(b) Turn the ignition switch to the ON position and turn the tester on.
(c) Clear the DTCs (See page ES-39).
(d) Start the engine and warm it up.
(e) Select the check mode using the tester (See page ES-43).
(f) Drive the vehicle for more than 10 minutes.
(g) Confirm that no DTC is set using the tester.
OK:
No DTC output.
HINT:
DTC P0014, P0015, P0024 or P0025 is output when foreign objects in engine oil are caught in some parts 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.

NG → **REPLACE ECM (See page ES-498)**

OK

SYSTEM IS OK