DTC	P0340	Camshaft Position Sensor Circuit Malfunction

DTC	P0341	Camshaft Position Sensor "A" Circuit Range / Performance (Bank 1 or Single Sensor)

DTC	P0345	Camshaft Position Sensor "A" Circuit (Bank 2)

DTC	P0346	Camshaft Position Sensor "A" Circuit Range / Performance (Bank 2)

ES

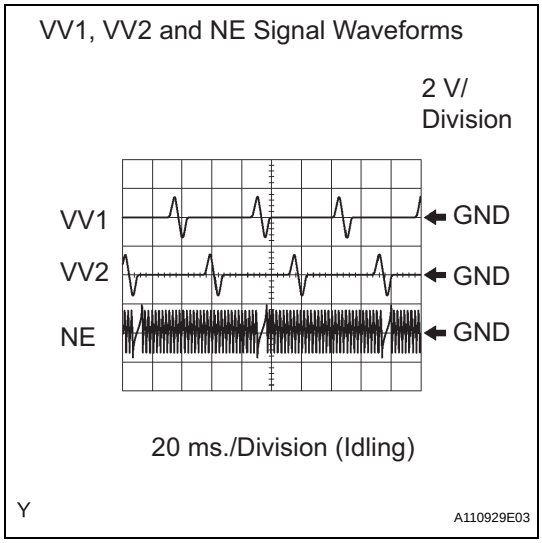
DESCRIPTION

The intake camshaft's Variable Valve Timing (VVT) sensor (G signal) consists of a magnet and MRE element.

The VVT camshaft drive gear has a sensor plate with 3 teeth on its outer circumference. When the gear rotates, changes occur in the air gaps between the sensor plate and pickup coil, which affects the magnet. As a result, the resistance of the MRE material fluctuates. The VVT sensor converts the gear rotation data to pulse signals, and uses the pulse signals to determine the camshaft angle, which it sends to the ECM. Then the ECM uses this data to control fuel injection time and injection timing.

The crankshaft angle sensor plate has 34 teeth. The pickup coil generates 34 signals for each engine revolution. Based the G signal and actual crankshaft angle, the ECM detects the normal crankshaft angle. Also, based on the NE signal, the ECM detects the engine speed.

DTC No.	DTC Detection Condition	Trouble Area
P0340 P0345	• No VVT sensor signal to ECM during cranking. (1 trip detection logic) • No VVT sensor signal to ECM with engine speed 600 rpm or more (1 trip detection logic)	• Open or short in VVT sensor • VVT sensor • Camshaft timing gear • Jumped tooth of timing belt • ECM
P0341	While crankshaft rotates twice, VVT sensor signal is input to ECM 12 times or more. (1 trip detection logic)	• Open or short in VVT sensor • VVT sensor • Camshaft timing gear • Jumped tooth of timing belt • ECM
P0346	While crankshaft rotates twice, VVT sensor signal is input to ECM 5 times or more. (1 trip detection logic)	• Open or short in VVT sensor • VVT sensor • Camshaft timing gear • Jumped tooth of timing belt • ECM



Reference: Inspection using an oscilloscope
HINT:
- The correct waveform is shown.
- VV1+ and VV2+ stand for the VVT sensor signal, and NE+ stands for the CKP sensor signal.

Item	Content
Terminals	NE+ - NE- VV1+ - NE- VV2+ - NE-
Equipment Settings	5 V/Division, 20 ms./Division
Conditions	Cranking or idling

MONITOR DESCRIPTION

If no signal is transmitted by the VVT sensor despite the engine revolving, or the rotations of the camshaft and the crankshaft are not synchronized, the ECM interprets this as a malfunction of the sensor.

MONITOR STRATEGY

Related DTCs	P0340: CMP Sensor (Bank 1) Range Check P0340: CMP/CKP Misalignment (Bank 1) P0341: CMP Sensor (Bank 1) Malfunction P0345: CMP Sensor (Bank 2) Range Check P0345: CMP/CKP Misalignment (Bank 2) P0346: CMP Sensor (Bank 2) Malfunction
Required Sensors / Components (Main)	CMP (Crankshaft position) sensor
Required Sensors / Components (Related)	CKP sensor
Frequency of operation	Continuous
Duration	5 seconds
MIL Operation	2 driving cycles: CMP Sensor Range Check Immediate: CMP/CKP Misalignment and CMP Malfunction CMP Sensor Malfunction
Sequence operation	None

TYPICAL ENABLING CONDITIONS

All:

The monitor will run whenever these DTCs are not present	None

CMP Sensor Range Check P0340:

Starter	ON
Minimum battery voltage while starter is ON	Less than 11 V

CMP/CKP Misalignment P0340 :

Engine RPM	600 rpm or more
Starter	OFF

VVT Sensor Range Check P0345 (Case 1):

Starter	ON
Minimum battery voltage while starter is ON	Less than 11 V

VVT Sensor Range Check P0345 (Case 2):

Engine RPM	600 rpm or more
Starter	OFF
Battery voltage	8 V or more
Ignition switch	ON

TYPICAL MALFUNCTION THRESHOLDS

CMP Sensor Range Check P0340:

CMP Signal	No signal

CMP/CKP Misalignment P0340:

Alignment is judged using CMP-CKP input timing CMP sensor signal input in appropriate timing	No signal

CMP Sensor (Bank 1) Malfunction P0341:

CMP and CKP phase	Misaligned
CMP signal per 2 revolutions crankshaft	12 signals or more

VVT Sensor Range Check P0345 (Case 1):

VVT sensor signal	No signal

VVT Sensor Range Check P0345 (Case 2):

VVT sensor signal	No signal

VVT Sensor (Bank 2) Malfunction P0346:

VVT sensor signal count	12 signals or more

COMPONENT OPERATING RANGE

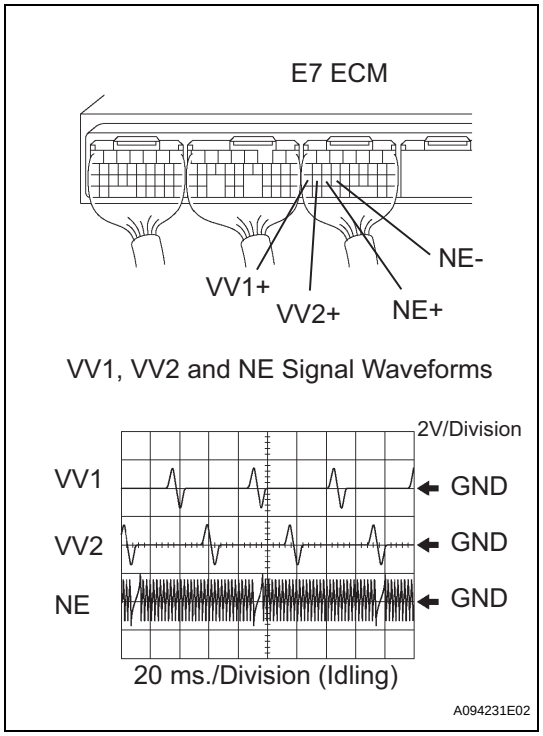
VVT sensor voltage	Camshaft position sensor voltage fluctuates when the crankshaft rotates 3 camshaft position signals per 1 revolution camshaft 3 camshaft position signals per 2 revolutions camshaft

WIRING DIAGRAM

Refer to DTC P0335 (See page ES-172).

HINT:
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 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 CHECK ECU TERMINAL VOLTAGE (VV1+, VV2+, NE+ AND NE- TERMINALS)



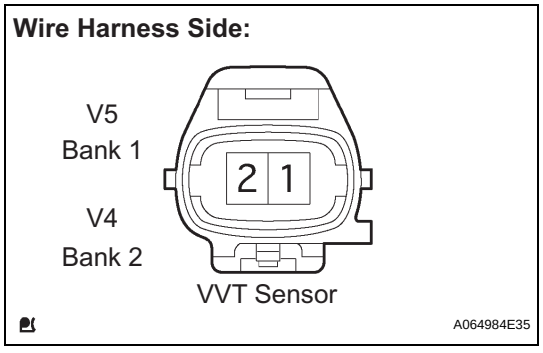
(a) Inspect the ECM using an oscilloscope.
(1) While the engine is idling, check the waveform between the terminals of the ECM connector.
Standard

Tester Connection	Specified Condition
E7-27 (VV1+) - E7-24 (NE-)	Correct waveform shown
E7-26 (VV2+) - E7-24 (NE-)	Correct waveform shown
E7-25 (NE+) - E7-24 (NE-)	Correct waveform shown

NG → **REPLACE VVT SENSOR**

OK

2 CHECK VVT SENSOR (SENSOR RESISTANCE)



(a) Disconnect the V4 or V5 VVT sensor connector.
(b) Measure the resistance between the terminals of the sensor.
Standard resistance

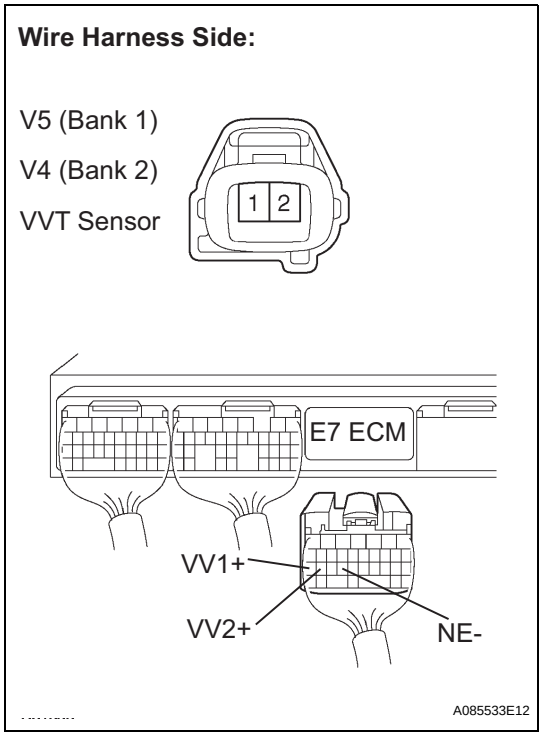
Tester Connection	Specified Condition
1 - 2	835 to 1,400 Ω at cold
1 - 2	1,060 to 1,645 Ω at hot

(c) Reconnect the VVT sensor connector.
HINT:
In the above section, the terms "cold" and "hot" refer to the temperature of the coils. "Cold" means approximately -10°C to 50°C (14°F to 122°F). "Hot" means approximately 50°C to 100°C (122°F to 212°F).

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

OK

3	CHECK HARNESS AND CONNECTOR (VVT SENSOR - ECM)



(a) Disconnect the V4 or V5 VVT sensor connector.
(b) Disconnect the E7 ECM connector.
(c) Measure the resistance between the terminals of the VVT sensor and ECM.
Standard resistance

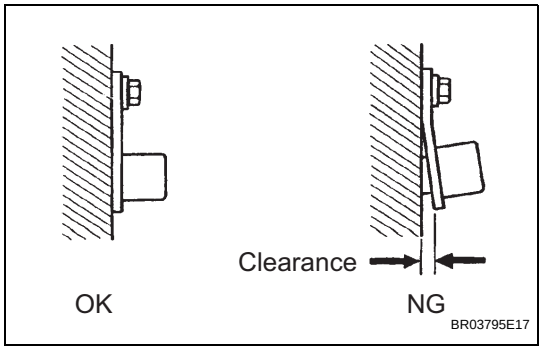
Tester Connection	Specified Condition
V5-1 - E7-27 (VV1+)	Below 1 Ω
V4-1 - E7-26 (VV2+)	Below 1 Ω
V4 or V5-2 - E7-24 (NE-)	Below 1 Ω
V5-1 or E7-27 (VV1+) - Body ground	10 kΩ or higher
V4 -1 or E7-26 (VV2+) - Body ground	10 kΩ or higher
2 of V4 or V5 or E7-24 (NE-) - Body ground	10 kΩ or higher

(d) Reconnect the VVT sensor connector.
(e) Reconnect the ECM connector.

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

OK

4	CHECK SENSOR INSTALLATION (VVT SENSOR)



(a) Check the CKP sensor installation.
OK:
Sensor is installed correctly.

NG → **TIGHTEN SENSOR**

OK

5	CHECK CAMSHAFT TIMING PULLEY

(a) Check the teeth of the signal plate.
OK:
Sensor plate teeth do not have any cracks or deformation.

NG → **REPLACE CAMSHAFT TIMING PULLEY**

OK

REPLACE ECM