

|            |                 |   |
|------------|-----------------|---|
| <b>DTC</b> | <b>P0340/12</b> | <b>CAMSHAFT POSITION SENSOR "A" CIRCUIT (BANK 1 OR SINGLE SENSOR)</b> |
|------------|-----------------|---|

|            |                 |   |
|------------|-----------------|---|
| <b>DTC</b> | <b>P0341/12</b> | <b>CAMSHAFT POSITION SENSOR "A" CIRCUIT RANGE/PERFORMANCE (BANK 1 OR SINGLE SENSOR)</b> |
|------------|-----------------|---|

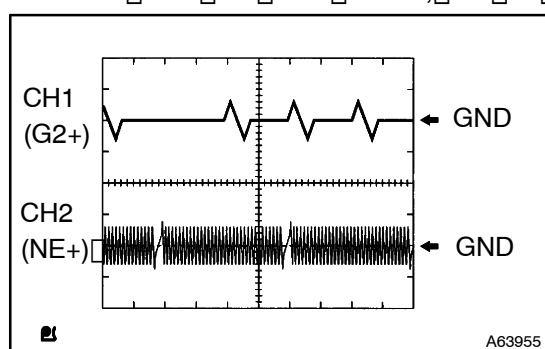
## CIRCUIT DESCRIPTION

The Camshaft Position (CMP) sensor consists of a magnet and an iron core which is wrapped with copper wire, and is installed on the cylinder head. When the camshaft rotates, each of 3 teeth on the camshaft passes through the CMP sensor. This activates the internal magnet in the sensor, generating a voltage in the copper wire. The camshaft rotation is synchronized with the crankshaft rotation. When the crankshaft turns twice the voltage is generated 3 times in the CMP sensor. The generated voltage in the sensor acts as a signal, allowing the ECM to locate the camshaft position. This signal is then used to control ignition timing, fuel injection timing, and the VVT system.

| DTC No.  | DTC Detection Condition   | Trouble Area   |
|----------|---|--|
| P0340/12 | <ul style="list-style-type: none"> <li>No camshaft position sensor signal to ECM during cranking (2 trip detection logic)</li> <li>No camshaft position sensor signal to ECM at engine speed of 600 rpm or more (1 trip detection logic)</li> </ul> | <ul style="list-style-type: none"> <li>Open or short in camshaft position sensor circuit</li> <li>Camshaft position sensor</li> <li>Camshaft timing pulley</li> <li>Jumped tooth of timing chain</li> <li>ECM</li> </ul> |
| P0341/12 | While crankshaft rotates twice, camshaft position sensor signal is input to ECM 2 times or more (1 trip detection logic)  | <ul style="list-style-type: none"> <li>Open or short in camshaft position sensor circuit</li> <li>Camshaft position sensor</li> <li>Camshaft timing pulley</li> <li>Jumped tooth of timing chain</li> <li>ECM</li> </ul> |

### HINT:

- DTC P0340/12 indicates a malfunction related to the CMP sensor (+) circuit (the wire harness between the ECM and CMP sensor, and the CMP sensor itself).
- DTC P0341/12 indicates a malfunction related to the CMP sensor (-) circuit (the wire harness between the ECM and CMP sensor, and the CMP sensor itself).



Reference: Inspection using the oscilloscope.

### HINT:

- The correct waveform is as shown on the left.
- G2+ stands for the camshaft position sensor signal, and NE+ stands for the crankshaft position sensor signal.

| Item              | Contents                         |
|-------------------|----------------------------------|
| Terminal          | CH1: G2+ - NE-<br>CH2: NE+ - NE- |
| Equipment Setting | 5V/Division, 20ms/Division       |
| Condition         | During cranking or idling        |

## WIRING DIAGRAM

Refer to DTC P0335/12, 13 on [page 05-345](#).

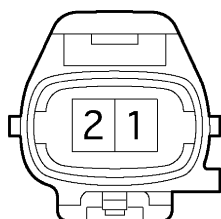
## INSPECTION PROCEDURE

### HINT:

Read freeze frame data using the intelligent tester II. Freeze frame data record the engine condition when malfunctions are detected. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, 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 INSPECT CAMSHAFT POSITION SENSOR(RESISTANCE)

#### Component Side:



Camshaft Position Sensor

A64984

- Disconnect the C1 camshaft position sensor connector.
- Measure the resistance between the terminals of the camshaft position sensor.

#### Standard:

| Tester Connection | Specified Condition            |
|-------------------|--------------------------------|
| 1 - 2             | 835 to 1,400 $\Omega$ at cold  |
| 1 - 2             | 1,060 to 1,645 $\Omega$ at hot |

#### NOTICE:

Terms "cold" and "hot" refer to the temperature of the coils. "Cold" means approximately  $-10^{\circ}$  to  $50^{\circ}\text{C}$  ( $14^{\circ}$  to  $122^{\circ}\text{F}$ ). "Hot" means approximately  $50^{\circ}$  to  $100^{\circ}\text{C}$  ( $122^{\circ}$  to  $212^{\circ}\text{F}$ ).

- Reconnect the camshaft position sensor connector.

NG

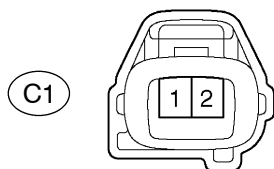
REPLACE CAMSHAFT POSITION SENSOR

OK

### 2 CHECK HARNESS AND CONNECTOR(CAMSHAFT POSITION SENSOR - ECM)

#### Wire Harness Side:

Camshaft Position Sensor Connector



Front View

A54385

- Disconnect the C1 camshaft position sensor connector.
- Disconnect the E9 ECM connector.
- Check the resistance.

#### Standard (Check for open):

| Tester Connection                             | Specified Condition |
|---|---------------------|
| Camshaft position sensor (C1-1) - G2+ (E9-27) | Below 1 $\Omega$    |
| Camshaft position sensor (C1-2) - NE- (E9-24) | Below 1 $\Omega$    |

#### Standard (Check for short):

| Tester Connection  | Specified Condition     |
|--|-------------------------|
| Camshaft position sensor (C1-1) or G2+ (E9-27) - Body ground | 10 k $\Omega$ or higher |
| Camshaft position sensor (C1-2) or NE- (E9-24) - Body ground | 10 k $\Omega$ or higher |

- Reconnect the camshaft position sensor connector.
- Reconnect the ECM connector.

NG

REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

**3 CHECK SENSOR INSTALLATION (CAMSHAFT POSITION SENSOR)**

(a) Check the sensor installation.

**OK:** The sensor is installed correctly.

**NG** ➤

**SECURELY REINSTALL SENSOR**

**OK**

**4 CHECK CAMSHAFT**

(a) Check the teeth of the camshaft.

**OK:** The teeth do not have any cracks or deformation.

**NG** ➤

**REPLACE CAMSHAFT**

**OK**

**REPLACE ECM (See page 10-30)**