

ATTENTION:

GENERAL MANAGER
 PARTS MANAGER
 CLAIMS PERSONNEL
 SERVICE MANAGER

IMPORTANT - All Service Personnel Should Read and Initial in the boxes provided, right.



QUALITY DRIVEN® SERVICE

SERVICE BULLETIN

APPLICABILITY: 2011MY-2013MY Forester 2.5L N/A
SUBJECT: Difficulty Starting, **Rough Idle**
 DTCs P0301, P0302, P0303, P0304
 P0340, **P0341**, P0345, **P0346**

NUMBER: 11-100-11R
DATE: 05/20/11
REVISED: **11/27/12**

INTRODUCTION

If you encounter a customer complaint that the engine is difficult to start, the camshaft position sensor air gap may be out of specification. This is caused by an irregular stamping of the camshaft position sensor plate. To remedy the condition, a shim will need to be added to the Bank 1 (right hand) camshaft position sensor to bring the air gap into specification.

NOTE: DTCs P0341 and P0346 are applicable to 2013MY vehicles only.

PART INFORMATION

- Shim Kit Part Number 10130AA060 contains 8 shims, 0.1 ~ 0.8mm.
- **Note:** The individual part numbers are listed as a reference only, and can not be ordered.
- Camshaft Position Sensor O-Ring Part Number 13099AA050 (replace if necessary).

PART NUMBER	CLEARANCE (MM)	SHIM THICKNESS (MM)	TARGET GAP (MM)
10130AA070	0.45 – 0.55	0.8	1.25 – 1.35
10130AA080	0.56 – 0.65	0.7	1.26 – 1.35
10130AA090	0.66 – 0.75	0.6	1.26 – 1.35
10130AA100	0.76 – 0.85	0.5	1.26 – 1.35
10130AA110	0.86 – 0.95	0.4	1.26 – 1.35
10130AA120	0.96 – 1.05	0.3	1.26 – 1.35
10130AA130	1.06 – 1.15	0.2	1.26 – 1.35
10130AA140	1.16 – 1.25	0.1	1.26 – 1.35

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CAUTION: VEHICLE SERVICING PERFORMED BY UNTRAINED PERSONS COULD RESULT IN SERIOUS INJURY TO THOSE PERSONS OR TO OTHERS.

Subaru Service Bulletins are intended for use by professional technicians ONLY. They are written to inform those technicians of conditions that may occur in some vehicles, or to provide information that could assist in the proper servicing of the vehicle. Properly trained technicians have the equipment, tools, safety instructions, and know-how to do the job correctly and safely. If a condition is described, DO NOT assume that this Service Bulletin applies to your vehicle, or that your vehicle will have that condition.

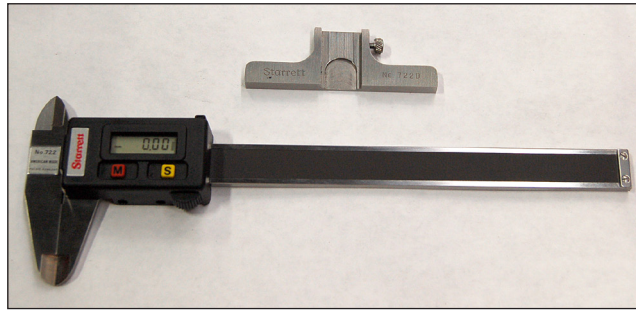
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The international standard for excellence in Environmental Management Systems. Please recycle or dispose of automotive products in a manner that is friendly to our environment and in accordance with all local, state and federal laws and regulations.

Special Tools

Pulse / Analog Box, SDI Box and SSMIII

Digital Caliper with Depth Attachment



1 - Washer (outside diameter 25.5mm, inside diameter 11.1mm, thickness 1.72mm) or equivalent in size. **Note:** If your digital caliper has a depth attachment you do not need the washer.



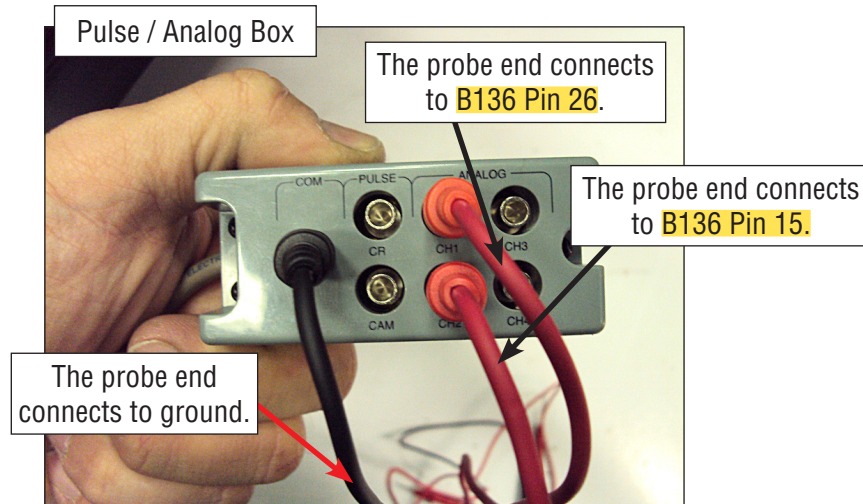
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SERVICE PROCEDURE/INFORMATION

Check the waveforms of the camshaft position sensors using the Pulse/Analog Box, SDI Box and SSMIII oscilloscope function. For detailed information and instructions, refer to the applicable Subaru Service Manual, Select Monitor III (SSMIII) - Users Guide and Subaru Diagnostic System (SDS). The “Help” function will allow you to access the tutorial information.

Back probing the ECM connector B136

- 1) Insert Pulse/analog probes in the Pulse/analog Box.



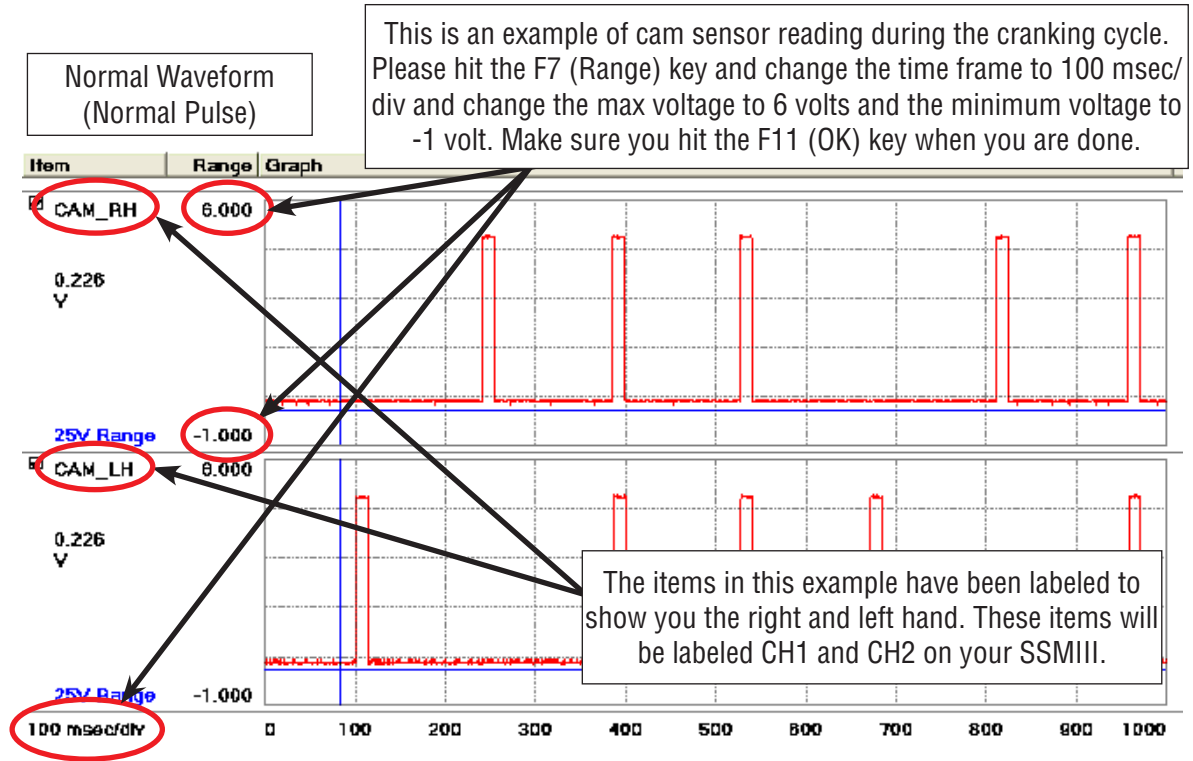
CH1, when connected to **B136 pin 26**, will monitor the right hand camshaft position sensor.

CH2, when connected to **B136 pin 15**, will monitor the left hand camshaft position sensor.

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- 2) Carefully install straight pins to back probe pins 15 and 26.
- 3) Connect the leads to the straight pins which are back probed at the ECM connector. Make sure they do not touch each other or ground.

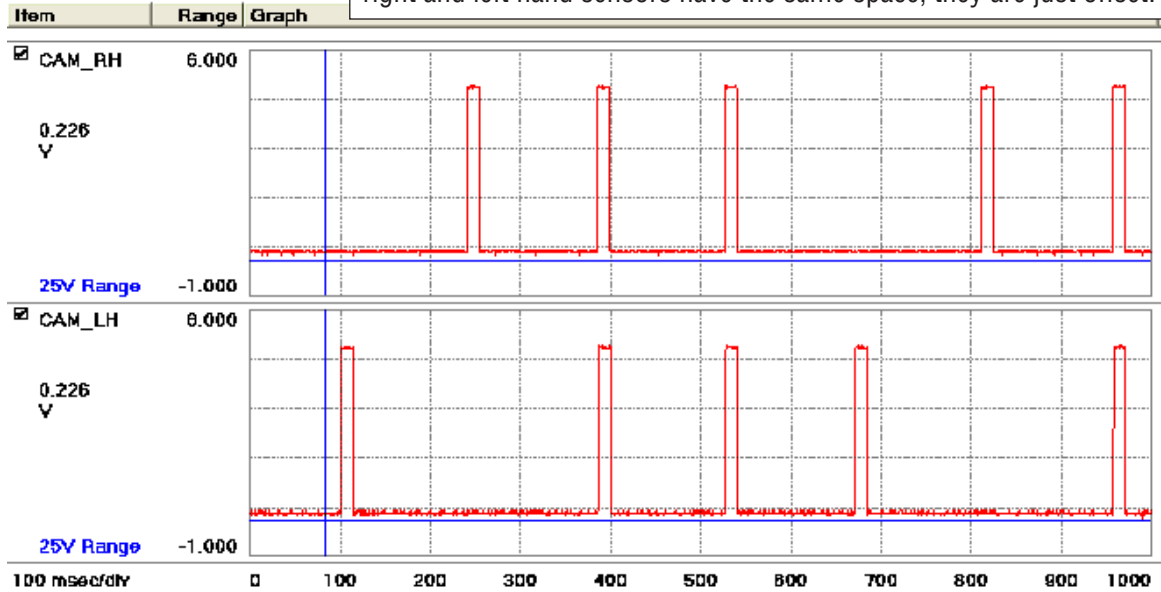
NOTE: Make sure that none of the back probes touch each other or ground.



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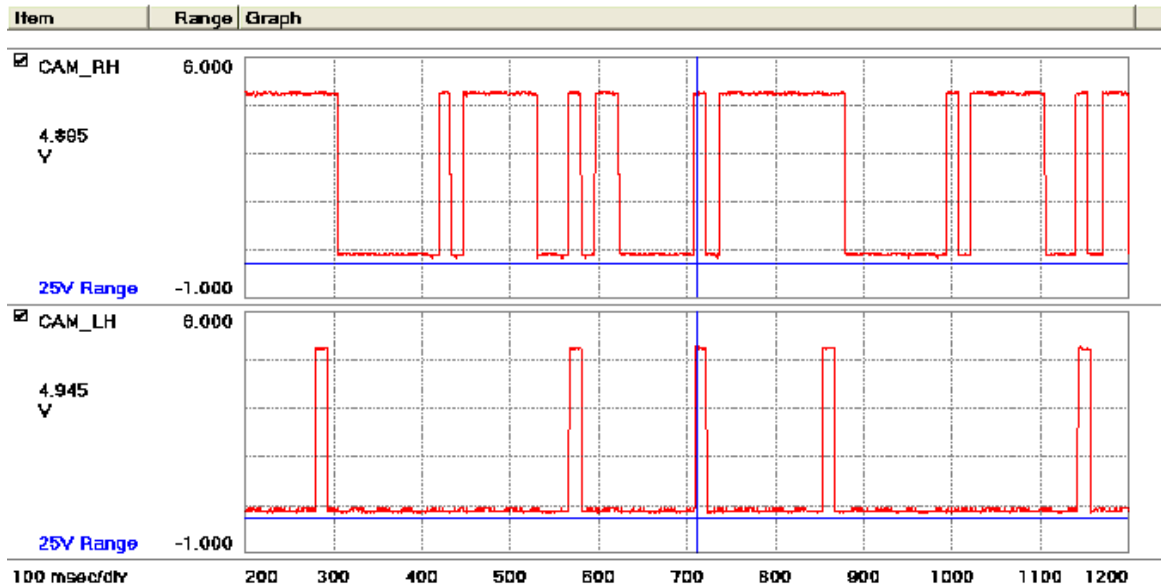
Normal Waveform
(Normal Pulse)

This example shows a normal reading during the cranking cycle. You will see three peaks equally spaced, then a longer space. Note that the right and left hand sensors have the same space, they are just offset.



Abnormal Waveform
(abnormal pulse)

This example shows the right hand sensor has an abnormal reading during the cranking cycle compared to the left hand sensor.



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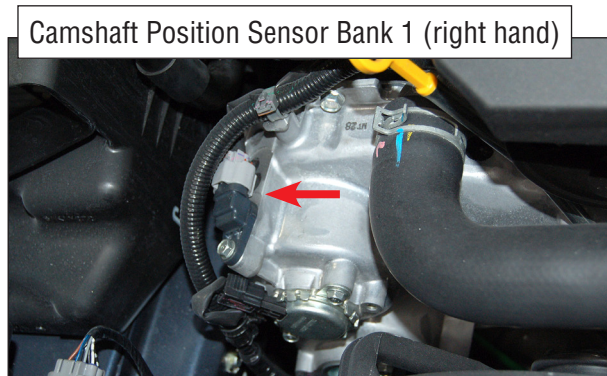
If an abnormal pulse is present, proceed with the following service procedure. If the pulse is normal, refer to the applicable service manual for additional troubleshooting and diagnostics.

Shim Selection and Installation

- 1) Record pre-set radio stations.
- 2) Disconnect negative battery cable.
- 3) Remove the 2 clips which secure the air intake duct, and then remove air duct.



- 4) Disconnect the wiring harness connector from the camshaft position sensor.

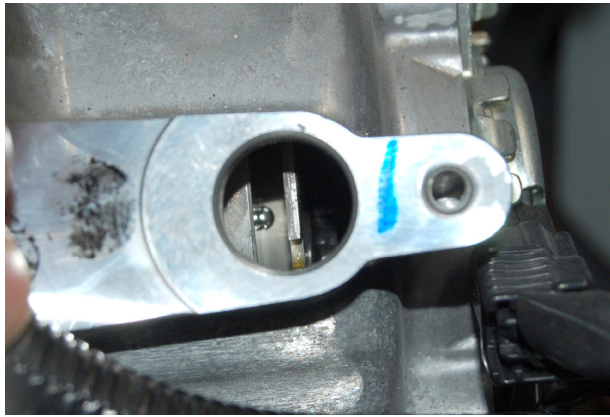


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Wire Harness Connector

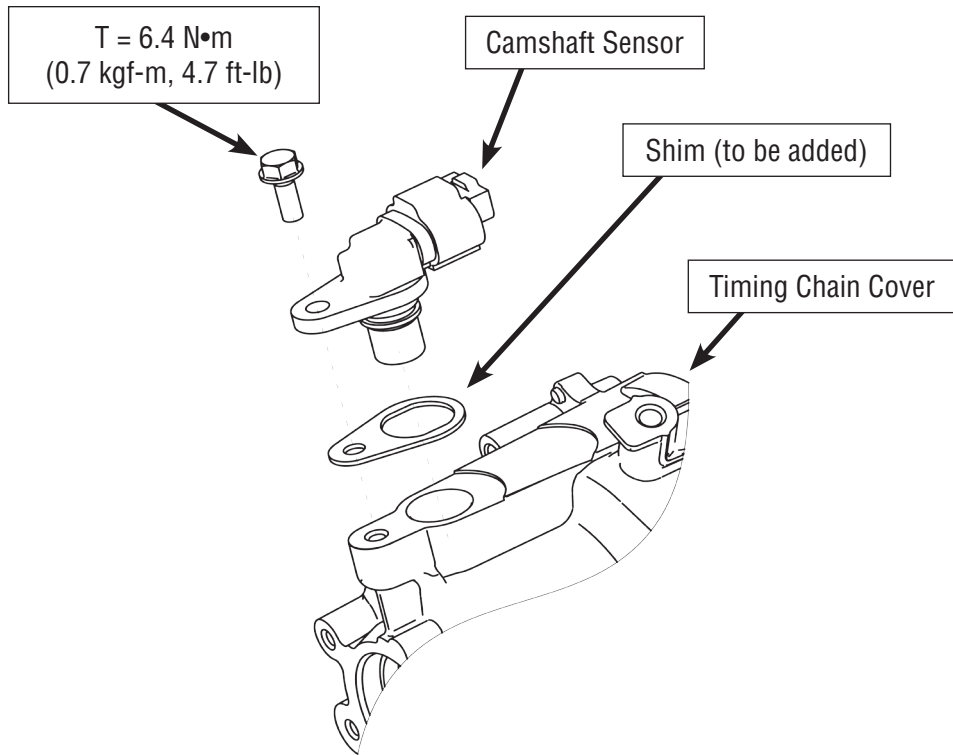


- 5) Remove the camshaft position sensor from the timing chain cover.



The following steps will determine what size shim will be required. **Note:** Make sure to record all measurements.

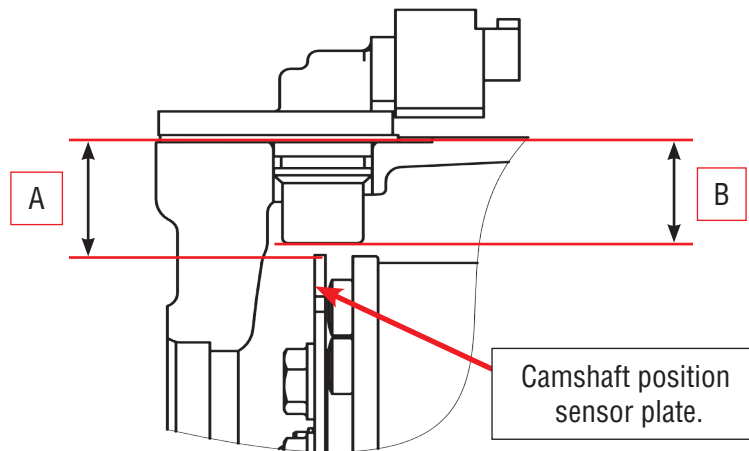
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Measurements

A = Top of timing chain cover to camshaft position sensor plate

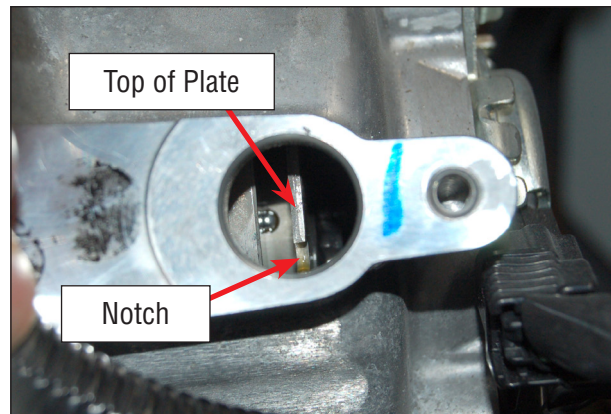
B = Camshaft position sensor mating surface to the bottom of the sensor



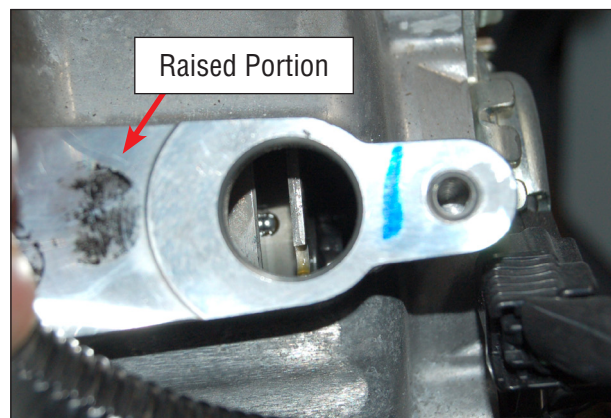
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Measurement “A” using digital caliper *with* depth attachment

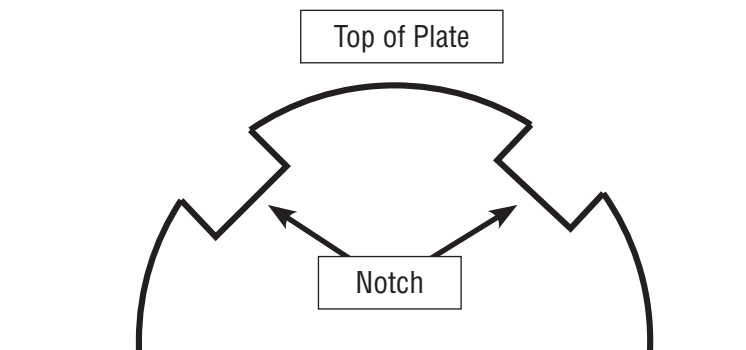
Note: The camshaft position sensor plate has notches. **Do Not** measure within the notch; measure from the top of the plate. Measurement “A” is critical, therefore it needs to be taken **3 times** at different locations on the camshaft position sensor plate.



Note: When taking measurements, make sure the depth attachment or washer is **NOT** sitting on the raised portion of the timing chain cover.



Below is a line-art illustration of the camshaft position sensor plate.



Make sure to measure from the top of the plate. **Do Not** measure **within** the notch. On the initial reading, it may be necessary to rotate the camshaft position sensor plate by rotating the engine clockwise if the notch interferes with the measurement.

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Measurement Using Digital Caliper with Depth Attachment

Measurement taken using digital caliper with depth attachment.



- 1) Take a measurement and record the reading.
- 2) Using a breaker bar and 22mm socket, place the socket on the crankshaft pulley bolt and rotate the engine clockwise approximately 70°. **Caution:** Do not rotate the engine counter-clockwise, doing so will loosen the crankshaft pulley bolt. If the engine is accidentally turned counter-clockwise make sure the bolt is re-torqued to proper specifications when completed.
- 3) Take a measurement and record the reading.
- 4) Rotate the engine clockwise approximately 70°.
- 5) Take a measurement and record the reading.
- 6) Use the smallest of the three measurements, and record the result.

Measurement “A” using digital caliper without depth attachment using washer

- 1) Place washer over hole opening of timing chain cover. The purpose of the washer is to provide a surface for the caliper to rest on to take the measurement.

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Measurement taken using digital caliper with washer.



Make sure to measure from the top of the plate, **DO NOT** measure within the notch. On the initial reading, it may be necessary to rotate the camshaft position sensor plate by rotating the engine clockwise if the notch interferes with the measurement.

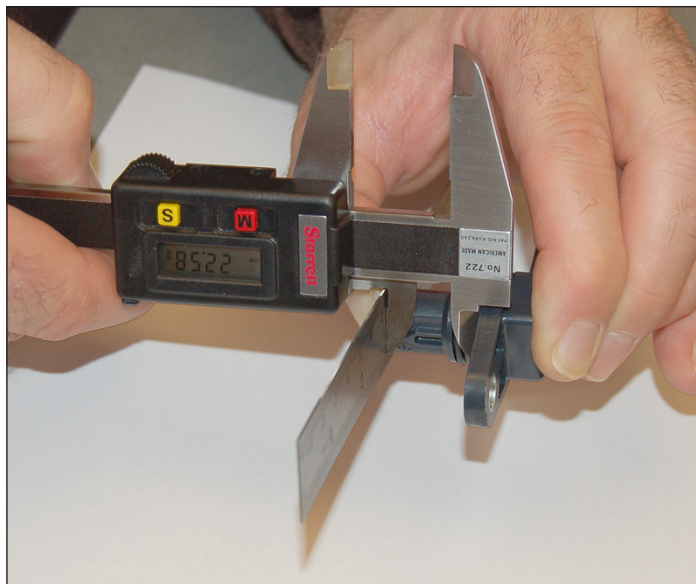
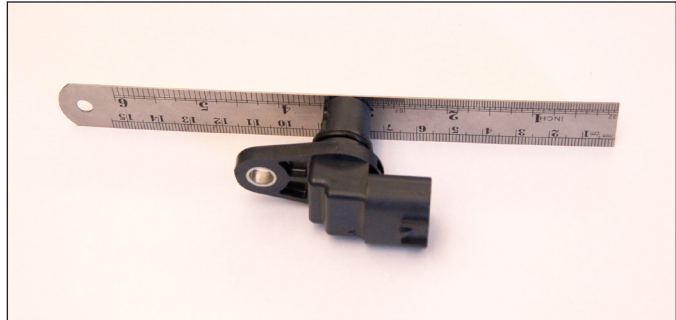
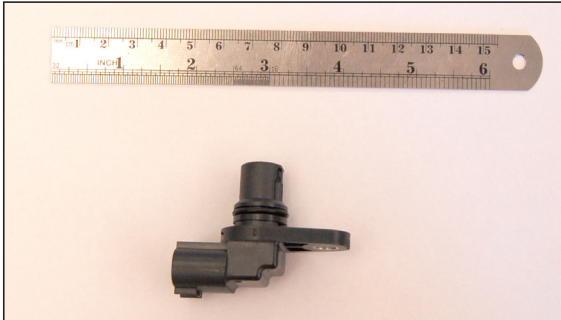
- 1) Take a measurement and record the reading.
- 2) Using a breaker bar and 22mm socket, place the socket on the crankshaft pulley bolt and rotate the engine clockwise approximately 70°. **Caution:** Do not rotate the engine counter-clockwise, doing so will loosen the crankshaft pulley bolt. If the engine is accidentally turned counter-clockwise make sure the bolt is re-torque to proper specification when completed.
- 3) Take a measurement and record the reading.

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- 4) Rotate the engine **clockwise** approximately 70°.
- 5) Take a measurement and record the reading.
- 6) Use the smallest of three measurements and record the result

Measurement “B”

For an accurate measurement, use a flat metal ruler or equivalent.

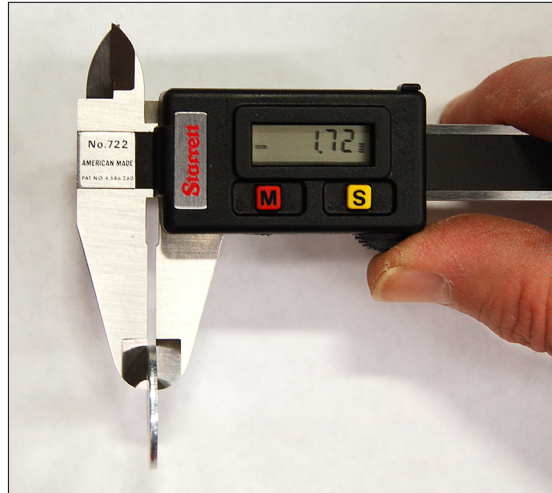


Measure the camshaft position sensor mating surface (the area that sits flush on the timing chain cover) to the bottom of the sensor and record measurement.

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Washer Measurement

Measure the thickness of the washer and record measurement.



Camshaft Position Sensor Air Gap Specification

- 1.3 +/- 0.05mm (1.25 to 1.35mm)

Shim Chart

PART NUMBER	CLEARANCE (MM)	SHIM THICKNESS (MM)	TARGET GAP (MM)
10130AA070	0.45 – 0.55	0.8	1.25 – 1.35
10130AA080	0.56 – 0.65	0.7	1.26 – 1.35
10130AA090	0.66 – 0.75	0.6	1.26 – 1.35
10130AA100	0.76 – 0.85	0.5	1.26 – 1.35
10130AA110	0.86 – 0.95	0.4	1.26 – 1.35
10130AA120	0.96 – 1.05	0.3	1.26 – 1.35
10130AA130	1.06 – 1.15	0.2	1.26 – 1.35
10130AA140	1.16 – 1.25	0.1	1.26 – 1.35

Example calculation (no washer used in measuring)

A = Top of timing chain cover to camshaft position sensor plate

B = Camshaft position sensor mating surface to the bottom of the sensor

$$A = 23.70$$

$$B = 22.58$$

$$A - B = 1.12 \text{ (clearance)}$$

In this example, an 0.2 shim is required.

Clearance (mm)	Shim Thickness (mm)	Target Gap (mm)
1.06 – 1.15	0.2	1.26 – 1.35

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Example calculation (washer used in measuring)

A = Top of timing chain cover to camshaft position sensor plate (minus the washer thickness).

B = Camshaft position sensor mating surface to the bottom of the sensor

$$A) 25.42 - 1.72 = 23.70$$

$$A = 23.70$$

$$B = 22.58$$

$$A - B = 1.12 \text{ (clearance)}$$

In this example a 0.2 shim is required.

Clearance (mm)	Shim Thickness (mm)	Target Gap (mm)
1.06 – 1.15	0.2	1.26 – 1.35

REASSEMBLY

- 1) Inspect camshaft position sensor o-ring and replace if necessary.
- 2) Install camshaft position sensor and shim. Bolt torque spec 6.4 N•m (0.7 kgf-m, 4.7 ft-lb).
- 3) Connect wiring harness connector.
- 4) Install air intake duct.
- 5) Connect negative battery cable.
- 6) Reset radio stations.

WARRANTY/CLAIM INFORMATION

For vehicles within the Basic New Car Limited Warranty period, this repair can be claimed using:

Labor Description	Labor Operation#	Fail Code	Labor Time
Cam Sensor Measurement & Shim Installation	A817-211	UKM-20	0.5