

# INSTALLATION INSTRUCTIONS

## 107112 CAM SENSOR CAP with built-in Setting LED

This new engineered cam sensor cap is designed to facilitate proper cam sensor timing by incorporating a single LED and a pair of specially designed slots for the cap mounting screws. By following the procedure outlined below, the sensor position will be accurately set to 25 degrees ATDC (after Top Dead Center). This exact position is necessary for proper fuel timing for engines using the standard camshaft on the turbo Buick V6 engine with SFI (sequential fuel injection). The following is a short lesson in cam sensor operation and how it relates to precise fuel injector control.

**⚠ THE CAM SENSOR DOES NOT SET BASE IGNITION TIMING.**  
**Ignition spark timing is performed by reference tables within the PROM chip in the ECM.**

Essentially, the 25 deg. ATDC setting places the fuel into the intake valve port at exactly the same moment that the intake valve opens. This is why the setting is critical; if the fuel injects too late, the engine "bogs" and if it's too early, the fuel puddles on the valve port and doesn't vaporize properly, resulting in a rich condition due to unburned fuel passing through the cylinder.

The 25 degree setting is required with stock factory OEM camshafts and sometimes needs to be slightly modified. With the adjustment slots, this sensor cap is designed to allow for slight adjustment on either side of the 25 ATDC degree setting, to reduce the off-idle "stumble" which frequently occurs with certain aftermarket camshaft intake lobe profiles. It is widely regarded that "tweaking" the cam sensor has positive effects in improving drivability of the vehicle. This new design makes it easy to vary the baseline adjustment, without having to disturb the initial drive shaft setting.

**It is important to note that the cam sensor signal works in conjunction with the CCCI ignition module to initiate spark timing by signaling the module, which then communicates to the ECM, with the exact reference to TDC (Top Dead Center) of the No. 1 cylinder. Without the cam signal, the CCCI ignition won't initiate fuel timing or spark timing upon initial startup, which means the engine cannot start.**

Since the cam sensor rotates at exactly one-half engine speed, it is possible to be exactly 180 degrees out of phase of top dead center when installing a cam sensor. Finding actual top dead center involves removing the No. 1 spark plug to check for the "compression stroke" and will be outlined later in this instruction procedure.

Let's start by finding the cam sensor. It's sandwiched in, at the top of the timing cover, in the same location that you would expect to find a distributor. It would make access easier if you first remove the turbo inlet hose. The cam sensor operates as sort of an electronic distributor, sending information to the engine computer by way of a "Hall-Effect" electronic device. This device, which is the heart of the sensor, senses magnetic energy. The magnetic energy is provided by the use of a fixed magnet, aligned with the Hall Effect switch. The magnetic path is interrupted by way of the interrupter ring (fitted to the cam sensor shaft) directly under the cap. This ring has a small "window" cut into it, which allows the magnetic path to continue, where the solid part of the ring interrupts the path. So, when the window is open, the sensor switches on, and when the window closes, the sensor switches off. By switching on and off at a precise interval, the CCCI uses this interval to determine when the engine reaches top dead center, hence, initiating fuel injector sequencing and timing.

This image shows where the factory cam sensor is located. Note the position of the cam sensor cap; it is secured by two Philips head screws, one is visible. When looking straight down on the sensor standing in front of the car, the mounting screws are at approximately 7 o'clock and 1 o'clock. The wiring exits at approximately 4 o'clock.



**ALWAYS CHECK END PLAY ON YOUR CAM SENSOR SHAFT! EXCESSIVE END PLAY CAUSES THE INTERRUPTOR TO HIT THE INSIDE OF THE CAM SENSOR CAP AND WILL VOID YOUR WARRANTY! IF END PLAY IS EXCESSIVE, YOU MUST REPLACE THE CAM SENSOR DRIVE SHAFT ASSEMBLY. INSPECT ORIGINAL SENSOR CAP.**

This position is typical of a factory installed cam sensor, and is exactly how GM had installed the sensor from the beginning. If you remove the two Philips screws and unplug the connector, you will see the interrupter ring directly under the cap, as shown here.

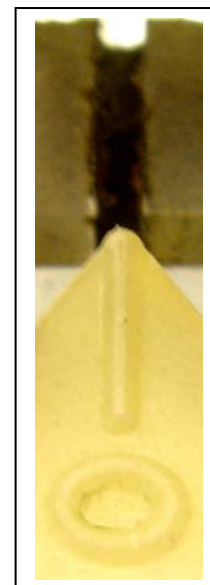
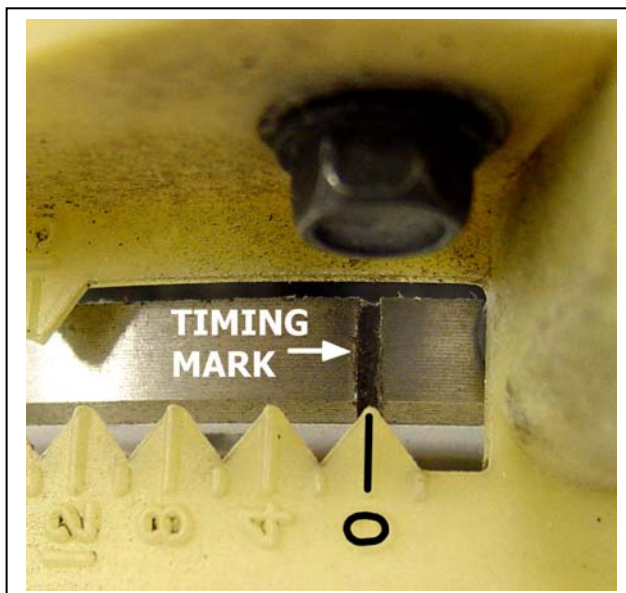


In this image, the "window" is shown in the position you would expect it to be when the crankshaft is exactly at TDC. This would be the starting point for setting the cam sensor with the new design sensor cap in place. Actually, it really doesn't matter where the slot is in relationship to the sensor body but it is IMPERATIVE that the engine is at TOP DEAD CENTER when setting the cam sensor. It is possible that the engine is 180 degrees off – in which case, looking at the cam sensor interrupter wheel (above), you would find the window at the ten o'clock position instead of the 4 o'clock position as shown in the image above. BE SURE that you have successfully found actual Top Dead Center when installing the cam sensor cap.

Let's find Top Dead Center. To do this, remove the No. 1 spark plug. It's located at the front of the engine, drivers' side. Insert a short length of rubber hose into the spark plug hole, long enough so you can put your thumb over the opposite end. Have a helper assist in cranking the engine (be sure to unplug the cam sensor when cranking so it won't try to start). As the engine is cranking, feel for pressure (compression) to build in the hose. As soon as you feel pressure, stop cranking the engine. You need to look at the timing window above the harmonic balancer as shown here:



This timing window is (of course) buried in the front of the engine and is difficult to see. Once you detect compression pressure, the notch on the harmonic balancer (which rotates clockwise) will have approached the "0" timing mark and probably passed it up. You will likely need to grab a hold of the serpentine belt and rotate the belt pulley counter-clockwise slightly to re-align the timing notch so that it is in alignment with the "0" timing mark as shown here:



Once you are satisfied that the timing notch is aligned as shown AND it happened right as the compression stroke was occurring on cylinder No. 1, you have effectively set your engine to TDC and are now ready to install the new design sensor cap. **Remember, if you have never had the reason to adjust your cam sensor and it has been untouched from the factory, then Top dead Center will place the window of the interrupter at around the 4 o'clock position as viewed from standing in front of the engine, looking straight down.**



**NOTE: YOU WILL NOT NEED TO INDEX THE HARMONIC BALANCER TO ANY OTHER TIMING MARK AS YOU MAY HAVE DONE IN THE PAST USING THE CAMTOOL. YOU SIMPLY SET THE TIMING MARK TO ZERO. THE NEW DESIGN CAM SENSOR CAP IS DESIGNED TO SET THE PROPER CAM TIMING AT 25 DEG. ATDC WITH THE FOLLOWING PROCEDURE, USING THE SLOTTED INDEXING EARS AS A GUIDE.**

The new design cam sensor cap has two slotted indexing ears instead of the usual drilled holes. The slots are exactly 25 degrees wide, which, because the cam sensor runs at half engine speed, equates to 50 degrees of total cam sensor adjustment. Note that the Philips screws fit into each slot, and allow rotational adjustment of the sensor even when the sensor drive is firmly bolted to the timing cover. Install this sensor cap onto the sensor drive and plug in the connector.



Since the slot can allow 50 degrees of rotation, we will only need to use half of the slot to make our 25 degree index adjustment. To attain the 25 degree offset, start by installing the sensor cap with the screws over to the side **EXACTLY AS SHOWN** in this illustration:

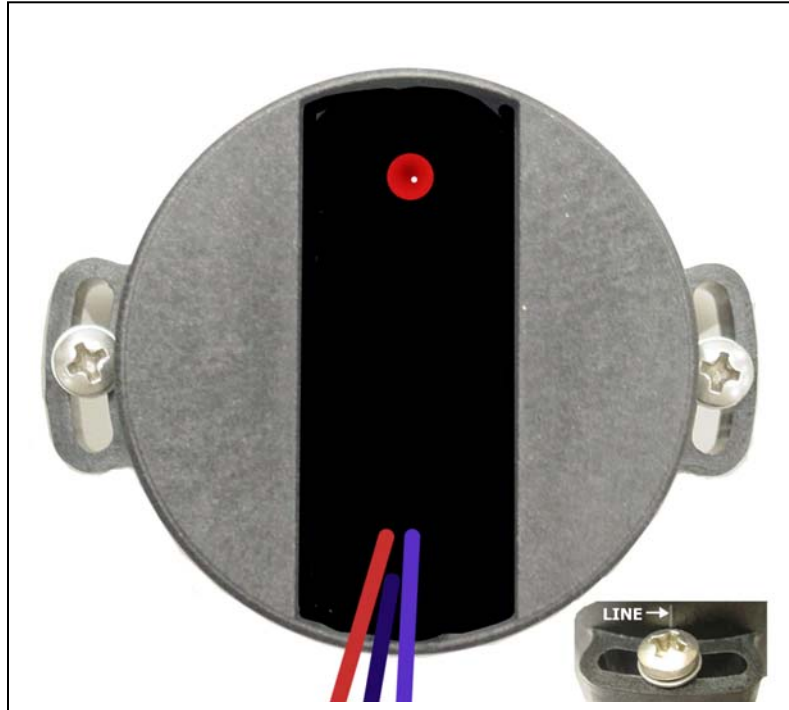


Tighten the two Philips screws, but don't overtighten – you could break the plastic if you apply too much force. Just tighten the screws snugly. Then, loosen the bolt that holds the cam sensor drive shaft assembly in place.



**Before you proceed, unplug the orange ECM MEMORY wire (connector located at the positive battery cable) to prevent accidental starting of the engine.**

With the key turned on (don't try to start the engine) rotate the cam sensor slowly **counter-clockwise** until the LED just turns on. Now, tighten the bolt that holds the cam sensor in place, being **VERY CAREFUL** not to move the cam sensor shaft while tightening. Double-check your work; remember, the engine is set exactly at zero degrees (TDC) and the LED just turned on when rotating the sensor **counter-clockwise**. After tightening the bottom bolt, slightly loosen the two Philips screws that hold the cam sensor cap onto the sensor. Rotate the **sensor cap only** - slightly clockwise to position it as shown in the image below. This will effectively place the cam sensor timing at 25 degrees after-top-dead-center:



**If you are only replacing the cam sensor cap and do not intend to make any sensor adjustments, simply install the new sensor cap as illustrated above.**

There is a raised line at exactly the halfway point in the slot (illustrated above). Note that the screw is **EXACTLY IN THE MIDDLE OF THE SLOT** as seen in this image. This is the precise 25 deg. ATDC setting for the cam sensor.

Tighten the Philips screws once you set the cap to this position. Don't forget to plug in the ECM MEM connector. Your cam sensor is now properly set to the 25 degree setting.

Because the sensor cap is slotted, you can "tweak" the 25 degree setting in either direction. This is sometimes required when you upgrade the camshaft to an aftermarket style where slight adjustment of sensor timing can overcome a "bog" or hesitation when throttling the engine off of idle. Typically, roller cams with rapid intake events will exhibit a slight hesitation using the stock 25 degree cam sensor timing, and would require a slight decrease in the setting. Loosen the screws slightly and rotate clockwise very slightly (only one or two degrees) and test-drive the vehicle. In some cases, you might need to rotate the cap counter-clockwise a few degrees – it all depends upon the type of camshaft used.

Making slight adjustment of the cam sensor has never been easier. Because the drive shaft stays in place, you can make the adjustment very easily using only a Philips screwdriver. And, if you wish to return the sensor to its original setting, simply return the screws to their mid-point within the slot. You never need to loosen the hard-to-get-at drive shaft mounting bolt to make minor adjustments in the sensor degree setting.

As the engine is running, the LED will blink rapidly. This is an indication that the unit is operating properly and functioning normally. If for some reason the LED does not illuminate, check the CCCI fuse.