



## INSTRUCTIONS

### COMP Cams® GM VVT Camshaft Installation (156, 189, 656, 689 Series)

Thank you for choosing COMP Cams® products; we are proud to be your manufacturer of choice. Please read this instruction sheet carefully before beginning installation, and also take a moment to review the included limited warranty information. Feel free to contact us at 1.800.999.0853 or at [www.compcams.com/tech-help/](http://www.compcams.com/tech-help/) with any questions.



#### COMP Cams® GM Variable Valve Timing (VVT) Camshaft Parts List

- 1) Camshaft
- 2) Installation Bolt

#### Required Extra Parts

- 1) COMP Cams® VVT limiter kit (Part number depends on your phaser part number)
- 2) COMP Cams® matched valve springs required
- 3) New camshaft phaser bolt, GM part #12588151
- 4) Crankshaft bolt (Part number dependent on your specific application)

#### Specialty Tools Required

- 1) 24mm socket
- 2) Torque angle gauge

#### Optional Tools

- 1) COMP Cams® LS Valve Spring Compressor #5462 (Pictured, not included)
- 2) COMP Cams® LS Crankshaft Turning Socket #4914



## **Before you start**

Call your dealership with your VIN number of your vehicle, or the vehicle that the engine originated. Ask them “*What is the replacement part number for my camshaft actuator?*” This will determine which COMP Cams® phaser limiter kit you will need for your installation.

Camshaft Actuator (aka: Phaser) #12585994 requires COMP Cams® Phaser Limiter Kit #5456

Camshaft Actuator (aka: Phaser) #12606358 requires COMP Cams® Phaser Limiter Kit #5460

Order a new camshaft phaser bolt #12588151. The dealership calls this a camshaft position actuator solenoid valve. Also order your crankshaft pulley bolt for your respective engine.

## **Camshaft Removal Preparation**

- 1) Prepare a clean work area and assemble the tools needed for the camshaft installation. It is suggested to use an automotive manual to help determine which items must be removed from the engine in order to expose, remove, and reinstall the timing chain, camshaft actuators/phaser, and camshaft. A good, complete automotive manual will save time and frustration during the installation.
- 2) Disconnect the negative post of your battery.
- 3) Remove any coil covers from the engine.
- 4) Disconnect any PCV connection and emission equipment, make sure to label, or take pictures, of their respective positioning to help during reinstallation.
- 5) Remove coil packs from the engine.
- 6) Remove the valve covers from both sides of the engine.
- 7) Remove rocker arms, stands, and pushrods from both sides of the engine.
- 8) Remove all eight spark plugs, this will ease rotation of the engine later.
- 9) Remove water pump, front drive accessories and timing chain cover.

## Camshaft Removal

- 10) Rotate the engine so the crankshaft gear is timing marker is pointing to the twelve o'clock position and the camshaft phaser gear timing marker is pointing to six o'clock. This is also known as dot to dot. (COMP Cams® LS crank turning socket #4914 makes this step easy)
- 11) Using a 24mm socket remove the camshaft phaser bolt.
- 12) **IMPORTANT:** Remove the camshaft phaser, this part is extremely fragile and mishandling it will quickly destroy it. NEVER handle the camshaft phaser by the front cam sensor reluctor! Only use the timing gear when handling the cam phaser.
- 13) Rotate the camshaft 360° a few times so the lifters are captured in their lifter trays. Make sure all the lifters are captured before you remove the camshaft.
- 14) Remove the camshaft retaining plate.
- 15) Remove the camshaft.



### Comp Cams® LS Valve Spring Compressor (LS1/LS2/LS3/LS6/LS7/L99/L92)

The easy-to-use, custom design of the new COMP Cams® Valve Spring Compressor for LS Engines enables the effortless removal of either one or two valve springs at a time, without the hassle of first having to remove the rocker stand or any of the other installed rockers. The tool works on all GM Gen III/IV LS-type engines, both with cylinder heads installed or with the cylinder heads off.

The simple design facilitates easy usage in vehicles where other tools are incapable of reaching the tight spaces. This innovative Valve Spring Compressor is a must have for all LS engine builders and enthusiasts.

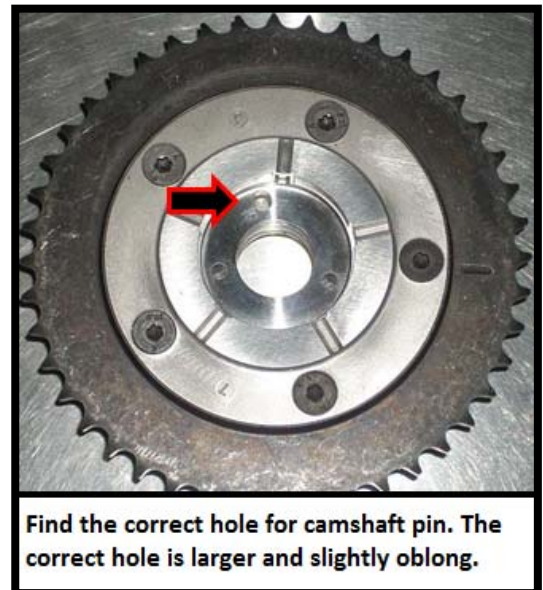


## Camshaft Installation

- 16) Lube your new camshaft with COMP Cams® #103 Cam & Lifter Installation Lube or fresh engine oil if reinstalling immediately.
- 17) Using the supplied installation bolt carefully install your new COMP Cams® VVT camshaft.
- 18) **IMPORTANT:** Install your VVT limiter kit using the instructions included in your VVT limiter kit. COMP Cams® VVT camshafts require the use of phaser limiters. GM has used two different phasers, make sure your VVT limiter kit is the correct part number based upon your phasers part number as referenced in the beginning of these instructions.
- 19) Reinstall the camshaft raining plate, ensuring the O-ring is facing the back. Torque the bolts to 18 lb\*ft.
- 20) Lock the timing chain tensioner out using a small Allen wrench to hold it in place.
- 21) Look at the back of the phaser. Identify the camshaft pin locator hole, which is larger and slightly oblong. GM VVT phasers do not have a through hole to help ensure your cam and upper timing chain gear is properly aligned. You must ensure the cam and the phaser are properly aligned and engaged or engine damage will occur.

**Note:** The bolt supplied is to help you pull the camshaft forward during installation, because if you try to install the phaser without pulling the cam forward the camshaft will slide backwards and make it hard to ensure proper alignment.

- 22) Without using the timing chain, carefully slip the supplied bolt through the center of the phaser and thread it into the camshaft by a few threads. Align the camshaft pin and the phaser alignment hole. Push the phaser onto the camshaft pin, while pulling out on the camshaft. Rotate the camshaft and phaser until the camshaft phaser gear timing marker is pointing to six o'clock. Since we have not rotated the crankshaft you should now be lined up dot to dot once again.



- 23) Remove the camshaft phaser again. Check to make sure the camshaft pin is located between a 3 o'clock and 4 o'clock position.



24) Again, use the supplied bolt and carefully slip it through the center of the phaser. This time slide the timing chain over the phaser timing gear and start threading it into the camshaft again. Align the camshaft pin and the phaser in hole and push the phaser onto the camshaft pin, while pulling out on the camshaft with the supplied bolt. You must ensure the cam and the phaser are properly aligned and engaged or engine damage will occur.



**Use a straight edge to ensure phaser and timing chain do not protrude from the block**

25) **Critical Check:** Before installing the phaser bolt, pull out on the camshaft bolt and use a straight edge. Place the straight edge across the surface that the timing chain cover mounts to the block and also across the phaser, as pictured. While holding the camshaft in the forward most position, ensure that the phaser and timing chain do not protrude out past the engine block.

26) Install your new camshaft phaser bolt until finger tight. This bolt is torque-to-yield and must be tightened in two steps. Ensure the crankshaft does not move during this process;

**Step 1:** Torque to 48 lb\*ft

**Step 2:** Tighten an additional 90 degrees, using a torque angle gauge.

27) Release the timing belt tensioner by pulling out the Allen bolt used to hold it.

28) Install proper matching COMP Cams® valve springs, if it has not been done already.

29) Reinstall spark plugs.

30) Reinstall pushrods and rocker arms following the OEM procedure. Final torque is 22-24lb\*ft on the rocker arms.

31) Reinstall valve covers, coil packs, etc.

32) Start reassembling the engine starting with the timing chain cover and crankshaft pulley. Seat your crankshaft pulley using your old bolt and torque to 250lb\*ft and remove bolt once again.

33) Install new crankshaft pulley bolt, it must be tightened in two steps;

**Step 1:** Torque to 37 lb\*ft

**Step 2:** Tighten an additional 140 degrees, using a torque angle gauge.

34) Reinstall the front accessory drive system including the water pump, belts, etc.

35) Reinstall any other PCV or emissions equipment removed during teardown for the cam swap.

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### **Limited Warranty**

Competition Cams, Inc. warrants that all of its products are free from defects in material and workmanship, and against excessive wear for a period of (1) one year from the date of purchase. This **limited warranty** shall cover the original purchaser.

**Competition Cams, Inc.'s obligation under this warranty is limited to the repair or replacement of its product.** To make a warranty claim, the part must be returned within (1) one year of purchase to the address listed below, freight prepaid. Items covered under warranty will be returned to you freight collect.

**It is the responsibility of the installer to ensure that all of the components are correct before installation. We assume no liability for any errors made in tolerances, component selection, or installation.**

**There is absolutely no warranty on the following:**

- A) Any parts used in racing applications;**
- B) Any product that has been physically altered, improperly installed or maintained;**
- C) Any product used in improper applications, abused, or not used in conjunction with the proper parts.**

**There are no implied warranties of merchantability or fitness for a particular purpose.** There are no warranties, which extend beyond the description of the face hereof. Competition Cams, Inc. will not be responsible for incidental and consequential damages, property damage or personal injury damages to the extent permitted by law. Where required by law, implied warranties or merchantability and fitness are limited for a term of (1) one year from the date of original purchase.

This warranty gives you specific legal rights and you may also have other legal rights, which vary from state to state.