

#23-NA-115: Ticking, Tapping or Snapping Noise from Engine - 5.5L RPO LT6 Realign Camshaft Caps as Required - (Jun 28, 2023)

Subject: Ticking, Tapping or Snapping Noise from Engine - 5.5L RPO LT6 Realign Camshaft Caps as Required



| Brand: | Model: | Model Year: | | VIN: | | Engine: | Transmission: |
|-----------|----------|-------------|------|------|----|----------------|---------------|
| | | from | to | from | to | | |
| Chevrolet | Corvette | 2023 | 2023 | — | — | 5.5L (RPO LT6) | — |

| | |
|-----------------------------------|---|
| Involved Region or Country | North America |
| Condition | <p>Some customers may comment on a ticking, tapping, or snapping noise from the engine.</p> <p>Note: It is important to note that this engine incorporates a mechanical valve train design to enable maximum engine performance and does not use traditional hydraulic lifters and as a result there will be some mechanical tick noise from the valvetrain, which is normal. However, if the noise is excessive and not periodic, as described in this bulletin, this procedure can be used to reduce the noise. For reference, this ticking disturbance noise can be heard while the engine is idling and more noticeable with the hatch open and in tour mode. It may also be found that the noise slightly increases as the engine gets towards operating temperature.</p> |
| Cause | This condition may be caused by the misalignment of the camshaft caps. |
| Correction | <p>The verify you have this concern, it will be necessary to follow the steps below. Do not proceed with this bulletin if the customer has not commented about this concern.</p> <p>Important: Please read entire bulletin prior to performing any repair.</p> <p>Important: You MUST use the PicoScope to verify if you have this noise concern. Failure to use the PicoScope may result in incorrect diagnosis and the need for further or unnecessary repairs.</p> <p>Important: You need to take PicoScope measurements before and</p> |

after the repair to share with customer. Before performing any repair on the left or right side of the engine please review the realignment procedure with the customer and ask them if they want to proceed with the repair.

Important: Not all engines will see the same level of noise reduction after performing the realignment procedure. Some engines may see a marginal improvement in noise reduction.

Important: Service agents must comply with all International, Federal, State, Provincial, and/or Local laws applicable to the activities it performs under this bulletin, including but not limited to handling, deploying, preparing, classifying, packaging, marking, labeling, and shipping dangerous goods. In the event of a conflict between the

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must follow those applicable laws.

Service Procedure

Step 1:

Follow the directions below to setup the PicoScope to obtain the sound file needed for review.

If you need to download or update the PicoScope, follow the steps below:

1. Log into GM GlobalConnect.
2. Click on the "Departments" drop down menu and select "Service."
3. Under "Applications" on the service page, select "Special Tools and Software updates." (in Canada, "GM Special Tools & Equipment - Software Updates")
4. You will now be re-directed to www.gmtoolsandequipment.com (do not access this site directly as it requires the use of GlobalConnect to allow downloads).
5. Click the link under "Software Downloads" for the latest PicoScope software version and a new page will open.



The screenshot shows the 'SPECIAL SERVICE TOOLS' website. Under the 'Software Downloads' section, there are several product listings with images and links. The products include:

- GM-10000-USA Multi-Meter Information Tester (MIFIT)**: Includes a software link and a support document link.
- GM-10000-USA Multi-Meter Information Tester (MIFIT) - (MIFIT)**: Includes a software link and a support document link.
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6. Click the setup links and follow instructions to update the tool.

Step 2:

⇒ Start up the vehicle/engine. Ensure engine is at operating temperature. Stand on the driver's side and then passenger side of the engine to listen to the suspected tick. Subjectively determine which bank (LH vs RH) has a more prominent tick and proceed with instrumenting on that bank.

Determine which side of the engine the noise is coming from.

Step 3:

Place the accelerometer on the suspect bank.



⇒ With the suspect bank determined, prep/position the accelerometer so the X, Y, Z coordinate system (that's laser etched) is facing upwards before securing to the bolt head. After accelerometer is placed on bolt head, double check to ensure its centered and did not rotate on the bolt head. Doing so will ensure the best results.

Note: Ensure to keep the cable routed away from the exhaust if working in the engine compartment or moving parts if working under the vehicle.



Important: Ensure accelerometer coordinates are facing up towards the intake.

Step 4:

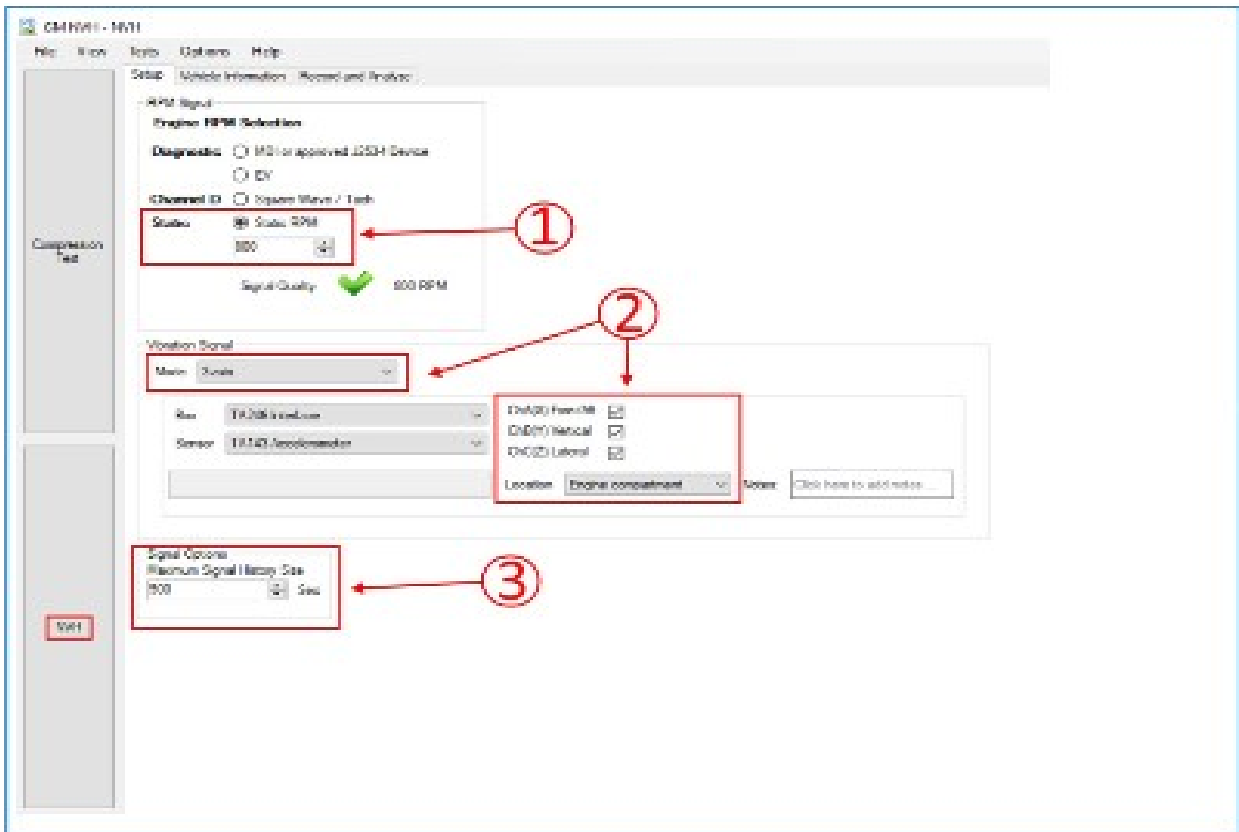
Hook up the accelerometer to the oscilloscope.

- ⇒ Screw the accelerometer connector into the sensor interface. The red LED will start to blink when it senses the connection. Attach a blue, red, and green BNC cable to X, Y, and Z ports, respectively. Then attach the blue, red, and green cables to channels A, B, and C, respectively.

Step 5:

Setup the software to collect data.

1. Open the GM NVH software and click on the NVH button.



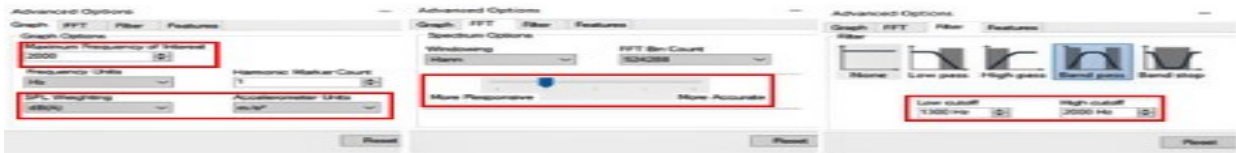
2. Start a new test with the setup wizard:

⇒ 1) Under RPM Signal – Ensure Static RPM is set to 800 RPM.

⇒ 2) Under Vibration Signal – Select three-axis mode then ensure all 3 channels are checked and the location is set to Engine Compartment.

⇒ 3) Under Signal Options – Set the Maximum Signal History Size to 500 seconds.

3. Go to the setup screen to finalize the wizard setup.



- Go to options at the top then to advanced options and change the maximum frequency of interest to 2000. Update the SPL Weighting to dB(A) and check that the accelerometer units are (m/s^2). Under the FFT tab, change the responsiveness marker to the position shown above. Finally, under the filter tab, add a bandpass filter from 1300 to 2000 Hz.

Step 6:

Collect data.

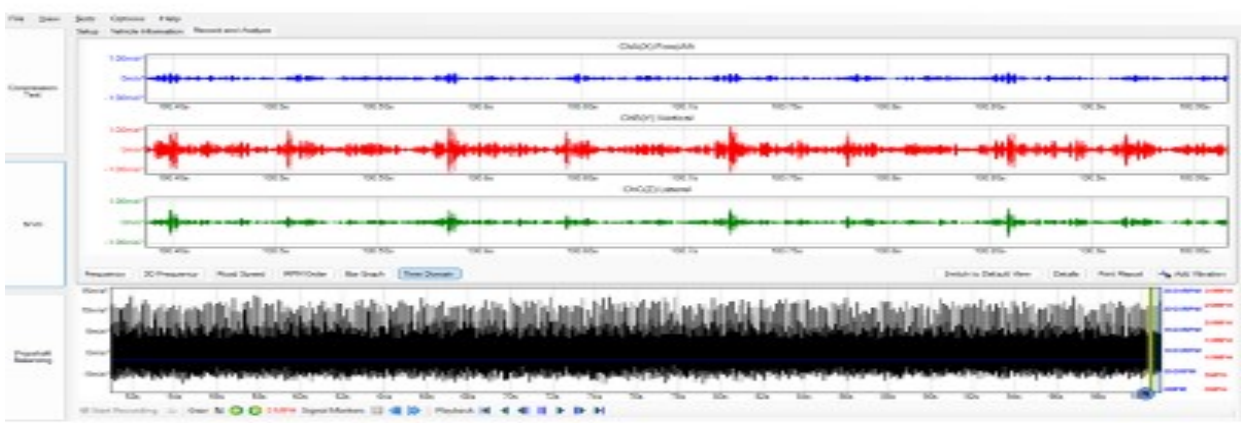
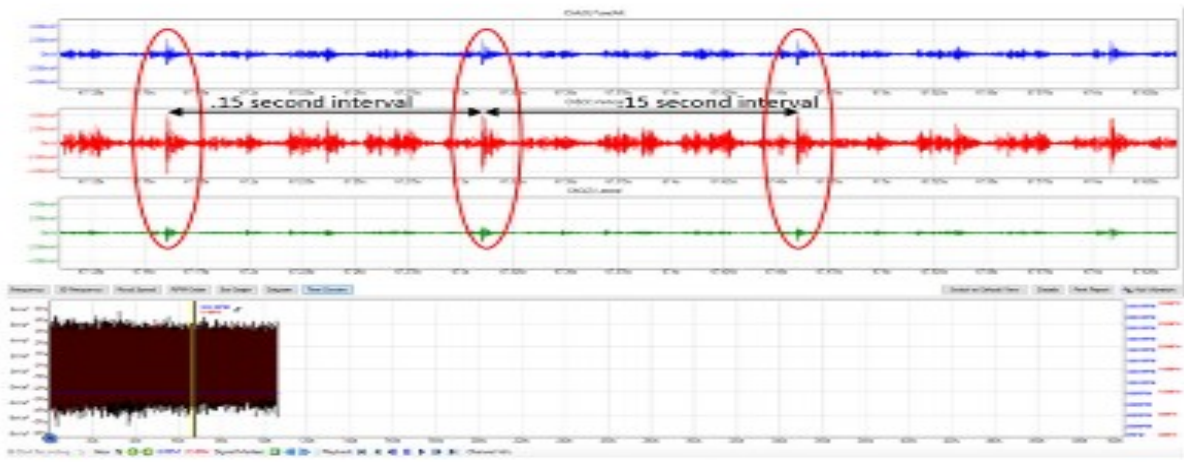
- Startup the vehicle/engine, leave at idle. Make sure the HVAC is off and the vehicle is put into weather mode so that the vehicle idles at 800 rpm. Let the engine settle and wait for the suspected tick to start.
- When the suspected tick starts, click on the "start recording" button. Let the recording go for 60 seconds, then click "stop recording." Do not adjust the accelerometer throughout the recording.
Note: If the instrumentation needs to be moved, restart the data collection.
- After finishing the recording, click file then save. Click OK on the details box as this input is optional and save as a .pddata. Change the file name to "[last 8 of vin]_[LH or RH bank]_[pre or post service fix]_[date]."

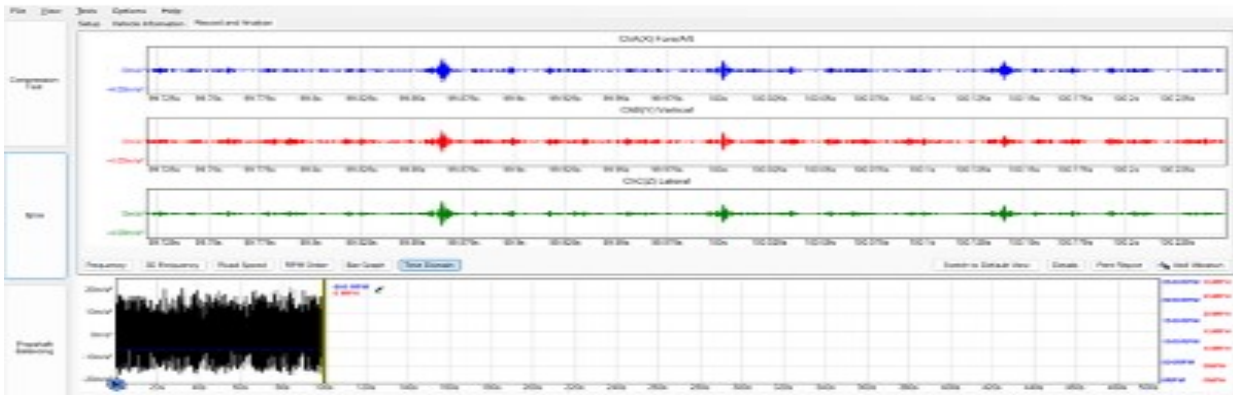
Step 7:

Analyze the data.

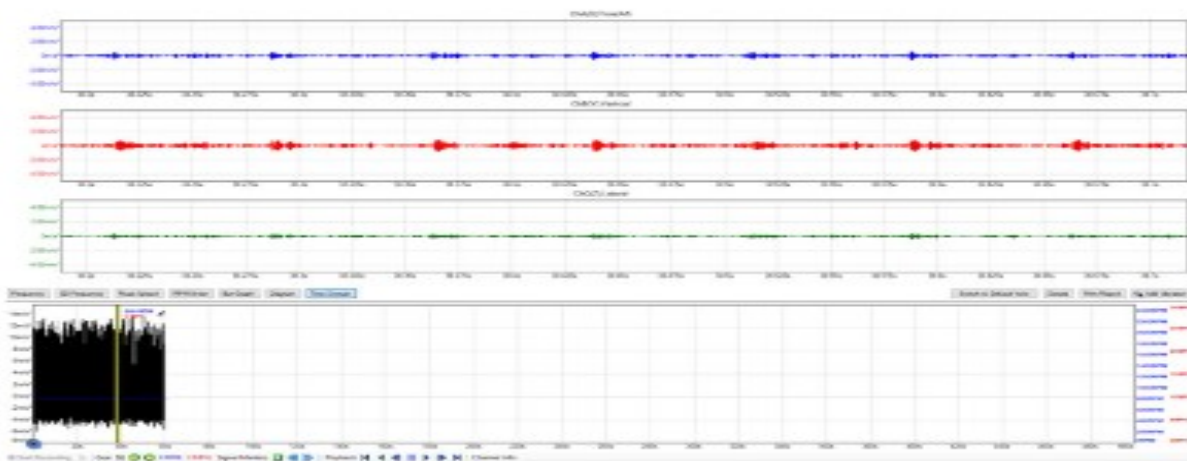
- Right click in the time domain display and change the display mode to single.
- If scales on the left end for each channel are not ranging from $-4 m/s^2$ to $4 m/s^2$, right click in the time domain display and select "reset scale."
- Pull the yellow window cursors on the bottom in as close together as they will go.
- Look at the channel lines in the time domain window for ticks with a .15s gap between them.
⇒ Compare to the examples below for an engine with a tick and an engine without a tick:

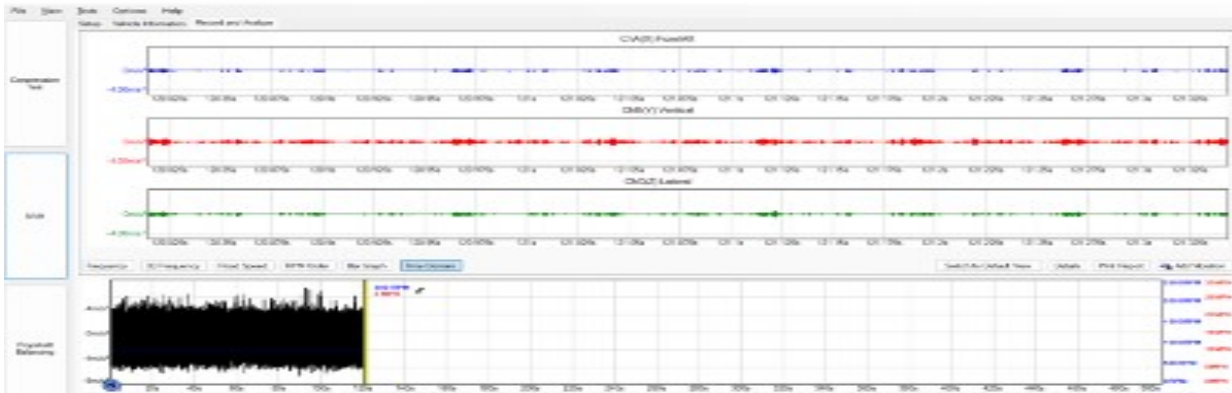
Examples of Tick:





Examples of No Tick:





Important: Once you have captured your Pico results before and after performing the service procedure, please reset the settings menu to default for the next user by clicking on the reset buttons at the bottom of the advance PICO set up screens.

Once it is determined which bank the noise is coming from, it will be necessary to follow the service procedure below to adjust the camshaft cap torque.

Important: If the noise is heard from the left bank, the camshaft cap adjustment procedure can be done with powertrain in vehicle. If the noise is heard coming from the right bank, it will be necessary to drop the engine and transmission assembly to gain access and remove the camshaft cover for the adjustment procedure.

Important: Please review the PICO results with the customer and give them the option if they want their powertrain removed and reinstalled for repair on the passenger side.

Important: Ensure you batteries in the interface module are good.

Camshaft Cap Re-Alignment Procedure:

Please use the following procedure to execute a complete bank camshaft re-alignment procedure:

1. If the tick noise is on the Driver's side bank 1, the repair can be done in the vehicle. If the tick is on the passenger side bank 2, the rear cradle and powertrain assembly must be lowered to be able to remove the camshaft cover on that bank.
 - Refer to *Camshaft Cover Replacement – Bank 1* or *Camshaft Cover Replacement – Bank 2* in SI to get the camshaft cover removed to perform the next steps.
2. Remove the camshaft cover (w/solenoids installed in cover if LH bank, remove solenoids from cover first if RH bank).
3. With aid of helper, rotate the engine from below by the crankshaft damper bolt until the Intake Cyl #1 (LH) or Intake Cyl #2 (RH) cam lobes are pointed straight up to the top of the cap (on base circle).

- This is the first cam cap that will be adjusted per the steps 4-8 below.
- Note that the larger front camshaft caps behind the actuators will NOT be adjusted with this procedure.

Important: Always remember to work from front to rear when performing the re-alignment procedure.

For the Bank 1 adjustment procedure, the cam lobes can be monitored through the wheel well opening to properly position.

- Loosen the cam cap bolts on the cap to be adjusted 1 full turn.
 - Do not remove or physically try to shift, wiggle, or adjust the cap seating.
- Tighten the inner camshaft cap bolt first to 15 N.m (11 lb ft).

Note: The inner camshaft cap bolt is the one farthest away from the spark plug tube.
- Tighten the outer camshaft cap bolt first to 15 N.m (11 lb ft).

Note: The outer camshaft cap bolt is the one farthest away from the spark plug tube.
- Make a second pass on both camshaft cap bolts to confirm each is torqued to 15 N.m (11 lb ft).
- Place a black sharpie mark on the cam cap adjusted to note that it has been completed.
- Repeat the steps 4-8 above on the exhaust camshaft caps on the same engine bank (LH, RH) depending on the side on which you are working on.
- Repeat the steps 4-8 above on the exhaust camshaft caps on the same engine bank (LH, RH) depending on the side on which you are working on.

Important: Always remember to work from front to rear when performing the re-alignment procedure.
- Reinstall the cam cover and solenoids (if removed) and reconnect electrical.
- Once the exhaust and intake camshaft cap bolts have been re-torqued, the engine can be reassembled.

Important: If the work was done with the engine still in vehicle (LH bank) and the cam phasing solenoids were left installed in the cam cover, it is critical to make sure that the solenoid plungers are fully recessed before lowering the cover onto the engine. The plungers can loosely move inward and outward. Tip the cam cover front (solenoids) end down to make sure plungers are in/down. Carefully move cover with the front (solenoid) end tilted slightly down while positioning onto the engine to prevent plungers from extending. If the solenoid plungers are extended out, they will catch on the phaser OCV center bolt plunger and be bent – phasing will not work and both the solenoid and OCV will need to be replaced.

Parts Information

Note: Only select the parts that coincide with the repair performed. Replace the part with the P/N outlined in the Electronic Parts Catalog (EPC) in accordance with the vehicle VIN.

| Causal Part | Description | Part Number | Qty | Bank |
|-------------|-----------------------------|-------------|-----|------------|
| N/A | SEAL, OIL TRFER TUBE O-RING | 12697070 | 1 | Right Bank |
| N/A | SEAL, OIL TRFER TUBE O-RING | 12697071 | 1 | Right Bank |
| | GASKET, EXH | | | |

| | | | | |
|-----|--|--|----|------------|
| N/A | MANIF | 12673594 | 1 | Both Banks |
| N/A | GASKET, INT MANIF | 12668302 | 8 | Both Banks |
| N/A | BOLT, R/AXL SHF | 11601876 | 12 | Right Bank |
| N/A | FILTER KIT, OIL | 12730579 | 1 | Both Banks |
| N/A | OIL, ENG (5W- 50) SUPERCAR MOBIL 1 | 19433208 (in Canada, 19434897) | 8 | Both Banks |
| N/A | SEALANT | 19369831 (U.S) 19369832 (Canada) | 1 | Both Banks |
| N/A | SEAL, CM/SHF HSG CVR | 12672530 Right | 1 | Right Bank |
| N/A | SEAL, CM/SHF HSG CVR | 12672531 Left | 1 | Left Bank |
| N/A | SEAL, SPLG SHLD | 12672529 | 4 | Both Banks |
| N/A | GASKET, CTLTC CONV | 10354707 | 1 | Both Banks |
| N/A | GASKET, CTLTC CONV | 12672379 | 1 | Both Banks |
| N/A | GASKET, PCV OIL SEP | 12695546 | 1 | Left Bank |
| N/A | SEAL, SPLG SHLD | 12672529 | 1 | Left Bank |
| N/A | BOLT, EXH MANIF | 11546600 | 5 | Both Banks |

Warranty Information

Note: Only select the Labor Operation that coincides with the repair performed.

For vehicles repaired under the Powertrain coverage, use the following labor operation. Reference the Applicable Warranties section of Investigate Vehicle History (IVH) for coverage information.

| Labor Operation | Description | Labor Time |
|-----------------|-------------|------------|
| | | |

| | | |
|--|--|----------|
| 4089038* | Record and Review Sound File | 0.5 hr |
| 4089048* | Camshaft Cap Realignment Bank 1 (Driver's Side) Coupe | 9.9 hrs |
| 4089058* | Camshaft Cap Realignment Bank 2 (Passenger Side) Coupe | 17.3 hrs |
| 4089068* | Camshaft Cap Realignment Bank 1 (Driver's Side) Convertible | 6.6 hrs |
| 4089078* | Camshaft Cap Realignment Bank 2 (Passenger Side) Convertible | 16.6 hrs |
| *This is a unique Labor Operation for bulletin use only. | | |

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|-----------------|------------------------|
| Version | 1 |
| Modified | Released June 28, 2023 |

GM bulletins are intended for use by professional technicians, NOT a "do-it-yourselfer". They are written to inform these technicians of conditions that may occur on some vehicles, or to provide information that could assist in the proper service of a vehicle. Properly trained technicians have the equipment, tools, safety instructions, and know-how to do a job properly and safely. If a condition is described, DO NOT assume that the bulletin applies to your vehicle, or that your vehicle will have that condition. See your GM dealer for information on whether your vehicle may benefit from the information.



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