



Service Bulletin

Bulletin No.: 19-NA-253

Date: November, 2019

TECHNICAL

Subject: Diagnostic Tip for Engine Misfire, Malfunction Indicator Lamp (MIL) Illuminated - DTCs P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0307 and/or P0308

Brand:	Model:	Model Year:		VIN:		Engine:	Transmission:
		from	to	from	to		
Cadillac	CT6	2019	2020			4.2L (LTA)	

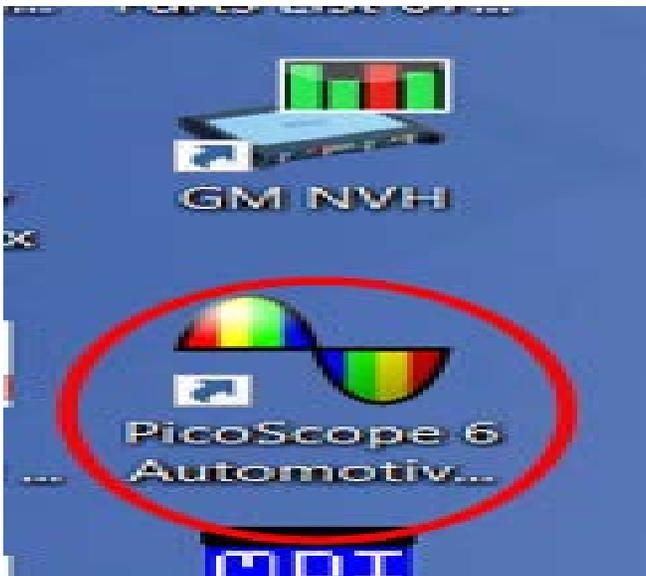
Involved Region or Country	United States, Canada, Mexico, N.A. Export Regions
Condition	<p>Some customers may comment on one or more of the following conditions:</p> <ul style="list-style-type: none"> • MIL illuminated • Misfire <p>Some technicians may find one or more of the following DTCs set in the Engine Control Module (ECM):</p> <ul style="list-style-type: none"> • P0300 • P0301 • P0302 • P0303 • P0304 • P0305 • P0306 • P0307 • P0308
Cause	<p>This condition may be caused by one or more of the following:</p> <ul style="list-style-type: none"> • Fuel Injector • Electrical issue • Loss of cylinder compression
Correction	<p>Note: The purpose of the bulletin is to show you a way to confirm if you have a mechanical engine issue or not.</p> <p>A Relative Compression test can be used to determine if the misfire is caused by an engine compression issue or not.</p>

Service Procedure for Running a Compression Test

A technician may find that a relative compression test can be used to rule out an engine compression issue. A relative compression test can be performed with different tools and the engine can be cranked over using many different methods.

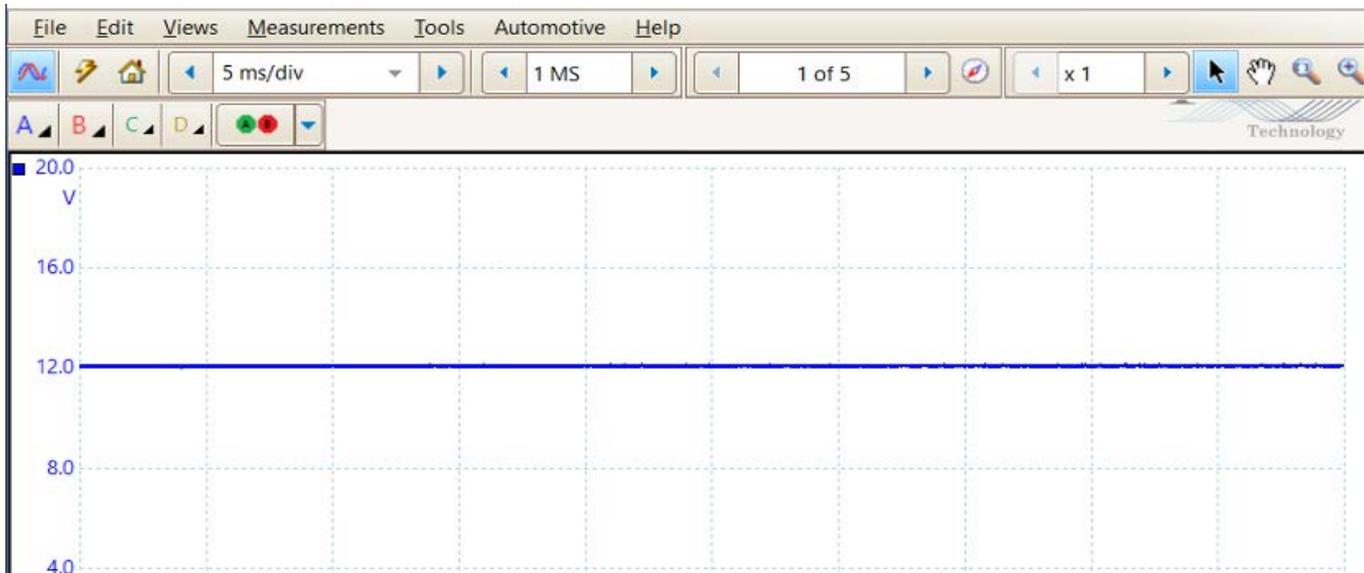
For this communication, use the PicoScope CH-51450 and available CH-51450-LEAD kits or equivalent.

1. Connect the PicoScope to the computer using the included USB cable as you would do using GM NVH.
2. Connect test leads to the battery (hook the colored lead to Battery (+) and the black lead to Battery (-)) and to channel A of the PicoScope.



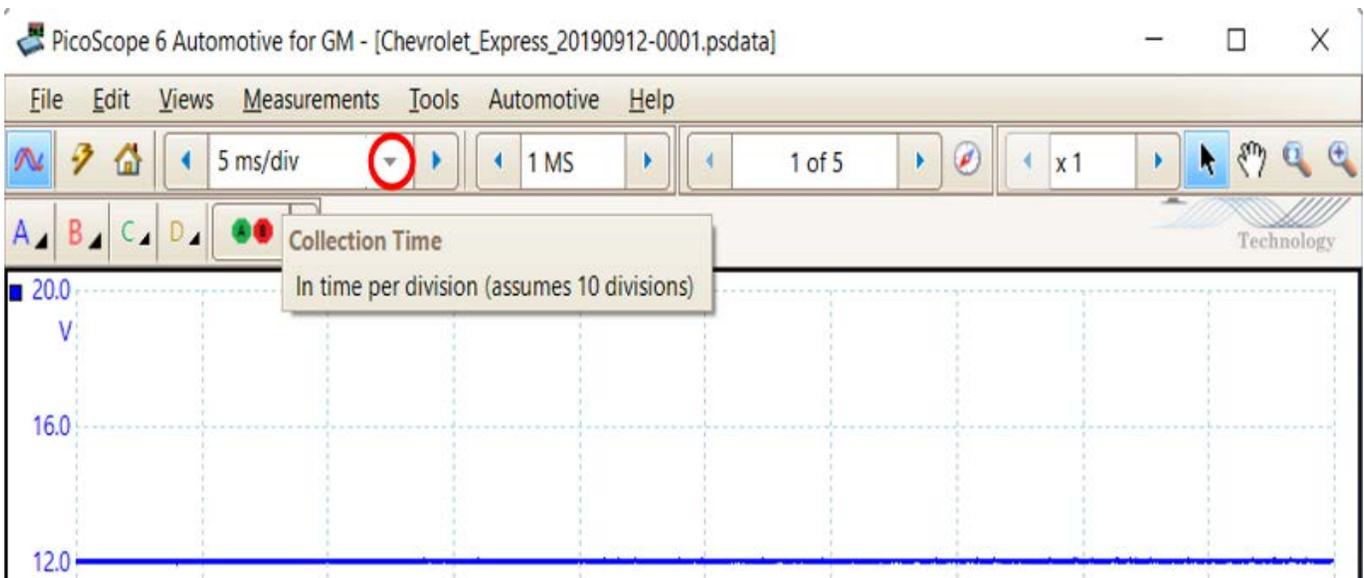
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3. Open the most current version of PicoScope 6 Automotive for GM software that is loaded when GM NVH software is installed.
 - ⇒ If PicoScope 6 Automotive is not on your computer, download the newest version of PicoScope NVH Software Update V.R.1.11.1_September_2018 or later.



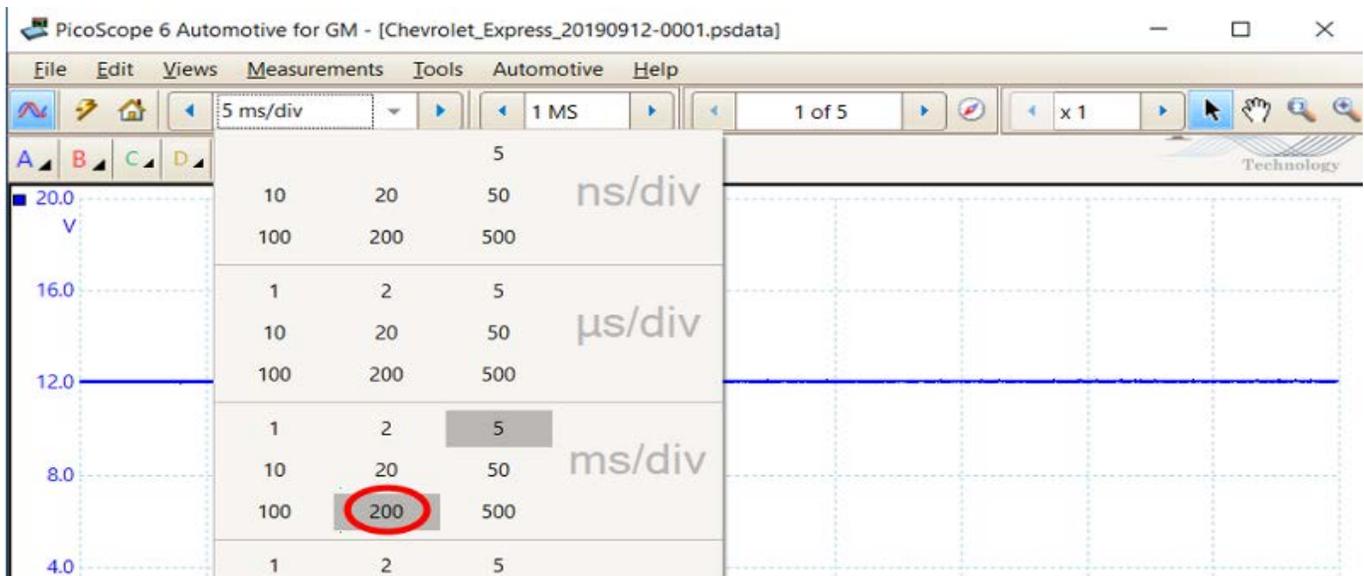
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4. With the PicoScope hooked up and the software running, a steady line at battery voltage on the graph should be displayed.



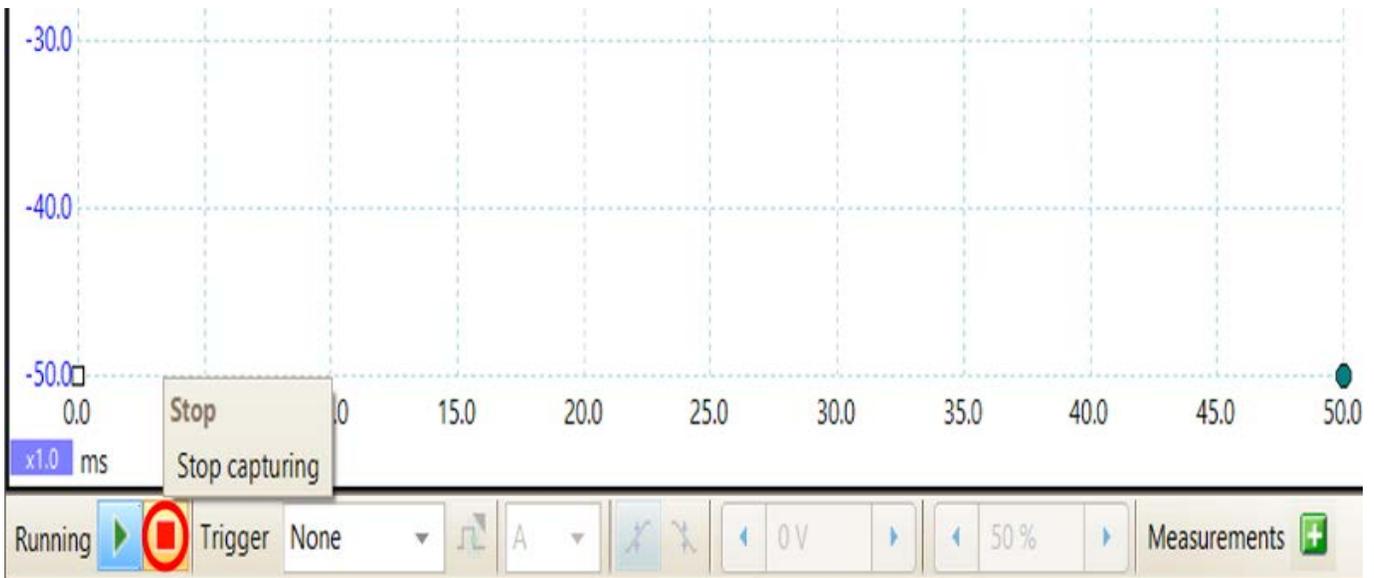
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5. Select the Collection Time drop down.



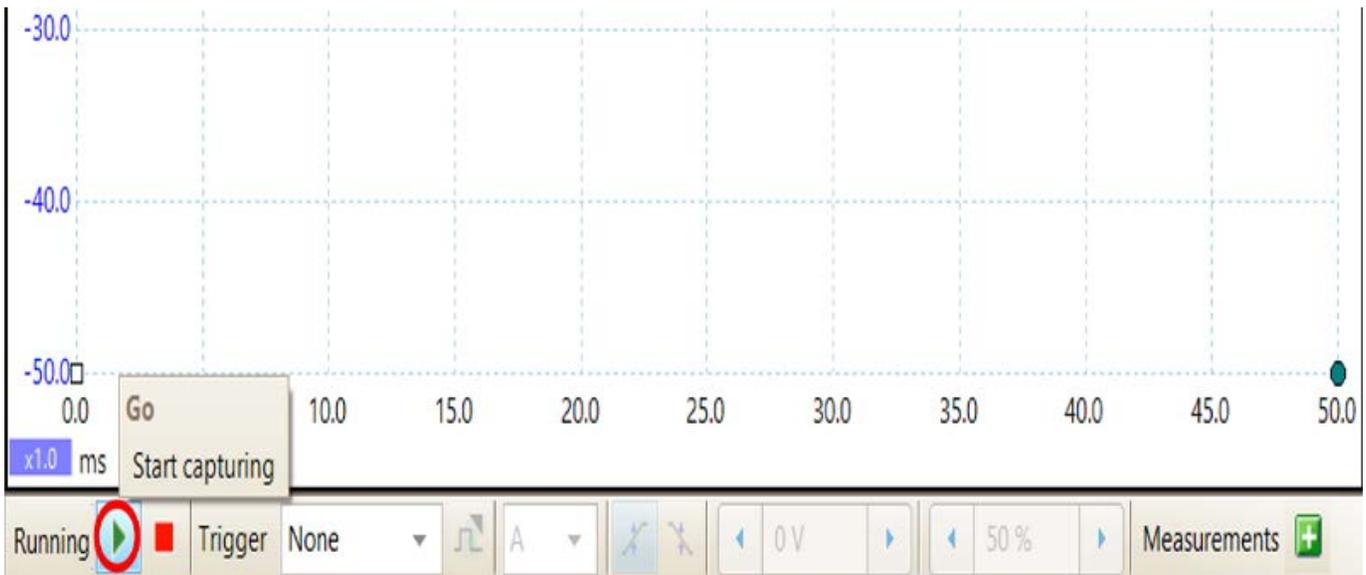
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6. Change the collection time from 5ms/div to 200ms/div.



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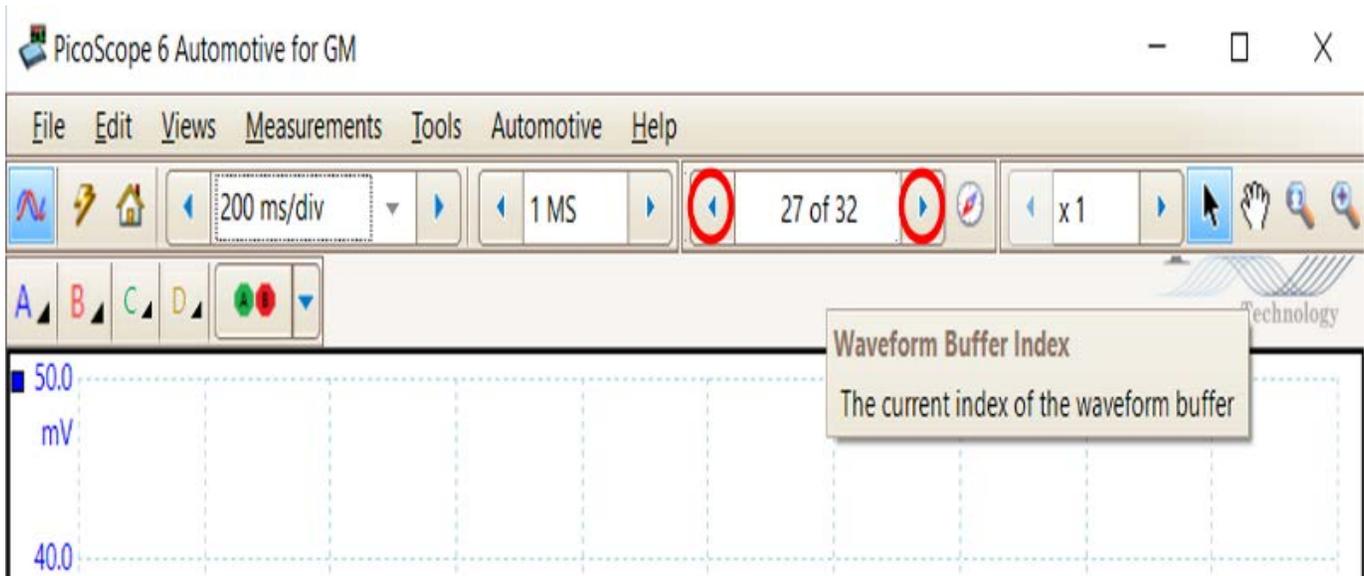
7. While holding the accelerator pedal to the floor (Clear Flood), crank the engine for two to three seconds.
8. Immediately after cranking the engine, select the Stop capturing button at the bottom of the screen.



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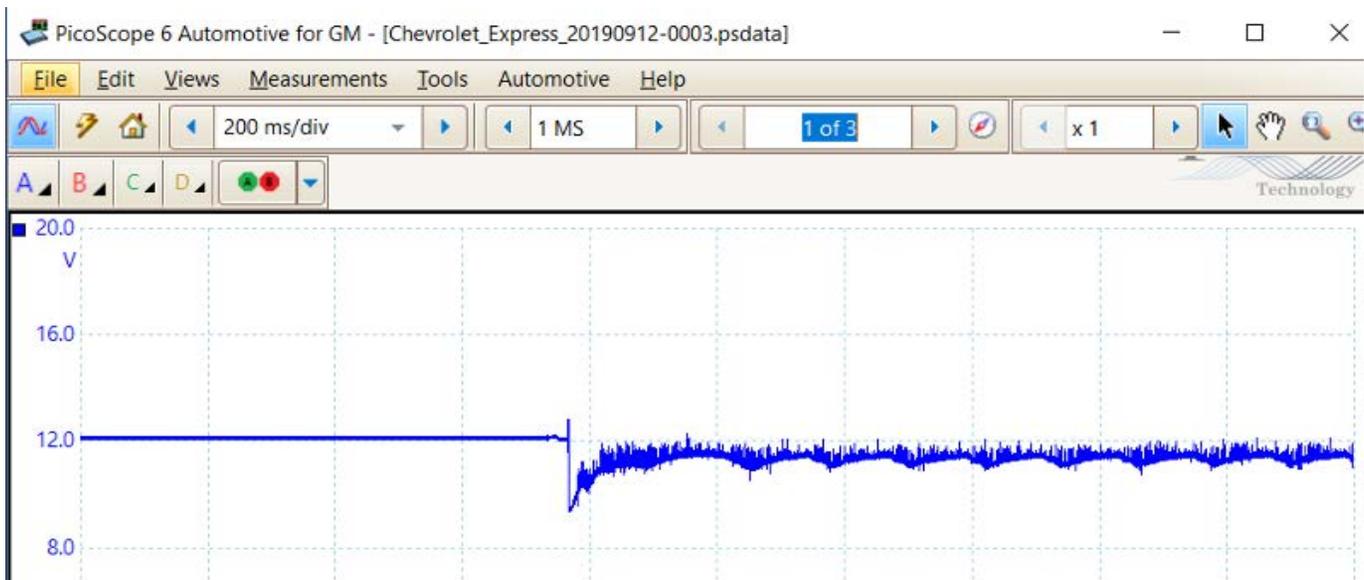
9. Save this file to the PC.
 - ⇒ It may be useful to repeat steps 8 thru 10 a few more times to collect additional wave forms. To do this, you will need to hit the Go or Start capturing button prior to cranking the engine.
10. Disconnect the PicoScope.

Setting Up PicoScope 6 Software to View Waveforms



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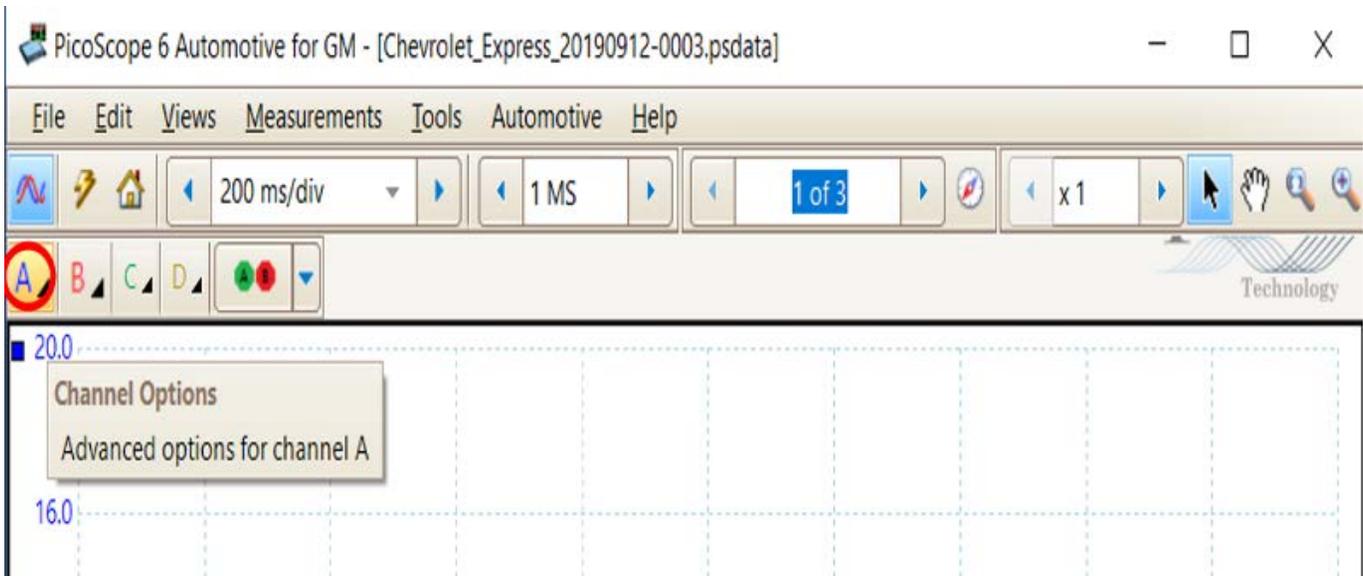
To examine one of these wave forms, use the Waveform Buffer Index navigation buttons to locate the start of the cranking.



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The graphic above depicts a viewable Wave Form Pattern.

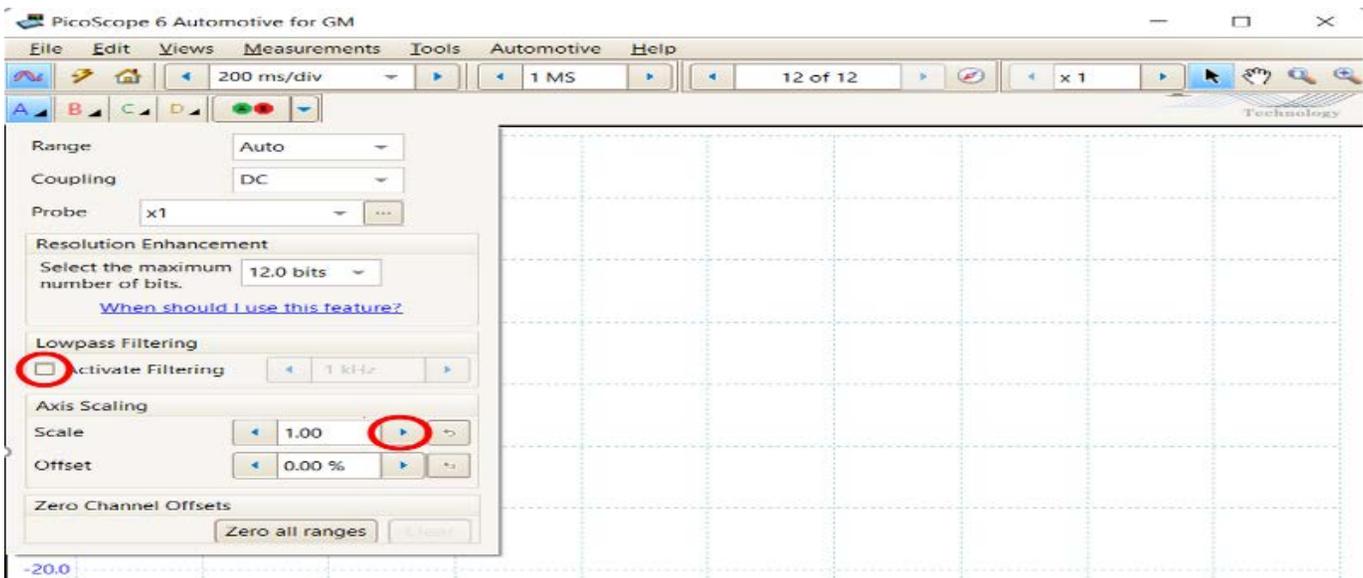
To view the Wave Form, zoom in to the right side of the graph.



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Change settings.

⇒ Select the drop down next to the blue “A” (for channel A).

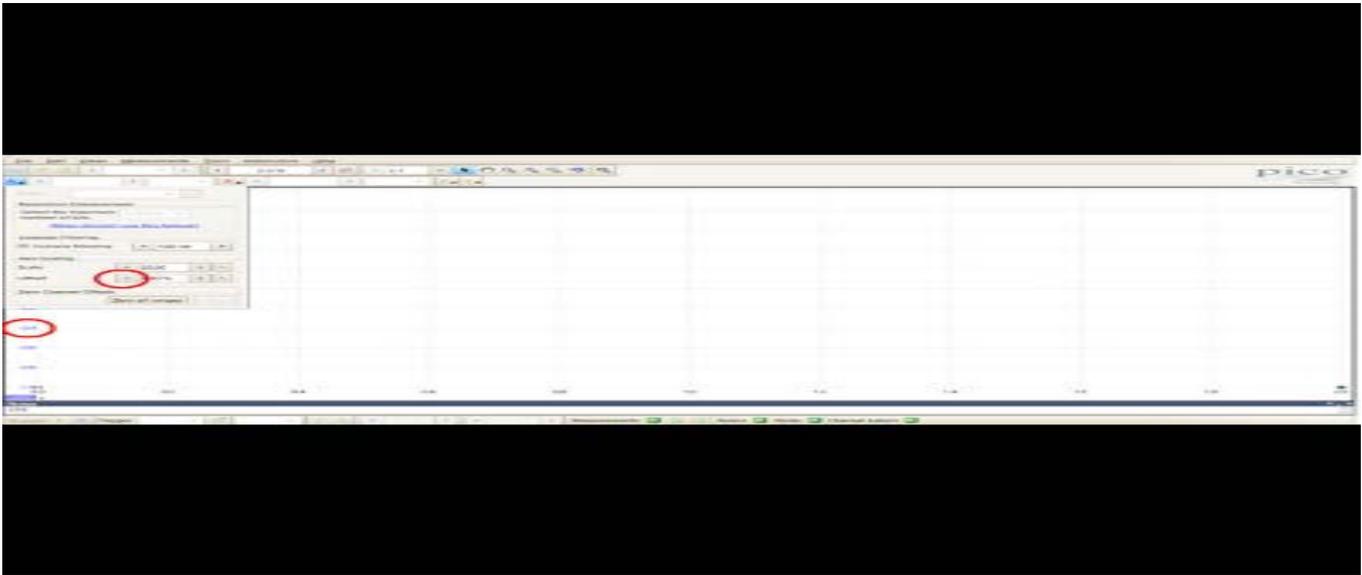


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The channel options screen should be displayed.

⇒ Select the Lowpass Filtering Active Filtering check box (100 Hz to start).

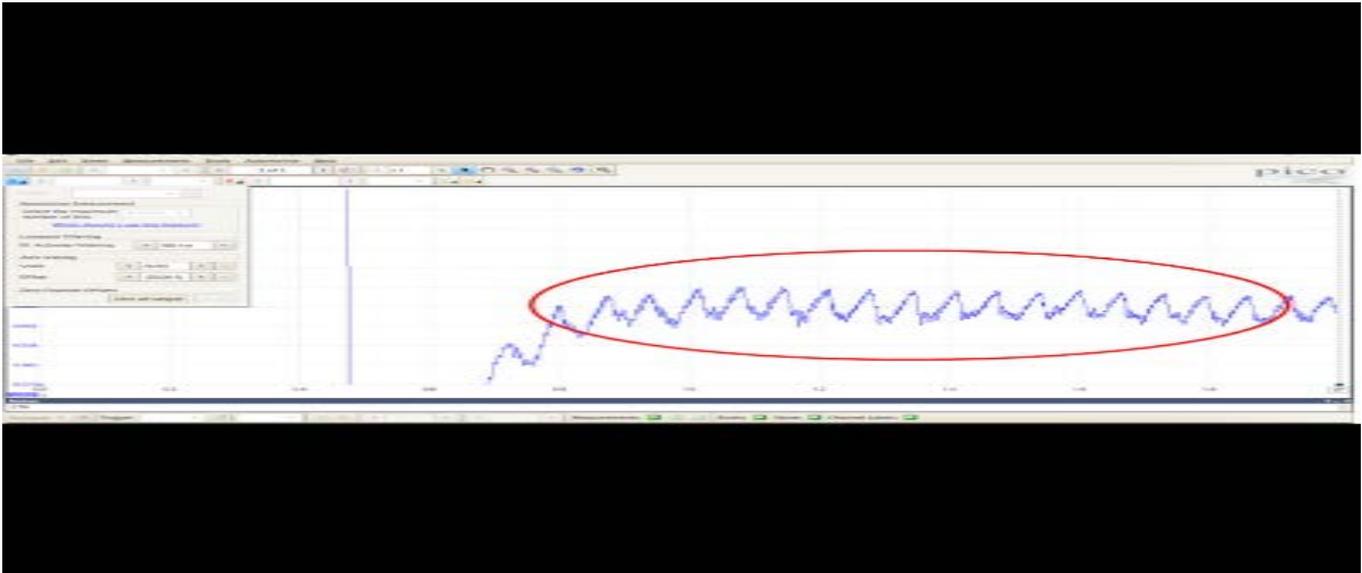
⇒ Change the Axis Scaling Scale value to 26.00.



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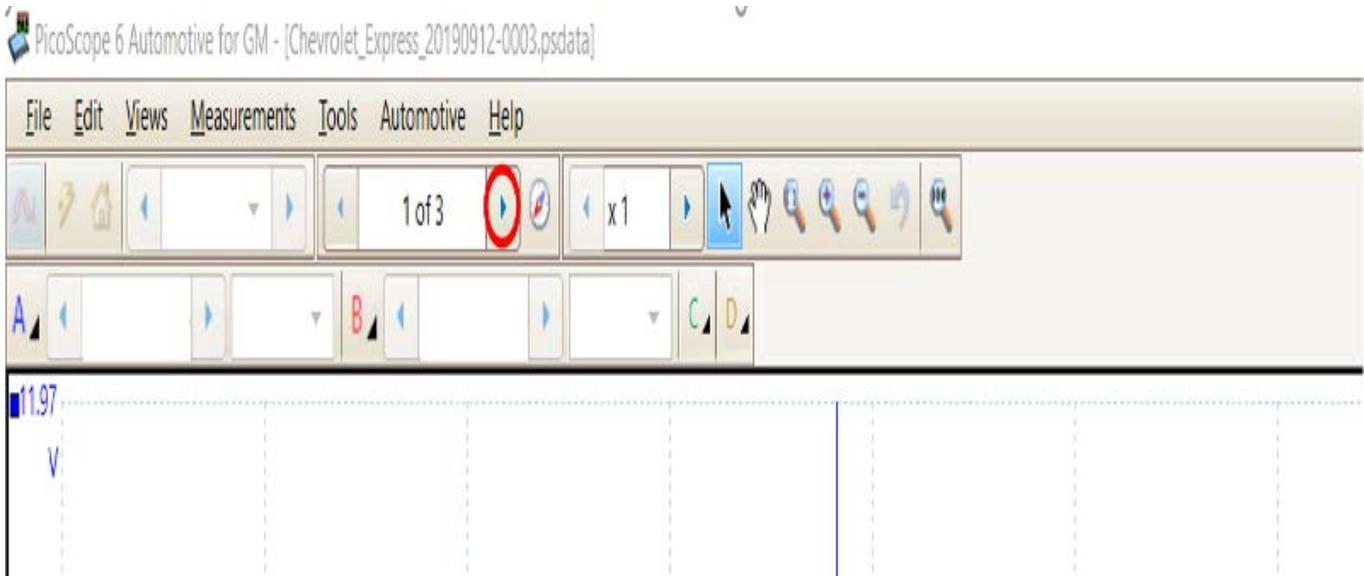
Take note, the voltage graph appears to have disappeared, but if you look at the scaling on the left, you will see that the value is a negative number.

⇒ Use the axis scaling offset to bring the graph back into view.



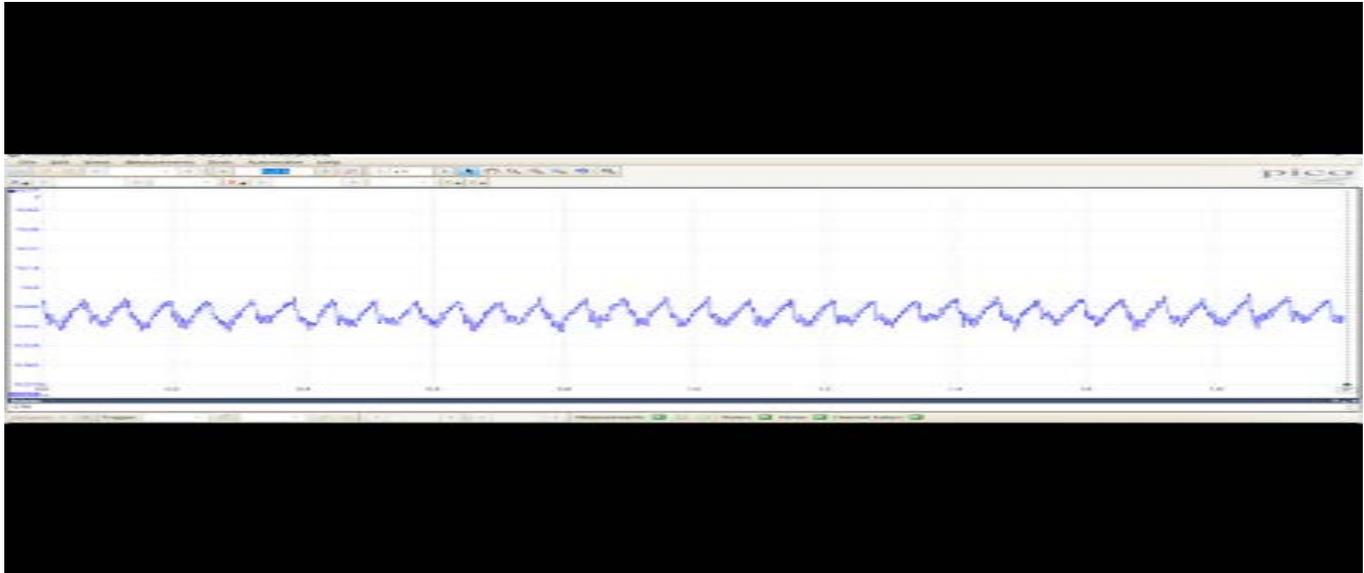
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The graphic above depicts a viewable Voltage Graph Pattern.



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Use the waveform Buffer button to move to the next window.

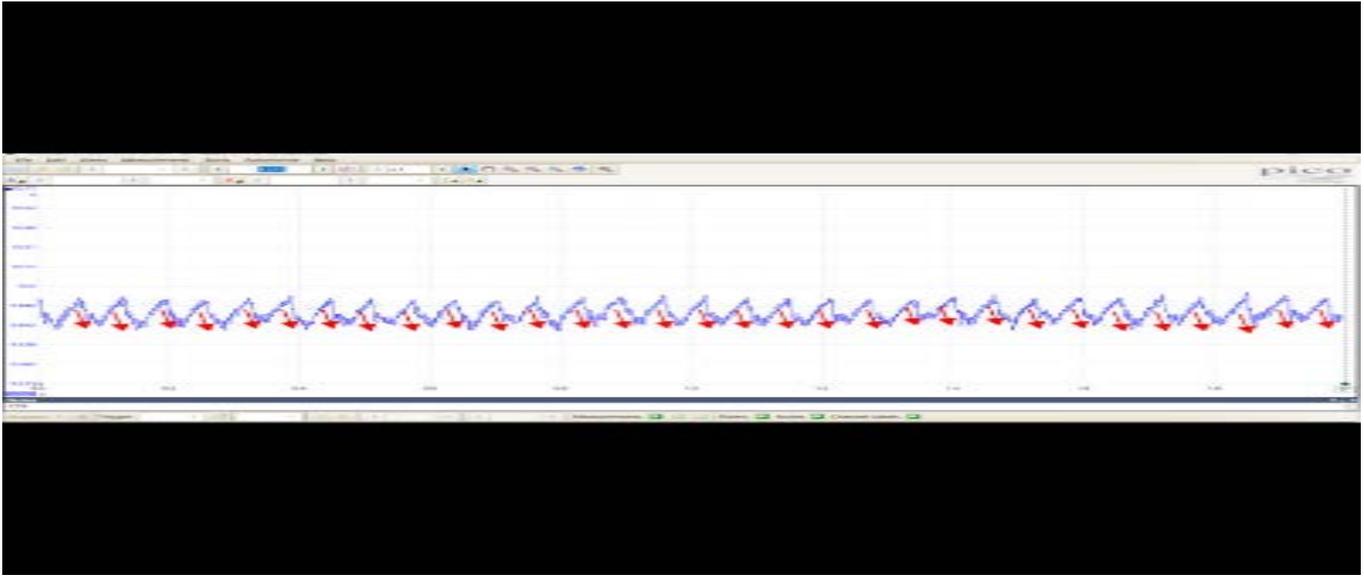


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The graph above illustrates an engine that will pass a compression test and there is no reason to think that there is anything mechanically wrong with the engine.

⇒ If the graph does not look like the graph above, refer to the Analyzing Relative Compression Graphs section below.

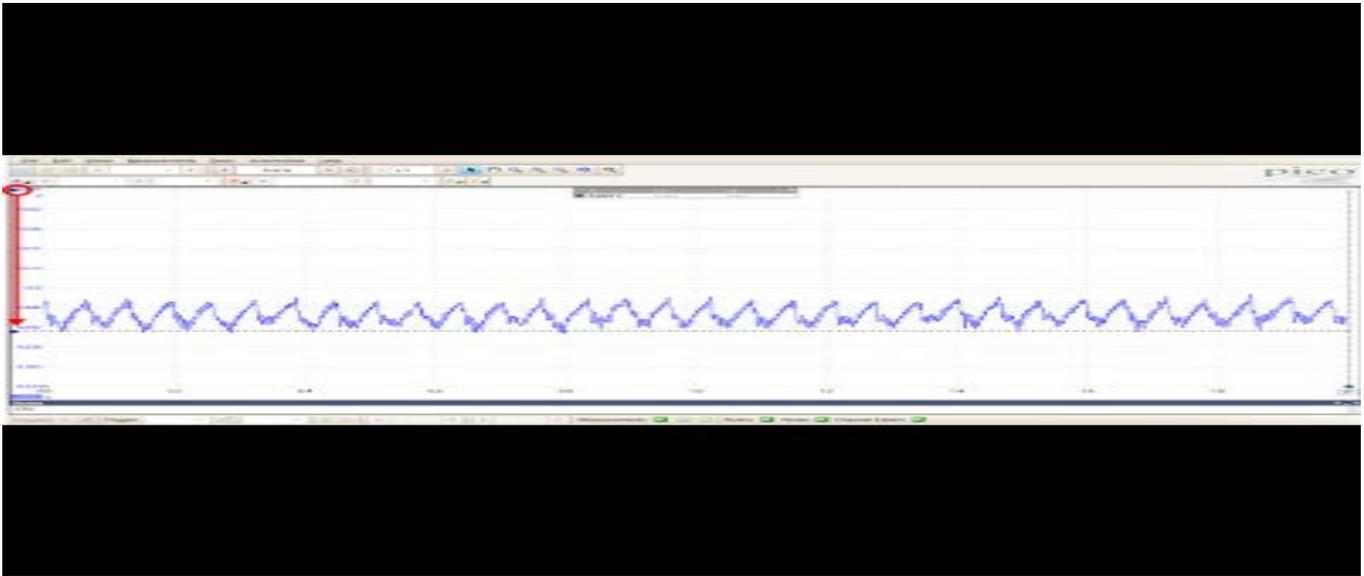
Analyzing Relative Compression Graphs



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When examining these graphs, view the downward portion of the waveform.

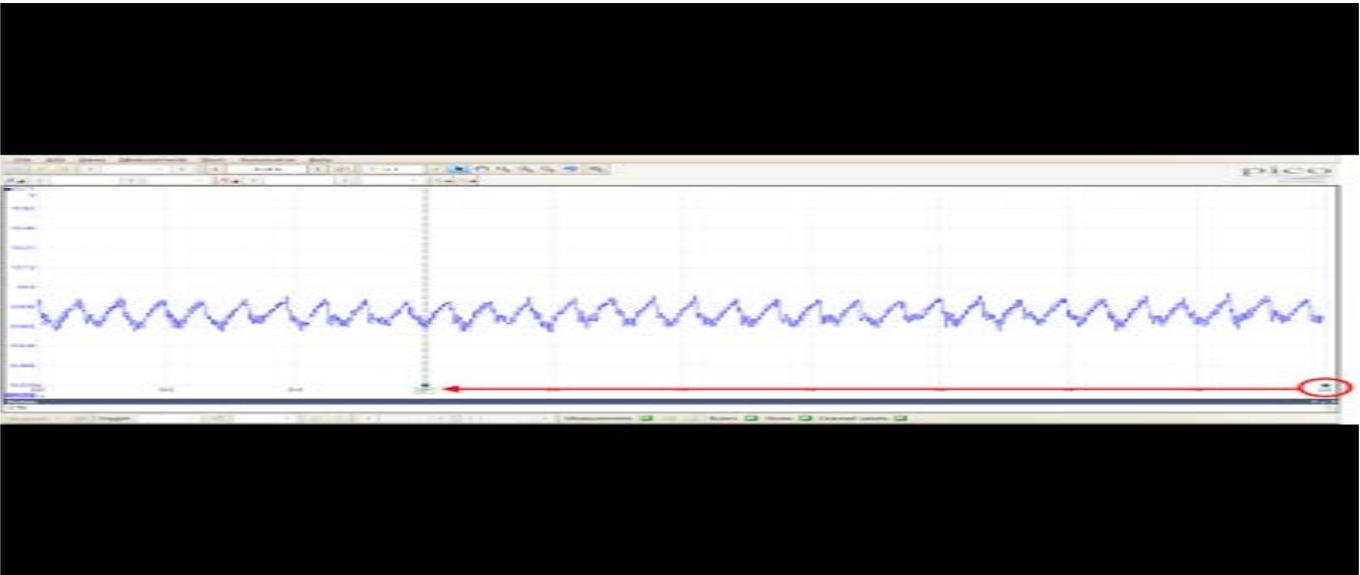
This area of the graph is the engine starter pulling more electricity from the battery during a compression stroke.



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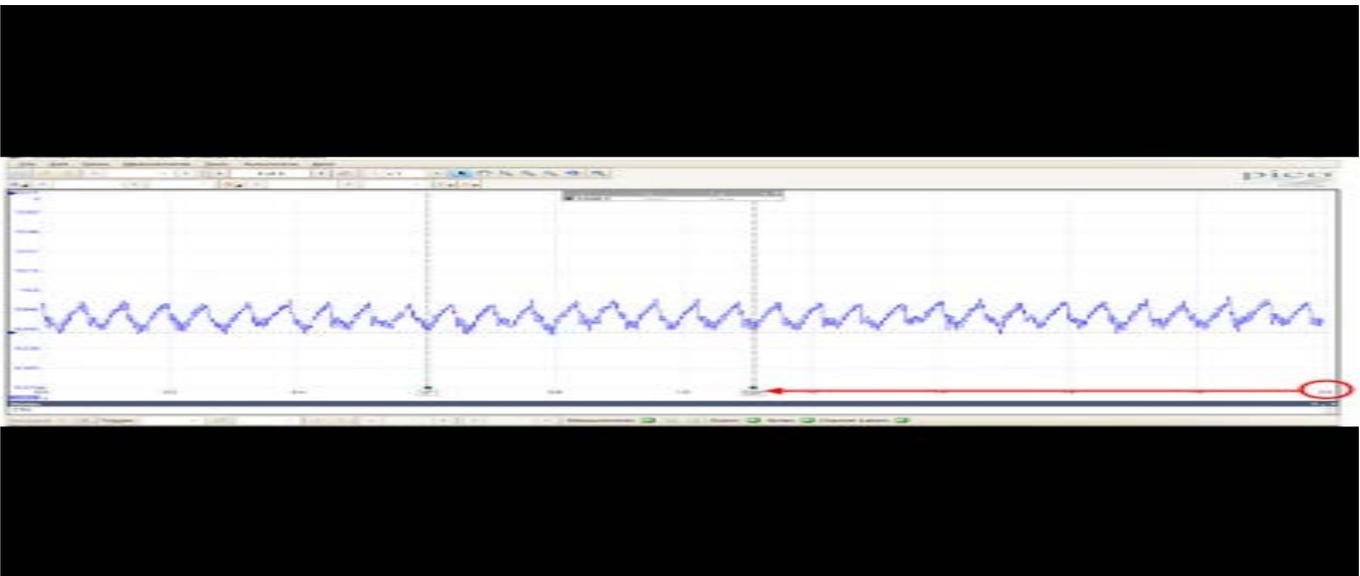
Utilizing a horizontal ruler, line up the bottom of the waveform.

⇒ Select the blue box and drag it to the location that's viewable.



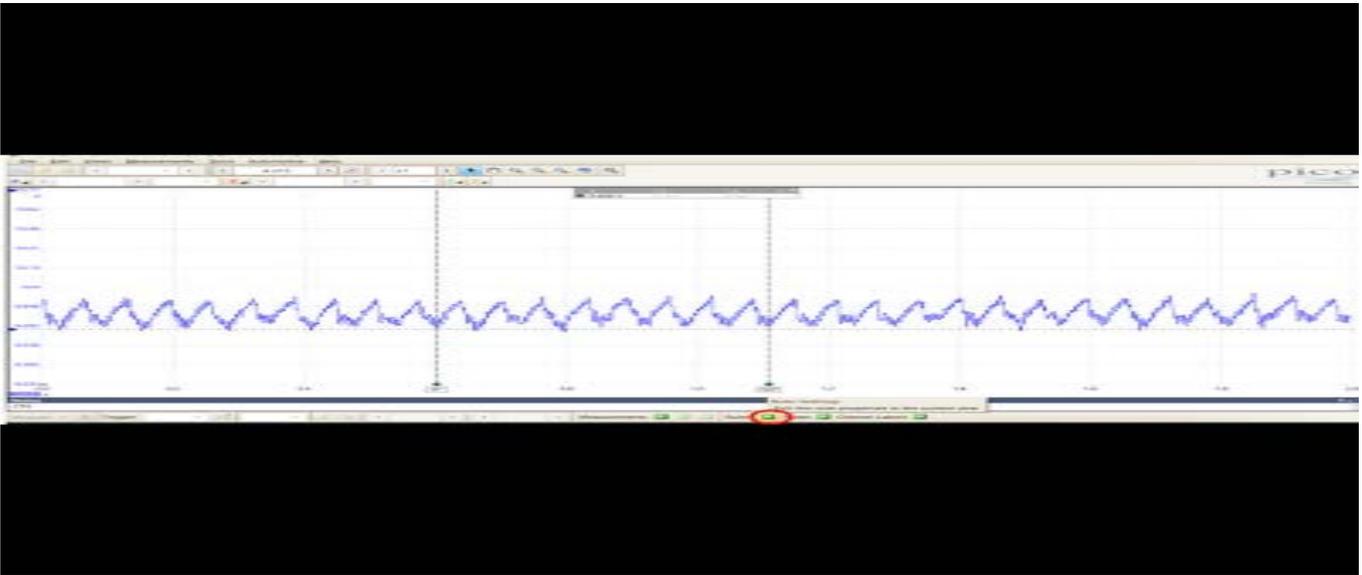
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Vertical rulers may be used as well.



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Utilize a second ruler.



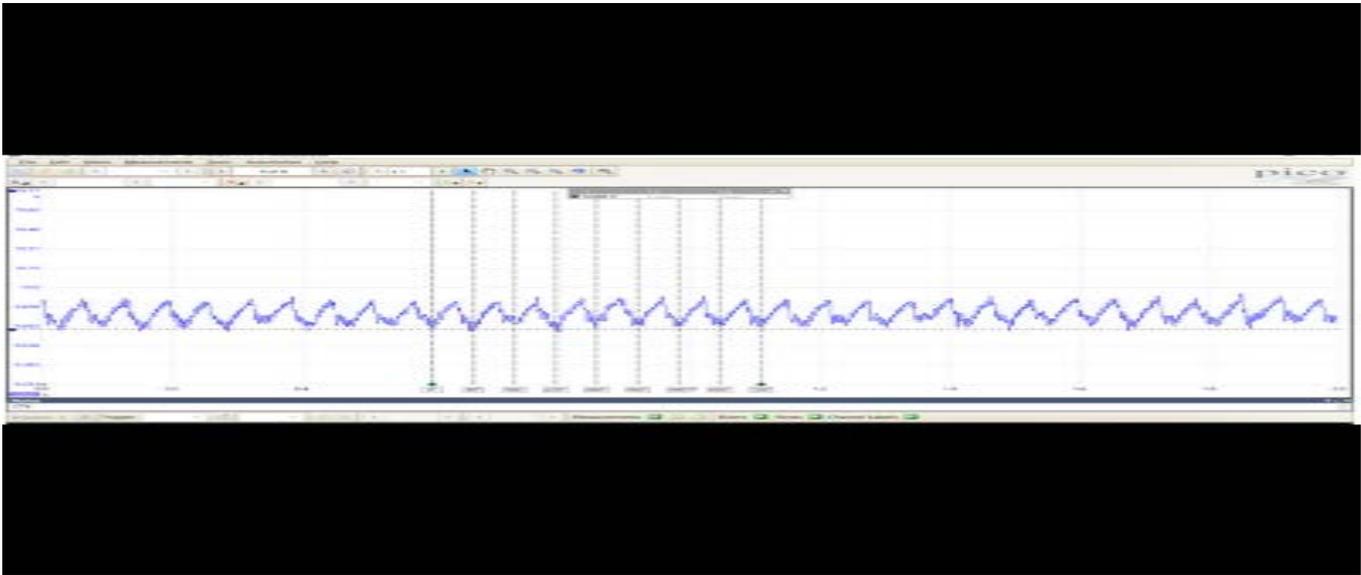
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Select the Ruler Settings Button to display the Ruler Setting menu options.



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Change the rotation partition to 8, to represent the number of cylinders in the engine.

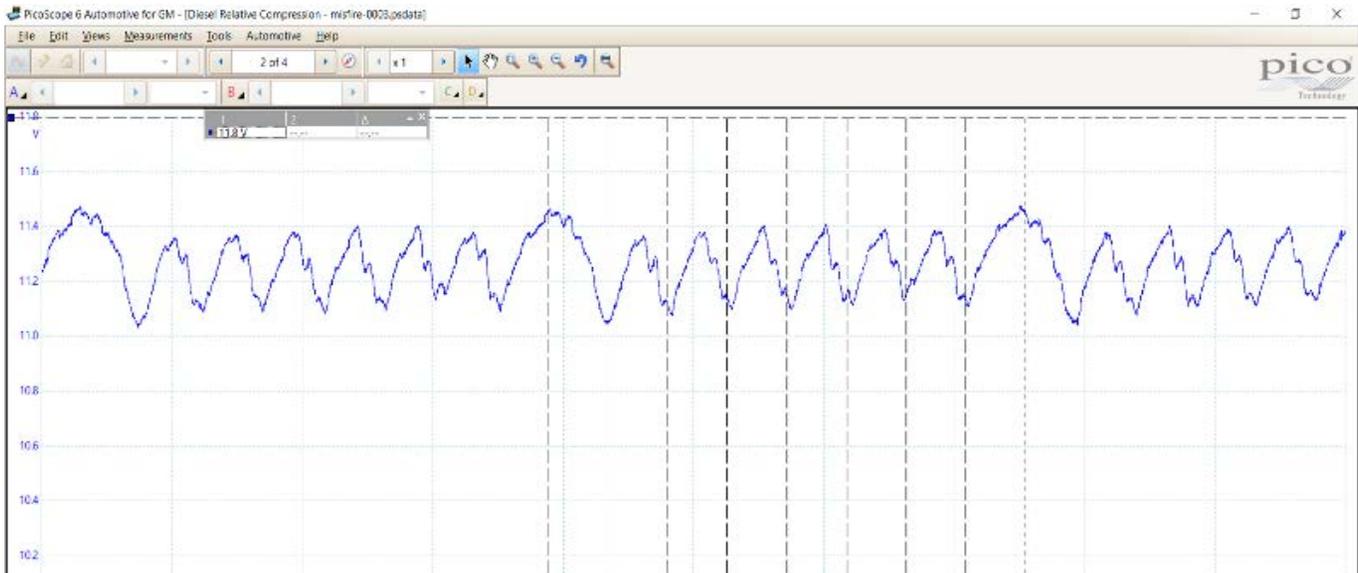


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This should help to identify the top of each compression stroke in two rotations of the engine.

It is not an issue if you see a few of these “tips” that do not touch the line. What we are looking for is consistently one of every eight points not hitting the line for an eight cylinder engine.

Sample Waveforms for Reference

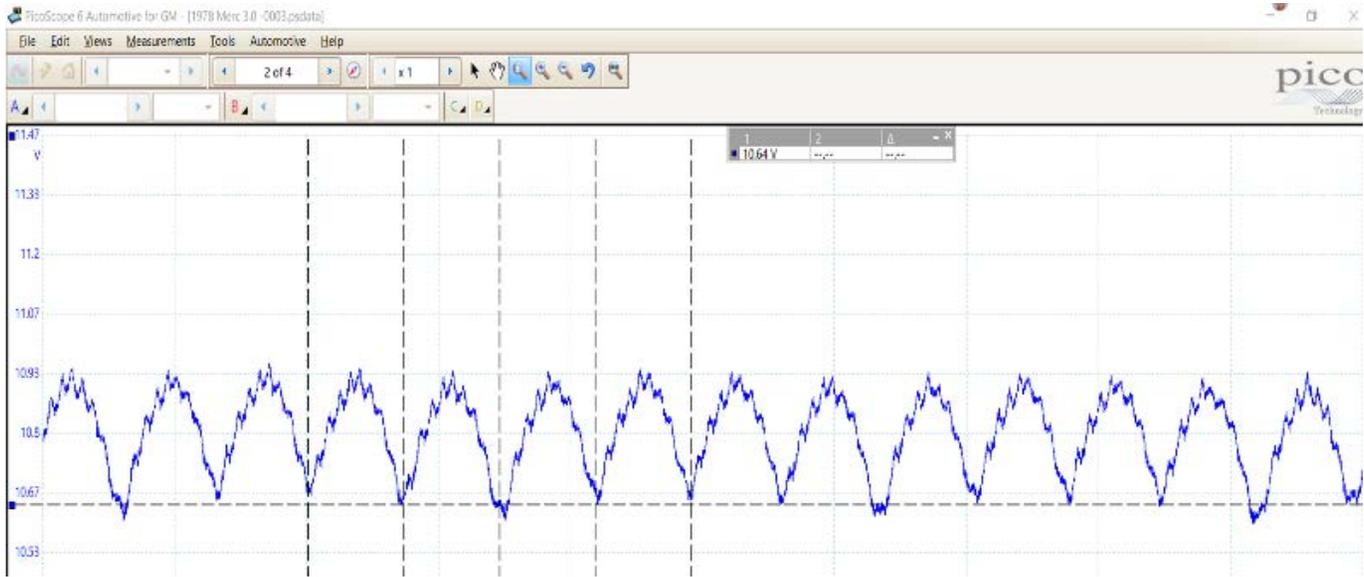


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The graphic above depicts an example of an eight-cylinder engine with a cylinder that has no compression in one cylinder.

Note that one of the dips is missing and it repeats every eight dips.

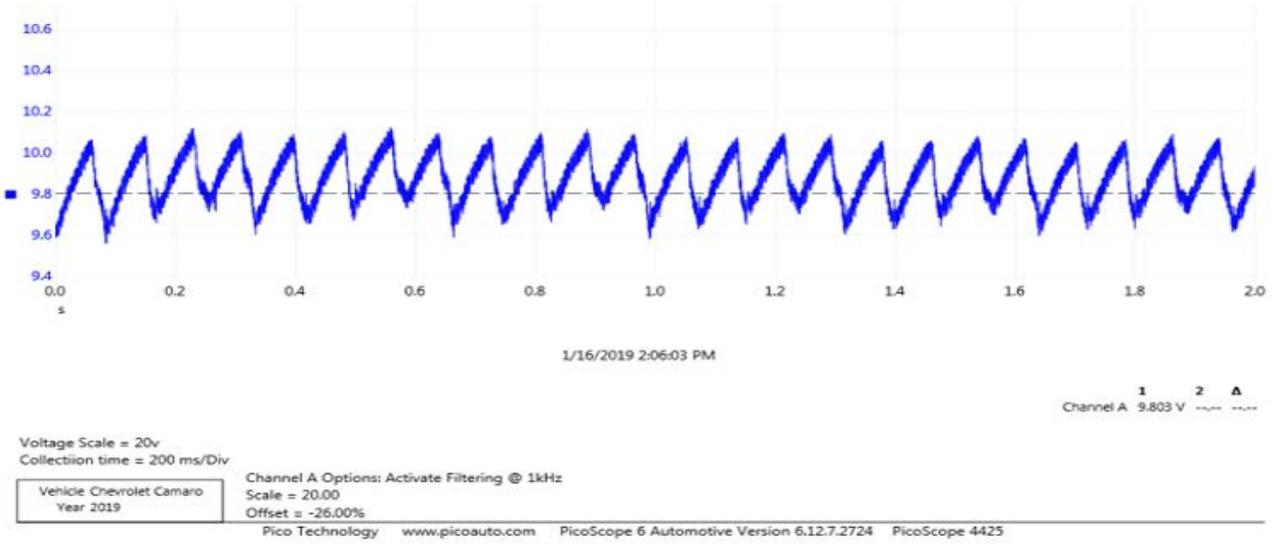
- This is a clear indication that there is an issue with this engine.



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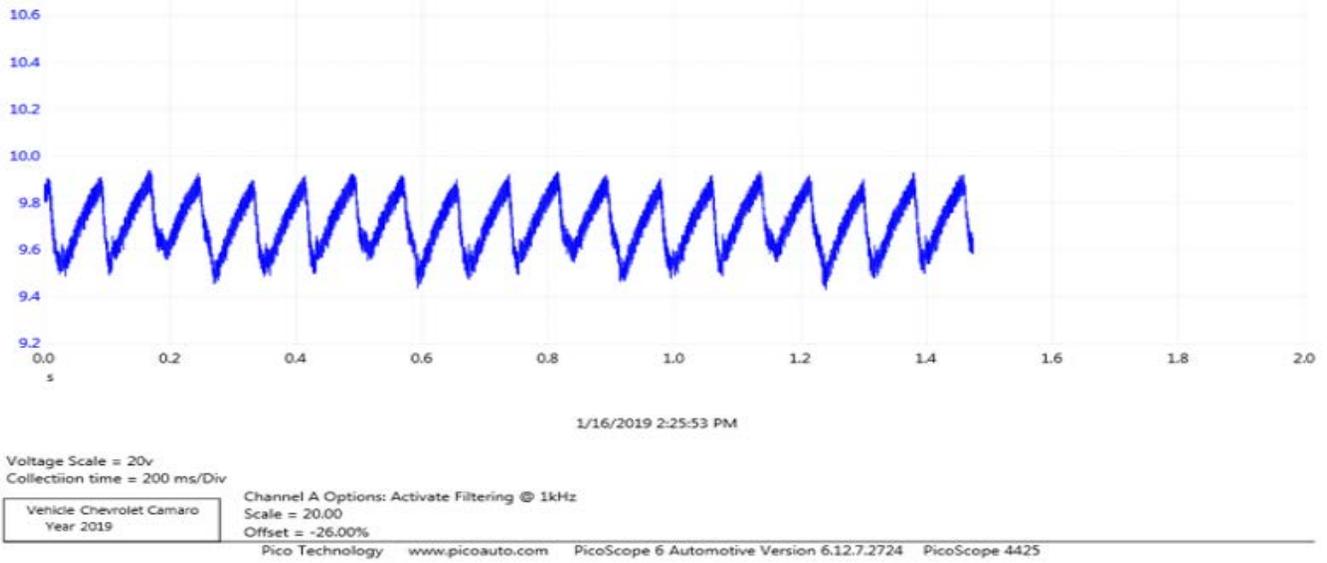
The graphic above depicts an example of a four-cylinder engine with a bad exhaust cam lobe. Note that consistently there is one cylinder with an extra-long compression stroke.

- Examination of this engine showed that cylinder number four had a worn down cam lobe.



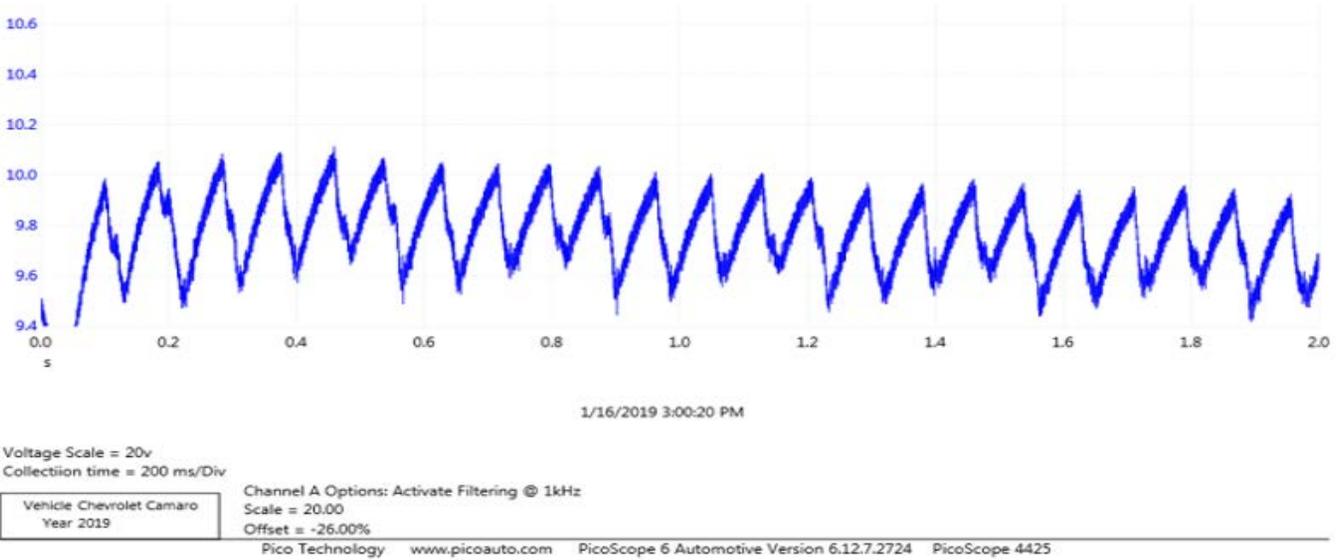
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This is a four-cylinder engine with a 20 PSI loss in one cylinder.



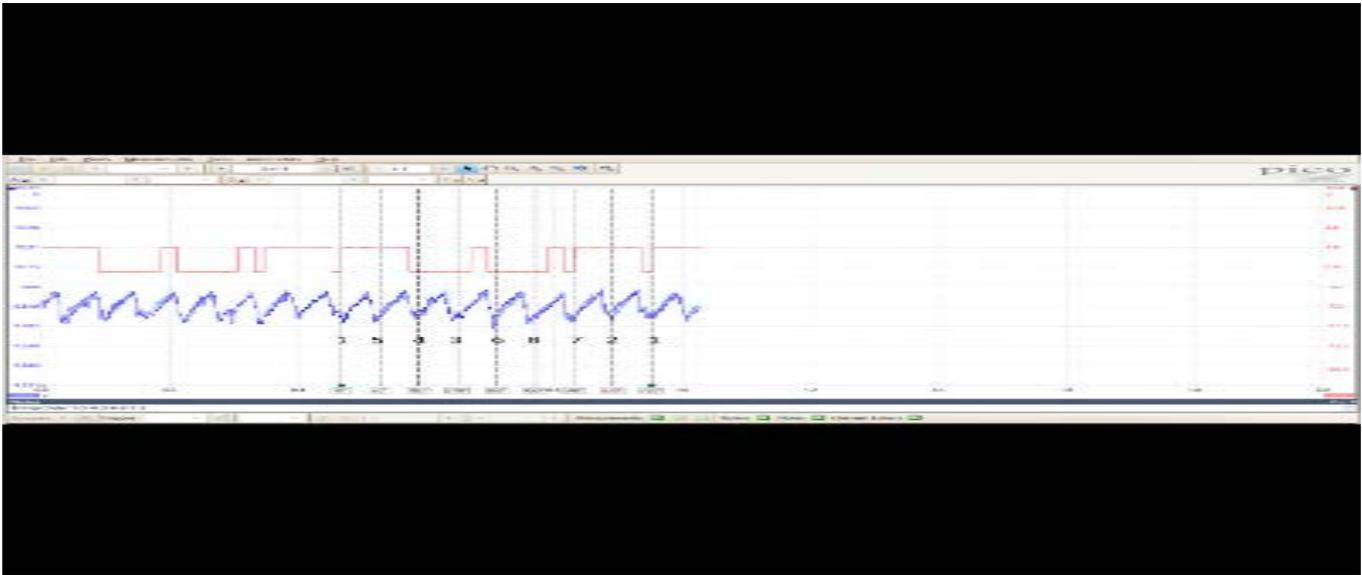
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This is a four-cylinder engine with a 40 PSI loss in one cylinder.



5420040

This is a four-cylinder engine with a 60 PSI loss in one cylinder.



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If an engine has low or high compression on one cylinder, it may be useful to add an injector pulse or a Camshaft Position Sensor to help determine which cylinder has an issue.

The graphic above shows the signal from the even bank intake Cam Position Sensor for reference.

Background Information

By graphing the battery voltage while cranking an engine, we can get a good picture of how the compression in each cylinder compares to the compression in each of the other cylinders in the engine. When you think about an engine being cranked over by the starter, each time a piston compresses the charge in the cylinder, the drag on the starter increases, which in turn, increases the starter draw and decreases the battery voltage until the air in the cylinder is compressed.

After this compression stroke and before the next cylinder in the firing order begins its compression stroke, there is a short period of cranking where the voltage increases. This is what gives us the pattern to examine on a scope as well as the distinctive sound of an engine being cranked.

If each cylinder in the engine are of very close compression, the resulting pattern on the scope will be equal all the way across the screen. If one of the cylinders in a four-cylinder engine has low compression compared to the other three, then every four “waves” will look different from the other three. The same can be said of an eight-cylinder engine that has a weak cylinder. The wave pattern will look different on every eighth wave.

Version	1
Modified	Released November 12, 2019

