Capturing Compression Wave Forms with your eSCOPE ELITE

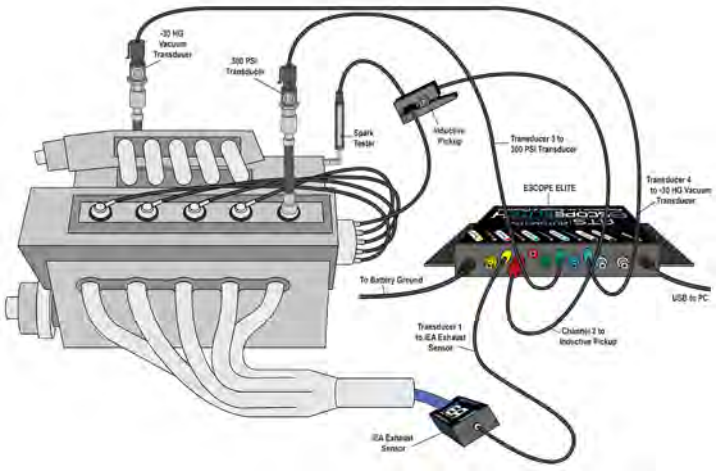
Follow this process for ***every*** compression waveform you are capturing with the eSCOPE ELITE.

Please connect as follows: Channel 1 – Exhaust Transducer

Channel 2 – Ignition Trigger

Channel 3 – 300PSI Transducer

Channel 4 – Vacuum Transducer

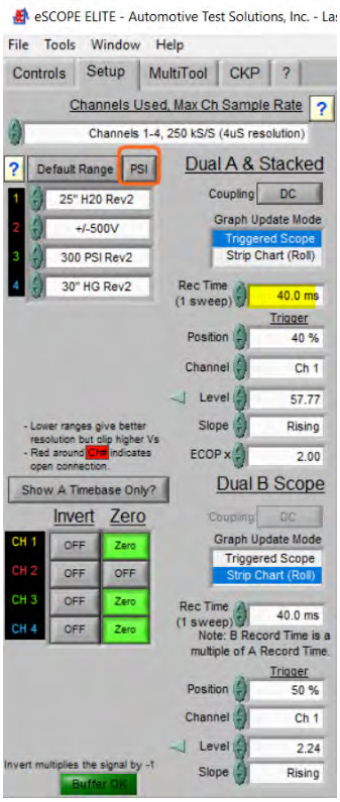


The ignition trigger can be Inductive as displayed above, back probed to the signal side of a coil or with an eCOP (Coil on Plug Adapter).

You MUST trigger off the same cylinder that you re analyzing. If the 300psi transducer is in cylinder 3 use the cylinder 3 coil or plug wire.

You can set the Range values automatically by simply clicking on the PSI button.

Remember to set the record time to 40.0 or 80ms.



1. Cranking Wave Form Capture

Note: For this capture you will need 7 to 10 seconds of cranking data obtained with the throttle in the closed position and the fuel system disabled to prevent the engine from starting.

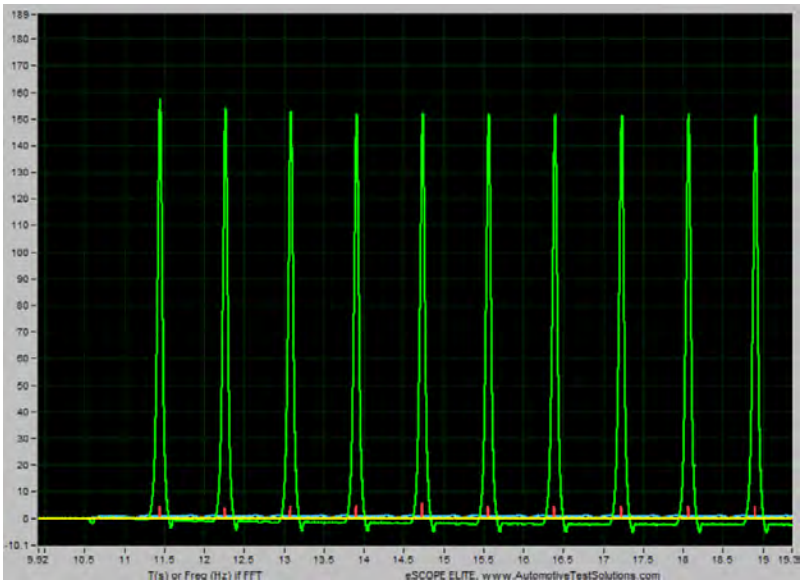
Do NOT use Flood Mode to prevent starting.

a. From the "Measure and Deep Rec" tab, click on "Start Deep Record."

b. Crank the engine for 7 to 10 seconds.

c. Click on "Stop Deep Record"

We are looking for a captured waveform that is like the one below:

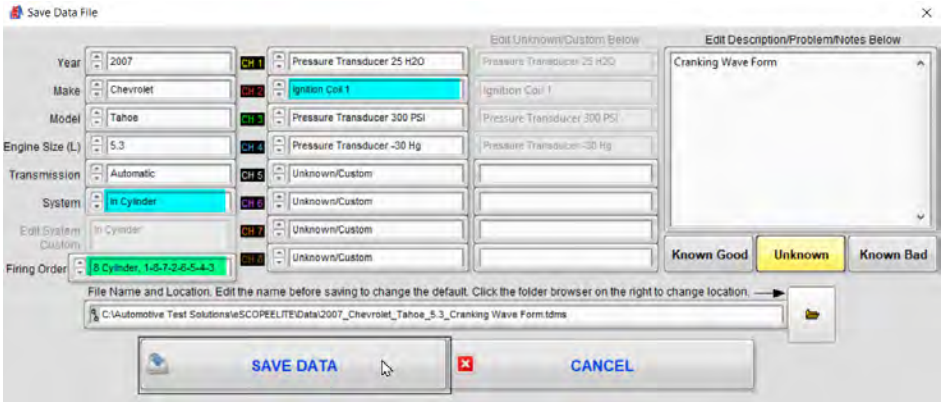


d. Click on "Save Deep Record"

e. Save the Deep Recording and name accordingly.

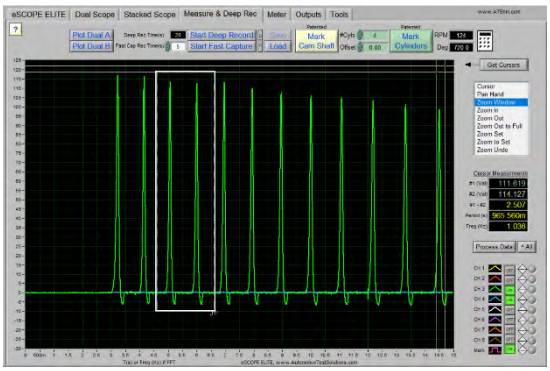
1 Set the System" to "In Cylinder", this will automatically populate the channel labels for you, if you are in any other cylinder other that 1, set the Channel 2 label accordingly.

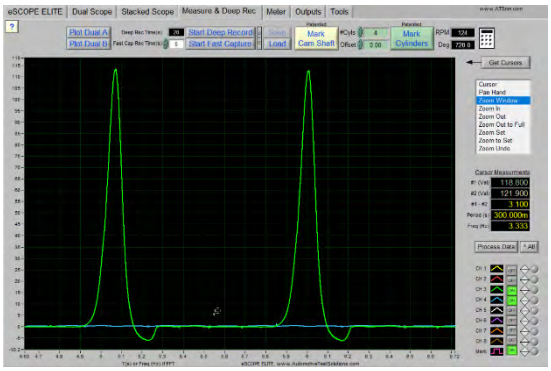
2 Choose the correct firing order using the drop down listing next to Firing Order.



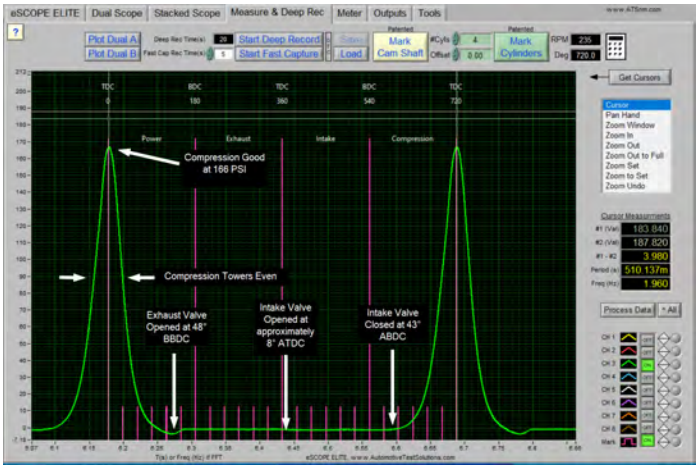
You have saved your capture, now what?

1. Choose Zoom Window
    a. Draw a box around two compression towers.
2. Choose Get Cursors
    a. Drag a vertical cursor to the center of each compression tower

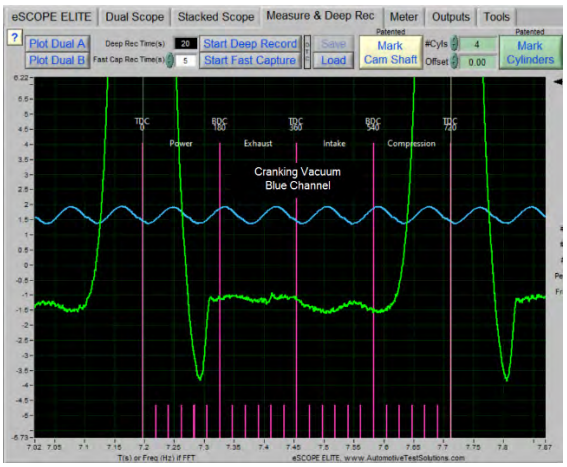




3. Choose Mark Camshaft



When the engine is in a cranking condition the engine can only produce 1 inch hg to 3 inches hg of intake manifold cranking vacuum.



With this reduced intake manifold vacuum, the exhaust plateau will also be reduced or will decrease in its definition. With this decrease in the exhaust plateau's definition the exhaust plateau will change in the way that it appears and is used. Since the height of the plateau is based on only 1 to 3 inches hg, this plateau will no longer cross the bottom dead center 180º mark or the TDC 360º +20 mark. The intake manifold vacuum will need to be much greater for the exhaust plateau to have enough height or pressure change for these exhaust and intake ramps to cross their targets. Since the exhaust and intake ramps cannot be used to check cam timing during a cranking condition, the valve openings must be checked instead.

Rules of Thumb

The exhaust valve opening should occur 30º to 50º before BDC 180º.

The intake valve opening should occur just after TDC 360º.

The intake valve closing should occur 30º to 60º after BDC 540º.

If these targets are met the camshafts are timed closely enough for the engine to start however, the camshaft timing could still be up to 1 tooth out of time.

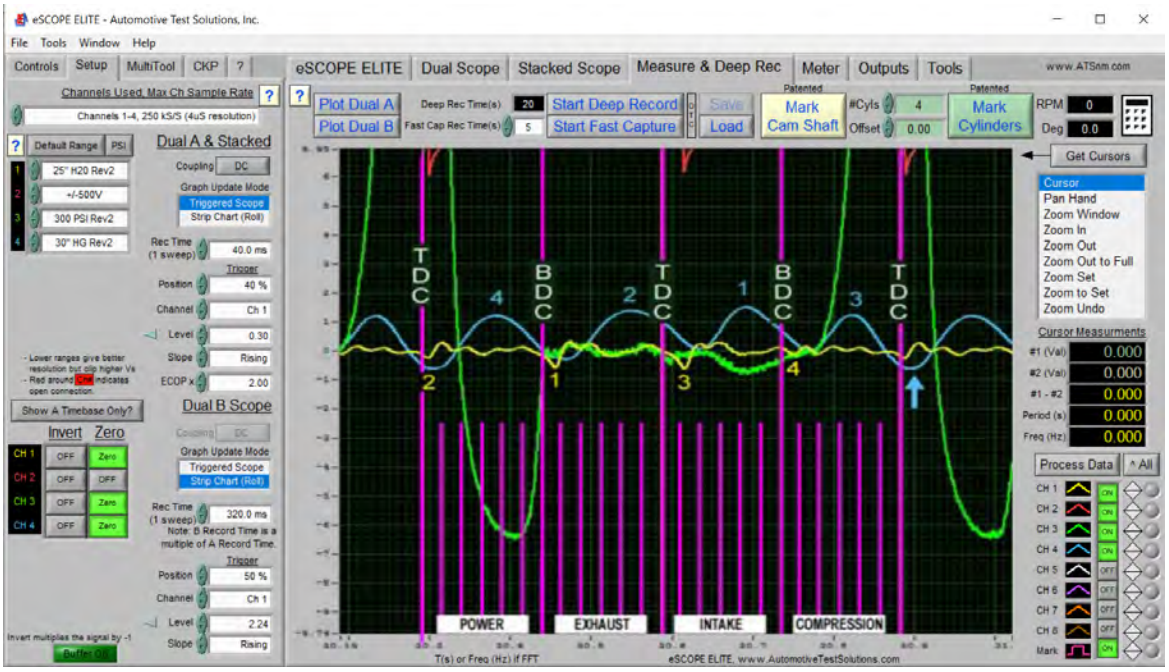
For the cam timing to be known the engine must be at a steady idle state.

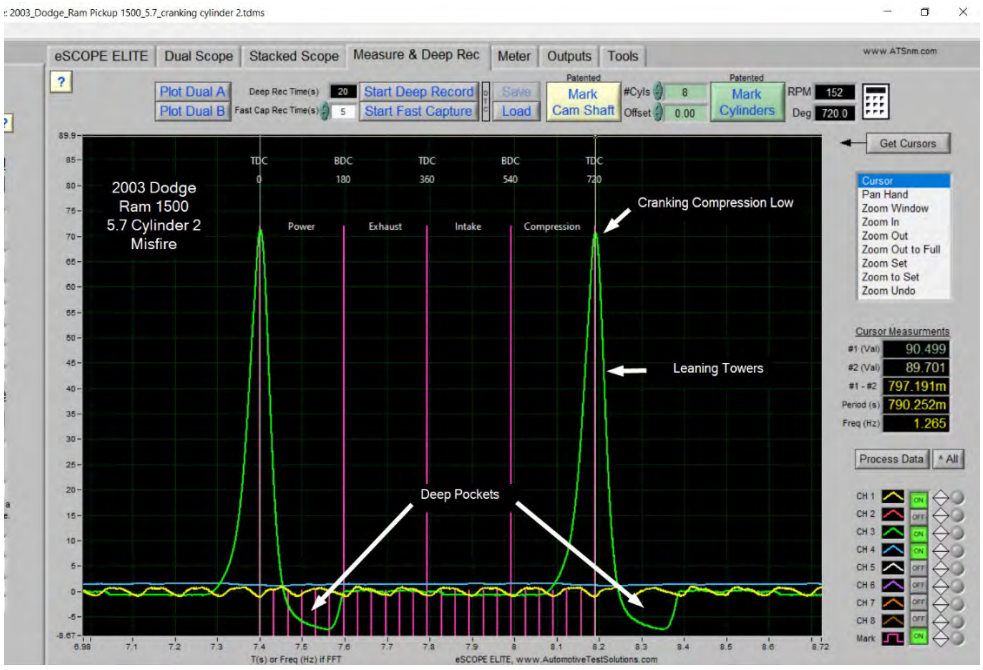
Examples:

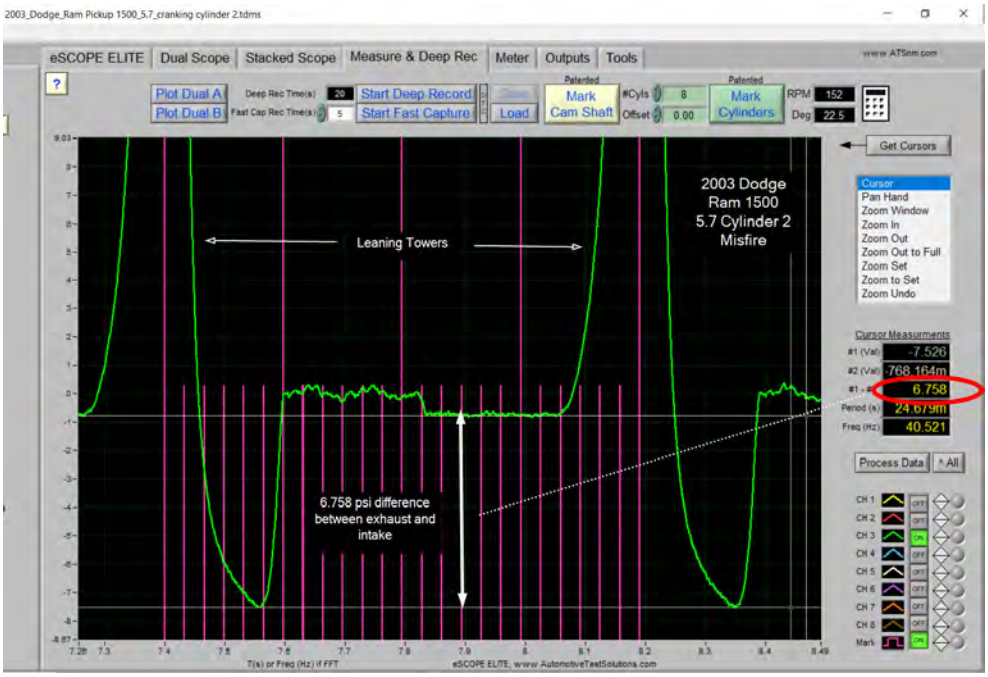
Leaking Intake Valve

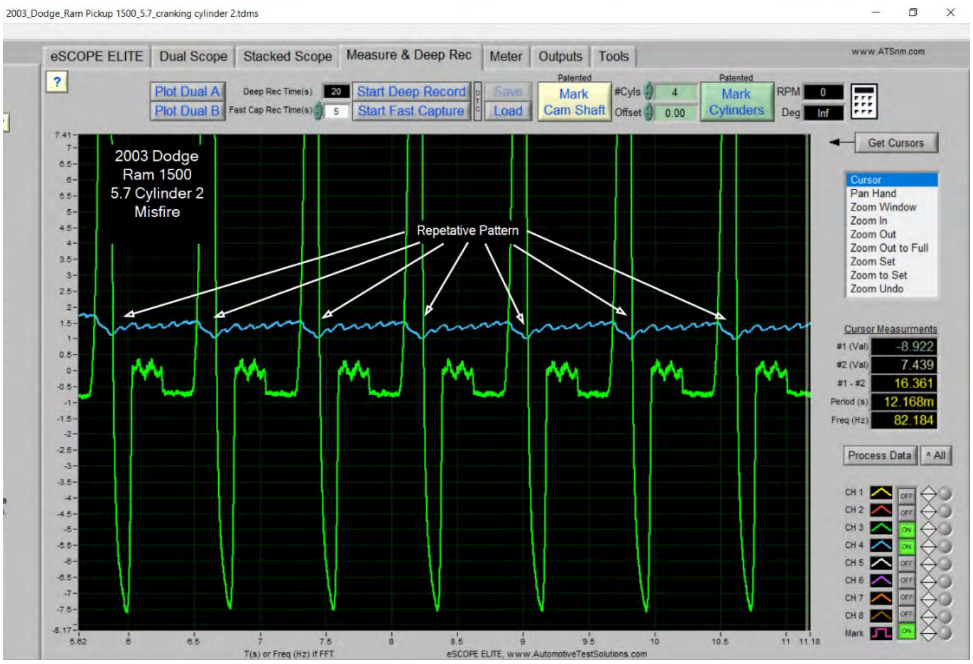
Now we will look at a problem cylinder as seen in image below; the green trace is the in-cylinder pressure waveform, while the blue trace is the intake waveform, and the yellow trace is the exhaust waveform. When analyzing the in-cylinder waveform several things stand out, such as the leaning compression towers, and the deep exhaust pocket. These items clearly show the cylinder is leaking.

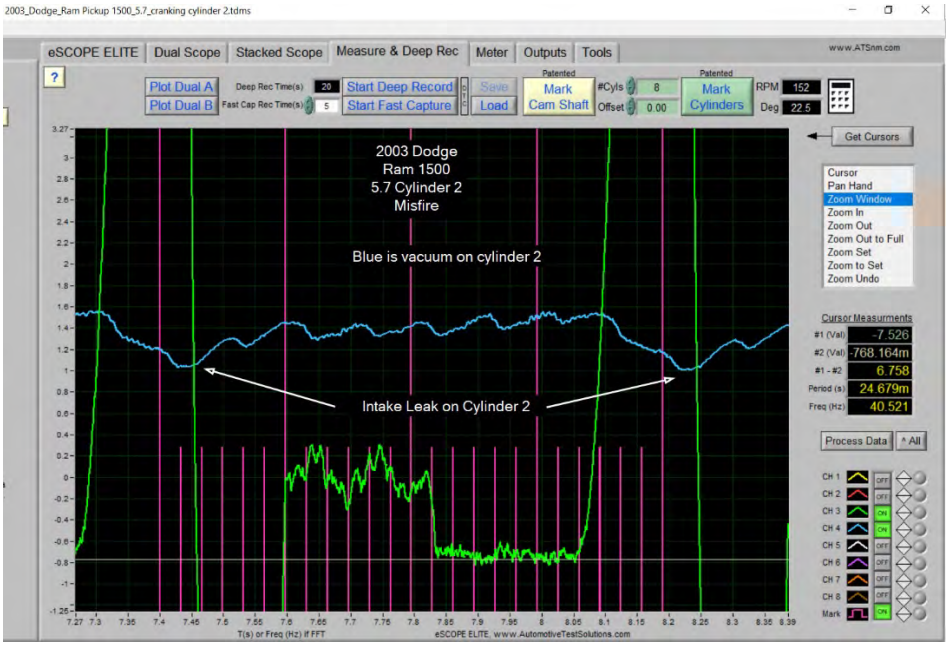
Now look at the intake waveform in blue. The cylinder intake pull marked 1 is from the cylinder we are currently testing. The intake pull marked 3 as we can see is narrow and the transfer point at the TDC mark has moved to a positive pressure. This is caused from an intake valve sealing problem. As the piston moves up ward on the compression stroke the air volume in the cylinder is push into the intake manifold past the leaking intake valve. This creates the narrow intake pull on 3 and then the positive pressure in the intake manifold




2003_Dodge_Ram Pickup 1500_5.7_cranking cylinder 2.tdms
eSCOPE ELITE
Dual Scope
Stacked Scope
Measure & Deep Rec
Meter
Outputs
Tools
www.ATSnm.com
Plot Dual A
Plot Dual B
Start Deep Record
Start Fast Capture
Load
Mark Cam Shaft
Mark Cylinders
Get Cursors
2003 Dodge Ram 1500 5.7 Cylinder 2 Misfire
TDC
BDC
TDC
BDC
TDC
0
180
360
540
720
Power
Exhaust
Intake
Compression
Cranking Compression Low
Leaning Towers
Deep Pockets
Cursor
Pan Hand
Zoom Window
Zoom In
Zoom Out
Zoom Out to Full
Zoom Set
Zoom to Set
Zoom Undo
Cursor Measurments
#1 (Val) 90.499
#2 (Val) 89.701
#1 - #2 797.191m
Period (s) 790.252m
Freq (Hz) 1.265
Process Data
All
T(s) or Freq (Hz) if FFT
eSCOPE ELITE, www.AutomotiveTestSolutions.com


2003_Dodge_Ram Pickup 1500_5.7_cranking cylinder 2.tdms
eSCOPE ELITE
Dual Scope
Stacked Scope
Measure & Deep Rec
Meter
Outputs
Tools
www.ATSnm.com
Plot Dual A
Plot Dual B
Start Deep Record
Start Fast Capture
Load
Mark Cam Shaft
Mark Cylinders
Get Cursors
2003 Dodge Ram 1500 5.7 Cylinder 2 Misfire
Leaning Towers
6.758 psi difference between exhaust and intake
Cursor
Pan Hand
Zoom Window
Zoom In
Zoom Out
Zoom Out to Full
Zoom Set
Zoom to Set
Zoom Undo
Cursor Measurments
#1 (Val) -7.526
#2 (Val) -768.164m
6.758
Period (s) 24.679m
Freq (Hz) 40.521
Process Data
All
T(s) or Freq (Hz) if FFT
eSCOPE ELITE, www.AutomotiveTestSolutions.com


2003_Dodge_Ram Pickup 1500_5.7_cranking cylinder 2.tdms
eSCOPE ELITE
Dual Scope
Stacked Scope
Measure & Deep Rec
Meter
Outputs
Tools
www.ATSnm.com
Plot Dual A
Plot Dual B
Deep Rec Time(s)
Fast Cap Rec Time(s)
Start Deep Record
Start Fast Capture
Save
Load
Mark Cam Shaft
#Cyls
Offset
Mark Cylinders
RPM
Deg
Get Cursors
2003 Dodge Ram 1500 5.7 Cylinder 2 Misfire
Repetative Pattern
Cursor
Pan Hand
Zoom Window
Zoom In
Zoom Out
Zoom Out to Full
Zoom Set
Zoom to Set
Zoom Undo
Cursor Measurments
#1 (Val) -8.922
#2 (Val) 7.439
#1 - #2 16.361
Period (s) 12.168m
Freq (Hz) 82.184
Process Data
All
T(s) or Freq (Hz) if FFT
eSCOPE ELITE, www.AutomotiveTestSolutions.com


2003_Dodge_Ram Pickup 1500_5.7_cranking cylinder 2.tdms
eSCOPE ELITE
Dual Scope
Stacked Scope
Measure & Deep Rec
Meter
Outputs
Tools
www.ATSnm.com
Plot Dual A
Plot Dual B
Deep Rec Time(s)
Fast Cap Rec Time(s)
Start Deep Record
Start Fast Capture
Save
Load
Mark Cam Shaft
#Cyls
Offset
Mark Cylinders
RPM
Deg
Get Cursors
2003 Dodge Ram 1500 5.7 Cylinder 2 Misfire
Blue is vacuum on cylinder 2
Intake Leak on Cylinder 2
Cursor
Pan Hand
Zoom Window
Zoom In
Zoom Out
Zoom Out to Full
Zoom Set
Zoom to Set
Zoom Undo
Cursor Measurments
#1 (Val) -7.526
#2 (Val) -768.164m
#1 - #2 6.758
Period (s) 24.679m
Freq (Hz) 40.521
Process Data
All
T(s) or Freq (Hz) if FFT
eSCOPE ELITE, www.AutomotiveTestSolutions.com

Exhaust Opening Advanced

This 1996 Ford F-150 5.0 is exhibiting exceptionally low power/acceleration.