



## *Technicians Service Training*

**INSIDE THIS ISSUE:**

***"Labscope Tidbits"***

*P. 1 - 25*

***Upcoming Webinar / Seminars:***

***May 18th TBA***

***SAVE MONEY*** by signing up for ***Membership...Simulcast*** \$20.00 member price

***Checkout TST TechFlix*** over 90 videos with more being added. ***TST Members \$9.99 a month***

***Check out our YouTube channel*** [\*tstseminars\*](https://www.youtube.com/tstseminars)

***Like us Facebook***

***Editor***

***"G" Jerry Truglia***

© 2022 ATTS INC.

### *"Labscope Tidbits"*

An oscilloscope, labscope, or scope for short, is a voltmeter that captures many voltage samples and then graphs them on a screen. Voltage appears as a trace of light that moves up and down and across the screen to indicate circuit voltage trends. The scope creates a picture of voltage changes as they occur in a circuit over time. It's today's MRI into the vehicle's electrical system and easy to use.

Labsopes either have push buttons or use the mouse or keyboard if they are installed on a computer. These controls allow for voltage, time or trigger changers. The list below shows a range of Volt/Div adjustments we might see on a scope, and the maximum voltage that can be displayed on screen for each setting.

The range of adjustment and individual voltage levels depend on the scope design. The maximum voltage that can be displayed is calculated by multiplying the number of vertical divisions times the voltage setting, e.g. 10 divisions x 10 volts = 100 volts.

Volt/Div	Maximum Voltage Displayed on Screen
.050 V (50 mV)	400 mV
.1 V (100 mV)	800 mV
.2 V (200 mV)	1.6 V
.5 V (500 mV)	4 V
1 V	8V
2 V	16 V
5 V	40 V
10 V	80 V
20 V	160 V
50 V	400 V
100 V	800 V
200 V	1600 V

*(Con't on page 2)*

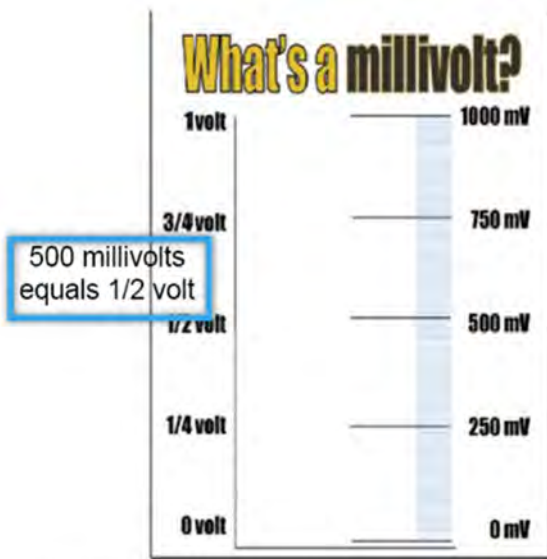
## *"Labscope Tidbits" (con't from p. 2)*

### VOLTS AND MILLIVOLTS

Scope voltage is displayed in volts and millivolts.

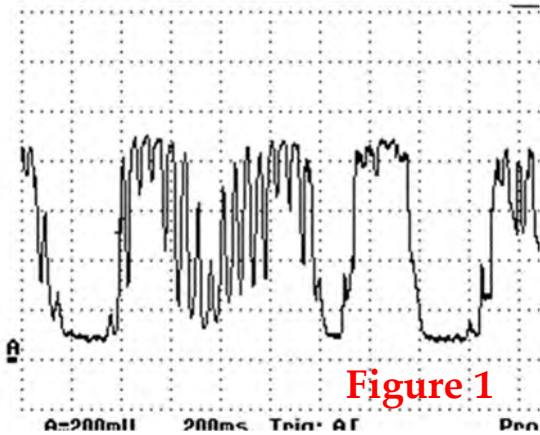
To better understand millivolts, simply cut one volt into 1000 equal pieces. Each piece equals one millivolt.

*There are 1000 millivolts in one volt.*



Traditional zirconia style oxygen sensors operate in a 0-1 volt range. That's zero to one thousand millivolts! The waveform to the right dithers from approximately 150 mv to 850 mv. Note that this waveform has a high frequency rate that indicates an issue on how the engine is operating.

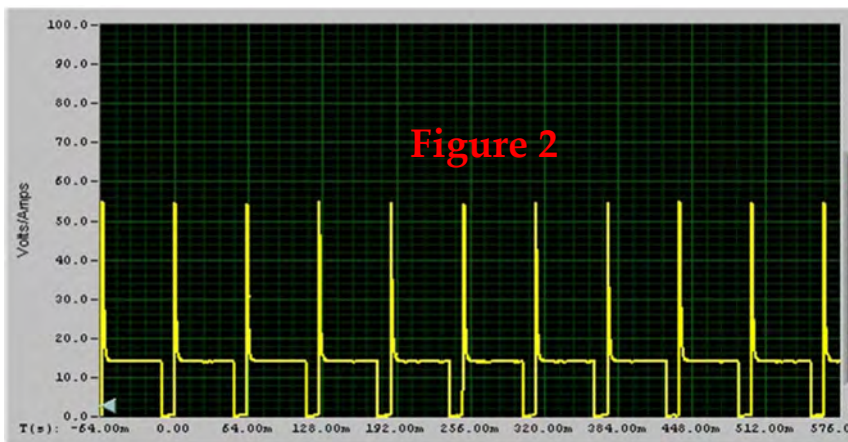
The waveform below left (**Figure 1**) is from an engine that has a current issue that is displayed in the signature of the waveform.



**Figure 1**

Below (**Figure 2**) is a repetitive waveform of a fuel injector that is displaying more than one signature of the signal. If we count the number of divisions the signal rises, we see that the signal's vertical voltage spike rises 5.5

complete divisions.



**Figure 2**

Multiplying volts times the number of divisions tells us the spike's amplitude 5.5 divisions x 10 volts = 55 volts in this instance, a *(Con't on page 6)*

## DORMAN TECHNICIAN TRAINING



### YOU KNOW US FOR THE PARTS. **NOW WE DELIVER THE SMARTS.**

We are continuing to invest in the transportation aftermarket by offering in-person training throughout North America, and online training wherever you are. As vehicles are always changing, we are always releasing new solutions, and now that means both products and knowledge.

**For additional information contact**

**[DTC@DormanProducts.com](mailto:DTC@DormanProducts.com).**

#### Curriculum Includes:

- **Critical Thinking-  
Diagnostic Strategies**
- **P0420 & P0430 “Keeping  
the Light Off”**
- **Unlocking the Potential of  
Your Scan Tool**
- **Understanding  
and Diagnosing Air  
Conditioning**
- **20+ additional topics  
available**



Get vehicle applications and technical details at [dormanproducts.com](http://dormanproducts.com)  
Dorman Products, Inc. | Corporate Office and Customer Service: 1-800-523-2492 | Tech Line: 1-856-933-2911  
©2021 No reproduction in whole or in part without prior written approval.

DTC 2021040400000000

# DID YOU KNOW?

## ASE CERTIFIED TECHNICIANS

- GET PAID MORE
- GET HIRED FIRST
- ADVANCE FASTER

**MOTOR AGE**  
**TRAINING**

Motor Age Training offers the most complete and extensive ASE training series available anywhere!

Get the materials you need to pass all of your ASE Certification tests - Guaranteed!

...you pass or don't pay!



[www.passthease.com](http://www.passthease.com)

## What is TST?

*TST is a group of dedicated technicians and instructors committed to the continuing education of our fellow technicians. We provide training seminars to technicians at a reasonable price. TST brings our members nationally known instructors and state of the art training.*

### Our Goal & Mission Statement

- *Keep our fellow technicians up to date with the latest technology.*
- *Provide training seminars for a reasonable price.*
- *Deliver information that the technician can use now.*
- *Keep technicians informed of information affecting our industry.*
- *Increase consumer awareness of what a good technician is.*

## Why join TST?

TST membership includes special pricing on weekday night seminars and the occasional full Saturday seminar. With a **\$75.00 yearly individual or shop \$250.00 membership, the simulcast are only \$20.00. TST seminars are NOT sales or product seminars.** The instructors that TST brings in are all “hands-on” industry experts with up to date, cutting edge knowledge that you can use in your shop the next day. That’s 75 dollars for a seminar in which you are able to learn something useful, for fixing those tough jobs that we all see on a regular basis. Our instructors are masters at making the complex understandable. Membership also includes a newsletter full of real world technical articles, diagnostic case studies, and solutions to the kinds of problems you see in your bays each week.

The following are some of TST’s regular instructors:

**Bernie Thompson** of ATS

**John Thornton** of Autotrain Inc.

**Wayne Colonna** of ATSG

**Jorge Menchu** the “Labscope Guru,” AES Wave

**John Anello** of Auto Tech On Wheels

**Mark Warren** of World Pac / Motor Magazine

**Brandon Steckler** of CTI & Motor Age Magazine

**Peter Meier** of Motor Age Magazine

**Ken Zanders** of Illinois Air Team

**"G" Jerry Truglia** of A.T.T.S. Inc.



*Technicians Service Training*

**11 Lupi Plaza**

**Mahopac, NY 10541**

**Phone: (845) 628-6928**

**Fax: (845) 628-9109**

**Email:**

[Info@tstseminars.org](mailto:Info@tstseminars.org)

**TST on YouTube...type  
in tstseminars**

**No part of this newsletter may be reproduced, stored in a retrieval system, or transmitted, in any form by any means, electronic, mechanical, photocopying, recording, or otherwise, without prior written permission of the authors.**

Information contained in this newsletter is intended for use by professional auto repair technicians familiar with approved vehicle repair procedures. The authors are not responsible for physical injury or property damage resulting from the incorrect application of information or procedures outlined in this volume.

Currently there are **TST chapters in Connecticut, Massachusetts, New Jersey, New York** and membership continues to grow. For more information you can call **TST** headquarters at:

**(845) 628-6928**

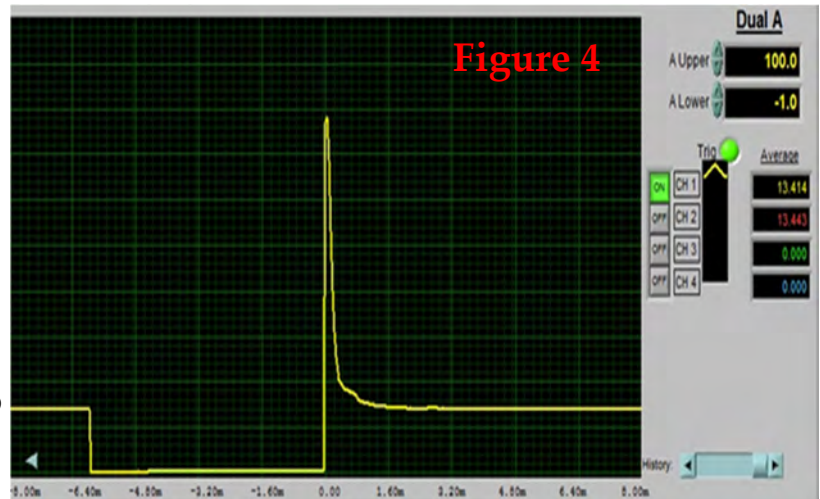
**[www.TSTseminars.org](http://www.TSTseminars.org)**

## *"Labscope Tidbits" (con't from p. 2)*

10 volts per division or 100 volts per screen allows us to view the height of the waveform with an amplitude of 55 volts on the screen.

This labscope waveform to the right (**Figure 4**) below is the signature of the signal at the same voltage level.

The only difference from this waveform to the one on page 2 is the time that has been selected.



Voltage adjustments allow us to zoom in and out to control how much of a waveform is displayed on screen.

The most common voltage settings are 200 mv - 1v - 5 v - 10 v - 20 v per division, or 10 times per screen.

Sometimes we want to zoom in for a closer look at a waveform. It's like putting the waveform under a magnifying glass.

To zoom in, decrease the voltage per division setting.

On page 7 (**Figures 5 & 6**) we are zooming in to take a closer look at part of the fuel injector waveform. The scope voltage is set to 2 Volts/Div. At this setting, we can fit a waveform on screen with a maximum 20 volt amplitude (10 vertical divisions times 2 volts = 20 volts maximum display). Our waveform has an amplitude of 60 volts, however, so approximately 40 volts of the waveform will not fit on screen (unless we increase the Volt/Div setting.)

Right now we don't need to see the entire waveform. Instead, we want to zoom in closer to take a look at the ground measurement. This allows us to see the slope from dead zero ground to slightly off ground. If you zoom in further the bottom of the injector ground would resemble

*(Con't on page 6)*

**TOPDON**

# BUILD YOUR OWN BUNDLE!

Pick between three Adas Packages and create a system that fits your needs unlike any other!



• Phoenix ADAS Mobile **STANDARD PACKAGE**

• Phoenix ADAS Mobile **DELUXE PACKAGE**

• Phoenix ADAS Mobile **MAX PACKAGE**



## *"Labscope Tidbits" (con't from p. 6)*

a current waveform as pictured below  
**(Figure 6)** of an injector.



## TIME AND VOLTAGE SETTINGS

Not sure which voltage is the correct voltage to choose for the Volts/Div setting?

Actually, there will always be more than one setting that will get a waveform on screen initially. Once it's on screen, the scope settings can be tweaked to improve the waveform appearance.

## SELECTING THE RIGHT VOLTAGE SETTINGS

Here are some sample voltage setting starting points for common measurements:

- Battery and system voltage (2 Volts/Div)
- Any sensor operating on a 5 volt reference voltage (1 or 2 Volts/Div) (examples include ECT, MAP, MAF, TPS, photo-optic, many Hall effect sensors, various 3-wire position sensors, etc.)
- Zirconia oxygen sensors (0.2 Volt/Div).
- Magnetic inductive crankshaft sensors (2 Volts/Div AC)
- Magnetic ABS wheel speed sensors (1 or 2 Volts/Div AC)
- Idle speed control devices operating at system voltage (2 or 5 Volts/Div)
- Knock Sensor (.2 volt/Div)
- Ignition Coil Primary (10 or 20 Volts/Div)
- Fuel Injectors (10 Volts/Div)
- Alternator AC Ripple ( 50 mV AC coupling )

*(Con't on page 11)*





# ATF & MOTOR OIL EXTRACT & FILL MACHINES

## E-100 EXTRACTION MACHINE



- Graduated fluid level scale on waste tank for gallons, quarts and liters
- 12V DC powered, rated 4 GPM pump used for extracting used fluid and emptying waste tank
- Large capacity, 4 gallon (16 quart) waste tank
- 6' extraction tubes (5/16" & 1/4")

## EF-100 EXTRACT & FILL MACHINE



- Everything listed in the E-100, plus 'Y' Adapter
- 12V DC powered, new fluid diaphragm pump
- Large 3 gallon (12 quart) capacity new fluid tank

**“This unit *KICKS BUTT!*”**

**“Only *FIVE MINUTES* to extract the oil!”**

**“Air units take *WAY MORE TIME!*”**



**“G” Jerry Truglia**  
Instructor/Owner  
TST Technicians Service Training

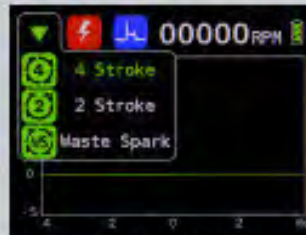
“G” is a ASE World Class Technician who has been in the industry for 48 years. He is recognized by the US Environmental Protection Agency as one of the foremost OBD II experts, technicians, and trainers in the country. He is an experienced presenter and trainer, and has presented at Mobile Air Conditioning Society conferences, five SAE World Congresses, the Clean Air Conference, and for many years at I/M Solutions conferences. He has extensive experience in the automotive field as a technician, service manager, shop owner of twelve different repair shops (five at once), and technical writer. This was his response after using our unit for months.

# GTC505

## Engine Ignition Analyzer



### Complete ignition system diagnostic:



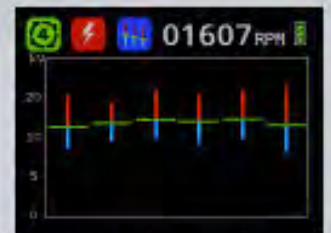
Works on 2 and 4 cycle, and waste spark ignition systems engines.



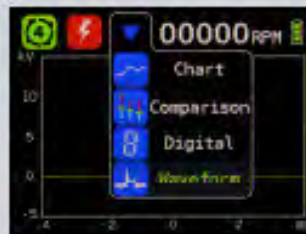
Displays secondary ignition waveforms.



Displays and measures spark burn (firing) time, dwell time, current ramp time, RPM, and spark plug peak voltage.



Candle stick graph compares maximum, minimum and average measurements of several cylinders.



Selectable view of all measurements modes as chart, compare graph, analog gauge / digital readout and waveforms.



Analog gauge and digital readout with maximum and minimum.

### Quick, powerful and easy to use

- Plug the appropriate sensor pick-up into the flexible probe
- Select the engine's cycle (4-stroke, 2-stroke, or waste spark)
- Select the measurement type and display format
- Place the pick-up on top of the ignition module, or over the spark plug wire
- The GTC505 will automatically detect and adjust all parameters to provide accurate measurements and clear graphs

### Useful for troubleshooting:

- Non-starts
- Misfires
- Intermittent problems
- Primary and secondary coil circuits faults
- Fouled or damaged spark plugs
- Damaged spark plug wires



Specially designed pick-ups for coil on plug ignition modules (left) and spark plug wires (right).

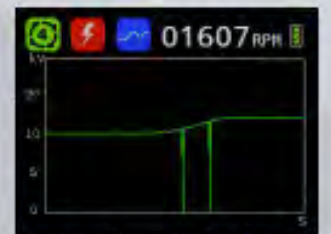
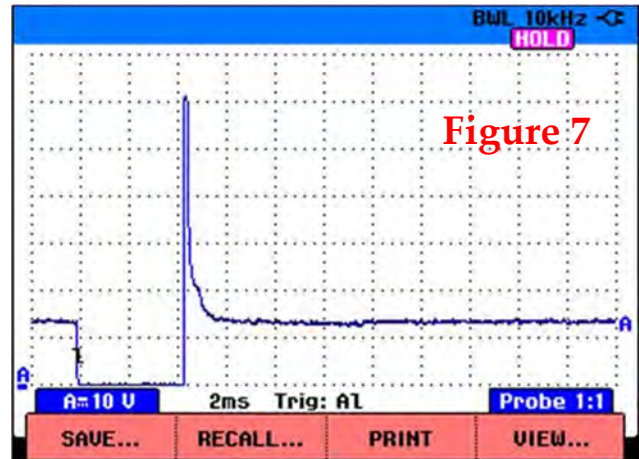


Chart mode used for detecting intermittent or infrequent failures and misfires.

## *"Labscope Tidbits" (con't from p. 8)*

### SELECTING THE RIGHT TIME SETTINGS

A good starting time base (**Figure 7**) for many automotive signals is 2 mS/Div (0.002 second per division). For slow changing waveforms like those from the oxygen sensor, TP sensor, and analog MAP sensor, start at 0.2S (200 milliSeconds/Div).



**Figure 7**

### USING AUTO SETUP

Many DSOs take the guesswork out of the initial setup process by sampling the signal, then selecting settings that will display a stable waveform.

This is known as auto setup.

The most obvious advantage to auto setup is that you don't need to remember time and voltage adjustments or set the trigger. The scope gets "something" on the screen and then it's up to you to zoom in or out by making minor adjustments to time and voltage settings.

There are several disadvantages to auto setup:

**Auto setup is NOT a good choice** if you are hoping to catch a transient event (glitch) since it does not adjust the trigger level outside the signal's normal voltage range. On Auto Setup the scope automatically chooses a trigger level at 50% of the signal amplitude. The screen shot to the right (**Figure 8**) from Snap On has Auto Find.



**Figure 8**

*(Con't on page 15)*



**iSCAN BY AUTOLAND**

**SINCE 1989**

# SEE THE COMPLEX TURN SIMPLE



**iSCAN BY**

# AUTOLAND SCIENTECH



**DRIVING DIAGNOSTIC SINCE 1989**

- The technicians choice as the top-tier aftermarket solution for advanced functions such as coding, programming, calibrations, intializations and adaptations
- Covers all makes & models with a specialty towards European coverage & capabilities
- Native 'cloud based' programming
- Remote on-demand diagnostic & programming via SOD (Support on Demand)
- Built-in J2534
- Optional pass-thru plus, OE level interface capabilities via IMS2

**MORE THAN JUST A SCAN TOOL**

**" iSCAN IS COMMITTED TO BEING A VALUED PARTNER TO THE INDEPENDENT WORKSHOP "**



**Fast-forward 30 years** and iSCAN is still forging industry trends by offering a host of fast, OE- level capable diagnostic solutions for the aftermarket. Never content with the status quo, iSCAN continues to bolster its diagnostic and programming capabilities while tirelessly improving on base and emerging technologies that make diagnostics faster, easier and more powerful for the end-user.

**The latest generation of solutions** from iSCAN include technologies such as remote diagnostics and remote, licensed OE programming capabilities.



**HAVE A QUESTION?  
CONTACT US AT**



**512-336-5152  
SALES@ISCANTECH.COM**

**iSCAN BY AUTOLAND  
1464 E Whitestone Blvd. #2601  
CEDAR PARK, TX 78613**



# AutoLeap<sup>+</sup>

[www.autoleap.com](http://www.autoleap.com)



## The Easiest To Use Shop Management Software

Save Time. Make More Money.



**8 - 12** Average Monthly Leads\*

**\$600+** Average Repair Order\*

\*Requires full participation in our program; numbers are based on national averages.



## Get RepairPal Certified and Meet New Customers

Join the largest network of high-quality shops, certified by mechanics. RepairPal.com gets 4+ million online visitors each month and lets you expand your reach with optional partner relationships such as CarMax, Consumer Reports, USAA, and Verizon, as well as vehicle service contracts and tow programs.

TST 2022 Attendees

## Special Price

First month FREE (\$199 discount)  
\$49 Certification Fee (\$150 discount)

**\$350**  
Savings

Build trust and loyalty with your customers by leveraging the RepairPal Certified brand, highlighting our key values:

✓ Fair Price ✓ High Quality ✓ High Customer Satisfaction

*"With RepairPal, I see an increase in work coming in the shop and I think it's great that potential customers can see my verified reviews!"*

**Bernie Oliveira, Bernie's Automotive, Doraville, GA**

### Here's Why 3,000+ Shop Owners Joined RepairPal:



#### \$600 Average Repair Order

Expect a higher ARD than your other marketing channels. Customers in need of mid-major-mechanical repairs go to RepairPal Certified Shops.



#### Brand Building

Join the only nationwide auto repair network focused on quality. Opt into our nationally known partner programs for even more exposure.



#### More Leads

RepairPal introduces potential customers to your shop to the tune of 8-12 leads a month. Partners like USAA, CarMax, Consumer Reports, Verizon, and some of the largest tow companies refer even more customers!\*



Contact us today about becoming a RepairPal Certified Shop.

**866-936-8428**  
[shops.repairpal.com/TST2022](https://shops.repairpal.com/TST2022)



## *"Labscope Tidbits" (con't from p. 11)*

The scope may assign a default time base for a rather wide range of sampled signal frequencies. If the time base selected is too slow, the waveform may not display correctly.

### CURRENT PROBES

A transducer is a device that converts a measurement into a voltage. Transducers commonly measure things like temperature, pressure, electrical current, and sound. You are probably familiar with a common transducer known as the amp probe. Amp probes (**Figure 9**) convert current measurement (amps) into a calibrated voltage output. Remember, the scope displays only voltage!

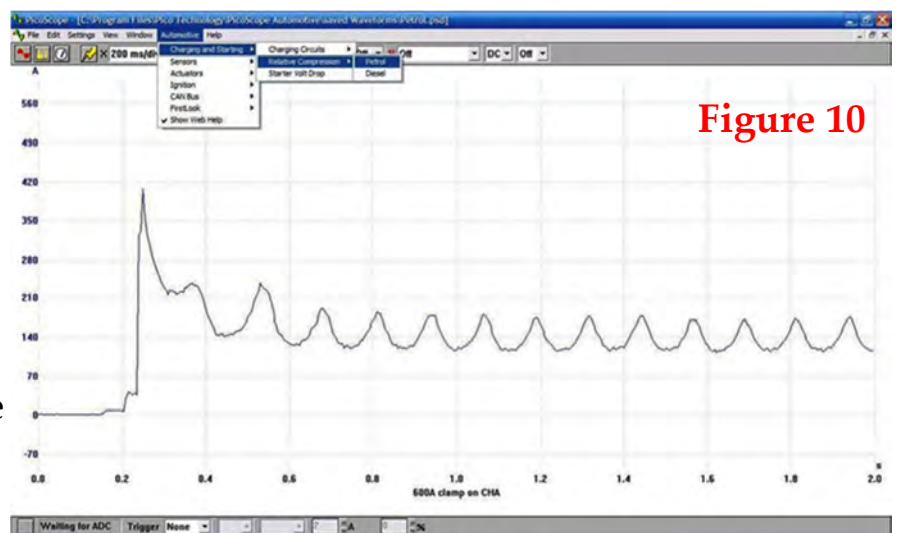
High amp current probes are used to measure large load current levels in starting and charging systems.



Our photo shows the amp probe (sometimes referred to as an amp clamp). The probe is connected to the scope input channel, which **Figure 9** is adjusted to a low millivolt scale, commonly 50-100 mV/Div. Then the probe is clamped around a main battery cable while the engine is cranked, or around the main alternator B+ wire to measure charging current with the engine running.

The high initial current (labeled Peak Current) is normal. After the initial surge, the current in the starter circuit falls to a lower, steady level. In this example

**(Figure 10)**, initial current falls from a brief initial peak of 400+ amps, to a steady cranking current of approximately 165 amps.



**Figure 10**

*(Con't on page 17)*



**BACHARACH®**

# THE INDUSTRY STANDARD

## Neutronics Refrigerant Analysis



Regulations require service technicians to confirm refrigerant purity prior to recovery during A/C service. MSA Bacharach has you covered with a range of refrigerant analyzers, powered by Neutronics technology.

### HANDHELD ANALYZERS

### EMBEDDED IDENTIFIERS



Quick, easy, and portable. Neutronics' handheld refrigerant analyzers and identifiers increase technician efficiency with 2-minute system checks.



Neutronics' embedded refrigerant identifiers are trusted by market leaders in their SAE standard service carts to provide accurate analysis.

[myBacharach.com/MACS](http://myBacharach.com/MACS)

**+1 610-524-8800**



## *"Labscope Tidbits" (con't from p. 15)*

Another current measurement accessory is the low amp probe. Its operation is similar to that of the high amp probe; current measurements are converted to a millivoltage that is displayed on a scope as a waveform.

The low amp probe is so named because it is calibrated to measure lower current levels commonly found in fuel injector, fuel pump, blower motor, and ignition coil primary circuits, as well as solenoids and a long list of miscellaneous electrical components.



**Figure 11**

Low amps probes are faster and easier to use than conventional ammeters. To connect a conventional ammeter, the circuit must be physically opened so the ammeter can be connected in series. The amp probe, however, simply clamps around a circuit wire.

This Fluke 80i-10 low amp probe (**Figure 11**) above has an ON/OFF switch setting and two input levels for low and high resolution measurements. Like the high amp probe, each 10 millivolt or 100 millivolt change in the low amp probe represents one ampere. The low amp probe is accurate to very low current measurements, including milliamperage readings associated with key-off battery drains.

The low amp probe has opened an entirely new area of automotive diagnostics by allowing technicians to view current waveforms of components and circuits as they operate. Dynamic "pictures" of circuit current identify many problems that are harder to detect using only voltage and resistance measurements.

The yellow amp clamp to the right (**Figure 12**) is the Fluke i30s that is the BEST amp clamp to use because the size of the jaw that fit around the battery cables. The specification on the DC range is 30 mA to 30 A with dead on accuracy. There is no problem using this on any vehicle for parasitic / key-off battery drains.



**Figure 12**

*(Con't on page 20)*

# THE FUTURE IS NOW!

**PREMIUM PREVENTATIVE  
MAINTENANCE PRODUCTS**

**GDI  
Fuel and Air  
Differential  
Transfer Case  
Power Steering  
Automatic Transmission/CVT**



**Brake  
Coolant  
Battery Service  
Climate Control  
Diesel Injection  
DPF Maintenance**

**Lifetime  
BG Protection Plan**

 **Lubri-Care.com**

**203-877-5690**

# PROTECT AND CONNECT WITH CONFIDENCE



## AWARD WINNING AUTOMOTIVE SERVICE SOLUTIONS



### PROTECT RECOVERY MACHINES **DUAL RECYCLE GUARD™**

*Debris, Sealant and Contaminant Separator*  
 Traps Harmful Contaminants  
 Easy Quick Connects and Hoses *Now Included*  
 R134a And R1234yf Compatible  
 Greater Filtration Capacity  
 Maintains Refrigerant Flow  
 High & Low Side Protection Simultaneously

### CONNECT & REPAIR LINES **SMART SPLICE™**

*Installs in Minutes, OE Approved*  
 Quickly repair A/C, heater, transmission, and power steering lines  
 Installs with a standard wrench  
 No Special Tools  
 No Adhesives or Glues Needed  
 Burst Tested to 2600 psi



**SCAN ME TO LEARN MORE**

**(800) 999 1051 / (678) 973 2287**

**WWW.AIRSEPT.COM**

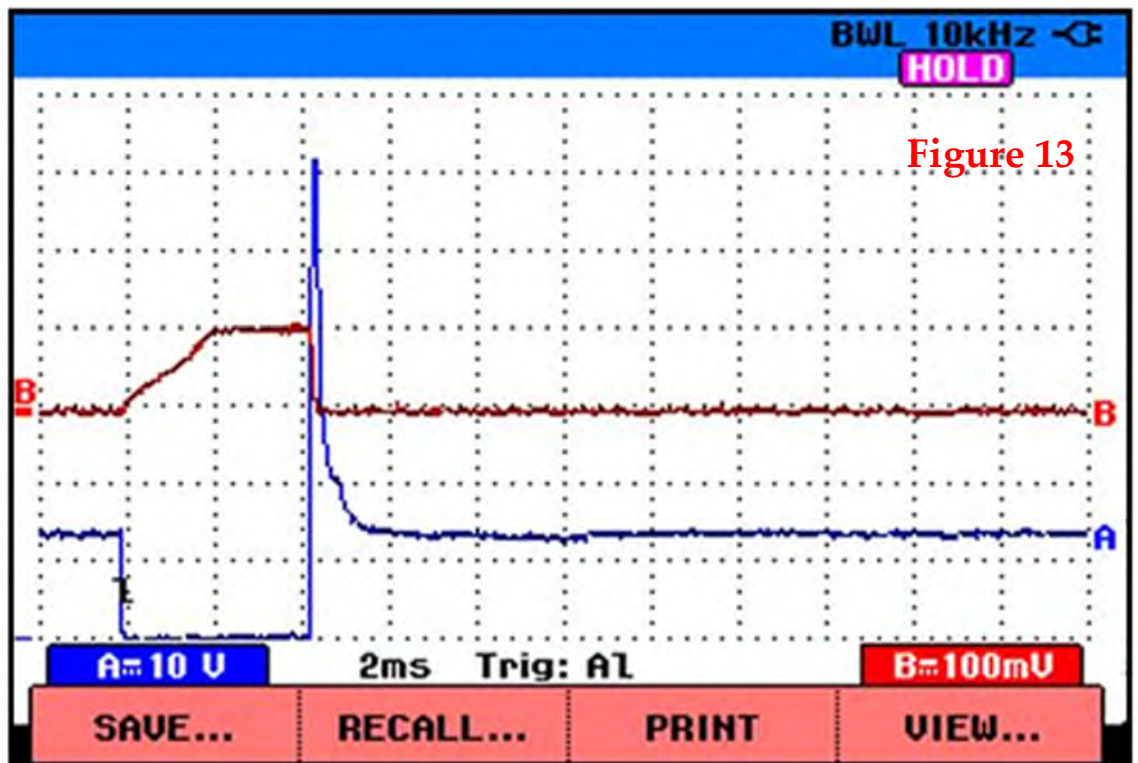
## *"Labscope Tidbits" (con't from p. 17)*

### COMBINING VOLTAGE PROBES AND CURRENT PROBES

If we connect one scope channel to a fuel injector using a conventional voltage probe, and then connect the other channel to the same injector with a low amp probe, the scope will display voltage and current — at the same time. The dual trace display lets us compare injector circuit voltage and current.

- Voltage waveforms help us identify common injector circuit problems including low supply voltage, faulty switching, weak grounds, etc.
- Current waveforms display circuit current, important when we suspect a problem such as a shorted injector winding, poor computer grounding, or low supply voltage.

The waveform to the right (**Figure 13**) is a good example as voltage falls from it's higher level of about 13 volts to ground on the blue voltage waveform. Notice on the red amperage waveform the current goes up as the voltage went down. This is exactly



similar to a starter motor cranking and engine over. The 12 plus volts would go down a couple of volts as the engine was cranked over and amperage would rise from zero amperes to approximately 150 amps.

*(Con't on page 25)*



# MEMBER ONLY PRICING AND PACKS AVAILABLE NOW! CALL TST FOR MORE!



**N2 NEURON**  
RP-4DOJG23



**LOW AMP CLAMP**  
RP-4COR23



**PREMIUM STACKABLE SILICONE TEST LEADS**  
RP-4UMCEM3CFU



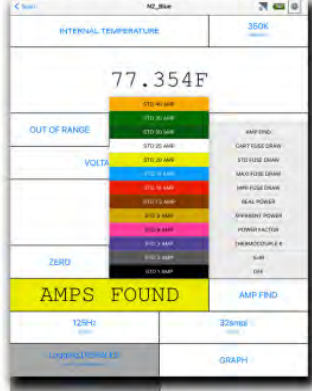
**MAGNETIC BOOT**  
RP-4DQQV23124125



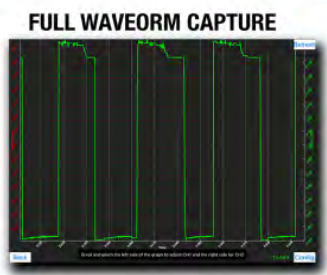
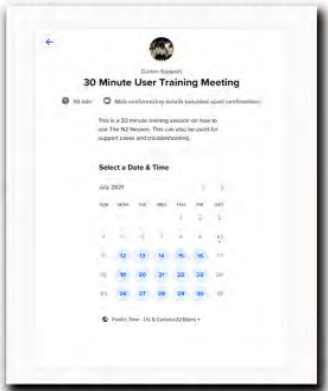
**ROUND TERMINAL PIN TEST KIT**  
RP-4ETRVUMK23



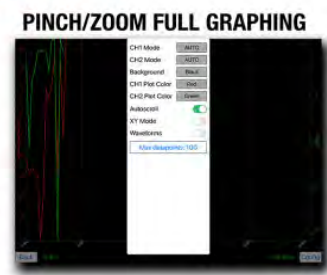
### AMP FINDER & FUSE DRAW TEST



### FREE 1 ON 1 TRAININGS BUILT IN



**FULL WAVEFORM CAPTURE**



**PINCH/ZOOM FULL GRAPHING**

GRAPHING

### FULL 2 CH. MULTIMETER

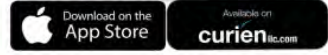
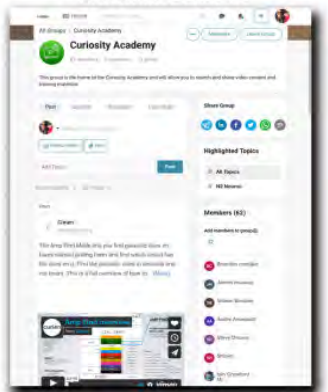


**2 ZONE TEMP TESTING**

### 30 DAY FREE PREMIUM TRAINING



### FULL TRAINING VIDEO LIBRARY BUILT IN



WWW.CURIENLLC.COM



## Working on Commercial Vehicles & Off-highway Equipment? CanDo has YOU Covered.

**HIGHWAY**



- IP67 Wireless 10" Tablet
- Class 4-8 and Off-highway
- Full Bi-directional Controls
- Change/Set Parameters
- 2 Years Free Software
- All Cables and Connectors included



- Wired Android 10" Tablet
- Class 4-8 and Off-highway
- Full Bi-directional Controls
- Change/Set Parameters
- 2 Years FleetCross Troubleshooter included!
- 2 Years Free Software
- All Cables and Connectors included

**OFF-HIGHWAY**



- IP67 Wireless 8" Tablet
- Off-highway Equipment
- Generic and Diesel OBD
- Full Bi-directional Controls
- Change/Set Parameters
- Calibrate Hydraulics
- 2 Years Free Software
- All Cables and Connectors included

**TRUCK**



- IP67 Wireless 8" Tablet
- Medium and Light Duty Truck including Jeep and Sprinter
- Full Bi-directional Controls
- Special Functions: Injector Programming, Module Recoding, DPF Reset/Regen and more!
- 2 Years Free Software
- All Cables and Connectors included

**ACTIVATOR**



- Activate/Read Sensors
- Check Tire Pressure
- Check Tire Temperature
- Display and Identify Sensors
- Manage up to 22 tires
- 3 years free software!

**ACTIVATOR**



- Activate/Read Sensors
- Check Tire Pressure
- Check Tire Temperature
- Display and Identify Sensors
- Manage up to 22 tires
- 3 years free software!

**CONNECTOR**



- Wireless Smart Device VCI
- Read/Clear Codes
- Performs DPF Reset/Regen: Detroit, Cummins, Isuzu, Mack and Volvo, International and Fuso
- New Data Logging Feature
- Lifetime free updates



INTERNATIONAL, INC.

www.candointl.com | 909-CanDo-11(226-3611)

*Coverage for:* **Detroit, Aerial, Goughage Pro, Bendix Wingman, Detroit Assurance, CASE IH, JCB & Liebherr**

## We're changing the game again - and this time it's for **MOTORCYCLES & POWERSPORTS!**



**Coverage for over 30 brands including Harley, Indian, Ducati, BMW, Triumph, CanAm, Polaris and many, many more!**

The **MOTO Pro** is a comprehensive, full-functionality scan tool for motorcycles and recreational vehicles. With today's modern motorcycles having computer systems controlling not only the engine, but brakes, transmissions and much more, it is now imperative to have a scan tool that can access these systems and make diagnostics and repair much faster.

The **MOTO Pro** covers all major manufacturers from Europe, Asia and North America. Furthermore, PWC, or personal watercraft is also covered, as are recreational vehicles, such as ATVs and Side-by-Sides.



INTERNATIONAL, INC.

www.candointl.com • 909-CanDo-11(226-3611)





# THE ONLY TOTAL KEY MAKING SOLUTION

**IN ONE AFFORDABLE PACKAGE**

WE PROVIDE THE KEYS, AND THE MACHINES TO CUT & PROGRAM THEM.



TO LEARN MORE VISIT  
[KEYMAKINGSYSTEM.COM/RESOURCES](https://keymakingsystem.com/resources)



# REMOTE PROGRAMMING & SUPPORT MADE EASY

Work LIVE with IVS 360™ Master Techs to Repair More Complex Vehicles

**IVS360™**  
Live Expert Support

SAVE \$1,000 NOW ON

NEW **DrivePro™ Remote UNLIMITED**

## ELIMINATE GUESSWORK AND GO STRAIGHT TO THE REPAIR WHEN YOU ACCESS IVS 360™ SUPPORT VIA DRIVEPRO™ REMOTE UNLIMITED

IVS 360™ brand-specific Master Techs utilize patented DrivePro Remote™ technology to connect directly to the vehicle using OE and aftermarket tools. This enables you to expand your brand coverage through live access to experts in all U.S. Domestic, Asian and European makes to service vehicles you don't see every day.

Use **IVSRAP™** for hassle-free Remote Assist Programming, including ADAS calibration, with guaranteed results. It's easy-to-use and update.

Get complete built-in, licensed multi-brand diagnostic software with **IVSRepair™** for scanning, live data, bi-directional controls, self-tests and ADAS functions.

**STOP THE UNCERTAINTY THAT LEADS TO SUBLETTING, DELAYS AND MARGIN LOSS. GET IVS 360™ – YOUR TICKET TO REAL-TIME REMOTE EXPERT SUPPORT**



SAVE \$1,000 NOW

**DRIVEPRO™ REMOTE UNLIMITED**

Offer Ends April 15, 2022



Learn More



**OPUS | IVS™ GET THE POWER TO REPAIR™**



## *"Labscope Tidbits" (con't from p. 20)*

Pressure transducers (**Figure 14**) convert pressure and/or vacuum readings into a voltage signal displayed on the scope as a waveform. The pressure/vacuum transducer plugs into the scope. A hose from the transducer is then connected to a fuel line, transmission fluid line, engine oil line, manifold vacuum nipple, or any other pressure/vacuum source.

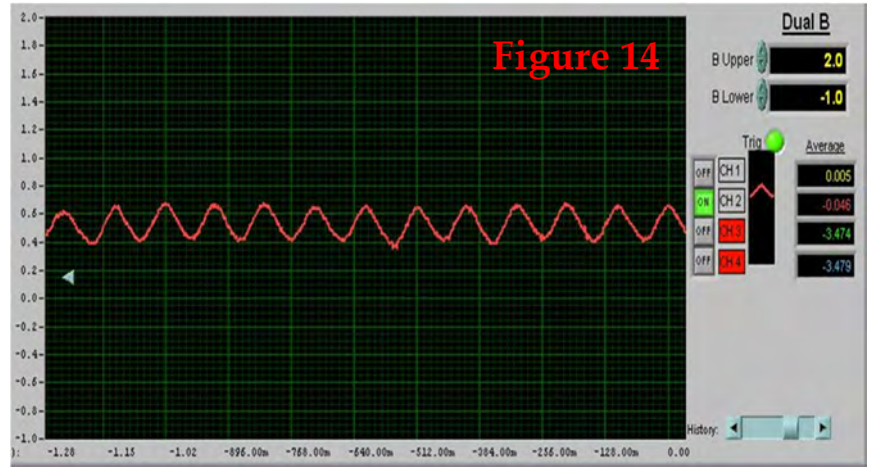


**Figure 14**

Like the amp probe, the transducer converts the measured pressure or vacuum into a voltage that is then displayed on the scope screen.

Here the scope displays an analog intake manifold pressure sensor waveform, providing us with diagnostic detail not available from a DMM measuring MAP sensor average voltage.

This scope waveform above is displaying a waveform showing pressure pulses inside the intake manifold in a running engine. Even if you aren't sure how to interpret the waveform, you can see that the waves have a consistent general shape and amplitude, indicating a good cranking vacuum on a good engine.



**Figure 14**

*Article 's By  
"G" Jerry Truglia  
TST Founder and President  
ASE World Class Triple Master  
Auto, Truck, School Bus L1, L3, F1, X1, C1, Technician*

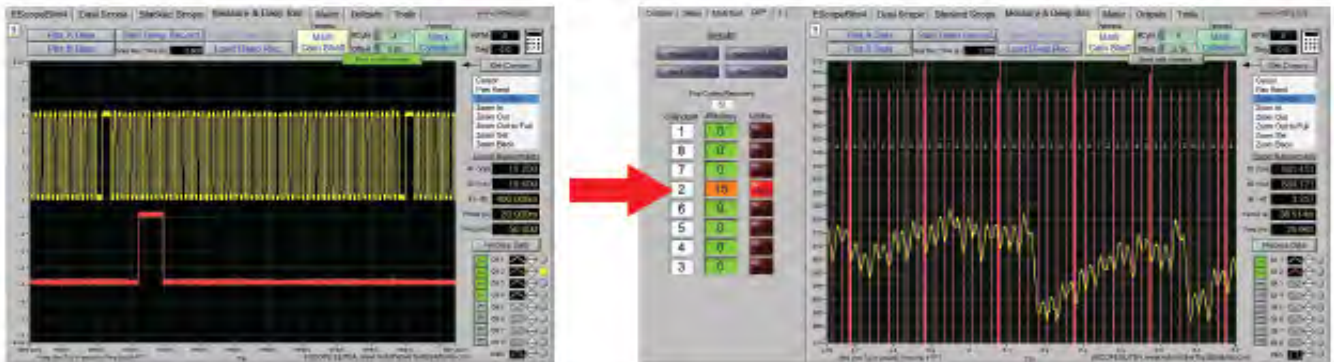
# eSCOPE ELITE8™

## Electronic Lab Scope 8 Channel

Accurately diagnose electric and electronic circuit issues fast!  
 All 8 traces attach to inputs and outputs quickly to diagnose problem vehicles.



### Revolutionary CKP misfire software included free!



Patent Pending

### Converts CKP signal into an advanced misfire analyzer

Quickly find engine misfires from the crankshaft position sensor. Works on gasoline or diesel engines.

ATS offers free support for our scopes. Let our master technicians assist you!