Volume 17, Issue 8

November 2020

Technicians Service Training

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Dave Hobbs

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Editor

"G" Jerry Truglia

" What Is Your Game Plan? "

Get information, ideas and tools to improve your thinking process so you can find, diagnose and repair difficult vehicle problems. We will start with some easy stu® and progress on to the advanced. It's like a building with a roof that's sagging you don't replace the roof without first checking the foundation. If the foundation was sagging and you didn't repair or replace it, the new roof would only sag again. It's the same on a vehicle; we need to start at the battery and go on to the mechanical, then move on from there in a process that I call a "Game Plan."

Before you take the field

The first place to start is by interrogating the driver of the vehicle. That Q&A session may lead you to investigate an area that you may have not checked were it not for the information the driver provided. The next step is to use the best tools you own: your brain, eyes, ears, nose and hands to check the problem out. Over the years of working on vehicles I bet just like me you have seen, heard or smelled something that helped you identify a problem. That step should be followed by researching Technical Service Bulletins (TSBs) that may be related to the issue and uncover the problem. You should also check other service information sources like ALLDATA, Identifix, Moto-logic or ProDemand. Use

(Con't on page 2)

"What Is Your Game Plan" (con't from p. 1)

These sources to read up on the system so you under-stand how it works so you can properly diagnose it. A game plan is a needed mindset when work-ing on today's complex vehicles. Part of your mindset should be having a game plan on how to proceed with the problem that con-fronts you. Your game plan for a problem vehicle is just as important as a professional sports team's game plan. The sports team cannot win a game if they don't have a plan on how they can beat their opponent. Don't forget what Benjamin Franklin said, "If you fail to plan, you plan to fail."

Time to hit the field

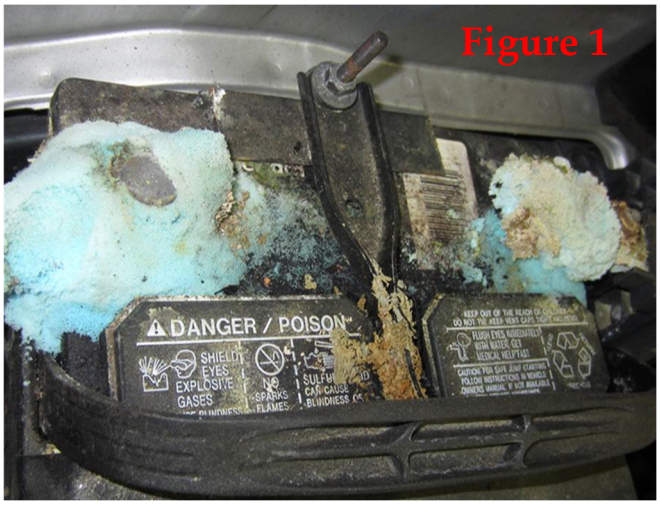

Figure 1

With your preliminary homework done and having an idea of how the other team operates, it's time to get hands-on. Start your diagnostic procedure by test-ing from the basics up, finding out what's right and what's wrong, just like the big-box scope analyzers did in years past. The good thing about the old big-box analyzers was that they forced us to start testing at the battery, starter, alter-nator, then moved us on to checking the engine's mechanical condition, tak-ing emission gas readings, verifying ignition, then fuel, and scan data. The cor-rosion in the picture **(Figure 1)** is from a Toyota Rav 4 battery that caused the fusible link and underhood fuse box to be damaged, pre-venting the engine from starting.

The battery is the first place to start since it's the heart of vehicle's electrical system. If the battery is not the correct one for the vehicle you're working on, you may encounter many problems that will not be resolved without replac-ing it with the recommended one. Just because the battery is the same physi-cal size does not mean it's the correct one for the

(Con't on page 6)

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.***

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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:

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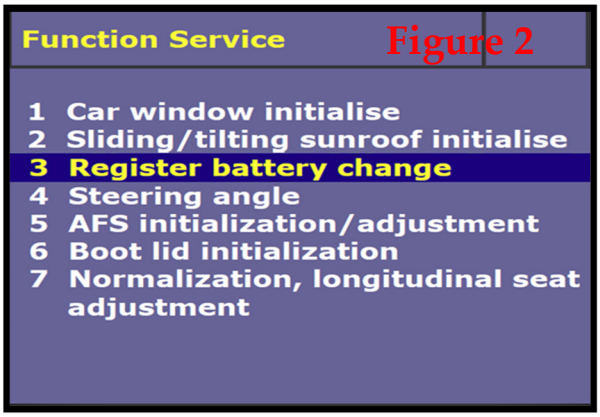
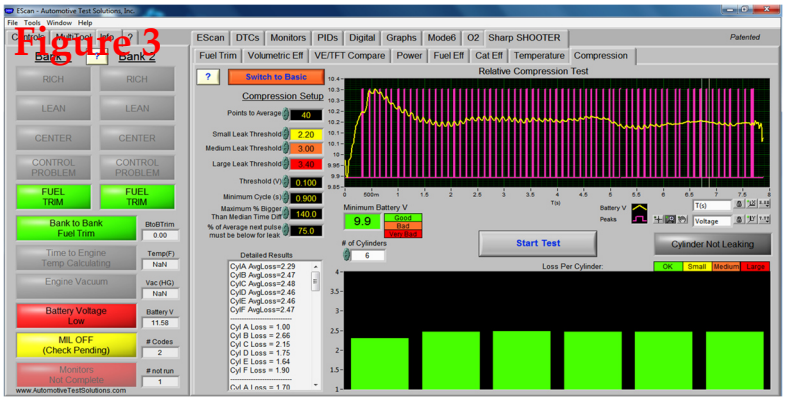
" What Is Your Game Plan" (con't from p. 2)

application. Always make sure the battery that is installed in the vehicle has the correct CCA (cold cranking amp – at 0 degrees) rating. Installing a battery with a different rating will affect the battery's Reserve Capacity rating. The Reserve Capacity rating is the number of minutes a fully charged battery at 80°F will discharge 25 amps until the battery drops below 10.5 volts. The wrong battery in a modern vehicle can cause many issues and even cause Readiness Monitor or Check Engine light problems.

Check the battery with an electronic or carbon pile tester and make sure it passes before moving forward. If replacing the battery, be aware of the type of battery that is installed and any coding or registration requirements that may need to be performed **(Figure 2)**. If the battery being replaced is a lead-acid battery, you may choose to replace it with an AGM (Absorbed Glass Mat) type instead. If you do, you will need to program it with the correct information to prevent damage to the battery and possibly the engine management system. If the battery is already an AGM-style battery, it can ONLY be replaced with another equivalent AGM.



The next step is to check the mechanical condition starting with a Relative Compression test **(Figure 3)**. In this case, I connected directly to the DLC (Diagnostic Link Connector) with my ATS EScan and disabled fuel using the Clear Flood mode — that is, by holding the throttle pedal to the floor. Clear Flood is available on some 85-plus percent of vehicles that are under 8501 pounds GVWR. If Clear Flood is not available, dis-connect the fuel pump relay or power source to the fuel pump.



(Con't on page 7)

" What Is Your Game Plan" (con't from p. 6)

The Relative Compression test here is calculated by measur-ing the voltage drop at the battery as each piston is going up and down while the starter motor is cranking the engine over. If you don't own the EScan scan tool, you can use any lab scope to perform a Relative Compression test. The Snap-On Verus lab scope **(Figure 4)** is set up using the "AC Coupling" feature and connected to a BOB (Break Out Box) at PIN 4 (ground) and 16 (B+ battery) as the engine is being cranked over in Clear Flood Mode. If the engine is in good mechanical condition the wave-form will have evenly spaced and same size humps as pictured.

Read that defense!

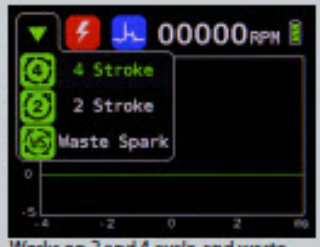
After the results are reviewed, the next step in an effective Game Plan is to query the ECM using the Generic/Global mode on your scan tool (even if you have the factory information available). The reason why is that Generic/Global OBD II PID (Parameter ID) data is limited to a select number of the most important data that the ECM can provide for emissions/OBD II. Another reason is that Generic/Global PIDs are the same on every vehicle, so whether it's a GM or a Porsche, the data PIDs are all the same and not confusing to understand. Also, there are NO substituted PID values allowed (well maybe one — that's an air fuel/wide range sensor that was not invented when the OBD II ruling was adopted).

Make sure you check your scan tool data O2/air fuel PID

(Con't on page 10)

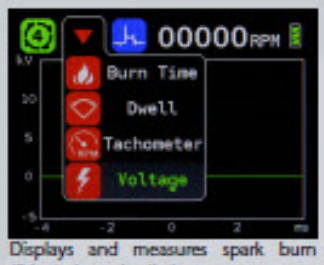
GTC505
Engine Ignition Analyzer

Complete ignition system diagnostic:

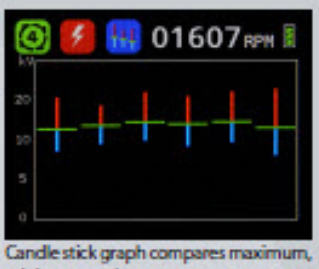


Works on 2 and 4 cycle, and waste spark ignition systems engines.

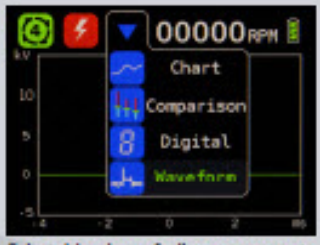
Displays secondary ignition waveforms.



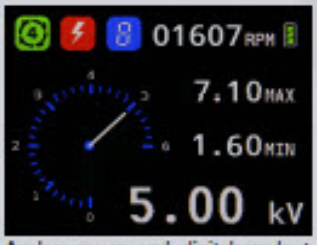
Displays and measures spark burn (firing) time, dwell time, current ramp time, RPM, and spark plug peak voltage.



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 appropiate sensor pick-up into the flexible probe
- Select the engine's cycle (4-stoke, 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).

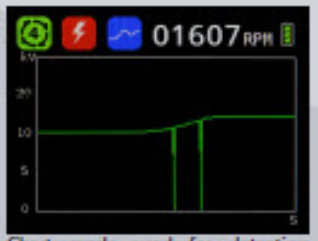


Chart mode used for detecting intermittent or infrequent failures and misfires.

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" What Is Your Game Plan" (con't from p. 7)

for a reading over 0.685 volts if you're connected to a Toyota prod-uct. Some scan tools will not calculate the data correctly. For example, a Toyota engine at hot idle should display 3.3 volts on a good motor with a capable scan tool that will display the data correctly. If the scan tool does not display the data correctly, it may display only a percentage such as 0.685 volts rather than 3.3 volts. If you encounter that on your generic scan tool, go out of generic and go into Enhanced OE data.

The next thing to be concerned with is the status of the Readiness Monitors. Make sure they are displaying as "Ready" or "Not Ready." If you don't check the Monitors, Pending DTCs, Freeze Frame, Mode $06 and Mode $10 you may be in for the Friday night surprise. (That's when a customer comes back in and starts going off on you or your service writer. They're upset because the Check Engine light has come back "on" after you recently charged them for a repair.) In the case of the EVAP or Catalyst Monitor NOT being Ready there is a good chance the vehicle owner is coming back with the Check Engine light illuminated. Always take a picture or save a screen-shot of the Monitor status then provide it to the vehicle owner to prevent the Friday night surprise.

After the generic-side scan, make sure to perform a full vehicle scan of all the computer systems. This full system scan can uncover problems in other computer systems that may be affecting the drivability issue that the customer is concerned about. On some scan tools, the full system scan function also performs an OBD II check as well, but I have seen some high-priced scan tools that do not provide all the OBD II information correctly. After the scan, it's time to look up the DTCs and find the best course of action. If you're not familiar with the component or system that the DTCs are identifying, go to SI and read up on it. Don't forget to reach out to someone, whether in your shop or on the internet since there is always someone who knows something you don't know.

(Con't on page 11)

"European Mixed Bag Case Studies" (con't from p. 10)

Time for a game film

A good one came in our shop just recently with a couple of different customer complaints on their 2013 GMC Sierra 2500 with a 6.0L Flex Fuel that had 159K on the clock along with an illuminated MIL. My lead tech Bill diagnosed this vehicle first using Generic OBD II since it was a Check Engine light and drivability problem. His diagnosis first uncovered the following DTCs: P0101 (Mass Air Performance), P0171, P0174 (Bank 1 and 2 Lean Condition), P0172, P0715 (Bank 1 and 2 Rich Condition).

Even after clearing the codes, the PID data displayed Bank 1 STFT -14 percent and LTFT 32 percent and Bank 2 STFT -13 percent and LTFT 30 percent — so you can see where the lean and rich codes were coming from. The screenshot this time only captured one rich and lean code **(Figure 5)** while the previous scan tool reading displayed all four codes before being cleared. Another problem Bill noticed was that the O2 sensors were responding slowly. The slow response was most likely being caused by a mixture that was so far out of control.

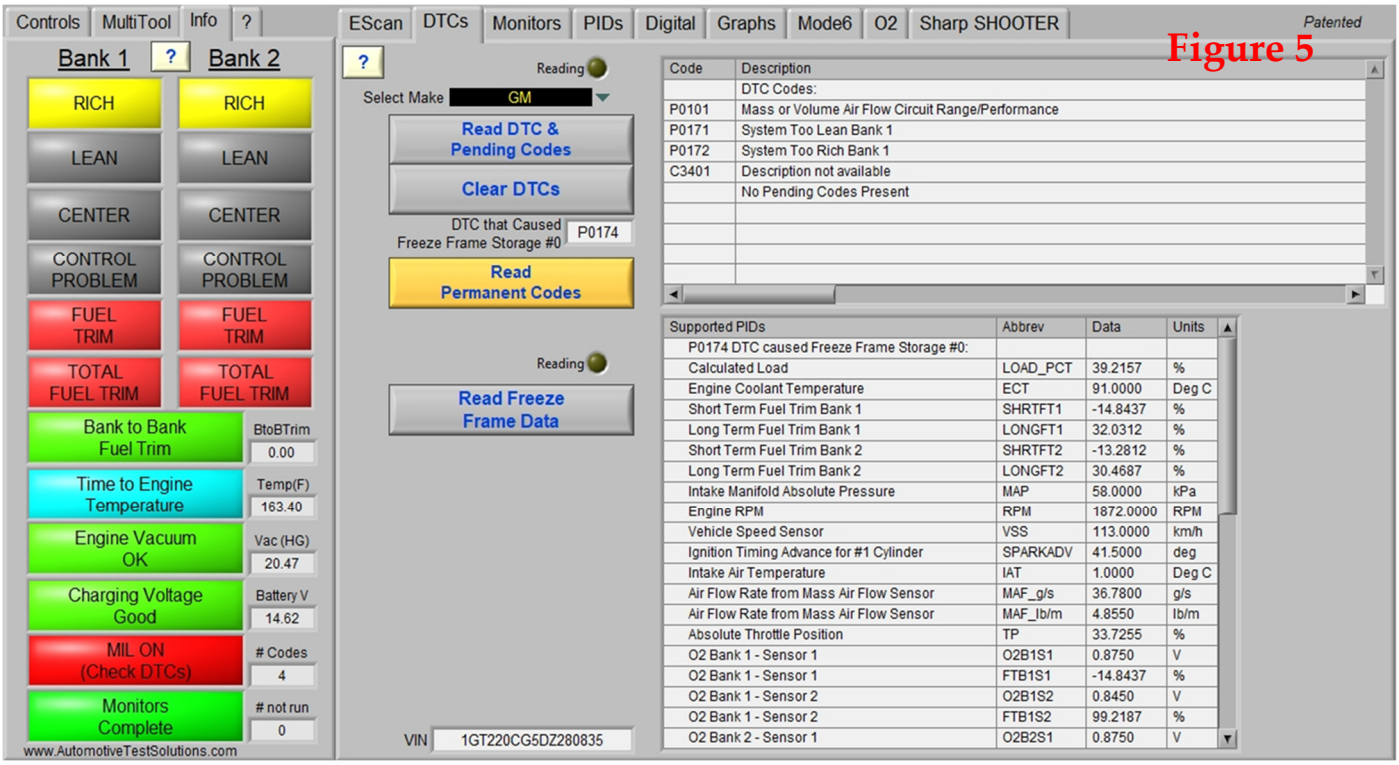

Figure 5

(Con't on page 14)

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Electronic Lab Scope 4 Channel

eSCOPE ELITE4 (ESL3100)

eSCOPE ELITE4
with Surface Pro 4 Tablet
(ESL3000)

eSCOPE ELITE4
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eSCOPE ELITE4 - 4 Channel scope

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- **TTL Output:** Sends a 0-5v square wave signal out of scope. Turn on devices such as ignition coil drivers, test vehicle's circuits, and test vehicle's circuits for loading.
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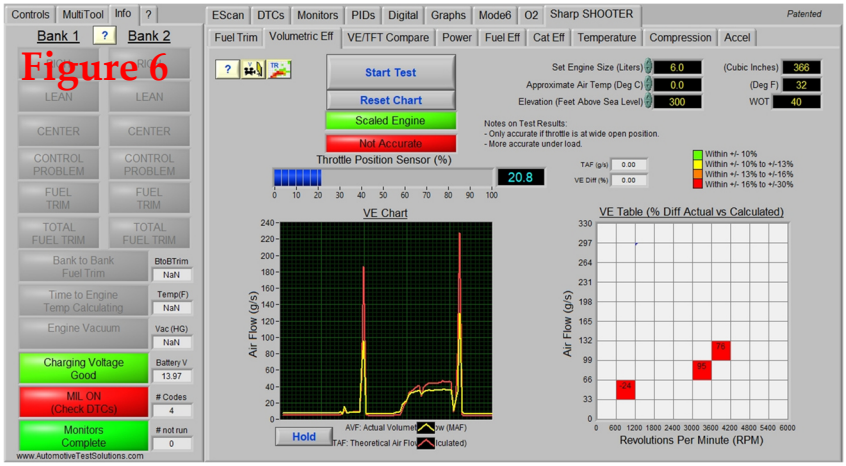
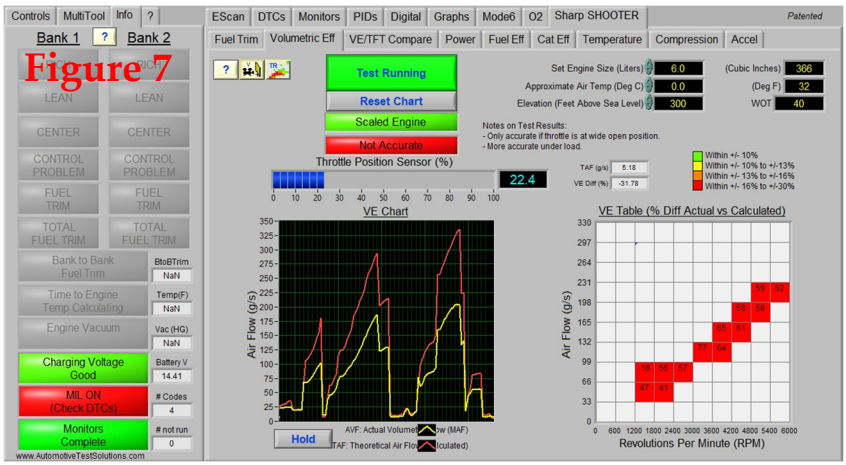
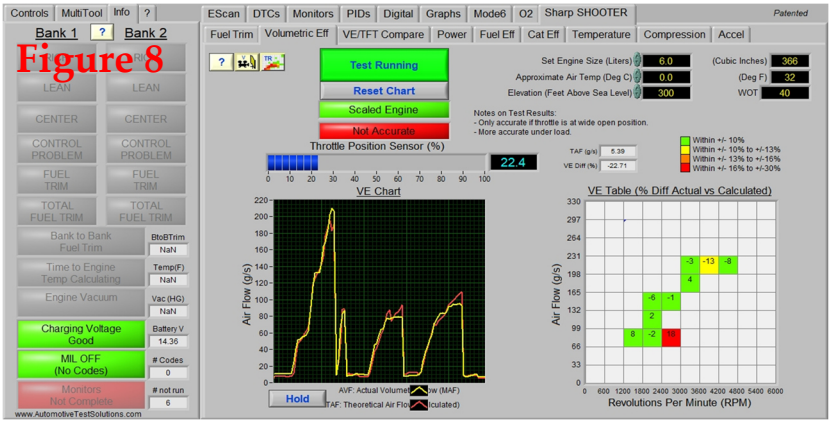
"European Mixed Bag Case Studies" (con't from p. 11)

In his diagnostic process, Bill's next step was to perform a VE (volumetric efficiency) test using the EScan to check out the P0101 DTC. When Bill performed the test on the road it failed miserably **(Figure 6, 7)**, as seen on the EScan screen-shots. The recommendation was a new MAF sensor since the old one could not be cleaned and was so far out of specification. With the new MAF installed Bill ran the VE test again **(Figure 8)** with the results now displaying normal.

It was not over yet since the fuel trims **(Figure 9 page 17)** were not down to normal — both long and short term were still showing positive rich numbers. Bill knew he was missing something, so he did more research and reached out to me. After reviewing the scan data, I agreed with Bill's findings that a rich condition could be caused by a wrong fuel calcula-tion. We connected our Autel MaxiSys **(Figure 10 page 17)** to check the fuel alcohol PID and found that the computer was using a calculation of 73 percent rather than the 5 percent that we had found. Bill used our graduated alcohol tube rather than our old water bottle that we marked up so we can have a precise calculation of the amount of alcohol in the fuel. Many techs are not aware of the alcohol refueling problem so I will







(Con't on page 17)

"European Mixed Bag Case Studies" (con't from p. 14)

explain how the system works. The following will provide a better understanding of the system and the alcohol effect of fuel trim and drivability.

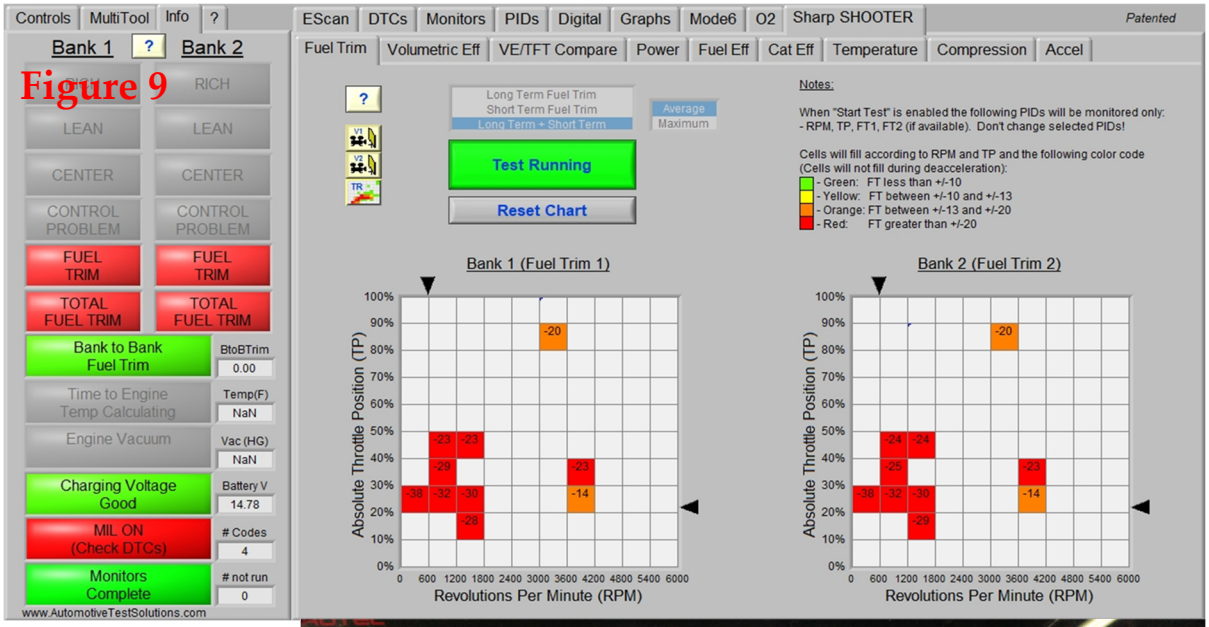


Figure 9

Many E85 Flex Fuel vehicles and some non-E85 that are newer than 2005 or so do not have an alcohol sensor to test for content. Fuel alcohol calculations are done a different way through a measured fuel change from input of the gas tank level sensor. After the vehicle is fueled with at least three gallons of E85 fuel with the engine running, the canister purge valve will remain temporarily closed for a few seconds. This is to ensure that no extra fuel vapors are introduced to influence the closed-loop fuel status of the engine so the system

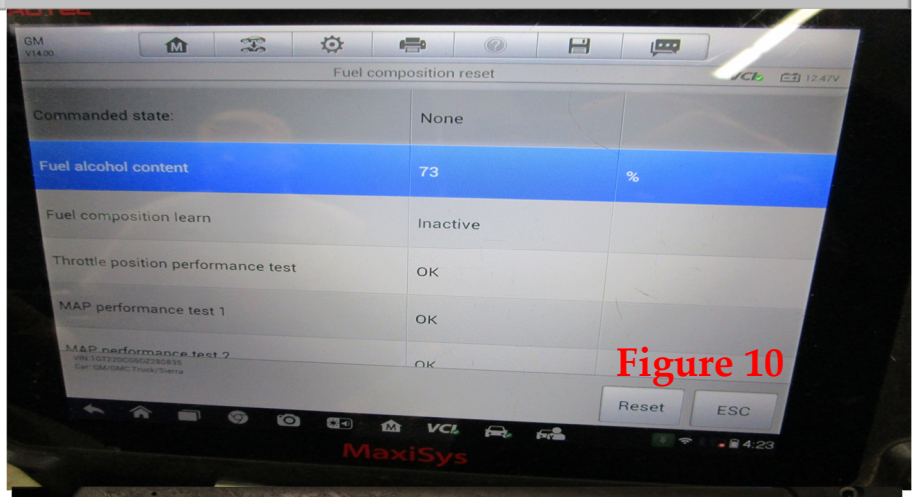


Figure 10

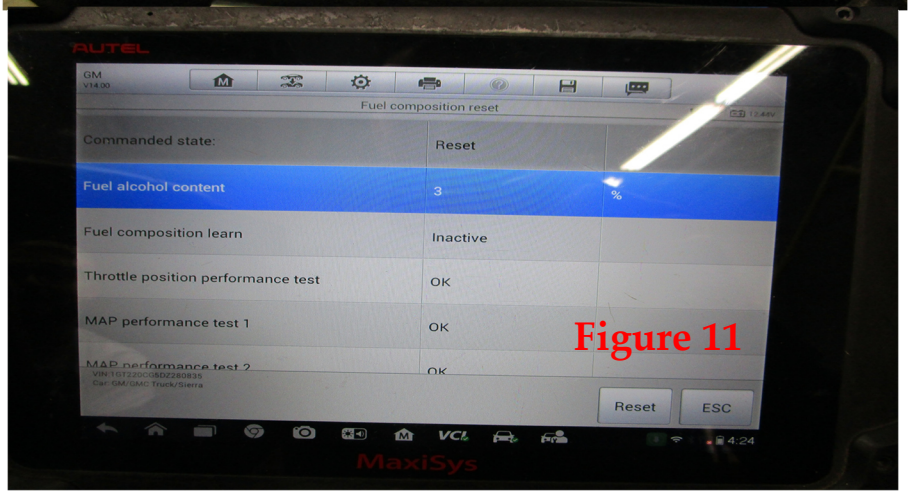


Figure 11

(Con't on page 18)

"European Mixed Bag Case Studies" (con't from p. 17)

can monitor the correct information to calculate the ethanol content. Sometimes this process takes extra time depending on the amount of fuel added or if the engine RPMs are rapidly changing.

Something to remember about newer vehicles is that the ECM is set to learn alcohol content and may have to be reset if the calculations are skewed. It may not be easy to find the alcohol reset on your favorite scan tool so take a look around in the different menus. Many of us don't think about this issue of wrong calculation of fuel trim and start replacing parts on the vehicle. This problem can stump you when it comes to diagnosing a drivability problem if you are not aware of it. Usually, a vehicle owner will see a lower price for fuel and decides to fill their vehicle up, not knowing there is a difference in the fuel itself. Once again remember that it takes as little as three gallons of fuel for the ECM to recognize the fueling event and make calculations that can make the engine run badly. The system uses the amount of fuel added from the gas tank level sensor reading then monitors the O2 sensors activity versus the current total fuel trim readings so it can determine the alcohol content. From time to time a vehicle has come into the shop with fuel trim readings that were way out of limit. I always look at the fuel alcohol PID in enhanced data to make sure it's about 10 percent because if it's not, get ready for some high fuel trim reading like the one on our problem GMC.

Since this 6.0L had more than one problem, the MAF was diagnosed, re-placed and retested. The engine ran better with the new MAF and the VE test now received a passing grade but the fuel trim number was still elevated. After replacing any component such as a fuel filter, fuel pump, MAF, MAP or anything that can cause fuel trim number to be out of the normal range it is important to reset the adaptive fuel trim. On most vehicles and scan tools, there is a reset option that must be used or the fuel trim to go back to a zero reading. If your scan tool does not have an adaptive fuel trim reset, you need to get a 1 ohm, 10-watt resistor and place it between the DISCONNECTED negative and positive battery cable ends for at least 15 minutes. I know that most of us have taken the cable ends and just touch them

(Con't on page 23)

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At AE Tools & Computers we help the aftermarket repair facility do everything the OEM dealer can do with regards to diagnostics. We give them the ability to keep their customer's vehicles in their bays through completion of the repair. This generally starts with a phone consultation to determine the TRUE needs of the individual repair facility. We do not want to just sell another tool. We want to sell the tool that meets the needs of the repair shop that we are servicing. We are selling Solutions.

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WHAT MAKES OUR LAPTOPS SO SPECIAL?

"European Mixed Bag Case Studies" (con't from p. 18)

together, but this is not a 1980 flashback. The importance of the 1 ohm, 10-watt resistor is to slowly drain the capacitors in the computers and bring them back to the base set-tings. With all the reset's completed, the GMC Sierra was running great and returned to the vehicle owner.

I hope, as usual, that this article was helpful. If you want to take your diagnostic game plan to the next level, plan on attending my seminar on "Critical Thinking Skills for The Professional Technician.

Article By
"G" Jerry Truglia
TST Founder and President
ASE World Class Triple Master
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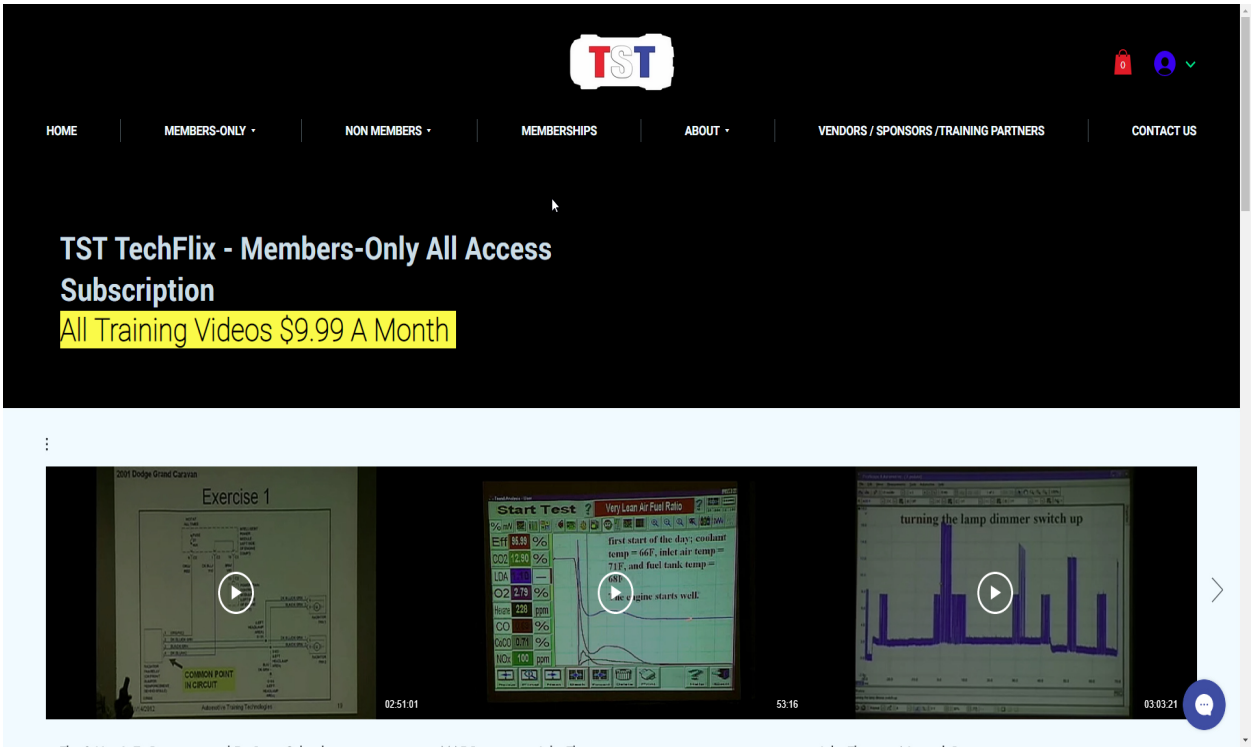
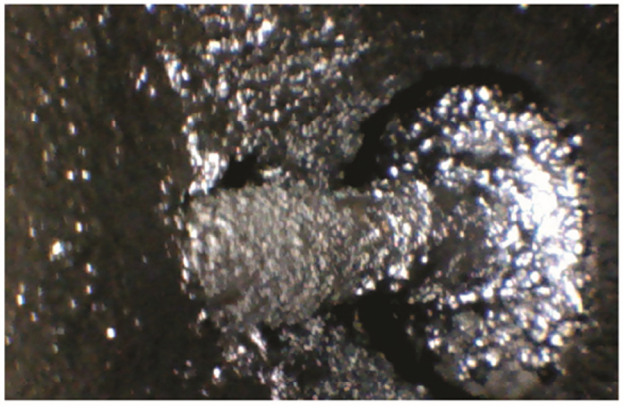


Finally...

A Cleaning Solution That Actually Works!

1.6L Turbo Mini Cooper at 83,000 miles

Before Cleaning



After Cleaning

3C Intelligent Induction Cleaner

Patent Pending

3C Intelligent Induction Cleaner (Patent Pending) removes heavy carbon deposits from the internal combustion engine's induction system in just 20 minutes.

Air Assist Injection Nozzle (Patent Pending) delivers chemical in small droplets that are suspended and carried to the carbon deposits by the engine's air flow. This air assisted nozzle is superior to any other nozzle available for carbon removal.

Chemical Layering (Patent Pending) removes more carbon because it alters the application of chemical mixtures between chemical A and Chemical B in on/off cycles, then washes the induction system with Chemical C.

Micro-Burst Injection Technology (Patent Pending) delivers the maximum amount of chemical during the cleaning process while still allowing the engine to run well.

3C Chemical A, 3C Chemical B, 3C Chemical C (Patent Pending) are laboratory proven to remove more carbon weight from different carbon types than any other commercially available induction carbon cleaning chemical, while having a low HMIS heath rating of (2).

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