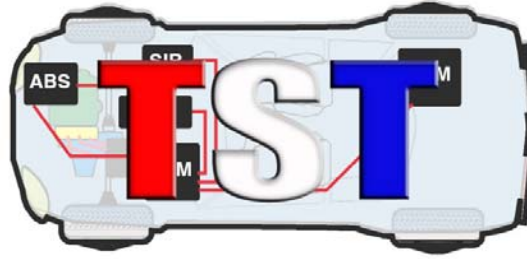


October 2016



Technicians Service Training

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Editor

"G" Jerry Truglia

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"Honda Odyssey Battery Drain"

Our first vehicle in our Asian Buffet is a 2010 Honda Odyssey 3.5L, V6 came in with a complaint of a dead battery. The vehicle owner had already replaced the battery himself and was still experiencing a dead battery if the vehicle was not started twice a day. The first order of business was to charge the battery marking sure we started with a fully charged battery. This was followed by checking for a parasitic draw by installing a current clamp on the negative battery cable. As you can imagine there had to be a large draw if the battery was being drained in less than one day. The amp clamp was reading 0.389 milliamps current draw that is way over the specification of 0.030 milliamps. Our next step was to locate the circuit that was drawing the current that is not the easiest thing to find. Our usual first step would be to perform a voltage drop test on all available fuses, followed by pulling fuses while observing the current draw on the meter with an attached amp clamp attached. Since this Honda has a few power distribution boxes we started with the easiest first, the one located under the hood. Unfortunately the testing did not yield the circuit that was killing the battery. The next place we tested was at the power distribution box located under the driver's

(Con't on page 2)

“Honda Odyssey Battery Drain” (con’t from p. 1)

dash where we hit pay dirt. When we pulled fuse 7 the current draw dropped down to a normal level assuring us that we found the problem. When we looked at the wiring diagram in MotoLogic we noticed that fuse 7 had everything from power mirrors to the immobilizer, numbering over a dozen culprits that can be causing the battery drain. Now it was time to take out the artillery, our General Thermal Imager that would save us time going through the vehicle and unplugging each load. The thermal imager led us to the right rear side sliding door motor assembly (Figure 1) and the right rear body panel (Figure 2) that we removed. At first we thought that the problem was just the right sliding motor and latch assembly but even with both disconnected we still had a current draw of 0.146 (Figure 3). Since there was still a good size draw on the battery we performed another scan with our General Thermal Imager that located the last draw. Take a look at the thermal image of the (Figure 4) right side



(Con't on page 4)

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 membership**, the seminars are only **\$50.00**. **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 80 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.

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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

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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:

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"Engine Eats Oil In 100 Miles" (con't from p. 2)

sliding control module. Take notice of the yellow/lite color that indicated current draw even after the load (right side sliding door motor and latch) were removed. The fix for this vehicle was to install a new right side sliding door motor, latch and control module.



Figure 3

Thermal imager's are a great tool to look into many different vehicle problems besides parasitic draw (battery drain) such as cooling system flow, air conditioning problems, wheel bearings, hybrid motors and batteries

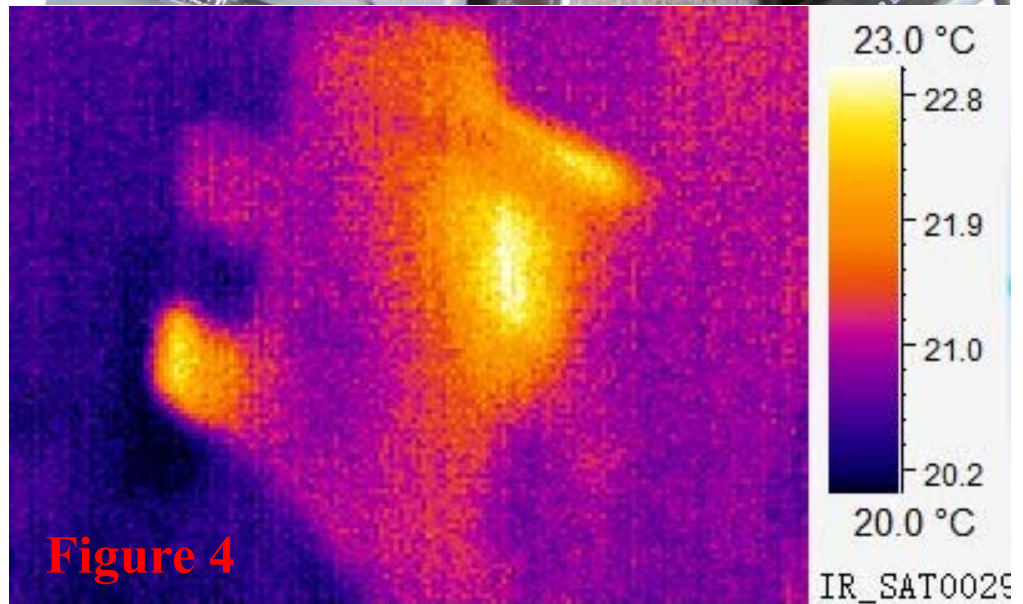


Figure 4

and just about everything else that involve a change in temperature. **Note; be careful when selecting a thermal imager they are not all equal.** For instance there is an inexpensive unit that connects to your smart phone that is good for home use, heat lost, etc. but when it comes to finding a sticking relay for example, it does not display properly, all the relays will look bad. **The cheaper thermal camera is different than an imager so be careful on your purchase or you will be unhappy with the results.**

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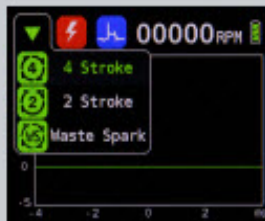
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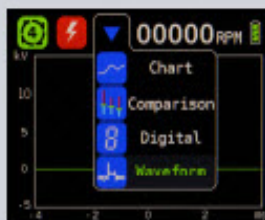
Displays secondary ignition waveforms.



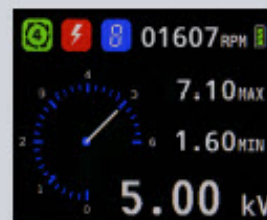
Displays and measures spark burn (firing) time, dwell time, current ramp time, RPM, and spark plug peak voltage.



Candlestick 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.



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

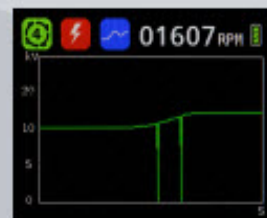


Chart mode used for detecting intermittent or infrequent failures and misfires.

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“2003 Toyota Prius DTCs ”

A 2003 Toyota Prius that was towed in with two hard DTCs and two Pending DTCs. This no start Prius had two DTCs (Figure 1), a P0420 that indicates a

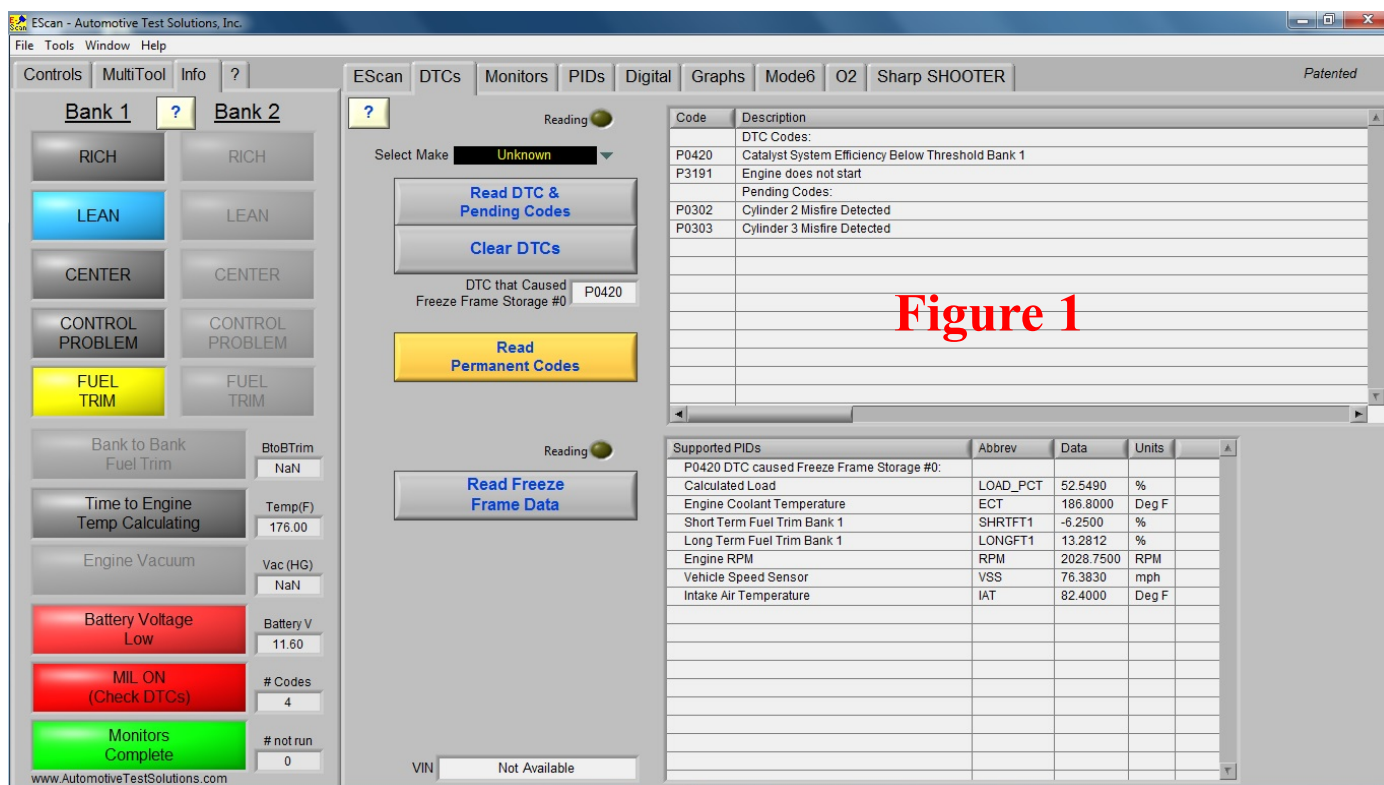


Figure 1

Catalyst Efficiency Below Threshold (Bank 1) and P3191 that can indicate everything from an air induction problem to running out of fuel. In this case the P3191 was caused by the vehicle running out of fuel that is common with both GEN 1 and 2 Prius vehicles since they both have bladder fuel tanks. The problem is covered by a TSB number EL008-03 that is due to the bladder fuel tank that is installed on these vehicles. The recommend thing to do is to reset the fuel gauge inclination sensor if the fuel level reading is inaccurate. I followed the procedure described to reset the fuel gauge inclination sensor. The factory procedure is as follows; 1. Park the vehicle on a level surface. 2. Turn the ignition switch to the “ON” position. 3. Place the odometer display into the “ODO” mode. 4. Turn Off the ignition switch. 5. Depress and hold the “ODO/TRIP” button while turning the ignition switch to the “ON” position. Hold ODO button for 2 seconds. 6. Release and press the ODO Button three (3) more times within 5 seconds until the leveling infor-

(Con't on page 8)

“2003 Toyota Prius DTCs ” (con’t from p. 7)

-mation is displayed on the odometer. 7. Release the button, 8. Depress and hold the “ODO/TRIP” button until the odometer display confirms that reset has begun (odometer reads “1”), 9. Once reset is complete, the odometer returns to normal, 10. Release the button, 11. Turn off the ignition and the procedure is complete. With that DTC out of the way it was now time to turn our attention to the P0420 DTC. We performed a catalyst efficiency test that passed at both 1196 or idle (Figure 2), and 1492 rpms (Figure 3) but at 2242 rpms (Figure 4) it failed the test. If you are wondering why it failed at 2242 rpms but pass at idle and 1475 rpms you can find the answer in the Freeze Frame data. Take notice that the LTFT was at 13% and the engine rpms were at 2028 when the DTC for P0420 was set. Never clear or erase Freeze Frame data since it hold a great deal of information that can be helpful. Erasing Freeze Frame is like pouring Clorox on a crime scene removing all the evidence that would be helpful in solving where, when and why the DTC was set.



(Con't on page 10)

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"2003 Toyota Prius DTCs " (con't from p. 8)

We backed up our converter test by using our General Thermal Imager (Figure 5) to see what is really going on in the catalytic converter. Unfortunately the vehicle owner did not allow us to repair the vehicle but if he did we would have first diagnosed and repaired both cylinder 2 and 3 misfires. This would be followed by a quick converter load test, by first warming the engine up to operating temperature, shutting it down and removing one sources of ignition (ignition wire (grounded) or remove power to COP), followed by raising the idle to 2500 rpms for 2 to 3 minutes while looking at Mode 6 data before and after this test. If after performing the procedure Mode 6 data drops (test drive needed) indicating an improvement, than I normally recommend a fuel system cleaner that in most cases brings the cat back to life. In our shop this is common practice that works 95% of the time.

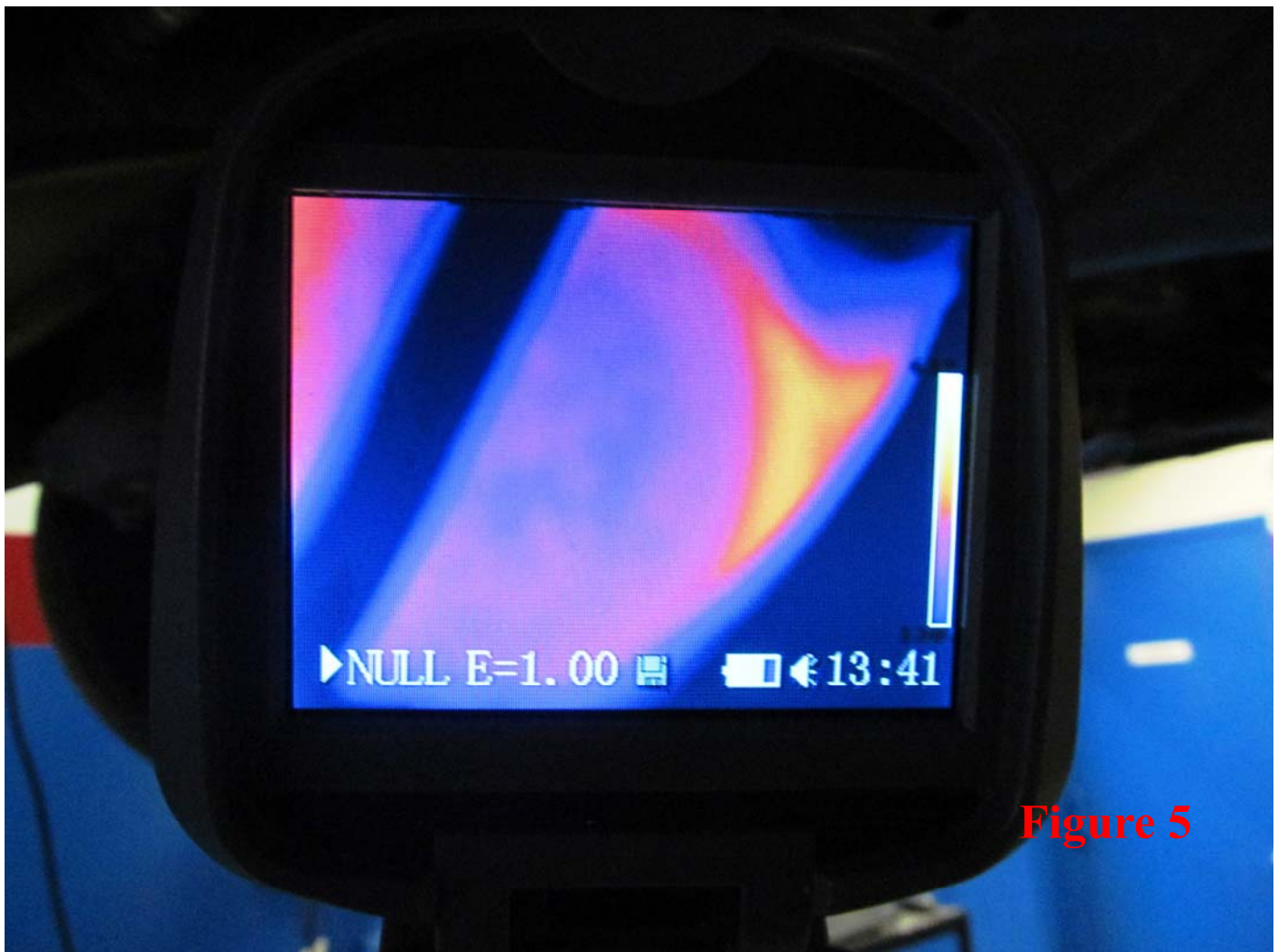


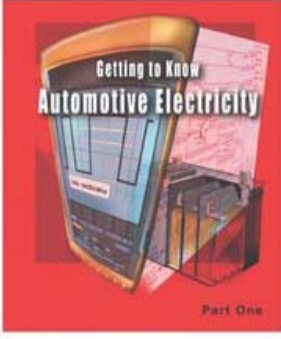
Figure 5

"Hyundai High Idle Issue"

A 2012 Hyundai Elantra 1.8L with a complaint of a high idle issue along with a P0507 (Idle Air Control System – RPM Higher Than Expected). This vehicle came in from our local used car dealer that had a problem diagnosing this odd condition. In fact they had another vehicle exactly like it where they swapped the complete throttle assembly to see if it would lower the idle. When we started to diagnosis the vehicle we checked all the basics along with checking cam and crank sync signal. Since the service information waveform example was different than what we were reading on our labscope, we had a hard time deciding if there was a problem or not. We asked the used car dealer if they could drive over the other 2012 Hyundai Elantra they had so we could compare a vehicle with no problems and see what a good waveform should look like. **What we found was the cam and crank signal was the same as the problem vehicle, so there was no problem with the vehicle's waveform even though 3 different repair information systems suggested otherwise.** Since the idle was about 1700 rpms at times we check for a vacuum leak and found that the intake manifold was porous (Figure 1).



Figure 1



Part One

Batteries
Starters
Alternators
Common Tests and Testers
Circuit Types
Ohm's Law

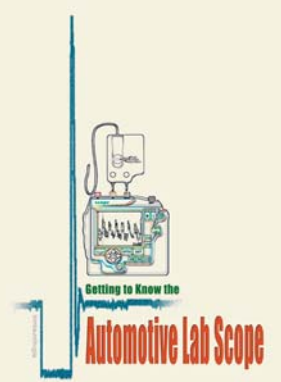
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Getting to Know the
Automotive Lab Scope

(Con't on page 12)

"Hyundai High Idle Issue" (con't from p. 11)

We discovered this by using our ATS BullsEye leak detection tool that we connected to the oil dipstick tube. With the system pressurized to 25 inches of a column of water, the low pressure (approximately 1 psi) in the system helped us locate the leak with the ATS tester (Figure 2). As you can see in the picture the manifold was sprayed with the BullsEye form that changes color from pink to yellow when the leak was detected. The next problem we noticed on the vehicle was that both the intake and exhaust VVT solenoids were clicking with the key on and engine off. Since we had never heard this before on these vehicles it was good to have an exact vehicle match in the next bay. We decided to remove the solenoids that were clicking from the problem vehicle and install them in the vehicle that was running good and not making a clicking sound. With the solenoids swapped the bad car still had the same problem, while the good vehicle did not make any sound. You maybe thinking what a half ass way to test the engine, but since it was so simple and available we swapped the VVT solenoids to confirm that they were not the problem. With the results of our testing we told the used car dealer that the intake was porous and that we believed the PCM was also bad. Thinking carefully about what can cause the idle to be higher than normal besides the vacuum leak left me believing that the PCM was the problem. If you carefully think about what can cause the VVT solenoids to click when the engine is not running with just the ignition on, you will come up with the same conclusion, the PCM. Since the used car dealer had already sold the vehicle prior to us diagnosing it, they were in a jam to get it fixed fast. They decided to take the vehicle to the dealer since they were able to get the PCM faster than we would. This is another vehicle that I wish we could have had more time on so we could have fixed the vehicle. Remember that it's not always up to



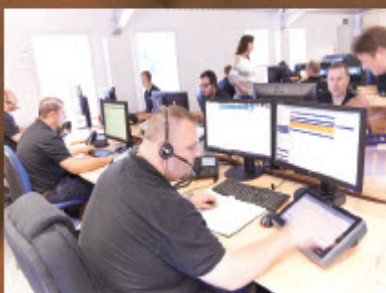
Figure 2

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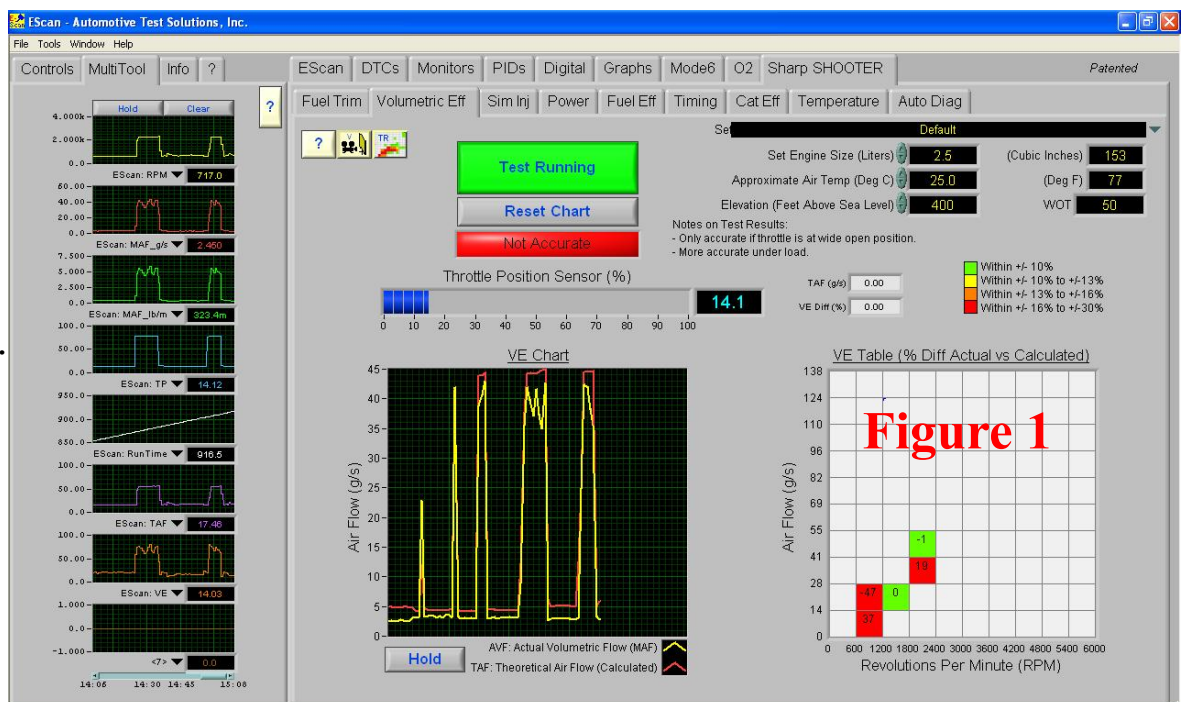


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“Forester Volumetric Efficiency”

A 2005 Subaru Forester came in with a driveability problem that was detected by performing a Volumetric Efficiency test. Since this vehicle was not running right and had no DTCs we started with testing the battery, starter, alternator, relative compression, 5 gas analysis and scanning of the computer system. When we test for a driveability problem we connect the EScan scan tool since it will allow us to check many different areas quickly. As we were testing the MAF sensor we found the problem. Take a look at (Figure 1) the MAF test and you will notice that not only did it reach the proper height but at the top of the yellow graph there is a frequency that looks like Bart Simpson’s hair. The frequency on the yellow graph

indicates a clog in the exhaust system such as a clogged catalytic converter. Using this test saves time since we do not have to remove any AF or O2 sensor’s and perform a



back pressure test. If you don’t own the EScan don’t worry since the test can be performed on any scan tool that has Generic OBD II that graphs. **Take any Generic scan tool and select graph, Calculated Load PID along with TP and RPM only, that way you can get the fastest update rate watching the relationship of the throttle position, rpm and calculated load.** The Calculated Load graph should reach 90% without having a Bart Simpson hairdo. If the calculated load does not reach the 90% area take a look at the air filter and MAF sensor, if it’s a type that can be cleaned try some CRC MAF cleaner and retest. **The problem with this vehicle is that it had a clogged converter.**

"Mazda RX8 Rough Running"

Our last problem vehicle is a 2004 Mazda RX8, Wankel Rotary engine with 93128 miles. The customer complaint was that the engine was running rough without the Check Engine light illuminated. The vehicle owner thought that the rough running engine was a result of it needing a tune up, so he was surprised when we told him that it was caused by a compression problem. This RX8 engine had low compression that was common on the older RX7 and sometimes it would cause a no start condition due to an engine sealing problem. One of the important steps to follow on this engine is to make sure the engine is always warmed up to operating temperature before turning the motor off. If the engine is shut down when it is still cold the fuel will affect the operation of the apex seals preventing good compression. If the seals are washed with excessive fuel the engine will not start. The only way to alleviate the problem would be to remove the spark plugs from the (Figure 1) Leading (lower) and Trailing (upper) Rotor Housing (Figure 2) of the engine. This would need to be followed by disconnecting the Eccentric Shaft



Position Sensor to prevent fuel from being injected in the leading and trailing rotors. Next step would be to squirt 5W20 or thicker motor oil in all of the Leading and Trailing rotors. Our problem engine was able to start, so our next step would be to perform a compression test. That being said we still tried squirting oil in the engine since the apex seals are such a problem, but it made no difference. If the oil squirt made no difference the only other issue that can cause the rough engine running is most likely carbon build up. We proceeded to perform a compression test and looked up the specifications; compression pressure recommended standard 120 psi @ 250 rpms or a minimum of 98.6 psi with no more difference in the chambers of 21.8 psi and a difference between rotors is 14.5 psi. Mazda recommends using their pressure trans-

(Con't on page 16)

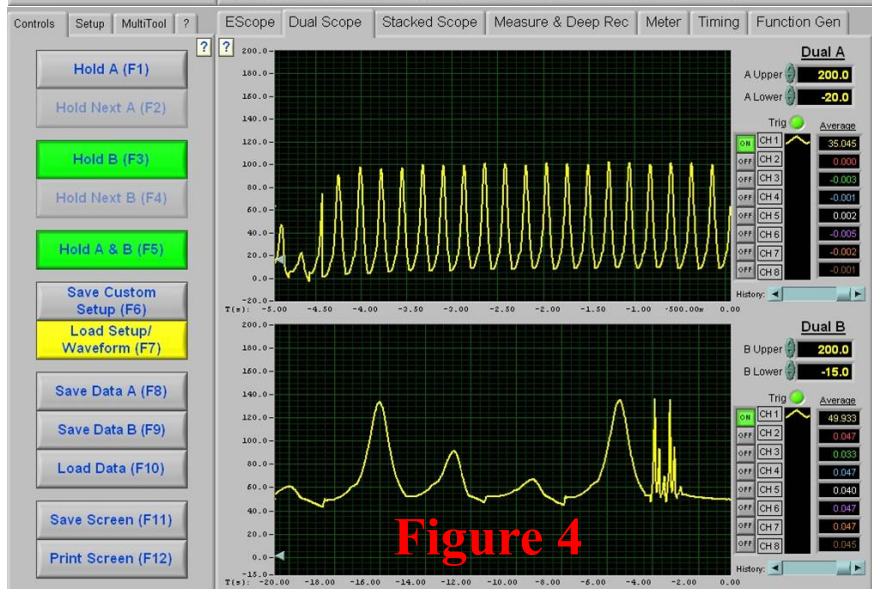
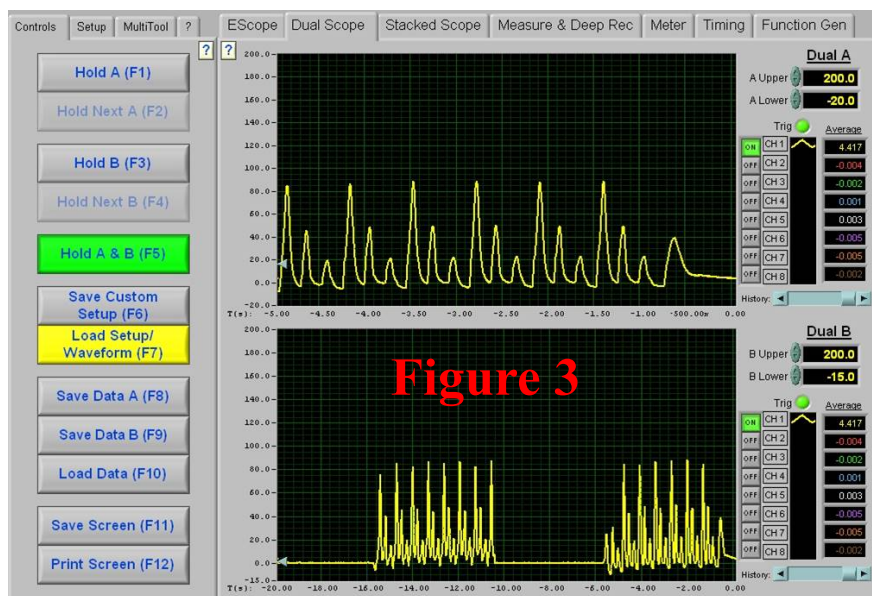
"Mazda RX8 Rough Running" (con't from p. 15)

-ducer compression tester to perform the test. Using a standard compression test may not come up with an accurate reading. In fact when Kevin and Craig first performed the compression test it look good on our Snap On compression gauge. A different story would be told as we used the Automotive Test Solutions pressure transducers. Take a look at the compression reading of the **Leading (Figure 3) and the Trailing (Figure 4) rotors that indicate there is indeed a problem.**

The Leading pressure transducer waveform looks like it has high and lows without reaching the minimum specification of 98.6 psi. Meanwhile the Trailing rotor looks even and hits 100 psi.

With the results at hand we decided to perform a Run Rite fuel induction cleaning from the power booster hose after the engine was warmed up. The cleaning went well as a bunch of smoke exited the tail pipe the engine was sounding better. When the cleaning procedure was completed the motor ran real smooth. We decided to run another compression test after a good test drive making sure the engine was not shaking anymore. **Take a**

look at the Leading pressure transducer (Figure 5) waveform that no long has highs and lows in the waveform, but rather a compression reading of about 92 psi. Even though the compression was not up to the minimum



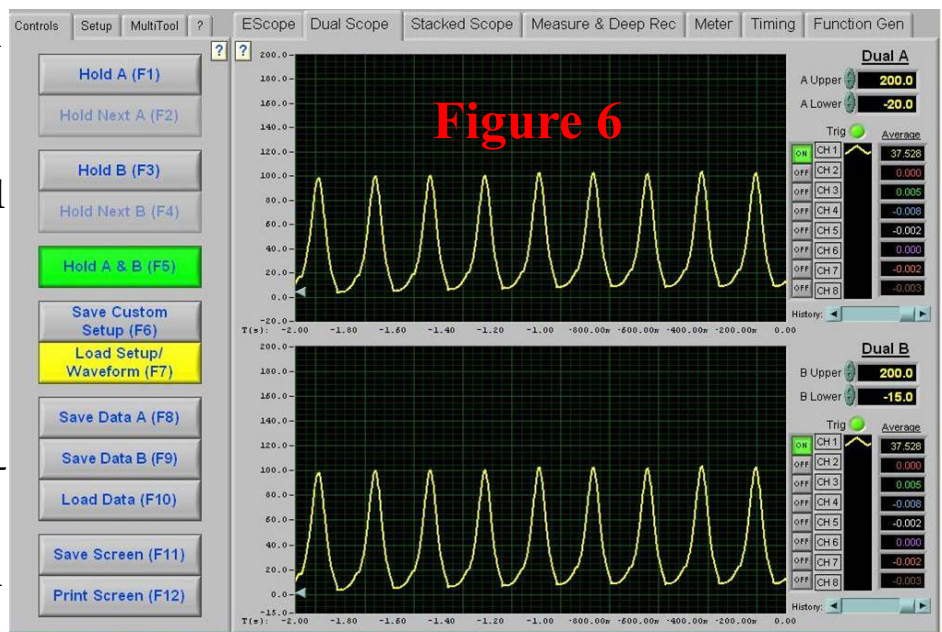
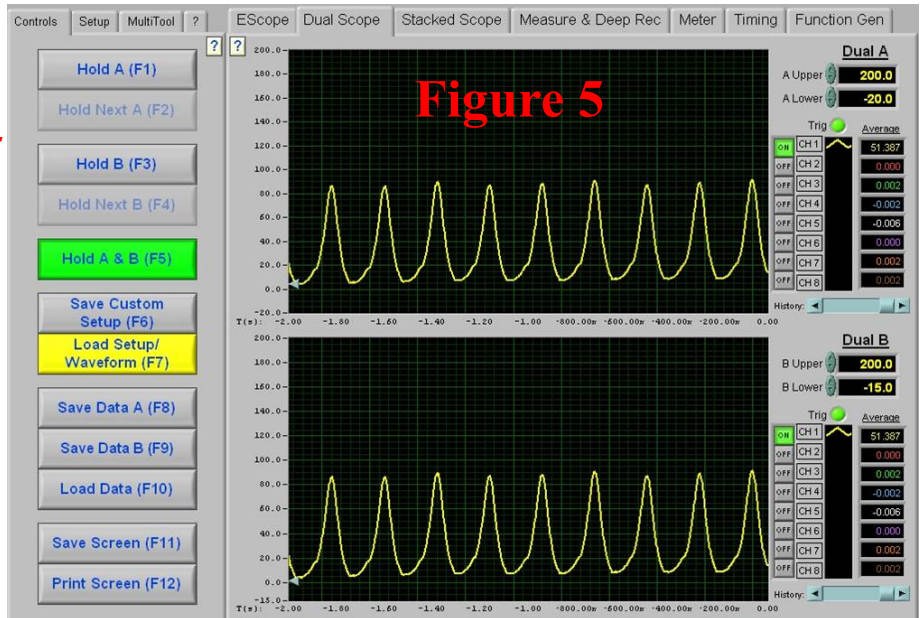
(Con't on page 17)

"Mazda RX8 Rough Running" (con't from p. 17)

standard the vehicle ran well with no idle or power issues. **Looking at the Trailing rotor waveform (Figure 6) we noticed the compression was up to about 100 psi with a difference better chambers of 8 psi that did not cause any problems.**

We thought as the vehicle was being driven more carbon would be broken down with the Run Rite / Techron fuel additive that was added to the full tank of fuel. This vehicle ran so well and the owner was very happy that he offered free dinners at his restaurant. Upon further investigation I contacted Ernie Darrow from Mazda that informed me that the owner was eligible for a new motor at no charge. So

even though the engine was now running good the vehicle owner was able to get a new motor for nothing. You talk about happy, well it really put a smile on his face and we were glad that we could help and hook him up with a new motor. With a little research and help from Ernie we made our shop look good and made a vehicle owner very happy.



All Articles By G Truglia TST Founder, President and ASE World Class Triple Master L1, L3 Technician

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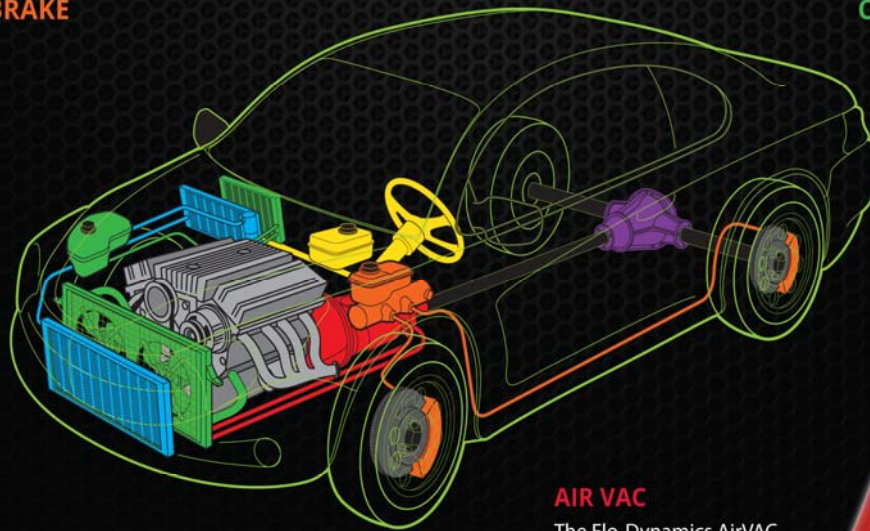
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9AM	Chu	Eagle	Brown	O'Donnell	Conn	Zumpe
10AM	Smith	Wooden	Cisco	Chin	Chang	King
11AM	Moore	Baker	Glass	Burton	Ellis	Cas
12PM	Daniels	Amber	Green	Alph	Alfady	Davis
1PM	Fisch	Smith	Ricco	Nichols	Fullerton	Dinky
2PM	Hovan	Perry	Green	Line Co.	Treash	Blake
3PM	Allen	Capstone	Testa	Baxter	McArthur	Carissim
4PM	Williams	Getz	Longo	Pitts	Blow	Corica
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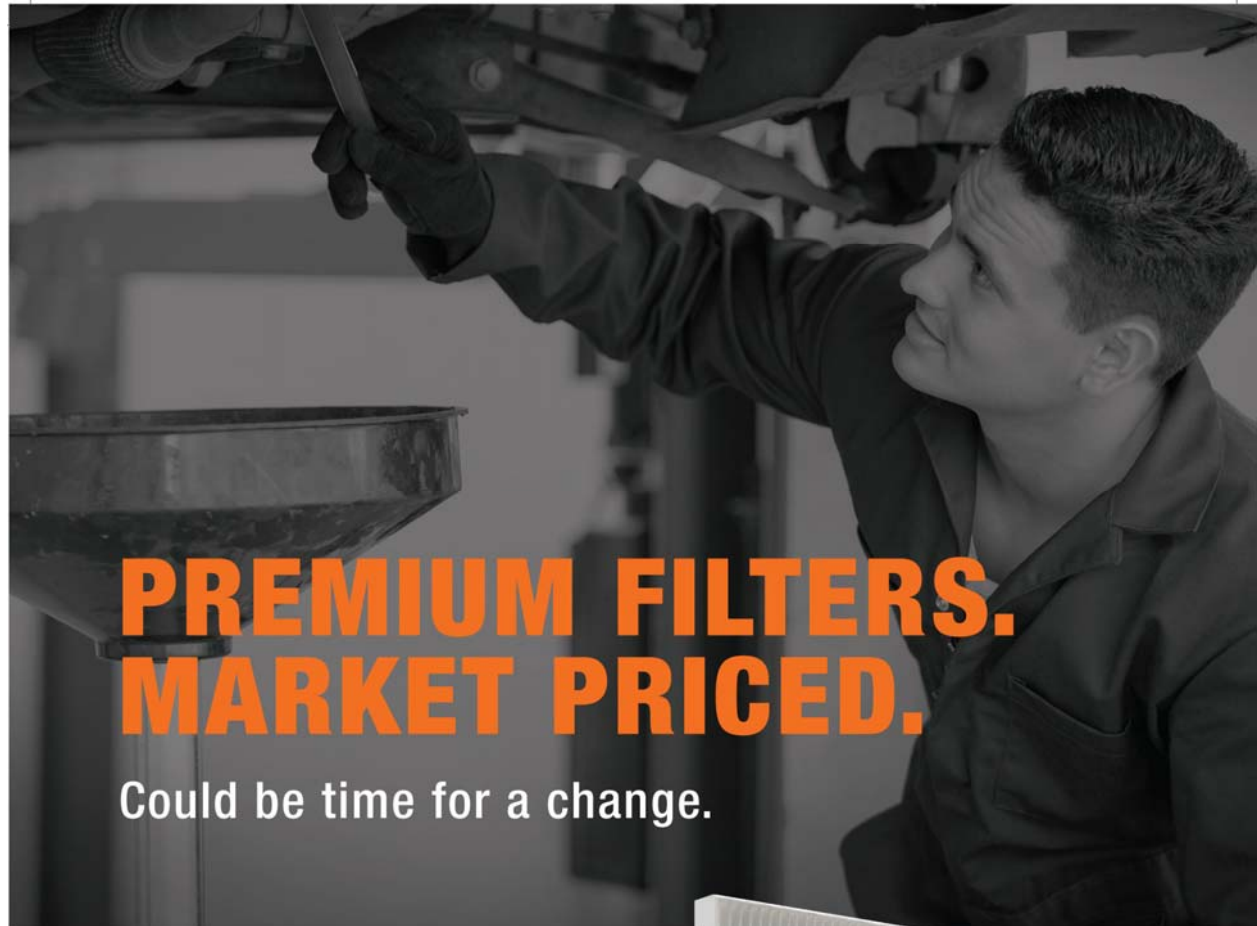


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