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Technicians Service Training

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Editor

"G" Jerry Truglia

"ASSORTED ISSUES"

Our first vehicle is a 2010 Honda Odyssey 3.5L, V6 that came in with a complaint of a dead battery. The vehicle owner already had replaced the battery himself and still was experiencing a dead battery if the vehicle was not started twice a day. The first order of business was to charge the battery to make sure we started our diagnosis with a full charge. We followed this by checking the charging system that was working as designed. The next step to perform was a parasitic draw test that is done 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, and that is way over the specification of 0.030 milliamps.

Our objective was to locate the circuit drawing the current; that was easier said than done. 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 a meter. Because this Honda has a few power distribution boxes, we started with the easiest first, the one located under the hood. Unfortunately, this testing did not yield the circuit that was killing the battery. The next place we tested was at the power distribution box under the driver's dash. There we hit pay dirt. When we pulled fuse 7, the

(Con't on page 2)

"ASSORTED ISSUES" (con't from p. 1)

current draw dropped to a normal level assuring us that we found the problem. When we looked at the wiring diagram, we learned that fuse 7 powered everything from power mirrors to the immobilizer, numbering more than a dozen potential culprits that could be causing the battery drain. We've been using thermal imaging as a diagnostic tool for a while now and thought 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 and the right rear body panel was removed. At first we thought that the problem was just the right sliding door motor and latch assembly, but even with both disconnected we still had a current draw **(Figure 1)** of 0.146 milliamps.

Figure 1

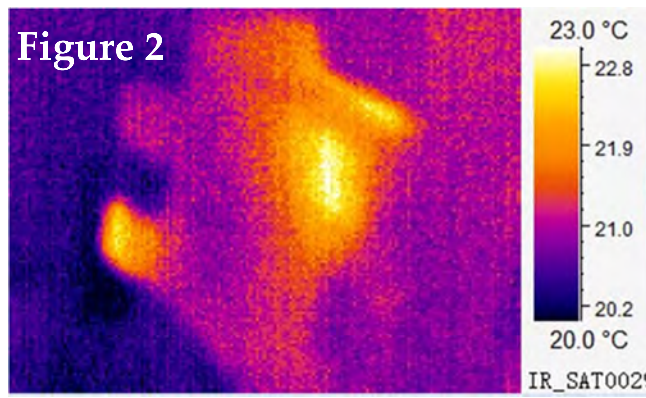

Figure 2

Because there was still a good size draw on the battery, we performed another scan with our thermal imager and located the last draw. Even with the door motor and latch unplugged, our thermal imager still showed a heat source (current flow) **(Figure 2)** in the control module. The yellow/light color 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.

Next, a Toyota Prius The next vehicle is a 2003 Toyota Prius that was towed in with two hard Diagnostic Trouble Codes (DTCs) and two Pending DTCs. This no start Prius had two DTCs (Figure 1), a P0420 that indicates a 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 *(Con't on page 6)*

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"ASSORTED ISSUES" (con't from p. 2)

common with both GEN 1 and 2 Prius vehicles since they both have bladder fuel tanks. The problem is covered by Technical Service Bulletin (TSB) EL008-03, and is caused by the bladder fuel tank that is installed on these vehicles.

The recommended thing to do is to reset the fuel gauge inclination sensor if the fuel level reading is inaccurate. Here's the procedure I followed to reset the indicator:

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 two seconds.
6. Release and press the ODO Button three more times within five seconds until the leveling information 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 idle **(Figure 3)** and at 1,500 rpm **(Figure 4)**, but at 2,000 rpm (Figure 5) it failed the test. You can find the reason why it failed at 2,000 rpms but pass at idle and 1,500 rpms in the Freeze Frame data. Notice that the LTFT was at 13 percent and the engine rpms were at 2,028 when the DTC for P0420 was set.

Scan tool screen shots on page 8

(Con't on page 8)


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"ASSORTED ISSUES" (con't from p. 6)

Never clear or erase Freeze Frame data since it holds a great deal of information that can be helpful. Erasing Freeze Frame is like pouring bleach on a crime scene, thus removing all the evidence that would be helpful in solving where, when and why the DTC was set. I have found that in many cases if the converter test is not performed at idle along with two higher rpms, I would miss one or more of the tests that failed.

Figure 3

Figure 4

Figure 5

We backed up our converter test by using our thermal imager 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 2,500 rpms for two to three 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, then I normally recommend a fuel system that in most cases brings the cat back to life.

(Con't on page 11)


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"ASSORTED ISSUES" *(con't from p. 8)*

Next, a 2012 Hyundai Elantra 1.8L had a complaint of a high idle issue along with a P0507 (Idle Air Control System – RPM Higher Than Expected). The 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. Because information on the normal waveform reading was so different from what was being displayed on the engine that was running OK except for the high idle, we had a hard time deciding if there was a problem or not.

Figur

We asked the used car dealer if they could drive over the other 2012 Hyundai Elantra so we could have a vehicle with good reading to compare it to. 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 three different repair information systems suggested otherwise. Because the idle was about 1,700 rpms at times, we checked for a vacuum leak and found that the intake manifold was porous. We discovered this by using our ATS Bulls-Eye leak detection tool connected to the oil dipstick tube. With the system pressurized to 25 in./H2O (inches of water – a pressure measurement common in low pressure systems like EVAP), the low pressure approximately 1 psi) in the system helped us located the leak. Applying the special foam to the leak site confirmed that we'd found the problem.

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

(Con't on page 15)


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"ASSORTED ISSUES" *(con't from p. 11)*

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 might be thinking that's an amateurish 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.

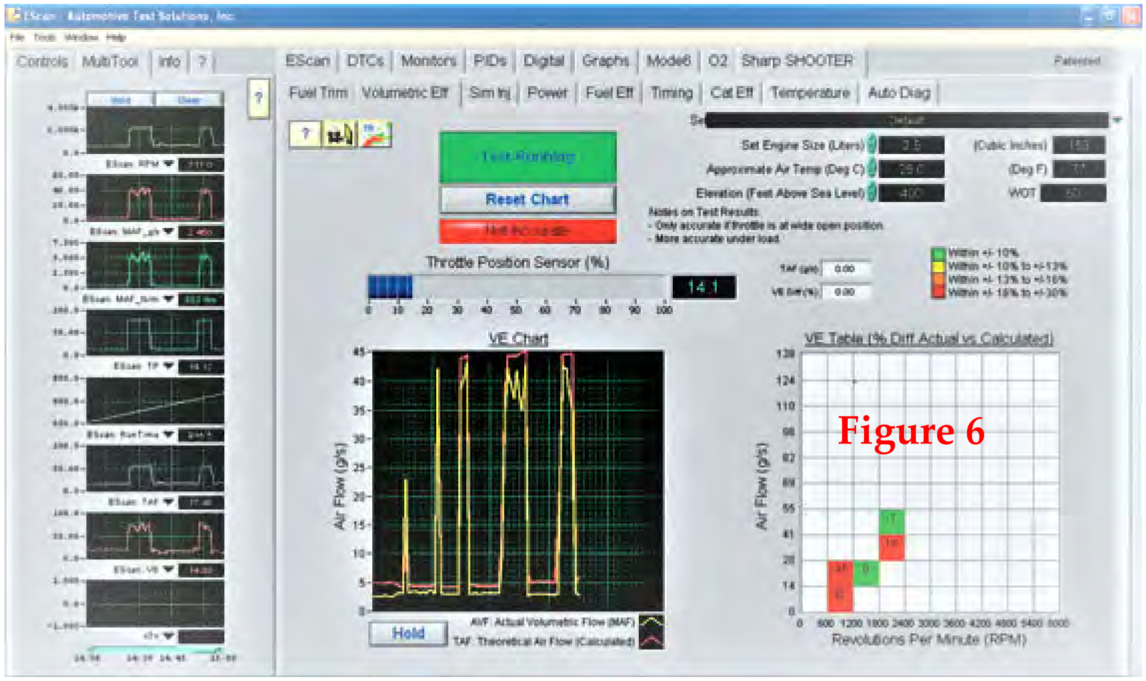
The used car dealer had already sold the vehicle prior to us diagnosing it, so they were in a jam to get it fixed fast. They decided to take the vehicle to the dealer, as the dealer was able to get the PCM faster than we would. This is another vehicle that I wish we could have had more time on so we could have fixed the vehicle. Remember, it's not always up to us.

A Forester presents a challenge
A 2005 Subaru Forester came in with a drivability problem that a Volumetric Efficiency test detected. Because 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 drivability problem, we connect the EScan scan tool because it will allow us to check many different areas quickly.

As we were testing the Mass Air Flow (MAF) sensor, we found the problem. Take a look at the MAF test **(Figure 6)** 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 sensors and

(Con't on page 17)

"ASSORTED ISSUES" (con't from p. 15)



perform a back pressure test.

If you don't own the EScan don't worry — the test can be performed on any scan tool that has Global OBD II and graphs. Take your scan tool, select and graph Calculated Load along with TPS 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 percent without having a Bart Simpson hairdo. If the calculated load does not reach the 90 percent 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.

A rare rotary

Our final vehicle is a 2004 Mazda RX8, Wankel Rotary engine with 93,128 miles. The customer complaint was that the engine was running rough but the Check Engine light was not 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

(Con't on page 20)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"ASSORTED ISSUES" (con't from p. 17)

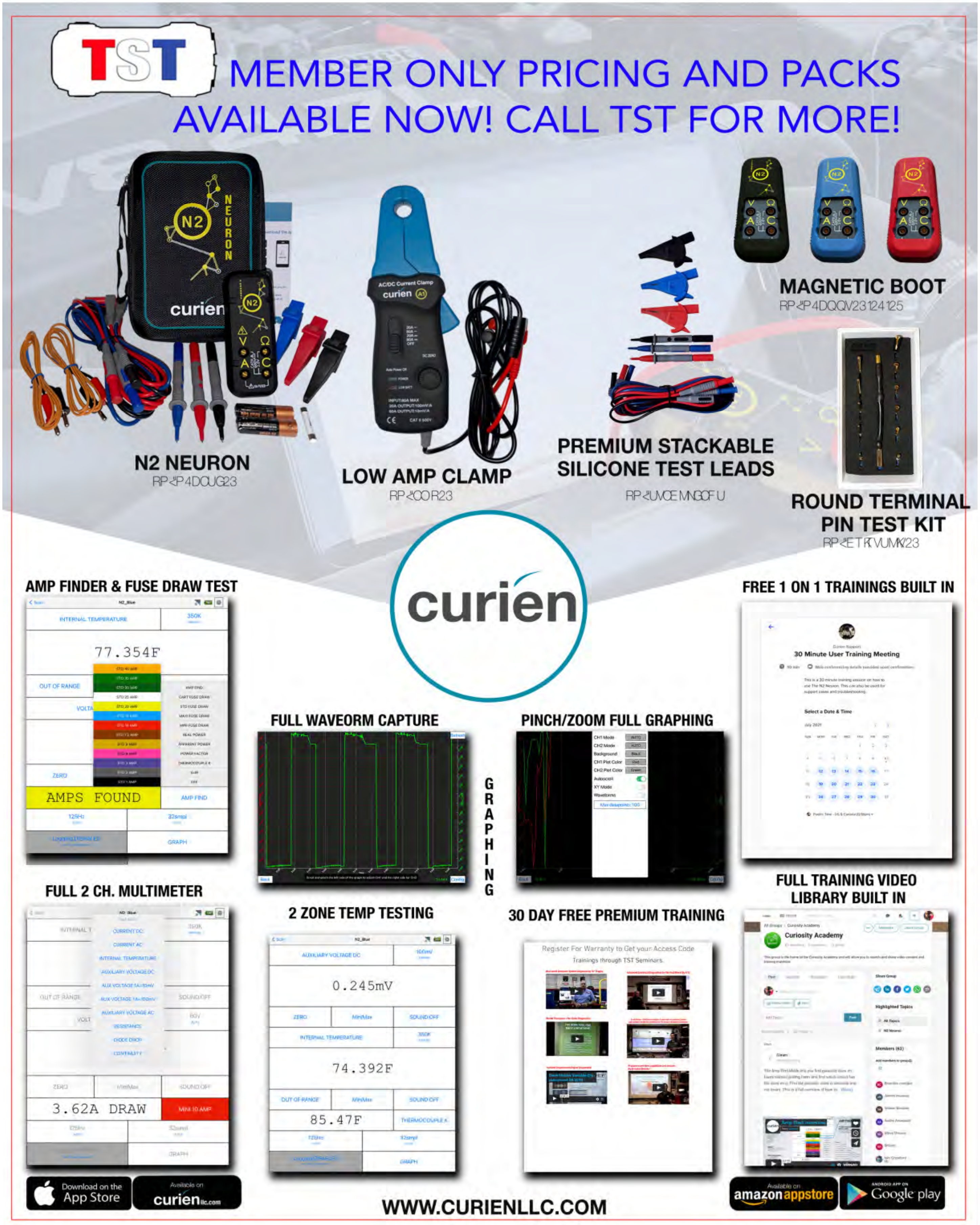
the operation of the apex seals, preventing good compression. If the seals are washed with excessive fuel, the engine will not start. The only way would be to remove the spark plugs from the Leading (lower) and Trailing (upper) Rotor Housing of the engine. This would need to be followed by disconnecting the Eccentric Shaft Position Sensor to prevent fuel from being injected in the leading and trailing rotors. The 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 at 250 rpm 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 its pressure transducer compression tester to perform the test. Using a standard compression test might not come up with an accurate reading. In fact, when my technicians first performed the compression test, it looked good on our 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 7)** and the Trailing **(Figure 8 both figures on page 22)** rotors that indicate there is indeed a problem. The Leading pressure transducer waveform look like it has high and lowers 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, and the engine was sounding better.

(Con't on page 22)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"ASSORTED ISSUES" (con't from p. 20)

We decided to run another compression test after a good test drive to make sure the engine was not shaking anymore. Take a look at the Leading pressure transducer waveform that no longer has high and lows in the waveform but rather a compression reading of about 92 psi. Even though the compression was not up to the minimum standard the vehicle ran well with no idle or power issues. Looking at the Trailing rotor waveform, 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.

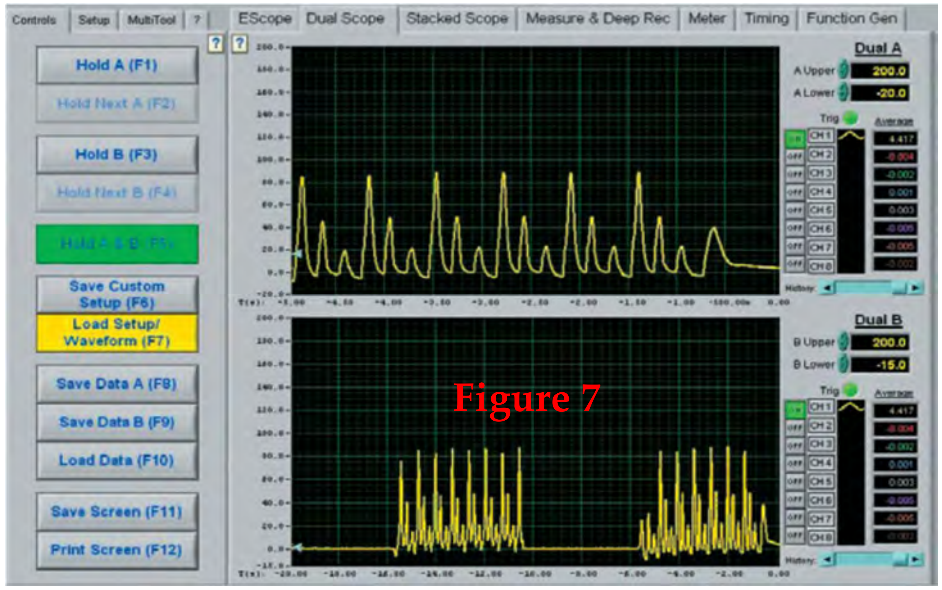

Figure 7

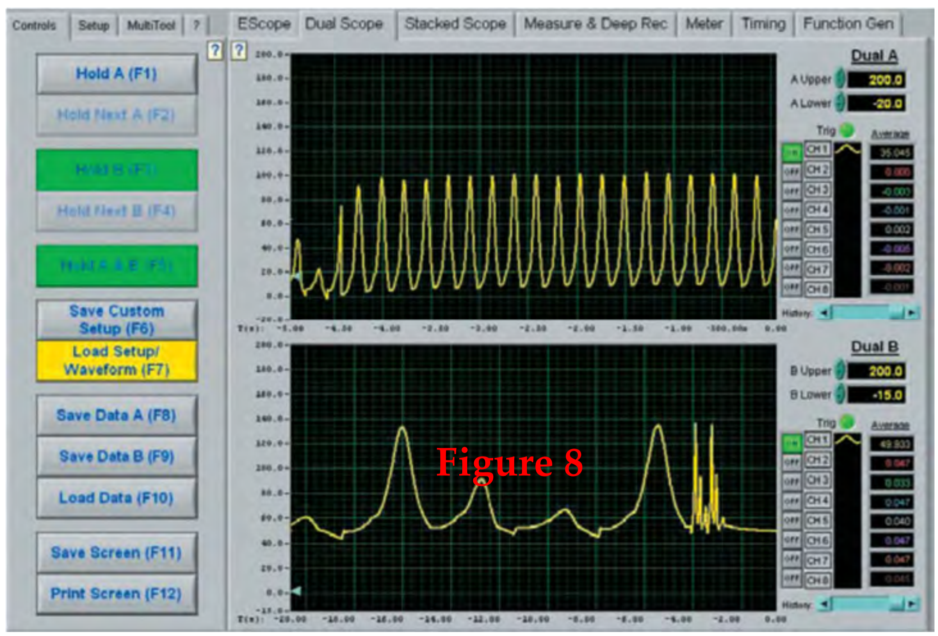

Figure 8

Article By

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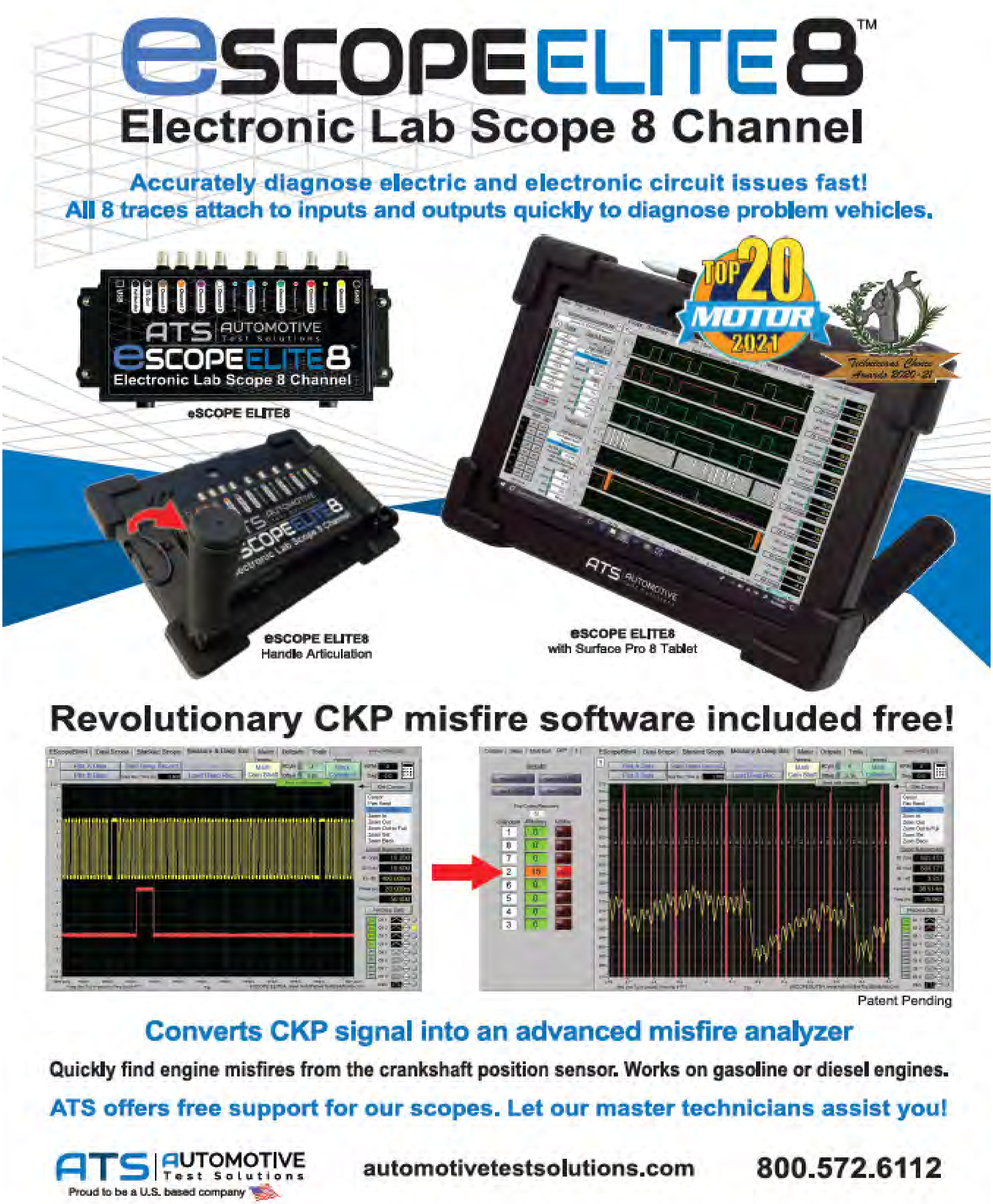
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