Volume 19, Issue 3

March 2022

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Editor

"G" Jerry Truglia

"Another Day In The Life"

We had a 2006 Volvo XC 90, 2.5 L 5 cylinder with 128,852 miles on the odometer come in with a complaint of low power, stalling and excessive oil consumption. The Volvo owner brought the vehicle in for a timing belt replacement thinking that this would solve the problem. I explained to him that the timing belt had nothing to do with the stalling or oil consumption problem. After conversing with him further, I uncovered that the vehicle had close to no maintenance performed other than routine oil changes about every 6,000 to 7,000 miles, using non-synthetic oil. In addition to the work he requested on the vehicle, I suggested that we perform a thorough vehicle inspection.

Upon inspection of the vehicle, we noticed that the serpentine belts and timing belt were all overdue for replacement. We also noticed that the Positive Crankcase Ventilation (PCV), or oil trap system, was in real bad shape. The PCV system consists of the flame trap, small and large vacuum hoses, along with an oil cap. A telltale sign of a problem was that there was a cracked PCV breather hose located on the upper part of the engine next to the fuel injectors. The odd thing about this hose being broken **(Figure 1 - Page 2)** was that there was not much oil in the surrounding area, to

(Con't on page 2)

"Another Day In The Life" (con't from p. 1)

believe that the breather system had to be clogged. A quick test of the system for proper operation is to remove the dipstick and place a rubber glove or balloon over the dipstick tube. If the balloon or rubber glove starts to blow up, it indicates crankcase pressure is present and not vacuum. Since one of the customer's complaints was excessive oil consumption (using 3 or more quarts of oil within 5,000 miles without any visible signs of a leakage) it was a good indication that the flame trap and hoses were clogged. To perform the PCV flame trap replacement, the intake manifold would have to be removed to uncover all the hoses and components. One of the PCV hoses is connected to the fuel line that goes from the front of the engine to the rear. Since this vehicle had more than 128,000 miles on it, it was in desperate need of every PCV line. Obviously since the engine had so many miles on it and all the plastic components had hardened with age, everything we touched broke, forcing us to replace more than the normal PCV breather replacement parts.

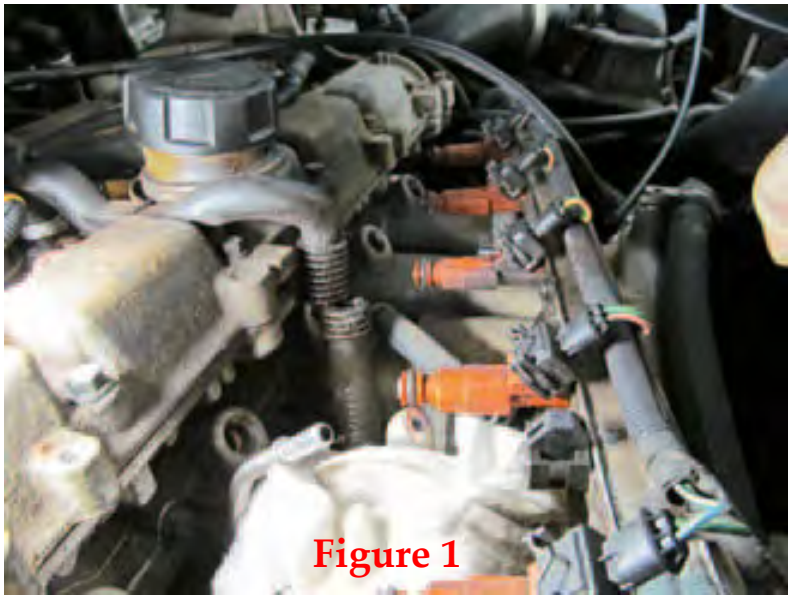

Figure 1

Once the manifold was removed, we were able to see just how clogged this engine's PCV system really was. Take a look at one of the main breather ports **(Figure 2)** for the system that is located on the lower front engine block.

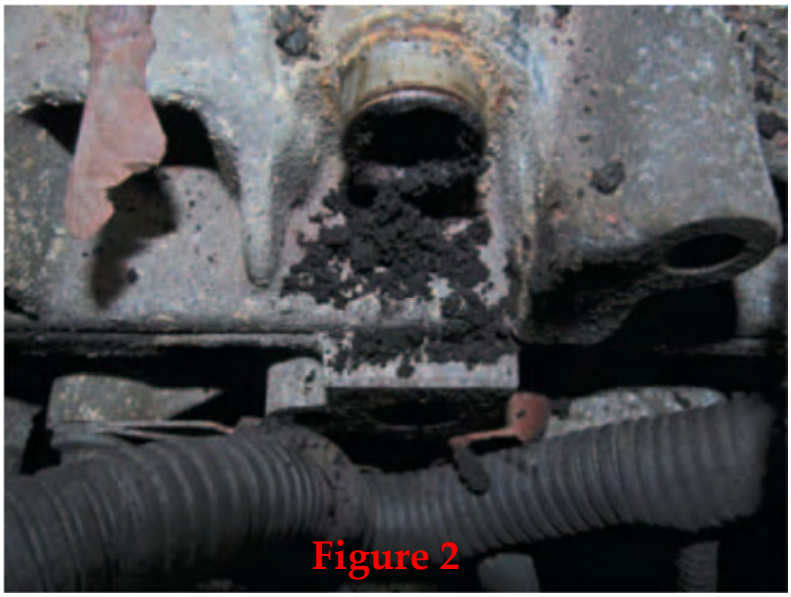

Figure 2

(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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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
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"Another Day In The Life" (con't from p. 2)

As you can see, it was totally clogged and needed to be drilled, scraped and picked clean. My tech Franklin had to spend a good two or more hours just cleaning all the passages, as well as cleaning carbon deposits from the valves and intake manifold. If the vehicle would have had proper maintenance, the replacement of the flame trap **(Figure 3)** would have been much easier. If we would have just done what the customer originally requested, he would have still had the same problem of oil consumption and stalling. It's always a good idea to perform a thorough inspection and make sure to address the vehicle owner's concerns so they leave the shop satisfied with a vehicle that is running well.

Figure 3

A Tough EVAP Leak

Sometimes EVAP leaks are close to impossible to find, especially when the leak is in the canister. Obviously when we are working on any small leak EVAP problem, we know it's going to be difficult to locate. Our first line of defense is to use our Smoke Wizard smoke machine, connected to a CO2 supply. I have used CO2 with my smoke machine for years and for good reason. First, using shop air can cause potentially explosive gas fumes in the system and poses a safety threat to my techs. Second, if smoke is not readily visible, I can use my 5-gas analyzer to sniff out the CO2, saving my techs time. Since we now have the ATS BullsEye Leak Detection system, we no longer have to fire up the gas analyzer to locate CO2 leaking from the EVAP system. The ATS system uses CO2 to help techs find leaks in a variety of applications, and includes a CO2 leak detector similar to the A/C "sniffers" you're used to. It is very accurate and easy to use, so we fired ours up and

(Con't on page 7)

"Another Day In The Life" (con't from p. 6)

went looking.

As you can see from the picture **(Figure 4)**, there was no smoke visible at the charcoal canister, but the BullsEye leak detector told a different story and pinpointed a canister leak. I have noticed over the years of diagnosing EVAP system problems that leaks at either the charcoal canister or the gas tank are the more difficult ones to find. With the use of CO2 and a tool that can detect CO2, I am able to find the leak easier. Our next step was to spray the BullsEye foam to confirm the exact location of the EVAP leak. Once the foam was sprayed on the canister **(Figure 5)**, we were able to confirm without a doubt that the canister was leaking. We called the Nissan dealer and ordered a new canister, installed it and re-tested the system. Since the vehicle owner was leaving the vehicle for a few days with us, we were able to road test it cold a few times to confirm the repair. The vehicle was now ready to return to the owner with the EVAP system problem resolved.


Figure 4

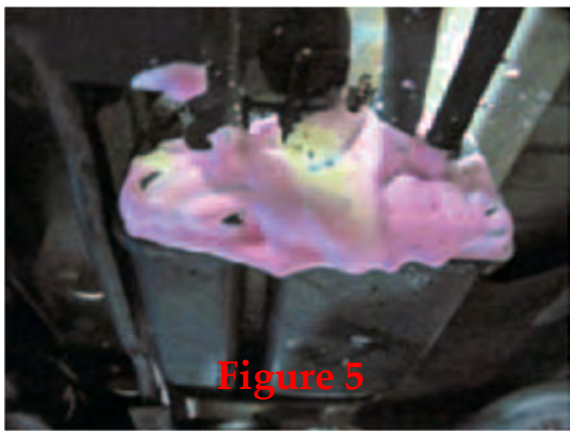
Figure 5

Headgasket Problem

In our industry there are always new tools that come out, some good and some not so good, all designed to make our job easier. Using the ATS BullsEye leak detection system has really been a big time saver in locating not only tough EVAP leaks, but also in helping my techs find elusive leaks in air conditioning systems, head gaskets and tough tire leaks. Take a look at **(Figure 6)** this A/C leak we had on a Honda that could not be located by the A/C sniffer

(Con't on page 10)

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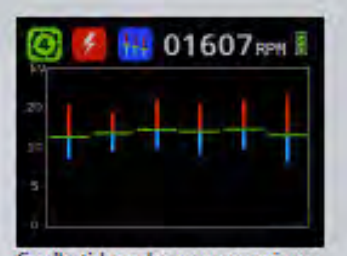
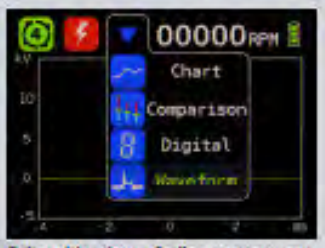


Candle stick graph compares maximum, minimum and average measurements of several cylinders.



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

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- 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).

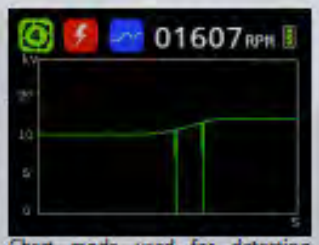

Chart mode used for detecting intermittent or infrequent failures and misfires.

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"Another Day In The Life" (con't from p. 7)

(that conforms to the new J2970 standard) or by the use of A/C dye and a UV light. Another difficult case my guys faced was a 2004 Audi 3.0L V6 with a vehicle owner concern of antifreeze usage. The first thing they did was to perform the usual visual inspection and cooling system pressure test. The results of the visual and pressure test did not provide us with any test results that were conclusive. Our next step was to perform a dye block test that did not result in any color change of the dye in the tube. Since all three tests had failed to indicate any problem, I told my techs that we needed to check the coolant reservoir bottle with the BullsEye leak detector. As you can see from the picture **(Figure 7)**, the detector confirmed the coolant leak problem. Would we have been able to find this problem some other way? Sure, but having the right tools and using them the right way just makes finding the more difficult problems easier – and that makes our job easier!

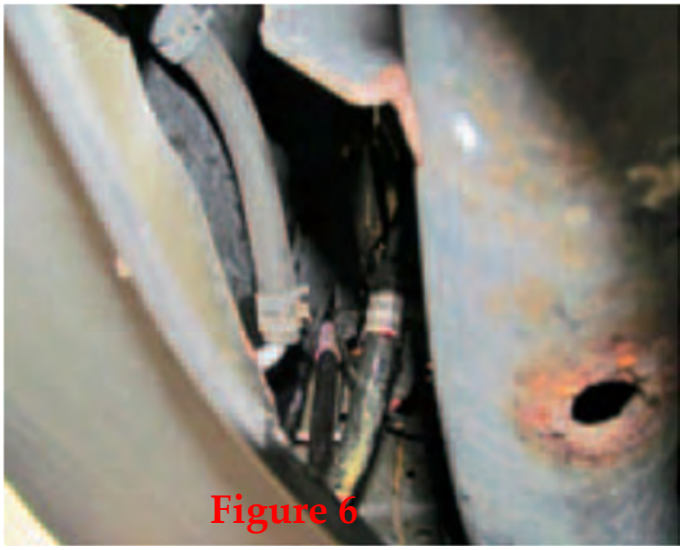
Figure 6


Figure 7

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"G" Jerry Truglia
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ASE World Class Triple Master
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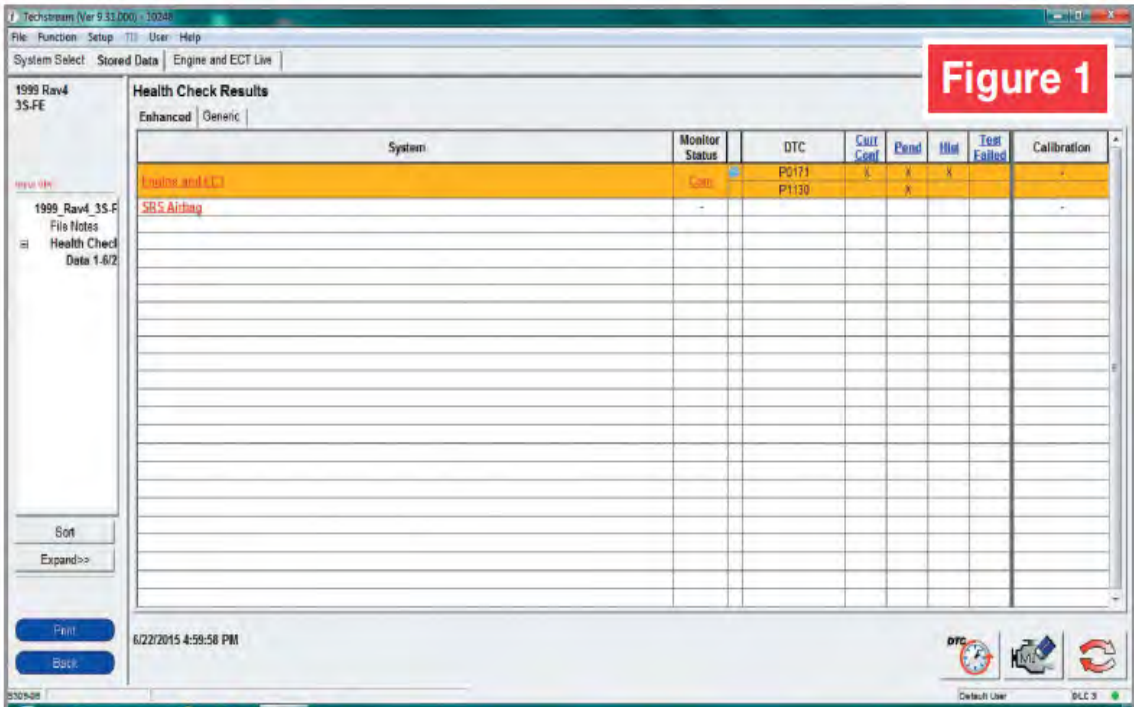
"Vehicle's From The Bays"

Our first vehicle is a 1999 Toyota Rav 4 2.0L with an automatic transmission that came in with the customer concerns of running rough, stalling and an illuminated Malfunction Indicator Lamp (MIL). When we connected our scan tool to the vehicle, we found two Diagnostic Trouble Codes (DTCs); a P0171 (System Lean – Bank 1) with Freeze Frame data and a P1130 (Air Fuel Ratio sensor circuit performance malfunction) **(Figure 1)**. Our visual inspection under the hood revealed that the AF sensor had already been replaced. With the scan data readings we saw for the P0171 and the AF sensor voltage, one could question if the AF sensor was defective or the wrong one for this Rav 4. We always want to test before we ever condemn any component and in this case, I wanted to see if the AF sensor could distinguish between rich and lean.



But before we move on to testing components, we should first take a hard look at the Freeze Frame data to better understand the conditions that were in play when the code was set. My tech (Bill) had already started to perform a bunch of tests that should have been performed only after reviewing the Freeze Frame data. So Bill and I reviewed the Freeze Frame data together and discovered an important clue as to what may be causing the lean condition. I asked Bill to accelerate and decelerate the engine as we monitored the Bank 1 downstream oxygen sensor (B1S2) voltage.

(Con't on page 15)

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"Vehicle's From The Bays" (con't from p. 12)

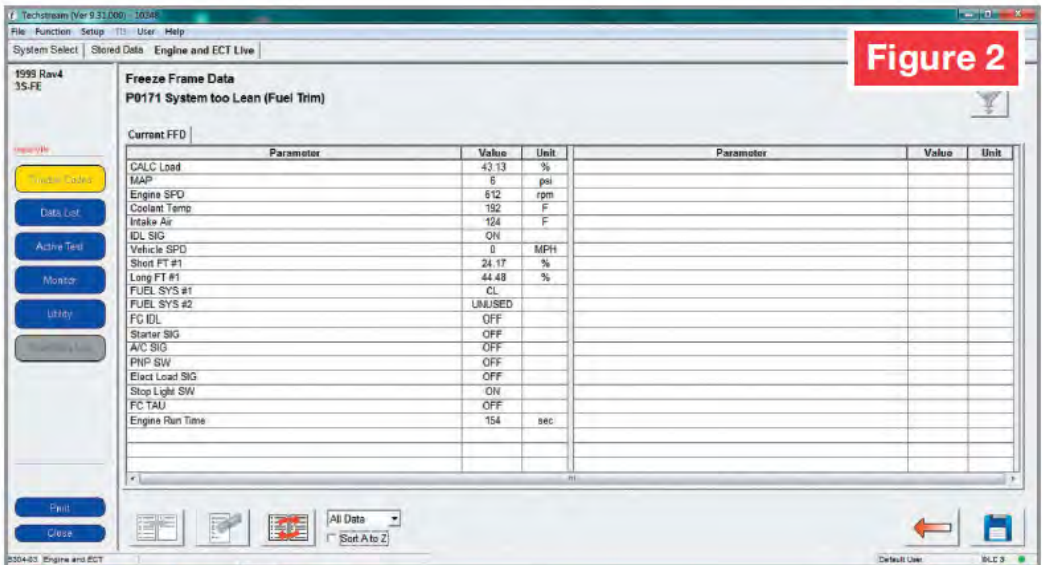
That split-second shift from fully closed throttle to wide open throttle should cause a momentarily lean mixture to pass through the engine, and when the throttle is abruptly closed again, a rich mixture should be present. The rich and lean mixtures going through the catalytic converter should have caused a shift in the downstream sensor voltage, but we did not see any change. Bill was surprised to learn that the rear oxygen sensor could have any control on fuel delivery. He thought that the rear sensor's job was only to check the operation of the catalyst. I proceeded to explain that the rear oxygen sensor on many vehicles plays a role in fuel delivery. The first test that Bill had performed (before our little Freeze Frame session) was a smoke test on the engine to see if there were any vacuum leaks a not uncommon problem on Toyotas but none were found. However, Bill had tested the engine "hot" and would need to wait for the engine to cool off to smoke the engine to make sure that there was not an intake gasket contraction problem. The next step was to check the operation of the AF sensor by introducing propane to see if the sensor would respond with a rich shift. The results of the test confirmed that the sensor was able to read a rich condition. Our next step was to introduce a vacuum leak by pulling the power booster hose to see if the AF sensor would respond in the opposite direction. The AF voltage went high and confirmed that the sensor was able to distinguish a lean condition.

Obviously the next step would be to check fuel pressure and more impor©tantly, fuel volume. Both were in specification. With no vacuum leaks found and fuel delivery verified as good, we next checked the load sensor (in this case, an MAP sensor) and the PCV system, as both can cause a lean condition, but both were good. Take a look at the Freeze Frame data **(Figure 2 Page 17)** that shows the Long Term Fuel Trim (LTFT) at 44.48 percent while the Short Term Fuel Trim (STFT) was at 24.17 percent. The question to ask is what can cause such a condition that would command such a high fuel delivery?

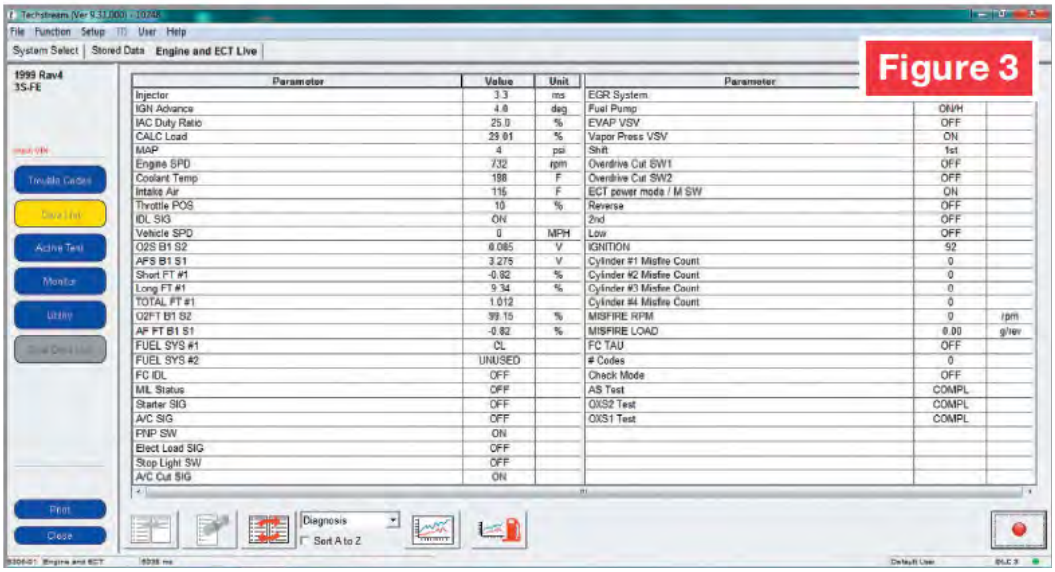
We decided to look at the current engine data that still displayed the LTFT at 44.48 percent, along with the AF sensor at 3.15 volts. The AF sensor reading from a normal running engine should be at 3.3 volts at idle and not what was currently being displayed.

(Con't on page 17)

"Vehicle's From The Bays" (con't from p. 15)



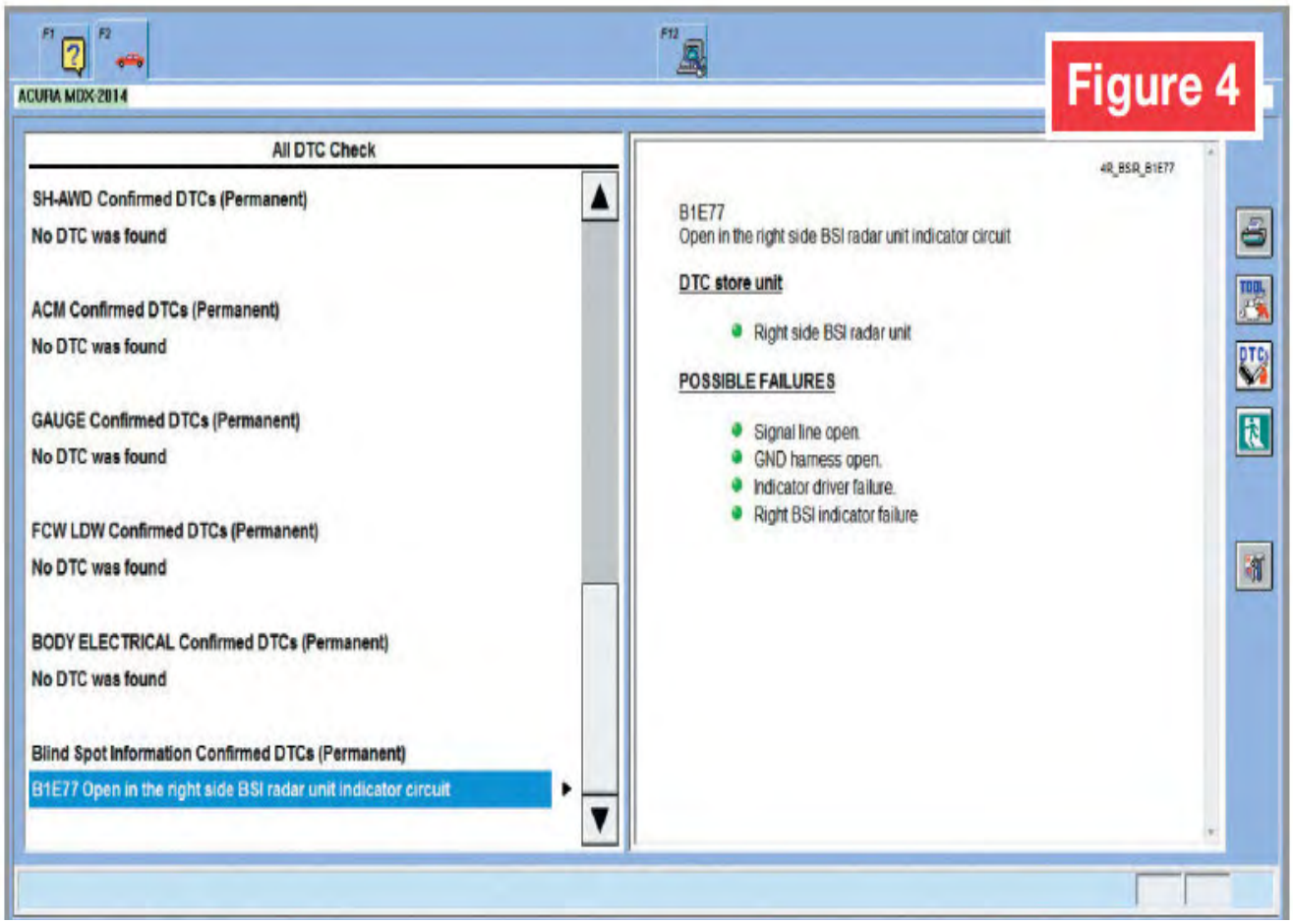
an important fact to remember is voltage under 3.3 volts is a reading that the engine is running rich, while a reading over 3.3 volts indicates the engine is running lean. Our problem Rav 4 AF sensor confirmed the P0171 DTC that it set in the Engine Control Module (ECM), now all we had to do is find out the root cause.



Looking carefully at the current engine data revealed that HO2S B1S2 (the oxygen sensor after the converter) was reading 0.0 volts. As we raised and lowered the idle, we monitored the rear sensor expecting to see a change in the voltage, but it did not. Could a rear sensor cause our problem of high LTFT command? The answer is yes and here's why: on many engines, the B1S2 sensor has authority to adjust fuel trim. On this vehicle it would have been easy to blame or replace a load sensor or other sensor without finding the cause of the problem. We ordered a new Toyota rear oxygen sensor, installed it and reset the fuel adaptation. Once the repair and the procedure were completed, we drove the vehicle until the monitor was "Ready." As you can see by the after-repair engine data **(Figure 3)**, the LTFT was down to 9.34 percent while the AF sensor voltage reading was at 3.275 volts, just about the perfect 3.3 volts that Toyota recommends at idle.

(Con't on page 20)

"Vehicle's From The Bays" (con't from p. 17)



A 2015 Acura MDX came in from a body shop that I do work for with a problem with a DTC B1E77 Blind Spot (open in the right side BSI radar unit indicator circuit) (**Figure 4)**. The possible causes associated with this DTC are problems with the signal line open, ground harness open, indicator driver failure or right BSI indicator failure. The description tells it all — an open circuit means that something has been disconnected or broken open. The fix for this vehicle was simple thanks to the information provide with the DTC description. The problem was as simple as removing the passenger door **(Figure 5)**, connecting the open connector and then clearing the DTC.

This type of DTC is becoming more and more popular as many vehicles are being outfitted with lane departure and front and rear radar systems. Take a look at the 2014 Caddy ATS on which I had to clear a DTC and reset and relearn the Long Range Radar Module.

(Con't on page 25)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"Vehicle's From The Bays" (con't from p. 20)

The process is very involved since it entails more than just reading and clearing the DTC. In fact, the module has to be programmed with the GM GDS and then be relearned while driving the vehicle at different speeds. The vehicle has to be driven for 10 to 30 minutes at different speeds while the radar system makes adjustments as the vehicle approaches other vehicles or objects on the road. Once the system has learned the low-speed calibration, the scan tool prompts the operator to accelerate to a higher speed to perform the next calibration. This procedure adds more time to programming many of the vehicles that are on the road using a radar system. Some European and Asian vehicles need special lane departure/radar alignment tools that have to be used to reset the systems.

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