

## *Technicians Service Training*

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***Editor***

***"G" Jerry Truglia***

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### *"Life On The Front Lines"*

Sometimes vehicle owners don't understand the importance of engine oil and only look at price when they need their oil changed. I am sure we have all come across a customer who has purchased or, worse yet, leased a vehicle that they really can't afford. This vehicle owner is always looking for a bargain that in the long run will get them into trouble. We recently had one such customer who gave his 2002 Lexus GS300 to his son.

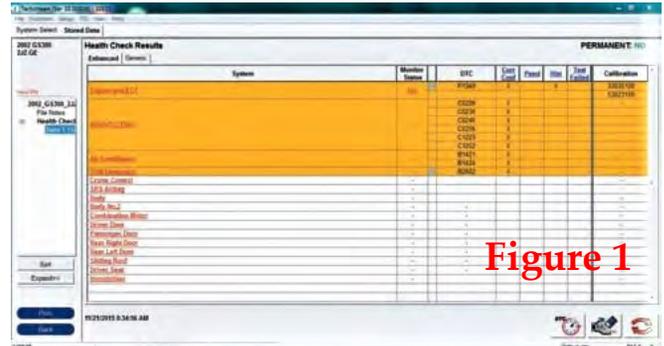
He had changed the oil about every 7,000 miles at a tire shop that used the wrong oil grade and a cheap overseas oil filter. In fact, when the vehicle owner went to the tire shop with the Malfunction Indicator Lamp (MIL) illuminated, they told him they didn't repair engine drivability problems and just proceeded to clear the codes.

The father instructed his son to go to the auto parts store and see if they could read the codes and recommend a fix. The auto parts store usually reads codes for free and recommends replacement parts for the common problems, but this vehicle was another story. The problem with this 3.0L DOHC 6 cylinder Lexus was that it had a P1349 along with eight different ABS/VSV/TRAC DTCs, so they recommended him to us. The first thing after speaking to the vehicle owner that I did was to check the oil level to make sure it was correct, ***(Con't on page 2)***

## *"Life On The Front Lines" (con't from p. 1)*

checked the DTCs for myself (**Figure 1**) and tested the Variable Valve Timing (VVT) using the Toyota Techstream's bi-directional control.

Using the VVT command with the Techstream on this vehicle is a simple on or off command that should cause the engine to run rough and stall. When the bi-directional command did not stall the engine, I disconnected the wire after



**Figure 1**

turning the ignition off, followed by restarting the engine to check the VVT solenoid operation. The results were the same as the scan tool - VVT command that did not yield any results and confirmed the lack of operation of the VVT system.

My next step was to remove the oil line (**Figure 2**) and check the screen to see if it was clogged. What I found were only pieces of the screen along with debris that I proceeded to clean out, followed by draining the oil and replacing the filter. With the correct 5W-30 GF5 ILIC rated oil, I retried the bi-directional VVT command, and now the engine was stalling out every time I selected the command. This confirmed that the circuit was now functioning properly. Our problem engine had over 138,000 miles and was neglected, since it did not even have the oil changed at the correct intervals. The engine was also way overdue for a tune up and timing belt.



**Figure 2**

While looking up the service information for the P1349 VVT DTC, I found that there were other problems that can set this DTC besides oil problems. MotoLogic listed a DTC diagnostic plan that included checking the mechanical condition of the timing belt and ECM as the possible causes. As I stated before, the timing belt was never replaced so I removed *(Con't on page 6)*

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## *"Life On The Front Lines" (con't from p. 2)*

The front upper cover to confirm what I already suspected. The timing belt **(Figure 3)** was old and had never been replaced, but the timing marks were still properly aligned. Next I decided to check the most common problems as found on Identifix and found that techs had also reported issues with the VVT actuator sprocket, VVT solenoid, VVT oil control valve (OCV), timing belt, spark plugs, ignition coils and ECM. Other important information I found is an intermittently sticking VVT solenoid or a VVT actuator sprocket that leaks oil. I explained these potential problems to the vehicle owner who said his father would be making the decision on what repairs, if any, would be performed. After explaining and reviewing all the data along with the pictures of the vehicle, the father said his son will just drive the vehicle as is.



### **I told you so ...**

A couple of days went by before I received a call from the owner's dad, mad that the MIL was back on and the vehicle was now bucking and stalling. After checking the vehicle out again, I found new codes stored in the ECM, namely; P0300, P0301, P0302, P0303, P0304, P0305, P0306, along with the same P1349. I explained that the spark plugs, coils and wires were original and in real bad shape, and that replacing them would be the next logical place to start. I also reminded him that there were still the other problems that I had already reported to him, such as the timing belt, VVT solenoid, VVT sprocket and ECM that may also need replacing. To rule the ECM/PCM out, I connected my labscope to check for aPCM command. As you can see by the waveform **(Figure 4 on page 8)**, a commanded signal square wave signal was present. But even though the square wave command changed with engine rpm, the timing never moved. These results led me to believe that the oil passages may still be clogged, so I recommended an engine flush along with changing the oil and filter. The engine flush helped remove a bunch of debris, but the solenoid still would not function properly, so I recommended

*(Con't on page 8)*

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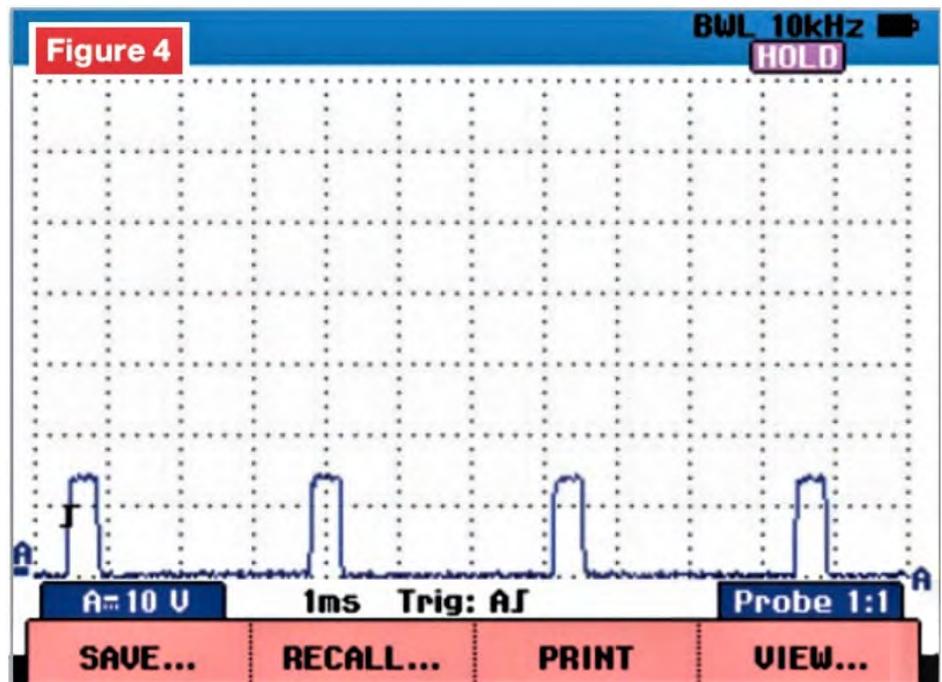


## *"Life On The Front Lines" (con't from p. 6)*

replacing the solenoid to get the engine back running good (that is until the timing belt breaks). We can only lead the vehicle owner down the right path and suggest what needs to be repaired, but we cannot make them do it. You can't fix it cheap and since the owner did not want to spend the money, I could not repair his vehicle!

### *Running rough*

Our next problem vehicle is a 2004 BMW 745i 4.4L with a complaint of engine misfire only when the engine was cold. Before coming to us, it was at a BMW dealer



where the owner was told that the repair would be more than \$5,000 because the engine needed a complete Valvetronic unit replacement. Since the owner did not trust the diagnosis from the dealer, he decided to call me (after watching a few of my webcasts on YouTube). I saw what most likely happened and why the dealer recommended the Valvetronic repair. There is a TSB on rough running that relates to the Valvetronic unit, along with another TSB for reprogramming the ECU (that the dealer performed but it did not fix the problem). The mistake in a proper diagnosis by the BMW dealer cost them a good customer because they overlooked the basics.

When one of these BMWs comes in with a complaint of rough running, it usually has the problem both cold and hot. That was not the case on this 745i, since it only happened when the engine was cold. To confirm the problem, we checked Freeze Frame data that indicated a cold temperature when the DTCs were set.

*(Con't on page 11)*



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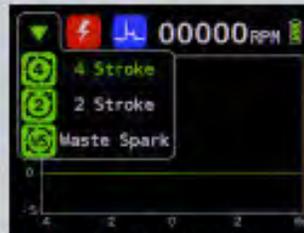
“G” is a ASE World Class Technician who has been in the industry for 48 years. He is recognized by the US Environmental Protection Agency as one of the foremost OBD II experts, technicians, and trainers in the country. He is an experienced presenter and trainer, and has presented at Mobile Air Conditioning 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.

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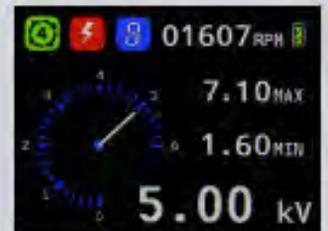
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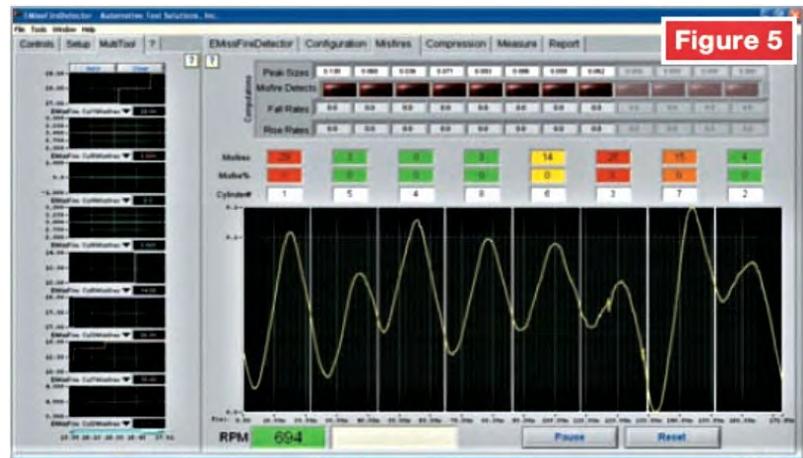
Specially designed pick-ups for coil on plug ignition modules (left) and spark plug wires (right).



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

## *"Life On The Front Lines" (con't from p. 8)*

After reviewing the Freeze Frame, we inspected the intake with our video scope for carbon build up, since it's a common problem on these engines. Our visual looksee did result in finding some carbon, but not an overabundance of it, but we still recommended the service to the vehicle owner since the engine had 140K on the clock. We checked the engine out hot both with our Autologic scan tool and with the ATS pressure transducer scope kit. The results with the scan tool showed very few misfires, while the ATS pressure transducer **(Figure 5)** found many. After performing the decarb, the engine still ran fine hot with no noticeable engine misfires.



We also noticed that the engine was leaking a large amount of oil so we suggested that the breather/PCV system be replaced since it was never replaced. We showed the owner the white oily debris that was in the breather hose ends and made him aware of the upgrade cold weather tube kit that has been available for years. We suggested that he leave the vehicle with us so we could check the engine when it was cold, since this was when the engine was misfiring and causing the check engine light to flash.

The next morning when the engine was cold, I started the vehicle up to drive it in the bay and noticed that the check engine light was flashing and the engine was running rough. Before the engine warmed up and reached operating temperature, we smoked the engine and found smoke coming out of the intake manifold at a high volume. Next we started the engine up so it could reach operating temperature then re-smoked the engine only to find no smoke coming out of the intake manifold. The results now confirmed why the engine when it was cold and had no problem misfiring when it was hot.

*(Con't on page 15)*



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## *"Life On The Front Lines" (con't from p. 11)*

Now it was time to come up with a "Game Plan" by first performing a visual inspection followed by checking the battery. We found that the battery was original and needed to be replaced before moving on and performing the other repairs. With the starting and charging system components all passing the test, I now could perform a relative compression test using my labscope to make sure that there were no engine problems. With all the testing completed, I turned the job over to Bill, who had the fun job of taking the intake manifold off and cleaning everything up. After waiting for all the parts to show up, I suggested to Bill to seal up the intake plenum while it was off the engine to make sure that the plenum was not leaking. It was a good move **(Figure 6)**! We found an intake plenum leak on the rear seam of the unit. We checked the torque on the bolts and added some RTV to the seam, since there are no gaskets available for the unit, only a complete replacement is available. After the repair was complete the real test would be if the vehicle would start up cold without flashing the MIL and running rough. The next morning with the temperature in the low 30s, I started the engine up and noticed the engine was running good and there was no flashing MIL or DTCs being set. I drove the vehicle for about an hour to make sure that there were no other problems before calling the vehicle owner and telling him it was ready to pick up.



### *Misfiring Ford*

A 2008 Ford E350 van came in with a vehicle owner complaint of an illuminated MIL and a real bad misfire that the owner said just appeared suddenly. The engine was running so bad there was no doubt that the engine had a severe misfire. Our next step was to connect our scan tool to check for DTCs and see what was happening. A P0202 (cylinder number 2 circuit open) was the cause of the problem. This code should be an easy fix since there are only three different possibilities: an open circuit, defective fuel injector and/or a PCM problem.

The first place to start is by checking voltage at the fuel injector to make sure that system voltage is going to the injector on one side.

*(Con't on page 17)*



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## *"Life On The Front Lines" (con't from p. 15)*

Our test confirmed the injector was getting more than 13 volts at one side of the injector, but was the PCM supplying ground to the injector? To confirm if the injector would fire, we grounded the negative side of the injector momentarily to make sure the injector was working and spray fuel. Since the injector had the ability to open and close, we could rule out the injector and suspected that the wiring or the PCM injector driver for cylinder 2 had to be burned open.

Before jumping to replacing a PCM, we need to confirm what caused the PCM injector driver to burn out. If we just install a replacement PCM and the injector or the wiring has low electrical resistance, the high amperage would just take out the replacement PCM. To confirm what the amperage of this conventional saturated drive injector was, we installed our amp clamp around one of the wires going to the injector as we applied ground. What we found was that the injector was drawing about 1 amp – right in spec. If the injector was drawing more than 1.2 amps for more than 6 ms, the PCM drive would be damaged. Confirming that the injector was good led us to our next step: making sure the wiring to the injector was not shorted anywhere. To confirm if the wires are shorted, damaged or good, we disconnected the wire from the PCM and the injector while placing a voltmeter (min/max selected) at one end and applying 12 volts from our Power Probe at the other end. If the wiring was good, the meter should read 12 volts without blowing the Power Probe fuse. As we were performing this test we wiggled, jerked and massaged the wires to make sure the voltage was stable while making sure not to pop the Power Probe circuit breaker. After confirming that the wiring to the PCM was good on both sides, we now felt confident in ordering a replacement PCM. We called around to the local parts store and dealers and were told that it would take a couple of days to get the PCM so we decided to call AutoPCMS.com, which could overnight the unit. The job looked like an easy PCM replacement followed by a test drive that would put this van back on the road.

replaced the PCM, the engine ran fine on the test drive until I went to park the van. The MIL illuminated and revealed a P0420 DTC that was most likely a result of the previous cylinder misfire. We suggested to the owner a fuel system cleaning to clear out the carbon and lean up the converter substrate.

*(Con't on page 20)*

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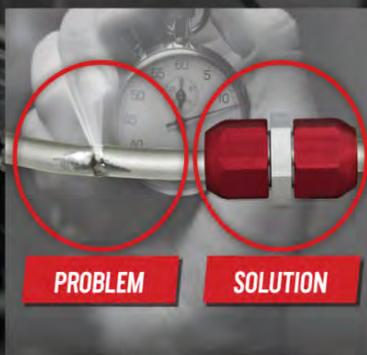
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## *"Life On The Front Lines" (con't from p. 17)*

After the procedure was completed the P0420 was gone, but the engine had a network DTC along with P0201, 202, 203 and 204. The engine was running great with no power or misfire noticed during the test drive. We checked all the injectors for power and ground, along with current ramping all the injectors only to find everything normal. It did not make any sense that the engine was running great while still having DTCs and the illuminated MIL. We called AutoPCMS.com and had them send another PCM only to find a similar problem where the engine was running great but the DTC and MIL were still a problem. At this point you start to second guess yourself and go back and recheck all your test results and do them over. All our test results were good, so I decided to install the original PCM to see if it had the same DTCs as the two replacement PCMs. What we found was that the original PCM had just the P0202 DTC that made the engine run rough. I even made sure that I programmed all three PCMS with the same Ford software from my IDS. With the same software on all three PCMs, the same problems existed on the two replacement PCMs while the original PCM just had the No. 2 cylinder problem. I called AutoPCMs.com back up and explained what was going on. They said all the PCMs that they send out are tested and that there were no problems, but they would overnight me the other one. The third PCM was good, and the vehicle ran great without an illuminated MIL or DTC and was ready to give back to the vehicle owner.

### *Article 's By*

*"G" Jerry Truglia*

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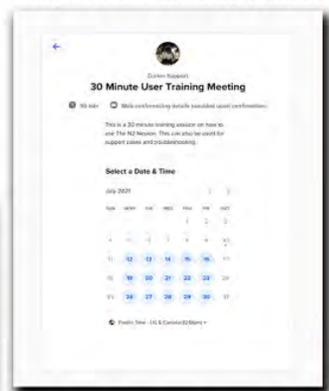
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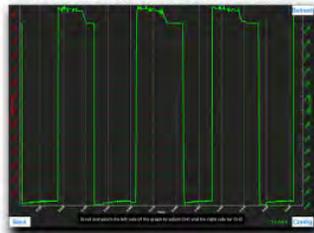
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<p><b>HIGHWAY</b></p>  <ul style="list-style-type: none"> <li>• IP67 Wireless 10" Tablet</li> <li>• Class 4-8 and Off-highway</li> <li>• Full Bi-directional Controls</li> <li>• Change/Set Parameters</li> <li>• 2 Years Free Software</li> <li>• All Cables and Connectors included</li> </ul>	 <ul style="list-style-type: none"> <li>• Wired Android 10" Tablet</li> <li>• Class 4-8 and Off-highway</li> <li>• Full Bi-directional Controls</li> <li>• Change/Set Parameters</li> <li>• 2 Years FleetCross Troubleshooter included!</li> <li>• 2 Years Free Software</li> <li>• All Cables and Connectors included</li> </ul>	
<p><b>OFF-HIGHWAY</b></p>  <ul style="list-style-type: none"> <li>• IP67 Wireless 8" Tablet</li> <li>• Off-highway Equipment</li> <li>• Generic and Diesel OBD</li> <li>• Full Bi-directional Controls</li> <li>• Change/Set Parameters</li> <li>• Calibrate Hydraulics</li> <li>• 2 Years Free Software</li> <li>• All Cables and Connectors included</li> </ul>	<p><b>TRUCK</b></p>  <ul style="list-style-type: none"> <li>• IP67 Wireless 8" Tablet</li> <li>• Medium and Light Duty Truck including Jeep and Sprinter</li> <li>• Full Bi-directional Controls</li> <li>• Special Functions: Injector Programming, Module Recoding, DPF Reset/Regen and more!</li> <li>• 2 Years Free Software</li> <li>• All Cables and Connectors included</li> </ul>	
<p><b>ACTIVATOR</b></p>  <ul style="list-style-type: none"> <li>• Activate/Read Sensors</li> <li>• Check Tire Pressure</li> <li>• Check Tire Temperature</li> <li>• Display and Identify Sensors</li> <li>• Manage up to 22 tires</li> <li>• 3 years free software!</li> </ul>	<p><b>ACTIVATOR</b></p>  <ul style="list-style-type: none"> <li>• Activate/Read Sensors</li> <li>• Check Tire Pressure</li> <li>• Check Tire Temperature</li> <li>• Display and Identify Sensors</li> <li>• Manage up to 22 tires</li> <li>• 3 years free software!</li> </ul>	<p><b>ACTIVATOR</b></p>  <ul style="list-style-type: none"> <li>• Wireless Smart Device VCI</li> <li>• Read/Clear Codes</li> <li>• Performs DPF Reset/Regen: Detroit, Cummins, Isuzu, Mack and Volvo, International and Fuso</li> <li>• New Data Logging Feature</li> <li>• Lifetime free updates</li> </ul>

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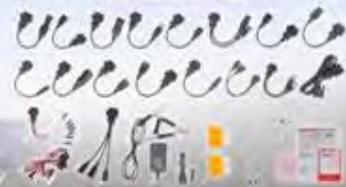
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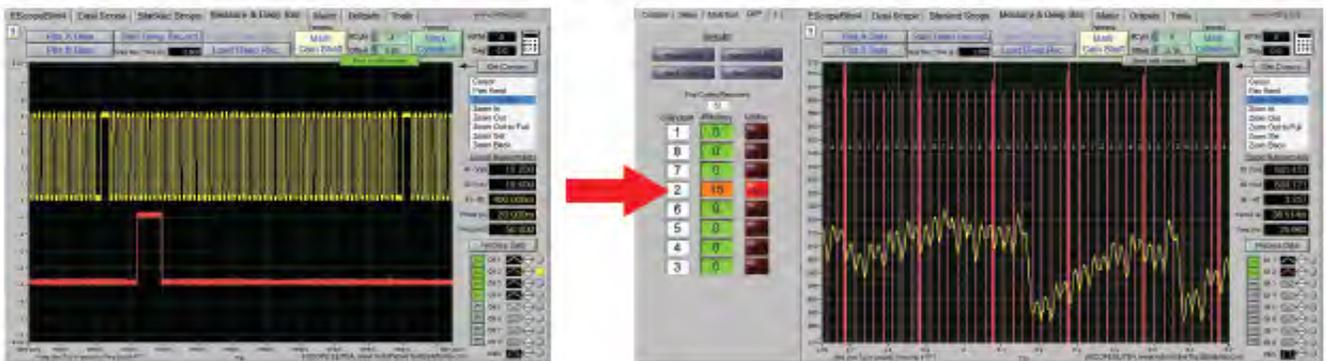
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