

THE DRIVEABILITY GUYS

RANDOM MISFIRE

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OUR ANNUAL THANKS!

Another February/March training blitz has come and gone. Between the technical courses offered at both Vision and the Auto-wares / BTB Tech Expos, and the network-ing opportunities inherent to all three events, my head is still spinning!

We'd like to take this opportunity to thank all those involved for their continuing dedi-

cation to making these training events happen. We don't know where we'd be today without events such as these!

Thanks again!

THE DRIVEABILITY GUYS

MECHANICAL DIAGNOSTICS WITH A SCOPE IS ABOUT TO GET EASIER

There has been plenty of interest recently re-garding pressure transducers, DSO's and me-chanical diagnostics with such tools. There have been many classes offered by multiple instruc-tors on this topic.

Camshaft timing and valve timing events seem to be one of the strong points of using the tech-niques taught in these classes. However, accu-rate analysis often requires potentially time con-suming calculations. Also, many overlays used to analyze the resulting scope captures have been made available, but don't work with all applications. Or hinder the technician's ability to manipulate data once the overlays are applied. Some of the tools that are currently available do an OK job of this for you, but the options are limited.

The Driveability Guys have developed a soft-ware application that will do the math for you no matter what tool you are using. The soft-ware also offers an array of overlays for those of you using a PC based scope.

Here are some of the highlights:

- Accurately plot where valve timing events are supposed to happen no matter what scope you are using.
- Calculate actual ignition timing on any vehicle with any scope with cursors.
- Use customizable overlays for a variety of situations and maintain the ability to ma-nipulate your scope data without switch-ing back and forth between windows or applications.
- Accurately pinpoint the position of any piston in the firing order anywhere in the 720 degree 4 stroke cycle.
- Works with vacuum, compression and exhaust captures. Even usable with rela-tive compression cranking current cap-tures.
- And more!

If this sounds interesting to you, check www.driveabilityguys.com for updates. As soon as the finished product is available details will be posted there.

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Points of interest:

- Join our mailing list.
Click the "Sign Up TODAY" button on our main page.
go to:
www.driveabilityguys.com
- New mechanical diagnostic software coming soon! Book mark our site and check back for details!
- Contact us if you are inter-ested in having us train at your event.

O2'S, FUEL TRIMS AND LOOP STATUS

Using O2 sensors, upstream and downstream, to diagnose misfires. This is a perfectly acceptable technique, but there can be some bumps in that road. Some of these bumps can be avoided by paying attention to fuel system (or loop) status.

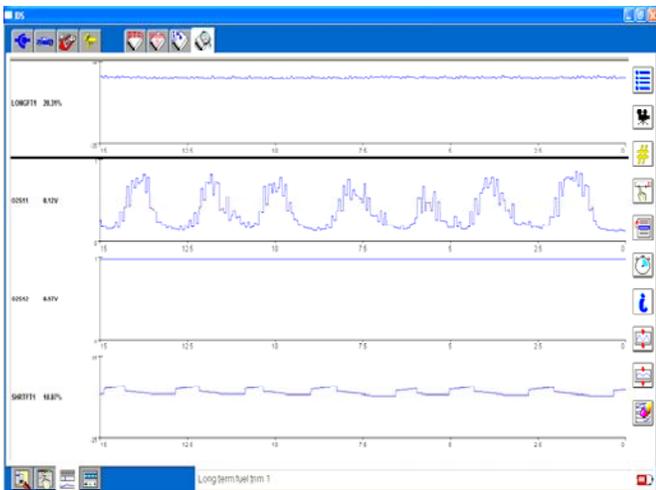
The vehicle I am using for this issue's example is a 2000 Sable with a 3.0 liter engine. The customer's complaint is runs rough and MIL flashing. A quick check of codes reveals a P0302—misfire detected cylinder number 2.

Freeze frame data shows total fuel trim correction on bank 1 is 11% positive. Although 11% is not considered optimal (+/- 5%) it is just outside the acceptable range (+/- 10%). If I had a fuel injector related issue I would expect total corrections somewhere in the neighborhood of 33% on this vehicle. This indicates to me that an ignition issue are the most likely culprit. Also high engine load, 2490 RPM and a VS of 52 MPH point me in the direction of ignition. But, let's not just trust the freeze frame... let's look at some live data.

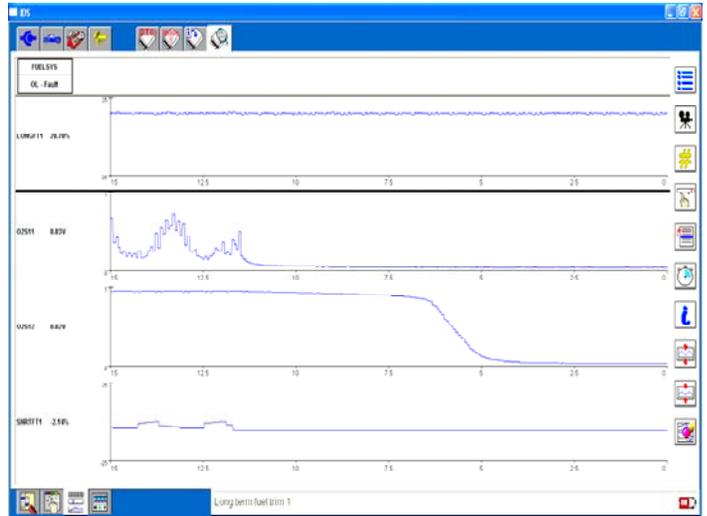
FUELSYS1 : Closed Loop
FUELSYS2 : -----
LOAD : 86.3%
ECT : 163.4°F
SFT1 : 10.9%
LFT1 : 0%
SFT2 : 2.34%
LFT2 : 0.78%
RPM : 2490RPM
VS : 52.206MPH

With the engine running and the misfire occurring I opened up IDS's data logger and the first thing I see is high positive trim numbers. Fuel injector related misfire? No. A closer inspection reveals that the trim numbers for both banks are skewed equally positive. So trim corrections at this point are being skewed by another issue that is effecting both banks.

With trims being skewed I have 2 options. I can adjust for the correction which still pints me in the direction of an ignition misfire. Or I can move to my next indicator... downstream oxygen sensor readings. In the capture below you can see my downstream O2 sensor reads high. Yet another indicator of an ignition issue.



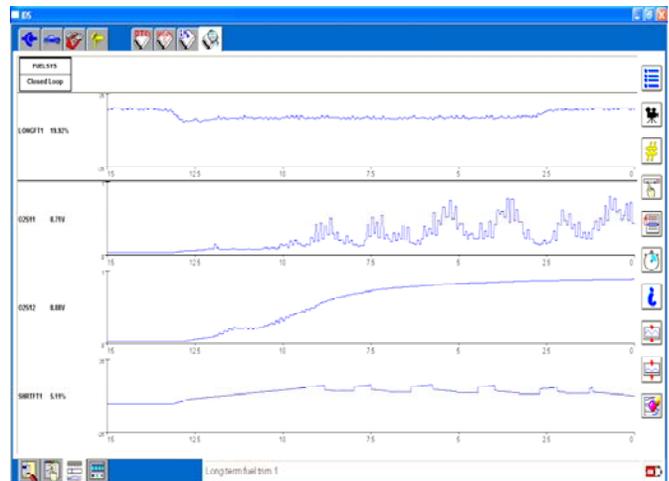
Now is the point in this article where I issue my caution statement: pay attention to loop status. Take a look at the next screen capture.



The data obviously changed. However, the vehicle still feels like it is running exactly the same... one dead cylinder. What happened?

My downstream O2 sensor flat lines lean. If I had happened to use my downstream O2 for diagnosis when this condition was occurring it would have lead me towards a fuel issue. This is a case where loop status (or the Fuel Sys PID here) needs to be paid attention to. If you notice in the upper left corner of the screen the Fuel Sys PID reads: OL—Fault. Simple enough, the PCM went into open loop because of the misfire. But, why did the downstream O2 sensor go so lean? Is the PCM not reporting accurately? Or did the engine actually start running very lean?

If we leave the vehicle run for a while it switches back to closed loop.

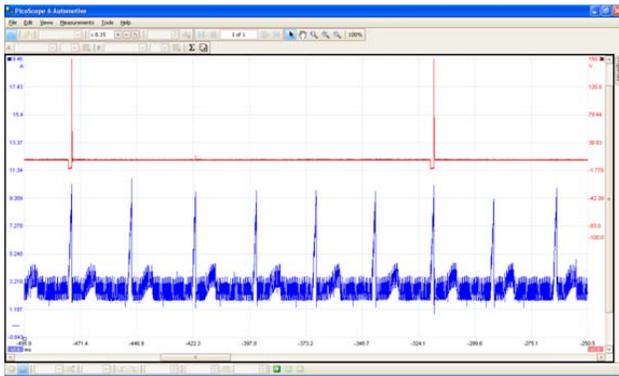


(continued on page 3)

LOOP STATUS (CONTINUED)

What is actually occurring on this vehicle is exactly what the data is telling me. Open loop fault is in fact open loop and the vehicle is now running very lean on bank 1. Why? The PCM has detected a misfire on cylinder number 2. In order to protect the catalyst from damage it periodically goes into a catalyst protection mode. The PCM enters open loop fault and disables the injector driver for the suspect cylinder to stop pumping raw hydrocarbons into the cat.

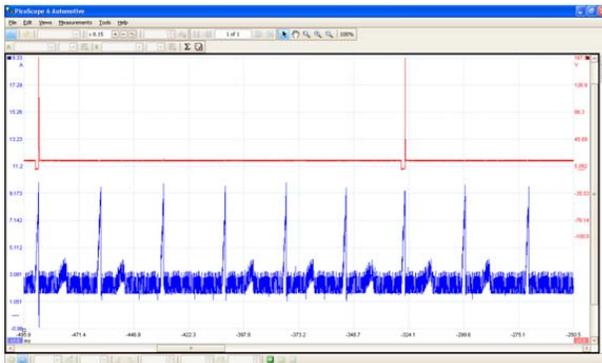
As a result, bank 1 does run lean (aprox. 33%). The downstream O2 sensor is accurately reporting this condition.



Here is a capture of closed loop operation on a scope. Please excuse the noise in the capture, but it should still be sufficient to get my point across.

The high spikes are the current ramps from the ignition coils. The 6 smaller ramps are the current being drawn by the fuel injectors.

The next capture is of the vehicle running in open loop fault.



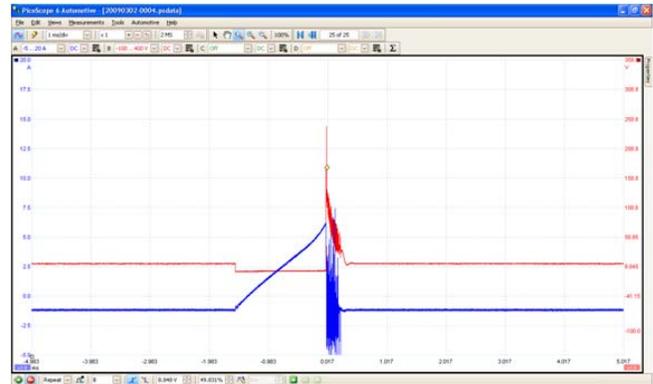
Notice that the current ramp for the number 2 fuel injector is missing. This is normal operation for this open loop fault mode. The PCM will continue to switch back and forth between the 2 modes.

Remember... the PCM does not know if the misfire is being caused by a fuel, ignition or mechanical issue. The PCM only knows that there is a misfire. Therefore, the misfire does not change when the injector is disabled. There is no difference in how the car feels when you drive it. But this strategy is the best way for the PCM to protect the catalyst.

So why the caution statement? If you are using fuel trims, oxygen sensors or even scope captures of injector current, pay attention to the loop status or you could end up chasing your tail.

This vehicle did in fact have an ignition misfire. The problem was resolved and the misfire went away.

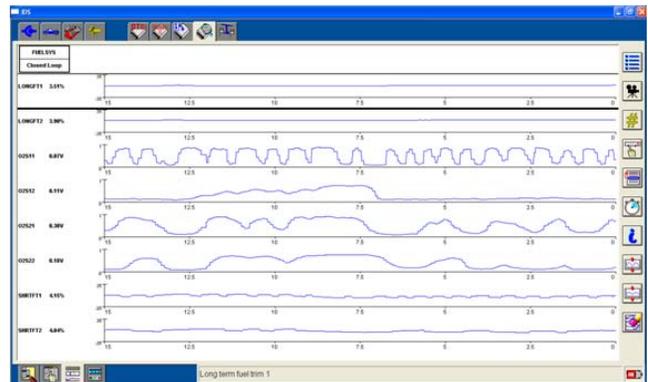
But what about the positively skewed fuel trims? Some further diagnosis showed positive total trim correction on both banks



under idle conditions. When the engine was brought up to around 2500 RPMs the total trim numbers neared zero. This indicated to me that a vacuum leak was the most likely cause. It also explained why the fuel trim numbers stored in the freeze frame were not extremely positive. The freeze frame was stored at 2490 RPM, much like the conditions I created in the bay when my trim numbers came back down.

This Sable did in fact have a vacuum leak. Another quick repair and multiple problems solved!

Final thought... do you see a slow B2S1 and a catalytic converter in the near future?



All of these full page images can be downloaded here:

www.driveabilityguys.com/uploads/loop.pdf

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We're on the web!
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JUST FOR FUN... LET'S JUST KEEP DRIVING LIKE NOTHING HAPPENED

I know that these pictures have been floating around the internet, but I thought they were too good not to pass on to those of you who haven't seen them yet. I would love to give credit for these pictures, but I don't know where they came from exactly... sorry.

Anyway, someone ran over a mattress and just kept going. Apparently they managed to go 30 miles or so before the springs ripped a hole in the gas tank.

So the vibration did not stop the customer, but the lack of fuel did.

The customer, did however, complain of a shimmy at highway speeds when the vehicle was



brought into the shop. Imagine that! I wonder what could have possibly caused this mysterious shimmy?

Thanks again to the Random Misfire reader who sent these pictures to me.

If anyone else has some "interesting" photos they would like to share, feel free to email them and they might make it to a future "Just for Fun" page.

Parting thought:

If you run something over you might want to stop before the vehicle stops you.