PHANTOM STALL

What can a tech do when an intermittent problem refuses to be duplicated in the bay?

By Mark Giammalvo, Contributing Editor

Probably one of the worst service problems you will ever encounter is a vehicle with an intermittent symptom. Worse yet is a vehicle with an intermittent stall condition. In fact, not many other problems will upset a customer more than a car that intermittently stalls.

Several years back, General Motors coined the phase: "Phantom Stall" to describe this condition. I am amazed at the American cars today that still have this problem. I have often wondered why the Asian and German cars we see in the shop rarely develop intermittent stalling. It could be just a coincidence. Then again, it might be better engineering of critical engine management sensors and their related wiring.

THE PATIENCE OF A SAINT

It all started with one of our long-time customers: a 70-year-old female, whose Buick has been stalling about every four to five months for the past two years. We have driven, inspected and tested systems and subsystems on this car during that time frame. Typically, as with intermittents, this car rarely becomes symptomatic while it is with us for service. It has always started normally and run well after the tow truck has dropped it here.

I must say that this customer has the patience of a saint. Some customers get angry when we tell them we cannot duplicate the problem. I have had people actually walk out of our service department because they refuse to understand the complexity and time needed to diagnose some of these problems.

A friend at a Buick dealership suggested we replace the crank sensor and ignition module. I have never been comfortable replacing parts on a shotgun approach. In addition, it is difficult to tell a customer: "I'm going to make some trial repairs at around $450, but remember, it might not solve the problem." Then again, some techs would say: "I didn't build it, buy it or break it."

The customer had really been frightened by this recent stall event. The vehicle had stalled out right in the middle of a busy intersection. Although she was very patient and understanding, she was nearing her wit's end with this car. As usual, I was able to start the car right off the tow truck. The customer also added that the car seemed to run strange whenever she was descending a hill or steep grade. The customer told me to drive it as long as needed to attempt to duplicate the stalling. Well, lets just say I lost count after 10 lengthy test drives. This car was running exceptionally well for a 117,000-mile car.

Later that week, the car finally did reveal some clues to its ailments. Although the car never stalled for me, I was able to duplicate the customer's complaint of trouble on steep grades. At the end of a hilly decent, the engine seemed to be run-

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ning rough. After the descent, the engine would clear out and run normally. It did not seem to be as rough as an ignition problem. To me, it felt more like a fuel mixture change.

My first thought was an improperly positioned fuel strainer or leaking mass airflow (MAF) intake hose. The MAF hose inspection revealed nothing, and I did not exactly have enough test data to warrant dropping the fuel tank. As I drove the car more, I noticed that the rough running condition did not always relate to a hilly descent. The car appeared to be developing a pattern of running rough during any significant braking event. By significant braking event I mean the long brake pedal application associated with ending a steep decent or any quick stop on level pavement that required more than normal braking time and force.

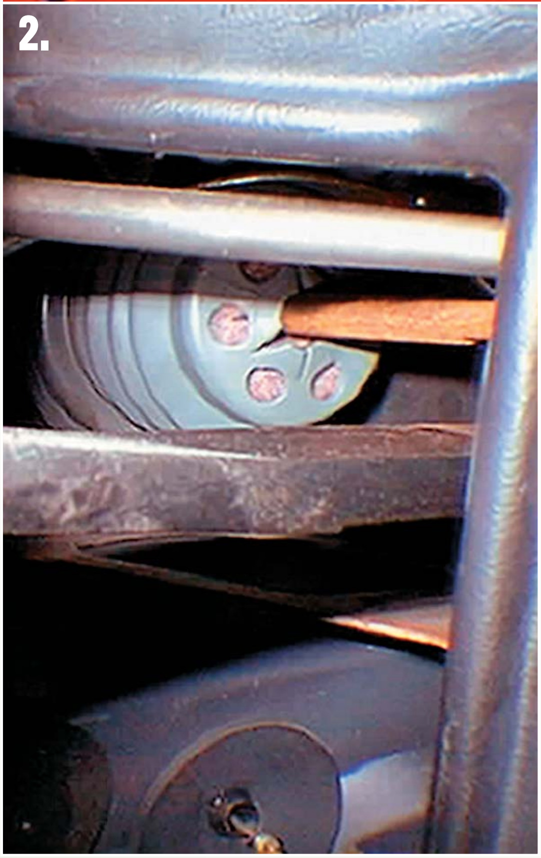
Could the rough running be related to a brake problem? If so, that would be a new one on me. It was time to look at scan data.

A PATTERN EMERGES

Although no codes were present, the scan data revealed some interesting information. Every time I applied moderate-to-heavy brake pedal pressure, the O_2 sensor's value would swing lean. Now to many mechanics, this will not come as a great surprise: Many technicians will check an idling engine's O_2 sensor's response by pumping the brake pedal quickly at a stop.

WHAT A HEADACHE

VEHICLE :	1994 Buick LeSabre Custom
DRIVETRAIN:	3.8 liter six-cylinder with four-speed A/T
MILEAGE:	117,061
SYMPTOM:	Intermittent stalling and rough running.



1. Fuel trim out of control. With fuel trim already at 148, the O_2 sensor is still showing only 13 millivolts (mV).

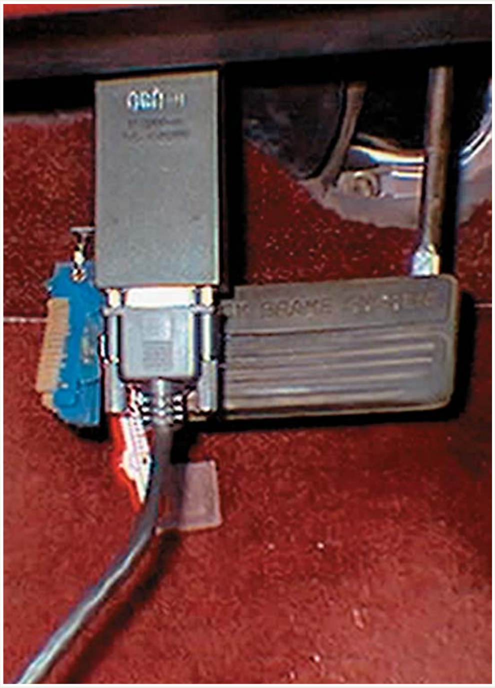
2. The vacuum leak was heard here at the pedal push rod boot.

(All photos: Mark Giammalvo)

Normally, the O_2 sensor will quickly swing lean as the additional brake booster air is inhaled into the intake manifold. Then, within a few seconds, the electronic control module (ECM) will correct this lean condition by enriching fuel mixture, thus resulting in an O_2 sensor swing to rich. The datastream values on this Buick were not exactly mimicking typical textbook fuel correction values. It seemed that the longer I held down the brake pedal, the longer the O_2 sensor would report lean.

At first I thought the O_2 sensor might be lazy when reporting the lean to rich transitions.

A subsequent O_2 sensor test proved the sensor to be working normally. Further analysis of the datastream revealed more to the story. As the brake pedal was held down, not only did the O_2 sensor report lean, but short-term fuel trim was rising rapidly. The ECM was trying to correct for the consistent lean report by increasing fuel injector on time. No big surprise there. However, no matter how much fuel trim the ECM added, the O_2 sensor kept reporting lean. If I held the brake pedal down long enough, the car would start running a little rough. Although it was not rough enough to cause a stall, this was definitely not a normal condition.



3. This is where the OBD connector is located. How convenient for it to interfere with the brake pedal. Road testing with the scan tool connected will definitely test your driving skills.

STRANGER THAN FICTION

Suddenly, a strange yet soft noise under the dash caught my attention. While pushing on the brake pedal, I could hear the familiar hissing sound of a vacuum leak. When I pushed very hard on the brake pedal, the sound of the vacuum leak became louder. Although I had never seen a brake booster cause a driveability problem, this one definitely was. If you really forced the brake pedal down, the vacuum leak was as loud as an engine with a large vacuum hose off.

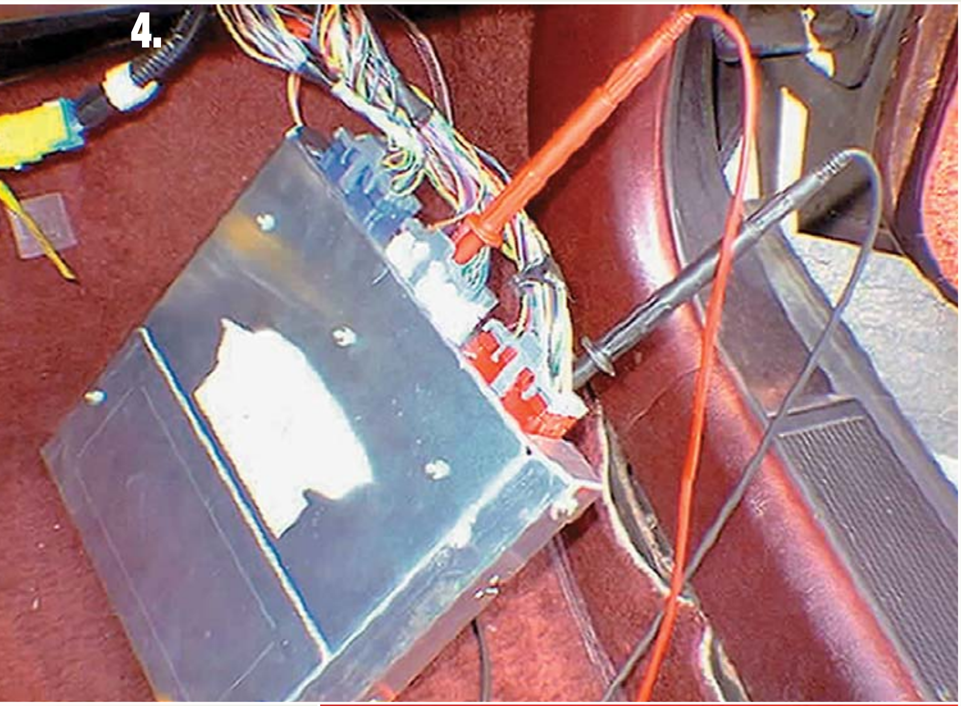
The brake booster had a tear in its internal diaphragm. Routine ECM adaptive strategy could not compensate for the resulting vacuum leak. As a result, the engine would run rough due to the lean mixture at all cylinders. Another strange thing caught my interest: Normally, if you shut off an engine while holding down the brake pedal, the pedal will drop slightly after the engine stops. On this car, the brake pedal would rise and even force my leg up as the engine stopped.

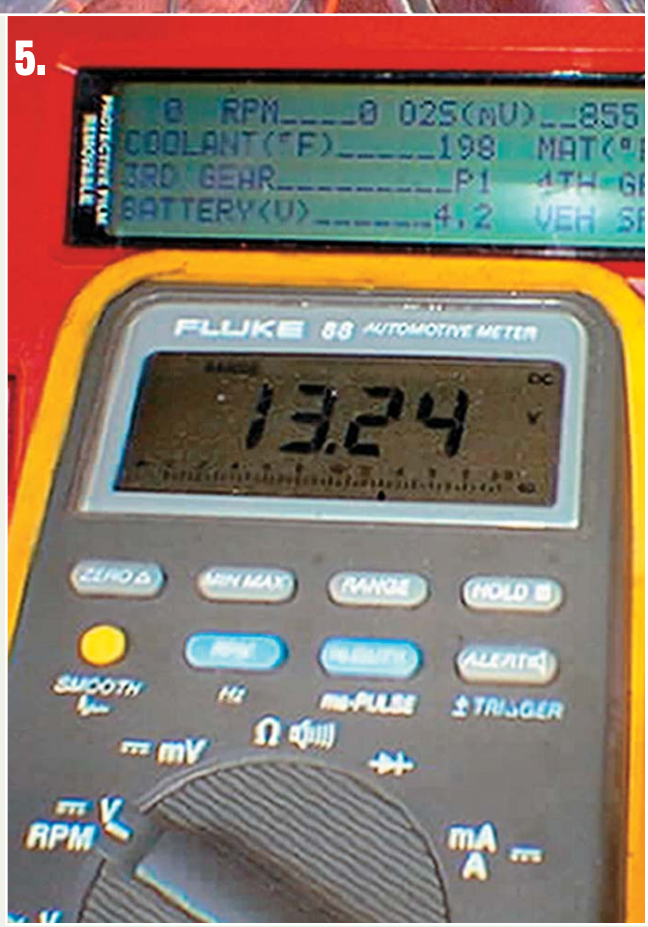
This incident reminded me of my sci-fi TV watching days. I have always been amazed at the great effort in technical accuracy in the production of the Star Trek series. Several years ago, I was watching an episode in which the Enterprise had suffered serious structural damage. A message on one of the computerized display screens caught my eye. The computer screen showed the warning message: "Environmental Systems Emergency. Habitable sections are venting to vacuum." This statement is scientifically accurate. In that scenario, damaged areas of the ship are "venting" into the vacuum of space.

The same was true here with the Buick. As I shut the engine off, atmospheric pressure entered the vacuum side of the booster through the tear in the diaphragm. This in turn moved the diaphragm and forced the brake pedal upwards and against me.

STALLING? WHAT STALLING?

Obviously, the Buick's story does not end there. Although the faulty brake booster addressed the rough running condition, no one had ever witnessed the engine stall. Even in numerous test drives after discovery of the booster problem, the car still would not stall. However, one morning when I started the car, it began to skip violently. I was hoping that I would now find the cause to the intermittent stalling. By the time I reconnected the scan tool, the engine was running as smooth as a top.





4. Here is a view of the Buick's ECM being back-probed after being taken down from its hiding place behind the dash.

5. Notice the datastream is showing ECM internal voltage at 4.2 volts. The voltmeter clearly shows the ECM was receiving proper charging system voltage.

After another week of test drives and extensive idling the engine was again running poorly. A quick glance at the datastream revealed one item out of normal parameters: The ECM internal voltage was reporting 4.1 volts instead of charging system voltage. Now, was this a problem with the ECM grounds and feeds or a problem with the ECM itself? As typical with this headache vehicle, by the time I got the ECM pulled down from under the dash the problem had mysteriously corrected itself.

The next day the engine was again barely running. Scan data showed 4.1 volts to the ECM. With voltmeter in hand, I quickly back-probed the three separate red ECM power wires and the two black/white ECM ground wires. The power wires all had charging system voltage and the ground was OK at 0.02 volts. This was definitely a problem internal to the ECM. Not that bad ECMs are uncommon in this vehicle make, but this ECM had been given the famous "tap test" by yours truly often over the past three weeks. During those tests the engine never sputtered and datastream values never changed.

MULTIPLE PROBLEMS

In the end, the Buick had two problems. So much for me thinking that intermittents are the worst problem in servicing today's vehicles. Now one could say that multiple intermittent problems are the worst service issues in modern automobiles. MA

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1. A technician is trying to diagnose a vehicle that cranks but won't run. The technician notices that the "Check Engine" light doesn't illuminate during key-on or during cranking. Technician A says that a faulty ECM could be the cause of the non-illuminated "Check Engine" light. Technician B says that a faulty ignition module could be the cause. Who is right?

A. Technician A **B.** Technician B **C.** Both technicians **D.** Neither technician

2. Technician A says that a vacuum leak could cause fuel pressure to decrease. Technician B says that a vacuum leak could cause fuel pressure to increase. Who is right?

A. Technician A **B.** Technician B **C.** Both technicians **D.** Neither technician

3. Technician A says that a defective brake booster could cause the brakes to inadvertently apply. Technician B says that a faulty brake booster could cause the brake rotors to overheat. Who is right?

A. Technician A **B.** Technician B **C.** Both technicians **D.** Neither technician

4. An exhaust leak downstream of a post-catalyst O_2 sensor could cause a change in ECM fuel trims.

A. True **B.** False

5. A MAF intake hose has a visible crack upstream of the mass airflow (MAF) sensor. Technician A says that the cracked hose could cause an increase in fuel injector on time. Technician B says the cracked hose could cause a decrease in fuel injector on time. Who is right?

A. Technician A **B.** Technician B **C.** Both technicians **D.** Neither technician

6. A vehicle with a four-speed automatic transmission will not shift into overdrive. Technician A says a faulty overdrive switch could be the cause. Technician B says that a faulty thermostat could be the cause. Who is right?

A. Technician A **B.** Technician B **C.** Both technicians **D.** Neither technician

7. A customer with an OBD II software vehicle fills his tank with fuel at a gas station. Within a mile from the station the check engine lamp starts flashing. Technician A says that a loose fuel cap could be the cause. Technician B says that a faulty ignition wire could be the cause. Who is right?

A. Technician A **B.** Technician B **C.** Both technicians **D.** Neither technician

8. A vehicle pings excessively when accelerating up hills. Technician A says that a faulty EGR valve could be the cause. Technician B says that low fuel pressure could be the cause. Who is right?

A. Technician A **B.** Technician B **C.** Both technicians **D.** Neither technician

9. Two technicians are monitoring the datastream of a vehicle that is idling in park. The technicians notice that the datastream line for the Brake Pedal Switch is displaying the exact opposite of actual brake pedal position. When the brake pedal is applied, the datastream shows the switch is off. When the brake pedal is released, the datastream shows the switch is on. Technician A says that the car must be in gear for correct readings. Technician B says this could be a glitch in the scan tool's software. Who is right?

A. Technician A **B.** Technician B **C.** Both technicians **D.** Neither technician

10. Throttle body deposits can cause the ECM to decrease the engine's idle speed.

A. True **B.** False

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