

eAir REPAIR

November 2010

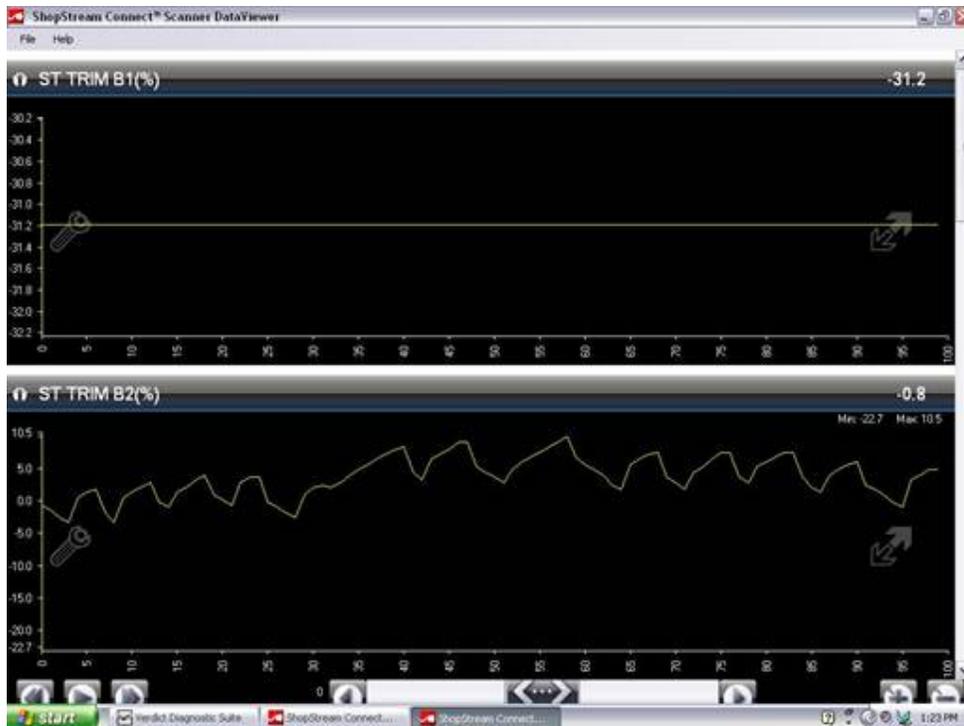


Bad Oxygen Sensor Right Out of the Box

By: Scott Shotton from *The Driveability Guys*

I recently was handed a 2003 Hyundai Tiburon with a 2.7 that was not running very well and the MIL was illuminated. The history of this vehicle was one of my favorite scenarios. It has been to four shops already, one of which was a dealer and it's still not fixed. I couldn't verify everything that had been done to the car already, but I was told an oxygen sensor had already been replaced. I really enjoy a challenge so I dove right in.

First, I connected my scan tool and pulled a P1166 – Lambda Bank 1 Control Limit. Being fuel related, I chose to look at fuel trims next. The image below is of the short term trims with bank 1 locked at 31.2% and bank 2 averaging around 2% to 4%. So bank 1 definitely had an issue.



Second, I wanted to see the oxygen sensor signals. Below are the graphs for both upstream oxygen sensors while the vehicle was idling. Bringing up the RPM's caused very little change to their appearances. Bank 1 was flat at 0.4 volts while bank 2 was switching between 0.4 volts and 4.7 volts. The bank 1 sensor turned out to be the replacement sensor. Could it be completely dead right out of the box?

In This Issue

» [Bad Oxygen Sensor Right Out of the Box](#)

2010 Seminar Schedule

- » **(NEW)** Mass Airflow and Fuel Trim Diagnostics
- » **(NEW)** Advanced Communication Protocol Testing for OBD Failures
- » **(NEW)** Four Wire Air:Fuel Sensor Diagnostics

Tec Tip of the Month

» [Send Us Your Tech Tips](#)

Got a Case Study

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Helpful Links

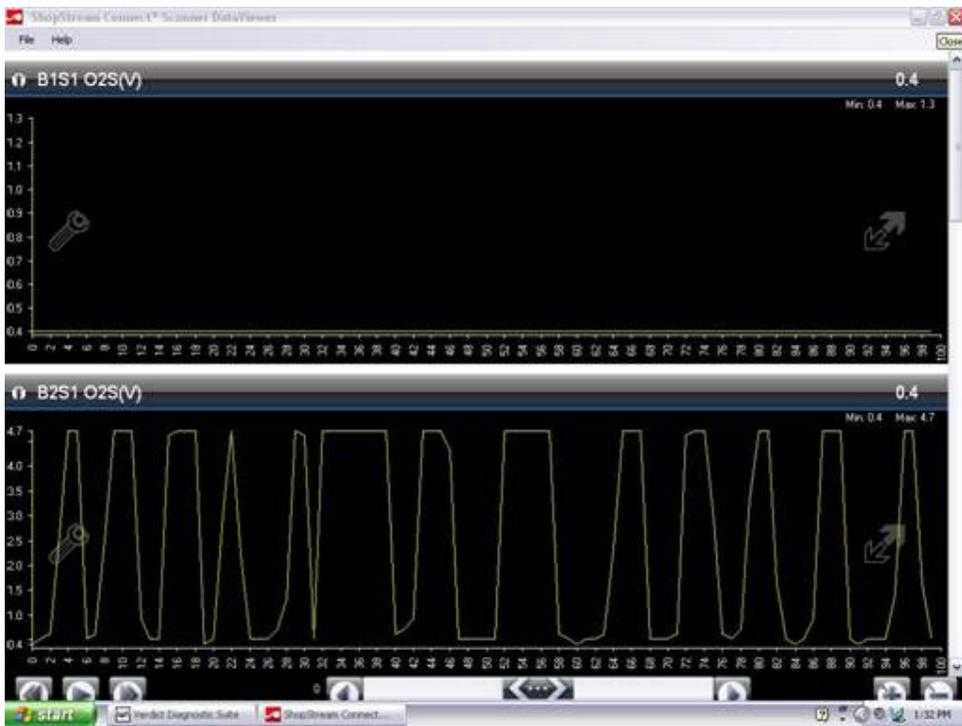
[Air Repair Newsletter Archives](#)

[Test Station Locations](#)

[Check Station Wait Times](#)

[Repair Shop Report Card](#)

[OBDII Pass / Fail / Reject Criteria](#)

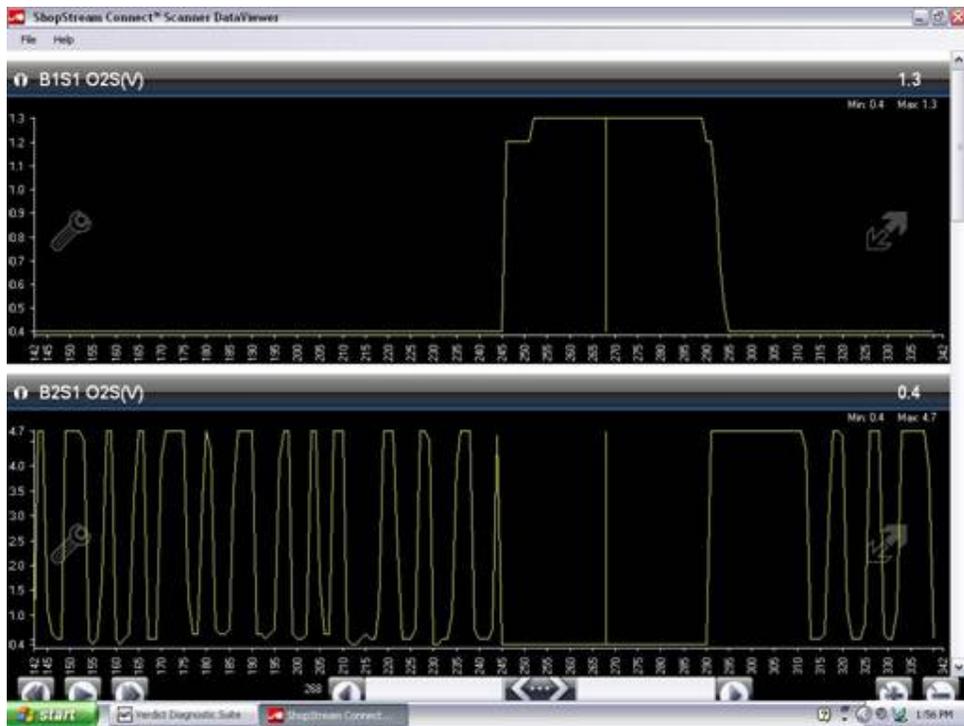


There was something else that seemed a bit odd to me. If bank 1 is showing lean on the oxygen sensor signal, why is the short term trim showing that the PCM is taking away fuel instead of adding it? Also, even though bank 2's switching appears good, why the high voltage range? Just as a double check I confirmed that the vehicle was running lean with my exhaust gas analyzer. I guess it is time to do some research.

Low and behold I found an interesting TSB that included the following chart, along with these statements: "If a vehicle was originally equipped with titanium oxygen sensors, zirconium oxygen sensors cannot be installed. Although the connectors are different, if abnormally high force is used, it may be possible to improperly force the connectors together."

OXYGEN SENSOR PROPERTIES	PREVIOUS (SM V6 before 7/28/02) (EF V6 before 8/9/02) (GK V6 before 1/1/03)	NEW (SM V6 on or after 7/28/02) (EF V6 on or after 8/9/02) (GK V6 on or after 1/1/03)
Sensing Material	Titanium	Zirconium
Sensor Operating Range	0 - 5 V	0 - 1 V
Sensor Principle	Variable Resistance	Voltage Generating
Lean Mixture	5 V	0 V
Rich Mixture	0 V	1 V

Note the difference in the voltage range of the two different sensors and how the rich/lean ends of the voltage spectrum are opposite each other. Could the oxygen sensor that was installed in bank 1 be the wrong type of sensor for this vehicle? Possibly, but let's prove it. I figured if I add propane to the intake I should be able to see the operation of both sensors and verify that very thought.



Halfway through the above capture I injected the propane. Notice how the bank 1 sensor rose to just over 1 volt. That looked like a conventional zirconium type oxygen sensor to me. And bank 2 just as the TSB described for the titanium type: 0.4 volts indicating a rich condition. This vehicle did have a functioning oxygen sensor installed in bank 1, it just happened to be the wrong type. I don't know if the original sensor was actually in need of replacement, but I was pretty sure it needed to be replaced again.

[back to top](#)

2010 Seminar Schedule

All seminars are from 6 pm – 10 pm on dates below.
They are sponsored by the Illinois EPA for the repair industry, and they are free!

[2010 Complete Seminar Schedule Registration](#)

[back to top](#)

Location

NORTH	SOUTH	EAST	WEST
Des Plaines	Joliet Palos Hills Chicago Heights	Cicero Chicago	Addison

Mass Airflow and Fuel Trim Diagnostics (NEW)

This seminar will help the driveability and emission technician make accurate decisions regarding diagnosing Mass Airflow sensor problems and fuel trim issues. A three-step procedure for testing Mass Airflow sensors will be illustrated. Fuel trim operation and strategies will be discussed as well as using fuel trim values to help diagnose driveability problems. Vehicle repair case studies will be used to enhance understanding.

Presented by: [Scot Manna](#)

ID	Date	Location
M609	November 15, Monday	Technology Center of DuPage
M610	December 13, Monday	Prairie State College

[back to top](#)

Advanced Communication Protocol Testing for OBD Failures (NEW)

This seminar will take a more in-depth look into communication issues. Case studies will be reviewed with a strong emphasis on labscope and advanced techniques leading to repair. This class was designed for the serious emission and driveability specialists.

Presented by: [Ken Zanders](#)

ID	Date	Location
Z106	November 8, Monday	Truman College
Z107	November 9, Tuesday	Morton College
Z108	December 6, Monday	Moraine Valley Community College
Z109	December 8, Wednesday	Technology Center of DuPage
Z110	December 9, Thursday	Joliet Junior College

[back to top](#)

Four Wire Air:Fuel Sensor Diagnostics (NEW)

Over the last ten years, four wire air:fuel sensors have slowly started to replace oxygen sensors. While these sensors look similar to a conventional oxygen sensor, operation and testing techniques are significantly different. This class will discuss operation and testing of air:fuel sensors used by Toyota, Nissan, Honda, and Subaru. The class will discuss in detail air:fuel sensor operation and air:fuel sensor testing. Testing techniques will include the use of a labscope, scan tool (fuel trims and rear oxygen sensor), and a gas analyzer.

Presented by: [John Thornton](#)

ID	Date	Location
T104	November 4, Thursday	Moraine Valley Community College
T105	December 2, Thursday	Oakton Community College

[back to top](#)

Tech Tip of the Month

From: the Illinois EPA Repair Industry Outreach Team

Send Us Your Tech Tips

Share your emissions related tip. Send your tech tip to epa.repair.outreach@illinois.gov.

[back to top](#)

Articles Needed for eAir Repair

From: the Illinois EPA Repair Industry Outreach Team

Got a Case Study

We are always looking for short articles of interest for eAir Repair. Many of you have gathered information for successful emissions repairs. It is time to share those tips with your fellow technicians. Please help us out by writing a brief story (a couple of paragraphs) about your success or fix.

Those tips can be e-mailed to epa.repair.outreach@illinois.gov.

[back to top](#)