

Technicians Service Training

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TST Information Update

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Upcoming Seminars:

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Editor

"G" Jerry Truglia

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HO2S (Heated Oxygen Sensor) P0135– P0141 and other Heater DTCs

P0135 and P0141 DTCs are usually the result of a defective oxygen sensor heater and or their circuits. In order to diagnosis an oxygen sensor heater DTC you first need to understand how they work and what they do. The HO2S (Heated Oxygen Sensor) is responsible for faster sensor warm up, and Closed Loop operation, in order to provide better fuel economy along with lower emissions. Once the oxygen sensor is warmed up by the O2 heater, fuel delivery will be controlled by the PCM. If the heater has a malfunction, the engine will not operate at its optimal range, effecting the O2 sensors response time, driveability and emissions. The PCM monitors HO2S voltages levels trying to keep, or bring the engine into fuel control, while providing the best performance and fuel economy. The PCM constantly checks all sensor input's trying to keep the correct air-fuel ratios in order to maintain a stoichiometric window, allowing for peak engine and converter efficiency. In plain English, this means that the PCM constantly adjusts fuel delivery up and down in response to HO2S sensor data.



(Con't on page 3)

Technicians Service Training

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Information contained in this newsletter is intended for use by professional auto repair technicians familiar with approved vehicle repair procedures. The authors are not responsible for physical injury or property damage resulting from the incorrect application of information or procedures outlined in this volume.

Currently there are **TST chapters in Connecticut, Massachusetts, New Jersey, New York** and membership continues to grow. For more information you can call

TST headquarters at:

(845) 628-6928



Technicians Service Training



What is TST?

TST is a group of dedicated technicians and instructors committed to the continuing education of our fellow technicians. We provide once a month 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.**

Why join TST?

TST membership includes special pricing on weekday night seminars and the occasional full Saturday seminar. With a **\$75.00 yearly membership, the monthly seminars are only \$65.00. TST classes are NOT sales or product seminars.** The instructors that TST brings in are all “hands-on” industry experts with up to date, cutting edge knowledge that you can use in your shop the next day. That’s 65 dollars for a seminar in which you are able to learn something useful, for fixing those tough jobs that we all see on a regular basis. Our instructors are masters at making the complex understandable. Membership also includes a Monthly Newsletter full of real world technical articles, diagnostic case studies, and solutions to the kinds of problems you see in your bays each week.

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 Motor Magazine

Bob Pattengale of Bosch

Peter Meier of Motor Age Magazine

Ken Zanders of Illinois Air Team

Jerry “G” Truglia of A.T.T.S. Inc.

HO2S (Heated Oxygen Sensor) P0135– P0141 and other Heater DTCs (con't from p. 1)

The front (upstream before the converter) HO2S is mainly used for fuel control (fuel delivery – more or less fuel to be delivered) while the rear HO2S is used for catalytic converter efficiency and sometimes fuel control on many vehicles. With that important information out of the way, let's take a closer look at the heater circuit.

A P0135 DTC refers to the front oxygen sensor on Bank 1. The PCM tracks how long it takes for the HO2S to begin switching. The DTC can be set if the engine takes too long to start switching. The most common problem as a result of the P0135 besides an illuminated MIL is a complaint of poor fuel economy.

The following are problems that can cause the vehicle owner complaint and DTCs, P0135-P0141-P0155-P0161;

- Oxygen sensor heater element that has high resistance
- Oxygen sensor heater element has an open or short
- Oxygen sensor heater circuit wiring problem, poor connections, high resistance = voltage drop
- Oxygen sensor wiring harness has an open or short in the heater circuit

Tools you need to test the heater circuit include a scan tool, DVOM (Digital Volt Ohm Meter), amp clamp and labscope.

Let's start with the easiest tool first, why use a backhoe when a shovel will do. That brings us to the scan tool, make sure that your scan tool has bi-directional controls, next select the correct PIDS (Parameter Identification). Take a look at the following scan tool screen shots, notice (*on page 9*) that the readings are displayed in DC % while some scan data maybe in amps.

(Con't on p. 7)

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Jim Bradanini
Program Administrator

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They offer \$50,000 for \$250 but we upped it to \$70,000 for \$350. <http://www.mechanicsinsurance.com>. The guys name is Jim Bradanini and his email address is: JimB@cpminsurance.com. Their phone is 203-439-2810. I had left a message and he got back to me within the hour.

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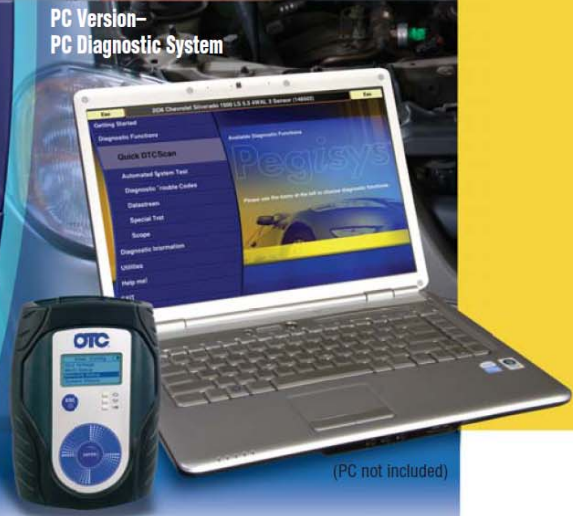
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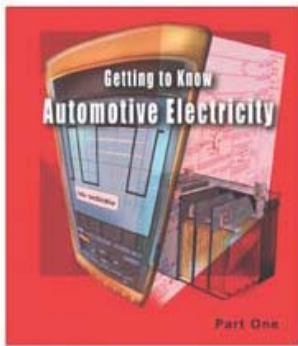
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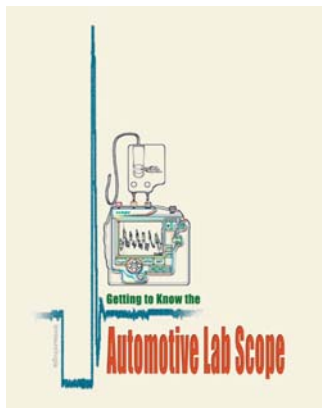
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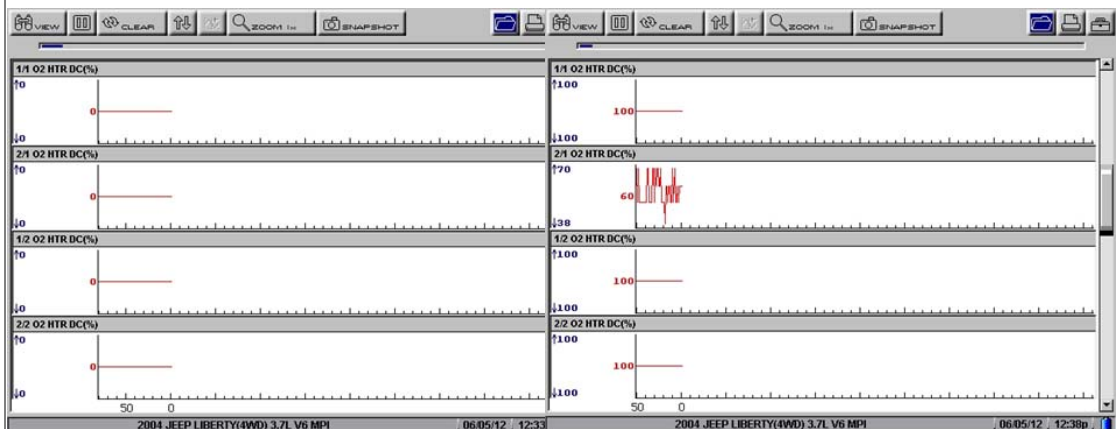
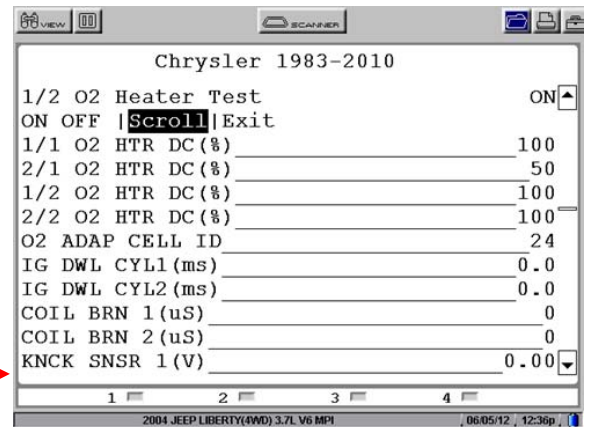
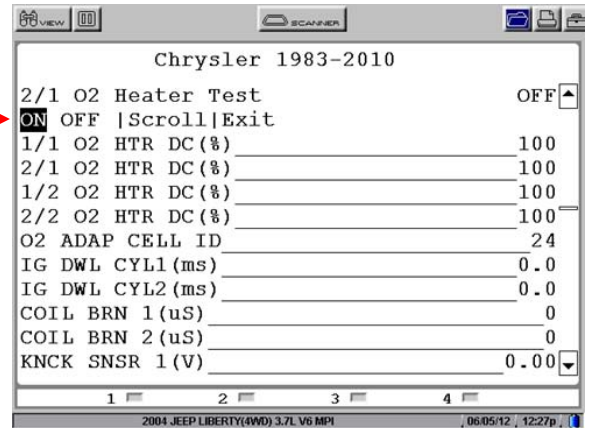
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HO2S (Heated Oxygen Sensor) P0135– P0141 and other Heater DTCs (con't from p. 3)

The scan tool screen shot (right) is the bi-directional command, that is ON so the O2 Heater can be tested. The easiest test can be done by graphing the O2 sensor voltage while watching for a change. Another test that can be performed, is by connecting an amp clamp around one of the two heater wires, checking for current. **No current = problem.** The scan tool screen shot (right) is the scroll function that can be used to display PIDS that can be used to confirm the bi-directional operation.



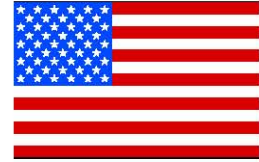
Scan tool heater graph (above left), bi-directional test, commanded OFF and above right, bi-directional test, commanded ON. This is another test that can be used to confirm if the heater is working. See the difference?

(Con't on page 9)

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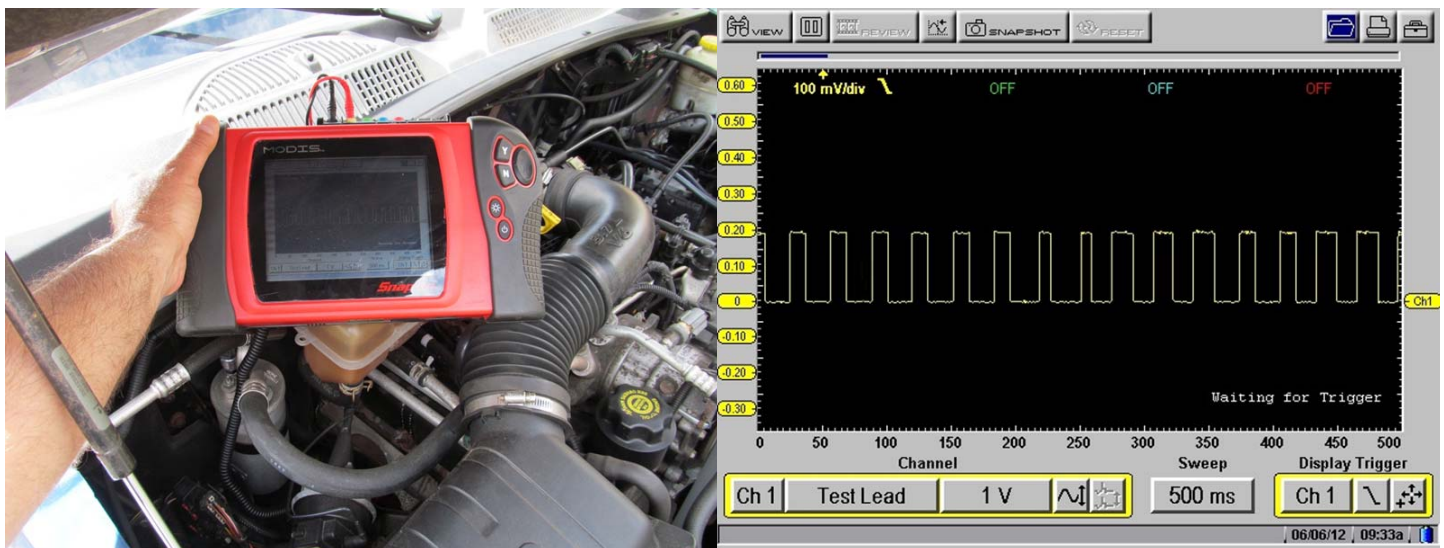
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HO2S (Heated Oxygen Sensor) P0135– P0141 and other Heater DTCs (con't from page 7)

The next tool to use is your DVOM but I am going to spare you the pictures since the directions are simple. You can use the DVOM to check resistance of the HO2S heater circuit. Select the OHM scale on the meter followed by touching the red and black leads together to zero the meter. Take the meter leads and touch the two heater circuit wires on the oxygen sensor to make sure you have the proper resistance reading. This test will check the integrity of the heater circuit. If the meter displays OL or OUCH (out limits and different for some other meters) you have an open circuit that is the cause of the DTC.

Now, the best tools to use if scan data is not available are an amp clamp and labscope as shown below.



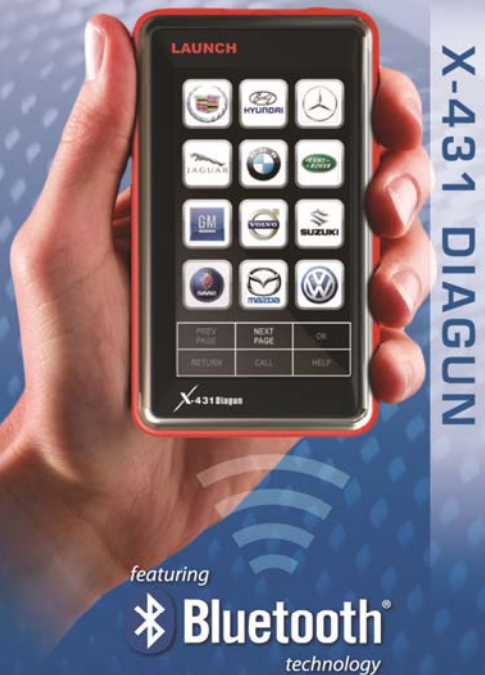
Amp clamp connected to HO2S heater circuit (above left), current amperage displayed on screen (above right). As you can see this is a very easy test to perform, just connect the amp clamp to your favorite labscope, zero the amp clamp, select the proper range (most amp clamps 100Mv = 1V) attach it to one of the two heater wires (one will be ground and the other 12 V) and read the current. The HO2S heater current reading displayed (above right) is about 1.9 amps.

(Con't on page 12)

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Questions:

1. Do you want seminars to continue in your area?

2. Do you find the seminars useful?

Please ask a fellow technician to come and check-out our seminars so we can continue to bring you the best available information each month.

We need your support:

Thank you,
G Truglia

HO2S (Heated Oxygen Sensor) P0135– P0141 and other Heater DTCs (con't from page 9)



Amp clamp connected to one of the two heater wires and set to 1mv/10ma that equals 100 mv/1 amp. Always make sure that the amp clamp jaws are fully closed and that the battery in the clamp is good.

Case Study

2004 Jeep liberty 3.7L

This vehicle came in with a P0141 HO2S Heater Circuit Bank 1 Sensor 2 problem. The location of this sensor is after the catalytic converter so its easy to access, diagnosis and repair. Knowing that this vehicle uses an oxygen sensor heater relay for the rear sensor, I made sure to make a mental note just in case my amperage test came up with a zero reading. I started my diagnosis using my amp clamp and labscope connected to the heater circuit. Take a look at [page 16, scope screen shoot to the left](#), to see what I found. Notice that I have no current being displayed on the scope. I proceeded to check the connector and found that it did have voltage. Next I switched my DVOM from the voltage scale to the OHMS scale, so I could test the heater circuit, only to find that the heater circuit was open.

(Con't on page 16)

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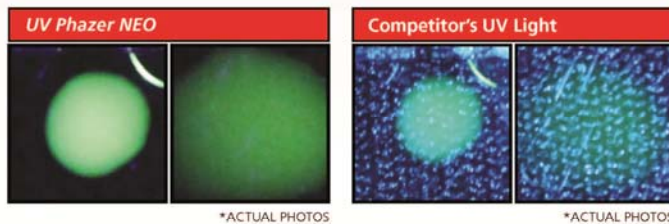
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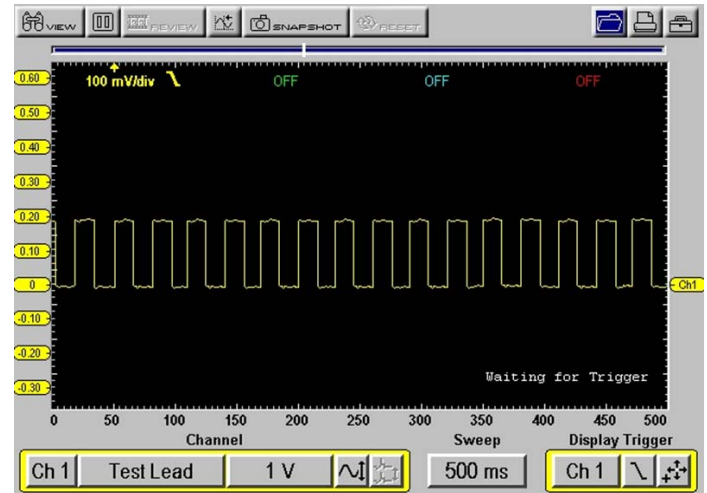
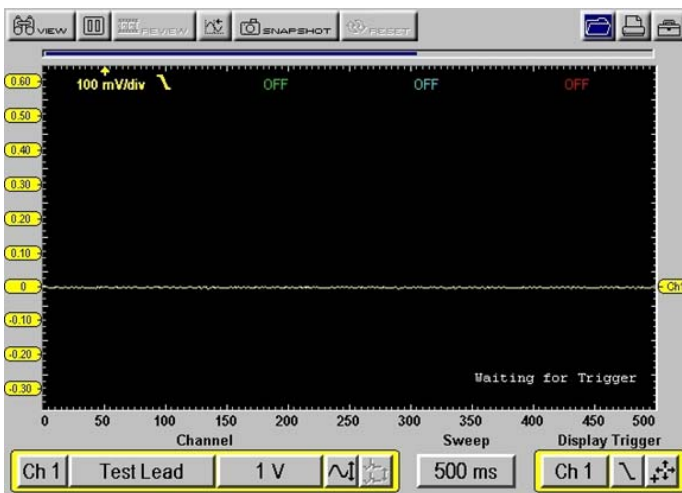
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HO2S (Heated Oxygen Sensor) P0135– P0141 and other Heater DTCs (con't from page 12)

The fix for this vehicle was to replace the HO2S sensor and clear the DTC. Take a look at the heater circuit amps readings (below right) on the labscope after the repair. Notice that the amperage is being pulsed on and off, depending on how hot the sensor is. Remember to prevent damage to the HO2S heater and circuit the on time is pulsed, limiting the current to 2 amps. The screen shot I capture (below right) displays the heater circuit cycling on and off to maintain proper temperature and oxygen sensor operation.



Article by G Truglia,

ASE CMAT, CMTT, CMST, L1, CNG & TST Founder, President

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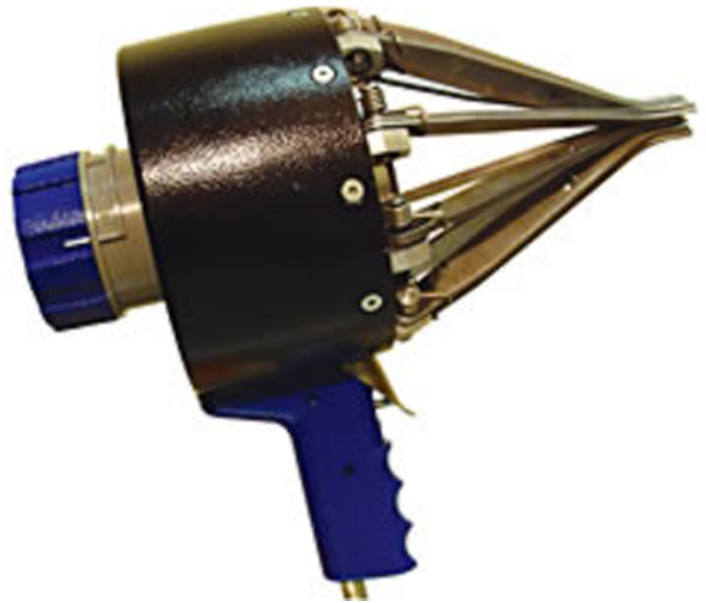
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TST Information Update

In an effort to keep our current pricing and provide our membership with the highest level of live seminars, webcast, TST Round Tables and information, we are implementing a new membership policy. The policy is as follows;

Membership for all members starts in September and ends at the end of August

Prorated for all memberships whether personal \$75 or shop \$225 so you are credited for the part of your membership left till September.

Are you receiving our; Postcards? Emails? Faxes?

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Remember that TST Seminars are **NOT CANCELLED** due to weather related problems including snow. If for some reason there is a need to cancel a seminar you will receive a phone call. **We need accurate contact information to accomplish this.**

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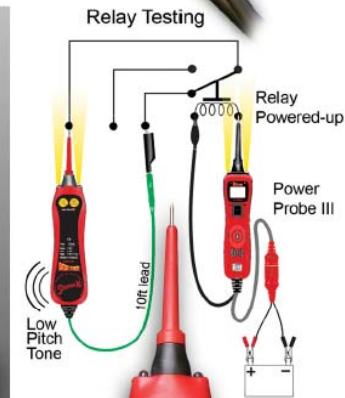


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