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Using the DG-700 and TECLOG to Measure Worst Case Fan Depressurization and Appliance Draft

Buildings with natural draft combustion appliances should be routinely tested to ensure that the spillage of combustion products into the building is unlikely. Combustion safety testing is critical because of the potential for severe health effects from spillage susceptible appliances, including carbon monoxide poisoning. Building depressurization, caused by exhaust fans, dryers, unbalanced forced air distribution systems, and duct leakage can be a major cause of appliance spillage. As buildings (or combustion appliance rooms) are made tighter, these problems can be made worse, although very leaky buildings can also have venting problems related to depressurization. One way to determine how the combustion appliances respond to changes in building pressures is to perform a worst case depressurization test, along with an appliance draft test.

If you have a DG-700 gauge (or a DG-500 or APT data acquisition box) and a laptop computer, you can easily perform and graphically document these important tests. All you need is a copy of our TECLOG for Windows software (available for free at www.energyconservatory.com) and a standard 9 pin serial cable to connect the DG-700 gauge to your computer. Using TECLOG along with your DG-700 gauge you can capture and record the two best indicators of venting performance, namely the pressure in the Combustion Appliance Zone (CAZ) and the appliance draft pressure. (Consult Chapter 10 of the Minneapolis Blower Door Operation Manual for more details on combustion safety testing.)

Getting Started/Example File

Below is a quick summary of what is involved in performing these tests. This summary uses an example test file recorded on a house with a natural draft water heater (the furnace was sealed combustion).

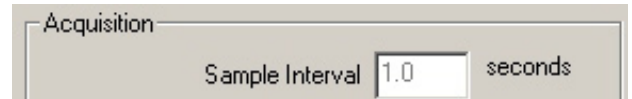
1. Set up your DG-700 to measure both the CAZ pressure and the vent pressure for a natural draft appliance. Since we want to measure the CAZ pressure with reference to outside, you will need to connect the **Channel A** Reference tap to an outside pressure hose. Leave the **Channel A** Input tap open to the CAZ (assuming the gauge is in the CAZ). Connect the **Channel B** Input tap to

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a static pressure probe installed in the appliance vent. Leave the **Channel B** Reference tap open to the CAZ.

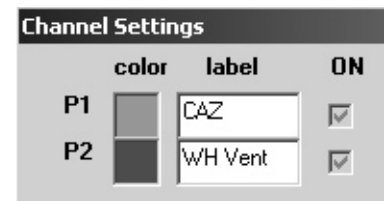
2. Connect the DG-700 to your computer using a 9 pin serial cable, and turn on the computer and gauge. Make sure all fans and combustion appliances are off. (**Note:** If your computer does not have a serial port but does have a USB port, you will need to purchase a USB to serial adapter - contact TEC for recommendations).

Figure 1.



3. Start TECLOG and open the **Configuration Settings** window (click on **Configuration....Settings**). Enter **1.0** seconds into the **Sample Interval** field (this tells TECLOG to take one second average pressure readings - see Figure 1).

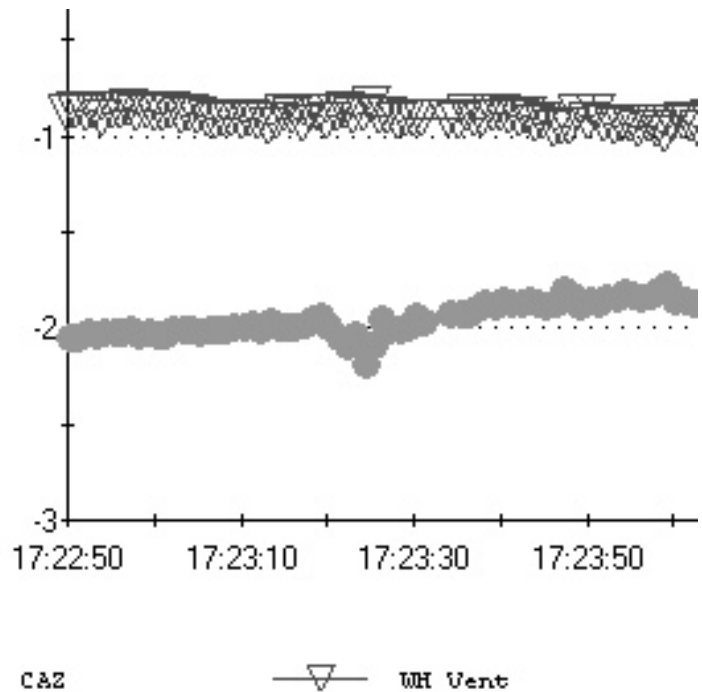
Figure 2.



4. Now open the **Channel Settings** window (click on the “**View and Edit Channel Settings**” button). In the **label** fields, type in appropriate labels for P1 and P2 (these correspond to **Channels A and B** on the DG-700 - see Figure 2). These labels will appear on the graph generated by TECLOG. After typing in the labels, exit both the **Channel Settings** and the **Configuration Settings** windows.

5. Begin data recording using the **Recording....Start Recording** menu item. After entering a filename, data collection and recording will begin. TECLOG will display a graph showing the CAZ pressure and the appliance draft pressure. In the graph to the right, the baseline CAZ pressure is approximately -2 Pa (typical cold climate wintertime pressure - see Figure 3) while the baseline water heater vent pressure is about -1 Pa.

Figure 3.



6. Turn on exhaust fans one at a time. Each time an exhaust fan is turned on, TECLOG graphically displays the change in both the CAZ pressure and the vent pressure. In this case, a dryer, a kitchen fan and a bath fan were turned on (See Figure 4 on page 3). The CAZ becomes more depressurized with each successive fan, until the CAZ pressure was about -4.5 Pa with all fans running. This represents a measured worst case fan depressurization of -2.5 Pa (from -2 Pa baseline to -4.5 Pa with all fans running). The graph also shows that the water heater vent pressure becomes slightly positive with all fans running, indicating that outside air has begun to come down the water heater venting system. **Note:** The air handler fan did not cause a change in CAZ pressure.

(Continued on Page 3)

(WCD Testing, continued from Page 2)

7. Now turn on the water heater with all fans continuing to run. In this case, the water heater immediately begins to spill into the house due to the downdraft in the vent (note the positive vent pressure - see Figure 5). The water heater continues to spill for about 90 seconds at which time the venting system finally warms up, suddenly reverses and begins to operate properly. Once the venting system overcomes the downdraft, the water heater draft is a strong -4 Pa.
8. Stop data recording using the **Recording....Stop Recording** menu item.

Although this testing can certainly be done without TECLOG, using TECLOG gives you better documentation of what you found, more definitive measurement of the pressure changes and a more professional way of reporting the results to your client.

Other Hints

- Create a TECLOG configuration file which stores all of the channel and configuration settings needed to do your testing. Then simply load the configuration file using the **File.... Load Configuration** menu item and you are ready to go.
- Use a notebook to jot down the times at which you turned on or off the exhaust devices and air handler. Make sure to synchronize your computer clock with your watch before starting. These “events” can then be added to your test file by using the TECLOG **Event Marker** tool (as shown in the graphs above).
- Use the **Stats** tool to quickly determine the average pressure reading for any selected portion of the graph.

Figure 4.

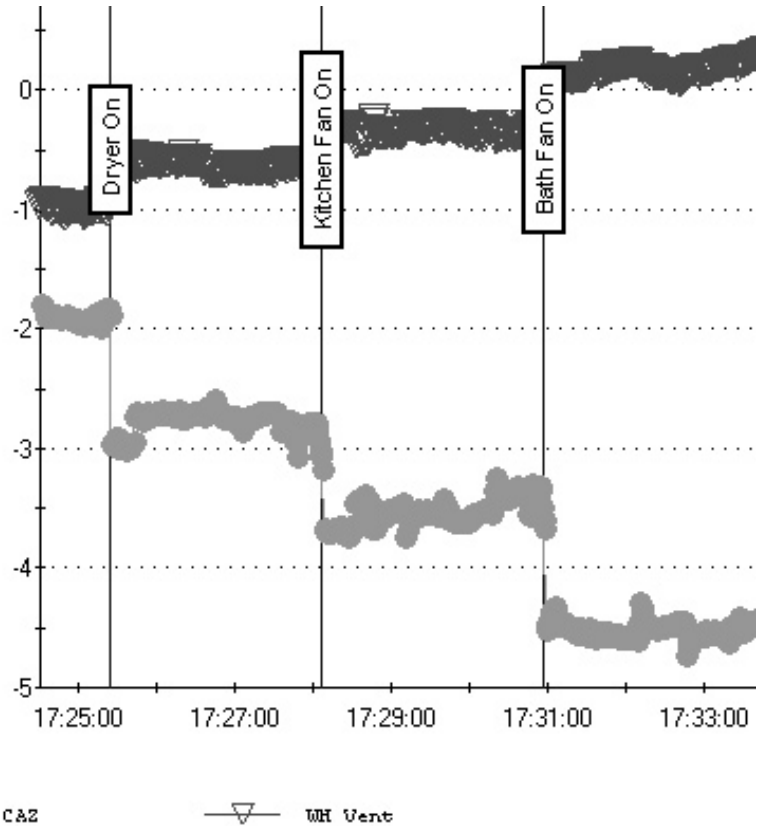
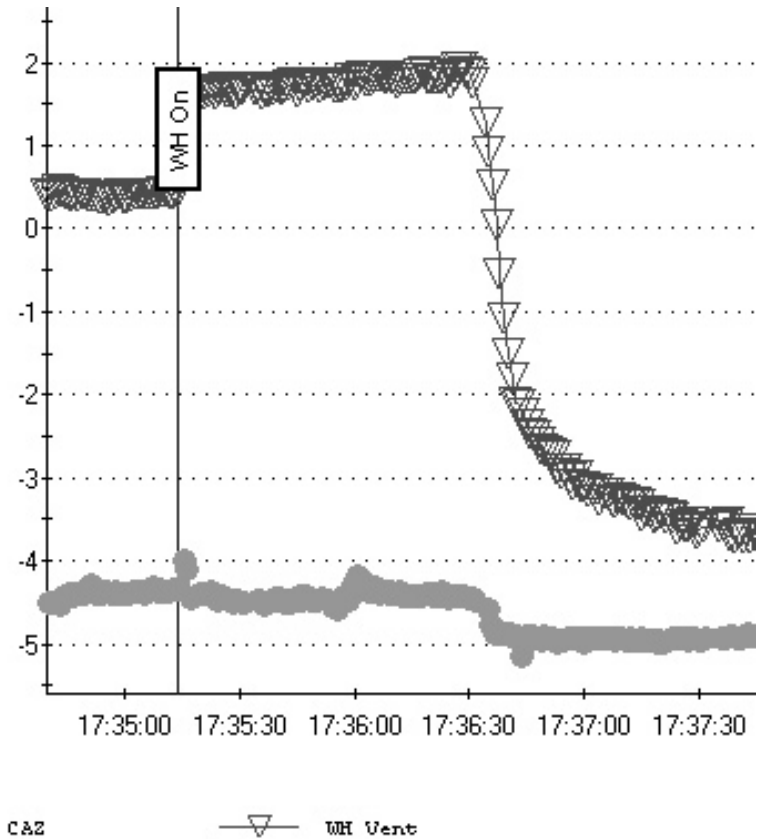


Figure 5.



Product Update – Blower Door Fan Speed Controller

One of the great features of the DG-700 Digital Pressure and Flow Gauge is the ability to perform automated Blower Door tests. In order to conduct automated tests you need a laptop computer, the TECTITE software, some cabling and a Blower Door fan speed controller with a communication jack. Beginning in September of this year, all new Blower Door fan speed controllers come with a 3.5mm round communication jack installed on the side of the controller box. In the past, a telephone style communication jack could be retrofitted to your controller for a \$50 charge. The new speed controller with 3.5mm jack also provides better automated fan control than the older style controller.

The cost of a new Blower Door fan speed controller is \$125. We are still able to make repairs to your old speed controller, but you might want to consider purchasing a new one. If you have questions about the new speed controller, please call us.

How Can I Revive My Old Blower Door Fan?

You've been using that old reliable friend for a number of years now. The motor still runs great, but the white fiberglass fan housing is getting pretty beat up, maybe even missing a few pieces. Is there anything that can be done to revive it, short of replacing the whole fan?

The answer is yes. An increasing number of our customers are having their old Model 2 or Model 3 fiberglass fan housing replaced with our new injection molded black urethane housing. The old fan is first disassembled and inspected to see which parts may be reused. "We try to use as much of the old fan as possible" says Bill Tatam of TEC. Parts typically re-used include the motor, motor mount and fan prop.

The upgrade includes new electrical components, flow sensor and low-flow rings. "The final product looks and acts just like a new Model 3 fan" says Tatam. The cost for a complete fan housing retrofit is typically \$675, assuming we can re-use the motor, mount and prop. If your speed controller is currently mounted on the top of the fan housing, you will also need to purchase a new speed controller for \$125.00. Call TEC for more information.

Reduced Prices on the Exhaust Fan Flow Meter and the TrueFlow® Air Handler Flow Meter

The Exhaust Fan Flow Meter was designed for use in verifying the air flow of bathroom exhaust fans. In Minnesota, the energy code allows for a continuously running bath fan to meet the requirements for inducing fresh air into the house. In order for this bath fan option to be accepted by the building inspector, the fan flow needs to be verified by a performance test. In many cases the air flow from the exhaust fan is too low to be measured by a commercial flow measuring hood. The Exhaust Fan Flow Meter can measure exhaust flows from 125 cubic feet per minute down to 10 cubic feet per minute (CFM) with an accuracy of +/- 10%, so even very small exhaust fan flows can be easily and accurately measured.

Beginning this fall, the price of the Exhaust Fan Flow Meter has been reduced to \$130 (from \$170). This includes the 13"x16"x 8" (deep) Metering Box and a 6 foot extension pole to help reach tall ceilings.

The TrueFlow Air Handler Flow Meter has also been gaining acceptance with HVAC contractors, weatherization crews and energy raters. The TrueFlow has made the job of measuring total air handler flow much easier and faster.

The new price for the TrueFlow Metering Kit has been reduced to \$745 (from \$975). This price includes a 14x20 metering plate, a 20x20 metering plate, 8 different spacers to adjust the size of the TrueFlow plate to match various filter sizes, a static pressure probe, tubing, manual, charts, and a durable carrying case.

Both of these products can be used with any existing DG-2 or DG-3 gauge as well as the new DG-700 and DG-500 gauges. To find out more about the TrueFlow Air Handler Flow Meter or the Exhaust Fan Flow Meter, visit our website at www.energyconservatory.com.

Product Update – InSight-T™ Infrared Camera can Now Measure Temperature

For the past 2 years, TEC has been selling a terrific infrared camera from Infrared Solutions called the InSight. Our customers have been very impressed by the quality of the image, ease of use and the camera's affordable price. Recently, Infrared Solutions added a center point temperature measurement feature to the InSight camera line. This new feature, included with the InSight-T model, conveniently displays a center point temperature reading in the upper right hand corner of the image. Temperature readings are stored along with the image by simply pulling the camera's trigger.

The InSight-T's center point temperature measurement is averaged from a 2 x 2 pixel array that provides an accuracy of +/- 2° C from 0° to 50°C (32 to 122°F). The "spot size" for the temperature measurement (meaning the ratio of the target distance to the size of measurement area) is a very nice 166 to 1. This means that when you are standing approximately 14 feet away from an object, the temperature measurement area is about 1 inch in diameter.

In addition to the center point temperature reading, Infrared Solutions has incorporated an image review feature on all of the new InSight and InSight-T cameras. This new feature lets you review all of the camera's stored images directly on the display (both models will store up to 150 separate images).

The new InSight-T camera can be purchased from TEC for \$9,995. The price of the standard InSight (without temperature measurement) is \$8,900. Customers who have already purchased a standard InSight camera can have it upgraded to measure temperature. The cost of this upgrade is \$1,700 through TEC. To obtain the upgrade, the camera will need to be shipped back to Infrared Solutions for the conversion and calibration. For more details on the upgrade, give us a call. A new InSight and InSight-T product brochure is available at our website for viewing or downloading. Visit our site at www.energyconservatory.com and click on Products.

New Product – DG-500 replaces DG-2

Beginning in September 2004, the DG-2 pressure gauge has been replaced by our new DG-500 digital pressure gauge. The DG-500 gauge was designed to be a very accurate, versatile and easy to use diagnostic tool. The DG-500 gives you the same high resolution pressure measurements as the DG-700 Pressure and Flow Gauge, but without the specialized airflow and airtightness measurement features. The DG-500's simultaneous display of 2 independent pressure measurement channels makes it ideally suited for a wide range of building performance testing applications including:

- Building pressurization and depressurization mapping - Accurately measure pressure imbalances from one room to another such as isolation suites or manufacturing clean rooms.
- Combustion safety testing - With 2 independent channels you can determine the effect of exhaust fans on both the combustion vent and the appliance room.
- Air handler and duct pressure measurements - Measure total external static pressure at the air handler, duct work static pressures and air velocity to help diagnose airflow performance problems.

The DG-500 includes the quality features you expect from TEC pressure gauges like auto-zeroing of both measurement channels, choice of time-averaging options and a display HOLD button. Pressure measurements can be displayed in units of either Pascals or Inches w.c.. When connected to a pitot tube, the DG-500 can display velocity measurements in fpm or m/s. And of course you get precision pressure measurements with an accuracy of 1% from -1,250 to +1,250 Pascals.

One of the best features of the DG-500 is that it can be used along with a computer and TECLOG for Windows® software to conduct data logging of pressure measurements from both channels. TECLOG for Windows is a free, powerful data logging and graphing program designed for anyone interested in documenting pressure conditions of rooms, houses, and commercial buildings (see article in this newsletter on combustion safety testing using TECLOG).

The DG-500 sells for \$695 and includes a carrying case and tubing. For more information and to download the literature for the DG-500 visit our website at www.energyconservatory.com.

Meet Noah Kaufman

Hello. My name is Noah Kaufman. I have been a part of the Energy Conservatory since 1989.

I'm responsible for shipping, receiving, repairs and light assembly on most TEC equipment. It's been a rewarding experience working for a company that produces equipment that is used to help save energy and make buildings more comfortable.

I've lived in Minneapolis most of my life and try to enjoy all of the seasons by getting outdoors often. My hobbies include canoeing, mountain biking, skiing and golf. I look forward to talking with customers on the phone, or possibly meeting customers at trade shows or TEC sponsored events.

Upcoming Shows

The following is a list of industry tradeshow where TEC will be exhibiting. If you are in the area, stop by the booth and see some of the new products first hand. You can also visit our website for links to many of these tradeshow.

Better Buildings Conference, Wisconsin Dells, WI, February 1 – 3, 2005 www.ecw.org/betterbuildings

Affordable Comfort Northwest, Portland, OR, Feb. 23- 24, www.affordablecomfort.org

RESNET Conference, Feb, 28 - March 2, San Antonio, TX www.natresnet.org

Affordable Comfort, Indianapolis, IN, May 16 – 21, www.affordablecomfort.org

Comfortech, Nashville, TN, September 14-17, hvacomfortech.com

National Weatherization Conference, New Orleans, LA September

UPDATE



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