

Chapter 13 Using the Duct Blaster as a Powered Capture Hood

In addition to measuring duct airtightness, the Minneapolis Duct Blaster can be used as a powered capture hood to measure total air handler flow, as well as air flows through supply and return registers, exhaust fans and other air flow devices.

13.1 Measuring Total System Air Flow (Pressure Matching Method)

This procedure is used to measure total air flow through an air handler. **Note:** If you are using a DG-700, the gauge has a built-in mode (**PR/ AH**) which can be used for making measurements of total air handler flow with a Duct Blaster fan. Refer to the DG-700 manual for specific operating instructions.

Part 1: Measure the Normal System Operating Pressure (NSOP)

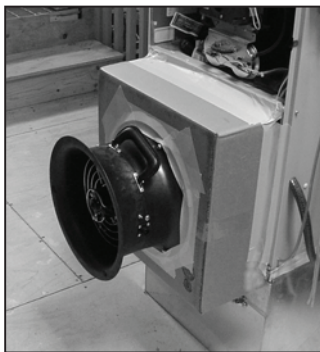
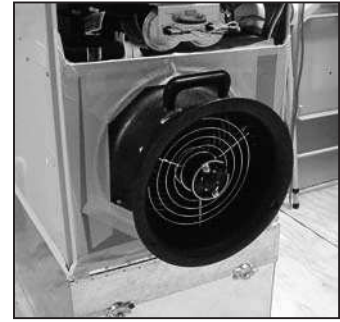
- Turn off the air handler fan.
- Open a window or door between the building and outside to prevent pressure changes in the building during the test.
- If the air handler fan is installed in an unconditioned zone (e.g. crawlspace, attic), open any vents or access doors connecting that zone to the outside (or to the building) to prevent pressure changes in the zone during the test.
- Make sure all supply and return registers are open and untapped. Replace filters if they are dirty (or keep dirty filters in place if you want to measure flow in a "as found" condition).
- Insert a static pressure probe into the supply plenum, or in a main supply trunk line a few feet away from the supply plenum. Make sure the static pressure probe is pointing into the air flow created by the air handler fan.
- Connect a piece of tubing to the static pressure probe. Connect the other end of the tubing to the **Channel A Input** tap on the digital pressure gauge.
- The **Channel A Reference** tap should be connected to the inside of the building, or it can be connected to an unconditioned zone containing the air handler provided that the zone remains at the same pressure as the building during the test.
- Turn on the air handler and measure the Normal System Operating Pressure (**NSOP**) in the duct system using **Channel A**. If the **NSOP** is fluctuating too much to determine the reading, try using the **5** or **10** second or *Long-term* time average setting on the gauge. Record the **NSOP** and turn off the air handler. Do not move the static pressure probe because you will need to use it in Part 3 of this test.

Part 2: Connect the Duct Blaster Fan to the Duct System

The Duct Blaster fan is typically installed at the air handler cabinet. However, if this test is being performed on a single return duct system, and the return ductwork is substantially airtight, the Duct Blaster fan may be installed at the single return.

Option 1: Installing at the Air Handler Cabinet

- Open the air handler cabinet access panel. Seal off the return opening in the cabinet from the air handler fan using tape and cardboard.
- Now install the Duct Blaster in place of the air handler cabinet access door as described in *Section 5.2.b Option 2*. In this configuration, all return air flow will be moving through the Duct Blaster fan, with the return ductwork effectively sealed off from the supply system.
- Connect a piece of tubing to the brass pressure tap on the Duct Blaster fan housing. Connect the other end of the tubing to the **Channel B Input** tap.
- The **Channel B Reference** tap should be connected to the space where the Duct Blaster fan is installed. If the Duct Blaster fan and gauge are located in the same space, leave the **Channel B Reference** tap open.



Note: If the air flow exiting from the Duct Blaster is severely obstructed by the air handler fan or other air handler components, this may significantly reduce the total flow capacity of the Duct Blaster. If this is a problem, try attaching the Duct Blaster fan to the blower compartment access opening using a small cardboard box rather than a flat piece of cardboard. This will tend to increase the Duct Blaster fan flow by providing less restriction to air flow as it enters the air handler blower compartment.

Option 2: Installing at the Single Central Return

- An optional 20" x 20" filter grille attachment panel is available from TEC to provide for quick attachment of the Duct Blaster fan to the filter slot of a single return.
- To use the attachment panel, first open the filter grille door, remove the existing filter, and push the attachment panel into the open filter slot. The H-channel gasket on the edges of the attachment panel should provide an airtight seal between the panel and the filter slot, and should hold the panel in place.
- You may now secure the Duct Blaster fan directly to the attachment panel using the 4 clips mounted on the panel. The clips are pushed down onto the exhaust flange of the Duct Blaster fan.



Note: The Duct Blaster fan can also be attached to the filter slot using cardboard and tape.

Part 3: Match the Normal System Operating Pressure (NSOP)

- Turn the air handler fan back on and re-measure the operating duct pressure using **Channel A** (be sure the static pressure probe has not been moved from **Part 1** above). Now turn on the Duct Blaster fan and adjust the fan speed until the operating duct pressure on **Channel A** equals the normal operating duct pressure (**NSOP**) measured in **Part 1** above. Once adjusted in this way, determine the air flow through the Duct Blaster fan by measuring the fan pressure on **Channel B** and using the flow table, or by using the digital gauge's fan flow feature.
- The measured Duct Blaster fan flow is your estimate of the total system air flow including flow through return registers, plus return duct leakage, plus leakage at the air handler access panel. The only component of total system airflow that is not included in this measurement is any leakage on the return side of the air handler cabinet (other than the air handler access panel).

13.2 Measuring Return Register and Exhaust Fan Flows

The first step is to construct a flow box to seal around the return register (or exhaust fan) where you want to make your measurement. One easy option is to use a cardboard box, but the hood from a commercial flow capture hood may also work well. The open end of the flow box or hood should have rough dimensions which are at least 2 times the register dimensions, and the depth of the box should be at least the average of the two opening dimensions.

Part 1: Construct a Flow Box and Make Tubing Connections

- Cut a square hole in the back side of cardboard flow box which is approximately one inch smaller than the dimensions of the square transition piece. Tape and seal the square transition piece over the hole you cut in the box.
- Attach the open side of the round transition piece to the exhaust flange of the Duct Blaster. Connect the open end of the flex duct to the square transition piece on the flow box.
- Install the Flow Ring (on the fan inlet) which you think will provide the proper flow range for the test.
- Punch a small hole (1/4") in one of the corners of the open end of the box and insert a piece of tubing into the hole. Connect the other end of the tubing to the **Channel A Input** tap. The **Channel A Reference** tap should be left open to the room where the register or exhaust fan is located.
- Connect a piece of tubing to the brass pressure tap on the Duct Blaster fan housing. Connect the other end of the tubing to the **Channel B Input** tap.
- The **Channel B Reference** tap should be connected to the space where the Duct Blaster fan is installed. If the Duct Blaster fan and gauge are located in the same space, leave the **Channel B Reference** tap open.



Part 2: Install Flow Box and Zero Out the Box Pressure

- Turn on the air handler fan (or exhaust fan), and place the flow box tightly over the return register (or exhaust fan grill). If the wall or ceiling surface is very uneven, you may want to attach a piece of gasket to the open end of the flow box to make a tighter seal - The Energy Conservatory has gasket available.
- Now turn on the Duct Blaster fan and slowly adjust the fan speed until the pressure on **Channel A** (the pressure difference between the flow box and the room) equals zero. Once adjusted in this way, determine the flow through the Duct Blaster fan by measuring the fan pressure on **Channel B** and using the flow table, or by using the digital pressure gauge's fan flow feature.
- The Duct Blaster fan flow at this point is your estimate of air flow through the return register (or exhaust fan) tested.

Note: The Energy Conservatory manufactures an Exhaust Fan Flow Meter which will measure exhaust fan flow rates up to 120 cfm with an accuracy of 10%.

13.3 Measuring Supply Register Flows

As in measuring return register flows, you will need to construct a flow measuring box for this method. One easy option is to use a cardboard box, but a hood from a commercial flow capture hood may also work well. The open end of the flow box or hood should have rough dimensions which are at least 2 times the register dimensions, and the depth of the box should be at least the average of the two opening dimensions.

Part 1: Construct a Flow Box and Make Tubing Connections

- Cut a square hole in the back side of cardboard flow box which is approximately one inch smaller than the dimensions of the square transition piece. Tape and seal the square transition piece over the hole you cut in the box.
- Insert the white foam flow conditioner into the round transition piece. Attach the open side of the round transition piece, along with one of the Flow Rings, to the inlet flange of the Duct Blaster fan. Use the Flow Ring which you think will provide the correct flow range. Connect the open end of the flex duct to the square transition piece on the flow box.
- Punch a small hole (1/4") in one of the corners of the open end of the box and insert a piece of tubing into the hole. Connect the other end of the tubing to the **Channel A Input** tap. The **Channel A Reference** tap should be left open to the room where the register or exhaust fan is located.
- Connect a piece of tubing to the brass pressure tap on the Duct Blaster fan housing. Connect the other end of the tubing to the **Channel B Input** tap.
- The **Channel B Reference** tap should be connected to the plastic pressure tap on the round transition piece using an additional piece of tubing.



Part 2: Install Flow Box and Zero Out the Box Pressure

- Turn on the air handler fan and place the flow box tightly over the supply register. If the wall or ceiling surface is very uneven, you may want to attach a piece of gasket to the open end of the flow box to make a tighter seal - The Energy Conservatory has gasket available.
- Make sure that flex duct is stretched relatively straight (for about 4 feet) where the flex duct is connected to the Duct Blaster fan.
- Now turn on the Duct Blaster fan and slowly adjust the fan speed until the pressure on **Channel A** (the pressure difference between the flow box and the room) equals zero. Once adjusted in this way, determine the flow through the Duct Blaster fan by measuring the fan pressure on **Channel B** and using the flow table, or by using the digital gauge's fan flow feature.
- The Duct Blaster fan flow at this point is your estimate of air flow through the supply register tested.