

Procedure for Field Checking the Model 3 Blower Door and Series B Duct Blaster Fans

1. Introduction

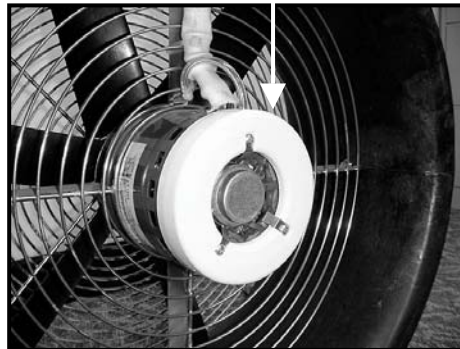
Model 3 Blower Door and Series B Duct Blaster fans maintain their calibration unless physical damage occurs to the fan. Conditions which could cause the fan calibration to change are primarily damaged flow sensors, leaks in the flow sensor or tubing running from the flow sensor to the fan pressure tap, or improper positioning of the flow sensor relative to the fan housing. These conditions are easily detected and should be tested for on a regular basis.

2. Checking for a Leaky or Damaged Flow Sensor

a. Model 3 Blower Door Fan

Model 3 Blower Door fans use a round white plastic flow sensor that is mounted on the end of the fan motor opposite the fan blades.

Model 3 Blower Door Flow Sensor



First visually confirm that the flow sensor is not broken or deformed due to impact. Check that the flow sensor is firmly attached to the motor using the 3 metal attachment clips.

Next, perform a test for air leaks in the flow sensor and the tubing connecting the sensor to the fan pressure tap (this test is easier if you first place the fan in an elevated position such as on a bench top or table.)

- 1) Attach a piece of tubing to the pressure tap on the Blower Door fan electrical box. Leave the other end of the tubing open.
- 2) Find the 4 intentional sensing holes in the outside rim of the flow sensor (the sensing holes are located at 2, 4, 8, and 10 o'clock). Temporarily seal the 4 sensing holes by carefully covering them with masking tape.

- 3) Create a vacuum in the tubing connected to the fan pressure tap by sucking on the open end of the tubing. While creating a vacuum in the tubing, place your tongue over the end of the tubing. The vacuum in the tubing should cause the end of the tubing to stick to your tongue. If the tubing remains stuck to the end of your tongue for at least 5 seconds, the fan and flow sensor pass this part of the test. (Be sure to remove the masking tape from the flow sensor holes.)

If a vacuum can not be created (i.e. air is easily sucked through the tubing), or a vacuum will not persist for at least 5 seconds (i.e. the end of the tubing will not stick to your tongue for at least 5 seconds), there is a leak in either the flow sensor itself or in the tubing that connects the flow sensor to the fan pressure tap. Contact TEC for help in further diagnosing the problem.

b. Series B Duct Blaster Fan

The Duct Blaster uses a flow sensor manufactured out of thin stainless steel tubing. The flow sensor is permanently attached to the end of the fan motor opposite the fan blades.

Series B Duct Blaster Flow Sensor



First visually confirm that the sensor is not broken or deformed due to impact. Check that the sensor is firmly attached to the motor. Next, perform a test for leaks in the sensor and the tubing connecting the sensor to the fan pressure tap.

1. Attach a piece of tubing to the brass pressure tap on the Duct Blaster fan housing. Leave the other end of the tubing open.
2. Find the 3 intentional sensing holes in the flow sensor - they are evenly spaced on the back side of the sensor. Temporarily seal the 3 holes by covering them with masking tape.
3. Create a vacuum in the tubing connected to the fan pressure tap by sucking on the open end of the tubing. While creating a vacuum in the tubing, place your tongue over the end of the tubing. The vacuum in the tubing should cause the end of the tubing to stick to your tongue. If the tubing remains stuck to the end of your tongue for at least 5 seconds, the fan and flow sensor pass this part of the test. (Be sure to remove the masking tape from the flow sensor holes.)

If a vacuum can not be created (i.e. air is easily sucked through the tubing), or a vacuum will not persist for at least 5 seconds (i.e. the end of the tubing will not stick to your tongue for at least 5 seconds), there is a leak in either the flow sensor itself or in the tubing that connects the flow sensor to the fan pressure tap. Contact The Energy Conservatory for help in further diagnosing the problem.

3. Checking the Flow Sensor Position

The position of the flow sensor relative to the inlet of the fan housing is an important component of the fan's air flow sensing system. Because the fan flow sensor is attached to the end of the fan motor, the position of the flow sensor can change if the position of the motor changes. If a fan has been dropped, the motor may have shifted from its proper position in the motor mount, or the motor mount itself can sometimes bend. This movement of the motor and flow sensor can degrade the fan calibration.

a. Model 3 Blower Door Fan

To check the flow sensor position, lay the fan on its side with the flow sensor facing up and all flow rings removed. Place a straightedge (such as a heavy yardstick on edge) across the inlet of the fan. Use a ruler to measure the distance from the bottom of the straightedge to the face of the flow sensor (see diagram #1 below). This distance should be in the range of $3/16^{\text{th}}$ to $5/16^{\text{th}}$ of an inch. If the flow sensor is within this range, the fan passes this part of the field check procedure. If the flow sensor is not in the proper position, contact The Energy Conservatory for further instructions.

b. Series B Duct Blaster Fan

To check the flow sensor position, lay the fan on its side with the flow sensor facing up and all flow rings removed. Place a straightedge (such as a heavy yardstick on edge) across the inlet of the fan. Use a ruler to measure the distance from the bottom of the straightedge to the tip of the motor bearing's domed cover (see diagram #2 below). This distance should be in the range of $5/8^{\text{th}}$ to $7/8^{\text{th}}$ of an inch. If the flow sensor is within this range, the fan passes this part of the field check procedure. If the flow sensor is not in the proper position, contact The Energy Conservatory for further instructions.

Diagram #1 (Model 3 Blower Door Fan)

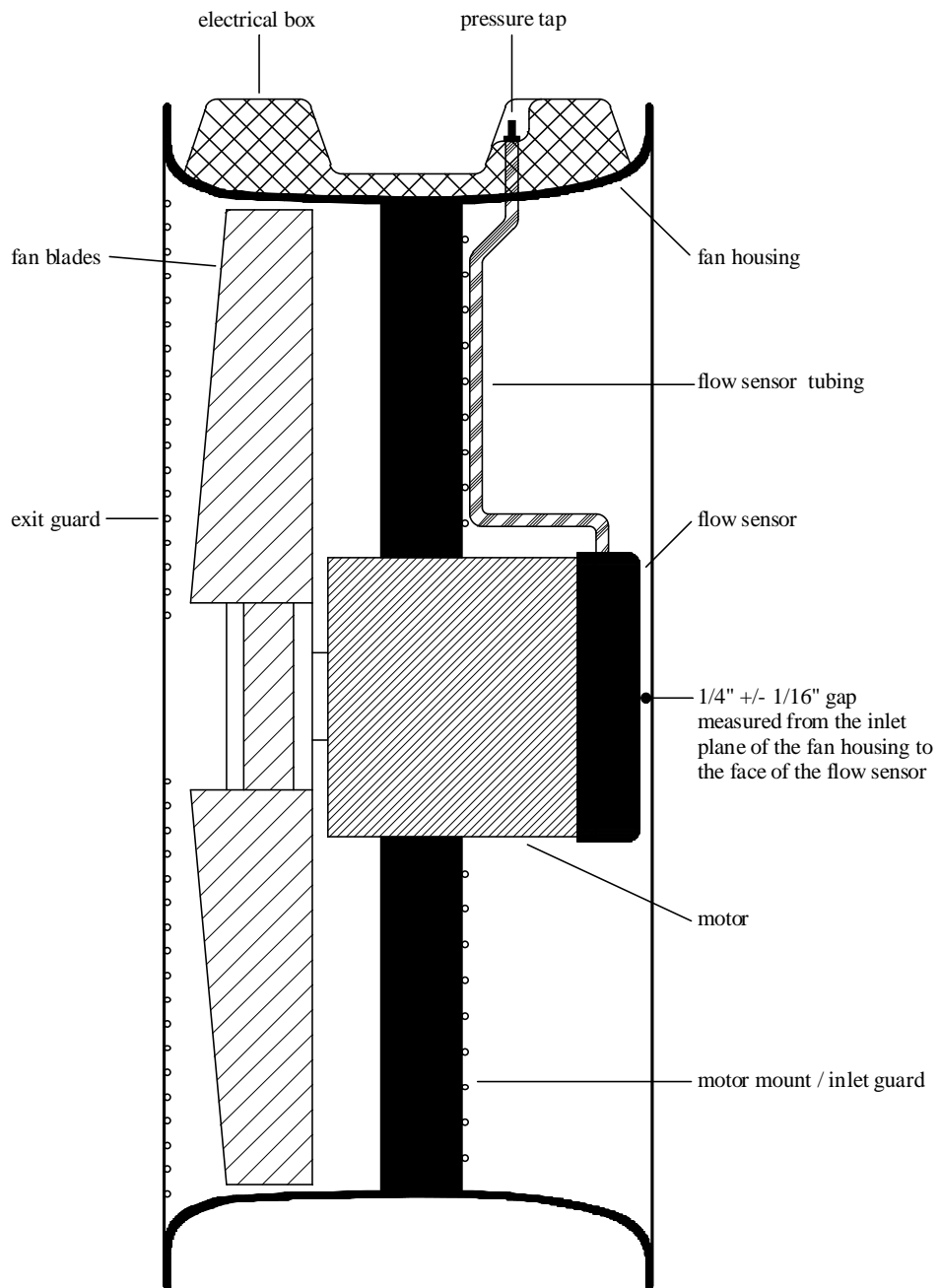
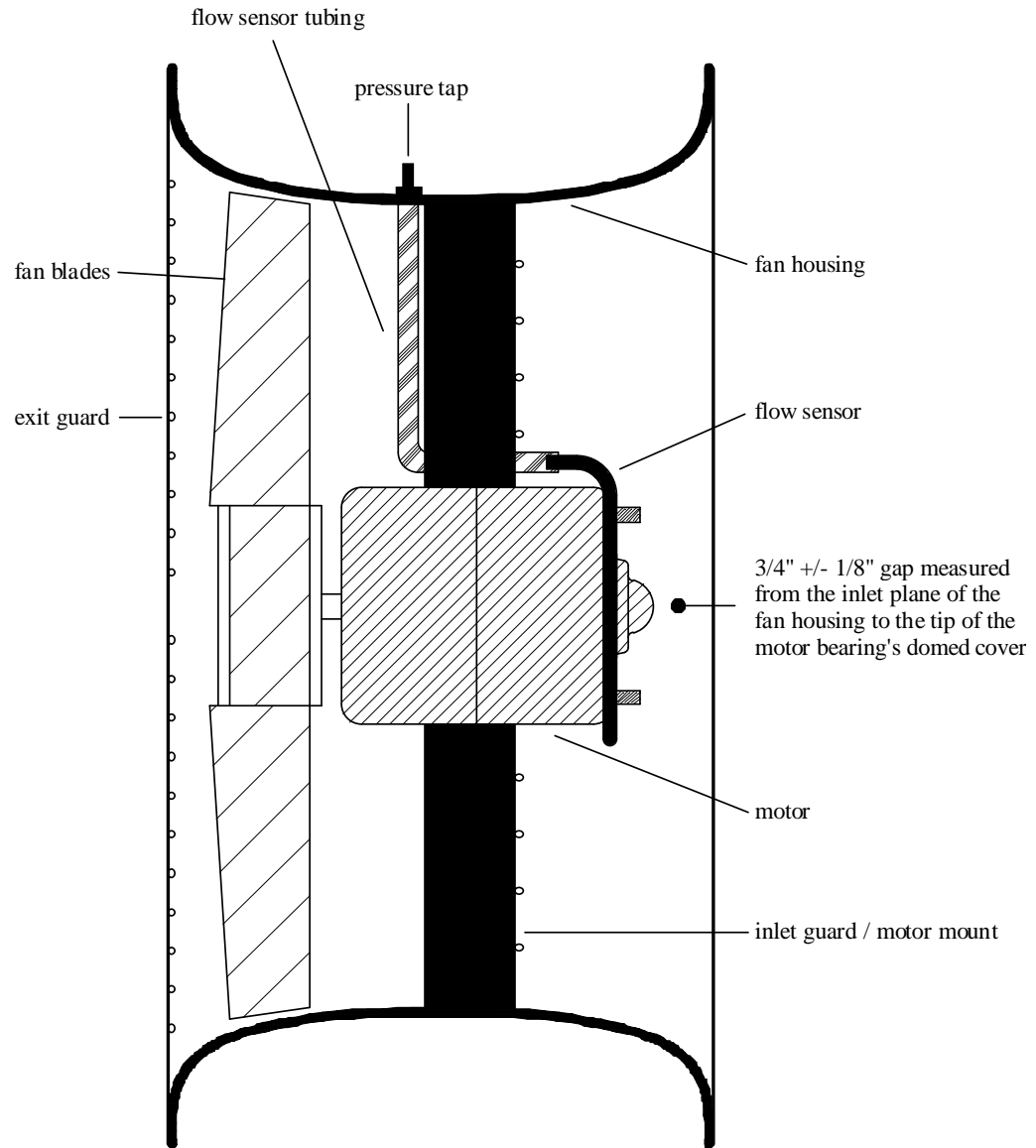


Diagram #2 (Series B Duct Blaster Fan)



4. Other Issues Affecting the Accuracy of Fan Flow Measurements

a. Model 3 Blower Door Fan

Upstream Air Flow Conditions:

The calibration for all Blower Door fans are slightly sensitive to upstream air flow conditions (e.g. orientation of walls, doors, stairs etc. relative to the fan inlet). This is particularly true when measurements are taken using the “open fan” configuration. As a result, follow these simple rules whenever possible.

- It is always best to install the fan in a doorway leading to a large open room. Try to avoid installing the fan in a doorway where there are stairways or major obstructions to air flow very close (1-5 feet) to the fan inlet.
- If the fan must be installed next to a stairway or major obstruction, it is best to take measurements using one of the Flow Rings and not “open fan”.
- Always open the inside door and outside storm door as much as possible during the Blower Door test to prevent restrictions to air flow.

Operating Under High Backpressure Conditions:

Note: For most testing applications, backpressure is not a concern and can be ignored.

The term "backpressure" is used to describe the pressure that the Blower Door fan is working against when it is running. Backpressure is determined by measuring the static pressure difference between the air directly upstream of the fan, and the air directly exiting the fan.

Under typical testing applications, the backpressure seen by the fan is simply the test pressure at which the building airtightness measurement is being measured made (e.g. 50 Pascals). However, there are applications where the Blower Door fan could see backpressures that are greater than the test pressure. For example, if the Blower Door fan is exhausting air into a confined area (such as an attached porch), it is possible that the porch area could become pressurized relative to outside creating a backpressure condition that is greater than the test pressure. Although the Blower Door 's flow sensor was designed to be affected as little as possible by variations in backpressure, under certain high backpressure operating conditions (described below) the calibration of the fan can degrade.

High Backpressure Conditions

Model 3 fans can be used in testing applications with backpressures up to 80 Pascals with no significant effect on calibration accuracy. This is true for all fan flow configurations (Open through Ring E), provided that the fan is operated within the accepted flow range for each configuration. Backpressures above 80 Pa can diminish the accuracy of the fan calibration and should be avoided.

b. Series B Duct Blaster Fan

Upstream Air Flow Conditions:

- When using the Duct Blaster fan to conduct a duct leakage depressurization test (i.e. the flex duct is connected to the inlet side of the fan), always position the fan so that the flex duct is stretched relatively straight for about 4 feet in front of the fan.
- When the fan inlet is open to the room, try to install the fan so that there is not a large obstruction within 2 feet in front of the fan.

Operating Under High Backpressure Conditions:

Note: For most testing applications, backpressure is not a concern and can be ignored.

The term "backpressure" is used to describe the pressure that the Duct Blaster fan is working against when it is running. Backpressure is determined by measuring the static pressure difference between the air directly upstream of the fan, and the air directly exiting the fan. High backpressures are typically caused by a large restriction between the Duct Blaster fan and the location where the test pressure is being made.

Although the Duct Blaster's flow sensor was carefully designed to be affected as little as possible by variations in backpressure, under certain very high backpressure operating conditions (described below) the calibration of the fan can degrade.

High Backpressure Conditions

Series B Duct Blaster fans can be used in most testing applications with backpressures up to 100 Pascals with no significant effect on calibration accuracy. This is true for all fan flow configurations (Open through Ring 3), provided that the fan is operated within the accepted flow range for each configuration. The only exception to this rule is for flow measurements below 20 CFM (Ring 3 will measure down to 10 CFM). When measuring flows between 20 and 10 CFM using Ring 3, backpressures should be kept below 40 Pascals. Backpressures above these values can diminish the accuracy of the fan calibration and should be avoided.

One example of an application that could cause high backpressure is when the flexible extension duct is connected to a small, high resistance register. The high resistance register can cause the pressure in the flex duct to be very high (i.e. over 150 Pascals) even if the test pressure in the duct system is only 25 Pascals. Operating the Duct Blaster fan under these operating conditions is not advised. To avoid this problem:

- Always try to avoid connecting the Duct Blaster fan to the duct system using a relatively high resistance connection (such as a small supply register).
- If you are using a high resistance connection and suspect a high backpressure condition, try to measure the backpressure. If the measured backpressure is less than the values listed above, then there should not be a problem. If the flexible extension duct is being used, the backpressure can be easily determined by measuring the pressure difference between the room where the Duct Blaster fan is installed and pressure inside the flex duct (measured from the plastic tap on the round transition piece).

5. General Maintenance Information for Model 3 Blower Door and Series B Duct Blaster Fans

a. Model 3 Blower Door Fan

- Examine the motor cooling holes for excessive dust build-up. Use a vacuum with a brush attachment to remove dust, or blow out the dust with compressed air.
- Inspect housing, blades and guards. Especially note clearance of blade tips relative to the fan housing. There should be about 1/4 inch of clearance.
- Inspect electrical wiring and electrical connections on the fan and the fan speed controller.
- Do not reverse the fan (using the flow direction switch) while the blades are turning. Turn off the fan and wait for it to come to a complete stop before reversing the flow direction.
- For long-term operation, such as maintaining house pressure while air-sealing, use a Flow Ring whenever possible to ensure good airflow over the fan. This will minimize the heating of the fan and is especially important in warmer weather. In particular, do not operate the fan for long periods of time on low speed with open fan.
- Do not run the fan for long periods of time in reverse.
- If the motor gets too hot, it may experience a shut-down due to the thermal overload protection. If this happens, make sure to turn off the controller so that the fan does not restart unexpectedly after it cools down.
- Make sure to press the power plug firmly into the power receptacle on the fan. Failure to do so can cause overheating of the power cord and possible damage.
- Do not use ungrounded outlets or adapter plugs.
- The fan should not be left running unattended.
- Do not operate if the motor, controller or any of the electrical connections are wet.
- Keep people and pets away from the fan when it is operating.
- If the fan housing, fan guards, blade, controller or cords become damaged, do not operate the fan until repairs have been made.

b. Series B Duct Blaster Fan

- Examine the motor cooling holes for excessive dust and dirt build-up. Use a vacuum with a brush attachment to remove dust, or blow out the dust with compressed air.
- Inspect housing, blades and guards. Especially note clearance of blade tips relative to the fan housing. There should be about 1/4 to 1/8 inch of clearance.
- Inspect electrical wiring and electrical connections on the fan and the fan speed controller.
- The Duct Blaster fan motor is not a continuous duty motor and should not be run for extended periods of time (more than 2 hours at one time).
- The fan should not be left running unattended.
- Do not use ungrounded outlets or adapter plugs.
- Do not operate if the motor, controller or any of the electrical connections are wet.
- Keep people and pets away from the fan when it is operating.
- If the fan housing, fan guards, blade, controller or cords become damaged, do not operate the fan until repairs have been made.

