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Retrotec Inc.

Door Fan Operation Manual

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1 Important Safeguards

When using electrical appliances, basic safety precautions should always be followed.

Please read the following carefully:

- Avoid contact with moving parts.
- Special attention should be made to keep children and pets away from the Door Fan when it is operating.
- Do not insert anything into the fan casing while the fan is moving.
- Ensure that no debris is inside the fan casing before operating the fan.
- Keep hands, hair and clothing away from fan at all times.
- The fan is designed to be used while mounted in the door panel.
- At high-speed, the fan can tip over if not secured properly.
- The fan can cause serious damage or injury if it were to fall on someone/something.
- Do not use equipment for other than its intended use.
- Do not stand on the fan, or use the fan to support the weight of another object.
- To protect against risk of electric shock, do not place this equipment or power cord in water or other liquid.
- Press the power plug firmly into the power receptacle on the fan. Failure to do so can cause over-heating of the power cord and possibly damage the fan.
- Do not use un-grounded outlets or adapter plugs. Never remove or modify the grounding prong.
- Do not operate any device with a damaged electrical cord, or after an equipment malfunction.
- Use only the included power plug to operate the fan.
- Turn the unit off and unplug from electrical outlet before moving and when not in use, or when making any adjustments to the fan motor, blades or electrical components.
- The fan can move a significant amount of air, causing papers or other light flat objects such as pictures to be thrown around.
- If dust, pollen, mould spores, chemicals, asbestos, vermiculite dust, fiberglass dust, cellulose dust or other undesirable substances can get blown into living spaces, keep those susceptible to these substances away from the test area, and wear dust masks.
- Do not pressurize an enclosure with air that is polluted or exposed to any toxic substances. For example, blowing air from a car-port, into a house, while a motor vehicle is running, can quickly fill a house with toxic carbon monoxide.
- Cover exposed ashes or test at or below 25 Pa to avoid blowing ashes from open fire pits.
- Ensure proper cooling of the fan motor.
- During prolonged operation, such as when maintaining building pressure while air-sealing, use Flow Ring A.
- If the motor gets too hot, the thermal overload protection will shut-down the fan. When this happens, turn the controller off, so that the fan does not restart unexpectedly after it cools down.
- Be aware of all possible sources of combustion. Ensure any appliances do not turn on during the test. Turn off power to the appliance, or set the appliance to the "Pilot" setting. It is possible for flames to be sucked out of a combustion air inlet (flame rollout) during a test, which is a fire hazard and can result in high carbon monoxide levels.

- If there are attached spaces (e.g. townhouses) that could contain a vented combustion appliance, either adjust those appliances to prevent them from turning on during the test, or be sure that the attached spaces are not depressurized or pressurized when the Door Fan is operating.
- If combustion safety problems are found, tenants and building owners should be notified immediately and steps taken to correct the problem (including notifying a professional heating contractor if basic remedial actions are not available). Remember, the presence of elevated levels of carbon monoxide in ambient building air or in combustion products is a potentially life threatening situation. Air sealing work should not be undertaken until existing combustion safety problems are resolved, or unless air sealing is itself being used as a remedial action.

Failure to follow these instructions carefully may result in bodily injury, damage to property and equipment failure.

Failing to operate equipment as intended may void the warranty and compliance with the CE mark and other listings.

2 How a Door Fan Works

A Door Fan is a specially designed, calibrated fan, which is temporarily mounted in a doorway. The fan is used to blow air into or out of a room, house, or building, to measure the air leakage of the enclosure.

A Door Fan works by establishing a pressure differential between the inside and the outside of an enclosure. The pressure difference forces air to leak through all of the holes in the exterior envelope of the enclosure. The amount of air that is required to maintain a constant pressure difference, is equal to the amount of air that is leaking from the enclosure. A specially designed gauge is then used to measure the amount of air flowing through the Door Fan, and the pressure difference, which can be used to determine the total size of all those leaks.

Components of a Door Fan system

A typical Door Fan or Blower Door system is comprised of three main parts:

- A door panel, which temporarily seals a typical doorway and provides a hole to mount a fan.
- A calibrated fan, capable of creating a measured flow of air.
- A two-channel differential pressure gauge that calculates flow.

A typical Door Fan system breaks down like this:

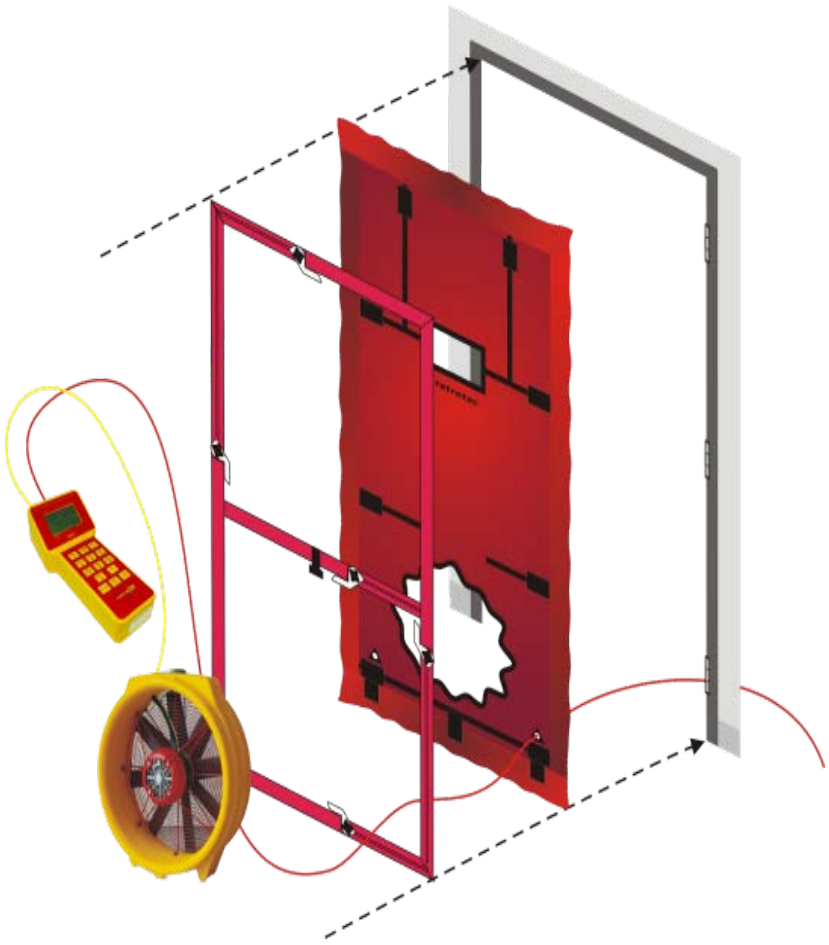


Figure 1. The breakdown of a typical Door Fan system.

In this case, an aluminum frame holds a cloth panel in place, sealing the doorway. The fan is mounted in the hole in the cloth, and is supported by the aluminum frame crossbar. The gauge is connected to the fan through a yellow tube, which measures the flow pressure of the fan. The red tube is run through a small hole in the cloth to the other side of the doorway, to measure the pressure differential across the doorway.

A Calibrated Fan

When the fan is turned on, air is pulled through. Flow Ranges are typically installed on the inlet side of the fan to artificially restrict flow, and control the amount of air going through the fan.

The rotating fan blade creates a suction pressure (flow pressure) between the fan blade and the installed Range Rings or Plates by pulling air through the fan in the direction of flow. In order for the air to be pulled through the holes, there must be a flow (suction) pressure.

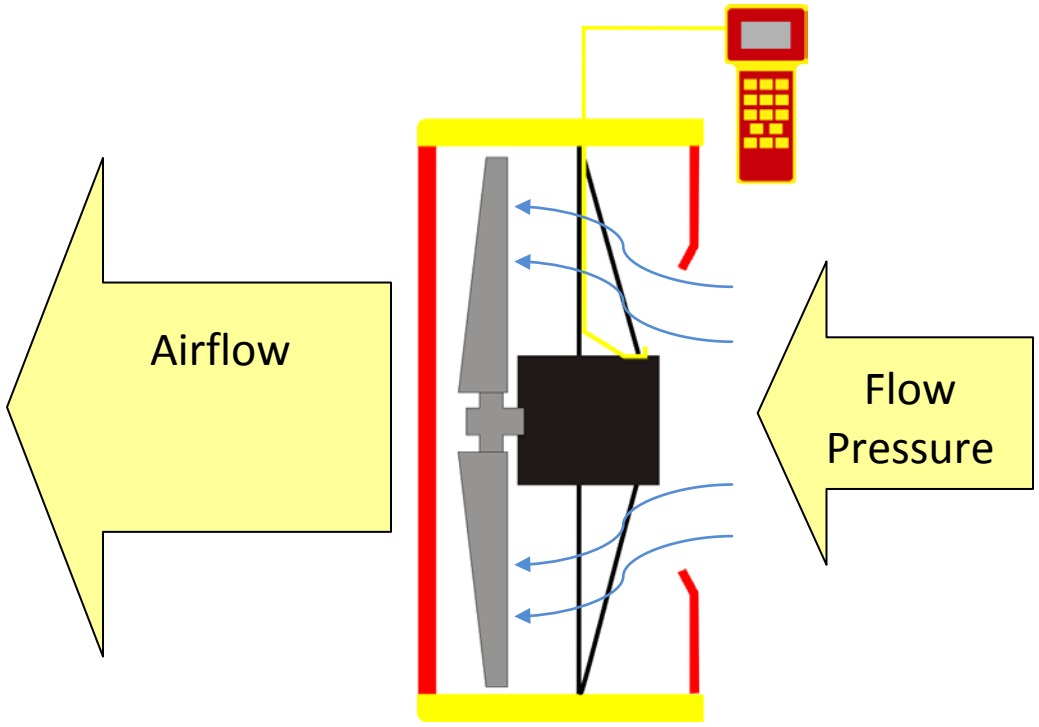


Figure 2. Pictorial display of how a calibrated Door Fan works.

By measuring the flow pressure, and knowing the size of the open hole(s) Flow Range, we can calculate the volume of air moving through the fan.

3 Calibrated Fans

Retrotec Door Fans are of a standard size, and can all be used in a Retrotec cloth door panel. Some fans will not fit, however, in the hard panel system.

3.1 Fan Models

Model 1000 fans

The 1000 model fan is a basic ¾ horsepower fan with built in speed control and dual Ethernet ports. Multiple fans can be daisy chained together, and simultaneously controlled by a single DM-2 Digital Pressure Gauge. Speed control can be automatically controlled via the DM-2, or manually controlled with the dial on the fan top.

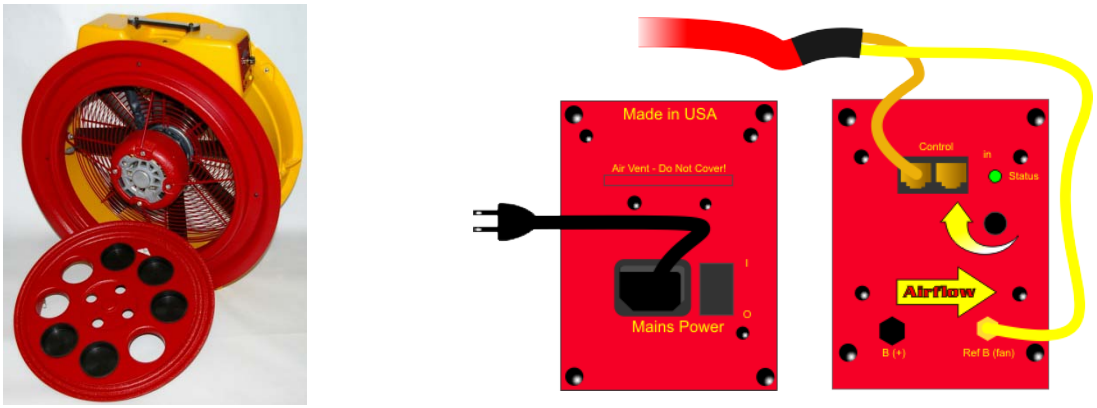


Figure 3. Model 1000 fan with two electrical plates containing power connection and switch, dual Ethernet ports and manual speed knob.

To connect the 1000 to the DM-2 Digital Pressure Gauge

1. Connect the power cord from the fan to a compatible wall outlet.
2. Connect a pressure tube from the Ref(B) (yellow) port on the fan top to the Ref B (negative) port on the DM-2.
3. Connect the Ethernet control cable from the DM-2 to the left Control port.

Model 2100 fans (no longer available)

The 2100 was Retrotec's original 2000 model fan. It is a ¾ horsepower fan, suitable for most residential testing. It requires a manual speed control to adjust the fan speed.

Figure 4. Model 2100 fan and fan top (no longer available).

To connect the 2100 to the DM-2 Digital Pressure Gauge

1. Connect the power cord from the fan to a compatible wall outlet.
2. Connect a pressure tube from the Ref(B) (yellow) port on the fan top to the Ref B (negative) port on the DM-2.
3. Connect the manual speed control to the Remote port on the fan (new speed controls connect via Ethernet cables, and are not compatible with the 2100 fan).

Model 2200 fan (no longer available)

A fully automatic version of the 2100, the 2200 fan can be controlled by the DM-2 automatically, with the Set Speed and Set Pressure functions. If required, an optional speed control can be connected via an Ethernet cable to allow manual control of the fan speed (so that the gauge can be used for Zone or room pressure testing).

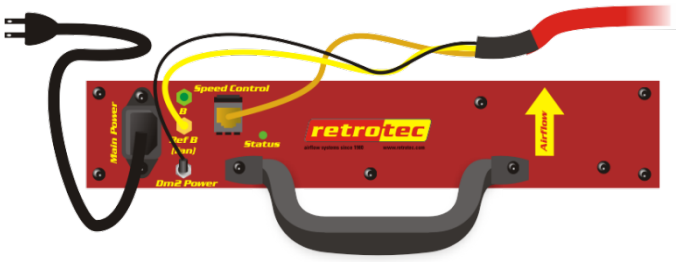


Figure 5. Model 2200 fan and fan top (no longer available).

To connect the 2200 to the DM-2 Digital Pressure Gauge

1. Connect the power cord from the fan to a compatible wall outlet.
2. Connect a pressure tube from the Ref(B) (yellow) port on the fan top to the Ref B (negative) port on the DM-2.
3. Connect the Ethernet control cable from the DM-2 to the Speed Control port on the fan top.

4. If required, connect a Manual Speed Control to the Speed Control port on the fan top with an Ethernet cable.

Model 2350 fan

Retrotec's design goal in developing the 2350 fan top was to solve several problems that all air leakage measurement equipment manufacturers struggle with:

- Unstable voltage, which causes the fan to change speed even though the voltage being input has not changed.
- Non-linear control, which causes the initial part of the control to have very little effect, the middle part of the control to have a rapid effect, and the top part of the control to have again to little effect. This 'S' shaped curve response seriously undermines a traditional fan's performance.
- Noisy output, which can cause excessive heating in ¾ horsepower fans.

In addition to overcoming these shortcomings, unique features such as onboard speed control and daisy chain inputs (which allow any number of fans to be controlled by one gauge), were incorporated into the new speed control. The fan top can now be reprogrammed using firmware that would allow Retrotec to make adjustments in performance, and features as required. All of this development represents a huge advance in the field of air leakage testing.

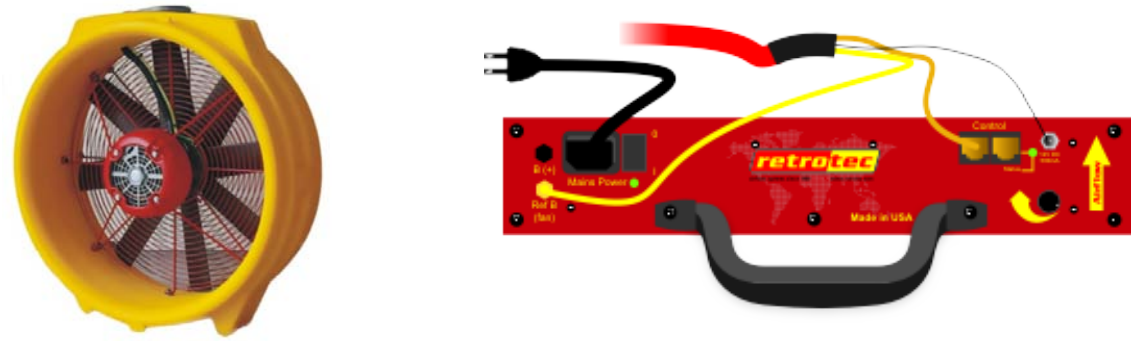


Figure 6. Model 2350 fan and fan top.

To connect the 2350 to the DM-2 Digital Pressure Gauge

1. Set the fan speed control knob as low as it will go (counter clock-wise), and power switch in the off position.
2. Connect the power cord from the fan to a compatible wall outlet.
3. Connect a pressure tube from the Ref(B) (yellow) port on the fan top to the Ref B (negative) port on the DM-2.
4. Connect the Ethernet control to a Control port on the fan.
5. Use the second Ethernet port to connect another 2350 fan by connecting a standard Ethernet cable from a Control port of one fan to a Control port on the second.

Models 3300 and 3300SR fans

The 3300 and 3300SR fans are 2 horsepower fans suitable for residential and commercial testing. The fans are fully automatic and can be controlled through the DM-2. They include a 3-Phase power supply.

The 3300SR fan has an additional green reference pressure port; SR stands for “self-referencing”, which requires the extra green port. A self-referenced fan is able to compensate for when the fan is blowing air towards the gauge (and fan operator). Normally a correction in the DM-2, but with a SR fan, this correction is not required.

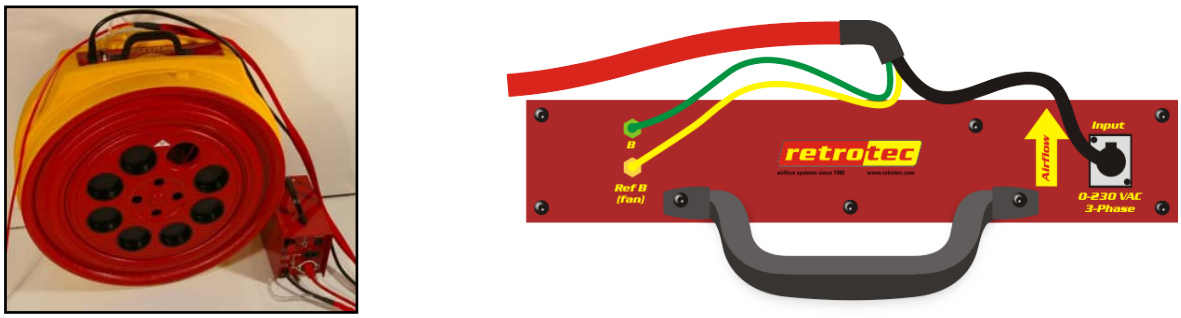


Figure 7. Model 3300 fan and fan top (fan top shows the 3300SR model).

To connect the 3300(SR) to the DM-2 Digital Pressure Gauge

1. Connect control cable from the 3-Phase power supply (red box).
2. Connect the pressure tubes from the power supply umbilical to the matching-color ports on the variable speed drive box (some boxes do not have color-coded ports – attach using pressure port naming conventions on the DM-2).
3. Connect the power cord from the power supply to a 20A compatible wall outlet. The 3300 fan draws a significant amount of power; no other devices should be running on the same circuit.
4. Connect a pressure tube from the Ref(B) (yellow) port on the power supply to the Ref B (negative) port on the DM-2.
5. If available, connect a second pressure tube from the B (green) port on the power supply to the Input B (positive) port of the DM-2.
6. Connect the Ethernet cable from the DM-2 umbilical to the Control port on the power supply.

The 3300 and 3300SR fans are not designed to operate on GFCI protected circuits. Doing so may cause the circuit breaker to trip. Do not operate multiple 3300 or 3300SR fans on the same circuit. Stove top electrical outlets are an ideal 20A circuit to connect the 3300(SR) fans to.

Status Lights

Current Retrotec Door Fans have two LED lights on the fan top. Mains Power indicates the power status next to the AC power input. The second LED, Status, indicates DM-2 status.

The 3300(SR) series fan includes a three-phase power supply, which contains two power status lights.

Table 1. 3300SR fans mains power – power input monitoring

3300 Series Fans		
100 – 140 VAC, 22 Amp	210 – 260 VAC, 14 Amp	Indication
Solid green	Off	Low voltage input
Solid green	Solid green	High voltage input
2000 Series Fans		Indication
Solid green		Voltage input

The 3300(SR) fan will operate at a reduced efficiency level when connected to a low voltage input. It is safe to use, but may not reach is maximum operating speed.

Table 2. DM-2 status light indications.

DM-2 Status Light	Indicates
Blinking red	Lost communication with DM-2
Solid green	Good communication with DM-2
Flashing green	DM-2 not connected or turned off

3.2 Connecting a Fan to a DM-2 gauge

It's very simple to connect a Retrotec fan to the DM-2 digital gauge. Depending on which model fan is in use, there will be some combination of red, blue, green, and yellow pressure tubes included. These tubes connect to their corresponding color coded ports on the back of the DM-2. The Ethernet speed control cable connects to the port marked Speed Control.

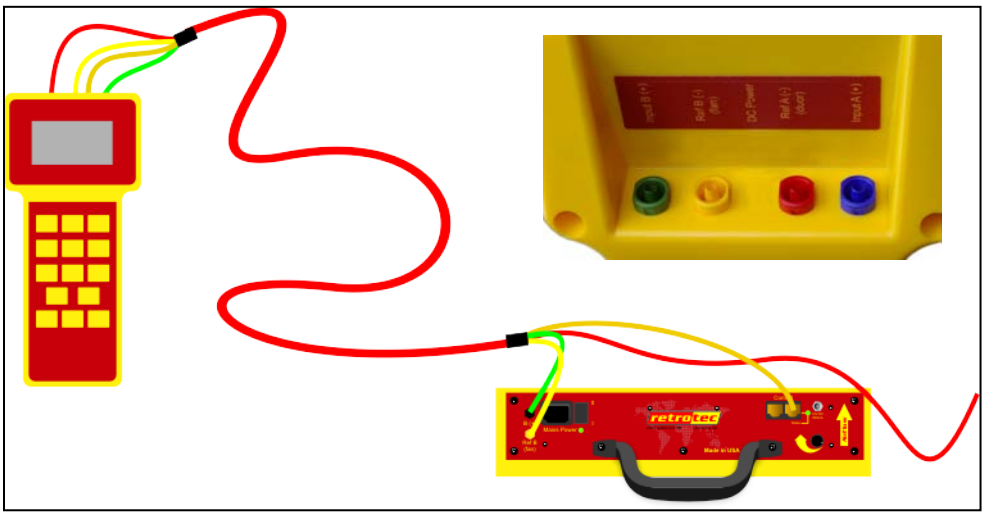


Figure 8. DM-2 to fan connection.

To connect the fan to a DM-2 digital gauge

1. All Retrotec fans include a yellow Ref B port (might be brass on some models of 3300 fans). Connect the yellow pressure tube from Ref B to the yellow port on the DM-2 (Ref B (-)).
2. For most Door Fan tests, a red pressure tube is used to run through the door panel (away from the tester). The other end of the red pressure tube should usually be connected to the red pressure port on the DM-2.
3. Some model fans will include a self-referencing port (green). Connect the green tube from the port marked B on the fan (usually green), to the green port on the DM-2.
4. If available, a blue pressure tube can be connected to the blue port on the DM-2, for some types of testing.

The green, reference, port is available on Self-Referencing fans (3000SR and DU220). When this port is present on the fan, connect a green tube from the green port on the DM-2 to the fan top. This will ensure that results are accurate, regardless of which direction the fan's airflow is in. A Self-Referencing

fan not affected by airflow that is directed towards the user. Non-referenced gauges need to corrected before results can be taken when the airflow is directed towards the operator.

Reference the test procedure for more information on which connections need to be made for specific tests.

To control the fan speed with a DM-2

1. Connect the included Ethernet cable from the fan top to the back top of the DM-2 (labeled "Speed Control"). If unavailable, any standard Ethernet cable can be used.
2. Additional Ethernet cables can be used to link multiple fans together, with the primary fan being connected to the DM-2. This will allow one gauge to control the fan speed of all fans in a chain.
3. If the battery power is too low, connect the DM-2 power cable from the fan to the gauge. Some model fans do not have this option.

3.3 Flow Range Configurations

All Retrotec fans have multiple Flow Ranges. The Flow Range configurations are used to affect the airflow and flow pressure through the fan. During testing, it's necessary to select the correct Flow Range to achieve measurable and accurate results.

Figure 9. Flow range plates for 2000/3300 series fans.

A Door Fan measures flow by measuring the flow pressure. As the fan speeds up, a suction pressure develops in the fan that causes air to flow. By measuring this suction pressure (flow pressure), airflow can be calculated.

When the fan slows down, the flow pressure becomes too small to accurately measure. To increase the fan speed, while not increasing the volume of air being moved, a restriction is placed in front of the fan. The fan, therefore, has to move faster to move the same volume of air. The suction pressure required increases to where it can be accurately measured again. By providing a set of flow restricting plates with ever smaller holes, the Retrotec Door Fans can measure flow from 5 cfm to 8300 CFM (2 to 3917 litres per second or 8 to 14,100 cubic meters per hour).

When less flow is required, (such as in tighter buildings), the fan must move less air through the fan, without decreasing the flow pressure, in order to maintain an accurately readable pressure. Each inlet size has a pre-established configuration or range. Flow Ranges are somewhat analogous to gears in a standard transmission. The lower the flow, the smaller the hole required to maintain a readable pressure.

Selecting a Flow Range

Testing should always be done with the most restrictive Flow Range on the fan as possible for the following reasons:

- Accuracy increases as flow pressure increases
- High flow pressure results in high fan speed, which aids in cooling the fan
- When conducting multi-point tests, starting with a restrictive Flow Range eliminates the need to change the Flow Range during the test.

Note: In European countries where a 50 Hz power system is used, Flow Range selection becomes more critical because the fans will run 20% slower. Therefore, there is not as much difference between minimum and maximum flow on any given Flow Range.

Each Retrotec DucTester includes three ranges, and each Door Fan comes with 11 flow ranges for the greatest possible accuracy and versatility.

Selecting a Flow Range is based upon the air flow that is required to achieve the test pressure in the enclosure.

To determine when to change the Flow Range on a Door Fan

1. Attach Range Ring A and B.
2. Set the gauge to Flow Range B
3. Adjust the fan speed until the desired room pressure is reached.

If using the DM-2 digital gauge:

4. If "TOO LOW" is shown on channel B of the DM-2, attach the C8 Range Plate. Restrict the flow further, until the gauge is able to measure a pressure.
5. Press **[Range Config]** until the correct Flow Range is displayed on the DM-2 screen.

Or

3. If the desired room pressure cannot be reached, take Range Plates or Range Rings off.
4. Press **[Range Config]** until the correct Flow Range is displayed on the DM-2 screen.

If using analog gauges:

1. Select a Flow Range so that the flow pressure is twice (or more) the room pressure.

If the enclosure to be measured has an excessive amount of leakage, to the point where a single fan unit, on the Open Range and at maximum speed, cannot reach the required pressure, try one of the following solutions:

- Use a second (additional) fan to produce more flow. The combined flow readings can be used to get the total amount of airflow required to achieve the test pressure. Do not add flow pressure readings (PrB), they are not cumulative. Flow pressure must be converted (or read off the gauge) to flow in cfm (or some other units) before they can be added together.
- Test at the highest pressure that can be reached, and use the @ Pressure key to extrapolate what the flow would be at the desired pressure.

- Seal leaks prior to testing. This can include ensuring that all dampers, windows, and doors are closed, in addition to sealing leaks and holes. This may reduce the leakage enough that the desired test pressure can be reached.

3.4 Common Sources of Error

Some level of error is unavoidable in all Door Fan testing. However, there are a number of common mistakes that are made that can lead to grossly inaccurate results.

Wrong Flow Range or Device

Always make sure that the fan in use, and the Flow Range that is installed on the fan, is correctly reflected in the settings on the DM-2. Each device, and associated Flow Ranges, has a specific calibration. Selecting the incorrect device or Flow Range will lead to incorrect calculations of airflow and other results.

No Reference Tube when Pressurizing

When pressurizing an enclosure, the fan is pushing air into the same enclosure in which it is located. It's important to make sure that the fan is referencing the correct pressure.

The DM-2 is capable of self-correcting when the fan flow is towards the fan operator, however, fans with an additional reference port must be connected properly, as the DM-2 will not apply the correction when those devices are selected.

Incorrect @ Pressure Usage

Forgetting that @ Pressure is on, can lead to all results being taken at the same pressure. If the flow doesn't appear to be changing when multiple points are being taken at different pressure, check that the @ Pressure function is turned off. Also, if the measurements indicate that the enclosure is far tighter, or leakier than expected, the @ Pressure setting could be converting the results to a vastly different pressure than the desired test pressure.

It is not advisable to use the @ Pressure function when the fan cannot reach a pressure that is even close to the desired pressure reading. This can lead to highly inaccurate results.

Choosing a Test Direction

Selecting a test direction is heavily dependent on the type of test being conducted. Consult the specific test procedure to ensure the correct direction is chosen. All Retrotec fans include an arrow on the fan top or control panel to indicate which way the airflow will travel in. Use the airflow arrow to determine if the fan is pointed in the correct direction. Buildings often leak exactly the same in both directions but occasionally a small increase in leakage of 5 to 10% may be apparent under pressurization since this test direction can open up flaps over exhaust fans.

Figure 10. Airflow direction arrow on the fan top.

Upstream Air Flow Conditions

The calibration for all Door Fans is 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 Flow Range. To minimize problems, follow these rules whenever possible:

- Install the fan in a doorway leading to a large open room. Avoid installing the fan in a doorway where stairways or other major obstructions to air flow are 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 with a Range Ring or Plate installed, and not the Open Flow Range.
- Open the inside door and outside storm door as much as possible during the Door Fan 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" describes the pressure that the 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. Typically, backpressure is simply the test pressure at which the building airtightness measurement is being made (e.g. 50 pascals). However, in some applications, the Door Fan could experience backpressures that are greater than the test pressure. For example, if the 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 Door Fan flow sensor is designed to account for variations in backpressure, certain high-backpressure operating conditions can degrade the calibration of the fan.

Retrotec Door Fans are calibrated to function in testing applications with backpressures up to 80 pascals, with no significant effect on accuracy. This is true for all fan flow configurations (Flow Ranges Open through L1), provided that the fan is operated within the accepted Flow Range for each configuration. Backpressures above 80 Pa will restrict the available Flow Ranges that accurate results can be obtained from. When a Retrotec fan is used with the Retrotec DM-2, or with Retrotec software, compensation is automatically applied for the backpressure and the flow rate is not displayed when results might be inaccurate.

Figure 11. DM-2 can't display flow reading because of back pressure.

Problems During Testing

Ashes and Other House Materials

Depressurizing a house causes air to be sucked in from openings. This can be especially troublesome in a fireplace. If proper care isn't taken to cover exposed, loose ashes, prior to beginning a test, the air flowing in through the chimney can blow ashes out of the fireplace.

Likewise, other loose household materials can be moved around by airflow, especially if the materials are located close to a major leak or the fan itself. It's very easy to blow loose papers, and other small objects around a house if due care isn't taken to secure them before beginning testing.

Doors Slamming Shut

If a door suddenly shuts while using a Door Fan, the sudden change in pressure can be enough to damage an enclosure or pop the fan out of the panel. Be sure to secure doors in the correct position, prior to starting the fan. If a door shuts during testing, and it goes unnoticed, the accuracy of the test will be affected, because not all of the building will be included in the test, as the area behind the closed door is treated as unconditioned space.

4 Door Panels

Retrotec offers three types of door panels. The most common style of door panel is a cloth panel on an aluminum frame. Modular panels (or hard panels) are a set of solid panels that expand to fit most doors, and offer a quick setup or take down option that is professional looking and easy to carry. For large buildings, three fans can be mounted in one Three-Fan panel, to maximize the airflow pushed through one doorway.

4.1 Cloth Door Panel with Aluminum Frame

A cloth door panel, and aluminum frame, are standard with the Q46, Q56, and 1000 Door Fan systems. If purchased separately, the cloth door panel can be used with most Retrotec fans.

The frame consists of the following parts:

- 1 - #2/3 right side piece
- 1 - #1/4 left side piece
- 1 - #1/2 top end piece
- 1 - #3/4 bottom end piece
- 1 - #5 Lower crossbar with fan strap

Each piece has a black rubber knob which, when loosened, permits the piece to be adjusted in length. The white plastic, tightening, Cam Lever expands the frame a small amount, to provide a tight fit when in the doorway.

Extender kits are available to increase the size of doorway that can be fit with the aluminum frame. An extender kit consists of both vertical and horizontal extenders, a crossbar extender, plus an additional crossbar (#6 Upper crossbar, and extender). Also included is the Extra Tall, Extra Wide cloth panel.

Table 3. Aluminum door frame panel dimensions.

Dimensions		With Extender Kit
Panel width	29.5 - 41.5 in (75 - 105.4 cm)	30 - 48 in (76 - 122 cm)
Panel height	51.5 - 95 in (131 - 241 cm)	60 - 110 in (152 - 280 cm)
Frame thickness	1.75 in (5.3 cm)	
Frame case	53 x 10 x 4 in (134 x 25 x 10 cm)	
Frame weight	14.2 lbs (6.4 kg)	

Aluminum Frame Instructions

The Retrotec aluminum frame is quick and easy to assemble. Each piece is numbered; align the corresponding numbers to build the frame.

To assemble the aluminum frame

1. Attach the frame pieces so that the corresponding numbers are aligned. The small metal button may need to be depressed slightly to slide the pieces in. The button should pop back out when the frame pieces are correctly aligned.
2. Flip all of the white cam levers to the “off” position (flat against the channel).

3. Install the #5 Lower crossbar into the side pieces at the location stamped “5”.
4. Place the frame in a doorjamb, with the black rubber knobs exposed. Loosen the black knobs to allow height adjustment of the frame, and raise the top of the frame (while holding the lower part down with a foot) until it is in contact with the upper inside of the jamb. Tighten both knobs.
5. Loosen all the horizontal adjustment knobs (knobs on the top and bottom and crossbar frame pieces) and adjust frame width until it is in contact all along both sides of the doorjamb. Now tighten the knobs.
6. Remove the frame from the doorway.
7. Put the cloth cover on the frame. Put the bottom of nylon cover around the bottom of the frame and connect the Velcro strips. Bring the nylon cover up and around the top of the frame and connect the top Velcro strips. Wrap the panel around the side, and connect the final Velcro straps.
8. Put the covered frame back in the door opening. Turn all five of the white plastic cam levers to the “expand” position (away from side of channel).
9. Ensure that the panel is solidly anchored in position. If it needs to be tighter, release the cam levers one at a time, loosen the knob, push the frame into position, tighten the knob, and re-actuate the cam lever.

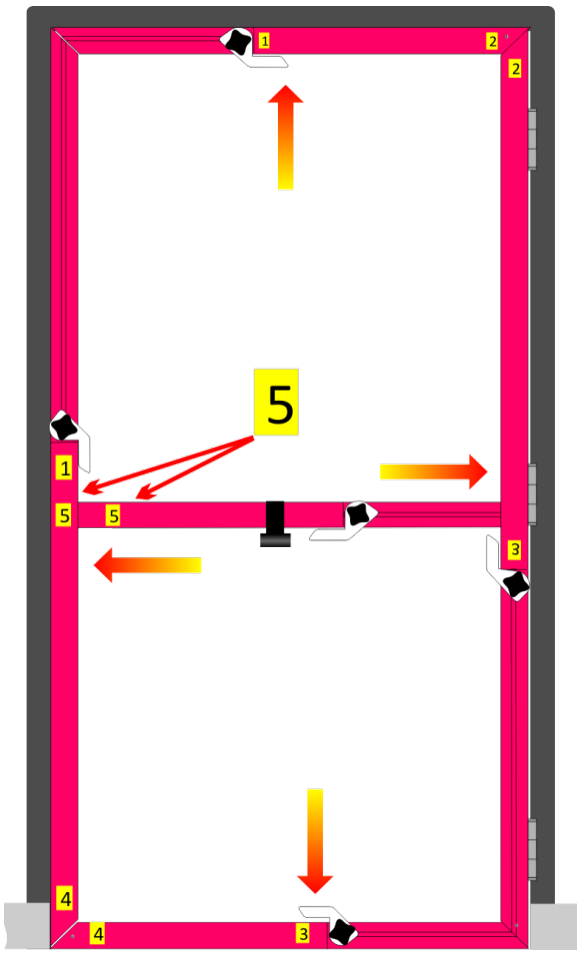


Figure 12. Aluminum frame for the cloth fan door panel.

To remove the frame

1. Release all five white cam levers. Pull the frame from the doorway. It may be necessary to loosen some of the black knobs if the frame was secured tightly in the doorway.
2. Lay the frame flat on the ground, a lean it against a wall.
3. Remove the cloth, and fold it for easy packing.
4. Loosen the black knobs and collapse the frame to its smallest size. The frame can be transported in this fashion, partially assembled, by re-tightening all of the knobs.
5. To disconnect the frame, push the metal button in while pulling the frame pieces apart.

To install the frame extender pieces

1. The horizontal extenders can be attached to the top and bottom pieces of the aluminum frame.
2. Attach the crossbar extender as well.

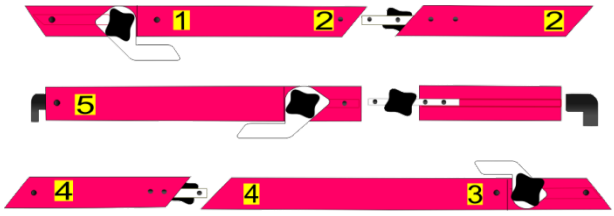


Figure 13. Aluminum frame extender pieces.

3. To install the vertical extenders, first remove the corner pieces from the top ends of the vertical frame pieces.
4. Attach the vertical extenders where the corners were removed from.
5. Re-attach the corner pieces to the top of the now longer vertical pieces.
6. Re-assemble the frame as described in the previous steps.

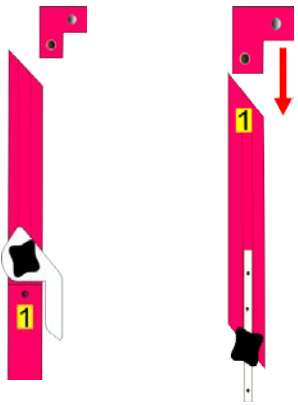


Figure 14. Installing vertical extender pieces.

To install a fan in the cloth panel

1. Determine which direction the airflow is required in, and align the fan according to the airflow indicator on the fan top panel. Airflow into an enclosure pressurizes the enclosure, and airflow out of an enclosure depressurizes.
2. Hook the bottom of the fan into the cloth fan hole.
3. Guide the elastic ring of the fan hole around the fan casing. The fan hole elastic can be tightened, if required, on some versions of the cloth panel. A tight fit is required to prevent air leakage.
4. Use the Velcro fan strap on the horizontal crossbar to hold the fan in place. The fan hole elastic should not be supporting the weight of the fan.
5. Double-check that the fan airflow is in the correct direction. It will be much harder to switch the fan around once all of the equipment has been connected.

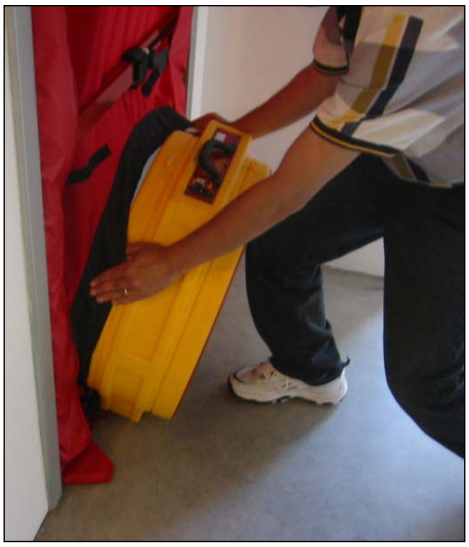


Figure 15. Installing a fan in the cloth door panel.

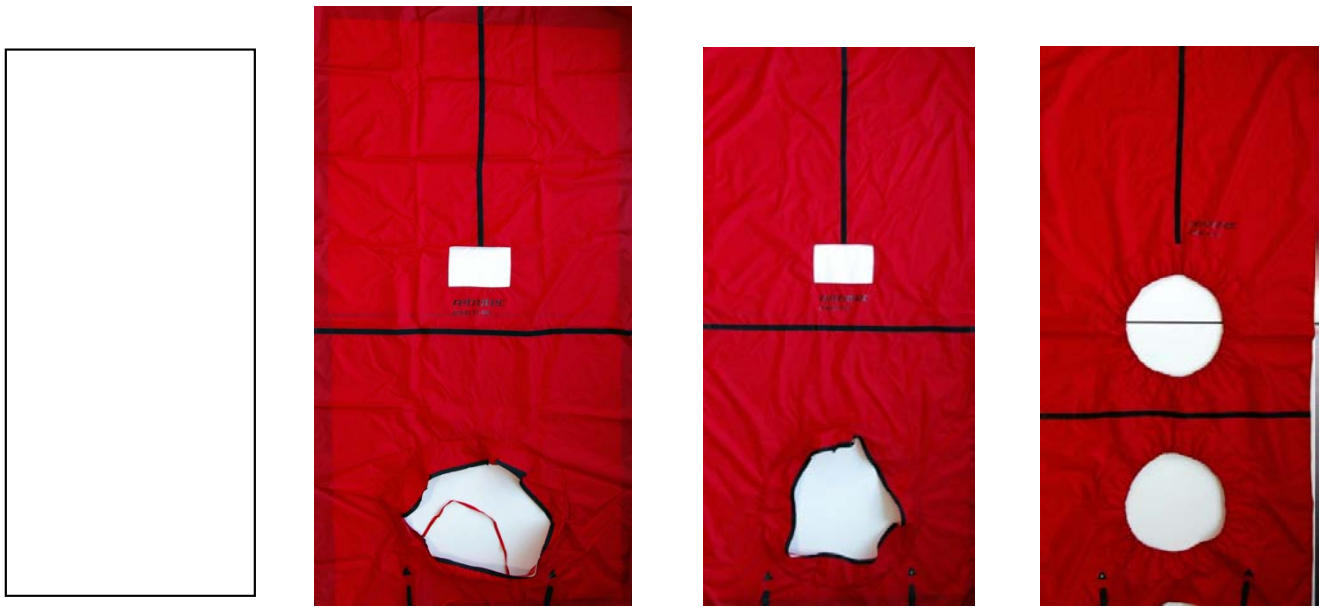
Types of Cloth Panels

Retrotec's aluminum frame comes with a standard cloth panel, which can fill a door up to 41.5 inches wide by 95 inches high. However, some applications may require that a different cloth panel be used with the aluminum frame.

Larger doorways will require the Aluminum Frame Extender Kit, and an Extra Tall Extra Wide cloth panel. With the extension kit and panel, the maximum door frame width is extended to 48in and the maximum height becomes 110in.

A Hi-Pressure cloth panel is required if testing is expected to exceed 150 Pa (it's rated for tests at pressures up to 300 Pa). The Hi-Pressure cloth includes additional security straps to hold the fan in place. Adding an additional crossbar is also recommended for high-pressure tests.

Two fans can also be mounted in a single aluminum frame with the addition of a second crossbar and a two-fan cloth panel.



Standard Panel | Extra Tall - Extra Wide | Hi-Pressure | Double Fan

Figure 16. Cloth door panel types (standard, tall, hi-pressure, double fan).

Aluminum Frame Parts

It is possible to replace damaged or broken parts of the Aluminum Frame. The following pieces can be replaced:

- Cam Levers
- Knob
- Channel Guides
- Corner Block
- Expander Block

To order replacement parts, reference the part number in Appendix D.

4.2 Modular Door Panels

A modular door panel is standard with two Door Fan systems: models Q56 and Q5E. If purchased separately, the modular door panel can be used with most Retrotec 2000 and 3300 series fans. A special adapter plate is also available to incorporate Retrotec's low-flow fans for use with the modular panel.

The modular panel consists of the following parts:

- 1 - Fan panel with fan strap
- 1- Large-X panel
- 1 - XY panel
- 2 - Fan panel fill sheets (one large, one small)

Additional panels, including a Small-X panel, can be purchased to increase the maximum doorway height that the modular panels are capable of filling.

Figure 17. Modular door panel set.

Modular Panel Instructions

For detailed instructions on installing the modular hard panels, see the Modular Door Panel Quick Guide.

To install the modular door panels

1. Unpack the panels. The Fan panel is installed first. Place it in the doorway, touching the ground. All panels should expand towards the door hinges. The panels can be expanded by pulling the yellow cords tight, and then securing the cord on the cleat. Do not secure the yellow cords on the Velcro, to hold the straps tight. The Velcro is only meant to hold the straps against the panels. Attach the fan strap.
2. Attach a Fan panel fill sheet to cover any gap that is created by expanding the Fan panel.
3. Install the Large-X panel, so that it is touching the top of the door frame. Expand it so that it is held in place securely.
4. If required, install a Small-X panel just below the Large-X panel.
5. Install the XY panel. Expand it both vertically and horizontally to completely seal the doorway.
6. Grill mask can be used to seal any small gaps that remain.
7. A second Fan panel can be substituted for the Large-X panel if required. However, it should be placed directly above the first Fan panel, with the Small-X or XY panel being used at the top of the doorway instead.

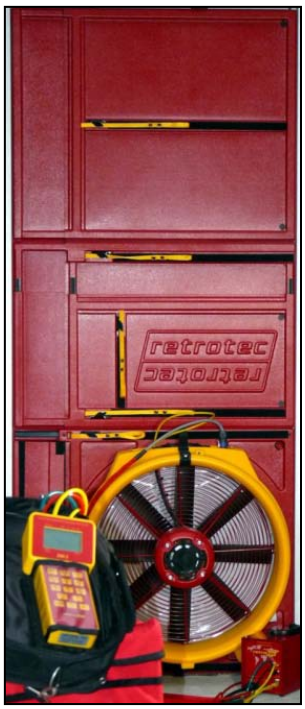


Figure 18. Modular door panel set installed.

To install a fan in a hard panel

Figure 19. Installing a fan in a modular door panel set.

1. Determine which direction of airflow is required and align the fan according to the airflow indicator on the top fan panel. Airflow into an enclosure pressurizes the enclosure, and airflow out of an enclosure depressurizes.
2. Insert the bottom of the fan into the Fan panel.
3. Align the notches on the fan with the corresponding notches on the Fan panel.
4. Push the fan into the hole, and rotate the fan slightly to secure it in the panel.
5. Hook the fan strap over the edge of the fan shell to hold it in place.
6. Double-check that the fan airflow is in the correct direction. It will be much harder to switch the fan around once all of the equipment has been connected.

4.3 Three-Fan Panel

The Three-Fan panel is a specially designed folding panel which supports three Retrotec fans in one doorway. The panel is included with the QMG system, or can be ordered separately. Blanking plates are included with the panel, so that it can be used with fewer than three fans if required.

Three-Fan Panel Instructions

For detailed instructions on using the Three-Fan panel, see the QMG Quick Guide.

To install the Three-Fan panel

Figure 20. Lock and butterfly latch for the three-fan QMG panel set.

1. Unfold the panel, and lock the four butterfly latches.
2. Place the fan panel against the doorway, on the opposite side of the door frame from the door.
3. Secure the top corner of the panel, nearest the hinges, by placing the circular retention strap anchor behind the door/door frame gap.
4. Slide two retention straps over each cross brace, and insert the narrow end of the cross braces into the door/door frame gap, so that it runs parallel to the fold joints of the three fan panel. Secure the cross braces to the door panel using the retention straps. The locking collars should be used to keep the retention straps from sliding around the cross braces.
5. Use the corner brace to secure the remaining top corner, by placing it diagonally across the door frame, and attaching a retention strap to the door panel.

6. Attach a fan strap for each fan being used.
7. Use grill mask to seal any gap left between the top of the panel and the door frame.

Space permitting, two three-fan panels can be joined together to mount six fans together. Use the connector plate to connect the two panels, with the fan holes oriented towards the middle. In this situation, it is unlikely that the cross braces can be used. Use the retention straps and secure the panels using the door/door frame gap where possible.

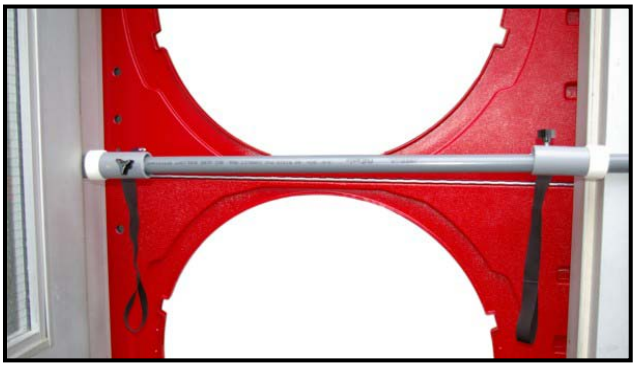


Figure 21. Cross brace for the three-fan QMG panel set.

5 Other Equipment

5.1 Manual Speed Control

Figure 22. Manual speed control.

A manual speed control is included with all high-power Retrotec fan systems and can be requested for standard power fan systems. All ‘E’ and ‘R’ model systems require the manual speed control to adjust the fan speed. ‘Q’ model systems include the manual speed control as an alternative method of regulating fan speed. The newest ‘Q’ model fans have the manual speed control incorporated into the fan top, and therefore do not come with an external fan control piece.

Note: The speed control included with older ‘Q’ model systems connects to the fan using an Ethernet cable, and will not function with an ‘E’ or ‘R’ model system (which uses a DU-210 or 2100 model fan).

To use the manual speed control

1. Ensure the switch is in the ‘off’ position to prevent an accidental startup of the fan.
2. Attach the speed control to the fan using either the attached control cable or an included Ethernet cable.
3. Adjust the speed control knob as far as it will go, counter clock-wise, so that the fan is set at zero speed. Turn the switch ‘on’.
4. Slowly adjust the knob clock-wise, to accelerate the fan.
5. The on/off switch can now be used to turn the fan on/off while maintaining exactly the same set speed.

To use the fan top speed control on the 2350 Fan

1. Set the fan speed to zero, by adjusting the speed control knob as far as it will go, counter clock-wise.
2. Turn the switch ‘on’.
3. Slowly adjust the knob clock-wise, to accelerate the fan.

Figure 23. Fan speed control knob on the fan top.

5.2 Flex Duct

Flex Duct is available in two sizes. A 12-foot long, 24-inch diameter Flex Duct is compatible with all Retrotec Door Fans, and can be used to neutralize the pressure difference across a drop ceiling, below a raised floor, or to measure the air flow through large registers and vents. When using the Flex Duct, it's important to extend it out to its full length in a straight line, to avoid

Figure 24. Flex duct for Door Fans (mainly used for enclosure integrity testing).

A smaller, 12-inch diameter Flex Duct is included with all Retrotec duct testing systems, and makes it easy to direct the fan airflow into the duct system.

Flex Duct can also be used to check the calibration of a Door Fan system, if a panel with a hole of a known size is attached to the opposite end. For more information, see Field Calibration.

5.3 Fan Splitter

A Fan Splitter is used to allow a single DM-2 gauge to control the fan speed of multiple fans. This is a useful tool when trying to test very large, open, enclosures. Testing time can be significantly reduced by simplifying fan speed adjustment. It also means that automatic control to a test pressure is still possible, even with multiple fans.

The Fan Splitter connects to the DM-2 with the included Ethernet cable. Additional lengths of Ethernet cable are used to connect up to seven fans to the Fan Splitter. It does not matter which Ethernet port the fans or DM-2 are connected to on the Fan Splitter.

Model 1000 fans, or fans using the 2350 fan top include a second Ethernet port on the fan top, which can be used to link multiple fan together, and eliminates the need for the Fan Splitter.

While the DM-2 connected to the fan splitter will control the fan speed of all connected fans, it can only measure the flow pressure from one fan. Flow and/or flow pressure will need to be measured from each fan to get accurate airflow results. Do not add the measured flow pressure from each fan. Instead, convert the flow pressure to cfm (or adjust the DM-2 to display Flow in cfm), before adding the numbers together.

5.4 Wind Damping Kits

Wind damping kits help to minimize the effect of wind on an exterior reference pressure tube. For more information about dealing with problems, see Troubleshooting.

Figure 25. Basic wind-damping kit.

Figure 26. Deluxe "wild wind tamer" wind-damping kit.

5.5 Cases and Bags

Sturdy cases or bags are available for all Retrotec equipment. Fan cases can protect your fan from damage during transport, and make it easier to carry on location. Replacement bags are available if needed.

All Retrotec bags are hard sided, and made of a durable nylon weave that is hard to tear and is weather resistant.

Figure 27. Carrying cases for fans.

5.6 Grill Mask and Dispensers

Grill mask is useful for sealing both supply and return registers, and attaching the flex duct flange. Standard rolls are 12 inches wide.

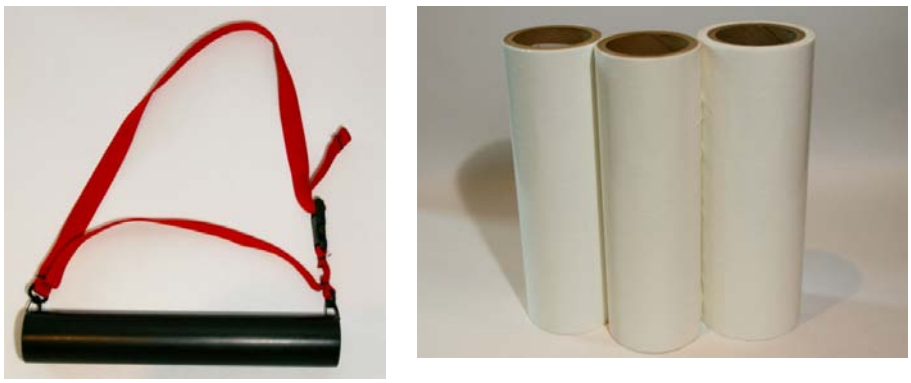


Figure 28. Grill mask dispenser (left) and rolls (right).

5.7 Air Current Testers

Retrotec Air Current Testers produce a neutral buoyancy smoke which can be a useful tool in locating air leaks. Even a small puff of smoke will immediately follow the direction of air movement.

Figure 29. Air current testers.

6 Conducting a Test

6.1 Installing the Door Fan for Depressurization Testing

A building depressurization test (blowing air out of the building) is the most common way of conducting a Door Fan measurement. This direction of testing has a number of advantages, but the primary reason is that back-draft dampers in exhaust fans and dryers are pulled closed during depressurization. Since these dampers are usually shut, leakage from them can be left out of a typical Door Fan test.

Select a Location

The first step in any test is to select a doorway, and install the door panel.

- An exterior doorway in a large open room is best. Avoid doorways that have walls, stairs, or other obstructions nearby. These will restrict airflow, and can lead to inaccurate results.
- If the exterior doorway opens to an enclosed porch, garage or other area, open doors or windows to ensure the enclosed area is open to the outside.
- The building's door frame can be used to help secure the fan and panel in place. For a depressurization test, install the door panel on the inside of the door, the door frame will then help keep the panel in place when the negative pressure tries to pull it through the door way.

To install the Door Fan

1. Install the door panel by following either the aluminum frame or modular panel setup instructions.
2. Run the red pressure tube through the hole in the door panel to the outdoors. Make sure the end of the tube is not in the path of the fan's airflow.
3. Install the fan in the door panel. Make sure the flow direction is out of the building.
4. Connect the digital gauge to the fan. A Retrotec DM-2 is connected the same way for both pressurization and depressurization.
5. Connect the fan to a suitable wall outlet for power.

6.2 Conducting a Door Fan Depressurization Test

Once the Door Fan system has been setup, it is ready for conducting a test.

Choosing a Test Procedure

There are two common Door Fan test procedures available, for testing the air leakage of a building: a single-point test, and a multi-point test.

A single-point test establishes a 50 Pa test pressure in the building; results come from measuring the fan flow required to maintain the pressure imbalance. This is a quick and simple way of measuring airtightness, and by using the flow pressure measurement, simple results such as the size of the total leakage can be determined.

Basic Results

Basic test results from a single-point test can be used to provide a simple and quick assessment of a building's airtightness. The DM-2 digital gauge is capable of displaying most common calculations directly on the screen as the measurements are being made.

Air Leakage at 50 Pascal

The industry standard measurement is CFM50. This is the airflow (in cubic feet per minute) required by the Door Fan to create a pressure difference, between the building interior and the outdoors, of 50 pascals. This is roughly the equivalent pressure that the building experiences in a 20 mph wind.

ACH50

ACH50 is the number of complete air changes that will occur in one hour, when a building pressure of 50 pascals is applied across the building envelope. The value is calculated based on the volume of the enclosure, so it is a useful method of normalizing leakage rate.

EqLA 10

Equivalent leakage area is defined as the area of a hole in a thin panel that would leak the same amount of air as the building does at a pressure of 10 pascals.

EfLA 4

Effective leakage area calculation is defined as the area of the elliptical nozzle-shaped hole that would leak.

Air Density Correction

In conditions where the interior and exterior temperature differential varies greatly, the accuracy of the fan measurements can be less accurate. In a depressurization test, the Door Fan system measures the fan flow out of the building. However, the measurement is meant to reflect the air infiltrating into the house through all the leaks. When there's a temperature difference, the air density changes, and the leaks will not exactly equal the measured fan flow. In extreme conditions, this difference can be as much as 10%. To compensate, use the temperature correcting table in Appendix C.

7 System Maintenance

Regular ongoing maintenance is an important part of keeping equipment in a usable condition.

7.1 Required Maintenance

Before performing a test, the pressure connections on the fan must be inspected for blockages that can occur due to water or dust. It is not recommended to allow excessive quantities of gypsum dust to enter the fan since it will prematurely ware out the bearings and may plug the fan pressure ports. Use a vacuum cleaner to clear the 4 ports on the nacelle of dust and/or water in the places where the tubing attaches to the fan.

Fan Sensor and Motor Position

Retrotec Door Fans maintain their calibration unless physical damage occurs. Conditions which could cause the fan calibration to change are movement of the motor and blades, relative to the fan housing, damaged flow sensors, and leaks in the sensor or tubing running from the flow sensor to the fan pressure tap. The first condition will be easily apparent if the C8 Range Plate will not sit properly on Range Ring B, or if the motor mount looks bent.

Damaged Flow Sensor

Retrotec calibrated fans use four flow sensors that are mounted inside the plastic housing that goes over the front of the fan.

To test for leaks in the sensor or from the sensor to the fan pressure tap

1. Attach a piece of tubing to the yellow connector on top of the fan. Leave the other end of the tubing open.
2. Find the four small holes located on the red plastic that covers the motor. They should be evenly spaced around the motor, with one on the top, bottom, left, and right. Temporarily seal the four holes by covering them with masking tape.
3. Suck on the open end of the tube, to create a vacuum in the tubing. Cover the end of the tube with your tongue or finger, if the tubing sticks, a vacuum has been created, and the flow sensor does not leak. Make sure that the vacuum persists for at least 5 seconds. If you hear a sound of air moving through the tubing, then there may be a disconnection inside the fan somewhere.

Figure 30. Pressure sensor on the fan motor casing.

4. Remove the tape from each hole individually, and ensure that air can be sucked through that particular hole. Check each of the four pressure sensing points in turn.

7.2 Field calibration check of the fan

A field calibration check should be performed approximately monthly. It is a simple way to verify that the equipment is still operating correctly.

Figure 31. Homemade calibration plate.

To perform a field calibration using a doorway

1. Perform a Door Fan test on the building and record the EqLA.
2. Install cardboard in upper part of doorway with a 20 x 20 inch hole cut in it.
3. Perform a second Door Fan test on the building, record the EqLA.
4. Subtract the first result from the second result and the value should be 400 in^2 (+/- 10%).

The same check can be performed with the Calibration Plate, which can be purchased for the Modular Hard Panel system.

./A field calibration can also be performed by using the optional Flex Duct and a plate with a 400in^2 hole cut in the end.

Figure 32. Flex Duct attached for calibration.

To perform a field calibration using a Flex Duct

1. Secure the Flex Duct to the outlet side of the fan.
2. Attach a panel to the open end of the Flex Duct with a 400in^2 (20 in X 20 in) hole cut into it.
3. Connect the DM-2 to the fan.
4. Run a blue tube from the gauge (blue port) to the panel, and insert it into the Flex Duct.
5. Turn the fan on and press **[Set Pressure] [50] [Enter]** to establish a 50 Pa pressure inside the Flex Duct.
6. Monitor EqLA on channel B of the gauge. EqLA should measure the same size hole as was cut into the panel.

Appendix A: Troubleshooting

Motors Overheat and Shutoff

Retrotec 2000 series 120 Volt AC Motors

There is a lot of variation from one motor to the next as they come from the manufacturer. Some motors heat up more than others, in spite of undergoing the same manufacturing process. All motors are tested at Retrotec facilities for 1.5 hours under full current and stress. The motors which shut off due to excess heat are rejected, and sent back to the beginning of the production line. Some users, however, may still encounter problems in the field. Below are some points that may be followed to remedy a specific problem.

- Make sure the motor runs as close to full speed as possible. The faster it runs, the more air goes through the motor. A rule of thumb is to have the flow pressure over 100 Pa and the motor running near full speed. The motor heats up the most at ¾-speed where it draws 13 amps at 120 volts. At full speed the motor will draw less current!
- Make sure the C8 Range Plate has the cooling ports in line with the ones on the motor cover. If the mounting indicator sign is in the correct position, this will ensure the ports are fully open.
- Ensure that the switch on the speed controller is in the off (0) position at the rocker switch, not just turned down. If left on low speed with the blade not turning, the controller and the motor will be stressed.
- The thermal breakers that shut down the motor are not adjustable. To learn when maximum heat is created, put a current meter on the fan, and adjust the fan speed to see when it is pulling maximum current, and therefore creating maximum heat.
  - More current = more heat.
  - More airflow through motor = less heat.

  A more drastic solution is to change the blade or to cut a quarter inch off the blade tips and re-balance the blade to reduce the load on the motor.

3300 Fans

High Power Fan Will Not Control Smoothly

Retrotec 3300 series variable-frequency fans require 100-280 VAC 50/60 Hz power in order to operate reliably. Voltage drops due to line losses and fluctuations in AC power can be significant. The fans will not work at line voltages of less than 95 VAC.

If the system will:

- Not control smoothly
- Slow suddenly
- Stop completely
- Produce less than 6,500CFM @100% speed
- Multi-fan systems will oscillate, with fans running at varying speeds

The problem is likely that insufficient line voltage is arriving at the variable-frequency power supply.

To resolve the issue

- Use a 240VAC Stove or Dryer outlet
- Use 208VAC
- Reduce extension cord length on 120V circuits and/or use an industrial quality 12 gauge extension wire.

Fan Will Not Start

The 3300 series fan's autoswitching power supply will stop working if either of the following conditions occurs:

1. The internal 25 Amp circuit breaker is triggered
2. The internal relay comes loose

If either situation occurs, disconnect the supply power cord from the wall outlet.

To reset the power supply's circuit breaker

The circuit breaker can be located without removing the cover of the power supply. Look through the holes on the right side of the power supply. The white button is located at the top left of the right side panel. Check whether it is popped open (upward). It can be reset without removing the case by using a paper clip.

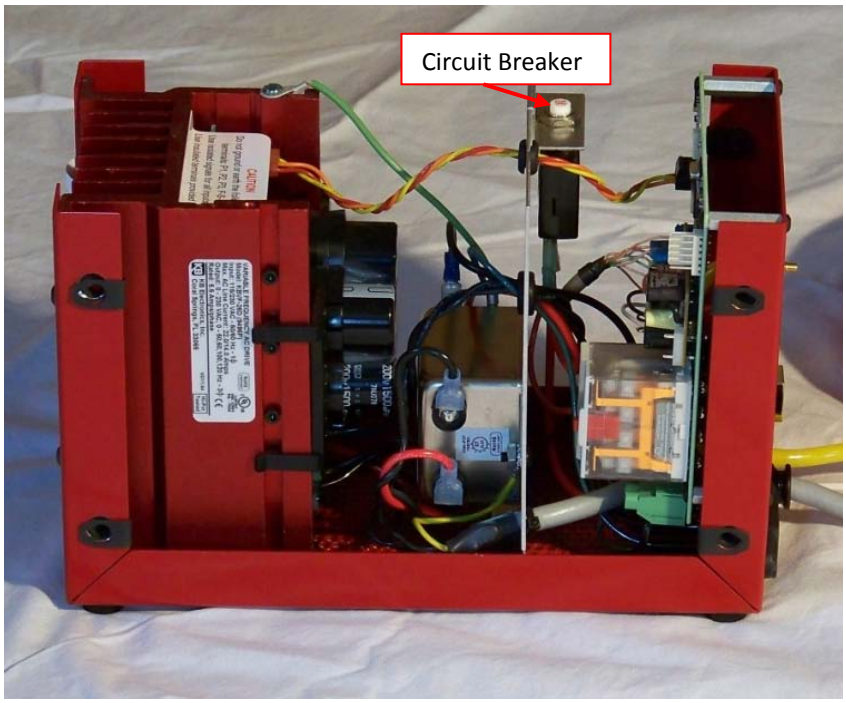


Figure 33. Reset the variable speed box power supply with the circuit breaker.

To ensure the relay hasn't come loose

If you shake the power supply slightly, you should be able to determine if the relay has come loose. Look through the holes on the left side of the power supply. The relay is located at the bottom right of the left side panel. The relay is enclosed in a clear plastic box.

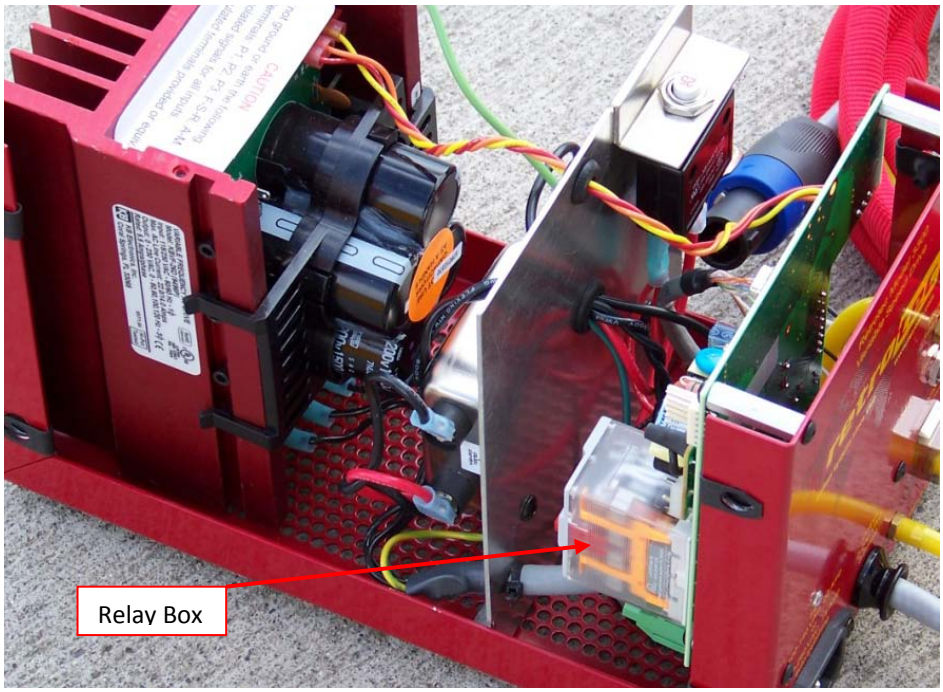


Figure 34. Relay box in the variable speed drive.

Ensure that the relay is seated properly. The relay may require gluing with silicon glue. The case cover screws will need to be removed in order to access the relay. Remove the tamper seal, if so equipped. Remove the front left side and right side, top and bottom screws. Also remove the rear left and right bottom screws. Loosen the rear top screws, but do not remove them. The cover can then be swung upward.

Power supply Interior Status Light

You can see the lights by looking through the holes in the right side of the power supply. The lights are toward the rear of the power supply.

The PWR (Power) LED is the LED to the right. This LED is solid green when AC is applied to the power supply.
The ST (Status) LED is the LED to the left. This LED will indicate an abnormal or fault condition. The information can be used to diagnose an installation problem such as incorrect input voltage, an overload condition, and power supply output mis-wiring. It will also provide a signal which informs the user that all power supply and microcontroller operating parameters are normal.

Table 4. Power supply status light indications.

Status LED			
Colour	**Flash Rate**	**Power supply Status**	**Colour and Sequence After Recovered Fault**
Green	1 sec on/off	Normal operation	--
Red	On	Overload	Green
Red	¼ sec on/off	Power supply timed out	--
Red	1 sec on/off	Short circuit	--
Red/Yellow	¼ sec on/off	Under voltage	Red/Yellow/Green
Red/Yellow	1 sec on/off	Over voltage	Red/Yellow/Green
Yellow	On	Stop	--
Yellow	0.04 s on/0.06 s off	Phase Loss Detection	--
Green/Red	1 sec on/off	Communication Error	Green

Using the Fan with a Generator

Retrotec recommends a generator with inverter type AC power output. Size the generator capacity above the maximum power required in order to reduce distortion of the AC power waveform. The higher the rated power output, the better. Suggestions for minimum generator output sizes are 3000W for Door Fans and 500W for DucTesters.

Table 5. Acceptable generator power output for specific fans.

Fan	Operating Voltage	Max Operating Current (Watts)	Max Inrush Current	Minimum Generator Power Output
3300 - 3 Phase Power supply, double wall fan as found in: QMG, Q4E, Q5E	120VAC	22A (2640W)	Equal due to soft-start ramp-up of inverter.	3000 W
	208VAC	13A (2704W)		
	230VAC	10.5A (2415W)		
	240VAC	10.3A (2472W)		
2000 Series , double wall fan as found in Q46, Q56	120VAC	12 (1440W)	15.5A (1860W)	
	208VAC	6.2A (1290W)	7.6A (1580W)	
2350 , double wall fan as found in Q46, Q56	120VAC	10A (1200W)	23A (2760W)	
	208VAC	4.5A (936W)	10A (2080W)	
1000 Wheel rim style, single layer	120VAC	12A (1440W)	23A (2760W)	
	208VAC	4.8A (998W)	11A (2288W)	
DU200 Series DucTester	120VAC	2A (240W)	2.5A (300 W)	500 W
	208VAC	N/A	N/A	
DU200 w/2350 fan top	120VAC	2A (240W)	3A (360W)	
	208VAC	0.9A (187W)	1.2A (250W)	

When selecting the generator, look for key words and phrases including:

- “inverter output”
- “utility-grade AC power”
- “suitable for sensitive electronics”

Table 6. Portable generator AC power output types.

Type of AC Power Output	Comments/Expectation	
Inverter	Best; Compatible	Recommended
AVR – Automatic Voltage Regulation	Questionable; May not perform	Not Recommended
Brushless	Worse; May not perform	Not Recommended
CycloConverter	Worst; May not perform	Not Recommended

Generators

Honda Generator EU2000 (120V, 2000W, 67 lbs)

- Works will all DucTester fan models.
- Works with both 2200 and 2350 series fans.

The Honda EU2000 provides 2000 watts and 120V AC power. It is equipped with an inverter, and is specially designed for sensitive electronic equipment. At 16.7 Amps, it meets the needs of most Retrotec equipment, although it does fall below the recommended minimum power output.

GENYX G3000HI (230V, 3000W) generator

- Works with all Retrotec Fans.

The G3000HI is equipped with an inverter, and runs at 230V and a maximum of 3000W. It meets the minimum requirements for even the most powerful Retrotec equipment.

Portable Power Supplies

Portable power supplies can provide enough power for Retrotec DucTester fans, but are unlikely to produce sufficient power for a Door Fan. Please ensure that the power supply meets the minimum power requirements of the fan before attempting to use one.

Black and Decker Electromate 400 Model VEC026BD

- Works with DucTester fans with a 2350 fan top.
- Do not use with Door Fans, or with DucTesters without a 2350 fan top.

The VEC026BD is a 110/120VAC power supply with a built in 400W inverter.

Appendix B: Calculating Airflow Manually

When testing without a computer, or when testing very large or leaky buildings, it may be necessary to calculate the airflow manually.

Note: Manual calculations are really only appropriate for Single Reading Tests. It is possible to do a Multi-Reading Test manually and attempt to plot out the results on log-log graph paper, but it is not recommended.

To calculate airflow

1. Record the Door Fan Flow Range.
2. Adjust the fan speed to achieve the desired room pressure.
3. Record the flow pressure (Channel B on the DM-2, lower two gauges on the gauge clip).

If using a computer program:

4. Record the indoor and outdoor temperature.
5. Record the airflow direction.
6. Input the information into the software, and calculate the results.

If calculating manually:

7. Reference the temperature correction table to account for indoor and outdoor temperature.
8. When pressurizing (flow towards operator), subtract the room pressure from the flow pressure to determine the true flow pressure.
9. Locate the flow pressure in the left column and read the airflow under the appropriate Flow Range column.

Manually calculated flows may vary from the more accurate computer output for several reasons:

- The flow pressure is corrected for room pressure which is not known so approximated to equal flow pressure.
- The computer corrects each input for gauge error.
- The computer may add a fan correction factor K4.

In spite of this, manually calculated results will typically be within 2% of the computer result.

When using multiple fans, never add flow pressures, they aren't additive. Determine airflows in cfm separately and add them together to determine total airflow.

The Manual Flow Tables are listed in the DM-2 Operation Manual.

Appendix C: Part Numbers

Part #	Product	Part #	Product
Fans & Accessories			
FN150 (120V) FN151 (110V) FN152 (240V)	1000 Digital Fan 	FN208 (120v) FN209 (240v)	2350 Digital Fan 
FN252 (120V) FN256 (240V)	2350 Fan-Top 	FN309	3300SR Digital Fan 
FN308	3300 Auto-Switching 110v/240v Drive for 3300 Fan 	FN216 (A Ring) FN217 (B Ring) FN218 (C Plate) FN219 (Plugs set of 8)	Flow Range Plates/Rings 

FN211 Hard Sided Fan Case

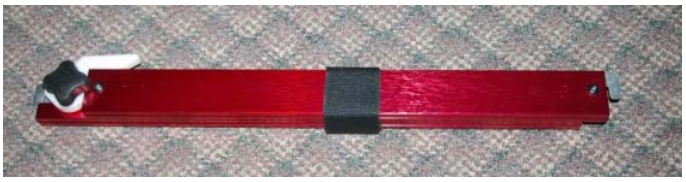
FN229 Cover for Front or Back of Fan

Aluminum Frame

AL110 Aluminum Frame with Slots, Red Anodized

AL215 Extender Kits for height & width, Red

AL112 Crossbar #6, upper, Red



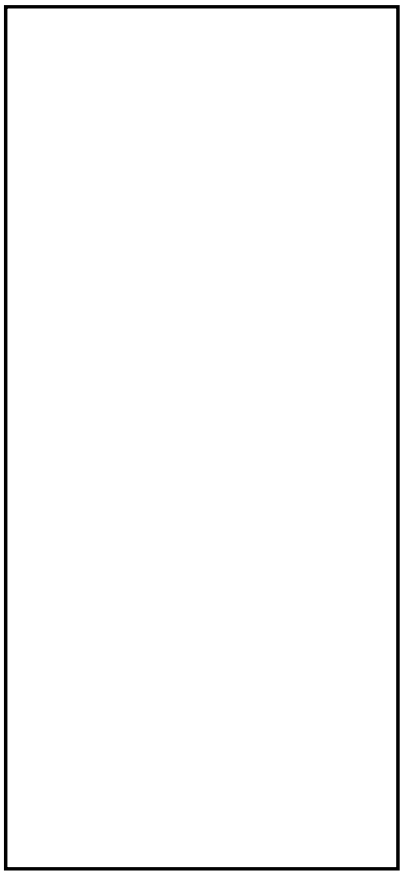
AL106 Aluminum Frame Cam Lever Replacement Kit

AL107 Aluminum Frame Replacement Knob

AL113 Alum Frame Replacement Channel Guide Kit (5 Units)

AL114	Alum Frame Replacement Corner Block Kit (Single) 	AL115	Alum Frame Replacement Expander Block Kit (Single) 
AL103	Case for Standard Aluminum Frame, Gun Style 		

Cloth Panels

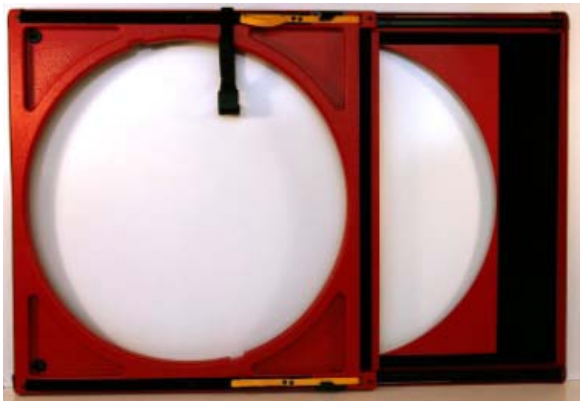
AL203	Standard Cloth Panel 	AL211	Extra Tall Extra Wide Cloth Panel 

AL206 Hi-Pressure Cloth Panel 	AL204 Double Fan Cloth Panel 
AL214 Low-Flow Cloth 	

Modular/Hard Panels

PN201 Modular Door Panel Set

PN206R Fan Panel



PN207 Large Fill-In Sheet

PN208 Small Fill-In Sheet

PN210R Large-X Panel

PN211 XY Panel

PN209R Small-X Panel

PN213 Field Calibration Plate

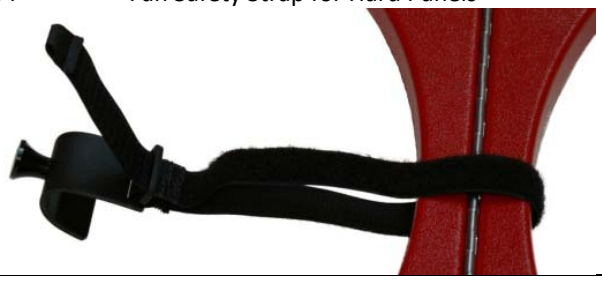
PN212 Blanking Plate

PN204 Panel Case with Shoulder Strap

PN302 3-Fan Moulded Panel Set for 3000 fans

PN311 3-Fan Cordura Panel Case

FN234 Fan Safety Strap for Hard Panels



Digital Gauges

DM221 DM-2A Mark II 2-channel Digital Gauge with Automatic Control

System Accessories

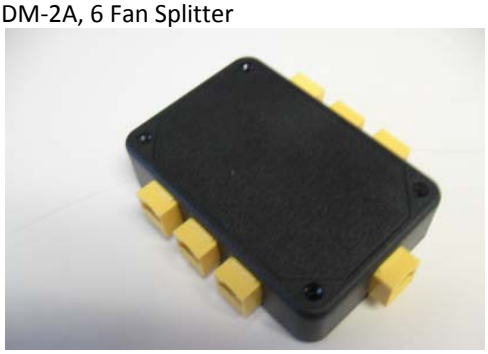
DM235 Umbilical for 1000 fan, 6.5ft (2m) Umbilical
DM218 for 2000 fan, 20ft (7m)
DM224 Umbilical for 3300SR fan, 20ft (7m)

DM222 Optional Umbilical extension for 3300 fans + box 75 ft (22.5 m)

DM229 DM-2 Umbilical extender (box only)

DM212 USB Cable Type A to Mini B - 6ft (2m)

FN242 DM-2A, 6 Fan Splitter



DM205 Control Cable for 1000/2000/3000 Digital Fan - 20ft (7m)

DM203 (120v or 240v) 9V Country Specific Power Supply

TU119 Tubing Accessory Kit

CU230 Manual Speed Control 	FX201 Imperial FX202 Metric 2000 Flex Duct (24") 
TU101 Basic Wind-Damping Kit 	TU103 Wild Wind Tamer Wind Damping Kit 
GR113 Grill Mask 12in x 160ft, 12in perfs, Hi-stick White, Single Roll 	GR106 Grill Mask Dispenser 13in 
AC107 Air Current Testers