The Energy Conservatory

MODEL 3
MINNEAPOLIS BLOWER DOOR™

OVERVIEW

ENERGY CONSERVATORY WARRANTY

EXPRESS LIMITED WARRANTY

Seller warrants that this product, under normal use and service as described in the operator's manual, shall be free from defects in workmanship and material for a period of 24 months, or such shorter length of time as may be specified in the operator's manual, from the date of shipment to the Customer.

LIMITATION OF WARRANTY AND LIABILITY

This limited warranty set forth above is subject to the following exclusions:

- With respect to any repair services rendered, Seller warrants that the parts repaired or replaced will be free from defects in workmanship and material, under normal use, for a period of 90 days from the date of shipment to the Purchaser.
- Seller does not provide any warranty on finished goods manufactured by others. Only the original manufacturer's warranty applies.
- Unless specifically authorized in a separate writing, Seller makes no warranty with respect to, and shall have no liability in connection with, any goods which are incorporated into other products or equipment by the Purchaser.
- All products returned under warranty shall be at the Purchaser's risk of loss. The Purchaser is responsible for all shipping charges to return the product to The Energy Conservatory. The Energy Conservatory will be responsible for return standard ground shipping charges. The Customer may request and pay for the added cost of expedited return shipping.

The foregoing warranty is in lieu of all other warranties and is subject to the conditions and limitations stated herein. No other express or implied warranty IS PROVIDED, AND THE SELLER DISCLAIMS ANY IMPLIED WARRANTY OF FITNESS for particular purpose or merchantability.

The exclusive remedy of the purchaser FOR ANY BREACH OF WARRANTY shall be the return of the product to the factory or designated location for repair or replacement, or, at the option of The Energy Conservatory, refund of the purchase price.

The Energy Conservatory's maximum liability for any and all losses, injuries or damages (regardless of whether such claims are based on contract, negligence, strict liability or other tort) shall be the purchase price paid for the products. In no event shall the Seller be liable for any special, incidental or consequential damages. The Energy Conservatory shall not be responsible for installation, dismantling, reassembly or reinstallation costs or charges. No action, regardless of form, may be brought against the Seller more than one year after the cause of action has accrued.

The Customer is deemed to have accepted the terms of this Limitation of Warranty and Liability, which contains the complete and exclusive limited warranty of the Seller. This Limitation of Warranty and Liability may not be amended or modified, nor may any of its terms be waived except by a writing signed by an authorized representative of the Seller.

TO ARRANGE A REPAIR

Please call The Energy Conservatory at 612-827-1117 before sending any product back for repair or to inquire about warranty coverage. All products returned for repair should include a return shipping address, name and phone number of a contact person concerning this repair, and the purchase date of the equipment.

Safety Information

- The blower door fan should only be connected to a properly installed and tested power supply. In case of emergencies, disconnect the power cord from the AC power mains outlet. During installation, use the nearest readily accessible power outlet and keep all objects away from interfering with access to the outlet.
- Disconnect the power plug from the blower door fan receptacle before examining or making any adjustments to the fan motor, blades or electrical components.
- The blower door fan is a very powerful and potentially dangerous piece of equipment if not used and maintained properly. Carefully examine the fan before each use. If the fan housing, fan guards, blade, controller or cords become damaged, do not operate the fan until repairs have been made. Repairs should only be made by The Energy Conservatory.
- If you notice any unusual noises or vibrations, stop and unplug the fan. If you can't find the source of the problem, contact the manufacturer/distributor.
- Keep people, animals and objects away from the blower door fan when it is operating.
- Press the power plug firmly into the power receptacle on the blower door fan, and the AC power mains outlet. Failure to do so can cause overheating of the power cord and possible damage.
- Do not use ungrounded outlets or adapter plugs. Never remove or modify the grounding prong. Use only approved and inspected electrical wiring and connections.
- Do not operate the blower door fan if the motor, controller or any of the electrical connections are wet.
- For long-term operation, such as maintaining building pressure while air-sealing, use a flow ring whenever possible to ensure proper cooling of the blower door fan motor. This will minimize the heating of the fan and is important in warmer weather.
- Do not reverse the blower door fan (if the fan has a flow direction switch) while the blades are turning.
- The motor is thermally protected and if you experience a motor shut down, be sure to turn off the fan speed controller so that the fan does not restart unexpectedly after the motor cools down.
- The operator should wear hearing protection when in close proximity to the fan operating at high speed.
- Adjust all combustion appliances so they do not turn on during the test. If combustion appliances turn on during a depressurization test, it is possible for flames to be sucked out of the combustion air inlet (flame rollout). This is a fire hazard and can possibly result in high CO 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 blower door is operating.
- Be sure that fires in fireplaces and woodstoves are completely out before conducting a test. Take precautions to prevent ashes from being sucked into the building during the test. In most cases it will be necessary to either tape doors shut, clean out the ashes, and/or cover the ashes with newspaper.
- Be sure you have returned the building to its original condition before leaving. This includes turning the thermostat and water heater temperature controls to their original setting. Always check to see that furnace, water heater and gas fireplace pilot lights have not been blown out during the blower door test - re-light them if necessary. Remove any temporary seals from fireplaces or other openings sealed during the test.
- 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.

System Components

A standard Model 3 Minneapolis Blower Door Kit includes

- Blower Door Accessory Case
  - » Single fan nylon panel
  - » Fan speed controller
  - » 30’ clear tubing
  - » Gauge board with clamp
  - » Overview booklet
- Aluminum frame with carrying case
  - » Two 96” vertical pieces
  - » Two 45” horizontal pieces
  - » One 45” crossbar with Velcro strap
  - » One gauge hanger bar
- Model 3 Fan
  - » No flow plate
  - » Ring A
  - » Ring B
- One digital pressure and flow gauge (DG-1000 or DG-700)
  - » DG-1000
    - Carrying case
    - Two Lithium Ion batteries (installed)
    - Micro USB cable
    - Power adapter/charger
    - Parts bag with fan control cable, digital gauge extension tube and plastic hose connectors
    - Screen protector
    - 15’ green hose
    - 10’ red hose
    - Ground cable kit
    - Micro SD card
    - Overview booklet
  - » DG-700
    - Carrying case
    - Six AA alkaline batteries (installed)
    - Parts bag with fan control cable, digital gauge extension tube and plastic hose connectors
    - 15’ green hose
    - 10’ red hose
    - Manual

Blower Door Fan

The blower door fan consists of a molded fan housing with a 3/4 horsepower permanent split capacitor AC motor. Air flow through the fan is determined by measuring the pressure at the flow sensor which is attached to the end of the motor. When the fan is operating, air is pulled into the inlet side of the fan and exits through the exhaust side (a metal fan guard is bolted to the exhaust side of the fan). The blower door fan can accurately measure airflow over a wide range of flow rates using a series of calibrated flow rings which are attached to the inlet of the fan.

Fan Flow Ranges

Ring	Flow Range in CFM
Open (no flow ring)	6,100 - 2,435
Ring A	2,800 - 915
Ring B	1,100 - 300
Ring C (optional)	330 - 85
Ring D (optional)	115 - 30
Ring E (optional)	45 - 11

TEC Digital Pressure and Flow Gauges

The Minneapolis Blower Door System can come with a DG-700 or a DG-1000 Pressure and Flow Gauge. Both are differential pressure gauges which measure the pressure difference between either of their input pressure taps and its corresponding reference pressure tap. Both gauges have two separate measurement channels which allow you to monitor the building pressure and fan pressure during a blower door test.

DG-1000 Pressure and Flow Gauge

DG-700 Pressure and Flow Gauge
(with optional TEC WiFi Link)

Fan Speed Controller

Each system comes with one fan speed controller, which will work with either the DG-700 or the DG-1000. Fan speed is adjusted using the adjustment knob on the face of the fan speed controller.

Adjustable Aluminum Door Frame and Fabric Panel

One single fan aluminum door frame and nylon panel is included with each system. The frame will come in a soft cloth frame case.

Each frame consists of six separate pieces and a carrying case.

One 45” crossbar with Velcro strap

Two 45” horizontal frame pieces

Two 96” vertical frame pieces

Carrying case for the frame

One gauge hanger bar

For instructions on how to assemble the frame, please see the [Blower Door Manual.]

Model 3 Blower Door Specifications

COMPONENT	SPECIFICATIONS	
Model 3 Blower Door Fan	Maximum Flow	6,300 CFM at free air (2,973 l/s, 10,700 m3/h) 5,350 CFM at 50 Pa (2,524 l/s, 9,090 m3/h) 4,900 CFM at 75 Pa (2,360 l/s, 8.495 m3/h)
	Minimum Flow	300 CFM with Ring B (141 l/s, 510 m3/h) 85 CFM with Ring C (40 l/s, 144m3/h) 30 CFM with Ring D (14 l/s, 51 m3/h) 11 CFM with Ring E (5 l/s, 18 m3/h)
	Dimensions	20 in. (50 cm) inlet diameter, 10.25 in (26 cm) length
	Weight	33 lbs. (15 kg) with Flow Rings A & B
	Flow Accuracy	+/- 3% with DG-700 or DG-1000, Rings D & E +/- 4% or 1 CFM
	Calibration	Meets ASTM Standard E779, E1554, CGSB-149.10-M86, EN 13829, ATTMA Technical Standard 1, NFPA 2001, RESNET and USACE
	Power	3/4 hp motor available in 110V or 220V
Adjustable Frame and Frame Material	Frame Material	Extruded aluminum
	Width	28 in. to 40 in. (71 cm to 101 cm)
	Height	52 in. to 96 in. (132 cm to 244 cm)
	Seal	EPDM flexible gasket
	Panel Material	Nylon with built-in vinyl window

Specifications subject to change without notice.

Software Information

The Energy Conservatory (TEC) offers a variety of Windows-based programs. These programs can be found and downloaded for free at software.energyconservatory.com.

TEC also offers driver support for the DG-500, DG-700 and DG-1000. The drivers are designed to work with Windows-based computers with the following operating systems:

- Windows 7
- Windows 8
- Windows 8.1
- Windows 10

The drivers are available through Windows Update, and the DG-500 and DG-700 drivers can be downloaded from TEC at software.energyconservatory.com.

TEC also offers mobile apps for Apple and Android devices that can be found in the Apple App Store or the Google Play Store.

Instructional Videos

The Energy Conservatory (TEC) offers a variety of online instructional videos, including

- Minneapolis Blower Door Quick Guide
- Minneapolis Duct Blaster Quick Guide
- Field Calibration Checks for Gauges
- Pressure and Airflow Basics
- Exhaust Fan Flow Meter
- TECLOG3
- TECTITE 4.0
- And many more

Visit www.YouTube.com/EnergyConservatory to see all of TEC's instructional videos.

More Blower Door Guides

All blower door guides are available online at energyconservatory.com/blowerdoorguides

Please refer to the guides listed below for further instructions.

- Minneapolis Blower Door Manual
- Using the DG-1000 with the Minneapolis Blower Door
- Using the DG-700 with the Minneapolis Blower Door
- Test Results and Sample Test Forms

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TEC
The Energy Conservatory

MODEL 3 MINNEAPOLIS BLOWER DOOR™ SYSTEM

USER MANUAL

ENERGY CONSERVATORY WARRANTY

EXPRESS LIMITED WARRANTY

Seller warrants that this product, under normal use and service as described in the operator's manual, shall be free from defects in workmanship and material for a period of 24 months, or such shorter length of time as may be specified in the operator's manual, from the date of shipment to the Customer.

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- Seller does not provide any warranty on finished goods manufactured by others. Only the original manufacturer's warranty applies.
- Unless specifically authorized in a separate writing, Seller makes no warranty with respect to, and shall have no liability in connection with, any goods which are incorporated into other products or equipment by the Purchaser.
- All products returned under warranty shall be at the Purchaser's risk of loss. The Purchaser is responsible for all shipping charges to return the product to The Energy Conservatory. The Energy Conservatory will be responsible for return standard ground shipping charges. The Customer may request and pay for the added cost of expedited return shipping.

The foregoing warranty is in lieu of all other warranties and is subject to the conditions and limitations stated herein. No other express or implied warranty IS PROVIDED, AND THE SELLER DISCLAIMS ANY IMPLIED WARRANTY OF FITNESS for particular purpose or merchantability.

The exclusive remedy of the purchaser FOR ANY BREACH OF WARRANTY shall be the return of the product to the factory or designated location for repair or replacement, or, at the option of The Energy Conservatory, refund of the purchase price.

The Energy Conservatory's maximum liability for any and all losses, injuries or damages (regardless of whether such claims are based on contract, negligence, strict liability or other tort) shall be the purchase price paid for the products. In no event shall the Seller be liable for any special, incidental or consequential damages. The Energy Conservatory shall not be responsible for installation, dismantling, reassembly or reinstallation costs or charges. No action, regardless of form, may be brought against the Seller more than one year after the cause of action has accrued.

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SAFETY INFORMATION

- The blower door fan should only be connected to a properly installed and tested power supply. In case of emergencies, disconnect the power cord from the AC power mains outlet. During installation, use the nearest readily accessible power outlet and keep all objects away from interfering with access to the outlet.
- Disconnect the power plug from the blower door fan receptacle before examining or making any adjustments to the fan motor, blades or electrical components.
- The blower door fan is a very powerful and potentially dangerous piece of equipment if not used and maintained properly. Carefully examine the fan before each use. If the fan housing, fan guards, blade, controller or cords become damaged, do not operate the fan until repairs have been made. Repairs should only be made by The Energy Conservatory.
- If you notice any unusual noises or vibrations, stop and unplug the fan. If you can't find the source of the problem, contact the manufacturer/distributor.
- Keep people, animals and objects away from the blower door fan when it is operating.
- Press the power plug firmly into the power receptacle on the blower door fan, and the AC power mains outlet. Failure to do so can cause overheating of the power cord and possible damage.
- Do not use ungrounded outlets or adapter plugs. Never remove or modify the grounding prong. Use only approved and inspected electrical wiring and connections.
- Do not operate the blower door fan if the motor, controller or any of the electrical connections are wet.
- For long-term operation, such as maintaining building pressure while air-sealing, use a flow ring whenever possible to ensure proper cooling of the blower door fan motor. This will minimize the heating of the fan and is important in warmer weather.
- Do not reverse the blower door fan (if the fan has a flow direction switch) while the blades are turning.
- The motor is thermally protected and if you experience a motor shut down, be sure to turn off the fan speed controller so that the fan does not restart unexpectedly after the motor cools down.
- The operator should wear hearing protection when in close proximity to the fan operating at high speed.
- Adjust all combustion appliances so they do not turn on during the test. If combustion appliances turn on during a depressurization test, it is possible for flames to be sucked out of the combustion air inlet (flame roll-out). This is a fire hazard and can possibly result in high CO 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 blower door is operating.
- Be sure that fires in fireplaces and wood stoves are completely out before conducting a test. Take precautions to prevent ashes from being sucked into the building during the test. In most cases it will be necessary to either tape doors shut, clean out the ashes, and/or cover the ashes with newspaper.
- Be sure you have returned the building to its original condition before leaving. This includes turning the thermostat and water heater temperature controls to their original setting. Always check to see that furnace, water heater and gas fireplace pilot lights have not been blown out during the blower door test - re-light them if necessary. Remove any temporary seals from fireplaces or other openings sealed during the test.
- 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.

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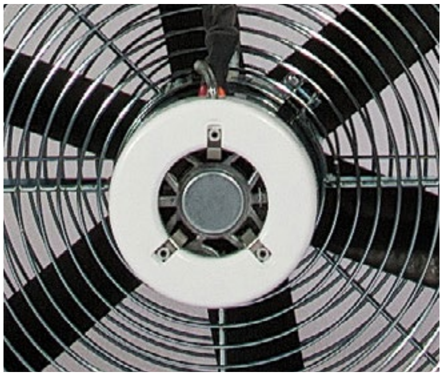
Blower Door System Details

The blower door fan consists of a molded fan housing with a 3/4 horsepower permanent split capacitor AC motor. Air flow through the fan is determined by measuring the pressure at the flow sensor which is attached to the end of the motor. When the fan is operating, air is pulled into the inlet side of the fan and exits through the exhaust side (a metal fan guard is bolted to the exhaust side of the fan).

The blower door fan can accurately measure airflow over a wide range of flow rates using a series of calibrated flow rings which are attached to the inlet of the fan. The standard Minneapolis Blower Door System comes with two flow rings (A and B), and optional flow rings are C, D and E.

Fan Flow Ranges

Ring	Flow Range in CFM
Open (no flow ring)	6,100 - 2,435
Ring A	2,800 - 915
Ring B	1,100 - 300
Ring C (optional)	330 - 85
Ring D (optional)	115 - 30
Ring E (optional)	45 - 11



The table above shows the approximate flow range of the blower door fan when used with each flow ring. The greatest accuracy in fan flow readings will always be achieved by installing the flow ring with the smallest opening area, while still providing the necessary fan flow. When taking blower door measurements, stand at least 12 inches away from the fan. Standing directly in front of the fan may affect the flow readings and result in erroneous measurements.

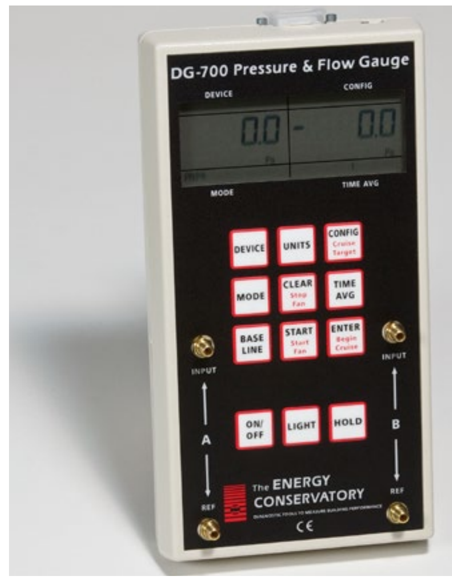
- To install flow ring A, place ring A onto the inlet side of the fan housing and rotate the eight fastener clips attached to the fan housing so that they rotate over the edge of ring A and secure it in place.
- To Install flow ring B, place ring B in the center of ring A and rotate the six fastener clips attached to ring A so that they rotate over the edge of ring B and secure it in place.
- In addition to flow rings A and B, the blower door comes with a solid circular no flow plate to seal off the fan opening. The no flow plate is attached to ring B in the same manner that ring B attaches to ring A.
- The no flow plate and rings A and B can be removed separately, or all three pieces can be removed at the same time by releasing the eight fastener clips holding ring A to the fan housing.
- Installation and use of flow rings C, D and E are discussed on our website.

Fan Speed Controller

Fan speed is adjusted using the adjustment knob on the face of the speed controller. Model 3 blower door systems come with the fan speed controller clipped onto the black mounting board supplied with the system. The Model 3 controller can be removed from the mounting board by sliding the controller clip off the board.

Digital Gauge Options

DG-1000 Pressure and Flow Gauge



DG-700 Pressure and Flow Gauge

The DG-1000 and DG-700 are differential pressure gauges which measure the pressure difference between either of their input pressure taps and its corresponding reference pressure tap. Both gauges have two separate measurement channels which allows you to monitor the building pressure and fan pressure (air flow) signals during the blower door test. In addition, both gauges are able to directly display air flow through the blower door fan. The digital gauge is shipped in a separate padded case which is stored in the blower door accessory case. Also included is a black mounting board to which the digital gauge can be attached using either the Velcro strips (DG-700 board) or the magnets (DG-1000 board).

DG-1000 gauge board

DG-700 gauge board

Both gauges can also be used to automate control of the blower door fan using the following two features:

- Both gauges have a built-in "cruise control" feature which allow the user to control the blower door fan to maintain a constant building pressure, without using the TECTITE software or a computer.
- The gauge can be used along with TECTITE software and a computer to conduct a fully automated blower door test. When conducting automated tests, the speed of the blower door fan is computer controlled while the TECTITE program simultaneously monitors the building pressure and fan flow using the gauge's two pressure channels. Test results are recorded, displayed on the screen, and can be saved to a file.

Aluminum Frame and Door Panel

The adjustable aluminum door frame and nylon panel is used to seal the fan into an exterior doorway. The door frame is adjustable to fit a typical size residential door opening. The aluminum frame comes in a soft carrying case and includes:

- Two 96″ vertical pieces
- Two 45″ horizontal pieces
- One 45″ crossbar with Velcro strap
- One gauge hanger bar

Where to Install the Blower Door Frame

- It is always best to install the blower door system in an exterior doorway of 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 (one to five feet) to the fan inlet.
- If the doorway leads to a porch or garage, make sure this space is open to the outside by opening doors and/or windows.
- The door frame is almost always installed from the inside of the building and may be installed in place of the prime door, the storm door or anywhere in between.
- Always open the inside door and outside storm door as much as possible during the test to prevent restrictions to airflow.

How to Assemble the Blower Door Frame and Nylon Panel

- Remove all frame pieces from the bag and lay them out on the floor
  - » Lay the two vertical frame pieces on the floor parallel with each other, cam lever side up.
  - » Lay one horizontal piece on the floor between the bottom of the two vertical pieces, cam lever side up.
  - » Lay the second horizontal piece on the floor between the top of the two vertical pieces, cam lever side up.
  - » Set aside the crossbar with the Velcro strap for later use.

- Put all cam levers into the relaxed position (lever should be pointing inward, and not be in the horizontal locked position)

Relaxed/unlocked

Locked

- Both vertical frame pieces have a silver bar on each end, with a small silver button on the bar. Push in the silver button and slide into the end of the horizontal piece. Note: Two of the buttons will be on the side of the frame facing the floor.

- Temporarily install the frame in the doorway
  - » Stand the frame up and put into the doorway.
  - » Loosen all of the adjustment knobs.
  - » Place one foot on the bottom of the frame to hold it place, and extend the top of the frame to the top of the doorway, leaving about a fingers width of space between the top of the frame and the top of the doorway.
  - » Tighten the knobs on the vertical pieces.
  - » Extend the frame horizontally so both vertical pieces fit into the doorway, leaving about a fingers width of space between the vertical pieces and the sides of the doorway.
  - » Tighten the knobs on the horizontal pieces.

- Attach the nylon panel to the frame and install into doorway

  - » Lay the fabric panel on the floor, with the Velcro straps and blower door logo facing up.
  - » Remove the frame from the doorway, being sure the adjustment knobs are still tightened so the frame doesn't adjust in size.
  - » Lay the frame onto the fabric door panel, lining up the top and bottom horizontal pieces with their respective Velcro straps.
  - » Drape each side of the panel over the frame snugly and tighten the Velcro straps.
  - » Stand the frame up near the doorway and run the green tubing outside so the end is well away from the nylon panel. Extend the other end through one of the patches at the bottom corners of the nylon panel. Pull just enough of it to the inside so it can make the connection to the gauge.
  - » Readjust the frame so it fits snuggly in the door opening and tighten all four adjustment knobs. Now engage all four cam levers so the frame is secured tightly in the opening.
  - » Install the crossbar with the Velcro strap in the lowest slot above the fan hole and tighten the knob so it fits snug. Engage the cam lever.

- Insert the blower door fan into the hole in the fabric panel

  - » Set the fan down in front of the panel. For a depressurization test, the side of the fan with the guard should be facing outside. The side of the fan with the flow rings should be facing inside. (For a pressurization test, insert the fan the other way, with the guard inside the house and the flow rings outside the house.)
  - » Insert the fan bottom first into the hole, and then work the elastic around the fan until it's completely inserted.
  - » The top of the hole should rest in the middle of the electrical box on top of the fan so the plug inlet and handle are not covered.
  - » The bottom of the fan should be resting on the lower horizontal frame piece.
  - » Slip the velcro strap through the fan handle and loop it up and back around the cross bar.

- Attach the gauge mounting board
  - » The mounting board for the gauge can be attached to any door by using the C-clamp connected to the back of the board.
  - » The mounting board can also be easily attached to a horizontal surface (book shelf or desk top) by rotating the clamp 90 degrees before securing the board.
  - » The mounting board can be attached to the gauge hanger bar. Connect the gauge hanger bar to either side of the vertical pieces by inserting the hook into one of the remaining slots. Tighten the mounting board clamp onto the hanger bar.
- Attach the fan speed controller to the bottom of the gauge mounting board by sliding it on using the metal clamp on the back of the controller.
- Insert the female plug from the fan speed controller into the receptacle located on the fan electrical box. Make sure the plug is inserted completed as the plug or receptacle can overheat.
- Plug the power cord into an AC outlet that is compatible with the voltage of the fan motor and speed controller. Be sure the controller knob on the fan speed controller is turned all the way counter clockwise to the off position before plugging in the power cord.

Complete setup without gauge

Complete setup with gauge

See one of the following guides for gauge setup and testing instructions

[Using the DG-1000 with the Minneapolis Blower Door]

[Using the DG-700 with the Minneapolis Blower Door]

Setting Up the Building for the Test

The following preparations are appropriate when using the blower door to determine retrofit airsealing potential, weatherization effectiveness or estimating natural infiltration rates. If the purpose of the blower door test is to document construction airtightness quality for new houses, additional preparation may be needed. Your program guidelines may require you to prepare the building differently than described below.

The building set-up and test procedures below are recommended specifically by The Energy Conservatory. These procedures generally conform to the Canadian General Standards Board (CGSB) standard CGSB-149.10-M86 “Determination of the Airtightness of Building Envelopes by the Fan Depressurization Method,” and American Society for Testing and Materials (ASTM) standard E779-10 “Standard Test Method for Determining the Air Leakage Rate by Fan Pressurization.” However, our procedures include options and recommendations that are not contained within the CGSB and ASTM standards. If you need to perform a blower door airtightness test that exactly meets the CGSB, ASTM or some other test procedure (e.g. RESNET), you should obtain a copy of the applicable standard and follow the specific set-up directions contained in the standard.

Adjustable Openings

- Close all storm and prime windows.
- Close all exterior doors and interior attic or crawlspace hatches which are connected to conditioned spaces. Also close exterior crawl space hatches and vents if they are normally closed most of the year.
- Open all interior doors to rooms that are conditioned. The object here is to treat the entire building as one conditioned space and to subject all of the leaks in the building to the same pressure difference. Because few house basements can be completely sealed from the house and usually some conditioning of the basement is desirable, they are typically included as conditioned space.
- Tape plastic over window air conditioners if they appear to be a source of air leakage into the building and they are typically removed during a large part of the year.

Combustion Appliance/Exhaust Devices

- Adjust all combustion appliances so they do not turn on during the test. This is commonly done by temporarily turning off power to the appliance, or setting the appliance to the “Pilot” setting. If combustion appliances turn on during a depressurization test, it is possible for flames to be sucked out of the combustion air inlet (flame rollout). This is a fire hazard and can possibly result in high CO 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 Blower door is operating.
- Be sure that fires in fireplaces and woodstoves are completely out. Take precautions to prevent ashes from being sucked into the building during the test. In most cases it will be necessary to either tape doors shut, clean out the ashes, and/or cover the ashes with newspaper.
- Turn off all exhaust fans, vented dryers, air conditioners, ventilation system fans and air handler fans.

After the Test

Be sure you have returned the building to its original condition before leaving. This includes turning the thermostat and water heater temperature controls to their original setting. Always check to see that furnace, water heater and gas fireplace pilot lights have not been blown out during the blower door test (re-light them if necessary). Remove any temporary seals from fireplaces, woodstoves or other openings sealed during the test. In addition, combustion safety tests should usually be performed before leaving the house.

Finding Air Leaks

There are many techniques that are used to find air leaks with the blower door. Air leaks between the interior and exterior of the building often follow long and complicated leakage paths. Typically, the air sealing goal is to find where the leaks cross the exterior envelope of the building and to concentrate sealing activities on those areas.

- Using Your Hand
  The easiest method and one that is used most often is to depressurize the building and walk around the inside, checking for leaks with your hand. When you are looking for leaks, let the blower door fan run at a speed which generates between 20 and 30 Pascals of building pressure. You should get in the habit of always using the same pressure so you will get a good feel for what is a big leak and what is not. An entire room can be checked quickly if there is a door between it and the rest of the house. Standing just outside of the room, close the door most of the way, leaving about a one inch crack. A large blast of air coming through this crack indicates large leaks between that room and the outdoors.

- Using a Chemical Smoke Puffer
  In houses, many of the most important leaks are found between the house and the attic or between the house and a ventilated crawlspace. These leaks usually will not be easy to find unless you physically go into the attic or crawlspace. The use of a handheld smoke puffer is often helpful in these areas. With the house depressurized (and the crawlspace or attic access door shut), you can squirt small puffs of smoke toward suspected leakage sites from the attic or crawlspace and watch to see if the smoke gets sucked into the leak. With a piece of tubing attached to the smoke puffer, you can often reach deep into corners or in hard to reach spots. A smoke puffer or a pressure pan is a necessity when looking for leaks in the forced air ductwork.

- Using an Infrared Camera
  The ideal technique for finding leaks is to use an infrared scanner with a blower door. This procedure usually involves performing two infrared scans from the interior of the building; one before turning on the blower door and one after the blower door has been depressurizing the building for five to 10 minutes. As long as the air being sucked in through the leaks is either warmer or colder than the interior of the house, the area surrounding the leakage path will change temperature and show up on the infrared scanner screen. Even if there is little temperature difference between inside and outside, an infrared scan may still be possible if the attic space has been warmed from solar radiation on the roof or the crawlspace has been cooled from the ground. A temperature difference of about five to 10 degrees is sufficient to expose the important leaks. This technique often allows you to find significant leaks without having to enter the attic or crawlspace.

- Other Diagnostic Techniques
  Many important air leaks in a building are not direct leaks to the outside. Air leaks often follow complicated paths through building cavities and through unconditioned zones (such as attics, crawlspaces or garages) on their way into or out of the building. Attic bypasses, found in many houses, are a good example of a series leak. Air leaving the house first must flow through the ceiling/attic boundary and then through the attic/roof boundary before exiting the house.

  Diagnostic procedures have been developed to analyze series leakage. These procedures, called zone pressure diagnostics (ZPD), are widely used by weatherization professionals to prioritize airsealing efforts in houses by estimating the amount of air leakage from attached zones (e.g. attics, crawlspaces, garages and basements). ZPD techniques typically combine blower door airtightness test results with zone pressure measurements made both before and after an opening or hole has been added to one surface of the zone being tested.

  Duct leakage to the outside can add to your overall airleakage values during a blower door test. One method of finding those leaks is using a pressure pan. You may also quantify the leakage to the outside by using the blower door subtraction method.

Using the Can't Reach 50 Factor: One-Point Test

If you were performing a one-point test and the blower door fan was unable to depressurize the building by approximately 50 Pascals because one of the flow rings was installed, remove the ring and repeat the test (removing the flow ring will increase the maximum air flow available from the fan). If you were not able to depressurize the building by approximately 50 Pascals (with the "open fan" running at full speed) because the building is extremely leaky, use the following instructions:

For DG-1000 and DG-700 Users

No adjustments to the test procedure above are necessary other than to make sure the gauge was in the PR/ FL @50 mode during the one-point test. If you can not achieve the target test pressure of 50 Pascals because the building is extremely leaky, a CFM50 leakage estimate will automatically be displayed on Channel B. The leakage estimate shown on Channel B is determined by continuously adjusting the measured air flow from the blower door fan to a test pressure of 50 Pascals, using the real-time Channel A building pressure reading and the can't reach 50 factors shown below.

Building Pressure (Pa)	CRF Factor
48	1.03
46	1.06
44	1.09
42	1.12
40	1.16
38	1.20
36	1.24
34	1.28
32	1.34
30	1.39
28	1.46
26	1.53
24	1.61
22	1.71
20	1.81
18	1.94
16	2.10
14	2.29
12	2.53
10	2.85

Example: With the fan running full speed, you are able to achieve a building pressure of 28 Pascals with a measured fan flow of 5,600 cfm. The corresponding CRF Factor for a building pressure of 28 Pascals is 1.46. The estimated flow needed to achieve the target pressure of 50 Pascals is
5,600 x 1.46 = 8,176 cfm.

$$\text{Can't Reach Fifty Factor} = \left\{ \frac{50}{\text{Current Test Pressure (Pa) (Channel A)}} \right\}^{0.65}$$

Potential Errors In one-point CFM50 Estimate from Using the CRF Factors

The table below show the potential errors in the one-point CFM50 leakage estimates from using the CRF factors. There are two main sources of error:

- The actual test pressure (Channel A) not being equal to the target pressure of 50 Pascals.
- The actual exponent of the leaks being measured differing from the assumed exponent of 0.65.

Actual Exponent "n"

Test Pressure in Pa (Channel A)		0.5	0.55	0.6	0.65	0.7	0.75
	10	21.4%	14.9%	7.7%	0.0%	-8.4%	-17.5%
	15	16.5%	11.3%	5.8%	0.0%	-6.2%	-12.8%
	20	12.8%	8.8%	4.5%	0.0%	-4.7%	-9.6%
	25	9.9%	6.7%	3.4%	0.0%	-3.5%	-7.2%
	30	7.4%	5.0%	2.5%	0.0%	-2.6%	-5.2%
	35	5.2%	3.5%	1.8%	0.0%	-1.8%	-3.6%
	40	3.3%	2.2%	1.1%	0.0%	-1.1%	-2.3%
	45	1.6%	1.0%	0.5%	0.0%	-0.5%	-1.1%
	50	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	55	-1.4%	-1.0%	-0.5%	0.0%	0.5%	0.9%
	60	-2.8%	-1.8%	-0.9%	0.0%	0.9%	1.8%
	65	-4.0%	-2.7%	-1.3%	0.0%	1.3%	2.6%

For example, the table shows that for a one-point 50 Pa blower door building airtightness test, a 2.5% error would be introduced if the leakage estimate was determined at an actual test pressure of 30 Pa (Channel A), and the actual exponent of the leaks was 0.60 rather than the assumed value of 0.65.

Testing in Windy Weather

During strong or gusty winds, building pressure readings can vary significantly. As wind gusts contact a building, the actual pressures within the building will change (10 to 20 Pa changes are common in windy weather). Under these conditions, you will need to spend more time watching the gauges to determine the "best" reading. Use of the time-averaging functions can help stabilize readings in windy conditions.

While conducting a multi-point blower door test over a wide range of building pressures will tend to even out some of the error introduced from moderate wind fluctuations, significant wind related error can still exist. Under very windy conditions, it is sometimes impossible to manually collect accurate and repeatable test data. Under these conditions, conducting a fully automated test using a DG-1000, and software or apps, may be the only way to collect accurate and repeatable test results. During an automated test hundreds of simultaneous measurements of building pressure and fan flow are quickly collected greatly reducing the variability of tests results due to wind.

Blower Door Fan Calibration

Model 3 (110V) Calibration Parameters

Fan Configuration	Calibration Parameters
Open Fan	Flow (CFM) = 506.8 x (Fan pressure in Pascals)$^{.4879}$
Ring A Installed	Flow (CFM) = 190.1 x (Fan pressure in Pascals)$^{.4876}$
Ring B Installed	Flow (CFM) = 60.67 x (Fan pressure in Pascals)$^{.4955}$
Ring C Installed	Flow (CFM) = 21.37 x (Fan pressure in Pascals)$^{.5132}$
Ring D Installed	Flow (CFM) = 7.216 x (Fan pressure in Pascals)$^{.4942}$
Ring E Installed	Flow (CFM) = 2.726 x (Fan pressure in Pascals)$^{.5267}$

Model 3 (230V) Calibration Parameters

Fan Configuration	Calibration Parameters
Open Fan	Flow (CFM) = 498.9 x (Fan pressure in Pascals)$^{.4918}$
Ring A Installed	Flow (CFM) = 190.1 x (Fan pressure in Pascals)$^{.4889}$
Ring B Installed	Flow (CFM) = 60.35 x (Fan pressure in Pascals)$^{.4958}$
Ring C Installed	Flow (CFM) = 20.47 x (Fan pressure in Pascals)$^{.5178}$
Ring D Installed	Flow (CFM) = 6.870 x (Fan pressure in Pascals)$^{.5022}$
Ring E Installed	Flow (CFM) = 2.817 x (Fan pressure in Pascals)$^{.5139}$

All fan flows indicated on TEC gauges or flow tables are corrected to a standard air density of 0.075 lbs/cubic foot, and are not the actual volumetric flow going through the fan. The indicated flows are corrected to standard air density according to the CGSB Standard CAN/CG-SB-149.10-M86.

Issues Affecting Fan Calibration

Model 3 door fans maintain their calibration unless physical damage occurs. Conditions which could cause the fan calibration to change are primarily damaged flow sensors, movement of the motor and blades relative to the fan housing, and leaks in the sensor or tubing running from the flow sensor to the fan pressure tap. These conditions are easily detected and should be tested for on a regular basis. See the Fan Field Check Guide to learn more.

Flow Conversion Tables: Model 3 (110V)

Flow (CFM)

Fan Pressure (Pa)	Open Fan	Ring A	Ring B	Ring C
16				89
18				94
20				99
22				104
24				109
26	2484	931	305	114
28	2576	965	316	118
30	2664	998	327	122
32	2749	1030	338	127
34	2832	1061	348	131
36	2912	1091	358	134
38	2990	1120	368	138
40	3065	1149	377	142
42	3139	1176	387	145
44	3211	1203	396	149
46	3282	1230	404	152
48	3351	1255	413	156
50	3418	1281	421	159
52	3484	1305	430	162
54	3549	1330	438	165
56	3612	1353	446	169
58	3675	1377	454	172
60	3736	1400	461	175
62	3796	1422	469	178
64	3855	1444	476	181
66	3914	1466	484	183
68	3971	1488	491	186
70	4028	1509	498	189
72	4083	1530	505	192
74	4138	1550	512	195
76	4193	1571	519	197
78	4246	1591	525	200
80	4299	1610	532	202
82	4351	1630	539	205
84	4402	1649	545	208
86	4453	1668	551	210
88	4503	1687	558	213
90	4553	1706	564	215
92	4602	1724	570	218
94	4651	1742	576	220
96	4699	1760	582	222
98	4746	1778	588	225
100	4793	1796	594	227
102	4840	1813	600	229
104	4886	1830	606	232
106	4932	1847	612	234
108	4977	1864	617	236
110	5021	1881	623	238
112	5066	1898	629	241
114	5110	1914	634	243
116	5153	1930	640	245
118	5196	1946	645	247
120	5239	1962	650	249
122	5282	1978	656	251
124	5324	1994	661	254
126	5365	2010	666	256
128	5407	2025	672	258
130	5448	2041	677	260
132	5489	2056	682	262
134	5529	2071	687	264
136	5569	2086	692	266
138	5609	2101	697	268
140	5648	2116	702	270
142	5688	2130	707	272
144	5727	2145	712	274
146	5765	2159	717	276
148	5804	2174	722	278
150	5842	2188	726	280
152	5880	2202	731	281
154	5917	2216	736	283
156	5955	2230	741	285
158	5992	2244	745	287
160	6029	2258	750	289
162	6065	2272	755	291
164	6102	2285	759	293
166	6138	2299	764	294

Flow Conversion Tables: Model 3 (110V) continued

Flow (CFM)

Fan Pressure (Pa)	Open Fan	Ring A	Ring B	Ring C
168	6174	2312	768	296
170	6210	2326	773	298
172	6245	2339	777	300
174	6281	2352	782	302
176	6316	2365	786	303
178	6351	2378	791	305
180	6385	2391	795	307
182	6420	2404	799	309
184	6454	2417	804	310
186	6488	2430	808	312
188	6522	2443	812	314
190		2455	817	316
192		2468	821	317
194		2480	825	319
196		2493	829	321
198		2505	834	322
200		2518	838	324
202		2530	842	326
204		2542	846	327
206		2554	850	329
208		2566	854	331
210		2578	858	332
212		2590	862	334
214		2602	866	335
216		2614	870	337
218		2626	874	339
220		2637	878	340
222		2649	882	342
224		2661	886	343
226		2672	890	345
228		2684	894	347
230		2695	898	348
232		2707	902	350
234		2718	906	351
236		2729	909	353
238		2740	913	354
240		2752	917	356
242		2763	921	357

Fan Pressure (Pa)	Open Fan	Ring A	Ring B	Ring C
244		2774	924	359
246		2785	928	360
248		2796	932	362
250		2807	936	363
252		2818	939	365
254		2829	943	366
256		2840	947	368
258		2850	950	369
260		2861	954	371
262		2872	958	372
264		2883	961	374
266		2893	965	375
268		2904	968	377
270		2914	972	378
272		2925	976	379
274		2935	979	381
276		2946	983	382
278		2956	986	384
280		2966	990	385
282		2977	993	387
284		2987	997	388
286		2997	1000	389
288		3007	1004	391
290		3018	1007	392
292		3028	1011	394
294		3038	1014	395
296		3048	1017	396
298		3058	1021	398
300		3068	1024	399
302		3078	1028	400
304		3088	1031	402
306		3098	1034	403
308		3108	1038	404
310		3117	1041	406
312		3127	1044	407
314		3137	1048	408
316		3147	1051	410
318		3156	1054	411

Flow Conversion Tables: Model 3 (110V) continued

Flow (CFM)

Fan Pressure (Pa)	Open Fan	Ring A	Ring B	Ring C
320		3166	1057	412
322		3176	1061	414
324		3185	1064	415
326		3195	1067	416
328		3204	1070	418
330		3214	1074	419
332		3223	1077	420
334		3233	1080	422
336		3242	1083	423
338		3252	1086	424
340		3261	1090	425
342		3270	1093	427
344		3280	1096	428
346		3289	1099	429
348		3298	1102	431
350		3307	1105	432
352		3317	1109	433
354		3326	1112	434
356		3335	1115	436
358		3344	1118	437
360		3353	1121	438
362		3362	1124	439
364		3371	1127	441
366		3380	1130	442
368		3389	1133	443
370		3398	1136	444
372		3407	1139	446
374		3416	1142	447
376		3425	1145	448
378		3434	1148	449
380		3443	1151	450
382		3452	1154	452
384		3460	1157	453
386		3469	1160	454
388		3478	1163	455
390		3487	1166	457
392		3495	1169	458
394		3504	1172	459

Fan Pressure (Pa)	Open Fan	Ring A	Ring B	Ring C
396		3513	1175	460
398		3521	1178	461
400		3530	1181	462
402		3538	1184	464
404		3547	1187	465
406		3556	1190	466
408		3564	1193	467
410		3573	1196	468
412		3581	1198	470
414		3590	1201	471
416		3598	1204	472
418		3606	1207	473
420		3615	1210	474
422		3623	1213	475
424		3632	1216	477
426		3640	1218	478
428		3648	1221	479
430		3657	1224	480
432		3665	1227	481
434		3673	1230	482
436		3681	1233	483
438		3690	1235	485
440		3698	1238	486
442		3706	1241	487
444		3714	1244	488
446		3722	1246	489
448		3730	1249	490
450		3739	1252	491
452		3747	1255	492
454		3755	1258	494
456		3763	1260	495
458		3771	1263	496
460		3779	1266	497
462		3787	1268	498
464		3795	1271	499
466		3803	1274	500
468		3811	1277	501
470		3819	1279	502

Flow Conversion Tables: Model 3 (110V) continued

Flow (CFM)

Fan Pressure (Pa)	Open Fan	Ring A	Ring B	Ring C
472		3827	1282	503
474		3834	1285	505
476		3842	1287	506
478		3850	1290	507
480		3858	1293	508
482		3866	1295	509
484		3874	1298	510
486		3882	1301	511

Fan Pressure (Pa)	Open Fan	Ring A	Ring B	Ring C
488		3889	1303	512
490		3897	1306	513
492		3905	1309	514
494		3913	1311	515
496		3920	1314	516
498		3928	1317	518
500		3936	1319	519

Flow Conversion Tables: Rings D and E (Model 3 (110V))

Flow (CFM)

Fan Pressure (Pa)	Low-Flow Ring D	Low-Flow Ring E
15	28	11
20	32	13
25	35	15
30	39	16
35	42	18
40	45	19
45	47	20
50	50	21
55	52	22
60	55	24
65	57	25
70	59	26
75	61	26
80	63	27
85	65	28
90	67	29
95	68	30
100	70	31
105	72	32
110	74	32
115	75	33
120	77	34
125	78	35
130	80	35
135	81	36

Fan Pressure (Pa)	Low-Flow Ring D	Low-Flow Ring E
140	83	37
145	84	37
150	86	38
155	87	39
160	89	39
165	90	40
170	91	41
175	93	41
180	94	42
185	95	43
190	96	43
195	98	44
200	99	44
205	100	45
210	101	46
215	103	46
220	104	47
225	105	47
230	106	48
235	107	48
240	108	49
245	109	49
250	110	50
255	112	50
260	113	51

Flow Conversion Tables: Rings D and E (Model 3 (110V)) continued

Flow (CFM)

Fan Pressure (Pa)	Low-Flow Ring D	Low-Flow Ring E
265	114	52
270	115	52
275	116	53
280	117	53
290	119	54
295	120	54

Fan Pressure (Pa)	Low-Flow Ring D	Low-Flow Ring E
300	121	55
305	122	55
310	123	56
315	124	56
320	125	57

Air Density Correction Factors: Depressurization

Inside Temperature (F)

Outside Temperature (F)

	50	55	60	65	70	75	80	85	90
-20	0.929	0.924	0.920	0.915	0.911	0.907	0.903	0.898	0.894
-15	0.934	0.930	0.925	0.921	0.916	0.912	0.908	0.904	0.899
-10	0.939	0.935	0.930	0.926	0.921	0.917	0.913	0.909	0.904
-5	0.945	0.940	0.935	0.931	0.927	0.922	0.918	0.914	0.909
0	0.950	0.945	0.941	0.936	0.932	0.927	0.923	0.919	0.914
5	0.955	0.950	0.946	0.941	0.937	0.932	0.928	0.924	0.919
10	0.960	0.955	0.951	0.946	0.942	0.937	0.933	0.929	0.924
15	0.965	0.960	0.956	0.951	0.947	0.942	0.938	0.934	0.929
20	0.970	0.965	0.961	0.956	0.952	0.947	0.943	0.938	0.934
25	0.975	0.970	0.966	0.961	0.957	0.952	0.948	0.943	0.939
30	0.980	0.975	0.971	0.966	0.962	0.957	0.953	0.948	0.944
35	0.985	0.980	0.976	0.971	0.966	0.962	0.957	0.953	0.949
40	0.990	0.985	0.981	0.976	0.971	0.967	0.962	0.958	0.953
45	0.995	0.990	0.985	0.981	0.976	0.972	0.967	0.963	0.958
50	1.000	0.995	0.990	0.986	0.981	0.976	0.972	0.967	0.963
55	1.005	1.000	0.995	0.990	0.986	0.981	0.977	0.972	0.968
60	1.010	1.005	1.000	0.995	0.991	0.986	0.981	0.977	0.972
65	1.015	1.010	1.005	1.000	0.995	0.991	0.986	0.981	0.977
70	1.019	1.014	1.010	1.005	1.000	0.995	0.991	0.986	0.982
75	1.024	1.019	1.014	1.009	1.005	1.000	0.995	0.991	0.986
80	1.029	1.024	1.019	1.014	1.009	1.005	1.000	0.995	0.991
85	1.034	1.029	1.024	1.019	1.014	1.009	1.005	1.000	0.995
90	1.038	1.033	1.028	1.024	1.019	1.014	1.009	1.005	1.000
95	1.043	1.038	1.033	1.028	1.023	1.019	1.014	1.009	1.005
100	1.048	1.043	1.038	1.033	1.028	1.023	1.018	1.014	1.009
105	1.053	1.047	1.042	1.037	1.033	1.028	1.023	1.018	1.014
110	1.057	1.052	1.047	1.042	1.037	1.032	1.027	1.023	1.018

To use the air density correction factor, multiply the measured fan flow by the appropriate correction factor from the Table above. For example, if the measured fan flow was 3,200 cfm, and during the test the inside temperature was 70 F and the outside temperature was 40 F, the appropriate correction factor would be 0.971. The density corrected fan flow is 3,200 x 0.971 = 3,107 cfm.

Altitude Correction Factor = (1+(.000006 x altitude)) x CFM50

Air Density Correction Factors: Pressurization

Inside Temperature (F)

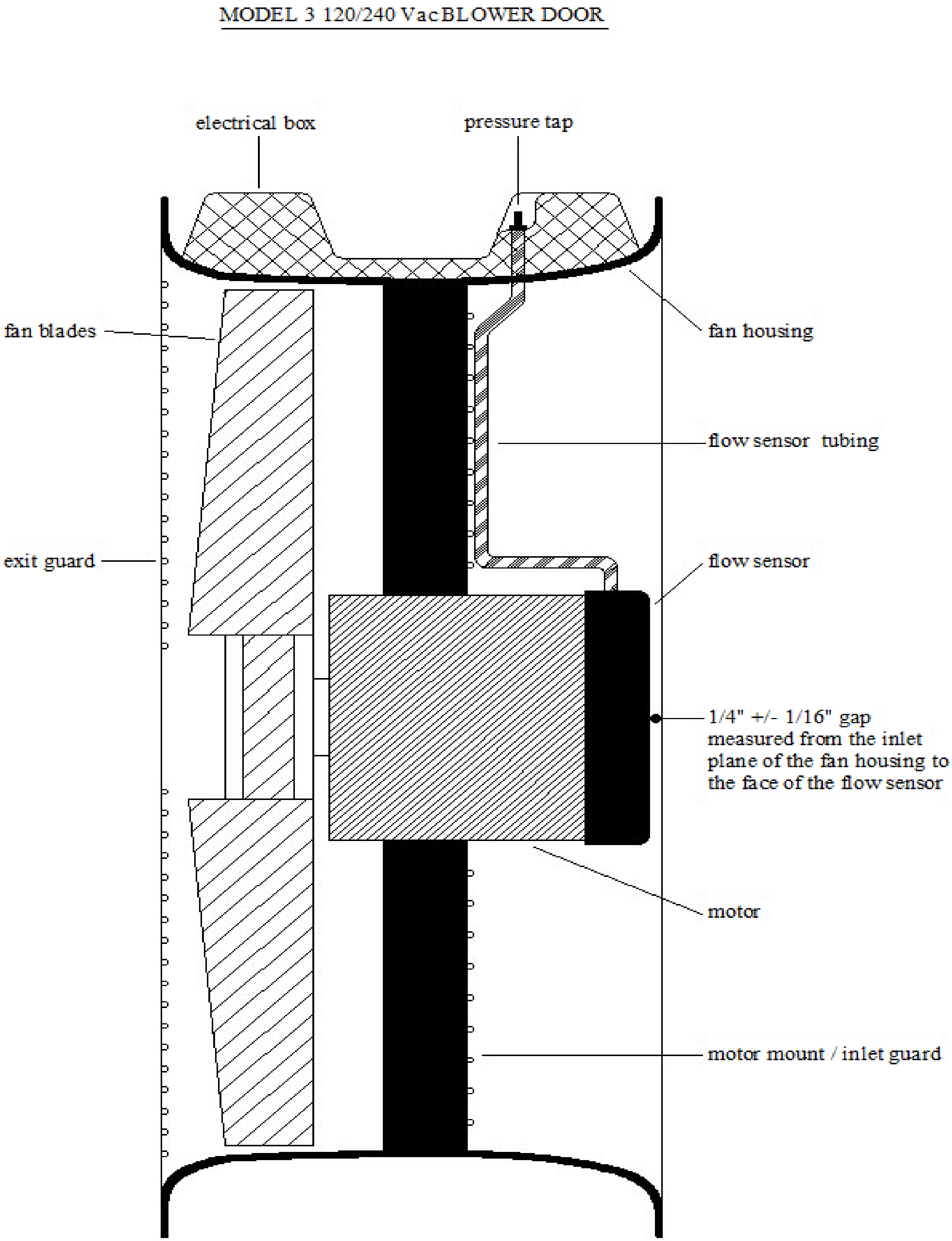
Outside Temperature (F)

	50	55	60	65	70	75	80	85	90
-20	1.077	1.082	1.087	1.092	1.098	1.103	1.108	1.113	1.118
-15	1.071	1.076	1.081	1.086	1.091	1.097	1.102	1.107	1.112
-10	1.065	1.070	1.075	1.080	1.085	1.090	1.096	1.101	1.106
-5	1.059	1.064	1.069	1.074	1.079	1.084	1.089	1.095	1.100
0	1.053	1.058	1.063	1.068	1.073	1.078	1.084	1.089	1.094
5	1.047	1.052	1.058	1.063	1.068	1.073	1.078	1.083	1.088
10	1.042	1.047	1.052	1.057	1.062	1.067	1.072	1.077	1.082
15	1.036	1.041	1.046	1.051	1.056	1.061	1.066	1.071	1.076
20	1.031	1.036	1.041	1.046	1.051	1.056	1.061	1.066	1.070
25	1.025	1.030	1.035	1.040	1.045	1.050	1.055	1.060	1.065
30	1.020	1.025	1.030	1.035	1.040	1.045	1.050	1.055	1.059
35	1.015	1.020	1.025	1.030	1.035	1.040	1.044	1.049	1.054
40	1.010	1.015	1.020	1.025	1.030	1.034	1.039	1.044	1.049
45	1.005	1.010	1.015	1.020	1.024	1.029	1.034	1.039	1.044
50	1.000	1.005	1.010	1.015	1.019	1.024	1.029	1.034	1.038
55	0.995	1.000	1.005	1.010	1.014	1.019	1.024	1.029	1.033
60	0.990	0.995	1.000	1.005	1.010	1.014	1.019	1.024	1.028
65	0.986	0.990	0.995	1.000	1.005	1.009	1.014	1.019	1.024
70	0.981	0.986	0.991	0.995	1.000	1.005	1.009	1.014	1.019
75	0.976	0.981	0.986	0.991	0.995	1.000	1.005	1.009	1.014
80	0.972	0.977	0.981	0.986	0.991	0.995	1.000	1.005	1.009
85	0.967	0.972	0.977	0.981	0.986	0.991	0.995	1.000	1.005
90	0.963	0.968	0.972	0.977	0.982	0.986	0.991	0.995	1.000
95	0.959	0.963	0.968	0.973	0.977	0.982	0.986	0.991	0.995
100	0.954	0.959	0.964	0.968	0.973	0.977	0.982	0.987	0.991
105	0.950	0.955	0.959	0.964	0.969	0.973	0.978	0.982	0.987
110	0.946	0.951	0.955	0.960	0.964	0.969	0.973	0.978	0.982

To use the air density correction factor, multiply the measured fan flow by the appropriate correction factor from the Table above. For example, if the measured fan flow was 3,200 cfm, and during the test the inside temperature was 70 F and the outside temperature was 40 F, the appropriate correction factor would be 1.030. The density corrected fan flow is 3,200 x 1.030 = 3,296 cfm.

Altitude Correction Factor = (1+(.000006 x altitude)) x CFM50

Schematic of the Model 3 Fan



Blower Door Fan Maintenance and Safety

There are several maintenance tips and procedures to ensure the proper operation of the blower door fan and to avoid any safety risks.

Maintenance Checks

- 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.

General Operational Notes and Tips

- 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.
- The motor is thermally protected and if you experience a motor shut down, be sure to turn off the fan speed controller so that the fan does not restart unexpectedly after the motor cools down.
- Make sure to press the power plug firmly into power receptacle on fan. Failure to do so can cause overheating of the power cord and possible damage.
- Do not use ungrounded outlets or adapter plugs.
- Do not operate if the motor, controller or any of the electrical connections are wet.

The blower door fan is a very powerful and potentially dangerous piece of equipment if not used and maintained properly. Carefully examine the fan before each use. If the fan housing, fan guards, blade, controller or cords become damaged, do not operate the fan until repairs have been made. Keep people and pets away from the fan when it is operating. Contact The Energy Conservatory if there are any unusual noises or vibrations while the fan is running.

Model 3 Blower Door Specifications

COMPONENT	SPECIFICATIONS	
Model 3 Blower Door Fan	Maximum Flow	6,300 CFM at free air (2,973 l/s, 10,700 m3/h) 5,350 CFM at 50 Pa (2,524 l/s, 9,090 m3/h) 4,900 CFM at 75 Pa (2,360 l/s, 8.495 m3/h)
	Minimum Flow	300 CFM with Ring B (141 l/s, 510 m3/h) 85 CFM with Ring C (40 l/s, 144m3/h) 30 CFM with Ring D (14 l/s, 51 m3/h) 11 CFM with Ring E (5 l/s, 18 m3/h)
	Dimensions	20 in. (50 cm) inlet diameter, 10.25 in (26 cm) length
	Weight	33 lbs. (15 kg) with Flow Rings A & B
	Flow Accuracy	+/- 3% with DG-700 or DG-1000, Rings D & E +/- 4% or 1 CFM
	Calibration	Meets ASTM Standard E779, E1554, CGSB-149.10-M86, EN 13829, ATTMA Technical Standard 1, NFPA 2001, RESNET and USACE
	Power	3/4 hp motor available in 110V or 220V
Adjustable Frame and Frame Material	Frame Material	Extruded aluminum
	Width	28 in. to 40 in. (71 cm to 101 cm)
	Height	52 in. to 96 in. (132 cm to 244 cm)
	Seal	EPDM flexible gasket
	Panel Material	Nylon with built-in vinyl window

Specifications subject to change without notice.

OTHER RESOURCES

Software Information

The Energy Conservatory (TEC) offers a variety of Windows-based programs. These programs can be found and downloaded for free at software.energyconservatory.com.

TEC also offers driver support for the DG-500, DG-700 and DG-1000. The drivers are designed to work with Windows-based computers with the following operating systems:

- Windows 7
- Windows 8
- Windows 8.1
- Windows 10

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- Exhaust Fan Flow Meter
- TECLOG3
- TECTITE 4.0
- And many more

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More Blower Door Guides

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Please refer to the guides listed below for further instructions.

- Minneapolis Blower Door Overview
- Using the DG-1000 with the Minneapolis Blower Door
- Using the DG-700 with the Minneapolis Blower Door
- Test Results and Sample Test Forms

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TEC®
The Energy Conservatory

MODEL 3
MINNEAPOLIS BLOWER DOOR™

USING THE DG-1000 WITH THE MINNEAPOLIS BLOWER DOOR

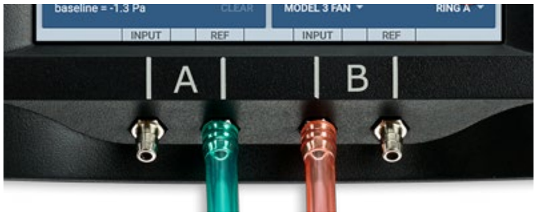
CONDUCTING A ONE-POINT DEPRESSURIZATION TEST

Before the Test

- Install the blower door frame, panel and fan into an exterior doorway. For instructions about how to do this, please see [Chapter 2 of the Minneapolis Blower Door User Manual.]

- Prepare the building for the blower door test. For instructions about how to do this, please see [Chapter 3 of the Minneapolis Blower Door Manual.]

Tubing Hookup



1. Attach one end of the green tube to the Channel A reference tap. Run the other end of the tubing outside through one of the holes provided in the lower corner of the nylon panel and away from the flow of the fan.

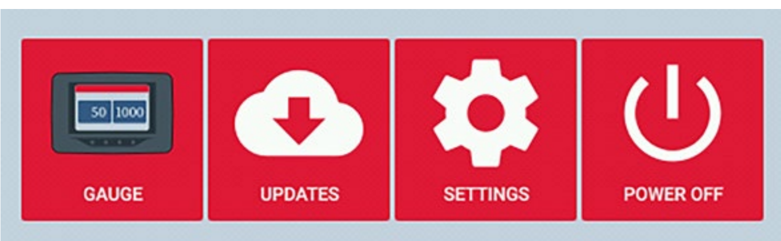
2. Attach one end of the red tube to the Channel B input tap. Attach the other end of the red tube to the pressure tap on the blower door fan.

Note: For help with how to connect the tubing to the DG-1000, please use the Tubing Assistant on our website.

Conducting the Test

1. Turn on the DG-1000 gauge by pressing and holding the power button for a few seconds

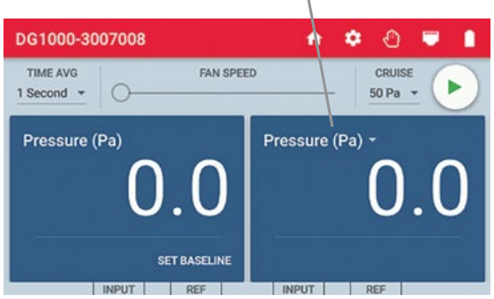
2. After the Home screen loads, touch Gauge to open the Gauge app



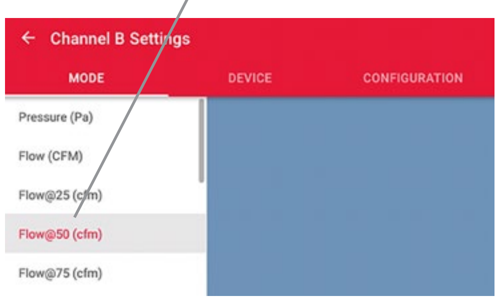
Power button

3. Touch the mode area to open the Channel B Settings menu. Select Flow @50. Touch device and then select Model 3 Fan. Touch the arrow in the upper left of the screen to return to the Gauge app screen.

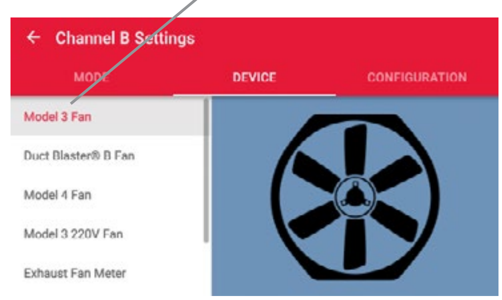
Mode



Flow @50



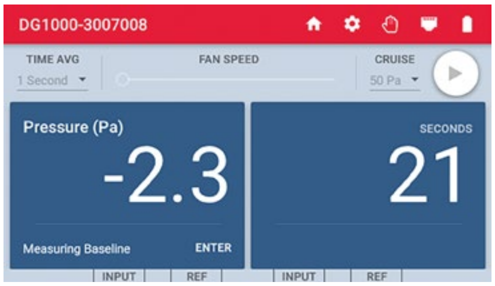
Model 3 Fan



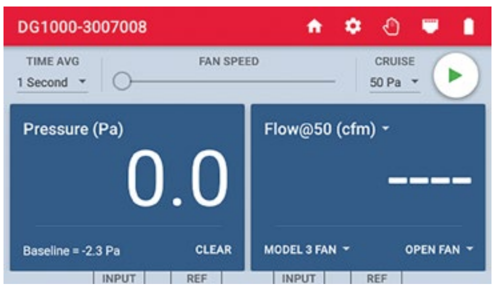
Note: In this specialized test mode, Channel A measures building pressure while Channel B displays the estimated building leakage at a test pressure of 50 Pascals (CFM50). The leakage estimate shown on Channel B is determined by mathematically adjusting the actual air flow from the blower door fan to a test pressure of 50 Pascals, using the real-time Channel A building pressure reading and a Can't Reach 50 factor, which can be found in the Blower Door Manual on page 9.

Set baseline

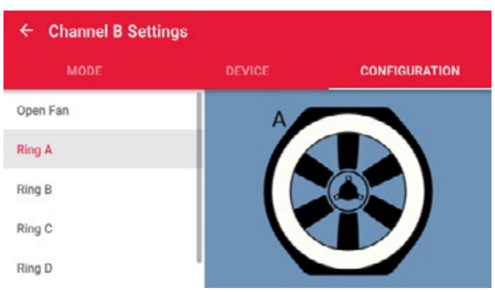
4. With the fan inlet still covered, touch Set Baseline to initiate the building baseline measurement procedure on Channel A.



5. During a baseline measurement, Channel A will display a long-term average baseline pressure reading while Channel B is used as a timer in seconds to show the elapsed measurement time. When you are satisfied with the baseline measurement, touch enter and enter the baseline reading into the gauge.



6. Channel A will now display the baseline adjusted building pressure value.



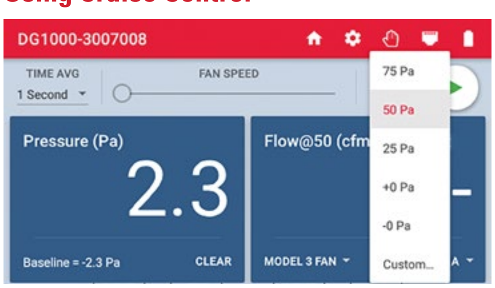
7. Remove the No-Flow Plate from the Blower Door fan and install the flow ring which you think best matches the needed fan flow (see table below.)

Ring	Flow Range in CFM
Open (no flow ring)	6,100 - 2,435
Ring A	2,800 - 915
Ring B	1,100 - 300
Ring C (Optional)	330 - 85
Ring D (Optional)	115 - 30
Ring E (Optional)	45 - 11

8. Check (and adjust if necessary) the selected test device (i.e. fan) and configuration (i.e. flow ring) shown in the Gauge app to match the fan and flow ring being used in the test.

9. Turn on the blower door fan.

Using Cruise Control



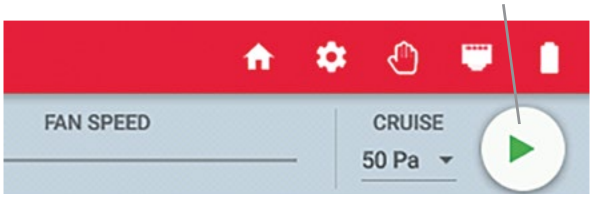
1. Turn the blower door speed control knob to the “just on” position (the controller is on but turned all the way down).

2. Set the cruise target by touching the Cruise menu and selecting 50 Pa.

   Note: The fan control cable must be connected to the DG-1000 and the fan speed controller for this feature to work.

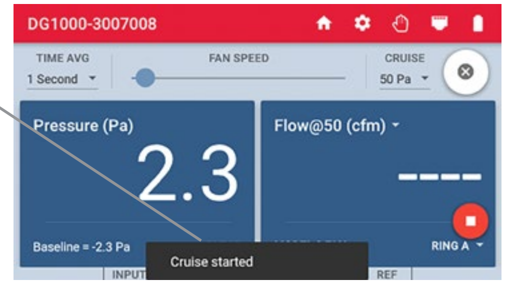
3. Touch the green play icon to start cruise. Once cruise is started, the fan speed slider will move on it's own. The green play icon will change to an X, and a red stop icon will appear in the lower right of the screen. A pop-up will appear at the bottom of the screen to indicate that cruise has started.

Start cruise



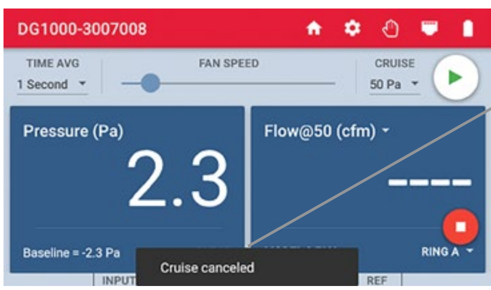
Cruise started

Cruising screen



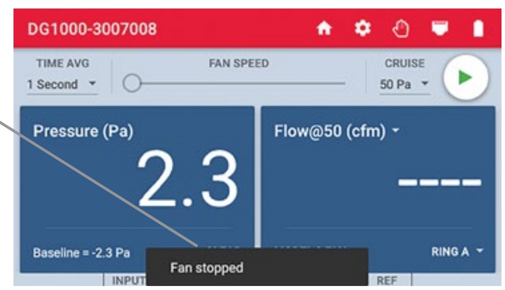
4. The blower door fan will now slowly increase speed until the building depressurization displayed on Channel A is approximately –50 Pa.

5. Cruise will turn off when the X is touched, but the fan will continue running. When the X is touched, a pop-up will appear at the bottom of the screen that says "Cruise canceled." Touch the red stop icon in the bottom right corner of the screen to stop the fan. When the fan is stopped a pop-up will appear at the bottom of the screen that says "fan stopped."



Cruise canceled

Fan stopped

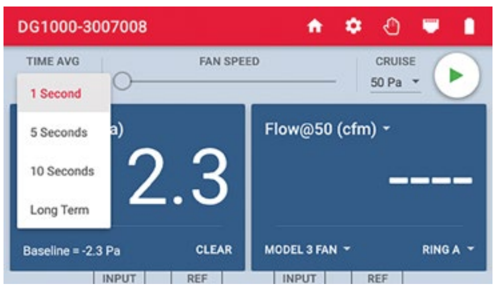


5.1 Controlling the Fan with the Gauge app

Touch and slide the dot on the fan speed slider in the Gauge app to adjust the fan speed using the DG-1000. As the fan speed increases, the building depressurization displayed on Channel A should also increase. Continue to increase the fan speed until the building depressurization shown on Channel A is between –45 and –55 Pa.

5.2 **Manually Controlling the Fan**

Gradually increase the fan speed by slowly turning the fan controller clockwise. As the fan speed increases, the building depressurization displayed on Channel A should also increase. Continue to increase the fan speed until the building depressurization shown on Channel A is between –45 and –55 Pa.



6. Channel B will display the one-point 50 Pa leakage estimate. Record this number. If the leakage estimate is fluctuating more than desired, try changing the time average setting on the gauge by touching the Time Average menu and choosing the 5 or 10 second or long-term averaging period.

7. Turn off the blower door fan. If you are using cruise control, this is done by touching the red stop icon in the Gauge app.

8. "-----" or "LOW" appearing on Channel B

- Whenever "-----" or "LOW" appears on Channel B in the Flow @ 50 mode, the gauge can not calculate a reliable leakage estimate. The messages "-----" and "LOW" appear on Channel B under the following conditions:

  » "-----" is continuously displayed when the building test pressure from Channel A is below a minimum value of 10 Pa. Estimating building leakage results when the test pressure is below this value may result in large errors. If possible, install a larger flow ring or remove the flow rings to generate more fan flow. Be sure the fan is off when changing flow rings.

  » Channel B reads "LOW" is continuously or LOW alternates with a flow reading when the air flow reading through the device is unreliable (i.e. you are trying to measure a flow outside of the calibrated range of the test device in its current configuration). If possible, you should change the test device configuration to match the flow rate being measured (e.g. install a flow ring or a smaller flow ring). Be sure the fan is off when changing flow rings.

CONDUCTING A ONE-POINT PRESSURIZATION TEST

Before the Test

- Install the blower door frame, panel and fan into an exterior doorway. For instructions about how to do this, please see [Chapter 2 of the Minneapolis Blower Door User Manual.]

- Prepare the building for the blower door test. For instructions about how to do this, please see [Chapter 3 of the Minneapolis Blower Door Manual.]

Tubing Hookup

1. Attach one end of the red tube to the Channel B input tap. Attach the other end of the red tube to the pressure tap on the blower door fan.

2. Attach one end of the green tube to the Channel A reference tap. Run the other end of the tubing outside through one of the holes provided in the lower corner of the nylon panel.

3. Attach one end of the clear tube to the Channel B reference tap. Run the other end of the tubing outside through one of the holes provided in the lower corner of the nylon panel. The end of the clear tubing should be placed next to the side of the fan, but not in the fan's airstream.

Note: For help with how to connect the tubing to the DG-1000, please use the Tubing Assistant on our website.

Fan Direction

Before conducting the pressurization test, make sure the fan direction is reversed by removing the fan from the nylon panel, and re-inserting it with the exhaust side facing inside the building.

Conducting the Test

Once the equipment has been setup, follow the instructions in the depressurization test section of this guide (page 2).

Software Information

The Energy Conservatory (TEC) offers a variety of Windows-based programs. These programs can be found and downloaded for free at software.energyconservatory.com.

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- Using the DG-700 with the Minneapolis Blower Door
- Test Results and Sample Test Forms

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Updated Aug 2017, V1

The Energy Conservatory

MODEL 3
MINNEAPOLIS BLOWER DOOR™

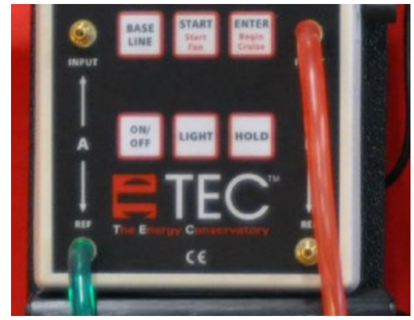
USING THE DG-700 WITH THE MINNEAPOLIS BLOWER DOOR

CONDUCTING A ONE-POINT DEPRESSURIZATION TEST

Before the Test

- Install the blower door frame, panel and fan into an exterior doorway. For instructions about how to do this, please see Chapter 2 of the Minneapolis Blower Door User Manual.

- Prepare the building for the blower door test. For instructions about how to do this, please see Chapter 3 of the Minneapolis Blower Door Manual.



Tube Hookup

1. Attach one end of the green tube to the Channel A reference tap. Run the other end of the tubing outside through one of the holes provided in the lower corner of the nylon panel.

2. Attach one end of the red tube to the Channel B input tap. Attach the other end of the red tube to the pressure tap on the blower door fan.

Note: For help with how to connect the tubing to the DG-700, please use the Tubing Assistant on our website.

Conducting the Test

1. Turn on the DG-700 and place it in the proper mode
   Turn on the gauge and press the MODE button twice to put the gauge into the PR/ FL @50 mode. In this specialized test mode Channel A is used to measure building pressure while Channel B is used to display estimated building leakage at a test pressure of 50 Pascals (CFM50). The leakage estimate shown on Channel B is determined by mathematically adjusting the actual air flow from the blower door fan to a test pressure of 50 Pascals, using the real-time Channel A building pressure reading and a Can't Reach 50 factor, which can be found in the Blower Door Manual on page 9.

2. Measure the baseline building pressure
   When conducting a blower door test, we want to measure the change in building pressure caused by air flowing through the blower door fan. In order to measure this change accurately, we need to account for any existing pressures on the building caused by stack, wind and other driving forces. This existing building pressure is called the "baseline building pressure."

   The DG-700 has a built-in baseline measurement procedure which allows the user to quickly measure and record the baseline pressure on Channel A, and then display the baseline adjusted pressure. This feature makes it possible to "zero out" the baseline building pressure on Channel A, and display the actual change in building pressure caused by the blower door fan.

   With the fan sealed off, begin a baseline building pressure reading from Channel A by pressing the BASELINE button. The word "BASELINE" will begin to flash in the Channel A display indicating that the baseline feature has been initiated. Press START to start the baseline measurement. During a baseline measurement, Channel A will display a long-term average baseline pressure reading while Channel B is used as a timer in seconds to show the elapsed measurement time. When you are satisfied with the baseline measurement, press the ENTER button to accept and enter the baseline reading into the gauge. The Channel A display will now show an ADJ icon to indicate that it is displaying a baseline adjusted building pressure value. Note: Once a baseline measurement has been taken and entered into the gauge (i.e. ADJ appears below the Channel A reading), a new baseline measurement procedure can be initiated by pressing the BASELINE button.

3. Choose a flow ring for the blower door fan

Ring	Flow Range in CFM
Open (no flow ring)	6,100 - 2,435
Ring A	2,800 - 915
Ring B	1,100 - 300
Ring C	330 - 85
Ring D	115 - 30
Ring E	45 - 11

Remove the No-Flow Plate from the blower door fan and install the flow ring which you think best matches the needed fan flow. Installation of flow rings will depend on the tightness level of the building stock being tested. For example, for relatively leaky buildings (greater than 3,000 CFM50), you will want to start the test using the Open Fan configuration (i.e. no flow rings installed). As you test tighter buildings, you will need to install flow rings A or B. Refer to the table for approximate flow ranges of the fan using the various flow rings configurations. Don't worry if you guess wrong and start the test with the incorrect flow ring - you can change the fan configuration during the test procedure.

4. Enter the selected flow ring into the gauge
In order for the DG-700 to properly display fan flow, you need to input the blower door fan model and selected flow ring into the gauge. Check (and adjust if necessary) the selected test Device (i.e. fan) and Configuration (i.e. flow ring) shown in the upper part of the gauge display to match the fan and flow ring used in the test.

5. Press the DEVICE button to change the selected blower door fan.

6. Once the fan is selected, the configuration of the fan can be selected by pressing the CONFIG button. The currently selected flow ring configuration is shown in the Config section of the gauge display.

Config Setting	Flow Ring
Open	No flow ring
A1	Ring A
B2	Ring B
C3	Ring C
D	Ring D
E	Ring E

Also be sure that Channel B is showing the proper air flow units for your test (this should typically be set to CFM). Units can be changed by pressing the UNITS button.

7. Turn on the fan for an initial inspection
Turn on the blower door fan by slowly turning the fan controller clockwise. As the fan speed increases, the building depressurization displayed on Channel A should also increase. As you increase the fan speed, you will be increasing the pressure difference between the building and outside resulting in increased pressure exerted on the aluminum door frame installed in the door opening. If you did not properly install the door frame, the frame may pop out of the doorway at higher building pressures (over 30 Pascals). If this happens, simply reinstall the frame more securely. When installed properly, the frame will easily stay in place during the entire test procedure. Before making measurements, you may want to quickly walk around the building with the fan producing about 30 Pascals of building pressure to check for any problems such as windows or doors blown open or blowing ashes from a fire place or wood stove.

8. Make final adjustments to the blower door fan

- If Manually Controlling the Fan
  Continue to increase fan speed until the building depressurization shown on Channel A is between –45 and –55 Pascals. Do not waste time adjusting and re-adjusting the fan speed control to achieve a test pressure of exactly -50 Pascals – just get close to the target pressure. As long you are using the PR/ FL @50 mode and the test pressure displayed on Channel A is within 5 Pascals of the -50 Pascal target pressure, any errors introduced by estimating the leakage on Channel B will typically be very small (less than 1%).

- If Using Cruise Control
  Turn the blower door speed control knob to the "just on" position (i.e. the controller is on but the blower door fan is not turning). Now press the Begin Cruise (Enter) button. The Channel A display will now show the number 50 (your target Cruise pressure). Press the Start Fan (Start) button. The blower door fan will now slowly increase speed until the building depressurization displayed on Channel A is approximately 50 Pascals.

  Channel B will now display the One-Point CFM50 leakage estimate. If the leakage estimate is fluctuating more than desired, try changing the Time Averaging setting on the gauge by pressing the TIME AVG button and choosing the 5 or 10 second or Long-term averaging period. Record the CFM50 test reading.

  Turn off the fan. If you are using Cruise Control, this is done by pressing the Stop Fan (Clear) button.

  Whenever "-----" or "LO" appears on Channel B in the PR/ FL @ 50 mode, the DG-700 can not calculate a reliable leakage estimate. The messages "-----" and "LO" appear on Channel B under the following three conditions
  » "-----" is continuously displayed when the building test pressure from Channel A is below a minimum value of 10 Pascals. Estimating leakage results when the test pressure is below this value may result in unacceptably large errors. If possible, install a larger flow ring or remove the flow rings to generate more fan flow.
  » "LO" is continuously displayed when there is negligible air flow through the test device.
  » "LO" alternates with a flow reading when the air flow reading through the device is unreliable (i.e. you are trying to measure a flow outside of the calibrated range of the test device in its current configuration). If possible, you should change the test device configuration to match the flow rate being measured (e.g. install a flow ring or a smaller flow ring).

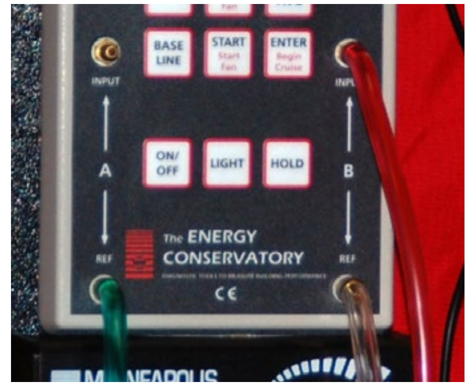
CONDUCTING A ONE-POINT PRESSURIZATION TEST

Before the Test

- Install the blower door frame, panel and fan into an exterior doorway. For instructions about how to do this, please see Chapter 2 of the Minneapolis Blower Door User Manual.

- Prepare the building for the blower door test. For instructions about how to do this, please see Chapter 3 of the Minneapolis Blower Door Manual.

Tube Hookup



1. Attach one end of the green tube to the Channel A reference tap. Run the other end of the tubing outside through one of the holes provided in the lower corner of the nylon panel.

2. Attach one end of the red tube to the Channel B input tap. Attach the other end of the red tube to the pressure tap on the blower door fan.

3. Attach one end of the clear tube to the Channel B reference tap. Run the other end of the tubing outside through one of the holes provided in the lower corner of the nylon panel. The end of the clear tubing should be placed next to the side of the fan, but not in the fan's airstream.

Note: For help with how to connect the tubing to the DG-700, please use the Tubing Assistant on our website.

Fan Direction

Before conducting the pressurization test, make sure the fan direction is reversed by removing the fan from the nylon panel, and re-inserting it with the exhaust side facing inside the building.

Note: If you have an older blower door fan, it may have a reverse switch. You cannot use the reverse switch to get accurate flow readings, you must turn the fan around.

Conducting the Test

To conduct the pressurization test, follow the same instructions provided in the depressurization test section of this guide, which starts on page 2.

Software Information

The Energy Conservatory (TEC) offers a variety of Windows-based programs. These programs can be found and downloaded for free at software.energyconservatory.com.

TEC also offers driver support for the DG-500, DG-700 and DG-1000. The drivers are designed to work with Windows-based computers with the following operating systems:

- Windows 7
- Windows 8
- Windows 8.1
- Windows 10

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Instructional Videos

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- Minneapolis Blower Door Quick Guide
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- TECTITE 4.0
- And many more

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More Blower Door Guides

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Please refer to the guides listed below for further instructions.

- Minneapolis Blower Door Overview
- Minneapolis Blower Door Manual
- Using the DG-1000 with the Minneapolis Blower Door
- Test Results and Sample Test Forms

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TEC
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MODEL 3
MINNEAPOLIS BLOWER DOOR™

TEST RESULTS AND SAMPLE TEST FORMS

BASIC AIRTIGHTNESS TEST RESULTS

Airtightness test results can be presented in a number of standardized formats.

- **Air Leakage at 50 Pascals**
  - **CFM50**
    CFM50 is the airflow (in cubic feet per minute) from the blower door fan needed to create a change in building pressure of 50 Pascals (0.2 inches of water column). A 50 Pascal pressure is roughly equivalent to the pressure generated by a 20 mph wind blowing on the building from all directions. CFM50 is the most commonly used measure of building airtightness and gives a quick indication of the total air leakage in the building envelope. When conducting a one-point test at 50 Pascals of building pressure, you are directly measuring CFM50.

  - **Percent Reduction in CFM50**
    Performing a one-point CFM50 test before and after airtightening work will allow you to determine the reduction in building airtightness. Reductions in CFM50 as large as 40 to 50 percent are often achieved in high level weatherization programs working on leaky houses. To determine the percent reduction in CFM50, subtract the after-tightening test result from the before-tightening test result. Divide this difference by the before-tightening result and multiply by 100.

$$\% \text{ Reduction} = \frac{\text{CFM50 (before)} - \text{CFM50 (after)}}{\text{CFM50 (before)}} \times 100$$

- **Normalizing Air Leakage for the Size of the House**
  In order to compare the relative tightness of buildings, it is useful to adjust (or normalize) the results for the size of the building. This allows easy comparison of various size buildings with each other, or with program standards. There are many aspects of building size which can be used to normalize including volume and surface area of the building envelope.

  - **Air Change per Hour at 50 Pascals (ACH50)**
    One way to compare different size buildings is to compare the measured air leakage at 50 Pascals (e.g. CFM50) to the conditioned volume of the building. Air Change per Hour at 50 Pa (ACH50) is calculated by multiplying CFM50 by 60 to get air flow per hour, and dividing the result by the volume of the building. ACH50 tells us how many times per hour the entire volume of air in the building is replaced when the building envelope is subjected to a 50 Pascal pressure.

$$\text{ACH50} = \frac{\text{CFM50} \times 60}{\text{Building Volume (cubic feet)}}$$

  - The airtightness of existing homes can vary dramatically based on the construction style, age and region. The chart below shows the relative tightness of homes based on the ACH50.

0 - 1.5 ACH	Very tight
1.5 - 3 ACH	Tight
3 - 5 ACH	Moderately tight
5 - 7 ACH	Loose
7 - 10 ACH	Very loose
10 + ACH	Extremely loose

Refer to the International Energy Conservation Code (IECC) tor climate zone specific maximum allowable ACH50 values.

» **Air Leakage at 50 Pascals per Unit of Surface Area**
This parameter is calculated by dividing the measured air leakage at 50 Pascals (e.g. CFM50) by the surface area of the building. This is the measured Air Leakage at 50 Pascals (e.g. CFM50) divided by the surface area of the building.
Note: Residential buildings above five stories and commercial buildings are typically tested at 75 Pascals.

$$\text{CFM50 per Square Foot of Surface Area} = \frac{\text{CFM50}}{\text{Square Feet of Surface Area}}$$

- **Optional Correction for Air Density Based on Temperature**
To increase the accuracy of a one-point test, the fan flow measurements can be corrected for differences in air density caused by air temperature. During a depressurization test, the blower door system is measuring the air flow through the blower door fan. But what we really want to know is the air flow coming back into the building through air leaks. When the inside and outside temperature are different, the air flow leaving the building through the fan is actually different from the air flow back into the building (due to differences in air density). In extreme weather conditions, this difference in air flow can be as great as 10 percent. If you wish to manually adjust your test results for differences in air density, a table of air density correction factors can be found in the Blower Door Manual, starting on page 17.

- **Optional Correction for Air Density based on Elevation**
Some standards will also require a correction based on elevation above sea level. The formula for this conversion can be found in the Blower Door Manual, on pages 17 and 18.

- **Envelope Leakage Test Forms**
Homeowners or building inspectors may require that information about the test and the results be documented. There are a number of software and mobile apps available from TEC that can automate the process and provide for a more complete way of documenting the test. See software.energyconservatory.com for a list of all TEC software. On the next page, we have included a blank form that may be used if you are not using any computer or mobile device for testing.

Sample blank form (Click here for a fillable PDF version of this form)

Envelope Leakage Test

Testing Company

Name:

Address:

Phone:

Technician

Name:

Credentials:

Email:

Building Information

Project ID:

Address:

Customer Information

Name:

Address:

Phone:

Email:

Test Results

Measured Leakage:

Leakage Target:

Compliance with Leakage Target: Pass Fail

Test ID:

Measured CFM50:

Building Volume:

Enclosure Surface Area:

ACH50 = (CFM50 x 60)/Volume:

CFM50/Sq Feet of Surface Area:

Test Characteristics

Indoor Temp:

Outdoor Temp:

Altitude:

Time Average Period:

Test Date:

Test Equipment

Flow Device: Serial Number:

Pressure Gauge: Serial Number: Calibration Date:

Comments:

Technician Signature: Date:

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