

BY JIM BRADLEY

## Multi-Point Testing Using TEC Auto Test

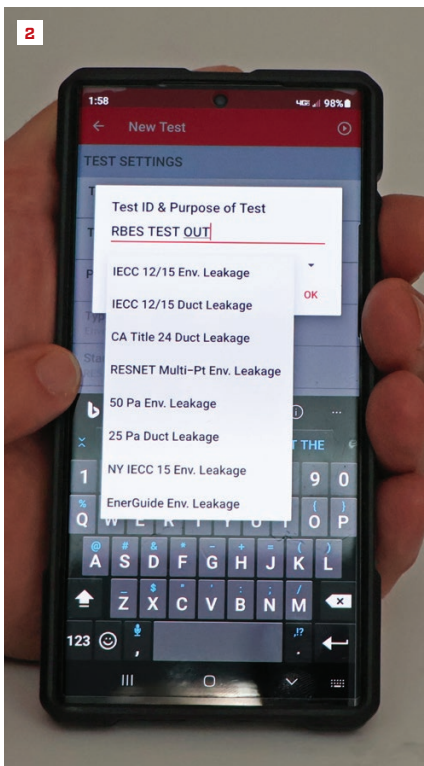


I've been a BPI-certified home-performance contractor for 18 years, and over that time, I've mostly performed single-point blower door tests. The state of Vermont, where I work, doesn't require multi-point blower door testing, nor does the Building Performance Institute (BPI). However, my views on testing methods began to change after reading an article in *JLC* last fall that discussed multi-point testing (see "Single-Point vs. Multi-Point Blower Door Testing," Sept/Oct/22). In it, the author explained that multi-point tests are more accurate for predicting building leakage at lower pressures, which are more common during normal operating conditions of a home. Multi-point tests collect the airflow data (in cfm) at five different pressure levels between 10 pascals and 60 pascals, while single-point blower door tests collect the airflow data (in cfm) at only one pressure level, typically 50 pascals.

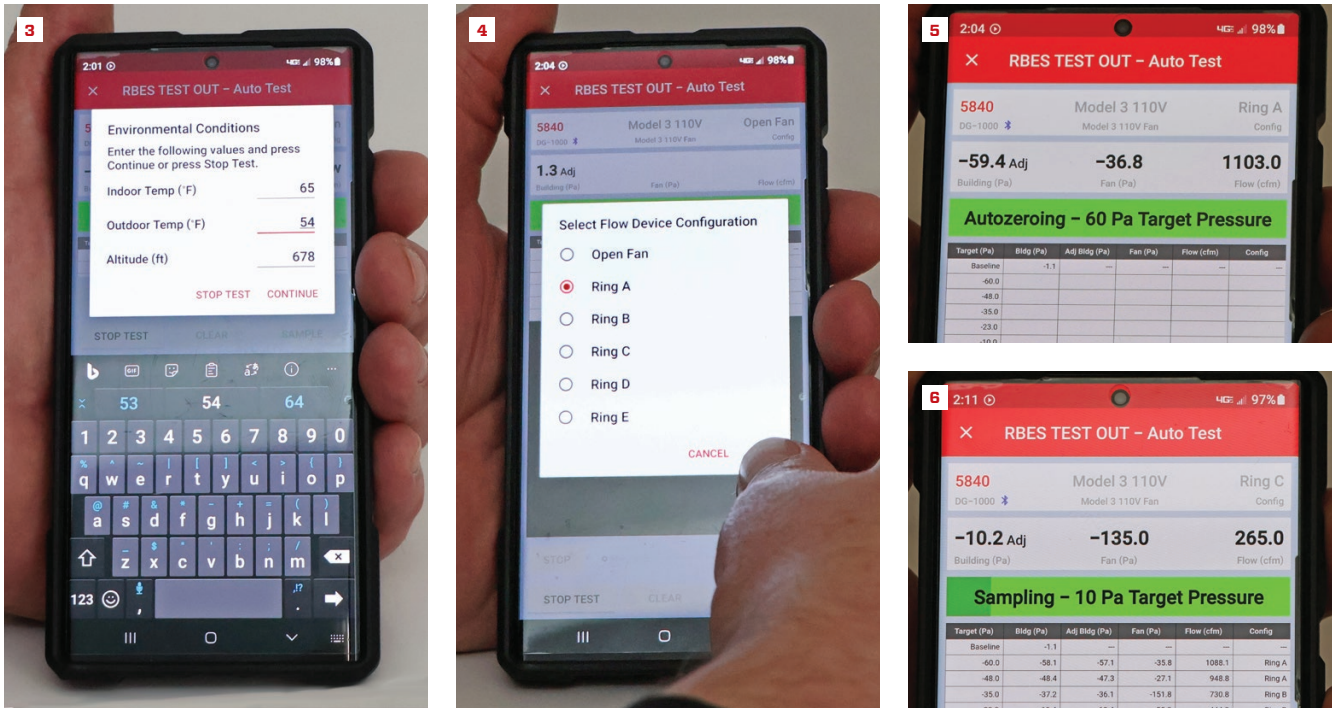
Coincidentally, I was going through the RESNET HERS Rater training shortly after reading the article, and the instructors explained that you have to take a 10% penalty for air leakage when performing single-point tests—something I hadn't known about. This revelation prompted me to do a little online research, which led me to the latest version of The Energy Conservatory's Auto Test software. The software appeared to have several testing options for various industry standards, so I downloaded the TEC Auto Test app, started tinkering with it, and right away thought, "Why haven't I been using this all along?"

First off, Auto Test is free and supports single-point and multi-point testing along with allowing you to set up custom metrics. It was released in 2017 (not long after the TEC DG-1000 manometer) and has been through multiple software updates, which continually improved on how Auto Test operates and connects to the gauge. It comes with helpful features like a one-time report setup to allow you to add your company information and credentials into every report and the ability to build templates for different clients. It has Bluetooth connectivity to your gauge, GPS location, and "Wind Assistant," which detects if it is too windy for accurate readings and adjusts your data collection time and fan control to get better data in rough weather conditions.

A feature I particularly like is it provides data at the end of your test in easy-to-share formats, so you can



While testing a new house, the author uses the TEC Auto Test app on his smartphone to connect to his TEC DG-1000 manometer (1). The program first sends the user through a series of prompts (such as location via GPS, the year the building was built, and the client's name, etc.), then a test can be created. TEC's Auto Test offers eight different tests (2). The author uses the RESNET multi-point test, which collects the airflow data at five different pressure points, starting with 60 pascals and going down to 48, 35, 23, and 10 pascals. Multi-point testing is more accurate for predicting building leakage at lower pressures, which are more common during normal operating conditions of a home.



Indoor and outdoor temperatures need to be manually entered, while the home's altitude auto-fills from the GPS (3). To start a baseline test, the ring size needs to be selected (4). The program will also prompt the user to change the ring size as necessary while collecting airflow data from 60 pascals (5) down to 10 pascals. A chart infills with data as the test progresses (6).

have your report done and sent before you leave the site. These include a PDF that can be attached to an email or text, as well as data in a JSON file type, which can be used to re-create the report or share the raw data. Though I would normally provide our clients with reports that include substantial information, this additional data raises the bar on what I have offered. The data can be stored to any location you like, such as iCloud, Google Drive, Dropbox, etc.

**USING THE AUTO TEST APP FOR MULTI-POINT TESTING**

After calculating the volume of the house, I start by selecting the TEC Auto Test app on my smartphone (1). You can select a new project or access a list of past projects, which auto-fills the data and helps speed up the process. This is helpful because I perform blower door tests for a lot of the same construction companies. It then sends you through a series of prompts: determine location (which locates the home via Google Maps GPS); the year the building was built; the customer's name, address, phone, and email, along with the project ID name. You then create a test.

Under test settings, the app offers a selection of eight different tests, though I prefer to use the RESNET multi-point test because of its accuracy (2). It takes into account a home's altitude and indoor and outdoor temperature, and collects airflow data at different pressures, so it gives you a better average than just a single-point

test (again, for RESNET, if you do a single-point test, you have to take a 10% penalty for air leakage). Enter building volume, then hit "connect" to sync to the DG-1000 (as soon as it's connected, it shows the serial number of the manometer, so it knows which one you're using). It'll start monitoring, then ask for the environmental conditions, and you enter in the indoor and outdoor temperatures (the altitude of residence auto-fills from the GPS) (3). Factoring in the altitude was new to me, which I learned about in RESNET training. You start to see a difference in the testing data at 600 feet above sea level, and many of the homes I test are above that.

I also test homes on Lake Champlain and the surrounding mountainous area where it tends to be breezy. Auto Test's "Wind Assistant" will sense if it's too windy and suggest when to use it. In Wind Assistant mode, it will take a lot more samples than normal to determine a better average of the building air leakage.

It'll then ask to start the baseline test. After that, you enter the ring size configuration, and it starts running the fan unit (4). Should you need to change the ring size on the fan to obtain the measurements, it tells you to do so (you don't have to tell the program that you changed it; the app knows automatically). The software also can detect when the equipment is not set up correctly, and it tells you so. For instance, my sons work with me because I'm teaching them how to perform blower door tests. One of them put

## Envelope Leakage Test

### Testing Company:

Name: Authenticated Building Performance Diagnostics  
Address: 211 Cambridge Glen Road  
Cambridge, VT 05444  
Phone: 802.578.5007

### Technician:

Name: Jim Bradley  
Credentials: BPI Building Analyst Certification  
10/11/22  
Email: jim@authenticateddiagnostics.com

### Building Information:

Project ID: Custom Homes - Brown Res  
Address: 16 Town Road  
Jericho, Vermont 05465  
Year Built: 2023  
Geo-Tag Latitude: 44.491271  
Data: Longitude: -72.957220  
Timestamp: 2023-04-29 13:55:49

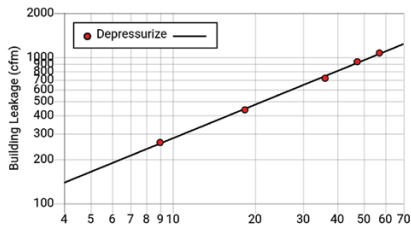
### Customer Information:

Name: Tom Brown  
Address: 16 Town Road  
Jericho, Vermont 05465

### Measured Leakage: 950.7 CFM50

Test ID: RBES TEST OUT  
Purpose of Test: RESNET Multi-Pt Env. Leakage  
Measured ACH50: 1.05 (+/- 5.2%)  
Building Volume: 54,450.0 ft<sup>3</sup>  
Coefficient (C): 48.0 (+/- 19.5%)  
Correlation Coefficient: 0.99916  
Test Standard: RESNET 380 Multi-Point  
Test Characteristics: Indoor Temp: 65 °F  
Altitude: 678.0 ft  
Test Date and Time: 2023-04-29 14:01:41

Effective Leakage Area: 39.3 in<sup>2</sup>  
Enclosure Surface Area: 0.0 ft<sup>2</sup>  
Exponent (n): 0.763 (+/- 0.058)  
Test Mode: Depressurize  
Outdoor Temp: 55 °F  
Time Average Period: 10 seconds



### Envelope Leakage Test

#### Test Readings:

Target (Pa)	Bldg. (Pa)	Adj Bldg. (Pa)	Fan. (Pa)	Flow (cfm)	Config
Baseline	-1.1				
-60.0	-58.1	-57.1	-35.8	1,088.1	Ring A
-48.0	-48.4	-47.3	-27.1	948.8	Ring A
-35.0	-37.2	-36.1	-151.8	730.8	Ring B
-23.0	-19.4	-18.4	-55.8	444.8	Ring B
-10.0	-10.0	-9.0	-136.1	265.9	Ring C

#### Test Equipment:

Flow Device: Model 3 110V Fan  
Pressure Gauge: DG1000  
Serial #: 5840  
Calibration Date: 2020-06-09

#### Deviations from Standard:

- None

#### Comments:

None

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the outdoor pressure line in line with the fan flow, and I was getting readings saying, “we can’t get the building pressure, something is wrong.” So, I checked, and sure enough, the outdoor pressure line was too close to the fan exhaust (the line needs to be at least 5 feet away). So, I moved the pressure tap and continued on with the test.

**Collecting airflow data (autozeroing).** The program begins the multi-point test and collects airflow data at five different pressure points, starting with 60 pascals (5) and going down to 48, 35, 23, and 10 pascals (6). The app will sense if you need to change ring size mid-test, and it’ll prompt you to do so. Then once you change the ring, the app will just say “continue,” and it’ll carry on with the test. For example, on the project shown in the photos, a pop-up window, “Update Flow Device Configuration,” appeared while the program was autozeroing at 35 pascals. It noted, “Flow too small to measure for current configuration. Install ring B and press Continue or press End Test to end test at previous pressure.” My son swapped out ring A with ring B, and we continued the test.

After autozeroing the 10-pascal target pressure, a pop-up window asks, “Test Complete. Would you like to review the report?” The two-page report appears instantly with all the data (temperature measurements, building volume, measured CFM50 and ACH50, etc.) (7). It looks highly professional, and you can email it to yourself and your client in real time. As a blower door tester, I’ve found this has certainly upped my game.

**Assessment.** The TEC Auto Test app will enhance the power of your DG-1000 manometer. Its multi-point testing gives you a more accurate, across-the-board differential baseline and average of what the actual leakage is by taking into account factors such as the delta between indoor and outdoor temperatures, the altitude, and whether it’s windy. Again, the software is more accurate for predicting building leakage at lower pressures, which are more common during normal operating conditions. Also, the professional-looking report is great. You can send the report as is or take that data and modify it for your own report.

The only negative is that poor cellphone service will limit some of Auto Test’s functionality. I frequently work in rural sections of Vermont with no cell service, so I have to manually add some information later on, such as the location, altitude, etc. The software will adjust the numbers accordingly. Other than that, using TEC’s Auto Test app has been phenomenal.

*Jim Bradley is a BPI-certified home-performance contractor, builder, and remodeler based in Vermont. He is currently a project developer and manager for Hayward Design Build in Colchester, Vt..*