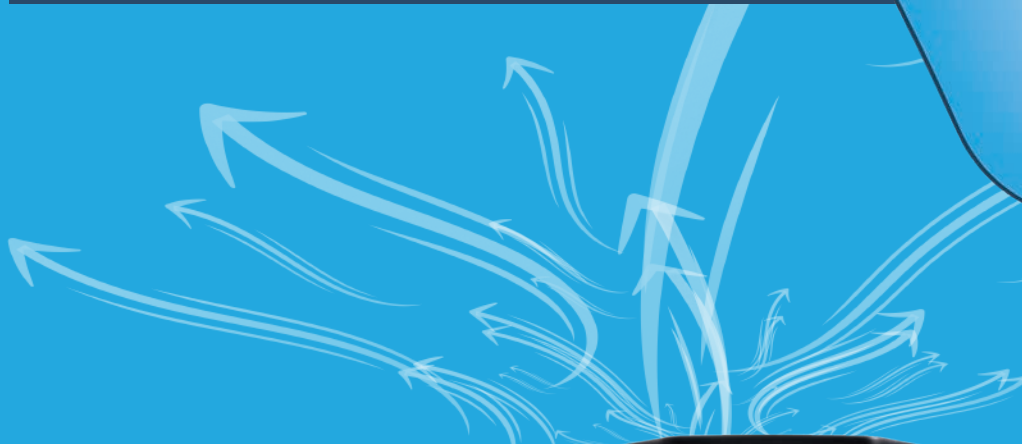


Revolution

USER MANUAL



FILTR

Revolution



Operators Manual

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Manufactured by:
Lighthouse Worldwide Solutions
1221 Disk Drive
Medford, Oregon 97501

LWS Part Number: 248083486-1 R2



EU CE DECLARATION OF CONFORMITY

Manufacturer's Name: Lighthouse Worldwide Solutions, Inc.

Manufacturer's Address: Lighthouse Worldwide Solutions, Inc.
1221 Disk Drive
Medford, OR 97501 USA

Declares the product: FILTR Revolution


Conforms to the Following Harmonized Standards:

- EN301 489-1 V2.1.1 Electromagnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements; Harmonized Standard covering the essential requirements of article 3.1(b) of the Directive 2014/53/EU and the essential requirements of article 6 of the Directive 2014/30/EU
- EN301 489-17 V3.1.1 Electromagnetic Compatibility (EMC) standard for radio equipment; Part 17: Specific conditions for Broadband Data Transmission Systems; Harmonized standard covering the essential requirements of article 3.1(b) of Directive 2014/53/EU
- EN 61326-1:2013 Electrical Equipment for Measurement, Control and Laboratory Use

Supplementary Information

This declaration of conformity is issued under the sole responsibility of the manufacturer.

2019-05-24, Medford OR, USA
Date/Location Issued


Jerry Szpak
Vice President of Engineering

FCC STATEMENT



**Supplier's Declaration of Conformity
47 CFR § 2.1077 Compliance Information**

Product: FILTR Revolution

Responsible Party : Lighthouse Worldwide Solutions
47300 Kato Road
Fremont CA 94538 USA
Tel: (510) 438-0500

FCC Compliance Statement

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

(1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at their own expense.

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1 Introduction

The FILTR Revolution Air Filtration System was engineered to combat all forms of air pollution, from mold spores and smoke particles to viruses and microbes. Using FDA regulations as a base, the Revolution provides superior protection and filtration in a mobile, affordable package.

The Revolution combines VOC reduction, HEPA filtration, and patented bipolar ionization technology to protect everyone and everything in the environment. Onboard sensors track particle count and VOC (Volatile Organic Compound) increases to detect outbreaks, while the multi-stage filter system provides Clean Room grade filtration down to .01 microns.



Figure 1-1

FEATURES

- 3 stages of Superior Filtration
- Patented Bi-Polar Ionization
- Measurement and Tracking of Temp, RH, PM2.5, and VOCs
- Multiple placement options including wall and ceiling mounting
- Easy integration into existing HVAC duct systems
- FILTR app for remote monitoring and control, plus email alerts from customizable alarm settings
- Easy replacement of filters
- Quiet running: max of 60 dB
- Up to 700CFM flow rate

Superior Filtration

Pre-Filter

The Revolution starts the filtration process with a Pre-Filter rated at MERV 8.



Figure 1-2

MERV stands for Minimum Efficiency Reporting Value, a standard scale to rate the effectiveness of air filters. The MERV 8 rating of the Pre-Filter represents the filter's ability to control contaminants of down to 3.0 microns in size, removing contaminants like textile fibers, pollen, and mold spores from the air.

Carbon Filter

The second stage of filtration in the Revolution is a custom-designed carbon/potassium permanganate filter.



Figure 1-3

Carbon filtering uses activated carbon in a process called chemical adsorption. This process traps air contaminants and VOCs, and helps to remove odors from the filtered air.

HEPA Filter

The third filtration stage is the HEPA filter.



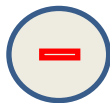
Figure 1-4

Air is forced through the HEPA filter before returning to the environment. This filter is rated at MERV 17, representing a 99.98% efficiency at removing particles as small as 0.3 microns from the environment. This filter is capable of capturing carbon dust, viruses, bacteria, and smoke particles, providing an exceptionally clean output from the Revolution.

Bipolar Ionization

Ionization

In the output of the Revolution unit is the Ionizer. This patented bi-polar ionizer produces both negatively charged air molecules and positively charged air molecules.



These charged molecules produce several effects:

- Ionized particles can kill live bacteria in surrounding atmosphere. This provides an immediate benefit of cleaning the Revolution's output air even more, and helping to scrub clean the air around the unit.
- The charged molecules attach themselves to airborne contaminants and allergens. The change in mass for the particles causes them to become heavier than the surrounding air molecules, enabling gravity to pull down the contaminated air and prevent it from spreading.
- VOCs (Volatile Organic Compounds) in the surrounding area can be neutralized by these charged particles, removing chemical contaminants that could cause long-term health effects.

Onboard Sensors

The Revolution unit comes with a Sensor Pack that expands the user's ability to track the environment surrounding the unit. The Sensor Pack can communicate information about the Temperature, Relative Humidity, VOC levels, and Particulate Matter levels. The FILTR app is required to view the data generated by these sensors, and enables users to track these metrics from anywhere they have a data connection.



The Sensor Pack, located on the lower left side of the Revolution, pulls in and exhaust air through these holes

Figure 1-5

Temperature

The FILTR app can display the temperature at the Revolution unit. This display is able to be set to Fahrenheit or Celsius, and is accurate to within 0.9 degrees F/ 0.5 degrees C. The FILTR app is able to alert the user based on Alarm Settings to conditions that are outside of those desired.

Relative Humidity

A RH sensor within the Revolution unit provides Relative Humidity information to the user via the FILTR app. This sensor has an accuracy of +/- 3%.

The RH sensor information accessible via the app allows the user to track RH trends, and alerts the user to undesired changes. Updates are provided every ten minutes.

Volatile Organic Compounds

VOCs are organic chemicals that have a high vapor pressure at room temperatures. These chemicals can cause health issues via both short-term and long-term exposure.

This class of contaminants is analyzed by the Sensor Pack on the Revolution unit, and is communicated to users via updates on the FILTR app every 10 minutes. Measurement is recorded and displayed in parts per billion.

Particulate Matter

The Revolution unit's Sensor Pack contains a PM2.5 sensor. This sensor measures Particulate Matter in the environment less than or equal to 2.5 microns in diameter.

The FILTR app updates the PM reading every ten minutes, and records and displays the measurement in micrograms per cubic meter, $\mu\text{g}/\text{m}^3$.

Mounting and Integration

The Revolution has optional hardware that enables the user to mount the unit onto wooden studs in a wall, onto Structural Insulated Panels (SIPs) or other metal framing, and even be integrated into a HVAC duct system or ducted on its own.

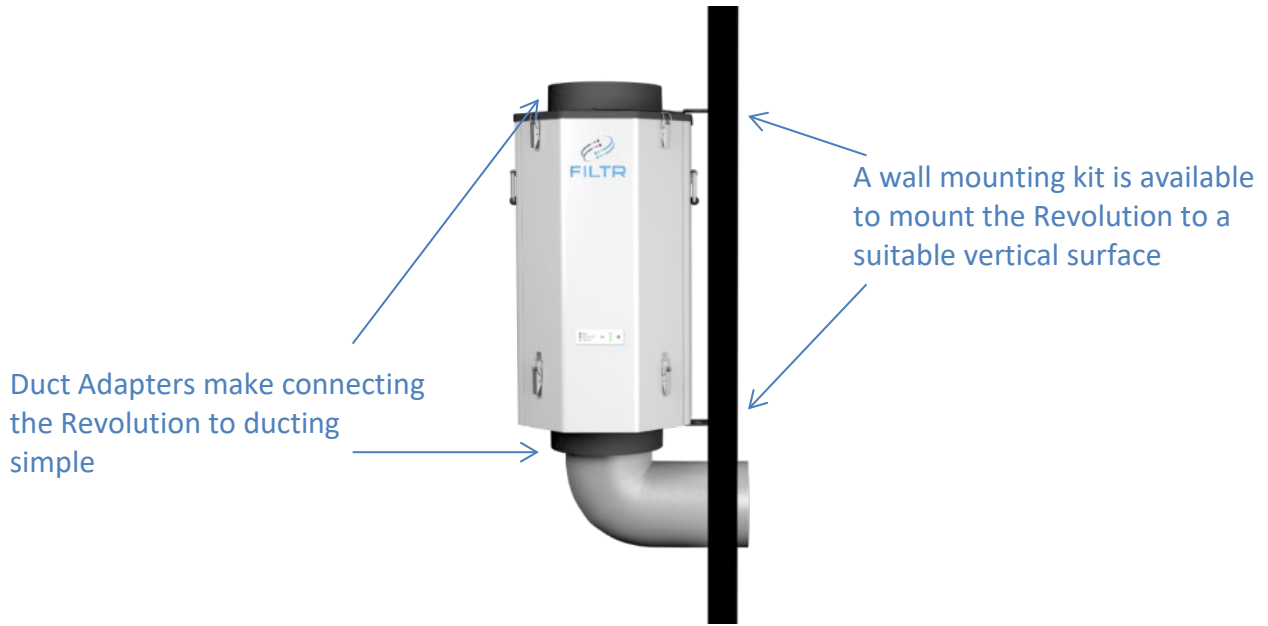


Figure 1-6



Figure 1-7

Revolution Smartphone App

While the Revolution unit maintains all of its physical functionality via the keypad interface, the FILTR app expands the capability of the user to control the Revolution remotely and monitor the environment the unit is in.

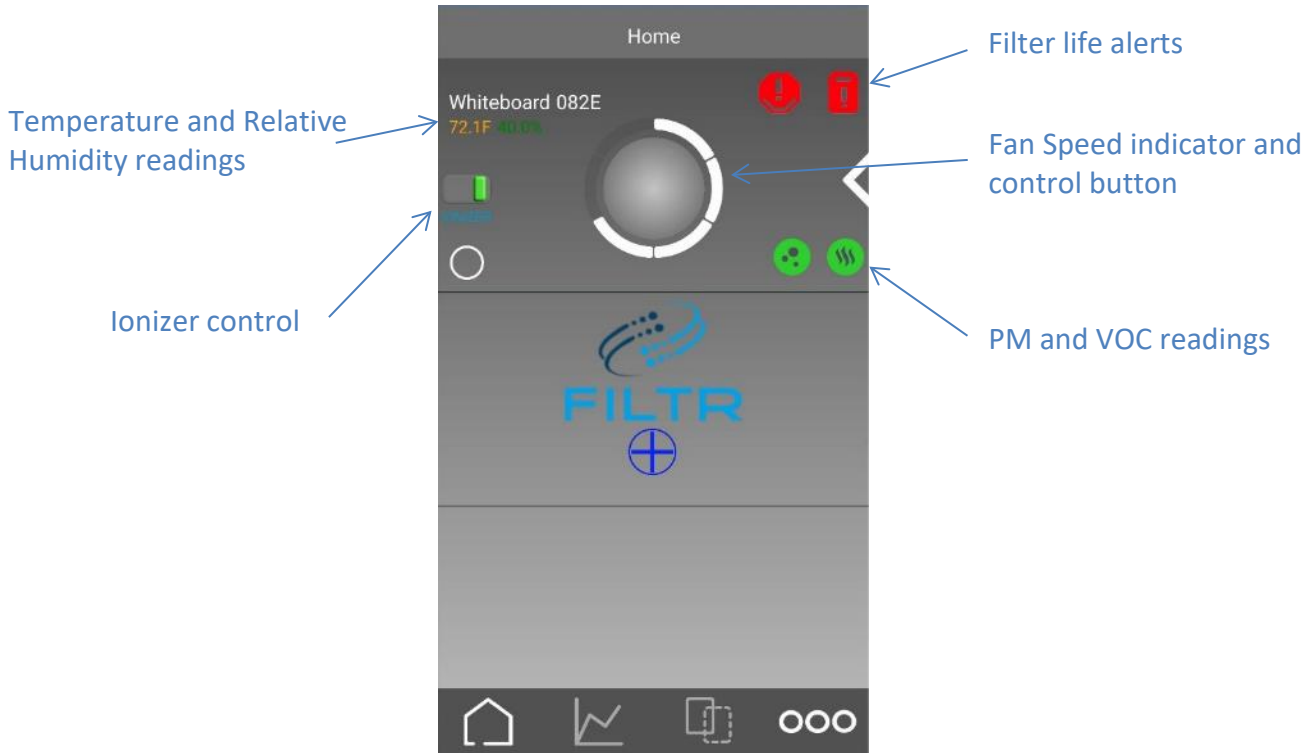


Figure 1-8

Using the FILTR app (listed as *FILTR* in the Google Play store and *FILTR AIR* in the Apple App Store), a user can perform the following with the Revolution unit:

- Control the Fan speed
- Turn the Ionizer on and off
- View the current Temperature, RH, PM, and VOC readings
- View a graph of all measured sensor data points for the last day, week, or month
- Adjust the Alarm thresholds for each measured data type
- and more!

The FILTR app also sends the registered user email alerts based on filter usage and user-defined Alarm thresholds.

As long as the Revolution unit is within range of its local wireless router, and the user has a data connection, the user of the FILTR app is always connected to their unit, no matter the distance.

Simple Filter Replacement

The Revolution was designed with serviceability in mind. While the unit can operate without constant physical interaction, as with any filtration device physical access will be necessary for filter maintenance.

Revolution is engineered to make filter replacement quick and easy. Access to each filter compartment is gained via four latches being released and the unit opened.



Figure 1-9



Figure 1-10



Figure 1-11

Each contained filter is designed for drop-in replacement – no extra clamps, fittings, or latches. Simply remove the old filter and place in a new one.

For replacements, contact your local distributor, or Lighthouse Sales at 541-454-8308.

LWS Filter Part Numbers:

- **HEPA Filter:** 211317419-1
- **Carbon Filter:** 211317420-1
- **Pre-Filter:** 211317421-1

End Of Chapter

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2 Initial Set Up

The Revolution unit has a number of optional accessories. Options include external components such as the wall mounting hardware, ceiling mounting hardware, and 10" ducting kit. See Chapter 5 for setup and use of these.

Listed internal components are all shipped installed in the Revolution unit. These include the Carbon Filter, Sensor Pack, and Ionizer.

The Revolution requires little in the way of set up for initial use.

Unpacking

Upon receipt of the packaged unit, inspect the package for damage. If it is damaged, notify the shipper immediately.

If the package is not damaged, open it carefully. Be sure to inspect each item as it is removed for broken parts, scratches, dents, and other damage. Be sure to document any damage found and inform the shipping company and Lighthouse of any findings. Take photographs of damage upon initial discovery.

With the top of the package opened, the unit casters will be visible as shown below. Remove the casters and set them aside for later installation (if desired), then remove the top shipping foam. This foam extends a short way down the sides of the Revolution unit to keep the unit firmly secured in the shipping package.



Figure 2-1

With the upper foam removed, reach down into the box and grasp the handles on the sides of the unit. Lift up to remove the unit from the shipping package.

Installing the Casters

If desired, the casters can be attached to the pedestal on the bottom of the Revolution unit for easier mobility. To install them, lay the unit on its side to expose the pedestal as shown in Figure 2-2.

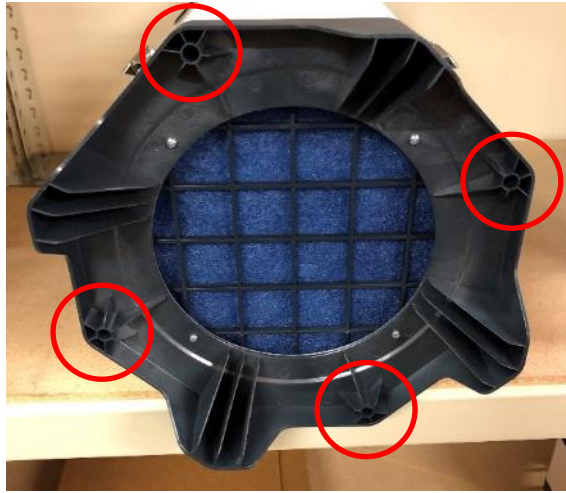


Figure 2-2



Figure 2-3



Figure 2-4

To install the casters, firmly push the post of each one into the four mounting locations shown in Figure 2-2. The casters will sit snugly up against the pedestal as shown in Figure 2-4.

Powering on the Unit

The power cable for the Revolution unit comes shipped inside the upper compartment of the unit. Flip up the four latches around the top cover, remove the top cover (see Figure 2-6), and obtain the cable from the inner cavity. Re-install the top cover before proceeding.



Figure 2-5

The Revolution unit comes with all ordered filters installed. To begin running the unit, locate the power port on the side of the unit above the Filter Tray.

Attach the supplied power cord to the unit and a power source.

Flip the power switch to the ON position.

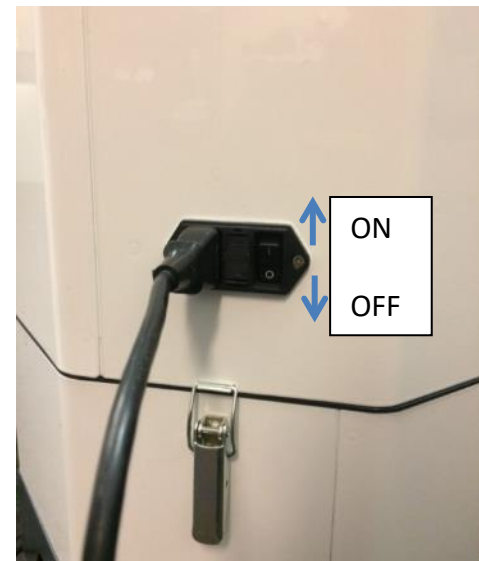


Figure 2-6

On the keypad, press the (+) button to cause the fan to start and the unit will begin pulling air through and filtering it.

See Chapter 3, Using the Keypad, for instruction on using the keypad to control the unit, including activating the Ionizer and setting the unit up for wifi communication.

See Chapter 4, Using the FILTR app, for instruction on connecting the unit to the FILTR app and using the app to control the unit.

End Of Chapter

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3 Using the Keypad

The Revolution unit comes with a physical interface consisting of six LEDs and two buttons.

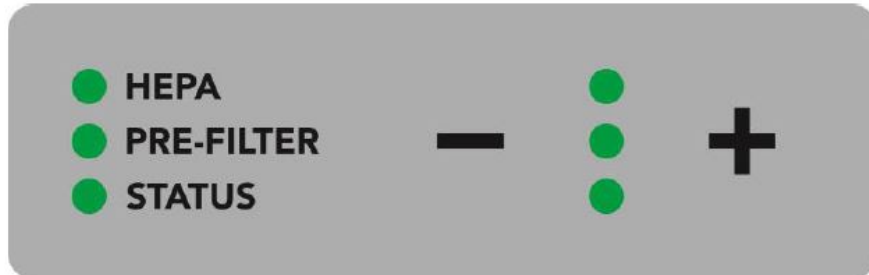


Figure 3-1

With the Revolution unit plugged in and turned on, the Keypad can be used for a variety of functions, including:

- Controlling the fan speed
- Turning the ionizer on and off
- Indicating filter status based on pre-determined lifespans and resetting the filter life timers
- Setting the unit into AP mode for connecting wireless devices

When the unit is connected to the FILTR app for wireless control, the keypad will be overridden by the commands from the app. This allows the unit to be placed in harder-to-reach areas without the user needing physical access to the unit to control it.

Controlling the Fan Speed

The + and – buttons on the interface allows the user to increase and decrease the speed of the units internal blower, thereby increasing the airflow through the Revolution unit.

Four speeds are available using this interface: Off, Low, Medium, and High. Each momentary button press increments or decrements the speed by one step.

If the Ionizer is turned off, the LEDs will illuminate as shown in Figure 3-2.

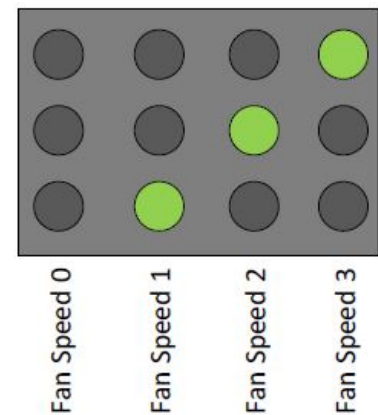


Figure 3-2

Turning the Ionizer On and Off

The Ionizers operation can be controlled from the keypad.

Press both the (+) and (-) buttons on the keypad and hold them down. Any illuminated flow LEDs will go dark, then after three seconds the bottom flow LED will illuminate. Release the buttons then to toggle the Ionizer on/off.

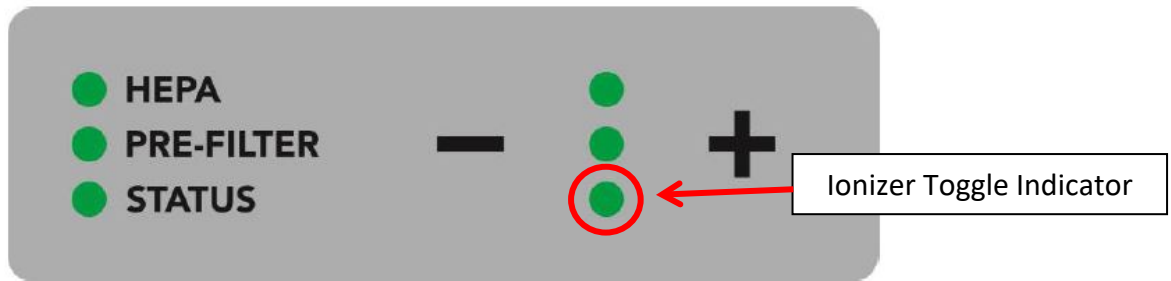


Figure 3-3

With the Ionizer activated, the flow LEDs will display as shown in Figure 3-4.

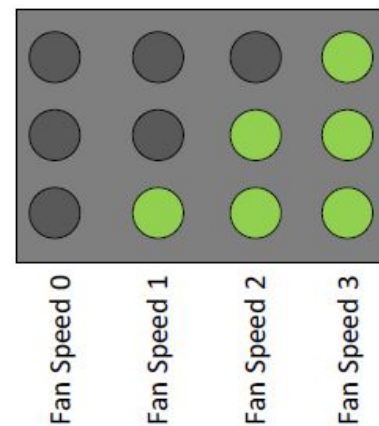


Figure 3-4

To turn the Ionizer off, press both the (+) and (-) buttons for three seconds then release them.

Filter Indications

The first two LEDs on the left side of the keypad show the status of the standard HEPA filter and the Pre-Filter/Carbon Filter. During normal operation these two LEDs should be off.



Figure 3-5

HEPA Filter

The HEPA filter status LED will light after a 1-year period of use has elapsed, to indicate that the filter life has expired. The user should contact Lighthouse for a replacement.

Once the filter has been replaced, press and hold the (-) button for three seconds. The HEPA Filter LED will turn off and the timer will be reset to zero.

Pre-Filter

The Pre-Filter status LED will light after a 4-month period of use has elapsed. This does not indicate that the filter needs to be replaced, as the pre-filter is washable and re-usable. The 4-month period is a default time period after which it is suggested the filter be cleaned, dried, and placed back into the unit.

Once the filter has been replaced, press and hold the (+) button for three seconds. The Pre-Filter LED will turn off and the timer will be reset to zero.

Carbon Filter

The Pre-Filter LED also doubles as the replacement indicator for the Carbon Filter. This filter also has a recommended 4-month lifespan (measured by time of use), and should be replaced when the unit is opened to perform maintenance on the Pre-Filter.

WiFi Access Point Provision

The keypad must be used to initially set the unit into connection mode so that the Wifi can be configured, enabling the user to communicate with the unit via the FILTR app.

The Status LED on the keypad displays the current state of the wireless connection, while the middle Fan Speed LED doubles as the Access Point Provisioning mode indicator.

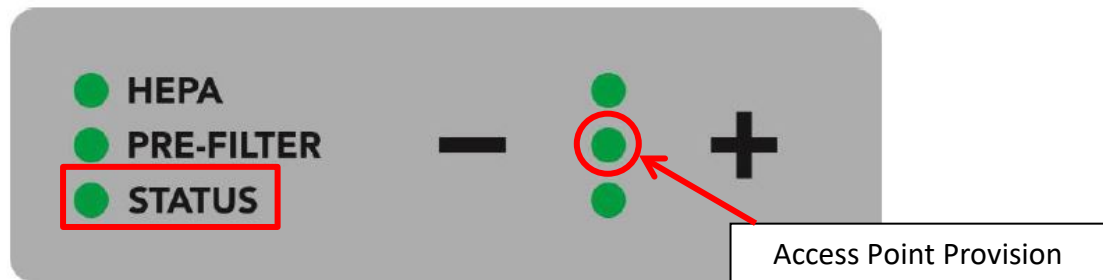


Figure 3-6

Status LED:

LED Off: The WiFi router is not connected to an access point

LED blinking at 1Hz (once per second): Unit in Access Point Provisioning mode

LED blinking at 4Hz (4 times per second): Unit connected to Access Point

LED On: Unit connected to End Point (i.e. cloud server)

Changing WiFi Status

The unit can be connected to an Access Point and set up to communicate with the FILTR app.

To initially set up the Revolution unit to connect to an Access Point follow these steps:

1. Ensure that the Revolution unit is not already connected to an access point (WiFi Status LED will be Off).
2. Hold down both the (+) and (-) buttons until only the center Fan Speed LED illuminates (will take 5 seconds) then release the buttons.
3. This will put the unit into Access Point Provisioning mode, and the Status LED will begin blinking at a rate of 1Hz (once per second).

4. Open the Wireless Network settings on your phone or laptop and search for access points. The Revolution unit will come up listed as FILTR-XX:XX:XX. Connect to the access point that corresponds to your Revolution unit's ID.

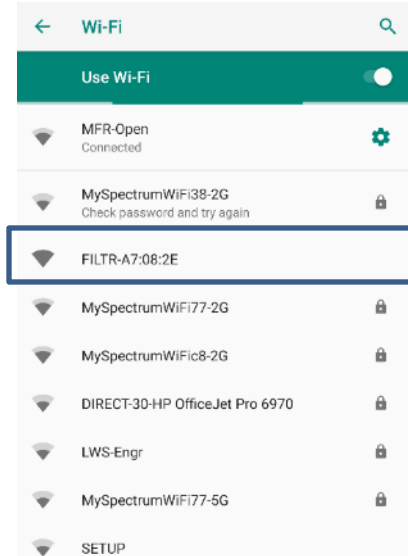


Figure 3-7

5. Open your phone or computers web browser and enter filtrconnect.com in the address bar.
6. Enter the SSID of your Wifi router in the "Network Name" field, or click "Refresh" under Detect Device and select the Access Point to which you want the unit to connect.

NOTE: Revolution devices can only connect to 2.4GHz, 802.11 b/g/n access points.

7. Enter the Wifi password in the "Password" field.
8. Leave the "Device Name" field blank.
9. Click "Connect".
10. At this point, the unit will disconnect from the phone or laptop and initiate its own connection with the selected Wifi router. The browser may display a disconnection page, this is normal.

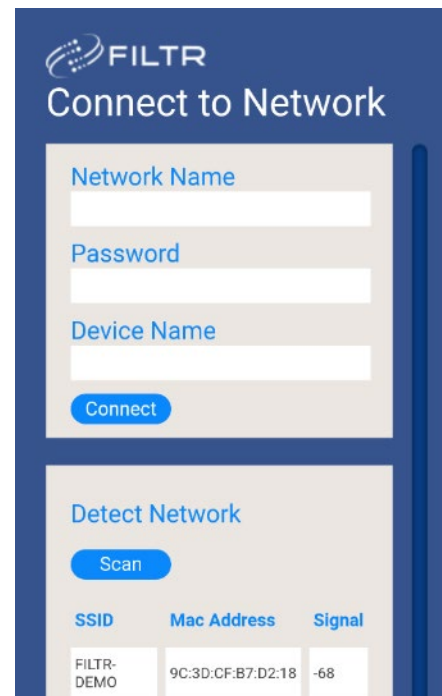


Figure 3-8

11. The Wifi Status LED will turn a solid green when the connection is complete, indicating the connection to your Wifi router and the cloud server.
12. Open the FILTR App to register your device. See Chapter 4 for information about using the FILTR app.

End Of Chapter

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4 Using The FILTR App

One of the strengths of the FILTR Revolution is the control capability via the FILTR app. Designed to operate on Android (OS 5.1 and above) and Apple (iPhone 6 or higher) smartphone operating systems, the FILTR app delivers unit control and unit information to the users smartphone. A data connection must be present for operational control via the FILTR app.

The app can be found in the Google Play store as *FILTR* and in the Apple App Store as *FILTR AIR*.

See the “Wifi Access Point Provision” section of Chapter 3 to set up the Revolution unit for communication with a smartphone running the FILTR app.

Upon download of the FILTR app, the user will need to register themselves and log in. After that, Revolution units can be added to the Home screen.

User Registration

Upon launching the app for the first time, a user will have to be registered. Press the “Register New User” button to get started.

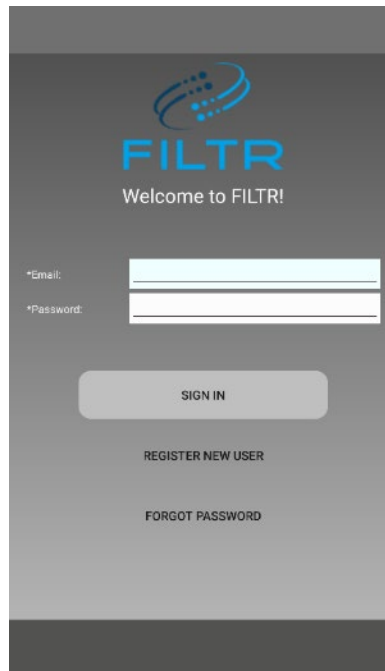


Figure 4-1

In the Register page, fill in the requested information. Data fields that are required are marked with an asterisk.

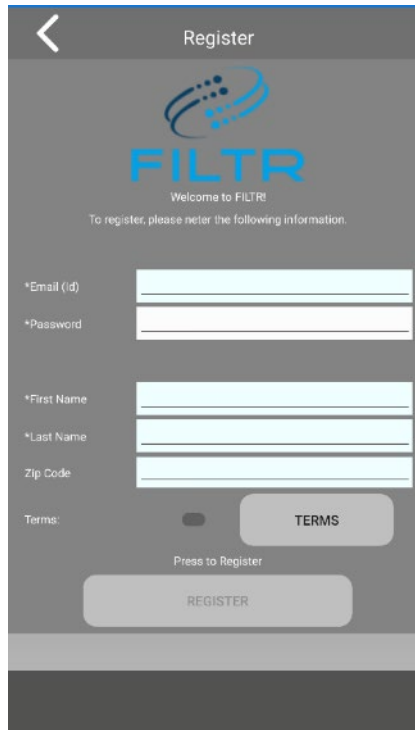


Figure 4-2

Once all the fields are filled out, press the Terms button to bring up the Terms of Agreement. Once the Terms are reviewed, press the Terms slider, then the Register button will activate at the bottom of the Register page.

Once Registration is complete, the Home screen will appear with a “dummy” unit displayed as a Sample Device. When subsequently logging in to the app, registered users can simply enter their username and password and go straight to the Home screen.

Listed devices are unique to each users login. Once a Revolution device is added to a user’s account, it will appear on any device that user logs in to.

NOTE: When a user becomes an Admin for a unit, that users login will be required to remove/change the Admin user. It is recommended to keep this login information on record.

Home Screen Overview

The Home screen is where all connected devices will be listed alpha-numerically by Device Name. When the app is opened for the first time, a Sample Device with “dummy” values will be displayed. See the “Adding a Device” section to connect to your Revolution unit.

For each listed Revolution unit, you can view the Device Name, change the fan speed, toggle the Ionizer on or off, access the Info and Settings (swipe left for this menu), select the device for display on the Graph and Compare screens, and view the Temperature, Relative Humidity, PM, and VOC readings.

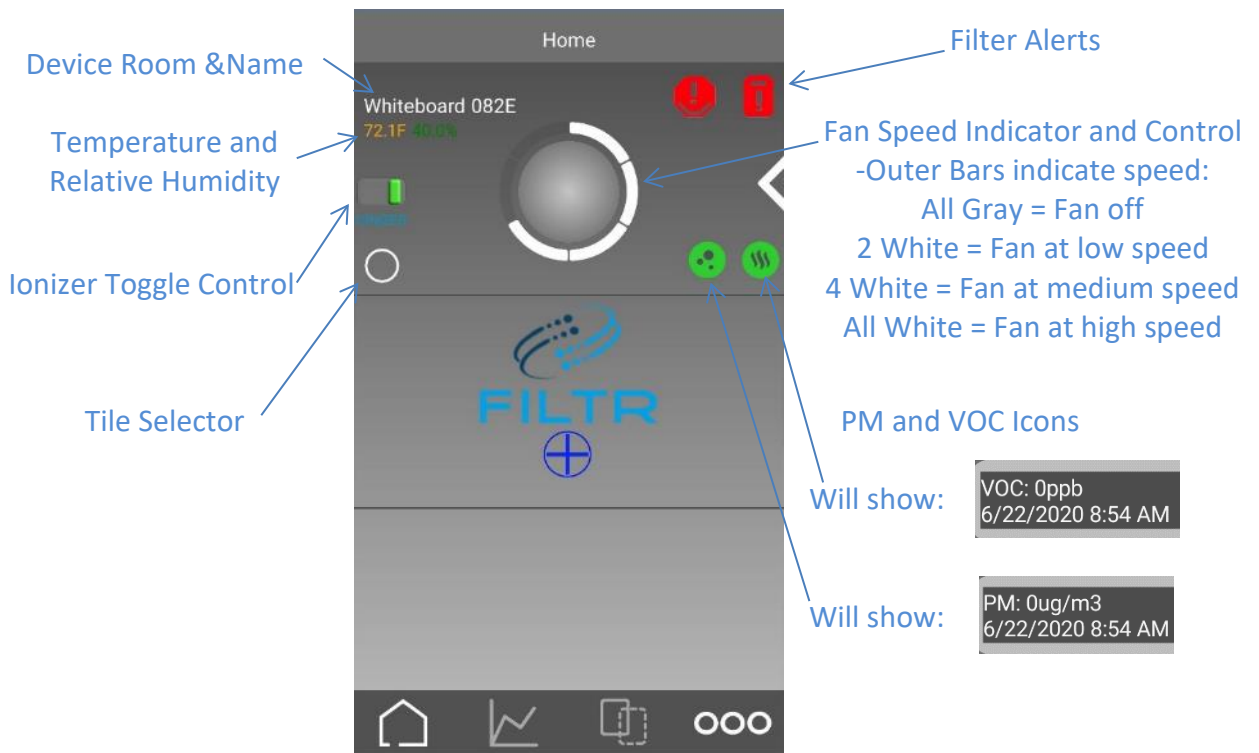


Figure 4-3

The toolbar at the bottom of the Home screen provides access to the Graphs and Compare screens, as well as the additional app management options.

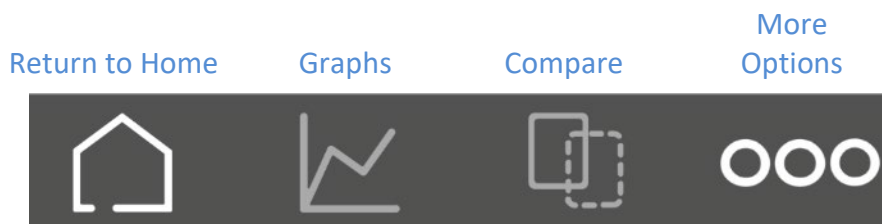




Figure 4-4

More in-depth descriptions for these indications and functionalities are talked about later in this chapter.

Adding A Device

At this point, the Revolution unit needs to be connected to a Wifi Access Point. See the “WiFi Access Point Provision” section of Chapter 3 for setting up the Revolution unit for communication with the FILTR app.

There are two ways to add a new Revolution device to the FILTR app: Using the  button on the Home screen or using the Add & Share FILTRs screen.

Press the  button from the Home screen to bring up the Add FILTR screen, then press the “SCAN QR CODE” button. If the FILTR app does not yet have permission to use the camera, the PERMISSIONS button will be shown to assist in gaining that permission.

Alternatively, select the More Options icon from the bottom right of the screen. Select Add & Share FILTRs from the menu that pops up, then select the “SCAN QR CODE” button that is available. If the FILTR app does not yet have permission to use the camera, the PERMISSIONS button will be shown to assist in gaining that permission.

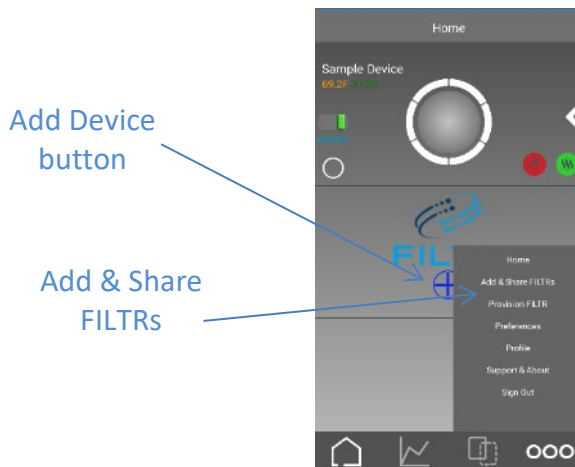


Figure 4-5

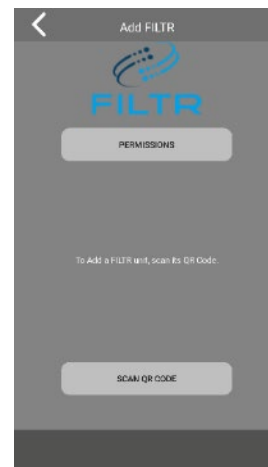


Figure 4-6

The smartphone will go into camera mode and be ready to scan the QR code located on the Revolutions Serial Label. This QR code is unique to the Wifi board contained inside the unit. Once the unit is paired to a particular user this way, that user becomes the Admin for the Revolution device, and no other user can scan and pair the device to their login. The Admin can share the device (see “More Options: Add & Share Devices” section later in this chapter), but will have to delete the device before a new Admin can exist.

NOTE: It is recommended to keep the Admins login on record to facilitate Admin record changes, sharing, and access.

The QR code is located on the Serial Label, which is located above the power connection port on the Revolution unit.



Figure 4-7

Multiple QR codes can be scanned before returning to the Main Screen. Once all QR codes are scanned, press the back arrow to return to the Main Screen and see the connected unit(s) displayed.



Figure 4-8

With the Revolution unit tile on the Home Screen, the user now has the ability to manage the functionality of the unit and view all measured data from the Sensor Pack.

Controlling Fan Speed

As long as the Revolution is turned on (must be done on the unit itself) and connected to Wifi, the app is able to control the speed of the fan. There are four speeds that can be set: Off, Low, Medium, and High.

The circle in the middle of the unit tile is both the indicator and the control button for the fan speed. Press the button to increase the fan speed; when off all the bars will be dark. Low is two bars lit, medium is four, and high speed is all six bars lit.



Figure 4-9

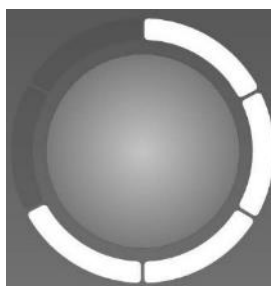


Figure 4-10

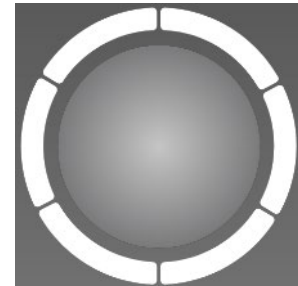


Figure 4-11

At high speed, press the button once more to turn the fan off. The indicator lights on the Revolution will correspond to the flow set on the app.


Controlling the Ionizer

If the Ionizer is installed, its status can be viewed from the Home screen. The Ionizer toggle button on the left side of the unit tile will be gray if the Ionizer is off, and green if it is on. Changing its status is as simple as pressing the toggle button.



The indicator lights on the Revolution unit will indicate when the ionizer is on.

The Admin user can choose to not display the Ionizer toggle on the Main Screen:

Press on the More Options button  in the lower right corner of the Main Screen. Select Preferences from the menu, and the Preferences screen will display. The last option on this screen will be a toggle for “Ionizer Component”. With this toggle to the left, the Ionizer toggle will not display on the Main Screen.

Viewing Sensor Information

Due to the installed Sensor Pack, the FILTR app is able to display the Temperature (in degrees Fahrenheit or Celsius, see the “More Options: Preferences” section), Relative Humidity (in %), PM (Particulate Matter 2.5um) levels, and VOC (Volatile Organic Compounds) levels at the Revolutions location.

If the Sensor Pack is not installed, the Temperature and RH indicators will not be shown, and the PM and VOC indicators will be grayed out.

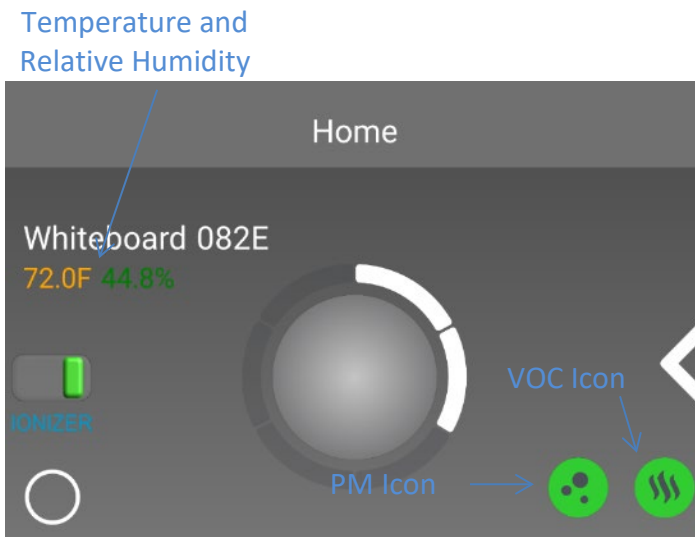


Figure 4-12

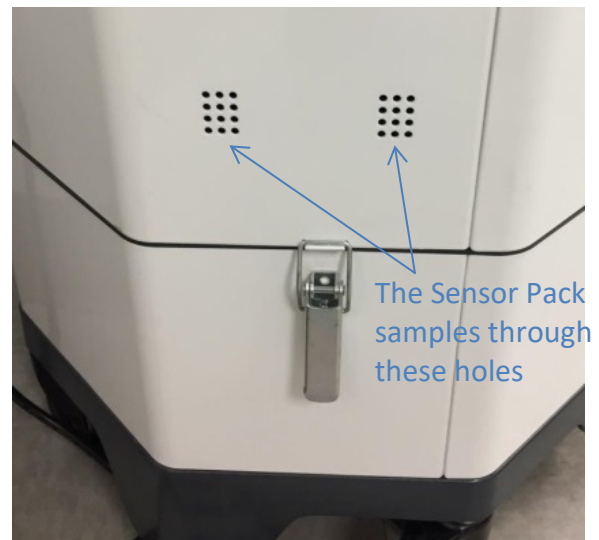


Figure 4-13

Whiteboard 082E

Temperature: 73.6F 38.2%

This position will list the air temperature in degrees Fahrenheit or Celsius, with an accuracy of +/- .9 degrees Fahrenheit (+/- 0.5 degrees Celsius). Depending on the temperature range set in the Alarm Settings (see “Alarm Settings” section) the color of the text may be green, indicating it is well within the range set; orange, indicating that it is within 10 degrees of the alarm limits; or red, indicating that the temperature has exceeded either the lower or upper alarm limit.

Whiteboard 082E

Relative Humidity 73.6F 38.2%

The Relative Humidity (RH) will be shown at this location, with an accuracy of +/- 3%. As with the Temperature, the color of the text will indicate the current RH’s value respective to the limits set in the Alarm Settings.

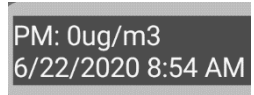


Particulate Matter

The sensor in the Sensor Pack measures the Particulate Matter (PM) in the air less than or equal to 2.5 microns in diameter. This indicator can be touched to briefly bring up a small window that shows the most recent PM reading, which is updated every 10 minutes. This icon can be green, orange, or red, to indicate the measurements value respective to the range set in the Alarm Settings screen.

This sensor has a range of 0 to 1,000ug/m³.

The window that briefly appears when the icon is pressed shows the most recent measured value from the PM sensor:

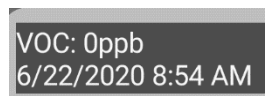


Volatile Organic Compounds

The Volatile Organic Compound (VOC) sensor give a measurement of the VOCs contained in the local environment, in parts per billion. This indicator can be touched to briefly bring up a small window that shows the most recent VOC reading, which is updated every 10 minutes. As with the other indicators, this icon can be green, orange, or red to indicate the measurements value respective to the range set in the Alarm Settings screen.

This sensor has an output range of 0 to 1,187 ppb.

The window that briefly appears when the icon is pressed shows the most recent measured value from the VOC sensor:



Viewing Device Info

In the Home Screen, swipe left or press the arrow in any Revolution unit tile to display a side menu with three options.

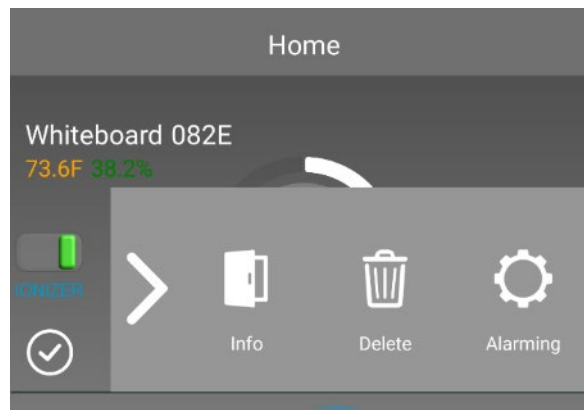


Figure 4-14

Press the Info icon to bring up the FILTR Info screen.

 A screenshot of the 'FILTR Info' screen for the 'Whiteboard 082E' unit. The screen displays a list of device specifications and sensor data in a two-column format.

FILTR Info	
Whiteboard 082E	
Model:	Air Purifier
Serial #:	190516001
FILTR Id:	F8F005A7082E
WiFi FirmWare:	1.02.001
Cont Firmware:	1.01.009
IP Address:	192.168.10.114
RH:	38.2%
Temp:	73.6F
PM:	0ug/m3
VOC:	0ppb
Fan Level:	Low
HEPA Filter:	0%
Carbon Filter:	0%

Figure 4-15

This screen will display various information, including the Revolution Serial Number, Device MAC ID, firmware versions, IP address, sensor information, fan speed, and filter lifetime consumed.

The filter percentages shown count up from 0; the closer to 100% the value is the more of the filter lifetime has been consumed. The value will continue to increase above 100% if the timer is not reset.

Alarm Settings

In the Home Screen, swipe left or click on the arrow in any Revolution unit tile to display a side menu with three options.

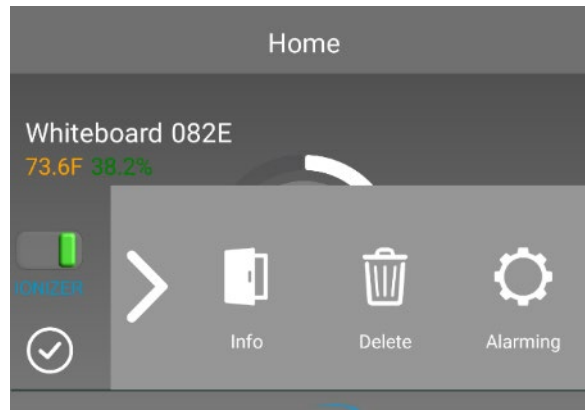


Figure 4-16

Press on the Alarming icon to bring up the Alarm Settings screen.

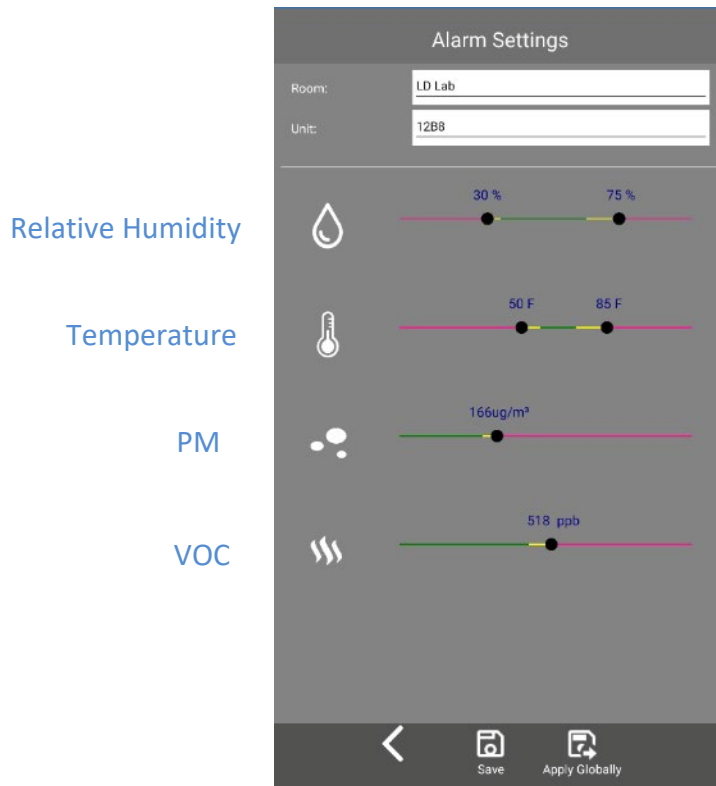


Figure 4-17

In this screen the user can change the Room name and Unit name, and modify the Alarm thresholds for the Relative Humidity, Temperature, PM, and VOC sensors.

Change Room and Unit Name

To change the Room or Unit name, press on the box displaying the current Room/Unit name. This will bring up a soft keyboard which will allow you to customize the Room to which the Revolution unit is associated, and the Name of the unit.

The Room and Unit names can be up to 20 characters in length, though it is recommended to keep it under 10 for proper displaying on smaller devices.

Email Alerts

With all of the alarm thresholds, when the limits are exceeded the app will send an email notification to the user about the alarm, indicating the Unit, Room, and type of reading that exceeded the limit. The email will look like the following:

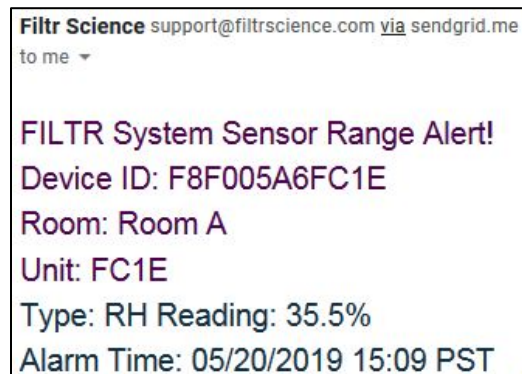
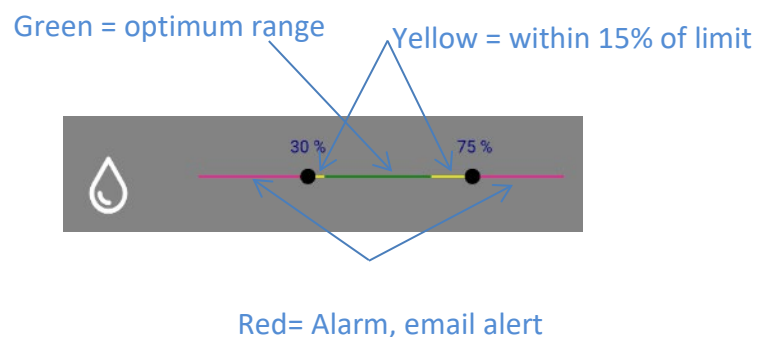


Figure 4-18

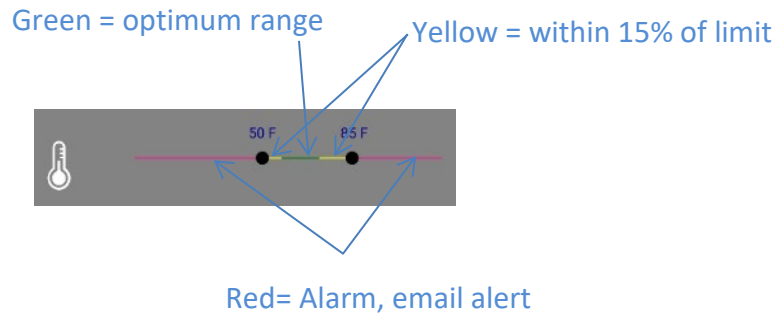
Changing Alarm Thresholds

The four slider bars on this screen have threshold points which are all manipulable. These allow the user to set custom ranges for the RH, Temperature, PM2.5, and VOC sensors.

The Relative Humidity slider bar is used to set an acceptable range for the RH. Areas beyond the lower and upper points generate alerts for the user.

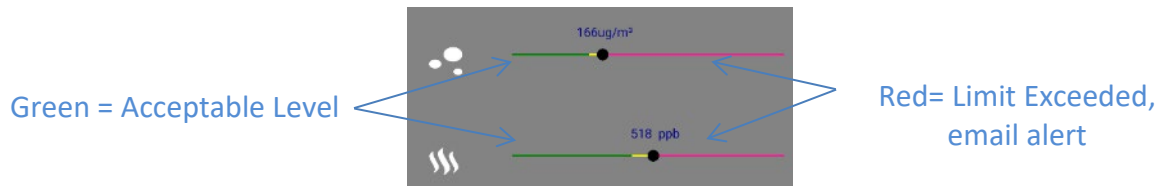


The Temperature slider bar points indicate those temperatures above/below which the FILTR app will trigger an alert for the unit.



Apple OS users will not see the Yellow section, though the range is stored the same.

The PM and VOC slider bars give the Admin the ability to set an upper alarm limit for the volume of contaminants measured, generating an email alert when those values are exceeded.



Saving Settings

At the bottom of the Alarm Settings page are two options for saving any information changed in the Alarm Settings screen.



The left-pointing arrow will return the user to the Main Screen without saving any changes.

“Save” is used to save changed values for the current Revolution unit only. This is the button that must be pressed in order to save a Room or Unit name change.

“Apply Globally” saves Alarm Threshold settings only, but it will apply those settings to all Revolution units that the user is Admin for and that have the same Room name. This enables identical settings to be applied to multiple units at once.

After all settings are changed and saved, press the left-facing arrow button to return to the Main Screen.

Deleting A Device

In the Home Screen, swipe left or click the arrow in any Revolution unit tile to display a side menu with three options.

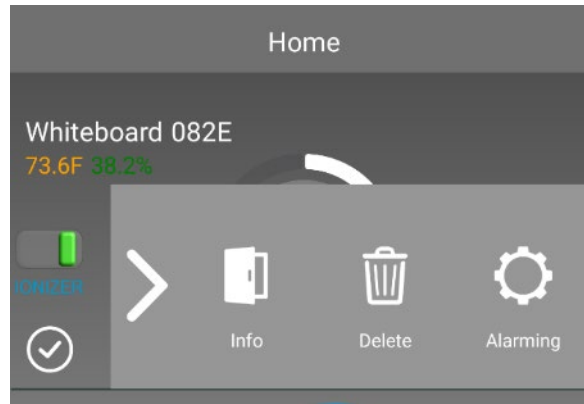
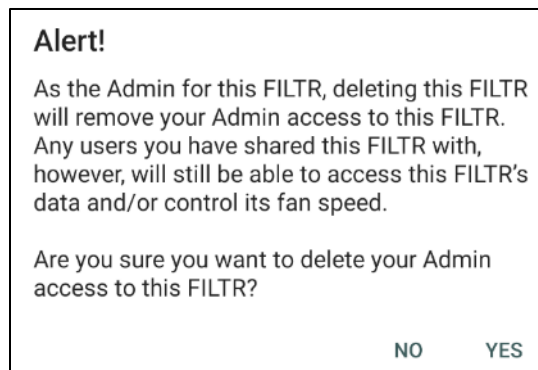


Figure 4-19

To remove a Revolution unit from control of the current user, press on the Delete icon. An Alert will pop up similar to the one shown in Figure 5-21, informing the user of their action and acting as a double-check prior to deletion.



NOTE: The Admin login is required for changing Admin users. It is recommended to keep the current Admin login information on record.

Figure 4-20

Pressing OK will remove the device from the current users list of connected devices and allow another user to scan the QR code and add the Revolution unit to their device list. The new user will become the Admin for the unit.

If the Revolution device being deleted is one that was Shared from the Admin user, the Alert pop-up will be slightly different.



Figure 4-21

If all devices are deleted, the Home screen will display the Sample Device.

Graph View

The FILTR app has the ability to display collected Sensor Pack data in graph form via the Graph View screen.

First, locate the Tile Selector icon on the Revolution unit tile that graphed data is desired for. This icon is in the lower right corner of the tile.

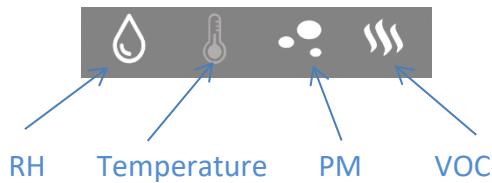


Tap on the icon and it will change to have a checkmark inside of it. This indicates that the data from the tile will be used on the Graph screen.



Two units can be displayed on the graph simultaneously. (By default, the first device listed will already be checked. The user can change this at any time).

Press the Graph Screen icon at the bottom of the Home Screen. This will open up the Graphs screen as shown below.



The icon bar at the top allows the user to select the type of collected data to graph.

Users can zoom in and out on the graph using normal touchscreen techniques.

The x and y axis on the graph will dynamically scale according to the data being displayed.

The Range bar at the bottom allows the user to select the time range of historical data to be displayed on the graph.

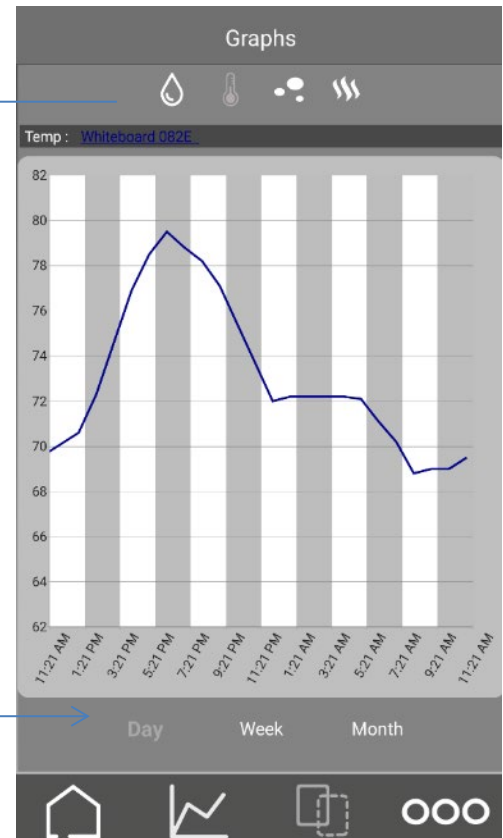


Figure 4-22

The Graph Screen allows the user to graph data from either the Relative Humidity, Temperature, PM, or VOC sensor, and to vary the amount of rolling historical data shown from one day, one week, or one month, within the limit of historical data available.

Any units selected for graphing will show in the bar near the top, and have their graph lines color coded per the color of the unit descriptor shown.

Compare View

The FILTR app has the ability to compare data received from different Revolution units. For this function, more than one unit must be listed in the app., and each selected unit must have the sensor pack installed to display relevant data.

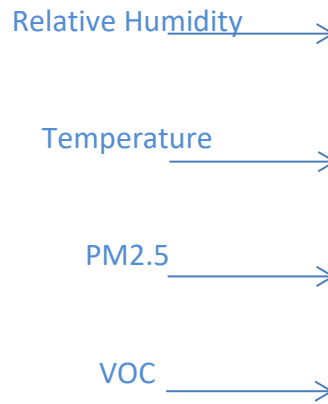
To select a unit for comparison, press the white Tile Select circle in the bottom left of the desired Revolution’s tile. It will change to contain a check mark.



Select a second Revolution tile for comparison with the first, and the Compare icon at the bottom of the Main screen will become selectable.

Press the Compare Units icon at the bottom of the Main Screen to bring up the Compare screen.

As shown below, this screen will list the last measurements from the Sensor Pack for each of the units selected, along with a colored dot indicating the status of the measurement relative to the set Alarm Thresholds. Any unit that is turned off, or has no Sensor Pack installed, will have the indicator dots grayed out.



Compare			
Status	Whiteboard 082E	Room A 0686	Measure
Water drop icon	39.3	33.0	%
Thermometer icon	72.8	71.7	F
PM2.5 icon	1	11	ug/m3
VOC icon	113	0	ppb

Indicator Dots

- Green = Measurement within threshold
- Orange = Measurement close to limit
- Red = Measurement exceeds threshold

Figure 4-23

As with the regular data indicators, the values displayed in the Compare screen will be updated every 10 minutes.

Main Screen Alerts

The FILTR app is designed to warn the user when the replaceable filters are getting close to their end-of-life, and when unit components are malfunctioning.

General Service Alert

When a component within the Revolution is malfunctioning, or has stopped working for some reason, the FILTR app will alert the user with a wrench icon in the upper right corner of the affected Revolution units' tile.

If this icon appears, contact the Lighthouse Service department at (800) 945-5905.

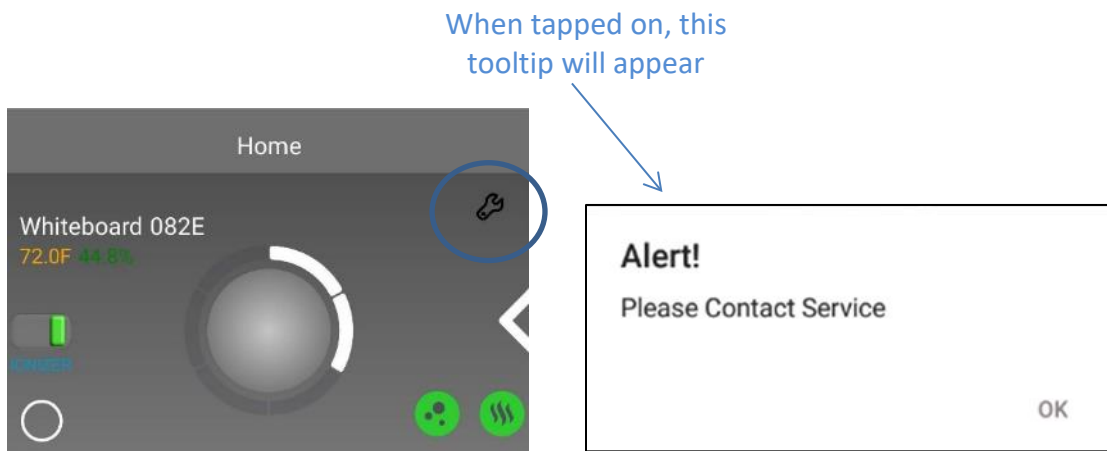


Figure 4-24

Figure 4-25

Tapping on the icon will give the tooltip shown above.

When the app alerts the user with this wrench icon, it will also send an email to the user indicating that service is required for the particular unit. The email will look similar to the one shown below.

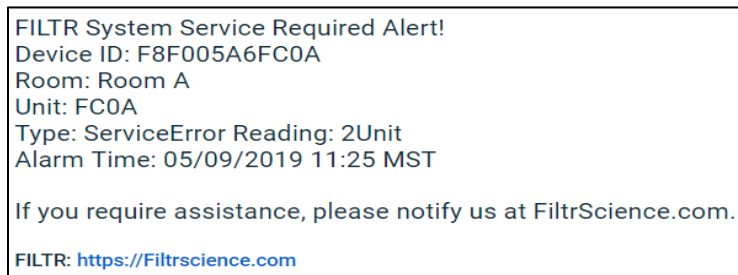


Figure 4-26

Filter Alerts

The Main Screen will also show lifetime warnings and alerts for the HEPA filter and the Pre-Filter/Carbon Filter.

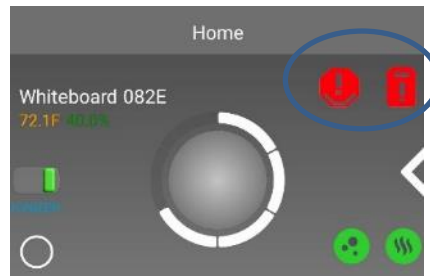




Figure 4-27

This icon  is used for the HEPA filter. It will first show up when the HEPA filter reaches 90% of its total lifetime used, and will be an orange color. It will appear again when the filter reaches 98% of its lifetime used, and will be red in color.

This icon  is used for the Pre-Filter/Carbon Filter. It will first show up when the filters are at 80% of their total lifetime used, and will be an orange color. It will appear again when the filters are at 90% of their total lifetime used, and will be red in color.

Tapping on the icons will bring up a tooltip similar to those shown below.



Figure 4-28

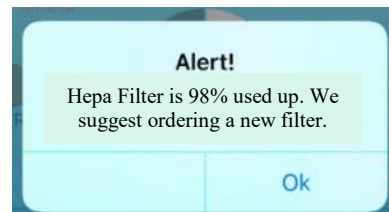


Figure 4-29


The percentage of use will continue increasing until the user resets the timer on the unit. See Chapter 6 for filter replacement and timer reset procedures.

When the FILTR app alerts the user with the above warnings, it will also send an email to the user indicating the nature of the alert for the particular unit. The email will look similar to the one shown below.

```
FILTR System Change Carb Filter Alert!
Device ID: F8F005A6FC03
Room: Room A1
Unit: FC03
Type: CarbFilter Reading: 86%
Alarm Time: 05/17/2019 02:25 PST
If you require assistance, please notify us at FiltrScience.com.
FILTR: https://Filtrscience.com
```

Figure 4-30

More Options Overview

Clicking the  button at the bottom right of the Home screen will bring up the More Options menu.

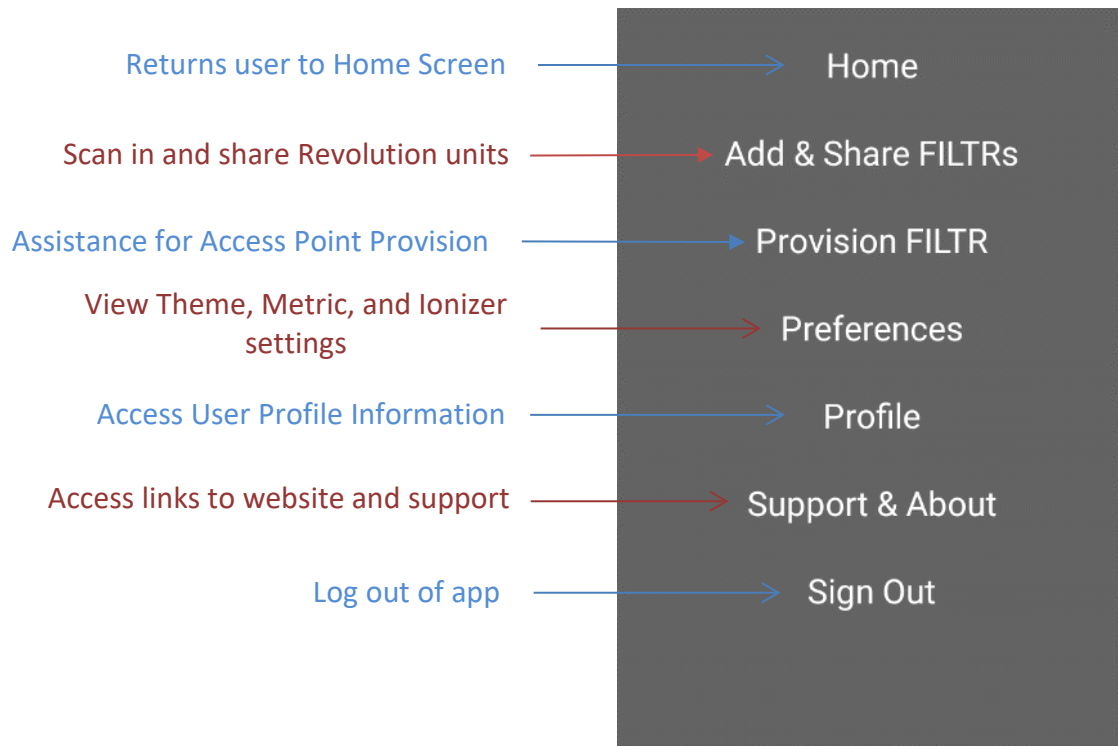


Figure 4-31

Some of these options are self-explanatory:

- The Home button returns you to the Home screen
- Add & Share FILTRs is the access point for adding new units and sharing current ones
- Provision FILTR aids in connecting a new Revolution unit to wifi
- Preferences contains color theme options and the Metric and Ionizer toggles
- Profile contains User profile information
- Support & About contains links to the filtrscience.com website and tech support
- Sign out allows the user to sign out of the FILTR app

See the earlier section **“Adding A Device”** for information on the Add section of the “Add & Share FILTRs” option.

Other options bear more description and are covered in the following sections.

More Options: Add & Share FILTRs

Each unit can only be paired to one user via the steps found earlier in the “**Adding A Device**” section. However, the FILTR app also allows units to be shared to other users, designating the original user as Admin and others as Users.

Press on the Add & Share FILTRs button in the More Options menu to bring up the Add & Share FILTRs screen, then press the SHARE FILTERS button to bring up the Share FILTRs screen.

To share a device, first slide the selector bar for that unit to the right (enabled by default).

Enter the email address of the other registered user in the provided space near the bottom.

Press the SHARE FILTERS button at the bottom of the screen and the app will provide a pop-up message indicating the task was successful.

The other registered user will receive an email similar to the one below notifying them of the shared device. The next time that the other user logs in to the app, the shared device will appear in their list of Revolution units.

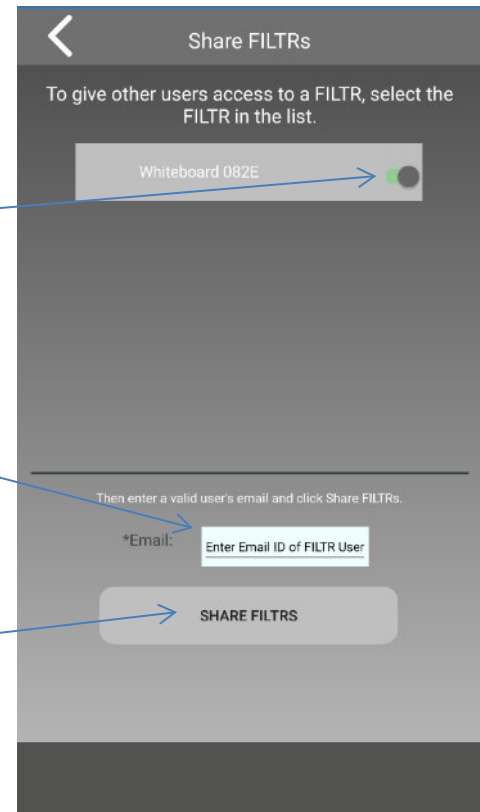


Figure 4-32



Figure 4-33

Secondary Users will be able to change the Revolution units fan speed, toggle the Ionizer on and off, view Graphs, and Compare the unit with others, but will be unable to change any Alarm Thresholds, change the Unit or Room name, or Share the unit to any other users.

More Options: Provision FILTR

The Provision FILTR screen provides for easy connection of the Revolution unit to a wifi network and then to the FILTR app, as an alternative to some of the steps described in the “Wifi Access Point Provision” section of Chapter 3.

Access the Provision FILTR screen by selecting it from the More Options pop-up menu. The screen contains a breakdown of the steps to take to facilitate connecting a new Revolution unit to a wifi signal.

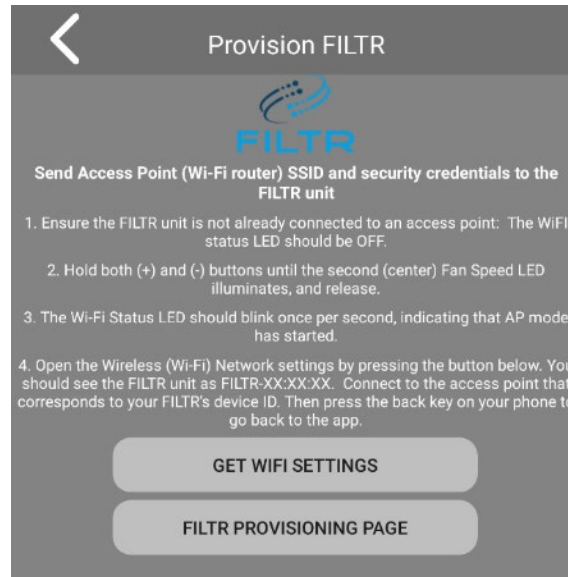


Figure 4-34

Follow the steps on the screen to connect the Revolution to a wifi signal:

- Put the unit into Access Provision mode (hold the + and – buttons down until the middle fan speed LED lights)
- Press the “GET WIFI SETTINGS” button in the FILTR app to open the Wireless Network settings on your device
- Select the Revolution unit listed in the available connections
- Return to the app and press the “FILTR PROVISIONING PAGE” button to open a web browser to the filtrconnect.com website
- Enter the information for the desired network connection and click Connect

Once the Revolution unit is connected to a wifi signal, go to the “Add & Share FILTRs” screen and click on the SCAN QR CODE button. Scan the QR code located above the power connection port on the unit to add the Revolution to your device.

More Options: Preferences

The Preferences screen accessible from the More Options menu gives the user a number of color theme choices, along with the ability to change the Temperature measurement to Metric and control the display of the Ionizer toggle on the Main screen.

Press on Preferences from the More Options menu to bring up the Preferences screen.

There are four color themes that the user can choose from by simply activating the slider bar. The one slid to the right is the current active theme.

The Metric slider controls the unit of measurement for displayed Temperature readings. With the slider to the left units will display in Fahrenheit, while moving it to the right will change them to Celsius.

The Ionizer Component slider controls display of the Ionizer toggle switch on the Main screen.

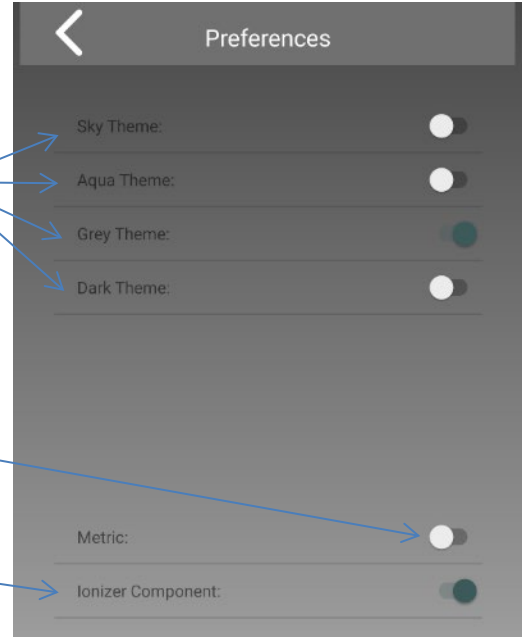


Figure 4-35

Pressing the back arrow button from the Preferences screen will return the user to the Main screen and display the Alert shown below.

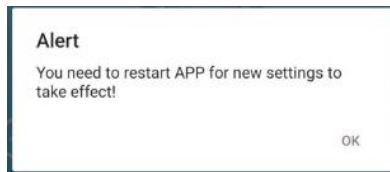


Figure 4-36

As indicated, changes made in the Preferences screen will not take effect until the FILTR app has been restarted.

More Options: Profile

Pressing the Profile button in the More Options menu will bring up the Profile screen, allowing the user to view and make changes to their user profile.

The Profile screen allows the user to change the information that was entered when registering.

Fields that are required to have an entry are marked with asterisks, while the others are optional.

After changes are made, review the Terms by pressing on the TERMS OF USE button.

Press the “Save” button when done, and the app will save the new information and return the user to the Main screen.

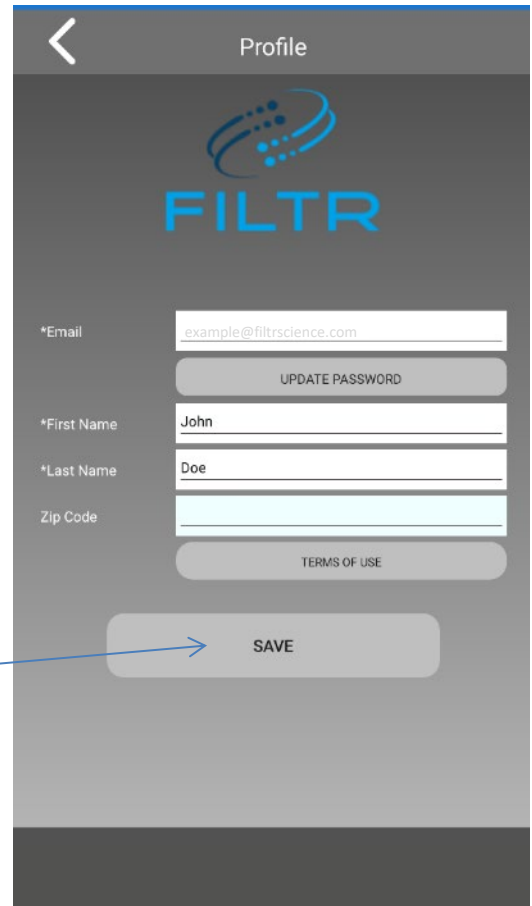


Figure 4-37

The email listed for the Profile will be the one that the system sends Information and Alert emails to.

End Of Chapter

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5 External Accessories

The Revolution is designed for more than just static placement on a horizontal surface. With the casters installed in the Pedestal (see Chapter 2) the unit can be easily mobile. Other external accessories are available that will allow the unit to be mounted to a standard wall, Structural Insulated Panels (SIPs), or even hung from overhead supports. The unit also ships with an adapter kit for connecting to 10" ducting, which allows the unit to intake/exhaust from physically separated locations, or even be entirely removed from the space that the Revolution is cleaning.

Overview of External Accessories

There are three external accessory kit options that exist for the Revolution unit to support the operational needs of the installation space:

- Vertical Wall Mount (Including SIPs)
- Horizontal Ceiling Mount
- 10" Ported Duct Adapter Kit

The Wall and Ceiling mounting options involve removal of the units Pedestal and installation of the mounting hardware.

The Duct Adapter Kit comes with four main pieces: Two Duct adapters and two hose clamps. The Duct Adapters can be installed on only one or on both ends of the unit. If the Duct Adapter is installed on the bottom of the unit, one of the mounting kits will also need to be installed in order to allow the ducting to access the bottom of the unit.

The wall mounting kit comes with four main pieces: Two brackets that anchor to the wall and two brackets that connect to the top and bottom covers of the unit and enable the Revolution to hang on the brackets installed on the wall. Associated hardware is also included.

The ceiling mounting kit comes with two brackets, one each for the top and bottom of the unit, that enable the unit to be hung from overhead supports using ropes or cabling. Hardware to connect the brackets to the unit is included. Overhead supports and ropes or cabling are not included.

Vertical Wall Mounting

The wall mounting hardware kit is designed to facilitate mounting the Revolution onto a wall that can support its weight. Hardware is included to support mounting on wooden and SIPs walls.



Figure 5-1

Ensure that the Wall Mounting kit received (shipped separately from the Revolution unit) contains the items shown above.

Eight wood screws are included for mounting the unit onto a wooden wall, and eight metal drilling screws are included for mounting the unit to a rigid metal wall such as that used in SIPs buildings.

Connect the Unit Brackets

The first step in installing the Wall Brackets is to determine which side of the Revolution unit will be towards the wall. It is suggested to keep both the side with the Keypad and the side with the Power Port away from the wall for viewing and access, respectively.

Once the side facing the wall is determined, place the Upper Unit Bracket on top of the Revolution with the mounting face towards the “wall side” of the unit. Secure the bracket to the unit using three of the Unit Bracket screws (see Figure 5-1 for proper screw).



Figure 5-2

Lay the Revolution unit on its side and remove the Pedestal from the bottom of the unit by removing the four screws holding it to the base.



Figure 5-3

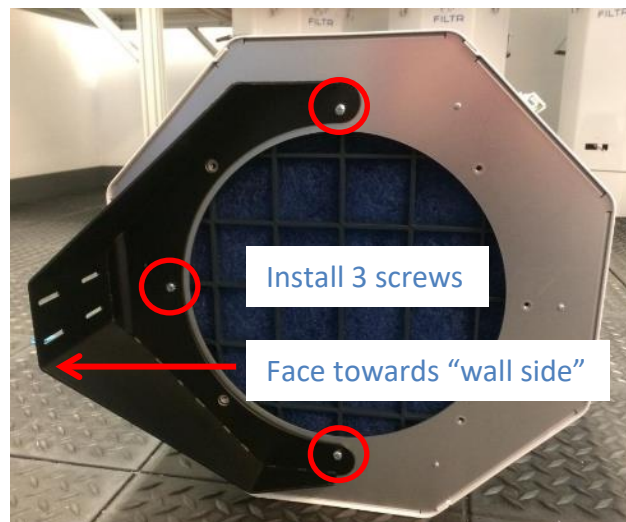
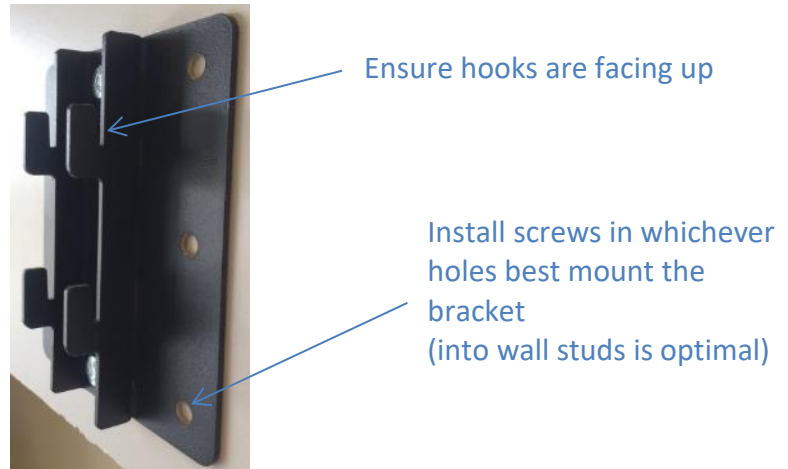


Figure 5-4

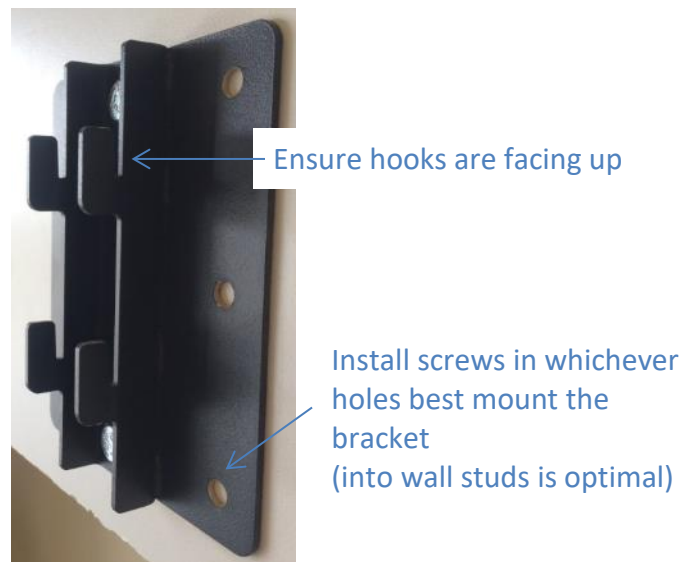
Using three of the Unit Bracket screws, install the Lower Unit Bracket onto the bottom of the unit, ensuring that the mounting face is towards the chosen “wall side” of the unit.

Install the Wall Brackets

Locate the position on the wall at which the Revolution will be located. Install one of the Wall Brackets at the height the bottom of the unit is desired to be. Wall Bracket screws are provided to secure the bracket to the wall; select the proper screws for the medium being mounted to (wood or metal). Four of each type are provided for each Wall Bracket.

**Figure 5-5**

Place the Revolution unit onto the installed Wall Bracket. Slide the other Wall Bracket into the Upper Unit Bracket and use the Wall Bracket to mark the wall at the location it is desired to be installed.

**Figure 5-6****Figure 5-7**

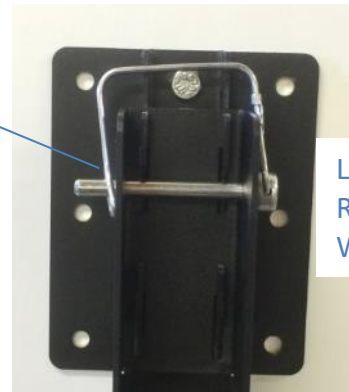
Remove the Revolution from the lower bracket, then install the upper Wall Bracket in the marked location, using the proper screws for the wall medium.

Hang the Revolution

With both Wall Brackets in place, the Revolution can be hung onto the brackets. Once the brackets seat together, install the Locking Pin into the Upper Wall Bracket and secure it in place with the Retainer.



Figure 5-8



Locking Pin with Retainer in Upper Wall Bracket

Figure 5-9

To remove the Revolution from the wall mounts, first remove the Locking Pin with Retainer from the Upper Bracket. The unit can then be lifted up then away from the Wall Brackets and set on the ground for filter maintenance or other activities.

Ceiling Mounting

An alternative to the wall mounting option is the ceiling mounting kit. This allows the Revolution to be hung from overhead supports, providing filtering in places that may not have available ground or wall space.

The Revolution Ceiling Mount kit does not come with overhead anchors, or ropes or cables for use in hanging the unit.

The Revolution Ceiling Mounting kit comes with the following parts:

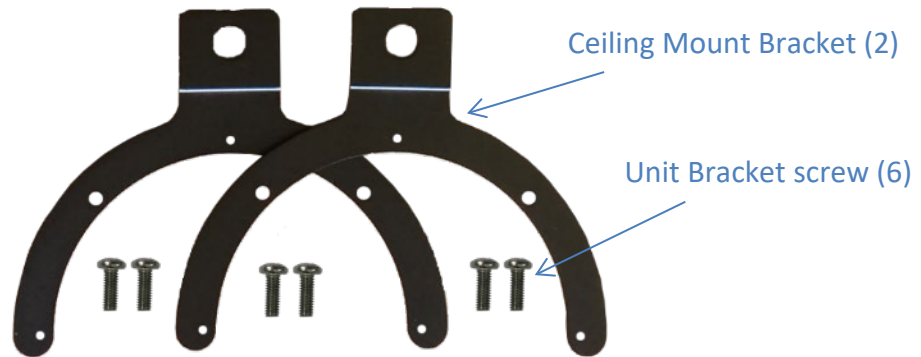


Figure 5-10

Install Upper Bracket

The first step in installing the Ceiling Mount Brackets is to determine which side of the Revolution unit will be towards the ceiling. It is suggested to keep both the side with the Keypad and the side with the Power Port accessible and visible from the ground.

Once the side facing the ceiling is determined, place one of the Ceiling Mount Brackets on top of the Revolution with the anchor point towards the “ceiling side” of the unit. Secure the bracket to the unit using three of the Unit Bracket screws.



Figure 5-11



Figure 5-12

Install Lower Bracket

Lay the Revolution unit on its side and remove the Pedestal from the bottom of the unit by removing the four screws holding it to the base.



Figure 5-13

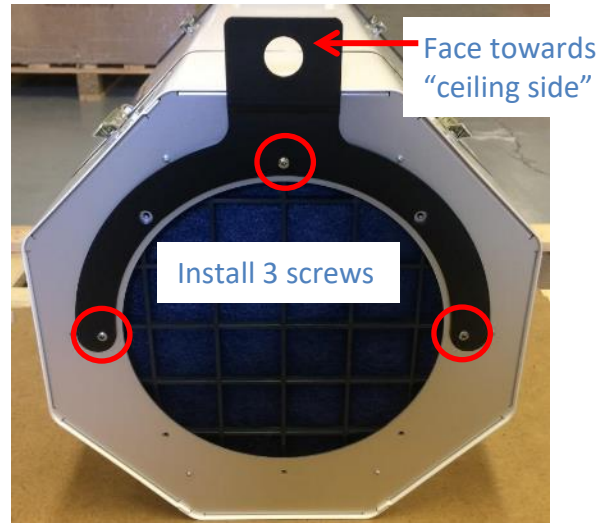


Figure 5-14

When installing the Ceiling Mount Bracket on the bottom of the Revolution it is critical to ensure that the “lip” on the bracket is facing the correct direction, so that the bracket does not cause damage to the unit body.

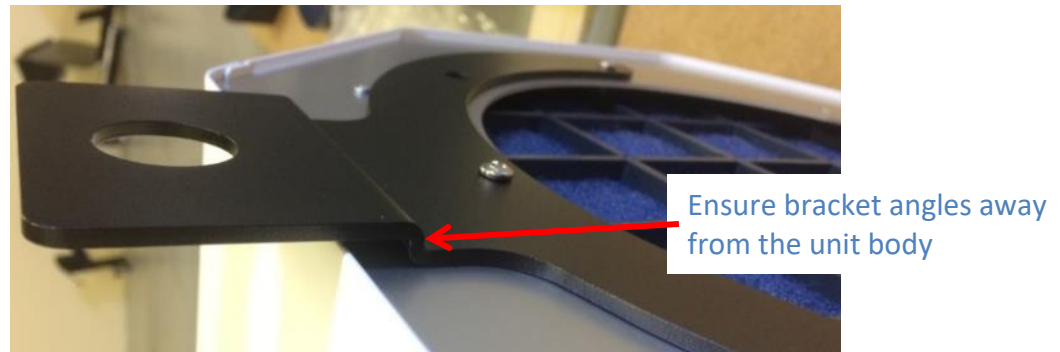


Figure 5-15

Duct Adapter Kit

The 10" Ported Duct Adapter Kit allows the connection of 10" ducting to either or both ends of the Revolution unit to enable pulling air from a remote location, exhausting filtered air to a remote location, or even installing the Revolution itself outside of the location the air is being filtered in.

The Duct Adapter Kit comes with the following parts:



Figure 5-16

The Upper Duct Adapter can be installed by itself. When the Lower Duct Adapter is installed, either the Wall or Ceiling Mounting Kit must be used in order to keep the bottom of the unit off of the ground to allow for air intake.

Install Upper Duct Adapter

To connect the upper Duct Adapter, first peel the backing off one of the Duct Gaskets and place it over the mounting holes on the top of the unit, lining up the screw cutouts. Then set one of the Duct Adapter Brackets onto the top of the Revolution unit and secure it using eight of the included bracket screws.



Figure 5-17

Connecting one of the Mounting Kits while using the Duct Adapter is fairly simple. Determine the “wall side” or “ceiling side” of the unit, remove the three screws that correspond to the holes in the mounting bracket, then install the mounting bracket on top of the Duct Adapter.

Duct Adapter with Ceiling Mount Bracket



Figure 5-18

Duct Adapter with Wall Mount Bracket



Figure 5-19

Install Lower Duct Adapter

Lay the Revolution unit on its side and remove the Pedestal from the bottom of the unit by removing the four screws holding it to the base. Install one of the Duct Gaskets over the mounting holes, then secure a Duct Adapter to the unit using five of the supplied screws, as one of the mounting options will also be installed.

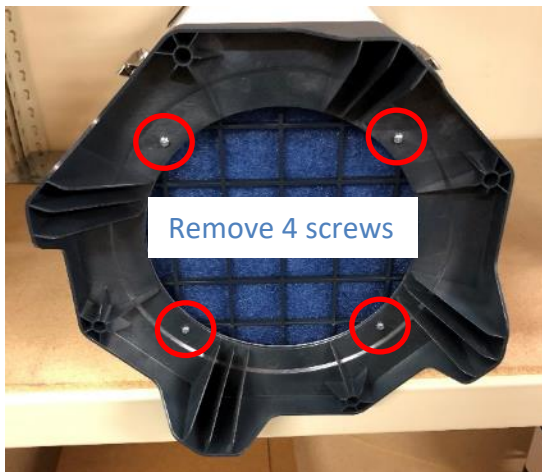


Figure 5-20

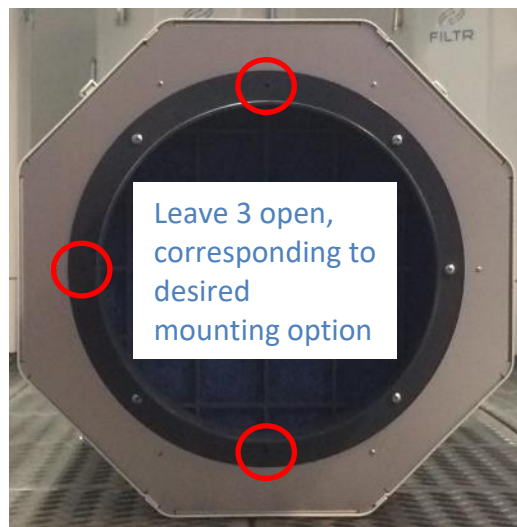


Figure 5-21

Attach either the Lower Unit Bracket from the Wall Mounting kit or one of the Ceiling Mounting Brackets to the bottom of the unit, installing it on top of the Duct Adapter. Secure this bracket with three of the unit bracket screws.

See earlier in this chapter for details about each of the other mounting kits.

Duct Adapter with Ceiling Mount Bracket

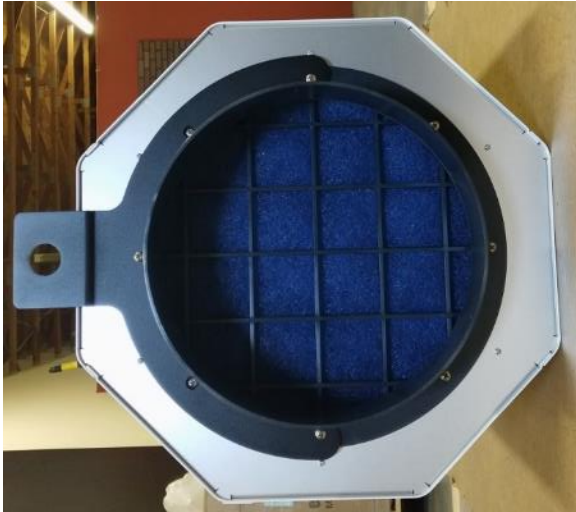


Figure 5-22

Duct Adapter with Wall Mount Bracket

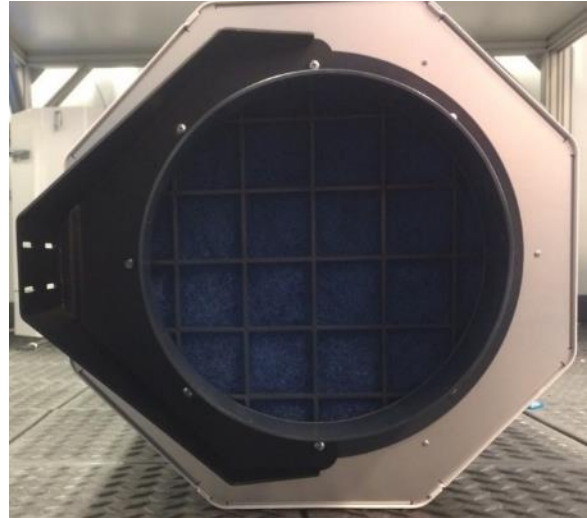


Figure 5-23

See previous steps in this chapter to finish installing the chosen mounting kit.

Once the Duct Adapters are attached to either or both ends, slide the ducting over the sleeve and secure it using the supplied hose clamps.

End Of Chapter

6 Filter Maintenance

The Revolution unit comes with three filters that will require periodic maintenance. Standard filters for all units are the Pre-Filter, HEPA filter, and Carbon Filter.

The HEPA and Pre-Filter LEDs on the Unit Interface, along with the notifications in the App, will indicate when a pre-set amount of time has gone by and these filters should be serviced. The HEPA filter has a lifespan of 12 months of use, while the Pre-Filter and Carbon Filter have a lifespan of 4 months of use.

In some cases where there is higher pollution, the filters may need to be serviced more often. Users should pay attention for signs that the unit needs early maintenance such as reduced airflow and increased noise. Any time that the filters are service/replaced before the time period elapses, the user should reset the timer on the unit for the serviced filter.

Ordering Replacement Filters

To order replacement filters, contact your local distributor, or call Lighthouse Sales at 541-454-8308.

It is recommended that the Carbon Filter be changed every 4 months, the Pre-Filter be cleaned every 4 months, and the HEPA filter be changed every 12 months. These numbers can vary depending on the dust and chemical levels in the environment.

LWS Part Numbers:

- **HEPA Filter:** 211317419-1
- **Carbon Filter :** 211317420-1
- **Pre-Filter:** 211317421-1

Filter Locations

The replaceable filters inside the Revolution unit are all easily accessible. See Figure 6-1 for the locations of the various filters.



Figure 6-1

Pre-Filter and Carbon Filter Maintenance

Pre-Filter

The unit keypad and the FILTR app will indicate when a 4-month time period has elapsed for the Pre-Filter. Unlike the other filters, the Pre-Filter does not need to be replaced each time. It is made of washable material and can be re-used a number of times, until it shows signs of wear.

Carbon Filter

It is recommended that the Carbon Filter be replaced after 4 months of regular use, which corresponds to the Pre-Filter maintenance period. The unit keypad and app will indicate when this time period has elapsed. The filter may need to be changed out more frequently if the Revolution unit is in an area with a large amount of pollution, or the lifetime may be able to be extended if the area has very light pollution.

Accessing the Carbon Filter and Pre-Filter

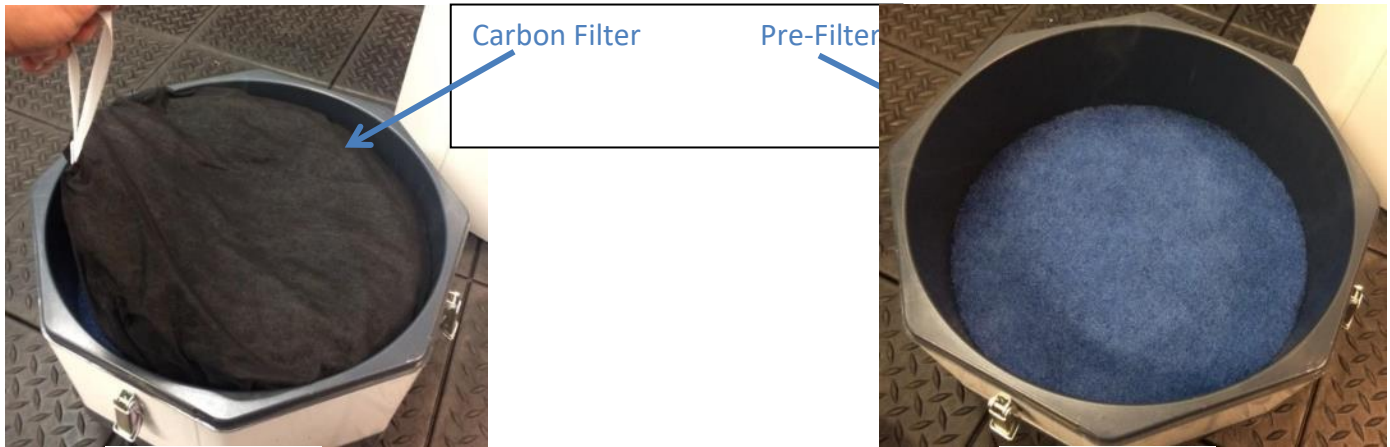
Locate the latches holding the bottom section on. With the unit turned off, disconnect all four latches and lift off the top section. This will expose the Filter Tray which contains the Carbon Filter and the Pre-Filter.



Figure 6-2



Figure 6-3

**Figure 6-4****Figure 6-5**

Replacing the Carbon Filter is a simple matter of pulling out the used filter and setting in the new one. Use only the LWS authorized replacement filter; for part information see the beginning of this chapter.

The Pre-Filter can be washed, dried, and re-used until it shows signs of wear.

Cleaning the Pre-Filter

The Pre-Filter can be cleaned off with regular soap and water. Ensure that the filter is dried thoroughly before re-installing it into the Revolution.

Re-Installation of the Filter Tray

With cleaning of the Pre-Filter accomplished, replace the Pre-Filter into the bottom of the Filter Tray, followed by the Carbon Filter.

Once the filters have been installed, replace the top section of the Revolution unit. Ensure that the keyed sections of the unit mate up properly.



Note the keyed sections of the Filter Tray. There are two pairs of them on opposite sides of the tray.

Figure 6-6

The panel seams on the upper section of the unit will seat onto these keyed sections. Rotating the upper section 180 degrees will seat it the same (if the wall or ceiling mounts are installed, be sure to align them properly). The unit needs to seat together properly to prevent unfiltered air from leaking in.



Panel seams will line up, indicating the two sections are properly aligned.

Figure 6-7

Reset the Pre-Filter Timer

After successfully re-assembling the unit, apply power and turn the unit on.

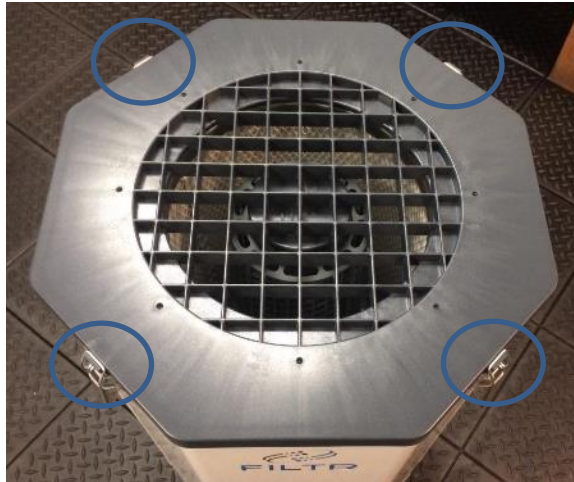
Resetting the Pre-Filter timer can be accomplished on the unit itself by pressing the (+) button on the keypad for three seconds. This will turn the LED off and reset the timer to zero.

HEPA Filter Maintenance

The HEPA filter is scheduled to be replaced after twelve months of use. The unit and the FILTR app will indicate when this time period has elapsed. The filter may need to be changed out more frequently if the Revolution is in an area with a large amount of pollution, or the filters lifetime may be able to be extended if the area has very light pollution.

Accessing the HEPA Filter

Locate the four latches holding the top of the Revolution unit on. With the unit turned off, disconnect all four latches and lift off the unit cover to expose the HEPA filter.



Flip up the four latches holding the cover on.

Figure 6-8



Removing the cover shows the HEPA filter inside the Revolution.

Figure 6-9

Replacing the HEPA Filter

The HEPA filter is held in by pressure exerted from the cover, so removing it is a simple matter of lifting the circular filter out of the unit. To place in a new one, simply set it down into the Revolution.

The design of the Revolution is such that the HEPA filter will center itself when placed into the unit. Set the cover back onto the top, ensuring that the outer groove sits onto the edges of the unit, and secure the four latches onto the cover. This seals the outer cavity of the Revolution and ensures that the air is forced to go through the filter before returning to the environment.

Reset the HEPA Timer

After successfully replacing the filter and cover, apply power to the unit and turn it on.

Resetting the HEPA Filter timer can be accomplished on the unit itself by pressing the (-) button on the keypad for three seconds.

Disposal of Old Filters

Removed filters can be disposed of as regular waste, or recycled via appropriate means.

Filtering of environments containing certain chemicals may change the disposal needs of the removed filters. Take care to follow local regulations governing any materials that the filters may have picked up from the filtered environment.

End of Chapter

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Appendix A: Limited Warranty

Limitation of Warranties

A. Lighthouse Worldwide Solutions (LWS) warrants that all equipment shall be free from defects in material and workmanship under normal use for a period of one year from date of shipment to Buyer. LWS does not warrant that operation of the software will be completely uninterrupted or error free or that all program errors will be corrected. Buyer shall be responsible for determining that the equipment is suitable for Buyer's use and that such use complies with any applicable local, state, or federal law. Provided that Buyer notifies LWS in writing of any claimed defect in the equipment immediately upon discovery and any such equipment is returned to the original shipping point, transportation charges prepaid, within one year from date of shipment to Buyer and upon examination LWS determines to its satisfaction that such equipment is defective in material or workmanship, i.e. contains a defect arising out of the manufacture of the equipment and not a defect caused by other circumstances, including, but not limited to accident, misuse, unforeseeable use, neglect, alteration, improper installation, improper adjustment, improper repair, or improper testing, LWS shall, at its option, repair or replace the equipment, shipment to Buyer prepaid. LWS shall have reasonable time to make such repairs or to replace such equipment. Any repair or replacement of equipment shall not extend the period of warranty. If the Instrument is modified or in any way altered without the explicit written consent of LWS then the warranty is null and void. This warranty is limited to a period of one year, except as noted below, without regard to whether any claimed defects were discoverable or latent on the date of shipment. Accessories (other than filters) with all products are warranted for one (1) year. Replaceable filters and fuses carry no warranty.

B. If Buyer shall fail to pay when due any portion of the purchase price or any other payment required from Buyer to LWS under this contract or otherwise, all warranties and remedies granted under this Section may, at LWS's option, be terminated.

C. THE FOREGOING WARRANTY IS EXCLUSIVE AND IN LIEU OF ALL OTHER REPRESENTATIONS, WARRANTIES AND COVENANTS, EXPRESS OR IMPLIED WITH RESPECT TO THE EQUIPMENT AND ANY DEFECTS THEREIN OF ANY NATURE WHATEVER, INCLUDING AND WITHOUT LIMITATION WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. LWS SHALL NOT BE LIABLE FOR, AND BUYER ASSUMES ALL RISK OF, ANY ADVICE OR FAILURE TO PROVIDE ADVICE BY LWS TO BUYER REGARDING THE EQUIPMENT OR BUYERS USE OF THE SAME. UNDER NO CIRCUMSTANCES SHALL LWS BE LIABLE TO BUYER UNDER ANY TORT, NEGLIGENCE, STRICT LIABILITY, OR PRODUCT LIABILITY CLAIM AND BUYER AGREES TO WAIVE SUCH CLAIMS. LWS'S SOLE AND EXCLUSIVE LIABILITY AND BUYERS SOLE AND EXCLUSIVE REMEDY, FOR ANY NON CONFORMITY OR DEFECT IN THE PRODUCTS OR ANYTHING DONE IN CONNECTION WITH THIS CONTRACT, IN TORT, (INCLUDING NEGLIGENCE), CONTRACT, OR OTHERWISE, SHALL BE AS SET FORTH IN THE SUBSECTION A HEREOF AS LIMITED BY SUBSECTION B HEREOF. THIS EXCLUSIVE REMEDY SHALL NOT HAVE FAILED OF ITS ESSENTIAL PURPOSE (AS THAT TERM IS USED IN THE UNIFORM COMMERCIAL CODE) PROVIDED THAT THE SELLER REMAINS WILLING TO REPAIR OR REPLACE DEFECTIVE EQUIPMENT (AS DEFINED IN SUBSECTION A) WITHIN A COMMERCIALY REASONABLE TIME AFTER RECEIVING SUCH EQUIPMENT. BUYER SPECIFICALLY ACKNOWLEDGES THAT SELLER'S PRICE FOR THE EQUIPMENT IS BASED UPON THE LIMITATIONS OF LWS'S LIABILITY AS SET FORTH IN THIS CONTRACT.

Warranty of Repairs After Initial One (1) Year Warranty

A. Upon expiration of the initial one-year warranty, all parts and repairs completed by an authorized Lighthouse repair technician are subject to a six (6) month warranty.

B. Other than the above, LWS makes no warranty of any kind expressed or implied, except that the products manufactured and sold by LWS shall be free from defects in materials and workmanship and shall conform to LWS's specifications; Buyer assumes all risk and liability resulting from use of the products whether used singly or in combination with other products. If instrument is modified or in any way altered without the explicit written consent of LWS, then the warranty is null and void.

C. WARRANTY REPAIRS SHALL BE COMPLETED AT THE FACTORY, BY AN AUTHORIZED SERVICE LOCATION, BY AN AUTHORIZED SERVICE TECHNICIAN, OR ON SITE AT BUYER'S FACILITY BY A LIGHTHOUSE AUTHORIZED EMPLOYEE. BUYER PAYS FREIGHT TO FACTORY; SELLER WILL PAY STANDARD RETURN FREIGHT DURING THE WARRANTY PERIOD. BUYER MAY SELECT A FASTER METHOD OF SHIPMENT AT ITS OWN EXPENSE.

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