SMART VENTILATION

PARTICULATE DEFENSE

BUILD EQUINOX
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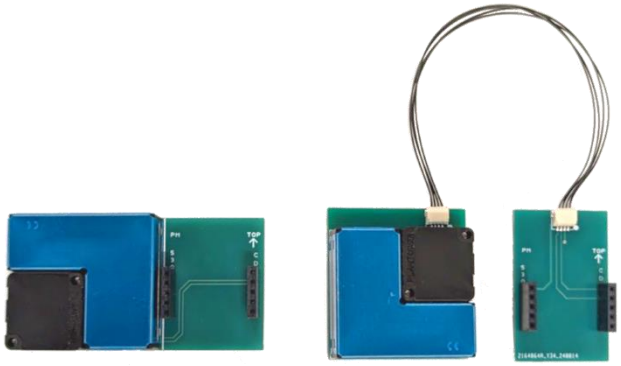

CERV2 Particulate Defense Kit

The Particulate Defense Kit for the CERV2 is designed to actively monitor and respond to airborne particulate levels in both indoor and outdoor environments. By utilizing high-precision sensors, the system continuously measures particulate concentrations in the airstreams, allowing it to intelligently adapt its ventilation and filtration operation to maintain optimal indoor air quality. This proactive approach ensures that contaminants such as cooking pollutants, smoke, dust, pollen, and other airborne pollutants are managed effectively, providing a healthier indoor environment.

Sensor Features:

- Calibration-free
- Low Power
- Particulate Mass and Particulate Count measurement
- High sensitivity

Sensor Specifications:

Technology	Laser Scattering
Particle Measurement Bins	PM [µg/m^3]: 1.0, 2.5, 5.0, 10.0 PC [#/L]: 0.3, 0.5, 1.0, 2.5, 5.0, 10.0
Particle Counting Efficiency	98% @ >= 0.5µm
Particle Resolution	1 µg/m^3
Particle Maximum Consistency Error (PM2.5 Standard)	± 10% @ 100~500 µ g/m ³ ±10 µ g/m ³ @0~100 µ g/m ³

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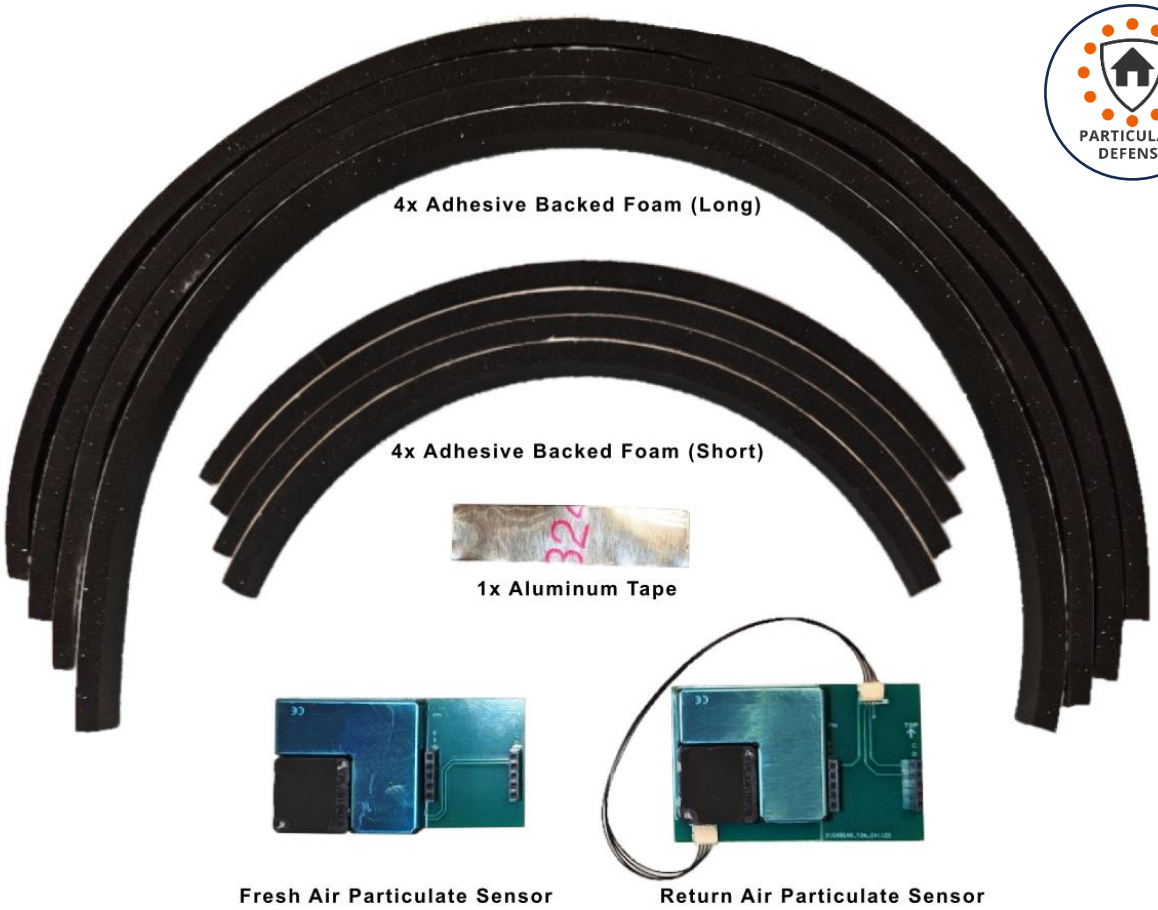
Particulate Defense Kit Contents

Each CERV2 Particulate Defense Kit contains:

- 1x Return Air Particulate Sensor Module (two boards connected by cable)
- 1x Fresh Air Particulate Sensor Module (single board)
- 1x Aluminum Tape Strip
- 4x Adhesive Backed Foam (9.75” long ea)
- 4x Adhesive Backed Foam (18.5” long ea)
- 1x “Particulate Defense” Sticker



Particulate Sensor Module Installation – Return Air

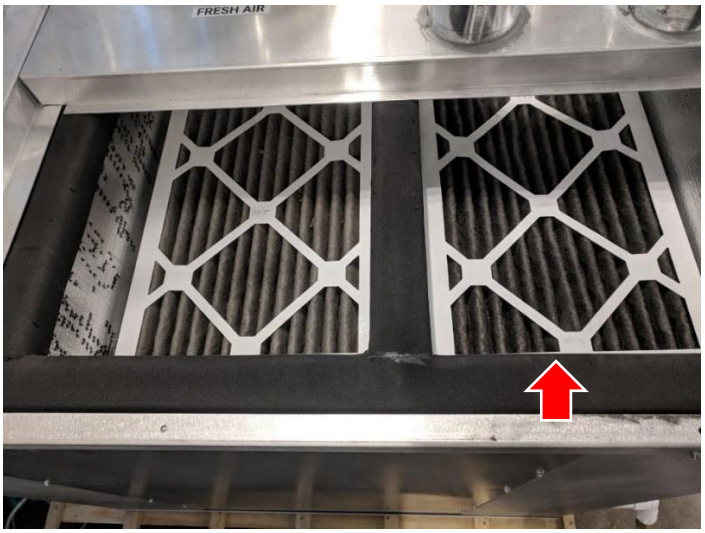
Materials needed:

- 1x Return Air Particulate Sensor Module (two boards connected by cable)
- 1x Aluminum Tape Strip
- 2x Adhesive Backed Foam (9.75” long ea)
- 2x Adhesive Backed Foam (18.5” long ea)

The Return Air Particulate Sensor installs above the filter to allow the indoor return air’s particulate content to be measured unaffected by the return air filter. This section will demonstrate how to install the sensor circuit boards and the adhesive backed foam filter gasket.

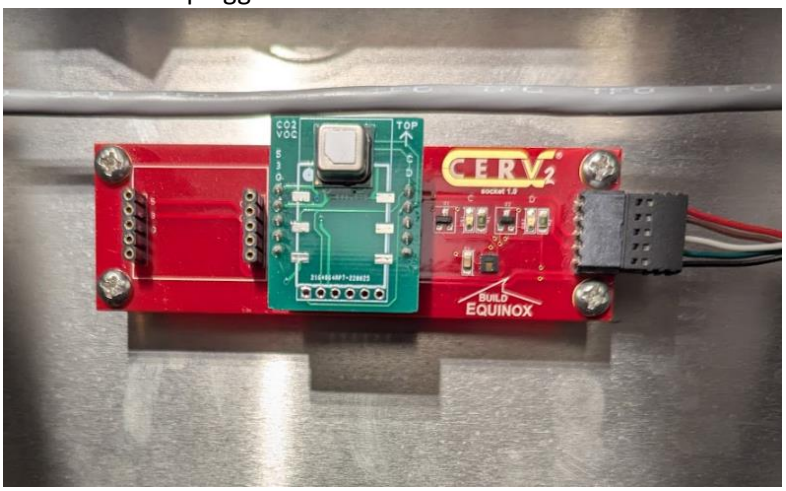
Procedure – Install Return Air Particulate Sensor Module

1) Turn off power to the CERV2 using the main power switch on the bottom right front of the unit.
2) Open the filter access cover and remove the return air filter.

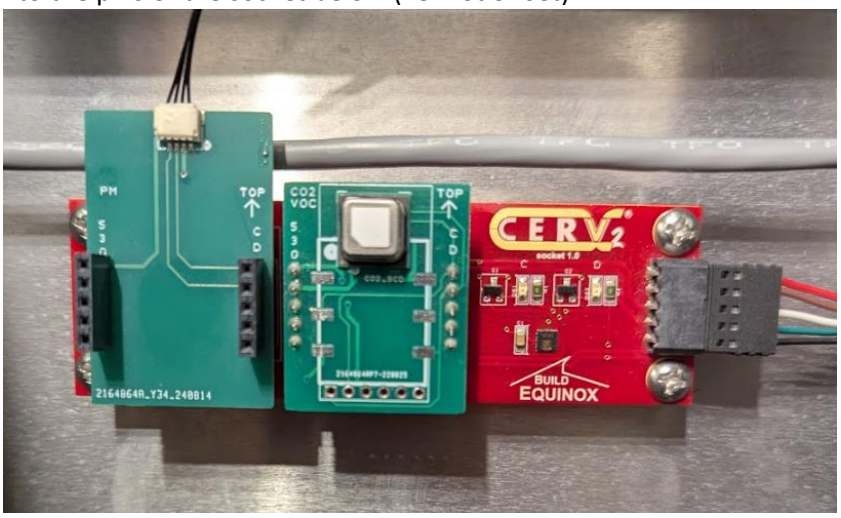


3) The return air sensor board is now visible. There is a main board with two small modules plugged in (these are the CO2 and VOC sensors). Unplug the module on the left by pulling directly outwards. Be very careful not to drop the module and set it aside.

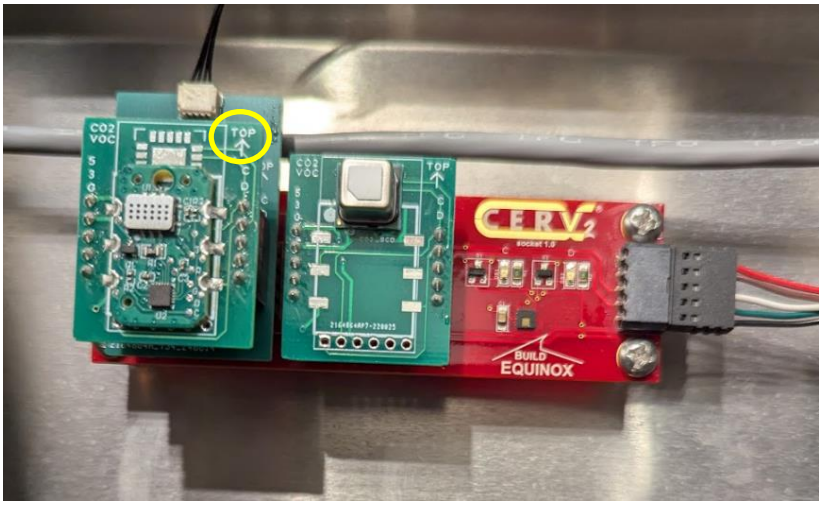
4) There should now only be one module plugged into the board.



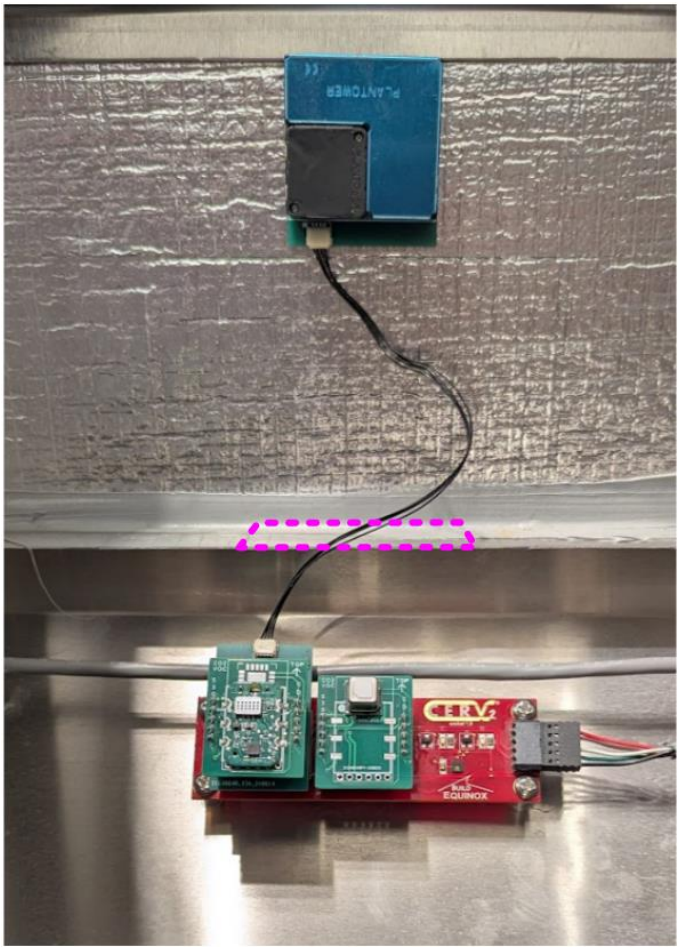
5) Plug in the Particulate Sensor circuit board, with the wire connector at the top. Ensure that the pins of the board plug correctly into the pins of the socket below (i.e. not offset).

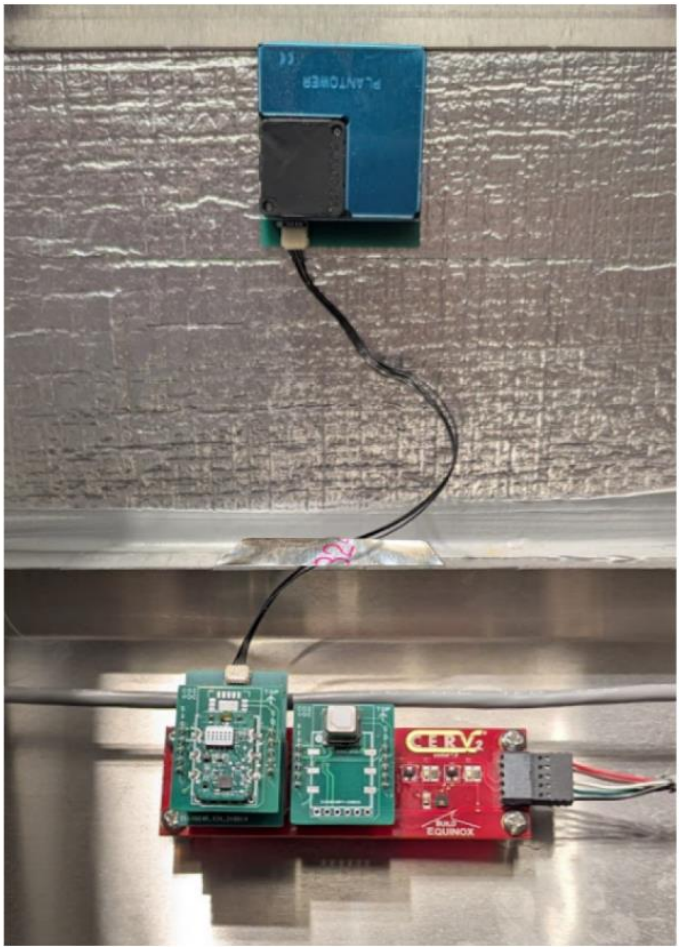


6) Plug the removed sensor module into the particulate sensor connector board. Ensure that the pins of the board plug correctly into the pins of the socket below (i.e. not offset), and the module is oriented properly with arrow pointing up.



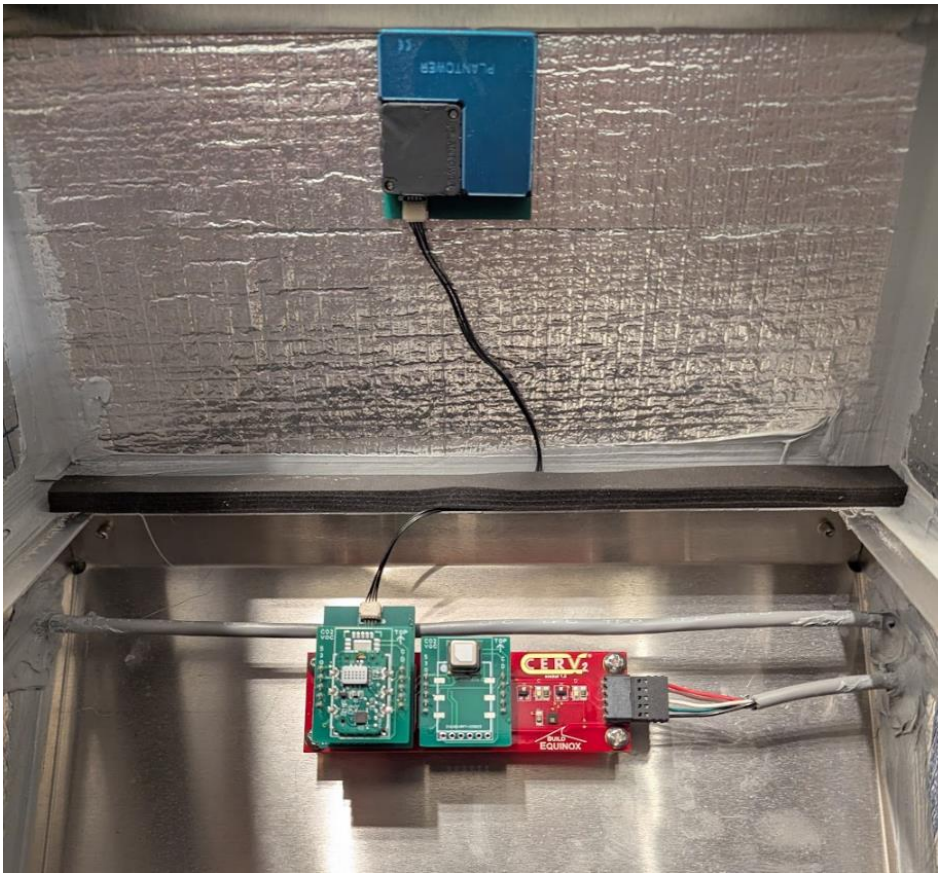
7) Remove the film from the double-stick tape on the back of the blue sensor module. Stick the sensor module to the wall directly below the return air duct, with the connector facing downwards.
8) Using the small piece of aluminum tape, cover the wire on the metal filter platform so it is flat on the surface.



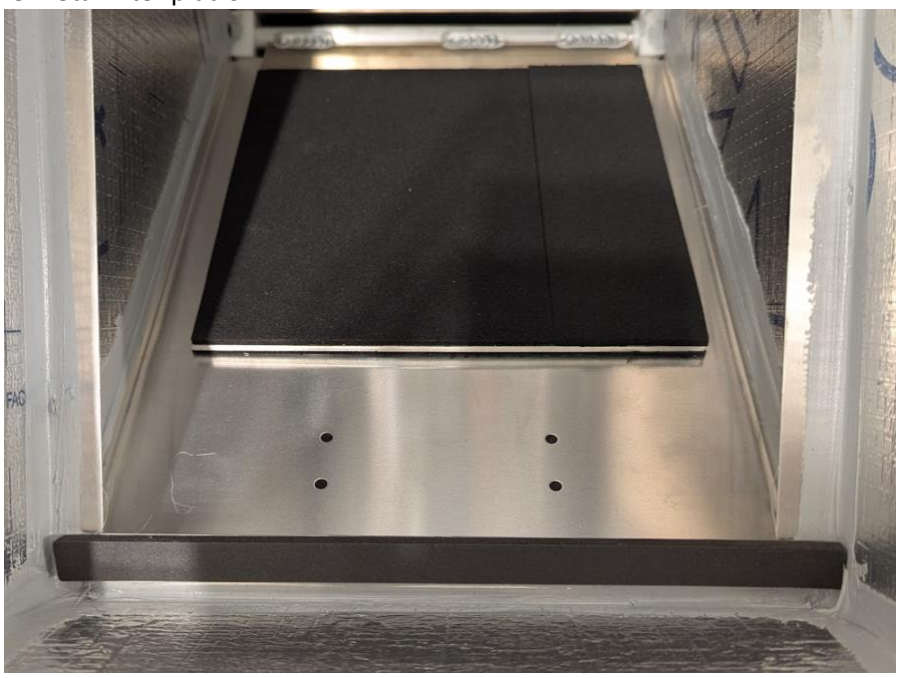


Procedure – Install Return Air Filter Gasket

1) Before sticking the adhesive backed foam to the metal filter platform, clean the metal platform surfaces first (isopropyl alcohol and a paper towel is suitable).
2) Remove the film from the back of one of the short (9.75”) sections of adhesive backed foam strips and stick it on the edge of the metal filter platform (covering the wire).



3) Remove the film from the back of another short (9.75”) section of adhesive backed foam and stick it on the opposite edge of the metal filter platform.



4) Remove the film from the back of one of the long (18.5”) sections of adhesive backed foam and stick it on the left side of the metal filter platform. Make sure to butt it tight against the short foam strips.

5) Lastly, remove the film from the back of the other long (18.5”) section of adhesive backed foam and stick on the right side of the metal filter platform. Butt it tight against the short foam strips. This completes the installation of the Return Air Particulate Sensor. The return air filter can be put back in place.

Particulate Sensor Module Installation – Fresh Air

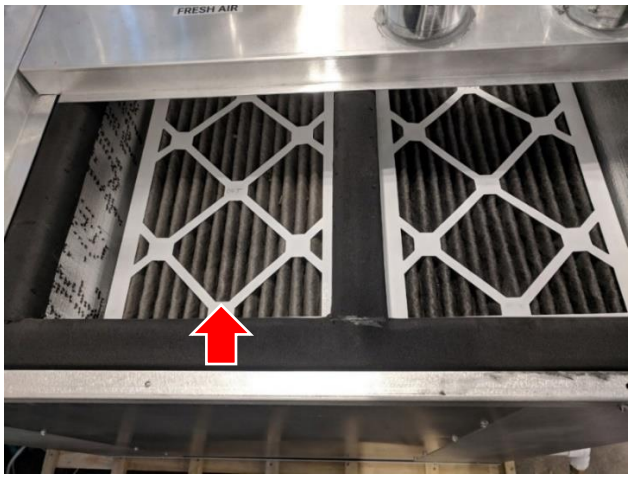
Materials needed:

- 1x Fresh Air Particulate Sensor Module (single board with sensor attached)
- 2x Adhesive Backed Foam (9.75” long ea)
- 2x Adhesive Backed Foam (18.5” long ea)

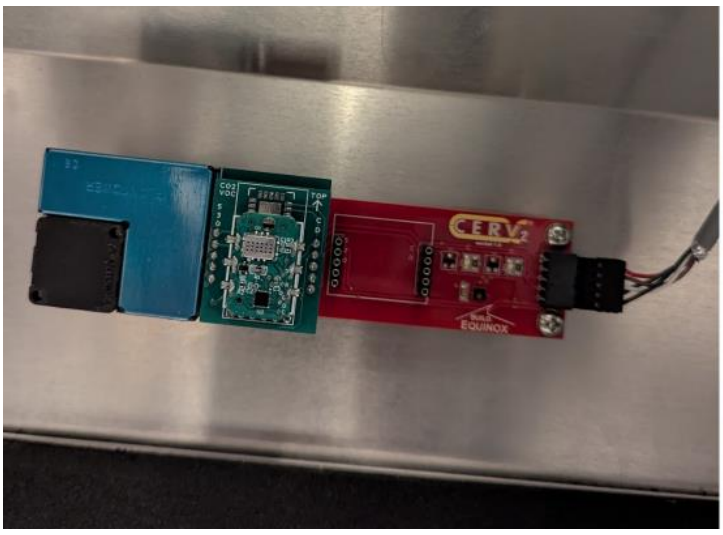
The Fresh Air Particulate Sensor installs below the fresh air filter to obtain a post filtered fresh air reading and to protect it from heavy outdoor dust and debris. This section will demonstrate how to install the sensor circuit board and the adhesive backed foam filter gasket.

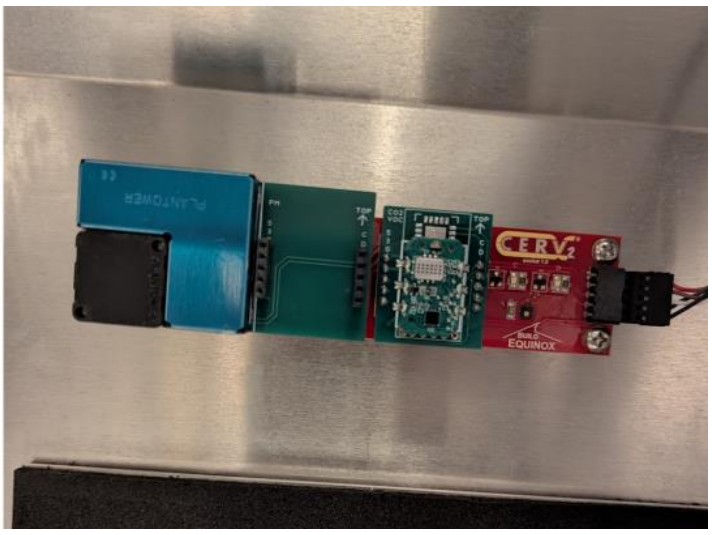
Procedure – Install Fresh Air Particulate Sensor Module

1) Power for the CERV2 should remain off and the filter access covered removed.
2) Remove the Fresh Air filter.



3) The fresh air circuit board is now visible. If an Outside VOC sensor option is installed, this module will be plugged into the right pin socket space, otherwise, there will be two sets of open sockets. Plug the blue Fresh Air Particulate Sensor into the left-most socket, as shown below. The pictures show the PM sensor installed without an Outside VOC module (left) and with an Outside VOC module (right). Ensure that the pins of the board plug correctly into the holes of the socket below (i.e. not offset).





Procedure – Install Fresh Air Filter Gasket

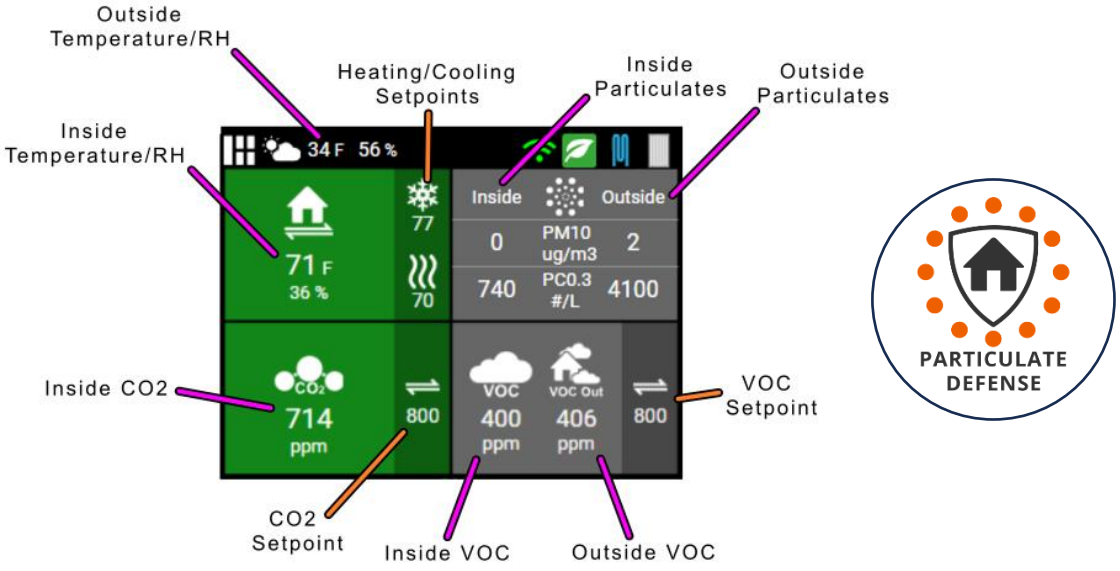
Please follow the same steps for installing the adhesive backed foam strips from the Return Air Filter Gasket section. Replace the fresh air filter when finished.

Finishing Installation

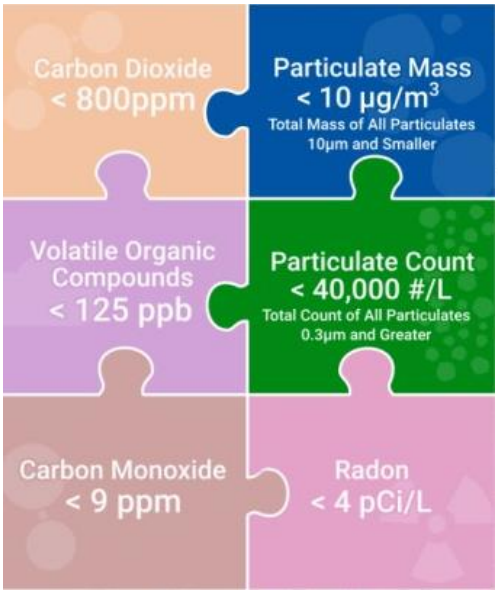
1) After completing the installation of the two particulate sensors and the filter gaskets, make sure to install both filters and secure the filter access cover back in place. Power to the CERV2 can be turned back on.
2) Log into your CERV-ICE account online to view the new control screen for your CERV2 as shown below. Make sure that the green wireless signal appears, indicating the CERV is connected online. After a few minutes of operation numbers should appear for Inside and Outside Particulate readings. If so, sensors are installed and working properly.

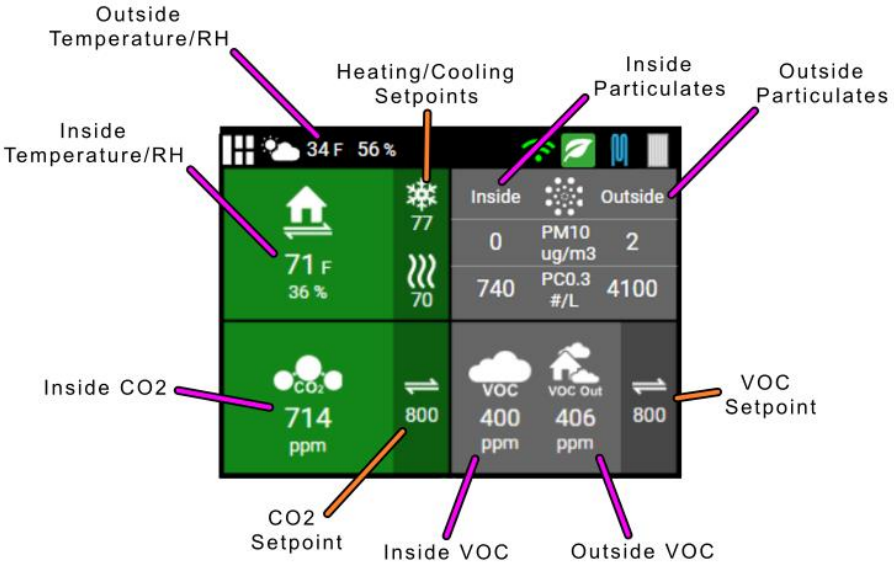
   If numbers do not appear after several more minutes, turn power back off to the CERV2, open the filter access cover, and remove the filter for the sensor where readings are not appearing. Check that the particulate sensor is aligned properly in the pin socket. If necessary, remove the sensor and try installing again. Replace filter(s), filter cover, and power on CERV2. Check CERV-ICE screen for CERV2 to connect and wait to see if numbers appear. Repeat these steps if necessary.

   Once the PM sensors are working properly, affix the “Particulate Defense” sticker to the upper right front face of your CERV2 to indicate it is now equipped to mitigate and defend against elevated levels of indoor and outside particulate matter. Proceed to the user guide section to learn how to use this new functionality.



Inside Particulate Reduction





The CERV2 Particulate Defense kit integrates seamlessly with Build Equinox's IAQ Standards to ensure that your home's particulate levels are properly managed. Inside and outside particulate mass (PM10) and count (PC0.3) are displayed in the upper right quadrant of the controller Home Screen.

When **indoor particulate levels exceed 10 µg/m³ in mass (PM10) or 40,000 particles per liter in count (PC0.3)** - thresholds identified as poor indoor air quality (IAQ) by Build Equinox's standards - the CERV2 activates **ventilation mode**. This mode expels the contaminated indoor air and replaces it with cleaner, filtered outdoor air, ensuring that pollutants are promptly removed to improve indoor air quality. The following status icons will appear in the status bar at the top right corner of the Home Screen to indicate ventilation due to elevated inside PM or PC. The left side of the particulate data quadrant will also turn green during this time.

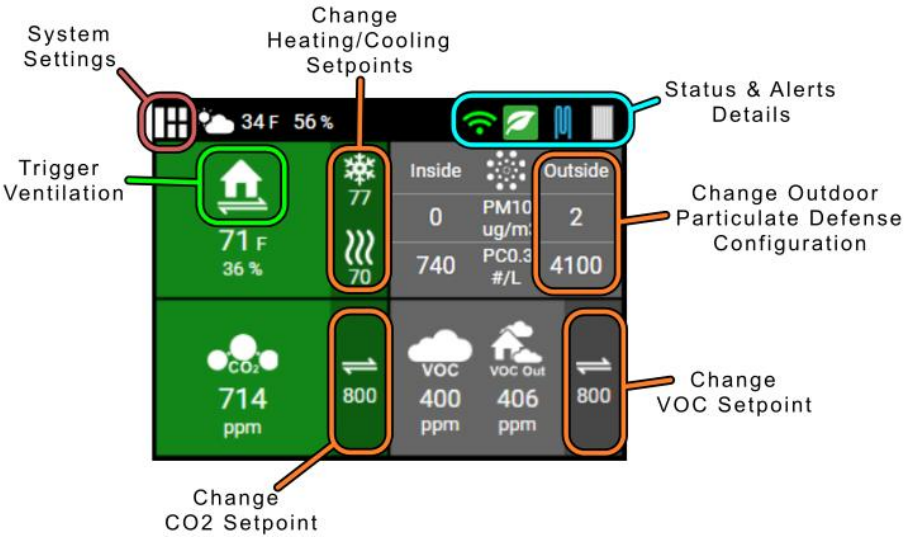
The CERV is venting due to high levels of indoor Particulate Mass (PM10 > 10 µg/m³)

The CERV is venting due to high levels of indoor Particulate Count (PC0.3 > 40,000 #/L)

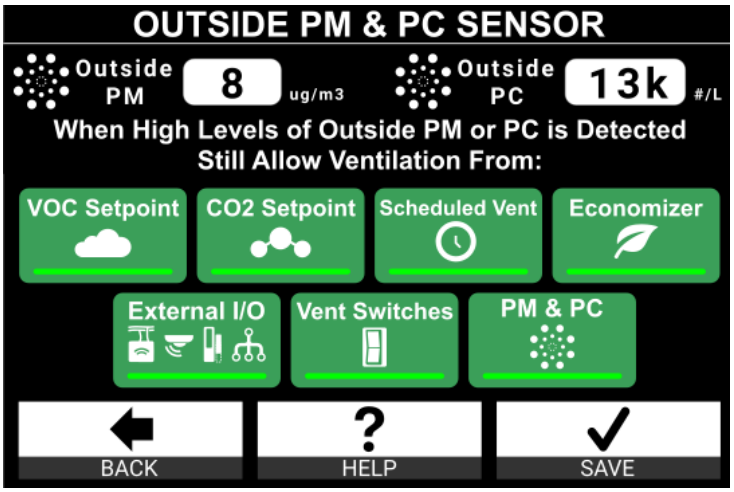
If outdoor particulate levels are higher than inside during this period, instead of ventilating, the CERV will use **air purification mode** to recirculate indoor air over its high-efficiency filters to remove the particulates.

User Controlled Outside Particulate Defense

The user can control ventilation modes to disable when outdoor particulates exceed the recommended levels **10 µg/m³ in mass (PM10) or 40,000 particles per liter in count (PC0.3)**. This control is accessed by tapping/clicking on the area displaying the Outside particulate levels.



The following control screen will be displayed showing the current outside PM and PC levels and clickable buttons for the CERV2's various ventilation modes. Clicking on these ventilation mode buttons will gray them out. Press the checkmark to save the selection, which will disable that ventilation mode when outside particulate levels exceed the threshold. Below the control screen is a full list and description of the ventilation mode controls.

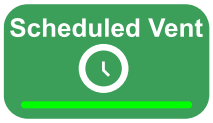


VOC Setpoint Allowed - If outdoor particulates are high:
CERV still ventilates to keep indoor VOCs below setpoint. Remote VOC sensors can still trigger ventilation.

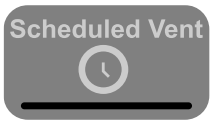
VOC Setpoint Restricted - If outdoor particulates are high:
The CERV will not ventilate due to high indoor VOC levels. Remote VOC sensors do not trigger ventilation.

CO2 Setpoint Allowed - If outdoor particulates are high:
CERV still ventilates to keep indoor CO2 below setpoint. Remote CO2 sensors can still trigger ventilation.

CO2 Setpoint Restricted - If outdoor particulates are high:
The CERV will not ventilate due to high indoor CO2 levels. Remote CO2 sensors do not trigger ventilation.



Scheduled Ventilation Allowed - If outdoor particulates are high:
A ventilation schedule (ex. Vent 10 min every hour) still allows the CERV to vent periodically.



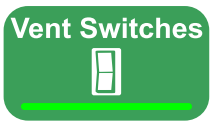
Scheduled Ventilation Restricted - If outdoor particulates are high:
The CERV will not ventilate due to scheduled ventilation.

Economizer Allowed - If outdoor particulates are high:
If outdoor temperature and relative humidity are beneficial, the CERV may ventilate to help heat or cool.

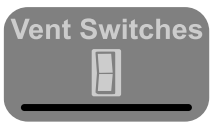
Economizer Restricted - If outdoor particulates are high:
The CERV will not ventilate to help boost heating or cooling.

External I/O Allowed - If outdoor particulates are high:
Status Monitors (ACT, motion detectors, etc), auxiliary inputs, and remote RH sensors may trigger ventilation.

External I/O Restricted - If outdoor particulates are high:
Status Monitors (ACT, motion detectors, etc), auxiliary inputs, and remote RH sensors will not trigger ventilation.



Vent Switches Allowed - If outdoor particulates are high:
Triggering a wireless ventilation switch will cause the CERV to ventilate for the configured amount of time.



Vent Switches Restricted - If outdoor particulates are high:
Wireless ventilation switches will not trigger the CERV to ventilate.

Indoor PM / PC Sensor Allowed - If outdoor particulates are high:
Indoor particulate sensor will trigger ventilation when the indoor PM or PC is high (PM10 > 10 µg/m³ or PC0.3 > 40,000 #/L).

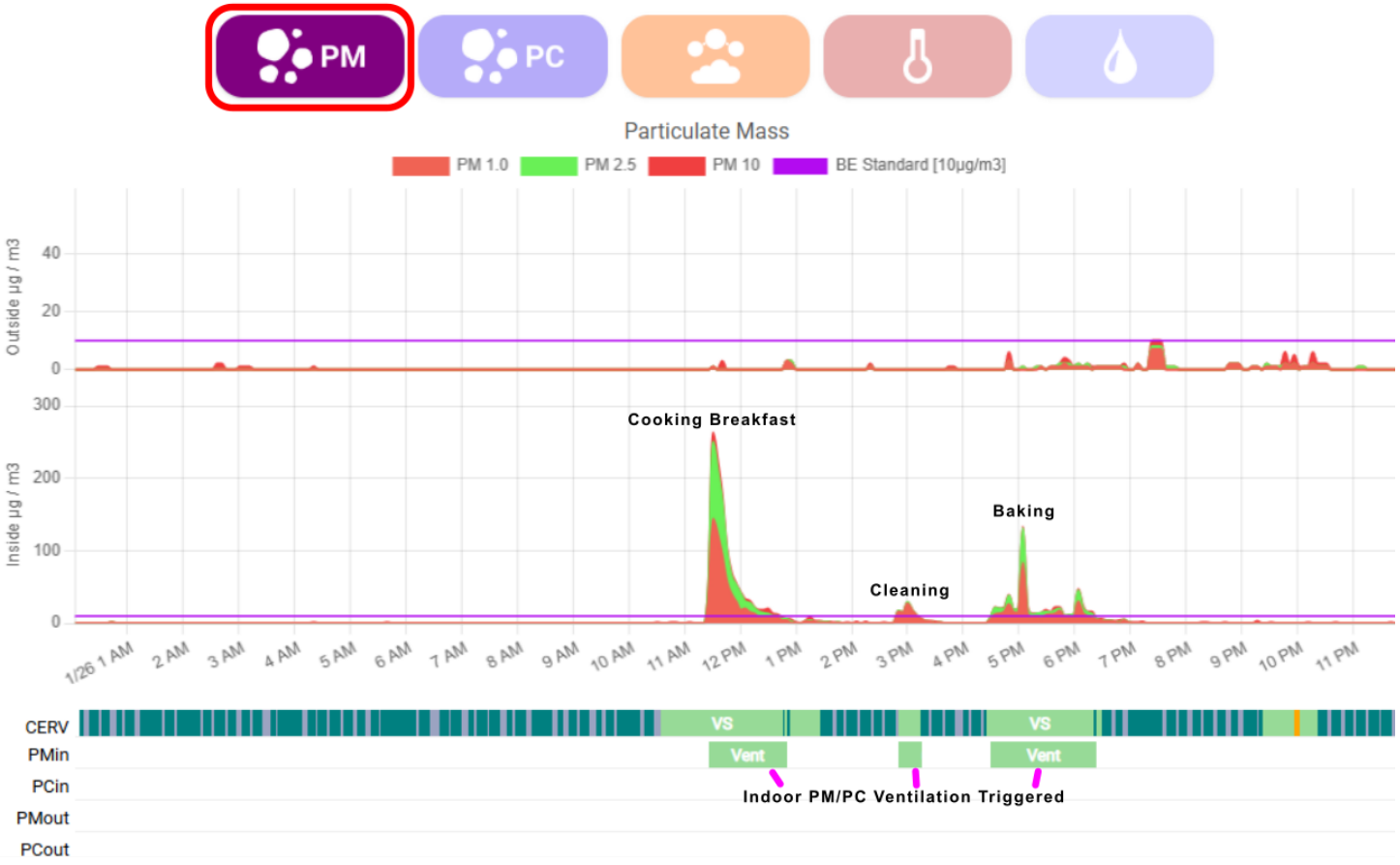
Vent Switches Restricted - If outdoor particulates are high:
If outdoor particulates are higher than indoor particulates, the CERV will not ventilate. If indoor particulates are higher than outdoor particulates, the CERV will still ventilate to reduce indoor.

CERV-ICE Historical Data

With the CERV2 Particulate Defense kit installed, historical particulate sensor data can be viewed on CERV-ICE. In CERV-ICE's Historical Data section is an option to view plots for PM (particulate matter) or PC (Particulate Count). These charts not only show the total PM and PC levels, but also break down the particulate composition into size groups. For Particulate Mass, the bins are: 1.0, 2.5, and 10 microns. For Particulate Count, the bins are: 0.3, 0.5, 1.0, 2.5, 5.0, and 10.0 microns. Example plots are shown below.

The top half of the chart above shows particulate data for the outside sensor, and the bottom half shows particulate data for the inside sensor. Both charts additionally show a purple horizontal line, which indicates the Build Equinox IAQ maximum recommended level for PM and PC (PM10: 10 µg/m³ or PC0.3: 40,000 #/L).

Under the chart are CERV and PM / PC Activity Bars – composed of PMin, PCin, PMout, and PCout. When these horizontal bars show activity, that indicates the sensors were triggered. For the case of inside particulate mass and count, PMin and PCin, activity would mean that the CERV is ventilating to reduce indoor particulates as described earlier in the **Inside Particulate Reduction** section. These events often align with activity in the home such as cooking, cleaning, burning a candle, etc. In the below chart the green periods in the PMin activity bar show that inside particulate levels triggered the CERV to ventilate.



For the case of outside particulate mass and count, PMout and PCout, activity indicates that outdoor particulates are high and the CERV could be in a restricted ventilation mode (as defined by the user settings in the previous **User Controlled Outside Particulate Defense** section). In this case, there could have been a nearby neighbor burning leaves.