Smart-er Ventilation

March 29, 2018

Alex Long

Second Generation Smart Ventilation System

Automatic Fresh Air Measurement & Control

Fresh Air Ventilation & Recirculation Modes

Heat Pump Energy Recovery & Conditioning

Inverter Drive Compressor & ECM Fans

Innovative Controls & Internet Connectivity

Designed & Built in the USA

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CERV2 Smart-er Ventilation - Outline

- General CERV Overview
- Configuration
- Installation & Maintenance
- Operation
- Performance
- Features/Options
- Future Tech
- Availability
- Questions

CERV Overview

BASE SYSTEM INCLUDES

FRESH AIR CONTROL MODULE (PART-B)

HEAT PUMP MODULE (PART-A)

SUPPLY & EXHAUST FANS

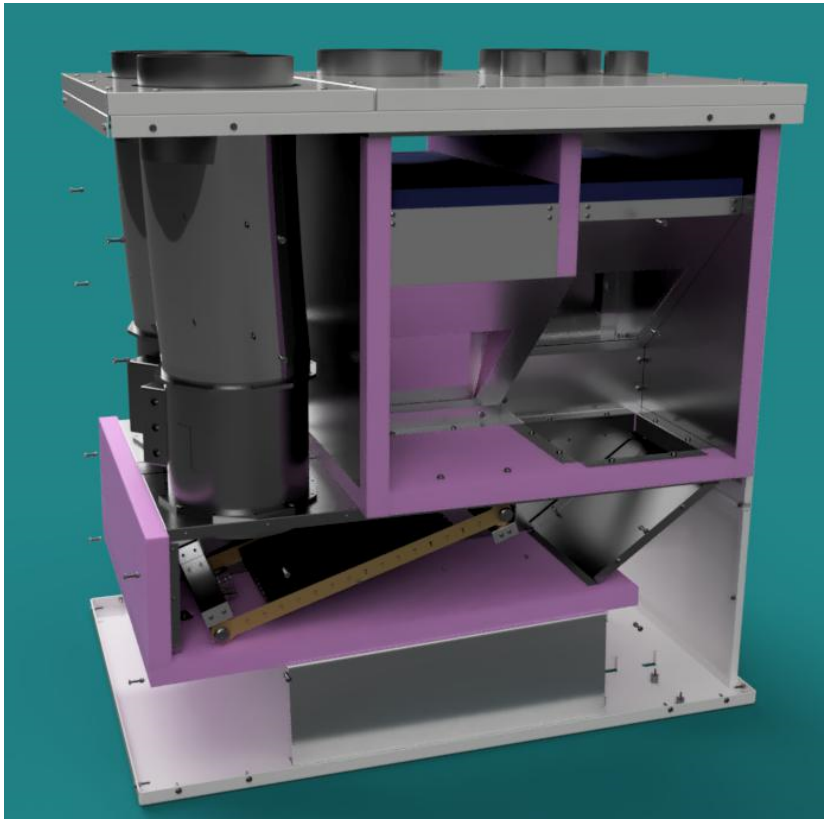
TOUCHSCREEN CONTROLLER

- **CERV Smart Ventilation** sets the standard for superior indoor air quality
  - Measures Temp, RH%, CO2, and VOCs
  - Automatically accounts for changes in pollution levels and occupancy
  - Senses poor air quality before you do
    - High CO2 and VOC levels occur much sooner than indicated by odors or discomfort
  - Adjusts for opening of doors, windows, and infiltration
  - Optimized for energy conservation
  - Use data metrics to provide user feedback to improve air quality

CERV2 Configuration

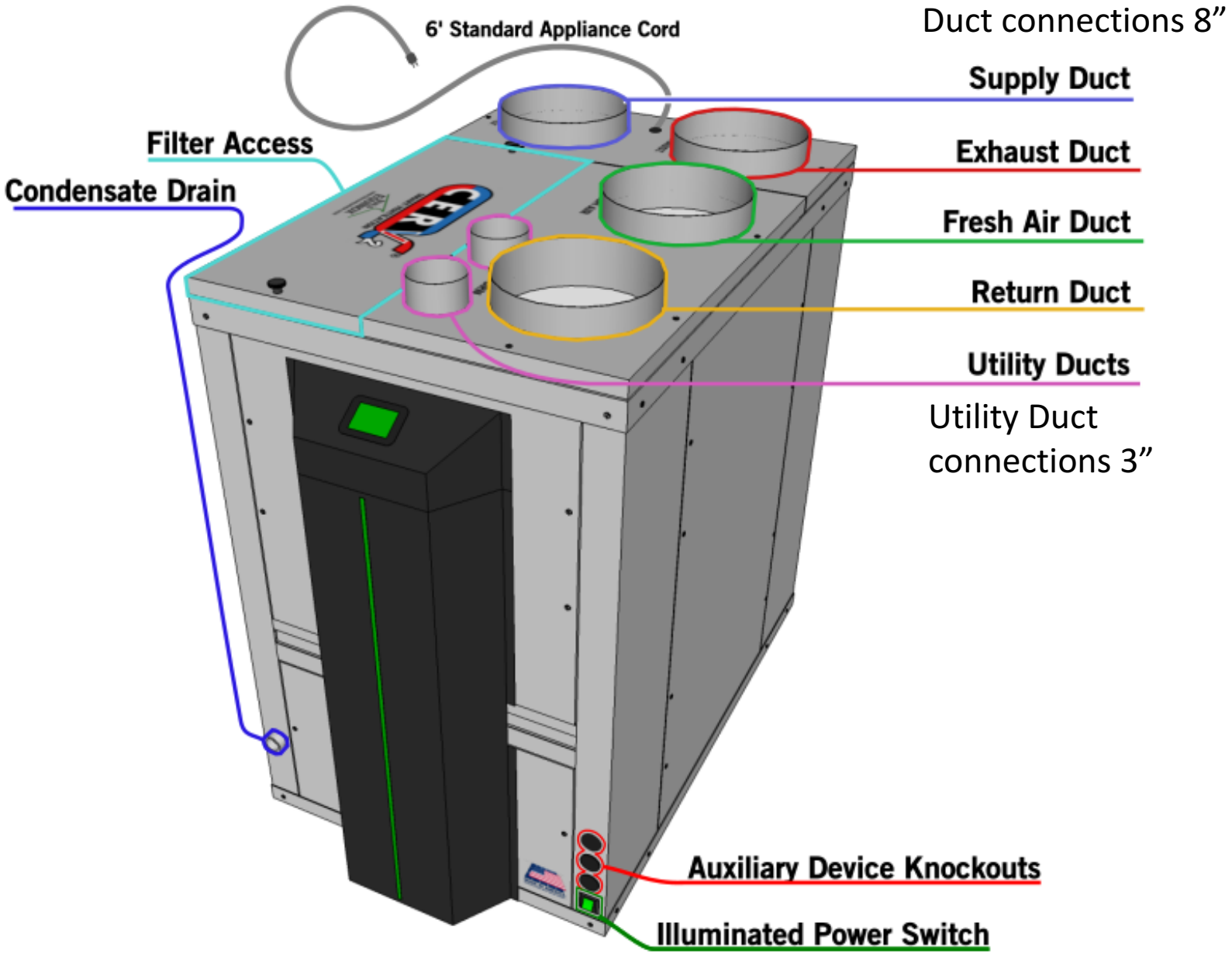
Unitary All-in-One System

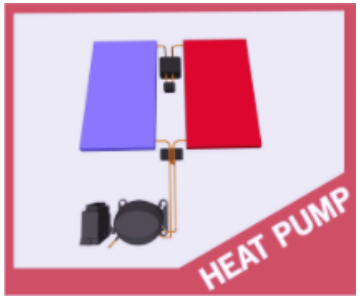
- Heat pump and dampers
- Fans – same ECM fans as current CERV
- Fresh air and return filters (10”x20”x1”)
- Integrated color touch screen display



- Unpainted appliance grade aluminum construction for sharp look and easy end of life recyclability
- 8” duct connections for improved airflow performance

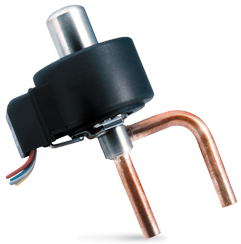
CERV2 Configuration





CERV2 Heat Pump Advancements

Same digitally controlled inverter drive variable speed compressor



Electronic expansion valve for increased efficiency and capacity control

Advanced aluminum microchannel heat exchangers

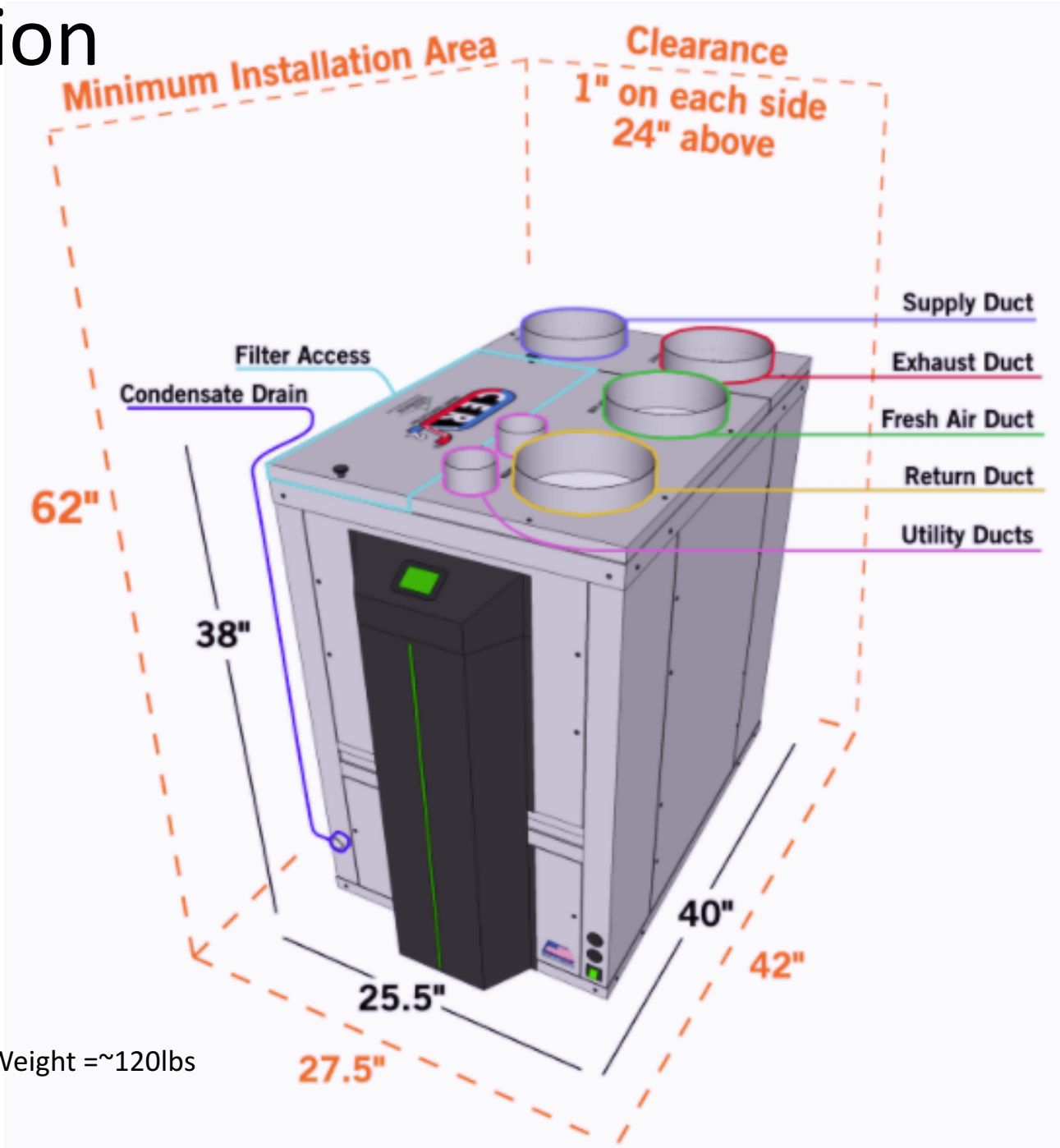
- Lightweight
- Reduced refrigerant charge
- High heat transfer performance
- Fully recyclable

CERV2 display

- Screen built into front of unit
- Color capacitive touch display
- 3.5” screen size
- Large, clear, and easy to navigate

Optional Wireless CERV2 display

Installation

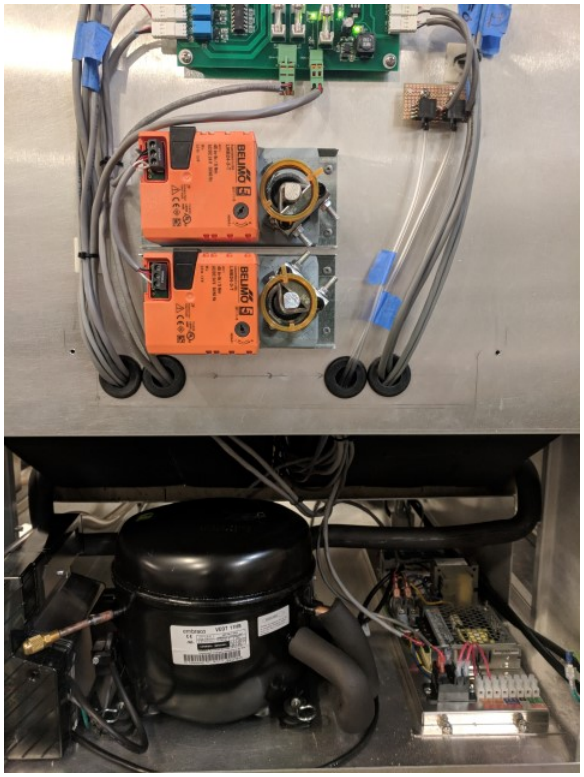


Total Weight =~120lbs

Maintenance and Service

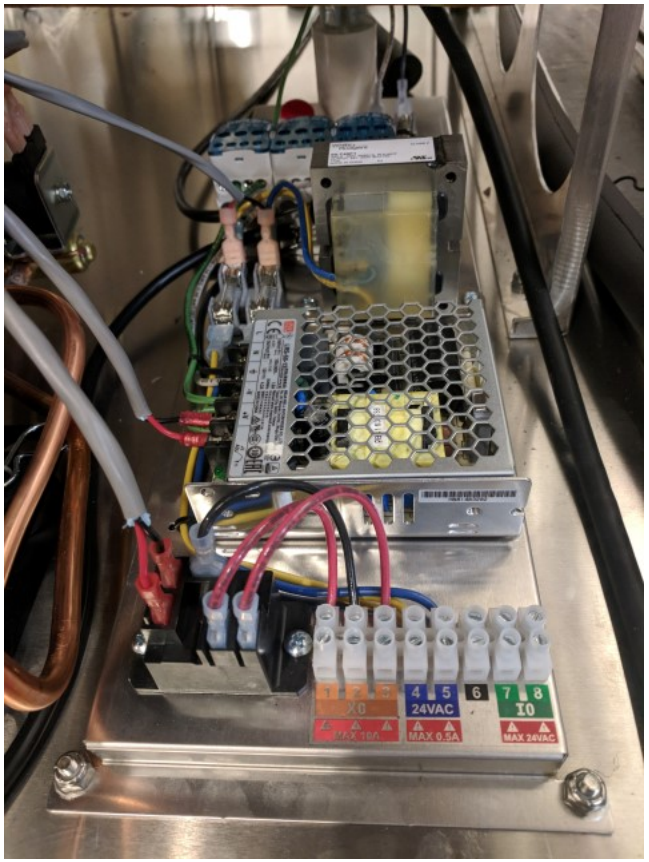
Front Access Panel Cover

Low Voltage Electronics & Damper Motor Access

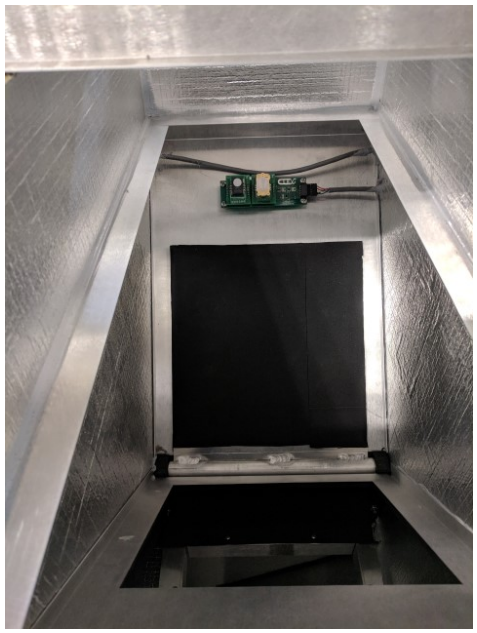


120V Electronics, Aux Device Field Wiring, & Heat Pump Access

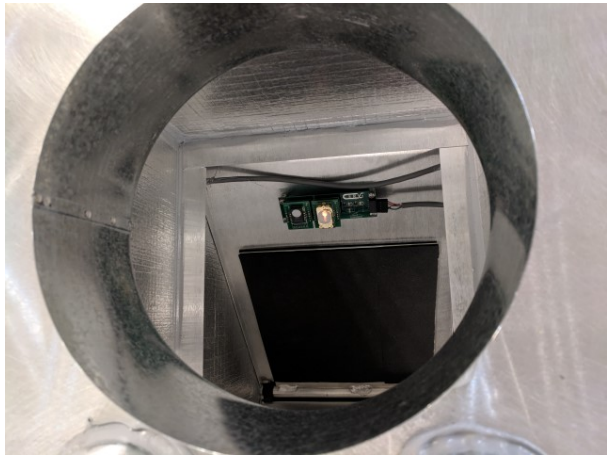
Maintenance & Service



Removable 120V electronics panel, Auxiliary In/Out Wiring

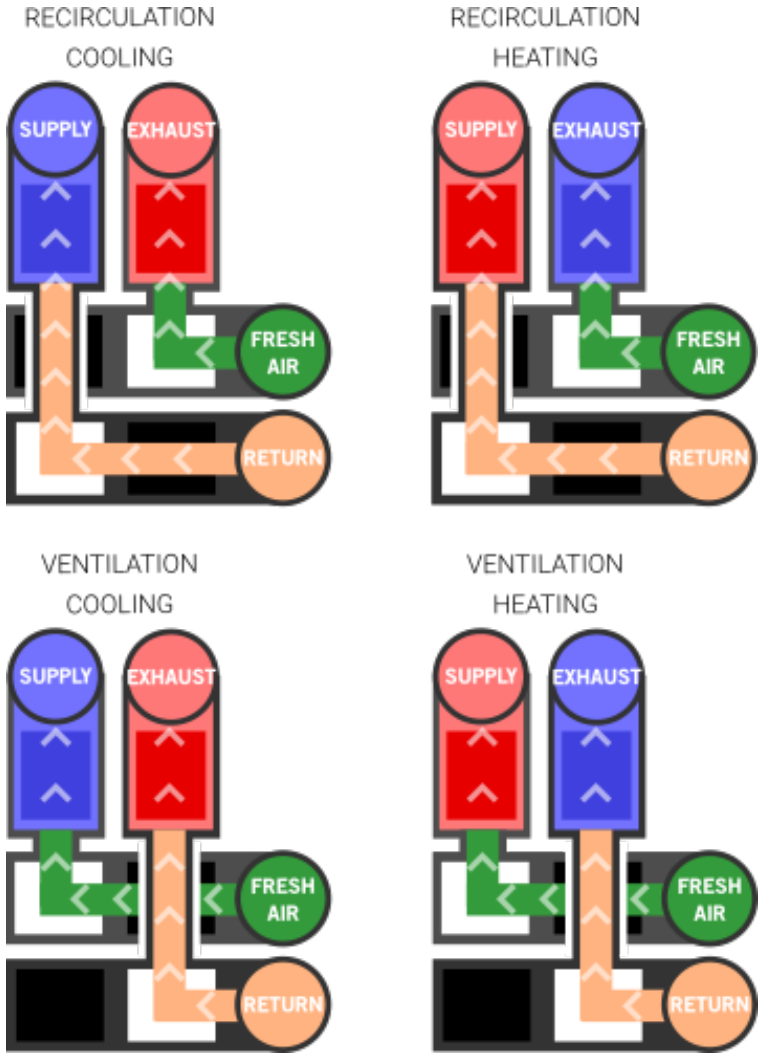


Return / Fresh Air Sensors



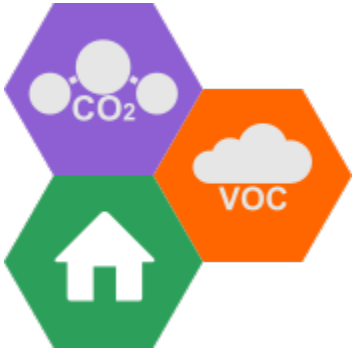
CERV2 Operation

CERV2 Operational Modes



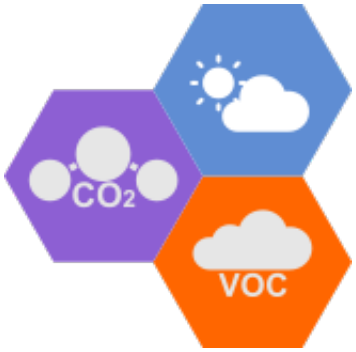
Monitoring

Indoor Air Quality



Temperature/Humidity

Optional Outdoor Air Quality



- Add on CO2 and/or VOC sensors for fresh air quality monitoring
- Locations with concerns about outdoor air pollution (wildfires, smog, etc)
- Modify ventilation based on outdoor air quality
- Change filters (charcoal) during outdoor pollution events

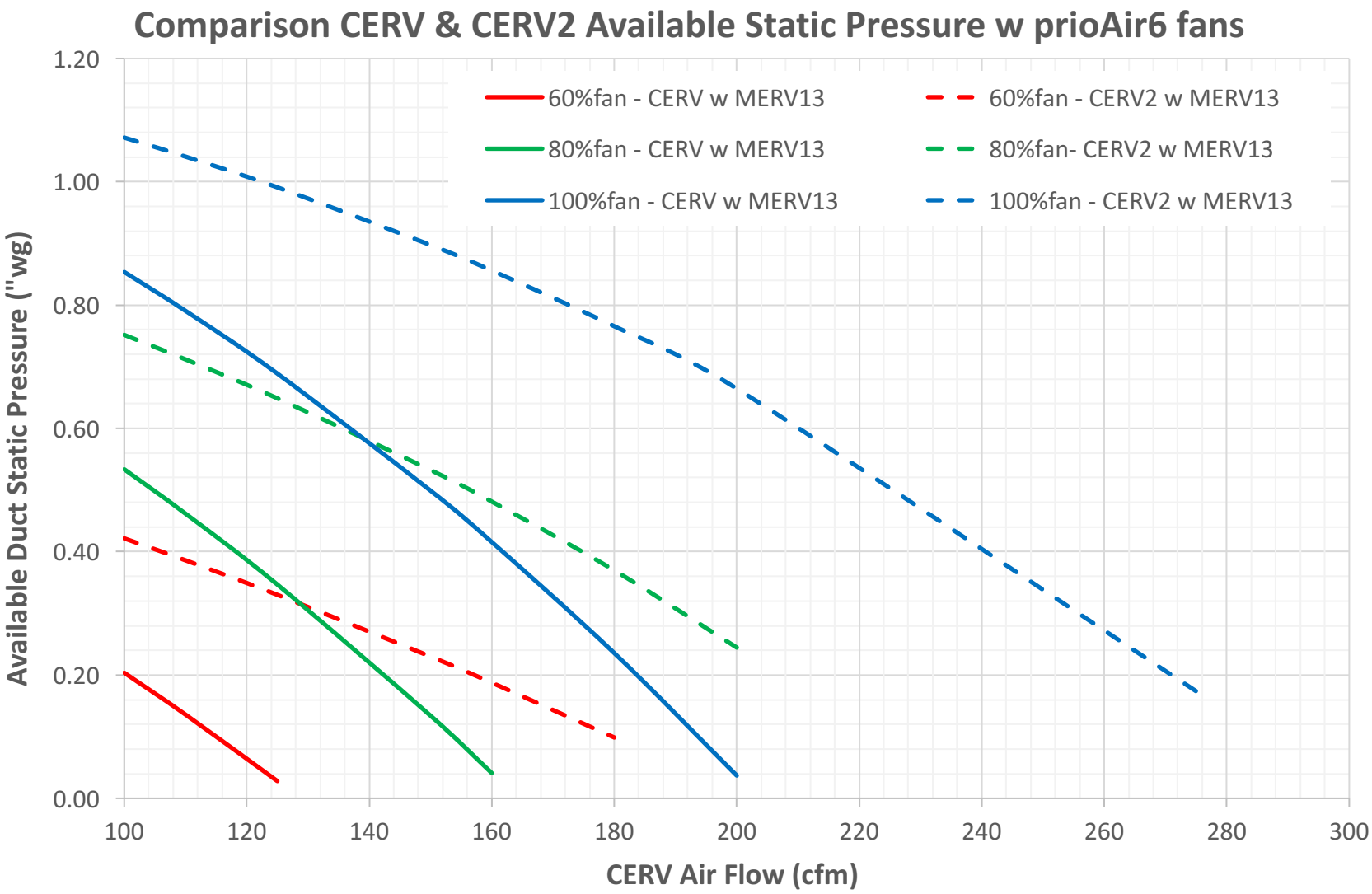
Performance Summary

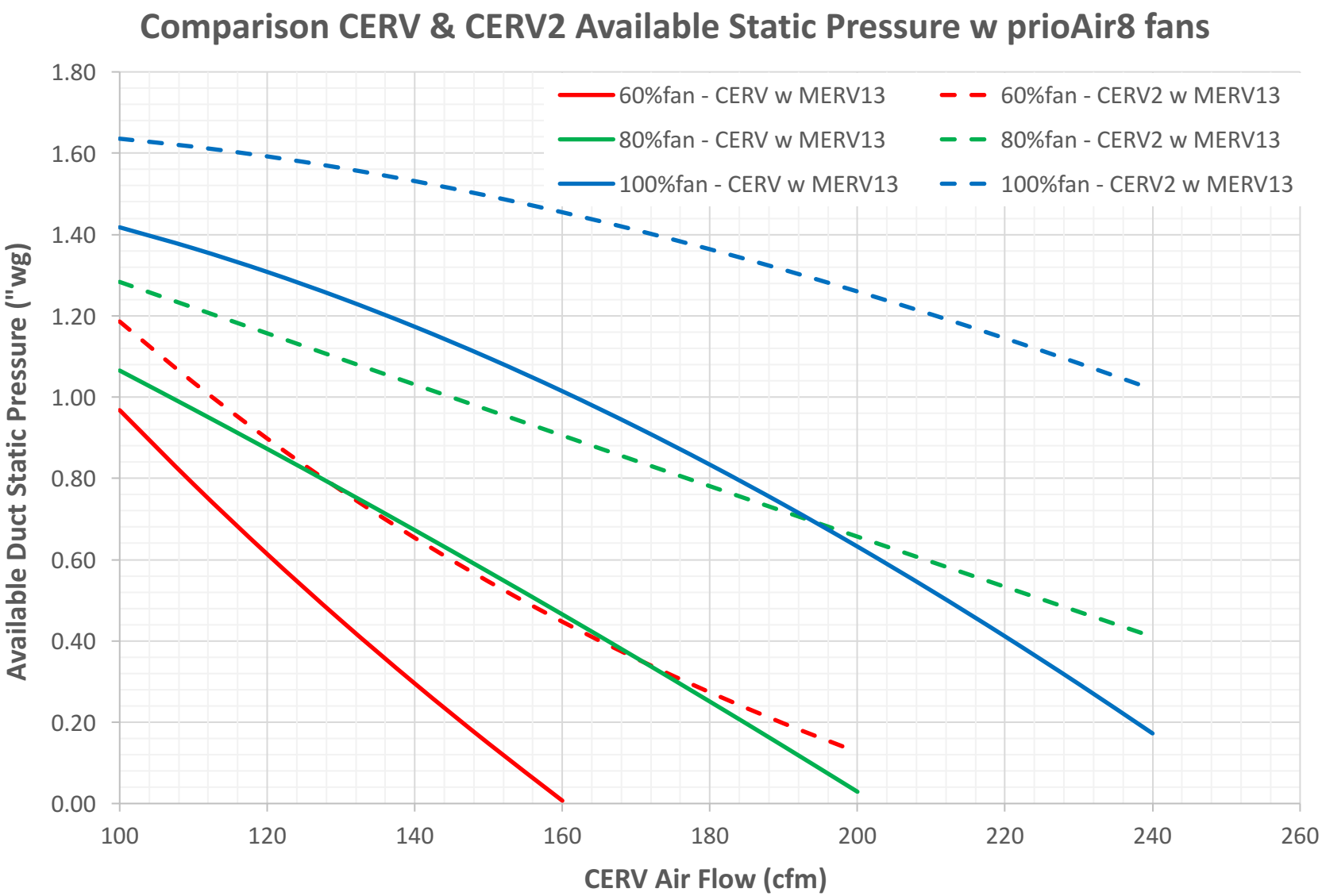
- Internal pressure loss is reduced
  - Better airflow capability
  - Fans operate at lower speed
  - Reduction in fan power

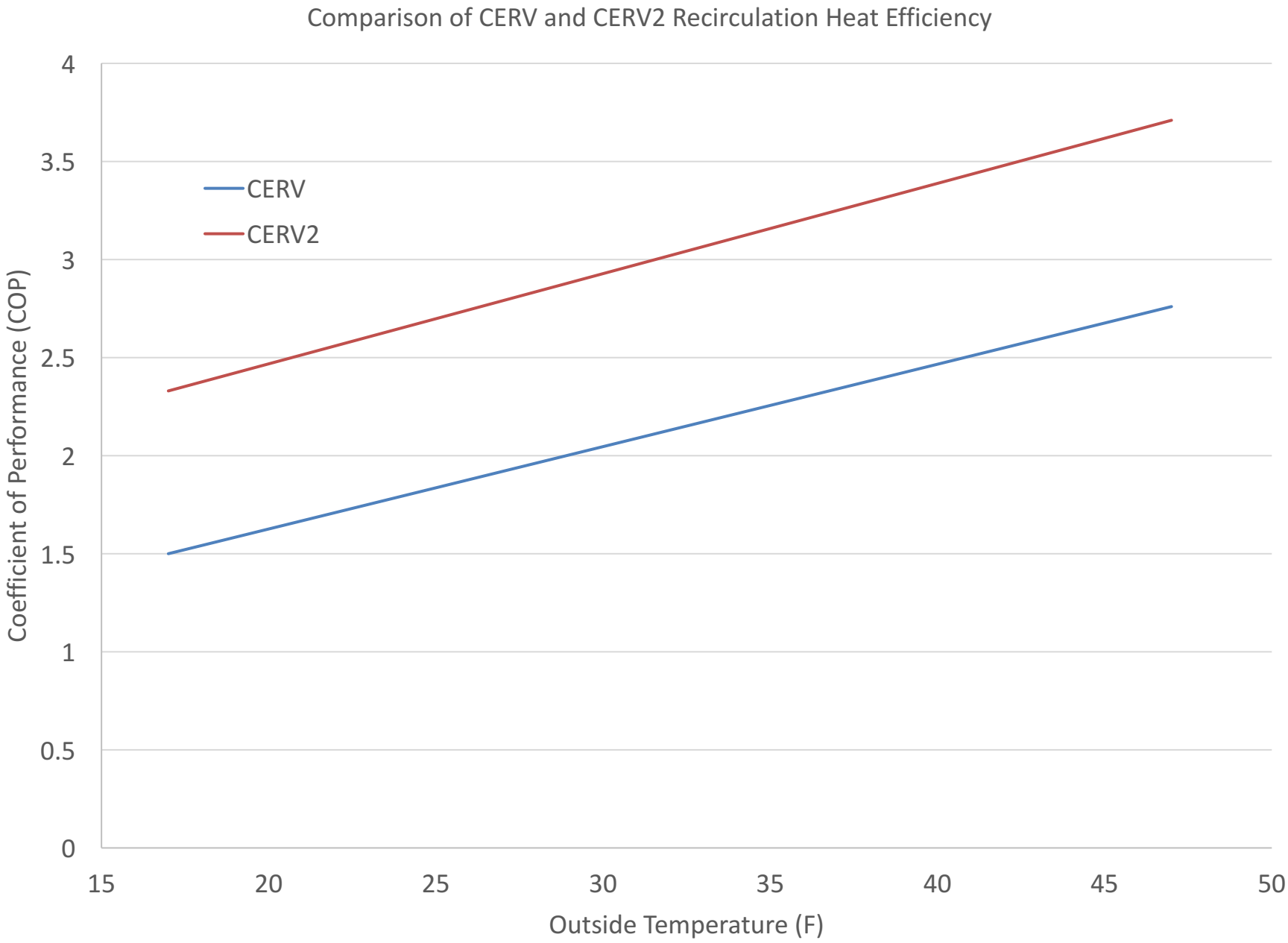
- CERV2 heating heat pump COP increase of 150%
- CERV2 has increased low temperature heating capacity

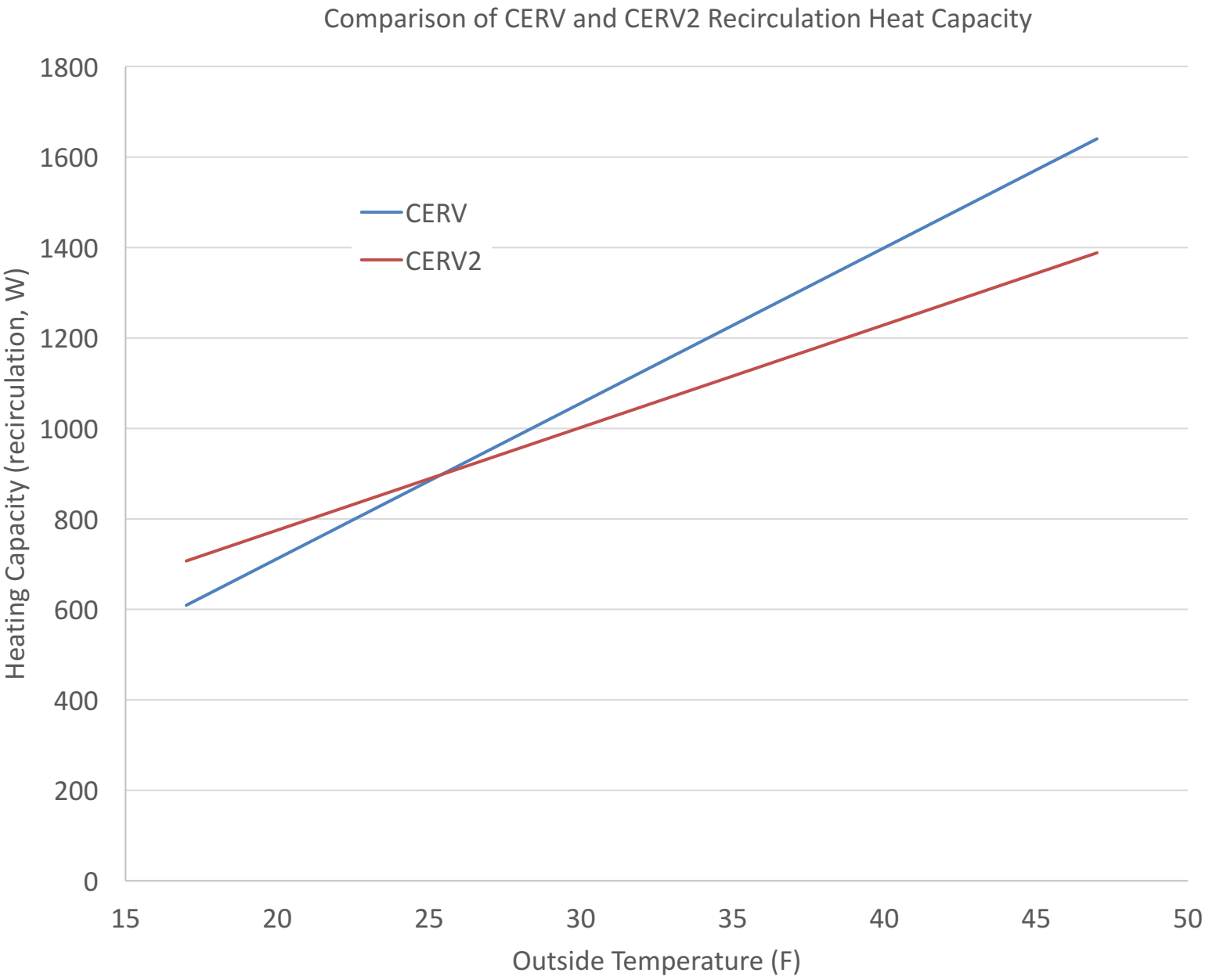
- CERV2 cooling heat pump COP increase 150%
- CERV2 cooling capacity similar to current 600-800W
- Latent removal ~10 liters per day

*Performance parameters are preliminary


Comparison CERV & CERV2 Available Static Pressure w prioAir6 fans
60%fan - CERV w MERV13
60%fan - CERV2 w MERV13
80%fan - CERV w MERV13
80%fan- CERV2 w MERV13
100%fan - CERV w MERV13
100%fan - CERV2 w MERV13
Available Duct Static Pressure ("wg)
1.20
1.00
0.80
0.60
0.40
0.20
0.00
100
120
140
160
180
200
220
240
260
280
300
CERV Air Flow (cfm)


Comparison CERV & CERV2 Available Static Pressure w prioAir8 fans
60%fan - CERV w MERV13
60%fan - CERV2 w MERV13
80%fan - CERV w MERV13
80%fan - CERV2 w MERV13
100%fan - CERV w MERV13
100%fan - CERV2 w MERV13
Available Duct Static Pressure ("wg)
1.80
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
100
120
140
160
180
200
220
240
260
CERV Air Flow (cfm)


Comparison of CERV and CERV2 Recirculation Heat Efficiency
Coefficient of Performance (COP)
4
3.5
3
2.5
2
1.5
1
0.5
0
CERV
CERV2
15
20
25
30
35
40
45
50
Outside Temperature (F)

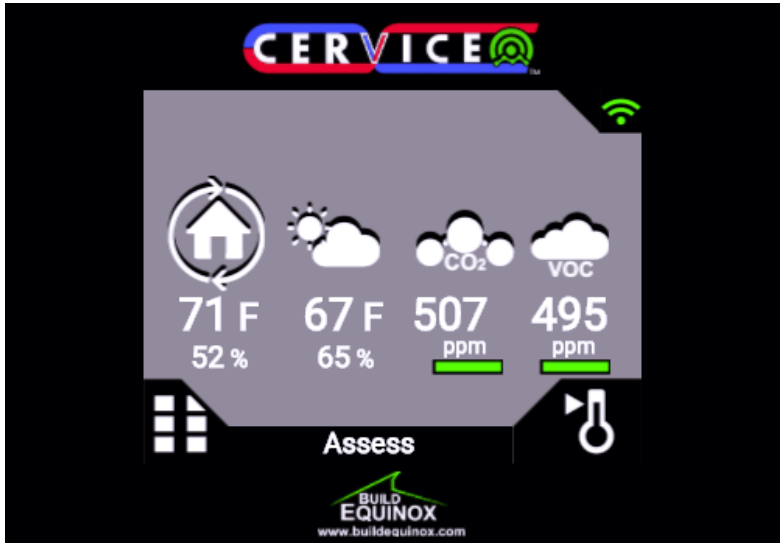

Comparison of CERV and CERV2 Recirculation Heat Capacity
Heating Capacity (recirculation, W)
1800
1600
1400
1200
1000
800
600
400
200
0
CERV
CERV2
15
20
25
30
35
40
45
50
Outside Temperature (F)

Features/Options

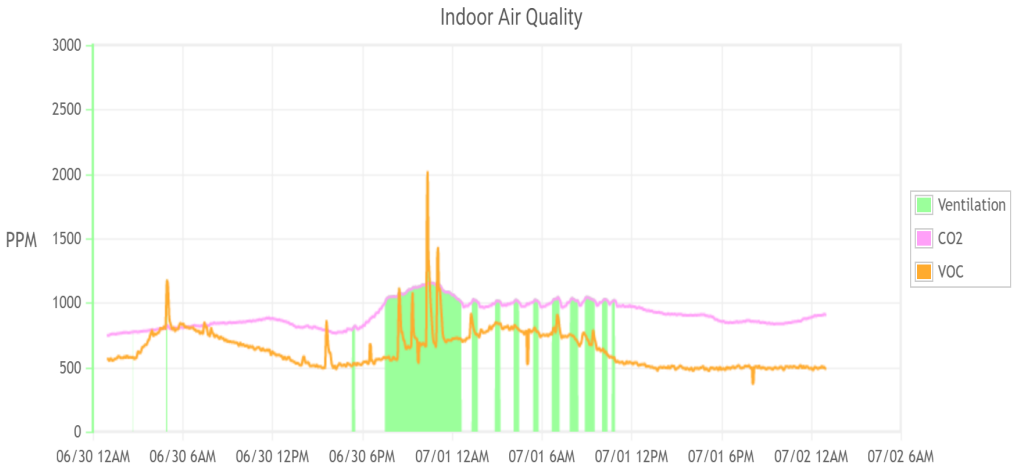
Built-In Communication

- Wifi and EnOcean communication are built-in standard
- CERV-ICE online interface for CERV control and historic data. It's free!
- OTA (over the air) software updates

With CERV-ICE your CERV will get better over time! Software updates and increased capabilities.

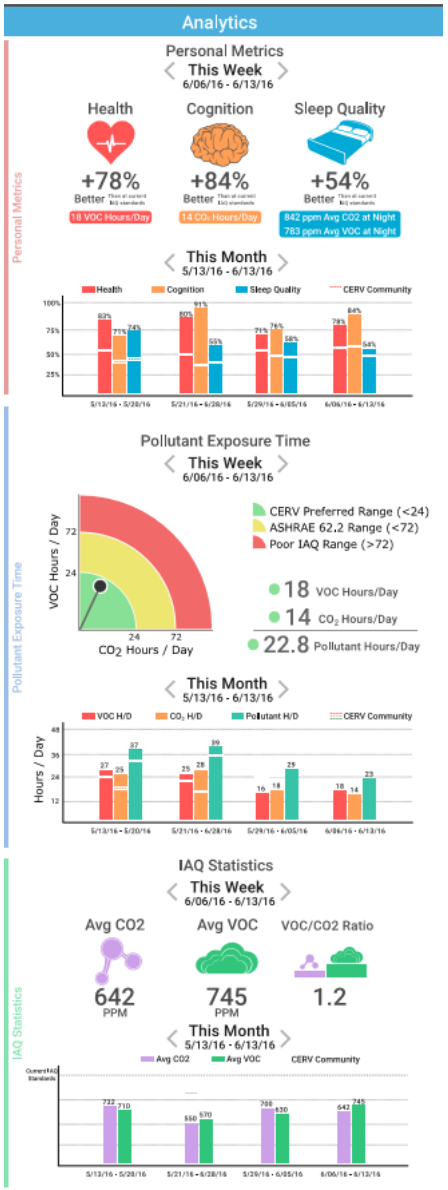


Online control

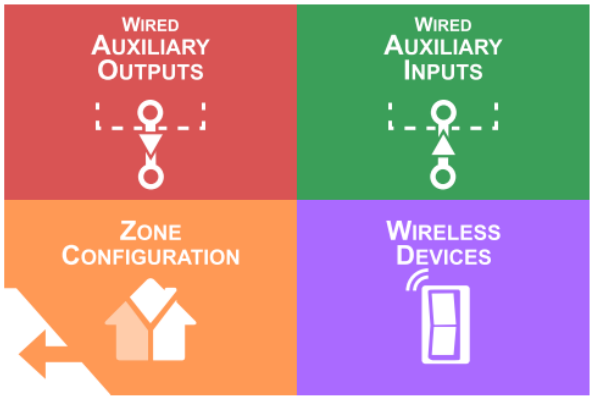


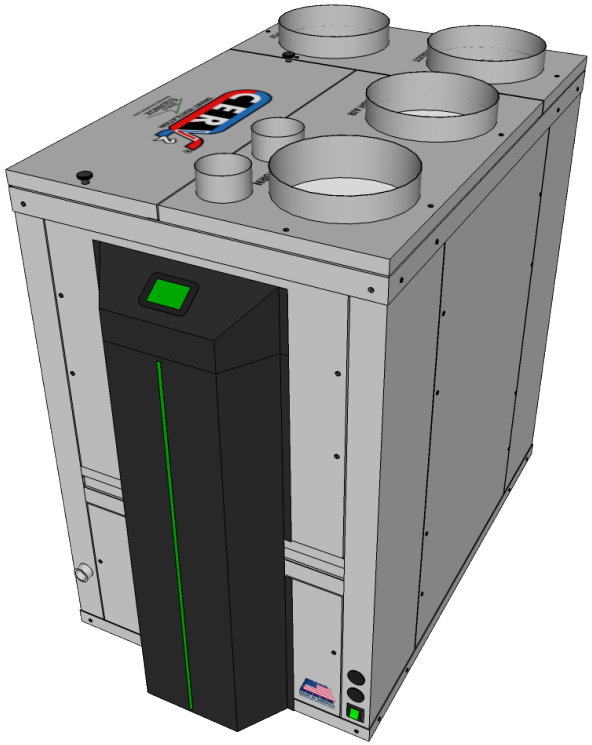
View and download historic data

Analytics home health reporting



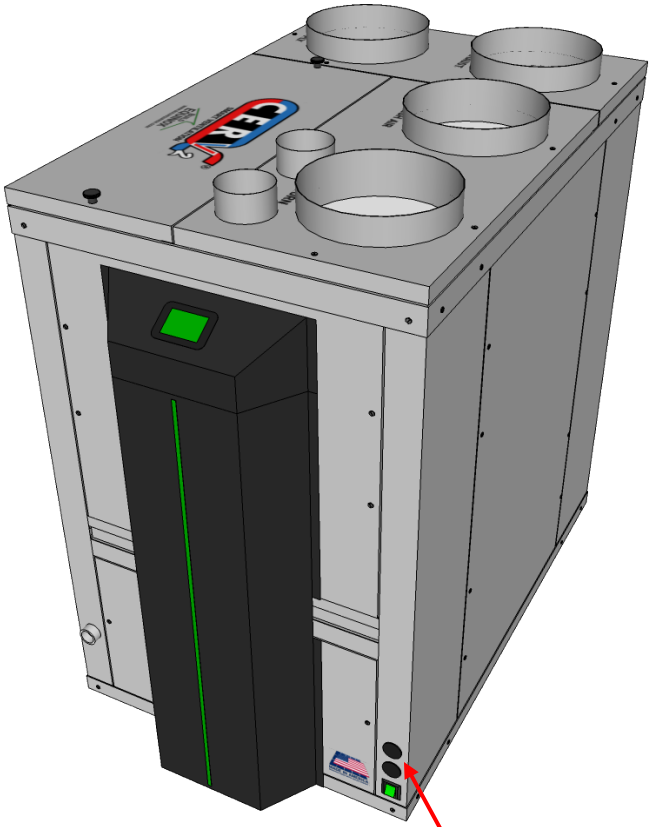
CERV2 Communication to the Outside





- Wifi
  - CERV-ICE for online control and monitoring
- Wired Inputs
  - CERV detects inputs from external devices to trigger operation modes
  - 24V sense
  - Dry contact
- Wired Outputs
  - CERV controls external devices
  - Dry contact – NO or NC
  - 24VAC output
- Wireless EnOcean Devices

CERV2 Wired I/O



Knockouts for making wired connections

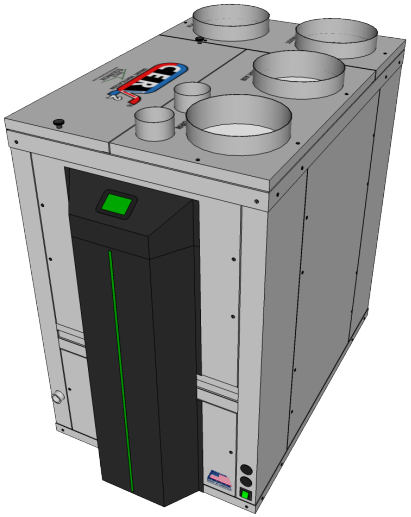
CERV2 I/O Built-in

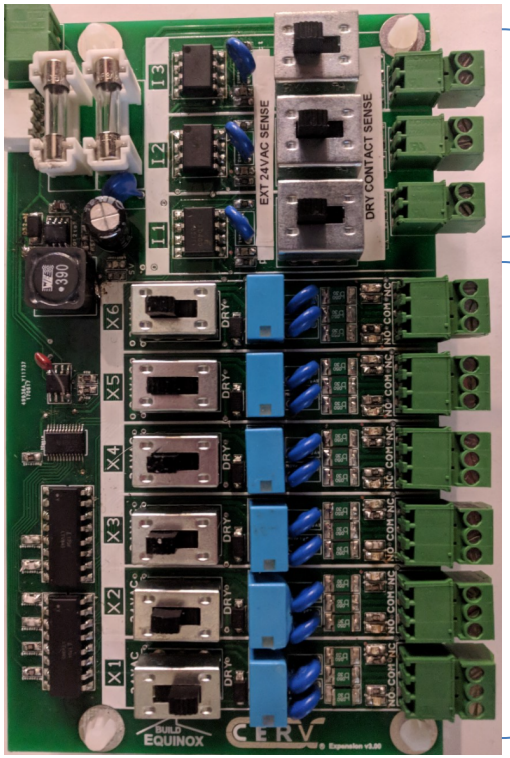
- One Output – X0
  - Dry contact NO, Comm, NC
  - Max 10A
- One 24VAC Output
  - Max 0.5A
- One Signal Input – I0
  - Dry contact or 24V sense
  - Max 24VAC

Expansion Board Option

I/O Expansion Board

An additional 3 Input Channels and 6 Output Channels for wired external connections





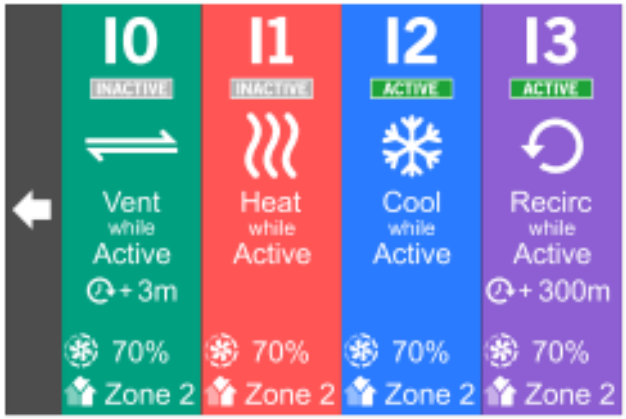
3 Input Channels

- Set to either dry contact or 24VAC sense

6 Output Channels

- Set to either dry contact or 24VAC output

Wired Inputs

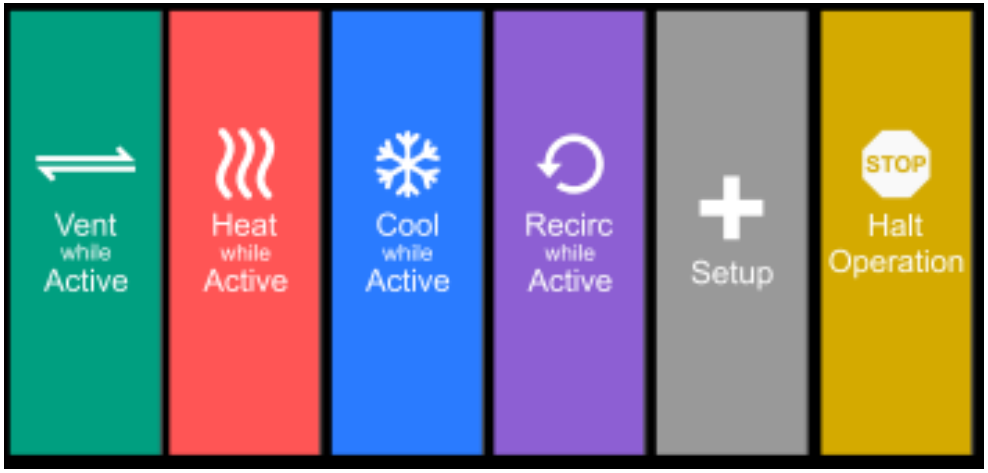


4 Input Channels with Expansion Board

- Set to either dry contact or 24VAC sense

- CERV detects inputs from external devices to trigger operation modes

- Trigger Modes
  - Vent
  - Heat
  - Cool
  - Recirc
  - Stop

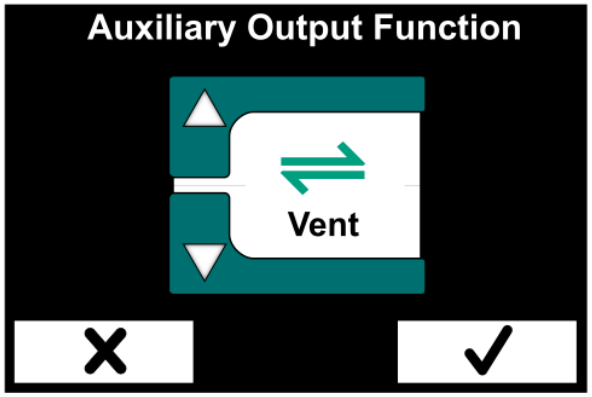


Wired Outputs

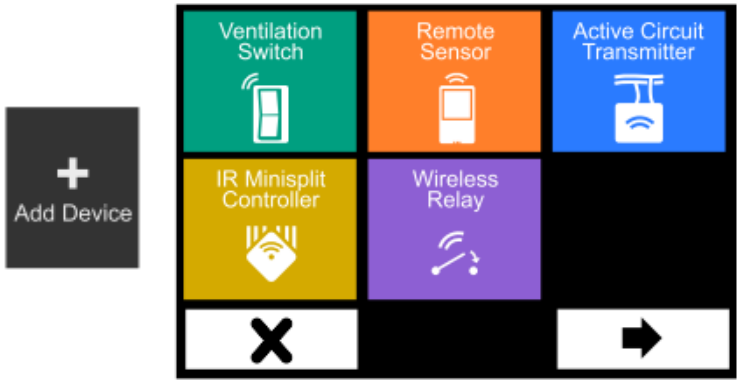
7 Wired Output Channels with Expansion Board

- Set to either dry contact or 24VAC output

- CERV triggers an external device
  - Heating
  - Cooling
  - Venting
  - Humidity
  - Geo-Boost
  - Zone Dampers
  - Fan Interlock



Wireless Devices



- EnOcean low power wireless communication
- Can add up to 18 wireless devices
- Use devices to trigger, sense, and control

Wireless Switches
- Trigger venting

Active Circuit Transmitters
- 24VAC/DC or 120-277VAC
- Sense when circuit is active (light, vent hood, etc)

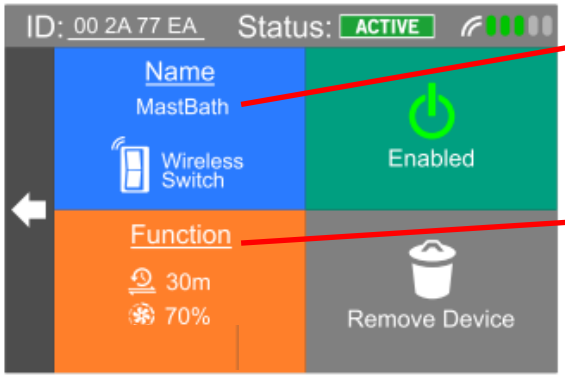
Remote Sensing
- Temp, humidity, CO2
- Pair with external heat, cool, dehum, vent control

Wireless Relays
- 24VAC/DC or 120-277VAC
- Trigger an external device
- Same config as wired aux

Remote Venting

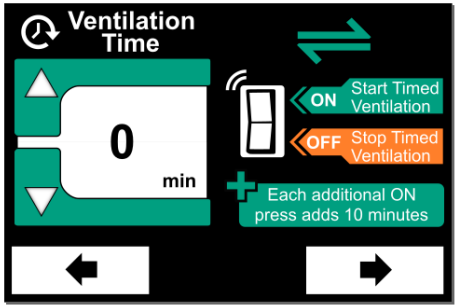
Wireless, battery free switch options for on-demand timed ventilation (i.e. kitchen, bathroom spot ventilation)

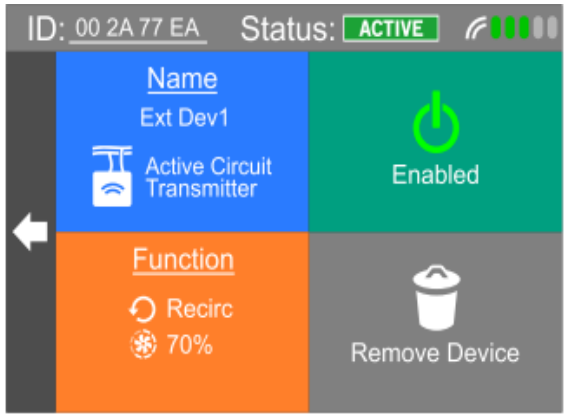
Wall switches or ACTs (active circuit transmitters)

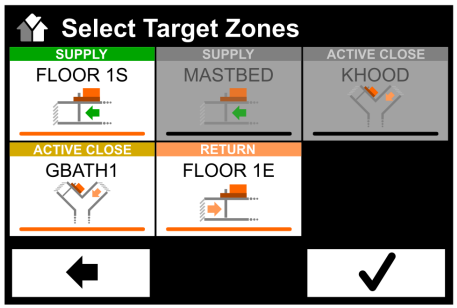


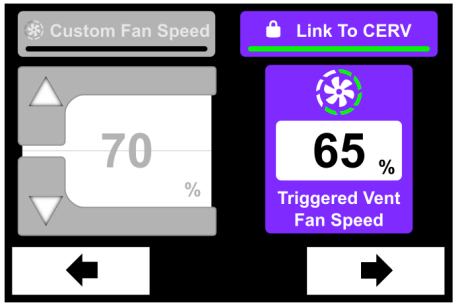
Add Custom Name

- Set vent length
- Set fan speed
- Set linked zone





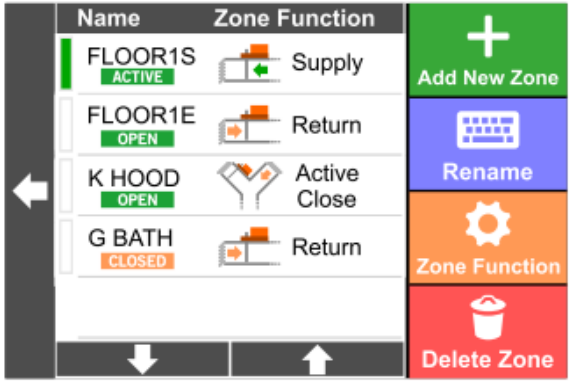


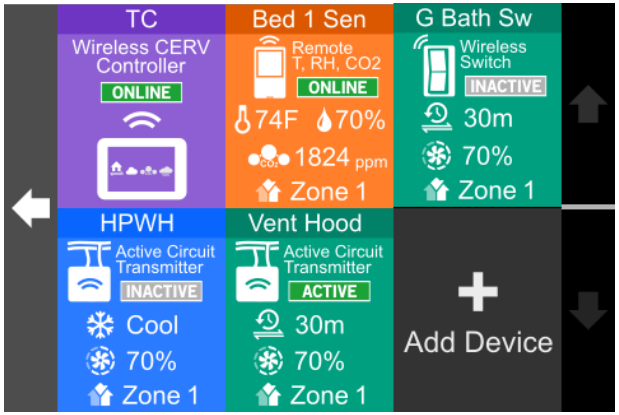


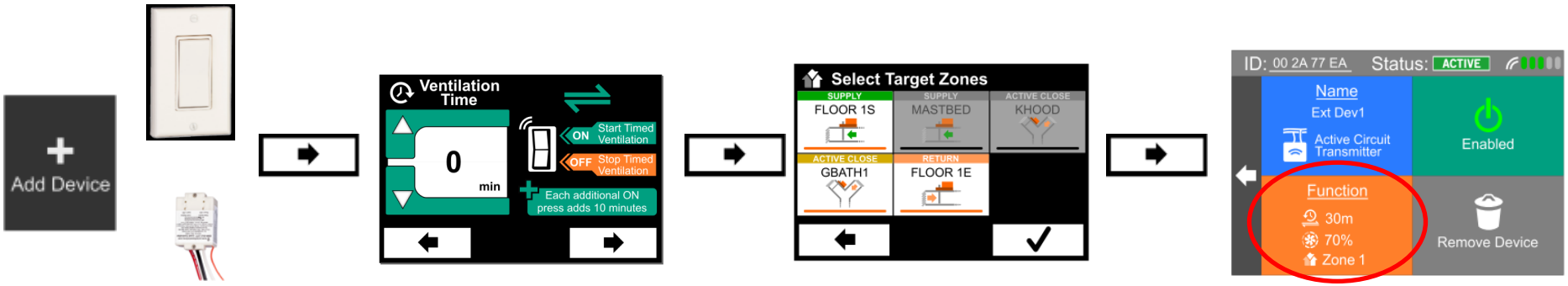
Zone Dampers

CERV2 has increased zoning capability

- Increases airflow to the specific zone when active
  - Link wireless switches to zones
  - Boost exhaust air from bathrooms/kitchens
  - Supply zones can direct fresh air to certain locations (bedrooms, living rooms)







Future

CERV, what's my air quality?

Availability

- Currently taking orders/ production underway – non-UL Listed systems
- Initial orders started shipping in March – non UL only
- UL Certification is underway
- Q1 ‘18 CERV2 UL Listing expected completion
- Q2 ‘18 transition production to UL Listed units

Stay Informed:

- Monthly Newsletter signup on our website http://buildequinox.com/#learnmore

- On website under "News" find past newsletter articles, archived webinar videos, and reports/publications
  - "New IAQ Metrics Webinar" has in depth information on air quality and CERV-ICE Analytics

- Contact us with any questions or for more information

Thank you!

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