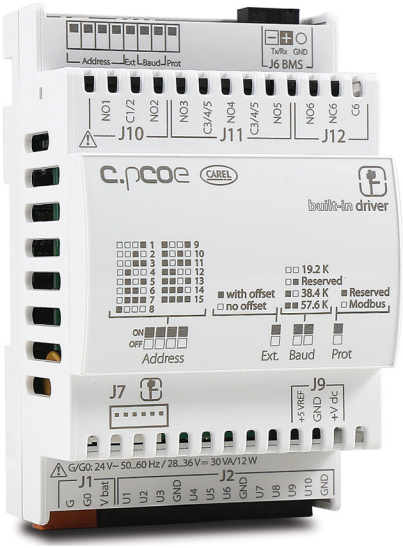
RenewAire®
Energy Recovery Ventilation

PREMIUM COMMERCIAL CONTROLS

Installation, Operation and Maintenance Manual

FOR HE1.5-8X, LE-Series, and RD-Series Units

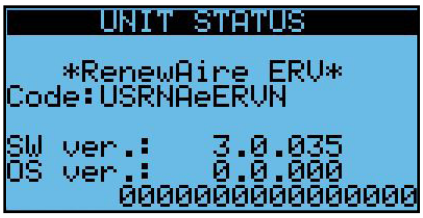
Carel c.pCO Mini



Carel c.pCOe Expansion Board

This manual applies to energy recovery ventilator (ERV) units with Premium controls version 3.xx.xx. For previous versions refer to the older manual. The version number can be seen on the splash screen when the unit power is cycled.

Newer units also have this version information in the *Unit Status* screens.



⚠ WARNING

ARC FLASH AND ELECTRIC SHOCK HAZARD

Microprocessor controllers as discussed in this manual are typically installed in a control panel where high voltages are present. Whenever accessing any controller, disconnect all electric power supplies, verify with a voltmeter that electric power is OFF and wear protective equipment per NFPA 70E when working within the electric enclosure. Failure to comply can cause serious injury or death.

The line side of the disconnect switch contains live high-voltage.

The only way to ensure that there is NO voltage inside the unit is to install and open a remote disconnect switch and verify that power is off with a voltmeter. Refer to unit electrical schematic.

Follow all local codes.

⚠CAUTION

RISK OF ELECTRIC SHOCK OR EQUIPMENT DAMAGE

Whenever electrical wiring is connected, disconnected or changed, the power supply to the ERV and its controls must be disconnected. Lock and tag the disconnect switch or circuit breaker to prevent accidental reconnection of electric power.

⚠CAUTION

RISK OF COMPUTER SECURITY BREACH

This controller is capable of being connected to a network. Any device that is connected to a network is susceptible to unauthorized access and hostile activities. It is the owner's responsibility to determine acceptable risks and to safeguard the security of the controller and all connected devices.

IMPORTANT

This controller is only for use in protected environments. It is not to be exposed to the weather or exposed to extremes in temperature.

IMPORTANT

Risk of degraded unit efficiency. Improper adjustment of unit setpoints may result in the ERV operating inefficiently. Improper selection of Input Offsets may cause incorrect or inefficient operation of the ERV.

IMPORTANT

Only persons who have been properly trained and authorized are to access the ERV control panel and the controller. Changes to the controller settings are to be made only by trained and authorized personnel. All changes to the controller settings are to be documented in the Controller Maintenance Records section in this manual.

IMPORTANT

This control system is subject to periodic updates in firmware and the User Manual itself. Please contact RenewAire Support at RenewAireSupport@RenewAire.com to determine if you have the most recent manual and firmware.

READ AND SAVE THIS MANUAL/LIRE ET CONSERVER CE MANUEL

NOTE: This page is to be completed by the installing contractor. The completed document is to be turned over to the owner after start up.

NOTICE

This manual contains space for maintaining written records of settings and changes. See Section 14, Maintenance Records. At the time the ERV is commissioned, a complete record (an operating parameter file) should be made of all settings, to include setpoints and offsets. Whenever changes are made to the controller data points, those changes should be recorded, along with the reason for the change.

Information that is recorded is specific to just one ERV or controller. If additional controllers are being documented, please make copies of these pages and identify each copy by its unit tag.

UNIT INFORMATION

Record information as shown below.

In the unlikely event that factory assistance is ever required, information located on the unit label will be needed.

Locate the RenewAire unit label found on the outside of the unit.

NOTE: This information is for purposes of identifying the unit-specific option data from the Configuration Code.

Configuration Code:

					J								-						-	-		

Serial Number:

SO #:

NOTE: When the ERV is first connected to electric power, the unit is to be started only for purposes of testing correct wiring and to verify correct operation of the fans and dampers.

UNIT INFORMATION

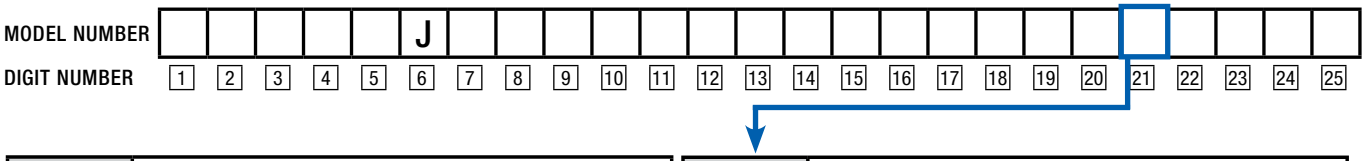
UNIT LABEL (TYPICAL)

NOTICE

Whenever an operating parameter file is created in the controller internal memory, a backup file should be created on an external memory device and stored in some convenient place.

CONFIGURATION CODE

Refer to Section 15, Reference in this manual for the full interpretation of the various configuration codes.



Digits 1–5:	Model
"EV450", "HE-1X", "HE1.5", "HE-2X", "HE-3X", "HE-4X", "HE-6X", "HE-8X"	

Digit 21:	Unit Control Enhancements (see Restrictions 16 & 22)
"T" = Transformer with Isolation Relay (Standard) "1" = Enhanced Controls "2" = Premium Controls "3" = Enhanced Controls with BACnet License "4" = Premium Controls with BACnet License	

TABLE OF ILLUSTRATIONS

1.0 OVERVIEW

1.1 CONTROL SEQUENCE OVERVIEW

NOTE: This unit has a microprocessor controller. It is commonly referred to as a "controller."

NOTE: Many of these control features require the use of optional sensors. The unit configuration will determine the availability of some functions.

The Renewaire ERV with premium controls provides outdoor air while saving energy by passing the Exhaust Air through the energy recovery core to exchange energy with the incoming air, with energy being passed to the incoming air in the winter and energy being passed to the outgoing air in the summer. Pairing this with the factory-programmed premium controller provides an excellent turn-key solution with the following control options.

1. Turning the unit off and on based on
    - A digital input (smoke detector, occupancy sensor, etc)
    - The controller keypad
    - Schedule
    - A BMS system, if the feature is enabled
    - CO2 level, if the feature is enabled
2. Isolation damper control (if option is included)
3. Supply and exhaust fan control
    - On/Off fan control for constant speed fans
    - Variable speed fan control for variable speed and ECM fans (set as a percentage)
    - Variable speed fan control for variable speed fans as a CFM reading
    - Exhaust fan tracking
    - Fan control based on CO2 or VOC levels (with optional sensor added)
    - Fan control based on space or duct pressure levels (with optional sensor added)
    - Single fan operation with digital input or BMS command
4. Supply and Exhaust Fan status via current sensors
5. Monitoring of these values
    - Outdoor Air (OA) Temperature
    - Outdoor Air (OA) Relative Humidity
    - Return Air (RA) Temperature
    - Return Air (RA) Relative Humidity
    - Supply Temperature (SA) before tempering
    - Exhaust Temperature (EA)
    - Supply Air CFM
    - Exhaust Air CFM
    - User-supplied CO2 or VOC sensors
    - User-supplied Room or Duct Pressure sensors
6. Monitoring of pressure across filter for filter status
7. Bypass control (with external bypass option) for frost control/economizer control
8. Control for added heating (additional Conditioned Air Temperature sensor required)
    - 0–10V Gas or Electric
    - One- or two-stage Heat Pump
    - 10-0V Hot water valve control
    - Control based on Supply or Return Air
    - Setpoint can be reset off Outdoor Air temperature
9. Control for added cooling (additional Conditioned Air Temperature sensor required)
    - 0–10V chiller water valve
    - One- or two-stage compressor/heat pump
    - Control based on Supply or Return Air
10. VRF Control Sequence
11. Dual Temp Coil (using BMS command for heat/cool signal)
12. Alarm alerts and logging

1.2 ENERGY RECOVERY BASICS

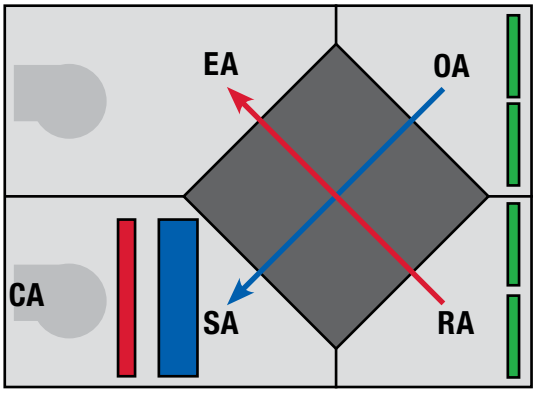
IMPORTANT

It is important to understand and use the equipment airstream terminology as it is used in this manual. The airstreams are defined as:

- Outside Air (OA): Air taken from the external atmosphere and, therefore, not previously circulated through the system. Each ERV unit has an OA air inlet.
- Supply Air (SA): Air that is downstream of the enthalpic cores and is ready for conditioning.
- Conditioned Air (CA): Air that is supplied to an occupied space.
- Return Air (RA): Air that is returned to a heating or cooling appliance from a conditioned space. When the ERV unit operates in recirculation mode, RA is conditioned and returned to the occupied space in the form of CA. Each ERV unit has an RA inlet.
- Exhaust Air (EA): Air that is removed from a heating or cooling appliance and discharged. Each ERV unit has an EA outlet.

RenewAire energy recovery ventilators use static-plate, enthalpy-core heat exchangers that have no moving parts.

- During summer months, the hot and humid OA passes by the cooler, drier RA, lowing its temperature and humidity.
- During winter months, the cold and dry OA passes by the warmer, moister RA, raising its temperature and humidity.



NOTE: If an optional internal heating device is selected the CA duct sensor may need to be installed at least three duct diameters away from the ERV unit CA outlet.

1.3 TEMPERATURE SENSORS

There are four temperature sensors installed in each ERV. These are NTC sensors that have a Carel curve. The curve characteristics can be found in the Reference section. They are located at:

- One at the inlet side of the EA Fan cone
- One at the inlet side of the SA Fan cone
- One at the entrance of the air intake to measure outdoor air (OA) temperature
- One at the entering RA duct of the unit

If a unit has heating and/or cooling, there is also a fifth CA sensor that is required. It needs to be installed down the duct past the heating and cooling.

FIGURE 1.3.0 DUCT TEMPERATURE SENSOR

1.4 COMBINATION TEMPERATURE AND HUMIDITY SENSORS

Humidity transducers are mounted in the OA and RA compartments and provide an output from 0–10VDC that is proportional to 0–100% Relative Humidity.

FIGURE 1.4.0 TEMPERATURE AND HUMIDITY SENSOR

1.5 SENSOR LOCATIONS

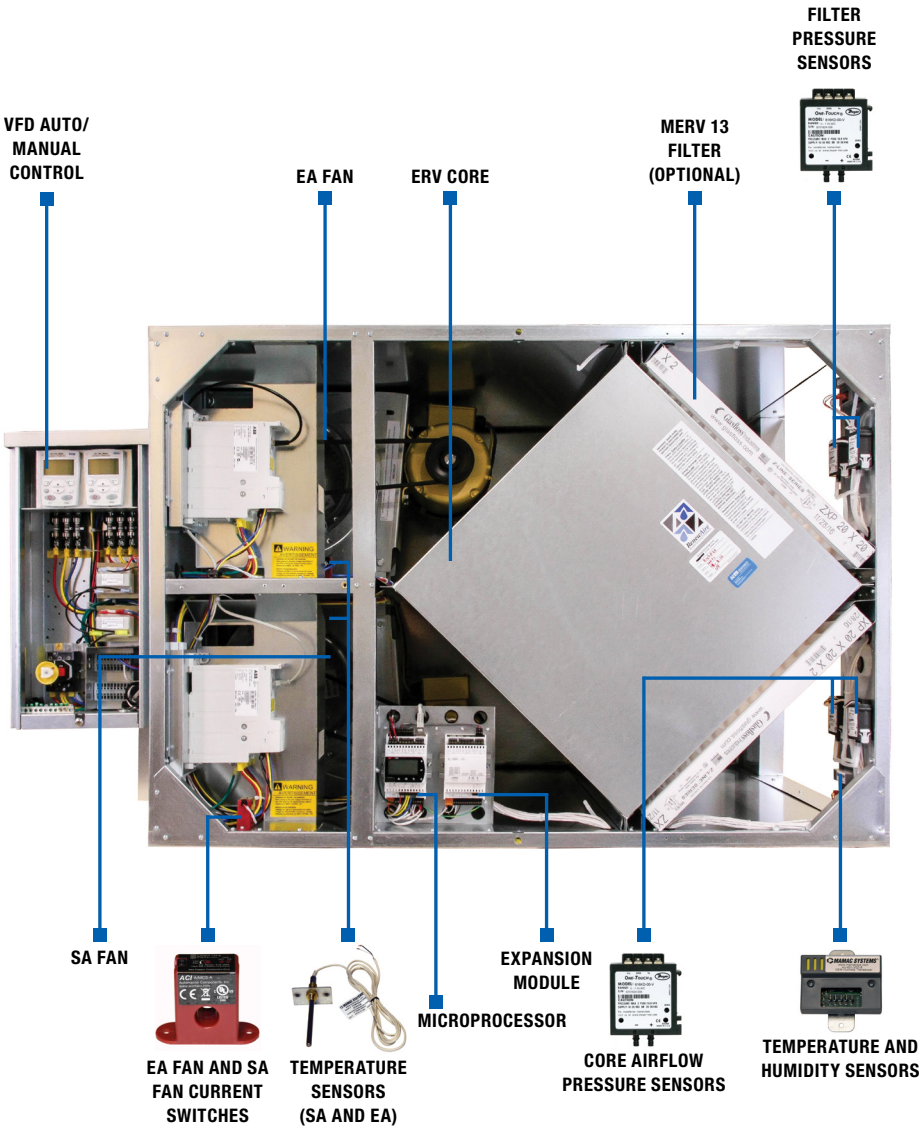
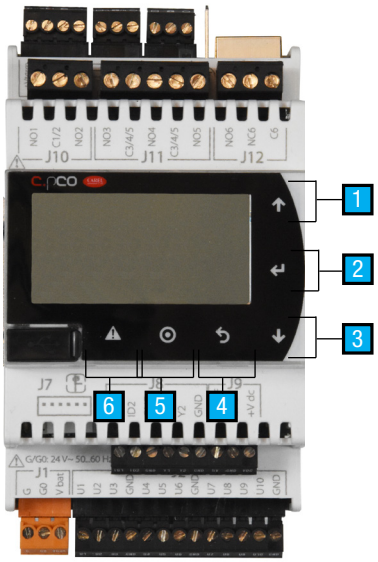


FIGURE 1.5.0 SENSOR LOCATIONS IN ERV UNITS, HE2XINH SHOWN

NOTE: Not shown here are the Smoke Detector, CO2, IAQ, Duct Pressure Sensor, Room Temperature and Humidity Sensor, and Motion Detector. These items are all accessories and are field-installed.

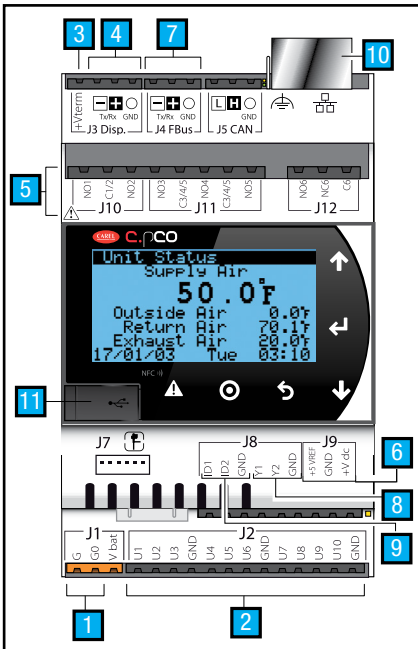
2.0 CONTROLLER OVERVIEW

The control utilizes the Carel c.pco (pronounced see-pee-ko) controller with the c.pcoe expansion module.



1	Up Button
2	Enter Button
3	Down Button
4	Escape Button
5	Program Button
6	Alarm Button

FIGURE 2.0.0 C.PCO CONTROLLER BUTTONS

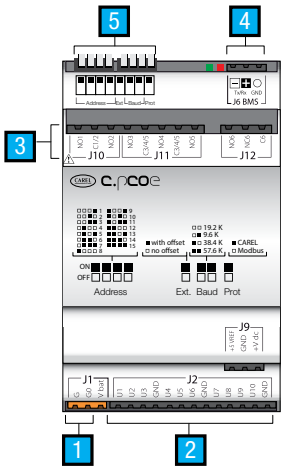


1	24VAC Power
2	Universal inputs/outputs
3	Power for RUT remote display
4	Remote display or BMS connection
5	Relay digital outputs
6	+5V power supply
7	FBUS connection to expansion module
8	Analog outputs
9	Digital inputs
10	Ethernet port
11	Micro USB port

FIGURE 2.0.1 CONTROLLER EXTERNAL CONNECTIONS

The c.pCOe expansion module has multiple digital and analog inputs and outputs, serving as an extension of the controller. The expansion board provides:

- Heating and Cooling Control
- Monitor Airflow Rates, Temperatures, and Pressures



1	24VAC Power
2	Universal inputs/outputs
3	Relay digital outputs
4	Serial connector to main controller
5	Dip switches

FIGURE 2.0.2 EXPANSION MODULE DETAIL

NOTE: Expansion module DIP switches are factory set to address 5, No Offset, 19.2K, and Modbus. These settings should not be changed.

NOTE: Dip switch positions (Left to Right) are always set as follows:

Forward
Backward
Forward
Backward

Forward
Forward
Forward
Forward

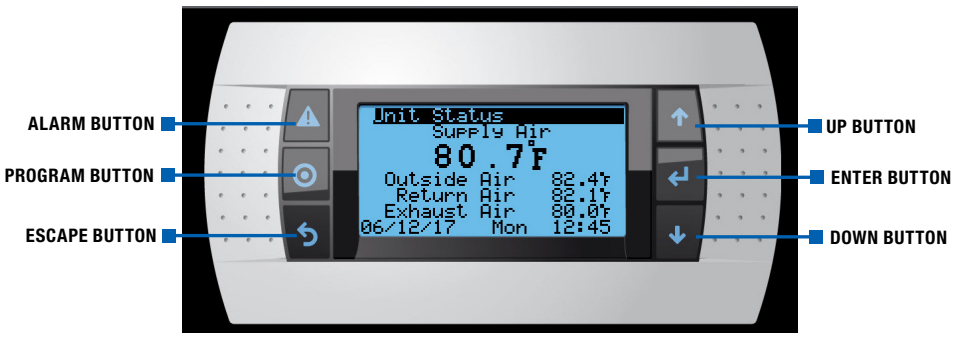


FIGURE 2.0.3 OPTIONAL REMOTE USER TERMINAL (RUT) BUTTON LOCATIONS

Pressing the PRG (program) button accesses the Service Menu or Login screen from any location in the user interface screens. The options that are available dynamically change depending on the configuration of the unit and the options installed on the unit.

The ESC button is used to go one level back from the screen the user is currently on. If the user is finished setting variables in a sub-menu, the ESC button takes them back to the previous menu. If the user is editing a variable and decides to not make a change, the ESC button takes them back to the top of that screen. Pressing the ESC button from the Main Menu takes the user back to the Main Status screen.

When on a screen with the cursor in the upper left-hand corner,the UP or DOWN hard buttons move the user from one screen to the next. While editing a variable, the UP or DOWN hard buttons allow the user to set the desired value of the variable. When viewing a view only variable, the UP or DOWN hard buttons scroll through the values available to the user.

When a menu or menu item has been highlighted, press the “ENTER” hard button to enter the highlighted selection. When a writable entry has been changed, press the hard button to enter the new value and then press it again to confirm the change.

Pressing the ALARM button displays any alarms that are currently active. There may be multiple screens of alarms. Pressing and holding the Alarm button for three seconds resets the alarms.

NOTE: When an alarm is first detected, the Alarm button will be flashing and an audible alarm will sound. After the alarm has been viewed, the light will remain on and the audible alarm will stop.

2.1 CONTROLLER ACCESS METHODS

The controller has a built-in display that can be used to set up the system and view the status of the system as well as address alarms. Two other options for accessing these are through the remote RUT and through the embedded web pages. All three methods use similar keys for the same purpose.

2.1.1 Using the Remote User Terminal (RUT)

The Remote User Terminal (RUT) allows you to plug into a controller and see the screens from that controller. RUTs are connected to the controller by means of a 10' cable and then used as hand-held devices. They can alternately be installed on a wall in some convenient location. The push buttons on the face of the RUT have the same functions as the push buttons on the controller.

FIGURE 2.1.0 OPTIONAL REMOTE USER TERMINAL (RUT)

The RUT (optional accessory, field-installed) plugs into the controller by means of a six wire cable with RJ12 jacks on each end. The six-wire cable is inserted in the RJ12 jack on the back of the RUT and the other end of the cable is inserted into the RJ12 adapter. The controller uses a pre-configured cable that plugs into the J3 jack on the controller and the other end is plugged into the RJ12 adapter. The cable looks similar to a standard phone cable but has a different pin out. The cable and coupler from the controller to the low voltage electrical box is included with the RUT.

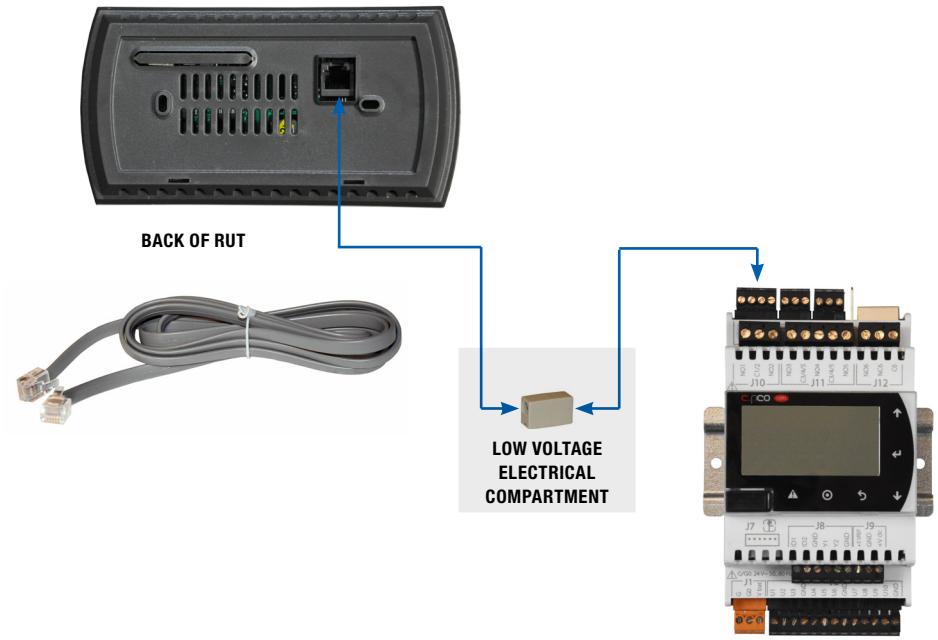


FIGURE 2.1.1 CONNECTING A RUT

NOTE: Common telephone wiring is 4 conductor and uses RJ11 terminals. It is different from the six-wire cable with RJ12 terminals needed for this accessory.

NOTE: If the controller was ordered for use with a serial BMS and an RUT is also desired, contact the factory for further information.

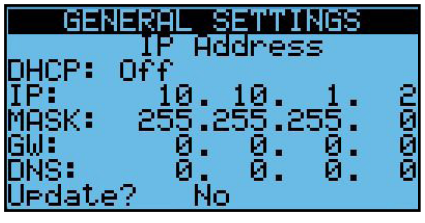
NOTE: For direct connection from RUT to J3 Terminal, use the following wiring:
Green & Black = +Vterm
Brown & Blue = GND
Red = Negative (-)
White = Positive (+)

2.1.2 Connecting Using Internal Web Pages

The controller has embedded web pages and when they are accessed, an interactive screen appears that allows the user to move through all the controller menus. The IP address of the controller is factory-set at 10.10.1.2. The subnet address (needed for setting up a LAN) is set at 255.255.255.0. These can be changed in the *General Settings* menu.

In order to connect to the controller with your pc you will need:

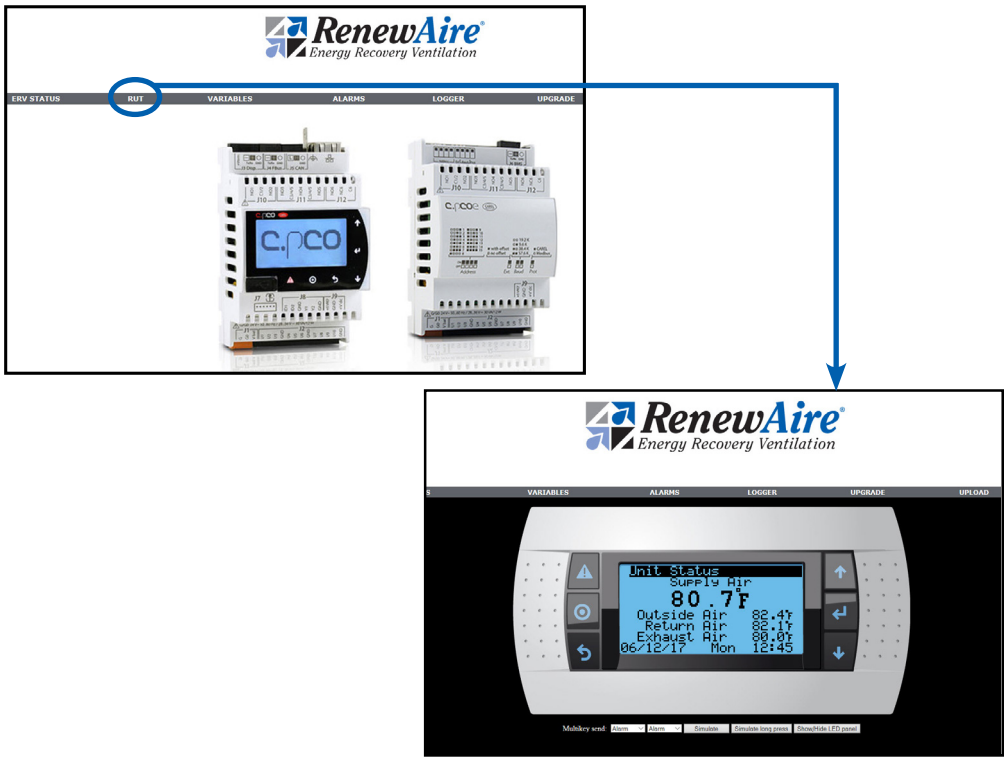
- An ethernet cable between the PC and the controller
- The PC connection must be on the same subnet as the controller. For example, if using the defaults, you would set the IP address of the PC connection to 10.10.1.xx where xx is not equal to 2, and the subnet to 255.255.255.0. (See directions for setting the PC IP address if you are not familiar with this.)



NOTE: The controller will only support private IP addresses which start with 192, 172, or 10.

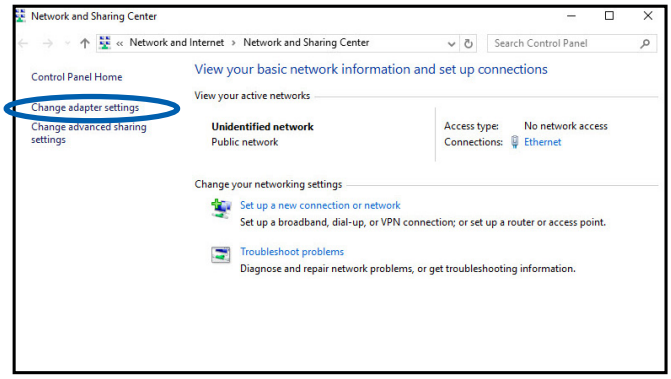
- Using a browser such as Chrome, put the controller IP address into the address bar.

You should see this web page. To get to the menu screens, click on RUT on the Menu Bar.

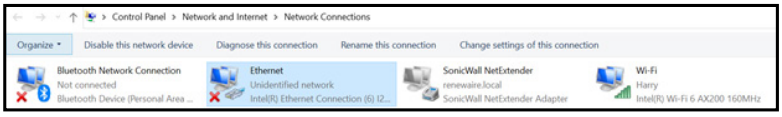


2.1.3 Setting the PC IP Address

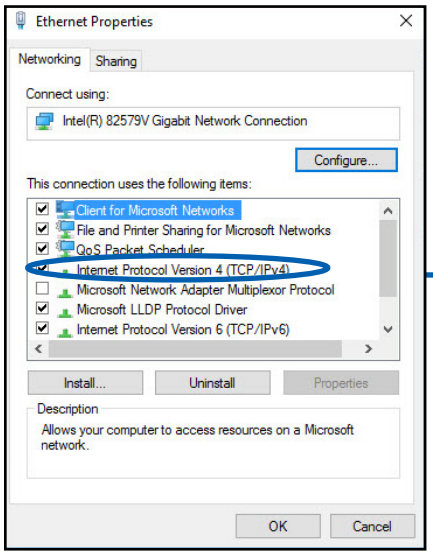
For those that are not familiar with changing their PC adapter settings, go into Network Setting in the Control Panel and *Change Adapter Settings*.

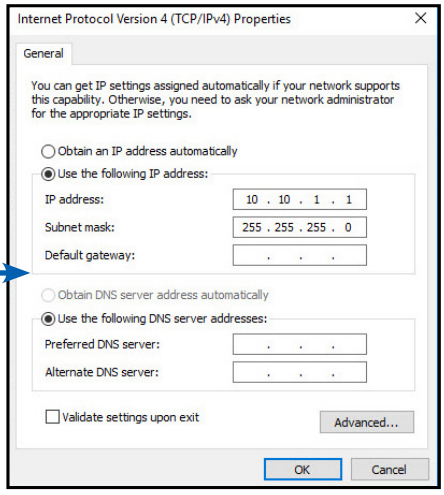


Choose the adapter you are using to connect to the controller.



Select Internet Protocol 4 and click on Properties.



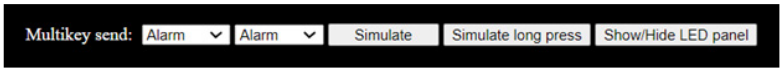


NOTE: When you are finished viewing the controller on your computer, remember to restore the original settings.

Enter the IP address you want to use. It should not be identical to the controller IP address. The last octet of the IP address should be different. Click OK.

2.1.4 Using the Multikey Function of the Web Pages

When you want to press multiple keys or press a key longer for a function you can use the keys below the Menu Screens to do this.



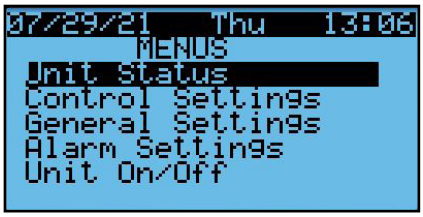
Two common uses are:
- Set the two keys to Alarm and Alarm and press *Simulate long press* to acknowledge alarms.
- Set the two keys to Alarm and Enter and press *Simulate long press* to get to system menus.

2.2 CONTROLLER MENU STRUCTURE

Any screen will have the name of the menu to which it belongs on the top line of the screen.

2.2.1 User Menu Structure

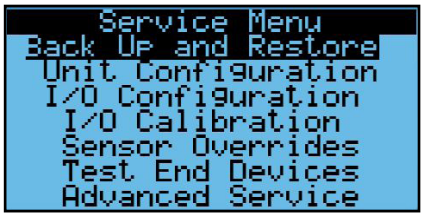
The user menu can be reached but pressing the ESC (back) button. The menus contain the following areas:
- *Unit Status*—Contains the status values of the sensors, fans, and heating and cooling, if applicable
- *Control Settings*—Contains the control settings for the fans and heating and cooling, if applicable
- *General Settings*—Contains the clock settings, Unit of Measures, IP Address, BMS settings, and the scheduler
- *Alarm Settings*—Contains the alarm settings
- *Unit On/Off*—Allows the user to turn the unit on and off via the keypad



2.2.2 Password Protected Menu Structure

The password protected menu can be reached but pressing the PROG button and entering the password. The menus contain the following areas:

- Back Up and Restore—Contains the screens to back up your settings or return to factory defaults
- Unit Configuration—Main Unit Configuration Settings that determine which screens show up in other areas
- I/O Configuration—Secondary configuration settings for functions
- I/O Calibration—Allows sensors to be adjusted for accuracy
- Sensor Overrides—Allows a sensor value to be temporarily overwritten for testing
- Test End Devices—Allows outputs to be manually manipulated for troubleshooting
- Advanced Service—Advanced Service Information and Settings

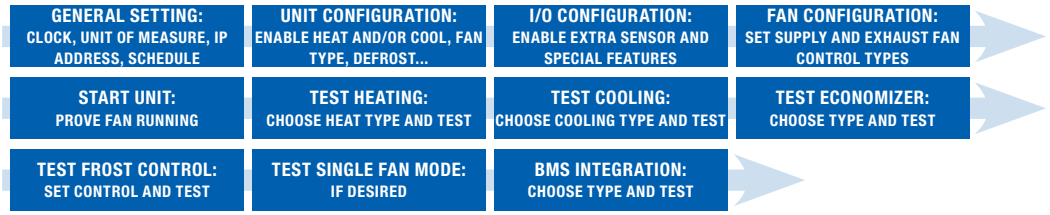


2.2.3 Password Entry

To access the password protected service screens, press the program (bullseye) button to get to the screen and enter the user password “1000.”

3.0 GENERAL FLOW FOR SETUP AND RUNNING UNIT

Depending upon features selected for the unit, the general flow for setup and running the unit is as follows:



4.0 UNIT CONFIGURATION

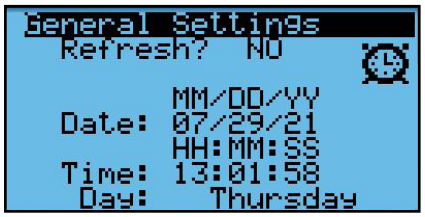
4.1 CONFIGURE GENERAL SETTING

There are several general settings that are need for correct operation of the controller.

4.1.1 Setting the Time and Date

It is important to have the correct time and date for alarm time stamps and logging.

- Set Refresh to YES, It will turn back to NO after changing the display to the current controller time and date.
- Change the Time ad Date accordingly. (Day is automatically generated.)

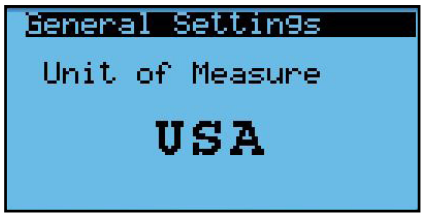


4.1.2 Setting the Unit of Measure

The controller supports the following settings:

- SI (bar, Celsius)
- USA (psi, Fahrenheit)
- UK (bar, Celsius)
- CAN (psi, Celsius)

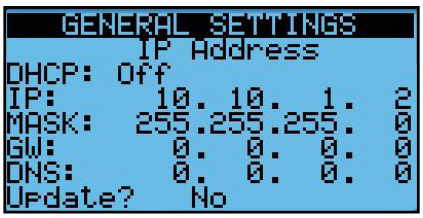
Set the Unit of Measure to the desired units for the display.



4.1.3 Setting the IP Address of the Controller

The controller IP address may be used for the BMS, networking, or local access.

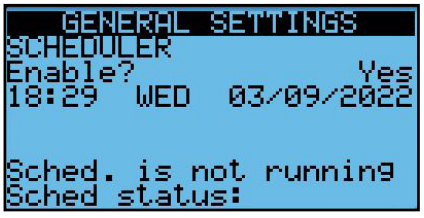
- Set the DHCP to OFF if using a static IP
- Set the IP address and Mask
- Set Update to YES
- Cycle power to the controller

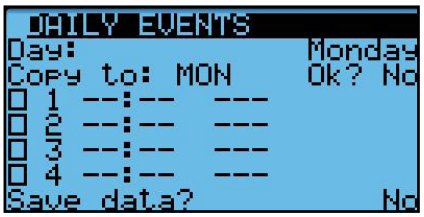


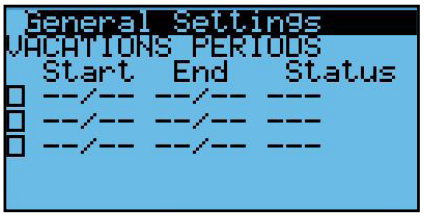
4.1.4 Scheduler

Enable the scheduler, if desired. If you enable the scheduler, it will have to be set for “ON” for the unit to run along with all other “ON” conditions.

- Enable the scheduler by setting to YES.
- Set the schedule for each day. You can use the copy feature to copy days. Save data after each.
- Set vacation periods.
- Set Special Days.





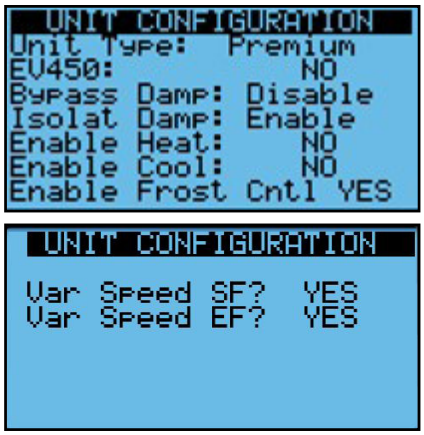


4.2 VERIFY UNIT CONFIGURATION

4.2.1 Main Unit Configuration

It is important to verify the configuration as the settings on these screens will also determine which screens show up in the user settings screens.

- Unit Type is Premium or Premium RD (for RD units).
- Choose whether an EV450 unit (one fan motor).
- Will you be adding an external bypass?
- Was the unit ordered with isolation dampers?
- Will you be controlling heat?
- Will you be controlling cooling? (Must be set for Premium RD).
- If bypass is added, will you have frost protection?
- Are the supply and exhaust fans variable speed (VFD or ECM)?

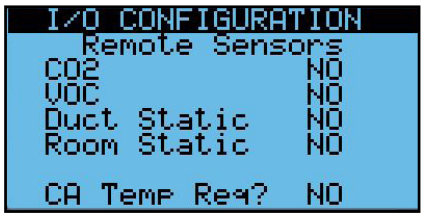


NOTE: If you choose EV450 you will only see information for the supply fan as both fans are run from one motor.

4.2.2 I/O Configuration

If using CO2, VOC, Room Static Pressure or Duct Static Pressure to control the fans, enable the sensors here and adjust the scaling if needed. These are user supplied sensors.

If either heating or cooling was enabled, the unit also requires a CA Temperature sensor in the discharge air duct. This may be included with RD units if heating or cooling was ordered with the unit but will have to be placed in the duct. The sensor may also be included with heating units purchased from RenewAire.



4.2.3 Field-Installed Sensors and General Wiring

All sensors are wired to an intermediate terminal, as shown. The factory wiring connects to the controller itself. It is shown for troubleshooting purposes but should not be changed.

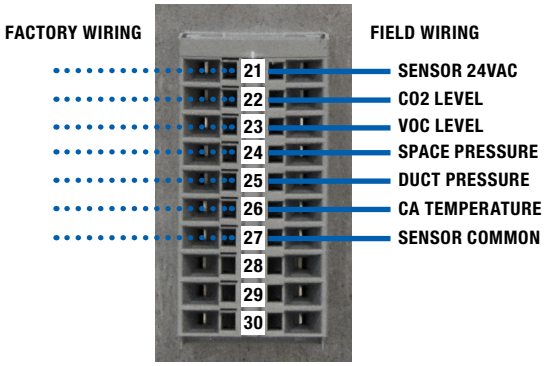


FIGURE 4.2.0 X3 TERMINALS

Field-installed control sensors and monitors are to be installed and wired in accordance with instructions shipped in the documentation package. Wire gauge must be in accordance with the following:

Wire Gauge	#22	#20	#18	#16	#14	#12
Circuit Length	100'	150'	250'	400'	700'	1000'

4.2.4 CO2/VOC Sensors

The ERV control allows the use of a CO2 sensor and/or a VOC sensor. The sensor may be physically attached to the system (Source = Hardware) or the value may be written from the BMS system (Source = from BMS).

The CO2 sensor is used as part of a demand control ventilation system to provide speed control of fans based on the level of CO2 in the space or duct. These sensors provide a 0–10VDC signal scaled as specified in the CO2 scaling screen.

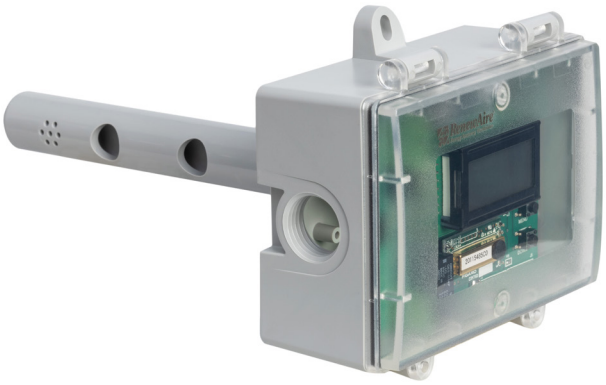
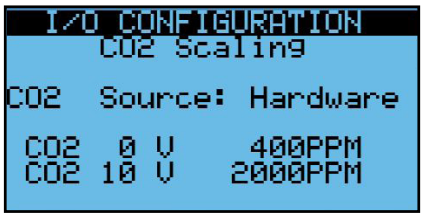
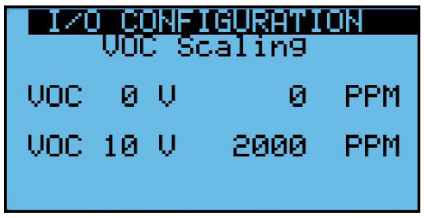


FIGURE 4.2.1 CO2 SENSOR (DUCT MOUNT, SIDE VIEW)

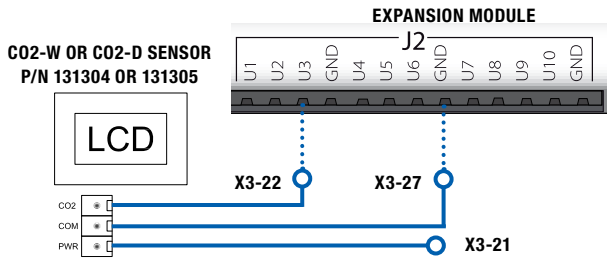
FIGURE 4.2.2 CO2 SENSOR (WALL MOUNT)

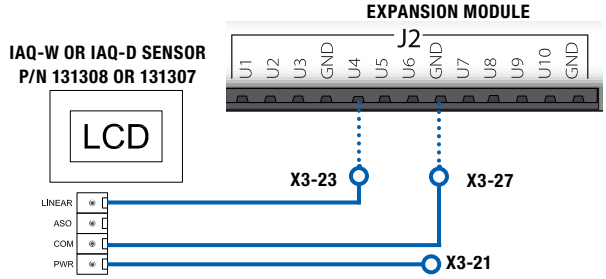
The Air Quality Monitor detects total VOCs (TVOC) in the supply airstream or the space. It uses a MEMs metal oxide semiconductor sensor to capture VOC emissions that are invisible to CO2 sensors. It is installed in the SA duct or the space. These sensors provide a 0–10VDC signal scaled as specified in the VOC scaling screen.





NOTE: When wiring sensor, do not wire directly to the expansion module; wire to the X3 terminal block, see Figure 4.2.0.





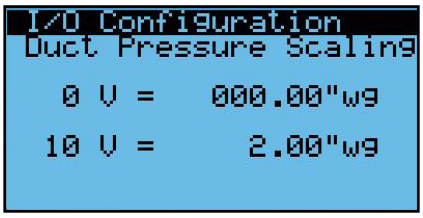
NOTE: When wiring sensor, do not wire directly to the expansion module; wire to the X3 terminal block, see Figure 4.2.0.

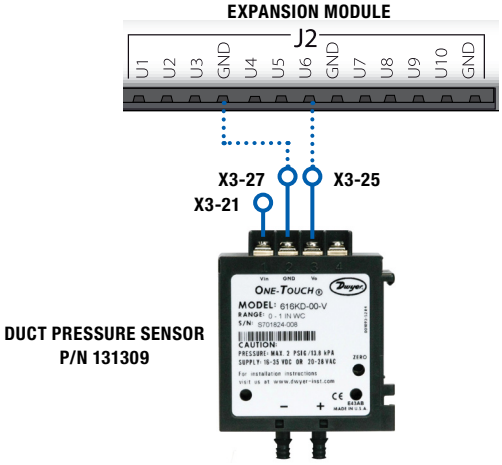
4.2.5 Differential Pressure Duct or Room Pressure Sensor

The pressure transmitter with a display screen (below right) is an optional accessory and would be installed in a duct to run the fan to meet a specific duct pressure. These sensors provide a 0–10VDC signal scaled as specified in the Duct Pressure scaling screen.

FIGURE 4.2.3 PRESSURE DIFFERENTIAL TRANSMITTER (TYP)

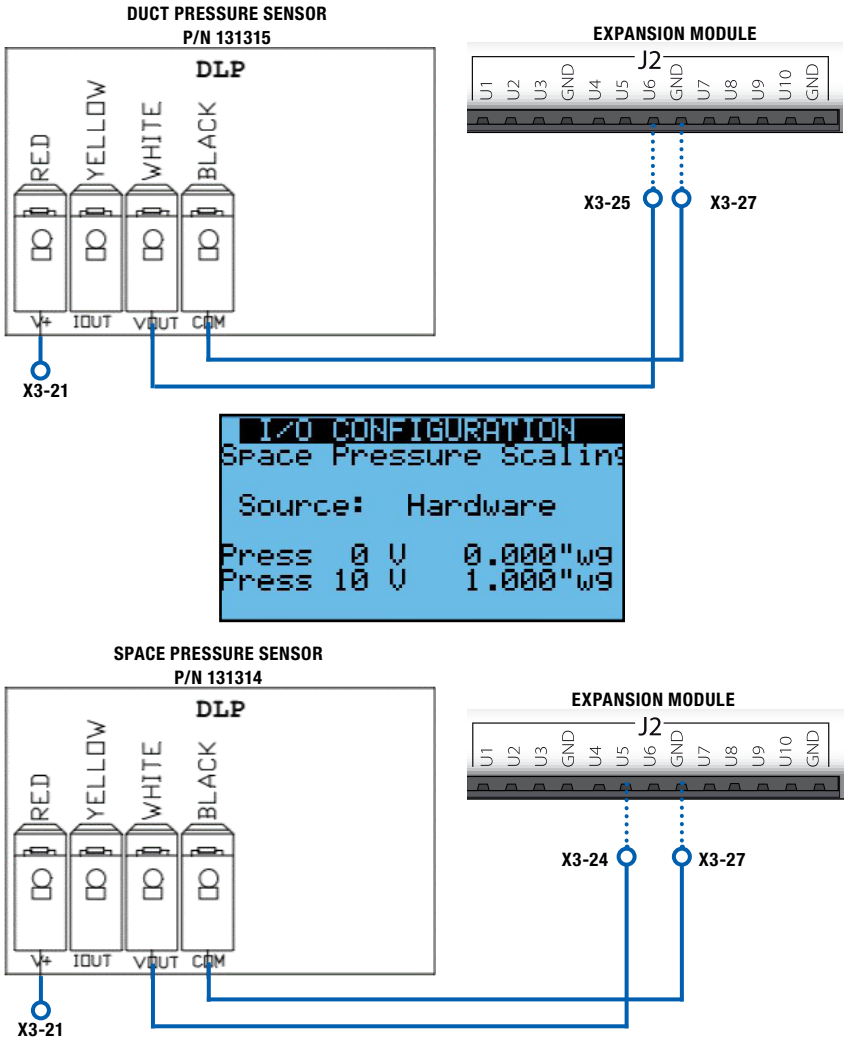
FIGURE 4.2.4 ELECTRICAL PRESSURE DIFFERENTIAL TRANSMITTER





NOTE: When wiring sensor, do not wire directly to the expansion module; wire to the X3 terminal block, see Figure 4.2.0.

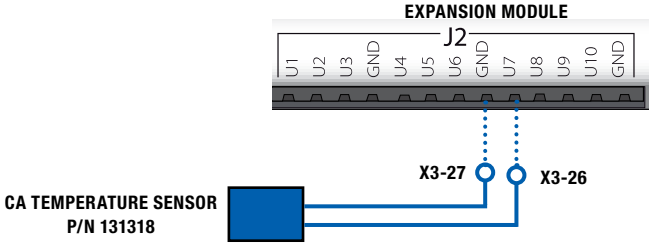
NOTE: When wiring sensor, do not wire directly to the expansion module; wire to the X3 terminal block, see Figure 4.2.0.



4.2.6 CA Temperature Sensor

The CA Temperature sensor is automatically enabled if the heating and/or cooling is enabled. If it is not connected, an alarm will occur. If your unit was ordered with heating and/or cooling, the supply temperature sensor should be included but may need to be installed down the duct to prevent cycling of heating or cooling. The sensor uses a special curve and cannot be swapped with standard T2 or T3 NTC sensors.

NOTE: When wiring sensor, do not wire directly to the expansion module; wire to the X3 terminal block, see Figure 4.2.0.



5.0 UNIT OPERATION AND FAN CONTROL

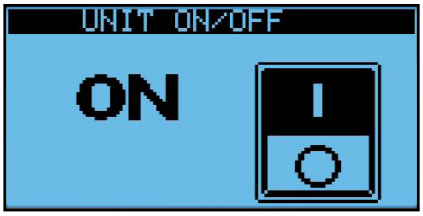
The primary purpose of the ERV unit is to provide 100% OA. The amount of air that it provides is based on the configuration of the supply and exhaust fans and whether the unit is running or not.

Fans are either controlled with variable speed drives or ECM motors.

5.1 SEQUENCE OF OPERATION FOR UNIT START

The unit will start when all of the following conditions are true:

- There are no serious alarms.
- The Digital Input for start/stop (terminals 17 and 18) are closed.
- The unit is turned on at the keypad.
- The time is within the scheduler "ON" time, if scheduler enabled.
- The BMS has written the unit on signal, if BMS control is enabled.

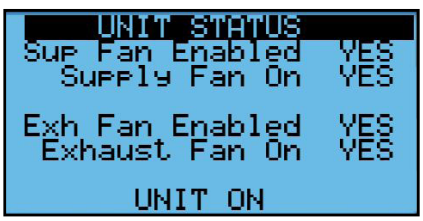


Upon starting, the isolation dampers will open. The end switches of these dampers will complete the Fan Enable signal to the ECM or VFD fans.

Once the fan enable signal is complete, the fan command signal will be sent to the fan after the start up delay time. Each fan is paired with a current sensor. If within the alarm delay time, default 90s, the current sensor does not detect the fan running, the unit will shut down and an alarm will occur.

The setting *SF Alarm Unit Run?* setting tells whether the unit, and thus the exhaust fan, will continue to run if there is an alarm with the supply fan.

The Unit status is shown on the bottom of this screen. More than one of these statuses may be valid at one time



UNIT STATUS CONDITIONS	
STATUS SHOWN	MEANING
Unit on	The unit is on and running.
Off by alarm	The unit is off by a serious alarm.
Off by BMS	The unit is off by command from the BMS.
Off by Time Band	The unit is off by the scheduler.
Off by Schedule	The unit is off by the ID1 digital input.
Off by Keypad	The unit is off by the setting on the local interface.
EF Only Mode	The unit is in single fan mode with exhaust fan running.
SF Only Mode	The unit is in single fan mode with supply fan running.
BMS Cool Lockout	The unit is in HEAT mode from the BMS.
BMS Heat Lockout	The unit is in COOL mode from the BMS.
In Device Test	The system is in device test mode.
Input Overwritten	There is a sensor input that is overwritten.
Off by CO2 Level	The CO2 level is below the limit for running.
Flush Mode	The unit is running in FLUSH mode.
Frost Control on	The unit is running in Frost Control Mode.

5.1.1. Digital Input (ID1) Unit On/Off

The digital input across terminals 17 and 18 must be closed to turn the unit on. It can be jumpered if not used. Some of the uses are a remote switch, a smoke detector or a motion/ occupancy sensor. The unit can also be supplied with an optional drain overflow switch that is wired into this input. Shown are the accessories are offered by RenewAire.

5.1.1.1 Optional Smoke Detector

Normally field-installed on the discharge duct, near the furnace.

FIGURE 5.1.0 SMOKE DETECTOR

5.1.1.2 Optional Motion Sensor

Used for occupancy-based ventilation, hardwired to the low-voltage terminal strip.

FIGURE 5.1.1 MOTION SENSOR (CEILING MOUNT)

FIGURE 5.1.2 MOTION SENSOR (WALL MOUNT)

5.1.1.3 Optional Drain Overflow Switch

This is an optional accessory, ordered with the unit and factory-installed. The overflow switch monitors condensate levels in the condensate pan and if unacceptable levels are detected, it will cause the fans to switch OFF and the dampers will return to their Normally Closed positions. When the condensate level drops, the unit will return to normal operation.

FIGURE 5.1.3 OVERFLOW SWITCH

5.1.2 Optional Dampers

The ERV unit has optional isolation dampers with end switches. For more information consult the unit specific IOM.

5.1.3 Fans

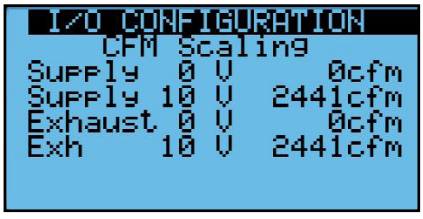
The variable speed fans may be driven by VFDs or may be ECM fans. The VFD fans get an enable signal and both types of fans get a 0–10VDC signal which is proportional to 0–100% fan command.

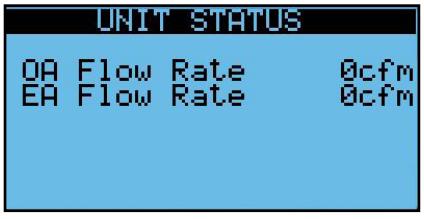
Factory VFD settings should not be changed. The settings are available in the *Reference* section of this manual.

5.1.4 Airflow Measurement

Two pressure transmitters that measure up to 20" w.g. are installed at the fan inlet cones and are used to measure pressure drop across the fan inlet rings. The scaling screen can be found in the *I/O Configuration*. The kfactor is factory set for the fans and should only be adjusted during test and balance. The supply and exhaust flow values can be read in the *Unit Status* screens.

FIGURE 5.1.4 PRESSURE DIFFERENTIAL TRANSMITTER (TYP)





NOTE: Current sensors are calibrated for reduced fan speed at time of shipment from the factory. Immediately after entering new operating parameters for the fans (done during the start up process), current sensors are to be re-calibrated for minimum current draw. The fan should be running at its minimum speed.

5.1.5 Current Sensors

Current sensors are installed on high voltage supply wires to sense current going to a fan motor. They are used to prove the ON/OFF state of fan motors.

FIGURE 5.1.5 CURRENT SWITCH

When the unit starts, this screen will show when the fans are enabled. There is a slight delay of a few seconds, and then the second line, supply (or exhaust) fan on shows the status of the current sensor.

```
UNIT STATUS
Sup Fan Enabled  YES
  Supply Fan On  YES

Exh Fan Enabled  YES
 Exhaust Fan On  YES

      UNIT ON
```

The current sensors are factory adjusted and may need to be field-adjusted for the application. This will be evidenced by getting a supply fan alarm (AL10) or exhaust fan alarm (AL11). The instructions are in the Alarms and Troubleshooting section of this manual.

5.1.6 Filter Monitoring

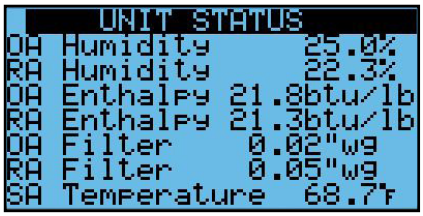
There is a pressure transducer across the filters on the outdoor air and RA streams to monitor the filter status. The scaling is factory set in this screen.

```
I/O Configuration
Filter Press Scaling
OA Flt 0 V=   0.0"wg
       10 V=   2.0"wg

RA Flt 0 V=   0.0"wg
       10 V=   2.0"wg
```

The alarm level can be set pressure can be set such that if the pressure reaches the alarm level, the unit will alarm but keep running.

```
ALARM SETTINGS
   Filter Alarms

OA Level      1.0"wg
RA Level      1.0"wg
Alarm Delay   60 sec
```

You can also see the pressure in this screen so that if it gets close to the alarm level you can change it at your convenience.



5.2 OPTIONS FOR SUPPLY FAN CONTROL

Units with a VFD or ECM for the supply fan can control the fan for constant speed, SA flow control, supply duct static pressure control, room static pressure control, CO2 control, VOC control, or CO2 Flow control. Available modes may depend on the sensors added.

NOTE: It is possible to have the BMS control the fan directly. Refer to the BMS section for more information.

5.2.1 Constant Fan Speed Option

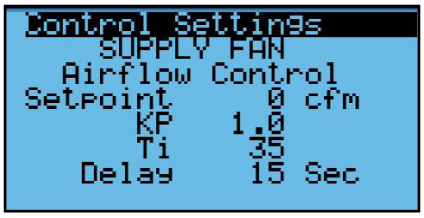
The analog voltage command to the supply fan VFD or ECM can be set from the unit controller display or by the BMS. The adjustable range of 0% to 100% correspond to the minimum and maximum fan operating speed.

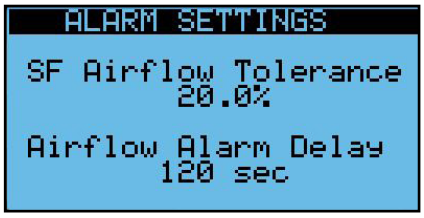
This supply fan operation mode can be used to field balance the SA flow rate.

5.2.2 SA Flow Control Option

The controller will adjust the supply fan VFD or ECM command to maintain the SA flow rate at a setpoint.

The SA flow rate setpoint is entered and adjusted from the unit controller display or provided by the BMS. The minimum and maximum values for SA flow rate setpoint are unit dependent. An adjustable proportional and integral (PI) loop will compare the measured SA flow to the airflow rate setpoint and adjust the fan speed. If the measured SA flow rate varies from the desired airflow rate by more than 10% (adjustable) for more than 60 seconds (adjustable) a SA flow rate alarm will be set to true. This supply fan operation mode can be used to provide a constant SA flow rate as the unit filters become loaded.

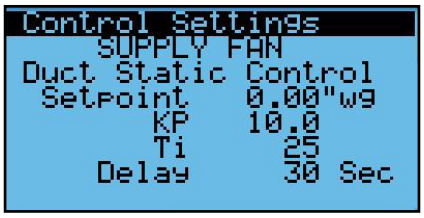


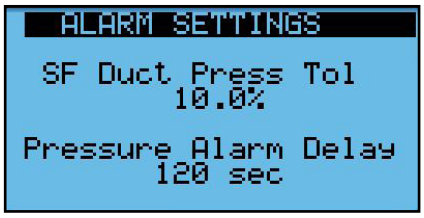


5.2.3 Supply Duct Static Pressure Control Option

The controller will adjust the supply fan VFD or ECM command to maintain the supply duct static pressure at a setpoint. This option requires a field-installed duct pressure transmitter and setup for the transmitter in the I/O configuration.

The SA duct static pressure setpoint is entered and adjusted from the unit controller display or provided by the BMS. The minimum and maximum values for SA duct static pressure setpoint are unit dependent. An adjustable PI loop will compare the measured SA duct static pressure to the static pressure setpoint and adjust the fan speed. If the measured static pressure varies from the desired static pressure by more than 0.05" w.g. (adjustable) for more than 60 seconds (adjustable) a SA static pressure alarm will be set to true. This supply fan operation mode can be used to provide a constant supply duct pressure for
VAV systems.

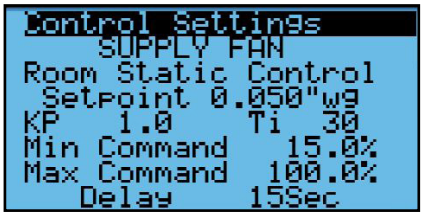


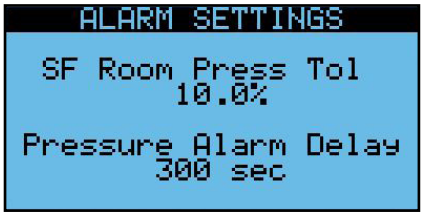


5.2.4 Room Static Pressure Control Option

The controller will adjust the supply fan VFD or ECM command to maintain the room static pressure at a setpoint. This option requires a field-installed room pressure transmitter and setup for the transmitter in the I/O configuration.

The room static pressure setpoint is entered and adjusted from the unit controller display. The minimum and maximum values for room static pressure setpoint are unit dependent. An adjustable PI (proportional & integral) loop will compare the measured room static pressure to the static pressure setpoint and adjust the fan speed. If the measured static pressure varies from the desired static pressure by more than 0.05" w.g. (adjustable) for more than 60 seconds (adjustable) a room static pressure alarm will be set to true. This supply fan operation mode can be used to provide a constant static pressure in an area to control infiltration or exfiltration from an adjacent area or outdoors.

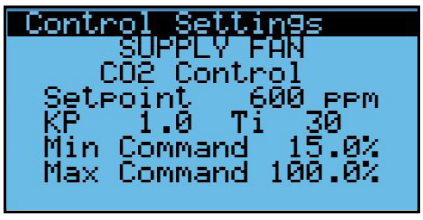


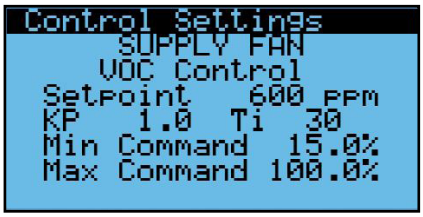


5.2.5 CO2/VOC Control Option

The controller will adjust the supply fan VFD or ECM command to maintain the room or RA CO2 or VOC level at a setpoint. This option requires a field-installed CO2 and/or VOC sensor or value from a BMS and setup for the sensor in the I/O configuration.

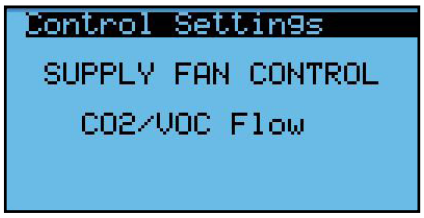
The CO2/VOC setpoint is entered and adjusted from the unit controller display or provided by the BMS. An adjustable PI loop will compare the measured CO2/VOC level to the CO2/VOC setpoint and adjust the fan speed. The minimum and maximum fan speed commands are adjustable. If the measured CO2/VOC level exceeds 1000 ppm (adjustable) for more than 60 seconds (adjustable) a CO2/VOC alarm will be set to true. This supply fan operation mode can be used to provide demand-controlled ventilation of a space. The minimum fan speed will provide the required minimum outdoor air when the CO2/VOC level is at or below the CO2/VOC setpoint.



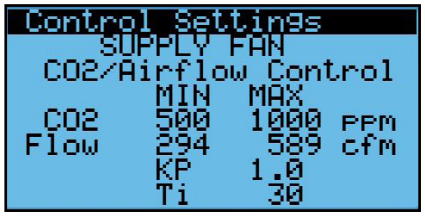


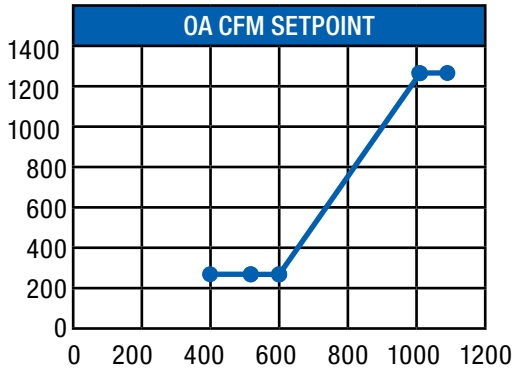
5.2.6 CO2 Flow Control Option

The controller will adjust the supply fan VFD or ECM command based on the measured room or RA CO2 level.



The SA flow setpoint is derived from the user entered minimum and maximum CO2 levels and minimum and maximum desired airflow rates. When the CO2 level is at or below the minimum CO2 level the airflow setpoint is at the minimum and when the CO2 level is at or above the maximum CO2 level the airflow setpoint is at the maximum. Between the minimum and maximum CO2 levels the airflow setpoint is linearly scaled. If the measured CO2 level exceeds 1000 ppm (adjustable) for more than 60 seconds (adjustable) a CO2 alarm will be set to true. This supply fan operation mode can be used to provide demand-controlled ventilation of a space. The minimum fan speed will provide the required minimum outdoor air when the CO2 level is at or below the CO2 setpoint.





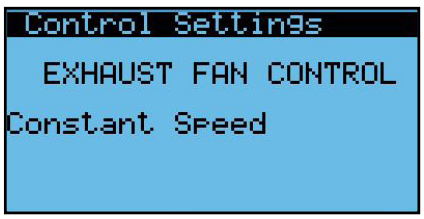
5.3 OPTIONS FOR EXHAUST FAN CONTROL

Units with a VFD or ECM for the exhaust fan can control the fan for fixed speed, EA flow control, supply fan command tracking control, supply fan flow rate tracking control, or room static pressure control.

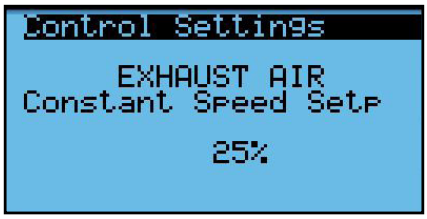
NOTE: It is possible to have the BMS control the fan directly. Refer to the BMS section for more information.

5.3.1 Constant Fan Speed Option

The analog voltage command to the exhaust fan VFD or ECM can be set from the unit controller display or by the BMS.

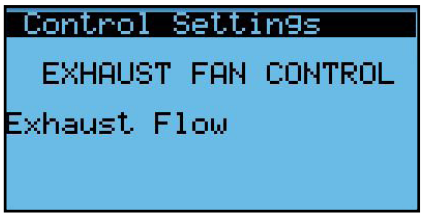


The adjustable range of 0% to 100% correspond to the minimum and maximum fan operating speed. This exhaust fan operation mode can be used to field balance the EA flow rate.

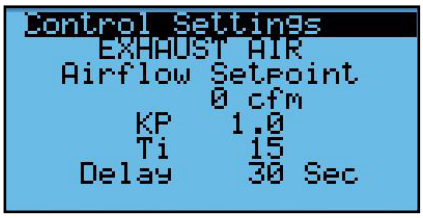


5.3.2 EA Flow Control Option

The controller will adjust the supply fan VFD or ECM command to maintain the EA flow rate at a setpoint.



The EA flow rate setpoint is entered and adjusted from the unit controller display or provided by the BMS. The minimum and maximum values for EA flow rate setpoint are unit dependent. An adjustable PI loop will compare the measured EA flow to the airflow rate setpoint and adjust the fan speed. If the measured EA flow rate varies from the desired airflow rate by more than 10% (adjustable) for more than 60 seconds (adjustable) an EA flow rate alarm will be set to true. This exhaust fan operation mode can be used to provide a constant EA flow rate as the unit filters become loaded.



5.3.3 Supply Fan Command Tracking Control Option

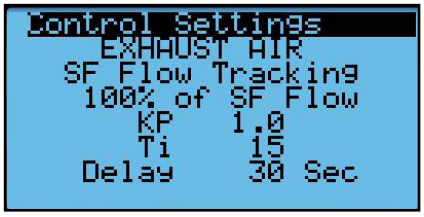
The controller will adjust the exhaust fan VFD or ECM command to track the supply fan VFD or ECM command.

The minimum (50%) and maximum (200%) tracking rates are adjustable. This exhaust fan operation mode can be used to maintain proportional supply and exhaust fan commands as the supply fan modulates.

5.3.4 Supply Fan Flow Tracking Control Option

The controller will adjust the exhaust fan VFD or ECM command to track the supply fan air flow rate.

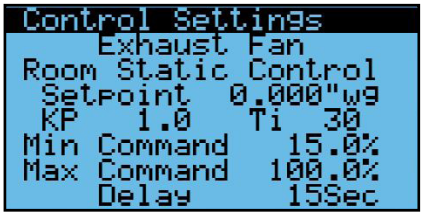
The offset from the SA flow rate is adjustable from -25% to +25%. An adjustable PI loop will compare the measured EA flow to the airflow rate setpoint and adjust the fan speed. This exhaust fan operation mode can be used to maintain proportional supply and EA flows as the supply fan modulates and as the unit filters become loaded.

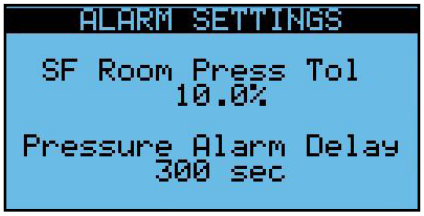


5.3.5 Room Static Pressure Control Option

The controller will adjust the exhaust fan VFD or ECM command to maintain the room duct static pressure at a setpoint.

The room static pressure setpoint is entered and adjusted from the unit controller display or provided by the BMS. The minimum and maximum values for the room static pressure setpoint are unit dependent. An adjustable PI loop will compare the measured room static pressure to the static pressure setpoint and adjust the exhaust fan speed. If the measured static pressure varies from the desired static pressure by more than 0.05 inches water gauge (adjustable) for more than 300 seconds (adjustable) a room static pressure alarm will be set to true. This exhaust fan operation mode can be used to provide a constant room pressure for variable exhaust systems





6.0 TEMPERING CONTROL

The ERV unit with Premium Controls revision 03.00.41 or higher has the ability control for dehumidification using cooling.

6.1 MODES OF OPERATION

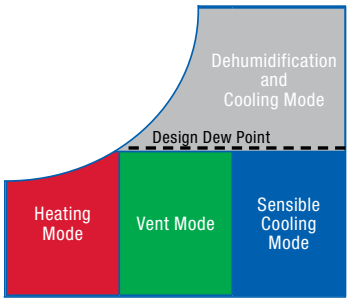
There are four modes of operation (if applicable):

- Dehumidification (and cooling) Mode —will run the cooling to maintain a dehumidification setpoint (around 50°F) and then reheat the air (to around 60°F), if feature is included
- Heating Mode—Will run the heating to maintain a heating setpoint
- Sensible Cooling Mode—Will run the cooling to maintain a cooling setpoint
- Ventilation Mode—Will only run the fans for ventilation

The mode during occupied operation will depend upon the following conditions. The mode is dependent upon whether the feature is enabled and the lockout dewpoint or outdoor air temperature for that feature

See the following sections for more information on these modes. The mode is determined in this order:

1. Heating: Is the unit configured for heating? Is the outdoor air temperature lower than the heating lockout temperature?
2. Dehumidification: Is the unit configured for dehumidification? If so, is the unit in dehumidification mode?
3. Cooling: Is the unit configured for cooling? Is the outdoor air temperature higher than the cooling lockout temperature?
4. If it in no other mode and the unit is on, it will be in Ventilation Mode.



In normal heating operation, the controller will prevent the heater from running when the Outdoor Air temperature is above the Lockout Above setpoint. This causes the unit to use OA air for heating instead of firing the heat module. The Lockout Above setpoint is assigned by the user, based on both ambient temperatures and experience with the building being heated. RenewAire suggests an initial Lockout Above setting of 50°F. If the OA air is at 50°F and the Exhaust Air coming from the Occupied Space is at 72°F, the Supply Air recovers enough heat energy from the Exhaust Air that it will reach about 67.6°F without any supplementary heat from the heat module when the heat exchange core is at maximum efficiency. In every building, there is additional heat being generated by human activity, equipment and thermal gain from sunlight, etc. If there is very little additional heat being generated in the Occupied Space, the Lockout Above setting may have to be raised. If there is a great deal of heat being generated, the Lockout Above setting can actually be lowered further.

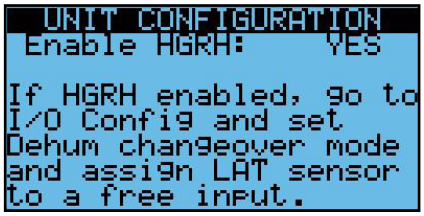
The Lockout Above function has a hysteresis band built into it to prevent short-cycling when the OA air is near the Lockout Above setpoint. In other words, if the Lockout Above setpoint is at 50°F, the gas heat module will be disabled whenever the OA air temperature is higher than 50°F. When the OA air temperature drops to 50°F, the controller will continue to lockout the heat module until the OA temperature drops an additional 1.8°F, the hysteresis band.

Lockout Below performs the same function as Lockout Above, but for cooling. The factory setpoint for Lockout Below is 70°F, meaning that if the Outdoor Air temperature is lower than 70°F, the cooling unit will be blocked from running. RenewAire suggests an initial Lockout Below setting of 70°F.

If the controller shuts off the heat command signal because of the Lockout Above setting, the Unit Status > Heating screen will show Disabled, regardless of the strength of the Call For Heat signal.

6.2 DEHUMIDIFICATION

The dehumidification is performed with the cooling. Therefore, the unit must have cooling enabled. It may also have HGRH enabled here, used for reheat during dehumidification.

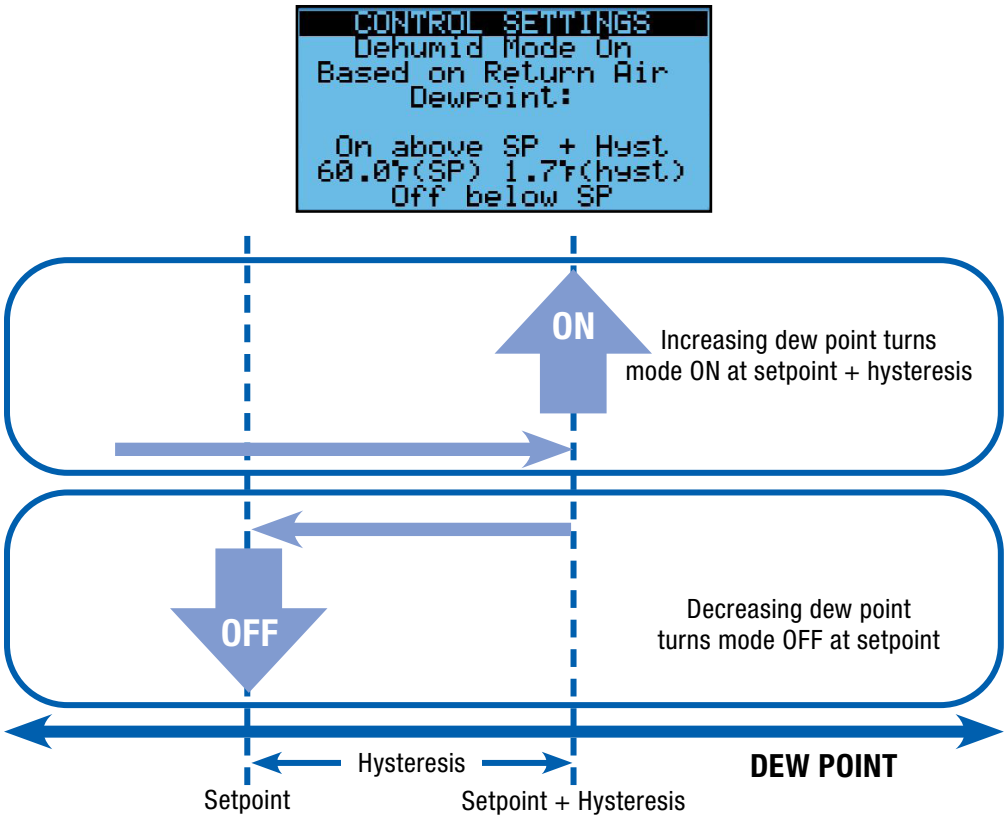


6.2.1 Dehumidification Mode Settings

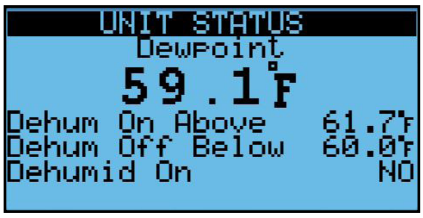
The type of dehumidification changeover is set in *I/O Configuration*. It is normally set for return air but if there is a lot of air changes this will cause the cooling to cycle excessively so the setting can be set for changeover based on outdoor air. It can also be disabled here.

The setting for changeover is in Control Variables. Dehumidification mode will be on at the dehumidification setpoint + the hysteresis value set here. It will turn back out of dehumidification mode below the setpoint.

This screen will not show up if dehumidification is disabled in the prior screen.



The status can be monitored in *Unit Status.*



6.2.2 Dehumidification Types and Settings

There are four possibilities for dehumidification:

1. Cooling with Hot Gas Reheat. In this case the HGRH will be enabled in the above screen.
2. Cooling with Reheat performed by the heating source.
3. Cooling only. Since this will produce very cold air, this method should not be used to feed the space directly.
4. Disabled. In this case no dehumidification mode is available.

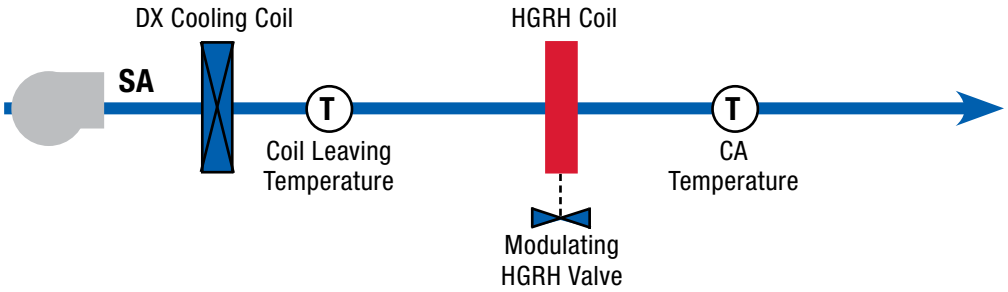
6.2.2.1 Dehumidification with Hot Gas Reheat

This dehumidification method requires DX cooling. It relies on an additional HGRH coil downstream of the cooling coil in which the hot refrigerant piping is in contact with the supply air. This allows a portion of the refrigerant cycle's normally rejected heat to be reclaimed as reheat.

When the return (or outdoor) air dew point exceeds the 55 degrees F (adjustable) the dehumidification mode will be enabled. The air is cooled to a cooling coil leaving temperature setpoint, usually 55 F or below. Then it is reheated to a unit supply temperature setpoint (or return air, based on setting for

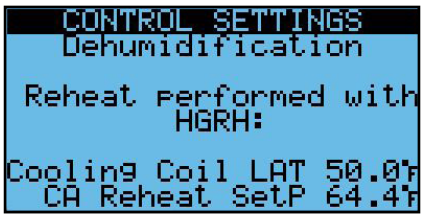
heating), usually around 60 F. An adjustable PI (proportional & integral) loop will compare the measured air temperature to the air temperature set point and adjust the analog output to the valve.

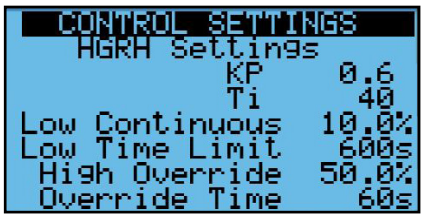
If the unit was ordered with HGRH, the coil leaving temperature sensor was included.



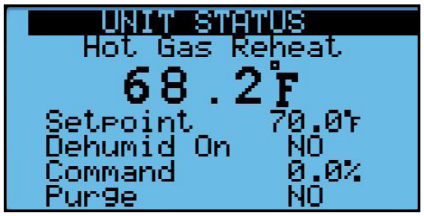
The settings for this method require that

- Cool and HGRH are enabled in the *Unit Configuration.*
- Input assigned to Coil LAT Sensor and LAT Sensor installed after coil.
- A setpoint for the coil leaving temperature and the CA temp are set.
- KP an Ti settings are adjusted for control of the HGRH valve, if necessary.
- The purge settings are adjusted, if necessary. These setting show a low % whereby if the valve is set to the low limit for the low limit time, it will be opened for the high override % for the override time.





The status can be viewed in *Unit Status*.

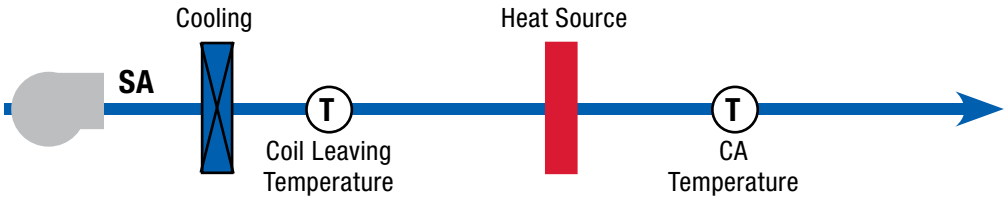


6.2.2.2 Dehumidification with Reheat from Heat Source

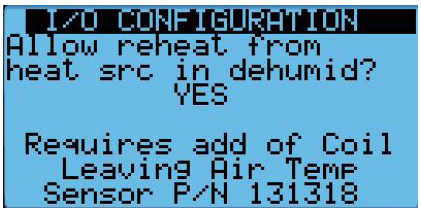
This dehumidification method uses any cooling source and heating source.

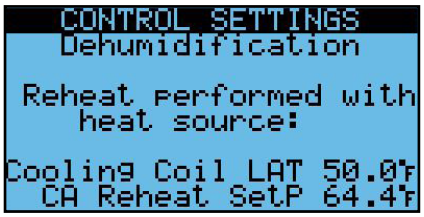
When the return (or outdoor, selectable) air dew point exceeds the 55°F (adjustable) the dehumidification mode will be enabled. The air is cooled to a cooling coil leaving temperature setpoint, usually 55°F or below. Then it is reheated to a CA temperature setpoint (or RA, based on setting for heating), usually around 60°F. An adjustable PI loop will compare the measured air temperature to the air temperature setpoint and adjust the analog output to the valve. The NO1 heating enable contact is engaged whenever the heating output is at 1% or higher.

To use this method you need to add a cooling coil leaving temperature sensor, P/N 131318, and install it after the cooling method. It should be wired as described in the *Verify Unit Configuration* section.

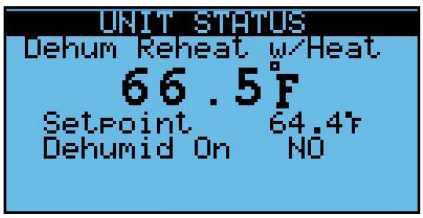


The settings for this method require that
- Cool and Heat are enabled in the *Unit Configuration*
- Input assigned to Coil LAT Sensor amd LAT Sensor installed after coil
- Set Allow heat src in dehumid to YES in *I/O Configuration*
- A setpoint for the coil leaving temperature and the CA temp are set





The status can be viewed in *Unit Status*.

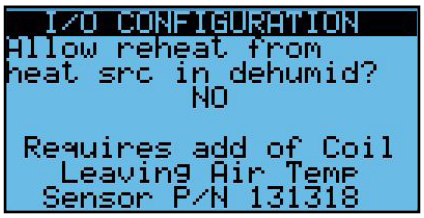


6.2.2.3 Dehumidification with No Reheat

This dehumidification method uses any cooling source.

When the return (or outdoor) air dew point exceeds the 55°F (adjustable) the dehumidification mode will be enabled. The air is cooled to a CA temperature setpoint, usually around 50–55°F. If feeding the space directly, this could cause overcooling.

The settings for this method require that
- Cool is enabled in the *Unit Configuration*
- Set Allow heat src in dehumid to No in *I/O Configuration*
- A setpoint for the CA temp is set



6.2.2.4 Dehumidification Disabled

The settings for this method require that
- Dehumidification Changeover Selection is set to “Dehum Disabled” in *I/O Configuration*. In this case the cooling will only be used to supply sensible cooling.

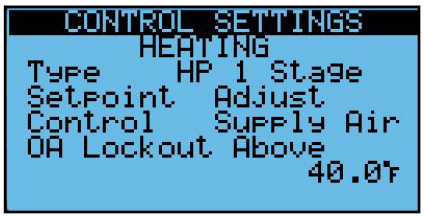
THIS PAGE IS INTENTIONALLY LEFT BLANK.

6.3 HEATING

The heating requires that heating be enabled in the *Unit Configuration*. The heating type is set in the *Control Settings*.

6.3.1 Heating Mode

For any type of heating there is an outdoor air lockout temperature above which heating will not be allowed. Note that the default is low. This is to insure that at start up, you can start your fans without worrying if the tempering will also start. This value will need to be raised to an acceptable value.



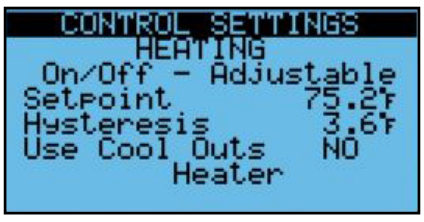
6.3.2 Setpoint Type and Control Type

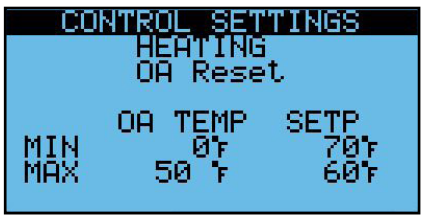
For each type of heating, you can choose a setpoint type and a control type. Setpoint types available:

- Adjust: If you choose this it will allow you to set a heating setpoint.
- OA Reset: You are prompted to set a reset schedule. In the screen shown, the setpoint will be 70°F if the outdoor air is 0°F or below, and 60°F if the outdoor air is 50°F and above. It will be linear between. For example, if the outdoor air is 25°F, the setpoint will be 65°F. This method is useful to avoid overheating the space or to avoid excess cycling in warmer temperatures.

Control types available:

- CA: Be sure to install your CA temperature sensor far enough down the duct to prevent over-cycling.
- RA: If you are only feeding one space this is a useful control method. RA is always used for unoccupied operation. RA should also be used when a staged heat source is utilized.



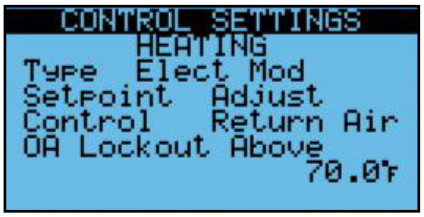


6.3.3 Heating Types

The following heating types are supported:

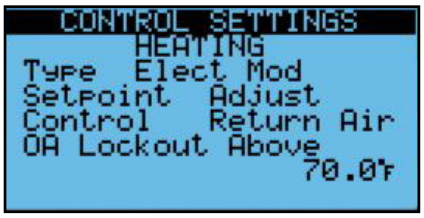
- 0–10VDC: Gas
- 0–10VDC: Electric
- 10–0VDC: Hot Water Valve
- Single Stage Heater
- Two-Stage Heater
- HP 1 Stage: with or without 0–10VDC aux heat—See *Combined Tempering*
- HP 2 Stage: with or without 0–10VDC aux heat—See *Combined Tempering*
- Dual Temp Coil: A coil that is used for both hot and cold water, depending upon season—See *Combined Tempering*
- VRF—See *Combined Tempering*

The heating type is set at the top of this screen.



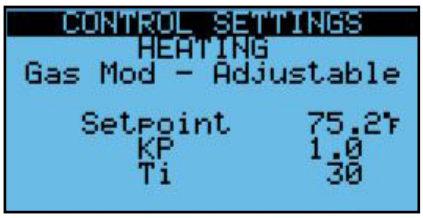
6.3.3.1 0–10VDC Gas or Electric Heating

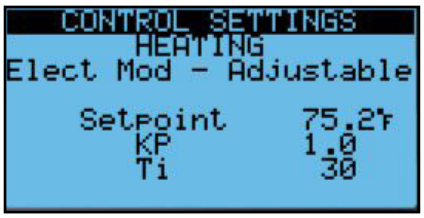
The mode is determined by the outdoor temperature and the heating lockout temperature settings.



This type of heating will modulate gas or electric heat using PI control. The KP and Ti can be adjusted to fine tune the control. The setpoint is also set here if set for Adjust. The NO1 heating enable contact is engaged whenever the heating output is at 1% or higher.

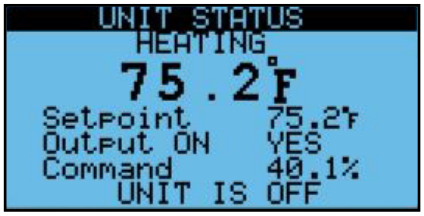
A unit-specific electrical schematic is found inside the access door to the core module.





The heating status can be monitored in the *Unit Status*. The screen shows:

- Heating Control Variable which will be as selected if in occupied operation
- Heating setpoint which will be:
    - Heating setpoint if selected adjust
    - Calculated OA reset heating setpoint if selected OA reset
- Whether heating enable 1 is ON
- Command (0–100%) to Heater, where 0 = 0VDC output and 100% = 10VDC output
- Heating Status

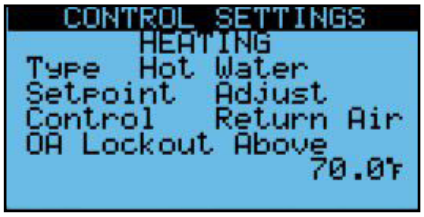


The heating status values are shown. Multiple values may be true.

MESSAGE	MEANING
Heat Locked Out by OA	The heating outdoor air lockout is higher than the OA temperature.
Unit OFF	Unit is off.

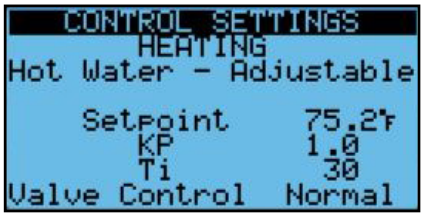
6.3.3.2 10–0VDC Hot Water Valve

The mode is determined by the outdoor temperature and the heating lockout temperature settings.



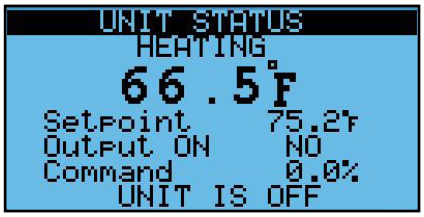
NOTE: The valve control can be set directly from the BMS if you change Valve control to BMS. In this case all Heating Control settings from the controller will be ignored.

The hot water valve control is 10VDC for closed and 0VDC for open so that it fails open. This type of heating will modulate using PI control. The KP and Ti can be adjusted to fine tune the control. The setpoint is also set here if set for Adjust. The NO1 heating enable contact is engaged whenever the heating output is at 99% or lower.



The heating status can be monitored in the *Unit Status*. The screen shows:

- Heating Control Variable which will be as selected if in occupied operation
- Heating setpoint which will be:
  - Heating setpoint if selected adjust
  - Calculated OA reset heating setpoint if selected OA reset
- Whether heating enable 1 is ON
- Command (0–100%) to Heater, where 0 = 10VDC output and 100% = 0VDC.
- Heating Status



The heating status values are shown. Multiple values may be true.

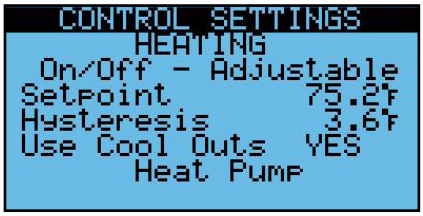
MESSAGE	MEANING
Heat Locked Out by OA	The heating OA lockout is higher than the OA temperature.
Unit OFF	Unit is off.

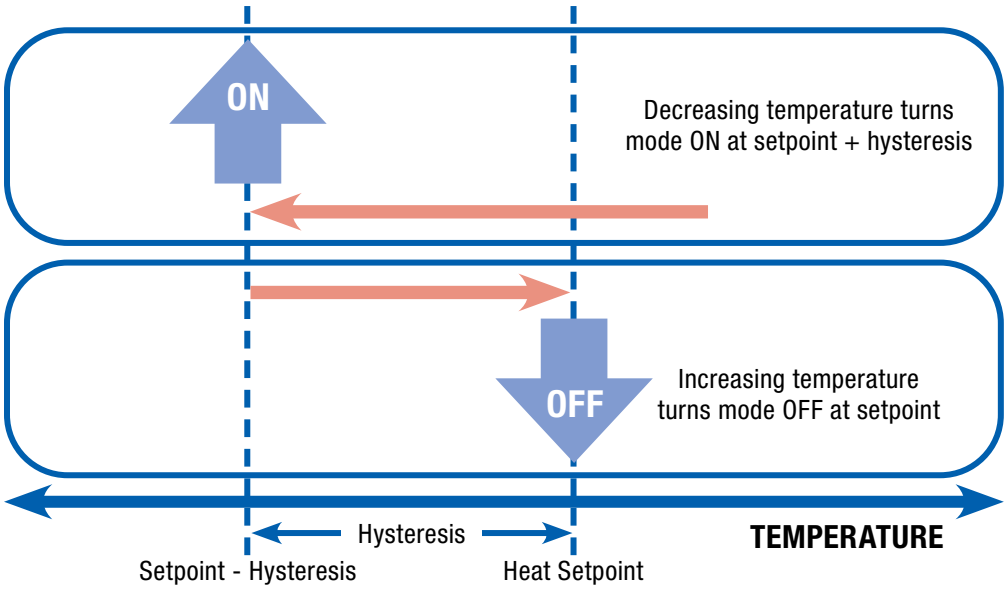
6.3.3.3 Single Stage Heater

The mode is determined by the outdoor temperature and the heating lockout temperature settings.

This type of heating cycles one stage of heating to maintain the heating setpoint. You must set a hysteresis value whereby the stage will turn on at the setpoint + hysteresis and turn at setpoint.

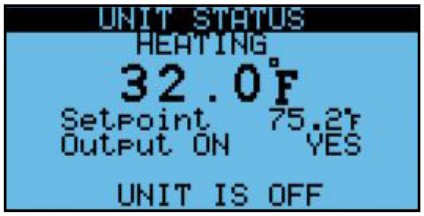
The “Use Cool Outs” setting should be set to no for heater mode, where the output used for this control will be the heating output NO1 on the expansion module.





The heating status can be monitored in the *Unit Status*. The screen shows:

- Heating Control Variable which will be as selected if in occupied operation
- Heating setpoint which will be:
    - Heating setpoint if selected adjust
    - Calculated OA reset heating setpoint if selected OA reset
- Whether heating enable 1 is ON
- Heating Status

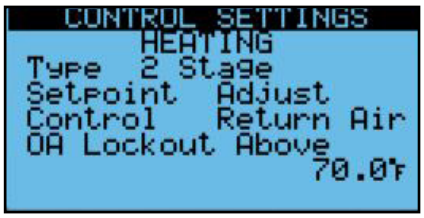


The heating status values are shown. Multiple values may be true.

MESSAGE	MEANING
Heat Locked Out by OA	The heating OA lockout is higher than the OA temperature.
Unit OFF	Unit is off.

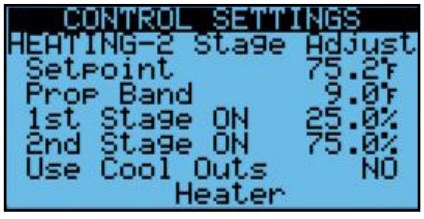
6.3.3.4 Two-Stage Heater

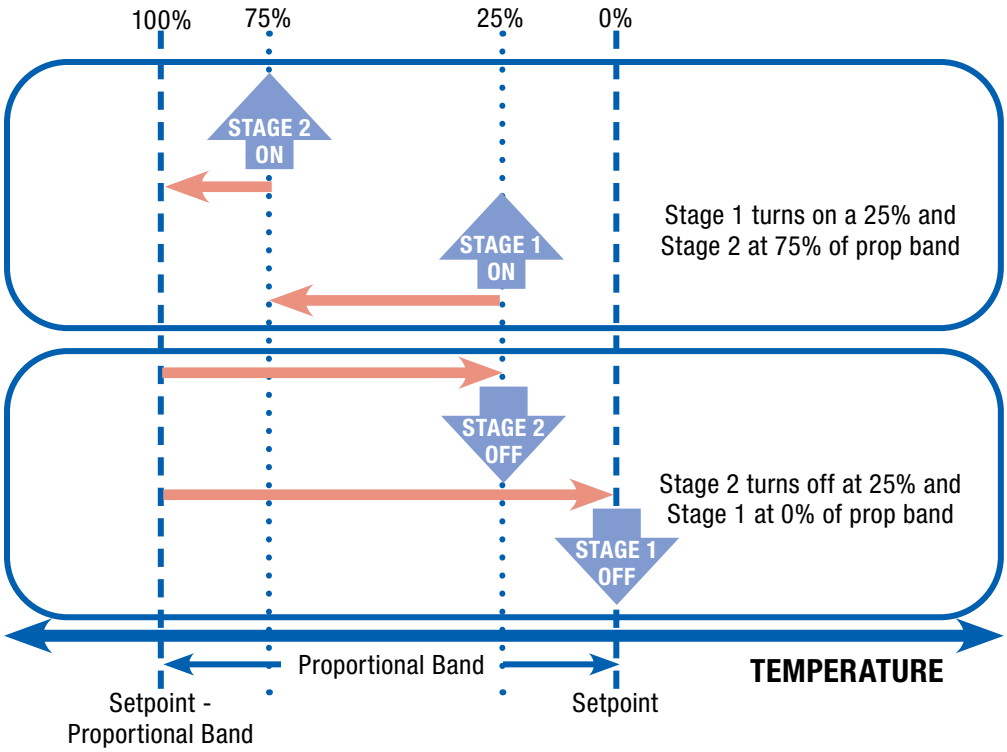
The mode is determined by the outdoor temperature and the heating lockout temperature settings.



This type of heating cycles two stages of heating to maintain the heating setpoint. You must set a prop band value. This value represents 100%; the wider the prop band the slower the response. Then you specify the “on point” for stages one and two in percentages. Stage one will turn off at setpoint and stage two will turn off at the on point for stage one. There is also a minimum on and off time to prevent over-cycling.

The “Use Cool Outs” setting should be set to no for heater mode, where the output used for this control will be the heating output NO1 on the expansion module.

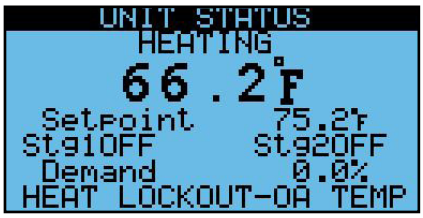




Example: In this case 4°F = 100% which means that 1°F = 25%, which makes our calculation easy. With the default settings, stage 1 turns on at 75.2 - 1 = 74.2. Stage 2 turns on at 75.2 - 3 = 72.2.

The heating status can be monitored in the *Unit Status*. The screen shows:

- Heating Control Variable which will be as selected if in occupied operation
- Heating setpoint which will be:
  - Heating setpoint if selected adjust
  - Calculated OA reset heating setpoint if selected OA reset
- Whether heating enable 1 is ON
- Heating Status



The heating status values are shown. Multiple values may be true.

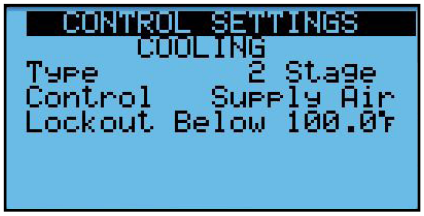
MESSAGE	MEANING
Heat Locked Out by OA	The heating OA lockout is higher than the OA temperature.
Unit OFF	Unit is off.

6.4 COOLING

The cooling requires that cooling be enabled in the *Unit Configuration*. The cooling type is set in the *Control Settings*. The unit should also be set to PremiumRD, as shown at the top of the screen.

6.4.1 Cooling Mode

For any type of cooling there is an outdoor air lockout temperature below which cooling will not be allowed. Note that the default is high. This is to insure that at start up, you can start your fans without worrying if the tempering will also start. This value will need to be lowered to an acceptable value.



6.4.2 Cooling Control Type

For each type of cooling, you can choose a control type.

Control types available:

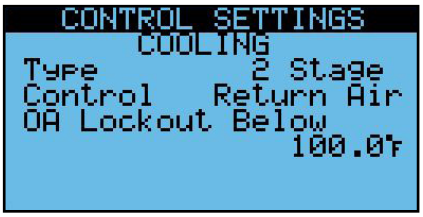
- CA: Be sure to install your CA temperature sensor far enough down the duct to prevent over-cycling
- RA: If you are only feeding one space this is a useful control method.

6.4.3 Cooling Types

The following cooling types are supported:

- On/Off: one-stage DX or heat pump—See *Combined Tempering* for heat pump operation
- 2 stage: two-stage DX or heat pump—See *Combined Tempering* for heat pump operation
- CW Mod: 0–10VDC signal to a chilled water valve, also used in Dual Temp Coil—See *Combined Tempering*.
- VRF—See *Combined Tempering*

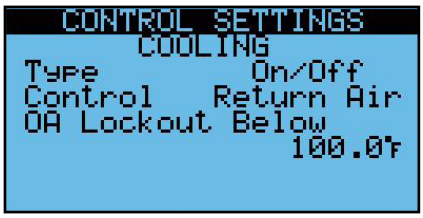
The cooling type is set at the top of this screen.



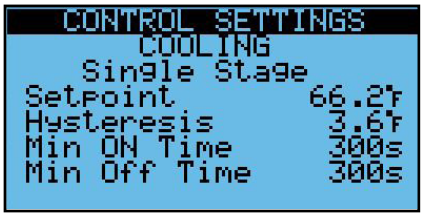
6.4.3.1 On/Off: One Stage of Cooling

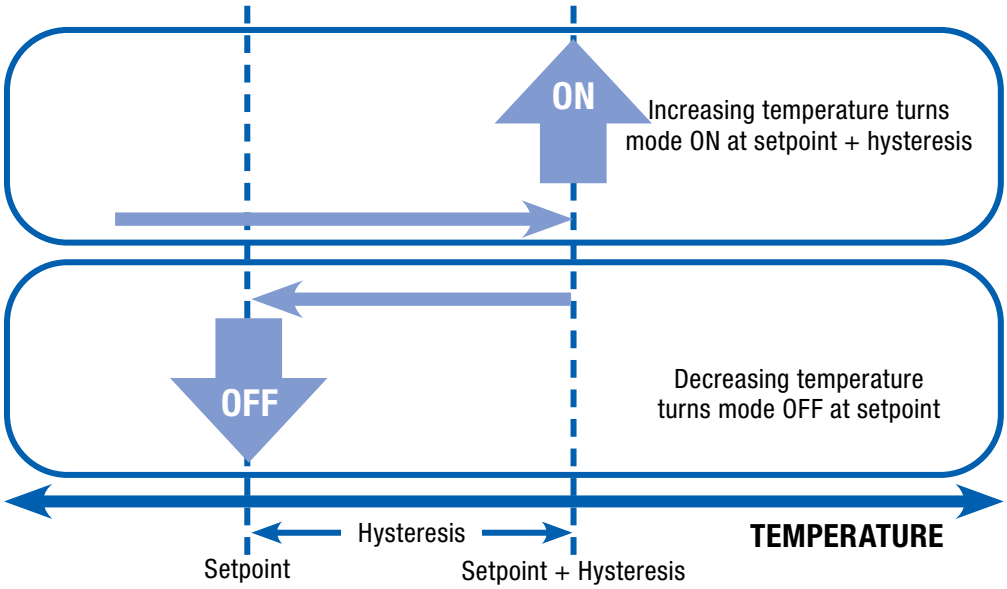
If this is a one-stage heat pump, see *Combined Tempering*.

The mode is determined by the outdoor temperature and the cooling lockout temperature settings.



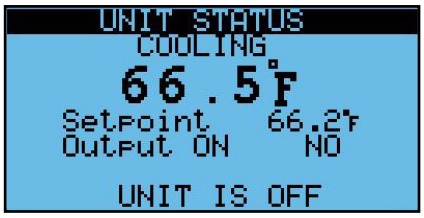
This type of cooling cycles one stage of cooling to maintain the cooling setpoint. You must set a hysteresis value whereby the stage will turn on at the setpoint + hysteresis and turn at setpoint. There is also a minimum on and off time to prevent over-cycling.





The cooling status can be monitored in the *Unit Status*. The screen shows:

- Cooling Control Variable which will be supply or return air, as selected.
- Cooling setpoint
- Whether cooling enable 1 is ON
- Cooling Status



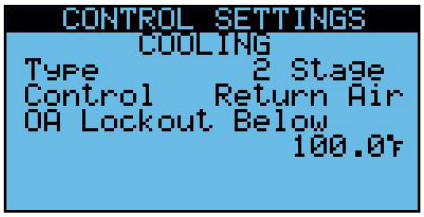
The cooling status values are shown. Multiple values may be true.

MESSAGE	MEANING
Cool Locked Out by OA	The cooling OA lockout is lower than the OA temperature.
Lockout Overlap	The OA lockouts for heating and cooling overlap. (No vent mode). The heating takes preference.
Econ Only	If cooling is not on.
Econ Mode	If in economizer mode.
Unit OFF	Unit is off.

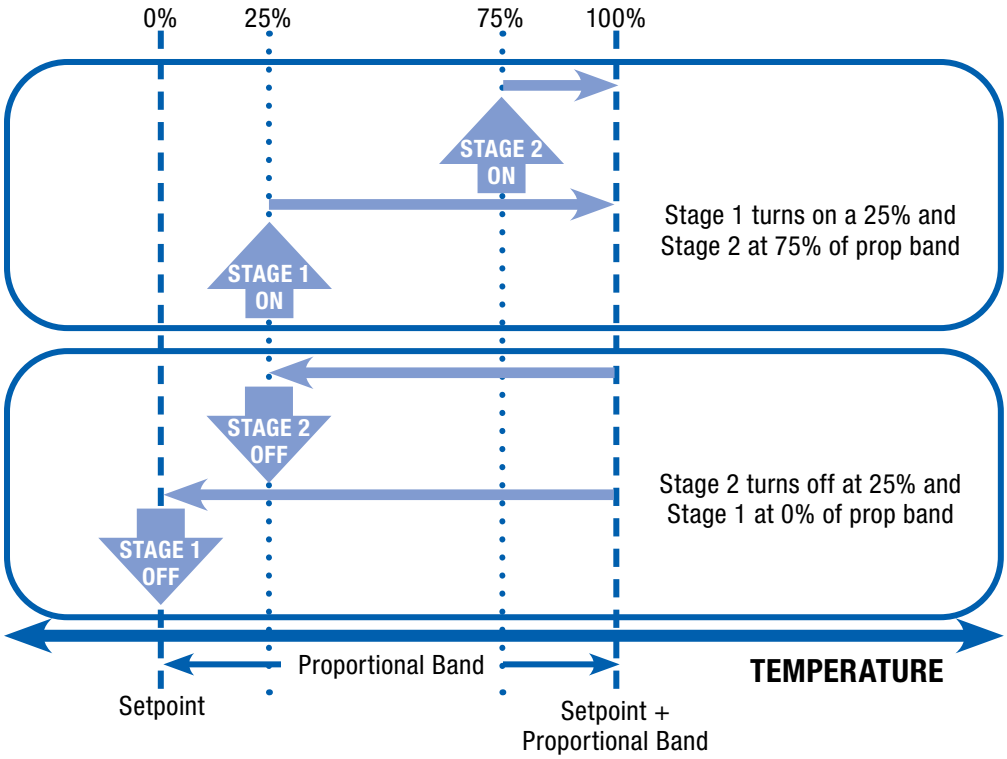
6.4.3.2 2-Stage: Two Stages of Cooling

If this is a two-stage heat pump, see *Combined Tempering*.

The mode is determined by the outdoor temperature and the cooling lockout temperature settings.



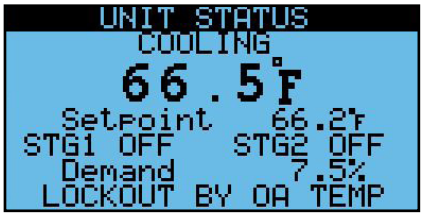
This type of cooling turns cycles two stages of cooling to maintain the cooling setpoint. You must set a prop band value. This value represents 100%; the wider the prop band the slower the response. Then you specify the “on point” for stages one and two in percentages. Stage one will turn off at setpoint and stage two will turn off at the on point for stage one. There is also a minimum on and off time to prevent over-cycling.



Example: In this case 4°F = 100% which means that 1°F = 25%, which makes our calculation easy. With the default settings, stage 1 turns on at 66.2 + 1 = 63.2. Stage 2 turns on at 66.2 + 3 = 65.2.

The cooling status can be monitored in the *Unit Status*. The screen shows:

- Cooling Control Variable which will be supply or return air, as selected
- Cooling setpoint
- Whether cooling enable 1 (stage 1) and cooling enable 2 (stage 2) are ON
- Cooling demand, expressed as a percentage of proportional band
- Cooling Status



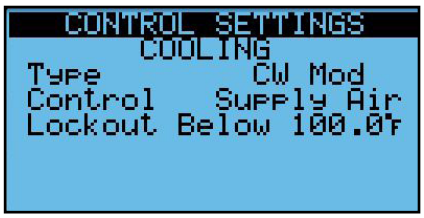
The cooling status values are shown. Multiple values may be true.

MESSAGE	MEANING
Cool Locked Out by OA	The cooling OA lockout is lower than the OA temperature.
Lockout Overlap	The OA lockouts for heating and cooling overlap. (No vent mode). The heating takes preference.
Econ Only	If economizer is open less than 100%.
Econ Mode	If in economizer mode.
Unit OFF	Unit is off.

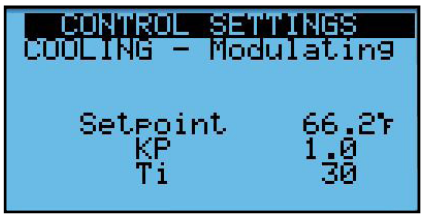
6.4.3.3 CW Mod: Chilled Water Modulating Coil

If this is a dual temp coil used for heating and cooling, see *Combined Tempering*.

The mode is determined by the outdoor temperature and the cooling lockout temperature settings.

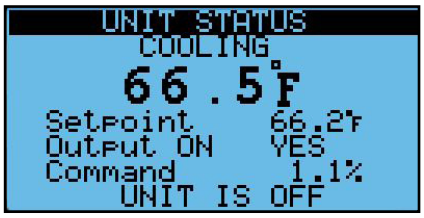


This type of cooling modulates a 0–10VDC chilled water valve using PI control. The KP and Ti can be adjusted to fine tune the control. The NO4 cooling enable contact is engaged whenever the cooling output is at 1% or higher.



The cooling status can be monitored in the *Unit Status*. The screen shows:

- Cooling Control Variable which will be supply or return air, as selected
- Cooling setpoint
- Whether cooling enable 1 ON
- Command (0–100%) to valve, where 0 = 10VDC output and 100% = 0VDC.
- Cooling Status



The cooling status values are shown. Multiple values may be true.

MESSAGE	MEANING
Cool Locked Out by OA	The cooling OA lockout is lower than the OA temperature.
Lockout Overlap	The OA lockouts for heating and cooling overlap. (No vent mode). The heating takes preference.
Econ Only	If economizer is open less than 100%.
Econ Mode	If in economizer mode.
Unit OFF	Unit is off.

6.5 COMBINED TEMPERING

Combined Tempering are methods where the same control is used for heating and cooling. These types include:

- Single-stage heat pump with or without auxiliary heat
- Two-stage heat pump with or without auxiliary heat
- VRF with or without auxiliary heat
- Dual Temp water coil which supplies heating or cooling, depending upon season

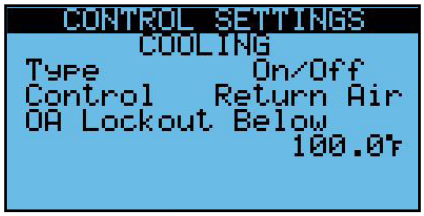
These methods require that both heating and cooling be enabled in the *Unit Configuration*.

6.5.1 Heat Pump 1-Stage: with or without 0–10VDC Aux Heat

This type requires cooling type On/Off and heating type On/Off. These type settings are made in the *Control Settings*.

6.5.1.1 Heat Pump 1-Stage Mode

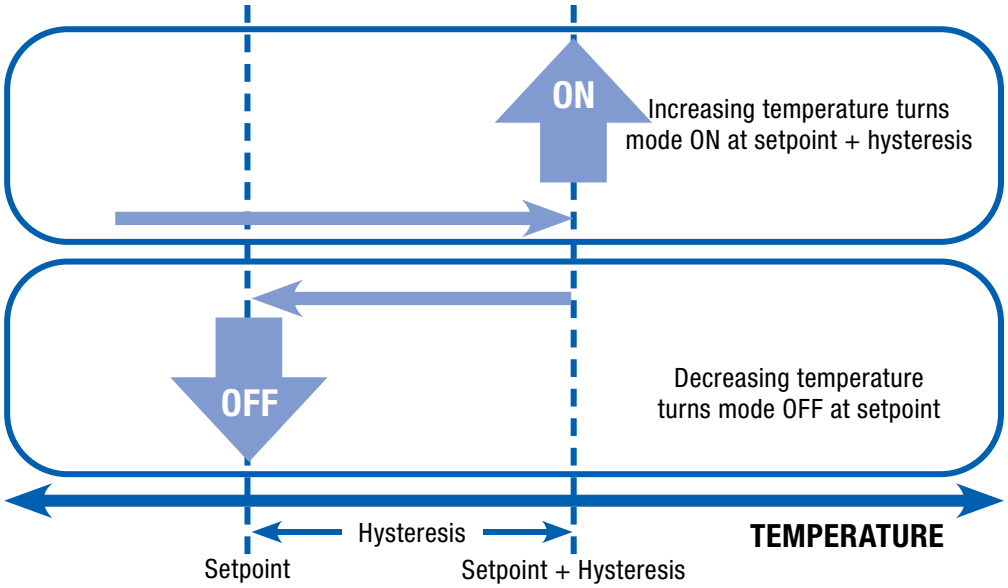
The mode is determined by the outdoor temperature and the heating and cooling lockout temperature settings.



6.5.1.2 Heat Pump 1-Stage Cooling Operation

This type of cooling cycles one stage of cooling to maintain the cooling setpoint. You must set a hysteresis value whereby the stage will turn on at the setpoint + hysteresis and turn at setpoint. There is also a minimum on and off time to prevent over-cycling.

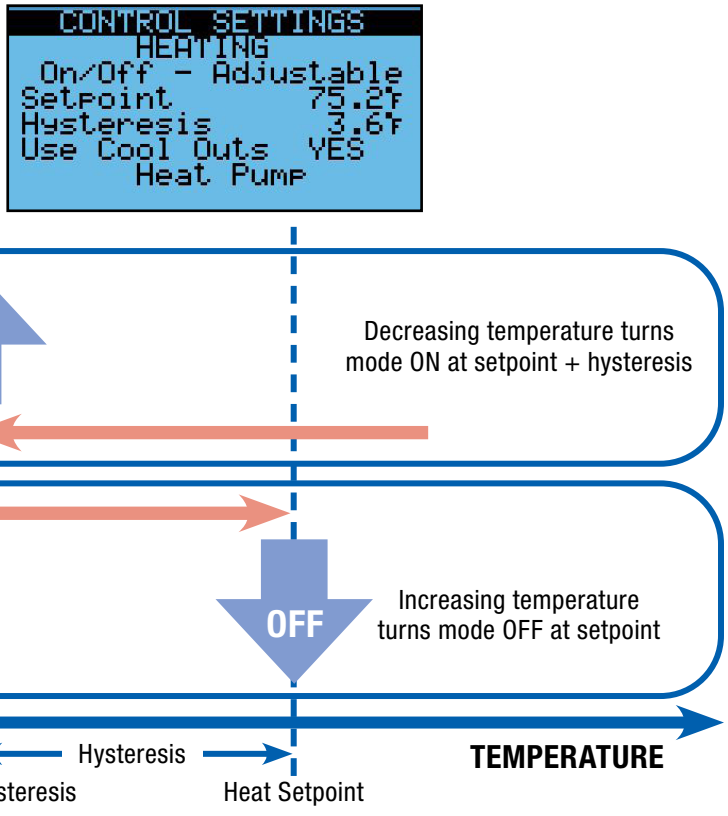
If in cooling mode, and the unit calls for cooling, it puts the tempering mode output used for a reversing valve, in the cool position and after a delay, will turn the compressor on and off to maintain the cooling setpoint.



6.5.1.3 Heat Pump 1 Stage Heating Operation

This type of heating cycles one stage of compressor to maintain the heating setpoint while the reversing valve is in heat mode. There is also an option to use axillary heat when the OA is below a certain temperature. You must set a hysteresis value whereby the stage will turn on at the setpoint + hysteresis and turn at setpoint. There is also a minimum on and off time to prevent over-cycling.

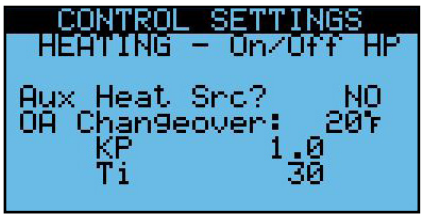
If in heating mode, and the unit calls for heating, it puts the tempering mode output used for a reversing valve, in the heat position and after a delay, will turn the compressor on and off to maintain the heating setpoint.



6.5.1.4 Heat Pump 1-Stage Auxiliary Heat

The unit allows you to use an 0–10VDC auxiliary heat source when the outdoor temperature is very cold. It will run a PI control to maintain the heat setpoint with the aux heat instead of the heat pump. If you have an auxiliary 0–10VDC heat source:

- Set the *Aux Heat Src?* To YES
- Set the outdoor temperature at which the unit will change from using the heat pump to aux heat.
- Adjust the KP and Ti for the PI loop, if necessary.

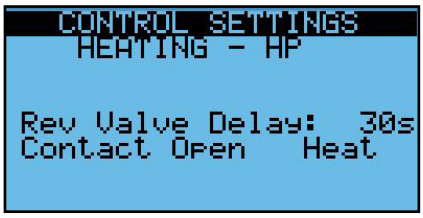


6.5.1.5 Heat Pump 1-Stage Reversing Valve

The reversing valve controls which direction the refrigerant flows. On change of mode (i.e. cool to heat), there will be a delay before the compressor turns on to allow the valve to come into position.

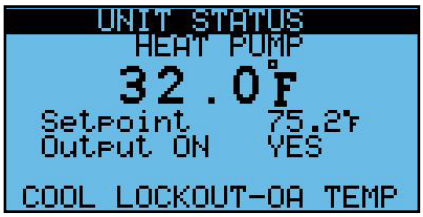
Reversing valve settings:

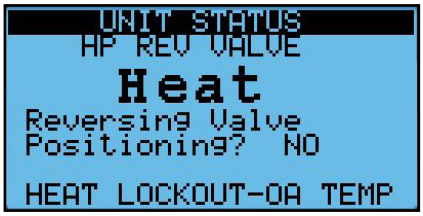
- Delay: This is the delay between the heating and cooling changeover where the compressor will not be turned on to allow the valve to get into position.
- Contact Open: Choose to have the contact open in heat or cool.

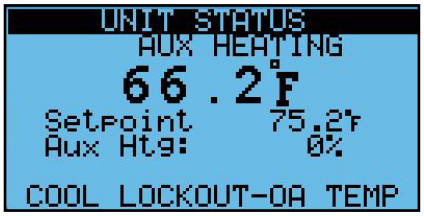


6.5.1.6 Heat Pump 1 Stage System Monitoring

The heat pump is monitored with heating and cooling screens as well as a reversing valve screen and if auxiliary heat is enabled, a screen showing its status.







The heat pump status values are shown. Multiple values may be true.

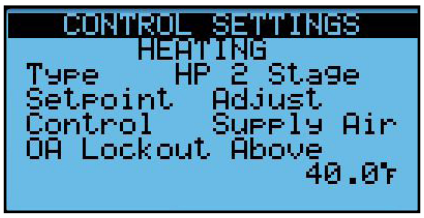
MESSAGE	MEANING
Cool Locked Out by OA	The cooling OA lockout is lower than the OA temperature.
Heat Locked out by OA	The heating OA lockout is higher than the OA temperature.
Lockout Overlap	The OA lockouts for heating and cooling overlap. (No vent mode). The heating takes preference.
Econ Only	If cooling is not on.
Econ Mode	If in economizer mode.
Unit OFF	Unit is off.
Aux Heat Mode	OA temp is cold enough that the auxiliary heat is used.
IN HEAT MODE	Valve is positioned for heat mode.
IN COOL MODE	Valve is positioned for cool mode.
Valve Positioning	Reversing valve is positioning. Not heat or cool is on during this time.

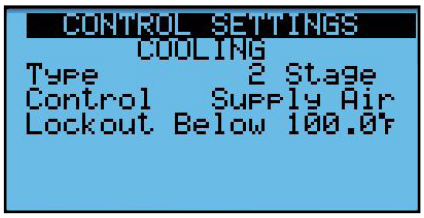
6.5.2 Heat Pump 2-Stage: with or without 0–10VDC Aux Heat

This type requires cooling type 2-stage and heating type HP 2-Stage.

6.5.2.1 Heat Pump 2-Stage Mode

The mode is determined by the outdoor temperature and the heating and cooling lockout temperature settings.

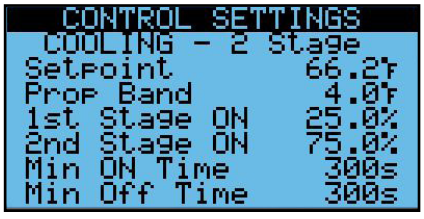


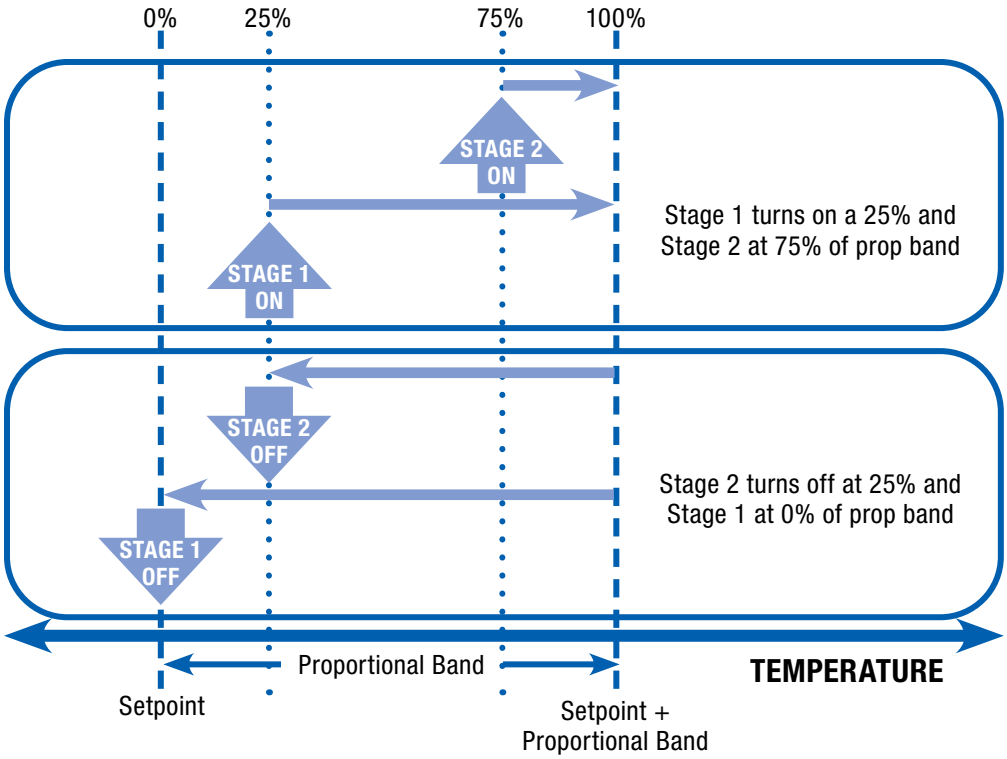


6.5.2.2 Heat Pump 2-Stage Cooling Operation

This type of cooling cycles two stages of cooling to maintain the cooling setpoint. You must set a prop band value. This value represents 100%; the wider the prop band the slower the response. Then you specify the “on point” for stages one and two in percentages. Stage one will turn off at setpoint and stage two will turn off at the on point for stage one. There is also a minimum on and off time to prevent over-cycling.

If in cooling mode, and the unit calls for cooling, it puts the tempering mode output used for a reversing valve, in the cool position and after a delay, will turn the compressor on and off to maintain the cooling setpoint.



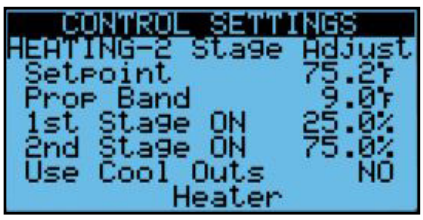


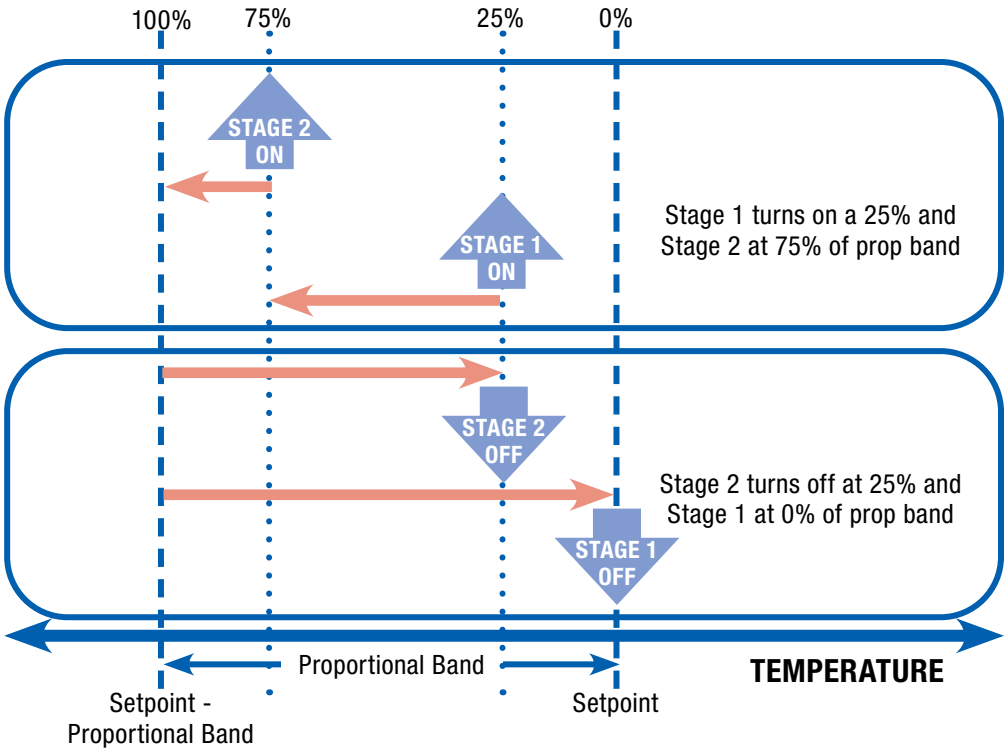
Example: In this case 4°F = 100% which means that 1°F = 25%, which makes our calculation easy. With the default settings, stage 1 turns on at 66.2 + 1 = 63.2. Stage 2 turns on at 66.2 + 3 = 65.2.

6.5.2.3 Heat Pump 2-Stage Heating Operation

This type of cooling cycles two stages of heating to maintain the heating setpoint. You must set a prop band value. This value represents 100%; the wider the prop band the slower the response. Then you specify the “on point” for stages one and two in percentages. Stage one will turn off at setpoint and stage two will turn off at the on point for stage one. There is also a minimum on and off time to prevent over-cycling.

If in heating mode, and the unit calls for heating, it puts the tempering mode output used for a reversing valve, in the heat position and after a delay, will turn the compressors on and off to maintain the heating setpoint.



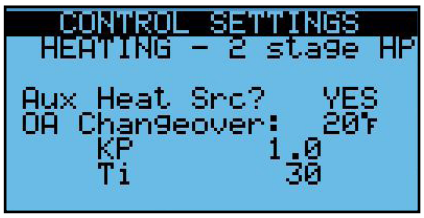


Example: In this case 4°F = 100% which means that 1°F = 25%, which makes our calculation easy. With the default settings, stage 1 turns on at 75.2 - 1 = 74.2. Stage 2 turns on at 75.2 - 3 = 72.2.

6.5.2.4 Heat Pump 2-Stage Auxiliary Heat

The unit allows you to use a 0–10VDC auxiliary heat source when the outdoor temperature is very cold. It will run a PI control to maintain the heat setpoint with the aux heat instead of the heat pump. If you have an auxiliary 0–10VDC heat source:

- Set the *Aux Heat Src?* To YES
- Set the outdoor temperature at which the unit will change from using the heat pump to aux heat
- Adjust the KP and Ti for the PI loop, if necessary.

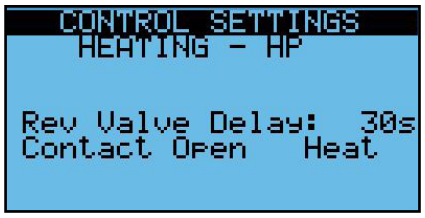


6.5.2.5 Heat Pump 2-Stage Reversing Valve

The reversing valve controls which direction the refrigerant flows. On change of mode (i.e. cool to heat), there will be a delay before the compressor turns on to allow the valve to come into position.

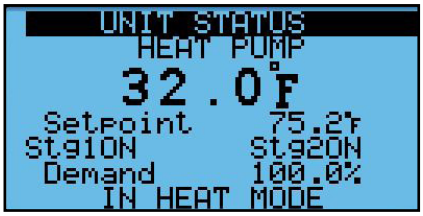
Reversing valve settings:

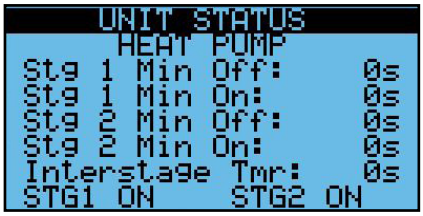
- Delay: This is the delay between the heating and cooling changeover where the compressor will not be turned on to allow the valve to get into position.
- Contact Open: Choose to have the contact open in heat or cool.

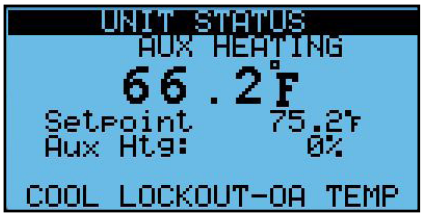


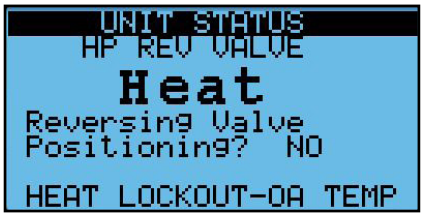
6.5.2.6 Heat Pump 2-Stage System Monitoring

The heat pump is monitored with heating and cooling screens as well as a reversing valve screen and if auxiliary heat is enabled, a screen showing its status.









The heat pump status values are shown. Multiple values may be true.

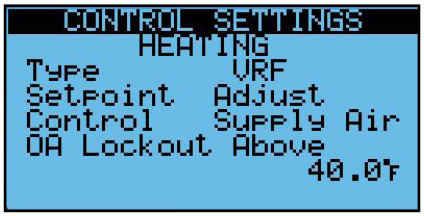
MESSAGE	MEANING
Cool Locked Out by OA	The cooling OA lockout is lower than the OA temperature.
Heat Locked out by OA	The heating OA lockout is higher than the OA temperature.
Lockout Overlap	The OA lockouts for heating and cooling overlap. (No vent mode). The heating takes preference.
Econ Only	If cooling is not on.
Econ Mode	If in economizer mode.
Unit OFF	Unit is off.
Aux Heat Mode	OA temp is cold enough that the auxiliary heat is used.
IN HEAT MODE	Valve is positioned for heat mode.
IN COOL MODE	Valve is positioned for cool mode.
Valve Positioning	Reversing valve is positioning. Not heat or cool is on during this time.

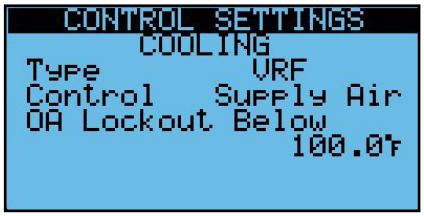
6.5.3 VRF

This type requires cooling type VRF and heating type VRF

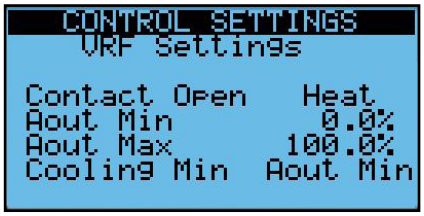
6.5.3.1 VRF Mode

The mode is determined by the outdoor temperature and the heating and cooling lockout temperature settings.



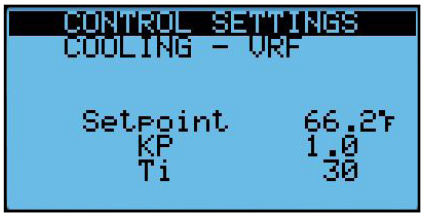


Based on whether the unit is in heating or cooling mode, the controller will set the tempering mode output in the correct position according to this setting. The minimum and maximum vales are also set here, as well as whether the cooling minimum demand coincides with the analog minimum or maximum.



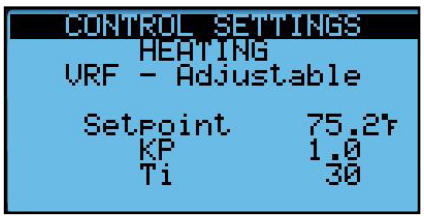
6.5.3.2 VRF Cooling Operation

This type of cooling modulates a 0–10VDC output using PI control to maintain the cooling setpoint. The KP and Ti can be adjusted to fine tune the control. The NO4 cooling enable contact is engaged whenever the cooling demand is at 1% or higher.



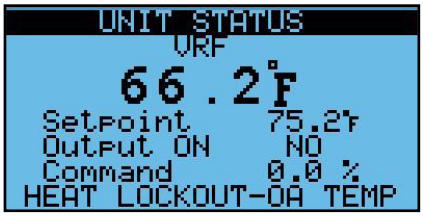
6.5.3.3 VRF Heating Operation

This type of heating modulates a 0–10VDC output using PI control to maintain the heating setpoint. The KP and Ti can be adjusted to fine tune the control. The NO4 cooling enable contact is engaged whenever the heating demand is at 1% or higher.



6.5.3.4 VRF Monitoring

This screen is available for monitoring the system in *Unit Status*.



The VRF status values are shown. Multiple values may be true.

MESSAGE	MEANING
Cool Locked Out by OA	The cooling OA lockout is lower than the OA temperature.
Heat Locked out by OA	The heating OA lockout is higher than the OA temperature.
Lockout Overlap	The OA lockouts for heating and cooling overlap. (No vent mode.) The heating takes preference.
Econ Only	If cooling is not on.
Econ Mode	If in economizer mode.
Unit OFF	Unit is off.
Aux Heat Mode	Auxiliary Heat is used.
VRF On	VRF is used (rather than aux heat).
IN HEAT MODE	Valve is positioned for heat mode.
IN COOL MODE	Valve is positioned for cool mode.

6.5.4 Dual Temperature Coil

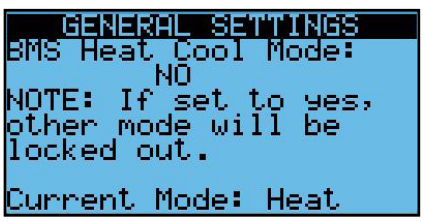
The dual temperature coil is a coil which provides heating in the winter and cooling in the summer by changing the temperature of the fluid in the coil. To do this, the coil needs to know what type of fluid (hot or cold) is being provided. It will lock out cooling in heat mode and vice versa. The only method for this is a BMS command. Therefore, the system must be equipped with a BMS system for this control.

The BACnet objects for this are:

- BV 60 BMS_SetHeatCool: 0 = No, 1 = Yes. This enables the control. This can also be set in the screen below.
- BV 61 BMS_HeatCoolMode: 0 = Heat, 1 = Cool. This sets the type. The current setting can be seen in the screen below for troubleshooting.

The Modbus Registers for this are:

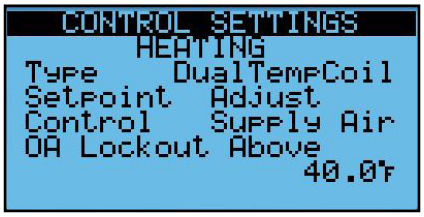
- Coil 4 BMS_SetHeatCool: 0 = No, 1 = Yes. This enables the control. This can also be set in the screen below.
- Coil 5 BMS_HeatCoolMode: 0 = Heat, 1 = Cool. This sets the type. The current setting can be seen in the screen below for troubleshooting.

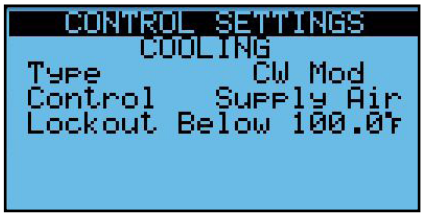


This type requires cooling type CW Mod and heating type DualTempCoil.

6.5.4.1 Dual Temperature Coil Mode

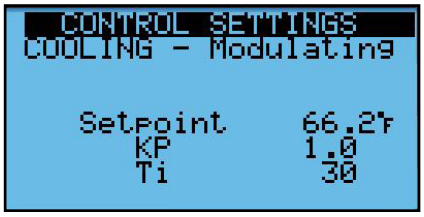
The mode is determined by the OA temperature and the heating and cooling lockout temperature settings as well as the BMS command. Both heating or cooling demand drive the same cooling command analog and cooling enable digital output.





6.5.4.2 Dual Temperature Coil Cooling Operation

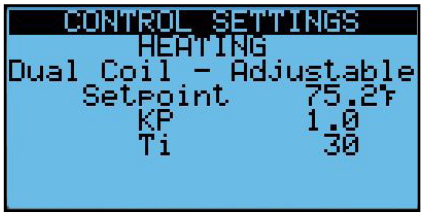
This type of cooling modulates a 0–10VDC cooling command output using PI control to maintain the cooling setpoint. The KP and Ti can be adjusted to fine tune the control. The NO4 cooling enable contact is engaged whenever the cooling demand is at 1% or higher.



6.5.4.3 Dual Temperature Coil Heating Operation

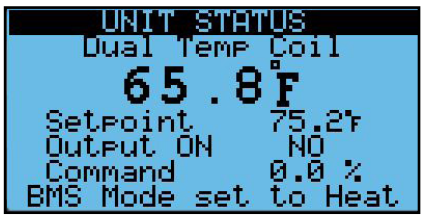
NOTE: The valve control can be set directly from the BMS if you change Valve control to BMS.

This type of heating modulates a 0–10VDC cooling command output using PI control to maintain the heating setpoint. The KP and Ti can be adjusted to fine tune the control. The NO4 cooling enable contact is engaged whenever the heating demand is at 1% or higher.



6.5.4.4 Dual Temperature Coil System Monitoring

This screen is available for monitoring the system in *Unit Status*.



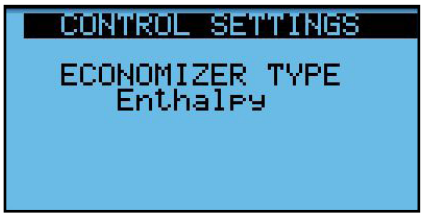
The Dual Temperature Coil status values are shown. Multiple values may be true.

MESSAGE	MEANING
Cool Locked Out by OA	The cooling OA lockout is lower than the OA temperature.
Heat Locked out by OA	The heating OA lockout is higher than the OA temperature.
Lockout Overlap	The OA lockouts for heating and cooling overlap. (No vent mode.) The heating takes preference.
Econ Only	If cooling is not on.
Econ Mode	If in economizer mode.
Unit OFF	Unit is off.
Set BMS Heat/Cool!!	In order to work properly, the BMS must be set to give a heat/ cool command.
BMS Mode set to Heat	BMS is setting the mode to heat. No cooling is allowed.
BMS Mode set to Cool	BMS is setting the mode to cool. No heating is allowed.
IN HEAT MODE	Valve is positioned for heat mode.
IN COOL MODE	Valve is positioned for cool mode.

6.6 ECONOMIZER CONTROL (BYPASS/FREE COOLING)

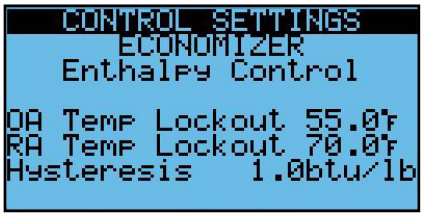
All ERV units that are equipped with a bypass damper allow the incoming air bypass the enthalpic plate.

The economizer settings are:
- Temperature
- Enthalpy
- Disabled



Economizer based on Enthaply Sequence:
When the OA temperature is below the RA temperature less the hysteresis value, the economizer will bypass the core with incoming air.

The economizer will be locked out when:
- The OA temperature is less than the economizer adjustable low lockout.
- The RA temperature is below the adjustable low lockout
- Heating is enabled



7.0 SPECIAL FEATURES

These features are not common but are available in the ERV controller.

7.1 FROST CONTROL

ERV units utilize the optional bypass damper to bypass the core when it is very cold outside. This is usually used in northern states and Canada. To enable the frost control functionality for these units the Enable Frost Cntl must be set to YES in the *Unit Configuration* (password protected) screen.

The frost control function disables the supply fan and closes the OA damper when the following conditions are met:

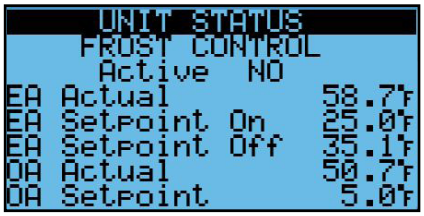
- The OA temperature is less than the OA Below set point
- The EA temperature (sensed at the inlet to the EA fan—average exhaust air temperature) is below the EA Below set point.

For variable speed fans, an additional setting is required for the exhaust fan operation. While the supply fan is off, a variable speed exhaust fan (ECM or VFD) will operate at the command set by the FC Exh Command set point. This command allows the user to minimize the negative space pressure that will be generated with the EF on and the SF off during frost control.

For fans that are not variable speed, the exhaust fan will run at the normal speed and this setting will not be shown.

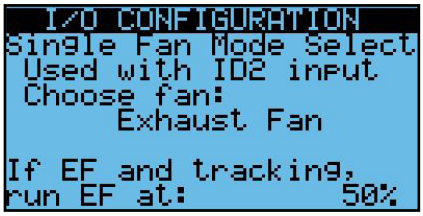
The frost control mode ends (OA damper is opened and the supply fan is enabled) when the EA temperature increases to the EA Above set point. The unit then resumes the selected normal operating mode. If the EA temperature then falls below the OA Below set point frost control mode is enabled again.

There is a *Unit Status* screen that will appear if frost control function is enabled.



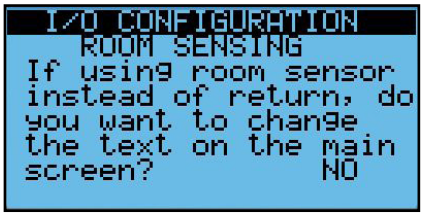
7.2 SINGLE FAN MODE

In some cases the application may require that only one fan run. The single fan mode is initiated by either closing the ID2 contact (terminals and 19) or a BMS command to BMSEFOnly variable. It is BV11 for BACnet and Coil 1 for Modbus, where 0 = No and 1 = Yes. The default is Exhaust Fan but it can be changed to Supply Fan here. If tracking the supply fan, also set a value for exhaust fan in single fan mode.

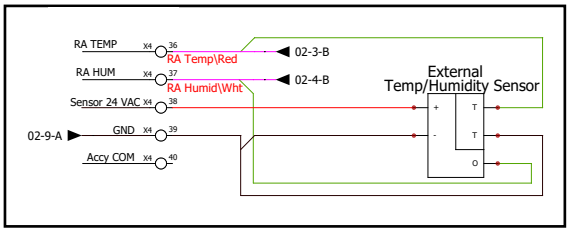


7.3 USE ROOM TEMP AND HUMIDITY RATHER THAN RETURN

The system allows you to use a room temperature and humidity sensor in place of the return air temperature and humidity sensor. One use for this is when you have unoccupied operation when the fans are off, you will be able to get a temperature indicative of the actual room temperature. This feature is useful when feeding a single zone. It requires the removal of the return sensors and replace them with the room sensor. The setting here will change the word “return” to “room” on the main screen to eliminate confusion.

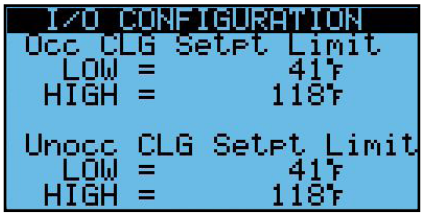


The Room Temperature and Humidity Sensor is P/N 102397 Wall Mount, RTH-W.



7.4 LIMIT SETPOINT RANGES FOR USERS

It is possible to set different limits for the heating and cooling occupied and unoccupied setpoints. The defaults are shown in these screens. This will limit the users in the front non-password protected screens from setting extreme setpoints.



7.5 ADJUSTMENTS FOR TWO-STAGE COOLING

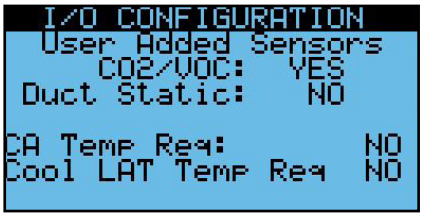
There are several special settings for the two-stage cooling.

- In cases where the condensing unit is tied to only the first compressor, set only allow comp 2 is comp 1 in on: to YES. (Because of minimum off times it is normally possible that the second compressor turns back on before the first).
- Interstage delay: the is a delay between when the compressors are allowed to stage. It is defaulted to 180s.
- Normally the second compressor turns off at the same percentage that the first turned on and the first turns off at setpoint. If you set Specify Off Values: to YES, it will turn them off at the values specified.

7.6 TURN UNIT ON AND OFF BASED ON CO2 LEVEL

The system allows you to turn the unit on and off based on CO2 Level. This is useful when the ERV has been added specifically to give more fresh air to a space when occupied, such as a church.

The CO2 sensor must be enabled and installed.



The feature needs to be enabled.

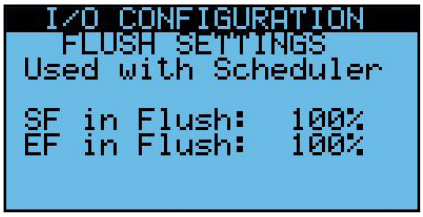
The setting for CO2 level to turn off is set, as well as a hysteresis value that is added to this to turn on and one that is subtracted from this to turn off.

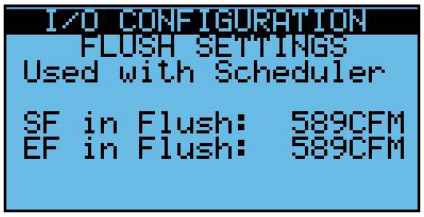
7.7 FLUSH FEATURE

The flush feature is used in conjunction with the scheduler function that allows you to set the unit into flush mode for specific time periods where the exhaust fan and supply fan will run at a specified CFM or % during this period.

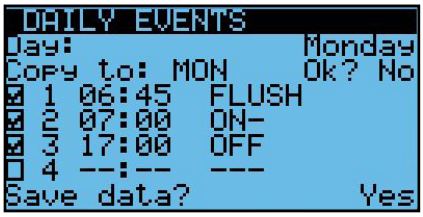
It is enabled in the *I/O Configuration* screen. You can also set whether the fans will run to a specified % or CFM.

Depending upon the last setting, you will se either one of these screens to allow you to define how the fans will run while in flush mode.





Once these setting are done, you will now have a third type of mode for the scheduler called FLUSH, as shown. In this example the unit will go into flush mode at 6:45 until 7:00 when it will turn on and run normally. During flush mode the OA and RA dampers (if included) will be open as in normal operation.

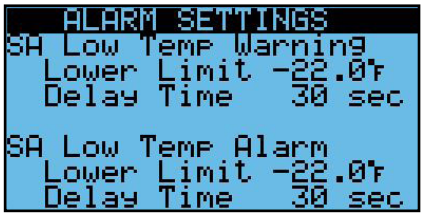


7.8 COLD WEATHER OPERATION

The ERV has a built-in feature for detecting low temperatures to avoid dumping cold air into the space. The settings are shown in the following screen.

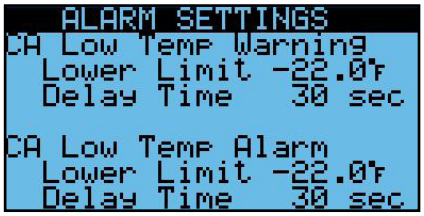
In versions 3.00.30 and higher, the low temperature allowed was decreased. Be sure to make sure these settings are appropriate for your application.

- If the SA Temperature falls below the low warning temperature for the delay time while the supply fan is running, the warning will sound but the unit will remain running.
- If the SA Temperature falls below the low alarm temperature for the delay time while the supply fan is running, the alarm will sound but the unit will shut down and require a manual reset to start again.



For systems that control heat, the settings are shown in the following screen.

- If the CA Temperature falls below the low warning temperature for the delay time while the supply fan is running, the warning will sound but the unit will remain running.
- If the CA Temperature falls below the low alarm temperature for the delay time while the supply fan is running, the alarm will sound but the unit will shut down and require a manual reset to start again.

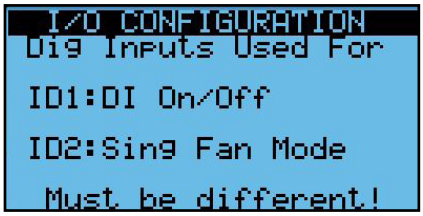


7.9 SMOKE OR FREEZESTAT DEDICATED INPUT

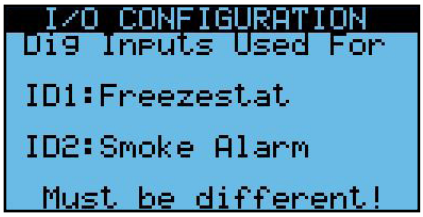
This feature was added in version 03.00.41

It is possible to dedicate either digital input for a smoke and/or freezestat alarm which will shut down the unit and issue a manual reset alarm when engaged.

To use this feature, go to the I/O Configuration area and view this screen. The default for ID1 is DI On/Off and the default for ID2 is Single Fan Mode.



Change the input(s) to your desired alarms. Make sure you do not duplicate them. Shown is a sample but either input can be used for either alarm.



Once you do that, you will see either of these screens show up accordingly. Make sure you set the action for either *Open is ON* or *Open is Off*.

You will also have the additional manual reset alarm(s) according to your selection:

- AL08: Smoke Alarm
- AL09: Freezestat Alarm

THIS PAGE IS INTENTIONALLY LEFT BLANK.

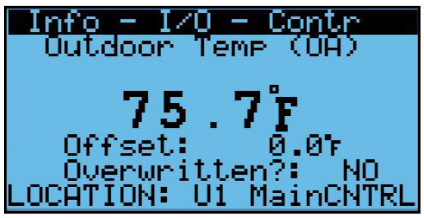
8.0 VERIFYING I/O AND UNIT WIRING

All of the I/O values should be verified and calibrated, if necessary.

8.1 VERIFYING ALL I/O THROUGH UNIT STATUS SCREENS

All of the individual I/O are able to be viewed in one place by pressing “ENTER” when on this screen, which is located toward the and of *Unit Status*.

There will be individual screens for each input and output. Several examples are shown.



8.2 CALIBRATING I/O

For a temperature sensor that may have run a long distance or a humidity sensor with a reading that may have drifted over time, a calibration may be necessary. There is a screen such as the one shown for each sensor and transducer. The current value at the top will reflect the change with the offset that is set in this screen.

8.3 GENERAL UNIT CONTROL WIRING

The following tables and diagrams show the general unit control wiring for the ERV units. A unit-specific electrical schematic is found inside the access door to the core module.

8.3.1 Sensor Inputs

Sensors in Grey are optional, and field-installed.

SENSOR	TYPE	SENSOR TERMINALS	INTERMEDIATE TERMINALS	CONTROLLER TERMINALS
OA Temperature	Combined CAREL NTC/0–10VDC	Far Left (Red)	-	U1 (Main)
		2 (Black)	X4-39 GND	GND TS2
OA Humidity		3 (Red)	X4-38	24VAC TS1
		4 (Black)	X4-39 GND	GND TS2
		5 (White)	-	U2 (Main)
RA Temperature	Combined CAREL NTC/0–10VDC	Far Left (Red)	X4-36	U3 (Main)
		2 (Black)	X4-39 GND	GND TS2
RA Humidity		3 (Red)	X4-38	24VAC TS1
		4 (Black)	X4-39 GND	GND TS2
		5 (White)	X4-37	U4 (Main)
SA Temperature	CAREL NTC	(Red or White)	-	U5 (Main)
		(Red or White)	-	GND (Main)
EA Temperature	CAREL NTC	(Red or White)	-	U6 (Main)
		(Red or White)	-	GND (Main)
OA Filter Pressure	0–10VDC	Vin (Red)	-	24VAC TS1
		GND (Black)	-	GND TS2
		Vo (White)	-	U7 (Main)
RA Filter Pressure	0–10VDC	Vin (Red)	-	24VAC TS1
		GND (Black)	-	GND TS2
		Vo (White)	-	U8 (Main)
OA Flow Rate Pressure	0–10VDC	Vin (Red)	-	24VAC TS1
		GND (Black)	-	GND TS2
		Vo (White)	-	U1 (Exp)
RA Flow Rate Pressure	0–10VDC	Vin (Red)	-	24VAC TS1
		GND (Black)	-	GND TS2
		Vo (White)	-	U2 (Exp)
CO2 Level Sensor*	0–10VDC		X3-21 (PWR)	
			X3-27 (GND)	GND TS2
			X3-22	U3 (Exp)
VOC Level Sensor*	0–10VDC		X3-21 (PWR)	
			X3-27 (GND)	GND TS2
			X3-23	U4 (Exp)
Space Pressure Sensor*	0–10VDC	Vin	X3-21 (PWR)	
		GND	X3-27 (GND)	GND TS2
		Vo	X3-24	U5 (Exp)
Duct Pressure Sensor*	0–10VDC	Vin	X3-21 (PWR)	
		GND	X3-27 (GND)	GND TS2
		Vo	X3-25	U6 (Exp)
CA Temp Sensor	CAREL NTC	(Red or White)	X3-26	U7 (Exp)
		(Red or White)	X3-27 (GND)	GND (Main)

* If I/O is unused, it may be assigned to a different input in I/O Configuration.

8.3.2 Digital Inputs

Inputs in Grey are optional, and field-installed.

INPUT	TYPE	INPUT TERMINALS	INTERMEDIATE TERMINALS	CONTROLLER TERMINALS
Smoke Detector	Dry Contact		X2-15	C1/2**
			X2-16	24VDC
ID1 Unit Enable*	Dry Contact		X2-17	ID1
			X2-18	GND
ID2 Single Fan Mode	Dry Contact		X2-19	ID2
			X2-18	GND
SF Current Switch (SF Status)	Dry Contact	(Black)	-	GND TS2
		(Red)	-	U9 (Main)
EF Current Switch (EF Status)	Dry Contact	(Black)	-	GND TS2
		(Red)	-	U10 (Main)

*Overflow switch is wired into here if unit was ordered with one.
** Smoke alarm will interrupt the enable signal to the fans. This will cause a fan alarm.

8.3.3 Digital Outputs

Outputs in Grey are optional, and field-installed. Heating and cooling may be factory-installed or field-installed, depending upon the unit.

OUTPUT	TYPE	OUTPUT TERMINALS	INTERMEDIATE TERMINALS	CONTROLLER TERMINALS
SF Enable	Dry Contact	(See wiring diagram)	X2-13	NO1 (Main)
			X2-14	
EF Enable	Dry Contact	(See wiring diagram)	X2-11	NO2 (Main)
			X2-12	
Bypass Damper	Dry Contact	HOT	X2-07 (Red)	NO3 (Main)
		COM	X2-06 (Black)	Accy COM
OA Damper	Dry Contact	HOT	X2-03 (Red)	NO4(Main)
		COM	X2-02 (Black)	Accy COM
RA Damper	Dry Contact	HOT	X2-05 (Red)	NO5 (Main)
		COM	X2-04 (Black)	Accy COM
Serious Alarm Output	Dry Contact*		-	NO6/NC6 (Main)
			-	C6 (Main)
Heating Enable 1	Dry Contact*		X1-09**	NO1 (EXP)
			X1-08**	C1/2 (EXP)
Heating Enable 2	Dry Contact*		X1-10**	NO2 (EXP)
			X1-08**	C1/2 (EXP)
Tempering Mode	Dry Contact*		X4-32**	NO3 (EXP)
			X4-35**	C3/4/5 (EXP)
Cooling Enable 1	Dry Contact*		X4-33**	NO4(EXP)
			X4-35**	C3/4/5 (EXP)
Cooling Enable 2	Dry Contact*		X4-34**	NO5 (EXP)
			X4-35**	C3/4/5 (EXP)
Any Alarm Output	Dry Contact*		-	NO6/NC6 (EXP)
			-	C6 (EXP)

*There is an option to use 24VAC ACCY power if it is needed to drive a 24VAC relay. For example, to drive a cooling stage 1 relay, wire as follows:

- Accy 24VAC (X1-01) connected to EXP C3/4/5 (X4-35)
- EXP NO4 (X4-33) Cooling stage 1 connected to one side of the 24VAC relay coil.
- Accy COM (X4-40) connected to the other side of the 24VAC relay coil.

**RD units Only. All other units go directly to the terminals on the expansion module as listed on the right.

8.3.4 Analog Outputs

Outputs in Grey are optional, and field-installed. Heating and cooling may be factory-installed or field-installed, depending upon the unit.

OUTPUT	TYPE	OUTPUT TERMINALS	INTERMEDIATE TERMINALS	CONTROLLER TERMINALS
SF Signal	0–10VDC		01-6-D	Y1 (Main)
			01-2-D	GND (Main)
EF Signal	0–10VDC		01-4-D	Y2 (Main)
			01-2-D	GND (Main)
HGRH Command**	0–10VDC		–	U8 (EXP)
			–	GND (EXP)
Cooling Command	0–10VDC		X3-29 (Black)*	U9 (EXP)
			X4-31*	GND (EXP)
Heating Command	0–10VDC		X3-30 (White)*	U10 (EXP)
			X4-31*	GND (EXP)

*RD units Only. All other units go directly to the terminals on the expansion module as listed on the right.

**May also be used for a preheater.

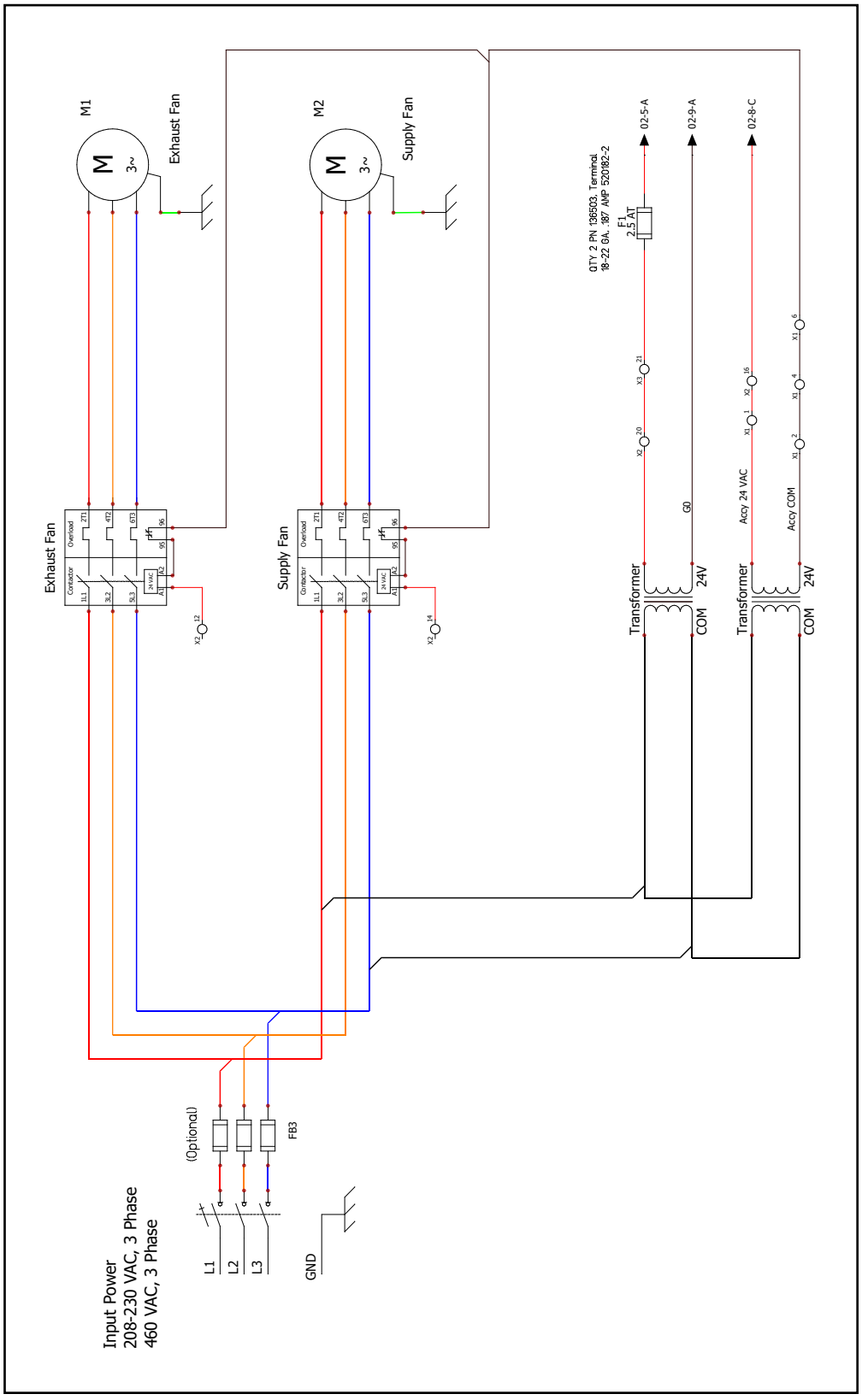
8.3.4.1 Wiring to Three-Wire Valves

For Cooling or Dual Temp valves, use the following wiring:
Sensor signal X3-29
Common X4-31
24V Power to valve X3-21

For Heating valves, use the following wiring:
Sensor signal X3-30
Common X4-31
24V Power to valve X3-21

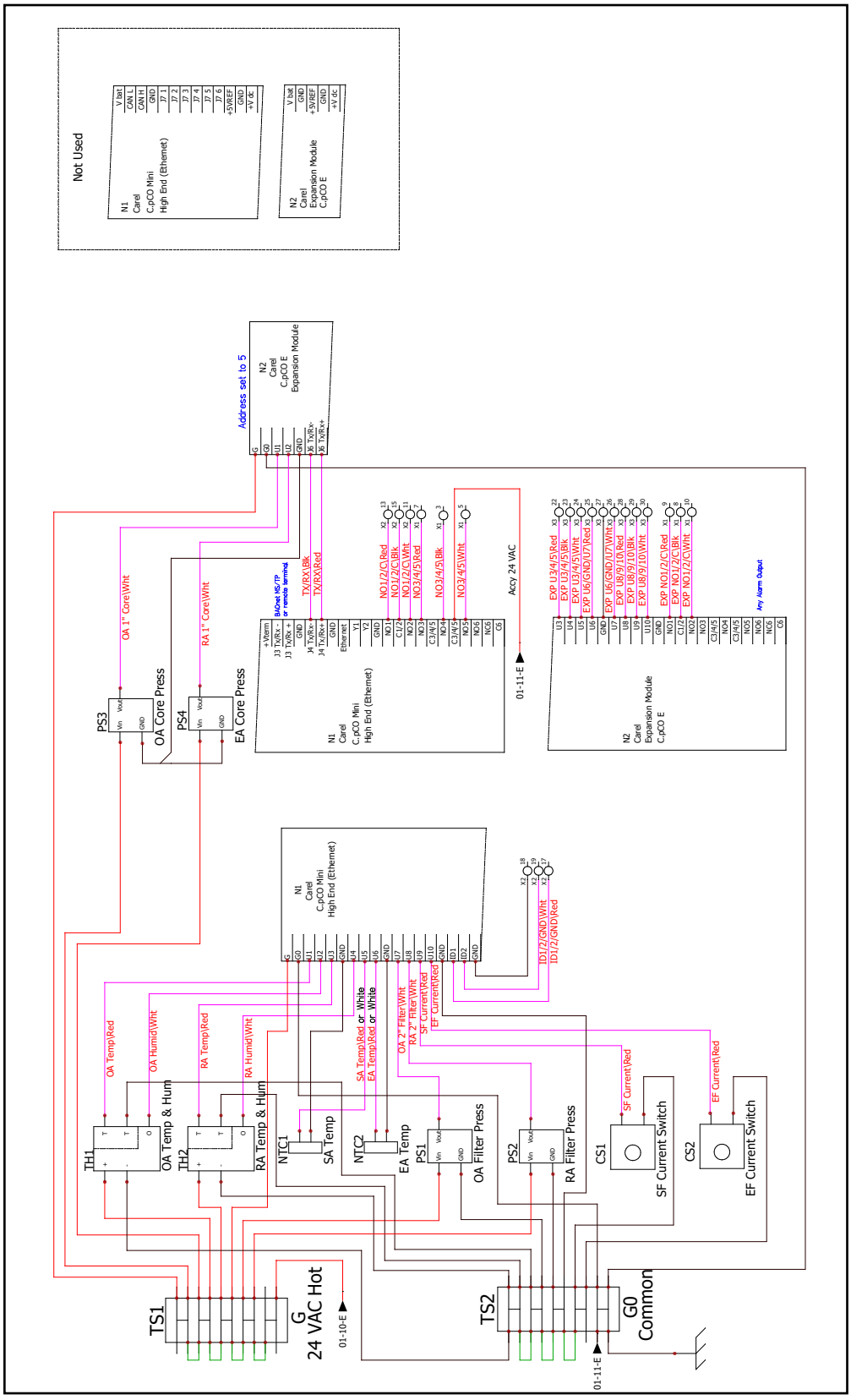
NOTE: This wiring schematic is TYPICAL control wiring for a three phase, 208-230VAC and 460VAC input for models HE-2X, HE3X, HE-4X, HE-6X, and HE-8X. A unit-specific electrical schematic is found inside the access door to the core module.

8.3.5 Sample Power Wiring Schematic



RenewAire Energy Recovery Ventilation

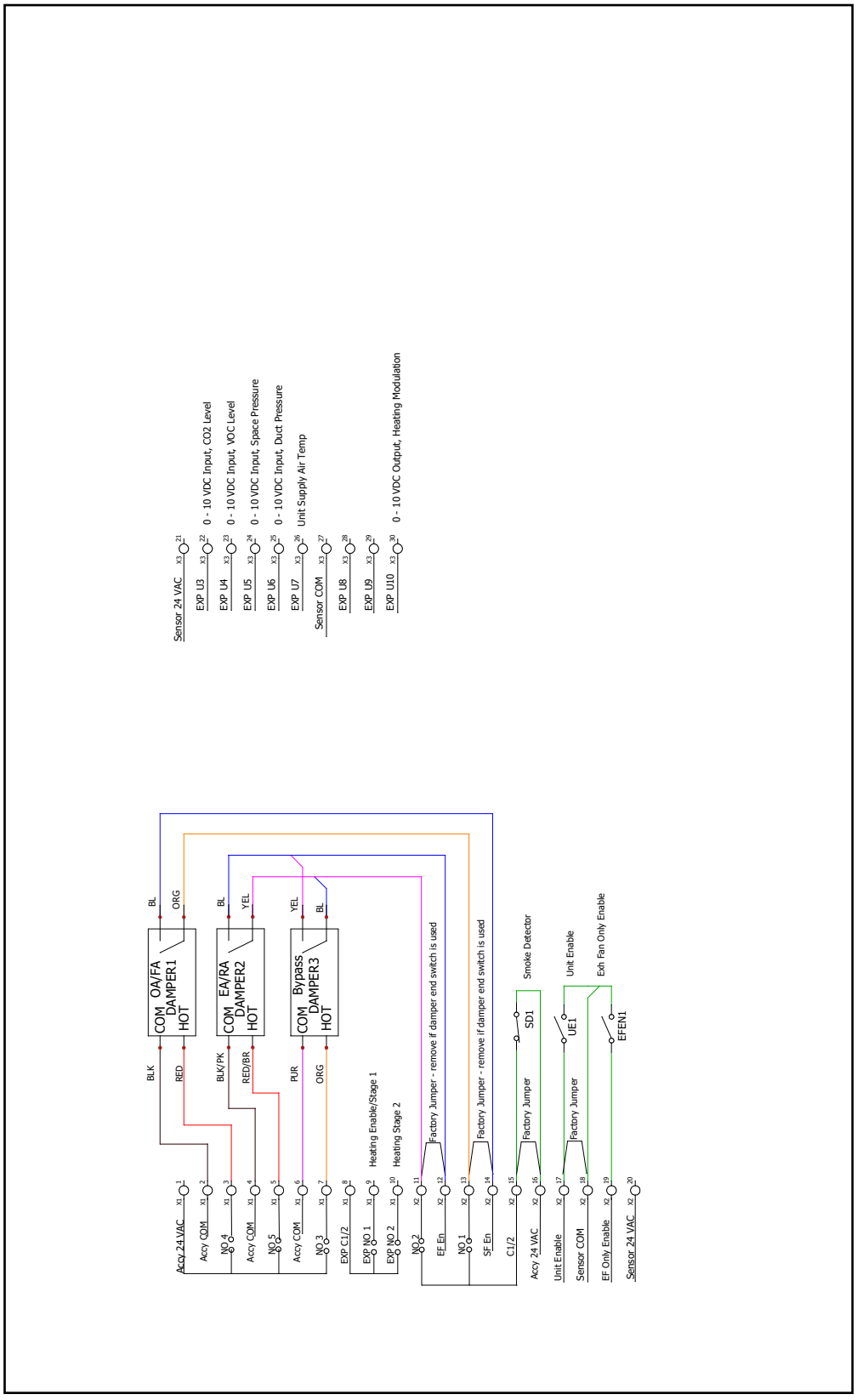
8.3.6 Sample Control Wiring Schematic



NOTE: This wiring schematic is TYPICAL control wiring for a three phase, 208-230VAC and 460VAC input for models HE-2X, HE3X, HE-4X, HE-6X, and HE-8X. A unit-specific electrical schematic is found inside the access door to the core module.

NOTE: This wiring schematic is TYPICAL control wiring for a three phase, 208-230VAC and 460VAC input for models HE-2X, HE3X, HE-4X, HE-6X, and HE-8X. A unit-specific electrical schematic is found inside the access door to the core module.

8.3.7 Sample Field Wiring Schematic



RenewAire Energy Recovery Ventilation

9.0 ALARMS AND TROUBLESHOOTING

If the problem is caused by an alarm, the first step in troubleshooting is to view the Alarm screens. Press the Alarm button on the face of the controller to see all current alarms and what function or component is causing the alarm. In some cases, the Alarm pre-set may need to be adjusted or an offset may need to be changed. Before making any changes to the controller programming, be certain to have an updated Backup file so that current settings can be easily restored, if needed. See the following *Alarms* section for these.

Problems with an air handler are sometimes strictly mechanical, in which a fan or damper or some other component simply stops working. Mechanical problems are easily traced to specific components by using the Test End Device feature in the service level. See the following *Test End Devices* section for this.

In other cases, problems may be caused by the air handler trying to overcome a pre-set or operating parameter that has been set by the user. In these cases, view the controller screens to trace the problem. See *Other Common Problems* section for these.

9.1 ALARMS

The alarms are viewed through the controller screen or through the BMS.

9.1.1 Acknowledging Alarms

When an alarm occurs, you will hear a buzzer sound and the alarm light will flash. Press the alarm button to acknowledge the alarm and quiet the buzzer.

9.1.2 Viewing Alarms and Alarm Log

If there are active alarms the alarm button will be red. To view the active alarms, press the alarm button. Each alarm has an alarm number (AL*11, in this case), a time stamp, and a message to show which alarm occurred.

Continue to press the button to cycle through all active alarms. At the end you will see this screen. Here you can press “ENTER” to see the past alarms.

An alarm log screen looks like this. If the event is Stop, it shows the time that the alarm went away. If the event is Start, it shows the time that the alarm first occurred. There may be up to 50 entries.

If no alarms are active, the screen will say No Alarms but you can still press “ENTER” to view the last 50 alarm occurrences.

9.1.3 Resetting Alarms

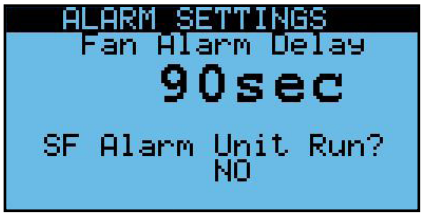
If you cycle through the alarms, you will see this screen. At this time, you can hold the alarm button down to reset the “User Reset” alarms. (The auto reset alarms reset themselves.)

9.1.4 Alarm Digital Outputs

The controller includes a digital output for remote indication of an alarm condition.

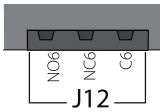
The first is AlarmOut.val and it closes the contact if there is an alarm that will shut down the unit. These include:

- Low Supply Temperature Alarm
- High Supply Temperature Alarm
- Loss of communication between the controller and the expansion module
- Exhaust Fan Alarm (Failure to start)
- Supply Fan Alarm (Failure to start) ONLY IF the *SF Alarm Unit Run?* is set to No. If yes, the unit will not shut down and the exhaust fan will be allowed to continue to run. All heating and cooling functions will be locked out, however.



The second is AnyAlarmOut.val and it closes the contact if there is any alarm including the ones in AlarmOut.val.

The physical connection for the first is made at the controller and the second is made at the expansion module. Both are terminated at the same terminal, J12, located in the upper right corner. There is both a normally open (NO6 to C6) and normally closed (NC6 to C6) option.



9.1.5 Specific Alarms and Their Meaning

The alarms are identified by number. The are grouped by type. Alarms 50–57, alarms 66–68.

9.1.5.1 General Alarms

NUMBER	NAME	STATUS SHOWN	MEANING
0	AI_retain	User reset	Error in the number of retain memory writings
1	AI_Err_retain_write	User reset	Error in retain memory writings
2	AI_Device_Test	Auto reset	Device Test is Running—Outputs Disabled!
3	AI_BMS_Offline	Auto reset	Device offline alarm to BMS
4	OfflineAlrm_CPCOE_1	Auto reset	Device offline alarm CPCOE
5	CfgErrAlrm_CPCOE_1	Auto reset	Wrong configuration on device CPCOE
8	AI_Smoke	User Reset	Smoke Alarm Input is engaged
9	AI_Freeze	User Reset	Freezestat Alarm Input is engaged

Alarm Number 0: Error in the number of retain memory writings
This usually means indicates that the BMS is writing to a retained setpoint too often. Retained values are stored in a special memory so that they are kept on power loss. Failure to correct this could result in damage to the controller.

Alarm Number 1: Error in retain memory writings
This usually means indicates that the BMS is writing to a retained setpoint too often. Retained values are stored in a special memory so that they are kept on power loss. Failure to correct this could result in damage to the controller.

Alarm Number 2: Device Test is Running—Outputs Disabled!
This alarm occurs if someone had the unit in device test mode and the time limit has passed, usually an hour. Either cycle power to the unit or go into the Device Test section in the password protected menus and turn it off.

Alarm Number 3: Device offline alarm to BMS
This alarm occurs if the BMS is enabled, and it is offline.

Alarm Number 4: Device offline alarm CPCOE
This alarm occurs if the controller and expansion module have lost communication. For correct operation the dipswitches are set (left to right) Forward, backward, forward, backward, forward, forward, forward, forward. This coincides with an address of 5. Sometimes if they have been moved around it is necessary to set them all to OFF (forward), cycle power, and then set them as required, and then cycle power again.

- Check the wiring: FBUS on the controller to BMS on the expansion.
- Check that the dipswitches are positioned correctly.

NOTE: The green LED indicates communication status on the BMS port. If there is communication on the BMS port (online) the green LED flashes, if there is no communication (offline) the LED stays on steady.

Alarm Number 5: Wrong configuration on device CPCOE
This alarm is an internal alarm. Contact TSS if this alarm occurs.

Alarm Number 8: In Special Features, either ID1 or ID2 may be dedicated to a smoke alarm input. This alarm indicated that the alarm is engaged.

Alarm Number 9: In Special Features, either ID1 or ID2 may be dedicated to a freezestat alarm input. This alarm indicated that the alarm is engaged.

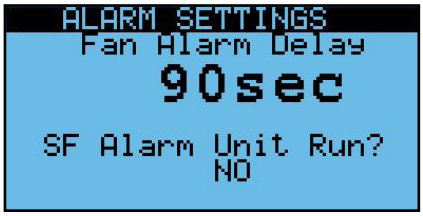
9.1.5.2 Supply and Exhaust Alarms

NUMBER	NAME	STATUS SHOWN	MEANING
10	AI_SupplyFan	User reset	Supply Fan Alarm
11	AI_ExhaustFan	User reset	Exhaust Fan Alarm

Alarm Number 10: Supply Fan Alarm

This indicates that either the supply fan did not start, or that the current switch did not register the supply fan as running. Refer to the Supply or Exhaust Fan Alarm Troubleshooting section in the Test End Devices.

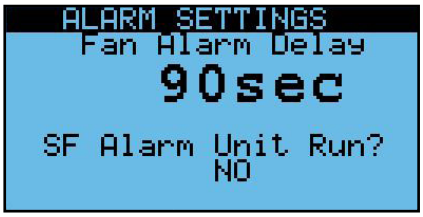
The delay for this alarm is set here. The setting is shared with the exhaust fan. Whether the unit shuts down if this alarm occurs is also set here.



Alarm Number 11: Exhaust Fan Alarm

This indicates that either the exhaust fan did not start, or that the current switch did not register the exhaust fan as running. Refer to the Supply or Exhaust Fan Alarm Troubleshooting section in the Test End Devices.

The delay for this alarm is set here. The setting is shared with the supply fan. This alarm will shut the unit down.



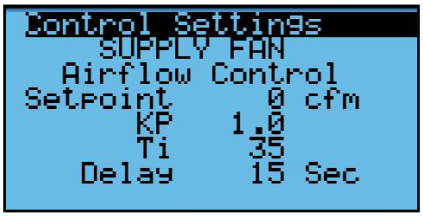
9.1.5.3 Airflow Condition Alarms

NUMBER	NAME	STATUS SHOWN	MEANING
12	AI_SA_Airflow	Auto reset	Supply Airflow Alarm
13	AI_EA_Airflow	Auto reset	Exhaust Airflow Alarm
14	AI_SA_StaticPress	Auto reset	SA Static Pressure Level Alarm
15	AI_CO2	Auto reset	CO2 Level Alarm
16	AI_SupAir_Low_ Temp_Warn	User reset	Low SA Temp Warning
17	AI_SupAir_Low_ Temp_Alarm	User reset	Low SA Temp Shutdown
18	AI_SupAir_Hi_Temp_ Warn	User reset	High SA Temp Warning
19	AI_SupAir_Hi_Temp_ Alarm	User reset	High SA Temp Shutdown
20	AI_VOC	User Reset	VOC Alarm
21	AI_EA_StaticPress	Auto reset	EA Static Pressure Level Alarm

Alarm Number 12: Supply Airflow Alarm

This alarm occurs when the supply is set to control on supply flow (CFM). It indicates that the flow measured is out of tolerance set here for more than the alarm delay set here.

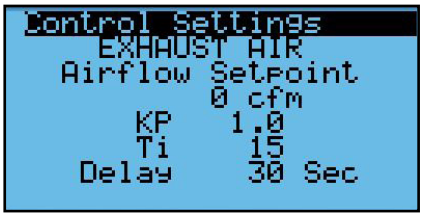
This usually indicates that the unit is probably hunting and the KP (gain) for the PI control needs to be adjusted. Set the KP to 0.1 or 0.2 to start. If it responds too slow, you can increase it but these values are usually acceptable.



Alarm Number 13: Exhaust Airflow Alarm

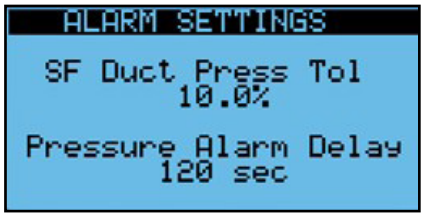
This alarm occurs when the supply is set to control on exhaust flow (CFM). It indicates that the flow measured is out of tolerance set here for more than the alarm delay set here.

This usually indicates that the unit is probably hunting and the KP (gain) for the PI control needs to be adjusted. Set the KP to 0.1 or 0.2 to start. If it responds too slow, you can increase it but these values are usually acceptable.

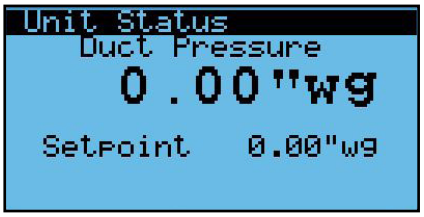


Alarm Number 14 and 21: Supply and Exhaust Air Static Pressure Level Alarms

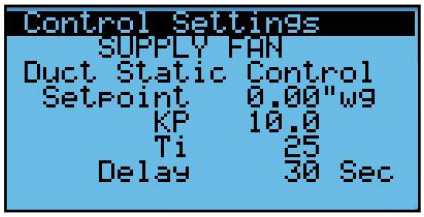
These alarms occur when the supply fan is set to control on duct static pressure, or the exhaust fan is set to control on return static pressure. It indicates that the pressure measured is out of tolerance set here for more than the alarm delay set here.

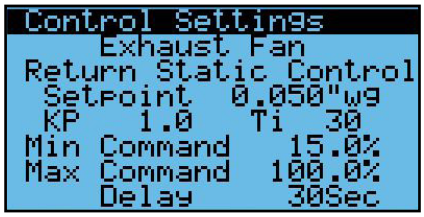


First make sure the pressure sensor is enabled in the *I/O configuration* and that there is a reading in the *Unit Status*. If you don't see this screen the sensor is not enabled. If the sensor is not reading correctly, check the wiring and calibration screen.



If the sensor is reading correctly, this usually indicates that the unit is probably hunting and the KP (gain) for the PI control needs to be adjusted. Decrease the KP to slow the response Increase to get a faster response.

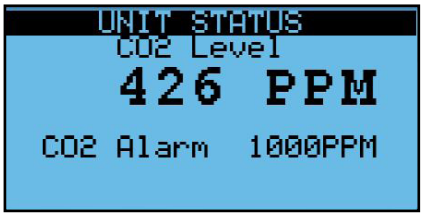


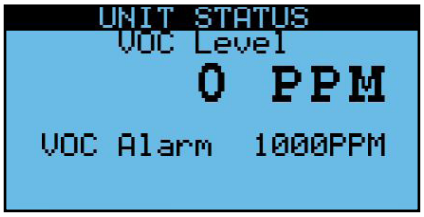


Alarm Number 15 and 20: CO2 or VOC Level Alarm

This alarm occurs when the CO2 or VOC sensor is enabled, and the CO2 or VOC level rises above the level set in this screen for more that the delay time.

First make sure the pressure sensor is reading correctly in the *Unit Status*. If the sensor is not reading correctly, check the range settings in *I/O Configuration*, the wiring, and the calibration screen.



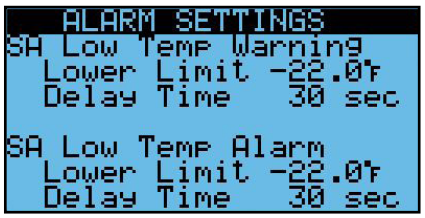


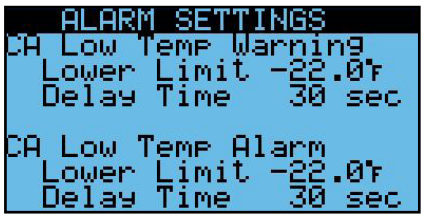
If the sensor is reading correctly, the CO2/VOC level is too high. You may have to adjust the fan control to keep it within limits.

Alarm Numbers 16 and 17: Low SA Temp Warning and Low SA Temp Shutdown

In units without heating, the alarm applies to the supply temperature (SA). In units with heating, this alarm applies to the unit supply temperature that is measured after the heating unit.

First, view the sensor value in *Unit Status*. If it seems OK, then check the alarm levels set here. (Only one will show, depending upon whether you have a Unit Supply Temp Sensor). The difference in the two is that the warning will just show as an alarm while the shutdown will shut down the unit. You can use the warning as a warning set at higher temperature for the purposes of warning. You can also just use one or the other by setting the limits of the one you do not want to use very low.

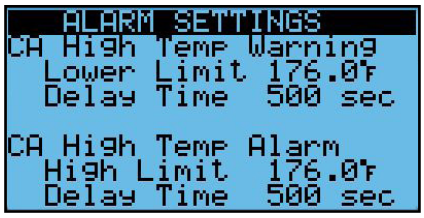




Alarm Numbers 18 and 19: High SA Temp Warning and High SA Temp Shutdown

This alarm only applies to units with cooling and applies to the CA Temperature.

First, view the sensor value in *Unit Status*. If it seems OK, then check the alarm levels set here. The difference in the two is that the warning will just show as an alarm while the shutdown will shut down the unit. You can use the warning as a warning set at lower temperature for the purposes of warning. You can also just use one or the other by setting the limits of the one you do not want to use very high.



9.1.5.4 Sensor Alarms

NUMBER	NAME	STATUS SHOWN	MEANING
30	AI_OA_Temp_Prb	Auto reset	OA Temperature Sensor Error
31	AI_OA_Hum_Prb	Auto reset	OA Humidity Transducer Error
32	AI_RA_Temp_Prb	Auto reset	RA Temperature Sensor Error
33	AI_RA_Hum_Prb	Auto reset	RA Humidity Transducer Error
34	AI_SA_Temp_Prb	Auto reset	SA Temperature Sensor Error
35	AI_EA_Temp_Prb	Auto reset	EA Temperature Sensor Error
36	AI_OA_Flt_Press_Prb	Auto reset	OA Filter Pressure Transducer Alarm
37	AI_RA_Flt_Press_Prb	Auto reset	RA Filter Pressure Transducer Alarm
38	AI_OA_Flow_Rate_Prb	Auto reset	OA Flow Rate Sensor Error
39	AI_EA_Flow_Rate_Prb	Auto reset	EA Flow Rate Sensor Error
40	AI_CO2_Level_Prb	Auto reset	CO2 Sensor Error
41	AI_Duct_Press_Prb	Auto reset	Duct Pressure Probe Error
42	AI_Supply_Temp_Prb	Auto reset	CA Temperature Sensor Error
44	AI_VOC_Level_Prb	Auto reset	VOC Sensor Error

Alarm Numbers 30–44: Sensor Alarms

These alarms occur when the controller detects that sensor is not reading in the expected range. Passive sensors such as temperature sensors show an error when the controller detects a short circuit or open circuit. Active sensors (0–10V) are in alarm when they value read is slightly above 10V.

To resolve the alarms, check the wiring to see if there is a loose wire or missing sensor.

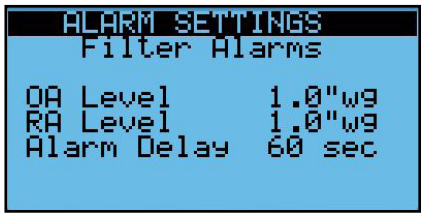
9.1.5.5 Filter Alarms

NUMBER	NAME	STATUS SHOWN	MEANING
60	AI_OA_Flt_Press	Auto reset	OA Filter Pressure Alarm
61	AI_RA_Flt_Press	Auto reset	RA Filter Pressure Alarm

Alarm Numbers 60–61: Filter Alarms

These alarms occur when the pressure exceeds the OA Level or the RA Level as set in the *Alarm Settings*.

For more information refer to Pressure Drop Charts in the unit specific IOM.



To resolve the alarms, change the filter. If the alarm is still active, verify that the reading is as expected in the *Unit Status*. If not, check that someone has not changed the pressure transducer range in the *I/O Configuration*. Also check the offset or override for the sensors.

9.1.5.6 Maintenance Alarms

NUMBER	NAME	STATUS SHOWN	MEANING
62	AI_UnitLife	Auto reset	Unit Service Threshold Reached
64	AI_SupplyFanLife	Auto reset	Supply Fan Service Threshold Reached
65	AI_ExhaustFanLife	Auto reset	Exhaust Fan Service Threshold Reached

Alarm Numbers 62–65: Maintenance Alarms

These alarms occur when the number of run hours reaches the thresholds set in the *Advanced Service*. A typical screen is shown here.

Refer to the *Advanced Service* for more information on these settings.

9.2 TEST END DEVICES

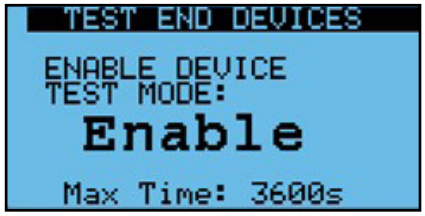
The *Test End Devices* allows you to manually control outputs for testing. The unit must be off for this feature to be enabled. An alarm will occur in one hour (default) if you forget to take the device out of test mode.

Once done. Make sure you cycle power to end test mode and put all values back to zero.

9.2.1 Supply or Exhaust Fan Alarm Troubleshooting

These alarms, 10 and 11, mean that either the fan did not start or that the current switch did not detect that the fan is running. To troubleshoot this:

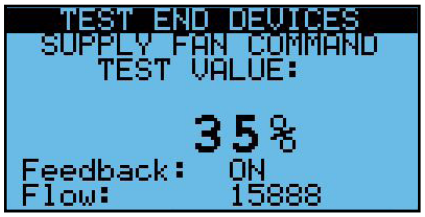
- Turn the unit off through the keypad.
- In the password protected menus, go to the *Test End Devices* and enable. As shown, an alarm will sound if you leave the unit in device test mode for more than an hour (default).



- Open both dampers.

- Enable both fans.

- For the fan that has the alarm (supply or exhaust), command the fan to run at 35% or so. If you see the flow increase but don't see the feedback (current switch) to yes, then the problem is with the current switch. If you don't see the flow increase the fan did not start and the problem is either with the wiring or the VFD parameters.



- If you think the problem is with the current switch, try adjusting the fan % up until you see the feedback go to YES. During this time, you should also see the flow to continue to increase. Once you see the feedback turn to yes you know the current switch needs adjustment. If it gets to 100% and you do not see it turn to yes, it may be wiring or a bad current switch. You can try to adjust it below.

Adjusting the Current Switch

With the dampers open and the fans enabled as described in the Test End Devices mode above, set the fan for which you want to calibrate to the minimum speed (%) at which you expect it to operate.

On the top of the sensor, there are an adjusting screw and two LED lights, one red and one blue. The adjusting screw will turn 15 turns. To set the sensor for any fixed-speed fan:

- Verify that the blue LED is on.
- Slowly adjust the potentiometer screw clockwise until the RED LED just turns on. This sets the trip point at the normal operating load current
- If the RED LED is on after initial power-up, slowly adjust the potentiometer counter-clockwise until the BLUE LED turns on and then slowly adjust the potentiometer clockwise until the RED LED just turns on.

IMPORTANT
Cycle power to the unit after you are done testing. This will take the unit out of Device Test Mode and reset all of the test values to off or 0%.

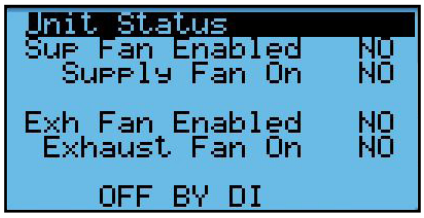
9.3 OTHER COMMON PROBLEMS

Listed are some other common problems you may encounter.

9.3.1 Unit Not On

If the unit will not run, go to this screen in *Unit Status* and the bottom line will tell you why. Multiple items may be true. Possible messages and their meaning:

- Unit On: Unit is running
- Off by Alarm: A serious alarm is present; usually a fan alarm or supply temp alarm.
- Off by BMS: The BMS has set Enable BMS Control to yes and is not sending an On command.
- Off by DI: The terminals 17 and 18 need to be closed or jumped.
- Off by Keyboard: The menu screen *Unit On/Off* is set to off.
- Off by CO2 Level: the CO@ level is too low for the unit to run (special feature).
- Exhaust Fan Only Mode: The terminals 18 and 19 are closed indicating single fan mode. The setting for which fan will run is in *I/O Configuration*.
- Supply Fan Only Mode: The terminals 18 and 19 are closed indicating single fan mode. The setting for which fan will run is in *I/O Configuration*.
- BMS Cool Lockout: This means that *BMS Heat/Cool Mode?* Is set to Yes in *General Settings* and the current mode is heat.
- BMS Heat Lockout: This means that *BMS Heat/Cool Mode?* Is set to Yes in *General Settings* and the current mode is cool.
- In Device Test: Mode in *Test End Devices* is enabled. Cycle power to get it out of this mode.
- Input Overwritten: There is a sensor that is overwritten in Sensor Overrides. This occurs after 24 hours as a reminder.
- Unit Off by CO2 Level, Frost Control Active.



9.3.2 Sensor Reading #### or Has Extreme Value

This normally means that the sensor is not connected, or it has faulty wiring.

9.3.3 BMS Loss of Comm after Param Change or Restore

Most BMS setting changes require a power cycle. This applies to a parameter restore, which is basically the same thing.

9.3.4 Can Not See Device via IP Connection

If you are connected locally with a PC:

- Make sure your PC is on the same subnet but not the exact same IP address. The last octet has to differ.
- If you have just changed the IP address, make sure you said “update” on that screen and cycle power.
- Make sure the cable “snaps in” on both sides.
- Microsoft Edge browser does not work as well. Use Chrome, if possible.
- Make sure you don’t have anything in the USB connection in the front of the controller.

If you are connected remotely, check all of the above but also note that the connection has to be on the same subnet. An IP tunnel may also work.

9.4 TESTING FUNCTIONS IN GENERAL

When testing in general, the Sensor Overrides is a handy tool. These allow you to temporarily override a sensor to see if a function is working correctly. For example, if you want to test your cooling but it is cool outside, you can override your outdoor sensor to exceed the cool lockout temperature. This is handier than having to change all of your settings and then set them back.

To override a sensor, first set the value of the sensor and then enable. If you enable before setting the value, the value shown will be set right away. In this case, it will most likely turn on your heat.

If you leave a sensor overwritten, an alarm will occur after 24 hours. All overwritten values are lost on power cycle and the statuses go back to disabled.

9.5 RESTORE PARAMETERS (SETTING)

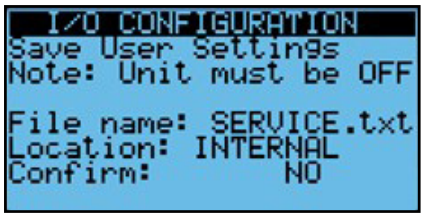
There are several levels of settings in the controller. Some are set by the factory, and some are set be users. These parameters include all configuration settings, fan settings, heat/cool settings, and BMS settings.

9.5.1 User Commissioning Settings (Service)

At the end of the I/O Configuration, the user is prompted to save their settings. It is probably best to save these values after setting all of the values in the Control Variables as well. This is password protected as every time you save the settings, the file will overwrite. The file name is "SERVICE.txt," and it will be save to either the internal memory location, or the external USB drive that is attached in front.

To perform this operation, the unit must be OFF.

- Choose the location: internal or USB
- Set Confirm to YES



If you choose USB and you get "Cannot access disk," there is something wrong with the connection or disk.

NOTE: RenewAire highly recommends that a USB thumb drive be installed in the USB port and a system backup (external) be made immediately after start up or commissioning.

If you do the operation correctly, it will say “Operation Done.”

To restore user settings, the screen is in Backup and Restore. The steps are:

- Choose the location: internal or USB
- Set Confirm to Yes

You should see “Operation done.”

If the unit does not confirm that the operation was done, the controller may have been older and upgraded in the field. Older version saved factory parameters in EXPORT_76. See the *General Save and Restore* for information on how to get those settings back into the controller.

9.5.2 Restore Factory Settings

This operation is used to go back to factory settings that were set in the factory while they tested the unit. These are somewhat specific settings but going back to these settings will require you to perform start up and commissioning again. To return to factory defaults:

- Choose internal
- Set Confirm to YES

If the unit does not confirm that the operation was done, the controller may have been older and upgraded in the field. Older version saved factory parameters in EXPORT_76. See the *General Save and Restore* for information on how to get those settings back into the controller.

9.5.3 General Save and Restore

There is a general save and restore function that allows you to save different versions of your parameters and save them under slightly different names.

Both saving and restoring use the same screen so care should be taken to make sure you have the screen set correctly so you do not lose all of your settings.

- Choose IMPORT (for restoring) or EXPORT (for saving)
- Choose memory type: INTERNAL or USB

If the unit does not confirm that the operation was done, the controller may have been older and

- Choose File ID: EXPORT_xx, where xx is any number from 00 to 99, If you are saving a set of parameters remember the number.
- Set Confirm to YES

9.5.4 Code List for Save and Restore

Use these codes to troubleshoot the Save and Restore Feature.

MESSAGE	MEANING
Operation Done	Save or Restore was successful.
Cannot Access Disk	This usually happens when you choose USB and the USB is not inserted or detected. If inserted, the connector may be too short.
Cannot access file	This usually happens when you are importing and the file you are importing does not exist.
Memory buffer is too small	You may have to erase some data from the drive or USB before you can perform the operation.
Time parameters are not correct	The clock needs to be set in *General Settings*.
Module is currently busy—retry is required	Another operation was running. Retry.
Log exporting failed	It is possible the connection was interrupted.
Input parameter value is not valid	The file may not be compatible with the program.

9.5.5 Return to Program Defaults

A more drastic approach may be needed to get internal settings out of the controller. Once done, you can restore a set of parameters by using any of the previously described methods. The process is called “Wipe Retain” for anyone familiar with the Carel controller. Most likely you will not use this operation unless you are directed to do so by RenewAire Technical Sales Support (TSS).

NOTE: Do not use the other two lines unless directed to do so by TSS.

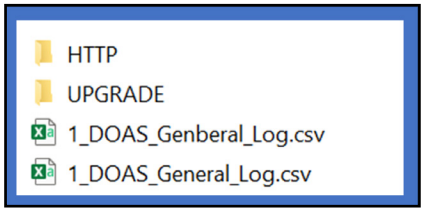
To perform this operation, choose YES on the top line Wipe retain mem.

The unit will take a minute to get back. Then you can resume entering your parameters by any method.

10.0 ACCESSING FILES FROM AND PERFORMING UPDATES TO THE CONTROLLER

The controller has a total of about 92 MB of internal memory. There are several types of files that use the internal 92 MB of mass storage that are available on the controller.

- Logs—exported automatically in the root
- Alarm List—exported on demand
- Parameter sets —see *Restore Parameters (Settings)*
- Program and OS Upgrade packages—Reside in an UPGRADE folder
- Web pages—Reside in an HTTP folder
- User storage, such as documents



These files can be accessed through one of two methods:

- Connection via FTP through the Ethernet port
- Connection with a micro USB cable

It is also possible to export directly alarms, current log, and parameter sets to a USB drive that has either a micro USB connector or uses an adapter.

NOTE: You cannot be connected by both methods at the same time. If you are viewing the web pages and then connect with USB, the web page will go blank until you disconnect.

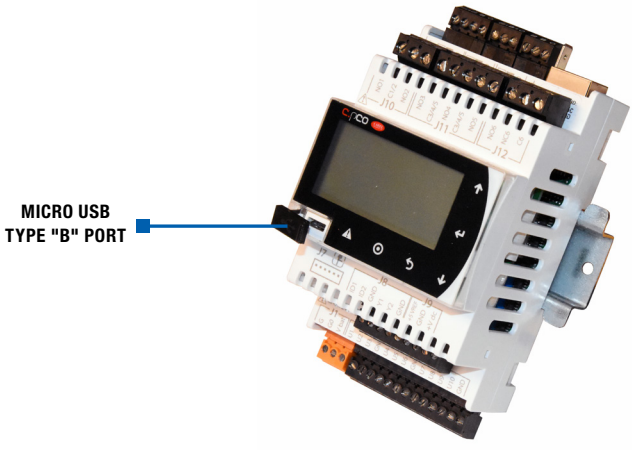
10.1 CONNECTIONS USING THE MICRO USB PORT

The controller has a built-in USB port where an external memory device such as a USB thumb drive can be plugged in. The external memory device may be used for backing up all settings and reported conditions such as Alarm History and presets. Backing-up is user-commanded and is done through the menu screens.

Note that the USB port is a Micro USB Type “B.” Thumb drives with a Micro USB Type B are difficult to find in some areas and it may be necessary to purchase an adapter to go from a more common Type A connector to the newer Micro Type B.

Make sure that the longer side of the USB connection is to the bottom of the controller. Do not force the connector in or you could damage the controller.

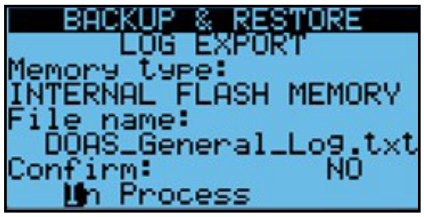
The controller requires that you use a cable or adapter with a longer end for the Micro USB side. One adapter we have found that works is the UGreen, purchased on Amazon.



10.2 ALARMS AND DATA LOGS

Two types of files that are exported on demand are logs and alarm lists. They can be exported to the internal memory or the USB drive.

The export of the logs will show “In Progress” while exporting. It may take a while depending upon the size.



10.2.1 Example of Alarm Log

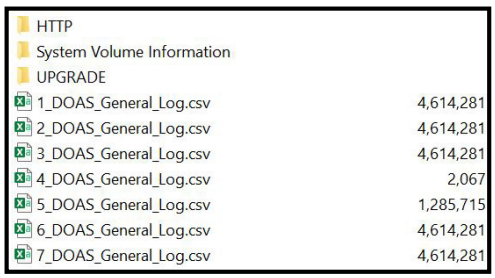
This is the file as opened in Excel. It includes a timestamp, alarm number, alarm name, and whether the event was the start of the alarm or the end (stop).

TIME	ID	NAME	EVENT	VAR1	VAR2
2022-01-28T16:11:22+00:00	39	AI_EA_Flow_Rate_Prb.Active	Start		
2022-01-28T16:11:22+00:00	38	AI_OA_Flow_Rate_Prb.Active	Start		
2022-01-28T16:11:21+00:00	42	AI_Supply_Temp_Prb.Active	Start		
2022-01-27T17:48:22+00:00	39	AI_EA_Flow_Rate_Prb.Active	Start		
2022-01-27T17:48:22+00:00	38	AI_OA_Flow_Rate_Prb.Active	Start		
2022-01-27T17:48:20+00:00	42	AI_Supply_Temp_Prb.Active	Start		
2022-01-27T15:48:02+00:00	39	AI_EA_Flow_Rate_Prb.Active	Start		
2022-01-27T15:48:02+00:00	38	AI_OA_Flow_Rate_Prb.Active	Start		

10.2.2 Example of Data Log

This is the file as opened in Excel. It includes a timestamp and values of all of the factory preconfigured log values.

TIME	EVENT	OA_Temp. Val	OA_Hum. Val	RA_Hum. Val	SA_Temp. Val	EA_Temp. Val	Cooling_Command.	Heating_Command.	RA_Temp. Val
2022-02-06T00:00:03+		22.079	23.14	20.73	20.111	21.768	0	0	22.134
2022-02-06T00:00:08+		22.079	23.14	20.74	20.134	21.756	0	0	22.134
2022-02-06T00:00:13+		22.079	23.13	20.69	20.154	21.756	0	0	22.134
2022-02-06T00:00:18+		22.067	23.15	20.71	20.166	21.756	0	0	22.134
2022-02-06T00:00:23+		22.067	23.15	20.725	20.166	21.756	0	0	22.123
2022-02-06T00:00:28+		22.067	23.14	20.695	20.178	21.756	0	0	22.123
2022-02-06T00:00:33+		22.067	23.14	20.71	20.189	21.756	0	0	22.123
2022-02-06T00:00:38+		22.067	23.14	20.705	20.199	21.745	0	0	22.123
2022-02-06T00:00:43+		22.067	23.14	20.69	20.209	21.745	0	0	22.123
2022-02-06T00:00:48+		22.067	23.14	20.735	20.209	21.745	0	0	22.123



NOTE: There will be several log files on the internal drive. This is because the log is exported every night at midnight. The files are listed by day of week, where 1 = Monday. The file that starts with 9 is the file that is exported on demand.

The variables that are logged are as listed here.

VARIABLE	VARIABLE	VARIABLE
OA_Temp.Val	Heating_Command.Val	Unit Status
OA_Hum.Val	RA_Temp.Val	CA_TEMP.VAL
RA_Hum.Val	OA_Enthalpy	OA+Flow_Rate
SA_Temp.Val	Bypass_Command.Val	EA_Flow_Rate
EA_Temp.Val	Any_Alarm_Out.Val	SF_Status
Cooling_Command.Val	Unit On	EF_Status

10.3 VIEWING PARAMETER FILES

You can view the parameter files that were created in *Restore Parameters (Settings)*. You can also share them between controllers. An excerpt of a file is shown below.

#Ver.1.0 cpCO Family Exported Configuration file

#VARIABLE	DESCRIPTION	DATA TYPE DEFAULT VALUE
BACnet_Mapping	UINT	0
BMSMng.BACnetPort	UDINT	47808
BMSMng.BMS_Address_RS485	UINT	4
BMSMng.BMS_BACnetDeviceInstance	UDINT	5002
BMSMng.BMS_BACnetMSTP_MaxInfoFrames	UINT	20
BMSMng.BMS_BACnetMSTP_MaxMaster	UINT	127
BMSMng.BMS_BACnet_CmdTimeout	UINT	1500
BMSMng.BMS_BACnet_Timout	UINT	3000
BMSMng.BMS_Baud_Msk	UINT	2
BMSMng.BMS_Baud_RS485	UDINT	19200
BMSMng.BMS_Modbus_Timeout	UINT	3000
BMSMng.BMS_Parity_MSK	USINT	0

10.4 PERFORMING UPDATES TO THE CONTROLLER

If directed by TSS, you may need to perform an upgrade to the controller program. A very similar process is also used to field-install BACnet licenses into the controller. Refer to the BMS Access for that process.

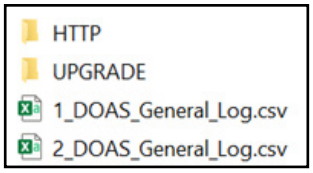
There are three different methods to update a program, depending upon which way you connect to the controller. All three require that you have a file called “autorun.ap1,” given to you by TSS.

NOTE: It is advised that you delete this file once you are done. Every upgrade file is named the same, regardless of version.

1. Connect via USB. This requires that you have a micro USB cable to go from your PC to the controller micro USB connection and can see the files in Windows Explorer.
2. Connect with a USB thumb drive to the micro USB connection.
3. Connect via Ethernet. This requires a PC and the ability to connect to the embedded web pages inside the controller.

10.4.1 Upgrade Type: Connect via USB

1. Save the parameters using the *General Save and Restore* method. Make sure you choose EXPORT! Remember the Export_XX number you chose.
2. Carefully connect the micro USB cable to the front connection of the controller (long side to the bottom) and to your PC. Verify that you can see the files in Windows Explorer. It shows up as a USB drive. If you cannot see these files you will need to use another method.



3. Put the autorun.ap1 file in the folder called “UPGRADE.” You should not have other files in the root of that folder. You can have other folders in this folder, if needed.
4. You will be prompted to press “ENTER” to proceed.

5. Once it is done you will be prompted to press “ENTER” to restart the controller.

6. Restore the parameters using the *General Save and Restore* method. Make sure you choose IMPORT! Use the Export_XX number you chose in step 1.
7. Cycle power.

10.4.2 Upgrade Type: Connect with a USB Thumb Drive

Connect with a USB thumb drive to the micro USB connection.

1. Save the parameters using the *General Save and Restore* method. Make sure you choose EXPORT! Remember the Export_XX number you chose.
2. Put the autorun.ap1 file in a folder in the root of the thumb drive called “UPGRADE.”
3. Carefully connect the micro USB drive to the front connection of the controller (long side to the bottom).
4. You will be prompted to press “ENTER” to proceed.

5. Once it is done you will be prompted to press “ENTER” to restart the controller.

6. Restore the parameters using the *General Save and Restore* method. Make sure you choose IMPORT! Use the Export_XX number you chose in step 1.
7. Cycle power.

10.4.3 Upgrade Type: Connect via Ethernet

This requires a PC and the ability to connect to the embedded web pages inside the controller.

1. Save the parameters using the *General Save and Restore* method. Make sure you choose EXPORT! Remember the Export_XX number you chose.
2. Go to the Upgrade Tab in the web pages.

3. Click on “CHOOSE FILE” and locate the autorun.ap1 file on your PC that corresponds to the controller. Click “OPEN.” You should now see that file name next to “CHOOSE FILE.”
4. Click “Upload AP1 to c.pco.” You will see the file upload.
5. Once 100% on the upload, switch back to the RUT screen to see the upgrade taking place.
6. On the controller the program will see the file and require you to push “ENTER.” You can see that on the front of the controller itself or on the RUT page of the web pages.
7. Restore the parameters using the *General Save and Restore* method. Make sure you choose IMPORT! Use the Export_XX number you chose in step 1.
8. Cycle power.

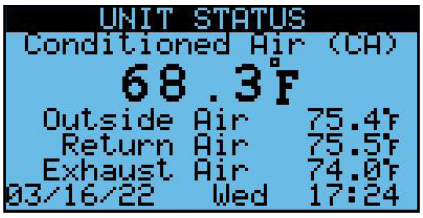
11.0 GENERAL SYSTEM MONITORING

This section describes the general system monitoring. It is here only to provide a general sense of how to monitor the system. Specific screens and information appear depending upon the features you have selected. Refer to the documentation on the specific function for the information on specific monitoring screens.

The unit is monitored through *Unit Status*.

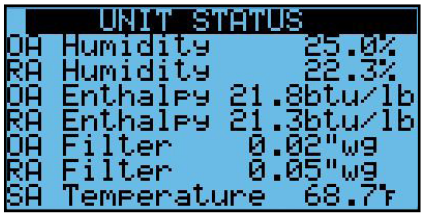
11.1 MAIN SCREEN

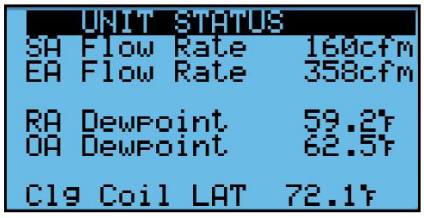
The main screen shows either the SA temperature coming off the core, or the CA temperature, depending upon whether the unit has tempering or not. It also shows the other four temperatures near the core.



11.2 OTHER STANDARD SCREENS

These screens also show standard values.



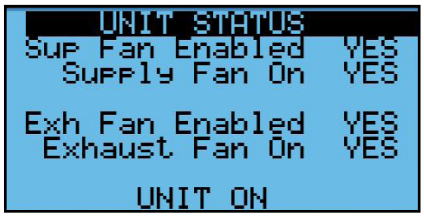


11.3 FAN AND UNIT STATUS SCREENS

The first screen is helpful on starting the unit. It shows whether the fan is being asked to turn on (enabled), and whether the current sensor is detecting that it has turned on.

It also shows the *Unit Status* conditions, described in the chart below.

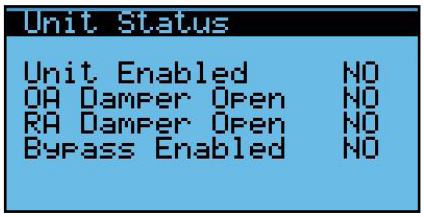
The seconds screen shows the speed of the fans.



UNIT STATUS CONDITIONS	
STATUS SHOWN	MEANING
Unit on	The unit is on and running.
Off by alarm	The unit is off by a serious alarm.
Off by BMS	The unit is off by command from the BMS.
Off by Time Band	The unit is off by the scheduler.
Off by Schedule	The unit is off by the ID1 digital input.
Off by Keypad	The unit is off by the setting on the local interface.
EF Only Mode	The unit is in single fan mode with exhaust fan running.
SF Only Mode	The unit is in single fan mode with supply fan running.
BMS Cool Lockout	The unit is in HEAT mode from the BMS.
BMS Heat Lockout	The unit is in COOL mode from the BMS.
In Device Test	The system is in device test mode.
Input Overwritten	There is a sensor input that is overwritten.
Off by CO2 Level	The CO2 level is below the limit for running.
Flush Mode	The unit is running in FLUSH mode.
Frost Control on	The unit is running in Frost Control Mode.

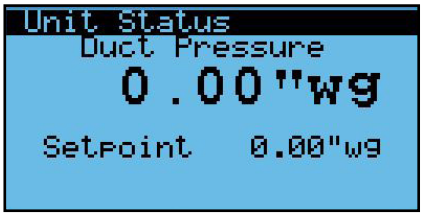
The third screen shows:

- Whether the unit is enabled. (See *Unit Status Conditions* in the first screen to assess why the unit is not on).
- Whether the OA and RA dampers are open—they should be open if the unit is ON and in occupied mode, if applicable.
- The status of the bypass damper which is used for economizer and frost control, if the features are enabled.



11.4 FIELD-INSTALLED SENSOR SCREENS

If the CO2/VOC and/or duct pressure sensors were enabled and installed, their value and setpoint are shown here.



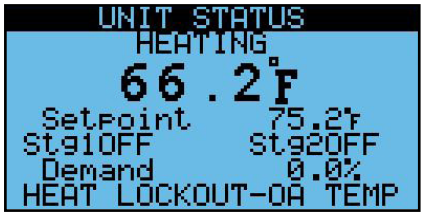
11.5 TEMPERING SCREENS

Depending upon whether dehumidification, heating, or cooling are enabled for the unit, and depending upon which type is used, the screens here will vary.

11.5.1 Heating Screens

Each screen tells

- Heating type in use
- Control Variable (unit supply or return air)
- Current Setpoint (or OA reset value)
- Status of outputs for that heat type
- Heating Status



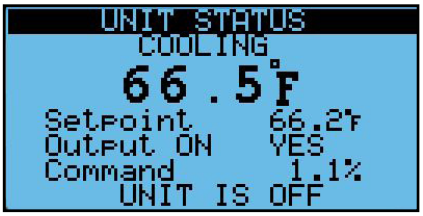
The heating status values are shown. Multiple values may be true.

MESSAGE	MEANING
Heat Locked Out by OA	The heating OA lockout is higher than the OA temperature.
Unit OFF	Unit is off.

11.5.2 Cooling Screens

If in dehumidification, this screen will reflect the cooling used for dehumidification. Each screen tells:

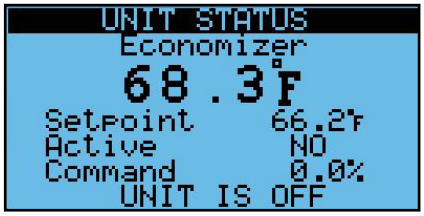
- Control Variable (unit supply or return air for cooling, or coil LAT for dehumidification)
- Current Setpoint
- Status of outputs for that cooling type
- Cooling Status



The cooling status values are shown. Multiple values may be true.

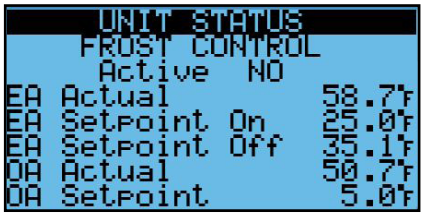
MESSAGE	MEANING
Cool Locked Out by OA	The cooling OA lockout is lower than the OA temperature.
Lockout Overlap	The OA lockouts for heating and cooling overlap. (No vent mode). The heating takes preference.
Econ Only	If economizer is open less than 100%.
Econ Mode	If in economizer mode.
Unit OFF	Unit is off.

Screen showing economizer information, if enabled, including
- Cooling control value
- Cooling setpoint
- Whether economizer is active
- The economizer damper command
- Cooling status



11.6 FROST CONTROL INFORMATION

This screen contains all frost control information.

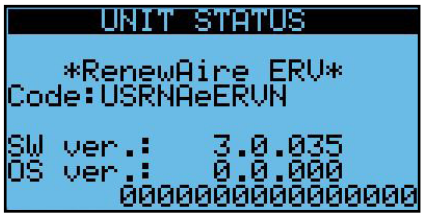


11.7 ENTRY TO THE I/O INFORMATION SCREEN

This screen is described in *Verifying all I/O through Unit Status Screens.*

11.8 VERSION INFORMATION SCREEN

This screen contains:
- Type of application
- Version of program (SW) and operating system (OS)
- Unique controller identifier



12.0 BMS ACCESS

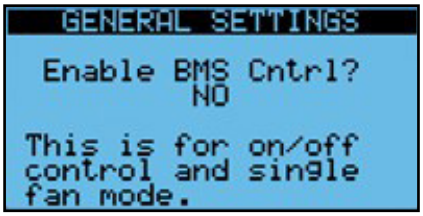
The BMS settings are located in the *General Settings* after the scheduler. To get to that menu press the back button until it shows up.

12.1 SETTING CONTROL LEVEL

The first screen sets whether the unit will get an on/off command from the BMS. If you set this to Yes right away, the unit will not start until the BMS command is sent. Therefore, do not set this to Yes until you are ready to operate the unit.

Background: The unit will not turn on unless are all of the following are true. As a result, any one can turn the unit off.

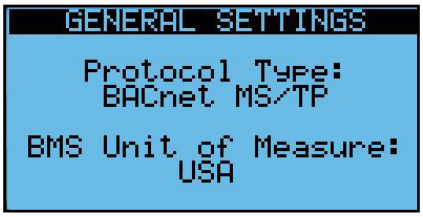
- There are no serious alarms.
- The Digital Input for start/stop (terminals 17 and 18) are closed.
- The unit is turned on at the keypad.
- The time is within the scheduler "ON" time, if scheduler enabled.
- The BMS has written the unit on signal, if BMS control is enabled.



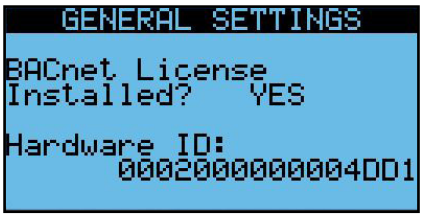
12.2 SETTING BMS TYPE

There are either three or five setting for BMS Type. The BACnet options will not show up unless a BACnet license has been installed.

- None
- BACnet MS/TP
- BACnet IP
- Modbus RTU
- Modbus IP



The license status can be viewed in a later screen. Refer to *Adding a BACnet License* for more information.



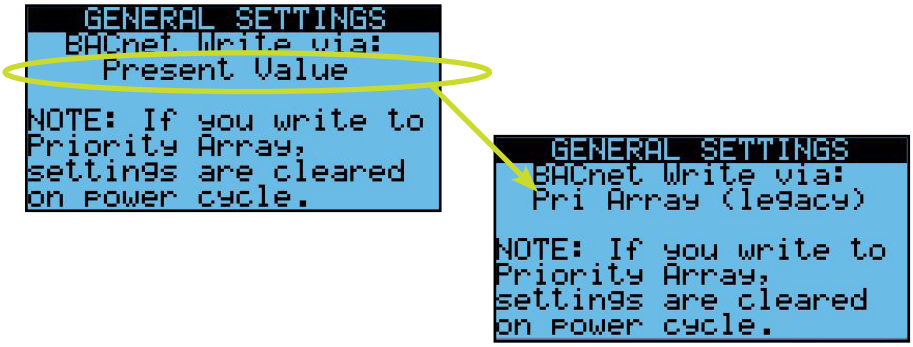
Once a protocol has been selected, additional BMS programming screens will appear. Change settings as needed. After the BMS protocol has been selected and protocol options have been selected, cycle power to the controller.

12.3 BACNET

RenewAire units Are BTL listed by CAREL. They allow the BMS to write to the present value by default. This means that if the BMS writes to a setpoint that setpoint can be changed by the local HMI display. (Last one in wins). Priority array is not supported.

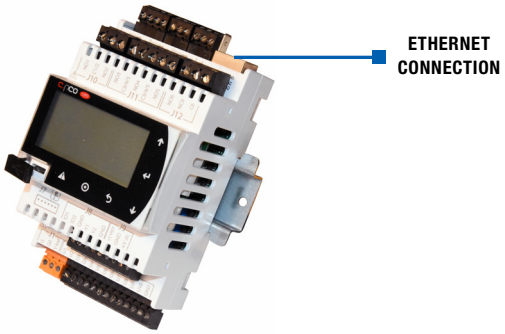
Setpoints, in general, are saved in EEPROM memory and maintained on power loss. These are referred to as RETAINED. For retained values, DO NOT write to these values constantly. Doing so will flag an alarm and can damage the controller. If you have a need to write to a value constantly, contact TSS to discuss options.

Older units wrote to the priority array. This was cumbersome to support. They also had limited mapping. If upgrading from an older version and you want to keep that mapping, change the setting below to "Pri Array legacy." The mapping is quite different and is supported in the older documentation. Also note that priority array setpoints were not kept on power loss.



12.3.1 BACnet IP Connection

Connection of BACnet IP requires a physical cable connection to the RJ45 jack on the controller. Prior to making the wiring connections, the controller is to be tested to verify proper control of the unit under local control.

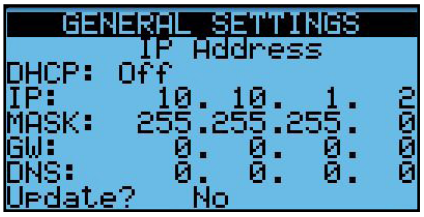


12.3.2 BACnet IP Settings

NOTE: The controller will only support private IP addresses which start with 192, 172, or 10.

First, set the IP address of the controller in the same *General Settings* area.

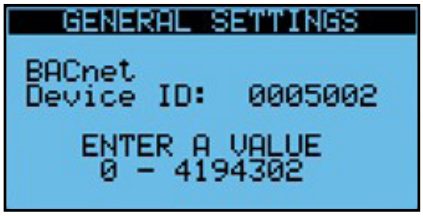
- Set DHCP to Off if static.
- If Static, set the IP, mask, and gateway if required.
- *Set Update?* To Yes (power will need to be cycled. This can be done after all of the other settings.)



Next, set the BACnet Device ID. This screen allows you to set the ID digit by digit.

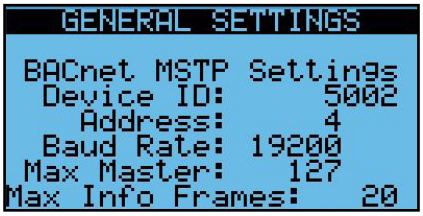
12.3.3 BACnet MSTP Settings

First, set the BACnet Device ID. This screen allows you to set the ID digit by digit.

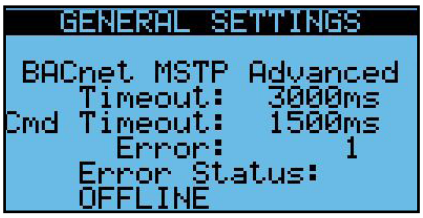


NOTE: Whenever the BMS type is changed, power to the controller must be cycled.

Next, set the BACnet MSTP Address, Baud rate, Max Master and Max Info frames as needed.



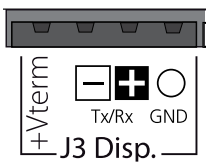
If you need to set the timing values, you can do that here.



12.3.4 BACnet MSTP Wiring

The BACnet MSTP network is wired into the four-pin connector named J3 Disp. In the upper left-hand corner of the controller. This is also used for a RUT display so the two cannot be used at the same time. For MSTP, use the plus (+) and minus (-), as well as the GND for reference if desired.

DO NOT use the +Vterm terminal. If you happen to plus a three-pin block in here and use the wrong three pins you might damage the port.



12.4 BACNET OBJECT LIST

TYPE	INSTANCE	VARIABLE NAME	DESCRIPTION	VALUE RANGE	READ/WRITE (RET)
Analog Input	0	OA_Temp.Val	OA Temperature	F	Read_NoWrite
Analog Input	1	OA_Hum.Val	OA Relative Humidity	%	Read_NoWrite
Analog Input	2	RA_Temp.Val	RA Temperature	F	Read_NoWrite
Analog Input	3	RA_Hum.Val	RA Relative Humidity	%	Read_NoWrite
Analog Input	4	EA_Temp.Val	EA Temperature	F	Read_NoWrite
Analog Input	5	SA_Temp.Val	SA Temperature (before tempering)	F	Read_NoWrite
Analog Input	6	OA_Flow_Rate.Val	OA Flow Rate	CFM	Read_NoWrite
Analog Input	7	EA_Flow_Rate.Val	EA Flow Rate	CFM	Read_NoWrite
Analog Input	8	Heating.HTG_SetP_Adjusted	Acting heating setpoint	F	Read_NoWrite
Analog Input	9	SA_Hum.Val	SA Relative Humidity	%	Read_NoWrite
Analog Input	10	EA_Hum.Val	EA Relative Humidity	%	Read_NoWrite
Analog Input	11	RA_Dewpoint	RA_Dewpoint	F	Read_NoWrite
Analog Input	12	OA_Dewpoint	OA_Dewpoint	F	Read_NoWrite
Analog Input	24	RA_Flt_Press.Val	RA Filter Pressure	iwc	Read_NoWrite
Analog Input	25	OA_Flt_Press.Val	OA Filter Pressure	iwc	Read_NoWrite
Analog Input	26	SF_Command.Val	Supply Fan Command (actual)	%	Read_NoWrite
Analog Input	27	EF_Command.Val	Exhaust Fan Command (actual)	%	Read_NoWrite
Analog Input	28	CO2_Level.Val	CO2 Level	PPM	Read_NoWrite
Analog Input	29	VOC_Level.Val	VOC Level	PPM	Read_NoWrite
Analog Input	30	Space_Pressure.Val	Space Pressure	iwc	Read_NoWrite
Analog Input	31	Duct_Press.Val	Duct Pressure	iwc	Read_NoWrite
Analog Input	32	CA_Temp.Val	CA Temperature (after tempering)	F	Read_NoWrite
Analog Input	33	Cooling_Command.Val	Cooling Command	%	Read_NoWrite
Analog Input	34	Cooling_LAT.Val	Cooling Coil Leaving Air Temperature (Used for dehumidification)	F	Read_NoWrite
AnalogInput	62	HGRH_Command.Val	Hot Gas Reheat Valve Command - Dehumification	F	Read_NoWrite
AnalogValue	32	HGRH_Coil_LAT_Setp.Val	Hot Gas Reheat Setpoint for conditioned air	F	Read_Writeable
Analog Value	34	Heating_Command.Val	Command to Heating output	%	Read_Writeable
Analog Value	35	RA_Flt_AlarmHigh	RA Filter Alarm Level	iwc	Read_Writeable (X)
Analog Value	36	OA_Flt_AlarmHigh	OA Filter Alarm Level	iwc	Read_Writeable (X)
Analog Value	37	SF_ConstSpeedSetP.Val	SF Const Speed Setpoint	%	Read_Writeable (X)

TYPE	INSTANCE	VARIABLE NAME	DESCRIPTION	VALUE RANGE	READ/WRITE (RET)
Analog Value	38	SF_FlowControlSetP.Val	SF Flow Control Setpoint	CFM	Read_Writeable (X)
Analog Value	39	SF_DuctStaticSetP.Val	SF Duct Static Pressure Setpoint	iwc	Read_Writeable (X)
Analog Value	40	SF_RoomStaticSetP.Val	SF Room Static Pressure Setpoint	iwc	Read_Writeable (X)
Analog Value	41	SF_CO2SetP.Val	SF CO2 Setpoint	PPM	Read_Writeable (X)
Analog Value	42	SF_VOCSetP.Val	SF VOC Setpoint	PPM	Read_Writeable (X)
Analog Value	43	EF_ConstSpeedSetP.Val	EF Constant Speed Setpoint	%	Read_Writeable (X)
Analog Value	44	EF_FlowControlSetP.Val	EF Flow Control Setpoint	CFM	Read_Writeable (X)
Analog Value	45	EF_SF_TrackingSetP.Val	EF SF Tracking Setpoint	%	Read_Writeable (X)
Analog Value	46	EF_ReturnStaticSetP.Val	EF Return Static Setpoint	iwc	Read_Writeable (X)
Analog Value	47	CoolLockoutTemp	OA Cooling Lockout Temperature	F	Read_Writeable (X)
Analog Value	48	HeatLockoutTemp	OA Heating Lockout Temperature	F	Read_Writeable (X)
Analog Value	50	Econ_Temp_Diff	Economizer Temperature Differential	F	Read_Writeable (X)
Analog Value	51	Economizer.Econ_Low_OA_Temp_Limit	Economizer Low OA Temp Limit	F	Read_Writeable (X)
Analog Value	52	Economizer.Econ_Hysteresis	Economizer Hysteresis	Btu/lb	Read_Writeable (X)
Analog Value	53	BMS_CO2_Reading	BMS CO2 Reading (in lieu of attached sensor)	PPM	Read_Writeable
Analog Value	54	BMS_Space_Press_Reading	Coil LAT Setpoint for dehumidification	F	Read_Writeable (X)
Analog Value	55	Occ_HTG_Setp.Val	Occupied Heating Setpoint	F	Read_Writeable (X)
Analog Value	56	Occ_CLG_Setp.Val	Occupied Cooling Setpoint	F	Read_Writeable (X)
Analog Value	58	Economizer.Econ_Low_RA_Temp_Limit	Economizer.Econ_Low_RA_Temp_Limit	F	Read_Writeable (X)
Analog Value	59	SF_CO2FlowMinCO2.Val	SF Flow: MinCO2	PPM	Read_Writeable (X)
Analog Value	60	SF_CO2FlowMaxCO2.Val	SF Flow: Max CO2	PPM	Read_Writeable (X)
Analog Value	61	SF_CO2FlowMinFlow.Val	SF Flow: Min Flow	CFM	Read_Writeable (X)
Analog Value	62	SF_CO2FlowMaxFlow.Val	SF Flow: Max Flow	CFM	Read_Writeable (X)
AnalogValue	73	Dehumid_Changeover_SetP.Val	Dewpoint value where dehumidification is engaged	F	Read_Writeable
Analog Value	77	Defrost_OA_SetP.Val	Frost control OA Setpoint Low Limit	F	Read_Writeable (X)
Analog Value	78	Defrost_EA_Low_SetP.Val	Frost control EA Setpoint Low Limit	F	Read_Writeable (X)
Analog Value	79	Defrost_EA_High_SetP.Val	Frost control EA High Limit Setpoint	F	Read_Writeable (X)
AnalogValue	80	BMS_SupplyFanCommand	Command used when BMS commands fans directly every cycle	%	Read_Writeable
AnalogValue	81	BMS_ExhaustFanCommand	Command used when BMS commands fans directly every cycle	%	Read_Writeable

TYPE	INSTANCE	VARIABLE NAME	DESCRIPTION	VALUE RANGE	READ/WRITE (RET)
AnalogValue	82	EF_Tracking_SFMode	Fan speed to run EF when it is in EF only mode and it is tracking Supply Fan	%	Read_Writeable
Binary Input	8	OA_Damp.Val	OA Damper Command	Closed/ Open	Read_NoWrite
Binary Input	9	RA_Damp.Val	RA Damper Command	Closed/ Open	Read_NoWrite
Binary Input	13	Tempering_Mode.Val	Tempering Mode	Heat/Cool	Read_NoWrite
Binary Input	14	AlarmMng.AlrmRes	Alarm Reset Status	No/Yes	Read_NoWrite
Binary Input	15	SF_Status.Val	SF Status from Current Sensor	Off/On	Read_NoWrite
Binary Input	16	EF_Status.Val	EF Status from Current Sensor	Off/On	Read_NoWrite
Binary Input	17	Alarm_Out.Val	Serious Alarm (Also a physical output)	OK/Alarm	Read_NoWrite
Binary Input	18	Heating_Enable_1.Val	Heating Stage 1	Off/On	Read_NoWrite
Binary Input	19	Cooling_Stage_1.Val	Cooling Stage 1	Off/On	Read_NoWrite
Binary Input	20	Cooling_Stage_2.Val	Cooling Stage 2	Off/On	Read_NoWrite
Binary Input	21	UnitOn	Unit On Status	Off/On	Read_NoWrite
Binary Input	22	AI_SupplyFan.Active	Supply Fan Start Alarm	OK/Alarm	Read_NoWrite
Binary Input	23	AI_ExhaustFan.Active	Exhaust Fan Start Alarm	OK/Alarm	Read_NoWrite
Binary Input	49	Bypass_Damper.Val	Bypass Damper Command	Close/ Open	Read_NoWrite
Binary Input	50	OfflineAlrm_CPCOE_1.Active	Expansion Module is offline	OK/Alarm	Read_NoWrite
Binary Input	61	DehumidMode_On	Unit is in dehumidification mode	Off/On	Read_NoWrite
Binary Input	57	Heating_Enable_2.Val	Heating Stage 2	Off/On	Read_NoWrite
Binary Input	72	Any_Alarm_Out.Val	Any Alarm is True Status	OK/Alarm	Read_NoWrite
Binary Input	500	AI_retain.Active	Too Many Writes to Retained Memory	OK/Alarm	Read_NoWrite
Binary Input	501	AI_Err_retain_write.Active	Too Many Writes to Retained Memory	OK/Alarm	Read_NoWrite
Binary Input	502	AI_Device_Test.Active	Unit Was Left In Device Test Mode	OK/Alarm	Read_NoWrite
Binary Input	503	AI_BMS_Offline.Active	BMS Is Offline	OK/Alarm	Read_NoWrite
Binary Input	504	OfflineAlrm_CPCOE_1.Active	Offline Alarm Expansion Module	OK/Alarm	Read_NoWrite
Binary Input	505	CfgErrAlrm_CPCOE_1.Active	Expansion Module Config Error	OK/Alarm	Read_NoWrite
Binary Input	508	AI_Smoke.Active	Smoke Alarm Input Engaged	OK/Alarm	Read_NoWrite
Binary Input	509	AI_Freeze.Active	Freezestat Alarm Input Engaged	OK/Alarm	Read_NoWrite
Binary Input	510	AI_SupplyFan.Active	Supply Fan Start Alarm	OK/Alarm	Read_NoWrite
Binary Input	511	AI_ExhaustFan.Active	Exhaust Fan Start Alarm	OK/Alarm	Read_NoWrite
Binary Input	512	AI_SA_Airflow.Active	Supply Airflow Out of Tolerance Alarm	OK/Alarm	Read_NoWrite
Binary Input	513	AI_EA_Airflow.Active	Exhaust Airflow Out of Tolerance Alarm	OK/Alarm	Read_NoWrite

TYPE	INSTANCE	VARIABLE NAME	DESCRIPTION	VALUE RANGE	READ/WRITE (RET)
Binary Input	514	AI_SA_StaticPress.Active	SA Static Pressure Level Alarm	OK/Alarm	Read_NoWrite
Binary Input	515	AI_CO2.Active	CO2 Level Alarm	OK/Alarm	Read_NoWrite
Binary Input	516	AI_SupAir_Low_Temp_ Warn.Active	Supply Air Low Temperature Warning	OK/Alarm	Read_NoWrite
Binary Input	517	AI_SupAir_Low_Temp_ Alarm.Active	Supply Air Low Temperature Alarm	OK/Alarm	Read_NoWrite
Binary Input	518	AI_SupAir_Hi_Temp_Warn. Active	Supply Air High Temperature Warning	OK/Alarm	Read_NoWrite
Binary Input	519	AI_SupAir_Hi_Temp_Alarm. Active	Supply Air High Temperature Alarm	OK/Alarm	Read_NoWrite
Binary Input	521	AI_EA_StaticPress.Active	EA Static Pressure Level Alarm	OK/Alarm	Read_NoWrite
Binary Input	530	AI_OA_Temp_Prb.Active	OA Temperature Sensor Open or Short	OK/Alarm	Read_NoWrite
Binary Input	531	AI_OA_Hum_Prb.Active	OA Relative Humidity Transmitter Out of Range	OK/Alarm	Read_NoWrite
Binary Input	532	AI_RA_Temp_Prb.Active	RA Temperature Sensor Open or Short	OK/Alarm	Read_NoWrite
Binary Input	533	AI_RA_Hum_Prb.Active	RA Relative Humidity Transmitter Out of Range	OK/Alarm	Read_NoWrite
Binary Input	534	AI_SA_Temp_Prb.Active	SA Temperature Sensor Open or Short	OK/Alarm	Read_NoWrite
Binary Input	535	AI_EA_Temp_Prb.Active	EA Temperature Sensor Open or Short	OK/Alarm	Read_NoWrite
Binary Input	536	AI_OA_Flt_Press_Prb. Active	OA Filter Pressure Transmitter Out of Range	OK/Alarm	Read_NoWrite
Binary Input	537	AI_RA_Flt_Press_Prb. Active	RA Filter Pressure Transmitter Out of Range	OK/Alarm	Read_NoWrite
Binary Input	538	AI_OA_Flow_Rate_Prb. Active	OA Flow Rate Pressure Transmitter Out of Range	OK/Alarm	Read_NoWrite
Binary Input	539	AI_EA_Flow_Rate_Prb. Active	EA Flow Rate Pressure Transmitter Out of Range	OK/Alarm	Read_NoWrite
Binary Input	540	AI_CO2_Level_Prb.Active	CO2 Level Transmitter Out of Range	OK/Alarm	Read_NoWrite
Binary Input	541	AI_Duct_Press_Prb.Active	Duct Pressure Transmitter Out of Range	OK/Alarm	Read_NoWrite
Binary Input	542	AI_Supply_Temp_Prb.Active	Conditioned Air (CA) Temperature Sensor Open or Short	OK/Alarm	Read_NoWrite
Binary Input	544	AI_VOC_Level_Prb.Active	VOC Probe Alarm	OK/Alarm	Read_NoWrite
Binary Input	545	AI_Space_Press_Prb.Active	Space Pressure Probe Alarm	OK/Alarm	Read_NoWrite
Binary Input	560	AI_OA_Flt_Press.Active	OA Filter Needs Change	OK/Alarm	Read_NoWrite
Binary Input	561	AI_RA_Flt_Press.Active	RA Filter Needs Change	OK/Alarm	Read_NoWrite
Binary Input	562	AI_UnitLife.Active	Unit Service Request	OK/Alarm	Read_NoWrite
Binary Input	564	AI_SupplyFanLife.Active	Supply Fan Service Request	OK/Alarm	Read_NoWrite
Binary Input	565	AI_ExhaustFanLife.Active	Exhaust Fan Service Request	OK/Alarm	Read_NoWrite
Binary Value	10	OnOffUnitMng.BmsOnOff	BMS On/Off Command	Off/On	Read_Writeable
Binary Value	11	OnOffUnitMng.BmsEfOnly	BMS Exhaust Fan Only Command	Off/On	Read_Writeable

TYPE	INSTANCE	VARIABLE NAME	DESCRIPTION	VALUE RANGE	READ/WRITE (RET)
Binary Value	12	AlarmMng.AlrmResByBms	Alarm Reset BMS Command	OK/Reset	Read_Writeable
Binary Value	13	One_Fan_Mode	When single fan mode is engaged, this is the fan that will run	Exhaust Fan/Supply Fan	Read_Writeable
Binary Value	60	BMS_SetHeatCool	BMS Set Heat/Cool Capability	No/Allow	Read_Writeable (X)
Binary Value	61	BMS_HeatCoolMode	BMS Heat/Cool Mode Setting	Heat/Cool	Read_Writeable (X)
Binary Value	74	BMS_HW_Valve_Control	BMS HW Valve Control	No/Allow	Read_Writeable
Binary Value	75	Heating_Enable_1.Val	Heating Stage 1 BMS Enable	Off/On	Read_Writeable
MultiState Input	2	SF_ControlType_BN	SF_ControlType_BN	(See Notes)	Read_NoWrite
MultiState Input	3	EF_ControlType_BN	EF_ControlType_BN	(See Notes)	Read_NoWrite
MultiState Input	4	HTG_ControlType_BN	HTG_ControlType_BN	(See Notes)	Read_NoWrite
MultiState Input	5	CLG_ControlType_BN	CLG_ControlType_BN	(See Notes)	Read_NoWrite
MultiState Input	6	Heating_SetPtType_BN	Heating_SetPtType_BN	(See Notes)	Read_NoWrite
Multistate Input	7	UnitStatus_BN	UnitStatus_BN	(See Notes)	Read_NoWrite
MultiState Input	8	Cooling_SetPtType_BN	Cooling_SetPtType_BN	(See Notes)	Read_NoWrite

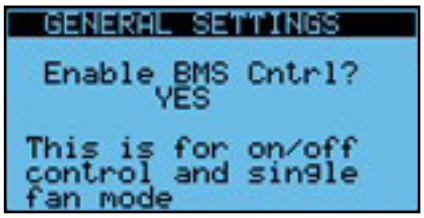
12.5 BACNET APPLICATION NOTES

12.5.1 Turning the Unit On and Off

If you plan to use the BMS to turn the unit on and off, make sure you have the control enabled through the keypad. Use Binary Value 10 “OnOffUnitMng.BmsOnOff.” The status can be read at “UnitOn” at Binary Input 21.

All of the following have to be true in order for the unit to be on:

- There are no serious alarms.
- The Digital Input for start/stop (terminals 17 and 18) are closed.
- The unit is turned on at the keypad.
- The time is within the scheduler “ON” time, if scheduler enabled.
- The BMS has written the unit on signal, if BMS control is enabled



UNITSTATUS_BN: MULTISTATE INPUT 7		
VALUE	STATUS	MEANING
1	Unit on	The unit is on and running.
2	Unit switched off due to alarm	The unit is off by a serious alarm.
3	Unit switched off by BMS	The unit is off by command from the BMS.
4	Unit switched off by time band	The unit is off by the scheduler.
5	Unit switched off by digital input	The unit is off due to contacts across 17 and 18 open.
6	Unit switched off from the local keypad	The unit is off by the setting on the menu screen.
8	Exhaust Fan Only Mode	The unit is in single fan mode with exhaust fan running.
9	Supply Fan Only Mode	The unit is in single fan mode with supply fan running.
11	Cool Locked Out by BMS	A BMS command has the cooling locked out.
12	Heat Locked Out by BMS	A BMS command has the heating locked out.
13	Device Test	The system is in device test mode for more than an hour.
14	Sens Ovrd Active	The system has a sensor overwritten for more than 24 hours.
15	Off by CO2 Level	Off by CO2 Level.
16	Frost Control On	Frost Control Mode Active.

12.5.2 Alarms

Individual alarms are mapped to Binary Inputs 500 and above. Two general alarms are available:

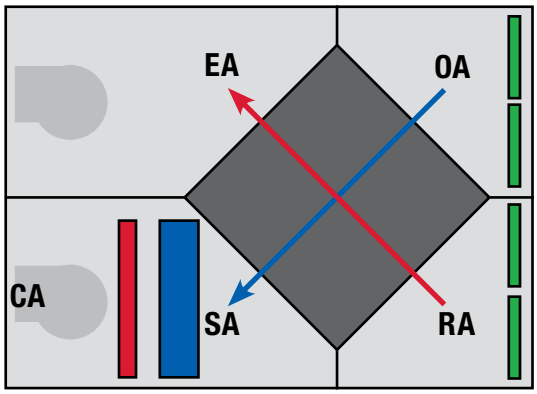
- Serious Alarm: Located at Binary Input 17, “Alarm_Out.val” indicates whether there is a serious alarm that stops the unit.
- Any Alarm: Located at Binary Input 72, “Any_Alarm_Out.val” indicates whether there is any alarm present.

To reset the User Reset type alarms, set Binary Value 12 “AlarmMng.AlrmResByBMS” to true. The program will set it back to false. You can view the status change through Binary Input 14 “AlarmMng.AlrmRes.”

12.5.3 Temperature and Humidity Around the ERV

The following are available:

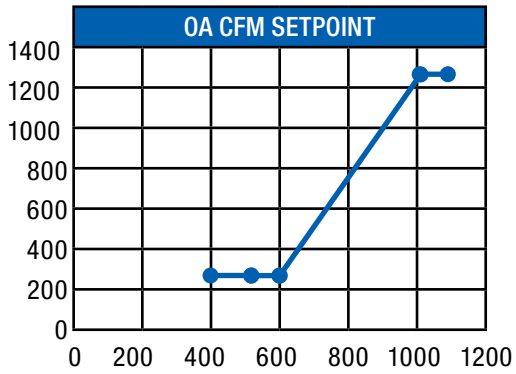
- Analog Input 0 “OA_Temp.Val”
- Analog Input 1 “OA_Hum.Val”
- Analog Input 2 “RA_Temp.Val”
- Analog Input 3 “RA_Hum.Val”
- Analog Input 4 “EA_Temp.Val”
- Analog Input 5 “SA_Temp.Val”



12.5.4 Fan Control

The supply fan control type method can be viewed at Multistate Input 2 “SF_ControlType_BN.” The valid values are 0 = Constant Speed, 1 = Supply Airflow, 2 = Duct Static Pressure, 3 = Room Static Pressure, 4 = CO2, 5 = VOC, 6 = CO2 Flow.

The corresponding settings are as follows:
- Constant Speed setpoint is Analog Value 37 “SF_ConstantSpeedSetP.Val”
- Supply Airflow setpoint is Analog Value 38 “SF_FlowControlSetP.Val”
- Room Static Setpoint is Analog Value 40 “SF_RoomStaticSetP.Val”
- Duct Static setpoint is Analog Value 39 “SF_DuctStaticSetP.Val”
- CO2/VOC setpoint is Analog Value 41 “SF_CO2_SetP.Val” or Analog Value 42 “SF_VOCSetP.Val”
- CO2 Flow ramp set at Analog Values 59, 60, 61, and 62



The command to the fan is read at Analog Input 26 “SF_Command.Val.” The feedback from the current sensor is read at Binary Input 15 “SF_Status.Val.” The actual flow rate is viewed at Analog input 6 “OA_Flow_Rate.Val.”

The exhaust fan control type method can be viewed at Multistate Input 3 “EF_ControlType_BN.” The valid values are 1 = Constant Speed, 2 = Exhaust Airflow, 3 = SF Command Tracking, 4 = SF Flow Tracking, 5 = Return Static Pressure.

The corresponding settings are as follows:
- Constant Speed setpoint is Analog Value 43 “EF_ConstantSpeedSetP.Val”
- Exhaust Airflow setpoint is Analog Value 44 “EF_FlowControlSetP.Val”
- Exhaust Fan Tracking setpoint is Analog Value 45 “EF_SF_TrackingSetP.Val”
- Return Static setpoint is Analog Value 46 “EF_ReturnStaticSetP.Val”

The command to the fan is read at Analog Input 27 “EF_Command.Val.” The feedback from the current sensor is read at Binary Input 16 “EF_Status.Val.” The actual flow rate is viewed at Analog input 7 “EA_Flow_Rate.Val.”

12.5.5 BMS Direct Fan Control

Available in ERV versions 03_00_26 ERV and higher.

Normally we use the setpoints below for constant speed fan control. These are retained variables that are kept on power loss and should not be written to constantly. You will get an alarm error and/or damage the controller by doing so.

Normal setpoint objects for constant speed fan control:
- SF_ConstSpeedSetP.Val AV37
- EF_ConstSpeedSetP.Val AV43

The newer versions allow a BMS system to command directly to the speed control with a non-retained variable. This is done with systems where the BMS is writing to the value every program cycle. One example would be when they use their own pressure control loop and only write the output to the fan.

The fan settings for supply and exhaust fan are independent. The user must set the control for that fan to constant speed control.

The objects used for writing the fan control type are:
- SF_ControlType_BN MV2
- EF_ControlType_BN MV2

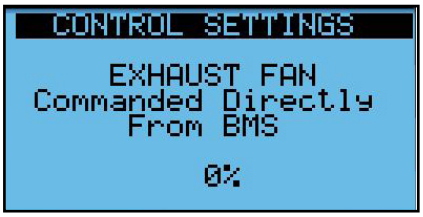
They can also be set on these screens.

In order to use this feature, the settings must be set in this screen, located in the General Settings near the other BMS settings. The user must set the corresponding fan to "YES."

The objects used for direct writing the percentages are:
- BMS_SupplyFanCommand AV80 expressed as 0-100%
- BMS_ExhaustFanCommand AV81 expressed as 0-100%

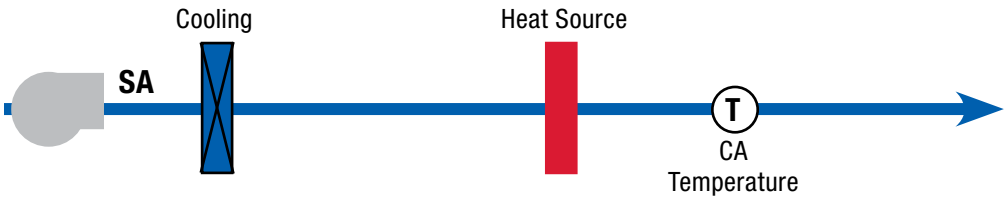
In the screen above you will be able to see the value of these objects under "Current Value" for troubleshooting purposes.

The Control Setting Screen will no longer be available. Instead, the following screen(s) will be shown accordingly, with the current command shown being read-only on the screen.



12.5.6 Tempering Control

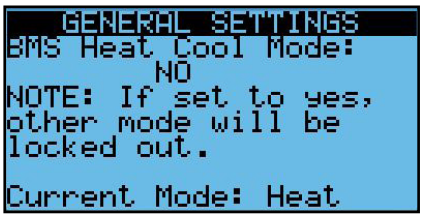
The ERV unit may provide heating and cooling/if ordered as such. For heating and/or cooling, there will be a conditioned air temperature sensor which measured the air coming out of the unit as Analog Input 32 "CA_Temp.Val."



12.5.6.1 Determining Tempering Mode

To determine the mode in which the unit is operating, the following values are considered:
- Analog Value 48 “HeatLockoutTemp”
- Analog Value 47 “CoolLockoutTemp”

In addition, the BMS has the potential to use one more setting to determine whether the unit will lock out heating or cooling functions. This is required for the dual temp systems and may be useful for other situations. The Binary Value 60 “BMS_SetHeatCool” must be true and then the mode is set through Binary Value 61 “BMS_HeatCoolMode” where 0 =Heat and 1 = Cool. The BMS mode is shown for troubleshooting.



The current Tempering Mode is viewed at Binary Input 13 “Tempering_Mode.Val.” It is also an output used for VRF applications. The tempering mode will show heating when in heating or ventilation only mode, and cooling.

12.5.6.2 Heating Control

The heating control type is located at Multistate Input 4 “HTG_ControlType_BN.” The setpoint is Analog Value 55 “Occ_HTG_SetP.Val” if adjustable setpoint is chosen. Otherwise the setpoint is based on an outdoor temperature schedule. The type is Multistate Input 6 “Heating_SetPtType_BN,” where 1 = Adjust and 2 = OA Reset. The acting setpoint is Analog Input 8 “HTG_SetP_Adjusted.”

The heating output statuses are the following:
- Binary Input 18 “Heating_Enable_1.Val” for stage one or modulating types where the demand is greater than 0
- Binary Input 57 “Heating_Enable_2.Val” for stage two
- Analog Input 34 “Heating_Command.Val” shows a percentage for the 0–10V output.

It is also possible for the BMS to take over total control of the 10–0V hot water valve signal out to the controlled valve and heating output directly for special cases. All setpoints, etc. will be ignored in this case. To do this, set the heating setting “Valve Control” to BMS on the screen, or through Binary Value 74 “BMS_HW_Valve_Control.”

Then control the valve through
- Analog Value 34 “HeatingCommand_BMS” to set a value for the 0–10V output, where 0 is 0V and 100 is 10V.
- Binary Value 75 “Heating_Enable_1.Val” can also be controlled directly if needed.

12.5.6.3 Cooling Control

The cooling control type is located at Multistate Input 5 “CLG_ControlType_BN.” The setpoint is Analog Value 56 “Occ_CLG_SetP.Val.”

The cooling output statuses are the following:
- Binary Input 19 “Cooling_Enable_1.Val” for stage one or modulating types where the demand is greater than 0
- Binary Input 20 “Cooling_Enable_2.Val” for stage two
- Analog Input 33 “Cooling_Command.Val” shows a percentage for the 0–10V output.

12.5.6.4 Economizer Control

The economizer will be enabled when there is a call for cooling and the outdoor is more favorable than the return air. In this case it will open the bypass damper to bypass the enthalpic core and thus inhibit the exchange of energy. During this time the unit still uses 100% OA.

Economizing is allowed when both of the following Are below their limit:
- Analog Value 52 “Economizer.Econ_Low_OA_Temp_Limit”
- Analog Value 58 “Economizer.Econ_Low_RA_Temp_Limit”

12.5.7 Frost Control

The frost control function is enabled, when the OA is lower than Analog Value 77 “Defrost_OA_SetP.Val” minus Analog Value 78 “Defrost_OA_SetP.DBright,” and turns off again when the OA exceeds the AV77. During this time, the supply fan is OFF and the OA damper is closed.

12.5.8 Filter Monitoring

Filter pressures are read through Analog Input 24 “RA_Flt_Press.Val” and Analog Input 25 “OA_Flt_Press.Val.”

Filter alarm levels are set at Analog Value 35 “RA_Flt_AlarmHigh” and Analog Value 36 “OA_Flt_AlarmHigh.”

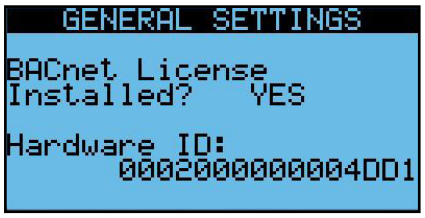
12.5.9 Exhaust Fan Only Mode

If BMS control is enabled, the unit can also be put in exhaust fan only mode in occupied operation using Binary Value 74 “UnitOnOffMng.BMSEFOnly.”

12.6 ADDING A BACNET LICENSE

12.6.1 Obtaining a BACnet License

If your controller does not have a BACnet license, contact whoever provided the unit to obtain one. You will need the Hardware ID number on this screen when ordering. Be sure to copy it carefully or the license will not work.



The license will be delivered as a file with extension “.ap1.”

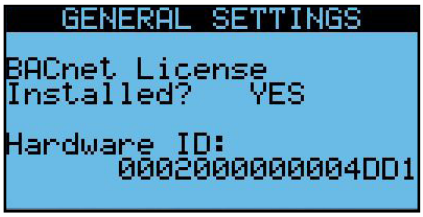
12.6.2 Installing the BACnet License via Web Page

Prerequisites
- Have ap1 BACnet upgrade file(s) located on your PC
- Ethernet connection from the PC to the controller and view the web page

Steps
1. Go to the Upgrade Tab in the web pages.

2. Click on “CHOOSE FILE” and locate the file on your PC that corresponds to the controller. HINT: The ending character in the UID of the controller should match the character of the ap1 file. Click “OPEN.”
3. You should now see that file name next to “CHOOSE FILE.” Click “Upload AP1 to c.pco.” You will see the file upload.
4. On the controller the program will see the file and require you to push “ENTER.” You can see that on the front of the controller itself or on the RUT page of the web pages.
5. Once the upgrade is finished the controller will ask you to reboot.

You can then verify that the license is installed by going to the RUT page.



12.6.3 Installing the BACnet License via USB Drive

Prerequisites

- Micro USB Adapter.
- USB Stick with the file in a folder in the root called “UPGRADE.” The file you received should be in that folder.

Steps

1. Carefully insert the micro USB end into the controller front under the door with the wide side to the bottom.
2. You should now see a prompt telling you press the enter key.
3. Once finished you will be prompted to press “ENTER” again.

You should now see the license is installed in the controller screen.

12.6.4 Installing the BACnet License via USB Connection

Prerequisites:

- PC
- Micro USB cable with the ability to plug in with a PC and have the controller appear as a USB drive in your Windows Explorer

Steps

1. Carefully insert the micro USB end into the controller front under the door with the wide side to the bottom.
2. You should see a folder called “UPGRADE” in the controller. Put the file in that folder. 3. Once finished you will be prompted to press “ENTER” again.

You should now see the license is installed in the controller screen.

12.7 MODBUS

The Modbus utilizes the standard registers and references them as an offset. For example, an offset of Input Register 0 is Register 30,001 and an offset for Holding Register 0 is register 40,001. All values are shown in decimal format. The implementation also uses Coils and Discrete Inputs in a similar manner.

12.7.1 Modbus TCP Connection

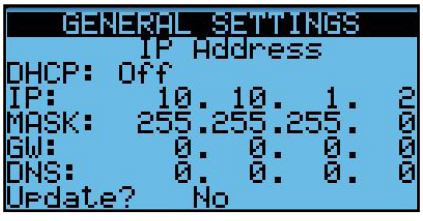
Connection of Modbus TCP requires a physical cable connection to the RJ45 jack on the controller. Prior to making the wiring connections, the controller is to be tested to verify proper control of the ERV unit under local control.

FIGURE 13.2.0 ETHERNET CONNECTION

12.7.2 Modbus TCP Settings

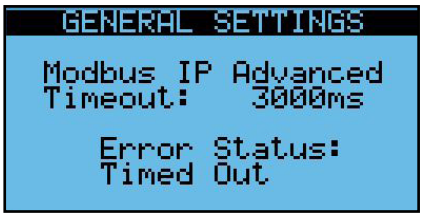
First, set the IP address of the controller in the same *General Settings* area.

- Set DHCP to Off if static
- If Static, set the IP, mask, and gateway if required.
- *Set Update?* To Yes (Power will need to be cycled. This can be done after all of the other settings.)



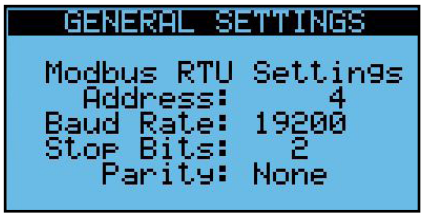
NOTE: The controller will only support private IP addresses which start with 192, 172, or 10.

Then set the timeout parameter, if needed.

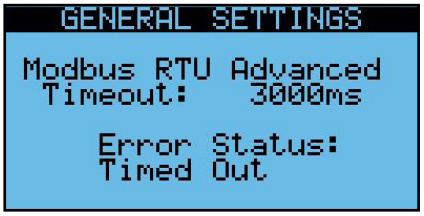


12.7.3 Modbus RTU Settings

First, set the address, baud rate, stop bits and parity.



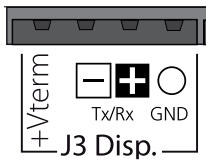
Then set the timeout parameter if needed.



12.7.4 Modbus RTU Wiring

The Modbus RTU network is wired into the four-pin connector named J3 Disp. In the upper left-hand corner of the controller. This is also used for a RUT display so the two cannot be used at the same time. For Modbus RTU, use the plus (+) and minus (-), as well as the GND for reference if desired.

DO NOT use the +Vterm terminal. If you happen to plus a three-pin block in here and use the wrong three pins you might damage the port.



12.8 MODBUS REGISTER LIST

Modbus Registers with an offset of 0 have been duplicated at register 98 to accommodate Automated Logic Systems and other systems that cannot map 0.

TYPE	#	VARIABLE	DESCRIPTION	RANGE	READ/WRITE MODE (RET)
Coil	0	OnOffUnitMng.BmsOnOff	BMS On/Off Command	Off/On	Read_Writeable
Coil	1	OnOffUnitMng.BmsEfOnly	BMS Exhaust Fan Only Command	Off/On	Read_Writeable
Coil	2	AlarmMng.AlrmResByBms	Alarm Reset BMS Command	OK/Reset	Read_Writeable
Coil	4	BMS_SetHeatCool	BMS Set Heat/Cool Capability	No/Allow	Read_Writeable (X)
Coil	5	BMS_HeatCoolMode	BMS Heat/Cool Mode Setting	Heat/Cool	Read_Writeable (X)
Coil	3	OnOffUnitMng.BmsUnocc	BMS Unoccupied Command	Occ/Unocc	Read_Writeable
Coil	6	BMS_HW_Valve_Control	BMS HW Valve Control	No/Allow	Read_Writeable
Coil	7	Heating_Enable_1.Val	Heating Stage 1 BMS Enable	Off/On	Read_Writeable
Coil	98	OnOffUnitMng.BmsOnOff	BMS On/Off Command	Off/On	Read_NoWrite
DiscreteInput	0	OA_Damp.Val	OA Damper Command	Closed/Open	Read_NoWrite
DiscreteInput	1	RA_Damp.Val	RA Damper Command	Closed/Open	Read_NoWrite
DiscreteInput	16	Tempering_Mode.Val	Tempering Mode	Heat/Cool	Read_NoWrite
DiscreteInput	2	AlarmMng.AlrmRes	Alarm Reset Status	No/Yes	Read_NoWrite
DiscreteInput	3	SF_Status.Val	SF Status from Current Sensor	Off/On	Read_NoWrite
DiscreteInput	4	EF_Status.Val	EF Status from Current Sensor	Off/On	Read_NoWrite
DiscreteInput	5	Alarm_Out.Val	Serious Alarm (Also a physical output)	OK/Alarm	Read_NoWrite
DiscreteInput	6	Heating_Enable_1.Val	Heating Stage 1	Off/On	Read_NoWrite
DiscreteInput	7	Cooling_Stage_1.Val	Cooling Stage 1	Off/On	Read_NoWrite
DiscreteInput	8	Cooling_Stage_2.Val	Cooling Stage 2	Off/On	Read_NoWrite
DiscreteInput	9	UnitOn	Unit On Status	Off/On	Read_NoWrite
DiscreteInput	10	OfflineAlrm_CPCOE_1.Active	Device offline alarm CPCOE	OK/Alarm	Read_NoWrite
DiscreteInput	21	AI_SupplyFan.Active	Supply Fan Start Alarm	OK/Alarm	Read_NoWrite
DiscreteInput	22	AI_ExhaustFan.Active	Exhaust Fan Start Alarm	OK/Alarm	Read_NoWrite
DiscreteInput	12	Bypass_Damp.Val	Bypass Damper Command	Close/Open	Read_NoWrite
DiscreteInput	13	Heating_Enable_2.Val	Heating Stage 2	Off/On	Read_NoWrite
DiscreteInput	20	Any_Alarm_Out.Val	Any Alarm is True Status	OK/Alarm	Read_NoWrite
DiscreteInput	98	OA_Damp.Val	OA Damper Command	Closed/Open	Read_NoWrite
HoldingRegister	44	HeatingCommand_BMS	Heating Command from BMS	%	Read_Writeable
HoldingRegister	0	RA_Flt_AlarmHigh	RA Filter Alarm Level	iwc	Read_Writeable (X)

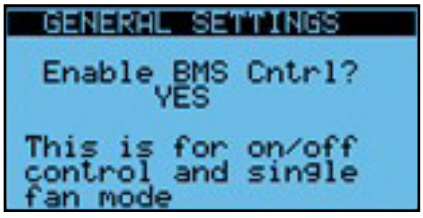
TYPE	#	VARIABLE	DESCRIPTION	RANGE	READ/WRITE MODE (RET)
HoldingRegister	2	OA_Flt_AlarmHigh	OA Filter Alarm Level	iwc	Read_Writeable (X)
HoldingRegister	4	SF_ConstSpeedSetP.Val	SF Const Speed Setpoint	%	Read_Writeable (X)
HoldingRegister	6	SF_FlowControlSetP.Val	SF Flow Control Setpoint	CFM	Read_Writeable (X)
HoldingRegister	8	SF_DuctStaticSetP.Val	SF Duct Static Pressure Setpoint	iwc	Read_Writeable (X)
HoldingRegister	12	SF_CO2_SetP.Val	SF CO2 Setpoint	PPM	Read_Writeable (X)
HoldingRegister	14	SF_VOC_SetP.Val	SF VOC Setpoint	PPM	Read_Writeable (X)
HoldingRegister	16	EF_ConstSpeedSetP.Val	EF Constant Speed Setpoint	%	Read_Writeable (X)
HoldingRegister	18	EF_FlowControlSetP.Val	EF Flow Control Setpoint	CFM	Read_Writeable (X)
HoldingRegister	20	EF_SF_TrackingSetP.Val	EF SF Tracking Setpoint	%	Read_Writeable (X)
HoldingRegister	22	EF_RoomStaticSetP.Val	EF Room Static Setpoint	iwc	Read_Writeable (X)
HoldingRegister	24	CoolLockoutTemp	OA Cooling Lockout Temperature	F	Read_Writeable (X)
HoldingRegister	26	HeatLockoutTemp	OA Heating Lockout Temperature	F	Read_Writeable (X)
HoldingRegister	34	BMS_CO2_Reading	BMS CO2 Reading (in lieu of attached sensor)	PPM	Read_Writeable
HoldingRegister	36	BMS_SpacePressPress_ Reading	BMS Space Pressure	iwc	Read_Writeable (X)
HoldingRegister	38	Occ_HTG_Setp.Val	Occupied Heating Setpoint	F	Read_Writeable (X)
HoldingRegister	40	Occ_CLG_Setp.Val	Occupied Cooling Setpoint	F	Read_Writeable (X)
HoldingRegister	52	SF_CO2_VOCFlowMinCO2. Val	SF Flow: MinCO2	PPM	Read_Writeable (X)
HoldingRegister	54	SF_CO2_FlowMaxCO2.Val	SF Flow: Max CO2	PPM	Read_Writeable (X)
HoldingRegister	56	SF_CO2_FlowMinFlow.Val	SF Flow: Min Flow	CFM	Read_Writeable (X)
HoldingRegister	58	SF_CO2_FlowMaxFlow.Val	SF Flow: Max Flow	CFM	Read_Writeable (X)
HoldingRegister	98	RA_Flt_AlarmHigh	RA Filter Alarm Level	iwc	Read_Writeable (X)
InputRegister	0	OA_Temp.Val	OA Temperature	F	Read_NoWrite
InputRegister	2	OA_Hum.Val	OA Relative Humidity	%	Read_NoWrite
InputRegister	4	RA_Temp.Val	RA Temperature	F	Read_NoWrite
InputRegister	6	RA_Hum.Val	RA Relative Humidity	%	Read_NoWrite
InputRegister	8	EA_Temp.Val	EA Temperature	F	Read_NoWrite
InputRegister	10	SA_Temp.Val	SA Temperature (before tempering)	F	Read_NoWrite
InputRegister	12	OA_Flow_Rate.Val	OA Flow Rate	CFM	Read_NoWrite
InputRegister	14	EA_Flow_Rate.Val	EA Flow Rate	CFM	Read_NoWrite
InputRegister	16	RA_Flt_Press.Val	RA Filter Pressure	iwc	Read_NoWrite
InputRegister	18	OA_Flt_Press.Val	OA Filter Pressure	iwc	Read_NoWrite

TYPE	#	VARIABLE	DESCRIPTION	RANGE	READ/WRITE MODE (RET)
InputRegister	20	SF_Command.Val	Supply Fan Command (actual)	%	Read_NoWrite
InputRegister	22	EF_Command.Val	Exhaust Fan Command (actual)	%	Read_NoWrite
InputRegister	24	CO2_Level.Val	CO2 Level	PPM	Read_NoWrite
InputRegister	26	VOC_Level.Val	VOC Level	PPM	Read_NoWrite
InputRegister	28	Space_Press.Val	Space Pressure	iwc	Read_NoWrite
InputRegister	30	Duct_Press.Val	Duct Pressure	iwc	Read_NoWrite
InputRegister	32	CA_Temp.Val	CA Temperature (after tempering)	F	Read_NoWrite
InputRegister	34	Cooling_Command.Val	Cooling Command	%	Read_NoWrite
InputRegister	36	Heating_Command.Val	Heating Command from Program	%	Read_NoWrite
InputRegister	98	OA_Temp.Val	OA Temperature	F	Read_NoWrite
InputRegister	42	SF_ControlType_BN	SF_ControlType_BN	(See Notes)	Read_NoWrite
InputRegister	43	EF_ControlType_BN	EF_ControlType_BN	(See Notes)	Read_NoWrite
InputRegister	44	HTG_ControlType_BN	HTG_ControlType_BN	(See Notes)	Read_NoWrite
InputRegister	45	CLG_ControlType_BN	CLG_ControlType_BN	(See Notes)	Read_NoWrite
InputRegister	48	Heating_SetPtType_BN	Heating_SetPtType_BN	(See Notes)	Read_NoWrite
InputRegister	50	UnitStatus_BN	UnitStatus_BN	(See Notes)	Read_NoWrite

12.9 MODBUS APPLICATION NOTES

12.9.1 Turning the Unit On and OFF

If you plan to use the BMS to turn the unit on and off, make sure you have the control enabled through the keypad. Use Modbus Coil “OnOffUnitMng.BmsOnOff” at Coil 0. The status can be read at “UnitOn” at Discrete Input 9.



All of the following have to be true in order for the unit to be on:

- There are no serious alarms.
- The Digital Input for start/stop (terminals 17 and 18) are closed.
- The unit is turned on at the keypad.
- The time is within the scheduler “ON” time, if scheduler enabled.
- The BMS has written the unit on signal, if BMS control is enabled.

UNITSTATUS_BN: INPUT REGISTER 50		
VALUE	STATUS	MEANING
1	Unit on	The unit is on and running.
2	Unit switched off due to alarm	The unit is off by a serious alarm.
3	Unit switched off by BMS	The unit is off by command from the BMS.
4	Unit switched off by time band	The unit is off by the scheduler.
5	Unit switched off by digital input	The unit is off due to contacts across 17 and 18 open.
6	Unit switched off from the local keypad	The unit is off by the setting on the menu screen.
8	Exhaust Fan Only Mode	The unit is in single fan mode with exhaust fan running.
9	Supply Fan Only Mode	The unit is in single fan mode with supply fan running.
11	Cool Locked Out by BMS	A BMS command has the cooling locked out.
12	Heat Locked Out by BMS	A BMS command has the heating locked out.
13	Device Test	The system is in device test mode for more than an hour.
14	Sens Ovrd Active	The system has a sensor overwritten for more than 24 hours.
15	Off by CO2 Level	Off by CO2 Level.
16	Frost Control On	Frost Control Mode Active.

12.9.2 Alarms

Two general alarms are available:

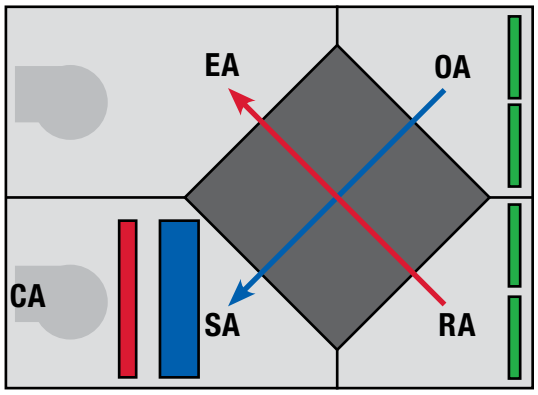
- Serious Alarm: Located at Discrete Input 5, “Alarm_Out.val” indicates whether there is a serious alarm that stops the unit.
- Any Alarm: Located at Discrete Input 20, “Any_Alarm_Out.val” indicates whether there is any alarm present.

To reset the User Reset type alarms, set Coil 0 (or 98) “AlarmMng.AlrmResByBMS” to true. The program will set it back to false. You can view the status change through Discrete Input 2 “AlarmMng.AlrmRes.”

12.9.3 Temperature and Humidity Around the ERV

The following are available:

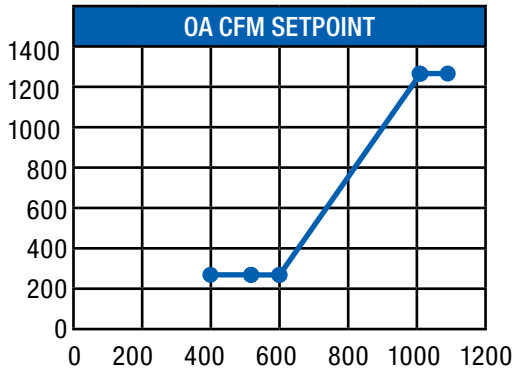
- Input Register 0 “OA_Temp.Val”
- Input Register 2 “OA_Hum.Val”
- Input Register 4 “RA_Temp.Vall”
- Input Register 6 “RA_Hum.Vall”
- Input Register 8 “EA_Temp.Val”
- Input Register 10 “SA_Temp.Vall”



12.9.4 Fan Control

The supply fan control type method can be viewed at Input Register 42 “SF_ControlType_BN.” The valid values are 0 = Constant Speed, 1 = Supply Airflow, 2 = Duct Static Pressure, 3 = CO2/VOC, 4 = CO2/VOC Flow.

The corresponding settings are as follows:
- Constant Speed setpoint is Holding Register 4 “SF_ConstantSpeedSetP.Val”
- Supply Airflow setpoint is Holding Register 6 “SF_FlowControlSetP.Val”
- Duct Static setpoint is Holding Register 8 “SF_DuctStaticSetP.Val”
- CO2/VOC setpoint is Holding Register 12 “SF_CO2_VOCSetP.Val”
- CO2/VOC Flow ramp set at Holding Registers 52, 54, 56, and 58.



The command to the fan is read at Input Register 20 “SF_Command.Val.” The feedback from the current sensor is read at Discrete Input 3 “SF_Status.Val.” The actual flow rate is viewed at Input Register 12 “OA_Flow_Rate.Val.”

The exhaust fan control type method can be viewed at Input Register 43 “EF_ControlType_BN.” The valid values are 1 = Constant Speed, 2 = Exhaust Airflow, 3 = SF Command Tracking, 4 = SF Flow Tracking, 5 = Return Static Pressure.

The corresponding settings are as follows:
- Constant Speed setpoint is Holding Register 16 “EF_ConstantSpeedSetP.Val”
- Exhaust Airflow setpoint is Holding Register 18 “EF_FlowControlSetP.Val”
- Exhaust Fan Tracking setpoint is Holding Register 20 “EF_SF_TrackingSetP.Val”
- Return Static setpoint Holding Register 22 “EF_ReturnStaticSetP.Val”

The command to the fan is read at Input Register 22 “EF_Command.Val.” The feedback from the current sensor is read at Discrete Input 4 “EF_Status.Val.” The actual flow rate is viewed at Input Register 14 “EA_Flow_Rate.Val.”

12.9.5 BMS Direct Fan Control

Available in ERV versions 03_00_26 ERV and higher.

Normally we use the setpoints below for constant speed fan control. These are retained variables that are kept on power loss and should not be written to constantly. You will get an alarm error and/or damage the controller by doing so.

Normal setpoint registers for constant speed fan control:
- SF_ConstSpeedSetP.Val HR4
- EF_ConstSpeedSetP.Val HR16

The newer versions allow a BMS system to command directly to the speed control with a non-retained variable. This is done with systems where the BMS is writing to the value every program cycle. One example would be when they use their own pressure control loop and only write the output to the fan.

The fan settings for supply and exhaust fan are independent. The user must set the control for that fan to constant speed control.

The registers used for writing the fan control type are:
- SF_ControlType_BN IR42
- EF_ControlType_BN IR43

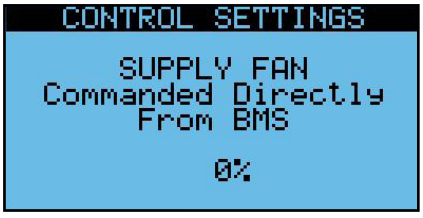
They can also be set on these screens.

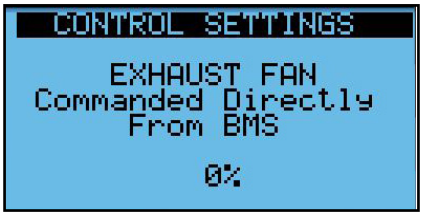
In order to use this feature, the settings must be set in this screen, located in the General Settings near the other BMS settings. The user must set the corresponding fan to “YES.”

The registers used for direct writing the percentages are:
- BMS_SupplyFanCommand HR70 expressed as 0-100%
- BMS_ExhaustFanCommand HR72 expressed as 0-100%

In the screen above you will be able to see the value of these objects under “Current Value” for troubleshooting purposes.

The Control Setting Screen will no longer be available. Instead, the following screen(s) will be shown accordingly, with the current command shown being read-only on the screen.





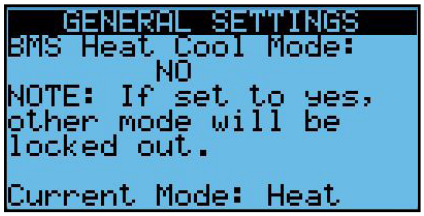
12.9.6 Tempering Control

The ERV unit may provide heating and cooling/if ordered as such. For heating and/or cooling, there will be a conditioned air temperature sensor which measured the air coming out of the unit as Input Register 32 “CA_Temp.Val.”

12.9.6.1 Determining Tempering Mode

To determine the mode in which the unit is operating, the following values are considered:
- Holding Register 26 “HeatLockoutTemp”
- Holding Register 24 “CoolLockoutTemp”

In addition, the BMS has the potential to use one more setting to determine whether the unit will lock out heating or cooling functions. This is required for the dual temp systems and may be useful for other situations. The Coil 4 “BMS_SetHeatCool” must be true and then the mode is set through Coil 5 “BMS_HeatCoolMode” where 0 =Heat and 1 = Cool. The BMS mode is shown for troubleshooting.



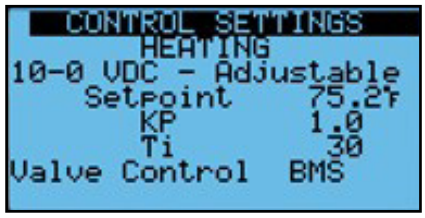
The current Tempering Mode is viewed at Discrete Input 16 “Tempering_Mode.Val.” It is also an output used for VRF applications. The tempering mode will show heating when in heating or ventilation only mode, and cooling for cooling mode.

12.9.6.2 Heating Control

The heating control type is located at Input Register 44 “HTG_ControlType_BN.” The setpoint is Holding Register 38 “Occ_HTG_SetP.Val” if adjustable setpoint is chosen. Otherwise the setpoint is based on an outdoor temperature schedule. The type is Input Register 48 “Heating_SetPtType_BN,” where 1 = Adjust and 2 = OA Reset. The acting setpoint is Input Register 46 “HTG_SetP_Adjusted.”

The heating output statuses are the following:
- Discrete Input 6 “Heating_Enable_1.Val” for stage one or modulating types where the demand is greater than 0
- Discrete Input 13 “Heating_Enable_2.Val” for stage two
- Input Register 36 “Heating_Command.Val” shows a percentage for the 0–10V output.

It is also possible for the BMS to take over total control of the 10–0V hot water valve signal out to the controlled valve and heating output directly for special cases. All setpoints, etc. will be ignored in this case. To do this, set the heating setting “Valve Control” to BMS on the screen, or through Binary Value 74 “BMS_HW_Valve_Control.”



Then control the valve through
- Holding Register 44 “HeatingCommand_BMS” to set a value for the 0–10V output, where 0 is 0V and 100 is 10V.
- Coil 7 “Heating_Enable_1.Val” can also be controlled directly if needed.

12.9.6.3 Cooling Control

The cooling control type is located at Input Register 45 “CLG_ControlType_BN.” The setpoint is Holding Register 40 “Occ_CLG_SetP.Vall.”

The cooling output statuses are the following:
- Discrete Input 7 “Cooling_Enable_1.Val” for stage one or modulating types where the demand is greater than 0
- Discrete Input 8 “Cooling_Enable_2.Val” for stage two
- Input Register 34 “Cooling_Command.Val” shows a percentage for the 0–10V output.

12.9.6.4 Economizer Control

The economizer will be enabled when there is a call for cooling and the outdoor is more favorable than the return air. In this case it will open the bypass damper to bypass the enthalpic core and thus inhibit the exchange of energy. During this time the unit still uses 100% OA.

Economizing is allowed when both of the following Are below their limit:
- Holding Register 30 “Economizer.Econ_Low_OA_Temp_Limit”
- Holding Register 42 “Economizer.Econ_Low_RA_Temp_Limit”

12.9.7 Frost Control

The frost control function is enabled, when the OA is lower than Holding Register 64 “Defrost_OA_SetP.Val” minus Holding Register 66 “Defrost_OA_SetP.DBright,” and turns off again when the OA exceeds the HR66. During this time, the supply fan is OFF and the OA damper is closed.

12.9.8 Filter Monitoring

Filter pressures are read through Input Register 16 “RA_Flt_Press.Val” and Input Register 18 “OA_Flt_Press.Val.”

Filter alarm levels are set at Holding Register 0 (or 98) “RA_Flt_AlarmHigh” and Holding Register 2 “OA_Flt_AlarmHigh.”

12.9.9 Exhaust Fan Only Mode

If BMS control is enabled, the unit can also be put in exhaust fan only mode in occupied operation using Coil 1 “UnitOnOffMng.BMSEFOnly.”

13.0 ADVANCED SERVICE

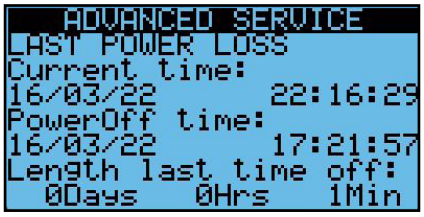
This area gives advanced service information, as described. These screens are used infrequently.

13.1 RUN HOURS AND STARTS

For the ERV unit as well as each fan and compressor, if applicable, there is a screen that shows the run hours as well as the number of starts. This screen also lets you specify a threshold for alarm to alert that service is required and the ability to reset those numbers once service is performed.

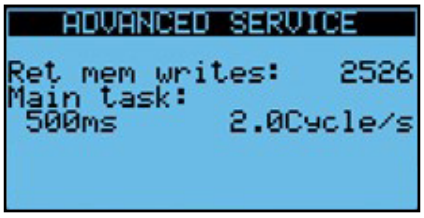
13.2 LAST POWER LOSS

This screen gives information on the last time the unit was powered down as well as the length of time the unit was powered down for troubleshooting.



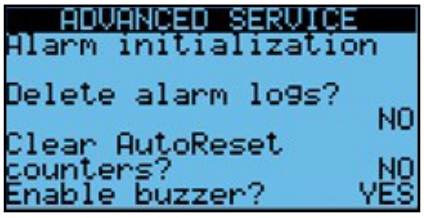
13.3 INTERNAL MEMORY WRITES

This screen gives information memory writes and the cycle speed of the applications. This would normally be used to give information to TSS, if requested.



13.4 ALARM INITIALIZATION

This screen will allow you to delete the alarm logs.



13.5 MEMORY WIPE

This screen will allow to wipe retained values (most setpoints) and/or NVRAM (clock and IP settings). You should only use this screen if directed to do so by TSS.

13.6 COMMUNICATION TO EXPANSION MODULE

This screen allows you to see the status of the communication to the expansion module. TSS may request this information for troubleshooting.

14.0 MAINTENANCE RECORDS

14.1 UNIT START UP CONDITIONS

This page is to be used to record all settings on the controller at the time of unit start up.

UNIT ID OR TAG:

14.1.1 Setpoints

NAME OF SETPOINT	VALUE

14.1.2 Offsets

NAME OF OFFSET	VALUE

14.1.3 IP Addresses

NAME OF COMPONENT	IP ADDRESS
Controller	

14.2 CHANGES MADE TO UNIT AFTER START UP

This page is to be used to record all user changes made to controller settings and indicate the reason for the change. In some cases, the reason for the change may be self-evident.

UNIT ID OR TAG:

14.2.1 Setpoints

NAME OF SETPOINT	NEW VALUE

14.2.2 Offsets

NAME OF OFFSET	NEW VALUE

14.2.3 I/O Configuration Changes

14.3 CONTROLLER UPDATES

Anytime an updated controller program is provided by the factory and installed by the user, it should be recorded here:

DATE

14.4 SETTINGS BACKUP FILE

Use this space to record whether or not a backup has been performed to an external memory device (USB stick) and indicate where the USB stick is to be found.

Controller System Backup has been performed: ☐ Yes

Type/ID of memory device:

Storage location of external memory device:

15.0 REFERENCE

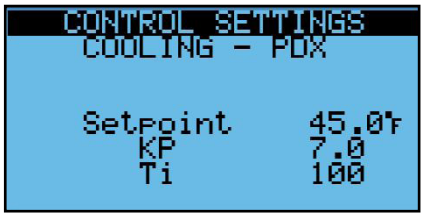
15.1 TUNING PI CONTROL LOOPS

For any heating or cooling device that has a variable output and uses a variable control signal (including HGRH), the desired action is for the heating/cooling device to reach the setpoint quickly and smoothly. The controller monitors a selected temperature sensor and any variation from the setpoint is considered "ERROR." The controller senses the Error and sends a control signal (call for heat or call for cooling) to the heating/cooling device. This control signal is referred to as a "command." For most variable output hardware, the command will be an analog 0–10VDC signal.

This controller uses PI programming to control the response to Error. PI programming uses two different types of settings to control the command; KP and Ti

KP = proportional gain
- Responds directly to difference between setpoint and actual
- Larger KP values will cause a greater output response and eventually will oscillate.

Ti = integral band
- Responds to the accumulated difference between setpoint and actual
- Larger Ti values will cause a slower output response, very small values eventually will oscillate.



15.1.1 Proportional Constant (KP)

The Proportional Constant (KP) determines the strength of the command for any given error.

Example: the setpoint in a heating system is 72°F. The actual temperature is 71°F so the Error is 10°F, which requires very little heat from the heater. The controller sees there is an error and immediately sends a call for heat that starts at 0.1% strength and ramps up as needed, but the rate of increase tapers off as the Error decreases. The rate of increase is proportional to the amount of Error. When the controller senses that the Error is decreasing, it will slow the rate of increase of the command.

- When the Error is small, the rate of increase of the command is slow.
- When the Error is large, the rate of increase is greater (the command responds proportionally to the amount of Error).

The factory default KP setting for most heating and cooling devices is 1, which produces a low and slow response. If the response is too slow, the KP setting can be increased so that the command will be stronger and faster.

Example: when the KP setting is 1 and Ti is set for 30 (the factory defaults) and there is a 1°F Error, it takes about 50 seconds for the command to change by 10%. If the KP setpoint is changed to 10, it takes about 5 seconds for the command to change by 10%. For most installations, the KP value will have to be increased to speed up changes in the command signal to an acceptable level. Setting the KP value too high will result in the heater/cooler over-shooting the setpoint constantly.

- If the KP value is too low, the command will change too slowly and the setpoint may take too long to reach.
- If the KP value is too high, the command will change to 100% too quickly and the setpoint will be over-shot. This results in the heating/cooling device switching "ON" and "OFF" constantly.

15.1.2 Time Integral (Ti)

If the KP setting did not have some means of control, the resulting command signals would constantly over-shoot the setpoint. The Time Integral causes the controller to re-examine the amount of error at specific time intervals to see the amount of error remaining. Ti produces a damping effect on the KP value to reduce over-shooting the setpoint. Ti is an actual measure of time so that when the value is reduced, the frequency of sampling increases.

Example: the default Ti value is 30. If the value were changed to 15, sampling would occur twice as often. If the value were changed from 30 to 60, sampling would occur only half as often. If Ti were changed to 500, the result is that the sampling value would be insignificant and corrections to KP would not be happening.

- If the Ti value is set too low (meaning that sampling is occurring too often), the increase in the command signal will immediately begin to slow and keep getting slower because Ti is damping the KP value too much.
- If Ti is set too high (sampling is not occurring often enough), the Command signal will overshoot the setpoint in both a negative and positive direction, causing short-cycling of the heating device.

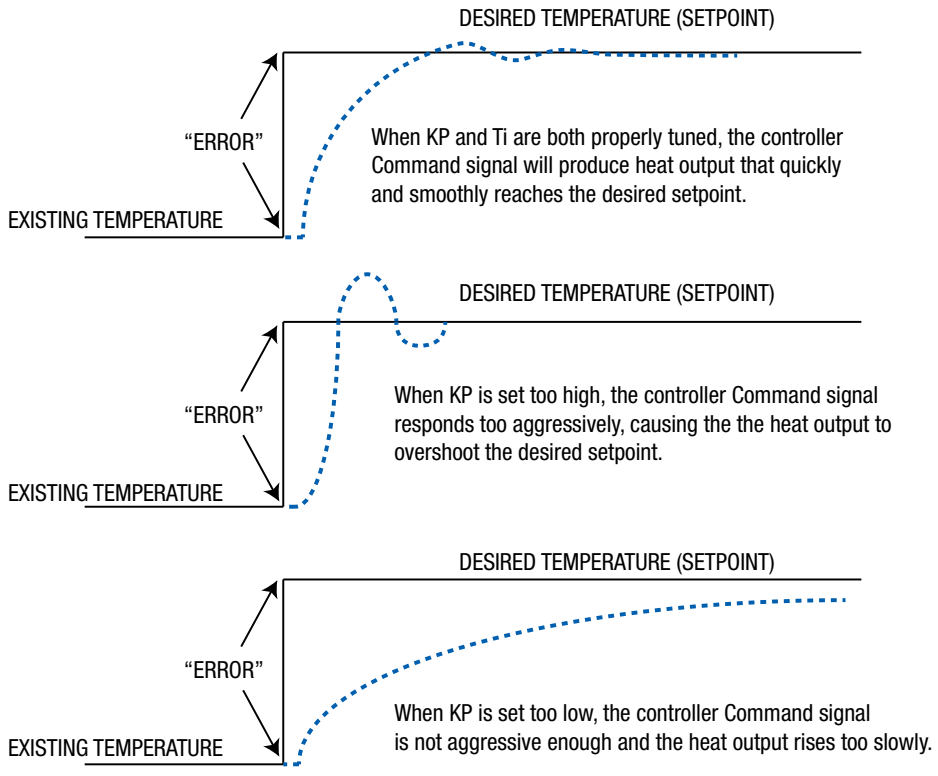


FIGURE 15.1.0 KP SETPOINT CHARTS

The process of adjusting KP and Ti to provide the most satisfactory controller output is known as tuning the controller. There are some sophisticated math equations that can be done to predict where the KP and Ti settings should be, but in the field, adjustment is normally done by a trial-and-error method. The KP setting is first adjusted and then the Ti setting is adjusted to manage the KP setting.

Tools needed:

- Laptop computer to view the Heating screens and make adjustments to KP and Ti.
- A stopwatch or watch with a second hand to monitor times.
- Connect the laptop to the controller via ethernet.

15.1.3 Establish a KP Setting

Use the KP Adjustment Chart to track and log test trials of different controller settings. Make copies of the adjustment charts, as needed.

- Go to Main Menu > Unit Status > Heating. Note the temperature here.
- Go to Main Menu > Control Settings> Heating.
- Set the KP value at 5.
- Set the Ti value at 500. This will make the sampling frequency so low that it is essentially of no consequence and permits adjustment of KP without being affected by Ti.
- Set the setpoint for 20°F warmer than the current temperature as noted above. (Change the setpoint last because the controller will immediately respond to the setpoint change, using the KP and Ti settings that it currently has.)
- Click the "ENTER" button and then immediately go back to Main Menu > Unit Status > Heating.

  View the Command and Temperature lines on the screen and enter the data at each time interval that was selected.

When the trial is complete, view the Command line on the chart to see how quickly it ramps up to 100%. If the Command percentage is rising too slowly, increase the KP value and run the trial again. The Command percentage should reach 100% (or very nearly) within 2–4 minutes.

Repeat the process, but move the heating setpoint 20°F lower than the current temperature and change the KP value to a larger value, possibly 10 or 15 larger than the previous trial.

Make data entries on the KP Adjustment Chart (following page) to help track changes to the KP settings. Select the most appropriate KP setting.

15.1.4 Establish a Ti Setting

- Leave the KP value as found above.
- Set the Ti value at the default value of 30. For each trial, increase the Ti setting.
- Follow the same process as described above. Repeat the trials until the smoothest response is found that does not cause over-shooting or oscillation of the heating command.

15.1.5 Verify the Combined KP and Ti Settings

When both KP and Ti have been set, run one final trial with the KP and Ti settings at their new values and record the results in the final chart. This ensures that the results are repeatable. Temperature and Command readings are obtained from Main Menu > Unit Status > Heating

For Elapsed Time, select a convenient amount of time to allow between readings (example: 30 seconds).

In the first column of each trial, fill in the starting data for the trial

DEVICES BEING ADJUSTED

KP Adjustment Trial 1

KP SETTING								
HEATING SETPOINT								
TEMPERATURE								
COMMAND PERCENTAGE								
ELAPSED TIME	0							

KP Adjustment Trial 2

KP SETTING								
HEATING SETPOINT								
TEMPERATURE								
COMMAND PERCENTAGE								
ELAPSED TIME	0							

KP Adjustment Trial 3

KP SETTING								
HEATING SETPOINT								
TEMPERATURE								
COMMAND PERCENTAGE								
ELAPSED TIME	0							

KP Adjustment Trial 4

KP SETTING								
HEATING SETPOINT								
TEMPERATURE								
COMMAND PERCENTAGE								
ELAPSED TIME	0							

FIGURE 15.1.1 KP ADJUSTMENT WORKSHEET

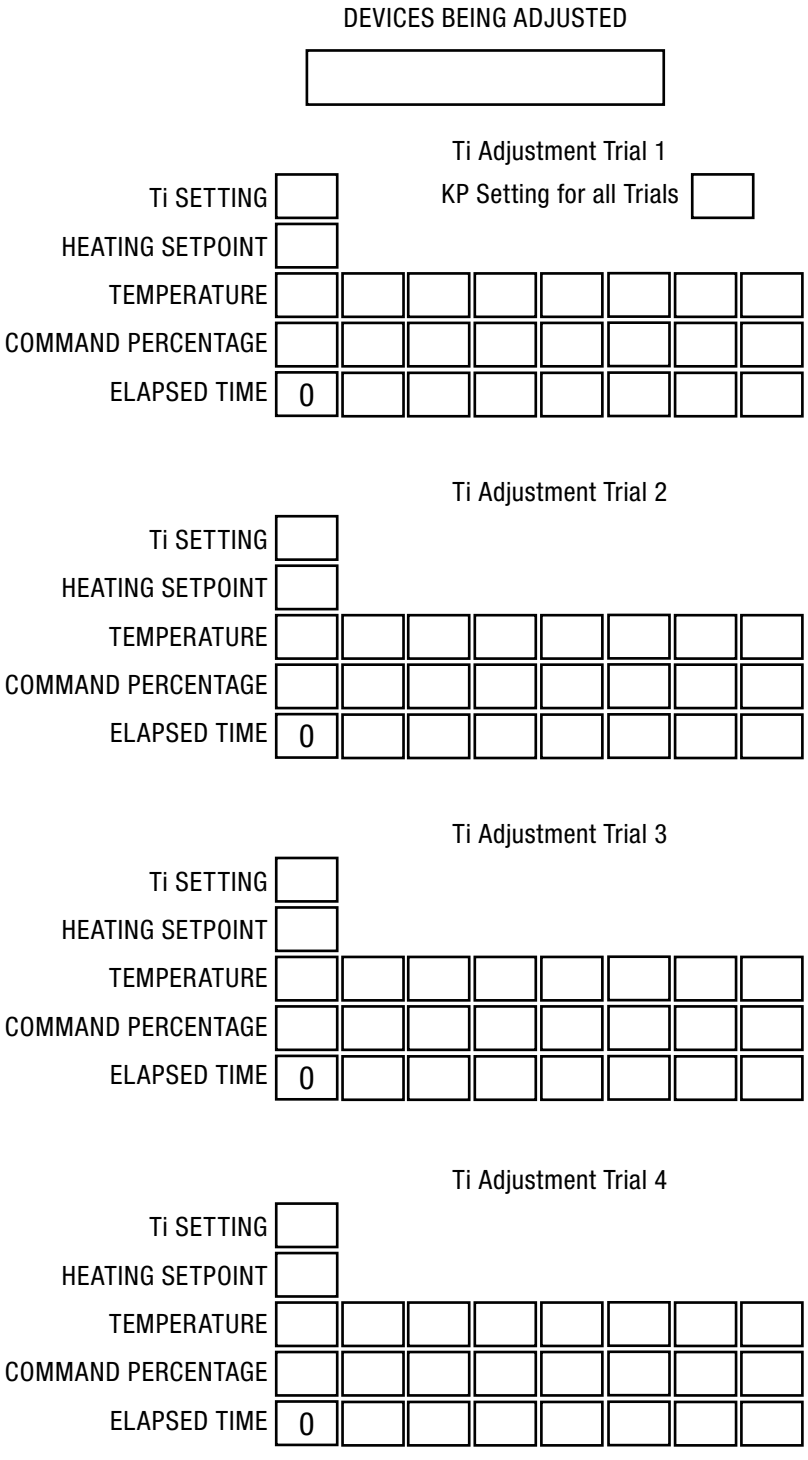


FIGURE 15.1.2 TI ADJUSTMENT WORKSHEET

15.2 TEMPERATURE SENSOR CURVE

Only sensors with this Carel curve should be used with this system.

°C	°F	KΩ
-50.0	-58.0	329.20
-49.0	-56.2	310.70
-48.0	-54.4	293.30
-47.0	-52.6	277.00
-46.0	-46.0	261.80
-45.0	-49.0	247.50
-44.0	-47.2	234.10
-43.0	-45.4	221.60
-42.0	-43.6	209.80
-41.0	-41.8	198.70
-40.0	-40.0	188.40
-39.0	-38.2	178.30
-38.0	-36.4	168.90
-37.0	-34.6	160.10
-36.0	-32.8	151.80
-35.0	-31.0	144.00
-34.0	-29.2	136.60
-33.0	-27.4	129.70
-32.0	-25.6	123.20
-31.0	-23.8	117.10
-30.0	-22.0	111.30
-29.0	-20.2	105.70
-28.0	-18.4	100.40
-27.0	-16.6	95.47
-26.0	-14.8	90.80
-25.0	-13.0	86.39
-24.0	-11.2	82.22
-23.0	-9.4	78.29
-22.0	-7.6	74.58
-21.0	-5.8	71.07
-20.0	-4.0	67.74
-19.0	-2.2	64.54
-18.0	-0.4	61.52
-17.0	1.4	58.66
-16.0	3.2	55.93
-15.0	5.0	53.39
-14.0	6.8	50.96
-13.0	8.6	48.65
-12.0	10.4	46.48
-11.0	12.2	44.41
-10.0	14.0	42.25
-9.0	15.8	40.56
-8.0	17.6	38.76
-7.0	19.4	37.05
-6.0	21.2	35.43
-5.0	23.0	33.89
-4.0	24.8	32.43
-3.0	26.6	31.04
-2.0	28.4	29.72
-1.0	30.2	28.47
0.0	32.0	27.23
1.0	33.8	26.13
2.0	35.6	25.03
3.0	37.4	23.99
4.0	39.2	22.99
5.0	41.0	22.05
6.0	42.8	21.15
7.0	44.6	20.29
8.0	46.4	19.40
9.0	48.2	18.70
10.0	50.0	17.96
11.0	51.8	17.24
12.0	53.6	16.55
13.0	55.4	15.90
14.0	57.2	15.28
15.0	59.0	14.68
16.0	60.8	14.12
17.0	62.6	13.57
18.0	64.4	13.06
19.0	66.2	12.56
20.0	68.0	12.09
21.0	69.8	11.63
22.0	71.6	11.20
23.0	73.4	10.78
24.0	75.2	10.38
25.0	77.0	10.00
26.0	78.0	9.63
27.0	80.6	9.28
28.0	82.4	8.94
29.0	84.2	8.62
30.0	86.0	8.31
31.0	87.8	8.01
32.0	89.6	7.72
33.0	91.4	7.45
34.0	93.2	7.19
35.0	95.0	6.94
36.0	96.8	6.69
37.0	98.6	6.46
38.0	100.4	6.24
39.0	102.2	6.03
40.0	104.0	5.82
41.0	105.8	5.63
42.0	107.6	5.43
43.0	109.4	5.25
44.0	111.2	5.08
45.0	113.0	4.91
46.0	114.8	4.74
47.0	116.6	4.59
48.0	118.4	4.44
49.0	120.2	4.30
50.0	122.0	4.16
51.0	123.8	4.02
52.0	125.6	3.90
53.0	127.4	3.77
54.0	129.2	3.65
55.0	131.0	3.53
56.0	132.8	3.42
57.0	134.6	3.31
58.0	136.4	3.21
59.0	138.2	3.11
60.0	140.0	3.02
61.0	141.8	2.92
62.0	143.6	2.83
63.0	145.4	2.75
64.0	147.2	2.66
65.0	149.0	2.58
66.0	150.8	2.51
67.0	152.6	2.43
68.0	154.4	2.36
69.0	156.2	2.29
70.0	158.0	2.22
71.0	159.8	2.16
72.0	161.6	2.10
73.0	163.4	2.04
74.0	165.2	1.98
75.0	167.0	1.92
76.0	168.8	1.87
77.0	170.6	1.81
78.0	172.4	1.76
79.0	174.2	1.71
80.0	176.0	1.66
81.0	177.8	1.62
82.0	179.6	1.57
83.0	181.4	1.53
84.0	183.2	1.49
85.0	185.0	1.45
86.0	186.8	1.41
87.0	188.6	1.37
88.0	190.4	1.33
89.0	192.2	1.30
90.0	194.0	1.26
91.0	195.8	1.23
92.0	197.6	1.20
93.0	199.4	1.16
94.0	201.2	1.13
95.0	203.0	1.10
96.0	204.8	1.08
97.0	206.6	1.05
98.0	208.4	1.02
99.0	210.2	0.99
100.0	212.0	0.97
101.0	213.8	0.94
102.0	215.6	0.92
103.0	217.4	0.90
104.0	219.2	0.87
105.0	221.0	0.85
106.0	222.8	0.83
107.0	224.6	0.81
108.0	226.4	0.79
109.0	228.2	0.77
110.0	230.0	0.75

15.3 EV450 AND HE-SERIES FULL CONFIGURATION CODE

Note: Not all options are available on every model.

MODEL NUMBER						J				-						-	-						-		
DIGIT NUMBER	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25

Digits 1–5:	Model
"EV450", "HE-1X", "HE1.5", "HE-2X", "HE-3X", "HE-4X", "HE-6X", "HE-8X"	

Digits 7–8:	Location
"IN" = Indoor	
"RT" = Rooftop	

Digit 9:	Orientation (see Restriction 1)
"V", "H" (Indoor Units)	
"V", "H", "R", "F", "C" (Rooftop Units)	
"-" = Default in EV450	

Digit 11:	Wall Type
"S" = Single	
"D" = Double	

Digit 12:	Phase (See Restriction 7 & 17)
"1" = Single Phase	
"3" = Three Phase	

Digit 13:	Voltage (see Restrictions 2, 3, 4, 5, 6, & 19)
"1" = 120V	
"4" = 460V	
"5" = 208-230V	
"8" = 575V	
"9" = 277V	

Digit 14:	FA Horsepower (see Restrictions 7 & 19)
"-" = Standard EV450 Motors	
"H" = 0.75 HP Standard Direct-Drive Motors (HE-1X only)	
"E" = EC Direct Drive Motors (EV450, HE-1X, and HE1.5 only)	
"S" = Standard Impellers (HE1.5 only)	
"U" = 1.5HP (HE-2X only)	
"V" = 2HP (HE-2X, HE-3X, HE-4X only)	
"W" = 3HP (HE-3X, HE-4X only)	
"X" = 5HP (HE-3X, HE-4X, HE-6X, HE-8X only)	
"Y" = 7.5HP (HE-6X, HE-8X only)	
"Z" = 10HP (HE-8X only)	

Digit 15:	EA Horsepower (see Restrictions 7 & 19)
"-" = Standard EV450 Motors	
"H" = 0.75 HP Standard Direct-Drive Motors (HE-1X only)	
"E" = EC Direct Drive Motors (EV450, HE-1X, and HE1.5 only)	
"S" = Standard Impellers (HE1.5 only)	
"U" = 1.5HP (HE-2X only)	
"V" = 2HP (HE-2X, HE-3X, HE-4X only)	
"W" = 3HP (HE-3X, HE-4X only)	
"X" = 5HP (HE-3X, HE-4X, HE-6X, HE-8X only)	
"Y" = 7.5HP (HE-6X, HE-8X only)	
"Z" = 10HP (HE-8X only)	

Digit 18:	Flow Control* (see Restrictions 11, 12, & 14)
"-" = No Isolation Dampers (with no Bypass)	
"D" = Motorized Damper both Airstreams (with no Bypass)	
"E" = Motorized Damper EA or RA Airstream (with no Bypass)	
"F" = Motorized Damper FA or OA Airstream (with no Bypass)	
"S" = Backdraft Damper OA Airstream (with no Bypass)	
"R" = Backdraft Damper EA Airstream (with no Bypass)	
"B" = Backdraft Damper both Airstreams (with no Bypass)	
"T" = Motorized Damper OA, Backdraft Damper EA (with no Bypass)	
"0" = Dry Bulb Face and Bypass Dampers only	
"1" = Dry Bulb Bypass with Motorized Dampers all Airstreams	
"4" = Dry Bulb Bypass with Backdraft Damper OA Airstream	
"5" = Enthalpy Face and Bypass Dampers only	
"6" = Enthalpy Bypass with Motorized Dampers all Airstreams	
"9" = Enthalpy Bypass with Backdraft Damper OA Airstream	

Digit 19:	Unit Control (see Restrictions 8, 9, 10, 15, 16, & 17)
"A" = Standard Unit Control Wiring	
"D" = Independent Blower Control (HE-1X and HE1.5 only)	
"V" = Onboard VFD Both Airstreams	
"G" = Terminal Strip for EC Motors or Impellers	

Digit 20:	Disconnect
"N" = Non-Fused (Standard)	
"F" = Fused	

Digit 21:	Unit Control Enhancements (see Restrictions 16 & 18)
"T" = Transformer with Isolation Relay (Standard)	
"1" = Enhanced Controls	
"2" = Premium Controls	
"3" = Enhanced Controls with BACnet License	
"4" = Premium Controls with BACnet License	

Digit 22:	Filter Options (see Restriction 18)
"-" = None (Standard)	
"F" = Filter Monitor Both Airstreams	

Digit 23:	Other Options
"-" = None (Reserved)	

Digit 24:	Paint and Customization
"-" = None	
"W" = White Paint	
"C" = Custom Paint	
"X" = Custom Unit	

Digit 25:	Safety Listing (see Restriction 13)
"L" = Listed	
"N" = Non-Listed	

***NOTES:**

Digit 6 "J" = G5 Core Type. Digits 10, 16, and 17 are not used in these models. Digit 15 is not used in EV450 models.

*Digit 18: Flow Control: Codes for Bypass: Face damper also acts as Isolation Damper in EA or RA Airstream.

Restrictions:
1: Orientation Code "C" not available with models EV450, HE-6X, HE-8X, HE1.5
2: Voltage Codes "1" & "9" only available with Phase Code "1" (Single-Phase).
3: Voltage Codes "4" & "8" only available with Phase Code "3" (Three-Phase).
4: Voltage Code "9" (277V) only available with EV450, HE-1X & HE1.5 models.

Note: Not all options are available on every model.

MODEL NUMBER						J				-						-	-						-		
DIGIT NUMBER	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25

Restrictions:
5: Voltage Code "8" (575V) not available with EV450, HE-1X & HE1.5 models.
6: Voltage Code "1" only available with FA/EA Horsepower Codes "EE", "E-", "H", "S","U", "V" & "-".
7: Motor Codes "E-" & "EE" (EC Motors) only available with Phase Code "1" (Single Phase).
8: Unit Control Code " V" not available in EV450, HE-1XIN, HE1.5IN & HE-1XRTC.
9: Unit Control Code "G" (Terminal Strip) only available in EV450, HE-1X & HE1.5 with Motor Codes "E-" and "EE" (EC Motors).
10: Unit Control Code "D" only available in HE-1X & HE1.5.
11: Dampers and Bypass not available in EV450 or with Orientation Code "C".
12: Backdraft Dampers only available with HE1.5 models.
13: Some units with Customization Code "X", HE-6X & HE-8X models are not safety listed.
14: Bypass only available with Location Code "IN".
15: Unit Control Code "V" not available with Voltage Code "1".
16: Unit Control "A" not available with Unit Control Enhancements Codes "1", "2", "3" & "4" in HE-1X and HE1.5 models.
17: Unit Control "V" not available with Phase Code "1" in HE-1X and HE1.5 models.
18: Filter Code "F" not available with Unit Control Enhancements Codes "1", "2", "3" & "4". Filter Monitor is provided with those options.
19: Voltage Code "9" not available with FA/EA Horsepower Codes "EE" & "E-".

15.4 LE-SERIES FULL CONFIGURATION CODE

Note: Not all options are available on every model.

MODEL NUMBER	L	E				J										-	-							
DIGIT NUMBER	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25

Digits 1–5:	Model
"LE-6X"	
"LE-8X"	
"LE10X"	

Digits 7–8:	Location
"IN" = Indoor	
"RT" = Rooftop	

Digit 9:	Orientation
"V", "H" (Indoor Units)	
"V", "H", "R", "F" (Rooftop Units)	

Digit 10:	Vibration Isolation
"N" = Neoprene Isolators	
"S" = Spring Isolators	

Digit 11:	Wall Type
"S" = Single	
"D" = Double	

Digit 12:	Phase (See Restriction 2)
"1" = Single Phase	
"3" = Three Phase	

Digit 13:	Voltage (see Restriction 1 & 10)
"4" = 460V	
"5" = 208–230V	
"8" = 575V	

Digit 14:	FA Horsepower (see Restrictions 2, 3, & 4)
"D" = 3 HP Low Speed	
"F" = 3 HP Medium Speed	
"G" = 3 HP High Speed	
"J" = 5 HP Low Speed	
"K" = 5 HP Medium Speed	
"L" = 5 HP High Speed	
"M" = 7.5 HP Low Speed	
"N" = 7.5 HP Medium Speed	
"P" = 7.5 HP High Speed	
"Q" = 10 HP Medium Speed	
"R" = 10 HP High Speed	

Digit 15:	EA Horsepower (see Restrictions 2, 3, & 4)
"D" = 3 HP Low Speed	
"F" = 3 HP Medium Speed	
"G" = 3 HP High Speed	
"J" = 5 HP Low Speed	
"K" = 5 HP Medium Speed	
"L" = 5 HP High Speed	
"M" = 7.5 HP Low Speed	
"N" = 7.5 HP Medium Speed	
"P" = 7.5 HP High Speed	
"Q" = 10 HP Medium Speed	
"R" = 10 HP High Speed	

***NOTES:**
Digit 6 "J" = G5 Core Type. Digits 16 and 17 are not used in these models.

Digit 18:	Flow Control
"-" = No Isolation Damper	
"D" = Motorized Damper both Airstreams	
"E" = Motorized Damper EA or RA Airstream	
"F" = Motorized Damper FA or OA Airstream	

Digit 19:	Unit Control (see Restrictions 6, 7, 8, & 11)
"A" = Standard Unit Control Wiring	
"V" = Onboard VFD Both Airstreams	
"W" = Onboard VFD Both Airstreams with IE5+ Ultra Premium Efficiency Motors	

Digit 20:	Disconnect
"N" = Non-Fused (Standard)	
"F" = Fused	

Digit 21:	Unit Control Enhancements
"T" = Transformer with Isolation Relay (Standard)	
"1" = Enhanced Controls	
"2" = Premium Controls	
"3" = Enhanced Controls with BACnet License	
"4" = Premium Controls with BACnet License	

Digit 22:	Filter Options (see Restriction 9)
"-" = None (Standard)	
"F" = Filter Monitor Both Airstreams	

Digit 23:	Flexible Packaging
"A" = Assembled (single piece flat bed)	
"M" = Modular (two pieces for enclosed trailer)	

Digit 24:	Paint and Customization
"-" = None	
"W" = White Paint	
"C" = Custom Paint	
"X" = Custom Unit	

Digit 25:	Safety Listing (see Restriction 5)
"L" = Listed	
"N" = Non-Listed	

Note: Not all options are available on every model.

MODEL NUMBER	L	E				J										-	-							
DIGIT NUMBER	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25

Restrictions:
1: Voltage Codes "4" & "8" only available with Phase Code "3" (Three-Phase).
2: Phase Code "1" only available in Motor Codes "D", "F", & "G".
3: Motor Code "P" (7.5 HP High Speed) not available in LE-6X.
4: Motor Codes "Q" & "R" (all 10 HP Speeds) not available in LE-6X & LE-8X.
5: Some units with Customization Code "X" are not safety listed.
6: Unit Control Code "V" & "W" only available with Motor Codes "G", "L", & "N" in LE-6X.
7: Unit Control Code "V" & "W" only available with Motor Codes "G", "L", & "P" in LE-8X.
8: Unit Control Code "V" & "W" only available with Motor Codes "G", "L", "P", & "R" in LE10X.
9: Filter Code "F" not available with Unit Control Enhancements Codes "1", "2", "3", & "4". Filter Monitor is provided with those options.
10: Voltage Code "8" (575V) not available with Unit Control Code "W" (Onboard VFD Both Airstreams with IE5+ Ultra Premium Efficiency Motors).
11: Unit Control Code "W" (Onboard VFD Both Airstreams with IE5+ Ultra Premium Efficiency Motors) not available with Voltage Code "8" (575V).

15.5 RD-SERIES FULL CONFIGURATION CODE

Note: Not all options are available on every model.

MODEL NUMBER	R	D	-			J												-					-		
DIGIT NUMBER	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25

Digits 1–5:	Model
"RD-2X"	
"RD-4X"	

Digits 7–8:	Location
"IN" = Indoor	
"RT" = Rooftop	

Digit 9:	Coil Location (see Restrictions 1 & 2)
"7" = Coil Connections Front	
"8" = Coil Connections Back	

Digit 10:	Orientation
"A", "B", "C", "D", "E", "F", "G", "H", "J", "K", "L", "M", "N", "P", "Q", "R" (Indoor)	
"A", "C", "E", "G" (Rooftop)	

Digit 11:	Wall Type
"S" = Single	
"D" = Double	

Digit 12:	Phase
"1" = Single Phase	
"3" = Three Phase	

Digit 13:	Voltage (see Restriction 3)
"4" = 460V	
"5" = 208–230V	
"8" = 575V	

Digit 14:	FA Horsepower (see Restrictions 4 & 5)
"V" = 2HP	
"X" = 5HP	

Digit 15:	EA Horsepower (see Restrictions 4 & 5)
"V" = 2HP	
"X" = 5HP	

Digits 16–17:	Coil Type
"DX" = Dehumidification 1-Circuit Coil	
"DU" = Dehumidification 2-Circuit Coil	
"CW" = Chilled Water Coil	
"XS" = Heat Pump 1-Circuit Coil	
"XB" = Heat Pump 2-Circuit Coil	
"XH" = Dehumidification Coil and Hot Water Coil 1-Circuit	
"DH" = Dehumidification Coil and Hot Water Coil 2-Circuit	
"CH" = Hot Water Coil and Chilled Water Coil	
"SC" = Hot and Chilled Water Coil	
"HW" = Hot Water Coil	
" --" = No Coil	
"FC" = Field Installed Coil, Include Drain Pan	

Digit 19:	Unit Control
"V" = Onboard VFD Both Airstreams	

Digit 20:	Disconnect
"N" = Non-Fused (Standard)	
"F" = Fused	

Digit 21:	Unit Control Enhancements
"-" = Transformer with Isolation Relay (Standard)	
"2" = Premium Controls	
"4" = Premium Controls with BACnet License	

Digit 22:	Filter Options (see Restriction 7)
"-" = None (Standard)	
"F" = Filter Monitor Both Airstreams	

Digit 23:	Other Options
"-" = None (Reserved)	

Digit 24:	Paint and Customization
"-" = None	
"W" = White Paint	
"C" = Custom Paint	
"X" = Custom Unit	

Digit 25:	Safety Listing (see Restriction 6)
"L" = Listed	
"N" = Non-Listed	

***NOTES:**
Digit 6 "J" = G5 Core Type. Digit 18 is not used.

Restrictions:
1: Coil Location Code "7" only available with Location Code "IN" .
2: Coil Location Code "8" only available with Location Code "RT".
3: Voltage Codes "4" & "8" only available with Phase Code "3" (Three-Phase).
4: FA and EA Motor Code "V" only available with RD-2X models.
5: FA and EA Motor Code "X" only available with RD-4X models.
6: Some units with Customization Code "X" are not safety listed.
7: Filter Code "F" not available with Unit Control Enhancements Codes "2" & "4". Filter Monitor is provided with those options.

Coil Rows (answered for each coil) (See Restriction 3)
1, 2, 3, 4, 5, 6

Coil Fins Per Inch (answer for each coil)
6, 7, 8, 9, 10, 11, 12, 13, 14

Coil Coating (answer for each coil)
None
Electrofin UV

Coil Style (See Restriction 1)
Standard
Interlaced 2 Circuits

Restrictions:
1: Interlaced 2 Circuits Coil Style only available with Direct Expansion or Heat Pump Coil.
2: One coil may be specified to act as both a hot water and chilled water coil. Only available with Coil Code “SC”.
3: The combined case depths of the coils must be no more than 7.75". The selected Coil Tube Geometry and Coil Rows will determine whether two coils can fit in the space available.

15.6 VFD INFORMATION

The following information is for reference only. All of the VFD control is done by the RenewAire system and the settings are pre-set in the factory and should not be altered. Refer to the appropriate VFD section, following, according to the VFD provided with your unit.

15.6.1 ABB VFD Information

This drive is used on ERV units with VFDs. ABB ACS320 VFDs are generally supplied in indoor units and ABB ACS355+N831 VFDs in rooftop units.

FIGURE 15.6.0 MODEL ACS320 SHOWN

FIGURE 15.6.1 VFD KEYPADS IN EBOX

15.6.1.1 ABB VFD Parameters

VFD parameters are instructions that the Variable Frequency Drives follow. They are factory set and should not be changed unless you are instructed to do so by TSS.

To view the VFD's parameters from the keypad, press the "MENU" softkey. Press up/down arrows to highlight PARAMETERS, then select it by pressing the "ENTER" softkey.

15.6.1.2 View All Parameters

VFD must be powered up to view the parameters.

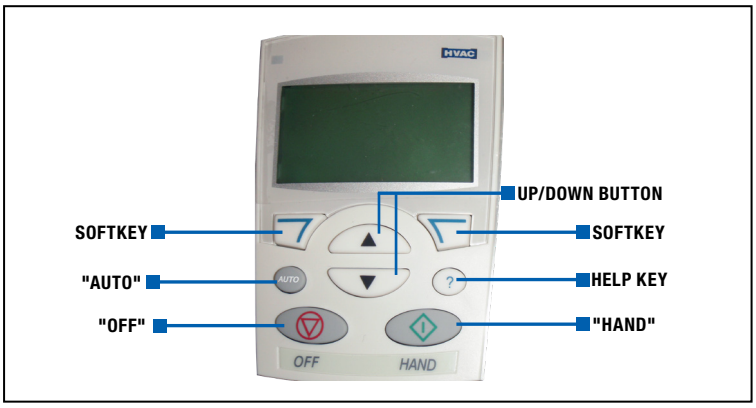


FIGURE 15.6.2 ABB KEYPAD BUTTONS

1. If “EXIT” is displayed above the left softkey, press softkey repeatedly until MENU appears above the right softkey.
2. Press the “MENU” softkey.
3. Use the “UP/DOWN” arrows to scroll the display until PARAMETERS is selected, then press the “ENTER” softkey.
4. You will see a numbered list of parameter “groups”—those numbers are the first two digits of the parameters in each group.
5. Press the “SEL” softkey to view all the parameters in each Group. Use the “UP/DOWN” buttons to scroll through the parameters. As each parameter is selected, its value will be displayed.

15.6.1.3 Locking and Unlocking Parameters

VFDs are shipped locked to prevent accidental changes to parameter settings. If changes to factory parameter settings are desired, the VFD will need to be unlocked for editing the settings.

To unlock all Parameters if Parameter 1602 reads LOCKED:

1. Select Parameter 1603 PASS CODE: press “EDIT” softkey.
2. Use the “UP/DOWN” buttons to scroll to 358: press “SAVE” softkey (the entry will automatically revert back to 0); press “EXIT” softkey.

3.Scroll up to Parameter 1602 PARAMETER LOCK which reads LOCKED; press “EXIT” softkey.

4. Scroll to OPEN; press “SAVE” softkey; press “EXIT” softkey.

Parameters are now unlocked. You can view and change them.

To lock Parameters after changes are made if Parameter 1602 reads OPEN:

1. Select Parameter 1603 PASS CODE: press “EXIT” softkey.
2. Use the “UP/DOWN” buttons to scroll to 358: press “SAVE” softkey (the entry will automatically revert back to 0); press “EXIT” softkey.
3. Scroll up to Parameter 1602 PARAMETER LOCK which reads OPEN; press EXIT” softkey.
4. Scroll to LOCKED; press “SAVE” softkey; press “EXIT” softkey.

Parameters are now locked. You can view them but you cannot change them.

Change VFD Parameters When Unlocked

1. Select the parameter you want to edit. Press the “EXIT” softkey.
2. Use the “UP/DOWN” arrows to scroll through the available settings for that parameter.
3. Press the “SAVE” softkey to set the parameter to the selected value.

To return to RenewAire’s defaults, select parameter 9902 APPLIC MACRO and press “EDIT” softkey. Scroll down to USER 1 LOAD (Not USER 1 SAVE as this will overwrite the factory settings saved under USER 1 in the VFD base memory). Press the “SAVE” softkey.

Alternatively, to return to RenewAire’s defaults, select “PAR BACKUP” in the keypad menu; scroll to and select “DOWNLOAD FULL SET” (not UPLOAD TO PANEL as this will overwrite the factory settings saved in the keypad memory).

To return to ABB’s defaults, select parameter 9902 APPLIC MACRO and press EDIT softkey. Scroll up or down to select “HVAC DEFAULT.” Press the “SAVE” softkey. If HVAC DEFAULT was displayed without scrolling after pressing EDIT in parameter 9902, you will need to scroll up to another macro numbered 2 through 15 and press SAVE, then scroll back down to 1=HVAC DEFAULT and press “SAVE” again to get the settings to revert back to the original ABB defaults.

NOTE: VFD Manufacturer instructions list many other parameters. Copies of the complete manufacturer’s instructions for the VFD are shipped with this unit, and are also available on-line at their respective manufacturer's website.

ABB: www.abb.com/drives
SMV: www.leeson.com
www.lenze.com/en-us/products/inverters
YASKAWA: www.yaskawa.com/downloads

To save an edited parameter set for possible restoration, select parameter 9902 APPLIC MACRO and press EDIT softkey. Scroll down to USER 2 SAVE (Not USER 1 SAVE as this will overwrite the factory settings saved under USER 1 in the VFD base memory). Press the “SAVE” softkey. This edited parameter set can now be reset using USER 2 LOAD.

The VFD should be relocked as described above after the desired parameter settings are entered to avoid further, accidental changes to parameter settings.

15.6.1.4 RenewAire ABB Parameter Settings

PARAMETER	NAME/SELECTION	ABB ACS355+N831 OR ACS320 HVAC DEFAULT	SETTINGS AS SHIPPED BY US	COMMENTS
1611	PARAMETER VIEW	2=SHORT VIEW ACS320 3=LONG VIEW ACS355	3=LONG VIEW	Technician needs to set to LONG VIEW in order to edit some parameters in ACS320 VFDs
1103	REF1 SEL	1=AI1	1=AI1	Leave at Default value for CC units
1104	REF1 MIN	0.0 Hz	15 Hz	Added parameter for CC units
1105	REF1 MAX	60.0 Hz	60.0 HE, 90.0 LE units, 120.0 DN units	Added parameter for CC units
1301	MINIMUM AI1	20.0%	0%	Added parameter for CC units
1302	MAXIMUM AI1	100.0%	100.0%	Leave at Default value for CC units
1401	RELAY OUTPUT 1	1=READY	2=RUN	
1601	RUN ENABLE	0=NOT SEL	1=DI1	Added parameter for CC units
1608	START ENABLE 1	4=DI4	4=DI4	Leave at Default value for CC units
2003*	MAX CURRENT	1.8*I2N	Typically 125% FLA for >=1.15 SF Motor (*see exceptions)	CRITICAL PARAMETER. This provides motor protection!
2007	MINIMUM FREQ	0.0 Hz	15.0 Hz	
2008	MAXIMUM FREQ	60.0 Hz	60.0 HE, 90.0 LE units, 120.0 DN units	
2101	START FUNCTION	1=AUTO	6=SCAN START	ACS320 arrives with P2101 default at e6=SCAN START but ACS320 manual says default is 1=AUTO
2607	SWITCHING FREQUENCY	2=ON (LOAD)	1=ON	Set to match ACS320 Default
3007**	MOT LOAD CURVE	100%	Typically 98% for >=1.15 SF Motor (**see exceptions)	CRITICAL PARAMETER. This provides motor protection!
3401	SIGNAL 1 PARAM	103=OUTPUT FREQUENCY	101=SPEED AND DIR	Changing P3401 will also change P3405 to RPM and P3407 to 30000 rpm listed in CHANGED PARAMETERS
3418	OUTPUT 3 DSP FORM	9=DIRECT	8=BAR METER	Added parameter for CC units
3419	OUTPUT 3 DSP UNIT	11=mA	4=%	Added parameter for CC units
3421	OUTPUT 3 MAX	200%	100%	Added parameter for CC units
9802	COMMUNICATION PROTOCOL SELECTION	5=BACnet	0=NOT SELECTED	Set to match ACS320 Default

PARAMETER	NAME/SELECTION	ABB ACS355+N831 OR ACS320 HVAC DEFAULT	SETTINGS AS SHIPPED BY US	COMMENTS
9901	LANGUAGE	ENGLISH	ENGLISH (AM)	
9905	MOTOR NOM VOLT	Varies	Equal to Motor Nameplate Volts	When unit is marked 208–230V, set this value at 208V.
9906	MOTOR NOM CURR	Varies	Equal to Motor FLA (*per unit nameplate, see exceptions)	When unit is marked 208–230V, set this value at the FLA corresponding to 208V.
9908	MOTOR NOM SPEED	Varies	Equal to motor nominal RPM.	See separate document.
9909	MOTOR NOM POWER	Varies	Equal to motor nameplate HP (*see exceptions)	
9902	APPLIC MACRO	1=HVAC DEFAULT or ABB STANDARD	-1=USER S1 SAVE	This will save the settings above that can be restored by pressing SAVE when “USER S1 LOAD” is selected in parameter 9902.
CHANGED PAR				CHECK PARAMETERS for mistakes
PAR BACKUP				UPLOAD TO PANEL
1603	PASS CODE	0	358	Allows parameters to be locked.
1602	PARAMETER LOCK	1=OPEN	0=LOCKED	

15.6.1.5 Motor Specific VFD Parameter Settings

					PARAMETER #					
					9905	9906*	9908	9909	2003*	3007**
ACS355—RT VFD PN	ACS320—IN VFD PN	VFD PH	MOTOR PN	MOTOR BRAND	VOLTAGE	FLA	RPM	HP	MAX FLA	MOTOR LOAD CURVE %
136483	136450	1	136350_001 106350_000	Baldor	208	4.5	1760	1.5	5.6	98
136484	136451	1	136351_001 106351_000	Baldor	208	6.6	1755	2.0	8.2	98
136485	136452	1	136352_002 106352_000	Baldor	208	9.0	1760	3.0	11.2	98
136486	136471	3	140625_000	Marathon	208	2.3	1725	0.8	2.9	100
136473	NA	3	135253_000	S&P	208	2.2	1407	1.0	2.7	100
136487	136453	3	136350_001 106350_000	Baldor	208	4.5	1760	1.5	5.6	98
136488	136453	3	136351_001 106351_000	Baldor	208	6.6	1755	2.0	8.2	98
136489	136455	3	136352_002 106352_000	Baldor	208	9.0	1760	3.0	11.2	98
136490	136456	3	136353_002 106353_000	Baldor	208	13.9	1750	5.0	17.3	98
136491	136457	3	136354_002 106354_000	Baldor	208	20.0	1770	7.5	25.0	98
136492	136458	3	136355_002 106355_000	Baldor	208	25.4	1770	10.0	31.7	98
136490	136456	3	135543_002	Dayton***	208	14.0	1760	5.0	17.5	98
136491	136457	3	134314_002	Dayton***	208	20.5	1770	7.5	25.6	98
136492	136458	3	134316_001	Baldor***	208	26.0	1770	10.0	32.5	98
136492	136458	3	106353_000	Baldor	208	27.8*	1750	5x2	31.2*	98
136493	136472	3	140625_000	Marathon	460	1.2	1725	0.8	1.4	100
136474	NA	3	135254_000	S&P	460	1.2	1477	1.0	1.4	100
136494	136459	3	136350_001 106350_000	Baldor	460	2.2	1760	1.5	2.7	98
136494	136459	3	136351_001 106351_000	Baldor	460	2.9	1755	2.0	3.6	98
136496	136461	3	136352_002 106352_000	Baldor	460	4.2	1760	3.0	5.2	98
136497	136462	3	136353_002 106353_000	Baldor	460	6.7	1750	5.0	8.3	98
136498	136463	3	136354_002 106354_000	Baldor	460	9.5	1770	7.5	11.8	98
136499	136464	3	136355_002 106355_000	Baldor	460	12.0	1770	10.0	15.0	98
136497	136462	3	135543_002	Dayton***	460	6.4	1760	5.0	7.9	98
136498	136463	3	134314_002	Dayton***	460	9.3	1770	7.5	11.5	98
136499	136464	3	134316_001	Baldor***	460	12.5	1770	10.0	15.6	98
136499	136464	3	106353_000	Baldor	460	13.4*	1750	5x2	15.0*	98

***Parameter 9906 motor nameplate FLA** round up to nearest 10th and Parameter 2003 125% motor nameplate FLA round down to nearest 10th. Parameter 2003 is typically set at 125% FLA for motors with >= 1.15 Service Factor (SF) or motors otherwise thermally protected regardless of SF and set at 115% FLA for motors with <1.15 SF and otherwise unprotected based on National Electric Code (NEC) Article 430.32.

DN-5 units have two 5 HP motors with a single 10 HP VFD per airstream. Parameter 2003 is 2.25 x motor FLA. Parameter 9906 is 2 x motor nameplate FLA, parameter 9909 motor 1 nameplate HP plus motor 2 nameplate HP.

****Parameter 3007 Motor Load Curve %** is typically 125%/127%=98% for motors with >= 1.15 Service Factor (SF), 115%/127%=90% for motors with <1.15 SF, 100% (default setting) for otherwise thermally protected motors regardless of SF.

*****Motor PN** shown is the Grainger Kit PN that can be seen in HE6X8X Job BOMs. Motor is supplied with the kit.

See RPART VFD Parameter Specifications for TECO and WEG-S motor parameter settings used in the past, located at U:\Procedures\Engineering Procedures\Procedures for Production\VFD – RPART Parameter Specifications_JAN16.pdf

Select “CHANGED PAR” in the “Menu” to verify none of the parameters to be changed were missed and that the changed parameters were correctly altered from the VFD default settings.

NOTE: This wiring schematic is TYPICAL control wiring using ABB VFDs for a three phase, 208-230VAC and 460VAC input for models HE-2X, HE3X, HE-4X, HE-6X, and HE-8X. A unit-specific electrical schematic is found inside the access door to the core module.

15.6.1.6 ABB VFD Wiring to Controller

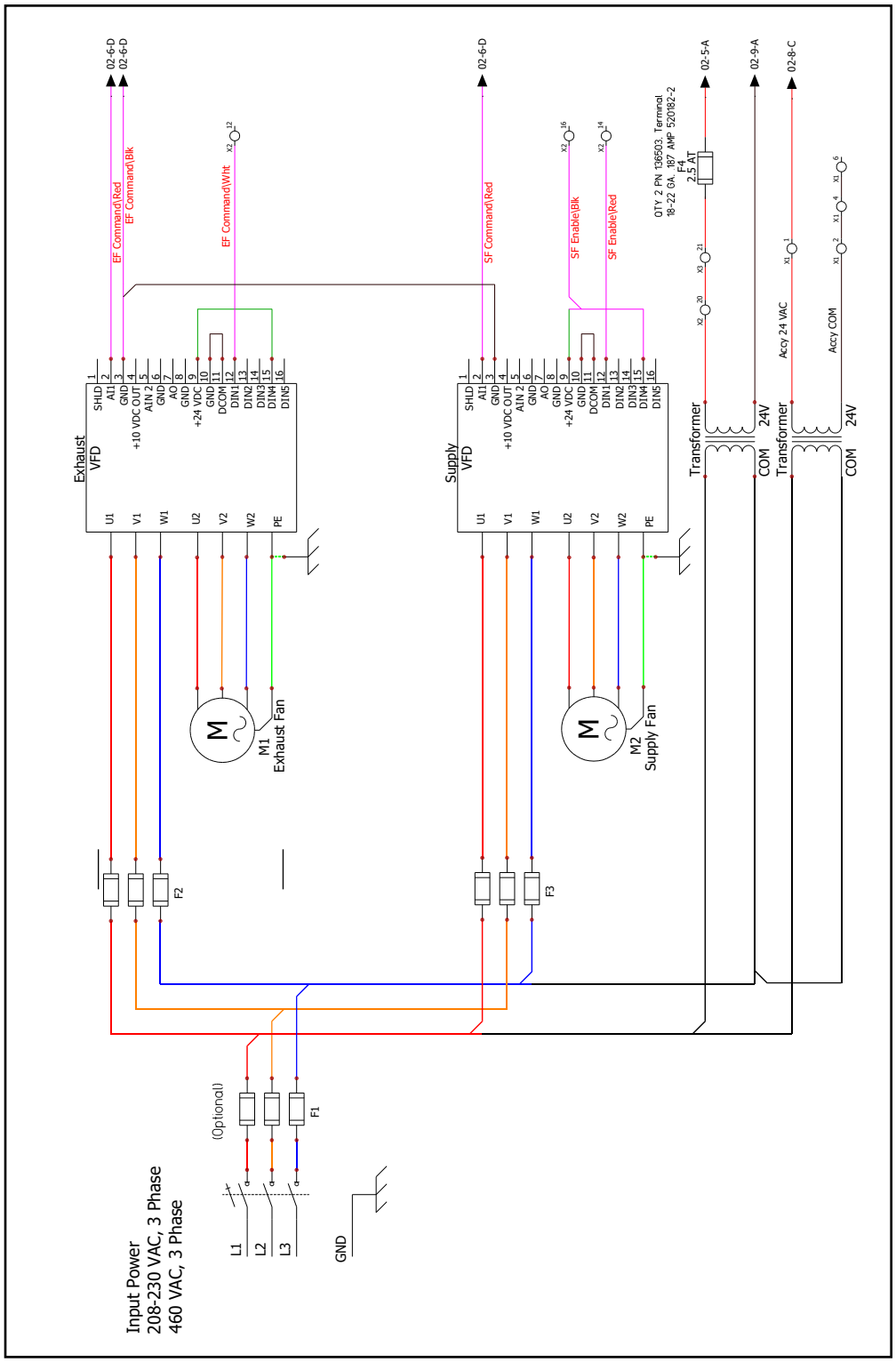


FIGURE 15.6.3 THREE PHASE ABB POWER WIRING SCHEMATIC

15.6.2 Lenze/Leesen SM Vector (SMV) VFD Information

The drive is the Lenze AC Tech/Leeson SM Vector (SMV) model.

FIGURE 15.6.4 SMV VFD SHOWN

FIGURE 15.6.5 VFD KEYPADS IN EBOX

15.6.2.1 SMV VFD Parameters

VFD parameters are instructions that the Variable Frequency Drives follow. They can be adjusted by using the keypads on the VFDs. Do not change these parameters from factory settings unless instructed to do so by TSS.

To view the parameters, the VFD must be powered up This can be verified by the LED display of the VFD.

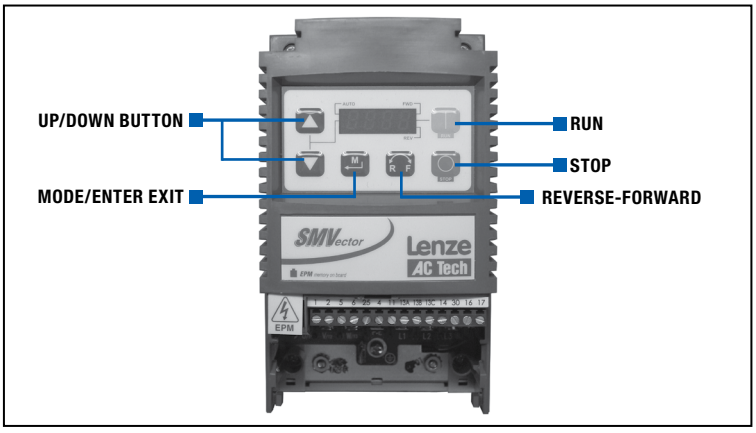


FIGURE 15.6.6 SMV KEYPAD BUTTONS

1. Push “MODE” button—PASS will flash onscreen followed by “0000.”
2. Push “MODE” button again to display P498.
3. Use “UP/DOWN” arrows to scroll through the parameters.
4. Press “MODE” button to display the parameter value.
5. Press “MODE” to exit—STOP will display.
6. To view other parameters start process over

To change the parameters, IF PASS CODE is enabled (i.e. P194 is set to something other than “0”):

1. Push “MODE” button—PASS will flash on screen followed by “0000.”
2. Press and hold “UP” Button to scroll to password 225.
3. Press “MODE”; P100 will be displayed.
4. Proceed to step 6, below.

If PASS CODE is NOT enabled (i.e. P194 is set to “0”):

5. Press “MODE” button; the last-viewed parameter will be displayed.
6. Use “UP/DOWN” Button to scroll to parameter of interest.
7. Press “MODE” Button; parameter value will be displayed.
8. Use “UP/DOWN” Arrow button to change parameter value.
9. Press “MODE” button to save changed parameter value.
10. Press “MODE” button to exit; STOP will be displayed (in some cases the display will be different).

After parameter changes are complete, you must enter “225” and cycle power to lock changed parameters. Turn on the power to verify it is locked. Press “MODE” and PASS 0000 should be displayed if locked from making changes to parameters.

To Reset VFD Parameters to Factory Settings using keypad:

The VFD will need to be unlocked as described on page 11 to reset parameters to RenewAire factory or ABB defaults.

To return to RenewAire’s defaults, select parameter 9902 APPLIC MACRO and press “EDIT” softkey. Scroll down to USER 1 LOAD (Not USER 1 SAVE as this will overwrite the factory settings saved under USER 1 in the VFD base memory). Press the “SAVE” softkey.

Alternatively, to return to RenewAire’s defaults, select “PAR BACKUP” in the keypad menu; scroll to and select “DOWNLOAD FULL SET” (not UPLOAD TO PANEL as this will overwrite the factory settings saved in the keypad memory).

To return to ABB’s defaults, select parameter 9902 APPLIC MACRO and press EDIT softkey. Scroll up or down to select “HVAC DEFAULT.” Press the “SAVE” softkey. If HVAC DEFAULT was displayed without scrolling after pressing EDIT in parameter 9902, you will need to scroll up to another macro numbered 2 through 15 and press SAVE, then scroll back down to 1=HVAC DEFAULT and press “SAVE” again to get the settings to revert back to the original ABB defaults.

To save an edited parameter set for possible restoration, select parameter 9902 APPLIC MACRO and press EDIT softkey. Scroll down to USER 2 SAVE (Not USER 1 SAVE as this will overwrite the factory settings saved under USER 1 in the VFD base memory). Press the “SAVE” softkey. This edited parameter set can now be reset using USER 2 LOAD.

The VFD should be relocked as described above after the desired parameter settings are entered to avoid further, accidental changes to parameter settings.

NOTE: VFD Manufacturer instructions list many other parameters. Copies of the complete manufacturer’s instructions for the VFD are shipped with this unit, and are also available on-line at their respective manufacturer's website.

ABB: www.abb.com/drives
SMV: www.leeson.com
www.lenze.com/en-us/products/inverters
YASKAWA: www.yaskawa.com/downloads

15.6.2.2 RenewAire SMV Parameter Settings

PARAMETER	NAME	FACTORY SETTINGS	COMMENTS
P400	Network Protocol	1	1 = Parameter changed on base VFD keypad to get Remote Keypad to display that is mounted in the ebox. Remote keypad not used on RD units.
P100	Start Control Source	1	1 = Start Control on VFD Terminal Strip on, terminals 1 and 4.
P101	Standard Reference Source	1	1 = 0–10VDC speed reference.
P102	Minimum Frequency	15	Determines the minimum operating speed (Hz) for the motor.
P103	Maximum Frequency	120.0	Determines the maximum operating speed (Hz) for the motor.
P108	Motor Overload	Set per Motor Table	Critical Safety Parameter P108 = Motor FLA/VFD Output Rating X 100
P160	Speed at Minimum Signal	15	When analog input is used to control VFD speed, sets VFD speed (Hz) when analog signal is 0%.
P161	Speed at Maximum Signal	120.0	When analog input is used to control VFD speed, sets VFD speed (Hz) when analog signal is 100%.
P165	Base Voltage	Set per Motor Table	Must match motor nameplate voltage. Parameter P165 may not be adjustable.
P194	Password	Enter “225” and cycle power to lock VFD from parameter changes and display PASS 0000	0 = password disabled and VFD is unlocked. Must enter “225” to unlock and make changes to parameters if locked. PASS 0000 will show on screen when attempting parameter changes if locked.

15.6.2.3 Motor Specific VFD Parameter Settings in RD Units

						PARAMETER #	
						P108	P165
SMV VFD PN	3PH MOTOR PN	MOTOR BRAND	HP	FLA	VFD OUTPUT AMPS	MOTOR OVERLOAD	VOLTAGE
136506 wired 1PH	136297_001	Marathon	2	6.0	7.0	86	208
136506 wired 3PH	136297_001	Marathon	2	6.0	7.0	86	208
136508	136298_001	Marathon	2	2.9	3.5	83	460
136509	136299_001	Marathon	2	2.3	2.7	85	575
136511	136295_000	Marathon	5	15	16.5	91	208
136512	136295_000	Marathon	5	7.0	8.2	85	460
136513	136296_000	Marathon	5	5.6	6.1	90	575

15.6.2.4 Motor Specific VFD Parameter Settings for Condenser Fans in DN w/ Packaged Refrigeration

						PARAMETER #	
						P108	P165
SMV VFD PN	3PH MOTOR PN	MOTOR BRAND	KW	FLA	VFD OUTPUT AMPS	MOTOR OVERLOAD	VOLTAGE
*136513	136329_000	Ziehl-Abegg	2.8 kW	3.7	6.1	61	575
**136466	136329_000	Ziehl-Abegg	2.8 x 2	7.4	9.0	82	575

***DN-2 has single condenser fan controlled by single 5 hp/4 kW VFD.**
****DN-3 and DN-5 have two condenser fans controlled by a single 7.5 hp/5.5 kW VFD.**

15.6.2.5 Motor Specific VFD Parameter Settings (continued) for 575V

						PARAMETER #	
						P108	P165
SMV VFD PN	3PH MOTOR PN	MOTOR BRAND	HP	FLA	VFD OUTPUT AMPS	MOTOR OVERLOAD	VOLTAGE
136509	136356_000 106356_000	Baldor	1.5	1.8	2.7	67	575
136509	136357_000 106357_000	Baldor	2	2.3	2.7	85	575
136465	136314_001 106314_000	Baldor	3	3.3	3.9	85	575
136513	136315_001 106315_000	Baldor	5	5.3	6.1	87	575
136466	136360_000 106360_000	Baldor	7.5	7.6	9	85	575
136467	136361_000 106361_000	Baldor	10	9.6	11	88	575
136467**	106315_000	Baldor	5 x 2	10.6	11	96	575

****DN-5 has two 5 HP motors per airstream with a single 10 HP VFD per airstream.**

15.6.2.6 Motor Specific VFD Parameter Settings (continued) for 208–230V

						PARAMETER #	
						P108	P165
SMV VFD PN	3PH MOTOR PN	MOTOR BRAND	HP	FLA	VFD OUTPUT AMPS	MOTOR OVERLOAD	VOLTAGE
136820 wired 1PH	140625_000	Marathon	0.75	2.3	4.2	55	208
136820 wired 1PH	135253_000	Soler & Palau	1.0	2.2	4.2	52	208
136821 wired 1PH	136350_001 106350_000	Baldor	1.5	4.5	6	75	208
136506 wired 1PH	136351_001 106351_000	Baldor	2	6.6	7	94	208
136822 wired 1PH	136352_002 106352_000	Baldor	3	9	9.6	94	208
136820 wired 3PH	140625_000	Marathon	0.75	2.3	4.2	55	208
136820 wired 3PH	135253_000	Soler & Palau	1.0	2.2	4.2	52	208
136821 wired 3PH	136350_001 106350_000	Baldor	1.5	4.5	6	75	208
136506 wired 3PH	136351_001 106351_000	Baldor	2	66	7	94	208
136822 wired 3PH	136352_002 106352_000	Baldor	3	9	9.6	94	208
136511	135543_002	Grainger w/Dayton	5	14	16.5	85	208
136511	136353_002 106353_000	Baldor	5	13.9	16.5	84	208
136823	134314_002	Grainger w/Dayton	7.5	20.5	23	89	208
136823	136354_002 106354_000	Baldor	7.5	20	23	87	208
136824	134316_001	Grainger w/Dayton	10	26	29	90	208
136824	136355_002 106355_000	Baldor	10	25.4	29	88	208
136824	106353_000	Baldor	5 x 2	27.8	29	96	208

15.6.2.7 Motor Specific VFD Parameter Settings (continued) for 460V

						PARAMETER #	
						P108	P165
SMV VFD PN	3PH MOTOR PN	MOTOR BRAND	HP	FLA	VFD OUTPUT AMPS	MOTOR OVERLOAD	VOLTAGE
136825	140625_000	Marathon	0.75	1.15	2.1	55	460
136825	135253_000	Solar & Palau	1.0	1.13	2.1	54	460
136508	136350_001 106350_000	Baldor	1.5	2.2	3.5	63	460
136508	136351_001 106351_000	Baldor	2	2.9	3.5	63	460
136826	136352_002 106352_000	Baldor	3	4.2	4.8	88	460
136512	135543_002	Grainger w/Dayton	5	6.33	8.2	77	460
136512	136353_002 106353_000	Baldor	5	6.7	8.2	82	460
136827	134314_002	Grainger w/Dayton	7.5	9.25	11	84	460
136827	136354_002 106354_000	Baldor	7.5	9.5	11	86	460
136828	134316_001	Grainger w/Dayton	10	12.5	14	89	460
136828	136355_002 106355_000	Baldor	10	12	14	86	460
136828	106353_000	Baldor	5 x 2	13.4	14	96	460

****DN-5 has two 5 HP motors per airstream with a single 10 HP VFD per airstream.**

15.6.2.8 SMV VFD Wiring to Controller

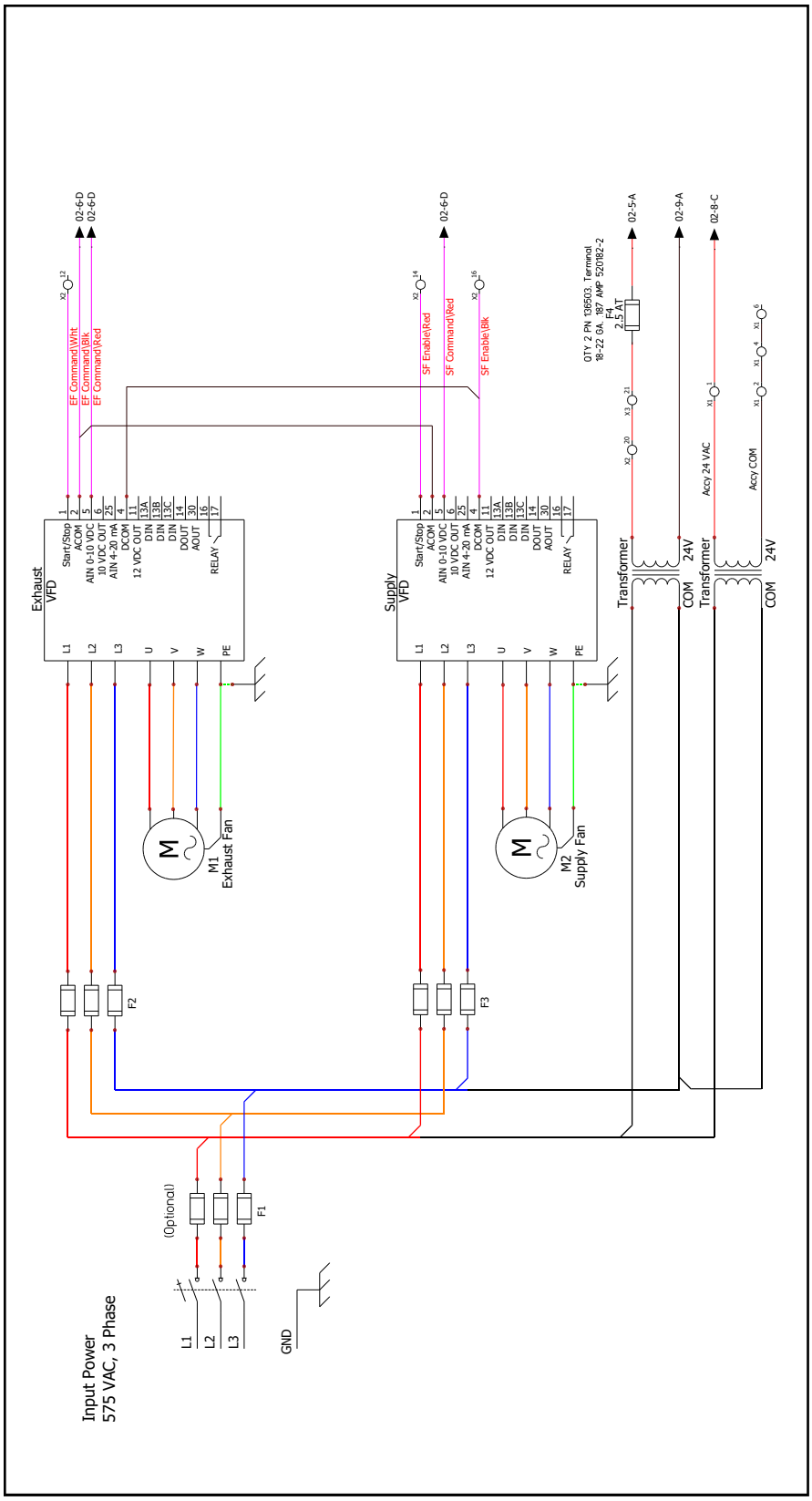


FIGURE 15.6.7 575V THREE PHASE SMV POWER WIRING SCHEMATIC

NOTE: This wiring schematic is TYPICAL control wiring using SMV VFDs for a three phase, 575VAC input for models HE-2X, HE3X, HE-4X, HE-6X, and HE-8X. A unit-specific electrical schematic is found inside the access door to the core module.

15.6.3 Yaskawa VFD Information

Yaskawa V1000 VFDs are supplied in indoor and rooftop units.

FIGURE 15.6.8 MODEL V1000 SHOWN

FIGURE 15.6.9 VFD KEYPADS IN EBOX

15.6.3.1 Yaskawa VFD Parameters

VFD parameters are instructions that the Variable Frequency Drives follow. They are factory set and should not be changed unless you are instructed to do so by TSS.

15.6.3.2 View All Parameters

VFD must be powered up to view the parameters.

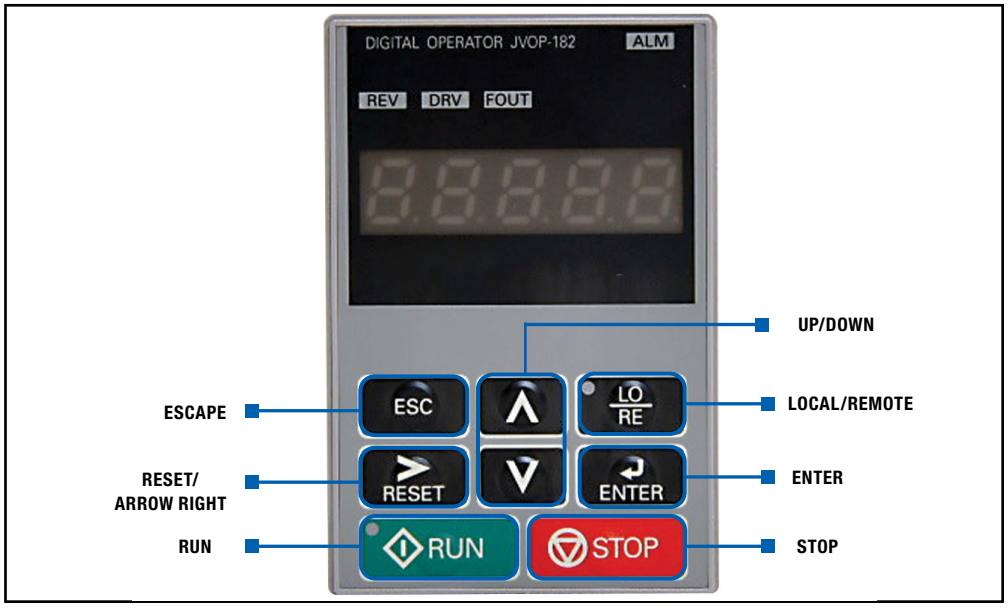


FIGURE 15.6.10 YASKAWA KEYPAD BUTTONS

1. Press the “UP” arrow key until PAr is displayed and press the “ENTER” key to access the parameter settings. Parameters are categorized into groups by letter and number (Example: C3-02). The first parameter shown is A1-01.

2. To change the parameter number, each character in the parameter number will have to be adjusted. When accessing a parameter, the letter will be flashing. While the letter is flashing, press the “UP/DOWN” arrow key to change its value. Once the letter has been selected, press the “RIGHT” arrow key once to make the first number flash. Press the “UP/DOWN” arrow key to change the number's value. Repeat this process for all characters until the parameter number is displayed, then press the “ENTER” key.
3. The display will show the value of the selected parameter. If the motor is running, or if the VFD parameters are locked, the parameters can only be viewed and not changed.
4. Press the “ESC” button to go back to the parameter number adjustment screen and repeat steps 2–4 to view remaining desired parameters.

14.6.3.3 Locking and Unlocking Parameters

VFDs are shipped locked to prevent accidental changes to parameter settings. If changes to factory parameter settings are desired, the VFD will need to be unlocked for editing the settings.

To unlock all Parameters:

1. Press the “UP” arrow key until PAr is displayed. Press the “ENTER” key.
2. Change the parameter to A1-04. Press the “ENTER” key.
3. Change the value from a 0000 to 0358. Press the “ENTER” key.

All parameters should be visible/writable.

To lock Parameters:

1. Press the up-arrow key until PAr is displayed. Press the “ENTER” key.
2. Change the parameter to A1-04. Press and hold the “STOP” key, then press the “UP” arrow key to display parameter A1-05. Press the “ENTER” key.
3. Change the value from a 0000 to 0358. Press the “ENTER” key.
4. Change the parameter back to A1-04. Press the “ENTER” key.
5. The value should display 0000. Press the “ENTER” key to lock the VFD parameters.

All parameters should be visible/readable but cannot be adjusted.

Changing VFD Parameters:

To modify VFD parameters, the VFD must not be enabled and applying power to the motor. If the motor is running, press the “STOP” softkey or remove the enable from the controls.

1. Press the “UP” arrow key until PAr is displayed and press the “ENTER” key to access the parameter settings. Parameters are categorized into groups by letter and number (Example: C3-02). The first parameter shown is A1-01.
2. To change the parameter number, each character in the parameter number will have to be adjusted. When accessing a parameter, the letter will be flashing. While the letter is flashing, press the “UP/DOWN” arrow key to change its value. Once the letter has been selected, press the “RIGHT” arrow key once to make the first number flash. Press the “UP/DOWN” arrow key to change the number's value. Repeat this process for all characters until the parameter number is displayed, then press the “ENTER” key.
3. The display will show the default value of the selected parameter. Using the same process as step 2, change the values per the tables below. Once the desired value has been input, press the “ENTER” key. The word “END” will be displayed briefly to indicate the parameter has been changed. Then the parameter number that was just changed will be displayed again.
4. Repeat steps 2 and 3 to set remaining parameters.

View only changed VFD parameters:

Select “urFy” in the “Menu” to verify none of the parameters to be changed were missed and that the changed parameters were correctly altered from the VFD default settings.

1. Press the “DOWN” arrow button until “urFy” is displayed and press “ENTER” key.
2. Parameter B3-01 should be displayed. Press “ENTER” key to verify the setting.
3. Press “ENTER” key again to advance to the next parameter.
4. Repeat process until settings listed above have been verified.
5. If any parameters are not shown in the “urFy” list, set parameters per tables above.

15.6.3.4 RenewAire Yaskawa Parameter Settings—Standard AC Motors

PARAMETER	NAME/SELECTION	YASKAWA V1000 DEFAULT SETTINGS	SETTINGS AS SHIPPED BY RENEWAIRE	COMMENTS
B1-01	Frequency Reference Selection 1	1: Terminals (Analog Input Terminals)	1: Terminals (Analog Input Terminals)	Defines source of frequency command.
B1-02	Run Command Selection 1	1: Control Circuit Terminal	1: Control Circuit Terminal	Defines source of run command.
B1-03	Stopping Method Selection	0: Ramp to Stop	0: Ramp to Stop	VFD follows acceleration and deceleration times defined
B3-01	Speed Search Selection at Start	0: Disabled	1: Enabled	VFD will attempt to detect a free-wheeling motor before applying output power.
B3-24	Speed Search Method Selection	0: Current Detection Speed Search	1: Speed Estimation Speed Search	Speed estimation method will be used.
C1-01	Acceleration Time 1	10.0 s	10.0 s	Time to accelerate from 0 speed to maximum frequency.
C1-02	Deceleration Time 1	10.0 s	10.0 s	Time to decelerate from maximum frequency to 0 speed.
C6-02	Carrier Frequency Selection	7: Swing PWM 1	2: 5.0 kHz	Carrier frequency setting. If increased, may cause unintended derating of VFD output current capacity.
D1-02	Frequency Reference 2	0.00 Hz	30.00 Hz	Low fixed frequency settting.
D1-03	Frequency Reference 3	0.00 Hz	45.00 Hz	Medium fixed frequency setting.
D1-04	Frequency Reference 4	0.00 Hz	60.00 Hz	High fixed freequency setting.
D2-02	Frequency Reference Lower Limit	0%	HE and RPART–25.0%	Set per ERV type. Defines the minimum output frequency as a percentage of maximum frequency (E1-04 setting).
			LE–16.7%	
			DN–12.5%	
E1-04	Maximum Output Frequency	60 Hz	HE and RPART–60 Hz	Set per ERV type. Defines the maximum output frequency via the V/f pattern selected.
			LE –90 Hz	
			DN–120 Hz	
E1-05	Maxiumum Voltage	Varies	230V VFD: 230.0 V	Set per input voltage rating of VFD.
			460V VFD: 460.0 V	
E1-11	Middle Output Frequency 2	0.00 Hz	HE and RPART–60 Hz	Set per ERV type. Defines points for V/f pattern.
			LE–75 Hz	
			DN–90 Hz	
E1-12	Middle Output Frequency Voltage 2	0V	230V VFD: 230.0 V	Set per input voltage rating of VFD. Defines points for V/f pattern.
			460V VFD: 460.0 V	

PARAMETER	NAME/SELECTION	YASKAWA V1000 DEFAULT SETTINGS	SETTINGS AS SHIPPED BY RENEWAIRE	COMMENTS
E2-01	Motor Rated Current	Varies	See Standard AC Motor Specific Settings Table	Set to the motor full load Amps output current rating on the nameplate.
E2-04	Number of Motor Poles	Varies	See Standard AC Motor Specific Settings Table	"1800 rpm motor = 4 pole 1200 rpm motor = 6 pole"
H1-01	S1 Digital Input Function Selection	40: Forward Run	40: Forward Run	Sets digital input S1 to forward run enable when connected to the SC terminal.
H2-01	Terminal MA, MB, and MC Function Setting (relay)	E: Fault	0: During Run	Sets function of relay output to close contacts between MA and MC terminals.
H3-01	Analog Input A1 Signal Level Selection	0: 0-10 Vdc with Limit	0: 0-10 Vdc with Limit	Sets the upper and lower limits of the analog input A1 range. Setting prevents frequency setpoint going negative when set to 0.
H3-02	Analog Input A1 Function Selection	0: Frequency Bias	0: Frequency Bias	The analog input A1 value will be added to the frequency reference.
H3-03	Terminal A1 Gain Setting	100.0%	100.0%	The analog input A1 value will be multiplied with the frequency reference
H3-04	Terminal A1 Bias Setting	0.0%	0.0%	Sets the analog input 1 Bias value to scale a 0-10 Vdc input signal.
L1-02	Motor Overload Protection Time	1.0 Minutes	0.2 Minutes	Sets the amount of time the VFD can output 120% VFD rated current before faulting.
L2-01	Momentary Power Loss Operation Selection	0: Disabled	2: CPU Power Active	Enables VFD to attempt to ride through momentary power loss.
L3-06	Stall Prevention During Run	Varies	See Standard AC Motor Specific Settings Table	"L3-06 = (Motor FLA / VFD FLA) X 1.25 CRITICAL PARAMETER. This provides motor protection!"
L5-01	Number of Auto Restart Attempts	0	10	Number of automatic fault reset attempts.

15.6.3.5 208V Standard AC Motor Specific VFD Parameter Settings

							PARAMETER #		
							E2-01	E2-04	L3-06
# OF PH AND VOLTAGE	RA-YASKAWA VFD PN	YASKAWA MODEL #	VFD FLA	3PH MOTOR PN	MOTOR HP	MOTOR BRAND	MOTOR RATED CURRENT	# OF MOTOR POLES	STALL LEVEL DURING RUN
1 PH 208V	136831	CIMR-VUBA0006FAA	6	140625_000	3/4	Marathon	2.3	4	48%
1 PH 208V	136831	CIMR-VUBA0006FAA	6	135253_000	1	Soler & Palau	2.2	4	46%
1 PH 208V	136831	CIMR-VUBA0006FAA	6	136350_001 106350_000	1.5	Baldor	4.5	4	94%
1 PH 208V	136832	CIMR-VUBA0010FAA	9.6	136297_001	2	Marathon	6	4	78%
1 PH 208V	136832	CIMR-VUBA0010FAA	9.6	136351_001 106351_000	2	Baldor	6.6	4	86%
1 PH 208V	136832	CIMR-VUBA0010FAA	9.6	136352_002 106352_000	3	Baldor	9	4	117%
3 PH 208V	136834	CIMR-VU2A0004FAA	3.5	140625_000	3/4	Marathon	2.3	4	82%
3 PH 208V	136834	CIMR-VU2A0006FAA	6	135253_000	1	Soler & Palau	2.2	4	46%
3 PH 208V	136835	CIMR-VU2A0006FAA	6	136350_001 106350_000	1.5	Baldor	4.47	4	94%
3 PH 208V	136836	CIMR-VU2A0010FAA	9.6	136297_001	2	Marathon	6	4	78%
3 PH 208V	136836	CIMR-VU2A0010FAA	9.6	136351_001 106351_000	2	Baldor	6.6	4	86%
3 PH 208V	136836	CIMR-VU2A0010FAA	9.6	136352_002 106352_000	3	Baldor	8.48	4	117%
3 PH 208V	136838	CIMR-VU2A0020FAA	19.6	136295_000	5	Marathon	15	6	96%
3 PH 208V	136838	CIMR-VU2A0020FAA	19.6	135543_002	5	Grainger w/ Dayton**	14	4	89%
3 PH 208V	136838	CIMR-VU2A0020FAA	19.6	136353_002 106353_000	3	Baldor	13.9	4	89%
3 PH 208V	136839	CIMR-VU2A0030FAA	30	134314_002	7.5	Grainger w/ Dayton**	20.5	4	85%
3 PH 208V	136839	CIMR-VU2A0030FAA	30	136354_002 106354_000	7.5	Baldor	20	4	83%
3 PH 208V	136839	CIMR-VU2A0030FAA	30	134316_001	10	Grainger w/ Dayton**	26	4	108%
3 PH 208V	136839	CIMR-VU2A0030FAA	30	136355_002 106355_000	10	Baldor	25.4	4	106%
3 PH 208V	136839	CIMR-VU2A0030FAA	30	106353_000	5	Baldor*	27.8*	4	116%*

*DN-5 units have two 5 HP motors with a single 10 HP VFD per airstream. Parameter E2-01 is 2 x motor FLA. Parameter L3-06 is 1.25 x (2 x motor nameplate FLA) / VFD FLA.

****Motor PN** shown is the Grainger Kit PN that can be seen in HE6X8X Job BOMs. Motor is supplied with the kit.

15.6.3.6 460V Standard AC Motor Specific VFD Parameter Settings

							PARAMETER #		
							E2-01	E2-04	L3-06
# OF PH AND VOLTAGE	RA-YASKAWA VFD PN	YASKAWA MODEL #	VFD FLA	3PH MOTOR PN	MOTOR HP	MOTOR BRAND	MOTOR RATED CURRENT	# OF MOTOR POLES	STALL LEVEL DURING RUN
3 PH 460V	136840	CIMR-VU4A0002FAA	2.1	140625_000	3/4	Marathon	1.15	4	68%
3 PH 460V	136840	CIMR-VU4A0002FAA	2.1	135253_000	1	Soler & Palau	1.13	4	67%
3 PH 460V	136841	CIMR-VU4A0004FAA	4.1	136298_001	2	Marathon	2.9	4	88%
3 PH 460V	136841	CIMR-VU4A0004FAA	4.1	136350_001 106350_000	1.5	Baldor	2.2	4	67%
3 PH 460V	136841	CIMR-VU4A0004FAA	4.1	136351_001 106351_000	2	Baldor	2.9	4	88%
3 PH 460V	136842	CIMR-VU4A0005FAA	5.4	136352_002 106352_000	3	Baldor	4.2	4	97%
3 PH 460V	136843	CIMR-VU4A0009FAA	8.8	136295_000	5	Marathon	7	6	99%
3 PH 460V	136843	CIMR-VU4A0009FAA	8.8	135543_002	5	Grainger w/ Dayton**	6.33	4	90%
3 PH 460V	136843	CIMR-VU4A0009FAA	8.8	136353_002 106353_000	5	Baldor	6.7	4	95%
3 PH 460V	136844	CIMR-VU4A0011FAA	11.1	134314_002	7.5	Grainger w/ Dayton**	9.25	4	104%
3 PH 460V	136844	CIMR-VU4A0011FAA	11.1	136354_002 106354_000	7.5	Baldor	9.5	4	107%
3 PH 460V	136845	CIMR-VU4A0018FAA	17.5	134316_001	10	Grainger w/ Dayton**	12.5	4	89%
3 PH 460V	136845	CIMR-VU4A0018FAA	17.5	136355_002 106355_000	10	Baldor	12	4	86%
3 PH 460V	136845	CIMR-VU4A0018FAA	17.5	106353_000	5	Baldor*	13.4*	4	96%*

*DN-5 units have two 5 HP motors with a single 10 HP VFD per airstream. Parameter E2-01 is 2 x motor FLA. Parameter L3-06 is 1.25 x (2 x motor nameplate FLA) / VFD FLA.

****Motor PN** shown is the Grainger Kit PN that can be seen in HE6X8X Job BOMs. Motor is supplied with the kit.

15.6.3.7 RenewAire Yaskawa Parameter Settings—EC-Titanium Motors

PARAMETER	NAME/SELECTION	YASKAWA V1000 DEFAULT SETTINGS	SETTINGS AS SHIPPED BY RENEWAIRE	COMMENTS
A1-02	Control Mode Selection	0: V/f Control	5: PM Open Loop Vector	Enables VFD to control EC-Titanium motors.
B1-01*	Frequency Reference Selection 1	1: Terminals (Analog Input Terminals)	1: Terminals (Analog Input Terminals)	Defines source of frequency command.
B1-02	Run Command Selection 1	1: Control Circuit Terminal	1: Control Circuit Terminal	Defines source of run command.
B1-03	Stopping Method Selection	0: Ramp to Stop	0: Ramp to Stop	VFD follows acceleration and deceleration times defined
B3-01	Speed Search Selection at Start	0: Disabled	1: Enabled	VFD will attempt to detect a free-wheeling motor before applying output power.
C1-01	Acceleration Time 1	10.0 s	10.0 s	Time to accelerate from 0 speed to maximum frequency.
C1-02	Deceleration Time 1	10.0 s	10.0 s	Time to decelerate from maximum frequency to 0 speed.
C6-02	Carrier Frequency Selection	7: Swing PWM 1	2: 5.0 kHz	Carrier frequency setting. If increased, may cause unintended derating of VFD output current capacity.
D1-02	Frequency Reference 2	0.00 Hz	30.00 Hz	Low fixed frequency settting.
D1-03	Frequency Reference 3	0.00 Hz	45.00 Hz	Medium fixed frequency setting.
D1-04	Frequency Reference 4	0.00 Hz	60.00 Hz	High fixed freequency setting.
D2-02	Frequency Reference Lower Limit	0%	HE and RPART–25.0%	Set per ERV type. Defines the minimum output frequency as a percentage of maximum frequency (E1-04 setting).
			LE–16.7%	
			DN–12.5%	
E1-04	Maximum Output Frequency	60 Hz	HE and RPART–60 Hz	Set per ERV type. Defines the maximum output frequency via the V/f pattern selected.
			LE–90 Hz	
			DN–120 Hz	
E1-05	Maxiumum Voltage	Varies	230V VFD: 230.0 V	Set per input voltage rating of VFD.
			460V VFD: 460.0 V	
E1-06	Base Frequency	60 Hz	60 Hz	Sets the base frequency rating of the motor.
E1-09	Minimum Frequency	Varies	6 Hz	Sets the minimum operating frequency of the EC Titanium motor.
E5-01	PM Motor Code Selection	Varies	FFFF	Sets motor type to non-Yaskawa PM motor.
E5-02	Motor Rated Power (PM)	Varies	See EC-Titanium Motor Specific Settings Table	Set per motor nameplate data. Units in kW.
E5-03	Motor Rated Current (PM)	Varies	See EC-Titanium Motor Specific Settings Table	Set per motor nameplate data. Units in kW.
E5-04	Number of Motor Poles (PM)	Varies	4	EC-Titanium motors are 4-pole motors.
E5-05	Motor Stator Resistance (PM)	Varies	See EC-Titanium Motor Specific Settings Table	Stator resistance equals motor nameplate data divided by 2. Units in Ohms.
E5-06	Motor d Axis Inductance (PM)	Varies	See EC-Titanium Motor Specific Settings Table	Set per motor nameplate data. Units in mH.

PARAMETER	NAME/SELECTION	YASKAWA V1000 DEFAULT SETTINGS	SETTINGS AS SHIPPED BY RENEWAIRE	COMMENTS
E5-07	Motor q Axis Inductance (PM)	Varies	See EC-Titanium Motor Specific Settings Table	Set per motor nameplate data. Units in mH.
E5-09	Motor Induction Voltage Constant 1	Varies	0	Units in V/kRPM.
E5-24	Motor Induction Voltage Constant 2	Varies	See EC-Titanium Motor Specific Settings Table	Units in V/kRPM.
H1-01	S1 Digital Input Function Selection	40: Forward Run	40: Forward Run	Sets digital input S1 to forward run enable when connected to the SC terminal.
H2-01	Terminal MA, MB, and MC Function Setting (relay)	E: Fault	0: During Run	Sets function of relay output to close contacts between MA and MC terminals.
H3-01	Analog Input A1 Signal Level Selection	0: 0-10 Vdc with Limit	0: 0-10 Vdc with Limit	Sets the upper and lower limits of the analog input A1 range. Setting prevents frequency setpoint going negative when set to 0.
H3-02	Analog Input A1 Function Selection	0: Frequency Bias	0: Frequency Bias	The analog input A1 value will be added to the frequency reference.
H3-03	Terminal A1 Gain Setting	100.0%	100.0%	The analog input A1 value will be multiplied with the frequency reference
H3-04	Terminal A1 Bias Setting	0.0%	0.0%	Sets the analog input 1 Bias value to scale a 0-10 Vdc input signal.
L1-02	Motor Overload Protection Time	1.0 Minutes	0.2 Minutes	Sets the amount of time the VFD can output 120% VFD rated current before faulting.
L2-01	Momentary Power Loss Operation Selection	0: Disabled	2: CPU Power Active	Enables VFD to attempt to ride through momentary power loss.
L3-06	Stall Prevention During Run	Varies	See EC-Titanium Motor Specific Settings Table	"L3-06 = (Motor FLA / VFD FLA) X 1.25 CRITICAL PARAMETER. This provides motor protection!"
L5-01	Number of Auto Restart Attempts	0	10	Number of automatic fault reset attempts.
N8-62	Output Voltage Limit	Varies	"230V VFD: 230.0 V 460V VFD: 460.0 V"	Limits the maximum voltage applied to the motor.

15.6.3.8 230V EC-Titanium Motor Specific VFD Parameter Settings*

					PARAMETER #						
					E5-02	E5-03	E5-05	E5-06	E5-07	E5-24	L3-06
# OF PH AND VOLTAGE	RA-YASKAWA VFD PN	3PH MOTOR PN	MOTOR HP	MOTOR BRAND	MOTOR RATED POWER	MOTOR RATED CURRENT	MOTOR STATOR RES.	MOTOR D AXIS IND.	MOTOR Q AXIS IND.	MOTOR VOLTAGE CONST. 2	STALL LEVEL DURING RUN
1 PH 208V	136832	106371	2	Baldor EC Titanium	1.5	4.5	1.12	27.1	87.9	124	59%
1 PH 208V	136832	106372	3	Baldor EC Titanium	2.2	7.3	0.49	14.4	54.4	106	96%
3 PH 208V	136836	106371	2	Baldor EC Titanium	1.5	4.5	1.12	27.1	87.9	124	59%
3 PH 208V	136836	106372	3	Baldor EC Titanium	2.2	7.3	0.49	14.4	54.4	106	96%
3 PH 208V	136838	106373	5	Baldor EC Titanium	3.7	10.5	0.41	13.5	47.8	126	67%
3 PH 208V	136839	106374	7.5	Baldor EC Titanium	5.5	17.4	0.18	6.6	20.4	113	73%
3 PH 208V	136839	106375	10	Baldor EC Titanium	7.5	22	0.12	5.5	19.2	121	92%

*EC-Titanium parameter settings must only be utilized when ERV is equipped with Baldor EC-Titanium motors. Settings not compatible with standard AC induction motors.

15.6.3.9 460V EC-Titanium Motor Specific VFD Parameter Settings*

					PARAMETER #						
					E5-02	E5-03	E5-05	E5-06	E5-07	E5-24	L3-06
# OF PH AND VOLTAGE	RA-YASKAWA VFD PN	3PH MOTOR PN	MOTOR HP	MOTOR BRAND	MOTOR RATED POWER	MOTOR RATED CURRENT	MOTOR STATOR RES.	MOTOR D AXIS IND.	MOTOR Q AXIS IND.	MOTOR VOLTAGE CONST. 2	STALL LEVEL DURING RUN
3 PH 460V	136841	106371	2	Baldor EC Titanium	1.5	2.3	5.25	108	351.6	248	70%
3 PH 460V	136842	106372	3	Baldor EC Titanium	2.2	3.7	1.94	57.7	217.7	212	86%
3 PH 460V	136843	106373	5	Baldor EC Titanium	3.7	5.3	1.65	54	191	252	75%
3 PH 460V	136844	106374	7.5	Baldor EC Titanium	5.5	8.7	0.7	26.5	81.4	225	98%
3 PH 460V	136845	106375	10	Baldor EC Titanium	7.5	11	0.47	29.1	76.7	241	79%

*EC-Titanium parameter settings must only be utilized when ERV is equipped with Baldor EC-Titanium motors. Settings not compatible with standard AC induction motors.

THIS PAGE IS INTENTIONALLY LEFT BLANK.

15.6.3.10 To Reset VFD Parameters to Factory Settings using Keypad

The VFD will need to be unlocked as described on in section 3.3 to reset parameters to RenewAire factory or Yaskawa defaults.

To return to RenewAire's defaults, complete the following steps:

1. Press the "UP" arrow key until PAr is displayed. Press the "ENTER" key.
2. Change the parameter to A1-03. Press the "ENTER" key.
3. Change the value from a "0000" to "1110." Press the "ENTER" key.
4. The backup parameters should now overwrite any existing parameter settings.
5. The parameters should be verified using the "urFy" process outlined in section 3.3.

To return to Yaskawa's defaults, complete the following steps:

1. Press the "UP" arrow key until PAr is displayed. Press the "ENTER" key.
2. Change the parameter to A1-03. Press the "ENTER" key.
3. Change the value from a "0000" to "2220." Press the "ENTER" key.
4. The Yaskawa factory default parameters should now overwrite any existing parameter settings.
5. The parameters should be verified using the "urFy" process outlined in section 3.3.

NOTE: VFD Manufacturer instructions list many other parameters. Copies of the complete manufacturer's instructions for the VFD are shipped with this unit, and are also available on-line at their respective manufacturer's website.

ABB: www.abb.com/drives
SMV: www.leeson.com
www.lenze.com/en-us/products/inverters
YASKAWA: www.yaskawa.com/downloads

To save an edited parameter set for possible restoration, complete the following steps:

1. Press the "UP" arrow key until PAr is displayed. Press the "ENTER" key.
2. Change the parameter to O2-03. Press the "ENTER" key.
3. Change the value from a "0" to "1." Press the "ENTER" key.
4. The parameters are now backed up to the VFDs internal memory.

There is no option to save the parameters in the remote-mounted keypad for Yaskawa V1000 VFDs.

The VFD should be relocked as described in section 3.3 after the desired parameter settings are entered to avoid further, accidental changes to parameter settings.

15.6.3.11 Yaskawa VFD Wiring to Controller

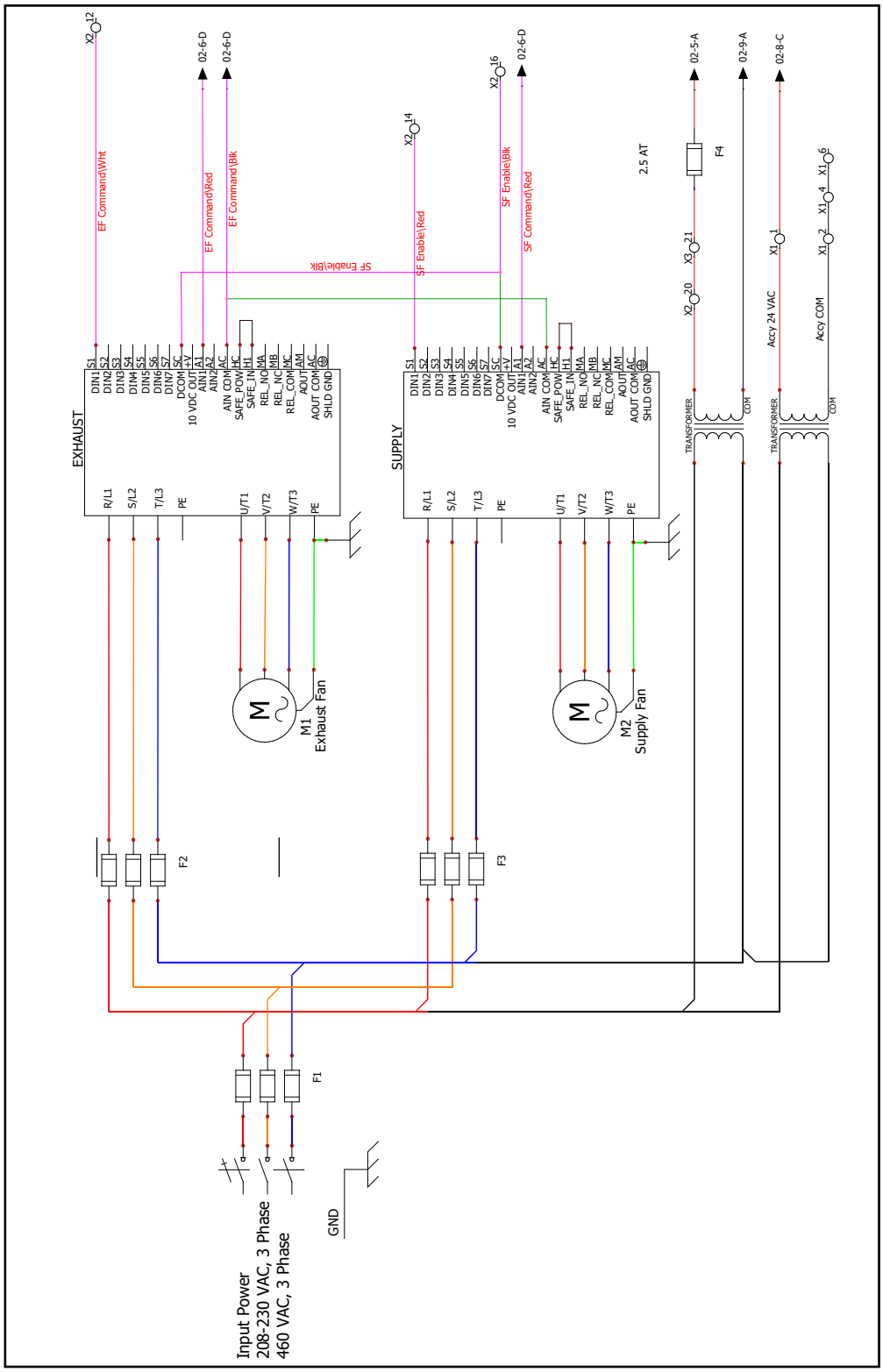


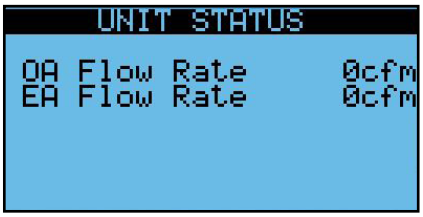
FIGURE 15.6.11 THREE PHASE YASKAWA POWER WIRING SCHEMATIC

NOTE: This wiring schematic is TYPICAL control wiring using Yaskawa VFDs for a three phase, 208-230VAC and 460VAC input for models HE-2X, HE3X, HE-4X, HE-6X, and HE-8X. A unit-specific electrical schematic is found inside the access door to the core module.

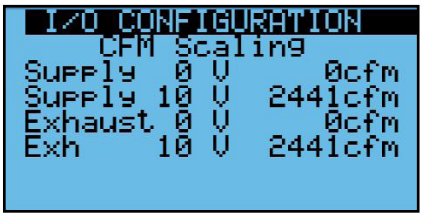
15.7 CFM SCALING

The premium controller provides a reading of CFM along with control options to control fans to maintain a specific flow. In order for these features to work correctly it may be required to scale this value.

To do this, you would require a manometer to read the actual flow value. Compare it to this screen in Unit Status.



If it reads off, you can adjust the upper (10V) range on the following screen. Increasing that value will decrease the reading. Decreasing the value will increase the reading.



The factory set values are in this table.

UNIT MODEL	SUPPLY 10V	EXHAUST 10V
HE1.5X	2450	2450
HE2X	2780	2780
HE3X	3800	3800
HE4X	5520	5520
HE6X	6000	6000
HE8X	7200	7200
LE6X	7855	7855
LE8X	9170	9170
LE10X	11460	11460
RD2X	2250	2250
RD4X	4180	4180

16.0 GLOSSARY

Analog Control Signal
An analog signal is a varying-voltage output signal, typically between 0–10 volts. It is most often used to produce a specific amount of output from a variable-output device, such as a digital scroll compressor or a variable speed fan. 0 volts would represent an OFF condition and 10 volts would represent a demand for output at 100% of capacity.

BACnet
Building Automation Control Network. BACnet is a communications protocol for building automation and control networks. It is just one of several different control systems that may be used as part of a BMS.

BACnet IP

BACnet MSTP
BACnet Master Slave Token Passing—this is one of the possible BACnet protocols that may be used.

BMS
A building management system (BMS) is a control system that can be used to monitor and manage the mechanical, electrical and electromechanical services in a facility. Such services can include power, heating, ventilation, air-conditioning, physical access control, pumping stations, elevators and lights.

Cat-5 Cables
Cat-5 cable, sometimes called Ethernet cable, is short for Category 5 cable, a current industry standard for network wiring. This type of cable is unshielded wire containing four pairs of 24-gauge twisted copper pairs, terminating in an RJ-45 jack. If a wire is certified as Cat-5 and not just a twisted pair wire, it will have this designation printed on the outside.

Controller
Direct Digital Control is the automated control of a condition or process by a digital device (computer). The controller accepts digital or analog inputs from a variety of sensors and then follows all of its programmed instructions to produce action instructions to valves, actuators, fans, compressors and other HVAC components that can be adjusted. The Carel controller is a DDC controller.

Digital Control Signal
A digital control signal is a fixed-voltage or amperage output signal, representing either an “ON” or “OFF” condition for the device it is connected to. It is typically used to activate a relay that controls operation of a device.

DIN Rail
A DIN rail is a specially shaped metal strip which is used to mount relays, switches, terminals, etc. in industrial panels. The shape of the strip is such that these items can pressed onto it and a spring clip on each device slips into the bend in the rail and the device is held firmly. The strip can be mounted with screws or bolts to a wall or panel. The controller and any expansion boards are typically mounted on a DIN rail in the Main Control Panel.

Economizer Bypass
The Economizer Bypass provides energy conservation during operation of an ERV. It accomplishes this by sensing ambient conditions and it then allows the return air stream to move through an alternate duct, bypassing the ERV enthalpic core when the unit calls for cooling and the outdoor conditions are more favorable than the return air.

Ethernet
Ethernet is the standard way to connect computers on a network over a wired connection. It provides a simple interface and is used for connecting multiple devices, such as computers, routers, and switches. When the Carel controller is incorporated into a BMS, the BMS computer and the Carel controller become an ethernet.

IO Configuration
Refers to the specific wiring terminals on the controller that are assigned for each Input or OutputIP

IP Address
A unique string of numbers separated by periods that identifies each computer using the Internet Protocol to communicate over a network

Hot Gas Reheat (HGRH)
Used in dehumidification, hot gas reheat relies on an additional coil downstream of the cooling coil in which the hot refrigerant piping is in contact with the supply air. This allows a portion of the refrigerant cycle's rejected heat to be reclaimed as reheat. The amount of refrigerant piped to the coil is modulated to maintain a supply temperature during dehumidification.

Hysteresis
The hysteresis is a value that is added to a setpoint for a specific control option to turn on, and then it turns off at setpoint. This helps prevent over cycling of the controlled device.

I/O
Refers to all of the inputs and outputs such as sensors and control to fans.

Modbus
Modbus is a serial communications protocol for use with programmable logic controllers (PLCs). It is a standard communication protocol, and it is now a commonly available means of connecting industrial electronic devices. Modbus enables communication among many devices connected to the same network, for example a system that measures temperature and humidity and communicates the results to a computer. Modbus is often used to connect a supervisory computer with a remote terminal unit (RTU) in supervisory control and data acquisition systems.

Modbus RTU—see Modbus, above.

Modbus RTP—see Modbus, above.

NAND Memory
NAND flash memory is a type of non-volatile storage technology that does not require power in order to retain data. The technology is used in common storage devices such as flash drives, solid-state drives and memory cards.

NODE
Any system or device connected to a network is also called a node. For example, if a network connects a file server, five computers, and two printers, there are eight nodes on the network. Each device on the network has a network address, such as a MAC address, which uniquely identifies each device.

PI Control
The output of PID controllers will change in response to a change in process variable or setpoint.

RJ-45 jack
RJ-45 is a standard type of connector for network cables. RJ-45 connectors are most commonly seen with ethernet cables and networks. RJ-45 connectors feature eight pins to which the wire strands of a cable interface electrically. Standard RJ-45 pinouts define the arrangement of the individual wires needed when attaching connectors to a cable. Several other kinds of connectors closely resemble RJ-45 and can be easily confused for each other.

RUT
Remote User Terminal. The RUT is the User Interface where a person can view current operating conditions or status, make changes to setpoints and otherwise control the operation of the air handler. The Carel RUT is an electronic device that has multiple push buttons and a viewing screen and is connected to the Carel Controller by means of a common telephone cable.

Setpoint
The desired value in a closed-loop feedback system, as in regulation of temperature or pressure.

USB/USB Port
Universal Serial Bus. There are different types of USB ports that are commonly used. Type “A” ports are almost always found on computers and are used to connect with other electronic devices. The Carel c.pCO Mini has a Micro USB type “B” that is used to connect to external memory devices or to a computer.

USB Thumb Drive
A very small, portable, solid-state hard drive that can be inserted into a USB port for storage and retrieval of data.

UI
User Interface—commonly called “UI.” A user interface is the means by which a person controls a hardware device or a software application. For the Carel Controller, the RUT (Remote User Terminal) is one possible User Interface.

URL
Uniform Resource Locator. Commonly referred to as a web address. It is a very specific address that identifies the location of a specific website or address on the internet.

Wipe Retain
Wipe/Retain is a user-commanded function in which all non-volatile memory in the Controller is erased and factory defaults are reinstalled.

About RenewAire

For over 40 years, **RenewAire has been a pioneer in enhancing indoor air quality (IAQ)** in commercial and residential buildings of every size. This is achieved while maximizing sustainability through our fifth-generation, static-plate, enthalpic-core **Energy Recovery Ventilators (ERVs) that optimize energy efficiency**, lower capital costs via load reduction and decrease operational expenses by minimizing equipment needs, resulting in significant energy savings. Our ERVs are competitively priced, simple to install, easy to use and maintain and have a quick payback. They also enjoy the industry's best warranty with the lowest claims due to long-term reliability derived from innovative design practices, expert workmanship and **Quick Response Manufacturing (QRM)**.

As the pioneer of static-plate core technology in North America, RenewAire is the largest ERV producer in the USA. We're **committed to sustainable manufacturing** and lessening our environmental footprint, and to that end our Waunakee, WI plant is 100% powered by wind turbines. The facility is also one of the few buildings worldwide to be LEED® Gold and Green Globes certified, as well as having achieved ENERGY STAR Building status. In 2010, RenewAire joined the Soler & Palau (S&P) Ventilation Group in order to provide direct access to the latest in energy-efficient air-moving technologies. For more information, visit: renewaire.com

201 Raemisch Road | Waunakee, WI | 53597 | 800.627.4499 | RenewAire.com

Soler&Palau Ventilation Group

Member of the SandP Group
Family of Brands

RenewAire® Energy Recovery Ventilation