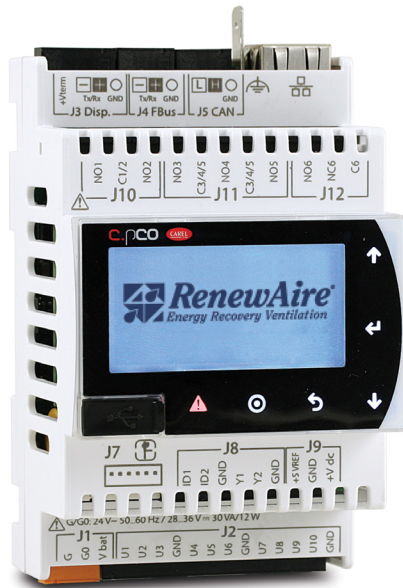


ENHANCED COMMERCIAL CONTROLS

Installation, Operation and Maintenance Manual

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



Carel c.pCO Mini

This manual applies to energy recovery ventilator (ERV) units with enhanced 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.



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.

READ AND SAVE THIS MANUAL/LIRE ET CONSERVER CE MANUEL

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.




ETL LISTED
CONFORME TO
UL STD 1812
CERTIFIED TO
CAN/CSA C22.2
Intertek
4000510 No. 113


Energy Recovery Ventilator



WARNING

Danger of electric shock. Always disconnect power source before servicing. Do not install in a cooking area or make line-voltage electrical power connections directly between this unit and any appliance.





AVERTISSEMENT

Danger de choc électrique. Toujours déconnecter la source d'alimentation avant les réparations. N'installez pas de zone de cuisine ou de ligne de tension les connexions d'alimentation électrique directement entre cette unité et tout.

POWER SUPPLY TO UNIT / alimentation d'énergie à l'unité

| Voltage | Minimum Circuit Amps | Maximum Overcurrent Protection Device |
|---------|----------------------|---------------------------------------|
| 460V | 27.5 | 35 |

60 HZ 3-Phase Amp. Minimales de Circuit Dispositif à maximum de protection contre les surintensités

Motors Protected by IEC / Les Moteurs protégés par des

| (Qty) & HP | FLA |
|------------|------|
| 2@10.0 | 12.2 |
| (Qty) & CV | APC |


TION

Motors Protected by Variable Frequency Drives / Les moteurs protégés par la fréquence variable conduit

| (Qty) & HP | FLA |
|------------|-----|
| None | - |
| (Qty) & CV | APC |

Option Code: LE10XJRTHND34RQ--DANTFA-L

MODEL/MODELE: LE10XRT
SO#: 063124
JO#: 35579-0000
Serial Number: D18 8890C



Serial No. 1812 10 2002 002

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.

| | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------------|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--|
| 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"

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

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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.

1.0 OVERVIEW

1.1 CONTROL SEQUENCE OVERVIEW

The Renewaire ERV with enhanced 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 enhanced 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
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)
 - Exhaust fan tracking
 - 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)
6. Monitoring of pressure across filter for filter status
7. Bypass control (with external bypass option) for economizer control
8. Alarm alerts and logging

1.2 ENERGY RECOVERY BASICS

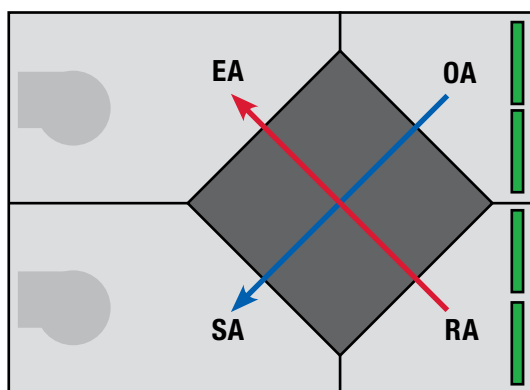
IMPORTANT

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, lowering its temperature and humidity.
- During winter months, the cold and dry OA passes by the warmer, moister RA, raising its temperature and humidity.



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



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

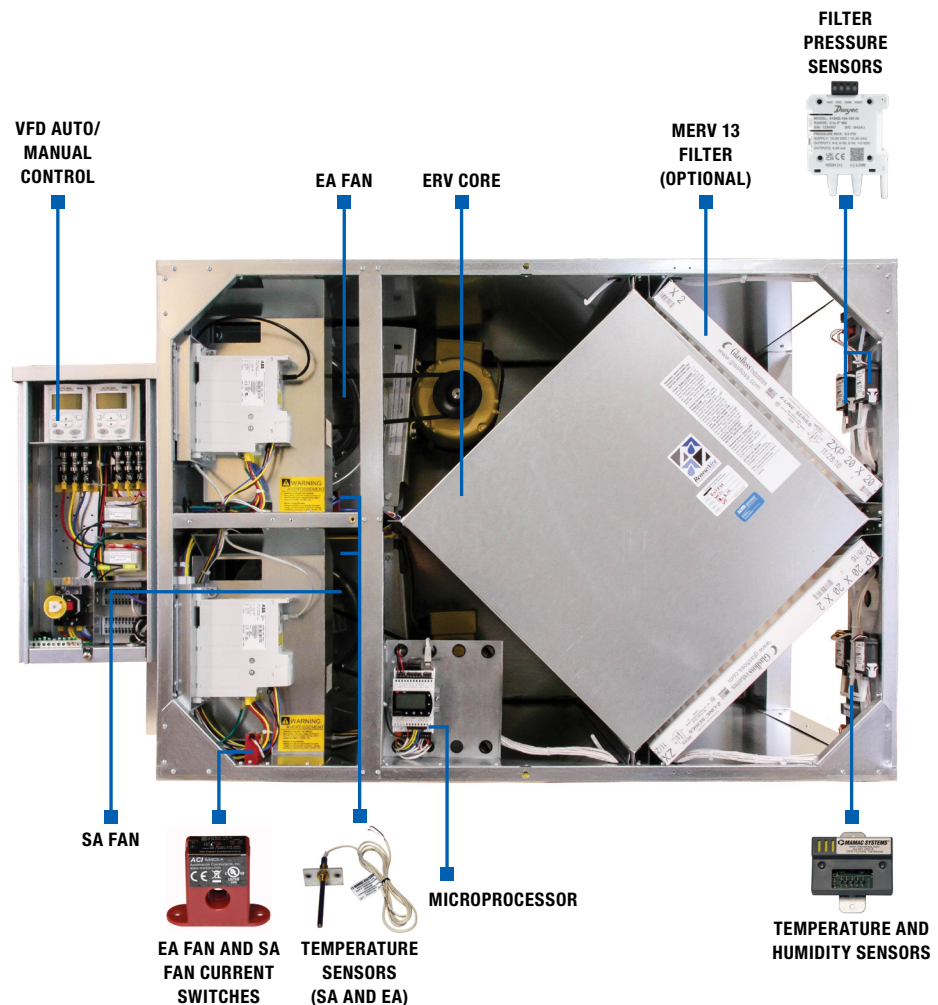
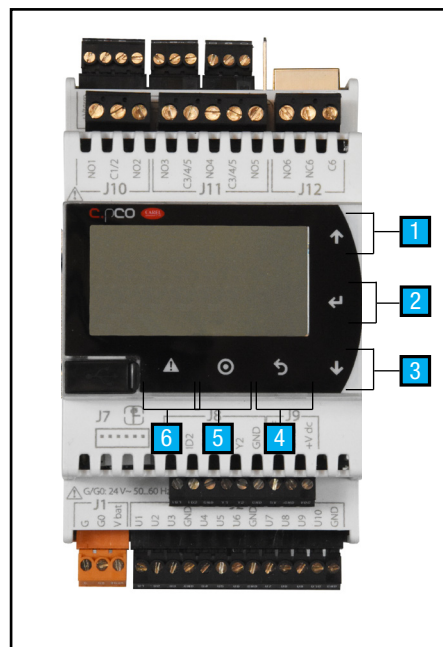


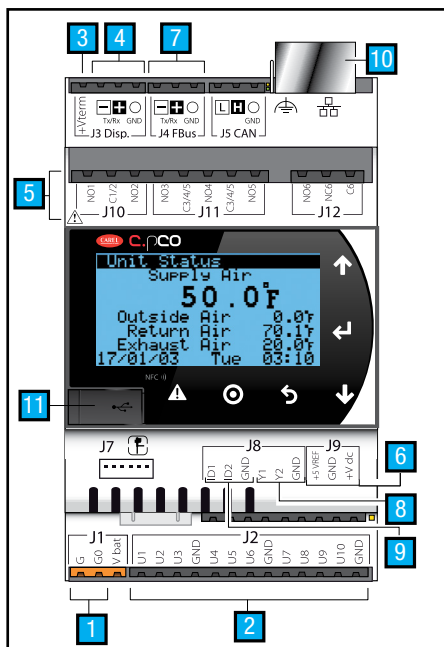
FIGURE 1.5.0 SENSOR LOCATIONS IN ERV UNITS, HE2XINH SHOWN

2.0 CONTROLLER OVERVIEW

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



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



| | |
|----|----------------------------------|
| 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 (not used) |
| 8 | Analog outputs |
| 9 | Digital inputs |
| 10 | Ethernet port |
| 11 | Micro USB port |

FIGURE 2.0.0 C.PCO CONTROLLER BUTTONS

FIGURE 2.0.1 CONTROLLER EXTERNAL CONNECTIONS

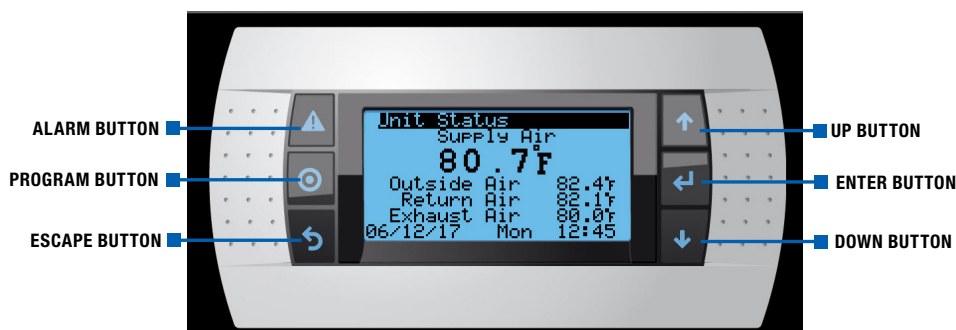


FIGURE 2.0.2 OPTIONAL REMOTE USER TERMINAL (RUT) BUTTON LOCATIONS



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.



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.

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.

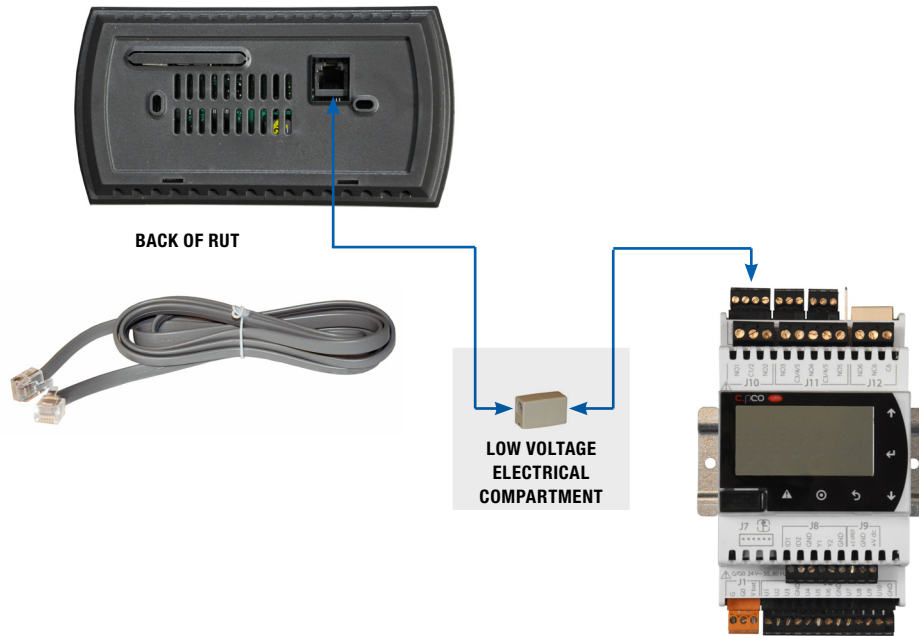


FIGURE 2.1.1 CONNECTING A RUT

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.

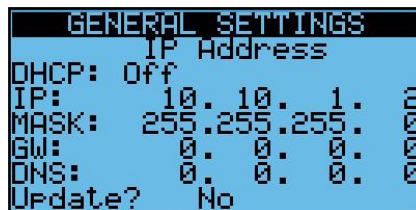
NOTE: For direct connection from RUT to J3 Terminal, use the following wiring:
 Blue & White = +Vterm
 Yellow & Black = GND
 Green = Negative (-)
 Red = Positive (+)

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.)

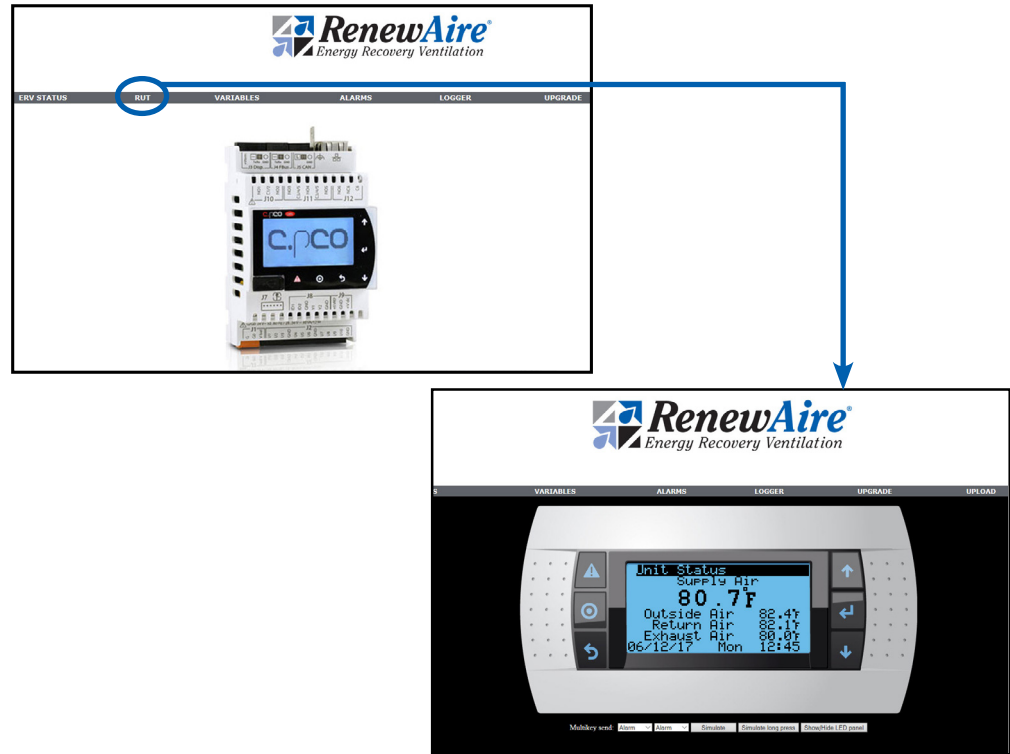


NOTE: The controller will only support private IP addresses which start with 192, 172, or 10.

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

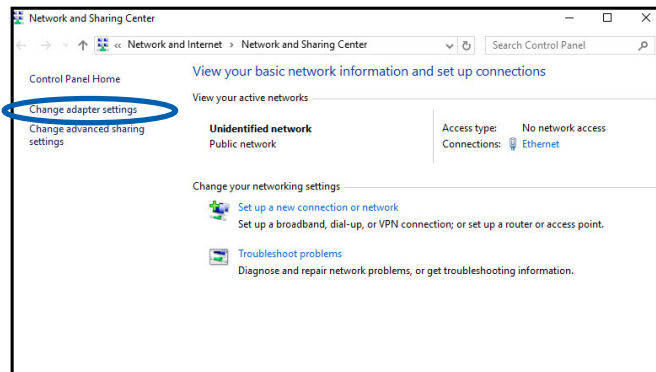


You should see this web page. To get to the menu screens, click on RUT on the Menu Bar.

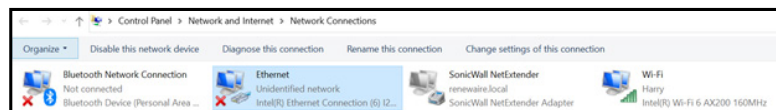


2.1.3 Setting the PC IP Address

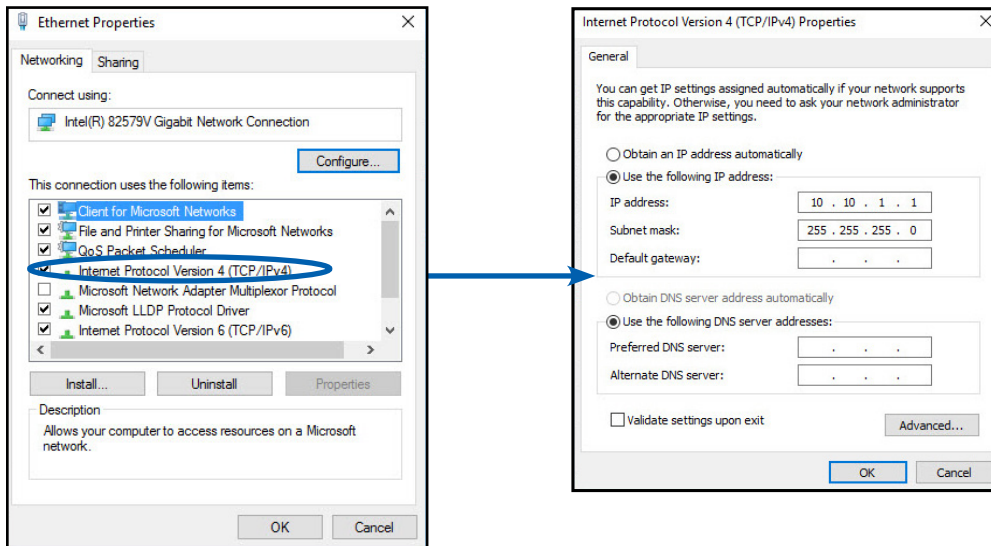
For those that are not familiar with changing their PC adapter settings, go into Network Setting in the Control Panel and *Change Adapter Settings*.



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



Select Internet Protocol 4 and click on Properties.

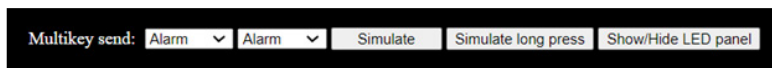


NOTE: When you are finished viewing the controller on your computer, remember to restore the original settings.

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 by pressing the ESC (back) button. The menus contain the following areas:

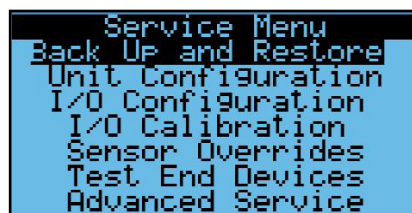
- *Unit Status*—Contains the status values of the sensors, fans, and heating and cooling, if applicable
- *Control Settings*—Contains the control settings for the fans and heating and cooling, if applicable
- *General Settings*—Contains the clock settings, Unit of Measures, IP Address, BMS settings, 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 by 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



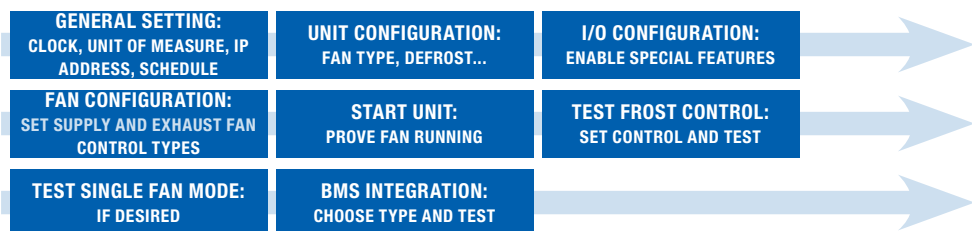
2.2.3 Password Entry

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

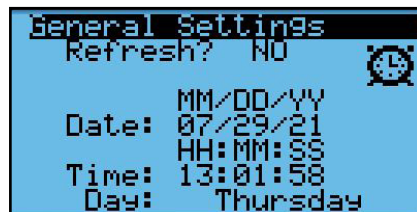
4.1 CONFIGURE GENERAL SETTING

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)

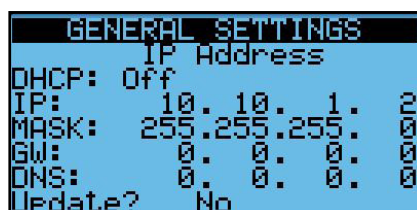
Set the Unit of Measure to the desired units for the display.



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.

The image displays four sequential screenshots of a unit's configuration interface, likely a monochrome LCD screen.

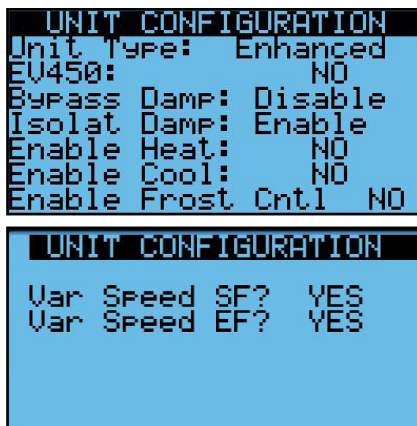
- GENERAL SETTINGS:** Shows 'SCHEDULER' with 'Enable?' set to 'Yes'. The time is 18:29, WED, 03/09/2022. Below, it states 'Sched. is not running' and 'Sched status:'.
- DAILY EVENTS:** Shows 'Day:' set to 'Monday'. 'Copy to:' is set to 'MON', with 'Ok?' set to 'No'. There are four rows for event settings (1-4), each with a checkbox and three dashes. 'Save data?' is at the bottom, set to 'No'.
- General Settings VACATIONS PERIODS:** Shows a table with columns 'Start', 'End', and 'Status'. There are three rows, each with a checkbox and three dashes.
- SPECIAL DAYS:** Shows a table with columns for day selection (checkboxes) and three dashes. There are six rows, labeled 1 through 6.

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 Enhanced or Enhanced 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?
- 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.

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.



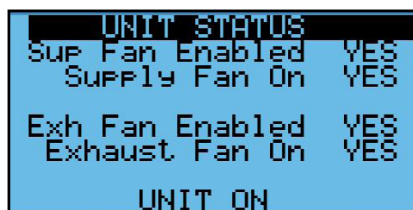
Upon starting, the isolation dampers will open. The end switches of these dampers will complete the Fan Enable signal to the ECM or VFD fans.

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. |
| 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.

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)

5.1.2 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.



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.

5.1.4 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 5.1.3 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.

5.1.5 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 U= 0.0"wg
      10 U= 2.0"wg

RA Flt 0 U= 0.0"wg
      10 U= 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.

```

UNIT STATUS
OA Humidity 25.0%
RA Humidity 22.3%
OA Enthalpy 21.8btu/lb
RA Enthalpy 21.3btu/lb
OA Filter 0.02"wg
RA Filter 0.05"wg
SA Temperature 68.7°f

```

5.2 OPTIONS FOR SUPPLY FAN CONTROL

Units with a VFD or ECM for the supply fan can control the fan for constant speed.

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.



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

```

Control Settings
SUPPLY FAN CONTROL
Constant Speed

```

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


```

Control Settings
SUPPLY FAN
Constant Speed Setp
25 %

```

5.3 OPTIONS FOR EXHAUST FAN CONTROL

Units with a VFD or ECM for the exhaust fan can control the fan for fixed speed, or supply fan command tracking 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.

```
Control Settings
EXHAUST FAN CONTROL
Constant Speed
```

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.

```
Control Settings
EXHAUST AIR
Constant Speed Setp
25%
```

5.3.2 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.

```
Control Settings
EXHAUST FAN CONTROL
SF Command Tracking
```

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.

```
Control Settings
EXHAUST AIR
SF Command Tracking
100%
```

6.0 SPECIAL FEATURES

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

6.1 FROST CONTROL

ERV units utilize an optional frost control method to prevent frost build up on the core warm the core when it is extremely 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.

```

UNIT CONFIGURATION
Unit Type: Premium
EU450: NO
Bypass Damp: Disable
Isolat Damp: Enable
Enable Heat: NO
Enable Cool: NO
Enable Frost Cntl YES
  
```

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.

```

CONTROL SETTINGS
Frost Control Settings
Turn On When:
  OA Below 5.0°F
  EA Below 25.0°F
Turn Off When:
  EA Above 35.1°F
FC Exh Command 50.0%
  
```

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.

```

UNIT STATUS
FROST CONTROL
Active NO
EA Actual 58.7°F
EA Setpoint On 25.0°F
EA Setpoint Off 35.1°F
OA Actual 50.7°F
OA Setpoint 5.0°F
  
```


6.2 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.

```

I/O CONFIGURATION
Single Fan Mode Select
Used with ID2 input
Choose fan:
    Exhaust Fan
If EF and tracking,
run EF at:      50%
  
```

6.3 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.

```

I/O CONFIGURATION
ROOM SENSING
If using room sensor
instead of return, do
you want to change
the text on the main
screen?          NO
  
```

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

6.4 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 % during this period.

It is enabled in the *I/O Configuration* screen.

```

I/O CONFIGURATION
FLUSH SETTINGS
Used with Scheduler

Enable:          YES
Fan Set Type:%
  
```

This screen to allow you to define how the fans will run while in flush mode.

```

I/O CONFIGURATION
FLUSH SETTINGS
Used with Scheduler

SF in Flush:    100%
EF in Flush:    100%
  
```


Once these settings 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.

```

DAILY EVENTS
Day: Monday
Copy to: MON Ok? No
[✓] 1 06:45 FLUSH
[✓] 2 07:00 ON-
[✓] 3 17:00 OFF
[ ] 4 --:-- --
Save data? Yes
  
```

6.5 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.

```

ALARM SETTINGS
SA Low Temp Warning
Lower Limit -22.0°F
Delay Time 30 sec

SA Low Temp Alarm
Lower Limit -22.0°F
Delay Time 30 sec
  
```

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

```

CONTROL SETTINGS
ECONOMIZER TYPE
Enthalpy
  
```

```

CONTROL SETTINGS
ECONOMIZER TYPE
Temperature
  
```

Economizer based on Enthalpy Sequence:

If the OA Enthalpy is below the RA Enthalpy 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

```

CONTROL SETTINGS
ECONOMIZER
Enthalpy Control

OA Temp Lockout 55.0°F
RA Temp Lockout 70.0°F
Hysteresis 1.0btu/lb

```

```

CONTROL SETTINGS
ECONOMIZER
Temperature Control

OA Temp Lockout 55.0°F
RA Temp Lockout 70.0°F
Hysteresis 2.0°F

```

6.7 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.

```

I/O CONFIGURATION
D19 Inputs Used For

ID1:DI On/Off
ID2:Sing Fan Mode

Must be different!

```

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.

```

I/O CONFIGURATION
D19 Inputs Used For

ID1:Freezestat
ID2:Smoke Alarm

Must be different!

```

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*.

```

I/O CONFIGURATION
Smoke Alarm
Action

Open is OFF

```

```

I/O CONFIGURATION
Freezestat Alarm
Action

Open is OFF

```

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

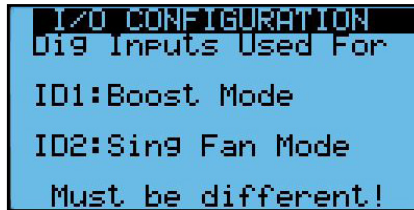
- AL08: Smoke Alarm
- AL09: Freezestat Alarm

6.8 BOOST MODE

This feature was added in version 03.00.45.

This feature allows the user to designate an unused digital input (ID1 or ID2) as a boost input that will boost an ERV running in constant speed or constant flow mode to a “boost” level set in the screen or through BACnet.

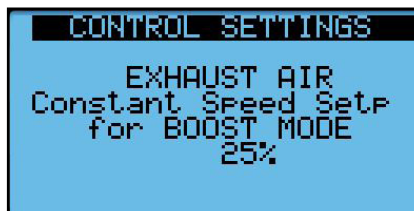
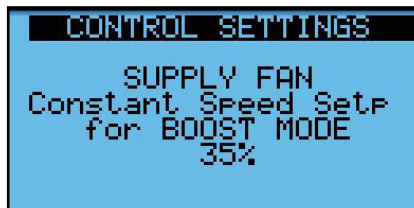
In order to enable the feature, assign Boost Mode to one of the inputs in the I/O Configuration.



In the Control Settings, you will now see that you have two extra screens that appear for Supply and Exhaust Fan settings provided you have set the fans for constant speed control or flow control.

If the supply fan is set for flow control, for example, and the exhaust fan is set for tracking, the exhaust fan will track the boosted supply fan automatically.

This feature is not available for fans controlled by pressure or CO2 levels.



7.0 VERIFYING I/O AND UNIT WIRING

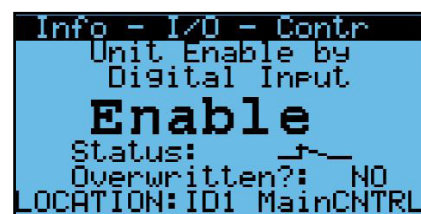
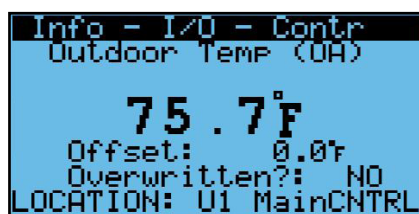
All of the I/O values should be verified and calibrated, if necessary.

7.1 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 end of *Unit Status*.



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



7.2 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.



7.3 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.

7.3.1 Sensor Inputs

| SENSOR | TYPE | SENSOR TERMINALS | INTERMEDIATE TERMINALS | CONTROLLER TERMINALS |
|-----------------------|-------------------------------|---------------------|---------------------------|-------------------------|
| OA Temperature | Combined CAREL NTC/0–10VDC | Far Left (Red) | - | U1 (Main) |
| OA Humidity | | 2 (Black) | X4-39 GND | GND TS2 |
| | | 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) |
| RA Humidity | | 2 (Black) | X4-39 GND | GND TS2 |
| | | 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 | VAC/V+ (Red) | - | 24VAC TS1 |
| | | COM/GND (Black) | - | GND TS2 |
| | | VOUT/OUT (White) | - | U7 (Main) |
| RA Filter Pressure | 0–10VDC | VAC/V+ (Red) | - | 24VAC TS1 |
| | | COM/GND (Black) | - | GND TS2 |
| | | VOUT/OUT (White) | - | U8 (Main) |

7.3.2 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* (unless designated for other use) | Dry Contact | | X2-17 | ID1 |
| | | | X2-18 | GND |
| ID2 Single Fan Mode (unless designated for other use) | 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.

7.3.3 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 | N01 (Main) |
| | | | X2-14 | |
| EF Enable | Dry Contact | (See wiring diagram) | X2-11 | N02 (Main) |
| | | | X2-12 | |
| Bypass Damper | Dry Contact | HOT | X2-07 (Red) | N03 (Main) |
| | | COM | X2-06 (Black) | Accy COM |
| OA Damper | Dry Contact | HOT | X2-03 (Red) | N04 (Main) |
| | | COM | X2-02 (Black) | Accy COM |
| RA Damper | Dry Contact | HOT | X2-05 (Red) | N05 (Main) |
| | | COM | X2-04 (Black) | Accy COM |
| Serious Alarm Output | Dry Contact* | | - | N06/NC6 (Main) |
| | | | - | C6 (Main) |

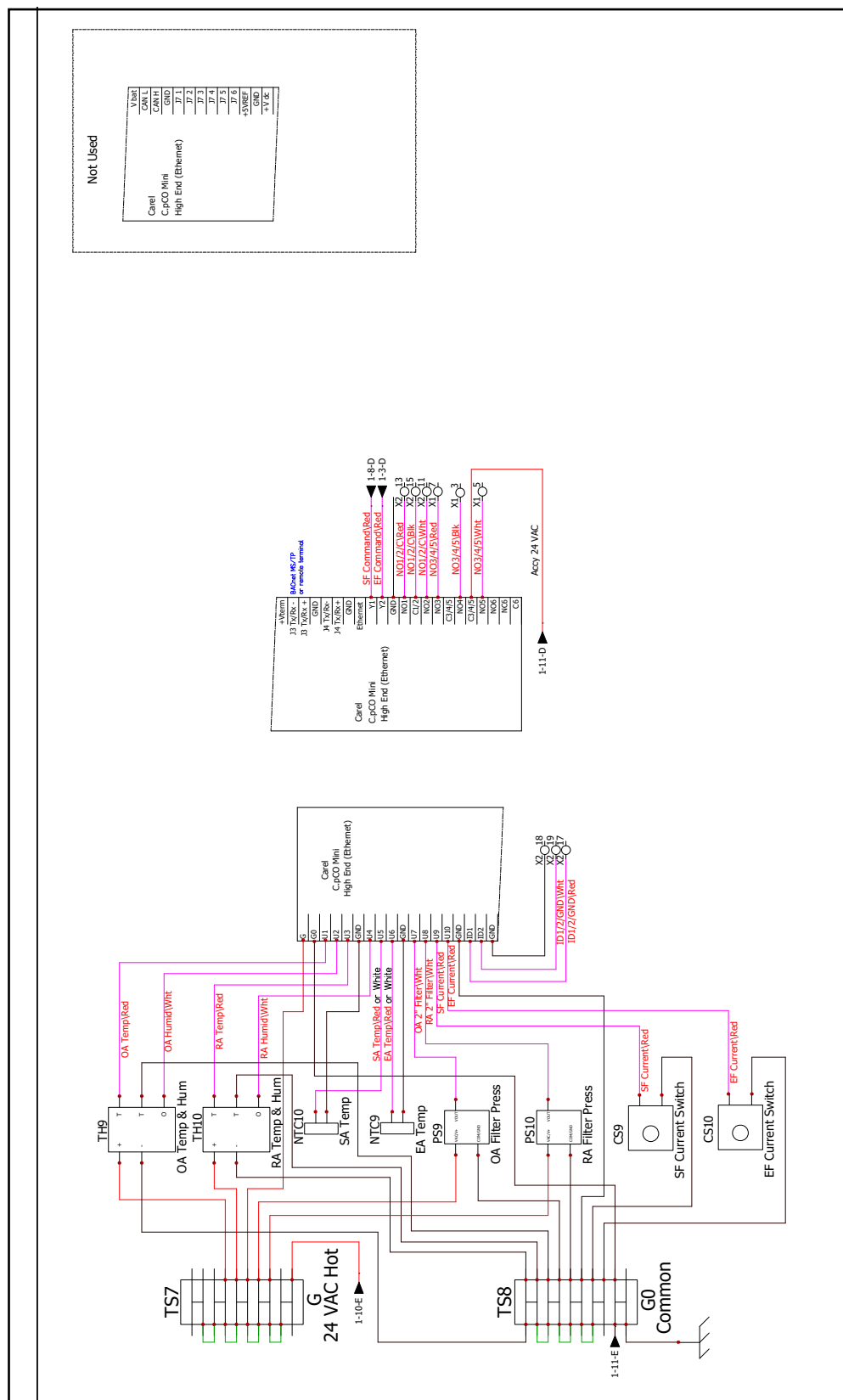
7.3.4 Analog Outputs

| OUTPUT | TYPE | OUTPUT TERMINALS | INTERMEDIATE TERMINALS | CONTROLLER TERMINALS |
|-----------|---------|------------------|------------------------|----------------------|
| SF Signal | 0–10VDC | | 01-6-D | Y1 (Main) |
| | | | 01-2-D | GND |
| EF Signal | 0–10VDC | | 01-4-D | Y2 (Main) |
| | | | 01-2-D | GND |

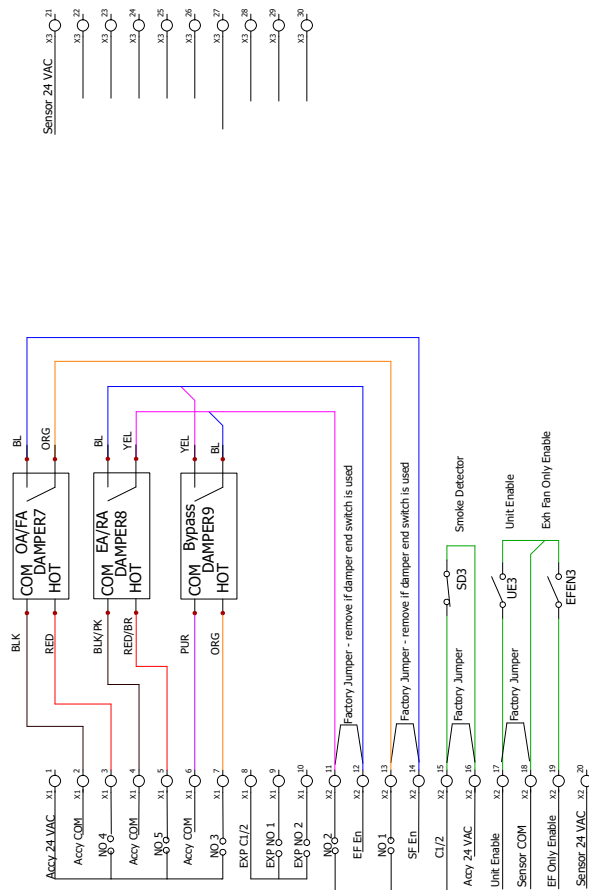



 **NOTE:** This wiring schematic is TYPICAL control wiring for a three phase, 208-230VAC and 460VAC input for models HE-2X, HE3X, HE-4X, HE-6X, HE-7X, and HE-8X. A unit-specific electrical schematic is found inside the access door to the core module.

7.3.6 Sample Control Wiring Schematic



7.3.7 Sample Field 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, HE-7X, and HE-8X. A unit-specific electrical schematic is found inside the access door to the core module.

8.0 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.

8.1 ALARMS

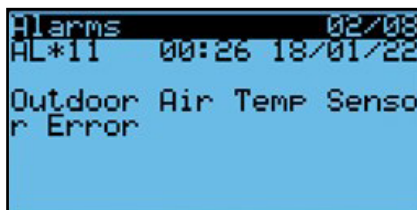
The alarms are viewed through the controller screen or through the BMS.

8.1.1 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.

8.1.2 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.

```

Data logger Record:01
          14:32 14/03/22
Exhaust Air Flow Rate
Sensor Error
Event:      Start
  
```

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

```

NO ALARMS
Press ENTER
to DATA LOGGER
  
```

8.1.3 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.)

```

Alarms
Press ALARM for 3s
to reset all alarms
Press ENTER
to DATA LOGGER
  
```

8.1.4 Alarm Digital Outputs

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

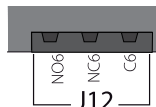
This is AlarmOut.val and it closes the contact if there is an alarm that will shut down the unit. These include:

- 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.

```

ALARM SETTINGS
Fan Alarm Delay
    90sec
SF Alarm Unit Run?
    NO
  
```

The physical connection is made at the controller, it is terminated at J12, located in the upper right corner. There is both a normally open (NO6 to C6) and normally closed (NC6 to C6) option.



8.1.5 Specific Alarms and Their Meaning

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

8.1.5.1 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 |
| 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 is not set to Enhanced. Go to the *Unit Configuration* and change this setting.

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.



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.

8.1.5.2 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.



8.1.5.3 Airflow Condition Alarms

| NUMBER | NAME | STATUS SHOWN | MEANING |
|--------|--------------------------|--------------|----------------------|
| 16 | AI_SupAir_Low_Temp_Warn | User reset | Low SA Temp Warning |
| 17 | AI_SupAir_Low_Temp_Alarm | User reset | Low SA Temp Shutdown |

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

The alarm applies to the supply temperature (SA).

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 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 SETTINGS
SA Low Temp Warning
  Lower Limit -22.0°F
  Delay Time 30 sec

SA Low Temp Alarm
  Lower Limit -22.0°F
  Delay Time 30 sec

```

8.1.5.4 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 |

Alarm Numbers 30–37: 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.

8.1.5.5 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.

```

ALARM SETTINGS
Filter Alarms

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

```

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.

8.1.5.6 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.

8.2 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.



8.2.1 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%.

8.3 OTHER COMMON PROBLEMS

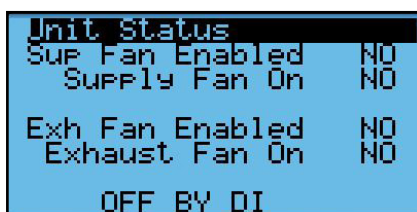
Listed are some other common problems you may encounter.

8.3.1 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.
- 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*.
- 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.



8.3.2 Sensor Reading #### or Has Extreme Value

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

8.3.3 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.

8.3.4 Can Not See Device via IP Connection

If you are connected locally with a PC:

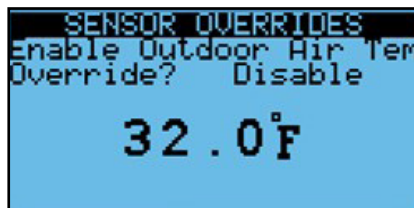
- Make sure your PC is on the same subnet but not the exact same IP address. The last octet has to differ.
- If you have just changed the IP address, make sure you said "update" on that screen and cycle power.
- Make sure the cable "snaps in" on both sides.
- Microsoft Edge browser does not work as well. 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.

8.4 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.

8.5 RESTORE PARAMETERS (SETTING)

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



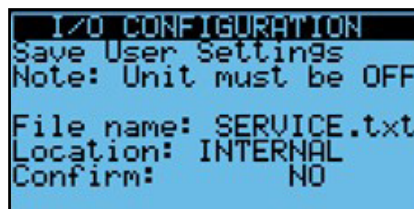
NOTE: RenewAire highly recommends that a USB thumb drive be installed in the USB port and a system backup (external) be made immediately after start up or commissioning.

8.5.1 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 saved 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.



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

```

I/O CONFIGURATION
Save User Settings
Note: Unit must be OFF

File name: SERVICE.txt
Location: INTERNAL
Confirm: YES
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."

```

BACKUP & RESTORE
Restore User Settings
Note: Unit must be OFF

File name: SERVICE.txt
Location: INTERNAL
Confirm: NO
  
```

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.

8.5.2 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

```

S BACKUP & RESTORE
Restore Factory
Note: Unit must be OFF

File name: FACTORY.txt
Location: INTERNAL
Confirm: NO
  
```

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.

8.5.3 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

```

S  BACKUP & RESTORE
Params Import/Export
Import/Export:
EXPORT
Memory type:
INTERNAL FLASH MEMORY
File ID:      EXPORT_00
Confirm:      NO
  
```

8.5.4 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 <i>General Settings</i> . |
| 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. |

8.5.5 Return to Program Defaults



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

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).

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

```

ADVANCED SERVICE
DEFAULT INSTALLATION

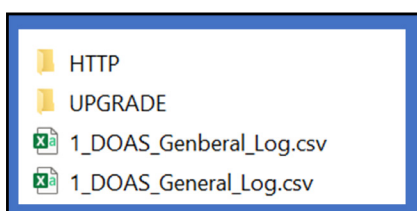
Wipe retain mem.: NO
Wipe NVRAM mem.: NO
Wipe both mem.: NO
  
```

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

9.0 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.

9.1 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.

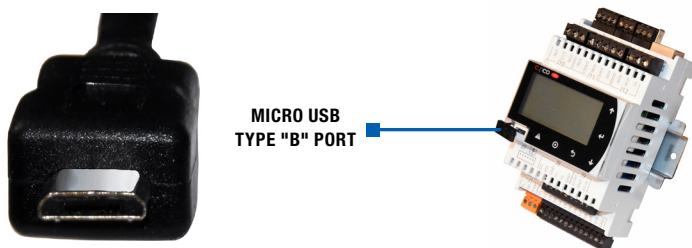
Note that the USB port is a Micro USB Type “B.” Thumb drives with a Micro USB Type B are difficult to find in some areas and it may be necessary to purchase an adapter to go from a more common Type A connector to the newer Micro Type B.

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.



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.



9.2 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.



9.2.1 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 | Al_EA_Flow_Rate_Prbl.Active | Start | | |
| 2022-01-28T16:11:22+00:00 | 38 | Al_OA_Flow_Rate_Prbl.Active | Start | | |
| 2022-01-28T16:11:21+00:00 | 42 | Al_Supply_Temp_Prbl.Active | Start | | |
| 2022-01-27T17:48:22+00:00 | 39 | Al_EA_Flow_Rate_Prbl.Active | Start | | |
| 2022-01-27T17:48:22+00:00 | 38 | Al_OA_Flow_Rate_Prbl.Active | Start | | |
| 2022-01-27T17:48:20+00:00 | 42 | Al_Supply_Temp_Prbl.Active | Start | | |
| 2022-01-27T15:48:02+00:00 | 39 | Al_EA_Flow_Rate_Prbl.Active | Start | | |
| 2022-01-27T15:48:02+00:00 | 38 | Al_OA_Flow_Rate_Prbl.Active | Start | | |

9.2.2 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.



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.

| TIME | EVENT | OA_Temp. Val | OA_Hum. Val | RA_Hum. Val | SA_Temp. Val | EA_Temp. Val | Cooling_C ommand. | Heating_C ommand. | 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 |

| | |
|---------------------------|-----------|
| HTTP | |
| System Volume Information | |
| UPGRADE | |
| 1_DOAS_General_Log.csv | 4,614,281 |
| 2_DOAS_General_Log.csv | 4,614,281 |
| 3_DOAS_General_Log.csv | 4,614,281 |
| 4_DOAS_General_Log.csv | 2,067 |
| 5_DOAS_General_Log.csv | 1,285,715 |
| 6_DOAS_General_Log.csv | 4,614,281 |
| 7_DOAS_General_Log.csv | 4,614,281 |

The variables that are logged are as listed here.

| VARIABLE | VARIABLE | VARIABLE |
|-------------|--------------------|-------------------|
| OA_Temp.Val | EA_Temp.Val | Any_Alarm_Out.Val |
| OA_Hum.Val | RA_Temp.Val | |
| RA_Hum.Val | OA_Enthalpy | |
| SA_Temp.Val | Bypass_Command.Val | |

9.3 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 |

9.4 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.

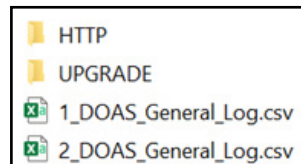


NOTE: It is advised that you delete this file once you are done. Every upgrade file is named the same, regardless of version.

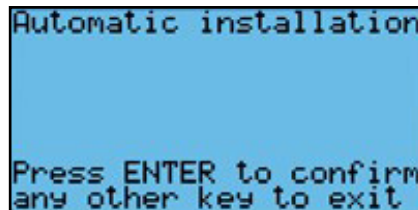
1. Connect via USB. This requires that you have a micro USB cable to go from your PC to the controller micro USB connection and can see the files in Windows Explorer.
2. Connect with a USB thumb drive to the micro USB connection.
3. Connect via Ethernet. This requires a PC and the ability to connect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

9.4.1 Upgrade Type: Connect via USB

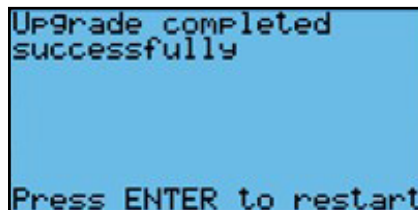
1. Save the parameters using the *General Save and Restore* method. Make sure you choose EXPORT! Remember the Export_XX number you chose.
2. Carefully connect the micro USB cable to the front connection of the controller (long side to the bottom) and to your PC. Verify that you can see the files in Windows 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.



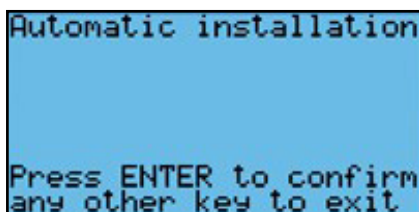
6. Restore the parameters using the *General Save and Restore* method. Make sure you choose IMPORT! Use the Export_XX number you chose in step 1.

7. Cycle power.

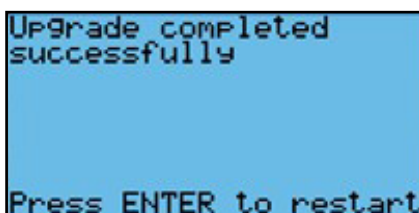
9.4.2 Upgrade Type: Connect with a USB Thumb Drive

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.

A blue screen with black text that reads "Automatic installation" at the top and "Press ENTER to confirm any other key to exit" at the bottom.

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

A blue screen with black text that reads "Upgrade completed successfully" at the top and "Press ENTER to restart" at the bottom.

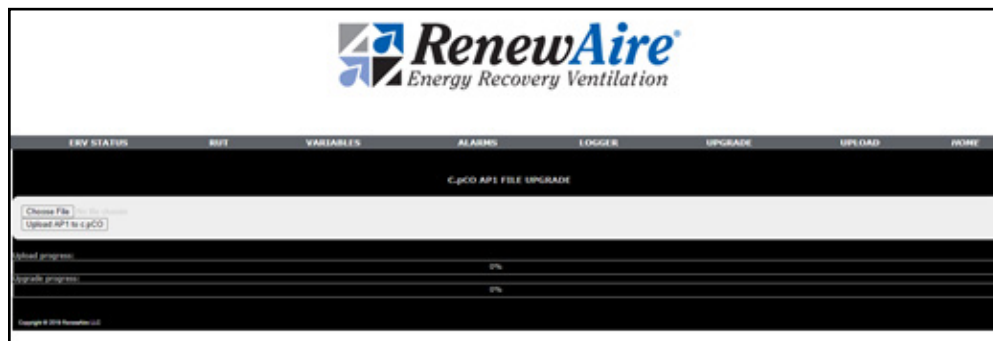
6. Restore the parameters using the *General Save and Restore* method. Make sure you choose IMPORT! Use the Export_XX number you chose in step 1.

7. Cycle power.

9.4.3 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.

10.0 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*.

10.1 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.

| UNIT STATUS | |
|----------------------|-----------|
| Conditioned Air (CA) | |
| 68.3°F | |
| Outside Air | 75.4°F |
| Return Air | 75.5°F |
| Exhaust Air | 74.0°F |
| 03/16/22 | Wed 17:24 |

10.2 OTHER STANDARD SCREENS

These screens also show standard values.

| UNIT STATUS | |
|----------------|------------|
| OA Humidity | 25.0% |
| RA Humidity | 22.3% |
| OA Enthalpy | 21.8btu/lb |
| RA Enthalpy | 21.3btu/lb |
| OA Filter | 0.02"wg |
| RA Filter | 0.05"wg |
| SA Temperature | 68.7°F |

| UNIT STATUS | |
|--------------|--------|
| SA Flow Rate | 160cfm |
| EA Flow Rate | 358cfm |
| RA Dewpoint | 59.2°F |
| OA Dewpoint | 62.5°F |
| Clg Coil LAT | 72.1°F |

10.3 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 | |
|-----------------|-----|
| Sup Fan Enabled | YES |
| Supply Fan On | YES |
| Exh Fan Enabled | YES |
| Exhaust Fan On | YES |
| UNIT ON | |

| UNIT STATUS | |
|-----------------|-----|
| Sup Fan Command | 60% |
| Exh Fan Command | 53% |

| 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. |
| 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.

| Unit Status | |
|----------------|----|
| Unit Enabled | NO |
| OA Damper Open | NO |
| RA Damper Open | NO |
| Bypass Enabled | NO |

10.4 FROST CONTROL INFORMATION

This screen contains all frost control information.

| UNIT STATUS | |
|-----------------|--------|
| FROST CONTROL | |
| Active | NO |
| EA Actual | 58.7°F |
| EA Setpoint On | 25.0°F |
| EA Setpoint Off | 35.1°F |
| OA Actual | 50.7°F |
| OA Setpoint | 5.0°F |

10.5 ENTRY TO THE I/O INFORMATION SCREEN

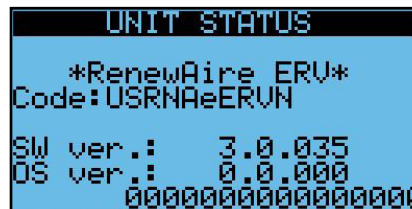
This screen is described in *Verifying all I/O through Unit Status Screens*.



10.6 VERSION INFORMATION SCREEN

This screen contains:

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



11.0 BMS ACCESS

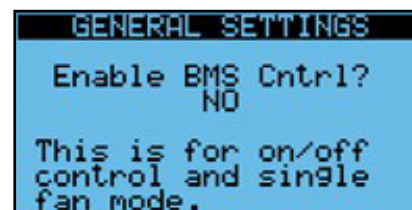
The BMS settings are located in the *General Settings* after the scheduler. To get to that menu press the back button until it shows up.

11.1 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 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.



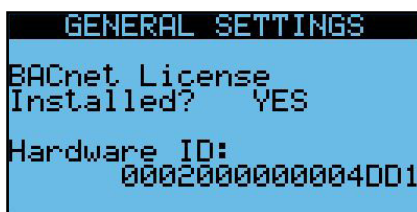
11.2 SETTING BMS TYPE

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.



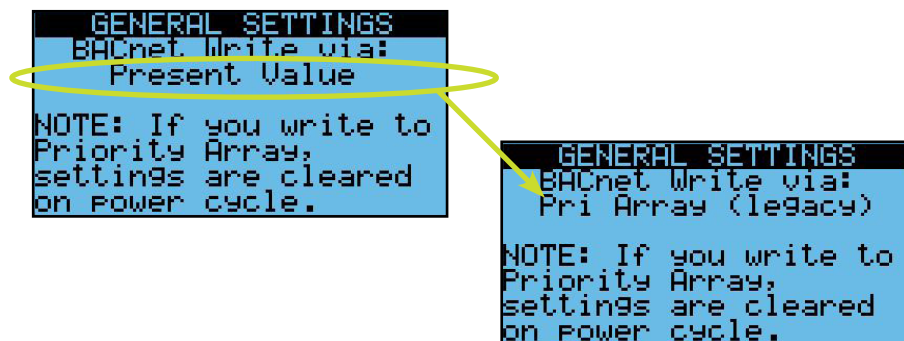
Once a protocol has been selected, additional BMS programming screens will appear. Change settings as needed. After the BMS protocol has been selected and protocol options have been selected, cycle power to the controller.

11.3 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.

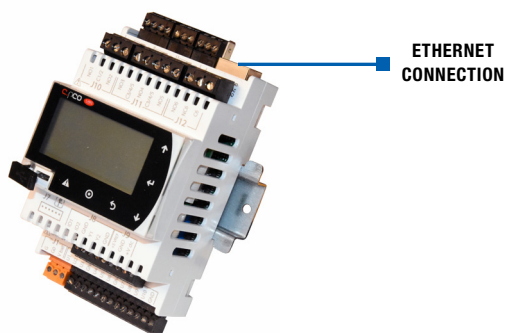
Setpoints, in general, are saved in EEPROM memory and maintained on power loss. These are referred to as RETAINED. For retained values, DO NOT write to these values constantly. Doing so will flag an alarm and can damage the controller. If you have a need to write to a value constantly, contact TSS to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



11.3.1 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.



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

11.3.2 BACnet IP 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.)

```

GENERAL SETTINGS
IP Address
DHCP: Off
IP: 10.10.1.2
MASK: 255.255.255.0
GW: 0.0.0.0
DNS: 0.0.0.0
Update? No
  
```

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

```

GENERAL SETTINGS
BACnet IP Settings
Device ID: 5002
Port: 47808
  
```

Last, set the BACnet port if different from the 47808 (BAC0). This screen allows you to set the BACnet Device ID scrolling up or down.

```

GENERAL SETTINGS
BACnet IP Settings
Device ID: 5002
Port: 47808
  
```

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



11.3.3 BACnet MSTP Settings

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

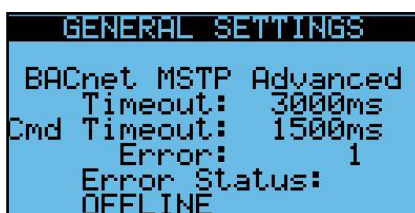


NOTE: Whenever the BMS type is changed, power to the controller must be cycled.

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



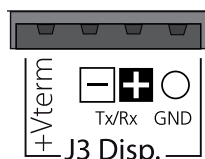
If you need to set the timing values, you can do that here.



11.3.4 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.



11.4 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 | 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 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) |
| Analog Value | 43 | EF_ConstSpeedSetP.Val | EF Constant Speed Setpoint | % | Read_Writeable (X) |
| Analog Value | 45 | EF_SF_TrackingSetP.Val | EF SF Tracking Setpoint | % | Read_Writeable (X) |
| 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) |
| Analog Value | 80 | BMS_SupplyFanCommand | Command used when BMS commands fans directly every cycle | % | Read_Writeable |
| Analog Value | 81 | BMS_ExhaustFanCommand | Command used when BMS commands fans directly every cycle | % | Read_Writeable |
| Analog Value | 82 | EF_Tracking_SFMode | Fan speed to run EF when it is in EF only mode and it is tracking Supply Fan | % | Read_Writeable |
| AnalogValue | 90 | SF_ConstSpeedSetP_Boost.val | SF Constant Speed Setpoint in Boost Mode | % | Read_Writeable |
| AnalogValue | 91 | EF_ConstSpeedSetP_Boost.val | EF Constant Speed Setpoint in Boost Mode | % | Read_Writeable |
| AnalogValue | 92 | SF_FlowControlSetP_Boost | SF Control Setpoint in oost Mode | cfm | Read_Writeable |
| AnalogValue | 93 | EF_FlowControlSetP_Boost | EF Flow Control Setpoint in Boost Mode | cfm | Read_Writeable |

| TYPE | INSTANCE | VARIABLE NAME | DESCRIPTION | VALUE RANGE | READ/WRITE (RET) |
|--------------|----------|---------------------------------|---|--------------|------------------|
| 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 | 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 | 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 | 71 | BoostMode.val | Boost Mode Status | 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 | 508 | AI_Smoke.Active | Smoke Alarm Input Engaged | OK/Alarm | Read_NoWrite |
| Binary Input | 509 | AI_Freeze.Active | Freeze 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 | 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 | 530 | AI_OA_Temp_Prbl.Active | OA Temperature Sensor Open or Short | OK/Alarm | Read_NoWrite |
| Binary Input | 531 | AI_OA_Hum_Prbl.Active | OA Relative Humidity Transmitter Out of Range | OK/Alarm | Read_NoWrite |
| Binary Input | 532 | AI_RA_Temp_Prbl.Active | RA Temperature Sensor Open or Short | OK/Alarm | Read_NoWrite |
| Binary Input | 533 | AI_RA_Hum_Prbl.Active | RA Relative Humidity Transmitter Out of Range | OK/Alarm | Read_NoWrite |
| Binary Input | 534 | AI_SA_Temp_Prbl.Active | SA Temperature Sensor Open or Short | OK/Alarm | Read_NoWrite |

| TYPE | INSTANCE | VARIABLE NAME | DESCRIPTION | VALUE RANGE | READ/WRITE (RET) |
|------------------|----------|----------------------------|---|----------------------------|------------------|
| Binary Input | 535 | AI_EA_Temp_Prb.Active | EA Temperature Sensor Open or Short | OK/Alarm | Read_NoWrite |
| Binary Input | 536 | AI_OA_Fit_Press_Prb.Active | OA Filter Pressure Transmitter Out of Range | OK/Alarm | Read_NoWrite |
| Binary Input | 537 | AI_RA_Fit_Press_Prb.Active | RA Filter Pressure Transmitter Out of Range | OK/Alarm | Read_NoWrite |
| Binary Input | 560 | AI_OA_Fit_Press.Active | OA Filter Needs Change | OK/Alarm | Read_NoWrite |
| Binary Input | 561 | AI_RA_Fit_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 |
| 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 |
| 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 | 7 | UnitStatus_BN | UnitStatus_BN | (See Notes) | Read_NoWrite |

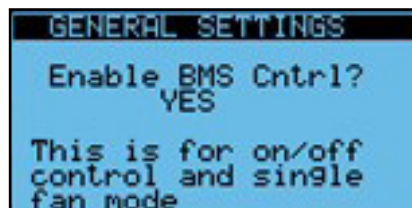
11.5 BACNET APPLICATION NOTES

11.5.1 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. |
| 13 | Device Test | The system is in device test mode for more than an hour. |
| 14 | Sens Ovrdr 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. |

11.5.2 Alarms

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

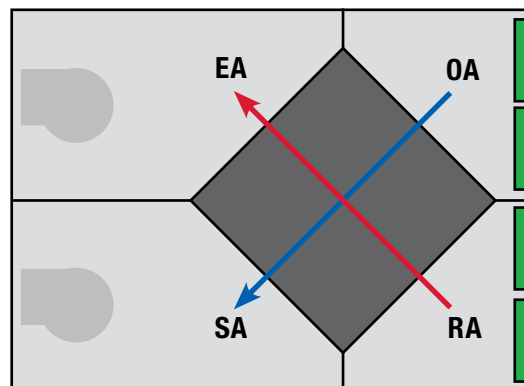
- Serious Alarm: Located at Binary Input 17, “Alarm_Out.val” indicates whether there is a serious alarm that stops the unit.
- Any Alarm: Located at Binary Input 72, “Any_Alarm_Out.val” indicates whether there is any alarm present.

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.”

11.5.3 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”



11.5.4 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.

The corresponding settings is as follows:

- Constant Speed setpoint is Analog Value 37 “SF_ConstantSpeedSetP.Val”

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 exhaust fan control type method can be viewed at Multistate Input 3 “EF_ControlType_BN.” The valid values are 1 = Constant Speed and 3 = SF Command Tracking.

The corresponding settings are as follows:

- Constant Speed setpoint is Analog Value 43 “EF_ConstantSpeedSetP.Val”
- Exhaust Fan Tracking setpoint is Analog Value 45 “EF_SF_TrackingSetP.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 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.

11.5.5 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

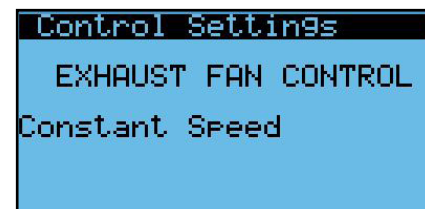
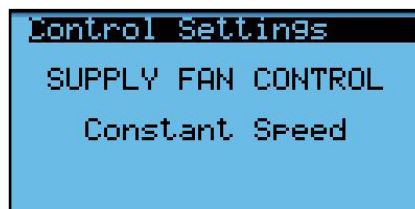
The newer versions allow a BMS system to command directly to the speed control with a non-retained variable. This is done with systems where the BMS is writing to the value every program cycle. One example would be when they use their own pressure control loop and only write the output to the fan.

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

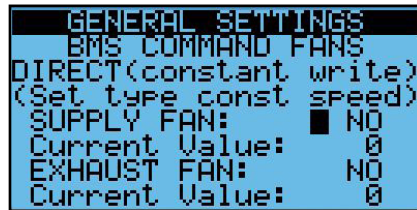
The objects used for reading the fan control type are:

- SF_ControlType_BN MI2
- EF_ControlType_BN MI3

They must 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.”

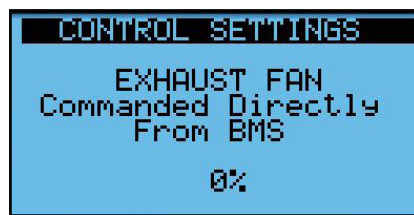


The objects used for direct writing the percentages are:

- 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.



11.5.6 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”

11.5.7 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.

11.5.8 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.”

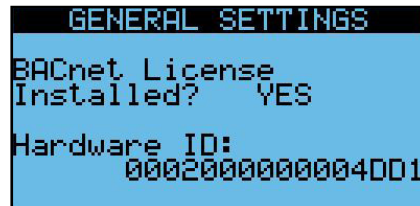
11.5.9 Exhaust Fan Only Mode

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.”

11.6 ADDING A BACNET LICENSE

11.6.1 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.”

11.6.2 Installing the BACnet License via Web Page

Prerequisites

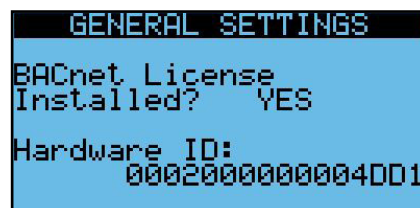
- Have ap1 BACnet upgrade file(s) located on your PC
- Ethernet connection from the PC to the controller and view the web page

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.



11.6.3 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.

11.6.4 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.

11.7 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.

11.7.1 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 11.2.0 ETHERNET CONNECTION

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

11.7.2 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.)

```

GENERAL SETTINGS
IP Address
DHCP: Off
IP: 10.10.1.2
MASK: 255.255.255.0
GW: 0.0.0.0
DNS: 0.0.0.0
Update? No
  
```

Then set the timeout parameter, if needed.

```

GENERAL SETTINGS
Modbus IP Advanced
Timeout: 3000ms

Error Status:
Timed Out
  
```

11.7.3 Modbus RTU Settings

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

```

GENERAL SETTINGS
Modbus RTU Settings
Address: 4
Baud Rate: 19200
Stop Bits: 2
Parity: None
  
```

Then set the timeout parameter if needed.

```

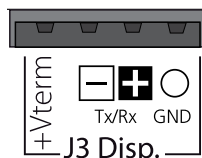
GENERAL SETTINGS
Modbus RTU Advanced
Timeout: 3000ms

Error Status:
Timed Out
  
```

11.7.4 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 plug a three-pin block in here and use the wrong three pins you might damage the port.



11.8 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.

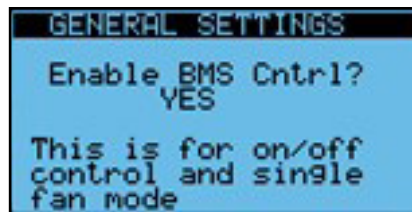
| TYPE | # | VARIABLE | DESCRIPTION | RANGE | READ/WRITE MODE (RET) |
|-----------------|----|------------------------|--|-------------|-----------------------|
| Coil | 0 | OnOffUnitMng.BmsOnOff | BMS On/Off Command | Off/On | Read_Writeable |
| Coil | 1 | OnOffUnitMng.BmsEfOnly | BMS Exhaust Fan Only Command | Off/On | Read_Writeable |
| Coil | 2 | AlarmMng.AlrmResByBms | Alarm Reset BMS Command | OK/Reset | Read_Writeable |
| Coil | 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 | 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 | 9 | UnitOn | Unit On Status | Off/On | 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 | 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 | 0 | RA_Flt_AlarmHigh | RA Filter Alarm Level | iwc | Read_Writeable (X) |
| 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 | 16 | EF_ConstSpeedSetP.Val | EF Constant Speed Setpoint | % | Read_Writeable (X) |
| HoldingRegister | 20 | EF_SF_TrackingSetP.Val | EF SF Tracking Setpoint | % | 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 | 16 | RA_Flt_Press.Val | RA Filter Pressure | iwc | Read_NoWrite |

| TYPE | # | VARIABLE | DESCRIPTION | RANGE | READ/WRITE MODE (RET) |
|---------------|----|-------------------|------------------------------|-------------|-----------------------|
| InputRegister | 18 | OA_Flt_Press.Val | OA Filter Pressure | iwc | Read_NoWrite |
| InputRegister | 20 | SF_Command.Val | Supply Fan Command (actual) | % | Read_NoWrite |
| InputRegister | 22 | EF_Command.Val | Exhaust Fan Command (actual) | % | 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 | 50 | UnitStatus_BN | UnitStatus_BN | (See Notes) | Read_NoWrite |

11.9 MODBUS APPLICATION NOTES

11.9.1 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. |
| 13 | Device Test | The system is in device test mode for more than an hour. |
| 14 | Sens Ovrdr 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. |

11.9.2 Alarms

Two general alarms are available:

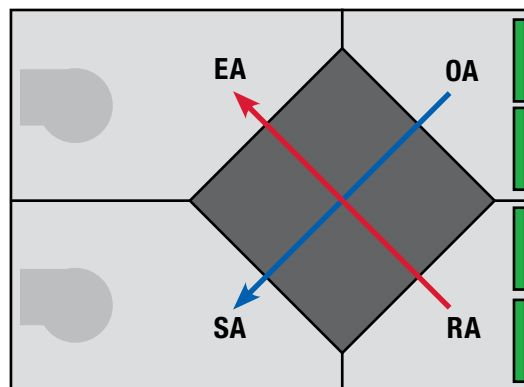
- Serious Alarm: Located at Discrete Input 5, "Alarm_Out.val" indicates whether there is a serious alarm that stops the unit.
- Any Alarm: Located at Discrete Input 20, "Any_Alarm_Out.val" indicates whether there is any alarm present.

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."

11.9.3 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.Val"
- Input Register 6 "RA_Hum.Val"
- Input Register 8 "EA_Temp.Val"
- Input Register 10 "SA_Temp.Val"



11.9.4 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.

The corresponding setting is as follows:

- Constant Speed setpoint is Holding Register 4 "SF_ConstantSpeedSetP.Val"

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 exhaust fan control type method can be viewed at Input Register 43 "EF_ControlType_BN." The valid values are 1 = Constant Speed, 3 = SF Command Tracking, .

The corresponding settings are as follows:

- Constant Speed setpoint is Holding Register 16 "EF_ConstantSpeedSetP.Val"
- Exhaust Fan Tracking setpoint is Holding Register 20 "EF_SF_TrackingSetP.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."

11.9.5 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

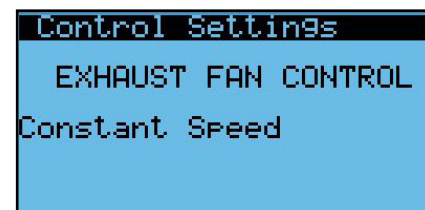
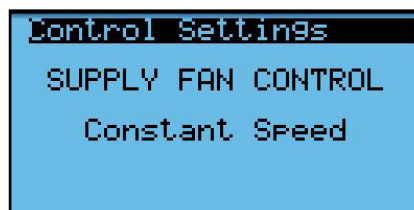
The newer versions allow a BMS system to command directly to the speed control with a non-retained variable. This is done with systems where the BMS is writing to the value every program cycle. One example would be when they use their own pressure control loop and only write the output to the fan.

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

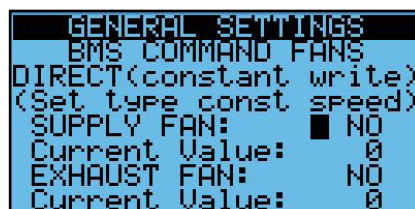
The registers used for reading the fan control type are:

- SF_ControlType_BN IR42
- EF_ControlType_BN IR43

They must 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."

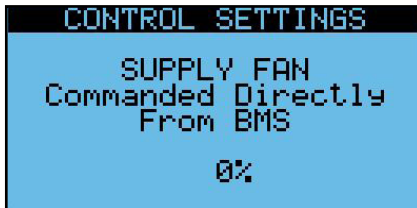


The registers used for direct writing the percentages are:

- 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.



11.9.6 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.

11.9.7 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.”

11.9.8 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.”

12.0 ADVANCED SERVICE

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

12.1 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.

```

ADVANCED SERVICE
UNIT SERVICE INFO
Run Hours:      0
Svc Thr: 200000hr
STATUS:OK
Reset Svc Hrs:  NO
Starts:         0
Reset Starts:   NO
  
```

```

ADVANCED SERVICE
SUPPLY FAN SVC INFO
Run Hours:      22
Svc Thr: 200000hr
STATUS:OK
Reset Svc Hrs:  NO
Starts:         1
Reset Starts:   NO
  
```

12.2 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.

```

ADVANCED SERVICE
LAST POWER LOSS
Current time:
16/03/22      22:16:29
PowerOff time:
16/03/22      17:21:57
Length last time off:
0Days 0Hrs 1Min
  
```

12.3 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.

```

ADVANCED SERVICE
Ret mem writes: 2526
Main task:
500ms          2.0Cycle/s
  
```

12.4 ALARM INITIALIZATION

This screen will allow you to delete the alarm logs.

```

ADVANCED SERVICE
Alarm initialization
Delete alarm logs?      NO
Clear AutoReset
counters?               NO
Enable buzzer?          YES
  
```

12.5 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.



13.0 MAINTENANCE RECORDS**13.1 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:

13.1.1 Setpoints

| NAME OF SETPOINT | VALUE |
|------------------|-------|
| | |
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13.1.2 Offsets

| NAME OF OFFSET | VALUE |
|----------------|-------|
| | |
| | |
| | |
| | |
| | |

13.1.3 IP Addresses

| NAME OF COMPONENT | IP ADDRESS |
|-------------------|------------|
| Controller | |

13.2 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:

13.2.1 Setpoints

| NAME OF SETPOINT | NEW VALUE |
|------------------|-----------|
| | |
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13.2.2 Offsets

| NAME OF OFFSET | NEW VALUE |
|----------------|-----------|
| | |
| | |
| | |
| | |
| | |

13.2.3 I/O Configuration Changes

13.3 CONTROLLER UPDATES

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

| DATE |
|------|
| |
| |
| |
| |

13.4 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:

14.0 REFERENCE

14.1 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.

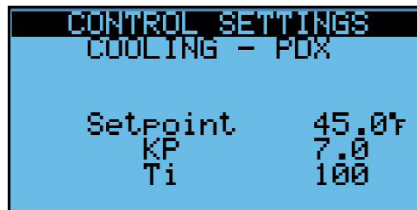
This controller uses PI programming to control the response to Error. PI programming uses two different types of settings to control the command; KP and Ti

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.



14.1.1 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 overshooting 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.

14.1.2 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.

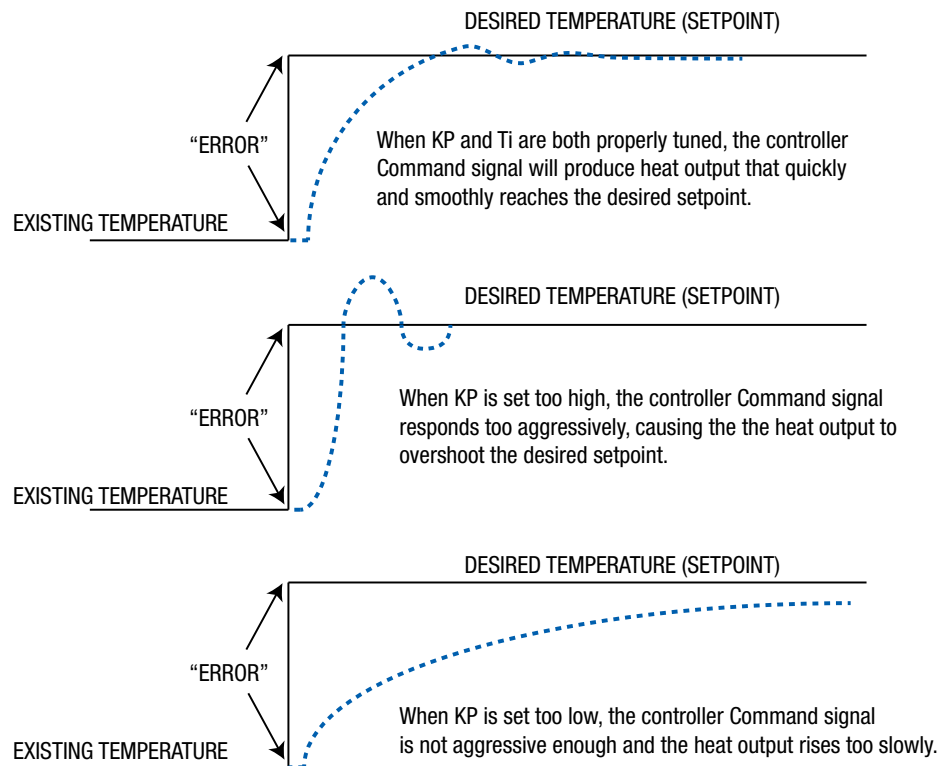


FIGURE 14.1.0 KP SETPOINT CHARTS

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.

14.1.3 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.

14.1.4 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.

14.1.5 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 | <input type="text"/> | | | | | | | |
| HEATING SETPOINT | <input type="text"/> | | | | | | | |
| TEMPERATURE | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> |
| COMMAND PERCENTAGE | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> |
| ELAPSED TIME | <input type="text" value="0"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> |

KP Adjustment Trial 2

| | | | | | | | | |
|--------------------|--------------------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| KP SETTING | <input type="text"/> | | | | | | | |
| HEATING SETPOINT | <input type="text"/> | | | | | | | |
| TEMPERATURE | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> |
| COMMAND PERCENTAGE | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> |
| ELAPSED TIME | <input type="text" value="0"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> |

KP Adjustment Trial 3

| | | | | | | | | |
|--------------------|--------------------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| KP SETTING | <input type="text"/> | | | | | | | |
| HEATING SETPOINT | <input type="text"/> | | | | | | | |
| TEMPERATURE | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> |
| COMMAND PERCENTAGE | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> |
| ELAPSED TIME | <input type="text" value="0"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> |

KP Adjustment Trial 4

| | | | | | | | | |
|--------------------|--------------------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| KP SETTING | <input type="text"/> | | | | | | | |
| HEATING SETPOINT | <input type="text"/> | | | | | | | |
| TEMPERATURE | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> |
| COMMAND PERCENTAGE | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> |
| ELAPSED TIME | <input type="text" value="0"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> |

FIGURE 14.1.1 KP ADJUSTMENT WORKSHEET

DEVICES BEING ADJUSTED

Ti Adjustment Trial 1

Ti SETTING

HEATING SETPOINT

TEMPERATURE

COMMAND PERCENTAGE

ELAPSED TIME

Ti Adjustment Trial 2

Ti SETTING

HEATING SETPOINT

TEMPERATURE

COMMAND PERCENTAGE

ELAPSED TIME

Ti Adjustment Trial 3

Ti SETTING

HEATING SETPOINT

TEMPERATURE

COMMAND PERCENTAGE

ELAPSED TIME

Ti Adjustment Trial 4

Ti SETTING

HEATING SETPOINT

TEMPERATURE

COMMAND PERCENTAGE

ELAPSED TIME

FIGURE 14.1.2 TI ADJUSTMENT WORKSHEET

14.2 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 |

| °C | °F | KΩ |
|------|------|-------|
| -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 |

| °C | °F | KΩ |
|------|-------|------|
| 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 |

| °C | °F | KΩ |
|-------|-------|------|
| 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 |

14.3 HE-SERIES FULL CONFIGURATION CODE

Note: Not all options are available on every model.

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------------|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--|--|--|
| MODEL NUMBER | H | 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 |
|---|-------|
| "HE05-", "HE07-", "HE10-", "HE1.5", "HE-2X", "HE-3X", "HE-4X", "HE-6X", "HE-7X", "HE-8X" | |

| | |
|---------------------------------|------------------------------|
| Digits 7-8: | Location (see Restriction 1) |
| "IN" = Indoor "RT" = Rooftop | |

| | |
|---|---|
| Digit 9: | Orientation (see Restriction 2, 3, & 4) |
| "V", "H" (Indoor Units) | |
| "V", "H", "R", "F", "C" (Rooftop Units) | |

| | |
|--|---|
| Digit 10: | Vibration Isolation (see Restrictions 37 & 38) |
| "-" = None "N" = Neoprene Isolators "S" = Spring Isolators | |

| | |
|------------------|--------------------------------------|
| Digit 11: | Wall Type (see Restriction 5) |
| "S" = Single | |
| "D" = Double | |

| | |
|------------------|---|
| Digit 12: | Phase (See Restriction 6, 12, 16, & 25) |
| "1" = | Single Phase |
| "3" = | Three Phase |

| | |
|------------------|---|
| Digit 13: | Voltage (see Restrictions 7, 8, 9, 10, 11, 16, 24, & 35) |
| "1" = 120V | |
| "4" = 460V | |
| "5" = 208-230V | |
| "8" = 575V | |
| "9" = 277V | |

| | |
|------------------|--|
| Digit 14: | SA Horsepower (see Restrictions 11, 12, 13, 14, 15, 26, & 34) |
| "E" | EC Direct Drive Motors (HE05-, HE07-, HE-10-, and HE1.5 only) |
| "A" | Advanced EC Direct Drive Motorized Impellers (HE07- and HE10- only) |
| "B" | Intermediate EC Direct Drive Motorized Impellers (HE07- 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, HE-6X, HE-7X, HE-8X only) |
| "X" | 5HP (HE-3X, HE-4X, HE-6X, HE-7X, HE-8X only) |
| "Y" | 7.5HP (HE-6X, HE-7X, HE-8X only) |
| "Z" | 10HP (HE-7X, HE-8X only) |

| | |
|------------------|--|
| Digit 15: | EA Horsepower (see Restrictions 11, 12, 13, 14, 15, 26, & 34) |
| "E" | EC Direct Drive Motors (HE05-, HE07-, HE10-, and HE1.5 only) |
| "A" | Advanced EC Direct Drive Motorized Impellers (HE07- and HE10- only) |
| "B" | Intermediate EC Direct Drive Motorized Impellers (HE07- 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, HE-6X, HE-7X, HE-8X only) |
| "X" | 5HP (HE-3X, HE-4X, HE-6X, HE-7X, HE-8X only) |
| "Y" | 7.5HP (HE-6X, HE-7X, HE-8X only) |
| "Z" | 10HP (HE-7X, HE-8X only) |

| | |
|------------------|---|
| Digit 18: | Flow Control* (see Restrictions 17, 18, & 19) |
| "-" | 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 SA 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 20, 21, 22, 23, 24, 25, 26, 33, & 35) |
| "A" | Standard Unit Control Wiring |
| "D" | Independent Blower Control (HE1.5 only) |
| "V" | Onboard VFD Both Airstreams with IE3 Premium Efficiency Motors |
| "W" | Onboard VFD Both Airstreams with IE5+ Ultra Premium Efficiency Motors |
| "G" | Terminal Strip for EC Motors or Impellers |

| | |
|----------------------------|---------------------------------|
| Digit 20: | Disconnect (see Restriction 27) |
| "N" = Non-Fused (Standard) | |
| "F" = Fused | |

| | |
|---|---|
| Digit 21: | Unit Control Enhancements (see Restrictions 21, 28, & 29) |
| "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 29 & 30) |
| "_" | = None (Standard) |
| "F" | = Filter Monitor Both Airstreams |

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

| | |
|------------------|--|
| Digit 24: | Paint and Customization (see Restriction 31) |
| "-" | None |
| "W" | White Paint |
| "C" | Custom Paint |
| "X" | Custom Unit |

| | |
|------------------|-------------------------------------|
| Digit 25: | Safety Listing (see Restriction 32) |
| "L" = Listed | |
| "N" = Non-Listed | |

***NOTES:**

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

*Digit 18: For units with the Bypass Option, the face damper also acts as an isolation damper in the EA or RA airstream.

Note: Not all options are available on every model.

MODEL NUMBER

DIGIT NUMBER

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--|--|--|--|
| H | E | | | | J | | | | | | | | | | - | - | | | | | | | | - | | | | |
| 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: Location Code "RT" not available with model HE05-.
- 2: Orientation Code "C" not available with models HE07-, HE10-, HE-6X, HE-7X, HE-8X, HE1.5.
- 3: Orientation Code "V" not available with Location Code "IN" in models HE-6X, HE-7X, and HE-8X.
- 4: Orientation Code "H" not available with model HE05-.
- 5: Wall Type Code "D" not available with model HE05-.
- 6: Phase Code "3" not available with models HE05- or HE07-.
- 7: Voltage Codes "1" & "9" only available with Phase Code "1" (Single-Phase).
- 8: Voltage Codes "4" & "8" only available with Phase Code "3" (Three-Phase).
- 9: Voltage Code "8" (575V) not available with models HE05-, HE07-, HE10-, & HE1.5.
- 10: Voltage Code "9" (277V) only available with HE1.5 models.
- 11: Voltage Code "1" (120V) only available with SA/EA Motor Codes "AA", "BB", "EE", "S", "U", "V".
- 12: Motor Codes "EE" or "BB" (EC Motors) only available with Phase Code "1" (Single Phase).
- 13: Only Motor Codes "EE", "AA", & "BB" (EC Motors) are available with models HE07- & HE10-.
- 14: Only Motor Code "EE" is available for HE05- units.
- 15: Only Motor Code "AA" is available for HE07- & HE10- Models with Phase & Voltage Code "11".
- 16: Voltage Code "5" (208-230V) not available with Phase Code "3" in HE10- models.
- 17: Dampers and Bypass not available with HE05- models or Orientation Code "C".
- 18: Bypass only available with Location Code "IN" on models HE-2X, HE-3X, HE-4X, HE-6X, HE-7X, & HE-8X.
- 19: Backdraft Dampers only available with HE1.5 models.
- 20: Unit Control Code "A" not available with models HE05-, HE07- or HE10-.
- 21: Unit Control Code "A" not available with Unit Control Enhancements Codes "1", "2", "3", & "4" in HE1.5 models.
- 22: Unit Control Code "D" only available with HE1.5 models.
- 23: Unit Control Code "V" not available with models HE05-, HE07-, HE10-, & HE1.5IN.
- 24: Unit Control Code "V" not available with Voltage Code "1".
- 25: Unit Control Code "V" not available with Phase Code "1" in HE1.5 models.
- 26: Unit Control Code "G" (Terminal Strip) only available in HE05-, HE07-, HE10-, & HE1.5 with Motor Codes "EE", "AA", or "BB" (EC Motors).
- 27: Disconnect Code "F" not available for HE05-.
- 28: Unit Control Enhancement Codes "1", "2", "3", and "4" not available with HE05-.
- 29: Filter Code "F" not available with HE05-.
- 30: Filter Code "F" not available with Unit Control Enhancements Codes "1", "2", "3", & "4". Filter Monitor is provided with those options.
- 31: Paint and Customization Codes "W", "C", & "X" not available with HE05-.
- 32: Some units with Customization Code "X" are not safety listed.
- 33: Unit Control Code "W" (Onboard VFD Both Airstreams with IE5+ Ultra Premium Efficiency Motors) only available in HE-2X through HE-8X with motor codes "V", "W", "X", "Y", or "Z".
- 34: Motor Codes "UU", "UV", & "VU" not available in HE-2X with Unit Control Code "W" (Onboard VFD Both Airstreams with IE5+ Ultra Premium Efficiency Motors).
- 35: Voltage Code "8" (575V) not available with Unit Control Code "W" (Onboard VFD Both Airstreams with IE5+ Ultra Premium Efficiency Motors).
- 36: Unit Control Code "W" (Onboard VFD Both Airstreams with IE5+ Ultra Premium Efficiency Motors) not available with Voltage Code "8" (575V).
- 37: Vibration Isolation "N", & "S" only available with models HE-6X, HE-7X, & HE-8X.
- 38: Vibration Isolation "-" only available with models HE07-, HE10-, HE1.5, HE-2X, HE-3X, & HE-4X.

14.4 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-5X" | |
| "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 1) |
| "1" = Single Phase | |
| "3" = Three Phase | |

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

| | |
|---------------------------|--|
| Digit 14: | SA Horsepower (see Restrictions 1, 5, 6, 7, & 8) |
| "A" = 2 HP Low Speed | |
| "B" = 2 HP Medium Speed | |
| "C" = 2 HP High Speed | |
| "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 1, 5, 6, 7, & 8) |
| "A" = 2 HP Low Speed | |
| "B" = 2 HP Medium Speed | |
| "C" = 2 HP High Speed | |
| "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 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 9, 10, 11, 12, 13, & 14) |
| "A" = Standard Unit Control Wiring | |
| "V" = Onboard VFD Both Airstreams with IE3 Premium Efficiency Motors | |
| "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 15) |
| "-" = None (Standard) | |
| "F" = Filter Monitor Both Airstreams | |

| | |
|---|---|
| Digit 23: | Flexible Packaging (See Restrictions 16 & 17) |
| "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 18) |
| "L" = Listed | |
| "N" = Non-Listed | |

*NOTES:

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

Note: Not all options are available on every model.

MODEL NUMBER

DIGIT NUMBER

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--|--|--|--|
| L | E | | | | J | | | | | | | | | | | - | - | | | | | | | | | | | |
| 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: Phase Code "1" only available in Motor Codes "A", "B", "C", "D", "F", & "G".
- 2: Voltage Codes "4" & "8" only available with Phase Code "3" (Three-Phase).
- 3: Voltage Code "8" (575V) not available with Unit Control Code "W" (Onboard VFD Both Airstreams with IE5+ Ultra Premium Efficiency Motors)
- 4: Voltage Code "1" (120V) only available with Motor Codes "A", "B", & "C".
- 5: Motor Code "P" (7.5 HP High Speed) not available in LE-5X & LE-6X.
- 6: Motor Codes "Q" & "R" (all 10 HP Speeds) not available in LE-5X, LE-6X, & LE-8X.
- 7: Motor Code "M" & "N" (7.5 HP Low Speed and 7.5 HP Medium Speed) not available in LE-5X.
- 8: Motor Codes "A", "B", & "C" (2 HP) only available in LE-5X.
- 9: Unit Control Codes "V" & "W" only available with Motor Codes "G", "L", & "N" in LE-6X.
- 10: Unit Control Codes "V" & "W" only available with Motor Codes "G", "L", & "P" in LE-8X.
- 11: Unit Control Codes "V" & "W" only available with Motor Codes "G", "L", "P", & "R" in LE10X.
- 12: Unit Control Code "W" (Onboard VFD Both Airstreams with IE5+ Ultra Premium Efficiency Motors) not available with Voltage Code "8" (575V).
- 13: Unit Control Codes "V" & "W" not available with Voltage Code "1".
- 14: Unit Control Codes "V" & "W" only available with Motor Codes "C", "G", "L", & "M" in LE-5X.
- 15: Filter Code "F" not available with Unit Control Enhancements Codes "1", "2", "3", & "4". Filter Monitor is provided with those options.
- 16: Flexible Packaging Code "M" (Modular) not available in LE-5X.
- 17: Flexible Packaging Code "A" (Assembled) can ship in an enclosed trailer in LE-5X.
- 18: Some units with Customization Code "X" are not safety listed.

14.5 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 | |

***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. |

| | |
|-----------------------------------|--------------|
| 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 | |

| |
|---|
| 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. |

14.6 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.

14.6.1 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 14.6.0 MODEL ACS320 SHOWN



FIGURE 14.6.1 VFD KEYPADS IN EBOX

14.6.1.1 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.

14.6.1.2 View All Parameters

VFD must be powered up to view the parameters.

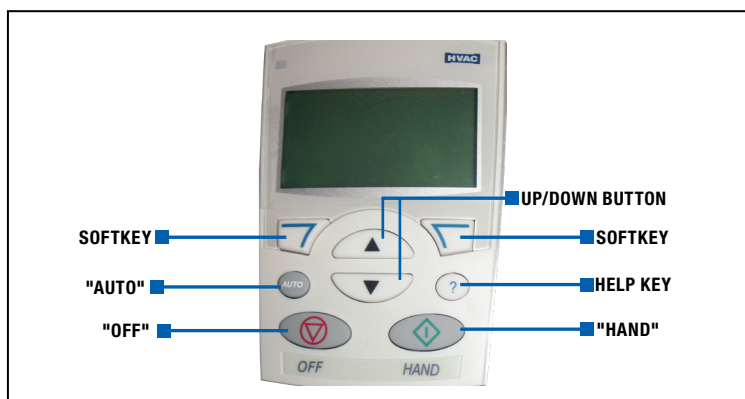


FIGURE 14.6.2 ABB KEYPAD BUTTONS

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.

14.6.1.3 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.

14.6.1.4 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 |

REFERENCE

ERV

Enhanced Commercial Controls

| 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 | |

14.6.1.5 Motor Specific VFD Parameter Settings

| ACS355— RT VFD PN | ACS320— IN VFD PN | VFD PH | MOTOR PN | MOTOR BRAND | PARAMETER # | | | | | |
|----------------------|----------------------|-----------|--------------------------|----------------|-------------|-------|------|------|------------|--------------------------|
| | | | | | 9905 | 9906* | 9908 | 9909 | 2003* | 3007** |
| | | | | | 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 $2.25 \times$ motor FLA. Parameter 9906 is $2 \times$ 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.

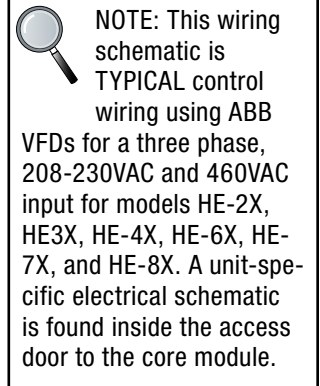


FIGURE 14.6.3 THREE PHASE ABB POWER WIRING SCHEMATIC

14.6.2 Lenze/Leeson SM Vector (SMV) VFD Information

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



FIGURE 14.6.4 SMV VFD SHOWN



FIGURE 14.6.5 VFD KEYPADS IN EBOX

14.6.2.1 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.

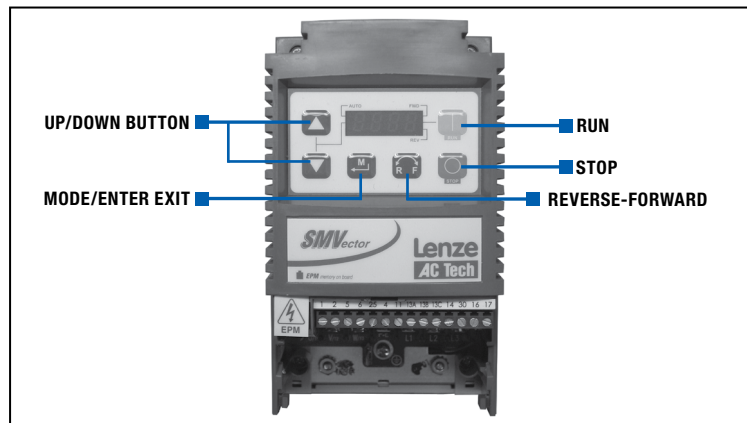


FIGURE 14.6.6 SMV KEYPAD BUTTONS

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

14.6.2.2 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. |

14.6.2.3 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 |

14.6.2.4 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.

14.6.2.5 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.

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

| SMV VFD PN | 3PH MOTOR PN | MOTOR BRAND | HP | FLA | VFD OUTPUT AMPS | PARAMETER # | |
|------------------|--------------------------|----------------------|-------|------|-----------------|------------------------|-----------------|
| | | | | | | P108 MOTOR OVERLOAD | P165 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 | 6.6 | 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 |

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

| SMV VFD PN | 3PH MOTOR PN | MOTOR BRAND | HP | FLA | VFD OUTPUT AMPS | PARAMETER # | |
|------------|--------------------------|-------------------|-------|------|-----------------|----------------|---------|
| | | | | | | P108 | P165 |
| | | | | | | 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.**



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, HE-7X, and HE-8X. A unit-specific electrical schematic is found inside the access door to the core module.

14.6.2.8 SMV VFD Wiring to Controller

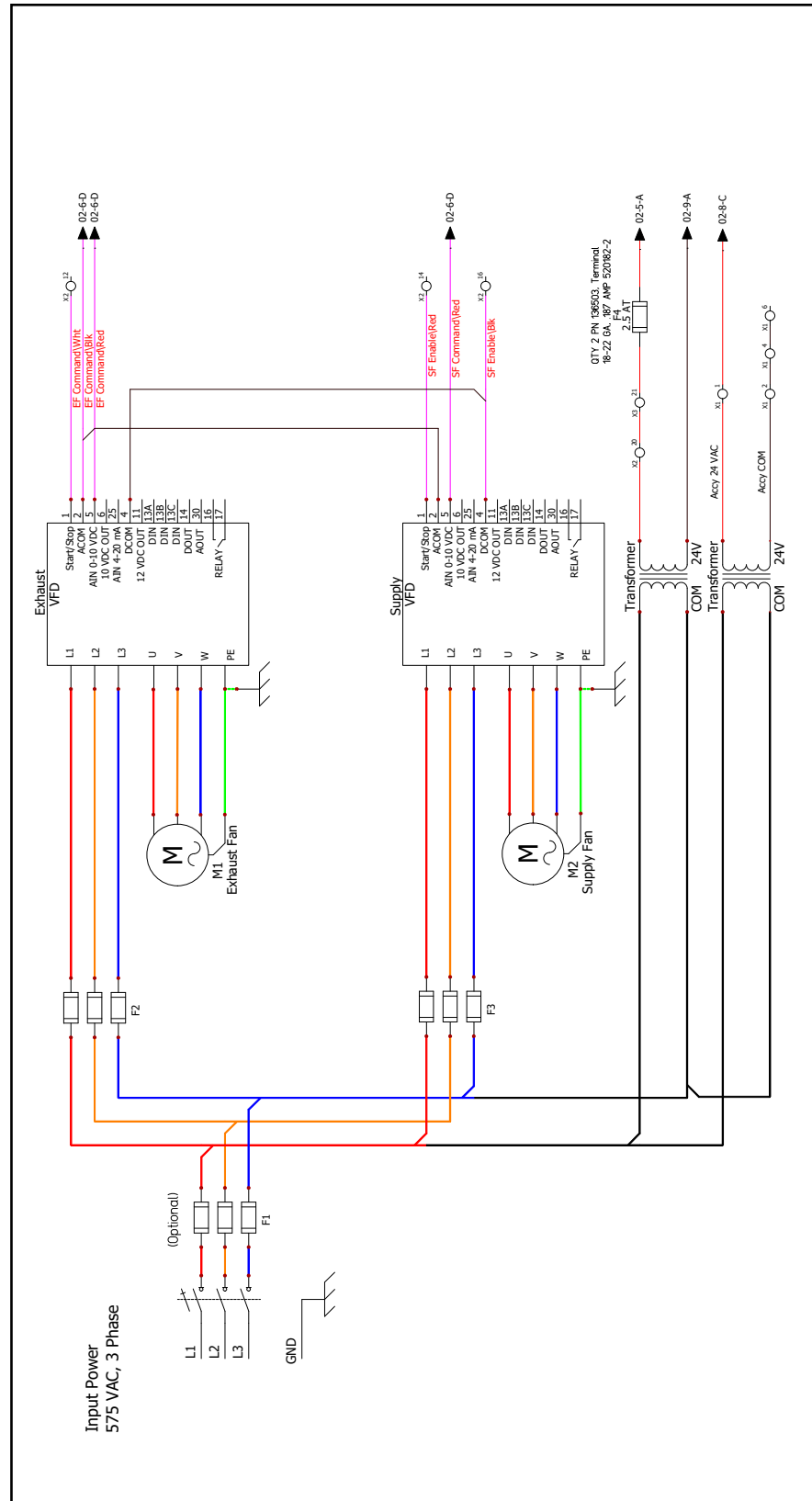


FIGURE 14.6.7 575V THREE PHASE SMV POWER WIRING SCHEMATIC

14.6.3 Yaskawa VFD Information

Yaskawa V1000 VFDs are supplied in indoor and rooftop units.



FIGURE 14.6.8 MODEL V1000 SHOWN

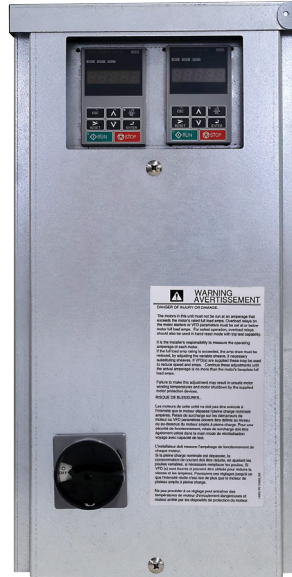


FIGURE 14.6.9 VFD KEYPADS IN EBOX

14.6.3.1 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.

14.6.3.2 View All Parameters

VFD must be powered up to view the parameters.



FIGURE 14.6.10 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.

14.6.3.4 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 setting. |
| 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 frequency setting. |
| D2-02 | Frequency Reference Lower Limit | 0% | HE and RPART–25.0% LE–16.7% DN–12.5% | Set per ERV type. Defines the minimum output frequency as a percentage of maximum frequency (E1-04 setting). |
| E1-04 | Maximum Output Frequency | 60 Hz | HE and RPART–60 Hz LE –90 Hz DN–120 Hz | Set per ERV type. Defines the maximum output frequency via the V/f pattern selected. |
| E1-05 | Maximum Voltage | Varies | 230V VFD: 230.0 V 460V VFD: 460.0 V | Set per input voltage rating of VFD. |
| E1-11 | Middle Output Frequency 2 | 0.00 Hz | HE and RPART–60 Hz LE–75 Hz DN–90 Hz | Set per ERV type. Defines points for V/f pattern. |
| E1-12 | Middle Output Frequency Voltage 2 | 0V | 230V VFD: 230.0 V 460V VFD: 460.0 V | Set per input voltage rating of VFD. Defines points for V/f pattern. |

| 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. |

14.6.3.5 208V Standard AC Motor Specific VFD Parameter Settings

| 14.6.3.5 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.

14.6.3.6 460V Standard AC Motor Specific VFD Parameter Settings

| 14.6.3.6 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.

14.6.3.7 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 | 20.0 s | Time to accelerate from 0 speed to maximum frequency. |
| C1-02 | Deceleration Time 1 | 10.0 s | 20.0 s | Time to decelerate from maximum frequency to 0 speed. |
| C2-01 | S-Curve Characteristic at Accel Start | Varies | 10.00 s | Smooths frequency output during transition from acceleration/deceleration to setpoint frequency operation. |
| C2-02 | S-Curve Characteristic at Accel End | 0.20 s | 10.00 s | |
| C2-03 | S-Curve Characteristic at Decel Start | 0.20 s | 10.00 s | |
| C2-04 | S-Curve Characteristic at Decel End | 0.00 s | 10.00 s | |
| 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 setting. |
| 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 frequency 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 | Maximum 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. |

REFERENCE

ERV

Enhanced Commercial Controls

| PARAMETER | NAME/SELECTION | YASKAWA V1000 DEFAULT SETTINGS | SETTINGS AS SHIPPED BY RENEWAIRE | COMMENTS |
|-----------|--|-----------------------------------|---|---|
| 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. |
| 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. |
| N8-51 | Acceleration/Deceleration Time Pull-In Current | Varies | 30% | Sets the d-axis current during accel. and decel. as a percentage of the motor rated current. |
| N8-55 | Load Inertia | 0 | 3 | Sets the ratio between motor inertia and the inertia of the connected machinery. |
| N8-62 | Output Voltage Limit | Varies | "230V VFD: 230.0 V 460V VFD: 460.0 V" | Limits the maximum voltage applied to the motor. |

*If no digital or analog signals will be used for the frequency setpoint, set B1-01 to function 0 to set frequency setpoint via keypad.

14.6.3.8 230V EC-Titanium Motor Specific VFD Parameter Settings*

| # OF PH AND VOLTAGE | RA- YASKAWA VFD PN | 3PH MOTOR PN | MOTOR HP | MOTOR BRAND | PARAMETER # | | | | | | |
|---------------------------|---------------------------|-------------------------|-------------------------|-------------------------|---------------------------------|---------------------------------|-------|-------|-------|-------|-------|
| | | | | | E5-02 | E5-03 | E5-05 | E5-06 | E5-07 | E5-24 | L3-06 |
| 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 | 1.11 | 14.4 | 54.4 | 58.9 | 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 | 1.11 | 14.4 | 54.4 | 58.9 | 96% |
| 3 PH 208V | 136838 | 106373 | 5 | Baldor EC Titanium | 3.7 | 10.5 | 0.41 | 13.5 | 47.8 | 70 | 67% |
| 3 PH 208V | 136839 | 106374 | 7.5 | Baldor EC Titanium | 5.5 | 17.4 | 0.18 | 6.6 | 20.4 | 62.8 | 73% |
| 3 PH 208V | 136839 | 106375 | 10 | Baldor EC Titanium | 7.5 | 22 | 0.12 | 5.5 | 19.2 | 75.2 | 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.

14.6.3.9 460V EC-Titanium Motor Specific VFD Parameter Settings*

| # OF PH AND VOLTAGE | RA- YASKAWA VFD PN | 3PH MOTOR PN | MOTOR HP | MOTOR BRAND | PARAMETER # | | | | | | |
|---------------------------|---------------------------|-------------------------|-------------------------|-------------------------|---------------------------------|---------------------------------|-------|-------|-------|-------|-------|
| | | | | | E5-02 | E5-03 | E5-05 | E5-06 | E5-07 | E5-24 | L3-06 |
| 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 | 138 | 70% |
| 3 PH 460V | 136842 | 106372 | 3 | Baldor EC Titanium | 2.2 | 3.7 | 4.4 | 57.7 | 217.7 | 118 | 86% |
| 3 PH 460V | 136843 | 106373 | 5 | Baldor EC Titanium | 3.7 | 5.3 | 1.65 | 54 | 191 | 140 | 75% |
| 3 PH 460V | 136844 | 106374 | 7.5 | Baldor EC Titanium | 5.5 | 8.7 | 0.7 | 26.5 | 81.4 | 125 | 98% |
| 3 PH 460V | 136845 | 106375 | 10 | Baldor EC Titanium | 7.5 | 11 | 0.47 | 29.1 | 76.7 | 149 | 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.

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14.6.3.10 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.

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 02-03. 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.



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



NOTE: This wiring schematic is TYPICAL control wiring using Yaskawa VFDs for a three phase, 208-230VAC and 460VAC input for models HE-2X, HE-3X, HE-4X, HE-6X, HE-7X, and HE-8X. A unit-specific electrical schematic is found inside the access door to the core module.

14.6.3.11 Yaskawa VFD Wiring to Controller

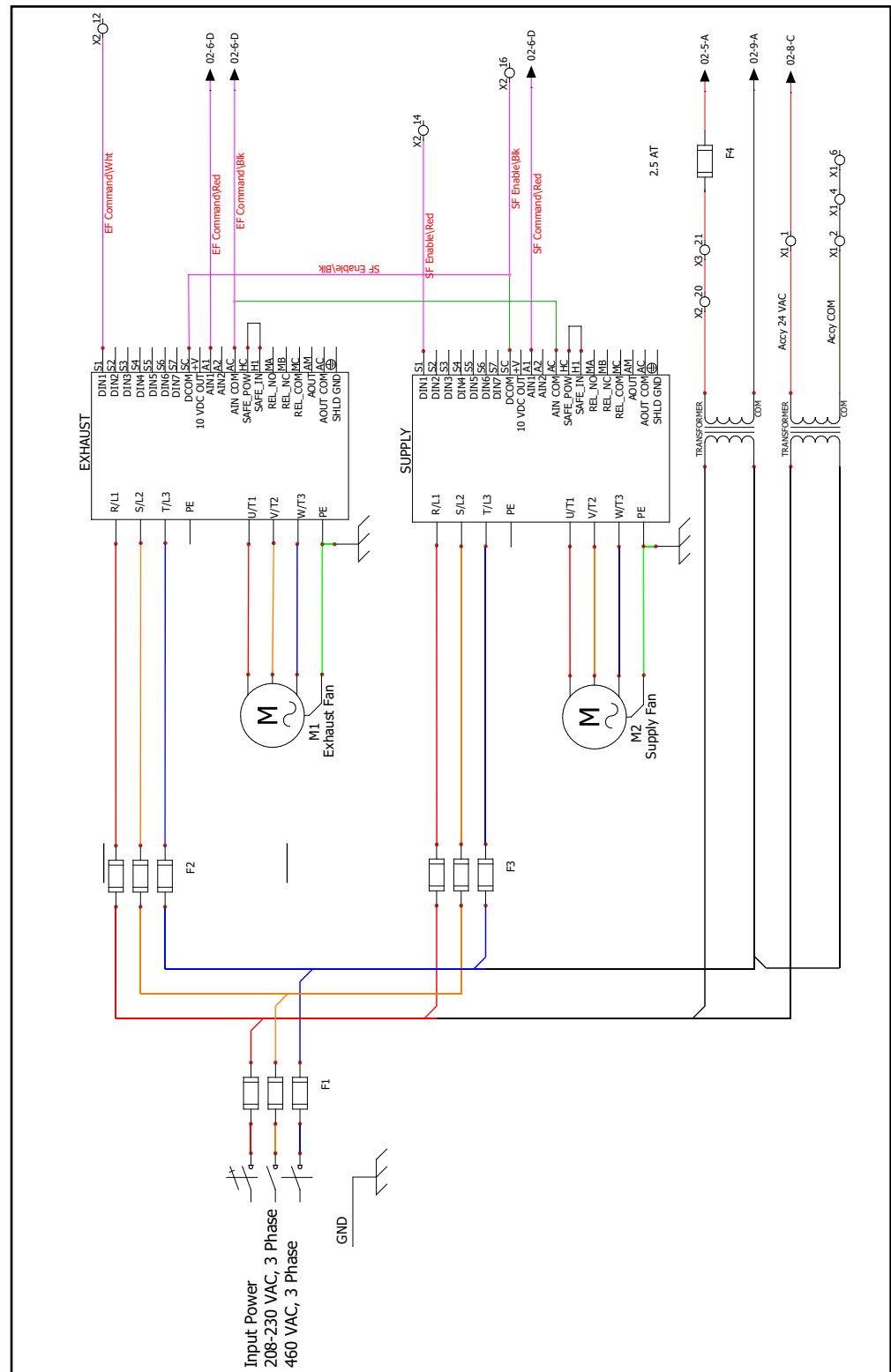


FIGURE 14.6.11 THREE PHASE YASKAWA POWER WIRING SCHEMATIC

15.0 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 be 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

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