RenewAire®
Energy Recovery Ventilation

FACTORY-INSTALLED i510 protec VARIABLE FREQUENCY DRIVES IN RENEWAIRE UNITS

Supplemental Manual for Options

FOR COMMERCIAL UNITS

LENZE i510 protec VFD

⚠ WARNING

RISK OF FIRE, ELECTRIC SHOCK, OR INJURY.
OBSERVE ALL CODES AND THE FOLLOWING:

1. Before servicing or cleaning the unit, switch power off at disconnect switch or service panel and lock-out/tag-out to prevent power from being switched on accidentally. More than one disconnect switch may be required to de-energize the equipment for servicing.
2. This installation manual shows the suggested installation method. Additional measures may be required by local codes and standards.
3. Installation work and electrical wiring must be done by qualified professional(s) in accordance with all applicable codes, standards and licensing requirements.
4. Any structural alterations necessary for installation must comply with all applicable building, health, and safety code requirements.
5. This unit must be grounded.
6. Use the unit only in the manner intended by the manufacturer. If you have questions, contact the manufacturer.
7. When cutting or drilling into unit, wall or ceiling, do not damage electrical wiring and other hidden utilities.
8. Do not re-wire the VFD(s) to control more than one motor per VFD.
9. Do not operate the motors in this unit above the motor's rated full load amps (FLA) as indicated on the unit's nameplate. Follow all local codes.

⚠ WARNING

Capacitors in VFDs Retain Charge

Allow 3 minutes after shutting off power to the VFDs to allow the capacitors in the VFD to fully discharge. Do not connect or disconnect wires at the VFD without waiting 3 minutes.

⚠CAUTION

DO NOT OPERATE VFD IN CONDITIONS OUTSIDE OF TEMPERATURE LIMITS. The manufacturer's ambient temperature limits for the VFDs are -22–140°F. It is not recommended that the VFDs be used under conditions above or below these temperature limits. Operate outdoor ERV units continuously if outdoor design conditions are not within the VFD operating temperature range or make other provisions to bring the VFD operating condition into the acceptable ambient temperature range. RenewAire commercial ERVs are VFD ready, in extreme climates consider field installing VFDs in a climate controlled indoor electrical cabinet.

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1.0 OVERVIEW

1.1 ABOUT i510 protec VARIABLE FREQUENCY DRIVES (VFDS)

This manual supplements RenewAire's standard Installation & Operation Manuals, which do not include information on units equipped with i510 protec VFDs. RenewAire uses i510 protec VFDs for some models, typically those using a 575VAC power supply when the VFD option is selected.

When the unit includes Enhanced or Premium Integrated Programmable Controls, all wiring and VFD parameters are preset and should not be changed unless instructed to do so by TSS. In units where the controls are not provided, follow these instructions to integrate the VFDs into your control strategy.

For complete ERV installation you will also need:

- **Standard Installation and Operation Manual for the ERV**—physical installation and duct connection, maintenance procedures, etc.
- **Supplemental Wiring Schematic Manual**—complete unit wiring diagrams.
- i**510 protec-Frequency Inverter Operating Instruction**s—Lenze users/installers manual. More information is available online in the Technical Library at www.lenze.com.

1.2 PLANNING YOUR INSTALLATION

⚠ WARNING

RISK OF FIRE, ELECTRIC SHOCK, OR INJURY.
OBSERVE ALL CODES AND THE FOLLOWING:

1. Before servicing or cleaning the unit, switch power off at disconnect switch or service panel and lock-out/tag-out to prevent power from being switched on accidentally. More than one disconnect switch may be required to de-energize the equipment for servicing.
2. This installation manual shows the suggested installation method. Additional measures may be required by local codes and standards.
3. Installation work and electrical wiring must be done by qualified professional(s) in accordance with all applicable codes, standards and licensing requirements.
4. Any structural alterations necessary for installation must comply with all applicable building, health, and safety code requirements.
5. This unit must be grounded.
6. Use the unit only in the manner intended by the manufacturer. If you have questions, contact the manufacturer.
7. When cutting or drilling into unit, wall or ceiling, do not damage electrical wiring and other hidden utilities.
8. Do not re-wire the VFD(s) to control more than one motor per VFD.
9. Do not operate the motors in this unit above the motor's rated full load amps (FLA) as indicated on the unit's nameplate. Follow all local codes.

NOTE: VFD(s) in this unit can be operated in many ways. This Manual provides only an outline of common methods.

⚠CAUTION

DO NOT OPERATE VFD IN CONDITIONS OUTSIDE OF TEMPERATURE LIMITS. The manufacturer's ambient temperature limits for the VFDs are -22–140°F. It is not recommended that the VFDs be used under conditions above or below these temperature limits. Operate outdoor ERV units continuously if outdoor design conditions are not within the VFD operating temperature range or make other provisions to bring the VFD operating condition into the acceptable ambient temperature range. RenewAire commercial ERVs are VFD ready, in extreme climates consider field installing VFDs in a climate controlled indoor electrical cabinet.

1.2.1 “ON” and “SPEED” Signals

VFD operation in this unit is dependent on two signals: an “ON” signal and a “SPEED” (or REFERENCE) signal. The sources and types of these signals can vary. If the ERV is equipped with dampers the “ON” signal to the VFD comes from the end switch on the damper. If the ERV is not equipped with dampers, the “ON” signal comes from an external control connected directly to the VFD. When an “ON” signal is received by the VFD, it starts the motor. The VFD then operates the blower at the speed established by the “SPEED” signal. The “SPEED” signal is often provided by an external control, but in some applications “pre-set” speeds are set inside the VFD and are selected by external switches or relays.

1.2.2 Principles of External Control

This ERV can be operated by various external control devices including remote switch or relay, digital time clock with relay, occupancy sensor with relay, and carbon dioxide sensor with relay and analog output. These devices are commonly known as 2-wire, 3-wire, and 4-wire devices. A Building Management System (BMS) can control this ERV through relay contacts and with 0–10vdc or 4–20mA analog inputs.

The external control devices can be connected to this ERV to operate each blower independently
or
for one blower to act as leader and the other blower to act as follower. In leader-follower mode, a single external switch or relay calls for operation and the leader VFD sets “SPEED” to internal presets, or in response to an analog input signal. The follower VFD then operates at either exactly the same speed, at an offset above or below the leader’s speed, or at a scaled speed.

The VFD’s are pre-programmed at the factory so only a few parameters need change for a specific installation.

1.2.3 Connecting External Controls

If this ERV is equipped with damper(s), the “ON” signal is connected to the terminal strip in the electrical enclosure (E-box). If this ERV is not equipped with damper(s), and has 2 VFDs, the “ON” signal is connected directly to the VFDs. The SPEED” signals are always connected directly to the VFD(s).

1.2.4 Wire Routing

Route input power cables, motor cables and control cables separately to decrease electromagnetic interference caused by the rapid changes in the drive output voltage. Where control cables must cross power cables make sure that they are arranged at an angle as near to 90 degrees as possible.

Power cables and control cables can be brought into the bottom of the e-box attached to the ERV unit or through the bottom of the unit itself. There are plugged holes to run control wires and power wires between the electrical box and the unit interior, marked on the interior of the ERV unit and another plugged hole in the unit compartment divider to run wires to VFDs in the other airstream compartment if needed.

In some configurations the VFD and/or VFD protective guard may need to be removed to access the control wire hole plug to run wires. A label is located in the ERV on the left interior wall indicating the power and control wire hole plug locations. Bring wires out from the top or bottom of the VFD mounting bracket and not through the mounting bracket window when routing wires if the VFD is mounted over the hole plug.

After the wires are run, apply caulk around the wires at wire bushings used between the electrical box and ERV unit and between compartments in the unit to prevent air leakage between these compartments.

1.2.5 Purpose of Providing Keypad

Each VFD has a keypad which is accessible at the e-box while the unit is operating.

You can check the status of the VFD at the keypad, and make changes to the VFD parameters at the keypad. You can manually control the VFD from the keypad during start-up and commissioning.

VFD is factory programmed to cover most needs but some parameters will need to be set to interact with the external control system.

Access the keypad(s) through the removable cover to the e-box.

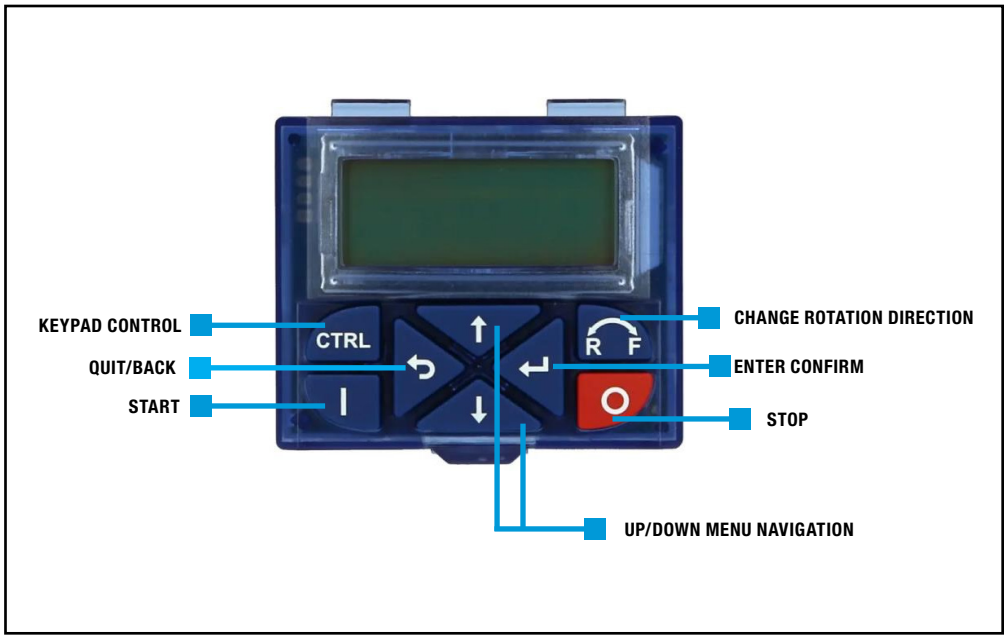


FIGURE 1.2.0 i510 protec KEYPAD BUTTONS

2.0 INSTALLATION

2.1 WIRING OPTIONS

2.1.1 “ON” Signal Connections

Depending on features installed, connect ON-SIGNAL connections either to the VFDs themselves, or to the low-voltage terminal strip in the ERV e-box. See schematics below.

Install a jumper between terminals 2 and 3 to use the ERV’s on-board 24VAC power. Do this when the external control(s) have isolated contacts that don’t provide any voltage, as in the top two examples. Make no connections between terminals 1 & 2 and terminals 3–5 if the external control has a voltage output to provide the “ON” signal. This voltage must be 24VAC.

⚠ WARNING

Capacitors in VFDs Retain Charge

Allow 3 minutes after shutting off power to the VFDs to allow the capacitors in the VFD to fully discharge. Do not connect or disconnect wires at the VFD without waiting 3 minutes.

2.2 WIRING SCHEMATICS

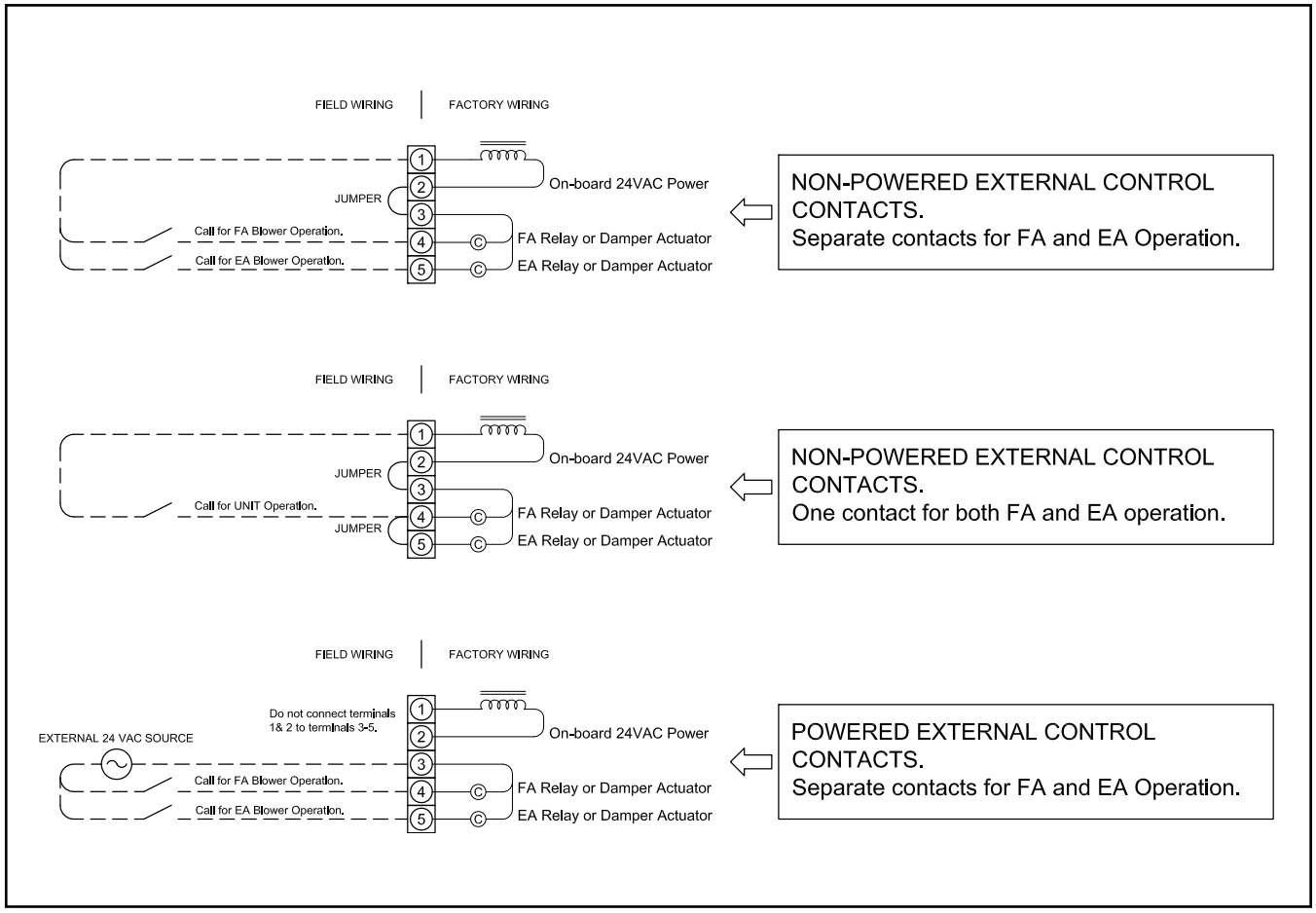


FIGURE 2.2.0 CONNECTION OF “ON” SIGNALS TO LOW-VOLTAGE TERMINAL STRIP IN ERV E-BOX

See Figure 2.2.0 for Relay or Damper Actuator Connection alternatives.

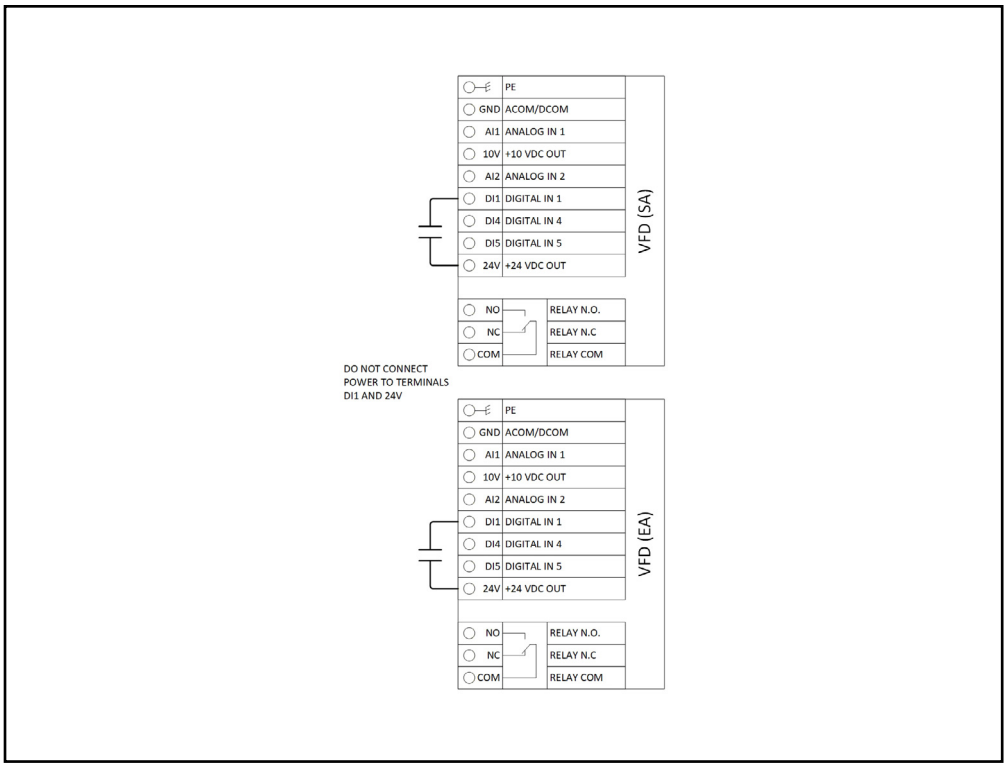


FIGURE 2.2.1 FACTORY CONTROL WIRING: ON SIGNALS CONNECTED TO EACH VFD

Alternative Control Wiring: “ON” signal connected directly to one VFD, passed to second VFD from terminals NO and COM.

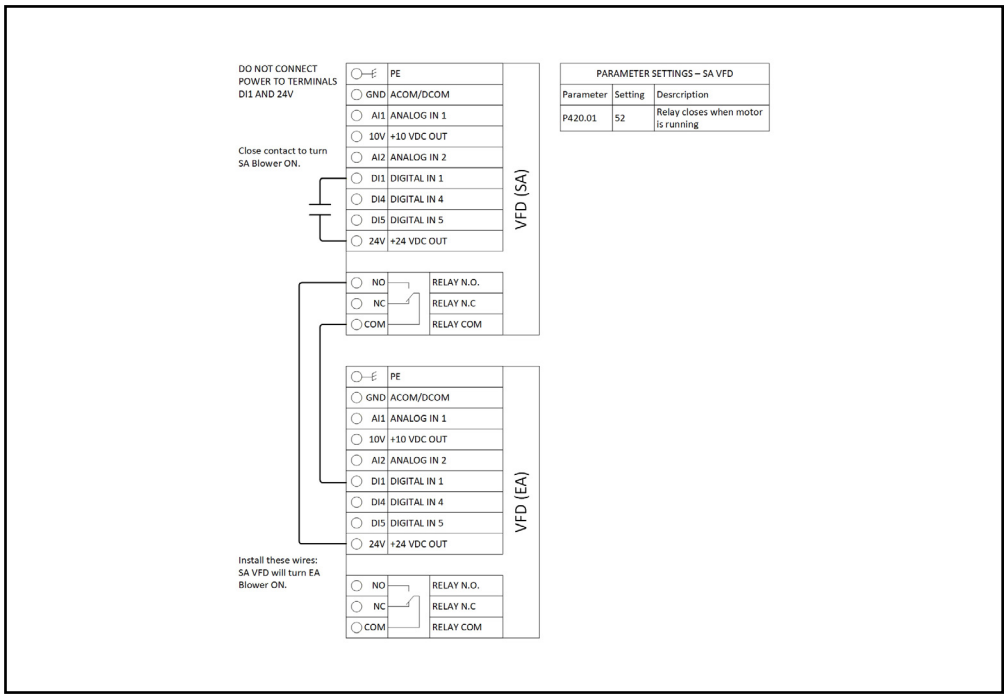


FIGURE 2.2.2 ALTERNATE CONTROL WIRING

2.2.1 Analog Inputs to Provide the "SPEED" Signal

Analog inputs are connected as shown below. It may be necessary to scale the response of the VFD to the analog "SPEED" signal.

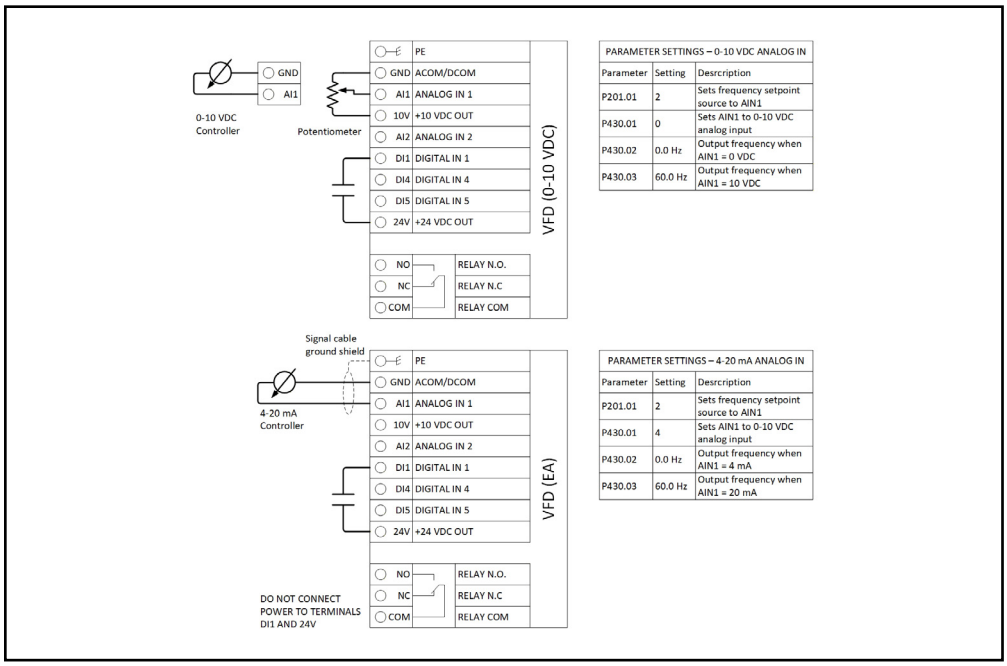


FIGURE 2.2.3 EXAMPLES OF ANALOG INPUT CONNECTIONS

NOTE: All wiring for analog signals connected to the VFDs should be double- or single-shielded twisted-pair cable. Ground the shield at one end of the cable only. The grounding clamp on the VFD may be used.

2.2.2 Wiring Two VFDs for Leader-Follower Operation

One VFD can provide the "SPEED" signal to a second VFD, as shown below.

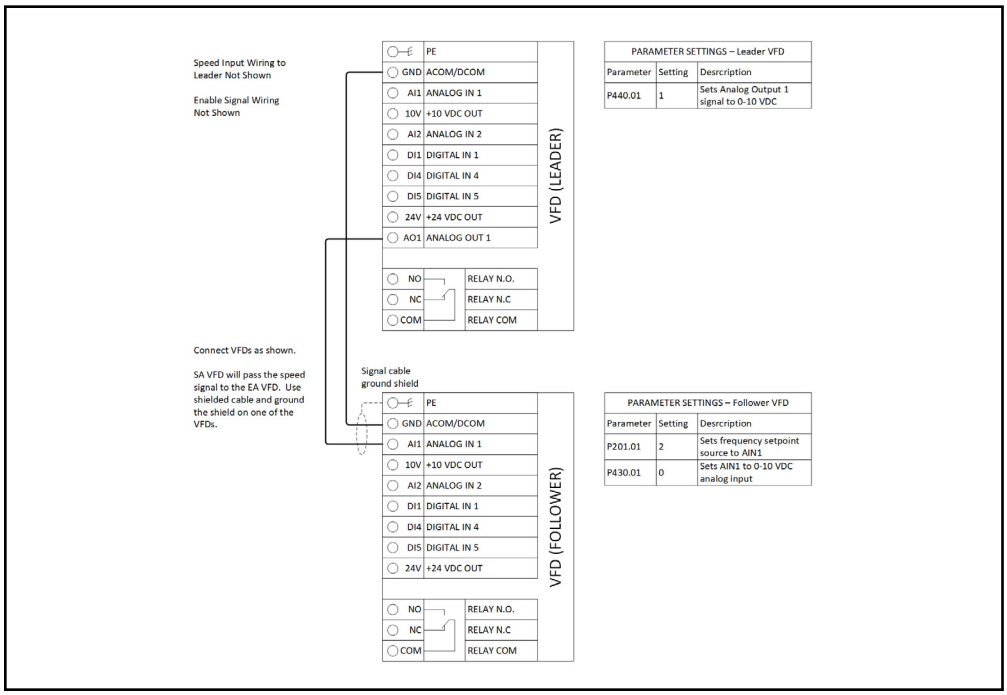


FIGURE 2.2.4 LEADER-FOLLOWER CONNECTION

NOTE: If the SA VFD is controlled by an analog input signal, it is likely that the SA VFD's response to the analog input will need to be scaled. See "Lenze i510 protec frequency inverter operating instructions"—Lenze user's/installer's manual.

Parameter LENZE i510 protec frequency inverter operating instructions can be used to scale the Analog Output of the Leader VFD in order to offset or correct the speed of the Follower VFD.

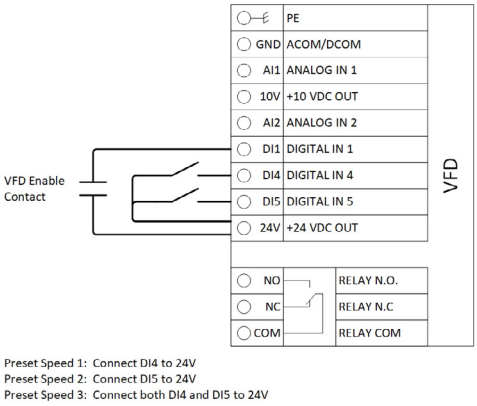
If both VFDs are to run at the same speed, no scaling parameters need be applied to the EA VFD since it is controlled as a "Follower."

NOTE: Pre-set speeds override any Frequency (Speed) inputs.

2.2.3 Using VFD Presets for the “SPEED” Signals

The VFD can be programmed with 3 pre-set speeds. Switches can then be used to direct the VFD to operate at one of those speeds. See i510 protec manuals for additional options. Leader-follower wiring can also be used to make a second VFD operate at the same speed as the first VFD.

Install Leader-Follower connection wiring if desired to operate second VFD at the same speeds.



PARAMETER SETTINGS – Preset Speeds		
Parameter	Setting	Desrcription
P450.01	30 Hz	Sets Preset 1 to 30 Hz
P450.02	45 Hz	Sets Preset 2 to 45 Hz
P450.03	60 Hz	Sets Preset 3 to 60 Hz

FIGURE 2.2.5 USE OF 2 SWITCHES TO COMMAND THE VFD TO OPERATE AT ANY OF 3 PRE-SET SPEEDS (SPDT SWITCH ALTERNATIVELY)

The desired preset speeds are set by Parameters P450.01–P450.03. Values as shipped from factory are shown below:

PARAMETERS	VALUE AS SHIPPED FROM RENEWAIRE	PARAMETER DESCRIPTION
P450.01	30 Hz	Preset Speed #1
P450.02	45 Hz	Preset Speed #2
P450.03	60 Hz	Preset Speed #3

2.2.4 Use with a CO2 Controller

If both VFDs are to run at the same speed, no scaling parameters need be applied to the EA VFD in this example since it is controlled as a "Follower." If it is required that the VFDs shut off when CO2 levels drop below a setpoint, connect the Normally Open contacts of the CO2 controller (relay terminals) to terminals DI1 and 24V of the SA VFD. Adjust the operating parameters of the CO2 controller to set the relay setpoint.

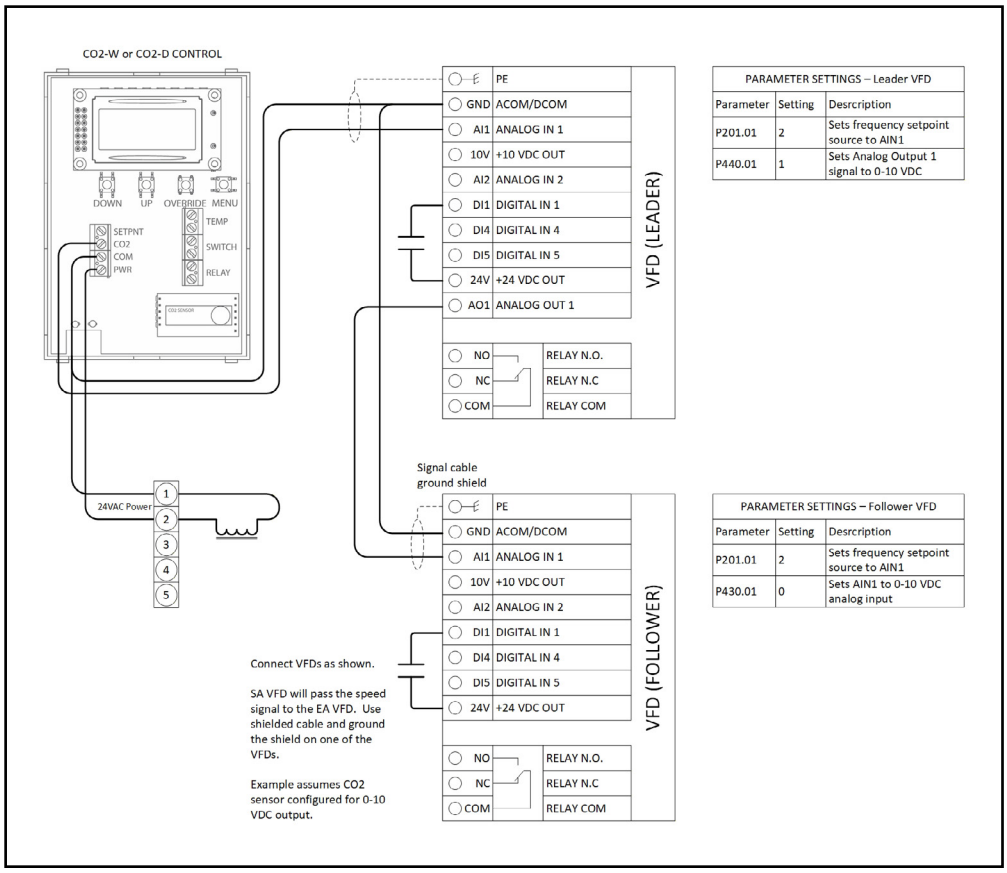


FIGURE 2.2.6 EXAMPLE OF OPERATION OF 2 VFDS BY A CO2 CONTROLLER

3.0 OPERATION

3.1 INSTALLATION INSTRUCTION

3.1.1 Use with a Building Management System

The i510 protec drive can be connected to an external control system. The drive supports Modbus RTU, CANopen®. See the i510 protec Drives User's Manual for details on connecting to an external control system.

3.2 INITIAL START-UP

3.2.1 To Start ERV

1. Turn off power to the ERV at its Disconnect Switch.

   Make sure the ERV is wired to provide an "ON" signal. (See Control Wiring Schematics later in this Manual.) You may need to install a temporary jumper at the ERV or VFD low-voltage terminal strip.
   VFDs are set at the factory to respond to the keypad. If an external controller providing an analog input is connected to the VFD, you may want to temporarily disconnect it.
   Close ERV doors and main cover for the E-box; leave keypads accessible.

2. Turn on power to the ERV at its Disconnect Switch.
   Wait for keypad display to appear.

3. Test both VFD:
   Provide an enable command from terminals 1 & 2 of the ERV control terminal strip. This will ensure any damper, if installed, are open prior to powering up motors. The VFD should start operating at 15 Hz. adjust speed via analog signals or by adjusting frequency parameters as needed. Confirm the motor amps are no greater than the motor FLA as listed on the unit nameplate using parameter P103.00

4. To transfer control of the VFD to a control system:
   Press the "STOP" button on the keypad. Motor should stop running.
   Change the VFD parameters as required for the specific controls system (see "Control Connections" and "VFD parameters," below, for examples; see also the i510 protec Manuals.)

3.2.2 Motor Protection by the VFD(s)

Each VFD in this unit protects one motor against overload. It is critical that the VFD Motor Overload be properly set using the Full Load Amps (FLA) of the motor. The following Parameter must be set correctly and individually for each VFD to match the characteristics of the motor attached to it:

- P306.01—Overload Selection = 0 (Heavy Duty)
- P308.01—Max Load for 60 s = 125%
- P323.00—Rated Motor Current = Motor Nameplate FLA
- P324.00—Max Current = 150%

These parameters are set at RenewAire to match the motor controlled by the VFD. In most cases they should not be changed.

3.3 SETTINGS

3.3.1 VFD Parameter Overview

VFD Parameters are instructions that the Variable Frequency Drives follow. They can be adjusted by using the keypads on the VFDs. In some control configurations, they will need to be changed from the settings as shipped in the unit to interface with your control system.

3.3.2 To View All VFD Parameters

VFD must be powered up —The remote keypad will likely display “STOP”.

1. Press the ENTER button to access the parameters. The display will ask for a password to be entered. To skip, press ENTER key again. Parameter write access will remain restricted.
2. “PIN ERR” and “LEVEL 1” will be briefly displayed, then the parameters will be accessible.
3. Use the UP and DOWN buttons to navigate to the desired parameter group. Press the ENTER button to access parameters within that group.
4. Use the UP and DOWN buttons to navigate to a specific parameter. Press the ENTER button to view the current setting of the parameter.
5. Press the BACK button to go back a level.
6. Repeat process as needed to view additional parameters.

3.3.3 To Change VFD Parameters

VFD must be powered up—The remote keypad will likely display “STOP”.

1. Press the ENTER button to access the parameters. The display will ask for a password to be entered.
2. Use the UP button to enter the password. The default password is 5.
3. Press the ENTER button to confirm the password. If the password in incorrect, “PIN ERR” and “LEVEL 1” will be briefly displayed. If the incorrect password is entered 10 times, the VFD must be power cycled prior to entering the password again.
4. After the password has been entered, parameters can be accessed and modified.
5. Use the UP and DOWN buttons to navigate to the desired parameter group. Press the ENTER button to access parameters within that group.
6. Use the UP and DOWN buttons to navigate to a specific parameter. Press the ENTER button to view the current setting of the parameter.
7. To change the parameter setting, use the UP and DOWN buttons to modify the parameter. Press the ENTER button to confirm the new parameter value.
8. Press the BACK button to go back a level.
9. Repeat process as needed to view/modify additional parameters.
10. Ensure that parameter P732.00 is set to 1—Enabled. Otherwise, parameter settings will not be retained after power cycle.
11. Parameter access will be restricted again 10 minutes after password has been entered or after power cycle.

3.3.4 Summary Table of Commonly Used Parameters

	NAME/SELECTION	DEFAULT	VALUE AS SHIPPED FROM RENEWAIRE	FUNCTION
P200.00	Control selection	0: Flexible I/O	0: Flexible I/O	0 = Sets the source of the "START" command is digital I/O 1 = Sets the source of the "START" command to exclusively use remote keypad"
P201.01	F-setp.source	2: Analog input 1	1: Keypad (no commercial controls) 2: Analog input 1 (with commercial controls)	1 = Sets the frequency setpoint source to the remote keypad 2 = Sets the frequency setpoint source to Analog Input 1
P208.01	Mains voltage	0: 230 Veff	6: 600 Veff	
P210.00	Min. frequency	0.0 Hz	15.0 Hz	Sets the minimum output frequency
P211.00	Max. frequency	60.0 Hz	HE & RPART: 60.0 Hz LE: 90.0 Hz	Sets the maximum output frequency
P220.00	Acceleration 1	5.0 s	10.0 s	Sets the time to accelerate from 0 Hz to maximum frequency
P221.00	Deceleration 1	5.0 s	10.0 s	Sets the time to decelerate from maximum frequency to 0 Hz
P300.00	Motor control mode	6: VFC open loop	6: VFC open loop	Defines the method that the VFD controls the motor
P302.00	V/f Characteristic shape	0: Linear	1: Quadratic	Defines the V/f characteristic shape for adaptation to different load profiles
P303.01	Base voltage	600 V	575 V	Motor nameplate base voltage
P303.02	Base frequency	60.0 Hz	60.0 Hz	Motor nameplate base frequency
P306.01	Overload Selection	0: Heavy Duty	0: Heavy Duty	Sets the overload monitoring to I2t
P308.01	Max.load for 60s	150%	125%	Sets as a percentage of motor FLA the allowable overload current for 60 s
P323.00	Rated. Mot curr.	VFD dependent	Set per motor nameplate	Motor nameplate FLA current rating
P324.00	Max. current	200%	150%	Maximum possible output current limited to 125% of motor FLA
P420.01	Relay function	51: Ready for operation	52: Operation enabled	Sets relay output function to close when motor is running
P430.01	AI1 input area	0: 0–10 VDC	0: 0–10 VDC	Sets Analog Input 1 to 0–10 VDC input
P430.02	AI1 freq @ min	0.0 Hz	15.0 Hz	Scales 0 VDC analog signal to 15 Hz frequency setpoint
P430.03	AI1 freq @ max	60.0 Hz	HE & RPART: 60.0 Hz LE: 90.0 Hz	Scales 10 VDC analog signal to maximum frequency setpoint
P440.01	AO1 output area	1: 0–10 VDC	1: 0–10 VDC	Sets Analog Output 1 to 0–10 VDC output
P440.02	AO1 function	1: Output frequency	1: Output frequency	Sets Analog Output 1 function to output frequency
P450.01	Freq. preset 1	20.0 Hz	30.0 Hz	Sets preset frequency #1
P450.02	Freq. preset 2	40.0 Hz	45.0 Hz	Sets preset frequency #2
P450.03	Freq. preset 3	60.0 Hz	60.0 Hz	Sets preset frequency #3
P732.00	Auto-Save EPM	0: Inhibit	1: Enable	Enables the VFD to automatically write the parameter values to the memory module any time a parameter is changed, otherwise modified values will not be retained upon power cycle

3.3.5 Scaling and Response to Analog Inputs

The most likely reason to control the VFD from an analog signal is automatically change the amount of outside air ventilation to meet the actual needs for each time period.

If one or both of the VFDs will be controlled by an analog input from an external Control Device (e.g. a CO2 controller or a Building Management System), you may need to "scale" the rate of response of the VFD(s) to the rate of change of the analog signal. Usually only one of the two VFDs requires scaling.

We need to introduce two concepts relating to the amount of outside air ventilation needed in the building:

- The "ACTION LEVEL" (AL) is the level of measurement of indoor air quality or occupancy at which the ERV Unit should start to deliver more than the "Design Minimum Supply Airflow;"
- The "MAXIMUM RESPONSE LEVEL" (MRL) is the level of measurement of indoor air quality or occupancy at which the ERV Unit should be operating at the "Design Maximum Supply Airflow."

3.3.6 Additional Job Information Needed

1. **Input Type (IT)** of analog signal: VDC or mA
2. **Minimum Signal Value (MinSV)** of the analog signal: e.g. 0VDC or 4mA.
3. **Maximum Signal Value (MaxSV)** of the analog signal: e.g. 10VDC, 20mA
4. **Measurement Range (MR):** the range of the values that can be measured by the Control Device (e.g. a controller set to measure CO2 from 0ppm to 1100ppm).
5. **Action Level Signal (ALS):** the value of the analog signal corresponding to the "Action Level."
6. **Maximum Response Level Signal (MRLS):** the value of the analog signal corresponding to the "Maximum Response Level."
7. **Maximum Hertz (MaxH):** VFD frequency setting at maximum design airflow. This was determined during the initial balancing process.
8. **Minimum Hertz (MinH):** setting corresponding to minimum design airflow, again determined during the initial balancing process.
9. Whether ventilation should stop whenever air quality is below the "Action Level," or should continue at minimum design airflow.

3.3.7 Application Example: CO2 Controller

Consider the following building provided with outside air ventilation by an ERV Unit:

- The engineer requires a minimum outside air ventilation rate of 700 CFM at all times in order to control the level of indoor air pollutants generated by the furnishings.
- To address the higher level of ventilation required when the building is occupied, the engineer specifies that a CO2 controller shall be used to increase ventilation if CO2 levels rise above 600ppm.
- The engineer specifies a maximum outside air ventilation rate of 1500 CFM and expects this to restrain CO2 levels to 1000ppm.

In short, the ventilation requirements call for the ERV Unit to be running at no less than 700CFM at all times. When CO2 levels increase above 600ppm, the airflow volume should increase, reaching a maximum of 1500CFM at a CO2 level of 1000ppm.

Turning to the equipment itself:

- The CO2 controller is set up to deliver a linear 0–10vdc signal over a measurement range of 0–1100ppm.
  Therefore: the "INPUT TYPE" (IT) = VDC.
  The Minimum Signal Value (MinSV) = 0VDC.
  The Maximum Signal Value (MaxSV) = 10VDC.
  The Measurement Range (MR) = 0–1100ppm.
- During Balancing we recorded VFD frequencies of 50hz at 1500 CFM, and 20hz at 700CFM.
  Therefore: "Maximum Hertz (MaxH) = 50.
  "Minimum Hertz" (MinH) = 20.
- From the engineer's requirements:
  the "Action Level" = 600ppm;
  the "Maximum Response Level" = 1000ppm.

We must calculate the Action Level Signals (ALS), the value of the analog signal coming from the controller when CO2 = 600ppm:

$$ALS = MinSV + \left[\frac{ACTION\_LEVEL}{MR} \text{ X } MaxSV \right]$$

Or, in this example:

$$ALS(VDC) = 0(VDC) + \left[\frac{600(ppm)}{1100(ppm)} \text{X } 10(VDC) \right] = 5.5(VDC)$$

We must calculate the Maximum Response Level Signal (MRLS): the value of the analog signal coming from the controller when CO2 = 1000ppm:

$$MRLS = MinSV + \left[\frac{MRL}{MR} \text{ X MaxSV} \right]$$

Or, in this example:

$$MRLS(VDC) = 0(VDC) + \left[\frac{1000(ppm)}{1100(ppm)} \text{X } 10(VDC) \right] = 9.1(VDC)$$

Now we can set the VFD parameters that will scale the response of the VFD to the inputs from the CO2 controller (see table on page 15):

Set Parameter P201.01, Frequency Setpoint Source, to "2". This sets Analog Input 1 as the frequency setpoint.

Set Parameter P210.00, Minimum Frequency, to 0.0 Hz. The VFD will never operate the motors below this speed.

Set Parameter P211.00, Maximum Frequency, to 60.0 Hz. The VFD will never operate the motors above this speed.

Set Parameter P430.02, AI1 Frequency at Min, to the following calculated value:

$$P430.02 = P210.00 - \left[\frac{P211.00 - P210.00}{MRLS - ALS} \text{ X } (ALS - MinSV \right]$$

Or, in this example:

$$P430.02(hz) = 20(hz) - \left[\frac{(50 - 20)(hz)}{(9.1 - 5.5)(VDC)} \text{ X } (5.5(VDC) - 0(VDC))\right] = -25.8(hz)$$

Do not be concerned if this P160 is a negative number or is lower than the desired minimum—Parameter 102 will maintain VFD speed above this level.

Set Parameter 161 Speed at Maximum Signal to the following calculated value:

$$P430.03 = P211.00 + \left[\frac{(P211.00 - P210.00)}{(MRLS - ALS)} \text{ X } (MaxSV - MRLS)\right]$$

Or, in this example:

$$P430.03(hz) = 50(hz) + \frac{(50 - 20)(hz)}{(9.1 - 5.5)(VDC)} \text{X } (10 - 9.1(VDC)) = 57.5(hz)$$

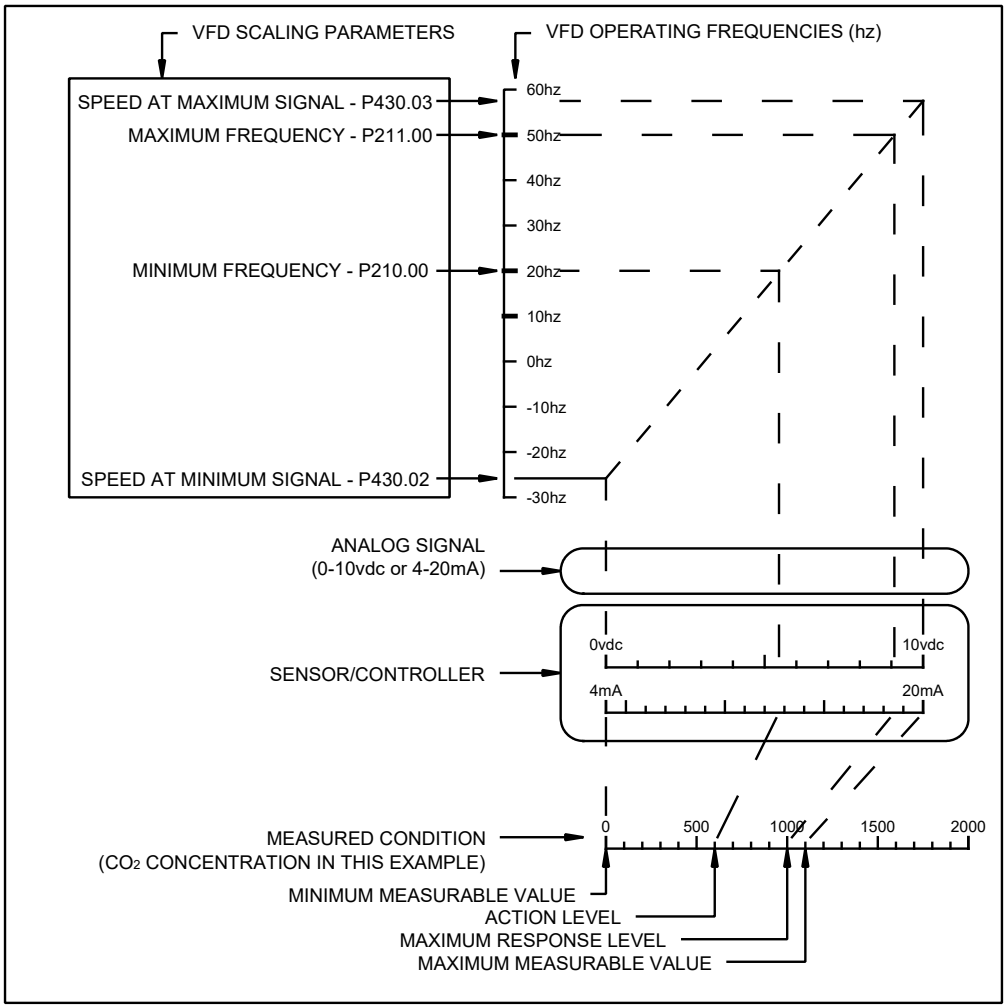
Do not be concerned that this setting is higher than the desired maximum—Parameter P211.00 will cap VFD speed below this level.

Ventilation can continue at analog signals below the CO2 concentration Action Level.

In this application example the ERV Unit is intended to run continuously.

PARAMETERS USED IN SCALING		
Parameters		**Values**
P430.01	AI1 Input Area	1 = Keypad 2 = Analog Input 1 3 = Analog Input 2 5 = Network 11–25 = Frequency Preset 1–15
P210.00	Minimum Frequency	Input the value in hertz
P211.00	Maximum Frequency	Input the value in hertz
P430.02	AI1 Frequency at Min	Input the value in hertz. This value may be negative but this does not call for reverse rotation.
P130.03	AI1 Frequency at Max	Input the value in hertz. This value may be higher than the desired maximum blower speed.

3.3.8 Examples of VFD Scaling



4.0 FACTORY ASSISTANCE

For questions about applications not covered in this manual, and for questions specific to the Lenze VFDs, contact Lenze Technical Support at 800-217-9100 or (508) 278-9100.

A listing of Lenze support and service contacts can be found on the Internet at www.lenze.com/en-us/support and selecting Aftersales Service.

Lenze manuals are available as PDFs at www.lenze.com/en-us/support and selecting Documentation.

Lenze offers training courses on their VFDs; navigate to www.lenze.com/en-us/support and selecting Documentation.

For questions about applications covered in this manual, and for questions about how the VFDs are installed in your RenewAire ERV unit, contact RenewAire Customer Support at (800)-627-4499.

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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