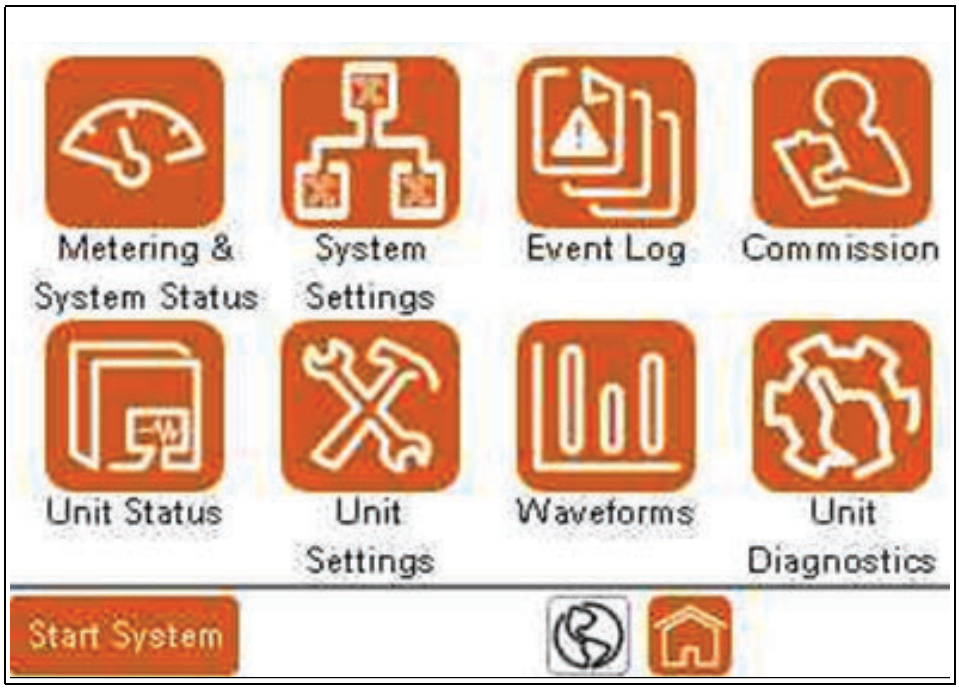
PowerLogic™

AccuSine Firmware Version 004

User Manual

PKR30257-00
01/2023



Schneider Electric

Safety Information

Important information

Read these instructions carefully and look at the equipment to become familiar with the device before trying to install, operate, service or maintain it. The following special messages may appear throughout this bulletin or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.

The addition of either symbol to a “Danger” or “Warning” safety label indicates that an electrical hazard exists which will result in personal injury if the instructions are not followed.

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

⚠ DANGER

DANGER indicates a hazardous situation which, if not avoided, **will result in** death or serious injury.

⚠ WARNING

WARNING indicates a hazardous situation which, if not avoided, **could result in** death or serious injury.

⚠ CAUTION

CAUTION indicates a hazardous situation which, if not avoided, **could result in** minor or moderate injury.

NOTICE

NOTICE is used to address practices not related to physical injury.

Please note

Electrical equipment should be installed, operated, serviced and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

A qualified person is one who has skills and knowledge related to the construction, installation, and operation of electrical equipment and has received safety training to recognize and avoid the hazards involved.

Legal information

You can download the latest documentation from our website at https://www.se.com/en/download.

Chapter 1 Safety Precautions

Installation, wiring, testing and service must be performed in accordance with all local and national electrical codes.

⚠⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E in the USA, CSA Z462, or applicable local standards.
- This equipment must be installed and serviced only by qualified electrical personnel.
- Do not exceed the device's ratings for maximum limits.
- Ground equipment using the ground connecting point provided before turning on any power supplying this device.
- Turn off all power supplying this device and the equipment in which it is installed before working on the device or equipment.
- After removing power, wait for 15 minutes to allow the capacitors to discharge prior to opening the doors or removing covers.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors, and covers before turning on power to this equipment.
- Carefully inspect the interior for tools left behind before closing and sealing the door.
- Verify the rating of the neutral conductor for each unit in the system is greater than the neutral current limit setting.

Failure to follow these instructions will result in death or serious injury.

⚠ WARNING

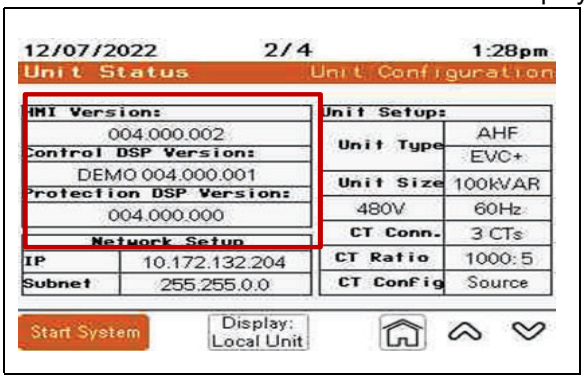
POTENTIAL COMPROMISE OF SYSTEM AVAILABILITY, INTEGRITY, AND CONFIDENTIALITY

- Change default passwords at first use to help prevent unauthorized access to device settings and information.
- Disable unused ports/services and default accounts, where possible, to minimize pathways for malicious attacks.
- Place networked devices behind multiple layers of cyber defenses (such as firewalls, network segmentation, and network intrusion detection and protection).
- Use cybersecurity best practices (for example: least privilege, separation of duties) to help prevent unauthorized exposure, loss, modification of data and logs, interruption of services, or unintended operation.
- Restrict physical access to unit to authorized personnel only.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Chapter 2 Introduction

This manual covers units that have HMI, Control and Protection firmware version 004.xxx.xxx. To determine the Firmware version installed in the unit select Unit Status from Home screen. Go to screen 2/4 Unit Configuration. HMI Version Control DSP Version and Protection DSP Version must display 004.xxx.xxx.



Active Harmonic Filter PCS+

Active Harmonic Filters (AHF) are static power electronic products. AHF employ digital logic and IGBT semiconductors to synthesize a current waveform that is injected into the electrical network to cancel harmonic currents caused by nonlinear loads. AHF employ current transformers to measure the load current to determine the content of harmonic current present. By injecting the synthesized current, network harmonic currents are greatly mitigated. Thus, reducing the heating effects of harmonic current and reducing voltage distortion to permit other equipment to operate properly and enjoy a long product life span.

AHF also have the ability to correct for poor displacement power factor (DPF) and for mains current balancing. DPF correction can be provided for either leading (capacitive) or lagging (inductive) loads that cause poor DPF. Mains current balancing is achieved by measuring the negative sequence current present and injecting the inverse negative sequence current to balance the current for the upstream network.

Power Factor Correction PFV+

AccuSine PFV+ are static power electronic products. It employs digital logic and IGBT semiconductors to synthesize a current waveform that is injected into the electrical network to cancel load induced poor displacement power factor (DPF), phase current unbalance, and flicker. The DPF correction can be provided for either leading (capacitive) or lagging (inductive) loads that cause poor DPF. The mains current balancing is achieved by measuring the negative sequence current present and injecting the inverse negative sequence currents to balance the current for the network. Flicker control is provided by rapid detection and injection of reactive current (VARs) to help to prevent the reactive current from overloading the network that causes rapid voltage deviations identified as flicker.

AccuSine PFV+ also have the ability to monitor the network voltage on which they are connected and determine the proper amount of VARs to either raise the network voltage or lower it. AccuSine PFV+ will inject leading VARs to raise the voltage and lagging VARs to lower the voltage. The entry of appropriate parameters will keep the network within its stated voltage tolerance level.

Active Harmonic Filter PCSn

Active Harmonic Filters (AHF) are static power electronic products. AHF employ digital logic and IGBT semiconductors to synthesize a current waveform that is injected into the electrical network to cancel harmonic currents caused by nonlinear loads. AHF employ current transformers to measure the load current to determine the content of harmonic current present. By injecting the synthesized current, network harmonic currents are greatly mitigated. Thus, reducing the heating effects of harmonic current and reducing voltage distortion.

AHF also have the ability to correct for poor displacement power factor (DPF) and for mains current balancing. DPF correction can be provided for either leading (capacitive) or lagging (inductive) loads that cause poor DPF. Mains current balancing is achieved by measuring the negative and zero sequence current present and injecting the inverse of those currents to balance the current for the upstream network.

AccuSine PCSn can be powered by three phase conductors to provide corrective current for Line-to-Line connected loads or by three phase conductors and neutral to provide correction for Line-to-Line and Line-to-Neutral connected loads. The amount of correction can be selected to provide neutral current for up to three times the phase current correction. The neutral wiring must be sized appropriately based on the selected neutral current correction.

AccuSine PCSn can be either a main unit or an expansion unit. A minimum of one main unit is required per system. A main unit is easily identified as it is equipped with a HMI. The HMI permits viewing and changing parameter settings of complete system or any other unit in the parallel system. The unit has a means for connecting CT secondary wiring. Expansion units are also available to allow operating a system in parallel for additional capacity. Adding an expansion unit to a system only requires the connection of power cabling and a paralleling cable (shielded Cat 5e or greater).

EVC+

Electronic VAR control (EVC) are static power electronic products that employ digital logic and IGBT semiconductors to synthesize a current waveform that is injected into the electrical network to cancel load induced poor displacement power factor (DPF), phase current unbalance, and flicker. DPF correction can be provided for either leading (capacitive) or lagging (inductive) loads that cause poor DPF. Mains current balancing is achieved by measuring the negative sequence current present and injecting the inverse negative sequence currents to balance the current for the network. Flicker control is provided by rapid detection and injection of reactive current (VARs) to prevent the reactive current from overloading the network that causes rapid voltage deviations identified as flicker.

EVC also have the ability to monitor the network voltage on which they are connected and determine the proper amount of VARs to either raise the network voltage or lower it. EVC will inject leading VARs to raise the voltage and lagging VARs to lower the voltage. Entry of appropriate parameters will keep the network within its stated voltage tolerance level.

Additionally, EVC+ has the ability to cancel harmonic currents caused by nonlinear loads in a similar operating model to AHF to a limited capacity, focusing on dominant lower order harmonic frequencies 5th, 7th, 11th, and 13th. By injecting the synthesized current, network harmonic currents are greatly mitigated, thus reducing the heating effects of harmonic current and reducing voltage distortion.

Chapter 3 Operation

This chapter provides information operation of the active filter. It covers additional settings that you can configure after commissioning. It includes descriptions of parameters and information available on the display as well as event logs.

Front Panel LEDs

The LED on the front panel of the unit indicates the status of the unit.

Model	LED indication	Status description
AccuSine PCS+ and PVF+	ON	+24 VDC power supply board is operating
AccuSine PCSn & EVC+	Blinking red	Unit is not operating due to active event
	Blinking red with pattern	Provides the unit identification in conjunction with the **Parallel Unit Status** screen. For more information, refer “Parallel Unit Status” section.
	Steady orange	USB is connected to the unit
	Steady green	Unit is operating
	Blinking green/yellow	Unit is running in standby mode
	Steady yellow	Unit is stopped

Home Screen

Home Screen

When first energized, the HMI displays the Home screen. To return to the Home screen, press the Home icon at the bottom on any of the screens. To change parameters, you must be logged in as an Admin level user. From the Home screen, you can access the following:

- **Metering & System Status**: Displays screens that provide measured values of the unit, system, and electrical distribution system, as well as the system status.
- **System Settings**: Allows changes to be made to the system parameters. When operating in parallel, all systems settings must match for each unit in the parallel system.
- **Event Log**: Displays a list of all events that occurred with the unit.

- **Commission**: Provides a step-by-step procedure to commission the unit.

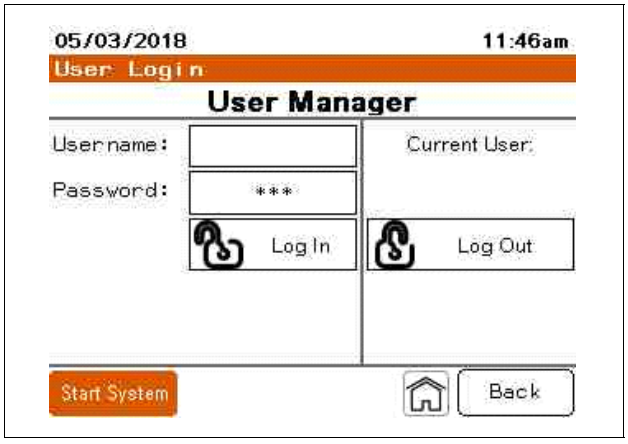
  NOTE: Once the unit is commissioned, you do not need to perform this procedure again.
- **Unit Status**: Displays information for the unit.
- **Unit Settings**: Allows changes to the unit parameters.
- **Waveforms**: Displays screens that graphically represent various values measured.
- **Unit Diagnostics**: Provides a method for testing the operation of the unit and the performance of the system.
- **Start System/Stop System**: This icon toggles between Start System when inactive and Stop System when active. Start System activates the unit, or in parallel operation, it starts the entire system. Stop System stops the unit, or in parallel operation, it stops the entire system.
- **Globe Icon**: Allows the HMI language to be changed.

User Login

User Login is required to change various the parameters and to perform the unit or system commissioning. The User Login Manager can be accessed by going to System Settings or Unit Settings and selecting Login at the top of the screen. The Login Manager can also be accessed by attempting to change a parameter without prior logging. Step 3 of the commissioning procedure also provides access to the User Manager.

For information on changing the password and setting up users, refer to “Set Up Users with the User Manager” on page 70. To log in:

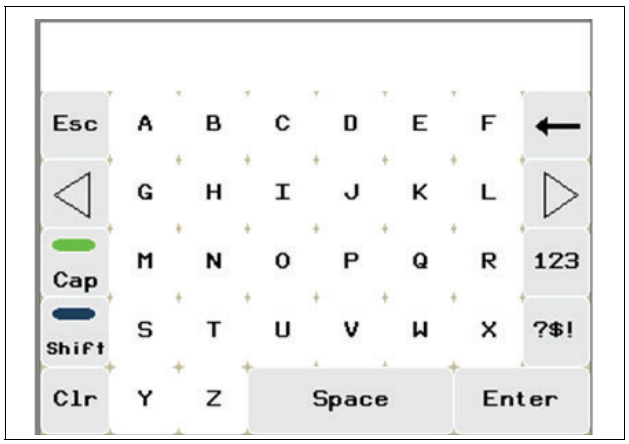
1. Press **User Login**.



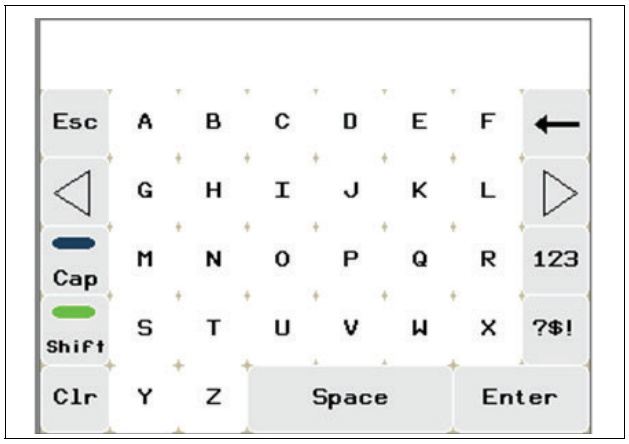
2. Press the Username field. Type your user name on the keypad and press Enter.
3. Press the Password field and enter your password.
4. Press **Log In**.

On Screen Keyboard

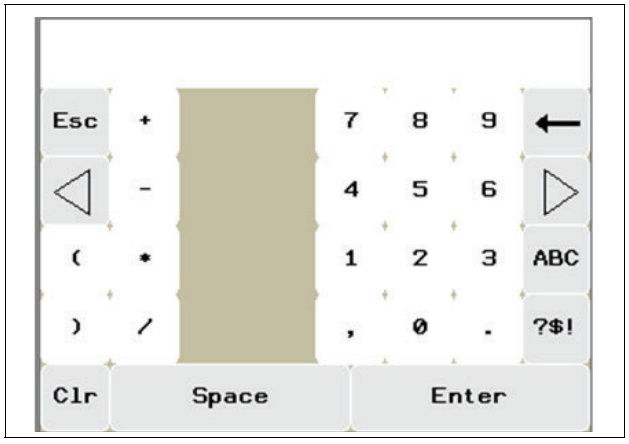
To enable Caps Lock function, press **Cap** icon. A green oval indicator above the **Cap** icon indicates that the Cap Lock function is enabled. To disable Caps Lock function press **Cap** to change indicator to blue.



Press **Shift** icon to enable shift which will change the case of the next letter entered. A green oval indicator above the **Shift** icon indicates that the shift function is enabled.

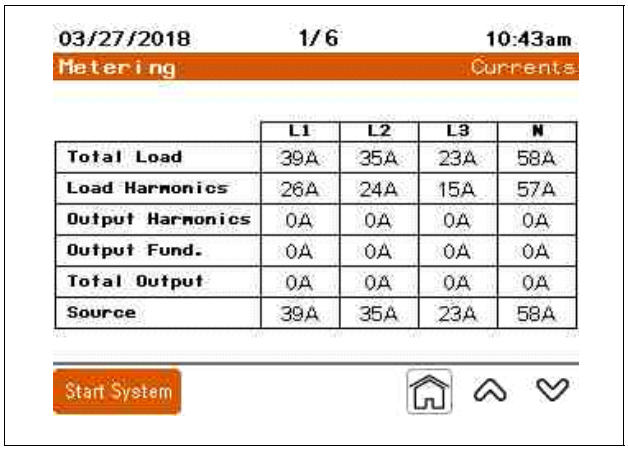


Press icon **123** to display number keyboard. Press **ABC** on number keyboard to return to letter keyboard.



Metering & System Status

Currents



Total Load: Total load current in amperes RMS.

Load Harmonics: Total load harmonic current in amperes RMS.

Output Harmonics: Harmonic current output of the unit in amperes RMS for harmonic mitigation.

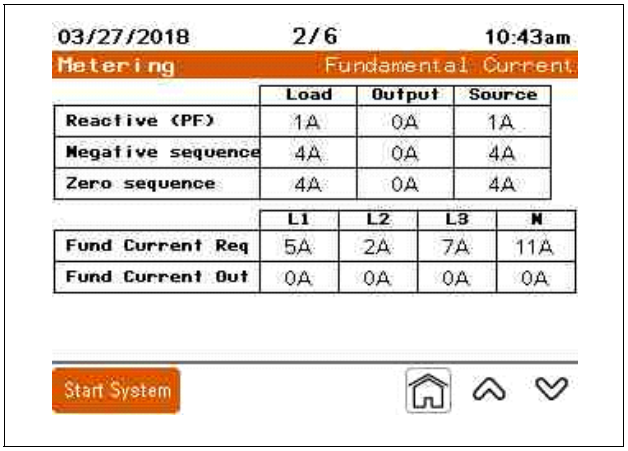
Output Fund: Output current at the fundamental frequency for power factor correction and/or load balancing.

Total Output: Total output current of the unit in amperes RMS.

Source: Total source current in amperes RMS.

NOTE: Neutral current (N) values are only displayed when the unit is installed with 3 CTs.

Fundamental Current



	Load	Output	Source
Reactive (PF)	1A	0A	1A
Negative sequence	4A	0A	4A
Zero sequence	4A	0A	4A

	L1	L2	L3	N
Fund Current Req	5A	2A	7A	11A
Fund Current Out	0A	0A	0A	0A

Reactive (PF): Displays positive sequence reactive currents of the load, system output, and source in amperes RMS.

Negative sequence: Negative sequence current of the load, system output, and source in amperes RMS.

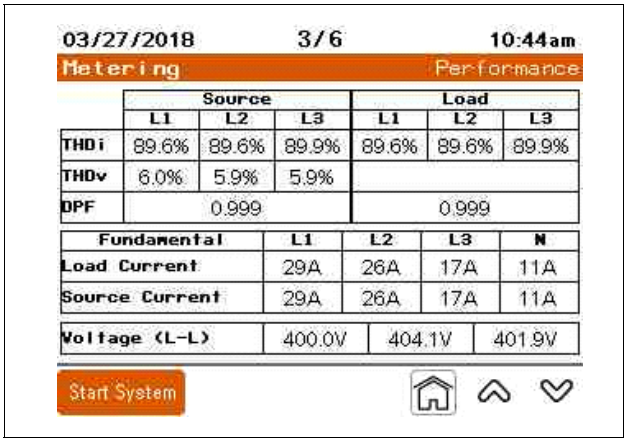
Zero Sequence: Zero Sequence current of the load, system output and source. Zero sequence is only available when 3 CTs are installed.

Fund current Req: Fundamental current required per phase to achieve set point or to achieve a balanced network with unity PF.

Fund Current Out: Displays system fundamental current produced per phase.

NOTE: Neutral current (N) values are only displayed when the unit is installed with 3 CTs.

Performance



	Source			Load		
	L1	L2	L3	L1	L2	L3
THDi	89.6%	89.6%	89.9%	89.6%	89.6%	89.9%
THDv	6.0%	5.9%	5.9%			
DPF	0.999			0.999		

Fundamental	L1	L2	L3	N
Load Current	29A	26A	17A	11A
Source Current	29A	26A	17A	11A
Voltage (L-L)	400.0V	404.1V	401.9V	

THDi: Total Harmonic Distortion of the current as a percentage of fundamental per phase at the Source and the Load.

THDv: Total Harmonic Distortion of the voltage as a percentage of fundamental per phase at the Source.

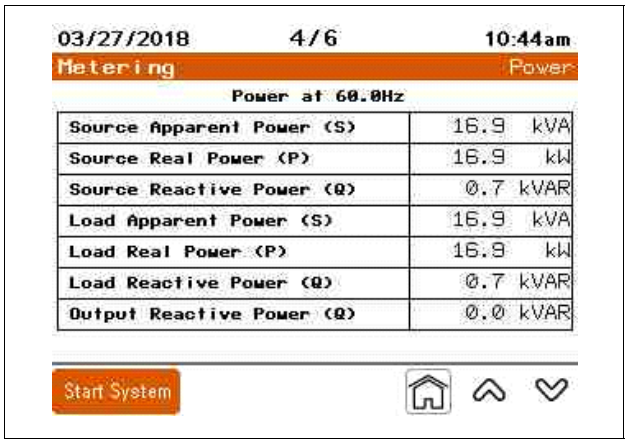
DPF: Displacement Power Factor of the Source and Load.

Load Current: Fundamental current of the Load per phase.

Source Current: Fundamental current of the source per phase.

Voltage (L-L): Line-to-Line voltage per phase.

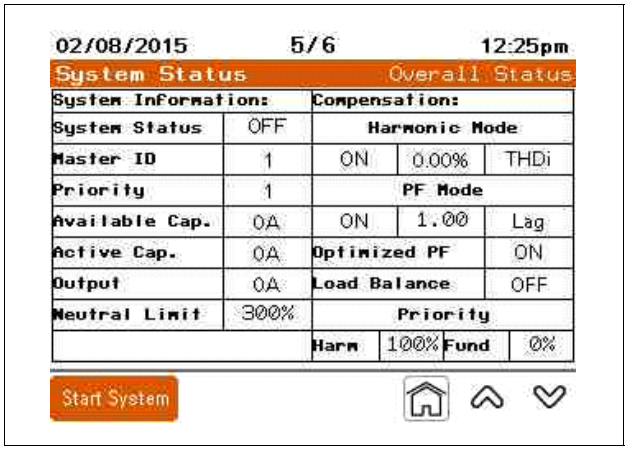
NOTE: Neutral current (N) values are only displayed when the unit is installed with 3 CTs.



This screen displays three-phase power values of the source, load, and output of the active harmonic filter.

Overall Status Screen

The Overall Status screen provides information on the status of the unit. When connected in parallel with other active filters, it provides information on the status the entire parallel system.



System Information

System Status: Indicates the status of the system.

Master ID: Indicates the unit ID of the unit that is currently acting as the Master.

Priority: Indicates the priority group that is operating.

Available Cap: Indicates the total capacity of units in the parallel system currently available, which includes all units currently running (actively compensating) and units in stand-by.

Active Cap: Indicates the total capacity of units in the parallel system currently running (actively compensating).

Output: Indicates the output current of the system in amperes.

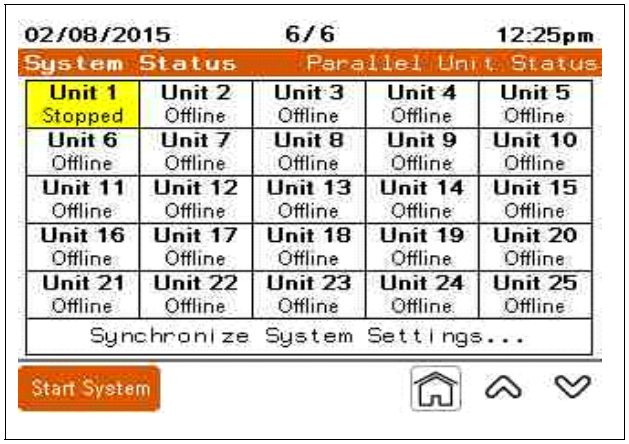
Neutral Limit (PCSn only): The amount of neutral current corrected in percent of unit rating.

Compensation

Indicates the modes of operation that are enabled and setpoints for each mode.

Parallel Unit Status

Parallel Unit Status displays when Network is selected in **System Settings** > **Parallel Configuration**.



The Parallel Unit Status provides general operating condition of each unit in the parallel system.

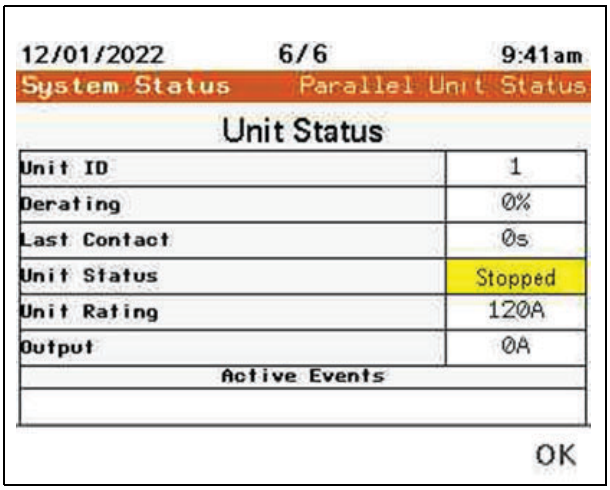
By touching the unit number:

- PCS+ and PFV+ units displays popup on the selected unit to assist in identifying which unit is assigned each ID. The unit associated with the Unit number will display a popup on the HMI.
- PCSn and EVC+ units, the front panel LED will also flash indicating the unit ID associated.

Pressing and holding the unit number will cause a screen with details regarding that specific unit.

Press the number field of new unit ID to change the unit ID.

Result: The numeric keypad appears.



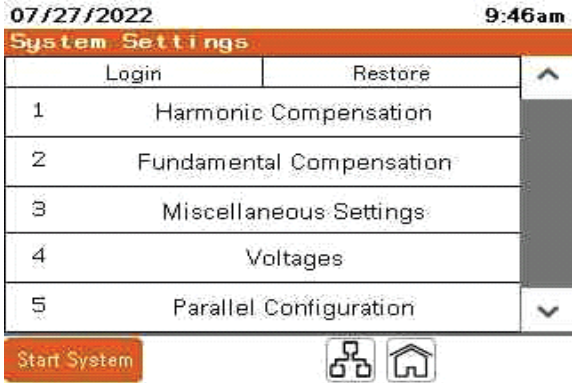
New Unit ID can be used to change the unit ID.

New Priority Group can be used to change the unit's priority group.

A banner of any Active Events will be displayed at the bottom of the screen.

System Settings

System Settings



Within System Settings, you can change parameters for the system. When the unit is part of a parallel system, all of these settings for each unit must match. Changes to System settings are synced to all units that are on-line in a parallel system.

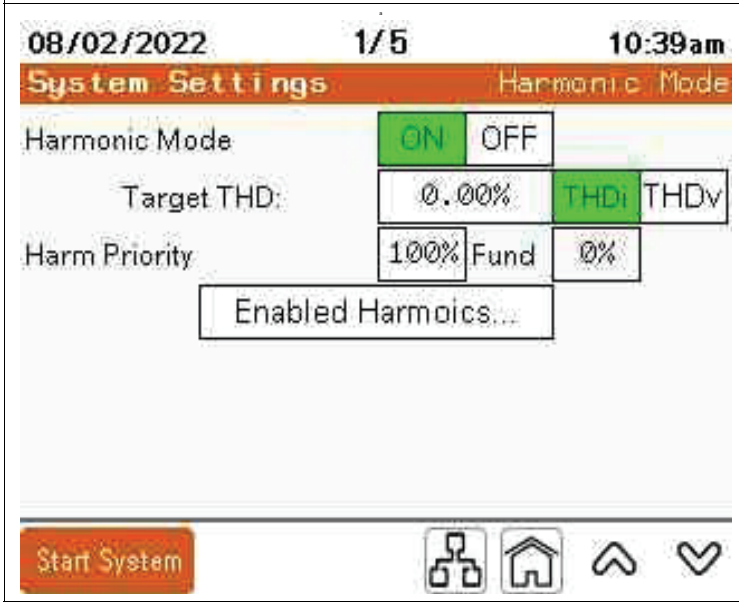
Press **Login** to display the Login screen.

Press **Restore** if you want to reset parameters to the default values.

Press the screen name to access a screen.

Harmonic Compensation

Harmonic Compensation



Harmonic Mode: Activates/Deactivates the harmonic correction mode.

Target THD: Allows a target THDi or THDv to be achieved at the source. Setting the Target THD to 0% the unit will inject as much harmonic correction to achieve the best THD value. PCSP and PCSn system sized for full harmonic correction will typically result in source THDi of less than 5% in a system that is installed with all application requirements and recommendations. If a system requires and 8% THDi at the source by setting the Target THDi to 8% the harmonic current output of the unit be reduced so

the set target is achieved. If the application goal is to achieve a 5% THDv, the system will inject sufficient harmonic current correction to achieve the THDv set point. The best THDv value that can be achieved is based on the unloaded THDv value of the source.

Harm Priority: Sets the percentage of the unit's output to harmonic mitigation when the system is at or over maximum capacity.

NOTE: Harmonic Priority is not available for EVC+ or PFV+. Power Factor correction is the highest priority for these unit types.

Fund: Displays the percentage of the unit's rating that is dedicated to correcting fundamental current as the result of the Harmonic Priority setting. This is mathematically calculated based on the Harmonic Priority setting.

Harmonic Priority only affects the unit when harmonic mode and at least one other mode of operation is enabled. When the total current output of the active filter required exceeds the unit's rating, harmonic priority determines which mode has priority. With harmonic priority set to 100%, the unit outputs all current necessary to correct the harmonic content. Any output capacity left over is used for correcting PF and/or load balancing.

Conversely, with harmonic priority set to 0%, the unit outputs the fundamental current required for correcting power factor and/or load balancing. Any capacity left over is used for harmonic mitigation. When the unit is sized to correct both harmonic current and fundamental currents, PF, and/or load balancing, this parameter has no effect.

The total percentage of adding Harmonic priority to fundamental priority can be greater than 100%. The rated output current of the active filter is equal to the rms-sum of the harmonic and reactive current injected. The following table provides a representation of this relationship. All values are in percentage of rated output current.

Use the following formulas to calculate this current relationship:

$$\mathbf{I}_{O/P}^2 = \mathbf{I}_h^2 + \mathbf{I}_r^2$$

- or -

$$\mathbf{I}_{O/P} = \mathbf{SQRT}(\mathbf{I}_h^2 + \mathbf{I}_r^2)$$

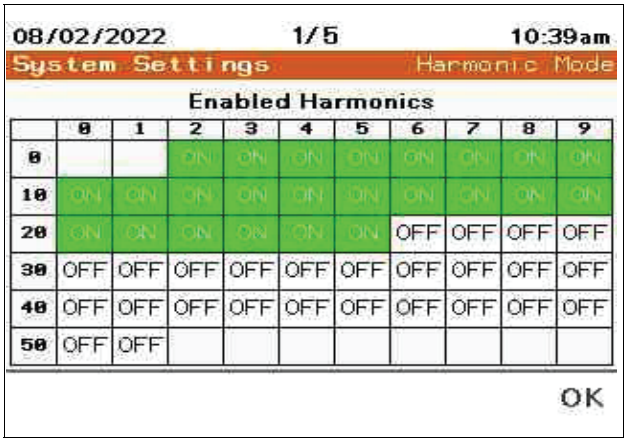
Where

- $\mathbf{I}_{O/P}$ is the total output current of active filter
- $\mathbf{I}_h$ is the injected harmonic current of active filter
- $\mathbf{I}_r$ is the injected reactive current of active filter

Use these percentages to determine the amount of current available for each function. Multiply the percentage by the active filter rated current to obtain the approximate amount of correction provided by the active filter for each function.

Dual Mode Output Percentiles											
Harmonic current drawn by load	100%	90%	80%	70%	60%	50%	40%	30%	20%	10%	0%
Maximum reactive current available	0%	44%	60%	71%	80%	87%	92%	95%	98%	99%	100%

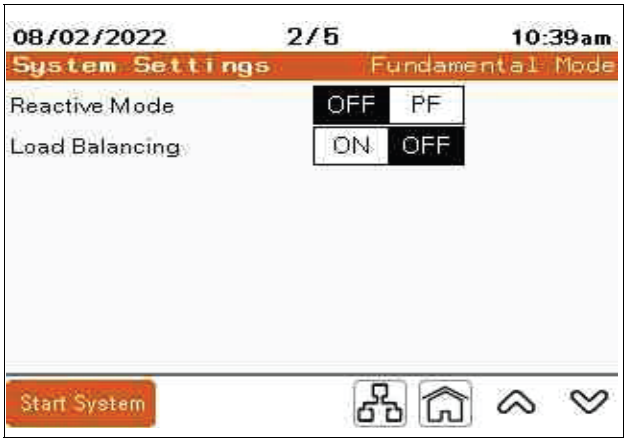
Enable Harmonic:



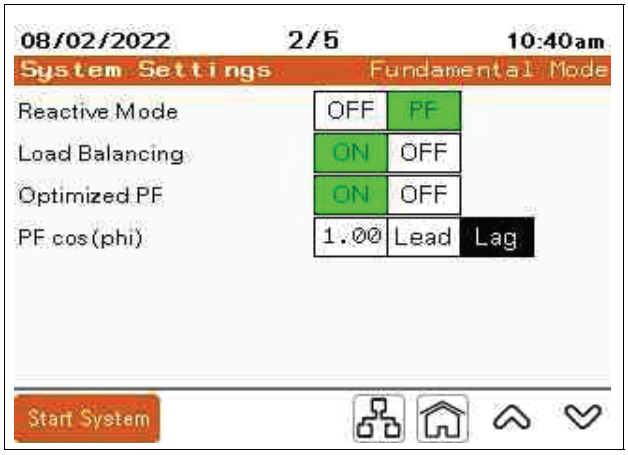
On this screen, you can select which individual harmonic orders are compensated. When ON, the harmonic order compensation is enabled. Touching any harmonic order toggles it OFF or ON.

NOTE: EVC+ units are only capable of correcting 5, 7, 11, and 13 orders harmonics.

Fundamental Compensation PCS+ and PCSn



Selecting Reactive Mode PF additional parameters are displayed, Optimized PF and PF cos(phi).



PF Mode: Activates/Deactivates the Power Factor correction mode.

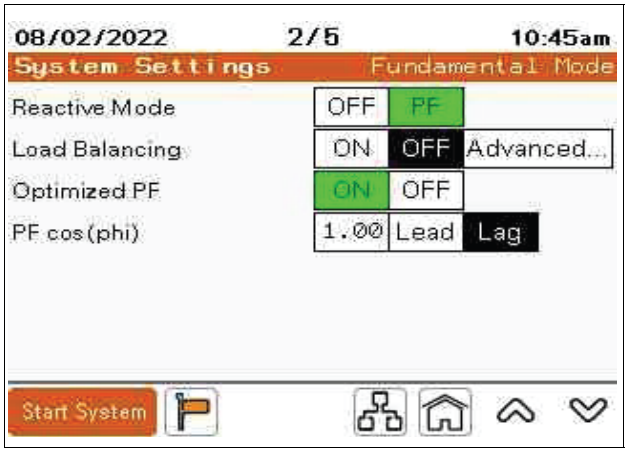
Optimized PF: When set to OFF, the unit maintains the PF cos(phi) setting. When set to ON and the load is less than the PF cos(phi) setting, the unit corrects the power factor to PF cos(phi). If the load PF is greater than the setting, the unit does not compensate unless the power factor is set to maintain a Lag power factor and the load becomes leading. Then, the unit corrects the power factor to a PF cos(phi) of 1.00. If the PF cos(phi) is set to Lead and the power factor of the load is lagging, the unit corrects to a PF cos(phi) of 1.00.

Example*:* With a PF cos(phi) set to 0.98 Lag, the unit maintains a Power Factor of 0.98 Lag when the corrected load is lagging. If the power factor improves to 0.99, no compensation is provided. If the connected load produces a leading power factor, the unit corrects the power factor to 1.00.

PF cos(phi): Target power factor setting.

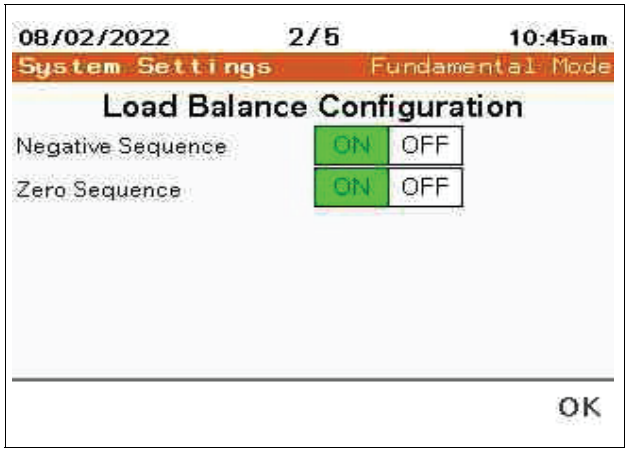
Load Balancing: Activates/deactivates the load balancing mode.

PCSn units will also display an Advanced icon.



Parameter	Function
ON	Activates the load balancing.
OFF	Deactivates the load balancing.
Advanced	Only available on PCSn units.

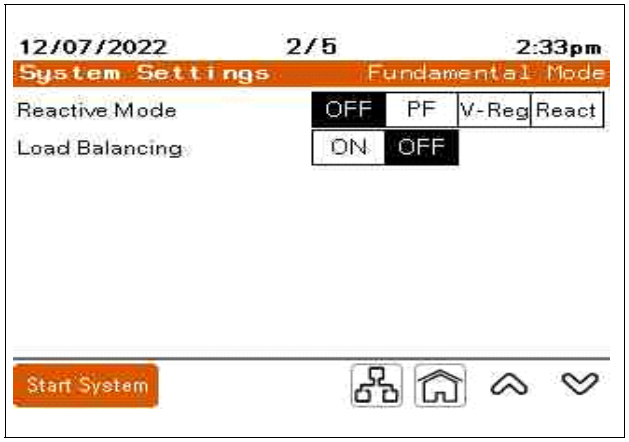
Selective Advance will bring up and additional screen. Load Balance Configuration.



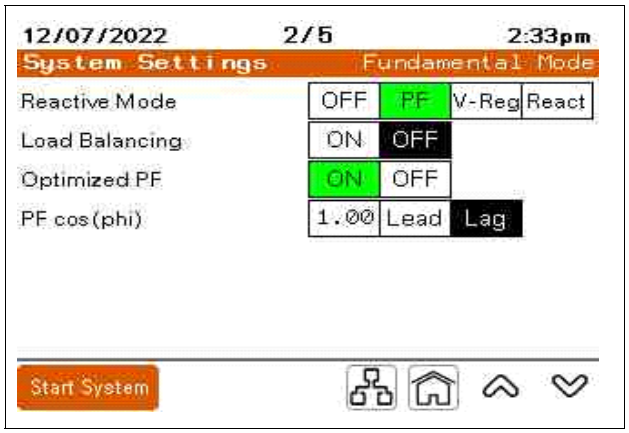
NOTE:

- **Negative Sequence** is associated with the unbalanced current due to line-to-line loads.
- **Zero Sequence** is associated with the unbalanced current due to line-to-neutral loads. This setting is available in Accusine PCSn model only.

Fundamental Compensation EVC+ and PFV+



When **Reactive Mode** is OFF, no compensation is selected.



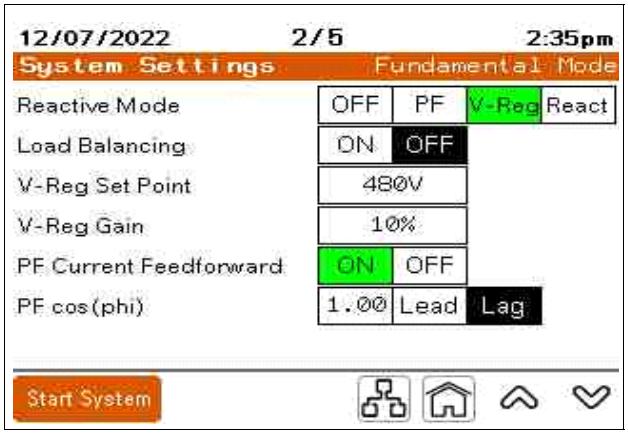
Reactive Mode - PF: With PF mode selected, additional parameters available for the PF mode are displayed.

Load Balancing: When ON, the unit corrects for load imbalance (negative sequence current).

Optimized PF: When set to OFF, the unit maintains the PF cos(phi) setting. When set to ON and the load is less than the PF cos(phi) setting, the unit corrects the power factor to PF cos(phi). If the load PF is greater than the setting, the unit does not compensate unless the power factor is set to maintain a Lag power factor and the load becomes leading. Then, the unit corrects the power factor to a PF cos(phi) of 1.00. If the PF cos(phi) is set to Lead and the power factor of the load is lagging, the unit corrects to a PF cos(phi) of 1.00.

Example: With a PF cos(phi) set to 0.98 Lag, the unit maintains a Power Factor of 0.98 Lag when the corrected load is lagging. If the power factor improves to 0.99, no compensation is provided. If the connected load produces a leading power factor, the unit corrects the power factor to 1.00.

PF cos(phi): Target power factor setting. The power factor can be set for either a leading or lagging cos(phi).



Reactive Mode - V-Reg: Voltage Regulation Mode. Voltage regulation mode monitors the voltage and adjusts the reactive current injected to maintain a voltage level.

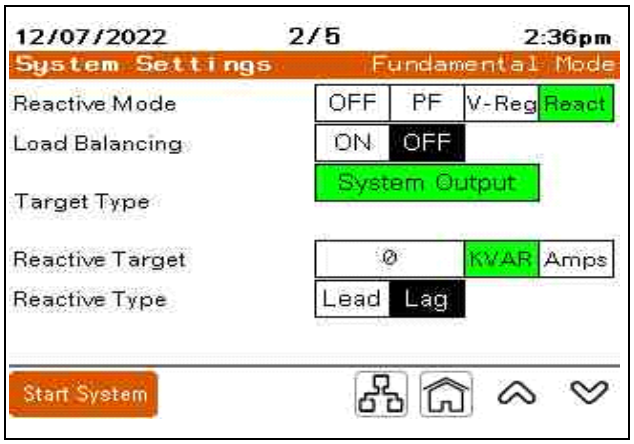
V-Reg Set Point: Set the desired voltage to be maintained.

V-Reg Gain: Adjusts the response time of the voltage regulation. The higher the percentage of V - Reg Gain, the faster the response is. Faster response increases the potential for voltage instability of the electrical system.

PF Current Feedforward: When OFF, CTs are not required for this application. The unit maintains the V - Reg Set Point based on the unit's terminal voltage. When ON, CTs are required for this application. The unit provides the reactive current required based on the PF cos(phi) set point resulting from rapid changes in the load. Adjustments to the reactive power are implemented to maintain the V - Reg Set Point.

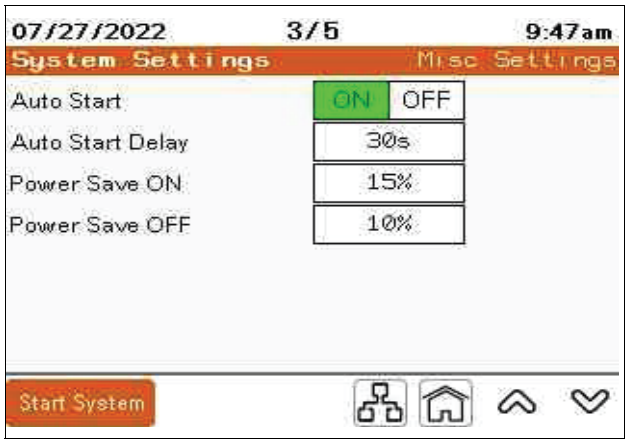
PF cos(phi): This is only displayed when PF current Feedforward is ON. PF cos(phi) is set to the appropriate value based on the source resistance.

Load Balancing can also be selected on this screen. Load Balancing requires the installation of CTs.



PF Current Feedforward: When OFF, the CTs are not required for this application. The unit maintains the V - Reg Set Point based on the terminal voltage of the unit. When ON, the CTs are required for this application. The unit provides the reactive current required based on the PF cos(phi) set point resulting from rapid changes in the load. Adjustments to the reactive power are implemented to maintain the V - Reg Set Point.

Miscellaneous Settings



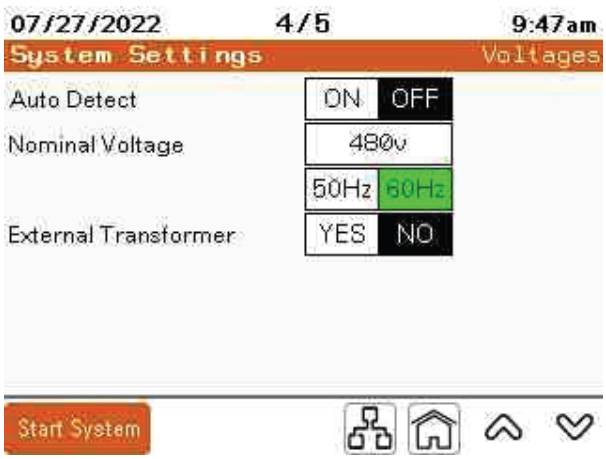
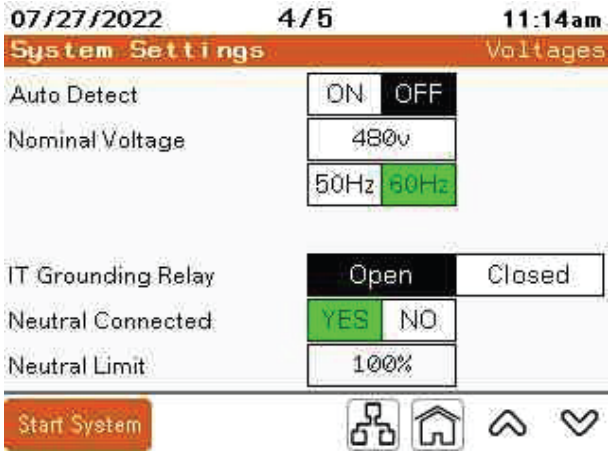
Auto Start: The unit shuts down when the line voltage drops below 85% of nominal. With Auto Start ON, the unit automatically returns to RUN condition when the line voltage is within 85% of nominal. The unit must be in RUN condition during the event to return to RUN condition.

Auto Start Delay: Delay of Auto Start feature in seconds. The minimum is 10 seconds.

Power Save ON: Percentage of rated output current above which the unit starts up. The default value is 15%. It must be higher than the Power Save Off percentage.

Power Save OFF: Percentage of rated output current below which the unit shuts down. The default value is 10%. It must be lower than the Power Save On percentage.

Voltages

AccuSine PCS+ & PFV+	AccuSine PCSn and EVC+
	

Auto Detect: Instructs the controller to determine nominal grid voltage and frequency when power is applied.

Nominal Voltage: With Auto Detect ON, the nominal voltage is automatically entered. With Auto Detect OFF the nominal voltage level applied at the input power connection must be entered. For other nominal operating voltages, enter them manually.

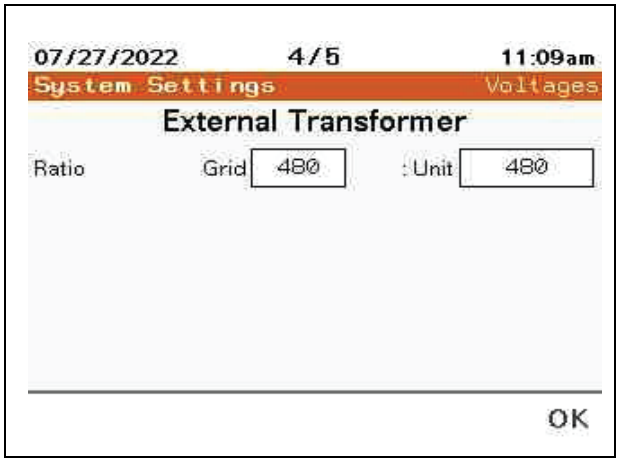
NOTE:

- For AccuSine PCS+,PFV+, and EVC+ 380 volt to 480 volt units the nominal voltages at 480 V, 415 V, 400 V, and 380 V are automatically detected.
- For AccuSine PCS+ and PFV+ 208 volt to 240 volt units the nominal voltages are 208 V, 220 V, 240 V, and 380 V are automatically detected.
- For AccuSine PCSn, the nominal voltages at 208 V, 220 V, 240 V, 380 V, 400 V and 415 V are automatically detected.

External Transformer: Change this parameter if there is an external transformer between the active harmonic filter and the voltage bus being corrected. This parameter is not used for the integrated transformer units. These units are identified by a rating of 600 or 690 volts on the nameplate.

Active filters that are connected to the electrical distribution systems at voltage levels above the unit's nameplate voltage rating require a transformer to step up the voltage to the desired level. Auto-transformers, Delta-Delta, and Wye-Wye transformers have no phase shift. Therefore, the AF= parameter is set to 0 degrees.

If transformers are used with a Delta to Wye configuration, the phase shift must be entered. Typically transformer manufacturers indicate this in clock face notation. The Grid side of the transformer is used as the reference and is set to zero or 12 o'clock.



The high voltage side is indicated with a capital letter. “D” indicates the delta winding is on the high voltage side. A lower case letter indicates the winding type of the low voltage side; “y” indicates a wye wound low voltage side.

Refer to the following table for setting the AF= parameter based on common transformer nameplate information.

External Transformer AF= Settings	
Transformer Nameplate	**Unit options AF=**
Dy1	30 Lag
Dy2	60 Lag
Dy4	120 Lag
Dy5	150 Lag
Dy6	180
Dy7	150 Lead
Dy8	120 Lead
Dy10	60 Lead
Dy11	30 Lead

Nominal Frequency: With Auto Detect ON, the nominal frequency is automatically entered. With Auto Detect OFF, the nominal frequency applied at the input power connection must be selected.

IT Grounding Relay [PCSn and EVC+]: Select the appropriate settings based on the grounding system.

- **Open** for TN and TT systems
- **Closed** for IT, HRG, and Corner grounded delta systems

Neutral Connected [PCSn only]: Select YES if a neutral conductor is connected to the unit or system.

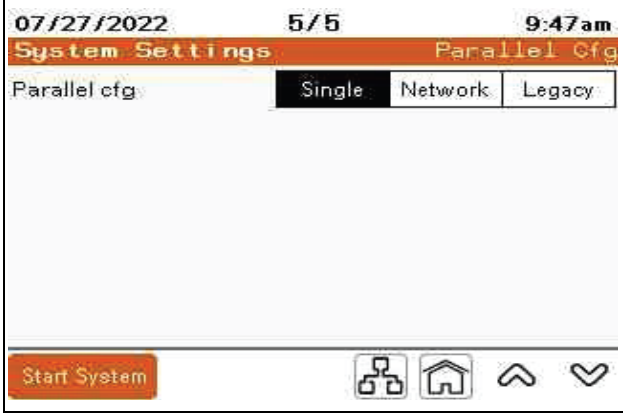
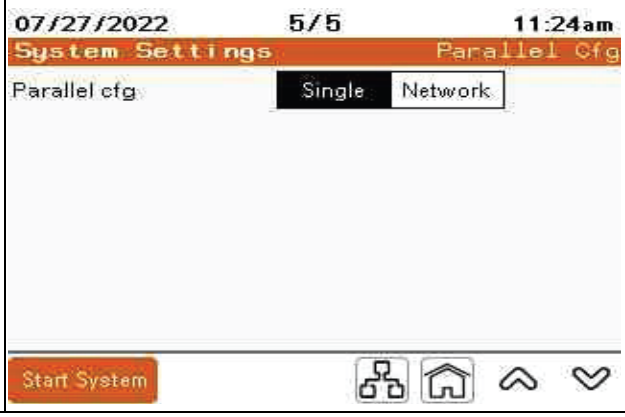
Neutral Limit [PCSn only]: Select the maximum neutral current allowed as a percent of the unit or system rating.

NOTE:

- AccuSine PCS+ and PFV+ models consist of IT/BP switches. For more information, refer Installation Manual.

- IT Grounding Relay, Neutral Connected, and Neutral Limit parameters are applicable to only AccuSine PCSn units.
- IT Grounding Relay is applicable to EVC+.

Parallel Configuration

AccuSine PCS+, PFV+ and EVC+	AccuSine PCSn
	

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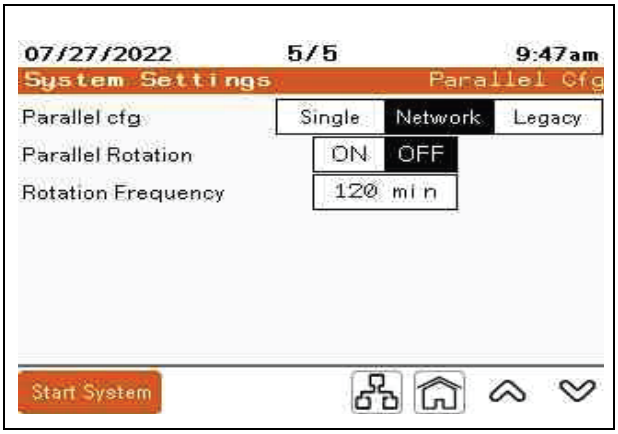


Single: Select single for a standalone unit not operating in parallel with another active filter.

When **Network Parallel** is selected, two additional parameters are displayed. These parameters are used if the system is designed for redundant operation.

Select **Parallel Rotation OFF** if the system is designed with parallel for capacity only or if the units are to equally share the load at all times.

Select **Parallel Rotation ON** if the additional units should be cycled through with the minimum number operating to support the correction required. This is based on the Parallel Priority Group parameter located under Unit Settings, Basic Setup.

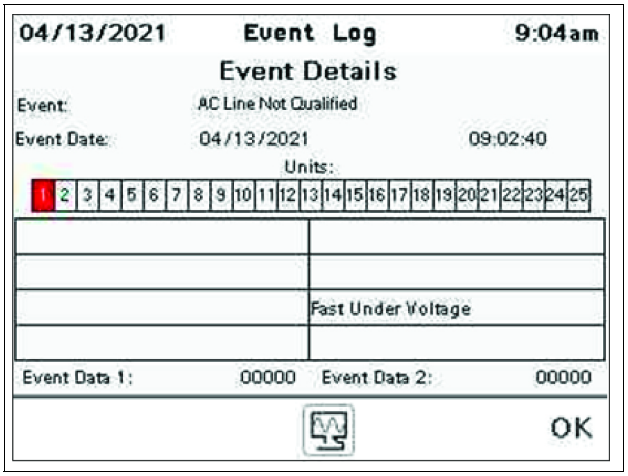
Set the **Rotation Frequency** to the time the lowest priority group is off until the next priority group is off. With this setting, the units the units that are on or off rotate based on the total capacity required by the load to achieve set point.

Legacy: Select if the unit is added to an existing active filter system that does not have the parallel networking capability. When the unit is selected, the total capacity of the active filter system must be entered in the **Total System Capacity** text box.

Event Log

The **Event Log** displays the events that occurred. Touch an event to select it. Then, press the magnifying glass icon to display the details for that event. The event log can store up to 1,024 events. Once this value is exceeded, the oldest event will be removed.

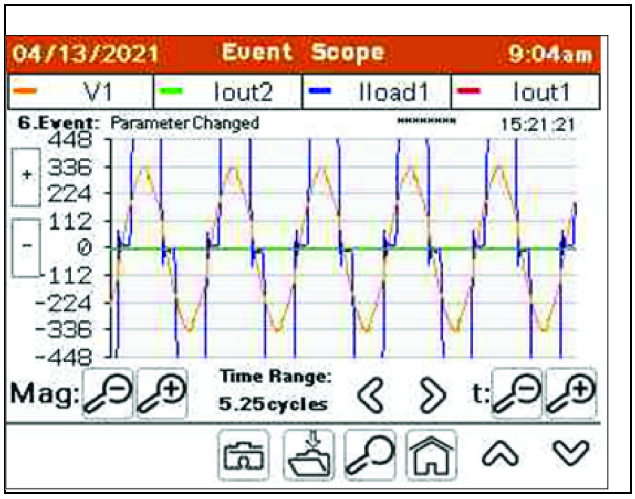
You can save the Event Log to a USB storage device. Once it is connected, press the folder icon to save the log:



In the **Event Details** screen, the highlighted unit numbers indicates the units that the event were recorded.

Click the **Event Scope** icon available on the bottom of the **Event Details** screen.

Result: The **Event Scope** screen displays.

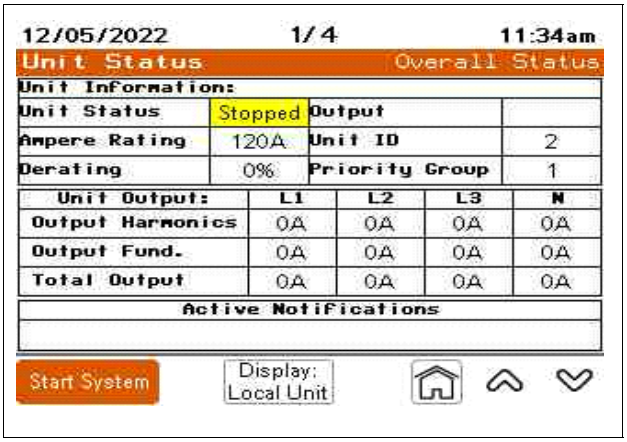


Button		Description
Camera		If you have a USB drive inserted into the USB port next to the HMI, click the camera icon to save the screen in a PDF format.
Folder		If you have a USB drive inserted into the USB port next to the HMI, click the folder icon to save the detailed sample data to the USB flash drive.
Magnifying glass		Click to return to the **Event Log** screen.
Home		Click to return to the **Home** screen.

Unit Status

Unit Status


Overall Status



Unit Information

Unit Status: Indicates whether the unit is in Run or Stopped condition.

Unit Rating: Indicates the amperage rating of the unit.

Derating: Indicates if the unit has been derated by a percentage.

Output: Indicates the total output current of the unit.

Unit ID: Indicates the unit unique identification number. Each unit in a parallel system must have a unique unit ID.

Priority: Indicates the Priority Group Number assigned to the unit.

Unit Output

Output Harmonics: Harmonic current output of the unit in amperes RMS for harmonic mitigation.

Output Fund: Output current at the fundamental frequency for power factor correction and/or load balancing.

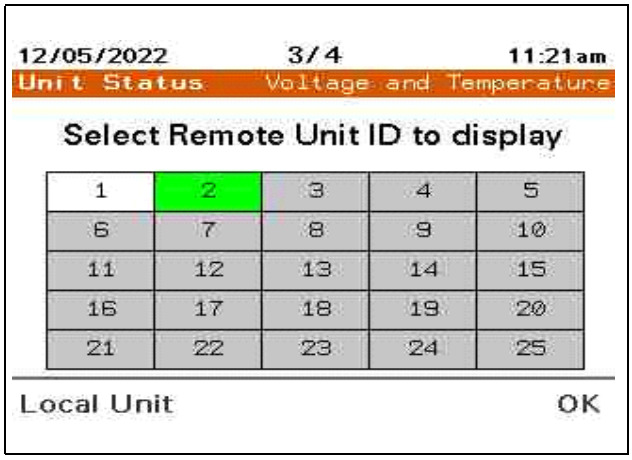
Total Output: Total output current of the unit in amperes RMS.

Active Notifications

Displays active events.

Display Local Unit

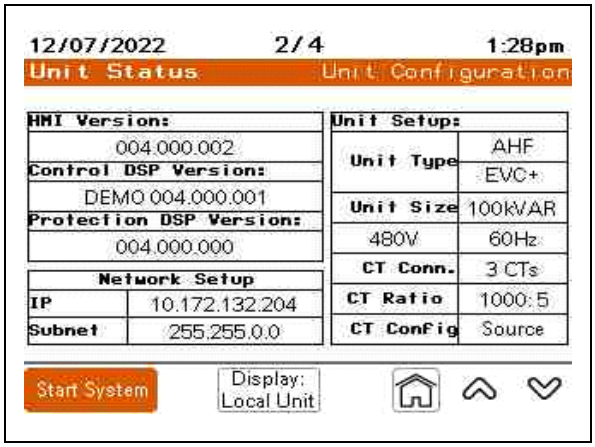
This is displayed in parallel systems. Pressing the icon will result in a pop-up window providing a mean view and interact with a different unit in the parallel system. When a different unit is select the Display and unit number which is being displayed.



NOTE: Neutral current (N) values are only displayed when the unit is installed with 3 CTs.

Unit Configuration Screen

The Unit Configuration screen provides the configuration information for the unit.



HMI Version: Displays the HMI software version that is loaded on the HMI.

Control DSP Version: Displays the software version installed on the Control DSP.

Protection DSP Version: Displays the software version installed on the Protection DSP.

Network Setup

IP: Displays the IP address for the TCP/IP Ethernet connection.

Subnet: Displays the unit's subnet address.

See "Unit Settings" on page 36 for instructions on changing the Network Setup values.

Unit Setup

Unit Type: Indicates whether the unit is an active filter or an electronic VAR compensator.

Unit Size: PCS+, PFV+ and PCSn displays the unit rating in amps. EVC+ displays unit size in kVAR.

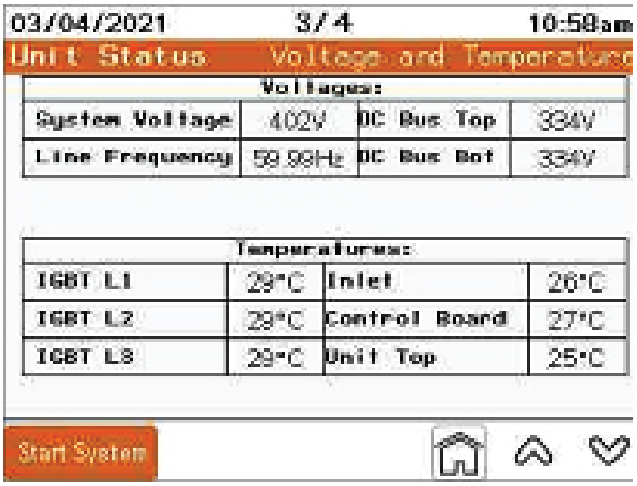
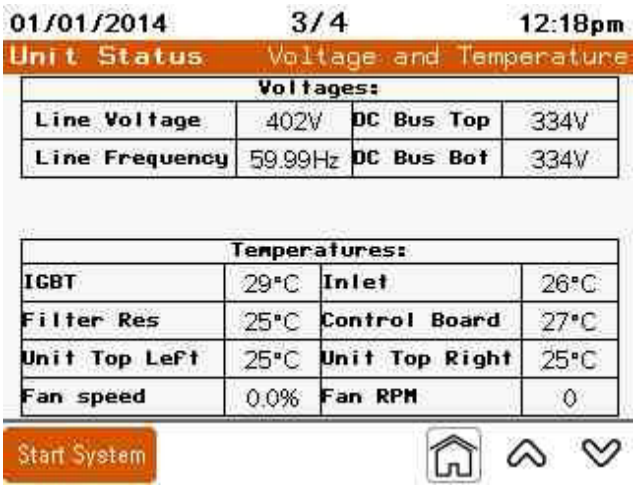
Nominal voltage and frequency: Displays the system nominal voltage and frequency settings.

CT Conn.: Indicates the number of CT's connected to the unit.

CT Ratio: Displays the CT ratio used.

CT Configuration: Indicates whether the CT's are located on the Source or Load side of the active filter system.

Voltages and Temperature

AccuSine PCS+ and AccuSine PFV+	AccuSine PCSn and EVC+
	

NOTE: The parameters of **Voltage and Temperature** screen is described below. Based on the product used, refer to the appropriate screen as required.

Voltages

Line Voltage (System Voltage): The three phase average of the incoming line voltage to the unit.

Line Frequency: The measured source frequency.

DC Bus Top: The measured DC voltage of the top DC bus section.

DC Bus Bot: The measured DC voltage of the bottom DC bus section.

Temperatures

All temperatures are displayed in degrees Celsius.

IGBT L1: Temperature of phase L1 inverter IGBT.

IGBT L2: Temperature of phase L2 inverter IGBT.

IGBT L3: Temperature of phase L3 inverter IGBT.

Inlet: Inlet air temperature of the unit.

Control Board: Air temperature surrounding the Control Printed Circuit Board.

Unit Top: Outlet air temperature of the electronic air section.

IGBT: Temperature of the inverter IGBT.

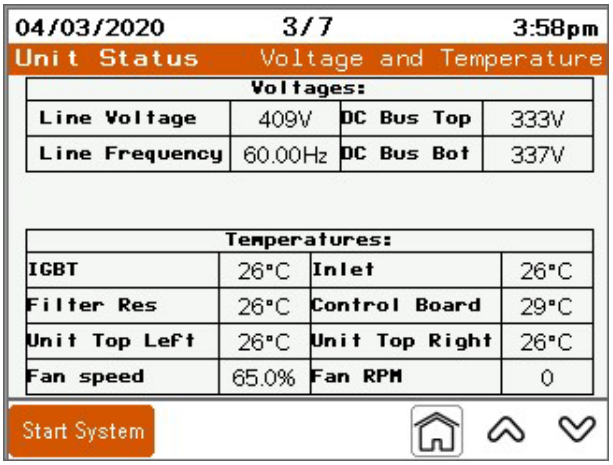
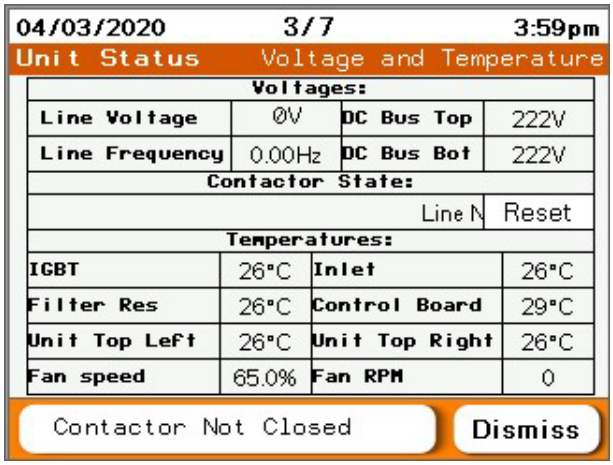
Filter Res: Temperature of the filter resistor.

Unit Top Left: Outlet air temperature on the left side.

Fan Speed: Percentage of the fan speed.

Unit Top Right: Outlet air temperature on the right side.

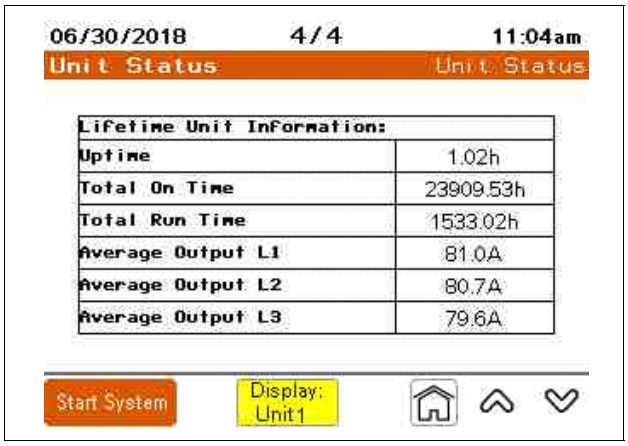
Fan RPM: Rotation per minute of the fan.

Display in Normal condition	Display with Contactor Tripped in Stop condition
	

Contactor State Reset: Provide information on why the contactor is tripped.

Reset: Closes the contactor if a filter trip occurs while the unit is in STOP condition.

Unit Status



Uptime: Elapsed time from the last energization.

Total On Time: Total time the unit has been energized.

Total Run Time: Total time the unit has been in Run condition.

Average Output L1: Average output current for L1 phase.

Average Output L2: Average output current for L2 phase.

Average Output L3: Average output current for L3 phase.

Unit Settings

Unit settings are individual settings for the specific unit. This section covers the parameters you can configure.

Basic Setup

Displayed with no User logged in	Displayed when logged in as ADMIN
	

When logged in as ADMIN, access for Advanced Diagnostics is present.

Output Enabled: When ON, the unit provides corrective current as necessary. When OFF, the unit does not provide corrective current. Output Enabled must be set to the ON condition after stopping the unit in parallel systems.

Derating Factor: Percentage of rated output current that is subtracted from maximum output to compensate for high altitude. The unit must be de-rated if the unit is installed at an elevation over 1,000 meters above sea level. Derate by 1% for every 100 meters over 1,000 meters above sea level.

Unit ID: For parallel systems, each unit in the parallel system must have a unique unit identification number.

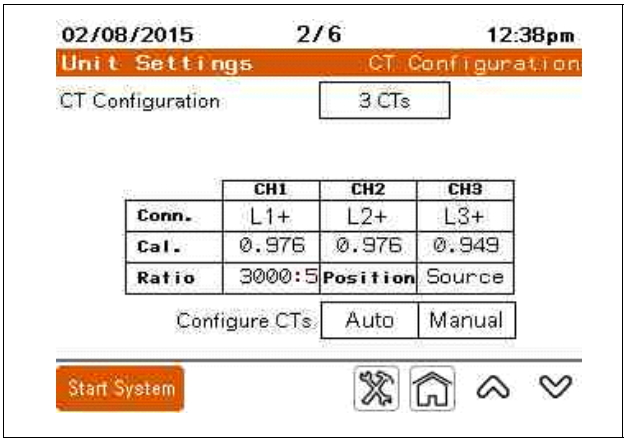
Parallel Priority Group: Identifies the parallel priority group to which the unit belongs.

Fault Restart Time: How long in seconds a restart of the active filter is delayed after the occurrence of a non-critical fault. The minimum is 10 seconds.

Advanced Diagnostics: Displays Enabled Diagnostic Access screen. This screen allows advanced diagnostics and settings to be displayed and adjusted by factory trained personnel. The factory trained person will have the appropriate password to access the advanced diagnostics and settings parameters and screens.

NOTE: Advanced Diagnositics is only available in HMI version 002.001.005 or later.

CT Configuration



The **CT Configuration** screen provides information on how the unit is currently configured for the connected CTs. If needed, you can configure additional CTs manually or automatically.

CT Configuration: Displays the number of CTs used.

CH1, **CH2**, and **CH3** refer to which channels are used on the CT board.

Conn.: Indicates the setting for which phase and polarity the CT is connected for that channel.

Cal: When Automatic CT detection is used and the CTs are connected on the source side, the unit performs a CT calibration. The calibration value is indicated.

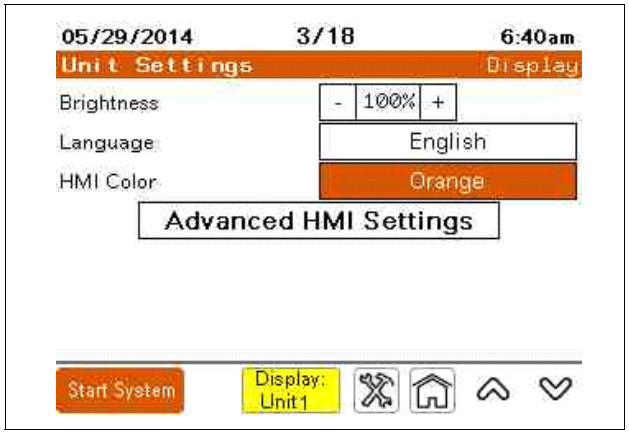
Ratio: Displays the parameter setting of the CTs installed.

Position: Displays the position of the CTs in relationship to the active filter.

Configure CTs: When selecting Auto, the unit detects the CT connection type for each input, CT ratio, and position. Refer to “Automatic CT Configuration” on page 66.

Selecting Manual displays a Modify CT Configuration screen to allow manual setting of these parameters. Refer to “Manual CT Configuration” on page 65.

Brightness and Advanced HMI Settings



Brightness: Press "-" or "+" to adjust the brightness of the HMI display.

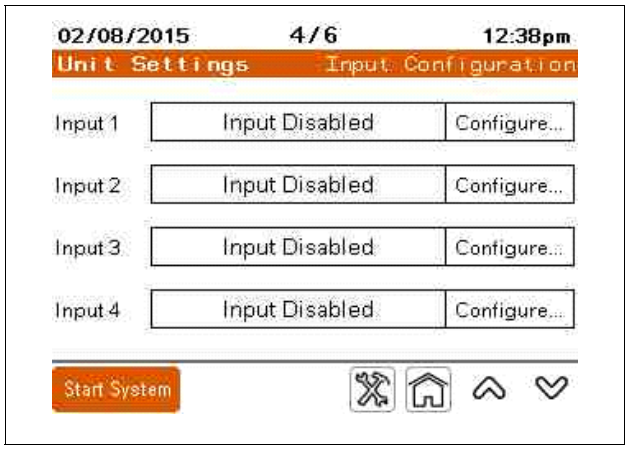
Language: Allows the HMI language to be changed.

Advanced HMI Settings accesses the options for adjusting TCP/IP Address, Subnet, and default gateway as well as DHCP settings. Refer to “Modbus TCP/IP Address Setup” on page 41 for more information.

Input Configuration

Four input controls are available at J2 of the Control Board: one Ground and four inputs labeled I1 to I4. The inputs are at 5 V DC and are grounded to activate. See the Installation Manual for details and requirements for wiring input controls.

On the Input Configuration screen, press “Configure...” to display the options and set the parameters.



The choices for an input command are:

- **Input Disabled**: The input is not used.
- **Run System**: Causes the system to go into RUN condition.
- **Stop System**: Causes the system to STOP (no output).
- **Unit Pause**: Stops the output current until input changes states.
- **Disable Remote Access**: When enabled, this prevents remote access to the unit.

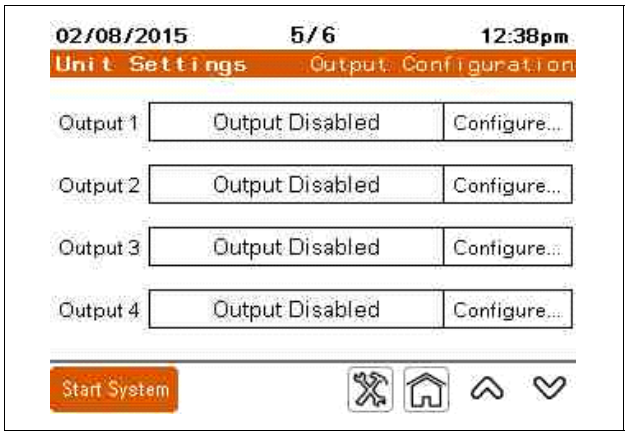
- **Disable Auto-Start**: When enabled, the unit does not auto-start after power has been reapplied.

Active when: You can set the condition to be active when the input is either Not Grounded or Grounded.

Current State: Indicates the current condition of the input.

Output Configuration

Four configurable outputs or dry contacts are provided on the Control board labeled Q1 to Q4. The four outputs can be programmed to change states based on different conditions set on the HMI.



Touch **Configure…** to access the User Output Configuration screen.

Each Output Function can be active when the switch is either Open or Closed.

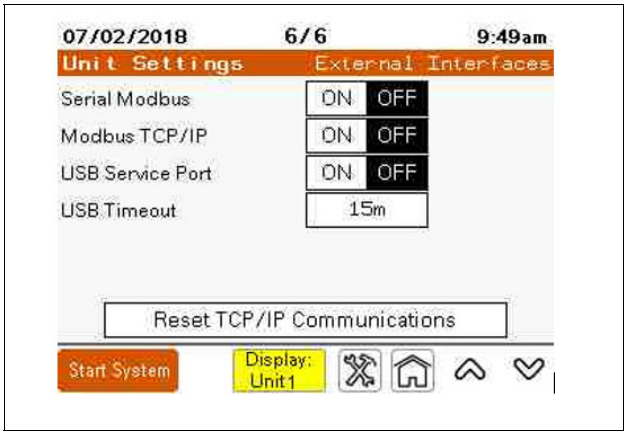
Available output functions are:

- **Output Disabled**: Indicates that the output contact is not used.
- **Unit Running**: Switched when the unit is Running.
- **Event Active**: Switched when an event is activated.
- **Power On**: Indicates that power is applied to the unit.
- **Max Capacity Reached**: Indicates that the unit is operating at maximum current capacity.
- **Defined Capacity Reached**: Indicates when a user set capacity is reached.
- **Temperature Threshold Reached**: Indicates when a user defined temperature is reached on either, IGBT, CB Temp (Control Board Temperature), Unit Top (Exhaust air temperature), or Inlet (intake air temperature).
- **KVAR Threshold Reached**: Indicates that a user-set kVAR threshold is reached.

External Interfaces

In the event of TCP/IP network denial of service attack on AccuSine device, the network connectivity on AccuSine device may cease to function. Therefore, it is advised to always keep the connection to AccuSine device behind network firewall and not leave the device directly exposed to the internet. Network functionality can be restored by pressing **Reset TCP/IP Communication**.

NOTE: Even during network connectivity interruption, AccuSine will continue to maintain its main functionality of providing active filtering compensation to the system.



NOTICE

LOSS OF NETWORK CONNECTIVITY

Keep the connection to AccuSine TCP/IP device behind a network firewall.

Failure to follow these instructions can result in the loss of remote control and/or monitoring of the equipment.

Modbus TCP/IP Address Setup

⚠ WARNING

POTENTIAL COMPROMISE OF SYSTEM AVAILABILITY, INTEGRITY, AND CONFIDENTIALITY

Modbus TCP/IP is NOT a secure communication protocol. Place networked devices behind multiple layers of cyber defenses (such as firewalls, network segmentation, and network intrusion detection and protection).

Failure to follow these instructions can result in death, serious injury, or equipment damage.

To set up the Modbus TCP/IP address, do the following:

1. Press Unit Settings.
2. Press Display Settings.
3. Press Advanced HMI Settings.
4. Press the OFFLINE tab.
5. Press Network.

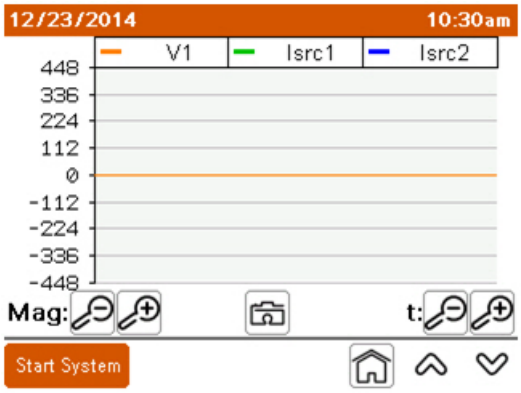
   The HMI shuts down and restarts for entering network settings.
6. Press the DHCP tab and ensure the DHCP check box is not selected.

   The DHCP must be disabled to enter a Static IP.
7. Press Static IP.
8. Enter the IP Address, Subnet Mask, and Default Gateway provided by the facility's network administrator.
9. Press OK.
10. Press To Run Mode.
11. Press OK to shut down and restart the HMI.

Waveforms

The Waveforms screens display system information in three formats: Oscilloscope, Bar Graph, and Phasor diagram.

Waveforms



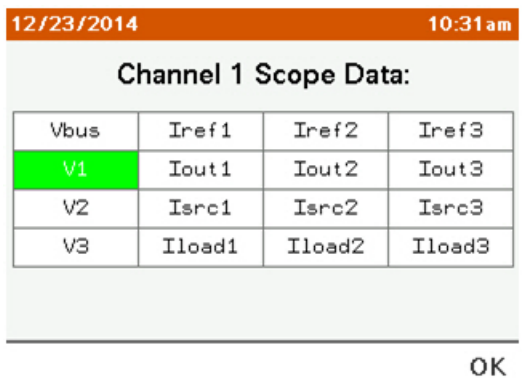
The oscilloscope screen can display up to three different values at the same time. You can touch one of the boxes at the top of the oscilloscope screen to display a table of the 16 different values available.

Mag: The magnifying glass icons next to Mag increase or decrease the amplitude scale.

t: The magnifying glass icons next to “t:” increases or decreases the time scale.

If you have a USB drive inserted into the USB port next to the HMI, you can click the camera icon to save the screen in a PDF format.

Available Scope Data



Vbus: Voltage of the total DC bus.

V1: Line to line voltage of L1 to L2

V2: Line-to-line voltage of L2 to L3

V3: Line-to-line voltage of L3 to L1

Iref1: Current reference L1

Iref2: Current reference L2

Iref3: Current reference L3

Iout1: Current output L1

Iout2: Current output L2

Iout3: Current output L3

Isrc1: Current source L1

Isrc2: Current source L2

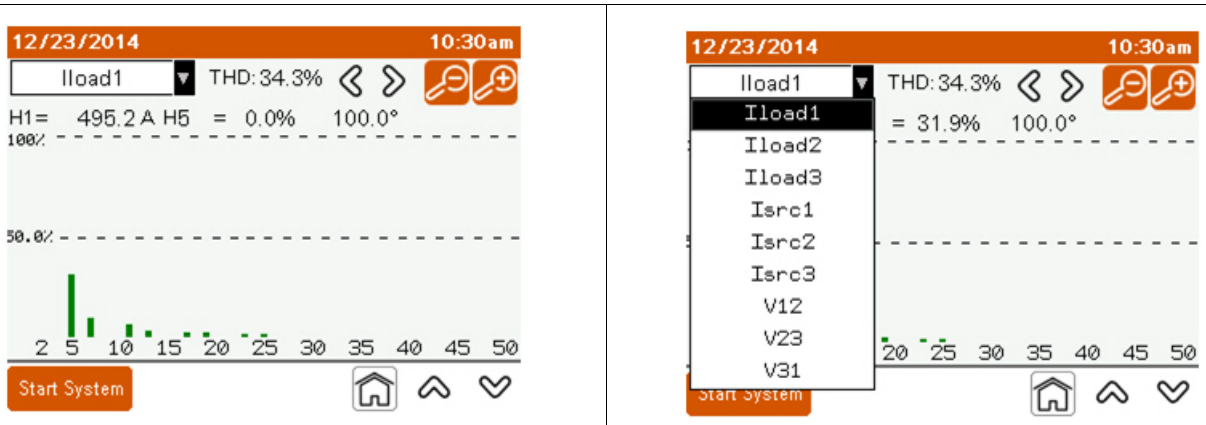
Isrc3: Current source L3

Iload1: current load L1

Iload2: current load L2

Iload3: current load L3

Harmonic Analyzer Bar Graph

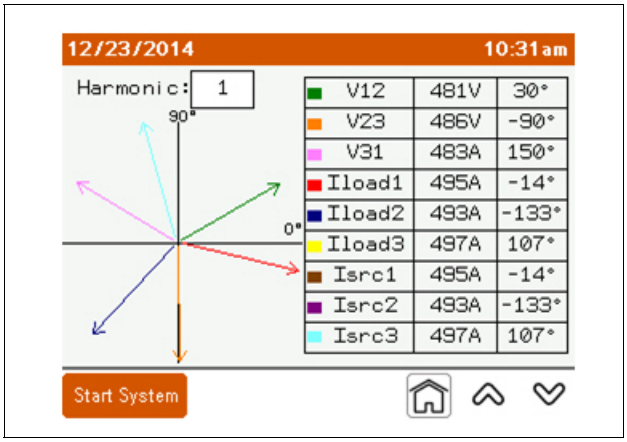


Use the top left drop-down to select the value to be analyzed.

H1, the fundamental value is constantly displayed. You can display a specific harmonic order value by pressing the left or right arrows at the top of the screen. You can adjust the amplitude scale with the magnifying glass icons. The values you can display are:

- **V12**: Bar graph harmonic analysis of the voltage of L1 to L2.
- **V23**: Bar graph harmonic analysis of the voltage of L2 to L3.
- **V31**: Bar graph harmonic analysis of the voltage of L3 to L1.
- **Isrc1**: Bar graph harmonic analysis of Current source L1.
- **Isrc2**: Bar graph harmonic analysis of Current source L2.
- **Isrc3**: Bar graph harmonic analysis of Current source L3.
- **Iload1**: Bar graph harmonic analysis of current load L1.
- **Iload2**: Bar graph harmonic analysis of current load L2.
- **Iload3**: Bar graph harmonic analysis of current load L3.

Phasor Diagram



V12: Line-to-line voltage of L1 to L2.

V23: Line-to-line voltage of L2 to L3.

V31: Line-to-line voltage of L3 to L1.

Iref1: Current reference L1.

Iref2: Current reference L2.

Iref3: Current reference L3.

Iout1: Current output L1.

Iout2: Current output L2.

Iout3: Current output L3.

Isrc1: Current source L1.

Isrc2: Current source L2.

Isrc3: Current source L3.

Iload1: Current load L1.

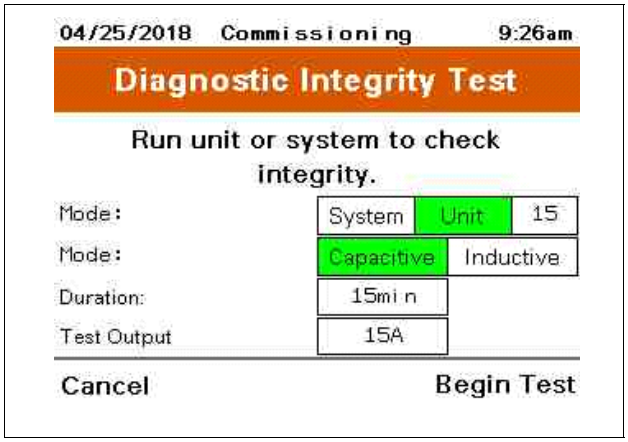
Iload2: Current load L2.

Iload3: Current load L3.

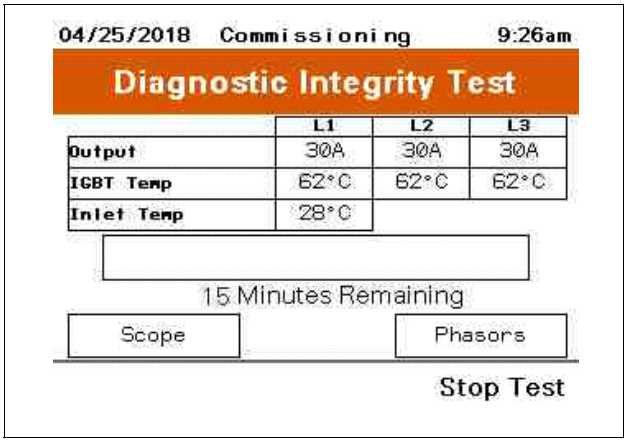
Unit Diagnostics

Integrity Test, provides a means to verify the unit or system is operational.

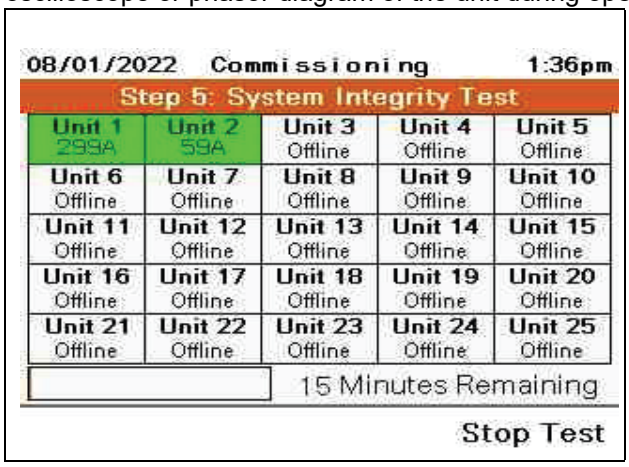
Test Run provides a means to verify the performance of the system. It also provides a method to generate a report showing the performance of the system and all settings.



Mode: Select system which will cause all units in a system to operate or unit and unit ID to select a specific unit to test.



During the test, the HMI will display the output current per phase, IGBT temperature, and unit Inlet temperature during the test. Scope and Phase allows a means to view the oscilloscope or phasor diagram of the unit during operation.



Parallel Systems will display the output current for each unit in the parallel system.

Upon completion of the test, a system pass or fail screen will be displayed.

Chapter 4 Commissioning and Start-up

This chapter provides information for commissioning the active filter. Before applying power, read and understand this information thoroughly.

⚠⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E in the USA, CSA Z462, or applicable local standards.
- This equipment must be installed and serviced only by qualified electrical personnel.
- Do not exceed the device's ratings for maximum limits.
- Ground equipment using the ground connecting point provided before turning on any power supplying this device.
- Turn off all power supplying this device and the equipment in which it is installed before working on the device or equipment.
- After removing power, wait for 15 minutes to allow the capacitors to discharge prior to opening the doors or removing covers.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors, and covers before turning on power to this equipment.
- Carefully inspect the interior for tools left behind before closing and sealing the door.

Failure to follow these instructions will result in death or serious injury.

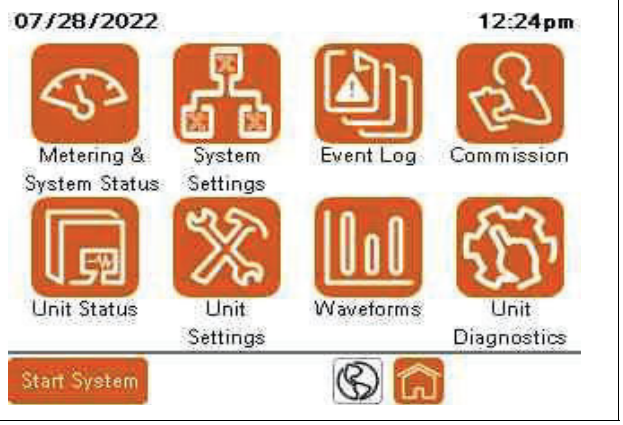
The following is a summary of the steps for commissioning and starting up the active filter:

1. Ensure that the unit has been installed according to procedures in the installation guide.
2. Complete the inspection and checklist covered in the Pre-commissioning chapter of the installation guide.
3. Follow the procedure covered in "Commissioning the unit" on page 48.
4. Start up the unit.
5. Set up users in the User Manager and configure the network, system, and unit settings. Refer to "Operation" on page 11.

Commissioning the unit

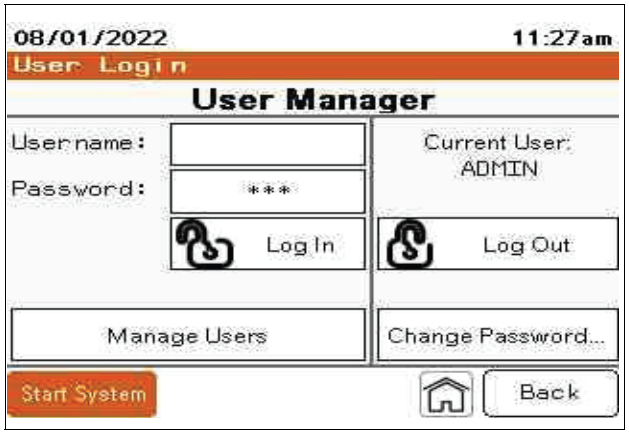
When the active filter is first energized, the HMI displays the **Home Screen**.

Home Screen



1. Press **Commission**.

2. Press **Configure Security** icon.
3. To log in for the first time, enter user name ADMIN. Enter Password 3w7ADMN.

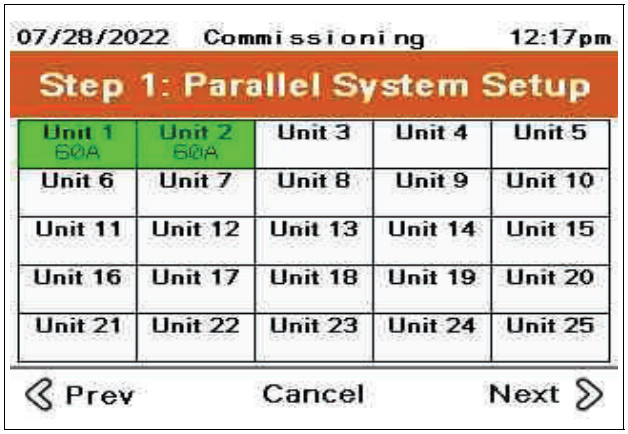


4. Press **Back** to begin the commissioning procedure.

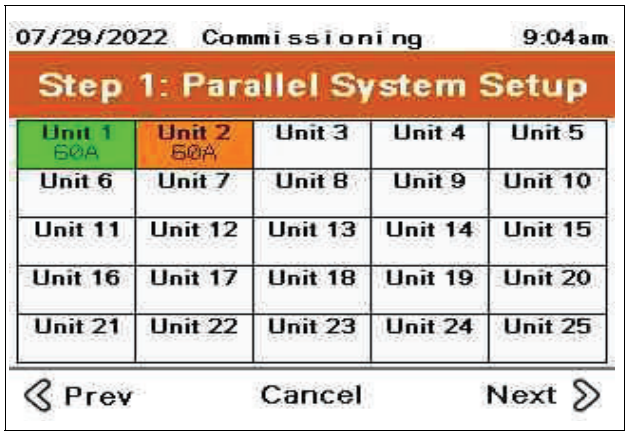
Parallel System Setup

To set up the parallel system, do the following:

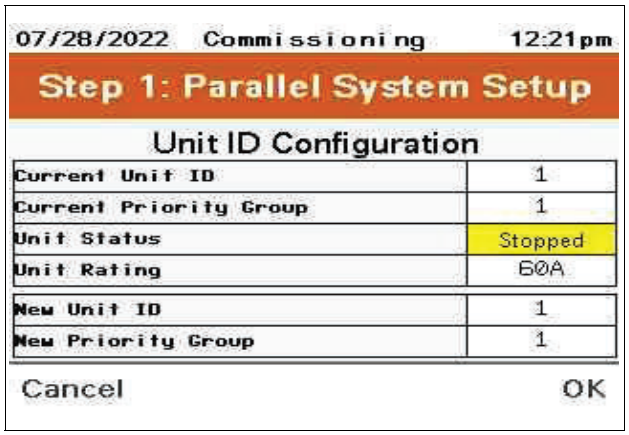
1. Select **Single** unit or **Parallel** system.
   When **Single** is selected proceed to Step 2, Adjust Date & Time.
   When **Parallel** is selected, following procedure is required.



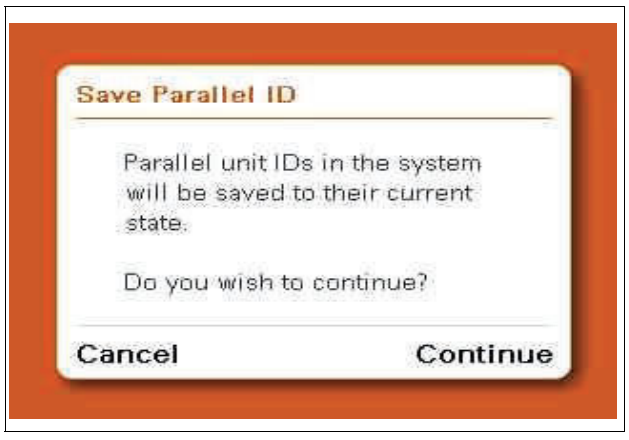
2. For parallel systems, the **Parallel System Setup** screen will be displayed. Pressing the unit ID number will cause the unit number on the screen to cycle in color default is green to orange. The LED on the front of the unit with that ID will also flash.



3. By pressing and holding the unit number, a screen will be displayed providing a means to change the unit ID.
4. Press the number field of new unit ID to assign the unit ID.
   Result: The numeric keypad appears**.**

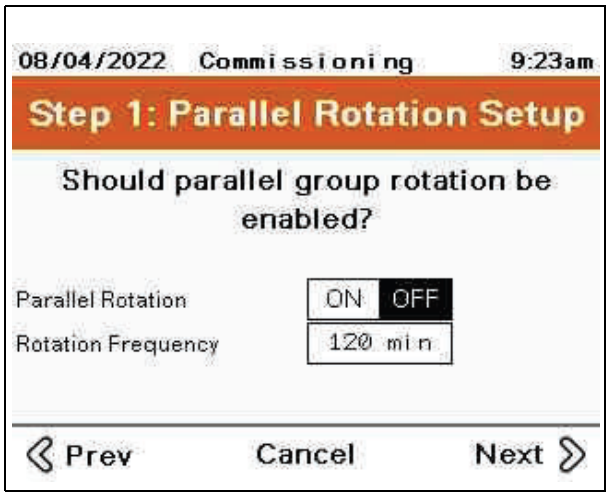


5. All the units have been assigned a Unit ID as desired.



Parallel Rotation Setup

To set up the parallel rotation, do the following:



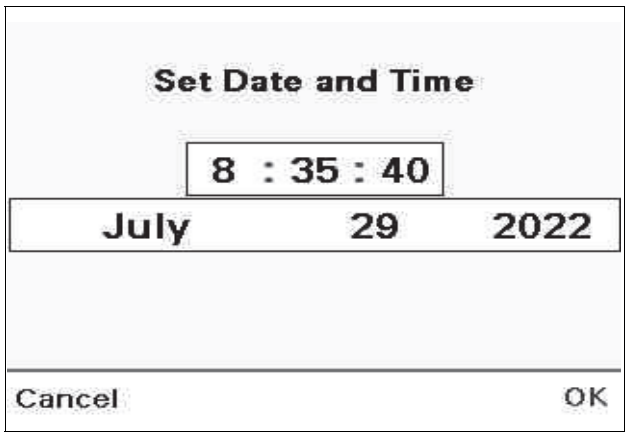
1. Select **Parallel Rotation** as required:
   - Select ON, if the system is designed with parallel for capacity only or if the units are to equally share the load at all times.
   - Select OFF, if the additional units should be cycled with the minimum operating number, to support the correction required. This is based on the Parallel Priority Group parameter located under Unit Settings > Basic Setup.

2. Set the **Rotation Frequency** to the time the lowest priority group is off until the next priority group is off. With this setting, the units that are ON or OFF rotate based on the total capacity required by the load to achieve the set point.

Adjust Date and Time

Set the date time for the active filter as follows:

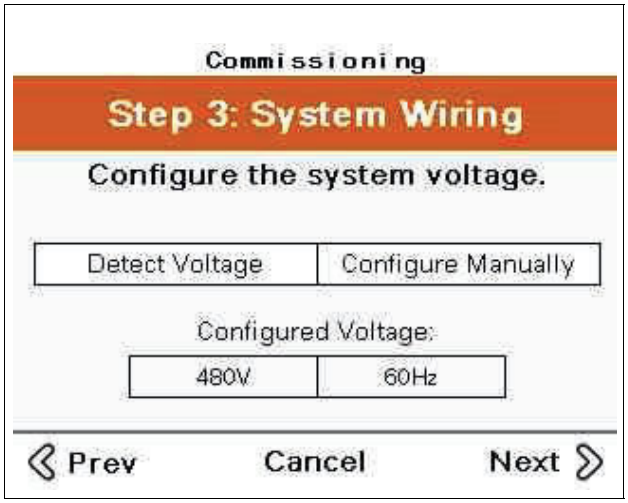
1. Press either the **Date** or **Time** to open an editable screen.



2. Touch the hour, minutes, seconds, date, and year to open a numeric keypad to enter the date and time. Touch the month to display arrows, scroll to the appropriate month and press **Enter**.
3. Press **OK**.

System Wiring

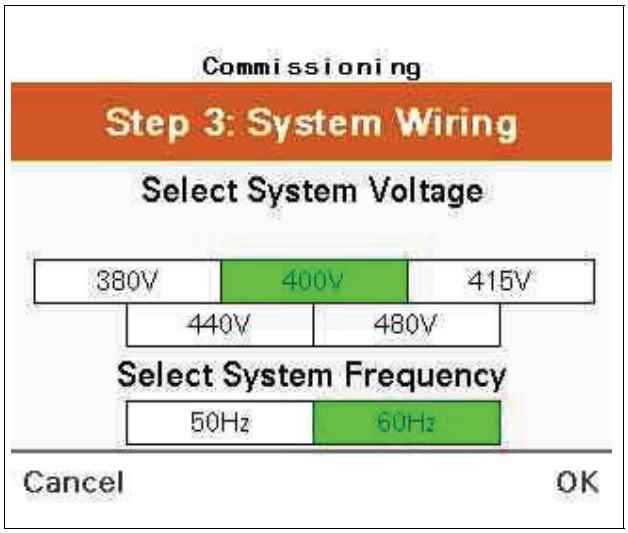
AccuSine PCS+ and PFV+ System Wiring Settings



Detect Voltage will automatically detect the nominal system voltage.

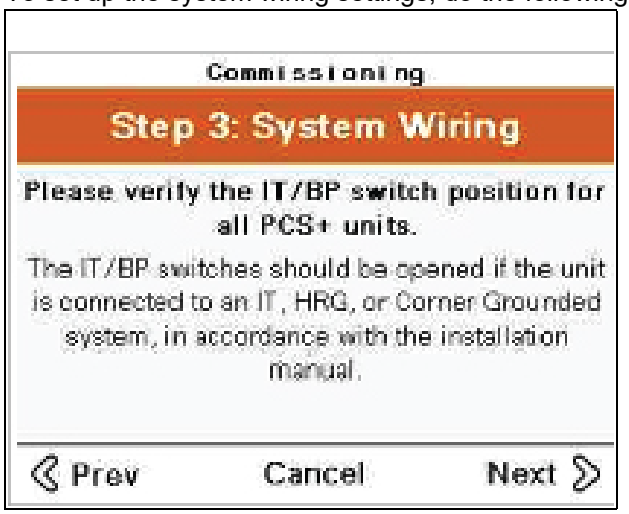
Configure Manually will allow the Nominal voltage to be manually set. By selecting Configure Manually the following screen will appear.

New Screen

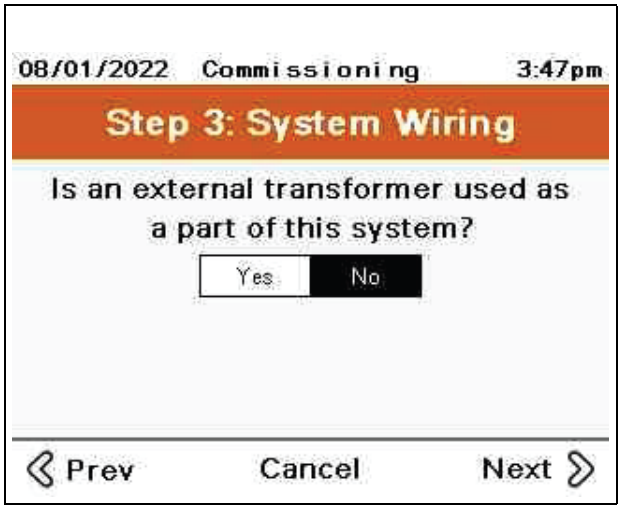


Select the system voltage and frequency for the installed application.

To set up the system wiring settings, do the following:



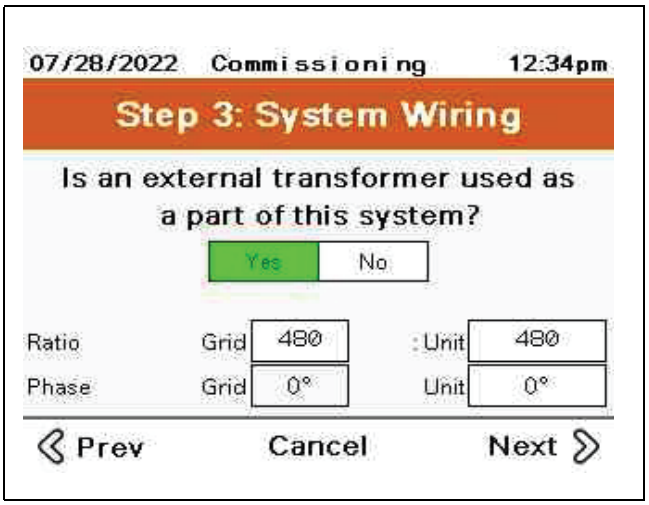
1. Open the IT/BP switches if the system is connected to an IT, HRG, or Corner Grounded delta system. See the Installation Manual for details on the IT/BP switches.



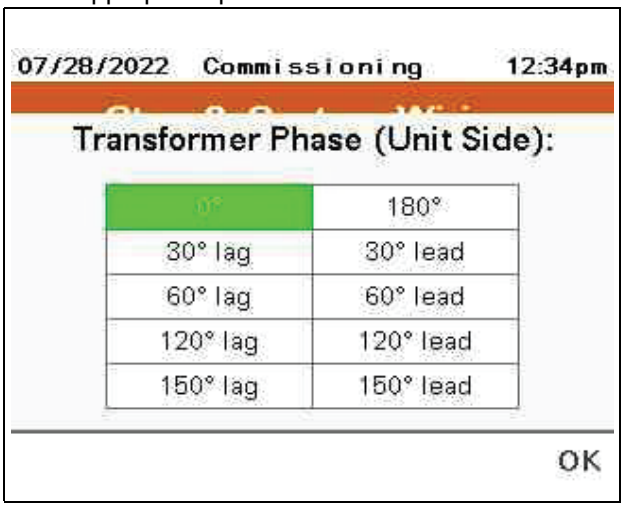
2. Change the settings on the External Transformer screen if there is an external transformer between the active harmonic filter and the voltage bus being corrected.

NOTE: This parameter does not apply to the integrated transformer units that are rated at 600 V or 690 V on the nameplate.

3. For external transformer setup, select the appropriate settings:
   - **Yes**, if there is a transformer added to the output of the active filter for connection to a voltage level that is different from the nominal voltage rating of the unit.
   - **No,** if the output voltage rating of the unit matches the voltage rating of the loads being corrected.

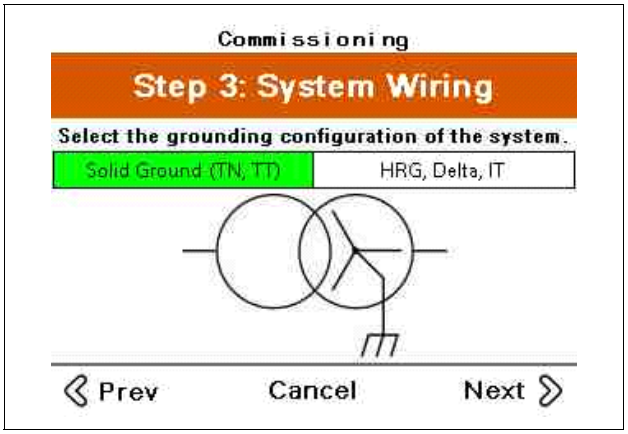


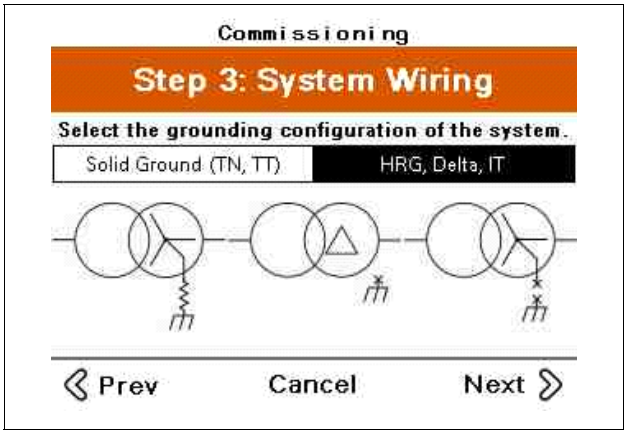
4. Configure the following settings only if you have selected Yes in the previous step, otherwise go to Step 5.
   - **Ratio Grid:** Enter the Grid side voltage of the transformer.
   - **Unit:** Enter the transformer voltage rating at the active filter side.
   - **Phase Grid:** This value is set to 0°. It is not an adjustable parameter.
   - **Unit:** Touch this field to open the External Transformer screen. Select the appropriate phase shift of the transformer based on the transformer design.



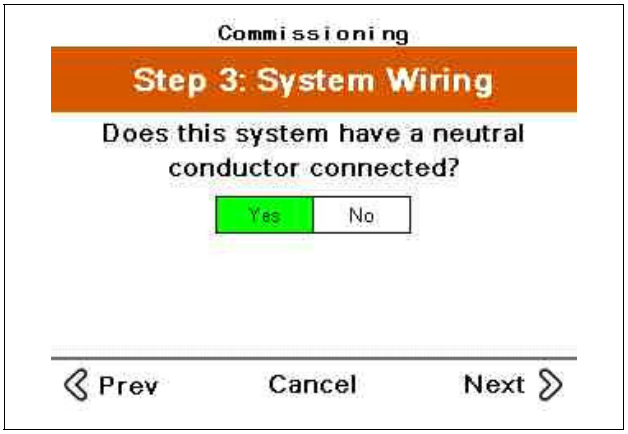
AccuSine PCSn and EVC+ System Wiring Settings

1. Select the grounding configuration of the facility where the system is installed.

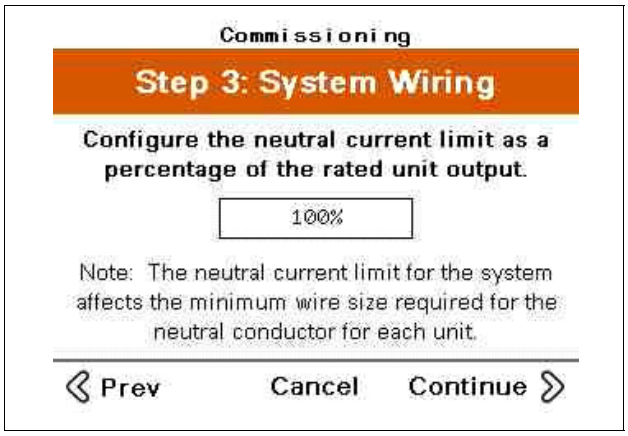




PCSn Only



2. Select Yes if a neutral conductor is connected to the system. If a neutral conductor is connected 3 CTs are required to be installed.



3. Enter the neutral current limit as a percentage of the rated unit output.

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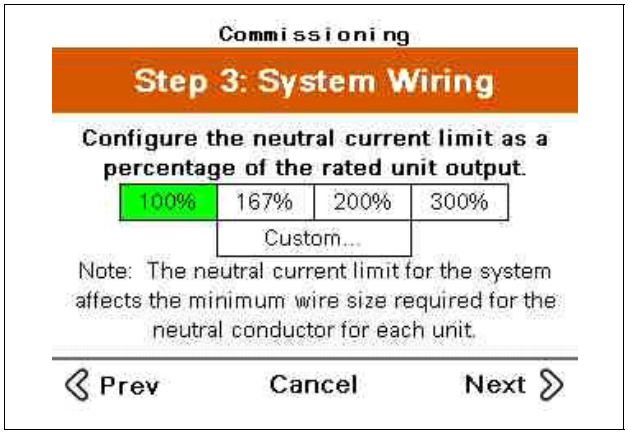
HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Verify that the rating of the neutral conductor for each unit in the system is greater than the neutral current limit setting.

Failure to follow these instructions will result in death or serious injury.



4. Select the percent of unit desired for neutral correction.

Check Fans

Test each fan individually as follows:

AccuSine PCS+ and AccuSine PFV+	AccuSine PCSn and EVC+
	

By entering the unit ID number, each fan can be operated for each unit.

System Integrity Test

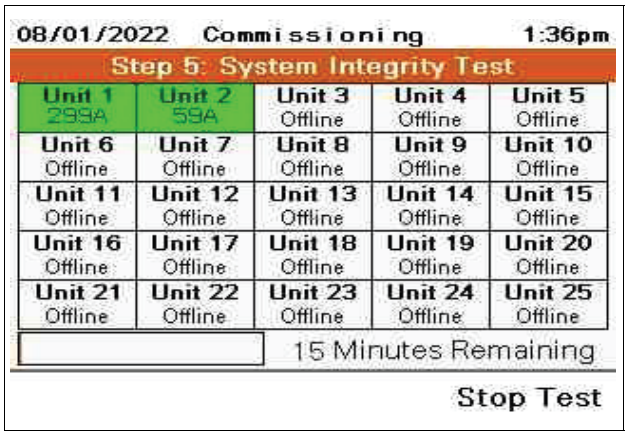
This test verifies that the unit can generate current and provide current correction.

During this test, the unit will generate current in either a capacitive (Leading) or inductive (Lagging) manner. Enter the duration for the test. The test should be performed for a minimum of 15 minutes to allow the unit to reach operating temperature. Enter the maximum system output current of the system.

To run the System Integrity Test, do the following:

1. Select the appropriate mode for the application and press Begin Test.
2. Press Start.

Single unit system will display the output current phase, IGBT temperature, and unit inlet temperature. Scope and Phase allows a means to view the oscilloscope or phasor diagram of the unit during operation.



Parallel Systems will display the output current for each unit in the parallel system.

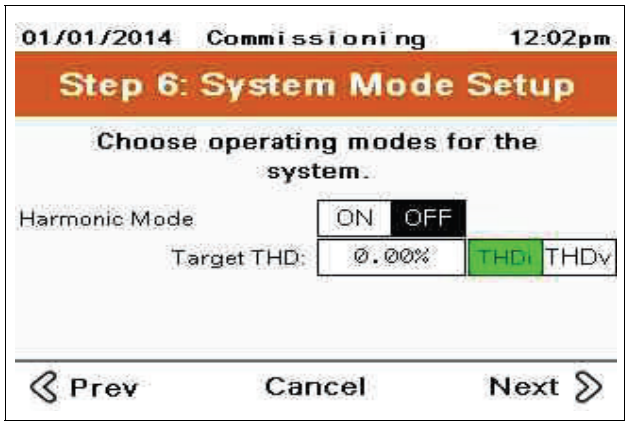
Upon completion of the test, a system pass or fail screen will be displayed.

When successfully completed the unit display the output current values per phase, IGBT temperature rise during the test period. The inlet air temperature at the start and end of the test, ant the duration time of the test.

System Mode Setup

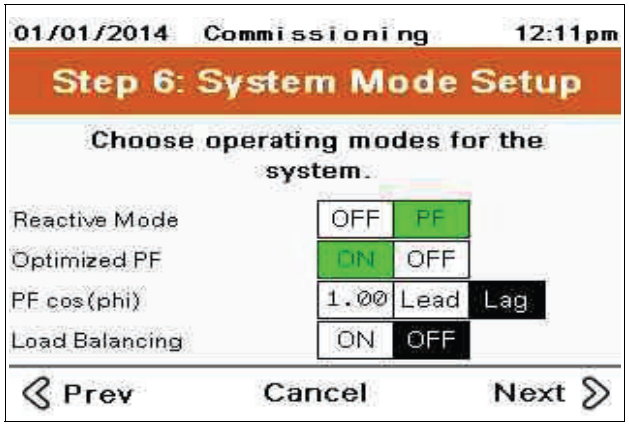
AccuSine PCS+, PCSn, and EVC+ System Mode Setup

Choose the desired operating mode for the system.



When Harmonic mode is selected, a Target THDi or THDv can be set. Leaving the Target at zero will result in the unit doing the best possible correction.

AccuSine PCS+ and PCSn Fundamental Mode Setup



PF Mode: Activates/Deactivates the Power Factor correction mode.

Optimized PF: When set to OFF, the unit maintains the PF cos(phi) setting. When set to ON and the load is less than the PF cos(phi) setting, the unit corrects the power factor to PF cos(phi). If the load PF is greater than the setting, the unit does not compensate unless the power factor is set to maintain a Lag power factor and the load becomes leading. Then, the unit corrects the power factor to a PF cos(phi) of 1.00. If the PF cos(phi) is set to Lead and the power factor of the load is lagging, the unit corrects to a PF cos(phi) of 1.00.

Example*:* With a PF cos(phi) set to 0.98 Lag, the unit maintains a Power Factor of 0.98 Lag when the corrected load is lagging. If the power factor improves to 0.99, no compensation is provided. If the connected load produces a leading power factor, the unit corrects the power factor to 1.00.

PF cos(phi): Target power factor setting.

Load Balancing: Activates/deactivates the load balancing mode.

AccuSine PFV+ and EVC+ System Mode Setup

When **Reactive Mode** is OFF, no compensation is selected.

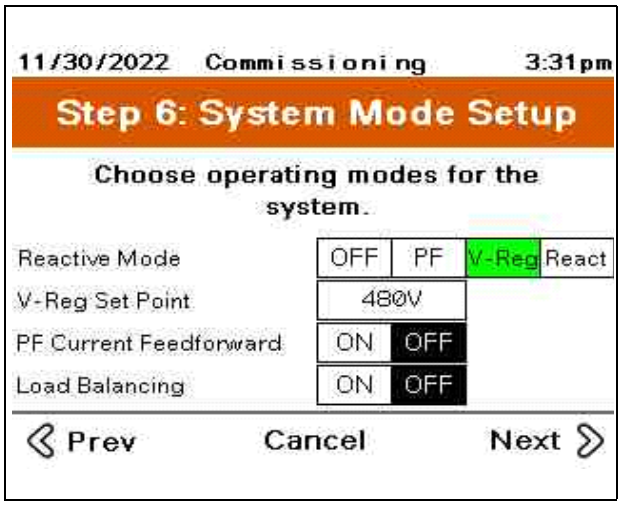
Reactive Mode - PF: With PF mode selected, additional parameters available for the PF mode are displayed.

Optimized PF: When set to OFF, the unit maintains the PF cos(phi) setting. When set to ON and the load is less than the PF cos(phi) setting, the unit corrects the power factor to PF cos(phi). If the load PF is greater than the setting, the unit does not compensate unless the power factor is set to maintain a Lag power factor and the load becomes leading. Then, the unit corrects the power factor to a PF cos(phi) of 1.00. If the PF cos(phi) is set to Lead and the power factor of the load is lagging, the unit corrects to a PF cos(phi) of 1.00.

Example*:* With a PF cos(phi) set to 0.98 Lag, the unit maintains a Power Factor of 0.98 Lag when the corrected load is lagging. If the power factor improves to 0.99, no compensation is provided. If the connected load produces a leading power factor, the unit corrects the power factor to 1.00.

PF cos(phi): Target power factor setting. The power factor can be set for either a leading or lagging cos(phi).

Load Balancing: When ON, the unit corrects for load imbalance (negative sequence current).



Reactive Mode - V-Reg: Voltage Regulation Mode. Voltage regulation mode monitors the voltage and adjusts the reactive current injected to maintain a voltage level.

V-Reg Set Point: Set the desired voltage to be maintained.

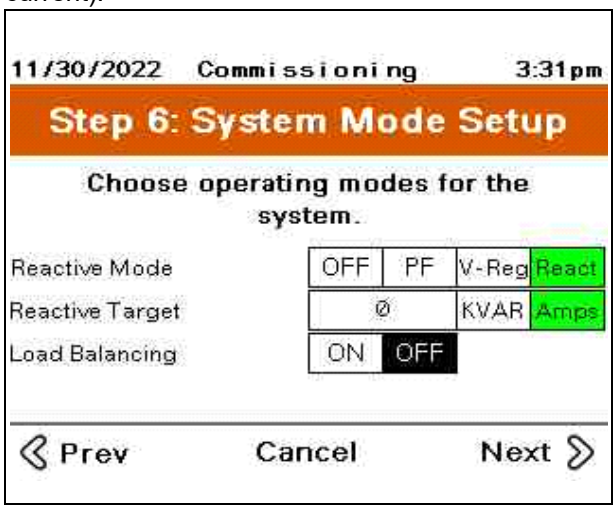
V-Reg Gain: Adjusts the response time of the voltage regulation. The higher the percentage of V - Reg Gain, the faster the response is. Faster response increases the potential for voltage instability of the electrical system.

PF Current Feedforward: When OFF, the CTs are not required for this application. The unit maintains the V - Reg Set Point based on the terminal voltage of the unit.

When ON, the CTs are required for this application. The unit provides the reactive current required based on the PF cos(phi) set point resulting from rapid changes in the load. Adjustments to the reactive power are implemented to maintain the V - Reg Set Point.

The **PF cos(phi)** is set to 1.0 by default. Go to System Settings > Fundamental Mode to change the target PF cos(phi) set point.

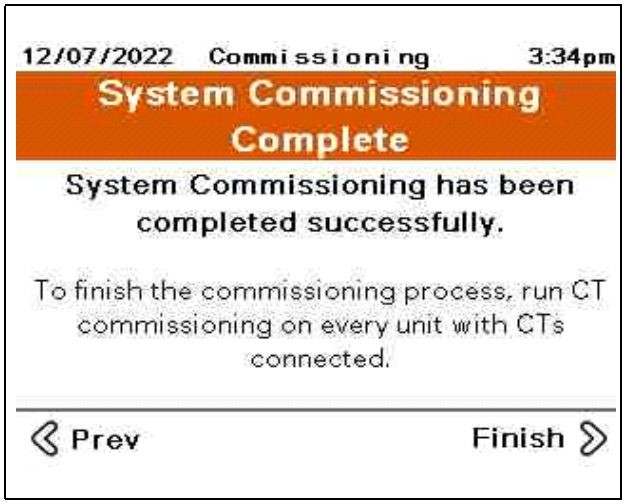
Load Balancing: When ON, the unit corrects for load imbalance (negative sequence current).



Reactive Mode - React: Reactive mode provides leading or lagging kVAR based on the Reactive Target. React Mode does not require the installation of CTs.

Reactive Target can be set either based on kVAR or amperes. Reactive Target can be set remotely through Modbus.

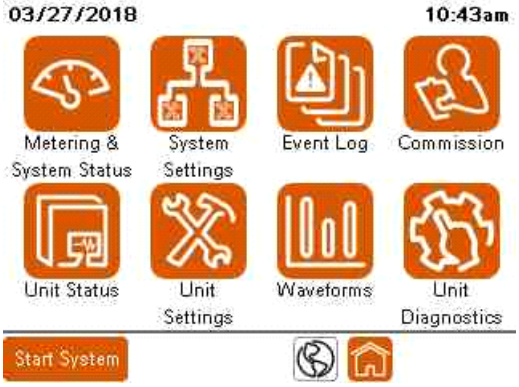
Load Balancing: When ON, the unit corrects for load imbalance (negative sequence current). CTs are required when Load Balancing is selected.



CT Configuration

CT commissioning is required on any main unit, a unit with an HMI and has CTs connected. Units with neutral connected are required to have 3 CTs installed.

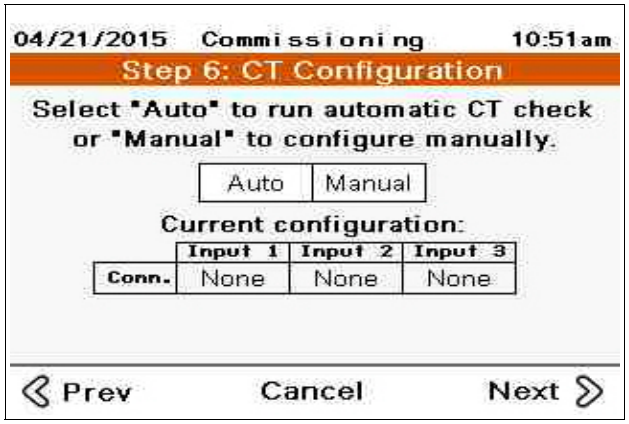
Home Screen



1. Press **Commission**.

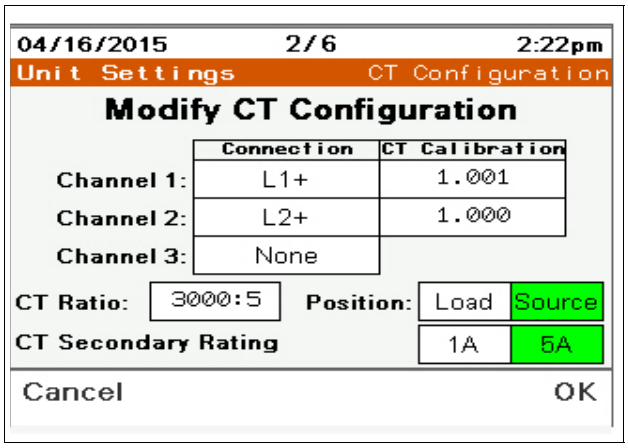
2. Press **Commission CTs** icon. For CT Configuration, choose either Yes or No based on the following:
   - Press **Yes** to perform CT configuration if CT wiring is connected to the unit.
   - Press **No** if the unit is intended to operate as a Slave in a parallel system.

3. If you chose **Yes** in the preceding step, do one of the following:
   - Press **Auto** to have the unit automatically detect CT configuration.
   - Press **Manual** to manually enter the CT configuration.



Manual CT Configuration

If you chose **Manual** for CT configuration, refer to the following for making the settings on this screen:



Channel is the location where the CT secondary wiring is connected to the CT board.

When you tap the **Connection** data block, you can scroll through the available options:

- L1+
- L1-
- L2+
- L2-
- L3+
- L3
- None

  L1, L2, L3 and None describe which phase the CT is connected to. The polarity of the CT connection is identified as “+” or “-”.

  – "+" indicates H1 of the CT is closest to the source,
  – "-" indicates H1 of the CT is closest to the load.

CT Calibration allows for adjusting for CT variation.

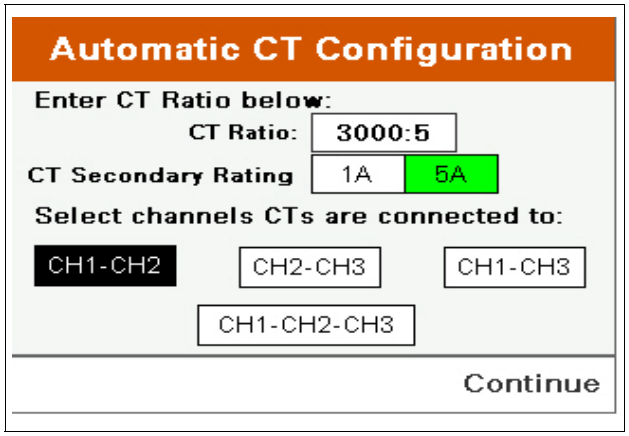
CT Ratio: Touching the data box opens a numerical keypad to enter the primary ratio of the CTs being used.

Position: Select Load if the CTs are measuring only the connected loads to be corrected. This option is not allowed for systems operating in parallel. Select Source if the CTs are measuring the current of all loads being corrected and the active filter current.

CT Secondary Rating: Select the secondary rating of the CT installed.

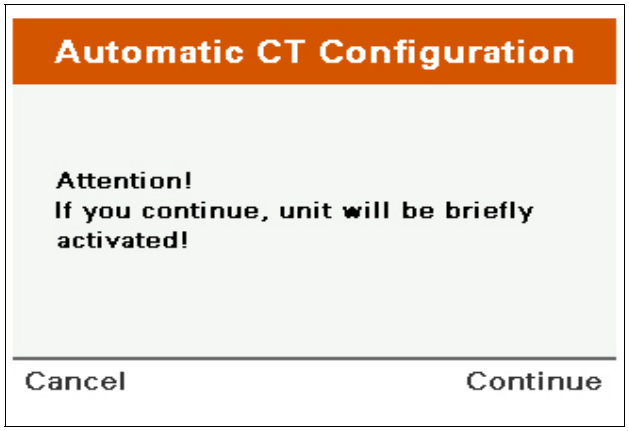
Automatic CT Configuration

If you chose **Auto** for CT configuration, do the following:

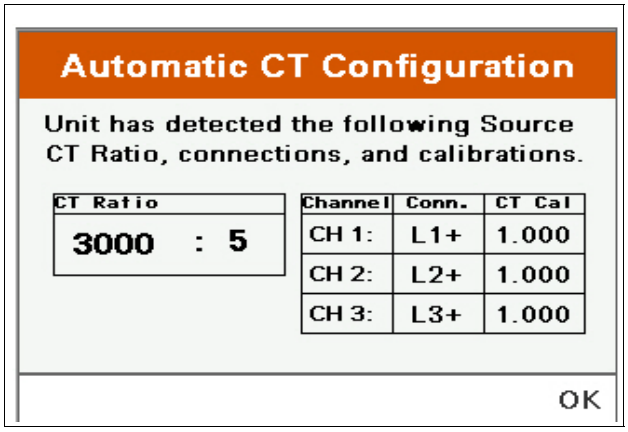


1. In the **CT Ratio** field, enter the primary CT ratio.
2. In the **CT Secondary Rating** field, select either 1 A or 5 A based on the secondary rating of the CTs installed.
3. In the **Select channels CTs are connected** field, select the channels used to connect the CT secondary wiring to the CT board of the unit. This information should be provided by the installer. See Installation Manual for CT installation details.

   An information screen is displayed indicating that the unit is ready to perform the automatic CT detection.
4. Touch **Continue** to continue the test.



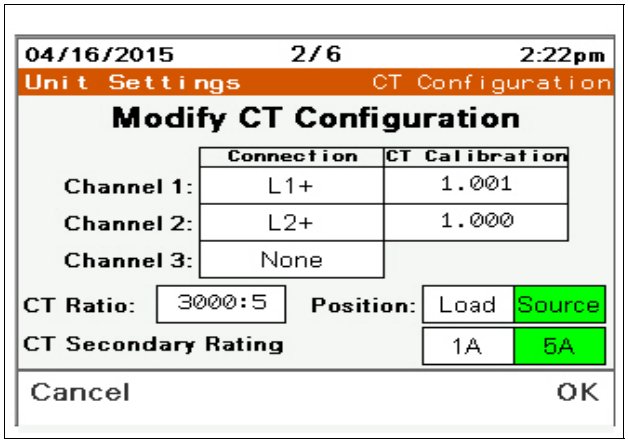
   The unit runs for a short period of time to detect how the CTs are installed.
5. Touch **OK** when the test is complete and the detected CT configuration is displayed.



Source Position Detected

With CTs installed on the source side of the active filter, the unit displays the configuration of the CTs as they are connected to the lines and the CT ratio.

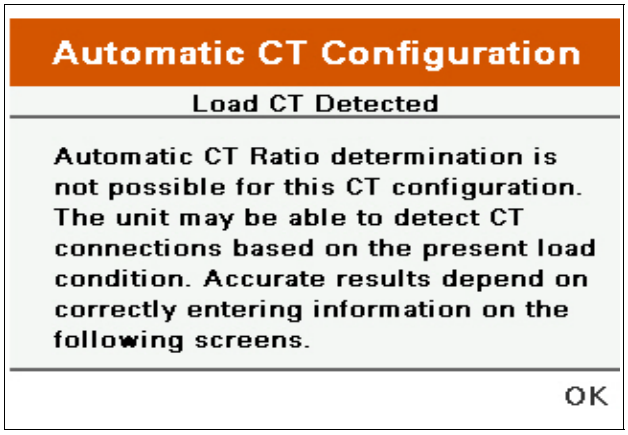
Press **OK** to modify the CT configuration.



Once the unit is configured for the CTs that are installed, press **OK** to continue

Load CT Detected

If a Load CT is detected, the following screen displays.



Parallel Systems

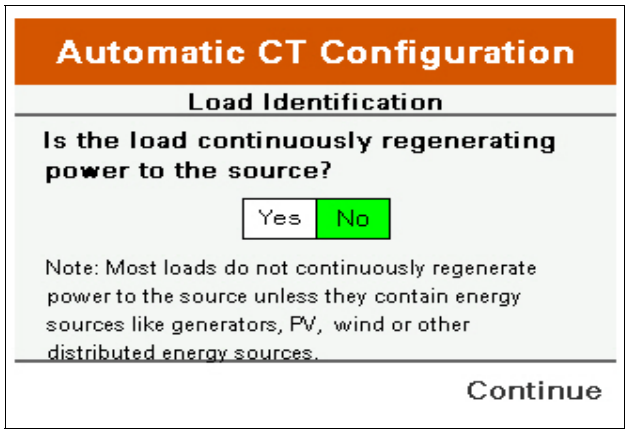
If this is a parallel system, the CTs cannot be installed on the load side of the active filter. Either the CTs are improperly installed, the CTs are not functioning, or the CT secondary wiring is not properly installed.

Single Unit

If you intend to install a single unit and the CTs on the source side of the active filter, verify CT installation, operation, or secondary wiring.

If you intend to install a single unit and the CT on the load side of the active filter, do the following:

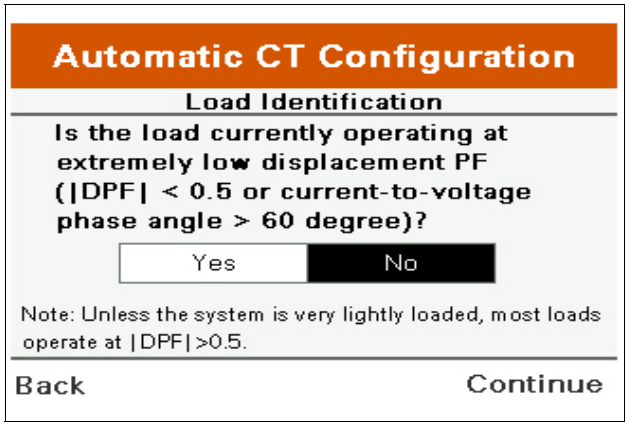
1. Press **OK**.



The unit asks if the load is regenerating.

– If so, the auto CT detection does not accurately determine the CT configuration. Manually enter the CT configuration.

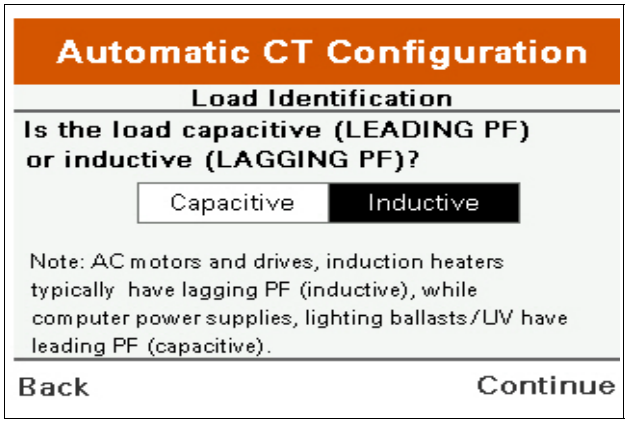
– If the loads are not regenerative, touch **NO** and **Continue**.



The unit asks if the displacement power factor of the load operating at the time of the test was extremely low, less than 0.5.

2. Touch **Yes** or **No** as applicable for the connected loads and then touch **Continue**.

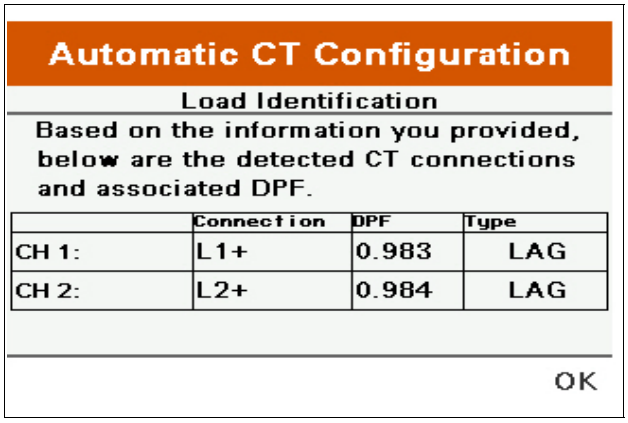
   The unit asks if the connected load at the time of the CT detection was capacitive (having a leading power factor) or inductive (having a lagging power factor).

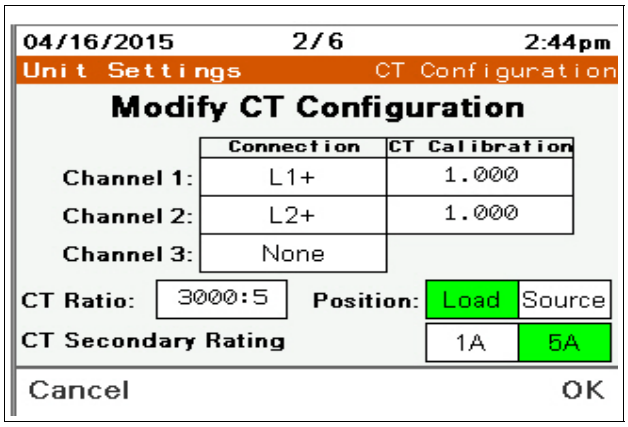


3. Select the appropriate load type and touch **Continue**.

   The CT configuration is displayed based on the answers entered. The DPF value and Leading or Lagging can be compared to an external meter to verify accuracy of the results.

4. Press **OK**.

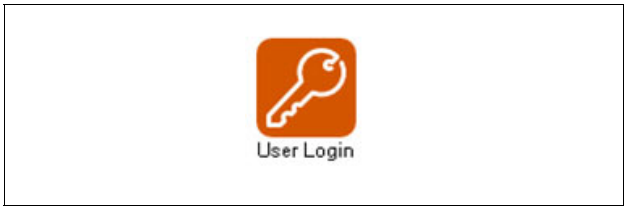




   The HMI returns to the CT Configuration screen.

5. When the CTs are properly configured, touch **OK**.

Set Up Users with the User Manager

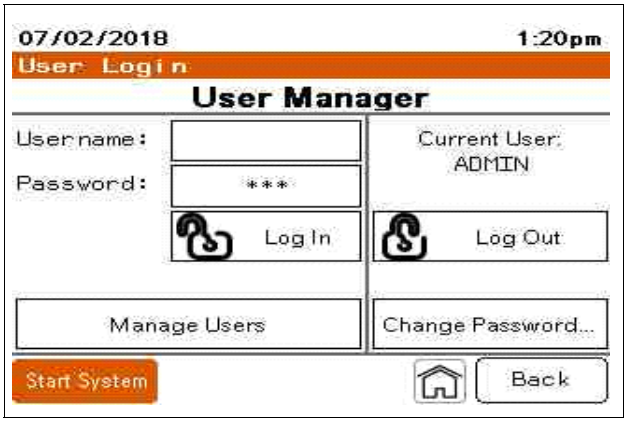


You must have ADMIN level access to set up users.

To change the default passwords to help prevent unauthorized access to device settings and information, do the following:

1. Press **Commission** from the **Home Screen**.

2. Press **Configure Security** icon.



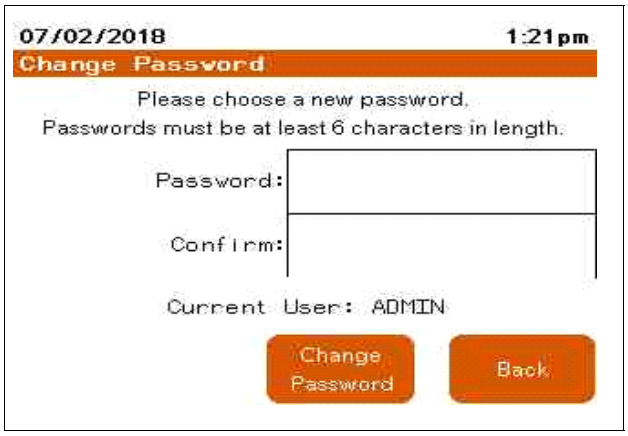
3. Press **Change Password**.
4. Enter the current password. The default password for HMI version 002.001.005 or later is 3w7ADMN.

The information on HMI version can be viewed in **System Status** > **Unit Configuration** page.

5. Enter the new password and confirm.

NOTE: The password must be between 7 and 32 characters with at least one lower case letter, one upper case letter, and one number. Only letters, numbers, and the underscore character are allowed.

6. Press **Change Password**.



⚠ WARNING

POTENTIAL COMPROMISE OF SYSTEM AVAILABILITY, INTEGRITY, AND CONFIDENTIALITY

- Change default passwords at first use to help prevent unauthorized access to device settings and information.
- Disable unused ports/services and default accounts, where possible, to minimize pathways for malicious attacks.
- Place networked devices behind multiple layers of cyber defenses (such as firewalls, network segmentation, and network intrusion detection and protection).
- Use cyber security best practices (for example: least privilege, separation of duties) to help prevent unauthorized exposure, loss, modification of data and logs, interruption of services, or unintended operation.
- Restrict physical access to unit to authorized personnel only.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

NOTICE

EQUIPMENT DAMAGE

Only allow qualified electrical personnel access to the AdminUser or QualifiedUser level user name and password

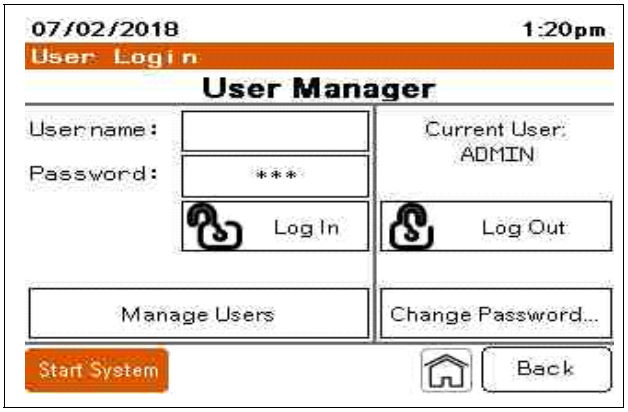
Failure to follow these instructions can result in equipment damage.

To add users, do the following:

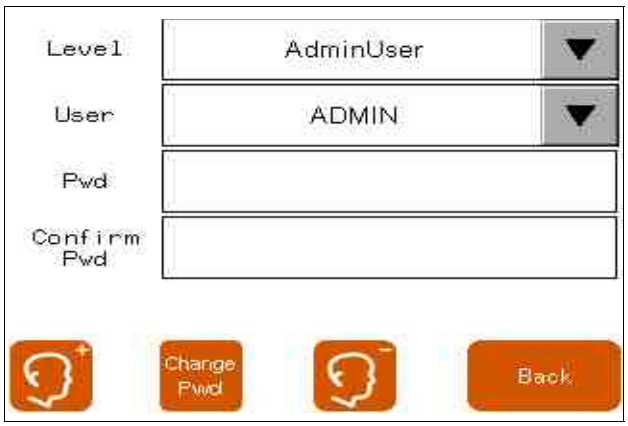
1. Press the User name field. Type ADMIN on the keypad and press Enter.
2. Press the Password field and enter the ADMIN password.

NOTE: The default password for the ADMIN user with HMI version 003.000.000 or later is 3w7ADMN. If the password has already been changed, use the new password.

3. Press **Log In**.
4. Press **Manage Users**.



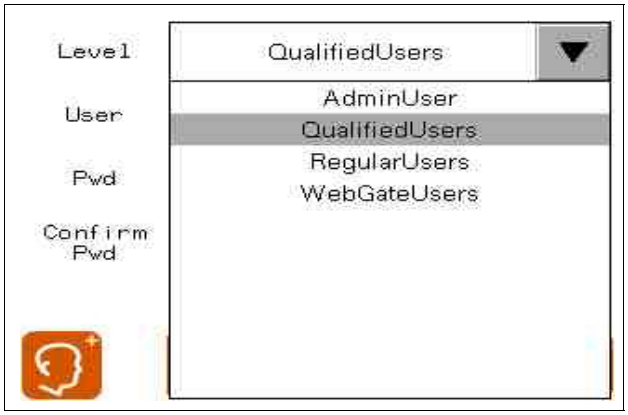
5. Press the drop-down arrow for Level.



Three choices are available for Level:

- **AdminUser:** Has complete access to all parameters described in this manual. The AdminUser level is the only level with permission to add or remove users. The AdminUser name must be ADMIN. There can only be one AdminUser level user.
- **QualifiedUsers:** Have access to all parameters except adding new users to the system.
- **RegularUsers:** Have access to change parameters on the Unit Setting, Compensation Mode screen only.

6. Select the appropriate user level for the person being added.



7. Press the User field. Type the new Username on the keypad and press Enter.
8. Press Pwd and let the user type the password. Or, you can create a temporary password for the user to change when first logging in.

NOTE: The password must be between 7 and 32 characters with at least one lower case letter, one upper case letter, and one number. Only letters, numbers, and the underscore character are allowed.

9. Press Confirm Pwd and re-enter the password.
10. Press the Add User icon.

Change a password

To change passwords:

1. Log in with the user name and password.
2. Press **Change Password**.
3. Enter the new password.

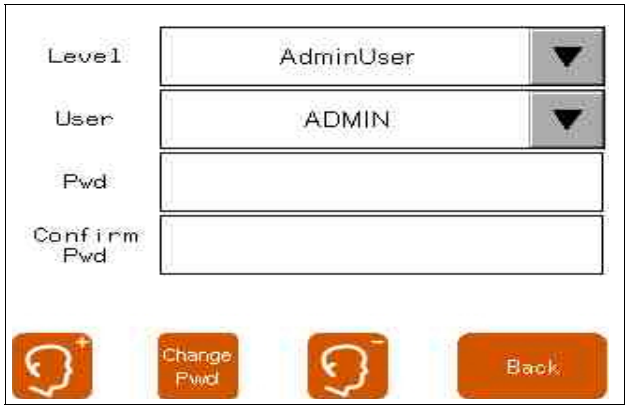
NOTE: The password must be between 7 and 32 characters with at least one lower case letter, one upper case letter, and one number. Only letters, numbers, and the underscore character are allowed.

4. Enter it again in the Confirm field.
5. Press **Change Password**.
6. Press **Back** to return to the log in screen.

Delete a user

To delete a user, do the following:

1. From the Level drop-down, choose the level the user is in.



2. From the User drop-down, choose the user.
3. Press the Delete User icon.

4. Confirm that the user is to be deleted.

Chapter 5 Troubleshooting

Refer to this table for troubleshooting.

Event	Explanation	Action
AC Line Not Qualified	Frequency Not Qualified	Verify Line Frequency is within ±3Hz.
	Three Phase Loss	Verify AC Line is present.
	Single Phase Loss	Verify all three line voltages are present.
	Over Voltage	Verify Line voltage is within +10%.
	Voltage Imbalance	Verify voltage imbalance is less than 8%.
	Fast Under Voltage	Verify voltage is within 50% of nominal (1/4 cycle).
	Fast Over Voltage	Verify voltage is within +10% of nominal (1/4 cycle).
Auto Detection Out of Range	Unit was unable to Auto Detect voltage or frequency.	Disable Auto Detect. Manually enter nominal voltage and frequency of the electrical system.
Low Order Harmonics OFF [AHF type only]	5th and/or 7th order harmonic disabled	Typically caused by harmonic loads without the minimum3% impedance or un-isolated power factor correction capacitors on the load side of the main CTs.
Fan Failure Detected	Power section fan inoperable	Call your local service center.
Filter Trip	Inverter Filter inoperable	Call your local service center.
Gate Drive Trip	Power supply issue on Gate Driver	Call your local service center.
HMI Communication Loss	HMI communication to Control Board loss	Verify Proper connection of HMI RJ45 Com jack. Call your local service center.
IGBT Trip	IGBT issue detected	Call your local service center.
MOV Requires Service	MOV issue detected	Call your local service center.
Over Current Condition Detected		Call your local service center.
Over Temperature	Over Temperature detected	Verify air temperatures to the air intake of the unit are within specification. Verify intake and exhaust air vents are not obstructed.
Parallel Power Wiring Mismatch	L1, L2 and L3 are not powered by the same phase for each parallel unit.	Ensure L1, L2 and L3 of all parallel units are power by the same phase.
Protection Firmware Trip	Firmware issue detected	Call your local service center.
Power Supply Out of Range	Power Supply issue detected	Call your local service center.
Current Sensor Out of Range	Internal Current Sensor issue detected	Call your local service center.
Internal Transformer Over Temperature	Transformer Over Temperature detected (600 and 690 volt units only)	Verify air temperatures to the air intake of the unit are within specification. Verify intake and exhaust air vents are not obstructed.
High Frequency Voltage Distortion Condition	Excessive inverter switching frequency detected on line voltage	Call your local service center.
Loss of Modbus TCP/IP Communication	Possible denial of service attack	Go to Unit Settings → External Interfaces. Press Reset TCP/IP Communications.

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