

AccuSine PCSn Active Harmonic Filter

User Manual

PHA59669-00
08/2018

03/27/2018

10:43am

 Metering & System Status	 System Settings	 Event Log	 Commission
 Unit Status	 Unit Settings	 Waveforms	 Unit Diagnostics
			

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.

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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.

Chapter 2 Introduction

Active Harmonic Filter

Active Harmonic Filters (AHF) 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 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 enclosures are available in an IP20 either as a wall mount or rack mount option. An IP00 open chassis is also available that can be installed in other types of enclosures such as motor control centers (MCC).

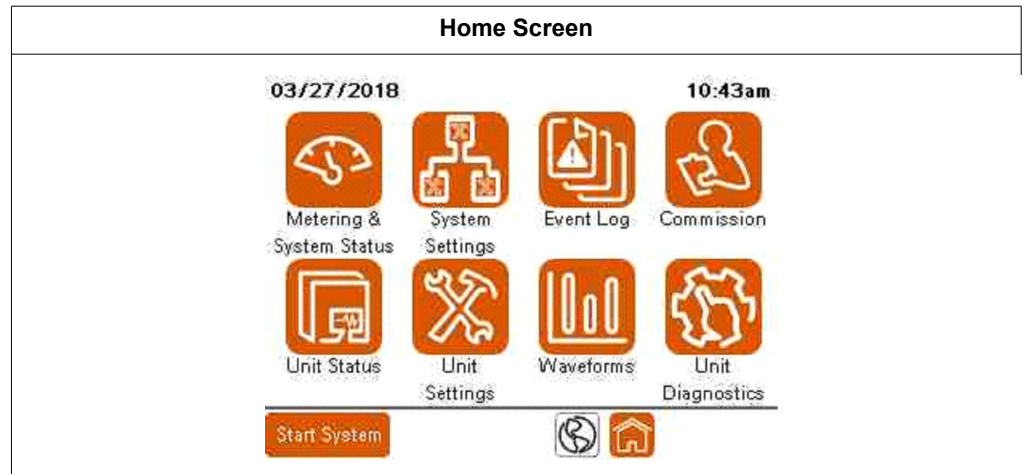
AccuSine PCSn can be powered by three phase conductors to provide corrective current for Line-to-Line connected loads or by three phase conductors and neutral to provide correction for Line-to-Line and Line-to-Neutral connected loads. The amount of correction can be selected to provide neutral current 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).

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.

Home Screen

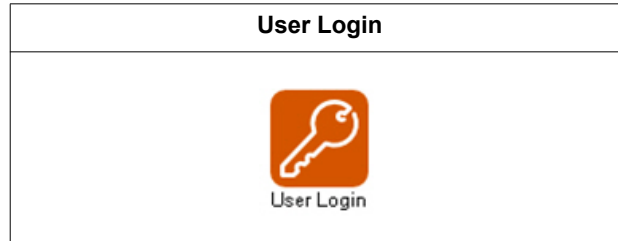


When first energized, the HMI displays the Home screen. To return to the Home screen, press the Home icon at the bottom on any of the screens. To change parameters, you must be logged in as an Admin level user. From the Home screen, you can access the following:

- **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.

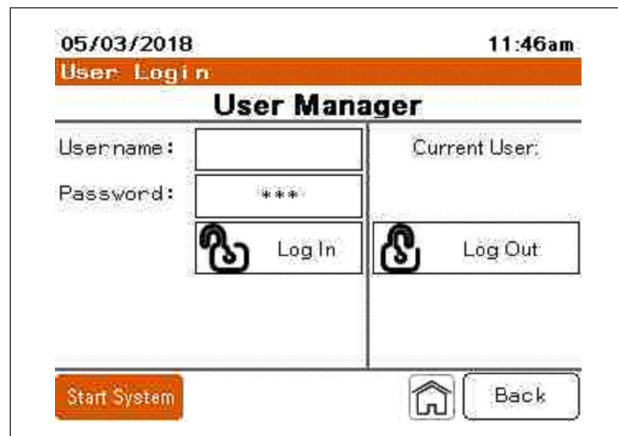
User Login

User Login is required to change various parameters and to perform 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 53. 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.

Metering & System Status



Currents

03/27/2018 1/6 10:43am

Metering Currents

	L1	L2	L3	N
Total Load	39A	35A	23A	58A
Load Harmonics	26A	24A	15A	57A
Output Harmonics	0A	0A	0A	0A
Output Fund.	0A	0A	0A	0A
Total Output	0A	0A	0A	0A
Source	39A	35A	23A	58A

Start System

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.

Fundamental Current

03/27/2018 2/6 10:43am

Metering 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

Start System

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

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

Zero Sequence: Zero Sequence current of the load, 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.




Fund Current Out: Displays fundamental current produced per phase.

Load Balancing: Indicates whether the Load Balancing mode is ON or OFF.

PF Mode: Indicates that the Power Factor correction mode is ON or OFF.

Performance

03/27/2018 3/6 10:44am						
Metering				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		

Start System   

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.




03/27/2018		4/6	10:44am
Metering		Power	
Power at 60.0Hz			
Source Apparent Power (S)	16.9 kVA		
Source Real Power (P)	16.9 kW		
Source Reactive Power (Q)	0.7 kVAR		
Load Apparent Power (S)	16.9 kVA		
Load Real Power (P)	16.8 kW		
Load Reactive Power (Q)	0.7 kVAR		
Output Reactive Power (Q)	0.0 kVAR		

Start System   

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.

02/08/2015		5/6		12:25pm	
System Status			Overall Status		
System Information:			Compensation:		
System Status	OFF	Harmonic Mode			
Master ID	1	ON	0.00%	THDi	
Priority	1	PF Mode			
Available Cap.	0A	ON	1.00	Lag	
Active Cap.	0A	Optimized PF		ON	
Output	0A	Load Balance		OFF	
Neutral Limit	300%	Priority			
		Harm	100%	Fund	0%
Start 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: 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 screenshot shows a user interface for 'Parallel Unit Status'. At the top, it displays the date '02/08/2015', a page indicator '6/6', and the time '12:25pm'. Below this is a header with 'System Status' and 'Parallel Unit Status'. The main content is a 5x5 grid of unit status information. Unit 1 is highlighted in yellow and labeled 'Stopped', while all other units (2-25) are labeled 'Offline'. At the bottom of the grid is a button labeled 'Synchronize System Settings...'. Below the grid is a 'Start System' button and three navigation icons: a home icon, an up arrow, and a checkmark.

Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
Stopped	Offline	Offline	Offline	Offline
Unit 6	Unit 7	Unit 8	Unit 9	Unit 10
Offline	Offline	Offline	Offline	Offline
Unit 11	Unit 12	Unit 13	Unit 14	Unit 15
Offline	Offline	Offline	Offline	Offline
Unit 16	Unit 17	Unit 18	Unit 19	Unit 20
Offline	Offline	Offline	Offline	Offline
Unit 21	Unit 22	Unit 23	Unit 24	Unit 25
Offline	Offline	Offline	Offline	Offline

Synchronize System Settings...

Start System

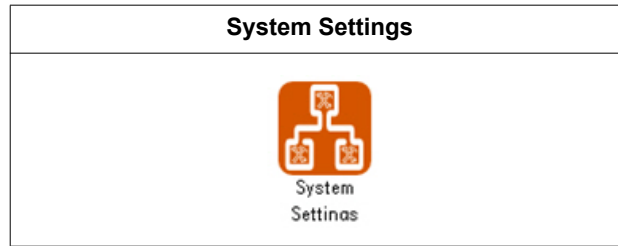
The Parallel Unit Status provides general operating condition of each unit in the parallel system.

Touching the unit number will cause that unit number to flash as well as the LED on the front panel of the physical unit associated with that unit number.

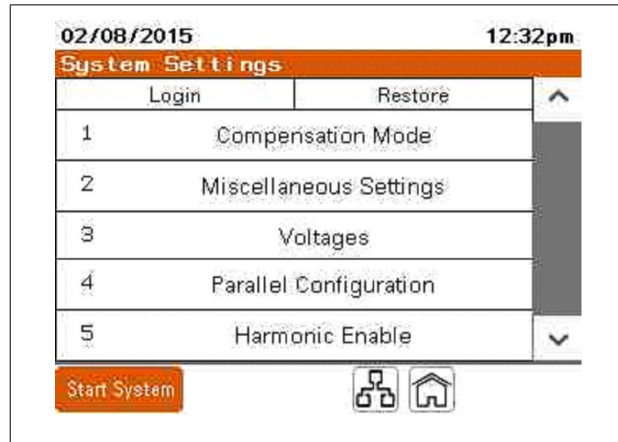
Pressing and holding the unit number will cause a screen with details regarding that specific unit.

Selecting Synchronize System Settings synchronizes the System Status settings for all networked parallel units in the system.

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.

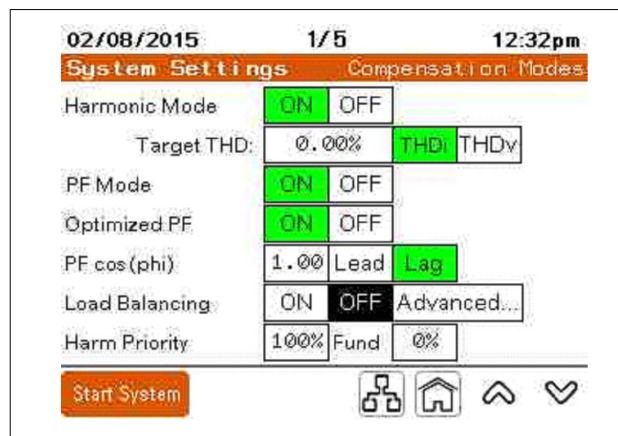


Press **Login** to display the Login screen.

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

Press the screen name to access a screen.

Compensation Mode Screen



Harmonic Mode: Activates/Deactivates the harmonic correction mode.

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 load balancing mode.

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

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.

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%

You can use the following formulas to calculate this current relationship:

$$I_{O/P}^2 = I_h^2 + I_r^2$$

- or -

$$I_{O/P} = \text{SQRT}(I_h^2 + I_r^2)$$




Where

- $I_{O/P}$ is the total output current of active filter
- I_h is the injected harmonic current of active filter
- 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.

Miscellaneous Settings

02/08/2015		2/5		12:32pm	
System Settings		Misc. Settings			
Auto Start	<input checked="" type="checkbox"/>	<input type="checkbox"/>			
Auto Start Delay	30s				
Power Save ON	15%				
Power Save OFF	10%				

Start System   

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

02/08/2015		3/5		12:32pm	
System Settings		Voltages			
Auto Detect	<input checked="" type="checkbox"/>	<input type="checkbox"/>			
Nominal Voltage	400v	50Hz	<input checked="" type="checkbox"/>		
IT Grounding Relay	Open	Closed			
Neutral Connected	<input checked="" type="checkbox"/>	<input type="checkbox"/>			
Neutral Limit	300%				

Start System   

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. Nominal voltages at 208 V, 220 V, 240 V, 380 V, 400 V, and 415 V are automatically detected. For other nominal operating voltages, enter them manually.

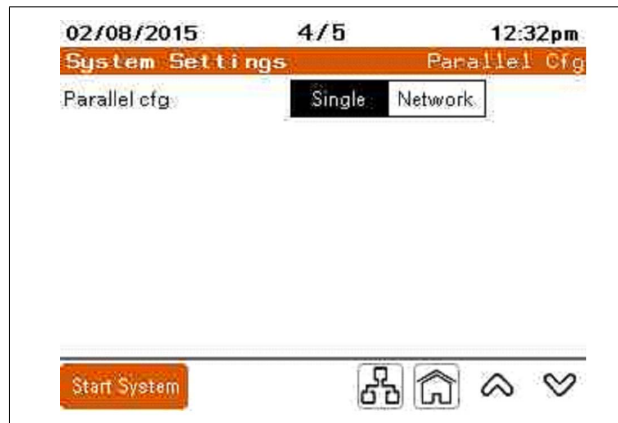
Nominal Freq.: With Auto Detect ON, the nominal frequency is automatically entered. With Auto Detect OFF, the nominal frequency applied at the input power connection must be selected.

IT Grounding Relay: Open for solidly grounded systems (TN, TT). Close when installed on system with IT, HRG, Corner grounded delta.

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

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

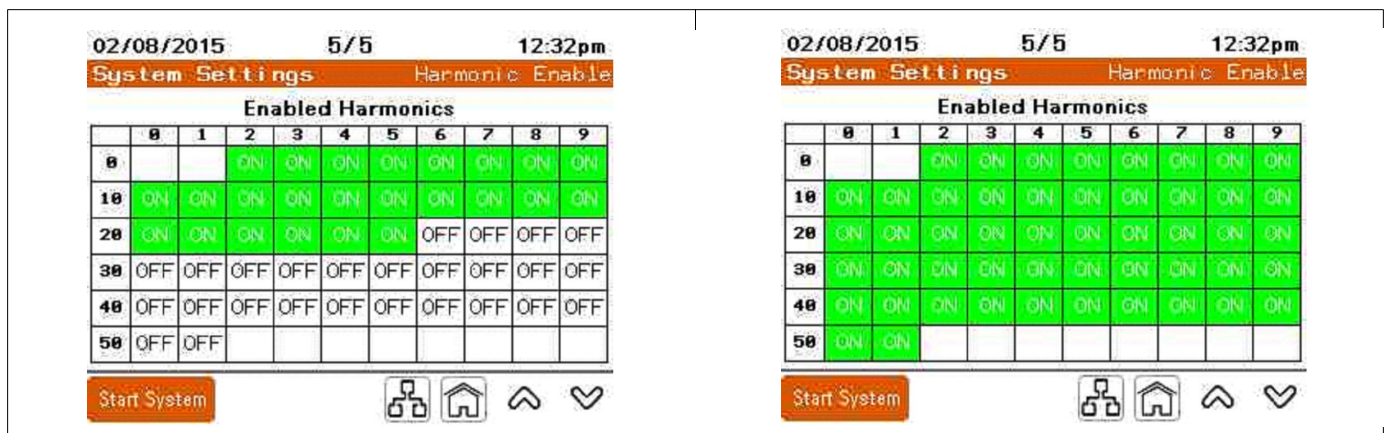
Parallel Configuration



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

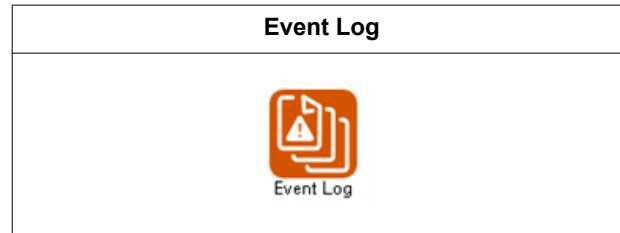
Network: Select if all units that are operating can be networked together for parallel operation.

Harmonic Enable



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.

Event Log



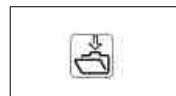
05/03/2018 Event Log 11:20am

Event	Time	Date
991 Under Temperature	08:44:28	02/19/2018
992 Unit Started	08:44:28	02/19/2018
993 System Started	08:44:10	02/19/2018
994 Control Board Startup	08:43:57	02/19/2018
995 Event Timeout	14:01:00	01/11/2018
996 System Stopped	14:01:00	01/11/2018
997 Unit Stopped	14:01:00	01/11/2018
● 998 Under Temperature	14:01:00	01/11/2018
999 Unit Started	14:01:00	01/11/2018
1000 Unit Stopped	14:00:30	01/11/2018
1001 Under Temperature	14:00:30	01/11/2018
1002 Unit Started	14:00:30	01/11/2018
1003 Unit Stopped	13:59:59	01/11/2018

Start System

The Event Log displays events that occurred. Touch an event to select it. Then, press the magnifying glass icon to display the details for that event.

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



05/03/2018 Event Log 11:20am

Event Details

Event: Under Temperature

Event Date: 01/11/2018 Event Time: 14:01:00

Units:

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

Event Data 1: 00000 Event Data 2: 00000

OK

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

Unit Status



Overall Status

Unit Status		Overall Status		
06/30/2018 1/4 11:04am				
Unit Informations:				
Unit Status	Stopped	Output		
Unit Rating	30A	Unit ID 1		
Derating	0%	Priority Group 1		
Unit Output:	L1	L2	L3	N
Output Harmonics	0A	0A	0A	0A
Output Fund.	0A	0A	0A	0A
Total Output	0A	0A	0A	0A
Active Notifications				
Start System Display: Unit1 Home Up Down				

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 that is operating.

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.

Unit Configuration Screen

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

06/30/2018		2/4		11:04am	
Unit Status		Unit Configuration			
HMI Version:		Unit Setup:			
PCSn_000.001.006		Unit Type	AHF		
Control DSP Version:		Unit Size	30A		
DM PCSn_000.001.006		400V	60Hz		
Protection DSP Version:		CT Conn.	3 CTs		
PCSn_000.001.006		CT Ratio	3000:5		
Network Setup					
IP	10.172.132.204				
Subnet	255.255.0.0				
Start System		Display: Unit1		  	

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 27 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: Displays the unit amperage rating.

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

06/30/2018		3/4		11:04am	
Unit Status: Voltage and Temperature					
Voltages:					
Line Voltage	402V	DC Bus Top	334V		
Line Frequency	59.99Hz	DC Bus Bot	334V		
Temperatures:					
IGBT	29°C	Inlet	26°C		
Filter Res	25°C	Control Board	27°C		
Unit Top Left	25°C	Unit top right	25°C		
Start System Display: Unit1 Home Up Down					

Voltages

Line Voltage: Displays 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: Temperature of the inverter IGBT.

Filter Res: Filter resistor temperature

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




Inlet: Unit's inlet air temperature.

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

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

Unit Status

06/30/2018 4/4 11:04am	
Unit Status	
Lifetime Unit Information:	
Uptime	1.02h
Total On Time	23909.53h
Total Run Time	1533.02h
Average Output L1	81.0A
Average Output L2	80.7A
Average Output L3	79.6A

Start System Display: Unit1   

Uptime: Elapsed time from the last energization.

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

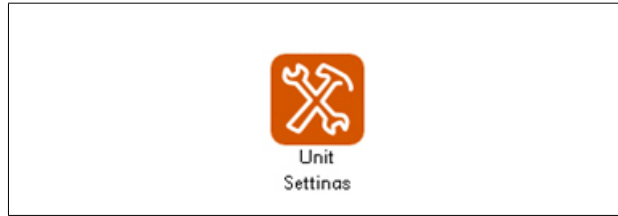
Total Run Time: Total time the unit has been in Run condition.

Average Output L1: Average output current for L1 phase.

Average Output L2: Average output current for L2 phase.

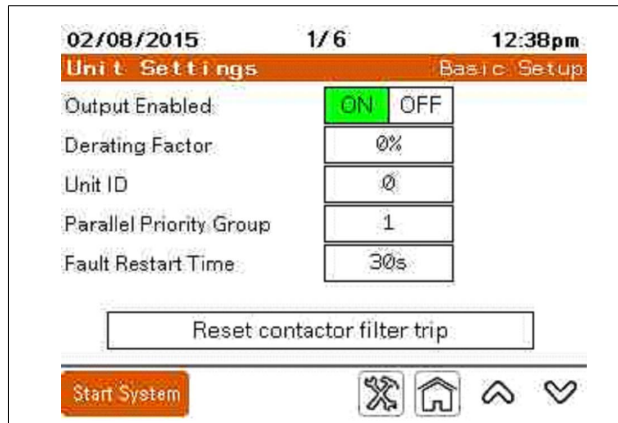
Average Output L3: Average output current for L3 phase.

Unit Settings



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

Basic Setup



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.

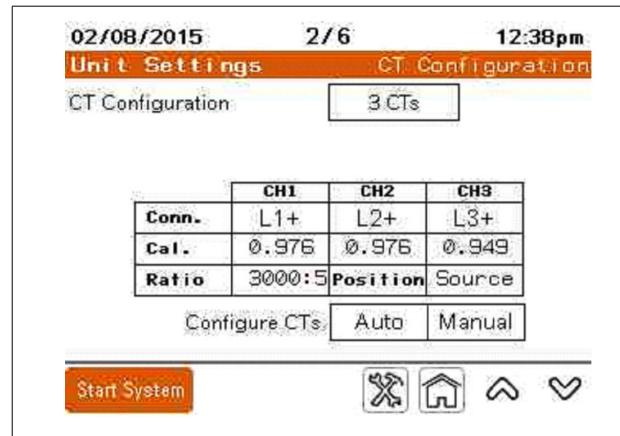
Unit ID: For parallel systems, each unit in the parallel system must have a unique unit identification number.

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.

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

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.

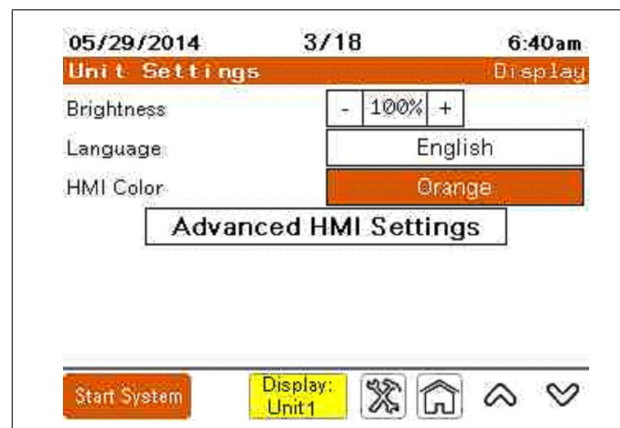
Ratio: Displays the parameter setting of the CTs installed.

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 49.

Selecting Manual displays a Modify CT Configuration screen to allow manual setting of these parameters. Refer to “Manual CT Configuration” on page 48.

Brightness and Advanced HMI Settings



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

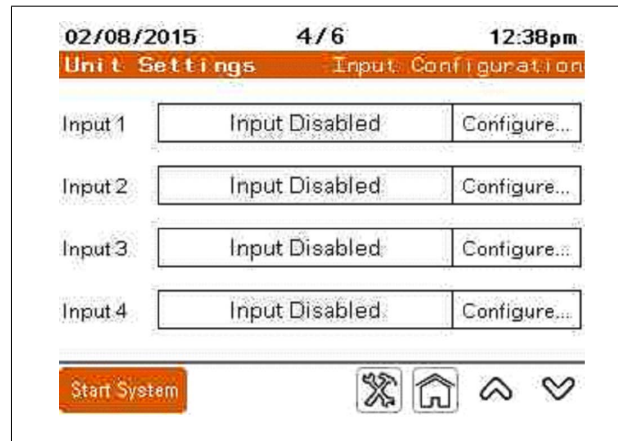
Language: Allows the HMI language to be changed.

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 31 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:

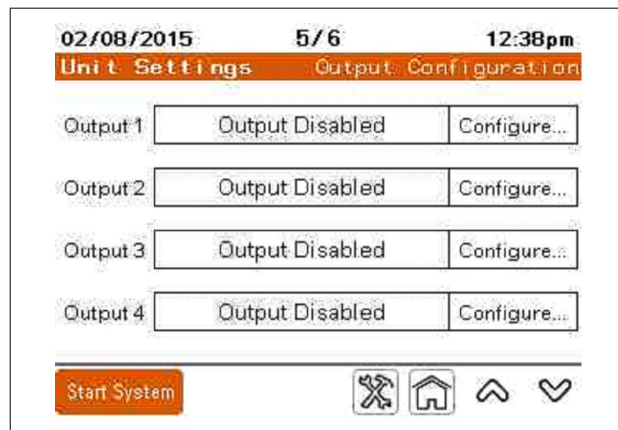
- **Input Disabled:** The input is not used.
- **Run System:** Causes the system to go into RUN condition.
- **Stop System:** Causes the system to STOP (no output).
- **Unit Pause:** Stops the output current until input changes states.
- **Disable Remote Access:** When enabled, this prevents remote access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

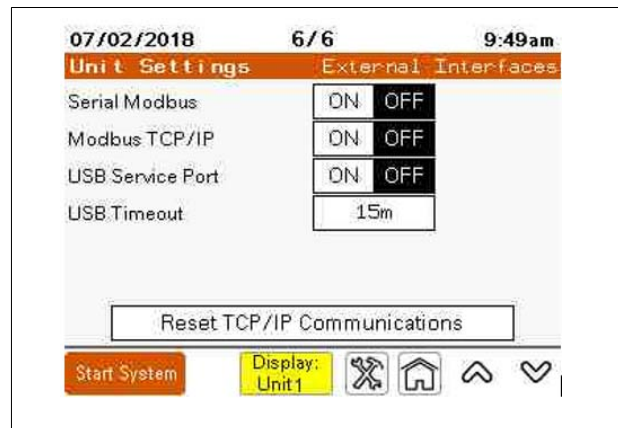
Each Output Function can be active when the switch is either Open or Closed.

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 PCSn device, the network connectivity on AccuSine PCSn device may cease to function. Therefore, it is advised to always keep the connection to AccuSine PCSn 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 that even during network connectivity interruption, AccuSine PCSn 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 PCSn 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.

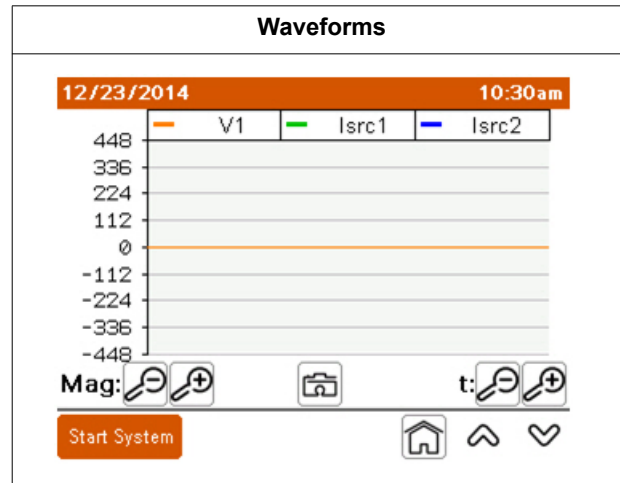
Modbus TCP/IP Address Setup

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 IPAddress, 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.



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	Iref1	Iref2	Iref3
V1	Iout1	Iout2	Iout3
V2	Isrc1	Isrc2	Isrc3
V3	Iload1	Iload2	Iload3

OK

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

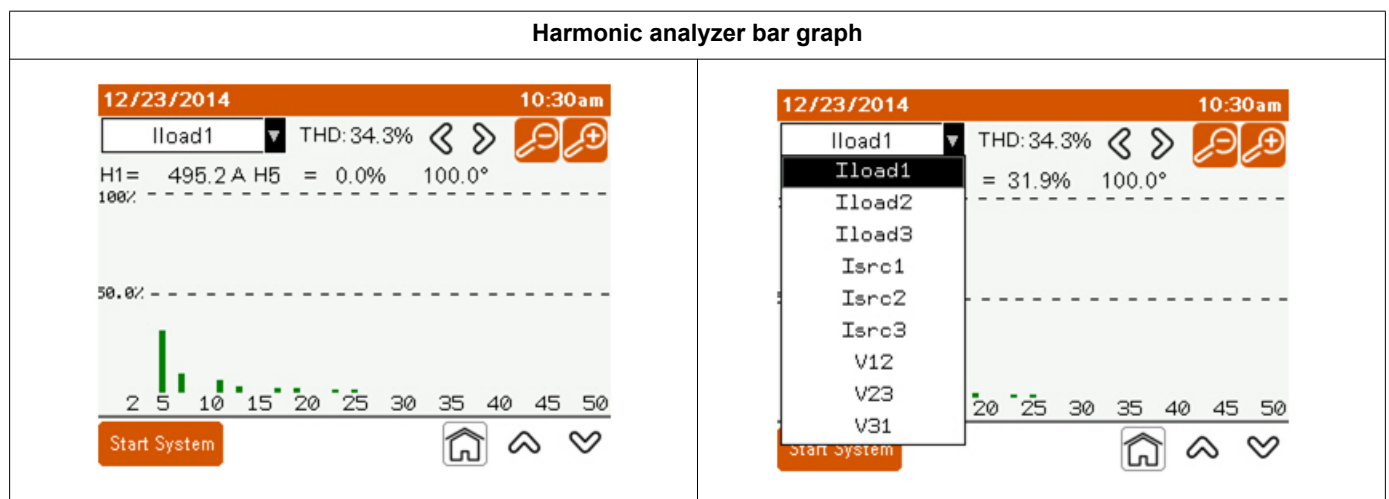
Isrc2: Current source L2

Isrc3: Current source L3

Iload1: current load L1

Iload2: current load L2

Iload3: current load L3

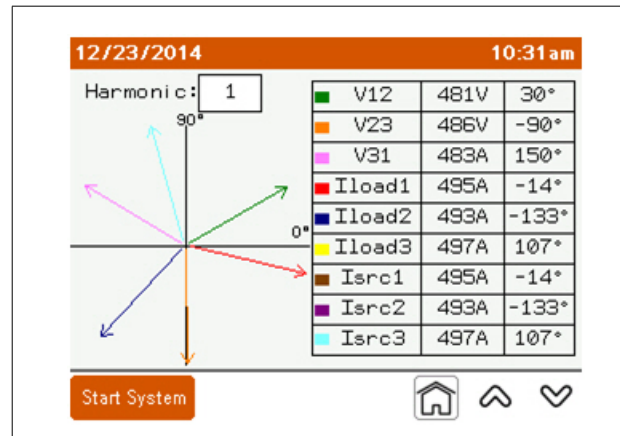


Use the top left drop-down to select the value to be analyzed.

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.

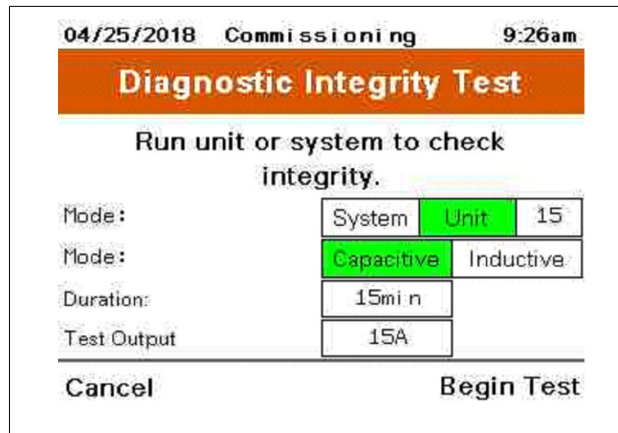
Iload3: Current load L3.

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.

04/25/2018 Commissioning 9:26am

Diagnostic Integrity Test

	L1	L2	L3
Output	30A	30A	30A
IGBT Temp	62°C	62°C	62°C
Inlet Temp	28°C		

15 Minutes Remaining

Scope Phasors

Stop 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.

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

Test Run Completed

	Unit On			Unit Off		
	L1	L2	L3	L1	L2	L3
THDi	3.8%	3.6%	3.4%	89.6%	89.6%	89.9%
THDv	2.4%	2.0%	1.8%	6.0%	5.9%	5.9%
DPF	-1.000			0.999		
Unbal	7%	0%	8%	12%	1%	13%
Fund Current Change	-4.4%	6.2%	64.2%			
Load Harmonic Rise	2%	2%	40%			
Output Harmonics	90%	81%	72%			
Total Output	90%	81%	72%			

OK

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.

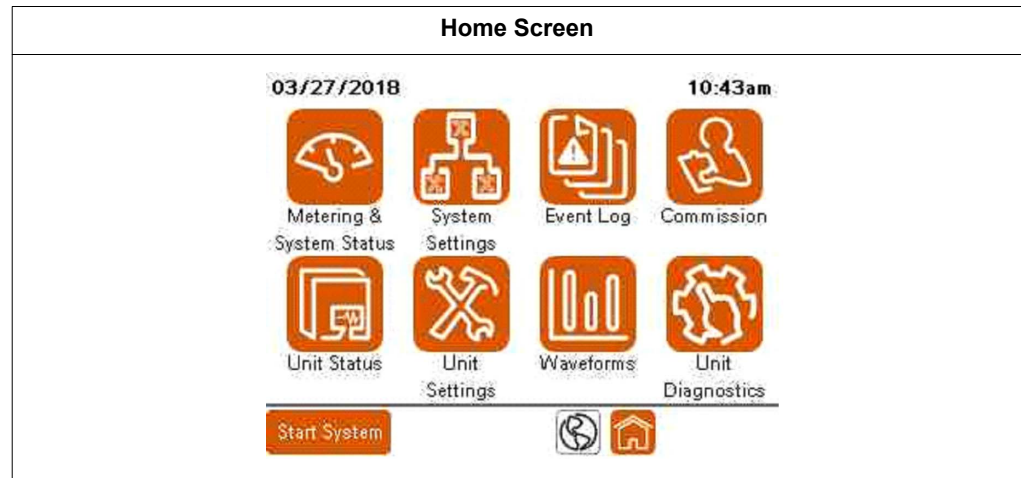
Once the unit is commissioned, you do not have to perform this procedure again.

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 38.
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

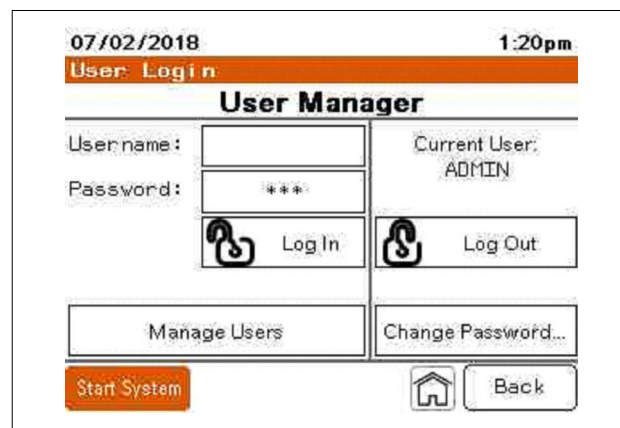
When the active filter is first energized, the HMI displays the Home screen.



1. Press Commission.



2. Press Configure Security icon.
3. To log in for the first time, enter ADMIN for both user name and password and press Log In.

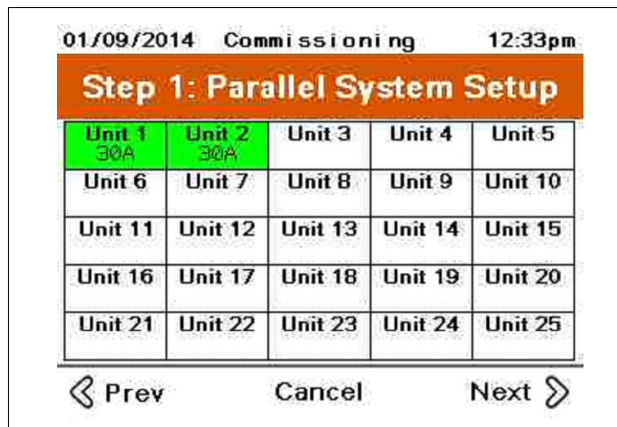
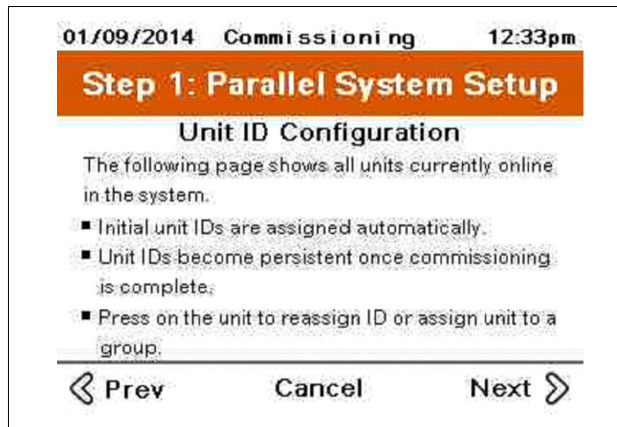


4. Press Back to begin the commissioning procedure.

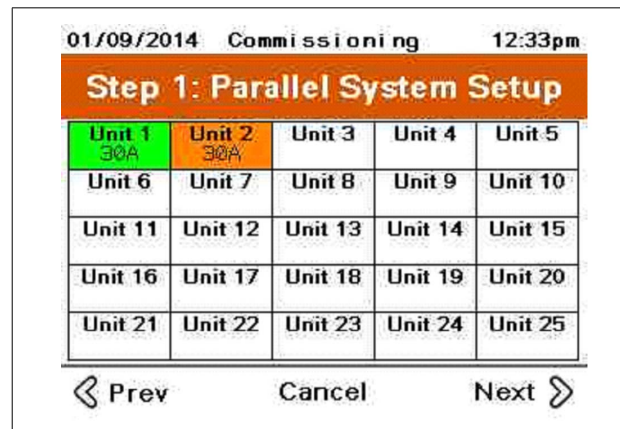
Parallel System Setup



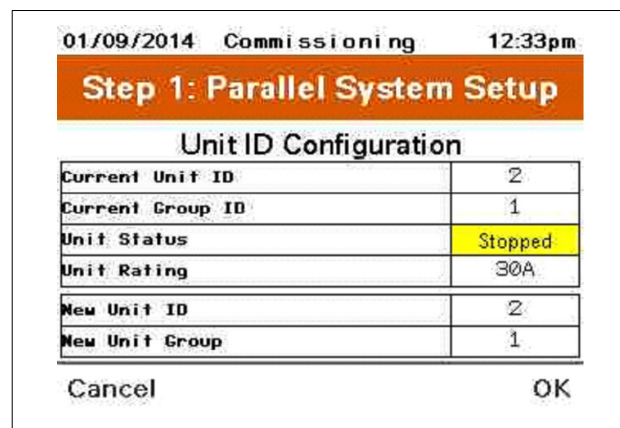
1. Select Single unit or Parallel system.
When Single is selected proceed to Step 2, Adjust Date & Time.
When Parallel is selected, following procedure is required.



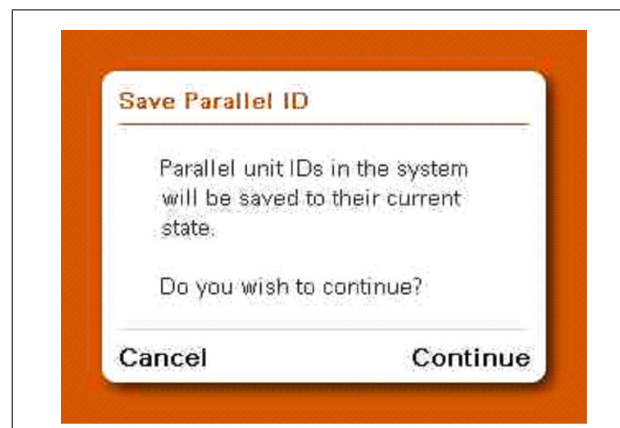
2. For parallel systems, the Parallel System setup screen will be displayed. Pressing the unit ID number will cause the unit number on the screen to cycle in color default is green to orange. The LED on the front of the unit with that ID will also flash.



- By pressing and holding the unit number, a screen will be displayed providing a means to change the unit ID.



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



Adjust Date and Time

Set the date time for the active filter as follows:



Commissioning

Step 2: Adjust Date & Time

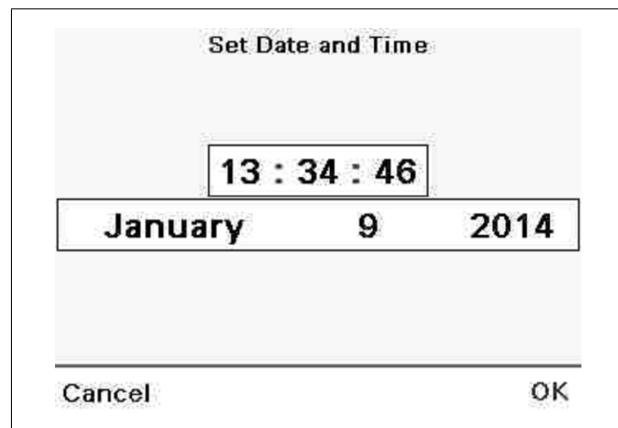
Set the date and time for all units in the system.

Date: 01/09/2014

Time: 12:02pm

◀ Prev Cancel Next ▶

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



Set Date and Time

13 : 34 : 46

January 9 2014

Cancel OK

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

Commissioning

Step 3: System Wiring

Select the grounding configuration of the system.

Solid Ground (TN, TT)	HRG, Delta, IT
-----------------------	----------------

⏪ Pre Cancel Next ⏩

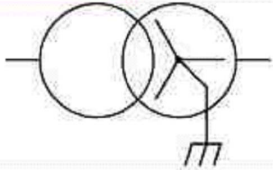
1. Select the grounding configuration of the facility where the system is installed.

Commissioning

Step 3: System Wiring

Select the grounding configuration of the system.

Solid Ground (TN, TT)	HRG, Delta, IT
-----------------------	----------------



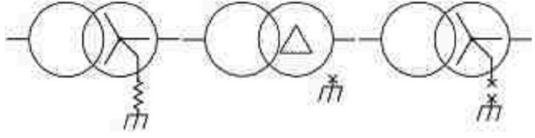
⏪ Pre Cancel Next ⏩

Commissioning

Step 3: System Wiring

Select the grounding configuration of the system.

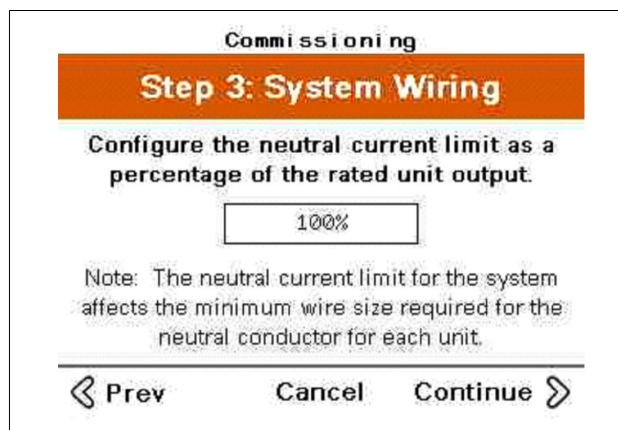
Solid Ground (TN, TT)	HRG, Delta, IT
-----------------------	----------------



⏪ Pre Cancel Next ⏩



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.



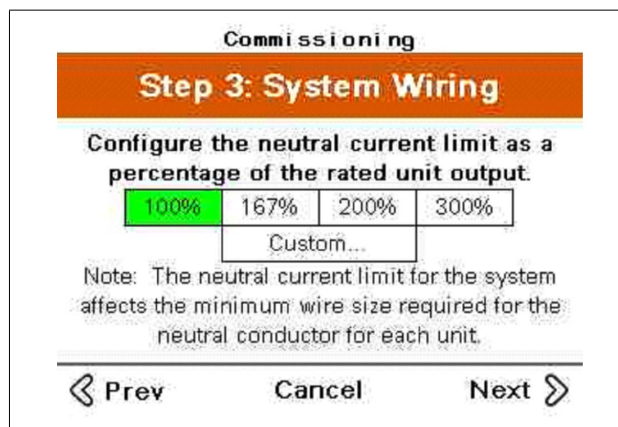
3. Enter the neutral current limit as a percentage of the rated unit output.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- 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.



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

Check Fans

Test each fan individually as follows.

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.

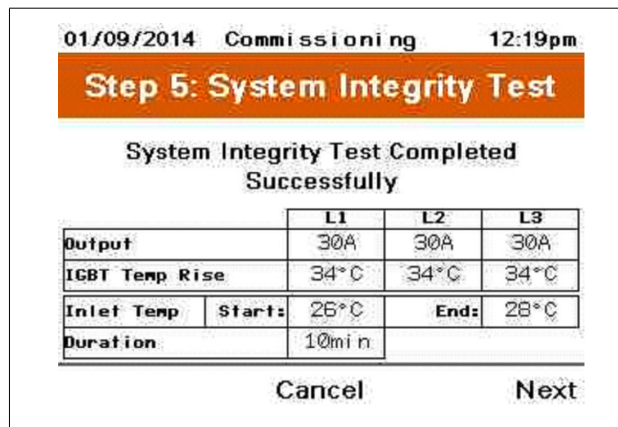
To run the System Integrity Test, do the following:

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



During the test, the HMI will display the output current per 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.

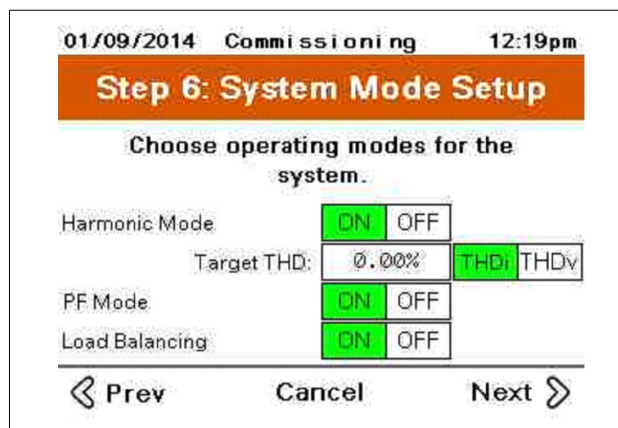
Upon completion of the test, a system pass or fail screen will be displayed.



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, and the duration time of the test.

System Mode Setup

Choose the desired operating mode for the system.

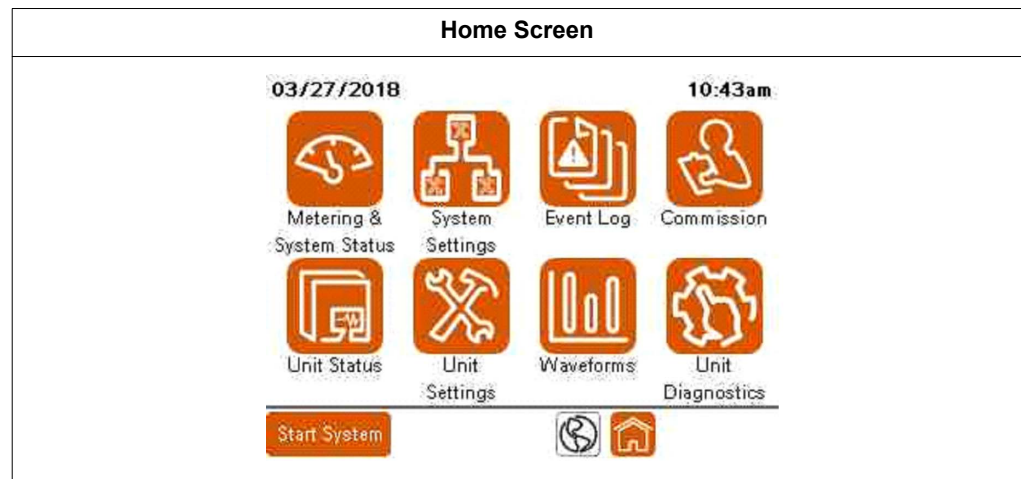


When Harmonic mode is selected, a Target THDi or THDv can be set. Leaving the Target at zero will result in the unit doing the best possible correction.



CT Configuration

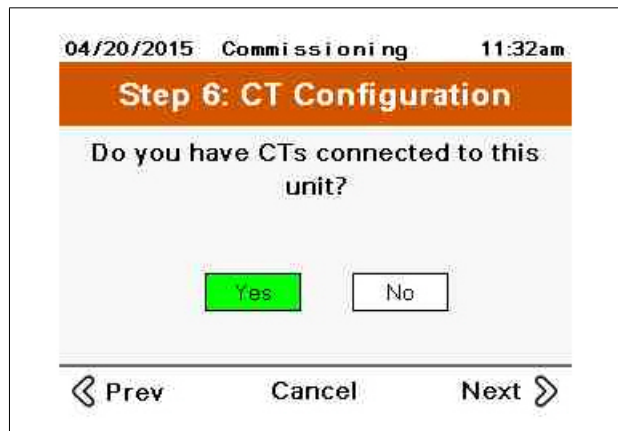
CT commissioning is required on any main unit, a unit with an HMI and has CTs connected. Units with neutral connected are required to have 3 CTs installed.



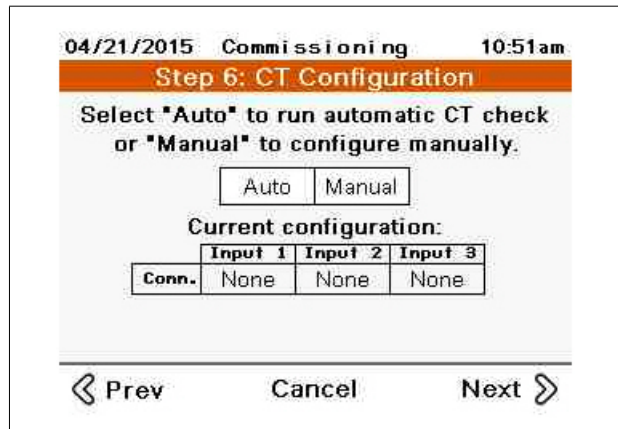
1. Press Commission.



2. Press Commission CTs icon.
3. 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.



4. 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:

	Connection	CT Calibration
Channel 1:	L1+	1.001
Channel 2:	L2+	1.000
Channel 3:	None	

CT Ratio: 3000:5 Position: Load Source

CT Secondary Rating 1A 5A

Cancel OK

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:

Automatic CT Configuration

Enter CT Ratio below:

CT Ratio: 3000:5

CT Secondary Rating 1A 5A

Select channels CTs are connected to:

CH1-CH2 CH2-CH3 CH1-CH3

CH1-CH2-CH3

Continue

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.

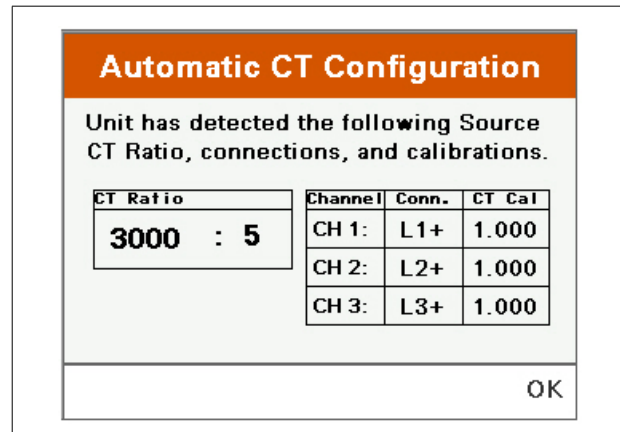
Automatic CT Configuration

Attention!
If you continue, unit will be briefly activated!

Cancel Continue

The unit runs for a short period of time to detect how the CTs are installed.

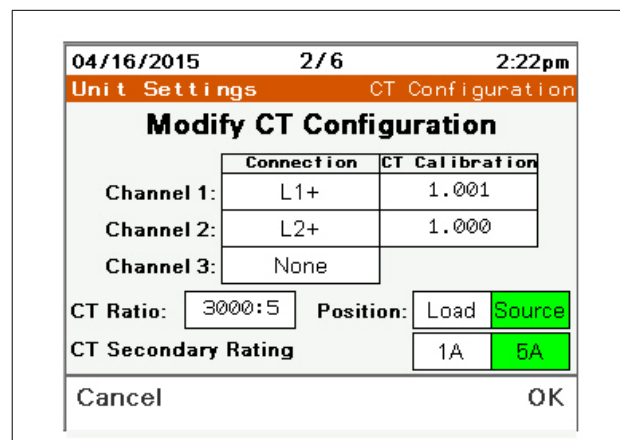
5. Touch OK when the test is complete and the detected CT configuration is displayed.



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.

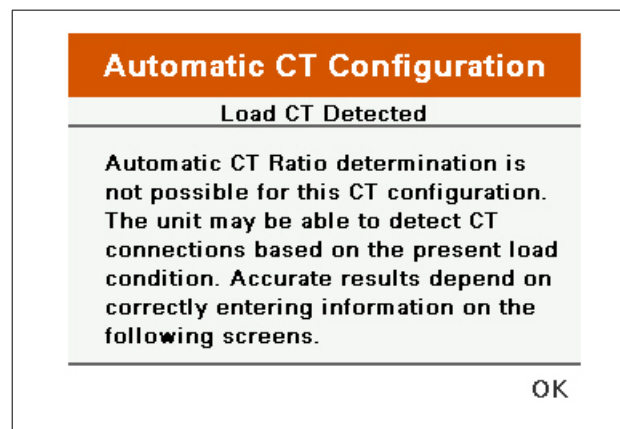
Press OK to modify the CT configuration.



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.

Automatic CT Configuration

Load Identification

Is the load continuously regenerating power to the source?

Note: Most loads do not continuously regenerate power to the source unless they contain energy sources like generators, PV, wind or other distributed energy sources.

Continue

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.

Automatic CT Configuration

Load Identification

Is the load currently operating at extremely low displacement PF ($|DPF| < 0.5$ or current-to-voltage phase angle > 60 degree)?

Note: Unless the system is very lightly loaded, most loads operate at $|DPF| > 0.5$.

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.

- 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).

Automatic CT Configuration

Load Identification

Is the load capacitive (LEADING PF) or inductive (LAGGING PF)?

Capacitive
Inductive

Note: AC motors and drives, induction heaters typically have lagging PF (inductive), while computer power supplies, lighting ballasts/UJV have leading PF (capacitive).

Back
Continue

- 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.

Automatic CT Configuration

Load Identification

Based on the information you provided, below are the detected CT connections and associated DPF.

	Connection	DPF	Type
CH 1:	L1+	0.983	LAG
CH 2:	L2+	0.984	LAG

OK

- Press OK.

04/16/2015
2/6
2:44pm

Unit Settings
CT Configuration

Modify CT Configuration

	Connection	CT Calibration
Channel 1:	L1+	1.000
Channel 2:	L2+	1.000
Channel 3:	None	

CT Ratio: Position: Load Source

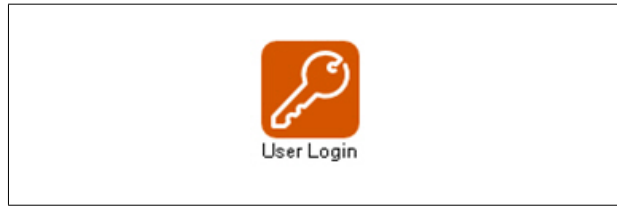
CT Secondary Rating: 1A 5A

Cancel
OK

The HMI returns to the CT Configuration screen.

- When the CTs are properly configured, touch OK

Set Up Users with the User Manager



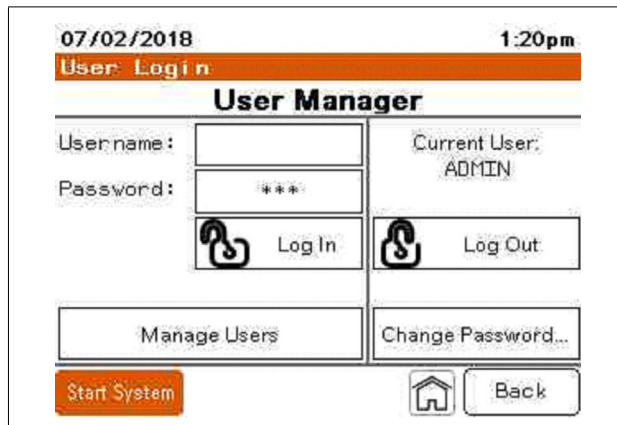
You must have ADMIN level access to set up users.

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 is ADMIN.

07/02/2018 1:54pm

Change Password

Please enter the current password before proceeding.

Current User: ADMIN

Password:

Next Back

5. Enter the new password and confirm.
6. Press Change Password.

07/02/2018 1:21pm

Change Password

Please choose a new password.

Passwords must be at least 6 characters in length.

Password:

Confirm:

Current User: ADMIN

Change Password Back

⚠ WARNING

POTENTIAL COMPROMISE OF SYSTEM AVAILABILITY, INTEGRITY, AND CONFIDENTIALITY

- Change default passwords 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.

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

NOTICE

RISK OF EQUIPMENT DAMAGE

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

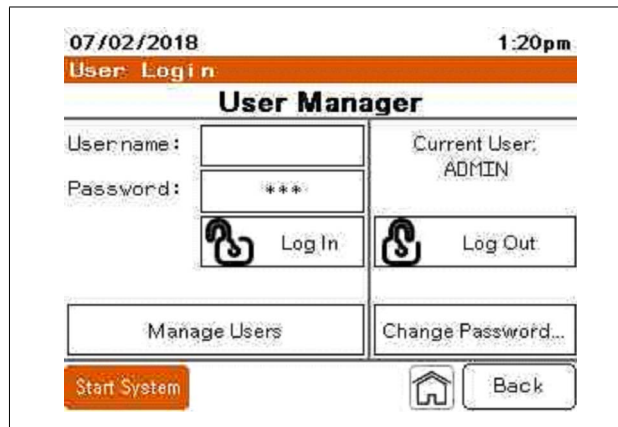
Failure to follow these instructions can result in equipment damage.

To add users, do the following:

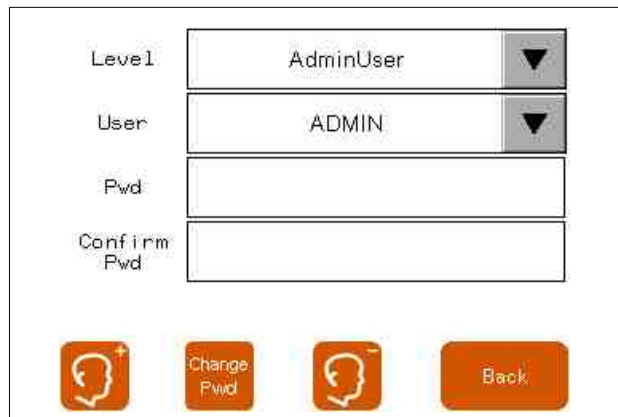
1. Press the Username field. Type ADMIN on the keypad and press Enter.
2. Press the Password field and enter the ADMIN password.

The default password for the ADMIN user is ADMIN. 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.

The password must be between 6 and 32 characters with any combination of letters or numbers. Passwords are case sensitive.

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.

The password must be between 6 and 32 characters with any combination of letters or numbers. Passwords are case sensitive.





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.

Level1	AdminUser	▼
User	ADMIN	▼
Pwd:	<input type="text"/>	
Confirm Pwd:	<input type="text"/>	

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 $\pm 3\text{Hz}$.
	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 minimum 3% 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 Inoperable	Internal Current Sensor issue detected	Call your local service center.
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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