AMETEK®
SOLIDSTATE CONTROLS

Operations Manual

ASCEND SERIES

Single Phase Modular Charger

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Scan the QR code to view the manual online.

PROPRIETARY NOTICE

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Important Safety Instructions

SAVE THESE INSTRUCTIONS

This manual contains important instructions for AMETEK Solidstate Controls (SOLIDSTATE) Digital Charger® (ASCEND) Series that should be followed during installation and maintenance of the charger.

The equipment described in this manual is intended for the conditioning of the power in the system for which it was specified. It should be installed, operated or serviced only by persons who have been trained in the proper interpretation of its readings and the appropriate safety procedures to be followed.

Although the equipment described in this manual is designed and manufactured in compliance with all applicable safety standards, certain hazards are inherent in the use of electrical power equipment.

Warnings and Cautions are presented throughout this document to alert the user to potentially hazardous situations. A Warning is a precautionary message preceding an operation that has the potential to cause personal injury or death. A Caution is a precautionary message preceding an operation that has the potential to cause permanent damage to the equipment and/or loss of data. Failure to comply with Warning and Caution messages is at the user's own risk and is sufficient cause to terminate the warranty agreement between AMETEK Solidstate Controls and the customer.

Adequate warnings are included in this manual and on the product itself to cover hazards that may be encountered in the normal use and servicing of this equipment. It shall be the owner's or user's responsibility to see to it that the procedures described here are followed. Failure on the part of the owner or user in any way to follow the prescribed procedures shall absolve AMETEK Solidstate Controls and its agents from any resulting liability.

Periodic system maintenance and operational tests should be performed to assure that the product is functioning properly. It is the owner's or user's responsibility to maintain records of all system maintenance and testing performed on the product. Failure to perform regular system maintenance can lead to reduced system life and/or premature system failures.

Table of Contents

1. SAFETY INSTRUCTIONS

1.1. Safety

SAVE THESE INSTRUCTIONS: This manual contains important safety and operating instructions for ASCEND battery chargers.

Before using the Ascend battery charger, read all instructions and cautionary markings on battery charger, battery, and product using the battery.

The procedures described in these instructions are intended for use by persons knowledgeable in the operation of Battery Chargers. Persons unfamiliar with this type of equipment should seek guidance from those who have experience with it.

1.2. Electrical Precautions

Always assume circuits are electrically “hot” when working on the equipment. Never handle a component or assembly without confirming no voltage is present. High voltages and currents exist inside this equipment and present an explosion and severe burn hazard!

- Never handle a component or assembly without personally confirming that no voltage is applied or present.
- Use only insulated tools.
- Wear safety glasses and appropriate PPE.
- Use only insulated tools.
- Remove all metal jewelry including earrings, necklaces, and watches.
- Keep doors closed at all times when starting equipment or during normal operations.
- Use battery operated test equipment and/or isolated ungrounded test equipment. On ungrounded test equipment, an electrical shock hazard will exist, and one should avoid touching the test equipment and Charger cabinet at the same time.
- Use a “buddy” system when working on energized equipment.

1.3. Other Recommendations

- Wear steel-toed shoes when handling heavy tools and parts.
- Electronic circuit boards are susceptible to Electro-Static Discharge (EDS) damage. Take appropriate EDS precautions (i.e.: grounded wrist bands).

The Ascend Battery Charger is designed and built for safe operation when used to supply its rated load, provided it is installed as specified by a qualified electrician.

2. PERFORMANCE SPECIFICATIONS

The ASCEND Series Battery Chargers maintain constant DC voltage to power inverters, battery banks, and other DC loads.

Parameters	
AC Input Phase	1 Ø
AC Input Voltage	208/240 V
AC Input Frequency	50 or 60 Hz
AC Input Voltage Tolerance	±10 %
Power Factor	>0.98
Input THD	<5%
Output Voltage	
Float 100-125% of nominal (110v)	110-137.5 Vdc
Equalize 110-135% of nominal (110v)	121-148.5 Vdc
Output Current:	20A, 40A, 60A, 80A, AND 100A, adjustable from 70% up to 100%
Output Current Limit:	50% to 100%
Grounding:	Floating ground on output
Static regulation:	< ±0.25% for simultaneous variations of ±10% input voltage, ±5% input frequency and 10-100% load for both the Float and Equalize mode
Dynamic regulation:	±8% from 10% to 90% and 90% – 10% load variation (t<200msec) with or without batteries
Efficiency:	up to 94%
AC ripple	< 1% ripple without the battery connected < 0.1% ripple filter with a battery connected
Environmental	
Continuous operational temperature:	-10 °C to +40 °C
Storage temperature range:	-20 °C to +70 °C
Operating humidity:	0 up to 95% non-condensing
Operating Altitude:	0 to 2,000 meters (6,600 feet)
Audible Noise:	< 65 dB (A) @ 1 meter
Cooling:	Enclosure convection cooled, Modules fan assisted
System Measurements	Charger Output Voltage
	Charger Output Current
	Percent Loading
	Battery Current & Voltage Metering (optional) Includes Battery Current limit & Battery Discharge alarm

Standard Alarms	Low DC Voltage
	Pos/Neg DC Ground Detect
	High DC Voltage
	AC Input Failure
	Battery Near Exhaustion
	Charger Overload
	DC Output Breaker Open
	Charger Output Fuse Blown
	Module Failure
	Module Over Temperature
	Module Over Temperature Shutdown
	Relay Communications Failure
	System Over Temperature – No Relay
	High DC Shutdown
Optional Alarms	High DC Disconnect
	AC Input CB Open
	Battery CB Open
	Low DC Disconnect (Trip Battery Breaker)
Relay Contacts – Form C	Common
	Communications Failure
	Up to 6 total Configurable alarm relays
Standard Features	Alarm Relay Test
	Audible Alarm
	Lamp Test
	Latching Alarms – configurable On/Off
	Charger Auto−Equalize – configurable On/Off
Optional Functions	Battery Temperature Compensation
	Equalize Inhibit
	Dual Charger Current Limit Control
	Communications Package
	SNMP Communication
	DNP 3.0 Communications
Optional Features	Key−Lockable Enclosure
	Tropicalization Fungus & Moisture Proofing
	PCB Corrosion Protective Coating
	Heat shrink Wire Markers (Power Only)
	Heat shrink Wire Markers (Power & Control)
	DC Rated Contacts
	Padlock Breakers
	20% Spare Terminals

Charger Rating		**20A**	**40A**	**60A**	**80A**	**100A**
Input Current	Amps	14.8	29.5A	44.3A	56.1	73.9
Full Load Losses	Watts	181	361	542W	723	903
	Btu	616	1233	1849	2465	3082
AC CB Rating	Current	20	40	70	80	100
	kAIC	10	10	25*	25*	25*
DC CB Rating	Current	25	50	80	100	125
	kAIC	10	10	25**	25**	25**
Heat Loss	Btu/Hr	616	1233	1849	2465	3082
Weight	lbs/kg	69/31	86/39	137/62.1	152/69	167/75.8
Enclosure		A	A	B	B	B

* Optional 100kAIC rating available

** Optional 70kAIC rating available

Enclosure	H	W	D
Size ‘A’:	48”	24”	24.7
	1219mm	609mm	627mm
Size ‘B’:	79”	32”	36”
	2006mm	813mm	914mm

3. INSTALLATION

3.1. Storage

If the equipment is not to be placed in immediate service, it should be kept in a clean and dry area and protected from water, condensation, dirt, and extremes of temperature. Do not stack the Chargers.

3.2. Unpacking and Inspection

Upon receipt of the unit, inspect the equipment for damage. If it has been damaged during shipment, keep the packing materials, and contact the carrier to file a claim for shipping damage.

Carefully remove the packing materials from the Charger. After all the external packing materials have been removed, inspect inside the Charger for any other temporary shipping materials which may have been used. Materials such as tape, which may be used to hold relays in their sockets, should be removed and discarded.

3.3. Mechanical Installation

The equipment should be located in a controlled environment (an environment relatively free of conductive contaminations and a temperature and humidity controlled indoor area). Adequate ventilation should be provided by allowing at least three feet of space in front of the equipment, at least one foot above the equipment and 6 inches on all vented surfaces.

The 20A & 40A Ascend Charger is designed to mount to the wall using the mounting flanges on the sides of the enclosure. The wall should be strong enough to support the Ascend weight, plus a safety factor. The 20A & 40A charger is designed to be lifted from the bottom by a pallet jack or lift truck. The modules may be removed to lighten the unit. A separate floor mounting stand can be ordered as a factory option.

The 20A & 40A charger is mounted to the wall using six (6) 0.25 in (6.4mm) bolts (not provided), see below for hole locations. The 60A-100A is designed for floor mounting. Four (4) 0.25 in (6.4mm) anchor bolts (not provided) may be used to mount to the floor. Refer to the outline drawings in the Appendix of this manual.

Cable entrance is available through the top or top right side of the equipment. Prefab knockouts are provided on the enclosure top and right side. The power connection terminals are located behind the AC Input circuit breaker, and the alarm connections are located on the rear. Reference the outline drawing for detailed connection locations.

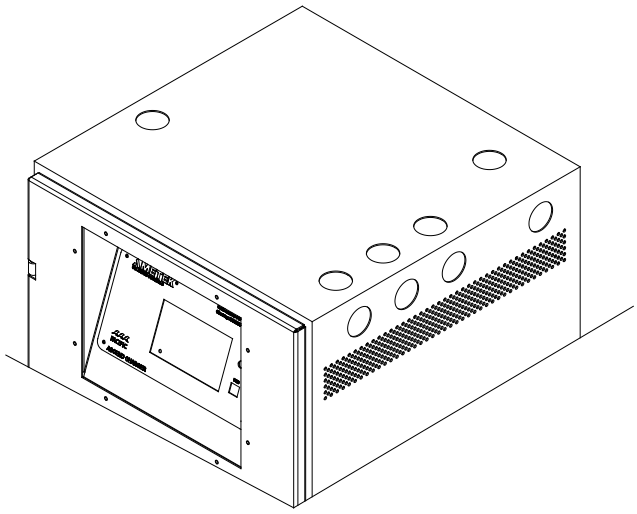
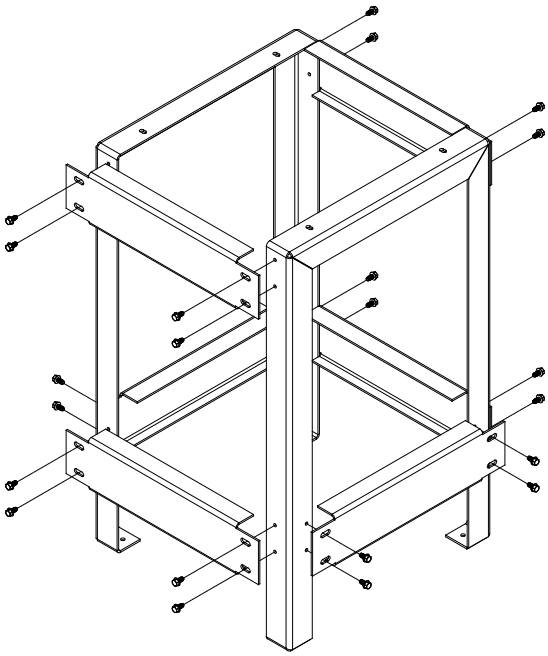


Figure 1: Conduit Entry Location

To mount the 20A & 40A Ascend Charger on the floor, an optional floor mounting stand is required. The kit includes:

Part #	Description	Qty
70-122743-90	Stand sides	2
70-122744-90	Stand brace	6
03-400041-00	1/4-20 x 1/2 Self-forming screw	24
03-400042-00	#10-24 x 1/2 Self-forming screw	4



Assemble the stand sides and braces as shown using the 1/4-20 x 1/2” tread-forming screws. The 1/4” Self-Forming screws should be torqued to 5-6 ft-lb.

Once the stand is assembled, mount the charger on the stand. Use the #10 screws to fasten the charger to the stand from underneath the stand in the four corners, torque to 30-32 in-lb.

Reference Appendix D:20A & 40A Outline for dimensions.

3.4. Electrical Installation

The Ascend Battery Charger is designed to be permanently connected to an appropriately rated single phase, AC mains and battery and DC load circuits. Wiring used must be sized appropriately for the charger input current and must be selected to meet any applicable local codes (reference

Table 1 for recommended wire sizes and circuit breaker ratings). Use copper conductors only.

Table 1: Input/Output Wire Sizes

Model	Input Breaker	Max Input current	Minimum Input Wire size		Output Breaker	Minimum Output Wire size	
			AWG	mm^2		AWG	mm^2
ASC-120-0020-	20	14.8	14	2.5	25	10	6
ASC-120-0040-	40	29.5	10	6	50	8	10
ASC-120-0060-	70	44.3	8	10	80	4	25
ASC-120-0080-	80	59.1	6	16	100	2	35
ASC-120-0100-	100	73.9	4	25	125	1	50

The wire size is based upon the National Electric Code Article 310-16 copper conductor assuming 90°C (194°F) wire, maximum wire length of 250 feet and 40°C (104°F) ambient temperature.

DC Wires should be sized to minimize voltage drop. The wire size will depend upon your installation. It is recommended that the AC and DC conductors are in separate conduit to reduce noise coupling between them.

Power terminal connections are located on the top right of the enclosure, reference Figure 2: Power Terminal Location.

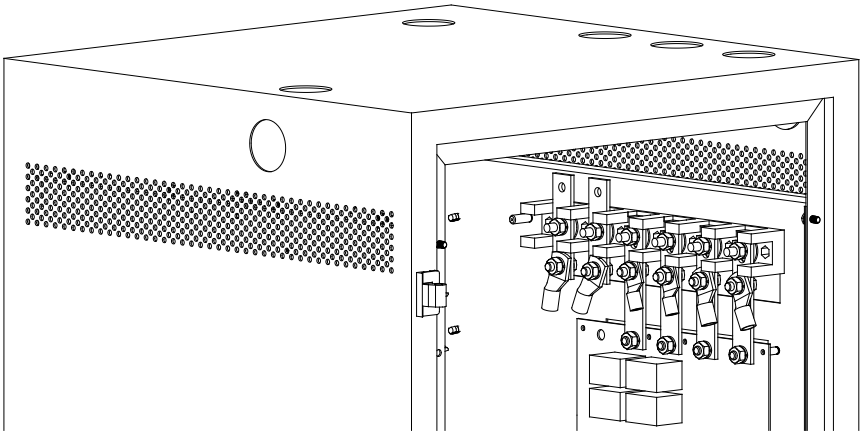


Figure 2: Power Terminal Location

3.4.1. AC Input Connections

Verify the branch circuit breaker or fused disconnect is locked out.

Confirm that the Serial tag voltage rating is correct for the AC input supply voltage.

Connect the Charger to the appropriate source of AC power via conduit knockout openings on the charger enclosure.

The earthed conductor of the AC input circuit must be connected to the charger-grounding stud left of the terminals. When routing the cable, make sure that the wire is not laying over any sharp edges which may cut into the wiring. AC Input wiring must be kept at least 1/4" (6.3 mm) away from all output, alarm, data interface wiring, and from other uninsulated electrical parts not connected to the input conductor.

20A and 40A models utilize compression terminals and will accept 16-8 GA (1.25-8mm^2) wire, reference Figure 3.

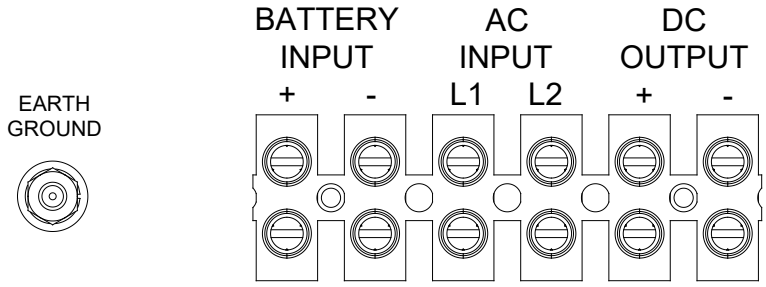


Figure 3: 20A & 40A Power Connections

60A through 100A models utilize a 1/4” stud terminal and require wire lugs, reference Figure 4.

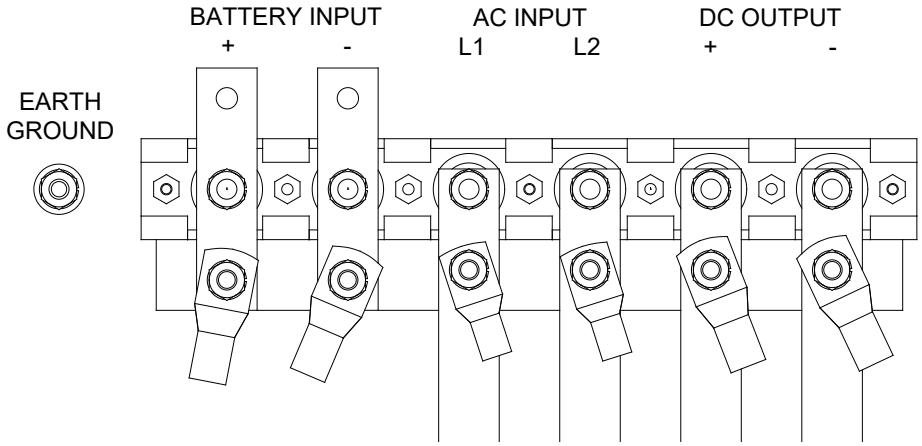


Figure 4: 60A to 100A Power Connections

Wire lugs to power connections should be a compression, die crimped, 600V copper tin plated, UL-listed lug. See **Table 2: Power Conductor Terminations** for recommended Burndy™ cable connections. Recommended Burndy MY29-3 crimp tooling shall be appropriate for the lugs being used. Tighten bolts to 60-72 in-lbs (6.8-8.1 nm)

Table 2: Power Conductor Terminations

Wire Size	Burndy™ Connector
#8 AWG	YA8CL2TC14E2
#6 AWG	YA6CL2TC14E2
#4 AWG	YA4CL2TC14E2
#2 AWG	YA2CL2TC14E2
#1 AWG	YA1CL2TC14E2

3.4.2. DC Output/Battery Input Power Connections

Connect the DC output to its load and/or batteries. It is extremely important to observe the proper polarity of the DC connections. Failure to do so could result in an explosion and damage to the battery charger. The DC output cable should be sized to carry the maximum ampere requirement when operating in the current limit mode (recharging batteries).

Contractors are encouraged to size power cables according to the circuit breaker ratings (when applicable) otherwise the cables should be sized to the maximum possible current. The steel hardware should be plated with zinc or other acceptable anti-corrosion material.

3.4.3. Alarm Interface Connections

The Alarm Interface Connections provide connections for remote monitoring of system alarms. SPDT contacts are provided for all standard and optional alarms. The connections are located behind the door on the top rear.

Each Ascend Charger comes with one Common alarm and one loss of communications alarm. Additional alarm relays can be configured, reference 7.5.12. Relay Configuration.

Alarms connections can be made through the #6 screw terminal blocks or via removeable screw terminal blocks provided. See Figure 5: Alarm Relay Connections for terminal locations. The factory configured relay assignments are on the inside front door label.

Most relays are energized in the normal state, reference sections 7.5. and 7.6. for normal state of alarm. A Red LED indicator is provided to easily show when the relay is energized.

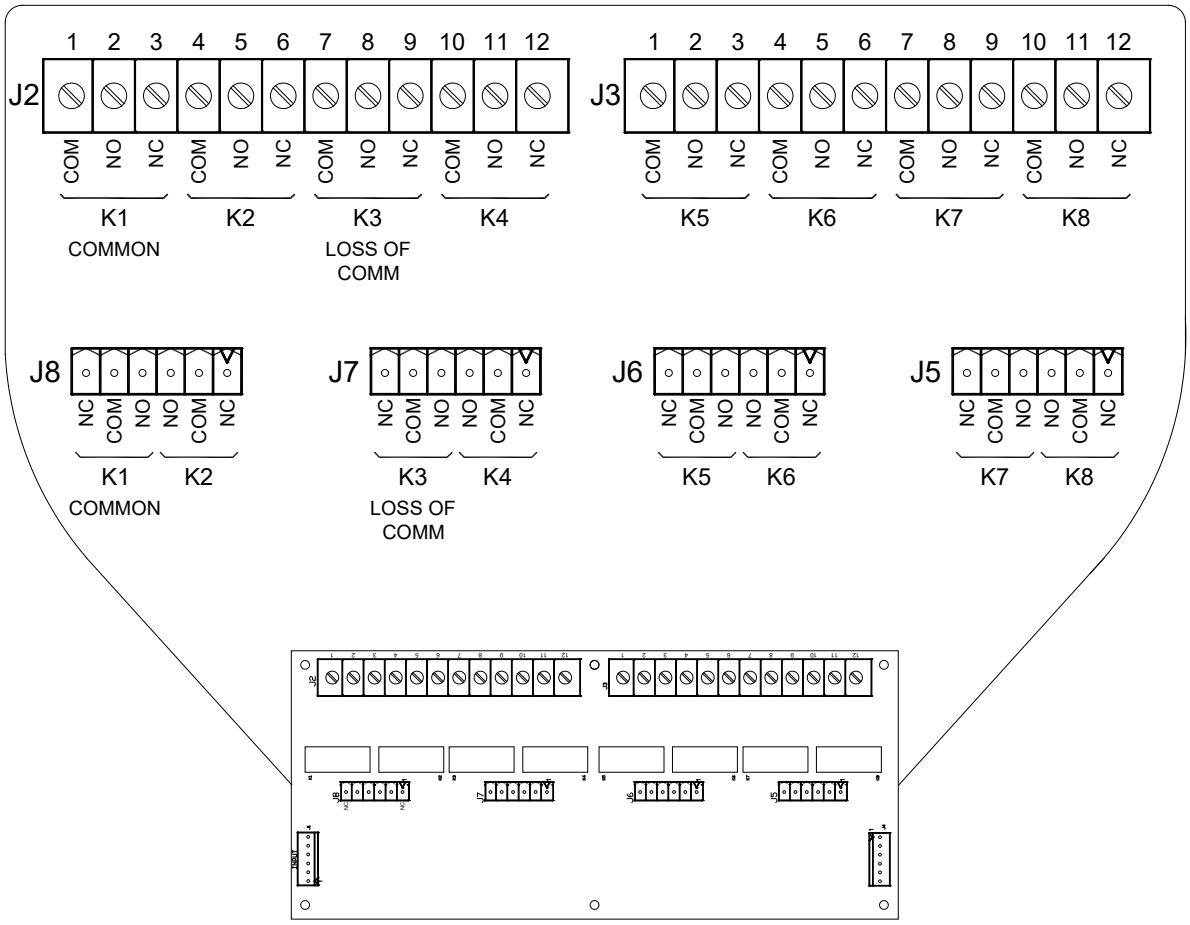


Figure 5: Alarm Relay Connections

These alarm connections should be connected using wiring appropriate for the annunciation system being used. The alarm contacts are rated 8A at 120Vac/30Vdc. DC contacts must be supplied from a single voltage source. For alarm wire connections it is recommended that T&B STA-KON™ connectors be used with Thomas & Betts™ # ERG4001 rachet crimper.

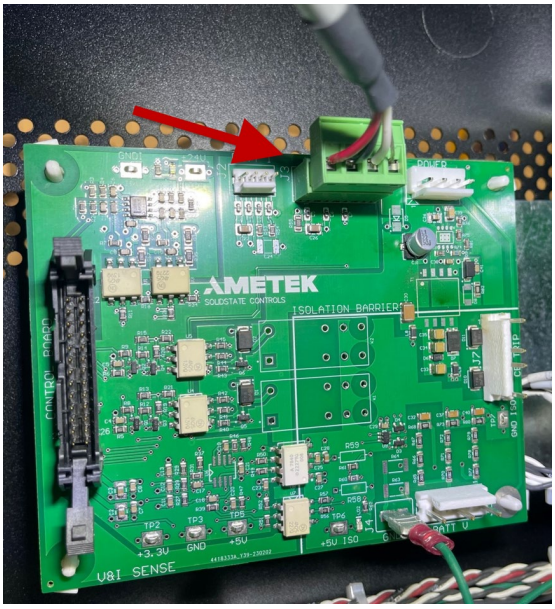
Table 3: Thomas and Betts Alarm Terminals

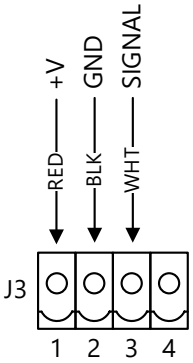
Wire Size	T&B Ring Terminals	T&B Locking Fork Terminals
18 AWG	RA18-6	RA18-6F
16-14 AWG	RB14-6	RB14-6F
12-10 AWG	RC10-6X	RC10-6F

3.4.4. Wiring Battery Temperature Compensation

The battery temperature compensation probe contains a temperature dependent resistor in a module. Mount the temperature sensor on the battery or in a central location near the batteries to provide an average ambient temperature.

Route the temperature sensor cable to the Ascend charger. Connect the Temperature compensation cable to PCB3, connector J3 located on the inside top left cabinet. The cable may be removed from the connector to facilitate routing and enclosure entry. Reconnect the cable as below using a small flat bade screwdriver.





The Temperature sensor cable should not be run along with any power cables, AC or DC to prevent noise from affecting the controls.

3.4.5. Wiring Communications

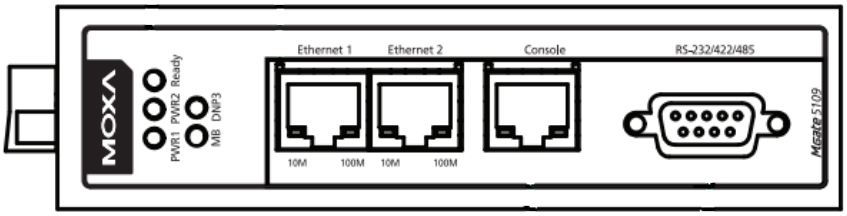
The Communications optional package (Opt #210) includes Modbus over RS-485 using RTU mode and Modbus TCP / Ethernet.

Screw terminals are provided for RS-485 transmit, receive, and ground on the inside top right of the cabinet. These terminals are mark.

A 10/100Base-T Ethernet RJ45 connector is provided for Modbus TCP / Ethernet on the inside top right of the cabinet.

Reference 7.7.5. Communications Package for configuration.

Optional DNP 3.0 is provided through a separate converter module located on the top left side of the cabinet. Connect 10/100Base-T Ethernet to the Ethernet 1 port.



Only one communication package can be provided Modbus RTU, IEC 61850 or DNP3.

4. SYSTEM STARTUP CONFIGURATION

The following items must be configured when the system is initially powered on. The procedures to set these parameters can be found in the Operations section of this manual.

4.1. Verify AC Input supply

With the AC and DC circuit breakers open, and power source turned off at the source, connect a voltmeter to the AC input terminals. Energize power source and verify the AC incoming voltage is within its acceptable range.

4.2. Verify Charger Output/Battery voltage

With the input AC and output DC breakers open, connect a voltmeter to the DC Output terminals and Battery Input terminals (if provided). Verify that DC voltage (for applications with batteries) is within acceptable range and polarity of the charger output voltage setting.

4.3. Start-up

Upon closing the AC Input Circuit Breaker, the Charger is in Float Mode as shown by the green battery indicator on the Users Interface LCD. Pressing the battery icon on the User Interface LCD, and confirming the change, sets the output to Equalize Mode and initiates a timed cycle indicated on the equalize timer.

Pressing the amber battery icon on the User Interface LCD while the Charger is in Equalize Mode, sets the output to Float Mode and resets the equalize timer.

Close the DC Output breaker to connect power to the load.

If a Battery breaker is included, close to connect the battery.

4.4. Power Off

Opening the AC Input breaker will remove power from the Charger modules. The Display will continued to operate if the Battery is connected and the DC Ouptut breaker is closed. Open the DC output and Battery breaker to completely remove power from the Charger.

5. OPERATIONAL MODES

5.1. Float Charge

Float mode is used to maintain stationary batteries in a fully charged state. When the charger is in Float mode the output voltage is maintained at the float voltage setting. The Charger is nominally set at 2.25V/cell or 135 Vdc.

Adjustments to the Charger Float voltage are made through the Setup menu. Consult the specific battery manufacturer specifications for the exact setting.

5.2. Equalize Charge

Equalize charge uses a higher voltage than the float mode to obtain equal charge in all cells. This setting is typically 2.33V/cell or 140 VDC. The Equalize mode can be manually initiated and will remain in the mode until the Equalize timer expires or Float mode is manually pressed. Refer to battery manufacturer's information for proper equalize settings.

Pressing the battery icon on the Mimic screen, and confirming the change, sets the output to Equalize Mode and initiates a timed cycle indicated on the equalize timer. Adjustments to the Charger Equalize voltage and timer are made through the Setup menu. Consult the specific battery manufacturer specifications for the exact setting.

Equalize parameters can be modified, see section 6.6.2. Float/Equalize Modes.

5.3. Battery Operation

When AC input power fails, the batteries change from a charging state to a dischaging state. No actual switching takes place. When AC power is restored, the charger will automatically restart and begin charging batteries. During recharge, the charger output voltage may be redeuced to limit output current from the charger. No attempt to adjust charging voltage should be made until battery current has been reduced below maximum output current from the charger.

During a power failure, the display will discharge batteries approximately 10 W with the display on and approximately 8W with the display in sleep mode. If power will be off for a long period of time, the output breaker should be opened to avoid complete discharge of the battery.

5.4. Emergency Operation

If the communications with a module is interrupted, the modules switch to a 'droop' mode. The output voltage level is maintained at reduced regulation, the voltage outut setting cannot be changed.

6. CONTROLS & NAVIGATION

The User Interface located on the front door simplifies the operation of the Ascend Series Battery Charger. The critical equipment controls, indicators, and alarms are located on this touch screen color LCD panel.

In addition to the LCD display, a Green LED is visible when the system is operating in normal condition and a Red LED illuminates when an any alarm occurs.

The main screen navigation below.

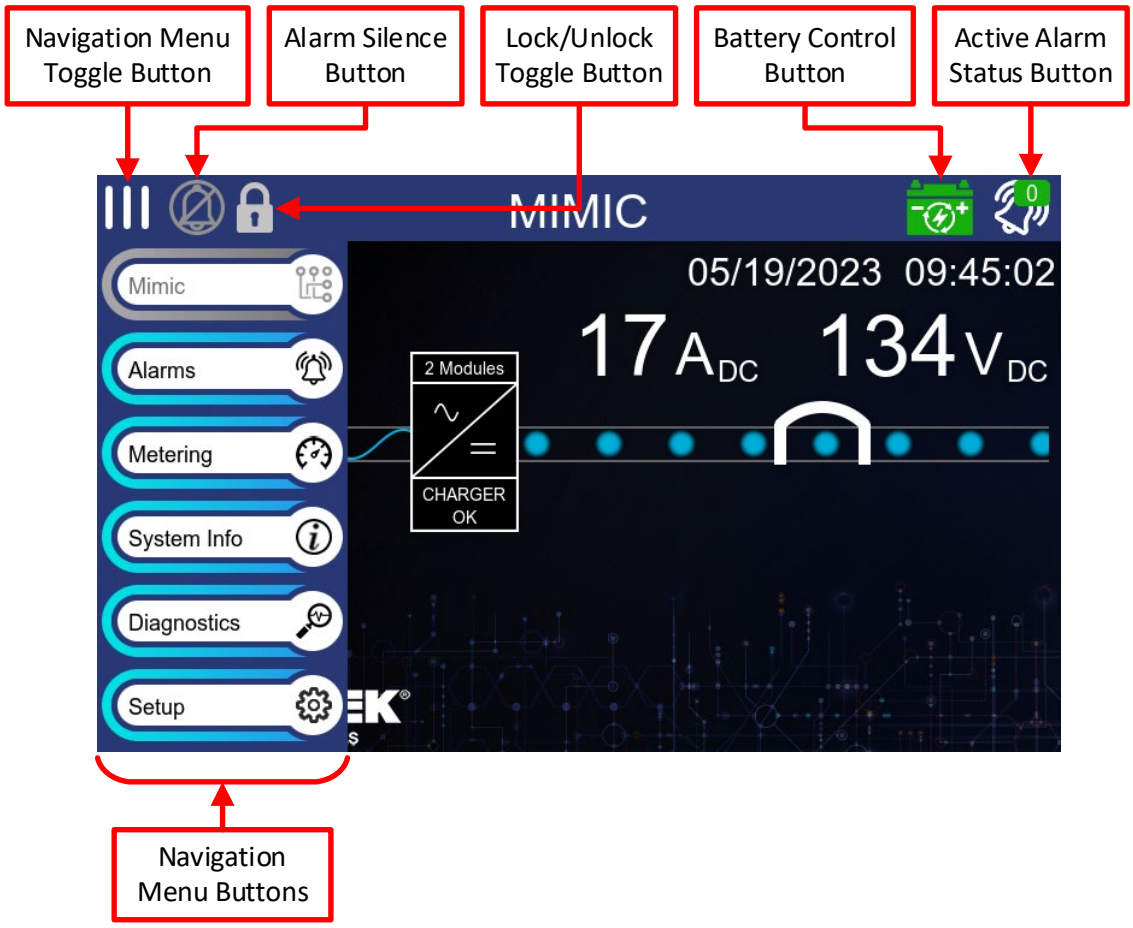


Figure 6: LCD Diagram

Navigation Menu

When a navigation button is pressed, the LCD will display to the corresponding screen. When the Setup Button is pressed and the user is not logged in, the Enter Password Screen is displayed.

Navigation Menu toggles, expands, or collapses the Navigation Menu. When the Navigation Menu is expanded, the entirety of the navigation buttons, including the button text, are visible. When it is collapsed, only the navigation buttons icons are visible.

Alarm Silence Button

The Alarm Silence Button  is enabled when the alarm buzzer is active. When it is pressed, the alarm buzzer will turn off and stay off for at least 60 seconds, even if a new alarm becomes active.

Lock/Unlock Toggle Button

This icon identifies if the setup menu password has been entered. Pressing this button while it is locked  navigates to the Enter Password Screen. Pressing it while unlocked logs the user out. The user will automatically be logged out when the LCD goes to sleep.

Battery Control Button

The Battery Control Button displays the status of the Charger output to the battery. A green battery  indicates the Charge is in Float Mode. An amber battery  indicates the Charge is in Equalize mode.

Pressing this button when the Charger is in Equalize Mode will return the Charger to Float Mode. Pressing this button when in Float Mode will automatically go to the menu for the user to put the Charger in Equalize Mode.

A red battery  signifies the battery is discharging.

A gray battery  indicates the communication between the Display and Charger modules has failed and the Battery current measurement is not included in the system.

Alarm Status Button

The Alarm Status Button displays the current number of active and latched* alarms. If an alarm is active or latched the button will display the number of alarms  , if no alarms are present the indicator is green. Pressing this button will automatically display the Active Alarms Window.

*Requires the Latching Alarms enabled, see 7.4.7. Latching Alarms.

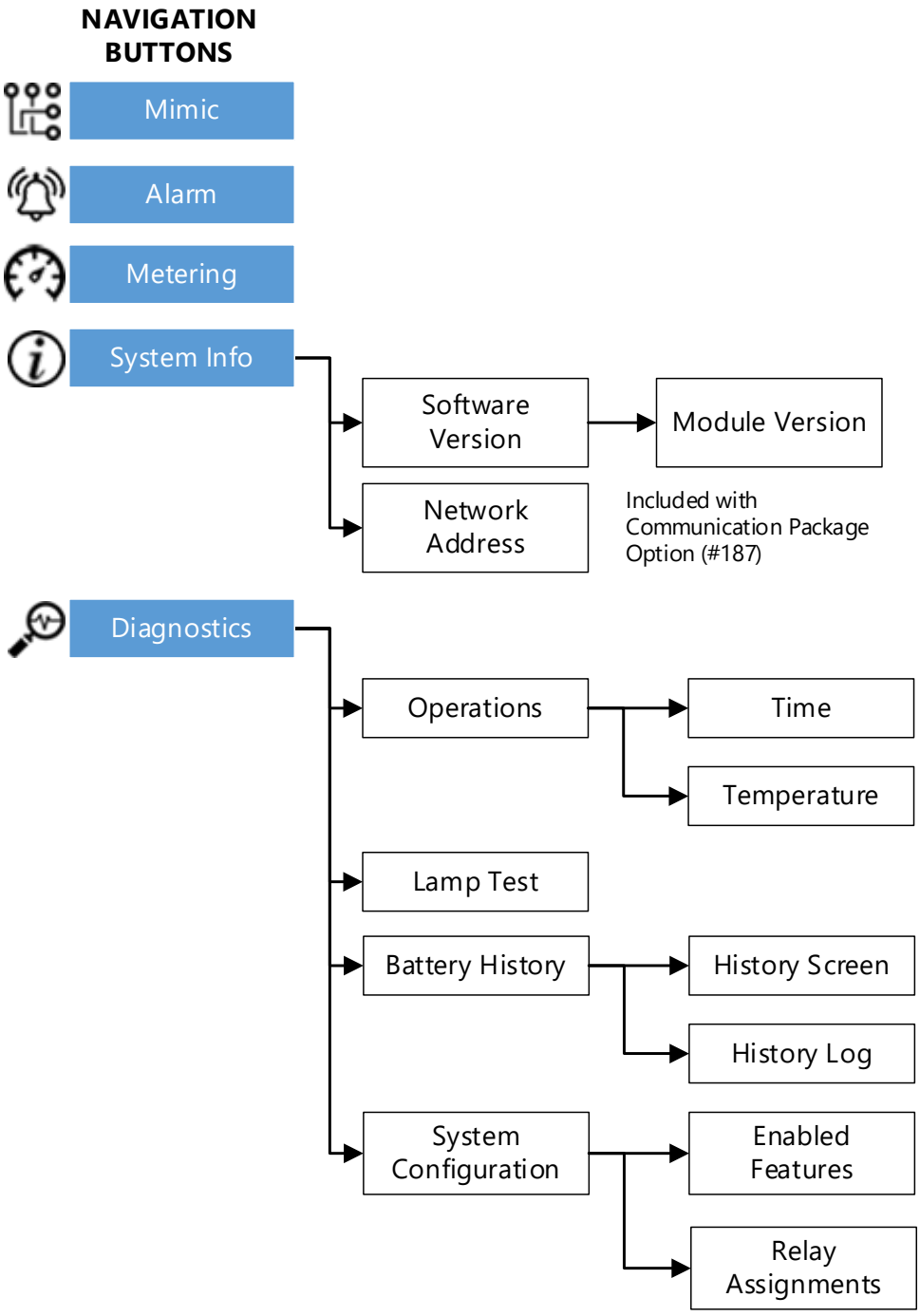


Figure 7: Navigation Menu

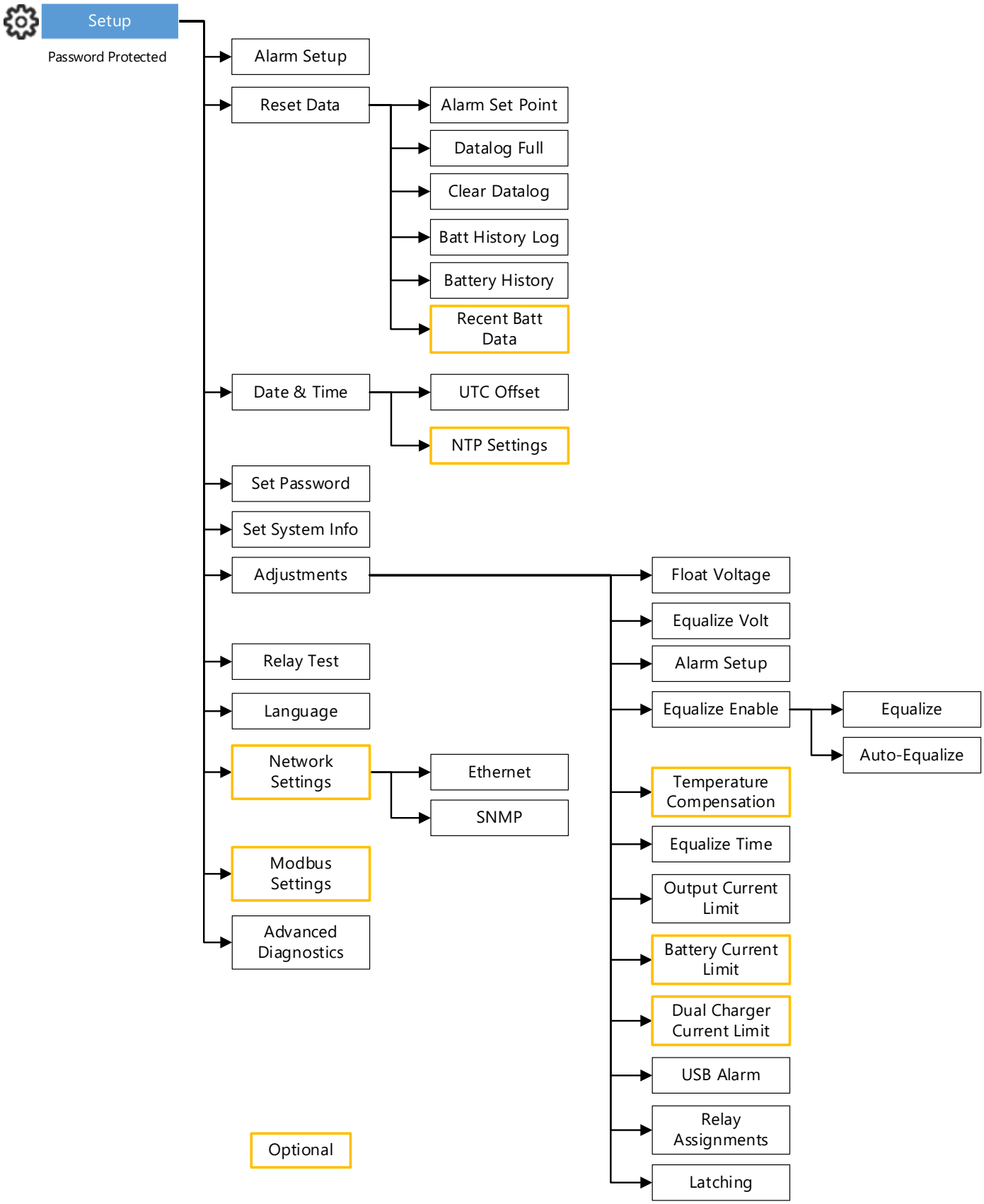


Figure 8: Setup Menu

6.1. Mimic Screen

The Mimic Screen is the default screen of the User Interface. It is displayed after start-up or when the LCD backlight turns on. The mimic Screen provides the user a high-level overview of the system status. It displays the Charger status, important voltage and current measurements, power flow, and circuit breaker statuses.

DC output voltage and current are displayed along with animated power flow.

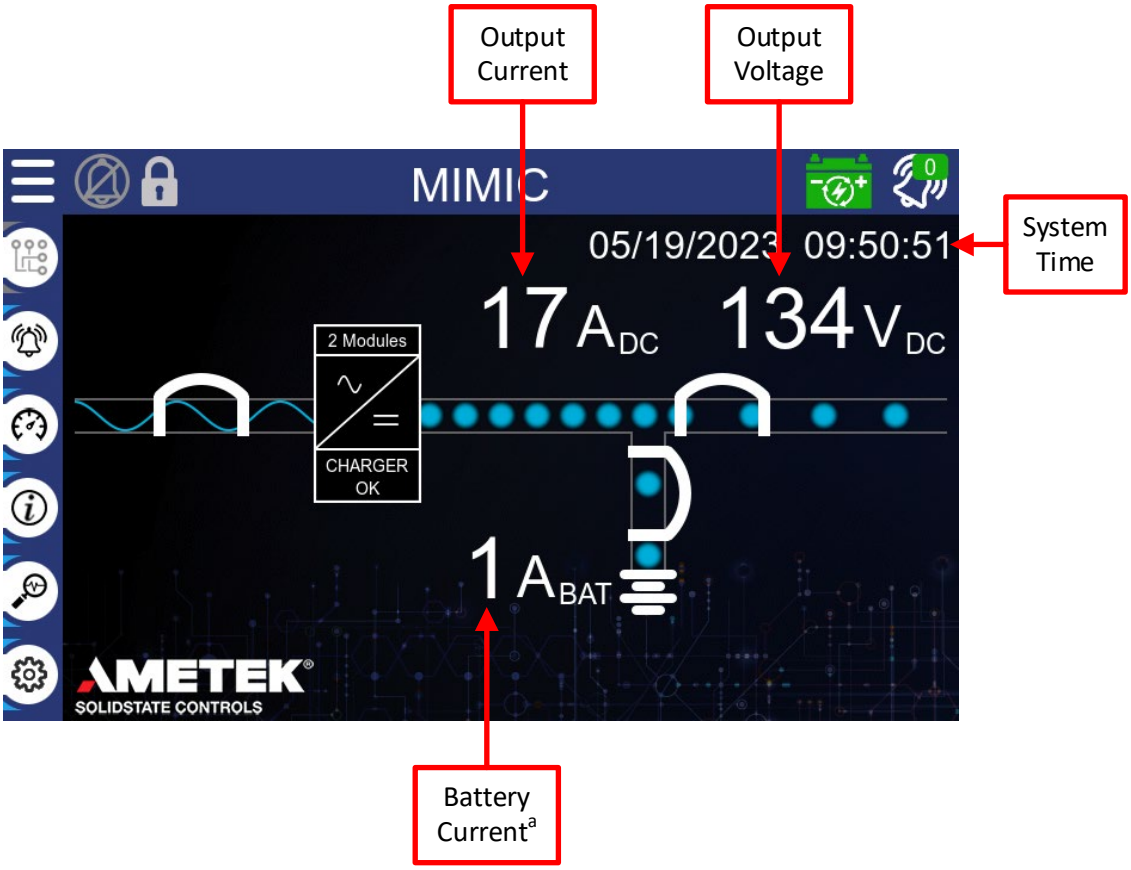


Figure 9: Mimic Screen – Measurements

The circuit breaker symbols will reflect the open and closed position. AC Input (Option # 101) and Battery (Option # 57) breaker position indication is optional.

When in Equalize mode the Equalize remaining time is displayed in the lower right corner

[a] Battery Current Metering is an optional feature.

6.2. Alarm

The Alarm Status Screen displays the states of all alarms in the system. If an alarm is normal, the box is Green, if in Alarm, Red. If Latching alarms is enabled, a Yellow box will be displayed if the Alarm has cleared indicating it is latched on. Pressing the Alarm Reset button will return the box to Green if the alarm is no longer active and clear any Alarm relays.

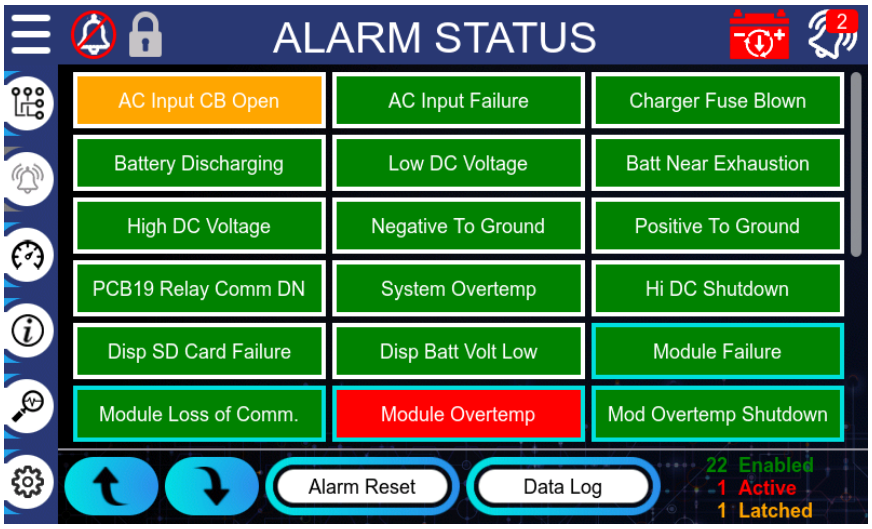


Figure 10: Alarm Status Screen

Any module alarm can be selected to determine what module is at issue.

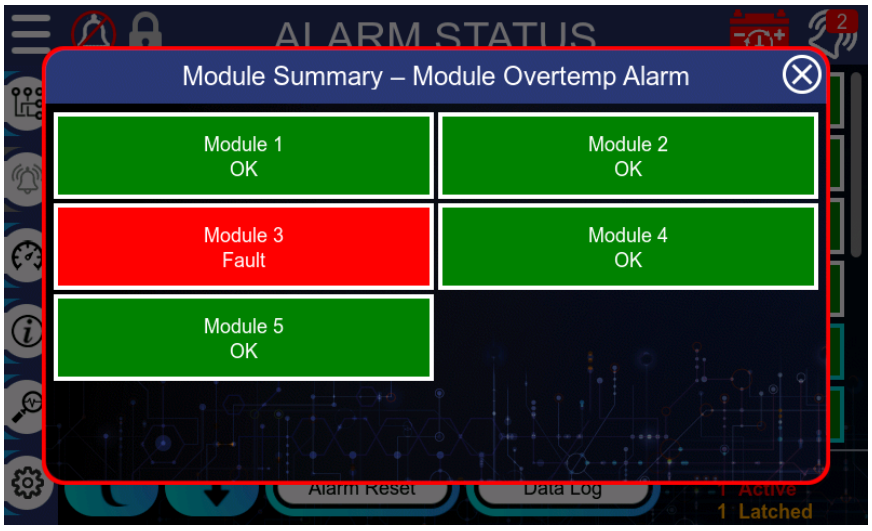


Figure 11: Module Alarm Screen

Data Log is viewed through the Alarm Status screen. The Data Log Screen displays the last 2,000 alarm events with the most recent at the top of the page.

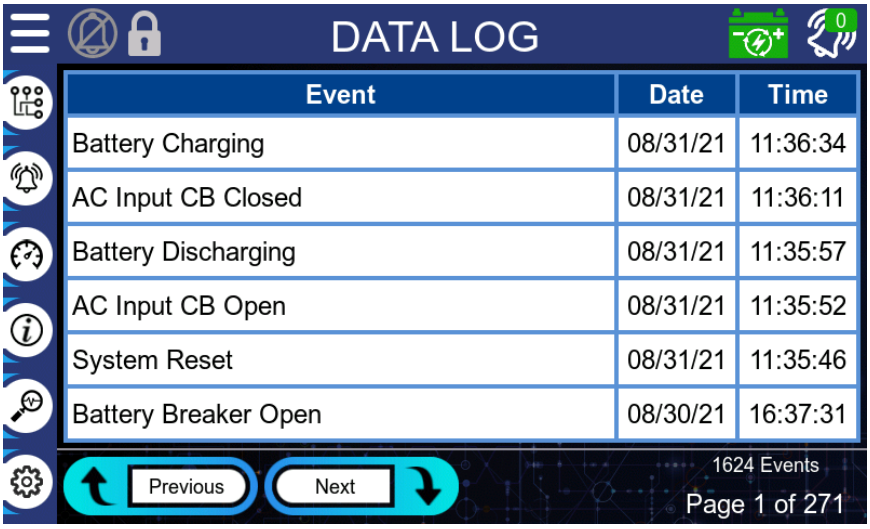


Figure 12: Data Log Screen

Pressing an event opens a window that displays the metering details of that event. Data Log can be cleared to zero events in the *Setup -> Reset Data -> Clear Data Log*.

A Data Log Full warning alarm occurs when the data log events reach 1600. This is a warning the data log events will roll over and you may lose data log history. The counter can be reset on the Web page or on the menu screen *Setup -> Reset Data -> Data Log Full.*

6.3. Metering

The Charger Metering Screen displays critical system input and output measurements. The first page on this screen displays a summary of all enabled measurements.

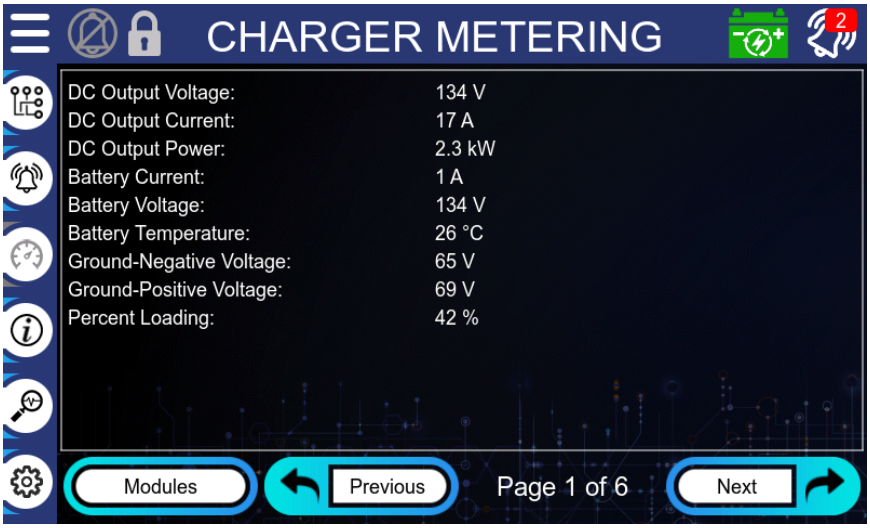


Figure 13: Charger Metering Screen – Summary

Pressing Next will display measurement gauges corresponding to each measurement point.

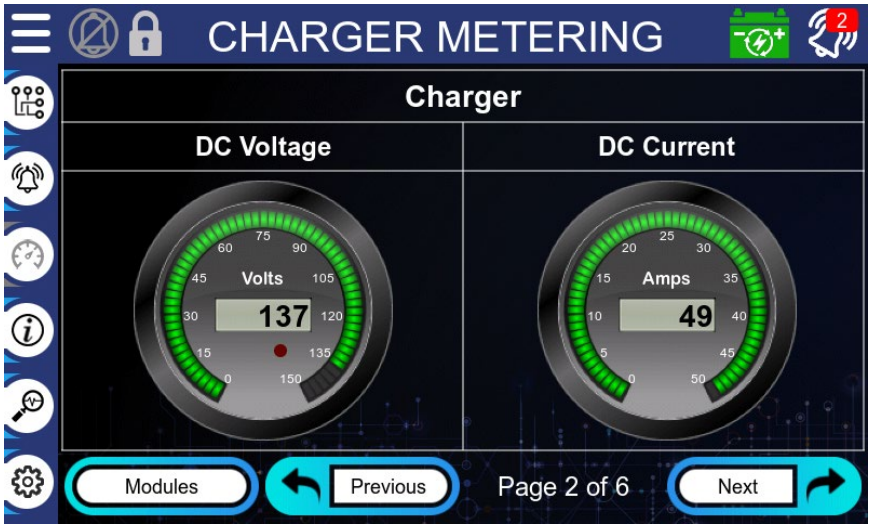


Figure 14: Charger Metering Screen – Gauges

Each Module can be interrogated in *Metering -> Modules*. The output voltage, current and heatsink temperatures are provided.

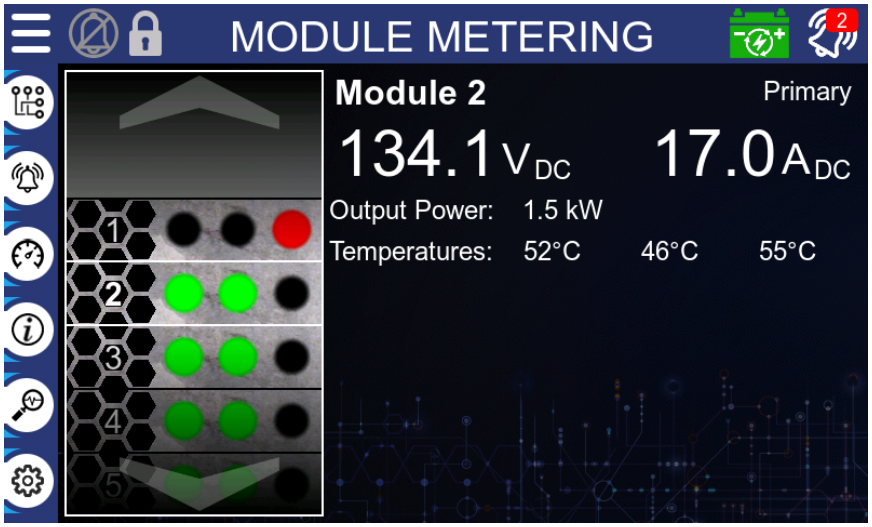


Figure 15: Charger Module Metering

6.4. System Information Screen

The System Information Screen displays the model, customer, and service information for the system. To view go to the *Diagnostics -> System Configuration* screen.

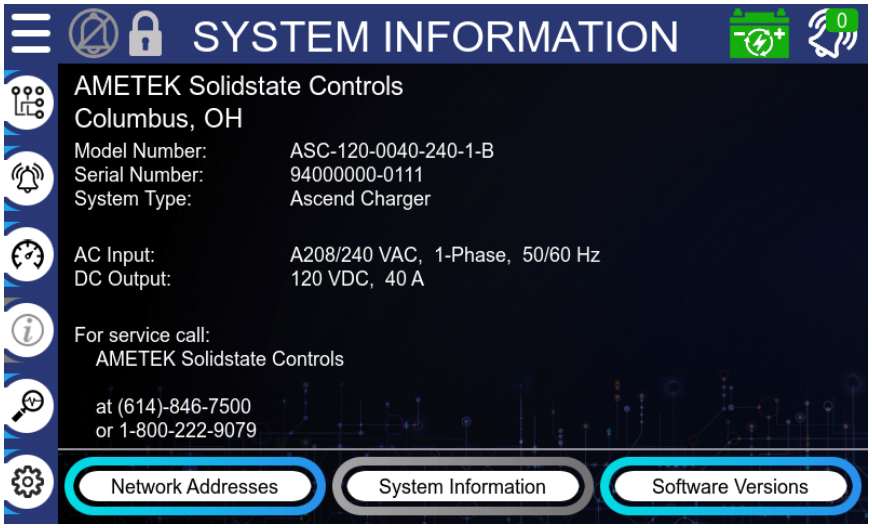


Figure 16: System Information Screen

In addition, the software versions used in the charger are provided for trouble shooting with the factory. If the Communication Package Option (187) is included the Network Settings Button is included on the menu screen.

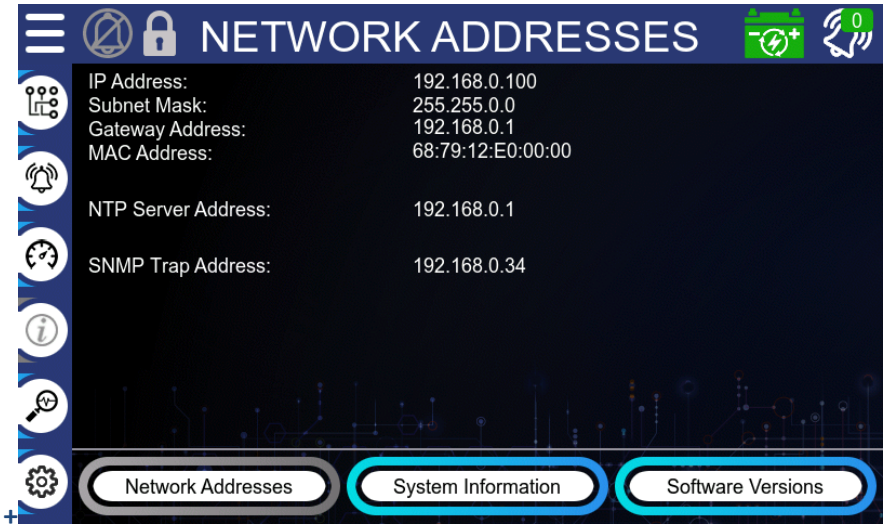


Figure 17: Network Address Screen

6.5. Diagnostics

The Diagnostics Screen is the launchpad for the system's diagnostics and information functions.

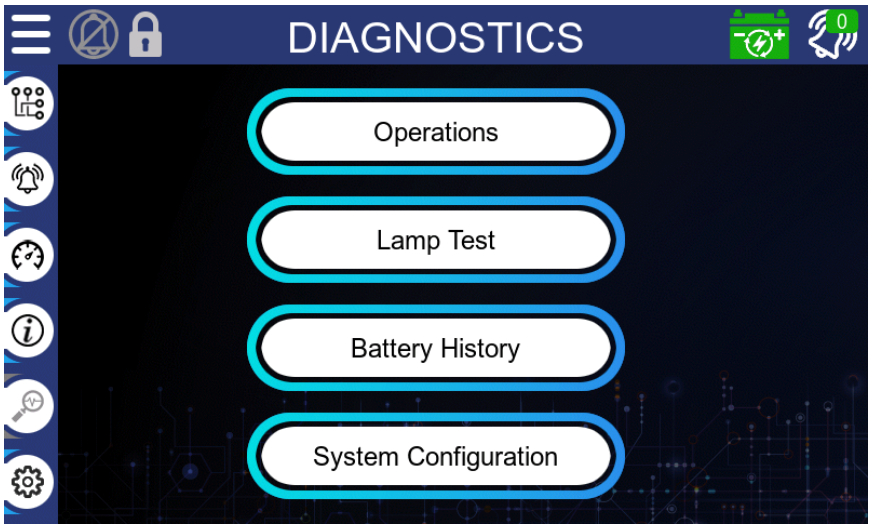


Figure 18: Diagnostics Screen

The Operations Screen displays lifetime and environmental measurements. The first page on this screen displays the total operational hours of the Charger and enclosure temperature. The second page displays gauges for the environmental measurements.

Pressing the Lamp Test Button will turn on the indicator lights on the User Interface for 5 seconds. Pressing the Lamp Test Button again while a lamp test is in progress will end the lamp test and return the indicator lights to normal operation.

Battery History Button is included with Battery Voltage and Current monitoring (Option# 210) and will provide event log of the battery discharges. Reference 7.3.1. Battery Voltage & Current Monitoring.

System Configuration provides a list of the features and alarms provided with your Charger. The Relay Assignment screen provides the configured Relay alarms for external annunciation. See 7.5.12. Relay Configuration for configuration of Alarm Relays. If a relay is in the Alarm state, it will be shaded blue.

6.6. Setup Menus

The Setup Screen is the launchpad for modifying system settings. Reference Figure 8: Setup Menu for navigation selections.

A password is required to enter the Setup menus. If you are interrupted while adjusting settings and do not press the touch screen for more than 10 minutes, the Setup mode ends automatically without saving adjustments and returns to the Mimic screen. See Section 6.6.6. Password for set up.

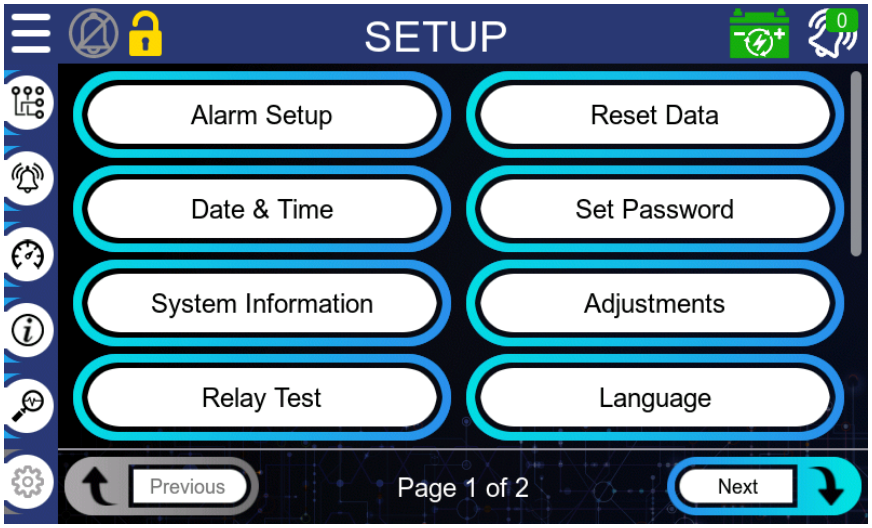


Figure 19: Setup Screen – Page 1

6.6.1. DC Voltage Adjust

The Float and Equalize voltage is adjusted through the *Setup -> Adjustment -> Float Voltage* and *Equalize Voltage* menus. Pressing the Float Voltage or Equalize Voltage button will provide a keypad for the user to adjust the voltage set point. Once the value is obtained press Save. A DVM should be used to verify the actual setting. The default button will set the Float voltage to factory default of 135vdc and Equalize Voltage to 140Vdc. The Float voltage adjustment range 120 Vdc to 141.6 Vdc and the Equalize voltage adjustment range 135 Vdc to 147.6 Vdc.

Note: 110Vdc (55 cell) unit range is 92% of 120 Vdc (60 cell) configuration.

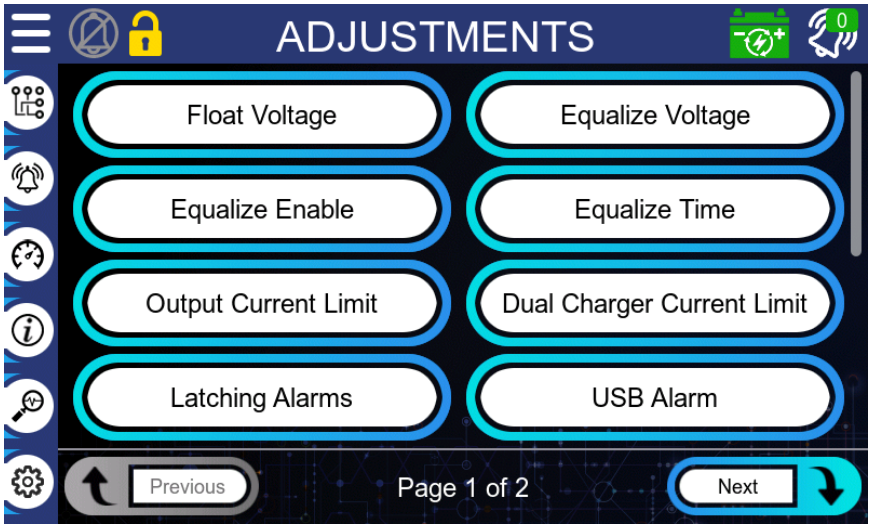


Figure 20: Adjustments Screen – Page 1

6.6.2. Float/Equalize Modes

Float mode is used to maintain stationary batteries in a fully charged state. When the charger is in Float mode the output voltage is maintained at the float voltage setting.

Equalize mode is used to help remove built-up sulphate and balance the voltage of each cell. An Equalize Timer is used to limit the time of the Equalize charge on the batteries to prevent damage. Before adjusting equalize settings, consult your battery datasheets.

The Equalize Time is 24 hours default from the factory. To change the time, go to the *Setup -> Adjustments -> Equalize Time* Menu. The range is 1 minute to 99 Hours (5,940 minutes).

To reduce the risks of applying an Equalize charge to batteries that do not require a equalize charge, the Equalize mode function can be disabled. To disable go to the *Setup -> Adjustments -> Equalize Enable* Menu.

An Automatic Equalize function is available to automatically place the Charger in Equalize mode after an AC power failure greater than 5 minutes. See 7.4.8. Charger Auto−Equalize.

The Battery Control Button on the Mimic screen displays the status of the Charger output to the battery.

 Charge is in Float Mode.

 Charge is in Equalize mode.

 Battery is discharging. All modules failed or Battery discharging alarm when Battery Voltage & Current option is provided, reference 7.7.2. Battery Voltage & Current Monitoring.

 There is no communication with the Charger modules when the Battery current metering is not included.

Pressing this button when the Charger is in Equalize Mode will return the Charger to Float Mode. Pressing this button when in Float Mode will automatically go to the menu for the user to put the Charger in Equalize Mode. The data log will store each Float or Equalize event.

6.6.3. Configuring Alarm Set Points

Alarm set points can be adjusted during operation via the *Setup -> Alarm* setup screen. Each alarm will list the Set Point and delay for the alarm. Depending on the alarm there may only be one of the variables for the alarms. See 7.5. Alarm Indications and 7.6. Optional Alarms for set up limits.

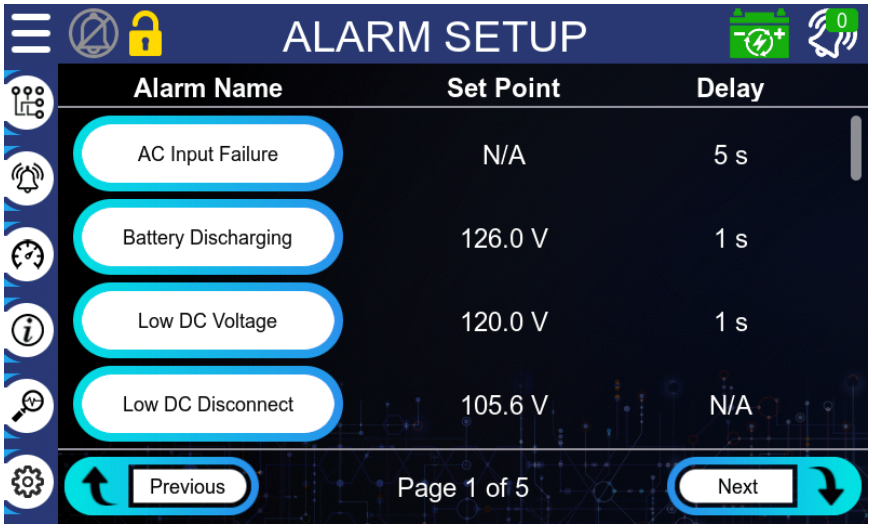


Figure 21: Alarm Setup Screen

Pressing an alarm button allows the set point and/or delay to be modified.

The Alarm set points can be reset to their factory defaults, by going to *Setup -> Reset Data -> Alarm Set Points* screen and pressing Reset. You can also cancel this operation.

6.6.4. Current Limit Adjustment

To change the Charger output current limit, go to the *Setup -> Adjustments -> Output Current Limit* Menu. Set the desired current limit value using the keypad, range is 50% to 100% of rated output. Press Save to save the new value and exit. The new current limit value will be in effect.

6.6.5. Date & Time

To change the date and time go to the *Setup -> Date & Time* screen.

If the Communications Package Option (187) is provided a Coordinated Universal Time (UTC) Offset Button is available to allow the UTC offset to be modified to reflect the time zone.

The NTP Button allows the Network Time Protocol to be enabled or disabled and the IP address of the NTP server to be changed. If NTP is enabled, the user will not be able to change the date or time manually.

6.6.6. Password

Supervisor passwords are intended to be used for individuals authorized to change parameters of the system as well as monitor and download event logs. The default password is “1962”.

The Set Password Screen allows the password to be modified. The password can be between 4 and 10 digits long. The user will be asked to confirm the new password before it is applied.

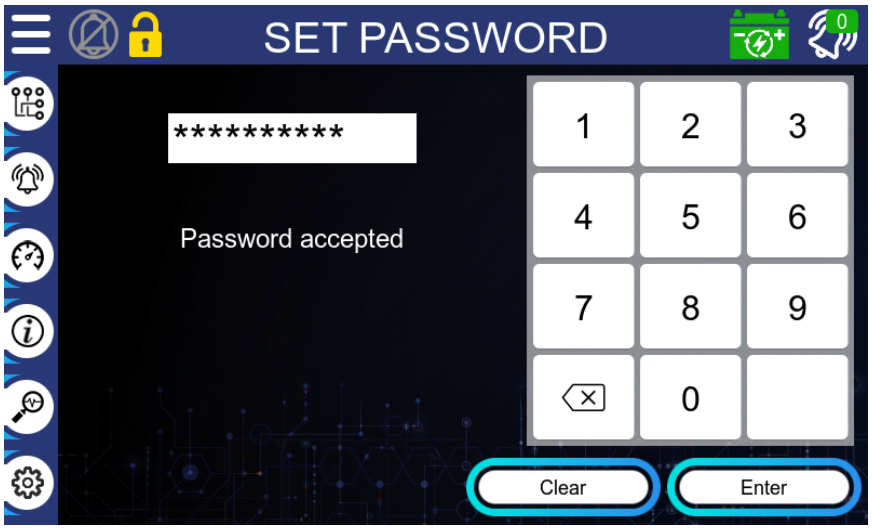


Figure 22: Set Password Screen

6.6.7. Language Setting

The Language Screen allows the user to change the language if the User Interface between English and Spanish. The language change will not take effect until the new setting is saved.

6.6.8. System Information

The Set System Information Screen Allows the system’s Client Name and Site ID text values to be viewed and modified. Pressing either text box will display a keyboard that can be used to change the value. The new value must be saved to take effect.

This information will be used on system and data log reports.

6.6.9. Advanced Diagnostics

This screen list design diagnostics information used to assist trouble shooting with AMETEK Solidstate Controls.

6.6.10. USB Alarm

The USB 2.0 port on the front door can be used to configure the Charger using the Ametek Solidstate Controls SCILink software.

The USB port may be disabled by SW1 on the Display PC board on the inside of the front door. A green LED next to SW1 is illuminated if the front USB port is enabled.

An alarm can be enabled to detect if the USB enable switch is moved to the ON position. This will enable the common alarm relay and data log.

This alarm can be enabled in the *Setup -> Adjustments* Menu.

6.6.11. Alarm Relay Test

An alarm relay test function exercises the alarm relay on PCB19 to check operation. When the Relay ON Test button is pressed, all relays PCB19 are energized. When the Relay OFF Test button is pressed, all relays on PCB19 are de-energized. Each state will remain on for 15 seconds. The activation time may be modified in the *Set up -> Alarm Set up -> Relay Test* screen, range of 1 to 255 seconds.

7. OPERATION

7.1. System Functionality

Incoming AC power is converted to regulated DC output by a High Frequency bridge. The charger utilizes a constant voltage and current control circuitry. Each module has a high-frequency isolation output transformer for galvanic isolation to the DC loads. The system block diagram is shown below.

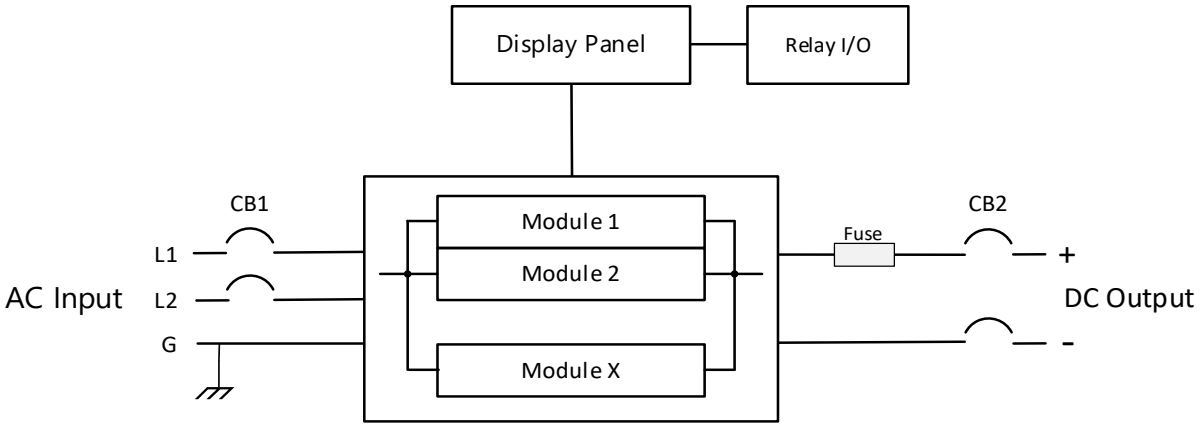


Figure 23: Block Diagram

When AC is turned on, the modules will automatically turn on to a predefined DC voltage. This will power the display. The display will then command the modules to the correct DC voltage via the CAN bus.

7.2. Charger Module

Each AC-DC power module contains Power Factor correction (PFC) circuitry to provide high power factor and low input current distortion. A high frequency bridge is used to power an isolation transformer and then rectified for a low ripple DC Output. EMI filtering is provided to minimize interference with other connected devices.

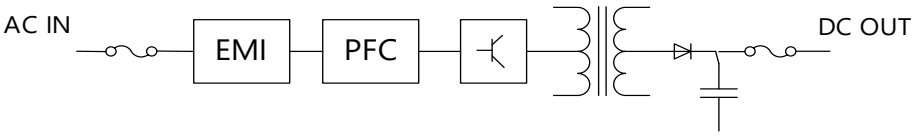


Figure 24: Module Block Diagram

On the front of each module an LED indicator is provided for AC ON, DC On and Fault for quick diagnostics of the module. The fault indicator will indicate a problem related to the module. The DC On LED will flash if the module is in current limit.

7.2.1. Display Panel

The Charger Display Board interfaces with the Control Board and provides the user a mechanism to monitor and control the operation of the charger via a touch screen color display. The Display board communicates to the Module via a CAN bus voltage and current set points. The module will communicate module status and alarms to the display.

A removable configuration memory card which contains the specific setup for each unit is located on the Display Board. The system will not operate if this card is not present. The memory card is used to transfer configurations and settings during a field replacement of the Display board. This card should never be removed or replaced while power is applied to the system. See 8.4. Display PCB Replacement

7.2.2. Alarm Relay Board

The system contains a relay alarm board containing 8 alarm contacts to allow remote monitoring of up to an additional 6 alarms. Common and Loss of Communication form-C relay contacts are provided on each Charger.

7.3. System Options

7.3.1. Battery Voltage & Current Monitoring

As an option, Battery voltage and current monitoring can be provided. This option will provide separate Battery input terminals to monitor the charge and discharge of the battery.

7.3.2. Battery Input / Breaker

A Battery breaker can also be provided to eliminate an external distribution panel and disconnect the battery. This configuration allows the DC loads to be worked on while maintaining charge to the battery.

The system with all available options is shown below:

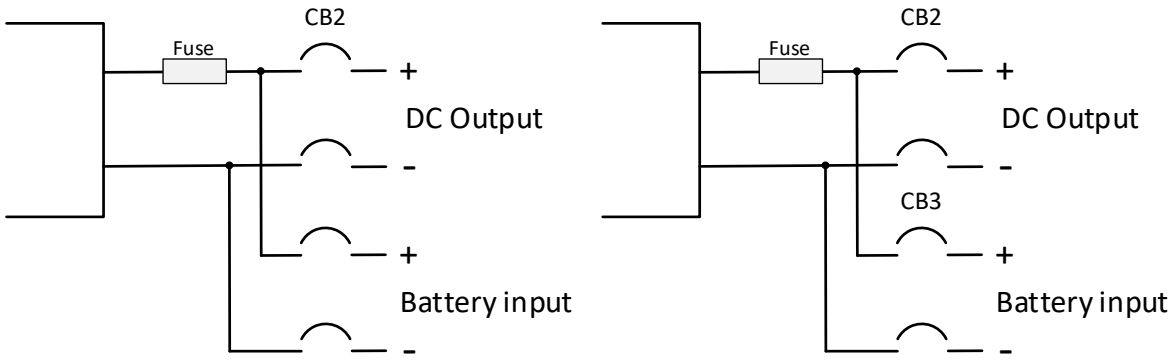


Figure 25: Battery Input Options

7.4. System Features

7.4.1. Input Power Walking (Soft Start)

The Charger incorporates input power walking capability to gradually accept the load upon being energized to prevent power surges.

7.4.2. Reverse Polarity Protection

The system incorporates a reverse polarity diode and an output fuse in the positive leg for reverse polarity protection. In case the battery is connected in reverse, the diode will conduct and blow the output fuse to prevent damage to the batteries.

7.4.3. Module Over Temperature

The system will provide module over temperature warning. If the over temperature persists the affected module will shut down.

In the event of an over temperature shut-down, the charger must be restarted by cycling AC power using the AC Input circuit breaker.

7.4.4. High DC Shutdown

The charger output will shut down if the DC voltage reaches the shutdown point of 145.2 for greater than 10 seconds. The High DC shutdown set point range 120Vdc to 162Vdc.

The charger will have to be AC power-cycled with the AC Input breaker to restart after a high voltage shutdown.

7.4.5. Audible Alarm

An Audible alarm is provided to annunciate any alarm. The alarm silence icon will silence the audible alarm for 60 seconds. If a new alarm occurs after that period, the audible alarm will turn on again.

7.4.6. Lamp Test

Lamp test will turn on the front panel Normal and Trouble LED indicators for 5 seconds to verify operation. The Lamp test function is in the User Interface Diagnostics menu.

7.4.7. Latching Alarms

The LCD alarms and alarm relays may be configured to be latching. This allows the user to verify which alarm occurred during an event. To turn on Latching alarms go to User interface *Setup -> Adjustments -> Latching* screen.

The latching alarms(s) will remain active until the Alarm Reset button is pressed on the Alarms screen.

The Alarms screen can be reached by pressing  on the mimic screen.

7.4.8. Charger Auto–Equalize

Auto-Equalize will automatically place the Charger in Equalize mode when AC power is removed for longer than 5 minutes. Battery power must be available to the Charger. Equalize is terminated when:

- The Equalize Timer expires.
- The Float button is pressed on the User Interface.
- The battery reaches the Equalize voltage level for 30 minutes after coming out of current limit (either battery or output current limit).

The Auto-Equalize function is enabled via *Setup –> Adjustment –> Equalize Enable -> Next*.

7.5. Alarm Indications

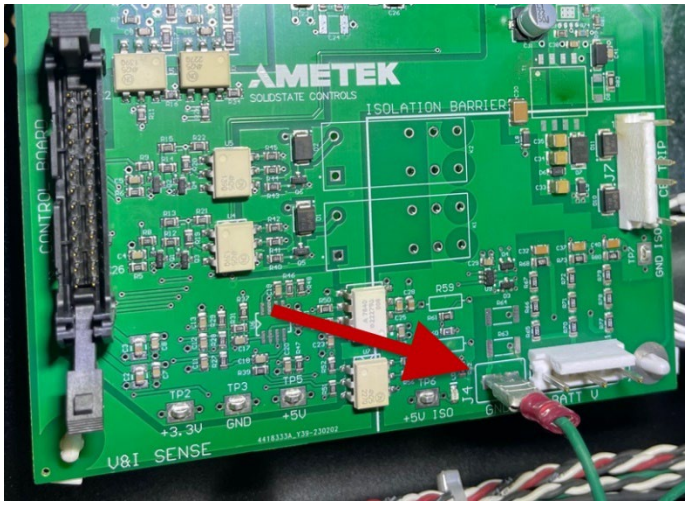
The Ascend Charger user interface provides alarms and status for the user to determine the health of the charger. When any alarm occurs, it is stored in data log, turns on the front panel Fault LED, and common alarm relay will go the de-energized alarm state. Many of the alarm set points and delays can be modified via the *Setup -> Alarm Setup* screen.

7.5.1. Low DC Voltage

If the DC output voltage goes below the set point threshold (factory default 120Vdc), the Low DC alarm will be activated. The Low DC voltage alarm set point may be configured between 100Vdc and 130Vdc with a delay up to 250 seconds. An alarm relay may be configured for remote annunciation. normal operation the alarm relay is energized.

7.5.2. Pos/Neg DC Ground Detect

The control senses a leakage path from DC bus to earth by monitoring the DC voltage from positive and negative to earth ground. When the DC voltage to ground increases above the set point (factory default 30Vdc) the Positive or Negative Ground detect alarm will be activated. The Positive and Negative to ground alarm set points may be adjusted between 20Vdc and 90Vdc with a delay up to 250 seconds. An alarm relay for both the Positive and Negative Ground detect may be configured for remote annunciation, under normal operation the alarm relay is energized.



The DC Ground Detect circuit may be disabled by removing the J4 connector on PCB3 located on the inside top left of the enclosure.

7.5.3. High DC Voltage

If the DC output voltage goes above the set point threshold (factory default 144Vdc), the High DC alarm will be activated. The High DC voltage alarm set point may be configured between 120Vdc and 150Vdc with a delay up to 250 seconds. An alarm relay may be configured for remote annunciation, under normal operation the alarm relay is de-energized.

7.5.4. Battery Near Exhaustion

If the DC output voltage goes below the set point threshold (factory default 110Vdc), the Battery Near Exhaustion alarm will be activated. The Battery Near Exhaustion voltage alarm set point may be configured between 99Vdc and 130Vdc with a delay up to 250 seconds. An alarm relay may be configured for remote annunciation, under normal operation the alarm relay is energized.

7.5.5. AC Input Failure

If power is not available to all modules, an AC Input Failure alarm is activated. The main display will indicate the failure and the Fault Indicator will be on. The AC Input Failure alarm has factory set delay of 5 seconds, the delay may be configured up to 250 seconds. An alarm relay may be configured for remote annunciation, under normal operation the alarm relay is energized.

If the AC Input breaker position option is included the AC Input breaker must be closed for the alarm to activate.

7.5.6. Charger Overload

If any charger module is in overload, the Charger Overload alarm will be activated. An alarm relay may be configured for remote annunciation, under normal operation the alarm relay is energized.

7.5.7. DC Output Breaker Open

The DC Output breaker position is monitored to see if the charger output is not connected. The Main display will indicate the DC output breaker position in the mimic screen. An alarm relay may be configured for remote annunciation, under normal operation the alarm relay is energized when the breaker is closed.

7.5.8. Charger Output Fuse Blown

If the output fuse opens, the Fuse Failure alarm will be activated. An alarm relay may be configured for remote annunciation, under normal operation the alarm relay is energized.

7.5.9. Equalize Relay

An alarm relay may be configured for Equalize mode remote annunciation, under normal operation the alarm relay is energized when the Equalize Mode.

7.5.10. Module Over temperature

If any charger module has an over temperature, the Module Over Temperature alarm will be displayed on the alarm screen. An alarm relay may be configured for remote annunciation, under normal operation the alarm relay is energized.

7.5.11. Relay Communications Failure

If the Display Control or Relay board does not receive a serial acknowledgement from each other for more than 5 seconds a Relay communications failure alarm will occur. An alarm relay is provided remote annunciation, under normal operation the alarm relay is energized.

7.5.12. Relay Configuration

Six additional alarm relays can be configured with alarm relay contacts. Go to *Setup -> Adjustments -> Relay Assignments* to configure the alarm(s) relays. Relays K1 and K3 are fixed and cannot be changed.

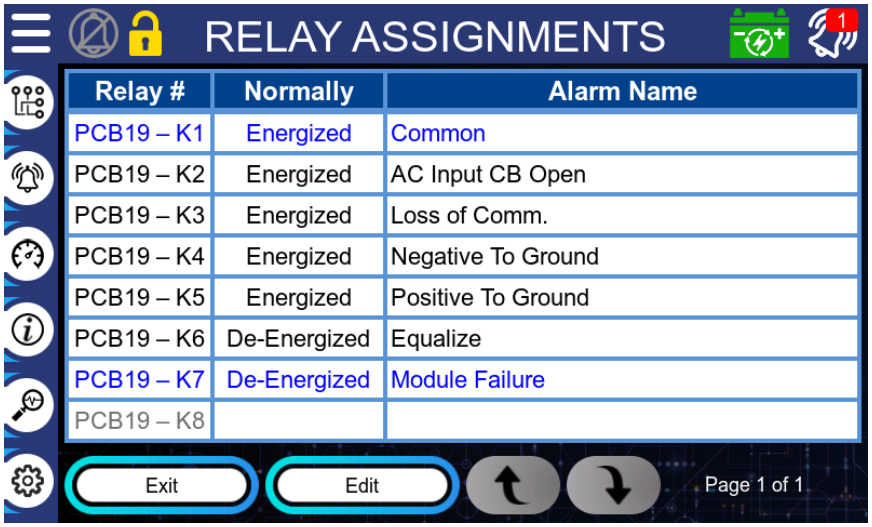


Figure 26: Relay Assignments

Select the alarms you want to be assigned to the relay alarms. A maximum of 6 may be selected. The relay assignment order is the same as what is in the assignment editor.

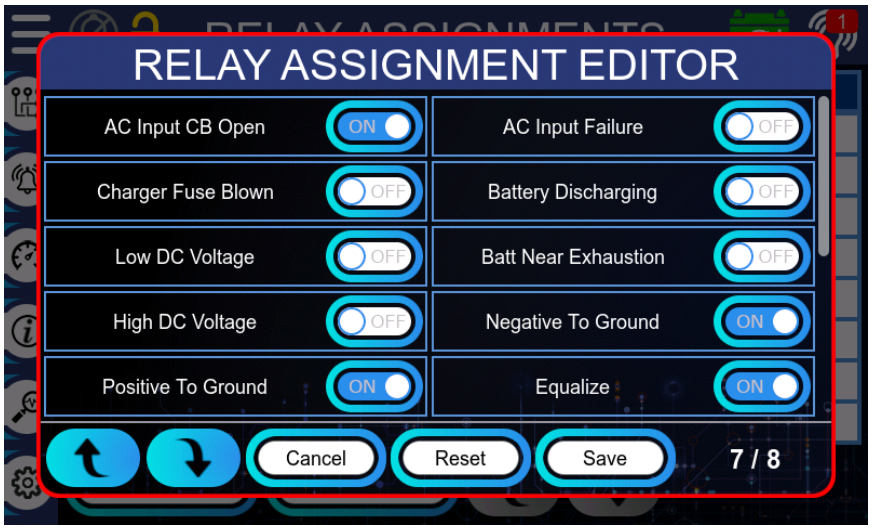


Figure 27: Relay Assignments Editor

7.6. Optional Alarms

Set points thresholds listed below are changed *Setup -> Adjustments -> Alarm Setup* screen.

7.6.1. High DC Disconnect

When enabled, this option (# 2) the AC Input breaker will trip when the DC voltage goes above the set point threshold (factory default 145Vdc). The High DC disconnect set point may be configured between 120Vdc and 162Vdc with a delay up to 250 seconds. An alarm relay may be configured for remote annunciation, under normal operation the alarm relay is de-energized.

7.6.2. Low DC Disconnect

When enabled, this option (# 107) the Battery Input breaker will trip when the DC voltage goes below the set point threshold (factory default 105Vdc). The Low DC disconnect set point may be configured between 90Vdc and 120Vdc with a delay up to 250 seconds. Battery Input breaker must be included for this option. An alarm relay may be configured for remote annunciation, under normal operation the alarm relay is energized.

7.6.3. AC Input CB Open

This option will provide the status of the AC Input breaker position. The breaker position will be indicated on the Mimic screen, alarm status screen when open, and any changes will be included in the data log. An alarm relay may be configured for remote annunciation, under normal operation the alarm relay is energized.

7.6.4. Battery CB Open

This option will provide the status of the Battery Input breaker position. The breaker position will be indicated on the Mimic screen, Alarm status screen when open, and any changes will be included in the data log. Battery Input breaker must be included for this option. An alarm relay may be configured for remote annunciation, under normal operation the alarm relay is energized.

7.7. Optional Features

7.7.1. Battery Temperature Compensation

Charger Temperature Compensation will continually adjust the Charger output Float voltage based on the ambient temperature in the battery room for temperatures from 3°C (37°F) to 40°C (104°F). An external temperature sensor is mounted in a central location near the batteries to provide an average ambient temperature. The probe must be in an area not directly affected by HVAC, sun light and drafts.

If the charger is in 'Equalize' mode, the Temperature Compensation is disabled.

The variable value is based on mV/°C/Cell. Therefore, the variable is multiplied with the number of cells in the battery string. Variable values of 2 mV, 3 mV and 4 mV are available, while the default is 2 mV. For example, a 60-cell system with a default variable of 2 mV the Float voltage will change by 120mV (60 cells x 2 mV) for every 1°C of temperature change. The variable corresponds to a curve, which is illustrated below. Note the Float voltage setting is based on 25°C (77°F). To modify the Temperature Compensation variable, go to User interface *Setup -> Adjustments -> Temperature Compensation* screen.

Consult the battery manufacturer to determine which setting is correct for your system battery.

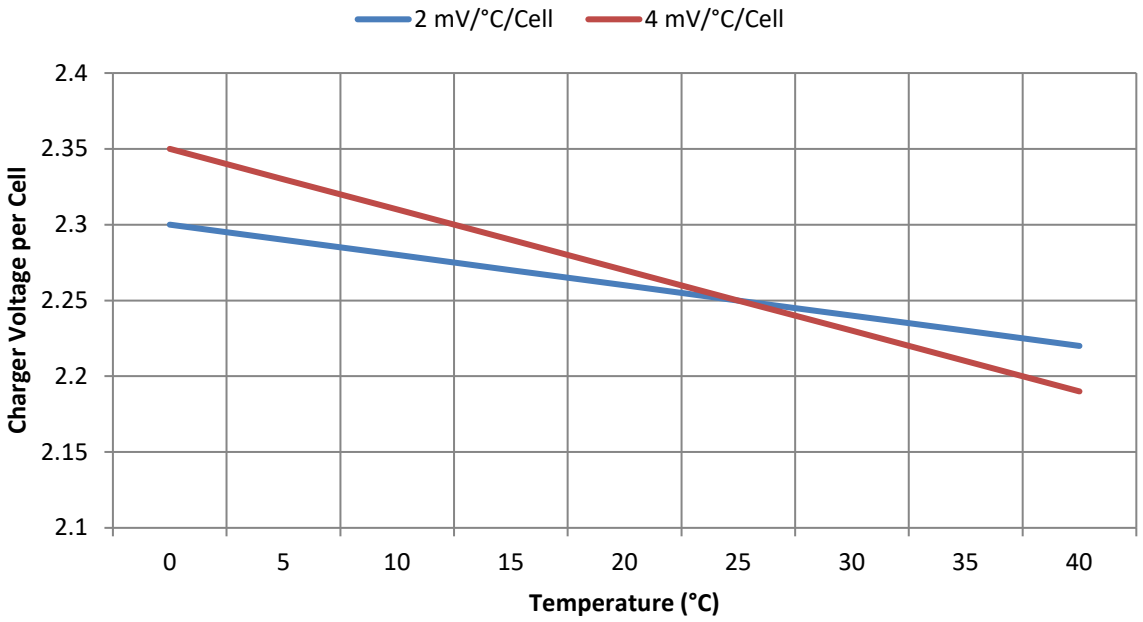


Figure 28: Charger Voltage Set point vs. Battery Temperature

When this option is enabled, an external temperature probe must be connected. The number of cells and volts per cell must be configured and the charger will calculate the final battery voltage. The Battery Temperature can be viewed in the Metering screen.

Temperature Compensation configuration is made through the Setup Menu along with enabling and disabling the compensation function.

To set the DC Float voltage, the temperature compensation function must be disabled, or the Float voltage setting may not be accurate due to the compensation due to the battery temperature. Once the DC voltage is set, re-enable the Temperature compensation.

If the temperature compensation probe is disconnected, a Temperature Compensation Failure alarm will occur.

7.7.2. Battery Voltage & Current Monitoring

This option (# 210) provides battery current and voltage monitoring. Separate battery input terminals are provided for direct connection to the batteries.

With this option, Battery Current Limit is provided. With this feature the charger current control regulates the amount of current that flows to the battery. When the current charging the battery exceeds the battery current limit setting, the Charger shall reduce the DC output voltage until the battery current is at or below the battery current limit setting. If the DC voltage reaches 110V the current limit will stop. Overall charger current limit still remains in force. To modify the Battery current limit, go to User interface *Setup -> Adjustments -> Battery Current Limit* Menu enter new value. Default current limit is 90% of rated output current and adjustment range is 25% to 100%.

Battery Discharging Alarm

In addition, a battery discharging alarm is provided. If the battery current to the load exceeds 5% of the rated current an alarm will occur. The discharge current may be adjusted from 1A to 20% of rated output current. An alarm relay may be configured for remote annunciation, normal operation the alarm relay is energized.

Battery History Screen

Each battery discharge is recorded in the Battery History screen. Which includes the number of battery discharges, time on the battery, and historical and recent battery voltages. Battery History is viewed in *Diagnostics -> Battery History*, screen to view the data log go to *Battery Log*.

The battery statistics may be reset using the *Setup -> Reset Data -> Battery History* Screen.

Each battery discharging alarm is data logged in the Battery History Log. These can be viewed using *Setup -> Reset Data -> Battery History Log*.

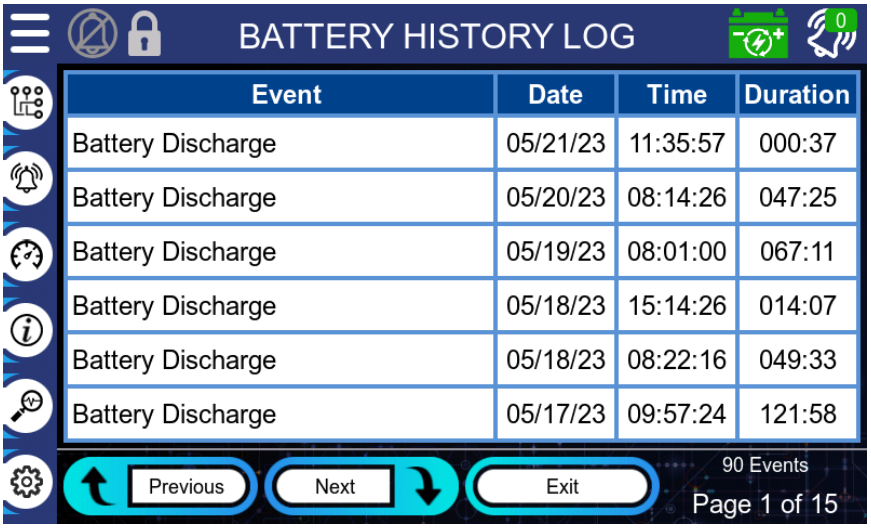


Figure 29: Battery History Log Screen

The Battery History Log Screen displays the last 100 battery events. The duration of each event is formatted to display minutes and seconds.

7.7.3. Equalize Inhibit

Equalize inhibit option (# 155) will prevent the charger from going into Equalize mode. This can be slaved with a 'Vent Fan Fail' to prevent the Charger to equalize the batteries and contributing to the batteries gassing hydrogen. A 120 Vac external signal will initiate the Inhibit. An alarm will be registered in the alarm screen and data log.

7.7.4. Dual Charger Current Limit Control

An optional external signal will reduce the Charger current limit to a secondary level to limit the load on a source in an emergency. A 120 Vac external signal will initiate the Inhibit. The Charger current limit can be adjusted through the *Setup -> Adjustments -> Dual charger Current Limit* screen with an adjustment range of 10% to 90%.

7.7.5. Communications Package

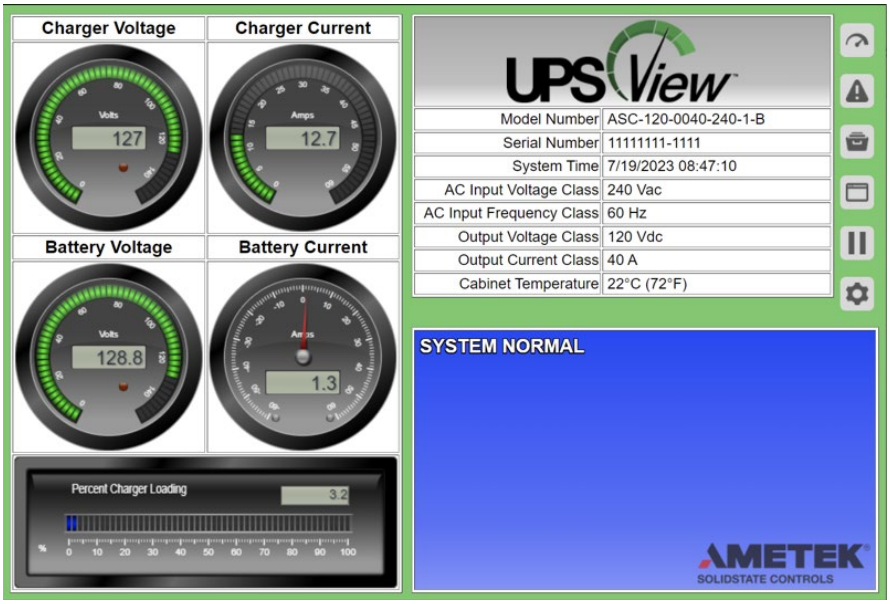
The optional communications package (# 187) provides Web page and Ethernet/Modbus communications over RTU and TCP communications to remotely read alarms, voltages, current and status. The RJ45 connector supports Modbus TCP, Web page, SNMP, and NTP.

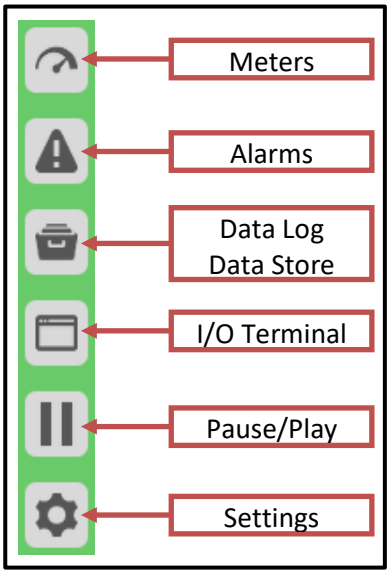
Connect 10/100Base-T Ethernet to the RJ-45 Ethernet port of the Charger.

7.7.5.1. Web Page

The web page allows the Charger system to be monitored remotely. The web page can be viewed by navigation to the IP address of the Charger using a web enabled device. The web page displays meters, alarms of the system and datalog can be viewed or downloaded.

The buttons appearing along the right side of the Main Screen, except for the Pause/Play button, will open the window corresponding to which button is clicked. The Alarms button will flash red when there are active alarms, as will the Pause/Play button when pulling is paused.





When you are viewing the Web page on an external browser and the device loses connection for more than 90 seconds with the Charger, the webpage will notify Ethernet Loss of Comm. This notification is not reflected on the Charger system.

Datalog Reports can be downloaded in three different formats:

- Standard data log with the event name, date, and time only.
- Extended data log with addition system readings at the time the event occurred.
- CSV (Comma-Separated Values) data log with same information as extended data log.

7.7.5.2. Network Addresses

The Ethernet Settings Screen displays the network configurations for the system. The network configurations can be modified using the Ether Setting Screen. In *Setup -> Network Settings*.

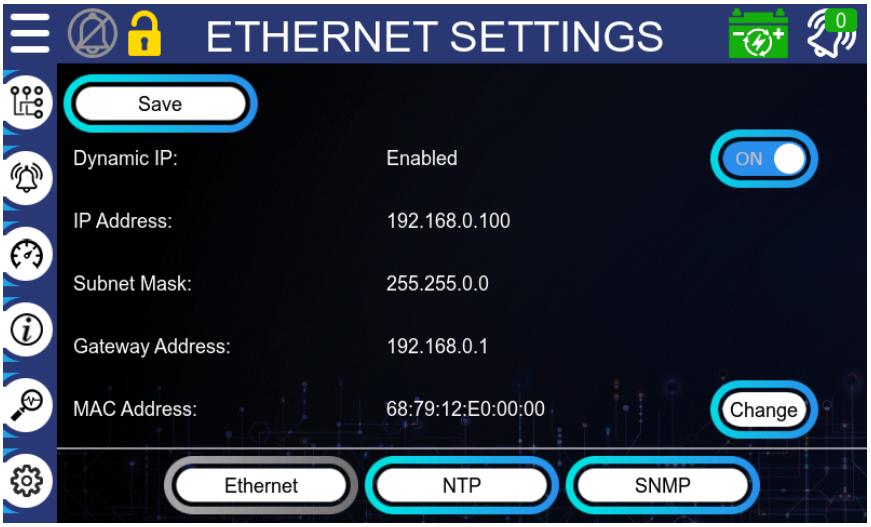


Figure 30: Network Settings Screen – Ethernet Settings

7.7.5.3. Network Time Protocol

The Network Time Protocol (NTP) compatibility allows the Charger to synchronize the system time with a NTP server on the network. The time will be synchronized once an hour. This feature can be enabled on the User Interface *Setup -> Network Settings -> NTP*.

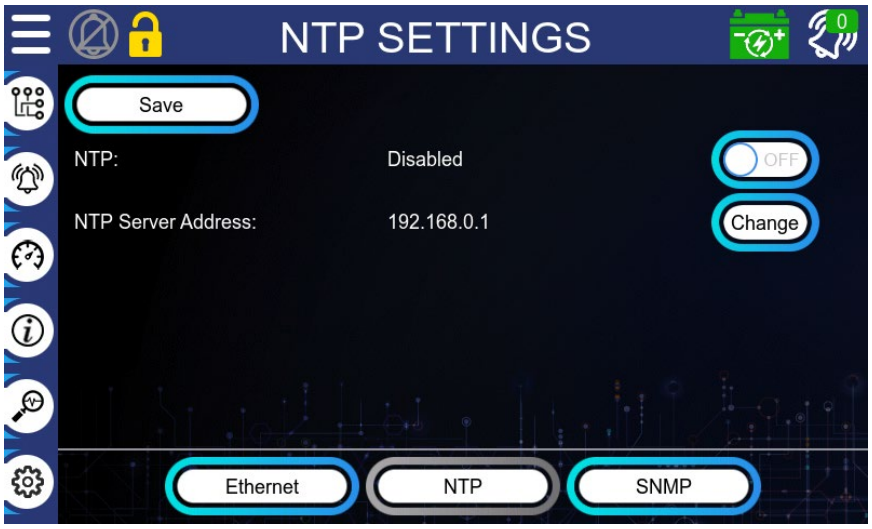


Figure 31: Network Settings Screen – NTP Settings

7.7.5.4. Modbus RTU Setup

Serial Modbus communications over RS-485 using RTU mode is optional. Modbus communications settings may be configured in *Setup -> Modbus Settings.*

The Modbus Settings Screen allows the user to configure the address, baud rate, parity, and RTU address used for Modbus RTU communication.

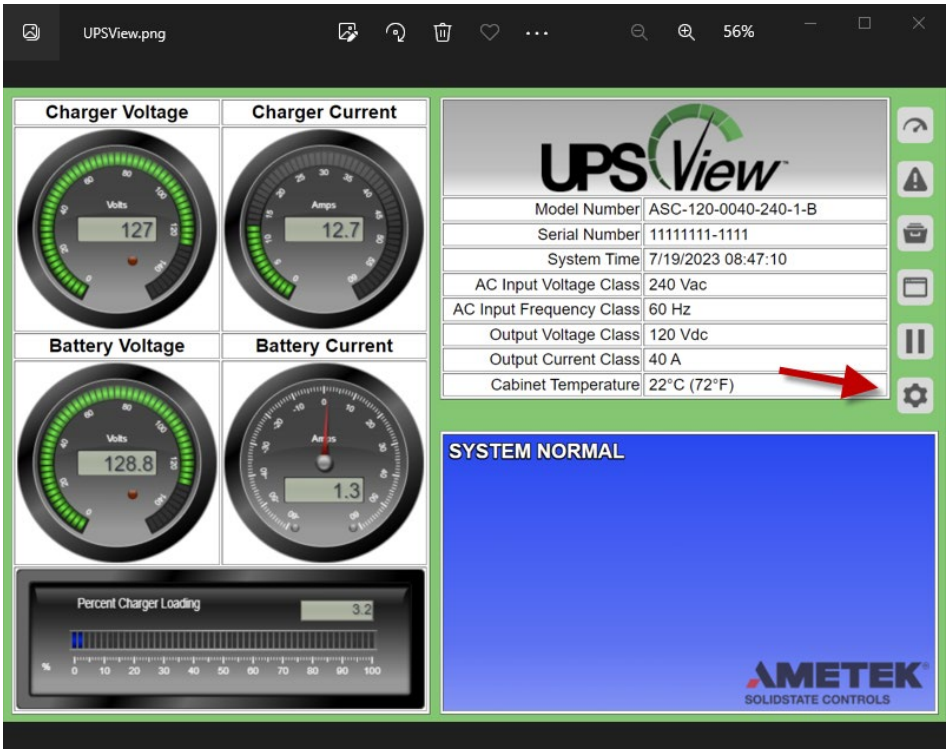
Table 4: Modbus Default setting

Setting	Default Value	Range
RTU address	1	1 to 247
Baud Rate	19200	9600, 19200
Data bits	8	8
Parity	Even	Even, Odd, None
Stop bits	1	1

Modbus RTU registers can be read over the RS-485 connection. A minimum delay of 2 seconds is required between polls. The Modbus registers, which are read only, can be found in Appendix A: for Modbus mapping.

7.7.5.5. SNMP

To install the SNMP, open UPSView in a web browser by navigating to the URL on the Ethernet Settings screen. Select the Settings buttons.



A window will appear, download SNMP MIB file to be loaded int the SCADA system.

Configure the SNMP Trap Address and connect a browser.

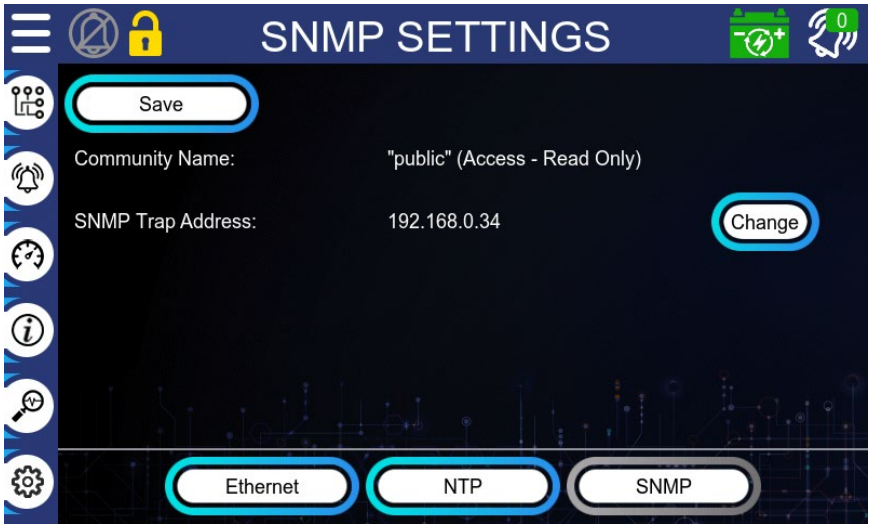


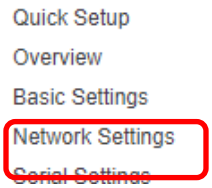
Figure 32: Network Settings Screen – SNMP Settings

7.7.6. DNP3 Communications

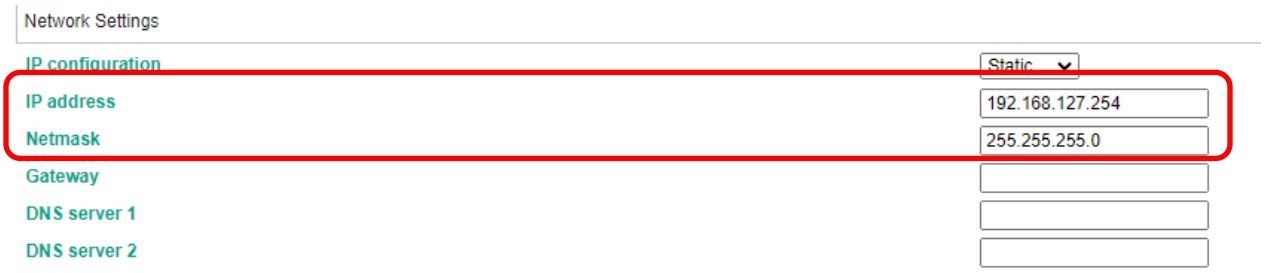
DNP3 optional (# 234) communications provides access to system voltages, currents, and alarm status. There is no control provided via DNP3. A Moxa MGate 5109 Industrial protocol gateway is used to convert Modbus RTU to DNP3.

Configure the DNP3 IP address by connecting a Web enabled browser to the gateway and follow the instructions below.

1. Type the IP address of the device into the search bar of your choice of browser (default is 192.168.127.254)
2. Sign into device (default: username-admin, password-moxa)
3. Open the tab labeled “Network Settings”



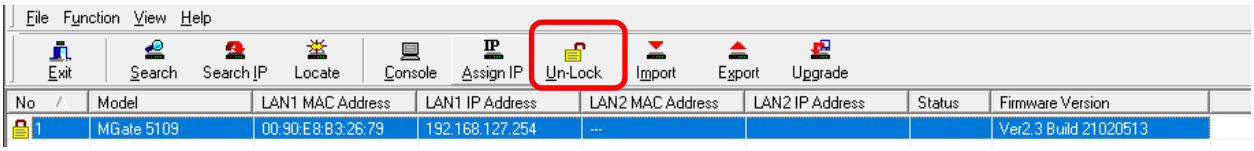
4. Change IP and Netmask as needed.



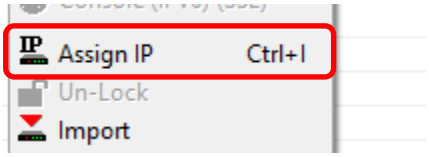
If you cannot detect the IP address on your network, use the following alternate method. This method requires software to be loaded on a computer.

1. Download and install the DSU software and finish using the setup wizard. Software is available at https://www.solidstatecontrolsinc.com/knowledgecenter/software.
2. Open the DSU software.
3. Select search and wait for device to be found.

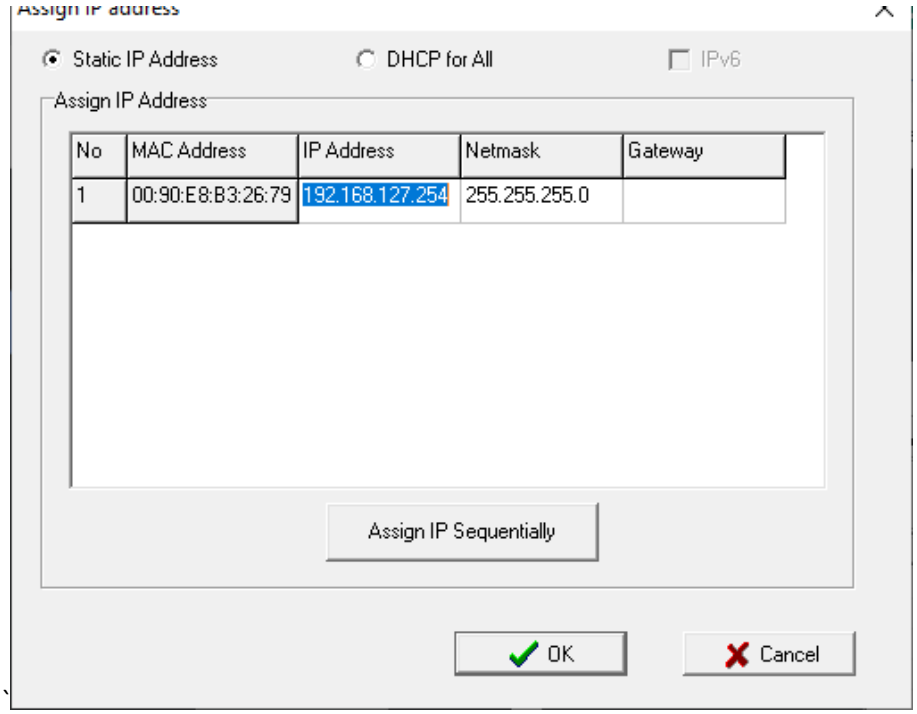
4. Select the device and press unlock, and enter the username and password to unlock the device (default: username-admin, password-moxa)



5. After unlocked, right click the device, and select “Assign IP”, where the IP and mac address can be changed to desired values.

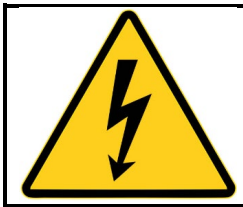


6. Change the IP and Netmask to desired values. When done, press ok to continue.



8. MAINTENANCE

8.1. Preventive Maintenance



DANGEROUS HIGH VOLTAGE inside the enclosure
TO REDUCE RISK OF FIRE OR ELECTRIC SHOCK, do not attempt to open enclosure or gain access to areas where you are not instructed to do so.
SERVICING IS TO BE DONE ONLY BY QUALIFIED SERVICE PERSONNEL

The ASCEND Series Charger is designed and manufactured to assure maximum reliability, flexibility, serviceability, and performance.

To assure longer component life and trouble-free operation, minor preventive maintenance procedures should be performed annually. More frequent inspection intervals are recommended for severe operating conditions.

8.2. Recommended Maintenance Procedures

Annual maintenance is adequate for environments that are relatively clean, and temperature controlled. More severe conditions will warrant additional maintenance as needed.

1. Verify output voltage is within specifications.
2. Turn off all power to unit.
3. Ensure all cooling fans are operational, clean, and free of dust and debris.
4. During each service inspection, any accumulated dust, dirt, or foreign particles should be carefully removed. Special care should be taken to avoid damage to controls and PCB's.
5. Inspect all wiring for loose connections, burnt, frayed or broken wires. Check for burned semiconductor components and circuit boards.
6. Re-torque all high current connections and secure any loose connections. Refer to Torque Specifications chart in this section.

Table 5: Torque Specifications

Bolt	Mild Steel			SAE 5	
	in-lb	ft-lb	Nm	in-lb	ft-lb
#6	11		1.2		
#8	20		2.3		
#10	32		3.6		
1/4"		5-6	6.8-8.1	9-10	12.2-13.6
5/16"		10-12	13.6-16.3	14-18	19.0-24.4
3/8"		16-20	21.7-27.1	25-31	34-42
1/2"		37-48	50-65	37-74	50-100

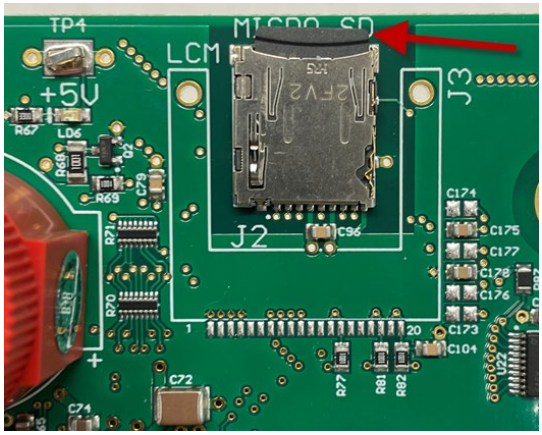
NOTE: Information from P.A. Sturevant Co. & Snap-On Tool Co. & AMETEK Solidstate Controls part vendors. Conversions: 12 in-lb = 1 ft-lb = 1.356 Nm

8.3. Module Replacement

1. Shutdown the Charger by opening AC Input, DC Output, and Battery breaker if provided. This will eliminate all power to the module.
2. Remove the two screws on each side of the module.
3. Using the handle pull the module out until you can grab onto each side to remove the module.
4. Carefully insert the replacement module with both hands. You should feel the rear connector engage.
5. Make sure that the module is fully inserted, and the module front is flush to the side rails.
6. Install two mounting screws one on each side. There is not much force required, do not exceed 20 in-lbs.
7. Restart the Charger by closing the AC Input, DC Output, and Battery breaker if provided.

8.4. Display PCB Replacement

The Display PC board utilizes a removable Micro SD memory card contains the specific setup for the unit. The system will not operate if this card is not present. The memory card is used to transfer configurations and setting during a field replacement of the Display board. This card should never be removed or replaced while power is applied to the system. To remove the Micro SD, push to release.



1. Shutdown the Charger per 4.4. Power Off procedure
2. Disconnect the connectors from the PC board.
3. Remove the screws holding the board to the door and remove the PC board.
4. Remove the MicroSD card from the old board and place it in the replacement PC board.
5. Install the new Display PC Board using the screws and connect cable to the board.
6. Start the Charger per 4.3. Start-up procedure.
7. The Display will indicate the configuration memories do not match. Select the Back-up Memory.

8.5. Troubleshooting

As an aid in troubleshooting the unit, the following list of problems and possible causes is suggested as a guide. Before attempting to troubleshoot any problem, record all system parameters and indicator status. If a problem falls outside of this list or is not cured by taking the appropriate action mentioned below, the factory should be consulted for additional help.

8.5.1. DC Voltage not adjustable

1. Communications failure between Display and Module(s); Replace Display
2. Charger in Current limit, Module DC OK LED flashing: Reduce output current

8.5.2. No Output Voltage and/or Current

1. Open AC Input breaker: reset breaker. If trips again check High Output voltage
2. Open Output Fuse or Breaker: Replace fuse with same type or reset breaker.
3. Module(s) shut down due to over voltage or over current, cycle AC Power.

8.5.3. Low Output Voltage

1. Voltage Adjust Control Improperly Set: Readjust Float and Equalize values.
2. Charger Output in Current Limit. Check module DC OK LED, flashing = current limit, check current limit setting, reduce output load
3. Battery Output in Current Limit. Increase Battery current limit, Check battery condition.
4. Communications failure with Display at start up, Defective Display Board: Replace with new board. Move the configuration memory into the new board prior to applying power.
5. Defective Module, Check Module Fault indicator.

8.5.4. Ground Fault Alarm

1. Ground Fault is on the DC positive or negative: remove fault.
2. View ground fault voltages in Charger Metering on the display; Adjust Ground fault sensitivity in *Setup -> Alarm Setup*.

8.5.5. Relay Communications Failure

1. Relay Communications Failure alarm: Verify relay S1 Dip switches all closed.
2. Replace Relay PCB
3. Replace Display PCB

8.5.6. Module (CAN)Communications Failure

1. Verify which module has the communication failure in the Alarms menu, Replace failed module.

8.5.7. Low Output Current

1. Output Current Limit Adjusted Incorrectly: Check module DC OK LED, flashing = current limit Adjust current limit.
2. Defective Control Board: Replace with new board. Move the configuration memory into the new board prior to applying power.

8.5.8. No Output – Fuses Open or Input Breaker Tripped

1. Open output fuse, replace with new fuse.
2. Defective Control Board: Replace with new board.
3. Shorted Wiring: Locate and replace defective wiring.
4. Station Battery Defective or not in Circuit: Check battery and DC circuit.

8.5.9. Alarm Diagnostics

Disp SD Card Failure alarm indicates hardware failure to R/W to the SD data. The SD card contains back-up datalog and system configuration. Replace the SD card with microSD, 2Gbyte minimum.

Disp Batt Volt Low (Coin Battery) alarm indicates the battery back-up for the primary configuration and Real time clock. Replace the coin battery with CR1632 battery.

Duplicate Module ID alarm indicates that a duplicate module address exists within the system. The module CAN interface address (PCB301-305) is duplicated.

Module Reset alarm indicates when a module processor resets. If reset continue replace module.

Mod AC Input Failure Alarm indicates when a module has and AC input failure. Replace Module.

9. PRODUCT SUPPORT SERVICES

9.1. Warranty Coverage

9.1.1. Standard Warranty

AMETEK Solidstate Controls' warrants this product to be free from defects in material and workmanship for a period of five (5) years from date of manufacture. During the term of the warranty period: parts, assemblies, or components deemed to be defective will be repaired or replaced at the manufacturer's option, free of charge. All costs related to removal, reinstallation and transportation will be paid by the purchaser/customer and/or operator of the product. Evaluation, repair and/or replacement of any defective part(s) are FCA manufacturer's factory. This warranty does not cover products or parts that are damaged from improper use or abuse, as determined by the manufacturer. Any consequential damage due to diagnosis or repair by any party other than the manufacturer's authorized personnel is not covered under this warranty.

For additional information concerning product support services available, contact your local AMETEK Solidstate Controls Representative or call the factory at (614) 846-7500 or Service Hotline at (800) 222-9079.

9.2. Return Material Authorization (RMA)

If the product requires service for any reason, the Customer should contact the Field Service Department. If the product must be returned to the Manufacturer for repair or replacement, the Customer must obtain a Returned Materials Authorization (RMA) number. The product must be packed in the original shipping container or other equally suitable container. The product must be shipped prepaid with the RMA number on the packing slip. Unauthorized returns of units will be subject to an inspection and handling charge plus any repair and all transportation charges.

9.3. Recommended Spare Parts

Although AMETEK Solidstate Controls design emphasis is on reliability, we realize that failures can occur. We have developed Recommended Spare Parts options, listing key components for your system. We recommend that these items be available on the job site. The system was designed to allow easy replacement of components by qualified personnel.

9.3.1. Operational Spare Parts

The Spare Part option include a selection of the parts commonly used when making repairs to our products.

A. Printed Circuit Board Kit (Operational)
   - Contains one of each of the printed circuit boards contained in your equipment.

B. Hardware Kit (Operational)
   - Contains one module and two of each type of fuse.

C. Combination Kit (Operational)
   - All the items included in A and B operational kits.

9.3.2. Optional Custom Spares

A. Circuit Breakers

9.3.3. Bill of Material/ Components List

Designator	Description	Part Number
Mod1-5	1-Phase Module	80-138160-90
PCB4	Display PCB	80-246801-90
PCB3	Sense PCB	80-247400-90
PCB5	Power Supply	03-358012-03
PCB19	Relay PCB	80-247104-90
D1	Diode	03-789902-05
FU1-20A	Fuse, 80A	03-752812-00
FU1-40A	Fuse, 80A	03-752812-00
FU1-60A	Fuse, 150A	03-752163-00
FU1-80A	Fuse, 200A	03-752213-00
FU1-100A	Fuse, 200A	03-752213-00

Note: FU1 fuse labeled with output current rating

9.3.4. Service Organization Contact Numbers

Columbus Headquarters
Telephone: 1 (614) 846-7500
Telephone: 1 (800) 222-9079 (after hours)

Houston Service Center
Telephone: 1 (281) 240-2135

Mexico Headquarters
Telephone: +52-55-5250-1232

APPENDIX A: MODBUS REGISTERS

Table 6: Read Holding Registers

Description	4x Register Address	Range	Unit
N/A	4x0001	N/A	N/A
N/A	4x0002	N/A	N/A
N/A	4x0003	N/A	N/A
N/A	4x0004	N/A	N/A
N/A	4x0005	N/A	N/A
N/A	4x0006	N/A	N/A
N/A	4x0007	N/A	N/A
N/A	4x0008	N/A	N/A
N/A	4x0009	N/A	N/A
N/A	4x0010	N/A	N/A
N/A	4x0011	N/A	N/A
N/A	4x0012	N/A	N/A
N/A	4x0013	N/A	N/A
N/A	4x0014	N/A	N/A
N/A	4x1001	N/A	N/A
Cabinet Temperature	4x1002	-32,768 – 32,767	°C
N/A	4x1003	N/A	N/A
N/A	4x1004	N/A	N/A
DC Battery Current [a]	4x1005	-32,768 – 32,767	ADC
DC Battery Voltage [a]	4x1006	-32,768 – 32,767	VDC
Charger DC Current	4x1007	-32,768 – 32,767	ADC
Charger DC Voltage	4x1008	-32,768 – 32,767	VDC
Percent Output Loading	4x1009	-32,768 – 32,767	%
N/A	4x1010	N/A	N/A
Communication Status Good	4x1011	0 – 1	N/A
	4x2001	-32,768 – 32,767	VAC
	4x2002	-32,768 – 32,767	VAC
	4x2003	-32,768 – 32,767	VAC
	4x2004	-32,768 – 32,767	AAC
	4x2005	-32,768 – 32,767	AAC
	4x2006	-32,768 – 32,767	AAC
Serial Number (Byte 1)	4x3001	0 – 255	ASCII
Serial Number (Byte 2)	4x3002	0 – 255	ASCII
Serial Number (Byte 3)	4x3003	0 – 255	ASCII
Serial Number (Byte 4)	4x3004	0 – 255	ASCII

Description	4x Register Address	Range	Unit
Serial Number (Byte 5)	4x3005	0 – 255	ASCII
Serial Number (Byte 6)	4x3006	0 – 255	ASCII
Serial Number (Byte 7)	4x3007	0 – 255	ASCII
Serial Number (Byte 8)	4x3008	0 – 255	ASCII
Serial Number (Byte 9)	4x3009	0 – 255	ASCII
Serial Number (Byte 10)	4x3010	0 – 255	ASCII
Serial Number (Byte 11)	4x3011	0 – 255	ASCII
Serial Number (Byte 12)	4x3012	0 – 255	ASCII
Serial Number (Byte 13)	4x3013	0 – 255	ASCII
Serial Number (Byte 14)	4x3014	0 – 255	ASCII
Serial Number (Byte 15)	4x3015	0 – 255	ASCII
Serial Number (Byte 16)	4x3016	0 – 255	ASCII
Serial Number (Byte 17)	4x3017	0 – 255	ASCII
Serial Number (Byte 18)	4x3018	0 – 255	ASCII
N/A	4x3019	N/A	N/A
Charger Output Current Class	4x3020	-32,768 – 32,767	ADC
N/A	4x3021	N/A	N/A
N/A	4x3022	N/A	N/A
Charger DC Output Voltage	4x3023	-32,768 – 32,767	VDC
N/A	4x3024	N/A	N/A
System Type	4x3025	-32,768 – 32,767	N/A
Module Count	4x3026	0-255	N/A

NOTES: Check option availability.

All Read Holding Register value are signed 16-bit integers.

[a] Requires the Battery Voltage & Current Metering Option (210).

Table 7: Read Coil Status

Description	0x Register Address	Description	0x Register Address
Spare	1	Spare	49
Spare	2	Low DC Voltage	50
Battery Discharging	3	AC Input Failure	51
Equalize	4	Spare	52
Spare	5	Spare	53
Spare	6	Spare	54
Spare	7	Spare	55
Spare	8	Spare	56
Spare	9	Spare	57
Spare	10	Spare	58
Spare	11	Spare	59
Spare	12	Spare	60
Spare	13	Battery CB Open [c]	61
Spare	14	Batt Near Exhaustion	62
Spare	15	Spare	63
Spare	16	Charger Fuse Blown	64
Spare	17	Spare	65
Spare	18	Charger Failure	66
Spare	19	Input A [d]	67
Spare	20	Input B [e]	68
Spare	21	Spare	69
Spare	22	Spare	70
Spare	23	AC Input CB Open [f]	71
Spare	24	Spare	72
Spare	25	Spare	73
Spare	26	Spare	74
PCB19 Relay Comm DN	27	Spare	75
Spare	28	Spare	76
Spare	29	Spare	77
Spare	30	Spare	78
Spare	31	Charger System Over Temperature	79
Spare	32	Spare	80
Common	33	Spare	81
Low DC Disconnect [a]	34	Charger High DC Shutdown	82
Spare	35	Spare	83
Spare	36	Spare	84
Spare	37	Spare	85
Spare	38	Spare	86
Spare	39	Spare	87
Spare	40	Spare	88
High DC Disconnect [b]	41	Module Failure	89
Negative to Ground	42	Module Loss of Comm	90
Positive to Ground	43	Module Overtemp	91
High DC Voltage	44	Mod Overtemp Shutdown	92
Spare	45	Module Overload	93

Description	0x Register Address	Description	0x Register Address
Spare	46	DC Output Breaker Open	94
Spare	47		
Spare	48		

NOTES: [a] *Requires the Low DC Disconnect Alarm Option (107).*

[b] *Requires the High DC Disconnect Alarm Option (2).*

[c] *Requires the Battery Breaker Open Alarm Option (57).*

[d] *Requires the Input A Alarm Option (73).*

[e] *Requires the Input B Alarm Option (74).*

[f] *Requires the AC Input CB Open Alarm Option (101).*

APPENDIX B: DNP3 INDECIES

Table 8: DNP3 Analog Outputs

Description	*Index*	*Range*	*Unit*
Cabinet Temperature	15	-32,768 – 32,767	°C
DC Battery Current [a]	18	-32,768 – 32,767	ADC
DC Battery Voltage [a]	19	-32,768 – 32,767	VDC
Charger DC Current	20	-32,768 – 32,767	ADC
Charger DC Voltage	21	-32,768 – 32,767	VDC
Percent Output Loading	22	-32,768 – 32,767	%
Communication Status Good	24	0 – 1	N/A
Serial Number (Byte 2)	32	0 – 255	ASCII
Serial Number (Byte 3)	33	0 – 255	ASCII
Serial Number (Byte 4)	34	0 – 255	ASCII
Serial Number (Byte 5)	35	0 – 255	ASCII
Serial Number (Byte 6)	36	0 – 255	ASCII
Serial Number (Byte 7)	37	0 – 255	ASCII
Serial Number (Byte 8)	38	0 – 255	ASCII
Serial Number (Byte 9)	39	0 – 255	ASCII
Serial Number (Byte 10)	40	0 – 255	ASCII
Serial Number (Byte 11)	41	0 – 255	ASCII
Serial Number (Byte 12)	42	0 – 255	ASCII
Serial Number (Byte 13)	43	0 – 255	ASCII
Serial Number (Byte 14)	44	0 – 255	ASCII
Serial Number (Byte 15)	45	0 – 255	ASCII
Serial Number (Byte 16)	46	0 – 255	ASCII
Serial Number (Byte 17)	47	0 – 255	ASCII
Serial Number (Byte 18)	48	0 – 255	ASCII
Charger Output Current Class	50	-32,768 – 32,767	ADC
Charger DC Output Voltage	53	-32,768 – 32,767	VDC
System Type	55	-32,768 – 32,767	N/A
Module Count	56	0-255	N/A

Table 9: DNP3 Binary Outputs

Description	Index	Description	Index
AC Input CB Open	1	Battery Time Remaining	123
Low AC Input	2	Ethernet	126
AC Input Failure	3	CHG Output CB Open	127
Charger Fuse Blown	6	System Overtemp	128
Battery Discharging [b]	17	Cabinet Humidity	129
Low DC Voltage	18	Hi DC Shutdown	132
Batt Near Exhaustion	19	Chg AC PS Fault	133
Low DC Disconnect [e]	20	Chg DC PS Fault	134
High DC Voltage	21	Battery I&V Metering	135
High DC Disconnect [f]	22	Batt Current Limiting	136
Negative to Ground	23	Dual Current Limit	138
Positive to Ground	24	AC Phase Loss	139
Equalize	26	Low DC Current	140
Battery Breaker Open	27	Ethernet Loss of Comm.	145
Input A	66	Data Log Full	147
Input B	67	Disp SD Card Failure	188
PCB19 Relay Comm DN [c]	75	Disp Batt Volt Low	196
PCB20 Relay Comm DN [d]	76	SNMP Enable	197
Common	83	USB Port Enabled	198
Loss of Comm.	84	Module Failure	199
Lamp Test	85	Module Loss of Comm.	200
Latching Alarms	86	Module Overtemp	201
Input Power Metering	88	Mod Overtemp Shutdown	202
Percent Loading	92	Duplicate Module ID	203
System Reset	98	Mod Algorithm Mismatch	204
Temperature Comp Fail	102	Module Reset	205
High AC Input	103	Mod AC Input Failure	206
Relay Test	110	Module Overload	207
DC CB Open	116	Mod Ctrl Loop Mismatch	209
Equalize Inhibit	122		

NOTES: [a] Requires the Low DC Disconnect Alarm Option (107).

[b] Requires the High DC Disconnect Alarm Option (2).

[c] Requires the Battery Breaker Open Alarm Option (57).

[d] Requires the Input A Alarm Option (73).

[e] Requires the Input B Alarm Option (74).

[f] Requires the AC Input CB Open Alarm Option (101).

APPENDIX C: SCHEMATIC AND WIRING DIAGRAM

REV.	DATE	REVISION RECORD	DWN	APP.
A	06/16/23	INITIAL RELEASE		
B	11/15/23	REMOVED EARTH ON PCB3, J3		

CURRENT RATING	MODULE				
	1	2	3	4	5
20	X				
40	X	X			
60	X	X	X		
80	X	X	X	X	
100	X	X	X	X	X
X = CLOSED					

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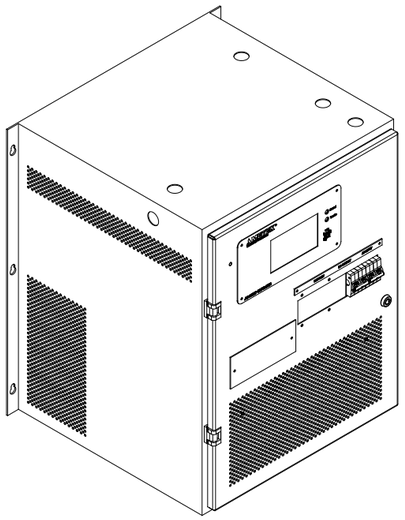
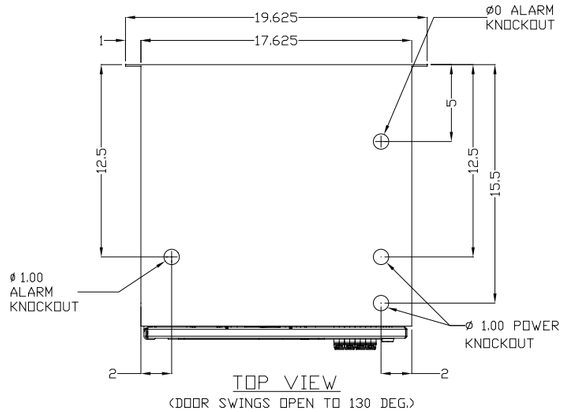
DRAWN BY	DATE 6/16/23	REFERENCE	
APP'VD. BY	DATE 6/16/23	TITLE	ASCEND, 1ø, CHARGER SCHEMATIC 130VDC OUTPUT 208–240VAC, 50/60HZ INPUT
SIZE D	SCALE		
WIRE NO. AVAIL	DWG. NO. 20–20–	SH 1 OF 1	PROJECT NO.

HALF SIZE DRAWING

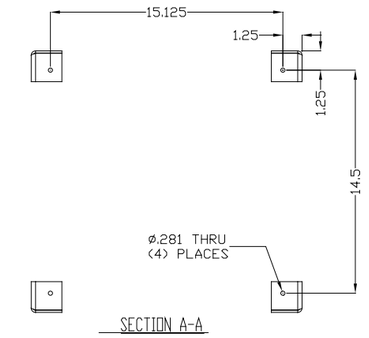
APPENDIX D: 20A & 40A OUTLINE

REVISIONS				
REV	DATE	REVISION RECORD	DWN	APP
A	07/21/23	INITIAL RELEASE.	NB	SW



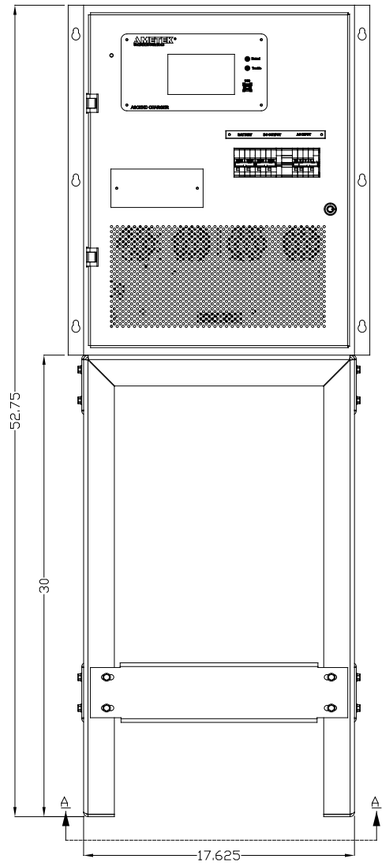


TOP VIEW
(DOOR SWINGS OPEN TO 130 DEG.)

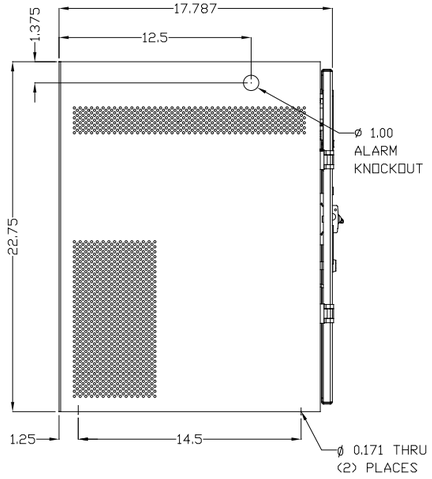


SECTION A-A

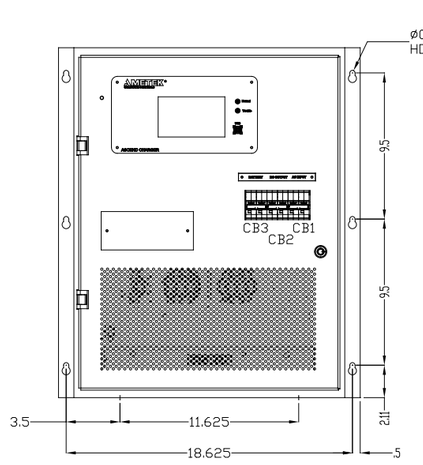
OPTIONAL FLOOR STAND MOUNTING



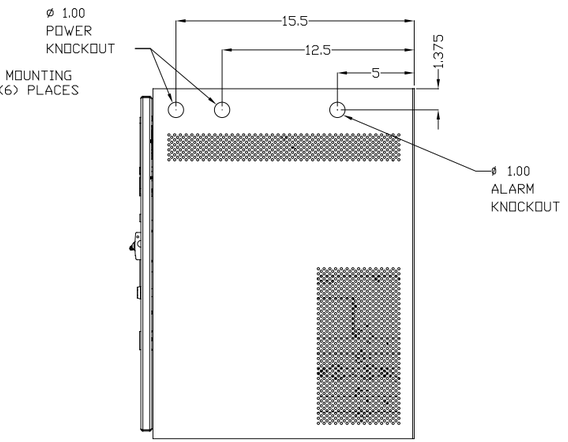
OPTIONAL FLOOR STAND



LEFT SIDE VIEW



FRONT VIEW



RIGHT SIDE VIEW

CB1 = AC INPUT BREAKER
CB2 = DC OUTPUT BREAKER
CB3 = OPTIONAL BATTERY BREAKER

NOTES:
1) ALLOW 6" MIN. OF FREE SPACE ON ALL VENTED SURFACES
2) DIMENSIONS IN INCHES

LICENSED INFORMATION

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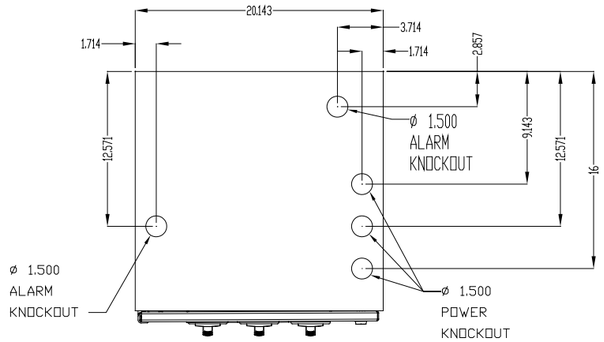
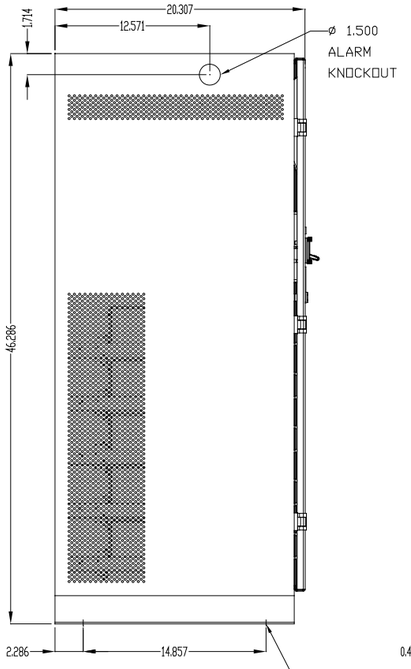
DWN NB	DATE 4/5/23	REFERENCE	
APPROVED	DATE	TITLE	20-40A OUTLINE
SIZE D	SCALE 1:4		
WHSE NO. AVAIL.	DWG NO.	80-137317	SH 1 OF 1 PROJECT NO.

APPENDIX E: 60A-100A OUTLINE

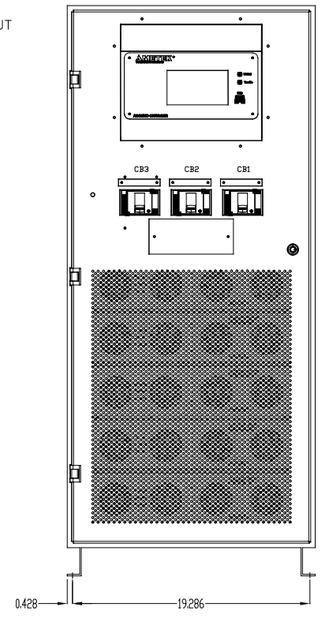
REVISIONS				
REV	DATE	REVISION RECORD	DWN	APP
A	07/21/23	INITIAL RELEASE.	NB	SW



TOP VIEW

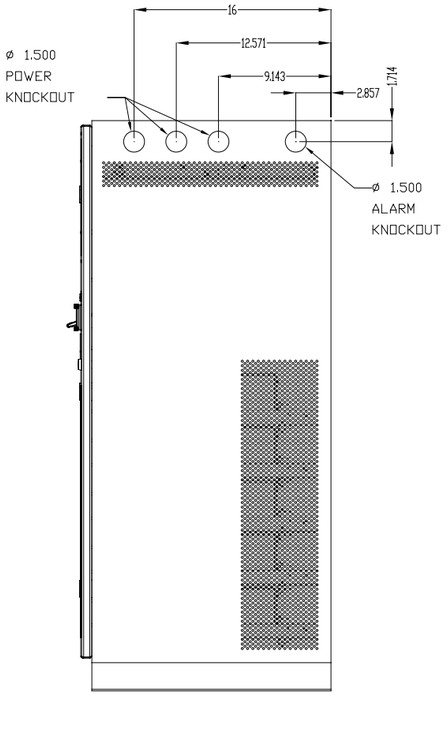


LEFT SIDE VIEW

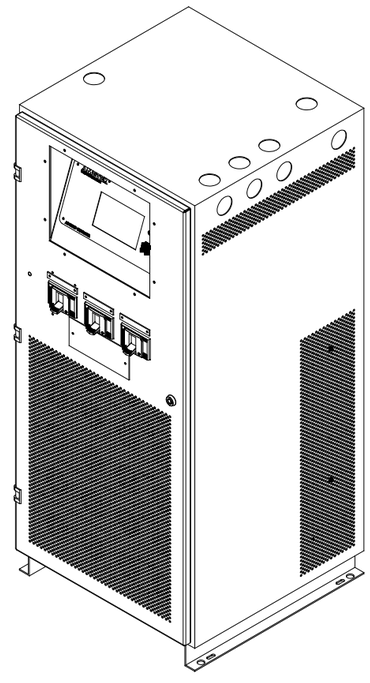


FRONT VIEW

CB1 = AC INPUT BREAKER
CB2 = DC OUTPUT BREAKER
CB3 = OPTIONAL BATTERY BREAKER



RIGHT SIDE VIEW



NOTES:
1) ALLOW 6" MIN. OF FREE SPACE ON ALL VENTED SURFACES
2) DIMENSIONS IN INCHES

LICENSED INFORMATION

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DWN: NB	DATE: 4/12/23	REFERENCE	
APPROVED	DATE	TITLE: 60-100A OUTLINE	
SIZE: D	SCALE: 1/7		
VDRE NO. AVAIL.	DWG. NO.: 80-137318	SH: 1 OF: 1	PROJECT NO.

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