LC SERIES OPERATION AND INSTALLATION MANUAL

EXELTECH

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SAFETY
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CAUTIONS AND WARNINGS

CAUTION: It is essential to read and understand all Warnings, Cautions, and Notes before any connections are made to the unit or system. If further assistance is needed call (800) 886-4683 and ask for Customer Service.

ATTENTION: Il est essentiel de lire et de comprendre tous les avertissements, précautions et notes avant connexions sont faites à l'unité ou du système. Si une assistance supplémentaire est nécessaire appelez (800)-886-4683 et demandez le service à la clientèle.

WARNING: The inverter is designed to operate from a battery. Performance cannot be guaranteed when a charger or power supply is used without a battery in the circuit. The Inverter might sustain damage with a battery in the circuit.

AVERTISSEMENT: Le variateur est conçu pour fonctionner à partir d'une batterie. Performance ne peut pas être garantie si un chargeur ou d'alimentation est utilisé sans une batterie dans le circuit. L'onduleur peut subir des dommages avec une batterie dans le circuit.

WARNING: Inverter chassis and neutral AC must be connected together with either of the battery connections and bonded to earth ground to comply with most code requirements.

ATTENTION: L'onduleur de châssis et neutre ca doit être connecté avec l'une des deux bornes de la batterie et ensuite connecté à la terre pour se conformer aux exigences du code.

WARNING: Inverter should be installed in Restricted Access Location.

ATTENTION: L'onduleur doit être installé dans un endroit à accès restreint.

WARNING: A means of disconnect shall be provided external to the inverter in the installation process.

AVERTISSEMENT: Un moyen de déconnexion doit être fournie externes à l'onduleur dans le processus d'installation.

CAUTION: Check batteries and battery cables for correct polarity and voltage. The polarity of the leads is critical to avoid damage to the unit or the system.

ATTENTION: Vérifiez les piles et les câbles de batterie pour la polarité et la tension. La polarité de la mène est essentiel pour éviter d'endommager l'appareil ou le système.

CAUTION: Observe all national and local electric codes during installation.

ATTENTION: Respectez tous les codes nationaux et locaux lors de l'installation.

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Introduction
1.0

Thank you for purchasing the finest sine-wave inverter in the power conversion industry. Exeltech's journey to excellence includes the first affordable sine wave inverter, first modular inverter system, first N+1 redundant inverter system, and the cleanest sine wave output in the industry. Exeltech strives to manufacture products of the highest possible quality and is dedicated to 100% customer satisfaction. Proudly built in the USA, Exeltech is committed to TL 9000 standards and beyond, adding people and procedures continually to further improve quality and customer service. We welcome you as a customer to the Exeltech family. Congratulations!

Exeltech's LC series inverter systems are equipped with 2kW power modules, this now provides our customers double the output power within similar space requirements as our MX series inverter systems. They are extremely low in Total Distortion; specified to 2%, and typically better than 1.5%. Total Harmonic Distortion is typically 0.8 to 0.9%. Remaining distortion is a result of residual switching noise, which amounts to a very clean 25 kHz sine wave superimposed on the fundamental output. No significant harmonics of 25 kHz exist. This spectral purity will exist over the inverter's entire operating envelope, including non-linear and reactive loads. As long as peak output current remains less than 200% of rated current for a period of 3 seconds, total harmonic distortion will remain within the 2% spec. Peak current capability of the inverter is key to understanding it's operational envelope. As long as the inverter is supplying less than this amount, it will function properly and operate virtually any load.

Many inverters are rated in volt-amperes (VA), as opposed to watts (W). This is an attempt to make an inverter or UPS (Uninterruptible Power Supply) appear larger than it really is. The only fair way to specify these products is in Watts, which is power the inverter can actually deliver. If Exeltech inverters were specified in VA, our 2000 Watt inverter could be rated at 2500 VA @ 0.8 PF, 2857 VA @ 0.7 PF, or an incredible 4000 VA @ 0.5 PF. It is confusing to specify a product in VA, because the power factor must also be specified.

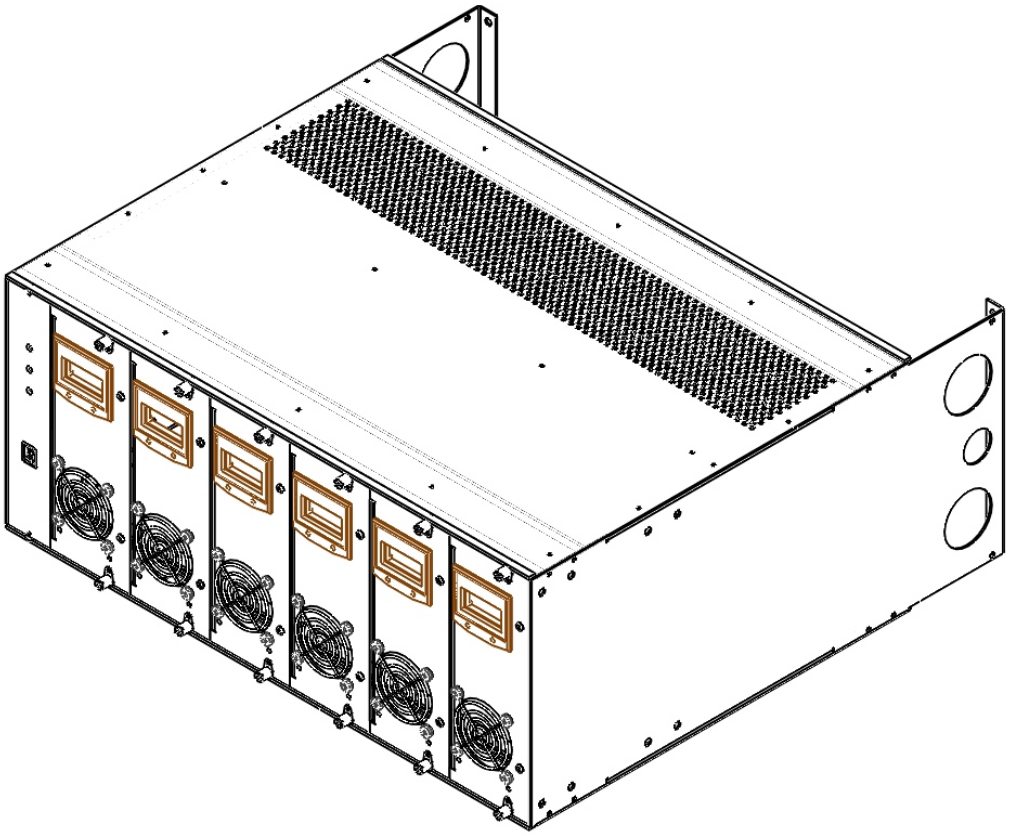
The inverter can maintain a spectrally pure output with any load due to a specially designed non-linear control loop in the primary DC to DC converter. This circuitry is one of three circuits which protect the inverter from any overload condition.

Adhere to this manual, and your inverter will provide years of trouble-free service.

1.1 System Overview

This document provides system application and specification information on Exeltech's LC Inverter System. The system is comprised of the following components:

· Power Module Cage Assembly (Single Phase Configuration)
· Power Module (2,000 Watts)
· Monitoring Module (Alarm Card or Monitor Card)



Description

The power module cage assembly, power modules, and monitoring module comprise of a DC to 120V, 277V, or 230V AC line to neutral, or 240V, 208V, and 480V AC line to line power inverter system. In a properly sized and configured system, the power modules can deliver N+1 redundancy. The LC inverter system is a modular design and allows each system to be tailored for specific needs. Systems can range in phase relation, output power, level of redundancy, and a variety of other options. This is done by selecting different combinations of modules in the system.

Each cage assembly of the inverter system can be configured from the factory as a single phase, bi-phase, or three phase with operational power for 10KW N+1 redundancy up to a maximum 12KW of output power. The Inverter produces a true sine wave output with minimal distortion. Both line and load distortion are also minimal. (See Section 6.0)

1.2 Modules Overview

The LC Series inverters are a modular design and allows each system to be tailored for specific needs. Systems can range in output power, input voltage, redundancy, and a variety of other options. This is done by selecting different combinations of modules to create a LC inverter system.

1.2.1 Power Module Cage Assembly

The cage assembly can be designed to accept DC input of either positive or negative. It will house from 1 to 6 inverter power modules resulting in a system output of up to 12,000 Watts. It will also house an optional monitoring module (recommended). The left most power module is the system's master module. The next power module to the right is the system's redundant (backup) master module. For redundant operation the system MUST include a monitoring module. The monitoring module is required to initiate a transfer of control to the backup master module.

1.2.2 Power Modules

The power module is the backbone of the LC inverter system and is the majority of the modules in all systems. Each module is capable of producing 2000 Watts of continuous output power. Each module can perform all of the functions to operate as a system's master module. The module will only perform the system master function when placed in the power module cage assembly location identified in the previous section. Each power module is equipped with an LCD display that can show power module status information as well as system status information.

1.2.3 Monitoring Module

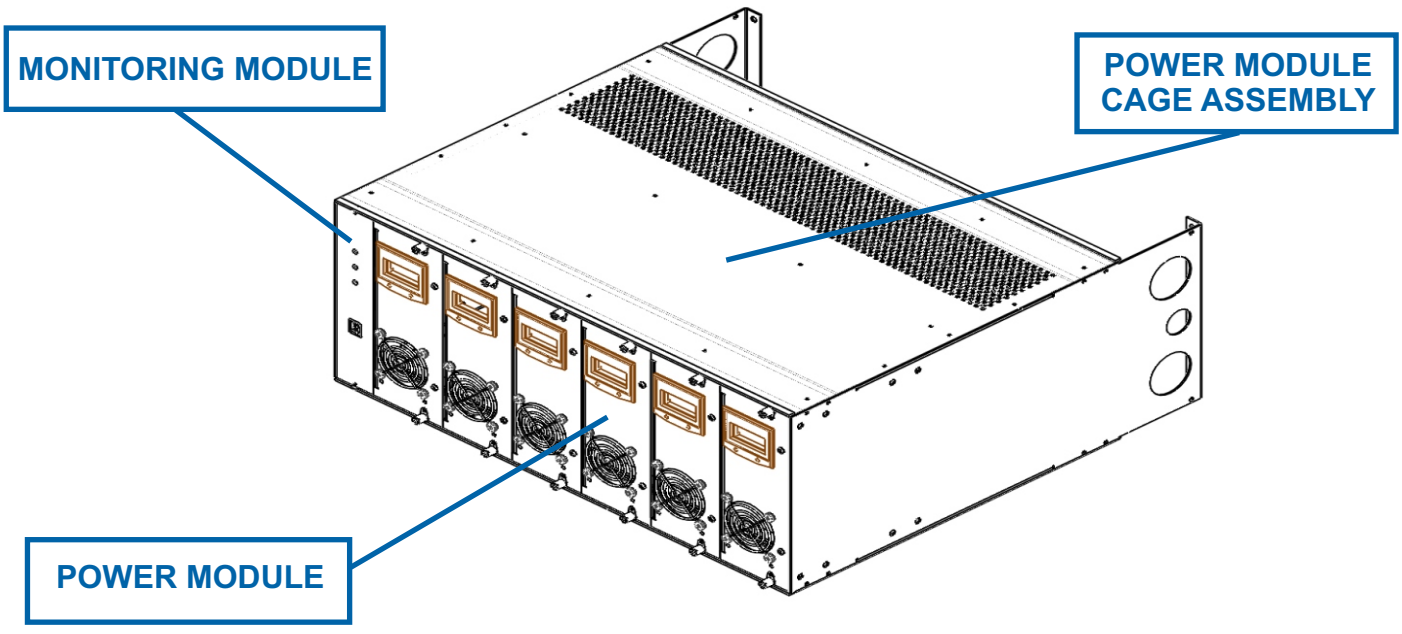
The monitoring module provides a visual representation of different alarms created by the system. Each monitoring module has an ON/OFF switch for the system. If a monitoring module is not used the remote switch must be used to turn the system on and off. A monitoring module is required to detect a master power module failure and switch to the secondary master power module if it is available. There are a few different options available to monitor the LC inverter system.

1. **Alarm Card:**

With the alarm card, system monitoring is basic and is seen manually through power module LCD displays. Pre set alarms (Alarm1/Minor & Alarm 2/Major) are provided via dry form C relay contacts on the inverter systems backplane. Use of the other connections on the back plane may result in damage to the module or system.

2. **Monitor Card:**

With the monitor card, system data is more detailed and can be seen either manually through power module LCD displays or through Ethernet connection which allows for remote monitoring of system data. Each phase's information can be reported via the Ethernet connection. The data can be sent to a PC to be viewed and logged or reported via SNMPv2 or an optional secure SNMPv3. Programmable alarms (Alarm1/Minor & Alarm 2/Major) are provided via dry form C relay contacts on the inverter systems backplane. Product Status is used to program alarms. Use of the other connections on the back plane may result in damage to the module or system.



Standard Features
2.0

2.1 System Configuration

The system can be configured from 2,000 to 12,000 Watts (1 to 6 power modules), with or without an optional monitoring module (highly recommended). With the monitoring module and a sufficient number of power modules, the system provides N+1 redundancy.

Remote On/Off Switch:
A set of terminals are provided to turn the inverter system on and off from a remote location(See Section 6.3.1 for location). The connection for the remote switch is on a remote alarm connector located under the rear access cover. Connect battery negative 'Bat(-)' to the 'Sw1' terminal to turn the inverter on. The maximum current in this connection is under 0.1 ADC, and has a maximum open circuit voltage of either 24, 48, or 108 VDC. An appropriately rated switch should be used. The remote switch and front panel switch are "OR'd" together so if either switch is on, the inverter system will turn on, and both must be off for shut down. When using the remote switch, insure the front panel switch is in the "OFF" position to control the inverter system with the remote switch.

Over Voltage Protection:
The inverter system will shutdown immediately if the DC voltage exceeds the set limits. When the voltage returns to the normal range, the inverter system will immediately restart. There is a small amount of hysteresis built into the over voltage turn off set point to avoid the possibility of turning off and on rapidly. An over voltage greater than 10% above the limit may cause damage.

Under Voltage Protection:
The inverter system will shutdown when the DC voltage goes below the set limit. The inverter system monitoring module will set an alarm when the inverter system reaches a voltage 5% above the low voltage set limit. When the voltage rises to approximately 15% above the low voltage set limit, the inverter system will turn back on and the alarm condition will clear.

2.2 Power Modules

DC Voltage Inputs:
24V, 48V, and 108V DC inputs are available. It is recommended to have a maximum ripple voltage of less than 5% with the peaks not going above Vmax and below Vmin.

AC Voltage Outputs:
120V, 277V, 230V AC outputs are available (+/- 6%) at 50Hz, 60Hz, 400Hz (+/- 0.1%).

Load Sharing:
By control system design, the power modules will automatically load share current with other power modules. The load sharing occurs immediately when a module is either added or removed from a power module cage assembly. If a module fails for any reason, the remaining modules will immediately redistribute the load among themselves.

Cooling:
A microprocessor controlled variable speed fan is located on the face plate of the power module. The fan will operate when the module senses an appropriate combination of temperature and power. Fan speed is monitored, and reported to the inverter system monitoring module. Fan speed can be displayed on the power module's LCD display.

Over Temperature Protection:
Each power module will go into thermal shutdown when its internal temperature exceeds the maximum set point. Approximately 5C prior to thermal shutdown, a warning alarm will be sent to the inverter system monitoring module, and will also be displayed on the power module's LCD display. The power module will provide its full rated output up to the temperature listed in the specification sheet. Ambient temperatures in excess of the maximum specification will likely result in thermal shutdown unless the load is reduced appropriately (see detailed specifications for derating). When the power module shuts down, the alarm condition will persist and the cooling fans will continue to run. The power module will automatically restart when it has sufficiently cooled.

Overload/Short Circuit Protection:
If the load attempts to draw current in excess of this value, the output waveform will be “clipped” so that this limit is never exceeded.

The power module has a continuous output of 2000 Watts. In addition, the power module is also able to provide a 3 second surge of up to 4000 Watts (depending on the battery voltage and internal temperature). This surge current is available to supply the inrush current demanded by electronic or motor loads. If the surge persists for longer than 3 seconds, the waveform will be “clipped” in an attempt to reduce the output to under 2000 Watts. If “clipping” the waveform is ineffective in reducing the output below 2000 Watts (as would be the situation for an overload/short circuit condition), the power module will shut down after a period of about 7 seconds. Once shut down, it requires cycling the inverter system's ON/OFF switch to reset from this condition. The cause of the overload/short circuit condition must be removed prior to cycling the ON/OFF switch, otherwise, the inverter system will shut down again after the 7 second delay. There is a 30 second delay between surges and the inverter will attempt 3 times then shut down and require a hard restart from the ON/OFF switch on the front of the inverter or on the remote switch.

2.3 Monitoring Module

Alarm Card:

Alarm LEDs:
The alarm card will monitor and display different alarms from the system through the LED’s on the front panel.

On/Off Switch:
The on/off switch is located on the front plate of the alarm card. It is used to turn the inverter system on and off.

Relay Contacts for Alarms:
Dry relay contacts are available on the backplane to be used with pre set alarms (Alarm1/Minor & Alarm 2/Major).

*Alarm Cards with thumb screws are Hot Swappable and can be replaced without interruptions to the system.

Monitor Card:

Alarm LEDs:
The monitor card will monitor and display different alarms from the system through the LED’s on the front panel.

On/Off Switch:
The on/off switch is located on the front plate of the monitor card. It is used to turn the inverter system on and off.

Relay Contacts for Alarms:
Dry relay contacts are available on the backplane to be used with programmable alarms (Alarm1/Minor & Alarm 2/Major).

Ethernet Monitoring:
An Ethernet port is available on the front panel to connect to a network for remote monitoring of the system. This includes the industry standard Modbus over Ethernet or SNMPv2 remote monitoring or an optional secure SNMPv3 connection.

*Monitor Cards with thumb screws are Hot Swappable and can be replaced without interruptions to the system.

Installation 3.0

3.1 Location

The inverter is a highly sophisticated piece of electronic equipment. As such, its location warrants some special consideration. The inverter system should be mounted in a location where only non-conductive pollution may occur such as an office or laboratory environment. For full power capability, the temperature must be within the Operating Environment Specifications. The unit may be operated at elevated temperatures if the loading is reduced. See Physical Specifications for Operating Environment Specifications.

The inverter must be sheltered from the weather. Keep it away from condensing water.

Air is drawn into the system through the front panel mounted fans, and exits through vent holes in the top and rear. Adequate clearance is required in the front, rear, and top for both cooling and to provide access space for maintenance. See Physical Specifications, Mounting Clearance Requirements, for details.

Choosing a mounting location is critical to the performance and life span of the inverter. Heat and moisture are the two worst enemies of any electronic device.

When choosing a mounting location, consider the following requirements:
1. The inverter must be sheltered from the elements. Select a clean, dry location.
2. The inverter requires adequate ventilation for cooling. With proper cooling the inverter will operate efficiently and meet its published ratings. Do not obstruct air circulation. Air is drawn into the inverter through the front panel mounted fans, and exits through vent holes in the top and rear of the inverter.
3. The inverter should be mounted as close to the battery as possible. Shorter lengths of wire have less resistance, which translates to increased efficiencies (See Section 3.2.1 Wiring Charts).

3.2 Wiring

DC Input Connections:
Positive (+) and Negative (-) input terminals are 5/16" studs with brass hardware, spaced 1 inch apart. They are provided under the Rear Cover. Choose appropriate gauge wire for your specific model and distance from the battery.
(Recommended Torque = 70 in-lbs.)

AC Output Connections:
Output terminals are UL listed connection lugs (Ilsco CO5SW 1/0-14AWG). They are provided under the Rear Cover. Choose appropriate gauge wire for your specific model.
(Recommended Torque = 45 in-lbs.)

How to Size a Breaker for the Utility AC Input or Load AC Output:
1. Take the maximum capacity of the inverter system in Watts. Divide that number by rated system output voltage (VAC).

Example: 11,000W/117VAC = 94A

2. Choose a breaker that is widely available in a value that is close to but higher than the result. In the above example that would typically be either a 100A or 125A breaker.

NOTE: Never use a breaker that exceeds the rating of the wires in the feed. (E.g. Do not use a 100A breaker on a wire that is only rated for 50A)

3.2.1 Wiring Charts

Wiring between inverter and battery bank should be as short as possible and of a gauge as large or larger than that called for in the chart.

DC INPUT WIRING:

WIRING SIZE FOR 75 deg C RATED CONDUCTOR

Input Voltage	Recommended Circuit Protection	Feet (Round Trip)	Conductors	Wire Size	Voltage Drop	Inverter Voltage	% Voltage Drop
24	700 Amps	30	4	300MCM	.4414	23.56	-1.84%
24	700 Amps	40	4	400MCM	.4414	23.56	-1.84%
24	700 Amps	50	4	500MCM	.4414	23.56	-1.84%
24	700 Amps	75	4	750MCM	.4414	23.56	-1.84%
48	350 Amps	30	1	300MCM	.8828	47.12	-1.84%
48	350 Amps	40	1	400MCM	.8828	47.12	-1.84%
48	350 Amps	50	1	500MCM	.8828	47.12	-1.84%
48	350 Amps	75	1	750MCM	.8828	47.12	-1.84%
108	160 Amps	30	1	2AWG	1.824	106.18	-1.69%
108	160 Amps	40	1	1AWG	1.928	106.07	-1.79%
108	160 Amps	50	1	0AWG	1.9037	106.10	-1.76%
108	160 Amps	75	1	3/0AWG	1.801	106.20	-1.67%

WIRING SIZE FOR 90 deg C RATED CONDUCTOR

Input Voltage	Recommended Circuit Protection	Feet (Round Trip)	Conductors	Wire Size	Voltage Drop	Inverter Voltage	% Voltage Drop
24	700 Amps	30	4	300MCM	.4414	23.56	-1.84%
24	700 Amps	40	4	400MCM	.4414	23.56	-1.84%
24	700 Amps	50	4	500MCM	.4414	23.56	-1.84%
24	700 Amps	75	4	750MCM	.4414	23.56	-1.84%
48	350 Amps	30	1	300MCM	.8828	47.12	-1.84%
48	350 Amps	40	1	400MCM	.8828	47.12	-1.84%
48	350 Amps	50	1	500MCM	.8828	47.12	-1.84%
48	350 Amps	75	1	750MCM	.8828	47.12	-1.84%
108	160 Amps	30	1	2AWG	1.824	106.18	-1.69%
108	160 Amps	40	1	1AWG	1.928	106.07	-1.79%
108	160 Amps	50	1	0AWG	1.9037	106.10	-1.76%
108	160 Amps	75	1	3/0AWG	1.801	106.20	-1.67%

3.2.1 Wiring Charts Continued

1) Using the standard scientific value of 10.371 cmillohm/foot as the resistivity of copper at 20C, and the linearity in the temperature ranges 20C-90C the formula R2/R1=(234.5+t2)/(234.5+t1) will accurately calculate the copper wire resistance changes at 75C and 90C.

2) For these two temperature points, cable sizing was determined to minimize voltage drop to less than 2% of rated voltage. This is only a guide and should be used as a tool to help determine the system dc voltages between the batteries and inverter terminals.

3)Wire sizes are based on a maximum of 2% voltage drop at the rated temperature of the cabling. Cabling decisions should be based entirely on local electrical code requirements which in certain cases supersede the NEC guidelines

AC OUTPUT WIRING:
Wiring should be of a gauge as large or larger than that called for in the chart.

WIRING SIZE FOR 75 OR 90 deg C RATED CONDUCTOR			
Output Voltage	Operating Ambient Temperature	Recommended Circuit Protection	Wire Size
120V	40 deg C	100 Amps	3 AWG
277V	40 deg C	43.3 Amps	8 AWG

4) Wire sizes based on recommendations in the NEC, Table 310.16 for Insulated Conductors in a Raceway, Cable, or Earth, adjusted for an Operating Ambient Temperature of 40 deg. C. For operating in other ambients, apply the derating factors listed in the NEC. For operation in countries where the NEC is not recognized, follow applicable codes.

GROUNDING:
The input and output of the inverter are isolated with a minimum of 1500 Vac. This isolation guarantees hazardous voltage from the output will not reach the input. The inverter is designed to have both the input and output grounded. The inverter is compatible with negative or positive ground battery systems. The treatment of the Battery Return (BR) input terminal can be configured as either Isolated DC return (DC-I) or Common DC return (DC-C).

3.3 Start Up Procedure (Single Phase System)

NOTE: Refer to Section 6.3 for system connections.

STEP 1: Make sure the inverter system is mounted securely.

STEP 2: Remove the rear access cover of the inverter system.

STEP 3: Do not connect the AC load until all steps are complete.

STEP 4: Verify that the ON/OFF switch on the front panel of the monitoring module is in the “OFF” position.

STEP 5: Verify the battery cable polarity. Reversed polarity will lead to power module - damage.

STEP 6: Verify the battery voltage is within the specifications of the inverter.

STEP 7: Verify DC breaker or fuse is open and leads are not energized.

STEP 8: Connect the positive cable from the battery bank to the positive terminal of the inverter's backplane.

STEP 9: Connect negative cable from battery bank to negative terminal of the inverter's backplane.

NOTE: If the battery system is being utilized by other equipment it may be necessary to pre-charge the inverter's DC buss. Pre-charge the input capacitors of the inverter by connecting one lead of a 50 ohm, 50 Watt resistor to the negative terminal of the battery bank and the other lead to the negative terminal of the inverter. The time to pre-charge the input capacitors will be about 5 seconds.

Alternatively a Pre-charge panel is available: Pre-charge Circuit Panel PN: 800-DCPRE-400

STEP 10: Close the DC breaker or insert the fuse to energize cables and the inverter's DC bus.

STEP 11: Turn the inverter “ON”. The switch is located on the monitoring module.

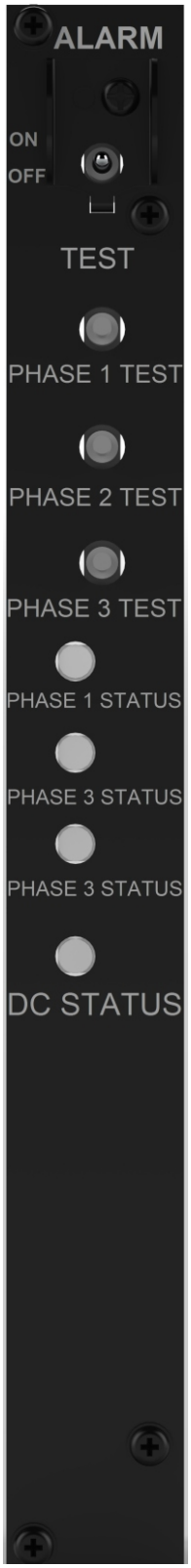
NOTE: If using the remote switch, the switch on the monitoring module must be in the “OFF” position.

STEP 12: Measure the output voltage at the LOAD terminals on the backplane. The reading should be the nominal AC voltage +/- 1%.

STEP 13: Check the total power requirement of all equipment to be powered by the inverter system. Make sure that it is less than the rated output power if the inverter.

STEP 14: Close the LOAD breakers to energize the equipment.

Operation
4.0



4.1 Alarm Card

The alarm card can be added to 19” and 23” power module cage assemblies.

The alarm card is powered by the inverter or utility.

Each alarm card is specific to one input voltage.

AC & DC alarms only (Non-Programmable)
(See Section 6.3.1 for Remote Alarm Connections)

No data reporting through Ethernet.

Data can be monitored via power module LCD display.
(See Section 4.3.3 for LCD Display Details)

Faceplate Displays:

INVERTER SWITCH:
Up is “ON” and Down is “OFF”

PHASE TEST BUTTONS:
Test the following functions for each phase:
- -AC ALARMS
- -AC LED STATUS
- -MASTER TOGGLE

PHASE STATUS LED:
Will be green when AC power is in specs

See Section 4.1.1 for LED color indicators

DC STATUS LED:
Will be green when the DC power is in specs

See Section 4.1.1 for LED color indicators

4.1.1 Alarm Specs (Alarm Card)

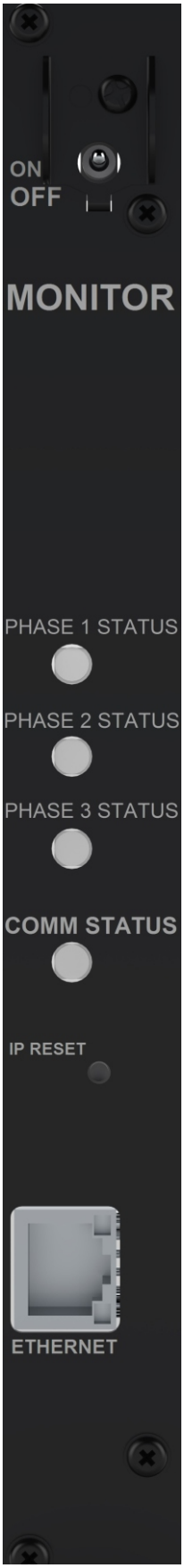
AC Alarm Levels:

AC Alarms	Phase Status LED	120VAC	277VAC
AC Fail	RED	Fail	Fail
AC Under Voltage Warning	ORANGE	<108VAC	<247VAC
AC Normal Range	GREEN	108-140VAC (Nominal)	261-313VAC (Nominal)
AC Over Voltage Warning	ORANGE	>140VAC	>324VAC

DC Alarm Levels:

DC Alarms	DC Status LED	24VDC	48VDC	108VDC
DC Fail	RED	<21VDC	<42VDC	<96VDC
DC Under Voltage Warning	ORANGE	21< **warning** <22VDC	42< **warning** <44VDC	96< **warning** <100VDC
DC Normal Range	GREEN	22< **normal** <29VDC	44< **normal** <59VDC	100< **normal** <133VDC
DC Over Voltage Warning	ORANGE	29< **warning** <30VDC	59< **warning** <60VDC	133< **warning** <135VDC
DC Over Voltage	RED	>30VDC	>60VDC	>135VDC

4.2 Monitor Card



It is now possible to monitor all of your remote power stations from a single location. You can have up to the minute verification that all of your remote power systems are 100% operational. For example, the remote power system can report that it is currently running at 90% of its rated capacity.

Operation
Normal operation of the monitor card is similar to the alarm card previously described in this document. The biggest difference is the remote monitoring of the system data.

Remote Monitoring
Ethernet connection allows for remote monitoring of system data. Each phase's information can be reported via an Ethernet connection. The data can be sent to a PC to be viewed and logged or reported via SNMPv2 or an optional secure SNMPv3. Programmable Alarm 1/Minor and Alarm 2/Major are provided via dry form C relay contacts. Use of the other alarm ports on the back plane may result in damage to the module or system.

Differences from Alarm Card:

-Remote data monitoring

-Not limited to a specific input voltage

-Allows for programmable alarms

-Built in microprocessor that allows for a wider range of system data. Data can be monitored both remotely and via power module LCD display.

(See Section 4.3.3 for LCD Display Details)

(See Section 6.3.1 for Remote Alarm Connections)

Faceplate Displays:

INVERTER SWITCH:
Up is “ON” and down is “OFF”

PHASE STATUS LED:
Will be green when AC power is in specs

See Section 4.2.1 for color indicators

COMM STATUS:
Will be green when monitor card is communicating to another device.

IP RESET:
When pushed it will Reboot the communication port

Ethernet Port:
Allows connection to the inverter system via Ethernet cable

4.2.1 Alarm Specs (Monitor Card)

AC Alarm Levels:

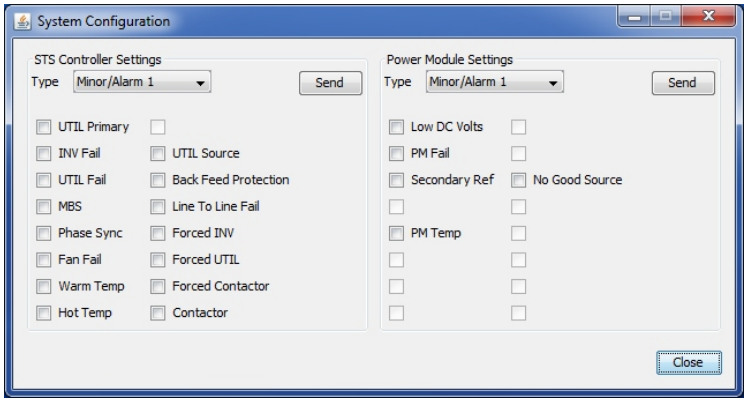
AC Alarms	Phase Status LED	120VAC	277VAC
AC Fail	RED	Fail	Fail
AC Under Voltage Warning	ORANGE	<108VAC	<247VAC
AC Normal Range	GREEN	108-140VAC (Nominal)	261-313VAC (Nominal)
AC Over Voltage Warning	ORANGE	>140VAC	>324VAC

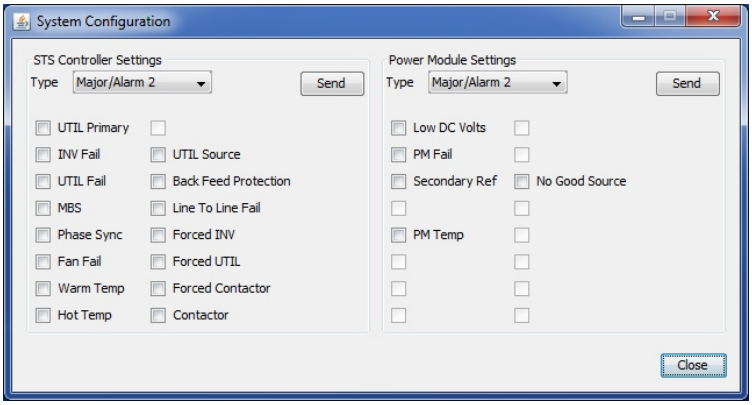
Note: No DC alarm LED on monitor card faceplate. DC alarms found in Product Status.

4.2.2 Programming Alarms (Monitor Card)

LC systems with ship with the following factory default alarm settings: Alarm 1/Minor is set to Low DC Volts, PM Fail, Secondary Ref., and PM Temp, Alarm 2/Major is set to No Good Source. To program alarms open Product Status and click the “Tools” tab in the top left of the screen. Next select “System Configuration” this will bring up the screen shown below. Within the System Configuration screen you are able to select the “Type” of alarm which will be either Alarm 1/Minor or Alarm 2/Major. After the Type is selected, click on the boxes next to the alarm options to set the specific alarms (Options will vary by system). Once you have selected the alarms click the “Send” button to complete alarm setup for that specific section of alarms (STS Controller or Power Module Settings). To confirm alarms have set please close and re-open the system configuration screen to make sure alarm selections remain checked.

Note: Programmable alarms must be programmed individually on each Monitor Card in the system.





Programmable Alarm Descriptions:

UTIL Primary – Activates when the primary is NOT set to INV

INV Fail – Activates if the INV source fails

UTIL Fail – Activates when the UTIL source fails (also activates while in maintenance bypass)

MBS – Activates when the MBS is in bypass mode

Phase Sync – Activates when the UTIL source and the INV source are not phase locked (Also activates when UTIL is off)

Fan Fail – Activates if a fan failure is detected on the STS Powerswitch

Warm Temp – Activates 5C before going into thermal over temperature protection

Hot Temp – Activates if the STS System is in thermal over temperature protection

UTIL Source – Activates when the load is NOT being powered from the INV source

Back Feed Protection – Activates when the STS Controller is in backfeed prevention mode

Line to Line Fail - Activates when a polyphase loses one or more lines

Forced INV – Activates when an inverter SCR short has been detected

Forced UTIL – Activates when a utility SCR short has been detected

Forced Contactor – Activates if the STS Controller has forced the backfeed relay open

Contactor – Activates when the backfeed relay is closed

PM Temp – Activates if a Power Module is over temperature

PM Fail – Activates if a Power Module fails

Secondary Ref – Activates if any phase is running from the secondary master module

Low DC Volts – Activates if the control card sends a signal because of low DCV

No Good Source - Activates if both sources are bad or failed

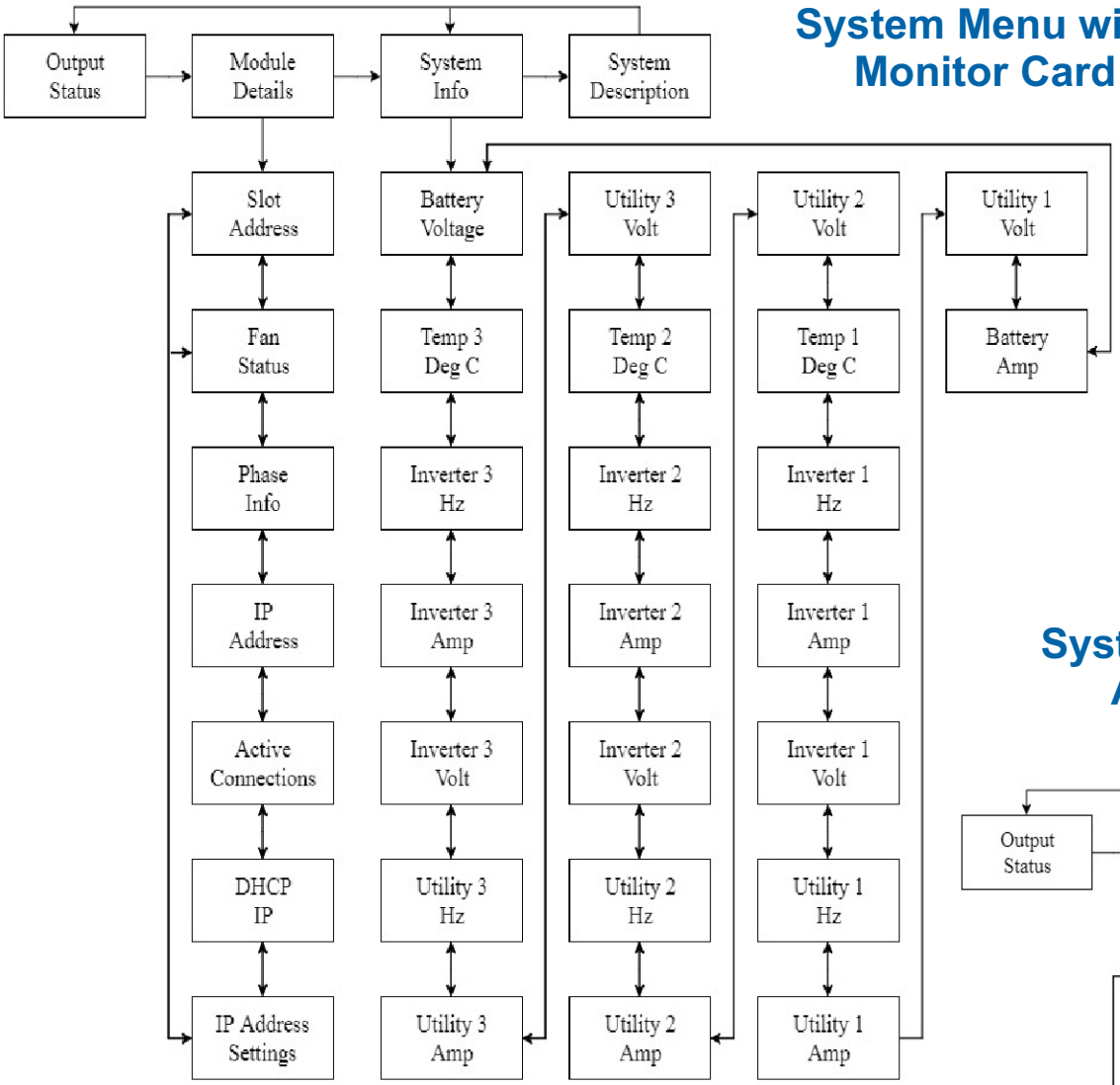
4.3 Power Module Display

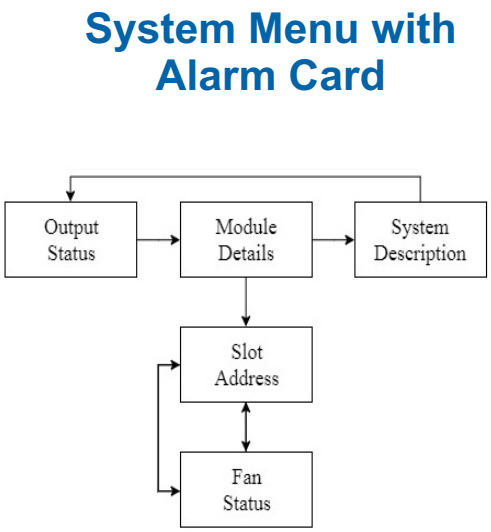
The LCD display provides information about the individual power module's performance. The power module's loading % and alarm conditions are shown with other items of interest. The menu button, and select button can be used to access additional power module and system information through the menu system.

4.3.1 LCD Buttons

The select button and menu button are located below the LCD display. The left button is select, and the right button is menu. When the menu button is pressed and released, the display will scroll through the available menus. When the select button is pressed and released, the display will enter into a sub-menu of the menu being displayed. Once in a sub-menu, the select and menu buttons are used to scroll forwards and backwards through the information being displayed. When the menu button is pressed and held, the display will exit the current sub-menu and return to the default menu screen.

Note: The 2 configurations of the system menu are shown below. The menu will be specific to the monitor module used in the system.





4.3.2 LCD Menus

The LCD menus are structured as a menu tree for ease of navigation. Upon start up, the menu will display the 'Output Status' as the default menu. As an Example: Pressing the Menu Button will move the LCD display from 'Output Status' to the 'Module Details'. Pressing the Select Button while on 'Module Details' will move the LCD display into the 'Module Details' sub-menu which starts with 'Slot Address'. To exit the sub-menu, press and hold the Menu Button.

Menu Descriptions:

Output Status: This screen displays the utilization of the cage as a percentage and a number of errors. Below are explanations of each possible Output Status.

"Output" message show the power utilization of the cage as a percentage, or if the system is Idle or Disabled.

"Module SPI ERR!" is an error that signifies that serial communication between the display and power module has been severed.

"Module OvrLoad" is an error that signifies the power module has gone into an Over Load condition and shut off output due to high current for the purpose of self preservation.

"Module LowBat" is an error that signifies the DC Voltage input to the cage is below the minimum operational threshold.

"Module OvrTemp" is an error that signifies the power module has over heated.

"Module FanFail" is an error that signifies the fan has failed or been blocked.

Module Details: On this screen, press the "Select" button to enter the Module Details sub-menu.

Slot Address: This screen displays which cage slot the power module is in with the left most module being slot 1.

Fan Status: This screen displays the speed of the fan as "Off", "Low", or "High."

Phase Info: This screen displays the phase orientation of the power module relative to the cage.

IP Address: This screen displays the IP address of the cage.

Active Connections: This screen displays if there is an active connection to the cage IP Address.

DHCP IP/Static IP: This screen displays if the cage has been set to use a static IP address or will be assigned one by DHCP.

System Info: On this screen, press the "Select" button to enter the System Info sub-menu.

Battery Voltage: This screen displays the DC Voltage input to the cage.

Temp # Deg C: This screen displays the temperature of the power module in degrees Celsius.

Inverter # Amp: This screen displays the Current of the inverter phase in Amps.

Inverter # Volt: This screen displays the AC Voltage of the inverter phase.

Inverter # Hz: This screen displays the AC Frequency of the inverter phase in Hertz.

Utility # Hz: This screen displays the AC Frequency of the utility power in Hertz.

Utility # Amp: This screen displays the Current of the utility power in Amps.

Utility # Volt: This screen displays the Voltage of the utility power.

System Description: This screen displays the Watts of the power module. The second line displays the firmware version number of the display and power module.

4.4 Product Status (Monitor Card Only)

The function of Product Status is to connect to a monitor card using Modbus over ethernet and display system information.

It is recommended to connect to a monitor card to receive true RMS current readings and the most accurate system data.

All the information displayed in Product Status is available using Modbus. The information in Modbus requires a spreadsheet of Modbus tables to understand the meaning of the information at a given address(See Section 4.4.4). This Modbus table spreadsheet is available for the monitor card at request. Product Status provides a user friendly view of the information without the need for a spreadsheet. In Product Status all of the displayed information is labeled. Product Status is the “In House” software we use for reading Modbus quickly, and it is offered for free with our products. It is encouraged that the end user develop or integrate our Modbus tables into their existing software.

This is a picture of the Product Status lay out of a three- phase system . Below a detailed description of each field will follow:

Note: Default low and high limit numbers are not specific to your system. Changing limits will not set any alarms for the system it will only change the color of the data box (Green= data within limits, Yellow=N/A, Red=data out of set limits).

4.4.1 DESCRIPTION OF LABELS

Overall System

00:00:00:00:00:00 Top Left Tab: Displays the MAC Address of the device that Product Status is connected to.

Alarm: Displays if any of the chosen alarms are currently active.

Prim: Displays if the Primary Source is active.[1]

Src: Displays if the Secondary Source is active.[1]

AB Bus: Displays if one of the two redundant battery banks are too low.[2]

Minor/Alarm 1: Displays if any Modbus alarm is currently triggered based on Alarm 1 configuration .

Major/Alarm 2: Displays if any Modbus alarm is currently triggered based on Alarm 2 configuration.

Maint BP: Displays the status of the Maintenance Bypass Switch if one is installed.[1]

Modbus Update: The update number increases every time Product Status receives new data from Modbus.

Readings General

Data Column Box: This output displays the value associated with the label to the left of it. The boxes background color indicates further information about the value.

Yellow: Not/Applicable means no data is available.
Red: The value has exceeded the High or Low Limit.
Green: The value is within the set data range.

Low Limit: This box allows the user to input a lower limit on the expected value of the data field.

High Limit: This box allows the user to input an upper limit on the expected value of the data field.

Battery Voltage (V dc): This displays the voltage of the DC input to the inverter.

Battery Current (I dc): This displays the current of the DC input to the inverter.

Line 1: The information inside the Line 1 section is related to the Phase 1 power modules. In single phase mode, this is the only section that will be displayed

Line 2: The information inside the Line 2 section is related to the Phase 2 power modules.

Line 3: The information inside the Line 3 section is related to the Phase 3 power modules.

Line to Line: Displays the voltage difference between two AC lines.

Inverter Voltage (V ac): Displays the AC voltage of the Phase 1 inverter output. (Displays true RMS readings when connected to the Monitor Card).

Inverter Current (I ac): Displays the AC current of the Phase 1 inverter output. (Displays true RMS readings when connected to the Monitor Card).

Inverter Frequency (Hz): Displays the AC frequency of the Phase 1 inverter output. (Displays true RMS readings when connected to the Monitor Card).

Utility Voltage (V ac): Displays the AC voltage of the Utility Source.

Utility Current (I ac): Displays the AC current of the Utility Source.

Utility Frequency (Hz): Displays the AC frequency of the Utility Source.

Output (V ac): Displays the AC voltage output of the system

Output VA (V ac * I ac): This displays the output power in Watts.

Power Switch Temp (C): This displays the temperature of the STS Powerswitch in degrees Celsius if one is installed.[1]

Minor Alarms

Power Module: This alarm indicates that there is a problem with the power module.

Power Module Temp: This alarm indicates that the power module is running at too high of a temperature.

Inverter Reference: This alarm indicates that the system switched from the primary to the secondary master module.

Phase 1 Sync: This alarm indicates that Phase 1 is out of sync with the Utility input signal.[1]

Low Voltage: This alarm indicates that the DC input voltage to the inverter is too low.

Power Switch Temp: This alarm indicates that the STS Powerswitch module is running at too high of a temperature.

Controls

Data State: This displays the state of the connection of Product Status with the monitor card.

-Inconsistent: Indicates that the connection is bad.

-Live: Indicates that the connection is good.

Mode: This button changes how Product Status is getting information from Modbus.

-The Poll setting will read in new information once every few seconds.

-The Receive is supported with Legacy MX products only.

Run: This button will attempt to connect Product Status to the monitor card with the MAC Address matching the tab in the upper left hand corner of the product status window. To change the MAC Address, see the" QUICK START" section of this manual. If Product Status successfully connects to the monitor card, the Data State box will display "Live".

Stop: This button will disconnect Product Status from the monitor card.

[1] If equipped with STS Transfer Switch

[2] If equipped with A/B Buss option

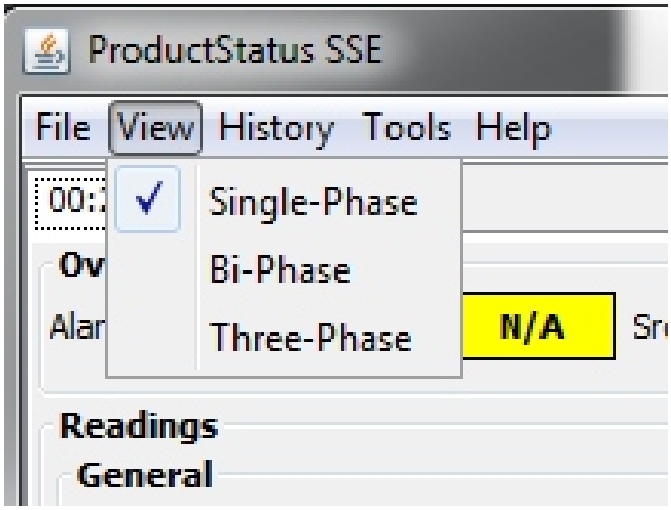
4.4.2 Quick Start

*To begin the Quick Start process you will need an Ethernet Cord, Router and Computer.

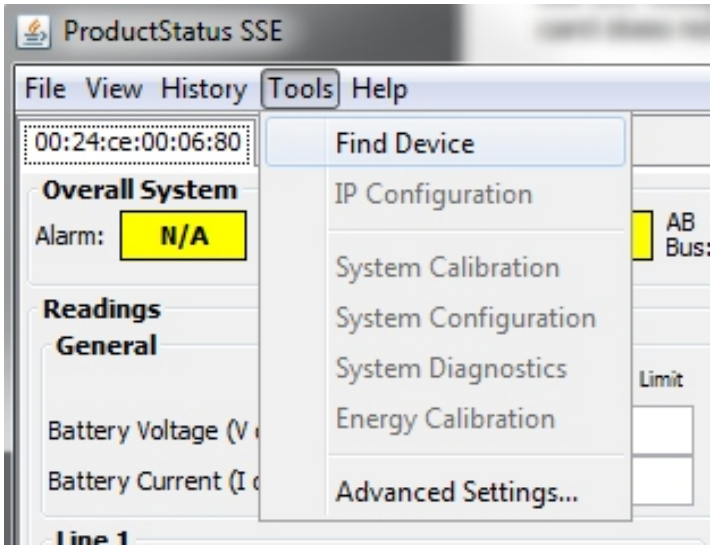
Step 1. Download the appropriate copy of the Product Status software from the Exeltech website www.exeltech.com.

Step 2. Start the Product Status Software.

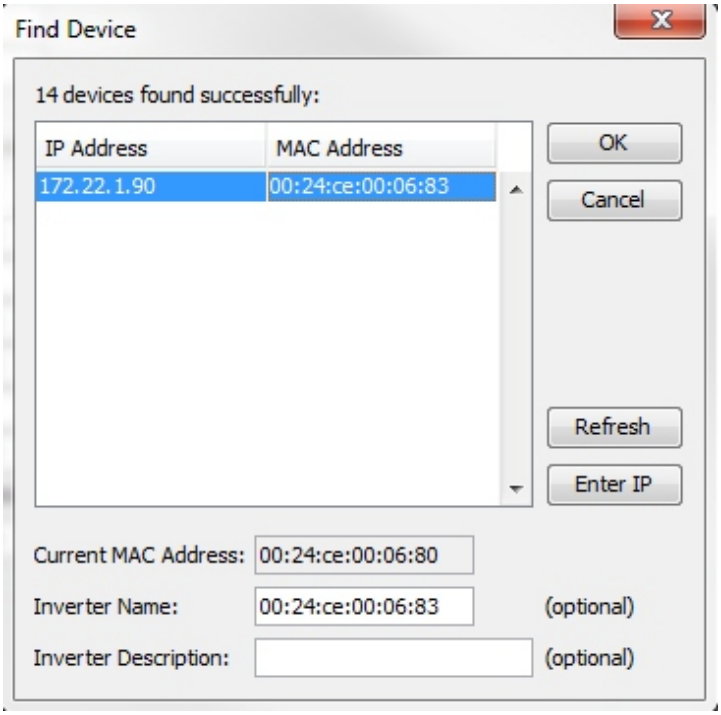
Step 3. Left click on “View” at the top and select the correct phase information for your system.

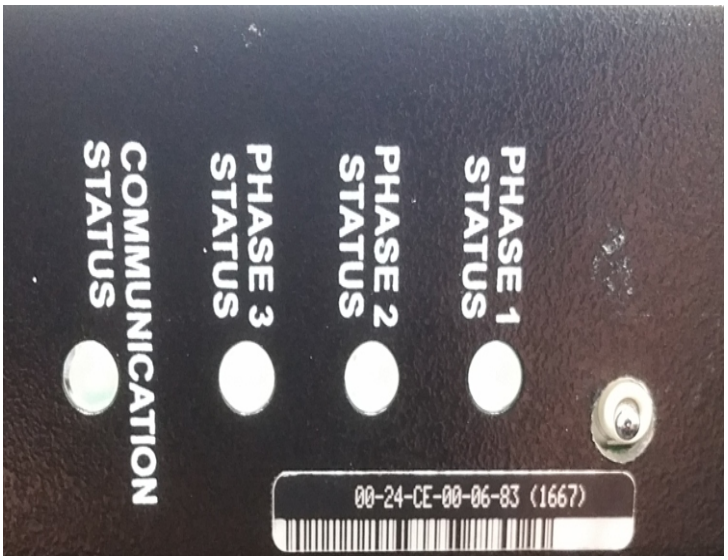


Step 4. Left click on “Tools” then “Find Device”. This will open the following window.

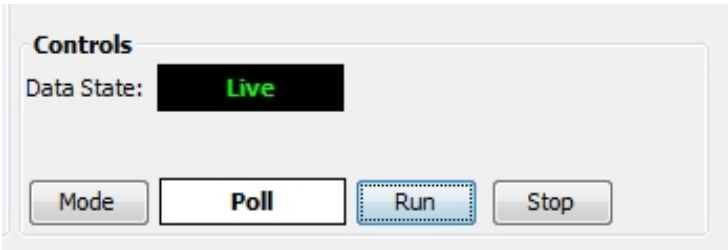


Step 5. Left click on the IP Address then “OK” to connect.
If you are unsure of the monitor card’s IP address, you can also locate it by using the MAC Address. The MAC Address is located on a barcode sticker next to the switches and LEDs on the monitor card’s face plate. In this example, the MAC Address 00-24-CE-00-06-83 has the IP of 172.22.1.90



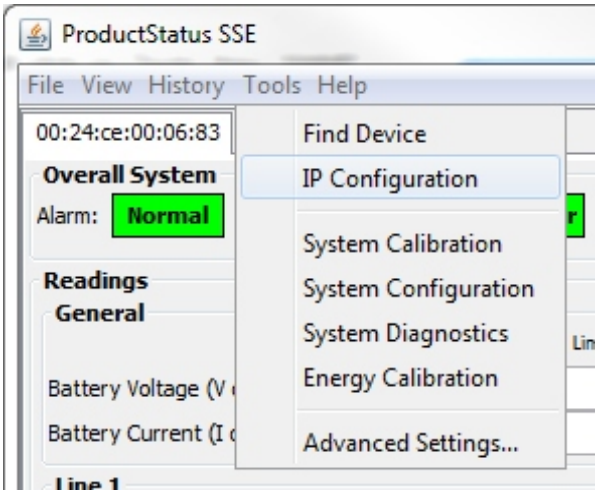


Step 6. Click “Run” in the bottom right corner of Product Status to connect Product Status to the monitor card. This should change Data State from “Inconsistent” to “Live”.

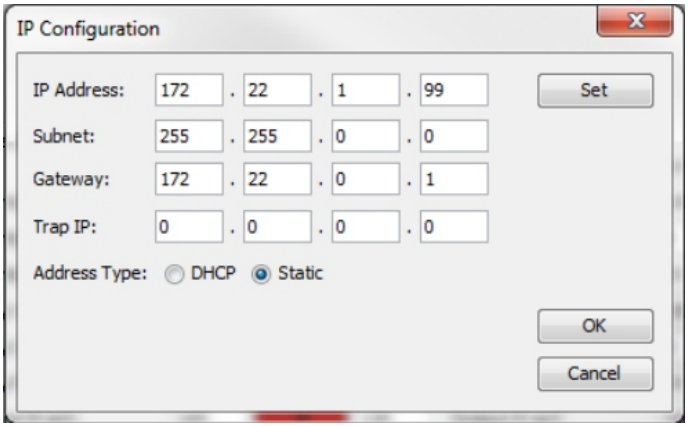


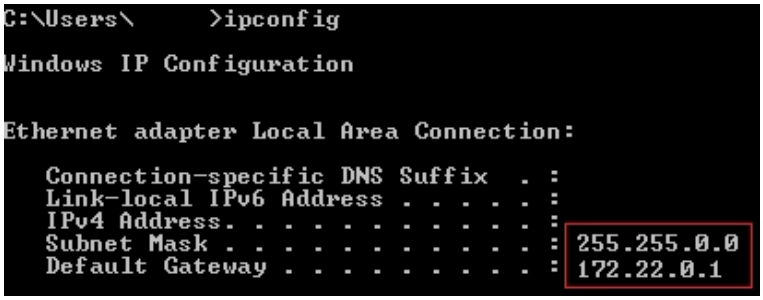
4.4.3 Static IP Address

Step 1. You are also able to set a custom Static IP Address for the monitor card using Product Status. Left click on “Tools” and then “IP Configuration.”



Step 2. Left click the “Address Type” button to change from DHCP to Static.
Input the desired Static IP Address on the IP Address line.
Ensure your Subnet/Gateway matches your network. Check this in CMD by typing ipconfig.





To complete this step press “SET”, and then “OK”-

Step 3. Reboot the communications port. ***NOTE: The information for your Static IP Address is now loaded into the memory of the monitor card but is NOT currently active.***
To make the Static IP Address active you must reboot the communications port. There are two methods to reboot the communications port.

Method 1: You may reboot the port by turning the system off and back on. To reboot the port you must both turn off the inverter as well as the Utility source to the inverter. The monitor card must power down.

Method 2: You may reboot the port by using the “IP RESET” feature. The button is located inside a small hole in the monitor card’s face plate labeled “IP RESET.” A narrow object must be used to press the button inside the hole. This is to prevent accidental resets.

Note: On initial setup this process must be replicated for each monitor card in the system.

4.4.4 Modbus Tables

Register Table			
Register	**Name**	**Multiplier**	**Description**
188	PHASE1_TXFR_STATUS	Bitfields	See TXFR_STATUS bitfields
189	PHASE1_MXPM_STATUS	Bitfields	See MXPM_STATUS bitfields
190	PHASE1_BATT_VOLT	x10	Display Battery voltage value x10
191	PHASE1_BATT_CURR	x1	Display Battery current value
192	PHASE1_UTL_VOLT	x1	Display Utility voltage value
193	PHASE1_UTL_CURR	x1	Display Utility current value
194	PHASE1_INV_VOLT	x1	Display Inverter voltage value
195	PHASE1_INV_CURR	x1	Display Inverter current value
196	PHASE1_UTL_FREQ	x10	Display Utility frequency x10
197	PHASE1_INV_FREQ	x10	Display Inverter frequency x10
198	PHASE1_OUTP_VOLT	x1	Display Output Voltage vaue
199	PHASE1_SCR_TEMP	x1	Display SCR Temperature
200	PHASE2_TXFR_STATUS	Bitfields	See TXFR_STATUS bitfields
201	PHASE2_MXPM_STATUS	Bitfields	See MXPM_STATUS bitfields
202	RES		
203	RES		
204	PHASE2_UTL_VOLT	x1	Display Utility voltage value
205	PHASE2_UTL_CURR	x1	Display Utility current value
206	PHASE2_INV_VOLT	x1	Display Inverter voltage value
207	PHASE2_INV_CURR	x1	Display Inverter current value
208	PHASE2_UTL_FREQ	x10	Display Utility frequency x10
209	PHASE2_INV_FREQ	x10	Display Inverter frequency x10
210	PHASE2_OUTP_VOLT	x1	Display Output Voltage vaue
211	PHASE2_SCR_TEMP	x1	Display SCR Temperature
212	PHASE3_TXFR_STATUS	Bitfields	See TXFR_STATUS bitfields
213	PHASE3_MXPM_STATUS	Bitfields	See MXPM_STATUS bitfields
214	RES		
215	RES		
216	PHASE3_UTL_VOLT	x1	Display Utility voltage value
217	PHASE3_UTL_CURR	x1	Display Utility current value
218	PHASE3_INV_VOLT	x1	Display Inverter voltage value
219	PHASE3_INV_CURR	x1	Display Inverter current value
220	PHASE3_UTL_FREQ	x10	Display Utility frequency x10
221	PHASE3_INV_FREQ	x10	Display Inverter frequency x10
222	PHASE3_OUTP_VOLT	x1	Display Output Voltage vaue
223	PHASE3_SCR_TEMP	x1	Display SCR Temperature

Bitfields Table					
TXFR_STATUS BITFIELDS			MXPM_STATUS BITFIELDS		
	bit	Set value – Alarms Indicated		bit	Set value – Alarms Indicated
_TXFR_STATUS	& 0X0001	Inverter Primary	_MXPM_STATUS	& 0X0001	Low DC Volt alarm
_TXFR_STATUS	& 0X0002	Bad Inverter Source	_MXPM_STATUS	& 0X0002	Module Fail Detected
_TXFR_STATUS	& 0X0004	Bad Utiity Source	_MXPM_STATUS	& 0X0004	Secondary Ref Detected
_TXFR_STATUS	& 0X0008	MBS Lockout Asserted	_MXPM_STATUS	& 0X0008	Module Overtemp Detected
_TXFR_STATUS	& 0X0010	2 sources not sync	_MXPM_STATUS	& 0X0010	n/a
_TXFR_STATUS	& 0X0020	Fan Fail Detected (SCR)	_MXPM_STATUS	& 0X0020	n/a
_TXFR_STATUS	& 0X0040	Warm Temp (SCR)	_MXPM_STATUS	& 0X0040	n/a
_TXFR_STATUS	& 0X0080	Overtemp (SCR)	_MXPM_STATUS	& 0X0080	AB Buss Fail Detected
_TXFR_STATUS	& 0X0100	SCR Active	_MXPM_STATUS	& 0X0100	n/a
_TXFR_STATUS	& 0X0200	Inverter SCR Driving	_MXPM_STATUS	& 0X0200	POPK Failure
_TXFR_STATUS	& 0X0400	Backfeed Protection Enabled	_MXPM_STATUS	& 0X0400	n/a
_TXFR_STATUS	& 0X0800	Line 2 Line fail	_MXPM_STATUS	& 0X0800	n/a
_TXFR_STATUS	& 0X1000	Forced Inverter State	_MXPM_STATUS	& 0X1000	n/a
_TXFR_STATUS	& 0X2000	Forced Utility State	_MXPM_STATUS	& 0X2000	n/a
_TXFR_STATUS	& 0X4000	Forced Contactor open	_MXPM_STATUS	& 0X4000	n/a
_TXFR_STATUS	& 0X8000	Contactor Open Detected	_MXPM_STATUS	& 0X8000	n/a

Table of Typical Values		
Description	Range	Units
PHASE_BATT_VOLT	100 – 1200	DC Volts x10
PHASE_BATT_CURR	1-1000	DC Amps
PHASE_UTL_VOLT	100-277	AC Volts
PHASE_UTL_CURR	1-200	AC Amps
PHASE_INV_VOLT	100-277	AC Volts
PHASE_INV_CURR	1-200	AC Amps
PHASE_UTL_FREQ	500-4000	Frequency x10
PHASE_INV_FREQ	500-4000	Frequency x10
PHASE_OUTP_VOLT	100-277	AC Volts
PHASE_SCR_TEMP	25-110	Celcius

Maintenance 5.0

5.1 Common Maintenance

Preventative maintenance required on Exeltech products is minimal. Under normal circumstances, the only maintenance required is a regular visual inspection of the inverter to check for signs of dirt, dust, corrosion or other damage. Inverters that are used in harsh environments such as mining or marine, should be inspected more frequently as well as cleaned if dusty or dirty. Accumulated dust may block airflow and impede cooling which can cause overheating. The units should also be checked thoroughly for loose hardware or damaged wiring caused by excessive shock or vibration.

Since the inverter system is modular, repair is done on each module as necessary. If a module fails, remove and replace with a new module. Call Exeltech for an RMA number, then send the failed module to Exeltech. Repairs are done at Exeltech only. Inverters not in use (ie; stock) should be powered up and run partially loaded for a few hours every 12 months. This will help keep the electrolytic capacitors from depolarizing. These units should be stored in a manner so that exposed contacts are subject to minimal oxidation.

5.2 (48VDC-108VDC) Power Module Replacement

Power modules are “HOT SWAPPABLE”, meaning the modules can be replaced while the system is powered and running. However, to maintain system output only perform a removal on the power module #1 or #2 (left most modules), never both simultaneously, or the system output will be interrupted.

STEP 1: Alternately loosen the two thumb screws on front panel of the power module two turns at a time. They should become completely loose from the power module cage assembly, yet remain captive in the power module front panel.

STEP 2: Remove the power module by pulling on the front handle.

STEP 3: Install the new power module, insuring that the ribs on the edge of the heat sink are in the grooves of the plastic slides.

STEP 4: Slide the power module in until it just touches the rear connector.

STEP 5: Tighten the top and bottom thumb screws using the procedure below. The power module will not seat in the connector until the thumb screws are completely screwed into the power module cage assembly. The power module cannot be quickly inserted into the power module cage assembly. There is a 3 step procedure that occurs during installation of the power module.

a) The input capacitors are pre-charged.
b) All electrical connections to the power module occur.
c) The power module is powered up and brought on line with the rest of the modules.

In order for these things to occur in the correct sequence and timing, the screws are designed to stop the installation of the power module before any electrical contact takes place in the card edge connector. As the thumb screws are tightened, the above events are forced to happen in sequence and fairly slowly.

1) The power module should be placed in the cage just to the point of starting the thumb screws.

2) Turn the bottom screw in 2 turns. DO NOT ATTEMPT TO SCREW ALL THE WAY AT ONCE. SCREW STRIPPING MAY RESULT.

3) Turn the top screw in 2 turns. DO NOT ATTEMPT TO SCREW ALL THE WAY AT ONCE. SCREW STRIPPING MAY RESULT.

4) Repeat 2 and 3 until the power module is completely seated.

***Annual maintenance (tightening connections)**

(24VDC) Power Module Replacement

24VDC power modules are NOT replaceable while the system is ON. The System must be turned OFF and the DC supply must be disconnected before the rear access panel is removed. The rear access panel must be removed to gain access to the brass screws that make the HIGH current DC connection on the copper bus bars on the system back plane. It is very important that these screws are reinstalled and tightened appropriately in order to prevent catastrophic failure.

STEP 1: Turn off the system with the provided toggle switch or customer installed remote switch.

STEP 2: Disconnect the DC Supply from the Inverter.

STEP 3: Remove the Rear Access cover.

STEP 4: Although 24V is not a hazardous voltage, Exeltech recommends discharging the residual voltage on the capacitors by placing a resistor across the Positive and Negative DC connections. This will prevent arching and prolong the life of Exeltech products.

STEP 5: Remove the two BRASS SCREWS (one Positive and one Negative) associated with the module to be replaced. They can be found on the copper bus bars, aligned vertically with each other on the BACK PLANE.

STEP 6: Remove two (Top and Bottom) Phillips head screws on the front cover of the power module to be replaced.

STEP 7: Remove the Power Module by pulling on the front handle.

STEP 8: Be careful to avoid touching the components under the SHROUD when handling the module. The hazardous voltage will have diminished to safe levels within 5 minutes. But there will still be voltage present for a substantially longer period of time.

STEP 9: Align the rails of the replacement module with the nylon slides and push the module into the cage until the face plate is flush with the rest of the system.

STEP 10: Install the BRASS SCREWS in the rear of the system. Torque them 8 inch/pounds. It is very important that these screws are reinstalled and tightened appropriately in order to prevent catastrophic failure.

STEP 11: Re-install two (Top and Bottom) Phillips head screws on the front cover of the new power module.

STEP 12: Re-install the rear access cover.

STEP 12: Re-connect the DC Supply.

STEP 13: Turn System ON and verify all modules are operating properly.

***Annual maintenance (tightening connections)**

Specifications 6.0

6.1 12KW System Electrical Specifications

INPUT POWER

MODEL VOLTAGE	MINIMUM (TYPICAL)	SYSTEM (TYPICAL)	MAXIMUM (TYPICAL)	MAXIMUM CURRENT
24V	20.8V	27.6V	30V	700A
48V	41.6V	55.2V	60V	350A
108V	93.6V	124.2V	135V	160A

OUTPUT POWER

CONTINUOUS POWER	SURGE POWER (3 seconds)	OUTPUT VOLTAGE	OUTPUT CURRENT	WEIGHT LBS. (With Monitoring Module)
12000W	24000W	120V +/-2%	100 A	69
12000W	24000W	277V +/-2%	43.3 A	69
12000W	24000W	230V +/-2%	52.2 A	69

GENERAL

CONDITIONS	MINIMUM	TYPICAL	MAXIMUM
WAVEFORM	-	SINUSOIDAL	-
LINE REGULATION	-	.1%	2%
LOAD REGULATION	-	1%	2%
DISTORTION	-	1.5%	2%
FREQUENCY	-.1%	60Hz	+.1%

PHYSICAL SPECIFICATIONS

Dimensions: 8.75” x 21” x 20” (H x W x D)
8.75” x 23” x 20” (H x W x D) (Includes rack/shelf mounting hardware)

Mounting Clearance Requirements Above: 1.75” (1 U)
Front: 18”
Rear: 18”

Access: Rear for Installation and Maintenance and Front for Operation

Control: Microprocessor control, Ethernet based monitoring

Options: Pre-charge Circuit Panel PN: 800-DCPRE-400

Accessories: Blank Position Cover Panel PN: 020-00411-400
Relay Rack Mounting Bracket PN: 020-00317-401

6.1.1 Power Module Electrical Specifications

INPUT POWER (PER EACH POWER MODULE)

MODEL VOLTAGE	MINIMUM (TYPICAL)	SYSTEM (TYPICAL)	MAXIMUM (TYPICAL)	TYPICAL EFFICIENCY @ FULL POWER	PEAK EFFICIENCY @ 1/2 POWER
24V	20.8V	27.6V	30V	> 88%	> 91%
48V	41.6V	55.2V	60V	> 88%	> 91%
108V	93.6V	124.2V	135V	> 88%	> 91%

OUTPUT POWER (PER EACH POWER MODULE)

CONTINUOUS POWER	SURGE POWER (3 seconds)	NO LOAD POWER	OUTPUT VOLTAGE	OUTPUT CURRENT	WEIGHT LBS.
2000W	4000W	15W	120V +/-2%	16.7 A	9
2000W	4000W	15W	277V +/-2%	7.2 A	9
2000W	4000W	15W	230V +/-2%	8.7 A	9

GENERAL

CONDITIONS	MINIMUM	TYPICAL	MAXIMUM
WAVEFORM	-	SINUSOIDAL	-
LINE REGULATION	-	.1%	2%
LOAD REGULATION	-	1%	2%
DISTORTION	-	1.5%	2%
FREQUENCY	-.1%	60Hz	+.1%

PHYSICAL SPECIFICATIONS

Dimensions: 8.65” x 3.2” x 16.25” (H x W x D)

Weight: 9lbs

PROTECTION CIRCUITRY

Over Voltage:	Shutoff at maximum input voltage, per input table.
Under Voltage:	Shutoff at minimum input voltage, per input table.
Thermal:	Shuts off due to over temperature condition.
Output Short:	Unit shuts off: electronically limited. Manual reset required.

ENVIRONMENTAL

Temperature:	-25°C to +40°C full power, derated -25% per 10°C above 40°C.
Humidity:	5 to 95% non-condensing
Altitude:	-60m to 3,048m (-197ft. To 10,000ft.) Altitudes >10,000ft. thermally derate from 40°C to 30°C.
Cooling:	Thermostatically controlled variable speed forced air.
Warranty:	Full year parts and labor.

6.1.2 Monitoring Module Electrical Specifications

Electrical Specifications

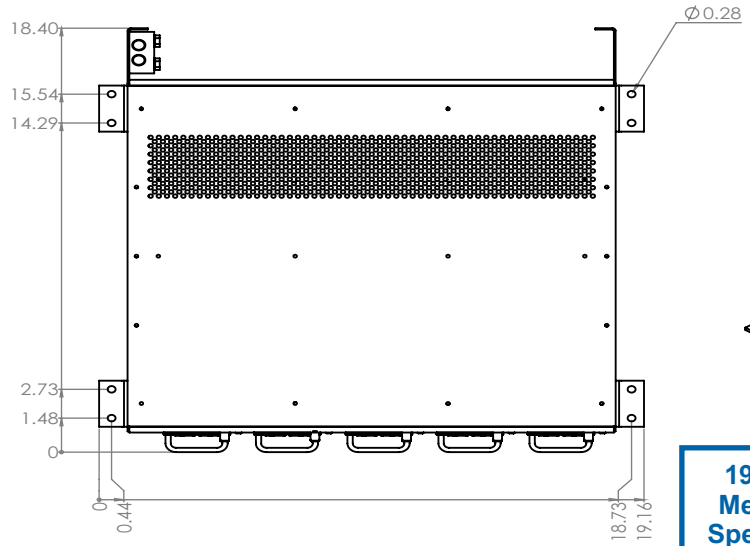
Inverter Voltage Reading:	True RMS Voltage +/- 1%
Inverter Current Reading:	True RMS Current +/- 1%
Frequency Reading:	1/10 Hz resolution
DC Voltage Reading:	Nominal DC Voltage +/- 1%

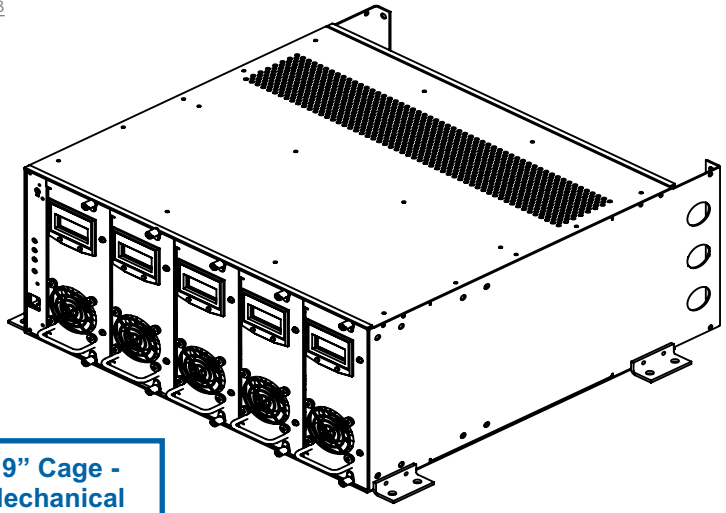
Physical Specifications

Dimensions: 8.65” x 3.2” x 16.25” (H x W x D)

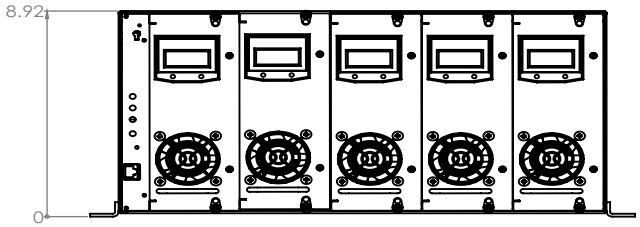
Weight: < 1.5 lbs

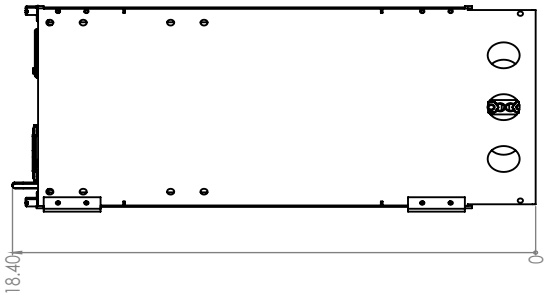
6.2 Mechanical Specs/Drawings

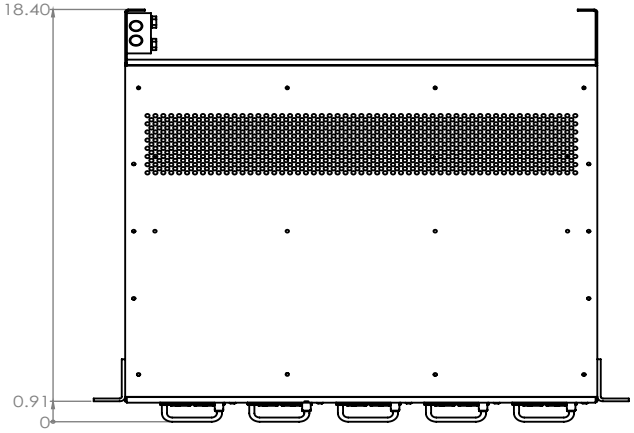


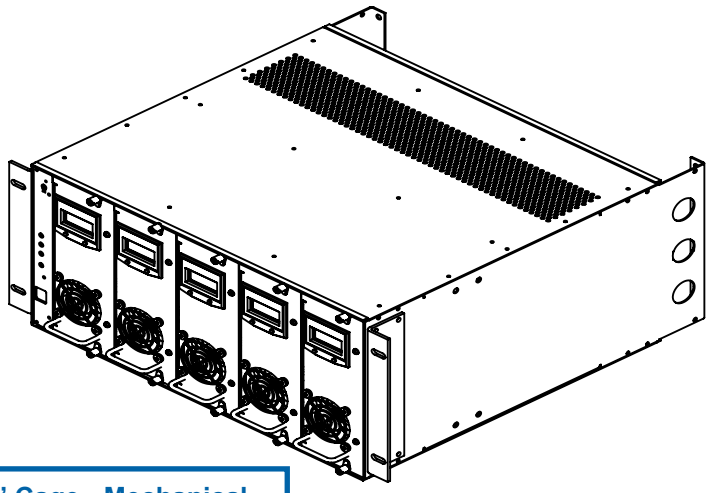


19” Cage - Mechanical Specification Surface Mount

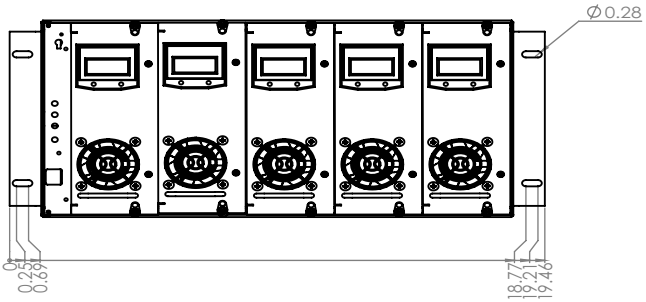


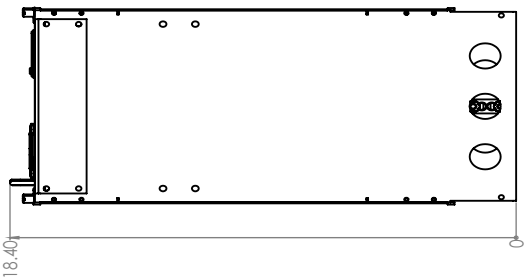


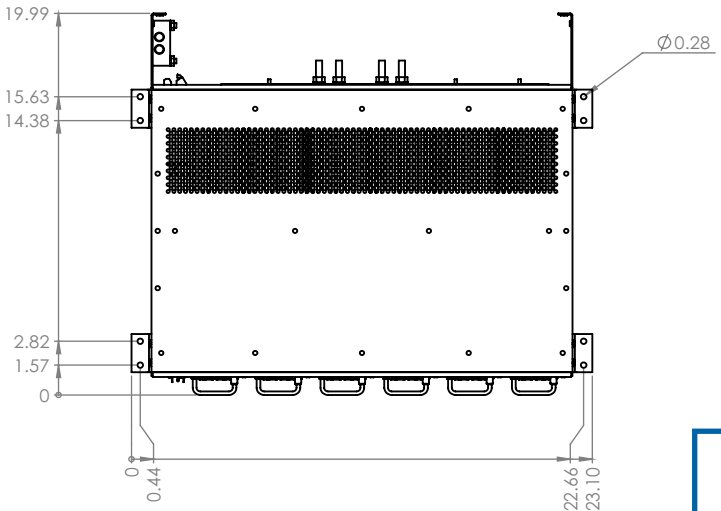


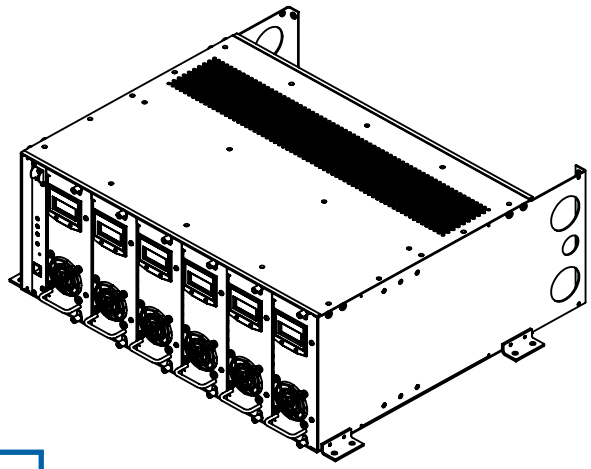


19” Cage - Mechanical Specification Rack Mount

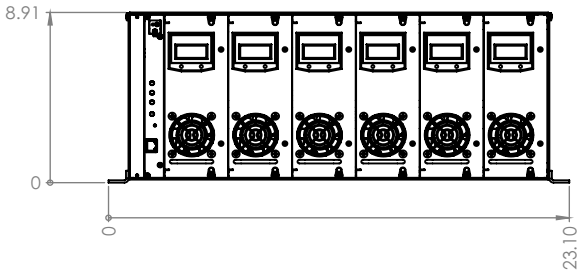


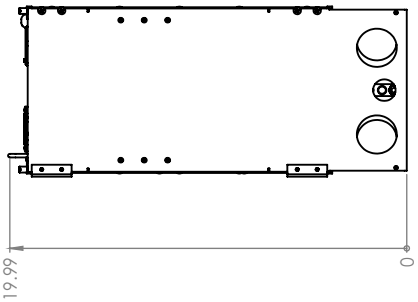


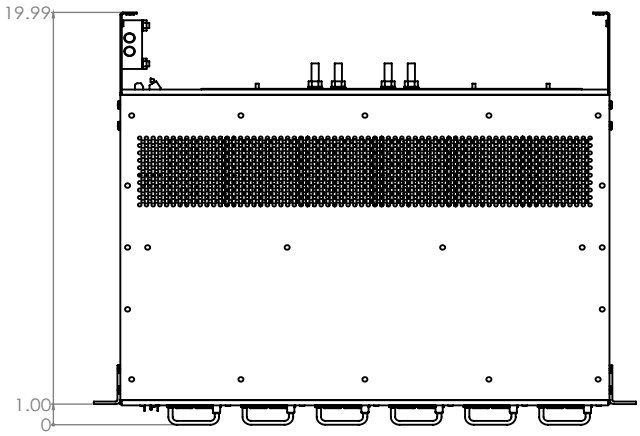


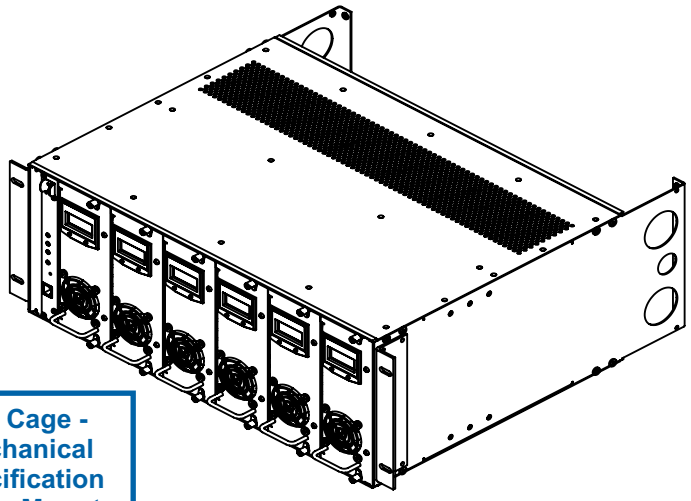


23” Cage - Mechanical Specification Surface Mount

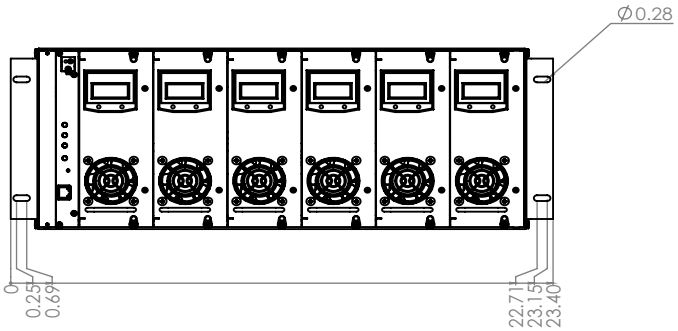






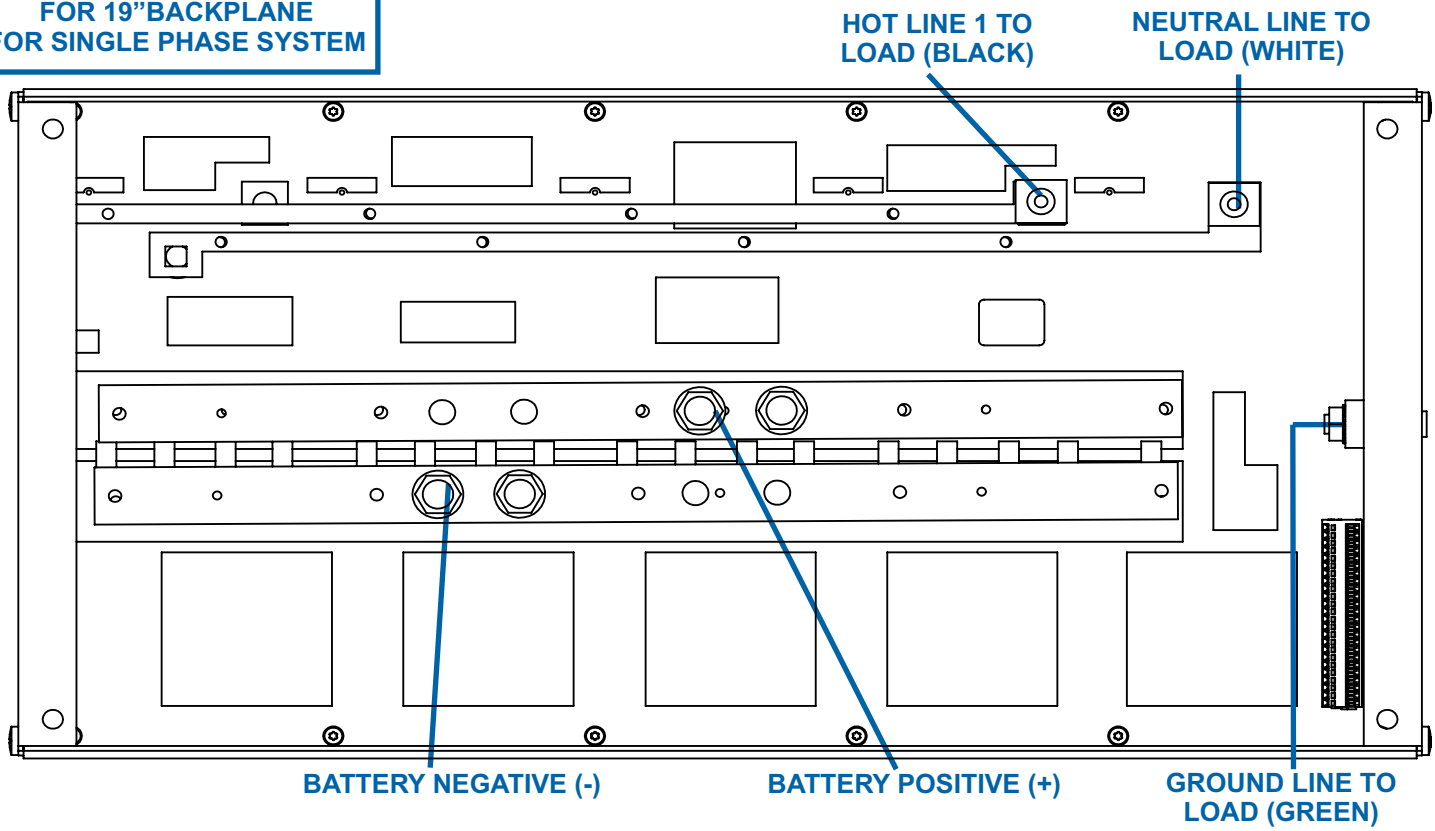


23” Cage - Mechanical Specification Rack Mount

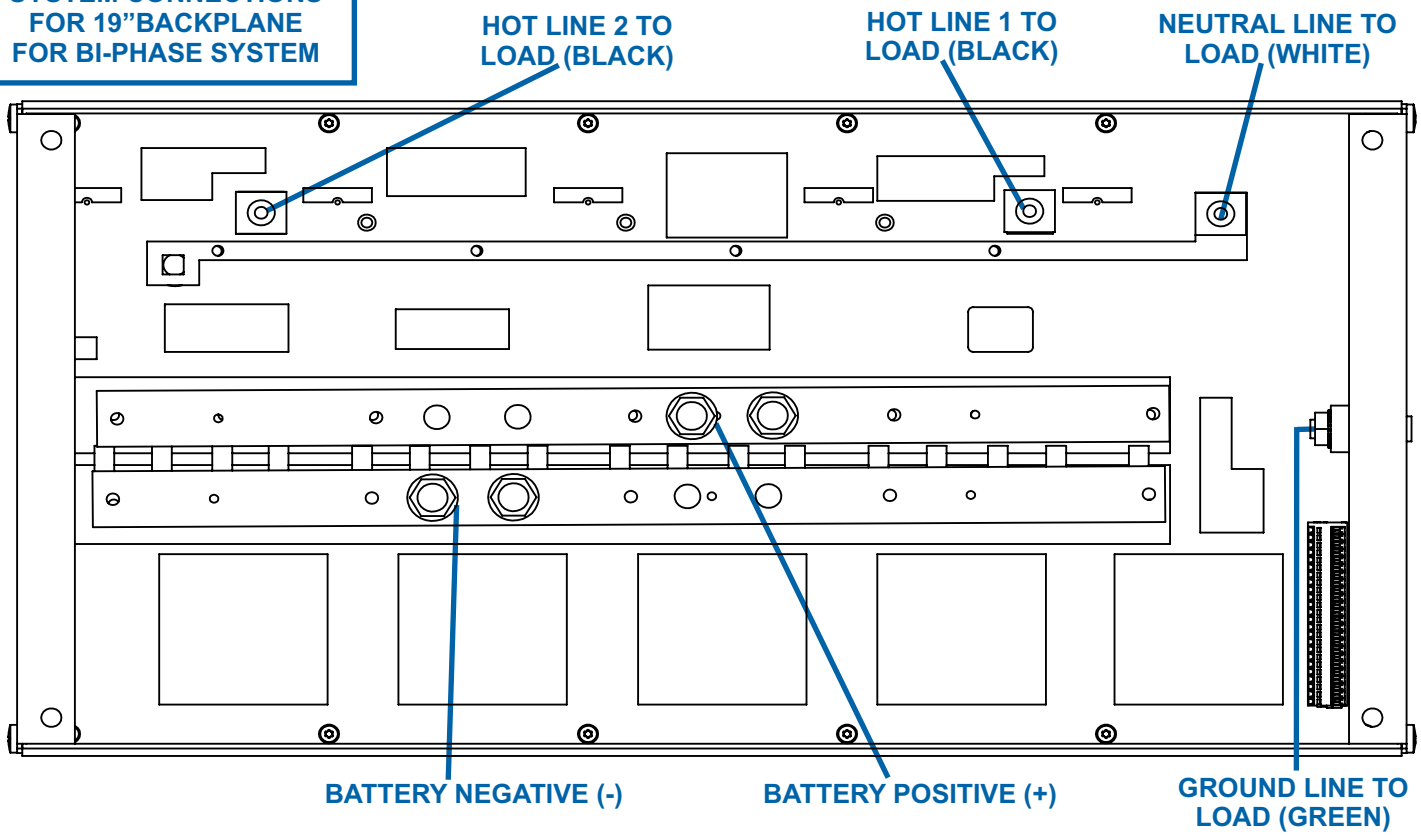


6.3 Backplane Connections

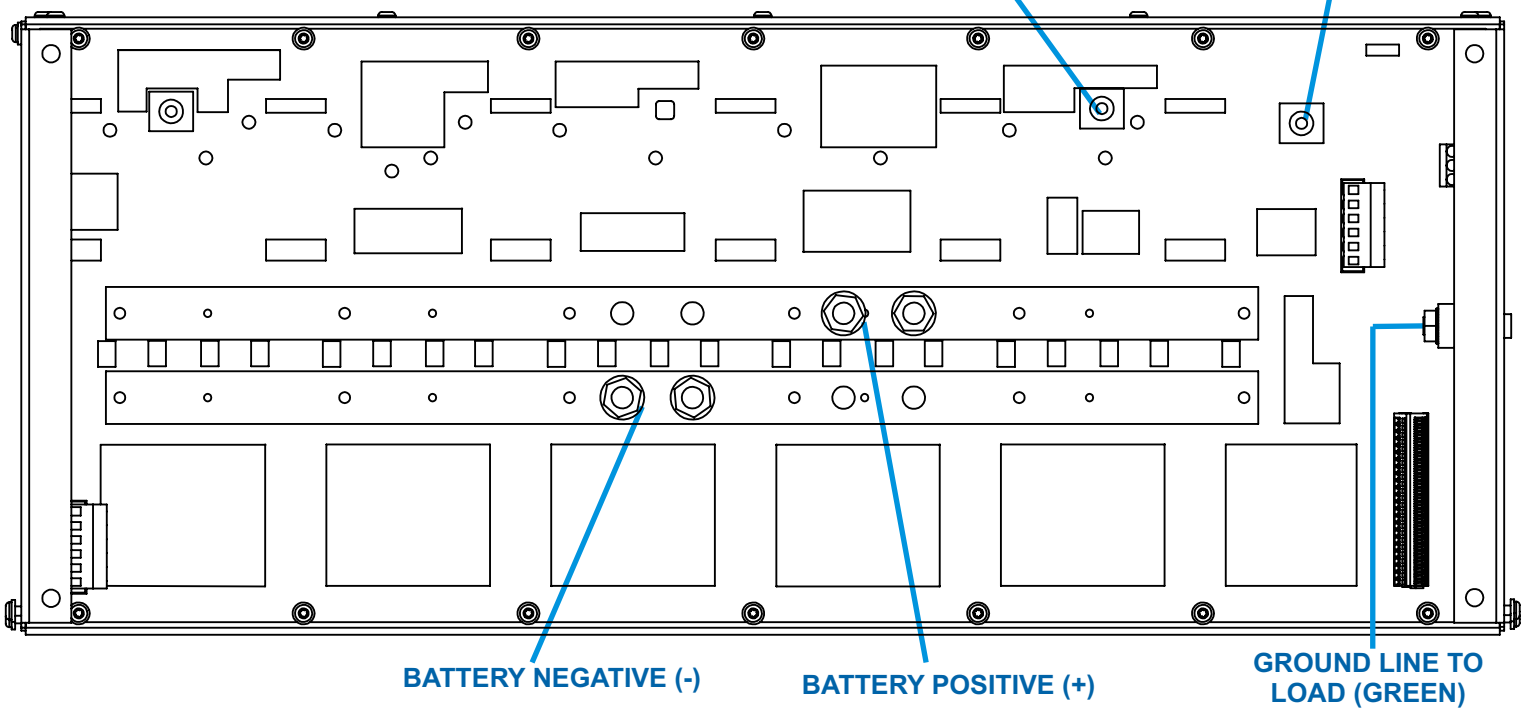
SYSTEM CONNECTIONS FOR 19"BACKPLANE FOR SINGLE PHASE SYSTEM



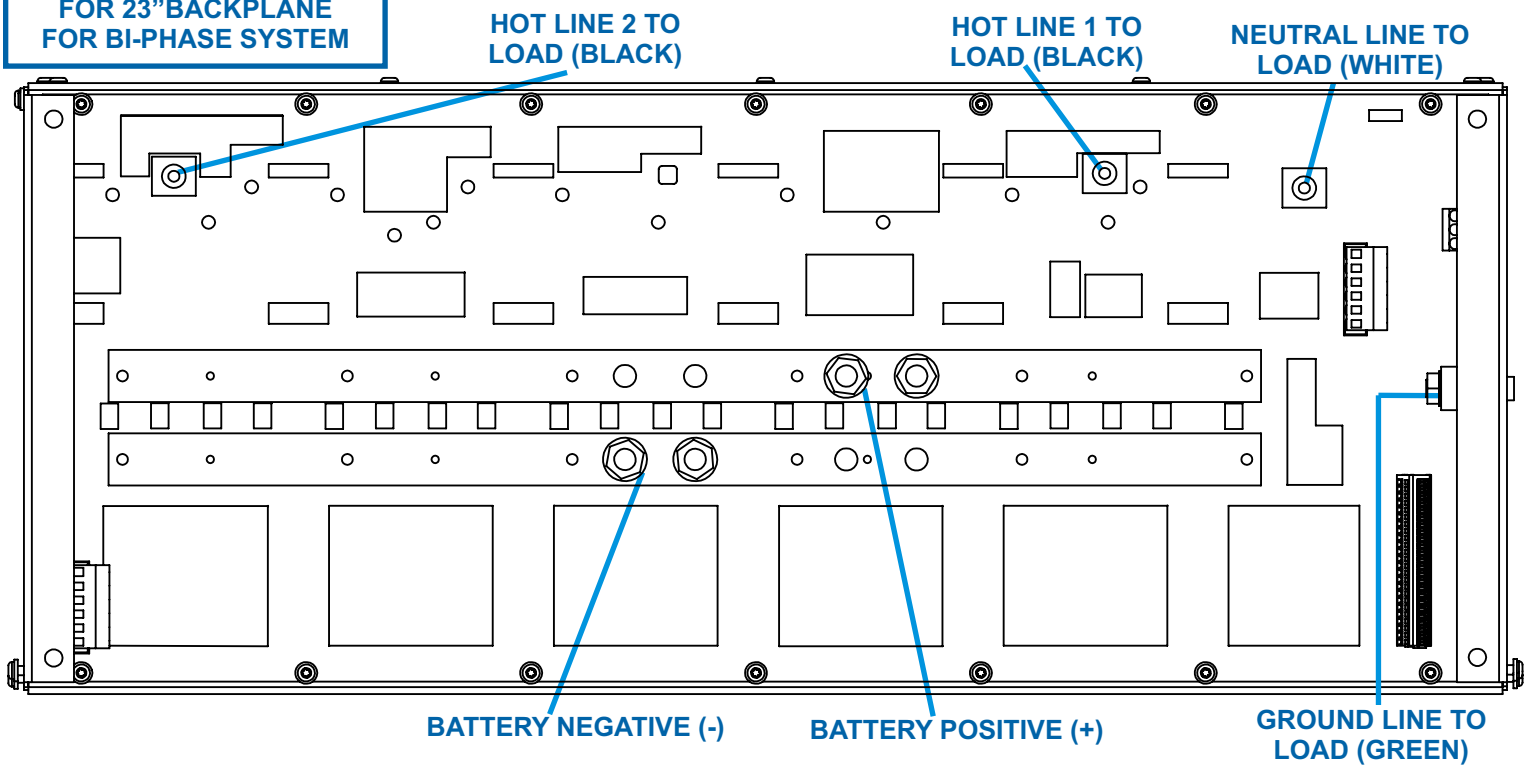
SYSTEM CONNECTIONS FOR 19"BACKPLANE FOR BI-PHASE SYSTEM



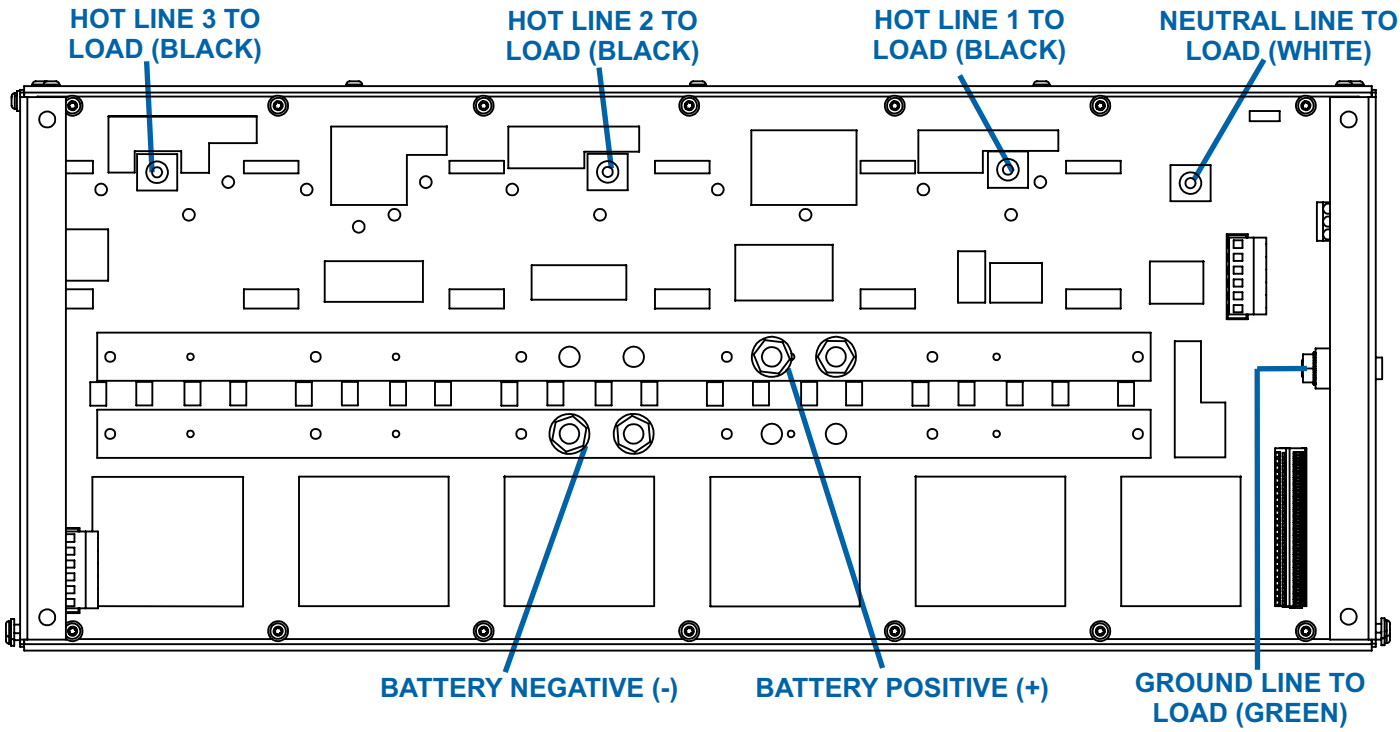
SYSTEM CONNECTIONS FOR 23”BACKPLANE FOR SINGLE PHASE SYSTEM



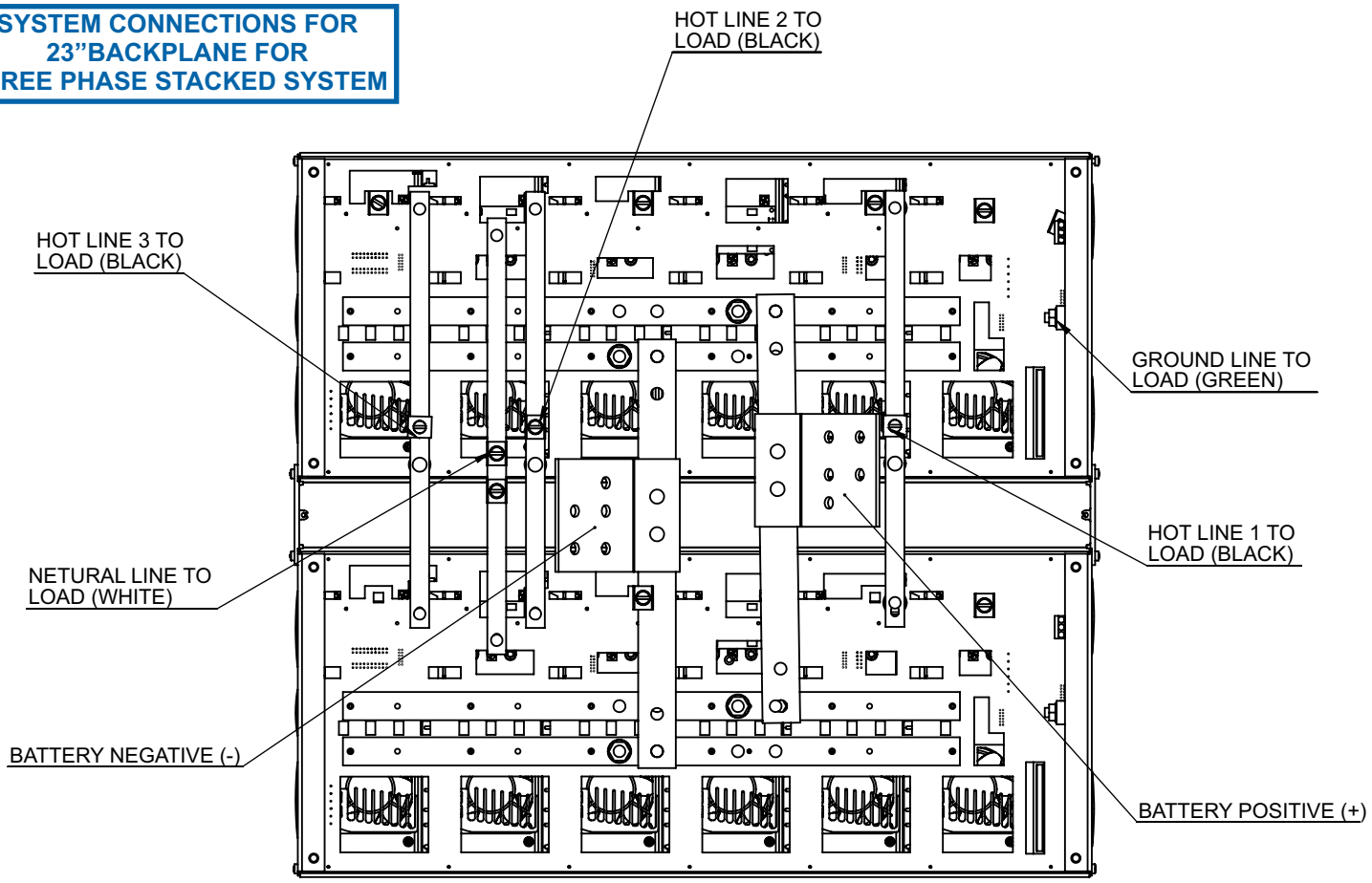
SYSTEM CONNECTIONS FOR 23”BACKPLANE FOR BI-PHASE SYSTEM



SYSTEM CONNECTIONS FOR 23”BACKPLANE FOR THREE PHASE SYSTEM

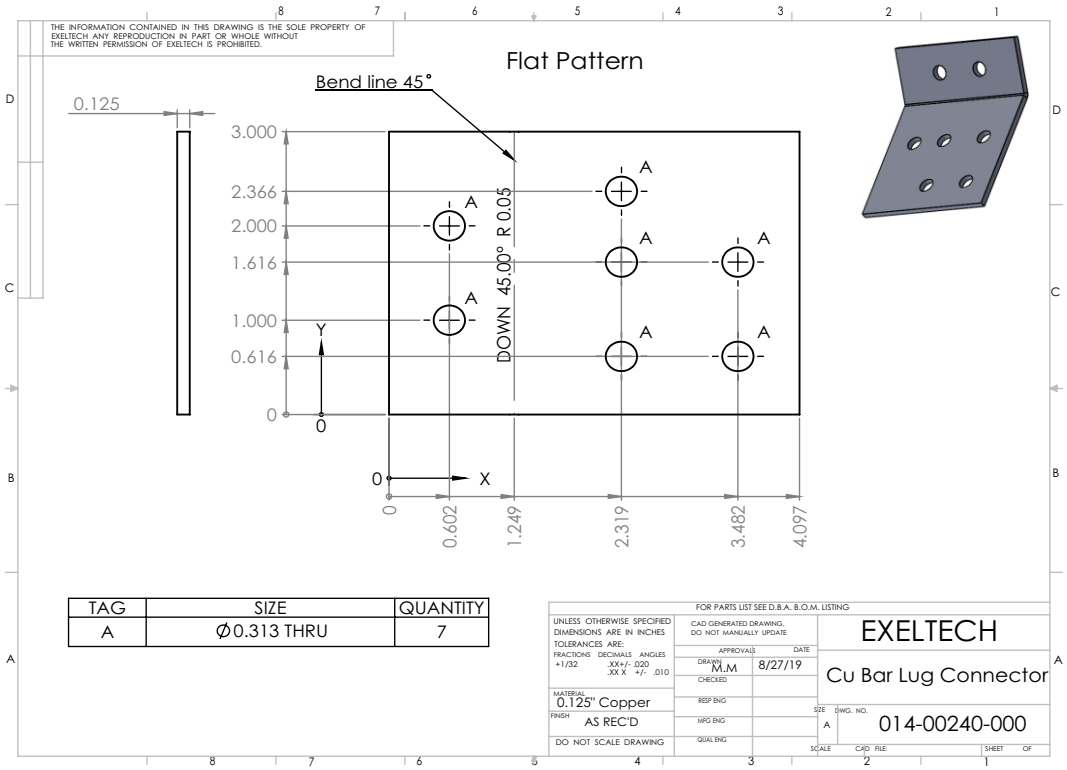


SYSTEM CONNECTIONS FOR 23"BACKPLANE FOR THREE PHASE STACKED SYSTEM



* This drawing is used to show basic system connections only. Data in this manual is not be specific to this system.

CU Bar Lug Connector Measurements:
(For Use With Stacked Systems)



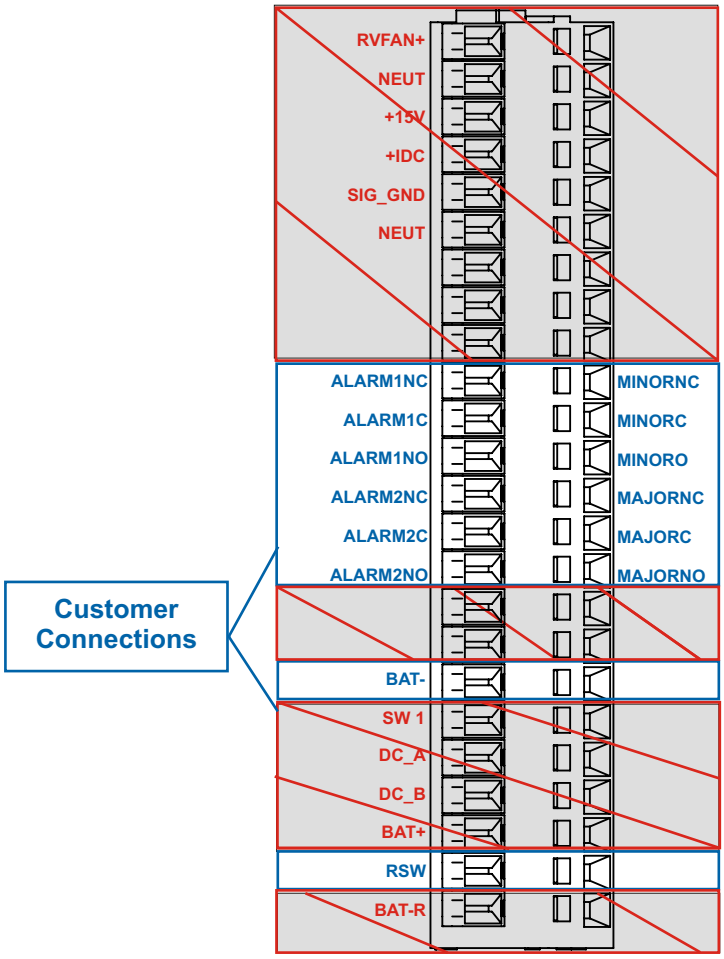
6.3.1 Remote Alarm Connections (Available in the Backplane)

CONTACT CLOSURES (REMOTE ALARMS): The alarm module contains "form-C" contact closures to monitor inverter status remotely. These remote alarms include: Alarm 1/Minor, and Alarm 2/Major.

Remote Alarm Connector:
Rated for solid or fine strand wire.
28 AWG-20AWG

NOTES:
RVFAN+, NEUT, +15V, +IDC, SIG_GND, DC_A, DC_B, BAT+, Sw 1, and **BAT-R** are for **Exeltech Use ONLY.**

Remote Switch:
BAT- and RSW relays are used for the addition of a Remote Switch to the system (See Section 2.1).



With the Alarm Card:

ALARM 1/MINOR:
Relay is energized in case of any AC Under Voltage/Over Voltage.

ALARM 2/MAJOR:
Relay is energized in case of any DC Under Voltage/Over Voltage.

Alarm Card alarms (Alarm 1/Minor & Alarm 2/Major are not programmable.

With the Monitor Card:

ALARM 1/MINOR:
-Alarms programmable through Product Status (See Section 4.2.2).
-Alarm options will vary by system.

ALARM 2/MAJOR:
-Alarms programmable through Product Status (See Section 4.2.2).
-Alarm options will vary by system.

Note: Programmable alarms must be programmed individually on each Monitor Card in the system.

Part Numbering System
7.0

LC SERIES SYSTEM PART NUMBER

1. Model number starts with
LC

2. Cage Assembly
1 = 19"
2 = 23”

3. Configuration.
B=1 phase Single Cage Systems
E=2 phase Single Cage Systems
F=3 phase Single Cage Systems
U=1 phase Stacked Rack Systems
V =2 phase, Stacked Rack Systems
W =3 phase, Stacked Rack Systems
X=2 phase, master phase, Stacked Systems “23T”
Y=2 phase, phase inverter, Stacked Systems “23T”

4. Designates the type of System “brain”
A00= Alarm Card (120VAC)
B00= Monitor Card (120VAC)
G00= Alarm Card (277VAC)
H00= Monitor Card (277VAC)

5. Alpha character assigned by EXELTECH to represent changes or revisions levels in rack and alarm card.
Current Revision = A

6. To designate power level, enter the number of modules required. (* if none used)

7. Enter the character code from **L**C System Design Chart. M = 120, 7 = 277

8. Revision level of Power Modules.
\- = (REV. 1)
A = (REV.2)

9. To designate input voltage, enter the single character from the VDC voltage chart below.

VDC INPUT VOLTAGE CHART

DC Volts	12	24	32	48	66	108
Designation	**1**	**2**	**B**	**4**	**E**	**I**

10. Output frequency is designated by using the first number of the frequency. (5 for 50Hz, 6 for 60Hz, 4 for 400Hz)

11. For options, enter two digit code. If no option, enter (00).

LC SERIES STACK SYSTEM PART NUMBER

Step 1: Model number always starts with
L = LC

Step 2: 1=1 phase, Stacked Rack Systems
2=2 phase, Stacked Rack Systems
3=3 phase, Stacked Rack Systems

Step 3: Cage Assembly
1=19"
2 = 23”

Step 4: Alpha character assigned by EXELTECH to represent changes or revisions levels in rack and alarm card.
Current Revision = A

Step 5: To designate the type of module “brain”,
A00= Alarm Card (120VAC)
B00= Monitor Card (120VAC)
G00= Alarm Card (277VAC)
H00= Monitor Card (277VAC)
T00= Transfer Switch

Step 6: Number of power cages
Hexadecimal, 1-F= 1 through 15

Step 7: Output voltage :
M = 120 VAC
7 = 277 VAC

Step 8: Number of Power Modules per phase
01-30

Step 9: To designate input voltage, enter the single character code from the VDC Input Voltage Chart below. If ordering a cage assembly, enter an asterisk(*).

VDC INPUT VOLTAGE CHART

DC Volts	12	24	32	48	66	108
Designation	1	2	B	4	E	I

Step 10: Output frequency is designated by using the first number of the frequency. (5 for 50Hz, 6 for 60Hz, 4 for 400Hz)

Step 11: To designate option enter 2 characters. If no option is required please enter “00”

LC SERIES OPERATION AND INSTALLATION MANUAL

931-LC1M*-**0F

Document subject to change without notice.
931-LC1M*-*0F

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