

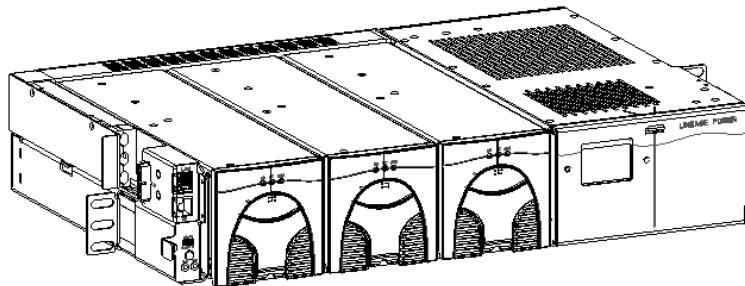
## **CPS6000 Series 2**

### **Models:**

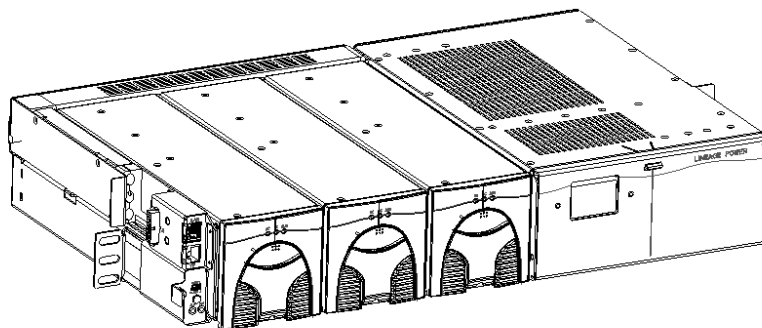
**CC109152113 (19" 10A system, 2 Batt, 2 Load, 12 GMT)**

**CC109152138 (23" 30A system, 2 Batt, 2 Load, 16 GMT)**

**CC109152146 (23" 50A system, 2 Batt, 2 Load, 16 GMT)**



*10A System*



*30A, 50A System*

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## Customer Service Contacts

For customers in the United States, Canada, Puerto Rico, and the US Virgin Islands, call 1-800-THE-1PWR (1-800-843-1797). This number is staffed from 7:00 am to 5:00 pm Central Time (zone 6), Monday through Friday, on normal business days. At other times this number contacts an answering service with on-call personnel for out of service emergencies.

### ***Customer Training***

Lineage Power offers customer training on many Power Systems products. For information call 1-877-LINEAGE (1-877-546-3243). This number is answered from 8:00 a.m. until 4:30 p.m., Central Time Zone (Zone 6), Monday through Friday.

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**LINEAGE POWER**  
**World Wide Headquarters**  
601 Shiloh Road, Plano, TX 75043, USA

+1-800-843-1797  
Outside U.S.A.: +1-972-284-2626

<http://www.lineagepower.com>  
e-mail: [techsupport1@lineagepower.com](mailto:techsupport1@lineagepower.com)

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# 1 Safety Statements

CPS6000 DC Power System accepts operating AC voltage between 85V and 275V, 47-63 Hz, and produces a regulated DC Output of 42-58V. It can deliver a maximum DC output of 100A at an operating temperature range of -40C to +50C (depending on the rectifiers used). Some rectifiers are derated from 50C to 75C (2% per degree C).

**HAZARDOUS VOLTAGE AND ENERGY LEVELS CAN PRODUCE SERIOUS SHOCKS AND BURNS.** This power system and connected cables will have hazardous energy and voltages present. Follow all safety warnings and practices when servicing this equipment. This equipment must be installed, serviced, and operated only by authorized, qualified and trained personnel who have the necessary knowledge and practical experience with electrical equipment and who understand the hazards that can arise when working on this type of equipment. Observe all local and national electrical, environmental and workplace codes.

## APPROVALS

- **Shelf:** Underwriters Laboratories (cUR) Recognized per the U.S. and Canadian (Bi-National) Standard for Safety of Information Technology Equipment, Part 1: General Requirements, CAN/CSA C22.2 No. 60950-1-03, UL 60950-1, 1<sup>ST</sup> Edition. Considerations were also given to the safety requirements of IEC 61204-7, First Edition, Low voltage power supplies, d.c. output, Annex PS-E.
- **Rectifiers:** Underwriters Laboratories (cUR) Recognized per the U.S. and Canadian (Bi-National) Standard for Safety of Information Technology Equipment, Part 1: General Requirements, CAN/CSA C22.2 No. 60950-1-03, UL 60950-1, 1<sup>ST</sup> Edition or evaluated to EN60950-1 by an EC Notified Body, as appropriate. The CE Mark demonstrates compliance with the European Union Council Directives for Low Voltage and EMC.

## INSTALLATION SITE

- Install only in restricted access areas (dedicated equipment rooms, equipment closets, or the like) in accordance with paragraphs 110.18, 110.26, and 110.27 of the U.S. National Electric Code (NEC), NFPA 70, and pursuant to applicable local codes.
- This equipment is to be used in controlled environments (an area where the humidity is maintained at levels that cannot cause condensation on the equipment, the contaminating dust is controlled, and the steady-state ambient temperature is within the range specified). This equipment must not be installed over combustible surfaces.
- CPS6000 is suitable for connection to ac utility systems where the expected level of lightning surges complies with ANSI C62.41 Category B or IEC 60664-1 Overvoltage Category II.
- A service entrance surge protector is required in applications where the installation categories cannot be classified as being compliant to either ANSI C62.41 Category B or IEC 60664-1 Overvoltage Category II.

- CPS6000 rectifiers have been tested for repeated lightning surges typically found in an Overvoltage Category III installation; however, a service entrance surge protector is recommended in cabinet applications to bring the power feeds in compliance to the installation categories above. The service entrance protection should be coordinated with the protection provided in the power modules.
- The power module provides common-mode protection via a 320V MOV in series with a 2500V gas-discharge device and differential-mode protection via a 320V MOV in series with a 3.5A fuse.

## AC

- An accessible ac disconnect/protection device to remove ac power from the equipment in the event of an emergency must be provided.
- AC branch circuits to this equipment must be protected with either fuses or circuit breakers sized as required by the National Electric Code (NEC) and/or local codes. The maximum size of the over-current protector is based on the rectifier type used. Refer to Table 1 for appropriate breaker to assure rating of equipment will not exceed 80% of the value of the protector chosen.
- The equipment could be powered by two ac inputs. Ensure that the appropriate circuit protection device for each ac input being serviced is disconnected before servicing the equipment. Do not disconnect permanent bonding provisions unless all ac inputs are disconnected.
- High leakage currents are possible due to contribution from two AC input connections. Earth ground connection is essential before connecting the ac source to the shelf. This connection must be achieved by ensuring that the shelf is properly grounded as shown in the Installation Section.
- In enclosed equipment cabinets, the mounting framework must be connected directly to the cabinet ac service ground bus. For applications in huts, vaults, and central offices, the framework must be connected to the system integrated ground grid.
- CPS6000 outputs are not connected to earth. Earthing of rectifier outputs may be performed externally to the shelf at a “ground window” or “mesh ground”. Reliable earthing of the DC return bus (DC reference Ground) and the chassis ground should be performed.

## WIRING

- For installations in the United States, Listed compression connectors shall be used to terminate field-wired conductors, where required. For all installations, the appropriate connector is to be applied only to the correct size conductor as specified by the connector manufacturer, using only the connector manufacturer's recommended tooling or tooling approved for that connector.
- If the proper connector for the country of installation is not provided, obtain appropriate connectors and follow manufacturer's and all local requirements for

proper connections. All national and local rules and regulations should be followed when making field connections.

- Insulation on field-wired conductors should be rated no less than 90° Celsius. Wire conductor size should be sized per electrical codes for 75° Celsius wire, and based on the ampacity of the associated protection device.
- Battery input cables must be dressed to avoid damage to the conductors (caused by routing around sharp edges or routing in areas where wires could get pinched) and undue stress on the connectors.
- Alarm contacts on the office alarm connector are not fused in the controller; therefore, current limiting protection for these contacts must be provided by external circuits. Maximum ratings for alarm connections are 60Vdc and 0.5 amperes. Exceeding these maximum ratings could result in fire or damage to the unit.
- Torque electrical connections to the values specified on Table 5

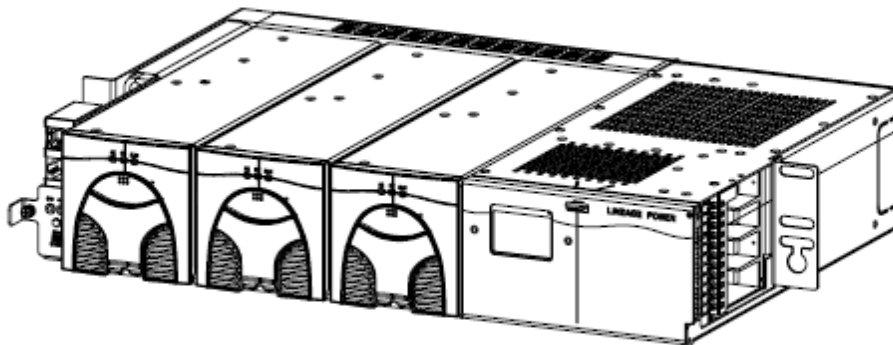
## DC PROTECTORS

- The DC output fuse and circuit breaker current shall not exceed 80% of their circuit breaker or fuse rating as seen during battery discharge.
- The short circuit current capability of the battery input to the distribution panel must not exceed 10,000A.
- Installing fuses or circuit breakers not specified for use in this shelf may result in injury to service personnel or equipment damage.
- The telecom-type (e.g., GMT type) fuses can produce sparks during interruption or clearing of a fault on a high energy circuit. Use only fuses provided with safety caps for this type of circuit. Installing telecom-type fuses not equipped with safety caps may result in injury to service personnel.
- While installing batteries, follow all safety precautions outlined in the appropriate battery product manuals.
- Batteries are connected in parallel with the output of the rectifiers. Turning off the rectifiers will not necessarily remove power from the bus. Make sure the battery power is also disconnected and/or follow safety procedures while working on any equipment that contains hazardous energy/voltage.

## 2 Product Specification

CPS6000 -48V DC Power Systems are modular power system designed for rack mounting into open frames or cabinets. The shelf is 3.5" (2U) high and 13.5" deep, 19" and 23" rack mounting ( see table below ). The following system kits are available

	CC109152113 10A System	CC109152138 30A System	CC109152146 50A System
CC109157426 Shelf 19"	1	-	-
CC109157401 Shelf 23"	-	1	-
CC109157418 Shelf 23"	-	-	1
CC109156535 Controller	1	1	1
CC109157450 Rectifier 10A	2	-	-
CC109129722 Rectifier 15A	-	2	-
CC109129730 Rectifier 25A	-	-	2
CC109157434 T - Probe Cable 20'	1	1	1
CC109142980 Thermal Probe	1	1	1
CC848865980 Alarm Cable 15'	1	1	1



**Figure 1: CPS6000 System**

### Rectifier Specifications

The following constant-power, vertical airflow rectifiers are available for order with this shelf. Values listed are per rectifier. Maximum Heat Release numbers are calculated at 175VAC and maximum DC voltage and current values for the rectifier.

**Table 1: Rectifier Specifications**

Model Number of Rectifier	Max DC Current (Idc)	DC Voltage (Vdc) Range	AC Voltage (Vac) Range	Heat Release BTU/hr (Watts)	Nominal AC Current (A)	Protector Size (Min Recommended) (A)
QS560ATEZ	10A	42-58	85-150	300(88)	5.2	15
			150-275	293(70)	2.9	15
QS861ATEZ	15A		85-150	450(132)	7.8	15
			150-275	445(130)	4.4	15
QS862ATEZ	25/30A		85-150	604(177)	12.0	15
			150-275	724(212)	8.8	15

## AC Input Requirements

The 10A system shelf has one 12 Gauge 15 foot AC cord terminated in L5-15P plugs

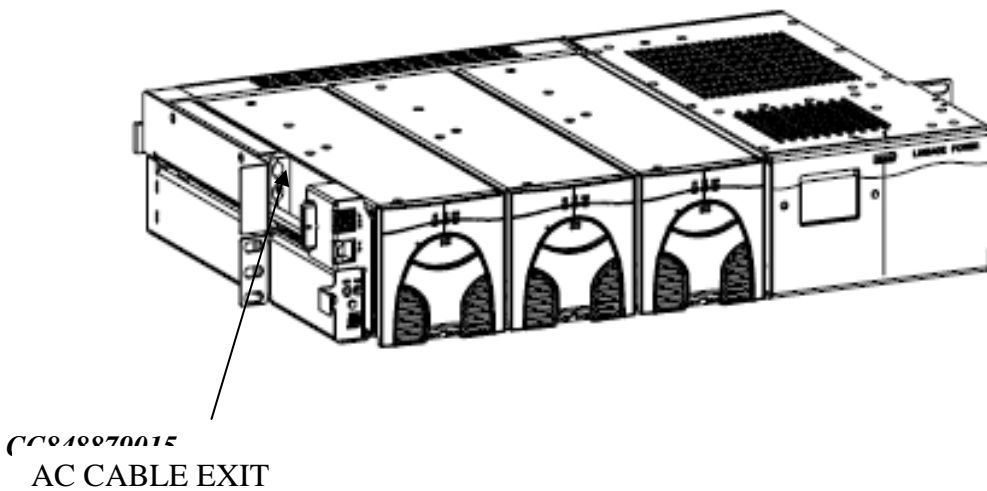
The 30A system shelf has three 12 Gauge 15 foot AC cords terminated in L5-15P plugs

The 50A system shelf has three 12 Gauge 15 foot AC cords terminated in L5-20P plugs.

See Table 1 for AC protection for each rectifier option.

\* L5-20P plug on end of cord must be changed in the field to use 208Vac rectifiers.

**Figure 2: AC Connections**



CC010070015  
AC CABLE EXIT



## DC Output Requirements

The following figure shows the DC circuit description for the shelf. The shelf has sixteen GMT fuses and two load circuit breakers. Two battery strings may be connected to the system through circuit breakers on the shelf which feed a low voltage load disconnect (LVLVD). GMT fuse connections are made to lugless terminal blocks. The maximum wire size for fuse connections is 10 AWG. Select a wire size for each GMT fuse connection according to the fuse connection rating on Table 3. Circuit breaker connections are made with double hole lugs on #10-32 studs on 5/8" centers. The maximum tongue width for breaker connections is 0.68". Select the wire size for each breaker connection according to Table 4. An extra return connection is available for the DC reference ground.

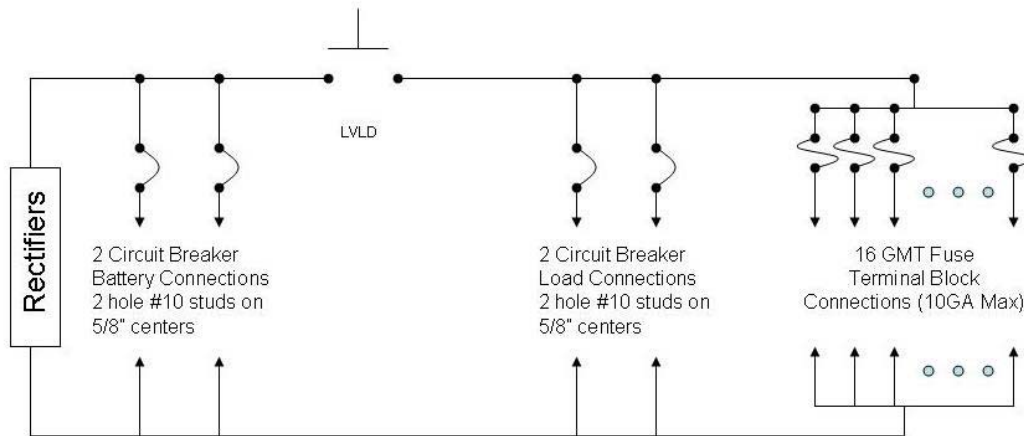


Figure 3: DC Distribution Circuit

Table 2: Overcurrent DC Protection

Manufacturer	Series	Rating	Notes
Airpax	LMLK, LMLHPK Circuit Breakers	1-pole, 100A max	Current through circuit breaker shall not exceed 80% of rating under charge or discharge conditions
Bussmann	GMT Type Fuses	15A max	Current through fuse shall not exceed 80% of fuse rating under charge or discharge conditions

### GMT Fuse Output Wires

Table 3 shows the appropriate output wiring based on the GMT fuse size rating.

**Table 3: Min Wire Gauge for GMT Fuses**

GMT Fuse Rating Nut	Min Wire Gauge 90C Wire
Amps	AWG
1	20
2	20
5	20
7.5	20
10	18
15	16

### Breaker-Protected Output Wires

Table 4 shows the appropriate wiring and terminal lug based on the circuit breaker size rating.

**Table 4: Wire and Lug Sizes for Circuit Breakers**

Breaker Rating	Wire Size using 90C Wire (NEC Table 310.16)	WP91412 Terminal Lug	Amp Ring Terminal	Description
Amps	AWG	Part #	Part #	
5*	18		31887	#10 Single hole ring
10*	16		35363	#10 Single hole ring
15	14	405356171 (List 73)		#10 Two hole lug on 5/8"
20	12	405356171 (List 73)		#10 Two hole lug on 5/8"
30	10	405356171 (List 73)		#10 Two hole lug on 5/8"
40	8	405348178 (List 52)		#10 Two hole lug on 5/8"
50	8	405348178 (List 52)		#10 Two hole lug on 5/8"
60	6	406338400 (List 108)		#10 Two hole lug on 5/8"
70	6	406338400 (List 108)		#10 Two hole lug on 5/8"
80	4	405347576 (List 5)		#10 Two hole lug on 5/8"
90	4	405347576 (List 5)		#10 Two hole lug on 5/8"
100	2	405347683 (List 8)		#10 Two hole lug on 5/8"

- Wire ratings for circuits less than 15A are based on Table 3B – Sizes of Conductors, UL60950, “Safety of Information Technology Equipment”, Dec.,2000 for non-building wiring.

## 3 Installation

### Unpacking and Safety Precautions

Before unpacking the DC power system, note any physical package damage that could indicate potential damage to the contents. After removing the components from their boxes and packing material, inspect for any shipping or other damage. Always consider personal safety. Remove all metal jewelry before beginning the installation. Care should be taken during the installation process to prevent exposure of the equipment to wire clippings. If possible, rectifiers should remain in their shipping boxes until the shelf wiring is complete.

### Installation Tools

- Wire cutters and strippers
- Heat shrink gun
- Torque wrench (0-75 in-lb / 10 Nm)
- 3/8" nut drivers and sockets
- Digital meter, +/- 0.02%
- Screw Drivers (#1 and #2 Phillips)
- Cable crimpers
- Screw Drivers (#1 and #2 Standard)

### Torque Settings

The following table lists the recommended torque settings for all mechanical and electrical connections according to screw and nut size.

**Table 5: Torque Settings**

Screw or Nut Size	Torque	
	Nm	In-lbs.
6-32	1.5	12
8-32	3	22
10-32	4.25	37
12-24	5.75	50

### Frame Mounting

The shelf is designed for a standard 19 or 23 -inch wide equipment rack. The shelf should be installed with a minimum gap of 3/4 inch above and below the system to allow proper airflow. Attach the CPS6000 shelf to the frame using a minimum of four (two on each side) of the 12-24 screws included with the shelf.

## DC Reference (CO) Ground

Use a #10 double-hole lug on 5/8-inch center (Not provided) to ground the DC System as shown in the figure below. The DC reference ground is connected to the DC return bus as shown below. Torque connections to 37 in-lbs. Minimum 8 gage wire is recommended for the DC reference ground.

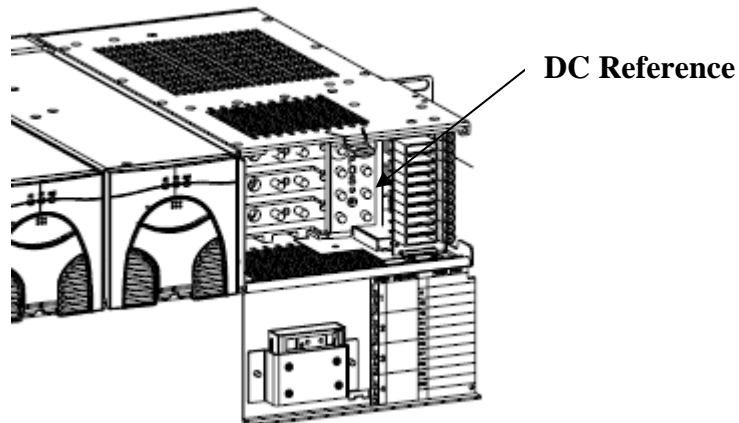


Figure 4: DC Reference Ground Connections

## AC Input Connections

Each shelf comes equipped with AC input cord(s). Connect the cord(s) plugs L5-15P or L5-20P to the appropriate mating connector.

**Caution:** Ensure ac power is OFF and use appropriate lock-out tag-out procedures before continuing with ac connections.

**Caution:** When connecting to utility source, ensure all local and national wiring rules are being complied with.

**Caution:** When routing AC cables ensure cable does not come in contact with sharp or rough surfaces that may damage insulation and cause a short circuit. Make sure cable does not come in contact with any pinch points such as doors.

## Battery String Connections

Two battery strings can be connected to the CPS6000 systems. Battery connects to the system through circuit breakers. Battery String Inputs are shown in Figure 5 below. Connections are #10-32 studs on 5/8” centers. Torque connections to 37 in-lbs. Select Lug and wire size per Table 4.

**Warning:** Batteries contain hazardous electrical energy, sulfuric acid, and explosive hydrogen gas. Follow all precautions noted in the manufacturer’s literature accompanying the batteries.

**Warning:** Mount the breakers before proceeding and make sure it is in the OFF/OPEN position prior to making any connections.

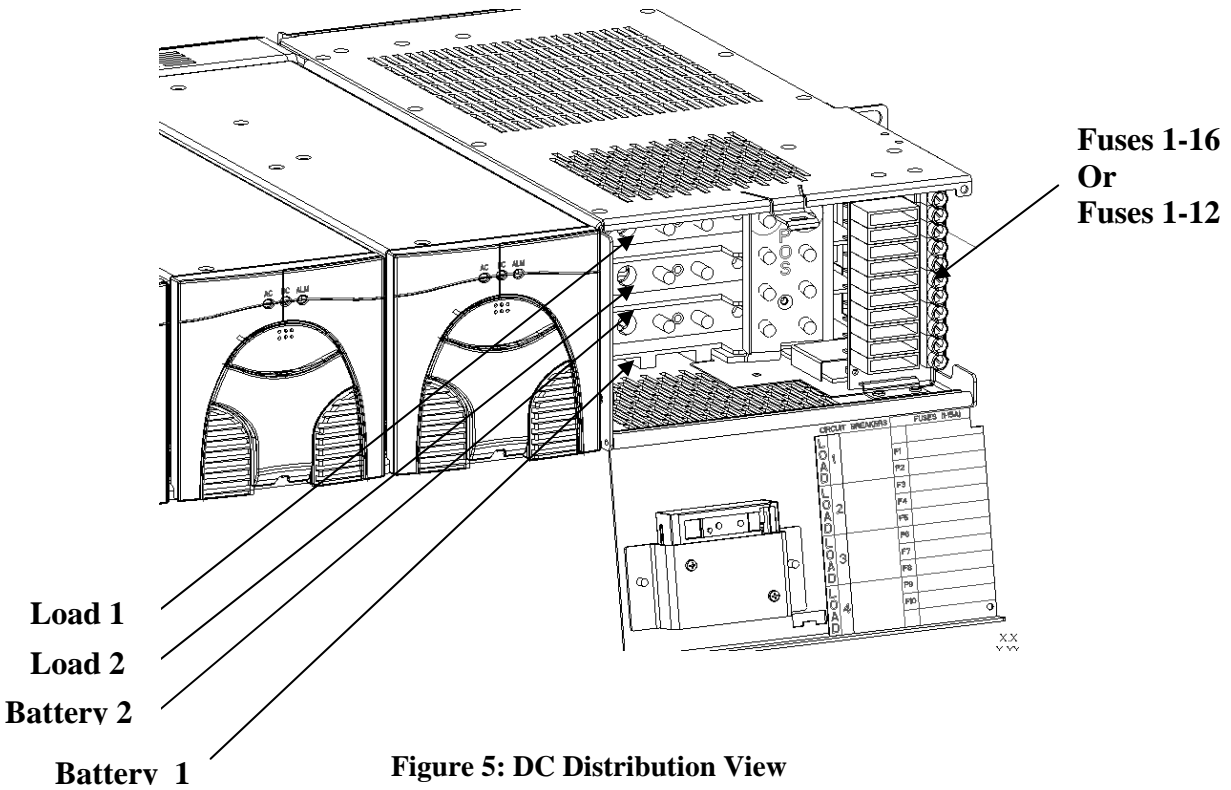


Figure 5: DC Distribution View

## DC Output Connections

DC Output consists of two load breakers and twelve or sixteen GMT fuses. All DC connections and protectors are accessible from the front. All loads are connected through a low voltage load disconnect (LVLVD). *Manual:*

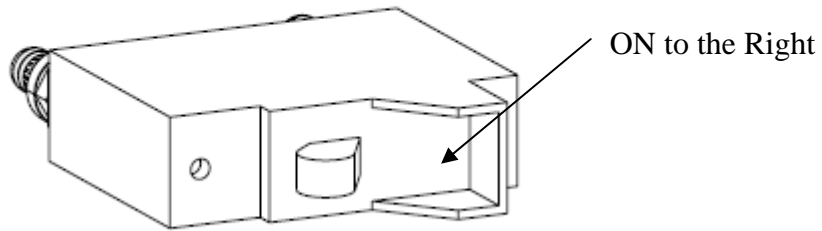
For GMT Fuse output and return connections, connect stripped wire to the terminal blocks. The output connection is to the terminal block and return connections to the bus bar block. Torque connections to 5.5 in-lbs.

For Circuit Breaker output and return connections, lug the wires according to table 4. Connections are #10-32 studs on 5/8” centers. Torque connections to 37 in-lbs

Identify all circuit breaker and fuse loads on the label located on the inside of the distribution front door.

### **Circuit Breaker Installation**

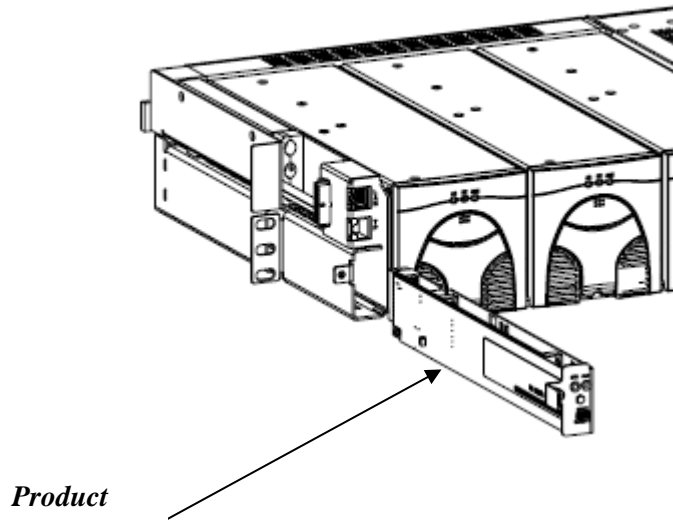
The following Figure shows the proper circuit breaker orientation in the shelf. These bullet style breakers are sold separately.



**Figure 6: Circuit Breaker Orientation**

## Controller Installation

Install the controller in the controller slot on the left side of the system. System controllers are sold separately. It is good practice to properly protect the controller against ESD discharge..

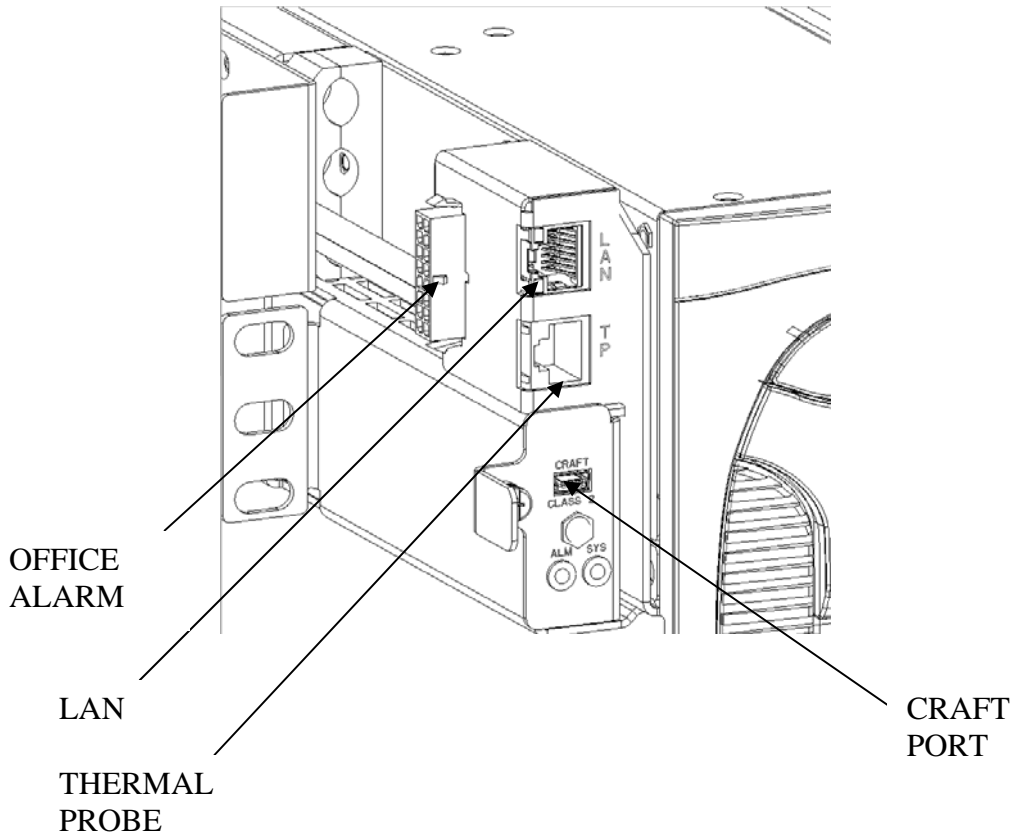


**Figure 7: Controller Installation**

## Controller Connections

The controller has user connections for:

- A) Craft (USB)
- B) Thermal Probe (RJ45)
- C) Office Alarms (Molex 16 pin 2x8)
- D) LAN (RJ45)



**Figure 8: Controller Connections**

### **Craft Port (USB) Connection**

This isolated USB serial port is used for local PC access. The software interface is compatible with Lineage Power EasyView for Windows GUI software for PCs. Software support is also provided for use with Lineage Power Galaxy Manager for web-based remote access and monitoring. You can download EasyView at [www.lineagepower.com](http://www.lineagepower.com). Click the **Downloads** button. Select **EasyView Monitoring Software**.

### **Battery Monitoring /Thermal Probe (TP) Connections**

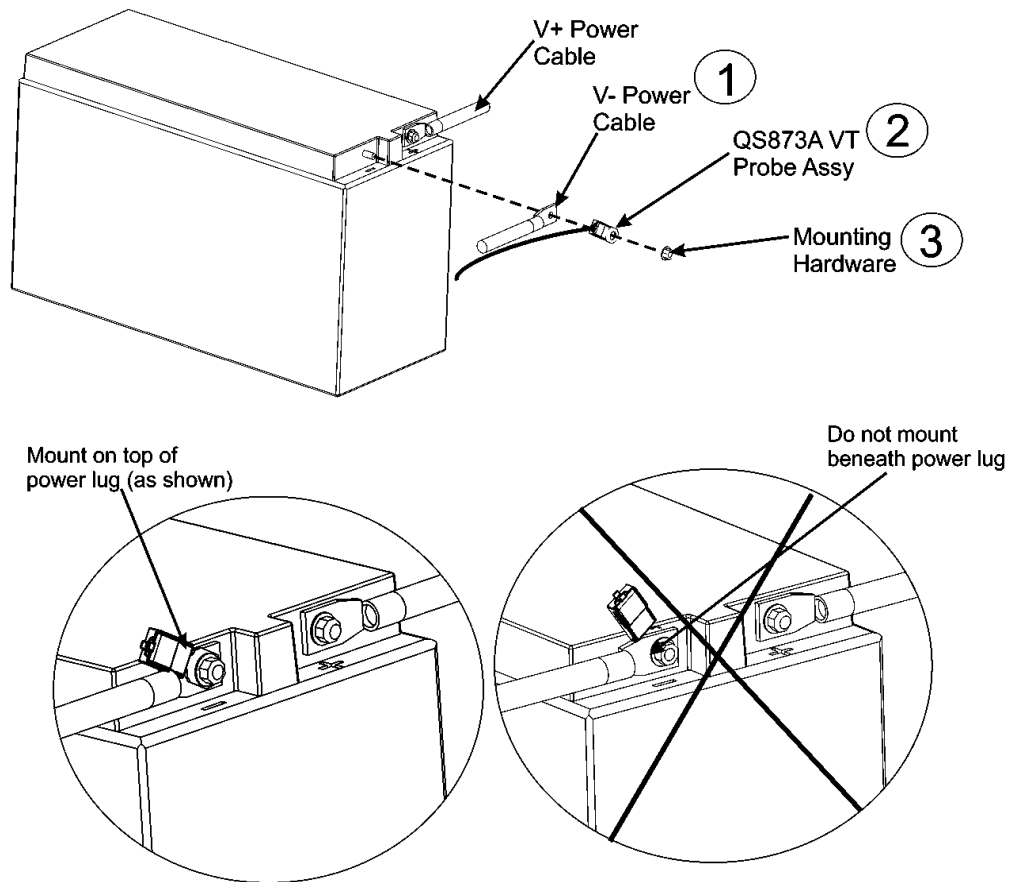
Optional QS873A VT-Probes are used to measure battery temperature for slope thermal compensation, and to measure battery voltage for battery voltage imbalance detection when the Voltage Monitoring Module 108958422 card is used. There is a maximum 18 probes.



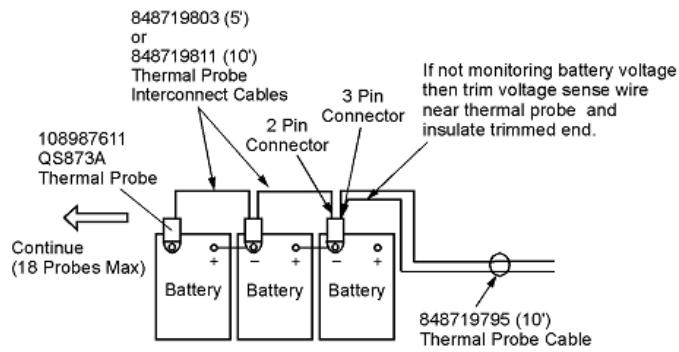
**Note: The number of probes per string is to be defined by the user. Typical installation requires 1 thermal probe in the middle of each string of batteries. The following Figures show a probe for each battery. Notice that the voltage wire is only connected at the middle of each string.**

**Note: Do not mount the VT-Probe under a lug or battery strap. The probe mounts on top of the lug or battery strap.**

**Note: Probes can be mounted prior to making the connections at the controller.**



**Figure 9: Connecting Thermal Probe Cable to the battery**



**Note:** 848719795, 848719803 and 848719811 all come with a discrete wire for Battery Voltage Sense. If not used, then trim and insulate trimmed end.

**Figure 10: Thermal-Probe Connections to Controller**

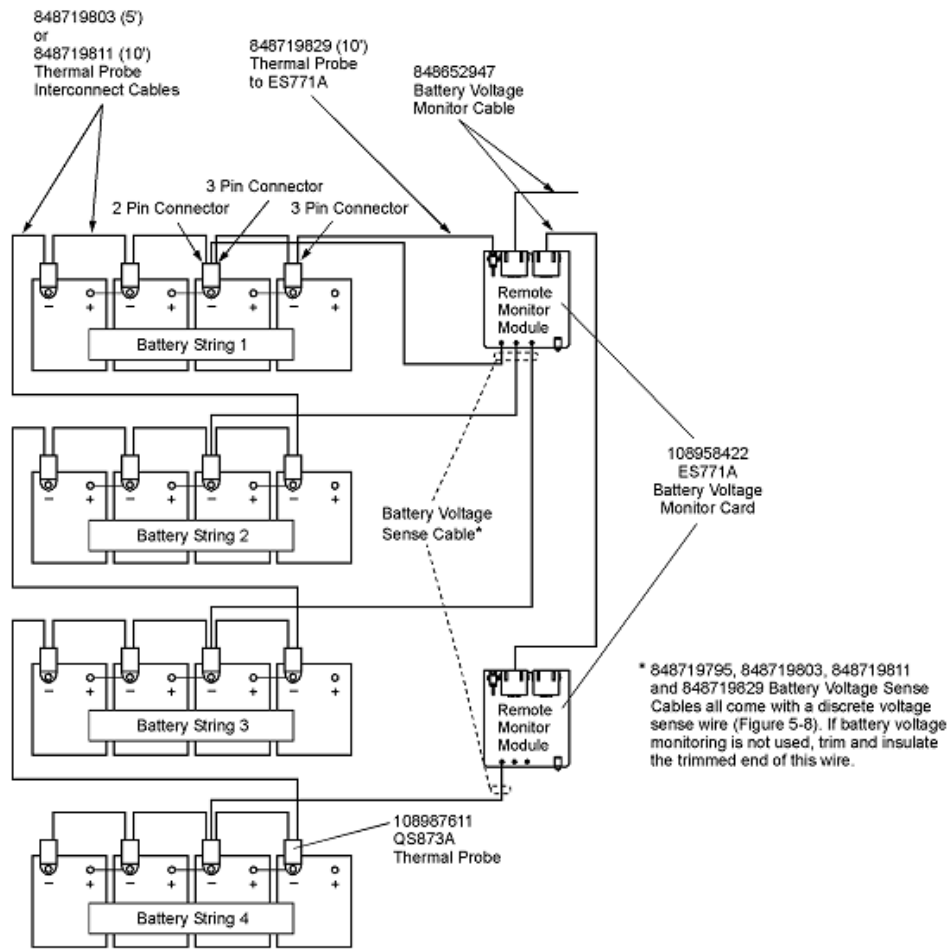
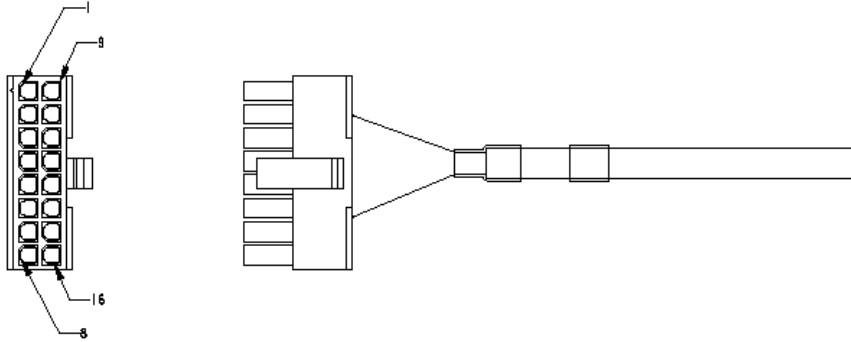


Figure 11: Thermal-Probe/Battery Voltage Monitor Connections to Controller

## Office Alarms

Office alarm connector (J1) provides access to the input and output alarm relays. Discrete wire cable assemblies of any length are available for purchase. Note the wire color and alarm descriptions in the following Figure.

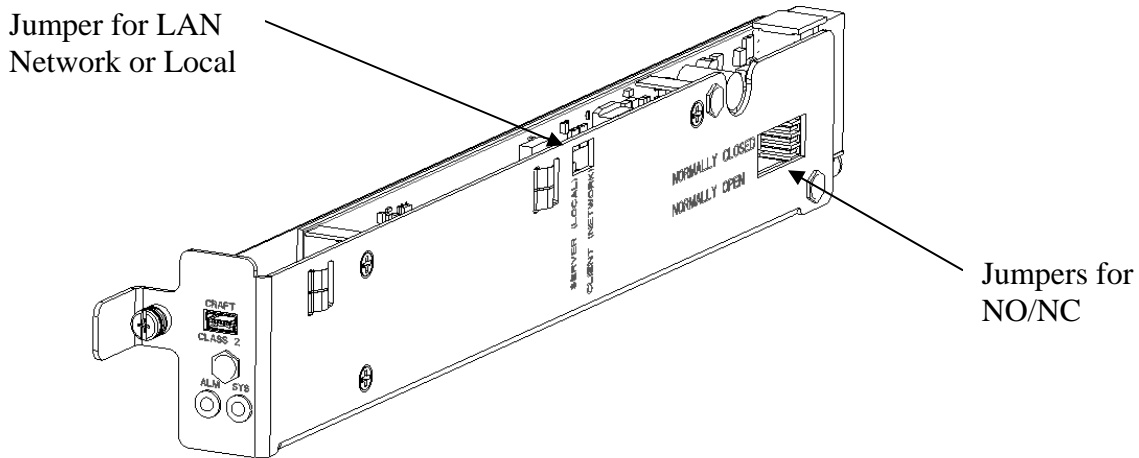


**Figure 12: J1 Office Alarm Connector**

Pos	Color	Signal	Factory Default	Software Default
1	BLACK	Input Alarm 5 (Closure to Pin 3)		
2	WHITE	Input Alarm 3 (Closure to Pin 3)		
3	RED/BLACK	System -48V for Input Alarms		
4	ORANGE	Output Alarm 5 Relay Common		
5	ORANGE/BLACK	Output Alarm 6 Relay Common		
6	RED/WHITE	Output Alarm 1 Relay Common		
7	WHITE/BLACK	Output Alarm 2 Relay Common		
8	BLUE/RED	Output Alarm 3&4 Relay Common		
9	RED	Input Alarm 8 (Closure to Pin 3)		
10	GREEN	Input Alarm 4 (Closure to Pin 3)		
11	BLUE	Alarm Relay 4 (J25 for NO/NC)	Open	
12	GREEN/BLACK	Alarm Relay 5 (J24 for NO/NC)	Open	Power Major
13	BLUE/BLACK	Alarm Relay 6 (J23 for NO/NC)	Open	Power Minor
14	GREEN/WHITE	Alarm Relay 1 (J22 for NO/NC)	Open	
15	WHITE/RED	Alarm Relay 2 (J21 for NO/NC)	Open	
16	ORANGE/RED	Alarm Relay 3 (J20 for NO/NC)	Open	

Open = Open to Common when Alarm condition exists

Closed = Closed to Common when Alarm condition exists



**Figure 13: J1 Office Alarm Connector NO/NC Jumper**

## LAN

The controller thru the LAN connection supports either remote communication or local communication using standard internet browsers. If used in the local connection mode the controller allows for direct/local communication much like the Local Port but without the use of the Easy View Software (see Local Port Section in this Manual)

When in Client (Network ) mode the controller can be contacted over the users Network internet connection. The user should contact their Network administrator for Network settings for this controller.

When in Server ( Local) mode the LAN connection can be used to directly connect the controller to a PC. If in Server ( Local ) mode and connected directly to a PC, launch the PC's internet browser and enter 192.168.2.1 in the address bar. When prompted for a password enter “super\_user”

**DO NOT** connect a controller configured as a Server ( Local ) to a Network internet connection. The factory Default hardware jumper is set to Client (Network). See Fig 13.

Display

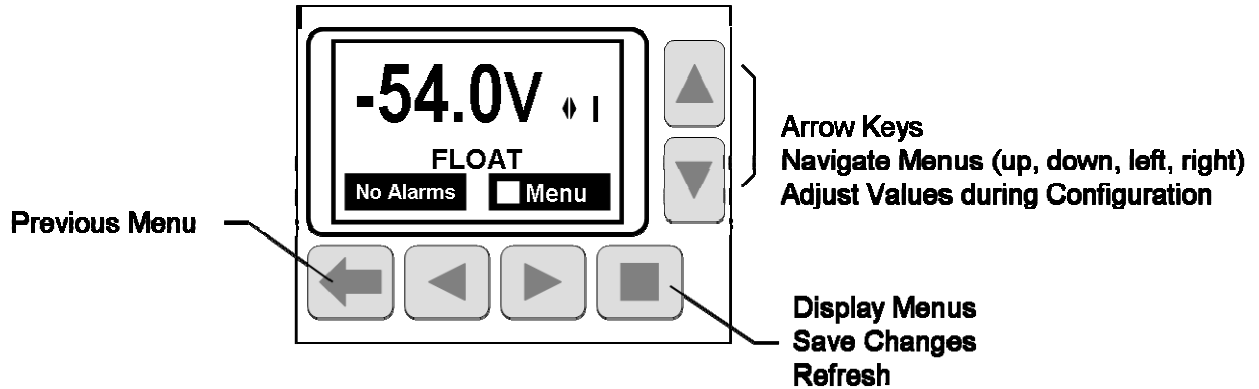


Figure 14: Controller Faceplate

The backlight of the four-line LCD display changes color to reflect the system alarm status as follows:

- Green** Normal
- Amber** Minor Alarms Present
- Red** Major Alarms Active

The up and down arrow keys can be used to adjust screen contrast when the controller is displaying the default screen. Contrast adjustment is also available through the menus at Menu>Configuration>System Settings. At the default menu, the left and right arrows are also used to toggle the display from displaying the system voltage or the system load current. Otherwise, the left and right arrow keys are used to navigate the menus and the up and down arrow keys are used to change values when configuring the system. A black box highlighting a menu item indicates that the item has sub-menus.

## Software Menus

The software is functionally divided on the Main Menu into the following categories: **Alarms, Warnings, Status, Control/Operations, History, Configuration.** The following tables show the software menu map..

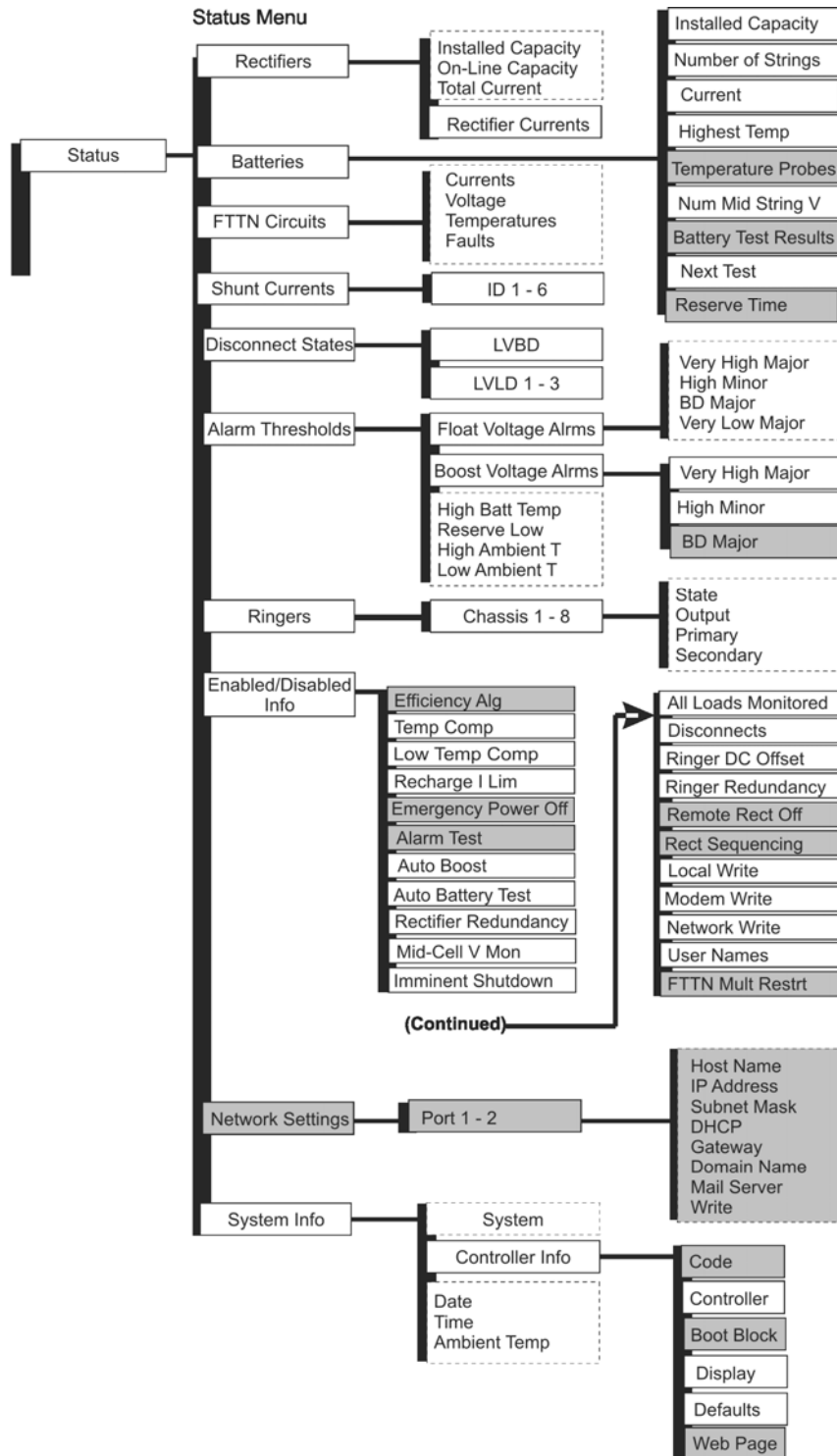


Figure 15a: Status Menu Map

Control / Operation  
and  
History Menus

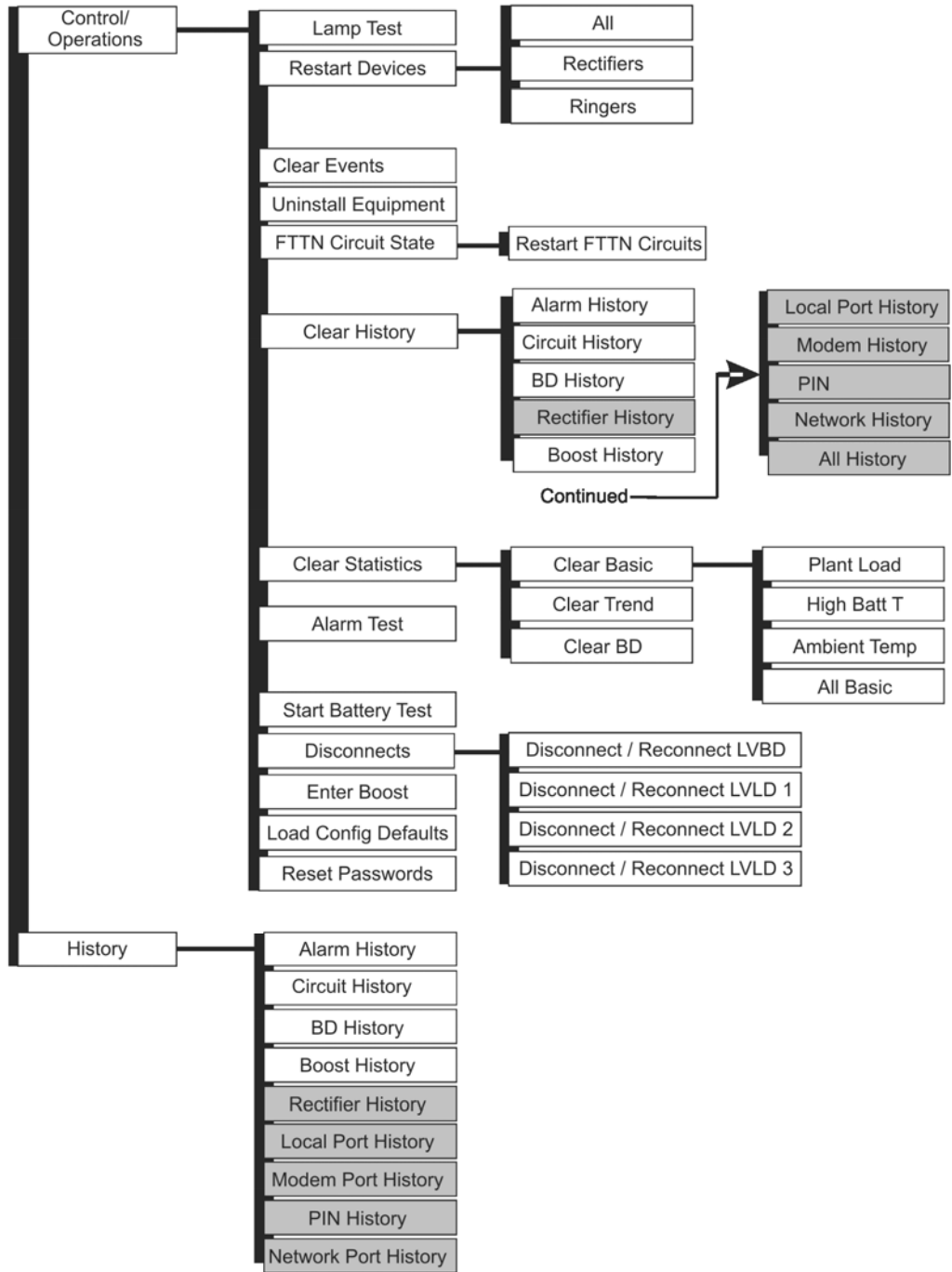
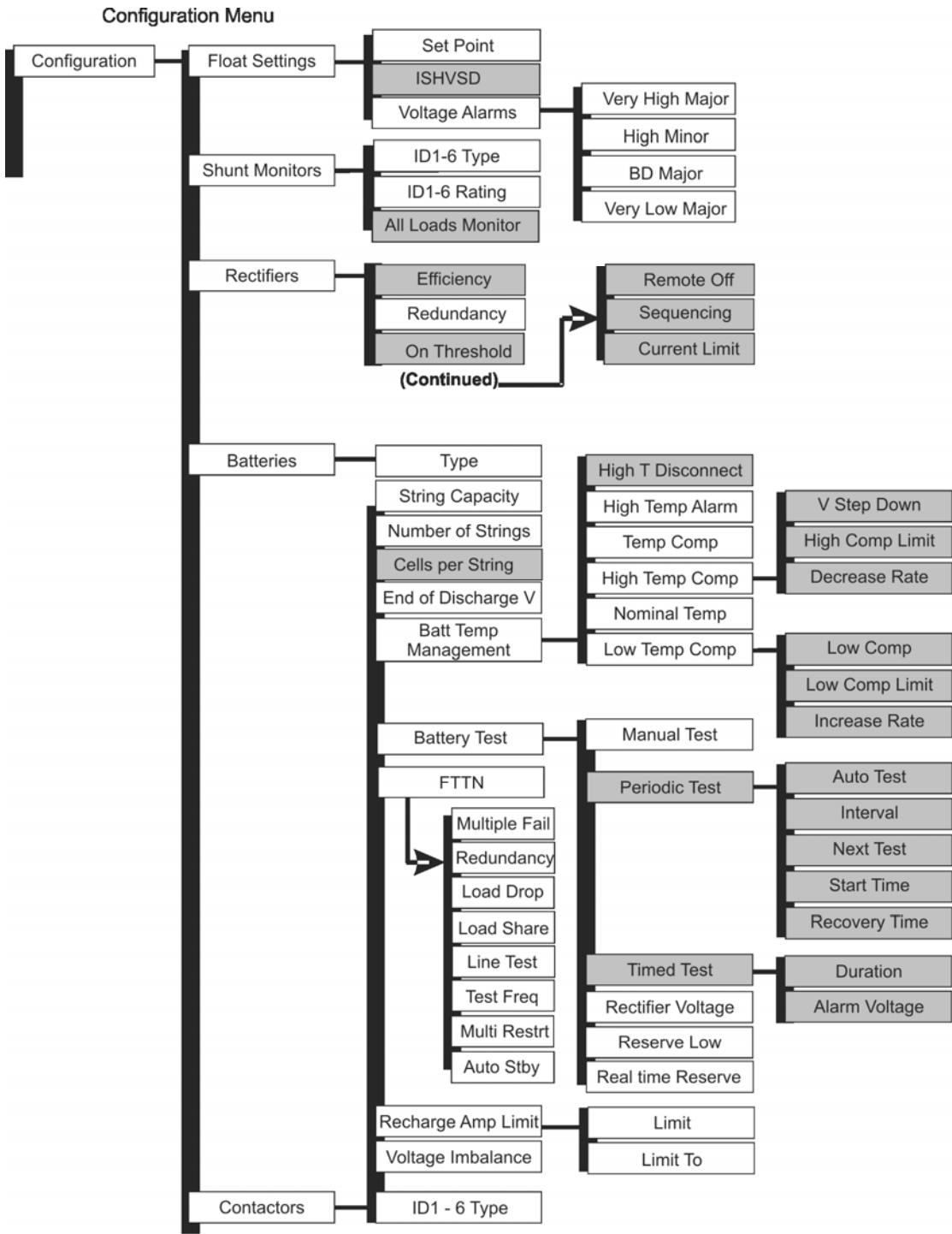


Figure 15b: Control / Operations and History Menu Map





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Next Page

Figure 15c: Configuration Menu Map (part 1)

Configuration Menu  
(continued)

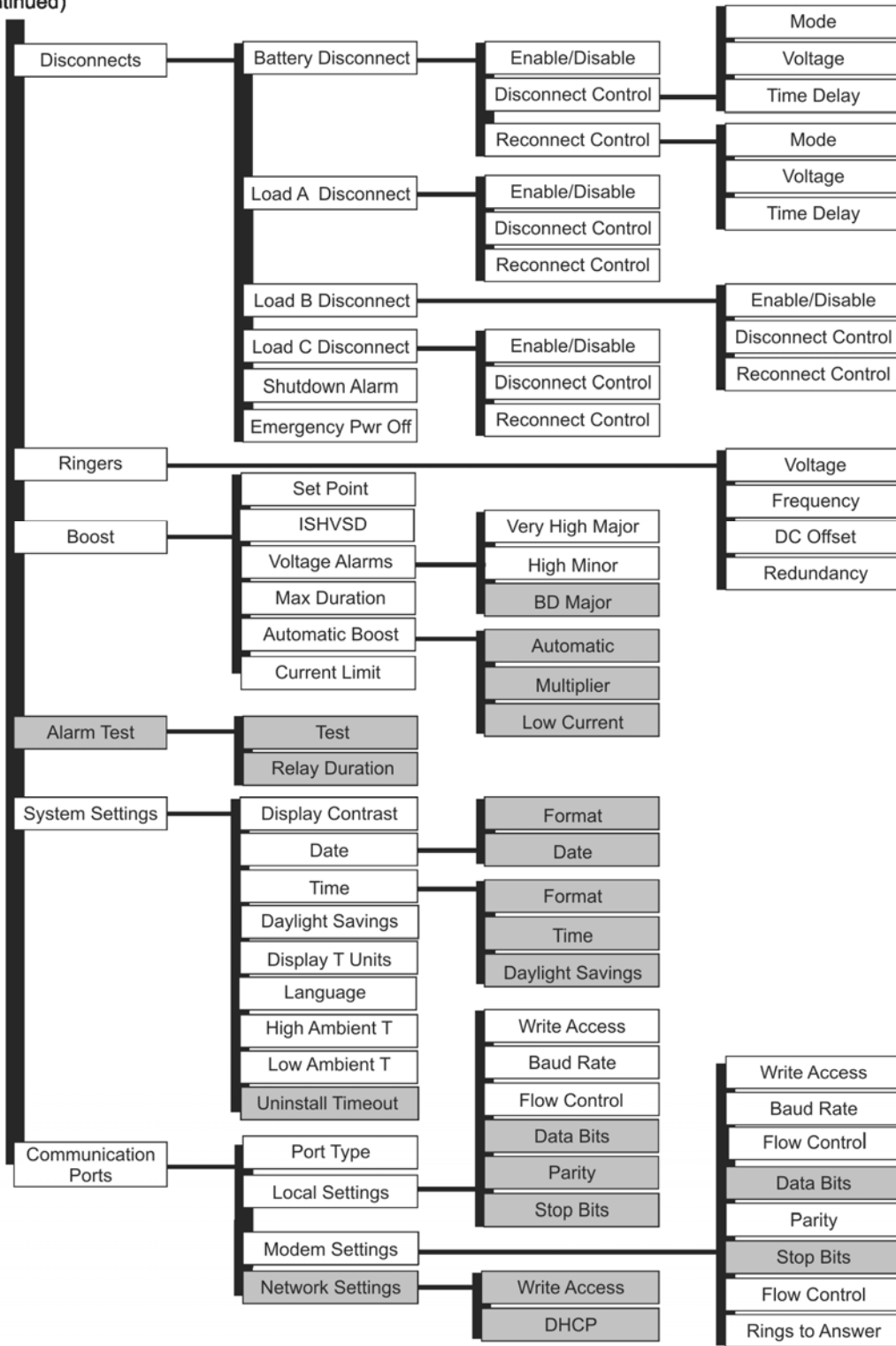


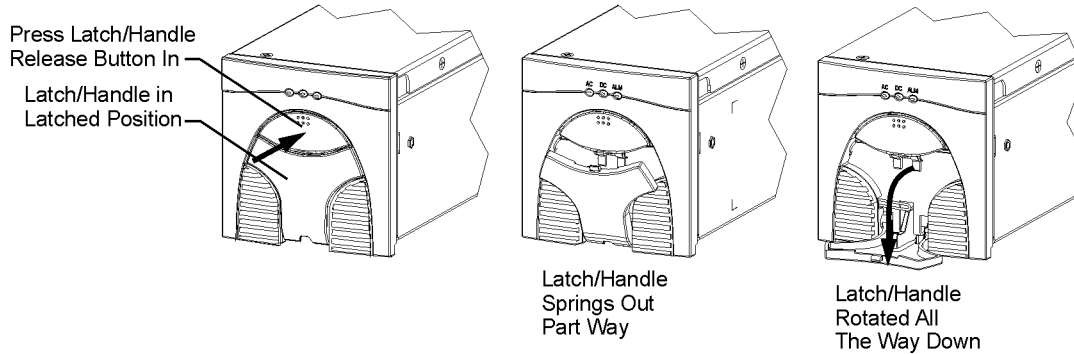
Figure 15d: Configuration Menu Map (part 2)

## Rectifier Installation

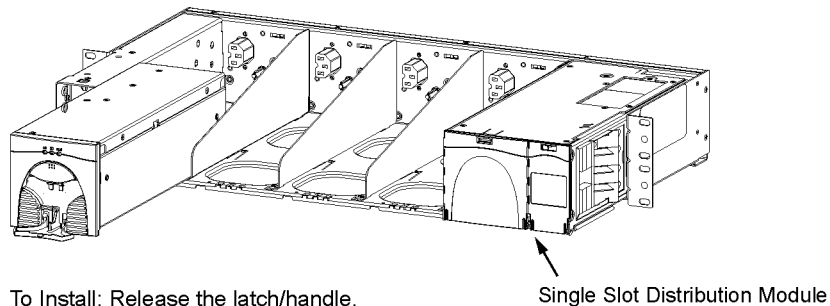
All rectifier ac and dc connections are made when rectifiers are installed in the shelf and will power up if ac is applied to the shelf.

Step	Action
1.	Before engaging the rectifier connector into the back of the rectifier slot, press the Latch release button, the latch will spring open. See Figure 16.
2.	Firmly push the rectifier into the rectifier slot until the connector on the rear of the rectifier engages with the connector at the back of the rectifier slot on the CPS shelf. The latch will pop most of the way up when the rectifier is properly seated. Push the latch up into the latched position.
3.	Repeat until all rectifiers are installed.

### Releasing the Latch Handle



### Installing / Removing the Rectifier



To Install: Release the latch/handle.  
 Push the rectifier in firmly until seated.  
 The latch/handle will pop most of the way up.  
 Push the latch/handle back into the latched position

To Remove: Release the latch/handle.  
 Push the latch/handle all the way down (shown).  
 Pull the rectifier out by the latch/handle.

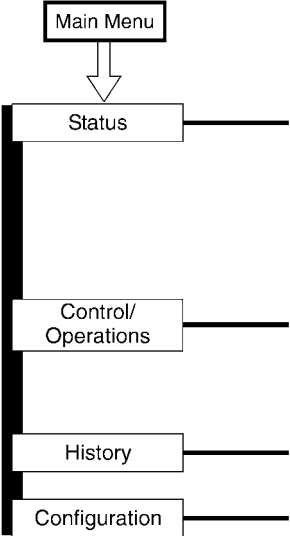
**Figure 16: Rectifier Installation**

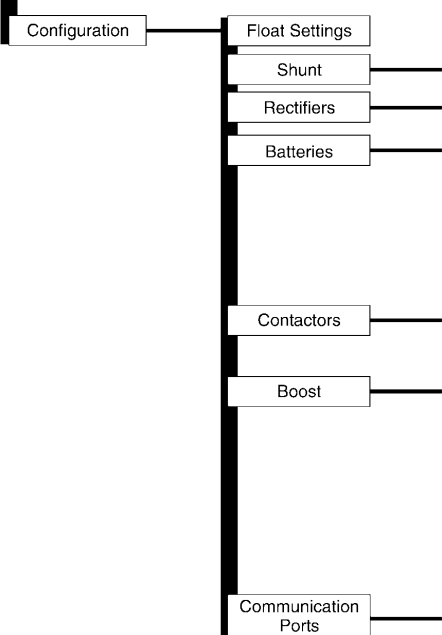
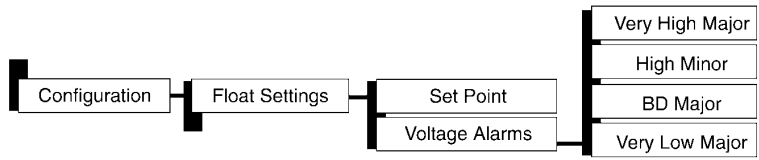
## 4 Initial Start-up

Verify that all AC, DC and Alarm connections are complete and secure. Once this is complete, the AC input breakers may be turned on. If rectifiers have not yet been installed, install rectifiers now as described in Section 3. As each rectifier is installed, the controller automatically identifies the new rectifier and begins communication.

If there are no alarms, make any adjustments to the default settings on the controller that are required for this installation. The following steps cover the minimum configuration of the controller. Refer to the controller sections in CPS6000 Manual (167-102-105) for issues like web pages, craft port and changes to settings. Most functions in software are intuitive by referring to the menu map listed in Section 3.

### Minimum Configuration

Step	Action
1.	<p>From the default screen, press the <b>Display Menu</b> key to see the Main Menu.</p> <div style="text-align: center;">  <pre> graph TD     MM[Main Menu] --&gt; B[ ]     subgraph B [ ]         S[Status]         CO[Control/Operations]         H[History]         C[Configuration]     end             </pre> </div>
2.	<p>Press the down arrow key until <b>Configuration</b> is highlighted, press the <b>Display Menu</b> key and the following selections are available; Float settings, Shunt rating, Rectifier Redundancy, Batteries, Contactors, Boost, System Settings, and Communication Ports.</p>

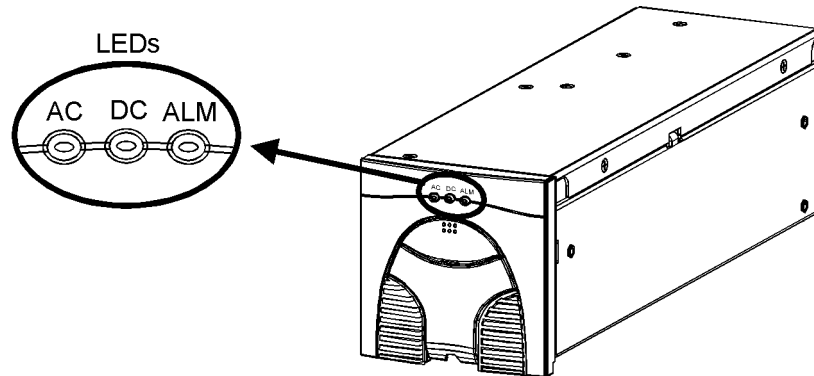
	
<p>3.</p>	<p>The <b>Float Settings</b> option will be highlighted, press the <b>Display Menu</b> key to access the Float Settings Menu.</p> 
<p>4.</p>	<p>The <b>Set Point</b> option will be highlighted. Press the <b>Display Menu</b> key to view or change the Float voltage Set Point. Use the left and right arrow keys to adjust the <b>Set Point</b> voltage. Once the Voltage has been set to the desired value Press the <b>Display Menu</b> key to save the change. The voltage range is 42.0 to 56.5 Volts. Factory default is -54.5V.</p>
<p>5.</p>	<p>Select Voltage Alarms to set the four Voltage Alarm thresholds.</p>

<b>Alarm</b>	<b>Description</b>
<p>Very High Voltage <b>Major</b></p>	<p>Alarm occurs and the unit is shut down when the system detects voltage above its set threshold. The threshold can be set from 50V to 60V in 1V increments. The factory default setting is 57V</p>
<p>High Voltage <b>Minor</b></p>	<p>Alarm indicates an abnormally high output voltage but does not shut the unit down. The alarm threshold can be set from 50V to 60V in 1V increments. The factory default setting is 56V.</p>
<p>BD (Battery on Discharge) <b>Major</b></p>	<p>Alarm occurs when the system is operating either completely or partially on battery power. The alarm threshold can be set from 46V to 55V in 0.1V increments. The factory default setting is 51.0V.</p>
<p>Very Low Voltage <b>Major</b></p>	<p>Alarm indicates an imminent system shutdown due to discharging batteries or low output voltage. Factory default -46.0V.</p>

## 5 Troubleshooting

### Rectifier Alarms

The rectifier converts ac to dc power for user equipment. This section describes the rectifier features, functions and alarms.



Three LEDs are provided, two green LEDs named AC OK and DC OK, and a red LED named Alarm. Their indications are listed below, followed by complete status descriptions.

LEDs: *= On, x=either state			
AC OK	DC OK	ALARM	Condition
*	*		Normal Operation
*			Start Up, Hiccup, Remote Standby
*		*	High Voltage Shutdown, Thermal Alarm, Internal Failure
			AC Fail, PFC Fail, Input Fuse, Missing AC, Low Input AC > 15 ms
*	Flashing		Current Limit Operation
x	x	Flashing	Communication Loss

## Troubleshooting Chart

Controller LED (Note 3)	User Interface Display	Rectifier LEDs (Note 4)			Distribution Module Board LED	Possible Problem(s)	Possible Solution(s)
		AC	DC	ALM			
None	No response.	G	G	-R-	-R-	Controller failure, all devices on the communication bus reporting loss of communication with controller.	Check controller to ensure it is properly inserted into its slot. If so, perform the following steps: 1. Remove the controller board for 1 minute and then reset. 2. If problem persists, replace controller with new controller board. 3. If problem still persists, call your local field representative.
RED	MIN, AC Fail MAJ, Multiple AC Fail MAJ, Battery on Discharge	o	o	o		Multiple rectifiers not receiving ac power, batteries are powering load. <ul style="list-style-type: none"> <li>AC input circuit breakers have opened.</li> <li>AC input voltage is out of range.</li> <li>Internal rectifier fault.</li> </ul>	1. Verify ac power to rectifiers is available. 2. Verify rectifier input circuit breakers are closed. 3. If problem is not corrected, replace rectifiers.
RED	MAJ, Battery on Discharge	G	G	o		Rectifier output voltage has fallen below the battery on discharge threshold set by the user.	If commercial ac power is present but the system voltage remains low, call your local field representative. Investigate other alarms that may be present such as rectifier related problems.
RED	MIN, Rectifier Fail MAJ, Rectifier Fail (Note 1)	G	o	R		All rectifier outputs have dropped below 36V, all rectifiers have entered hiccup mode. Defective controller.	Remove controller; if output voltage does not go to set-point previously set by user, call your local field representative.
RED	MAJ, Contactor 1 Open	G	G	o	-A-	One or both of the LVD contactors is open; someone may have manually opened LVD contactor.	Place disconnect switch in ON position.
RED	MAJ, Fuse Major	G	G	o	R	One or more of the output circuit breakers or fuses have opened.	Reset circuit breakers or replace fuse.
RED	MIN, Rectifier Fail MAJ, Multiple Rectifier Fail MAJ, Battery on Discharge	G	o	R	G	Multiple rectifier thermal alarm: Excessive ambient temperature Multiple rectifier failure	1. Verify that there is no obstruction of the vertical airflow path. 2. Reset rectifies by removing them, waiting approximately 30s and replacing them. 3. If problem persists, replace the rectifiers. 4. If problem still persists, call your local field representative.
RED	MAJ, High Voltage			G	G	High output voltage from rectifier(s) Rectifier(s) high voltage shutdown Internal rectifier(s) failure	1. Reset the rectifier(s) by removing the rectifier(s), waiting approximately 30s and replacing the rectifier(s). 2. If problem persists, replace the rectifier. 3. If problem still persists, call your local field representative.
RED	MAJ, Major Communication Fail	G	G	o	-R- (or missing LVD Board)	LVD Board lost communication with the controller.	1. Replace Distribution Module Board. (Note 2) 2. If problem persists, call your local field representative.

Controller LED (Note 3)	User Interface Display	Rectifier LEDs (Note 4)			Distribution Module Board LED	Possible Problem(s)	Possible Solution(s)
		AC	DC	ALM			
AMBER	MIN, AC Fail	o	o	o		Single Rectifier not receiving ac power. <ul style="list-style-type: none"> <li>AC input circuit breaker has opened.</li> <li>AC input voltage is out of range.</li> </ul>	1. Verify ac power to rectifier is available. 2. Verify rectifier input circuit breaker is closed. 3. If problem not corrected, replace rectifier.
AMBER	MIN, Rectifier Fail (Note 1)	G	o	o		Rectifier output has dropped below 36V, rectifier has entered hiccup mode.	Replace rectifier.
AMBER	MIN, Battery High Temperature	G	G	o		Batteries have exceeded temperature threshold set by user.	Call your local field representative.
AMBER	MIN, Thermal Probe Fail	G	G	o		Battery thermal probe failed.	1. Ensure thermal probe is properly connected to thermal probe cable. 2. Ensure cable is properly connected to the rear of the Distribution Module. 3. If problem persists, replace thermal probe per ensuing instructions. 4. If problem still persists, call your local field representative.
AMBER	MIN, Rectifier Fail	G	o	R		Single rectifier thermal alarm: Excessive ambient temperature Multiple rectifier failure	1. Verify that there is no obstruction of the vertical airflow path. 2. Reset the rectifier by removing the rectifier, waiting approximately 30 seconds, and replacing the rectifier. 3. If problem persists, replace the rectifier. 4. If problem still persists, call your local field representative.
AMBER	MIN, Minor Communication Fail (Single Rectifier signaling)			-R-		Rectifier lost communication with controller.	1. If a rectifier has been removed from an installed/operational system, go to the Control/Operations menu and execute Uninstall Equipment. 2. Reset the rectifier by removing the rectifier, waiting approximately 30 seconds, and replacing. 3. If problem persists, replace the rectifier. 4. If problem still persists, call your local field representative.



## 6 Product Warranty

A. Seller warrants to Customer only, that:

- 1 As of the date title to Products passes, Seller will have the right to sell, transfer, and assign such Products and the title conveyed by Seller shall be good;
- 2 During the warranty period stated in Sub-Article B below, Seller's Manufactured Products (products manufactured by Seller), which have been paid for by Customer, will conform to industry standards and Seller's specifications and shall be free from material defects;
3. With respect to Vendor items (items not manufactured by Seller), Seller warrants that such Vendor items, which have been paid for by Customer, will be free from material defects for a period of sixty (60) days commencing from the date of shipment from Seller's facility.

B. The Warranty Period listed below is applicable to Seller's Manufactured Products furnished pursuant to this Agreement, commencing from date of shipment from Seller's facility, unless otherwise agreed to in writing:

### Warranty Period

Product Type	New Product	Repaired Product
Central Office Power Equipment	24 Months	6 Months

\* The Warranty Period for a repaired Product or part thereof is six (6) months or, the remainder of the unexpired term of the new Product Warranty Period, whichever is longer.

C. If, under normal and proper use during the applicable Warranty Period, a defect or nonconformity is identified in a Product and Customer notifies Seller in writing of such defect or nonconformity promptly after Customer discovers such defect or nonconformity, and follows Seller's instructions regarding return of defective or nonconforming Products, Seller shall, at its option attempt first to repair or replace such Product without charge at its facility or, if not feasible, provide a refund or credit based on the original purchase price and installation charges if installed by Seller. Where Seller has elected to repair a Seller's Manufactured Product (other than Cable and Wire Products) which has been installed by Seller and Seller ascertains that the Product is not readily returnable for repair, Seller will repair the Product at Customer's site.

With respect to Cable and Wire Products manufactured by Seller which Seller elects to repair but which are not readily returnable for repair, whether or not installed by Seller, Seller at its option, may repair the cable and Wire Products at Customer's site.

- D. If Seller has elected to repair or replace a defective Product, Customer shall have the option of removing and reinstalling or having Seller remove and reinstall the defective or nonconforming Product. The cost of the removal and the reinstallation shall be borne by Customer. With respect to Cable and Wire Products, Customer has the further responsibility, at its expense, to make the Cable and Wire Products accessible for repair or replacement and to restore the site. Products returned for repair or replacement will be accepted by Seller only in accordance with its instructions and procedures for such returns. The transportation expense associated with returning such Product to Seller shall be borne by Customer. Seller shall pay the cost of transportation of the repaired or replacing Product to the destination designated by Customer.
- E. Except for batteries, the defective or nonconforming Products or parts which are replaced shall become Seller's property. Customer shall be solely responsible for the disposition of any batteries.
- F. If Seller determines that a Product for which warranty service is claimed is not defective or nonconforming, Customer shall pay Seller all costs of handling, inspecting, testing, and transportation and, if applicable, traveling and related expenses.
- G. Seller makes no warranty with respect to defective conditions or nonconformities resulting from actions of anyone other than Seller or its subcontractors, caused by any of the following: modifications, misuse, neglect, accident, or abuse; improper wiring, repairing, splicing, alteration, installation, storage, or maintenance; use in a manner not in accordance with Seller's or Vendor's specifications or operating instructions, or failure of Customer to apply previously applicable Seller modifications and corrections. In addition, Seller makes no warranty with respect to Products which have had their serial numbers or month and year of manufacture removed, altered, or experimental products or prototypes or with respect to expendable items, including, without limitation, fuses, light bulbs, motor brushes, and the like. Seller's warranty does not extend to any system into which the Product is incorporated. This warranty applies to Customer only and may not be assigned or extended by Customer to any of its customers or other users of the Product.

THE FOREGOING WARRANTIES ARE EXCLUSIVE AND ARE IN LIEU OF ALL OTHER EXPRESS AND IMPLIED WARRANTIES, INCLUDING BUT NOT LIMITED TO WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. CUSTOMER'S SOLE AND EXCLUSIVE REMEDY SHALL BE SELLER'S OBLIGATION TO REPAIR, REPLACE, CREDIT, OR REFUND AS SET FORTH ABOVE IN THIS WARRANTY.