PRODUCT MANUAL

CPS6000-48V Indoor/Outdoor Power Shelf

Product Manual
Select Code 167-102-105

This document is relevant to the following equipment series:

Controllers: QS840A 1:1 E App version 1.9 and defaults version Std-1.0

QS841A 1:0D App version 1.4.1 and defaults version Std-1.0

Rectifiers:	**Series**
15A	QS861A 1:1F
20A	QS852A 1:0E
25A	QS853A 1:0A
25/30A	QS862A 1:1H
40A	QS864A 1:0E
50A	QS865A 1:1E

Notice:

The information, specifications, and procedures in this manual are subject to change without notice. OmniOn Power assumes no responsibility for any errors that may appear in this document.

PRODUCT MANUAL

CPS6000-48V Indoor/Outdoor Power Shelf

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1 Introduction

Overview

CPS6000 -48V Outdoor Power System is a modular power system designed for 19-inch (483mm) and 23-inch (584mm) applications where reliability, space conservation and environmental considerations are critical. This highly dense power system occupies minimum space and its modular architecture enables an exact fit to custom needs.

The shelf architecture is based on the widely accepted and acclaimed CPS4000 systems. AC power is brought in on the left side of the shelf. The first slot on the left side is occupied by the controller. DC Output is aggregated on the right side of the shelf. Rectifiers/Ringers occupy the slots available between the controller and the DC output

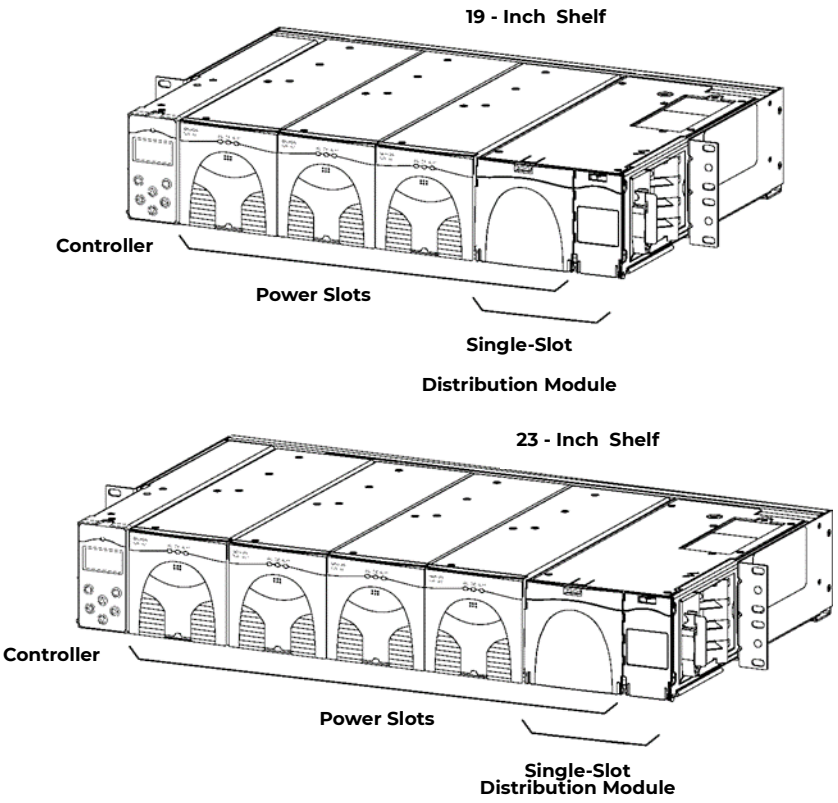

Figure 1-1: CPS6000 System with Distribution Module

The CPS6000 currently supports -48V primary loads up to 8.2kW of N+1 redundant power in a single 19-inch shelf, and up to 10.9kW of N+1 redundant power in a 23-inch shelf with a Bulk Output Module and 50A rectifiers.

CPS6000 systems may include up to 4 bulk-output shelves: an Initial shelf with controller, and up to three supplemental shelves. External distribution is used with multi-shelf systems.

Ringer Chassis may be installed in Power Slots. Each Ringer Chassis supports one ringing output in either non-redundant (simplex) or 1 + 1 redundant (duplex) operation. Ringer distribution is direct from the Ringer Chassis.

Applications

CPS6000 fits Outside Plant (OSP) applications, digital loop carrier, remote switch, fiber in the loop, cable television cabinets, Intelligent Vehicle Highway System (IVHS), Personal Communications Service (PCS), cellular, and customer premises applications.

Customer Service Contacts

Customer Service, Technical Support, Product Repair and Return, and Warranty Service

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 is still available, but for emergencies only. Services provided through this contact include initiating the spare parts procurement process, ordering documents, product warranty administration, and providing other product and service information.

For other customers worldwide the 800 number may be accessed after first dialing the OmniOn Direct country code for the country where the call is originating, or you may contact your local field support center or your sales representative to discuss your specific needs.

Customer Training

OmniOn Power offers customer training on many Power Systems products. For information call 1-972-284-2163. This number is answered from 8:00 a.m. until 4:30 p.m., Central Time Zone (Zone 6), Monday through Friday.

Downloads and Software

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2 Product Description

CPS6000 System Overview

CPS6000 power systems are comprised of shelves, rectifiers, ringer chassis, ringers, and distribution modules. Several types of distribution modules are available. The Bulk Output Module provides connection to an external distribution without consuming a shelf power slot.

The CPS6000 is available as single-shelf systems and multiple-shelf systems with both 19- inch and 23-inch shelves.

Single Shelf Systems

- With Distribution Module: all components contained in single shelf.
- With Bulk Output Module: uses external distribution, accommodates all other components within the shelf.

Multi-Shelf Systems

- With Bulk Output Module: uses external distribution, accommodates all other components within the shelves.

AC power is supplied to the rectifiers which produce regulated -48V dc output voltage. This voltage is used to power all other system components including ringers, the system controller and the LVD boards. Batteries are connected to distribution, internal or external. Some Distribution Modules provide battery circuit breakers. Single-Slot and Double-Slot Distribution Module options include GMT-style fuses and bullet-style circuit breakers.

Ringer Chassis may be installed in Power Slots. Each Ringer Chassis supports one ringing output in either non-redundant (simplex) or 1 + 1 redundant (duplex) operation. Ringer distribution is direct from the Ringer Chassis. Ringers power ringing signaling outputs and are powered by -48V_{dc}.

The batteries are monitored by the system controller to ensure their peak performance and longevity against thermal issues. They are monitored via the Voltage/Thermal Probes (VT- Probes), which are connected from the Distribution Module to the battery.

The Remote Voltage Monitor (RVM) module may be used with the VT-Probes in making voltage measurements for battery string-voltage imbalance detection. Additional VT-Probes may used by connecting them in a daisy-chain fashion.

The system controller monitors all system parameters and performs battery management functions. It communicates with all devices using the RS-485 bus. The RVM and VT-Probe communicate with the controller using the 1-Wire® from Maxim Integrated Products, Inc.

The LVBD contactor is used to connect the battery strings to the main power bus. Under ac fail conditions, the battery current will be flowing through the contactor to the output distribution in supporting the load. To prevent deep discharge of batteries, the CPS6000 can disconnect the batteries from the load by opening the LVBD contactor.

CPS6000 also offers an optional low voltage load disconnect (LVLD) contactor. Non-critical loads and loads sensitive to low voltages can be connected to the system via the LVLD in the Distribution Module. CPS6000 disconnects these loads at a set threshold during a battery discharge. This reduces drain on the batteries and extends reserve time available for critical loads.

With the Bulk Output Module, a supplementary shelf may be paralleled to the primary shelf to create a larger plant. Only the primary shelf would contain the system controller. The supplementary shelf only requires signal connections to the primary shelf, and power connections to an external distribution panel. The controller can monitor for open protectors, current from a battery shunt, and monitor and control a low voltage disconnect contactor via the Remote Distribution Module (RDM).

Block Diagrams

2-1a and 2-1b are basic block diagrams of the CPS6000 System in a single shelf with a Distribution Module. Figure 2-2 shows the Bulk Output Module in place of the Distribution Module.

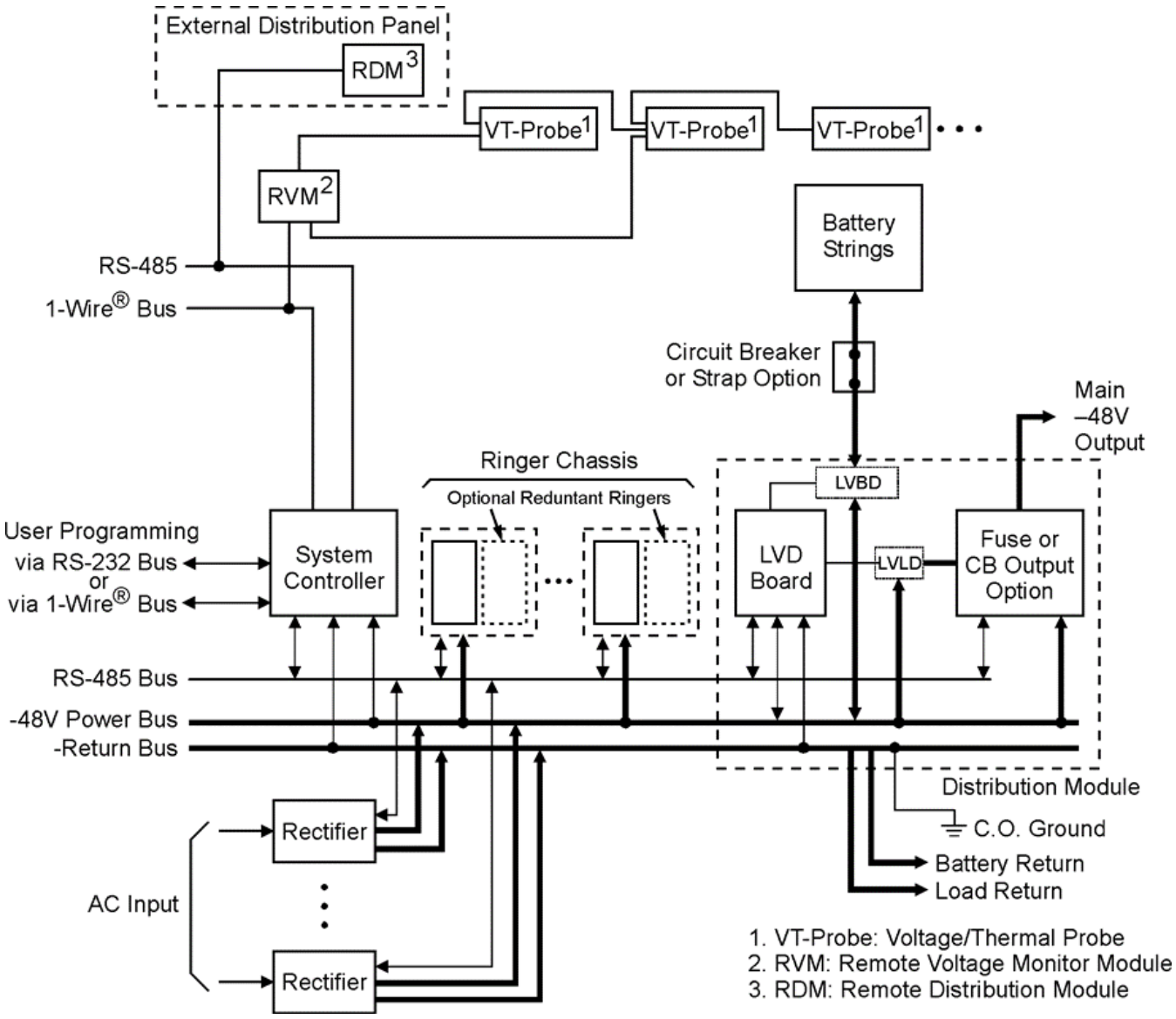


Figure 2-1a: CPS6000 System with Distribution Module

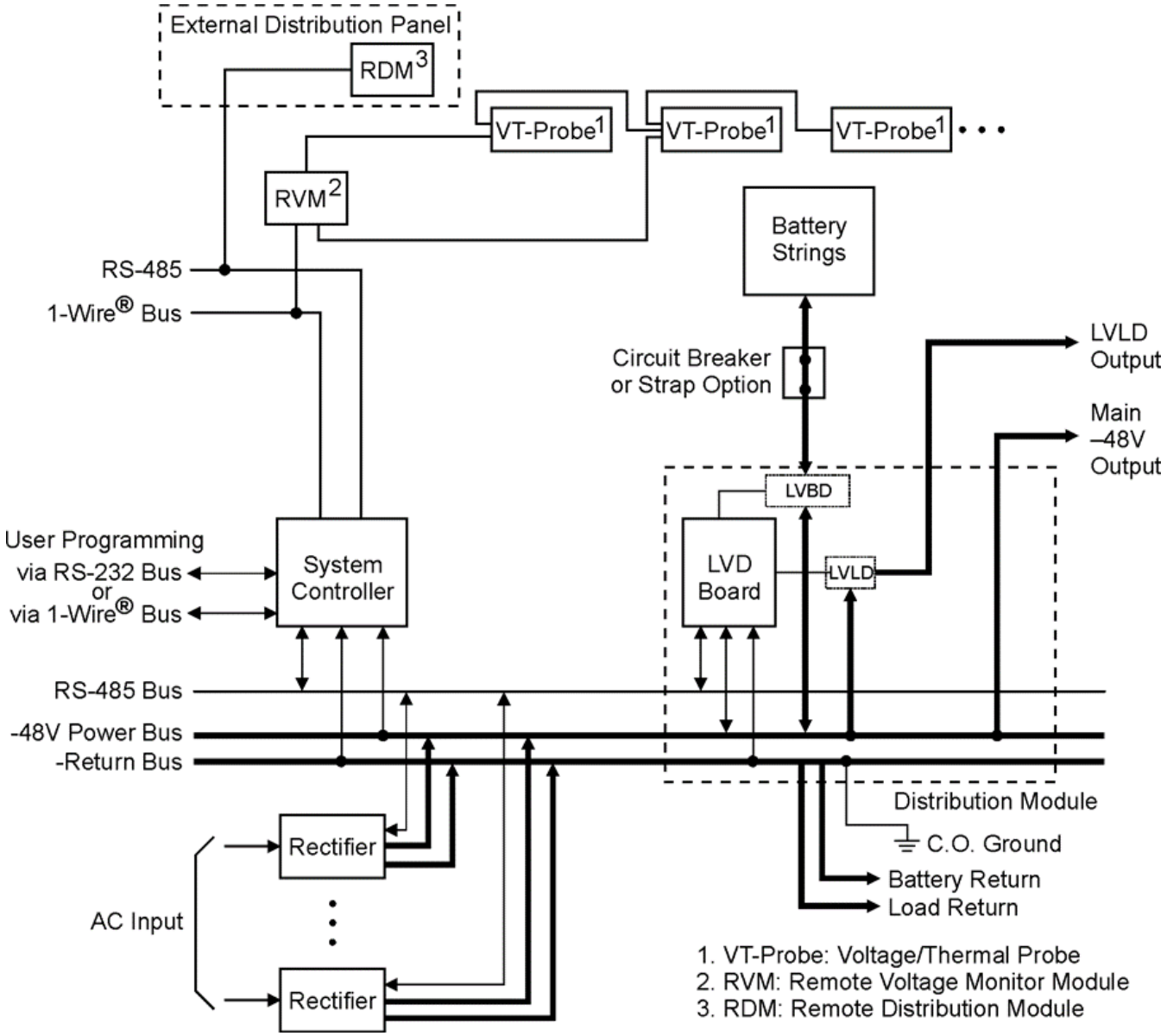


Figure 2-1b: CPS6000 System with Distribution Module

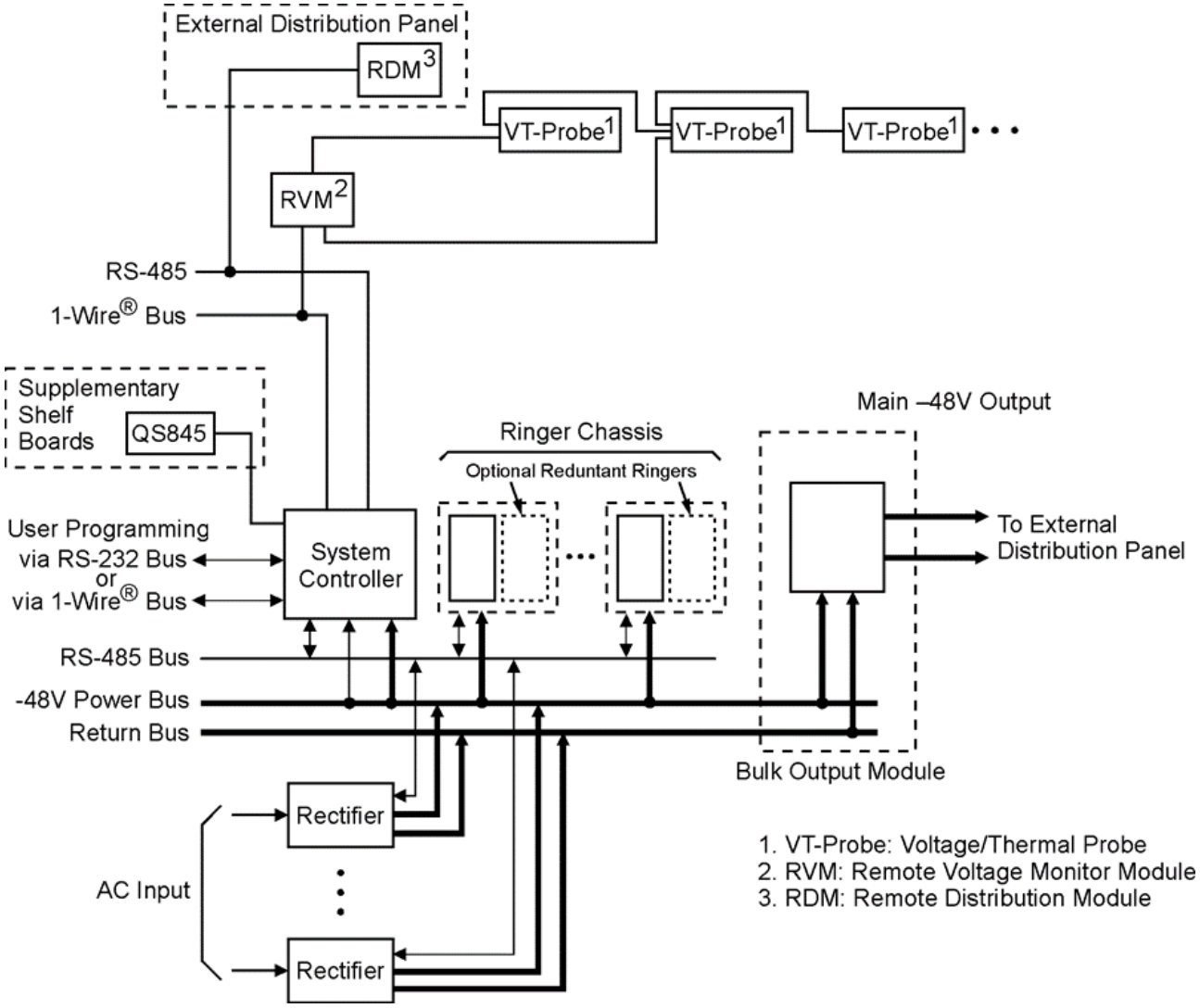


Figure 2-2: CPS6000 System with Bulk Output Module

Shelf Design

Features

- The shelf is available in 19-inch (phase 2) and 23-inch standard widths and has the following features:
- Accepts plug-in rectifier, ringer and Distribution Modules.
- 19-inch shelves provide 4 Power Slots
- 23-inch shelves provide 5 Power Slots
- Rectifiers, Ringer Chassis, and Distribution Modules may be installed in Power Slots. Permits growth of plant capacity and easy maintenance without service interruption

Configurations

The 19-Inch Shelf provides four Power Slots.

The 23-Inch Shelf provides five Power Slots.

Power Slots support Rectifiers, Ringer Chassis, and Distribution Modules. Figure 2-3 shows the show the locations of the CPS6000 components in the19-inch and 23-inch shelves with the Single-Slot Distribution Module.

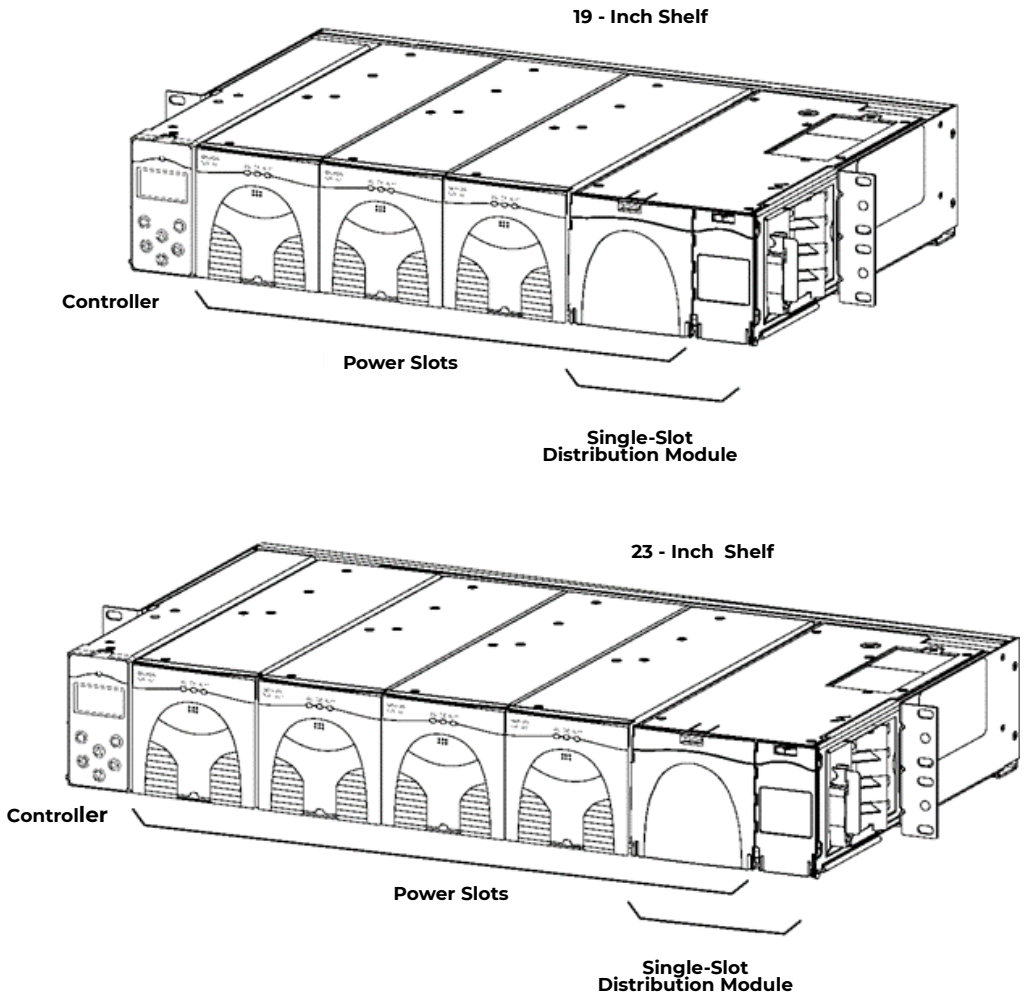


Figure 2-3: CPS6000 Systems with Single-Slot Distribution Module

Distribution and Power Module Configurations

The 19-inch shelf has four Power Slots, and the 23-inch shelf has five Power Slots for power modules (Rectifiers and up to two Ringer Chassis) and distribution options (See 2- 4). With Bulk Output Distribution only, all slots are available for power modules. The Single-Slot Distribution Module occupies the right-most Power Slot, and the Double-Slot Distribution Module occupies the right-most two Power Slots, leaving the remaining Power Slots available for power modules. Up to two Ringer Chassis can be installed in the right-most remaining Power Slots.

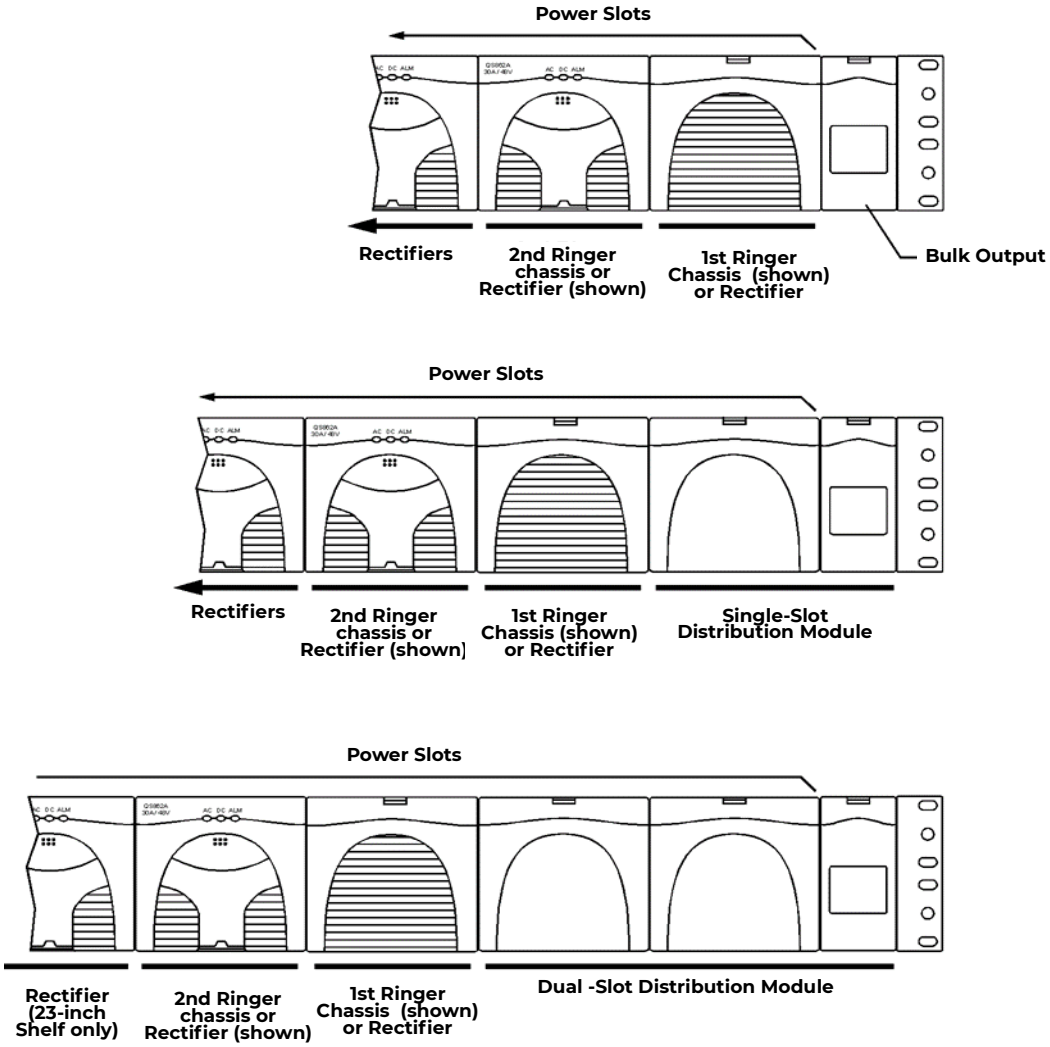


Figure 2-4: Distribution and Power Module Configurations

Battery Reserve System

Introduction

A battery reserve system is a key component for a reliable power system. The CPS6000 provides a primary voltage of -48V_{dc} that drives load equipment. At the same time, it provides float and recharge capability for the battery reserve system. If an ac power failure occurs, the batteries provide power to the load equipment until the ac can be restored.

Types of Batteries

CPS6000 may be used with valve-regulated lead-acid (VRLA) batteries. Up to four strings of VR-type batteries or equivalent general trade batteries may be connected directly to a CPS6000 shelf.

Certain Nickel-Cadmium (Ni-Cd) and Lithium-Ion batteries may also be used with the CPS6000. Please contact your sales representative for details. CPS6000 is also compatible to Flooded lead-acid batteries.

See Appendix D for detailed descriptions of battery related functions; float and boost charging, thermal compensation, and system battery test functions

Specifications

Shelf	Single 19-inch or 23-inch shelf		
Power Slots per Shelf	4 (19-inch shelf), 5 (23-inch shelf)		
Power Units Installed Position[5]	Unit	Max. per Shelf	Power Slots Each
Installed from the Right	Bulk Output Module	1	0
Bulk Output Module	Single-Slot Distribution Module	1	1
Distribution Module	Double-Slot Distribution ModuleRinger Chassis	1	2
Ringer Chassis		2	1
	Rectifiers (19-inch shelf)	4	1
Installed from the Left	(23-inch shelf)	5	1
Rectifiers			
Rectifier Input Distribution	Dual ac input (19 and 23-inch shelves) Individual ac input (19 and 23-inch shelves)Single ac input (19 and 23-inch shelves)		
System Architecture	Primary output: 1 primary output power bus per shelf		
Primary Power Bus Current with Bulk Output Module	19-inch shelf: 227A 23-inch shelf: 283A		
Output Distribution Primary Bus	Battery connections: double-hole lugs to terminate battery strings.		
Bulk Output Module	-48 V_{dc} bulk power outputs to loads or distribution		
Single-Slot and Double-Slot Distribution Modules	• Bullet-style circuit breakers • GMT-style fuses See Note 2.		
Maximum Discharge Current	Based on rectifier capacity. See Note 2		
Maximum Recharge Current	Installed shelf –48V rectifier capacity minus plant –48V load		
Operating Ambient Temperature	-40 to 75°C (-40 to 167 °F), see Note 3		
Altitude	-200 to 13,000 feet (-61 to 3962 meters). See Note 4		
Humidity	10% to 95% non-condensing		
Audible Noise	< 60 dBA		
Radiated and Conducted Emissions	FCC Part 15, Class B EN55022 (CISPR22), Class B		
Harmonics	EN61000-3-2 (IEC61000-3-2)		
Voltage Fluctuations	EN61000-3-3 (IEC61000-3-3)		
Electromagnetic Immunity	Meets Telcordia GR-1089-CORE		
Electrostatic Discharge	EN61000-4-2 Level 3		
RF Immunity	IEC61000-4-3 Level 3, 10 V/m		
EFT	IEC61000-4-4 Level 3, No Error; Level 4, No Damage		
Surge	IEC 61000-4-5 Level 3, No Error; Level 4, No Damage		
Conducted Immunity	IEC 61000-4-6 Level 3, 10V		
Voltage Dips, Interruptions, and Variations	IEC 61000-4-11		
Earthquake Rating	Zone 4, upper floors		
Safety Agency Approval	Underwriters Laboratories (UL) Listed per Subject Letter 1801:Power Distribution Center for Communications Equipment, and cUL Certified (CSA 22.2 950): Safety of Information Technology Equipment		
	VDE licensed to VDE0805/EN60950		

Table 2-A: CPS6000 System Specifications

	Rectifiers are individually UL Recognized (UL1950), cUL Certified (CSA 22.2 234) or evaluated to EN60950 by an EC Notified Body, as appropriate.
European Economic Community (EEC)Directives	EMC Directive 89/336/EEC Low Voltage Directive 73/23/EEC as amended by Marking Directive 93/68/EEC

Note 1: CPS6000 can be used with four strings of batteries depending on Distribution Module

Note 2: When used with Single-Slot and Double-Slot Distribution Modules, maximum output is limited to 200A or the size of the LVD contactor installed (if smaller). See Section 3 for limitations on maximum currents through Distribution Modules.

Note 3: Operating temperatures and required airflow are different when used with specific rectifiers. See Tables 2-D through 2-F for rectifier information.

Note 4: For altitudes above 5000 feet, derate the temperature by 3.6 °F per 1000 feet. For altitudes above 1524 meters, derate the temperature by 0.656 degrees Celsius per 100 meters.

Note 5: Power Unit Install Positions:

- Install these units in order beginning with the right most Power Slot

First: Distribution Module

Second: Ringer Chassis

- Install these units in order beginning with the left most Power Slot

First: Rectifiers

Table 2-A: CPS6000 System Specifications (continued)

Installation Category

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 can not 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.

	Height in. (mm)	Width in. (mm)	Depth in. (mm)	Weightlb (kg)
Rectifier	3.41 (86.6)	3.4 (86.3)	11.2 (284.5)	5.75 (2.6)
Ringer Chassis	3.41 (86.6)	3.4 (86.3)	11.2 (284.5)	3.45 (1.6)
Ringer	2.4 (61.0)	1.51 (38.4)	9.9 (252)	1.25 (0.6)
19-Inch Shelf	3.41 (86.6)	17.37 (441.2)	12 (304) - front access 13.25 (337)- rear access	7.5 (3.41)
23-Inch Shelf	3.41 (86.6)	20.95 (532.1)	12 (304) – front access 13.25 (337)- rear access	12.7 (5.77)
Single-Slot Distribution Module	3.41 (86.6)	5.1 (129.5)	12 (304)	9 (4.1)
Double-Slot Distribution Module	3.41 (86.6)	8.5 (216)	12 (304)	TBM
Bulk Output Module	3.41 (86.6)	1.59 (40.4)	12 (304)	4 (1.8)
23-Inch Frame Mounting Requirements	Standard 23 and 26-inch relay racks: Vertical mounting centers: 1.0 in. (25 mm) and 1.75 in.(44 mm) Horizontal mounting centers: 22.32 in. (567 mm)			
19-Inch Frame Mounting Requirements	Standard 19-inch relay racks: Vertical mounting centers: 1.0 in. (25 mm) and 1.75 in.(44 mm) Horizontal mounting centers: 18.31 in. (465 mm)			

Table 2-B: CPS6000 Physical Specifications

Control Unit	QS840A / QS841A
Nominal Output Voltages	48/52/54.5 V_{dc}
Operating Voltage Range	42 to 58 V_{dc}
Maximum Output Current	200A per 19-inch shelf; 250A per 23-inch shelf
(see Note 1)	
Nominal Input Voltage	100/120/200/208/240 V_{ac}
Input Voltage Ranges	85 to 275 Vac
Max Nominal Input Current per Rectifier (basedon 25A rectifier for low line ac, and 50A rectifier for high line ac)	13A at 120 V_{ac} 14.5A at 208 V_{ac}
Boost Voltage	48 to 58 V_{dc}
Output Voltage Regulation	±0.5%
Output Noise: Ripple Wideband Noise	100 mVrms maximum, 10 Hz to 20 MHz < 250 mV pk-pk over the range dc to 100 MHz
Load Share Accuracy	1.5A (maximum) for QS862A
Maximum Discharge Current (see Note)	227A per 19-inch shelf; 284A per 23-inch shelf
Maximum Recharge Current	Installed rectifier capacity minus plant load
Low-Voltage Disconnect	39 to 50 V_{dc}
Low-Voltage Reconnect	39 to 55 V_{dc}
Heat Dissipation	177W (604 BTU) per QS862A at full load and 120 V_{ac} operation; 132W (450 BTU) per QS861A rectifier at fullload and 120 V_{ac} operation;

Table 2-C: CPS6000 Shelf Specifications

Heat Dissipation	212W (724 BTU) per QS862A at full load and240 V_{ac} operation; 130W (445 BTU) per QS861A rectifier at fullload and 240 V_{ac} operation; 267W (911 BTU) per QS865A rectifier at fullload and 240 V_{ac} operation;
Power Factor	> 0.98 for loads > 50% of full load

Table 2-C: CPS6000 Shelf Specifications (continued)

Note: Maximum current is based on Bulk Output Module and 50A QS865A rectifier. System capacity will decrease with lower rated rectifiers.

Power Slots Available for Rectifiers or Ringer Chassis

	Distribution Module		
Shelf	**None (Bulk Output Module)**	**Single-Wide**	**Double-Wide**
19-Inch Shelf	4	3	2
23-Inch Shelf	5	4	3

Power Slots Available for Rectifiers or Ringer Chassis

Rectifiers

Nominal Output Voltage	48/52/54.5 V_{dc}
Operating Output Voltage Ranges	42 to 58 V_{dc}
Boost Voltage	48 to 58 V_{dc}
Output Current	0 to 15A at 54.5V
Nominal Input Voltage	100/120/200/208/240 V_{ac} (Shutdown from 135 to 150V)
Input Voltage Ranges	85 to 275 V_{ac}
Input Current	8A at 120 V_{ac} 4.4A at 208 V_{ac}
Operating Frequency Range	45 to 66 Hz
Operating Temperature	-40 to +75 °C
Output Voltage Regulation	±0.5%
Output Noise, Ripple	250 millivolts peak to peak maximum, over therange dc to 100 MHz
Load Share Accuracy	1.5A maximum deviation between rectifiers
Heat Dissipation (per rectifier, full load)	132W (450 BTU) at 120 V_{ac} operation 130W (445 BTU) at 240 V_{ac} operation
Power Factor	>0.99 (low-line), >0.98 (high line)
Selective High-Voltage Shutdown	Above 58 V_{dc}
Backup High-Voltage Shutdown	Above 60 V_{dc} for 1 millisecond

Table 2-D: QS861A Rectifier Specifications

Nominal Output Voltage	48/52/54.5 V_{dc}
Operating Output Voltage Ranges	42 to 58 V_{dc}
Boost Voltage	48 to 58 V_{dc}
Output Current	0 to 20A at 54.5V
Nominal Input Voltage	1200/208/240 V_{ac}
Input Voltage Ranges	150 to 275 V_{ac}
Input Current	6A at 208 V_{ac}

Table 2-E: QS852A Rectifier Specifications

Operating Frequency Range	45 to 66 Hz
Operating Temperature	-40 to +75°C
Output Voltage Regulation	±0.5%
Output Noise, Ripple	250 millivolts peak to peak maximum, over the range dc to 100 MHz
Load Share Accuracy	1.5A maximum deviation between rectifiers
Heat Dissipation (per rectifier, full load)	133 W (454 BTU) at 240 V_{ac} operation
Power Factor	>0.98 (high line)
Selective High-Voltage Shutdown	Above 58 V_{dc}
Backup High-Voltage Shutdown	Above 60 V_{dc} for 1 millisecond

Table 2-E: QS852A Rectifier Specifications (continued)

Nominal Output Voltage	48/52/54.5 V_{dc}
Operating Output Voltage Ranges	42 to 58 V_{dc}
Boost Voltage	48 to 58 V_{dc}
Output Current	0 to 25A at 54.5V (100/120 V_{ac})
Nominal Input Voltage	200/208/240 V_{ac}
Input Voltage Ranges	150 to 275 V_{ac} (Shutdown from 135 to 150V)
Input Current	7.4A at 208 V_{ac}
Operating Frequency Range	45 to 66 Hz
Operating Temperature	-40 to +75 °C
Output Voltage Regulation	±0.5%
Output Noise, Ripple	250 millivolts peak to peak maximum, over the range dc to 100 MHz
Load Share Accuracy	1.5A maximum deviation between rectifiers
Heat Dissipation (per rectifier, full load)	212W (724 BTU) at 200 to 240 V_{ac} operation
Power Factor	>0.98 for loads > 50% full load
Selective High-Voltage Shutdown	Above 58 V_{dc}
Backup High-Voltage Shutdown	Above 60 V_{dc} for 1 millisecond

Table 2-F: QS853A Rectifier Specifications

Nominal Output Voltage	48/52/54.5 V_{dc}
Operating Output Voltage Ranges	42 to 58 V_{dc}
Boost Voltage	48 to 58 V_{dc}
Output Current	0 to 25A at 54.5V (100/120 V_{ac}) 0 to 30A at 54.5V (200/240 V_{ac})
Nominal Input Voltage	100/120/200/208/240 V_{ac}
Input Voltage Ranges	85 to 275 V_{ac} (Shutdown from 135 to 150V)
Input Current	13A at 120 Vac 8.8A at 208 V_{ac}
Operating Frequency Range	45 to 66 Hz
Operating Temperature	-40 to +75°C
Output Voltage Regulation	±0.5%
Output Noise, Ripple	250 millivolts peak to peak maximum, over the range dc to 100 MHz
Load Share Accuracy	1.5A maximum deviation between rectifiers
Heat Dissipation (per rectifier, full load)	177W (604 BTU) at 100 to 120 V_{ac} operation 212W (724 BTU) at 200 to 240 V_{ac} operation
Power Factor	>0.98 for loads > 50% full load
Selective High-Voltage Shutdown	Above 58 V_{dc}
Backup High-Voltage Shutdown	Above 60 V_{dc} for 1 millisecond

Table 2-G: QS862A Rectifier Specifications.

Nominal Output Voltage	48/52/54.5 V_{dc}
Operating Output Voltage Ranges	42 to 58 V_{dc}
Boost Voltage	48 to 58 V_{dc}
Output Current	0 to 40A at 54.5V
Nominal Input Voltage	200/208/240 V_{ac}
Input Voltage Ranges	150 to 275 V_{ac}
Input Current	11.8A at 208 V_{ac}
Operating Frequency Range	45 to 66 Hz
Operating Temperature	-40 to +75°C
Output Voltage Regulation	±0.5%
Output Noise, Ripple	250 millivolts peak to peak maximum, over therange dc to 100 MHz
Load Share Accuracy	1.5A maximum deviation between rectifiers
Heat Dissipation (per rectifier, full load)	240W (819 BTU) at 240 V_{ac} operation
Power Factor	>0.98 for loads > 50% full load
Selective High-Voltage Shutdown	Above 58 V_{dc}
Backup High-Voltage Shutdown	Above 60 V_{dc} for 1 millisecond

Table 2-H: QS864A Rectifier Specifications (Preliminary)

Nominal Output Voltage	48/52/54.5 V_{dc}
Operating Output Voltage Ranges	42 to 58 V_{dc}
Boost Voltage	48 to 58 V_{dc}
Output Current	0 to 50A at 54.5V
Nominal Input Voltage	200/208/240 V_{ac}
Input Voltage Ranges	150 to 275 V_{ac}
Input Current	14.5A at 208 V_{ac}
Operating Frequency Range	45 to 66 Hz
Operating Temperature	-40 to +65°C
Output Voltage Regulation	±0.5%
Output Noise, Ripple	250 millivolts peak to peak maximum, over therange dc to 100 MHz
Load Share Accuracy	1.5A maximum deviation between rectifiers
Heat Dissipation (per rectifier, full load)	267W (911 BTU) at 240 V_{ac} operation
Power Factor	>0.98 for loads > 50% full load
Selective High-Voltage Shutdown	Above 58 V_{dc}
Backup High-Voltage Shutdown	Above 60 V_{dc} for 1 millisecond

Table 2-I: QS865A Rectifier Specifications

Input Voltage		-40 to -57 V_{dc} See Output VA Thermal Limiting.
Nominal Input Voltage		-48 V_{dc}
Input Current		5 A max.
Output Voltage	ac Component	65 to 100 V_{ac} Factory Default: 100Vac
	ac tolerance	± 5 V_{ac}
	Regulation	±5% ac component only
	dc Offset Type of ringing Battery Backed Ground Backed Ground Backed no-dc	• -40 to +57 Vdc Battery Backed • ·+40 to +57 V_{dc} Ground Backed • 0 V_{dc} Offset Disabled • dc Offset tracks dc Input Voltage • Factory Default: Enabled • Battery or Ground Backed is selected by Ringer Chassis jumper J12 or by external connection of Ring Rtn to Battery or to Ground. Factory Default:Battery Backed by Jumper See figures in the Ringer section.
	dc Offset Tracking Error	± 3 V_{dc}
	Harmonic Distortion	5% THD
	Crest Factor	1.21 to 1.51
Output Frequency		15 to 50 Hz Factory Default: 20 Hz
	Frequency tolerance	± 1 Hz
Output VA		100 VA
	Thermal Limiting	Output VA may be reduced by reducing Vac when operating simultaneously above 50°C and less than -50V_{dc} input. Vac is reduced only sufficiently to prevent damage to the ringer.
Load Power Factor		Operating: 0.5 Leading to 0.9 Lagging No Damage: 0 Leading to 0.7 Lagging
Operating Temperature		-40 to +75 °C See Output VA Thermal Limiting.
Heat Dissipation		50 W (170 BTU / hr)
Under Voltage Shutdown		50% of Output V_{ac} Set Point While shutdown due to external fault, restart will be performed at approximately 2 minute intervals.

Table 2-J: QS820A Ringer Specifications

Operating Input Voltage Range	38 to 60 V_{dc}
Input Power	6.0 watts maximum
Plant Parameter Setting	Through front panel LCD display and menu keys or with IBM compatible PC with RS-232 port. 841 also has 10/100 Baset-T network ability
Alarm Contact Ratings	60 V_{dc}, 0.5A, Form-C
Operating Temperature	-40 to +75 °C

Table 2-K: QS840A and QS841A Control Unit Specifications

Operating Input Voltage Range	Input power through QS840A or QS841A
Plant Parameter Setting	None, communicates with shelf components QS840A/QS841A
Alarm Contact Ratings	None
Operating Temperature	-40 to +75 °C

Table 2-L: QS845A Supplementary Board Specifications

3 Engineering and Ordering

Engineering Information

Introduction

This section discusses the factors to be considered in determining the number of rectifiers and ringers required in both non-redundant and redundant battery plants.

Rectifier Sizing (Non-Redundant Systems)

In non-redundant systems, the installed rectifier capacity of the battery plant must be sufficient to provide the current required for the load during normal operations as well as the current required to recharge the battery following ac power outages.

For the telecommunications industry, the system load current is known as the average busy- hour current. (The average busy-hour current drain is defined as the average busy-hour current drain during busy season with the plant operating at the normal voltage.) Therefore, the minimum installed rectifier capacity (mirc) is the sum of the average busy-hour (abh) current and the required battery recharge current, or

mirc = abh + recharge current

The battery recharge current is determined by two system considerations: the maximum time the system is required to operate in the absence of ac power (reserve time), and the time allocated to recharge the battery after ac power returns. These two times and Figure 3-1 may be used to determine the recharge factor. This factor, when multiplied by the average busy- hour current, determines the minimum installed rectifier capacity, or:

mirc = abh x recharge factor

The mirc divided by the individual rectifier capacity determines the number of rectifiers (of equal capacity) required for a non-redundant system.

Rectifier Sizing (Redundant Systems)

In redundant systems, a spare on-line rectifier is included so that the loss of any one rectifier will not cause the available plant capacity to fall below the required minimum installed rectifier capacity. Thus, the loss of a rectifier will not affect the normal system operation nor will it cause the batteries to discharge, and will allow the batteries to recharge in the required time.

In cases where the additional spare rectifier will provide the required battery recharge current, the mirc satisfies the requirements for both non-redundant and redundant systems. In other cases, rectifiers in addition to the redundant rectifier may be required to provide the battery recharge current. Typically, the number of spare rectifiers required for a redundant system is the larger of one spare rectifier or 200% of the rated load.

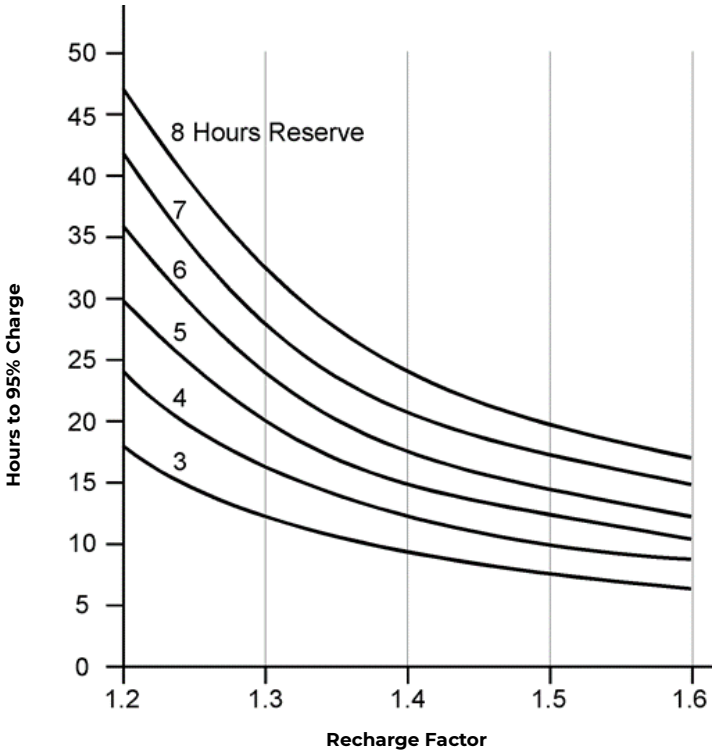


Figure 3-1: Recharge Factor vs. Recharge Time

Plant Configuration Examples

1. To illustrate the relationships between mirc, abh current drains, the recharge factor, and battery recharge current for non-redundant and redundant systems, consider the following examples. Note that the QS862A rectifier provides 25A at 54.5 V_{dc} (100-120 V_{ac}) and 30A at 54.5 V_{dc} (200-240V_{ac}).

   A battery plant is required to provide a load current of 50 amperes, have an 8-hour discharge time (reserve time) and recharge to 95% of battery capacity in 24 hours. Determine the number of rectifiers required for non-redundant systems.

   From Figure 3-1, the recharge factor is 1.38.

   mirc = abh x recharge factor

   mirc = 50 x 1.38 = 69 amperes

   For low line ac using QS862A 25A (100-120 Vac) rectifiers, three rectifiers (69/25 = 2.76) are required to provide the minimum installed capacity of 69 amperes for a non- redundant system. If one rectifier fails, the remaining rectifiers will provide the abh capacity.

2. An alternate method to calculate the number of rectifiers necessary is to utilize power. In the above example, the requisite current is 50A. As most battery plant loads are looking into constant-power loads, the 50A would increase as the battery voltage decreases during battery discharge. Assuming the 50A is the current being drawn from the load at the plant float voltage of 54.5V, the total power being drawn by the load is 2725W (54.5V x 50A).

   We can utilize the recharge factors from Figure 3-1 and use a modified mirc formula,

   therefore:

   mirc = power x recharge factor

   mirc = 2725W x 1.38 = 3761W

   In this high line ac example using QS862A 1635W (200-240 Vac) constant power rectifiers, three rectifiers (3761/1635 = 2.3) are needed to support the load and recharge the batteries within the requisite time.

Ordering Information

Ordering Guide

An ordering guide may be downloaded from the OmniOn Power web site. This guide will augment the information found here.

Note: Ordering information here is presented only from the viewpoint of miscellaneous item ordering and may not be complete. Complete System ordering should done using the ordering guide only.

Comcodes

The CPS6000 can be ordered by 9-digit numeric character sets called comcodes. The following guides you through the comcode selection process in creating a power system. Please refer to the product description section on the individual components for more details.

Power Shelves

Shelves are available in 23-inch (584 mm) and 19-inch (483 mm) rail widths. Mounting hardware is provided. Refer to Ordering Guide for other shelf types.

Baffle

A 1U tall baffle is available to mount between shelves, below the shelf or above the shelf. See Appendix F for application information.

Distribution Modules

The Platform has standard single slot, dual slot, front bulk and rear bulk output module options. An external 23” distribution panel is also available for systems with the bulk output. Battery breakers are available in lieu of the battery straps. However, maximum current allowed through each battery breaker is 50A instead of the 100A through the battery strap. For load breakers in a single slot distribution module, a max of two 60A load breakers can be used. If only a single breaker is used in the topmost position, a 70A breaker may be used.

Office Alarm Cable

WARNING

Disconnect alarm cable before cutting it to length. Cutting the alarm cable while it is plugged into the controller will damage the controller.

A cable assembly is available that mates to the host-interface connector on the controller allowing access to alarms. This cable is terminated on one end with a connector that mates to the Distribution Module host-interface connector, and un-terminated on the other end. Refer to the ordering guide for cable lengths available.

Distribution Module Circuit Breakers

The following bullet-style circuit breakers, which have been accepted for use in dc load and battery applications, are available for the current Distribution Module. These breakers only alarm for a trip condition. For a single slot distribution module, a max of two 60A load breakers can be used. If only a single breaker is used in the topmost position, a 70A breaker may be used.

Size (Amps)	Ordering code
3	407998137
5	407998145
10	407998152
15	407998160
16	407998178
20	407998186

Size (Amps)	Ordering code
25	407998194
30	407998202
45	407998210
50	407998228
60	407998236
70	407998244

Some versions of the distribution module accept breakers that alarm for trip or open condition. The Ordering codes for such breakers are provided below. These breakers can ONLY be used with specific distribution modules

Size (Amps)	Ordering code
3	CC408606834
5	CC408606842
10	CC408606850
15	CC408606867
20	CC408606875
25	CC408606883

Size (Amps)	Ordering code
30	CC408606891
40	CC408606900
45	CC408606917
50	CC408606925
60	CC408606933

Caution - Please check the type of breaker the distribution module accepts before using the above Ordering codes

Pluggable Strap

Size(Amps)	Ordering code
100A Pluggable Strap	CC109106548

Distribution Module GMT Fuses

The following GMT fuses have been accepted for use in dc load applications, are available for the current Distribution Module.

Size (Amps)	Ordering code
0.25	405006222
0.5	406976894
1.33	405673146
2	405181983
3	406976985
5	406159061

Size (Amps)	Ordering code
7.5	405725433
10	406159236
12	407845197
15	406473959
20	408555453

The following shows the possible fuse loading scenario for the Single-Slot and Double-Slot Distribution Modules. 20A fuse positions can be used only with factory wiring. When using 20A fuses, adjacent fuse positions must be left open.

For the Single-Slot Distribution Module with 10 GMT fuses, Field installation is only rated for 10A fuses. No more than 80A may be carried through the 10 fuse positions, or 40A through each half section. 15A and lower rated fuses may be used in any combination and position, as long as they do not violate the previous 80A/40A rule.

For the Single-Slot Distribution Module with **5 GMT fuses**, a maximum load of 32 A is permitted with restrictions on the fuse positions. Specifically:

Position F1 defined as the bottom fuse position and F5 as the top fuse position.

1. Configuration #1 - F1+F2 <= 15A, F3<=15A, and F5+F4<= 10A
2. Configuration #2 - F1<=15A; F2=No Fuse; F3<=15A; F4=No Fuse; F5<=10A 3.

For the Double-Slot Distribution Module, each 8-fuse board can support a maximum of 80A.

Position	Max Fuse
10	
9	20A
8	
7	20A
6	
5	
4	20A
3	
2	20A
1	

Single-Slot Distribution Module

Position	Max Fuse
10	15A
9	
8	15A
7	
6	15A
5	
4	15A
3	
2	15A
1	15A

Position	Max Fuse
8	15A/20A
7	
6	15A/20A
5	
4	15A/20A
3	
2	15A/20A
1	

Double-Slot Distribution Module

Controller

There are two controller options for the CPS6000. The QS840A system controller allows for control and monitoring of system functions and setting of all system parameters. The QS841 provides integrated Ethernet access and other enhanced features. Refer to Section 5 for more controller details and Appendix A for programming information. The QS845A supplemental kit allows up to 3 supplemental shelves to be controlled by the QS840A/QS841A controller on the primary shelf.

Rectifiers

The constant-power rectifiers each occupy a single slot in the CPS6000 shelf. If a full complement of rectifiers is not required, a rectifier slot filler may be to cover empty rectifier slots. The slot filler is not necessary from an earthquake standpoint.

Model	Amperage	Ordering code
QS861A Rectifier	15A low and high line ac	108993531
QS852A Rectifier	20A high line ac	CC109106440
QS853A Rectifier	25A high line ac	CC109121290
QS862A Rectifier	25A low line/30A high line ac	108986704
QS864A Rectifier	40A high line ac	108994513
QS865A Rectifier	50A high line ac	108990074
QS850 Slot Filler	N/A	108994273

Ringer Chassis

Ringer Chassis each occupy a single Power Slot in the CPS6000 Shelf.

Ringer Chassis	Ordering code
QS820M Ringer Chassis	108991262

Ringer Output Cable

Ringer Cables one per Ringer Output (Ringer Chassis).

Item	Ordering code
Ringer Output Cable H569-470 G kit – 15' cable with connector for CPS6000/CPS2000 shelf on one end and unterminated leads on the other end.	847922101
Ringer Output Cable – 150 ft	CC848804765
Commercial - Molex: Plug 39-01-4031 Socket (3 per plug): Terminal Type 5556 16 AWG 39-00-0079 18 AWG 39-00-0059 Tool 11-01-0197	Commercial

Ringers

Up to two Ringers plug into a Ringer Chassis.

One Ringer per Ringer Chassis is non-redundant (simplex). Two Ringers per Ringer Chassis is 1 + 1 redundant (duplex).

Ringer	Ordering code
QS820A Ringer	108990082

AC Power Cables

An ac power cable must be ordered. A standard ac cable set will not fit in the CPS6000 shelf. Verify that the sum of the input currents for all the rectifiers served by an ac circuit breaker does not exceed 80% of the breaker's rating.

OmniOn Power Rectifier (A)	Model Number of Rectifier	Nominal Input Voltage	Number of Rectifiers per AC feed	Nominal AC Current (A)	Minimum Circuit Breaker value recommended (A)*	75°C Minimum Recommended Wire Gauge (AWG)*
15A	QS861A	120	1	7.8	15	14
		120	2	15.6	20	12
		120	3	23.4	30	10
		120	4	31.2	40	8
		120	5	39.1	50	8
		208	1	4.4	15	14
		208	2	8.8	15	14
		208	3	13.2	20	12
		208	4	17.6	25	10
		208	5	22.0	30	10

Table 3-A: Rectifier AC Input Current Table

OmniOn Power Rectifier (A)	Model Number of Rectifier	NominalInput Voltage	Number of Rectifiers per AC feed	Nominal AC Current (A)	Minimum CircuitBreaker value recommended (A)*	75°C Minimum RecommendedWire Gauge (AWG)*
20A	QS852A	208	1	6	15	14
		208	2	12	15	14
		208	3	18	25	10
		208	4	24	30	10
		208	5	30	40	8
25A	QS853A	208	1	7.4	15	14
		208	2	14.8	20	12
		208	3	22.2	30	10
		208	4	29.6	40	8
		208	5	37.0	50	8
25/30A	QS862A	120	1	13.0	20	12
		120	2	26.0	35	8
		120	3	39.1	50	8
		208	1	8.8	15	14
		208	2	17.6	25	10
		208	3	26.4	35	8
		208	4	35.3	45	8
40A	QS864A	208	1	11.8	15	14
		208	2	23.5	30	10
		208	3	35.3	45	8
50A	QS865A	208	1	14.5	20	12
		208	2	29.1	40	8

*Conduit and further temperature deratings may be required in some installations .Cross-check table with local code and regulation requirements

Table 3-A: Rectifier AC Input Current Table (continued)

Thermal Compensation

Thermal Compensation: For thermal compensation, the QS873A Voltage/Thermal probe (VT-Probe) and its associated cables must be ordered. Refer to Section 5 for details on their interconnection, and Section 9 for more information on VT-Probes. The probe is provided with a weatherproof case.

Thermal Compensation/Voltage Monitoring: When voltage monitoring for battery string voltage imbalance detection is to be implemented in addition to thermal compensation, the VT-probe and its associated cables must be ordered. Refer to Section 5 for details on their interconnection, and Section 9 for more information on VT-Probes and voltage monitoring.

Remote Distribution Monitor Module

The Remote Distribution Monitor Module allows the CPS6000 system controller to monitor for open circuit breakers and fuses, monitor current through a battery shunt, and monitor/control low-voltage disconnect contactors at an external distribution panel that is bulk-fed from the CPS6000 system. See Section 11 for more details.

Inter-Shelf Kit for Multiple Shelves

Supplementary bulk-output shelves may be added to a bulk-output primary shelf to create a larger plant. Only the primary shelf requires a controller. The inter-shelf kit contains a QS845 shelf controller (with blank faceplate) and a connecting cable with connectors on both ends.

Refer to Appendix F for thermal considerations while paralleling shelves.

Lugs

Please refer to ordering guide H569-470 for lugs specific to distribution modules. The following table is generic and needs to be used in conjunction with the ordering guide. Note: TEPS lugs in the WP91412 specification are Burndy parts. The Panduit and T&B (and any others) may have different dimensions.

GA	Description	WP-91412 List	Ordering code	Burndy Equivalent	Panduit Similar	T&B Similar
2	Straight, STR	54	405348202	YA2CL-2TC14	LCD2-14A-Q	54207 (STR)
2	Straight, FLEX	8	405347683	YAV2C-L2TC14-FX	LCDX2-14A-E	54208 (Flex)
2	45°, STR	?	?	YA2CL-2TC14-45	LCD2-14AH-Q	54207UF (STR)
2	45°, FLEX	193	408210524	YAV2C-L2TC14-FX-45	LCDX2-14AH-E	54208UF (Flex)
4	Straight, STR / FLEX	5	405347576	YAV4C-L2TC14-FX	LCDX4-14A-L (FLEX) LCD4-14A-L (STR)	54206 (STR) 54206 (FLEX)
4	45°, STR / FLEX	?	?	YAV4C-L2TC14-FX-45	LCDX4-14AH-L (FLEX) LCD4-14AH-L (STR)	54206UF (STR) 54206UF (FLEX)
6	Straight, STR / FLEX	3	405347519	YAV6C-L2TC14-FX	LCDX6-14A-L (FLEX) LCD6-14A-L (STR)	54205 (STR) 54205 (FLEX)
6	45°, STR / FLEX	?	?	YAV6C-L2TC14-FX-45	LCDX6-14AH-L (FLEX) LCD6-14AH-L (STR)	54205UF (STR) 54205UF (FLEX)
8	Straight, STR / FLEX	75	406021626	YA8CL2TC14	LCDX8-14A-L (FLEX) LCD8-14A-L (STR)	542040410 (STR 542040410 (FLEX)
8	45°, STR / FLEX	?	?	YA8CL2TC14-45	LCDX8-14AH-L (FLEX) LCD8-14AH-L (STR)	N/A

4 Safety

Safety Statements

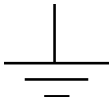
Please read and follow all safety instructions and warnings before installing, maintaining, or repairing the CPS6000 System:

- The CE Mark demonstrates compliance with the European Union Council Directives for Low Voltage and EMC.
- The CPS6000 platform is Underwriters Laboratories (UL) Listed per Subject Letter 1801, DC Power Distribution Centers for Telecommunications Equipment.
- CPS6000 shelves equipped with QS820A ringers (in development) have hazardous secondary voltages on the secondary bus output connectors.
- Install only in restricted access areas (dedicated equipment rooms, equipment closets, or the like) in accordance with articles 110-16, 110-17, and 110-18 of the U.S. National Electric Code (NEC), ANSI/NFPA No. 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 has been evaluated for continuous use in ambient temperature from - 40°C to 75°C when used with the QS862A rectifier.
- This equipment must not be installed over combustible surfaces.
- For installations in the United States, Listed compression connectors are to be used to terminate Listed 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.
- Load connections to Bulk Output Modules should be made in close proximity to the power shelf.
- The main output voltage (48V) meets SELV requirements.
- 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. Wiring internal to enclosed equipment cabinets should be rated at 105° Celsius (minimum).
- Torque electrical connections to the values specified on labels or in the product documentation.
- 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 (J1) are not fused within the distribution panel; 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.
- Fuse and/or circuit breaker loads must not exceed 80% of the fuse and/or circuit breaker current rating. Distribute loads across the panel.
- The short circuit current capability of the battery input to the distribution panel must not exceed 10,000A.
- 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 type of shelf. Refer to the equipment ratings to assure rating of equipment will not exceed 80% of the value of the protector chosen.
- An accessible ac disconnect/protection device to remove ac power from the equipment in the event of an emergency must be provided.

- High leakage currents are possible due to contribution from simultaneous multiple 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 C.O. grounding stud is connected as shown in the Installation Section, or quality service personnel shall ensure that the rack system is bonded per the provision below.
- In enclosed equipment cabinets, the CPS6000 mounting framework must be connected directly to the cabinet ac service ground bus. For applications in huts, vaults, and central offices, the CPS6000 mounting framework must be connected to the system integrated ground grid.
- Installing fuses or circuit breakers not specified for use in these distribution modules may result in injury to service personnel or equipment damage. Use only replacement parts listed in this manual and on the equipment drawings.
- 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.
- The terminal block for the GMT fuse panel is rated A for 20A with factory wiring, but only 10A for field installation.
- All ac inputs for the J85470S1 L12 and L13 must be connected to maximum 60A panel board breakers from maximum two ac conduit connections.
- 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”. Connection of Ringer tip outputs to CPS6000 Battery or Ground is optional via Ringer Chassis jumper or external connection.
- The QS841 has an IEEE 802.3 compliant 10Base-T network interface with a grounded connector shield.. Where intra building lightning surge protection is of concern, OmniOn Power recommends the use of a shielded cable, where both ends are tied to ground. This cable must be supplied by the user. (example: CAT 5 E STP)

Warning Statements and Safety Symbols

The symbols may sometimes be accompanied by some type of statement; e.g., “Hazardous voltage/energy inside. Risk of injury. This unit must be accessed only by qualified personnel.” Signal words as described below may also be used to indicate the level of hazard.

DANGER	Indicates the presence of a hazard that will cause death or severe personal injury if the hazard is not avoided.
WARNING	Indicates the presence of a hazard that can cause death or severe personal injury if the hazard is not avoided.
CAUTION	Indicates the presence of a hazard that will or can cause minor personalinjury or property damage if the hazard is not avoided.
	This symbol identifies the need to refer to the equipment instructions for important information.
	These symbols (or equivalent) are used to identify the presence of hazardousac mains voltage.
	This symbol is used to identify the presence of hazardous ac or dc voltages.It may also be used to warn of hazardous energy levels.
	One of these two symbols (or equivalent) may be used to identify the presence of rectifier and battery voltages. The symbol may sometimes be accompanied by some type of statement, for example: “Battery voltage present. Risk of injury due to high current. Avoid contacting conductors with uninsulated metal objects. Follow safety precautions.”
	One of these two symbols may be used to identify the presence of a hot surface. It may also be accompanied by a statement explaining the hazard. A symbol like this with a lightning bolt through the hand also means that thepart is or could be at hazardous voltage levels.
	This symbol is used to identify the protective safety earth ground for the equipment.
	This symbol is used to identify other bonding points within the equipment.
	This symbol is used to identify the need for safety glasses and may sometimes be accompanied by some type of statement, for example: “Fuses can cause arcing and sparks. Risk of eye injury. Always wear safety glasses.”

Precautions

When working on or using this type of equipment, the following precautions should be noted:

- This unit must be installed, serviced, and operated only by skilled and qualified 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.
- The equipment could be powered by multiple 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.
- Batteries may be 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.
- Hazardous energy and voltages are present in the unit and on the interface cables that can shock or cause serious injury. Follow all safety warnings and practices when servicing this equipment. When equipped with ringer modules, hazardous voltages will be present on the ringer output connectors.

In addition to proper job training and safety procedures, the following are some basic precautions that should always be used:

- Use only properly insulated tools.
- Remove all metallic objects (key chains, glasses, rings, watches, or other jewelry).
- Wear safety glasses. Fuses can produce sparks. High energy levels on buses and distribution components can produce severe arcing.
- Test circuits before touching.
- Lock out and tag circuit breakers/fuses when possible to prevent accidental turn on.
- Be aware of potential hazards before servicing equipment.
- Identify exposed hazardous electrical potentials on connectors, wiring, etc. (note the condition of these circuits, especially wiring).
- Use care when removing or replacing covers; avoid contacting circuits.

Special Installation Notes

Deutsch

Installationsanleitung

Eingangsspannung (Voltage) : 2x AC 120/200-240V V Eingangsstrom (Current) : QS801A, max 45A, QS800A, max 30A Eingangsleistung (Watts) :

Nennfrequenz (Frequency) : 50 / 60 Hz Seriennummer (Assembly No.):--

Modellnummer (Modell No.) : QS801A, QS 800A

Abmessungen sind nur zur Referenz : 150mm x 22.5mm x 77.5mm (Dimensions are for reference only)

Max. Umgebungstemperatur : max. 75 deg. C (Max. Operation temperatur)

Achtung: Für kontinuierlichen Feuerschutz sollte die Sicherung nur mit einer des gleichen Types ersetzt werden.

Sicherungswert :

(Warning : For continued protection against fire replace with same type and rating of fuse)

Das System ist ein Gerät der Schutzklasse I / Überspannungs Kategorie II (Power Supply is a Class I equipment / overvlotage category II)

Ausgangsspannungen und -stöme: DC 58 V / SELV (Output Voltage and Current)

--Das Gerät darf nur in Räumen mit beschränktem Zutritt aufgestellt werden. (Nur ausgebildetes Personal)

--Nur für Aufstellung auf Boden oder einer anderen brennbaren Oberfläche geeignet.

--Das Gerät hat keinen eigenen Ausschalter, es muß daher mit einem Ein - und Ausschalter im Versorgungskreis versehen msein.

--Das Gerät ist für den Einbau in IT- Geräte in einem Rahmen bestimmt (siehe weitere Anleitung)

--Beim Einbau des Gerätes ist daraf zu achten das alle Anforderungen gemäß EN60950 eingehalten werden.

ACHTUNG: HOHER ABLEITSTROM

VOR ANSCHLUSS AN DEN VERSORGUNGSSTROMKREIS UNBEDINGT ERDUNGSVERBINDUNG HERS TELLEN

Espanol

Notas especiales para instalaciones en países de habla hispana

- Instrucciones de instalación

  (Installation Instructions)
- Voltaje (Voltage):

  Vea tabla 2-A
- Corriente (Current):

  Vea tabla 2-A
- Frecuencia (Frequency):

  50/60Hz
- Voltaje y corriente de salida (Output Voltage and Current):

  Vea tabla 2-A
- Temperatura máxima de operación (Maximum Operation Temperature):

  75°C (167°F)
- Sin cabina contra incendios, suelo no combustible

  (No fire enclosure, non-combustible floor)
- Evaluado en EN60950

  (Evaluated to EN60950)

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5 Installation

CPS6000 Installation

Purpose

CPS6000 Shelf Installation guide for generic installations. Additional requirements are needed for application specific installations. Refer to Appendix F for spacing requirements.

Audience

Field application personnel.

Precautions

Observe ESD protection while installing circuit packs

Safety

Always consider personal safety.

Make sure the system is properly grounded per the National Electrical Code and local building codes.

Remove all metal jewelry before beginning the installation.

Installation Tools

- Wire cutters and strippers
- Heat shrink gun
- Torque wrench (0-240 in-lb / 28 Nm)
- 48 Volt test load
- Digital meter, +/- 0.02%
- Screw Drivers (flat-blade and Phillips)
- ESD wrist strap

Part List

	Ordering code	Qty	Description
Single-Wide	801085119	2	3/8-inch bolt
Distribution Module	802286773	2	3/8-inch lock washer
	802841635	2	3/8-inch flat washer
	407646330	2	Shelf plastic bushing
	408515823	1	Fuse puller
	7-22050-2	2	#4 screw
Double-Wide	801085119	2	3/8-inch bolt
Distribution Module	802286773	2	3/8-inch lock washer
	802841635	2	3/8-inch flat washer
	407646330	2	Shelf plastic bushing
	7-22050-2	4	#4 screw
	848702007	1	Spacer
Ringer Chassis	7-22050-2	1	#4 Screw
Shelf	901078717	8	12-24 mounting screw

CPS6000 Unpacking and Installation

There are two distribution options for the CPS6000, a Single-Slot Distribution Module and a Bulk Output Module. Only one distribution box can be used in a CPS6000 shelf. This hardware assembly is field installable, however in most cases the factory will have already installed the distribution module when it is required.

Step	Action	
1.	Unpacking. Inspect the shipping container for any signs of damage. If damage exists, have the carrier's representative sign a note acknowledging the damage.	
2.	Carefully cut the sealing tape and remove the shelf from the carton. Use the parts list to verify all materials are included. Save the shipping package until all parts are operating within specifications.	
3.	Is there a Distribution Module already installed in the right-most shelf position?	
	Yes - Go to the Install the CPS6000 shelf section.	**No** – Continue
4.	Remove the Distribution Module Assembly from the carton. The Assembly and the shelf will be shipped in separate cartons.	
5.	Is the Single-Slot or the Bulk Output Distribution Module being installed?	
	Bulk Output Distribution Module - Go to Step 8.	Single-Slot or Double-Slot Distribution Module - Continue.
6.	Slide the Assembly into the rightmost slot.	
7.	Verify the hook on the front engages under the shelf. See Figure 5-1.	

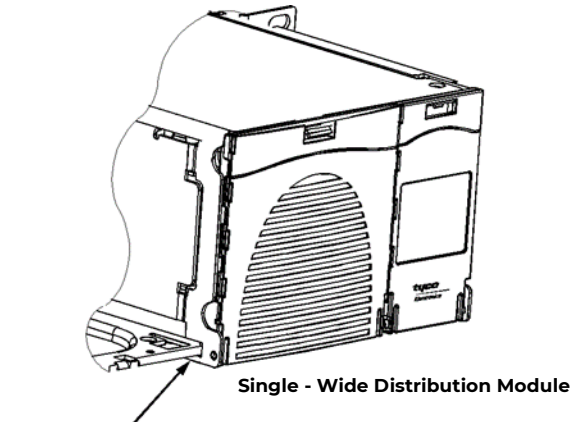


Figure 5-1: Distribution Module

Step	Action
8.	Insert one #4 Screw inside the left side of the Bulk Output Module, hand tightto approximately 5 in-lb. See Figure 5-2.
9.	Insert one #4 Screw on the right side of the shelf, hand tight to approximately5 in-lb. See Figure 5-3.
10.	Put a 3/8-inch lock washer and a flat washer on the 3/8-inch bolt. Locate the two access holes on the rear of the shelf. Attach the Distribution Module to theshelf with the washers and two bolts. Torque to 240 in-lb.
11.	Cover the two access holes with the Black Plastic Covers shown.

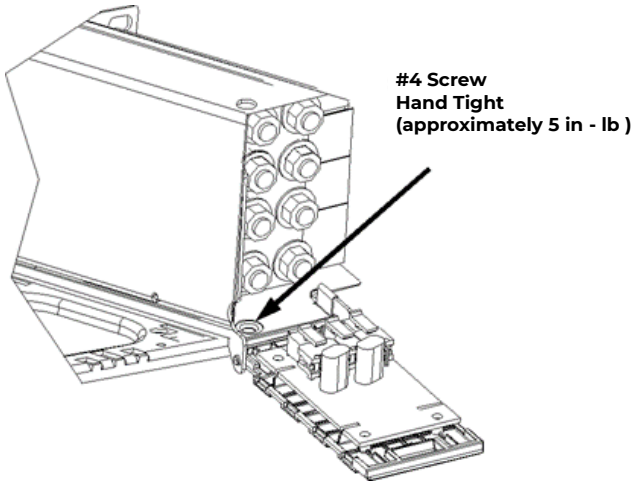


Figure 5-2: Bulk Output Module

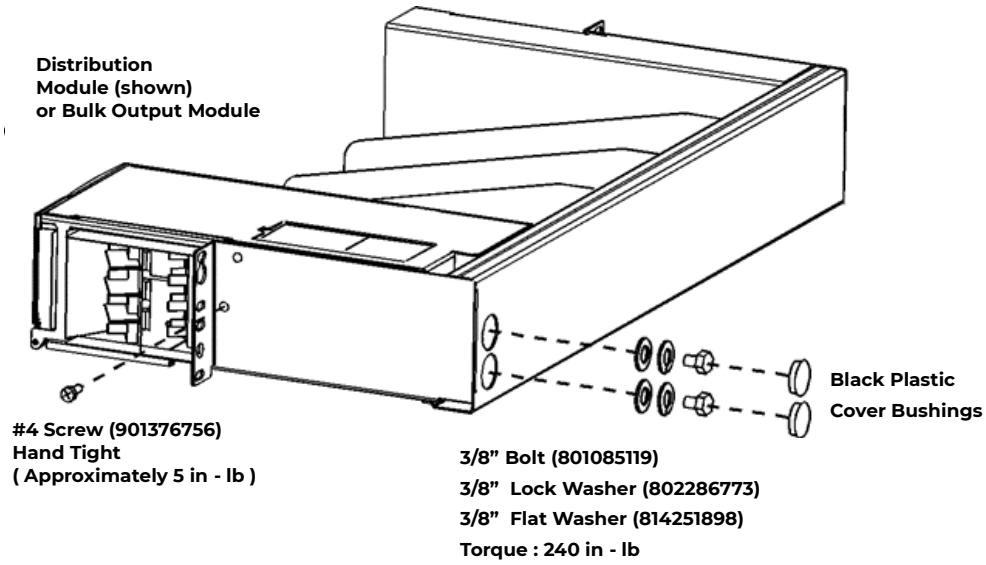


Figure 5-3: Distribution Module

Install the CPS6000 Shelf

Important Note

The following procedures are in order for a typical application. If the left side of the shelf will be blocked after the shelf is installed in the framework, the following procedures should be done before installing the shelf:

- Inter-Shelf Connections (multi-shelf installations only)
- AC Connections
- Office Alarm Cable
- Thermal Probe Connection

Leave a sufficient service loop on these cables.

Install the CPS6000 Shelf

Follow the steps in the table below to mount the CPS6000 shelf into a 19-inch or 23-inch frame.

Step	Action
1.	Locate the 2 mounting brackets, one on each side of the CPS shelf; align the holes in the shelf-mounting bracket with the holes in the mounting frame. See Figure 5-4.
2.	Attach the CPS shelf to the frame using a minimum of four (two on each side)of the 12-24 screws included in the supplied parts bag. Refer to the table below for Torque Specifications.

Hardware	Torque	
	Nm	In-lbs.
Metric M5	4	35
12-24	4	35
Metric M6	7.3	65

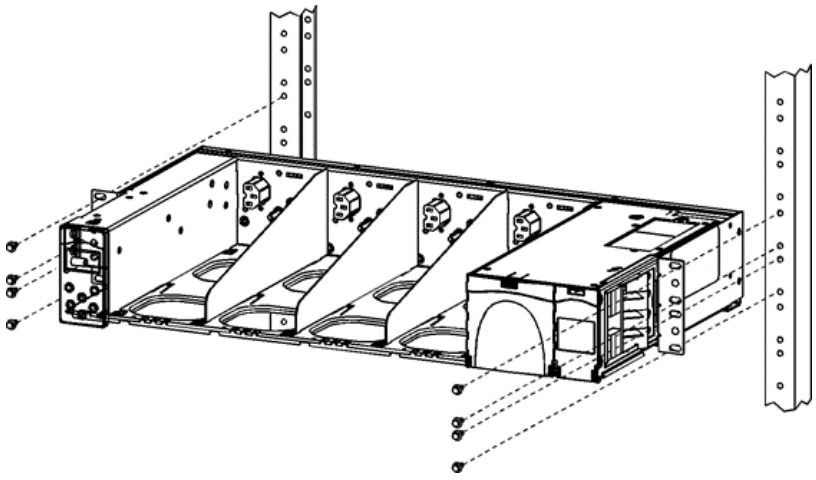


Figure 5-4: CPS6000 Frame Mounting

Controller

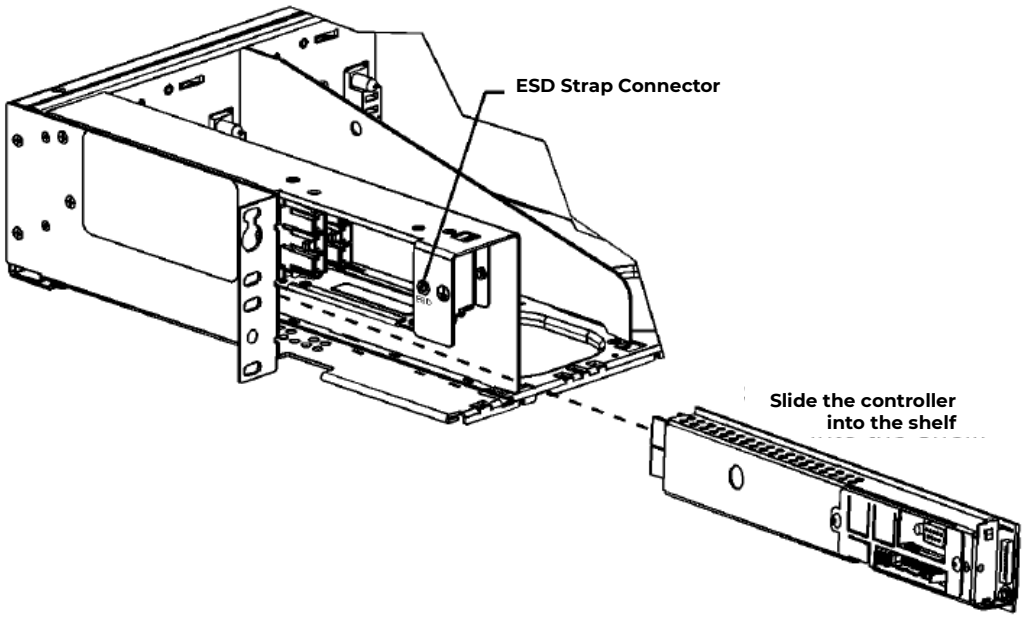
Controller Installation

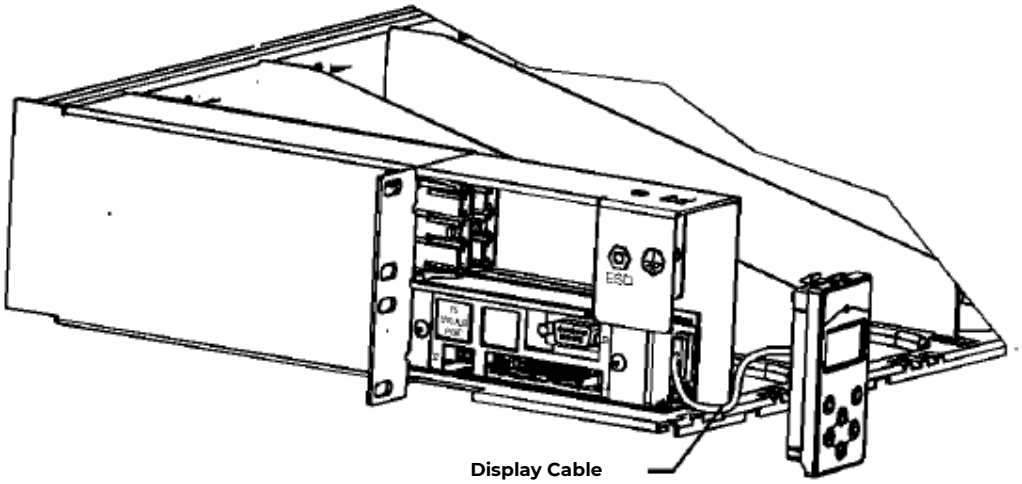
The Controller mounts in the controller housing located on the left side of the CPS shelf, Figure 5-5. The Controller is field installable, however in most cases it will be factory installed.

Warning: You must properly protect the Controller against ESD discharge.

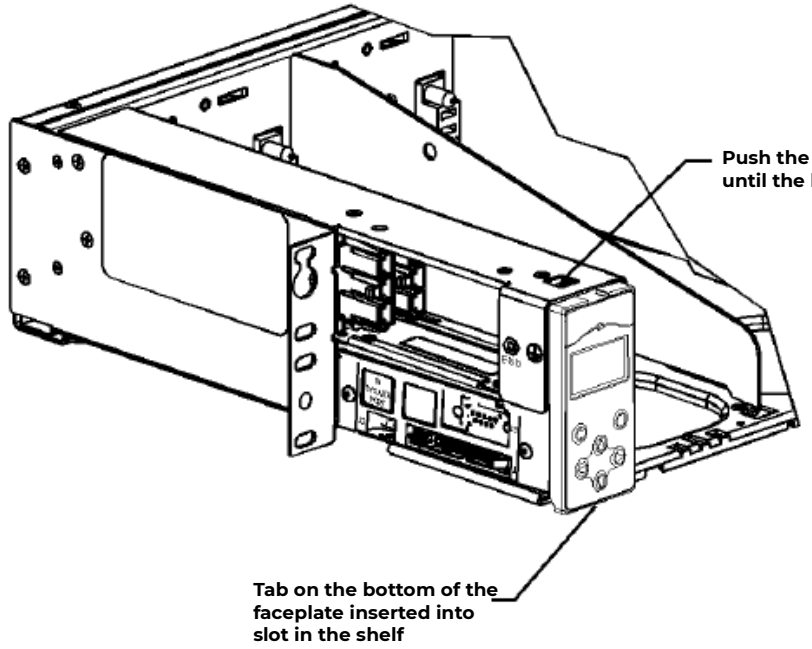
Note: There is an ESD cord connection located on the left side of the shelf.

Step	Action	
1.	Does the CPS shelf have the Controller already installed?	
	Yes - Proceed to the Rectifier Installation section	**No** - Continue
2.	Slide the controller into the shelf until it is fully seated in the connector on therear of the CPS shelf. See Figure 5-5.	
3.	Connect one end of the display cable to the connector on the controller. Connect the display faceplate to the other end of the display cable. Carefully dress the display cable when attaching to the shelf to ensure the cable does not get pinched.	
4.	Insert the tab on the bottom of the faceplate into the slot on the bottom of the controller housing.	
5.	Push the display faceplate into the shelf until the latch on the top of the controller housing catches.	





Connect the display cable between the controller and the display



QS845A Supplementary Shelf Board

Multi-Shelf Installations

The QS845A allows up to four CPS6000 shelves to be paralleled. It can be used either with the QS840A or the QS841A controller. This board is installed in the controller position on supplemental CPS6000 shelves and enables the subsequent shelf equipment to communicate with the controller on the initial shelf. The following procedure is for installing the QS845A Supplementary Boards and making inter-shelf connections.

Install the QS845A Supplementary Shelf Board

Step	Action	
1.	Does the system have a supplementary shelf?	
	Yes - Continue	**No** - Proceed to Thermal Compensation Connections
2.	Does the supplementary shelf have the QS845A controller already installed?	
	Yes - Proceed to Thermal Compensation Connections	**No** - Continue
3.	Slide the QS845A into the shelf until it is fully seated in the connector on therear of the CPS shelf. See Figure 5-6.	
4.	Insert the tab on the bottom of the faceplate into the slot on the bottom of the controller housing.	
5.	Push the display faceplate into the shelf until the latch on the top of the controller housing catches.	

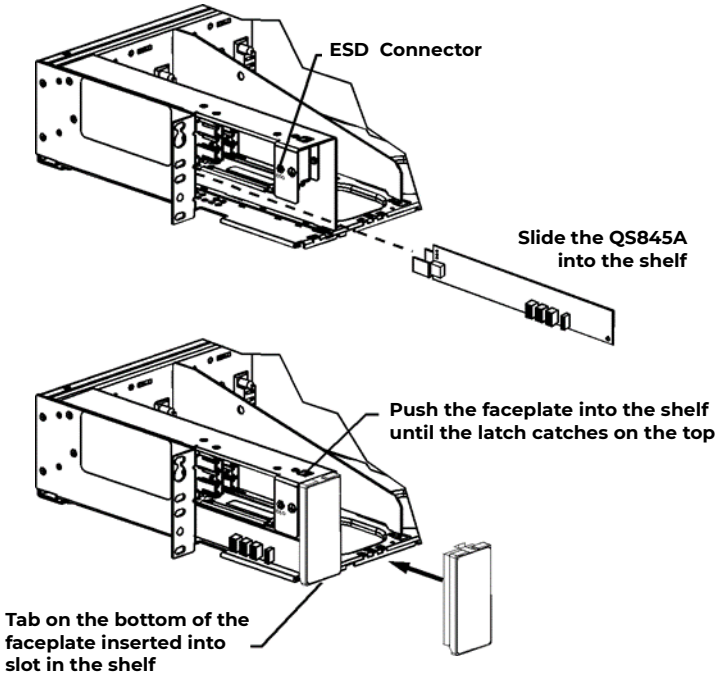


Figure 5-6: QS845A Supplementary Board Installation

Inter-Shelf Connection

Refer to Figure 5-7 for the following procedure.

Step	Action
1.	Connect a shelf-interconnect cable from P5 (SYS AUX PORT) on the primaryshelf controller to the shelf SHF 2 connector on shelf 2.
2.	Using shelf-interconnect cables, daisy-chain the remaining shelves as required,connecting from the TO NEXT SHELF connector, to the next applicable shelf connector as shown.

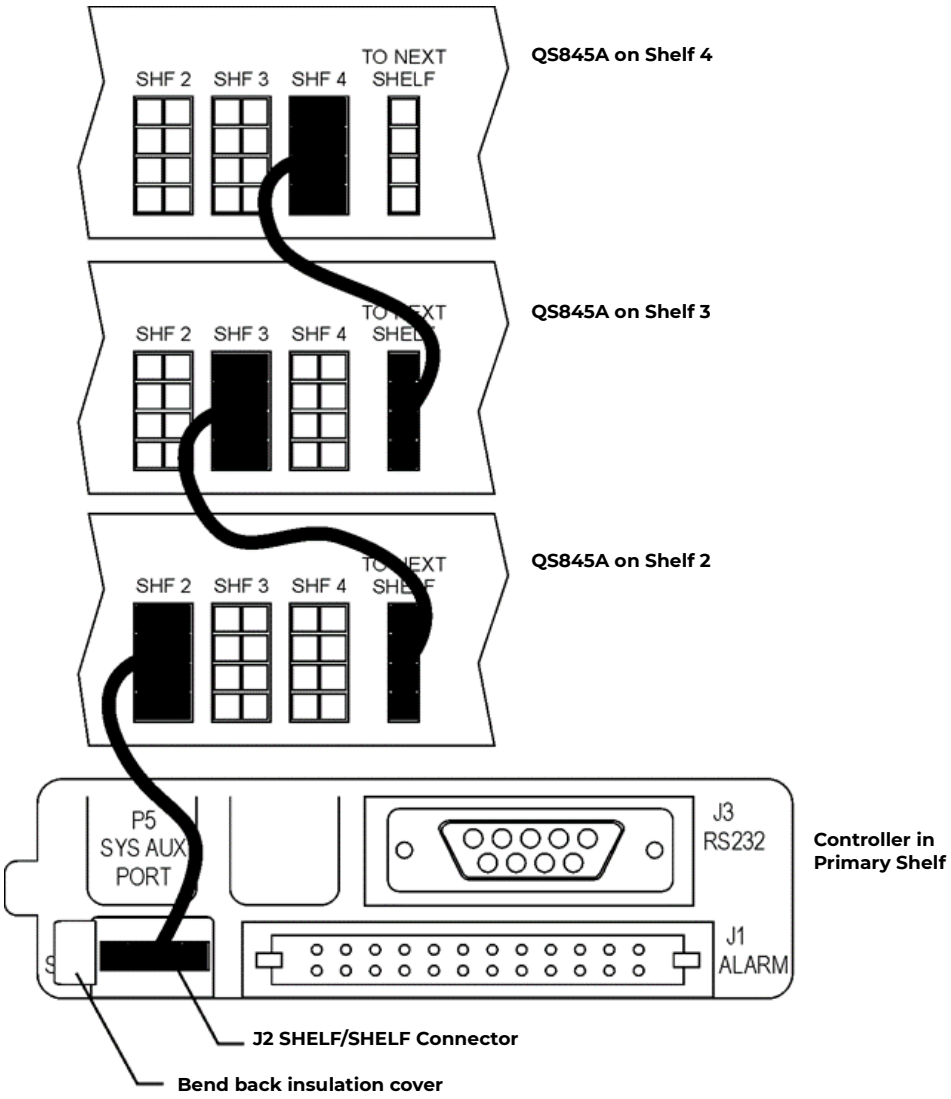


Figure 5-7: Inter-Shelf Connections

Thermal Compensation Connections

Thermal Compensation

The optional QS837A 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.

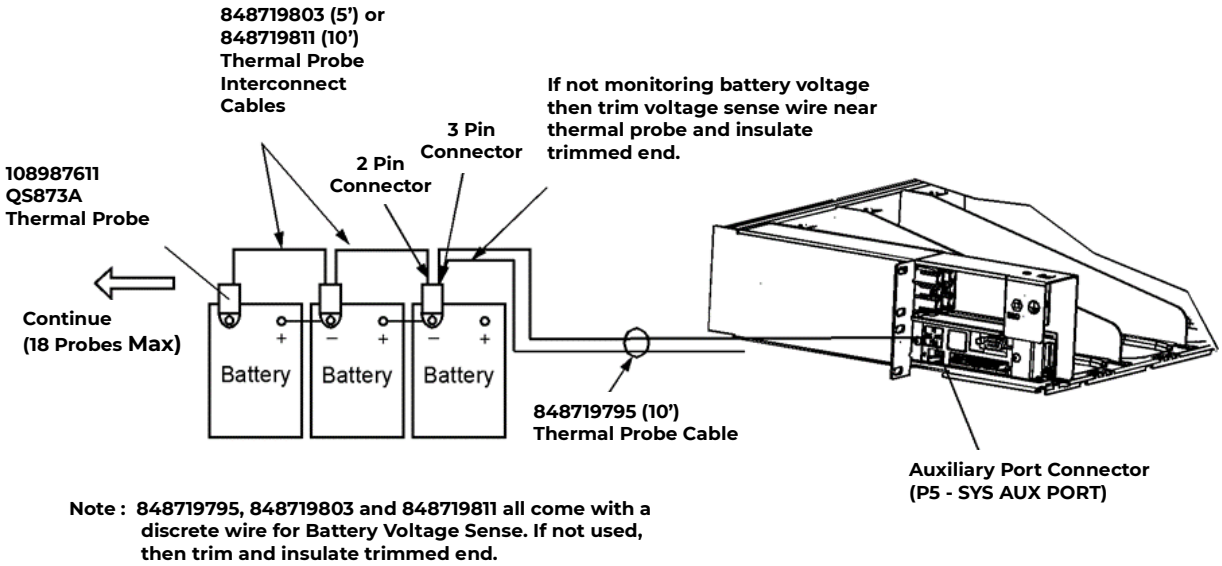
Note: The number of probes per string is to be defined by the user. Typical installation requires 1 thermal probe per string of batteries.

Refer to Section 11 Peripheral Devices for more details about Voltage/Thermal Probes and the Remote Voltage Monitoring Module if required.

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.

Step	Action	
1.	Is the Voltage Monitoring option being used?	
2.	**No** - Locate the 848719795 ThermalProbe Cable. Near the 3 Pin connector (Probe end), the volt sense wire has a 1 Pin connector on the end, cut and discard this wire and insulate the trimmed end.	**Yes** - Connect the 848652947 Battery Voltage Monitor Cable between the ES771A Battery Voltage Monitor Card and the controller P5- SYS AUX PORTconnector. See Figure 5-10.
3.	Connect the 3 Pin Connector into the 3 position plug on the VT-Probe.	
4.	Connect the other end of the Thermal Probe Cable to the controller P5- SYS AUXPORT connector. See Figure 5-8.	
5.	Are additional VT-Probes being used?	
6.	**Yes** - Using a interconnect cable connect the 2 pin connector to the first thermal probe and then connect the next probe with the 3 pin connector, daisy chain until all probesare connected. See Figure 5-8.Two interconnect cables are available; 5 foot cable 848719803 10 foot cable 848719811	**No** - Complete.
7.	Attach probe case to each VT-Probe making sure the case pin inserts into the hole on the probe. Close the case and verify the case is securely latched. See Figure 5-9.	



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 5-8: VT-Probe Connections to Controller

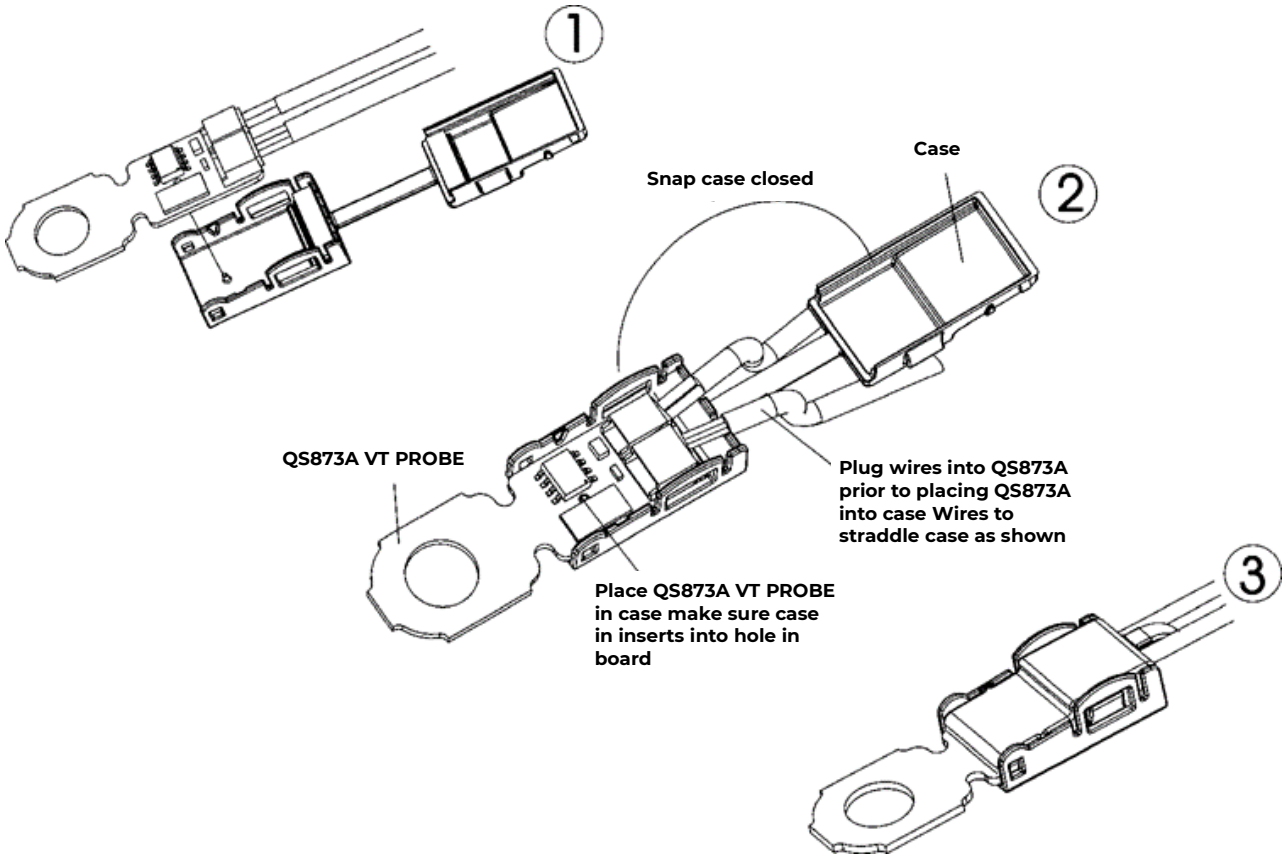


Figure 5-9a: Connecting Battery Monitor Voltage Wire to Thermal Probe Cable

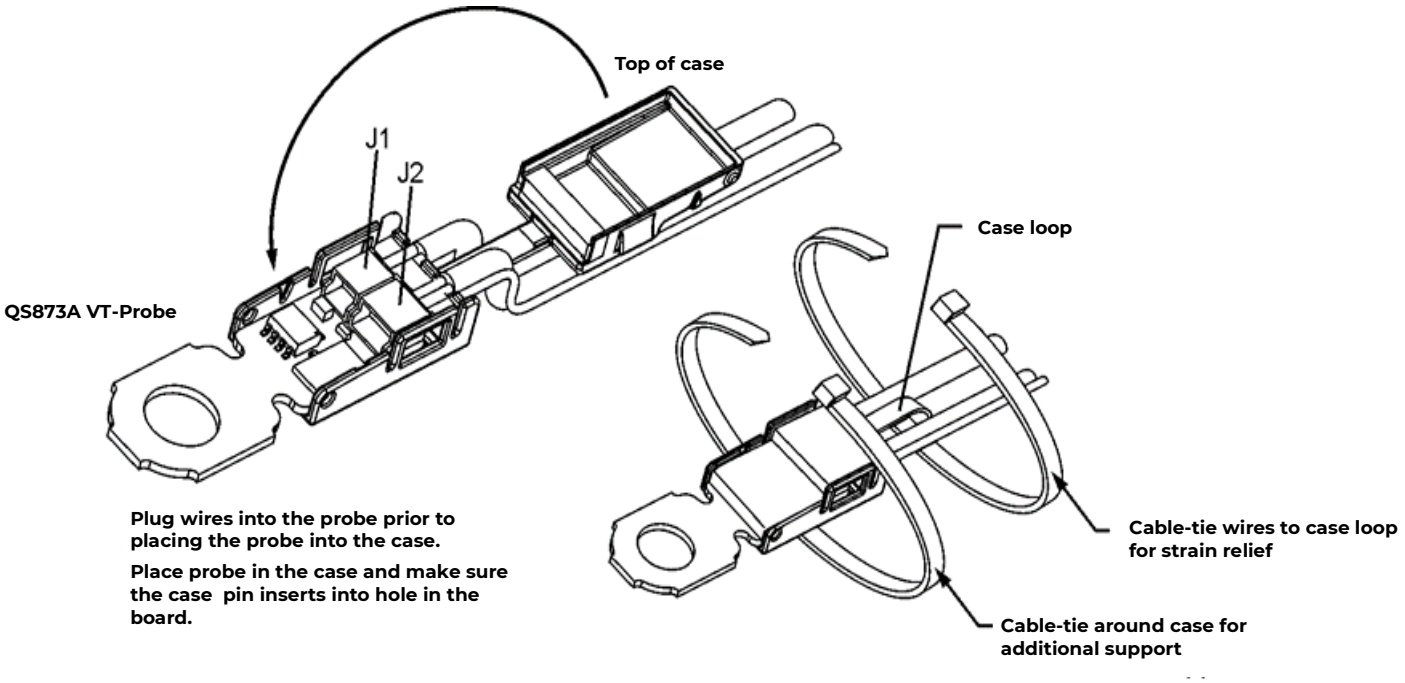


Figure 5-9b: Tie Wraps for strain relief and additional support

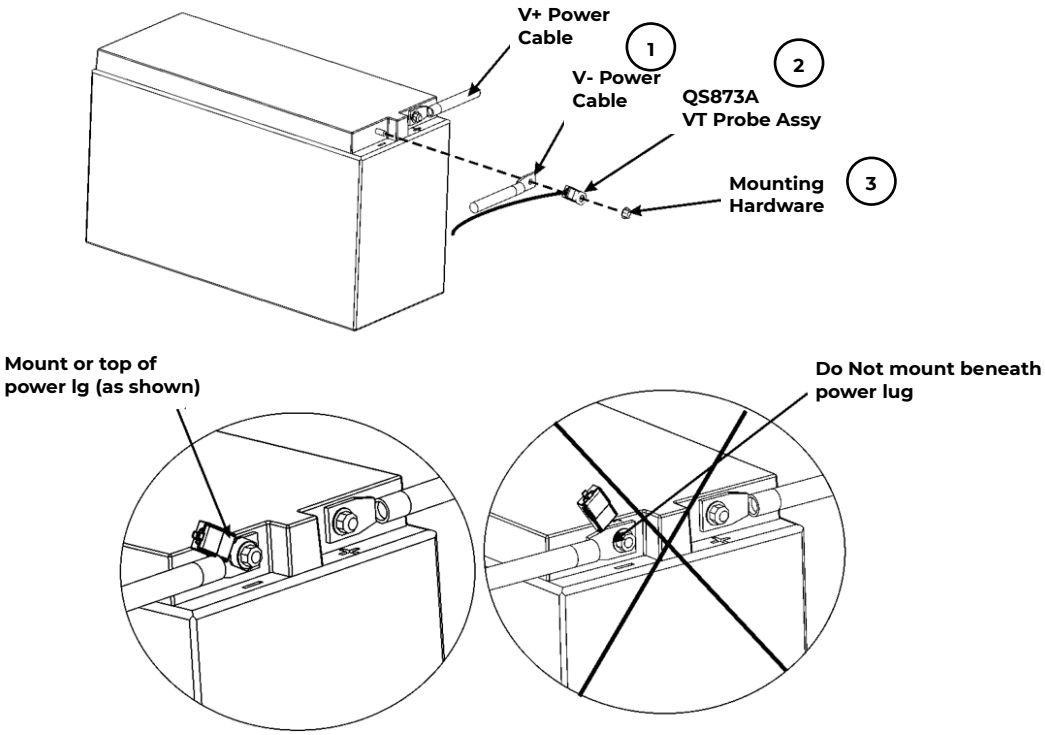


Figure 5-9c: Connecting Thermal Probe Cable to the battery

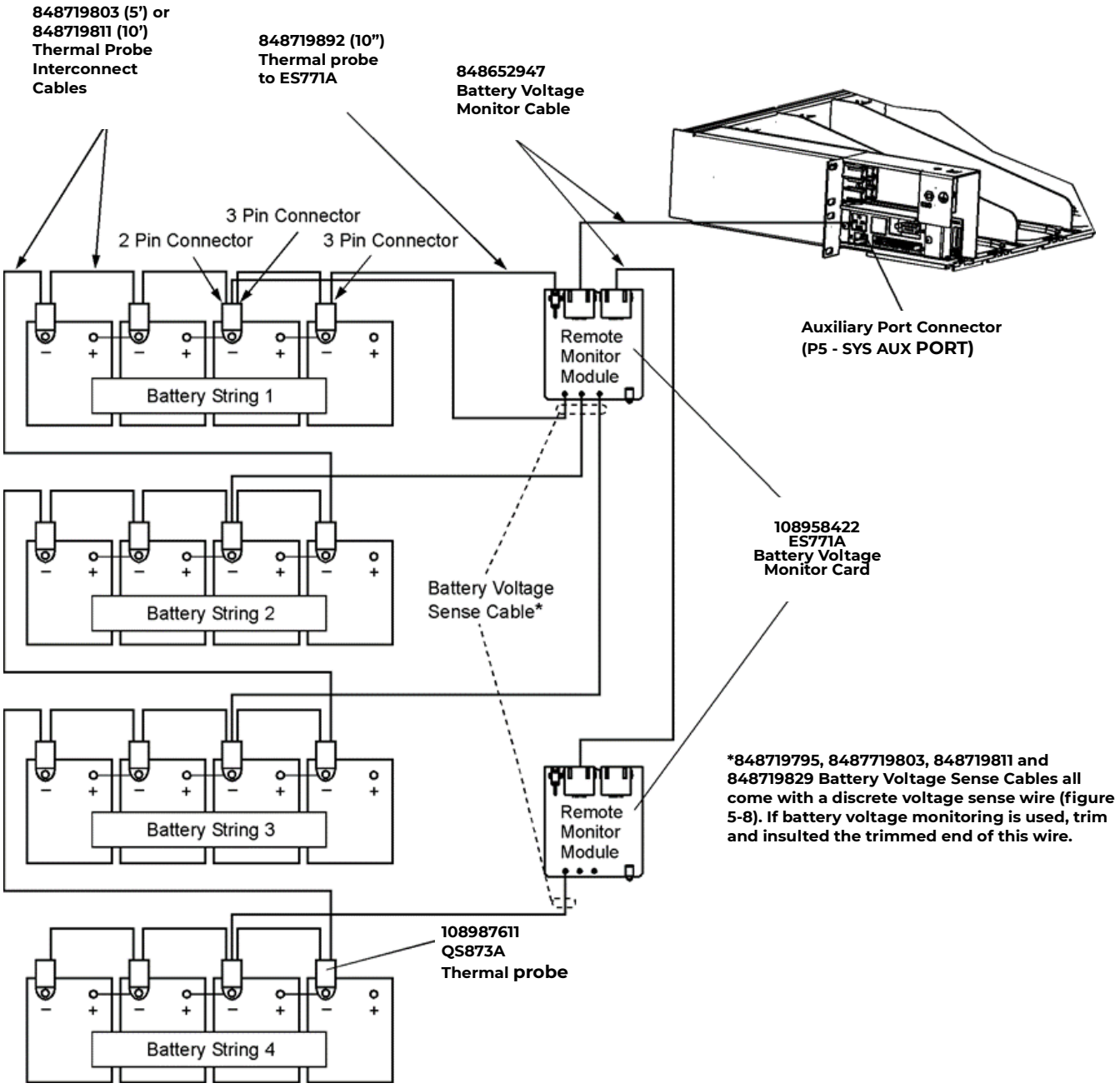


Figure 5-10: VT-Probe/Battery Voltage Monitor Connections to Controller

Office Alarms

An office alarm connector (J1) is provided on the QS840A/QS841A controller board. This connector provides access to the output of the alarm relays. Discrete wire and ribbon cable assemblies are available for making office alarm connections to the controller.

Step	Action
1.	Determine which office alarm connections are required per user specifications.
2.	Make user-defined terminations of the Office Alarm Cable leads as shown inFigure 5-11.
3.	Connect the Office Alarm Cable to J1 on the QS840A Controller.

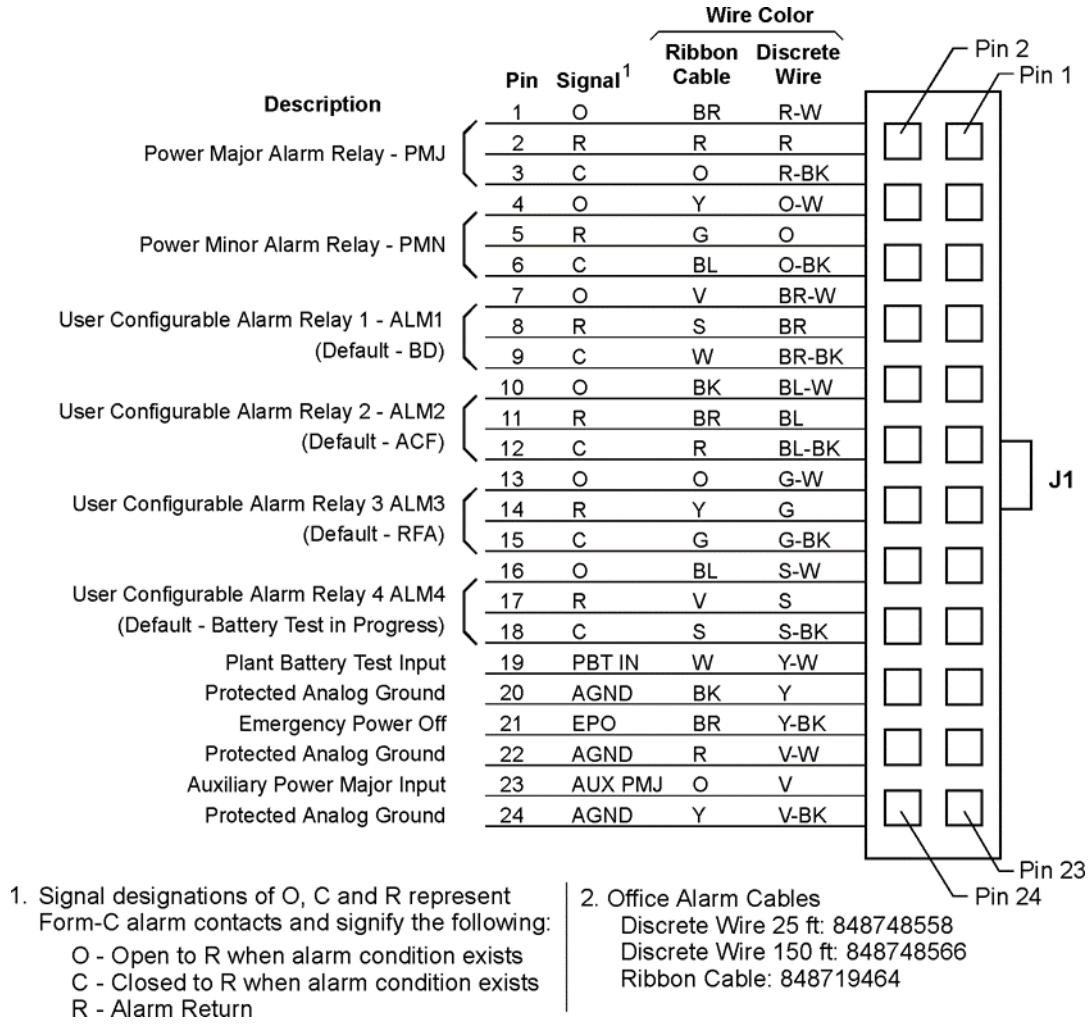
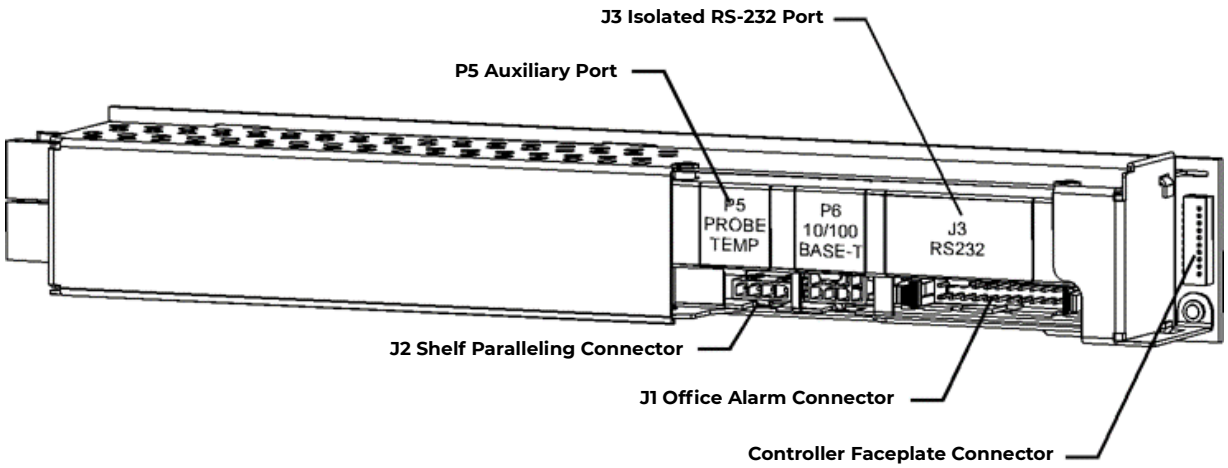


Figure 5-11: J1 Office Alarm Connector

Refer to Appendix E for an adapter cable that uses the CPS4000 alarm color scheme if required.

Controller Connections

The QS840A and QS841A provide the same interfaces with the exception of the LAN connection which is available on the QS841A. The QS841A provides a standard RJ45 receptacle, P6, for the 10/100 Base-T Ethernet connection. Following is the view of the controller and its interfaces.



The QS841A has an IEEE 802.3 compliant 10Base-T network interface with a grounded connector shield. Where intra building lightning surge protection is of concern, OmniOn Power recommends the use of a shielded cable, where both ends are tied to ground. This cable must be supplied by the user. (example: CAT 5 E STP)

Connection to the LAN is made by attaching standard Cat-5 cable from P5 to the appropriate 10/100Base-T LAN connection. The cable should be appropriately dressed out of the CPS6000 system to the LAN connection. The shroud of P5 has been terminated to chassis to accommodate the use of a shielded Cat-5 cable connection.

AC Connections

AC Connections to Shelf

Review the ac connection on the installed shelf. Refer to Tables 3-B and 3-C for detailed CPS6000 rectifier ac input requirements.

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.

Step	Action
1.	Insert the H569-470A ac cord into the ac receptacles on the CPS shelf. Refer Figure 5-12a, b, c or d for the appropriate shelf
2.	Terminate the supply end of the cable with an appropriate plug (plug not provided).

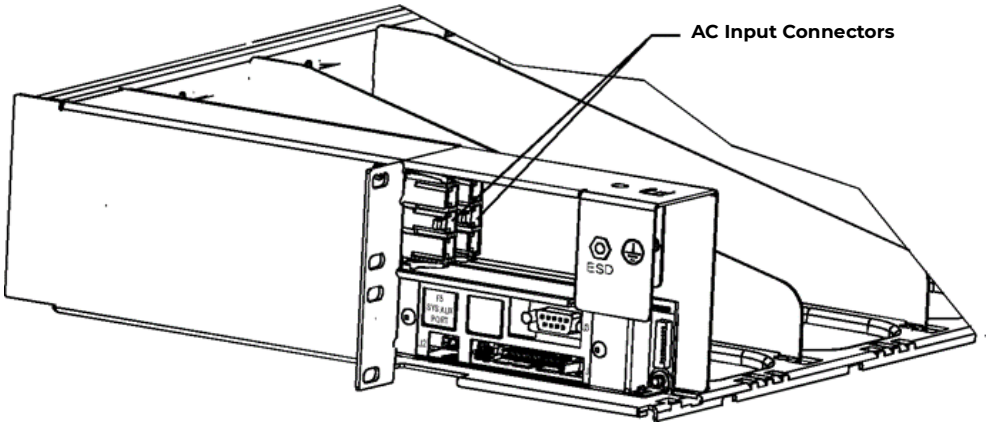


Figure 5-12a: Dual AC Input Connections

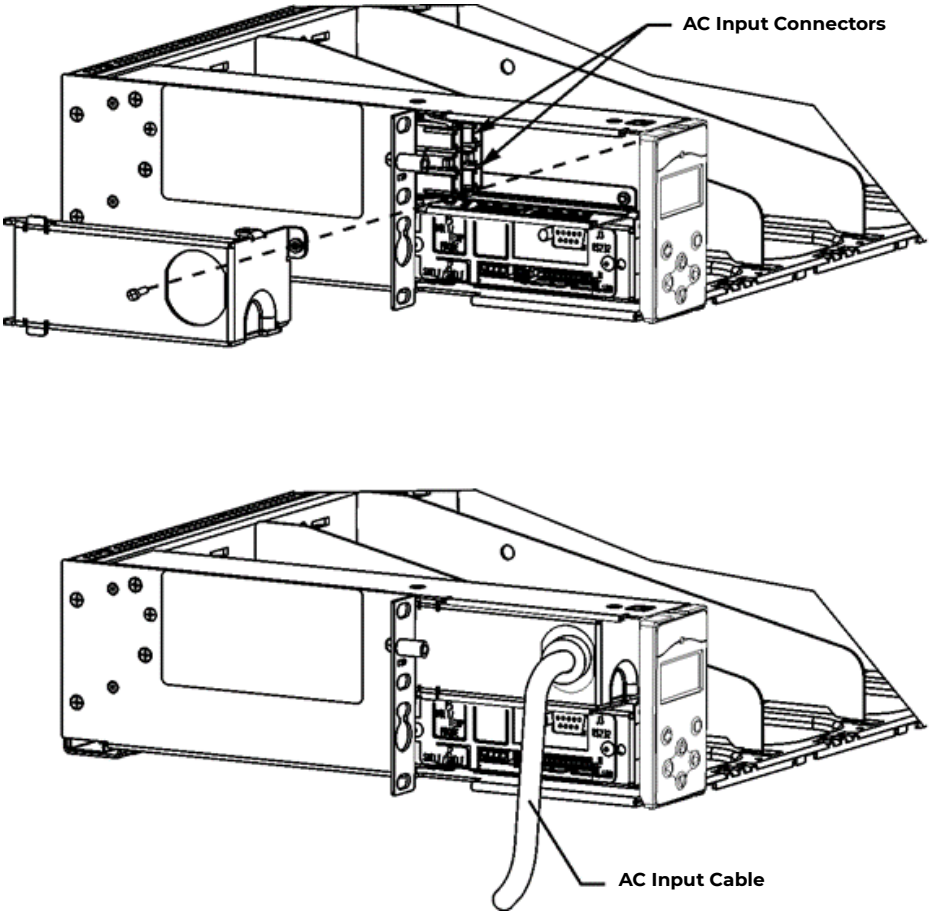


Figure 5-12b: Single cord AC Input Connections

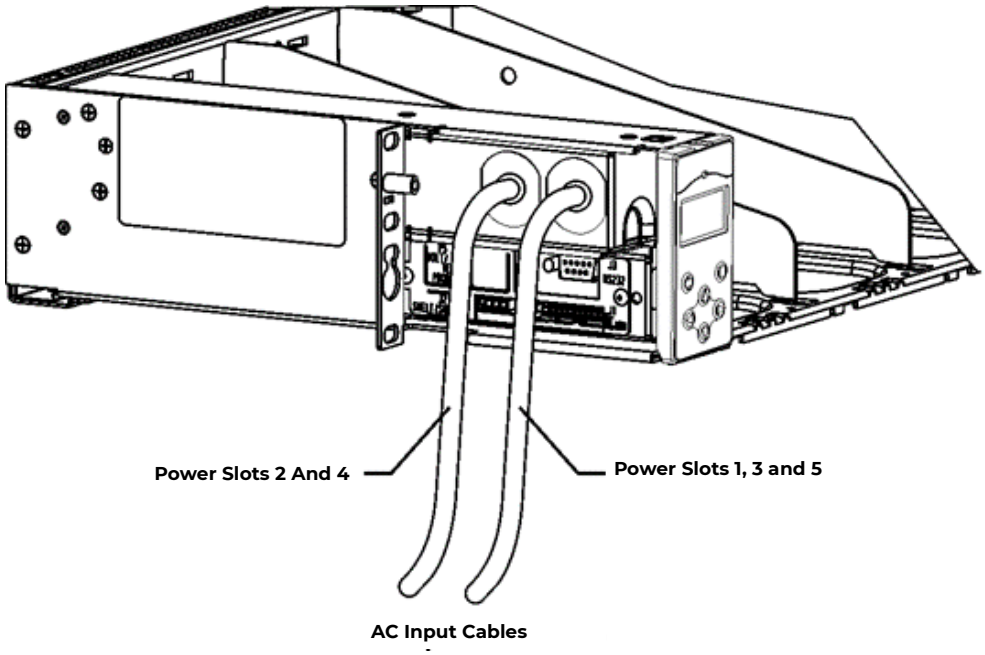


Figure 5-12c: Dual AC Input Cord (10 Awg, 10 ft) Connections

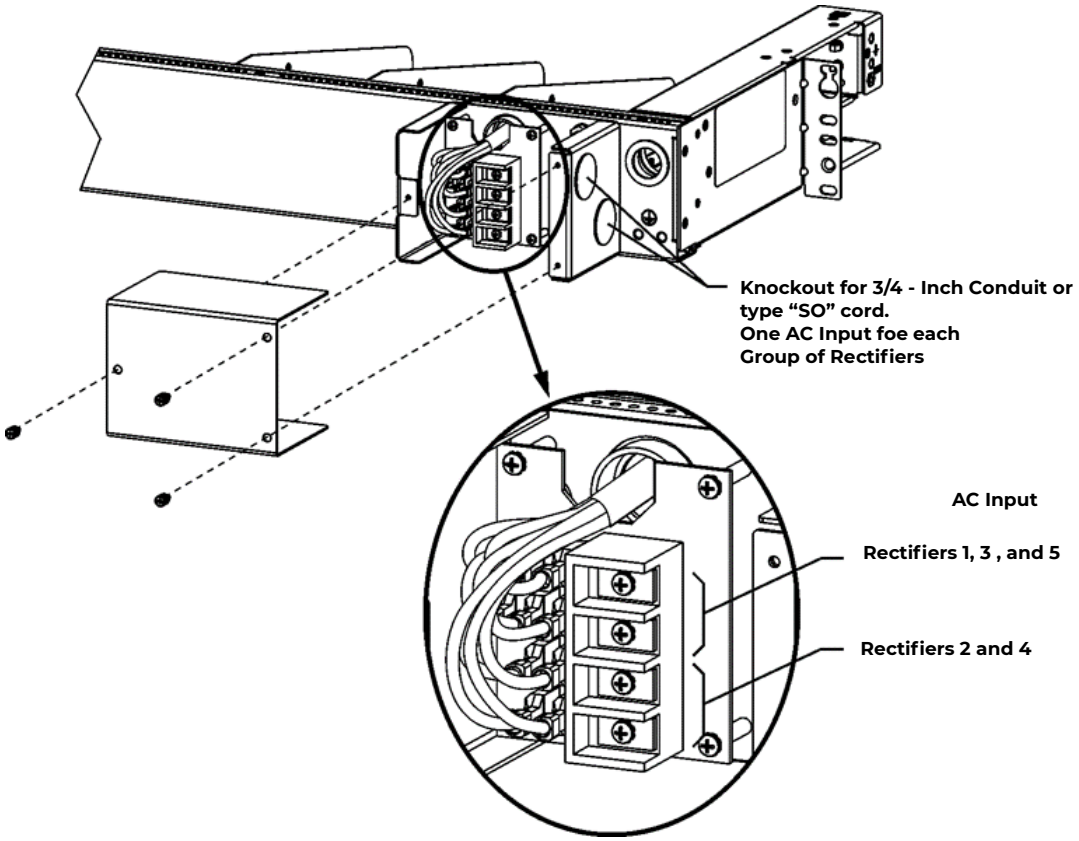


Figure 5-12d: Rear AC Input Connections

AC Connections to External AC Distribution Panel

CAUTION: Disconnect all AC branch circuits prior to making AC connections to the CPS6000 System.

Ensure ac power is OFF to the CPS6000 system before continuing with ac When connecting to utility source, ensure all local and national wiring rules are being complied with.

Refer to Rectifier AC Input Current table for input current values of rectifiers.

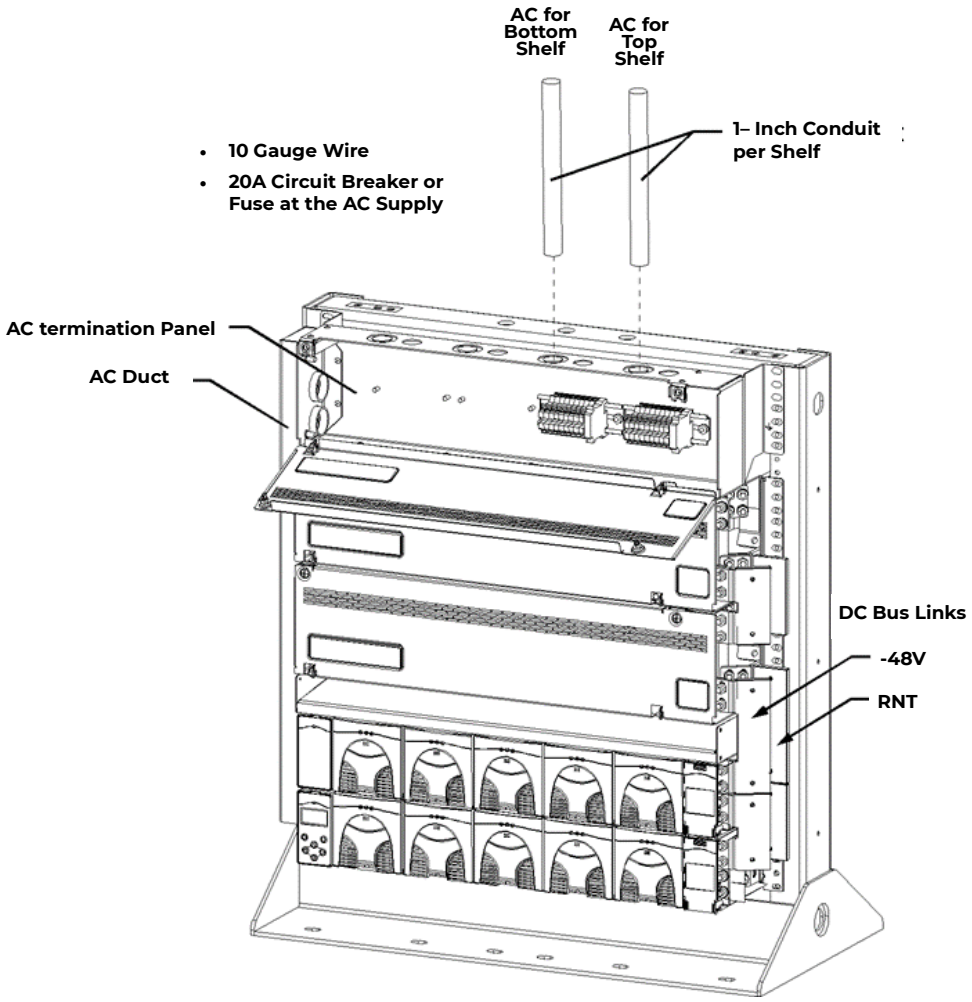


Figure 5-13: AC Input Connections

Refer to Rectifier AC Input Current table for input current values of rectifiers.

C.O. Ground Conductor Installation

Use an M6 double-hole lug on 5/8-inch center (Not provided) to terminate one end of the Central Office (C.O.) ground conductor to the CPS shelf. Terminate the other end of the conductor with a lug appropriate for the installation site. The C.O. Ground conductor can be top or bottom fed. 6 AWG is the maximum gauge that can be used with regular 5/8 -inch center lugs. To use 2 AWG, a suitable narrow tongue lug like the Burndy/FCI may be evaluated.

Install C.O. Ground Conductor

This procedure is used to connect the Central Office Ground Conductor.

Step	Action	
1.	Is the cable routed from the top?	
2.	**Yes** - Connect the conductor lug to the bottom 2 positions for C.O. ground. See Figure 5-14a and b.	**No** - Continue.
3.	Connect the C.O. ground conductor to the top two mounting positions.	
4.	Attach the M6 screws and torque to 65 in-lb (7.3 Nm).	

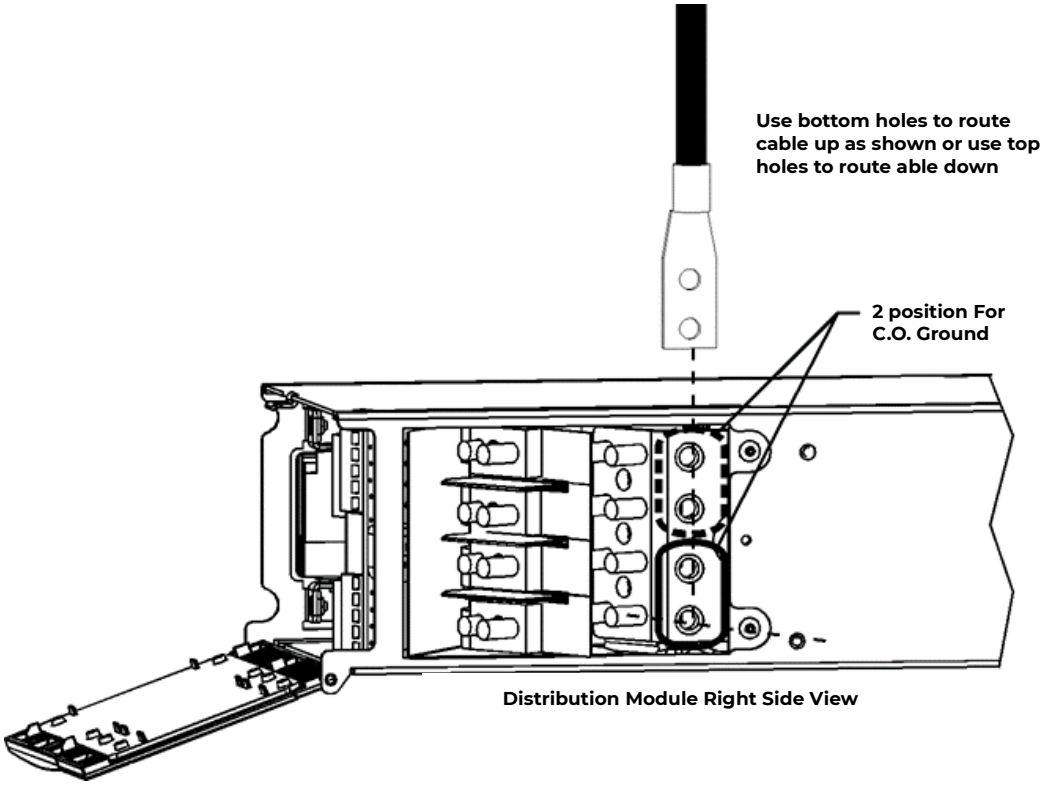


Figure 5-14a: C.O. Ground Conductor Connection

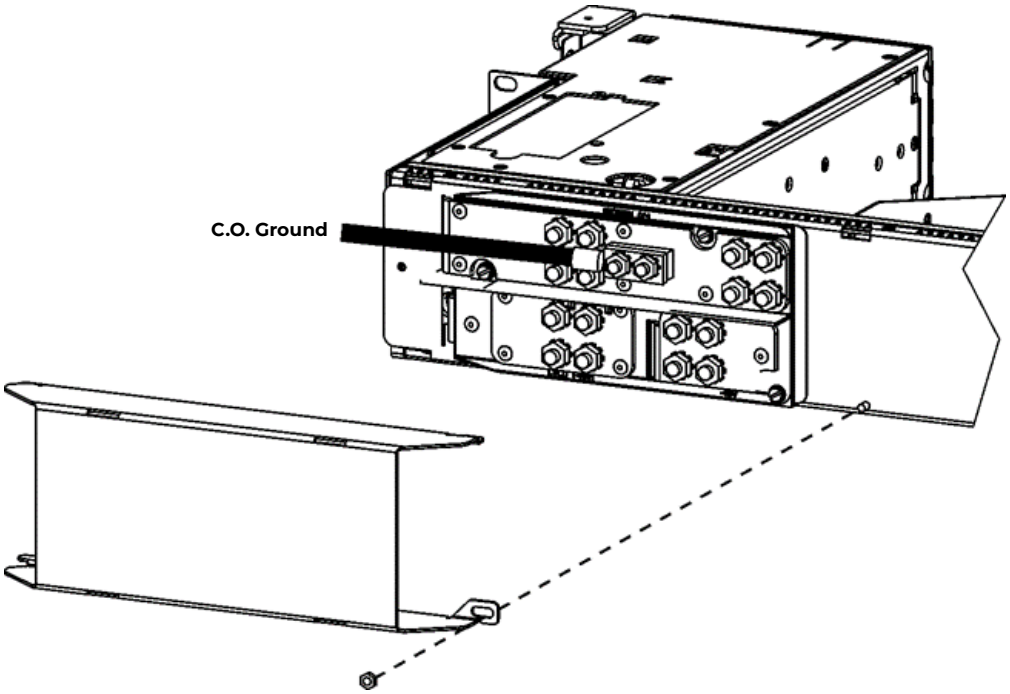


Figure 5-14b: C.O. Ground Conductor Connection

Rectifier Installation

Install the Rectifier

This procedure is used to install the rectifier in the CPS6000 shelf. Figure 5-15 is a 23-inch shelf with 4 rectifier positions and a Single-Slot Distribution Module.

Note: All rectifier ac and dc connections are made when rectifiers are seated in the shelf. Rectifiers will power up when 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 5-15.
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 properlyseated. Push the latch up into the latched position.
3.	Repeat until all rectifiers are installed.

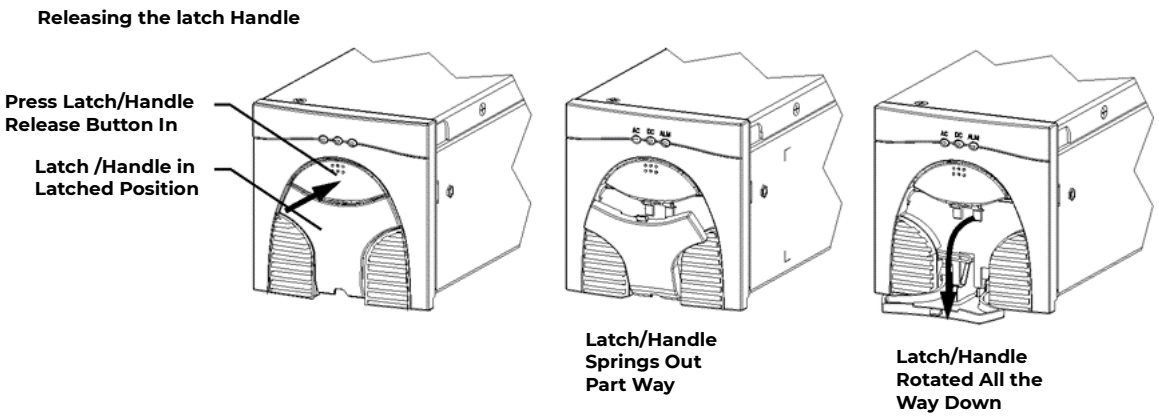


Figure 5-15: Rectifier Installation

Ringer Installation

Install the Ringer Chassis and Ringer Modules

This procedure is used to install ringer chassis's and ringer modules in the CPS6000 shelf. Figure 5-16 shows a shelf, Ringer chassis and a Distribution Module. Up to two Ringer Chassis's may be installed per shelf, one in each of the two right-most power slots to the left of the Distribution Section. Each Ringer chassis accepts two ringer modules, a primary and a spare. For redundant ringing, install both Primary and Spare Ringers in each Ringer Chassis. The Ringer chassis and ringer modules are shipped separate.

Warning: Consider the Ring signal as hazardous voltage.

Warning: Ringer chassis's and Ringer modules will be powered when installed in the shelf when rectifiers and/or battery power is present.

Note: Ringer output connections are made after ringers are seated in the Ringer chassis.

Note: The primary and spare Ringer modules install facing opposite directions.

Note: No rectifiers may be installed to the right of a Ringer Chassis.

Step	Action
1.	Slide the ringer chassis into the power slot until the connector on the rear of the ringer chassis engages with the connector at the back of the power slot on the shelf. Verify the hook under the front left of the ringer chassis hooks under the shelf.
2.	Press down on the faceplate latch and open the faceplate. See Figure 5-16.
3.	Secure the ringer chassis to the shelf using one #4 screw, hand tight to approximately 5 in-lbs. See Figure 5-16.
4.	Repeat until all ringer chassis's are installed.

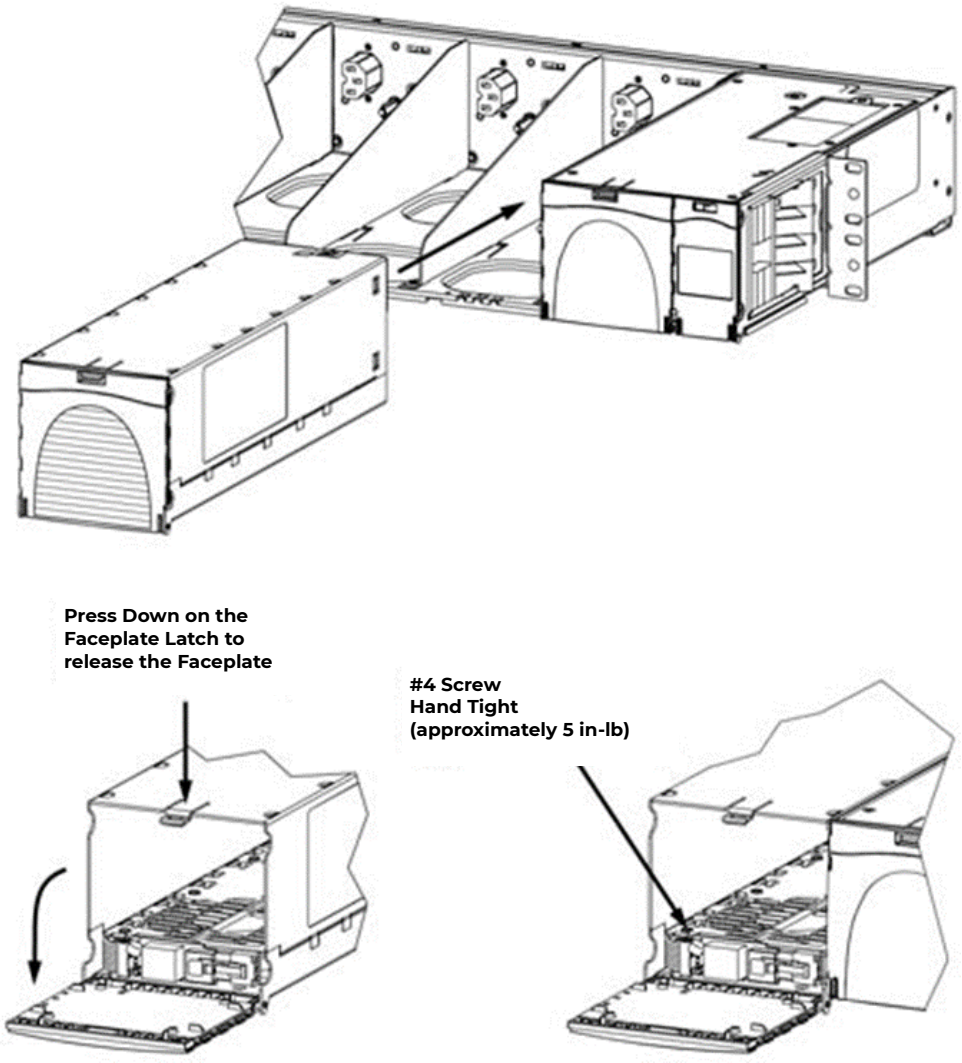


Figure 5-16: Ringer Chassis Installation

Step	Action
5.	Locate connector on rear of ringer module and the mating connector on the insiderear of the ringer chassis. Align the ringer module connector with the ringer chassis connector. Place the ringer module in the guides and slide the ringer in until it fully engages with the connector at the back of the ringer chassis. **Note**: The Ringer modules install facing opposite directions. See figure 5-17.
6.	Repeat until all primary and spare ringer modules are installed.

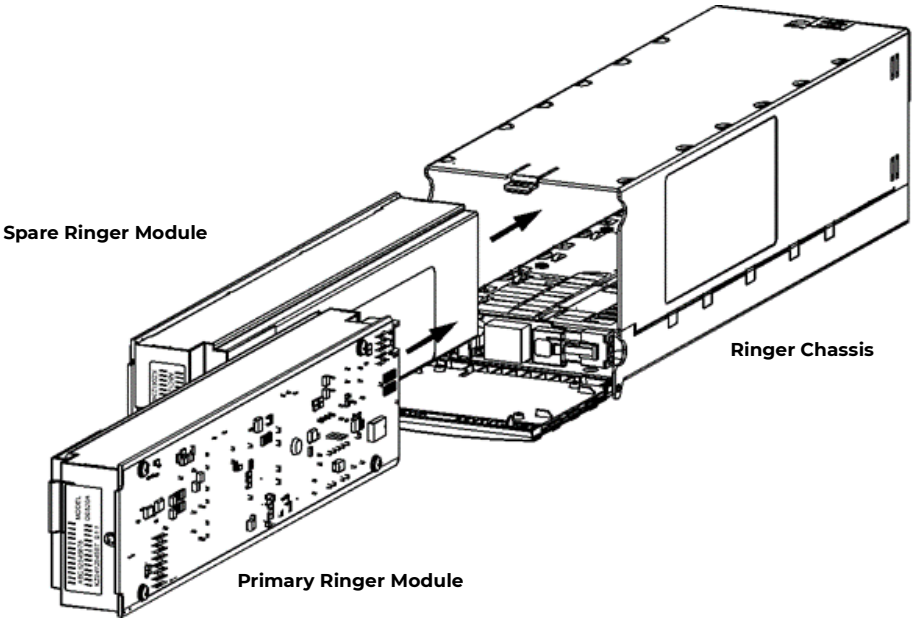
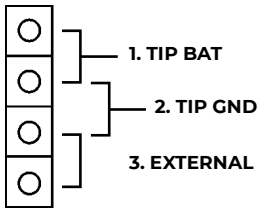


Figure 5-17: Ringer Installation

Step	Action
7.	Use Tip Jumper J12 to set the Ringer output type. See Figure 5-16 for J12 TipJumper location. Note: Ringer output type is determined by connecting Ring Return (Tip) to Battery or Ground. External connection of Ring Return (TIP) to Battery or Ground may beused with J12 in EXTERNAL position. Ringer output is disabled if Ring Return isnot connected to Battery or to ground. See Section 10 for more information on Ringing Types.

Ringing Type	Tip JumperJ12 Position	Comments
Ground Backed	1. TIP BAT	
Battery Backed	2. TIP GND	
Ground Backed – no-dc	2. TIP GND	Also requires Controller configuration of dc Offset: Disabled
Externally Selected	3. EXTERNAL	Requires external connection of Tip to Battery or Ground.



8.	**Warning:** Consider the Ring signal as hazardous voltage. Connect Ringer loads using Molex 39-01-4031 connector, Socket Terminal to the HDR13 plug located inside the Ringer Chassis at the bottom-front. See Figure 5- 18.
9.	Route ringer load cables through upper or lower notches in Ringer chassis and distribution module chassis. See Figure 5-18.

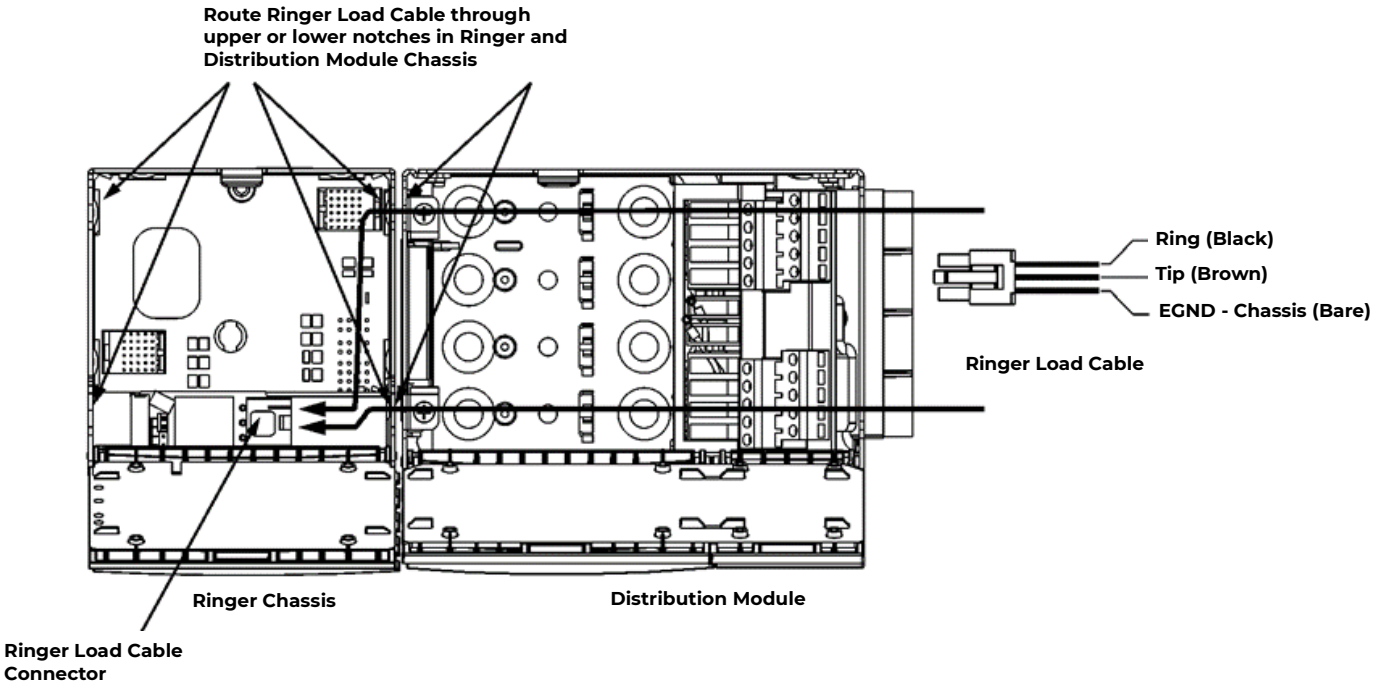


Figure 5-18: Ringer Load Cable and Routing

Battery Strings Installation

Up to four battery strings can be connected to the CPS6000 Distribution Module.

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: If a battery disconnect switch is being used, mount the switch before proceeding and make sure it is in the OFF/OPEN position prior to making any connections.

Connect Battery Strings

This procedure is used to connect up to four battery strings to the CPS6000.

Step	Action
1.	If battery circuit breakers are required, remove the straps installed by the factory and install the bullet-style circuit breakers into the bottom two positions in the Distribution Module. See Figure 5-19. **Caution**: Turn the circuit breakers to the OFF position until the unit is ready to be energized.
2.	Place batteries on the battery trays in a 48 V string arrangement per manufacturer's instructions.
3.	Make battery string V- and RTN connections to the Distribution Module. Refer to the appropriate Figures 5-19b through 5-19e for battery string connections to Distribution Modules.
5.	Secure the cables to the battery terminals with M6 nuts. Torque to 65 in-lb(7.3 Nm).

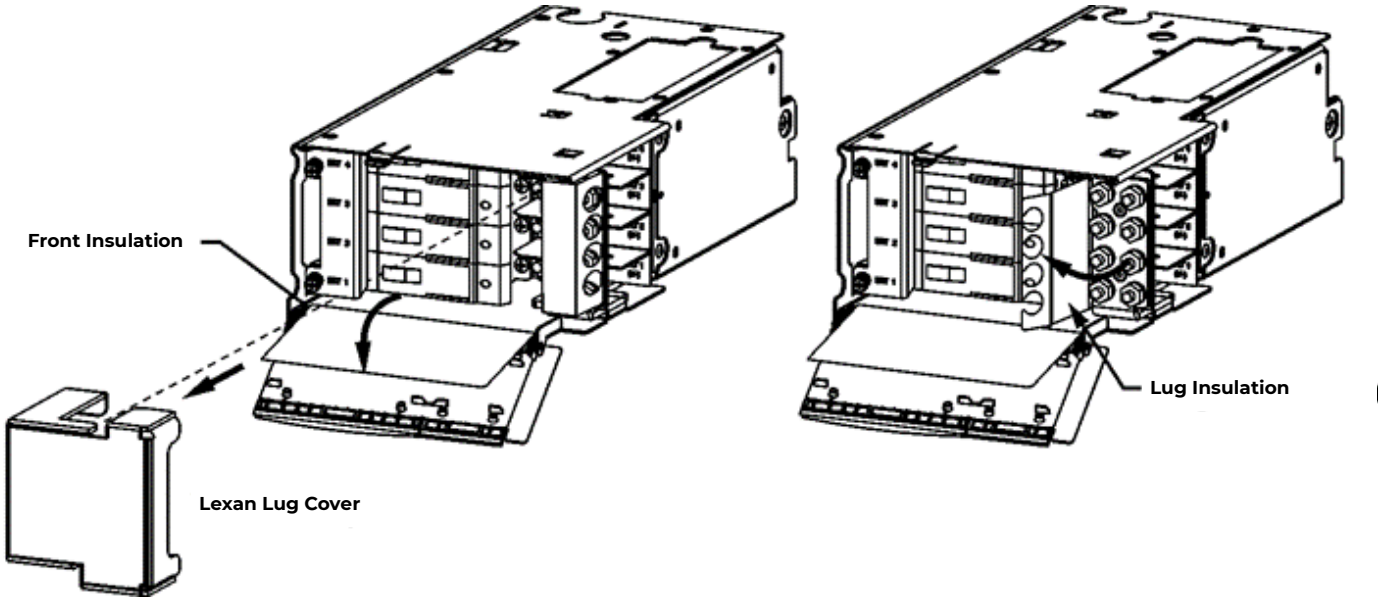


Figure 5-19a: Accessing Battery String Connections

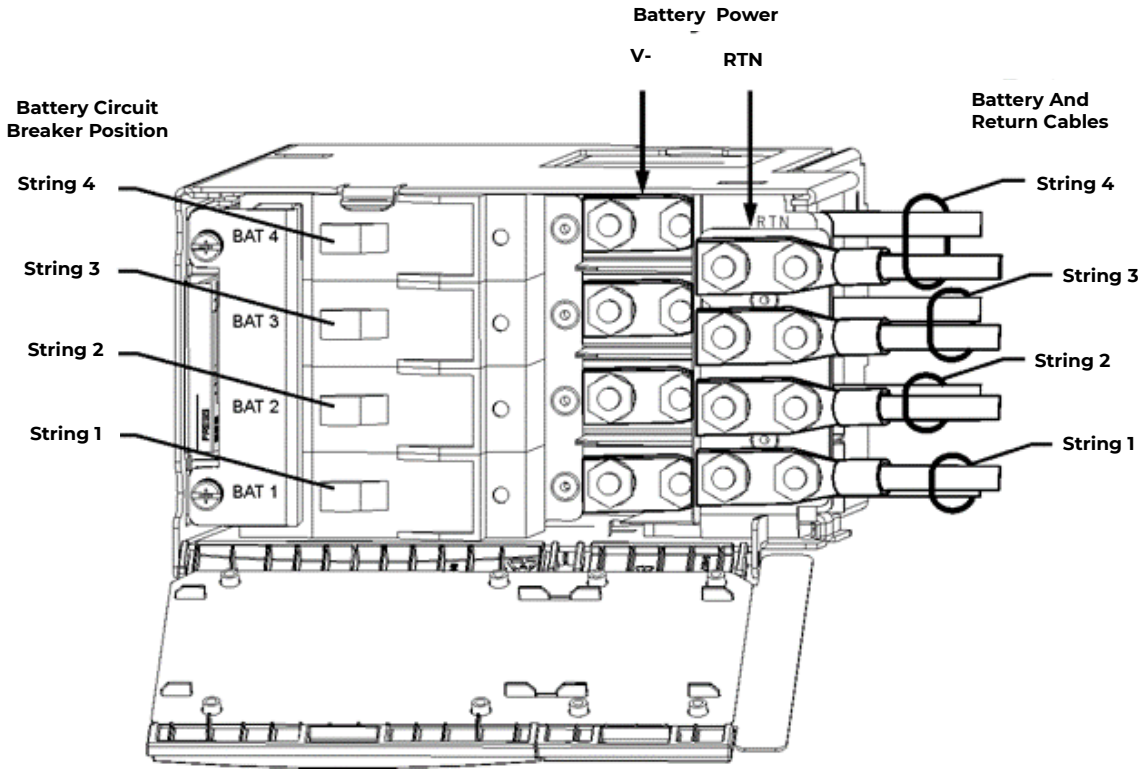


Figure 5-19b: Battery String Connections – Single-Slot, No GMT Fuses

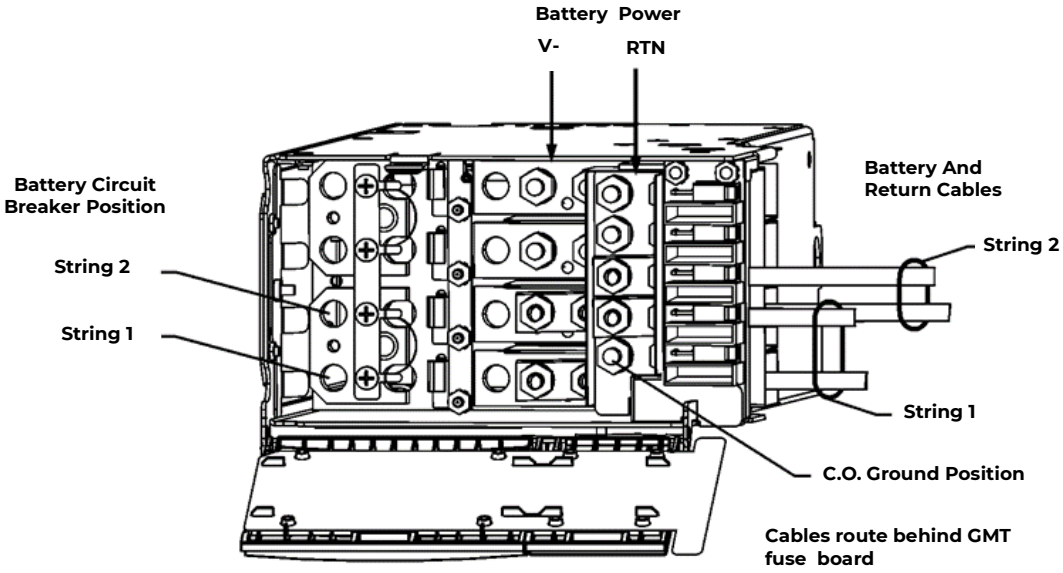
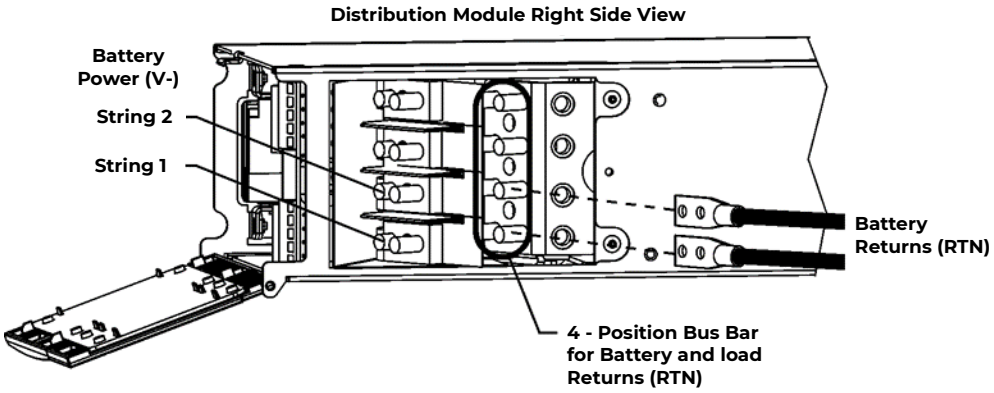


Figure 5-19c: Battery String Connections – Single-Slot, 5 GMT Fuses



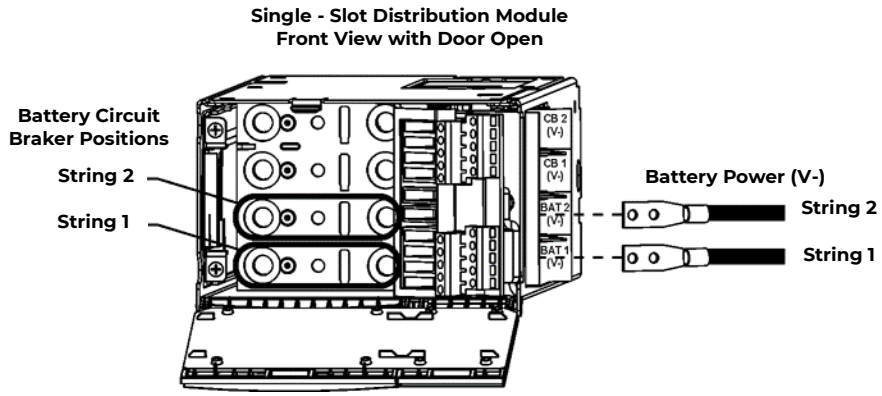


Figure 5-19d: Battery String Connections – Single-Slot, 10 GMT Fuses

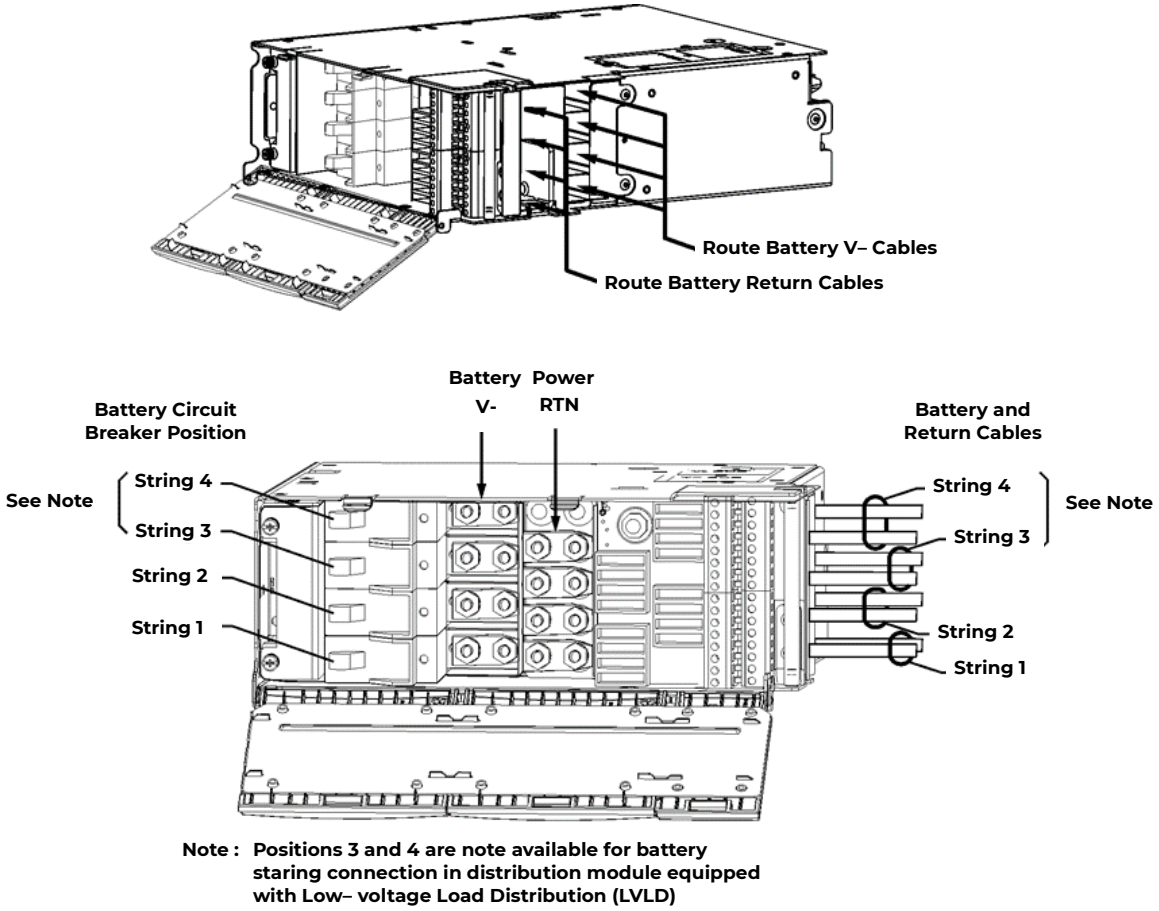


Figure 5-19e: Battery String Connections – Double-Slot

Load Connections

Loads can be connected using 2 bullet-style circuit breakers, GMT fuses or Direct Bus Connections.

Double-Slot Distribution Module Note

Check if Double-Slot Distribution Module positions can be used for load positions, make connections as described here. Positions are converted from battery to a load positions using an adapter on the circuit breaker. This is described in the section, “Installing Circuit Breakers and Fuses.”

Terminate Load Connections - Bullet-Style Circuit Breakers

Two Circuit Breakers can be installed in the top two positions in the Distribution Module. The load terminals on the circuit breakers can secure cabling from 18 AWG (1mm^2) to No. 2 AWG (33mm^2).

Step	Action
1.	Insert Load breakers in the top two positions in the Distribution Module.
2.	Terminate the load cables on the load buss with M6 nuts and torque to 65 in-lb(7.3Nm). See Appropriate Figures 5-20a, through 5-20c for Distribution Module connections.

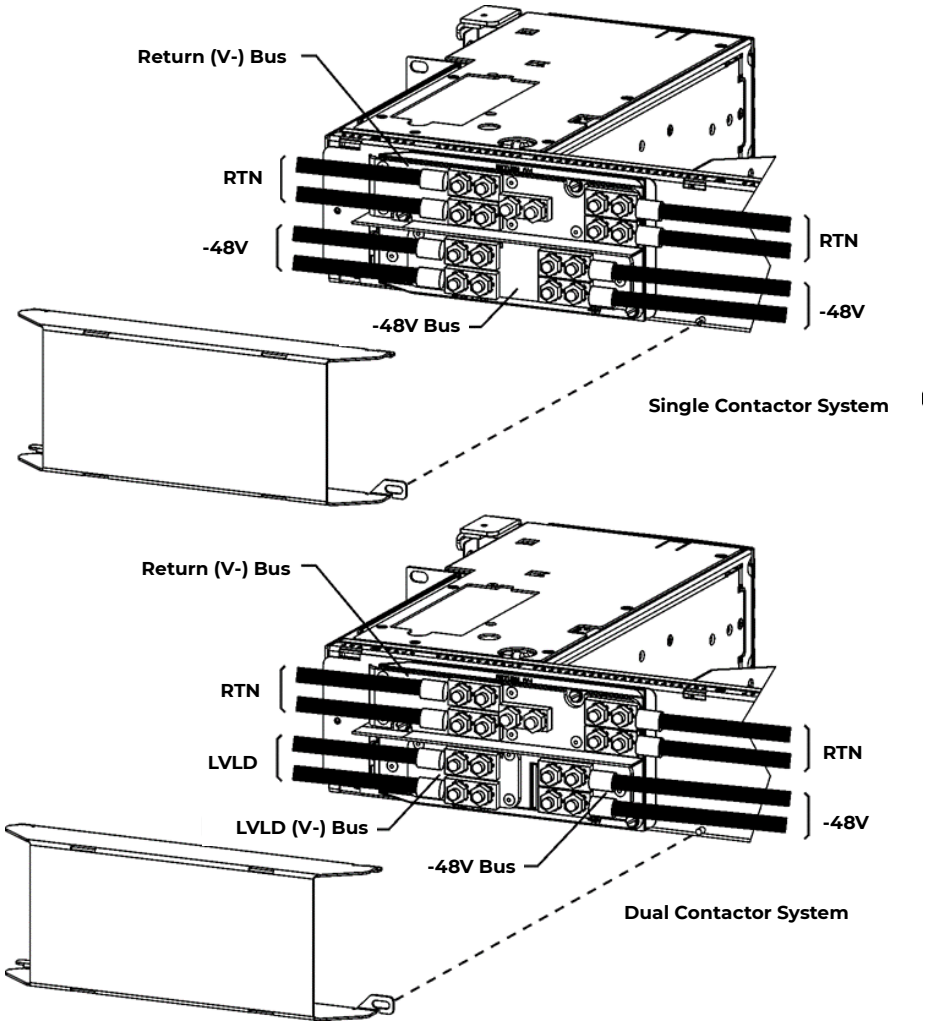


Figure 5-20a: Rear Load Connections

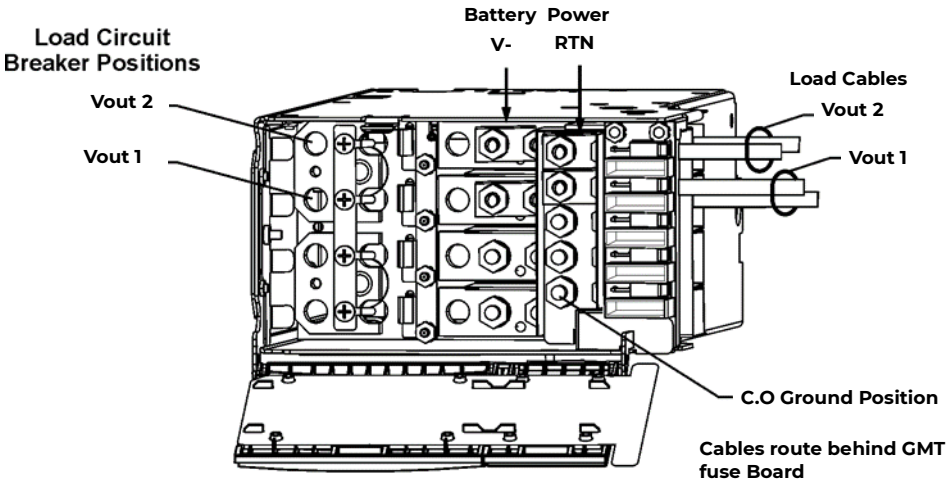


Figure 5-20b: Front Load Connections – Single-Slot, 5 GMT Fuses

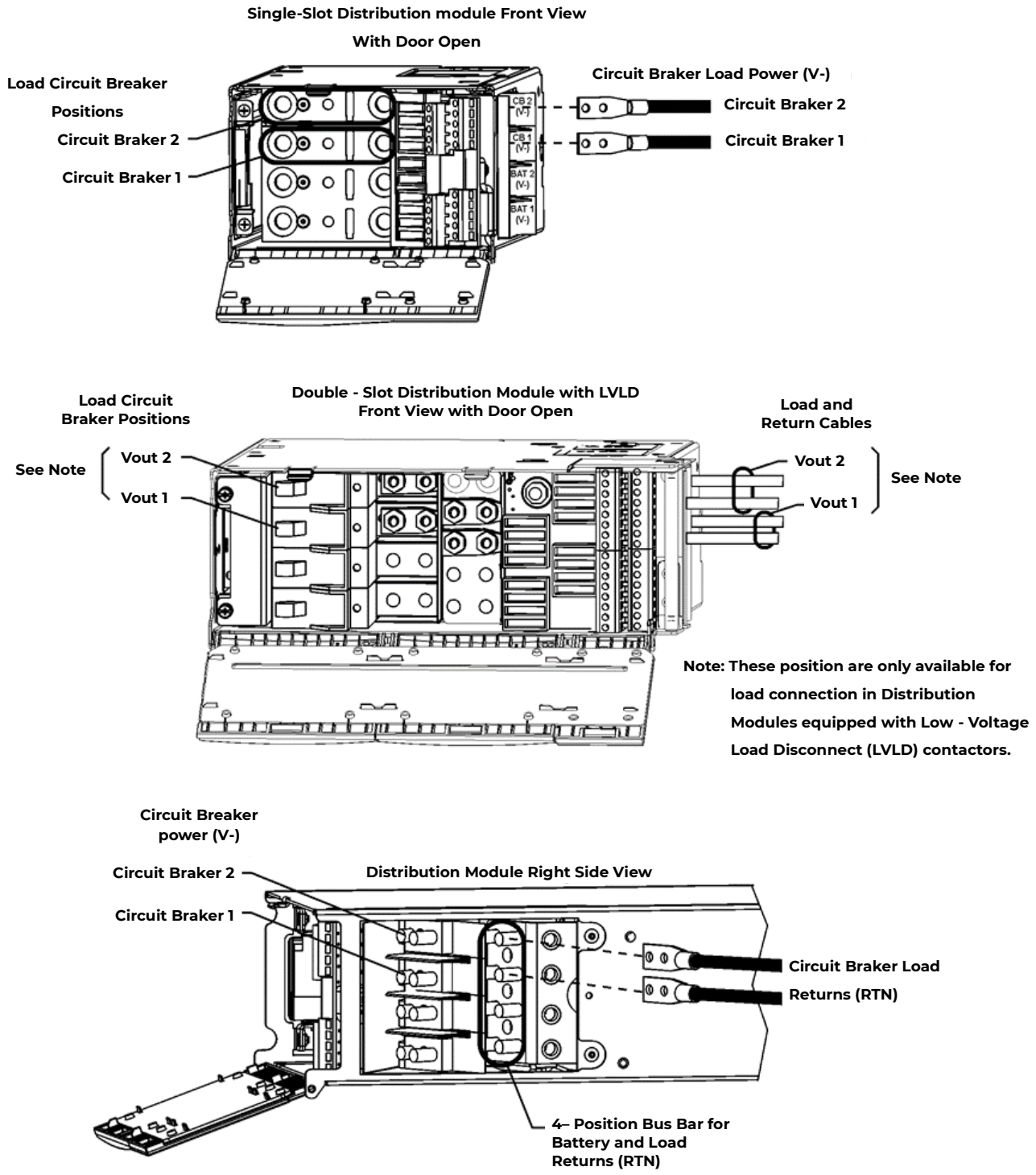


Figure 5-20c: Front Load Connections – Single-Slot, 10 GMT Fuses; Double-Slot

Terminate Load Connections - GMT Fuses

Single-Slot Distribution

When using 20 A fuses adjacent fuse positions must be left open. No more than 80A may be carried through the 10 fuse positions, or 40A per half-section. Up to 14 AWG wire can be used to connect loads to each of the fuse positions. See Figure 5-21 for fuse position and terminal block designations.

Double-Slot Distribution

The 16 GMT fuse position terminal blocks will accommodate 10 AWG wire. Each fuse board (A and B) has 8 GMT positions and is sized to handle up to 80A of total current and can support up to four 20 amp fuses if spaced properly. If 20A fuses are used, then adjacent fuse positions must be left empty. See Figure 5-22 for fuse position and terminal block designations.

Step	Action
1.	Strip 0.24 inches (0.6cm) of insulation from the wire.
2.	Insert the stripped wire through the side of the shelf and into the screw terminal. Torque to 4.5 in. lbs (0.5 Nm). See Figure 5-21 for Single-Slot, and Figure 5-22 for Double-Slot Distribution Modules.

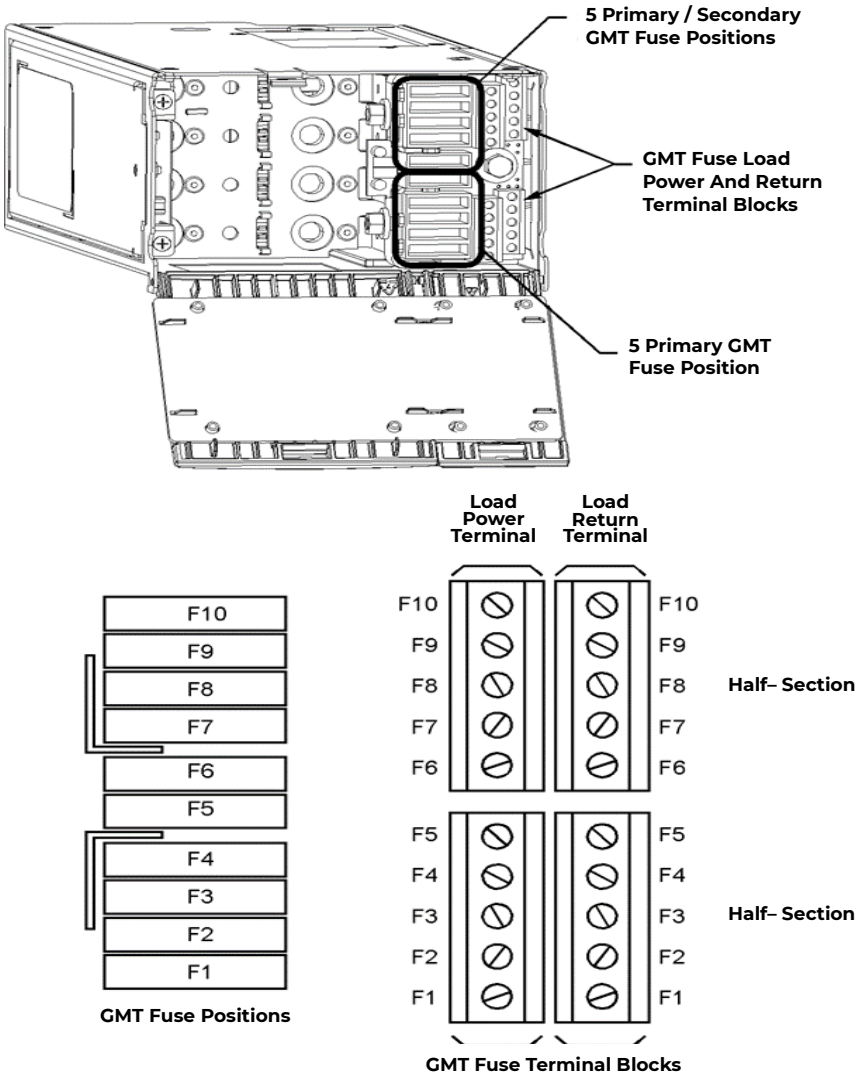


Figure 5-21: GMT Fuse Connections, Single-Slot Distribution Module

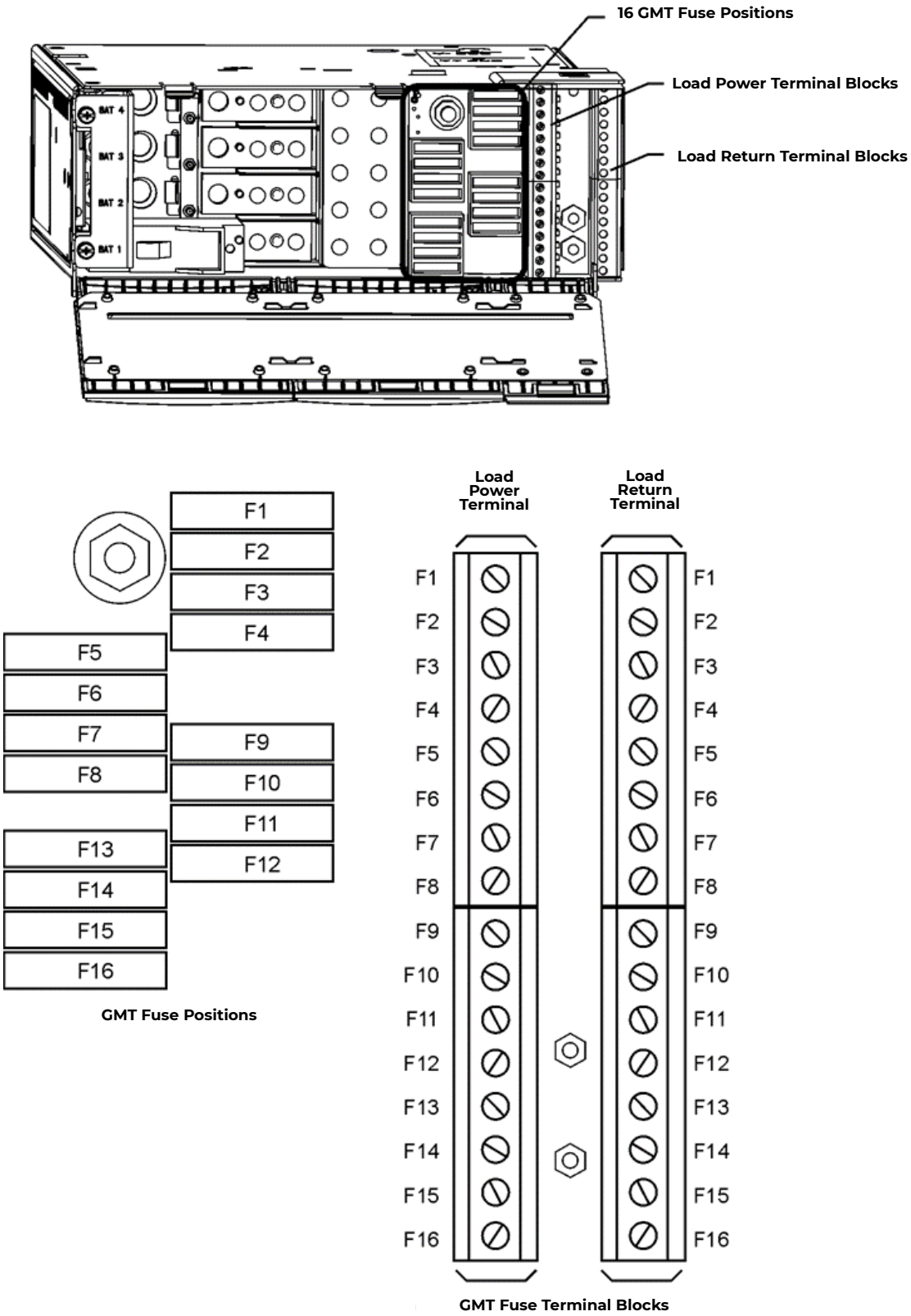


Figure 5-22: GMT Fuse Connections, Double-Slot Distribution Module

Circuit Breaker and Fuse Installation

Figure 5-23 and 5-24shows the proper circuit breaker and fuse orientation for installation. Retention bracket may or may not be provided with all configurations.

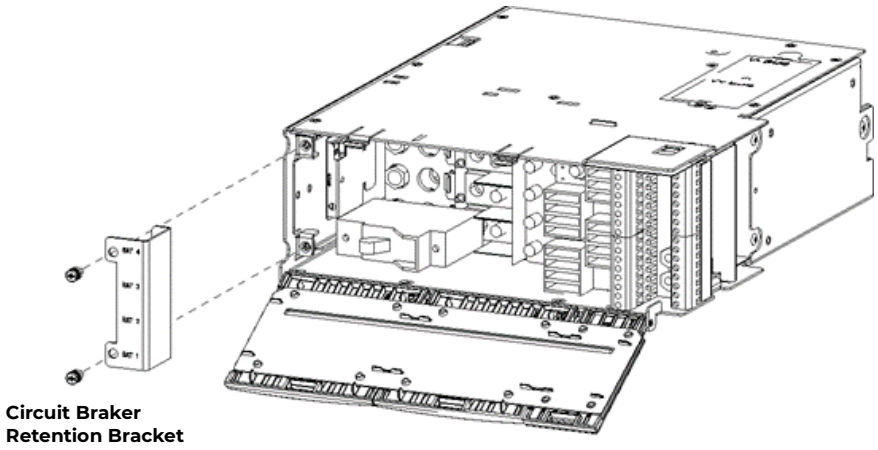


Figure 5-23: Circuit Breaker Retention Bracket

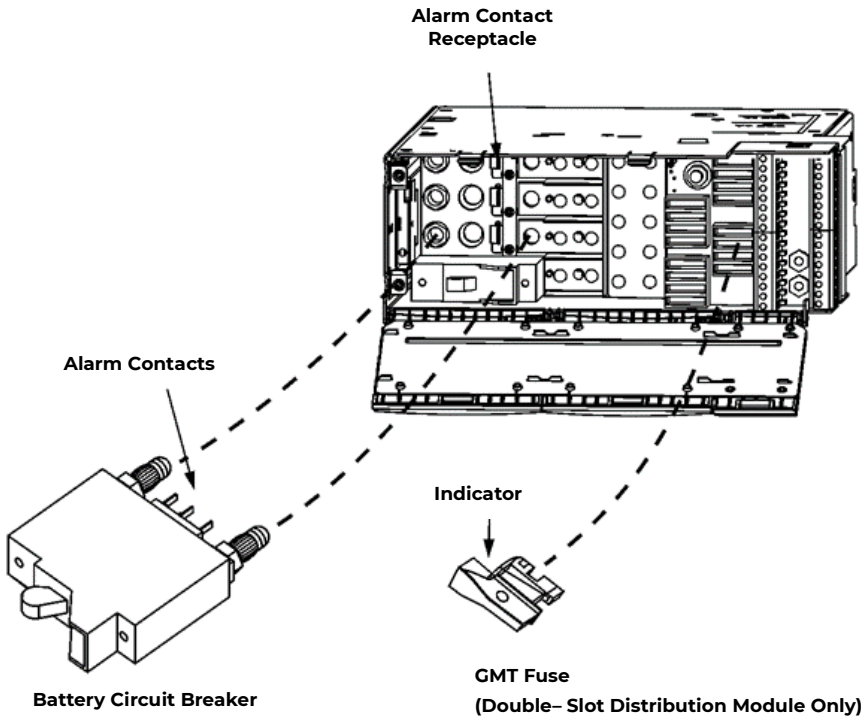


Figure 5-24: Circuit Breaker and Fuse Installation

Terminate Load Connections - Direct to Bus Connections

The Distribution Module can be connected directly to the unprotected (no fuses or circuit breakers) dc output bus. Connections are made from the top of the unit. Lug covers are not provided they must be ordered separately.

Warning: Cables terminated directly to the DC output bus in Figure 5-25 are unfused. Ensure cables ends are protected before terminating cables.

Step	Action
1.	Terminate 45° lugs (with 1/4-inch holes on 5/8-inch centers) to bus landings (hot spots) and torque M6 screws to 65 in-lbs. (7.3Nm).
2.	Break tabs off back of lug cover (see Figure 5-25).
3.	Insert the front post of the lug cover into the mounting hold and snap the tabon the back of the lug cover into place.

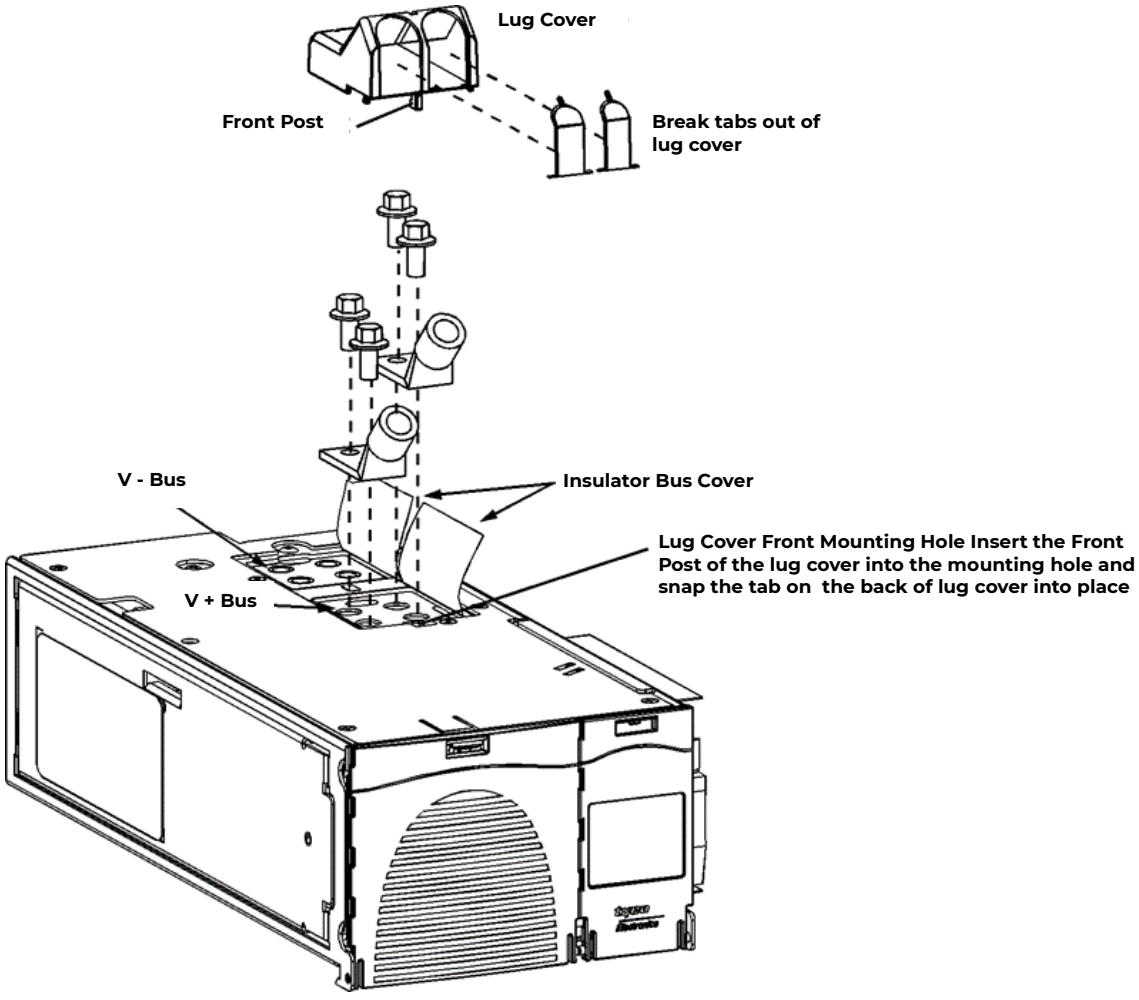


Figure 5-25: Direct Connection to V+ (shown) / V- Output Bus

Bulk Output Distribution Option

Load connections are made to the Bulk Output Distribution Module as shown in Figures 5- 26a or 5-26b or 5-26C

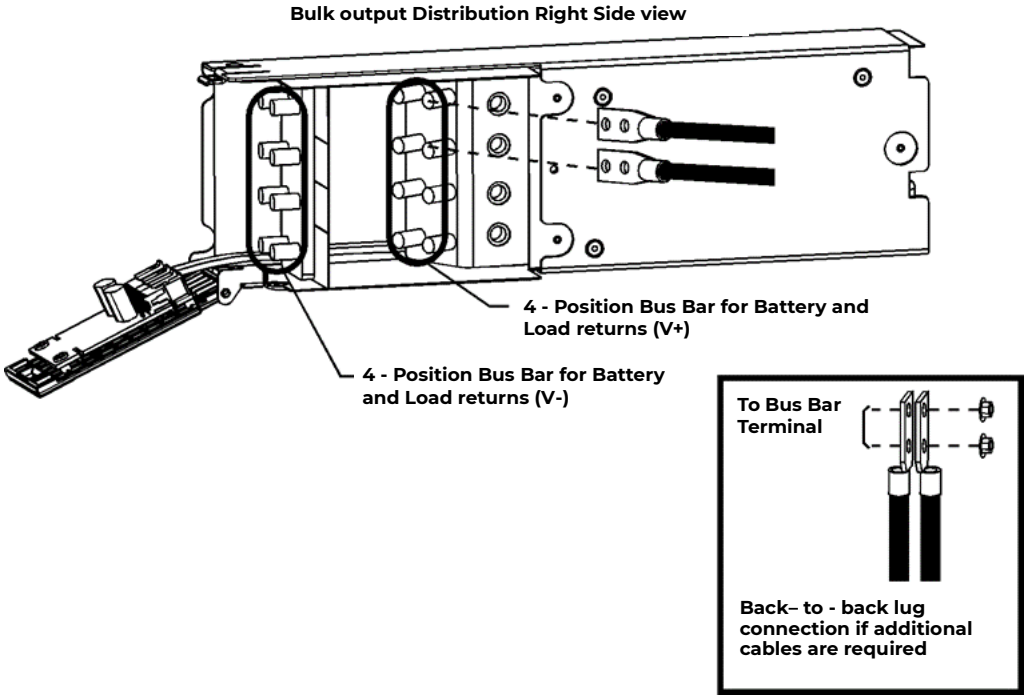


Figure 5-26a: Front Bulk Output Load Connections – up to 2Awg

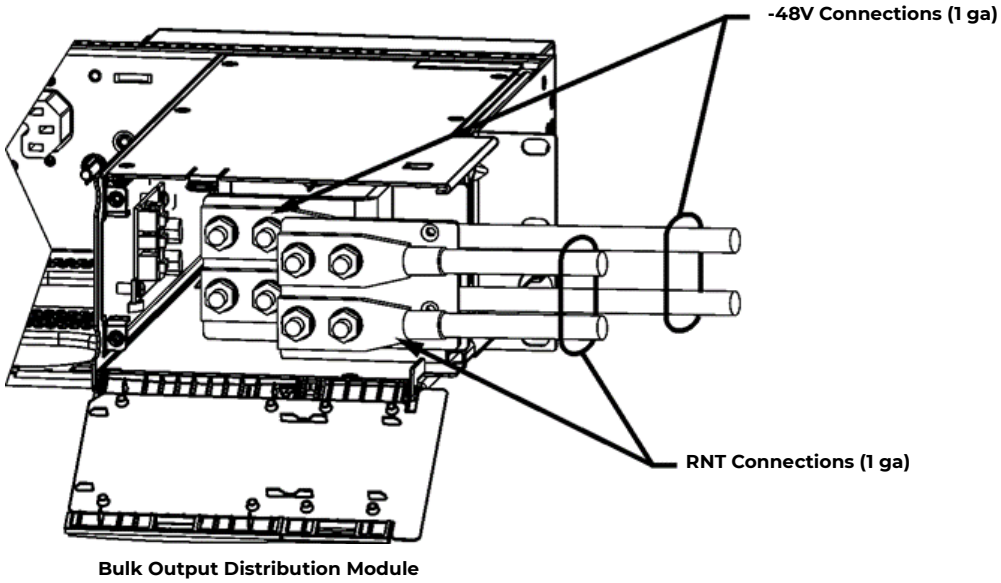


Figure 5-26b: Large Cable (1Awg) Bulk Output Load Connections

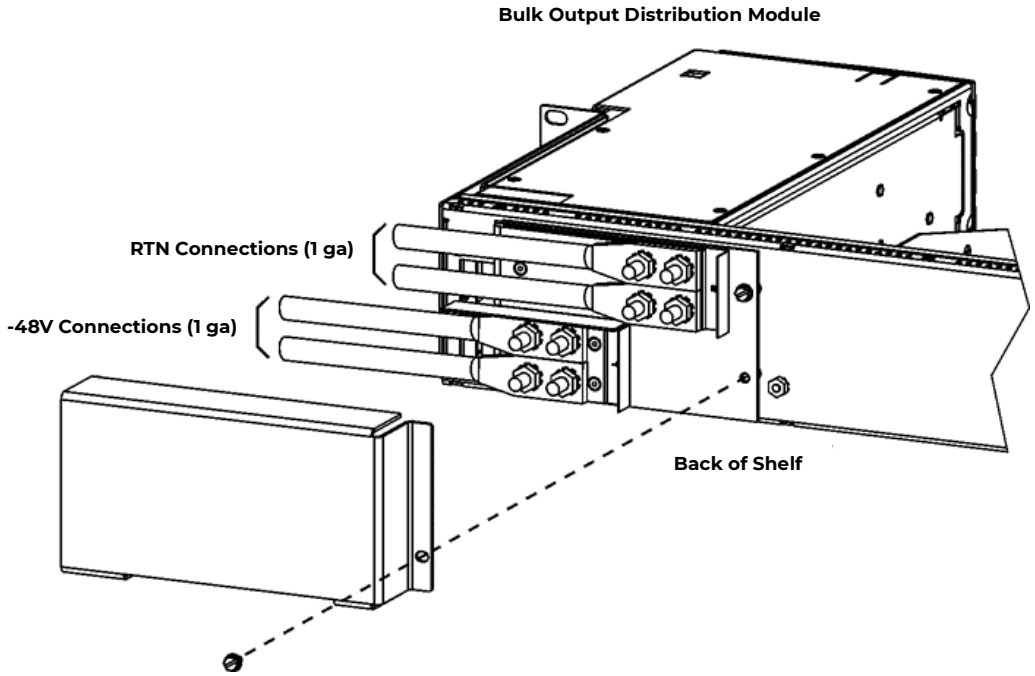


Figure 5-26c: Rear Bulk Output Load Connections

Battery and Load Connections - External DC Distribution Panel

Battery Cable Connection

Dress battery cables internal to the equipment frame up the right side of the frame to enter the top of a Group 163 distribution panel of H5694720 arranged for battery input.

Group 163 distribution panels are typically factory configured with four positions for battery input and eighteen positions configured for load outputs.

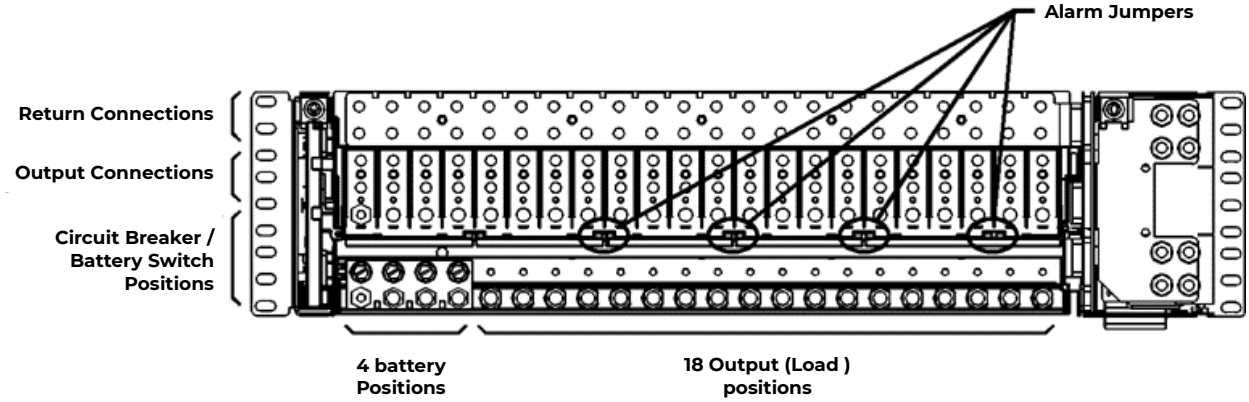


Figure 5-27: Distribution Factory Configuration

Configure Additional Battery Inputs (optional)

Configure the distribution panel for the additional battery inputs as required, in groups of four.

Step	Action
1.	Remove breaker terminal posts in groups of four.
2.	Install busbars.
3.	Remove jumpers and reinstall as shown to separate the alarm contacts between the battery input and load output sections.
4.	**If optional internal battery switches are required:** Install 1, 2, or 3 pole battery switches as required to match battery discharge current. Make sure switch is down, in the OFF position. **If optional internal battery switches are not required:** Install no-switch jumper busses as required.
5.	Using a voltmeter, verify polarity of the battery cables.
6.	Attach the POSITIVE cable to the RTN bus position in line with the switch.
7.	Attach the NEGATIVE cable to the busbar directly above the switch.
8.	Using a voltmeter, verify polarity of the battery connection between the RTN and battery input bus.
9.	Leave the switch in the OFF position until the unit is ready to be energized.

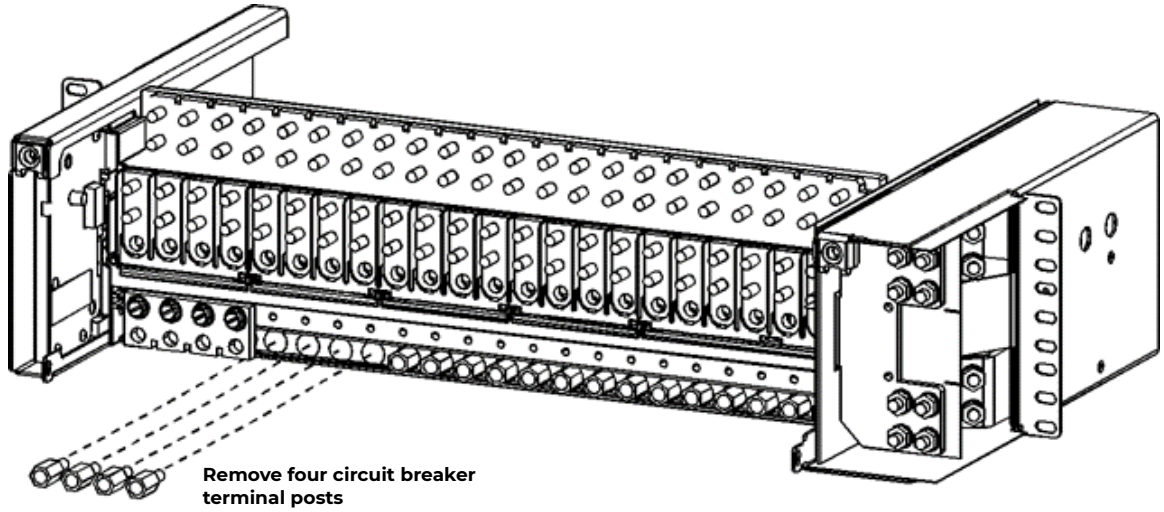


Figure 5-28: Remove Circuit Breaker Terminal Posts

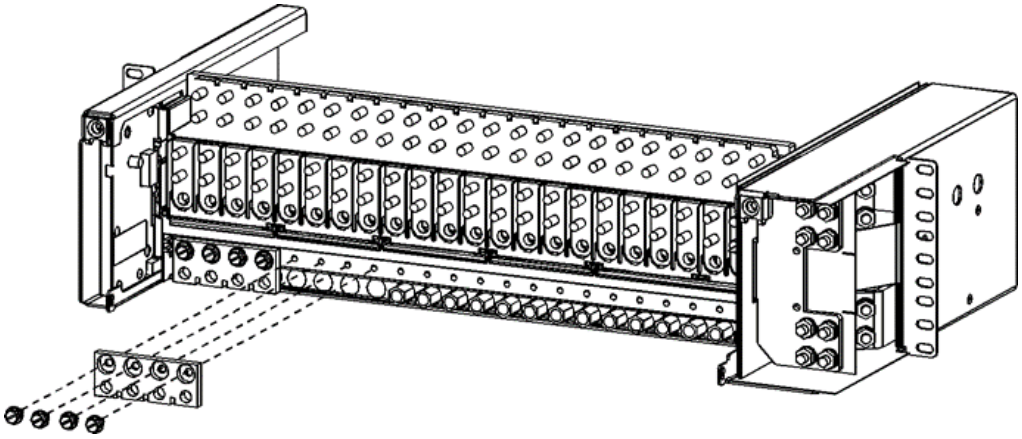


Figure 5-29: Install 4-String Battery Busbar

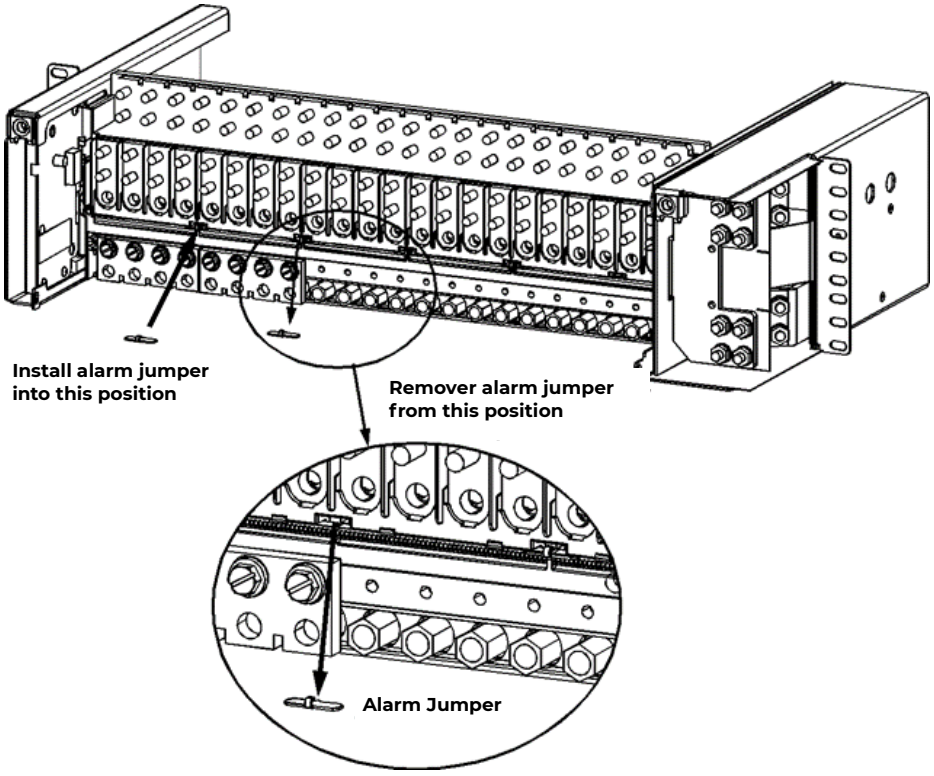


Figure 5-30: Relocate Alarm Jumper

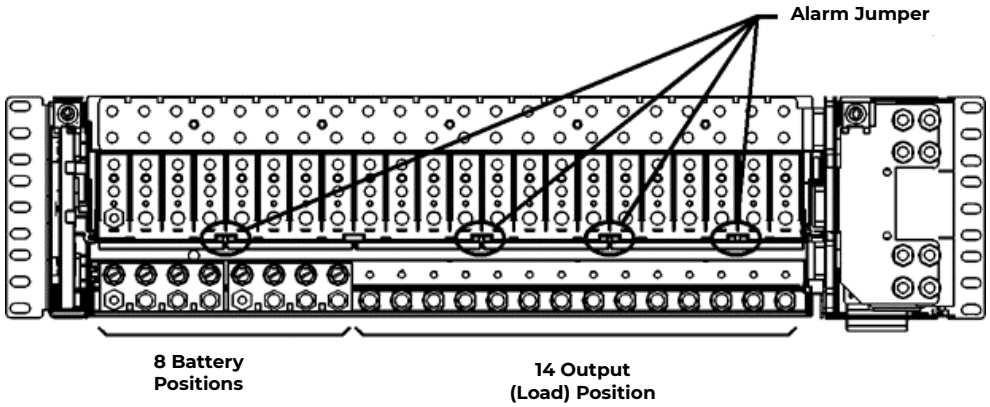


Figure 5-31: Jumper Locations in Completed 8-Position Configuration

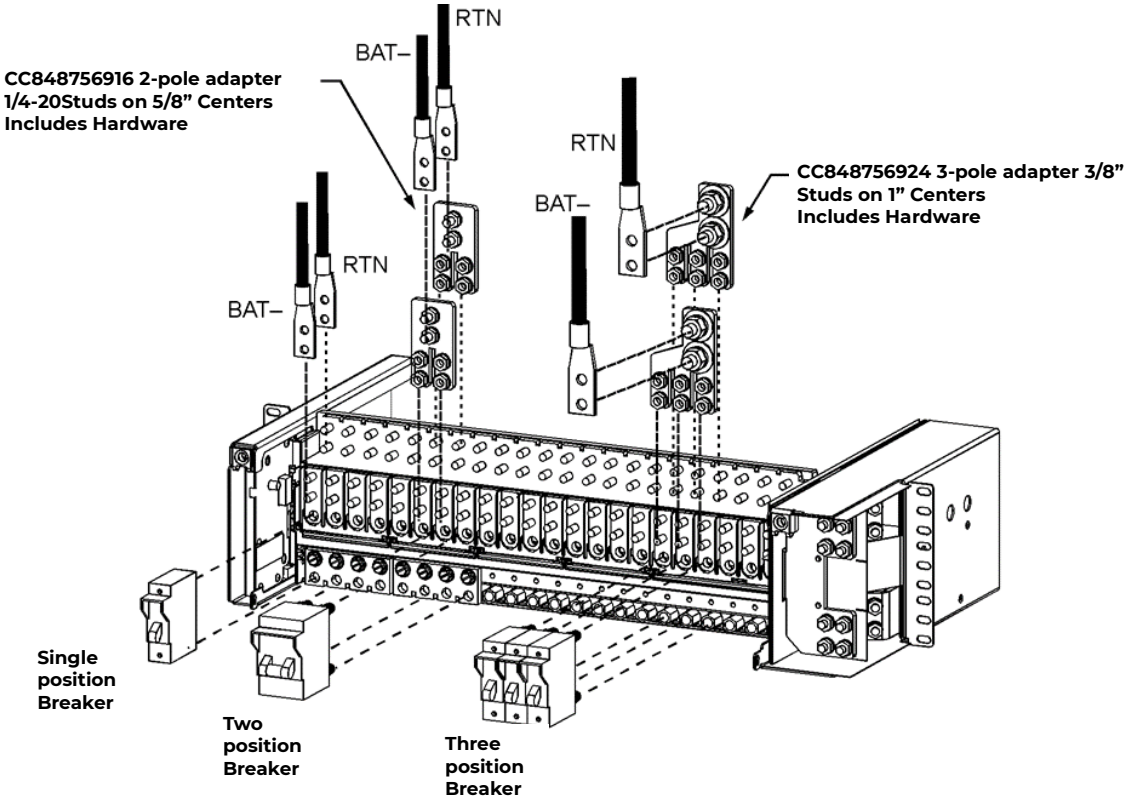


Figure 5-32: Battery and Load Connections to Distribution Panel

Single - Position and Two - position Load and return lugs

Ordering Code	STD Wire Ga (class B)	FLEX Wire Ga (class I)
405356171	14 - 10	14 - 10
405348178	8	8
406338400	6	6
405347576	4	4
405348202	2	-
405347683	-	2
407817568	1/0	-
407817550	2/0	1/0
407817576	-	2/0

three - Position and Two - position Load and return lugs

Ordering Code	STD Wire Ga (class B)	FLEX Wire Ga (class I)
406338665	2	-
405348228	1/0	-
405348236	2/0	1/0
406021725	-	2/0
405348251	4/0	4/0
405347923	-	-
407890763	350	350
407890748	-	

Bullet Style Circuit Breakers

Ordering code	Amperage	CB Positions	Min Wire Gauge
407998137	3	1	10
407998145	5	1	10
407998152	10	1	10
407998160	15	1	10
407998178	16	1	10
407998186	20	1	10
407998194	25	1	10
407998202	30	1	10
408213486	40	1	10
407998210	45	1	8
407998228	50	1	8
407998236	60	1	6
407998244	70	1	6
407998251	80	1	4
407998269	90	1	4
407998277	100	1	2
408185353	125	2	2
408185346	150	2	1/0
408564941	200	3	2/0
408535752	250	3	4/0

Initial Start-up

The system is ready to be powered up. Please verify all connections are as described prior to applying ac power.

Step	Action
1.	**If using battery disconnect switches** place them in their ON/CLOSED positions prior to applying ac power.
2.	Turn on the ac service circuit breakers to apply power to the CPS6000 power system.
3.	Verify that All LEDs on all components including rectifiers, controllers, LVD boards, and remote voltage monitor modules are green.
4.	Verify that the reading on the controller display is 54.5 V_{dc}. Note that if the connected batteries are not fully charged, the voltage may be lower. If possible, open the external disconnect switches or activate the disconnect switches in the Distribution Module prior to making measurements.
5.	If the conditions in Steps 3 and 4 are not met refer to Section 13,Troubleshooting.
6.	Refer to Section 6 for changing system parameters from the default settings if required (float voltages, alarm thresholds, controller settings, etc.)

Step	Action
7.	For QS841A only : If network parameters have been obtained from the corporate network administrator and the controller is ready to be configured for network operations follow the steps below: Otherwise the installation is complete. The following Network Configuration Parameters must be obtained from your Network Administrator before starting: IP address Subnet mask Host name Gateway IP address Note: Host and Gateway may be optional. Configuration of the network parameters may be done in one of two different ways: Easy View Serial Port
8	Configuring the network parameters for QS841A only : Using EasyView Using a PC with EasyView running connected to J3 of the QS841A go to **Configure → Port Communications → Network Port 1**. Enter all networkparameters and click “OK” to save. Serial Port The appropriate IP address, subnet mask, hostname, and default gateway IPaddress must be configured on the QS841A through serial port J3. To login to the QS841A, follow these steps: Start-up the PC terminal program (Windows Terminal,ProComm, etc.) using the following communication parameters: Baud : 9600 Data : 8 Parity : noneStop : 1 Handshaking: noneFlow Control: none Connect the PC to the QS841A local port (RS-232) connectorJ3 Wait for any diagnostic messages to pass. Wait for the “ENTER PASSWORD:” command line prompt. Type the Network Administrator password (default:administrator). Wait for the “$” prompt.
8A	Configuring Static Network Parameters After a valid password entry, a login header with the following format similar to that below will be displayed: Board Code QS841A Serial Number 05DJ09112345 Boot Block version 1.0 Application Code version 1.0Default Web Pages version 1.0 Custom Web Pages not found Ethernet Address 00-60-1D-00-5C-07 IP Address not configured Subnet Mask not configured Default Gateway not configuredHost Name not configured For assistance type help

Step	Action
8A	Typing HELP at the "$" will show all available network administration commands and command line formats. *note: 1) commands are not case sensitive 2) for the commands that follow, ddd is a number from 0 – 255 • To set the IP Address, type: CHA NET1,IP=ddd.ddd.ddd.ddd Verify by typing: STA NET1,IP • To set the Subnet mask, type: CHA NET1,SUB=ddd.ddd.ddd.ddd Verify by typing: STA NET1,SUB • Optional: To set the Default Gateway Address, type: CHA NET1,GTWY=ddd.ddd.ddd.ddd Verify by typing: STA NET1,GTWY • Optional: To set the Host Name, type: CHA NET1,HOST="hostname" Verify by typing: STA NET1,HOST
8B	Logging out of the QS841A MCU. To terminate the configuration session, enter the "bye" command. The QS841A will notify the user if configuration is not complete. This message will have the following format: NOTICE: Default Gateway may be required for network access.Host Name may be required for network access. Logging off... Messages referencing the Gateway and Host Name are acceptable, since the separameters are optional. Note: If the IP address or Subnet mask messages appear, for example:IP Address is required for network access. Subnet mask is required for network access. Then the configuration procedure must be repeated.
8C	Post Installation Procedure. Once configuration has been completed Disconnect the PC from the QS841A local port (RS-232)connector J3. After approximately one minute, observe the LEDs on the J3 net work connector: Green - STATUS LED: ON Yellow - Link / Active LED: ON The QS841A should be communicating over the network.

6 AC, Alarm, and Control Cable Reference Information

Overview

This section contains additional information (connector pin designations, etc.) that may be required for making, customizing, or troubleshooting system connections.

AC Utility Connection

Note: Each ac connection to the CPS6000 shelf is to be provided with circuit breaker protection at maximum 40A for a 23-inch shelf with dual ac feed and low-line (120V) input. For high-line (200-240V) input, a 40A circuit breaker is adequate.

CAUTION: Ensure ac power is OFF to the CPS6000 system before continuing with ac utility connection.

The 23-inch dual-feed shelf requires the H569-470 G50A ac cord, which consists of two sets and is unterminated at the utility end. Insert these into the ac receptacles on the CPS6000 shelf. Terminate the other end with an appropriate plug. Follow all safety rules provided with the plug when connecting the plug to the cable assembly. Refer to the following table for ac feed polarity.

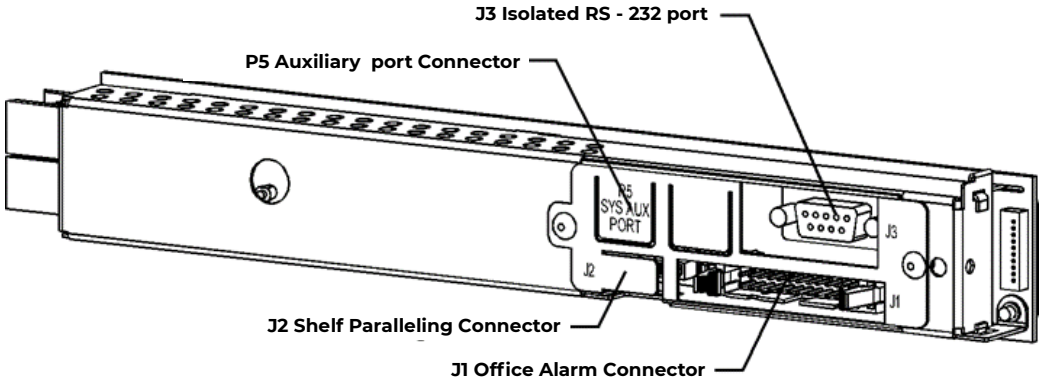
AC Voltage			
120V	**200 to 240V**	**Cable Color Code**	**Cable Color Code**
Line 1	Line 1	Black	Brown
Neutral	Line 2 / Neutral	White	Blue
Ground	Ground	Green	Green / Yellow

Guide the utility end of the ac cords to the utility source. When routing cable, please ensure cable does not traverse any sharp or rough surfaces that may over time cause its insulation to abrade. Also, please be careful to route cables away from doors and the like to prevent any possible damage from pinching.

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

Controller Connections

Figure 6-1 shows the Controller connector locations.



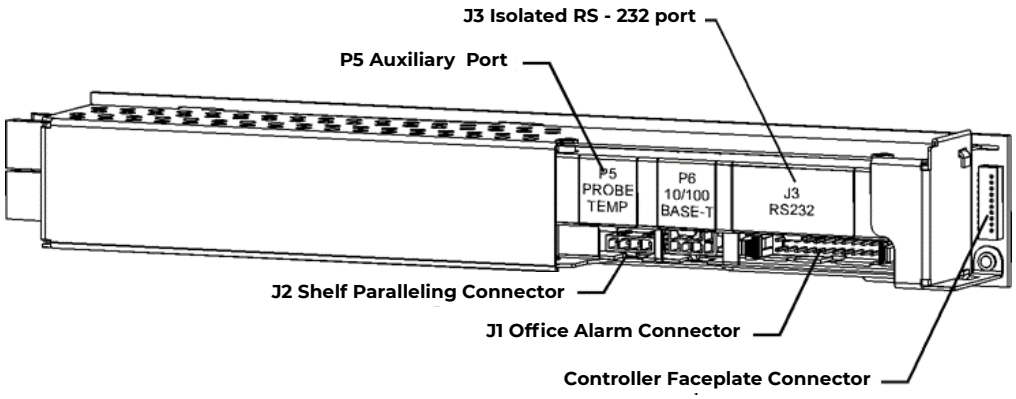


Figure 6-1: Controller Connectors for QS840 and QS841A

Shelf Paralleling Connector

J2 is a 4-pin connector provided on the controller for paralleling up to three additional shelves. This connector is accessible when the controller is inserted in the shelf. Two of the lines on the connector are used for inter-shelf RS-485 communication (RS485+, RS485-), two for shelf addressing, and one for the current share for rectifiers and one for V-. Pin assignments for this connector are shown in the following table:

Pin	Signal	Description
1	RS485+	RS-485 GP communication bus
2	RS485-	RS-485 GP communication bus
3	RECT_PG_EN	Programming enable signal to rectifier (future use)
4	ISHARE	Rectifier analog current share

Auxiliary Port Connector

An RJ-45 receptacle (P5) is provided on the QS840A/QS841A board for connecting to the QS773X VT-Probes or to the QS771A Remote Voltage Monitor. This connector is accessible when the controller is inserted in the shelf. The signals and pin assignments for this interface are shown in the following table:

Pin	Signal	Description
1	RS-485 +	RS485 GP communication bus
2	RS-485 -	RS485 GP communication bus
3	SIG_RTN	Protected signal return for RS485 and 1-wire
4		
5	1-Wire	1-wire communication signal
6	+5V	Protected +5V Power
7		
8		

Local RS232 Serial Port Connector

A DB-9 connector (J3) with a male housing and female pins supporting a local RS-232 port with a subset of handshake signals is provided for local terminal access. This connector provides an isolated RS-232 communication port for notebook computers and PCs.

The local port pin assignments should take the assignment as a Data Circuit-terminating Equipment (DCE). This assignment is shown in the following table.

Pin	Signal	Description
1	RS-232 DCD	*RS-232 Data Carrier Detect (output)
2	RS-232 TXD	RS-232 Transmit (output)
3	RS-232 RXD	RS-232 Receive (input)
4	RS-232 DSR	RS-232 Data Set Ready (input)
5	RS-232 ISO GND	RS-232 Isolated Ground
6	RS-232 DTR	*RS-232 Data Terminal Ready (output)
7	RS-232 CTS	RS-232 Clear To Send (input)
8	RS-232 RTS	RS-232 Request To Send (output)
9	NC	No Connect

* These signals are not necessary for supporting a local port connection.

LAN Connection (Ethernet)

A standard integrated RJ-45 receptacle (P6) is provided on the QS841A for connecting to an appropriate 10/100 Base-T LAN. P6 is shielded with the shield being tied to chassis. This connector is accessible when the controller is inserted in the shelf. The signals and pin assignments for this interface follow industry standard and are shown in the following table:

Pin	Signal	Description
1	TX+	Tranceive Data+
2	TX-	Tranceive Data-
3	RX+	Receive Data+
4	n/c	Not connected
5	n/c	Not connected
6	RX-	Receive Data-
7	n/c	Not connected
8	n/c	Not connected

Auxiliary Alarms

Distribution Module

Four auxiliary alarm inputs are provided, auxiliary inputs 1 through 4, and are configurable through RS-232 interface of the controller. Auxiliary alarm inputs can be made on the AMM board. Remove the Distribution Module side cover and AMM board for access to the connector as shown. The auxiliary alarm input connector pin assignments are shown below.

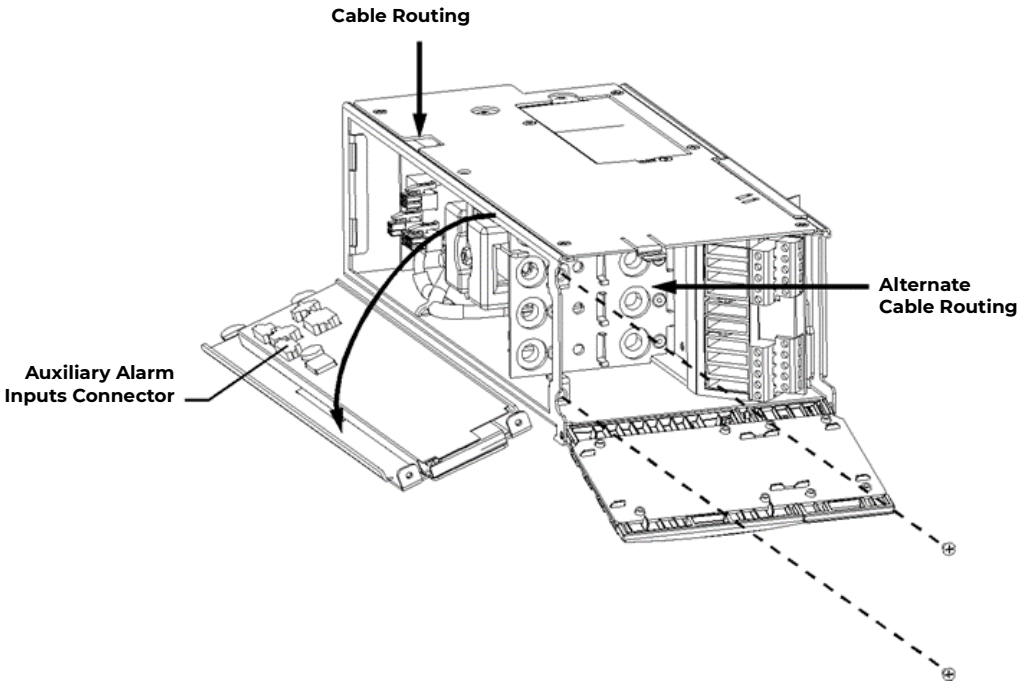


Figure 6-2: P5 Auxiliary Alarms Connector

Pin	Alarm*
1	Auxiliary 1
2	Auxiliary 2
3	Auxiliary 3
4	Auxiliary 4
5	Return (Vminus/Battery)
*Alarms are generated by connecting alarm contactinputs to Vminus, typically through a clean relay contact from the monitored device.	

Mating connector information for this 4-pin connector is as follows:

Housing: Amp part number 1445022-4

Contact (on a strip): Amp part number 794606-2

Contact (loose piece): Amp part number 794610-2

Bulk Output Module

A fuse alarm input for monitoring an external distribution is available on the Bulk Output Module on connector J3, pin 1 (Figure 6-3).

The input can be connected to a relay which provides system voltage on alarm. Pin 2 (V-) can be used to provide system voltage with a clean relay contact.

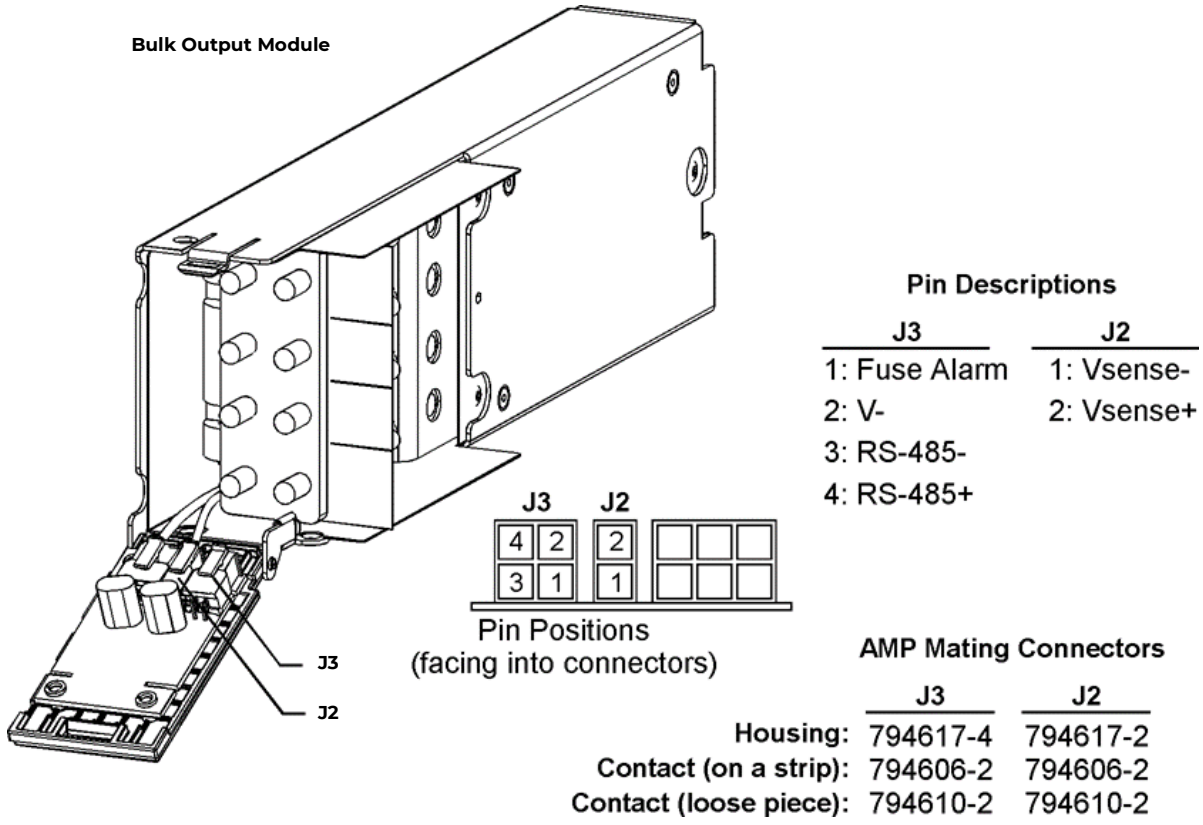


Figure 6-3: Bulk Output Module Connectors

Additional Bulk Output Module Connections

Vsense-, Vsense+

Pins 1 and 2 (Vsense- and Vsense+) on J2 are wired to monitor system voltage internal to the Bulk Output Module. To monitor system voltage externally, unplug the mating connector from J2 and connect Vsense- and Vsense+ to the external source to be monitored.

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7A QS840A System Controller

Overview

The QS840A Controller provides system monitoring and control features, as well as office alarm outputs from rectifiers, LVD boards, and remote modules. This section describes the controller features, functions and alarms.

Controls and Display

Figure 7-1 shows the front panel controls and display of the controller.

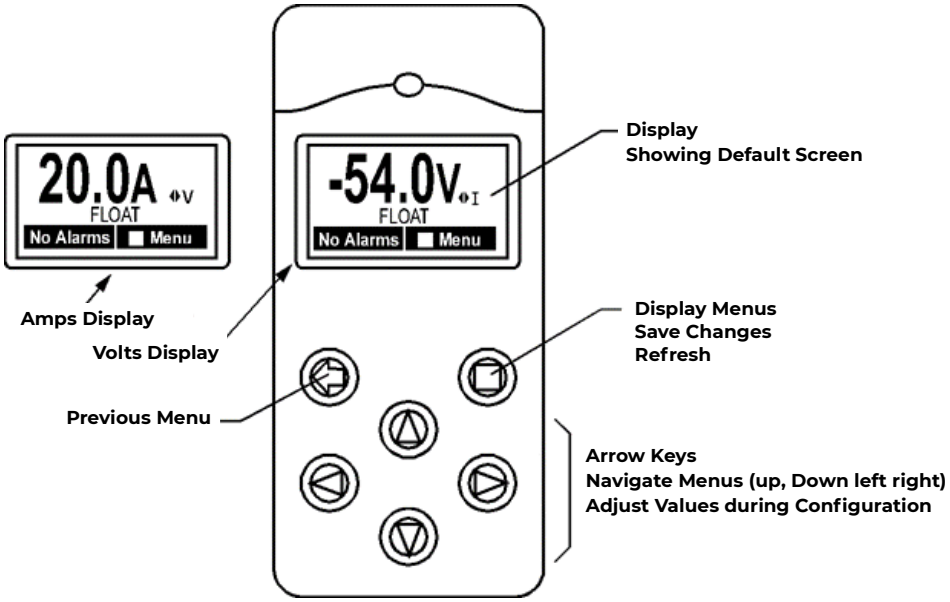


Figure 7-1: QS840A Controller Faceplate

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.

Connectors

Figure 7-2 shows a side view of the controller unit.

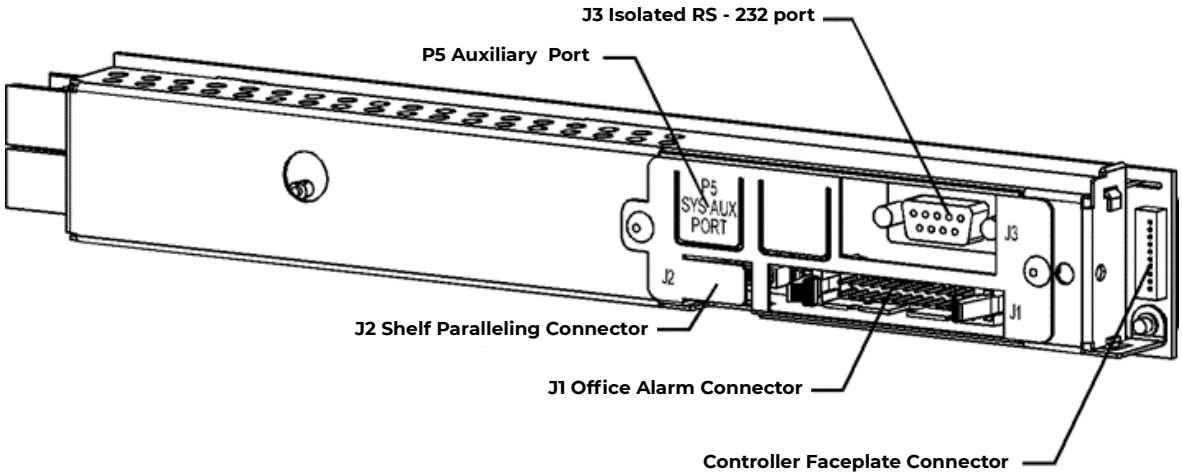


Figure 7-2: QS840A Controller Unit Side View

An isolated RS-232 connector (J3) is provided for local access or for connection to an external modem. The software interface is compatible with OmniOn Power EasyView for Windows GUI software for PCs. Software support is also provided for use with OmniOn Power Galaxy Manager for web-based remote access and monitoring.

The controller also includes six alarm relays. Two are pre-assigned as power Major and power Minor alarm relays. The four remaining relays are available as user-definable alarms and have been predefined for the various QS840A configurations.

Software

The software is functionally divided on the Main Menu into the following categories:

Alarms

Warnings

Status

Control/Operations

History

Configuration

The following figures show a map view of each category and the settings and operations found in each, and are followed by brief descriptions of the menu items. **Alarms** and **Warnings** are not hierarchal mapped and are presented in chronological order of occurrence when they are present. “No Active Alarms” or “No Active Warnings” will be displayed when they are no alarms or warnings detected by the controller.

Figures 7-3a through 7-3d provide a menu flow map of the QS840A controller software followed by brief descriptions of the menu items. Older or customer controller may have only some of the described menu items.

Status Menu

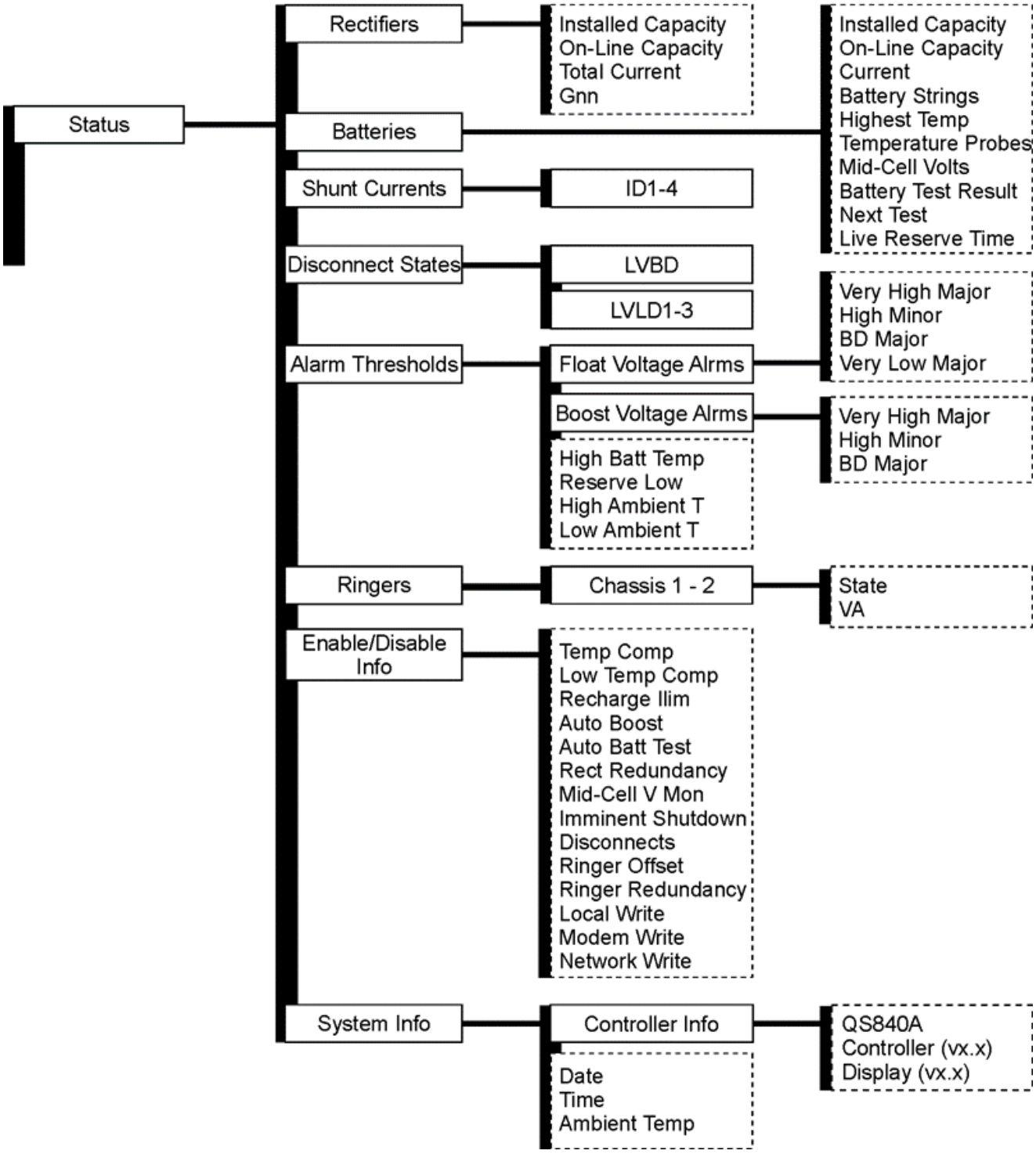


Figure 7-3a: Software Menu Map

Control / Operation and History Menus

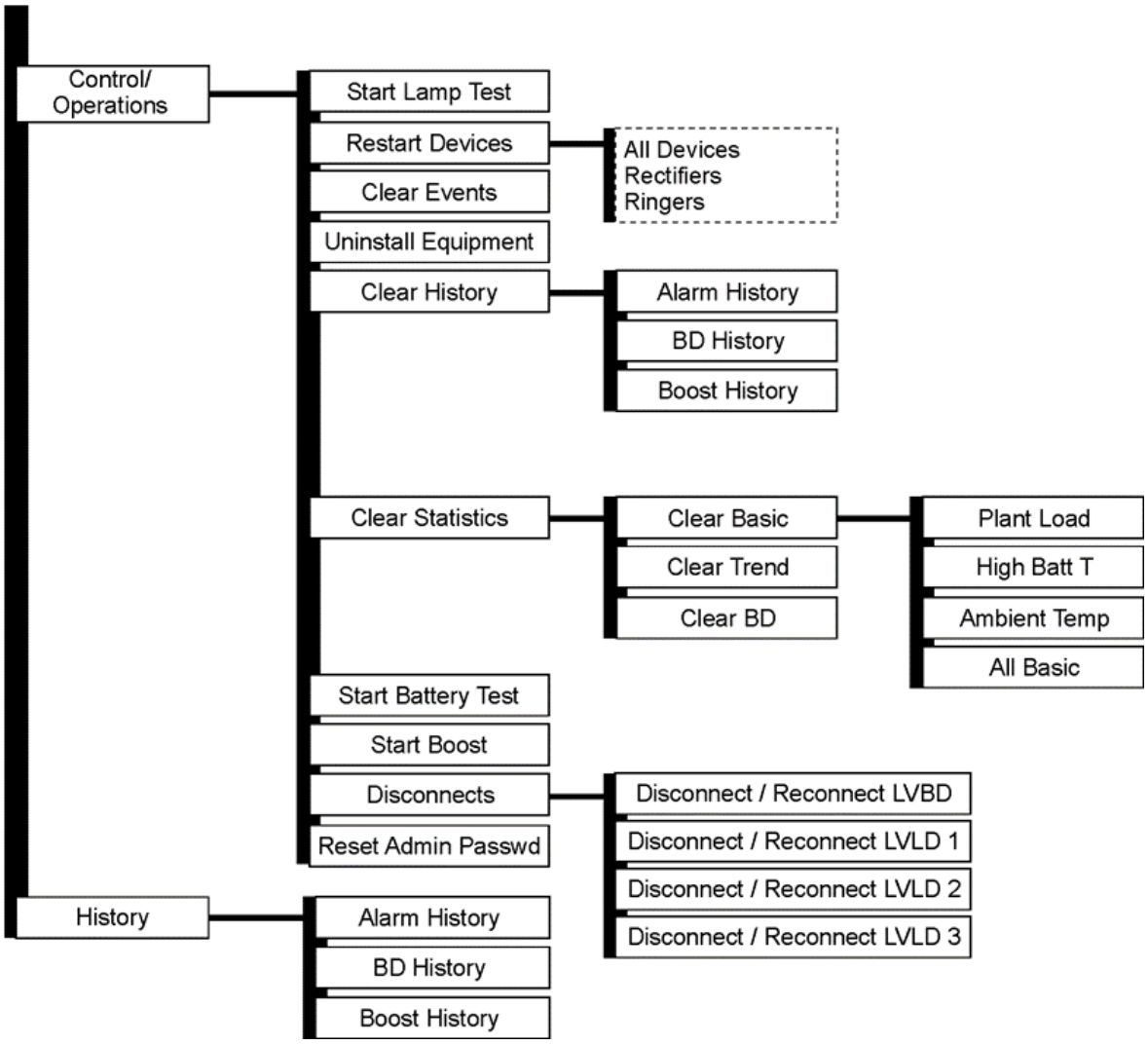


Figure 7-3b: Control / Operations and History Menus

Configuration Menu

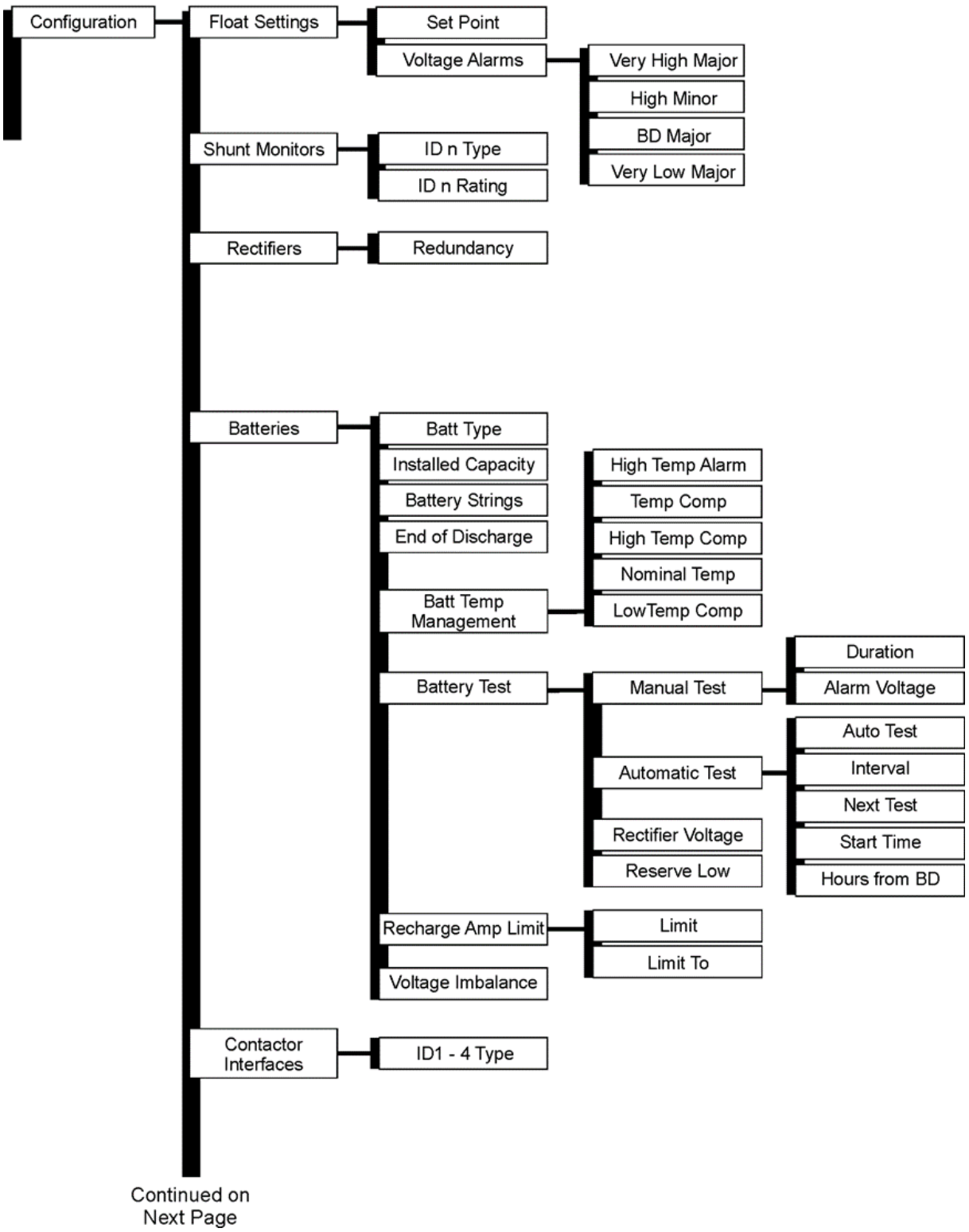


Figure 7-3c: Configuration Menu (part 1)

Configuration Menu (continued)

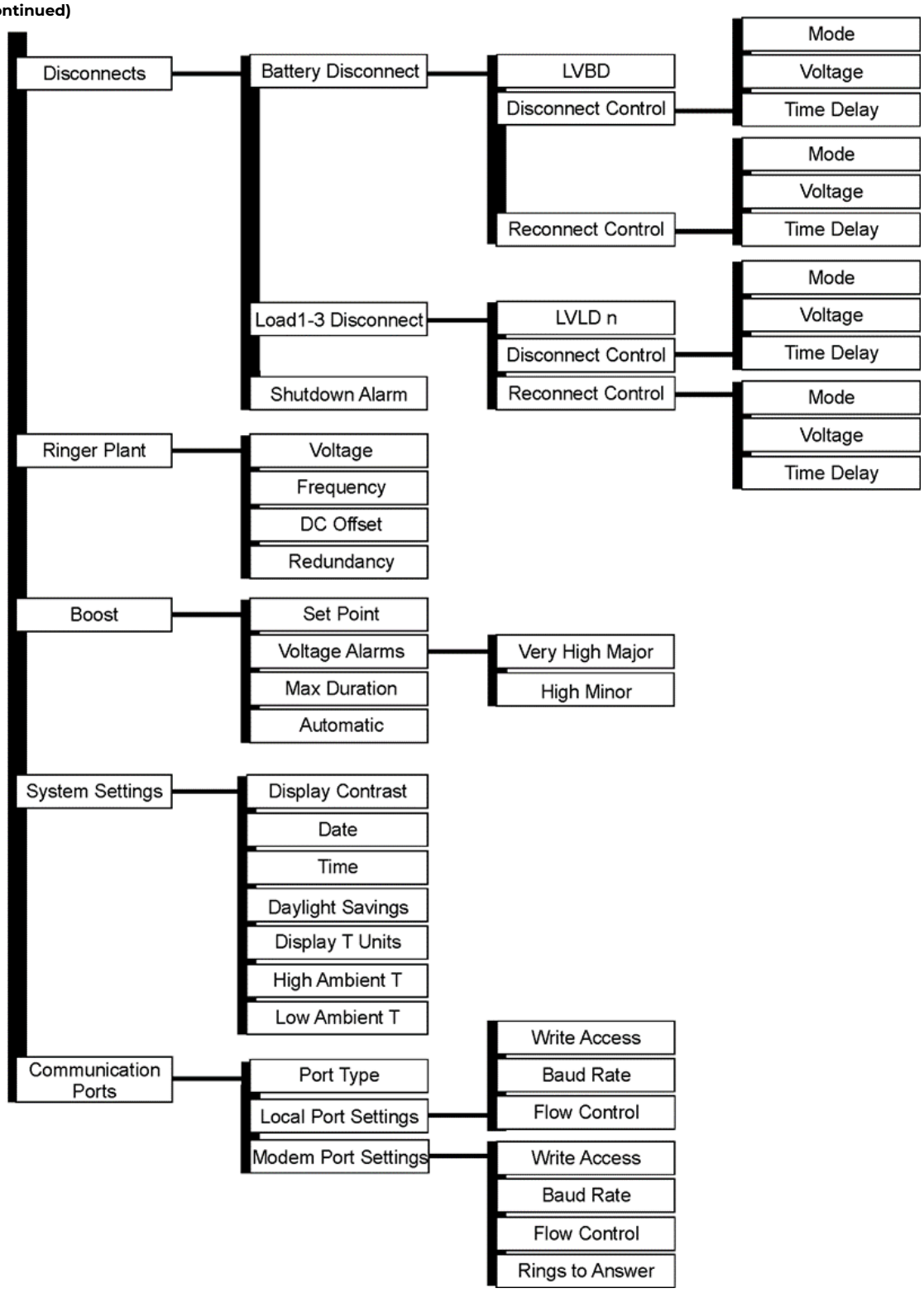


Figure 7-3d: Configuration Menu (part 2)

CPS6000 Controller Minimum Configuration

General Information

QS840A is the nerve center of the CPS6000 Battery Plant. The controller has six alarm relays; Two are pre-assigned as power major and power minor alarms. The four remaining relays are available as user-definable alarms to external devices.

QS840A

- Provides system monitoring and control features
- Controls alarm reporting from rectifiers, Low Voltage Disconnects (LVD), and other system components.

User Interface and Display

Overview

QS840A is primary user interface is a front panel display which includes the following:

- An array of simple push-button controls
- A backlit four-line LCD display that changes color to reflect the system alarm status as follows:

  Green Normal

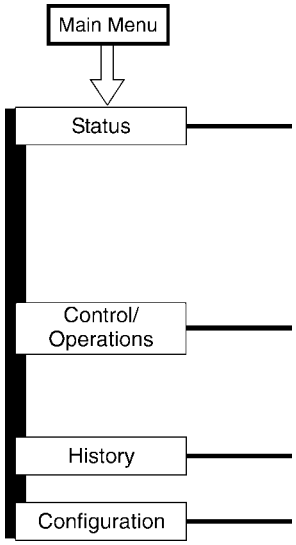
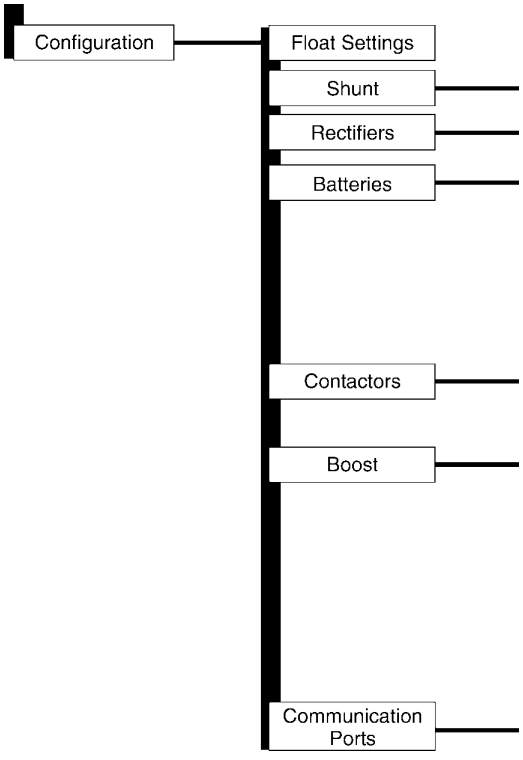
  Amber Minor Alarms Present

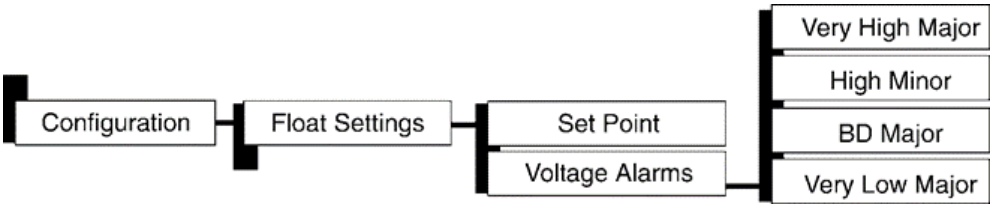
  Red Major Alarms Active

Minimum Configuration

The Controller has many configurable parameters. All parameters are discussed in this section. The following steps cover the minimum configuration.

Key	Description	Function
	Display Menu	Press to access the menu. Display Menus, Refresh, Save changes
	Up and Down Arrows	Press to adjust values when configuring the system parameters. Also used to adjust screen contrast when the controller default screen is displayed.
	Left and Right Arrows	Press to select the digit to adjust and navigate the menus.
	Previous Menu	Press to back up to a previous menu.

Step	Action
1.	From the default screen, press the **Display Menu** key to see the Main Menu. 
2.	Press the down arrow key until **Configuration** is highlighted, press the **Display Menu** key and the following selections are available; Float settings,Shunt rating, Rectifier Redundancy, Batteries, Contactors, Boost, System Settings, and Communication Ports. 

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

Alarm	Description
Very High Voltage **Major**	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 settingis 57V
High Voltage **Minor**	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.
BD (Battery on Discharge) **Major**	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.
Very Low Voltage **Major**	Alarm indicates an imminent system shutdown due to discharging batteries or low output voltage. Factory default - 46.0V.

Note: Factory defaults listed are for the standard QS840A controller.

Status

This area of the menu provides an overview of system threshold settings, equipment operation, and present component values. Only state type information is available in this menu. No configuration or operations are possible from the Status portion of the menu system. Following are the elements available in the Status menu.

Rectifiers: Total installed capacity of the system, total output current of all rectifiers, and the individual rectifier currents by rectifier number (Gnn).

Batteries: The following battery management information is available under Status:

Installed Capacity	User entered system battery capacity in AH. Automatically enteredwhen using smart Lithium batteries.
On-Line Capacity	Available battery reserve from installed capacity value directly connected to the bus. It is always the same value configured for installed capacity except for when the smart lithium batteries are utilized.
Current	Current flowing into or out of the batteries.
Number Of Strings	The total number of battery strings installed in the system.
Highest Temp	Highest battery temperature being measured by the thermal probes.
Temp Probes	Number of installed thermal probes.
Mid-Cell Volts	Number of installed Mid-cell voltage measurement modules.
Battery Test Result	Shows whether the most recent battery test was completed, and thereserve time.
Next Test	The date of the next automatic battery discharge test. The automatic discharge test feature must be enabled for this to work.
Live Reserve Time	Present value of battery reserve time calculated by the controller

Shunt Currents: A maximum of six measured currents from each Distribution Control and Monitoring module present in the system is displayed.

Disconnect States: The status of the LVBD (Low Voltage Battery Disconnect) and LVLD1-3 (Low Voltage Load) disconnects are displayed. “None” is displayed if there are no contactors in the system.

Alarm Thresholds: Present alarm threshold settings in xx.xV format of the following system alarms:

Float VoltageAlarms	Very High Major, Very High Minor, BD Major and Very Low major
Boost VoltageAlarms	Very High Major and High Minor
High Batt Temp	Highest temperature being measured by the thermal probes
Reserve Low	Low battery reserve time
High Ambient Temp	High ambient temperature
Low Ambient Temp	Low ambient temperature

Ringer Thresholds: Present status of up to two ringer chassis:

State	Ringer chassis present or not
VA	Output VA of ringer
Primary	Ringer module present in primary position
Secondary	Ringer module present in secondary/redundant position

Enable-Disable Info: Displays the enable/disable status of the following features:

Temp Comp	Temperature compensation
Low Temp Comp	Low temperature compensation
Recharge Ilim	Recharge current limit
Auto Boost	Automatic boost charge
Auto Batt Test	Automatic battery test
Rect Redund	Rectifier redundancy
Mid-Cell V Mon	Mid-cell voltage monitoring
Imminent Shutdn	Imminent system shutdown alarm (LVBD)
Local Write	Whether or not the system can be configured through the local port.
Modem Write	Whether or not the system can be configured through the modem port.

System Info: Various high level system statuses.

Controller Info	Provides the versions of software for the overall controller (QS840A_MC1), boot block of the controller, display, and the defaults.
Date	System controller present date using configured format.
Time	System controller present time using configured format.
Ambient Temperature	System controller present temperature using configured format.

Control/Operations

The following are the system control and operation functions that can be performed from the front panel. These operations are generally used in post installation and maintenance modes.

Start Lamp Test	Temporarily illuminates all status indicators of attached rectifiers, distribution monitoring and control modules and the systemcontroller.
Restart Rectifiers	Restarts all system serial controlled rectifiers. Does not affect rectifiers, and other system devices that are already functioning.
Clear Events	Used to clear momentary events or alarms. It clears the following system alarms: Check Battery, Reserve Time Low, Battery Voltage Imbalance
Uninstall Equipment	Clears alarms related to the removal of a system component such as a rectifier, thermal probe, or voltage monitoring module.
Alarm Test	Initiates the asserting the Form-C alarms.
Start Battery Test	Initiates the manual battery test feature. A stop battery test operation is displayed to interrupt the testing and return the unit to normal operation. The manual battery test utilizes the configured test duration and a system bus voltage threshold to represent the end of reserve.
Start Boost	Initiates the manual battery Boost feature. A stop battery Boost operation is displayed to interrupt the Boost operation mode and return the unit to normal operation.

Clear History: This area of the menus system can be used to clear of Alarm, BD and Boost History logs.

Clear Statistics: This operation allows the user to clear the Basic statistical data kept on Plant Load, the highest battery temperature, and ambient controller temperature.

Disconnects: Allows manual disconnect and reconnect of each of the four disconnects (LVBD, LVLD1-3).

Load Factory Defaults: Initiating this operation loads all factory configured defaults back into the controller.

History

This area of the menu system contains history information. The controller works on a first record in first record out once the record size of a specific field is reached. The following system history logs are available:

Alarm History	Chronological view of the last 30 alarms and events that have occurred since the last time the history log was cleared.
BD History	Chronological view of the last 10 battery on discharge (BD) events since the last time the history log was cleared.
Boost History	Chronological view of the last 10 times the system entered boost mode since the last time the history log was cleared.

Configuration

This area of the menu system is where system operational parameters, system device information, and alarm thresholds are set up.

Float Settings: Set the system float voltage and the thresholds for the following alarms:

Set Point	System Float Voltage set-point adjustable from -42.0 to -56.5V with a factory default of -54.5V.
Very High Voltage Major	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.
High Voltage Minor	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 57V.
BD (Battery on Discharge) Major	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.
Very Low Voltage Major	Alarm indicates an imminent system shutdown due to discharging batteries or low output voltage.

Shunt Monitors: Versions of the CPS6000 are equipped with a battery or load shunt. For those shelves that do not have shunts these settings are not used. The QS840A utilizes RS485 serial communication to external distribution monitoring and control boards for shunt measurements and contactor control. Up to four external boards can be controlled. These boards must be identified by assigning them an address and an appropriate operation. The following is shown for completeness.

ID1-4	The operation “Type” of each shunt monitoring circuit on system distribution boards 1-4 must be assigned based upon actual system implementation. The operational Type may be: None (Forno shunt), Battery (Monitoring battery currents), and Load (for load currents).
ID1-4 Rating	The current rating of each shunt being monitored by the system distribution boards 1-4 must be configured based upon actual system implementation. All shunts are assumed to be 50mV. Thecurrent rating may be from 0-9999 Amps. The factory default is 300A.

Redundancy: Enable or disable rectifier redundancy mode. When Enabled, an alarm is automatically generated when the rectifier capacity On-line in the system falls below N+1 based on the present system load. The factory default for this feature is disabled.

Batteries: Set up the following battery information:

Battery Type	The type of batteries used in the system and can be set for Valve-Reg (VRLA), Flooded, NiCd, Li-LMP, and Li-ELiTE type batteries. Factory default is Valve-Reg.
Installed Capacity	Total installed battery capacity assuming an 8-hour rate (0-30000AH). Factory default is 0.
Battery Strings	Total number of battery strings attached to the system
End Of Discharge Voltage	The user defined system bus voltage at which the batteries are considered to be at the end of their reserve capability for manual battery testing (End of Discharge). This end-of-discharge voltage isused for automatic and opportunistic reserve time calculations. It has a range of -36.00 to -48.00V. The system factory default is - 44.00V.

Battery Temp Management*	This section includes all the parameters required for thermal management of the batteries. These items include the ability to enable/disable thermal compensation for high and low temperatures and set the slope decrease and increase rates, respectively. There is also a “High Temperature alarm threshold”, “High Temperature Disconnect” feature. Thermal compensation features are factory defaulted Enabled.
Battery Test	This section includes all the parameters required for battery testing through manual or automatic means. Configuration for manual test duration and the system test end-voltage for manual battery test are here along with the interval, start date, start time, time from last battery on discharge BD, and enable/disable for automatic battery test. The rectifier voltage during battery discharge testing and system reserve time low alarm threshold are also available. Automatic battery testing is factory disabled.
Recharge Amp Limit	Enable or disable battery recharge limiting and set recharge current limit. Recharge current limit is factory Disabled.
Voltage Imbalance	User defined voltage threshold for a mid-string voltage alarm.Range 1.4 - 3.0 Volts. Factory default is 1.7V.

*See Appendix B for detailed descriptions of the Thermal Compensation and Battery Test features and parameters.

Contactor Interfaces: Various CPS6000 shelves and systems utilize contactors. The QS840A can be configured to monitor external control boards that can be assigned to LVD contactor control by appropriately configuring a unique board ID to a specific contactor function. The controller can assign up to four IDs to boards used for controlling LVDs. Each unique ID number can be assigned to one of the following LVBD 1 (Low Voltage Battery Disconnect 1), LVLD1 (Low Voltage Load Disconnect 1), LVLD2 (Low Voltage Load Disconnect 2), LVLD3 (Low Voltage Load Disconnect 3), or NONE. Each of these assignments has its own unique programmable parameters. Selecting NONE removes the ability of that particular remote distribution board to control and external LVD.

Disconnects: This section of the configuration menu contains the parameters associated with the individual function assignments made in the previous section. Each LVD type (LVBD and LVLD1-3) can individually be enabled or disabled. The contactor’s disconnect and reconnect method of operation used by the controller can be programmed for each LVD. The method of disconnect or reconnect can be based on reaching a system bus voltage threshold (Voltage) or based on both reaching the system bus voltage threshold and an elapsed time from once the system has been placed on discharge (BD) and at least two or more rectifiers are reporting AC failures (Voltage+Time). The Voltage and Time mode of operation can also be selected for reconnecting LVDs. In this case the elapsed time configured is the time from once the reconnect voltage threshold has been reached.

The factory defaults are the following:

- LVBD (Enabled)

  Disconnect Mode (Voltage); Range: Voltage, Voltage+Time

  Disconnect Voltage (42.0V); Range: 39-50V

  Time Delay (0 min); Range: 0-300min

  Reconnect Mode (Voltage); Range: Voltage, Voltage+Time

  Reconnect Voltage (44.0V); Range: 39-55V

  Time Delay (0 sec); Range: 0-300sec

- LVLD1 (Enabled)

  Disconnect Mode (Voltage); Range: Voltage, Voltage+Time

  Disconnect Voltage (42.0V); Range: 39-50V

  Time Delay (0 min); Range: 0-300min

Reconnect Mode (Voltage); Range: Voltage, Voltage+Time

Reconnect Voltage (44.0V); Range: 39-55V

Time Delay (0 sec); Range: 0-300sec

- LVLD2 (Disabled)

  Disconnect Mode (Voltage); Range: Voltage, Voltage+Time

  Disconnect Voltage (442.0V); Range: 39-50V

  Time Delay (0 min); Range: 0-300min

  Reconnect Mode (Voltage); Range: Voltage, Voltage+Time

  Reconnect Voltage (44.0V); Range: 39-55V

  Time Delay (0 sec); Range: 0-300sec

- LVLD3 (Disabled)

  Disconnect Mode (Voltage); Range: Voltage, Voltage+Time

  Disconnect Voltage (42.0V); Range: 39-50V

  Time Delay (0 min); Range: 0-300min

  Reconnect Mode (Voltage); Range: Voltage, Voltage+Time

  Reconnect Voltage (44.0V); Range: 39-55V

  Time Delay (0 sec); Range: 0-300sec

Shutdown Alarm: The Shutdown Alarm occurs when system shutdown due to a battery disconnect is imminent. The alarm can be enabled or disabled, and has a factory default threshold setting of 42.0V based upon the LVBD. The alarm is issued based on the lower disconnect threshold of the multiple contactors. This feature is factory Disabled.

Ringers: Ringer modules are an option for the CPS6000. The QS840A has the ability to manage two ringer chassis. Configuration for the ringer settings are shown below.

Voltage	Nominal ringer output AC voltage. Range 65-100 VAC_{rms}. Factorydefault is 100.
Frequency	Nominal ringer output frequency. Range 15-50 Hz. Factory default is 20.
DC Offset	Enable or Disable the capability of configuring a DC offset voltage to the Ring Output. The factory default setting is Enabled.
Redundancy	Enable or disable the loss of redundancy alarm. Alarms when one of the two ringer modules installed in the ringer chassis is lost.

Boost: The Boost function allows battery charging to be expedited by raising the system voltage to Boost level for a set time. The following boost mode parameters are set in this area of the menu system:

Set Point	Boost voltage (set point) is adjustable from 48.0V to 58.0V in 0.1 V increments. The factory default setting is 55.2V.
Voltage Alarms	High voltage alarm thresholds in effect while the system is in boost mode. The Very High Major alarm triggers shutdown of the faulty rectifier(s). This threshold can be set from 50V to 60V. The factory default setting is58.0V. The High Minor alarm does not force rectifiers to shut down. The threshold can be set from 50 to 60V. The factory default setting is 56V.
Max Duration	Duration the system can remain in boost mode can be set from 1 to 80hours. The factory default setting is 1 hour.
Automatic	Enable or disable the automatic boost feature. The factory default isdisabled.

System Settings: Menus for configuring the following system parameters:

Display Contrast	Allows display backlight intensity to be adjusted for contrast inlocal ambient light. Factory default is 50%.
System Date and Time	Set date in yyyy-mm-dd and time in hh:mm:ss format.
Daylight Savings	Enable or disable. Factory default is Enabled.
Display T Units	Display temperature status in °C or °F. Factory default is °C.
High Ambient T	High temperature alarm threshold that can be set from 35°C to75°C. The factory default setting is 75°C.
Low Ambient T	Low temperature alarm threshold that can be set from -40°C to10°C. The factory default setting is -40°C.

Communication Ports: Menus for configuring the following communication parameters:

Port Type	Set the communication port to either Local or Modem. Factorydefault is Local.
Local Port Settings	Enable or disable Write Access, the ability to change system settings through the local port. The factory default setting is enabled. Set the port Baud Rate to auto, 2400, 4800, 9600 or 19200. The factory default setting is auto. Set port Flow Control to none, HW (hardware) or SW (software).The factory default setting is none.
Modem Port Settings	Enable or disable Write Access, the ability to change system settings through the modem. The factory default setting is enabled. Set the port Baud Rate to 2400, 4800, 9600 or 19200. The factory default setting is 2400. Set port Flow Control to none or SW (software). The factory default setting is none. Set the number of rings to be detected by the modem before it answers (Rings to Answer). Can be set from 1 to 9. The factory default setting is 1.

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7B QS841A System Controller

Overview

The QS841A controller is the integrated network controller option that can be custom configured for a specific system or customer need. It provides system monitoring and control features, as well as office alarm outputs from rectifiers, LVD boards, and remote modules.

This section describes the controller features, functions and alarms from perspective of a user utilizing the front panel display. All these features are available through Web pages accessible from the Ethernet port. The controller content in the web pages versus the front panel is arranged differently due to the available large space that comes with using a monitor screen. However, the majority of the information content, commands, and configurable items remain the same as those on the front panel. This section focuses on describing the controller from the front panel perspective which is applicable to respective feature implementation in the web pages.

Controls and Display

Figure 7-1 shows the front panel controls and display of the controller.

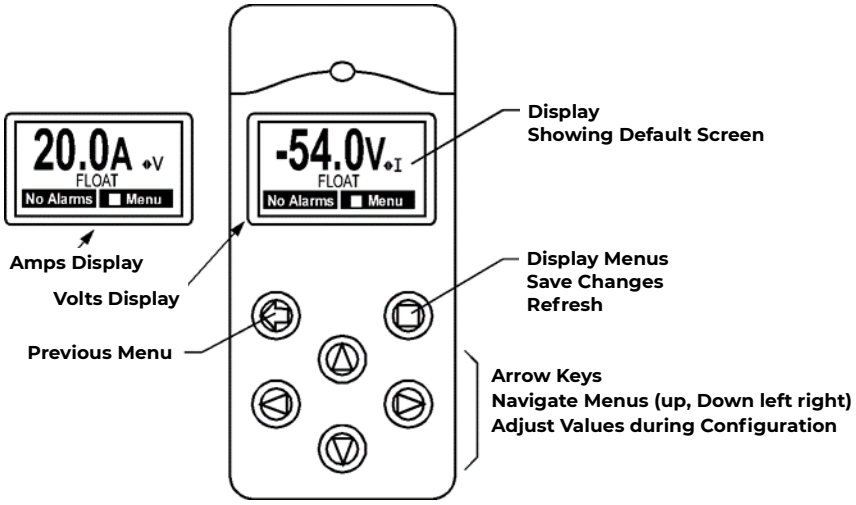


Figure 7-1: QS841A Controller Faceplate

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.

Connectors

Figure 7-2 shows a side view of the controller unit.

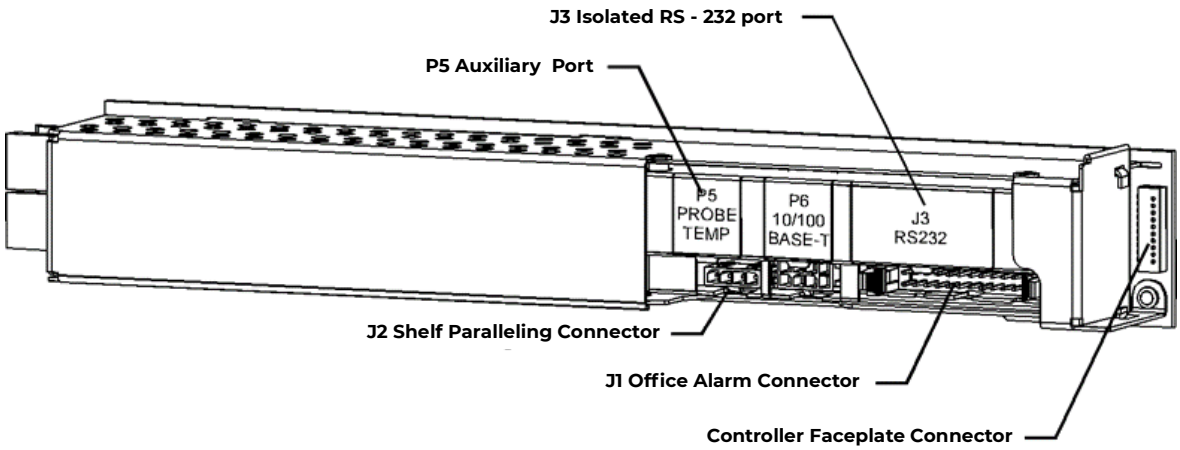


Figure 7-2: QS841A Controller Unit Side View

A ground referenced RS-232 connector (J3) serial port is available for serial connection to a PC using EasyView or standard terminal emulation for craft programming and retrieving status locally. This port can also be used to an external modem for remote access or with the EBW Network Interface Card known as the Gateway to provide a second Ethernet port. The Ethernet ports are compatible with OmniOn Power Galaxy Manager used for web-based remote access and network management. This serial port can also be used to provide local access or for a connection to an external modem in non-NX400 systems.

Ethernet connector P6 is brought out to the RJ45 attached at the front of the unit. This port can also serve a local Craft port by configuring the controller to place this port into Server mode. In this mode the port serves as the Ethernet Craft port and allows standard Web browsers to be used for accessing the controller. This port should never be plugged into the office LAN if it is in the DHCP Server mode. Factory default for this port operation is “Static” requiring an IP address to be programmed for the unit.

Connector P5 is used for the 1-Wire management options. J1 provides all the office alarms that are brought out to the unit with various cable options. Included in this alarm interface are six Form-C alarm relays. Two are pre-assigned as Power Major (Impaired) and Power Minor (degraded) alarm relays. The four remaining relays are available as user-definable alarms and have been predefined in the standard controller.

Software

The software is functionally divided on the Main Menu into the following categories:

- **Alarms**
- **Warnings**
- **Status**
- **Control/Operations**
- **History**
- **Configuration**

PIN

The QS841A has the ability to restrict certain access from the front panel of the unit. It incorporates a four-digit Power Identification Number (PIN) on the front panel for certain control/operations and configurable items. The default PIN password is 0000. Each position of the password is configurable between 0-9. The password can be configured from the remote interfaces by a user with Administrator privileges. The front panel PIN feature can be Enabled or Disabled through the remote interface by a user with Administrator privileges.

Factory default for PIN operation in the standard QS840A is Disabled.

If the PIN feature is enabled, the PIN is required for items that generally are not functions of a typical maintenance routine. It is assumed that the majority of the configured thresholds and system operational features will not be changed through a maintenance routine. Thus, they require entrance of the correct PIN in order for the parameter or feature to be modified in the field. There are some Control/Operations that also require the PIN shown below.

1. Clear History
2. Clear Statistics
3. Disconnects – Manual disconnect/reconnect of any LVLD/LVBD
4. Enter Boost

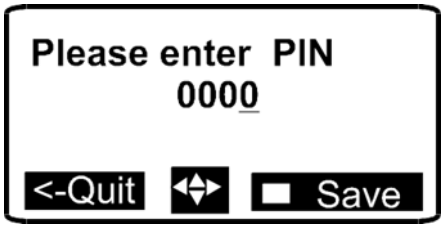
Other Control/Operations features listed below do not require PIN access.

1. Lamp Test
2. Restart Rectifiers
3. Uninstall Equipment
4. Start Battery Test
5. Start Alarm Test
6. Load Factory Defaults

All configuration items from the front panel require PIN access except for the following:

1. Battery Type
2. String Battery Capacity (AH)
3. Number Of Battery Strings
4. Manual Discharge Test Type
5. Manual Test Duration
6. Manual Test Check Battery Alarm Voltage Threshold
7. Battery Test Rectifier Voltage
8. System Date Format
9. System Date
10. System Time Format
11. System Time
12. Automatic Daylight Savings Feature
13. Display Contrast
14. Temperature Display Units
15. Alarm Test Feature
16. Alarm Test Relay Duration and Relay

The QS841A is programmed to associate the necessity of a PIN to the specific operation or configurable parameter. A sample screen like that following is required for PIN access.



The up, down, left and right arrows are used to enter the appropriate password. Upon entering a correct PIN the following momentary screen shows up and then disappears leaving the user at the menu location prior to entering the PIN. The QS841A has a factory default of 0000 for the PIN.

Once a user enters the PIN, total front panel access is allowed for:

- As long as the user remains in menus other than the default menu and/or
- The default display has remained on the front panel for more than user configurable time-out value. The QS841A has a factory configured default of 30 minutes. This time is adjustable between 1-120 minutes in 1 minute increments.
- An internal counter shall be kept and reset if the user leaves the default menu and returns to others menus before the time-out period is reached.

The following figures show a menu flow map for each primary category along with the settings and operations found in each. , and are followed by brief descriptions of the menu items. Alarms and Warnings are not hierarchal mapped and are presented in chronological order of occurrence when they are present. “No Active Alarms” or “No Active Warnings” will be displayed when they are no alarms or warnings detected by the controller.

NOTE: Controller may have menu options than those mentioned here due to improvements.

Status Menu

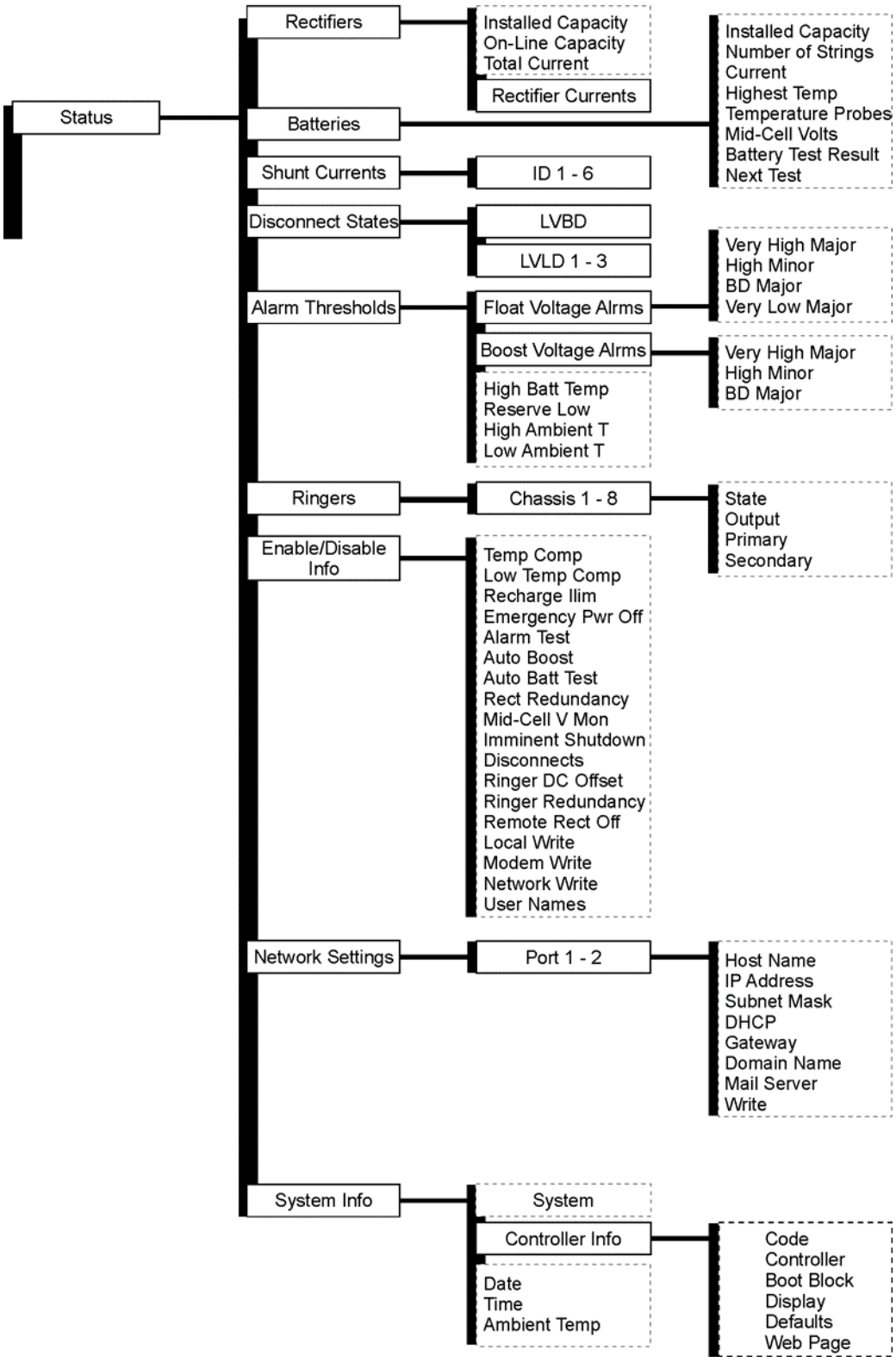


Figure 7-3: Status Menu

Control / Operation and History Menus

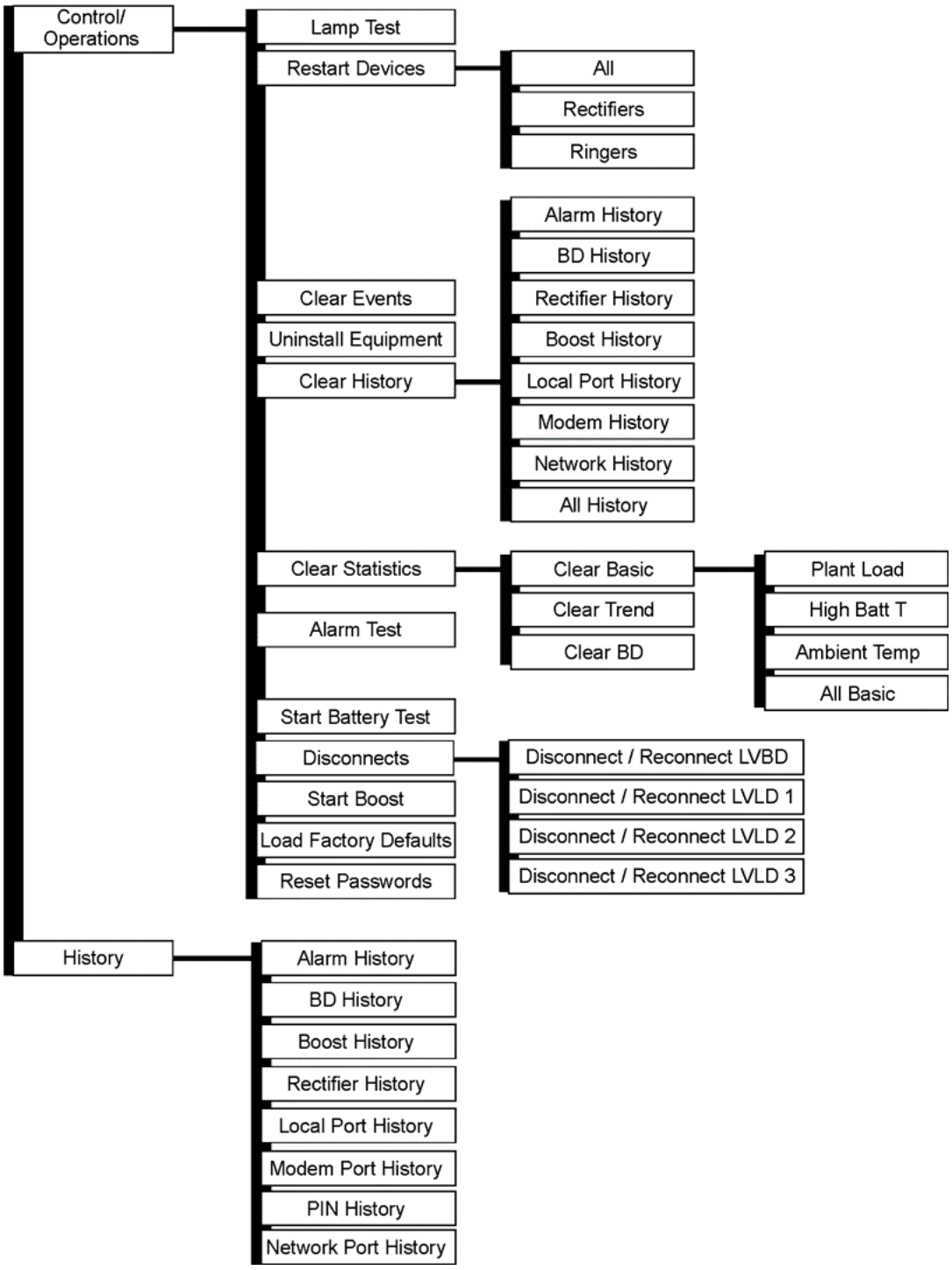


Figure 7-4: Control / Operations and History Menus

Configuration Menu

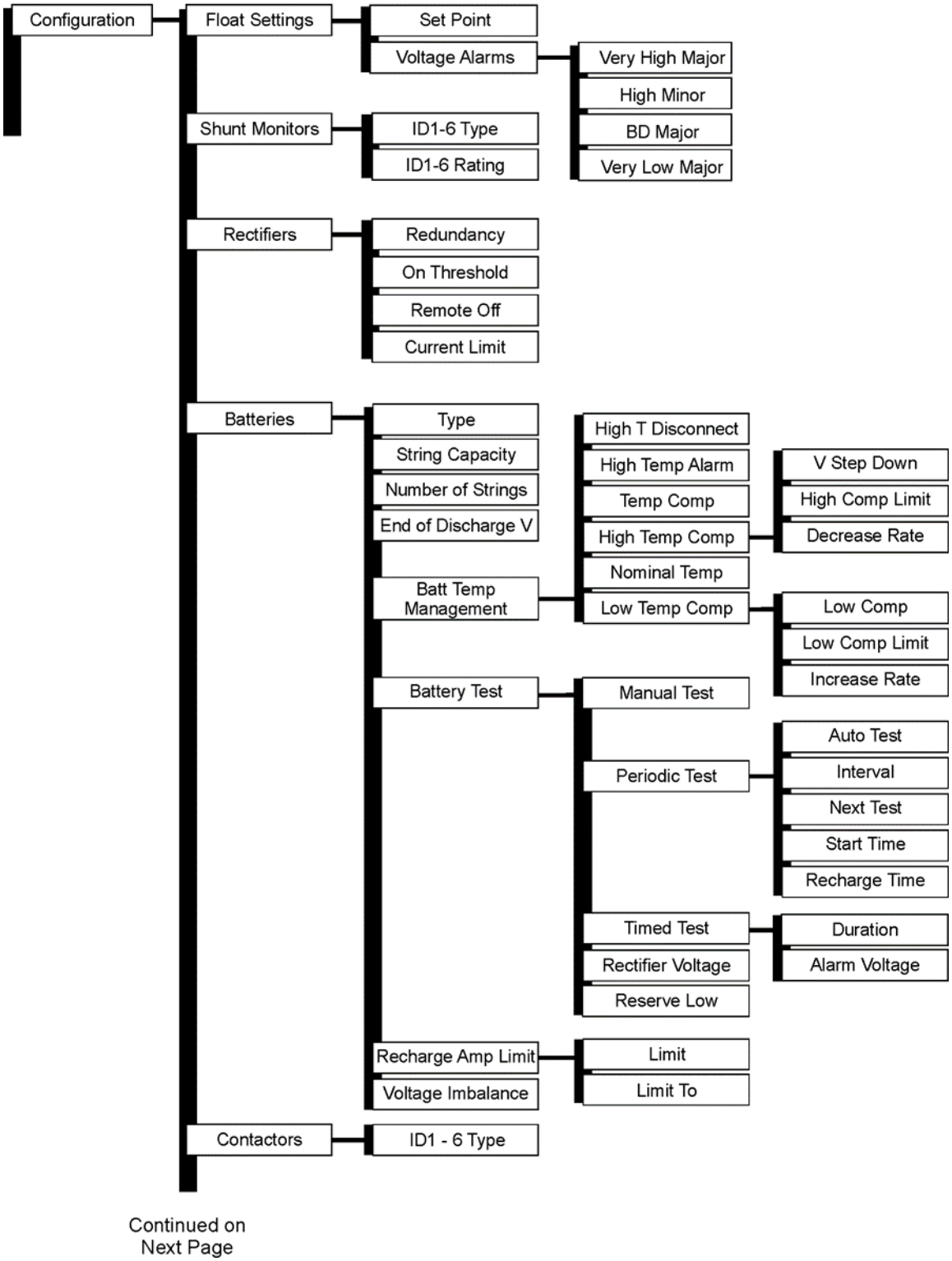


Figure 7-5: Configuration Menu (part 1)

Configuration Menu (continued)

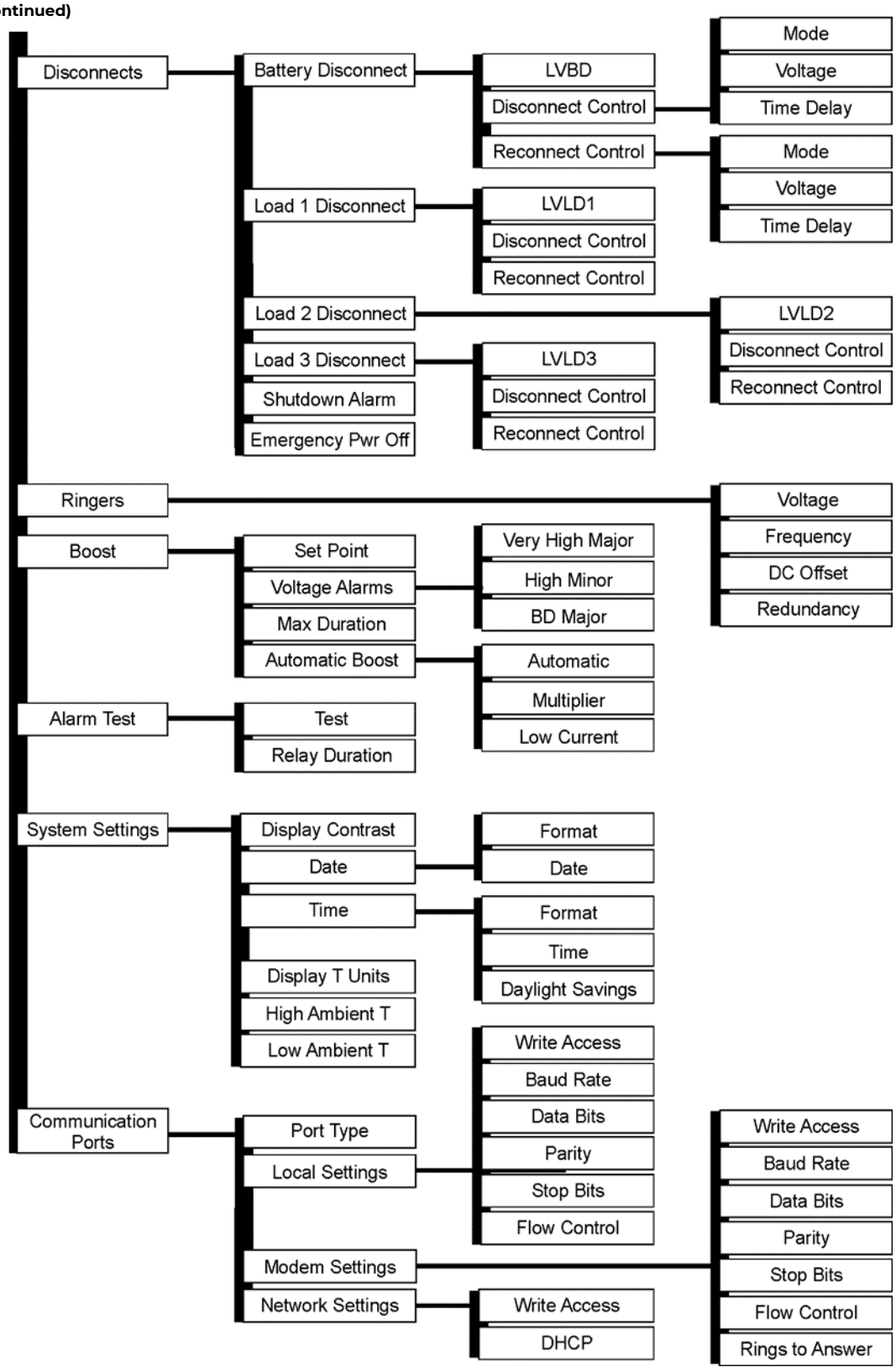


Figure 7-6: Configuration Menu (part 2)

Status

This area of the menu system provides an overview of system components, threshold settings, and feature configuration. No configuration is possible from the status portion of the menu system. Equivalent items are available through the craft port web pages.

Rectifiers

Information such as the total installed rectifier capacity in the system, total on-line rectifier capacity in the system (those producing power), total output current of all rectifiers, and the individual rectifier output currents by rectifier number (Gmn) are available. “m” represents the shelf number and “n” represents the rectifier position number in that shelf.

Batteries

The following battery management information is available under Status:

Installed Capacity	User entered system battery capacity in AH. Automatically entered when using smart Lithium batteries.
Number Of Strings	The total number of battery strings installed in the system.
Current	Current flowing into or out of the batteries.
Highest Temp	Highest battery temperature being measured by the thermal probes.
Temp Probes	Number of installed thermal probes.
Mid-Cell Volts	Number of installed Mid-cell voltage measurement modules.
Battery Test Result	Shows whether the most recent battery test was completed, and the reserve time.
Next Test	The date of the next automatic battery discharge test. The automatic discharge test feature must be enabled for this to work.

Shunt Currents

Up to six shunt measurements can be displayed through appropriate Distribution Control and Monitoring modules. The NX400 is equipped with four QS871 distribution control and monitoring modules. These modules are used to monitor one total battery current and each of the three Load bus currents.

Disconnect States

The status of the LVBD (Low Voltage Battery Disconnect) and LVLD1-3 (Low Voltage Load) disconnects are displayed in this menu. “None” is displayed for each contactor that is not configured to be present in the system. In the normal NX400 system state, all contactors should show “Closed”. A state of “Open” will be showed for contactors that have been disconnected.

Alarm Thresholds

This section of the menu shows the present alarm threshold settings in xx.xV format. These values are set by factory default but can be individually configured in the field. Appendix B and C provide additional details on factory settings.

Float Voltage Alarms	Very High Major, Very High Minor, BD Major and Very Low Major
Boost Voltage Alarms	Very High Major, High Minor, and BD Major
High Batt Temp	Highest temperature being measured by the thermal probes
Reserve Low	Low battery reserve time alarm
High Ambient Temp	High ambient temperature alarm
Low Ambient Temp	Low ambient temperature

Ringers

The NX400 does not contain ringers. However, the QS841A has the capability of managing eight ringer chassis in a system. The ringer states and output VA would be available when ringers are present in the system.

Enable-Disable Info

This section of the menu displays the enable/disable status of some of the QS841A features. These values are set by factory default but can be individually configured in the field.

Temp Comp	Temperature compensation
Low Temp Comp	Low temperature compensation
Recharge Ilim	Recharge current limit
Emrgncy Pwr Off	Emergency Power Off (Remote Emergency Battery Disconnect). Enabled when contact closure is applied to the EPO inputs.
Alarm Test	Form-C Alarm Test Feature
Auto Boost	Automatic boost charge
Auto Batt Test	Automatic battery test
Rect Redund	Rectifier redundancy
Mid-Cell V Mon	Mid-cell voltage monitoring
Imminent Shutdn	Imminent system shutdown alarm (LVBD)
Disconnects	LVBD (Low Voltage Battery Disconnect) and LVLD1-3 (Low Voltage Load Disconnects)
Ringer DC Offset	Ability to reference the output of the ringer to a DC offset
Ringer Redund	Ringer Redundancy Alarm feature
Remote Rect Off	Remote Rectifier Off – Individual Remote Rectifier Standby
Local Write	Whether or not the system can be configured through the local port.
Modem Write	Whether or not the system can be configured through the modem port.
Network Write	Whether or not the system can be configured through the network.
Usernames	Whether or not usernames and password identification has been enabled

Network Settings

This section of the menu displays the settings of the Network parameters for up to two Ports. The standard QS841A port is considered Port 1. A second network port is achieved by using a Gateway card communication through a serial port. If two ports are present Port 1(from the QS841A) is the Craft port and Port 2 from the Gateway would be the LAN port.

Host Name	Network name assigned and configured for the QS841A since it acts as are pository for data and services such as e-mail, FTP, HTTP, etc that are accessed remotely by other equipment or users on the network.
IP Address	Internet Protocol address assigned to the QS841A that identifies the unit on the network. The format for the IP address field is a 32-bit numeric address written as four numbers separated by periods (ddd.ddd.ddd.ddd). Each number digit, d, can be zero to 255. When in the server mode, a user shall use 192.168.2.1 to access the controller through the craft port.
Subnet Mask	Internal network address assigned for identifying an internal network mask that the QS841A has been assigned to by a network administrator. The mask selectively includes or excludes certain equipment on a Host. The format for the Subnet Mask field is a 32-bit numeric address written as four numbers separated by periods (ddd.ddd.ddd.ddd). Each number digit, d, canbe zero to 255.

DHCP	This field indicates the operational mode of the integrated Ethernet port. The port can be operating as a DHCP Client, Static Client, or a DHCP Server. DHCP Server is the default mode of operation for NX400 Craft portand Static is the default for the LAN port.
Gateway	This address is for the address of the Gateway or node on the network that will serve as the entrance to another network for the QS841. This address should be the address of the equipment or computer that routes the traffic from and to the QS841 to the outside network. It is generally the proxy server. The format for the Gateway address field is a 32-bit numeric address written as four numbers separated by periods (ddd.ddd.ddd.ddd). Eachnumber digit, d, can be zero to 255.
DNS	Address of the Domain Name Server that translates domain names into IP addresses. This field is of the format ddd.ddd.ddd.ddd.
Mail Server	The address for the computer or equipment within the network that will manage the QS841 e-mails. The format for the Gateway address field is a32-bit numeric address written as four numbers separated by periods (ddd.ddd.ddd.ddd). Each number digit, d, can be zero to 255.
Write Access	This field shows whether the port has bee configured to allow Read/Write access or Read Only access. Read/Write access is available when the feature has been enabled.

System Info

This section of the menu displays various high level system status.

Controller Info	Provides software versions for overall controller, boot block , display, and web pages. It also provides the file used for factory defaults along with its version number. For the NX400, the display is of the format (vNX.d.d).
Date	System controller present date using configured format.
Time	System controller present time using configured format.
Ambient Temperature	System controller present temperature of its on-board sensor using configured format.

Control/Operations

The following are the system control and operation functions that can be performed from the front panel. These operations are generally used in post installation and maintenance modes.

Start Lamp Test	Temporarily illuminates all status indicators of attached rectifiers, distribution monitoring and control modules and the system controller.
Restart Devices	Provides the ability to restart “All” system serial controlled rectifiers at once or individually resetting rectifiers or ringers. Does not affect rectifiers, ringers,and other system devices that are already functioning.
Clear Events	Used to clear momentary events or alarms. It clears the following system alarms: Check Battery, Reserve Time Low, Battery Voltage Imbalance
Uninstall Equipment	Clears alarms related to the removal of a system component such as a rectifier, thermal probe, or voltage monitoring module.

Clear History	This area of the menus system can be used to clear the various items that the controller maintains history records. Once cleared the controller begins to keep history of new events. **Alarm History** Operation to only clear alarm event history. **BD History** Operation to only clear BD network access history. **Rectifier History** Operation to only clear rectifier event history. **Boost History** Operation to only clear Boost event history. **Local Port History** Operation to only clear local port access history. **Modem History** Operation to only clear Modem port access history. **Network History** Operation to only clear network access history. **All History** Allows a single command operation to clear all history records from the QS841.
Clear Statistics	This area of the menus system can be used to clear the various items that thecontroller maintains statistical records. Once cleared the controller begins tokeep new statistical data. **Clear Basic -** This operation allows the user to clear individually or as a group the Basic statistical data kept on Plant Load, the highest battery temperature, and ambient. **Clear Trend -** This operation allows the user to clear the trend data kept on the plant load. **Clear BD -** This operation allows the user to clear the Battery on Discharge(BD) statistics kept on the plant load and voltage during discharge.
Alarm Test	Initiates the Form-C alarm test by asserting each of the configured Form-Calarms at the configured alarm interval.
Start Battery Test	Initiates the manual battery test feature. A stop battery test operation is displayed to interrupt the testing and return the unit to normal operation. The manual battery test utilizes the configured test duration and a system bus voltage threshold to represent the end of reserve.
Disconnects	Provides individual manual control of the four Low Voltage Disconnects (LVBD, LVLD1-3) for maintenance purposes.
Enter Boost Mode	Initiates the manual battery Boos feature. A stop battery Boost operation is displayed to interrupt the Boost operation mode and return the unit to normal operation.
Load FactoryDefaults	This operation allows a user to bring back all factory defaults with a single operation. Caution should be used when applying this command. Previousconfiguration changes will be overwritten.
Reset Passwords	Resets user, super-user and administrator passwords back to standard defaults.

Clear History

This area of the menu system contains event history information. The controller works on a first record in first record out once the record size of a specific field is reached. The following system history logs are available:

Alarm History	Chronological view of the last 256 alarms and events that have occurred since the last time the history log was cleared.
BD History	Chronological view of the last 16 battery on discharge (BD) events since the last time the history log was cleared.
Boost History	Chronological view of the last 16 times the system entered boost mode since the last time the history log was cleared.
Rectifier History	Chronological view of the last 256 rectifier alarms and events that have occurred since the last time the history log was cleared.

Alarm History	Chronological view of the last 256 alarms and events that have occurred since the last time the history log was cleared.
BD History	Chronological view of the last 16 battery on discharge (BD) events since the last time the history log was cleared.
Boost History	Chronological view of the last 16 times the system entered boost mode since the last time the history log was cleared.
Rectifier History	Chronological view of the last 256 rectifier alarms and events that have occurred since the last time the history log was cleared.
Local Port History	Chronological view of the last local terminal logins that have occurred sincethe last time the history log was cleared. The number of these events counts towards the total number of Modem, Network, PIN, and Local port events which can be up to 48 events.
Modem PortHistory	Chronological view of the last Modem port logins that have occurred since the last time the history log was cleared. The number of these events counts towards the total number of Modem, Network, PIN, and Local port events which can be up to 48 events.
PIN History	Chronological view of the last Front Panel access that required password entry. The number of these events counts towards the total number of Modem,Network, PIN, and Local port events which can be up to 48 events.
Network PortHistory	Chronological view of the last Network access events that have occurred since the last time the history log was cleared. The number of these events counts towards the total number of Modem, Network, PIN, and Local port eventswhich can be up to 48 events.

Configuration

This area of the menu system is where system operational parameters, system device information, and alarm thresholds are set up. These items have been pre-configured for the standard QS841A controller. Note: The controller requires time to update sectors in its flash memory when changes are made. Please allow approximately 2 minutes for the controller to accept and place the modifications in non-volatile memory before removing power to the unit.

Float Settings

Set the system float voltage and the thresholds for the following alarms:

Set Point	System Float Voltage set-point adjustable from -42.0 to -56.5V with a factory default of -54.5V.
Very High VoltageMajor	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.
High VoltageMinor	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.
BD (Battery on Discharge) Major	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.
Very Low VoltageMajor	Alarm indicates an imminent system shutdown due to discharging batteries or low output voltage. The alarm threshold can be set from -40V to -51V in 0.1V increments. The factory default setting is -46.0V.

Shunt Monitors

The QS841A utilizes RS485 serial communication to external distribution monitoring and control boards for shunt measurements and contactor control. Up to six external boards can be controlled by the controller. These boards are identified by assigning them an address and an appropriate operation.

Each individual LVD distribution and control board is uniquely addressed by an appropriate ID setting and assigned to an operation Type. The available Types are: Battery, Load, and None. Shunt sizes for each assigned battery or load type must also be configured. All shunts are assumed to have a voltage rating of 50mV. The current rating of each shunt is programmable between 0 to 9999A. Systems that are ordered with the QS841A such as the NX400 come factory preconfigured. Following are the fields that need to be programmed.

ID1-6	The operation "Type" of each shunt monitoring circuit on system distribution boards 1-6 must be assigned based upon actual system implementation. The operational Type may be: None (For no shunt), Battery (Monitoring battery currents), and Load (for load currents). The factory default is Battery for ID1 and NONE for the rest.
ID1-6 Rating	The current rating of each shunt being monitored by the system distribution boards 1-6 must be configured based upon actual system implementation. All shunts are assumed to be 50mV. The current rating may be from 0-9999 Amps. The factory default is 300A for ID1-4 and 600 for ID5-6.

Rectifiers

The following features pertaining to rectifiers can be configured:

Redundancy	An alarm is automatically generated when the rectifier capacity On-line in the system falls below N+1 based on the present system load. Thefactory default for this feature is Disabled.
Rectifier On Threshold	The system DC bus threshold that rectifiers placed into Standby will automatically be turned on. This value can be set between -40 and - 50V. The factory default is -44.0V
Remote Off	Provides the ability to disable or enable the capability of placing a rectifier into Standby operation through remote means such as the network, modem, or local terminal. The factory default for this feature is Disabled.
Current Limit	Adjustable from 30-100%.

Batteries

This section provides all the configurable items associated with batteries and battery management.

Battery Type	The type of batteries used in the system and can be set for the following battery types: • SE48S63 (Li-LMP) • SE48S80 (Li-LMP) • NSB110FT (VRLA) • NSB170FT (VRLA) • NSB60FT (VRLA) • IR30EC (VRLA) • IR40EC (VRLA) • 12A100FT (VRLA) • 12A150FT (VRLA)

Battery Type	• 12IR150/150LP (VRLA) • L48V60FTX (Li-ELiTE) • 6A95-15L (VRLA) • 3A95-21L (VRLA) • 3A95-27L (VRLA) • 3A95-33L (VRLA) • 6A95-13L (VRLA) • 3A125-33L (VRLA) • Generic VRLA (Valve Regulated Lead Acid) • Generic FLOODED (flooded lead acid) • Generic NiCd (Nickel Cadmium) • Generic Li-LMP (Lithium Metal Polymer) • Generic Li-ELiTE (Lithium ELiTE) Once selected the user has the opportunity to automatically accept the Once selected the user has the opportunity to automatically accept the standard defaults for all battery Type related features. Parameters such as float voltage, float alarms, thermal compensation parameters, etc. are automatically adjusted if defaults are accepted. Two additional battery types can be added to the list. Any battery type can be removed or added inthe field. The system factory default is VRLA.
String Capacity	Capacity of an individual battery string in the system which is used to derive the total installed system battery capacity. This value has to be entered for “Generic” battery types but is automatically configured for specific battery models. The available range is 0-9999 AH. The system factory default is 0 AH.
Battery Strings	The total number of battery string installed in the system entered by the user for inventory purposes and initial reserve time calculations. This valueis automatically configured when using smart lithium batteries. Available range is 0-16. The NX400 system factory default is 0 strings.
End of Dchrg	The user defined system bus voltage at which the batteries are considered tobe at the end of their reserve capability for manual battery testing (End of Discharge). This end-of-discharge voltage is used for automatic and opportunistic reserve time calculations. It has a range of -36.00 to -48.00V. The system factory default is -44.00V.
Battery Temp Management	This section includes all the parameters required for thermal management of the batteries. These items include the ability to enable/disable thermal compensation for high and low temperatures and set the slope decrease and increase rates, respectively. There is also a “High Temperature alarm threshold”, “High Temperature Disconnect” feature. Thermal compensation features are factory defaulted Enabled.
Batt Test	This section includes all the parameters required for battery testing through manual or automatic means. Configuration for manual test duration and thesystem test end-voltage for manual battery test are here along with the interval, start date, start time, time from last battery on discharge BD, and enable/disable for periodic battery test. The rectifier voltage during battery discharge testing and system reserve time low alarm threshold are also available. Automatic battery testing is factory disabled.
Recharge Amp Limit	Enable or disable battery recharge limiting and set recharge current limit. Recharge current limit is factory Enabled at 50A.
Voltage Imbal	User defined voltage threshold for a mid-string voltage alarm. Range 1.4 - 3.0 Volts. Factory default is 1.7V. This alarm is only generated afterbatteries have been sitting on float for a minimum of 24hours.

*See Appendix A for detailed descriptions of the Thermal Compensation and Battery Test features and parameters.

Contactors

The controller monitors external control boards that can be assigned to LVD contactor control by appropriately configuring a unique board ID to a specific contactor function. The QS841A can assign up to six IDs to boards used for controlling LVDs. Each unique ID number can be assigned to one of the following LVBD 1 (Low Voltage Battery Disconnect 1), LVLD1 (Low Voltage Load Disconnect 1), LVLD2 (Low Voltage Load Disconnect 2), LVLD3 (Low Voltage Load Disconnect 3), or NONE. Each of these assignments has its own unique programmable parameters. Selecting NONE removes the ability of that particular QS871A to control and external LVD.

Disconnects

This section of the configuration menu contains the parameters associated with the individual function assignments made in the previous section. Each LVD type (LVBD and LVLD1-3) can individually be enabled or disabled. The contactor's disconnect and reconnect method of operation used by the controller can be programmed for each LVD. The method of disconnect or reconnect can be based on reaching a system bus voltage threshold (Voltage) or based on both reaching the system bus voltage threshold and an elapsed time from once the system has been placed on discharge (BD) and at least two or more rectifiers are reporting AC failures (Voltage + Time). The Voltage and Time mode of operation can also be selected for reconnecting LVDs. In this case the elapsed time configured is the time from once the reconnect voltage threshold has been reached.

Disconnects are not used in the CPS6000-L. Thus, the factory defaults are the following:

- LVBD (Enabled)
    - Disconnect Mode (Voltage); Range: Voltage, Voltage + Time
    - Disconnect Voltage (42.0V); Range: 39-50V
    - Time Delay (0 min); Range: 0-300min
    - Reconnect Mode (Voltage); Range: Voltage, Voltage + Time
    - Reconnect Voltage (44.0V); Range: 39-55V
    - Time Delay (0 sec); Range: 0-300sec
- LVLD1 (Enabled)
    - Disconnect Mode (Voltage); Range: Voltage, Voltage + Time
    - Disconnect Voltage (42.0V); Range: 39-50V
    - Time Delay (0 min); Range: 0-300min
    - Reconnect Mode (Voltage); Range: Voltage, Voltage + Time
    - Reconnect Voltage (44.0V); Range: 39-55V
    - Time Delay (0 sec); Range: 0-300sec
- LVLD2 (Disabled)
    - Disconnect Mode (Voltage); Range: Voltage, Voltage + Time
    - Disconnect Voltage (42.0V); Range: 39-50V
    - Time Delay (0 min); Range: 0-300min
    - Reconnect Mode (Voltage); Range: Voltage, Voltage + Time
    - Reconnect Voltage (44.0V); Range: 39-55V
    - Time Delay (0 sec); Range: 0-300sec

- LVLD3 (Disabled)

  Disconnect Mode (Voltage); Range: Voltage, Voltage+Time

  Disconnect Voltage (42.0V); Range: 39-50V

  Time Delay (0 min); Range: 0-300min

  Reconnect Mode (Voltage); Range: Voltage, Voltage+Time

  Reconnect Voltage (44.0V); Range: 39-55V

  Time Delay (0 sec); Range: 0-300sec

Imminent Shutdown Alarm

The Imminent Shutdown Alarm is generated prior to opening the LVBD. Once the LVBD threshold has occurs, alarm is generated 15 seconds prior to opening the contactor to provide an indication that system shutdown is imminent due to a system battery disconnect. The alarm is based on the configured LVBD battery disconnect threshold.

Remote Emergency Power Off (EPO)

Also included in the Disconnect menu is the ability to Enable/Disable the remote Emergency Power Off (EPO) feature. If enabled, the controller will interpret a contact closure on the alarm terminal block interface to open the battery contactor. The battery contactor will open five seconds after the contact has been asserted. Once the contact is removed, the battery contactor will be re-asserted to its previous operational state.

Ringers

The QS841A can manage up to eight ringer chassis. Ringer operation parameters that include the ringer output voltage (65-100VAC), ringer output frequency (15-50Hz), whether it has remote DC Offset (Enabled/Disabled), and if the ringer chassis is operating in the redundant mode (Enabled/Disabled) are defined in this configuration menu.

Boost

The Boost function allows battery charging to be expedited by raising the system voltage to Boost level for a set time. The following boost mode parameters are set in this area of the menu system:

Set Point	Boost voltage (set point) is adjustable from -48.0V to -58.0V in 0.1V increments. The factory default setting is -55.2V.
Voltage Alarms	High voltage alarm thresholds in effect while the system is in boostmode. The Very High Major alarm triggers shutdown of the faulty rectifier (s). This threshold can be set from -50V to -60V. The factory default setting is -57.0V. The High Minor alarm does not force rectifiers to shut down. The threshold can be set from -50 to -60V. The factory default setting is -56V. The Battery On Discharge alarm is low voltage alarm setting while in Boost that operates similar to that on Float. The threshold can beset from -46 to -55V. The factory default setting is -51V.
Max Duration	Duration the system can remain in boost mode can be set from 1 to 80 hours. The factory default setting is 1 hour.
Automatic	Enabled or Disabled the automatic boost feature. The factory default setting is Disabled.

System Settings

Located here are the menus for configuring general system level settings.

Display Contrast	Allows display backlight intensity to be adjusted for contrast in local ambient light. Factory default is 50%.
System Date andTime	Sets system date and format. The format for date can be selected from: mm/dd/yyyy, dd/mm/yyyy, yyyy/mm/dd, mm-dd-yyyy, yyyy- mm-dd, dd-mm-yyyy, mm/dd/yy, yy/mm/dd, dd/mm/yy, mm-dd-yy, yy-mm-dd, or dd-mm-yy and the format for time can be 12HR/24HR format. The factory default is Date: mm/dd/yyyy and Time: 12HR.
Daylight Savings	Enable or disable. Factory default is Enabled.
Display T Units	°C or °F. Factory default is °C.
High Ambient T	High temperature alarm threshold that can be set from 35°C to 75°C.The factory default setting is 75°C.
Low Ambient T	Low temperature alarm threshold that can be set from -40°C to 10°C. The factory default setting is -40°C.

Communication Ports

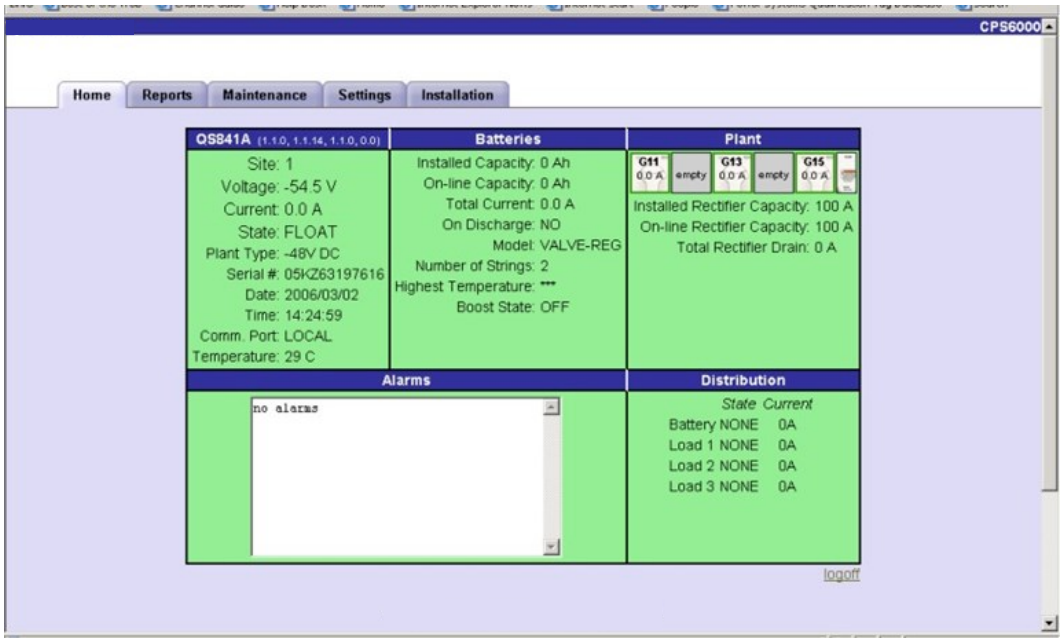
Menus for configuring the following communication parameters:

Port Type	Set the communication port to either Local or Modem. Factory default is Local. This connection setting is required by the EBW in the NX400 system in order to provide the SNMP management port.
Local Port Settings	Provides the ability to Enable or Disable Write access to the controller, theability to change system settings through the SNMP management or local port. The factory default setting is enabled. The baud rate, number of data bits, parity, number of stop bits, and flow control parameters for the port is also configurable. These parameters have been factory set to 9600, 8, none, 1, none, respectively, to facilitate communication between the QS841A_NX1 and the EBW NIC.
Modem Port Settings	Provides the ability to Enable or disable Write access, the ability to changesystem settings through the modem. The factory default setting is Enabled. The baud rate, number of data bits, parity, number of stop bits, and flow control parameters for the port is also configurable. Note: the initialization string of the external MODEM must be set in the controller. Factory default for the string is “AT&FEV&C1S0=0H”. This string can be modified by utilizing EasyView or T1.317 commands through a local terminal connection. Consult technical field support if further assistance is required. Thee number of rings to be detected by the modem before it answers (Rings to Answer) can be set from 1 to 9. The factory default setting is 1.

Network Settings	The access type and the Dynamic IP addressing mode are set in this section.The Dynamic IP address mode sets the IP address operation mode of the Ethernet port on the QS841A. This port has been set to act in DHCP (Dynamic Host Configuration Protocol) **Server** mode in the NX400 in orderto provide the Craft port located at the front of the system. The QS841A_NX serves up **192.168.2.1** which should be used as the destinationaddress on the Craft. This configuration should not be changed in the NX400. The Static and Client modes of operation allow the QS841A's portto be configured to operate plugged into the network. Note: once this parameter is changed, the controller must be re-booted by removing power from the unit by removing and re-inserting the unit into the shelf. In addition, there is the ability to Enable or disable Write access for someone who is attached to the Craft port. The factory default setting is Enabled.

10/100 Base-T Ethernet Port

The 10/100Base-T Ethernet is designed for remote access and system management but can be set-up to provide a Craft interface port. When accessing the port with a standard browser either remotely or as a Craft port all Status, Control/Operation, Configuration, and other items described previously are available through respective web pages. In addition to providing a top level Home view of the system depicted below, additional information or configuration is available that is not available through the front panel. Unlike the front panel interface which is limited structurally, the Web pages are more dynamic and will be enhanced over time. Consult factory for latest upgrades.



Security Levels/Passwords

The QS841A supports three levels of security from the Ethernet and other remote interfaces. The security levels are described in general below.

User security level:

- Can view almost every parameter in the system
- Can change only a few parameters
- Default password: ABB

Super-user security level:

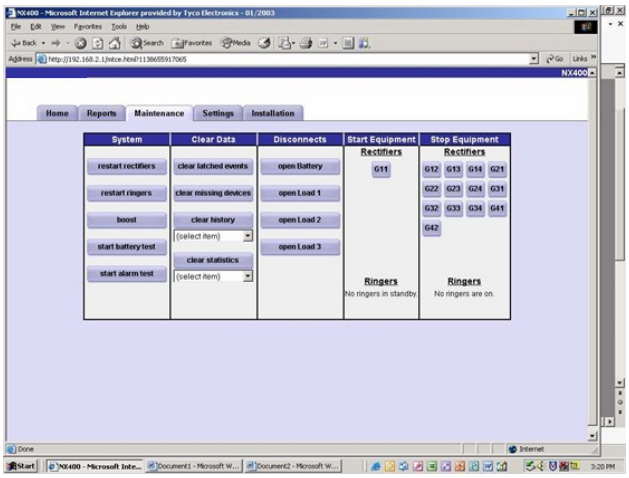
- Can do everything the user can do
- Can change any configuration parameter in the system (except passwords)
- Default password: super-user

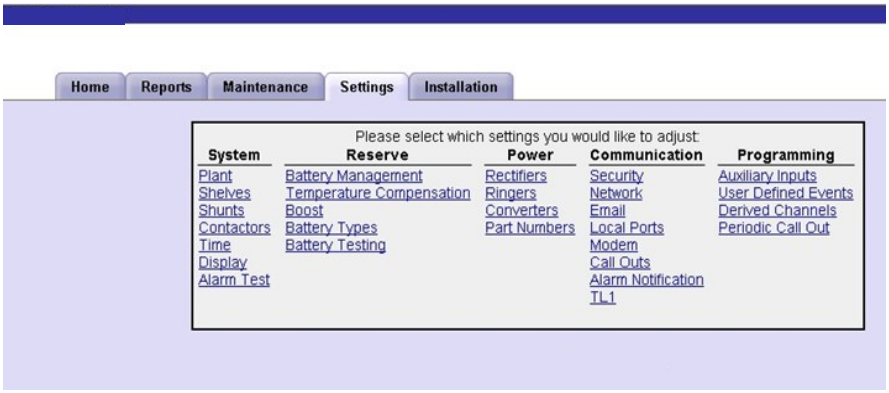
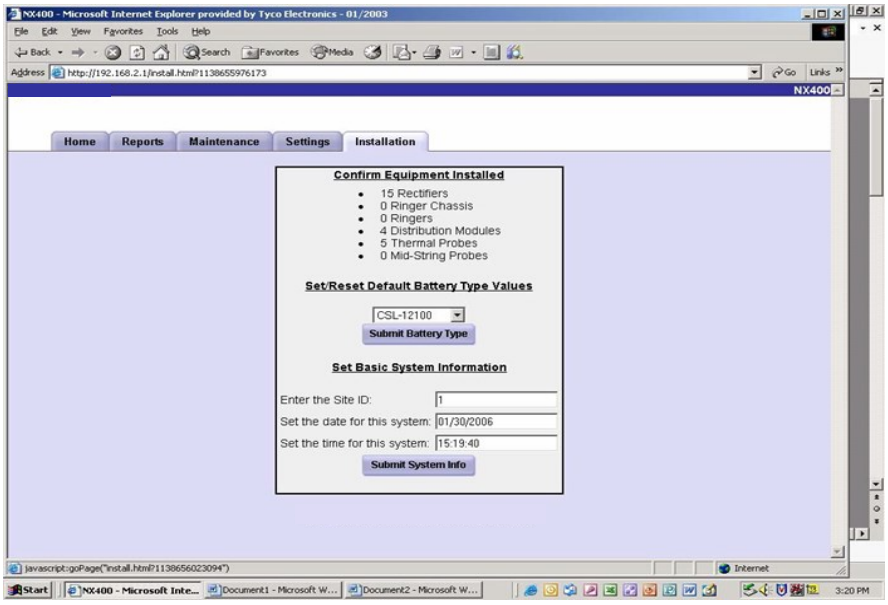
Administrator security level:

- Can do everything the super-user can do
- Can change passwords
- Can upgrade controller software
- Default password: administrator

Note: if the QS841A Ethernet port is configured as a Craft port then a person using the Craft Port locally has the same privileges defined for configuration and control from the front panel without using the PIN.

The Home Page shown previously has tabs that are partitioned as the following:

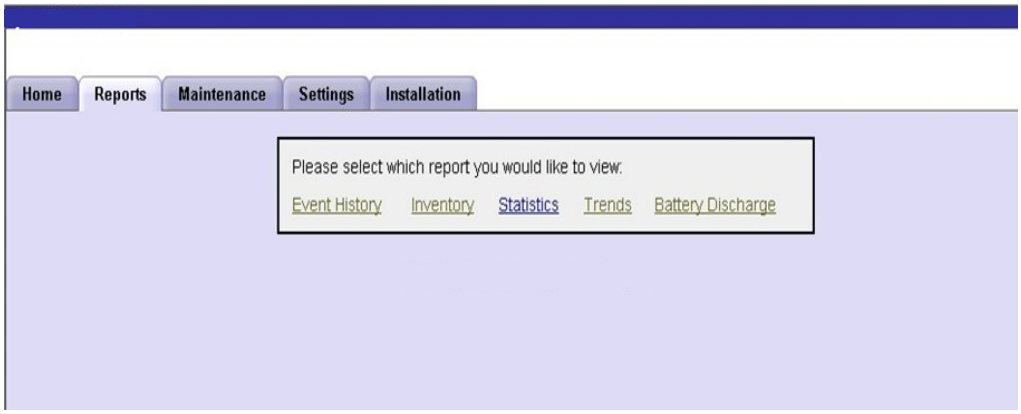
Home	Main login page that shows representative graphic of the plant. The graphic will depict the number of shelves, rectifiers in place with their appropriate outputs, empty slots, and indicate which rectifiers are in alarm. High-level summary for the Batteries, Distribution, Alarms present, and controller summary are shown. There are also quick link tabs that take you to specific features. These tabs are the Home, Reports, Maintenance, Settings, and Installation.
Reports	The reports tab displays reports that the system controller can display through web pages. These reports include Event History, Inventory, Statistics, Trends, and Battery on Discharge.
Maintenance	Allows remote access to Control/Operation commands assessable through the front panel. These include restarting rectifiers/ringers, starting alarm or battery tests, asserting boost, clearing history and statistics, clearing latched events and missing equipment, placing rectifiers/ringers in and out of Standby. 

Settings	Items in this menu are used to configure all the individual system parameters,features, and thresholds. These fields are arranged by System, Reserve, Communication and Programming. 
Installation	This tab allows a quick configuration of the primary items that need to be set for asite. These items include selecting the battery type, date, time, and the site ID mentioned during the front panel configuration start-up section. 

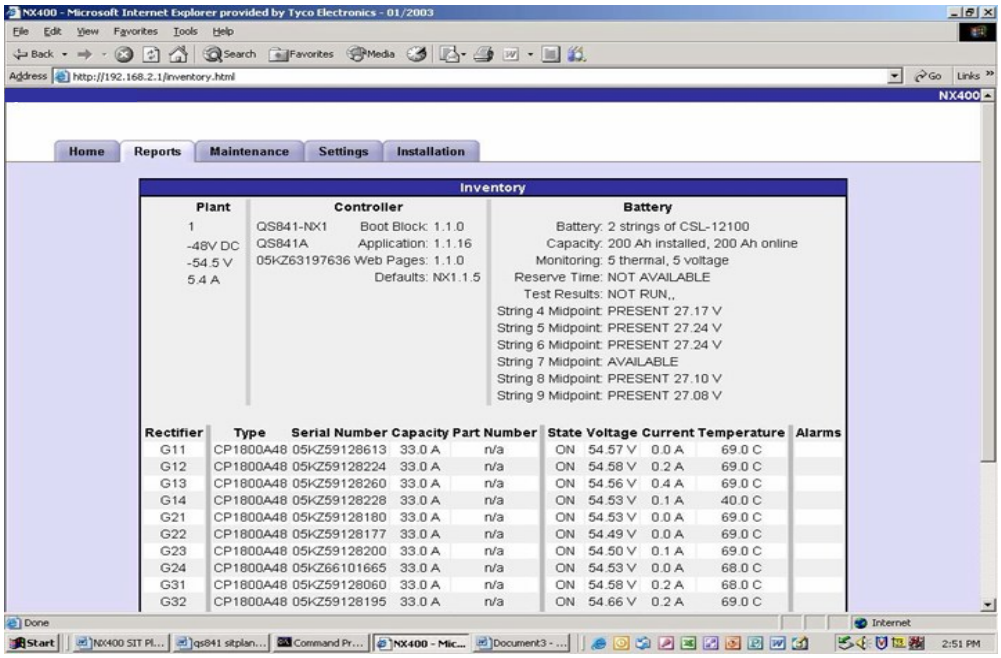
The Home Page shown previously has tabs that are partitioned as the following:

The previous screen shots introduced the high level functionality available through the web interface both remotely or locally when configured as a Craft port. The QS841A supports many different features through its web interface. Following are a few other screen shots of features available through the web interface. Web pages will continually be enhanced. Consult appropriate OmniOn Power personnel for additional details.

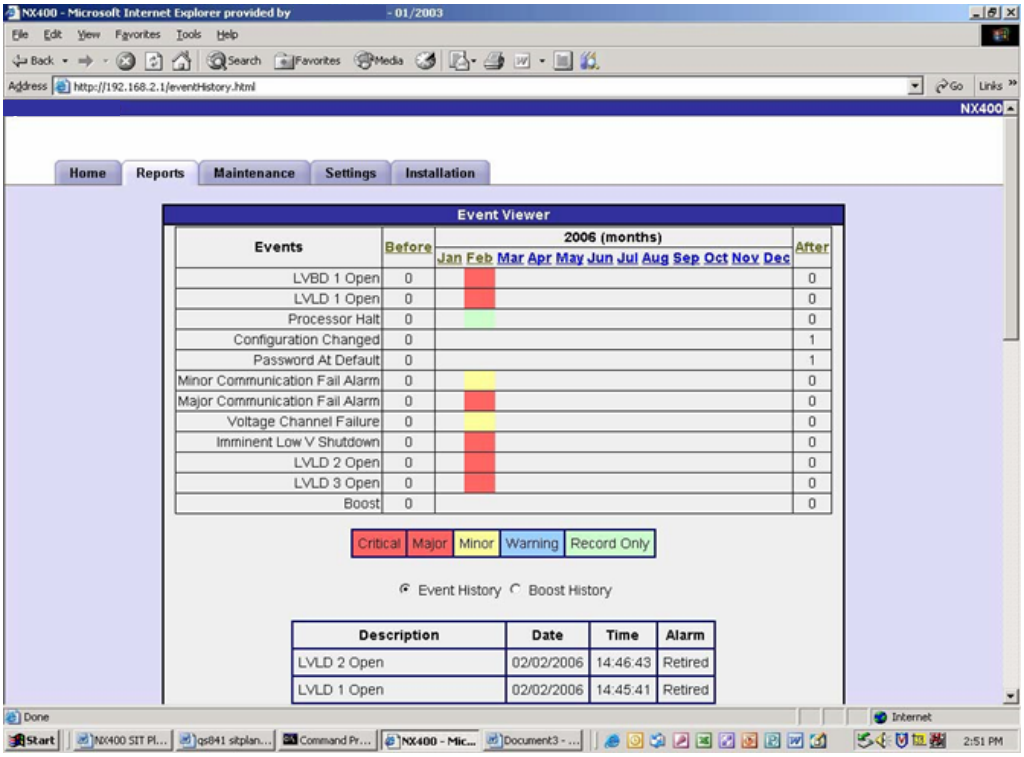
Selecting the “Reports” tab produces the following screen.



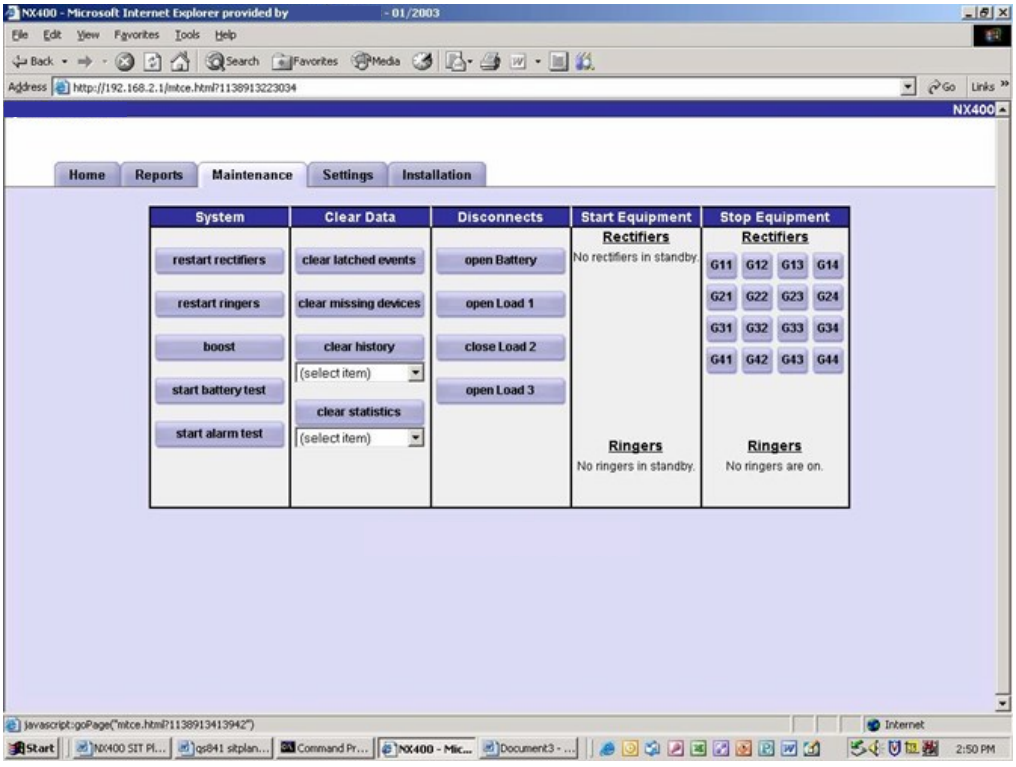
As an example, selecting “Inventory” from the “Reports” screen produces the following page.



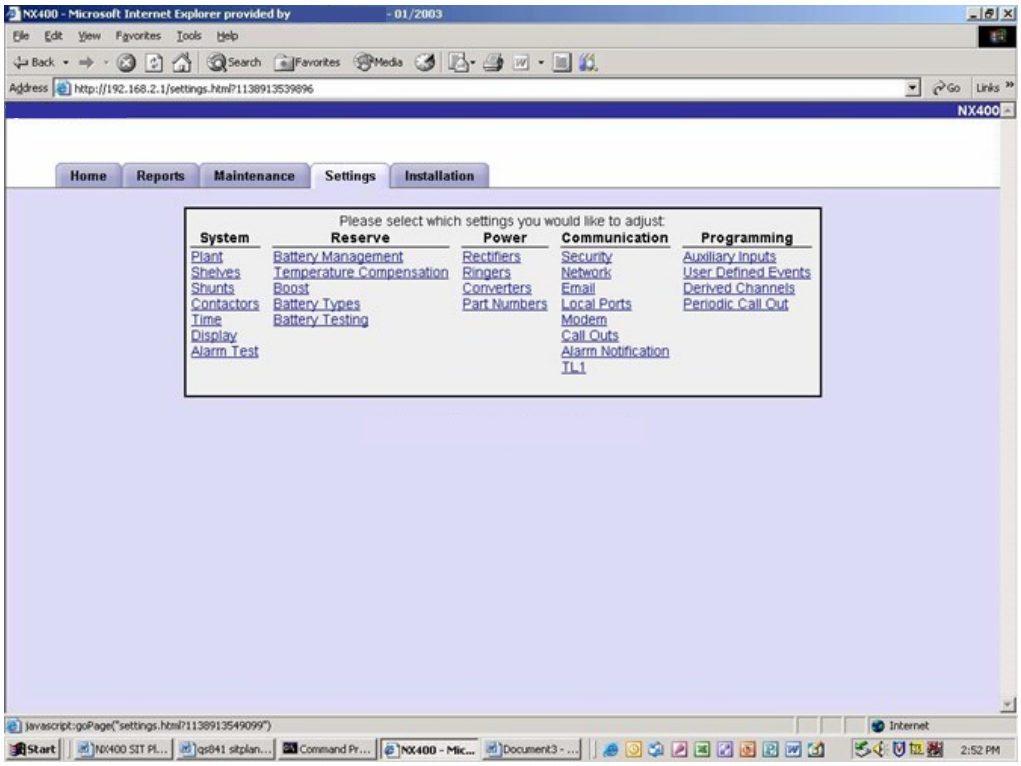
Obtaining a chronological view of the alarm events is also available by selecting “Event History” from the reports screen produces the following page.



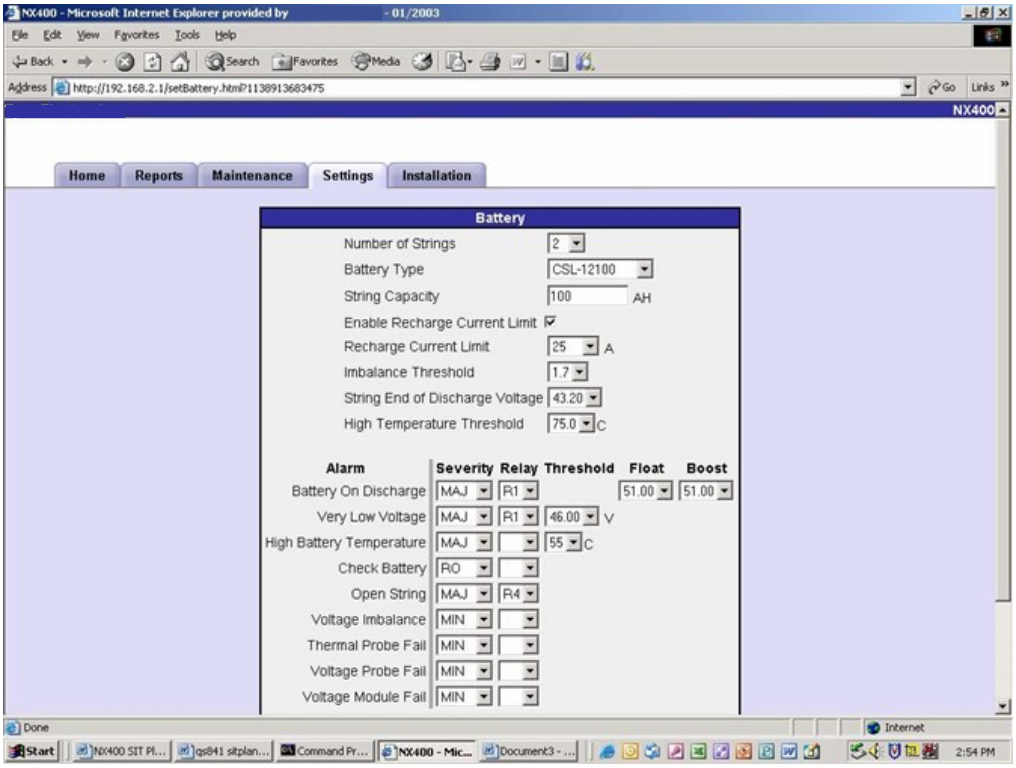
Selecting the “Maintenance” tab produces the following web page which allows various remote operations to be carried out.



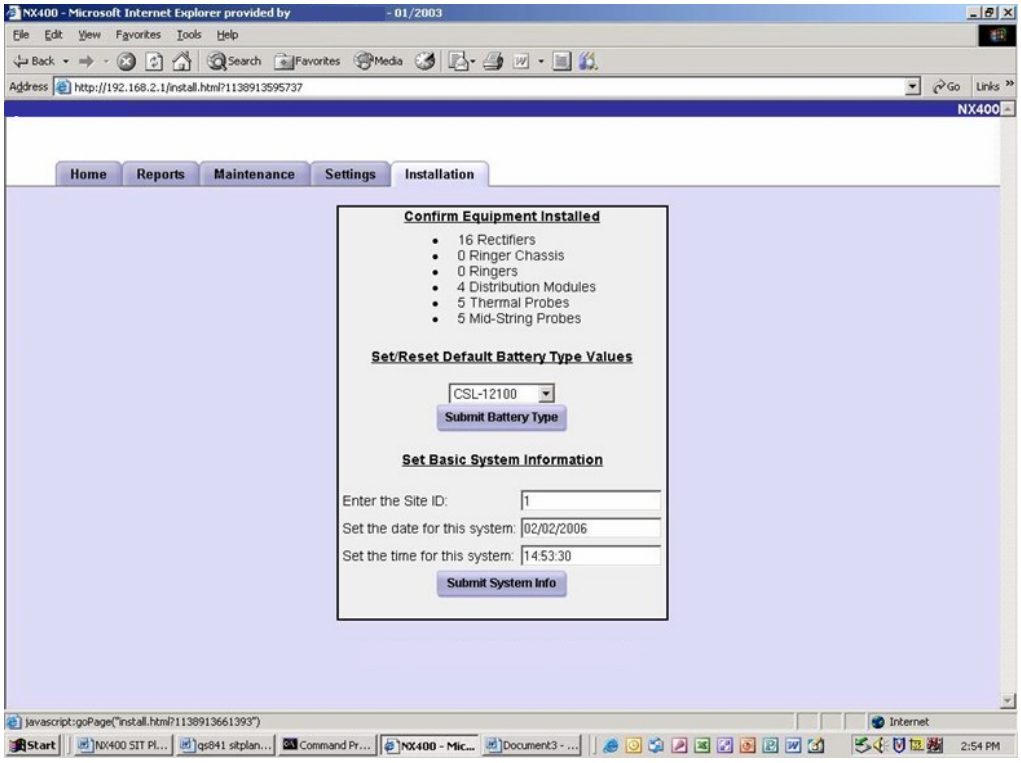
Selecting the “Settings” tab produces the web page from which configuration for all individual items can be performed.



Selecting “Battery” in the “Settings” screen produces the following web page:



Selecting the “Installation” tab produces the web page from which a quick high level configuration can be performed. Configuring the battery type, site ID, date and time are generally the only configuration items required for the plant.



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8 Rectifier

Overview

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

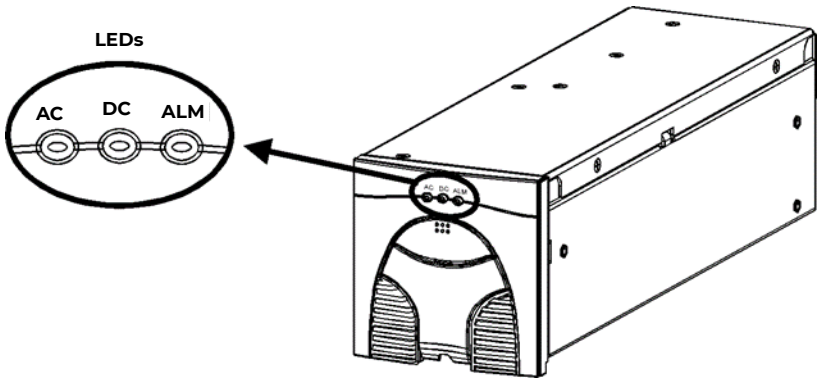


Figure 8-1: QS86x Series Rectifier

The QS860A rectifier produces 500W from 90 to 275V_{ac}. There is a dead zone of approximately 135 to 150Vac between the low line and high line ac input conditions where the rectifier shuts down. However the rectifier automatically restarts operation once the ac input voltage is out of the dead zone. It has two built-in fans and operates from -40 to +75°C ambient temperature.

The QS861A rectifier produces 817W from 90 to 275 V_{ac}. There is a dead zone of approximately 135 to 150 V_{ac} between the low line and high line ac input conditions where the rectifier shuts down. However, the rectifier automatically restarts operation once the ac input voltage is out of the dead zone. It has two built-in fans and operates from -40 to +75°C ambient temperature.

The QS862A rectifier produces 1363W from 90V to 132 V_{ac}, and 1635W from 180V to 275 V_{ac}. From 85 to 90 V_{ac} (low line) and 150 to 180 V_{ac} (high line) it goes into limited power mode where it continues to perform at a reduced output power level. It has two built-in fans and operates from -40 to 75°C ambient temperature. If it is initially powered up from 90V to 132V, it will operate as a 1363W rectifier and operate from 90 V_{ac} to 275 V_{ac}. If it is initially powered up from 170 to 265 V_{ac}, it will operate as a 1635W rectifier and will shut down for voltages below 150 V_{ac}.

The QS864A rectifier produces 2180W from 180 to 275V_{ac}. From 150 to 180V it goes into a power limited mode where it continues to perform at a reduced power level. It has two built- in fans and operates from -40 to +75°C ambient temperature

The QS865A rectifier produces 2725W from 180 to 275V . From 150 to 180 V_{ac} it goes into power limited mode where it continues to perform at a reduced output power level. It has two built-in fans and operates from -40 to 65°C ambient temperature.

Alarms and Displays

Status LEDs

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, LowInput AC > 15 ms
*	Flashing		Current Limit Operation
x	x	Flashing	Communication Loss

Status Descriptions

Normal Operation: Rectifier is operating within specified parameters.

Start Up: Rectifier is inserted into the shelf, powered up and initializing. Output power is not yet available.

High Voltage Shutdown: The CPS6000 rectifiers will shut down if either of these conditions are true:

- If an individual rectifier's output voltage is above 58V.
- If an individual rectifier's output voltage is greater than 59.9V for 1ms.

In both cases, the rectifier will attempt to restart up to three times. If after the third attempt the fault conditions prevail, the unit will be latched off and will require user intervention.

If the rectifier does latch off, the power supply must be power cycled. This may be accomplished by disengaging the power supply from its mating connector on the shelf, waiting until the front panel LEDs have stopped illuminating and then reinserting it back in the shelf.

Thermal Alarm (Power Limiting): The rectifier power limits itself to protect itself from thermal damage, yet at the same time, trying to support the load. An internal critical temperature is monitored. If the temperature exceeds 75°C, the QS862A rectifier begins to limit the output current. If the temperature exceeds the internal thermal safety temperature,

the rectifier will shut down. It will restart when the temperature drops below 10°C below the threshold.

Prior to shutdown, the rectifier transmits a rectifier fail alarm to the system controller. While in the thermal shutdown mode, the rectifier front panel LEDs will light as indicated in the Status LED table.

Hiccup: If the rectifier output is short-circuited or if its output voltage drops below 36V, the rectifier will go into a hiccup mode. In this mode, the rectifier will shutdown for 10s and attempt to restart. If the short circuit conditions exist, the rectifier will shutdown and perform another restart in 10 seconds. If the short / overload persists, the rectifier will shut down and attempt to restart a maximum of 3 times. After 3 restart attempts, the rectifier will shut down and lock out.

AC Fail: If the ac input voltage goes out of the operating range, the rectifier will issue an AC Fail alarm.

Current Limit: This is an indication that the rectifiers are delivering maximum current to the load. This is a situation that can occur after a battery on discharge event when the utility service comes back. The rectifiers will be powering the load as well as providing charging current to the batteries. Normal operation will resume and the blinking LED will stop blinking once the batteries are charged. See graph below for more details. While in the current limit mode, the rectifier front panel LEDs will light as indicated in the Status LED table.

Remote Standby: These rectifiers may be placed in standby mode by the Controller. When in standby, ac power is still provided to the rectifiers but the output is inhibited. When the controller is queried, it will report this rectifier's status as STANDBY. While in the standby mode, the rectifier front panel LEDs will light as indicated in the Status LED table.

Communication Loss: If the rectifier loses communication with the system controller, it will blink its Alarm LED. Once communication is lost with the system controller, the rectifier output voltage will remain at the last voltage set by the system controller.

Features and Functions

QS86xA Output Power Curve

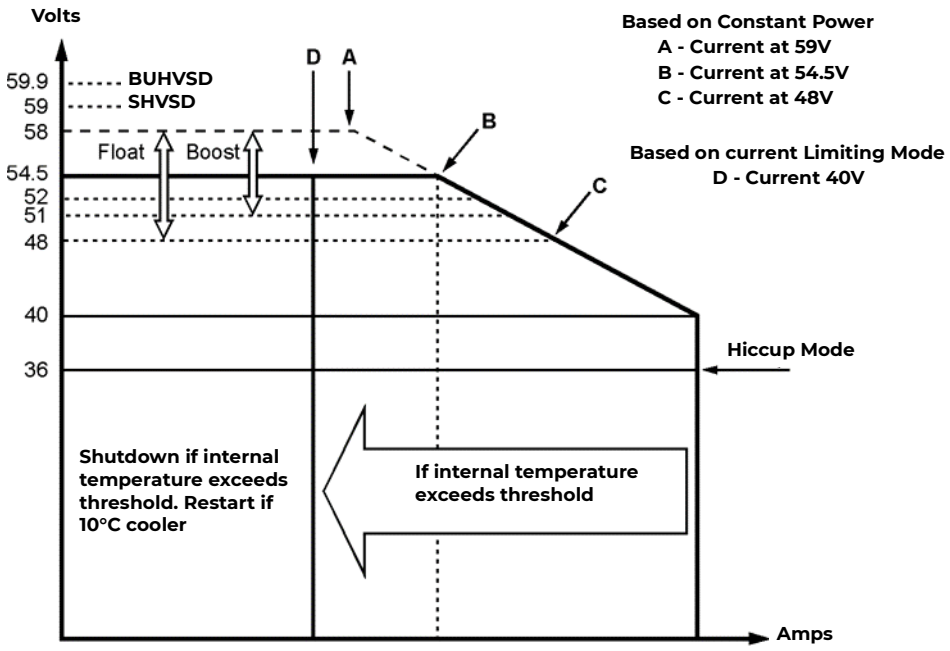
The following graph shows the QS86xA rectifier output power curve. This curve is valid for both low-line and high-line operation. Use the table following the curve for the current levels at key voltage levels. The rectifier can deliver constant power to approximately 48Vdc.

Further loading of the rectifier will result in the rectifier operating in the constant-current mode. If the rectifier is loaded below approximately 36V, the rectifier enters the hiccup mode.

During start-up, the rectifier can deliver an increased amount of current as specified at point

C. Point B is the nominal operating point.

Point D is the internal thermal threshold beyond which the rectifier shuts down to protect itself. Point D is not based on constant power.



Rectifier	Power	A	B	C	D
25A	1362.5W	23.49A	25A	28.39A	20A
30A	1635W	28.19A	30A	34.06A	24A
15A	818W	14.09A	15A	17.03A	12A
50A	2725W	46.98A	50A	56.77A	40A
40A	2180W	37..59A	40A	45.42A	32A
500W	500W	8.6A	9.2A	10.4A	7.3A

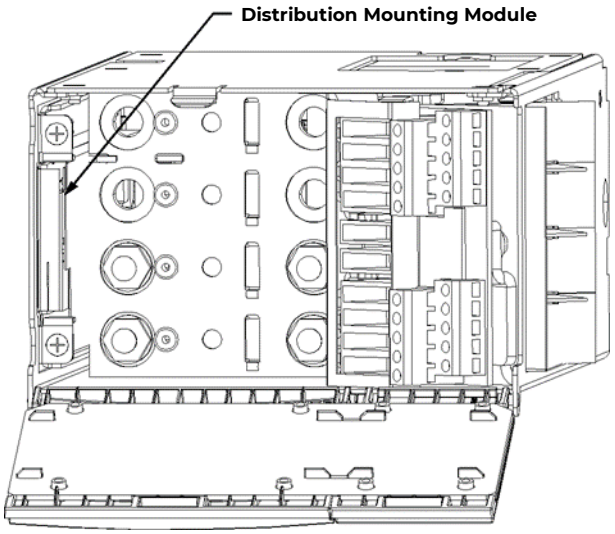
Output Voltage

The rectifier's output voltage is factory set to 52.0V. The voltage may be changed by the system controller. Note that the rectifier will remain at the last voltage it was set to should the system controller fail or be removed.

9 QS872A Distribution Monitoring Module

Overview

This section describes the Distribution Monitoring Module features, functions, and alarms. Figure 9-1 shows the QS872A Distribution Monitoring Module board. This board is installed on the left wall of the Distribution Module (if equipped). This board may also be used in external distribution panels.



Distribution Module With Front Door Open

Figure 9-1:Distribution Monitoring Module

LED: This is a tri-color LED and will illuminate accordingly for the conditions shown below.

LEDs: *= On			
Green	**Amber**	**Red**	**Condition**
*			Normal
	*		Minor Alarm
		*	Major Alarm
		Flashing	Communication Loss with System Controller

Communication Failure

If the LVD board loses communication with the system controller, it will blink its LED in red color. Note that during a battery on discharge event, the system controller signals the LVD board to disconnect the batteries from the system once the battery strings have discharged to the threshold voltage set by the user. This command is not possible during a communication failure. If communication is lost during this event, the LVD boards will disconnect at the backup disconnect voltage of 35V +/- 1V.

Similarly, when the utility supply source returns, the rectifiers will power up and the output bus voltage will rise to the Float Set Point set by the user. Once the output voltage crosses the reconnect threshold also set by the user, the system controller commands the LVD contactor to close and connect the batteries to the bus voltage. During communication loss with the controller, this command will not be possible. In this case, the LVD contactor will reconnect at the backup reconnect voltage of 48V +/- 1V.

Reverse Battery Protection

This feature prevents closure of the LVD contactors if the QS872A detects the battery strings are connected in reverse polarity.

Note that the system will prevent contactor closure only if it detects improper polarity. If no batteries are connected to the system and the CPS6000 system is powered up, the QS872A will close the contactors and present the output bus voltage at the battery terminals.

If an external disconnect switch is being used to take battery strings off-line for replacement, care must be taken to ensure battery connections are correct at the switch. This is because the contactors remain closed when an external disconnect switch is used to disconnect the batteries from the bus. If the batteries are reconnected in reverse polarity, closing the switch will result in the batteries being connected to the bus in reverse polarity.

10 Ringer Chassis and Ringers

Ringer Chassis

Overview

Ringer Chassis provide

- One ringing output – 100VA maximum
- Support for one (non-redundant) or two Ringers (1 + 1 redundant)
- Fans – Ringer powered, controlled, and monitored
- Ringing output connector
- Ringing type selection (Tip) Jumper J12

Redundant Configuration

1 + 1 redundant (duplex) operation

- Two ringers are installed in a Ringer Chassis
- Ringing output from that Ringer Chassis is powered by the primary ringer (the one on the right)
- Should the primary ringer be removed or fail
- Ringing output will be provided by the spare ringer (the one on the left)
- An alarm will be sent and displayed by the Controller.

Non-Redundant Configuration

Non-redundant (simplex) operation

- One ringer is installed in a Ringer Chassis
- Ringing output from that Ringer Chassis is powered by that ringer

Should that ringer be removed or fail, ringing output will not provide ringing, and an alarm will be sent and displayed by the Controller.

Ringer

Overview

Warning: The Ring signal shall be considered hazardous and shall be spaced from other circuits by 0.055 in. (1.4 mm).

Ringers convert dc to ringing power. QS820A Ringers convert -48V_{dc} to a 100VA ringing power output with configurable ac voltage, ac frequency, and dc offset. See Ringer Specifications for details.

Output Isolation

Ringers have output relays that isolate their ringing output from the Ringer Chassis ringing output in the event of standby operation, ringer failure, and output over-load. This facilitates 1

+ 1 redundant operation and the determination of external vs. internal faults.

Autonomous Operation

CPS6000 Controllers provide Ringer settings capability and status and alarms communications. QS820 Ringers operate without CPS6000 Controller.

When Ringers are not communicating with a Controller they

- Continue to operate normally from settings stored in their non-volatile memory
- When two Ringers are installed in a Ringer Chassis, they continue to provide 1 + 1 redundant (duplex) operation

Types of Ringing

QS820 Ringers can be configured to provide one of three types of ringing: Battery Backed, Ground Backed, and Ground Backed-no dc. Ringing type is selected by selecting dc Offset polarity and by enabling or disabling dc Offset.

dc Offset polarity is set by the J12 Ringer Chassis jumper or external connection. dc Offset may be disabled via controller setting if desired.

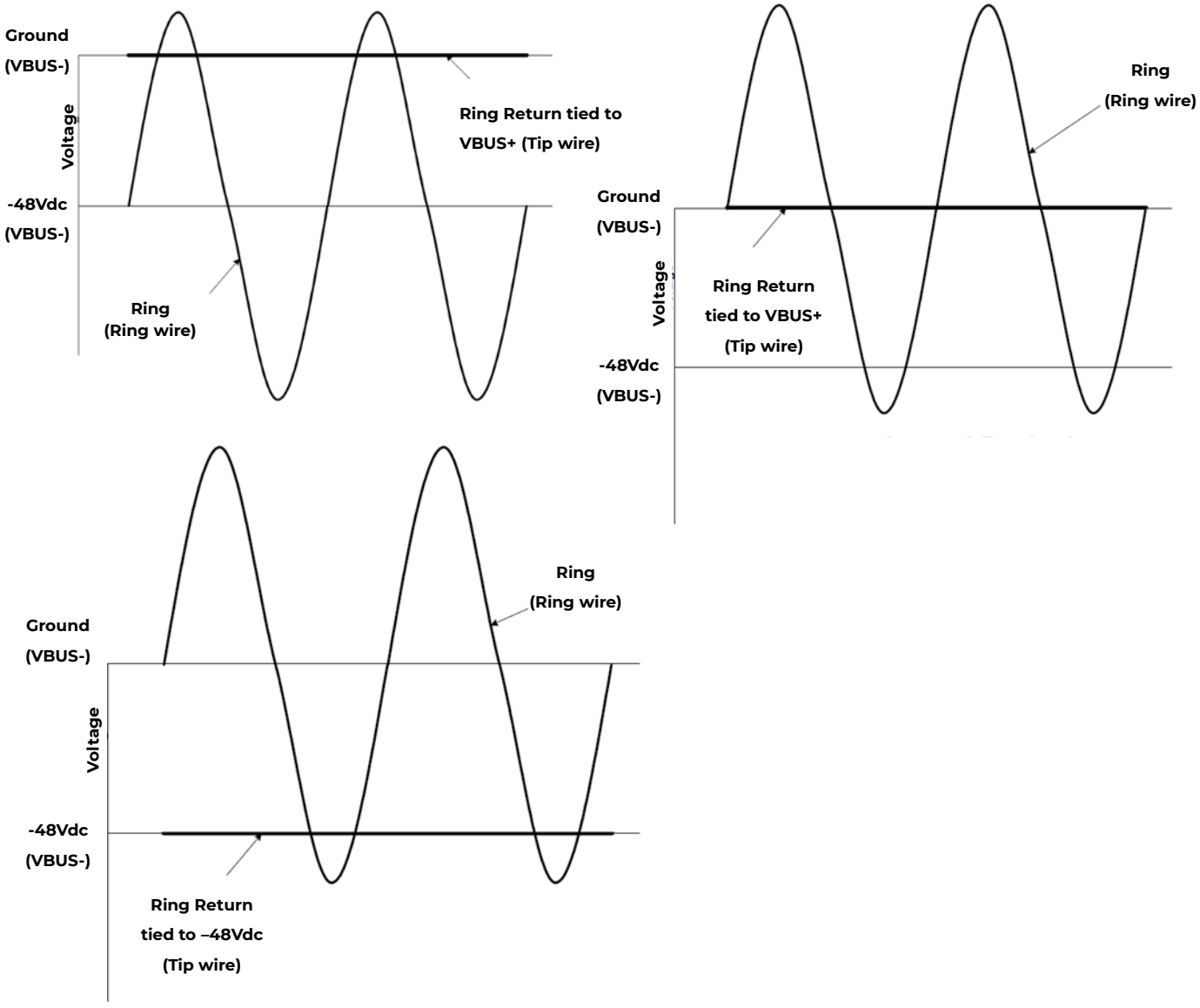


Figure 10-1: Ring Signaling Types

Output Voltage and Frequency

Ringer output voltage and frequency settings are controlled by the Controller. See Ringer specifications for ranges and factory settings.

Fan Power

Ringers provide power, control, and alarm monitoring for Ringer Chassis fans.

Status LED

QS820 Ringers have a single tri-color LED. The LED indications are listed below.

LEDs: *= On			
Green	**Amber**	**Red**	**Condition**
	*		Lamp Test
		*	Internal Fault Thermal shutdown Ringer Failure
	*		External Fault Ring Return not terminated Output limited – excessive output load Output limited – excessive temperature
		Flashing	Communication Loss
Flashing			Standby
*			Normal Operation
none			Input Under / Over Voltage Ringer Not Fully Inserted

1. Conditions are listed in precedence order, highest precedence on top, i.e. when both Internal Fault and External Fault conditions are active, the LED displays the Internal Fault pattern.
2. Normal is only active when no other condition is active.
3. Fan Fail (chassis fan) is not a Ringer failure and does not affect LEDs.
4. Output Power or Voltage is reduced (limited) to less than the Operational Setting due to excessive external load or excessive ringer temperature.

Status Descriptions

Normal Operation: Ringer is operating within specification, without output limiting.

Standby: Ringer is capable of Normal Operation, but its output is disabled due to one of two conditions:

- **Redundant Standby:** This is the Spare Ringer and the Primary is operating normally
- **Remote Standby:** The Controller has placed the Ringer into Standby

Communications Loss: Ringer has lost communications with the Controller. Ringer operation continues at the last received configuration.

External Fault: Ringer output is limited in response to an external condition.

- **Ring Return Not Terminated**: Ringer output is disabled. Ringer Chassis Jumper J12 is in the EXTERNAL position and there is no external connection between Ring Return and either Battery or Ground. Recovery is automatic when connection is made.

- **Excessive Temperature Reduced Output:** Ringer output is reduced due to high Ringer component temperature. Recovery is automatic when component temperatures return to safe values.

  Excessive Output Load: Ringer output load exceeds 100VA.

  Reduced Output: Ringer provides limited ringing output at 100VA by reducing Vac as low as 50% of Vac set point.

  Hiccup: If Ringer output is overloaded to Vac less than approximately 50% of the Vac set point, the Ringer enters the hiccup mode.

  Recovery is automatic when the external fault is removed.

  In this mode, the Ringer shuts-down and restarts briefly at intervals of approximately 2 minutes to test for the presence of the external fault.

  Restart will cause restart immediately.

- Internal Fault: Ringer output is disabled (shutdown) due to excessive temperature or Ringer failure.

  Recovery from Internal Fault

  Excessive Temperature recovery is automatic when the temperature returns to a safe value.

  Ringer Failure recovery is manual, requiring one of the following:

  - Removal of dc input power (remove and re-install Ringer in Ringer Chassis)
  - Restart command from Controller (from front panel menu or remote)
  - Ringer Failure is usually permanent and will reoccur upon completion or the recovery attempt.

11 Peripheral Devices

Voltage/Thermal Probes

The QS873A Voltage/Thermal Probes (VT-Probes) are used to measure battery temperatures for slope thermal compensation, and to measure battery voltage for battery voltage imbalance detection. They convert temperature measurements into serial data and transmit them to the system controller using the 1-Wire® bus from Maxim. They can also send battery voltage measurements to the system controller when used with the ES771A Remote Voltage Monitor. All probes are provided with a ptc device to protect against accidental short circuit during voltage measurements. Note: The CPS6000 system cannot use the thermal probes that are used with other OmniOn Power systems, e.g., CPS4000. The QS873A VT-Probes have a case that is used for weatherproof installs.

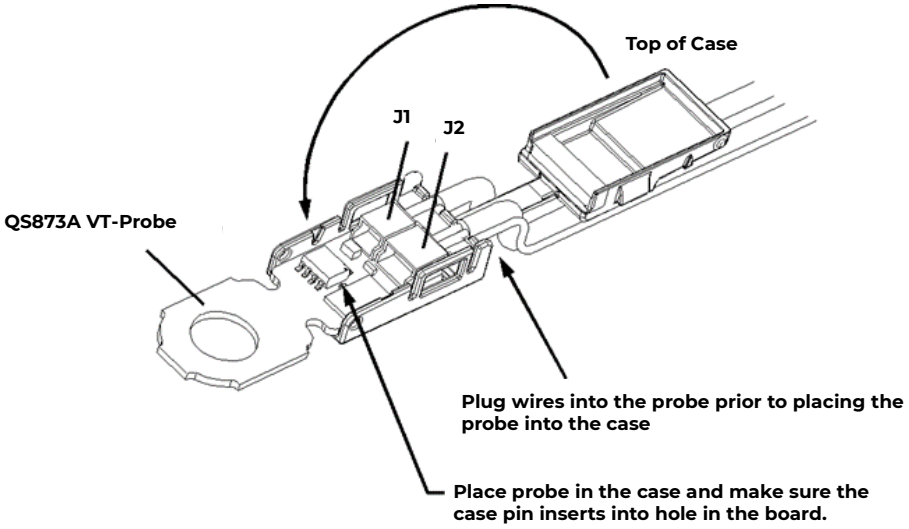


Figure 11-1: QS873A Voltage/Thermal Probe (VT-Probe)

J2

This 3-position connector serves to connect the VT-Probe to the Distribution Module using the H569-470GB (848719715) cable. It may also be connected to the ES771A Remote Voltage Monitor Module or be connected to other VT-Probes in daisy chaining using either the H569-470GC (848719803, 5-ft) or the H569-470GD (848719811, 10-ft) cable.

This connector also serves to connect the VT-Probes to the ES771A in making voltage measurements by using the H569-470GF (848719829) cable. This cable terminates on one end in a right-angled snap-fit connector and on the other end with a connector pin-socket. The pin-socked end of the cable is to be inserted into either of the two unused pin housings of the connector. See Installation Instructions for more details.

J1

This 2-position connector serves to connect the VT-Probe to J2 on other VT-Probes in daisy- chaining them together.

Remote Voltage Monitor Module

The ES771A Remote Voltage Monitor Module connects to the Auxiliary Port Connector on controller. It takes the voltage measurements from the VT-Probe and transmits them to the system controller in performing voltage imbalance detection. It also transmits the thermal data from the VT-Probes for slope-thermal compensation.

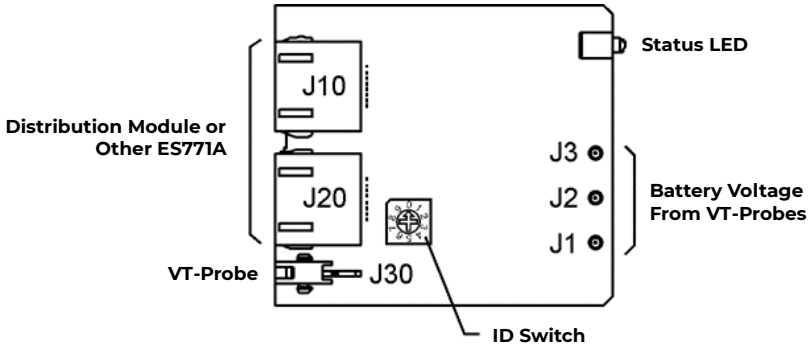


Figure 11-2: ES771A Remote Voltage Monitor Module

J10, J20

RJ-45 connectors that connect the ES771A to the Distribution Module or to another ES771A using 848652947 cable or other appropriate cable assemblies.

J30

Connects the ES771A to the VT-Probes using either the 848719803 (5-ft) or the 848719811 (10-ft) cables.

J1, J2, J3

Input connectors for the battery voltage from the VT-Probes. They accept the right-angled snap-fit connectors on the 848719829 cable assemblies.

ID Switch

A seven-position rotary ID switch used by the QS841A to individually address the ES771A. A setting of 0 produces and invalid ID alarm. Valid ID settings are from 1 through six.

Status LED

The module illuminates its green LED when plugged into the 1-wire network and with the VT-probe attached to negative battery terminal of the mid-string voltage. The LED will illuminate red when the controller determines that one or more of the strings from the unit has exceeded the Mid-String Voltage threshold and time considerations.

Following is a summary of the parts utilized in the 1-Wire management system

Item	Ordering code
QS873A Environmentally protected battery thermal probe (H569-470 GA)	108987611
10-ft (3m) Wire set to connect QS873A to system (H569-470 GB)	848719795
5-ft (1.5m) Battery thermal probe interconnect wire set (H569-470 GC)	848719803
10 ft. (3m) Battery thermal probe interconnect wire set (H569-470 GD)	848719811
ES771A Voltage Monitoring Module (H569-470 GE)	108958422
Probe to ES771A Voltage Monitor Cord, 10-ft (3-mm) wire set (H569-470GF)	848719829
Battery Voltage Monitor Cord, 10-ft (3-m) wire set (H569-470 GG)	848652947

12 ES772A Remote Distribution Module

Overview

The ES772A allows the QS840A CPS6000 Controller to communicate with devices in TEPS or OEM distribution panels. It will allow the QS840A to alarm for open load and battery protectors, read battery current from an external shunt, and control up to two contactors. One of the contactors could be a load-disconnect and one could be a battery disconnect type. An updated version of the ES772A will be available shortly that will offer additional features.

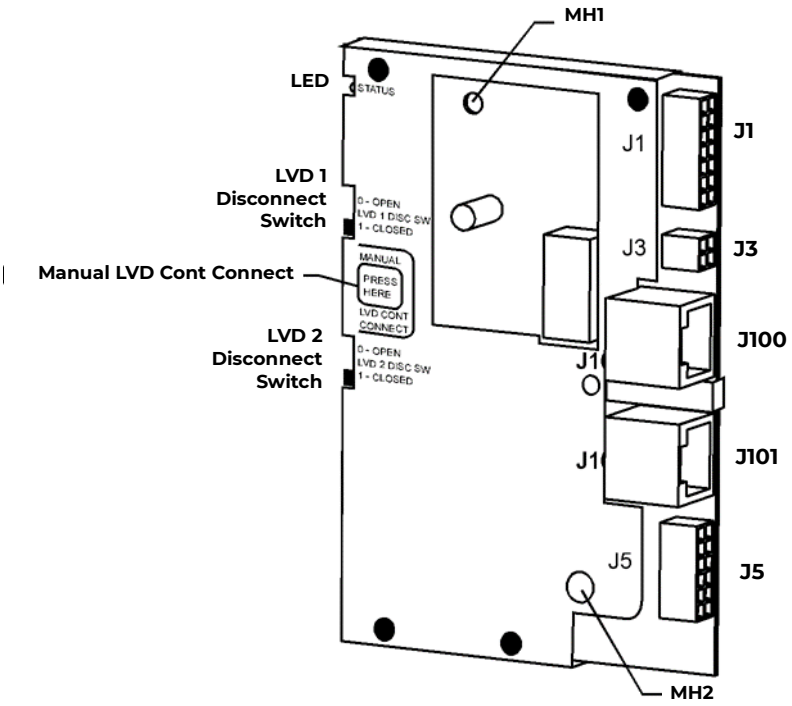


Figure 12-1: ES772A Remote Distribution Module

Controls, LED and Connectors

Receptacle J1: User connections to external distribution module.

Receptacle J3: User connections to external distribution module.

J100/J101: User connections to the QS840A System Controller Auxiliary Port Connector (P5) and to other devices such as the QS873A VT-Probe and the ES771A Remote Voltage Monitor Module.

Receptacle J5: User connections to external distribution module.

Mounting Hole MH1: Mounting hole to mount module in user application.

LVD2 Disc SW: Disconnect switch for external contactor 2, when wired as described in installation section.

Manual LVD Cont Connect: Switches for forced reconnect function.

LVD1 Disc SW: Disconnect switch for external contactor 1, when wired as described in installation section.

LED: This is a tri-colored LED and will illuminate accordingly for the conditions shown below.

LEDs: *= On			
Green	**Amber**	**Red**	**Condition**
*			Normal
	*		Minor Alarm
		*	Major Alarm
	Flashing		External Contactor (s) Manually Opened with either LVD1 or LVD2 DISC SW
		Flashing	Communication Loss with System Controller
Flash (5 sec)		*	Manual Reconnect Command Accepting

Mounting Hole MH2: Mounting hole to mount module in user application.

The ES772A is referenced to VBus(-), therefore, all alarm inputs are either alarmed on an open or a closure to VBus(-) as described in the following.

Module Features

The ES772A module has the following features:

- 16 Alarm inputs. These inputs may be used to monitor for distribution circuit breakers with micro-switch closures for protector opening, GMT style fuses with or DIN style circuit breakers. Furthermore, the two Auxiliary Major alarms may be used to monitor micro-switch closures from other devices such as a fan or a door, etc.

  The alarming states for the different inputs are as stated below:

  - 10 inputs to alarm or an open to VBus(-) for DIN style circuit breakers (J5 pins 1- 10)
  - 2 inputs to alarm on closure to VBus(-) for Auxiliary Major alarming from external source (J5 pins 11 and 12)
  - 2 inputs to alarm upon closure to VBus(-), for distribution protector open alarms (J1 pins 6 and 13)
  - 2 inputs to alarm upon closure to VBus(-) for battery circuit breaker open alarms (J1 pins 7 and 14)
- (2) LVBD or LVLD Contactor Manual Disconnect Switches are provided. These switches allows users to manually open up to two external contactors to disconnect a battery string from the V(-) bus and allow the user to perform maintenance on the battery. The switches can also disconnect a load from the V(-) bus if the contactor is configured for load disconnect.
- Reverse Battery Protection. If wired as instructed in Fig. 2 or 3 (see below), the ES772A will prevent the closure of contactors with batteries that are wired in reverse polarity. It will be active during initial start-up and also during servicing if the integral battery disconnect switches are used to connect and disconnect the battery strings from the V(-) bus. If the battery strings are wired in reverse polarity and an attempt was made to close the contactor, the ES772A will disconnect all contactors and appropriate alarms will be transmitted.

If an external disconnect switch is used to take battery strings off-line for servicing, care must be taken to ensure battery connections are correct at the disconnect switch. This is because the contactors remain closed when an external disconnect switch is used to disconnect the batteries from the bus. If the batteries are reconnected in reverse polarity, closing the switch will result in the batteries being connected to the bus in reverse polarity.

If the external disconnect switch is connected as shown in Fig 3, then the reverse battery protection feature will be provided.

Read all warning statements prior to making any connections.

- Manual LVD Cont Connect - Manual LVD Contactor Connect. This feature allows the CPS6000 system to resume powering the load after low voltage disconnect of batteries
- following a battery on discharge event. The fully depleted battery strings are to be replaced with fully charged strings. Once the strings have been replaced, depressing the Manual LVD Cont switches on the front of the ES772A module will result in the LVD contactors closing and the LED blinking in green color. Continue to depress the switches until the LED stops flashing and displays a continuous green color. This indicates acceptance of command and continued closure of contactors. Note that releasing the switches prior to the LED displaying a continuous green color will result in the contactor opening and removing power to the load.
- External battery shunt input, (J1, pins 4 and 11). The battery shunt must be in the VBatt(-) leg to maintain proper reference with the ES772A module. These inputs are for the system controller to read battery current. The polarity of the connections should be positive during battery discharge.
- Control and monitor two contactors. These connections are to control and monitor two contactors, either of which could be a load or battery disconnect device.
- Monitor plant voltage for backup LVD function (in case of failure of controller during battery discharge)

Module Connector Definitions

The ES772A module has five connectors that the user interfaces to, two are RJ-45 connectors that are used for serial communication to ES773A VT-Probes, the ES771A Remote Voltage Monitoring Module, and to the QS840A controller. The remaining connectors are used for monitoring circuit breakers, contactors and shunts.

Mating part for J1 (14 pin) is Amp, part number 1-794617-4.

Mating part for J3 (4 pin) is Amp, part number 794617-4.

Mating part for J5 (12 pin) is Amp, part number 1-794617-2.

Pin	Name	Definition	Comments/Connections
1	VPWR +	V(+) Power	Power for ES772A, connect to VBus(+)
2	N/A	Reserved	
3	N/A	Reserved	
4	SHUNT-	Neg Batt Shunt Input	Polarity is during battery discharge
5	BATT1_SENSE	Polarity Sense for String 1	Connect to battery negative, V(-) of String 1
6	DIST_ALM_1	Trip-Indicator Input-1 for US Style CB or GMT Fuse.Alarm on closure to VBus(-).	Connect to NC terminal of breaker micro switch or to indicator lead of GMT fuse, other end (C) referenced to VBus(-).
7	EXT BAT SW1	Alarm input for external battery disconnect switch; alarm on closure to VBus(-).	Connect to NC micro switch of US StyleCB, other end (C) referenced to VBus (-),micro switch must close upon manual opening of CB.

Table 12-A: Connector J1 Pin-out Definitions

Pin	Name	Definition	Comments/Connections
8	VPWR -	V(-) Power	Power for ES772A, connect to VBus(-)
9	STATUS1_RTN	Reference for STATUS1	Connect to C pin of micro switch of Contactor 1.
10	STATUS1	Contactor 1 Status Monitor	Connect to NO pin of micro switch ofContactor 1.
11	SHUNT+	Positive Battery Shunt Input	Polarity is during battery discharge
12	LVD1_COIL	Contactor 1 coil input	Connect to one side of Contactor 1 coil, other side of coil connected to VBus(+).
13	DIST_ALM_2	Trip-Indicator Input-2 for US Style CB or GMT Fuse.Alarm on closure to VBus(-).	Connect to NC terminal of breaker microswitch or to indicator lead of GMT fuse, other end (C) referenced to VBus(-).
14	EXT BAT SW2	Alarm input for external battery disconnect switch;alarms on closure to VBus(-).	Connect to NC micro switch of US StyleCB, other end (C) referenced to VBus(-),micro switch must close upon manual opening of CB.

Table 12-A: Connector J1 Pin-out Definitions (continued)

Pin	Name	Definition	Comments
1	BATT2_SENSE	Polarity Sense for String 2.	Connect to battery negative VBus(-) of string 2.
2	STATUS2_RTN	Reference for STATUS 2.	Connect to C pin of micro switch of Contactor 2.
3	STATUS2	Contactor 2 Status Monitor.	Connect to NO pin of micro switch ofContactor 2.
4	LVD2_COIL	Contactor 2 coil input.	Connect to one side of Contactor 2 coil, other side of coil connected to VBus(+).

Table 12-B: Connector J3 Pin Definitions

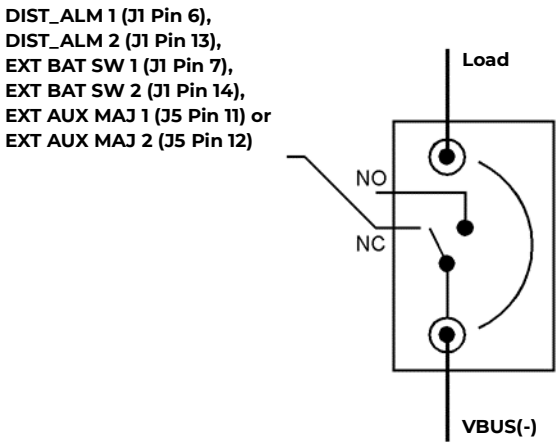


Figure 12-2: Typical Alarm Connections

The DIST_ALM(1, 2) EXT BAT SW(1, 2), and the EXT AUX MAJ(1, 2) alarm inputs are to be connected as shown in Figure 12-2. All of these inputs alarm on a closure to VBus(-).

The DIST_ALM(1, 2) alarm inputs are to be used for monitoring US Style CBs and GMT style fuses.

The EXT BAT SW(1, 2), alarm inputs are to be used for monitoring battery disconnect switches or circuit breakers with a micro switch that closes on manual opening of switch.

The EXT AUX MAJ(1, 2) alarms may be connected to external devices with a micro switch that closes on an alarmed state. Examples of this might be a Door Open alarm, or a Fan Fail alarm.

Since these devices all alarm on a contact closure, the protectors of the same type may have the indicating NC terminal connected together and the C terminals connected together and connected as shown above. This is not the case for DIN style circuit breakers, which must be individually monitored via different alarm inputs as shown in Figure 12-5.

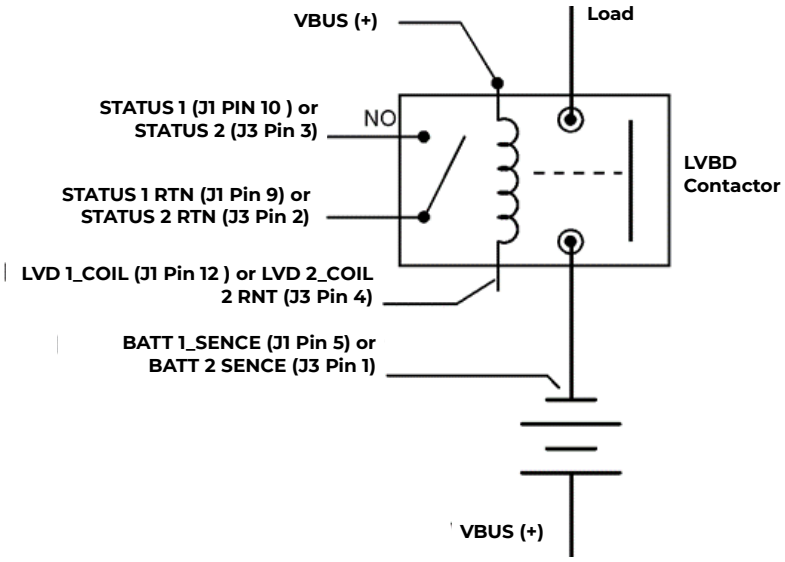


Figure 12-3: Alarm Connections with Reverse Polarity Protection

Figure 12-4 shows the connections required if Reverse Polarity Protection is to be used with an external disconnect switch. Note that the sense lead BATT1_SENSE or BATT2_SENSE must be connected as shown in order for the reverse polarity protection feature to work. If two strings are being used, connect one string to STATUS1, LVD1_COIL, STATUS1_RTN, BATCB1, and BATT1_SENSE connections and the other to the "-2" connections. When more than two strings are being used, divide the strings among the two inputs.

WARNING

When two battery strings are connected to the same battery terminal, care must be taken to ensure the polarity of the two strings is correct to each other. Improper connection will result in one string being shorted to the other string and the system can not protect against this.

With the above connections, the following alarms will be issued for the conditions noted.

	ContactorFail Alarm	Contactor Open Alarm	Open String Alarm	QS840ALED	ES772 LED
Open Integral ES772A Disconnect Switch		X		RED	BlinkingAMBER
Battery reconnected in reverse polarity	X	X		RED	RED
System started w/ reverse battery polarity	X	X		RED	RED

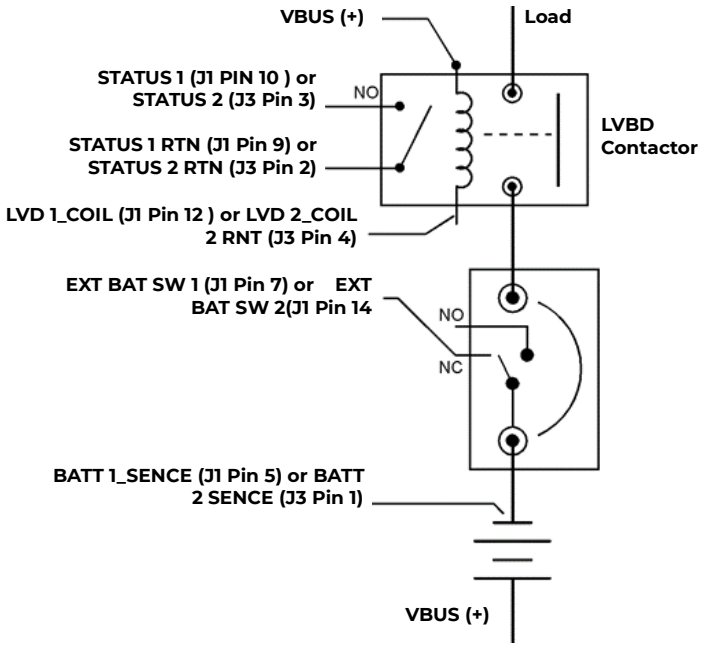


Figure 12-4: Reverse Polarity Protected Alarm Connections with an External Battery Disconnect Switch

Figure 12-4 shows the connections required if Reverse Polarity Protection is to be used with an external disconnect switch. Note that the sense lead BATT1_SENSE or BATT2_SENSE must be connected as shown in order for the reverse polarity protection feature to work. If two strings are being used, connect one string to STATUS1, LVD1_COIL, STATUS1_RTN, BATCB1, and BATT1_SENSE connections and the other to the "-2" connections. When more than two strings are being used, divide the strings among the two inputs.

WARNING

When two battery strings are connected to the same battery terminal, care must be taken to ensure the polarity of the two strings is correct to each other. Improper connection will result in one string being shorted to the other string and the system can not protect against this.

With the above connections, the following alarms will be issued for the conditions noted. This assumes the external disconnect switch is used to open and close the battery charging path to the batteries.

	ContactorFail Alarm	Contactor Open Alarm	Open String Alarm	QS840ALED	ES772 LED
Open Integral ES772A Disconnect Switch			X	RED	Blinking AMBER
Battery reconnected in reverse polarity	X	X		RED	RED
System started w/ reverse battery	X	X		RED	RED
polarity					

Auxiliary port Connector

Pin	Function	Pin	Function
1	DIN CB-1	2	DIN CB-2
3	DIN CB-3	4	DIN CB-4
5	DIN CB-5	6	DIN CB-6
7	DIN CB-7	8	DIN CB-8
9	DIN CB-9	10	DIN CB-10
11	EXT AUX MAJ-1	12	EXT AUX MAJ-2

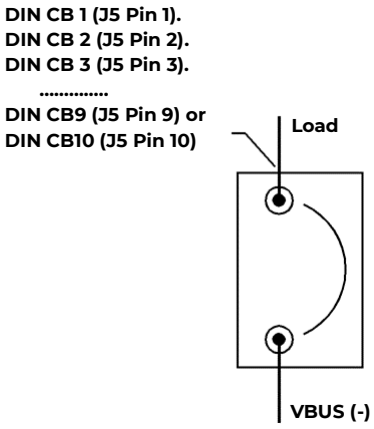


Figure 12-5: Alarm Connections for DIN Style Load Protectors

Figure 12-5 shows the connections required if load protectors are the DIN style circuit breakers. Note that 10 alarm inputs are provided for monitoring up to 10 DIN breakers because these breakers must be monitored individually. The DIN CB(1-10) inputs are alarmed on an open to VBus(-).

J100 and J101 Serial Ports

J100 and J101 are used to connect the ES772A to the QS840A controller. Note that if QS873A VT-Probes are to be used in conjunction with the ES772A, connect J100 or J101 on the ES772A to the controller via the Auxiliary Port connector on the QS840A controller, and then connect the QS873A to the unused RJ-45 jack on the ES772A.

If the ES772A is being used with both the QS873A and the ES771A Remote Voltage Monitoring Module, connect either the ES771A or the QS873A to the QS840A controller as both have two RJ-45 jacks for serial communication purposes. Then connect the two-jack device not connected to the controller to the unused serial port of the two-jack device connected to the controller, and connect the QS873A to its second serial port.

ES772A Module Mounting

Use the template in Figure 12-6 as a guide to mount the ES772A in your application. The location of the mounting holes MH1 and MH2 are outlined.

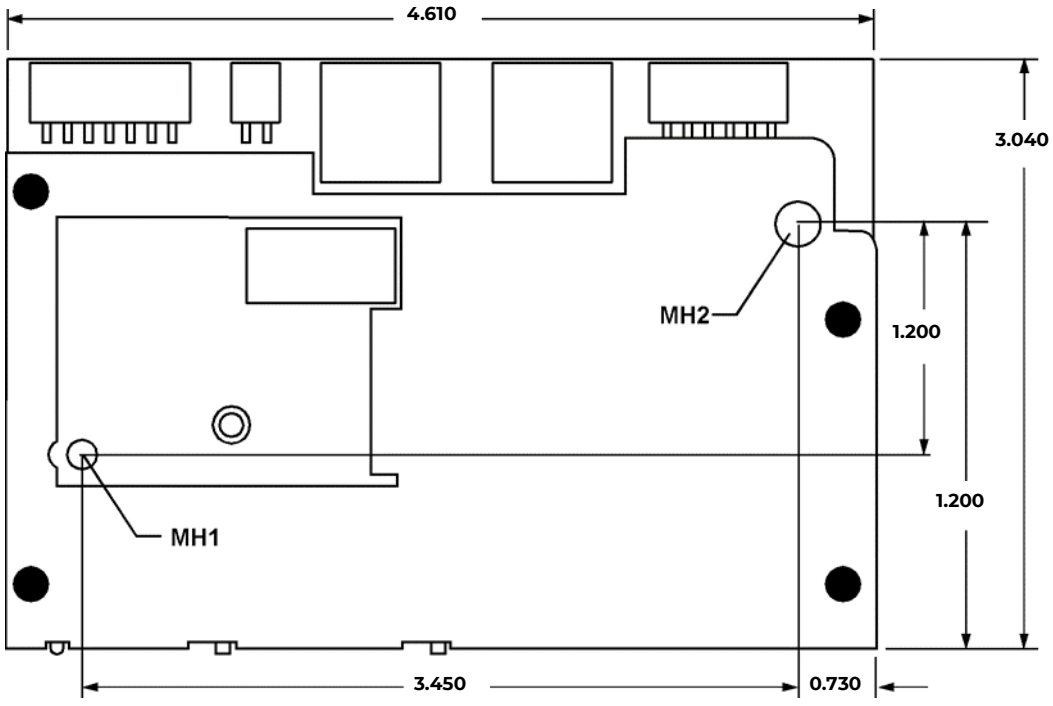


Figure 12-6: Mounting Hole Locations

22-position external distribution panel

Overview

The J5694722 external distribution accepts up to 22 bullet-breakers for DC loads and occupies 3U of vertical rack space in a 23î rack. The panel has a total output capacity of 400A and is front accessible. The following configurations are available in 3 distinct distribution modules:

- Without contactor
- With 400A LVLD and 500A shunt
- With 400A LVBD and 500A shunt

Features

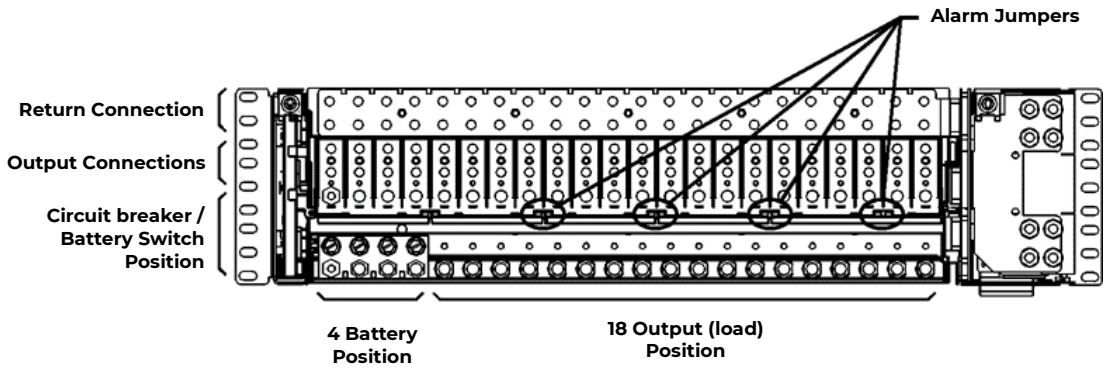


Figure 12-7: J5694722 External Distribution

- Up to 22 flexible battery positions that can be configured either with the battery bus or the load bus using an adapter plate
- All lug connections shall accept double-holed lugs.
- Staggered vertical arrangement of up to three distributions directly stacked with wiring access.
- Contactor control, measurements and alarms with the QS84x compatible ES772 module
- CO ground connection
- Contactor options ñ None, LVBD, LVLD
- 500A shunt
- Accommodates single, double and triple pole breakers with lug adapter for multi-pole breakers
- English hardware (1/4-20) for all customer connections
- TPS fuses in place of bullet-breakers

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13 Troubleshooting

Controller LED (Note 3)	User Interface Display	Rectifier LEDs (Note 4) AC	DC	ALM	Ringer LED	Distribution Module Board LED	Possible Problem(s)	Possible Solution(s)
None	No response.	G	G	-R-	-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. • AC input circuit breakers have opened. • AC input voltage is out of range. • Internal rectifier fault.	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.

Controller LED (Note 3)	User Interface Display	Rectifier LEDs (Note 4)			Ringer LED	Distribution Module Board LED	Possible Problem(s)	Possible Solution(s)
		AC	DC	ALM				
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 air flow 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	o	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.
RED	MAJ, Major Communication Fail Minor Ringer Redundancy				o (or missing Ringer)		No Ringers installed in a Ringer Chassis. Ringers not fully seated in Ringer Chassis.	1. Fully seat Ringers in Ringer Chassis. 2. Install Ringers in Ringer Chassis. 3. If problem persists, call your local field representative.
AMBER	MIN, AC Fail	o	o	o			Single Rectifier not receiving ac power. • AC input circuit breaker has opened. • AC input voltage is out of range.	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.

Controller LED (Note 3)	User Interface Display	Rectifier LEDs (Note 4)			Ringer LED	Distribution Module Board LED	Possible Problem(s)	Possible Solution(s)
		AC	DC	ALM				
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.

Controller LED (Note 3)	User Interface Display	Rectifier LEDs (Note 4) AC	DC	ALM	Ringer LED	Distribution Module Board LED	Possible Problem(s)	Possible Solution(s)
AMBER	MIN, Minor Ringer Redundancy				R (or missing Ringer)		Failed Ringer. Missing redundant Spare Ringer.	Replace failed Ringer. Install missing Ringer.
AMBER	MIN, Minor Ringer Redundancy Minor Ringer Fail				R		Failed Ringer. Missing redundant Spare Ringer.	Replace failed Ringer. Install missing Ringer.
AMBER	MIN, Minor Ringer External Fault (Note 1)				A		Ring return not terminated. Excessive Ringer output load. Excessive temperature.	1. Terminate ring return. 2. Correct Ringer output load fault. 3. Determine and correct the cause of excessive temperature. 4. If problem persists, call your local field representative.
AMBER	MIN, Minor Ringer Fan				G		Failed Ringer Fan	Replace Ringer Chassis
AMBER	MIN, Minor Ringer Fan				G		Failed Ringer Fan	Replace Ringer Chassis
any	any				o		Ringers not fully seated in Ringer Chassis. Ringer not powered. Failed Ringer.	1. Fully seat Ringers in Ringer Chassis. 2. Provide 48V_{dc} from Rectifiers or batteries. 3. Replace failed Ringer. 4. If problem persists, call your local field representative.
any	any				R		Failed Ringer.	Replace Ringer.

Note 1: While in hiccup mode:

- Rectifiers will attempt to restart every 10 seconds for a maximum of 3 times.
- Ringers will attempt to restart every 2 minutes.

Note 2: Refer to Section 5, LVD board Removal for removal details. Note that the power system will continue to power the load while the LVD board is out of the system; however, there will be no possibility of battery backup until the LVDboard is replaced

Note 3: LED may be RED where shown here as AMBER. Controller LED indicates the severity of the most severe active alarm. If any active alarm is Major, the LED will be RED. If only Minor alarms are active (no Major alarms), the LED will be AMBER. If no alarms are active, the LED will be GREEN.

Note 4: o = OFF

R, G, or A = ON (Red, Green, or Amber)

–R–, –G–, or –A– = Blinking (Red, Green, or Amber)

Grayed out cells = any LED state may be displayed. This LED does not indicate this problem.

Checking for Defective VT-Probes

1 Disconnect the first probe from its RJ-45 terminal block.

2 Run the CLE function. If the system controller illuminates its LED in green color, the probe is defective. Alternatively, the number of registered probes may be known from the terminal interface (TI) by running the Number of Temperatures present command, see Appendix A. If the registered number of probes is equal to the total number of probes connected, remember you've removed a probe, so the total number should be one less than that during installation, then the first probe is defective. Replace the probe with a different probe and follow the above procedure to ensure it is operational.

3 If the system controller LED remains green or the number of registered probes is still incorrect, replace the first probe and remove the second probe and repeat Step 2. Continue this procedure until the defective probe has been found.

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14 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. 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.

Appendix A: T1.317 Command Language

Initializing the QS840A Controller

The QS840A is a highly flexible controller with many features. This section outlines programming the controller using the Hyper Terminal program that is shipped with most IBM compatible PC's. Connect the cable between the computer RS-232 port, and the QS840A System Controller RS-232 port, J3. After Hyper Terminal has started and the programming cable is connected to the controller and the PC, you should see the login screen that allows access to the QS840A programming features.

RS-232 Terminal/Modem Port

This interface provides a T1.317 interface for local or dial-out access. The local port DTR signal switches the port personality from modem to terminal. This interface provides access to all status, configuration, and operations. It also provides call-out on alarm capability.

The controller communicates with the modem using the following settings:

Baud Rate:	2400
Data Bits:	8
Stop Bits:	1
Parity:	None

Two levels of security protect incoming access: user and super-user. A user has read ability and can only get status information from the CPS6000. A super-user can change configurations and perform control operations. All access to CPS6000 is via the T1.317 command set, to be discussed later.

This section describes how to log into the system via an RS-232 local port. The first step to logging in is to get to an “ENTER PASSWORD:” prompt. From a terminal connected to the RS-232 port, simply press ENTER until you see the log-in prompt. The number of ENTER keys required will depend on the baud rate you are trying to connect at. The controller will adjust its baud rate automatically until it recognizes the carriage return character (ASCII 13) sent by pressing ENTER.

At the “ENTER PASSWORD:” prompt, type the user or super-user password. The default password for each level of security is listed below.

Default user password - ABB

Default super-user password - super-user

Default administrator password - administrator

After receiving the correct password, the controller will respond with one of the following command line prompts:

User command-line prompt: *

Super-user command-line prompt: **

When these prompts appear the controller is ready to accept commands. Note that the session will be terminated if the port is idle for 15 minutes.

T1.317 Command Language

The QS840A command language is based on the T1.317 standard. This section describes the commands, objects and attributes used to access measurements, configuration, and control parameters in the QS840A controller.

Objects and Attributes

The T1.317 standard organizes system parameters called attributes into groups called objects. Note that all commands, objects, attributes and ranges for their respective parameters for the QS840A controller are given in the following tables.

An object-attribute pair uniquely identifies a measurement, configuration, or control parameter. For example, the object-attribute pair “dc1,vdc” identifies the plant voltage while the object-attribute pair “dc1,adc” identifies the plant load current. In each of these examples “dc1” identifies the plant object and “vdc” and “adc” identify DC voltage and DC current, respectively.

There are three main commands involved with plant operations in the system controller command set. The command “sta” is used to get the status of the plant, the command “cha” is used to change a plant parameter, and the command “ope” is used to initiate a plant function. A person at the “user” level can only perform the sta operations. A person at the “super-user” level can also perform the cha and ope operations.

Instructions in the T1.317 command set take the following form: command object,attribute[=parameter].

Certain commands do not require a value for parameter, while others do. Note that text parameters are to be enclosed in quotation marks while numeric parameters are not to be enclosed in quotation marks.

For example, to obtain the plant voltage, type in the following command: sta dc1,vdc

To enable low-temperature slope thermal compensation, type in the following command: cha sc1,rve=1

To change the voltage at which the LVD contactor disconnects the batteries from the load to 40V, type the following:

cha cn1,dth=40

To initiate a manual boost charging, i.e., place the plant into boost charging mode, type in the following command:

ope dc1,stt=“boost”

The tables below summarize the object-attribute pairs in the system along with the commands that can be used with the pair and the valid range that the attribute may have. The values in bold text are the default settings for the attributes.

obj,attr	Power System description	Related Commands sta	cha	ope	type	range of values
ps1,des	Power system description	x			text	"QS840A"
ps1,sid	Site ID	x	x		text	Up to 15 characters:""
ps1,swv	Software version	x			text	ACU software version
ps1,ltt	Lamp test			x	number	1: do lamp test
ps1,usl	Update serial link			x	number	1:perform update serial link
ps1,amt	System ambient temperature	x			number	dd°C
ps1,ptt	Communication port type	x	x		text	"**LOCAL**", "MODEM"
ps1,dls	Daylight savings time enable	x	x		number	0: disable, 1: enable
ps1,tim	Time	x	x		time	hh:mm:ss (24-hour format)
ps1,dat	Date	x	x		date	dd-mm-yy

Site ID: If desired, you may type in a maximum 15 alpha-numeric character set to uniquely define a site location.

Update Serial Link: Running this command allows the system controller to retake inventory of using equipment. Use this command to update acknowledged equipment when, for example, a system is to run with one less rectifier.

obj,attr	DC Plant description	Related Commands sta	cha	ope	type	range of values
dc1,stt	Plant state	x		x	text	"FLOAT", "BOOST"
dc1,vdc	Plant voltage	x			number	dd.dd V
dc1,adc	External Battery Shunt Size	x			number	ddd.d A
dc1,sha1	Plant shunt size	x	x		number	0-9999: **200**, 0: none
dc1,trd	Plant total rectifier drain	x			number	ddd.d A
dc1,isd	Imminent shutdown enable	x	x		number	**0: disable**, 1: enable
dc1,cap	Total rectifier capacity	x			number	ddd.dA
dc1,rss	Rectifier restart	x		x	number	0:no action 1:restart
dc1,bod	Battery on discharge	x			number	0:on discharge, 1: not ondischarge

Plant State: The plant is normally in the float-charge mode; however, the super-user may instruct the plant to enter the boost-charge mode.

Plant Voltage: The voltage of the plant at the time of querying.

Plant Current: The current being drawn by the load at the time of querying.

External Battery Shunt Size: External battery shunt amp rating.

Plant Total Rectifier Drain: The current being drawn by the battery and load from the plant at the time of querying.

Imminent Shutdown Enable: Factory shipped disabled. When enabled, prior to disconnecting of LVD contactor during battery discharge, the controller will transmit the Imminent Shutdown alarm to the host indicating batteries will disconnect from the load in 15 seconds. See Imminent Shutdown in Section 6 for more details on this feature.

Total Rectifier Capacity: Sum of the rated outputs of installed rectifiers.

Alarm Thresholds/Relays		Related Commands				
obj,attr	description	sta	cha	ope	type	range of values
bda1,acc	Battery on discharge relay	x	x		text	“**R1**” ,“R2”, “R3”, “R4”, or “”
bda1,ast	Battery on discharge alarm state	x			number	0:not active 1:active
bda1,sev	Battery on discharge severity	x	x		text	“**MAJ**”,“MIN” , or “RO"
bda1,thr	Battery on discharge threshold	x	x		number	46-55:**51V**
bta1,acc	High battery temperature relay	x	x		text	“R1” ,“R2”, “R3”, “R4”, or “”
bta1,ast	High batt temperature alarm state	x			number	0:not active 1:active
bta1,sev	High battery temperature severity	x	x		text	“MAJ”, “**MIN**” , or “RO"
bta1,thr	High battery temperature	x	x		number	30-85:**55C**
hfv1,acc	High voltage relay	x	x		text	“R1” ,“R2”, “R3”, “R4”, or “”
hfv1,ast	High voltage alarm state	x			number	0:not active 1:active
hfv1,bth	High boost voltage threshold	x	x		number	50-60:**56V**
hfv1,fth	High float voltage threshold	x	x		number	50-60:**56V**
hfv1,sev	High voltage severity	x	x		text	“MAJ”, “**MIN**” , or “RO"
hva1,acc	Very high voltage relay	x	x		text	“R1” ,“R2”, “R3”, “R4”, or “”
hva1,ast	Very high voltage alarm state	x			number	0:not active 1:active
hva1,bth	Very high boost voltage threshold	x	x		number	50-60:**57V**
hva1,fth	Very high float voltage threshold	x	x		number	50-60:**57V**
hva1,sev	Very high voltage severity	x	x		text	“**MAJ**”, “MIN” , or “RO"
rtl1,acc	Reserve time low relay	x	x		text	“R1” ,“R2”, “R3”, “R4”, or “”
rtl1,ast	Reserve time low alarm state	x			number	0:not active 1:active
rtl1,sev	Reserve time low severity	x	x		text	“MAJ”, “**MIN**” , or “RO"
rtll,thr	Reserve time low threshold	x	x		number	**0**-99.9 hours
vla1,acc	Very low voltage relay	x	x		text	“**R1**” ,“R2”, “R3”, R4, or “”
vla1,ast	Very low voltage alarm state	x			number	0:not active 1:active
vla1,sev	Very low voltage severity	x	x		text	“**MAJ**”,“MIN” , or “RO"
vla1,thr	Very low voltage threshold	x	x		number	40-51:**46V**
amtl1,acc	Low ambient temp relay	x	x		text	“R1” ,“R2”, “R3”, “R4”, or “”
amtl1,ast	Low ambient temp alarm state	x			number	0:not active 1:active
amtl1,sev	Low ambient temp severity	x	x		text	“MAJ”, “**MIN**” , or “RO"
amtl1,thr	Low ambient temp threshold	x	x		number	-40-10:-**40C**
amth1,acc	High ambient temp relay	x	x		text	“R1” ,“R2”, “R3”, “R4”, or “”
amth1,ast	High ambient temp alarm state	x			number	0:not active 1:active
amth1,sev	High ambient temp severity	x	x		text	“MAJ”, “**MIN**” , or “RO"
amth1,thr	High ambient temp threshold	x	x		number	35-75:**75C**
acf1,acc	AC fail relay	x	x		text	“R1” ,“**R2**”, “R3”, “R4”, or “”
acf1,ast	AC fail alarm state	x			number	0:not active 1:active
acf1,sev	AC fail severity	x	x		text	“MAJ”, “**MIN**” , or “RO"

obj,attr	Alarm Thresholds/Relays description	Related Commands sta	cha	ope	type	range of values
amj1,acc	Major auxiliary alarm relay	x	x		text	“R1” ,“R2”, “R3”, “R4”, or “”
amj1,ast	Major auxiliary alarm state	x			number	0:not active 1:active
amj1,sev	Major auxiliary alarm severity	x	x		text	“**MAJ**”, “MIN” , or “RO"
bbl1,acc	Clock battery low relay	x	x		text	“R1” ,“R2”, “R3”, “R4”, or “”
bbl1,ast	Clock battery low alarm state	x			number	0:not active 1:active
bbl1,sev	Clock battery low severity	x	x		text	“MAJ”, “MIN” , or “**RO**"
bfa1,acc	Check battery alarm relay	x	x		text	“R1” ,“R2”, “R3”, “R4”, or “”
bfa1,ast	Check battery alarm state	x			number	0:not active 1:active
bfa1,sev	Check battery alarm severity	x	x		text	“MAJ”, “**MIN**” , or “RO"
bts1,acc	Battery test active relay	x	x		text	“R1” ,“R2”, “R3”, “**R4**”, or “”
bts1,ast	Battery test alarm state	x			number	0:not active 1:active
bts1,sev	Battery test active severity	x	x		text	“MAJ”, “MIN” , or “**RO**"
cfo1,acc	Contactor 1 fail relay	x	x		text	“R1” ,“R2”, “R3”, “R4”, or “”
cfo1,ast	Contactor 1 fail alarm state	x			number	0:not active 1:active
cfo1,sev	Contactor 1 fail severity	x	x		text	“**MAJ**”, “MIN” , or “RO"
cfo2,acc	Contactor 2 fail relay	x	x		text	“R1” ,“R2”, “R3”, “R4”, or “”
cfo2,ast	Contactor 2 fail alarm state	x			number	0:not active 1:active
cfo2,sev	Contactor 2 fail severity	x	x		text	“**MAJ**”, “MIN” , or “RO"
cma1,acc	Minor communication relay	x	x		text	“R1” ,“R2”, “R3”, “R4”, or “”
cma1,ast	Minor communication alarm state	x			number	0:not active 1:active
cma1,sev	Minor communication severity	x	x		text	“MAJ”, “**MIN**” , or “RO"
cno1,acc	Contactor 1 open relay	x	x		text	“R1” ,“R2”, “R3”, “R4”, or “”
cno1,ast	Contactor 1 open alarm state	x			number	0:not active 1:active
cno1,sev	Contactor 1 open severity	x	x		text	“**MAJ**”, “MIN” , or “RO"
cno2,acc	Contactor 2 open relay	x	x		text	“R1” ,“R2”, “R3”, “R4”, or “”
cno2,ast	Contactor 2 open alarm state	x			number	0:not active 1:active
cno2,sev	Contactor 2 open severity	x	x		text	“**MAJ**”, “MIN” , or “RO"
cpa1,acc	Circuit pack fail relay	x	x		text	“R1” ,“R2”, “R3”, “R4”, or “”
cpa1,ast	Circuit pack fail alarm state	x			number	0:not active 1:active
cpa1,sev	Circuit pack fail severity	x	x		text	“MAJ”, “**MIN**” , or “RO"
faj1,acc	Major fuse alarm relay	x	x		text	“R1” ,“R2”, “R3”, “R4”, or “”
faj1,ast	Major fuse alarm state	x			number	0:not active 1:active
faj1,sev	Major fuse alarm severity	x	x		text	“**MAJ**”, “MIN” , or “RO"
fan1,acc	Minor fuse alarm relay	x	x		text	“R1” ,“R2”, “R3”, “R4”, or “”
fan1,ast	Minor fuse alarm state	x			number	0:not active 1:active
fan1,sev	Minor fuse alarm severity	x	x		text	“MAJ”, “**MIN**” , or “RO"
isd1,acc	Imminent shutdown relay	x	x		text	“R1” ,“R2”, “R3”, “R4”, or “”
isd1,ast	Imminent shutdown alarm state	x			number	0:not active 1:active
isd1,sev	Imminent shutdown severity	x	x		text	“**MAJ**”, “MIN” , or “RO"
macf1,acc	Multiple AC fail relay	x	x		text	“R1” ,“**R2**”, “R3”, “R4”, or “”
macf1,ast	Multiple AC fail alarm state	x			number	0:not active 1:active
macf1,sev	Multiple AC fail severity	x	x		text	“**MAJ**”, “MIN” , or “RO"
mcm1,acc	Major communication relay	x	x		text	“R1” ,“R2”, “R3”, “R4”, or “”
mcm1,ast	Major communication alarm state	x			number	0:not active 1:active

	Alarm Thresholds/Relays	Related Commands				
obj,attr	description	sta	cha	ope	type	range of values
macf1,sev	Multiple AC fail severity	x	x		text	"**MAJ**", "MIN" , or "RO"
mcm1,acc	Major communication relay	x	x		text	"R1" ,"R2", "R3", "R4", or ""
mcm1,ast	Major communication alarm state	x			number	0:not active 1:active
mcm1,sev	Major communication severity	x	x		text	"**MAJ**", "MIN" , or "RO"
mrfa1,acc	Multiple rectifier fail relay	x	x		text	"R1" ,"R2", "**R3**", "R4," or ""
mrfa1,ast	Multiple rectifier fail alarm state	x			number	0:not active 1:active
mrfa1,sev	Multiple rectifier fail severity	x	x		text	"**MAJ**", "MIN" , or "RO"
osa1,acc	Open string alarm relay	x	x		text	"R1" ,"R2", "R3", "R4", or ""
osa1,ast	Open string alarm state	x			number	0:not active 1:active
osa1,sev	Open string alarm severity	x	x		text	"**MAJ**", "MIN" , or "RO"
rfa1,acc	Rectifier fail relay	x	x		text	"R1" ,"R2", "R3", "R4", or ""
rfa1,ast	Rectifier fail alarm state	x			number	0:not active 1:active
rfa1,sev	Rectifier fail severity	x	x		text	"**MAJ**", "MIN" , or "RO"
rls1,acc	Rectifier redundancy loss relay	x	x		text	"R1" ,"R2", "**R3**", "R4", or ""
rls1,ast	Rect redundancy loss alarm state	x			number	0:not active 1:active
rls1,sev	Rect redundancy loss severity	x	x		text	"MAJ", "**MIN**" , or "RO"
scd1,acc	Battery voltage imbalance relay	x	x		text	"R1" ,"R2", "R3", "R4", or ""
scd1,ast	Battery voltage imbalance alarm state	x			number	0:not active 1:active
scd1,sev	Battery voltage imbalance severity	x	x		text	"**MAJ**", "MIN" , or "RO"
tpa1,acc	Thermal probe fail relay	x	x		text	"R1" ,"R2", "R3", "R4", or ""
tpa1,ast	Thermal probe fail alarm state	x			number	0:not active 1:active
tpa1,sev	Thermal probe fail severity	x	x		text	"MAJ", "**MIN**" , or "RO"
vmf1,acc	Voltage module fail relay	x	x		text	"R1" ,"R2", "R3", "R4", or ""
vmf1,ast	Voltage module fail alarm state	x			number	0:not active 1:active
vmf1,sev	Voltage module fail severity	x	x		text	"MAJ", "**MIN**" , or "RO"
vsf1,acc	Sense voltage fail relay	x	x		text	"R1" ,"R2", "R3", "R4", or ""
vsf1,ast	Sense voltage fail alarm state	x			number	0:not active 1:active
vsf1,sev	Sense voltage fail severity	x	x		text	"**MAJ**", "MIN" , or "RO"

The previous table outlines the various alarms that are available through the QS840A controller. Refer to Alarm Relays in Appendix C for more details. The QS840A controller is provided with two severity relays and two relays that may be assigned to any combination or all of the alarms noted above.

The controller is shipped with PMN assigned to Alarm Relay 2 and PMJ to Alarm Relay 1. Also, for each alarm condition noted above, the factory severity is noted in bold. The user may change the severity of configurable alarms from the factory set severity. Note that the alarms noted above may also be assigned a severity of RO (Record Only). If so assigned, the alarm condition will be transmitted without any PMJ or PMN severity.

The following is a brief explanation of the alarm conditions.

Battery on Discharge: The battery on discharge alarm is asserted when the controller detects the plant bus voltage going below the Battery on Discharge thresholds set by the user.

High Voltage: The high voltage alarm is asserted when the controller detects the plant bus voltage going above the High Voltage thresholds set by the user.

High Battery Temperature: This feature is only possible when used with slope thermal compensation. The battery thermal alarm is asserted when the controller detects battery temperatures in excess of 55°C. The alarm is retired when the battery temperatures drop 10°C below the alarm threshold.

Multiple AC Fail: The multiple AC fail alarm is asserted when the controller detects multiple ac fail alarms from the rectifiers.

Multiple Rectifier Fail: The multiple rectifier alarm is asserted when the controller detects multiple rectifier fail alarms from the rectifiers.

Major Fuse: The major fuse alarm is asserted when the controller detects an open load protector in the Distribution Module.

Auxiliary Major: The auxiliary major alarm is asserted when the controller detects an external equipment fail alarm, if present and monitored.

Imminent Shutdown: If enabled, the imminent shutdown alarm is asserted when the controller detects the LVD board about to disconnect the batteries from the load to prevent them from deep discharge. If asserted, this alarm may be used by the host to perform an orderly shutdown.

Voltage Imbalance Detection: If enabled and properly configured, the voltage imbalance detection alarm is asserted when the controller detects an imbalance between the two halves of each battery string being monitored.

AC Fail: The ac fail alarm is asserted when the controller detects a single ac fail alarm from any rectifier.

Rectifier Fail: The rectifier fail alarm is asserted when the controller detects a single rectifier fail alarm from any rectifier.

Rectifier Redundancy Loss: If enabled, the rectifier redundancy loss alarm is asserted when the total rectifier output current exceeds N rectifier capacity, assuming N+1 rectifiers are present in the system.

Open String: This alarm is only available when used with the QS872A Board (connector P4). This alarm is issued to indicate an open charge path to batteries when an external disconnect switch is used to disconnect the batteries from the charge bus; it is asserted with a PMJ severity.

Auxiliary Events		Related Commands				
obj,attr	description	sta	cha	ope	type	range of values
aux1-aux6,des	Auxiliary event 1-6 description	x	x		text	up to 32 characters
aux1-aux6,ast	Auxiliary event 1-6 alarm state	x	x		text	0:not active, 1:active
aux1-aux6,sev	Auxiliary event 1-6 severity	x	x		text	“MAJ”, “MIN” , or “RO”
aux1-aux6,acc	Auxiliary event 1-6 relay	x	x		text	“R1”,“R2”,“R3”,“R4”,or “”

The above commands facilitate assignment of the alarm relays on the controller. Refer to Appendix C for default assignments.

Rectifier Management		Related Commands				
obj,attr	description	sta	cha	ope	type	range of values
gm1,fsp	Rectifier float set-point	x	x		number	51-56.5, **54.5 V**
gm1,bsp	Rectifier boost set-point	x	x		number	54-56.5, **55.2 V**
gm1,rme	Redundancy monitor enable	x	x		number	**0: disable**, 1: enable

Rectifier Float Set-point: The voltage at which the plant will float charge the battery strings.

Rectifier Boost Set-point: The voltage at which the plant will boost charge the battery strings.

Redundancy Monitor Enable: Activates the Redundancy Loss alarm feature.

Rectifiers		Related Commands				
obj,attr	description	sta	cha	ope	type	range of values
gsr,stt	Individual rectifier state	r		x	text	“ON”, “OFF”, “STANDBY”,“MISSING” Only “ON” and “STANDBY”can be used with ope.
gsr,adc	Individual rectifier current	x			number	ddd

Individual Rectifier State: When requested, shows the state of the individual rectifiers. Note that the rectifier numbering starts from the left-most position of the master shelf (shelf number 1.)

When obtaining individual rectifier status information, the following information may be transmitted:

- **ON:** Rectifier operating normally. User may use ope to turn ON a rectifier in standby.
- **OFF:** Rectifier has been shutdown due to hardware failure.
- **STANDBY:** User has inhibited the rectifier's output voltage. User may use ope to place a rectifier into a standby condition.
- **MISSING:** An acknowledged rectifier has been removed.
- **VACANT:** Rectifier has not been installed in that position.

Rectifiers may also be put in standby; however, the ability to place rectifiers in standby requires some backup plan to take the rectifier out of standby automatically under a low voltage condition. The battery on discharge (BOD) threshold is used as a rectifier-on voltage threshold. In other words, when the plant voltage dips below the BOD threshold, the controller turns on all rectifiers that are in standby.

Individual Rectifier Current: When requested, shows the current output from an individual rectifier.

Battery Reserve Management		Related Commands				
obj,attr	description	sta	cha	ope	type	range of values
br1,hbt	Highest battery temperature	x			number	dd °C
br1,adc	Total battery current	x			number	d A (+ for discharge, - for charge)
br1,bts	Plant battery test (lower rect V)	x		x	number	0:stop 1:start
br1,scd	Battery voltage imbalance detection enable	x			number	0:disable 1:enable (Automatically enabled when mid cell V monitor present)
br1,ntm	Number of temperatures present	x				d
br1,nvm	Number of mid-cell V present	x				d
br1,cle	Recharge current limit enable	x	x		number	0:disable 1:enable
br1,clt	Recharge current limit threshold	x	x		number	5-100:10
br1,btr	Discharge test results	x			text	“???”
br1,btc	Battery type	x	x		text	ìFLOODEDî, ìVALVE-REGî
br1,bte	Auto test enable	x	x		number	0:disable 1:enable
br1,atd	Auto test date	x	x		date	dd-mmm-yy
br1,ath	Auto test start hour	x	x		number	0-23:0
br1,atw	Auto test min hours after BD	x	x		number	0-240:0 hours
br1,tin	Auto test interval	x	x		number	1-18:12 months
br1,tmd	Test duration	x	x		number	0.1-99.9: 4 hours
br1,cev	End cell voltage	x	x		number	1.5-2.0:1.85V/cell
br1,btv	Battery test rectifier voltage	x	x		number	42-52:42V

Highest Battery Temperature: When requested, will show the hottest temperature monitored by the VT-Probes.

Total Battery Current: When requested, will display the current being drawn by the battery string. This is determined by subtracting the load current from the total rectifier output current.

Plant Battery Test: When initiated, this function lowers the plant voltage to 44V and allows the batteries to discharge into the load. This may be used to determine the health of the batteries.

Voltage Imbalance Detection Enable: Activates the Shorted Cell Detection alarm.

Number of Temperatures Present: When requested, will display the number of QS873A (VT-Probes) that are currently connected to the system.

Number of mid-Cell V Present: When requested, will display the number of ES771A (Remote Voltage Monitoring Modules) that are currently connected to the system.

Battery Recharge Current Limit: The maximum current flowing into battery during the recharge period is adjustable to any value between 5A and 100A, in 1A increments. At least one battery string must be present to have this function operate.

Serial Ports		Related Commands				
obj,attr	Description	sta	cha	ope	type	range of values
mp1,bdr	Modem baud rate	x	x		text	2400,4800,9600,19200
mp1,ins	Modem initialization string	x	x		text	Up to 20 characters: “AT&FEV&C1S0=0H”
mp1,nrg	Modem number of rings before answering	x	x		number	1-9 rings
mp1,hsh	Modem handshaking	x	x		text	“NO”: none “SW”: xon and xoff
lp1,bdr	Local RS-232 baud rate	x	x		text	“AUTO”,2400,4800,9600, 192 00
lp1,hsh	Local RS-232 handshaking	x	x		text	“NO”: none “SW”: xon and xoff“HW”: cts and rts

Boost Management		Related Commands				
obj,attr	description	sta	cha	ope	type	range of values
bs1,abe	Auto boost enable	x	x		number	**0: disable**, 1: enable
bs1,tmd	Max boost duration in hours	x	x		number	1-80**:5**

Auto Boost Enable: Activates the Auto-Boost function.

Battery Contactor		Related Commands				
obj,attr	description	sta	cha	ope	type	range of values
	Low voltage battery disconnect threshold	x	x		number	39-48, **42 V**
cn1,rth	Low voltage battery reconnect threshold	x	x		number	39-48, **44 V**
cn2,dth	Low voltage load disconnect threshold	x	x		number	39-48, **42 V**
cn2,rth	Low voltage load reconnect threshold	x	x		number	39-48, **44 V**

Low Voltage Battery Disconnect Threshold: Sets the voltage at which the battery contactor disconnects the battery strings from the load.

Low Voltage Battery Reconnect Threshold: Sets the voltage at which the battery contactor reconnects the battery strings to the system bus voltage.

Low Voltage Load Disconnect Threshold: Sets the voltage at which the battery contactor disconnects the battery strings from the load.

Low Voltage Load Reconnect Threshold: Sets the voltage at which the battery contactor reconnects the battery strings to the system bus voltage.

The load disconnect feature is only supported in the Distribution Module with the LVD contactor.

Slope Thermal Compensation		Related Commands				
obj,attr	description	sta	cha	ope	type	range of values
sc1,stt	Slope compensation enable	x			number	**0: disable**, 1: enable (Automatically enabled when temperature monitor detected)
sc1,rve	LT Compensation Enable	x	x		number	**0: disable**, 1: enable
sc1,ltt	Low temperature limit	x	x		number	-5-20, **0°C**
sc1,ntt	Nominal temperature	x	x		number	15-30, **25°C**
sc1,utt	Upper temperature limit	x	x		number	30-55, **45°C**
sc1,spt	Step temperature	x	x		number	48-85, **75°C**
sc1,lsp	Low temperature slope	x	x		number	1-5, **3 mV/°C per cell**
sc1,usp	Upper temperature slope	x	x		number	1-5, **3 mV/°C per cell**

Slope Compensation Enable: The activation of the slope thermal compensation function is automatically enabled if the controller detects the presence of an QS873A (VT-Probe) configured for a thermal probe.

Low Temperature Compensation Enable: When enabled, this activates the low- temperature slope thermal compensation and the low temperature attributes of slope thermal compensation.

Low Temperature Limit: This sets the minimum temperature for which low temperature thermal compensation is continued.

Nominal Temperature: This sets the reference temperature at which increases in temperature above this reference temperature will result in the output voltage being decreased at the slope selected by the user. Temperatures below the reference temperature will result in the output voltage being increased at the slope selected by the user.

Upper Temperature Limit: This sets the maximum temperature for which thermal compensation is continued.

Step Temperature: This is the temperature at which float charging is terminated. This signifies that the batteries are too hot and charging current is stopped in order to cool the batteries. Once the battery strings have cooled by 10°C, thermally compensated float charging is resumed.

Low Temperature Slope: This sets the slope for low temperature slope thermal compensation.

Upper Temperature Slope: This sets the slope for the high temperature slope thermal compensation.

Input Management		Related Commands				
obj,attr	description	sta	cha	ope	type	range of values
in01-8,stt	Input 1-8 state	x			text	0:not alarming, 1:alarming
in01-8,typ	Input 1-8 alarm type	x	x		text	alarm object ID (i.e. faj1)
in01-8,pol	Input 1-8 alarming polarity	x	x		text	CLOSED, OPEN

obj,attr	Call-Out Description	Related Commands sta	cha	ope	type	range of values
p1,phn	Primary phone number	x	x		text	Up to 20 characters:””
a1,phn	Alternate phone number	x	x		text	Up to 20 characters:””

obj,attr	Ringer Plant Description	Related Commands sta	cha	ope	type	range of values
Rp1,frq	Ringer output frequency	x	x		number	15-50: 20 Hz
Rp1,vsp	Ringer boost voltage set-point	x	x		number	65-100: 100V
Rp1,ofe	Ringer offset enable	x	x		number	0: disable, 1: enable
Rp1,va	Ringer output va	x			number	dd.d VA

Additional T1.317 Commands

Ala	Report Active Alarms

Syntax: ala

Description

This command reports all the active alarm conditions in the plant. One alarm message is listed per line in the report. The table below lists the default alarm messages. Note that if user changes the severity of the alarm, the corresponding change will show up in the alarm message. However, alarm conditions with the RO severity will not be displayed, the rec command, discussed later, should be used.

Alarm Message

MAJ, Multiple Rectifier Fail
MAJ, Multiple AC Fail
MAJ, Battery On Discharge
MAJ, High Voltage
MAJ, Sense Fuse
MAJ, Fuse Major
MAJ, Auxiliary Major
MAJ, Contactor 1 Open
MAJ, Contactor 1 Fail
MAJ, Major Communication Fail
MAJ, High Battery Current Shutdown
MAJ, Shorted Cell Detected
MAJ, Imminent Low V Shutdown

MAJ, Open String
MIN, Rectifier Fail
MIN, AC Fail
MIN, Thermal Probe Fail

MIN, Battery High Temp
MIN, Rect Redundancy Loss
MIN, High Battery Current
MIN, Minor Communication Fail
MIN, Circuit Pack Failure
MIN, Mid-cell V Monitor Fail
If no alarms are active “NO ACTIVE ALARMS” is reported.

bye	**Log-off**

Syntax: bye

Description

This command is used to terminate the session.

Cha	**Change Value**

Syntax: cha obj,attr=value

where: obj,attr is an object-attribute pair. For example, ps1,sid.

Description

This command is used to change system configuration parameters. Examples are listed below to illustrate how this command works.

cha ps1,sid="My Plant"Change the site id to My Plant

cha p1,phn="123456789"Change the primary phone number to 123456789 You must be logged in as a super-user to use this command.

His	**Report Alarm History**

Syntax: his Description Syntaxhis

where: obj,attr is an object-attribute pair as defined in the following:

sum dc1,adc- report plant load current statistics

sum br1,hbt- report highest battery temperature statistics

His	**Report Boost History**

Syntax: his Description Syntaxhis

where: obj,attr is an object-attribute pair as defined in the following: sum dc1,adc- report plant load current statistics

sum br1,hbt- report highest battery temperature statistics

his Report Boost History

Syntax: his bs1,stt

Description

This command reports the boost history in the following format: sum bs1,stt

30-MAY-03,15:11:12,RESUMED,COMPLETED,78

30-MAY-03,12:03:34,AUTO,DISCHARGE,14

.

**

This report gives the start date, start time, start reason, stop reason, and boost duration in minutes. The start reasons are:

MANUALBoost initiated by user

AUTOBoost started automatically after a battery discharge

RESUMEDBoost resumed after being suspended by a discharge

The stop reasons are:

COMPLETEDBoost completed normally

TIMEOUTBoost timed out before completing

DISCHARGEBoost suspended because of a battery discharge

CANCELEDBoost canceled by user

ALARMBoost cancelled by an alarm condition

DISABLEDAuto boost cancelled by being disabled

his	**Report BD history**

Syntax: dc1,bod

Description

This command reports the battery discharge history in the following format: his dc1,bod

30-MAY-03,15:11:12,MANUAL,COMPLETED,118.3,23,

01-APR-03,03:11:12,BD,COMPLETED,118.3,26,130

12-FEB-03,12:00:02,PERIODIC,COMPLETED,120.9,27,135

.

**

This report gives the start date, start time, start reason, current at start of discharge, duration in minutes, and, if calculated, a reserve time prediction. The start reasons are:

MANUALDischarge test initiated by user

PERIODICPeriodic discharge test

BDNatural battery discharge

The stop reasons are:

COMPLETEDDischarge completed normally TIMEOUTAuto discharge test timed out DISABLEDAuto discharge test disabled ENDVDischarge test hit end voltage CANCELEDDischarge test canceled by user

lis	**List Rectifiers**
Syntax: lis rec **Description** This command is used to list all the rectifiers in the system. The command will list all present and missing rectifiers. Missing rectifiers are rectifiers that have been removed from a shelf. The cle will clear missing rectifiers from the controller's memory and they will no longer be listed by this command. Return value for a system with 3 rectifiers on shelf 1 would look like the following: * lis rec G11 G12 G13 . • _	

login	**Log-in**
Syntax: login “password” where password is either the user, super-user or administrator password Description This command is used to log-in as a user, super-user or administrator. For example, if you are currently logged into the controller as a user but would like to change the site id you must first use this command to log-in as a super-user. You must be logged in as an administrator in order to upgrade the software and change passwords.	

ope	**Operate a control**
Syntax: ope obj,attr=value where: obj,attr is an object-attribute pair. For example, dc1,pbt. Description This command is used to operate a system control parameter. Examples are listed below to illustrate how this command works. ope ps1,usl=1Update serial link ope dc1,stt="boost"Place plant into boost mode You must be logged in as a super-user to use this command.	

sta	Report Status
Syntax:	sta obj,attr
where: obj,attr is an object-attribute pair. For example, ps1,sid.	
Description	
This command reports the value of the measurement, configuration, or control parameters in the system. A couple examples are listed below to illustrate how this command works.	
sta dc1,vdcReport plant voltage	
sta dc1,adcReport plant load current	
The command line would respond as follows for first command listed above.	
* sta dc1,vdc	
:DC1	
VDC=-52.48	
.	
* _	
The "* " in the example above is the user command line prompt. The line ":DC1" indicates that the information that follows is for the plant object. The line starting with "VDC" identifies the DC voltage. The "." line is the end-of-command identifier.	

sum	Report Statistics
Syntax:	sum obj,attr
where: obj,attr is an object-attribute pair defined by the following: sum dc1,adcReport plant load current statistics	
sum br1,hbtReport highest battery temperature statistics sum br1,amtReport ambient temperature statistics	
Description	
This command reports the highest hourly a averages, highest hourly maximum, and the highest hourly minimum statistics for plant load and highest battery temperature. The following is an example of a command response:	
* sum dc1,adc	
:DC1 ADC HHI=	
30-MAY-03,12:03:00,127.3	
14-FEB-03,11:15:37,126.9	
24-DEC-03,02:30:13,126.2 LHI=	
29-MAR-03,10:43:00,120.0	
04-APR-03,11:15:53,121.1	
21-SEP-03,07:13:10,124.3 HHA=	
03-JAN-03,12:00:00,127.0	
18-APR-03,11:00:00,126.5	
21-OCT-03,02:00:00,126.1	
.	

*

The line ":DC1 ADC" indicates that the information that follows is for the plant load current. The "HHI=" indicates highest hourly instantaneous reading. The "LHI=" indicates highest hourly instantaneous reading. The "HHA=" indicates highest hourly average reading. The "." line is the end-of-command identifier. The "* " in the example above is the user command line prompt.

sum	**Report Plant Load Trend Statistics**

Syntax: sum dct1

Description

This command reports the plant trend statistics, which includes up to 16 daily highest hourly and lowest hourly instantaneous readings, up to 32 daily maximum hourly averages, and up to 13 monthly averages of the daily maximum hourly averages. The following is an example of a command response:

* sum dct1
:DCT1 SRC=DC1 ADC
CLR=01-JAN-2001,12:00:00 DHI=
29-JAN-2002,02:00;00,123.2
30-JAN-2003,05:00:00,120.1
31-JAN-2003,14:00:00,122.8 DLI=
29-JAN-2002,12:00;00,120.9
30-JAN-2003,08:00:00,118.7
31-JAN-2003,01:00:00,119.2 DHH=
29-JAN-2002,02:00;00,122.1
30-JAN-2003,05:00:00,119.7
31-JAN-2003,14:00:00,121.6 MAV=
31-JAN-2003,23:00:00,121.3
.
*

The "DHI=" indicates daily highest hourly instantaneous reading. The "DLI=" indicates daily highest hourly instantaneous reading. The "DHH=" indicates daily highest hourly average reading. The "MAV=" indicates monthly average of daily highest hourly average reading. The "." line is the end-of-command identifier. The "* " in the example above is the user command line prompt.

sum	Report Battery Discharge Statistics (profile)

Syntax: sum dc1,bod

Description

This command reports the last battery discharge profile report. The report includes cleared date and time, start date and time, end date and time, duration in seconds, and up to 50 sample points. Each sample is time stamped in seconds. We compress the samples to derive a minimum set of data required to reconstruct the curve while retaining important coup de fouet minimum and maximum voltages and lowest voltage at end of discharge. The following is an example of a command response:

* sum dc1,bod

:DC1 BOD

CLR=29-JUN-04,10:27:11 BEG=30-JUN-04,10:38:36 END=30-JUN-04,10:42:53 DUR=256

VAL= 0,51.08

8,50.18

18,49.24

20,48.87

248,48.36

252,49.76

254,50.84

256,51.13

.

*

The “.” line is the end-of-command identifier. The “* ” in the example above is the user command line prompt.

GUI	Report GUI Compatibility

Syntax: GUI

Description

This command is for internal use only. It reports an EasyView compatibility number. The command response is: QS840GUI=1.0

ali	Special Internet Command

Description

This command is for internal use only. It exists for EasyView compatibility purposes only and does nothing.

Error Messages

While logging into the QS840A controller or while entering commands, you may encounter one or more of the following error messages:

Error Message	Description
!-112, SYNTAX ERROR	Unrecognizable command was entered.
!-220, SECURITY	Super-user command was entered by someone with user status.
!-221, EXCESSIVE LOGIN ATTEMPTS	Too many attempts were made to login with an unrecognized password.
!-223, INVALID PASSWORD	New password contains an illegal character.
!-224, NEW PASSWORD MISMATCH	First and second copy of new passwords don't match
!-304, INVALID PARAMETER	An attempt was made to change a parameter to an illegal value.
!-319, INVALID ATTRIBUTE	An invalid object id was specified in the command or, a command referred to an attribute that doesn't support it.
!-320, INVALID OBJECT	An invalid object id was specified in the command
!328, FEATURE DISABLED	An attempt was made to initiate a feature that is disabled.
!335, COULD NOT EXECUTE	Command could not execute because of active alarms or a conflicting operation.

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Appendix B: Battery Functions

Float Mode

Float mode is the default mode of operation of the battery plant. The plant voltage, while in float mode, is determined by the configuration parameter Rectifier Float Set point (fsp) and may be adjusted by the Battery Thermal Compensation circuit, if active. No individual adjustment of plant rectifiers is necessary and load sharing among plant rectifiers is automatic in all plant modes and will take effect within several seconds of a new rectifier being added to the system.

The fsp should be set per the battery manufacturer's recommendations. Note that the actual fsp measured on the plant may differ from the value set by the user if thermal compensation is enabled. See Slope Thermal Compensation (next topic) for more details.

Slope Thermal Compensation

The following is a list of slope thermal compensation parameters that can be configured in the controller.

High Temperature Alarm

Alarm threshold can be set from 30°C to 85°C. The alarm retires when the temperature drops to 10°C below the set threshold. The factory default setting is 55°C.

High Temperature Compensation

The system controller automatically enables high temperature compensation if a VT thermal probe is detected. The feature can be disabled by disconnecting all thermal probes and updating the serial links using the Lamp Test function. Settings for this feature are as follows.

V Step Down: Battery step temperature can be set from 45°C to 85°C. The factory default setting is 75°C.

High Comp Limit: The upper temperature thermal limit can be set from 30°C to 55°C. The factory default setting is 45°C.

Decrease: The upper temperature slope setting (rate of decrease) can be set from -1mV to - 10mV in -2mV steps. The factory default is -3mV.

Nominal Temperature: Temperature above or below which Slope Thermal Compensation is enabled. The stable range is 15 to 30°C. The factory default setting is 25°C.

Low Temperature Compensation

This feature is disabled by default, and can be enabled only if Temperature Slope Thermal Compensation is enabled. The following are the associated parameters.

Low Comp Limit: Low temperature thermal compensation can be set from -5°C to 20°C. The factory default setting is 0°C.

Increase: The low temperature slope (rate of increase) can be set from 1mV to 10mV in 1mV increments. The factory default setting is 3mV.

The QS840A has a flexible Thermal Compensation feature which provides voltage compensation from

that level established by the Plant Float Set-Point (fsp) or Boost Set-Point (bsp), dependent on the highest temperature monitored by the QS873A VT-Probes located at the plant batteries. Thermal Compensation should be used in a plant containing “sealed” or valve regulated “maintenance free” batteries. Note that Thermal Compensation is automatically enabled if the system controller detects the presence of a VT-Probe. Refer to the Installation Instructions for more details on wiring and configuring this feature.

Thermal Compensation lowers plant voltage from the fsp for monitored battery temperatures which are above the ideal temperature established during configuration as the Battery Thermal Slope Nominal Temperature (ntt). (The items in parenthesis are the user configurable points referred to in the graph shown below.) Lowering the plant voltage helps to keep the batteries at their optimum state of charge while protecting them from thermal runaway. Thermal runaway is a complex sealed battery phenomenon where, for one or more of a number of reasons, one or more cells in a string are unable to dissipate the internal heat generated by their charging current and experience an increase in internal temperature. By lowering the float voltage as cell temperature increases, the float current is lowered to a point where this destructive behavior can be avoided. If a cell failure is imminent and the cell temperature continues to rise above the threshold configured for Battery Thermal Step Temperature (stp), plant voltage drops in a single step to a level which keeps the remaining cells in the string from overcharging and being damaged. Refer to Figure 6-2 for a graphical view of Battery Thermal Compensation and the relationship of its various set points.

The QS840A can also increase plant voltage above that set by the fsp or bsp for colder environments, again seeking to keep batteries at their optimum charge state. Batteries will lose capacity as the battery temperature drops below their optimal operating temperature. Increasing the plant voltage for decreases in temperature causes more current to flow into the batteries. This results in electrolysis of the water in the batteries. Since this reaction is exothermic, it also serves to keep batteries warm. This feature results in an increase in plant voltage, and is required to be enabled during controller configuration.

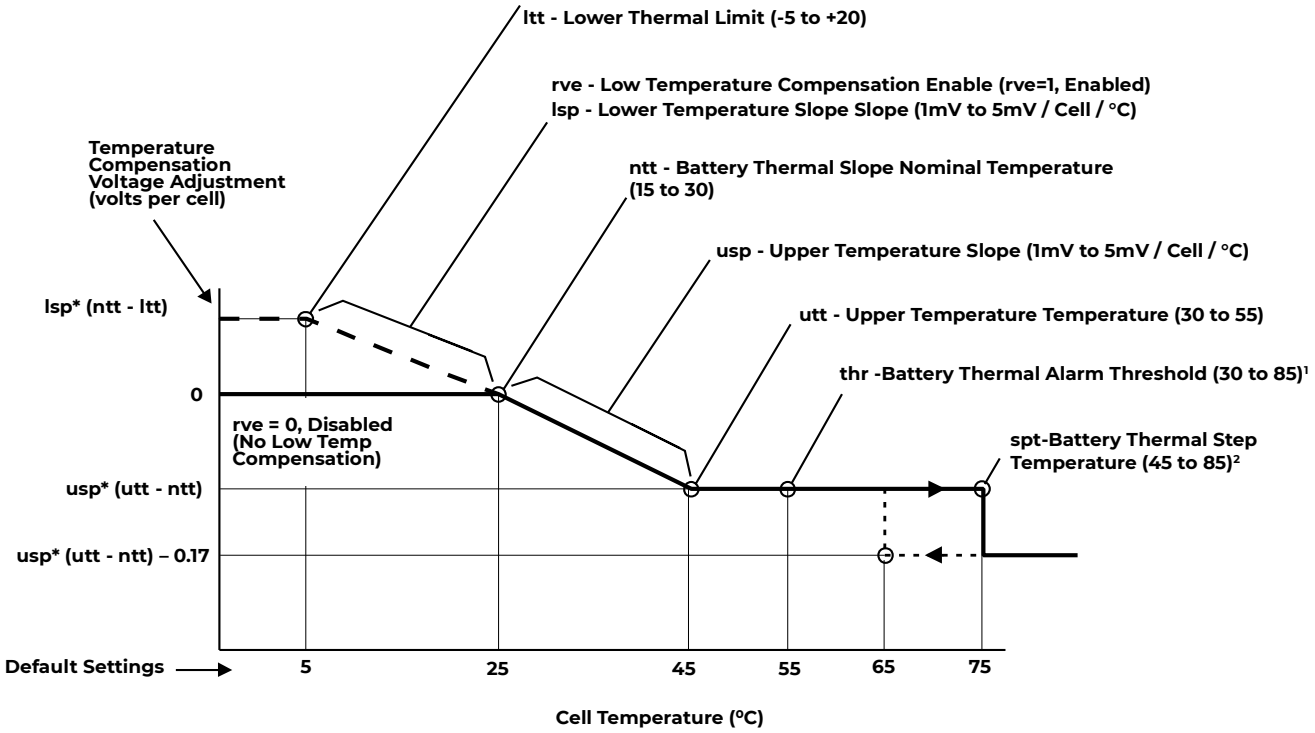

Figure B-1: Slope Thermal Compensation

The following describes the configuration parameters which may be activated or altered by the user. Refer to Appendix B for the ranges of values the parameters may take and their factory default settings.

Lower Thermal Limit (ltt): The lower temperature where, if Low Temperature Compensation is enabled, the controller will increase plant voltage to a level corresponding to (lsp * (ntt - ltt)* 24)V above the fsp. Plant voltage will be increased proportionally at any temperature between this point and the Battery Thermal Slope Nominal Temperature (ntt).

Low Temperature Compensation Enable (rve): A 0 disables and 1 enables the Low Temperature Thermal Compensation feature. Since rve increases plant voltage rather than decreasing it based on temperature, the option is provided to disable it separately from the entire feature so that equipment loads sensitive to high voltages can be protected.

Lower Temperature Slope (lsp): The slope rate for the voltage increase per cell when the battery temperature is below the ntt (Battery Thermal Slope Nominal Temperature).

Battery Thermal Slope Nominal Temperature (ntt): The zero compensation temperature point. Temperatures monitored between this point and the Upper Temperature Limit (utt) will result in a proportional decrease of plant voltage to a level corresponding to (usp*(utt- ntt)*24)V below the fsp at the utt. If Low Temperature Compensation is enabled,

temperatures monitored between this point and the Lower Thermal Limit (ltt) will result in a proportional increase of plant voltage to a level corresponding to (lsp*(ntt-ltt)*24)V above the fsp at the ltt.

Upper Temperature Slope (usp): The slope rate for the voltage decrease per cell when the battery temperature is above the ntt (Battery Thermal Slope Nominal Temperature).

Upper Temperature Limit (utt): The upper temperature where Battery Thermal Compensation will have reduced plant voltage to a level corresponding to (usp*(utt-ntt)*24)V below the fsp. Plant voltage will be reduced proportionally at any temperature between this point and the Battery Thermal Slope Nominal Temperature (ntt).

Battery Thermal Alarm Threshold (thr): A monitored battery temperature above this threshold results in a Battery Thermal alarm with a PMN severity.

Battery Thermal Step Temperature (spt): A monitored battery temperature above this threshold results in an additional 4.08V “step” decrease in plant voltage.

Plant Battery Test

The following is a list of plant battery test parameters that can be configured in the controller. The result of the Plant Battery Test is available in the “Batteries” sub-menu of the “Status” menu.

Manual Test: Permits manually starting a battery discharge test. The test can be set to end on either of the following two parameters.

Duration: The duration of the test can be set from 0.1 hours to 99.9 hours.

Cutoff Cell V: The test can be set to end when battery cell voltage reaches this cutoff voltage. Cutoff voltage can be set from 1.5V to 2.0V.

Automatic Test: Enable or disable automatic periodic running of the battery test. The factory default setting is disabled.

Interval: The test interval (time between tests) can be set from 1 to 18 months in 1 month increments. The factory default setting is 12 months.

Next Test: Enter a particular day in dd-mm-yy format to automatically run the battery test on that day.

Start Time: Enter a particular time in hh-mm format to automatically run the battery test at that time. The setting can configured from 0 to 23 hours. 00:00 is midnight.

Hours from BD: Time interval needed to elapse since the last Battery on Discharge alarm before a battery test can be performed. This can be set from 0 to 240 hours in 1 hour increments. The factory default setting is 72 hours.

Recharge Amp Limit: This section contains the settings for battery recharge current limit.

Limit: Enable or disable battery discharge current limiting.

Limit To: Current limit setting, from 5A to 100A. The factory default setting is 50A.

During this test, the controller lowers the rectifier voltage to 44V. (This value was chosen to be higher than 1.2V plus the highest possible LVD contactor disconnect threshold so as not to accidentally open the LVD contactor.) Lowering the rectifier output voltage to 44V creates a battery on discharge condition. If the batteries are present and healthy, the plant voltage will remain above 48V and the batteries will support the load. If the batteries are not present or are not able to support the load, the plant voltage will immediately drop to approximately 44V without any consequence to the load. The Battery on Discharge alarm is masked during this test.

The test is terminated by the occurrence of any of the following conditions:

- Initiating another Plant Battery Test. That is, once the test has been initiated, the test may be stopped by initiating another test either through the controller or by shorting pins 19 and 20 of the host interface connector.
- An alarm condition occurring. Any alarm condition that occurs during this test will result in the test being aborted regardless of whether the contact-closure exists between pins 19 and 20 of the host interface connector.
- The test has continued for over 100 minutes.
- The plant voltage has dropped below 44V. In this case, the system will abort the test and resume rectifier operation.

After the test has stopped, the plant will revert to the float mode. It may go to boost mode if the auto-boost feature has been enabled.

Boost Mode

Boost charging is a feature of the QS840A controller, which allows the user to temporarily raise the plant voltage to a higher, predetermined level in expediting the time needed to charge batteries. The system may manually be placed in the boost-mode through the front panel.

Note that the measured boost voltage may not exactly match the value chosen by the user if the thermal compensation feature is enabled. This is because the QS840A performs thermal compensated boost charging and will adjust the boost value based on the battery temperature per the slope chosen by the user.

The plant will exit the boost mode and enter the float mode if any of the following occurs:

- The current flowing into the battery string(s) is less than 5A
- The duration of boost mode charging has reached 8 hours
- The controller receives either a High-Voltage, Rectifier Fail alarm, or High-Battery Temperature alarms
- User sets the plant state to Float via the Controller.

Once initiated, the boost mode may be exited by placing the Plant State to Float.

Auto-Boost Charge

This feature may be enabled from the Controller. See Appendix A for details. When enabled, the plant enters the boost -charging mode of operation following a battery discharge once the BD alarm has been retired, provided the duration of the discharge was greater than 4 minutes. The controller will not enter the auto-boost-charging mode if the discharge duration was less than 4 minutes.

When in auto-boost mode, the controller raises the plant voltage to the value selected by the user. The controller keeps the plant in this mode of operation for a minimum of 5 minutes.

The exit conditions for the Auto-Boost Charge are the same as those for Boost Charge.

Redundancy Loss Function

This feature must be enabled from the front panel. The controller determines the number of rectifiers present and compares the actual currents being drawn by the load to that produced by the total number of rectifiers less one. If the measured load current exceeds the N rectifier's capacity for over 1 min, the alarm condition is activated. The alarm condition is latched on until the Clear Events command is activated from the front panel.

This feature may be used by customers to determine if the load being served is greater than N rectifiers worth, in an N+1 system. That is, the load requirements have changed such that the power system is no longer operating as a redundant power system. An additional rectifier may be required to ensure continuous redundant operation.

If enabled, this feature will be disabled during battery discharge and recharge conditions. It will be enabled when the battery charging current falls below 5A.

Battery Voltage Imbalance Detection

This feature requires the use of the ES771A Remote Voltage Monitoring Module. Note that this feature is automatically enabled if the controller detects the presence of the ES771A module. This module is to be placed in the electronics cabinet and utilizes the QS873A VT- Probes to measure the voltage of the battery string being monitored. The VT-Probe is to be placed on a battery terminal in the middle of the battery string. The CPS6000 controller has data on the plant voltage; the half-string voltage measured from each monitored battery string is compared to the plant voltage minus the measured half-string voltage. If the comparison results in a difference of greater than 1.7V for longer than 24 hours, the alarm is asserted. The alarm may be retired by initiating the Clear Events command from the front panel.

After this feature has been enabled, the system waits for 12 hours to ensure the battery strings are stable. A battery string is considered to be stable if the charging current is less than 3A. If a stable battery string yields a difference measurement greater than 1.7V for over 12 continuous hours, a Battery Voltage Imbalance alarm is generated.

When the alarm is issued, the Float Set-Point (fsp) and the Battery on Discharge (BoD) threshold values are reduced by 1/24th. Once the alarm has been cleared by the CLE command, the plant reverts to its normal fsp; however, the BoD threshold is maintained at the new threshold for up to four minutes before reverting back to the old threshold. This is done to ensure the batteries have had enough time to charge up to the nominal fsp and to prevent any spurious BoD alarm conditions.

This feature may be used by customers as part of their overall battery maintenance program in determining the health of battery strings. A voltage imbalance of 1.7V between half-string voltages may mean a shorted-cell somewhere in the string. A service person should be sent out to the site and determine if the string should be replaced.

Battery Recharge Current Limit

This feature must be enabled from the front panel. The battery recharge current limit feature enables the QS840A controller to limit the recharge current flowing into a battery section during the charge cycle. The recharge current flowing into the battery section can be limited to any value between 5A and 100A.

Note that this feature will not have any impact on the current being delivered to the load. Further, there will be no effect on the discharge current flowing from the battery strings to the load during an ac fail condition. The controller will maintain the recharge current within 10% of the set level.

Appendix C: Alarms and Relays

Alarm Relays

The control unit is provided with six alarm relays; four to provide the actual alarm condition, and two to provide the severity associated with the alarm. The severity relays transmit the either PMJ or PMN. Each alarm is factory assigned a severity based on industry practices, however, they may be reassigned to MAJ, MIN, or RO (Record Only). An alarm condition with the RO severity results in the system controller transmitting the alarm without the severity. That is, neither MAJ (PMJ) nor MIN (PMN) is transmitted with the alarm.

The four selectable alarm relays are called Alarm Relay 1 (ALM1) through Alarm Relay 4 (ALM4). Relays are user definable in that the user may assign any combination of alarms from a given set of alarms. The following table shows which alarms may be assigned along with their factory default settings.

Alarms

Table C-1 shows a list of all alarms along with their descriptions, default settings, ranges and/or severity, and affected alarm relays and LEDs.

				Alarm Relays						LED			LED
Alarm / Event	**Description**	**Default Setting**	**Range / Severity**	**PMJ**	**PMN**	**Relay 1**	**Relay 2**	**Relay 3**	**Relay 4**	**PMJ** Red	**PMN** Yellow	**NORM** Green	**AUX MD** Red
Auxiliary 1	Alarm asserted from a user configured event on this input. The alarm can be programmed to be asserted either on aclosure or open to Vminus. P5 on the Distribution Module control board.	Major	Major/ Minor/ RO	**x**						**x**			
Auxiliary 2	Alarm asserted from a user configured event on this input. The alarm can be programmed to be asserted either on aclosure or open to Vminus. P5 on the Distribution Module control board.	Major	Major/ Minor/ RO	**x**						**x**			
Auxiliary 3	Alarm asserted from a user configured event on this input. The alarm can be programmed to be asserted either on aclosure or open to Vminus. P5 on the Distribution Module control board.	Major	Major/ Minor/ RO	**x**						**x**			

Alarm / Event	Description	Default Setting	Range / Severity	Alarm Relays						LED			LED
				PMJ	PMN	Relay 1	Relay 2	Relay 3	Relay 4	PMJ Red	PMN Yellow	NORM Green	AUX MD Red
Auxiliary 4	Alarm asserted from a user configured event on this input. The alarm can be programmed to be asserted either on a closure or open to Vminus. P5 on the Distribution Module control board.	Major	Major/ Minor/ RO	x						x			
Auxiliary Major Alarm	Alarm asserted when the controller detects a contact closure between pins 23 and 24 of the host -interface. The alarm is used to represent a failure in external equipment.	Major	Major/ Minor/ RO	x						x			
Battery on Discharge	Voltage threshold generally used to indicate the system is completely or partially operating on battery power has been reached. System batteries are discharging.	51.1V Major	46-55V Major/ Minor/ RO	x		o				x			
Check Battery	Alarm asserted when battery does not pass the manual, automatic or periodicdischarge tests. Manual discharge tests must be user invoked.	Minor	Major/ Minor/ RO		x						x		
Circuit Pack Failure	External Modem can not be initialized.	Minor	Major/ Minor/ RO		x						x		
Clock Battery Low	The controller internal RAM backup battery is low and requires replacement.	RO	Major/ Minor/ RO		x						x		
Comm Loss Major	Alarm asserted when controller loses communication with multiple serially rectifiers or the LVD board. This alarm is masked for the rectifier if the ACF or RFA alarms are detected prior to loss ofcommunications in the failed rectifier.	Major	Major/ Minor/ RO	x						x			

Alarm / Event	Description	Default Setting	Range / Severity	Alarm Relays						LED			LED
				PMJ	PMN	Relay 1	Relay 2	Relay 3	Relay4	PMJ	PMN	NORM	AUX MD
										Red	Yellow	Green	Red
Comm Loss Minor	Alarm asserted when the controller cannot detect a single serially connected rectifier or any number of thermal probes that was previously connected.	Minor	Major/ Minor/ RO		x						x		
Controller Ambient TemperatureHigh	Controller on-board ambient temperature measurement has reached the configured high ambient temperature threshold.	75°C Minor	35-75 °C Major/ Minor/ RO		x						x		
Controller Ambient TemperatureLow	Controller on-board ambient temperature measurement has reached the configured low ambient temperature threshold.	-40°C Minor	-40-10 °C Major/ Minor/ RO		x						x		
Controller Fail	Controller has power and has failed. Implemented in hardware.	N/A	N/A	x	x					x	x		
Defective Temp Probe	Controller determines a “1-wire” probe t to be defective.	Minor	Major/ Minor/ RO		x						x		
Fan Fail	One or more rectifiers has reported afailed fan	Major	Major/ Minor/ RO	x						x			
Fuse Major	An input that has been properly configured and mapped as a Fuse Alarm Major has been detected.	Major	Major/ Minor/ RO	x						x			
Fuse Minor	An input that has been properly configured and mapped as a Fuse Alarm Minor has been detected.	Minor	Major/ Minor/ RO		x						x		
High Battery Temperature	Alarm asserted when the controller detects battery temperatures in excess ofthe configured threshold. Enabled with 1-wire temperature probes for slope thermal compensation.	55 °C Minor	30-85 °C Major/ Minor/ RO		x						x		

Alarm / Event	Description	Default Setting	Range / Severity	Alarm Relays						LED			LED
				PMJ	PMN	Relay1	Relay 2	Relay3	Relay 4	PMJ	PMN	NORM	AUX MD
										Red	Yellow	Green	Red
High Boost Voltage Major	A High Voltage threshold during the Boost mode of operation used to indicate a possible damaging high output DC voltage level is present. The controller quits the Boost mode of operation.	57V	50-60V	x						x			
High Boost Voltage Minor	A high voltage threshold during the Boost mode of operation used to indicate an abnormally high output DC voltage level is present. The controller does not quit the Boost mode of operation.	56V	50-60V		x						x		
High Float Voltage Major	A possible damaging Very High DC bus voltage threshold set for the normal Float mode of operation has been reached. The controller will issue a command to shut any offending rectifier/s off.	57.0V Major	50-60V Major/ Minor/ RO	x						x			
High Float Voltage Minor	Voltage threshold during the normal Float mode of operation used to indicatean abnormally high output DC voltage level is present. The controller does not issue commands to shut rectifier/s down.	56.0V Minor	50-60V Major/ Minor/ RO		x						x		
Imminent LVBD Shutdown	Alarm asserted when the DC buss voltages reach the lower disconnect threshold of the two contactors. The controller will assert this alarm to indicate the batteries will be disconnected from the load in 15 seconds. This alarm must be enabled.	Disabled/Major	Enabled/ Disabled (Major/ Minor/ RO)	x						x			

Alarm / Event	Description	Default Setting	Range / Severity	Alarm Relays						LED			LED
				PMJ	PMN	Relay 1	Relay2	Relay 3	Relay 4	PMJ Red	PMN Yellow	NORM Green	AUX MD Red
LV Disconnect Contactor 1 Fail	Controller has determined that LVD 1has failed. The contactor did not openor close when expected or is asserting an alarm in the closed state.	Major	Major/ Minor/ RO	x						x			x
LV Disconnect Contactor 1 Open	Low Voltage Disconnect Contactor 1 is in the Open state either through manual intervention or LVD disconnect.	Major	Major/ Minor/ RO	x						x			
LV Disconnect Contactor 2 Fail	Controller has determined that LVD 2has failed. The contactor did not openor close when expected or is asserting an alarm in the closed state.	Major	Major/ Minor/ RO	x						x			x
LV Disconnect Contactor 2	Low Voltage Disconnect Contactor 2 isin the Open state either through manual	Major	Major/ Minor/ RO	x						x			
Open	intervention or LVD disconnect.												
Manual Or Periodic Battery Test In Progress	Condition asserted to provide a remote indication that a battery test has been initiated either through automatic means. Automatic testing must be enabled. Factory default is disabled.	RO	Major/ Minor/ RO						o				
Monitoring Module Failure	Controller has detected a failure in anattached remote monitoring module.	Minor	Major/ Minor/ RO		x						x		
Multiple ACFail	Detection of two or more rectifiers reporting ACF in the system.	Major	Major/ Minor/ RO	x			o			x			
Multiple Rectifier Fail	Detection of two or more rectifiers failing in the system.	Major	Major/ Minor/ RO	x				o		x			

Alarm / Event	Description	Default Setting	Range / Severity	Alarm Relays						LED			LED
				PMJ	PMN	Relay 1	Relay2	Relay 3	Relay 4	PMJ	PMN	NORM	AUX MD
										Red	Yellow	Green	Red
Open String	Alarm issued when an external disconnect switch produces an open charge path to batteries in the Distribution Module. This alarm is onlyavailable when used with the QS872A Board is in the system (connector P4).	Major	Major/ Minor/ RO	x						x			
Rectifier Redundancy Loss	Alarm asserted when the total rectifier output current exceeds N rectifier capacity value. The feature must be enabled and assumes N+1 rectifiers are present in the system. Disabled by default.	Disabled/Minor	Enabled/ Disabled (Major/ Minor/ RO)		x						x		
Reserve TimeLow	Reserve time low alarm threshold configured for systems calculated back-up reserve has been reached.	0 hours Minor	0-99.9 hours Major/ Minor/ RO		x						x		
Sense Fuse	Alarm that is automatically asserted when the controller senses the DC busvoltage to be lower than 35.5V +/- 0.5V.	Major	Major/ Minor/ RO	x						x			
Single AC Fail	Detection of a single rectifier reporting ACF in the system.	Minor	Major/ Minor/ RO		x		o				x		
Single Rectifier Fail	Detection of a single rectifier failing in the system.	Minor	Major/ Minor/ RO		x			o			x		
Un-powered Controller	The controller is not receiving DC power from the shelf. All Form-C relaysare de-energized to assert respective alarms.	N/A	N/A	x	x	x	x	x	x				

Alarm / Event	Description	Default Setting	Range / Severity	Alarm Relays						LED			LED
				PMJ	PMN	Relay1	Relay2	Relay3	Relay4	PMJ	PMN	NORM	AUX MD
										Red	Yellow	Green	Red
Very Low Float Voltage	The system DC output voltage has reached a low voltage threshold generally set below the BD threshold. This alarm is used to indicate that the battery reserve is depleting and the DC voltage is approaching a critically low output value.	46.0V Major	40-51V Major/ Minor/ RO	x						x			
Voltage Imbalance	Alarm asserted when the controller detects greater than 1.7V difference	Disabled/Major	Enabled/ Disabled	x						x			
Detect	between two halves of each battery string for more than 24 hours. Feature isenabled through the use of 771 voltage modules.		(Major/ Minor/ RO)										

Note 1: Communication loss with a single rectifier or any number of thermal probes is considered a PMN alarm. Communication loss with the LVD card is considered a PMJ alarm.

Note 2: Communication loss with multiple rectifiers or devices other than thermal probes shall be considered PMJ alarms.

Note 3: An alarm can be triggered from an external event if a user has properly configured the input assignments. An alarm can be asserted either for closure or open to Vminus, depending on how user has configured alarm.

All alarm relays are Form-C type and have the O, C, and R pins available on the controller connector J1. The relays are rated for a maximum contact voltage of $60V_{dc}$ and maximum contact current of 0.5A.

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Appendix D: EasyView for Windows® for the CPS6000 Controller

Overview

EasyView® for Windows OS (EasyView) is a program that runs on an IBM®-compatible PC with an RS-232 port or laptop computer and provides access to a CPS6000 Controller. (Hereafter the term PC is used to refer to a PC with an RS-232 port or laptop computer.) The program provides access to controller alarms, system status, control and configuration. To use EasyView you will have to load the EasyView application onto your PC, connect your PC to the controller, and run the EasyView application.

Loading the EasyView Application

The EasyView software may be freely downloaded from the OmniOn Power web site **omnionpower.com**

Making the Connection

To use EasyView to access a CPS6000 controller you will need a PC, and a CPS6000 controller programming cable (comcode 848658100). Connect the cable to the serial port of your PC and to the controller programming connector of the CPS6000.

Configuring a Site

Start the EasyView program by selecting its icon. Once started, you will enter the Default screen. This is where the system alarms, warnings, and site descriptions are displayed. To configure a site, press the F11 key from this screen, or select Setup Sites from the Options menu. The Site List popup screen is displayed.

On this screen, hit the Add button and then the Modify button.

On the Description field, type in an identifier, e.g., CPS6000 Controller Connection. Then select Set Default Passwords button. To view controller status information without being able to change any settings, select User in the Connect Password field. If you will be changing parameters, select Super User. Super-users have configuration privileges.

Serial Port Setup

This selection defines the entire connection method except for password. If a suitable Serial Port Setup choice is not listed, you must define one by:

Clicking on Show Serial Port Setups.

Clicking on Add.

Clicking on Modify.

You will be making a direct connection to the CPS6000 controller. Look for the Set Default Values for: field and hit either Com 1 direct, Com 2 direct, Com 3 direct, or Com 4 direct depending on which communications port you will be using to connect to the controller.

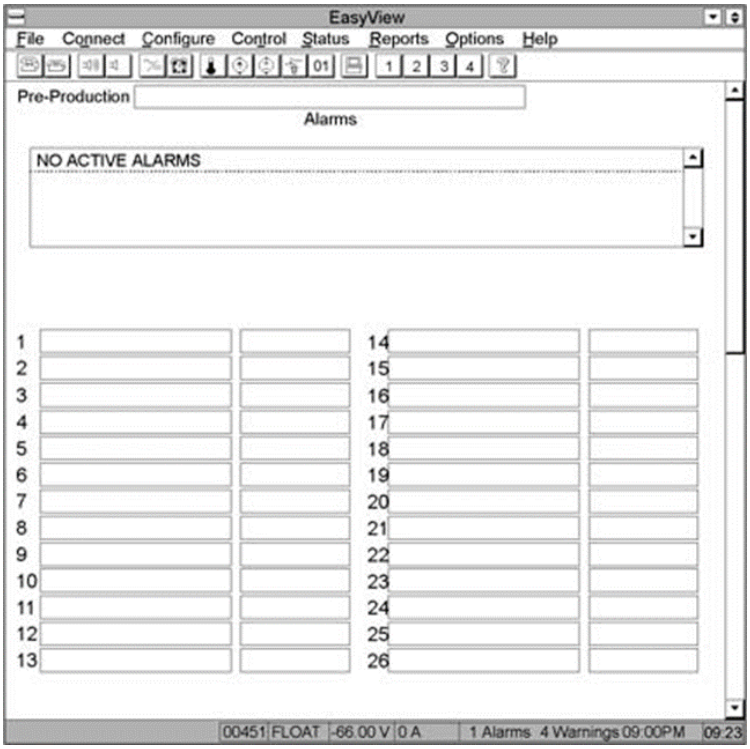
Hitting the button will automatically set all other parameters for you. Hit the OK button to exit this field. Hit OK again to exit the Site field. Then hit the Close button.

Connect to Site

To connect to the CPS6000 controller, hit F12 or from the Connect menu, select the Connect to Site option. You may now select one of the listed sites. EasyView will start the connect process and display the commands it is sending to the CPS6000 controller and responses it is getting back. When the connection process is completed, EasyView will obtain the alarms and warnings of the CPS6000 controller and display them on the default screen.

Navigating Once Connected

Once you've connected to the controller, you should see the following screen. Note that any alarms currently on the plant will be visible.



There are three pull-down menus you may choose to gain access to plant features and functions. They are Configure, Control, and Status.

Configure

This pull-down menu allows one to access all CPS6000 controller parameters that may be uniquely configured. It allows access to set alarm thresholds and alarm relays, set battery connect and disconnect thresholds, enable auto-boost mode and set boost charge thresholds, change passwords, enable imminent shutdown feature, set rectifier parameters, configure serial ports, and configure slope thermal compensation.

Control

This pull-down menu allows one to access all CPS6000 controller parameters that may be activated to perform a function. It allows one to perform a plant battery test, clear all clearable alarms, perform a lamp test, change the plant state from float to boost mode, and inhibit or restart rectifiers.

Status

This pull-down menu allows one to obtain the status of the battery management system, i.e., battery current, battery temperature, number of VT-Probes and ES771A Voltage Imbalance Detection modules are present. It also allows rectifier management, i.e., provides information as to the number of rectifiers present and their output current.

Exiting

To exit the program, either hit the Disconnect icon or hit File and Exit.

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Appendix E: Pigtail Alarm Cable

The pigtail alarm cable plugs into the CPS6000 shelf with a J1 connector on one end and in the CPS4000 alarm cable connector (36 pin Centronics type) on the other end. The length of the pigtail connection is 1 foot (12 in.).

CPS4000 Side Alarm Pins				CPS6000 Alarm Pins	
PinNo	**Color**	**Office Alarm**	**Signal**	**Pin No**	**Office Alarm**
1	W-BL	PMJ_NO	O	1	PMJ
2	BL-W	PMJ_C	R	2	PMJ
3	W-O	PMJ_NC	C	3	PMJ
4	O-W	PMN_NO	O	4	PMN
5	W-G	PMN_C	R	5	PMN
6	G-W	PMN_NC	C	6	PMN
7	W-BR	BD_NO	O	7	ALM1 (BD)
8	BR-W	BD_C	R	8	ALM1 (BD)
9	W-S	BD_NC	C	9	ALM1 (BD)
10	S-W	MJF_NO Ringer/Converter_NO	O	13	ALM3 (RFA)
11	R-BL	MJF_C Ringer/Converter_C	R	14	ALM3 (RFA)
12	BL-R	MJF_NC Ringer/Converter_NC	C	15	ALM3 (RFA)
13					
14	R-O	2ACF_NO/LV_NO	O	16	ALM4 (Batt Test)
15	O-R	2ACF_C/LV_C	R	17	ALM4 (Batt Test)
16	R-G	2ACF_NC/LV_NC	C	18	ALM4 (Batt Test)
17					
18					
19					
20					
21					
22	S-R	ACF_NO	O	10	ALM2 (ACF)
23	BK-BL	ACF_C	R	11	ALM2 (ACF)
24	BL-BK	ACF_NC	C	12	ALM2 (ACF)
25					
26					
27					
28					
29	BK-BR	PBT	PBT IN	19	Plant Battery Test Input
30	Y-BL	O/S_RTN	AGND	22	Protected AnalogGround
31					
32					
33					
34					
35					
36					

The relay configuration settings on the QS840 Controller in the CPS 6000 Power System also needs to change so that the QS840 reports alarms the same way as the CPS4000 ES648A or B controller.

Description	obj	Default		ES648A		ES648B		Comments
Battery On Discharge	bda1	R1	MAJ	R1	MAJ	R1	RO	Need to change to RO on ES648
Very Low Voltage	vla1	R1	MAJ	""	RO	R4	MAJ	Changes for both versions
Single ACFail	acf1	R2	MIN	R2	MIN	R2	MIN	No change from default
Battery Test Active	bts1	R4	RO	""	RO	""	RO	Disable relay R4 as Battery Test Active
Multiple Rectifier Failure	mrfa1	R3	MAJ	""	MAJ	""	MIN	Disable relay R3 as MultipleRect. Fail
Redundancy Loss	rls1	R3	MIN	""	MIN	""	MIN	Disable relay R3 as Redundancy Loss
Single Rectifier Fail	rfa1	""	MAJ	""	MIN	""	MIN	Change from MAJ to MIN for both versions
Multiple AC Fail	macf1	R2	MAJ	R4	MAJ	""	MIN	Changes to both versions
High Battery Temp	bta1	""	MIN	""	MAJ	""	MAJ	Change from MIN to MAJ for both versions
Major Fuse Alarm	faj1	""	MAJ	R3	MAJ	R3	MAJ	Relay R3 is Major Fuse alarmfor both versions

The following commands will help set up the programmable alarm relays as per the CPS4000 scheme.

No changes to default for thermal probe or contactor open alarms.

ES648A	Comments
cha faj1,acc=R3	Enable relay R3 as Major Fuse Alarm
cha mrfa1,acc=""	Disable relay R3 as Multiple Rectifier Fail alarm
cha bts1,acc=""	Disable relay R4 as Plant Battery Test Active
cha macf1,acc=R4	Enable relay R4 as Multiple AC Fail
cha macf1,sev=MAJ	Multiple AC Fail is MAJ
cha vla1,acc=""	Disable relay R1 as Very Low Voltage alarm
cha vla1,sev=RO	Change Very Low Voltage alarm from MAJ to RO
cha rls1,acc=""	Disable relay R3 as Redundancy Loss
cha rfa1,sev=MIN	Change Single Rectifier Failure to MIN
cha rfa1,acc=""	Disable all relays for Single Rectifier Fail alarm
cha bta1,sev=MAJ	Change High Battery Temperature from MIN to MAJ

ES648B	Comments
cha faj1,acc=R3	Enable relay R3 as Major Fuse Alarm
cha mrfa1,acc=""	Disable relay R3 as Multiple Rectifier Fail alarm
cha mrfa1,sev=MIN	Change Multiple Rectifier Failure from MAJ to MIN
cha bts1,acc=""	Disable relay R4 as Plant Battery Test Active
cha vla1,acc=R4	Enable relay R4 as Low Voltage Alarm
cha macfl,acc=""	Disable relay R2 as Multiple AC Fail
cha macfl,sev=MIN	Change Multiple Rectifier Failure to MIN
cha bda1,sev=RO	Change Battery On Discharge from PMJ to RO
cha rls1,acc=""	Disable relay R3 as Redundancy Loss
cha rfa1,sev=MIN	Change Single Rectifier Failure to MIN
cha rfa1,acc=""	Disable all relays for Single Rectifier Fail alarm
cha bta1,sev=MAJ	Change High Battery Temperature from MIN to MAJ

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Appendix F: Operating Temperature Measurement and Vertical Spacing

Overview

The CPS6000 has been designed for mounting in relay racks or in equipment cabinets, where

-48V_{dc} with optional ringing power is required. It is designed for use with other equipment that require vertical airflow cooling. Equipment may be placed on top of the CPS6000 provided airflow is not impeded or sufficient spacing is provided.

Vertical Spacing

To prevent airflow from being impeded when placed above or below a solid surface, ensure that 1U (1.75-inch) spacing is provided to allow for vertical airflow through the unit. If a solid surface is installed on both vertical locations, then 1U must be provided on both surfaces.

Operating Temperature

When installing CPS Shelves, it is important to determine that airflow to the rectifier will be within their operating limits. Rectifiers that operate at 75°C must see air intake with temperatures less than or equal to 75°C at the rectifier inlet. When using a dual or multi-shelf arrangement, the ambient intake to the lower-most shelf and the heat gain through the shelf shall be considered while determining the air intake temperatures of the subsequent shelves. If the air temperature is exceeding the operating range, a baffle will have to be used.

Baffles

In conditions where the exhaust temperature of the lower shelf exceeds the operating temperature of the next shelf, a 1U baffle shall be used to vent the exhaust and draw direct cabinet air. The cabinet air temperature for the upper shelf should be within the operating range of the rectifiers.

A baffle shall also be used when the rectifier shelves are mounted below a distribution module or any module where cables are being stripped and terminated. This protects the rectifiers from direct exposure to metallic shavings and strips, and also directs the hot exhaust air away from the distribution module.

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Revision

Version	Description of the change	Date Dept./ Init.
Issue 5	Page 2-2: Added QS845 to block diagram. Page 2-12: Added Table 2-F QS845A Supplementary Board Specifications. Page 3-6: Added QS845A statement under heading CPS6000 Controller; added comcode for rectifier slot filler. Page 3-8: Modified table. Page 3- 10: Added supplementary shelf information and 2-shelf kit comcode. Page 5-7: Added Figure 5-4 for QS845A installation. Page 5-19: Added Figure 5-13 for inter-shelf connections. Page 6-10: Added QS845A Supplementary Shelf Board section. Page 7-2: Relocated PFC Fail and Input Fuse in LED table. Page A -16: Added ringer command table. Page D-1: Added second link to EasyView software.	
Issue 6	Changed name from Aux Box to Distribution Module. Page 2-10, Table 2-C: Changed input current, maximum discharge current and note. Page 2-11, Table 2-D1: Added shutdown range notes to input voltage ranges. Page 2-12: Added Table 2D-3, QS865A Rectifier Specifications. Page 3-4: Aux Boxes, Added battery circuit breaker note. Page 3-6, Rectifiers: Added QS865 Rectifier and comcode. Page 3-7: Revised AC Input Current Table. Page 3-8: Replaced ac input table. Page 7-1: Changed dead zone upper limit to 180V. Deleted high-line range for current-limited mode. Changed QS862A initial lower limit power-up and low-limit shut-down to 180V. Added QS865A description. Page 7-4: Added 50A data to Figure 7-2. Page 11-1, Table 11-A: Changed first line Rectifier LED.	
Issue 7	Manual updated throughout to include Double-Slot Distribution Module and Ringer information. Page 2-11, 2-12, Updated rectifier specification tables 2-D1, D2, and D3. Page 3-4: Updated power shelves and distribution modules; Corrected comcode for H569-470 G60A. Page 3-9: Updated Shelf AC Input Current Table. Page 5-12: Moved Discrete Office Alarm Connector from Appendix E. Added Section 6, AC, Alarm, and Control Cable Reference Information. Pages 7-4 through 7-6: Added CPS6000 Controller Minimum Configuration section. Added Section 10, QS820A Ringer. Page C -2, Table C-1, Check Battery: Included failure of automatic and periodic discharge tests as alarm conditions. Page C-4, Table C-1, Open String: Changed alarm relay and LED status from PMN to PMJ. Page C-5, Table C-1, Very Low Float Voltage: Changed alarm relay and LED status from PMN to PMJ. Added Appendix F Operating Temperature Measurement and Vertical Spacing.	
Issue 8	Overview section changed, Table-2A, 2B revised, ordering information – baffle, distribution module section revised, rectifier section revised to add new rectifier ratings, ringer description corrections, and shelf ac input table revised. Added external AC distribution panel, changed view of double slot to show all 4 battery positions. Added External DC Distribution Panel. Updated rectifier section to include 500W, 40A rectifiers. Revised figure 8-2 to include all rectifiers, revised safety section on wires, added 25 and 150 ft cable Ordering code, removed pigtail Ordering code	
Issue 9	Added torque table to shelf installation.	
Issue 10	Updated Tables 2-C and 3-A	
Issue 11	Removed references to back-to-back lug configurations for battery and load connections	
Issue 12	Updated CPS6000 pin-out in Appendix E. Corrected text above Fig 5-11. Removed G161 and G162 panels	
Issue 13	Revised Introduction, System Overview. Updated tables 2-A,B,C,D,and G. Corrected Ringing Type in Ringer Installation. Added Figure 5-19 Ringer Load Cable Connector Pins.	

Version	Description of the change	Date Dept./ Init.
Issue 14	Added rear access configurations, QS841 Controller	
Issue 15	Figure5-7, AC cabling table on page 86. Enhanced QS841 descriptions.	
Issue 16	Removed Ordering codes. Added new thermal probe sketch for strain relief.	
Issue 17	Added sketch of new distribution module with 2 load breakers, 2 battery breakers and 5 GMT fuse positions	
Issue 18	Updated AC table for 50A rectifiers to remove non-applicable configurations	
Issue 19	Removed Shelf AC input current table. Added 150 ft ringer cable comcode.	
Issue 20	Corrected information related to Fig 5-13	
Issue 21	Rebranding	
1.2	Update as per template	2/18/2022
1.3	Updated page footer	4/5/2023
1.4	Updated as per OmniOn template	11/21/2023

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