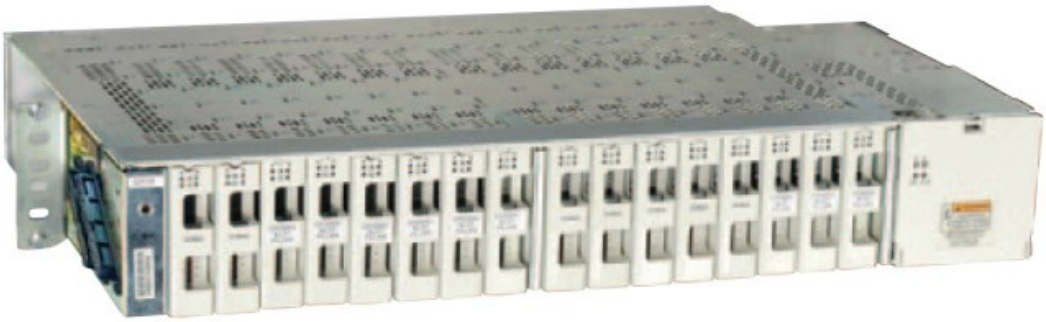
CPS3200U Upstream System

Remote Power System 48 Vdc Input, ± 190 Vdc Output Converter/Limiter System



CPS3200U Upstream System

Table of Contents

Table of Figures

Table of Tables

1. Introduction

Overview

The CPS3200U is the premier upstream dc/dc converter for line powering FTTN networks. The 3200U contains 16 dc/dc converter/limiter cards in a dense 2 RU shelf. Each card contains a pair of independent -48 Vdc input to ±190 Vdc output converters with each output safety limited to 100VA. In addition, each output terminal is safety Ground Fault protected. The cards are fully connectorized and insulator shielded, inrush current protected and completely hot swappable, making card addition to in-service shelves in the field an easy, one step process. The converter card shelf is completely front access, with all -48V input and RJ21 output connections made on connectors in front of the mid-mount shelf brackets. The alarm and communications connections are also on the front of the shelf.

The CPS3200U converter shelf meets the applicable requirements of these North American product standards: UL60950-21, UL60950-1, Telcordia GR-3108-CORE, GR-1089-CORE, GR-487-CORE (converter shelf), and GR-063-CORE.

Summary

The CPS3200U Upstream System delivers power over telephone lines. The primary application is enabling the delivery of video bandwidth data rates to residences over twisted pairs by allowing placement of powered electronics at an acceptable distance from the residence.

48 Vdc Input, ±190 Vdc Output Converter/Limiter System distributes battery backed up power from existing -48V battery backed up sites like Central Offices and Remote terminals to reliably power electronics near the home. It does this by converting the -48V to a UL60950-21 safety approved + and – 190V current limited and ground fault protected source. Each front access shelf provides 32 channels.

Reference Documents

Documents	Title
CC848836981	Galaxy Pulsar Edge Product Manual
CC848853457	CPS3200U Technical Support Guide
	Line Power Product Line Brochure – Specifications and Ordering Guide

Customer Service Contacts

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

Services provided include initiating the spare parts procurement process, ordering documents, product warranty administration, and providing other product and service information.

OmniOn Energy phones are staffed from 7:00 am to 5:00 pm USA Central Time Zone (GMT -6), Monday through Friday, on normal business days. At other times, this number is still available, but for emergencies only.

Calling from

- United States, Canada, Puerto Rico, and the US Virgin Islands
- All other countries

Phone Number
+1 877- 546 -3243 (US)
+1 972 -244- 9288 (Int'l)

Or

Contact your local field support center or your sales representative to discuss your specific needs.

On-Line Power Systems Product Manuals and Software

Product manuals, technical support guides, product line brochures, and software are available on-line. Software includes Easy View and SNMP MIB.

omnionpower.com

1. The USA direct country code for the country where the call is originating

2. Product Description

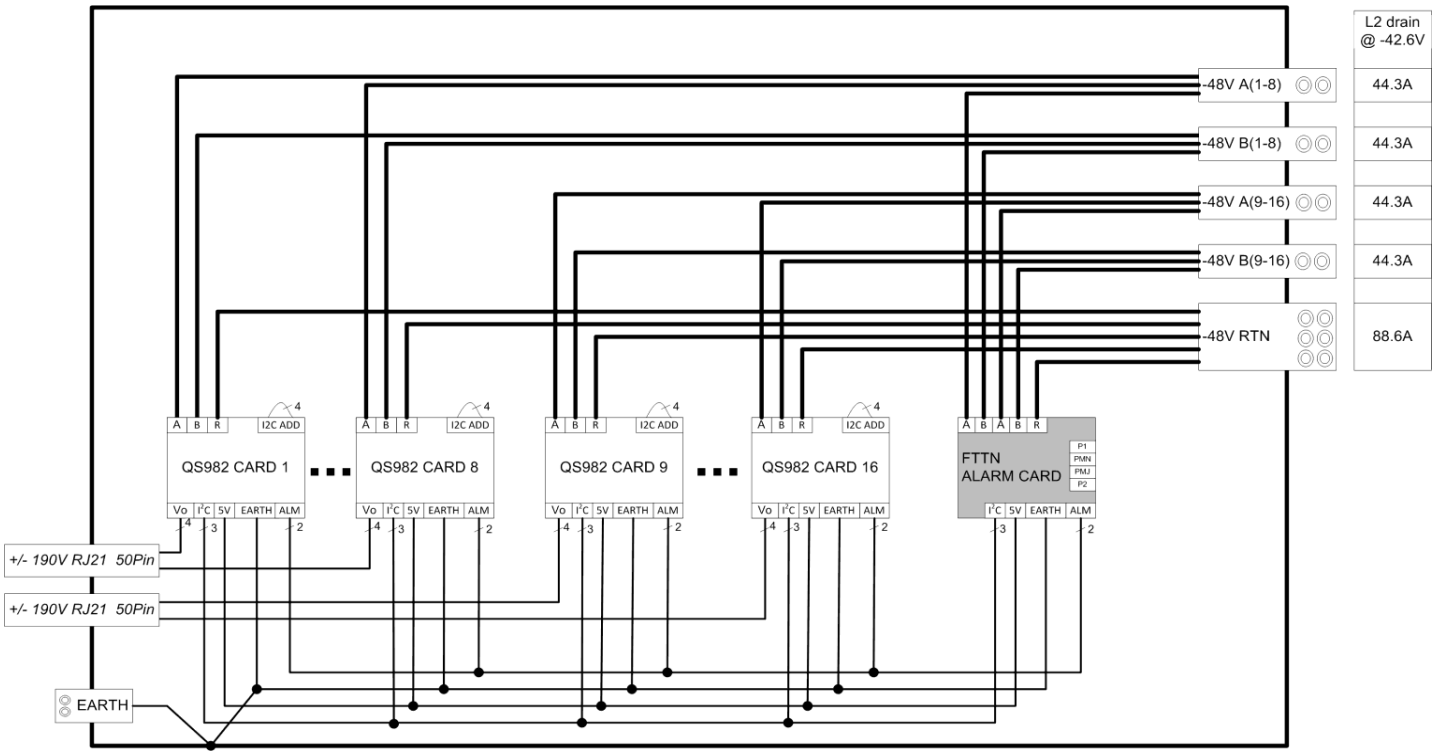


Figure 1 Block Diagram -48V Fed CPS3200U Shelf
Basic block diagram of single converter shelf System

Operation

Power comes in as -48V and is distributed in an A and B redundant fashion to each of the converter cards and the alarm card. There are two +/-190V circuits on each converter card. The circuits both boost the voltage and limit the current as prescribed by UL60950-21 and GR-1089-CORE.

Warning: Ground faults or short circuits on the output do not permanently disconnect the output. The converter circuit tests the line every 4 seconds and will re-energize if the wiring fault is cleared.

A serial communication bus links each converter to an alarm card at the end of each shelf.

The alarm card provides major and minor form C contacts, manages the converters and relays information to a OmniOn Power CPS6000 family controller using Galaxy Protocol over an RS485 bus. Up to 24 shelves can be controlled and monitored by one CPS6000 family controller. The CPS6000 controller is WEB and SNMP capable.

Configurations

32 circuit, front access +/-190V shelves come in two configurations - airflow from bottom to top and airflow from top to bottom. A single IP drop can be used to manage up to 24 shelves or 768 circuits.

Specifications

Electrical					
Parameter	**Symbol**	**Min**	**Typical**	**Max[2]**	**Unit**
Input Voltage Operating Continuous Non-operating, No Damage Transient (@ duration =) 5 Seconds 10 ms (rise and fall rate of 10V/ms) 10 µs 1 µs	 VI V_{tr} V_{tr} V_{tr} V_{tr}	 40 	 -52.8 	 -60 -40 -65 -75 -100 -200	 Vdc Vdc
Input Current - (per half shelf at 97.7W on all circuits) VIN = 54.4V VIN = 52.1V VIN = 42.6V VIN = 40.0V	 I_{IN} I_{IN} I_{IN} I_{IN}			 34.7 36.2 44.3 47.2	 Adc Adc Adc Adc
Temperature Normal Operating Ambient Temperature at 150 lfm airflow Operating Ambient Temperature at higher (TBD) airflow Cold Start Temperature Storage Temperature	 T_A T_A T_A T_{stg}	 -40 -40 -40 -55		 50 75 85	 °C °C °C °C
Power – per C/L Card Input Power at -42.6 Vdc input Power Dissipation Output Power	 Pin Pdiss Pout		 21	 240[3] 40* 200	 W W W
Output Voltage – line to line Power – per C/L circuit Current – per C/L circuit	 V_O P_O I_{OUT}	 378 95.0 251	 380 97.7 257	 382 100 262	 Vdc W mA
Isolation Input to Output Voltage				 1500	 Vdc

Physical				
	Height in (mm)	**Width in (mm)**	**Depth in (mm)**	**Weight lb (kg)**
23-Inch Shelf	3.5 (88.9)	21.4 (543.6)	12 (304)	30 (13.6)
Fan Shelf	3.5 (88.9)	21.4 (543.6)	12 (304)	20 (9.0)
1U Baffle	1.75 (44.4)	21.4 (543.6)	12 (304)	4 (1.8)

Table 1 Specifications

[2]Max = Absolute Maximum Rating

[3]These are maximum situations with each circuit loaded to 100W. No actual or engineered application would load every circuit to this level. In the absence of detailed information about the network we would recommend using the typical dissipation value of 21 Watts for most applications with 30W per card for highly loaded networks.

Installation Category

CPS3200U output circuits are suitable for connection to telephone lines that are equipped with primary lightning protectors consistent with UL 497. The user must provide protection on each copper pair to a level corresponding to a CommScope 3C*EW Gas tube primary protector or equivalent gas tube protector [For example: 3C3EW provides the part in a red color]. This protector has a voltage breakdown range of 265-465 Volts and an impulse spark over range of <265-700 Volts. The 5-Pin protector must be marked as a “special circuit” consistent with the marking protocol in the users network. Protectors are provided by the telco customer.

Network equipment and components along the powering circuit shall have suitable insulation resistance at 200 Vdc from each conductor to ground and a total insulation resistance suitable for 400 Vdc from line to line.

This page intentionally left blank

3. Ordering

Ordering Codes

This is a short list of CPS3200 items that can be purchased. See Line Power Product Line Brochure for detail.

CODE	ORDERING CODE	DESCRIPTION
Items for new installation or growth of existing installations		
QS912A	108996732	Converter Shelf with Alarm Module (provides landings for double-hole lugs)
QS982A	108996641	Converter Card (For first install on single shelf systems the sum of converters cards and converter slot fillers should be 16. For example: 14 Converter cards and 2 Converter slot fillers)
	CC109121992	Converter slot filler
QS930A	108996930	Fan Shelf with 2 redundant fan trays
QS941A	108996947	Controller with Display and Ethernet capabilities
	CC848756577	Airflow baffle without bracket for air filter
	CC109102638	Airflow baffle with bracket for air filter. Includes air filter. Replacement air filter CC109121984 listed below.
Spares: Items for repair or maintenance of existing installation		
	CC109121984	Air filter to be used with Airflow baffle CC109102638 (Spare)
QS930B	108997623	Fan tray assembly (Spare)
QS920A	CC109102118	Alarm Module (Spare)
Expansion Items: Provide a 4 ft long wire set to transmit alarm signals past a baffle. Use when adding a second fan shelf to an existing system.		
H5694820G050	CC109122074	Fan Shelf w/2 fan trays, wire set, baffle, filter, controller cover
H5694820G051	CC109132271	Fan Shelf w/2 fan trays, wire set, baffle, controller cover
H5694820G012	CC109122082	Converter Shelf, RJ45 wire set, hardware, alarm board (same as QS912A above)

Table 2 Ordering Codes

Note: A baffle must be placed above the topmost converter shelf for use in customer premise locations for UL safety compliance. Baffles are not required in restricted access locations such as outside plant cabinet, CEV or hut locations. The baffle can be ordered separately from the above list or in combination with a fan shelf by choosing an item from this list.

Lugs

GA	Description	WP-91412 List	Ordering Code	Burndy Equivalent	Similar Lugs NOTE: May have different dimensions.	
					Panduit	T&B
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

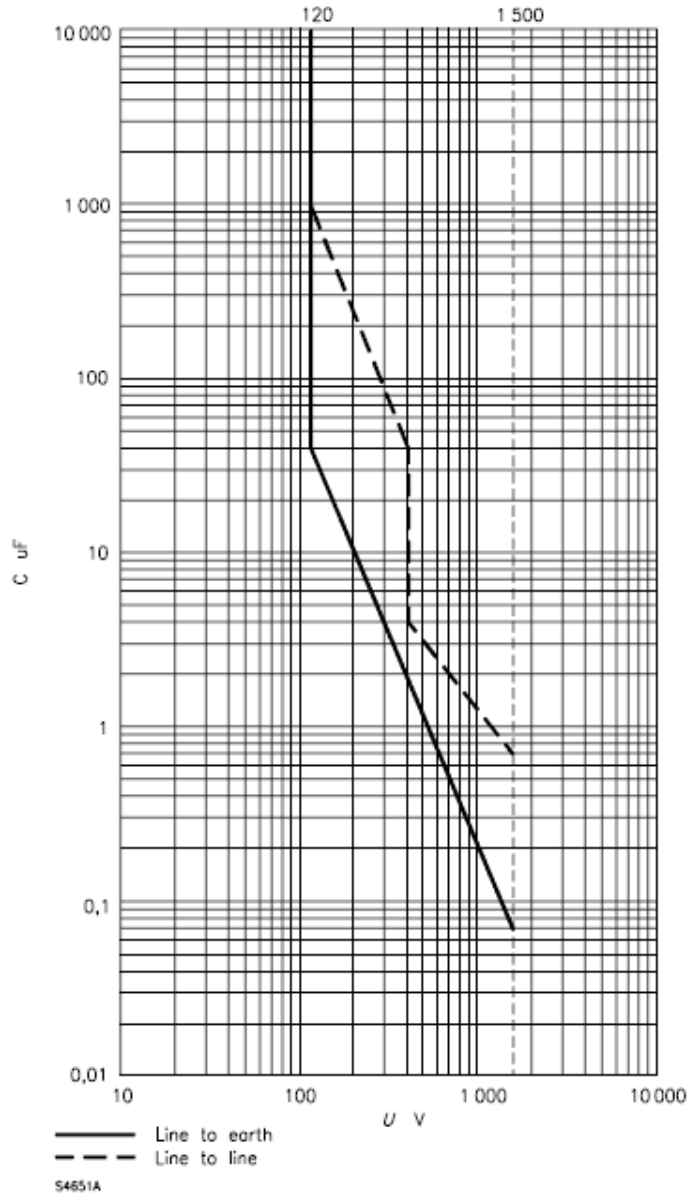
4. Safety

Safety Statements

Please read and follow all safety instructions and warnings before installing, maintaining, or repairing the CPS3200U System:

- The CPS3200U platform is Underwriters Laboratories (UL) Listed per UL60950-21.
- CPS3200U shelves have high, current limited, voltages on the output connectors with ground fault protection.
- For the product to be safe the chassis must be grounded by a permanent means.
- The return conductor of the -48V shall be terminated in the ground window, (held at frame ground potential).
- 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.
- The telecommunication line cable, carrying the +/-190V inside the cabinet between the equipment and the primary protectors, shall be minimum 26 AWG, and rated minimum 200V. Consideration shall be taken at the time of installation to verify cable rating.
- Primary protection must be provided on all the telecommunication line cable consistent with UL 497.
- Airflow must be provided at a rate of 175 lfm across the entire cross section of the shelf for operation in environments up to 65 C, when measured at the inlet of the warmest converter shelf.
- 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).
- For multi-shelf systems (up to 3), this equipment has been evaluated for continuous use in central office environments with ambient temperatures from -40°C to 50°C when used with the QS982A converters. For multi-shelf systems (up to 2), this equipment has been evaluated for continuous use in outside plant cabinet, CEV, and hut applications with ambient temperatures from -40°C to +75°C. Proper airflow is required in all cases to ensure maximum performance.
- 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 requirements and all local requirements for proper connections. All national and local rules and regulations should be followed when making field connections.
- The subject product is not provided with a dc mains disconnect. Provision for mains disconnect such as branch circuit breakers shall be provided by the end product installation.
- The main output voltage (+/-190V) meets UL60950-21RFT-V requirements. DO NOT CONNECT TO RFT-C CIRCUITS.

- 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.
- 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 (TB1) 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 panel must not exceed 10,000A.
- DC branch circuits to this equipment must be protected with either fuses or circuit breakers. Refer to the equipment ratings to assure rating of equipment will not exceed 80% of the value of the protector chosen.
- For applications in cabinets, huts, vaults, and central offices, the CPS3200U mounting framework must be connected to the system integrated ground grid.
- Installing fuses or circuit breakers not specified for use in these 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.
- The designed capacitance between +/-190V RFT-V conductors is 2.2uF and the measured capacitance between +/-190V and earth is 4.4uF. DO NOT add capacitance to the system to reach values that exceed safety limits per the following figure:



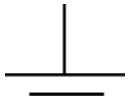
Key

U Voltage of the RFT CIRCUIT

Figure 2 Capacitance Safety Limits

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 ifthe hazard is not avoided.
CAUTION	Indicates the presence of a hazard that will or can cause minor personal injury orproperty 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 hazardous ac mains voltage.
	This symbol is used to identify the presence of hazardous ac or dc voltages. It mayalso 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 sometype 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 thiswith a lightning bolt through the hand also means that the part 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 andsparks. 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 dc inputs. Ensure that the appropriate circuit protection device for each dc input is disconnected before servicing the equipment. Do not disconnect permanent bonding provisions unless all dc inputs are disconnected.
- DC inputs may be connected in parallel to power the dc-dc converters. Disconnecting one dc input will not necessarily remove power from the bus. Make sure all battery power sources are 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 QS982A modules, hazardous voltages (+/-190Vdc) will be present on the output connectors and associated interconnection cables.

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.
- Do not rely on simple volt meter tests to determine if the +/-190V output circuit is off line. Physically break the circuit by removing the associated QS982A converter before touching the +/-190V RFT-V circuit. Confirmation test each circuit for 5 seconds before touching. In some line fault modes, power is cycled on every 4 seconds. The presence of a fault may make it difficult to determine if the circuit is online. Always physically break the circuit.
- 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.

This page intentionally left blank

5. Pre-Installation

CPS3200U Installation

Purpose

CPS3200U Shelf Installation guide for generic installations. Additional requirements are needed for application specific installations. Refer to Appendix A for spacing requirements.

Audience

Field application personnel

Precautions

Read Safety section prior to installation.

Observe ESD protection while installing circuit packs

Safety

- Always consider personal safety.
- Make sure the system is properly grounded per the National Electrical Code, local building codes, and any specific company requirements per standard practice.
- Remove all metal jewelry before beginning the installation.

Installation Tools

- A Complete Standard Insulated tool set
- Wire cutters and strippers
- Heat shrink gun
- Torque wrench (0-240 in-lb / 28 Nm)
- Sockets
- Digital meter, +/- 0.02%
- Screw Drivers (flat-blade and Phillips)
- ESD wrist strap

System Identification

Identify the product you have received. Make sure to select procedural steps to match the product you have.

This page intentionally left blank

6. Installing the Shelf Level Upstream Product

Unpacking Shelf Level Upstream Product

Make sure the framework has the space and the airflow to provide an acceptable operating environment for the CPS3200U shelf. Then unpack the equipment.

Step	Action
1.	Before opening the packaging, carefully inspect the outside in the presence of shipping personnel for signs of damage.
2.	Carefully open the packaging to verify that the contents are complete and undamaged.
3.	If damaged, follow the shipping carrier's procedure for filing a damage claim.
4.	Save the shipping package until all parts are operating within specifications. If the equipment must be returned, it should be repacked in the original shipping crate.

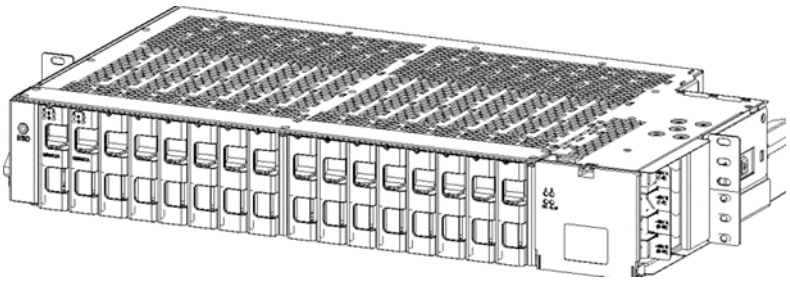
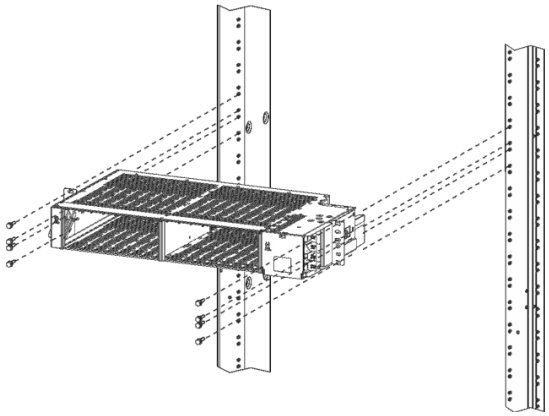
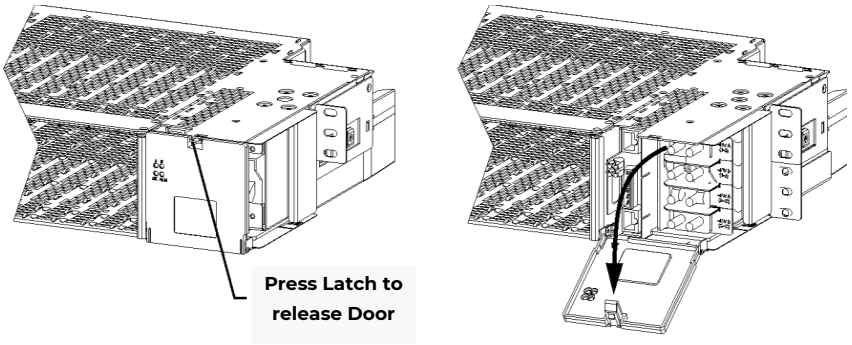
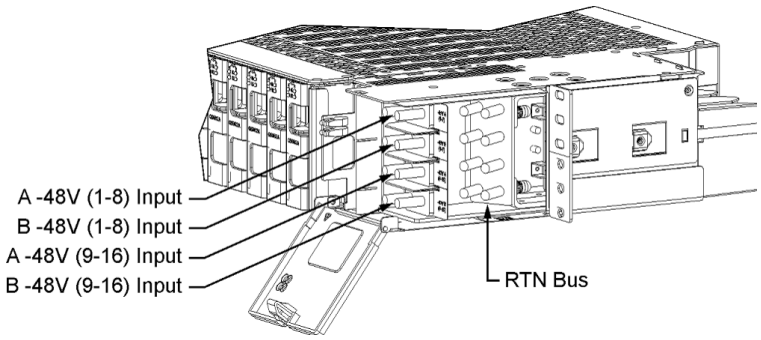


Figure 3 QS912A Converter Shelf
(Shown configured with 2 operational circuits and 14 slot fillers for airflow control)

Installing and Powering the CP3200U Converter Shelf

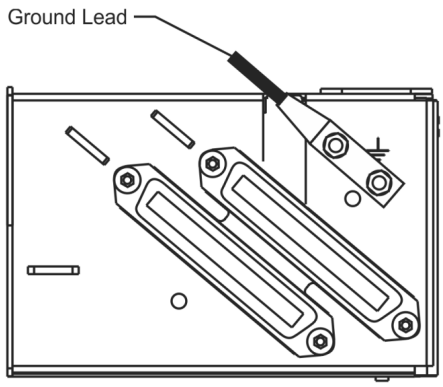
Position the Shelf and mechanically attach it to the frame

Step	Action
1	Locate the 2 mounting brackets, one on each side of the CPS3200U shelf; align the holes in the shelf mounting bracket with the holes in the mounting frame. Attach the brackets to the frame using two screws per frame as shown.  **Figure 4 Mounting the Converter Shelf**

Step	Action
2.	Torque each of the fasteners to 4 Nm or 35 in-lbs.
3.	Make sure the DC connections to be installed are not powered by turning off circuit breakers assigned tothis frame and checking with an Ohm meter.
4.	Open the distribution panel door on the right end of the shelf.  **Figure 5 Preparing to Make DC Connections to Converter Shelf**
5.	Run 4 DC branch circuits back to the -48V source**-** Each feed supplies half of the shelf. A&B feeds for side 1 and A&B feeds for side 2. Size each circuit to support 42 Amp List 2 Drains. Note: Lug landings are ¼ inch studs on 5/8 inch centers. Use a minimum of 6 AWG conductor for environments up to +65°C (reference NEC Table 310-16for applications of not more than three conductors in a raceway and correction factors for Ambient Temperatures Over 30°C). Each installation will vary and the installer should review NEC cabling requirements as well as local practice to ensure proper cable sizing is achieved for the local conditions. Lugs for 6AWG conductor are as follows or available equivalent:T&B 6STR30W Burndy YAV6C-L2TC14-FX
6.	Using the hardware supplied, attach the return wires for all 4 circuits.  **Figure 6 Making DC Connections to Converter Shelf**
7.	Using the hardware supplied, attach the A and B -48V conductors for side 1 (Slots 1-8).
8.	Using the hardware supplied, attach the A and B -48V conductors for side 2 (Slots 9-16).
9.	Torque each of the ¼ - 20 fasteners to 7 Nm or 65 in-lbs.
10.	Close the distribution door.
11.	Proceed to Grounding the Shelf.

Ground the Shelf

The next step is to ground the shelf to earth ground. This is an important safety step since each converter relies on this connection for proper ground fault detection

Step	Action
1.	Run and connect the framework ground lead as shown.  **Figure 7 Grounding Converter Shelf**
2.	Use 6GA conductor minimum and connect to the safety grounding point (frame ground, or main ground bar) per local practice. Additionally apply NO-OX ID to all bare metal connections if required by local practice. Lugs are ¼ inch studs on 5/8 inch centers. Lugs for 6AWG conductor are as follows or available equivalent: T&B 6STR30W Burndy YAV6C-L2TC14-FX
3.	Torque connections to 4 Nm or 35 in-lbs.

Attach the Load Wiring

Provide a circuit from each converter into the designated network telephone pairs. Follow the steps in the table below to attach load wiring to the CPS3200U shelf.

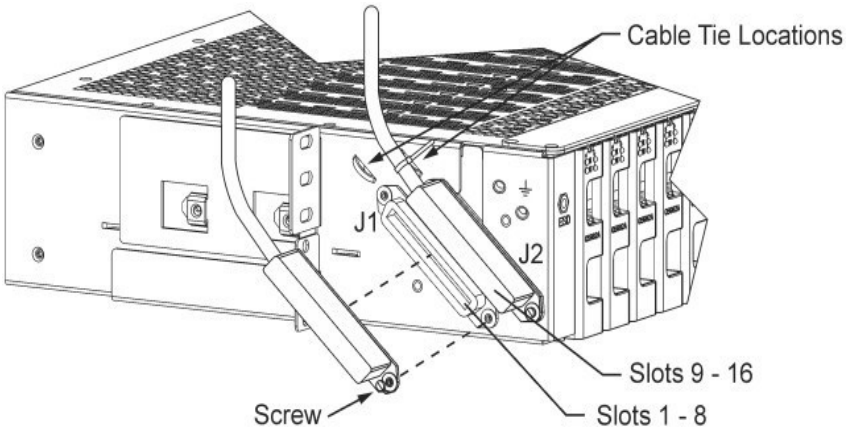
Step	Action
1.	The wiring assignment information in the following table provides the appropriate connections for each circuit. A cable should be provided with this pinout configuration to terminate the J1 and J2 output connectors on the CPS3200U Shelf.

- Wire set Connector: RJ-21 type 50 pin plug:
  - 22 AWG solid or stranded AMP 552173-1 or equivalent.
  - 24 AWG solid or stranded or 26 AWG solid AMP 229974-1 or equivalent.
  - The connector shall be arranged with a right angle housing such that the cable exits to the pin 1 side.

Connector for Circuits 1-8 (Shelf J1)						Connector for Circuits 9-16 (Shelf J2)					
Conv Out	Pos	Color	Conv Out	Pos	Color	Conv Out	Pos	Color	Conv Out	Pos	Color
1a-	1	BL / W	1a+	26	W / BL	9a-	1	BL / W	9a+	26	W / BL
1b-	2	O / W	1b+	27	W / O	9b-	2	O / W	9b+	27	W / O
2a-	3	G / W	2a+	28	W / G	10a-	3	G / W	10a+	28	W / G
2b-	4	BR / W	2b+	29	W / BR	10b-	4	BR / W	10b+	29	W / BR
3a-	5	SL / W	3a+	30	W / SL	11a-	5	SL / W	11a+	30	W / SL
3b-	6	BL / R	3b+	31	R / BL	11b-	6	BL / R	11b+	31	R / BL
4a-	7	O / R	4a+	32	R / O	12a-	7	O / R	12a+	32	R / O
4b-	8	G / R	4b+	33	R / G	12b-	8	G / R	12b+	33	R / G
5a-	9	BR / R	5a+	34	R / BR	13a-	9	BR / R	13a+	34	R / BR
5b-	10	SL / R	5b+	35	R / SL	13b-	10	SL / R	13b+	35	R / SL
6a-	11	BL / BK	6a+	36	BK / BL	14a-	11	BL / BK	14a+	36	BK / BL
6b-	12	O / BK	6b+	37	BK / O	14b-	12	O / BK	14b+	37	BK / O
7a-	13	G / BK	7a+	38	BK / G	15a-	13	G / BK	15a+	38	BK / G
7b-	14	BR / BK	7b+	39	BK / BR	15b-	14	BR / BK	15b+	39	BK / BR
8a-	15	SL / BK	8a+	40	BK / SL	16a-	15	SL / BK	16a+	40	BK / SL
8b-	16	BL / Y	8b+	41	Y / BL	16b-	16	BL / Y	16b+	41	Y / BL
spare	17	O / Y	spare	42	Y / O	spare	17	O / Y	spare	42	Y / O
spare	18	G / Y	spare	43	Y / G	spare	18	G / Y	spare	43	Y / G
spare	19	BR / Y	spare	44	Y / BR	spare	19	BR / Y	spare	44	Y / BR
spare	20	SL / Y	spare	45	Y / SL	spare	20	SL / Y	spare	45	Y / SL
spare	21	BL / V	spare	46	V / BL	spare	21	BL / V	spare	46	V / BL
spare	22	O / V	spare	47	V / O	spare	22	O / V	spare	47	V / O
spare	23	G / V	spare	48	V / G	spare	23	G / V	spare	48	V / G
spare	24	BR / V	spare	49	V / BR	spare	24	BR / V	spare	49	V / BR
*FR GRD	25	SL / V	*FR GRD	50	V / SL	*FR GRD	25	SL / V	*FR GRD	50	V / SL

Table 3 Output Connector Pinout

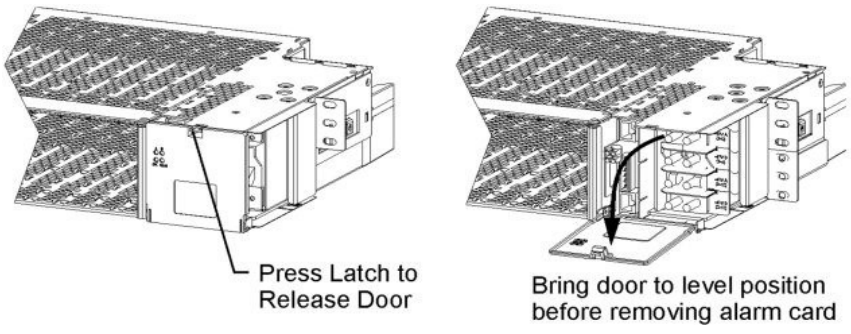
* EMI performance is enhanced when the output cable shield is grounded only at the CPS3200 end of the shield. Attach output cabling as shown

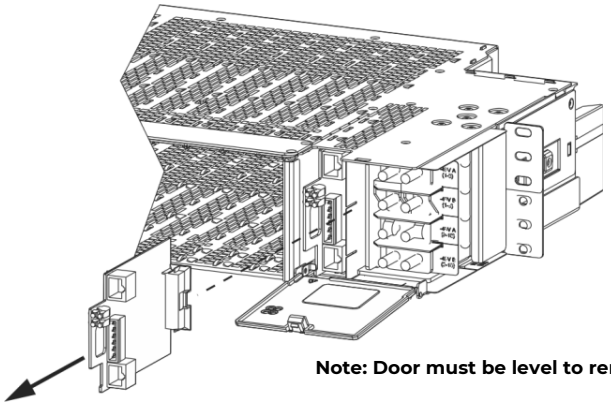
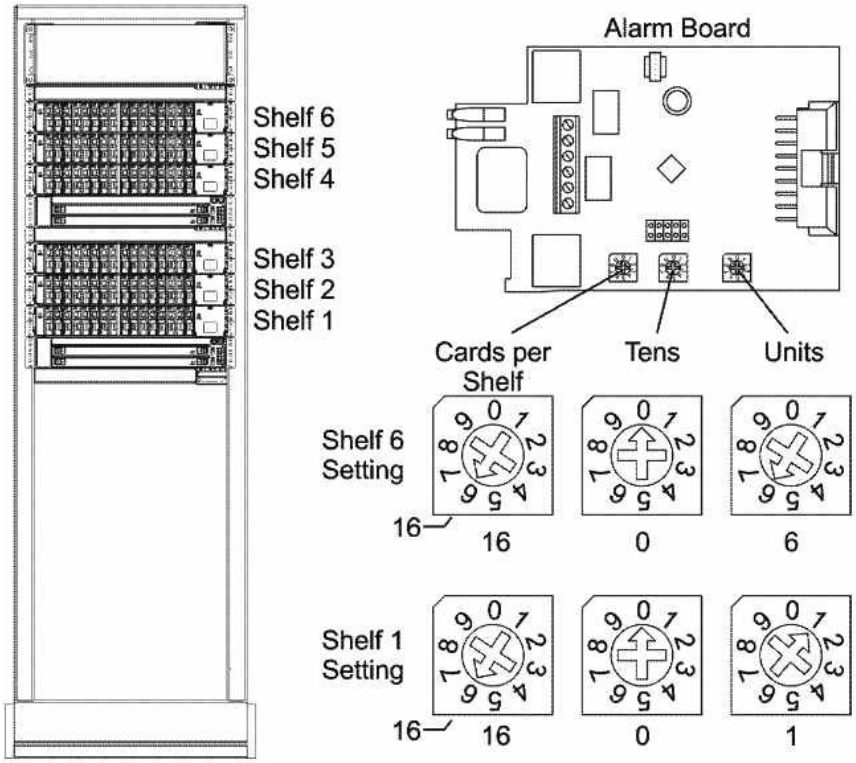
Step	Action
2.	Mark or tag the 25 pair cables on the unterminated end with J1 and J2 to differentiate the two cables at the splice chamber.
3.	Run the cable down the frame and attach as shown.  **Figure 8 Output Wiring for Converter Shelves**
4.	Use Screw and Cable tie to secure.

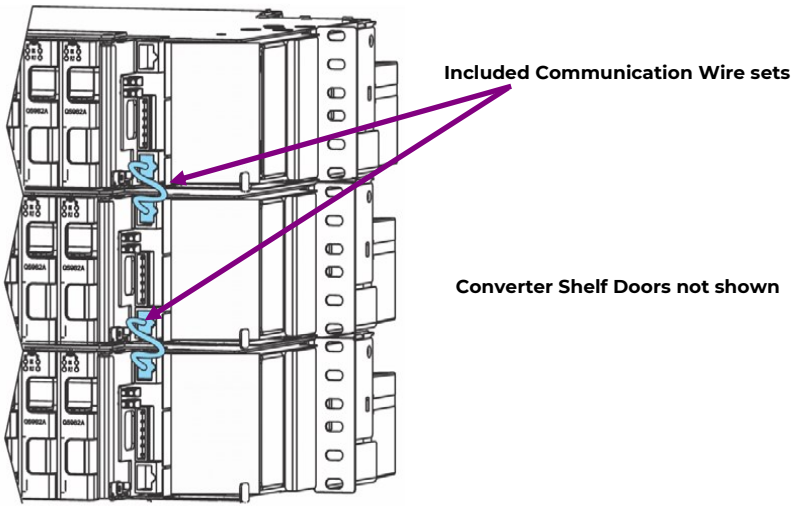
Set Shelf ID and Attach Alarm Wiring

For systems where alarming is processed through a central controller using serial communications, each shelf must have a unique address. Otherwise all alarm cards should be left in their factory default state of address 0, 0. Skip this step if no QS941 will be present in the system.

Warning: You must properly protect yourself against ESD discharge prior to accessing the alarm card and setting shelf IDs.

Step	Action
1.	Open the distribution door. 

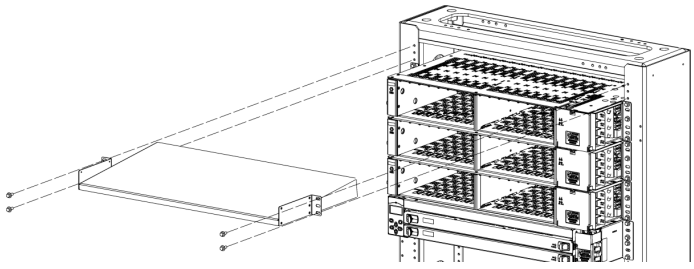
Step	Action
2.	Remove the alarm card  **Note: Door must be level to remove alarm card** **Figure 10 Removing Alarm Card**
3.	Use a Phillips Head screw driver to set the shelf address rotary switch to indicate a shelfID. For most applications the only switch requiring adjustment will be on the far right labeled 'Units.' Start with shelf 1 at the bottom and progress to higher numbers as one goes up the frame. This figure shows settings for shelf 1 and shelf 6 as examples.  **Figure 11 Setting Shelf ID**
4.	If local contact closures are also desired continue with Attach Alarm Wiring, otherwise reinstall alarm card and close door.

Step	Action
5.	Attach signal wiring between the Alarm Cards of adjacent Converter Shelves.  **Figure 12 Signal Wiring between Converter Shelves**

Installing the Baffle

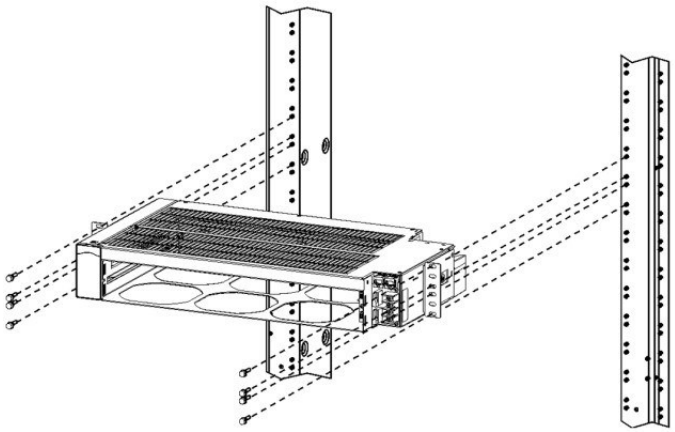
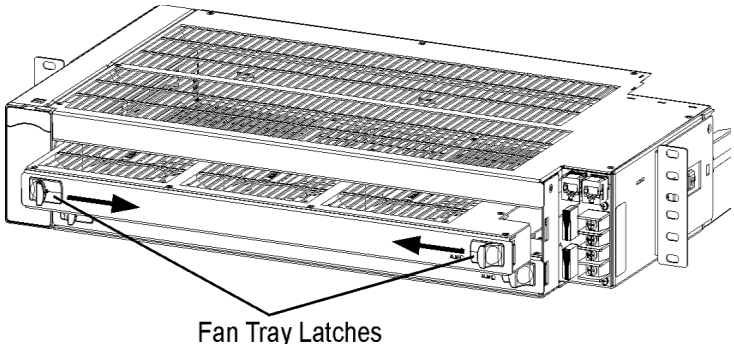
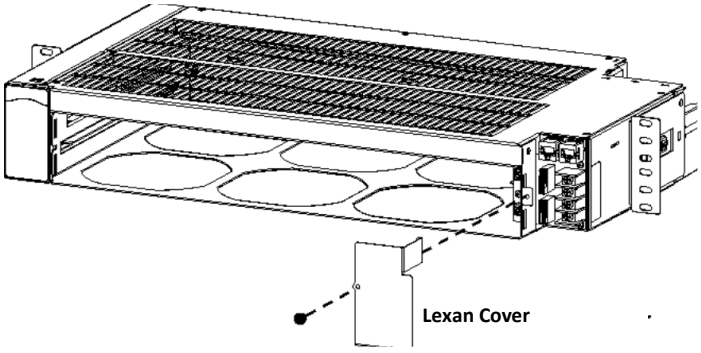
Purpose: Redirect air coming into, and objects falling down toward, the FTTN shelf. Follow the steps in the table below to attach a baffle above the FTTN shelves for all CO or customer premise applications. The baffle has two purposes: 1) redirect air toward the back isle so that components located below the FTTN shelves will not over heat, and 2) Keep objects from falling into the FTTN shelf. The baffle can either be fixed at a height above the Fan Shelf to allow for three CPS3200U Shelves or be removed and reattached every time a CPS3200U shelf is added.

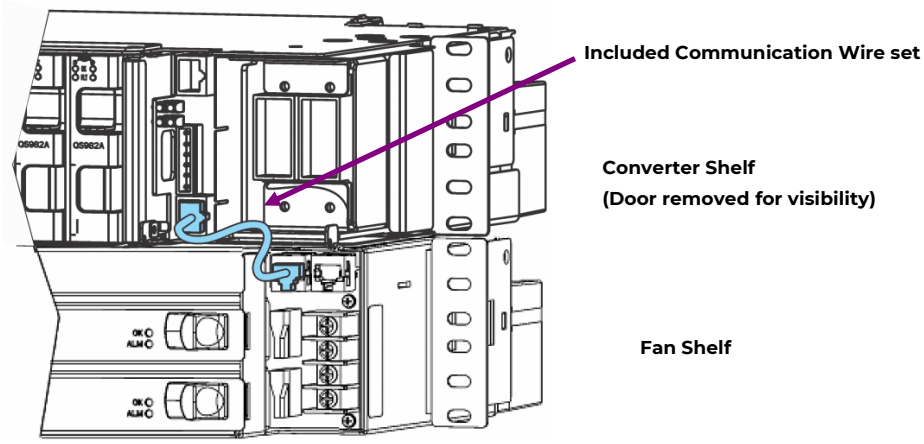
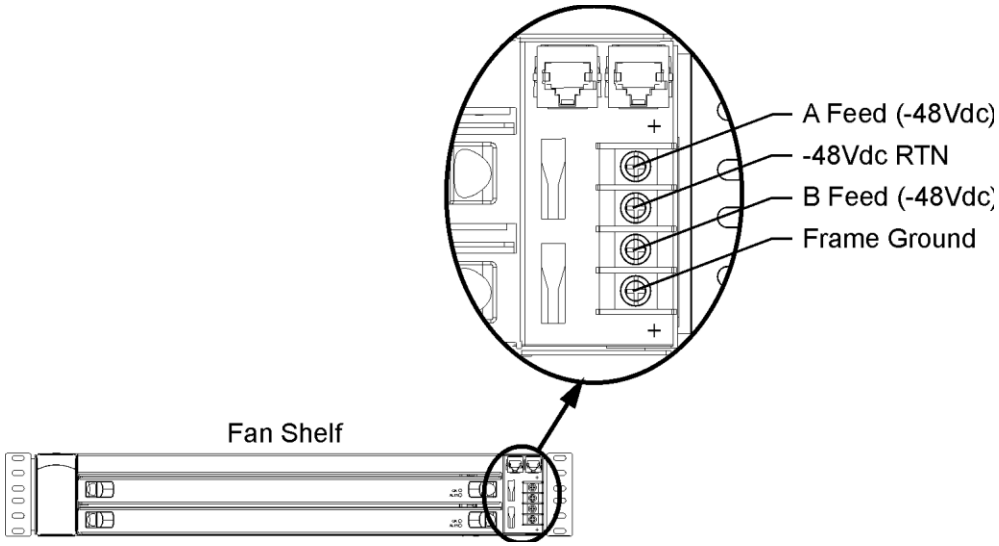
Note: There are two to airflow options provided for different applications: Airflow direction optimized for CO deployments provided by the FTTN fan shelf is downward. Airflow direction for OSP applications is bottom to top. Baffles should be oriented to direct cold air from the aisle through the converter shelf and out the back of the rack. A filter is available and should be utilized in high contaminant areas with proper filter maintenance.

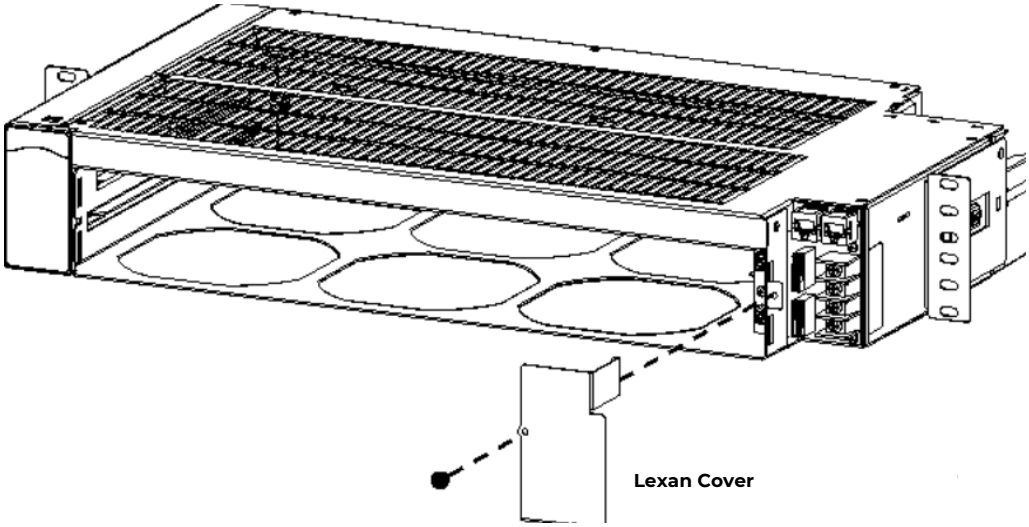
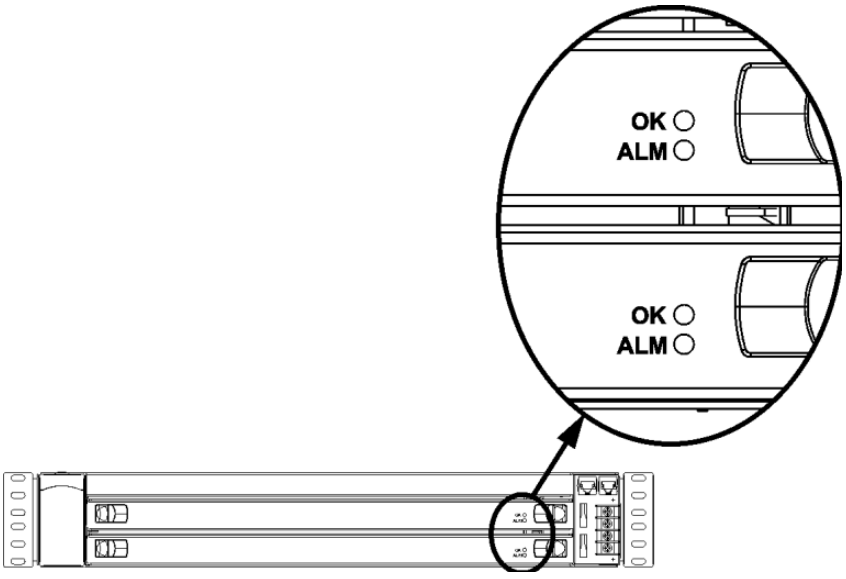
Step	Action
1.	Install the baffle using as many fasteners as the frame will accept as shown:  **Figure 13 Installing a Baffle**

Installing the Fan Shelf

CPS2300U shelves require external forced air. Follow the steps to install a fan shelf below each set of 3 CPS3200U shelves.

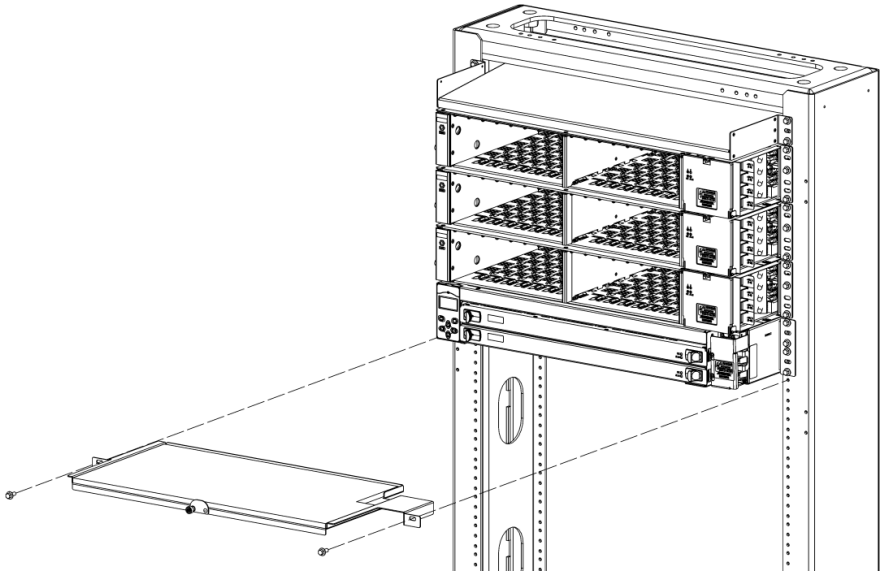
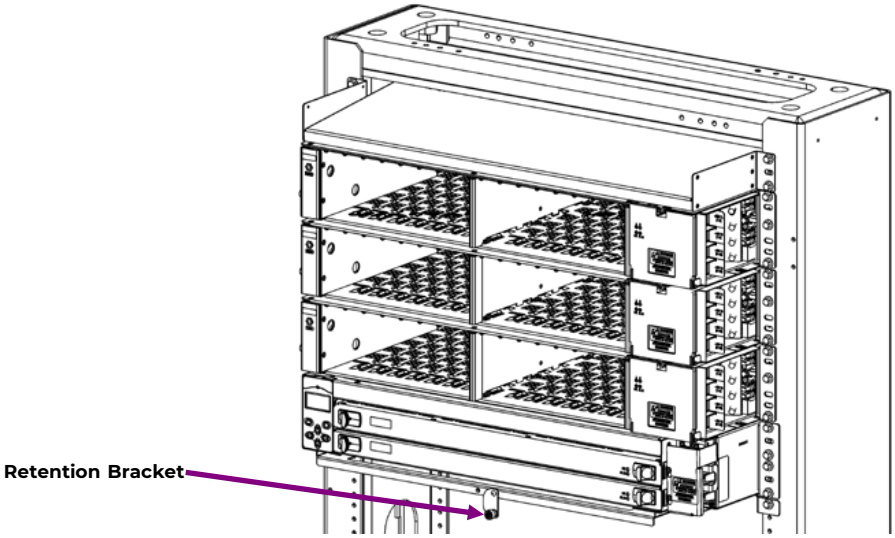
Step	Action
1.	Install the Fan Shelf using as many fasteners as the frame will accept:  **Figure 14 Mounting the Fan Shelf**
2.	Insert two fan trays operating the latches as shown:  **Figure 15 Inserting Fan Trays**
3.	Remove the clear plastic cover from the wiring area:  **Figure 16 Open the Wiring Region of the Fan Shelf**

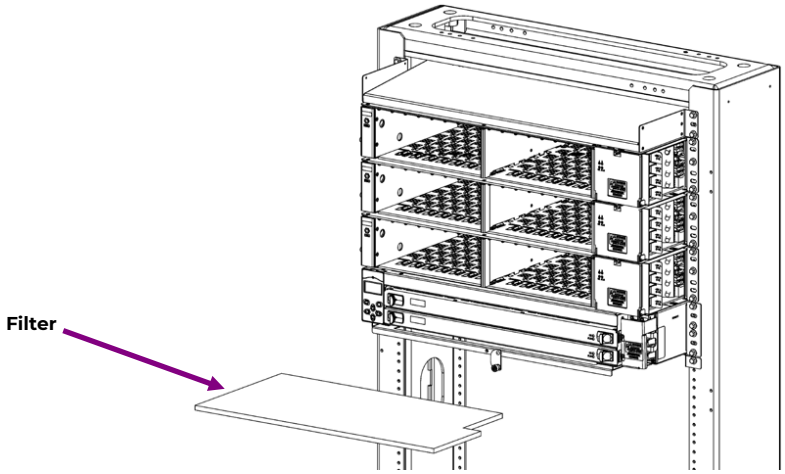
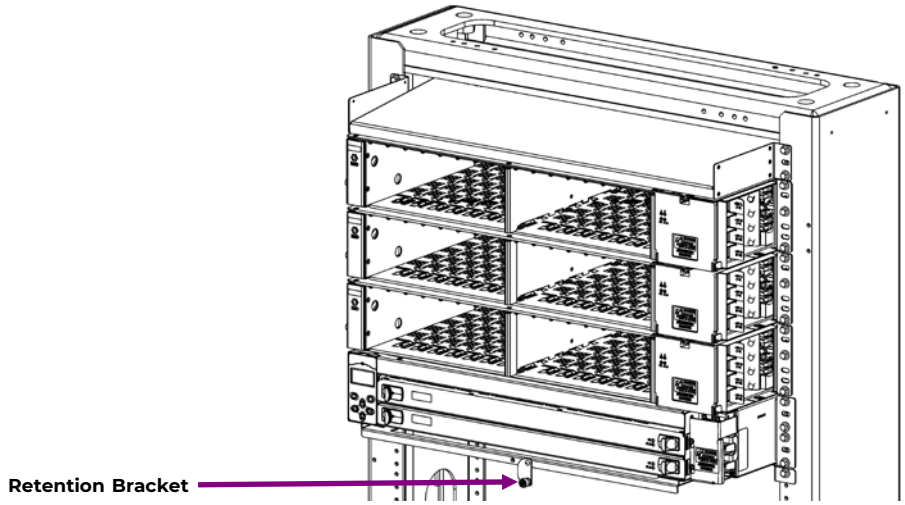
Step	Action
3.	Attach signal wiring from the fan shelf to the alarm card in the converter shelf immediatelyabove the fan shelf.  **Figure 17 Alarm Wiring for Fan Shelf**
4.	Attach de-energized DC cabling (typically 14 AWG) as shown here. Use ring lugs or alternate per local practice. Fuse externally at 5 Amps. Note: Returns for the A and B feeds are shared on the -48Vdc RTN. The lowest position on the terminal block is to provide frame ground for the fan shelf. Power feeds should be derived from a fuse or breaker panel using discrete cabling which is independent from the converter shelf.  **Figure 18 DC Cabling Fan Trays in CPS3200U Systems**

Step	Action
5.	Replace the clear plastic (Lexan) cover and apply DC power.  **Figure 19 Cover the Wiring Region of the Fan Shelf**
6.	Check LED Display on each fan tray for proper operation.  **Figure 20 Fan Tray LEDs**
7.	Resolve Alarm states by first assuring that DC power is being provided to both the A and the Bterminals on the shelf or Bay and then by replacing fan trays until the alarm clears.

Installing the Filter Bracket and Filter

CPS3200U system has optional filters to provide a degree of protection from airborne particulate matter. Follow the steps to install a filter bracket adjacent to the fan shelf. The example shown is for a separate filter bracket for bottom to top airflow solutions. Top to bottom airflow applications require the filter to be above the system.

Step	Action
1.	Install the Filter Bracket directly below the fan shelf as shown.  **Figure 21 Mounting the Filter Bracket**
2.	Loosen the filter retention screw and rotate retention bracket down.  **Figure 22 Filter Retention Bracket**

Step	Action
3.	Slide the filter in to the filter bracket.  **Figure 23 Install Filter**
4.	Rotate retention bracket back into place and tighten screw.  **Figure 24 Secure Filter Retention Bracket**

7. Inspect the Network - Check and Mark WiringCompliance

The CPS3200U +/-190V system is classified as an A3 circuit tested according to GR-1089-CORE Issue 6. As such, each location in the network where the output is available to be touched must be protected and marked as an A3 voltage.

<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>1.</td><td>Is accessibility to the circuit throughout the network consistent with A3 requirements?
<table>
<tr><th>Voltage Class</th><th>General public</th><th>Employees</th><th>Craftsperson's</th></tr>
<tr><td>A1</td><td>Restricted access</td><td>Exposed</td><td>Exposed</td></tr>
<tr><td>A2</td><td>Inaccessible</td><td>Restricted access</td><td>Exposed</td></tr>
<tr><td>A3</td><td>Inaccessible</td><td>Inaccessible</td><td>Restricted access
(Exceptions)</td></tr>
</table>
Table 7-1 accessibility to continuous class – A voltage</td></tr>
<tr><td>2.</td><td>Is the 5-pin protector marked as a special circuit?</td></tr>
<tr><td>3.</td><td>Does the 5-pin protector protect each pair to a level corresponding to a CommScope 3C*EW Gas tube primary protector? This protector has a voltage breakdown range of 265-465 Volts and an impulse spark over range of <265-700 Volts. Protectors with a lower voltage breakdown rating will be problematic.</td></tr>
</table>

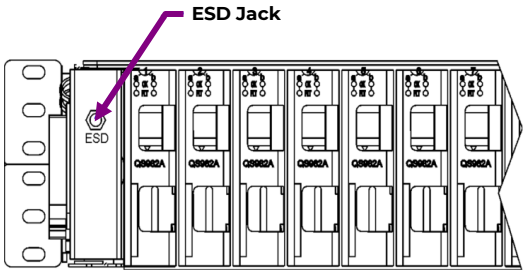
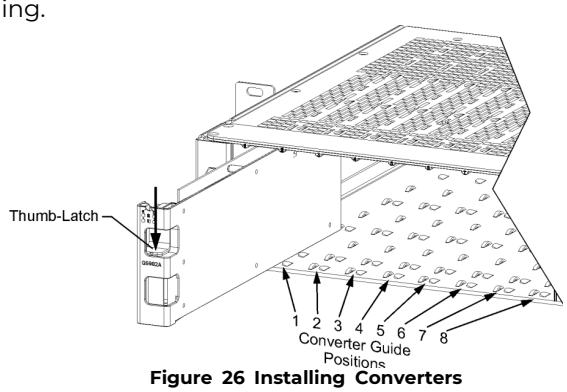
To meet UL60950-21 specific procedural steps must be taken at the time of installation. This section goes through those steps. These steps should be performed before power is distributed in the network. Normally the final step is performed by closing the circuit using a 5-pin protector after DC power is applied to the system

Step	Action
1.	Recognize that the Remote Feed Telecommunication Voltage limited (RFT-V) circuit is voltage limited to +190V and -190V from ground.
2.	Is the total capacitance to ground on each line of the circuit less than 10μF? The QS982A introduces 4.4μF. The remote electronics and line must introduce less than 5.6 μF of capacitance.
3.	Is the total capacitance line to line of the circuit less than 40μF? The QS982A introduces 2.2μF. The remote electronics and line must introduce less than 37.2 μF of capacitance from tip to ring.
4.	Is the remote equipment also a RFT-V voltage limited circuit? Both ends of the circuit must be designed to the same standard. This must be verified before the equipment isconnected together.
5.	Is the voltage rating of the Network Wiring sufficient to support 190V to ground?
6.	Is the chassis of the system bonded to ground? Verify by both observation and measurement before powering the system. Measurement from the exterior of the CPS3200U shelf to the cabinet ground bus should indicate continuity as determined via a meter providing an audible beep or the standard method of continuity verification used inthe network. Many network providers use a value of 10 ohms.
7.	Test each circuit by powering an open circuit at the remote end of the wire with a QS982 output. If red lights do not flash, there is no leakage path to ground at operating voltage. If the FLT light does not blink yellow, there is no hard short between tip and ring.

8. Final Installation

Installing the Converters

QS982A Converters mount in the CPS3200U shelf. Note that Converter Card numbering starts from the left and shouldbe correlated to the marking on the panel located on the other end of the load cable that plugs into J1 and J2. This may be a cross connect panel or the 5-pin protector block near the building entrance.

Step	Action
1.	**Warning:** You must properly protect yourself against ESD discharge prior to installing the QS982A Controller.
2.	Use the ESD jack on the left of each converter shelf to provide grounding before removingthe QS982A converters from their anti-static wrap:  **Figure 25 Shelf Level ESD Jack**
3.	Remove the QS982A converter from its shipping container.
4.	Align the plastic converter housing on the right and insulated circuit board on the left.
5.	Guide the converter into the first available slot by positioning the plastic converterhousing in the notch on the top right edge of the opening.  **Figure 26 Installing Converters**
6.	Slide the converter into the shelf until it is fully seated in the connector on the rear of theCPS3200U shelf.
7.	Push the display faceplate into the shelf until the latch on the top of the converterhousing catches.
8.	Repeat this process as needed for your application.
9.	Insert empty slot fillers into all unused slots to control airflow in multi-shelf systems

Apply DC Power

Apply DC power by turning on input fuses or circuit breakers. Power the fan shelf and the converter shelf simultaneously. The system will operate from voltages between -40 and -60 volts with normal status at feed voltages between -52 Volts and -54.5 Volts.

Fault LEDs will flash red until communications is established between the alarm card and each converter. The alarm card will flash its fault LED until connection is confirmed to the QS941, if present. If no QS941 is present the alarm cards will flash their red LED until they are set to address 0, 0 as described in the **Set Shelf ID and Attach Alarm Wiring** section.

Complete UL 60950-21 step 7 under Inspect the Network to test each circuit after DC power is applied.

Recognizing Normal States

Once power is provided to the CPS3200U system the LEDs on the converters will illuminate. Understanding what theLEDs mean allows one to recognize normal states and diagnose abnormal states.

Step	Action
1.	Observe the LEDs.
2.	Use the state table below to determine the state of the system and required corrective actions if needed.

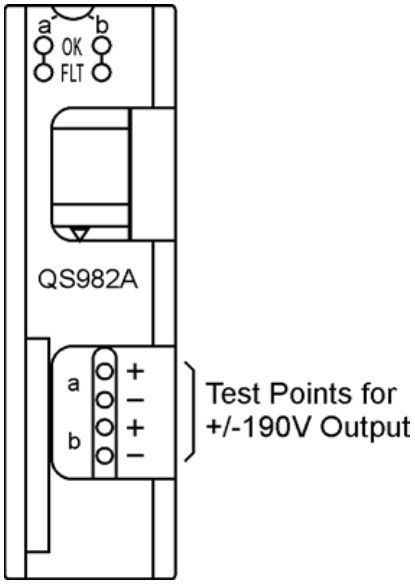


Figure 27 QS982A Faceplate and LEDs

(Note: Test points work best if each voltage is measured with respect to ground)

QS982A LED Information Map

Examples in the table are shown for conditions on the b circuit of the QS982A card. The same reasoning applies whenthe "a" circuit LEDs are illuminated

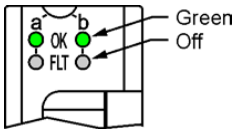
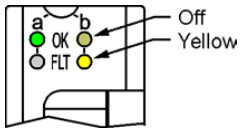
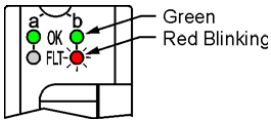
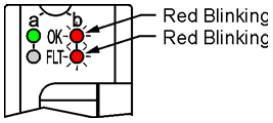
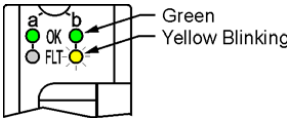
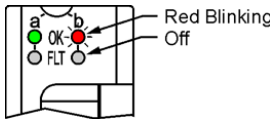
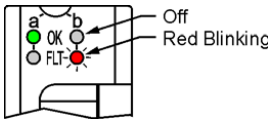
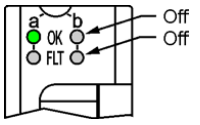
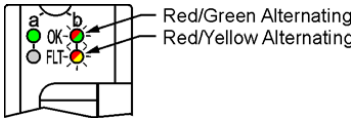
LED Display	Conditions (on b circuit)	Action Required
	All OK	None
	Circuit Placed in Standby	None depending on desired state of circuit b. Standby statecan be set using the QS941 controller or web browser.
	Loss of comm.	Check seating on Alarm card and converter card
	Ground fault	Check 5 pin protectors and faults to ground
	Overcurrent or undervoltage	Check output lines for shorts toeach other
	OV or internal failure	Replace unit
	Thermal Alarm	Solve Thermal problem
	card not powered or inputfuse failure	Check source voltage
	Lamps test requested fromcontroller	Observe Lamp Test

Table 4 QS982A LED Information Map

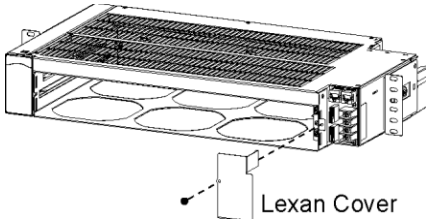
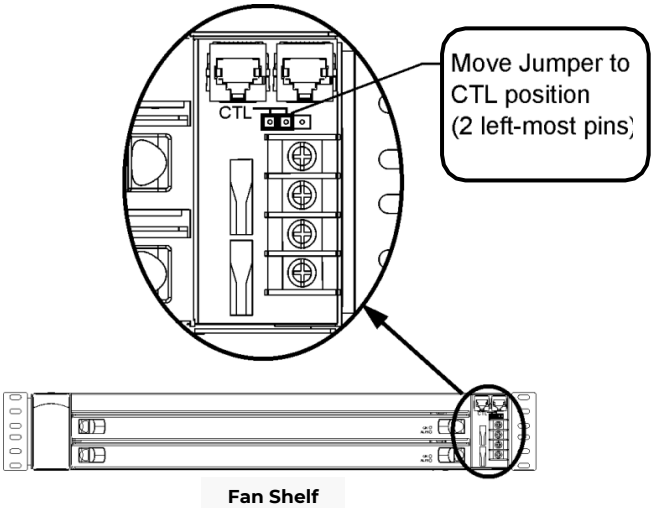
Confirm Operation of Alarm Wiring

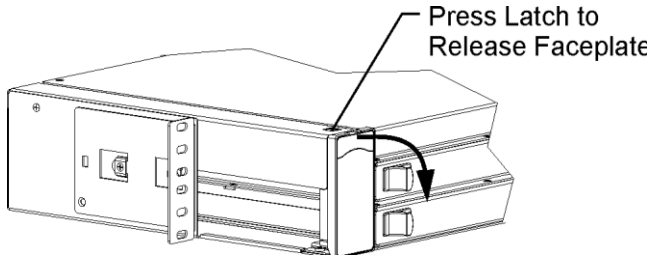
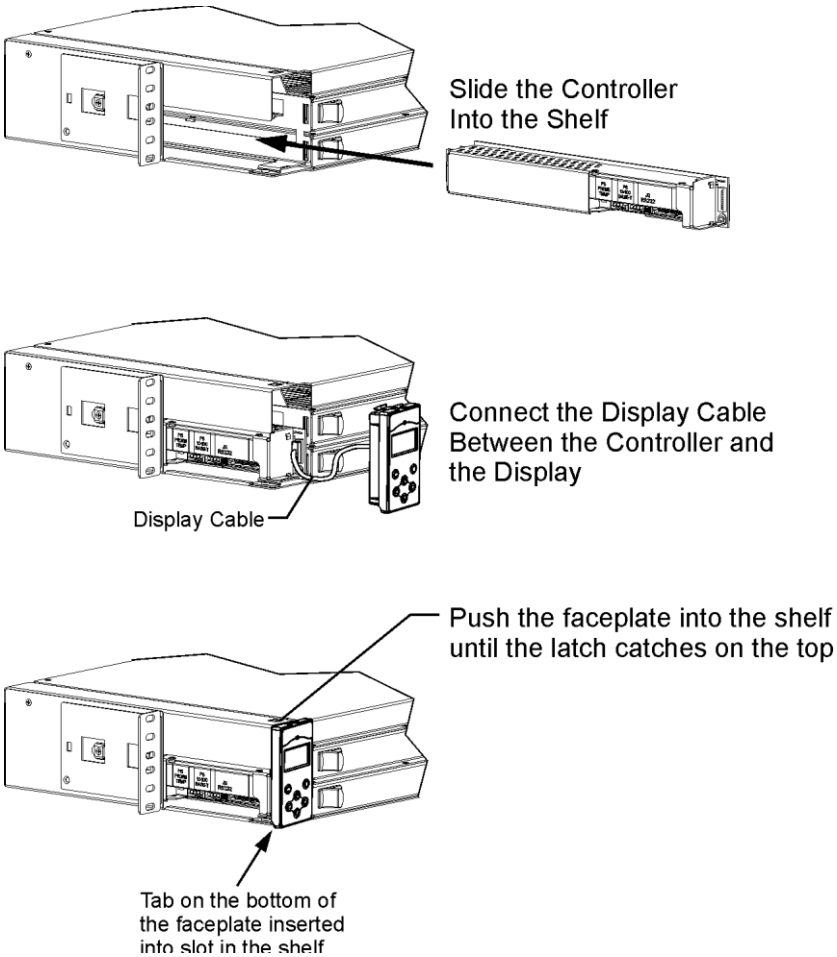
After the converters are recognized to be in a normal state, one should confirm the proper operation of the alarm contact closures. If alarm wiring is correct:

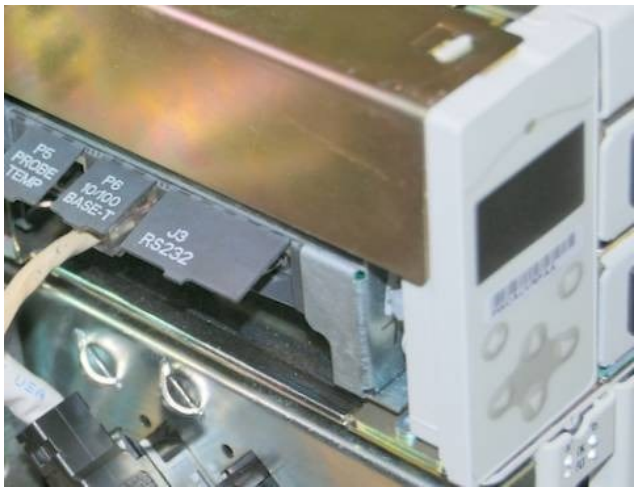
1. The loss of A or B input power should result in the assertion of a Power Minor.
2. The loss of both A and B input power, which will result in a loss of service, should result in a Power Major and a Power Minor.
3. If a controller is installed in the system then it will demonstrate an alarm state by turning the display red. Using the buttons on the keypad the specific alarm can be retrieved by pressing the Back ⬅ Arrow, When the system returns to normal function the display will be green.

Installing the QS941A Ethernet Module

To connect CPS2300U shelves to an IP Drop, follow these steps to install QS941A Ethernet module.

Step	Action
1.	Remove the cover from the right hand end of the fan shelf that will house the controller.  **Figure 28 Fan Shelf Right Hand Cover**
2.	Move the controller jumper on the selected fan shelf into the leftmost position. Warning: Controller may be damaged if this step is notcompleted.  **Figure 29 Fan Shelf Controller Jumper**
3.	Replace the cover over the right hand end of the shelf.

Step	Action
4.	Remove the faceplate on the left end of the fan shelf:  **Figure 30 Preparing a Fan Shelf for a CPS Controller**
5.	Install the controller into the fan shelf:  **Figure 31 Installing the Controller**

Step	Action
6.	Attach signal wiring to the controller at connector P6. The Ethernet connection to the localnetwork is made through the P6 RJ45 connector. Of the two RJ45s on the left side of the controller, P6 is the one more toward the front labeled: P6 10/100 Base-T. Plug the local network cable into P6. As shown here:  **Figure 32 Controller Wiring**
7.	To check the network connection, use the controller display to determine what IP address has been assigned to the QS941 controller. Press the square key, ■, on the upper right hand corner of the keypad to display the menu.
8.	Press the down arrow key, ▼, 2 times to scroll down to the “Status” item on the menu.
9.	Press the right arrow, ▶, to advance to the “Status” menu.
10.	Press the down arrow key, ▼, 8 times to scroll down to the “Network Settings” item and selectby pressing the right arrow key.
11.	Press the right arrow, ▼, to advance to the “Network Settings” menu.
12.	Press the right arrow, ▶, to select Port 1. The P6 connector is Port 1.
13.	Read and record the network address for Port 1.
	When an IP address is listed connection to the server is confirmed.

Step	Action
14.	Check the other end of the fan shelf to make sure the serial bus reaches all of the shelves in thesystem. RS-485 signals are Daisy Chained from all the elements in the system. The signal from equipment located in the frame above the controller typically comes through the RJ45 jack on the left. The jack shown here on the right will typically accept information from equipment mounted below the fan shelf containing the controller:

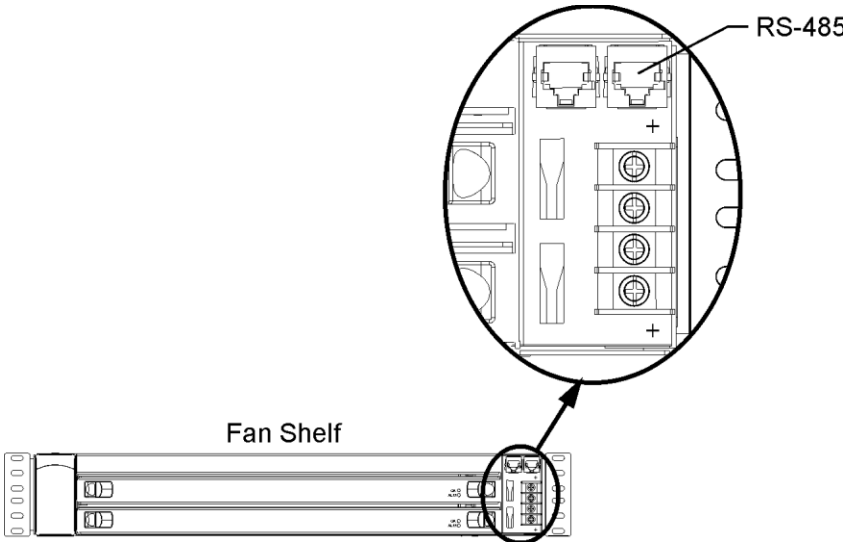


Figure 33 Fan Shelf RS-485 Jacks

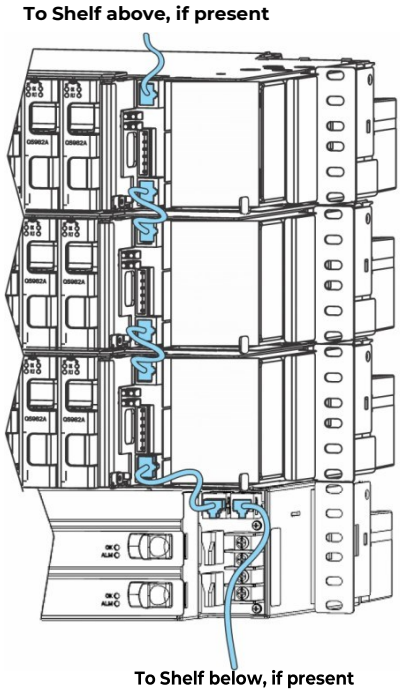


Figure 34 Signal Cables - System

Installing the Office Alarm Connector

Step	Action
1.	Plug appropriate length alarm cable into the socket on the side of the controller labeled J1. Alarm cable options listed below.
2.	Dress Cable out to alarm block and use the pinout below to appropriately route the alarms.
3.	Available alarm cables are as follows: CC848773671 10ft alarm cable - for QS941 controllers 848748558 25ft alarm cable - for QS941 controllers CC848764448 50ft alarm cable - for QS941 controllers 848748566 150ft alarm cable - for QS941 controllers

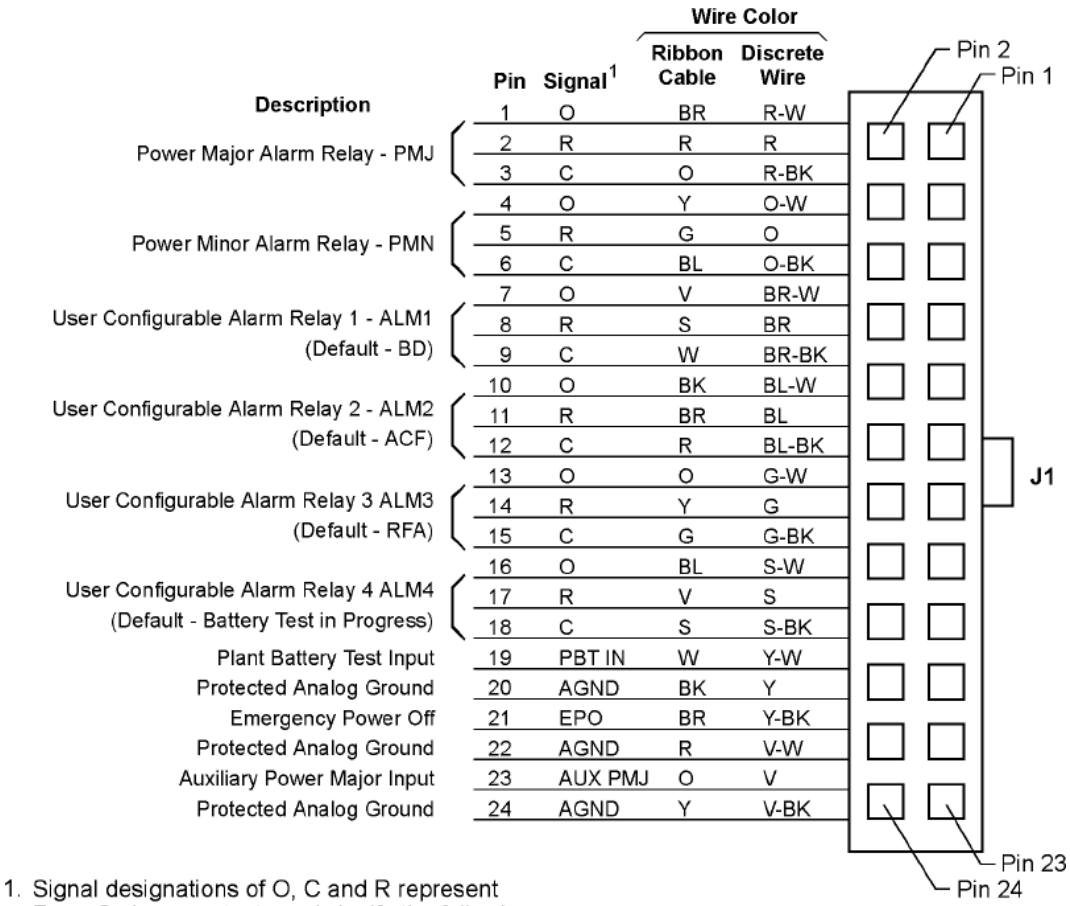


Figure 35 Office Alarm Cable Pinout

9. Reference Information

Overview

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

QS982A Converter LED Information Map

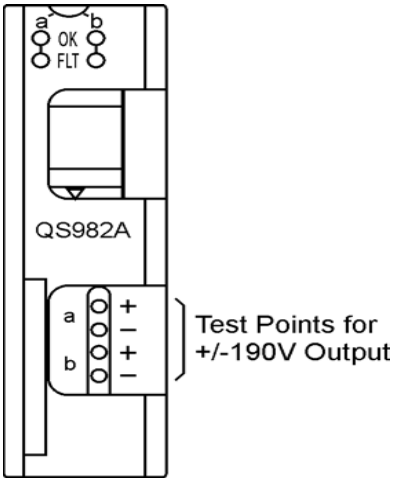


Figure 36 QS982 LEDs and Test Points

Action Required	OK LED	Fault LED	Conditions	Notes
None	Green	Off	All OK	
Verify circuit configuration	Off	Yellow	Standby	Standby can be set using the QS941 controller display or remotely using a web browser.
Check seating on Alarm card and converter card	Green	Blink Red On ½ second,Off ¼ second	Loss of comm.	
Check 5 pin protectors and faults to ground	Red Blink	Red Blink	Ground fault	
Check output lines for shorts to each other	Green	Yellow Blink	Overcurrent or under voltage	
Replace unit	Red Blink	Off	OV or internal failure	
Solve Thermal problem	Off	Red Blink	Thermal Alarm	Latch off after 3 retry cycles
Check source voltage	Off	Off	card not powered or input fuse failure	
Observe Lamp Test	Bi-Color: 4.5 seconds on, 4.5 seconds on and 1 second off	Bi-Color: 4.5 seconds on, 4.5 seconds on and 1 second off	Lamps test requested from controller	

Table 5 QS982A Converter LED Information Map

QS982A LED Information Map (visual)

Examples in the table are shown for conditions on the b circuit of the QS982A card. The same reasoning applies when the “a” circuit LEDs are illuminated.

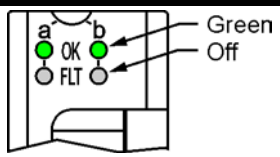
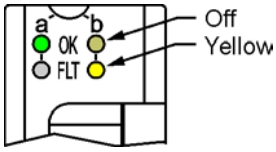
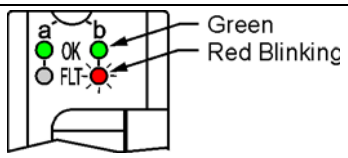
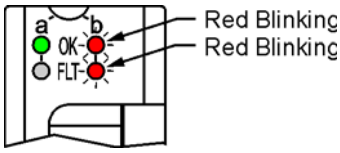
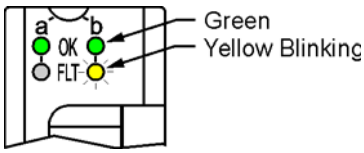
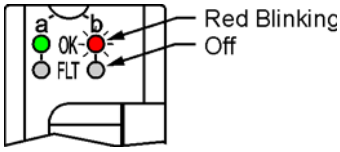
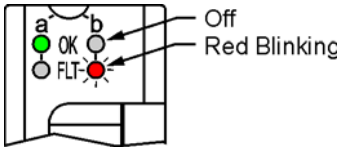
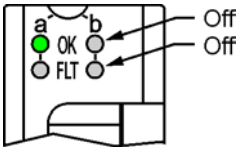
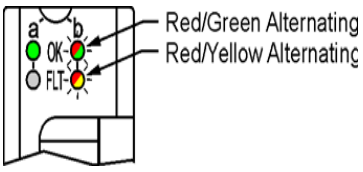
LED Display	Conditions(on b circuit)	Action Required
	All OK	None
	Circuit Placed in Standby	None depending on desired state of circuit b. Standby state can be set using the QS941 controller or web browser.
	Loss of comm.	Check seating on Alarm card and converter card
	Ground fault	Check 5 pin protectors and faults to ground
	Overcurrent or under voltage	Check output lines for shorts to each other
	OV or internal failure	Replace unit
	Thermal Alarm	Solve Thermal problem
	card not powered or inputfuse failure	Check source voltage
	Lamps test requested from controller	Observe Lamp Test

Table 6 QS982A Converter LED Information Map (visual)

Alarm Card Information

The alarm card faceplate looks one of these depending on whether you have a front access system (on the left) or a rear access system (on the right):

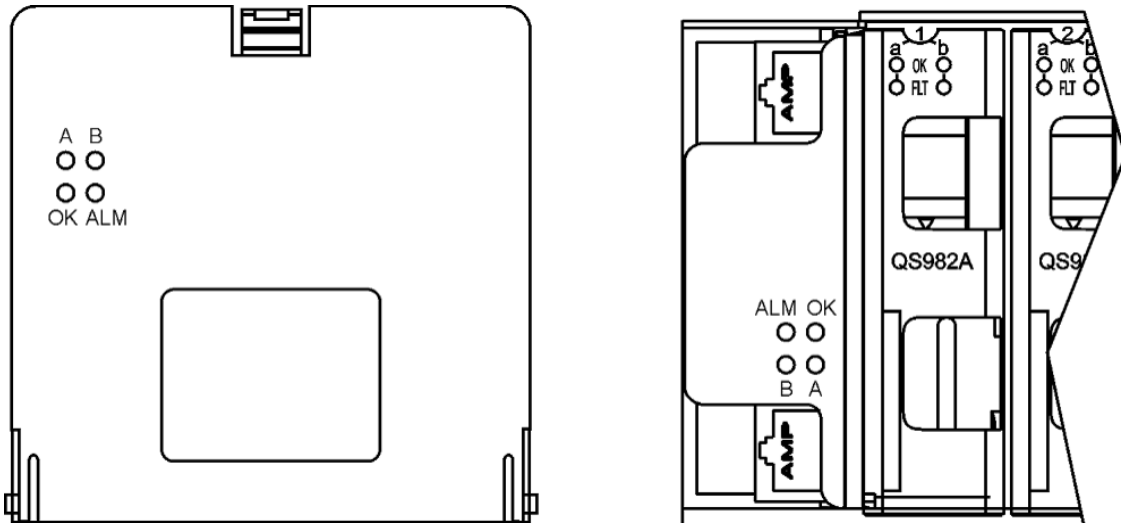


Figure 37 Alarm Card Faceplate

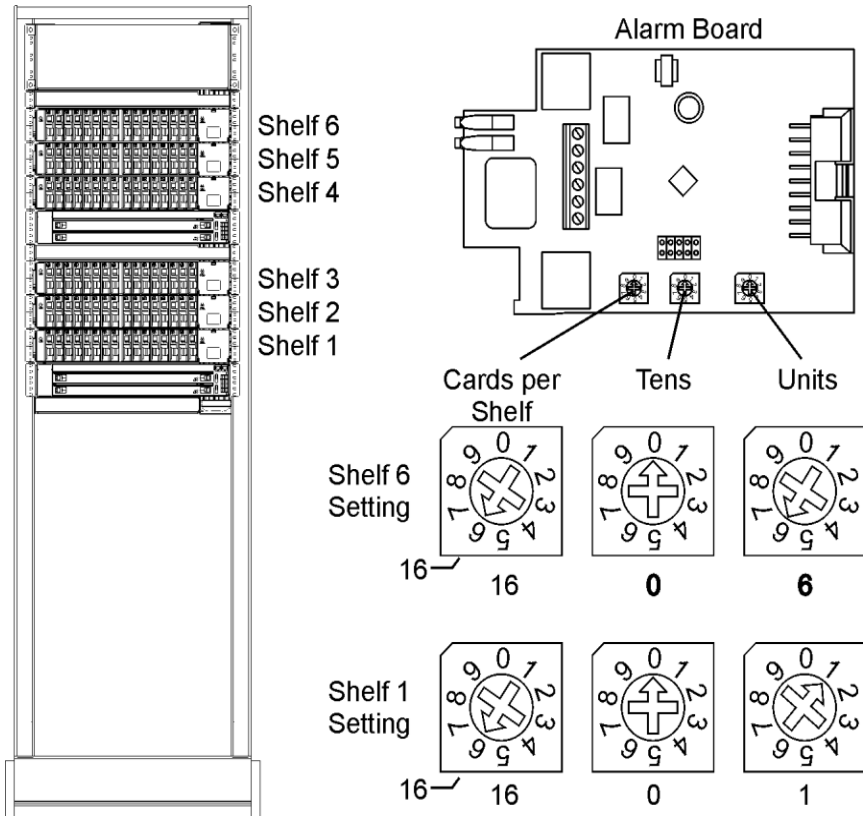


Figure 38 Shelf ID Rotary Switches

QS912A Converter Shelf

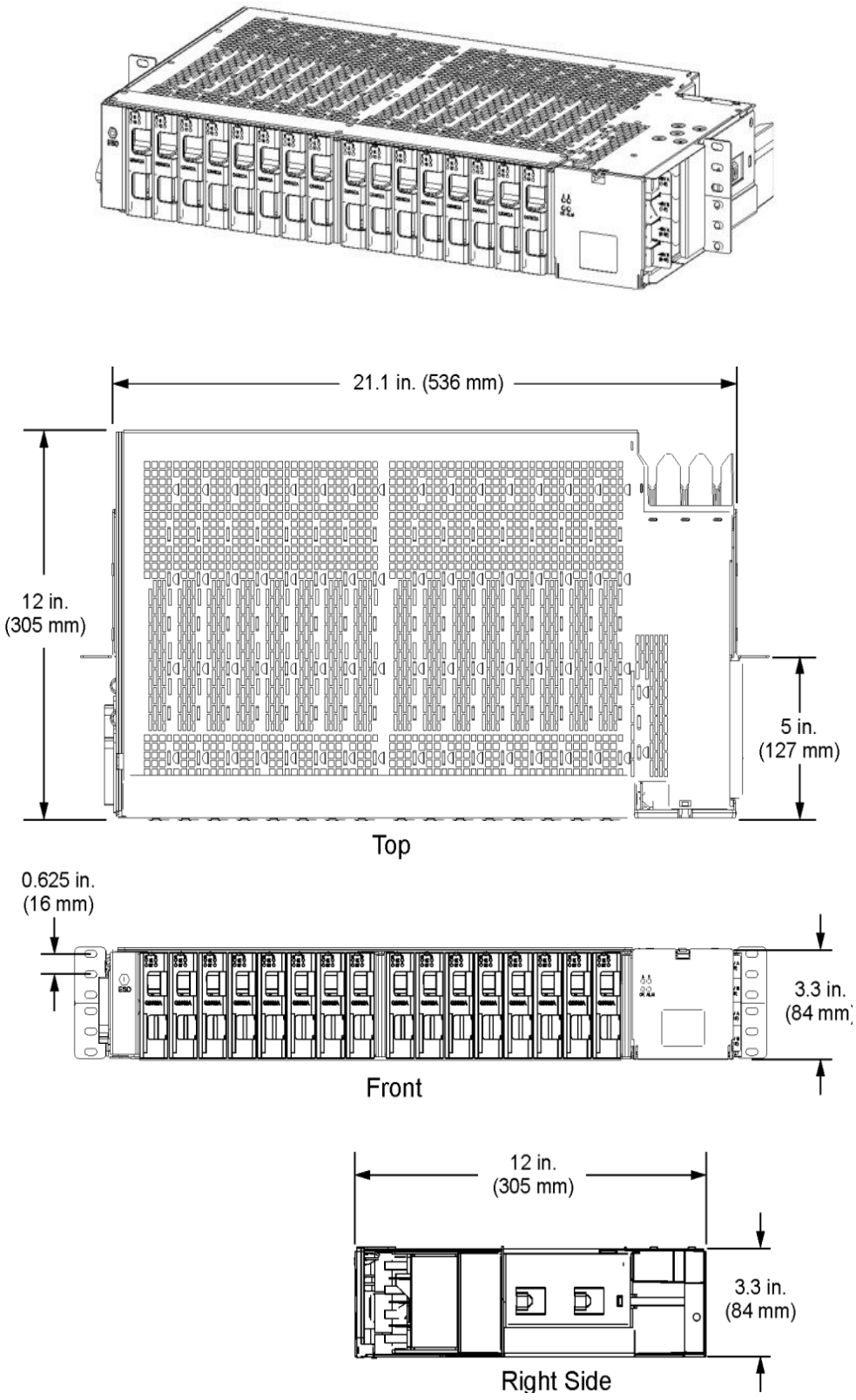


Figure 39 QS912A Dimensions

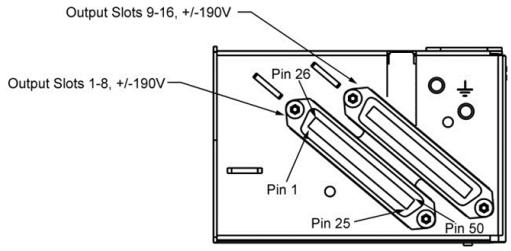


Figure 40 Output Connectors

Wire set Connector: RJ-21 type 50 pin plug:

- 22 AWG solid or stranded AMP 552173-1 or equivalent.
- 24 AWG solid or stranded or 26 AWG solid AMP 229974-1 or equivalent.
- The connector shall be arranged with a right angle housing such that the cable exits to the pin 1 side.

Connector for Circuits 1-8 (Shelf J1)						Connector for Circuits 9-16 (Shelf J2)					
Conv Out	Pos	Color	Conv Out	Pos	Color	Conv Out	Pos	Color	Conv Out	Pos	Color
1a-	1	BL / W	1a+	26	W / BL	9a-	1	BL / W	9a+	26	W / BL
1b-	2	O / W	1b+	27	W / O	9b-	2	O / W	9b+	27	W / O
2a-	3	G / W	2a+	28	W / G	10a-	3	G / W	10a+	28	W / G
2b-	4	BR / W	2b+	29	W / BR	10b-	4	BR / W	10b+	29	W / BR
3a-	5	SL / W	3a+	30	W / SL	11a-	5	SL / W	11a+	30	W / SL
3b-	6	BL / R	3b+	31	R / BL	11b-	6	BL / R	11b+	31	R / BL
4a-	7	O / R	4a+	32	R / O	12a-	7	O / R	12a+	32	R / O
4b-	8	G / R	4b+	33	R / G	12b-	8	G / R	12b+	33	R / G
5a-	9	BR / R	5a+	34	R / BR	13a-	9	BR / R	13a+	34	R / BR
5b-	10	SL / R	5b+	35	R / SL	13b-	10	SL / R	13b+	35	R / SL
6a-	11	BL / BK	6a+	36	BK / BL	14a-	11	BL / BK	14a+	36	BK / BL
6b-	12	O / BK	6b+	37	BK / O	14b-	12	O / BK	14b+	37	BK / O
7a-	13	G / BK	7a+	38	BK / G	15a-	13	G / BK	15a+	38	BK / G
7b-	14	BR / BK	7b+	39	BK / BR	15b-	14	BR / BK	15b+	39	BK / BR
8a-	15	SL / BK	8a+	40	BK / SL	16a-	15	SL / BK	16a+	40	BK / SL
8b-	16	BL / Y	8b+	41	Y / BL	16b-	16	BL / Y	16b+	41	Y / BL
spare	17	O / Y	spare	42	Y / O	spare	17	O / Y	spare	42	Y / O
spare	18	G / Y	spare	43	Y / G	spare	18	G / Y	spare	43	Y / G
spare	19	BR / Y	spare	44	Y / BR	spare	19	BR / Y	spare	44	Y / BR
spare	20	SL / Y	spare	45	Y / SL	spare	20	SL / Y	spare	45	Y / SL
spare	21	BL / V	spare	46	V / BL	spare	21	BL / V	spare	46	V / BL
spare	22	O / V	spare	47	V / O	spare	22	O / V	spare	47	V / O
spare	23	G / V	spare	48	V / G	spare	23	G / V	spare	48	V / G
spare	24	BR / V	spare	49	V / BR	spare	24	BR / V	spare	49	V / BR
*FR GRD	25	SL / V	*FR GRD	50	V / SL	*FR GRD	25	SL / V	*FR GRD	50	V / SL

Table 7 Output Connector Pinout

* EMI performance is enhanced when the output cable shield is grounded only at the CPS3200 end of the shield.

QS930A Fan Shelf

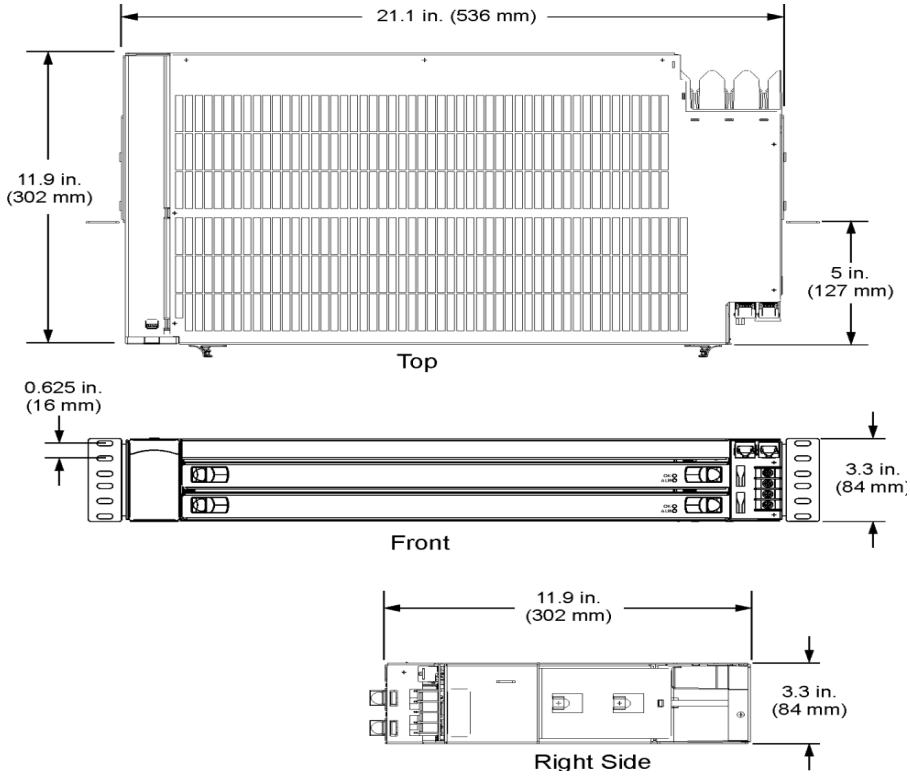


Figure 41 QS930 Fan Shelf Dimensions

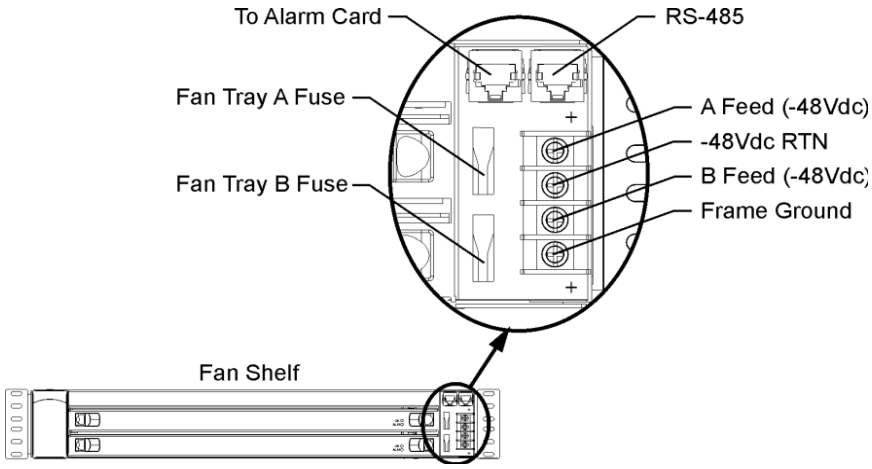


Figure 42 QS930 Fan Shelf Connections and Fuses

Note: Returns for A and B feeds are shared on the -48Vdc RTN terminal.

The lowest position on the terminal block is frame ground.

10. Maintenance

Filter Cleaning

Clean Filters on the schedule specified by the telco customer site specific instructions or practices.

See the **Installing the Filter Bracket and Filter** section for Filter removal and replacement detail.

Step	Action
1.	Remove the Filter from the Filter Bracket.
2.	Wash the filter in soap and water.
3.	Dry the filter completely.
4.	Replace the Filter in the Filter Bracket.
5.	Repeat from Step 1 for each Filter in the system.

This page intentionally left blank

11. Product Warranty

A. Seller warrants to Customer only, that:

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

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

Warranty Period

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.

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: Operating Temperature Measurement and Vertical Spacing

Overview

The CPS3200U has been designed for mounting in relay racks or in equipment cabinets. It is designed for use with user provided vertical airflow cooling of at least 175 linear feet per minute over the entire flow cross-section of the shelf. Equipment may be placed on top of the CPS3200U provided airflow is not impeded or sufficient spacing is provided. A 1U Baffle is required above the highest converter shelf; this baffle provides sufficient vertical spacing. Direct the airflow into a 3 inch minimum space. If the spacing is less than 3 inch spacing application specific testing is required.

Operating Temperature

The CPS3200U is rated to work to 65°C in stacks of two shelves in outdoor cabinets without baffles. Note: in outdoor cabinets where the air entering the second shelf may be heated above 65°C inlet temperature, additional airflow beyond the 175 linear feet per minute is required. These cases require an engineered solution.

In Central Office environments when baffles are required for safety reasons, a three shelf system is rated to operate in 55°C environments.

Baffles and Fan Trays

For Central Office applications, baffles are used between every set of three Converter shelves. Fan Shelves are required for every set of three Converter shelves. No more than 6 shelves may be located in a particular frame. Slot covers must be used on all empty slots when more than one shelf is being cooled by a particular airflow device.

Always mount converter shelves above the fan tray that cools them.

When mounting fan trays with converter shelves, leave no space between the top of a fan tray and the converter shelf above it. The QS930A Fan Shelf draws air down through whatever equipment is located directly above it. If a gap is left above a fan tray, air will be drawn into the fan tray from the aisles rather than from the converter shelf above the fan tray. This will result in service effecting problems due to insufficient cooling air flowing through the active converters.

The QS931A Fan Shelf forces air up through whatever equipment is located directly above it. If a gap is left above a fan tray, air will escape into the aisles rather than flowing into the converter shelf above the fan tray. This will result in service effecting problems due to insufficient cooling air flowing through the active converters.

When mounting converter shelves always mount a converter shelf immediately above a fan shelf, or above a converter shelf stacked on a fan shelf. Any gaps between converter shelves, or absence of slot covers, can cause service effecting problems.

Note: All unpopulated converter slots must be filled with slot fillers. For example the figure below shows a shelf with operational converters in the first two slots and slot fillers in the remaining 14 slots:

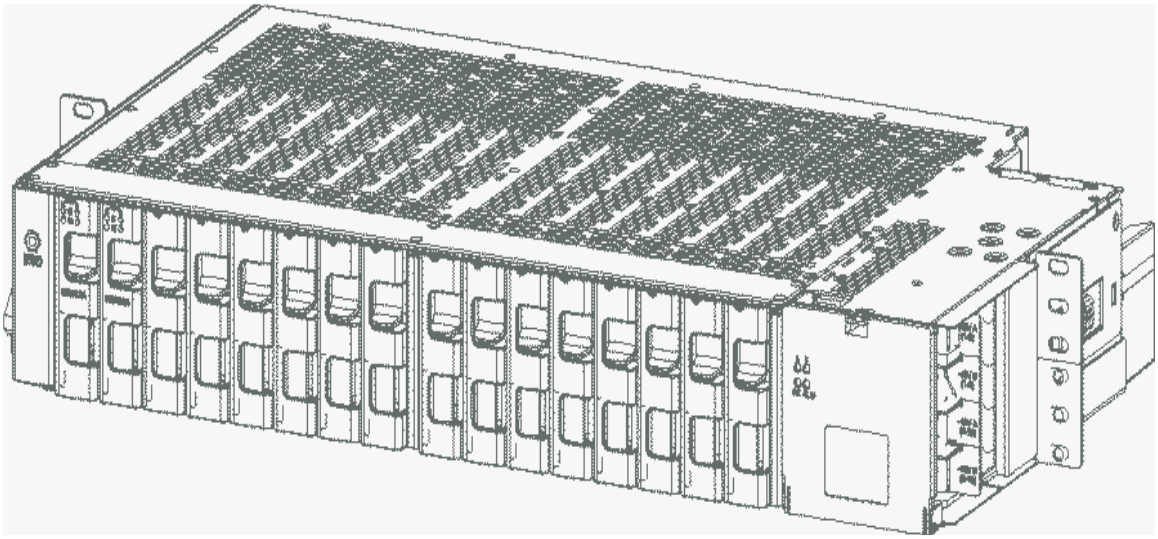


Figure 43 Converter Shelf with Slot Fillers

Appendix B: Alarm Reference Table

This Alarm Table shows how FTTN Alarms are categorized by the QS941 Controller. Details of non-FTTN Alarms can be found in the Plant Level product manuals. Many alarms are best processed at the converter shelf alarm card and converter card level.

		QS941		Alarm Card		Converter Card		
Alarm Display	**What it means**	**LED State**	**Relay State**	**Alarm LED State**	**Relay State**	**OK LED State**	**Alarm LED State**	**Corrective Action**
Circuit Fail	Short + to -	Yellow	Min	Yellow	Min	Green	Flashing Yellow	Make sure each converter has an independent isolated send and return path.
Circuit Fail	Short to Ground	Yellow	Min	Yellow	Min	Flashing Red	Flashing Red	Make sure each converter has an independent isolated send and return path.
Communication Fail	1 Card Removed	Yellow	Min	Yellow	Min	Green	Off	Check to see that all cards are seated. Replace non-functioning cards.
Communication Fail	2 Cards Removed	Red	Maj					Check to see that allcards are seated. Replace non-functioning cards.
Communication Fail	Communication Cable Removed	Red	Maj	Flashing Red		Green	Off	Check communicationpath from alarm cardsto QS941 controller. If no controller is present, set alarm card rotary switch to position 0 for contact closures only communication.
Communication Fail	Alarm Card Removed	Red	Maj			Green	Flashing Red	Replace Alarm card.
None	Standby	Green		Green			Yellow	Remove unit fromstandby if desired using QS941 or Ethernet interface
Circuit Fail	Open Fuse	Yellow	Min	Yellow	Min	Green	Flashing Yellow	Replace unit. Note: Restoring service to one line will interruptservice to the other line served by that card.
Circuit Fail	Under Voltage	Yellow	Min	Yellow	Min		Flashing Yellow	Replace unit. Note: Restoring service to one line will interruptservice to the other line served by that card.
Fan Fail	1 Fan Tray Failed	Yellow	Min	Yellow	Min	Green	Off	Replace fan tray.
Fan Fail	1 of 6 fans Failed on one Fan Tray	Yellow	Min	Yellow	Min	Green	Off	Replace fan tray.
Fan Fail	2 Fan Trays Failed	Red	Maj	Red	Maj	Green	Off	Replace fan trays.
Input Power	A1-8 Power Fail	Yellow	Min	A Red	Min	Green	Off	Reconnect DC inputpower flowing to theA1-8 input terminal.

Table 8 Alarm Reference

Alarm Display	What it means	QS941		Alarm Card		Converter Card		Corrective Action
		LED State	Relay State	Alarm LED State	Relay State	OK LED State	Alarm LED State	
Input Power	B1-8 Power Fail	Yellow	Min	B Red	Min	Green	Off	Reconnect DC input power flowing to the B1-8 input terminal
Input Power	A9-16 Power Fail	Yellow	Min	A Red	Min	Green	Off	Reconnect DC input power flowing to the A9-16 input terminal
Input Power	B9-16 Power Fail	Yellow	Min	B Red	Min	Green	Off	Reconnect DC input power flowing to the B9-16 input terminal.
Input Power Mul Circuit Fail	A1-8 & B1-8 Power Fail	Red	Maj	A Red B Red	Maj	Green	Off	Reconnect DC input power flowing to the A1-8 input terminal and Reconnect DC input power flowing to the B1-8 input terminal
Input Power Mul Circuit Fail	A9-16 & B9-16 Power Fail	Red	Maj	A Red B Red	Maj	Green	Off	Reconnect DC input power flowing to the A9-16 input terminal. Reconnect DC input power flowing to the B9-16 input terminal.
Load Drop	Load Drop	Yellow	Min	A, B &OK Green		Green	Off	Check the integrity of the circuits going to the load. Or Adjust load drop threshold to 0 to disable this feature.
Load Share	As set of circuits assigned to one remote destination are not sharing current as would be expected	Yellow	Min	A, B & OK Green		Green	Off	Check the integrity of the circuits going to the load. Or Adjust load share threshold to disable this feature.
Line Test	OK, Fail or Aborted			A, B & OK Green		Green	Off	Estimated line resistance has increased since last measurement.
Loss Of Redundancy		Yellow	Min	A, B &OK Green		Green	Off	The loss of n additionalcircuits will cause customers to lose service. Check redundancy threshold in the configuration.

Table 8 Alarm Reference

Appendix C: Operation without a Controller -Alarm Wiring

Each CPS3200U Shelf Provides Alarm contact closures for Power Major and Power Minor for operation without a controller. Wire these relays into the alarm network in deployments where a controller is not utilized. If a controller is installed then an alarm cable can be attached to the QS941A controller during final installation in section 8 under "Installing the QS941A Ethernet Module".

Step	Action
1.	Attach the required alarm leads to the office alarm screw terminals (TB1 on the alarm card) as designated.
2.	Set Shelf ID to address 0, 0 - **Figure 44.**
3.	Reinstall Alarm card and close distribution door.

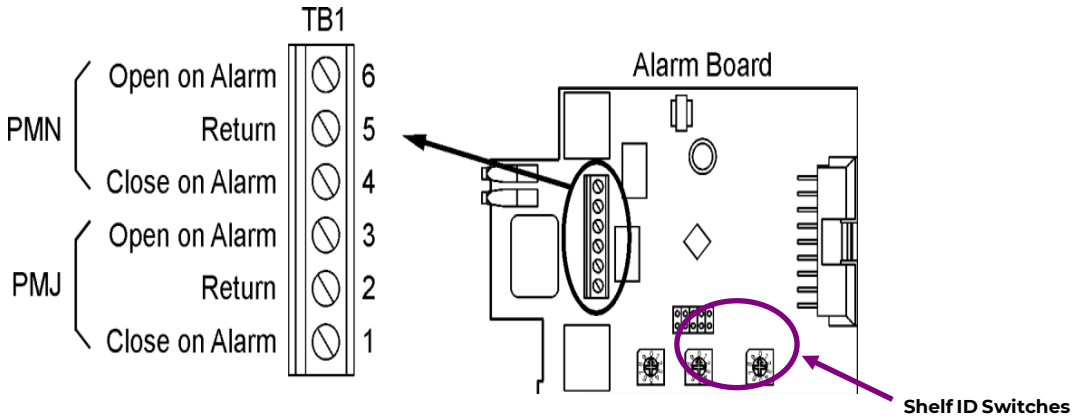


Figure 44 Alarm Card Office Alarm Pinout and Shelf ID

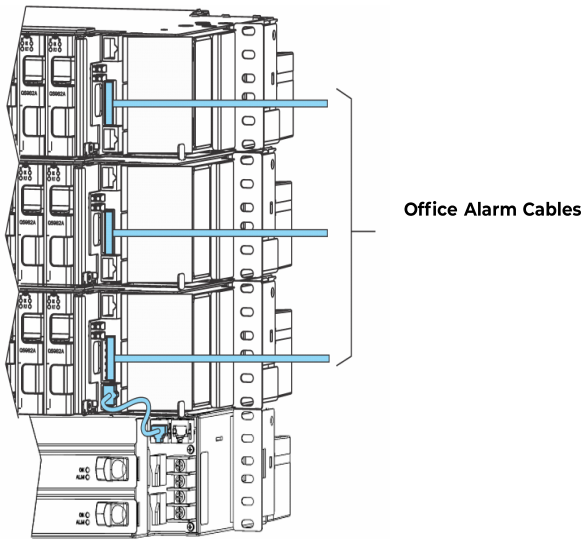


Figure 45 Alarm Card Office Alarm Cables

CPS3200U Shelf Alarm Card State Table

This section shows Alarm and LED response for the Alarm Card LEDs and Relays.

The CPS3200U shelf contains a pair of A bus feeds and a pair of B bus feeds. The use of dual A and B feeds is to not exceed the 48 AMPS L2 input current per feed. The A bus feeds are designated A1-8 and A9-16, and power shelf slots 1-8 (left side) and 9-16 (right side) respectively. The B bus feeds are also designated in an identical fashion. The alarm card monitors the -48v on each of these four feeds, and asserts alarms and indicators as follows:

-48 V INPUT BUS				Vin LEDs		STATUS LEDs		ALARM RELAYs	
A_{1-8}	B_{1-8}	A_{9-16}	B_{9-16}	A LED	B LED	OK LED	ALM LED	PMN	PMJ
OK	OK	OK	OK	GRN	GRN	GRN	OFF	E	E
LOW	OK	OK	OK	RED	GRN	OFF	YEL	D	E
OK	LOW	OK	OK	GRN	RED	OFF	YEL	D	E
OK	OK	LOW	OK	RED	GRN	OFF	YEL	D	E
OK	OK	OK	LOW	GRN	RED	OFF	YEL	D	E
LOW	LOW	OK	OK	RED	RED	OFF	RED	E	D
LOW	OK	LOW	OK	RED	GRN	OFF	RED	E	D
LOW	OK	OK	LOW	RED	RED	OFF	RED	E	D
OK	LOW	LOW	OK	RED	RED	OFF	RED	E	D
OK	LOW	OK	LOW	GRN	RED	OFF	RED	E	D
OK	OK	LOW	LOW	RED	RED	OFF	RED	E	D
LOW	LOW	LOW	OK	RED	RED	OFF	RED	E	D
LOW	LOW	OK	LOW	RED	RED	OFF	RED	E	D
LOW	OK	LOW	LOW	RED	RED	OFF	RED	E	D
OK	LOW	LOW	LOW	RED	RED	OFF	RED	E	D
LOW	LOW	LOW	LOW	OFF	OFF	OFF	OFF	D	D

Table 9 Shelf Alarm Card State

Alarm Relay: E – Energized relay in non-alarm state; D – De-energized relay in alarm state

Alarm Card Logical Operation of LEDs and Alarm Relays

The Alarm Card contains a pair of form C relays to provide shelf PMN and PMJ isolated closures. The relays are energized, from both the A & B input bus, in their non-alarmed state, such that these relays will revert to the alarm state if both A and B input fail. The relay circuit interfaces to a pair of parallel buses connected to each of the 16 Converter/Limiter Cards. Each Converter has an open collector output on the bus, and pulls the bus low to chassis ground when it is asserting an alarm. The PMN/PMJ circuit on the Alarm card recognizes the bus state change and deenergizes the relay. The alarm card separately monitors both the PNM and PMJ bus. When the PMN bus is active (pulled low), the Alarm card asserts a PMN relay and lights the ALM LED Yellow. When the PMJ bus is active (pulled low), the Alarm card asserts a PMJ relay and lights the ALM LED Red. While an active PMJ is present the Alarm Card ignores the state of the PMN bus (and does not assert a PNM relay/LED action). This IS necessary since the same LED is used for both Minor (Yellow) and Major (Red) visual indication.

The Alarm Card also monitors the -48V dc inputs and asserts PNM/PMJ for conditions as described in the earlier section dealing with input voltage monitoring.

The Alarm Card also monitors the two fan tray alarms. When either of the two fan tray alarms is active, the Alarm Card asserts a PMN relay and Yellow ALM LED. When both of the fan tray alarms are active, the Alarm Card shall assert a PMJ relay and Red ALM LED.

The Alarm Card shall also monitor its internal I2C to RS-485 conversion processor. A failure of this processor shall constitute a PMN condition.

This page intentionally left blank

12 Revision

Rev.	Description	Date Dept./Init.
1	Draft with focus on installing Bulk fed shelves. Pictures added	
2	Reformatted sections. Corrected shelf depth in reference information	
3	Removed -190V items including rear access converter shelf. Clarified sections to support downward airflow as standard configuration for fan tray. Corrected drawings	June/2006
4	September Added transitional statements to improve flow. Added note on grounding practice for best EMI performance to output connector pin out description. Added Ether net present confirmation procedure	Sept/2006
5	References to multi-shelf configurations removed. Network inspection added	March/2007
6	Clarifications: Page 5, added 'converter shelf' after GR487. Page 9, Dissipation clarifications. Page 10, Listed specific protector. Page 13, The return conductor of the -48V shall be terminated in the ground window, (held at frame ground potential). Page 13, The tele communication line cable, carrying the +/-190V between the equipment and the primary protectors ,shall be minimum 26 AWG, and rated minimum 200V. Page 13, Airflow must be provided at a rate of 175 lfm across the entire cross section of the shelf for operation in environments up to 65 C, when measured at the inlet of the warmest converter shelf. Page 13, For multi-shelf systems (up to 3), this equipment has been evaluated for continuous use in ambient temperature from -40°C to 50°C when used with the QS982A converters. Page 28, added: Otherwise all alarm cards should be left in their factory default state of address 0,0. Skip this step if no QS941 will be present in the system. Page 28, added text and changed picture to show angle required to remove alarm card. Page 38, Measurement from the exterior of the CPS3200U shelf to the cabinet or building ground bus should indicate a resistance of less than 10 Ohms. Page 56, cleaned up some of the tense grammatical errors. Changes: Pages 7 and 9: L1 and 2 currents. Page 13, changed J1 to TB1. Page 49, Step 12"J6" changed to "P6." Page 65, changed outdoor applications to 2 shelf system configurations between fan shelves. The operating temperature section now reads: The CPS3200U is rated to work to 65 C in stacks of two shelves in outdoor cabinets without baffles. Note: in outdoor cabinets where the air entering the second shelf may be heated above 65C inlet temperature, additional airflow beyond the 175 linear feet per minute is required. These cases require an engineered solution. In Central Office environments when baffles are required for safety reasons, a three shelf system is rated to operate in 55C environments.	December/2007
7	Rebranding	January/2008
8	Rebranding, minor reformatting, and minor updates	July/2013
9	Corrected typos, restored Specification of Output Voltage, added weights for fan shelf and baffle, updated figures showing converter shelf output side, updated figures showing baffle and filter holder installation, and added section for Maintenance – Filter Cleaning.	December/2013
10	Changed UL Class to A3.	July/2015
10.4	Updated as per template	10/06/2021
10.5	Updated as per OmniOn template	10/23/2023

OmniOn Power Inc.
601 Shiloh Rd.
Plano, TX USA

omnionpower.com