DATASHEET

Compact Power Line Shelves
Dual I²C shelves for the CP3500 rectifier
Model: J2014003

The J2014003 type shelves accommodate up to 4 CP3000/CP3500AC54TE and similar rectifiers in a standard 19" EIA-310-D mounting configuration. The shelf is stackable and parallelable for higher power capacity needs. Parallel ability is limited to four shelves when utilizing a single I²C bus, configuring the rectifiers with up to 16 different address possibilities. The shelf address is selected by a rotary switch accessible at the rear of the shelf. The L001 shelf has individual Molex input feed connectors for each rectifier. The shelf provides the interfacing connections to either a single PMBus™ compliant I²C bus, or to dual/ redundant PMBus™ compliant I²C busses for applications where duplicated control and monitoring of the power system are desired. The two independent I²C busses have their own dedicated connections to the two external controllers. A fault to one of the I²C buses should not propagate to the other bus. A built in steering circuit ensures that control is granted to only one of the controllers at any time. Taking over control is granted only during idle communication states. Both controllers are informed when changes are granted.

Features

- Mounts into standard 19" EIA-310-D racks
- Isolated output feed may be grounded at either polarity
- +5V standby power isolated from the main output
- Adjustable mounting ears for flush or set back positions.
- Supports hot-swapping of modules
- Accommodates mechanical latching into the slot
- Communicates via PMBus™ compliant dual, redundant I²C
- Passes Zone 4 earthquake requirements
- CUR*† recognized
- CE Mark (pending)§
- Shock & Vibration: Meets IPC 9562 Class II standards

* UL is a registered trademark of Underwriters Laboratories, Inc.
† CSA is a registered trademark of Canadian Standards Association.
‡ VDE is a trademark of Verband Deutscher Elektrotechniker e.V.
§ This product is intended for integration into end-user equipment. All CE marking procedures of end-user equipment should be followed. (The CE mark is placed on selected products.)
** ISO is a registered trademark of the International Organization of Standards

Technical Specifications

Absolute Maximum Ratings

Stresses in excess of the absolute maximum ratings can cause permanent damage to the device. These are absolute stress ratings only, functional operation of the device is not implied at these or any other conditions in excess of those given in the operations sections of the data sheet. Exposure to absolute maximum ratings for extended periods can adversely affect the device reliability.

Parameter	Symbol	Min	Max	Unit
Input Voltage: Continuous	V_{IN}	0	300	V_{ac}
Operating Ambient Temperature[1]	T_A	-40	65	°C
Storage Temperature	T_{stg}	-40	85	°C
I/O Isolation voltage to Frame (100% factory Hi-Pot tested)			2250	V_{ac}
[1] See the derating guidelines published in the rectifier data sheet				

Electrical Specifications

Unless otherwise indicated, specifications apply over all operating input voltage, load, and temperature conditions.

INPUT

Parameter	Symbol	Min	Typ	Max	Unit
Operational Range	V_{IN}	85	110/230	300	V_{AC}
Frequency Range	F_{IN}	47	50/60	63	Hz
AC Input Current, per module	I_{IN}			20	A_{AC}

MAIN OUTPUT

Parameter		Symbol	Min	Typ	Max	Unit
Output Power	V_{in} > 200V_{AC}	W	0	-	14,000	W
	V_{in} ≤ 140V_{AC}		0	-	6,000	W
Max output current		I_{OUT}			270	A_{DC}
Isolation Output/frame – other circuits		V	100			V_{DC}

AUXILIARY OUTPUT

Parameter	Symbol	Min	Typ	Max	Unit
Set point	V_{OUT}		5.0		V_{DC}
Output current	I_{OUT}	0		8	A_{DC}
Isolation Output/Frame	V	50			V_{DC}
Output/Main output	V	50			V_{DC}
The auxiliary output is accessible to the user via a two position panel mounted connector capable of carrying 9A of current.					

General Specifications

Parameter	Min	Typ	Max	Units	Notes
Reliability		14,000,000[2]		Hrs	Full load, 25°C ; MTBF per SR232 Reliability protection for electronic equipment, issue 2, method I, case III,
Service Life		10		Yrs	Full load, excluding fans
Unpacked Weight				Kgs/Lbs	
Packed Weight		5.53/12.2		Kgs/Lbs	
Safety/Standards Compliance					
Safety Standards	ANSI/UL* 62368-1 and CAN/CSA† C22.2 No. 62368-1 Recognized, DIN VDE‡ 0868-1/A11:2017 (EN62368-1:2014/ A11:2017)				
Certification Marks	CE mark, UL Recognized (Canada and U.S.)				

[2] Estimated based on comparable calculations of similar shelves

Technical Specifications (continued)

Environmental Specifications

Parameter	Min	Typ	Max	Units	Notes
Ambient Temperature Operating Storage	 -40[3] -40		 50[4] 85	 °C °C	
Humidity Operating Storage	5 5		95 95	%	Relative humidity, non-condensing
Shock and Vibration acceleration			6	Grms	NEBS GR-63-CORE, Level 3, 20 -2000Hz, min 30 minutes
Earthquake Rating	4			Zone	NEBS GR-63-CORE, all floors, Seismic Zone 4 Designed and tested to meet NEBS specifications.

[3] Designed to start and work at an ambient as low as -40°C, but may not meet operational limits until above -5°C
[4] At 277V input line operation the maximum ambient is reduced to 50°C. Power Derating with Temperature is 2%/°C above 55°C. Power Derating with Altitude is 2%/305m(1000 ft) above 1524m(5000 ft). Max operational altitude is 3962m(13000 ft). See the safety section for further limitations.

EMC

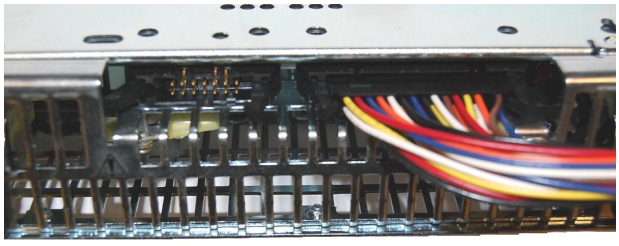
Parameter	Criteria	Standard	Level	Test
Conducted emissions	AC input	EN55032, FCC Docket 20780 part 15, subpart J EN61000-3-2 Meets Telcordia GR1089-CORE by a 6dB margin	A	0.15 – 30MHz 0 – 2 KHz
Radiated emissions		EN55032 by a 6dB margin	A	30 – 10000MHz
Lightning surge	AC input	EN61000-4-5, Level 4, 1.2/50µs – error free	A	4kV, common mode
			A	2kV, differential mode
		ANSI C62.41 - damage free	A3	6kV, common & differential
Fast transients	Input immunity	EN61000-4-4, Level 3	B	5/50ns, 2kV (common mode)
Conducted RF fields	Enclosure immunity	EN61000-4-6, Level 3	A	130dBµV, 0.15-80MHz, 80% AM
Radiated RF fields		EN61000-4-3, Level 3	A	10V/m, 80-1000MHz, 80% AM
		ENV 50140	A	
ESD	AC input & DC output	EN61000-4-2, Level 3	B	6kV contact, 8kV air

Communication Signals: J1 Connector

Pin out

Pin	Signal		Pin	Signal
1	POWER_CAP_1		16	SDA_1
2	POWER_CAP_2		17	Fault
3	POWER_CAP_3		18	Alert#_0
4	POWER_CAP_4		19	Enable side B
5	MOD_PRES_1		20	Logic_GRD
6	MOD_PRES_2		21	Enable Side A
7	MOD_PRES_3		22	Logic_GRD
8	MOD_PRES_4		23	Alert#_1
9	PFW_1		24	5VA
10	PFW_2		25	OTW
11	PFW_3		26	Reset
12	PFW_4		27	Iso. barrier n/c
13	SCL_0		28	Iso. barrier n/c
14	SCL_1		29	Vprog
15	SDA_0		30	n/c

Control Interface cable (part # CC848854034)



Technical Specifications (continued)

Communication Signals: J2 Connector

Pin out

Pin	Signal	Pin	Signal
1	SCL_0	8	Alert#_1
2	SCL_1	9	Isolation n/c
3	SDA_0	10	Isolation n/c
4	SDA_1	11	Ishare - B
5	Alert#_0	12	Ishare - A
6	5VA	13	8V_INT - B
7	Logic_GRD	14	8V_INT - A

Shelf-to-shelf cable connection (part # CC848848952)

Notes: (For all other signals refer to the rectifier data sheet)

1. 8V_INT-x, and Ishare-x are referenced to power output Vout(-). All other signals are referenced to Logic_GRD. A and B are signals referenced to the optional A and B side Vout (-) terminations when split outputs are utilized. A and B side connections are shorted for the standard single output shelf.
2. For paralleled shelves the Vout(-) busses must be tied together. Modules could get damaged if this connection is not made.
3. **Unit_ID:** The four rectifiers are internally configured into slots 1 - 4. Viewing from the front the leftmost slot is #1.
4. **Rack_ID:** Selected using the rotary switch on the back of the shelf. The two combinations provide the following addressing;

		Unit_ID			
		1	**2**	**3**	**4**
Rack_ID	**1**	0000	0001	0010	0011
	2	0100	0101	0110	0111
	3	1000	1001	1010	1011
	4	1100	1101	1110	1111

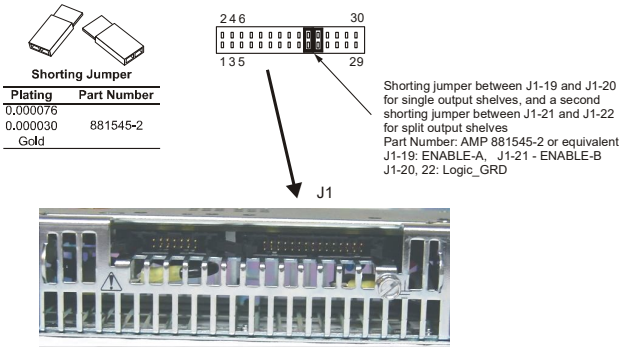
5. **Address detection:** The **Slot_ID** pin is shorted to **Vout(-)** on each rectifier connector in order to deliver output power. This connection provides a second interlock feature.
6. **Pull-up resistors:** 10kΩ pull-up resistors can be optionally provided between each signal pin; clock, data, Alert# and +5V. The basic shelf does not include the pull-ups resistors

Operation without I²C communications

Jumpers shorting ENABLE-A & B (turn ON) to Logic_GRD are either in a separate bag or inserted into the J1 signal connector.

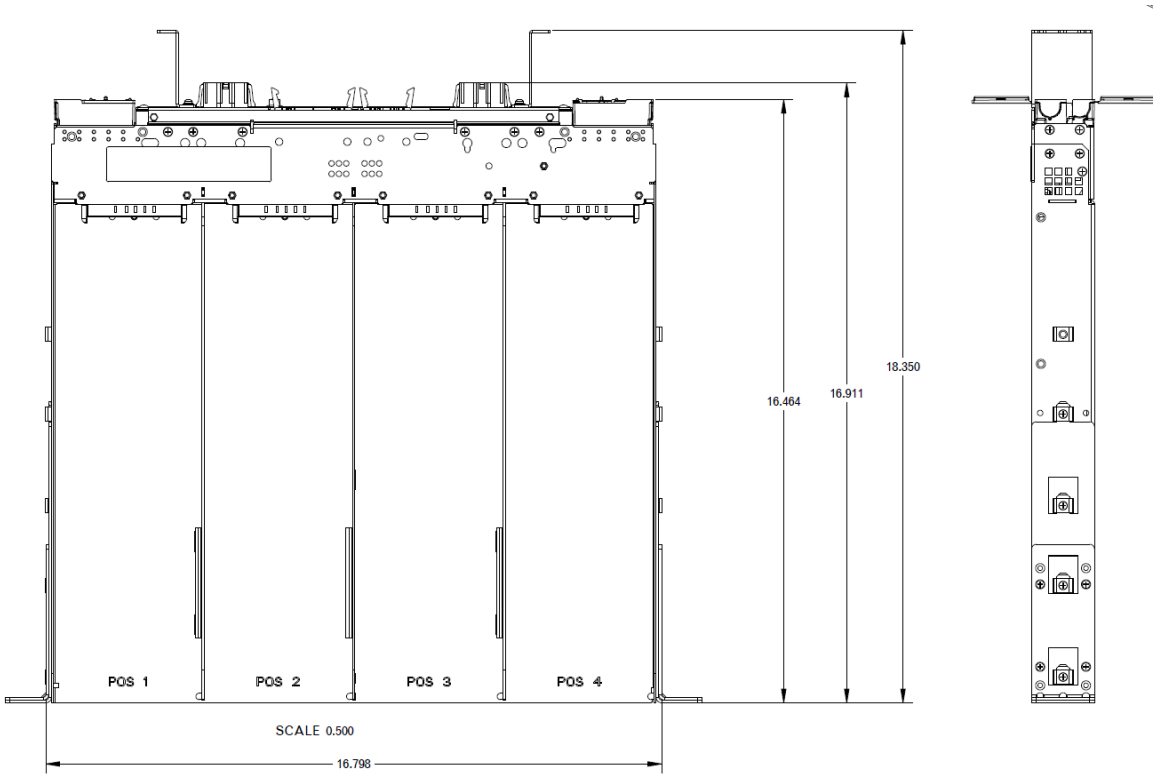
Remove these jumpers prior to inserting the J1 connector.

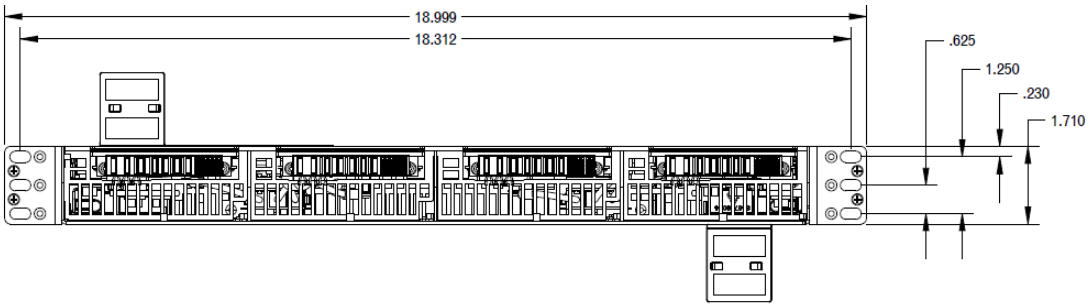
Applications desiring ON/OFF control of the output voltage should connect ENABLE-x to Logic_GRD via an external switch. In split shelves ENABLE-A controls the two leftmost rectifiers and ENABLE-B controls the two rightmost rectifiers. Single output shelves use only ENABLE-A.



Technical Specifications (continued)

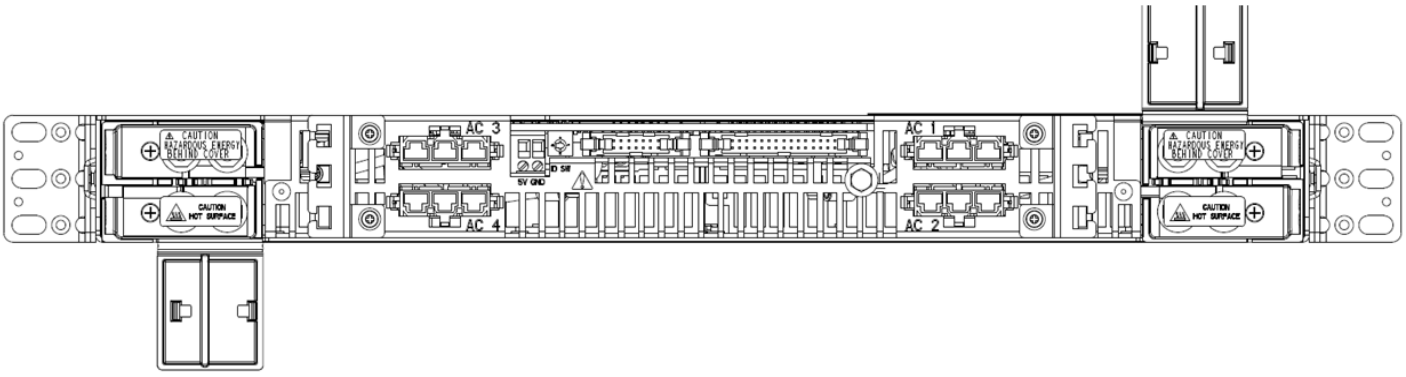
Package Outline



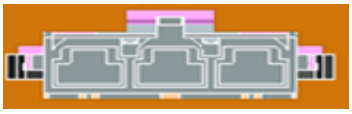


Technical Specifications (continued)

Rear of shelf



Shelf with lug terminations

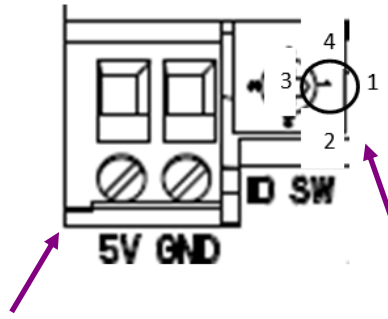


L - Line, G - frame ground, N – Neutral

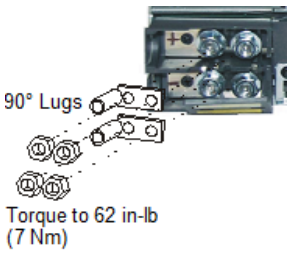
L G N

Polarized input connector pin-out

Part No: Molex 42818-0312



5V termination - Shelf ID switch for I²C addressing(1 – 4)



Output termination – M6 nuts with conical washers are provided
Both output buses need to be terminated to carry the output current from the shelf
Touch-safe plastic covers the output buses.

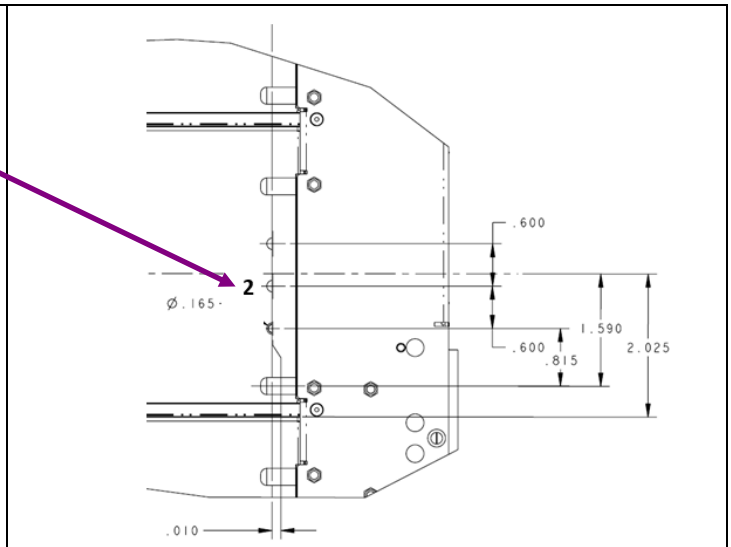
Notes:

1. Brackets are located near the input connectors to secure the input cable harness and thus relief strain from the input connector. These brackets are removable.

Technical Specifications (continued)

Shelf Insertion Keying

The notch has to be located to accept the key in position 2 location in the original design concept).



Ordering Information

Part Number	Description	Comcode	Usage
Shelves			
J2014003L001	Single output, lug output terminations, no communication pull-ups	150040608	
J2014003L002	Split output, lug output terminations, no communication pull-ups	1600092468A	
Blank Slot Fillers			
Central Office White		CC848822263	All
Raven Black		CC848781534	
Graphite		CC848825233	
Extensions and mounting brackets			
CP 19 inch mounting bracket kit (includes two brackets and mounting hardware)		CC109145760	
1U high extension bracket kit for 23" cabinets (includes two brackets and mounting hardware)		CC848844803	All
2U high extension bracket kit for 23" cabinets (includes two brackets and mounting hardware)		848683009	All
Cables sets			
Individual J1 controller wire set– 6 ft. One end mates into J1, other end not terminated.		CC848854034	All
Cable set from J1 of the shelf to the CPL Interface Board		CC848848960	All
Inter-shelf cable set for interconnecting J2 signals between shelves		CC848848952	All
Output cable set: 2 AWG DC Lug termination– 10 ft (1 RED and 1 BLACK cable)		848748987	All
m6 screw with conical washer		901377010	All

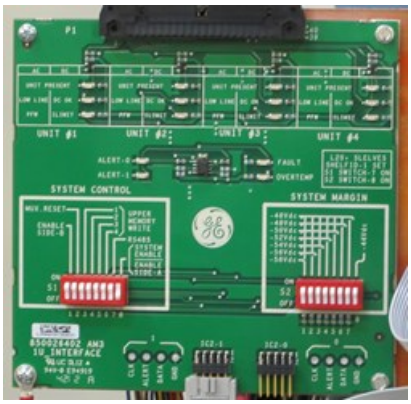
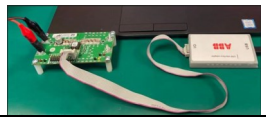
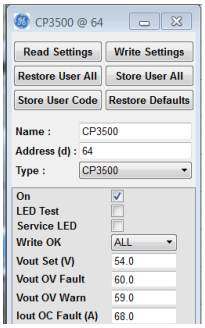
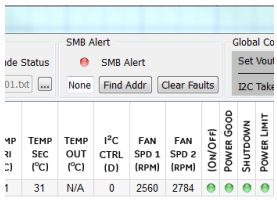
Signal connector part numbers (AMP – as specified or equivalent)

Connector	Positions	On shelf	Ribbon cable	Individual wires	Crimping tool
J1	30	5102159-7	1658621-7 header	102387-7 header	
		102320-1 latch	1-499252-2 retainer	6-87756-8 pin[5]	91517-1
J2	14	5102159-2	1658621-2 header	102387-2 header	
		102320-1 latch	499252-9 retainer	6-87756-8 pin	91517-1

[5] For 22 – 26ga wires

Technical Specifications (continued)

Accessories

Item	Description	Part number
	1u_CP3500_shelf_interface board. This debug tool can be used to evaluate the performance of a set of rectifiers inserted into this shelf. The board provides terminations to two independent Isolated Adaptors that can be connected to either of the two i2c lines. Additionally, connection points are provided for interfacing to the four signals of each i2c line for monitoring the signals. The input interface is a standard IEC 320 C20 type socket. Outputs are connected via standard 0.25 fast-ons.	150045498
	Interface cable between the 30 pin J1 signal connector of the shelf and the 40 pin mating connector of the interface board above.	CC848848960
	Isolated Interface Adapter Kit – interface between a USB port and the I²C connector on the rectifier interface board. Includes a cable set to the PC and to the 1u_CP3500_interface board above.	150036482
Software:  	The site below downloads the OmniOn Digital Power Insight™ software tools, including the pro_GUI. When the download is complete, icons for the various utilities will appear on the desktop. Click on proGUI_III.exe  to start the program after the download is complete. http://powertalk.campaigns.omnion.com/DigitalPowerInsight.html	Free download
	Graphical User Interface Manual; The GUI download created a directory  In that directory start the DPI_manual.pdf file.	

The OmniOn Digital Power Insight™ software tool exercises the various commands and functions available via the PMBus™ interface of the power supply.

Additionally, two independent GUIs, representing two independent 'system controllers' , can be connected to the two independent, multiplexed i²C lines in order to demonstrate the redundant communications features of the platform. The GUI displays and controls which i²C line is in control. The GUIs can also be set up such that control is shifted automatically from one controller to the other, executed at a pre-set time interval.

Another useful feature of the GUI is the automated polling feature that records all time stamped state changes automatically. The power system can be monitored for an extended period of time and if any operational state changed it will be recorded for further analysis

Technical Specifications (continued)

Safety

Product Labelling

Follow all warnings and instructions marked on the product. Some of the safety symbols used with the CP3500 rectifier and this shelf may include the following. They may also be accompanied by instructions:

Mounting and Installation

- This product shall be installed in compliance with mounting requirements for the ultimate application.
- This product 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. This product is intended for use in a Restricted Access Location.
- 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 use in a continuous ambient temperature of:
    a. 50°C at full load with sharing the load across the two DC output feeds with 2%/°C de-rating from 50°C to 75°C at low range and 2.3%/°C de-rating from 50°C to 75°C at high range.
    b. 44°C at full load with a single DC output feed setup with 1.6%/°C de-rating from 44°C to 75°C for low range and 1.8%/°C de-rating from 50°C to 75°C for high range.
- The CE mark if provided on the product is applied to show conformance to the requirements outlined in the European Union's Low Voltage Directive {2006/95/EC} and EMC Directive {2004/108/EC}.
- The internal AC-DC rectifier connectors have been evaluated for hot swapping. The four main AC input feed Mate-N-Lok connectors at the rear of the shelf have not been evaluated for hot swapping.
- A separate protective Earthing terminal is provided at the rear of the shelf
    - the building installation shall provide a means for connection to protective earth; and
    - the equipment is to be connected to that means; and
    - a SERVICE PERSON shall check whether or not the socket-outlet from which the equipment is to be powered provides a connection to the building protective earth. If not, the SERVICE PERSON shall arrange for the installation of a PROTECTIVE EARTHING CONDUCTOR from the separate protective Earthing terminal to the protective earth wire in the building.

Output Connections

- All field wiring should comply with the U.S. National Electrical Code (NEC) and/or applicable local codes/standards.
- Routing of the DC output cables should guarantee that cables are not in contact with sources of heat and surfaces that may damage the cable insulation.

Technical Specifications (continued)

- The DC output is not provided with a fuse or circuit breaker suitable for branch circuit protection. Therefore, the power shelf should be mounted in the same rack or cabinet as the equipment being powered. Use interconnecting power cables suitable for the application and sized to carry the rated output current. The interconnecting cables should be capable of carrying the overload current and short circuit current without damage or risk of fire.
- The output for the system is SELV and has available power greater than 240VA.
- Insulation on output field-wired conductors should be rated no less than 90°C. Wiring internal to enclosed equipment cabinets should be rated at 105°C (minimum). The provided DC output cords (red and black wires) are rated for 105°C.
- Before opening the insulating cover to gain access to load and ground connections, ensure all power supplies are disconnected from the AC MAINS.

AC Input Connections

- This shelf is configured with primary internal wiring and Molex connectors, rated for internal factory wiring only. The Molex connector is not UL Recognized for direct connection to the AC mains. The internal wiring is not UL recognized to be directly accessible by a user. Consideration should be taken on the end product's Listing to comply with NEC requirement for AC mains installations.
- The subject equipment was evaluated for use with a maximum 30A branch circuit per feed. Consideration shall be taken in the end-product evaluation in the sizing of conductors per Annex NAE s.c. 3.3.4. If used on a branch circuit greater than this, additional testing may be necessary.
- An accessible AC disconnect/protection device to remove AC power from the equipment in the event of an emergency must be provided.
- The equipment is powered by multiple AC inputs (one per rectifier). Disconnect all AC sources of power before servicing.
- These units are to be used with TN-S power systems only.

Safety Symbols and Guidelines

Read and understand all instructions before attempting any installation of this product. When installing, operating, or maintaining the J85480S1 Power System, basic safety precautions should always be followed to reduce the risk of fire, electric shock, and injury to persons. Such precautions include the following

	This symbol identifies the need to refer to the equipment instructions for important information.
	This symbol identifies the presence of hazardous AC or DC voltages or hazardous energy levels. In the context of this product • The DC output cables contain electrical energy levels capable of causing heating and arcing if shorted to metal objects. Make connections with the power disconnected. • Hazardous AC voltage and DC electrical energy is contained within the enclosure of the power shelf. No user or field serviceable parts inside.
	This symbol is used to identify safety earth ground connection points within the equipment.

Technical Specifications (continued)

German Safety Guidelines

Installationsanleitung

- Alle Ausgänge des Gerätes erfüllen die Anforderungen für SELV nach IEC/EN62368-1.
- Die Ausgänge des Gerätes liegen über den Limits für Energiegefahr nach IEC/EN62368-1 (>240 VA). Das Gerät ist zum

  Einbau in ein Montage-Rack bestimmt. Siehe Einbaubestimmungen in der Montageanleitung, um eine Gefährdung des

  Benutzers während der Installation zu vermeiden.

ACHTUNG:

Hoher Ableitstrom Vor Anschluss an den Versorgungsstromkreis unbedingt Erdungsverbindung herstellen

- Das Produkt ist zum Gebrauch in einer Umgebungstemperatur von max. 55°C bestimmt.
- Die Gerätestecker des Produktes sind dazu bestimmt, eine sichere Erdung des Gerätes herzustellen.
- Das Produkt ist zum Gebrauch in einer Umgebung mit Verschmutzungsgrad 2 nach IEC/EN62368 bestimmt.
- Die Netzteile des Gerätes können während des Betriebes einzeln ausgetauscht werden (Hot Swapping).
- Das Gerät wurde zusammen mit den Anschlussleitungen (ohne Anschlussstecker) geprüft. Die Installation eines Steckers des jeweiligen Landes, sollte nur durch geschultes Service Personal durchgeführt werden.Als alternative könnte eine Vorinstallation des Steckers bereits bei der Herstellung erfolgt sein.

Change History (excludes grammar & clarifications)

Revision	Date	Description of the change
1.0	07/01/2021	Initial Release
1.1	11/21/2023	Updated as per OmniOn template

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