

Compact Power Line Shelves

Dual I²C shelves for the CP3500 rectifier

Model J2014003



Features

- Mounts into standard 19" EIA-310-D racks
- Single main output feeder either grounded or isolated
- +5V standby power isolated from 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
- TUV‡ certified
- CE Mark§
- Shock & Vibration: Meets IPC 9562 Class II standards

Description

The 1U (1.75") high family of J2014003 type shelves are designed to mount into 19-inch wide frames providing up to 14kW of 54V output power. There are four slots for modules. These shelves are designed for the CP3500AC54TE rectifier. The shelves are parallelable using a selector switch that configures the shelf address assignment of up to 4 shelves containing up to 16 rectifiers on a single communications bus. Dual, redundant, I²C busses are standard.

* 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

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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	TA	-40	65 ¹	°C
Storage Temperature	Tstg	-40	85	°C
I/O Isolation voltage to Frame (100% factory Hi-Pot tested)			2250	V _{AC}

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	W	V _{in} > 200V _{AC}	0	-	14,000	W
		V _{in} ≤ 140V _{AC}	0	-	6,000	W
Max output current	I _{OUT}			270	A _{DC}	
Isolation ² Output/frame – other circuits	V	100				V _{DC}
		2250				

AUXILIARY OUTPUT						
Parameter	Symbol	Min	Typ	Max	Unit	
Set point	V _{OUT}		5.0			V _{DC}
Overall regulation (load, temperature, aging)	V _{OUT}	-10		+5		%
Output current	I _{OUT}	0		8		A _{DC}
Isolation Output/Frame Output/Main output	V	non-POE	50			V _{DC}
		POE	50			V _{DC}
		2250				

The auxiliary output should be accessible to the user via a two position panel mounted connector capable of carrying 9A of current. The 5V and  ground symbol should be located near the connector to identify the two pins.

¹ See the derating guidelines published in the rectifier data sheet

² The standard CP3500AC54TEZ currently in development is not designed for POE.

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General Specifications

Parameter	Min	Typ	Max	Units	Notes
Reliability		TBD		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		TBD		Kgs/Lbs	
Safety/Standards Compliance					
Safety Standards	UL60950-1, CAN/CSA C22.2 No 60950-1, EN60950-1				
Certification Marks	TUV Licensed, UL Recognized (Canada and U.S.)				

Environmental Specifications

Parameter	Min	Typ	Max	Units	Notes
Ambient Temperature	Operating	-40 ³	55	°C	UL recognition TUV certification
	Storage	-40	85	°C	
Humidity	Operating	5	95	%	Relative humidity, non-condensing
	Storage	5	95		
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.

EMC

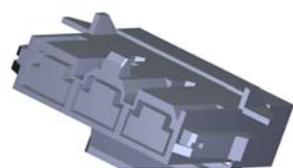
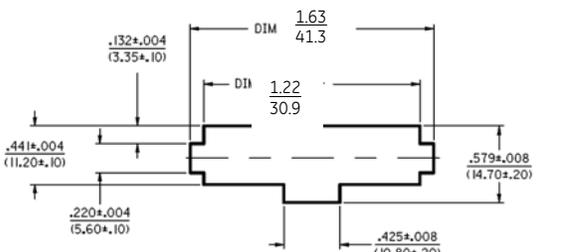
Parameter	Criteria	Standard	Level	Test
Conducted emissions	AC input	EN55022, FCC Docket 20780 part 15, subpart J EN61000-3-2 Meets Telcordia GR1089-CORE by a 6dB margin	A	0.15 – 30MHz 0 – 2 KHz
		EN55022 by a 6dB margin	A	30 – 10000MHz
Lightning surge	AC input	EN61000-4-5, Level 4, 1.2/50µs – error free	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

³ Designed to start and work at an ambient as low as -40°C, but may not meet operational limits until above -5°C

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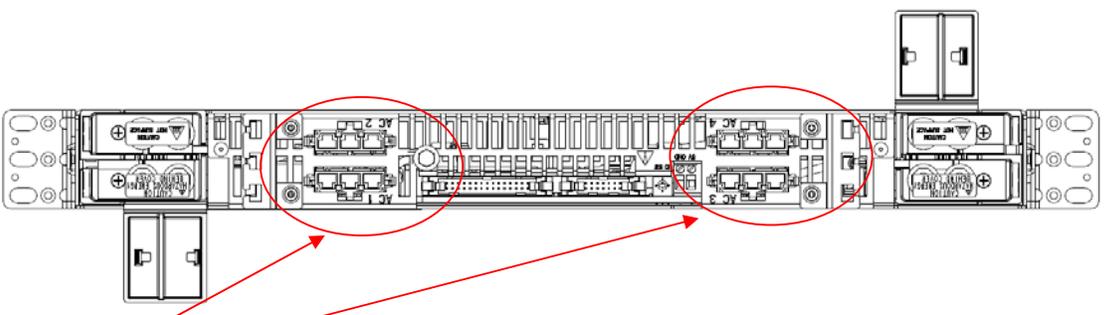
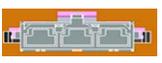
Flush mount capable 4 position shelf

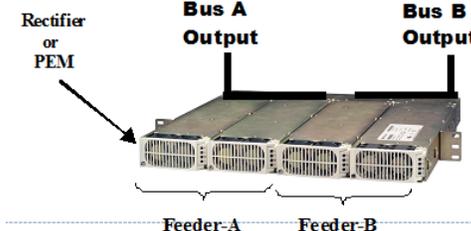
Input terminations

<p>Molex part number: 42818-0312 Mini-Fit Sr. single row, 3 circuit panel mounted connectors, or equivalent.</p>		
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Rear of shelf

Dual row (stacked inverted on top of each other) Molex Mini fit Sr single row 3 circuit connectors.
Lug output terminations on both sides of the shelf, each side is designed to carry half the maximum shelf load.

DC	AC-IN	J1	J2	AC-IN	DC
					
Shelf with lug terminations					
					
L - Line, G - frame ground, N - Neutral					
L G N					

	<p>Rectifier or PEM</p> <p>Bus A Output</p> <p>Bus B Output</p> <p>Two DC Output Buses</p> <p>AC or DC Input Feeds</p> <p>Feeder-A Feeder-B</p>
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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	Rack ID

Control Interface cable (part # CC848854034)



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)



A side (units 1 & 2) B side (units 3 & 4)

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

- Shelf_addr_x, 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 A and B side Vout (-) terminations when split outputs are utilized. A and B side connections should be shorted for single output.
- For paralleled shelves the Vout(-) busses must be tied together. Modules could get damaged if this connection is not made.
- Unit ID:** for communications is configured by a resistor at the power supply connector of each slot.

Unit_ID	Voltage level	Rs (± 0.1%)
Invalid	3.30	
1	3.00	100k
2	2.67	45.3k
3	2.34	24.9k
4	2.01	15.4k

- Rack_ID:** Up to 4 combinations are selectable. The Rack_ID resistor is terminated to Logic_GRD. Since Rack_ID is terminated to Logic_GRD that is common among the rectifiers, there is no reason to provide different signals for split shelves. Although the rack_ID is brought out on the J1 connector, it is there only for measurement purposes. It should not be loaded down in an attempt to change it.

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A voltage divider between 5V_{DC} and Logic_GRD configures Rack_ID. The 10k-20kΩ divider sets the initial voltage level to 3.3V_{DC}. A switch between each R_s value changes the Rack_ID level according to the table below.

Rack_ID	Voltage level	R _s (± 0.1%)
1	3.3	open
2	2.8	35.2k
3	2.3	15k
4	1.8	8k

5. **Configuration of the A3 – A0 bits:** with the above set Unit_ID and Rack_ID combinations

		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

- 6. **Address detection:** The Slot_ID pin must be shorted to Vout(-) on each rectifier connector in order to deliver output power. This connection provides a second interlock feature.
- 7. **Pull-up resistors:** 10kΩ pull-up resistors should be optionally provided between each signal pin; clock, data, Alert# and +5V for customers who would desire these components within the shelf. The basic shelf should be provided with the pull-ups included.

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.

These jumpers are not required on L22 , L25 & L30 since these shelves are configured always ON.

Shorting Jumper	
Plating	Part Number
0.000076	881545-2
0.000030	
Gold	

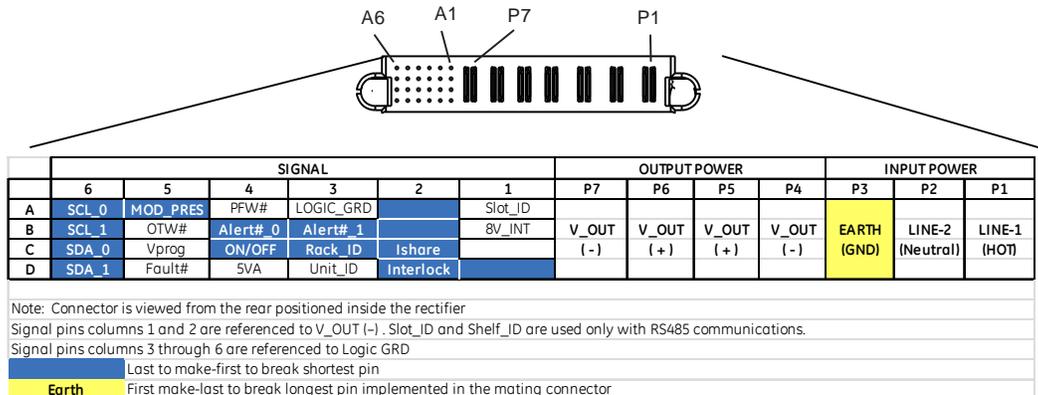
Shorting jumper between J1-19 and J1-20 for single output shelves, and a second shorting jumper between J1-21 and J1-22 for split output shelves
Part Number: AMP 881545-2 or equivalent
J1-19: ENABLE-A, J1-21 - ENABLE-B
J1-20, 22: Logic_GRD

Rectifier Interface

Rectifier output connector: TE: 3-6450832-8, or FCI: 10106262-7006001LF

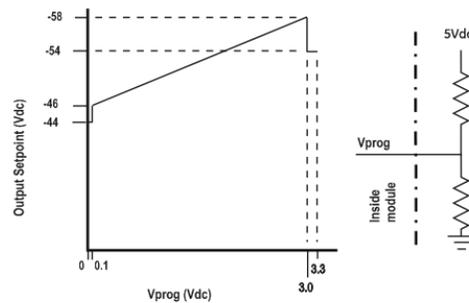
Shelf mating connector: TE – 6450874-3, or equivalent

The picture below is a view looking into the rectifier. The mate on the backplane of the shelf has to mate into the connector shown.



Vprog (Voltage margining): To satisfy the rectifier spec requirement for Vprog use a voltage divider from the 5Vstandby to create the required voltage level to change the default output voltage level of the power supply. (See the graph on the right). Connect all four Vprog pins together so that a single divider controls the output of all four power supplies in the shelf. Space for two resistors shall be provided on the shelf backplane so that the default voltage level on turn-ON could be configured in the shelf.

The signal is also brought out to the J1 connector so that the output voltage can be default adjusted externally. In multiple shelf applications the Vprog pin must be paralleled on each J1 connector of each shelf.



Signal Isolation: Signal pins columns 1 & 2 are referenced to Vout (-), Signal pins columns 3 through 6 are referenced to LOGIC_GRD. Signal pins that are not identified are used during I²C communications. These signal pins should be left a no-connect. POE isolation is optional.

8V_INT: This signal pin should be interconnected between the four rectifier slots. The reference for this signal is Vout(-).

Ishare: This signal pin should be interconnected between the four rectifier slots and brought out through an interfacing connector. The reference for this signal is Vout(-).

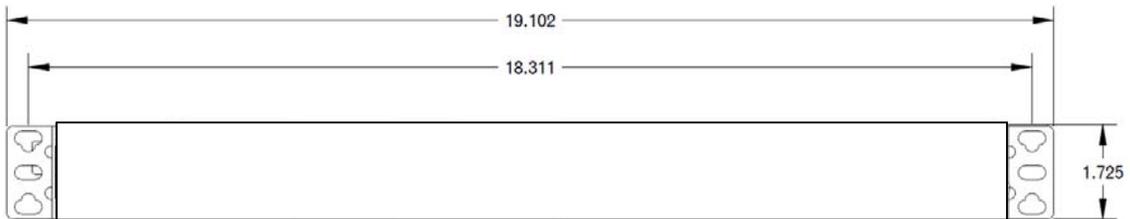
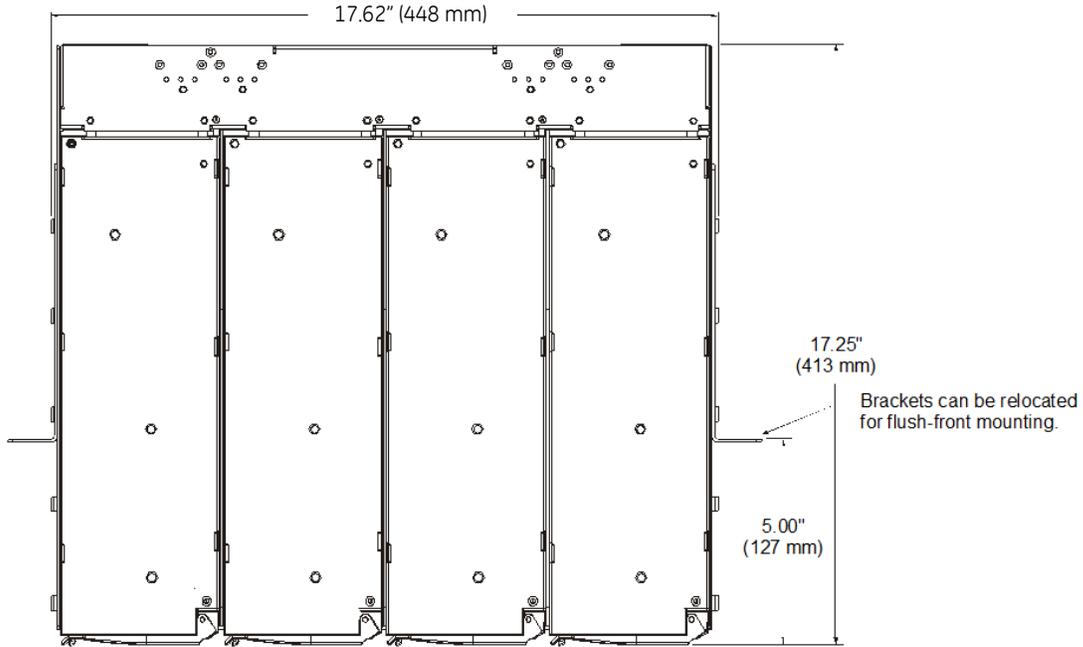
Interlock: This signal pin is connected to Vout(-). Its intent is to provide the last to make and first to break signal for interrupting output power for extraction and for applying power during hot insertion.

Protocol: This pin is to be left a no-connect

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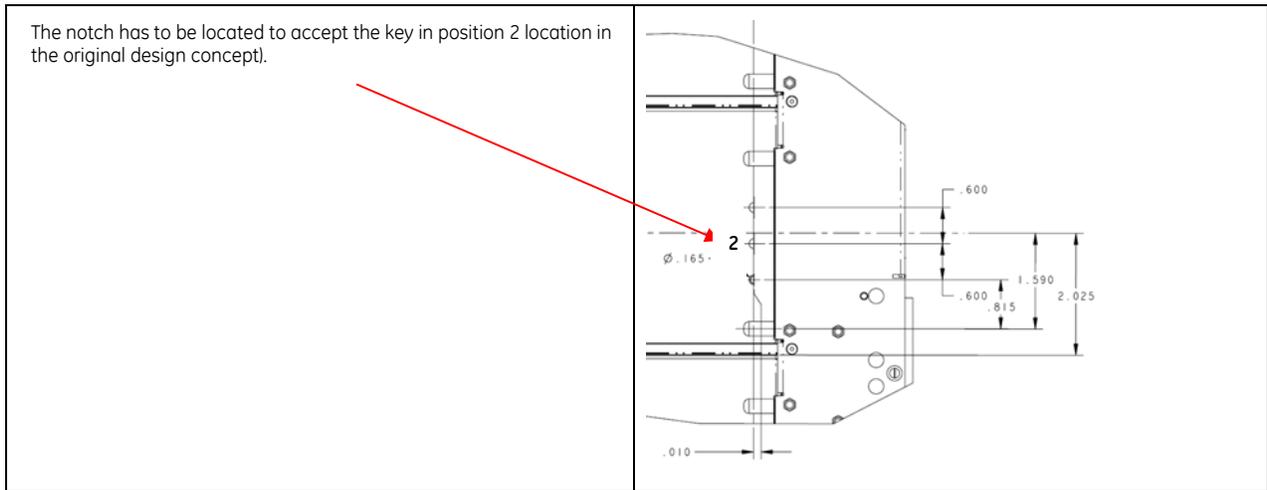
Package Outline

Note: The width of the shelf has been increased from 16.81 to 17.62 in order to stiffen the enclosure such that it would minimize sagging under the weight of the four rectifiers, especially in flush mounted applications.



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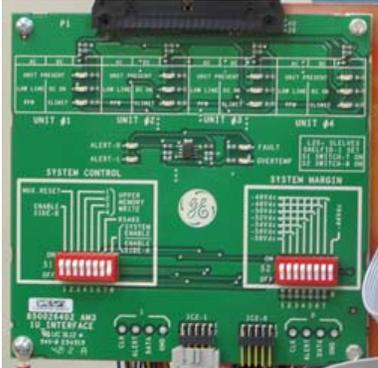
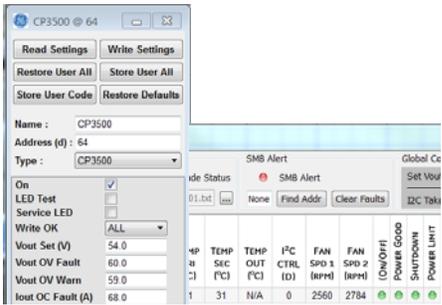
Shelf Insertion Keying



Ordering Information

Part Number	Description	Comcode	Usage
Shelves			
J2014003L001	Dual I ² C redundant busses, -54Vdc output @ 14,000W	150040608	
Blank Slot Fillers			
Central Office White		CC848822263	All
Raven Black		CC848781534	
Graphite		CC848825233	
Extensions and mounting brackets			
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			
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

Accessories

Item	Description	Part number
	<p>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.</p>	<p>150045498</p>
	<p>Interface cable between the 30 pin J1 signal connector of the shelf and the 40 pin mating connector of the interface board above.</p>	<p>CC848848960</p>
	<p>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.</p>	<p>150036482</p>
	<p>The site below downloads the GE 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 pro_GUI.exe to start the program after the download is complete.</p> <p>http://www.geindustrial.com/products/embedded-power</p> <p>Graphical User Interface Manual; The GUI download created a directory Computer > Windows7 (C:) > DPI Suite In that directory start the DPL_manual.pdf file.</p>	<p>Free download</p>

The GE 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.

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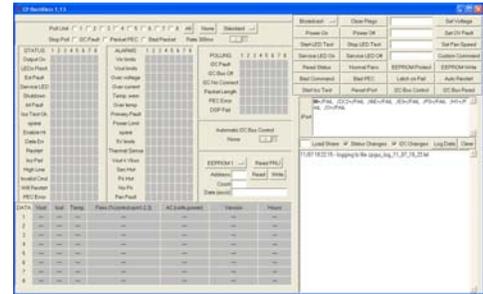
Support Tools

Graphical User Interface

This program exercises the various commands and functions available via the PMBus™ interface of the power supply.

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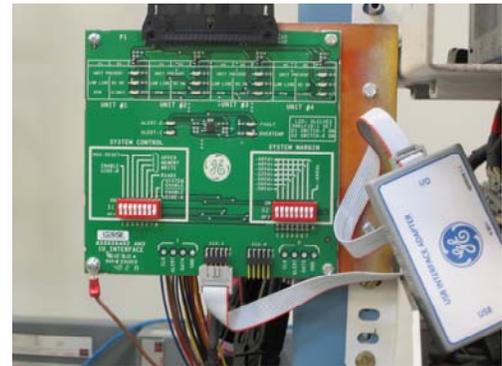


1U Interface Board and USB interface adapter

The 1U interface board can be used independently to test the 'analog' function capability of the platform, or

In combination with the USB interface adapter, shown in the gray box, the shelf can be mated to a computer and the PMBus™ functionality can be verified using the above described GUI.

Another option is to execute the 'command-line-interface' (CLI) program which, in addition to exercising commands one at a time, can be used to automatically exercise a set of commands using the 'scripting' feature of CLI.



Safety

Product Labeling

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.



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- 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 up to 55°C and the application environment should not exceed 55°C.
- 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}.
- This shelf has 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.
- 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.
- AC branch circuits to this equipment must be protected with fuses or circuit breakers sized as required by the U.S. National Electric Code (NEC) and/or local codes. Up to four AC mains power cords are required to power the shelf (one for each rectifier). Each power cord should be connected to a separate AC mains branch circuit with an overcurrent protector rated at no more than 30A.
- The power supply mains inlet may be used as the means to provide AC protective earthing.
- An accessible AC disconnect/protection device to remove AC power from the equipment in the event of an emergency must be provided. An accessible socket-outlet/receptacle installed near the equipment is also acceptable as a disconnect.
- 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:

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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.

German Safety Guidelines

Installationsanleitung

- Alle Ausgänge des Gerätes erfüllen die Anforderungen für SELV nach IEC/EN60950-1.
- Die Ausgänge des Gerätes liegen über den Limits für Energiegefahr nach IEC/EN60950-1 (>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/EN60950 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. Hungarian48ggs

Contact Us

For more information, call us at

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