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Installation Manual

HM-Series Shelf

HM1 and HM23 Mini DC Power Systems

Part No. DO600000061

Doc No. 2062060, Issue 8
Published 03-Mar-11

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Doc No. 2062060, Issue 8, March 2011

Published 03 March 2011

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Safety and Recommended Practices

For use in restricted-access locations only
Suitable for mounting on concrete or other non-combustible surface only

The M-series mini DC power system accepts a nominal AC voltage between 90 V and 264 V, 50–60 Hz, and produces a regulated DC output of 10.5–56 V (depending on deployed rectifiers). It is capable of delivering a maximum DC current of 400 A (300 A continuous) for 12 V rectifiers and a maximum of 200 A for 24 V and 48 V rectifiers (depending on the DC circuit; see the section "DC Circuit Drawings" on page 13 for details) in an ambient operating temperature range of –40 °C to +65 °C (depending on deployed rectifiers and the shelf).

WARNING: HAZARDOUS VOLTAGE AND ENERGY LEVELS CAN PRODUCE SERIOUS SHOCKS AND BURNS. Only authorized, qualified, and trained personnel should attempt to work on this equipment. Refer to datasheets for full product specifications.

Observe all local and national electrical, environmental, and workplace codes.

Each power shelf should be fed from a dedicated AC branch circuit of a terra neutral (TN) or an isolated-terra (IT) power system.

If a line cord is used as the AC connection means, the plug end of the cord is considered to be the primary disconnection means, and reasonable access must be given to the plug and receptacle area. The receptacle must be fed with a breaker or fuse according to specifications in Table 4.

For hard-wired AC connections, a readily accessible disconnection device must be incorporated in the building installation wiring. Select circuit breaker and wire sizes according to specifications in Table 4.

CAUTION: All rectifiers employ internal double pole/neutral fusing.

Use Underwriters Laboratories (UL)-listed, double-hole lugs for all DC connections to prevent lug rotation and inadvertent contact with other circuits.

Wires rated for 90 °C are recommended for all DC connections. Loop voltage drop necessitates choosing wire sizes larger than the minimum recommended.

Alarm contacts are rated for a maximum voltage of 60 V, SELV (Safety Extra Low Voltage) and a maximum continuous current of 0.5 A.

Connection and mounting torque requirements are listed in Table 6.

Eltek Valere does not recommend shipping the power shelf with rectifiers installed. Rectifiers should be shipped in separate boxes provided by Eltek Valere.

FCC Compliance Statement

NOTE: This device complies with Part 15 of Federal Communications Commission (FCC) Rules. Its operation is subject to the following two conditions:

1. This device may not cause harmful interference.
2. This device must accept any interference received, including interference that may cause any undesired operation.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his or her own expense.

WARNING: Changes or modifications to this unit not expressly approved by the party responsible for the compliance could void the user's authority to operate this equipment.

1. Product Specifications

Rectifier Specifications

Rectifiers that work in the HM-series power system are listed in Table 1. The input and output voltage ranges and the maximum output current for each model of rectifier are also given.

Model #	Input Voltage	Output Voltage	Output Current
H0500A1	100 Vac - 240 Vac	42 Vdc - 56 Vdc	10 amps
H0750A1	100 Vac - 240 Vac	42 Vdc - 56 Vdc	15 amps
H1000A1	100 Vac - 240 Vac	42 Vdc - 56 Vdc	20 amps
H1250A1	100 Vac - 240 Vac	42 Vdc - 56 Vdc	25 amps
H1500A1	200 Vac - 240 Vac	42 Vdc - 56 Vdc	30 amps
H2000A1	200 Vac - 240 Vac	42 Vdc - 56 Vdc	40 amps
H2500A1	200 Vac - 240 Vac	42 Vdc - 56 Vdc	50 amps
H2500A2	200 Vac - 277 Vac	42 Vdc - 56 Vdc	50 amps
H1250B1	100 Vac - 240 Vac	21 Vdc - 28 Vdc	50 amps

Table 1 – Rectifier Specifications

Heat Dissipation

Typical and maximum values of heat dissipation for each H-series rectifier are listed in Table 2. "Maximum" is calculated at AC 180 V, and maximum DC voltage and current values for a rectifier, and "typical" is calculated at AC 240 V, and typical DC voltage and current values for the rectifier.

Model	Typical		Maximum	
48V	**BTU/hr**	**Watts**	**BTU/hr**	**Watts**
H0500A1	249	73	410	120
H0750A1	338	99	588	172
H1000A1	405	119	704	206
H1250A1	451	132	833	244
H1500A1	541	159	765	224
H2000A1	635	186	897	263
H2500A1	794	233	1106	324
H2500A2	794	233	1106	324
24V	**BTU/hr**	**Watts**	**BTU/hr**	**Watts**
H1250B1	564	165	856	251

Table 2 – Heat Dissipation

AC Input Requirements

AC Input Diagrams

The HM-series system uses a single, dual, or individual feed AC architecture (Figure 1, Figure 2, and Figure 3).

The type of feed for the system can be determined from the shelf part number. This part number can be found on a sticker on the right side, near the rear of the shelf. Suppose the part number is HM1D-AUN-VV. The fourth character, "D" in this case, indicates the AC feed type. "S" indicates single feed, "D" indicates dual feed, "B" indicates individual feed with terminal blocks, "I" indicates individual feed with IEC320-C14, and "J" indicates individual feed with IEC320-C20. For details about the AC feed type for your system, see the following sections.

Single Feed

A system with a single feed AC architecture feeds all rectifier slots with a single AC feed. The AC connection to the shelf is made via a compression-style terminal block on the rear of the system (see Figure 8). This terminal block can accept a maximum wire size of 4 AWG. The connection should be torqued to 27 in·lb. The AC ground is connected to a ¼"-20 stud by using a ring terminal. A 1" knockout is provided for cable entry into the AC section. This knockout can accept either an AC cord grip provided by Eltek Valere or a conduit. Size the AC breaker and wiring according to specifications in Table 4.

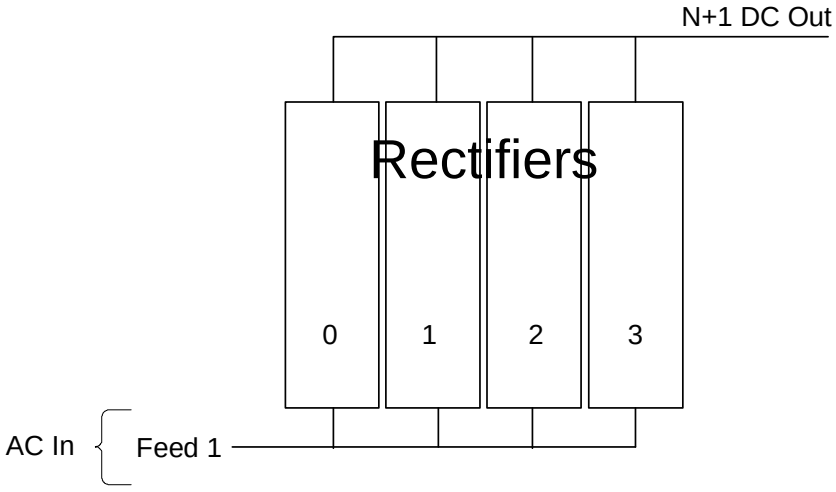

Figure 1 - Single Feed AC Wiring Architecture

Dual Feed

A system with a dual feed AC architecture feeds rectifier slots 0 and 1 with feed 1, and rectifier slots 2 and 3 with feed 2. The AC

connections to the shelf are made via compression-style terminal blocks on the rear of the system (see Figure 8). These terminal blocks can accept a maximum wire size of 10 AWG. The connections should be torqued to 6 in·lb. Size the AC breaker and wiring according to specifications in Table 4.

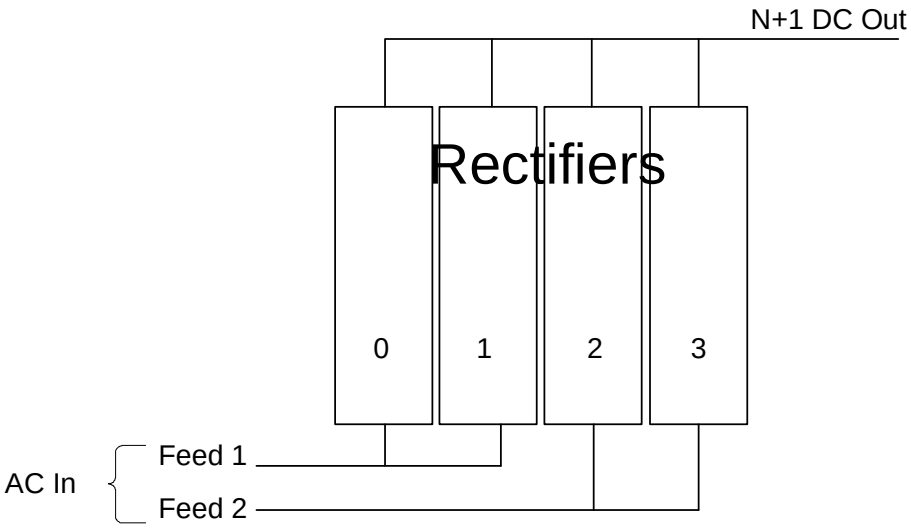

Figure 2 - Dual Feed AC Wiring Architecture

Individual Feed

A system with an individual feed AC architecture feeds each rectifier slot with an AC feed. There are three different styles of individual feeds for these systems based on the particular system ordered (see "AC Input Diagrams").

Terminal Block Connection

The first style of connection is made via rear-accessed compression-style terminal blocks (see Figure 10). These terminal blocks can accept a maximum wire size of 10 AWG. The connections should be torqued to 6 in·lb.

IEC320-C14 Connection

The second style of connection is made via rear-accessed IEC320-C14 socket (see Figure 11) rated at 12A or less. The connections should be sized for AC supply no larger than 15 A. Consider this limitation when sizing the rectifiers. Securing brackets are available to hold the IEC320 AC cords to the shelf (see the section "AC Cord Brackets" on page 21 for more information). Size the AC breaker and wiring according to specifications in Table 4.

NOTE: Current ratings for this connector inside the US and Canada may not exceed 12A. In Europe current ratings may not exceed 10A. Eltek Valere recommends referring to local and company standards before supplying AC power to these connections.

IEC320-C20 Connection

The third style of connection is made via rear-accessed IEC320-C20 socket (see Figure 12) rated at 16A or less. The connections should be sized for AC supply no larger than 20 A. Consider this limitation when sizing the rectifiers. Securing brackets are available to hold the IEC320 AC cords to the shelf (see the section "AC Cord Brackets" on page 21 for more information). Size the AC breaker and wiring according to specifications in Table 4.

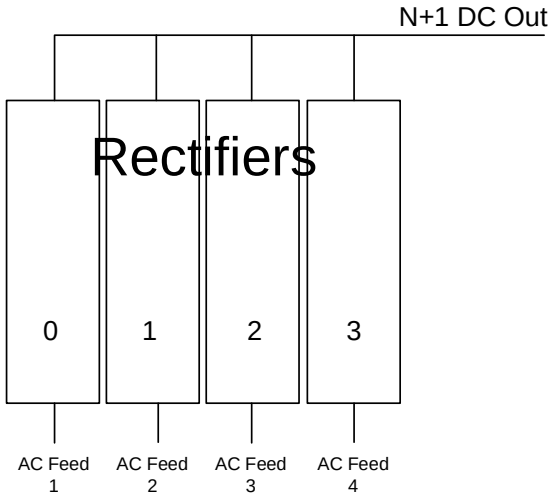

Figure 3 - Individual Feed AC Wiring Architecture

AC Feed Sizing

To size AC feeds properly, see the following example. **Failure to size the AC breaker and wiring properly can result in annoying breaker trips or even fire.** If you anticipate growth, size the AC breaker and wiring for the expected capacity. **ALWAYS FOLLOW NEC (NATIONAL ELECTRICAL CODE) RULES AND YOUR LOCAL COMPANY PRACTICES WHEN SELECTING AC WIRES AND PROTECTION DEVICES.**

Table 3 lists sizes of recommended AC input breakers and corresponding wires based on rectifier model number and input voltage. Because there are different input types of individual feed connections (see the section "Individual Feed"), the table lists the recommended input type based on the input current rating of the connector.

AC Feed	Model Number of Rectifier	Minimum Input Voltage	Maximum rate AC input Current	Minimum recommended circuit breaker	C14	C20	Terminal Block
		Volts	Amps	Amps	12A max	16A max	24A max
Individual	H0500A1	100	6.3	15	Yes	Yes	Yes
	H0500A1	200	3.6	15	Yes	Yes	Yes
	H0750A1	100	9.5	15	Yes	Yes	Yes
	H0750A1	200	5.5	15	Yes	Yes	Yes
	H1000A1	100	12.6	15	No	Yes	Yes
	H1000A1	200	7.3	15	Yes	Yes	Yes
	H1250A1	100	15.4	20	No	Yes	Yes
	H1250A1	200	8.9	15	Yes	Yes	Yes
	H1500A1	200	10.9	15	Yes	Yes	Yes
	H2000A1	200	11.7	15	Yes	Yes	Yes
	H2500A1	200	14.7	20	No	Yes	Yes
	H1250B1	100	15.8	20	No	Yes	Yes
	H1250B1	200	9.1	15	Yes	Yes	Yes

Table 3 - Recommended Breaker Sizing for Individual-feed Shelves

AC current requirements in Table 3 and Table 4 are based on the minimum rated input voltage for the rectifier. An overhead of 125% of the rated input current has been used to determine breaker ratings.

AC Feed	Number of Rectifiers on AC Feed	Model Number of Rectifier	Rated Input Voltage	Maximum Input Current	Minimum Recommended Circuit Breaker
			Volts	Amps	Amps
Dual	2	H0500A1	100	12.6	15
		H0500A1	200	7.3	15
		H0750A1	100	18.9	20
		H0750A1	200	10.9	15
		H1000A1	100	25.3	30
		H1000A1	200	14.6	15
		H1250A1	100	30.9	n/a
		H1250A1	200	17.8	20
		H1500A1	200	21.9	30
		H2000A1	200	23.5	30
		H2500A1	200	29.3	30
		H1250B1	100	31.6	n/a
		H1250B1	200	18.2	20
Single **NOTE:** Use only if a maximum of three rectifiers are to be installed	3	H0500A1	100	18.9	30
		H0500A1	200	10.9	15
		H0750A1	100	28.4	50
		H0750A1	200	16.4	20
		H1000A1	100	37.9	50
		H1000A1	200	21.9	30
		H1250A1	100	46.3	60
		H1250A1	200	26.7	30
		H1500A1	200	32.8	50
		H2000A1	200	35.2	50
		H2500A1	200	44	60
		H1250B1	100	47.3	60
		H1250B1	200	27.3	20
Single	4	H0500A1	100	25.3	30
		H0500A1	200	14.6	15
		H0750A1	100	37.9	50
		H0750A1	200	21.9	30
		H1000A1	100	50.5	60
		H1000A1	200	29.1	30
		H1250A1	100	61.8	75
		H1250A1	200	35.6	50
		H1500A1	200	43.7	50
		H2000A1	200	46.9	60
		H2500A1	200	58.7	75
		H1250B1	100	63.1	75
		H1250B1	200	36.4	50

Table 4 - Recommended AC Circuit Breaker Sizes for Dual- and Single-Feed Shelves

DC Output Requirements

DC Circuit Drawings

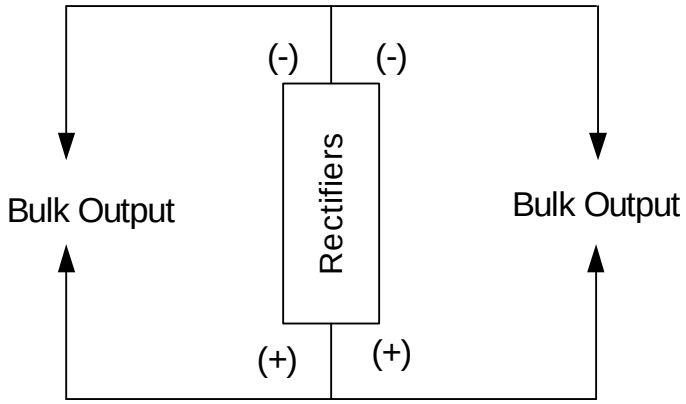

Figure 4 - DC Wire Diagram

Each system is equipped with two unprotected bulk output connections: one set located on each side of the rear of the shelf. Circuit 1 (Figure 16) can accept only lugs, and Circuit 23 (Figure 17) can accept lugs or bus bars. Unprotected bulk output connections are made on double, ¼"-20 (M6) studs with 5/8" centers. The maximum tongue width for bulk connections is 0.67". Choose lugs according to specifications in Table 5. The polarity of the system is universal; therefore, the polarity of the output is determined by system grounding. See the section "DC Reference Ground" for more detail. Circuit 1 is capable of delivering maximum total current of up to 200A, 100A per side (depending on the model). Circuit 23 is capable of delivering a maximum total current of 400A (300A continuous), 200A per side.

DC Reference Ground

The power system is a fully floating system. This means that neither the positive bus bar nor the negative bus bar is tied to the chassis or an earth ground. An external reference or earth ground may be connected to either the positive output or the negative output, depending on the desired output polarity. Follow your company's guidelines for sizing and attaching a reference ground.

DC Wire Sizing

There are two main considerations for sizing a DC wire: ampacity and voltage drop. Ampacity refers to the safe current-carrying capacity of a wire as specified by non-profit organizations such as Underwriters Laboratories and the National Fire Protection Association (NFPA), which publishes the National Electrical Code (NEC). Voltage drop is the amount

of voltage loss in a length of wire due to ohmic resistance of the conductor. A DC wire may be sized for either ampacity or voltage drop, depending on loop length and conductor heating. In general, for ampacity considerations, wires of length less than 50 feet are selected, and for voltage drop considerations, wires of length more than 50 feet are selected. NEC Table 310.16 provides ampacity values for various wire sizes, wire bundles, and insulation temperature–rated wires. **ALWAYS FOLLOW NEC RULES AND YOUR LOCAL COMPANY PRACTICES WHEN SELECTING DC WIRES AND PROTECTION DEVICES.**

The selection of unprotected DC output wires should be based on the total rectifier capacity of the shelf.

DC Lug Requirements

Table 5 lists lug part numbers from Burndy that can be used for DC connections. Wire type should be considered when determining the type of lug to use. These part numbers are of lugs used with the flex style cable. Follow your company practices when determining the exact lugs required. Systems requiring more than one 2 AWG connection will need custom bus bars.

NOTE: ¼" holes can be used with M6 studs.

Current Rating	Wire Size		Burndy Lug	Description
Amps	AWG	mm^2	Part Number	
Up to 30 amps	10	6	YAV102TC14	Double hole lug with 1/4" holes and 5/8" centers
50 amps	8	10	YA8CL2TC14	Double hole lug with 1/4" holes and 5/8" centers
75 amps	6	16	YAV6C-L2TC14-FX	Double hole lug with 1/4" holes and 5/8" centers
90 amps	4	25	YAV4C-L2TC14-FX	Double hole lug with 1/4" holes and 5/8" centers
100 amps	2	35	YAV2C-L2TC14-FX	Double hole lug with 1/4" holes and 5/8" centers

Table 5 – Lug Part Numbers for DC Output

Torque Settings

Table 6 lists recommended torque settings for all mechanical and electrical connections according to screw or nut size.

Screw or Nut Size	Torque (in•lb)	Torque (N•m)
4-40	6	1
6-32	12	1.5
8-32	22	3
10-32	37	4.25
12-24	50	5.75
¼-20	65	7.5

Table 6 - Recommended Torque Settings

Required Tools

The power system is designed to be installed with a minimum number of commonly available tools:

1. #1 cable and #2 Phillips screwdrivers
2. Torque wrench
3. 5/16” and 7/16” box wrenches, sockets, and nut drivers
4. Wire and cable strippers
5. Wire and cable crimpers

Alarm and Signal Cable

Access to alarms and rectifier control signals is accomplished via a rear-mounted connector with a mating cable part number CA312181178 (Figure 6). Table 7 provides pin-out details of the connector. Here is some additional information regarding the alarm interface:

1. The pin-out of the alarm connector on the shelf is at 180°, unlike the pin-out of a standard Molex connector (see Figure 5).
2. AC fail, DC fail, and thermal limit fail alarms are all open collector, opto-coupled signals. These alarms produce an active high signal as a result of a failure and produce an active low signal in a normal state between the alarm pin and pin 17. The pin can sink 10 mA of current at 5 V and 5 mA at Transistor-Transistor Logic (TTL) voltages.
3. Applying 5 V between pins 16 (module disable) and 17 will shut down all rectifiers. Removing the 5 V will allow the rectifiers to restore the DC output.
4. Tie pin 9 from multiple shelves together to share current between shelves.
5. When using multiple shelves, tie alarm and signal output connections together in parallel to monitor all shelves.

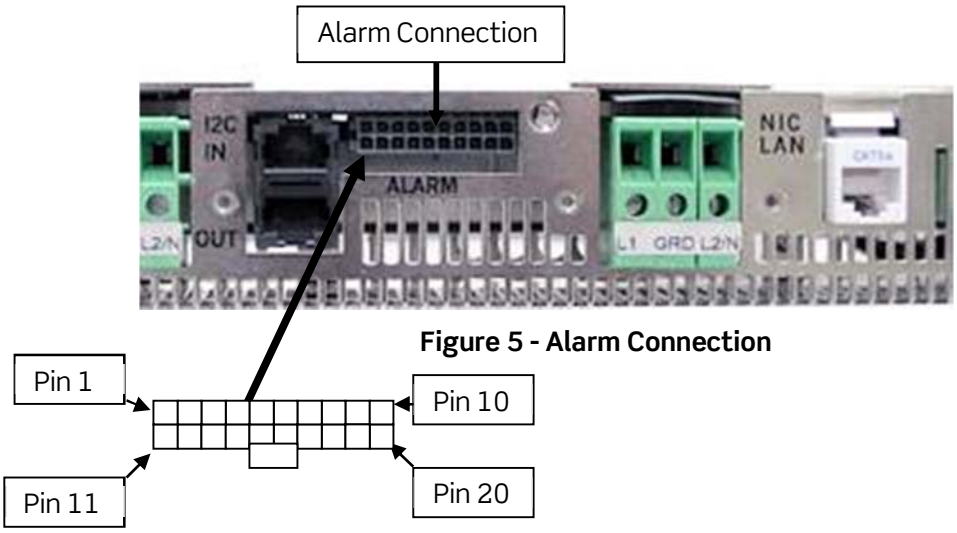

Figure 5 - Alarm Connection

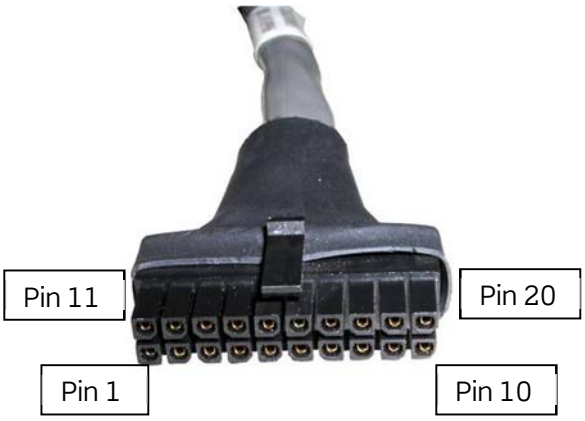

Figure 6 - Alarm Cable Pin-Out (CA312181178)

Pin #	Wire Color	Description
20	BLK	Shelf Bias: A regulated 12 V/100 mA bias supply. Referenced to Pin 10.
19	RED	SCL: I^2C clock line. Referenced to Pin 10.
18	RED/WHT	SDA: I^2C data line. Referenced to Pin 10.
17	RED/BLK	Logic Ground: Isolated ground for opto-coupled alarms.
16	GRN/WHT	Module Disable: Opto-coupled input. Applying 5 V between this pin and Pin 17 will disable all modules in the shelf.
15	LT BL	Module 0 (leftmost slot) AC Fail
14	LT BL/WHT	Module 1 AC Fail
13	LT BL/BLK	Module 2 AC Fail
12	YLW/WHT	Module 3 AC Fail
11	YLW/BLK	Not Used
10	TAN/WHT	V Main Output (-). DC power ground
9	TAN/BLK	I Share: Indicates average shelf current. Ratio varies with rectifier type. Call factory for details.
8	TAN	Unused
7	GRN/BLK	Open
6	GRN	Module Thermal Limit Failure
5	OR/WHT	Module 0 (leftmost slot) DC Fail
4	OR/BLK	Module 1 DC Fail
3	OR	Module 2 DC Fail
2	WHT	Module 3 DC Fail
1	YLW	Module Present

Table 7 - Alarm and Signal Interconnections

Multiple Shelf Connection

Input and output I^2C communication ports are available to connect multiple shelves together for communication with a single controller. Multiple shelf communication through the web interface is available only with the NIC1002 controller. This controller can be connected to a maximum of four shelves.

Inter-shelf communication is available for multiple shelf configuration purposes through two RJ45 ports (shown in Figure 19) on the rear side of the shelf. The cables (available separately) for these connections have a part number of CA210082262. Connect the first cable from the output point of the top power shelf to the input point of the next shelf. Repeat this procedure until all shelves are connected in a chain. In addition, a termination cable (CA210082917—available separately) must be inserted into the I^2C input port of the top shelf. Finally, all outputs, both positive and negative, must be connected to a single DC bus.

2. Power System Mounting and Wiring

Before installing the power system, consider the following safety requirements:

1. Elevated operating ambient temperature: If the system is installed in a closed or multi-unit rack assembly, the operating ambient temperature of the rack environment may be greater than the room ambient temperature. Therefore, the system should be installed in an environment compatible with the maximum ambient temperature (Tma) specified by the manufacturer.
2. Reduced air flow: Installation of the system in a rack should be such that the amount of air flow required for the safe operation of the system is not compromised.
3. Mechanical loading: Mounting of the system in the rack should be done carefully so that there are no hazards due to uneven mechanical loading.
4. Circuit overloading: Read the ratings on system labels carefully and consider these while connecting the system to the supply circuit. Be aware of the effect that overloading of the circuits might have on over-current protection and supply wiring.
5. Reliable earthing: The rack-mounted system must have reliable earthing.

Before unpacking the DC power system, note any physical package damage that could indicate potential damage to the contents. After removing the DC power system from boxes and packing material, inspect for any shipping or other damage. Contact sales or technical support immediately if you notice any damage. Have all tools, wires, cables, and hardware within easy reach. To the extent possible, ensure a clean (free of debris, dust, and foreign material) work environment. Care should be taken during the installation process to prevent exposure of the equipment to wire clippings. If possible, rectifiers should remain sealed in their shipping boxes until the shelf wiring is complete. Ensure that all AC and DC power sources are off and disconnected.

Mechanical Mounting

The system is intended for normal operations and should be installed in a standard 19" telecommunications rack. Eltek Valere recommends that one person hold the shelf into position in the rack while another person secures the shelf to the rack with the supplied mounting hardware. Torque the mounting hardware according to specifications in Table 6. Brackets (part # BR1923-1U) to mount the system in a 23" rack are available from Eltek Valere.

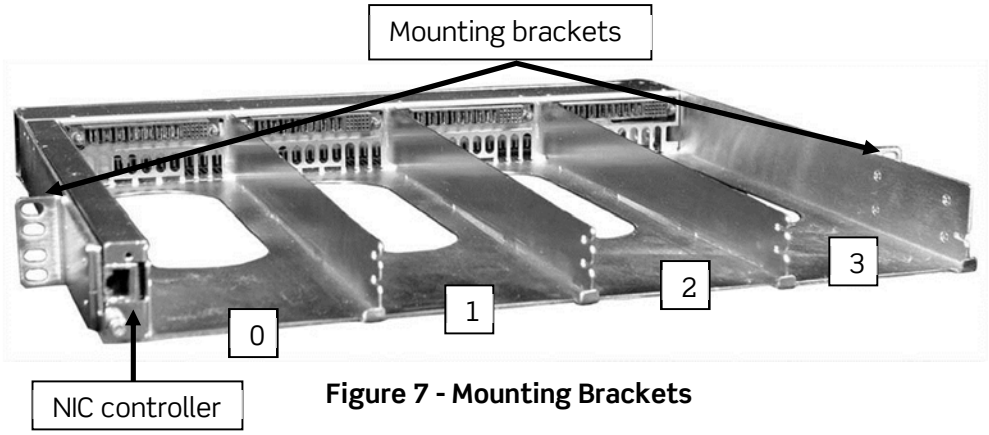

Figure 7 - Mounting Brackets

Controller Connections

The power system can work with an NIC-series controller. Install the controller in the controller slot on the extreme left of the system as shown in Figure 7. For more information about installing peripheral connections, see the Controller Installation and Operation manual that is shipped with the controller unit. System controllers are sold separately.

AC Input Connections

WARNING: Do not disconnect and reconnect input/output (I/O) power connectors during lightning storm.

Single Feed

Remove the safety cover from the AC section block. Install an AC cord grip or a conduit to feed AC wires to the terminal block. Feed AC wires through the hole on the terminal block cover, and connect wires from the AC cord into appropriate positions labeled in Figure 8. Connect the AC ground to GRD first, with a lead that is longer than the AC lines. Then connect line/hot to L1, the second line or neutral to L2/N. Tighten screws to 27 in·lb and replace the AC section block safety cover.

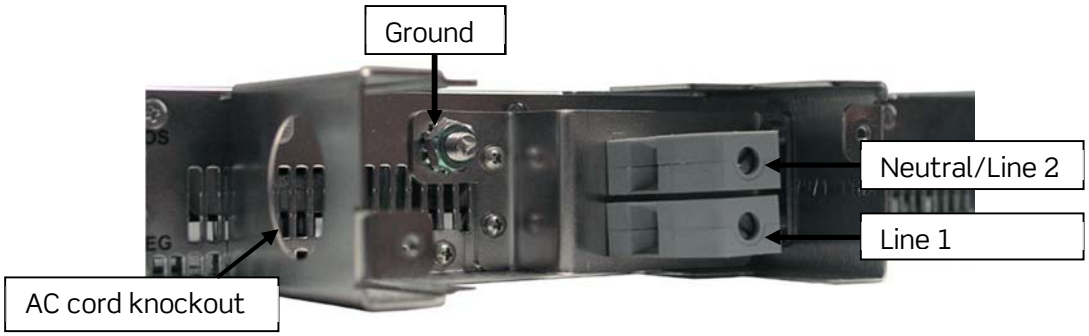

Figure 8 - Single Feed

Dual Feed

Remove the safety cover from the terminal block shown in Figure 9. Feed AC wires through the hole on the terminal block cover, and connect wires from the AC cord into appropriate positions labeled in Figure 9. Connect the AC ground to GRD first, with a lead that is longer than the AC lines. Then connect line/hot to L1, the second line or neutral to L2/N. Tighten screws to 6 in·lb, and tie the AC cord to support brackets (see the section "AC Cord Brackets" on page 21).

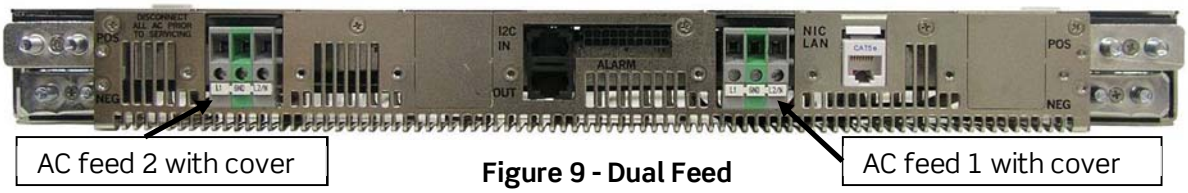

Figure 9 - Dual Feed

Individual Feed

Terminal Blocks

Connect wires from the AC cord into appropriate positions labeled on the terminal block. Connect the AC ground to GRD first, with a lead that is longer than the AC lines. Then connect line/hot to L1, the second line or neutral to L2/N. Tighten screws to 6 in·lb, and secure AC wiring to safety brackets (see the section "AC Cord Brackets").

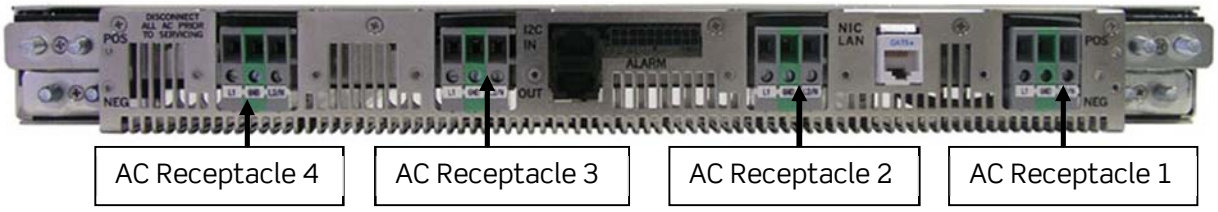

Figure 10 - Rear View (Terminal Block Individual Feed)

IEC320 Sockets

Plug in the appropriate cord into the AC connections on the back of the shelf and secure AC wiring to safety brackets (see the section "AC Cord Brackets").

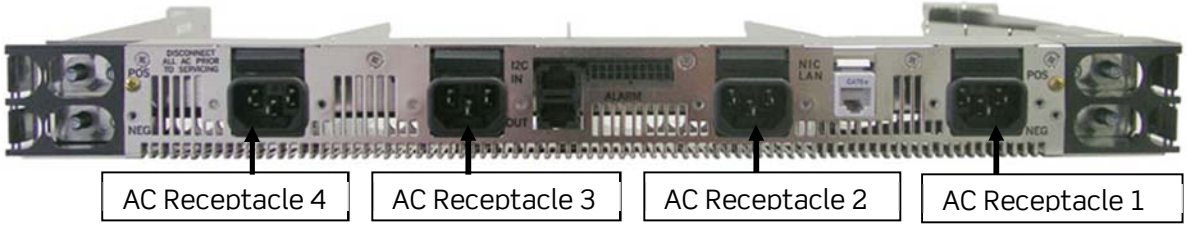

Figure 11 - Rear View (IEC320-C14)

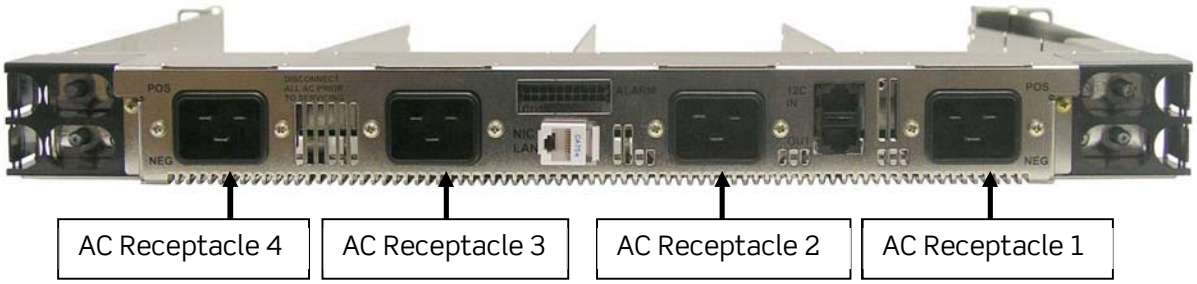

Figure 12 - Rear View (IEC320-C20)

AC Cord Brackets

Optional brackets are available in the mounting kit to secure the IEC320 plugs to the shelf in an individual feed system. Follow these instructions for using the brackets:

1. Place the bracket on the plug as shown in Figure 13. You can secure it to the plug by tightening the screw on the bracket.

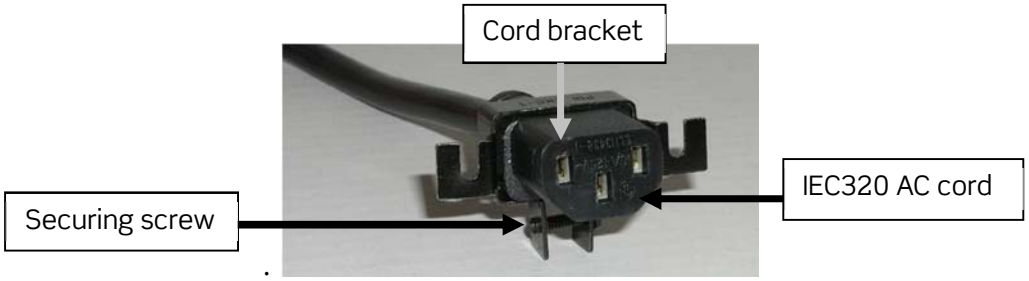

Figure 13 - AC Cord Bracket (IEC320 Connectors)

2. After plugging the cords into the shelf, secure the brackets to the shelf with #4-40 screws provided as shown in Figure 14.

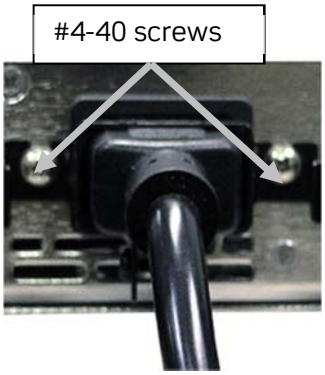

Figure 14 - Securing the Bracket to the Shelf

In addition, in case of the terminal block, a bracket is used to secure the wire to the shelf (see Figure 15). Secure the bracket to the shelf using the #4-40 screws provided. Then secure the wires to the bracket with the zip tie provided.

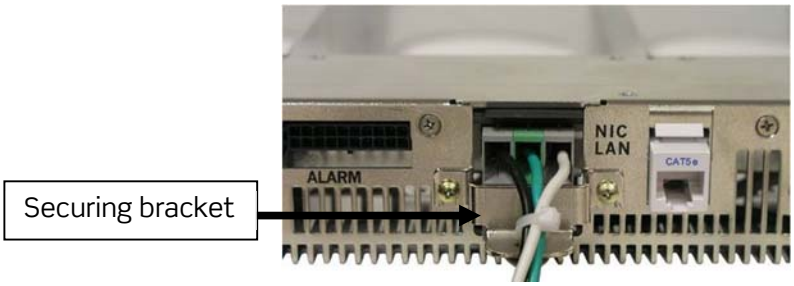

Figure 15 - AC Cord Bracket (Terminal Block Connectors)

DC Output Connections

WARNING: It is very important to verify polarity of all shelf connections, as well as of batteries, before connecting batteries to the shelf. Improper connection can cause the system not to work properly, damage the shelf, and may cause bodily harm.

Make DC connections via the two rear bulk output connection points as shown in Figure 16 (Circuit 1) and Figure 17 (Circuit 23). Torque connections are according to specifications in Table 6. DO NOT exceed the current rating of the shelf mentioned in the section "DC Output Requirements" on page 13.

Circuit 1

Remove the plastic knockouts from the DC cover. Connect lugged wires to the rear-accessed bulk output connection points. Verify the polarity of connections before turning on the power. Output connections are labeled "pos" for positive and "neg" for negative. Repeat connections for the other side.

Figure 16 - DC Output Connections (Circuit 1)

Circuit 23

Connect lugged wires or bus bars to the rear-accessed bulk output connection points. Verify the polarity of connections before turning on the power. Output connections are labeled "pos" for positive and "neg" for negative. Repeat connections for the other side.

Figure 17 - DC Output Connections (Circuit 23)

DC ground

Due to the universal capabilities of this system a specific location has not been provided for a DC ground. If an open output connection point is available on either side, a ground may be attached to the appropriate connection for the desired output polarity. If an output connection point is not available a ground will have to be connected to an external distribution point.

Alarm Connections

Access to alarm and rectifier control signals is accomplished by plugging an alarm cable into a rear-mounted connector as shown in Figure 18. The alarm cable available from Eltek Valere has a part number of CA31212181178. See the section "Alarm and Signal Cable" on page 15 for more information on alarms.

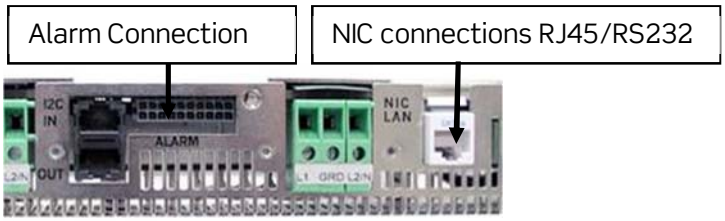

Figure 18 - Alarm Connection

NIC-Series Controller Interface (Optional)

The power system can work with any NIC100x-series controller. Install the controller in the controller slot on the extreme left of the system as shown in Figure 7. For more information, see the Controller Installation and Operation manual that is shipped with the controller unit. System controllers are sold separately.

I²C Communication Connection

Input and output I²C communication ports are available to connect multiple shelves together for single controller communication. More information about the required cables (available separately) is available in the section "Alarm and Signal Cable" on page 15.

Connect the first cable from the output point of the top power shelf to the input point of the next shelf. Repeat this procedure until all shelves are connected in a daisy chain. In addition, a termination cable (CA210082917) must be inserted into the I²C input port of the top shelf. Finally, all outputs, both positive and negative, must be connected to a single DC bus.

Figure 19 - I²C Communication Ports

3. Turn-Up

After all input and output connections have been secured and checked, begin turn-up as follows:

1. Activate all input breakers.
2. When input breakers are on, install rectifiers sequentially by sliding each rectifier into position and closing the latch as shown in Figure 22.

NOTICE: Rectifier latches must be open for installation. **Attempting to install rectifiers with latches closed can result in mechanical damage to the rectifiers and the shelf.** In addition, rectifier slots are keyed, and keys may be repositioned within the slot to accommodate the rectifier model being used.

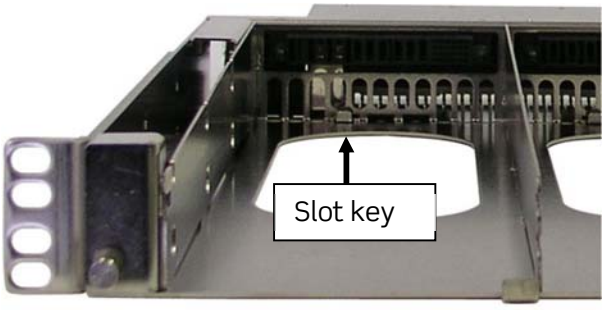

Figure 20 - Rectifier Slot Key

Rectifier fans start in high-speed mode and reduce their speed according to the ambient and plant conditions within 10 seconds. As each rectifier is installed, the controller automatically identifies the new rectifier and reconfigures the system. After all rectifiers have been installed, and if there are no alarms, the controller will display “System OK.”

If there are alarms, refer to section 5 for troubleshooting assistance. If there are no alarms, make any adjustments to the default controller settings by following the instructions in the Controller Installation and Operation manual that is shipped with the controller.

4. Replacement Items

The controller and rectifiers are designed as modular, field-replaceable units. The following sections outline the procedure to replace these items.

NIC-Series Controller

The controller is hot swappable and can be removed without affecting operation of the rectifiers. Remove existing controller from the shelf and replace with controller of same type (NIC100x series). Any setpoints changed on existing controller will have to be updated on the replacement.

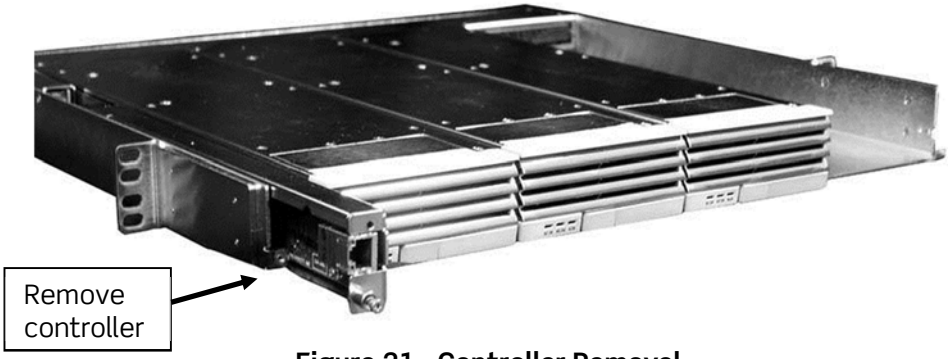

Figure 21 - Controller Removal

Rectifiers

The rectifier is hot swappable and can be removed without affecting operation of the other rectifiers. If a rectifier needs to be removed, press the latch button on the front of the unit, and pull the handle until the unit slides out of the slot. With the latch open (Figure 22), slide a new rectifier into the open slot until it connects with the backplane. After the rectifier is inserted, close the latch by pressing it. The rectifier will power up and the controller will configure it automatically. No further setup is required.

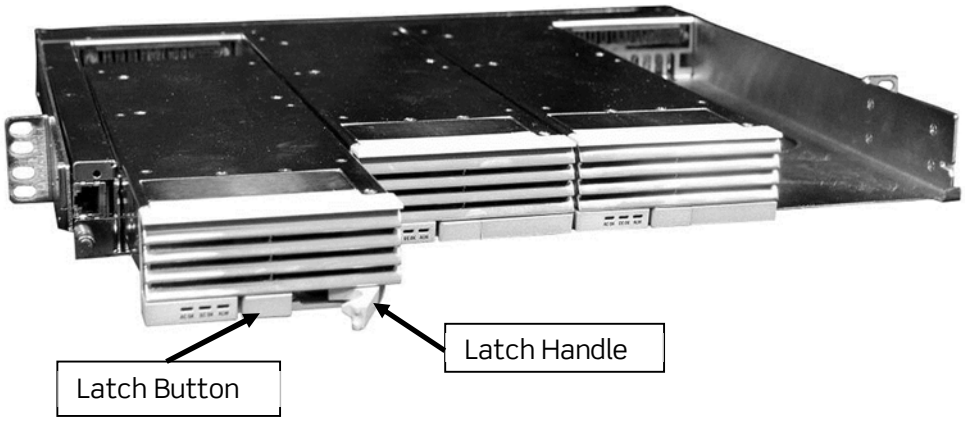

Figure 22 - Rectifier Removal

5. Troubleshooting

Problems and Solutions

In case of an alarm from the controller, verify the following (for details, refer to the Controller Installation and Operation manual):

1. All AC and DC connections are secured properly.
2. All rectifiers are installed and seated properly.
3. The controller is installed and seated properly.

Follow these instructions for different scenarios:

1. **AC OK off, DC OK off, and ALM on or off and AC Fail alarm from the alarm cable:** Verify that proper AC voltage has been supplied to the rectifiers being used. Refer to Table 1 for AC input voltage requirements. Reseat the rectifiers, and if problems continue, replace the rectifiers.
2. **AC OK on, DC OK off, and ALM LED on and DC Fail alarm from the alarm cable:** Check DC output connections for any short circuit. Reseat rectifiers, and if problems continue, replace the rectifiers.
3. **AC OK on, DC OK on, and Thermal Limit Failure alarm from the alarm cable:** For details about troubleshooting in this scenario, refer to the Controller Installation and Operation manual.

Short Circuit and Current Limit

Figure 23 represents the behavior of the output voltage in relation to the output current as load requirements exceed the ILimit setpoint. ILimit can be adjusted up to +105% of the rated current of the rectifier. The system output voltage will remain constant up to ILimit at which point it will drop quickly to 0 V, as shown in Figure 23. If the output voltage of a 24 V or 48 V rectifier drops below 12 V for more than 5 seconds, the system will shut down. The system will automatically restart after 60 seconds, and will continue to restart and shut down until the short circuit is cleared.

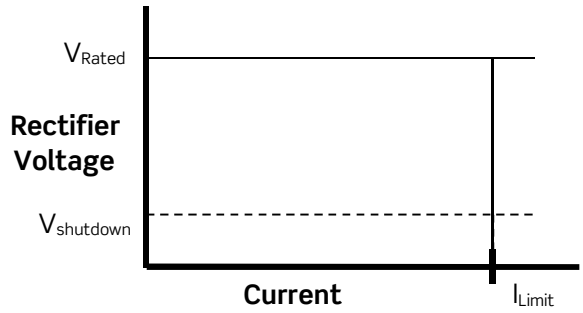

Figure 23 - Short Circuit and Current Limit

6. Revision Table

Revision	Release	Description	CO
1	5/13/2004	First release	NA
2	5/6/2005	Format update; new rectifier models added; dual-feed wiring added; recommended lugs added; photos updated to reflect new shelf design; AC cord bracket added; NIC information added	NA
3	5/5/2006	Format update; numbered sections; rectifier spec table added; DC reference ground description added; photos updated for new terminal blocks; NIC interface photo added; AC cord bracket section moved to AC input section	NA
4	8/22/2007	Input voltage range added to rectifier spec table; maximum heat dissipation added to table 2; single-feed AC option added; terminal block, IEC320-C14, and IEC320-C20 descriptions added for AC input; multi-shelf connection added; single-feed installation section added; NIC details removed	NA
5	4/07/2009	Format update; revision control implemented; revision table added; rating tables updated	NA
6	7/07/2009	Added DO6* part number for manufacturing control. Removed 12V rectifier information.	090707UA
7	06/08/2010	Added slot key information to page 25.	100608UA
8	03/03/2011	Corrected PIN 8 function in Table 7.	110201UA

Doc No. 2062060, Issue 8
Published 03-Mar-11

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