

Installation Manual

Integrated System



V-Series Power Family

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1. Safety and Recommended Practices

General practices

For use in restricted access locations only.

Only suitable for mounting on concrete or other non-combustible surface

The *Integrated* DC power system accepts a nominal AC voltage between 100 V and 240 V ($\pm 10\%$), 47 to 63 Hz, and produces a regulated DC output voltage of 21-28 V or 42-56 V (depending on rectifiers deployed). It is capable of delivering a maximum DC output of 240 A per power shelf (depending on which shelves and rectifiers deployed) at an ambient operating temperature range of -40°C to $+65^{\circ}\text{C}$.



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) power system.

The plug end of an AC line 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 3 (48V) or Table 4 (24V).

For hard-wired AC connections, a readily accessible disconnection device must be incorporated in the building installation wiring. Select circuit breaker sizes according to national and local electric codes.



CAUTION: All rectifiers employ internal double pole/neutral fusing. Fuses are not field-replaceable.

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

Wire rated for 90°C is recommended for all DC connections. In practice, wires of a size larger than the minimum safe wire size are selected for loop voltage drop considerations.

Alarm contacts are rated for a maximum voltage of 60 V, SELV (Safety Extra Low Voltage) and a maximum continuous current of 0.5A. Connection and mounting torque requirements are listed in Table 7.

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



WARNING: For safety, the power supply is required to be reliably connected to PROTECTIVE GROUND. The equipment is to be connected to supply mains by a qualified personal in accordance with local and national codes (e.g. NEC, CEC, etc). Do not disconnect and reconnect I/O power connectors during a lightning storm.

The output of the power supply is not intended to be accessible due to energy hazard. Rack mounting must be performed in accordance with instruction provided by the manufacturer to avoid potential hazards.

FCC Compliance Statement

Note

This device complies with Part 15 of FCC Rules. Operation is subject to the following two conditions:

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

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.

If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

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.

ICES-003 Class B Notice

This Class B digital apparatus complies with Canadian ICES-003. Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.

2. Product Specifications

Integrated Plant Systems consist of one or two power shelves whose DC output is bussed up to one or two distribution units. The power shelves operate on Eltek Valere's V-series rectifiers.

Rectifier Specifications

Rectifiers that work in the *Integrated* Power System are listed in Table 1. Specifications for each model are also given.

Model	Nominal DC Voltage (V DC)	DC Voltage (V DC) Range	Max DC Current (I DC)	AC Voltage (V AC) Range
V0500A	48	42 - 56	10	90 - 264
V0750A	48	42 - 56	15	90 - 264
V1000A	48	42 - 56	20	90 - 264
V1250A	48	42 - 56	25	90 - 264
V1500A	48	42 - 56	30	180 - 264
V2000A	48	42 - 56	40	180 - 264
V2500A	48	42 - 56	50	180 - 264
V1500B	24	21 - 28	60	180 - 264

Table 1 - Rectifier Specifications

Heat Dissipation

Table 2 displays the typical and maximum heat dissipation for V-series rectifiers. "Typical" is calculated at AC 240 V, and typical DC voltage and current values for the rectifier. "Maximum" is calculated at AC 180 V and maximum DC voltage and current values for the rectifier.

Note: Values displayed are per rectifier.

Model	Typical		Maximum	
48V Rectifiers	BTU/hr	Watts	BTU/hr	Watts
V0500A	180	53	281	82
V0750A	271	79	435	127
V1000A	361	106	563	165
V1250A	451	132	690	202
V1500A	541	159	844	247
V2000A	722	212	1100	322
V2500A	902	264	1355	397
24V Rectifiers	BTU/hr	Watts	BTU/hr	Watts
V1500B	882	258	1041	305

Table 2 - Heat Dissipation

AC Requirements

There are several AC input options in this system. The AC input type can be determined from the model number of the shelf. This number is located on a label located on the right side of the shelf (when facing the front of the system), near the rear, on the mounting bracket. To determine the AC input type, identify the shelf model (i.e., CA1D-AUN-VC). The fourth character (the letter D in this case) is the AC input type. Possible options are “S” for single feed, “D” for dual feed, and “I” for individual feed.

Rear-wire power shelves are equipped with a rear-mounted AC terminal block. Each rectifier position is fed through this terminal block. Table 4 and Table 3 show the maximum AC input current per rectifier at lowest rated AC line voltage and the recommended circuit breaker size per feed. ALWAYS FOLLOW NEC RULES AND YOUR LOCAL COMPANY PRACTICES WHEN MAKING FINAL SELECTIONS.

Front-wire power shelves require cables with Molex or AMP connectors, which are available from *Eltek Valere*. The input connectors are located above the controller section. There are only dual- and individual-feed options for front-wire power shelves, and each feed type uses a different connector.

Single Feed

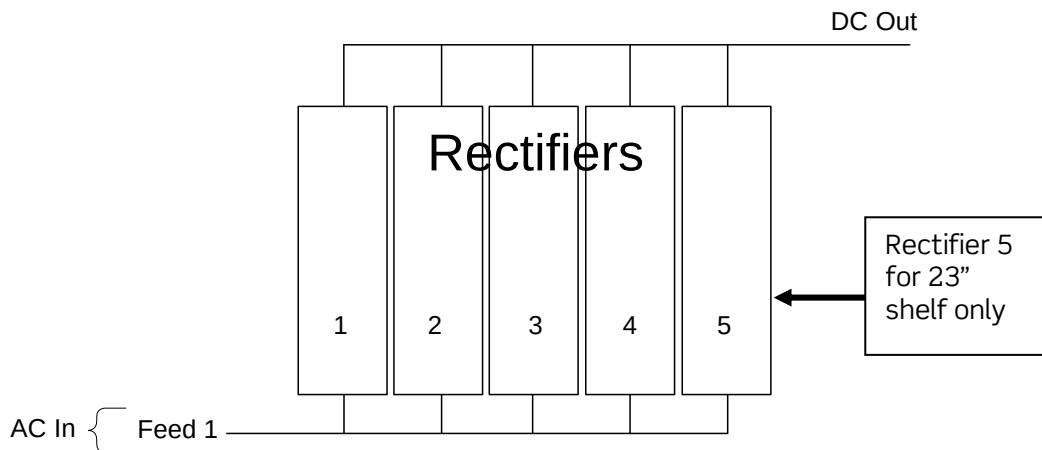


Figure 1 - Single Feed AC Wiring Architecture (per power shelf)

19" system

A single feed architecture powers all four rectifier slots from one AC feed. The feed connects to terminals with #8-32 screws, and the ground connects to a single, 1/4"-20 stud as seen in Figure 17. Always make ground terminations first. For systems without *Eltek Valere* AC cords, choose appropriate AC lugs. The AC terminal strip accepts ring terminals less than 0.5" wide. Two knockouts for 3/4" conduit are

provided for cable entry to the AC block. These entry points accept either conduit or an *Eltek Valere* cord grip.

23" system

A single feed architecture powers all five rectifier slots on one AC feed. The feed connects to two ¼"-20 studs designed for a two-hole lug with 5/8" center. Ground connection is also made to two ¼"-20 studs with 5/8" centers. Always make ground terminations first. See Figure 22. For systems without *Eltek Valere* AC cords, choose appropriate AC lugs. The AC connections on the rear of the shelf will accept lugs with a tongue width of less than 0.75" wide. A knockout for 1" conduit is provided for cable entry to the AC block. In addition, the cover of the AC block has three knockouts for ¾" conduit that can be used for additional entry ports. These entry points accept either conduit or an *Eltek Valere* cord grip.

Dual Feed

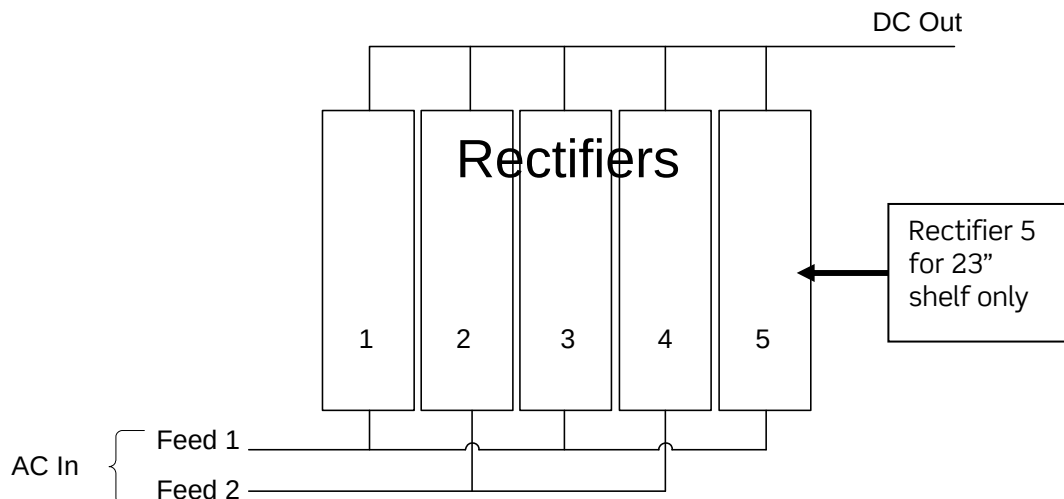


Figure 2 - Dual Feed AC Wiring Architecture (per power shelf)

19" system

For 19" systems, the dual feed architecture is available in front-wire only. Rectifier slots 1 & 3 are powered by AC feed 1, and rectifier slots 2 & 4 are powered by AC feed 2. The proper cable with Molex connector must be ordered from *Eltek Valere*. The mating connectors are located above the controller section, as shown in Figure 25.

23" system

A dual feed architecture powers rectifier slots 1, 3, & 5 on AC feed 1 and rectifier slots 2 & 4 on AC feed 2.

For rear-wire shelves, each feed connects to a single #8-32 screw; ground connects to two ¼"-20 studs with 5/8" centers as shown in Figure 23. Always make ground terminations first. For systems without *Eltek Valere* AC cords, choose appropriate AC ring terminals. The AC terminal strip on the rear of the shelf accepts ring terminals of less than 0.5" wide. Two knockouts for ¾" conduit are provided for cable entry to the AC block. There are also three knockouts for ¾" conduit on the box cover. These entry points accept either conduit or an *Eltek Valere* cord grip.

For front-wire shelves, the proper cable with Molex connector must be ordered from *Eltek Valere*. The input connectors are located above the controller section, as shown in Figure 25.

Individual Feed

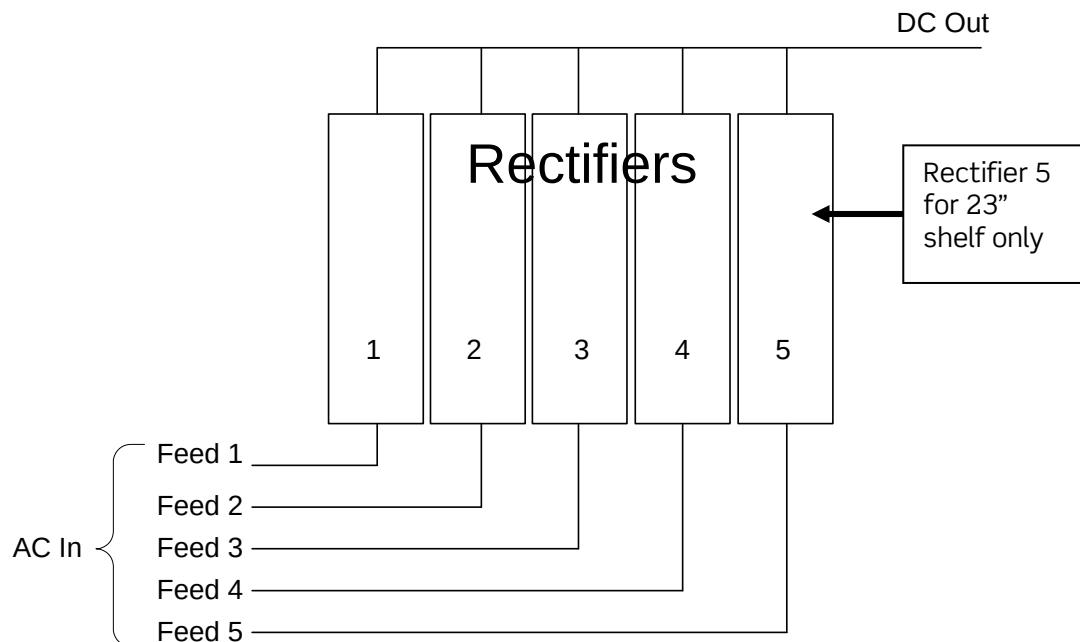


Figure 3 - Individual Feed AC Wiring Architecture (per power shelf)

19" system

An individual feed architecture powers one rectifier on each AC feed. Each feed connects to #8-32 screws, and all grounds connect to ¼"-20 studs, as seen in Figure 20. Always make ground terminations first. For systems without *Eltek Valere* AC cords, choose appropriate AC ring terminals. The AC terminal strip on the rear of the shelf accepts ring terminals of less than 0.5" wide. A single knockout for 1" conduit and two knockouts for ¾" conduit are provided for cable entry to the AC block. These entry points accept either conduit or an *Eltek Valere* cord grip. The cord grips for ¾" conduit knockouts are

provided; a grip for the 1" conduit knockout can be ordered separately.

23" system

An individual feed architecture powers one rectifier on each AC feed.

For rear-wire shelves, each feed connects to #8-32 screws, and all ground terminations are ¼"-20 studs as seen in Figure 24. Always make ground terminations first. AC cords with ring terminals are required, and they can be purchased from *Eltek Valere*. The AC terminal strip on the rear of the shelf accepts ring terminals of less than 0.5" width. Two knockouts for ¾" conduit are provided for cable entry to the AC block. There is also a knockout for 1" conduit provided for cable entry to the AC block. In addition, the cover of the AC block has three knockouts for ¾" conduit that can be used for additional entry ports. These entry points accept either conduit or an *Eltek Valere* cord grip. The cord grips for ¾" conduit knockouts are provided; a grip for the 1" conduit knockout can be ordered separately.

For front-wire shelves, the proper cable with AMP Mate-n-Lok connectors must be ordered from *Eltek Valere*. The mating connectors are located above the controller section, as shown in Figure 26.

AC Feed Sizing

To size AC feeds properly, see specifications listed in Table 4 or Table 3, depending on the system output voltage. **Failure to size the AC breaker and wiring properly can result in nuisance breaker trips or even fire.** If you anticipate future growth, size the AC breaker and wiring for expected future capacity. ALWAYS FOLLOW NEC RULES AND YOUR LOCAL COMPANY PRACTICES WHEN SELECTING WIRING AND PROTECTION.

NOTE: Undersizing AC breakers and wiring could cause nuisance breaker trips and system outages.

AC requirements listed in Table 4 and Table 3 are based on the absolute minimum input voltage at which the rectifiers will run. 90 V corresponds to low line and 180 V corresponds to high line.

AC Lug Requirements

If you are not using an *Eltek Valere* AC cord, wire type should be considered when determining the type of lug to use.

AC Feed Type	Number of Rectifiers on AC Feed	Model Number of Rectifier	Minimum Input Voltage	Maximum rated AC Current	Minimum circuit breaker
			Volts	Amps	Amps
Individual	1	V0500A	90	7.4	15
		V0500A	180	3.7	15
		V1000A	90	14.6	15
		V1000A	180	7.3	15
		V1250A	90	17.8	20
		V1250A	180	9.1	15
		V1500A	180	10.9	15
		V2000A	180	14.6	15
		V2500A	180	18.2	20
Dual	2	V0500A	90	14.8	15
		V0500A	180	7.4	15
		V1000A	90	29.2	30
		V1000A	180	14.6	15
		V1250A	90	35.7	50
		V1250A	180	18.2	20
		V1500A	180	21.9	30
		V2000A	180	29.1	30
		V2500A	180	36.4	50
	3	V0500A	90	22.1	30
		V0500A	180	11.0	15
		V1000A	90	43.8	50
		V1000A	180	21.9	30
		V1250A	90	53.5	75
		V1250A	180	27.3	30
		V1500A	180	32.8	50
		V2000A	180	43.7	50
		V2500A	180	54.6	75
Single	4	V0500A	90	29.5	30
		V0500A	180	14.7	15
		V1000A	90	58.4	75
		V1000A	180	29.1	30
		V1250A	90	71.3	75
		V1250A	180	36.4	50
		V1500A	180	43.7	50
		V2000A	180	58.3	75
		V2500A	180	72.8	75
	5	V0500A	90	36.9	50
		V0500A	180	18.4	20
		V1000A	90	73.0	75
		V1000A	180	36.4	50
		V1250A	90	89.1	90
		V1250A	180	45.5	50
		V1500A	180	54.6	75
		V2000A	180	72.8	75
		V2500A	180	89.1	90

Table 3 - Recommended AC Circuit Breaker Sizes (48 V_{dc} system)

AC Feed Type	Number of Rectifiers on AC Feed	Model Number of Rectifier	Minimum Input Voltage Volts	Maximum rated AC Current Amps	Minimum circuit breaker Amps
Individual	1	V1500B	180	11.2	15
Dual	2	V1500B	180	22.3	30
	3	V1500B	180	33.5	50
Single	4	V1500B	180	44.7	50
	5	V1500B	180	55.9	75

Table 4 - Recommended AC Circuit Breaker Sizes (24 V_{dc} system)

DC Output Requirements

The DC distribution accepts a single-pole breaker or a TPS fuse holder up to 100A per output. In addition, a double-pole breaker up to 200A can be used in two single breaker slots by strapping both outputs together with one of two available bus bars. These bus bars are designated by the part number SA000000802 (included with breaker) which has an output of 5/16" studs with 1" centers or the part number SA000000651 (available separately) which has an output of 1/4"-20 studs with 5/8" centers.

In the case of the distribution panels with GMT style fuses the fuse holder will accept fuses up to 15 A per position.

Distributions

Systems for 19" racks feature 3 primary distribution units, and there is 1 secondary distribution unit for dual distribution configurations. Systems for 23" racks feature 4 primary distribution units, and there is 1 secondary distribution unit for dual distribution configurations.

Single distributions are designed for installation directly above the power shelf (or shelves). The breaker panel and cable landings are in the rear waterfall position—or, closer to the back of the unit—to facilitate cabling in case a second distribution is added on top. Distributions with landings for bulk cabling have a shunt in line with the bus bar (see Figure 32), along with an LVD/alarm board located on the back panel. Only "primary" distributions can be used for a single distribution configuration.

Distribution units for dual configurations are designed for installation directly above an existing *Integrated Plant System* distribution. The breaker panel and cable landings are in the front waterfall position—or, closer to the front of the unit—to permit cabling to the distribution beneath. There are no options for shunt, LVD, or bulk landings in secondary distribution units.

All 19" distributions feature 19 positions for bullet-style breakers and fuse holders, and there are 20 positions for return landings. All 23" distributions feature 24 positions for bullet-style breakers and fuse holders, and there are 25 positions for return landings. Protection device positions can be divided into independent segments for shunt or LVD use.

Part Number	Distribution Type	Number of Protection Device Positions...			Rear Bulk Landings
		...on Shunt	...on LVD	...without shunt / LVD	
261914	Primary - A01	0	4	15	No
261915	Primary - A05	4	0	15	No
261916	Primary - A13	0	0	19	Yes
261843	Secondary - B07	0	0	19	No

Table 5 - 19" Distribution Options

Part Number	Distribution Type	Number of Protection Device Positions...			Rear Bulk Landings
		...on Shunt	...on LVD	...without shunt / LVD	
261910	Primary - C01	0	4	20	No
261911	Primary - C05	4	0	20	No
261912	Primary - C08	12	0	12	No
261913	Primary - C13	0	0	24	Yes
261842	Secondary - D07	0	0	24	No

Table 6 - 23" Distribution Options

Configuration Options

Integrated Plant Systems consist of one or two power shelves, with power bussed to one or two distribution units. The following sections describe the combinations available for both 19" and 23" systems.

1 Power Shelf, 1 Distribution

This configuration is the most basic *Integrated* system, consisting of a single power shelf and one distribution unit.

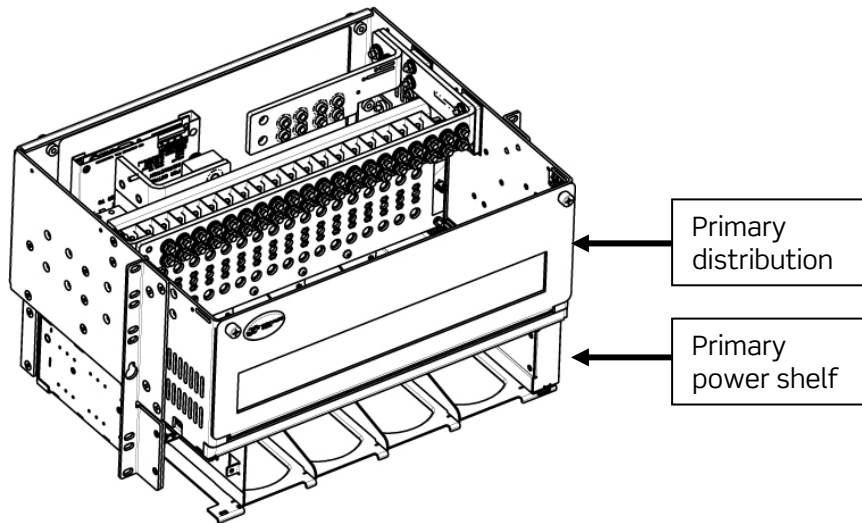


Figure 4 - 19" System, 1 shelf, 1 distribution

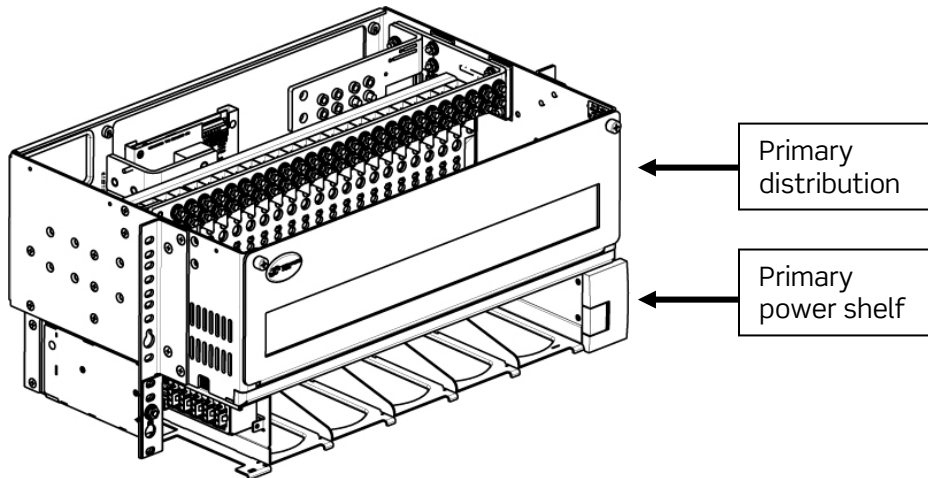


Figure 5 - 23" System, 1 shelf, 1 distribution

2 Power Shelves, 1 Distribution

A two-shelf configuration requires the use of the EC1000 expansion controller in the secondary (bottom-most) power shelf in order to monitor the rectifiers in the shelf. It is connected to the BC-series controller in the primary power shelf.

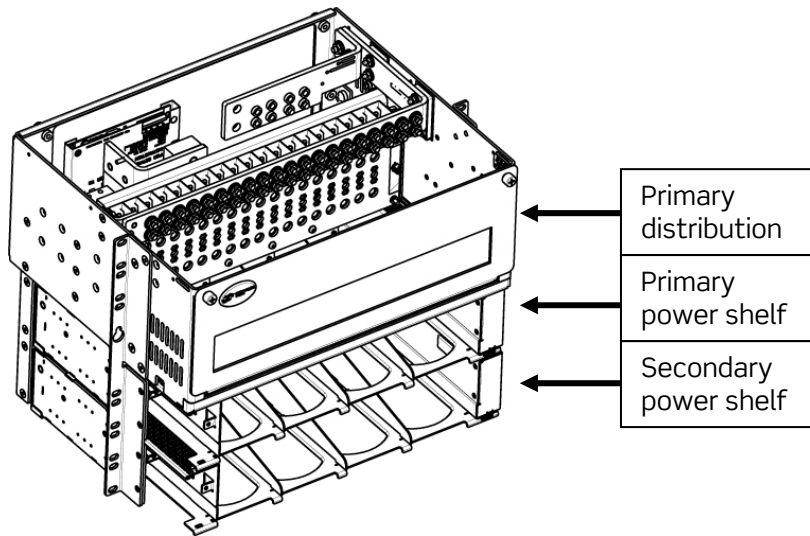


Figure 6 - 19" System, 2 shelves, 1 distribution

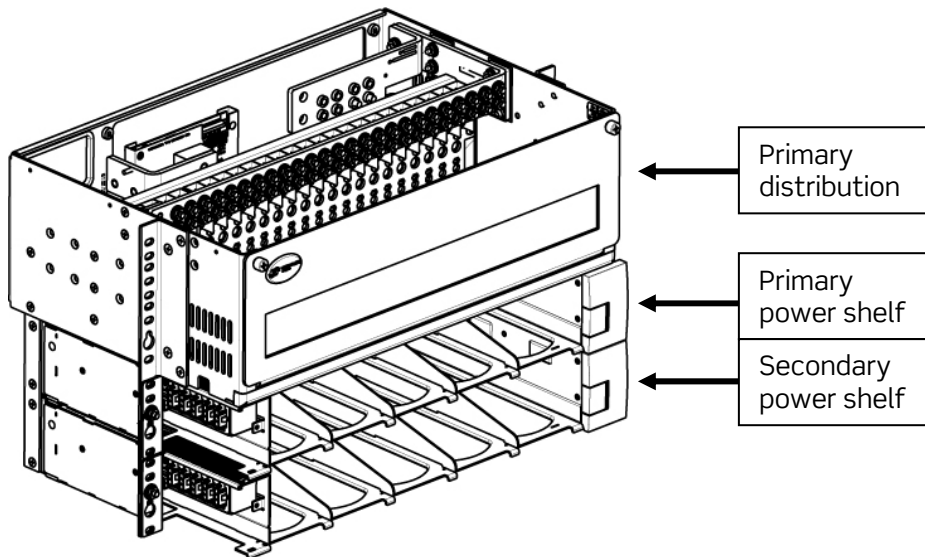


Figure 7 - 23" System, 2 shelves, 1 distribution

1 Power Shelf, 2 Distributions

A two-distribution configuration consists of a primary distribution unit directly above the power shelves and a secondary distribution unit above that (the 19" and 23" systems each have only one secondary distribution style).

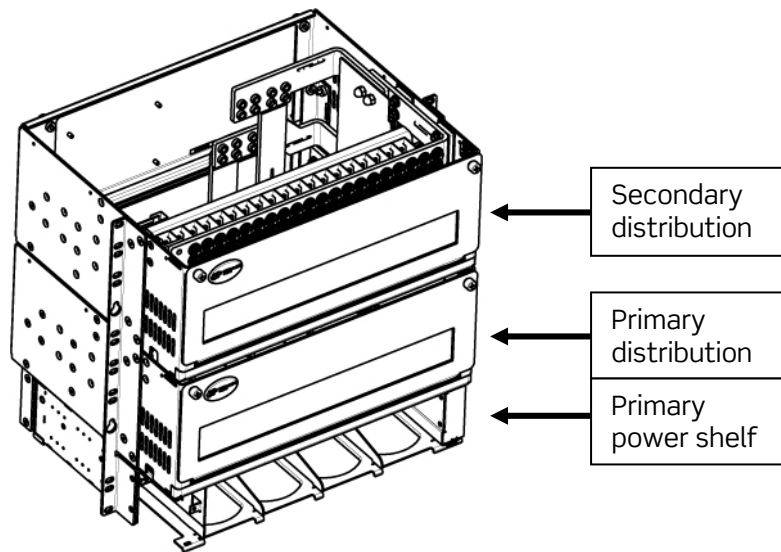


Figure 8 - 19" System, 1 shelf, 2 distributions

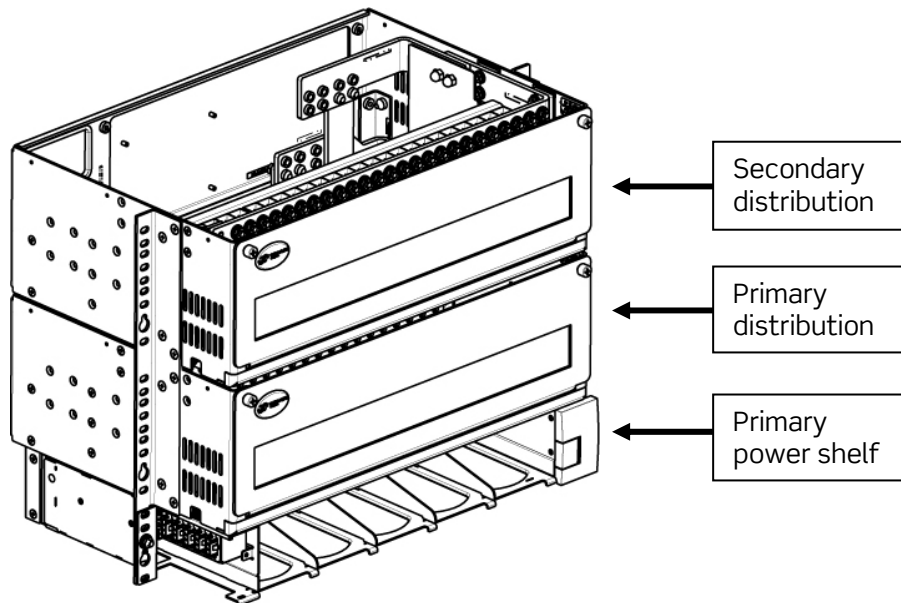


Figure 9 - 23" System, 1 shelf, 2 distributions

2 Power Shelves, 2 Distributions

The largest available configuration features two power shelves and two distribution units. An EC1000 expansion controller is required in the secondary (bottom-most) power shelf in order to monitor the rectifiers in that shelf. It is connected to the BC-series controller in the primary power shelf. A primary distribution unit is placed above the power shelves, and a secondary distribution is placed above that (the 19" and 23" systems each have only one secondary distribution style).

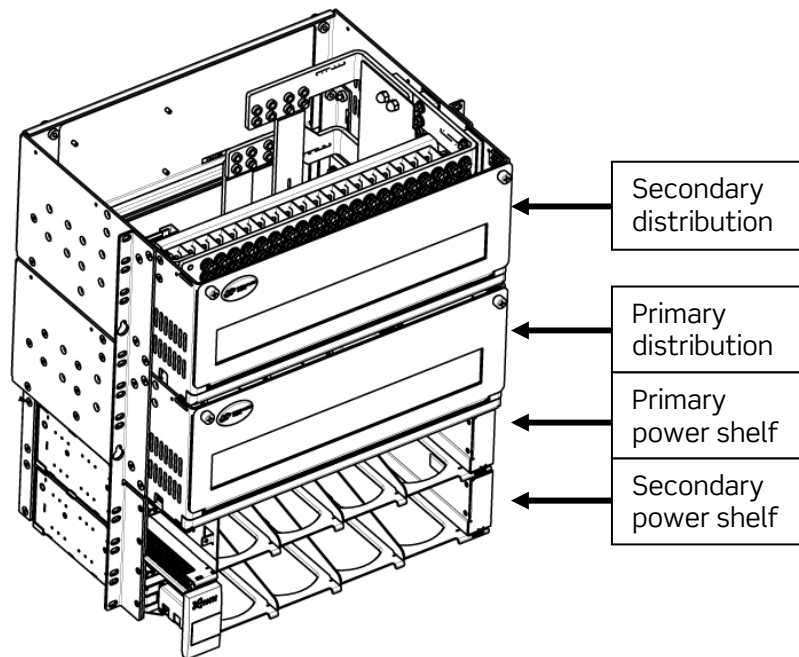


Figure 10 - 19" System, 2 shelves, 2 distributions

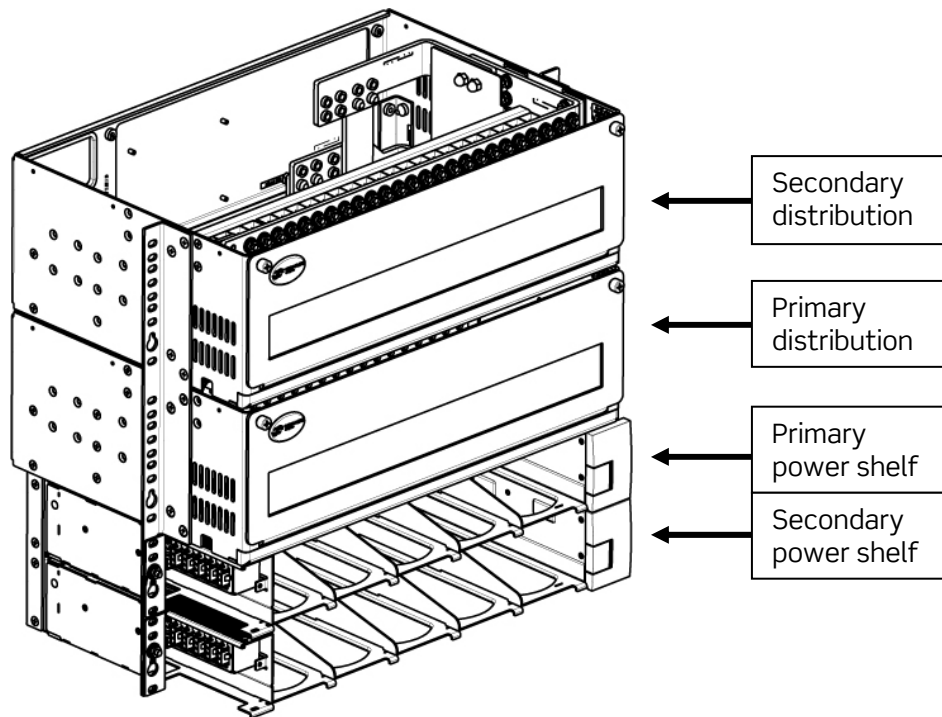


Figure 11 - 23" System, 2 shelves, 2 distributions

Grounding

The *Integrated* system is a fully floating system. This means that the return bus bar is not tied to the chassis or an earth ground. An external reference or earth ground may be connected to any return position; there is an extra ground connection provided on the front-facing return bus (¼"-

20 studs, 5/8" centers). As always, 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 Prevention Association, which publishes the National Electric Code. Voltage drop is simply the amount of voltage loss in a length of a 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 for voltage drop considerations, wires of length more than 50 feet are selected. The National Electric Code 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 WIRING AND PROTECTION.**

Requirements of unprotected DC output wires are based on the total installed output capacity of the shelf.

DC circuit breaker- and fuse-protected wires shall be based on the protector rating.

Wire type should be considered when determining the type of lug to use. Follow your company practices when determining the exact lug and ring terminals required.

Emergency Disconnect

Remote contactor opening inputs are available for the purpose of disconnecting the batteries from the system in the event of an emergency. Connect a normally-open disconnect switch to the R+ and R- connections available on the alarm controller card located on the back door of the distribution shelf. When the alarm controller card senses a closure across these inputs the LVD contactor will open and disconnect the batteries from the system. The LVD contactor can then only be closed from the front display of the controller. See the respective controller manual for information on closing the LVD contactor. See Figure 35.

3. Installation

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 shipping and/or other damage. Contact sales or technical support immediately if you notice any damage. Have all tools, wire, cables, hardware, etc. within easy reach. To the extent possible, ensure a clean (free of debris, dust, foreign material, etc.) 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.

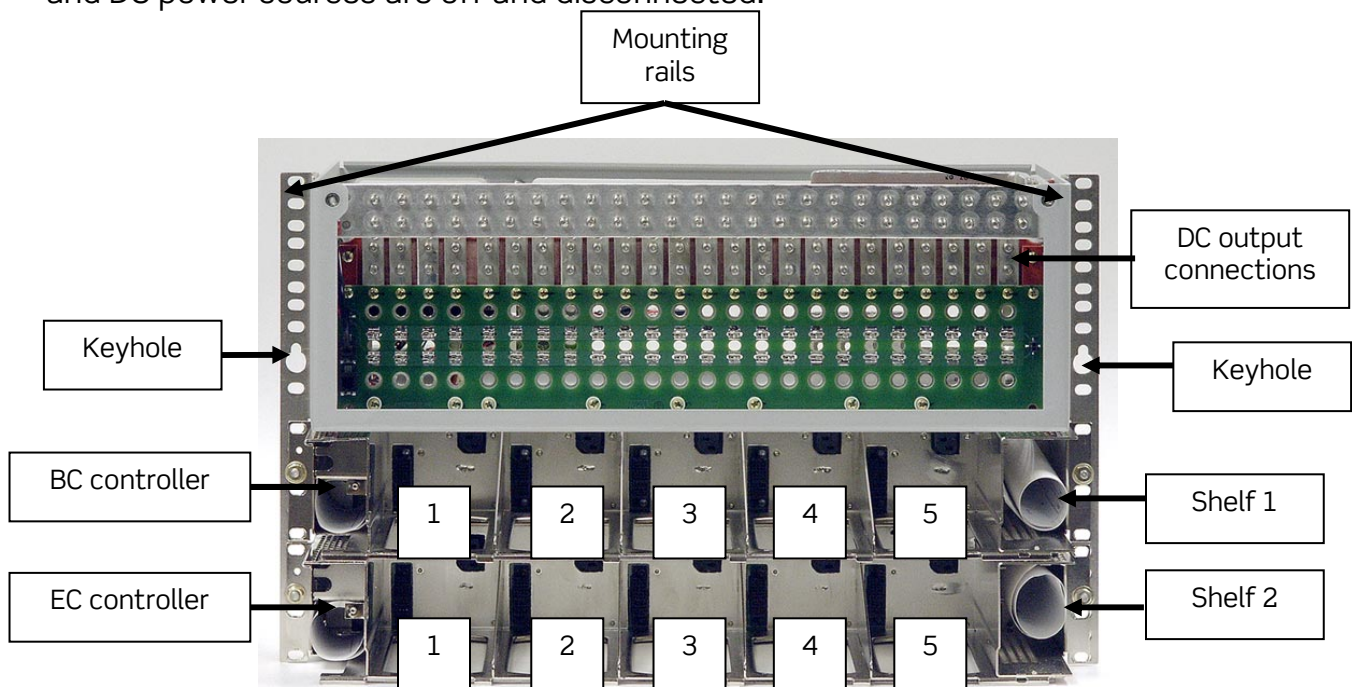


Figure 12 - Mounting rails (23" system shown)

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

- o **Elevated Operating Ambient:** If installed in a closed or multi-unit rack assembly, the operating ambient temperature of the rack environment may be greater than room ambient. Therefore, consideration should be given to installing the equipment in an environment compatible with the maximum ambient temperature (T_{ma}) specified by the manufacturer.
- o **Reduced Air Flow:** Installation of the equipment in a rack should be such that the amount of air flow required for safe operation of the equipment is not compromised.

- o **Mechanical Loading:** Mounting of the equipment in the rack should be such that a hazardous condition does not exist due to uneven mechanical loading.
- o **Circuit Overloading:** Consideration should be given to the connection of the equipment to the supply circuit and the effect that overloading of the circuits might have on overcurrent protection and supply wiring. Appropriate consideration of equipment nameplate ratings should be used when addressing this concern.
- o **Reliable Earthing:** Reliable earthing of rack-mounted equipment should be maintained. Particular attention should be given to supply connections other than direct connections to the branch circuit (e.g. use of power strips).

Required Tools

Integrated plants are designed to be installed with a minimum number of commonly available tools. **Use insulated tools when working on a live system!**

- #1 and #2 Phillips screwdrivers
- #1 flat head screwdriver
- Set of Box Wrenches, Ratchet Set, or Nut Drivers
- Wire and Cable Strippers suitable for the size wire selected

Torque settings

Table 7 shows recommended torque settings for all mechanical and electrical connections according to screw or nut size. Torque values are given in both American (in-lbs) and International (n-m) units.

Screw or Nut Size	Torque (in-lb)	Torque (ft-lb)
#4-40	3.9-4.7	--
#6-32	7.6-9	--
#8-32	15-18	--
#10-32	21-31.2	--
#12-24	36-42	--
1/4"-20	--	4.25-11

Table 7 - Recommended Torque Settings

Mechanical Mounting

The shelf mounting rails have a keyhole slots, pointed out in Figure 12, on each side that facilitate mounting into a rack or cabinet.

1. Partially thread one of the supplied mounting #12-24 screws into a hole on each side of the rack.
2. With one person on each side of the system, lift the system into position and rest the keyhole slots on the screws. Do not release the system until the screws are tightened.
3. Tighten the screws to the torque values in Table 7.
4. Secure the system to the rack with a minimum of three screws on each side.

The *Integrated* plant employs bottom to top airflow via self contained fans. Care should be taken when mounting in locations that present an airflow blockage on the bottom surface of the system. Allow at least 1.75" of unrestricted clearance for proper airflow if any blockages are present.

Controller Connections

This system can work with any BC-series controller. Install the controller in the controller slot on the extreme left of the system as shown in Figure 12.

1. Align the controller body with the slot and slide it in until it is fully seated.
2. Hook the bottom of the display into the shelf, then rotate the top to clip the display into the shelf.



Figure 13 - BC2000 Controller

For more information about peripheral connections, see the Operation Manual that is shipped with the controller unit. System controllers are sold separately.

If the *Integrated* Plant System consists of two power shelves, an EC1000 controller is required in the secondary (bottom-most) shelf. It is installed just like the BC-series controller, except that there is no faceplate connected to it. The blank faceplate provided can be installed to hide the EC controller module. Once installed, communication cables must be connected.

1. Open the primary distribution unit (bottom-most) to see what kind of alarm/distribution communication cable is provided.

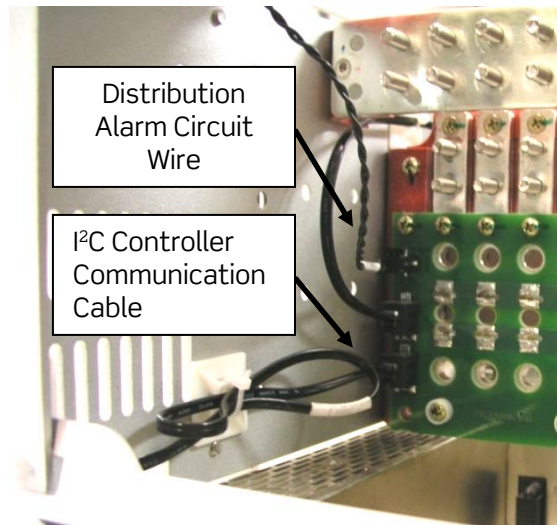


Figure 14 - Alarm/Distribution Cabling

- a. If there is a telephone-like cable with RJ11 connector on the left side of the breaker panel, run the unconnected end out the left wall of the distribution and down to one of the RJ11 ports of the EC1000 (there are only two available; see Figure 15). This is the I²C communication cable.
 - b. If there is a simple twisted pair cable with a Molex-type connector on the breaker panel, run the unconnected end out the left wall of the distribution and down to one of the alarm/temp probe inputs of the BC-series controller (there are four available).
2. Regardless of the distribution cable provided, the EC1000 must be connected to the BC controller's RJ11 port. Use the cable provided to connect one of the EC's RJ11 ports to the BC's port (it is black and located directly to the right of the Ethernet port).

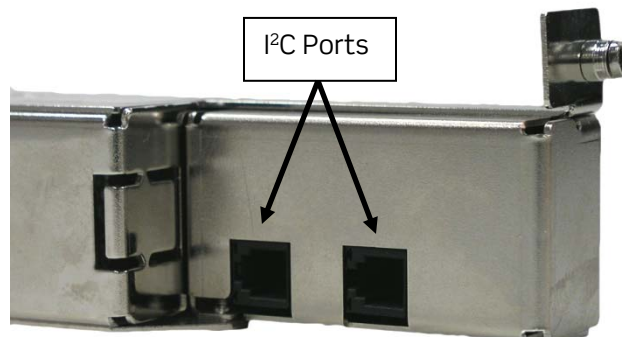


Figure 15 - EC1000 Controller

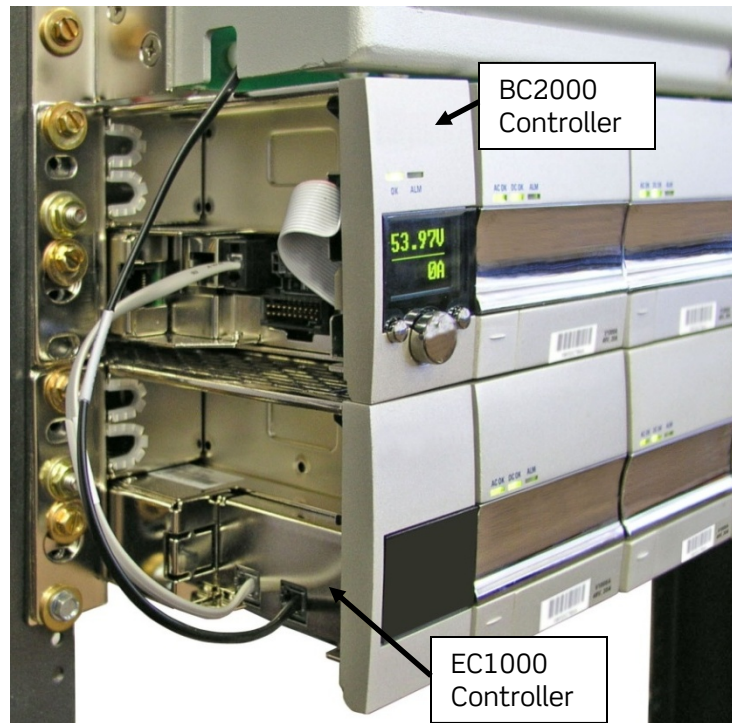


Figure 16 - Two-shelf Controller Connections

AC Input Connections

Cable connections differ by shelf and are specified in the following sections.

NOTE: Knockouts for cable entry are sized for conduit diameters, as specified by the National Electrical Manufacturers Association (NEMA). The knockout diameters shown in the figures in the following section reflect the size of conduit accommodated.

AC input, 19" shelf

AC input for 19" shelves is available in both front- and rear-wire access. There are three options: single, dual, and individual feed.

Single and dual feed, rear-wire

Always make ground connections first. Use the ¼"-20 stud labeled "ground", and torque according to Table 7. Line connections are on #8-32 screws and should also be torqued according to Table 7. Use ring terminals for these connections.

Single-feed

The single-feed AC option for 19" systems powers the bottom set of input terminals from the top set using a pair of bus bar straps (see Figure 17).

WARNING: Only one AC feed can be connected to the power shelf when the bus bar straps are installed. DO NOT attempt to connect a second feed in parallel. Refer to the “Dual-feed” section if two AC feeds are desired.

To install AC 110 V:

1. Make the ground connections with single-hole lugs onto the ¼"-20 stud labeled with the ground symbol, and follow torque settings listed in Table 7. Always make ground connections first.
2. Connect the line/hot to Line 1, labeled on the AC terminal block (Figure 21).
3. Connect the neutral to the slot labeled Line 1/N1.

To install AC 208/220 V:

1. Make the ground connections with single-hole lugs onto the ¼"-20 stud labeled with the ground symbol, and follow torque settings listed in Table 7. Always make ground connections first.
2. Connect the first line/hot to Line 1, labeled on the AC terminal block (Figure 21).
3. Connect the second line/hot to the terminal labeled Line 1/N1.

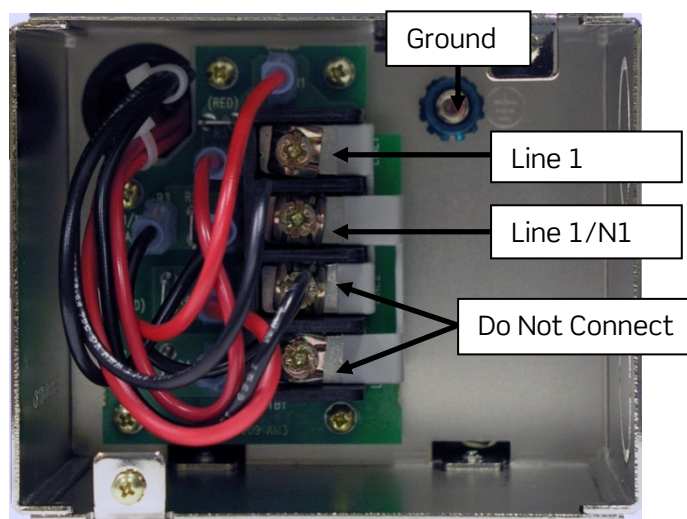


Figure 17 - AC Terminal Block Connections (Single Feed)

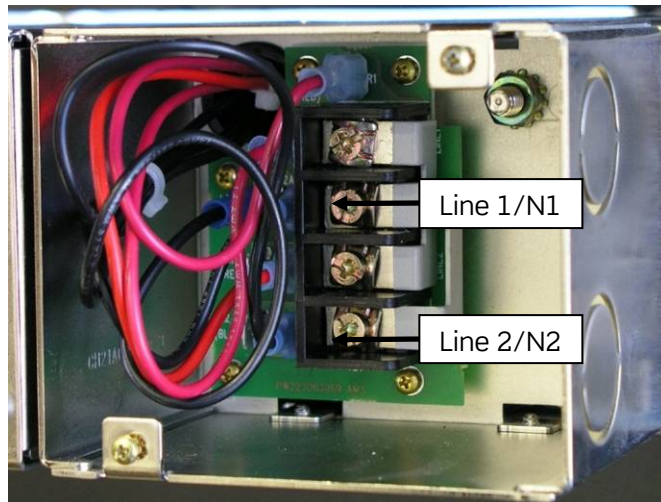
Dual-feed

To convert a single-feed box to dual-feed, remove the straps from the terminal block using the step-by-step instructions below. The straps are small bus bars (part numbers B0247011513 and B0247011512) that, when installed, power all rectifier slots from a single AC input.

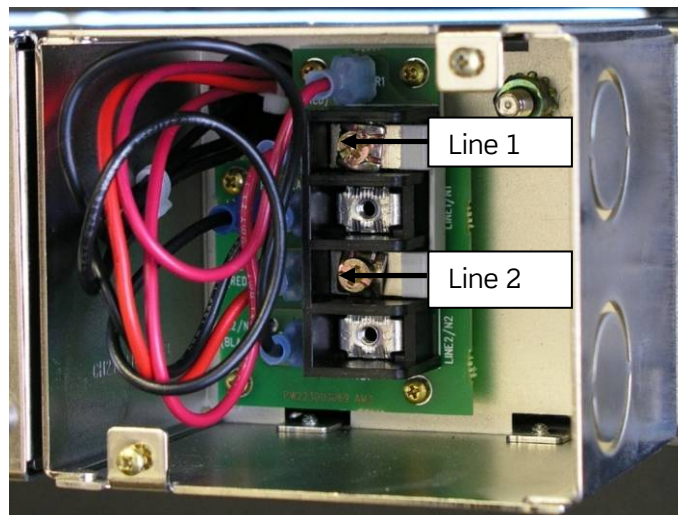
To remove the AC straps:

CAUTION: Ensure that AC power is removed from the system before following these instructions.

1. Remove the cover to the AC section. The AC section may look similar, but not identical to, the photos below.



2. Remove the screws from the terminals labeled Line 2/N2 (the bottommost screw) and Line 1/N1 (the second down from the top).
3. Remove the strap and replace the screws.



4. Remove the screws from the terminals labeled Line 1 (the topmost screw) and Line 2 (the second up from the bottom).
5. Remove the strap and replace the screws. Refer to Figure 21 for a depiction of how the AC box should appear with the straps removed.

Make AC line connections with single-hole ring terminals on #8-32 screws, and follow torque settings listed in Table 7.

To install AC 110 V:

1. Make the ground connections with a single-hole lug onto the $\frac{1}{4}$ "-20 stud labeled with the ground symbol, and follow torque settings listed in Table 7. Always make ground connections first.
2. Connect the first line/hot to Line 1, labeled on the AC terminal block (Figure 21).
3. Connect the neutral to the terminal labeled Line 1/N1.
4. For the second feed, connect line/hot to the slot labeled Line 2.
5. Connect the neutral to the terminal labeled Line 2/N2.

To install AC 208/220 V:

1. Make the ground connections with single-hole lugs onto the $\frac{1}{4}$ "-20 stud labeled with the ground symbol, and follow torque settings listed in Table 7. Always make ground connections first.
2. Connect the first line/hot to Line 1, labeled on the AC terminal block (Figure 21).
3. Connect the second line/hot to the terminal labeled Line 1/N1.
4. For the second feed, connect line/hot to the slot labeled Line 2.
5. Connect the second line/hot to the terminal labeled Line 2/N2.

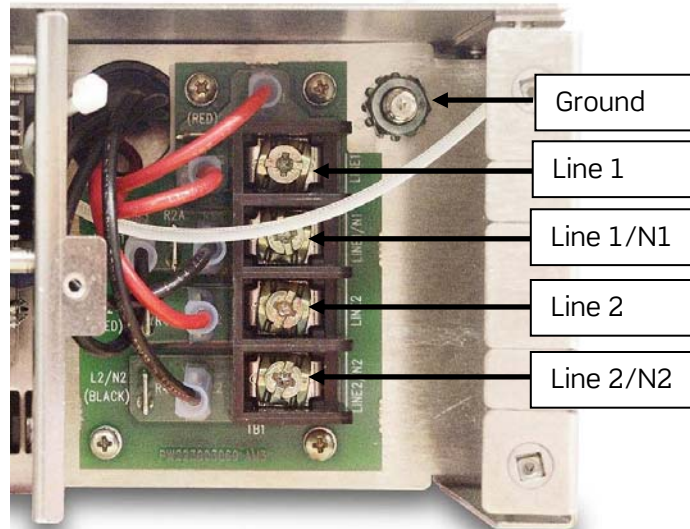


Figure 18 - AC Terminal Block Connections (Dual Feed)

Individual feed, rear-wire

Always make ground connections first. Use the two ¼"-20 studs labeled "ground", and torque according to Table 7. Line connections are on #8-32 screws and should also be torqued according to Table 7. Use ring terminals for these connections.

To install AC 110 V:

1. Make the ground connections with single-hole lugs onto the ¼"-20 studs labeled with the ground symbol, and follow torque settings listed in Table 7.
2. Connect each line/hot to Line 1 (L1), rectifier 1 (R1), labeled on the AC terminal block (Figure 20).
3. Connect the neutral to the slot labeled Line 2/N (L2), rectifier 1 (R1).
4. Repeat the procedure for each remaining rectifier.

To install AC 208/220 V:

1. Make the ground connections with single-hole lugs onto the ¼"-20 studs labeled with the ground symbol, and follow torque settings listed in Table 7.
2. Connect the line/hot to Line 1 (L1), rectifier 1 (R1), labeled on the AC terminal block (Figure 20).
3. Connect the second line/hot to the slot labeled Line 2/N (L2), rectifier 1 (R1).
4. Repeat the procedure for each remaining rectifier slot.



Figure 19 - Grounding Terminal

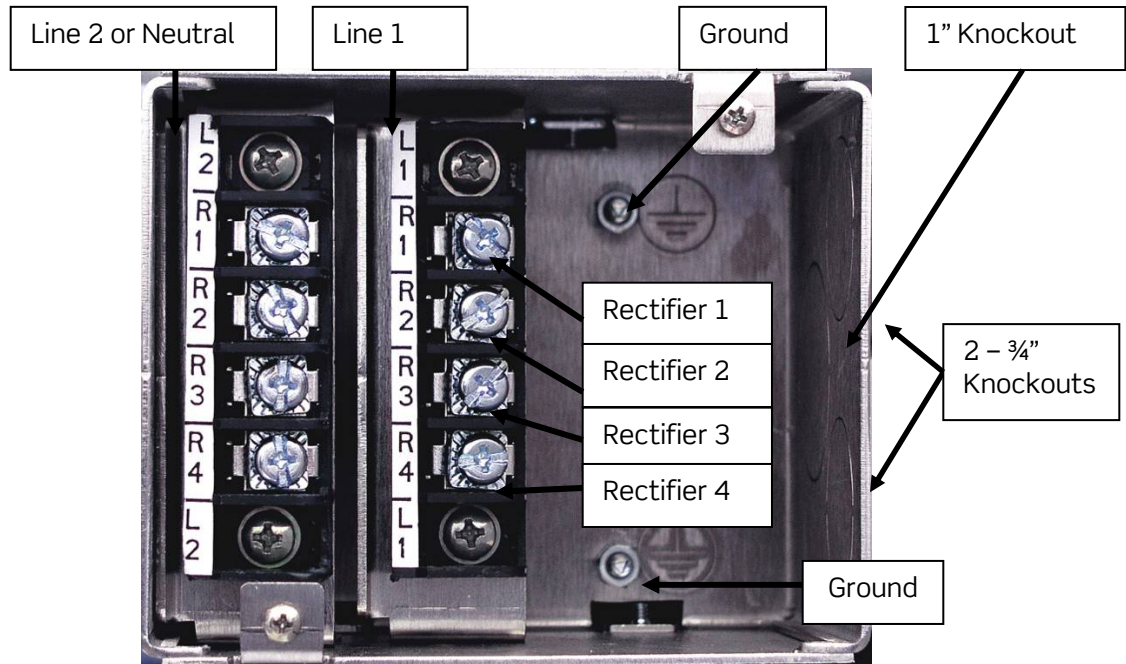


Figure 20 - AC Terminal Block Connections (Individual feed)

Dual feed, front-wire

Front-access, dual-feed AC input for 19" shelves consists of two Molex connectors, which require proper line cords that are available only from Eltek Valere. Plug in the Molex connector into the mating connectors on the shelf. When ready to power up, connect the AC plug to a suitable receptacle.

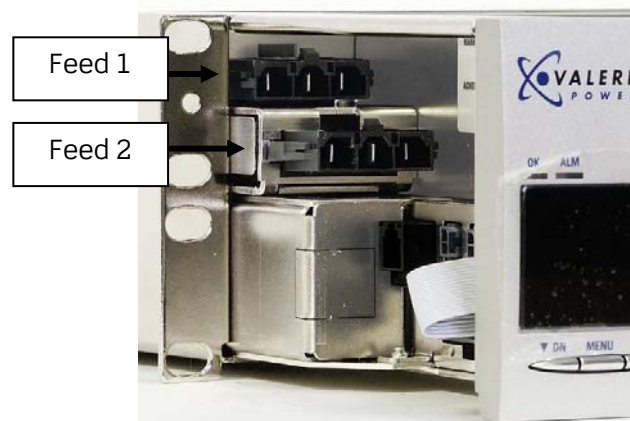


Figure 21 - AC Input Connectors (Dual feed)

AC Input, 23" shelf

AC input for 23" shelves is available in front- and rear-wire connection. There are three rear-wire options: single, dual, and individual feed. Front-wire options are dual and individual feed.

Single feed, rear-wire

Always make ground connections first. Use the studs labeled "ground". All connections are designed to accept two-hole lugs for ¼"-20 studs and 5/8" center. Torque according to Table 7.

For AC 110 V service:

1. Connect the line/hot wire to the double-stud landing labeled "Line", as shown in Figure 22.
2. Connect the neutral to the landing labeled "Line/N".
3. Use the supplied ¼" nuts and washers to secure the connections to the shelf, and follow torque specifications listed in Table 7.

For AC 208/220 V service:

1. Connect the line/hot wire to the double-stud landing labeled "Line", as shown in Figure 22.
2. Connect the second hot line to the slot labeled "Line/N".
3. Use the supplied ¼" nuts and washers to secure the connections to the shelf, and follow torque specifications in Table 7.

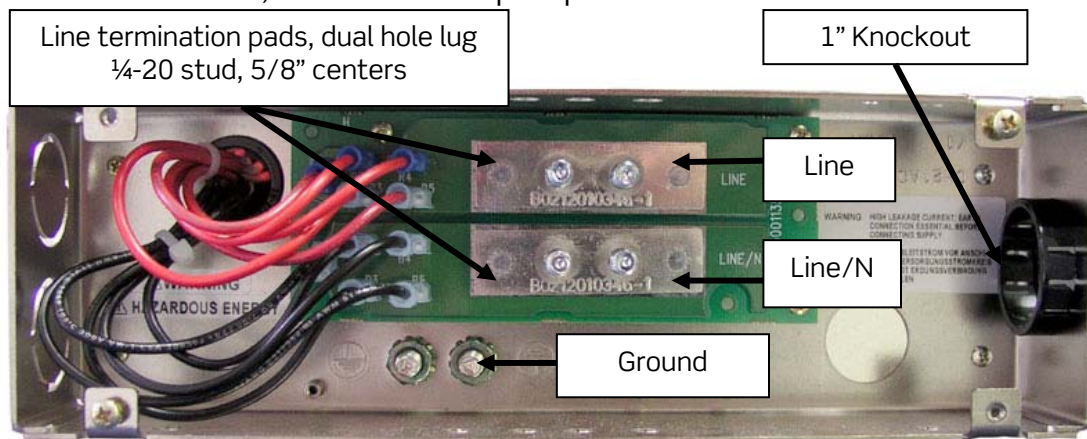


Figure 22 - AC Connections (Single feed)

Dual feed, rear-wire

Always make ground connections first. Use the ¼"-20 studs labeled "ground" for both AC feeds. Torque according to Table 7.

For 110 Vac service:

1. Connect the line/hot wire of the first feed to Line 1, labeled on the AC terminal block shown Figure 17.
2. Connect neutral to the terminal labeled Line 1/N1.
3. Repeat for the second feed, making connections to the terminals labeled Line 2 and Line2/N2.

For 208/220 Vac service:

1. Connect the line/hot of the first feed to Line 1, labeled on the AC terminal block shown Figure 17.
2. Connect the second line/hot to the terminal labeled Line 1/N1.
3. Repeat for the second feed, making connections to the terminals labeled Line 2 and Line2/N2.

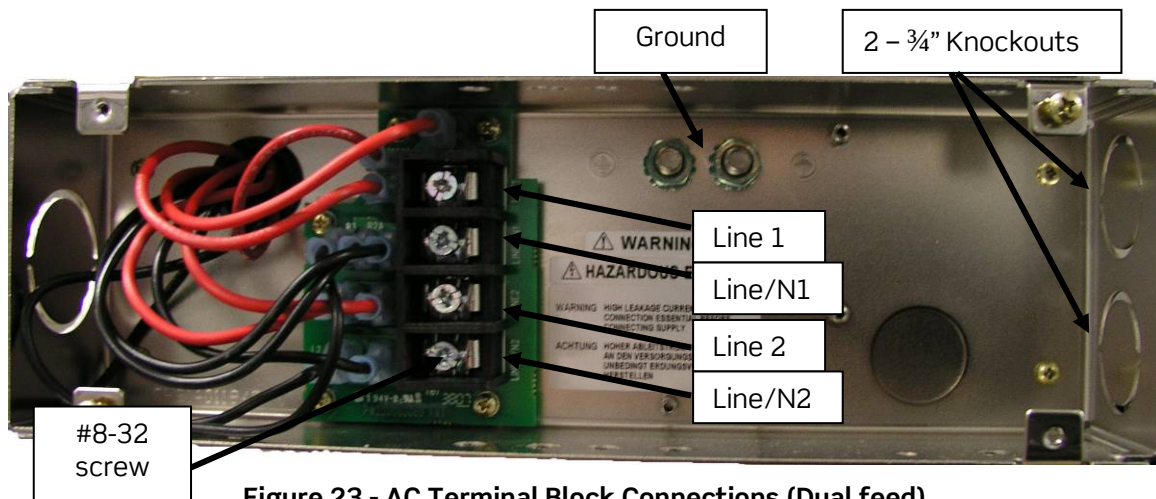


Figure 23 - AC Terminal Block Connections (Dual feed)

Individual feed, rear-wire

Always make ground connections first. Use the 1/4"-20 studs labeled "ground" for AC ground. Torque according to Table 7.

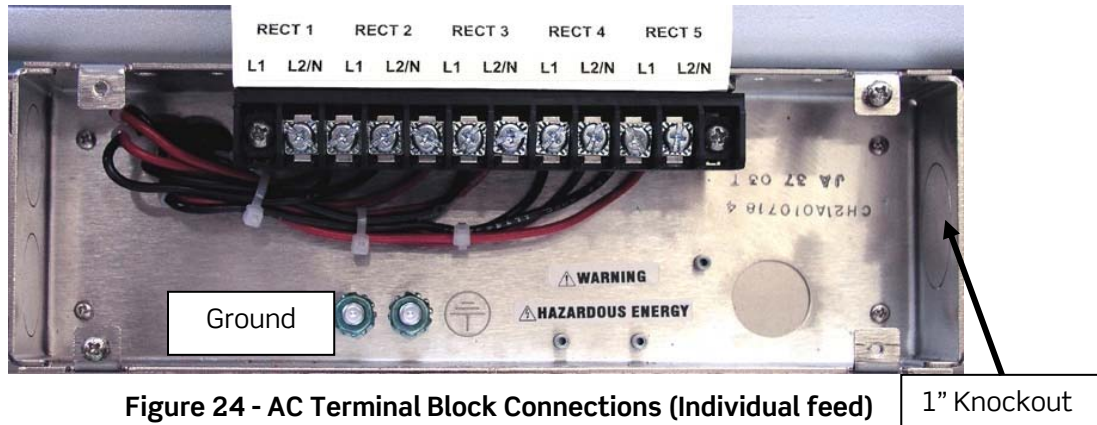
For AC 110 V service:

1. Connect the line/hot of the first AC feed to "Rect 1, L1", labeled on the AC terminal block as shown in Figure 24.
2. Connect the neutral to the slot labeled "Rect 1, L2/N".
3. Repeat this procedure for each remaining AC feed. Make these connections with ring terminals on #8-32 screws, and follow torque specifications listed in Table 7.

For AC 208/220 V service

1. Connect the line/hot of the first AC feed to "Rect 1, L1", labeled on the AC terminal block as shown in Figure 24.

2. Connect the second line/hot to the slot labeled “Rect 1, L2/N”.
3. Repeat this procedure for each remaining AC feed. Make these connections with ring terminals on #8-32 screws, and follow torque specifications listed in Table 7.



Dual feed, front-wire

A dual feed shelf is powered by two AC connections. Plug in the cable with the Molex connector into the mating connectors on the shelf. When ready to power up, connect the AC plug end to a suitable receptacle.

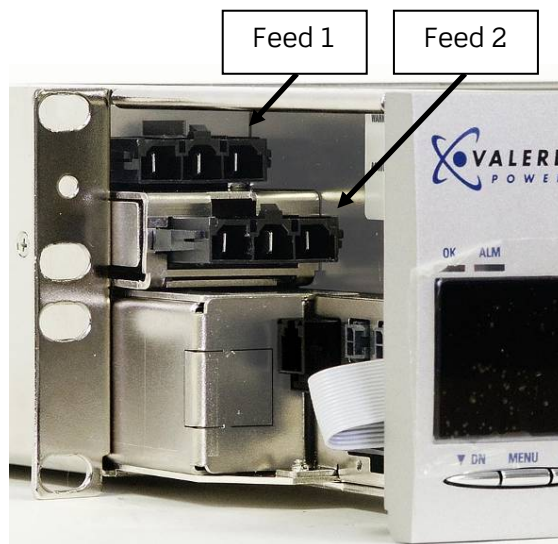


Figure 25 - AC Connections (Dual feed)

Individual feed, front-wire

An individual feed shelf is powered by five AC connections. Plug in the cables with AMP connectors into the mating connectors on the shelf. When ready to power up, connect the AC plug end to a suitable receptacle.

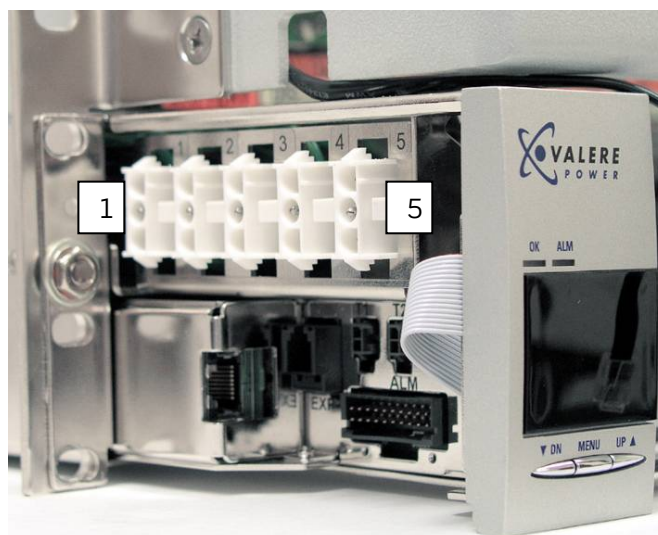


Figure 26 - AC Connections (Individual feed)

DC output connections

DC connections are dependent upon your system configuration.

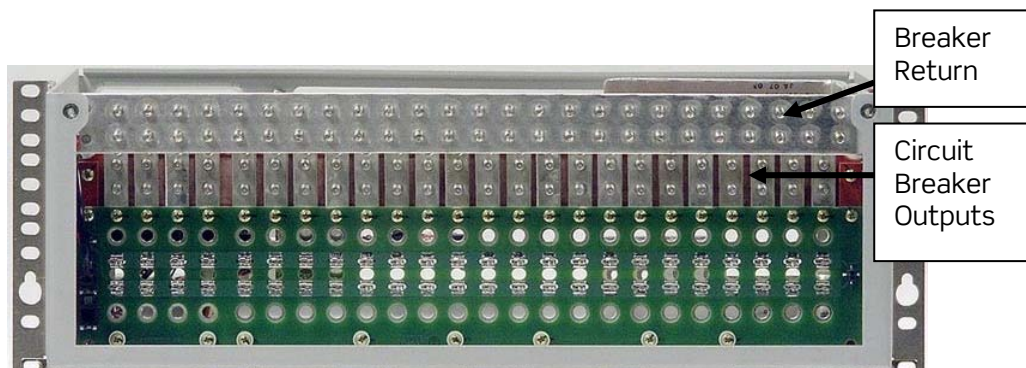


Figure 27 - DC connections (23" shelf shown)

Load circuit breakers

Connect your output cable to the connections labeled "Circuit Breaker Outputs", and connect the corresponding return cable to the connections labeled "Breaker Return". **DO NOT install an equipment load onto battery LVD-protected outputs.**

Battery circuit breakers

Connect your output cable to the connections labeled "Circuit Breaker Outputs", and connect the corresponding return cable to the connections labeled "Breaker Return". **Be very careful to connect the batteries with the proper polarity. Reversing the polarity of the batteries can destroy the equipment.**

Load GMT fuses

GMT fuses available as a kit (GMT5P). There are five GMT fuse positions per adapter module, and the module takes up two breaker positions. The GMT fuse connections are accomplished via the front GMT output and return terminal strips. The connection to the terminal strip is made via compression screws and should be torqued down to 4.5 in-lbs.

To install GMT fuse modules, plug the board into the desired circuit breaker positions, then fasten the one-hole tongues of the board to the lug landings using the hardware provided. Plug fuses into the appropriate slot in the GMT fuse block, and make wire connections as shown in Figure 28. More details are provided in an instruction guide that accompanies the fuse kit.

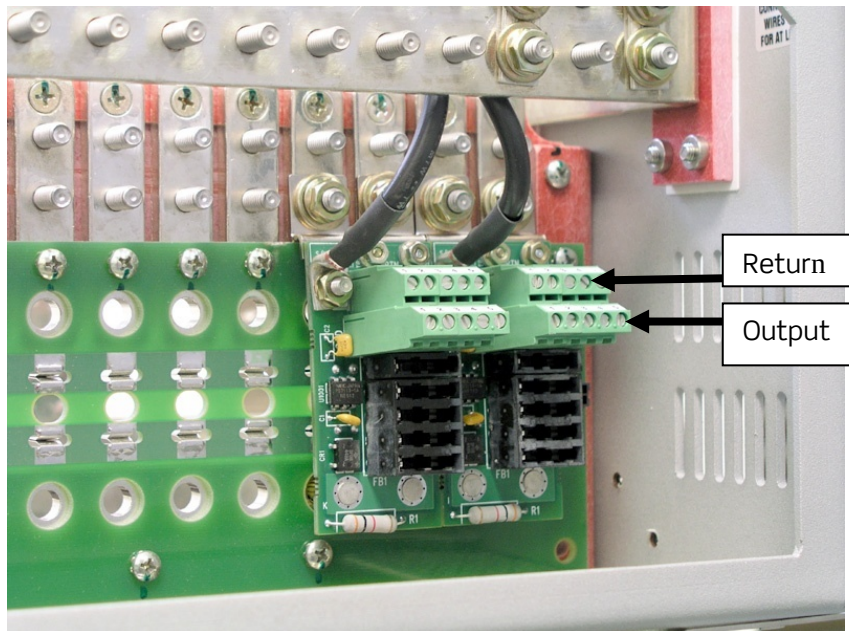


Figure 28 - GMT fuse connections

Output protection

Circuit breakers (sold separately) are bullet nose style and slide into the breaker positions shown in Figure 27. The breakers must be installed with the “line” bullet connector on top and the “load” bullet connector on the bottom. “Line” and “Load” are labeled on a sticker on the side of the breaker (Figure 29). If not using *Eltek Valere* circuit breakers, the system requires breakers with isolated Auxiliary outputs. In addition, alarm contacts should short between the NC (normally closed) and C (common) in a tripped state.

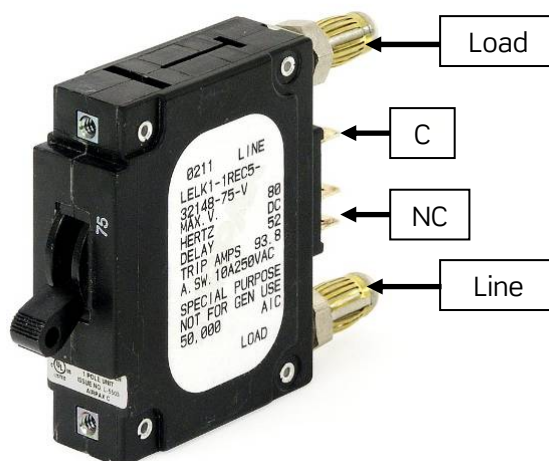


Figure 29 - Circuit breaker installation

TPS style fuses can be used in place of circuit breakers. Fuse holder must be installed with the alarm tab in the top position. Install the TPS fuse into the removable part of the fuse holder and return to the fuse holder. TPS fuse holders install into a single circuit breaker position on the external distribution panel.

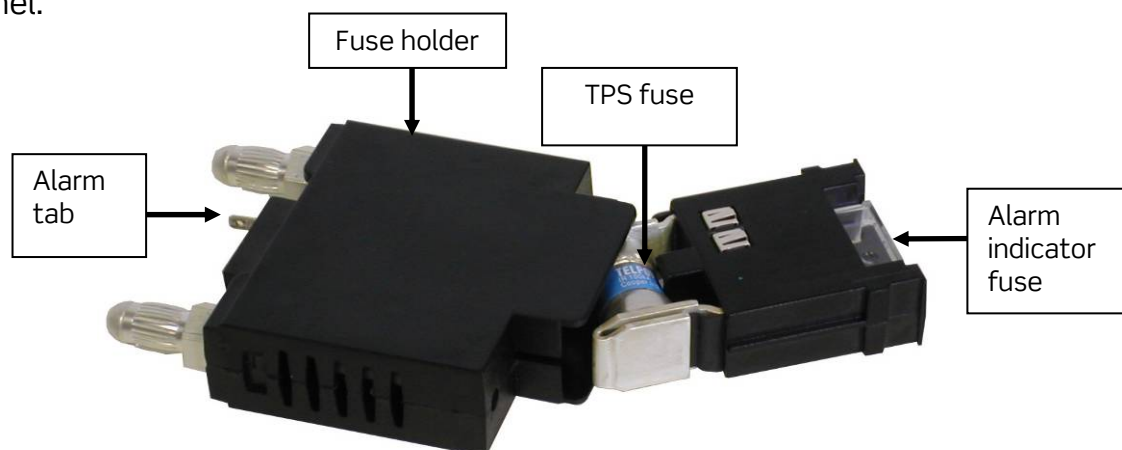


Figure 30 - TPS fuse and fuse holder

Bulk Connections

Bulk connections are accommodated by a distribution unit containing bus bars with PEM nuts for lug landings. The 19" and 23" systems each have one such distribution available. See Figure 31.

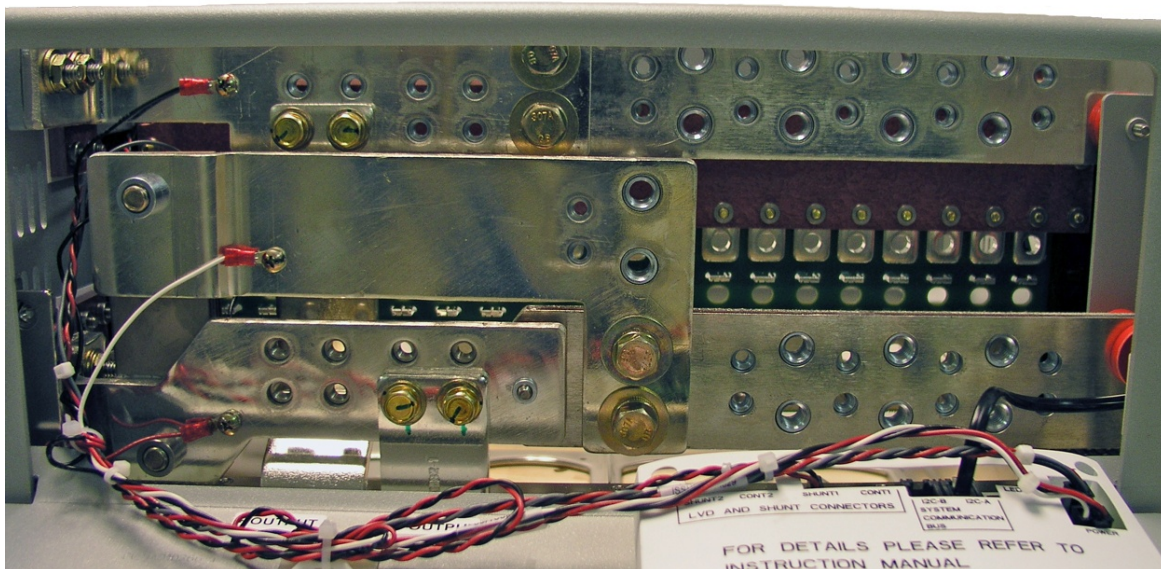


Figure 31 - Rear View of Distribution with Bulk Bus (19" system)

The output (or "hot") bus has a shunt installed ahead of the lug landings. See Figure 32. There are four sets of PEM nuts for two-hole lugs for 3/8" on 1" center, and five sets of PEM nuts for 1/4" by 5/8" lugs. Fastening hardware is provided.

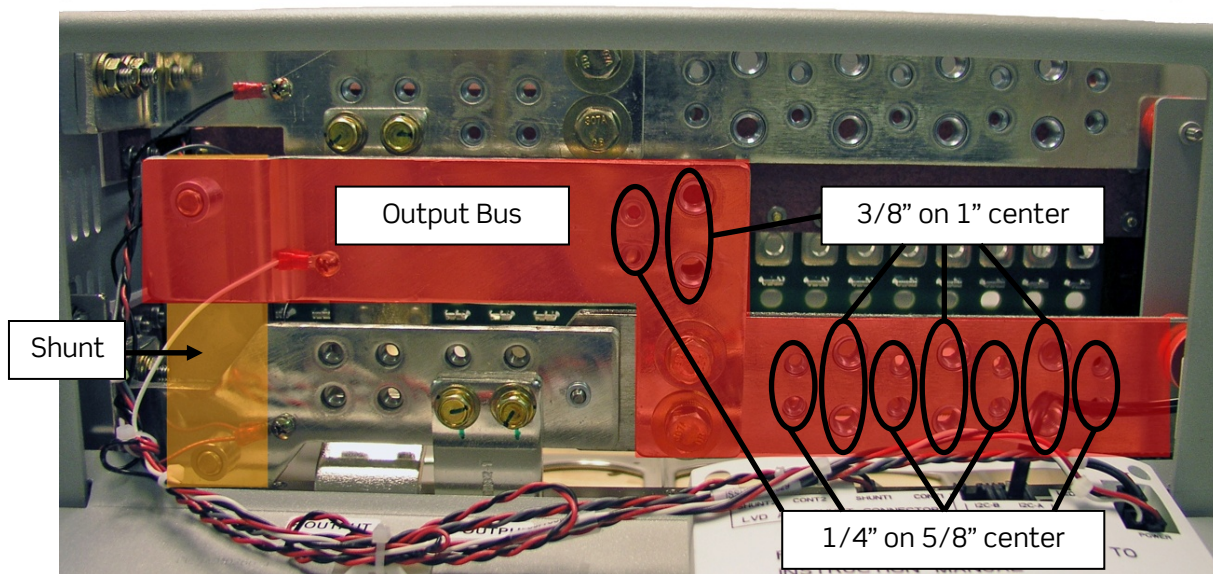


Figure 32 - Output Bus and Shunt (19" system)

The return bus is highlighted in Figure 33. It also has four sets of PEM nuts for two-hole lugs for 3/8" on 1" center, and five sets of PEM nuts for 1/4" by 5/8" lugs. Fastening hardware is provided.

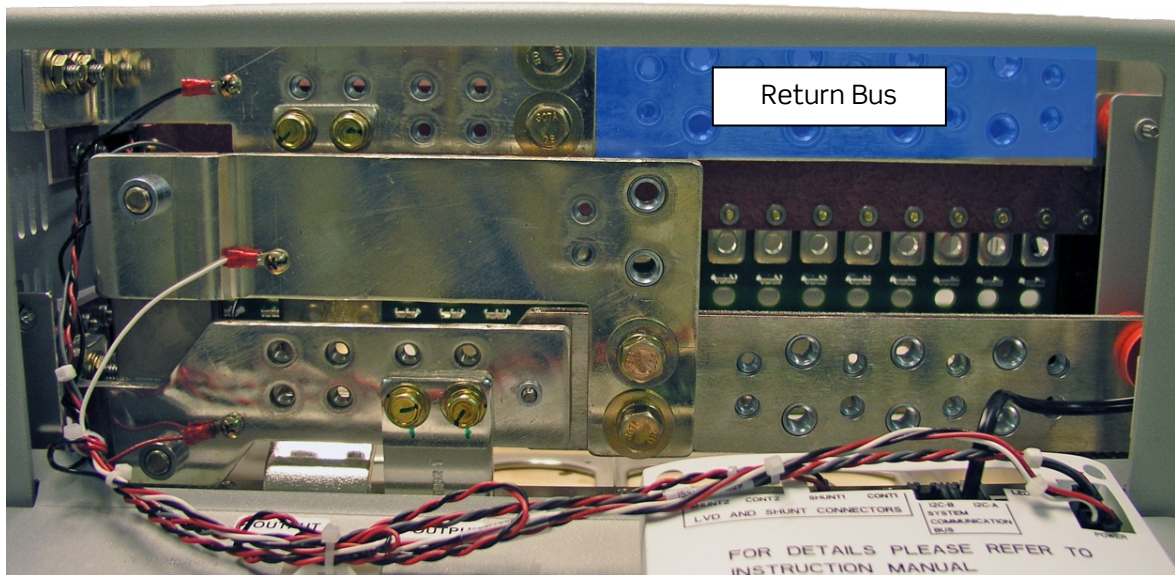


Figure 33 - Return Bus (19" system)

DC Reference Grounding

DC output grounding is not required, but it is recommended. Connect DC ground to any position available on the breaker return bar pointed out in Figure 27.

Optional Connections

Auxiliary input alarms

An LVD/alarm controller board (Figure 34) is located on the back panel of all primary distribution units. It has four input alarms. If using these inputs, connect the external alarm relay to "A1+" and "A1-". Repeat for additional input alarms. Alarm polarity by default is normally open, but can be changed via the web interface of the controller. See controller web interface manual for more detail.

4. Test and Turn-Up

Power up

1. After all input and output connections have been secured and checked, activate all input breakers.
2. When input breakers are on, install each rectifier sequentially by sliding the rectifier into position and closing the latch as shown in Figure 36.
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. Rectifier fans will 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.
3. Activate all DC breakers in the system. Leaving DC breakers in the off position may cause a distribution alarm on the controller. In addition, if the system contains an LVD contactor there may be a system alarm for a short period of time until the LVD closes.
4. 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 6 for troubleshooting assistance.) At this time, make any adjustments to the default controller settings by following the instructions in the *Installation and Operation* manual that is shipped with the controller.
5. If no changes are necessary, the installation is complete.



Figure 36 - Rectifier Insertion

5. Replacement Items

The controller and rectifiers are designed as modular, field replaceable units.

Controller

To replace a controller module:

1. Unlatch the display by using the release on the backside of the faceplate, and remove it. The display is connected to the controller module by a ribbon cable (do not disconnect it).
2. Pull the controller module out of the shelf.
3. Align the replacement controller module and carefully insert it into the shelf. If it does not seat properly, partially withdraw the body and try again until it mates with the connector in the rear of the shelf.

CAUTION: Using excessive force may permanently damage the communication pins or the housing on the back of the controller.

Once properly seated, the controller turns on if the shelf is powered.

4. Install the display by hooking the bottom of the faceplate into the shelf and rocking the top back until the release snaps in place.

For settings and operation of a BC-series controller, see the controller operation manual provided with the controller unit.

Rectifiers

In the event that a rectifier needs to be removed:

1. Press the latch button on the front of the unit, and pull the handle until the unit slides out of the slot.
2. With the latch open, (Figure 36), slide the replacement unit into the open slot until it connects with the backplane.
3. 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.

6. 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):

- All AC and DC connections are secured properly.
- All rectifiers are installed and seated properly.
- The controller is installed and seated properly.

Follow these instructions for the different scenarios:

- **AC OK off, DC OK off, ALM on or off, and display blank:** 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.
- **AC OK on, DC OK off, ALM LED on, and display blank:** Check DC output connections for short circuits. Reseat rectifiers, and if problems continue, replace the rectifiers.
- **AC OK on, DC OK on, and display blank:** For details about troubleshooting in this scenario, refer to the *Controller Installation and Operation* manual.

Short Circuit and Current Limit

I_{Limit} can be adjusted up to +105% of the rated current of the rectifier. The system output voltage will remain constant up to I_{Limit} at which point it will drop quickly to 0 V, as shown in Figure 35. 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. For a 12 V rectifier, if the voltage drops below 4 V for more than 60 seconds, the system will shut down. The system will automatically restart after 60 seconds, and will continue until the short circuit is cleared.

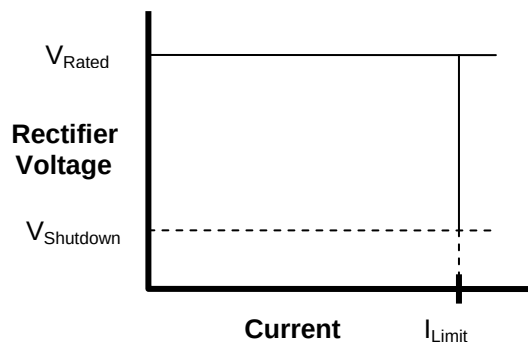


Figure 37 - Current Limit Graph



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