ELTEK

Installation Guide

Flatpack2 Integrated Power System

48 – 120V, 8kW DC Power System

Delta Part No. 5017163001

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Safety and Practices

The Flatpack2 Integrated DC power system is rated for an AC input voltage range of 100 VAC – 250 VAC or a DC input voltage of 80–300 VDC. It has an ambient operating temperature range of -40°C to +60°C (de-rating above +45°C).

WARNING: Keep hands, hardware and tools clear of fans. Fans are thermostatically controlled and will turn on automatically as a function of temperature.

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.

WARNING: HIGH-LEAKAGE CURRENT IS PRESENT. EARTH CONNECTION IS ESSENTIAL BEFORE CONNECTING THE SUPPLY.

WARNING: For safety, the power supply is required to be reliably connected to EARTH GROUND. The equipment is to be connected to supply mains by qualified personnel in accordance with local and national codes (e.g., NEC, CEC, etc). Do not disconnect and reconnect I/O power connectors during lightning storms. The output of the power supply is not intended to be accessible due to energy hazards. Rack mounting must be performed in accordance with instructions provided by the manufacturer to avoid potential hazards.

CAUTION: Flatpack2 rectifiers employ internal double pole/neutral fusing. Fuses are not field-replaceable.

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 isolated terra (IT) power system.

A readily accessible disconnect device shall be incorporated in the building installation wiring for all AC connections. Select wall breakers according to national and local electric codes.

If the plug end of an AC line cord is considered to be the primary disconnection means, reasonable access must be given to the plug and receptacle area.

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 1A.

Heat dissipation greater than the objectives listed in GR-63-CORE may occur. Additional equipment room cooling may be required. To cope with high heat release, aisle spacing may be increased and high heat-dissipating equipment may be located adjacent to equipment generating less heat.

Ensure that all circuit breakers (including those for DC distribution) are in the OFF position during both installation and removal.

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

WARNING: Protecting personnel against electrical shocks: The power system cabling must be done by qualified personnel in conformance with local and national electrical codes. Input voltages to rectifiers are at a dangerous level. Ensure that circuit breakers are locked in the OFF position at the AC service panel before attempting to work on the power system. Dangerous voltages may still be present at the terminals even if the rectifiers are OFF. Use a voltmeter to verify the presence of such voltages. Do not switch circuit breakers to ON until the entire system has been assembled and you have been instructed to do so according to the appropriate procedure. Improper wiring can cause bodily harm and equipment damage. Turn off all power sources before servicing units.

FCC Compliance Statement

NOTE: Changes or modifications to the system not expressly approved by the party responsible for the compliance could void the user's authority to operate the system.

The power system 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, and
2. This device must accept any interference received, including interference that may cause undesired operation

1. Overview

The Flatpack2 Integrated power system is designed for applications requiring 48 – 120 VDC output. It is powered by Flatpack2 HE rectifiers. The rectifier section can accommodate up to four rectifiers total.

Any system can also be used in a DC-DC converter application. However, only 110 VDC output is available. Refer to Table 1 on page 9.

The entire system is 2U in height, less than 17" (432mm) in depth, and is designed for a standard 19" telecommunications rack. It is not, however, intended for stand-alone, open-rack installation. There are no provisions for conduit landing, nor are there appropriate safety covers for open rack applications. System alignment with the rack is flush-mount.

There are two sections to the Flatpack2 Integrated power system: control and monitoring, and rectifiers.

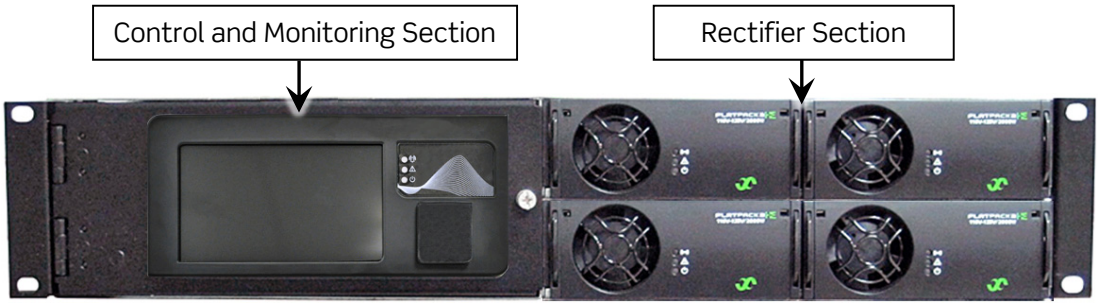


Figure 1 – Flatpack2 Integrated System Overview

Power Connections

AC or DC input connections are made to the rear of the shelf, in the far right side. DC operating range is 80 – 300 VDC, depending on the module used.

DC output connections are made to the rear of the shelf, immediately to the left of the input.

Alarm connections are made to the alarm blocks located within the control and monitoring section.

Figure 2 – Electrical Connections Overview

Control and Monitoring

The primary control unit is the Smartpack2 Touch Controller, which is on the front of the shelf. The other two units are internal, but are visible when the door is open: the Smartpack2 Basic and the I/O Monitor2.

Smartpack2

The Smartpack2 control system consists of at least two units: the Smartpack2 Touch Controller and the Smartpack2 Basic Controller.

- The Smartpack2 Touch controller is the primary control unit. It is located on the front of the shelf. It consists of a color touch screen, as well as USB ports and Ethernet ports. Through it, most system status information and parameters can be viewed and modified.

Figure 3 – Smartpack2 Touch Controller

Configurable parameters can be changed from the screen, or using the web browser interface. For additional information, see *Smartpack2 Touch Controller Ports and Navigation*, Doc. No. 370135.033, and the *Configuration Guide: Eltek Controllers*, Doc. No. 370013.063.

- Smartpack2 Basic Controller is inside the box, mounted to a DIN rail. It monitors and controls the power system's internal functions and supplies power for connected CAN nodes.

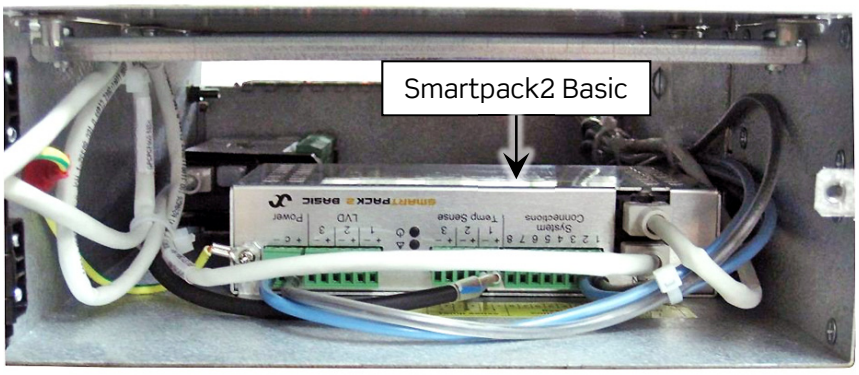


Figure 4 – Location of Smartpack2 Basic Unit (door opened)

I/O Monitor2

The I/O Monitor2 unit facilitates alarm output. Alarms can be mapped to the relays as desired through the Smartpack2 Touch Controller

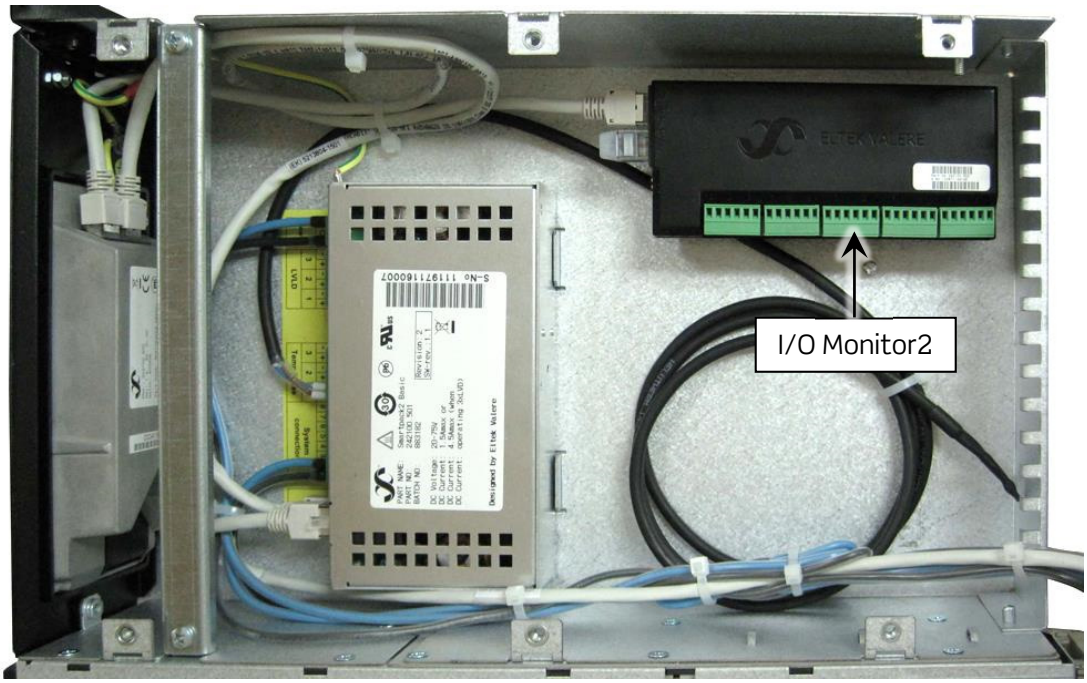


Figure 5 – Location of I/O Monitor2 (top cover removed)

Rectifiers

DC output is determined by the model and quantity of *Flatpack2* rectifiers that are deployed. There are several models that are compatible with the system.

Figure 6 – Flatpack2 Rectifier

See Table 1 for rectifier specifications.

Table 1 – Rectifier Specifications

Part No.	Nominal DC Voltage (V DC)	DC Output Voltage (V DC Range)	Max DC Output Current (A)	DC Output Power (W)	Rated Input Voltage (V)	Max. Continuous Input Current at Nominal Voltage (A)
241115.705*†	53.5 (48V mode) 67 (60V mode)	42V-58V (48V mode) 39.9V-66V (NiCAD mode) 52.5V-72V (60V mode)	41.6 (48V) 30 (67V)	2000	100 – 250	10.8 (120V) 10.2 (208V)
241115.105.*	48	43.5 – 57.6	41.7	2000	100 – 250	10.8 (120V) 10.2 (208V)
241115.805*	125	89.2 – 171.6	16.7	2000	100 – 250	11.3 (120V) 10.6 (208V)
241119.805	125	90 – 151.25V	20A	3025	100 – 277	11.5 (120V) 15.5 (208V)

*Accepts DC input.
† Wide output range rectifier.

Specifications

Table 2 – System Specifications

Mechanical	Dimensions		**Height:** 2U (3.5″) **Width:** Fits standard 19″ rack **Depth:** 15.4”
	Weights	System	System weight (without rectifiers): 13 lbs. (5.9 kg)
		Rectifier	4.30 lbs. (1.95 kg) each
	Clearances		Zero clearance needed below, left or right of unit. At least 6″ rear clearance required for proper airflow. Cable egress from top / rear. Front clearance at least 1″. Vertical clearance dependent on load cable size/bend radius.
Electrical	Input	Voltage	Full power output : Rated 100 – 250 VAC, depending on rectifier used.
		Current (per rectifier)	See Table 1
	Output	Voltage Range	See Table 1
		Power (per rectifier)	See Table 1
		Current (per rectifier)	See Table 1
	Efficiency		See Table 1
Connections	AC Input		Strip length: 0.35 in. (9 mm)
	DC Output		Stud size: M6 (equivalent to 1/4″) Landing width: 0.75″ (20 mm)
	Alarm Output Relays		Screw terminals Max. wire size: 16 AWG Strip length: 0.25 in. (6–7 mm)
Environmental	Operating Temperature		–40° to +60° C (–40° to +158° F), de-rating above 45°C (+113°F), depending on the model
	Storage Temperature		–40° to +70° C (–40° to +158° F)
	Relative Humidity		5 – 95%, non-condensing
	Cooling – Rectifier		Fan (front-to-back airflow)
Interface	TCP/IP		Ethernet interface, using standard Web Browser
	Alarm I/O		Six configurable form-C output relays Six configurable inputs
Applicable Standards	Electrical safety (shelf and rectifiers only)		IEC 60950-1, UL 60950-1 Approved for maritime use

References

This manual provides an overview and installation guidelines for Flatpack2 Integrated power systems. Additional information regarding system components is found in the following documents:

- *User's Guide: Flatpack2 Rectifiers*, Doc. No. 350002.013
- *Smartpack2 Touch Controller Ports and Navigation*, Doc. No. 370135.033
- *User's Guide: Smartpack2 Basic Controller*, Doc. No. 50021.013
- *Installation Guide: I/O Monitor2 CAN Node*, Doc No. 351509.033
- *Configuration Guide: Eltek Controllers*, Doc. No. 370013.063

2. Installation

NOTE: The system is to be mounted over a non-combustible surface only and installed in Restricted Access Locations (RAL). Access must be limited by use of tool, e.g. lock and key.

Recommended Tools

NOTE: Use of fully insulated tools is required when working with any powered circuits.

The following tools are recommended for installation:

- Standard wrench and/or socket set (1/4" to 1")
- Torque wrench
- Small flat blade screwdriver (3/32" wide)
- Standard blade screwdriver and Phillips tip screwdriver
- Wire cutters / strippers
- Multimeter

Torque Settings

Table 3 shows recommended torque settings for mechanical and electrical connections according to screw or nut size.

Table 3 – Recommended Torque Settings

Screw or Nut Size	Torque (in-lbs)
#12-24 – Rack screws	42
Input Terminal block	6
M5 studs – DC output	30
Controller inputs, alarm connections (terminal blocks)	3

Mechanical – Rack or Cabinet Mounting

CAUTION: Never install a power system without capable assistance. Use capable assistance when lifting and mounting the system.

Eltek recommends mounting the system in a rack or a cabinet made of a non-combustible material and of sufficient strength to withstand an earthquake. There should be adequate clearance above the system for the input feeds, as well as adequate free space in front of and behind the rack for air flow.

NOTE: This system is **not** intended for stand-alone, open-rack installation. There are no provisions for conduit landing, nor are there appropriate safety covers for open rack applications.

To install the shelf, use the following instructions for installation:

1. Use proper lifting equipment to position the system so that the holes in the support bracket are aligned with the correct mounting holes in the rack.
2. Use #12-24 screws to mount the system and torque according to the value in Table 3, page 12.

Electrical Connections

Input terminals are located on the rear of the shelf, on the right side (when facing the rear). See Figure 7.

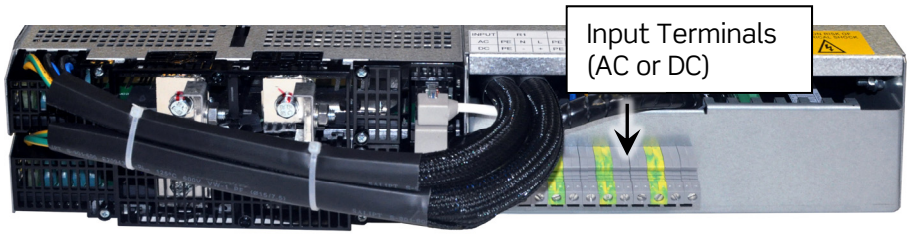


Figure 7 – Electrical Terminals

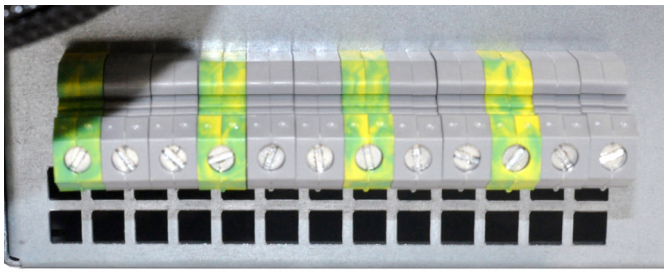
Electrical—AC or DC Input

CAUTION: Ensure that the AC or DC supply is OFF or DISCONNECTED before making connections!

AC or DC input connections are made to the right side of the shelf (when facing the rear). Input is individual-feed (one feed per rectifier).

Twelve (12) screw terminals are provided with the shelf for AC or DC input; see Figure 8.

Strip length is 0.35 in. (9 mm). Torque according to the value in Table 3, page 12.



R1			R2			R3			R4		
PE	N	L	PE	N	L	PE	N	L	PE	N	L

Figure 8 – Input Connections

Refer to the NEC for correct wiring sizes and derating factors.

Use a small Philips screwdriver to remove the cover; there is one screw in each cover, on the far left side.

From left to right, the terminals are as follows:

- Ground (⏚)
- N for DC connection – negative
- L for DC connection + positive

NOTE: Always connect ground first!

The rectifiers or DC/DC converters are positioned as shown in the following figure.

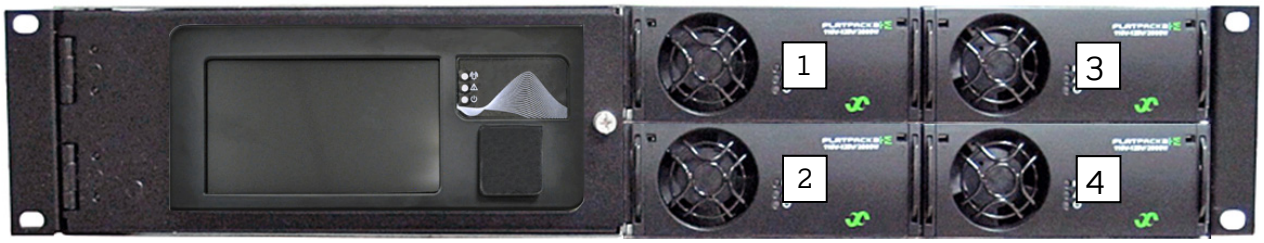


Figure 9 – Rectifier/Converter Positioning

Electrical – DC Output

CAUTION: Double-check polarity before terminating DC connections!

NOTE: Make sure that the DC circuit breaker is OFF.

The DC output of the system is bulk, meaning that there are no breakers or fuses in line with the output. When facing the rear of the shelf, the left terminal is positive (+), and the right terminal is negative (–).

- Stud size: M5 (equivalent to 1/4”)
- Landing width: 0.75” (20 mm)
- Torque according to the value in Table 3, page 12.

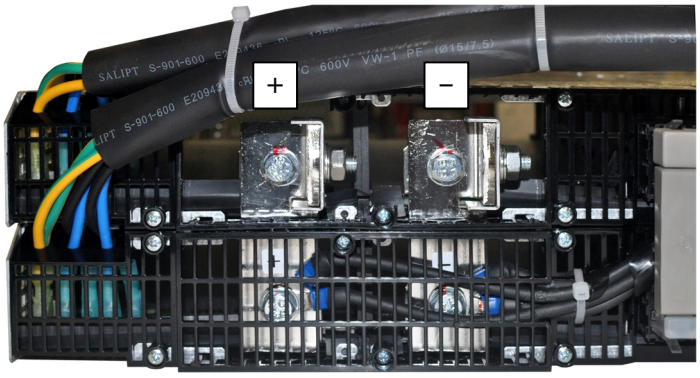


Figure 10 – DC Connections (TB2)

Alarm Connections

Alarms are controlled by the I/O Monitor2 unit, which provides a total of six alarm input terminals and six output relays. The I/O Monitor2 is located in the control and monitoring section, near the rear of the shelf.

To access the I/O Monitor2, remove the six screws from the cover on top of the control and monitoring section (see Figure 11).

Wire access is from the rear of the shelf.

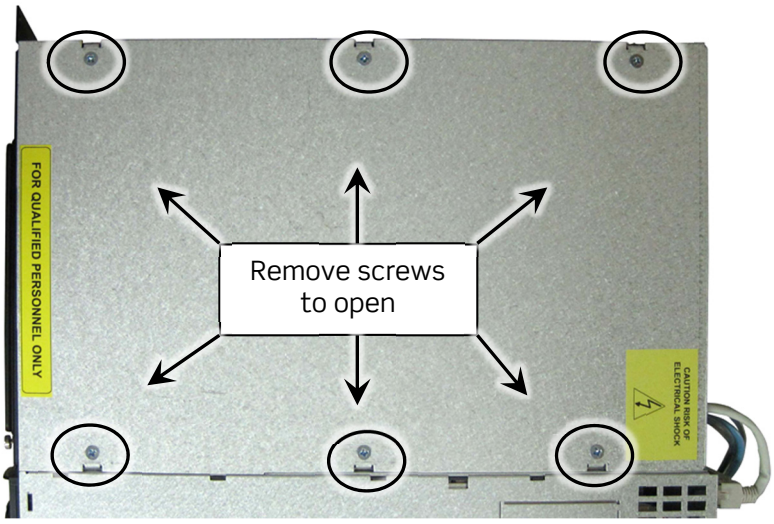


Figure 11 – Control and Monitoring Section Cover

- Maximum wire size: 16 AWG (5mm)
- Strip length: 0.25 in. (6–7 mm)
- Torque according to the value in Table 3, page 12.

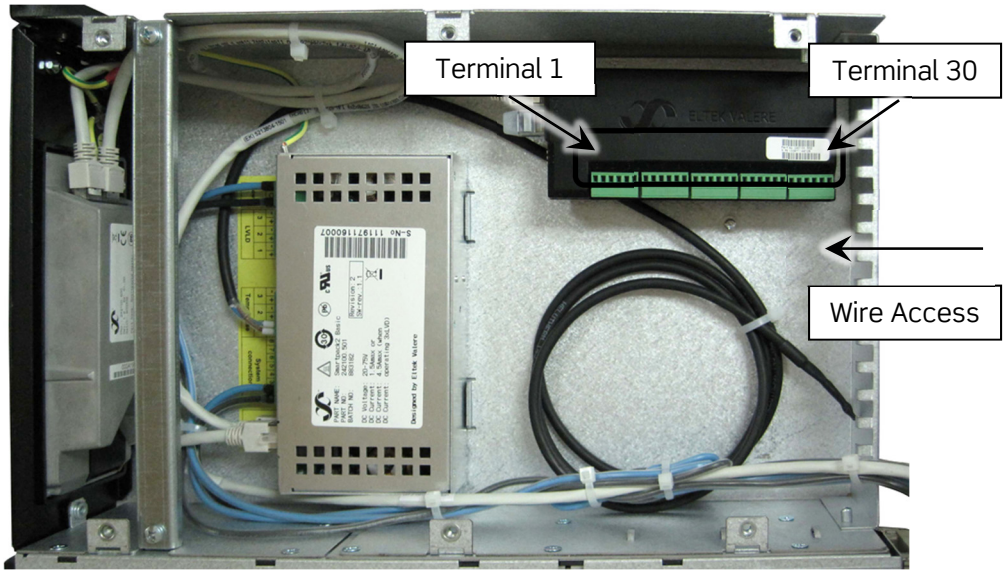


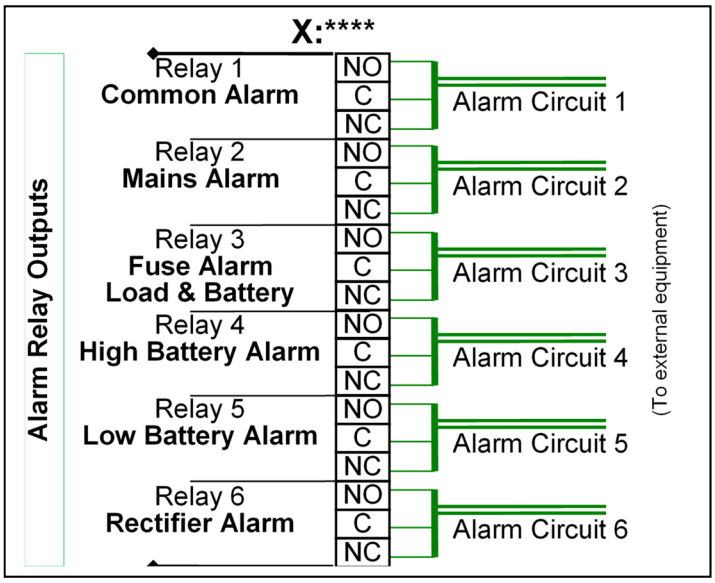
Figure 12 – Alarm Connections (TB4)

The terminals for the I/O Monitor2 are identified in Table 4.

Table 4 – Alarm Terminals (from left to right)

Terminal Block	1						2						3						4						5					
Terminal	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Designation	Input 1 (–)	Input 1 (+)	Input 2 (–)	Input 2 (+)	Input 3 (–)	Input 3 (+)	Input 4 (–)	Input 4 (+)	Input 5 (–)	Input 5 (+)	Input 6 (–)	Input 6 (+)	Output 1 (NC)	Output 1 (C)	Output 1 (NO)	Output 2 (NC)	Output 2 (C)	Output 2 (NO)	Output 3 (NC)	Output 3 (C)	Output 3 (NO)	Output 4 (NC)	Output 4 (C)	Output 4 (NO)	Output 5 (NC)	Output 5 (C)	Output 5 (NO)	Output 6 (NC)	Output 6 (C)	Output 6 (NO)

Standard Settings



NOTE: Replace the cover with the six screws when installation is complete.

Rectifier/Converter Installation

WARNING: Do not attempt to open or otherwise service rectifiers! Return defective units to Eltek.

CAUTION: DO NOT carry rectifiers by the latches.

NOTE: It is recommended that the rectifiers NOT be installed until system turn-up (section 4).

NOTE: Install rectifiers according to the numbering order preferred by the customer or site. This facilitates orderly numbering of the rectifiers rather than random ID assignment.

1. Release the handles on the rectifier by inserting an unlock tool (or flat blade screwdriver) into each release slot and pressing the tip upward. The latches are only for installation and extraction; do not carry the rectifier by the latches.

Figure 13 – Flatpack2 HE Rectifier Installation

2. Starting from the rectifier slot considered to be #1, insert the module into the power shelf. Slide it in until it connects to the backplane.
3. Retract latches to lock it in place.
4. Allow a two-second delay before inserting the next module. Turn-up

WARNING: Hazardous energy is present in the cabinet once the DC input circuit breakers are activated. Exercise caution when opening cabinet doors and accessing equipment when the system is powered.

The following procedure outlines the basic rectifier and controller installation startup procedure:

1. Apply AC or DC input power to system by turning ON the AC or DC input feed breakers.
2. Beginning with the rectifier position that will be considered #1, install the rectifier and lock the latches. If necessary, refer to the rectifier installation instructions beginning on page 17.
3. Verify proper rectifier startup with green LED illumination on each.
4. Verify proper startup of the Smartpack2 Master controller after brief boot-up delay.
5. Verify proper DC output voltage on the display of the Smartpack2 controller. Default output is set to 48V.

   Note: If you need to adjust voltage output, you can do so by using the touch screen (or a computer connected to the controller), by following the path **System Conf. › System Voltages**. For additional details, see *Configuration Guide: Eltek Controllers*, Doc. No. 370013.063.
6. Continue installing rectifiers one at a time, in the order desired. Rectifier ID is determined by installation order.
7. Verify proper startup and operation of load devices.

For alarm setup and testing, refer to the *Configuration Guide: Eltek Controllers*, Doc. No. 370013.063.

3. Turn-Up Checklist

Quick Start Turn-up Checklist	
Pre-start Check (Power is OFF)	
☐	Installation site prepared ○ Mounting location is well-ventilated and provides adequate room for airflow ○ Floor is level and capable of supporting the system (individual system weights vary; see product flyer for more information) ○ Suitable insulated tools available
☐	AC input supply prepared ○ AC supply is compatible with rectifier shelves ○ Supply fuses and/or circuit breakers and wires are properly rated
☐	System components inspected ○ All parts, equipment, documentation, etc. are accounted for ○ Components checked for damage; if damaged, contact Eltek
☐	Rack/cabinet anchored to suitable location (if applicable)
☐	Distribution circuit open ○ Circuit breaker actuator switched OFF
☐	Make AC input connections (power is OFF) ○ AC supply lines are correctly configured to the terminal blocks ○ Ground wire is larger than AC wires
☐	Make DC connections ○ Cables properly connected to system output and return bus
☐	Alarm cables connected to terminal blocks
☐	External devices connected to controller (if applicable)
Turn-up Procedure	
☐	Turn on AC input breaker and verify proper input voltage
☐	Insert rectifiers in the desired order; system will power up
☐	Verify system turn-up ○ Controller display turns on ○ Controller and rectifier LEDs turn on ○ Rectifier fans activate
☐	Check controller interface ○ Check display functionality ○ Connect PC to controller (if desired)
☐	Once alarms are cleared, run relay/alarm tests

4. Basic Troubleshooting

In case of alarm conditions, verify the following:

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

Specific rectifier and controller alarm conditions can be found in the following documents:

- 350002.013: User's Guide—Flatpack2 Rectifiers
- 350020.013: User's Guide—Smartpack2 Master Controller
- 350021.013: User's Guide—Smartpack2 Basic Controller
- 351509.033, Installation Guide I/O Monitor2 CAN Node

For assistance with technical questions and solutions, please contact Technical Support by email at tech.**support.us@eltek.com** or by phone at 1-800-435-4872.

Ordering information: **sales.us@deltaww.com**, (469) 330-9100

Revision Table

Revision	Release	Description	CO
1	3/29/12	First release	NA
1.1	3/23/15	Updated photos and diagrams of connections; modified tables and text to cover DC options, removed discontinued rectifiers; replaced outdated screen shot.	150323UA
1.2	09/12/2106	Corrected specs about DC converters.	160803UA
1.3	08/28/2020	Revised to reflect upgrade to Smartpack2 Touch Controller; updated photos.	N/A

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