



Scalable DC Power System

Overview

The Eltek *Scalable* DC power system offers an array of configurable components that come together to produce large-scale, high-power solutions—up to half a million watts!

Applications: Central offices (CO), switching offices (SO), data centers

Scalable Solutions

Eltek's *Scalable* line of power solutions is comprised of configurable components designed to meet the needs of Central Offices and other high-power DC applications. A variety of rectifier bays provides 48V DC output ranging from 3000A to 20,000A (if cabled).

Distribution options offer everything from bulk output to circuit breakers, fuses, and even overhead bus arrangements with shunts.

Plant Configurations

- *Scalable* plant design consists of at least one main rectifier bay with master controller
- Additional rectifier and distribution bays can be directly linked together by bus bars
- Bays can be configured side-by-side in any order

Please see architecture details on page 2.

Rectifier Bays

- Two bay models for three-phase *Powerpack* rectifiers
 - Accommodates up to 15 rectifiers
 - Output DC current of up to 3000A per bay
- DC bus available in 3000A, 6000A, and 10,000A ratings
- Control and monitoring devices

Distributions

- Bulk bus on each bay
 - 3000A, 6000A, and 10,000A ratings available
 - Bottom-feed buses available
- Distribution bays
 - 48 configurable distribution positions
 - Modules available for small and large circuit breakers and fuses
 - Alarm and shunt monitoring
 - Internal bus work rated for 3000A or 6000A
 - High-current bay shunt (either 4000A or 8000A)
 - Top and bottom cable access

Control and Monitoring Devices

- Interactive controller display on primary rectifier bay (*Smartpack2 Master*)
- Twelve alarm inputs and outputs available
- Distribution alarm and shunt monitors in distribution bays
- Optional add-on devices for monitoring alarms, shunts, temperatures, and voltages at several points.

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Centralized Architecture

Eltek's Scalable DC Power Systems are designed for centralized architecture. Even so, the bays have a variety of options that support a wide range of site-specific configurations.

Internal Bus

Each Scalable bay is configured with **rear-access hot and return buses** that can be **interlinked** between bays to form a system bus. Use of this internal bus structure can eliminate the need for an overhead bus structure or chandelier.

External Bus

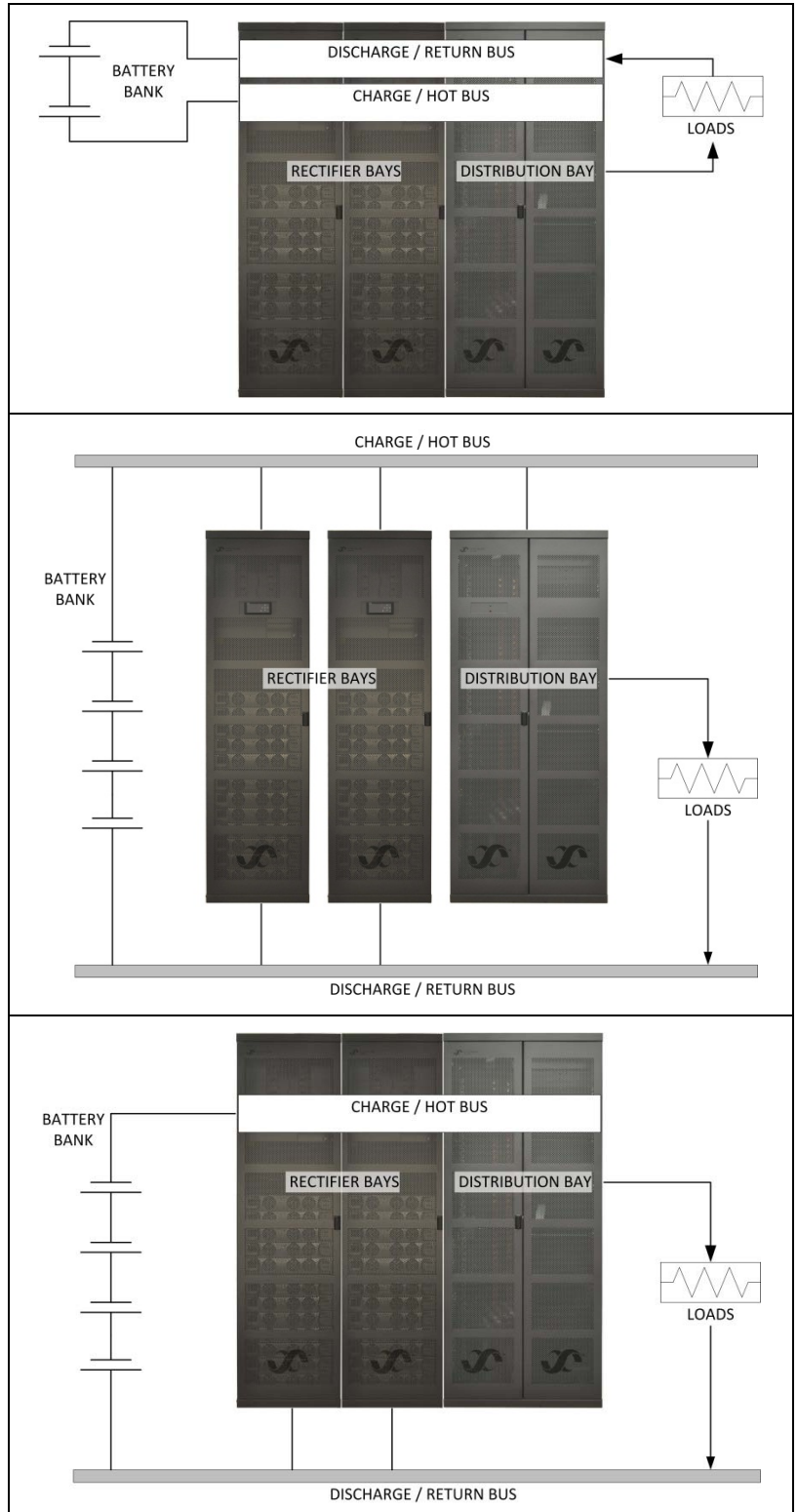
Scalable bays do not need to be linked together to operate as a single system. If an **overhead bus structure** is available, the bays can be physically separate and cabled to the buswork.

Control and monitoring of all Scalable bays—as well as supported monitoring devices—is centralized in the primary rectifier bay through the **Smartpack2 Master controller**.

If desired, the **distribution bay(s)** can be ordered **without an internal return bus**, relying instead on the overhead return bus as the central point for all return connections.

Internal Hot and External Return Buses

Another system configuration makes use of the **internal hot bus** and an **external overhead return bus**. The bays are interlinked along the hot bus, but returns are made to the overhead bus. Because of this, the **distribution bay(s)** can be ordered **without the internal return bus**.



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Powerpack Rectifiers

The Scalable system is powered by Eltek's *Powerpack* rectifiers. They operate on three-phase AC input. Each rectifier outputs up to 11kW of DC power (up to 230A at -48 Vdc). There are two models available, differentiated by the AC input voltage they accept: **208 Vac** and **480 Vac**.





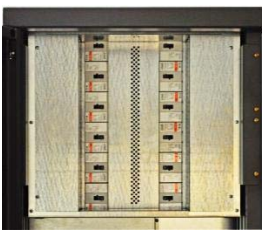
Figure 1 - Powerpack Rectifier

The **208 Vac** rectifier model operates on 208/240 Vac nominal input, between 185 and 250 Vac, and it tolerates short excursions in the range of 180 to 264 Vac. The **480 Vac** rectifier model operates between 430 and 530 Vac, and it tolerates short excursions in the range of 260 to 550 Vac.

Rectifier Bay

Scalable rectifier bays house up to 15 *Powerpack* rectifiers, providing up to 3000A of DC output. Rectifier bays are designed to be powered exclusively by one of the two *Powerpack* rectifier models: **208 Vac** or **480 Vac** (three-phase delta). Rectifier shelves are keyed to prevent the installation of the incorrect rectifier model. One bay per plant is designated as "Primary", containing the *Smartpack2 Master* controller and twelve (12) alarm I/O connections. Up to four rectifier bays can be installed in a single plant. Rectifier bays have three options for AC junction boxes, as detailed in Table 1.

Table 1 - AC Junction Box Options

AC JUNCTION BOX OPTIONS	Compression Terminal Blocks	Barrier Strip for One-Hole Lugs	Circuit Breakers
Image			
AC INPUT			
Feed type(s)	Individual Dual	Individual	Bulk*
Connection type	Stripped wire	One-hole lug	Two-hole lug
DC OUTPUT			
Maximum number of rectifiers	15	15	12
Maximum total output current	3000A	3000A	2400A

*In 208/240 Vac systems, each input feed powers three rectifiers. In 480 Vac systems, each feed powers either three or six rectifiers.

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Distribution Bay

Scalable distribution bays utilize the following overcurrent protection devices:

- One- and two-pole bullet-nosed, plug-in circuit breakers (50A – 200A)
- One-, two-, three-, and four-pole GJ/GS-style circuit breakers (150A – 800A)
- TPL-style fuses (70A – 600A)
- An adapter is available for TPS/TLS-style fuses

The distribution devices listed above are facilitated by factory-installed adapter modules, which take up anywhere from one to four distribution device positions. There are a total of 48 individual positions available.

Bullet Circuit Breaker



TPS/TLS Fuse and Holder



GJ/GS Circuit Breaker



TPL Fuse and Holder

Distribution bays also have the following bus options that are not available for the rectifier bays:

- **Bottom-feed buses** facilitate cabling run through the bottom of the bay so that connections do not have to be made to the system buses.
 - Hot connections: Rear-access, 10 landings, 3/8" holes on 1" centers
 - Return connections: Front-access, 8 landings, 3/8" studs on 1" centers
- **Ground bus extension** provides an extra bus bar, which is installed in parallel with the existing system ground bus. This extension adds 17 landing positions.
 - Connections: Rear-access, 17 landings, 3/8" holes on 1" centers
- **Small device returns** are useful if the distribution bay will be populated with smaller distribution devices (i.e., plug-in circuit breakers) and returns are needed at the bay. These returns provide several landings for smaller size cable, and they are accessible from the front of the bay.
 - Larger cable connections: Front-access, 3 landings, 3/8" studs on 1" centers
 - Smaller cable connections: Front-access, 6 landings, 1/4" nuts on 5/8" centers
- **No return buswork** is an option for systems where a ground bus already exists on site and will be used for all load returns.

Scalable Distribution Bays include the following CAN Nodes: Load Monitor and CAN Power. Descriptions of each device are provided on page 6.

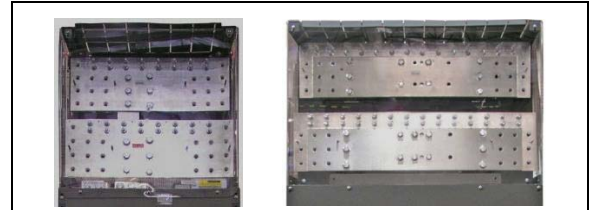
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System Bus Options

The integrated system bus of each Scalable bay can be configured in a variety of ways for a variety of uses. Below are some examples of how the system bus can be utilized.

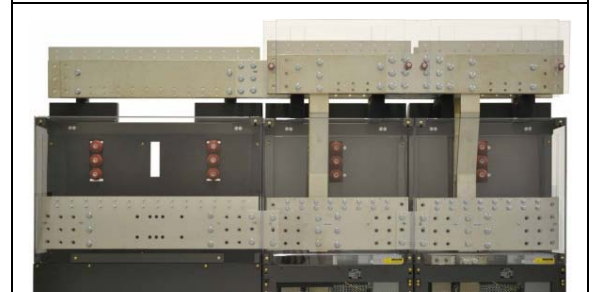
Distributed

This option provides **rear-access hot and return buses** on each bay that can be **interlinked** to form a continuous system bus. Use of this bus structure can eliminate the need for an overhead bus structure or chandelier.



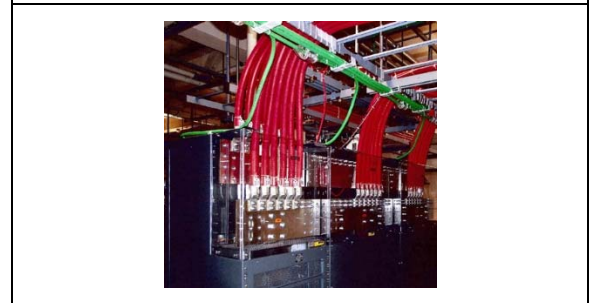
Raised

This option provides **hot and return buses** on the tops of each bay that can be **interlinked** to form a continuous system bus. While functionally similar to the “Distributed” bus option, more landings are available per bay in the “Raised” option.



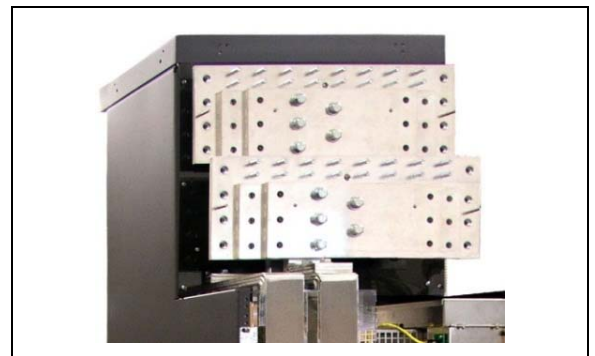
Centralized

This option involves cabling each bay individually to an overhead bus structure or chandelier. In this configuration, higher-ampacity bus bar kits and interlinking bay buses are unnecessary.



Higher Ampacity Bus Kits

The rear-access system bus structure can be ordered in the following current ratings: 3000A, 6000A, or 10,000A. Kits for linking cabinet buses are available in the same ratings.



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Control and Monitoring

The *Smartpack2* controller system handles plant control and monitoring. A variety of modules are used to collect a large variety of metrics to provide comprehensive system regulation and alarming.

The following three units make up a complete *Smartpack2* control system:

- **Smartpack2 Master** is the master controller and contains the interactive display.
- **Smartpack2 Basic Industrial** handles internal data aggregation and housekeeping.
- **I/O Monitor2 (Type 2)** handles external alarm inputs and outputs.

The system can be expanded with additional *Basic* controllers, I/O units and other CAN nodes in the *Smartpack2* family. All control and monitoring devices interconnect via the CAN bus.

A single *Smartpack2* Master controller is used for the entire plant; it is installed in one of the rectifier bays, which is designated the “primary” or “main” bay. Within this bay are two I/O Monitor2 units, which provide a total of 12 alarm inputs and 12 alarm output relays. The *Smartpack2* Master controller also contains an Ethernet port, which can be connected either directly to a computer or to a network (e.g., an office LAN).

Smartpack2 Control System



Supported CAN Nodes

In addition to the devices discussed above, other CAN nodes are available for use with the *Smartpack2* control system:

- **Battery Monitor** contains an internal temperature probe to measure battery temperature. It also has monitor inputs for one shunt and one breaker.
- **Load Monitor** can monitor up to eight shunts and eight fuses. These are used in the Scalable Distribution Bay. Additional Load Monitors can be ordered to monitor external distribution devices or shunts.
- **CAN Power** provides CAN bus isolation and can be used to supplement the available power in the control system. One CAN Power device is included with each Scalable Distribution Bay.

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Smartpack2 Control and Monitoring Features

Power System Components	Alarms / Events Available
<p>Control System</p> <ul style="list-style-type: none"> ○ Output Voltage Measurement ○ Load Current Calculation ○ Energy Calculation ○ Load/Battery Disconnect ○ Real Time Clock with Battery Backup ○ Stored Site Text/ID and Messages ○ Position (longitude/latitude) for auto placement ○ Test of Relay Outputs ○ Alarm grouping of events for relay outputs 	<p>Alarms can be set up with monitoring of minor and major levels. Hysteresis and time delay is user configurable. All average and peak levels on analogue values are auto logged in event log.</p>
<p>Battery</p> <ul style="list-style-type: none"> ○ Battery Current Measurement ○ Battery Temperature Measurement ○ Battery Testing (by discharge table or set time limit) ○ Setup of Battery Data/Table ○ Battery Capacity Indication ○ Battery Boost Charging <ul style="list-style-type: none"> ○ Auto – Ah discharge or voltage threshold ○ Interval or Manual ○ Temperature Compensated Charging ○ Charge Current Limitation ○ Battery Low Voltage Disconnect <ul style="list-style-type: none"> ○ Temperature dependent (optional) ○ Mains independent (optional) 	<p>Power and Control System</p> <ul style="list-style-type: none"> ○ AC Mains Low ○ AC Phase Voltage ○ “Digital” Inputs (programmable descriptions) ○ Events trigger by inputs ○ Service mode (block relays), Generator running, Lower charge current limit, Battery test, Boost inhibit, Emergency low voltage , Clear manual reset alarms.
<p>Rectifier</p> <p>Available information about each rectifier, e.g. serial number, version, internal temperature</p> <ul style="list-style-type: none"> ○ Individual Rectifier Current Measurement ○ Individual Rectifier Input Voltage ○ Efficiency Management ○ Emergency Voltage ○ Startup delay ○ Detailed internal alarms summary 	<p>Load</p> <ul style="list-style-type: none"> ○ Load Fuse ○ Load Current
<p>Generator</p> <ul style="list-style-type: none"> ○ On/Off control for cyclic charging and fuel reduction ○ Start-up delay of power system ○ Fuel consumption logging and alarming based on tank level measurement ○ Discharge cycle counter/Generator run hour logging ○ DoD [%] logging w/time stamp 	<p>Battery</p> <ul style="list-style-type: none"> ○ Battery Voltage ○ Battery Temperature ○ Battery Used Capacity [Ah or %] ○ Battery Remaining Capacity [Ah or %] ○ Battery Fuse ○ Symmetry Failure (only with Battery Monitor CAN Node) ○ Battery Quality after test ○ Battery Current ○ Battery Life Time (from temperature log)
	<p>Rectifier</p> <ul style="list-style-type: none"> ○ Rectifier Failure ○ Rectifier Capacity ○ Rectifier Current ○ Rectifier Avg. Temperature ○ Rectifier Current Share

- 48V systems with flexible distribution
- Interconnected system bus
- Advanced digital control and communication
- Rectifier cabinet with high power density

Power System Modules	
Powerpack rectifiers	<ul style="list-style-type: none"> ○ Two models, based on AC input: <ul style="list-style-type: none"> ○ 208/240 Vac, three-phase ○ 480 Vac, three-phase ○ Maximum output: 230A at 48Vdc
Rectifier bays	<ul style="list-style-type: none"> ○ Holds up to fifteen <i>Powerpack</i> rectifiers for a maximum output of 3000A ○ Equipped with system controller and door-mounted display ○ Front access AC termination panel ○ Rear access hot/charge and return/discharge buses (8 landings per polarity) ○ Stand-alone operation for upgrades and retrofits
Distribution bays	<ul style="list-style-type: none"> ○ 3000A or 6000A internal bus ○ 48 individual module positions ○ Variety of fuse/circuit breaker modules: <ul style="list-style-type: none"> ○ 1-100A TPS-style fuses ○ 70-600A TPL-style fuses with shunt ○ 1-200A bullet-style plug-in circuit breakers ○ 100-800A GJ-style circuit breakers (shunt optional) ○ Equipped with a bay shunt ○ Rear access hot/battery and return buses (14 landings per polarity)
Scalable bus bar system	<ul style="list-style-type: none"> ○ Each bay bus can connect to others to form a single system bus ○ Multiple connections points for bulk power needs ○ Rear bus available in ratings of 3000A, 6000A, and 10,000A ○ Raised bus with additional connections points available for both polarities, also in ratings of 3000A, 6000A, and 10,000A ○ Hot bus for bottom-feed cabling available (distribution bay only)

Control and Communications	
<i>Smartpack2</i> Controller	<ul style="list-style-type: none"> ○ Full plant and battery management features, including thermal compensation ○ Set points adjustable from front display and web-based interface ○ Event history log ○ Soft naming of bays and shunts ○ Expandable input and output features via CAN Nodes ○ Twelve (12) programmable form-C relays using the <i>I/O Monitor2</i> CAN node ○ Ethernet communications

AC Input Operating Voltage Ranges*	
208 Vac	185 to 250 VAC, three-phase
480 Vac	430 to 530 VAC, three-phase

*See rectifier datasheets for complete specifications

DC Output Specifications	
Voltage	43.0 to 56 VDC
Power	11 kW at nominal input
Efficiency	Typical 93.5% at 50% load Maximum of 94% (480 VAC model)*

*Result based on Verizon TEEER testing, according to practice VZ.TPR.9205

Dimensions and Weight	
Rectifier cabinet dimensions	<ul style="list-style-type: none"> ○ Height: 2133 mm (84.0") ○ Width: 600 mm (23.6") ○ Depth: 642 mm (25.3")
Distribution cabinet dimensions	<ul style="list-style-type: none"> ○ Height: 2133 mm (84.0") ○ Width: 900 mm (35.4") ○ Depth: 642 mm (25.3")
Empty cabinet weights*	<ul style="list-style-type: none"> ○ Rectifier bay: 342 kg (753 lbs) ○ Distribution bays: <ul style="list-style-type: none"> ○ 6000A: 456 kg (1005 lbs) ○ 3000A: 270 kg (595 lbs)
Rectifier weight	○ 18.5 kg (40.8 lbs)

*Estimated; actual weight depends on installed components

Temperature Range	
Storage	-40°C to +70°C (-40°F to +158°F)
Operating	-10°C to +40°C (+14°F to +104°F)

Agency Approvals	
NEBS Level 3	
UL60950-1 (Canada/US)	
IEC60950-1	

Specifications are subject to change without notice.