

# Scalable DC Power System with DPR 6000B Rectifiers

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 include Central Offices (CO), Switching Offices (SO), and Data Centers.



## Scalable (DC Power System)

Doc 2119266 – rev1.2

### PRODUCT DESCRIPTION

#### SCALABLE SOLUTION

The Eltek 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 10,000A (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

### RECTIFIER BAYS

- Two bay models for three-phase Powerpack rectifiers
- Accommodates up to 30 DPR 6000B or 15 Powerpack 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

### KEY FEATURES

- 48V SYSTEMS WITH FLEXIBLE DISTRIBUTION
- INTERCONNECTED SYSTEM BUS
- ADVANCED DIGITAL CONTROL AND COMMUNICATION
- RECTIFIER CABINET WITH HIGH POWER DENSITY

### 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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## SPECIFICATIONS

### POWER SYSTEM MODULES

Powerpack rectifiers	208 Vac, three-phase 480 Vac, three-phase Maximum output: 230A at 48Vdc
Rectifier bays	Holds up to 30 DPR 6000B or 15 Powerpack 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	3000A or 6000A internal bus 48 individual module positions Variety of fuse/circuit breaker modules: 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	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

Smartpack2 Master Controller	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/O Monitor2 CAN node Ethernet communications
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### AC INPUT

208 Vac	Full power output: 180 to 264 VAC, three-phase
480 Vac	Full power output: 430 to 530 VAC, three-phase

### DC OUTPUT

Voltage	42.0 to 58 VDC
Power	6 kW at nominal input per rectifier (x24 or 32)
Efficiency	Typical 93.5% at 50% load; maximum of 94% (480VAC model)

### DIMENSIONS AND WEIGHT

Rectifier cabinet dimensions	Height: 2133 mm (84.0") Width: 600 mm (23.6") Depth: 642 mm (25.25")
Distribution cabinet dimensions	Height: 2133 mm (84.0") Width: 900 mm (35.4") Depth: 642 mm (25.25")
Empty cabinet weights#	Rectifier bay: 342 kg (753 lbs) Distribution bays: 3000A: 270 kg (595 lbs); 6000A: 456 kg (1005 lbs)

### TEMPERATURE RANGE

Storage	-40°C to +70°C (-40°F to +158°F)
Operating	-40°C to +65°C (-40°F to +149°F)

### AGENCY APPROVALS

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

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

# Estimated; actual weight depends on installed components

Specifications are subject to change without notice

# Scalable DC Power System



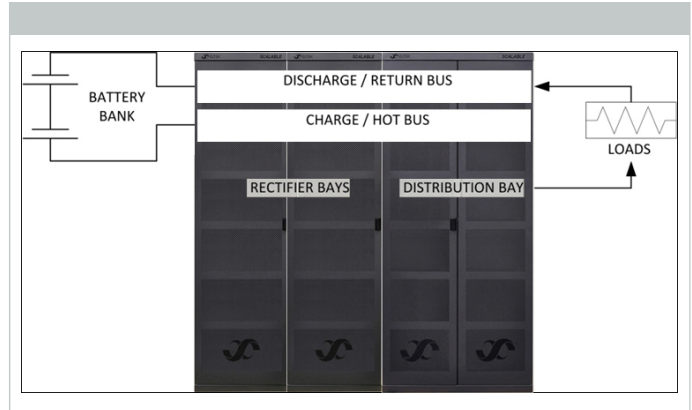
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## CENTRALIZED ARCHITECTURE

Eltek 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

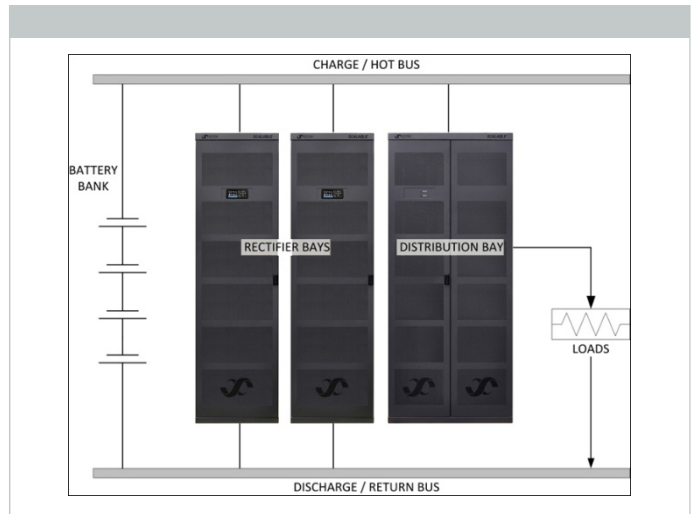


### EXTERNAL BUS

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.

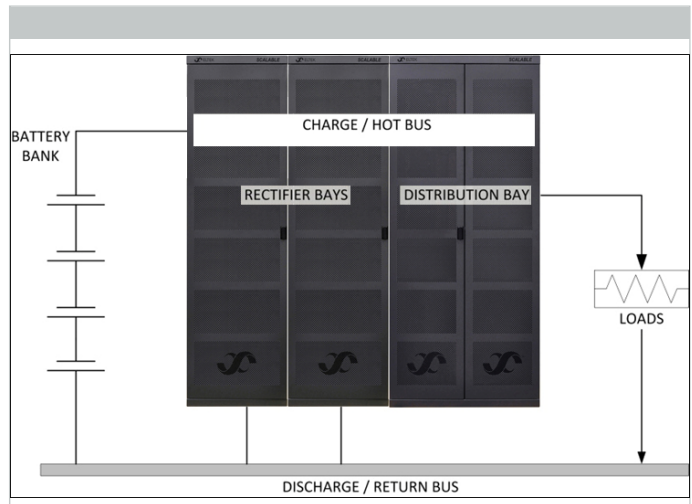
Control and monitoring of all Scalable bays – as well as supported monitoring devices – is centralized in the primary rectifier bay through the Smartpack2 Master controller.

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.



# Scalable DC Power System



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## RECTIFIER BAY

Scalable rectifier bays house up to 32 DPR6000B rectifiers, providing up to 3000A of DC output. Rectifier bays are designed to be powered exclusively by one of the two DPR 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 below.

### DPR 6000B RECTIFIER

DPR 6000B rectifiers operate on three-phase AC input. DPR rectifiers are hot plug/hot-swap modules. Each rectifier outputs up to 6kW of DC power (up to 125A at -48 Vdc). There are two models available, differentiated by the AC input voltage they accept: 208 Vac and 480 Vac.

The 208 Vac rectifier model operates on 208/240 Vac nominal input, with an operating range between 165 and 290 Vac. The 480 Vac rectifier model operates on 380/480 Vac nominal input, with an operating range between 250 and 530 Vac.



DPR 6000B Rectifier

### POWERPACK RECTIFIER (Not available after 2019)

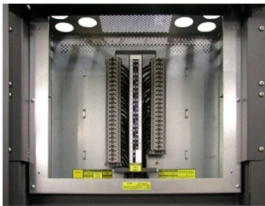

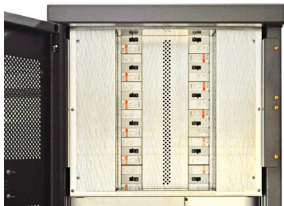
Powerpack rectifiers operate on three-phase AC input. Each rectifier outputs up to 11kW of DC power (up to 230A at -48 Vdc). There are two models available, differentiated by the AC input voltage they accept: 208 Vac and 480 Vac.

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.



Powerpack Rectifier

Table 1 – AC Junction Box Option

AC JUNCTION BOX OPTIONS	COMPRESSION TERMINAL BLOCKS	BARRIER STRIP	CIRCUIT BREAKERS
Part number			
<b>AC INPUT</b>			
Feed type(s)	Individual / Dual	Individual / Dual	Bulk*
Connection type	Stripped wire	One-hole lug	Two-hole lug
<b>DC OUTPUT</b>			
Maximum number of rectifiers	15	15	15
Maximum total output current	3000A	3000A	2400A
*In 280/240 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:

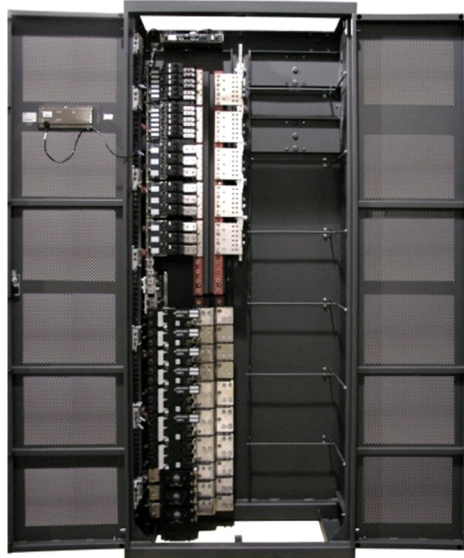
- One- and two-pole bullet-nosed, plug-in circuit breakers (1A – 200A)
- One-, two-, three-, and four-pole GJ/GS-style circuit breakers (150A – 800A)
- TPL-style fuses (70A – 600A)
- An adapter is available for TPS/TLS-style fuses

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*



*TPS 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 7.

# Scalable DC Power System



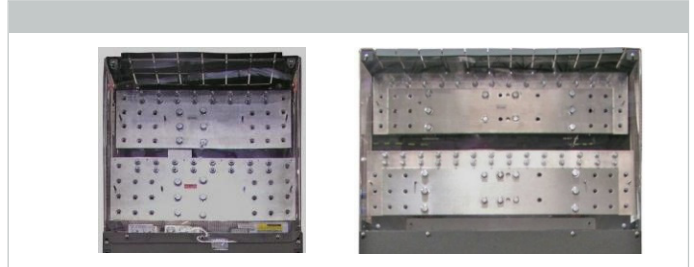
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## SYSTEM BUS OPTIONS

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

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.



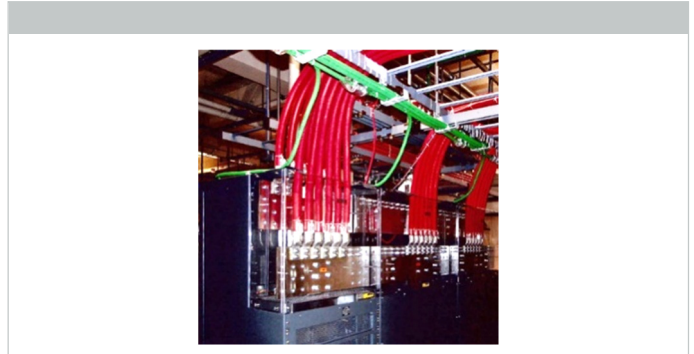
### RAISED

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.



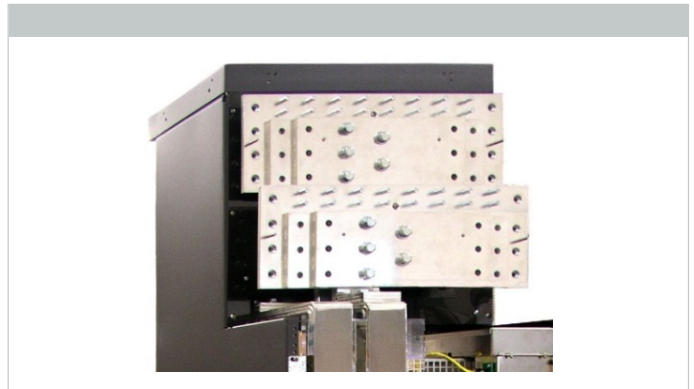
### CENTRALIZED

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 Touch 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 Touch 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 Touch features superior security, and contains 2 Ethernet ports for local or network interface, 2 USB host ports which can provide access to Wi-Fi or 4G networks through USB dongles, 2 serial interface ports and

## SMARTPACK 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.

## POWER SYSTEM COMPONENTS

### CONTROL SYSTEMS

- 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

### BATTERY

- 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
- Auto – Ah discharge or voltage threshold
- Interval or Manual
- Temperature Compensated Charging
- Charge Current Limitation
- Battery Low Voltage Disconnect
- Temperature dependent (optional)
- Mains independent (optional)

### RECTIFIER

- Available information about each rectifier, e.g. serial number, version, internal temperature
- Individual Rectifier Current Measurement
- Individual Rectifier Input Voltage
- Efficiency Management
- Emergency Voltage
- Startup delay
- Detailed internal alarms summary

### GENERATOR

- 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

## ALARM / EVENTS AVAILABLE

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.

### POWER AND CONTROL SYSTEM

- 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

### LOAD

- Load Fuse
- Load Current

### BATTERY

- 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)

### RECTIFIER

- Rectifier Failure
- Rectifier Capacity
- Rectifier Current
- Rectifier Avg. Temperature
- Rectifier Current Share