ELDRE IS NOW MERSEN

ELDRE®

BUS BAR TECHNOLOGIES

Unlock the Power of Innovation

ELDRE The Global Leader in Power Distribution

ELDRE IS ALSO THE PROUD HOME OF:

PRESS FIT

BUSHINGS

AMRON®

insulation systems

ABOUT ELDRE

WHAT IS A LAMINATED BUS BAR?

Laminated bus bars are engineered components consisting of layers of fabricated copper separated by thin dielectric materials, laminated into a unified structure. Sizes and applications range from surface-mounted bus bars the size of a fingertip to multilayer bus bars that exceed 6 meters in length. Laminated bus bar solutions are routinely used for low volumes up through tens of thousands per week.

ABOUT THE ELDRE CORPORATION

Eldre Corporation occupies a 10220+ square meters manufacturing facility close to major traffic arteries and the Rochester, NY, airport. This facility contains our North American engineering and production operation as well as corporate headquarters for Eldre worldwide. Eldre S.A.S. Europe, a wholly owned subsidiary of Eldre Corporation, is located in Saint Sylvain d'Anjou, France, 290 km southwest of Paris. It occupies a 4645+ square meters, modern manufacturing facility.

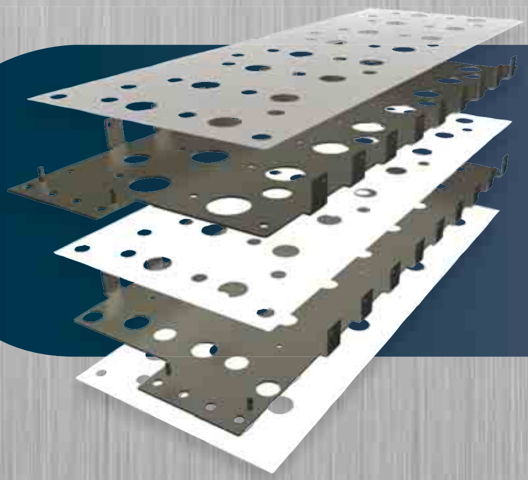
Our staff of professional engineers and experienced designers develop the tooling and manufacturing methods, procedures and process parameters to meet our customers' specifications.

With over sixty years of experience in designing laminated bus bars, and complete in-house manufacturing capability, we have the flexibility and expertise to respond to our customer's requirements through:

- quality control and quality assurance
- engineering & design
- chemical milling
- electroplating
- assembly
- epoxy encapsulation
- tool and die design and build
- metal fabrication
- metal joining
- die cutting
- laminating
- electrostatic powder coating

Eldre's reputation for outstanding technical expertise & quality is the result of a half century of design and manufacturing expertise, coupled with state-of-the-art equipment in both our North American and European facilities. Our capabilities include the manufacture of single and multilayer bus bars as well as integrated solutions in which the bus bar serves as a platform for discrete components.

Eldre's commitment to quality is clearly evident from the very beginning of the design process, right through to the production of the last part. Our Quality System is designed with defect prevention in mind and is certified to AS9100.



WHY ELDRE?

Peace of mind…
…in the confidence and comfort from over sixty years of success and technical innovation.
…because each design is a unique solution, based on millions of man-hours of experience.
…in a working relationship with privately owned, vertically integrated factories recognized worldwide for excellence.
…from a quality-driven, production-based approach to manufacturing.

WHAT WE OFFER

State-of-the-art metal fabrication is a key component to producing quality product. Eldre's state of the art metal fabrication is maintained in-house and includes CNC fabricators, photo-chemical machining, and production punch presses ranging up to 200 tons, CNC press brakes, and various edge conditioning processes. We offer a wide range of metal joining processes including ultrasonic welding, induction brazing, torch brazing, and soldering.

Plating – Eldre maintains a complete, in-house plating department that can produce almost any finish to meet your needs. Our finishing includes: tin, tin-lead, nickel, copper, silver and gold. Plating under tight, laboratory-controlled conditions, we monitor and control plating thickness to required specifications to meet all customer requirements. Careful data monitoring, in-process controls, and x-ray testing combine to ensure a quality finish.

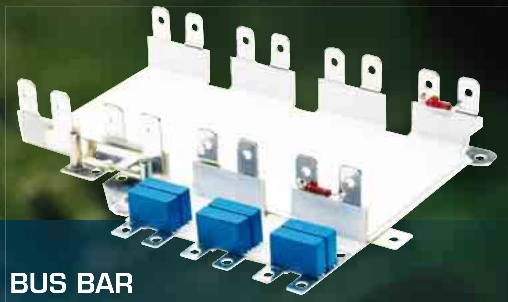
Precision manufacturing of dielectric components is crucial in laminated bus bar production. To ensure quality, we maintain calibrated humidity and temperature controlled conditions to store our insulation. Precision steel rule dies are used for cutting the insulation, ensuring uniformity of size to produce quality bus bars.

Properly selected insulation is the key factor to a bus bars electrical integrity. We utilize a wide variety of dielectric materials, including: Nomex, Tedlar, Mylar, Kapton, Epoxy-Glass, GPO, Gatex and Phenolics, readily available to meet virtually any specification. In addition to traditional sheet lamination systems, Eldre maintains its own electrostatic powder coating department that produces a quality epoxy finish with high dielectric protection for bus bars with geometric forms, or those used in harsh environments.

Assembly and Lamination is controlled using sophisticated laminating systems specifically designed and manufactured for each bus bar. Hardware and interconnection devices can be added before or after the laminating and plating process.

From the first design consultation through dock-to-stock shipments, Eldre provides customers with innovative power distribution solutions. You're always assured that Eldre has omitted nothing in our quest for customer satisfaction. Let us offer you the same peace of mind that thousands of other companies have enjoyed for more than 60 years.

POWER ELECTRONICS



MOTOR DRIVE BUS BAR

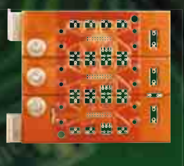
Thin copper conductors, separated by insulation material of only thousandths of an inch, provides the ultimate in low inductance for IGBT-based motor drives. Incorporating electrolytic capacitors into the same structure simplifies packaging, and reduces the effects of transient overshoots. Note the addition of Snubber Capacitors and Resistors built into the laminated bus bar!

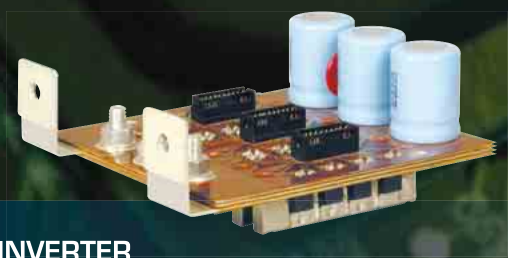
Size: 178 mm x 229 mm | Thickness: 1 mm | Voltage: 475VDC | Current: 150A

CAPACITOR BUS BAR FOR MOTOR DRIVE

Six electrolytic capacitors are easily connected to this edge sealed, two-layer laminated bus bar providing a low inductance power path for a low horsepower, variable speed motor drive. Note the use of a bonded insulator strip along the length of the bus bar to provide additional “creepage” protection between the plus and minus terminals.

Size: 46 mm x 160 mm | Thickness: 1 mm | Voltage: 480VDC | Current: 60A





HIGH CURRENT INVERTER

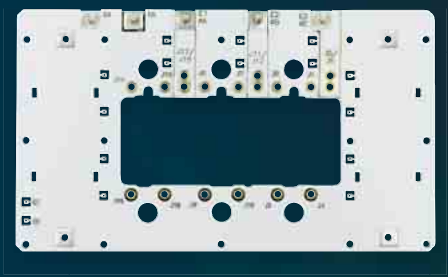
A laminated bus bar assembly consisting of three power layers and one signal layer with a total of 59 conductors providing a very low inductance power path and complete gate drive circuitry all designed for a wave-solder assembly process. This bus bar is used in a system powered by 24 MOSFETs, and includes Electolytic Capacitors, heatsinks and MOVs.

Size: 127 mm x 178 mm | Conductors: 1,5 mm (gate circuit: 0,8 mm) | Voltage: 28VDC
Current: 1000A peak

With the introduction of the IGBT in the early 1990s, a new era of design sophistication began. The higher switching speed of today’s IGBT demands a low inductance power path which is uniquely delivered by the Eldre laminated bus bar.

Eldre’s innovative Power Electronic designs provide the ultimate in low inductance DC power which is the “life blood” securing the best suppression of parasitic transients and safe operation for long life. The Eldre laminated bus bar is the key component of the DC power circuit enabling the IGBT / Electrolytic Capacitor circuit to provide perfect power & trouble-free service.

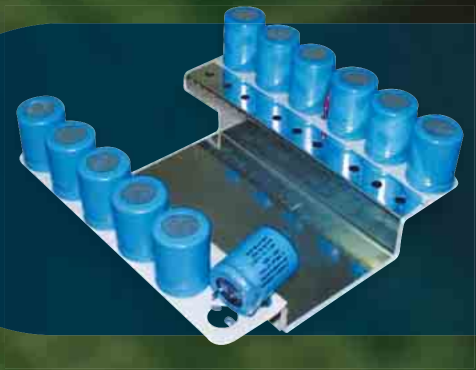
Engage Eldre’s design team on your next project and see first hand our ingenuity at work!



SPACECRAFT POWER INVERTER

High current circuit board design using laminated technology for IGBT's and support components. Includes gold plating, quick connect mounting. This laminated bus bar is an enhanced design of a typical IGBT bus bar. Manufactured to be easily serviced, the design uses gold high current sockets, which are soldered into the DC layers. The design also accommodates resistors and MOV's, soldered right into the assembly. Completely edge filled perimeter, the bus bar also has insulated mounting holes.

Size: 152 mm x 305 mm | Thickness: 1 mm | Voltage: 220V | Current: 75A



MOUNTING STRUCTURE FOR CAPACITOR BANK

Laminated bus bars provide a low inductance connection for capacitors. The assembly was designed for an automated production process and the assembly is the DC capacitor bank used in conjunction with high current, high speed switching applications. Positive and negative layers are formed and laminated without outside insulation. This design includes two rows of capacitors soldered into position.

Length: 203 mm | Width: 191 mm | Voltage: 28V | Current: 700A

HIGH-FREQUENCY WELDING

Connecting a complex network including Power IGBTs, Diodes, Resistors, and Film Capacitors, this multi-layer epoxy edge-filled bus bar provides a compact low inductance solution. Thirty-two bushings are brazed into position and maintain tightly controlled coplanar mounting surfaces on both top and bottom. Alternating the plus and minus layers throughout the assembly counters the skin effect of high frequencies.

Size: 127 mm x 229 mm | Voltage: 115VDC | Current: 125A
Thickness: 0,8 mm & 1,5 mm

HIGH FREQUENCY INVERTER

the addition of water-cooling for efficient operation. When thermal considerations exceed conventional means of heat dissipation, one option is to add water-cooling to the system. This design contains five cooling lines soldered directly on to the epoxy powder coated conductors to maintain a constant temperature. Due to the high frequency of the AC voltage, "skin effect" plays a big role in the heat created from the bus and without this additional cooling, the bus would surely over heat.

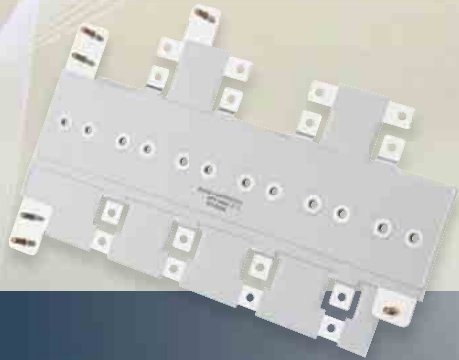
Size: 229 mm x 813 mm | Thickness: 0,8 mm & 1,5 mm | Voltage: 600V
Current: 700A

ALTERNATIVE ENERGY

HYBRID VEHICLES

Designed with automotive reliability in mind, this two-layer, laminated bus bar joins parallel rows of batteries together in a hybrid vehicle application.

Size: 76 mm x 102 mm | Thickness: 2 mm | Voltage: 60VDC | Current: 40A



SOLAR POWER

Multilayer, laminated bus bar used in a Photovoltaic Inverter application. Diodes, IGBTs, and Electrolytic Capacitors are all easily interconnected in one compact power distribution structure.

Size: 406 mm x 711 mm | Voltage: 48VDC | Current: 240A | Conductors: 1,5 mm

MASS TRANSIT

This rugged three-layer, five-conductor bus bar is production built for a Hybrid Transit Inverter application. The perimeter is a laminated-sealed edge construction, and shows the system simplicity of combining capacitors and IGBT's into a single bus bar system.

Size: 305 mm x 457 mm | Thickness: 3 mm | Voltage: 48V | Current: 250A per layer

As the depletion of fossil fuels drives our attention towards alternate energy sources to power our daily lives, Eldre's laminated bus bars can be found in new, but familiar territory.

Whether it is in Solar, Wind Power, or Fuel Cells, the creation of DC energy feeds directly through Eldre's low inductance laminated bus bars into an IGBT and Capacitor circuit delivering the safe and efficient power our customers demand.

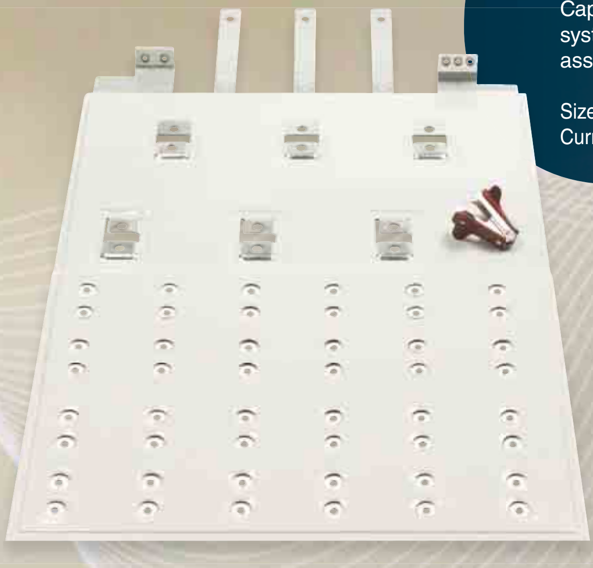
Eldre's quality-engineered laminated bus bars use state-of-the-art materials and manufacturing techniques that minimize weight & maximize simplicity!

ALTERNATIVE ENERGY

WINDMILL INVERTER

This laminated bus bar design demonstrates excellent packaging efficiency. By designing all electrical connection points for the IGBT's, Capacitors, I/O, and monitoring devices in one clean bus bar, overall system reliability is improved and optimal electrical performance is assured.

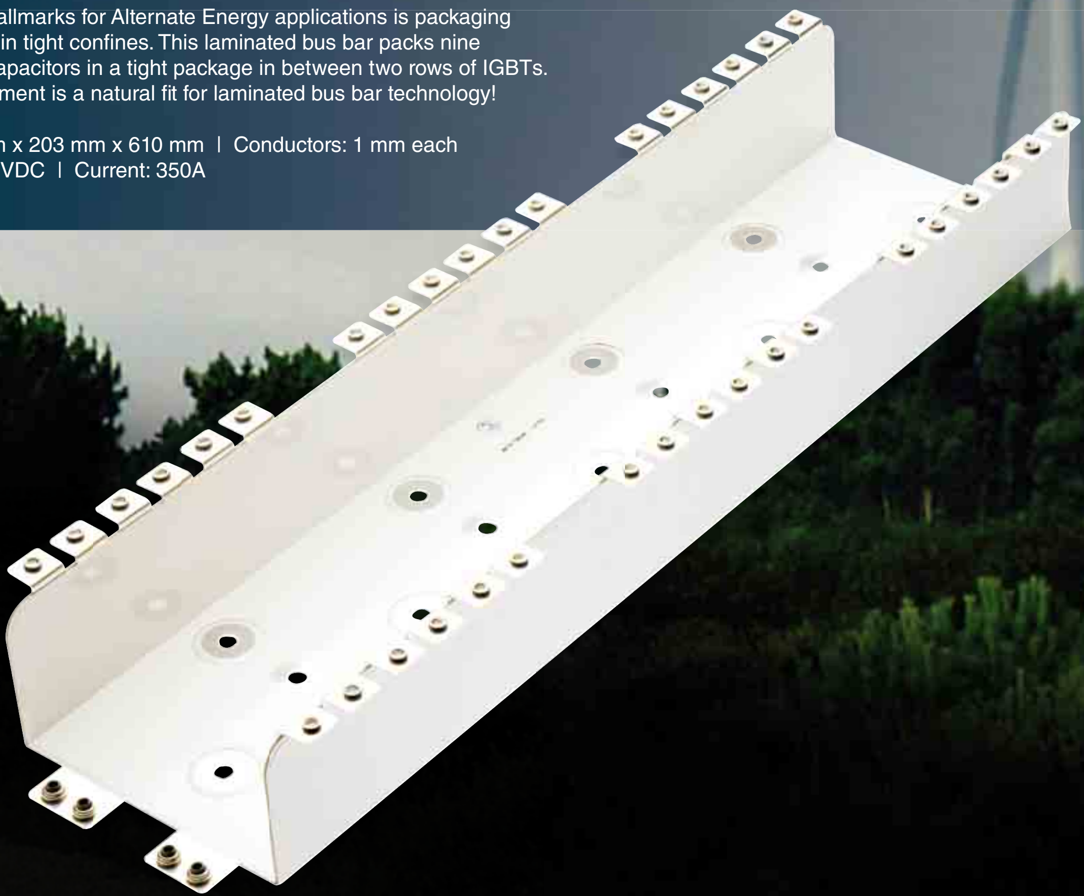
Size: 406 mm x 711 mm | Thickness: 2 mm & 6 mm | Voltage: 480V
Current: 240A



PUBLIC TRANSPORTATION

One of the hallmarks for Alternate Energy applications is packaging components in tight confines. This laminated bus bar packs nine electrolytic capacitors in a tight package in between two rows of IGBTs. This arrangement is a natural fit for laminated bus bar technology!

Size: 102 mm x 203 mm x 610 mm | Conductors: 1 mm each
Voltage: 400 VDC | Current: 350A

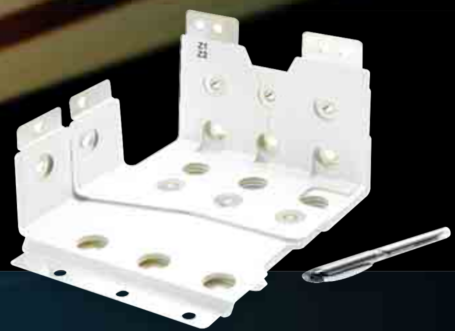


TRANSPORTATION

ALTERNATE FUEL SYSTEMS

Fuel cells and hybrid electric vehicles require rugged, reliable power distribution. Heavy duty construction with epoxy powder coating as a dielectric allows this laminated bus bar design to perform to specifications in harsh environments.

Size: 152 mm x 356 mm | Voltage: 600VDC | Current: 150A | Conductors: 3 mm



TRACTION DRIVE

Modern traction drives combine high current and high voltage in highly confined spaces. Eldre's design experience utilized individually laminated conductors, glass insulation spacers, and unique copper bushing "vias" to achieve an efficient, concentrated package with a minimum of special tools.

Size: 178 mm x 279 mm | Conductors: 1 mm | Voltage: 1200VDC | Current: 250A

LOCOMOTIVE

The laminated bus bar shown here represents a single-phase leg for a large three-phase inverter powering modern AC locomotives. Long term durability and continuous operation in hostile environments demand high quality and consistency. The laminated bus bar has mold-sealed edges and fully insulated mounting holes, built and tested to meet customer partial discharge requirements.

Size: 279 mm x 508 mm | Thickness: 1,5 mm | Voltage: 600V | Current: 140A

Whether it is carrying the high current necessary to power heavy equipment, rail and subway cars—or reducing weight and enhancing packaging efficiency for the latest aircraft and hybrid vehicles—Eldre laminated bus bars bring unique advantages to the transportation industry that are not available with traditional wiring or single conductor bars. The electrical performance of an Eldre-engineered laminated bus bar is a key component to success throughout the transportation industry.

A properly engineered laminated bus bar provides the lowest overall system inductance and the most balanced & distributed capacitance making the perfect match for the high demands of the transportation equipment industry. Eldre laminated bus bars help transportation equipment manufacturers achieve their reliability goals thus lowering warranty costs and enhancing customer satisfaction.

TRANSPORTATION

ELECTRIC VEHICLE POWER DISTRIBUTION

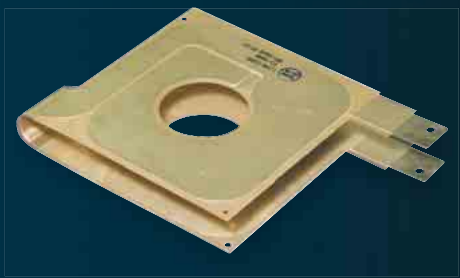
When power has to be routed through tight confines that twist and turn, Eldre's epoxy powder coating provides 100% dielectric protection. This two-conductor laminated assembly includes bonded ceramic chokes, nylon reinforced mounting holes, and floating clinch hardware for easy installation and optimized electrical performance in an automotive environment.

Size: 102 mm x 229 mm | Conductors: 3 mm | Voltage: 150VDC | Current: 100A

HIGH-END AUDIO / PCB BUS BAR

Uniquely designed two-layer, 18 conductor, PCB-style bus bar saves valuable board space while delivering low-impedance power to power-semiconductors in automotive sound systems. All conductors are made of 0,5 mm copper, plated for solderability and the entire assembly is formed at a right angle.

Length: 254 mm | Width: 38 mm | Voltage: 12V | Current: 6A to 16A



ELECTRIC VEHICLE CHARGE PORT

Planar power technology is enhanced through laminating with thin dielectric materials which yields a sealed, rugged structure. This design is formed into a “U” shape and is electrically tested underwater to assure performance.

Size: 178 mm square | Thickness: 0,5 mm | Voltage: 140VDC | Current: 40A

ELECTRIC VEHICLE POWER ELECTRONICS

Individually laminated, this two-conductor bus bar connects electrolytic capacitors and IGBTs in a small, lightweight package for an EV Inverter.

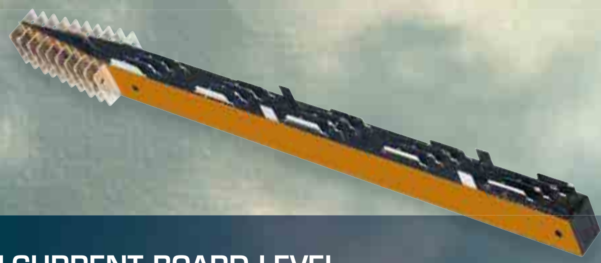
Size: 76 mm x 152 mm | Conductors: 0,5 mm | Voltage: 150VDC | Current: 60A

LOCOMOTIVE TRACTION DRIVE

High horsepower traction drives benefit from the low inductance power path made possible by Eldre laminated bus bars. Laminated bus bars are the essential component that ties IGBT's and capacitors together. By minimizing system inductance, transient over-shoots are reduced which greatly simplifies the need for complex snubber circuitry. Laminated bus bar designs for motor drives can contain a number of modular bus bars, linked together, to connect all of the system components into one complete system.

Length: 267 mm | Width: 203 mm | Voltage: 600V | Current: 650A

MILITARY



HIGH-CURRENT BOARD LEVEL

Dense packaging is a hallmark of laminated bus bars as shown in this 20-layer edge filled design with Kapton insulation to withstand high temperatures from soldering. Made for a special military application, the design distributes power through wide tabs inserted and soldered into a backplane. Power inputs are located at one end for easy connection with a cable assembly.

Size: 30 mm x 254 mm | Thickness: 0,5 mm per layer | Voltage: 12VDC
Current: 50A per conductor

Uncompromising performance and reliability are a must for the military. That is why laminated bus bars designed by Eldre are commonplace in a wide range of military applications, including missile guidance equipment, phase-array radar systems, sonar & radar tracking stations, airborne equipment, tanks, submarines, and numerous space programs.

Eldre laminated bus bars offer other advantages for military use. Their superior electrical characteristics help military systems achieve maximum electrical performance and efficiency. Laminated bus bars are also known to provide the most compact means of packaging, achieving the highest overall system performance where space is a premium. And, because bus bars can double as a structural support, they contribute to system strength and rigidity at the same time. If that's not enough, Eldre's laminated bus bars simplify field service, which makes it easier to keep mission critical equipment up and running.

MILITARY FIGHTER AIRCRAFT

This complex, nine layer, low inductance laminated bus bar is engineered to perform at very high alititudes in a confined area. It interconnects custom power modules through brazed bushings and PEM hardware. The high temperature insulation is entirely epoxy edge filled around each individual layer.

Size: 152 mm x 279 mm | Thickness: 0,8 mm per layer | Voltage: 300VDC
Current: 60A

SURFACE MOUNT FOR FIGHTER AIRCRAFT POWER ELECTRONICS

Used in tandem, one as a high-temp, high-current board for switching components and the other is densely populated with chip capacitors. The use of Kapton insulation allows full solderability for surface mount components. Both bus bars are epoxy edge filled and designed to withstand extemely demanding conditions of temperature and altitude.

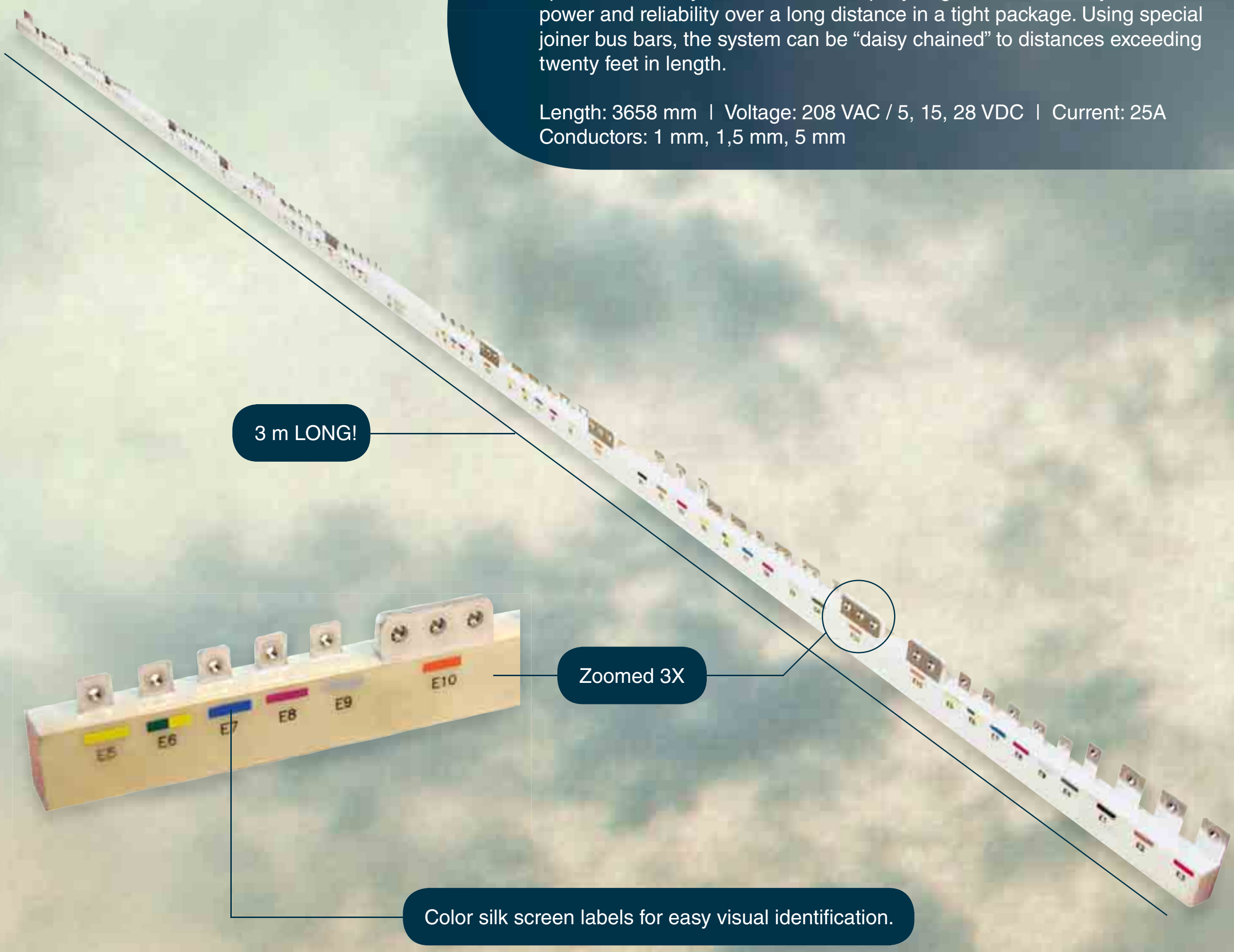
Length: approximately 102 mm each | Voltage: 200VDC | Current: 260A
Conductors: 0,8 mm & 1,5 mm

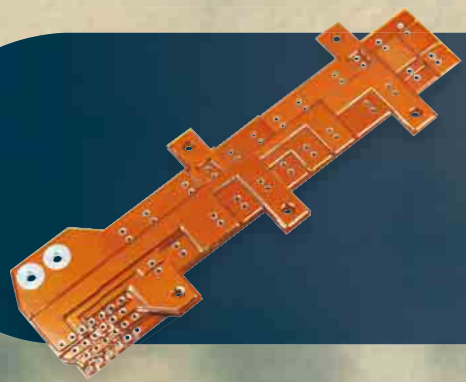
MILITARY

RADAR SYSTEMS POWER DISTRIBUTION

Distributing three AC and six DC voltages and currents over a long distance presents challenges in assembly time, wiring errors, and efficient use of space. This 10-layer laminated and epoxy edge filled bus bar system delivers power and reliability over a long distance in a tight package. Using special joiner bus bars, the system can be “daisy chained” to distances exceeding twenty feet in length.

Length: 3658 mm I Voltage: 208 VAC / 5, 15, 28 VDC I Current: 25A
Conductors: 1 mm, 1,5 mm, 5 mm

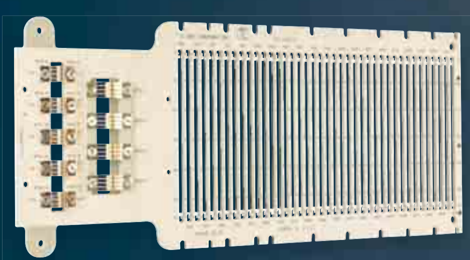




MILITARY BACKPLANE

High current power distribution is easily handled with this six-layer, twenty-one conductor laminated bus bar. Designed to function as a high-current backplane, a bank of special connectors are soldered directly to the bus bar, and used to distribute power within a turret control system.

Size: 76 mm x 279 mm I Conductors: 0,8 mm I Voltage:12VDC
Current: 30A



MILITARY MISSILE GUIDANCE SYSTEM

A complex and unique laminated bus bar design provides high power distribution over a backplane with solder tabs for output connectors and gold plated input connections. This military application for a laminated bus bar provides power within the Patriot Missile Guidance system. The pluggable input connections on this laminated bus bar are gold plated to provide low resistance and high reliability between the bus bar and its subsystem. Forty pairs of outputs from the bus bar to the backplane are made by solder connections. The bus bar is entirely encapsulated using epoxy edge fill to provide a complete hermetic seal.

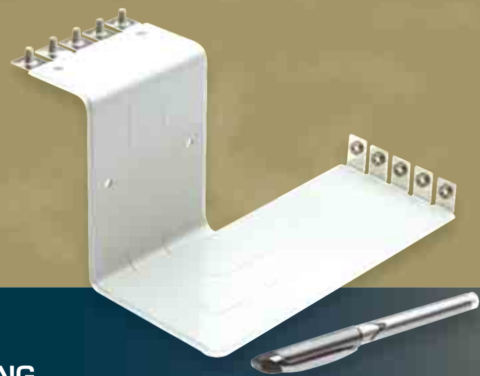
Size: 203 mm x 457 mm I Conductors: 1 mm I Voltage:48V I Current: 190A

INDUSTRIAL

RACK MOUNT POWER DISTRIBUTION

Mounted inside a circuit breaker power tray, individual bus bars are nested in a machined FR-4 frame to provide output connections. This assembly assures proper safety separation as well as single component installation.

Size: 152 mm x 305 mm | Voltage: 48V | Current: 280A | Conductors: 3 mm



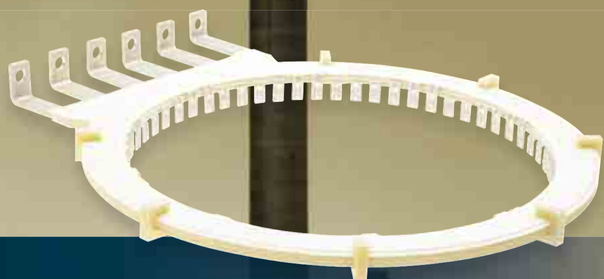
MEDICAL IMAGING

This space-saving design incorporates five conductors in two layers with clinch hardware at each end. Its laminated, edge-sealed construction is formed to stay out of the way within a tightly packaged medical testing device.

Size: 178 mm x 203 mm | Voltages: 3.3V, 5V, 12V | Current: 75A
Conductors: 1 mm

The rough and rugged world of the industrial environment demands a constant and consistent supply of quality products delivered right to the production floor.

Eldre's industrial bus bar design solutions reach over half a century delivering the ultimate in optimized, laminated bus bars to countless manufacturers of motor drives, fork lift trucks, welding machines, power generators, industrial testing machines, and much more! Eldre's laminated bus bar designs provide application specific characteristics, achieving a consistent level of performance that cannot be matched through wires, cables, or simple bars of copper!

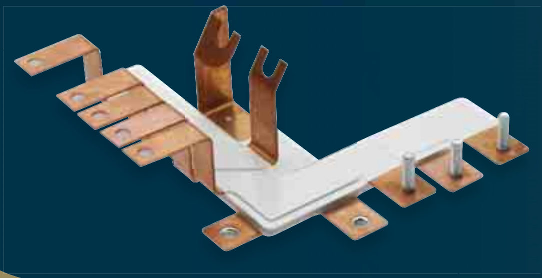


MOTOR ARMATURE BUS BAR

This three-layer bus bar is laminated with a mold-sealed construction and has nine "crown clip" power connectors that distribute power from the power supply onto the backplane. Glass mounting supports are bonded to the structure creating a rigid installation.

Size: 508 mm diameter | Conductor: 3 mm | Voltage: 48V Current: 250A per layer

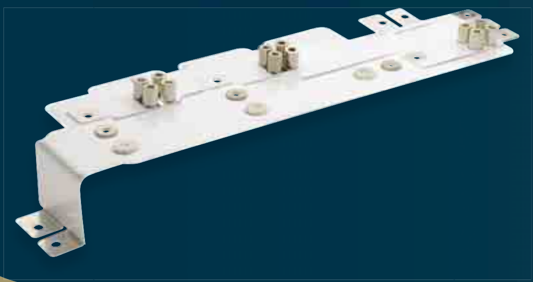
INDUSTRIAL



FORK LIFT TRUCK BUS BAR

Six-conductor, laminated bus bar assembly combines DC and AC bus bars, as well as a fuse link, all in one compact package! The system is designed to fit perfectly in a limited space and provides power to a variable speed motor in a rugged industrial environment.

Size: 178 mm x 178 mm I Current: 150A I Voltage: 42V
Conductors: 1,5 mm



COMPACT IGBT BUS BAR

This unique laminated IGBT bus bar delivers low-inductance DC power within a confined area. The design also includes six separate bus bars arranged as AC output with in-line diode connections.

Size: 102 mm x 483 mm I Conductors: 1,5 mm I Voltage: 600VDC/150VAC
Current: 120A (DC) / 220A (AC)

INDUSTRIAL INVERTER BUS BAR

Designed for low-inductance power distribution through multiple 90 degree formed bends, including connections for electrolytic capacitors. High temperature insulation material easily handles the demanding thermal requirements.

Size: 203 mm x 305 mm I Voltage: 475VDC I Current: 200A
Conductors: 2 mm

FREQUENCY INVERTER BUS BAR

An excellent layout containing two large DC bus bars, along with the three AC output bus bars laminated directly on top making a complete laminated power distribution system all under a single part number! Note the inclusion of Faston tabs for current sensing and press-fit studs for balancing resistors.

Size: 330 m x 457 mm I Current: 820A I Voltage: 550VDC
Conductors: 1,5 mm & 3 mm

VARIABLE FRQUENCY DRIVE

This simple, yet complex design incorporates DC and AC bus bars, plus accommodations for three current sensors at the AC output points, all built into a flexible, geometric package designed to fit into a tight, confined operating area!

Size: 254 mm x 381 mm I Current: 100A I Voltage: 550VDC
Conductors: 1 mm & 1,5 mm

COMPUTERS

PCB TO PCB

Two bus bar examples for DC power connections between circuit boards. These assemblies use an edge sealed construction and employ a special insulating washer that allows compression of the two conductors onto the board while insulating the fastener from the live conductor.

Size: 13 mm x 51 mm I Thickness: 0,8 mm x 1,5 mm I Voltage: 48V
Current: 35A

INFORMATION STORAGE SYSTEMS

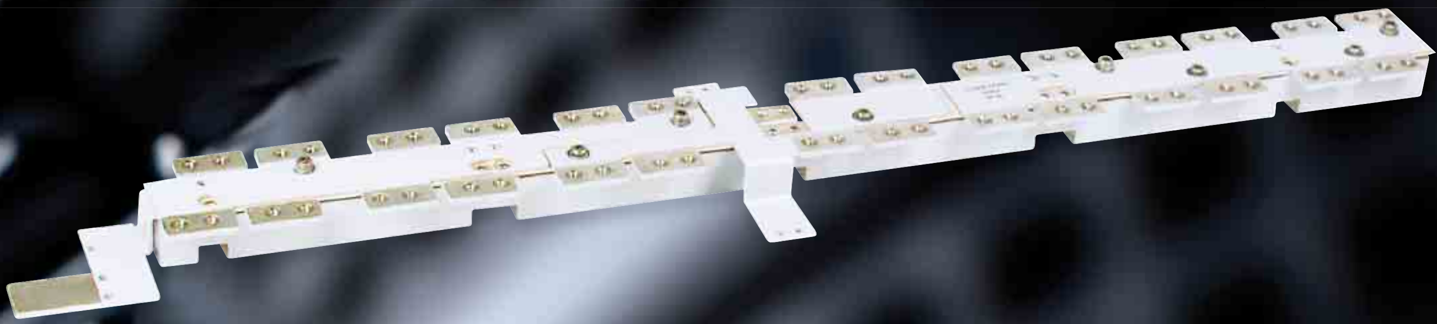
A complete set of epoxy powder coated, color coded bus bars (for differing voltages) are stamped, brazed, machined and with hardware installed to provide power interconnects directly from the power supply in a rugged package.

Size: 30 mm x 483 mm I Voltage: 48VDC I Current: 300A

As data volume and broadband use continue to expand, performance demands increase for high-speed servers, blade servers, network backbone equipment, engineering work stations, and such data storage systems as disk arrays.

Eldre laminated bus bars help these computer equipment designers meet that challenge offering uncompromising electrical performance while minimizing EMI, RFI and crosstalk. The low-profile of a laminated bus bar provides computer equipment manufacturers with the ultimate package efficiency, ease of service, and consistent quality necessary to satisfy the most demanding customers.

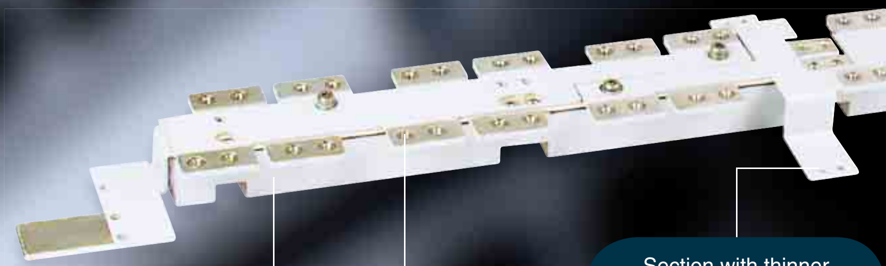
A properly engineered power distribution plan, including laminated bus bars, can also include thermal management, acting as a heat sink, and the bus bar's form-fitting designs help increase the air flow within a system where space is at a premium.

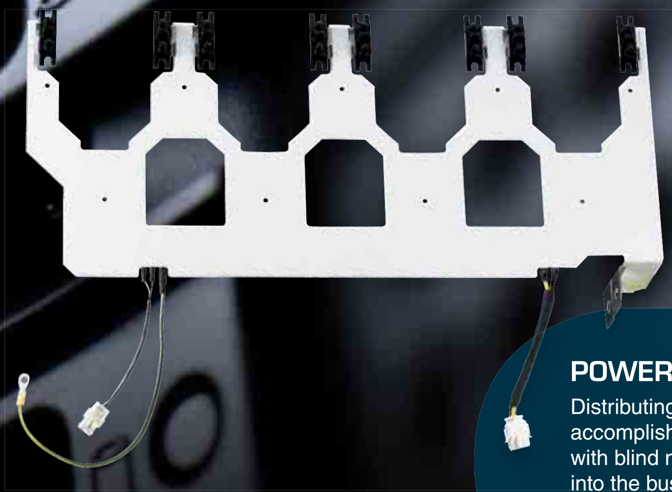


SUPERCOMPUTER BUS BAR

Modern supercomputer systems operate at extremely low voltages, and require a high concentration of current. This two-conductor bus bar assembly is constructed from machined, stamped, and soldered components that are insulated with a high quality epoxy powder coating, then laminated together to provide a low inductance power path distributed across a large circuit board or backplane.

Size: 51 mm x 483 mm | Voltage: 3VDC | Current: 450A



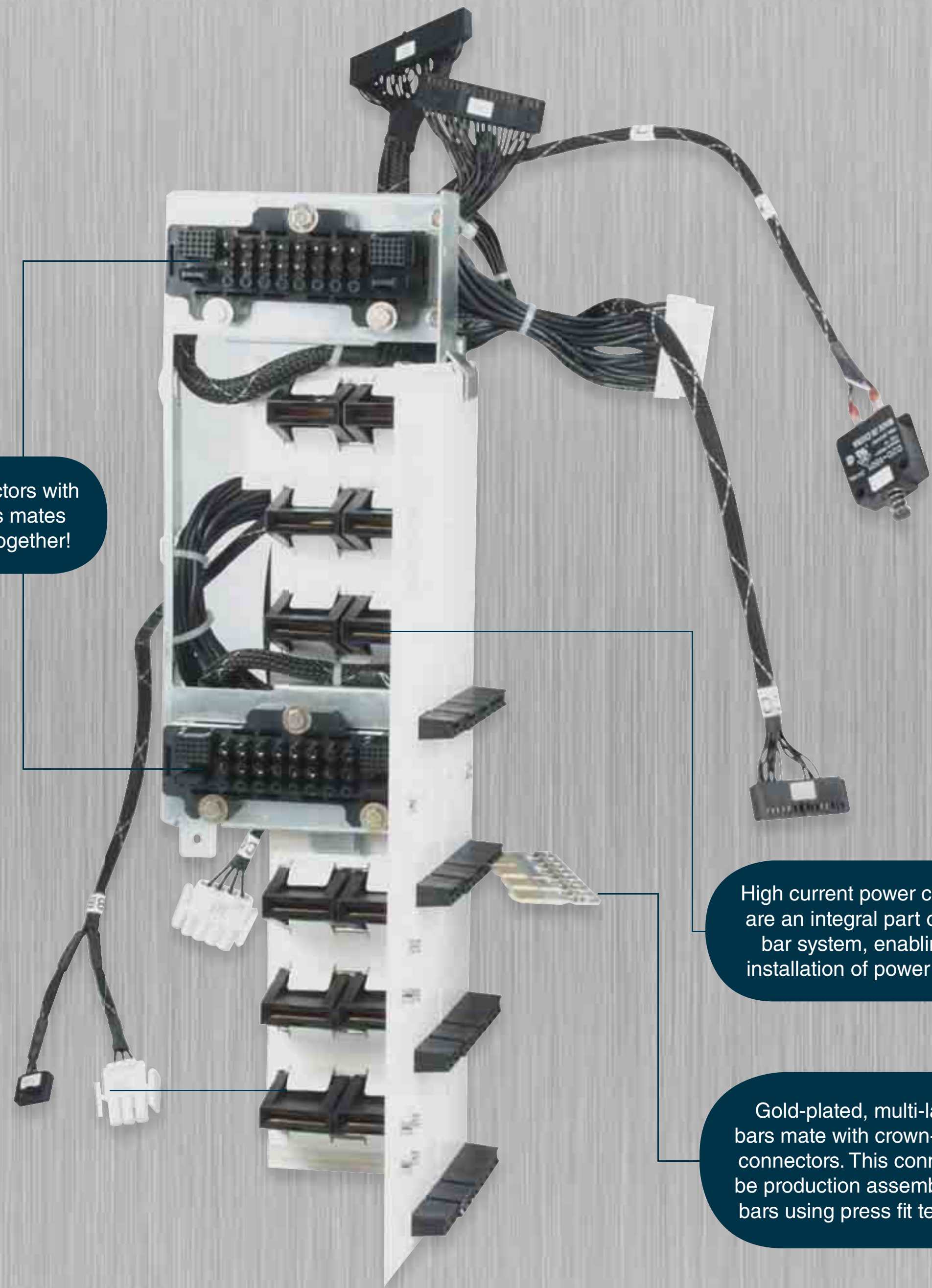


POWER BACKPLANE

Distributing power to eight blades in a large server is easily accomplished with this two conductor laminated bus bar complete with blind mate power connectors. Short cable assemblies are built into the bus bar for system monitoring.

Size: 406 mm x 711 mm | Voltage: 48VDC | Current: 240A
Conductors: 1,5 mm

COMPUTERS



Drawer-type connectors with integrated harness mates power and signal together!

High current power connectors are an integral part of the bus bar system, enabling easy installation of power supplies.

Gold-plated, multi-layer bus bars mate with crown-edge type connectors. This connector can be production assembled to bus bars using press fit technology!

HIGH END SERVER

An excellent combination of value! This multi-layer, laminated bus bar incorporates several different connectors for both power and signal, and through careful engineering, a wire harness is used for signal distribution. Eldre can engineer fully tested and serialized solutions to solve your power distribution challenge!

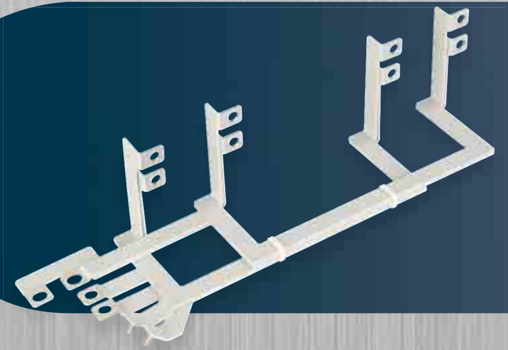
Size: 127 mm x 229 mm x 432 mm | Voltage: 48V | Current: 400A

Separate, mating laminated bus bar plugs into covnnectors

Press fit power connectors installed directly into bus bar conductors

Note three conductors tightly laminated through form

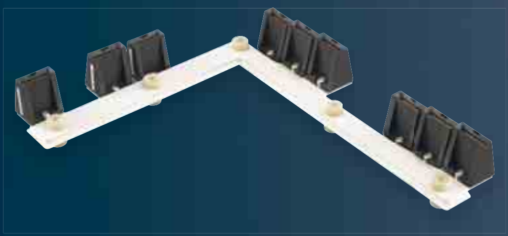
High current connectors fastened to bus bar



COMPUTER BACKPLANE POWER DISTRIBUTION

Epoxy powder coating allows multiple conductors, formed to differing geometries, to be assembled into a single unit. Insulated and bonded together, this assembly carries power to the backplane without adding costly and complex layers to the backplane.

Length: 356 mm I Thickness: 1,5 mm I Voltage: 3VDC & 5VDC
Current: 100A



COMPUTER BACKPLANE

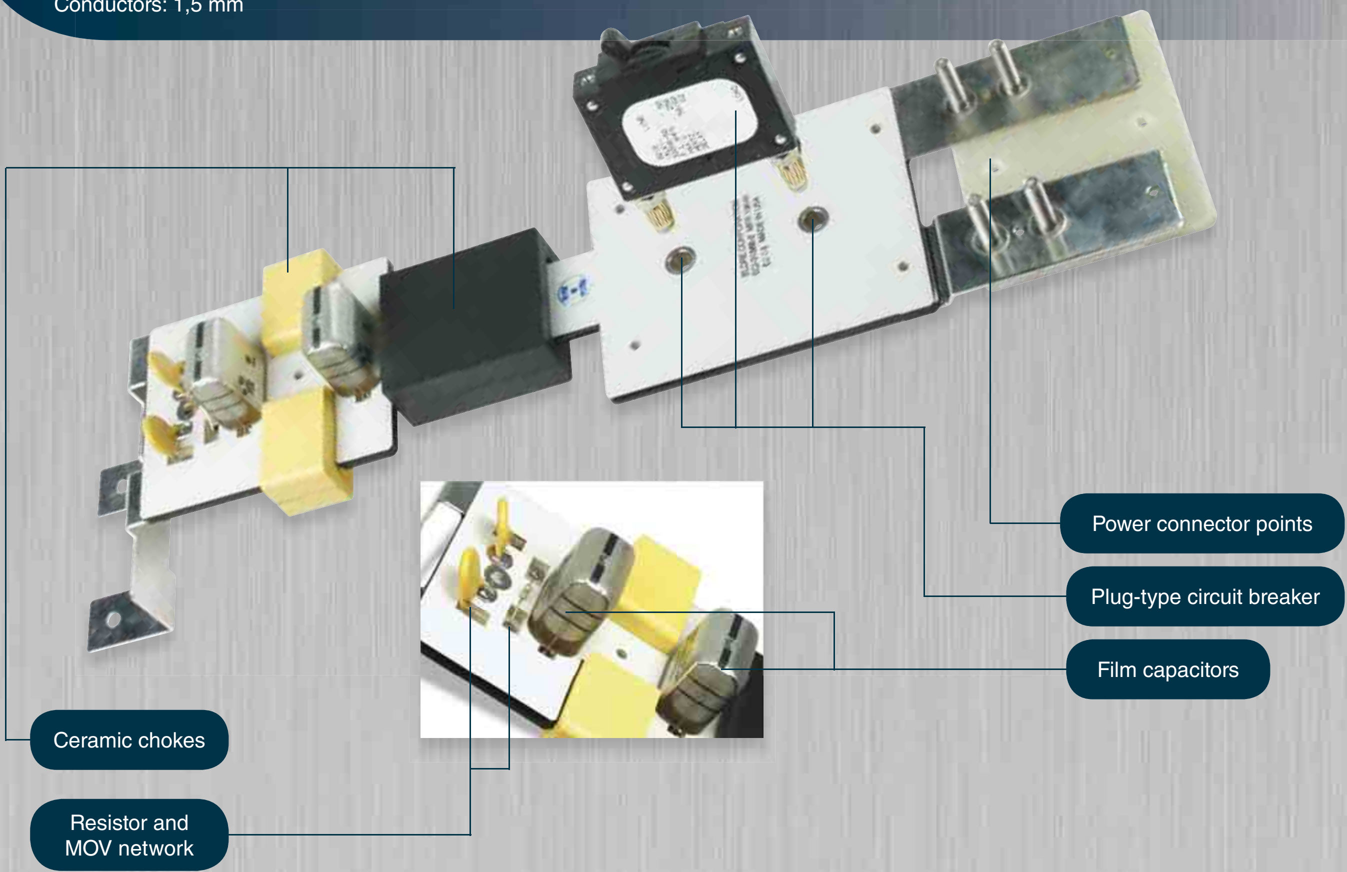
Redundant power supplies plug into this laminated bus bar design, and feed high current power into the computer backplane. Note the five glass (FR-4) mounting supports, which are bonded to the structure, to create a rigid, insulated mounting system.

Size: 305 mm x 229 mm I Thickness: 3 mm per layer I Voltage: 48V
Current: 250A per layer

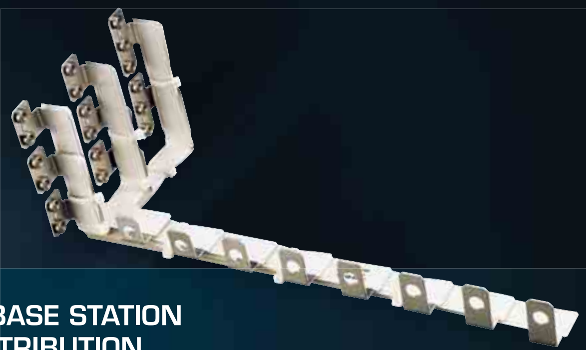
POWER DISTRIBUTION FOR OPTICAL SYSTEMS

Power distribution bus bar used in Optical Network System. This efficient and compact bus bar is designed to provide 48V power onto a backplane from its power supply, through circuit protection, common & differential mode inductors, film capacitors and resistors, all without the need for a separate PCB for the soldered connections of the resistors & capacitors!

Size: 127 mm X 457 mm I Voltage: 48VDC I Current: 75A
Conductors: 1,5 mm



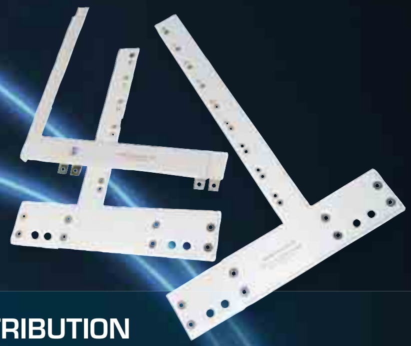
TELECOM



CELLULAR BASE STATION POWER DISTRIBUTION

An economical design that carries power from multiple power supplies onto the backplane within a Base Station Cabinet. Individually laminated and assembled together reducing a complex wiring scheme to a simple component, saving both space and assembly time.

Size: 178 mm x 178 mm x 483 mm | Voltage: 48VDC
Conductor thickness: 1,5 mm | Current: 125A



ROUTER BACKPLANE DISTRIBUTION

Two-conductor laminated bus bars designed to distribute DC power from dual power supplies across the backplane of an internet router. The insulation system uses a molded-edge seal around the perimeter as a cost effective means of providing the proper creepage distance between the two conductors while protecting the individual conductors from dust and contaminants. Due to the low voltage of the system, Eldre engineers assured that the design has sufficient cross sectional area for a minimal voltage drop.

Size: 305 mm x 457 mm | Voltage: 48VDC | Current: 250A | Conductors: 2,5 mm

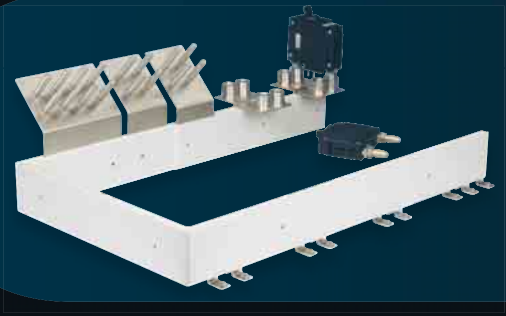
INTERNET ROUTER

This two-conductor bus bar distributes DC power within an internet router. The laminated structure utilizes tabs with offset forms and clinch hardware to mount directly onto the midplane, while allowing for proper airflow. High current pluggable connectors are mounted directly to the bus bar for interchangeable power supplies.

Length: 457 mm | Width: 305 mm | Voltage: +5V, -5V | Current: 110A

In the intensely competitive telecommunications market, manufacturers of equipment for Cellular Base Stations and Internet Routers must offer their customers exceptional performance and dependability. With their consistent quality, excellent electrical characteristics, and minimal EMI, RFI & crosstalk, Eldre laminated bus bars provide the perfect solution!

Eldre laminated bus bars offer telecommunications equipment manufacturers many other advantages, too—including ease of assembly, superior thermal management, reduced weight, packaging efficiency, and overall cost-effectiveness over alternative means of power distribution.



INTERNET BUS BAR SYSTEM

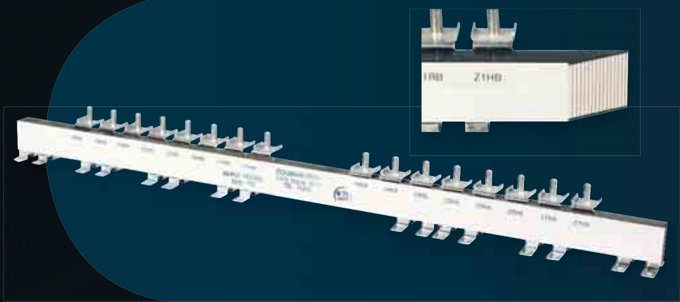
U-shaped, with angled power input tabs, feeding around a rack mounted frame. The unit also has plated, soldered bushings for bullet-style circuit breakers.

Size: 127 mm x 229 mm x 432 mm | Voltage: 48V | Current: 400A
Conductors: 1,5 mm

REDUNDANT POWER INPUT

When system requirements call for redundant power supplies, laminated bus bars are ideal! This two-layer design utilizes press-fit sockets for power supply input, and mates downstream with a custom power distribution network.

Size: 89 mm x 203 mm | Voltage: 48VDC | Current: 50A
Conductors: 3 mm



BACKPLANE POWER DISTRIBUTION

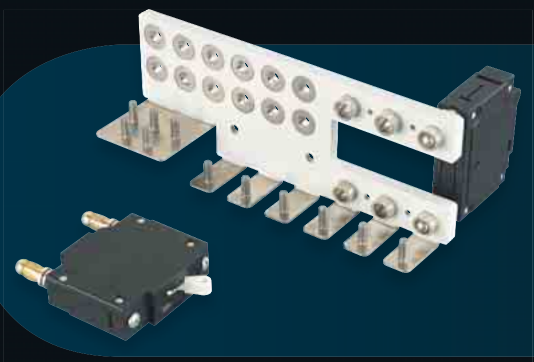
Sixteen layer laminated bus bar distributes +48V and return across a back plane in a rack system for a network routing application. Heavy gauge clinch hardware and anti-rotation tabs accommodate cable connections. The entire assembly is hermetically sealed using epoxy edge fill.

Size: 25 mm x 457 mm | Conductors: 0,8 mm | Current: 75A per layer
Voltage: 48VDC

TELECOMMUNICATIONS BOARD LEVEL POWER DISTRIBUTION

When board space is at a premium, laminated bus bars provide the perfect space saving solution. The bus bar is designed to be soldered into a PCB, and includes an integrated connector, which allows for interchangeability of either the power supply or PCB.

Size: 15 mm x 254 mm | Conductors: 1,5 mm | Current: 80A
Voltage: 60VDC



CIRCUIT BREAKER BUS BAR

This seven conductor, nickel-plated assembly receives filtered input power, routed through pluggable breakers, and directed to output terminals within a rack-mounted system. Such compact routing offers improved packaging and improved air flow—both key benefits of laminated bus bars.

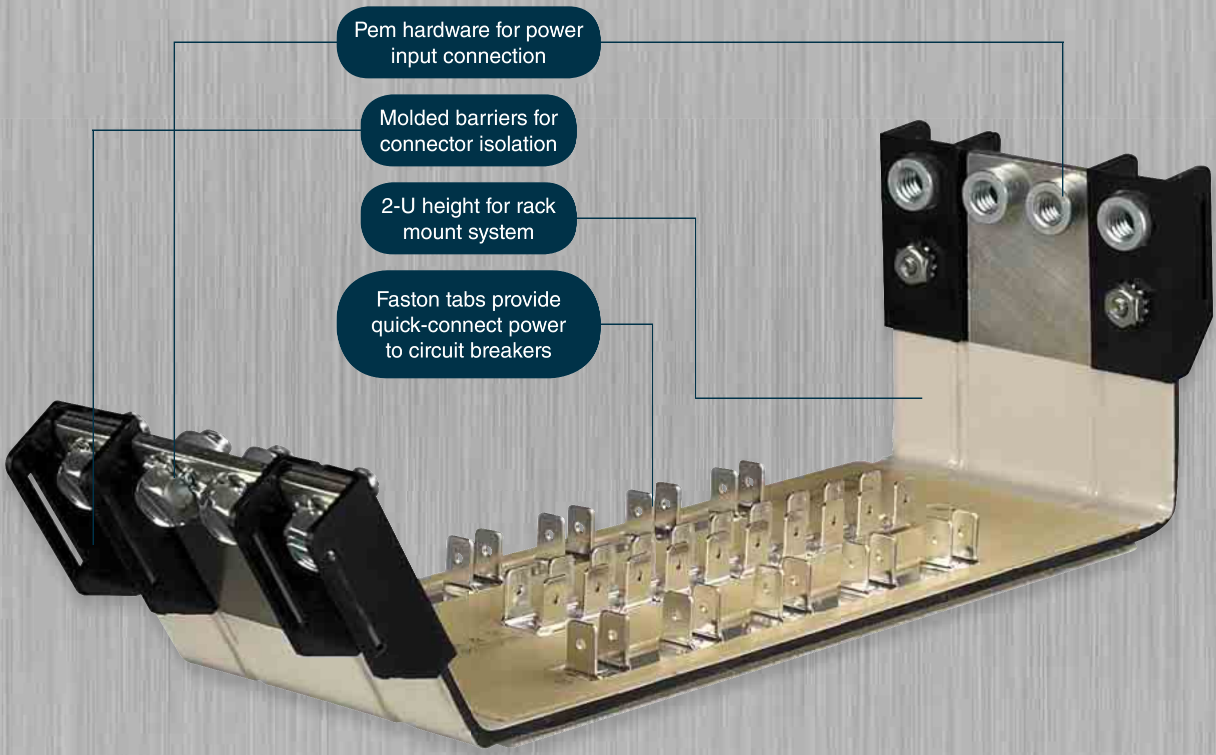
Size: 76 mm x 152 mm | Voltage: 48VDC | Current: 75A
Conductors: 1,5 mm

TELECOM

TELECOM POWER DISTRIBUTION

Part of a rack mounted circuit breaker network, this three-conductor, single-layer laminated bus bar assembly is used to provide power connections to a group of circuit breakers. Power connections are made at each end, and three banks of Faston tabs provide A, B, and Ground connections for twenty circuit breakers.

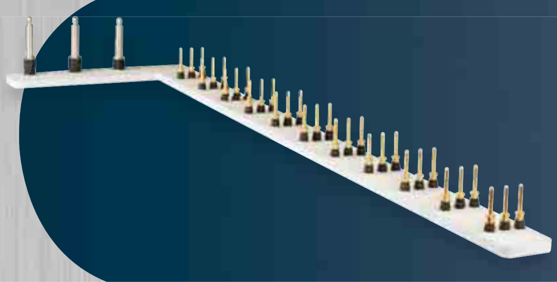
Size: 254 mm x 76 mm x 76 mm | Voltage: 48VDC | Current: 480A
Conductors: 3 mm



FILTERED POWER INPUT BUS BAR

A two-conductor bus bar routing filtered DC power through ring lugs and clinch hardware, terminating in multiple power connectors mounted in a 1U rack-mounted power drawer.

Size: 38 mm x 229 mm | Voltage: 48VDC | Current: 200A
Conductors: 1,5 mm



BACKPLANE POWER DISTRIBUTION

Three-phase shielded power is fed from a single power supply, extending horizontally along a backplane. Eleven sets of gold-plated pins, engineered to pass directly through the backplane, ensuring high reliability and low contact resistance connections to individual boards.

Size: 178 mm x 457 mm | Voltage: 12V | Current: 48A
Conductors: 1 mm

INTERNET ROUTER BACKPLANE BUS BAR

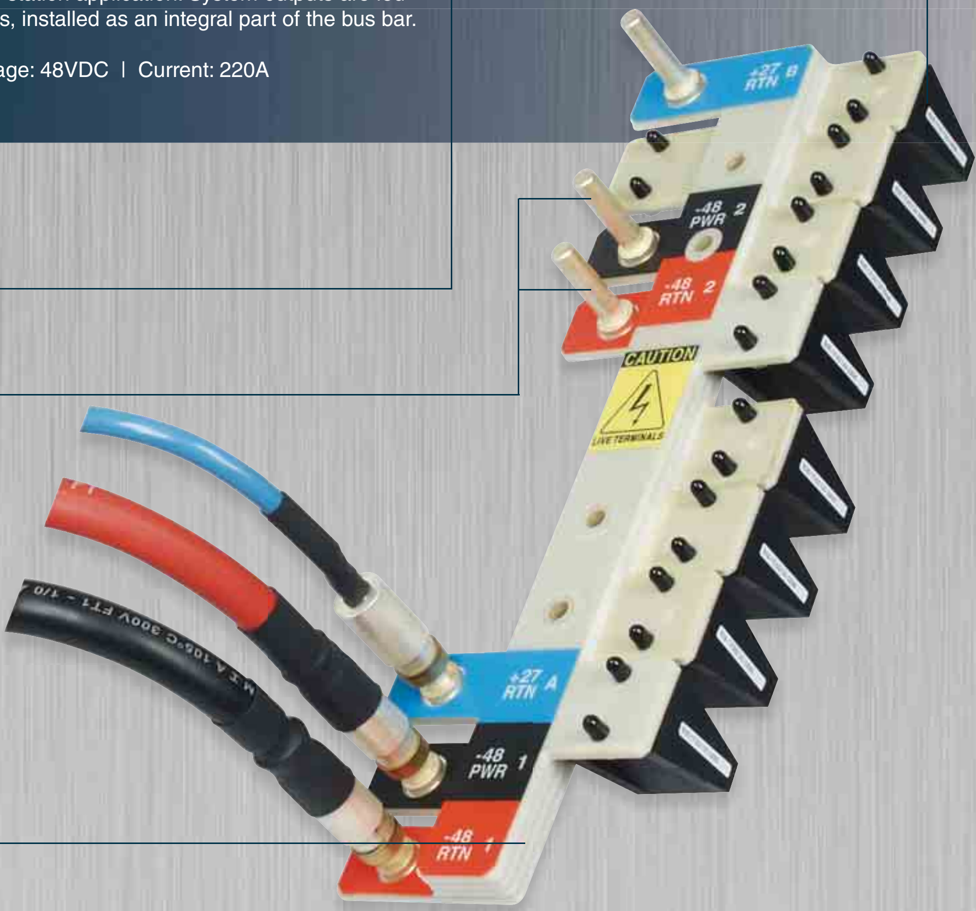
Three power supplies feed this DC bus bar assembly through a repeating series of blade style pluggable output "tabs" along its length. The long, narrow design makes short jump connections clean and easy for board mounted pluggable connectors. The manufacturer benefits from the efficient, low profile design, and clean distributed capacitance that are the natural results of laminated bus bars.

Size: 127 mm x 305 mm x 457 mm | Thickness: 1,5 mm & 3 mm
Voltage: +5V, -5V | Current: 130A

TELECOM POWER DISTRIBUTION

Redundant Power Supplies plug directly into this four-layer, six-conductor laminated bus bar through high-current power connectors and feed three separate voltages into this base station application. System outputs are fed through special silver-plated pins, installed as an integral part of the bus bar.

Size: 152 mm x 356 mm | Voltage: 48VDC | Current: 220A
Conductors: 3 mm

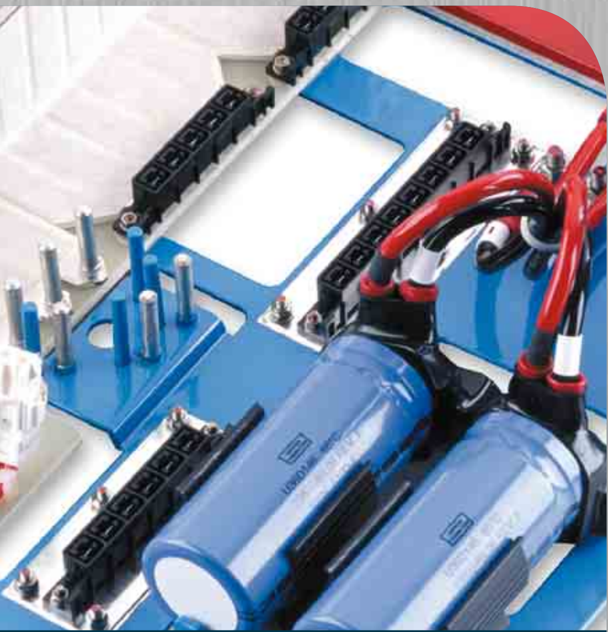


Heavy-duty power clips installed for mating with power supplies

Power pins are press-fit and soldered.

Four-layer, edge filled bus bar

VALUE ADDED



Multilayer bus bars offer a structural integrity that wiring methods just can't match. Eldre's Value Added bus bar designs incorporate a wide variety of components, built right in, each one is safety tested & certified, all designed to help simplify your life at the system assembly level.

Every day Eldre's innovation delivers complete multi-component bus bar and power distribution assemblies around the world to our dedicated family of customers.

PDA UNIT BEFORE BUS BAR

3-U drawer height; 29,5 kg. weight

Two large contactors

Two large capacitors

Dozens of cluttered wires = poor air flow

PDA UNIT WITH BUS BAR

Compact design means only 2-U height

- Much improved air flow
- Significantly reduced assembly time
- One "U" height smaller
- All wires replaced by multi-layer laminated bus bar
- "Plug-in" circuit breakers
- 25% lighter assembly weight

PDA ASSEMBLY RE-ENGINEERED USING BUS BAR TECHNOLOGY

Multilayer bus bar construction

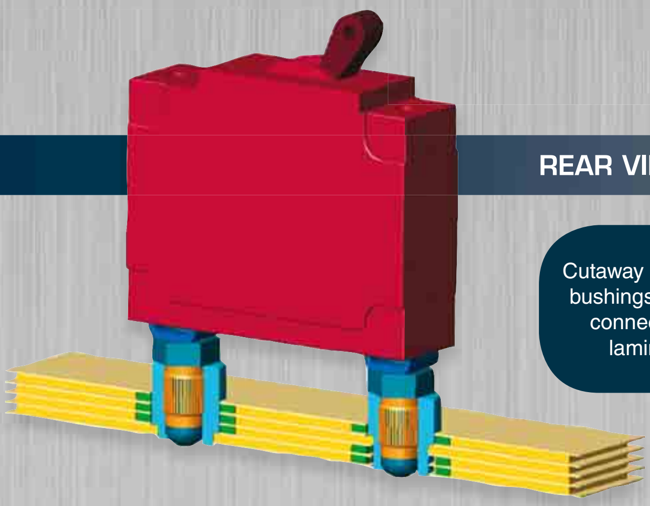
Circuit breakers plug directly into bus bar

PDA BUS BAR

Only one capacitor needed due to capacitance in the bus bar

Single IGBT replaces two contactors

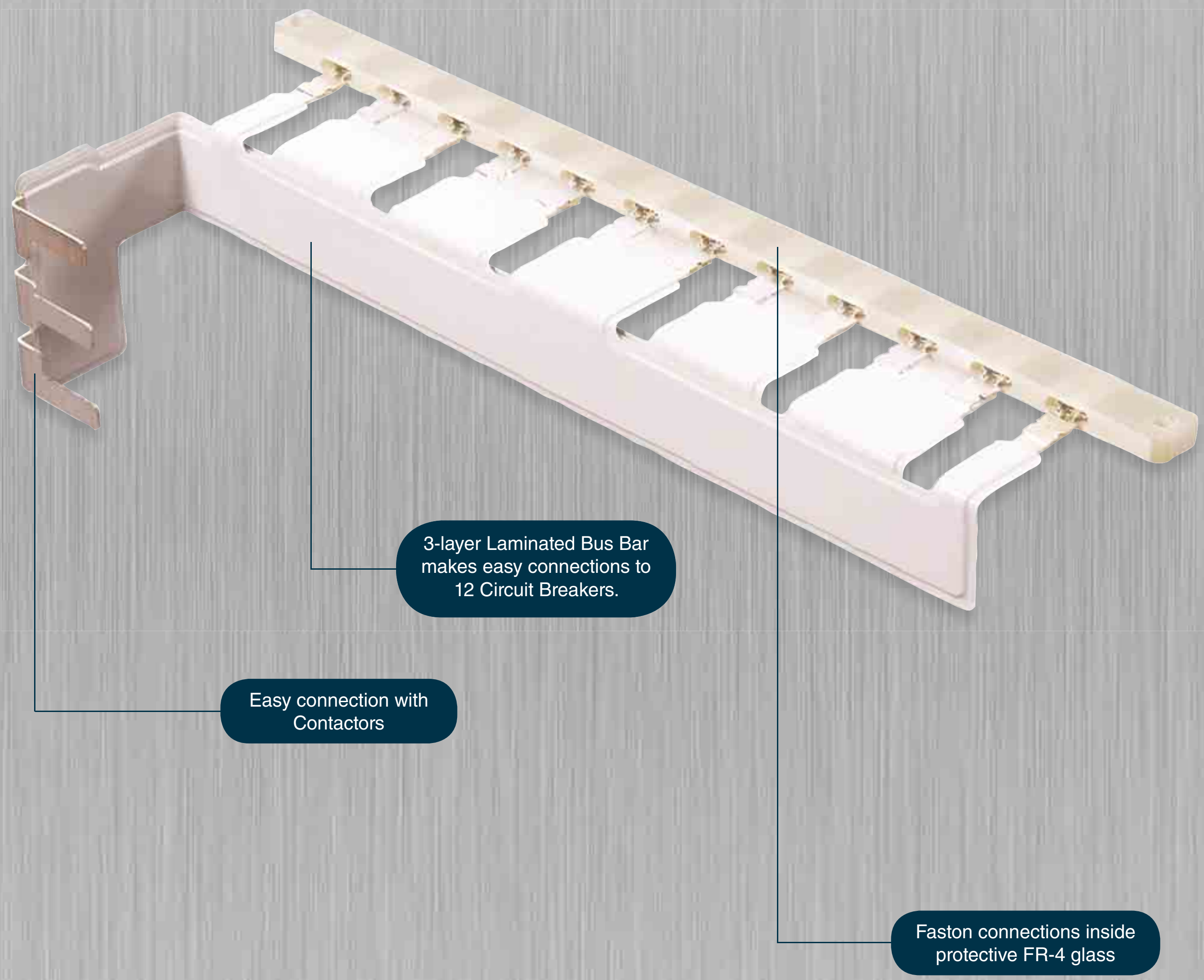
REAR VIEW

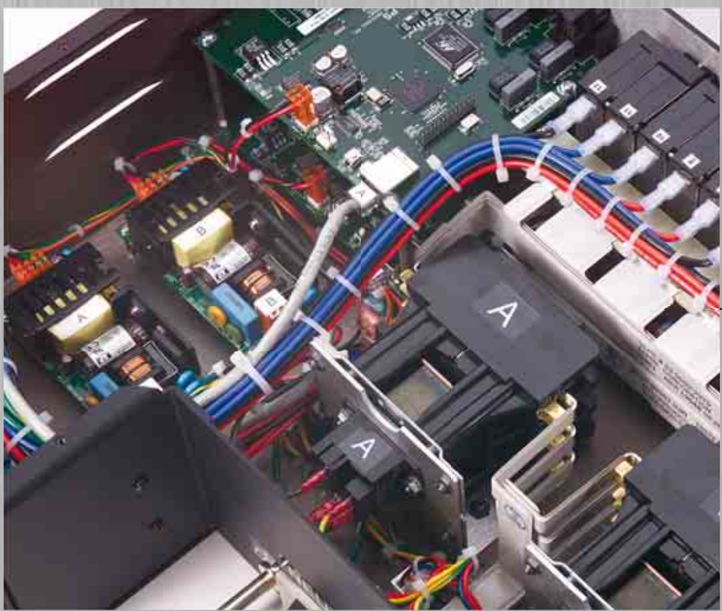


Cutaway showing the use of bushings as "vias" to make connections within the laminated bus bar.

VALUE ADDED

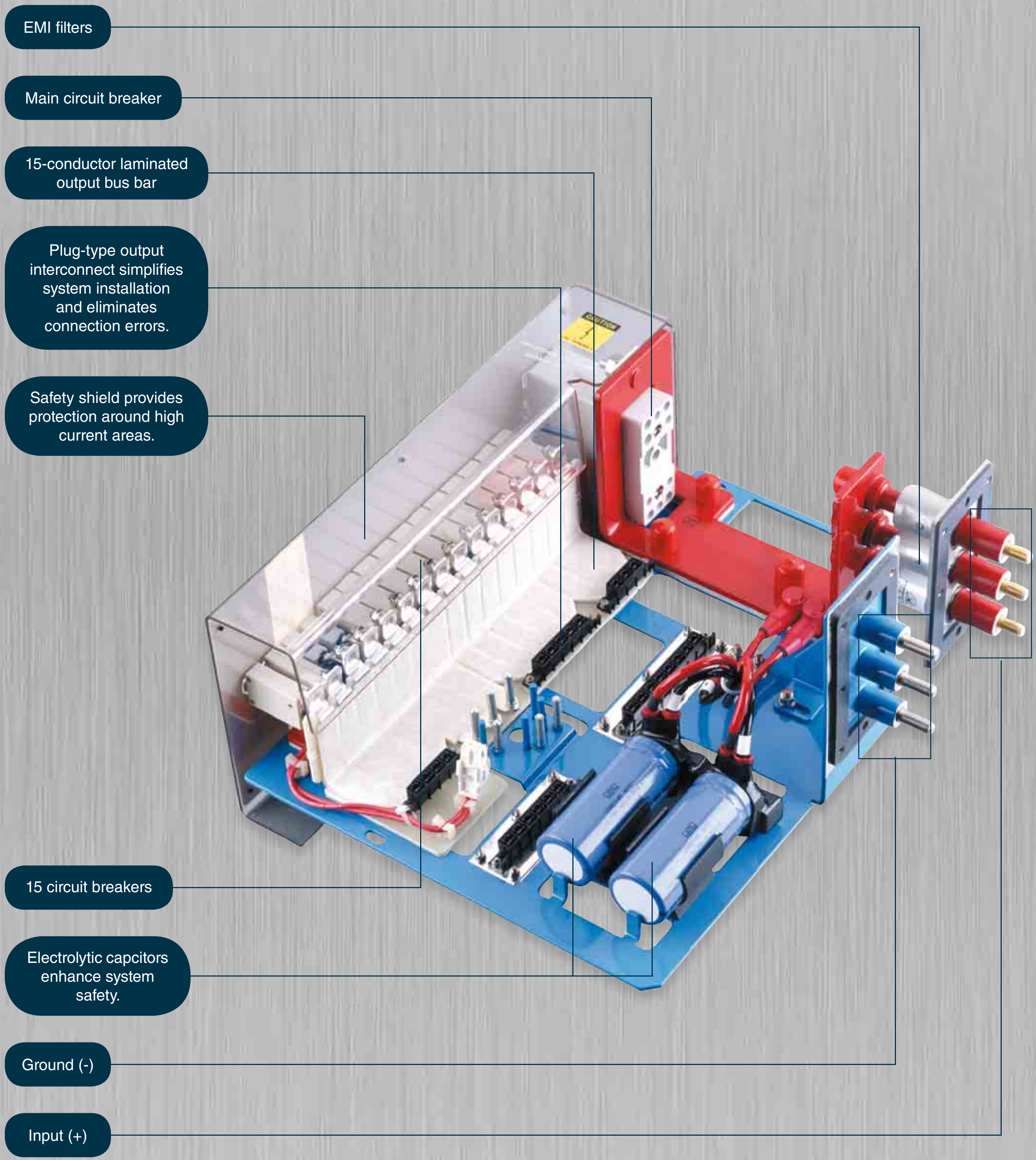
PDA ASSEMBLY A HIT IN STAGE LIGHTING SYSTEMS!





The design concept for this project was to create a rugged, lightweight power distribution system for a production lighting application. Due to the predictable performance characteristics of the solid copper conductors used in laminated bus bars (instead of the bulk and uncertainty of wires), the creativity of the design team was tapped. Total success was achieved through compact packaging, light weight, and simplified assembly!

VALUE ADDED



PLATFORM FOR CIRCUIT BREAKER CONFIGURATIONS

Created as a total power distribution scheme, Eldre engineers worked with the client to create a bus bar structure that accepts input power and ground, divides the power through 15 circuit breakers, and routes the various currents to modular output connections. Eldre laminated bus bars can be engineered to be made with an infinite number of connectors, fuses, capacitors, resistor networks, filters, surge protectors and circuit breakers. Our complete value-added assemblies are supplied fully tested and ready for installation. Manufacturing benefits by reduced assembly and test time, purchasing benefits by keeping track of fewer items (reducing inventory).

Length: 203 mm I Width: 191 mm I Voltage: 28V I Current: 700A

VALUE ADDED

POWER & SIGNAL DISTRIBUTION

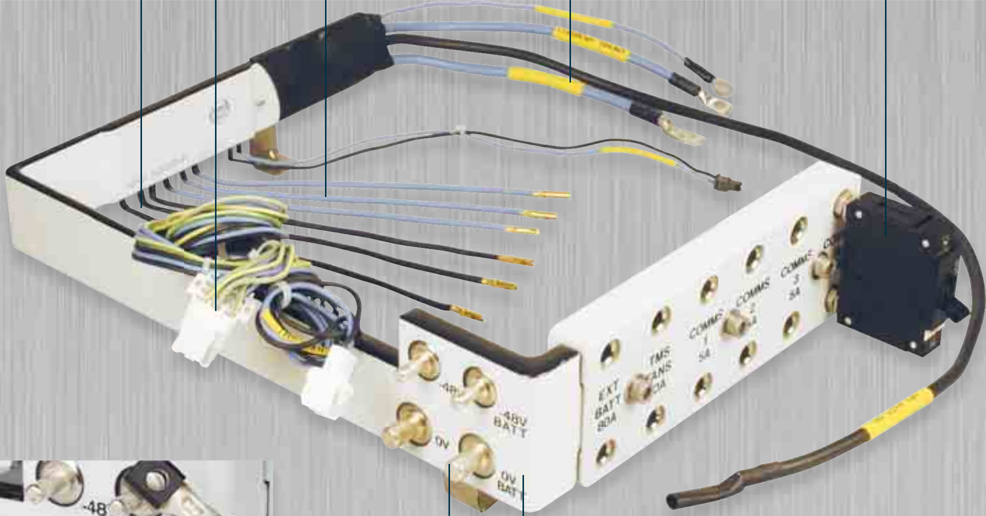
A series of small power supplies parallel to provide system power in a 483 mm rack application. Input connectors are press-fit into both the bus bar and PCBs for system simplicity. Attached to this bus bar's right side is its mate, a 1524 mm long vertical bus bar with pluggable output connectors for system distribution. Along the top section, signal output reports system intelligence to monitor each power supply's performance.

Size: 102 mm x 254 mm x 406 mm I Voltage: 24VDC I Current: 300A
Conductors: 1,5 mm

RACK MOUNT PDA - POWER & SIGNAL

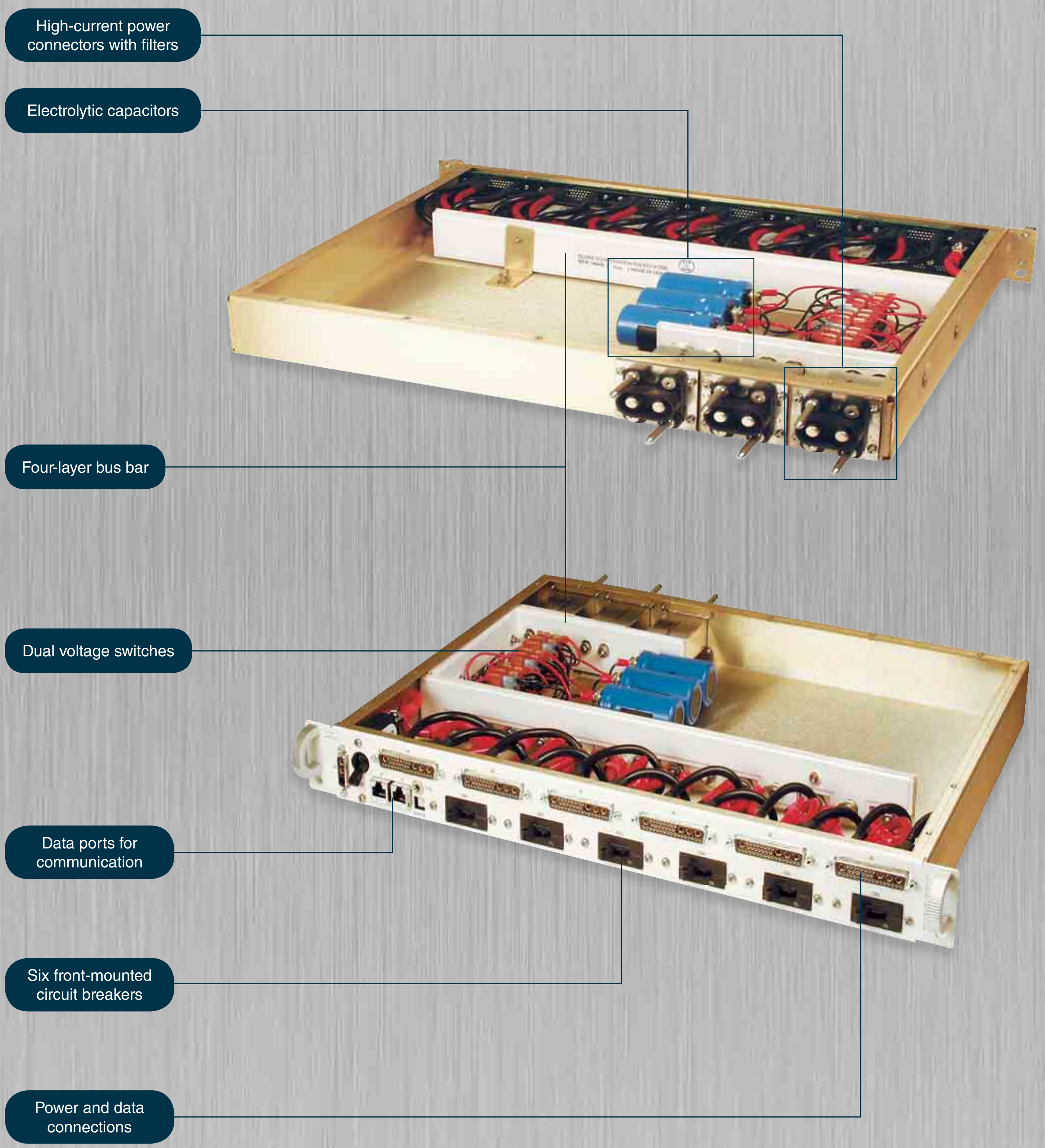
Plug-type circuit breakers

Integral wire feeds and connectors help eliminate wiring errors



Elcon Rapid-Lock connectors

Assembly fits into 2-U high rack drawer

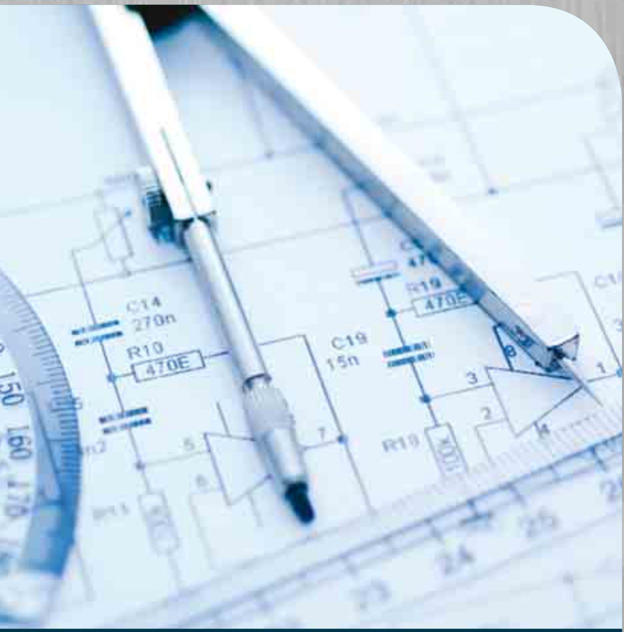


RACK MOUNTED POWER DISTRIBUTION ASSEMBLY

Eldre engineers work closely with customers to design complete rack mounted power distribution assemblies. This PDA contains a J-shaped, four-layer laminated bus bar, three input filters, six circuit breakers, sense monitoring and dual voltage switches. Tested, serialized, and completely labeled, each PDA is ready for system installation by the customer.

Size: 483 mm x 2U | Voltage: 125V/250V (switchable) | Current: 450A

DESIGN GUIDE



LAMINATED BUS BAR DESIGN GUIDE

The physical structure of bus bars offers unique features in mechanical design. For example, complete power distribution subsystems can also act as structural members of a total system. The proper design of bus bars depends on an application's mechanical and electrical requirements. This section includes basic formulas and data to aid design engineers in specifying bus bars for power distribution systems. Once an outline of a bus bar has been established, specific design and manufacturing considerations will affect the cost. (See Cost Considerations)

We've provided basic design criteria to help you specify bus bars for your application. The information required to specify a bus bar includes: conductor material, number of conductors (including ground), dimensions (length, width and thickness), interconnection schemes, mounting configuration (if required), type of finish, and choice of insulation material.

CONDUCTORS

Conductor material selection is critical in meeting electrical performance and mechanical rigidity requirements. Common materials used are copper, aluminum, and a variety of copper alloys. The material chosen, the mechanical constraints and the electrical performance for the specific application determine the conductor's minimum mechanical dimensions. (See Conductor Size in the Electrical Design section)

Thermal considerations may require system ventilation to remove excess heat from the bus bar. In this case, bus bar configuration might be low in profile, thereby changing the orientation of the bus structure and the airflow. Bus bars may also serve to remove heat from components by performing as a heat sink.

The selection of tabs or terminations may determine conductor thickness if there's a need to accept studs, nuts, tabs or threaded inserts. Minimum mechanical requirements for the connection style chosen must be considered for overall efficiency and cost effectiveness.

GROUNDS

The ground return conductor should be equal in size and circular mil area to its corresponding voltage conductor. A few advantages of a separate ground return are:

1. double the effective capacitance;
2. greater area for cooling, to minimize the voltage drop due to temperature rise;
3. drastically reduced intercoupling effects and
4. the opportunity for advantageous shielding between levels, obtained by the use of interleaved grounds.

MOUNTING

To mount a bus bar to an assembly structure, hardware (studs, holes, etc.) can be manufactured into the conductors. An alternative ground plane may be added as support for the bus bar assembly and to provide a platform for mounting hardware.

FINISH

Eldre offers in-house conductor plating in tin, tin/lead, nickel, silver, or gold. Plating is a major consideration in designing a bus bar because it is the point of contact for all bus bar electrical connections. The plating can provide advantageous electrical properties, decreasing the voltage drop. When gold is used, it is generally only plated on termination surfaces to minimize cost.

INSULATION

Bus bars use many different types of adhesive-coated insulation materials to permit structure layers to be laminated together. There

are added benefits from an electrical perspective. Insulation provides an inside and outside barrier to its installed environment. Insulations can increase the capacitance and lower the inductance and impedance. Commonly used insulation materials are: Nomex,® Tedlar,® Mylar,® Kapton,® Ultem,® Mylar/Tedlar, Tedlar/Mylar/Tedlar, Valox,® epoxy-glass, heat shrink tubing, and epoxy powder coating. There are many different thicknesses of these insulation materials available. Contact an Eldre engineer for more information.
Special insulations are available upon request.

COST CONSIDERATIONS

Prices of bus bar assemblies vary depending upon quantity ordered. In addition, individual dimensional characteristics, materials, manufacturing techniques, the interconnection scheme, plating finish, insulation, and hardware requirements affect overall cost.

Eldre engineers are available to assist in developing the most efficient and cost-effective design to provide solutions to any power distribution problem. The earlier we are involved in your design process, the more cost-effective your solution is likely to be. Early involvement enables us to optimize both ease of manufacturing and turnaround time. We recommend that you contact a new-product development engineer before you start designing your laminated bus bar power distribution system.

ELECTRICAL DESIGN

Important characteristics of laminated bus bars are resistance, series inductance, and capacitance. As performance parameters of electronic equipment and components become more stringent, these characteristics take on even more importance. In determining the impedance of a power distribution system, these characteristics are significant in solving two of the most important problems for designers—resistance and noise. It is important, therefore, to understand the electrical characteristics of the laminated bus bar.

Figure 1 shows a basic two-conductor laminated bus bar and Figure 2 shows its equivalent circuit. The bus bar is composed of two parallel conducting plates separated by a dielectric. The equivalent circuit illustrates the associated inductance (L), capacitance (C), and resistance (R), which are most often uniformly distributed along the bus bar. We discuss the basic relationships between physical dimensions and electrical parameters in the following analysis.

Figure 1.
Physical Representation.

Figure 2.
Electrical Equivalent

CONDUCTOR SIZE

Calculating conductor size is very important to the electrical and mechanical properties of a bus bar. Electrical current-carrying requirements determine the minimum width and thickness of the conductors. Mechanical considerations include rigidity, mounting holes, connections and other subsystem elements. The width of the conductor should be at least three times the thickness of the conductor.

Additions of tabs and mounting holes change the cross-sectional area of the conductor, creating potential hot spots on the bus bar. The maximum current for each tab or termination must be considered to avoid hot spots.

Cross-sectional area and the length determine bus bar conductor size. Cross-sectional area (A) is equal to conductor thickness (t) multiplied by conductor width (w).

$$A = (t)(w) \text{ inches}^2$$

A value of approximately 400 circular mils per ampere is a traditional basis for design of single conductors. Since bus bars are not round, circular mils must be converted to mils squared (simply multiply the circular mils value by 0.785).

The following formula determines the minimum cross-sectional area of a conductor. This area should be increased by five percent for each additional conductor laminated into the bus structure. This extra five percent is a safety factor compensating for the compounding heat gain within the conductors.

This equation calculates the minimum cross-sectional area necessary for current flow:

$$A = 400(I)(0.785)[1+.05(N-1)](1*10^{-6}) \text{ inches}^2$$

A = cross-sectional area of the conductor in inches2
I = Max DC current in amperes
N = Number of conductors in the bus assembly

To calculate the cross-sectional area of an AC current source, you must take frequency into consideration (See the section on Skin Effect).

Note: This formula has a breakdown point at approximately 400 amps of current. For calculations involving larger currents, we suggest you contact an Eldre engineer. In addition, you can find ampacity charts and comparative graphs at the Copper Development Association's website, www.copper.org.

CAPACITANCE

Capacitance of the bus arrangement depends upon the dielectric material and physical dimensions of the system. Capacitance varies only slightly with frequency change, depending on the stability of the dielectric constant. This variation is negligible and therefore is omitted in this analysis:

$$C = \frac{0.225(K)(w)(\ell)}{(d)} \text{ picofarads}$$

Increased capacitance results in a decreasing characteristic impedance. Low impedance means greater effective signal suppression and noise elimination. It is therefore desirable to develop maximum capacitance between conductor levels. This may be achieved by:

1. keeping the dielectric as thin as possible, consistent with good manufacturing and design practices.

2. using dielectrics having a high relative permitivity (k factor).

SKIN EFFECT

Because of skin effect phenomena, inductance and resistance are dependent on frequency. At high frequency, currents tend to flow only on the surface of the conductor. Therefore the depth of penetration of the electromagnetic energy determines the effective conducting volume.

The skin depth is given by:

$$SD = \frac{1}{\sqrt{\pi(f)(M)(1/\rho)}} \text{ inches}$$

For Copper:

$$SD = \frac{2.6}{\sqrt{f}} \text{ inches}$$

As frequency increases, inductance decreases to a limiting value, whereas the resistance increases indefinitely as the frequency approaches infinity.

INDUCTANCE

Maintaining a low inductance results in a low characteristic impedance and greater noise attenuation. When minimum inductance is a design objective, consider these tips:

1. Minimize the dielectric thickness.
2. Maximize the conductor width.
3. Increase the frequency.

There are two types of inductance to be determined: internal inductance, which is a result of flux linkages within a conductor, and external inductance, which is determined by the orientation of the two current-carrying conductors.

Distribution of current throughout a conductor at high frequencies is concentrated near the surfaces (called the "skin effect"). The internal flux is reduced and it is usually sufficient to consider only the external inductance. At low frequencies, however, the internal inductance may become an appreciable part of the total inductance. The formula for calculating the internal inductance at a low frequency is extremely lengthy and thus omitted in this analysis.

The formula for external inductance is:

$$L = \frac{31.9(d)(\ell)}{(w)} \text{ nanohenrys}$$

High-Frequency Inductance (t>SD)

$$L_t = \frac{31.9(d+SD)(\ell)}{(w)} \text{ nanohenrys}$$

RESISTANCE

To calculate the DC conductor resistance, the following formula applies (Resistance at 20°C):

$$R_{DC} = \frac{\rho(\ell)}{(w)(t)} \text{ ohms}$$

$$R_{DC} = \frac{0.68*(10^{-6})(\ell)}{(w)(t)} \text{ ohms}$$

To determine DC conductor resistance at temperatures above 20°C, use this formula:

⊠ = Temp. coefficient of resistivity for copper

$$R_2 = R(1+0.00393(T_2-T_1)) \text{ ohms}$$

$R_2 =$ Resistance at elevated temp

R2 = Resistance at elevated temperature (T2)
R = Resistance at 20°C (T1)

For high frequencies the skin depth is taken into consideration. The formula for AC resistance is:

For (t >2SD)

$$R_{AC} = \frac{2(\ell)\rho}{(SD)(w)} \text{ ohms}$$

AC resistance at 20°C

$$R_{AC} = \frac{2(\ell)0.68*10^{-6}}{(SD)(w)} \text{ ohms}$$

VOLTAGE DROP

As current travels across a conductor, it loses voltage. This is caused by the resistivity of the conductor. The losses are referred to as voltage drop. Use this formula to calculate the voltage drop across the conductors:

$$V_D = 2(R)(I)$$

$$R = \frac{\rho(\ell)}{(w)(t)} \text{ ohms}$$

$$VD = \frac{2(\rho)(I)(\ell)}{(w)(t)} \text{ Volts}$$

IMPEDANCE

In the design of laminated bus bars, you should consider maintaining the impedance at the lowest possible level. This will reduce the transmission of all forms of EMI (electromagnetic interference) to the load.

Increasing capacitance and reducing inductance are the determining factors in eliminating noise.

The formula for calculating characteristic impedance is:

$$Z = \sqrt{L/C} \text{ ohms}$$

TABLE OF DEFINITIONS

A	Cross sectional area of a conductor in inches ^{2}
C	Capacitance in picofarads
∂	Thickness of dielectric in inches
ρ	Resistivity of the conductor in ohms/inch
f	Frequency in hertz
I	Current in amps
K	Dielectric constant
ℓ	Length of conductor in inches
L	Inductance in nano henrys
L_t	Total inductance at high frequency
M	Permeability of nonmagnetic materials = 31.9*10-9 henrys/inch
R	Resistance in ohms
SD	Skin depth in inches
t	Thickness of the conductor in inches
T_1	Temperature at point 1 in C°
T_2	Temperature at point 2 in C°
w	Width of conductor in inches
V_d	Voltage drop in volts
π	Pi = 3.141592
α	Temperature coeffecient of resistivity
z	Impedence

MECHANICAL DESIGN GUIDE

RESISTANCE, INDUCTANCE, AND CAPACITANCE COMPARISONS

TWISTED PAIR

#10 AWG wire (solid) — 36" long
Insulation thickness (approx.) = .030"
Conductor area = .00815 in.^{2}
R_{DC} (calculated) = .006 ohms

Freq (Hz)	RAC (ohms)	L (µhenrys)	C (pfds)
10^3	0.006	0.700	50.0
10^6	0.078	0.464	53.6
10^7	0.160	0.478	48.1

#18 AWG wire (stranded) — 36" long
Insulation thickness (approx.) = .015"
Conductor Area = .00127 in.^{2}
R_{DC} (calculated) = .038 ohms

Freq (Hz)	RAC (ohms)	L (µhenrys)	C (pfds)
10^3	0.038	0.800	52.5
10^6	0.275	0.557	57.3
10^7	1.300	0.540	52.0

ELDRE BUS BARS

Eldre bus bar — 36" long x 1.5" wide x .010" thick
Insulation thickness = .006" AMRON™ 2—5
Conductor area = .015 in.^{2}
R_{DC} (calculated) = .0032 ohms

Freq (Hz)	RAC (ohms)	L (µhenrys)	C (pfds)
10^3	0.0032	0.0200	6400
10^6	0.0190	0.0060	6085
10^7	0.0610	0.0058	7480

Eldre bus bar — 36" long x .125" wide x .010" thick
Insulation thickness = .006" AMRON 2—5
Conductor Area = .00125 in.^{2}
R_{DC} (calculated) = .038 ohms

Freq (Hz)	RAC (ohms)	L (µhenrys)	C (pfds)
10^3	0.038	0.3000	700
10^6	0.233	0.0738	678
10^7	0.738	0.0614	667

TYPICAL CONVERSION CHARACTERISTICS

Wire Size Gauge	Diameter (in.)	Cir Mils	Sq Inches	Thick (in.)	Width (in.)	Current Carrying Capacity (amps)	DC Resistance of a 2-Conductor Bus (milliohm/ft)
22	.0253	640	.0005	.005	.101	1.52	32.44
16	.0508	2580	.0020	.005	.406	6.13	8.04
14	.0641	4110	.0032	.005	.646	9.75	5.05
10	.1019	10380	.0082	.010	.815	24.62	2.00
8	.1285	16510	.013	.015	.865	39.35	1.26
4	.2043	41740	.033	.030.	1.092	99.20	.500
0	.3249	106000	.084	.045	1.850	252.00	.200
00	.3648	133000	.105	.045	2.320	316.00	.160

INSULATION

Eldre utilizes many insulation systems to meet different applications. These systems combine the dielectric materials detailed in the table on the next page. By combining different materials with selective edge conditioning techniques, our insulating systems are designed to exceed any and all of your electrical, mechanical, and environmental requirements. Amron™ dielectric products were specifically developed for use in the manufacture of bus bars. Many of the products are coated with a B-stage resin that is reactivated during the assembly process. Most of our insulating systems are UL Recognized. Reference www.ul.com for a material listing. File No. E53800.

AMRON 1: Series 1 are polyvinyl fluoride (PVF) films. PVF films are chemical- and solvent-resistant, demonstrate excellent molding characteristics, and have both a high dielectric constant (K-factor) as well as a high dielectric strength. (Trade name: Tedlar®)

AMRON 2: Series 2 are aromatic polyamide polymer papers. Mechanical toughness, thermal stability, and solvent resistance are some of its characteristics. (Trade name: Nomex®)

AMRON 3: Series 3 are polyimide films. These films are recommended for high temperature applications. (Trade name: Kapton®)

AMRON 4: Series 4 is a composite film, made up of Amron 6 and Amron 1. Used exclusively as outside insulation, these films provide an excellent scuff-resistant coating. (Mylar/Tedlar)

AMRON 5: Series 5 is also a composite film made up of Amron 6 and Amron 1. These films are used as internal insulation and are recommended for high dielectric strength applications. (Tedlar/Mylar/Tedlar)

AMRON 6: Series 6 are polyethylene terephthalate (PET) films. PET are polyester films which offer an excellent balance of electrical, chemical, thermal, and physical properties. (Trade name: Mylar®)

AMRON 7: Series 7 is a composite insulator made up of Amron 2 and Amron 6. This composite combines the mechanical toughness of Nomex with the electrical properties of Mylar. (Nomex/Mylar/Nomex)

AMRON 8: Series 8 are laminated sheets constructed from continuous-filament type glass fabric with a flame-retardant epoxy resin binder. Good fabrication and high dielectric and physical strengths make this material suitable for many electrical applications. (NEMA Grade FR-4)

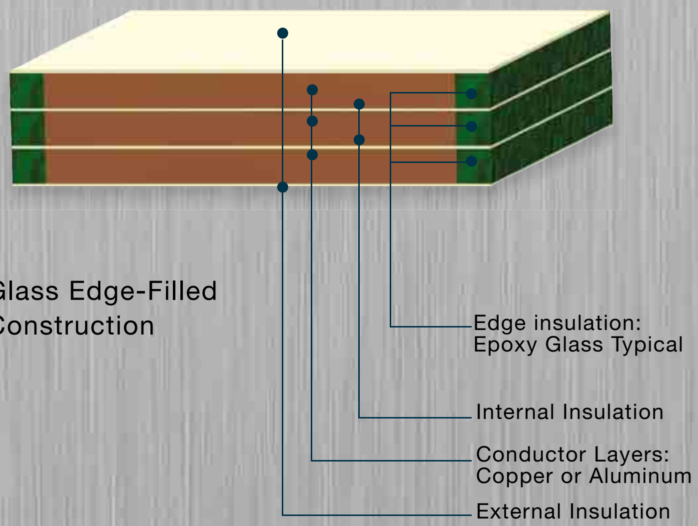
AMRON 9: Series 9 are epoxy powder coatings. These coatings exhibit exceptional durability. Amron 9 should be used where conventional insulation, due to part geometry, is not practical.

Note: The insulations listed above are standard materials used in the manufacture of our bus bars. Many other dielectric materials, among them Valox®, Ultem®, and PEN, can be incorporated into your design to meet specific requirements.

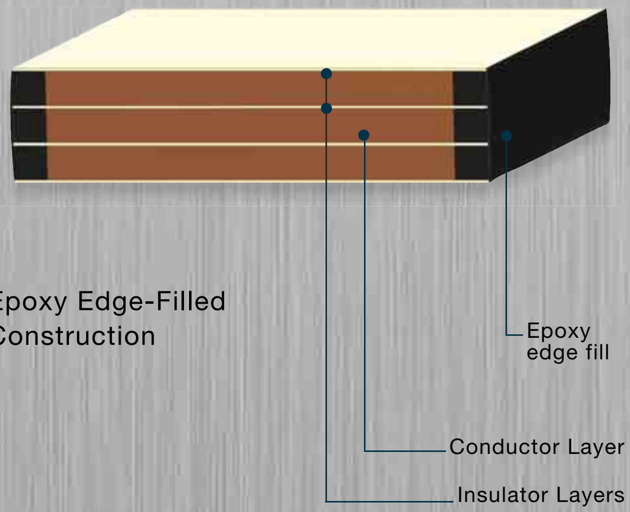
Be sure to consult with an Eldre application engineer in selecting insulation, as values may fluctuate after insulation has been applied.

MECHANICAL DESIGN GUIDE

BUS BAR INSULATION TECHNIQUES

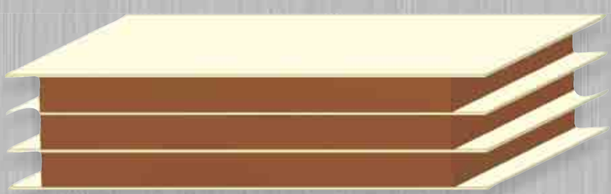


Glass Edge-Filled Construction



Epoxy Edge-Filled Construction

Epoxy Powder Coating



Open Laminated Construction

Molded/Sealed Construction

STANDARDS

These lists detail the specifications that our standard conductor material, insulation, and plating processes meet. Incorporating these standards into your own specifications (notes) will help reduce manufacturing costs and reduce cycle times.

CONDUCTOR MATERIAL

CDA 110	Copper	ASTM B152 / B187
CDA 260	Brass	ASTM B36
CDA 510	Phosphate Bronze	ASTM B103
CDA 172	Beryllium Cu. 25	ASTM B194/B196
CDA 194	Copper Alloy	ASTM B465
Alloy 42	Nickel/Iron Alloy	ASTM F-30
1100-H12	Aluminum Alloy	ASTM B209

INSULATION

Amron 1	Tedlar®/PVF	L-P-1040
Amron 2	Nomex®	MIL-I-24204
Amron 3	Kapton®	MIL-P-46112
Amron 6	Mylar®/PET	MIL-I-631
Amron 8	FR-4	MIL-I-24768/27
Amron 9	Epoxy Powder Coating	ASTM D3451
Amron 10	Ultem®	
Amron 11	Valox®	
Epoxy Edge Fill	Black or White	MIL-I-16923

PLATING

Tin	ASTM B545
Nickel	QQ-N-290 / AMS 2403
Electroless Nickel	MIL-C-26074
Sulfamate Nickel	MIL-P-27418
Gold	ASTM B488
Silver	QQ-S-365
Copper	AMS 2418
Tin-Lead (60/40)	AMS-P-81728; ASTM B579
Tin-Lead (90/10)	MIS-41177
Anodize	MIL-A-8625
Chromate	MIL-C-5541
Passivate	QQ-P-35

GLOSSARY OF TERMS

Capacitance
Measured in farads, it is the opposition to voltage changes in an alternating current circuit, causing voltage to lag behind current; exhibited by two conductors separated by an insulator.

Capacitor
A passive electronic component that stores energy in the form of an electrostatic field. In its simplest form, a capacitor consists of two conducting plates separated by an insulating material called the dielectric. The capacitance is directly proportional to the surface areas of the plates, and is inversely proportional to the separation between the plates. Capacitance also depends on the dielectric constant of the material separating the plates.

Choke
An inductor designed to present a high impedance to alternating current.

Clearance
The clearance is defined as shortest distance through the air between two conductive elements.

Common Collector Connection
Same as grounded collector connection. Also called the emitter-follower. A mode of operation for a transistor in which the collector is common to both the input and the output circuits and is usually connected to one of the power rails.

Common Emitter Connection
Same as grounded emitter connection. A mode of operation for a transistor in which the emitter is common to the input and output circuits. The base is the input terminal and the collector is the output terminal.

Conductivity
How easily something allows electric current to pass through it. If a substance is a good conductor (or highly conductive), for example copper or brass, it will allow electrons to pass freely through it, offering only minor resistance.

Corona
A luminous discharge due to ionization of the air surrounding a conductor caused by a voltage gradient exceeding a certain critical value.

Corona Extinction Voltage (CEV)
The highest voltage at which a continuous corona of specified pulse amplitude no longer occurs, as the applied voltage is gradually decreased from above the corona inception value.

Corona Inception Voltage (CIV)
The lowest voltage at which a continuous corona of specified pulse amplitude occurs as the applied voltage is gradually increased.

Creepage Distance
The shortest distance separating two conductors as measured along a surface touching both conductors.

Dielectric
Nonconducting material used to isolate and/or insulate energized electrical components.

Dielectric Constant (K)
The property of the dielectric material that determines how much electric energy can be stored in a capacitor of a particular size by a value of applied voltage.

Dielectric Strength
The maximum voltage an insulating material can withstand without breaking down.

EMI, RFI
Acronyms for various types of electrical interference; electromagnetic interference and radio-frequency interference.

Hi-Pot Test (High Potential Test)
A test performed by applying a high voltage for a specified time to two isolated points in a device to determine the adequacy of insulating material.

Impedance
(Z) Measured in ohms it is the total opposition to the flow of current offered by a circuit. Impedance consists of the vector sum of resistance and reactance.

Insulation Resistance
The resistance offered, usually measured in megaohms, by an insulating material to the flow of current resulting from an impressed DC voltage.

Insulators
Materials which prevent the flow of electricity. Nonconductive materials used to separate electric circuits.

Inverter
An electric or electronic device for producing alternating current from direct current.

Partial Discharge
A type of localized discharge resulting from transient gaseous ionization in an insulation system when the voltage stress exceeds a critical value.

Resistance
R and measured in ohms. Opposition to current flow and dissipation of energy in the form of heat.

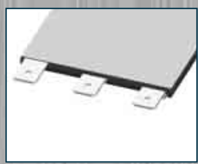
Self-inductance
The property of a conductor that produces an induced voltage in itself with changing current. The term inductance alone means self-inductance. When a varying current in one conductor induces a voltage in a neighboring conductor, the effect is called mutual inductance.

Shield
Partition or enclosure around components in a circuit to minimize the effects of stray magnetic and radio-frequency fields.

Shunt
A low-value precision resistor used to monitor current.

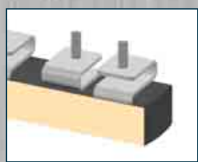
Snubber
A resistor-capacitor (RC) network used to reduce the rate of rise of voltage in switching applications.

Voltage Drop
Conductors carrying current always have inherent resistance or impedance to the current flow. Voltage drop is the amount of voltage loss that occurs through all or part of the circuit due to impedance.

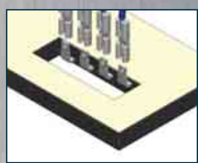


Three-layer bus bar with independent Faston tabs at long end.

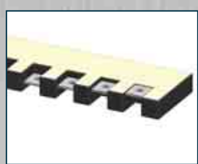
Press-fit bushings with crown band inserts



flexible tabs for low profile areas

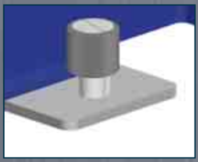


Faston tabs from inside the bus bar, saves space!

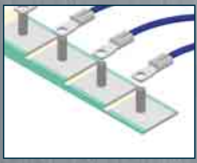


Bolt on tabs confined within the bus bar, saves space and material!

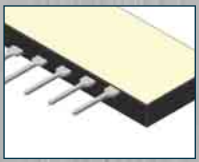
GLOSSARY OF TERMS



Panel Hardware



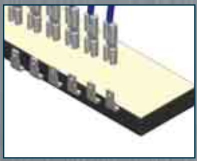
Clinch hardware for ring lugs



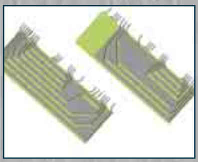
Square pins for solder connections or wire wrap

Faston tabs extending beyond the bus bar or within.

Molder hardware, ideal for thin materials and high torque ap-plications



Faston tabs along the edge with forms for easy access

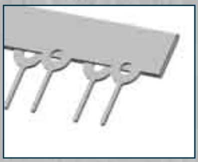


Multi-layer and multi-conductor tabs for PCB power

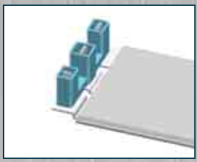
Flange tab construction with clinch hardware

Ring lug terminations using clinch stud hard-ware in formed tabs.

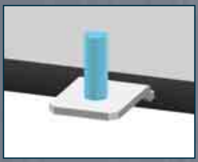
Solder pin connection with thermal relief.



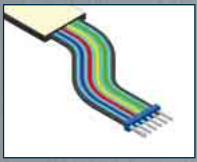
Solder pins for PCB connection with thermal relief holes in bus bar.



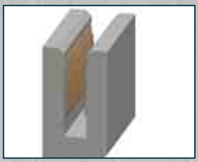
Connectors in plastic housing, soldered into each conductor.



Clinch stud hardware in side tab interconnect, note offset form in tab.



Flex Circuit integrated into bus bar for flexible interconnection.

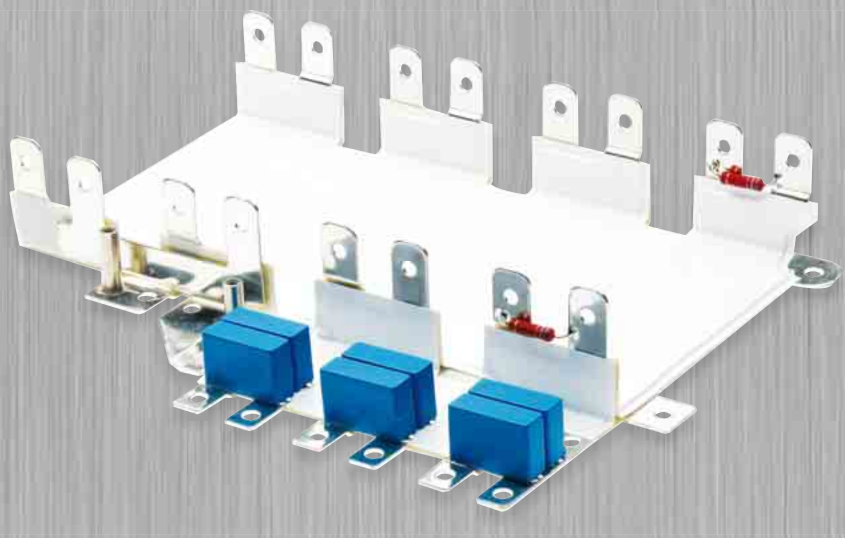


High current power receptacle with crown-band inserts

Three-layer bus bar utilizing embossed “dimples” for coplanar interconnection.

ELDRE®

BUS BAR TECHNOLOGIES



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