Power Distribution Panels
Circuit Breaker Panels
Waterproof Switch Panels
Instrument Panels
Box-Build Assemblies
Enclosure Assemblies
Mounting Frames
Parts & Components
About Paneltronics

Family owned and operated since 1979, Paneltronics is an electrical products manufacturing company based in Hialeah Gardens near Miami, FL, USA.

Paneltronics is an industry leader in the design, engineering and manufacturing of high quality power distribution systems, electrical panels, box-build assemblies, instrument panels, enclosures and electrical components. Paneltronics’ electrical panels, assemblies, and systems are specified on a wide variety of vessels, vehicles and equipment.

With more than 225 years of combined in-house electrical expertise and long standing relationships with premier OEMs, Paneltronics offers a broad line of superior engineered products and solutions to the marine, transportation and industrial markets. With a commitment to quality products, service and integrity, Paneltronics is a supplier of choice for OEMs worldwide.

Mission Statement & Company Focus

Mission Statement: Paneltronics is committed to providing high quality, cost effective products and superior service to our customers in an environment of cooperation and integrity.

Company Focus: Paneltronics is focused on continuous improvement through advancing streamlined manufacturing processes, engineering and technology. We also concentrate on providing quality and added value, which includes increased safety, reliability, and ease of installation. It is our goal to fulfill and exceed customer needs.

Capabilities

Paneltronics understands the needs of growing manufacturers in a dynamic economy and responds to these needs. We manufacture in our own U.S. facilities, which allows for scheduling flexibility, control of lead times, manufacturing processes, inventory and product quality and a stronger ability to meet our customers’ needs.

Engineering Capabilities: Paneltronics’ engineering department is a highly trained team of engineers and designers. Our team focuses on both electrical and mechanical design. Paneltronics’ engineering and design capabilities include, but are not limited to:

- Product Research, Development & Design
- Electrical & Mechanical Design & Engineering
- 3D-CAD (Solid Works & AutoCAD)
- Compliance/Standards Research & Implementation

Manufacturing Capabilities: Paneltronics provides high quality products in a timely fashion. The key is our streamlined manufacturing processes which include a combination of EDI, Kanban Inventory, JIT (Just-in-Time) inventory, Build-to-Print products, High & Low volume custom and aftermarket production, Prototypes, etc. Paneltronics’ manufacturing capabilities include, but are not limited to:

- CNC Engraving
- CNC Sheet Metal Punching
- CNC Routing, Cutting & Milling
- Screen Printing
- Painting
- Plastic Injection Molding & Tooling
- Welding & Metal Fabrication
- Electrical & Mechanical Assembly
- Wire Harness Assembly

Customer Service & Support Capabilities: Paneltronics’ knowledgeable staff is trained to assist our customers in a friendly, accessible and timely fashion. Our in-house professionals have a deep understanding of the product lines and their application. In addition, Paneltronics works with key regional representatives to ensure that you are receiving the best service and support by qualified individuals.
We manufacture products for:

- Agricultural Equipment
- Boats
- Broadcast Vehicles
- Buses
- Communication Vehicles
- Construction Equipment
- Display & Merchandising Equipment
- Emergency Vehicles
- Fire Trucks
- Generators
- Golf & Turf Equipment
- Hazmat Vehicles
- Material Handlers
- Mobile Command Post Vehicles
- Motor Coaches
- Off-Highway Vehicles
- Portable Compressors
- Specialty Vehicles
- Utility Vehicles
- Yachts

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Premier & Deluxe Line DC Distribution Panels

Deluxe Line
- A full line of High Quality Power Distribution Panels that can be customized to meet any requirement.

Premier Line
- A full featured line of High Quality Power Distribution Panels with all the custom and standard features of our Deluxe Line plus a Total Illumination Package.

Premier and Deluxe Line Features:
- Custom loaded to your specifications
- Most panels ship within 5 working days. Select panels available within 24 hours.
- 1/8” Corrosion resistant aluminum construction
- Two part polyurethane finish
- High accuracy analog meters are standard. Optional digital meters available

Selection:
- Largest selection of Circuit Breaker and Power Distribution Panels
- Over 250 Modular Panel Designs for Maximum installation flexibility (see page 52)
- Interchangeable, Polycarbonate Function Labels (Over 3000 available)
- Panels are Custom Configured to your specific requirements.
- Optional colors and finishes are available to match every application.
- Free Factory Technical Support

Flexibility:
- Color coded LED indicators on Premier Line panels
- Backlit labels and meters on Premier Line panels
- High accuracy analog meters, Optional Digital Meters available
- Hydraulic/ Magnetic, Trip Free UL Listed and Recognized and CSA Certified Circuit Breakers
- VDE Approved and CE Compliant Circuit Breakers available
Installation:
- Completely pre-wired for ease of installation
- Panel mounted Tin Plated Bus Bars
- Panel mounted Bus Connectors
- Detailed Wiring Diagrams for simple and safe installation
- Optional Hinges for further ease of installation
- Product of choice for Premier Boat Builders worldwide

DC Panel Features:
- Available in 12 VDC, 24 VDC or 32 VDC
- Tin plated, panel mounted DC Positive, DC Negative, and Grounding Bus Bars
- Large Frame DC Mains rated at 5,000 AIC
- Selector Switch permits monitoring of up to 4 Battery Banks
- High performance DC Ammeter Shunts

AC Panel Features:
- Available in 120 VAC, 240 VAC-60Hz or 220 VAC-50Hz
- AC Shore Main Circuit Breakers include Reverse Polarity Trip Coils that trip automatically upon sensing Reverse Polarity
- Red Warning LED indicates potentially dangerous Reverse Polarity condition
- Tin plated, panel mounted AC Hot, AC Neutral, and Safety Ground Bus Bars
- AC power single source selector sliding gate
- Convenient remote generator controls

Color Options:
- Textured black finish is standard on all panels.
- Custom colors and custom logos available.
- Premier and Deluxe models are also available in the following color options:
1000 & 2000 Series Distribution Panels

- **1201**: 5.5” W x 4.125” H x 2.25” D
  DC Voltmeter Panel

- **1202**: 5.5” W x 4.125” H x 3.5” D
  DC High AMP Breaker Panel
  50A Standard (60, 80, and 100A available)

- **2201**: 5.5” W x 8.25” H x 3” D
  DC Battery Selector with 50 Amp Main

- **2202**: 5.5” W x 8.25” H x 2.25” D
  DC Volt and Amp Meter Panel

- **2203**: 5.5” W x 8.25” H x 3.5” D
  DC 7 Position Circuit Breaker Panel
  with Main

- **2204**: 5.5” W x 8.25” H x 3.5” D
  DC 8 Position Circuit Breaker Panel

- **2205**: 5.5” W x 8.25” H x 3.5” D
  DC Waterproof 8 Position Circuit Breaker Panel

- **2206**: 11” W x 8.25” H x 3.5” D
  DC 12 Position Panel with Main and Voltmeter

- **2207**: 5.5” W x 8.25” H x 3.5” D
  AC Ship/Shore Source Selector Panel - 120 VAC 60 Hz

- **2208**: 5.5” W x 8.25” H x 3.5” D
  AC Ship/Shore Source Selector Panel - 240 VAC 60 Hz

- **2209**: 5.5” W x 8.25” H x 5.5” D
  AC Dual Shore/Generator Selector Panel - 120 VAC 60 Hz

- **2210**: 5.5” W x 8.25” H x 2.25” D
  AC Volt and Amp Meter Panel
  (Available in 120 or 240 VAC)
1000 & 2000 Series Distribution Panels

Symbols indicate special features for panels on these pages.

1000 & 2000 Series
Premier and Deluxe Distribution Panels

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</table>
3000 Series Distribution Panels

3201
13.75” W x 3.25” H x 3.5” D
DC 6 Position Circuit Breaker Panel

3202
13.75” W x 4.75” H x 3.5” D
DC 12 Position Circuit Breaker Panel

3203
13.75” W x 7” H x 3.5” D
DC 12 Position with Main and Meters

3204
13.75” W x 8.5” H x 3.5” D
DC 18 Position with Main and Meters

3205
13.75” W x 10” H x 3.5” D
DC 24 Position with Main and Meters

3206
13.75” W x 4.75” H x 3.5” D
DC Waterproof 12 Position Circuit Breaker Panel

3301
13.75” W x 3.25” H x 3.5” D
AC 6 Position Circuit Breaker Panel

3302
13.75” W x 4.75” H x 3.5” D
AC 12 Position Circuit Breaker Panel

3303
13.75” W x 3.25” H x 3.5” D
AC 3 Position Double Pole Circuit Breaker Panel

3304
13.75” W x 4.75” H x 3.5” D
AC 6 Position Double Pole Circuit Breaker Panel
3000 Series Distribution Panels

**3305**
13.75” W x 6” H x 3.5” D
AC 7 Position with Main and Meters

**3306**
13.75” W x 7.5” H x 3.5” D
AC 9 Position with Shore/Generator Mains and Meters

**3307**
13.75” W x 10” H x 3.5” D
AC 12 Position with Dual Shore/Generator Mains and Meters

**3308**
13.75” W x 8.625” H x 3.5” D
AC 10 Position with Shore/Generator/Inverter Mains and Meters

**3309**
13.75” W x 10.5” H x 3.5” D
AC 12 Position with Dual Shore/Generator/Inverter Mains and Meters

**NEW**

**3310**
13.75” W x 10” H x 3.5” D
AC 12 Position with Shore/Generator Mains and Meters
120/240 VAC

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### 3000 Series
Premier and Deluxe Distribution Panels

#### 3200 Series
DC Panels Available for:
- 12 VDC
- 24 VDC
- 32 VDC

#### 3300 Series
AC Panels Available for:
- 120 VAC - 60 Hz
- 240 VAC - 60 Hz
- 220 VAC - 50 Hz

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Symbols indicate special features for panels on these pages.
**4000 Series Distribution Panels**

**4202**
- 17.75” W x 3.25” H x 3.5” D
- DC 8 Position Circuit Breaker Panel

**4203**
- 17.75” W x 4.75” H x 3.5” D
- DC 16 Position Circuit Breaker Panel

**4204**
- 17.75” W x 7.75” H x 3.5” D
- DC 23 Position with Main and Meters

**4205**
- 17.75” W x 9.25” H x 3.5” D
- DC 31 Position with Main and Meters

**4206**
- 17.75” W x 7.75” H x 3.5” D
- DC 32 Position Circuit Breaker Panel

**4207**
- 17.75” W x 11.5” H x 3.5” D
- DC 32 Position with Dual Mains, 2 High Amp Breakers and Meters

**4301**
- 17.75” W x 3.25” H x 3.5” D
- AC 4 Position Circuit Breaker Panel

**4302**
- 17.75” W x 3.25” H x 3.5” D
- AC 8 Position Circuit Breaker Panel

**4303**
- 17.75” W x 4.75” H x 3.5” D
- AC 16 Position Circuit Breaker Panel

Each Position includes Auto/Manual Switch and Push-to-Reset 15 Amp Circuit Breaker.

Shown with optional Digital Meters.

New product.
4000 Series Distribution Panels

Symbols indicate special features for panels on these pages.

4304
17.75" W x 3.25" H x 3.5" D
AC 4 Position Double Pole Circuit Breaker Panel

4305
17.75" W x 4.75" H x 3.5" D
AC 8 Position Double Pole Circuit Breaker Panel

4306
17.75" W x 5.25" H x 3.5" D
AC 8 Position with Shore Main and Meters

4307
17.75" W x 6" H x 3.5" D
AC 8 Position with Shore/Generator Mains and Meters

4308
17.75" W x 8.75" H x 3.5" D
AC 18 Position with Shore/Generator Mains and Meters

4309
17.75" W x 9.25" H x 3.5" D
AC 16 Position with Dual Shore/Generator Mains and Meters

4310
17.75" W x 7.75" H x 3.5" D
AC 32 Position Circuit Breaker Panel

4000 Series Distribution Panels

4000 Series
Premier and Deluxe Distribution Panels

4200 Series
DC Panels Available for:
- 12 VDC
- 24 VDC
- 32 VDC

4300 Series
AC Panels Available for:
- 120 VAC - 60 Hz
- 240 VAC - 60 Hz
- 220 VAC - 50 Hz

Panel Series | Modular Width | Page
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2000 | 5.50" (139.70 mm) | 4
3000 | 13.75" (349.20 mm) | 6
4000 | 17.75" (450.85 mm) | 8
5000 | 11.00" (279.40 mm) | 12
6000 | 19.00" (482.60 mm) | 20

www.paneltronics.com
4000 Series Distribution Panels

4311
17.75" W x 7.75" H x 3.5" D
AC 16 Position Double Pole Circuit Breaker Panel

4312
17.75" W x 8.25" H x 3.75" D
AC High Amp Mains - 2 Position Source Selector - 120/240 VAC

4313
17.75" W x 8.25" H x 3.75" D
AC High Amp Mains - 3 Position Source Selector - 120/240 VAC

4314
17.75" W x 8.25" H x 3.75" D
AC High Amp Mains - 4 Position Source Selector - 120/240 VAC

4315
17.75" W x 8.25" H x 3.75" D
AC High Amp Mains - 5 Position Source Selector - 120/240 VAC

4316
17.75" W x 4.75" H x 2.25" D
AC Meter Panel - Volts, Amps and Frequency - 120/240 VAC

4317
17.75" W x 6.25" H x 6.75" D
AC Meter Panel with 3 Position Source Selector - 120/240 VAC

Shown with optional Digital Meters
4318
17.75” W x 6.25” H x 7.875” D
AC Meter Panel with 4 Position Source Selector - 120/240 VAC

4320
17.75” W x 9.75” H x 3.5” D
AC Dual Shore/Generator Mains and Parallel Switch with Meters

4321
17.75” W x 9.75” H x 3.5” D
AC Dual Shore/Generator/Inverter Mains and Parallel Switch with Meters

4322
17.75” W x 4.75” H x 2.25” D
AC Meter Panel - 2 Volt and 2 Amp Meters - 120/240 VAC

4326
17.75” W x 9.75” H x 3.5” D
6 Position Source Selector with Meters

4336
17.75” W x 8.75” H x 3.5” D
AC 18 Position with 3 Triple Pole Mains and Meters

4338
17.75” W x 8.75” H x 3.5” D
AC 18 Position with 3 Triple Pole Mains and Meters

4000 Series Distribution Panels

4000 Series
Premier and Deluxe Distribution Panels

4300 Series
AC Panels Available for:
- 120 VAC - 60 Hz
- 240 VAC - 60 Hz
- 220 VAC - 50 Hz

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Symbols indicate special features for panels on these pages.
5000 Series Distribution Panels

Symbols indicate special features for panels on these pages.

Shown with optional Digital Meters

5201
11" W x 6.5" H x 3.5" D
DC 12 Position Circuit Breaker Panel

5202
11" W x 11" H x 3.5" D
DC 24 Position Circuit Breaker Panel

5203
11" W x 9.75" H x 3.5" D
DC 11 Position with Main and Meters

5204
11" W x 4.5" H x 3.5" D
DC 6 Position Circuit Breaker Panel

5301
11" W x 6.5" H x 3.5" D
AC 12 Position Circuit Breaker Panel

5302
11" W x 11" H x 3.5" D
AC 24 Position Circuit Breaker Panel

5303
11" W x 6.5" H x 3.5" D
AC 6 Position Double Pole Circuit Breaker Panel

5304
11" W x 9.75" H x 3.5" D
AC 2 Position Source Selector with Meters
5000 Series Distribution Panels

**5000 Series**
**Premier and Deluxe Distribution Panels**

**5200 Series**
DC Panels Available for:
- 12 VDC
- 24 VDC
- 32 VDC

**5300 Series**
AC Panels Available for:
- 120 VAC - 60 Hz
- 240 VAC - 60 Hz
- 220 VAC - 50 Hz

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5000 | 11.00" (279.40 mm) | 12
6000 | 19.00" (482.60 mm) | 20

**5305**
11" W x 9.75" H x 3.5" D
AC Dual Shore/Generator Mains and Parallel Switch with Meters

**5306**
11" W x 9.75" H x 3.5" D
AC Dual Shore/Generator/Inverter Mains and Parallel Switch with Meters

**5307**
11" W x 9.75" H x 3.5" D
AC 3 Position Source Selector with Meters (240 VAC)

**5308**
11" W x 4.5" H x 3.5" D
AC 6 Position Circuit Breaker Panel

**5309**
11" W x 9.75" H x 3.5" D
AC 4 Position Source Selector with Meters (240 VAC)

**5310**
11" W x 6.5" H x 3.5" D
AC 7 Position with Main and Voltmeter

**5311**
11" W x 4.5" H x 3.5" D
AC Volt and Amp Meter Panel (Available in 120 or 240 VAC)
3400, 4400 & 5400 Series AC/DC Distribution Panels

**3401**
13.75" W x 12.125" H x 3.5" D
AC/DC 12 DC Position with Main and 7 AC Position with Shore Main and Meters

**3402**
13.75" W x 13.625" H x 3.5" D
AC/DC 18 DC Position with Main and 7 AC Position with Shore Main and Meters

**3403**
13.75" W x 16.625" H x 3.5" D
AC/DC 24 DC Position with Main and 9 AC Position with Shore/Generator Mains

**3404**
13.75" W x 19.125" H x 3.5" D
AC/DC 24 DC Position with Main and 12 AC Position with Dual Shore/Generator Mains

Symbols indicate special features for panels on these pages.
4400, 4400 & 5400 Series AC/DC Distribution Panels

**3400, 4400 & 5400 Series**
Premier and Deluxe Distribution Panels

**DC Section Available for:**
- 12 VDC
- 24 VDC
- 32 VDC

**AC Section Available for:**
- 120 VAC - 60 Hz
- 240 VAC - 60 Hz
- 220 VAC - 50 Hz

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**4400 Series**

- **4401**
  17.75" W x 12.25" H x 3.5" D
  AC/DC 23 DC Position with Main and 8 AC Position with Shore Main and Meters

- **4402**
  17.75" W x 15.25" H x 3.5" D
  AC/DC 31 DC Position with Main and 12 AC Position with Shore/Generator Mains and Meters

- **4403**
  17.75" W x 17.75" H x 3.5" D
  AC/DC 31 DC Position with Main and 16 AC Position with Dual Shore/Generator Mains and Meters

**5400 Series**

- **5401**
  11" W x 19.25" H x 3.5" D
  AC/DC 21 DC Position with Main and 7 AC Position with Main and Meters

- **4401** shown with optional Digital Meters

- **4403** shown with optional Digital Meters
Standard Line Panels

**9972207**
5.5” W x 4.125” H x 3.5” D
DC 3 Position Circuit Breaker Panel with LED Indicators
**9982207**
Without LED Indicators

**9972208**
5.5” W x 4.25” H x 3.5” D
DC 8 Position Circuit Breaker Panel with Indicator Lights (All hardware is included except breakers for customizing amperage ratings)
**9982208**
Without LED Indicators

**9972220**
5.5” W x 13.5” H x 3.5” D
DC 12 Position Circuit Breaker Panel with Meters - 7 Breakers Installed

**9982202**
5.5” W x 8.25” H x 2.25” D
DC Meter Panel. 8-16 VDC Expanded Scale Voltmeter and 0-50 DC Ammeter

**9982301**
5.5” W x 8.25” H x 2.625” D
Generator/Shore Single Source Selector Panel
120 VAC 60 Hz 50A Max
220 VAC 50 Hz 50A Max

**9982304**
5.5” W x 8.25” H x 2.25” D
AC Meter Panel. 0-150 AC Voltmeter and 0-50 AC Ammeter
Symbols indicate special features for panels on these pages.

This wide selection of pre-engineered panels is factory stocked for immediate delivery. Models include circuit breaker panels, source selectors and instrument panels. Circuit breaker panels are loaded with a breaker assortment to meet most applications. Additional circuit breakers may be purchased for a custom solution to your electrical system.

Made of corrosion resistant aluminum, panels are coated with a black polyurethane finish. Each panel includes mounting hardware and a set of interchangeable function labels.

Point of Purchase Packaging is available, ask a Paneltronics representative for details.

- Factory stocked for immediate delivery
- Completely pre-wired for ease of installation
- Panel mounted tin plated bus bars
- Recessed interchangeable polycarbonate labels
- All mounting hardware is included
- Modular panel designs
- 1/8" Corrosion resistant aluminum construction
- 3-Year Factory Warranty

Panel Insulation Cover: P/N 111-084
A simple solution for protecting exposed wiring behind the electrical panel. Standard Size: 5.250"W x 8.188"H x 5.125"D
Fits most 2000 Series Paneltronics Panels as well as many original equipment panels. Material: 0.125" ABS plastic easily drilled for mounting and wiring.

Standard Line Panels

9972305
5.5" W x 8.25" H x 3.5" D
AC 6 Position Circuit Breaker Panel with 30A Main and LED Indicators - 5 Breakers Installed

9982305
Without LED Indicators

9972313
5.5" W x 6" H x 3.5" D
AC 3 Position Circuit Breaker Panel with 30A Main and LED Indicators

9982313
Without LED Indicators

9972320
5.5" W x 13.5" H x 3.5" D
AC 10 Position Circuit Breaker Panel with 30A Main and Meters - 6 Breakers Installed

9972316
5.5" W x 4.5" H x 3.5" D
AC Main - Double Pole - 30 Amp Circuit Breaker with Reverse Polarity Indicator

9973210
13.75" W x 8.25" H x 3.5" D
DC 20 Position Circuit Breaker Panel with Meters
14 Breakers Installed

9973410
13.75" W x 8.25" H x 3.5" D
AC/DC 19 Position Circuit Breaker Panel with Meters
13 Breakers Installed

9973210
13.75" W x 8.25" H x 3.5" D
AC 240VAC Ship/Shore Selector

9972321
5.5" W x 6.5" H x 3.5" D
AC 240VAC Ship/Shore Selector

9972322
5.5" W x 8.25" H x 3.5" D
AC 3 Position Circuit Breaker Panel with 30A Double Pole Main Breaker (No reverse polarity trip coil)
Waterproof Line Switch Panels with Fuse Protection

9960002
4.625” W x 6.375” H x 3” D
DC 6 Position Toggle Switch with Fuse Protection

9960005
4.625” W x 5” H x 3” D
DC 4 Position Toggle Switch with Fuse Protection

9960007
5.5” W x 6” H x 3” D
DC 5 Position Illuminated Rocker Switch with Fuse Protection

9960008
5.25” W x 3.75” H x 3” D
DC 4 Position Toggle Switch with Fuse Protection and LEDs

9960009
7.5” W x 3.75” H x 3” D
DC 6 Position Toggle Switch with Fuse Protection

9960010
2.25” W x 4” H x 3” D
DC Illuminated Rocker Switch with Fuse Protection

9960011
5.25” W x 4” H x 3” D
DC 4 Position Illuminated Rocker Switch with Fuse Protection

9960012
7.5” W x 4” H x 3” D
DC 6 Position Illuminated Rocker Switch with Fuse Protection

9960013
9.5” W x 4” H x 3” D
DC 8 Position Illuminated Rocker Switch with Fuse Protection

9960014
5.5” W x 4.125” H x 3” D
DC 3 Position Illuminated Rocker Switch with Fuse Protection

9960015
5.5” W x 8.25” H x 3” D
DC 7 Position Illuminated Rocker Switch with Fuse Protection

9952205
5.5” W x 8.25” H x 3.5” D
DC Waterproof 8 Position Circuit Breaker Panel
Paneltronics offers a simple, reliable solution to satisfy your switch/fuse panel requirements. These quality panels are made from 1/8” corrosion resistant aluminum and are coated with a black polyurethane finish. Each panel includes mounting hardware and a set of interchangeable function labels.

- Ideal for exposed applications
- Rubber booted toggle switches or illuminated rocker switches
- Front access fuse holders for ease of replacement
- Durable 1/8” aluminum construction
- Pre-wired for ease of installation
- Recessed, interchangeable polycarbonate labels
- Toggle switches are provided with rubber boots for protection against dust and prolonged salt-water spray
- rocker switches are illuminated and sealed to offer protection against dust and prolonged salt-water spray

**Symbols indicate special features for panels on these pages.**

---

### Fused Panels Technical Information
- **Fuses:** Rated for 10 Amps
- **Fuse Holders:** Splash proof and molded of high temperature, flame retardant thermoplastic. (UL recognized and CSA certified for 20Amps @ 250V).
- **Front access fuse holders for ease of replacement**
- **DC Positive Bus:** 12AWG, flame retardant, moisture resistant conductor
- **Terminations are fully insulated 0.25” quick-connect terminals**

### Circuit Breaker Panels Technical Information
- **CE compliant Thermal Push-to-Reset Circuit Breakers**
- **Circuit Breakers Rated at 15 Amps**
- **Trip free, Manual Push-to-Reset Type Circuit Breakers**
- **Rated at 12VDC**
- **Rubber boots for protection against dust and prolonged salt-water spray**

---

Paneltronics offers a simple, reliable solution to satisfy your switch/fuse panel requirements. These quality panels are made from 1/8” corrosion resistant aluminum and are coated with a black polyurethane finish. Each panel includes mounting hardware and a set of interchangeable function labels.

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---

Symbols indicate special features for panels on these pages.
### 6000 Series 19” Rack Mount Distribution Panels

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
<th>Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>6001</td>
<td>19” W x 1.75” H (1-U) Blank Panel</td>
<td>19“ W x 1.75“ H (1-U)</td>
</tr>
<tr>
<td>6002</td>
<td>19” W x 3.50” H (2-U) Blank Panel</td>
<td>19“ W x 3.50“ H (2-U)</td>
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<tr>
<td>6003</td>
<td>19” W x 5.25” H (3-U) Blank Panel</td>
<td>19“ W x 5.25“ H (3-U)</td>
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<td>6004</td>
<td>19” W x 7.00” H (4-U) Blank Panel</td>
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<td>6201</td>
<td>19” W x 5.25” H (3-U) 10 Position DC Power Distribution Panel with Meters Include up to 5 High Amp Circuit Breaker Positions</td>
<td>19“ W x 5.25“ H (3-U)</td>
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<tr>
<td>6202</td>
<td>19” W x 8.75” H (5-U) 28 Position DC Power Distribution Panel with Meters Include a High Amp Main Circuit Breaker</td>
<td>19“ W x 8.75“ H (5-U)</td>
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<tr>
<td>6301</td>
<td>19” W x 5.25” H (3-U) 1 - AC High Amp Main with Meters (available for 120 VAC, 240 VAC - 60 Hz and 220 VAC - 50 Hz)</td>
<td>19“ W x 5.25“ H (3-U)</td>
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<tr>
<td>6302</td>
<td>19” W x 5.25” H (3-U) 2 - AC High Amp Mains with Source Selection Sliding Gate Interlock and Meters (available for 120 VAC, 240 VAC - 60 Hz and 220 VAC - 50 Hz)</td>
<td>19“ W x 5.25“ H (3-U)</td>
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<tr>
<td>6303</td>
<td>19” W x 5.25” H (3-U) 3 - AC High Amp Mains with Source Selection Sliding Gate Interlock and Meters (available for 120 VAC, 240 VAC - 60 Hz and 220 VAC - 50 Hz)</td>
<td>19“ W x 5.25“ H (3-U)</td>
</tr>
</tbody>
</table>
Paneltronics Rack Mount Panels are designed for control, monitoring, and protection of AC and DC electrical loads. These panels have all of the features and benefits of the Premier Line Panels detailed on pages 3 and 4. However, they are specifically designed for mounting onto Electronic Industries Association (EIA) compliant 19” racks accommodating preferred 482.60 mm standard panel widths and the modular unit “U” height of 44.45 mm.

These Rack Mount panels can be used to quickly and easily configure custom power distribution systems. They offer a varied selection of modular designs that combined can create large or small systems. The series includes panels for 12VDC, 24VDC, and 120VAC-60Hz, 240VAC-60Hz, and 220VAC-50Hz.

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7000 Series Push-to-Reset Distribution Panels

7203
16.50” W x 5.50” H x 2.50” D  DC 30 Position Push-to-Reset Circuit Breaker Panel
9997203
Black, 12/24 VDC, Loaded with 30 - 15Amp Push-to-Reset Circuit Breakers

7226
4.50” W x 9.00” H x 2.50” D  DC 12 Position Push-to-Reset Circuit Breaker Panel
9997226  Black, 12/24 VDC, Loaded with 12 - 15Amp Push-to-Reset Circuit Breakers

7252
9.00” W x 3.50” H x 2.50” D  DC 10 Position Push-to-Reset Circuit Breaker Panel
9997252  Black, 12/24 VDC, Loaded with 10 - 15Amp Push-to-Reset Circuit Breakers

7253
9.00” W x 4.85” H x 2.50” D  DC 15 Position Push-to-Reset Circuit Breaker Panel
9997253  Black, 12/24 VDC, Loaded with 15 - 15Amp Push-to-Reset Circuit Breakers

7255
9.00” W x 7.60” H x 2.50” D  DC 25 Position Push-to-Reset Circuit Breaker Panel
9997255  Black, 12/24 VDC, Loaded with 25 - 15Amp Push-to-Reset Circuit Breakers

7262
10.50” W x 3.50” H x 2.50” D  DC 12 Position Push-to-Reset Circuit Breaker Panel
9997262  Black, 12/24 VDC, Loaded with 12 - 15Amp Push-to-Reset Circuit Breakers

7263
10.50” W x 4.85” H x 2.50” D  DC 18 Position Push-to-Reset Circuit Breaker Panel
9997263  Black, 12/24 VDC, Loaded with 18 - 15Amp Push-to-Reset Circuit Breakers

7273
12.00” W x 5.50” H x 2.50” D  DC 21 Position Push-to-Reset Circuit Breaker Panel
9997273  Black, 12/24 VDC, Loaded with 21 - 15Amp Push-to-Reset Circuit Breakers

Push-to-Reset Circuit Protection for 12 VDC or 24 VDC Electrical systems.

This panel line is designed for applications where 24-hour circuit protection is required or for circuit protection of loads that are switched remotely.

Optional Clear Rubber Boots can be installed on the circuit breakers to protect the front of the panels and accommodate installation in exposed wet area such as open cockpits and flybridges.

A Black textured polyurethane finish is standard on all panels. Additional color options are also available - see page 3.

Features:
- 24 Hour Circuit Protection
- 12 VDC or 24 VDC
- Custom Loaded to your Specifications (5, 10, 15, 20, 25, and 30 Amps)
- Custom Labeled to your Specifications (see pages 47-51 for label selection)
- Pre-wired with Common Positive Buses for faster installation

Circuit Breakers:
- Ignition Protected (UL 1500/ISO8846)
- Trip Free (ABYC E-11.10.1.5.4)
- Manual Reset type (ABYC E-11.10.1.5.6)
- UL Recognized (UL 1077) and CSA certified
- CE marked

Symbols indicate special features for panels on these pages.
Mounting Frames

Decorative aluminum Mounting Frames eliminate the pressure of making an exact cutout for the panel to fit in and are available in three designs: High Profile, Slim, and Recessed Slim. Recessed and High Profile Frames recess the panel to help prevent accidental turning on or off of circuit breakers. In addition, a smoked or clear Plexiglas door may be installed for added protection of the panel.

All Slim Frames are ideal for smaller areas; the flange is only 7/8". All frames are available in custom sizes to fit your specific customized panel configuration. They may be used to accommodate multiple panel combinations and may also be hinged to allow for easier installation and future service of the electrical system. Designed for the marine environment with durable materials, these frames create an elegant, finished look.

Benefits:
- Reduce installation time
- Help to prevent accidental turning on or off of critical circuits
- Enhance the panel installation
- Concel bulkhead cutout imperfections
- Provide the option to add Plexiglas doors

Plexiglas Doors

These attractive doors are available in either a clear or smoked finish and are hinged to conveniently open left or right, up or down. They are factory installed as an option, and in addition to providing a more smooth and finished look, they also help to protect your panel from dust, the environment, and accidental turning on or off of critical circuits.

Benefits:
- Help to protect panel from dust and accidental access
- Help to prevent accidental turning on or off of critical circuits
- Enhance appearance

Enclosures

Protecting the electrical connections at the panel can help prevent potential electrical hazards. Paneltronics’ enclosures protect the wiring in situations where the back of the panel may be exposed. Terminal blocks and bus bars can also be mounted on the back plate of the enclosure providing a central location for your wiring. Enclosures are available in standard depths, while the widths and heights are custom sized to meet your requirements. Paneltronics’ enclosures are designed for the harsh marine environments and constructed of durable, corrosion resistant aluminum.

Benefits:
- Electro-Mechanical protection to exposed components
- Custom sized to fit most panel configurations
- Can be used for a variety of applications
- Custom wire access ports can be added

Standard Enclosure Depths: 6.50", 8.50", 10.00"
Paneltronics designs and manufactures custom enclosure box-build assemblies that efficiently consolidate multiple parts, components, and functions into a central control unit. These pre-assembled units can be designed for use in engine rooms, engine compartments, or any conveniently accessible location where centralized control is required.

Our Engineering Team carefully evaluates every design element and incorporates all specifications for size constraints as well as mounting, vibration, environmental and accessibility requirements. These are coupled with the specific electrical and mechanical requirements to design an optimal cost effective solution. Our team can also design turnkey solutions from concept to finished product or build-to-print to satisfy specific OEM customer requirements.

These high quality enclosures are designed for rugged environments such as off-highway, heavy truck, construction, or marine applications. They simplify installation by reducing labor and providing a central location for operation and/or troubleshooting.

Paneltronics enclosure box-build assemblies provide efficient consolidated assembly solutions for several common functions and requirements including:

- Ignition protection
- Battery switching
- Circuit protection
- Common buses
- Solenoids
- Relays
- Control module protection
- Sensors
- Monitoring devices

OEM Custom Enclosures & Box Build Assemblies

Ignition Protected Main DC power distribution enclosure assembly. Includes: battery switching solenoids, circuit breakers, fuse blocks, relays, external power studs and connectors.

Flush mount DC Control Panel with enclosure protection and internal wire management. Includes: meters, circuit breakers, switches for remote battery selection, terminal blocks, ground buses, and rear access connectors and power studs.

Main AC/DC Electrical Distribution Panel and Enclosure assembly. Isolated AC and DC distribution panels are individually hinged. Includes: terminal blocks, ground buses, relays, and wire access openings. All wires are labeled for easier installation.

Main DC Control Engine Room Panel with enclosure protection. Includes: ignition protected circuit breakers, solenoids, relays, ANL fuses, wire access ports, external connectors and power studs. Key locked access for easier and safer service.
Enclosure box-build assemblies features include:

- Surface or bulkhead mount options
- Hinged front panel faces or covers
- Wire access ports
- High amp, custom flexible buses
- Multi-pin bulkhead connectors
- High amp power feed-through studs
- Corrosion resistant aluminum fabrication
- Polyurethane or powder coat finishes
- Optional pre-fabricated fiberglass or plastic enclosures

Enclosure box-build assemblies benefit the production process with:

- Reduced installation labor and increased productivity
- Consistent electro-mechanical assemblies
- A central location for key functions and components
- Reduced wiring errors on the production line
- Go-to point for system troubleshooting
- Added durability and reliability
- Turnkey assemblies from a single source

Main DC Power Distribution Enclosure assembly. Includes: battery switches, circuit breakers, ANL fuse blocks, relays, and external access ports.

Main AC/DC Electrical Distribution Panels mounted on a hinged mounting frame. The complete assembly opens along with the AC enclosure permanently attached with mounting hardware. Includes: terminal blocks, ground buses, and wire access ports. This assembly includes a Plexiglas door for additional protection.

Main DC Power Disconnect and Distribution Enclosure assembly. This assembly is pre-wired with flexible bus bars that permit a higher density in a smaller enclosure. Includes: a NEMA rated fiberglass enclosure, ignition protected circuit breakers, battery switching solenoids, relays, fuse blocks, control modules, and external connectors and power studs.

Bulkhead mount Main DC Engine Room Control Panel with enclosure protection. Includes: ignition protected circuit breakers, fire protection control module, external connectors and power studs.
Paneltronics is an outsource turnkey manufacturer of electrical power distribution panels, instruments panels, switch panels and enclosure box-build assemblies for Original Equipment Manufactures - OEMs. These products gave us our start in 1979 and continue to be the mainstay of our business.

Paneltronics’ OEM customers rely on our Design, Engineering, and Manufacturing expertise to deliver custom panels, systems, and assemblies that are technically superior, quality built, and can be trusted to perform reliably. Our flexibility allows us to build-to-print or fully deliver from concept through completion.

Contact our Technical Sales Team to discuss your custom requirements and let us put our experts to work for you.
Vertically Integrated Engineering

- Application Engineering support
- Mechanical Design and Engineering support
- Electrical Design and Engineering support
- Component Specification and Sourcing
- Graphic Design and Styling
- Enclosure / Box-Build System Consolidation and Optimization
- Engineering Documentation and Revision Control

Vertically Integrated Manufacturing

- 3D-CAD Solid Works and AutoCAD
- Prototyping
- CNC Sheet Metal Punching
- CNC Milling and Routing
- Welding and Sheet Metal Fabrication
- Painting
- Hydrographic Film Application
- Silk-Screen Printing
- Wire Harness Assembly
- Wire Imprinting
- Injection Molding and Tooling
- Electro-Mechanical Production Line Assembly
- Low Volume Electro-Mechanical Assembly Stations
- System Testing
- Foam-in-Place Packaging

We Manufacture Products for:

- Agricultural Equipment
- Boats
- Broadcast Vehicles
- Buses
- Command Post Vehicles
- Communication Vehicles
- Construction Equipment
- Display & Merchandising Equipment
- Emergency Vehicles
- Fire Trucks
- Generators
- Golf & Turf Equipment
- Hazmat Vehicles
- Material Handlers
- Mobile Command Vehicles
- Motor Coaches
- Off-Highway Vehicles
- Portable Compressors
- Recreational Vehicles
- Specialty Vehicles
- Utility Vehicles
- Yachts
**“A” Frame Magnetic Circuit Breakers**
- Standard branch AC or DC circuit breaker for Paneltronics electrical distribution panels
- Meets all American Boat and Yacht Council (ABYC) Standards for non-ignition protected circuit breakers
- UL Recognized (UL 1077) for use in the U.S.A.
- CSA Certified for use in Canada (ABYC E-11.10.2.1)
- Trip free (ABYC E-11.10.1.5.4 and E-11.10.2.1.1)
- Manual reset (ABYC E-11.10.1.5.6 and E-11.10.2.1.1)

**Specifications**

<table>
<thead>
<tr>
<th>Handle Color</th>
<th>Maximum Amperage</th>
<th>Maximum Voltage/ A/C Rating</th>
<th>Rated Switch Cycles</th>
<th>Electrical Hardware</th>
<th>Mounting Hardware</th>
<th>Hole Plugs</th>
</tr>
</thead>
<tbody>
<tr>
<td>White</td>
<td>50 Amps</td>
<td>32 VDC/2,500 Amps with no Back-up Fuse (ABYC E-11.10.1.5.5)</td>
<td>10,000 actuations at rated current and voltage</td>
<td>Screw 10-32 x 3/8&quot; pan combo head (P/N 197-188)</td>
<td>Screw 6-32 x 5/16 black flat Phillips head (P/N 197-002)</td>
<td>5/8&quot; diameter Black (P/N 016-005) and White (P/N 016-021)</td>
</tr>
<tr>
<td>White</td>
<td>50 Amps</td>
<td>V 50/ 60 Hz / 3,650 Amps with maximum rated series 80 Amp Back-up Fuse (ABYC E-11.10.2.1.2)</td>
<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

**CE Compliant “A” Frame Magnetic Circuit Breakers**
- Branch AC or DC circuit breaker for Paneltronics electrical distribution panels
- Meets all American Boat and Yacht Council (ABYC) Standards for non-ignition protected circuit breakers
- UL Recognized (UL 1077) for use in the U.S.A., and CSA Certified for use in Canada, VDE Approved, and CE Compliant for use in Europe (ABYC E-11.10.2.1)
- Trip free (ABYC E-11.10.1.5.4 and E-11.10.2.1.1)
- Manual reset (ABYC E-11.10.1.5.6 and E-11.10.2.1.1)

**Specifications**

<table>
<thead>
<tr>
<th>Handle Color</th>
<th>Maximum Amperage</th>
<th>Maximum Voltage/ A/C Rating</th>
<th>Rated Switch Cycles</th>
<th>Electrical Hardware</th>
<th>Mounting Hardware</th>
<th>Hole Plugs</th>
</tr>
</thead>
<tbody>
<tr>
<td>White</td>
<td>30 Amps</td>
<td>80 VDC/ 7,500 Amps with no Back-up Fuse (ABYC E-11.10.1.5.5)</td>
<td>10,000 actuations at rated current and voltage</td>
<td>Screw 10-32 x 3/8&quot; pan combo head (P/N 197-188)</td>
<td>External tooth lockwasher #10 (P/N 197-051)</td>
<td>5/8&quot; diameter Black (P/N 016-005) and White (P/N 016-021)</td>
</tr>
<tr>
<td>White</td>
<td>30 Amps</td>
<td>V 50/ 60 Hz / 5,000 Amps with maximum rated series 80 Amp Back-up Fuse (ABYC E-11.10.2.1.2)</td>
<td></td>
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</tbody>
</table>

**Shore Main Circuit Breakers with Reverse Polarity Trip Coil**
- Shore main AC circuit breaker for Paneltronics electrical distribution panels
- 120VAC 60 Hz (simultaneously breaks both hot and neutral legs)
- 220VAC 50 Hz (simultaneously breaks both live and neutral legs)
- Reverse Polarity Protector 65VAC trip coil (Surge arrester P/N 281-001 required) (ABYC E-11.6.3.3.1)
- Smart Breaker: Trips automatically upon sensing reverse polarity

**Circuit Breaker Handle Locks**
- For CE compliant “A” and “C” Frame Breakers
- Prevents inadvertent actuation of the circuit breaker handle in either the ON or OFF position
- Does not interfere with the circuit breaker’s trip mechanism
Panel Seal/ Waterproof “A” Frame Magnetic Circuit Breakers

- Branch AC or DC Circuit Breakers for Paneltronics electrical distribution panels
- Meets all American Boat and Yacht Council (ABYC) Standards for non ignition protected circuit breakers
- UL Recognized (UL 1077) for use in the U.S.A., and CSA Certified for use in Canada
- Trip free (ABYC E-11.10.1.5.4 and E-11.10.2.1.1)
- Manual reset (ABYC E-11.10.1.5.6 and E-11.10.2.1.1)

Specifications

<table>
<thead>
<tr>
<th>Handle</th>
<th>Metal with Silicon rubber seal</th>
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<tbody>
<tr>
<td>Maximum Amperage</td>
<td>50 Amps</td>
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<tr>
<td>Maximum Voltage/ AIC</td>
<td>32 VDC/ 2.500 Amps with no Back-up Fuse (ABYC E-11.10.1.5.5)</td>
</tr>
<tr>
<td>Rating</td>
<td>Rated Switch Cycles 10,000 actuations at rated current and voltage</td>
</tr>
<tr>
<td>Electrical Hardware</td>
<td>Screw 10-32 x 3/8” pan combo head (P/N 197-188)</td>
</tr>
<tr>
<td>Mounting Hardware</td>
<td>Hex nut 1/2-32 (supplied with circuit breaker)</td>
</tr>
<tr>
<td>Optional Boot</td>
<td>Lockwasher 1/2” internal tooth (supplied with circuit breaker)</td>
</tr>
</tbody>
</table>

Optional Boot: Black silicone rubber (P/N 048-015)

“C” Frame Magnetic Circuit Breakers

- Standard Circuit Breakers for Paneltronics electrical distribution panels
- Meets all American Boat and Yacht Council (ABYC) Standards for non-ignition protected circuit breakers
- UL Recognized (UL 1077) for use in the U.S.A., and CSA Certified for use in Canada
- Trip free (ABYC E-11.10.1.5.4)
- Manual reset (ABYC E-11.10.1.5.6)

Specifications

| Electrical Hardware     | Hex Nut 1/4-20 (supplied with circuit breaker) |
| Flat Washer             | 1/4” Diameter (supplied with circuit breaker) |
| Mounting Hardware for non-CE Breakers | Screw 6-32 x 5/16” black Phillips head (P/N 197-002) |
| Mounting Hardware for CE Breakers | Screw 6-32 x 5/16” white Phillips head (P/N 197-002W) |
| Hole Plug               | Screw 6-32 x 1/4 black Phillips head (P/N 197-182) |
|                         | Screw 6-32 x 1/4” white Phillips head (P/N 197-182W) |
|                         | Black (P/N 100-295) |

Circuit Breaker Part Number

<table>
<thead>
<tr>
<th>Amp</th>
<th>37 VDC MAX AIC 5,000 Amps</th>
<th>250 VAC MAX AIC 5,000 Amps</th>
<th>90 VDC MAX AIC 10,000 Amps</th>
<th>250 VAC MAX AIC 5,000 Amps</th>
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<td>80</td>
<td>020-049</td>
<td>020-181</td>
<td>020-266</td>
</tr>
<tr>
<td></td>
<td>100</td>
<td>020-025</td>
<td>020-182</td>
<td>020-267</td>
</tr>
</tbody>
</table>

Shore Main Circuit Breakers with Reverse Polarity Trip Coil

- “C” Frame- UL Recognized
- Features: Smart Breaker
  - Trips automatically upon sensing reverse polarity

<table>
<thead>
<tr>
<th>Amperage</th>
<th>250 VAC MAX - AIC 5,000 Amps</th>
</tr>
</thead>
<tbody>
<tr>
<td>16A/65V</td>
<td>020-127</td>
</tr>
<tr>
<td>30A/65V</td>
<td>020-126</td>
</tr>
<tr>
<td>50A/65V</td>
<td>020-128</td>
</tr>
</tbody>
</table>

Smart Breaker: Trips automatically upon sensing reverse polarity
**Parts & Components**

“E” Frame Magnetic Circuit Breakers
- Standard three pole Circuit Breakers for Paneltronics electrical distribution panels
- Meets all American Boat and Yacht Council (ABYC) Standards for non ignition protected circuit breakers
- UL Listed (UL 489) for use in the U.S.A., and CSA Certified for use in Canada
- Trip free (ABYC E-11.10.1.5.4)
- Manual reset (ABYC E-11.10.1.5.6)

**Specifications**

<table>
<thead>
<tr>
<th>Handle Color</th>
<th>Black</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum Amperage</td>
<td>100 Amps</td>
</tr>
<tr>
<td>Maximum Voltage/AIC Rating</td>
<td>240 VAC/5,000 Amps</td>
</tr>
<tr>
<td>Rated Switch Cycle</td>
<td>10,000 actuations at rated current and voltage</td>
</tr>
<tr>
<td>Electrical Hardware</td>
<td>Hex Nut 1/4-20 (supplied with circuit breaker)</td>
</tr>
<tr>
<td>Flat Washer</td>
<td>1/4” Diameter (supplied with circuit breaker)</td>
</tr>
<tr>
<td>Torque Rating</td>
<td>45 in-lbs (5N•m) max</td>
</tr>
<tr>
<td>Mounting Hardware</td>
<td>6@ E-32 x 3/8” black flat head Phillips head (197-098)</td>
</tr>
<tr>
<td></td>
<td>6@ E-32 x 3/8” white flat head Phillips head (197-098W)</td>
</tr>
<tr>
<td>Torque Rating</td>
<td>8 in-lbs (0.9Nm) max</td>
</tr>
<tr>
<td>Hole Plug</td>
<td>Black (100-296)</td>
</tr>
</tbody>
</table>

**Branch Circuit Breaker**
- For 12 or 24 VDC systems
- Ignition Protected (ABYC E-11.10.1.5.1 and SAE J1171)
- Meets the requirements of SAE J1428 for use in the U.S.A. and CE marked for use in Europe
- Trip free (ABYC E-11.10.1.5.4)
- Manual reset (ABYC E-11.10.1.5.6)

**Specifications**

<table>
<thead>
<tr>
<th>Handle Color</th>
<th>Yellow</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum Voltage</td>
<td>48VDC</td>
</tr>
<tr>
<td>Maximum Amperage</td>
<td>150 Amps</td>
</tr>
<tr>
<td>AIC Rating</td>
<td>5,000 Amps @ 12VDC</td>
</tr>
<tr>
<td></td>
<td>3,000 Amps @ 24VDC</td>
</tr>
<tr>
<td></td>
<td>1,500 Amps @ 42VDC</td>
</tr>
<tr>
<td>Watertight per IEC 60529</td>
<td>IP66 Rating</td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>-40°F (-40°C) to 185°F (85°C)</td>
</tr>
<tr>
<td>Mounting Hardware</td>
<td>2@ #10 X 1” Pan Head Phillips Screw Black (198-014)</td>
</tr>
</tbody>
</table>

**Main Circuit Breaker**
- Over current protection for 12VDC systems
- Branch circuit breaker protection for 12 or 24VDC systems
- Ignition Protected (ABYC E-11.10.1.5.1 and SAE J1171)
- Meets the requirements of SAE J1428 for use in the U.S.A. and CE marked for use in Europe
- Trip free (ABYC E-11.10.1.5.4)
- Manual reset (ABYC E-11.10.1.5.6)

**Specifications**

<table>
<thead>
<tr>
<th>Handle Color</th>
<th>Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amperage</td>
<td>Part Number</td>
</tr>
<tr>
<td>100</td>
<td>010-009</td>
</tr>
</tbody>
</table>

**Circuit Breaker Color Caps**
- For “A” Frame Breakers (except CE Compliant and Waterproof units)
- Provides high visibility color coding for critical circuits

<table>
<thead>
<tr>
<th>Color</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red</td>
<td>206-093</td>
</tr>
<tr>
<td>Orange</td>
<td>206-094</td>
</tr>
<tr>
<td>Yellow</td>
<td>206-095</td>
</tr>
<tr>
<td>Green</td>
<td>206-096</td>
</tr>
<tr>
<td>Blue</td>
<td>206-097</td>
</tr>
<tr>
<td>Gray</td>
<td>206-098</td>
</tr>
<tr>
<td>White</td>
<td>206-099</td>
</tr>
</tbody>
</table>

**Circuit Breaker Hole Plugs**
- For “A” Frame Breakers
- Covers unused circuit breaker panel position

<table>
<thead>
<tr>
<th>Color</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black</td>
<td>016-004</td>
</tr>
<tr>
<td>White</td>
<td>016-021</td>
</tr>
</tbody>
</table>

**Part Numbers**

<table>
<thead>
<tr>
<th>Amperage</th>
<th>Circuit Breaker Part Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>206-034 206-036</td>
</tr>
<tr>
<td>30</td>
<td>206-043 206-037</td>
</tr>
<tr>
<td>40</td>
<td>206-044 206-038</td>
</tr>
<tr>
<td>50</td>
<td>206-045 206-039</td>
</tr>
<tr>
<td>60</td>
<td>206-046 206-040</td>
</tr>
<tr>
<td>80</td>
<td>206-047 206-041</td>
</tr>
<tr>
<td>100</td>
<td>206-048 206-042</td>
</tr>
</tbody>
</table>

**Single Pole - Ignition Protected CE Compliant Thermal Push-to-Reset Circuit Breakers**
- Branch Circuit Breaker for Paneltronics electrical distribution panels 12 or 24 VDC breaks positive line
- Meets all American Boat and Yacht Council (ABYC) Standards for ignition protected circuit breakers UL 1500 and ISO 8846
- UL Recognized (UL 1077) for use in the U.S.A., CSA Certified for use in Canada and CE Compliant for use in Europe
- Trip free (ABYC E-11.10.1.5.4)
- Manual reset (ABYC E-11.10.1.5.6)

**Specifications**

<table>
<thead>
<tr>
<th>Handle Color</th>
<th>White</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum Amperage</td>
<td>30 Amps</td>
</tr>
<tr>
<td>Maximum Voltage/AIC Rating</td>
<td>32 VDC - 2,500 Amps (ABYC E-11.10.1.5.5)</td>
</tr>
<tr>
<td>Mounting Hardware</td>
<td>Knurled dress nut 3/8-27 black plastic (P/N 001-185)</td>
</tr>
<tr>
<td>Boot</td>
<td>Clear Silicone rubber boot fits 3/8-27 UNS-2B bushing (P/N 048-033)</td>
</tr>
<tr>
<td></td>
<td>White Silicone rubber boot fits 3/8-27 UNS-2B bushing (P/N 048-034)</td>
</tr>
<tr>
<td></td>
<td>Black Silicone rubber boot fits 3/8-27 UNS-2B bushing (P/N 048-035)</td>
</tr>
</tbody>
</table>

**Series 187 Panel Mount Thermal Circuit Breakers (MRCB)**
- Main circuit breaker over current protection for 12VDC systems, and Branch circuit breaker protection for 12 or 24VDC systems
- Ignition Protected (ABYC E-11.10.1.5.1 and SAE J1171)
- Meets the requirements of SAE J1428 for use in the U.S.A. and CE marked for use in Europe
- Trip free (ABYC E-11.10.1.5.4)
- Manual reset (ABYC E-11.10.1.5.6)

**Specifications**

<table>
<thead>
<tr>
<th>Handle Color</th>
<th>Yellow</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum Voltage</td>
<td>48VDC</td>
</tr>
<tr>
<td>Maximum Amperage</td>
<td>150 Amps</td>
</tr>
<tr>
<td>AIC Rating</td>
<td>5,000 Amps @ 12VDC</td>
</tr>
<tr>
<td></td>
<td>3,000 Amps @ 24VDC</td>
</tr>
<tr>
<td></td>
<td>1,500 Amps @ 42VDC</td>
</tr>
<tr>
<td>Watertight per IEC 60529</td>
<td>IP66 Rating</td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>-40°F (-40°C) to 185°F (85°C)</td>
</tr>
<tr>
<td>Mounting Hardware</td>
<td>2@ #10 X 1” Pan Head Phillips Screw Black (198-014)</td>
</tr>
</tbody>
</table>

**Panel Mount and Surface Mount in additional amperages available. Contact Paneltronics for availability and information.**
S Series Push To Reset Thermal Circuit Breakers (SDLM)
- Main and Branch circuit breaker overcurrent protection for 12VDC systems.
- Ignition Protected (ABYC E-11.10.1.5.1 and SAE J1171)
- Meets the requirements of SAE J1625 for use in the U.S.A. and CE marked for use in Europe
- Trip free (ABYC E-11.10.1.5.4)
- Manual reset (ABYC E-11.10.1.5.6)

Specifications
- Handle Color: Red
- Maximum Voltage: 30VDC
- Maximum Amperage: 150 Amps
- AIC Rating: 5,000 Amps @ 12VDC
- Watertight per IEC 60529: IP67 Rating
- Operating Temperature: -60°F (-51.1°C) to 160°F (71°C)
- Mounting Hardware: #10-32 X 3/4” Flat Head Phillips Screw Black (197-095)

Fuse Holder Assembly
- Low profile
- Splash Proof
- For AGC and 3AG glass fuses (1/4” Diameter x 1/4” Long)
- Maximum panel thickness 0.300 inches
- Tin plated brass terminals
- UL Recognized and CSA Certified (250 VAC/ 250 VDC 20 A max)

In-line ATC fuse holder assembly
- Waterproof
- Terminals are tin plated brass
- 8” pigtails are tin plated copper 105°C (ABYC E-11.14.2.1.1)
- Accepts 1500/ SAE J1171 ATC Type fuse with 5,000 AIC rating at 24 VDC (ABYC E-11.10.1.6.2)

Circuit Breaker Mounting Screws
- Screws are stainless steel 6-32 phillips
- Heads are coated with polyurethane paint to prevent corrosion

Sealing Boots For C-Frame Circuit Breakers
- Front-panel mounted boot and frame for single lever and rocker actuated C-Frame circuit breakers
- Transparent boot marked ON with molded-in trigger to eliminate contact teasing
- Will not discolor or crack due to UV/ageing
- RoHs compliant

Specifications
- Boot, Transparent Silicone Rubber Frame, Steel Zinc Plated with Chromate Finish
- Operating Temperature: -80°F (-62.2°C) To 400°F (204°C)
- Watertight per IEC 60529: IP66 Rating Or IP68 depending on installation
- Mounting Hardware: 2@ #6-32 X 3/8” slotted stainless steel screws with Rubber O-Rings (supplied with boot)
**Digital Meters**
- Monitor marine/land based power distribution and generating systems (ABYC E-11.9.3.2)
- AC voltmeter and AC ammeter are true RMS (ABYC E-11.3.2.3)
- Surface mount with only two 5/32” diameter holes
- Window mount in standard 2.5” analog meter cutout (2.90” W x 1.28” H)
- Three digit LED display (Frequency meters are two digits)
- Reversed Polarity Protected
- Splashproof front
- Includes pigtails, mounting hardware, and instructions

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
<th>Range</th>
<th>Input</th>
<th>Sensitivity</th>
<th>Shunt or CT P/N</th>
</tr>
</thead>
<tbody>
<tr>
<td>570-001B</td>
<td>DC Voltmeter</td>
<td>0-50 VDC</td>
<td>Direct Read</td>
<td>0-50 VDC</td>
<td>N/A</td>
</tr>
<tr>
<td>570-002B</td>
<td>DC Ammeter</td>
<td>0-100 DCA</td>
<td>Shunt Rated</td>
<td>100 A/50 mV</td>
<td>289-013</td>
</tr>
<tr>
<td>570-003B</td>
<td>AC Voltmeter</td>
<td>10-250 VAC</td>
<td>Direct Read</td>
<td>0-250 VAC</td>
<td>N/A</td>
</tr>
<tr>
<td>570-004B</td>
<td>AC Ammeter</td>
<td>0-100 ACA</td>
<td>Transformer Rated</td>
<td>100 A/100 mA</td>
<td>289-009</td>
</tr>
<tr>
<td>570-005B</td>
<td>Freq. Meter</td>
<td>10-99 Hz</td>
<td>Direct Read</td>
<td>120-240 VAC</td>
<td>N/A</td>
</tr>
<tr>
<td>570-006B</td>
<td>DC Ammeter</td>
<td>0-500 DCA</td>
<td>Shunt Rated</td>
<td>500 A/200 mA</td>
<td>289-037</td>
</tr>
</tbody>
</table>

**Specifications**
- Display Character Size: 9/16”
- Input Voltage: 8-32 VDC
- Power Consumption: 1 Watt 12VDC
- Accuracy: +/-1 Count
- Operating Temperature Range: 32-122°F

**Dimensions**
- Width: 3.08” (78.23 mm)
- Height: 2.38” (60.45 mm)
- Depth: 1.0” (25.40 mm)

**DC Ammeter Shunts**
- Compact space-saving design
- Insulated mounting base
- End blocks are machined from solid naval brass
- Temperature coefficient 0.002% per 1°C
- Resistance elements are manganin for long term temperature stability
- Potential terminals are 6-32 brass screws

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Rating</th>
<th>Size L x W x H</th>
<th>High and Low Line Terminals</th>
</tr>
</thead>
<tbody>
<tr>
<td>289-010</td>
<td>50 mV/80 A</td>
<td>1.625 x 1.25 x 1.687</td>
<td>1/4-28 UNF Studs</td>
</tr>
<tr>
<td>289-013</td>
<td>50 mV/100 A</td>
<td>1.625 x 1.25 x 1.687</td>
<td>1/4-28 UNF Studs</td>
</tr>
<tr>
<td>289-015</td>
<td>50 mV/50 A</td>
<td>1.625 x 1.25 x 1.687</td>
<td>1/4-28 UNF Studs</td>
</tr>
<tr>
<td>289-037</td>
<td>200 mV/500 A</td>
<td>3.250 x 1.75 x 1.750</td>
<td>3/8-16 UNC hex Head Bolt</td>
</tr>
</tbody>
</table>

**AC Miniature Meter Current Transformer**
- Tape wound for quiet, long term, reliable, performance
- Tough PVC moisture resistant coating
- Rated for 50/60 Hz operation
- 6” secondary pigtails are tin plated, copper and are color coded red and black
- Temperature range 0-80°C

**Solid State 12 Volt Dual Blower Controller**
- Enables remote control of two blower motors from multiple locations
- Conveniently located, low current, SPST Momentary, switches with Integral Green LED Status Indicators (P/N 004-454) Control Blower Motors
- Status indicators flash if either blower fails
- Requires three #14 AWG Conductor Switch Control Circuit
- Surface Mount
- Meets SAE J1171, External Ignition Protection of Marine Devices (ABYC E-11.5.3.1 AND E-11.4.15 Note 7)

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enclosure Material</td>
<td>ABS - UL 94 V-0</td>
</tr>
<tr>
<td>Color</td>
<td>Black</td>
</tr>
<tr>
<td>Weight</td>
<td>0.12 lb (0.005 kg)</td>
</tr>
<tr>
<td>Size</td>
<td>4.3” (109.4 mm) x 3.8” (95.3 mm) x 1.4” (35.6 mm)</td>
</tr>
<tr>
<td>Mounting Hardware</td>
<td>4@8-32 x 1/2” round head slotted screw with external tooth lock washer (197-033)</td>
</tr>
<tr>
<td>Maximum Voltage</td>
<td>16 VDC</td>
</tr>
<tr>
<td>Minimum Voltage</td>
<td>10 VDC</td>
</tr>
<tr>
<td>Maximum Current</td>
<td>10 Amps per blower motor</td>
</tr>
<tr>
<td>Fuse</td>
<td>2@ 10 Amps ignition Protected blade type (010-006)</td>
</tr>
<tr>
<td>Fuse Holder</td>
<td>2@ In-Line blade type (001-724)</td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>-40°F (-40°C) to 185°F (85°C)</td>
</tr>
</tbody>
</table>
Analog Meters

- High intensity red LED 12VDC 12mA, 24 VDC 6mA, and 32 VDC 4mA
- Easy to install prism assembly
- Analog Meter Illumination Kits (for M2 type meters only)
  - High intensity red LED 12VDC 12mA, 24 VDC 6mA, and 32 VDC 4mA
  - Easy to install prism assembly

<table>
<thead>
<tr>
<th>Part Number</th>
<th>LED Color</th>
<th>LED Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>100-249-7</td>
<td>Red</td>
<td>12 VDC</td>
</tr>
<tr>
<td>100-249-8</td>
<td>Red</td>
<td>24 VDC</td>
</tr>
<tr>
<td>100-249-9</td>
<td>Red</td>
<td>32 VDC</td>
</tr>
</tbody>
</table>

M1 - 1 1/2” Panel Meters

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Meter Type</th>
<th>Range</th>
<th>Description</th>
<th>Sensitivity</th>
</tr>
</thead>
<tbody>
<tr>
<td>289-053</td>
<td>DC Volts</td>
<td>8-16 VDC</td>
<td>Moving magnet, suppressed zero</td>
<td>100 ohm/V</td>
</tr>
<tr>
<td>289-054</td>
<td>DC Amps</td>
<td>0-50 DCA</td>
<td>Moving magnet, zero left, internal shunt</td>
<td>N/A</td>
</tr>
<tr>
<td>289-049</td>
<td>AC Volts</td>
<td>0-150 VAC</td>
<td>Taut band, moving coil, rectifier type</td>
<td>900 ohm/V</td>
</tr>
<tr>
<td>289-050</td>
<td>AC Volts</td>
<td>0-300 VAC</td>
<td>Taut band, moving coil, rectifier type</td>
<td>900 ohm/V</td>
</tr>
<tr>
<td>289-051</td>
<td>AC Amps</td>
<td>0-50 ACA</td>
<td>Moving magnet, external transformer rated</td>
<td>CT P/N 289-009</td>
</tr>
</tbody>
</table>

M2 - 2 1/2” Panel Meters

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Meter Type</th>
<th>Range</th>
<th>Description</th>
<th>Sensitivity</th>
</tr>
</thead>
<tbody>
<tr>
<td>289-001</td>
<td>DC Volts</td>
<td>8-16 VDC</td>
<td>Taut band, moving coil, suppressed zero</td>
<td>1000 ohm/V</td>
</tr>
<tr>
<td>289-017</td>
<td>DC Volts</td>
<td>16-32 VDC</td>
<td>Taut band, moving coil, suppressed zero</td>
<td>1000 ohm/V</td>
</tr>
<tr>
<td>289-025</td>
<td>DC Volts</td>
<td>0-50 VDC</td>
<td>Taut band, moving coil</td>
<td>1000 ohm/V</td>
</tr>
</tbody>
</table>

Analog Meter Illumination Kits (for M2 type meters only)

- High intensity red LED 12VDC 12mA, 24 VDC 6mA, and 32 VDC 4mA
- Easy to install prism assembly

<table>
<thead>
<tr>
<th>Part Number</th>
<th>LED Color</th>
<th>LED Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>100-249-7</td>
<td>Red</td>
<td>12 VDC</td>
</tr>
<tr>
<td>100-249-8</td>
<td>Red</td>
<td>24 VDC</td>
</tr>
<tr>
<td>100-249-9</td>
<td>Red</td>
<td>32 VDC</td>
</tr>
</tbody>
</table>

Series 8500 Quartz Plus DC Hour Meters

- 10,000 hour quartz hour meter with automatic recycle to zero
- Displays operating time in hours and tenths, plus running indicator
- Shockproof quartz and odometer gear train mechanism totally sealed in a polyester case with gasketed glass lens
- UL Recognized and CSA Certified

Specifications

- Input Voltage: 12 - 60VDC
- Max Input Voltage: 80VDC
- Power Consumption: 0.05 Watts @ 12VDC
- Accuracy: +/- 0.02%
- Watertight per IEC 60529: IP 66 Rating
- Operating Temperature: -40°F (-40°C) To 185°F (85°C)
- Display Character Size: 0.12” (3mm)
- Electrical Termination: 1/4" Quick Connect Tab
- Panel Cutout: 1.74” (44.19mm) X 0.925” (23.49mm)
- Mounting Hardware: 6-32 X 1/2” Pan Head Phillips Screw Black (197-003)

Part Number

1808-001
Source Selection Rotary Switches
- Provides a convenient method of selecting from multiple power sources (ABYC E-11.5.5.6)
- Contacts break before make to maintain isolation of power sources (ABYC E-11.5.5.6.1)
- Mounts on panels up to 1/4” (6.35mm) thick
- UL Listed, CE marked, and CSA Certified
- Body made of non-corrosive materials
- I-Handle standard
- Operating Temperature: -13°F (-25°C) to 131°F (55°C)

Special Function Switches
- Three Phase AC Voltmeter/Ammeter Switch
- Enables the monitoring of three phase voltage and current by a single voltmeter and ammeter.

### Parts & Components

#### Source Selection Rotary Switches

- **Part Number**: 006-040
- **AC V MAX**: 300
- **AC I MAX**: 10
- **Maximum Wire Size**: 14 AWG
- **Width in (mm)**: 1.18 (30)
- **Height in (mm)**: 1.18 (30)
- **Depth in (mm)**: 3.41 (86.6)

#### Special Function Switches

- **Part Number**: 001-008
- **Poles/Throw Action**: SPST ON/OFF
- **Contact Marking**: None

#### Standard AC Source Selector Switches

- **Part Number**: 006-004
- **Function**: Power Sources
- **Poles**: 2
- **Throw**: 2
- **AC V MAX**: 600
- **AC I MAX**: 50
- **Maximum Wire Size**: 8 AWG
- **Width in (mm)**: 2.52 (64)
- **Height in (mm)**: 2.52 (64)
- **Depth in (mm)**: 2.56 (65)
- **Configuration**: Source 1 / OFF / Source 2 (120V/220V)

#### Metal Bat Handle Toggle Switches

- **Part Number**: 001-008
- **Poles/Throw Action**: SPST
- **Contact Marking**: None

#### Rocker Switches

- **Part Number**: 001-251
- **Poles/Throw Action**: SPST
- **Contact Marking**: None

#### Metal Bat Handle Toggle Switches

- **Part Number**: 001-008
- **Poles/Throw Action**: SPST
- **Contact Marking**: None
- **Hole plugs 1/2” diameter Black (P/N 016-016) and White (P/N 016-020)
Rockers Switches (Waterproof Contura)
- Single or double pole, and maintaining or momentary configurations are available
- Sealed IP68 rated per IEC 529
- Ignition protection construction meets requirements of UL 1500 and ISO 8846
- Black textured actuators (Hard Surface with Bumps)
- Red incandescent 12VDC 80mA Status Indicators
- Contacts are rated at 12VDC 20A, or 24VDC 15A (ABYC E-11.12.1.1)
- DC moisture resistant Per Mil-Std 202F, Method 107F
- Optional rubber gaskets provide a watertight panel seal meets IP67 (P/N 004-176)
- 1/4” male tab terminals are standard without barriers (ABYC E-11-14.5.4 Exception)
- Hole plug Black (P/N 001-295)

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Poles/Throw</th>
<th>Action</th>
<th>Status Indicator</th>
</tr>
</thead>
<tbody>
<tr>
<td>001-675</td>
<td>SPST</td>
<td>ON/ON</td>
<td>Dependent</td>
</tr>
<tr>
<td>004-246</td>
<td>SPST</td>
<td>ON/ON</td>
<td>None</td>
</tr>
<tr>
<td>004-178</td>
<td>SPST</td>
<td>OFF/(ON)</td>
<td>None</td>
</tr>
<tr>
<td>001-700</td>
<td>SPDT</td>
<td>ON/ON/ON</td>
<td>2 Dependent</td>
</tr>
<tr>
<td>001-692</td>
<td>SPDT</td>
<td>ON/ON/ON</td>
<td>None</td>
</tr>
<tr>
<td>004-244</td>
<td>SPDT</td>
<td>(ON)/OFF/ON</td>
<td>None</td>
</tr>
<tr>
<td>004-179</td>
<td>DPST</td>
<td>ON/OFF</td>
<td>None</td>
</tr>
<tr>
<td>001-699</td>
<td>DPDT</td>
<td>ON/OFF/ON</td>
<td>2 Dependent</td>
</tr>
<tr>
<td>001-455</td>
<td>DPDT</td>
<td>ON/OFF/ON</td>
<td>None</td>
</tr>
<tr>
<td>004-194</td>
<td>DPDT</td>
<td>ON/OFF/(ON)</td>
<td>None</td>
</tr>
<tr>
<td>001-453</td>
<td>DPDT</td>
<td>ON/(OFF)/ON</td>
<td>None</td>
</tr>
</tbody>
</table>

001-204
5/32” - LED Indicators
- Ideal for use as Status or Alarm Indicators
- Small T-1 size LED’s
- Nylon housing is classified UL 94 V-0
- Press to fit into 0.166” diameter panel hole
- Pigtailed are tin plated, 22 gauge, stranded, copper, 7” in length stripped 1/4” (ABYC E-11.14.1.2 and Exception 5)

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Voltage</th>
<th>LED Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>001-156</td>
<td>12-14 VDC</td>
<td>Red</td>
</tr>
<tr>
<td>001-204</td>
<td>12-14 VDC</td>
<td>Green</td>
</tr>
<tr>
<td>111-176</td>
<td>24 VDC</td>
<td>Red</td>
</tr>
<tr>
<td>111-177</td>
<td>24 VDC</td>
<td>Green</td>
</tr>
<tr>
<td>048-021</td>
<td>120 VAC</td>
<td>Red</td>
</tr>
<tr>
<td>048-022</td>
<td>120 VAC</td>
<td>Green</td>
</tr>
<tr>
<td>048-024</td>
<td>240 VAC</td>
<td>Red</td>
</tr>
<tr>
<td>048-025</td>
<td>240 VAC</td>
<td>Amber</td>
</tr>
<tr>
<td>048-026</td>
<td>240 VAC</td>
<td>Green</td>
</tr>
</tbody>
</table>

048-004
1/4” - LED Indicators
- Ideal for use as High Visibility Status or Alarm Indicators
- Large T-1 3/4 size LED’s
- Nylon housing is classified UL 94 V-0
- Press to fit into 0.25” diameter panel hole
- Pigtailed are tin plated, 22 gauge, stranded, copper, 7” in length stripped 1/4” (ABYC E-11.14.1.2 and Exception 5)

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Voltage</th>
<th>LED Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>048-003</td>
<td>12-14 VDC</td>
<td>Red</td>
</tr>
<tr>
<td>048-004</td>
<td>12-14 VDC</td>
<td>Green</td>
</tr>
<tr>
<td>048-005</td>
<td>12-14 VDC</td>
<td>Amber</td>
</tr>
<tr>
<td>048-029</td>
<td>24 VDC</td>
<td>Amber</td>
</tr>
<tr>
<td>048-011</td>
<td>120 VDC</td>
<td>Red</td>
</tr>
<tr>
<td>048-016</td>
<td>120 VAC</td>
<td>Green</td>
</tr>
<tr>
<td>048-017</td>
<td>120 VAC</td>
<td>Amber</td>
</tr>
<tr>
<td>048-027</td>
<td>240 VAC</td>
<td>Green</td>
</tr>
<tr>
<td>048-028</td>
<td>240 VAC</td>
<td>Red</td>
</tr>
</tbody>
</table>

048-007
Incandescent Indicators
- Ideal for use as High Visibility Status or Alarm Indicators
- Large polycarbonate Lens
- Black bezel
- Nylon housing
- Press to fit into 0.312” diameter panel hole
- Pigtailed are tin plated, 18 gauge, stranded, copper, 6” in length stripped 3/8” (ABYC E-11.14.1.2 and Exception 5)

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Voltage</th>
<th>LED Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>048-006</td>
<td>14 VDC</td>
<td>Red</td>
</tr>
<tr>
<td>048-007</td>
<td>14 VDC</td>
<td>Green</td>
</tr>
<tr>
<td>048-008</td>
<td>14 VDC</td>
<td>Amber</td>
</tr>
</tbody>
</table>

Silicone Rubber Boots
- For bat handle toggle switches, push button switches, and panel seal circuit breakers
- Provides a watertight seal between switch actuator, bushing, and panel face
- Highly flexible, tear resistant, silicone rubber construction enables an un-obstructed visual indication of switch actuator position (Except 048-034 and 048-035)
- Mounting nuts are bonded to eliminate delamination
- Thermal characteristics insure reliable performance over a wide temperature range
- Inhibits the rotation of switches or circuit breakers subjected to low frequency vibration
- Resists discoloring and cracking

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Base Thread Size</th>
<th>Base Shape</th>
<th>Base Diameter</th>
<th>Color</th>
<th>Height</th>
<th>Typical Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>048-001</td>
<td>15/35-32NS-2B</td>
<td>Hex</td>
<td>5/8”</td>
<td>Black</td>
<td>7/8”</td>
<td>Toggle Switch (pg.34)</td>
</tr>
<tr>
<td>048-002</td>
<td>15/35-32NS-2B</td>
<td>Round</td>
<td>23/32”</td>
<td>Black</td>
<td>7/8”</td>
<td>Toggle Switch (pg.34)</td>
</tr>
<tr>
<td>048-010</td>
<td>15/35-32NS-2B</td>
<td>Hex</td>
<td>5/8”</td>
<td>Gray</td>
<td>7/8”</td>
<td>Toggle Switch (pg.34)</td>
</tr>
<tr>
<td>048-015</td>
<td>1/2-20NS-2B</td>
<td>Round</td>
<td>23/32”</td>
<td>Black</td>
<td>7/8”</td>
<td>Waterproof Breaker (pg.29)</td>
</tr>
<tr>
<td>048-018</td>
<td>15/35-32NS-2B</td>
<td>Hex</td>
<td>5/8”</td>
<td>Black</td>
<td>3/8”</td>
<td>Toggle Switch (pg.34)</td>
</tr>
</tbody>
</table>
**Power Posts**
- Insulated bases are glass reinforced Nylon
- All fasteners are galvanically compatible to reduce corrosion (ABYC E-11.14.5.2)
- Studs are 300 series stainless steel
- Assembly includes stainless steel hex nut, split lockwasher, and flat washer
- Rated for 48VDC Maximum
- Current ratings are dependent on wire and terminal size utilized

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Stud Size</th>
<th>Stud Length</th>
<th>Outside Dimension</th>
</tr>
</thead>
<tbody>
<tr>
<td>048-036</td>
<td>100 DCA</td>
<td>10 x 10-24 nickel plate brass combo head screws</td>
<td>5.750&quot; L x 1.250&quot; W x 1.344&quot; H</td>
</tr>
<tr>
<td>048-037</td>
<td>120 DCA</td>
<td>12 x 10-24 nickel plate brass combo head screws</td>
<td>5.750&quot; L x 1.250&quot; W x 1.344&quot; H</td>
</tr>
</tbody>
</table>

**High Current Feed Through Bushings**
- Passes high current carrying conductors through 1/8"(3.18mm) panel thickness
- Provides strain relief and eliminates conductor insulation chafing
- Resists up to 422 in lbs (47.7Nm) of anti-rotation torque

**Specifications**
- Maximum Operating Voltage: 48VDC
- Stud Material: Brass
- Insulator Bushing Material: Glass Filled Nylon
- Insulator Bushing Color: Black
- Panel Cutout: Use Greenlee Double D Punch #60098(1.375" X 1.125" Diameter)

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Finish</th>
<th>I Max</th>
<th>Description</th>
<th>Max Torque</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>111-312</td>
<td>Brass</td>
<td>250 Amps</td>
<td>3/8&quot;-16 Stud</td>
<td>192 in lbs (21.7Nm)</td>
<td>0.22 lb (0.10kg)</td>
</tr>
<tr>
<td>111-312-TP</td>
<td>Tin-Plated Brass</td>
<td>250 Amps</td>
<td>3/8&quot;-16 Stud</td>
<td>192 in lbs (21.7Nm)</td>
<td>0.22 lb (0.10kg)</td>
</tr>
<tr>
<td>111-313</td>
<td>Brass</td>
<td>400 Amps</td>
<td>1/2&quot;-13 Stud</td>
<td>422 in lbs (47.7Nm)</td>
<td>0.4 lb (0.18kg)</td>
</tr>
<tr>
<td>111-313-TP</td>
<td>Tin-Plated Brass</td>
<td>400 Amps</td>
<td>1/2&quot;-13 Stud</td>
<td>422 in lbs (47.7Nm)</td>
<td>0.4 lb (0.18kg)</td>
</tr>
</tbody>
</table>

**Dual Bus Common Bus (tin plated brass)**
- Maximum continuous current rating is 60DCA
- Maximum voltage rating is 48VDC
- All fasteners and the bus are galvanically compatible to reduce corrosion (ABYC E-11.14.5.2)
- Bus material is 0.360" x 0.090" tin plated brass
- Back material is black Nylon

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
<th>Outside Dimension</th>
</tr>
</thead>
<tbody>
<tr>
<td>111-283-90</td>
<td>12 x 8-32 x 1/4&quot; tin plated brass combo head screws</td>
<td>4.375&quot; L x 1.500&quot; W x 0.430&quot; H</td>
</tr>
</tbody>
</table>

**Bus Bar (tin plated copper)**
- Maximum continuous current rating is 445DCA
- Maximum voltage rating is 48VDC
- All fasteners and the bus are galvanically compatible to reduce corrosion (ABYC E-11.14.5.2)
- Two 1/4-20 stainless steel studs with four nickel plated brass hex nuts and two stainless steel split lockwashers
- Bus material is 1" x 1/4" copper-tin plated
- Back material is black Nylon

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
<th>Outside Dimension</th>
</tr>
</thead>
<tbody>
<tr>
<td>100-875</td>
<td>2 x 3/8-16 stainless steel studs, 4 x hex nuts, 2 x lockwashers</td>
<td>6.750&quot; L x 1.250&quot; W x 1.875&quot; H</td>
</tr>
<tr>
<td>100-877</td>
<td>4 x 3/8-16 stainless steel studs, 8 x hex nuts, 2 x lockwashers</td>
<td>8.750&quot; L x 1.250&quot; W x 1.875&quot; H</td>
</tr>
</tbody>
</table>

**Bus Bars (nickel plated brass)**
- Maximum voltage rating is 48VDC
- All fasteners and the bus are galvanically compatible to reduce corrosion (ABYC E-11.14.5.2)
- Bus material is 3/32" thick corrosion resistant nickel plated brass
- Two 1/4-20 nickel plated brass studs with four nickel plated brass hex nuts and two stainless steel split lockwashers
- Back material is black Nylon

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Amperage</th>
<th>Description</th>
<th>Outside Dimension</th>
</tr>
</thead>
<tbody>
<tr>
<td>048-036</td>
<td>100 DCA</td>
<td>10 x 10-24 nickel plate brass combo head screws</td>
<td>5.750&quot; L x 1.250&quot; W x 1.344&quot; H</td>
</tr>
<tr>
<td>048-037</td>
<td>120 DCA</td>
<td>12 x 10-24 nickel plate brass combo head screws</td>
<td>5.750&quot; L x 1.250&quot; W x 1.344&quot; H</td>
</tr>
</tbody>
</table>
Bus Bar with Termination Holes Plus Power Feeder Hole
- Gang Up to 16 Single Pole A, B, or C Frame Magnetic Circuit Breakers plus Power Feeder Connection

Specifications
- Material: Solid 1/2” (12.7 mm) x 1/8” (3.2mm) Tin Plated Copper
- Terminations: Holes 7/32” (5.6mm) Diameter spaced on 3/4” (19mm) Centers
- Ampacity: 100 Amps Max

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Total Length in Inches</th>
<th>Total Number of Holes</th>
<th>Number of 1/4” Diameter Holes</th>
<th>Number of 7/32” Diameter Holes</th>
</tr>
</thead>
<tbody>
<tr>
<td>100-153-TP</td>
<td>1.625</td>
<td>3</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>100-154-TP</td>
<td>2.375</td>
<td>4</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>100-155-TP</td>
<td>3.125</td>
<td>5</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>100-156-TP</td>
<td>3.875</td>
<td>6</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>100-157-TP</td>
<td>4.625</td>
<td>7</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>100-158-TP</td>
<td>5.375</td>
<td>8</td>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>100-159-TP</td>
<td>6.125</td>
<td>9</td>
<td>1</td>
<td>8</td>
</tr>
<tr>
<td>100-160-TP</td>
<td>6.875</td>
<td>10</td>
<td>1</td>
<td>9</td>
</tr>
<tr>
<td>100-161-TP</td>
<td>7.625</td>
<td>11</td>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>100-162-TP</td>
<td>8.375</td>
<td>12</td>
<td>1</td>
<td>11</td>
</tr>
<tr>
<td>100-163-TP</td>
<td>9.125</td>
<td>13</td>
<td>1</td>
<td>12</td>
</tr>
<tr>
<td>100-164-TP</td>
<td>9.875</td>
<td>14</td>
<td>1</td>
<td>13</td>
</tr>
</tbody>
</table>

Main Circuit Breaker Bus Bar Jumpers
- Insulated, tin plated, solid copper, bus bar jumpers facilitate hot and neutral main circuit breaker load connections
- Reduces weight, saves space, and minimizes assembly time
- For use with A, B, or C frame magnetic circuit breakers mounted on 3/4” (19mm) centers

Specifications
- Material: Tin Plated Copper
- Insulation: Rubber

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Max Amp</th>
<th>Spacing (Center to Center)</th>
<th>Jumper Type</th>
<th>Circuit Breaker Frame Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>100-214-TP</td>
<td>100 Amps</td>
<td>1.5” (38 mm)</td>
<td>1 place</td>
<td>A &amp; B</td>
</tr>
<tr>
<td>100-545-TP</td>
<td>150 Amps</td>
<td>1.5” (38 mm)</td>
<td>1 place</td>
<td>A, B &amp; C</td>
</tr>
<tr>
<td>100-408-TP</td>
<td>150 Amps</td>
<td>2.25” (57 mm)</td>
<td>2 place</td>
<td>A, B &amp; C</td>
</tr>
</tbody>
</table>

Heavy Duty Remote Latching Battery Switches
- Battery switch meets the requirements Of ABYC E-11.6.1.2.1
- Eliminate long runs of unprotected Cranking Motor Cable (ABYC E-11.10.1.1.1 Exception 1)
- Install in close proximity to batteries (ABYC E-11.6.1.2.2)
- External Ignition Protection of Marine Devices (ABYC E-11.5.3.1 AND E-11.4.15 Note 7), Meets SAE J1171
- Conveniently located, low current, DPDT, Momentary, Control Switch opens and closes Latching Switch Contacts (P/N 001-453)
- Patented Magnetic Latching Mechanism draws zero current in open or closed position
- Operating Temperature from -40°F (-40°C) to 185°F (85°C)
- Replacement switches for Paneltronics battery management enclosures

<table>
<thead>
<tr>
<th>Part Number &gt;</th>
<th>570-012</th>
<th>139-032</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intermittent DC Rating (Up to 30 Seconds)</td>
<td>500 Amps</td>
<td>1,200 Amps</td>
</tr>
<tr>
<td>Continuous DC Rating</td>
<td>100 Amps</td>
<td>200 Amps</td>
</tr>
<tr>
<td>Nominal Actuation Volts</td>
<td>12 VDC</td>
<td>12 VDC</td>
</tr>
<tr>
<td>Minimum Actuation Volts</td>
<td>10.5 VDC</td>
<td>10.5 VDC</td>
</tr>
<tr>
<td>Actuation Current</td>
<td>3.0 Amps</td>
<td>5.6 Amps</td>
</tr>
<tr>
<td>Actuation Time Max</td>
<td>0.2 Sec</td>
<td>0.2 Sec</td>
</tr>
<tr>
<td>Switching Cycles</td>
<td>10,000</td>
<td>10,000</td>
</tr>
<tr>
<td>Coil Terminal</td>
<td>10-32</td>
<td>10-32</td>
</tr>
<tr>
<td>Torque</td>
<td>30 in lbs.</td>
<td>30 in lbs.</td>
</tr>
<tr>
<td>Switch Terminal</td>
<td>5/16-24</td>
<td>1/2-13</td>
</tr>
<tr>
<td>Torque</td>
<td>108 in lbs.</td>
<td>144 in lbs.</td>
</tr>
<tr>
<td>MOV P/N</td>
<td>N/A</td>
<td>139-034</td>
</tr>
<tr>
<td>Weight</td>
<td>0.8 lbs</td>
<td>4.4 lbs</td>
</tr>
<tr>
<td>Length</td>
<td>3.6 in</td>
<td>3.7 in</td>
</tr>
<tr>
<td>Depth</td>
<td>2.8 in</td>
<td>4.1 in</td>
</tr>
<tr>
<td>Height</td>
<td>3.6 in</td>
<td>7.1 in</td>
</tr>
<tr>
<td>Coil Fuses</td>
<td>5 Amp</td>
<td>7.5 Amp</td>
</tr>
</tbody>
</table>
One of the questions most frequently asked by boat owners during visits to our boat show booths over the years is “How do I go about designing a safe, compliant marine AC or DC electrical system that will meet all of my present and future power requirements?” Unfortunately, there is no simple answer to this question. However, after 25 years of listening attentively to customers, we have developed the following useful step-by-step approach to marine AC and DC electrical system design.

The marine industry is fortunate to have a boating standards organization. The American Boat and Yacht Council or ABYC is a consortium of boaters, marine surveyors, boat manufacturers, and the U.S. Coast Guard, working together to establish marine safety standards and recommended practices. Paneltronics is proud to have direct involvement in ABYC electrical standards development. Since 1988, we have actively participated on the ABYC Electrical Project Technical Committee. We design and manufacture our products to comply with ABYC standards, and we encourage you, as a potential customer, to do the same. Since we will be referring to ABYC Standard E-11, “AC and DC Electrical Systems on Boats” throughout this text, you should obtain a copy. Excerpts from ABYC E-11 can be found on our website www.paneltronics.com.

**ELEMENTS OF A SAFE MARINE ELECTRICAL SYSTEM**

**Step 1 - Safety First:**

Although every Paneltronics panel is completely pre-wired for ease of installation, we recommend that if you are not comfortable working with electricity and you want to avoid possible exposure to shock or electrocution, hire a qualified and experienced marine electrician. An ABYC Certified Marine Technician would be a great place to start. For a list of certified technicians, visit the ABYC website at www.abycinc.org, go to Certified Technicians and follow the screen directions.

A safety issue that must not be overlooked is fire. In an article “Why Boats Catch Fire,” published in the July 2003 issue of *Seaworthy* magazine, a Boat U.S. Marine Insurance claim study revealed that 55% of all boat fires start onboard vessels in the AC or DC wire harness, or in related appliances. Once ignited, electrical fires are difficult to extinguish unless the fault can be isolated from the power source, since heat generated from shorted wiring can re-ignite a totally extinguished fire. To minimize the possibility of damage, injury, or loss of life caused by boat electrical fires, you must design your electrical system to both isolate and limit the current in each appliance circuit. Obviously, the related costs required to isolate individual circuits in marine electrical systems will be greater than those incurred for similar residential wiring. The justification for this additional margin of safety on boats is that an open window or door can provide an easy escape from a burning house, but walking away from a burning boat may not be an option. By isolating individual circuits, there is a greater likelihood that critical electrical appliances will function during a fire emergency.

**Overcurrent Protection:**

It is our view that the magnetic circuit breaker is presently the most reliable and cost effective device for use in the marine environment to isolate and limit the current in an individual appliance circuit. Although it is common practice to use single rating circuit breakers (i.e. 15 Amps) for all loads, this may, at best, provide only conductor (wire) protection. Proper circuit breaker selection and sizing is critical. By selecting the proper amperage rating for each load (ABYC E-11.10.2.2), both the conductor and the individual appliance connected in the circuit will be isolated and current limited.

**CIRCUIT BREAKER SELECTION CHART**

1. **CIRCUIT BREAKER FULL LOAD AMP RATING:**
   Circuit breaker must be rated not to exceed the current rating of the load (F.L. AMPS), and must protect the smallest conductor in that circuit (ABYC E-11.10.2.3).

2. **CIRCUIT BREAKER VOLTAGE RATING:**
   Circuit breakers must be rated for a maximum voltage (MAX V) not less than the voltage of the power source AC or DC (ABYC E-11.10.1.5.2 and ABYC E-11.10.2.4).

3. **CIRCUIT BREAKER FREQUENCY:**
   Circuit breakers must be rated AC - (50/60 Hertz), DC, or AC/DC - (60Hz) (ABYC E-11.5.2.2.7).

4. **CIRCUIT BREAKER TRIP DELAY:**
   Circuit breaker must have a (DELAY) rating that is compatible with the power source AC or DC and tolerant to the inrush characteristics of the load (motor, lamp, resistive, inductive).

5. **CIRCUIT BREAKER TRIP AMPS:**
   Circuit breaker must have a (TRIP AMPS) rating that indicates the current level where the breaker will trip.

6. **CIRCUIT BREAKER INTERRUPTING CAPACITY:**
   Circuit breakers must have an ampere interrupting capacity (AIC) that is compliant with ABYC E-11.10.1.5.5 and ABYC E-11.10.2.1.2.

7. **CIRCUIT BREAKER IGNITION PROTECTION LABEL:**
   Circuit breakers installed in fume areas must be tested and labeled “IGNITION PROTECTED” (ABYC E-11.5.2.2.3) and (ABYC E-11.10.1.5.1)

Note: UL 1500 tested units will be marked with “IGNITION PROTECTED” and units tested to SAE J1171 will be marked “SAE J1171”. ISO 8846 is not presently an approved ABYC rating.
Step 2 - Load Calculation:

Before considering battery ratings, generator outputs, or wire gauges, you should first establish the total AC and/or DC requirements for your electrical system. For DC systems, refer to ABYC E-11.8.1.1 and complete Table II. For AC systems, see ABYC E-11.8.2 and complete all the sections through E-11.8.2.2.5. Remember to plan for future expansion. The addition of spare circuits now will save you considerable time and money in the future. Once you have determined your power requirements, you can then consider power source options.

### Table II - Electrical Load Requirement Worksheet

<table>
<thead>
<tr>
<th>Column A</th>
<th>Column B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Load</td>
<td>Amperes</td>
</tr>
<tr>
<td>Navigation Lights</td>
<td>Cigarette Lighter</td>
</tr>
<tr>
<td>Bilge Blower(s)</td>
<td>Cabin Lighting</td>
</tr>
<tr>
<td>Bilge Pump(s)</td>
<td>Horn</td>
</tr>
<tr>
<td>Wiper(s)</td>
<td>Additional Electronic Equipment</td>
</tr>
<tr>
<td>Largest Radio (Transmit Mode)</td>
<td>Trim Tabs</td>
</tr>
<tr>
<td>Depth Sounder</td>
<td>Power Trim</td>
</tr>
<tr>
<td>Radar</td>
<td>Toilets</td>
</tr>
<tr>
<td>Searchlight</td>
<td>Anchor Windlass</td>
</tr>
<tr>
<td>Instrument(s)</td>
<td>Winches</td>
</tr>
<tr>
<td>Alarm System (standby mode)</td>
<td>Fresh Water Pump(s)</td>
</tr>
<tr>
<td>Refrigerator</td>
<td></td>
</tr>
<tr>
<td>Engine Electronics</td>
<td></td>
</tr>
<tr>
<td>Total Column A</td>
<td>Total Column B</td>
</tr>
<tr>
<td>10% Column B</td>
<td></td>
</tr>
<tr>
<td>Largest Item in Column B</td>
<td></td>
</tr>
</tbody>
</table>

Total Load Required:
Total Column A: ______ Total Column B: ______ (The largest of 10% of Column B or the Largest Item)
Total Load: __________

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Step 3 - DC System:

The most widely used DC power source is the battery. Other sources of DC power include solar panels, wind generators, and alternators, but for the purpose of this article we will only concentrate on batteries. The most popular DC voltage rating found on vessels is 12VDC, although 24VDC and 32VDC are also popular ratings on larger boats. Paneltronics offers DC panels in 12VDC, 24VDC, and 32VDC.

### Engine Starting Batteries:

Engine cranking batteries are similar in construction and function to automotive batteries, but the materials used in automotive batteries will limit their longevity in a marine environment. Engine cranking batteries are designed to deliver a short burst of power, followed by a quick recharge. The Marine Engine General Data Sheet supplied by the engine manufacturer will specify the minimum Cold Cranking Ampere (CCA) battery rating required to ensure a reliable engine start (see ABYC E-11.4.3 DEFINITIONS Battery cold cranking performance and ABYC E-11.6.1.1.1).

House Batteries:

Unlike cranking batteries, house batteries are constructed with thick lead plates designed to be discharged over a long period of time. They may be discharged to about 50% of their capacity, and then recharged. These deep cycle batteries, so called because of this characteristic, are the batteries of choice for running appliances during long cruises. To select the proper rating for your deep cycle batteries, first refer to Table II in Step 2, and expand the data by multiplying each appliance load current (in amps) by the number of hours you plan to operate the appliance (in a 24 hour period). The sum of these amp-hour requirements represents Part 1 of the total DC Daily Load. Part 2 is calculated if an optional inverter is installed on your AC system, and is explained in the inverter section later in this article.

With the exception of cranking motor circuits, please note that overcurrent protection is required in all conductors connected directly to the batteries. (See ABYC E-11.10.1.1.1 and FIGURE 15 for placement requirements). It is important to remember that overcurrent devices placed in fume areas must also be ignition protected (ABYC E-11.10.1.5.1).

Step 4 - AC System:

AC represents Alternating Current. In marine electrical systems, the most common sources for alternating current (AC) are shore power from utility company generators, onboard generators, and inverters.

### Shore Power:

In the United States, the 3 most readily available marine shore cord configurations are 120VAC- 30 Amps, 120VAC- 50 Amps, and 240VAC- 50 Amps (ABYC E-11.6.3.1.1 through E-11.6.3.2.3). AC shore cord systems rated at 220VAC- 50Hz are commonly used in Europe and other parts of the world. Paneltronics offers panels for all these electrical systems, including panels with circuit breakers having the required European CE approval. When selecting shore power cords, check the quantity and ampacity of the inlets available on the dockside stanchions where your vessel will be docked. Then evaluate the physical weight and cost of each available shore power cord set that will power the maximum number of AC loads calculated in Step 2 above (ABYC E-11.8.2.1 through ABYC E-11.8.2.1.2).
Leakage Currents caused by defective wiring or defective electric appliance onboard a vessel present a significant shock hazard to personnel. In order to significantly reduce the risk of electric shock hazard to personnel in the water near a vessel, boarding a vessel, or onboard a vessel that is connected to shore power, effective July 2009 each 120VAC 60Hz or 240VAC 60Hz shore power cord set, or feed, must be protected by an Equipment Leakage Circuit Interrupter (ELCI) (see ABYC E-11.11.1). The ELCI may be a stand alone device or part of the Main Shore Power Disconnect Circuit Breaker located on the AC distribution panel.

If the distance from the shore power inlet mounted on the vessel is greater than 10 feet, measured along the conductor from the location of the Main Shore Power Disconnect Circuit Breaker, an additional overcurrent protection device and the ELCI is required within 10 feet of the power inlet (ABYC E-11.10.2.8.3 through E-11.10.2.8.3.1). ELCI devices installed in fume areas must be mounted in enclosures that are "Ignition Protected" (ABYC E-11.5.3.1) and (ABYC E-11.4.15). In addition, ELCI devices mounted in locations subject to rain, spray, or splash must be weather proof (ABYC E-11.4.31).

Another dangerous condition that can create a shock hazard for personnel in the water near a vessel, boarding a vessel, or onboard a vessel is Reverse Polarity. This is the unintentional backward connection of the hot (ungrounded/black), the neutral (grounded/white), or grounding (grounded/green) AC shore conductors. ABYC requires that a visible indicator of reverse polarity be present near the AC shore main circuit breaker (ABYC E-11.6.3.3.1). As an additional safety feature, Paneltronics provides an AC Shore Main Circuit Breaker that includes a Reverse Polarity trip coil. This “smart” circuit breaker trips automatically upon sensing a potentially dangerous reverse polarity condition.

It is our opinion that the installation of Isolation Transformers should be considered for all shore power circuits (ABYC E-11.7.1). They are designed to prevent galvanic corrosion and the hazard of electric shock caused by reverse polarity in the dockside stanchion. Personnel who are boarding, onboard, or swimming in close proximity to an unprotected vessel connected to an improperly wired dockside stanchion are exposed to potentially lethal electric shocks. Properly installed, isolation transformers magnetically couple a vessel’s AC system to shore, and at the same time, they isolate shore ground from the floating grounded neutral AC system onboard the vessel (ABYC E-11.17.4) and (ABYC E-11.17.5).

Note: Isolation Transformers should be mounted on a non-conductive surface. Mounting hardware should not come in contact with any vessel metallic structural members. Finally, to insure that total isolation from shore ground is maintained, ground connections from telephone lines and cable TV must also be isolated by transformers.

Generators are machines for generating AC electricity. To determine the size of the proper AC generator required for your application, multiply the total AC load calculated in amperes in Step 2 above (see ABYC E-11.8.2.2.5) by the AC system voltage, and divide by 1000. This result is the minimum KVA generator output rating required for a single-phase system (ABYC E-11.8.2.1.3).

Note: The AC system onboard vessel is a polarized grounded neutral system (ABYC E-11.5.5.1), (ABYC E-11.5.5.2), and (ABYC E-11.5.3.2.1); therefore, the generator neutral must be grounded at the generator (ABYC E-11.5.5.2.3).

Observance of the 7/40-inch rule for the placement of overcurrent protection devices may require their placement within a gasoline fume area near engines or generators (ABYC E-11.10.2.8.1), (E-11.10.2.8.4), and (ABYC E-11.4.15 DEFINITIONS Ignition protection). These overcurrent protection devices must be ignition protected. Paneltronics manufacturers circuit breaker panels with ignition protected (UL 1500) two-pole C-Frame circuit breakers that will bring your generator installation into compliance (ABYC E-11.10.2.7.1).

Inverters:

Inverters are devices that convert DC battery power to Alternating Current (AC) for powering household appliances. These devices are very popular on smaller boats, or as back-up to generators. Larger inverters may be used in place of generators. Inverter advantages include quiet, pollution free AC power on demand. However, larger inverters require larger battery banks to sustain their operation.

Note: Inverters are a major consumer of stored DC battery power. Consider this when calculating your total battery requirements. To determine the battery requirements for an inverter, use this simple calculation. Multiply each AC appliance power rating in watts by the number of hours you plan to operate the device for a 24 hour period (watt-hours); then add the sum of all AC appliances powered by the inverter and divide by the DC system voltage (12, 24, or 32VDC). This total should be added to Part 1 of your previous DC calculations for Daily Load. Finally, multiply 4 (diversity factor) to obtain the total Amp-hour rating of the required battery bank.

Single Power Source Selection:

Cogeneration, powering a load by multiple power sources at the same time, does not presently meet ABYC standards (ABYC E-11.8.2.1.4). Therefore, single source selection that isolates all power sources must be assured with the use of a break before make switch or lockout device (ABYC E-11.5.5.6.1). Paneltronics panels offer these for safe selection of up to 6 power sources (i.e. shore power, generators, or inverters) (ABYC E-11.5.5.7).
Wire Sizing:

The construction of insulated conductors (wire) used in marine AC and DC systems is very different. Conductors approved for AC use may also be used for DC, but the converse is not true. The insulation temperature rating of most marine wire available today, AC or DC, is 105°C. By selecting 105°C rated insulated wire as opposed to 75°C rated wire, higher currents can be transmitted safely using thinner, lighter wire. The markings on individual marine wire conductors must include type/style, voltage rating, gauge, and temperature rating (ABYC E-11.14.1.1). The minimum wire size permitted for marine use is 16 American Wire Gauge (AWG); however, there are several exceptions (see ABYC E-11.14.1.2). The possibility of strain hardening caused by low frequency vibration present on vessels mandates the exclusive use of stranded copper wire (ABYC E-11.14.2.4. and ABYC E-11.14.3.6). Tinned, stranded copper wire is the preferred wire conductor for use in marine electrical systems because it offers maximum protection against corrosion. At junctions, this wire is galvanically compatible with tin plated terminals. This compatibility helps prevent high resistance connections, overheated junctions, and fires.

DC Wire:

DC wire must have a minimum 50-volt insulation rating (ABYC E-11.14.2.1), and this insulation must meet the temperature rating requirements of the Society of Automotive Engineers (SAE) J378 and SAE J1127, or J1128 (ABYC E-14.2.1.1 through ABYC E-11.14.2.1.1.4). Wire types that conform to these requirements, such as GPT (PVC marine engine and component wire) and Boat Cable (UL 1426), are readily available. To calculate conductor size, see ABYC E-11.14.2.2 through ABYC E-11.14.2.7.1).

AC Wire:

AC wire must have a minimum 600-volt insulation rating (ABYC E-11.14.3.1), and flexible cords must have a minimum 300-volt insulation rating (ABYC E-11.14.3.2). This insulation must also meet the flame retardant and moisture resistant requirements of UL 83 (ABYC E-11.14.3.4). Wire types that conform to these requirements, such as AWM 1230, AWM 1231, and Boat Cable (UL 1426), are readily available. To calculate conductor size, see ABYC E-11 AP TABLE 1 and ABYC E-11.14.3.5 through ABYC E-11.14.3.7.2.

AC and DC Power Distribution Panels:

The primary considerations in the selection of an AC or DC power distribution panel are DESIGN, QUALITY, FUNCTION, and STYLE. Although many panels appear to be similar, a close inspection may show practical and functional differences.

Design Elements to be considered:

- Custom Configurability - Does the panel offer you the option to select the appropriate circuit breaker amperages to isolate and limit loads?
- Physical size - Does the panel fit in the space that you have available?
- Modularity - Does the panel offer you horizontal or vertical layout options?
- Flexibility - Does the panel offer you an option for future expansion?
- Ergonomics - Does the panel have a user-friendly layout?

Functional Elements to be considered:

- LED Indicator Lights - Color-coded LED’s can be very functional.
- Backlighting - Meters and Labels should be easily read in low light conditions.
- Function Labels - Labels should be easy to add and change.
- Meters - Meters should be accurate with easy to read scales or digital displays.

Quality features to look for:

- Tinned stranded copper wire rated at 105°C
- Bus Bars
  - Properly rated for total ampacity
  - Solid Copper/Tin Plated
  - Conveniently Panel Mounted
- Panel should be made of a corrosion resistant material such as aluminum
- Durable surface finish such as polyurethane or powder coat finish
- Quality Components
- Superior Workmanship

By now you should have determined the total number of circuit breakers, the amperage for each load, and all of your power inputs. In addition, you should have considered the design, function and quality elements that you want to incorporate in your panel. By coupling this information with the physical size available for your installation, you should be able to select the proper AC and/or DC power distribution panel. Paneltronics offers you over 180 modular panel designs. Each model is pre-wired for a simple installation. For additional product information, please visit us online at www.paneltronics.com or call us toll free at 1-800-36-PANEL. Factory trained technicians are available to help you design a safe, compliant marine AC or DC electrical panel system that will meet all of your present and future power requirements.
**Glossary**

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**For a complete Glossary log on to www.paneltronics.com**

**ABYC:** American Boat and Yacht Council, a voluntary standards creating body for the marine industry responsible for Standards and Recommended Practices.

**Ampacity:** The current carrying capacity of a conductor or device.

**Bus Bar:** A rectangular conducting bar, usually solid copper or brass, that carries currents to several electric circuits.

**CE (Conformité Européenne):** The CE marking is a conformity marking consisting of the letters “CE”. The CE marking is applied to products regulated by certain European health, safety, and environmental protection legislation. The CE marking is obligatory for products it applies to. The manufacturer affixes the marking certifying that the product conforms to applicable regulations, in order to be allowed to sell the product in the European market.


**Circuit:** A closed path of electrically, or electro-magnetically connected, components or devices that is capable of current flow. Typically consisting of loads, sources, conductors, and circuit protection (circuit breakers and fuses). For example: A battery, fuse, and bilge pump connected together with wire are a circuit. The path must be continuous and closed.

**Circuit Breaker:** An automatic switch that stops the flow of current in a circuit at a predetermined level without destroying itself.

**Conductor:** That part of an electrical circuit whose resistance relative to the balance of the circuit is zero. For example, in a circuit consisting of a light bulb and a battery, connected together with wire, the wire is referred to as the conductor.

**Current Rating:** The maximum current in amperes that a device will carry continuously under defined conditions without exceeding specified performance limits.

**Current Transformer:** The “CT”, as current transformers are commonly referred to, is used by AC ammeters to “sense” current flow in a wire in an AC circuit. It is a toroidal coil of wire through which a wire whose current we wish to measure is passed. It is normally encapsulated and looks like a “doughnut”, which is how electricians commonly refer to it. The doughnut has two wires coming out of it, which are connected to the AC ammeter. As current flows in the AC wire we wish to measure, it induces a current flow in the current transformer. The magnitude of the current varies directly with the current flowing in the AC wire. Current transformers are rated by the number of maximum amps that can flow in the measured wire and the current generated, by the CT, at that current flow. For example: A 50:5 CT is rated for 50 amps flowing in the measured wire, and it generates 5 amps of current as a consequence.

**DC Grounding Conductor:** A normally non-current carrying conductor used to connect metallic non-current carrying parts of direct current devices to the engine negative terminal, or its bus, for the purpose of minimizing stray current corrosion.

**Deep-Cycle Batteries:** Batteries with thick plates to allow for reserve energy to be stored within the battery plate and released during slow discharge for prolonged periods. The high-density active material remains within the batteries’ plate/grid structure longer, resisting the normal degradation found in cycling conditions. Deep cycle batteries are typically used where the battery is discharged to a great extent and then recharged.

**Digital Meter:** A digital meter is one that displays values as numerical values rather than as the position of a meter on a relative scale.

**Direct Current (DC):** An electric current that always flows in the same direction. The magnitude may vary but the current direction is always the same. Commonly referred to as DC. Examples of direct current sources are batteries, fuel cells, and photovoltaic cells. DC sources such as battery chargers and alternators actually use rectified AC current as the source.

**Double Pole:** A switch, circuit breaker, or relay that makes or breaks two isolated circuits at the same time.

**Engine Negative Terminal:** The point at which the engine negative, generally the engine block, is connected to the negative of the battery.

**Equipment Leakage Circuit Interrupter (ELCI):** A residual current device which detects equipment ground fault leakage current and disconnects in 120VAC 60Hz systems the hot (ungrounded / black) and the neutral (grounded / white) current carrying conductors at a preset threshold. In a 240VAC 60Hz system, the ELCI disconnects both (ungrounded / black) and the (ungrounded / red) current carrying conductors at a preset trip threshold. The ELCI device meets the requirements of UL 1053 and UL 943 except that the maximum trip level is 30mA and the maximum trip time is 100ms.

**Fault:** A defect in the normal circuit configuration, usually due to unintentional grounding. Commonly referred to as a short circuit.

**Frequency:** For an oscillating or varying current, frequency is the number of complete cycles per second in alternating current direction. The standard unit of frequency is the hertz, abbreviated Hz. If a current completes one cycle per second, then the frequency is 1 Hz; 60 cycles per second equals 60 Hz (the standard alternating-current utility frequency).

**Fuse:** A conductive device designed to melt when amperage flow through it exceeds a rated amount.

**Galvanic Corrosion:** Corrosion resulting from dissimilar electrically connected metals being immersed in an electrolyte.

**Galvanic Isolator:** A device installed in series with the green grounding conductor of the AC shore power cable designed to block galvanic DC current flow but permit the passage of AC if required.
**Generator:** A rotating machine capable of generating electrical power. In the narrow definition generator refers to a DC machine and alternator refers to an AC machine. However, in common use the term generator is used to refer to AC machines as well.

**GFCI (Grounded-Fault Circuit Interrupter):** A safety device that breaks an AC circuit anytime a short to ground occurs; also known as a residual current circuit breaker (RCCB).

**Hertz:** Hertz is a unit of frequency of one cycle per second. It replaces the earlier term of “cycle per second (cps).” The abbreviation for Hertz is Hz.

**Hot:** Hot usually refers to the ungrounded current carrying conductors in an AC system. These would typically have a voltage of 120V or 240V in the United States. The term Hot is also used to describe a circuit that is energized, and has a potential greater than ground.

**Ignition Protected:** A critical designation for any electrical device that is to be used in an area where gasoline, battery, or CNG or LPG vapors may accumulate. The ABYC describes ignition protection as: “the design and construction of a device such that under design operating conditions: it will not ignite a flammable hydrocarbon mixture surrounding the device when an ignition source causes an internal explosion, or it is capable of releasing sufficient electrical or thermal energy to ignite a hydrocarbon mixture, or the source of the ignition is hermetically sealed.” It is important to note that unlike most of the ABYC standards ignition-protection requirements are also mandated by USCG regulations, and compliance is not voluntary, but mandatory.

**Interrupt Capacity (AIC):** Maximum short-circuit current at rated voltage which protective device is required to interrupt under operating duty and with normal frequency recovery voltage not less than rated voltage.

**Inverter:** A device used to change stored DC from a battery source to AC on demand to power appliances.

**Isolation Transformer:** An AC device consisting of an isolated primary coil, connected to shore power; an isolated copper shield, connected to the shore grounding conductor; and an isolated secondary coil, connected to the onboard bus and magnetically coupled to the primary coil. See ABYC E-11.7.1.

**Magnetic Circuit Breaker:** Breaker that uses the magnetic field generated by a current-carrying coil to open the circuit.

**Main:** Refers to the main circuit breaker or bus in a power distribution system. This is the input power source for the system.

**NEMA:** National Electrical Manufacturers Association

**Over Current Protection Device:** A device, such as a fuse or circuit breaker, designed to interrupt the circuit when the current flow exceeds a predetermined value.

**Polarity:** Refers to the electrical charge, which may be positive or negative. It also refers to the positive and negative terminals of a battery or load in a DC system. In AC systems it refers to the connections made to the hot and neutral. There is often a reverse polarity light that indicates if the neutral and hot are reversed.

**Polarized System:** An electrical system in which the positive and negative or the hot and neutral must be connected in a particular way and cannot be switched. Sometimes there are mechanical preventions to insure the correct polarity. For example, in an AC plug the physical configuration of the plug and receptacle force a polarized connection.

**Reverse Polarity:** The unintentional backward connection of the hot (ungrounded / black), the neutral (grounded / white), or grounding (grounded / green) AC shore conductors. This condition can create a shock hazard for personnel in the water near a vessel, boarding a vessel, or onboard a vessel.

**Tin Plated:** A plating of the element tin, which prevents corrosion. Commonly used to plate copper components such as a power bus.

**Trip-free Circuit Breaker:** A breaker designed in such a way that the resetting means cannot be manually held in to override the current-interrupting mechanism.

**UL:** Underwriters Laboratories Marine Department, POB 13995, 12 Laboratory Drive, Research Triangle Park, NC 27709. Phone: (919) 549-1400. Web site: www.ul.com.

**UL Listed:** Indicates that a device or component has met certain specifications as set forth by Underwriters Laboratory. Further, it means that the device or component has been tested for conformance and ‘listed’ with UL so it can use the UL logo and claim conformance to the specification.

**Volt (Voltage):** The unit of electric potential and electromotive force, equal to the difference of electric potential between two points on a conducting wire carrying a constant current of one ampere when the power dissipated between the points is one watt.

**Volt-Amps:** The product of volts and amps, which is watts in a DC system and the apparent power in an AC system.

**Voltage Drop:** The loss of voltage as it works its way through a circuit. Excessive voltage drop indicates unwanted resistance in circuit or circuit component.

**Wire Amperage Rating:** The current a conductor can carry under a set of specified conditions such as open air, in an enclosure, and at a specified temperature.

**Wire Sizing:** A process to determine the appropriate conductor gauge, stranding, and insulation temperature rating based on length of run (voltage drop), circuit ampacity, ambient temperature, and bundling.
Order Form

Customer Information

Customer Number: __________________________ Contact: __________________________
Company: __________________________
Billing Address: __________________________ City: __________ State: __________ Zip Code: __________
Shipping Address: __________________________ City: __________ State: __________ Zip Code: __________
Telephone Number: __________________________ Fax Number: __________________________
Email Address: __________________________ Type of Business: __________________________

Payment Method

Open Terms □ Bank Transfer □ Certified Check □ Credit Card □

If paying by credit card, please complete the following:

Credit Card Type: Visa □ Master Card □ American Express □ Discover □
Credit Card Number: __________________________
Expiration Date: __________________________ Printed Name: __________________________
Signature: __________________________

Custom Panel Configurations

Premier and Deluxe Line Custom Panel Configurations

Model Number: __________________________
Meter Type (if applicable): Analog □ Digital □ Other: __________________________
Color: Black □ White □ Other: __________________________

AC Panel Options (if applicable)

AC Voltage: 120 VAC - 60 Hz □ 240 VAC - 60 Hz □ 220 VAC - 50 Hz □
Shore Main Rating: 30 Amp □ 50 Amp □ Other: □ __________________________
Generator Main Rating: 50 Amp □ 60 Amp □ 80 Amp □ 100 Amp □ Other: □ __________________________
Inverter Main Rating: 15 Amp □ 20 Amp □ 25 Amp □ 30 Amp □ Other: □ __________________________

DC Panel Options (if applicable)

DC Voltage: 12 VDC □ 24 VDC □ 32 VDC □
DC Main: 50 Amp □ 60 Amp □ 80 Amp □ 100 Amp □ Other: □ __________________________

Options

Hinge Option: Yes □ No □ Location: Left □ Right □ Bottom □
Frame Option: Yes □ No □ Frame Type: High Profile □ Slim □ Recessed Slim □
Enclosure Option: Yes □ No □ Enclosure Depth: 6.5” □ 8.5” □ 10” □
Plexiglass Door: Yes □ No □ Hinge: Left □ Right □ Finish: Smoked □ Clear □

For Paneltronics Use Only

Part Number: __________________________
Quoted Price: $________________________

Notes: __________________________

If you have any questions please feel free to contact us at 1-800-367-2635
Panels may also be configured online at: www.paneltronics.com Complete and Fax to: (305) 823-7802
Enter Function Labels and Circuit Breaker Ratings Below. Please Type or Print Clearly.

<table>
<thead>
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<th>POSITION</th>
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Part Number: 1 2 3 4 5 6 7 8 9 10

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Catalog Orders • 11960 N.W. 87th Ct., Hialeah Gardens, Florida 33018 • Fax Local: (305) 823-7802 • Toll Free Fax: (800) 833-7802
Telephone Local: (305) 823-9777 • Telephone Toll Free: (800) 36-PANEL • email: sales@paneltronics.com
Three Year Limited Warranty

Paneltronics, Inc., warrants its products to be free from defects in materials and workmanship under normal use for a period of three years from the date of purchase. In the event a defect in any part or parts appears within the warranty period, the product must be returned to Paneltronics, Inc. for replacement, repair, or refund. If Paneltronics, Inc. determines that repair cannot be made within a reasonable period of time, it may at its sole discretion, elect to replace the product or refund the purchase price. Any charges for transportation or installation of the original warranted item or its replacement are not covered by this limited warranty. No other person or company is authorized to make repairs under this warranty. Neither does this warranty cover (A) any incidental or consequential expenses to the user resulting from non-function or malfunction of the product or (B) any products which after delivery have been installed, tested, repaired, or altered other than according to Paneltronics’ instructions or (C) if, in Paneltronics’ reasonable opinion, the item or product has sustained damage by faulty installation or repair, misuse, misapplication, accident or any external force.

Maximum liability shall in any case not exceed the purchase price for the product claimed to be defective.

Paneltronics, Inc. makes no warranty of any sort, expressed or implied, with respect to any product, except as above. Any warranties are limited to the duration of this warranty, and Paneltronics shall not be liable with respect to them or, where allowed by law, for any incidental or consequential damages resulting from defects.

Proof of Purchase is required for warranty service.

Cancellations

If your order is in production and you must cancel the order, a minimum of 20% will be charged, plus any additional costs, which Paneltronics has incurred, depending on how far the order has progressed. Also, if you have changes to be made, and your order has passed the point where the changes were to have taken place, there will be a charge for work already done. Please note: It is not always possible to make changes on an order. Contact your Customer Service Representative to check on the status of the order before requesting a change to be made.

Claims

All claims must be made within 15 days of the invoice date.

Return Goods Policy

No returns are permitted without a Return Goods Authorization number issued by Paneltronics. This number must appear on the outside of the package and on the packing slip. Goods must be returned in proper protective packaging for repair, replacement or credit, and are subject to all the terms, conditions and warranty policies of Paneltronics. Credit will only be issued to Paneltronics’ original customer. All goods returned for credit are subject to a minimum restocking charge of 20%. Goods may not be returned after 60 days from the invoice date. Custom panels are not returnable for credit. All returned goods must be sent with freight prepaid.

Paneltronics, Inc. is a company committed to total quality and continuous product research, development and improvement. Therefore, all information, specifications and prices in this catalog are subject to change without notice. Paneltronics is not responsible or liable for anything that may occur as a result of errors and/or omissions within this catalog.
<table>
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<td>Individual and Custom labels may be purchased on our website: <a href="http://www.paneltronics.com">www.paneltronics.com</a></td>
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Modular Design Solutions

Paneltronics panels are Modular in design
- Flexible designs to go high or wide
- Combine panels from different series to meet your specific requirements
- Custom blank panels can be made to incorporate additional components
- Panel groups are often mounted onto a custom hinged frame and enclosure
- Frame and enclosure mounted panel groups are shipped as a complete assembly

Our Technical Sales Representatives can help you with creative modular designs.