Product Catalog 2003

Marine Electrical Products

- Battery Boxes
- Battery Switches
- Circuit Breakers
- Connectors
- Electronic Controls
- Electrical Distribution Panels
- Fuse Blocks
- Fuses
- Insulators
- Meters

BLUE SEA SYSTEMS

BLUE SEA SYSTEMS

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United States Sales Representatives

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2.	J. Janson Company	Joe Janson	401-847-5693	joe@madeusa.com
3.	W.M. Black and Company	Pat Black	440-357-7121	wblack4833@aol.com
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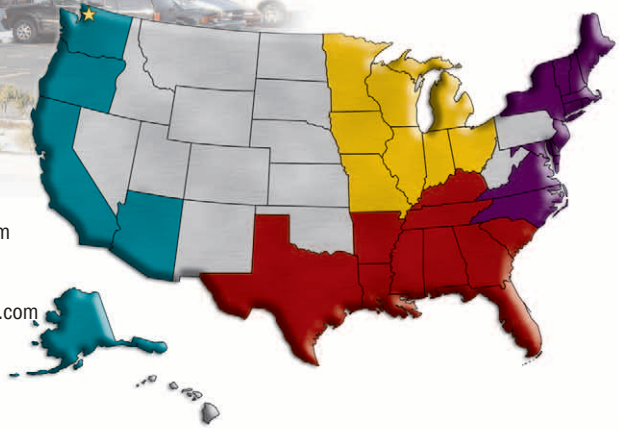
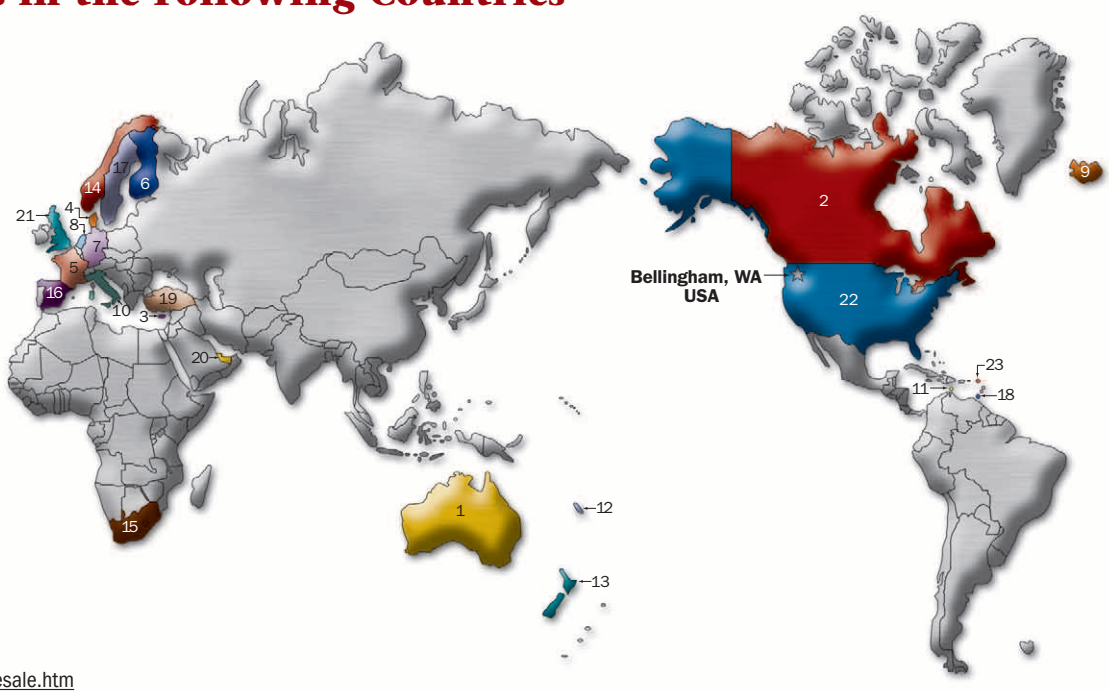


Distributors in the Following Countries

1. Australia
2. Canada
3. Cyprus
4. Denmark
5. France
6. Finland
7. Germany
8. Holland
9. Iceland
10. Italy
11. Neth Antilles
12. New Caledonia
13. New Zealand
14. Norway
15. South Africa
16. Spain
17. Sweden
18. Trinidad WI
19. Turkey
20. United Arab Emirates
21. United Kingdom
22. United States
23. US Virgin Islands



See www.bluesea.com/wholesale.htm
for distributor information in each country

MEMBER ABYC Setting Standards for Safer Boating

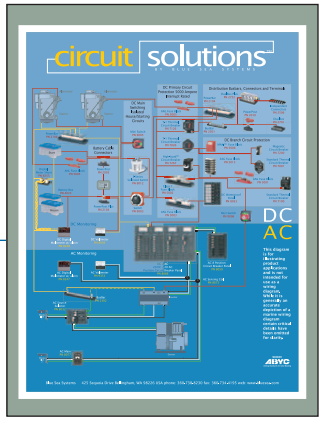
NMMA MEMBER

Marketing Support

Blue Sea Systems offers the following marketing support tools for distributors and dealers of Blue Sea Systems' products:

Counter Top Product Display

Attractive point of purchasing display featuring Blue Sea Systems' products.



Posters

The 11" x 17" laminated "Circuit Solutions™" poster shows applications for Blue Sea Systems' products.

WWW Site

The Blue Sea Systems' web site www.bluesea.com contains product images, retail prices, product distributors and technical information.

Circuit Solutions Newsletter

Blue Sea Systems brings new products and technical information to customers in the newsletter.

Retail Display

The 8225 Coastal Retail Display is our premier retail merchandiser. Designed to be a stand alone display, end cap display, or wall display with the optional wall brackets, this attractive display provides the dealer with a selection of our best selling products. The merchandiser comes with self-standing rack, hooks, re-order tags, header, product, set up instructions and planogram.

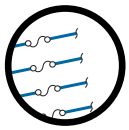
Product Packaging

All Blue Sea Systems' products are packaged in attractive retail display packages with UPC barcodes.

CD-ROM

A Macintosh and IBM PC compatible CD-ROM is available with all Blue Sea Systems' product photographs, logos, and drawings.

A Guide to Blue Sea Systems' Technical and Product Resources



Guide to Marine Circuit Protection

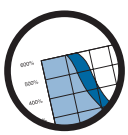
A step-by-step guide to selecting, sizing and installing fuses and circuit breakers aboard boats.

Location: Blue Sea Systems' Marine Electrical Products Catalog and www.bluesea.com/circuit.htm

ABYC Standards

Blue Sea Systems has obtained a Copyright License from the American Boat and Yacht Council (ABYC) that grants the right to reproduce sections of the ABYC Standards for the technical support work done by Blue Sea Systems. In this catalog and on the Company website are the most important sections of the ABYC Standards pertaining to marine electrical systems. These excerpts from the Standards should not be relied upon for assuring full compliance with ABYC Standards. The complete Standards are available from ABYC at http://www.abycinc.org/.

Location: www.bluesea.com/abyc.htm



Electrical Reference Data

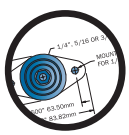
Blue Sea Systems maintains a library of technical data useful for marine electrical design and installation.

Location: www.bluesea.com/data.htm

Product Application Briefs

Series of articles explaining how to solve common marine electrical system requirements with Blue Sea Systems' products.

Location: www.bluesea.com/briefs.htm



Technical Briefs

Blue Sea Systems maintains a library of short articles explaining numerous subjects encountered in designing and installing marine electrical systems. These articles are general and not specific to any product. See Product Application Briefs for uses of specific Blue Sea Systems' products.

Location: www.bluesea.com/tech.htm

Product Instruction Sheets

All instruction manuals provided with Blue Sea Systems' products are also available for downloading.

Location: www.bluesea.com/instructions.htm

Circuit Solutions Newsletter

Blue Sea Systems' brings new products and technical information to customers in the newsletter.

Location: www.bluesea.com/newsletter.htm

Blue Sea Systems' Electronic Product Catalog

Each product page is available on-line exactly as seen in the printed version.

Location: www.bluesea.com/request.htm

Blue Sea Systems' Technical Glossary

Encyclopedia defines hundreds of terms encountered in the area of marine electrical systems.

Location: Blue Sea Systems' Marine Electrical Products Catalog and www.bluesea.com/glossary.htm

Dear fellow boater,

Blue Sea Systems celebrates its 10th anniversary in 2002. The Company was conceived on the ocean during two years of sailing the Pacific Rim from California to Mexico westward to Australia and north to Japan. At sea and at anchor we spent too much time and money repairing, maintaining and upgrading our boat's electrical system. Upon learning that fellow sailors had the same problems, I was determined to discover why marine electrical systems were not more reliable. It became clear that many of the components used in the systems were designed for automotive or industrial electrical systems. For some applications, the required components were not available at all. This, together with poor circuit design and implementation, insured that many boaters received inadequate performance from their electrical systems.

Blue Sea Systems designs products specifically for marine use. Although our products are purchased for land-based applications in harsh environments requiring high reliability, we have never designed a product for use on anything but a boat. Every design must pass a simple test of innovation. If the new product offers no innovations that make it a better product for boaters, we won't manufacture it.

We have not yet designed a product with which we are 100% content. Every product we manufacture is a candidate for redesign. Inevitably, after engineering, designing, manufacturing and selling a product and then listening to customers, we realize how the product could be even better. We dedicate a huge portion of our engineering and design resources to improving products that we already manufacture and are successfully at work on boat electrical systems around the world.

Improving the reliability of marine electrical systems requires not only better products, but an intimate knowledge of electrical system design. Much of our resources are expended on researching ways to use the products that will result in higher performing and more reliable marine electrical systems. On the facing page of this catalog you'll find a directory of the valuable information we have created on electrical system configuration, general technical data and regulatory information.

We don't guarantee our products for "Parts and labor for one year from date of purchase". When you buy a Blue Sea Systems' product we stand behind it for as long as you own it. Quality marine products are not inexpensive and boaters deserve reliable, long-term performance for their money.

We greatly respect the sea and the craft that travel on it. We believe we can be successful only through continuous improvement of our knowledge, our products and our service to you. In this spirit of continuous improvement we invite your comments, your ideas and especially your criticism. It makes us stronger.

Best regards,

Scott Renne
President and Founder

Table of Contents

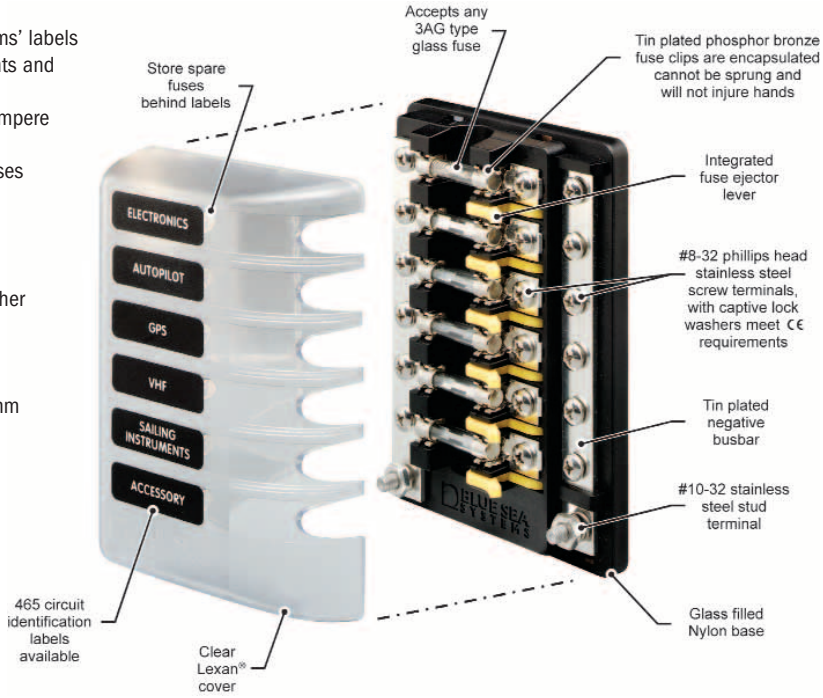
3AG Fuse Block System

- Clear insulating cover with label recesses for standard Blue Sea Systems' labels
- Cover insulates all conductive parts, satisfying ABYC/USCG requirements and storing spare fuses
- Tin-plated copper buses and Beryllium copper fuse clips give full 30 Ampere rating per circuit
- Uses AGC (Fast Acting), MDL (Time-Delay) and all other 3AG Glass Fuses

Specifications

Material, Cover and Base	Polycarbonate
AGC/MDL Fuses available	1/8 to 30 Amperes
Screw Terminal	8-32 with Captive Star Lockwasher
Fuse Dimensions	0.25" x 1.25" 6.3 mm x 32 mm
Block Dimensions	3.25" x 5.00" x 1.25" 82.6 mm x 127.0 mm x 31.8 mm
Maximum Amperage per circuit	30 Amperes
Maximum Amperage block	100 Amperes
Maximum Voltage	32 Volts DC

PN	Description	Weight Lb/Kg
5015	Fuse Block 3AG 6 circuit with ground	0.52/0.24
5018	Fuse Block 3AG 6 circuit without ground	0.42/0.19



5015

5018

AGC/MDL 3AG Fuses

- UL Listed 248-14/CSA Certified

Specifications

Maximum Voltage	32 Volts DC
Interrupt Capacity	1000 Amperes DC
Fuse Dimensions	0.25" x 1.25" 6.3 mm x 32 mm

AGC

- Fast-acting glass fuses
- Sold in packages of 5
- Weight (Package 5) 0.04 Lb / 0.018g

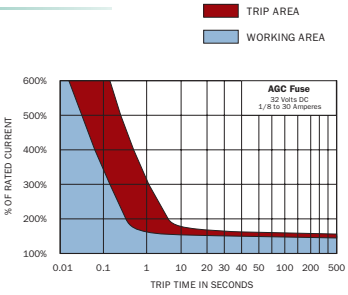
MDL

- Time-Delay glass fuses for high inrush motor type loads
- Sold in packages of 2
- Weight (Package 2) 0.03 Lb / 0.014g

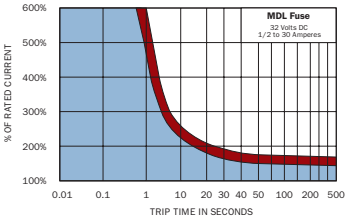
Amperage Rating	PN AGC	PN MDL
1/8	5200	
1/4	5201	
1/2	5202	5221
3/4	5203	
1	5204	5222
1.5	5205	5223
2	5206	5224
2.5	5207	5225
3	5208	5226
4	5209	
5	5210	5227
6	5211	
6.25		5228
7	5212	
7.5	5213	5229
8	5214	
10	5215	5230
12	5216	
15	5217	5231
20	5218	5232
25	5219	5233
30	5220	5234

Fuses

AGC



MDL



ATO/ATC Fuse Block System

- Clear insulating cover with label recess for small format Blue Sea Systems' labels
- Cover insulates all conductive parts, satisfying ABYC/USCG requirements
- Tin-plated copper buses and fuse clips give 30 Ampere rating per circuit
- Accepts ATO and ATC fast acting blade type fuses and plug-in style circuit breakers

Specifications *Subject to change*

Material, Base	Thermoplastic	
Material, Cover	Polycarbonate	
ATO/ATC available	1 to 30 Amperes	
Fuse Dimensions	0.75" x 0.75" x 0.20"	
	19.1mm x 19.1mm x 5.1mm	
Block Dimensions		
5025	6.00" x 2.00"	152.40mm x 50.80mm
5026	6.00" x 3.18"	152.40mm x 80.77mm
5028	4.50" x 2.00"	114.30mm x 50.80mm
5029	4.50" x 3.18"	114.30mm x 80.77mm
Maximum Amperage per circuit	30 Amperes	
Maximum Amperage per block	100 Amperes	
Maximum Voltage	32V DC	

PN	Description
5025	Fuse Block ATO/ATC 6 Circuit w/ground
5026	Fuse Block ATO/ATC 12 Circuit w/ground
5028	Fuse Block ATO/ATC 6 Circuit
5029	Fuse Block ATO/ATC 12 Circuit

Available in January 2003

5025 *5026* *5028* *5029*

Integral Ground Bus Style **Positive Bus Only Style**

ATO/ATC Fuses

- Fast-Acting type fuses ideal for electronic devices
- Standard circuit protection device for automobiles and trucks
- Tin-plated connector blades for corrosion resistance
- Visible indication of blown condition
- Sold in packages of 2

Specifications

Maximum Voltage	32 Volts DC
Interrupt Capacity	1000 Amperes DC
Fuse Dimensions	0.75" x 0.75" x 0.20"
	19.1mm x 19.1mm x 5.1mm

Amperage Rating	PN
1	5235
2	5236
3	5237
4	5238
5	5239
7.5	5240

Amperage Rating	PN
10	5241
15	5242
20	5243
25	5244
30	5245
40	5246

Automotive plastic fuses (ATO) vs. Glass fuses (3AG)

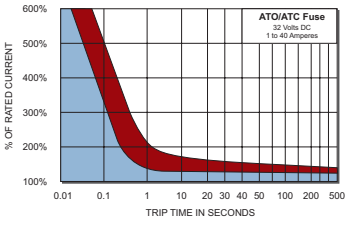
ATO Fuse Advantages:

- Their amperage color-coding makes determining amperage much easier than reading the small marking on the end caps of 3AG fuses.
- Their body size and configuration makes inserting and extracting ATO fuses easier.
- The visibility of the fusible link makes identifying a blown fuse easier.

3AG Fuse Advantages:

- They are available in "fractional" sizes such as 1/8, 1/4 and 3/4 ampere, whereas ATO fuses are available no lower than 1 ampere. This can be important in protecting delicate electronic circuits.
- 3AG fuses are available in both "slow blow" (MDL) and "fast blow" (AGC) styles that makes them more suitable for applications where both electronic and motor loads are being protected.
- Although this situation is changing, 3AG fuses are more widely available throughout the world and are less expensive than ATO fuses.

Available in January 2003



5006

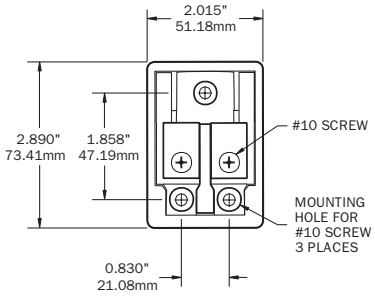
MAXI™ Fuse Block System

- The most economical system for 30–80 Ampere fusing
- Snap-on terminal cover insulates all conductive parts, satisfying ABYC/USCG requirements
- Accepts wire sizes 18–4 AWG from sides or bottom
- For use on systems up to 32V DC
- Ring terminal screws compress fuse blades within blocks for extremely low resistance connections

Specifications

Base Material	Red Lexan® Polycarbonate
MAXI™ Fuses Available	30–80 Amperes
Maximum Amperage	80 Amperes
Maximum Voltage	32 Volts DC
Fuse Mounting Blocks	Tin-Plated Brass

PN	Description	Weight Lb/Kg
5006	MAXI™ Fuse Block System 30-80 Amperes	0.26/0.12



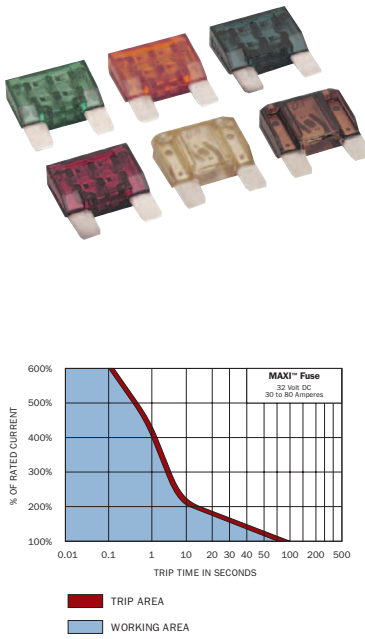
MAXI™ Fuses

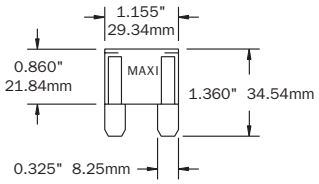
- Widely available through automotive parts stores
- Economical
- Tin-plated connector blades for corrosion resistance
- Visible indication of blown condition

Specifications

Interrupt Capacity	1000 Amperes DC
Maximum Voltage	32 Volts DC

PN	Description	Weight Lb/Kg
5138	MAXI™ Fuse 30 Ampere	0.04/0.02
5139	MAXI™ Fuse 40 Ampere	0.04/0.02
5140	MAXI™ Fuse 50 Ampere	0.04/0.02
5141	MAXI™ Fuse 60 Ampere	0.04/0.02
5142	MAXI™ Fuse 70 Ampere	0.04/0.02
5143	MAXI™ Fuse 80 Ampere	0.04/0.02





SEA Fuse Block System

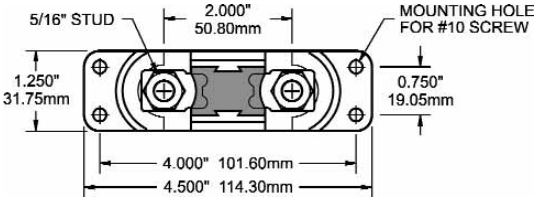
- The most economical system for 100–300 Ampere fusing
- Supplied terminal boots insulate all conductive parts, satisfying ABYC/USCG requirements
- For use on systems up to 32V DC
- 5/16" stud terminals accept wire ring terminals up to 00 AWG

Specifications

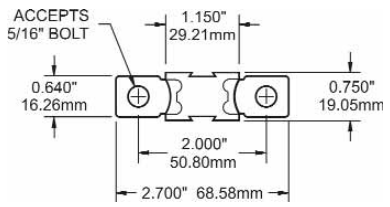
Base Material	Red glass-filled Nylon
SEA Fuses available	100–300 Amperes
Maximum Amperage	300 Amperes
Maximum Voltage	32 Volts DC

PN	Description	Weight Lb/Kg
5001	SEA Fuse Block System 100-300 Amperes	0.29/0.13

5001



5106



SEA Fuses

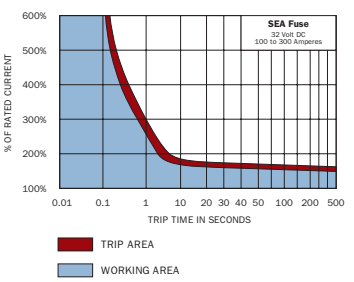
- Most economical fuse for 100–300 Ampere circuit protection

Specifications

Interrupt Capacity	2000 Amperes DC
Maximum Voltage	32 Volts DC

PN	Description	Weight Lb/Kg
5101	SEA Fuse 100 Ampere	0.06/0.03
5102	SEA Fuse 125 Ampere	0.06/0.03
5103	SEA Fuse 150 Ampere	0.06/0.03
5104	SEA Fuse 175 Ampere	0.06/0.03
5105	SEA Fuse 200 Ampere	0.06/0.03
5106	SEA Fuse 225 Ampere	0.06/0.03
5107	SEA Fuse 250 Ampere	0.06/0.03
5108	SEA Fuse 300 Ampere	0.06/0.03

Maxi™ Fuse Block System being produced.



CLASS T Fuse Block System

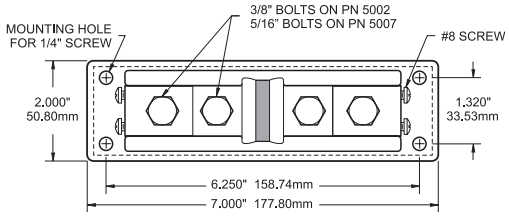
The fuse system recommended by most inverter manufacturers for high speed response to short circuits

- Clear Lexan® cover insulates all conductive parts, satisfying ABYC/USCG requirements
- For use on systems up to 160V DC
- Large stud terminals (3/8" on 5002, 5/16" on 5007) accept ring terminals for wire up to 0000 AWG
- Large heat dissipating tin-plated copper mounting blocks
- Two #8 accessory terminals located on each end

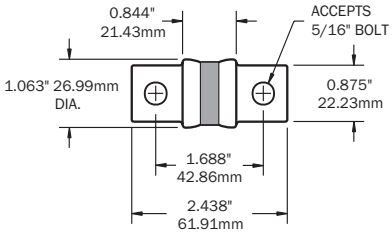
Specifications

Base Material	Black Lexan® Polycarbonate
Class T Fuses available	110–400 Amperes
Maximum Amperage	400 Amperes
Maximum Voltage	160 Volts DC
Fuse Mounting Blocks	Tin-plated Copper

PN	Description	Weight Lb/Kg
5007	Class T Fuse Block System 110–200 Ampere	1.40/0.64
5002	Class T Fuse Block System 225–400 Ampere	1.55/0.70



5112
5113
5114
5115
5116



110 to 200 Ampere

Class T Fuses

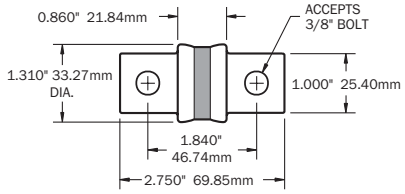
- Extremely fast short-circuit response
- 20,000 Ampere Interrupt Capacity (AIC)
- UL rated for DC applications under UL 198L

Specifications

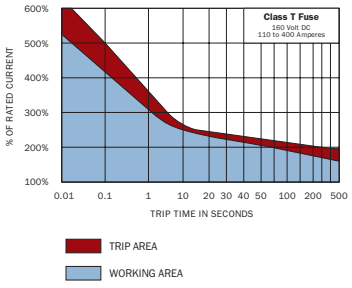
Interrupt Capacity	20,000 Amperes DC
Maximum Voltage	160 Volts DC

PN	Description	Weight Lb/Kg
5112	Class T Fuse 110 Ampere	0.19/0.09
5113	Class T Fuse 125 Ampere	0.19/0.09
5114	Class T Fuse 150 Ampere	0.19/0.09
5115	Class T Fuse 175 Ampere	0.19/0.09
5116	Class T Fuse 200 Ampere	0.19/0.09
5117	Class T Fuse 225 Ampere	0.29/0.13
5118	Class T Fuse 250 Ampere	0.29/0.13
5119	Class T Fuse 300 Ampere	0.29/0.13
5120	Class T Fuse 350 Ampere	0.29/0.13
5121	Class T Fuse 400 Ampere	0.29/0.13

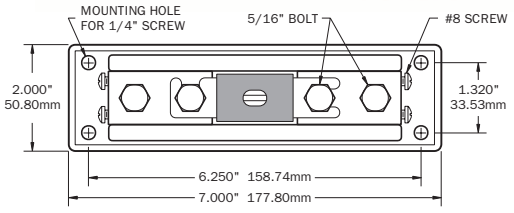
5117
5118
5119
5120
5121



225 to 400 Ampere



5003



5005

ANL Fuses CE

- Ignition protected fuses are safe for installation aboard gas-powered boats when installed in the appropriate Blue Sea Systems' Fuse Block
- Tin-plated connector blades for corrosion resistance
- Visible indication of blown condition
- 6000 Ampere Interrupt Capacity (AIC) satisfies ABYC requirements for main DC circuit protection on large battery banks

Agency Specifications

- 50-750A meet the requirements of ABYC, USCG Title 33 CFR 183.410(a) and UL 1500
- 50-500A meet the requirements of ISO 8846, SAE J1171, ABYC, USCG Title 33 CFR 183.410(a) and UL 1500
- When installed in the specified Blue Sea Systems' fuse block

Specifications

Interrupt Capacity	6000 Amperes DC
Maximum Voltage	32 Volts DC
CE marked	50 to 500 Amperes

PN	Description	Weight Lb/Kg
5122	ANL Fuse 50 Ampere	0.05/0.02
5123	ANL Fuse 60 Ampere	0.05/0.02
5124	ANL Fuse 80 Ampere	0.05/0.02
5125	ANL Fuse 100 Ampere	0.05/0.02
5126	ANL Fuse 130 Ampere	0.05/0.02
5127	ANL Fuse 150 Ampere	0.06/0.03
5128	ANL Fuse 175 Ampere	0.06/0.03
5129	ANL Fuse 200 Ampere	0.06/0.03
5130	ANL Fuse 225 Ampere	0.06/0.03
5131	ANL Fuse 250 Ampere	0.07/0.03
5132	ANL Fuse 275 Ampere	0.07/0.03
5133	ANL Fuse 300 Ampere	0.07/0.03
5134	ANL Fuse 325 Ampere	0.07/0.03
5135	ANL Fuse 350 Ampere	0.07/0.03
5136	ANL Fuse 400 Ampere	0.08/0.04
5137	ANL Fuse 500 Ampere	0.08/0.04
5161	ANL Fuse 600 Ampere	0.08/0.04
5162	ANL Fuse 675 Ampere	0.08/0.04
5163	ANL Fuse 750 Ampere	0.08/0.04

ANL Fuse Block Systems CE

5003 Features

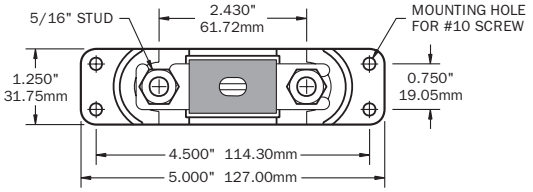
- 750 Ampere rating achieved with large heat dissipating tin-plated copper mounting blocks
- Clear Lexan® cover insulates all conductive parts, satisfying ABYC/USCG requirements
- For use on systems up to 32V DC
- 5/16" stud terminals accept wire ring terminals up to 0000 AWG

5005 Features

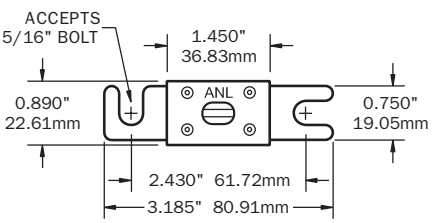
- 300 Ampere rating
- Supplied terminal boots insulate all conductive parts satisfying USCG/ABYC requirements
- For use on systems to 32V DC
- 5/16" stud terminals accept wire ring terminals up to 00 AWG

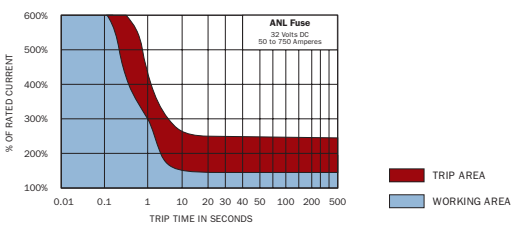
Specifications	5003	5005
Base Material	Black Lexan® Polycarbonate	Red Nylon Glass-filled
Maximum Amperage	750 Amperes	250 Amperes
Maximum Voltage	32 Volts DC	32 Volts DC
Fuse Mounting Blocks	Tin-Plated Brass	n/a

PN	Description	Weight Lb/Kg
5003	ANL Fuse Block System 50-750 Ampere	1.55/0.70
5005	ANL Fuse Block System 50-300 Ampere	0.28/0.13



5122





Thermal Circuit Breakers

Recessed mounting holes for clean appearance

"Trip-free"—designed to trip when subjected to a fault current, even if the reset lever is held in the ON position

Large lever with vertical/horizontal orientation provides clear indication of trip status

Clear, single lever operation

Large clearance around terminal studs accepts large gauge wire lugs

Robust 5/16" terminals provide high torque connections

Surface Mount
7126

5000 Ampere interrupt capacity meets primary circuit protection requirements for large DC systems

Each T-1 circuit breaker is tested during production on Blue Sea Systems' computer controlled test equipement

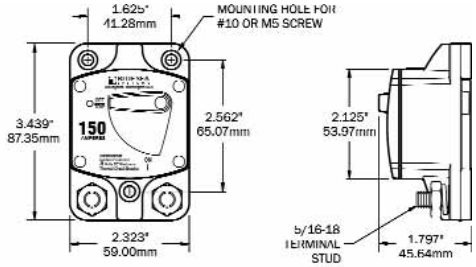
T-1 Series Surface Mount Circuit Breakers CE

- Vapor Proof (conforming to SAE J1171)—safe for installation aboard gas-powered boats
- Weatherproof
- Combines switching and circuit breaker functions into one unit
- "Trip Free"—designed to trip when subjected to a fault current, even if the reset lever is held in the ON position.

Agency Specifications

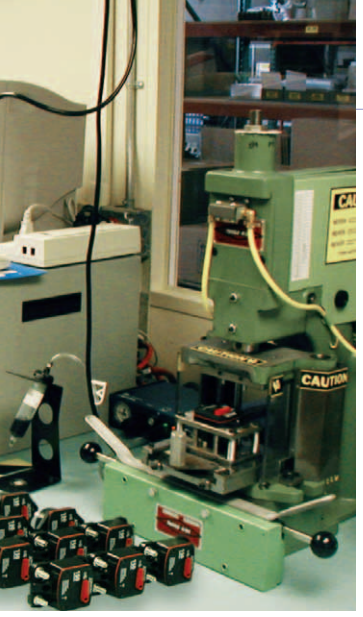
- Meets SAE J553 & J1625 Circuit Breaker Standards for Surface Vehicles.
- Meets SAE J1428 & J1171 Marine Circuit Breaker Standards Including External Ignition Protection

PN	Description
7120	T-1 Circuit Breaker 25 Amp
7121	T-1 Circuit Breaker 30 Amp
7122	T-1 Circuit Breaker 35 Amp
7123	T-1 Circuit Breaker 40 Amp
7124	T-1 Circuit Breaker 50 Amp
7125	T-1 Circuit Breaker 60 Amp
7126	T-1 Circuit Breaker 70 Amp
7127	T-1 Circuit Breaker 80 Amp
7128	T-1 Circuit Breaker 90 Amp
7129	T-1 Circuit Breaker 100 Amp
7130	T-1 Circuit Breaker 110 Amp
7131	T-1 Circuit Breaker 120 Amp
7132	T-1 Circuit Breaker 135 Amp
7133	T-1 Circuit Breaker 150 Amp

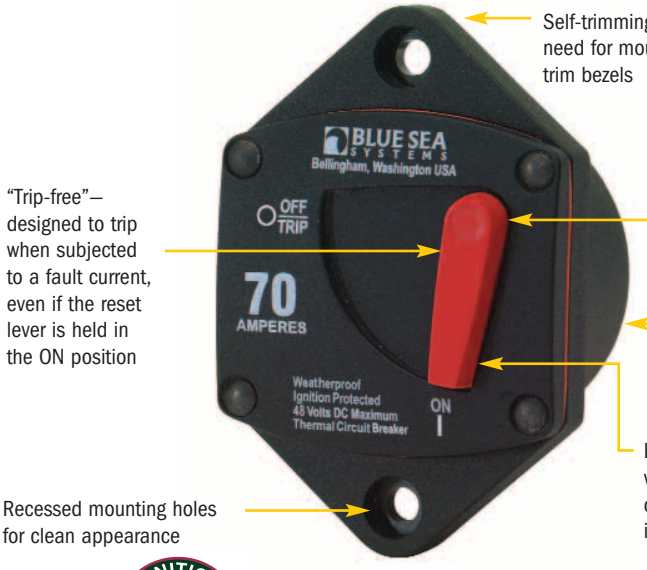


Specifications

Circuit Breaker Class	Type III – Switchable / Manual Reset – Trip Free
Type	Thermally Responsive Bi-Metal Blade
Body Material	Thermoset Polyester UL Rated 94V-0, 338°F (170°C)
Amperage Range	25 to 150 Amperes
Voltage Rating	48 Volt DC Maximum
Interrupt Rating DC	5,000 Amperes @ 12 Volts 3,000 Amperes @ 24 Volts 1,500 Amperes @ 42 Volts
Weight	0.50 Lb / 0.23 Kg Panel Mount 0.58 Lb / 0.26 Kg Surface Mount



Thermal Circuit Breakers



IGNITION PROTECTED

Panel Mount
7026

5000 Ampere interrupt capacity meets primary circuit protection requirements for large DC systems

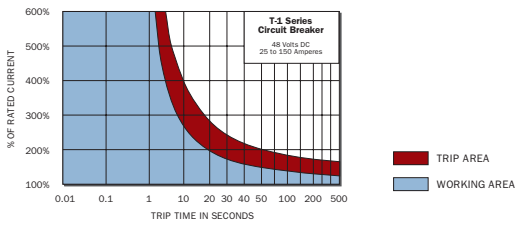
T-1 Series Panel Mount Circuit Breakers CE

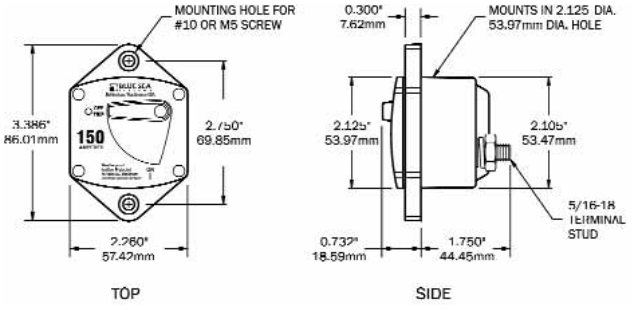
- Vapor Proof (conforming to SAE J1171)—safe for installation aboard gas-powered boats
- Weatherproof
- Combines switching and circuit breaker functions into one unit
- "Trip Free"—designed to trip when subjected to a fault current, even if the reset lever is held in the ON position.

Agency Specifications

- Meets SAE J553 & J1625 Circuit Breaker Standards for Surface Vehicles.
- Meets SAE J1428 & J1171 Marine Circuit Breaker Standards Including External Ignition Protection

PN	Description
7020	T-1 Circuit Breaker 25 Amp
7021	T-1 Circuit Breaker 30 Amp
7022	T-1 Circuit Breaker 35 Amp
7023	T-1 Circuit Breaker 40 Amp
7024	T-1 Circuit Breaker 50 Amp
7025	T-1 Circuit Breaker 60 Amp
7026	T-1 Circuit Breaker 70 Amp
7027	T-1 Circuit Breaker 80 Amp
7028	T-1 Circuit Breaker 90 Amp
7029	T-1 Circuit Breaker 100 Amp
7030	T-1 Circuit Breaker 110 Amp
7031	T-1 Circuit Breaker 120 Amp
7032	T-1 Circuit Breaker 135 Amp
7033	T-1 Circuit Breaker 150 Amp





Specifications

Circuit Breaker Class	Type III – Switchable / Manual Reset – Trip Free
Type	Thermally Responsive Bi-Metal Blade
Body Material	Thermoset Polyester, UL Rated 94V-0, 338°F (170°C)
Amperage Range	25 to 150 Amperes
Voltage Rating	48 Volt DC Maximum
Interrupt Rating DC	5,000 Amperes @ 12 Volts 3,000 Amperes @ 24 Volts 1,500 Amperes @ 42 Volts
Weight	0.50 Lb / 0.23 Kg Panel Mount 0.58 Lb / 0.26 Kg Surface Mount

Thermal Circuit Breakers

Push Button Circuit Breakers CE

NEW

- Lowest cost circuit breaker available
- Compact design enables high density circuit protection configurations
- Can be Waterproof with optional boot
- "Trip Free"—cannot be held closed after trip

7050

Specifications

Interrupt Capacity	1000 Amperes
Circuit Breaker Type	Thermal
Body Material	Phenolic
Maximum Voltage	28 Volts DC 125-250 Volts AC
Weight	0.24 Lb / 0.11 Kg

PN	Description
7050	Circuit Breaker Push Button 3 Amp
7051	Circuit Breaker Push Button 4 Amp
7052	Circuit Breaker Push Button 5 Amp
7053	Circuit Breaker Push Button 7 Amp
7054	Circuit Breaker Push Button 10 Amp
7055	Circuit Breaker Push Button 12 Amp
7056	Circuit Breaker Push Button 15 Amp
7057	Circuit Breaker Push Button 20 Amp
7058	Circuit Breaker Push Button 25 Amp
7059	Circuit Breaker Push Button 30 Amp
7060	Circuit Breaker Push Button 35 Amp
7061	Circuit Breaker Push Button 40 Amp


4135

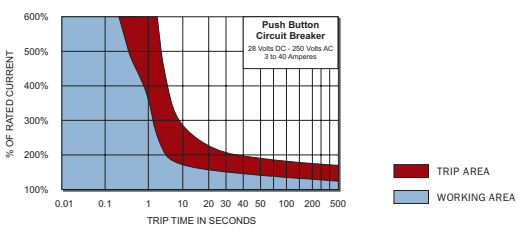

4136

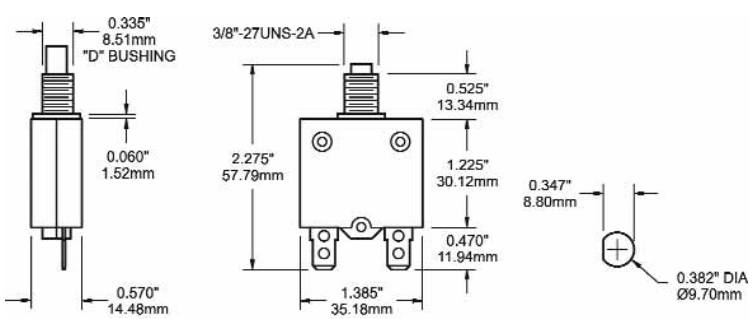

4137

PN	Description
4135	Boot Reset Button Clear
4136	Boot Reset Button White
4137	Boot Reset Button Black

New! Low Cost Waterproof Circuit Breakers.

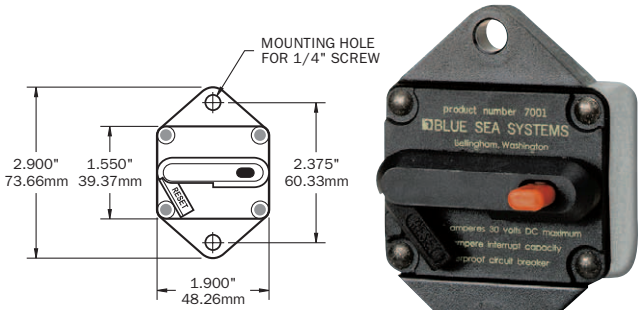
Push Button Thermal Circuit Breakers are designed for small boat applications where small size, low cost and waterproof integrity are demanded. The push button Circuit Breakers can be waterproofed with the optional clear, white or black boots or purchased installed in Blue Sea Systems' new Arctic Waterproof Circuit Breaker Panels (see page 37).



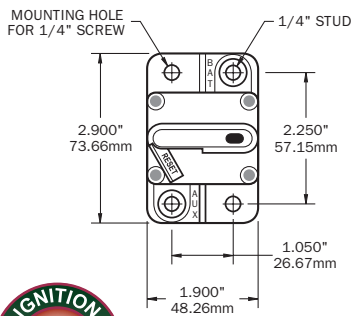


Push Button Circuit Breakers | **Panel Cutout Detail**

Thermal Circuit Breakers



7001
Panel Mount



7100
Surface Mount

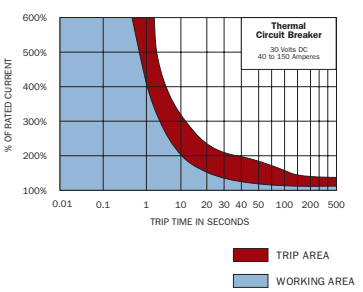
Thermal Circuit Breakers

- Vapor Proof (conforming to SAE J1171)—safe for installation aboard gas-powered boats
- Waterproof
- Combines switching and circuit breaker function into one unit
- "Trip Free"—cannot be held closed after trip

Specifications

Interrupt Capacity	3000 Amperes
Circuit Breaker Type	Thermal
Body Material	Phenolic
Maximum Voltage	30 Volts DC
Weight	0.24 Lb / 0.11 Kg Panel Mount 0.30 Lb / 0.14 Kg Surface Mount

PN Panel Mount	PN Surface Mount	Description
7005	7105	Circuit Breaker 40 Amp
7000	7100	Circuit Breaker 50 Amp
7001	7101	Circuit Breaker 75 Amp
7002	7102	Circuit Breaker 100 Amp
7003	7103	Circuit Breaker 125 Amp
7004	7104	Circuit Breaker 150 Amp
7198		Mounting Bezel for 700x Circuit Breakers
7199		Mounting Panel for 700x Circuit Breakers



DC Magnetic Circuit Breakers

7266

7244

7267

7270

C-Series Circuit Breaker Mounting Panels

- Designed for C-Series circuit breakers available in sizes 50A to 300A
- Position plugs can be added or removed individually to fill blank positions or add new circuit breakers
- Heavy 1/8" aluminum 5052 Alloy
- Two-Part Polyurethane textured slate finish
- Accepts standard Blue Sea Systems' backlightable labels
- Ready for installation of optional 8065 Label Backlight System
- Accepts standard Blue Sea Systems' "ON" indicating LED's
- Industry standard height and width
- Optional Plug Kit PN 8089 includes circuit breaker mounting screws, C-Series panel plug, LED plug and blank label

Specifications

Dimensions	8087	7.50"/190.50 mm high 5.25"/133.35 mm wide
Dimensions	8088	3.75"/95.25 mm high 5.25"/133.35 mm wide

PN	Description	Weight Lb/Kg
8087	8 Position C-Series Mounting Panel	0.40/0.18
8088	3 Position C-Series Mounting Panel	0.28/0.13
8089	C-Series Panel Plug Kit	0.10/0.04

DC C-Series Circuit Breakers

50 to 300 Ampere range provides overcurrent protection previously only available in fuses for:
• Inverters • Bow Thrusters • Windlasses

- Combines switching and circuit protection into a single device
- "Trip Free"—cannot be held closed after trip
- LED indicates power "ON" (in panel mounted units)

Specifications

Panel Material	0.125" Aluminum 5052 Alloy
Panel Undercoating	Chemical Treatment Mil-C-5541C or equivalent
Panel Front Coating	2-Part Polyurethane slate gray
Maximum Voltage	65 Volts DC
Rated Switch Cycles	10,000 @ rated amperage and voltage
LED Amperage	5 Milliwatts
Dimensions	5.25" / 133.40 mm high 3.75" / 95.25 mm wide

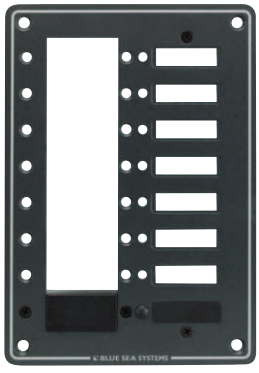
Interrupt Ratings *(See ABYC Interrupt Rating Requirements page 68)*

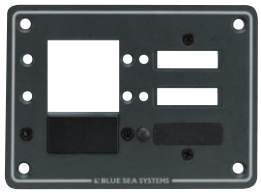
C–Series DC Single Pole 50–100A		UL 1077 – UL/CSA (US/Canada)[1]		EN 60934 – VDE (Europe)	
Voltage	**Current**	**w/o Fuse Backup**	**Fuse Backup**	**w/o Fuse Backup**	**Fuse Backup**
65V DC	71–100A	5000A	–	–	–
80V DC	0.1 – 70A	7500A	–	1500A	–
C–Series DC Double & Triple Pole 150–300A					
65V DC	110 – 300A	5000A	–	–	–

[1] *UL Recognized*

PN Panel Circuit Breaker	PN Circuit Breaker	Description	Weight Lb/Kg
7272*	7244*	Panel DC 50A C-Series 1 pole	0.36/0.17
7273*	7246*	Panel DC 60A C-Series 1 pole	0.36/0.17
7274*	7248*	Panel DC 80A C-Series 1 pole	0.36/0.17
7259*	7250*	Panel DC 100A C-Series 1 pole	0.36/0.17
7262	7267	Panel DC 150A C-Series 2 pole	0.64/0.31
7263	7268	Panel DC 175A C-Series 2 pole	0.64/0.31
7264	7269	Panel DC 200A C-Series 2 pole	0.64/0.31
7265	7270	Panel DC 250A C-Series 3 pole	0.93/0.46
7266	7271	Panel DC 300A C-Series 3 pole	0.93/0.46

**Single Pole units are AC/DC Rated*





8088

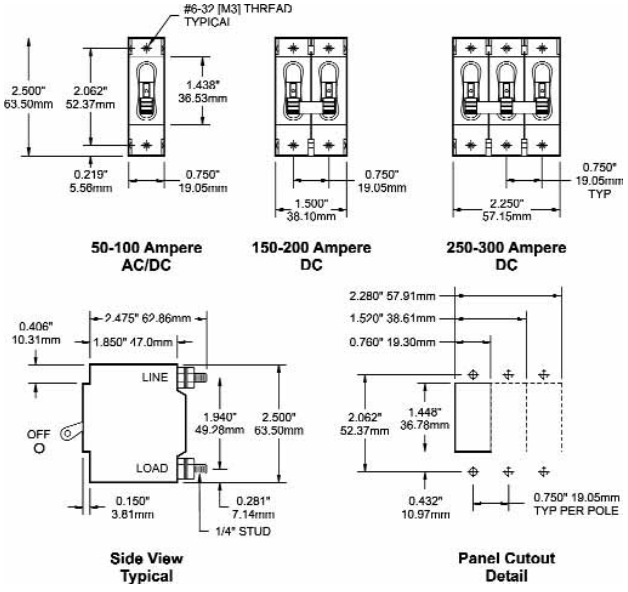
8087

AC Magnetic Circuit Breakers

7287

7244

7251



AC C-Series Circuit Breakers

- 5000 Ampere Interrupt Capacity to meet ABYC requirements for 120/240 Volt 50 Ampere Main Protection
- "Trip Free" design cannot be held ON during fault current condition

Specifications

Circuit Breaker Type	Magnetic	Maximum Amperage	100 Amperes
Body Material	Phenolic	Maximum Voltage	250 Volts AC

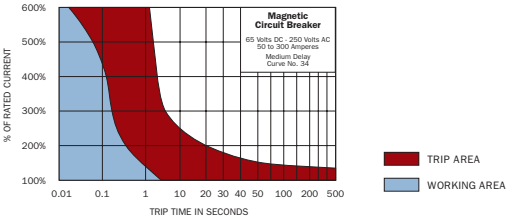
Interrupt Ratings *(See ABYC Interrupt Rating Requirements page 68)*

C–Series AC Single Pole 50–100A		UL 1077 – UL/CSA (US/Canada)[1]		EN 60934 – VDE (Europe)	
Voltage	**Current**	**w/o Fuse Backup**	**Fuse Backup**	**w/o Fuse Backup**	**Fuse Backup**
125V AC	0.1 – 100A	1000A	5000A 175A RK5	–	–
250V AC	0.1 – 70A	–	5000A 125A RK5	1500A	3000A 125A gL
C–Series AC Double Pole 50–100A					
120/240V AC	71 – 100A	1000A	5000A 175A RK5	–	–
125/250V AC	0.1 – 50A	3000A	5000A 125A RK5	–	–
250V AC	0.1 – 70A	–	5000A 175A RK5	1500A	3000A 125A gL

[1] *UL Recognized*

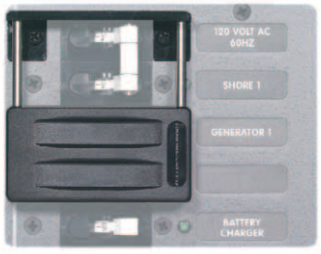
PN	Description			Weight Lb/Kg
7244*	Circuit Breaker	C-Series 1 Pole	50A White	0.28/0.13
7246*	Circuit Breaker	C-Series 1 Pole	60A White	0.28/0.13
7248*	Circuit Breaker	C-Series 1 Pole	80A White	0.28/0.13
7250*	Circuit Breaker	C-Series 1 Pole	100A White	0.28/0.13
7251	Circuit Breaker	C-Series 2 Pole	50A White	0.56/0.26
7254	Circuit Breaker	C-Series 2 Pole	60A White	0.56/0.26
7256	Circuit Breaker	C-Series 2 Pole	80A White	0.56/0.26
7258	Circuit Breaker	C-Series 2 Pole	100A White	0.56/0.26
7287	Circuit Breaker	C-Series 3 Pole	50A White	0.93/0.46
7288	Circuit Breaker	C-Series 3 Pole	60A White	0.93/0.46
7289	Circuit Breaker	C-Series 3 Pole	80A White	0.93/0.46
7290	Circuit Breaker	C-Series 3 Pole	100A White	0.93/0.46

** Single pole units are AC/DC Rated*



NEW

4131



4130

C-Series AC Lockout Slide

- Allows only 1 of a pair of double-pole or triple-pole AC circuit breakers to be activated at a time
- Guarantees that AC power from 2 sources (power company and genset or inverter) will not be mixed
- Fits all double-pole or triple-pole C-Series circuit breakers shown
- Uses circuit breaker mounting screw holes. Requires no special panel modification
- Includes 4 mounting screws

Specifications

Material	Acetal
Mounting Screw Size	#6 Flat Head Screw

PN	Description	Weight Lb/Kg
4130	Lockout Slide AC 2 position 2 pole	0.06/0.03
4131	Lockout Slide AC 2 position 3 pole	0.17/0.08

AC/DC Magnetic Circuit Breakers

World Circuit Breakers

Today's international trade requires that products be certified to sell in multiple markets without restriction. Boat manufacturers must be confident that their production can be sold globally without fear of denied entry into a country for regulatory non-compliance.

Blue Sea Systems introduces the World Circuit Breaker, the first implementation of the industry standard A-Series Magnetic Circuit Breaker ever to be certified for both North American and European markets. The World Circuit Breaker meets all American Boat and Yacht Council (ABYC) Standards, is UL 1077 Recognized, VDE Certified and CE marked for Europe, and CSA Certified for Canada.

Sell your product around the world with the confidence that it's World Circuit Breaker equipped electrical system meets the standards of any desired market.

Toggle Circuit Breakers

- The industry standard circuit breaker for Blue Sea Systems' electrical panels
- Combines switching and circuit protection into a single device
- Quick Trip models are designed specifically for electronics protection

Specifications

Circuit Breaker Type	Magnetic
Material	Phenolic
Maximum Amperage	50 Amperes
Maximum Voltage	65 Volts DC 277 Volts AC
Rated Switch Cycles	10,000 @ rated amperage and voltage

Double Pole Magnetic AC Circuit Breakers CE

- Used as AC main circuit breakers to switch both hot and neutral legs
- With neutral circuit on one pole and hot circuit on other pole, both poles will trip if either pole trips

Specifications

Weight 0.34 Lb / 0.16 Kg

7233

PN	Description
7232	Circuit Breaker 10A Black
7233	Circuit Breaker 10A White
7234	Circuit Breaker 15A Black
7235	Circuit Breaker 15A White
7285	Circuit Breaker 16A White
7236	Circuit Breaker 20A Black
7260	Circuit Breaker 20A White
7237	Circuit Breaker 30A Black
7238	Circuit Breaker 30A White
7286	Circuit Breaker 32A White
7239	Circuit Breaker 40A Black
7240	Circuit Breaker 40A White
7241	Circuit Breaker 50A Black
7242	Circuit Breaker 50A White

World Breaker AC Single Pole 1-50 Amp

		UL 1077 - UL/CSA (US/Canada)[1]		EN 60934 - VDE (Europe)	
Voltage	Current	w/o Fuse Backup	Fuse Backup	w/o Fuse Backup	Fuse Backup
65V DC	1 - 50A	5000A	-	1500A	-
125V AC	1 - 50A	5000A	-	1500A	-
120/240V AC	1 - 50A	5000A	-	1500A	-
250V AC	1 - 50A	5000A	-	1500A	-

[1] UL Recognized

Single Pole Magnetic AC/DC Circuit Breakers CE

Specifications

Weight 0.17 Lb / 0.08 Kg

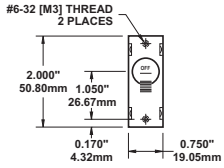
7200

Quick Trip Circuit Breakers

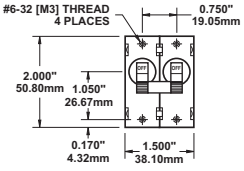
PN	Description
7291	Circuit Breaker 1A White
7292	Circuit Breaker 2.5A White
7293	Circuit Breaker 5A White

Standard Delay Circuit Breakers

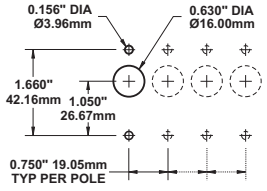
PN	Description
7200	Circuit Breaker 5A Black
7201	Circuit Breaker 5A Red
7202	Circuit Breaker 5A White
7277	Circuit Breaker 8A White
7204	Circuit Breaker 10A Black
7205	Circuit Breaker 10A Red
7206	Circuit Breaker 10A White
7208	Circuit Breaker 15A Black
7209	Circuit Breaker 15A Red
7210	Circuit Breaker 15A White
7212	Circuit Breaker 20A Black
7213	Circuit Breaker 20A Red
7214	Circuit Breaker 20A White
7216	Circuit Breaker 25A Black
7217	Circuit Breaker 25A Red
7218	Circuit Breaker 25A White
7220	Circuit Breaker 30A Black
7221	Circuit Breaker 30A Red
7222	Circuit Breaker 30A White
7224	Circuit Breaker 40A Black
7225	Circuit Breaker 40A Red
7226	Circuit Breaker 40A White
7228	Circuit Breaker 50A Black
7229	Circuit Breaker 50A Red
7230	Circuit Breaker 50A White



1-Pole Toggle Circuit Breakers

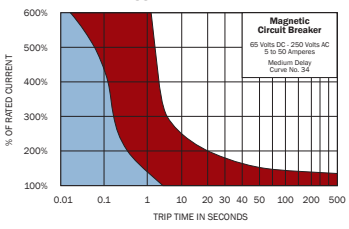


2-Pole Toggle Circuit Breaker

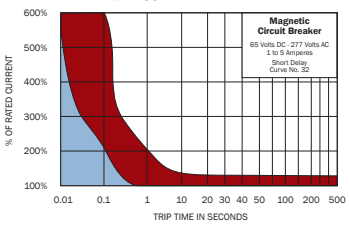


Panel Cutout Detail

Standard Toggle Circuit Breakers

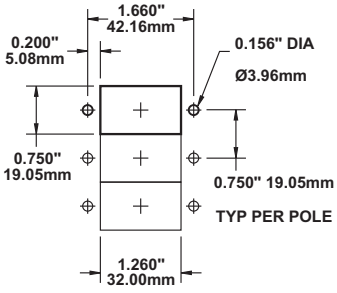


Quick Trip Toggle Circuit Breakers

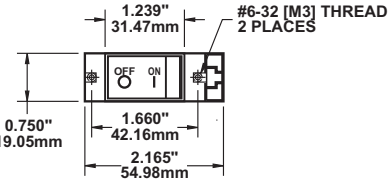


See page 42 for 8072 & 8173 mounting panels
See page 15 for AC Double Pole Lockout Slide

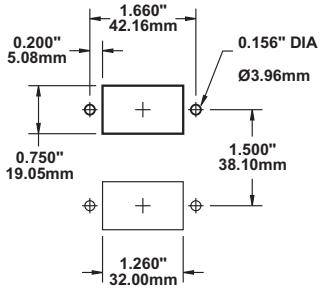
AC/DC Magnetic Circuit Breakers



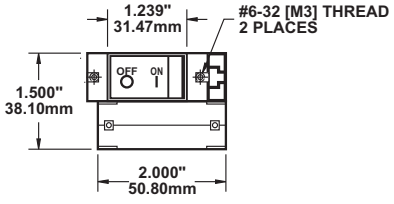
1-Pole Panel Cutout Detail



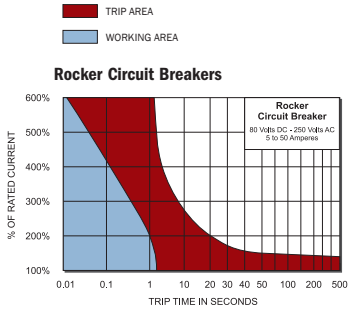
1-Pole Rocker Circuit Breaker



2-Pole Panel Cutout Detail



2-Pole Rocker Circuit Breaker



Rocker Circuit Breakers CE

- Rocker actuator gives modern appearance to electrical distribution panels
- European and North American agency approvals
- Highest interrupt rating of any panel circuit breaker
- Dual color rocker gives clear visual indication of handle position

Specifications

Circuit Breaker Type	Magnetic-Trip Free
Case Material	Polyester
Maximum Amperage	50 Amperes
Maximum Voltage	250 Volts AC 65/80 Volts DC
Rated Switch Cycles	10,000 @ rated amperage and voltage
Mounting screw	#6-32
Terminal screw	#10-32 SS w/external tooth lockwasher
Weight	
Single-pole	0.19 Lb/0.09 Kg
Double-pole	0.36 Lb/0.16 Kg

PN Description

Single Pole

7300 Circuit Breaker Rocker 5A
7301 Circuit Breaker Rocker 8A
7302 Circuit Breaker Rocker 10A
7303 Circuit Breaker Rocker 15A
7304 Circuit Breaker Rocker 20A
7305 Circuit Breaker Rocker 25A
7306 Circuit Breaker Rocker 30A
7307 Circuit Breaker Rocker 40A
7308 Circuit Breaker Rocker 50A

Double Pole

7320 Circuit Breaker Rocker 10A
7321 Circuit Breaker Rocker 15A
7322 Circuit Breaker Rocker 16A
7323 Circuit Breaker Rocker 20A
7324 Circuit Breaker Rocker 30A
7325 Circuit Breaker Rocker 32A
7326 Circuit Breaker Rocker 40A
7327 Circuit Breaker Rocker 50A

Interrupt Ratings (See ABYC Interrupt Rating Requirements page 68)

Circuit Breaker Rocker Single Pole 5Ð50 Amp		UL 1077 -UL/CSA (US/Canada)[1]		EN 60934 -VDE (Europe)	
Voltage	**Current**	**w/o Fuse Backup**	**Fuse Backup**	**w/o Fuse Backup**	**Fuse Backup**
65V DC	5 - 50A	-	-	2000A	-
80V DC	5 - 30A	-	-	4000A	-
80V DC	5 - 50A	7500A	-	-	-
125V AC	5 - 50A	3000A	5000A*	-	-
240V AC	5 - 50A	2000A	5000A*	-	-
250V AC	5 - 30A	2000A	5000A**	2000A	-
250V AC	5 - 50A	-	-	2000A	-

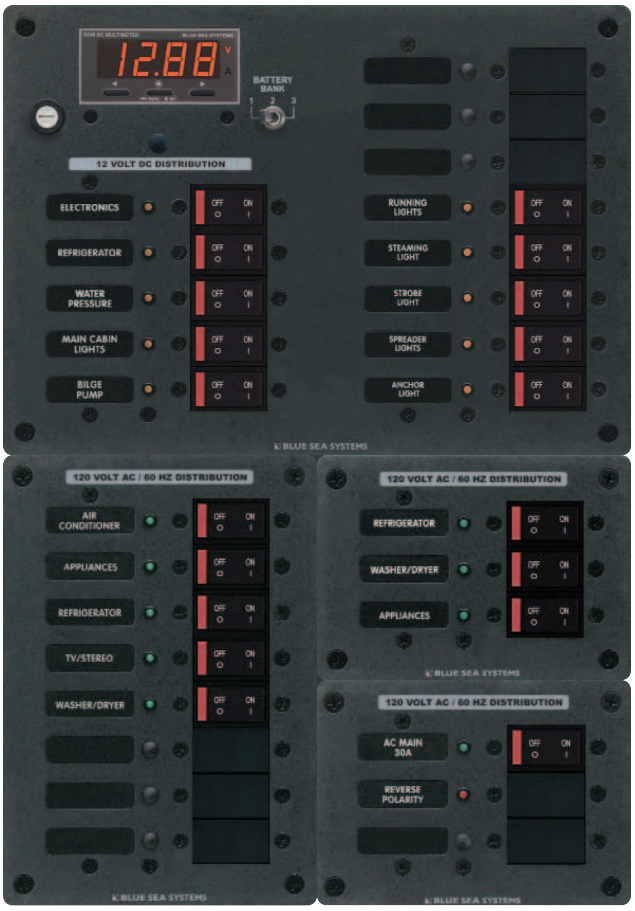
*With 125A max. RK5 series fuse **With 80A max. RK5 series fuse [1] UL Recognized

Interrupt Ratings (See ABYC Interrupt Rating Requirements page 68)

Circuit Breaker Rocker Double Pole 5Ð50 Amp		UL 1077 - UL/CSA (US/Canada)[1]		EN 60934 -VDE (Europe)	
Voltage	**Current**	**w/o Fuse Backup**	**Fuse Backup**	**w/o Fuse Backup**	**Fuse Backup**
125V AC	5 - 50A	3000A	5000A*	-	-
120/240V AC	5 - 50A	3000A	5000A*	-	-
240V AC	5 - 50A	2000A	5000A*	-	-
250V AC	5 - 30A	2000A	5000A**	2000A	-
250V AC	5 - 50A	-	-	2000A	-

*With 125A max. RK5 series fuse **With 80A max. RK5 series fuse [1] UL Recognized

Electrical Distribution Panels



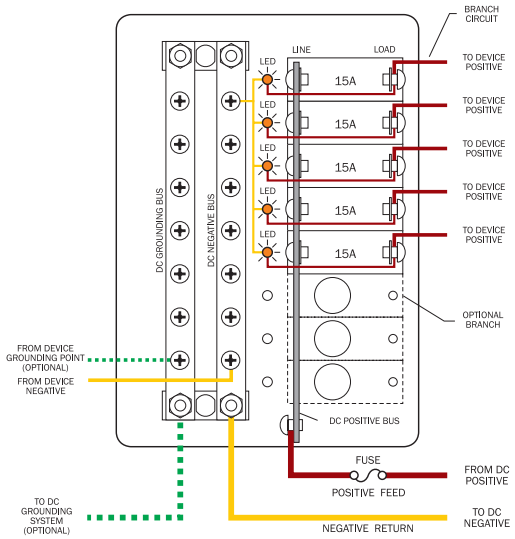
The elements of a superior electrical panel

- Industry standard circuit breakers see pages 16 and 17
- Countersunk mounting holes throughout
- Heavy 1/8" aluminum 5052 alloy
- MIL-C-5541C or equivalent Immersion Undercoating for lifetime corrosion resistance
- Two-part polyurethane slate grey finish
- Flush fitting backlightable labels (with optional backlight kit)
- Over 500 labels available worldwide
- "ON" indicating LED's for each circuit
- Special rocker and toggle magnetic circuit breakers meet all North American and European CE Standards for installation outside gasoline engine compartments
- Industry standard height and width
- Wide range of compatible AC and DC Analog and Digital Meters
- NEW DC Panels are 12 and 24 Volt capable
- NEW AC Isolation Covers meet ABYC AC installation standards

The consistent height and width of Blue Sea Systems' panels allow them to be stacked together to create larger panel assemblies with either horizontal or vertical orientations.

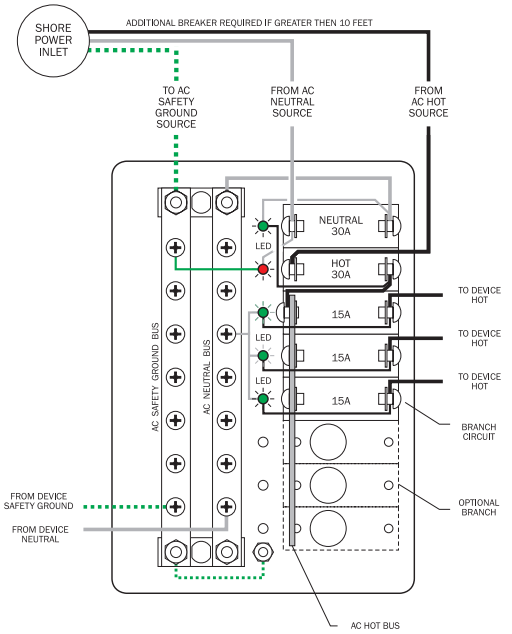
Blue Sea Systems' panel labeling system allows all DC distribution panels to be configured for 12 or 24 Volt applications. Simply install the supplied 24 Volt DC Distribution label(s). Panels with analog voltmeters will require meter upgrades (see panel specification). All other DC components are rated for 12 or 24 Volt DC operation.

Typical Panel Wiring



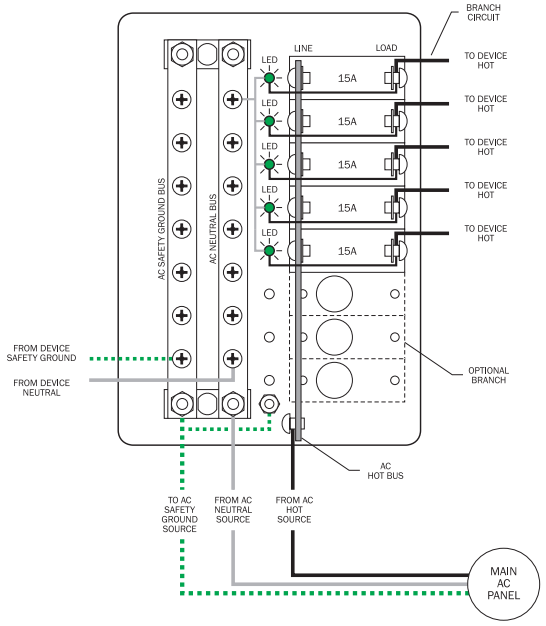
DC Panel Wiring Schematic

- 100 Ampere rated tin-plated copper negative and grounding buses
- 100 Ampere rated tin-plated copper positive bus
- Heavy #10 stud terminals for feed-wire connections
- Ready for optional label backlight system
- Amber circuit “ON” indicating LED’s



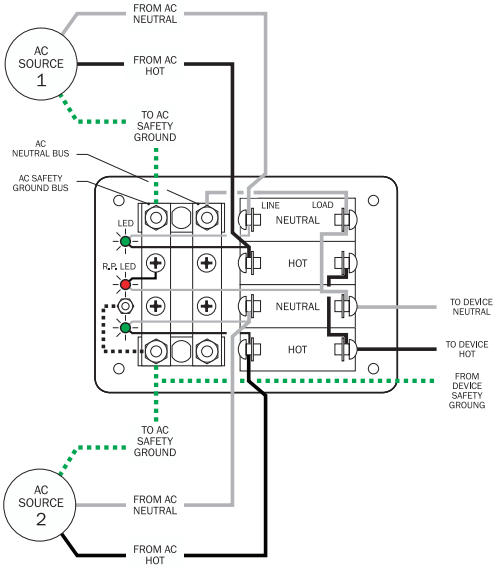
AC Main Panel Wiring Schematic

- Double-pole double-toggle AC rated magnetic circuit breakers break both neutral and hot AC
- 100 Ampere rated tin-plated copper neutral and safety ground (green wire) buses
- 100 Ampere rated tin-plated copper hot bus
- Heavy #10 stud terminals for feed-wire connections
- Ready for optional label backlight system
- Red reverse polarity indicating LED’s
- Green circuit “ON” indicating LED’s



AC Auxiliary Panel Wiring Schematic

- 100 Ampere rated tin-plated copper neutral and safety ground (green wire) buses
- 100 Ampere rated tin-plated copper hot bus
- Heavy #10 stud terminals for feed-wire connections
- Ready for optional label backlight system
- Green circuit “ON” indicating LED’s

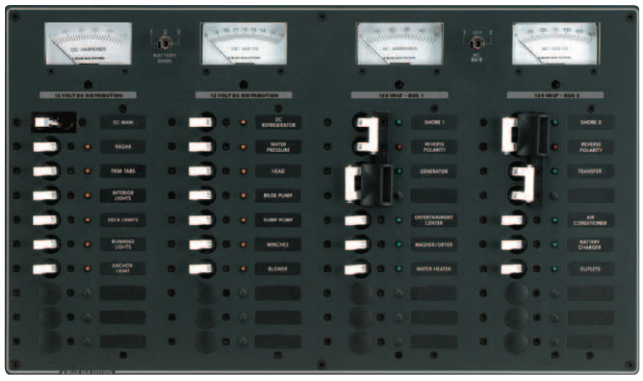


AC Source Selector Panel Wiring Schematic

- Double-pole double-toggle AC rated magnetic circuit breakers break both neutral and hot AC
- Heavy #10 stud terminals for feed-wire connections
- Ready for optional label backlight system
- Red reverse polarity indicating LED’s
- Green circuit “ON” indicating LED’s

Electrical Distribution Panels

AC/DC Circuit Breaker Panels



8086 Panel

8408 Panel

AC/DC 20AC/20DC Position Circuit Breaker Panel CE

- Ready for installation of optional 8069 Label Backlight System (4 required)
- Includes set of 30 common AC and 30 common DC labels, backlightable (see page 41)
- All AC and DC buses installed, fully pre-wired

AC Features Common to 8086 and 8186 Panels

- Two separate AC load groups with transfer switch to combine into one load group
- Switch allows ammeter and voltmeter to read either AC load group
- Twenty AC circuit breaker positions
- 0-50 Amp AC ammeter with remote sensing coil
- Reverse polarity indicators on both AC load groups
- NEW Ready for installation of optional 4031 AC Isolation Cover (see page 42)

AC Features of 8086 Panel only

- Six 15 Amp circuit breakers installed
- Four double-pole 30 Amp AC main circuit breakers with lockout slides
- 0-150 Volt AC Voltmeter

AC Features of 8186 Panel only

- Six 8 Amp circuit breakers installed
- Four double-pole 16 Amp AC main circuit breakers with lockout slides
- 0-230 Volt AC Voltmeter

DC Features Common to 8086 and 8186 Panels

- NEW 100 Amp C-Series circuit breaker provides both circuit protection and master switching for main distribution panel circuit
- Twenty DC circuit breaker positions, thirteen 15A circuit breakers installed
- 8-16 Volt voltmeter with 3 position switch for multiple battery banks
- 0-100 Ampere DC ammeter with remote shunt
- NEW Upgrade to 24V with 8240, 18-32V DC Voltmeter

Specifications

Voltage	8086 12 Volts DC / 120 Volts AC 8186 12 Volts DC / 230 Volts AC
Amperage	Panel Main Bus 100A AC / 100A DC
Weight	12.80 Lb / 5.81 Kg
Dimensions	11.50" / 292.10 mm high 19.50" / 495.30 mm wide

PN	Description
8086	120V AC / 12V DC 40 Position Circuit Breaker Panel with Meters
8186	230V AC / 12V DC 40 Position Circuit Breaker Panel with Meters

See pages 44-48 for meter specifications.

AC/DC AC Main + 6AC/18DC Position Circuit Breaker Panel CE

- Ready for installation of optional (2) 8065 and (1) 8069 Label Backlight System
- Includes set of 30 common AC and 30 common DC labels, backlightable
- All AC and DC buses installed, fully pre-wired

AC Features Common to 8408 and 8508 Panels

- 8247 AC Digital Multimeter displays amperes to 150A, voltage to 300V, frequency to 90 Hz and watts to 9999. Includes high and low amperage alarms.
- Eight AC circuit breaker positions
- Red reverse polarity indicating LED
- All hot, neutral and safety ground buses installed, fully pre-wired
- NEW Ready for installation of optional 4029 AC Isolation Cover (see page 42)

AC Features of 8408 Panel only

- Three 15 Amp circuit breakers installed
- One double-pole 30 Amp AC main circuit breaker

AC Features of 8508 Panel only

- Three 8 Amp circuit breakers installed
- One double-pole 16 Amp AC main circuit breaker

DC Features Common to 8408 and 8508 Panels

- 8248 DC Digital Multimeter displays amperes to 500A, voltage to 60V. Includes high and low voltage alarms with 3 position switch for multiple battery banks
- NEW 100 Amp C-Series circuit breaker provides both circuit protection and master switching for main distribution panel circuit
- All positive, negative and grounding buses installed, fully pre-wired
- Eleven 15 Amp circuit breakers installed

Specifications

Voltage	8408 12-24 Volts DC / 120 Volts AC 8508 12-24 Volts DC / 230 Volts AC
Amperage	Panel Main Bus 100A AC / 100A DC
Weight	8.73 Lb / 3.96 Kg
Dimensions	10.00" / 254.00 mm high 15.75" / 400.05 mm wide

PN	Description
8408	120V AC / 12 or 24V DC 26 Position Circuit Breaker Panel with Digital Meters
8508	230V AC / 12 or 24V DC 26 Position Circuit Breaker Panel with Digital Meters

See pages 46 & 47 for 8247 & 8248 digital meter specifications.

See pages 40-42 for circuit breaker panel accessories.

AC/DC Circuit Breaker Panels

8084 Panel

AC/DC 8AC/16 DC Position Circuit Breaker Panel CE

- Ready for installation of optional 8065 Label Backlight System (3 required)
- Includes set of 30 common AC and 30 common DC labels, backlightable (see page 41)
- All AC and DC buses installed, fully pre-wired

AC Features Common to 8084 and 8184 Panels

- Eight AC circuit breaker positions
- Red reverse polarity indicating LED
- NEW Ready for installation of optional 4029 AC Isolation Cover (see page 42)

AC Features of 8084 Panel only

- Three 15 Amp circuit breakers installed
- One double-pole 30 Amp AC main circuit breaker
- 0-150 Volt AC Voltmeter

AC Features of 8184 Panel only

- Three 8 Amp circuit breakers installed
- One double-pole 16 Amp AC main circuit breaker
- 0-250 Volt AC Voltmeter

DC Features Common to 8084 and 8184 Panels

- NEW 100A C-Series circuit breaker provides both circuit protection and master switching for main distribution panel circuit
- Sixteen DC circuit breaker positions, nine 15A circuit breakers installed
- 8-16 Volt voltmeter with 3 position switch for multiple battery banks
- 0-100 Ampere DC ammeter with remote shunt
- All positive, ground and grounding buses installed, fully pre-wired
- NEW Upgrade to 24V with 8240, 18-32V DC Voltmeter

Specifications

Voltage	8084 12 Volts DC / 120 Volts AC
	8184 12 Volts DC / 230 Volts AC
Amperage	Panel Main Bus 100A AC / 100A DC
Weight	6.50 Lb / 2.95 Kg
Dimensions	10" / 254 mm high
	14.75" / 374.65 mm wide

PN	Description
8084	120V AC / 12V DC 24 Position Circuit Breaker Panel with Meters
8184	230V AC / 12V DC 24 Position Circuit Breaker Panel with Meters

8085 Panel

AC/DC 16AC/8DC Position Circuit Breaker Panel CE

- Ready for installation of optional 8065 Label Backlight System (3 required)
- Includes set of 30 common AC and 30 common DC labels, backlightable (see page 41)
- All AC and DC buses installed, fully pre-wired

AC Features Common to 8085 and 8185 Panels

- Sixteen AC circuit breaker positions
- 0-50 Ampere AC ammeter with remote sensing coil
- Red reverse polarity indicating LED
- Nine 8 Amp circuit breakers installed
- Two double-pole 16 amp AC main circuit breakers with lockout slide
- NEW Ready for installation of optional 4029 (2 required) AC Isolation Cover (see page 42)

AC Features of 8085 Panel only

- 0-150 Volt AC Voltmeter
- Nine 15 Amp circuit breakers installed
- Two double-pole 30 Amp AC main circuit breakers with lockout slide

AC Features of 8185 Panel only

- 0-250 Volt AC Voltmeter

NEW *DC Features Common to 8085 and 8185 Panels*

- 100 Amp C-Series circuit breaker provides both circuit protection and master switching for main distribution panel circuit
- Eight DC circuit breaker positions, four 15A circuit breakers installed
- 8-16 Volt voltmeter with 3 position switch for multiple battery banks
- NEW All positive, ground and grounding buses installed, fully pre-wired
- Upgrade to 24V with 8240, 18-32V DC Voltmeter

Specifications

Voltage	8085 12 Volts DC / 120 Volts AC
	8185 12 Volts DC / 230 Volts AC
Amperage	Panel Main Bus 100A AC / 100A DC
Weight	6.50 Lb / 2.95 Kg
Dimensions	10.00" / 254.00 mm high
	14.75" / 374.65 mm wide

PN	Description
8085	120V AC / 12V DC 24 Position Circuit Breaker Panel with Meters
8185	230V AC / 12V DC 24 Position Circuit Breaker Panel with Meters

See pages 44-48 for meter specifications.
See pages 40-42 for circuit breaker panel accessories.

AC Circuit Breaker Panels

AC 24 Position Circuit Breaker Panel CE

- Twenty-four total circuit breaker positions, 9 blank positions
- Fifteen 15 Amp circuit breakers installed
- All hot, neutral and safety ground buses installed, fully pre-wired
- Includes set of 30 common AC labels, backlightable (see page 41)
- Ready for installation of optional 8065 Label Backlight Systems (3 required)

Features of 8265 Panel only

- Fifteen 15 Amp circuit breakers installed

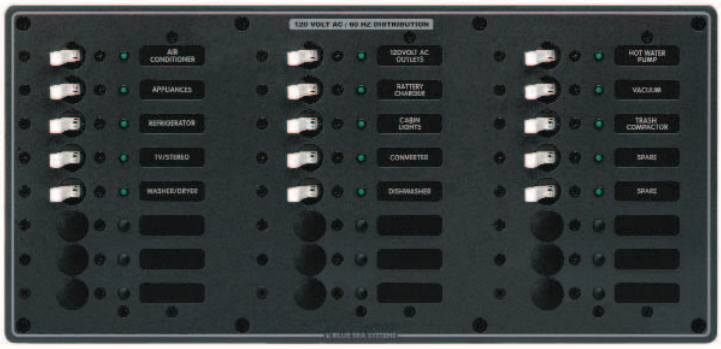
Features of 8165 Panel only

- Fifteen 8 Amp circuit breakers installed

Specifications

Voltage	8265 120 Volts AC / 8165 230 Volts AC
Amperage	Panel Main Bus 100A
Weight	5.12 Lb / 3.32 Kg
Dimensions	7.50" / 190.50 mm high 15.75" / 400.05 mm wide

PN	Description
8265	120V AC 24 Position Circuit Breaker Panel
8165	230V AC 24 Position Circuit Breaker Panel



8265 Panel

8076 Panel

See page 48 for meter specifications.

AC Main + 11 Position Circuit Breaker Panel CE

- 8247 AC Digital Multimeter displays amperes to 150A, voltage to 300V, frequency to 90 Hz and power to 45 kilowatts. Includes high and low amperage alarms.
- Thirteen total circuit breaker positions, 3 blank positions
- Red reverse polarity indicating LED
- All hot, neutral and safety ground buses installed, fully pre-wired
- Includes set of 30 common AC labels, backlightable (see page 41)
- Ready for installation of optional 8065 Label Backlight System (2 required)

Features of 8407 Panel only

- Eight 15 Amp circuit breakers installed
- One double-pole 30 Amp AC

Features of 8507 Panel only

- Eight 8 Amp circuit breakers installed
- One double-pole 16 Amp AC main circuit breaker

Specifications

Voltage	8407 120 Volts AC / 8507 230 Volts AC
Amperage	Panel Main Bus 100A
Weight	4.78 Lb / 2.17 Kg
Dimensions	7.50" / 190.50 mm high 10.50" / 266.70 mm wide

PN	Description
8407	120V AC Main + 11 Position Circuit Breaker Panel with Digital Meter
8507	230V AC Main + 11 Position Circuit Breaker Panel with Digital Meter

AC Main + 11 Position Circuit Breaker Panel CE

- Thirteen total circuit breaker positions, 3 blank positions
- Red reverse polarity indicating LED
- 0-50 Ampere AC ammeter with remote sensing coil
- All hot, neutral and safety ground buses installed, fully pre-wired
- Includes set of 30 common AC labels, backlightable (see page 41)
- Ready for installation of optional 8065 Label Backlight System (2 required)

Features of 8076 Panel only

- Eight 15 Amp circuit breakers installed
- One double-pole 30 Amp AC main circuit breaker installed
- 0-150 Volt AC Voltmeter

Features of 8176 Panel only

- Eight 8 Amp circuit breakers installed
- One double-pole 16 Amp AC main circuit breaker installed
- 0-250 Volt AC Voltmeter

Specifications

Voltage	8076 120 Volts AC / 8176 230 Volts AC
Amperage	Panel Main Bus 100A
Weight	3.18 Lb / 1.44 Kg
Dimensions	7.50" / 190.50 mm high 10.50" / 266.80 mm wide

PN	Description
8076	120V AC Main + 11 Position Circuit Breaker Panel with Meters
8176	230V AC Main + 11 Position Circuit Breaker Panel with Meters

8407 Panel

See page 47 for 8247 AC meter specifications.

See pages 40-42 for circuit breaker panel accessories.

AC Circuit Breaker Panels

8074 Panel

See page 48 for meter specifications.

AC Main + 8 Position Circuit Breaker Panel CE

- Ten total circuit breaker positions, 3 blank positions
- Red reverse polarity indicating LED
- 0-50 Ampere ammeter with remote sensing coil
- All hot, neutral and safety ground buses installed, fully pre-wired
- Includes set of 30 common AC labels, backlightable (see page 41)
- Ready for installation of optional 8069 Label Backlight System (1 required)

Features of 8074 Panel only

- Five 15 Amp circuit breakers installed
- One double-pole 30 Amp AC main circuit breaker installed
- 0-150 Volt AC Voltmeter

Features of 8174 Panel only

- Five 8 Amp circuit breakers installed
- One double-pole 16 Amp AC main circuit breaker installed
- 0-250 Volt AC Voltmeter

Specifications

Voltage	8074 120 Volts AC / 8174 230 Volts AC
Amperage	Panel Main Bus 100A
Weight	3.18 Lb / 1.44 Kg
Dimensions	11.25" / 285.75 mm high 5.25" / 133.40 mm wide

PN	Description
8074	120V AC Main + 8 Position Circuit Breaker Panel with Meters
8174	230V AC Main + 8 Position Circuit Breaker Panel with Meters

AC Main + 8 Position Circuit Breaker Panel CE

- 8247 AC Digital Multimeter displays amperes to 150A, voltage to 300V, frequency to 90 Hz and power to 45 kilowatts. Includes high and low amperage alarms.
- Ten total circuit breaker positions, 3 blank positions
- Red reverse polarity indicating LED
- All hot, neutral and safety ground buses installed, fully pre-wired
- Includes set of 30 common AC labels, backlightable (see page 41)
- Ready for installation of optional 8069 Label Backlight System (1 required)

Features of 8406 Panel only

- Five 15 Amp circuit breakers installed
- One double-pole 30 Amp AC main circuit breaker

Features of 8506 Panel only

- Five 8 Amp circuit breakers installed
- One double-pole 16 Amp AC main circuit breaker

Specifications

Voltage	8406 120 Volts AC / 8506 230 Volts AC
Amperage	Panel Main Bus 100A
Weight	3.84 Lb / 1.74 Kg
Dimensions	11.25" / 285.75 mm high 5.25" / 133.35 mm wide

PN	Description
8406	120V AC Main + 8 Position Circuit Breaker Panel with Digital Meter
8506	230V AC Main + 8 Position Circuit Breaker Panel with Digital Meter

8406 Panel

See page 47 for 8247 AC meter specifications.

See pages 40-42 for circuit breaker panel accessories.

Electrical Distribution Panels

AC Circuit Breaker Panels

8405 Panel

See page 47 for 8247 AC meter specifications.

AC Main + 3 Position Circuit Breaker Panel CE

- 8247 AC Digital multimeter displays amperes to 150A, voltage to 300V, frequency to 90 Hz and power to 45 kilowatts. Includes high and low amperage alarms.
- Five total circuit breaker positions
- All hot, neutral and safety ground buses installed, fully pre-wired
- Includes set of 30 common AC labels, backlightable (see page 41)
- Ready for installation of optional 8065 Label Backlight System (1 required)
- Red reverse polarity indicating LED

Features of 8405 & 8505 Panel only

- Red reverse polarity indicating LED

Features of 8405 Panel only

- One double-pole 30 Amp AC main circuit breaker
- Three 15 Amp circuit breakers installed

Features of 8505 Panel only

- One double-pole 16 Amp AC main circuit breaker
- Three 8 Amp circuit breakers installed

Specifications

Voltage	8405 120 Volts AC / 8505 230 Volts AC
Amperage	Panel Main Bus 100A
Weight	2.94 Lb / 1.33 Kg
Dimensions	7.50" / 190.50 mm high
	5.25" / 133.35 mm wide

PN	Description
8405	120V AC Main + 3 Position Circuit Breaker Panel with Digital Meter
8505	230V AC Main + 3 Position Circuit Breaker Panel with Digital Meter

AC Main + 3 Position Circuit Breaker Panel CE

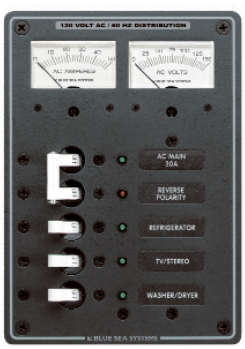
- Five total circuit breaker positions
- 0-50 Ampere AC Ammeter with remote sensing coil
- All hot, neutral and safety ground buses installed, fully pre-wired
- Includes set of 30 common AC labels, backlightable (see page 41)
- Ready for installation of optional 8065 Label Backlight System (1 required)
- Red reverse polarity indicating LED

Features of 8409 Panel only

- Three 15 Amp circuit breakers installed
- One double-pole 30 Amp AC main circuit breaker installed
- 0-150 Volt AC Voltmeter

Features of 8509 Panel only

- Three 8 Amp circuit breakers installed
- One double-pole 16 Amp circuit breaker installed
- 0-250 Volt AC Voltmeter



8409 Panel

See page 48 for meter specifications.

Specifications

Voltage	8409 120 Volts AC / 8509 230 Volts AC
Amperage	Meter 50A DC / Panel Main Bus 100A
Weight	4.06 Lb / 1.84 Kg
Dimensions	7.50" / 190.50 mm high
	5.25" / 133.40 mm wide

PN	Description
8409	120V AC Main + 3 Position Circuit Breaker Panel with Meters
8509	230V AC Main + 3 Position Circuit Breaker Panel with Meters

See pages 40-42 for circuit breaker panel accessories

AC Circuit Breaker Panels

AC Main + 3 Position Circuit Breaker Panel CE

- Five total circuit breaker positions
- Red reverse polarity indicating LED
- All hot, neutral and safety ground buses installed, fully pre-wired
- Includes set of 30 common AC labels, backlightable (see page 41)
- Ready for installation of optional 8065 Label Backlight System (1 required)

Features of 8043 Panel only

- Three 15 Amp branch circuit breakers installed
- One double-pole 30 Amp AC main circuit breaker installed
- 0-150 Volt AC Voltmeter

Features of 8143 Panel only

- Three 8 Amp branch circuit breakers installed
- One double-pole 16 Amp AC main circuit breaker installed
- 0-250 Volt AC Voltmeter

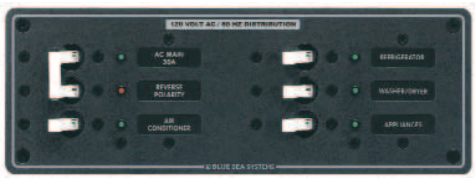
Specifications

Voltage	8043 120 Volts AC / 8143 230 Volts AC
Amperage	Panel Main Bus 100A
Weight	2.00 Lb / 0.91 Kg
Dimensions	7.50" / 190.50 mm high
	5.25" / 133.40 mm wide

PN	Description
8043	120V AC Main + 3 Position Circuit Breaker Panel with Meter
8143	230V AC Main + 3 Position Circuit Breaker Panel with Meter

8043 Panel

See page 48 for meter specifications.



8099 Panel

AC Main + 4 Position Horizontal Circuit Breaker Panel CE

- Five circuit breakers installed
- Red reverse polarity indicating LED
- All hot, neutral and safety ground buses installed, fully pre-wired
- Includes set of 30 common AC labels, backlightable (see page 41)
- Ready for installation of optional 8065 Label Backlight System (2 required)

Features of 8099 Panel only

- Four 15 Amp circuit breakers installed
- One double-pole 30 Amp AC main circuit breaker installed

Features of 8199 Panel only

- Four 8 Amp circuit breakers installed
- One double-pole 16 Amp AC main circuit breaker installed

Specifications

Voltage	8099 120 Volts AC / 8199 230 Volts AC
Amperage	Panel Main Bus 100A
Weight	2.22 Lb / 1.00 Kg
Dimensions	3.75" / 95.25 mm high
	10.50" / 266.70 mm wide

PN	Description
8099	120V AC Main + 4 Position Circuit Breaker Panel
8199	230V AC Main + 4 Position Circuit Breaker Panel

AC 6 Position Horizontal Circuit Breaker Panel CE

- Six circuit breakers installed
- All hot, neutral and safety ground buses installed, fully pre-wired
- Includes set of 30 common AC labels, backlightable (see page 41)
- Ready for installation of optional 8065 Label Backlight System (2 required)

Features of 8097 Panel only

- Six 15 Amp circuit breakers installed

Features of 8197 Panel only

- Six 8 Amp circuit breakers installed

Specifications

Voltage	8097 120 Volts AC / 8197 230 Volts AC
Amperage	Panel Main Bus 100 Amperes
Weight	2.20 Lb / 1.00 Kg
Dimensions	3.75" / 95.25 mm high
	10.50" / 266.70 mm wide

PN	Description
8097	120V AC 6 Position Circuit Breaker Panel
8197	230V AC 6 Position Circuit Breaker Panel

8097 Panel

See pages 40-42 for circuit breaker panel accessories.

AC Circuit Breaker Panels

AC 8 Position Circuit Breaker Panel CE

- Eight total circuit breaker positions, 3 blank positions
- Five 15 Amp circuit breakers installed
- All hot, neutral and safety ground buses installed, fully pre-wired
- Includes set of 30 common AC labels, backlightable (see page 41)
- Ready for installation of optional 8065 Label Backlight System

Specifications

Voltage	8059 120 Volts AC
	8159 230 Volts AC
Amperage	Panel Main Bus 100A
Weight	1.85 Lb / 0.84 Kg
Dimensions	7.50" / 190.50 mm high
	5.25" / 133.35 mm wide

PN	Description
8059	120V AC 8 Position Circuit Breaker Panel
8159	230V AC 8 Position Circuit Breaker Panel

8059 Panel

8058 Panel

AC 3 Position Circuit Breaker Panel CE

- Three circuit breakers installed
- All hot, neutral and safety ground buses installed, fully pre-wired
- Includes set of 30 common AC labels, backlightable (see page 41)
- Ready for installation of optional 8065 Label Backlight System

Features of 8058 Panel only

- Three 15 Amp circuit breakers installed

Features of 8158 Panel only

- Three 8 Amp circuit breakers installed

Specifications

Voltage	8058 120 Volts AC
	8158 230 Volts AC
Amperage	Panel Main Bus 100A
Weight	1.14 Lb / 0.52 Kg
Dimensions	3.75" / 95.25 mm high
	5.25"/ 133.35 mm wide

PN	Description
8058	120V AC 3 Position Circuit Breaker Panel
8158	230V AC 3 Position Circuit Breaker Panel

AC Main Circuit Breaker Panel CE

- Double-pole AC main circuit breaker
- Red reverse polarity indicating LED
- Safety ground screw on panel back

Features of 8077 Panel only

- One 30 Amp double-pole circuit breaker installed

Features of 8079 Panel only

- One 50 Amp double-pole circuit breaker installed

Features of 8177 Panel only

- One 16 Amp double-pole circuit breaker installed

Features of 8179 Panel only

- One 32 Amp double-pole circuit breaker installed

Specifications

Voltage	8077 / 8079 120 Volts AC
	8177 / 8179 230 Volts AC
Weight	0.51 Lb / 0.23 Kg
Dimensions	3.75" / 95.25 mm high
	2.625" / 66.675 mm wide

PN	Description
8077	120V AC Main 30 Amp Circuit Breaker Panel
8177	230V AC Main 16 Amp Circuit Breaker Panel
8079	120V AC Main 50 Amp Circuit Breaker Panel
8179	230V AC Main 32 Amp Circuit Breaker Panel

8077 Panel

See pages 40-42 for circuit breaker panel accessories.

AC Circuit Breaker Panels

AC Main + 6 Position Circuit Breaker Panel CE

- Eight total circuit breaker positions, 3 blank positions
- Five circuit breakers installed
- Red reverse polarity indicating LED
- Includes set of 30 common AC labels, backlightable (see page 41)
- Ready for installation of optional 8065 Label Backlight System (1 required)

Features of 8027 Panel only

- Three 15 Amp circuit breakers installed
- One double-pole 30 Amp AC main circuit breaker

Features of 8127 Panel only

- Three 8 Amp circuit breakers installed
- One double-pole 16 Amp AC main circuit breaker

8027 Panel

Specifications

Voltage	8027 120 Volts AC
	8127 230 Volts AC
Amperage	Panel Main Bus 100A
Weight	1.87 Lb / 0.85 Kg
Dimensions	7.50" / 190.50 mm, high
	5.25" / 133.35 mm wide

PN	Description
8027	120V AC Main + 6 Positions Circuit Breaker Panel
8127	230V AC Main + 6 Positions Circuit Breaker Panel

8029 Panel

AC Main + 1 Position Circuit Breaker Panel CE

- Three total circuit breaker positions, 1 blank position
- One circuit breaker installed
- Red reverse polarity indicating LED
- All hot, neutral and safety ground buses installed, fully pre-wired
- Ready for installation of optional 8065 Label Backlight System (1 required)

Features of 8029 Panel only

- One 30 Amp double-pole circuit breaker installed

Features of 8129 Panel only

- One 16 Amp double-pole circuit breaker installed

Specifications

Voltage	8029 120 Volts AC
	8129 230 Volts AC
Amperage	Panel Main Bus 30A
Weight	0.95 Lb / 0.43 Kg
Dimensions	3.75" / 95.25 mm high
	5.25" / 133.35 mm wide

PN	Description
8029	120V AC Main + 1 Positions Circuit Breaker Panel
8129	230V AC Main + 1 Positions Circuit Breaker Panel

AC Source Selector Circuit Breaker Panel CE

- Red reverse polarity indicating LED
- Two double-pole AC main circuit breakers with lockout slide
- All hot, neutral and safety ground buses installed, fully pre-wired
- Two green Power Available indicating LED's
- Allows connecting two different AC sources to a circuit
- Prevents connecting both AC sources simultaneously

Features of 8032 Panel only

- Two 30 Amp double-pole circuit breakers installed

Features of 8132 Panel only

- Two 16 Amp double-pole circuit breakers installed

Features of 8061 Panel only

- Two 50 Amp double-pole circuit breakers installed

Features of 8161 Panel only

- Two 32 Amp double-pole circuit breakers installed

Specifications

Voltage	8032 / 8061 120 Volts AC
	8132 / 8161 230 Volts AC
Weight	1.84 Lb / 0.83 Kg
Dimensions	3.75" / 95.25 mm high
	5.25" / 133.35 mm wide

8032 Panel

PN	Description
8032	120V AC Source Selector 30 Amp Circuit Breaker Panel
8132	230V AC Source Selector 16 Amp Circuit Breaker Panel
8061	120V AC Source Selector 50 Amp Circuit Breaker Panel
8161	230V AC Source Selector 32 Amp Circuit Breaker Panel

See pages 40-42 for circuit breaker panel accessories.

Electrical Distribution Panels

DC Circuit Breaker Panels

8264 Panel

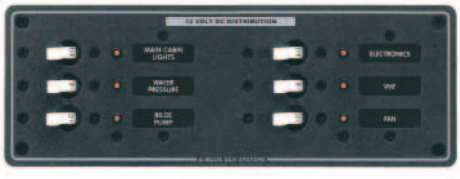
DC 24 Position Circuit Breaker Panel CE

- Twenty-four total circuit breaker positions, 9 blank positions
- Fifteen 15 Amp circuit breakers installed
- All positive, negative and grounding buses installed, fully pre-wired
- Includes set of 30 common DC labels, backlightable (see page 41)
- Detailed installation instructions and cutout template
- Ready for installation of optional 8065 Label Backlight Systems (3 required)
- Configure for 12 or 24V DC distribution with supplied labels

Specifications

Voltage	12/24 Volts DC
Amperage	Panel Main Bus 100A
Weight	5.12 Lb / 2.32 Kg
Dimensions	7.50" / 190.50 mm high
	15.75" / 400.05 mm wide

PN	Description
8264	12 or 24V DC 24 Position Circuit Breaker Panel



8096 Panel

DC 6 Position Horizontal Circuit Breaker Panel CE

- Six 15 Amp circuit breakers installed
- 12V DC Position Circuit Breaker Panel
- All positive, negative and grounding buses installed, fully pre-wired
- Includes set of 30 common DC labels, backlightable (see page 41)
- Ready for installation of optional 8065 Label Backlight System (2 required)
- Configure for 12 or 24V DC distribution with supplied labels

Specifications

Voltage	12/24 Volts DC
Amperage	Panel Main Bus 100 Amperes
Weight	2.20 Lb / 1.00 Kg
Dimensions	3.75" / 95.25 mm high
	10.50" / 266.70 mm wide

PN	Description
8096	12 or 24V DC 6 Position Circuit Breaker Panel

See pages 40-42 for circuit breaker panel accessories.

DC Circuit Breaker Panels

Cellular manufacturing at Blue Sea Systems gives each cell leader responsibility and authority for the complete product production process.

8068 Panel

DC 13 Position Circuit Breaker Panel CE

- Thirteen total circuit breaker positions, 3 blank positions
- Ten 15 Amp circuit breakers installed
- 8-16 Volt Voltmeter with 3 position switch for multiple battery banks
- 0-50 Ampere Ammeter with remote shunt
- All positive, negative and grounding buses installed, fully pre-wired
- Includes set of 30 common labels, backlightable (see page 41)
- Ready for installation of optional 8065 Label Backlight System (2 required)
- Upgradeable to 24V with 8243, 18-32V DC Micro Voltmeter

Specifications

Voltage	12 Volts DC
Amperage	Panel Main Bus 100A
Weight	4.06 Lb / 1.84 Kg
Dimensions	7.50" / 190.50 mm high
	10.50" / 266.80 mm wide

PN	Description
8068	12V DC 13 Position Circuit Breaker Panel with Meters

See pages 44-45 for meter specifications.

DC 13 Position Circuit Breaker Panel CE

- Thirteen total circuit breaker positions, 3 blank positions
- Ten 15 Amp circuit breakers installed
- 8248 DC Digital Multimeter displays amperes to 500A, voltage to 60V. Includes high and low voltage alarms with 3 position switch for multiple battery banks.
- All positive, negative and grounding buses installed, fully pre-wired
- Includes set of 30 common DC labels, backlightable (see page 41)
- Ready for installation of optional 8065 Label Backlight System (2 required)
- Configure for 12 or 24V DC distribution with supplied labels

Specifications

Voltage	12 or 24 Volts DC
Amperage	Panel Main Bus 100A
Weight	5.15 Lb / 2.34 Kg
Dimensions	7.50" / 190.50 mm high
	10.50" / 266.70 mm wide

PN	Description
8403	12/24V DC 13 Position Circuit Breaker Panel with Digital Meter

8403 Panel

See page 46 for meter specifications.

See pages 40-42 for circuit breaker panel accessories.

Electrical Distribution Panels

DC Circuit Breaker Panels

DC 5 Position Circuit Breaker Panel CE

- Five total circuit breaker positions,
- Five 15 Amp circuit breakers installed
- 8-16 Volt Voltmeter with 3 position switch for multiple battery banks
- 0-50A DC Ammeter with remote shunt
- All positive, ground and grounding buses installed, fully pre-wired
- Includes set of 30 common DC labels, backlightable (see page 41)
- Ready for installation of optional 8065 Label Backlight system (1 required)
- Upgradeable to 24V with 8243, 18-32V DC Micro Voltmeter

Specifications

Voltage	12 Volts DC
Amperage	Meter 50A DC / Panel Main Bus 100A
Weight	4.06 Lb / 1.84 Kg
Dimensions	7.50" / 190.5 mm high
	5.25" / 133.35 mm wide

PN	Description
8081	12V DC 5 Position Circuit Breaker Panel with Meters

8081 Panel

See pages 44-45 for meter specifications.

DC 5 Position Circuit Breaker Panel with Digital Meter CE

- 8248 DC Digital Multimeter displays amperes to 500A, voltage to 60V. Includes high and low voltage alarms with 3 position switch for multiple battery banks
- Five 15 Amp circuit breakers installed
- All positive, negative and grounding buses installed, fully pre-wired
- Includes set of 30 common DC labels, backlightable (see page 41)
- Ready for installation of optional 8065 Label Backlight System (1 required)
- Configure for 12 or 24V DC distribution with supplied labels

Specifications

Voltage	12/24 Volts DC
Amperage	Panel Main Bus 100A
Weight	3.45 Lb / 1.56 Kg
Dimensions	7.50” / 190.50 mm high
	5.25” / 133.35 mm wide

PN	Description
8401	12 or 24V DC 5 Position Circuit Breaker Panel with Digital Meter

8401 Panel

See page 46 for meter specifications.

DC 10 Position Circuit Breaker Panel with Digital Meter CE

- Ten total circuit breaker positions, 3 blank positions
- Seven 15 Amp circuit breakers installed
- 8248 DC Digital Multimeter displays amperes to 500A, voltage to 60V. Includes high and low voltage alarms with 3 position switch for multiple battery banks.
- All positive, negative and grounding buses installed, fully pre-wired
- Includes set of 30 common DC labels, backlightable (see page 41)
- Ready for installation of optional 8069 Label Backlight System (1 required)
- Configure for 12 or 24V DC distribution with supplied labels

Specifications

Voltage	12/24 Volts DC
Amperage	Panel Main Bus 100A
Weight	4.21 Lb / 1.91 Kg
Dimensions	11.25” / 285.75 mm high
	5.25” / 133.35 mm wide

PN	Description
8402	12 or 24V DC 10 Position Circuit Breaker Panel with Digital Meter

8402 Panel

See page 46 for meter specifications.

See pages 40-42 for circuit breaker panel accessories.

DC Circuit Breaker Panels

DC 10 Position Circuit Breaker Panel CE

8082 Panel

- Ten total circuit breaker positions, 3 blank positions
- Seven 15 Amp circuit breakers installed
- 8-16 Volt Voltmeter with 3 position switch for multiple battery banks
- 0-50 Ampere Ammeter with remote shunt
- All positive, negative and grounding buses installed, fully pre-wired
- Includes set of 30 common DC labels, backlightable (see page 41)
- Ready for installation of optional 8069 Label Backlight System (1 required)
- Upgradeable to 24V with 8243, 18-32V DC Micro Voltmeter

Specifications

Voltage	12/24 Volts DC
Amperage	Panel Main Bus 100A
Weight	4.06 Lb / 1.84 Kg
Dimensions	11.25" / 285.75 mm high
	5.25" / 133.35 mm wide

PN	Description
8082	12V DC 10 Position Circuit Breaker Panel with Meters

See pages 44-45 for meter specifications.

DC 8 Position Circuit Breaker Panel CE

- Eight total circuit breaker positions, 3 blank positions
- Five 15 Amp circuit breakers installed
- All positive, negative and grounding buses installed, fully pre-wired
- Includes set of 30 common DC labels, backlightable (see page 41)
- Ready for installation of optional 8065 Label Backlight System (1 required)
- Configure for 12 or 24V DC distribution with supplied labels

Specifications

Voltage	12/24 Volts DC
Amperage	Panel Main Bus 100A
Weight	1.84 Lb / 0.83 Kg
Dimensions	7.50" / 190.50 mm high
	5.25" / 133.35 mm wide

PN	Description
8023	12 or 24V DC 8 Position Circuit Breaker Panel

8023 Panel

8025 Panel

DC 3 Position Circuit Breaker Panel CE

- Three total circuit breaker positions
- Three 15 Amp circuit breakers installed
- All positive, negative and grounding buses installed, fully pre-wired
- Includes set of 30 common DC labels, backlightable (see page 41)
- Ready for installation of optional 8065 Label Backlight System (1 required)
- Configure for 12 or 24V DC distribution with supplied labels

Specifications

Voltage	12/24 Volts DC
Amperage	Panel Main Bus 100A
Weight	1.12 Lb / 0.61 Kg
Dimensions	3.75" / 95.25 mm high
	5.25" / 133.35 mm wide

PN	Description
8025	12 or 24V DC 3 Position Circuit Breaker Panel

See pages 40-42 for circuit breaker panel accessories.

Electrical Distribution Panels

AC Rocker Circuit Breaker Panels

AC Source Selector Panel CE

NEW

- Red reverse polarity indicating LED
- Two double-pole AC main circuit breakers with lockout slide
- All hot, neutral and safety ground buses installed, fully pre-wired
- Two green Power Available indicating LED's
- Allows connecting two different AC sources to a circuit
- Prevents connecting both AC sources simultaneously

8600 Panel

Features of 8600 Panel only

- Two 30 Amp double-pole circuit breakers installed

Features of 8602 Panel only

- Two 16 Amp double-pole circuit breakers installed

Specifications

Voltage	8600 120 Volts AC 8602 230 Volts AC
Weight	1.84 Lb / 0.83 Kg
Dimensions	4.25" / 107.95mm high 5.25" / 133.35 mm wide

PN	Description
8600	120V AC Source Selector 30 Amp Rocker Breaker Panel
8602	230V AC Source Selector 16 Amp Rocker Breaker Panel

NEW

8618 Panel

See page 47 for meter specifications.

AC Main + 3 Position Circuit Breaker Panel CE

- 8247 AC Digital Multimeter displays amperes to 150A, voltage to 300V, frequency to 90 Hz and power to 45 kilowatts. Includes high and low amperage alarms.
- Red reverse polarity indicating LED
- Five total circuit breaker positions
- All hot, neutral and safety ground buses installed, fully pre-wired
- Includes set of 30 common AC labels, backlightable (see page 41)
- Ready for installation of optional 8065 Label Backlight System (1 required)

Features of 8618 Panel only

- Three 15 Amp circuit breakers installed
- One 30 Amp double-pole circuit breaker installed

Features of 8619 Panel only

- Three 8 Amp circuit breakers installed
- One 16 Amp double-pole circuit breaker installed

Specifications

Voltage	8618 120 Volts AC / 8619 230 Volts AC
Amperage	Panel Main Bus 100A
Weight	2.94 Lb / 1.33 Kg
Dimensions	7.50" / 190.50 mm high 5.25" / 133.35 mm wide

PN	Description
8618	120V AC Main + 3 Position Rocker Breaker Panel with Digital Meter
8619	230V AC Main + 3 Position Rocker Breaker Panel with Digital Meter

AC Main Circuit Breaker Panel CE

- Double-pole AC main circuit breaker
- Red reverse polarity indicating LED
- Safety ground screw on panel back

NEW

Features of 8604 Panel only

- One 30 Amp double-pole circuit breaker installed

Features of 8606 Panel only

- One 16 Amp double-pole circuit breaker installed

Specifications

Voltage	8604 / 8079 120 Volts AC 8606 / 8179 230 Volts AC
Weight	0.51 Lb / 0.23 Kg
Dimensions	3.75" / 95.25 mm high 2.625" / 66.675 mm wide

PN	Description
8604	120V AC Main 30 Amp Rocker Breaker Panel
8606	230V AC Main 16 Amp Rocker Breaker Panel

8604 Panel

See pages 40-42 for circuit breaker panel accessories.

AC Rocker Circuit Breaker Panels

AC Main + 8 Position Circuit Breaker Panel with Digital Meter CE

NEW

8620 Panel

- 8247 AC Digital multimeter displays amperes to 150A, voltage to 300V, frequency to 90 Hz and power to 45 kilowatts. Includes high and low amperage alarms.
- Ten total circuit breaker positions, 3 blank positions
- Red reverse polarity indicating LED
- All hot, neutral and safety ground buses installed, fully pre-wired
- Includes set of 30 common AC labels, backlightable (see page 41)
- Ready for installation of optional 8069 Label Backlight System (1 required)

Features of 8620 Panel only

- Five 15 Amp circuit breakers installed
- One double-pole 30 Amp AC main circuit breaker

Features of 8621 Panel only

- Five 8 Amp circuit breakers installed
- One double-pole 16 Amp AC main circuit breaker

Specifications

Voltage	8620 120 Volts AC / 8621 230 Volts AC
Amperage	Panel Main Bus 100A
Weight	3.18 Lb / 1.44 Kg
Dimensions	11.25" / 285.75 mm high
	5.25" / 133.40 mm wide

PN	Description
8620	120V AC Main + 8 Position Rocker Breaker Panel with Digital Meter
8621	230V AC Main + 8 Position Rocker Breaker Panel with Digital Meter

See page 47 for meter specifications.

AC Main + 1 Position Circuit Breaker Panel CE

NEW

8614 Panel

- Three total circuit breaker positions, 1 blank position
- Red reverse polarity indicating LED
- All hot, neutral and safety ground buses installed, fully pre-wired
- Ready for installation of optional 8065 Label Backlight System (1 required)

Features of 8614 Panel only

- One 30 Amp double-pole circuit breaker installed

Features of 8615 Panel only

- One 16 Amp double-pole circuit breaker installed

Specifications

Voltage	8614 120 Volts AC
	8615 230 Volts AC
Amperage	Panel Main Bus 30A
Weight	0.95 Lb / 0.43 Kg
Dimensions	3.75" / 95.25 mm high
	5.25" / 133.35 mm wide

PN	Description
8614	120V AC Main + 1 Position Rocker Breaker Panel
8615	230V AC Main + 1 Position Rocker Breaker Panel

See pages 40-42 for circuit breaker panel accessories.

Electrical Distribution Panels

AC Rocker Circuit Breaker Panels

8616 Panel

AC Main + 6 Position Circuit Breaker Panel CE

- Eight total circuit breaker positions, 3 blank positions
- Three 15 Amp circuit breakers installed
- Red reverse polarity indicating LED
- Includes set of 30 common AC labels, backlightable (see page 41)
- Ready for installation of optional 8065 Label Backlight System (1 required)

Features of 8616 Panel only

- Three 15 Amp circuit breakers installed
- One double-pole 30 Amp AC main circuit breaker

Features of 8617 Panel only

- Three 8 Amp circuit breakers installed
- One double-pole 16 Amp AC main circuit breaker

Specifications

Voltage	8616 120 Volts AC 8617 230 Volts AC
Amperage	Panel Main Bus 100A
Weight	1.87 Lb / 0.85 Kg
Dimensions	7.50" / 190.50 mm, high 5.25" / 133.35 mm wide

PN	Description
8616	120V AC Main + 6 Position Rocker Breaker Panel
8617	230V AC Main + 6 Position Rocker Breaker Panel

AC 8 Position Circuit Breaker Panel CE

- Eight total circuit breaker positions, 3 blank positions
- Five 15 Amp circuit breakers installed
- All hot, neutral and safety ground buses installed, fully pre-wired
- Includes set of 30 common AC labels, backlightable (see page 41)
- Ready for installation of optional 8065 Label Backlight System

Specifications

Voltage	8612 120 Volts AC 8613 230 Volts AC
Amperage	Panel Main Bus 100A
Weight	1.85 Lb / 0.84 Kg
Dimensions	7.50" / 190.50 mm high 5.25" / 133.35 mm wide

PN	Description
8612	120V AC 8 Position Rocker Breaker Panel
8613	230V AC 8 Position Rocker Breaker Panel

8612 Panel

8610 Panel

AC 3 Position Circuit Breaker Panel CE

- Three total circuit breaker positions
- All hot, neutral and safety ground buses installed, fully pre-wired
- Includes set of 30 common AC labels, backlightable (see page 41)
- Ready for installation of optional 8065 Label Backlight System

Features of 8610 Panel only

- Three 15 Amp circuit breakers installed

Features of 8611 Panel only

- Three 8 Amp circuit breakers installed

Specifications

Voltage	8610 120 Volts AC 8611 230 Volts AC
Amperage	Panel Main Bus 100A
Weight	1.14 Lb / 0.52 Kg
Dimensions	3.75" / 95.25 mm high 5.25"/ 133.35 mm wide

PN	Description
8610	120V AC 3 Position Rocker Breaker Panel
8611	120V AC 3 Position Rocker Breaker Panel

See pages 40-42 for circuit breaker panel accessories.

DC Rocker Circuit Breaker Panels

DC 13 Position Circuit Breaker Panel CE

- Thirteen total circuit breaker positions, 3 blank positions
- Ten 15 Amp circuit breakers installed
- 8248 DC Digital Multimeter displays amperage from -500 to +500 Amps, voltage to 60V. Includes high and low voltage alarms with 3 position switch for multiple battery banks.
- All positive, negative and grounding buses installed, fully pre-wired
- Includes set of 30 common DC labels, backlightable (see page 41)
- Ready for installation of optional 8065 Label Backlight System (2 required)
- Configure for 12 or 24V DC distribution with supplied labels

8679 Panel

See page 46 for meter specifications.

Specifications

Voltage	12 or 24 Volts DC
Amperage	Panel Main Bus 100A
Weight	5.15 Lb / 2.34 Kg
Dimensions	7.50" / 190.50 mm high 10.50" / 266.70 mm wide

PN	Description
8679	12 or 24V DC 13 Position Rocker Breaker Panel with Digital Meter

DC 6 Position Horizontal Circuit Breaker Panel CE

- Six 15 Amp circuit breakers installed
- 12V DC 24 position circuit breaker panel
- All positive, negative and grounding buses installed, fully pre-wired
- Includes set of 30 common DC labels, backlightable (see page 41)
- Ready for installation of optional 8065 Label Backlight System (2 required)
- Configure for 12 or 24V DC distribution with supplied labels

8677 Panel

Specifications

Voltage	12 or 24 Volts DC
Amperage	Panel Main Bus 100 Amperes
Weight	2.20 Lb / 1.00 Kg
Dimensions	3.75" / 95.25 mm high 10.50" / 266.70 mm wide

PN	Description
8677	12 or 24V DC 6 Position Rocker Breaker Panel

See pages 40-42 for circuit breaker panel accessories.

Electrical Distribution Panels

DC Rocker Circuit Breaker Panels

8678 Panel

See page 46 for meter specifications.

DC 5 Position Circuit Breaker Panel CE

- Five 15 Amp circuit breakers installed
- 8248 DC Digital Multimeter displays amperage from -500 to +500 Amps, voltage to 60V. Includes high and low voltage alarms with 3 position switch for multiple battery banks.
- All positive, negative and grounding buses installed, fully pre-wired
- Includes set of 30 common DC labels, backlightable (see page 41)
- Ready for installation of optional 8065 Label Backlight System (1 required)
- Configure for 12 or 24V DC distribution with supplied labels

Specifications

Voltage	12 or 24 Volts DC
Amperage	Panel Main Bus 100A
Weight	3.45 Lb / 1.56 Kg
Dimensions	7.50” / 190.50 mm high
	5.25” / 133.35 mm wide

PN	Description
8678	12 or 24V DC 5 Position Rocker Breaker Panel with Digital Meter

DC 8 Position Circuit Breaker Panel CE

- Eight total circuit breaker positions, 3 blank positions
- Five 15 Amp circuit breakers installed
- All positive, negative and grounding buses installed, fully pre-wired
- Includes set of 30 common DC labels, backlightable (see page 41)
- Ready for installation of optional 8065 Label Backlight System (1 required)
- Configure for 12 or 24V DC distribution with supplied labels

Specifications

Voltage	12 or 24 Volts DC
Amperage	Panel Main Bus 100A
Weight	1.84 Lb / 0.83 Kg
Dimensions	7.50" / 190.50 mm high
	5.25" / 133.35 mm wide

PN	Description
8676	12 or 24V DC 8 Position Rocker Breaker Panel

8676 Panel

8675 Panel

DC 3 Position Circuit Breaker Panel CE

- Three total circuit breaker positions
- Three 15 Amp circuit breakers installed
- All positive, negative and grounding buses installed, fully pre-wired
- Includes set of 30 common DC labels, backlightable (see page 41)
- Ready for installation of optional 8065 Label Backlight System (1 required)
- Configure for 12 or 24V DC distribution with supplied labels

Specifications

Voltage	12 or 24 Volts DC
Amperage	Panel Main Bus 100A
Weight	1.12 Lb / 0.61 Kg
Dimensions	3.75" / 95.25 mm high
	5.25" / 133.35 mm wide

PN	Description
8675	12 or 24V DC 3 Position Rocker Breaker Panel

See pages 40-42 for circuit breaker panel accessories.

DC Waterproof Circuit Breaker Panels

Arctic White DC Waterproof Circuit Breaker Panels

- Designed for flybridge and open cockpit applications
- Rated IP66 – "Use on Shipdecks"
- Installed switch is ON-OFF

The features of a superior electrical panel:

- Push Button circuit breaker with waterproof boot
- Countersunk mounting holes throughout
- Heavy 1/8" Aluminum Material
- Two-Part Polyurethane Arctic White finish
- Waterproof Contura switches
- "ON" indicating LED's embedded in switch
- Waterproof mounting gasket
- Mil-Spec Chemical Treatment via immersion to protect every surface detail from corrosion
- All components waterproof from panel front
- Completely wired and ready to install
- Includes set of 60 common DC labels (see page 41)

NOTE: Waterproof Panel Labels are not backlightable

See page 12 for Push Button Circuit Breaker specifications

NEW

8273

RATED 12 24 VOLT

WATERPROOF

Panel Front withstands:

- **Rain**
- **Sea Spray**
- **Hose Spray Washdown**

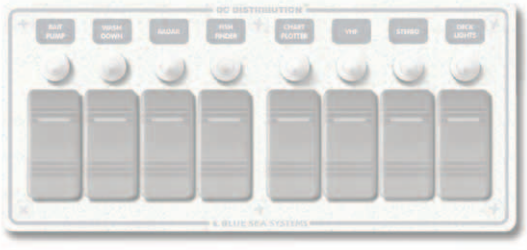
NEW

8274

NEW

8272

NEW



8271

Arctic White DC Waterproof Circuit Breaker Panels

Specifications

Voltage	12 or 24 Volts DC
Switch Rating	20 Amperes @ 12V DC 15 Amperes @ 24V DC
Switch LED Amperage Draw	18 Milliamperes each
Circuit Breaker Rating	15 Amperes
Panel Cumulative Rating	45 Amperes

PN	Description	Switch Positions	Height in/mm	Width in/mm	Weight Lb/Kg
Horizontal Panels					
8271	Waterproof Electrical Panel	8	4.25/95.25	9.37/238.00	1.34/0.61
8272	Waterproof Electrical Panel	4	4.25/95.25	5.25/133.35	0.77/0.35
Vertical Panels					
8273	Waterproof Electrical Panel	6	7.50/190.50	4.5/133.35	0.90/0.41
8274	Waterproof Electrical Panel	3	3.75/95.25	4.5/133.35	0.60/0.27

Arctic White Waterproof Panels use the new Push Button Circuit Breaker.

See page 12 for details

See pages 12, 39 & 41 for circuit breaker panel accessories.

DC Waterproof Fuse Panels

Vertical Series Waterproof Panels

- Designed for flybridge and open cockpit applications
- Rated IP66 – "Use on Shipdecks"
- Installed switch is ON-OFF

The features of a superior electrical panel:

- Waterproof panel mount fuse holders accept commonly available AGC (Fast Acting) and MDL (Slow Blow) 1-1/4" x 1/4"/32 mm x 6.5 mm glass fuses
- Countersunk mounting holes throughout
- Heavy 1/8" Aluminum Material
- Two-Part Polyurethane Slate Gray finish
- Waterproof Contura switches
- "ON" indicating LED's embedded in switch
- 450 labels available
- Industry standard height and width
- Waterproof mounting gasket
- Mil-Spec Chemical Treatment via immersion to protect every surface detail from corrosion
- All components waterproof from panel front
- Completely wired and ready to install
- Includes set of 30 common DC labels (see page 41)

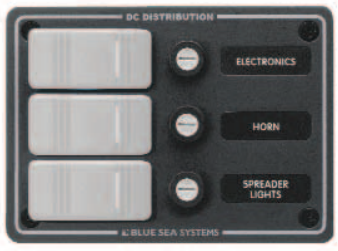
NOTE: Waterproof Panel Labels are not backlightable

Specifications

Voltage	12 or 24 Volts
Switch Rating	20 Ampere @ 12V DC 15 Ampere @ 24V DC
Switch LED Amperage Draw	18 Milliamperes each
Fuse Holder Rating	20 Amperes maximum
Panel Cumulative Rating	45 Amperes

PN	Description	Switch Positions	Height in/mm	Width in/mm	Weight Lb/Kg
8053	Waterproof Electrical Panel	6	7.50/190.50	5.25/133.35	0.90/0.41
8054	Waterproof Electrical Panel	3	3.75/95.25	5.25/133.35	0.60/0.27

8053



8054

Panel Front withstands:
- **Rain**
- **Sea Spray**
- **Hose Spray Washdown**

8261

8262

Horizontal Series Waterproof Panels

- Specifications match the Vertical Series Waterproof Panels, but are designed for installations where height restrictions are present.
- New compact labels minimize panel space requirements
- Includes set of 60 common DC labels

PN	Description	Switch Positions	Height in/mm	Width in/mm	Weight Lb/Kg
8261	Waterproof Electrical Panel	8	3.75/95.25	9.37/238.00	1.34/0.61
8262	Waterproof Electrical Panel	4	3.75/95.25	5.25/133.35	0.77/0.35

See pages 39 & 41 for Fuse Panel accessories

DC Waterproof Fuse Panels

Waterproof Bilge Pump Control Panels

· Specifications match the Vertical and Horizontal Series Waterproof Panels
· Installed switch is (ON)-OFF-AUTO

PN	Description	Height in/mm	Width in/mm	Weight Lb/Kg
8055	Bilge Pump Control Panel (ON)-OFF-AUTO Switch	1.875/47.62	5.25/133.35	0.23/0.10
8263	Bilge Pump Control Panel (ON)-OFF-AUTO Switch	3.75/95.25	2.25/57.15	0.43/0.20

8263

8055

Poles/Throw

SPST - Single Pole Single Throw
SPDT - Single Pole Double Throw
DPST - Double Pole Single Throw
DPDT - Double Pole Double Throw

Legend

- Center terminal and switch lever
- Center terminal
- Isolated terminal

Waterproof Fuse Holders

· Waterproof fuse holder will withstand water exposure normally encountered in above deck applications: salt spray, rain, hose washdown, or momentary immersion.

Specifications

Maximum Amperage	20 Amperes
Maximum Voltage	250 Volts AC / DC

PN	Description
5020	Fuseholder AGC Waterproof, Replacement

DC Waterproof Panel Accessories

Waterproof Contura Switches

· Mounts in Blue Sea Systems' Waterproof Panels
· Blue Sea Systems' Contura Waterproof Switches are specially manufactured for mounting in Blue Sea Systems' waterproof panels. Use of standard Contura switches will not maintain the waterproof integrity of these panels.

Specifications

Rating: 12V DC	20 Amperes
Rating: 24V DC	15 Amperes
Lighted	LED rated 100,000 hours 1/2 life
Seals	Internal & External Gasket Panel Seal
Temperature Rating	-40 C to 85 C
Mounting Hole	1.450" x 0.830" (36.83 mm x 21.08 mm)
LED Amperage	18 Milliamperes

PN	Description	Poles/Throw	Action
8230	Rocker Switch Contura	SPST	OFF - ON
8231	Rocker Switch Contura	SPST	OFF - (ON)
8232	Rocker Switch Contura	SPDT	ON - OFF - ON
8233	Rocker Switch Contura	SPDT	(ON) - OFF - ON
8234	Rocker Switch Contura	SPDT	(ON) - OFF - (ON)
8218	Rocker Switch Contura	DPST	OFF - ON
8219	Rocker Switch Contura	DPST	OFF - (ON)
8220	Rocker Switch Contura	DPDT	ON - OFF - ON
8221	Rocker Switch Contura	DPDT	(ON) - OFF - ON
8222	Rocker Switch Contura	DPDT	(ON) - OFF - (ON)

( ) = MOMENTARY POSITION

Panel Accessories

Panel Switches

- For applications such as starters, bilge pumps, horns, wipers and engine controls where switching, in addition to circuit protection, is required
- All Panel Switches mount in Blue Sea Systems' toggle type circuit breaker panels
- Supplied with Mounting Adapter for standard 5/8" circuit breaker mounting hole
- Nickel-plated brass and phenolic non-corrosive construction

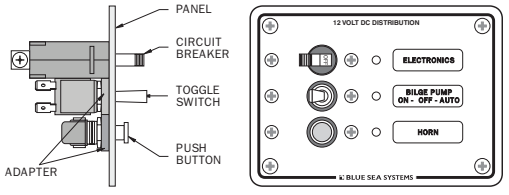
Specifications	Toggle Switches	Push Button Switch
Rating 250 VAC	10 Amperes	3 Amperes
Rating 125 VAC	15 Amperes	6 Amperes
Rating 32 VDC	15 Amperes	6 Amperes
Terminal Size	0.25" (6.35 mm)	0.25" (6.35 mm)
Terminal Type	Quick Connect Tab	Quick Connect Tab
Actuator Color	White	White

PN	Type	Poles/Throw	Action	Weight Lb/Kg
8200	Push Button	SPST	OFF-(ON)	0.07/0.03
8204	Toggle	SPST	OFF-ON	0.08/0.04
8205	Toggle	SPST	OFF-(ON)	0.08/0.04
8206	Toggle	SPDT	ON-OFF-ON	0.08/0.04
8207	Toggle	SPDT	(ON)-OFF-ON	0.08/0.04
8208	Toggle	SPDT	(ON)-OFF-(ON)	0.08/0.04
8209	Toggle	SP*	OFF-ON-(ON)	0.08/0.04
8210	Toggle	DPST	OFF-ON	0.08/0.04
8211	Toggle	DPDT	ON-OFF-ON	0.08/0.04
8212	Toggle	DPDT	(ON)-OFF-ON	0.08/0.04

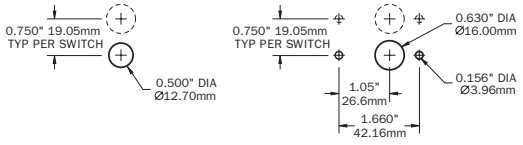
SP* Progressive Two Circuit ( ) = momentary

8200

8204-8212

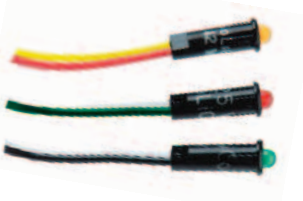


Panel Mounting Example



Panel Cutout Without Adapter

Panel Cutout With Adapter



LED Indicator Lights CE

- Easily installed in any Blue Sea Systems' circuit breaker panel
- Simple push-in installation mounts in any thickness material
- Useful as general indicator and alarm lights

Specifications

Amperage Draw 12 Volts DC	5 Milliamperes
Amperage Draw 24 Volts DC	5 Milliamperes
Amperage Draw 120 Volts AC	0.5 Milliamperes
Amperage Draw 230 Volts AC	0.25 Milliamperes
Mounting Hole Size	11/64" (4.36 mm)

PN	Description	Voltage	Weight Lb/Kg
8033	LED Amber	12/24V DC	0.07/0.03
8171	LED Red	12/24V DC	0.07/0.03
8172	LED Green	12/24V DC	0.07/0.03
8169	LED Amber	120V AC	0.07/0.03
8066	LED Red	120V AC	0.07/0.03
8034	LED Green	120V AC	0.07/0.03
8167	LED Amber	230V AC	0.07/0.03
8166	LED Red	230V AC	0.07/0.03
8134	LED Green	230V AC	0.07/0.03

Propane Gas Control System

- The smallest LPG control panel available
- Amber "ON" indicating LED
- UL Listed Solenoid
- Solenoid operates on either high or low pressure side of regulator

Specifications

Panel Material	0.125" Aluminum 5052 Alloy
Coating	Chemical Treatment–front and back Two-Part Polyurethane Slate Gray–front
Solenoid Amperage Draw	0.750 Amperes
LED Amperage Draw	5 Milliamperes
Voltage	12 Volts DC
Dimensions	2.625" / 66.675mm x 3.75" / 95.25mm

8071

PN	Description	Weight Lb/Kg
8071	Panel LPG Control with Solenoid	1.06/0.48
8075	Solenoid Only 1/4" Inlet	0.67/0.30

Panel Accessories

Panel Labels

- Tough, weatherproof Lexan® material
- Backlightable with Label Backlight System
- Over 450 circuit labels available

PN	Description	Weight
8063	Label Panel Single*	(specify #)
8031	Label Kit AC Panel Basic	(30 Labels)
8067	Label Kit AC Panel Extended	(120 Labels)
8030	Label Kit DC Panel Basic	(30 Labels)
8039	Label Kit DC Panel Extended	(120 Labels)

**See pages 64-65 for label listing and part numbers*

DC Basic Label Kit
Part Number 8030

18	ACCESSORY
35	ANCHOR LIGHT
43	AUTOPILOT
61	BILGE PUMP
65	BLOWER
106	COMPASS LIGHT
131	DEPTH SOUNDER
148	ELECTRONICS
168	ENGINE INSTRUMENTS
179	FAN
197	FOREDECK LIGHT
217	FWD CABIN LIGHTS
232	GPS
270	HORN
288	KNOTMETER
292	LIGHTS
308	MACERATOR PUMP
312	MAIN CABIN LIGHTS
349	RADAR
356	REFRIGERATOR
362	RUNNING LIGHTS
364	SAILING INSTRUMENTS
389	SPARE
391	SPREADER LIGHTS
401	STEAMING LIGHT
403	STEREO
408	STROBE LIGHT
421	TRICOLOR LIGHT
432	VHF
441	WATER PRESSURE

AC Basic Label Kit
Part Number 8031

3	BLANK
18	ACCESSORY
22	AFT CABIN LIGHTS
23	AFT CABIN OUTLETS
26	AIR CONDITIONER
27	AIR CONDITIONER 2
39	APPLIANCES
50	BATTERY CHARGER
87	CABIN OUTLETS
107	COMPUTER
172	ENTERTAINMENT CENTER
217	FWD CABIN LIGHTS
218	FWD CABIN OUTLETS
219	GALLEY
224	GALLEY OUTLETS
257	HEATER
285	INVERTER
292	LIGHTS
308	MACERATOR PUMP
312	MAIN CABIN LIGHTS
313	MAIN CABIN OUTLETS
318	MICROWAVE
333	OUTLETS
356	REFRIGERATOR
389	SPARE
406	STOVE
425	TV/STEREO
431	VCR
436	WASHER DRYER
438	WATER HEATER

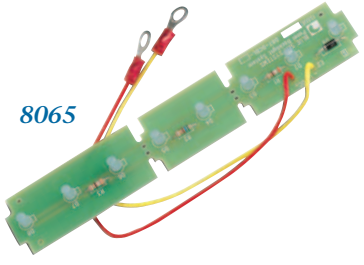
Label Set

- Tough, weatherproof Lexan® material
- Small format labels for waterproof panels
- Features 60 common DC labels

PN	Description
8214	Black Label Kit for Panels (8261, 8262, 8055)
8217	Grey Label Kit for Panels (8271, 8272, 8273, 8274)

8214

8217



8065

Label Backlight System

- Easily installed in Blue Sea Systems' circuit breaker panels
- Connects to 12 or 24 Volt sources via two 6" 18 AWG wire leads

Specifications

Voltage	12 or 24 Volts DC
Amperage Draw	5 Milliamperes per label

PN	Description	Weight Lb/Kg
8065	Backlight System 8/5/3 Positions	0.07/0.03
8069	Backlight System 10 Position	0.09/0.04

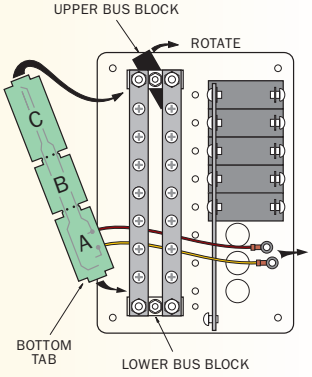
Label Backlight System Instruction

The backlight board is mounted between the 2 black bus support blocks on the back of the panel as shown.

The 8065 backlight board is easily shortened to fit all Blue Sea Systems' backlightable panels with 5 or 3 label positions. For panels with 8 label positions, no shortening of the boards is necessary. For panels with 5 label positions, snap off Section C furthest from the wire leads. For panels with 10 label positions, use the 8069 backlight board.

Loosen the single screw retaining the lower bus block exactly 1 turn. Then loosen the upper screw 2 turns.

With the green LED's facing the panel, insert the bottom tab nearest the wire leads into the slot and rotate the lower block back into position. Lightly tighten both bus screws.



Electrical Distribution Panels

Panel Accessories

8173

8072

Mounting Panel for Toggle Type Magnetic Circuit Breakers

- Mount any Toggle Type single-pole and double-pole breaker or panel switch

Specifications

Panel Material	0.125" Aluminum 5052 Alloy
Dimensions	2.625" / 66.675mm x 3.75" / 95.25mm

PN	Description	Weight Lb/Kg
8072	Mounting Panel Single Pole	0.08/0.04
8173	Mounting Panel Double Pole	0.08/0.04

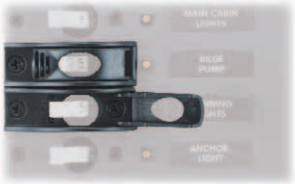
Toggle Guard

- Protects circuit breakers from being accidentally switched ON or OFF
- Fits all single-pole Toggle Type circuit breakers shown on page 16
- Fits all panel switches shown on page 40
- Can be used on any brand of circuit breaker panel using standard Toggle Type circuit breakers
- Uses circuit breaker mounting screw hole
- Includes 2 mounting screws

Specifications

Material	Acetal
Mounting Hole Size	#6 Flat Head Screw

PN	Description	Weight Lb/Kg
4100	Toggle Guard for Toggle Type breakers and panel switches	0.05/0.02



4100 (2 shown)

4125

AC Lockout Slide

- Allows only 1 double-pole AC circuit breaker to be activated at a time
- Guarantees that AC power from 2 or 3 sources (power company and genset or inverter) will not be mixed
- Fits all double-pole circuit breakers shown on page 16
- Uses circuit breaker mounting screw holes. Requires no special panel modification
- Includes mounting screws

Specifications

Material	Acetal
Mounting Screw Size	#6 Flat Head Screw

PN	Description	Weight Lb/Kg
4125	Lockout Slide AC 2 Position 2 Pole	0.06/0.03
4126	Lockout Slide AC 3 Position 2 Pole	0.07/0.03

Panel Back Circuit Breaker Insulating Covers

- Provides electrical insulation for exposed panel backs
- Provides mechanical protection for panel backs protruding into lockers
- Lightweight material is easily drilled for wire entrance and exit
- AC isolation covers meet ABYC requirements for AC separation on panels with combined AC and DC.

Specifications

Material ABS

PN	Description	Weight Lb/Kg
4026	Cover for 5-1/4" x 3-3/4"	0.09/0.04
4027	Cover for 5-1/4" x 7-1/2"	0.14/0.06
4028	Cover for 10-1/2" x 7-1/2"	0.39/0.18
4029	Cover for 1 Column x 8 Position + Meter	
4031	Cover for 2 Column x 10 Position + Meter	

4027

NEW

4031

Circuit Breaker Mounting Screws

- Fits all single and double-pole Toggle Type and C-Series circuit breakers
- Sold in packages of 6

PN	Description	Weight Lb/Kg
8035	Circuit Breaker Mounting Screws 6-32 x 1/4" Flat Head	0.027/0.012

See page 14 & 15 for High-Load™ C-Series circuit breakers.

DC Volt Meter Panels

DC Voltmeter Meter Panel

· 8-16 Volt DC Analog Voltmeter
· 3 position switch for multiple battery banks
· Full-size 2-3/4" meter

Specifications

Voltage	8-16 Volts DC
Dimensions	3.75" / 95.25 mm high
	6.25" / 133.35 mm wide

PN	Description	Weight Lb/Kg
8015	8-16 Volt DC Analog Voltmeter Panel	0.49/0.22

8015

8051

DC Digital Voltmeter Panel

· 7-60 Volt DC Voltmeter with 4 digit display
· 3 position switch for multiple battery banks
· Full-size 2-3/4" meter

Specifications

Voltage	60 Volts DC Maximum
Dimensions	3.75" / 95.25 mm high
	5.25" / 133.35 mm wide

PN	Description
8051	Digital voltmeter panel with 8235 Digital meter

See page 46 for detailed meter specifications.

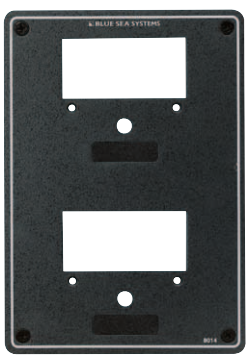
Meter Mounting Panel

· Flush mounts Blue Sea Systems' 2-3/4" Analog or Digital Meters

Specifications

Panel Material	0.125" Aluminum 5052 Alloy
Panel Undercoating	Chemical Treatment
	Mil-C-5541C or equivalent
Panel Front Coating	Two-Part Polyurethane Slate Gray
Dimensions 8013	3.75" / 95.26 mm high
	5.25" / 133.35 mm wide
Dimensions 8014	7.50" / 190.50 mm high
	5.25" / 133.35 mm wide

PN	Description	Weight Lb/Kg
8013	Meter Mounting Panel Single 2-3/4" Meter	0.22/0.10
8014	Meter Mounting Panel Double 2-3/4" Meters	0.36/0.16



8014

8013

120/240 AC Digital Meter Panel

· Perfect solution for monitoring 120/240V AC systems
· Monitor Line 1 or Line 2 to Neutral and Line 1 to Line 2 Voltages
· Monitor 120V and 240V Currents
· Convenient terminal block for connections
· Intended for use with 8247 AC Digital Multimeter (Not included)
· Includes two additional Current Transformers PN 8256

Specifications

See page 47 for 8247 AC Digital Multimeter

Dimensions	3.75" / 95.25 mm high
	5.25" / 133.35 mm wide

PN	Description
8410	120/240 AC Digital Meter Panel

NEW

8410

DC Volt Meters

DC Voltmeters

· Simple 2-wire connection

Specifications

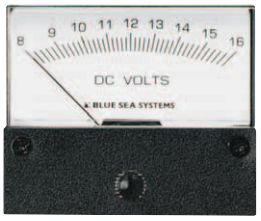
Amperage Draw	1 Milliampere
Accuracy	3% of scale range

Standard Size 2-3/4" Face Meters

PN	Description	Weight Lb/Kg
8003	Voltmeter 8-16V DC	0.23/0.10
8240	Voltmeter 18-32V DC	0.23/0.10

Compact 2" Face Micro-Meter

PN	Description	Weight Lb/Kg
8028	Micro Voltmeter 8-16V DC	0.24/0.11
8243	Micro Voltmeter 18-32V DC	0.24/0.11

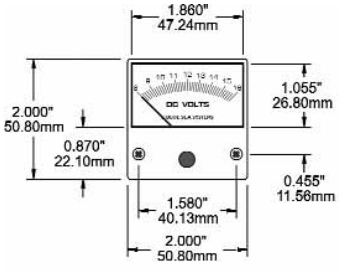


8003

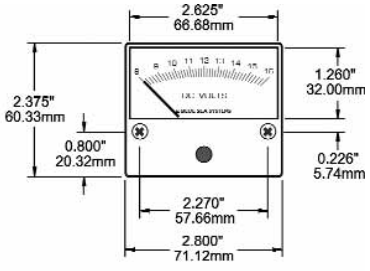
8240

8028

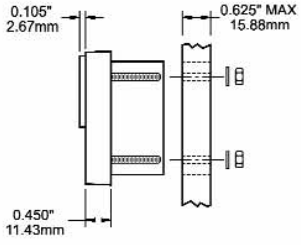
8243



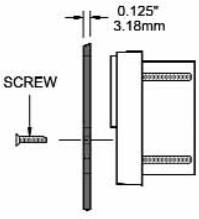
Micro Meter



Standard Meter



Surface Mount



Panel Mount

DC Ammeters

DC Ammeters

· Simple 2-wire connection from shunt—no other power required
· Meter senses and powers from shunt connection
· Packaged complete with shunt
(Except 8005 and 8038 meters with internal shunts)

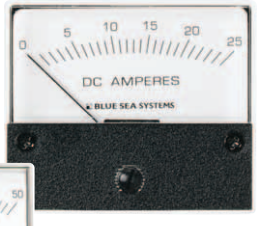
Specifications

External Shunt Type	50 Millivolt at meter full scale
Meter Operating Amperage	1 Milliampere
Accuracy	3% of scale range

Standard Size 2-3/4" Face Meters

PN	Description	Shunt Type	Weight Lb/Kg
8005	Ammeter 0-25A DC	Internal	0.24/0.25
8022	Ammeter 0-50A DC +Shunt	External	0.56/0.25
8016	Ammeter 0-75A DC +Shunt	External	0.56/0.25
8017	Ammeter 0-100A DC +Shunt	External	0.56/0.25
8018	Ammeter 0-150A DC +Shunt	External	0.66/0.25
8019	Ammeter 0-200A DC +Shunt	External	1.04/0.47

8005



8041

Compact 2" Face Micro-Meters

PN	Description	Shunt Type	Weight Lb/Kg
8038	Micro Ammeter 0-15A DC	Internal	0.24/0.11
8041	Micro Ammeter 0-50A DC +Shunt	External	0.56/0.25

DC Ammeters and Accessories

Zero Center DC Ammeters

- Meters read both discharge and charge current
- Simple 2-wire connection from shunt—no other power required
- Meter senses and powers from shunt connection
- Packaged complete with shunt

Specifications

External Shunt Type	50 Millivolt at meter full scale
Meter Operating Amperage	1 Milliampere
Accuracy	3% of scale range

Standard Size 2-3/4" Face Meters

PN	Description	Shunt Type	Weight Lb/Kg
8252	Ammeter 50-0-50A +Shunt	External	0.56/0.25
8253	Ammeter 100-0-100A +Shunt	External	0.56/0.25

Compact 2" Face Micro-Meter

PN	Description	Shunt Type	Weight Lb/Kg
8254	Micro Ammeter 50-0-50A DC +Shunt	External	0.56/0.25

8252

8253

8254

Shunt Shifter

- Shunt Adapter for DC Digital Ammeter positive side alternator applications.
- The Shunt Shifter is designed for use with Blue Sea Systems' Digital Meter shunt PN 8255.
- Advanced technology shifts the shunt's positive reference to negative as required by digital meters.
- Easily installs directly onto shunt using existing sense screws
- User selectable voltage for 12 or 24 Volt DC systems

PN	Description
8242	Shunt Shifter

8242

Available in January 2003

DC Shunts

- Power all Blue Sea Systems' external shunt, DC ammeters

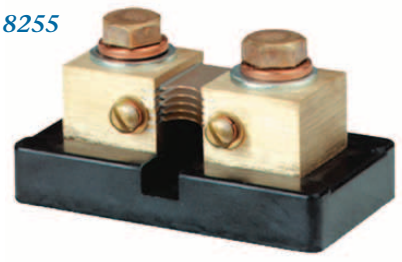
Specifications

Shunt Type	Resistive, manganin metal element
Full Scale Resistance	50 Millivolts

PN	Description	Weight Lb/Kg
9228	Shunt 50A/50mV	0.20/0.09
9230	Shunt 100A/50mV	0.20/0.09
9231	Shunt 150A/50mV	0.20/0.09
9233	Shunt 200A/50mV	0.71/0.32
8255	Digital Meter Shunt 500A/50mV	0.71/0.32

9228

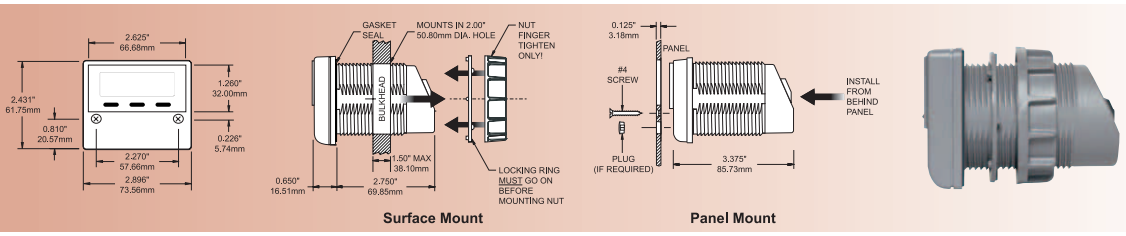
8255



DC Digital Meters

Blue Sea Systems' New Spin-On Mounting System

- Surface mounts in a standard 2" (52 mm) round hole
- Panel mounts in any full size Blue Sea Systems' electrical panel meter cut-out



DC Digital Ammeter

- Displays Amperage from -500 to +500 Amps
- 3 display brightness levels + off
- Splashproof front
- Standard meter operates in negative side of circuit only. PN 8242 shunt shifter required for positive side installation such as alternators - reference page 45
- Includes 500 Amp shunt - reference PN 8255, page 45

Specifications

Display Character Size	9/16" / 14.29mm
Input Voltage	7-60V DC*
Power Consumption Min.	0.60 Watt**
Power Consumption Max.	1.00 Watt**
Current Measurement	
Shunt	500A-50mV
Range	±500A DC
Resolution (below -99.9)	0.1A DC
Resolution (100 to 500.0)	1.0A DC
Accuracy (% of Reading)	±0.5%***

PN	Description	Weight Lb/Kg
8236	DC Digital Ammeter	1.12/0.51

8236

DC Digital Voltmeter with Alarm

- Displays Voltage to 7 to 60 Volts
- User settable high and low Voltage audio and visual alarms
- 3 display brightness levels + sleep mode
- Splashproof front

Specifications

Display Character Size	9/16" / 14.29mm
Input Voltage	7-60V DC*
Power Consumption Min.	0.60 Watt**
Power Consumption Max.	1.00 Watt**
Voltage Measurement	
Range	0-60V DC
Resolution	0.01V DC
Accuracy (% of Reading)	±0.5%***

PN	Description	Weight Lb/Kg
8251	DC Digital Voltmeter with Alarm	0.44/0.20

8251

8235

DC Digital Voltmeter

- Displays Voltage to 7 to 60 Volts
- 3 display brightness levels + off
- Splashproof front

Specifications

Display Character Size	9/16" / 14.29mm
Input Voltage	7-60V DC*
Power Consumption Min.	0.60 Watt**
Power Consumption Max.	1.00 Watt**
Voltage Measurement	
Range	0-60V DC
Resolution	0.01V DC
Accuracy (% of Reading)	±0.5%***

PN	Description	Weight Lb/Kg
8235	DC Digital Voltmeter	0.44/0.20

DC Digital Multimeter with Alarm

- Displays Amperage from -500 to +500 Amps
- Displays Voltage from 7 to 60 Volts in 0.01 Volt increments
- User settable high and low voltage, audio and visual alarms
- Standard meter operates in negative side of circuit only. PN 8242 shunt shifter required for positive side installation such as alternators - reference page 45
- 3 display brightness levels + sleep mode
- Splashproof front
- Includes 500 Amp shunt - reference PN 8255, page 45

Specifications

Display Character Size	9/16" / 14.29mm
Input Voltage	7-60V DC*
Power Consumption Min.	0.60 Watt**
Power Consumption Max.	1.00 Watt*
Current Measurement	
Shunt	500A-50mV
Range	±500A DC
Resolution (below -99.9)	0.1A DC
Resolution (100 to 500.0)	1.0A DC
Accuracy (% of Reading)	±0.5%***
Voltage Measurement	
Range	0-60V DC
Resolution	0.01V DC
Accuracy (% of Reading)	±0.5%***

PN	Description	Weight Lb/Kg
8248	DC Digital Multimeter with Alarm	1.12/0.51

8248

* *Applicable for 12, 24, 32, 36, and 42 Volt DC systems*

** *Variable with voltage, display intensity, segments illuminated and sleep mode*

*** *±1 least digit of resolution*

AC Digital Meters

Monitoring
120/240V AC Systems
Blue Sea Systems special 120/240V switch panel for use with the 8247 digital meter (see page 43)

Every Blue Sea Systems Digital Meter is programmed, calibrated and tested before shipment.

AC Digital Multimeter with Alarm

8247

- Displays Amperage from 1 to 150 Amps
- Displays Voltage from 70 to 300 Volts
- Displays Power to 45 kilowatts
- Displays Frequency from 40 to 90 Hertz
- User settable high Amperage audio and visual alarm
- 3 display brightness levels + sleep mode
- Sleep mode blanks display for power conservation
- Splashproof front
- Includes current transformer - reference PN 8256, page 48

Specifications

Display Character Size	9/16" / 14.29mm
Input Voltage Range	70-300V AC
Power Consumption Min.	0.010 Watt
Power Consumption Max.	0.027 Watt**
Voltage Measurement	
Range	70 to 300V AC*
Resolution	0.1V AC
Accuracy (% of Reading)	
90-270 V AC	±1.0%*** (RMS)
70-90 V AC & 270-300 V AC	±5.0%*** (RMS)
Current Measurement	
Current Transformer	150A-50mA
Resolution 0.01A	0.00-9.99A AC (RMS)
Resolution 0.1A	10.0-150.0A AC (RMS)
Accuracy (% of Reading)	±1.0%***
Frequency Measurement	
Range	40-90Hz
Resolution	0.1Hz
Accuracy (% of Reading)	±1.0%***
Power Measurement	
Range 1 (Resolution 10W)	0-9990 Watts
Range 2 (Resolution 0.1kW)	10-45 kilowatts
Accuracy (% of Reading)	±5.0%***

PN	Description	Weight Lb/Kg
8247	AC Digital Multimeter with Amperage Alarm	0.78/0.35

AC Digital Ammeter

8238

- Displays Amperage from 1 to 150 Amps
- 3 display brightness levels
- Splashproof front
- Includes current transformer - reference PN 8256, page 48

Specifications

Display Character Size	9/16" / 14.29mm
Input Voltage Range	70 to 270V AC*
Power Consumption Min.	0.010 Watt
Power Consumption Max.	0.027 Watt**
Current Measurement	
Current Transformer	150A-50mA
Resolution 0.01A	0.00-9.99A AC (RMS)
Resolution 0.1A	10.0-150.0A AC (RMS)
Accuracy (% of Reading)	±1.0%***

PN	Description	Weight Lb/Kg
8238	AC Digital Ammeter	0.78/0.35

AC Digital Voltmeter

8237

- Displays Voltage from 70 to 300 Volts
- 3 display brightness levels
- Splashproof front

Specifications

Display Character Size	9/16" / 14.29mm
Input Voltage Range	70 to 270V AC*
Power Consumption Min.	0.010 Watt
Power Consumption Max.	0.027 Watt**
Voltage Measurements	
Range	70-300V AC
Resolution	0.1V AC
Accuracy (% of Reading)	
100-270V AC	±1.0%*** (RMS)
70-90V AC	±5.0%*** (RMS)

PN	Description	Weight Lb/Kg
8237	AC Digital Voltmeter	0.72/0.33

AC Digital Frequency

8239

- Displays Frequency from 40 to 90 Hz
- 3 display brightness levels + off
- Splashproof front

Specifications

Display Character Size	9/16" / 14.29mm
Input Voltage Range	70 to 270V AC*
Power Consumption Min.	0.010 Watt
Power Consumption Max.	0.027 Watt**
Frequency Measurement	
Range	40-90Hz
Resolution	0.1Hz
Accuracy (% of Reading)	±1.0%***

PN	Description	Weight Lb/Kg
8239	AC Digital Frequency Meter	0.72/0.33

* *For 120 & 240 Volt AC single phase systems*
** *Variable with voltage, display intensity, segments illuminated and sleep mode*
*** *±1 least digit of resolution*

AC Meters and Accessories

AC Voltmeter

- Dial marked in 5 Volt increments
- Simple 2-wire connection to AC Hot and Neutral
- Meter senses and powers from same connection

Specifications

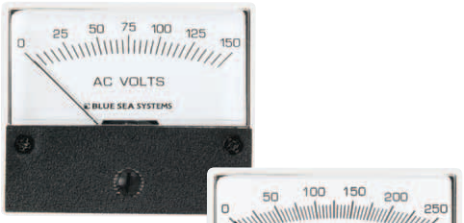
Input Voltage	9353, 8244	0-150 Volts AC
	9354, 8245	0-250 Volts AC
Accuracy	3% of scale	

Standard Size 2-3/4" Face Meter

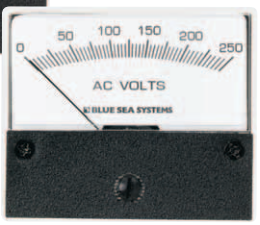
PN	Description	Weight Lb/Kg
9353	Voltmeter 0-150V AC	0.23/0.10
9354	Voltmeter 0-250V AC	0.23/0.10

Compact 2" Face Micro-Meter

PN	Description	Weight Lb/Kg
8244	Micro Voltmeter 0-150V AC	0.23/0.10
8245	Micro Voltmeter 0-250V AC	0.23/0.10



9353



9354

8244

8245

9630

8246

AC Ammeter

- 50 Amp dial marked In 2 Amp Increments
- Simple 2-wire connection
- Meter senses and powers from coil slipped over wire to be measured
- Includes AC current coil transformer

Specifications

Accuracy	3% of Scale
Meter Operating Amperage	60 Milliamperes AC
Coil Ratio	50 Amperes AC=50 Milliamperes AC

Standard Size 2-3/4" Face Meter

PN	Description	Weight Lb/Kg
9630	Ammeter 0-50A AC	0.36/0.16
8258	Ammeter 0-100A AC	

Compact 2" Face Micro-Meter

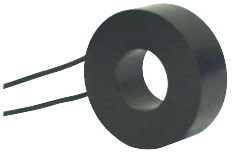
PN	Description	Weight Lb/Kg
8246	Micro Ammeter 0-50A AC	0.23/0.10

AC Current Coils

Specifictions

Dimensions	0.60"/15.24 mm Inside Diameter
	1.38"/35.05 mm Outside Diameter

PN	Description	Coil Ratio	Weight Lb/Kg
8073	Analog Ammeter Coil	50A AC/50mA AC	0.20/0.09
8257	Analog Ammeter Coil	100A AC/50mA AC	0.20/0.09
8256	Digital Ammeter Coil	150A AC/50mA AC	0.20/0.09



8073

- **Continuous voltage control from 0 to 100% of input voltage**
- **Last setting memory – On power up output is same as at shut down**
- **-20°C to +85°C operating temperature range**
- **Waterproof, sealed housings**
- **All models operate on 10 to 32 Volt DC systems**

DC 2 Ampere Digital Voltage Controller

- Rated for dashboard gauge or small single fixture interior dimming
- Small fans

7501

Specifications

Input Voltage	10 to 32 Volts DC
Amperage Continuous Rating	2 Amperes
Amperage Surge Rating (10 sec)	5 Amperes
Amperage Draw 0% Output	5 Milliamperes (0.005A)
Internal Over Current Protection	10 Amperes
Dimensions	2.05" L x 1.67" W x 1.5" H 52.07 mm x 42.42 mm x 38.10 mm
Weight	0.16 Lb / 0.35 Kg

PN	Description
7501	DC Digital 2A Voltage Controller

7502

DC 5 Ampere Digital Voltage Controller

- Rated for medium to large single fixture interior dimming
- Most fans and small blowers

Specifications

Input Voltage	10 to 32 Volts DC
Amperage Continuous Rating	5 Amperes
Amperage Surge Rating (10 sec)	10 Amperes
Amperage Draw 0% Output	5 Milliamperes (0.005A)
Internal Over Current Protection	20 Amperes
Dimensions	3.06" L x 2.16" W x 1.60" H 77.72 mm x 54.86 mm x 40.64 mm
Weight	0.28 Lb / 0.62 Kg

PN	Description
7502	DC Digital 5A Voltage Controller

NEW

8216

Contura Rocker Switch

- Mounts in Blues Sea Systems' Waterproof Panels
- Blue Sea Systems' Contura Waterproof Switches are specially manufactured for mounting in Blue Sea Systems' waterproof panels. Use of standard Contura switches will not maintain the waterproof integrity of these panels
- Legend - Bright and Dim

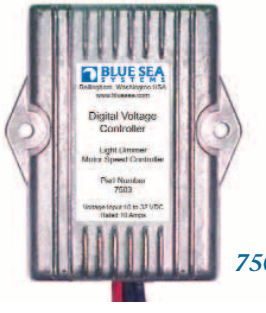
Specifications

Rating: 12V DC	20 Ampere
Rating: 24V DC	15 Ampere
Terminal Size	0.25"/6.35mm
Terminal Type	Quick Connect tab
Function	SPDT (ON)-OFF-(ON)

PN	Description
8216	Contura Rocker Switch SPDT (ON) - OFF - (ON)

DC 10 Ampere Digital Voltage Controller

- Rated for multiple fixture area lighting dimming
- Large fans and blowers
- Robust aluminum housing

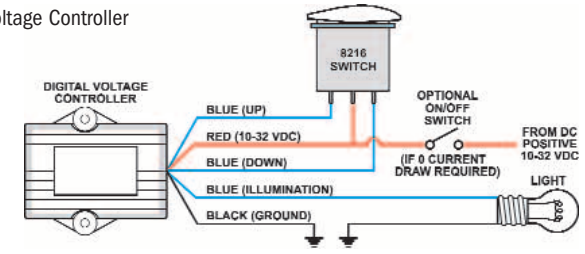


7503

Specifications

Input Voltage	10 to 32 Volts DC
Amperage Continuous Rating	10 Amperes
Amperage Surge Rating (10 sec)	25 Amperes
Amperage Draw 0% Output	5 Milliamperes (0.005A)
Internal Over Current Protection	50 Amperes
Dimensions	3.06" L x 2.16" W x 1.60" H 77.72 mm x 54.86 mm x 40.64 mm
Weight	0.44 Lb / 0.97 Kg

PN	Description
7503	DC Digital 10A Voltage Controller



8208 Circuit Breaker Panel Switch may also be used for Voltage Controller. See page 40

Four Position Battery Switches

9001
9002

Battery Switches CE

Compact High Amperage Switches

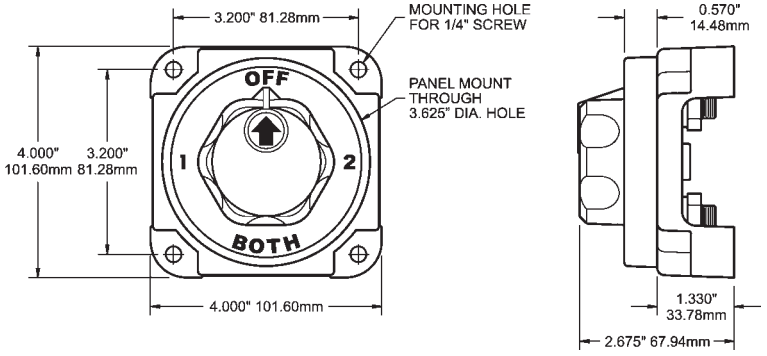
- Luminous label for low light readability
- 300 Amp Continuous Rating—25% higher than standard switches
- Vaporproof/Ignition Protected
- Optional AFD switch on 9002 and 9004 models
- Case design allows surface or flush mounting
- UL Listed - UL 1107 Electric Power Switches
- Meets UL 1500 - Ignition Protection Requirements
- Meets SAE J1171 - External Ignition Protection Requirements
- CE marked for EC applications

Specifications

Inrush Rating: 250ms (10 repeats)*	1400 Amperes DC
Cranking Rating: 9.75s (10 repeats)*	550 Amperes DC
Intermittent Rating: 300s (UL 1107)	400 Amperes DC
Continuous Rating: (UL 1107)	300 Amperes DC
Voltage Rating	32 Volts DC Maximum
Case Material	Lexan® Polycarbonate
Stud Terminal Size	3/8"

* Blue Sea Systems Engine Starting Standard on page 53

PN	Description	Weight Lb/Kg
9001	Switch Battery 4 Position	1.00/0.45
9002	Switch Battery 4 Position with AFD	1.00/0.45



Coming in March 2003...

The 9001 PK Battery Switch!

Blue Sea Systems will in March 2003 begin shipments of the completely redesigned 9000 Series Battery Switches. The new design preserves all the features that have made these switches so popular - The compact design, versatile cable entry, high amperage ratings and reliability, luminous dials, alternator field disconnect and US manufacture. Yet the new 9001 PK now features a more modern ergonomic design and has THE LOWEST RETAIL PRICE OF ANY MARINE BATTERY SELECTOR SWITCH!

Battery Switches CE

Compact High Amperage Switches

- Luminous label for low light readability
- 300 Amp Continuous Rating—25% higher than standard switches
- Vaporproof/Ignition Protected
- Optional AFD switch on 9002 and 9004 models
- Case design allows surface or flush mounting
- UL Listed - UL 1107 Electric Power Switches
- Meets UL 1500 - Ignition Protection Requirements
- Meets SAE J1171 - External Ignition Protection Requirements
- CE marked for EC applications

9003
9004

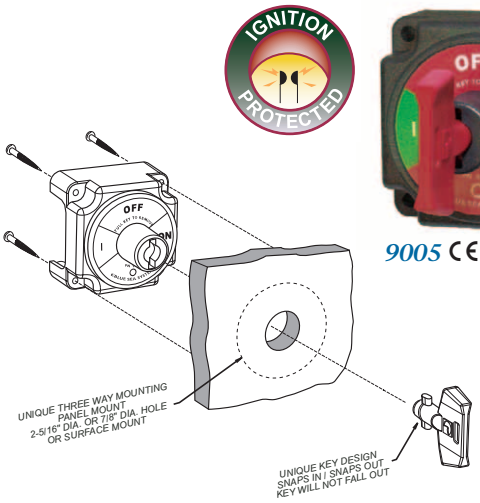
See page 50 for switch diagram

Specifications

Inrush Rating: 250ms (10 repeats)*	1400 Amperes DC
Cranking Rating: 9.75s (10 repeats)*	550 Amperes DC
Intermittent Rating: 300s (UL 1107)	400 Amperes DC
Continuous Rating: (UL 1107)	300 Amperes DC
Voltage Rating	32 Volts DC Maximum
Case Material	Lexan® Polycarbonate
Stud Terminal Size	3/8"

* Blue Sea Systems Engine Starting Standard on page 53

PN	Description	Weight Lb/Kg
9003	Switch Battery ON/OFF	0.90/0.41
9004	Switch Battery ON/OFF with AFD	0.90/0.41



9005 CE

Mini Battery Switches

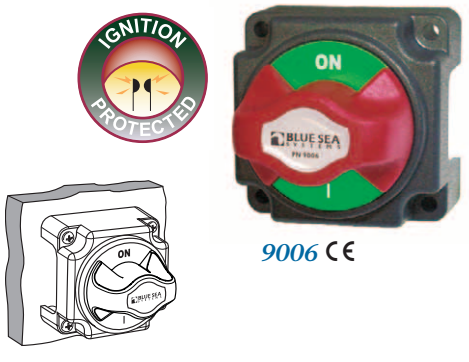
- Color coded label with international ON/OFF legends
- Vapor Proof/Ignition Protected
- Case design allows surface or flush mounting
- Contoured Knob and Key rotate 360 degrees for ease of operation
- Key is removable, yet positively retained at all times
- Meets SAE J1171 - External Ignition Protection Requirements
- CE marked for EC applications

Specifications

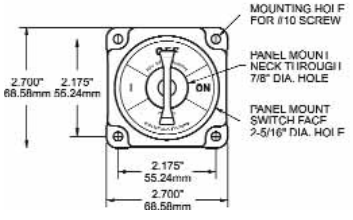
Inrush Rating: 250ms (10 repeats)*	1400 Amperes DC
Cranking Rating: 9.75s (10 repeats)*	600 Amperes DC
Intermittent Rating: 300s (UL 1107)	375 Amperes DC
Continuous Rating: (UL 1107)	250 Amperes DC
Voltage Rating	32 Volts DC Maximum
Case Material	Lexan® Polycarbonate
Stud Terminal Size	3/8"

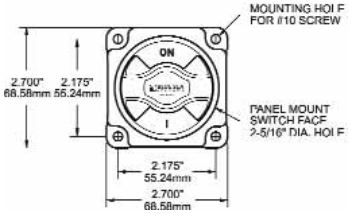
* Blue Sea Systems Engine Starting Standard on page 54

PN	Description	Weight Lb/Kg
9005	Switch ON/OFF (Key)	0.5/0.23
9006	Switch ON/OFF (Knob)	0.5/0.23
9664	Spare Key	0.1/0.05



9006 CE





Electronic Solenoid Switches

E-Series Electronic Switch CE

- Hermetically sealed
- Waterproof
- Vaporproof/Ignition Protected
- Pulse circuit requires very low current draw when contact is closed
- UL Recognized - UL 508 Industrial Control Equipment
- Meets SAE J1171 - External Ignition Protection Requirements
- CE marked for EC applications

9012

Specifications

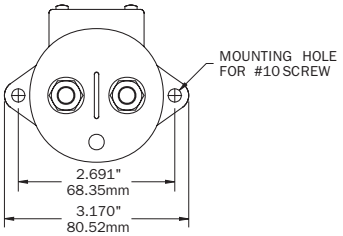
Coil Circuit

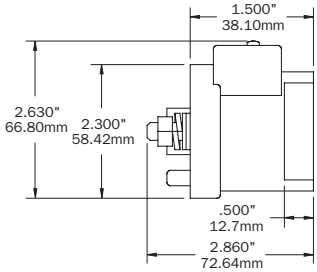
Input Voltage	9 to 36 Volts DC Maximum
Power Consumption	
–inrush max, 130 ms	3.80A @ 12-36V DC
–holding	0.13A @ 12V DC, 0.07 @ 24V DC

Main Power Contacts

Voltage Rating	60 Volts DC
Stud Terminal Size	M8 (accepts 5/16" terminals)
Contact Form	SPST-NO
Inrush Rating: 250ms (10 repeats)*	2000 Amperes
Cranking Rating: 9.75s (10 repeats)*	500 Amperes
Intermittent Rating: 300s (UL 1107)	275 Amperes
Continuous Rating: (UL 1107)	250 Amperes
Mechanical Life	1 Million Cycles
Make Current @ 10,000 Cycles:	2000 Amperes @ 28V
Break Current @ 10,000 Cycles:	2000 Amperes @ 28V

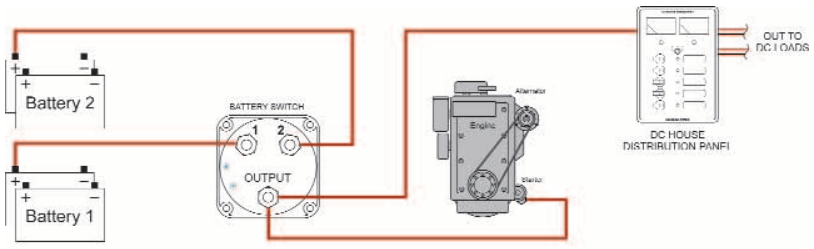
* Blue Sea Systems Engine Starting Standard



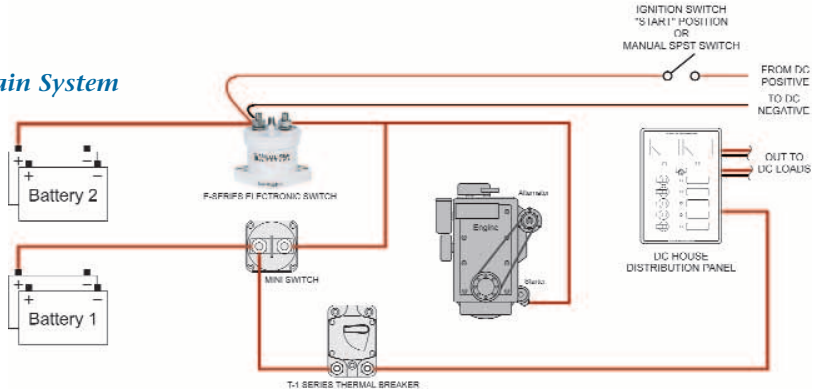


PN	Description	Weight Lb/Kg
9012	E-Series Electronic Solenoid	0.95 /0.43

Classic 4 Position Switch Model



Parallel DC Main System



Battery Switch Panels

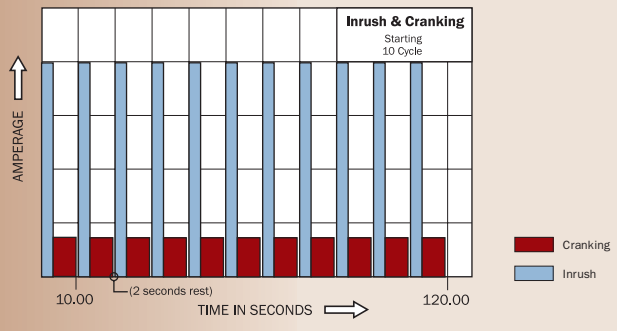
Switch Ratings

The UL standard under which all reputable manufacturers of battery switches rate their products is UL Standard 1107. This standard rates switches only for 5 minute and 1 hour time periods. Clearly, these ratings are not useful for the boater using a switch in the engine starting circuit where the time period may be 10 seconds or less. For this reason Blue Sea Systems has created an additional standard, called the Engine Starting Standard.

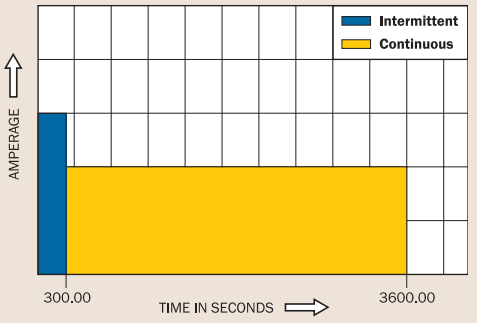
The Engine Starting Standard consists of 10 cycles with each cycle consisting of an Inrush Current spike of 1/4 second duration, a Cranking period of 9-3/4 seconds duration, and a 2 second rest period for a total of 120 seconds. This is representative of the load imposed on a battery switch in the starting circuit under very difficult starting conditions.

Blue Sea Systems' battery switches, in addition to being tested to UL 1107, are also tested to the Engine Starting Standard by a United States Coast Guard certified Nationally Recognized Testing Laboratory.

Blue Sea Systems
Engine Starting Standard



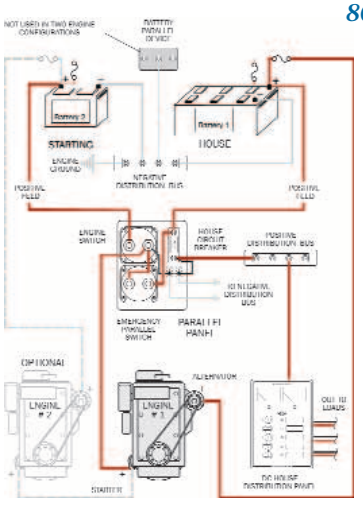
UL 1107 Standard



Intermittent must be minimum 150% of **continuous** amperage

See page 51 for Switch Amperage Ratings and Battery Switch specifications.

8080



DC Parallel Circuit Battery Switch Panel

The perfect panel for installations using Battery Combiners, Pathfinders, Echo Chargers, Battery Bank Integraters and other battery paralleling and combining devices.

Keeps starting circuit isolated from house circuit to:
- **Simplify battery switch operation**
- **Protect electronics from engine starting surges**
- **Charge batteries simultaneously**
- **Discharge independently**

· 100A C-Series circuit breaker provides both circuit protection and switching for house/main distribution panel circuit
· 250A Continuous/375A Intermittent ON/OFF battery switch provides isolated engine starting circuit
· 250A Continuous/375A Intermittent ON/OFF battery switch provides emergency cross connect circuit for starting engine from house battery bank

Specifications

Voltage	32 Volts DC Maximum
Amperage	House Circuit 100A DC Engine Circuit 375A Intermittent 600A Cranking / 1400A Inrush
Dimensions	6.50" / 165.10 mm high 5.25" / 133.40 mm wide

PN	Description	Weight Lb/Kg
8080	Parallel Battery Switch Panel	2.20/1.00

Battery Switch Panels

DC Circuit Breaker Panel with Battery Switch

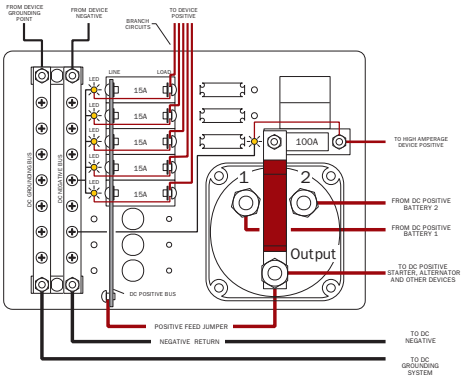
8083

- 100A C-Series circuit breaker provides both circuit protection and master switching for main distribution panel circuit
- 300A Continuous/400A Intermittent 4 position battery switch provides engine starting and house circuit switching
- Circuit breaker positive bus is independent of main switch for powering loads such as bilge pumps and alarms that must always remain ON or may be wired through battery switch
- Eight toggle circuit breaker positions, five 15A circuit breakers installed
- Three C-Series circuit breaker positions, one 100A circuit breaker installed
- All positive, ground and grounding buses installed, fully pre-wired
- Set of 30 common DC labels, backlightable
- Ready for installation of optional 8065 Label Backlight System (2 required)

Specifications

Voltage	32 Volts DC Maximum
Amperage	House Circuit 100A DC
	Engine Circuit 400A DC Intermittent
	550A Cranking / 1400A Inrush
Dimensions	7.50" / 190.50 mm high
	10.50" / 266.70 mm wide

PN	Description	Weight Lb/Kg
8083	Circuit Breaker Panel with Battery Switch	4.06/1.84



8062

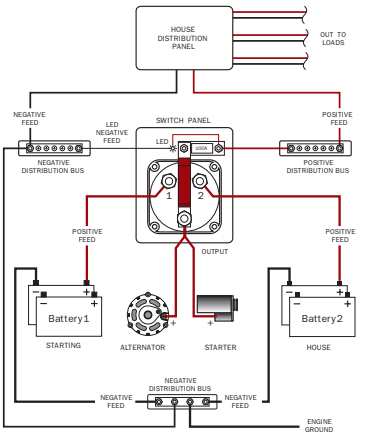
DC Master Switch Panel

- 100A C-Series circuit breaker provides both circuit protection and master switching for main distribution panel circuit
- 300A Continuous/400A Intermittent 4 position battery switch provides engine starting and house circuits

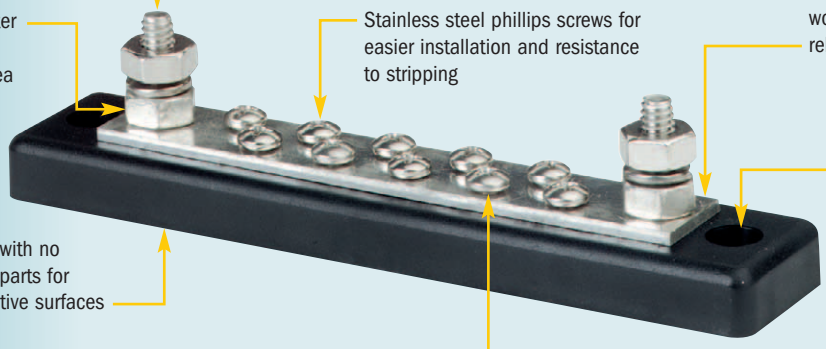
Specifications

Voltage	32 Volts DC maximum
Amperage	House Circuit 100A DC
	Engine Circuit 400A Intermittent
Dimensions	6.25" / 158.75 mm high
	5.25" / 133.4 mm wide

PN	Description	Weight Lb/Kg
8062	Battery Switch / DC Main Panel	1.90/0.86



The Industry Standard Electrical Bus



CE **Conformance verified for AC circuits up to 250 volts**

MiniBus 100 Ampere Common Bus

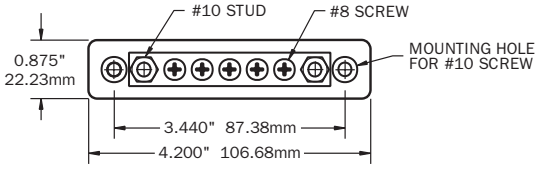
- Great for limited space applications in electronics cabinets and under dashboards

Specifications

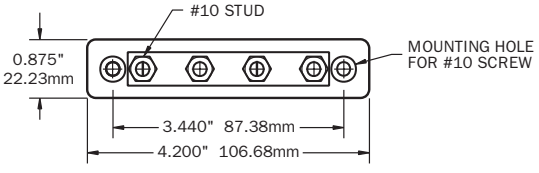
Continuous Amperage	100 Amperes DC 100 Amperes AC
Voltage Rating	48 Volts DC Maximum 300 Volts AC Maximum
Bus Material	Tin-Plated Copper
Base Material	ABS

PN	Description	Weight Lb/Kg
2304	MiniBus 5 x 8-32 Screw Terminal	0.14/0.06
2305	MiniBus 4 x 10-24 Stud Terminal	0.15/0.07
2306	Grounding Busbar 6 x 8-32 Screw Terminal	0.08/0.04
2714	Cover, Connector MiniBus 2304/5	0.03/0.01

2304 CE



2305 CE



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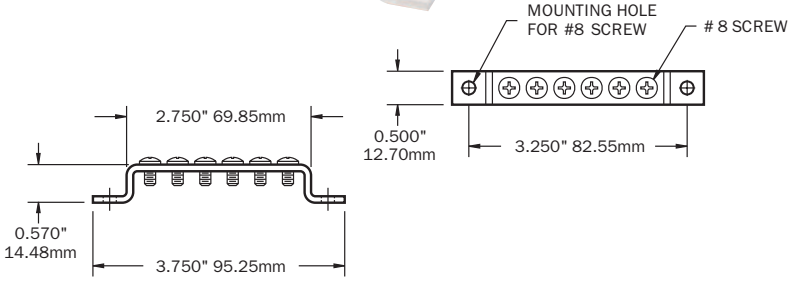

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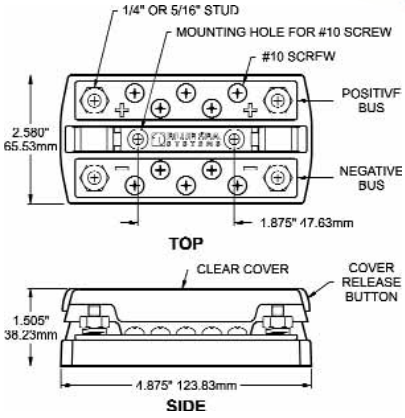
2722



DualBus Plus

- Combines negative and positive buses on one block
- Clear polycarbonate cover snaps on to meet Coast Guard and ABYC insulation requirements

Specifications

Continuous Amperage	150 Amperes DC / 130 Amperes AC
Voltage Rating	48 Volts DC Maximum 300 Volts AC Maximum
Bus Material	Tin-Plated Copper
Base Material	ABS
Cover Material	Clear Polycarbonate

PN	Description	Weight Lb/Kg
2720	DualBus Plus 1/4" stud	0.615/0.28
2722	DualBus Plus 1/4" stud, 5x10-32 screw terminal	0.615/0.28
2723	DualBus Plus 5/16" stud, 5x10-32 screw terminal	0.615/0.28

DualBus 100 Ampere Common Buses

- Combines negative and positive buses on one block

Specifications

Continuous Amperage	100 Amperes
Voltage Rating	48 Volts DC Maximum 300 Volts AC Maximum
Bus Material	Tin-Plated Copper
Base Material	ABS

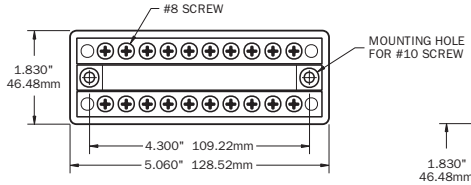
PN	Description	Weight Lb/Kg
2701	DualBus 5 x 8-32 Screw Terminal	0.17/0.08
2702	DualBus 10 x 8-32 Screw Terminal	0.27/0.12
2709	Cover, Connector DualBus 2701	0.04/0.02
2710	Cover, Connector DualBus 2702	0.05/0.02

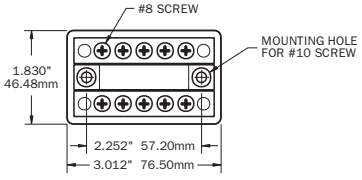
2701 CE

2702 CE

2710

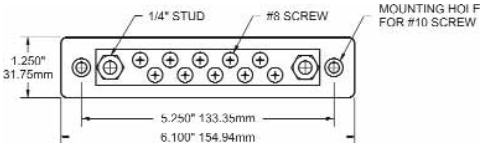
2709





2301 CE

2706



BusBar 150 Ampere Common Bus

- The industry standard bus for hot distribution or negative collection circuits

Specifications

Continuous Amperage	150 Amperes DC 130 Amperes AC
Voltage Rating	48 Volts DC Maximum 300 Volts AC Maximum
Bus Material	Tin-Plated Copper
Base Material	ABS

PN	Description	Weight Lb/Kg
2301	BusBar 10 x 8-32 Screw Terminal	0.28/0.13
2706	Cover, BusBar 2301/2303	0.05/0.02

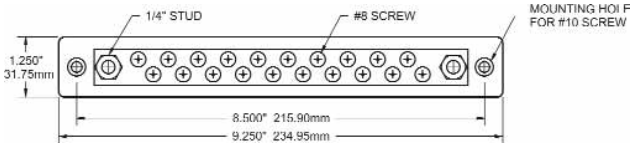
BusBar 150 Ampere Common Bus

Specifications

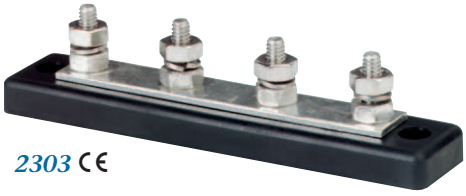
Continuous Amperage	150 Amperes DC 130 Amperes AC
Voltage Rating	48 Volts DC Maximum 300 Volts AC Maximum
Bus Material	Tin-Plated Copper
Base Material	ABS

PN	Description	Weight Lb/Kg
2302	BusBar 20 x 8-32 Screw Terminal	0.40/0.18
2303	BusBar 4 x 1/4" Stud Terminal	0.34/0.15
2706	Cover, BusBar 2301/2303	0.05/0.02
2707	Cover, BusBar 2302	0.06/0.03

2302 CE

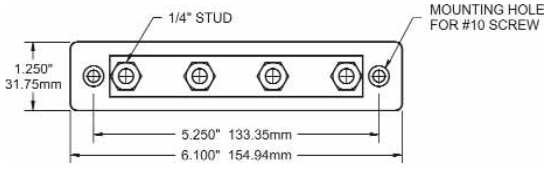


2706



2303 CE

2707



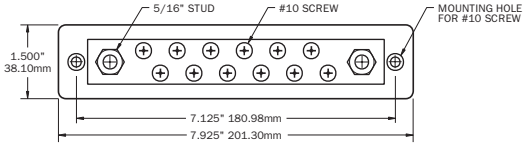
MaxiBus 250 Ampere Common Bus

Specifications

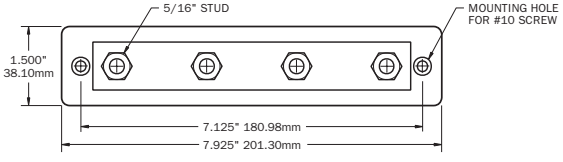
Continuous Amperage	250 Amperes DC 250 Amperes AC
Voltage Rating	48 Volts DC Maximum 300 Volts AC Maximum
Bus Material	Tin-Plated Copper
Base Material	Lexan® Polycarbonate

PN	Description	Weight Lb/Kg
2105	MaxiBus Common Bus 12 x #10 Terminal Screws	0.60/0.27
2106	MaxiBus Common Bus 4 x 5/16" Stud Terminals	0.60/0.27
2711	Cover, MaxiBus 2105/2106	0.06/0.03

2105 CE



2106 CE



2711

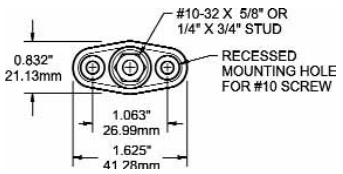
PowerPost High Amperage Cable Connector CE

· Connect high amperage cables securely

Specifications

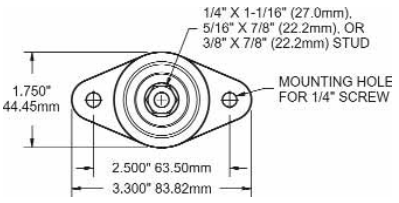
Continuous Amperage	Not rated—Amperage flow is between terminals stacked on the post and is dependent on wire and terminals used, not the PowerPost
Voltage Rating	48 Volts DC Maximum
Base Material	Glass-Reinforced Nylon

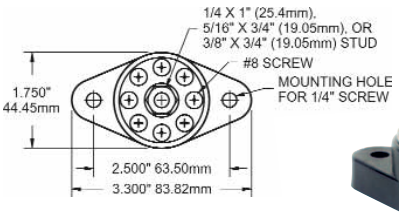
PN	Description	Weight Lb/Kg
2010	PowerPost #10 Stud	0.06/0.03
2011	PowerPost 1/4" Stud	0.08/0.04
2002	PowerPost 5/16"	0.23/0.11
2003	PowerPost 3/8"	0.27/0.12



2010

2003





2103

PowerPost Plus Cable Connector CE

· 150 Ampere bus allows small wire connections at high amperage cable connections

Specifications

Bus Continuous Amperage	150 Amperes DC 150 Amperes AC
Voltage Rating	48 Volts DC Maximum
Bus Material	Tin-Plated Copper
Base Material	Glass-Reinforced Nylon

PN	Description	Weight Lb/Kg
2101	PowerPost Plus 1/4"	0.29/0.13
2102	PowerPost Plus 5/16"	0.30/0.14
2103	PowerPost Plus 3/8"	0.34/0.15

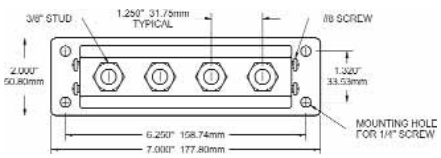
PowerBar 600 Ampere Cable Connector

Specifications

Bus Continuous Amperage	600 Amperes DC 545 Amperes AC
Voltage Rating	48 Volts DC Maximum 300 Volts AC Maximum
Bus Material	Tin-Plated CDA110 Copper
Base Material	GE Lexan® Polycarbonate

PN	Description	Weight Lb/Kg
2104	PowerBar 4 x 3/8 16 Stud Terminal	1.71/0.78
2107	PowerBar 8 x 3/8 16 Stud Terminal	3.42/1.55
2708	Cover, Connector PowerBar 2104	0.09/0.04

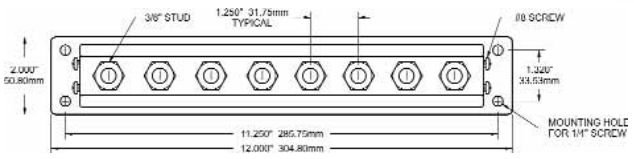
2104 CE



NEW

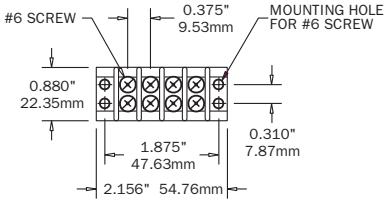
2107 CE

2708



Available in January 2003

2406



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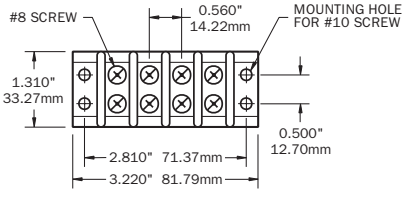

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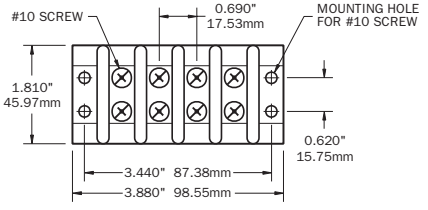


Independent Connectors CE

- Closed back design completely insulates power from the mounting surface
- Each screw pair is 1 isolated circuit
- Jumpers allow creation of common circuits

Specifications

Bus Material	Nickel-Plated Brass
Base Material 24xx	Nylon
Base Material 25xx, 26xx	Phenolic
Screw Size 24xx	#6
Screw Size 25xx	#8
Screw Size 26xx	#10
24xx Continuous Duty Rating	15 Amperes AC / DC
25xx Continuous Duty Rating	30 Amperes AC / DC
26xx Continuous Duty Rating	65 Amperes AC / DC
Voltage Rating 24xx	300 Volts AC / DC Maximum
Voltage Rating 25xx, 26xx	600 Volts AC / DC Maximum

PN	Description	Weight Lb/Kg
15 Ampere Blocks		
2402	Terminal Block 2 circuit	0.05/0.02
2404	Terminal Block 4 circuit	0.06/0.03
2406	Terminal Block 6 circuit	0.08/0.04
2408	Terminal Block 8 circuit	0.10/0.05
2410	Terminal Block 10 circuit	0.13/0.06
30 Ampere Blocks		
2502	Terminal Block 2 circuit	0.11/0.05
2504	Terminal Block 4 circuit	0.15/0.07
2506	Terminal Block 6 circuit	0.21/0.10
2508	Terminal Block 8 circuit	0.27/0.12
2510	Terminal Block 10 circuit	0.33/0.15
2512	Terminal Block 12 circuit	0.44/0.20
65 Ampere Blocks		
2602	Terminal Block 2 circuit	0.15/0.07
2604	Terminal Block 4 circuit	0.23/0.11
2606	Terminal Block 6 circuit	0.34/0.16
2608	Terminal Block 8 circuit	0.43/0.20
2610	Terminal Block 10 circuit	0.52/0.24

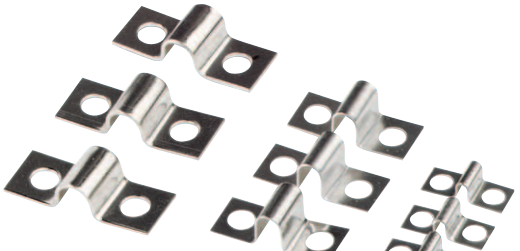
Independent Connector Jumpers

- Jumpers allow creation of common circuits on independent connectors

Specifications

Bus Material	Nickel-Plated Brass
Continuous Amperage	Equivalent to matching block

PN	Description	Pkg Qty	Weight Lb/Kg
9216	Jumper 2600 Series	5	0.05/0.03
9217	Jumper 2500 Series	5	0.04/0.02
9218	Jumper 2400 Series	5	0.03/0.01

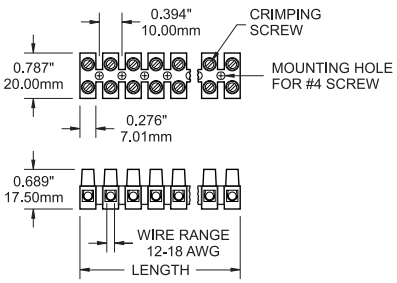


9216 9217 9218

Euro Style Connectors CE

- Stainless Steel pressure plates meet ABYC requirements for stranded wire connections without the use of crimp-on terminals
- Strips are easily cut to required length
- Screw and pressure plate construction meet ABYC pull-out strength requirements
- Nylon insulating body meets ABYC and USCG insulating requirements without the use of external covers

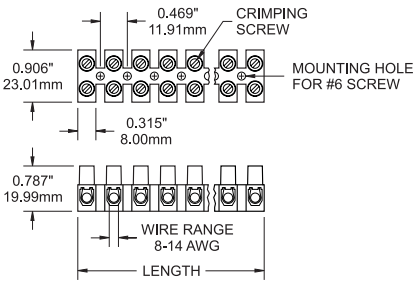
2808



Specifications

Bus Body	Nickel-Plated Brass
Clamping Screw Material	Nickel-Plated Brass
Wire protection pressure plate	Stainless Steel
Body Material	Polyamide 6 Nylon
Voltage Rating	600 Volts AC / DC Maximum
Wire Size Range 2800	12 - 18 AWG
Wire Size Range 2900	8 - 14 AWG
Continuous Duty Rating 2800	27 Amperes
Continuous Duty Rating 2900	45 Amperes

2908



PN	Description	Weight Lb / Kg	Length in / mm
27 Ampere EURO Blocks			
2804	EURO Block 4 Position	0.06 / 0.14	1.46 / 37.00
2808	EURO Block 8 Position	0.09 / 0.20	3.03 / 77.00
2812	EURO Block 12 Position	0.12 / 0.26	4.61 / 117.00
45 Ampere EURO Blocks			
2904	EURO Block 4 Position	0.11 / 0.23	1.73/43.94
2908	EURO Block 8 Position	0.18 / 0.39	3.61/91.70
2912	EURO Block 12 Position	0.25 / 0.55	5.47/138.93

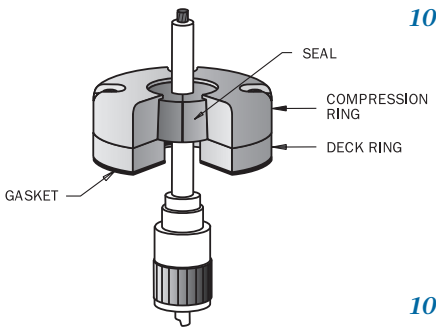
CableClams

- Waterproof co-axial installation without removing connectors
- Save the expense of removing and replacing connectors
- Avoid poor connections from removing factory connectors

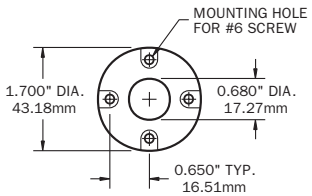
Specifications

Body Material	Acetal
Seal Material	UV-Stabilized Buna-N Rubber
Screws	Stainless Steel

PN	Description	Weight Lb/Kg
1001	CableClam 0.625" Connector Opening	0.15/0.07
1002	CableClam 0.825" Connector Opening	0.19/0.09
1003	CableClam 1.385" Connector Opening	0.22/0.10



1001



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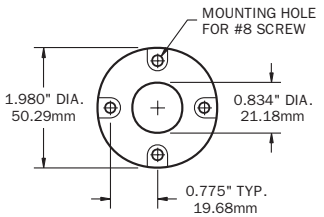
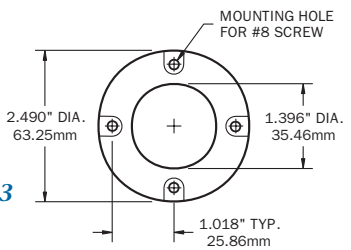


1003



1005

CableGrips

- Pass electrical cables and small hoses through bulkheads
- Waterproof
- Vaporproof—for LPG hose exits and gas vapor areas
- Strain relieving
- Surface mounts on any thickness material

Specifications

Body Material	Acetal

PN	Description	Weight Lb/Kg
1005	CableGrip small 9/16"–11/16"	0.21/0.10
1006	CableGrip large 3/4"–1"	0.33/0.15

Battery Boxes

4021
Twin Golf Cart

4022
4-D

4023
8-D

Battery Boxes

The Better Battery Box… The most advanced design available for Golf Cart, 4-D and 8-D Batteries

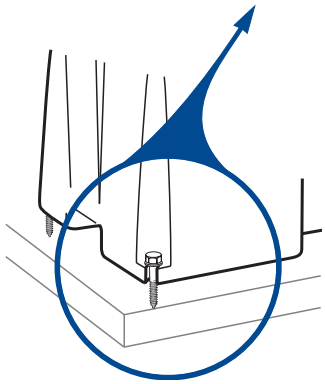
- Direct restraint system—the easiest installation of any box
- Straight cable entry path—no awkward bending of heavy cables
- Electrolyte reservoir—the battery is held away from spilled electrolyte
- Captive lid hold-down system—no more lost nuts in the bilge
- When installed according to instructions this battery box satisfies the following:
  - United States Coast Guard Code of Federal Regulations Title 46 subchapter T part 183.420
  - American Boat and Yacht Council Standards and Recommended Practices for small craft section E-10.7

Specifications

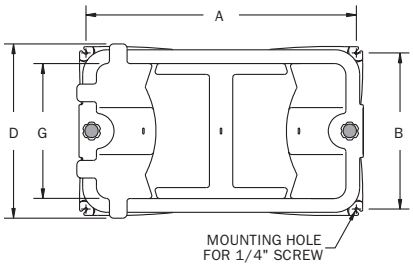
Material Polyethylene

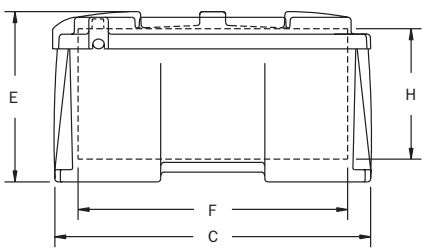
PN	Description	Weight Lb/Kg
4021	Box Battery Twin Golf Cart	10.70/4.86
4022	Box Battery 4D	12.50/5.68
4023	Box Battery 8D	13.90/6.32

Corner fastening system illustration



Battery Box Dimensions

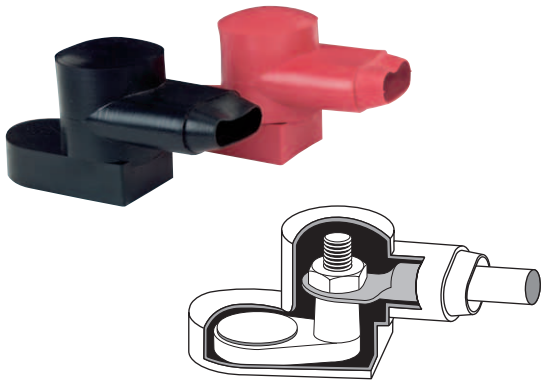




INDUSTRIAL DESIGN EXCELLENCE AWARDS

Winner Industrial Design Excellence Award

Battery Box	Mounting Hole Centers		Outside Dimensions			Inside Dimensions		
			Length	Width	Height	Length	Width	Height
PN	A	B	C	D	E	F	G	H
Golf Cart 4021	16.75" 425.45mm	12.375" 314.33mm	18.25" 463.55mm	14.25" 361.95mm	13.50" 342.90mm	14.75" 374.65mm	10.75" 273.05mm	11.50" 292.10mm
4D 4022	23.00" 584.20mm	10.875" 276.23mm	24.50" 622.30mm	12.50" 317.50mm	13.00" 330.20mm	21.00" 533.40mm	9.00" 228.60mm	10.50" 266.70mm
8D 4023	23.125" 587.38mm	13.25" 336.55mm	24.50" 622.30mm	15.00" 381.00mm	13.00" 330.20mm	21.00" 533.40mm	11.50" 292.10mm	10.50" 266.70mm



Rotating CableCaps

· Top rotates 360 degrees to allow cable entry from any angle
· For batteries with integral marine wing nut posts

Specifications
Material PVC

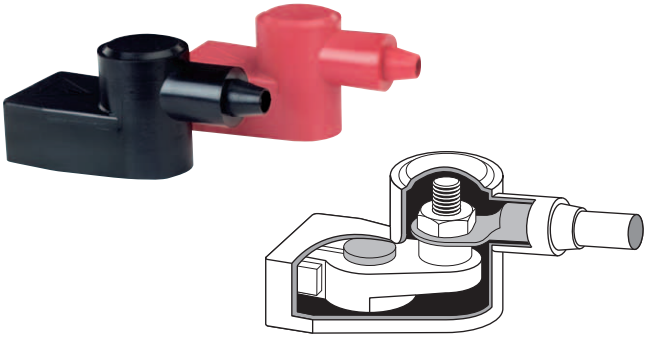
PN	Cable Size	Color	Package	Weight Lb/Kg
4001	All	Red/Black	Retail/Pair	0.24/0.11
9030	All	Black	Bulk	0.10/0.45
9031	All	Red	Bulk	0.10/0.45

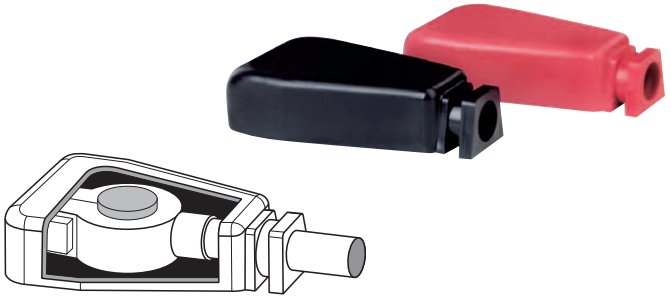
Standard CableCaps

· For batteries with marine adaptor terminals added on

Specifications
Material PVC

PN	Cable Size	Color	Package	Weight Lb/Kg
4005	4, 2, 1	Red/Black	Retail/Pair	0.17/0.08
4006	1/0, 2/0	Red/Black	Retail/Pair	0.17/0.08
9038	4, 2, 1	Black	Bulk	0.07/0.03
9039	4, 2, 1	Red	Bulk	0.07/0.03
9040	1/0, 2/0	Black	Bulk	0.07/0.03
9041	1/0, 2/0	Red	Bulk	0.07/0.03





Automotive CableCaps

· Designed to fit standard automotive posts

Specifications
Material PVC

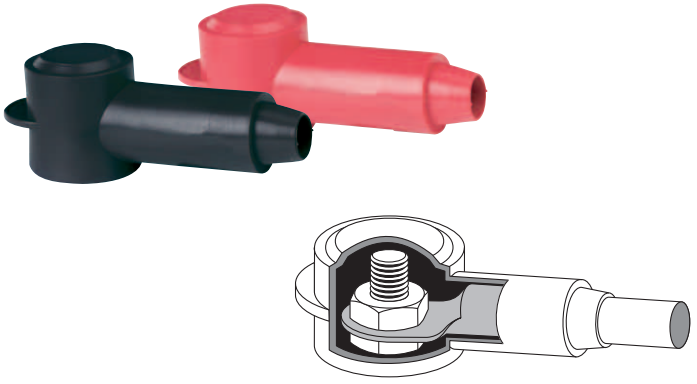
PN	Cable Size	Color	Package	Weight Lb/Kg
4016	4, 2, 1	Red/Black	Retail	0.15/0.07
4017	1/0, 2/0	Red/Black	Retail	0.15/0.07
9174	4, 2, 1	Black	Bulk	0.07/0.03
9175	4, 2, 1	Red	Bulk	0.07/0.03
9176	1/0, 2/0	Red	Bulk	0.07/0.03
9177	1/0, 2/0	Black	Bulk	0.07/0.03

CableCap Stud Insulators

· Insulate stud type connectors on alternators, starters, windlasses and other high amperage devices

Specifications
Material PVC

PN	Cable Size	Color	Package/ Quantity	Weight Lb/Kg
4008	18-10	Red	Retail/3	0.05/0.02
4009	18-10	Black	Retail/3	0.05/0.02
4010	8-4	Red	Retail/2	0.05/0.02
4011	8-4	Black	Retail/2	0.05/0.02
4012	2-2/0	Red	Retail/1	0.07/0.03
4013	2-2/0	Black	Retail/1	0.07/0.03
4014	3/0-4/0	Red	Retail/1	0.07/0.03
4015	3/0-4/0	Black	Retail/1	0.07/0.03



Panel Labels Listing

		Col. 1 — 8030 DC Basic	Col. 2 — 8039 DC Extended	Col. 3 — 8031 AC Basic	Col. 4 — 8067 AC Extended
1	#1				
2	#2				
3	(BLANK)		◧	◧	◧
4	12 VOLT DC OUTLETS		◧		
5	12 VOLTS DC		◧		
6	120 VOLT AC OUTLETS				◧
7	120 VOLTS AC / 60 HZ				◧
8	240 VAC				
460	240 VAC / 60 Hz				
9	24 VOLT DC OUTLETS				
10	24 VOLTS DC				
468	250 VOLTS AC / 50 HZ				
462	AC BUS 1				
11	AC COMPRESSOR				◧
12	AC FAN				◧
13	AC MAIN				◧
14	AC PANEL				◧
15	AC POWER				◧
16	AC REFRIGERATOR				◧
17	AC SUB PANEL				◧
18	ACCESSORY	◧		◧	
19	ADF				
20	AERATOR				
21	AFT CABIN		◧		◧
22	AFT CABIN LIGHTS			◧	
23	AFT CABIN OUTLETS			◧	
24	AFT HEAD		◧		◧
25	AIR COMPRESSOR				
26	AIR CONDITIONER			◧	
27	AIR CONDITIONER 2			◧	
28	AIR CONDITIONER 3			◧	
29	AIR CONDITIONER 4			◧	
30	AIR CONDITIONER PUMP				
31	AIR HORN				
32	ALARM SYSTEM		◧		◧
461	ALTERNATOR				
33	ALTERNATOR DISCONNECT				
34	AMPLIFIER				◧
35	ANCHOR LIGHT	◧			
36	ANCHOR LIGHT MAIN				
37	ANCHOR LIGHT MIZZEN				
38	ANCHOR WASH DOWN		◧		
39	APPLIANCES			◧	
40	ARCH LIGHTS				
41	AUDIO/VIDEO SYSTEM				◧
42	AUTO/MAN				
43	AUTOPILOT	◧			
44	BAIT PUMP		◧		
45	BAITWELL				
46	BALLAST CONTROLS				
47	BALLAST PUMP				
48	BAR				
481	BATHROOM				
49	BATTERY				
473	BATTERY 1				
474	BATTERY 2				
50	BATTERY CHARGER			◧	
51	BATTERY CHARGER 2				◧
52	BATTERY COMPARTMENT				
53	BATTERY PARALLEL				
54	BEACON				
480	BEDROOM				
485	BEDROOM SLIDEOUT				
55	BILGE				
56	BILGE ALARM		◧		
57	BILGE ALARM 2				
58	BILGE ALARM 3				
59	BILGE ALARM 4				
60	BILGE LIGHTS				
61	BILGE PUMP	◧			
62	BILGE PUMP 2		◧		
63	BILGE PUMP 3				
64	BILGE PUMP 4				
453	BILGE PUMP ON/OFF/AUTO				
65	BLOWER	◧			
66	BOAT DAVIT				
67	BOOM LIGHT				
68	BOW LIGHT				
69	BOW THRUSTER				
70	BRIDGE				
71	BRIDGE INSTRUMENTS		◧		
72	BRIDGE LIGHTS				◧
73	BRIDGE OUTLETS				◧
74	CABIN				◧
75	CABIN 2				◧
76	CABIN 2 LIGHTS		◧		◧
77	CABIN 2 OUTLETS				◧
78	CABIN 3				◧
79	CABIN 3 LIGHTS		◧		◧
80	CABIN 3 OUTLETS				◧
81	CABIN 4				◧
82	CABIN 4 LIGHTS		◧		◧
83	CABIN 4 OUTLETS				◧
84	CABIN FANS		◧		
85	CABIN HEATER				◧
86	CABIN LIGHTS		◧		◧
87	CABIN OUTLETS			◧	
88	CABLEMASTER				
89	CASSETTE PLAYER				
90	CB RADIO		◧		
91	CCTV				◧
92	CD PLAYER				
93	CELLULAR PHONE		◧		
94	CHARGER/INVERTER				◧
95	CHART LIGHT		◧		
96	CHART PLOTTER		◧		
97	CHOKE				
98	CIRCULATOR PUMP				
99	CLOSET LIGHT				
100	COCKPIT LIGHTS		◧		◧
101	COCKPIT REFRIG				◧
102	COLOR SOUNDER		◧		
103	COMMUNICATION ELECTRONICS		◧		
104	COMPARTMENT HEATER				
105	COMPARTMENT LIGHT				◧
106	COMPASS LIGHT	◧			
107	COMPUTER			◧	
108	CONDENSER PUMP				
109	CONSOLE LIGHT				
110	CONVERTER				
111	COOKING GRILL				
112	COOKTOP				◧
113	COOLING PUMP				
114	COURTESY LIGHTS				
115	CREW LIGHTS				
116	CREW QUARTERS				
117	DAVITS				
118	DC LIGHTS		◧		
119	DC MAIN		◧		
120	DC OUTLETS		◧		
121	DC REFRIGERATOR		◧		
122	DC SUB PANEL		◧		
123	DECK				
124	DECK LIGHTS		◧		◧
125	DECK LIGHTS AFT		◧		
126	DECK LIGHTS FWD		◧		
127	DECK LIGHTS PORT				
128	DECK LIGHTS STBD				
129	DEFROSTER				
130	DEPTH RECORDER		◧		
131	DEPTH SOUNDER	◧			
132	DEPTH/SPEED		◧		
133	DESALINATOR		◧		
134	DIMMER		◧		◧
135	DINING AREA LIGHTS		◧		◧
136	DINING AREA OUTLETS				◧
137	DISCHARGE PUMP				
138	DISHWASHER				◧
139	DISPOSAL				◧
140	DIVE COMPRESSOR				
141	DOCKING LIGHT PORT				
142	DOCKING LIGHT STBD				
143	DOCKING LIGHTS		◧		
144	DOWN RIGGER				
145	DRYER				◧
146	DUMP VALVES				
147	ELECTRIC HATCH				
469	ELECTRONIC CONTROL UNIT				
148	ELECTRONICS	◧			
149	EMERGENCY BACKUP SYS				
150	EMERGENCY LIGHTS		◧		◧
151	EMERGENCY PUMPS				
152	ENG ROOM BILGE ALARM		◧		
153	ENG ROOM BLOWER				
154	ENG ROOM HEATER				
155	ENG ROOM LIGHTS		◧		◧
156	ENG ROOM OUTLETS				◧
157	ENG ROOM PANEL MAIN		◧		
158	ENGINE ALARM		◧		
159	ENGINE BLOCK HEATER				
160	ENGINE CONTROL PORT				
161	ENGINE CONTROL STBD				
162	ENGINE CONTROLS				
163	ENGINE DRIVEN REFRIGERATOR				
164	ENGINE EXHAUST FAN				
165	ENGINE HATCH				
166	ENGINE HEATER PORT				
167	ENGINE HEATER STBD				
168	ENGINE INSTRUMENTS	◧			
169	ENGINE OIL PAN PUMP				
170	ENGINE SHUTDOWN				
171	ENGINE TEMP				
172	ENTERTAINMENT CENTER			◧	
173	ENTRANCE DOOR				
174	ENTRY STEP				
175	EXHAUST FAN				◧
176	EXHAUST TEMP				
177	EXTERIOR				
178	EXTERIOR LIGHTS		◧		◧
179	FAN	◧			◧
180	FAN 2		◧		◧
181	FAN 3				◧
182	FAN 4				◧
183	FAX				
184	FILLING PUMP				
185	FIRE ALARM		◧		
186	FIRE EXT				
187	FIRE HORN				
459	FISH FINDER				
188	FISHBOX ICEMAKER				
189	FISHING LIGHT		◧		
487	FISHWELL PUMP				
488	FISHWELL PUMP 2				
190	FLOOD LIGHTS		◧		◧
191	FLOSCAN				
192	FLYBRIDGE				
193	FLYBRIDGE ELECTRONICS		◧		
194	FLYBRIDGE LIGHTS		◧		
195	FLYBRIDGE OUTLETS				
196	FOG LIGHTS				
197	FOREDECK LIGHT	◧			
198	FREEZER				◧
199	FRESH WATER				
200	FRESH WATER PUMP		◧		
201	FRESH WATER PUMP 2				
202	FRESH WATER PUMP 3				
203	FRESH WATER PUMP 4				
204	FRESH WATER WASH DOWN		◧		
482	FRONT SLIDEOUT				
205	FUEL PRIMER PUMP				
206	FUEL PUMP				
207	FUEL PUMP 2				
208	FUEL PUMP 3				
209	FUEL PUMP 4				
210	FUEL TANK HEATER				
211	FUEL TRANSFER				
212	FURLER JIB				
213	FURLER MAINSAIL				
214	FURLER SPINNAKER				
215	FURNACE				◧
216	FWD CABIN				
217	FWD CABIN LIGHTS	◧		◧	
218	FWD CABIN OUTLETS			◧	
219	GALLEY			◧	
220	GALLEY APPLIANCES				◧
221	GALLEY DRAIN				
222	GALLEY FAN				
223	GALLEY LIGHTS		◧		◧
224	GALLEY OUTLETS			◧	
225	GARBAGE DISPOSAL				◧
226	GAS ALARM				
227	GENERAL PURPOSE				
228	GENERATOR 1				◧
229	GENERATOR 2				
454	GENERATOR OFF/ON/START				
230	GENERATOR ROOM BLOWER				

	Col. 1 — 8030 DC Basic	Col. 2 — 8039 DC Extended	Col. 3 — 8031 AC Basic	Col. 4 — 8067 AC Extended
466	GENERATOR RUNNING			
455	GENERATOR STOP			
231	GFI OUTLET			●
232	GPS	●		
233	GPS/LORAN			
234	GPS/PLOTTER		●	
235	GYRO COMPASS			
236	HAILER		●	
237	HALLWAY LIGHTS			●
238	HALON FIRE SYSTEM			
239	HAM RADIO		●	
240	HEAD		●	
241	HEAD 2			
242	HEAD 2 FAN			
243	HEAD 2 OUTLETS			●
244	HEAD 3			
245	HEAD 3 FAN			
246	HEAD 3 OUTLETS			●
247	HEAD 4			
248	HEAD 4 FAN			
249	HEAD 4 OUTLETS			●
250	HEAD FAN			
251	HEAD LIGHTS		●	●
252	HEAD LIGHTS 2		●	●
253	HEAD LIGHTS 3			●
254	HEAD LIGHTS 4			●
255	HEAD OUTLETS			●
256	HEADLIGHTS			
257	HEATER			●
258	HEATER 2		●	●
259	HEATER 3			●
260	HEATER 4			●
261	HELM ELECTRONICS		●	
262	HELM GUAGES		●	
263	HELM INSTRUMENTS		●	
264	HIGH WATER ALARM		●	
265	HOLDING TANK		●	
266	HOLDING TANK ALARM		●	
267	HOLDING TANK PUMP		●	
268	HOOD FAN			●
269	HOOD LIGHT			
270	HORN	●		
475	HOT TUB			
271	HOT WATER PUMP			
272	HYDRAULIC ALARM			
273	HYDRAULIC SYSTEM			
274	HYDRAULIC TANK ALARM			
275	ICEMAKER			●
276	IGNITION			
277	IGNITION PORT			
278	IGNITION STBD			
279	INSTRUMENT LIGHTS		●	
280	INSTRUMENTS		●	
281	INTERCOM		●	
282	INTERCOM HAILER			
283	INTERCOM/TELEPHONE			
284	INTERIOR LIGHTS		●	●
285	INVERTER			●
467	INVERTER 2			
476	INVERTER AC BUS			
471	INVERTER AC SUPPLY			
470	INVERTER DC SUPPLY			
286	INVERTER OUTLET			●
287	ISOLATION TRANSFORMER			●
479	KITCHEN			
484	KITCHEN SLIDEOUT			
288	KNOTMETER	●		
289	LAZARETTE LIGHTS			●
290	LECTRASAN			●
291	LIGHTER			
292	LIGHTS	●		●
293	LIGHTS 2		●	●
294	LIGHTS 3			●
295	LIGHTS 4			●
296	LIGHTS AFT			●
297	LIGHTS FWD			●
298	LIGHTS PORT			
299	LIGHTS STBD			
300	LIVEWELL		●	
301	LIVEWELL INPUT			
302	LIVEWELL OUTPUT			
303	LOCKER LIGHTS			
304	LOG		●	
305	LORAN		●	
306	LPG CONTROL			
307	LUBE OIL PUMP			
308	MACERATOR PUMP	●		●
309	MAIN			●
310	MAIN BREAKER			●
311	MAIN CABIN		●	●
312	MAIN CABIN LIGHTS	●		●
313	MAIN CABIN OUTLETS			●
314	MAIN SAIL FURLING			
315	MAP LIGHT		●	
316	MAST LIGHTS		●	
317	MASTHEAD LIGHT			
318	MICROWAVE			●
319	MINI DISC PLAYER			
320	MIZZEN FLOOD			
456	NAV LIGHT ANCHOR/OFF/NAV			
321	NAV STATION ELECTRONICS		●	
322	NAV STATION GUAGES		●	
323	NAV STATION INSTRUMENTS		●	
324	NAV STATION LIGHTS		●	●
325	NAVIGATION ELECTRONICS		●	
326	NAVIGATION INSTRUMENTS		●	
327	NAVIGATION LIGHTS		●	
328	NIGHT LIGHTS			
329	OFF			
330	ON-OFF			
331	OIL CHANGE PUMP			
332	ON			
333	OUTLETS			●
334	OUTLETS 2			●
335	OUTLETS 3			●
336	OUTLETS 4			●
337	OUTLETS DECK			●
338	OUTLETS EXTERIOR			●
339	OUTLETS INTERIOR			●
340	PORT			
341	PORT THRUSTER			
342	POWER			
343	POWER WASHER			
458	PANEL LIGHTS			
457	PRE-HEAT			
344	PRIMARY WINCHES			
345	PRINTER			
346	PUMP			
347	RACK LIGHTS		●	
348	RACK OUTLETS			●
349	RADAR	●		
350	RADAR ARCH LIGHT			
351	RADIO		●	
352	RANGE			●
353	RDF			
483	REAR SLIDEOUT			
354	RECEIVER			
355	RECEPTACLE			
356	REFRIGERATOR	●		●
357	REFRIGERATOR PUMP			
358	REFRIGERATOR/FREEZER			●
359	REGULATOR			
360	REVERSE POLARITY			●
361	ROD LOCKER			
489	RUDDER ANGLE INDICATOR			
362	RUNNING LIGHTS	●		
363	SAILING CONTROLS			
364	SAILNG INSTRUMENTS	●		
365	SALOON		●	●
366	SALOON HEATER			●
367	SALOON LIGHTS		●	●
368	SALOON OUTLETS			●
369	SALT WATER PUMP			
370	SAT/COM		●	
371	SAT/NAV		●	
372	SATELLITE DISH		●	●
373	SCRUBBER			
374	SEARCHLIGHT		●	
375	SEARCHLIGHT HAND HELD			
376	SEARCHLIGHT REMOTE			
377	SEAWATER TEMP		●	
378	SEAWATER WASH DOWN		●	
379	SECURITY SYSTEM		●	
380	SHIP			●
463	SHORE 1			
464	SHORE 2			
381	SHORE			●
382	SHORE CORD REEL			
383	SHORE POWER			●
384	SHORE POWER CORD			
385	SHOWER SUMP PUMP		●	
386	SINK DRAIN			
486	SLIDEOUT			
387	SOLAR PANEL			
388	SONAR		●	
389	SPARE	●		●
390	SPEED/LOG		●	
391	SPREADER LIGHTS	●		
392	SPREADER LT MIZZEN			
393	SSB		●	
394	STABILIZER			
395	STARBOARD			
396	START			
397	START - STOP			
398	START PORT			
399	START STBD			
400	STBD THRUSTER			
401	STEAMING LIGHT	●		
402	STEP LIGHT			
403	STEREO	●		●
404	STERN LIGHT			
405	STOP			
406	STOVE			●
407	STOVE/MICROWAVE			●
408	STROBE LIGHT	●		
409	SUB PANEL		●	●
410	SUMP PUMP		●	
411	SUMP PUMP 2			
412	SYNCHRO			
413	TAPE DECK			
414	TELEPHONE SYSTEM		●	●
415	TEST			
416	TOWING LIGHTS			
417	TRACK LIGHTS		●	●
465	TRANSFER			
418	TRANSFER PUMP		●	
419	TRANSFORMER			
420	TRASH COMPACTOR			●
478	TRAVEL LOCKS			
421	TRICOLOR LIGHT	●		
422	TRIM TABS		●	
423	TV		●	●
424	TV ANTENNA			
425	TV/STEREO			●
426	TV/VCR		●	
427	UPS SYSTEM			●
428	UTILITY		●	
429	VACUUM			●
430	VACUUM PUMP			
431	VCR			●
432	VHF	●		
433	VIDEO PLOTTER		●	
434	VIDEO SYSTEM			●
435	WASHER			●
436	WASHER/DRYER			●
437	WATER ALARM		●	
438	WATER HEATER			●
439	WATER LEVEL			
440	WATER MAKER		●	●
441	WATER PRESSURE	●		
442	WATER PUMP		●	
443	WEATHER FAX		●	
444	WEATHER INSTRUMENT		●	
445	WINCHES		●	
477	WIND GENERATOR			
446	WIND INSTRUMENTS		●	
447	WINDEX LIGHT		●	
448	WINDLASS			
449	WINDSHIELD WASHER			
472	WIPER CENTER			
450	WIPER PORT		●	
451	WIPER STBD		●	
452	WIPERS		●	

About Circuit Protection

What is circuit protection?

Circuit protection is the intentional installation of a "weak link" in an electrical circuit. This is a fuse or circuit breaker, referred to here as a circuit protection device or CPD.

What is the CPD protection against?

Prevention of wire conductor overheating and resultant burning of the wire insulation is the primary reason to install a fuse or circuit breaker. In some cases they are also installed to protect electrical or electronic equipment from damage.

How does fire start in an electrical circuit?

Fire results when too much amperage travels through a wire. Amperage is electron flow through a conductor. If too much amperage flows through a wire, enough heat can be generated to melt and burn the wire insulation or surrounding materials.

How much amperage can a wire safely conduct?

The American Boat and Yacht Council (ABYC) publishes the following table showing how much amperage each size wire can carry:

Allowable amperage of conductors under 50 Volts with 105˚C insulation

AWG Wire Size	Metric (Sq mm)	AWG CM area	SAE CM Area	Ohms /1000 ft	Ampacity Engine Space	
					Outside	*Inside*
18	0.8	1,600	1,537	6.385	20	17
16	1	2,600	2,336	4.016	25	21.3
14	2	4,100	3,702	2.525	35	29.8
12	3	6,500	5,833	1.588	45	38.3
10	5	10,500	9,343	0.9989	60	51
8	8	16,800	14,810	0.6282	80	68
6	13	26,600	24,538	0.3951	120	102
4	19	42,000	37,360	0.2485	160	136
2	32	66,500	62,450	0.1563	210	178.5
1	40	83,690	77,790	0.1239	245	208
0	50	105,600	98,980	0.09827	285	242.3
2/0	62	133,100	125,100	0.07793	330	280.5
3/0	81	167,800	158,600	0.06180	385	327.3
4/0	103	211,600	205,500	0.04901	445	378.3

Is "Allowable Amperage" the only thing to be considered in sizing a wire?

No. Voltage Drop must also be considered. Voltage Drop is the amount of voltage "consumed" as the voltage "pushes" the amperage through the resistance of the wire. Sometimes Allowable Amperage will be the determining factor in sizing a wire and in other cases Voltage Drop will dictate the wire size. The wire must be the larger of either the size required by the Allowable Amperage or the Voltage Drop.

How is Voltage Drop determined?

There are tables published by ABYC that use the formula below to calculate Voltage Drop. If the tables are not available, Voltage Drop can be calculated using the formula:

Voltage Drop = Amperage x Resistance
(this is Ohm's law, V=IR or I=V/R or R=V/I)

Voltage Drop = (Amperage) x (Circuit Length / 1000) x (Ohm's per 1000 ft)
(from Allowable Amperage chart)

(Voltage Drop / Nominal Circuit Voltage) / 100 = % Voltage Drop

If the wire is properly sized, why is a CPD necessary?

Even though the correct wire size is used for the amperage that is to flow through the wire normally, the circuit may be accidentally grounded, allowing a dangerous amount of amperage to flow. A circuit can be grounded by a wire's insulation chafing through and contacting a grounded conductor, by the failure of equipment in the circuit or by accidental grounding of the circuit during maintenance.

How does the CPD stop the amperage flow?

There are two primary methods that CPD's use to determine that excess amperage is flowing in a circuit. Thermal devices open to break the circuit and stop the current flow in response to heat generated by the excess amperage. Magnetic devices react to a magnetic field created by excess amperage.

How do fuses and circuit breakers differ?

Fuses are thermal devices that open the circuit by utilizing a "fusible link" that melts at a known amperage in a known length of time. Circuit breakers can be either thermal or magnetic devices or a combination of the two.

Are fuses and circuit breakers interchangeable?

The short answer is yes. The longer and more accurate answer is more complex and beyond the scope of this discussion.

As amperage ratings increase, circuit breakers become relatively more expensive than fuses. Generally, fuses are less expensive for a given rating, but circuit breakers are re-settable and don't require the purchase of spares, as do fuses. Also, circuit breakers can be used as switches.

Are thermal circuit breakers appropriate for marine use?

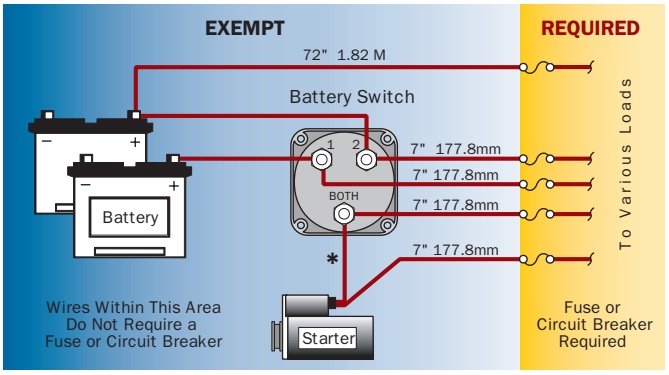
Yes. It is sometimes argued that this circuit breaker type is inappropriate for marine use because it is affected by temperature—that is, the hotter the ambient environment (such as an engine room) the lower the amperage at which the device will open, leading to undesired trips. The percentage by which the rated amperage lowers in normal operating environments is usually in the 10 to 20% range and when properly sized the risk of "nuisance trips" is remote.

What wires need to have CPD's installed?

The ideal answer is that every wire in the boat needs to be protected by a fuse or a circuit breaker. The CPD must be correctly sized to the wire it protects. Typically, wires branch away from the batteries or other power sources and become progressively lighter. Smaller CPD's must be installed at the beginning of a smaller wiring run, if the wire ampacity is lower than the rating of the last CPD.

ABYC Standards exempt wiring between the batteries, the main battery switch and the starter motor. These wires can also burn if too much current flows through them, however, it is often not practical to provide such protection. The diagram below shows the ABYC Standards for CPD placement. Measurements are maximum lengths between the point of connection and the CPD. All 7" dimensions may be increased to 40" if the conductor is enclosed in a sheath or enclosure in addition to the wire insulation.

ABYC Required Fuse Positions



*Note: There is no length restriction on the starter wire. Auxiliary wire that is designed to carry a starting current is exempt from circuit protection, regardless of length.

What size CPD is required?

The short answer is that the CPD should be rated to open at an amperage that is greater than the maximum load the circuit will carry and smaller than the rated amperage capacity of the wire in the circuit. We recommend choosing a size as close to, but not greater than, the amperage capacity of the wire.

What is Amperage Rating?

The amperage rating is the amperage on which the opening speed of the fuse is based. This is the number that is usually printed on the fuse and the most common way in which fuses are referenced. Most fuses will operate indefinitely at their amperage rating. Only when the amperage rating is exceeded by some significant percentage (usually at least 20%) will the fuse open or "blow."

What is Opening Speed?

"Opening" is a term used to describe a mechanical action by which the fuse or circuit breaker stops the current flow by "opening" the circuit. Fuses are described as opening by "blowing" and circuit breakers are described as "tripping." Opening speed defines the relationship between the percentage by which the fuse is operating over its Amperage Rating and the length of time that will be required for it to open. The opening of a fuse or circuit breaker is determined not just by the amperage rating, but by the amount of time and the percentage over its amperage rating at which it is being operated. There are other factors such as ambient temperature that influence a fuse's opening, but they are not significant enough to be included in this discussion.

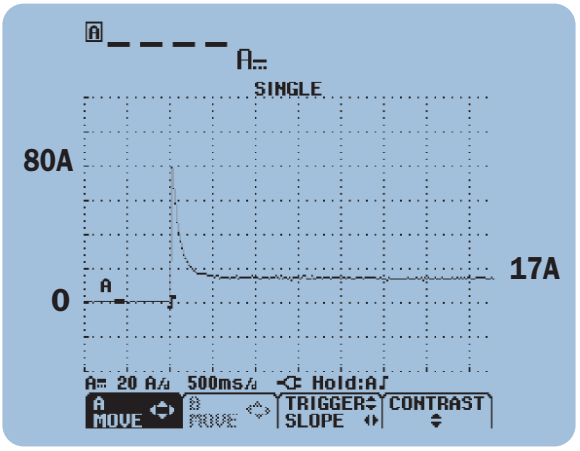
Why is opening speed important?

When a circuit is activated, there is an initial surge of current (amperage) that the CPD must allow to pass without tripping the CPD. The two screen reprints below from the Blue Sea Systems' testing system illustrate the difference in inrush currents between inductive (like motors) and resistive (like light bulbs) loads.

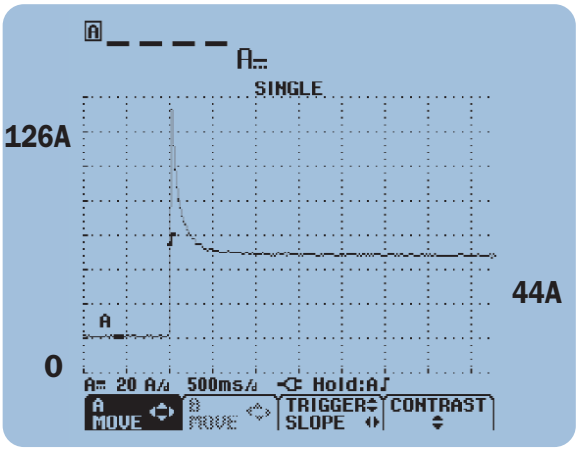
Notice that the ratio of normal running current (represented by the flat portion of the amperage line) between the inductive and the resistive graphs varies dramatically. The 17A inductive load initially drew 80 A or 470%, whereas the 44A resistive load initially drew only 126A or 286% of its normal operating current. Such inrush currents must be considered when sizing CPD's. Each Blue Sea Systems' CPD has a time/current chart shown on its catalog page.

We recommend sizing fuses and circuit breakers for 5X multiples for inductive loads and 3X multiples for resistive loads and assuming this inrush for approximately .5 seconds.

Inductive Load
Windlass pulling 20' 3/8" chain and 33 lb. anchor



Resistive Load
Bank of 100W DC Light Bulbs



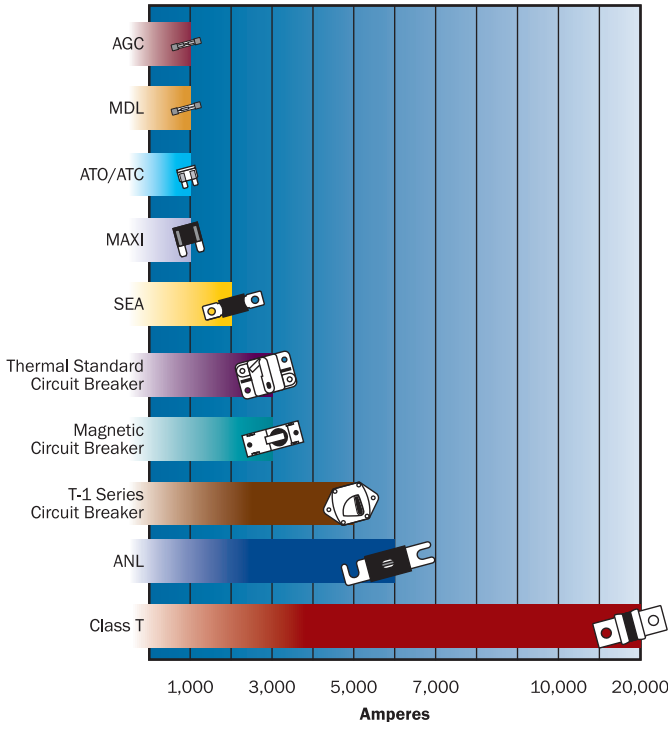
What is interrupt Rating?

The interrupt rating specifies how much current the CPD can safely handle in short circuit situations. See the ABYC tables I and II (combined) below for determining what minimum interrupt rating is required.

Total Connected Battery CCA*	Main Circuit Breaker	Branch Circuit Breaker
12 Volts and 24 Volts	Amperes	Amperes
650 or less	1500	750
651 - 1100	3000	1500
over 1100	5000	2500
32 Volts		
1250 or less	3000	1500
over 1250	5000	2500
AC Shore Power Source	**Main Circuit Breaker**	**Branch Cuicuit Breaker**
120V - 30A	3000	3000
120V - 50A	3000	3000
120/240V - 50A	5000	3000
240V - 50A	5000	3000
120/208V - 3 phase/WYE - 30A	5000	3000
120/240V - 100A	5000	3000
120/208V - 3 phase/WYE - 100A	5000	3000

*Cold Cranking Amperes

Interrupt Rating Comparison
Blue Sea Systems' Fuse and Circuit Breakers



What is Voltage Rating?

The voltage rating specifies the maximum voltage for the circuit in which the fuse is used.

Step by step instructions for selecting the type and size of fuse or circuit breaker for an electrical circuit.

1. Determine whether a fuse or a circuit breaker will best suit your needs:

Fuse advantages:
- Generally lower cost
- Available in higher amperage ratings
- Available in higher interrupt ratings
- Generally available in greater size ranges
- As requirements change fuse sizes can be changed without replacing the fuse block and disturbing the connected wires

Circuit Breaker advantages:
- Re-settable after opening
- Can be used as a switch
- In some cases can be obtained as vapor-proof and water-proof
- Can be obtained with a wide range of opening speed characteristics

Note that if the application requires the circuit protection to be in an explosive area; 1) gasoline engine room or other area susceptible to gasoline fumes 2) battery compartments 3) propane lockers, then a vapor-proof circuit breaker such as the T-1 Series will be required.

2. Determine these three numbers:

.1 The maximum continuous current that will flow in the circuit.

.2 The amperage capacity of the smallest wire (or other conductive element) in the circuit to be protected from the ABYC table on the page 66.

.3 **Also useful to know, but many times difficult to obtain is:** The maximum momentary (surge) current that will flow in the circuit and its duration. When a load is first applied to a circuit there is a surge or spike of current (also known as inrush current) that flows in the circuit. The fuse or circuit breaker must be able to withstand this inrush without opening (also known as nuisance tripping).

3. Consult the ABYC Interrupt Rating tables in the left column of page 68 to determine the minimum Interrupt Rating required for the application.

Limit the selection to a fuse or circuit breaker type that meets the interrupt Capacity requirement determined in step 2.1.

4. Select a fuse or circuit breaker amperage rating from the type selected in step 3. which is:

.1 Smaller than the amperage capacity of the smallest wire (from step 2.3)

.2 Larger than the maximum continuous current that will flow in the circuit (from step 2.2)

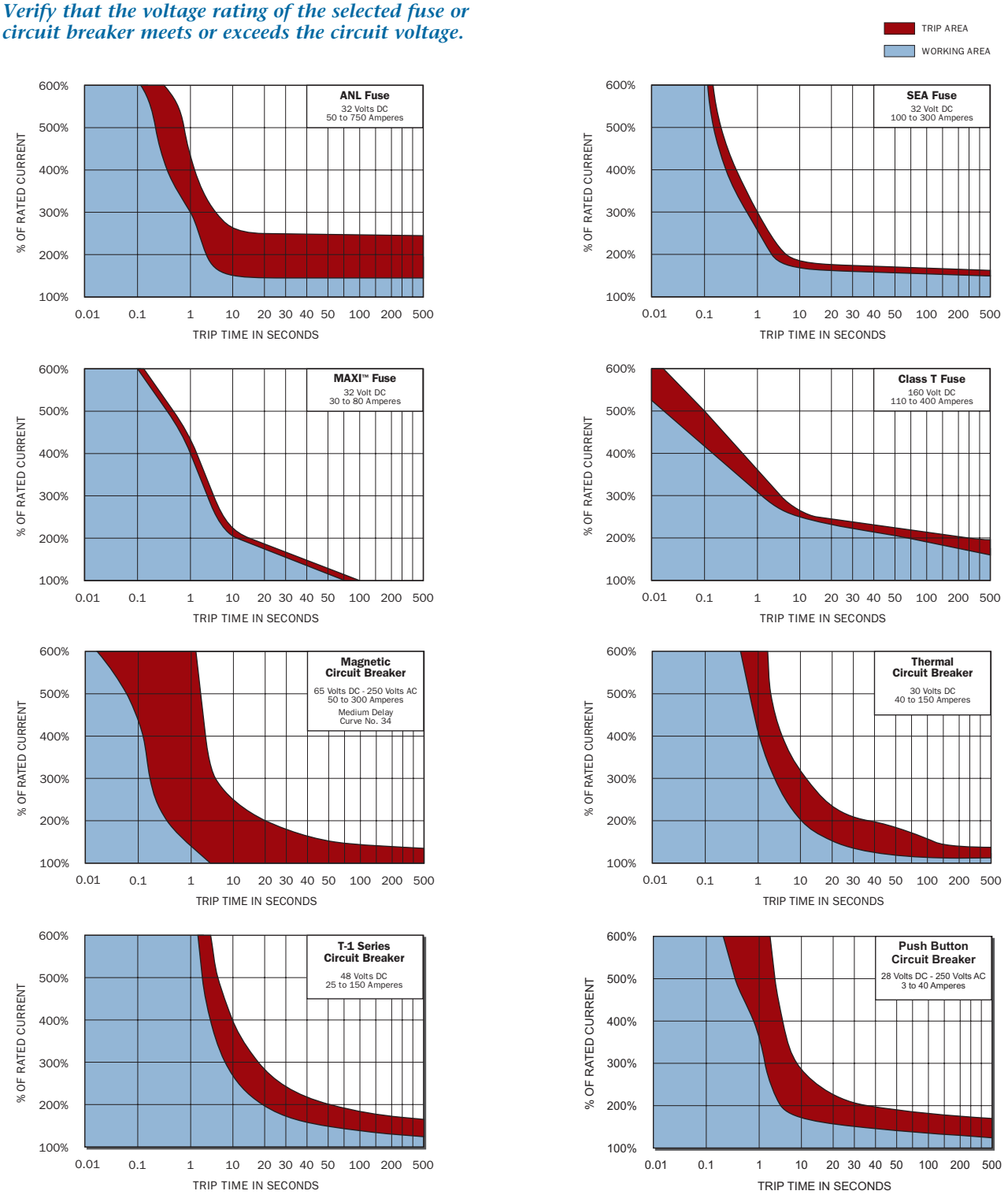
It is recommended that the fuse or circuit breaker amperage rating be at the upper end of this range to allow for surge currents and for growth in the number of devices on the circuit.

5. *If it is possible to obtain the surge current, consult the time/current curves shown below for each Blue Sea Systems' fuse or circuit breaker to make certain that the device will withstand the surge current without opening.*

6. *Verify that the voltage rating of the selected fuse or circuit breaker meets or exceeds the circuit voltage.*

7. *There are other issues that you may want to consider by reading ABYC E-9.12 Circuit Protection.*

See www.bluesea.com/abyc.htm for a synopsis of ABYC Standards.



NUMERIC

120V AC

The line to neutral voltage in a single phase three wire AC system as commonly found in the US.

240V AC

The line-to-line voltage in a single-phase three wire (not including green safety ground) AC system as commonly found in the US.

250V AC

The line-to-line voltage in a single-phase two wire (not including green safety ground) AC system as commonly found in Europe and many other parts of the world.

3 phase *see also Single Phase*

Refers to 3 phase power generation typically 480V AC and higher. The AC utility is a 3-phase system. In its simplest form there are three conductors connected to three conductive coils, which pass through a magnetic field, thus, inducing the electrons in the wires to flow. As the polarity of the magnetic field changes from North to South, electrons are induced to flow first one way then the other. This produces AC current flow. The current that is induced in the three wires is 120° out of phase. The current flow in the first conductor starts 120° before the second and it starts 120° before the third. Three phase generators are only found on the largest boats.

3 stage charging

A technique of battery charging that uses three distinct phases to ensure a fast and complete charge and a safe maintenance voltage. As there are several manufacturers of multiple stage charging systems, there is a slight difference in terminology in the field. See each key word for a more complete definition.

Stage 1: Charge or Bulk Mode

Stage 2: Acceptance or Absorption

Stage 3: Float

A

ABYC

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

AC *see Alternating Current*

AFD *see Alternator Field Disconnect*

AGC Fuse

A 1-1/4 inch long x 1/4 inch diameter glass fuse with fast blow characteristics.

AIC Amperes Interrupt Current *see Interrupt Rating*

ATO/ATC Fuse

The blade type fuse now commonly used in the automobile industry. It has fast blow characteristics like the AGC fuse.

AWG (American Wire Gauge) *see also SAE Wire Gauge*

AWG (American Wire Gauge) is a U.S. standard set of non-ferrous (copper or aluminum) wire conductor sizes. The "gauge" refers to the diameter. Typical household wiring is AWG number 12 or 14. Telephone wire is usually 22, 24, or 26. The higher the gauge number, the smaller the diameter and the thinner the wire. Thicker wire can carry more current because it has less electrical resistance over a given length. Thus larger wire is used when the voltage drop along its length must be minimized. For example: High output alternator wiring might be a 2 AWG and the starter cable for a modest engine a 1 or 0 AWG.

absorption *see 3 Stage Charging, see also Float Charge, Bulk, Equalization*

Absorption refers to the second phase of a multistage charging system, also called acceptance by some manufacturers. During the absorption cycle the battery is maintained at the maximum charging voltage. Typically about 2.4V per cell or 14.4V for a typical 12V system. (28.8V for a 24V system). This is the gassing voltage for a liquid battery. Gelled batteries are typically charged at slightly lower voltages. The gassing voltage is also temperature dependent. The battery cannot be maintained for long periods of time in the absorption phase.

acceptance *see absorption*

alternating current

A periodic current (sine wave) whose average value over a cycle is zero. The current reverses at regular intervals of time and has alternately positive and negative values.

alternator

Commonly refers to the DC charging source on an engine. The alternator is a three-phase AC device that produces alternating current, which is then rectified by a diode bridge to create direct current. Three phase AC devices are reliable and inexpensive to make compared to a DC generator of the same capacity.

alternator field disconnect

The alternator field is created by a coil of wire surrounded by ferrous metals. When the coil is energized with electric current it becomes an electro-magnet. This electromagnet is rotated, inducing a current flow in the three phase coils that surround it. By controlling the strength of the magnetic field, the output of the alternator may be controlled. If the output of the alternator is open circuited there is no place for the energy to go. The voltage rises to a dangerous level. By disconnecting the alternator field, the magnetic field is turned off, thus the voltage cannot soar. This is a safety feature on some battery switches.

ambient temperature

The temperature of the medium in which the heat of a device is dissipated. The ambient temperature is often specified in standards for device performance (such as the UL Standards) as the basis for determining the heat rise of the component.

ammeter

Ammeter measures current flow in a circuit. An ammeter is inserted in series in the circuit. We consider four types:

Analog

The classic analog ammeter uses the magnetic field associated with current flow through a moving coil of wire, to in turn move a needle over a meter face which displays amps. This type of meter can only measure very small current, micro-amps, before the moving coil becomes too large to be practical. To measure higher currents a shunt resistor is inserted into the circuit. *(see Shunt).* Most of the current flows through the shunt resistor but some passes through a meter movement as described to read amps when the movement is scaled appropriately.

Digital DC

The digital DC ammeter uses a shunt resistor to measure current flow. *(see Shunt).* The shunt is connected in series in the wiring of the circuit whose current is to be measured. The shunt sense leads are connected to the DC ammeter, which is really a millivolt meter. The millivolt input from the shunt is scaled to read amps per the resistance of the shunt. For example, a current flow of 10 amps through a 100A-100mV shunt would result in a voltage of 10mV across the sense leads. A millivolt meter would display 10, which we would interpret as 10 Amps.

Digital AC

The digital AC ammeter also uses a shunt resistor to measure a voltage drop, which is then scaled to read amps. The difference, however, is that the resistor is not normally connected directly in the AC wire of the circuit to be measured. A device called a current transformer (CT, *see Current Transformer*) is placed around the AC wire. A current is induced in the CT, which is then passed through a load resistor. The digital meter actually measures the voltage across this load resistor and internally scales it to read the appropriate number of amps.

Portable

Most portable meters today are digital and use the same techniques of measurement as described above. However, they are commonly limited to a few amps when connected in series to measure current. If high currents are to be measured, the portable meter must use some external sensing means. Commonly these consist of shunt resistors and clamp-on ammeter sensors that use Hall Effect sensors. (Operation of which are beyond the scope of this appendix. In short, they generate a voltage, which can be scaled to read amps just as the shunt resistor.)

ampacity

The current carrying capacity of a conductor or device.

ampere *see Coulomb*

1) The classic definition of an ampere is a unit of electric current flow equivalent to the motion of 1 coulomb of charge, or 6.25 X 10^{18} electrons, past any cross section in 1 second. This is an intuitive way to think about an ampere. It is the flow of a huge number of electrons through a conductor.

2) In 1948 this alternative definition was adopted: A unit of electric current in the meter-kilogram-second system. It is the steady current that when flowing in straight parallel wires of infinite length and negligible cross section, separated by a distance of one meter in free space, produces a force between the wires of 2 x 10^{-7} newtons per meter of length.

ampere-hour

The electric charge transferred past a specified circuit point by a current of one ampere in one hour.

Amp-Hour Rating (AH)

This is a common rating for batteries. This is the total number of ampere-hours that a battery can deliver over 20 hours at a constant rate of discharge before the battery voltage falls below 10.5 volts.

analog

Refers to a signal or input that varies continuously over time. Voltages and currents are analog signals, as are temperature and pressure.

anode

The electrode of an electrochemical cell with the more negative potential. The less noble metal of an electrolytic cell that tends to corrode.

B

battery *see also Cell*

Two or more cells connected together. Thus a group of batteries connected together can also be referred to as a battery.

battery bank

When groups of 6V or 12V batteries are wired in series or parallel or a combination to increase voltage or capacity the entire group is referred to as a battery bank. When batteries are connected in series the amp-hour rating is the same and the voltage is additive. When batteries are connected in parallel the voltage is the same and the amp-hour rating is additive.

battery state-of-charge

The term is used to describe and estimate of how much energy the battery is able to deliver. There have been many attempts to develop improved state-of-charge estimates. The most common methods include: specific gravity, at-rest open-circuit voltage, and amp-hour measurement.

battery switch rating *see Continuous Switch Rating and Intermittent Switch Rating*

battery types

AGM (Absorbed Glass Mat)

A technique for sealed lead-acid batteries. The electrolyte is absorbed in a matrix of glass fibers, which holds the electrolyte next to the plate, and immobilizes it, preventing spills. AGM batteries tend to have good power characteristics, low internal resistance, and good behavior during charging.

Flooded

A design for lead-acid batteries. The electrolyte is an ordinary liquid solution of sulfuric acid. Flooded cells are prone to making gas while being charged. Flooded cells must be periodically checked for fluid level and water added as necessary. Flooded cells are also typically less expensive than AGM or gel cell type lead-acid batteries.

Gel cell

Gel or sealed lead acid batteries are basically the same chemistry as a wet (flooded cell) battery. The batteries' electrolyte is in a gelatin form and is absorbed into the plates and the battery is sealed with epoxies. The batteries are exceptionally leak resistant and may be used in any position. Battery uses are UPS, emergency lights, and camcorders. These batteries are 2 volts per cell, so the common batteries are 4, 6, and 12 volt.

blade

That portion of a fuse to which the fuse block connects.

bonding, cathodic

The electrical interconnection of metal objects in common contact with water, to the engine negative terminal, or its bus, and to the source of cathodic protection.

branch circuit *see also Main*

The portion of the wiring system after the main circuit protection device.

break (rating)

The amount of current that can be passing through a set of contacts, such as those in a solenoid, when they open, without damaging the contacts. This can be a rating for a single event or over some number of cycles, generally 1000, 10,000 or 1,000,000.

bulk

That part of a multi-stage charge regime in which the maximum amount of current is flowing. This is normally limited by the size of the charging source. Lead acid batteries have the ability to accept, or absorb, large charging currents as long as they do not overheat or begin gassing. The bulk cycle allows the fastest possible charge.

bus, busbar

A bus is a group of common connections, often consisting of a strip of copper or brass with a number of screws or bolt studs for the connection of wires. It may be a negative or a positive bus.

C

CE (Conformité Européenné)

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.

CFR (Code of Federal Regulations)

The written regulations of the United States Federal Government.

cathode

The electrode of an electrochemical cell with the more positive potential. The more noble metal of an electrolytic cell that tends not to corrode.

cell

An electrochemical system that converts chemical energy into electrical energy. Typically consisting of two conductive plates with different galvanic potential immersed in an electrolyte.

cell, primary

An electrochemical device, which is discharged only once and then, discarded.

cell, secondary *see also Battery*

An electrochemical device, which may be discharged and recharged a number of times.

charge

Classically refers to an accumulation of electrons producing an electrostatic charge. In common use it often refers to restoring energy to a battery. Specifically, it would refer to the part of a multi-stage battery charging cycle when the voltage was held constant at or about the gassing voltage.

charge cycle

The stages through which a multi-stage charging source restores energy to a battery. A four-stage charge cycle includes:

bulk or charge cycle: Constant current for fast charging

acceptance or absorption cycle: Constant voltage for thorough charging

float cycle: For maintenance and long life

equalization cycle: Controlled overcharge for maximum capacity.

see key words above

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

A device that, like a fuse, interrupts a current in an electric circuit when the current becomes too high. Unlike a fuse, a circuit breaker can be reset after it has been tripped. When a high current passes through the circuit breaker, the heat it generates or the magnetic field it creates causes a trigger to rapidly separate the pair of contacts that normally conduct the current.

Circular mils

A method of specifying wire size mathematically. One Circular Mil is a unit of area equal to that of a circle .001" in diameter. The actual area of a Circular Mil is:

$A = \pi r^2$
$A = 3.1428 \times (.0005)^2$ inches
$A = .0000007857$ square inches

Class-T fuse

A very robust fuse carrying a 20,000 AIC. It also has very fast response to short circuit currents.

coil *see inductor*

Cold Cranking Amperes (CCA) *see also Marine Cranking Amperes*

CCA is the discharge load in amps which a battery can sustain for 30 seconds at 0° F. and not fall below 1.2 volts per cell (7.2V on 12V battery). This battery rating measures a burst of energy that an engine needs to start in a cold environment. This rating is used mainly for rating batteries for engine starting capacity and does not apply to NiCad batteries, NiMH batteries or Alkaline batteries.

common

May have more than one meaning. Typically denotes a bus that is at ground potential most often. The negative bus is called "the common"; sometimes the neutral bus is also called "the common". May also mean a group of connections that are connected together "in common" even though they are at a different potential than ground.

conductivity

Conductance is the reciprocal of resistance, which depends on the resistivity constant of the material. Resistivity is the resistance of a conductor having unit cross section and unit length. Conductivity is the reciprocal of the resistivity. Its units are 1/ohm-cm or ohm/cm, or 1/ohm-circular mils/ft.

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.

Conformité Européenné *see CE*

continuous current

The current flow, which a device or a conductor can carry, consume, or supply with no time limit. The continuous current rating is normally dependent on the temperature, since resistance increases with temperature. For battery switches the continuous current rating is established by testing for one hour at the rating. This is reasonable since thermal equilibrium would be reached within one hour.

continuous switch rating (UL)

The two ratings in the UL marine battery switch standard are Intermittent and Continuous. Intermittent is a 5 minute rating and is based on temperature rise of various sections of the switch as the rated current is applied over a 5 minute period. The Continuous rating is the same, but the time period is 1 hour.

converter

An electrical device that converts one type of electrical energy into another. Battery chargers convert AC power to DC to charge the battery. Inverters convert DC power into AC, both are converters. Often used in RV industry to mean a power supply that runs the domestic DC loads when shore power is available.

coulomb *see also Amperage*

The measurement unit of electric charge, which is determined by the number of electrons in excess (or less than) the number of protons. Classically a charge of 1 coulomb = 6.25×10^{18} electrons.

The meter-kilogram-second unit of electrical charge equal to the quantity of charge transferred in one second by a steady current of one ampere.

counterpoise

That portion of an antenna system composed of wires or other types of conductor arranged in a circular pattern at the base of the antenna at a certain distance above ground. Insulated from the ground, it forms the lower system of antenna conductors.

cranking (starting)

Normally associated with "cranking current" which is the current required by the starter circuit prior to engine starting. The cranking current varies significantly during the starting cycle. Initially, there is a large surge of current required to overcome the inertia and compression of the engine. This surge can be two to four times the average cranking current. Once the engine is turning there are peaks and valleys as the pistons go through the compression and exhaust cycles. The cranking current rating is used for sizing batteries, cables, and battery switches.

current *see also Amperage*

Current is a flow of electrical charge carriers, usually electrons or electron-deficient atoms. The common symbol for current is the uppercase letter I. The standard unit is the ampere, symbolized by A. Physicists consider current to flow from relatively positive points to relatively negative points; this is called conventional current or Franklin current. Electrons, the most common charge carriers, are negatively charged. They flow from relatively negative points to relatively positive points.

Electric current can be either direct or alternating. Direct current (DC) flows in the same direction at all points in time, although the instantaneous magnitude of the current might vary. In an alternating current (AC), the flow of charge carriers reverses direction periodically. The number of complete AC cycles per second is the frequency, which is measured in Hertz. An example of pure DC is the current produced by an electrochemical cell. The output of a power-supply rectifier, prior to filtering, is an example of pulsating DC. The output of common utility outlets is AC.

current rating

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

current transformer *see also Ammeter*

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.

cycle

A cycle of a battery is a discharge plus a charge. For example, if a fully charged battery has a load applied, is then discharged and recharged, that is one cycle. Cycle life is the total number of cycles a battery yields.

D

DC *see Direct Current*

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.

delay

A difference in time between the initiation of an event and its occurrence, or between an event's observation and enunciation of it. This is usually used to refer to the time between the application of rated amperage to a fuse or circuit breaker and the time when the device opens.

derating

A decrease in a device's rating, usually amperage, due to its application in ambient conditions different from those in which it was tested or for which it was designed originally.

dielectric strength

The maximum voltage stress that a material can withstand without rupture.

digital

A digital signal is one which has only two valid values denoted as 1 or 0. Commonly these are equated to distinctly different voltage. For example: A voltage of +5V would equal a 1 and a voltage of 0V would equal a 0.

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.

discharge

Refers to the consumption of energy from a battery, or to the electrostatic discharge associated with a lightning bolt, capacitor, etc.

double insulation system

An insulation system comprised of basic insulation and supplementary insulation, with the two insulations physically separated and arranged so they are not simultaneously subjected to the same deteriorating influences to the same degree.

double pole

Indicates a switch, relay, or circuit breaker with two separate conductive paths, which are opened or closed when the device is operated.

E

Earth

The third planet from the sun in Astronomy, but in electrical terms it refers to a connection, which is made to a conductor that is connected to the planet Earth. In grounded electrical systems there is a connection, which is a copper rod or some other highly electrically conductive connection, to the actual Earth. This is to ensure a safe conductive path for a short circuit, which in turn helps prevent electrocution.

electrode

A conductive material, in an electrolyte, through which electrical current enters or leaves.

electrolysis

Chemical changes in a solution, or electrolyte, due to the passage of electric current.

electrolyte

A liquid in which ions are capable of migrating and, therefore capable of conducting current. Solutions of acids, bases, and salts in water are electrolytes.

electron *see also Coulomb*

An electron is a negatively charged subatomic particle. It can be either free (not attached to any atom), or bound to the nucleus of an atom. In electrical conductors, current flow results from the movement of free electrons from atom to atom individually, and from negative to positive electric poles in general.

The charge on a single electron is considered as the unit electrical charge. It is assigned negative polarity. Electrical charge quantity is not usually measured in terms of the charge on a single electron, because this is an extremely small charge. Instead, the standard unit of electrical charge quantity is the coulomb, symbolized by C, representing about 6.25×10^{18} electrons.

Electromotive Force (EMF)

Commonly referred to as voltage, electromotive force is the energy per unit of charge that is supplied by a source of electrical energy such as a battery, charger or alternator.

Electromagnetic Interference (EMI)

Noise generated by a load (typically by electrical switching action). Usually specified as meeting agency limits for conducted EMI (noise reflected back onto the power bus) or radiated EMI (noise emitted into the area surrounding a device).

energy *see also Power*

The classically simple definition is, the capacity to do work. Energy may be manifested as, mechanical motion, thermal heat, or electrical power, which is consumed, radiated, dissipated, or stored over a period of time. The energy in a direct-current circuit is equal to the product of the voltage in volts, the current in amperes, and the time in seconds. The units for energy are Watt-hours. In alternating current (AC) circuits, the expression for energy is more complex.

engine negative terminal

The point at which the engine negative, generally the engine block, is connected to the negative of the battery.

equalization *see Charge Cycle*

Equalization is a controlled overcharge, which removes lead-sulfate that is not converted during normal charging. Equalization is best accomplished by using a constant current of 2-7% of battery capacity while allowing the battery voltage to rise to its highest "natural voltage". For a 12V battery this can be as high as 16.2V. The equalization cycle is continued until the specific gravity of all cells cease to continue to rise and are approximately equal. The equalization cycle should only be used on liquid electrolyte batteries and only while the operator is on the premises.

equalizer

A device wired across the same potential poles of a multiple bank battery bank consisting of serially wired batteries, i.e., two 12 volt batteries in series to produce 24 volts. An equalizer maintains half its input voltage at its output terminals. When loads are taken off one of the batteries in the bank at that batteries voltage, which is half of the bank voltage, the equalizer senses that battery's voltage is no longer the one half the voltage of the entire bank and the equalizer "recharges" the lower voltage battery from the higher voltage battery.

F

fast (fast acting) *see also Delay*

Refers to the amount of time that a fuse can endure an over-current before blowing. Fast fuses are used to protect sensitive equipment.

fault

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

field

Typically refers to a magnetic field. Specifically used when discussing the rotating electo-magnetic field associated with an alternator. By varying the field current, thus its strength, the output of the alternator may be controlled.

float charge *see also Bulk, Acceptance, Equalization*

A constant voltage, well below the gassing point, that is applied to a battery to maintain its capacity. The voltage is such that neither charging nor discharging is occurring.

frequency *see also Hertz*

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 fuse is a safety device, consisting of a strip of low-melting-point alloy, which is inserted in an electric circuit to prevent excess current from flowing. If the current becomes too high the alloy strip melts, opening the circuit.

fusible link

A type of fuse with a replaceable conductive alloy link that may be replaced if it "blows" due to over-current.

G

galvanic corrosion

The corrosion that occurs at the anode(s) of a galvanic cell.

galvanic isolator

A device installed in series with the (AC) grounding (green) conductor of the shore-power cable to effectively block low voltage DC galvanic current flow, but permit the passage of alternating current (AC) normally associated with the (AC) grounding (green) conductor. This is typically two diodes wired in parallel facing opposite directions, sized to meet full fault current.

galvanic series

A list of metals and alloys arranged in order of their potentials as measured in relation to a reference electrode when immersed in seawater. The table of potentials is arranged with the anodic or least noble metals at one end, and the cathodic or most noble metals at the other.

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.

green wire

The green wire is the non-current carrying safety grounding wire in an AC system in the United States. It is connected to an exposed metal part in the electrical system to provide a path for fault current in the case of a short circuit.

ground fault

GFI (Ground Fault Interrupter)

GFI is generic term referring to both GFCI and GFP

GFCI (Ground Fault Circuit Interrupter) see GFI

A device intended for the protection of personnel that functions to de-energize a circuit, or portion thereof, within an established period of time when a current to ground exceeds some predetermined value that is less than that required to operate the overcurrent protective device of the supply circuit.

GFP (Ground Fault Protector) see GFI

A device intended to protect equipment by interrupting the electric current to the load when a fault current to ground exceeds some predetermined value that is less than that required to operate the overcurrent protection device of that supply circuit.

ground, ground conductor

A point in a circuit which is at zero potential with respect to the Earth, or which is at the lowest potential in the system, (as with a floating ground).

grounded

The AC current carrying conductor that is intentionally maintained at ground potential, also called neutral.

grounding, grounding conductor

The AC conductor, not normally carrying current, used to connect the metallic non-current carrying parts of electrical equipment to the AC system and engine negative terminal, or its bus, and to the shore AC grounding conductor through the shore power cable. This term can also refer to the 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, to minimize stray current corrosion.

ground plate

A conductive plate, commonly sintered copper, that is placed in contact with seawater to provide a connection to earth for a boat's ground systems.

H

Hertz *see Frequency*

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.

I

ICAS *see International Annealed Copper Standard*

Impressed current

Direct current supplied by a device employing a power source external to the electrode system of a cathodic protection installation. The impressed current is used to counteract the undesired galvanic current.

inductance

An effect in electrical systems in which electrical currents store energy temporarily in magnetic fields before that energy is returned to the circuit.

inductor *see Coil*

A length of wire that is wound around a core that is used as a storage element for a magnetic field in an electric circuit.

inrush

The momentary steep wave front of very high current exhibited by a load on initial application of power.

International Annealed Copper Standard

Abbreviated as IACS, this is a measurement of relative electrical conductivity that uses copper as the standard of 100%. The expression "Brass 28 IACS" would mean that the brass under discussion had 28% of the electrical conductivity of an identically sized piece of copper.

interrupt rating (AIC)

The fault current that a device, normally a fuse or circuit breaker is capable of breaking without damage.

inverter

An inverter converts DC power stored in a battery to AC power which is used by most household appliances.

ignition protection (IP)

Devices, which operate in a potentially explosive environment, must be ignition protected. This would include engine rooms with gasoline engines. There is a very specific set of tests which a device must pass to claim ignition protection. They include operating safely in an explosive mixture of propane and air.

isolation transformer

A transformer that is inserted in series with the incoming AC power to provide a magnetic coupling for power between the ship's systems and the AC grid. By magnetically coupling the power there is no direct connection by wires, which isolates the ships AC system from the AC grid.

isolator

Refers to two or more diodes wired in parallel and then inserted in series with the output of an alternator. This allows for the alternator to charge multiple batteries. The voltage drop across the diodes can cause incomplete charging. Isolators should not be used with alternators that use internal voltage sensing for regulation. To be properly installed the voltage sense lead must come from the house battery.

J, K

kilo

A prefix in the metric system equal to 1000 times, as in kilohertz, 1000 cycles per second.

L

line *see also Load*

The conductors that are at the supply of energy to a circuit. Line normally refers to the current carrying non-grounded conductors in an AC system.

line loss *see Voltage Drop*

The power loss that occurs due to amperage flowing through the resistance of conductors over their length.

listed (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.

load *see also Line*

A device that consumes power and does work.

load group

A collection of loads, which normally have similar characteristics. For example the lighting circuits might be considered a load group. Also implies that the loads are supplied by a common bus.

lockouts (AC)

Mechanical or electrical devices or protection systems, that prevent the application of more than one source of power to a bus at the same time.

M

magnetic

Displaying the characteristics of a magnet, including being able to induce current flow in a conductor when relative motion exists between them and being able to attract ferrous materials.

main *see also Branch*

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

make (rating)

The current that a breaker, switch, or relay can connect without damaging the device.

make before break

Describes a switch action that connects the new circuit before disconnecting the old. This type of switch action is required for battery switches in order to avoid an open circuit for the engine alternator, which can cause extreme voltages that can damage the alternator and accessory electronics.

Marine Cranking Amperes (MCA)

MCA is the discharge load in amps, which a battery can sustain for 30 seconds at 32°F. and not fall below 1.2 volts per cell (7.2V on 12V battery). This battery rating measures a burst of energy that an engine needs to start in a cold environment.

modified sine wave

A marketing term to describe an AC waveform, created by an inverter that is a pulse width controlled square wave. While an improvement on the classic square wave inverter, it is not actually a sine wave or a close approximation.

momentary switch rating (UL)

There are two ratings in the UL marine battery switch standard, Intermittent and Continuous. Intermittent is a 5 minute rating and is based on temperature rise of various sections of the switch as the rated current is applied over a 5 minute period. The Continuous rating is the same, but the time period is 1 hour. As confusing as it may seem to equate "Continuous" with "1 hour", devices generally reach thermal equalibrium by this time and further testing is pointless.

motor circuit protection

Motors require circuit breakers or fuses that are specifically designed for their current requirements. This is because motors require a high initial surge of current to get them started.

N

NEC *see National Electrical Code*

NEMA

National Electrical Manufacturers Association

N-type (alternator)

An N-type alternator has a set of diodes, called the diode trio, which supply the positive DC potential required for the rotating field current. The actual regulator switches the negative to achieve the proper field strength to create the desired correct alternator output.

National Electrical Code NEC

The NEC is developed and maintained by the National Fire Protection Association which describes how residential, commercial, and RV electrical systems must be installed. The NEC is adopted, sometimes with revision, by states that also adopt the Uniform Building Code. Electrical inspections required by most building permits follow the NEC. While not required aboard boats, the NEC is a valuable guide to safe electrical systems. The goal of the NEC is personal safety and fire prevention.

neutral (ground) *see also Single Phase*

The neutral is the grounded current carrying conductor in a single phase, four wire, 120/240V AC system.

neutral-to-ground bonding

Connecting the ground and the neutral together via an electrical conductor.

neutral-to-ground switching

In the US, inverter/charger installations that are used in marine applications must have neutral-to-ground switching. This guarantees that the neutral and the green wire are common after the green wire connection to neutral that is achieved through the shore power cord no onger exists after the cord is disconnected and shore AC is no longer serving as the boat's AC source. There must also be only a single ground point in the AC system. This prevents a voltage differential from developing between the boat's AC neutral and the shore or genset AC neutral, which may cause an electric shock or nuisance tripping of GFI's.

non-inverter loads

Non-inverter loads are heavy loads that are not appropriate to run from an inverter because the load on the batteries would be excessive or illogical. They include hot water heater, electric space heat, air conditioning, heavy pumping loads, etc. A battery charger that supplies the same battery as is being used by the inverter would also be a non-inverter load.

nuisance trip

A circuit breaker or fuse, which trips or blows without the circuit actually being overloaded. This may be due to weak breaker or a surge current which requires a slow tripping breaker or a slow blow fuse.

O

ohm

The unit for resistance equals V/I = volt/amp. The unit of resistance is the ohm, symbol Ω, the Greek letter Omega.

Ohm's law

States that the ratio of the EMF (Electromotive Force) applied to a closed circuit to the current in the circuit is a constant. That constant is the resistance of the circuit. It may be stated as V= IR (or E=IR, using E as the abbreviation of EMF whose units are volts). The unit of resistance is the ohm.

open

Indicates a condition in an electric circuit in which there is a break in the conductive path. The break may be intentional such as an open switch or relay or it may be unintentional such as a broken wire or a blown fuse. In any case, the continuous conductive path required for an electric circuit is not available.

open circuit voltage

Generally, the voltage of a source when it is not connected to a load through an electrical circuit. Specifically, the voltage of a battery when it is not delivering or receiving power. A typical value for a liquid lead acid battery is 12.8V for a fully charged battery which has not been charged or used for 24 hours. Open circuit voltage is sometimes used as an indicator of the state-of-charge of a battery.

The table below gives typical open circuit voltages for both liquid and gelled electrolyte lead-acid batteries at various states-of-charge. These voltages should be considered approximations and may vary according to manufacturer and the specific gravity of the electrolyte the battery is initially filled with.

Typical Open Circuit Voltage After 24 Hours for Liquid and Gelled Electrolyte Batteries

Percent Charge	Liquid Electrolyte per cell voltage	Liquid Electrolyte Nominal 12V Battery	Gelled Electrolyte per cell voltage	Gelled Electrolyte Nominal 12V Battery
100%	2.10	12.60	2.175	13.05
80%	2.09	12.54	2.13	12.78
60%	2.07	12.42	2.08	12.48
40%	2.04	12.24	2.05	12.30
20%	1.98	11.80	2.02	12.12
0%	1.95	11.70	1.98	11.88

overcurrent

When the current in a circuit exceeds the rating of the devices or conductors in it. Fuses and circuit breakers protect from overcurrent by opening the circuit if such a condition exists and persists.

P

PE *see Protective Earth*

P-type (alternator)

A P-type alternator is one which one end of the coil which supplies the rotating magnetic field is connected to the negative and the regulator controls the positive side of the coil to regulate the alternator output.

panelboard

A collection of circuit breakers, switches, and instrumentation installed into a panel which provides the central point for power distribution and monitoring for the electrical system. May also refer to a smaller panel which is located remotely from the main panel which is used to supply loads in the adjacent area. "Panelboard" is a term generally used only by ABYC. In the marine industry they are usually called "panels", or "circuit breaker panels", or "distribution panels".

parallel circuit

An electrical circuit in which the positive connections are all in common and the negative connections are all in common. The voltage of the system appears across each branch of the circuit. The current varies as required by each load or source.

parallel device

A switch, solenoid, relay, or solid state device which is used to connect multiple batteries or busses together.

paralleling switch

Typically refers to a battery switch that allows multiple batteries to be connected together for engine starting. Often used to connect the battery serving the domestic system to the engine starting circuit for emergencies.

percent of charge

An estimate of the remaining charge in a battery. Percent of charge is very difficult to determine accurately without sophisticated microprocessor based calculations.

Peukert's equation

A formula that shows how the available capacity of a lead-acid battery changes according to the rate of discharge. The capacity of a battery is expressed in Amp-Hours, but the simple formula of current times hours does not accurately represent the situation. Peukert found that the equation: $C = I^n T$ fits the observed behavior of batteries. "C" is the theoretical capacity of the battery, "I" is the current, "T" is time, and "n" is the Peukert number, a constant for the given battery. The equation captures the fact that at higher discharge current, there is less available energy in the battery.

pigtail

Wires which protrude from a device to connect it to the circuit. Often used in encapsulated products. Sometimes refers to a method of hooking up circuits in which a group of conductors are connected together and then one wire is connected to the circuit. This is done in order to simplify wiring.

plate (battery)

Flat, typically rectangular components that contain the active material, lead or lead compound, and a mechanical support structure called a grid, which also has an electrical function, carrying electrons to and from the active material. Plates are either positive or negative, depending on the active material they hold.

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.

pole *see also Toggle*

Indicates a conductive path in a switch or relay. Switches that are single pole have one conductive path, switches that are two pole have two conductive paths. Also refers to the magnetic poles on an electromagnet or a permanent magnet.

potential

The voltage across a circuit element. Implies the potential to do work.

power

Electrical power is the rate at which electrical energy is converted to another form, such as motion, heat, or an electromagnetic field. The common symbol for power is the uppercase letter P. The standard unit is the watt, symbolized by W. In utility circuits, the kilowatt (kW) is often specified instead; 1 kW = 1000 W.

Power in a direct current (DC) circuit is equal to the product of the voltage in volts and the current in amperes. This rule also holds for low-frequency alternating current (AC) circuits in which energy is neither stored nor released. At high AC frequencies, in which energy is stored and released (as well as dissipated or converted), the expression for power is more complex.

In a DC circuit, a source of V volts, delivering I amperes, produces P watts according to the formula: $P = VI$

When a current of I amperes passes through a resistance of R ohms, then the power in watts dissipated or converted by that component is given by: $P = I^2R$

When a potential difference of V volts appears across a component having a resistance of R ohms, then the power in watts dissipated or converted by that component is given by: $P = V^2/R$

power factor

In an AC circuit loads other than resistance shift the phase angle between the voltage and the current. This shift is the result of energy being stored and released in an inductor. To calculate the power consumed one must consider this phase shift. We do so by using the following formula: P=VI cosine ø, where ø is the difference in phase angle between the voltage and current. Cosine ø is called the power factor. For resistive loads the power factor is equal to 1 because the phase angle equals 0. For pure inductive loads the power factor is 0 because the phase angle is +90°.

propagation

The transmission of an electrical or electromagnetic signal through a medium such as air or a conductor.

Q, R

RCD

Recreational Craft Directive - European Directive 94/25-EC relating to recreational craft.

Following are special definitions related to the RCD:

CD

Committee Draft – the first draft circulated for comment by ISO Small Craft Technical Committee Working Group developing the standard.

CEN

The European Committee for Standardization.

DIS

Draft International Standard – an advanced draft where comments on the CD have been taken into account. Minor comments accepted by the Working Group will be incorporated in the FDIS, major changes will result in a second circulation as a DIS.

EN

European Standard (Norme).

FDIS

Final Draft International Standard – the last voting stage where standard bodies can only vote "yes" or "no" and the only changes will be editorial.

ICOMIA

The International Council of Marine Industry Associations – the International Marine Industry Trade Association, which represents 24 national marine industry associations. That includes virtually all countries with an active marine industry in Europe, North America, Asia and Australia. Its officers and members represent its members' views at the EU Commission, ISO, and CEN and its members' representatives are actively involved in all the RSG Standards Working Groups.

ISO

International Standards Organization

PREN

The abbreviation used by CEN to identify a draft standard at any stage.

WG

Working Group – the committee whose members have been nominated by their national standards body to develop any new standard required by the ISO Small Craft Tec. Committee (TC188) one of whom is chosen to act as the Convenor (Chairman/Secretary) by the TC188 members.

LIST OF EUROPEAN UNION (EU) & EUROPEAN ECONOMIC AREA (EEA) NATIONAL STANDARDS BODIES

Austria	ON	Italy	UNI
Belgium	IBN	Luxembourg	ITM
Denmark	DS	Netherlands	NNI
Finland	SFS	Norway*	NSF
France	AFNOR	Portugal	IPQ
Germany	DIN	Spain	AENOR
Greece	ELOT	Sweden	SIS
Iceland*	STRI	Switzerland	SNV
Ireland	NSIA	UK	BSI

** EEA countries – whose national standards bodies are participants in CEN debates, but have a non-voting status.*

recognized (UL recognized)

A device that is UL Recognized differs from a device that is UL Listed. A Recognized device is expected to be installed within a larger assembly by a manufacturer, *not in the field,* and this larger assembly is then expected to be tested by UL. The UL Recognition then allows UL to skip testing of the specific embedded Recognized component. UL Recognition has little value for end users installing devices in the field.

rectifier

A device that allows current to flow in only one direction, such as a diode. Used to convert, or rectify AC current into DC.

regulator (voltage regulator)

A device, which uses a feedback loop to control the output of an alternator or other source. By measuring the output voltage and controlling the alternator field current, for example, the regulator is able to continuously adjust the alternator output to the desired voltage.

reserve capacity (battery)

RC is the number of minutes a new, fully charged battery at 80°F will sustain a discharge load of 25 amps to a cut-off voltage of 1.75 volts per cell (10.5V on 12V battery). This battery rating measures more of a continuous load on the battery.

resistance

The opposition to the flow of current in an electric circuit as defined by Ohm's law. The unit of resistance is the ohm, symbol Ω, the Greek letter Omega.

reverse polarity

Describes a situation where the neutral and hot wires of an AC system are reversed. Most AC panels have an indicator to annunciate this condition, as it can be very dangerous.

RMS (Root-mean-square)

Root-mean-square (RMS) refers to the most common mathematical method of defining the effective voltage or current of an AC wave.

To determine RMS value, three mathematical operations are carried out on the function representing the AC waveform:

(1) The square of the waveform function (usually a sine wave) is determined.

(2) The function resulting from step (1) is averaged over time.

(3) The square root of the function resulting from step (2) is found.

In a circuit whose impedance consists of a pure resistance, the RMS value of an AC wave is often called the effective value or DC-equivalent value. For example, if an AC source of 100 volts RMS is connected across a resistor, and the resulting current causes 50 watts of heat to be dissipated by the resistor, then 50 watts of heat will also be dissipated if a 100-volt DC source is connected to the resistor.

For a sine wave, the RMS value is 0.707 times the peak value, or 0.354 times the peak-to-peak value. Household utility voltages are expressed in RMS terms. A so-called "117-volt" AC circuit has a voltage of about 165 volts peak (pk), or 330 volts peak-to-peak (pk-pk).

S

SAE (Society of Automotive Engineers)

An organization which sets standards for various equipment used in the automotive industry. Since much of the basic equipment used in the marine industry originates in the automotive industry it can be a relevant specifications body for the marine industry as well.

SAE wire gauge

Wire sizes as specified by the SAE, specifically for stranded wire, similar to the AWG, *see also AWG*. The same gauge in SAE wire has a smaller conductor than in AWG wire.

sacrificial anode

A less noble metal intentionally connected to form a galvanic cell with a more noble metal for the purpose of protecting the more noble metal from corrosion. Most commonly zinc.

safety green (ground) wire

The non-current carrying conductor in a three wire 120V or four wire 240V AC circuit, it provides a safe path for fault current. See also green ground wire.

sealed lead-acid *see Gel Cell*

self-limiting

A device whose ability to limit output power regardless of input power is intrinsic to its design.

sheath

The ABYC uses this term when discussing the allowable length of a conductor before it must have over current protection. The distance is extended if it is in a sheath.

shore power

AC utility power that is available when plugged into an outlet that is supplied from the main utility system.

short circuit

A conductive path of zero resistance. Typically refers to an unintentional connection between two conductors of opposite polarity. If a voltage is applied to a short circuit the current becomes very large and can start a fire, thus the need for short circuit, or overcurrent, protection in the form of fuses or circuit breakers.

shunt

A shunt resistor is a precise, low Ohm resistor that is temperature stable. It is used as a current "sensor" by using a millivolt meter to measure the voltage drop across it. Large current shunts are commonly made of one or more strips of manganin, a copper alloy capable of carrying high currents, that are soldered between machined blocks of brass with connecting bolts.

Shunts are rated according to the number of Amps it is capable of carrying and the mill votage which is generated across the shunt when the rated current is being passed through it. Common shunt ratings include 100A 100mV or 500A 50mv. The resistance can be calculated by using Ohms Law, V=IR, 50mV=500A(R), therefore R=0.1mΩ, or 0.0001Ω. This is a very small value of resistance; it must be in order to minimize the power loss when large currents are flowing.

The shunt normally has two separate screws on to which the sense leads are attached. It is important to realize that the integrity of these connections are critical to accurate measurement and should not be used as current carrying connections.

sine wave

A waveform that can be expressed as the graph of the equation y = sin x. The utility AC power is a sine wave.

single phase

The typical 120/240V AC system in the United States is a single phase system, meaning that the current flow in the two conductors is in phase or that they both cross zero at the same time.

skin effect

Skin effect refers to the phenomena of conductors' propagating AC current more efficiently on the conductors' surface than in its interior. This is because AC voltage changes polarity 120 times per second (60 Hz). Voltage signal penetration into the conductor interior takes a brief amount of time, so the current propagation in the interior lags that of the exterior, resulting in a longer period of propagation on the surface.

slow *see Delay*

The speed with which a circuit element such as a fuse or circuit breaker responds to an over-current condition.

slow blow *see also delay*

A fuse that is a slow blow has a longer delay when subjected to over-current, before it fails. Slow blow fuses are required for loads that have high starting surges, like motors.

solenoid (relay)

An electromechanical device that is used to switch large currents. It consists of a coil of wire and a moving contact that makes an electrical connection when the coil of wire is energized.

source isolation (AC)

The arrangement of multiple AC power sources in such a manner that two AC sources cannot be connected to the same circuit simultaneously.

source selector

A switch or breaker configuration, which allows the user to pick which source to have connected to the bus. Typically used in AC systems with multiple sources such as shore power and one or more generators.

speed *see Delay*

Indicates how fast circuit protection devices react, specifically with respect to over current protection and fuses.

square wave

An electrical waveform in which the current quickly goes from zero to its peak value in a step fashion. This is typical of inexpensive inverters.

starting bank

An arrangement of batteries that is designated for the function of engine starting.

storage battery

An electrochemical device capable of storing energy and releasing it and then able to be re-charged and repeat the process.

stray current

Unwanted current flows which occur due to a partial short circuit.

stray current corrosion

Corrosion that results when current from a battery or other external electrical (DC) source causes a metal in contact with an electrolyte to become anodic with respect to another metal in contact with the same electrolyte.

sulfation

Sulfation is the formation or deposit of lead sulfate on the surface and in the pores of the active material of the batteries' lead plates. If the sulfation becomes excessive and forms large crystals on the plates, the battery will not operate efficiently and may not work at all. Common causes of battery sulfation are standing a long time in a discharged condition, operating at excessive temperatures, and prolonged under or over charging.

surge

A large amount of current during the initial starting phase of a motor for example.

surge capacity

The measurement of the ability to withstand surge currents without damage.

surge current *see also continuous current*

The pulse of current that is associated with the initial large current required to start an electric motor, large resistive loads, and engine cranking.

switch

An electro-mechanical device that is intended to open an electrical circuit and thus turn a load or source on or off.

switchboard *see panel board*

T

terminal

A connection point or device for an electrical circuit. A terminal strip is a series of screws which may or may not be in common to which wires are connected. Also refers to the connecting device which may be crimped on the end of a wire to enable it to be connected to the circuit with a screw, such as a ring terminal.

terminal studs

A threaded bolt onto which ring terminals may be placed and then fastened with a nut. Normally used for high current connections.

thermal

In a marine context thermal most commonly refers to a thermal circuit breaker, which uses the thermal effect of excess current flow to create differential expansion in a bi-metallic blade to open a circuit.

time-current curve *see also Delay*

A curve which depicts the relationship between the amount of current a fuse or breaker can withstand with respect to time.

tin plating

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

toggle *see also Pole*

A switch which has a handle type actuator that can be placed in, at the most, three positions.

transfer switch, AC *see Selector Switch, Source Isolation*

An electrical relay or manual switch which selects an AC source alternative, such as a generator, shore power, or inverter.

transformer *see Isolation Transformer*

trip free

A circuit breaker designed to trip when subjected to a fault current, even if the reset lever is held in the ON position.

U, V

ungrounded conductor

Any conductor that is not connected to the Earth ground system

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 *see line loss*

W

watt

The unit of power which for a DC circuit is equal to volts times amps.

weatherproof

Constructed or protected so that exposure to the weather will not interfere with successful operation in rain, spray, and splash.

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

The process of selecting the appropriate sized conductor for the amount of current to be carried while considering the length of the circuit.

withstand voltage

The maximum voltage level that can be applied between circuits or components without causing a breakdown.

X, Y, Z

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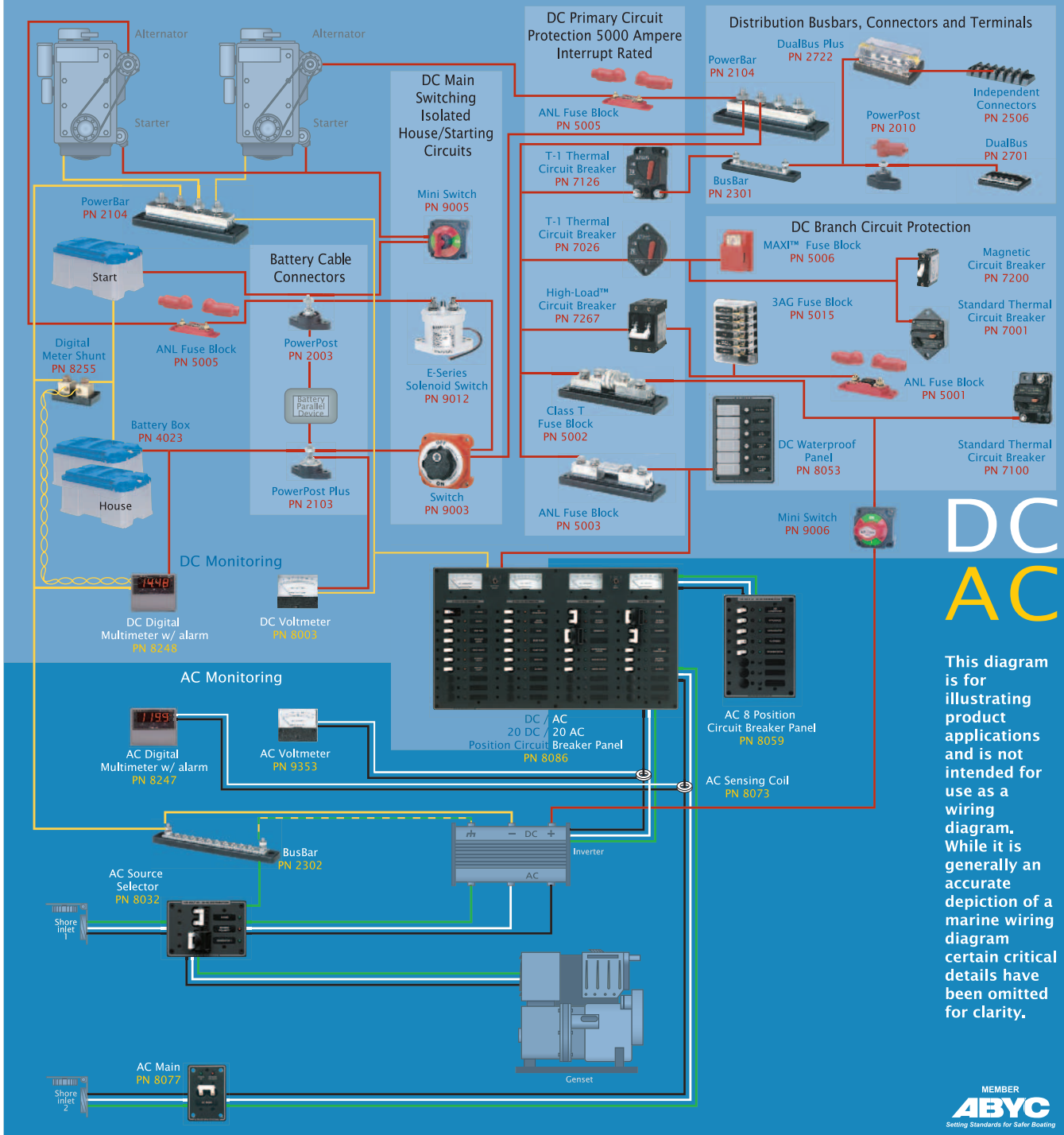

DC

AC

This diagram is for illustrating product applications and is not intended for use as a wiring diagram. While it is generally an accurate depiction of a marine wiring diagram certain critical details have been omitted for clarity.

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