

AC & DC Power Distribution Panel

PN 8095 / PN 3095 / PN 8195 / PN 3195

Specifications

Material:	0.125" 5052-H32 aluminum alloy
Primary Finish:	Chemical treatment per MIL-SPEC C-5541C
Final Panel Finish:	Graphite color 2 part textured polyurethane
Maximum Amperage:	Varies by components; busbar maximum 100A
Voltage Rating:	8095/3095 12 Volts DC / 120 Volts AC 8195/3195 12 Volts DC / 230 Volts AC

	Inches	Millimeters
Overall Dimensions:	19-1/2 × 11-1/2	495.30 × 292.20

Features

AC 8095 / 3095 / 8195 / 3195

- 10 AC circuit breaker positions
- 0-50 Ampere AC ammeter with remote sensing coil

DC 8095 / 3095 / 8195 / 3195

- 30 DC circuit breaker positions, twenty-one 15A circuit breakers installed
- 8-16 Volt voltmeter with 3 position switch for multiple battery banks
- 0-100A ammeter with remote shunt

AC 8095 / 3095

- Five 15 Ampere branch circuit breakers installed
- One double-pole 30 Ampere AC main circuit breaker installed
- 0-150 Volt AC voltmeter

AC 8195 / 3195

- Five 8 Ampere branch circuit breakers installed
- One double-pole 16 Ampere AC main circuit breaker installed
- 0-250 Volt AC voltmeter

Guarantee

Any Blue Sea Systems product with which a customer is not satisfied may be returned for a refund or replacement at any time.

8704 Rev. 008



WARNING



- ✓ These instructions are intended to provide assistance with the installation of this product, and are not a substitute for a more comprehensive understanding of electrical systems. We strongly recommend that a competent electrical professional perform the installation of this product.
- ✓ If either the panel front or back is to be exposed to water it must be protected with a waterproof shield.
- ✓ The panels must not be installed in explosive environments such as gasoline engine rooms or battery compartments as the circuit breakers are not ignition protected.
- ✓ The main positive connection must be disconnected at the battery post to avoid the possibility of a short circuit during the installation of this distribution panel.

Blue Sea Systems Inc.
425 Sequoia Drive
Bellingham, WA 98226 USA

Phone (360) 738-8230
Fax (360) 734-4195
www.blueseasystems.com

Installation Set Up

1. Disconnect all AC and DC power

Disconnect all AC power originating on or off the vessel. This includes inverters, generators, shore power attachments and any other device capable of supplying AC power to the ship's circuits.

Disconnect the main positive DC cable from all batteries to eliminate the possibility of a short circuit and to disable the inverter while installing the distribution panel.

2. Select mounting location and cut opening

If this panel is to serve as your main shore power disconnect circuit breaker, select a location which is not more than 10 feet from the shore power inlet or the electrical attachment point of a permanently installed shore power cord as measured along the conductors of the feed wires. If it is more than 10 feet, additional fuses or circuit breakers must be installed within 10 feet of the shore power inlet.

Select a mounting location which is protected from water on the panel front and back and is not in an area where flammable vapors from propane, gasoline or lead acid batteries accumulate. The circuit breakers used in marine electrical panels are not ignition protected and may ignite such vapors.

Using the panel template provided, make a cutout in the mounting surface where the distribution panel is to be mounted. Do not yet fasten the panel to the mounting surface.

DC Installation

1. Select positive feed wire and negative return

Determine the positive feed (red) and negative return (black or yellow) wire size by calculating the total amperage of the circuits that will be routed through the panel. Blue Sea Systems' electrical panels are rated at 100 amp total capacity. The positive feed wire must be sized for 3% voltage drop at the 100 amp panel rating or the maximum amperage that will be routed through the panel in any particular installation, whichever is less. It is recommended that the positive feed wire be sized for the full panel capacity, which, in most cases, will require at least 2 AWG wire, assuming a 10 foot wire run between the panel and the batteries in 12 volt systems. Refer to the Wire Sizing Chart for other situations. In the case of panels with two or more columns of breakers, jumpers from positive bus to positive bus and from negative bus to negative bus should be the same size as the positive feed and the negative return wires.

Remember that the length of the circuit is the total of the positive wire from the power source and the negative wire back to the DC Negative Bus. Be certain that there is a fuse or circuit breaker of the correct size protecting the positive feed wire.

2. Install shunt, positive feed wire and negative return

The panel is supplied with an external shunt ammeter that must be connected in the positive feed line to the panel. The shunt may be mounted at any point in the feed line, but mounting it close to the panel will keep the sense wires that run to the meter short, minimizing voltage loss and interference, creating the most accurate meter reading.

Connect the positive feed wire from the positive source to either of the 2 large bolt terminals on the shunt top. This is now the shunt positive terminal. Connect two additional lengths of feed wire from the remaining shunt terminal, now the negative terminal, to both panel positive buses.

DC Installation (continued)

Next, connect a minimum 16 AWG red wire from the screw on the side of the shunt positive terminal to the meter positive terminal and connect a black or yellow wire from the shunt negative terminal to the meter negative terminal. There should be a 1 ampere fuse in both sense wires near the shunt terminal. Be certain that on all 4 shunt connections the wire ring terminals sit directly on the brass blocks of the shunt without any washers in between.

Connect a negative return wire from both negative buses on the panel to DC negative.

3. Install battery bank voltage monitor wires

The panel is supplied with a meter and switch to monitor the voltage of three separate sources, usually the batteries. Connect a minimum 16 AWG red wire from each source to be monitored to each of the corresponding input wires of the switch. There should be a 1 ampere fuse in each positive wire near each source.

4. Install branch circuit wires

Determine the proper wire size for each branch circuit using the guidelines in step 4. Verify that the standard 15 amp circuit breakers installed in the panel are large enough for each branch circuit. Remove and replace with a higher amperage any that are undersized. Connect the positive (red) branch circuit wires to the load terminals of each circuit breaker. Connect each negative (black) branch circuit wire to the DC Negative Bus. **DO NOT CONFUSE THE DC NEGATIVE BUS WITH THE DC GROUNDING BUS.**

5. Installation of Backlight System

Connect the yellow negative wire to the panel negative bus.

To activate the label lights by the boat's battery switch, connect the red positive wire to the DC panel positive bus.

To activate the label lights by an independent switch or breaker, connect the red positive wire to the load side of the switch or breaker.

6. Optional—install grounding system wire

The grounding wire (bare, green or green with yellow stripe and normally non-current carrying) should not be confused with the negative ground wire (black or yellow and normally current carrying).

In *Boatowner's Illustrated Electrical Handbook*, Charlie Wing identifies three purposes of DC Grounding:

1. Holding conductive housings of low voltage (under 50 volts) DC devices at ground potential by providing a low resistance return path for currents accidentally contacting the device cases.
2. Providing a low resistance return path for electrical current, preventing stray currents that may cause corrosion.
3. Grounding metal electrical cases to prevent emission from inside or absorption from outside of radio frequency noise (RFI).

ABYC requires that grounding wires be sized no smaller than one wire size under that required for current carrying conductors supplying the device to which the grounding wire is connected.

7. Optional Branch LEDs

This panel is supplied with LEDs pre-installed in all optional branch positions. For future expansion of the panel remove the positive leg of the LED from the negative bus and connect it to the load side of the corresponding branch circuit breaker.

8. Optional—Upgrading to 24 Volts

Remove and replace the existing 8-16V DC voltmeter with an 18-32V DC voltmeter (PN 8240). Connect the existing meter sense wires to the new meter, Red Positive wire to "+" and Yellow Negative wire to "-".

Note

This Blue Sea Systems electrical distribution panel is furnished with 15A circuit breakers for DC branch circuits. These ratings will satisfy the vast majority of marine circuit protection situations. As shown in the Wire Sizing Chart, even 16 AWG wire, which is the minimum wire size recommended by ABYC, has an allowable amperage greater than 20A.

Wire Sizing Chart

1. Calculate the maximum sustained amperage of the circuit. Measure the length of the circuit from the power source to the load and back.
2. Does the circuit run in an **engine space** or **non engine space**.
3. Calculate **Famps** (Feet x amps). Multiply circuit length by max. current.
4. Base the wire on either the 3% or 10% **voltage drop**. In general, items which affect the safe operation of the boat and its passengers (running lights, bilge blowers, electronics) use 3%; all other loads use 10%.
5. Starting in the column which has the right **voltage** and **voltage drop**, run down the list until arriving at a value which is greater than the calculated **Famps**. Move left to the **Ampacity** column to verify that the total amperage of the circuit does not exceed the maximum allowable amperage of the wire size for that row. If it does, move down until the wire ampacity exceeds the circuit amperage. Finally, move left to the **wire size** column to select the wire size.

Example

- a. A 12 volt system at 10% drop with a 40' circuit x 45 amps = 1800 Famps. A wire size of 8 is required.

Wire Size	Wire Ampacity		Voltage Volt Drop →	12		24		32	
	non-engine	engine		3%	10%	3%	10%	3%	10%
16	25.0	21.3	→	86	288	173	576	230	768
14	35.0	29.8	→	138	459	275	918	367	1223
12	45.0	38.3		219	729	437	1458	583	1944
10	60.0	51.0		348	1159	695	2317	927	3090
8	80.0	68.0		553	1843	1106	3686	1474	4915
6	120.0	102.0		879	2929	1757	5858	2343	7811
4	160.0	136.0		1398	4659	2796	9319	3727	12425
2	210.0	178.5		2222	7408	4445	14815	5926	19754
1	245.0	208.3		2803	9342	5605	18684	7474	24912
0	285.0	242.3		3536	11788	7073	23576	9430	31434
00	330.0	280.5		4457	14858	8915	29715	11886	39620
000	385.0	327.3		5619	18731	11239	37462	14985	49950
0000	445.0	378.3		7086	23620	14172	47241	18896	62988

Note: For wire with 105°C insulation rating and AWG wire sizes.

Chart courtesy of the West Advisor

AC Installation

1. Install branch circuit wires

Determine the proper wire size for each branch circuit using the chart below. Verify that the standard circuit breakers installed in the panel are correct for each branch circuit. Remove and replace any that are incorrectly sized. The circuit breaker must have a rating less than the allowable amperage of the wire, yet greater than the circuit's continuous current.

Connect each branch circuit hot (black) to the appropriate load terminal. Connect each branch circuit neutral (white) to one of the screws on the neutral bus. Connect each branch safety ground wire (green) to one of the screws of the safety ground bus.

Do not confuse the neutral current carrying wires (sometimes called ground) with the green normally non-current carrying wires (sometimes called grounding). These two wires must be connected only at the source of power, nowhere else.

Wire sizing chart

Use the wire sizing chart below to determine the proper branch and feed circuit wire sizes.

Allowable Amperage of Conductors

Wire Size (AWG)	Outside Engine Spaces	Inside Engine Spaces
16	25.0	21.3
14	35.0	29.8
12	45.0	38.3
10	60.0	51.0
8	80.0	68.0
6	120.0	102.0
4	160.0	136.0
2	210.0	178.5

Note: For wire with 105°C insulation rating and no more than 2 conductors are bundled. Not suitable for sizing flexible shore power cords.

AC Installation (continued)

2. Install feed circuit wires

Install the feed wires from the shore power inlet or other AC source, referring to the wire sizing chart to select the correct wire size. Connect the black AC hot, white AC neutral and green AC safety ground as shown in the illustration.

If the feed wires are from the shore power inlet or the electrical attachment point of a permanently installed shore power cord and the inlet or attachment point is more than 10 feet from this panel, additional fuses or circuit breakers must be installed within 10 feet of the shore power inlet. The measurement is made along the conductors.

3. Optional Branch LEDs

This panel is supplied with LEDs pre-installed in all optional branch positions. For future expansion of the panel remove the AC hot leg of the LED from the AC neutral bus and connect it to the load side of the corresponding branch circuit breaker.

Note

This Blue Sea Systems electrical distribution panel is furnished with 15A or 8A circuit breakers for AC branch circuits. 15A circuit breakers are used in all 120V panels and 8A circuit breakers are used in all 230V panels. These ratings will satisfy the vast majority of marine circuit protection situations.

Panel Mounting and Testing

1. Apply branch circuit labels and mount panel

Apply a label for each circuit from the label set provided. If the appropriate label is not included, extended label sets are available through retail suppliers, and over 500 individual labels are available directly from Blue Sea Systems. Please go to www.blueseasystems.com to order stock or custom labels for specific applications. Fasten the panel to the mounting surface using the screws provided.

2. Testing

- Reconnect the main positive cable to the battery terminals and turn the main switch on to supply power to the panel. Turn on all branch circuits and test the voltage at the panel. Compare this voltage to the battery terminal voltage to determine that the voltage drop is within 3%. With all branch circuits still on, test the voltage at one device on each circuit to determine that there is a 3% or 10% drop as is appropriate.
- Connect the shore power cable to the boat AC power inlet. Do not connect the shore power cable to the shore power pedestal. Instead run the shore power cable such that the shore power plug is next to the AC panel. With an Ohmmeter verify that the pins of the shore power plug are connected to the appropriate terminals of the panel. Refer to ABYC E-11 Figure 13 or 14 or NEC / NEMA documents for the standard pin arrangements for your plug.
- Connect the vessel's shore power and verify the Reverse Polarity light is not illuminated. If the red Reverse Polarity light is on then either the hot and ground or the hot and neutral wires have been crossed. Starting at the panel, trace the connections back as far as necessary to locate the error.
- Using a multimeter where the power source is connected to the panel verify:
 - PN 8095 / PN 3095—120 Volt AC
 - a. 120 volts between hot and neutral (nominal, this may vary depending on source voltage)
 - b. 120 volts between hot and ground.
 - c. 0 volts between neutral and ground.
 - PN 8195 / PN 3195—230 Volt AC
 - a. 230 volts between hot and neutral (nominal, this may vary depending on source voltage)
 - b. 230 volts between hot and ground.
 - c. 0 volts between neutral and ground.
- Turn on each branch circuit to verify power to each circuit.

Reference

Applicable Standards

- American Boat and Yacht Council (ABYC) Standards and Recommended Practices for Small Craft sections: E-1, E-3, E-9.
- United States Coast Guard 33 CFR Sub Part 1, Electrical Systems

Useful Reference Books

- Calder, Nigel (2005). *Boatowner's Mechanical and Electrical Manual* (3d ed). Camden, ME: International Marine / McGraw-Hill.
- Wing, Charlie (2006). *Boatowner's Illustrated Electrical Handbook* (2d ed). Camden, ME: International Marine / McGraw-Hill.

Other Innovative Products from Blue Sea Systems

- 360 Panel System
- Battery Management Solutions
- AC and DC circuit protection devices
- Waterproof circuit breaker panels
- Fuses, fuse blocks, and BusBar
- Analog and digital meters

Questions and Comments

We invite your questions and comments. You may contact us at the address below. To find out more about our full line of marine electrical products visit our web site at www.blueseasystems.com.

