

## DC Power Distribution Panel

PN 8081 / PN 3081 5 Position  
PN 8082 / PN 3082 10 Position

### Panel 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		
Circuit Breakers:	15 Ampere AC/DC magnetic 65V DC/277V AC Maximum		
Amperage Rating:	All components are sized for 100 Amperes of continuous current		
Voltage Rating:	Panels are rated for 12 volts DC. Panels can be upgraded to 24 volts with PN 8243, 18-32V DC Micro Voltmeter.		
Voltmeter Rating:	8-16 Volt DC meter. Accuracy 3% of scale		
Ammeter Rating:	0-50 Ampere DC meter. Accuracy 3% of scale		
External Shunt:	50 Millivolt = 50 Ampere resistive manganin element		
Overall Dimensions:	<b>PN</b>	<b>Inches</b>	<b>Millimeters</b>
	8082/3082	5-1/4 x 11-1/4	133.40 x 190.50
	8081/3081	5-1/4 x 7-1/2	133.40 x 190.50
Mounting Centers:	8082/3082	4-7/16 x 10-7/16	112.70 x 265.10
	8081/3081	4-7/16 x 6-11/16	112.70 x 169.90

### Applicable Standards

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

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## ⚠ WARNING ⚠

- ✓ It is not possible within the scope of these instructions to fully acquaint the installer with all the knowledge of electrical systems that may be necessary to correctly install this product. If the installer is not knowledgeable in electrical systems we recommend that an electrical professional be retained to make the installation.
- ✓ 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 proof.
- ✓ 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.

### Guarantee

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

### Useful Reference Books

Calder, Nigel, 1996: *Boatowner's Mechanical and Electrical Manual*, 2nd edition, Blue Ridge Summit, PA: TAB Books, Inc.  
Wing, Charlie, 1993: *Boatowner's Illustrated Handbook of Wiring*, Blue Ridge Summit, PA: TAB Books, Inc.

### Related Products from Blue Sea Systems

PanelBack Insulating Covers  
High Amperage Fuses and Circuit Breakers for positive feed wires  
High Amperage Battery Switches  
Terminal Blocks and Common Bus Connectors  
AC and DC Voltmeters and Ammeters

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## Installation

### 1. Disconnect all AC and DC power

Before starting, disconnect the main positive cable from all batteries to eliminate the possibility of a short circuit while installing the distribution panel. Also disconnect the AC shore power cord from the boat to eliminate the possibility of electrocution from AC wiring in the proximity of the DC distribution panel.

### 2. Optional - Upgrading to 24 Volts

Remove and replace the existing 8-16V DC voltmeter with an 18-32V DC voltmeter (PN 8243). Connect the existing meter sense wires to the new meter, Red Positive wire to + and Yellow negative wire to -.

### 3. Apply Voltage Label

All panel components are sized for 12 or 24 Volt systems. Use the labels provided to permanently identify the system voltage and its type (DC) as required by ABYC. Apply the appropriate voltage label to the recessed area on the front of the panel.

### 4. Select mounting location and cut opening

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, gas 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 cut out in the mounting surface where the distribution panel is to be mounted. Do not fasten the panel to the mounting surface.

### 5. 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 ampere total capacity. The positive feed wire must be sized for 3% voltage drop at the 100 ampere 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.

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.

### 6. 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 an additional length of feed wire from the remaining shunt terminal, now the negative terminal, to the panel positive bus. 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 the positive sense wire 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 the negative bus on the panel to DC negative.

### 7. Install battery bank voltage monitor wires

The panel is supplied with a voltmeter 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.

# Installation (continued)

## 8. Install branch circuit wires

Determine the proper wire size for each branch circuit using the guidelines in step 4. Verify that the standard 15 ampere 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 or yellow) branch circuit wire to the DC negative bus. **DO NOT CONFUSE THE DC NEGATIVE BUS WITH THE DC GROUNDING BUS.**

## 9. Optional - install grounding system wire

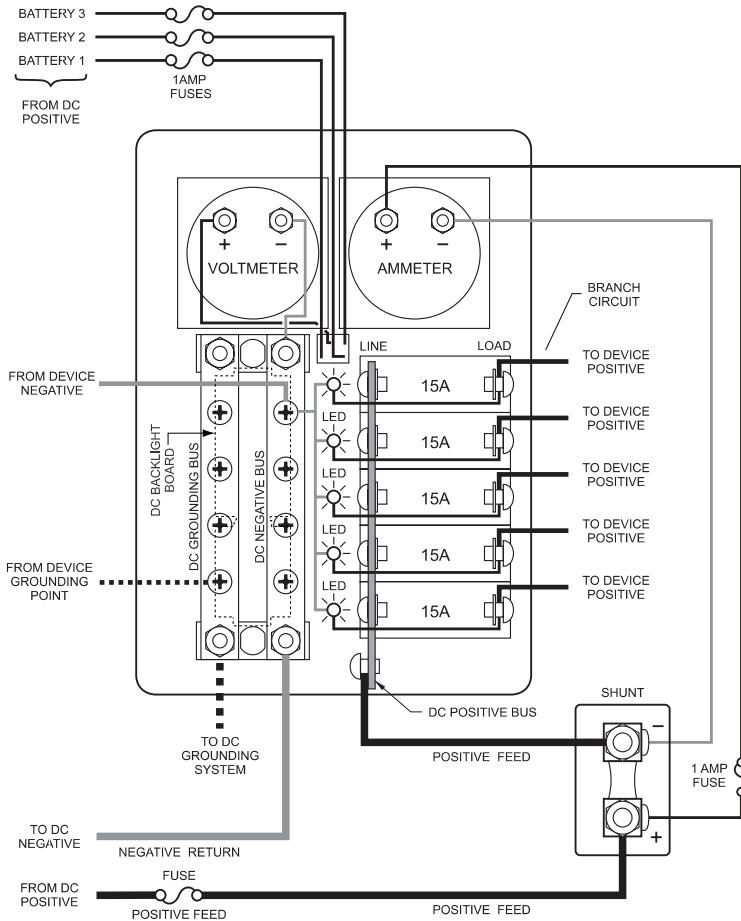
The grounding wire (bare, green or green with yellow stripe and normally non-current carrying) should not be confused with the negative ground wire (black or yellow and normally current carrying).

In *Boatowner's Illustrated Handbook of Wiring*, 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 coming into contact with 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 interference (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.

A full treatment of this subject is not possible within the scope of these instructions and there is controversy surrounding the general subject of DC bonding, of which DC grounding is a component. It is suggested that installers not familiar with this subject consult one of the reference books listed elsewhere in these instructions.



**Wiring Diagram**

DC Power Distribution Panel with Voltmeter and Ammeter  
(PN 8081 / PN 3081 shown for reference)

## 10. 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.

## 11. Apply branch circuit labels and mount panel

Apply a label for each of the branch circuits from the 30 basic labels provided. If the appropriate label is not included, the Extended Label Set of 120 labels may be ordered from your marine supplier (PN 8039). Individual labels are also available from Blue Sea Systems for specific applications. Refer to the label order form for a complete listing of individual labels.

Fasten the panel to the mounting surface using the panel mounting screws supplied with the panel.

## 12. 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.

## 13. Optional Branch LED's

This panel is supplied with LED's 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.

## Note

This Blue Sea Systems electrical distribution panel is furnished with 15 amp AC/DC circuit breakers. This rating was selected to minimize the need for removing the panel's circuit breakers and reinstalling different size circuit breakers. As shown in the Wire Sizing Chart included with these instructions, even 16 AWG wire, which is the minimum wire size recommended by ABYC, has an allowable amperage greater than 20 amperes. Additionally, it would be rare to have more than 15 amperes of current flowing in any one circuit. Therefore, 15 ampere circuit breakers will satisfy the vast majority of marine circuit protection situations.

## 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 runs 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% Famps	10% Famps	3% Famps	10% Famps	3% Famps	10% Famps
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

