

Analog DC Voltmeter

8-16 Volts PN 8003 / PN 8028

Meter Specifications

Input Voltage:	8 Volts DC to 16 Volts DC		
Amperage Draw:	1 Milliampere		
Display:	Analog scale 8-16 Volts		
Accuracy:	3% of scale range (.24 Volt)		
	PN	Inches	Millimeters
Face Width:	8003	2-1/2	63.50
	8028	2	50.80
Mounting Hole:	8003	1-7/8	47.60
	8028	1-1/2	38.10

Guarantee

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

Blue Sea Systems Inc.
425 Sequoia Drive Bellingham, WA 98226 USA
Phone (360) 738-8230 Fax (360) 734-4195
E-mail conductor@blueseas.com
www.blueseas.com

Document 9310 Rev.D

Installation

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.

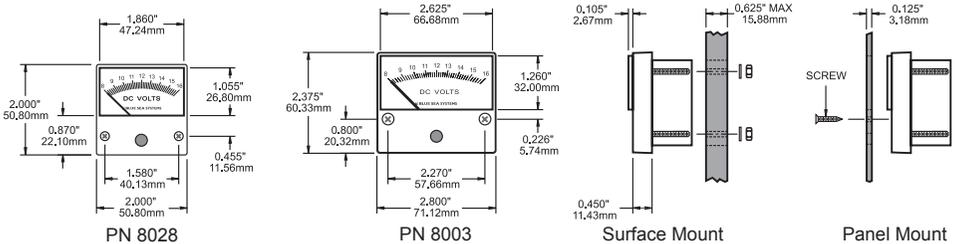
1. Disconnect all AC and DC power

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

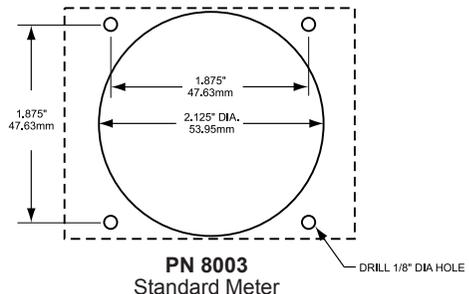
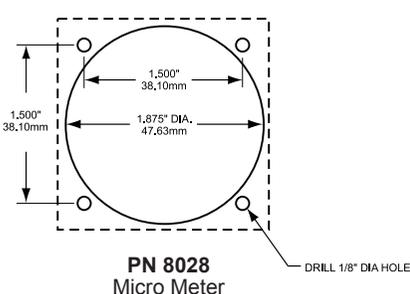
2. Select mounting location and cut opening

Select a mounting location which is protected from water on the meter front and back and is not in an area where flammable vapors from propane, gasoline or lead acid batteries accumulate. The meter is not ignition protected and may ignite such vapors. There are two mounting methods for the 8028 and 8003 meters, surface mount or panel mount.

Installation (continued)



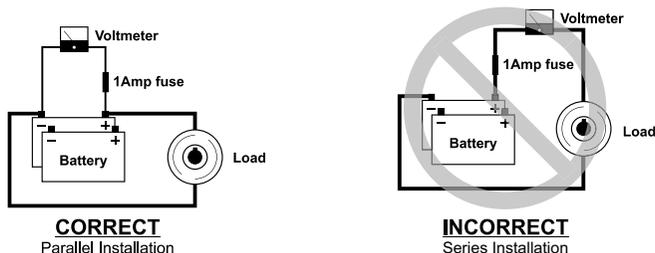
3. Surface Mount: Drill five clearance holes as shown below. The part number of the meter will determine the size and location of the clearance holes. Use the nuts and washers supplied in the accessory package to secure the four mounting studs to the mounting surface. This method will work on mounting surfaces up to 5/8" thick.



4. Panel Mount: For thicker mounting surfaces, the meter can be mounted into a 0.125" thick panel. Blue Sea Systems offers meter mounting panels for our standard size meters only. For PN 8003 use PN 8013 to mount a single meter or PN 8014 to mount two meters.

Installation of Voltmeter Wires

Wire the meter as shown below, making certain to attach the positive lead to the terminal on the meter marked "+" and the negative lead to the terminal marked "-". Use a minimum 16 AWG wire, red for positive and black or yellow for negative (ABYC recommends yellow for negative). Install a 1 ampere fuse in the positive lead near the source. Do not connect the voltmeter in a serial (in-line) configuration.



Use of Voltmeter

A full treatment of the subject of battery management is beyond the scope of these instructions. However, we believe that it is necessary to alert our customers to the issues involved and urge that the issue be studied further. There is probably no other activity that will contribute more to a healthy electrical system than proper battery management. There are several ways to measure the state of charge in a battery or battery bank. The three most common methods are:

1. Open Circuit Voltage 2. Electrolyte Specific Gravity 3. Net Amp-Hours
None of these methods is perfect, but the primary determinant of success in measuring battery charge and managing battery condition is the operator's knowledge. Voltage is an effective method of determining charge condition when properly used with an understanding of the battery charge/discharge process. It is not generally realized that the difference between a fully discharged and a fully charged battery is about 1 volt. The table below shows the percent of charge for various voltages:

**Open Circuit Voltage vs. State-of-Charge
12 Volt Battery Open Circuit Voltage**

State of Charge	Wet Cell	Gel Cell	AGM
100%	12.7-12.6	12.95-12.85	12.90-12.80
75%	12.40	12.65	12.60
50%	12.20	12.35	12.30
25%	12.00	12.00	12.00
0%	11.80	11.80	11.80

Note: Divide values in half for 6-volt batteries.

Experts recommend that for maximum life a battery be discharged no more than 50%. Once a battery has been charged to approximately 80% of full charge its acceptance rate decreases rapidly and it can take a great amount of charging time to bring the charge to 100%. For this reason, in practice, the operating range becomes the 50 - 80% of charge area. Voltage is a good indicator of charge condition only when a battery's true open circuit voltage is measured. Open circuit voltage is obtained when a battery is neither charged nor discharged and then the voltage is allowed to stabilize. There is disagreement about the length of time the battery is required to rest before a usable open circuit voltage is obtained. However, the user will observe that in the first 10 to 20 minutes of rest the voltage will settle to a figure close to its completely rested open circuit voltage, which is generally considered to be obtained at 24 hours. Gel batteries can take up to 48 hours. With experience, the user will learn the time required for reliable readings on any particular system.

A particularly good treatment of this issue is presented in Nigel Calder's *Boatowner's Mechanical and Electrical Manual* (Second Edition, McGraw Hill).