

# How to check your Boat's Electrics

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### Rules

1. Leave Shore Power and Mains Voltage Generators to the Professionals
2. Remember while 12 volts will not normally hurt you a 12 volt battery can deliver a large current which could melt a screwdriver.
3. Before you measure, check you've got the meter set up correctly.

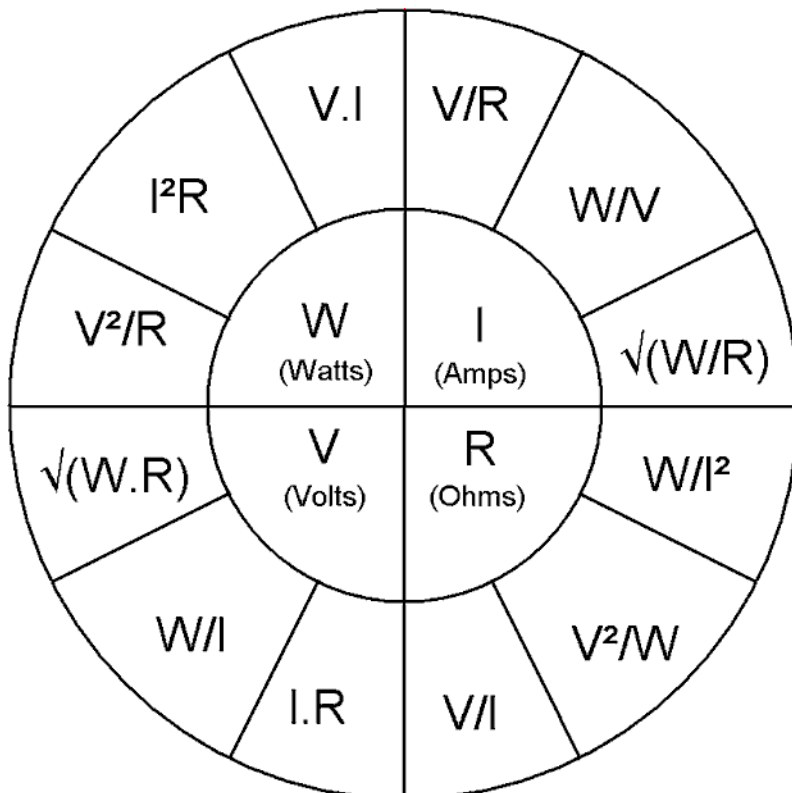
### Some Definitions

Quantity	Definition	Unit	Symbol
Voltage	Electromotive force or potential difference	Volts (V)	V
Current	A flow of electric charge	Amperes (A)	I
Resistance	The opposition of a body to current passing through it	Ohms ( $\Omega$ )	R
Power	the amount of work done by an electric current, or the rate at which electrical energy is transferred.	Watts (W)	W

### Ohms Law and Power Law

$$V=I \times R \quad \text{and} \quad W=V \times I$$

Knowing any two values allows you to calculate the other two using the "Electronic Wheel of Fortune"



For Example. If you want to know the voltage, look at the bottom left quarter and the three equations round the outside ( $\sqrt{W.R}$ ,  $W/I$  and  $I.R$ ) will all give voltage.

## Measuring Voltage

- Set the meter to the next highest range to the voltage you are measuring. For example if you are measuring a 12 volt system, select the 20 volt range.
- Connect the test leads to the correct sockets on the meter, normally those marked "Common" and the "V $\Omega$ mA".
- Connect the black lead to the battery negative and connect the red lead to the point to test.

For a 12 volt battery of the type used on a boat:

- A 12 volt battery:
  - Full Charge no load            12.6V – 12.8V
  - Full Discharge no load        11.8V – 12.0V
  - Full Discharge loaded        10.8V
- Check your battery and record the value in the log.

## Measuring Current

*Warning an Ammeter has a very low resistance and will be damaged if corrected directly across a battery.*

- Set the meter to the 10 Amp range.
- Connect the test leads to the correct sockets, normally those marked "Common" and the "10ADC".
- Break the circuit and connect the meter across the break. One way is to connect across the switch with it turned off, the meter completes the circuit.

## Measuring Resistance

Most meters will measure resistance, however in most boat cases the actual value is not what is needed, what is normally needed is to know whether a component (fuse, bulb etc) has "blown". To find out:

- Set the meter to a low resistance range.
- Connect the test leads to the correct sockets on the meter, normally those marked "Common" and the "V $\Omega$ mA".
- Connect the test leads across the component. If a low value is displayed then the component is good, if a high value then the component is bad. If you are not sure what constitutes a low or a high value, a low value will be displayed when the leads are connected together and a high value will be displayed when the leads are not connected to anything. Some meters have a buzzer which sounds when a very low resistance is found, i.e. the component is good.

Before using your meter in anger, it is worth practising with a small battery and a torch bulb so you get familiar with both the meter and how to set it up.