

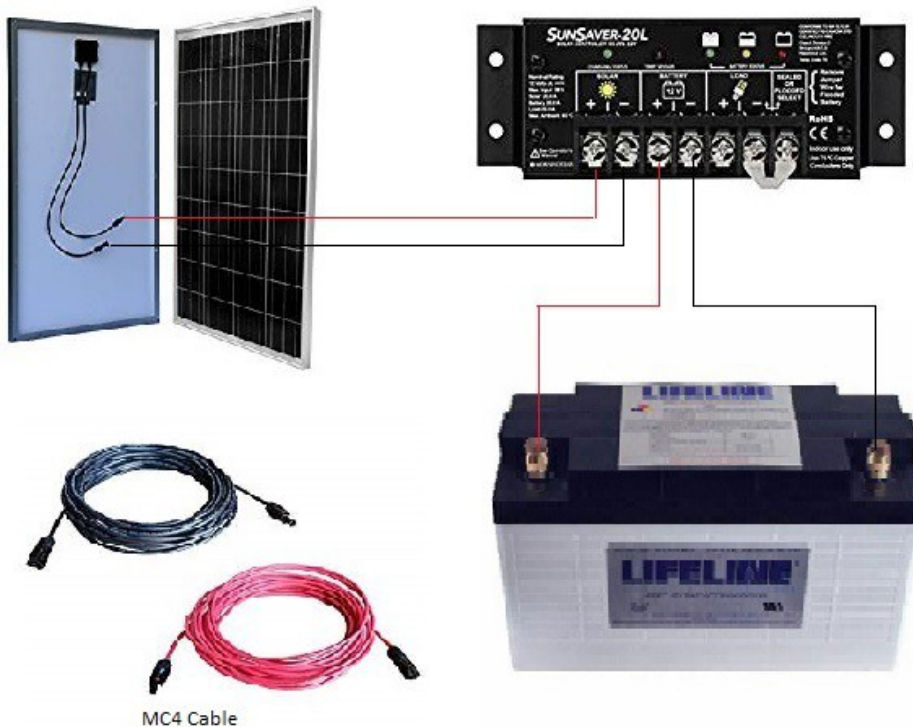
Solar Panels for your Boat

Solar panels can be a great addition to your boat. They can provide enough power so a typical boater can be self-sufficient indefinitely if his DC power needs are moderate.

This article will discuss a typical small system installation, either a single 100 watt panel or two parallel 100 watt panels. A bigger system will require a MPPT controller and probably a different wiring scheme. The discussion below uses a PWM (pulse width modulation) controller which is more cost effective for small systems.

A 100 watt panel such as one of these, <http://tinyurl.com/y9pmrrwy>, can be purchased from Amazon or eBay for about \$100. The flexible panels on this page would also be a great solution for a bimini mounted system as they weigh a third of the conventional panels. But they don't bend much and previous versions have suffered from deteriorating performance over time. So caveat emptor!

Victron now have low cost MPPT controllers available and this is a good one for a simple installation-
<https://tinyurl.com/y6x9oeco>. [This](#) is what the final installation will look like in a pictorial/schematic representation:



As you can see from above, most panels have an MC4 cable output which provides an easy, waterproof, high amperage connection. So, follow these installation tips if you want to use MC4 cables:

Depending on where you mount the panel, buy 20' or 50' of 10 gauge MC4 cables in pairs of red and black. Here is a page of them: <http://tinyurl.com/y933l4sb>.

Use the MC4 cables to connect the panel output to the controller input. Cut off the end of the MC4 connector near the controller and crimp on a ring connector to make the final connection.

Mount the controller inside. You can either connect it to the main DC panel or directly to the batteries. If to the DC panel, use a spare breaker (20A) to back feed the solar panel output. If directly to the batteries put a fuse within 6" of the battery. Use #10 wire if the distance is short-five feet or less, 8 gauge if longer.

To mount the panels buy some short aluminum brackets or cut pieces from angle aluminum for L brackets. Attach a bracket to each corner of the panels with nuts and bolts to make a stand off to allow air circulation underneath. Then using a tube of thickened epoxy, glue the brackets to your roof, someplace where it won't be shaded.

When everything is hooked up, make sure the panel is in sun and check the controller. It's LEDs will indicate how it is working. Then check the voltage at the battery terminals. It should be 13+ volts if the battery was fully charged before the panel was hooked up. If the voltage is lower, then check your connections and their polarity.

So, how about bigger or more panels? A simple and reasonably inexpensive way to increase capacity is to employ two 100 watt panels which will cover many boater's needs. Wire the two panels in parallel to a 20 amp controller with an MC4 Y and use all MC4 cables. Use 8 gauge MC4 cable for a run to the controller longer than 20 feet.

You can also use a higher wattage panel of 200 watts or more. But these are always higher voltage so it takes a maximum power point (MPPT) controller to manage the higher voltage which is much more expensive than the PWM controllers. Also since 200+ watt panels can't be shipped UPS, motor freight shipping can be expensive for a few panels.

Here are some rule of thumb values to help you with planning your installation:

A moderate DC user- an efficient fridge and LED lights, will use 50-75 amp hours in 24 hours.

You can pull 110 amp hours from a pair of GC batteries and stay within 50% SOC.

A horizontally mounted 100 watt panel puts out 30 amp hours over a full sun day.

From the above rules, you can estimate how much battery and solar charging capacity you need to stay at anchor for x days without running a generator or your propulsion engine. For example a moderate user who uses up to 60 amp hours daily should be able to last indefinitely in continuous sun with two 100 watt panels. But even if he is short by 30 amp hours every other day due to clouds, the solar panels will extend his stay to about a week without any other charging source. With no solar panels he would need to run the generator by the third day at anchor.

These are the basics of adding solar panels to your boat. Perhaps in a later article I will talk about how to measure your DC loads over time and how to calculate the size of panels you will need and the batteries that connect to them. But the above discussion should cover many of your solar panel installations.

David M