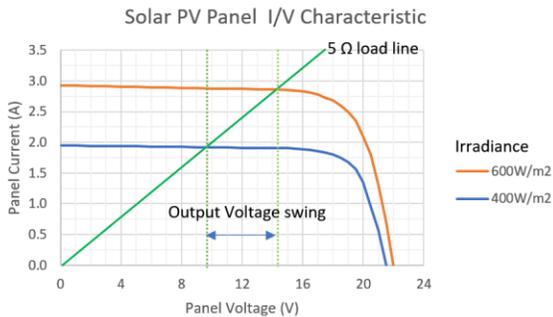


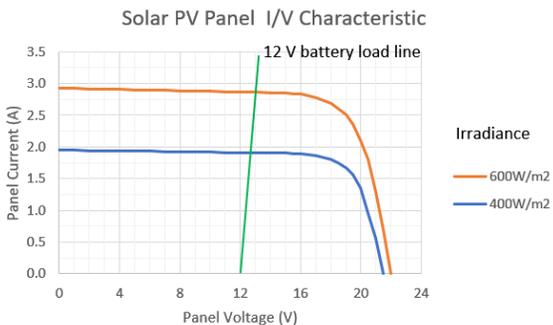
Solar Charging Basics - Application Note 106

Solar panel characteristics

Solar panels widely used today consist of an array of silicon diodes which convert the sun's energy directly into current. The output current of the panel is directly related to the solar energy falling on it but the voltage however is proportional to both the current and the load resistance. This can be seen from the chart below. A 40W load at 14V output voltage is represented by the 5 Ω load line. The solar panel output is shown for two different levels of solar radiation and the point where the load line intersects each of those curves indicates the panel voltage which in this case would swing from 9V to over 14V based on the change in sunlight from 400 to 600 W/m².



In practice this is not a problem since you will need to use a storage battery to provide power when the solar output is insufficient. Keep in mind that it is the storage battery that sets the output voltage. The load line is now almost vertical because of the low internal resistance of the battery and there is little variation in voltage with change in panel illumination.



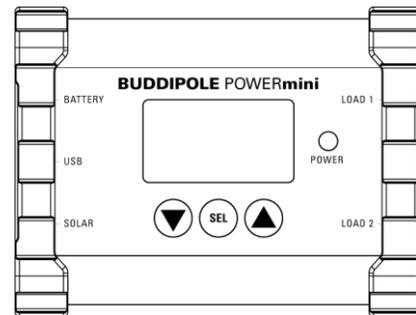
The message here is never try to operate your radio directly from a solar panel you must use a battery along with a charge controller.

Maximizing Panel Output

After it has made it through the atmosphere, on a clear day the amount of solar radiation reaching the surface of the earth is about 1000W/m², but this varies considerably by cloud cover, local obstructions, the time of day, the time of year and your latitude. To maximize the amount of energy captured, the surface of the panel should be perpendicular to the sun's rays. This is a big problem for a fixed installation, but fortunately for portable operations it is much less of a problem as it can be aligned in real time.

How do you know where to point the panel? A simple answer is to monitor the charge current and to orient the panel to maximize the current. POWERmini USB provides the tools to accomplish that.

POWERmini USB Solar Charging



POWERmini USB provides the ability to monitor the solar panel output in real time. This enables you to see just how much power the panel is actually delivering in real time and over the course of day.

```
SOLAR
13.49V
1.63A
3.0Ah
CHARGE
```

```
SYSTEM REPORT
PWR Up Time 4.5 Hr
SOLAR Power 22.0 W
SOLAR Peak 42.1 W
BATTERY Use 0.41 Ah
```

The ability to see panel output allows you to optimize both the elevation and azimuth so you can capture all of the available solar energy. You can lose 25% or more of the available solar energy if you don't optimize the position of your panel. Using the built in power measurement tools you can soon develop your skill in setting up your panel for best results so you can sit back and have fun operating your radio.