

Going Solar - Application Note 107

Solar Energy

The goals of portable radio solar power are considerably different from the goal of harnessing “free energy” from the sun to augment home energy needs and this note deals specifically with the radio application.

The biggest motivation for the portable operator is to supplement battery power to extend operating time without having to take a much larger (and heavier) battery. It is more about convenience than energy efficiency.

The sun bathes the entire planet with radiation, which on a clear day amounts to around $1\text{kW}/\text{m}^2$ on the surface of the earth. The very best solar panels of today are less than 25% efficient and accounting for other factors such as geographic location (latitude) the apparent height of the sun, (declination), the time of year and cloud cover you will not be harvesting nearly as much energy as you may think. Not to worry though, it is after all free!

Types of Solar PV panels

Electrical power for radio applications is generated mainly by Solar Photo Voltaic (PV) panels which are effectively an array of silicon diodes optimized for the conversion of solar energy to electrical energy. For portable operations the most popular panel type is the thin film amorphous panel. These are lower in efficiency than the rooftop fixed installations but have the advantage that they are physically flexible so they are available in both fold up and roll up forms. Another surprising advantage is that they perform well at lower light levels.

Aside from the theoretical performance of different panel types, it is important to recognize that there is a good deal of variability in the performance of low cost panels. Less reputable manufacturers are overly optimistic about efficiency and mute about the reliability of the panels.

Sizing a panel

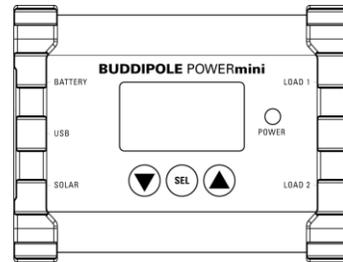
The panel should be sized to match the battery, which in turn needs to be sized to meet your operating requirements. Batteries are rated by their

capacity and output current capability. Many operators have found the combination of a 30W panel with a 20Ah battery to be just right. LiFePO4 batteries are lighter in weight and can normally provide much higher operating current for a given sized battery than a Lead Acid battery.

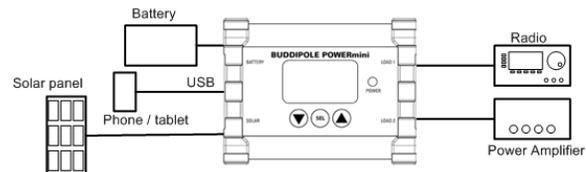
A question that is largely overlooked is, how do I know if I am getting enough charge to replenish the battery? Generic chargers don't help with this, but that is where a custom designed solution can.

POWERmini USB

POWERmini USB was designed specifically for portable radio operations and not only provides a capable and efficient charger, but also the tools to optimize the amount of solar charging as well as protecting the battery and radio.



In addition to providing monitoring of the solar panel as an aid to optimizing solar panel performance, POWERmini USB also monitors the energy consumption of your radio. This provides an instant summary of how much power reserve you have in your battery. The fact that all of this capability is provided in a single compact package means less cable clutter and the use of Powerpole connections means rapid setup and tear down.



The figure above shows a complete and sophisticated power system using POWERmini USB that not only powers your portable station but also provides the ability to charge a device such as a tablet or mobile phone, or other USB powered device.