



Portable Operation Power

Off Grid POTA HF Operation


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What we will be discussing

With the explosion of Parks On The Air, and portable operation in general, we will cover the following:

- Power Requirements of typical HF rigs
 - Battery Technology and Sizing
 - Solar Panels
 - Charge Controllers
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- A series of four yellow curved line segments in the bottom right corner, arranged to suggest a larger curved path or arrow pointing towards the top right.

Power Requirements

A typical POTA activation lasts an hour or less and in RI will be one or more QSOs a minute

Icom IC-7300
(modern)

CW: 5.5 A/H

SSB: 5.8 A/H



Icom IC-706

CW/SSB 7.4 A/H



Elecraft K3

CW/SSB: 9.5 A/H



NOTE: More casual Operation (20 QSOs/Hour) will take about 30% less current

How Much Voltage does your rig really need?

- While we use terms like “12 volt battery”, our rigs are really designed for a car’s electrical system.
- An Icom IC-7300 has a specification of 13.8 volts +/- 15%. In other words, it will work from a range of 11.8 volts to 15.9 volts.

If your voltage drops much below 12 volts, your rig will stop working!!



What about Sealed Lead Acid?

A 15AH Sealed Lead Acid (SLA) costs \$37

- At a 5.8 Amp discharge rate, the voltage will drop below 11.8 volts in only 60 minutes!!! (Usable capacity is 5.8AH)
- Life depends on discharge rate. At a 5.8 Amp rate it will last about 200 cycles.
- When we are done with it, it is HazMat with a \$10 disposal fee.



Weight: 9.4 Pounds

Height: 4 inches

Length: 6 inches

Depth 3.9 inches

A BETTER Choice: Lithium Iron Phosphate

- Battery Starts around 14 volts and will remain above 12 volts for more than 90% of it's rated capacity – ideal voltage range for ham use!
- It weighs half as much (4.2 pounds)
- It lasts TEN TIMES LONGER (2000 cycles)
- You can use 100% of its capacity without impacting life
- LiFePO4 “iron” batteries are MUCH safer than LiPo

The field performance of a 15AH LiFePO4 battery is equivalent to 3 SLA batteries weighting almost 30 pounds!!!

Life Cost of LiFePO4 vs SLA

The up-front cost of a 15 AH LiFePO4 battery is about \$140. It provides us with about 3 hours of operation and will do that 2,000 times.

To equal the capacity (3 hours of operation) and life, you will need to purchase 30 SLA batteries at \$37 each, for a life cost of \$1,100.

Those 30 SLA batteries will weigh 300 pounds and are all HazMat



Why chose 15AH?

Based on 12 years of field use and data from 50+ activations, it really is a personal choice

- Started at 60AH, ran a Field Day GOTA station with that and a 100-watt solar panel and had power left over.
- Got tired of lugging that around, so started using a 30AH battery
- Over time realized that a 15AH battery covered the longest POTA I've done (4 parks in a day)
- Like the idea of owning TWO 15AH batteries rather than ONE 30AH



Charging a LiFePO4 battery

Actual technology is simpler than an SLA charger. The charger will have a voltage limit between 14.2-14.6 volts and will limit the current to a value less than the Amp Hour capacity of the battery.

I use a 4A output Bioenno charger with mine (costs about \$25)



Solar Charging

LiFePO₄ batteries can easily be charged with portable solar panels AND an appropriate charge controller.

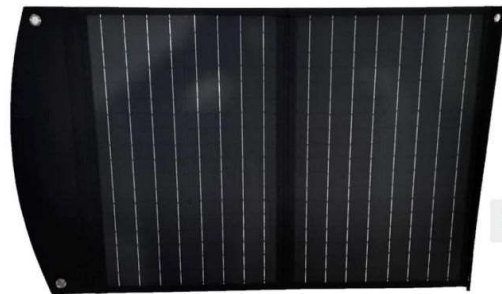


30-watt
PowerFilm
foldable panel
with Genasun
MPPT Charger

Solar Panels

Solar panels come in all sorts of capacities and types, like rigid panel, folding, rollable, etc.

I've been using a folding 30-watt PowerFilm panel that puts out about 2 amps at 16 volts. Newer panels are smaller and less costly



3.3 Amps @ 18 volts -> 60 watts
Weighs 5.5 pounds
20x14x2" folded
27x19x0.3" unfolded

Bioenno BSP-60-LITE \$150



Things to watch out for

Solar panels work best on bright sunny days with NO shading. Sun should be at a 90-degree angle to the panel.

- On an overcast day, you might get 10% output power
- If you shade the panel (shadow of a tree), expect to produce about 30% power
- If you don't keep the panel perpendicular to the sun by moving it throughout the day you will get about 50% power

In the field, I move my panel about once every 2 hours



Charge Controllers

- The purpose of the charge controller is to ensure that the output voltage remains at an appropriate level for the battery technology
- Essentially it is a voltage-limited power supply
- For LiFePO₄, the voltage limit is set to 14.2~14.6 volts
- Current is normally limited by the maximum capacity of a particular solar panel (like 3.3 amps for a 60-watt panel)

Charge Controller Types

- Cheapest are Pulse Width Modulation (PWM) – Keeps battery voltage at a safe level but won't use 20-25% of your panel's capacity. Your 60-watt panel will only provide about 47 watts while charging
- Optimal is MPPT (Maximum Power Point Tracking) Costs more but uses all your panel capacity. Bottom line is your 60-watt panel's 3.3 amp output will generate 4.0 amps of charging current



What I use

Genasun GV-10-Li-14.2V \$140

- Up to 10.5 amps
- Up to 35 volts
- 98% efficient
- Zero detectable RFI
- Industrial components



6.5 Ounces
5.5" long
2.5" tall
1.2" thick