



Bonner County Amateur Radio Club

November 8, 2023

VFW Post

1325 Pine Street, Sandpoint, ID 83864

18:00 hrs. – Informal Discussions & Eyeball QSO's

18:30 hrs. - Meeting

Opening Remarks



- Pledge of Allegiance
- Introductions
 - Members
 - New members
 - Guests
- Program for tonight
 - “Batteries and Solar Panels for Your Shack”
 - John Ailport, K7BSV, BCARC President



Batteries and Solar Panels for Your “Shack”

- Why might you consider including batteries in your radio shack.
- What kind of battery do you want/ need?
- Do you need an inverter?
- How much power do you need?
- What if one battery is not enough?
- Keeping them charged.
- Solar Panels.
- Solar panel charge controllers.
- Permanent or Temporary Hookup.



Why Batteries?

- You want to communicate quickly if the power goes out.
- Getting out the generator is a pain.
- You'd rather stay inside next to the wood stove in a storm.
- You want to always be capable of communicating.
- Your power goes out frequently.
- You live "off the grid".
- You just like the idea of never being without radio.

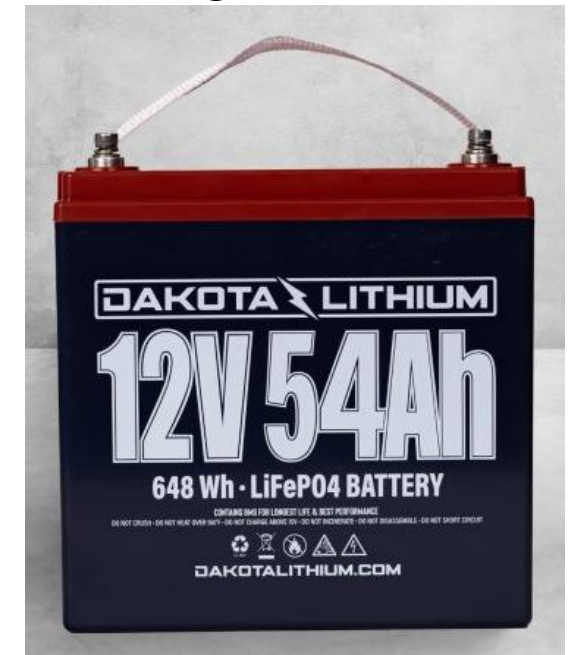




What Kind of Battery?



- Lead Acid Automotive Batteries – lowest cost, work well, good in cold, can off-gas and leak, very heavy.
- Deep Cycle batteries – various chemistries.
 - Lead Acid – many used for trolling motors, RVs etc. Good with solar, very heavy.
 - AGM – a different kind of lead acid, heavy, good deep cycle performance, safer than “old style” lead acid.
 - Li-Ion – NOT WITH A TEN FOOT POLE!!!!
 - LiFePO4 – Excellent power, lightweight, minimal safety concerns, Expensive!, not for subfreezing conditions.





Inverter Anyone?

- Do you need to run a computer or a monitor?
- Anything you must have to “run” your shack.
- Watch out for RFI, get one which is FCC compliant.
- You lose a lot of power with efficiency loss.
- Pure Sine Wave inverters good for FCC compliance.
- Size your 12V input wire accordingly!!



300W/ 12V = 25A
10 Ga wire needed

500W/12V = 42A
8 or 10GA wire needed





How much Battery?

To get a *very rough* estimate of how many amp hours your battery needs to have, you need to know:

- **Device current draw in amps (A):** How many amps does the device you're powering use? You can usually find this number listed on the device's label or power cord. If power consumption is listed in watts, [convert watts to amps](#).
- **Desired runtime in hours:** How many hours do you want to run your device for?
- **What is your battery's recommended depth of discharge?** Some brands will list a recommended depth of discharge (DoD) in the product manual. If yours doesn't have one, use the following rules of thumb: lead acid batteries can be safely discharged to 50%, while lithium and nickel-based rechargeable batteries can often be safely discharged to 100%.

Once you have the above info, [multiply the device's current draw in amps by your desired runtime in hours](#). Divide all that by the recommended depth of discharge.

Formula: battery amp hours = device current draw in amps × desired runtime in hours ÷ depth of discharge

Abbreviated: Ah = A × hrs ÷ DoD



How much Battery?

- Batteries don't discharge with 100% efficiency.
- The number of amp hours you'll actually get from your battery depends on how fast the battery is being discharged, something called C-rate.
- **Rechargeable batteries also lose capacity as they age.**
- So, you should treat the results you get from a battery calculation as the minimum number of amp hours you could possibly get away with.
- For most situations, oversize your battery by at least 25%.
- **If you plan on the possibility of several days of REALLY cloudy, foggy, nasty conditions, you may need more batteries to maintain communications until a solar panel will work (if power is still out).**



How much Battery?

How to Calculate Battery Amp Hours

To calculate a battery's amp hours, divide its watt hours by its voltage.

Formula: battery amp hours = battery watt hours \div battery voltage

Abbreviated: Ah = Wh \div V

How to Calculate Battery Watt Hours

- To calculate a battery's watt hours, multiply its amp hours by its voltage.
- **Formula:** battery watt hours = battery amp hours \times battery voltage
- **Abbreviated formula:** Wh = Ah \times V



- [LiFePO4 Batteries for Communication Equipment/Ham Radio – Bioenno Power](#)



Estimate of Ah required and Hours of run time:
20% Transmit
80% Receive

TRANSMIT (W)	RECEIVE (W)	TOTAL (W)	MODEL	VOLTAGE (V)	CAPACITY (AH)	CAPACITY (WH)	RUNTIME (HOURS)
5	5	5	BLF-1203W/A/AB	12	3	36	7.2
			BLF-12045W	12	4.5	54	10.8
			BLF-1206A/AB	12	6	72	14.4
			BLF-1209A/AS/WS	12	9	108	21.6
			BLF-1212A/AB/AS	12	12	144	28.8
10	5	6	BLF-1203W/A/AB	12	3	36	6
			BLF-12045W	12	4.5	54	9
			BLF-1206A/AB	12	6	72	12
			BLF-1209A/AS/WS	12	9	108	18
			BLF-1212A/AB/AS	12	12	144	24
20	5	8	BLF-1215A/AS	12	15	180	30
			BLF-1206A/AB	12	6	72	9
			BLF-1209A/AS/WS	12	9	108	13.5
			BLF-1212A/AB/AS	12	12	144	18
			BLF-1220A/AS	12	20	240	30
25	5	9	BLF-1215A/AS	12	15	180	22.5
			BLF-1206A/AB	12	6	72	8
			BLF-1209A/AS/WS	12	9	108	12
			BLF-1212A/AB/AS	12	12	144	16
			BLF-1220A/AS	12	20	240	26.7
50	5	14	BLF-1215A/AS	12	15	180	20
			BLF-1209A/AS/WS	12	9	108	7.7
			BLF-1212A/AB/AS	12	12	144	10.3
			BLF-1220A/AS	12	20	240	17.1

From Bioenno Power Website

- 4sqr.com/Battery_Capacity/index.php

W1PNS / WAØITP / AB8XA Battery Life Estimator *

Based on Jim Duffy's (KK6MC) Battery and Charging Systems White Paper **

Revised Aug. 10, 2011

[Batteries and Charging Systems for QRP](#) - Chocked full of facts and well worth reading.

Mode Duty Cycles

SSB - 20% CW - 40% AM/FM - 100% RTTY/Digital - 100%

The entries below are used to calculate the Battery A/H's needed based on your planned operation.

The entries below are used to calculate how long a Battery will deliver the desired A/H's.

Duration needed in Hours -

Mode Duty Cycle - ▼

Operator Duty Cycle (%) -

Radio's Receive Current in Amps -

Radio's Transmit Current in Amps -

Average Current Consumed -

A/H Capacity Needed -

A/H Capacity + Reserve -

- Battery Amp/Hour Rating

- Depth of Discharge (%)

Note - All Percentages must be entered as whole numbers without a "%" sign

- Usable Battery Amp/Hours

- Expected Battery duration in Hours ***



Estimating

- FM Radio VHF/UHF
- 2 Amps on receive
- 12 Amps transmit
- Listen 80%; Transmit 20%
- Formula: $2 \times .8 + 12 \times .2 = 4A$ required each hour
- Formula: Ah for battery / 4A = duration (hours)
- 60 Ah battery @50% discharge = 30 Ah avail.
- $30/4 = 7.5$ hours

If you have an emergency and you only turn on your radio to listen and possibly transmit once an hour you can extend the duration considerably, depending on the duration of the transmit vs. receive done each hour.

Like only turning on a light when you need it rather than leaving it on all the time.



If One is NOT Enough

Hook them in Parallel – Use Properly Sized Wire!!

This method assumes that your batteries are identical.

You should only wire identical batteries together.

The batteries should have the same age, voltage, and amp hours.

They should be the same battery type and the same brand.

Otherwise, you can get imbalances which can damage batteries and reduce capacity.



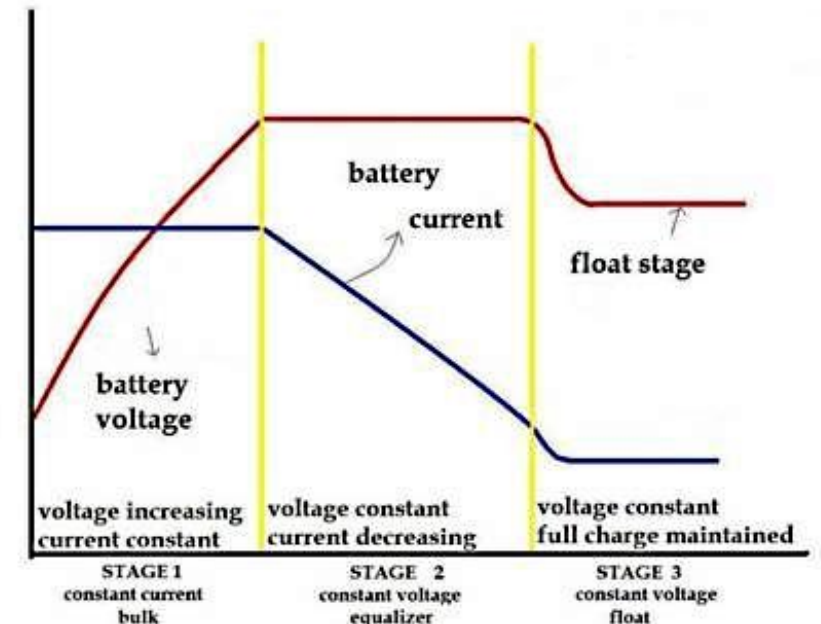


Keeping Them Charged

- Chargers are often chemistry specific (different voltages and charge rates).
- Lead Acid – ye olde automotive charger.
- AGM – need charger with that setting – or specific charger.
- LiFePO4 – need specific charger for that type battery and size battery.
- Watch out for RFI and interference from the charger.



THREE STAGE CHARGING CURVE





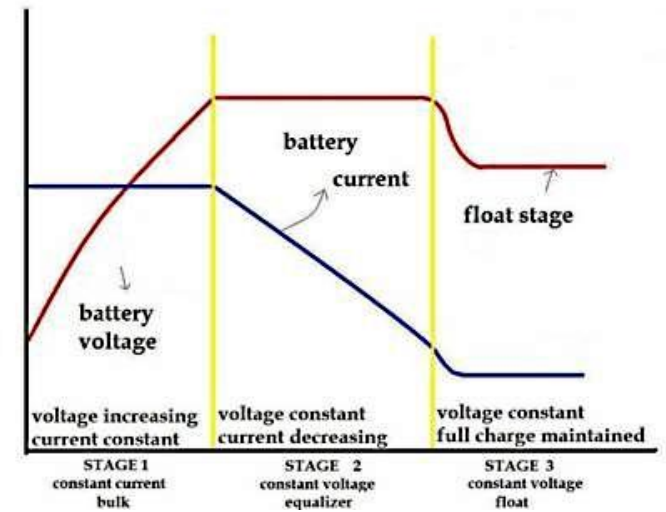
Keeping Them Charged

- Match the charger to the batteries – too many amps may damage a battery!
- Suggest you follow your battery manufacturers recommendation.
- You will want a plug in AC charger to keep them ready.
- Concerned about being out of power for a while – consider a solar panel.
- Solar panels also work well for POTA, SOTA, Field Day, etc.

Storage and maintenance of batteries

- Lead acid and AGM – OK for them to be in colder temps, but better if they are kept at room temp.
- Lithium type batteries (includes LiFePO4)
 - Store them at room temp (like in your shack).
 - Charge them every 2-3 months.
 - Fully charge them after use.

THREE STAGE CHARGING CURVE



Battery charging stages

There are three stages of charging a battery: **bulk**, **absorption**, and **float**. They correspond to how full the battery is.

- **Bulk:** When a battery charge is low, the charge controller can safely push a lot of energy to it, and the battery fills up with charge very quickly.
- **Absorption:** as the battery nears its full charge (around 90%), the charge controller reduces its current output, and the battery charges more slowly until it's full.
- **Float:** when the battery is full, the charge controller lowers its output voltage just a bit to maintain the full charge.



Solar Panels

- Lots of options
- Various sizes, weights
- Lots of options on wattage
- Most portable setup come with a charge controller
- Make sure the controller has the right voltage for your battery
- You can get complete sets with battery, solar panel, etc.
- Solar Panels/ charge controllers can produce RFI!!





How Many Watts - Solar Panel(s)

- Solar panels are rated at “full sun”, meaning no clouds, tree shadow, dust on the solar panel, etc.
- That’s with full sun – and this isn’t Arizona. Ratings will be for a new, clean panel in perfect conditions.
- Get data (if available) on how the solar panels will perform in various conditions.
- The type of panel will affect its solar efficiency.
- You can lose 25% of your solar efficiency with just dust on the panels – try to keep them clean.
- Cloudy days will reduce your solar efficiency to 10-25% of your rated wattage or less.
- Partial sun or, you forget to rotate the panel to follow the sun can cut the efficiency in half.
- Tilt angle can affect performance.
 - Winter sun is lower in the sky, panel should be more vertical
 - Summer sun is higher in the sky, panel should be aimed more upward

Bottom line: If you decide you normally will need a 100 watt solar panel, get one or a linked set with at least 50% more wattage. Average conditions when you expect to use the solar panels will dictate how much wattage you need.



How Many Watts - Solar Panel(s)

- Duty cycle, run time during no power situations – How long are you preparing for??
- How long is the power usually out?
- Do you need to run
- Size (Ah) of batteries
- Time to recharge
- Expected conditions (does the power go out on a bright sunny day?)
 - Probably stormy, cloudy, etc. - meaning really LOW to NO solar output.

Example: during Field Day with a strong 50-50 duty cycle, 170W panel will keep the battery fully charged even with partial sun and dust on the panel. Emergency use only – you don't need that much.

Test 11/2/23:

- Solar panel in house, facing a sliding glass door to the west. Very cloudy, fog, steady rain – 1030 no output
- Solar panel in house, facing a sliding glass door to the west. Same conditions-1430 .1A output
- Got good response with panel outside the garage and battery inside.
- Bottom Line – Test your equipment in your location!!



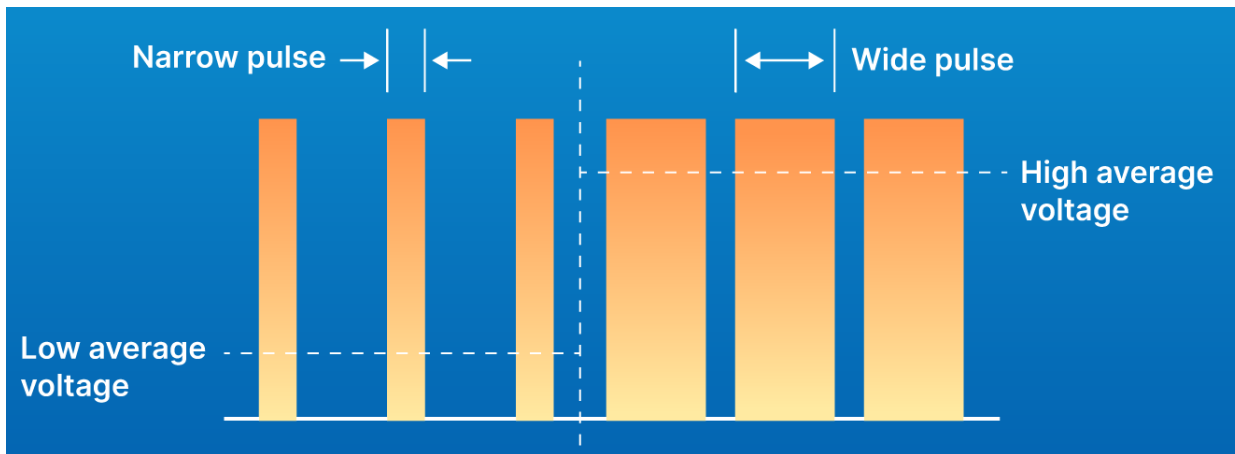
Charge Controllers for Solar Panel(s)

Pulse-width modulation (PWM)

Pulse-width modulation is the simplest and cheapest automatic way to control the flow of power between solar panels and a battery. **There are PWM charge controllers on the market for between about \$15 to \$40.**

Maximum power point tracking (MPPT)

An MPPT solar charge controller operates by converting the incoming power from solar panels to match the theoretical highest-efficiency output at the right input voltage for the battery. The charge controller does this by calculating the point at which the maximum current can flow at a voltage the battery can accept, then converting the solar panel output to that mixture of voltage and current.





Charge Controllers for Solar Panel(s)



These are FCC compliant. There are others.





Temporary or Permanent Hookup

- Are you going to run on battery all the time?
- Do you want to “be prepared” if the power goes out
- How complicated to you want to make it.

Permanent:

- Hard wire everything and make it neat.
- Standard automotive 12V connectors



Temporary:

- Can use “go-box” or Field Day/ POTA setup
- Use Anderson Power Poles or 12V SAE plugs; or battery clips

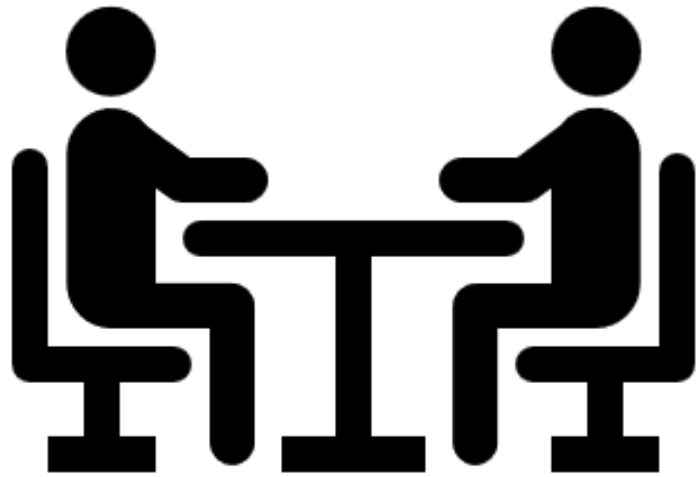




Well,



...And You were expecting "Bugs Bunny"?



BCARC
Business Items
and Activities

Business Items

- 2024 Officers Elections
 - Per the Bylaws, the Secretary will publish a slate of candidates in November
 - Positions are President, Vice President, Secretary, Treasurer
 - Please check out the position descriptions in the Bylaws (<https://k7jep.org/about-us/>)
 - If interested you can contact either John Ailport, K7BSV, BCARC President or Ken Conradi, KF7FDN, BCARC Secretary
- Annual dues are coming up January 1, 2024
 - Individual dues \$25, for families with more than one licensed ham \$35
 - Everyone please complete a membership form (<https://k7jep.org/about-us/>)
- Annual business meeting, January 10, 2024
 - Required by Idaho State Law of us as a 501(c)3
 - Please plan on being present and/or signing a proxy form just to make sure we have a quorum

Upcoming Activities

- Field Day 4th weekend in June (June 22-23, 2024)
 - We did very well in 2023 (1st in Idaho in Category 2A)
 - Forming a Planning Committee for 2024
 - Using callsign K7B
 - Single effort shared by BCARC and BCARES
 - Probable site just outside of Old Town on Highway 41
 - Please contact John Ailport, K7BSV, john.ailport13@comcast.net, if interested in joining the committee
- Radiosport opportunities
 - November 18-20 Sweepstakes – Phone
 - December 9-10 10-meter contest (phone and/or cw, Techs can play in this one!)

Breakfast at Connie's Cafe
323 Cedar Street, Sandpoint ID
November 18, 2023
09:00 hrs.

Next Meeting
December 13, 2023
VFW Post, Sandpoint, ID
No formal program

Holiday Gathering



PARTY

time

BCARC Holiday Gathering!

- Colleen Conradi, KK7KNL, organizing event
 - Expect RSVP request via [groups.io](https://www.groups.io)
 - If you are not on [groups.io](https://www.groups.io), respond directly to colleen_conradi@yahoo.com
- BCARC providing pizza, salad and non-alcoholic beverages
- If you are so motivated, please bring a holiday dessert
- Spouse and family most welcome

End of the Online Portion of the Meeting

- Going to be playing a game or two
- Awfully hard to do on Zoom!
- Please join us next month either in person or on Zoom



Tic Tac Code