Battery-Back-Up Power for Amateur Radio

These days of instant communications, we seem to rely on our cordless and cell phones, HTs and mobile rigs for our communications needs. One item we always seem to forget right as an emergency happens, are batteries. When the lights go out, the chargers we use to charge our HTs and cell phones no longer function.

Depending upon how sever the outage is, the cells and landlines might be dead also. You can't remember the last time you recharged your batteries for your HT, so it's operating time is unknown. The lights and phones are dead, the flashlights just barely work, and you can't communicate with other hams in your community or the outside world because your ham station is dead too.

Virtually all-modern amateur gear is designed to operate on 12 volts, making operation possible from highly reliable, heavy-duty batteries. Yet, battery backup is under appreciated and underutilized by amateurs probably because of a lack of familiarity and the supposed difficulty or expense of obtaining suitable batteries.

As useful and versatile as batteries are, building a battery back-up system requires a little care and planning. Many hams believe their HT's are a good battery back up for when the power goes out. Not so. HT's are notoriously unreliable into repeaters, and have very low output, and have marginal antennas and if you live in a wooded area the trees like to eat RF. Some even think that an old automobile battery with a dubious history, stuck under the operating desk with constitutes a battery back up for their ham station. Well, not exactly.

What Is a Battery?

We all know what a battery is…. it's that thing that goes dead in your wonderful electronic devices when you least expect it! Actually, there's a little more to it than that, so perhaps a review of battery basics is in order here.

A battery is an electrical storage device. Batteries do not make electricity; they store it, just as a water tank stores water for future use.

As chemicals in the battery change, electrical energy is stored or released. In rechargeable batteries this process can be repeated many times. Batteries are not 100% efficient --- some energy is lost as heat and chemical reactions when charging and discharging. The most efficient batteries are slow charging, slow discharging. Batteries are divided in two ways, by application (what they are used for) and construction (how they are built). The three major applications are **automotive**, **marine** and **deep-cycle** and all are flooded cell batteries. Selecting the correct batteries is all about lifespan. Its lifespan will vary considerably with how it is used, how it is maintained and charged, temperature, and other factors.

Automotive, or starting batteries; are normally used to start and run engines. Engine starters need a very large starting current for a very short time. Starting batteries have a large number of thin plates for maximum surface area. The plates are composed of lead “sponge”, similar in appearance to a very fine foam sponge. This gives a very large surface area, but if deep cycled, this sponge will quickly be damaged and will fall to the bottom of the cells.

Marine Batteries, many are actually “hybrid”, and fall between the starting and deep-cycle, while a few are true deep cycle. In the hybrid, the plates may be composed of lead sponge, but it is coarser and heavier than that used in stating batteries. It is often hard to tell what you are getting in a “marine” battery, but most are a hybrid. “Hybrid” types should not be discharged more than 50%.

Deep Cycle Batteries are designed to be discharged down as much as 80% repeatedly, and have much thicker plates. The major difference between a true deep cycle battery and others is that the plates are solid lead plates --- not sponge. Unfortunately, it is often impossible to tell what kind of battery you are really buying in some of the discount stores or places that specialize in automotive batteries.

There are two sizes, which will work very well for ham radio application, Group 24, and Group 27. These are the same groups that you might have in your car or truck. Group 24 will provide between 70-85 amp hour capacity, Group 27 between 85-105.

Deep cycle batteries are rated in Amp/Hours. Amp/Hour rating of a battery capacity is calculated by multiplying the current (in amperes) by time (in hours) the current is drawn. This rating will vary from battery manufacturers. For example:

A battery which can deliver 4 amperes for 20 hours before being discharged would have an 80 amp-hour battery rating (4 X 20= 80).

Selecting the Right Battery

If you plan to have a 2-meter rig on the air, a single deep cycle battery (Group 24) should suffice. Adding more radios might stretch the capability of that single battery; you would be better off incorporating two 24’s. The batteries should all be from the same group, and the same age; a new battery connected to an older battery will soon be drawn down to the level of the older battery and therefore won’t last as long. Maintenance free are flooded cell batteries, they are simply a standard flooded cell battery with sealed cells. Personally, I like to look inside to check the fluid levels every now and then.

If you chose to use automotive batteries, you will have to add some extra hard wear. Automotive batteries come with standard battery posts or side mounts. These mounts make it difficult to attach wires to, so what you will need are two “marine terminals.”

You can get these at any battery store, and fit over the standard posts (top mount) of the automotive battery and have a 3/8 inch threaded stud with wing nut attached; the newer deep cycle batteries will have both fittings.

Avoid the “side mount” batteries, for your system, you’ll need extra hard wear to convert to the marine type posts, and you may have trouble getting them to fit in the standard battery box’s if you plan to use plastic battery box’s.

Decisions and Everything in its Place

As with everything you have in your house, it would be a good idea to find a good place in your shack where are you going to put the batteries. If you have your shack in the garage, no problem; they can go any where with out a concerned look from your wife, girl friend or significant other.

If it’s in the house, there are some precautions you must undertake before you start this project.

Your shack may be your **cave**, but it’s in **her** house. Fine a place where the battery(s) will fit and be out of the way and accessible so you can check the fluid levels.

I suggest placing your battery(s) in plastic marine battery boxes; this will look nicer than the naked batteries sitting on **her** carpet or hardwood floors and will show her that you were concerned about taking every safety precaution that you could think of. You’ll score points here on safety and appearance issues.

Wiring It Up

I suggest using Red/Black Zip Cord. The reason for this is simple: You cannot be confused which is the positive and the negative. If you use regular brown lamp zip cord, you might get them confused and it might lead to fried wires or even a fire if you connect them to the wrong terminals.

I use the 12 gauge Red/Black Zip Cord* this would be your best bet for your VHF/UHF and HF operation. It’s made of 65/30 stranded copper wires and rated at 20 amps. I also suggest using the Red/Black Anderson Powerpole 30Amp* connector to connect your rig and batteries. They are genderless, easy to put together, the contact pins can be either crimped or soldered. The red/black color combination is the best connector I have found for DC operation. The next step you will be doing is wiring all the batteries together. This is not as difficult as you might think it is. To make this job neat and clean you will need some 10-12-ring terminals **. The 12 gauge will fit this terminal and I suggest you solder the wire to the terminal. These terminals come with a coating protecting the copper. Scrap the coating off so you expose the bare copper; it will make soldering much easier.

Depending how many batteries you have, you'll need 4 to connect 2 batteries, 2 for the charger, 2 for each radio you plan to use. Make sure your wiring harness between the batteries is long enough so the tops of the battery boxes will fit on the battery box.

Check your wiring with a VOM to make sure soldering and connections are good before you attach it to your batteries.

You will want to wire up all your batteries in PARALLEL. Connect the positive (red) wire of one battery to the positive of the second battery. Do the same with the negative (black) wire, negative to negative.

This will give you 12 volts, and the current rating total of all the batteries you have connected together, so if you have 2 Group 24 batteries rated at 130 Amp/Hrs; you'll have 260 Amp/Hrs at 12 volts. Again, check your voltage before you connect them to your radios.

Maintaining and Charging your Batteries

In order to get the most from your battery back up system, you can't just forget them now and expect them to work for you forever. It is very important to take good care of them and maintain the fluid levels. You must keep an eye on the electrolyte level in the batteries. Low electrolyte levels cause most premature failures. Electrolyte is lost whenever the batteries are charged and also discharged heavily. You should check the level in each cell of your batteries on a regular basis and keep the fluid above the plates. I recommend at least once a month, more often depending on usage and how you charge them.

To replenish the electrolyte, add **distilled water only** as required. I suggest using a turkey baster to add the distilled water. Never add acid. Do not use tap water! It contains chemical and mineral impurities and will kill your batteries prematurely. In order to keep your batteries in working order, you have got to keep them charged. A Battery Maintainer with a 1.5 to 2.0-amp charge rate should be adequate. The battery maintainer will charge the battery when it gets low, charge them to around 13.8, and then shut off. Most of these have indicator lights (green and red) tell you when the battery(s) are charged. To make sure your batteries are charged every day, use automatic on/off timer.

To Full Charge

The battery back up system and hard ware I have described to you in this article has been in use for emergency power for part of my station for about 10 years.

I keep one 2 meter radio connected to these two batteries as my emergency power system. The two deep cycle batteries have provided excellent service and I highly recommend them for battery back up for application for amateur radio.

Some of the items I have mentioned can be obtained locally, the Anderson Powerpoles and 12 gauge Red/Black cable can be purchased from Powerwerx*. I suggest purchasing your deep cycle batteries from a vendor who specializes in batteries and accessories.

You'll get professional advice from people who know their products and can answer any questions you have. A battery back up power system may be just what you need to keep your station going when emergencies arise and the commercial power fails

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* Powerwerx.com
** Home Depot or OSH