BATTERIES

All of our boats have batteries, and while an absolute necessity, they can be troublesome if not selected and cared for properly.

The battery's function is to provide current to start the engine. Once the engine is running, the current required to keep everything like the ignition system, bilge pump, lights and other components operating, as well as replenishing the current used to start the engine comes from the charging system, provided it has adequate charging capability. In theory, once the boat has started, current is provided by the charging system, and you no longer need the battery until the engine is stopped.

A typical battery utilizes a reversible chemical reaction to provide the necessary current to operate our boats. Traditional flashlight batteries simply produce current until they are depleted. By using the boat's charging system or a battery charger to provide current to reverse the chemical reaction, our lead-acid boat batteries can be recharged. Eventually however, a battery will wear out and will no longer hold a charge. A 12 V. lead-acid battery has 6 individual cells which each produce approximately 2 volts. Occasionally, you will experience a bad cell. The way to check for this is with a hydrometer. A typical battery well cared for will last reliably for approximately 3 years.

The fluid in a lead acid battery is a mixture of 2 parts of distilled water and 1 part of sulfuric acid. To measure the charge of a battery place the tube of the hydrometer in the cell you wish to check and withdraw enough acid into the tube to cover the float. The float will rise and float at a certain level. Merely read the scale on the float which lines up with the meniscus of the fluid to determine the specific gravity. Check each individual cell and look for any sign of a gross difference between cells. If one cell is noticeably lower, it is probably bad, indicating that the battery should be replaced.

Batteries are rated several different ways. The first and most obvious is by Voltage. The Reserve-Capacity Rating is the number of minutes a 12V. battery at 80 deg F can be discharged at a constant 25 amps and maintain at least 10.5V. Another way of looking at this rating would be to think of how many minutes your battery could sustain a 25 amp draw until it dipped below 10.5 Volts.

The second rating called Cold Cranking Amps or CCA involves how long a battery can operate a starter in extreme cold conditions. The rating specifies the minimum amps a battery at 0 deg. F can deliver for 30 seconds without falling below 7.2 Volts. Starters typically draw 300 amps or more under these conditions. As a general rule of thumb, when choosing a battery always try to get a battery that has at least 1 CCA for each cubic inch of engine displacement.

Our boats have two types of batteries; 6 Volt and 12 Volt. Many of our earlier boats, typically those made pre-1955 will have 6 Volt systems. While 6 Volt

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A hydrometer uses a graduated float or bobber to determine the specific gravity of the battery acid. The specific gravity determines the state of charge for the individual cells.

HYDROMETER A hydrometer is a special float contained within a glass tube similar to a turkey baster. See Fig 1. As the charge of the battery in increased, the specific gravity of the battery liquid rises. Interestingly, a fully charged battery will actually weigh slightly more than a discharged one. The float is carefully calibrated to measure the specific gravity or state of charge. When charging or checking your battery, aim for a specific gravity number around 1.270.

This small sticker is used by some sellers and installers to indicate the in-service or manufacturing date of the battery. Useful information in case of warranty issues. Make sure when you purchase a battery that the tag is never more than a month old.

systems work just fine when properly maintained, you may want to consider updating your system to 12V. Unless you feel obligated to maintain and preserve absolute originality, a 12 V, system is far superior for the following reasons:

Parts Availability Compared to 6V. batteries, 12 V. batteries are cheaper and more plentiful and are readily available in a wide variety of physical sizes. Accessories like bilge pumps, starters, and other electrical components are starting to become difficult to find in 6 V. configurations, which provide additional reasons to upgrade to 12V.

Functionality 12 V. systems offer much more power for starting which translates to reliability since they are not as affected by adverse current draw due to poor connections, and hot or cold conditions.

Cost 12 V. components such as bilge pumps, lights, and instruments, are much more available, and sold in a competitive market as opposed to 6 V. parts which enjoy a somewhat captive market.

By having a 12 V. system, you can now utilize an alternator in your charging system as opposed to a generator.

The battery data label gives all of the pertinent information for the battery including the in-service date in some cases.

Size - Batteries are classified by group number. This relates to the physical outside dimensions as well as the current capacity, post layout, and orientation. Charts giving the various dimensions for battery group designations can be found online. Learn your Group number and CCA rating so you can shop and compare batteries more effectively.

Tools - There are several dedicated battery tools which make dealing with batteries much easier. These tools are available as a kit at some auto and tools stores.

This set of dedicated battery tools can be very handy when installing or maintaining your battery

One of the best tools for somebody who just needs a quick analysis. It gives a quick reading of the charging system as well as the battery condition.

ALTERNATOR VS GENERATOR

An alternator provides DC current by switching alternating current to DC current. Alternators are far superior for our boats because they can deliver ample current at very low RPM as opposed to generators which perform poorly at low RPM. This deficiency comes into play when you have long periods of idle, such as an extended no-wake zone where your bilge pump, lights, stereo, and electric fuel pump and ignition may all be demanding current. A generator at low RPM cannot maintain the necessary current, so as a result, the battery becomes discharged. Unless an idle period is short, the ignition system fails because there is not enough current to operate it.

Purists and preservationists will have to live with a generator unless they are crafty and utilize an alternator hidden in the casing of a generator.

If you decide to retain your 6 V. system, here are some tips to keep the system running at peak performance.

1. Make sure ALL connections are clean and tight.
2. Make sure All grounds are in place and check them for resistance.
3. Cables and wires for 6 V systems must be much larger diameter than those found in 12 V. systems to prevent current loss. It is getting more difficult and expensive to find these heavier cables. They must often be fabricated or in some cases they can be sourced from heavy truck dealers.
4. Batteries should be maintained at full charge when not being used, and water must be replenished to prevent boiling due to overcharging. Using a Smart Charger which senses battery condition and does not overcharge the battery makes a lot of sense.

Overall good procedures for prolonged 6V. or 12V. battery life:

1. Keep all connections clean and well maintained.

A plastic battery box is the preferred method of housing a battery. In addition to physically restraining the battery,it is impervious to battery acid and vapors and it protects the battery from foreign objects which can damage or short out the exposed terminals.

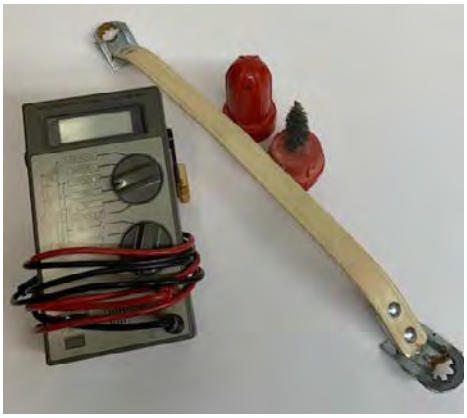
2. Keep the batteries fully charged and topped off with distilled water.
3. Unless absolutely necessary, try not to utilize rapid chargers which tend to overheat the batteries and boil off the water.
4. Make sure all components are operating properly. A starter motor which drags will consume an inordinate amount of current and will eventually fail; usually at an inopportune time and in a remote location. I have never known a starter to fail in someone's driveway on a day when they decide to just start their engine for the heck of it. Usually when the starter does fail, it will almost always be on a holiday weekend when you have a boatload of people and are as far away from the ramp as possible.
5. Make sure the starter cables are correctly sized to prevent current loss.
6. Use a bigger battery than you feel you need. Too big rarely ever hurts, too small is a constant source of trouble.
7. Make sure your battery is properly anchored to the boat to prevent movement and protected from objects which may come into contact with the positive terminal. A plastic battery box is the preferred method, unless you are trying to maintain originality.

A simple battery hold down frame when space is a consideration. If used be sure to cover the terminals with rubber boots to insulate them.

Jump Box – A handy accessory to have onboard when the battery is discharged. It will allow you to start the engine so the charging system can restore the charge. These are relatively inexpensive and worth their weight when you have a dead battery.

A small low amperage digital charger. These are sometimes called a battery maintainer. They are a perfect way to maintain your battery's charge when not in use. They are very low amperage, so they do not overheat the battery like the fast chargers do.

8. The marine environment is a breeding ground for corrosion, so take the time to clean the terminals on both ends of each battery cable thus ensuring good current flow.
9. Maintain your charging system by making sure the charging system belts are tight and the connections are clean and secure.
10. You may want to carry a backup battery system called a jump box if you are on an extended cruise or you don't trust your charging system or battery. At 7 PM on a Sunday, they are worth every penny spent.



A DVOM (Digital Volt-Ohm Meter) is indispensable for trouble shooting an electrical problem. Perhaps the handiest item is a battery carrying strap which attaches to the terminals and allows the battery to be safely lowered into close fitting boxes and surroundings as well as carried without having to cradle it and get acid on your clothes. The battery terminal brush allows the terminals and clamps to be properly cleaned.

CONNECTIONS

Batteries require good connections. To ensure not only full voltage but also full rated current capacity it pays to use large diameter cables and good terminals. There are two elements to every connection: Electrical and Mechanical. To have a good electrical connection, the terminal or clamp should be soldered in place after it is mechanically crimped onto the cable. The mechanical connection ensures that the cable will not pull loose during installation, removal, and operation. The electrical connection ensures that the joint will resist corrosion and be able to carry the full rated current. For these reasons, take the time to select or make the proper cables. The best place to find the correct heavy duty battery terminals is at heavy truck dealers. They also have to proper crimping tools to ensure a good mechanical connection.

These are the best terminals and clamps to use. Have them crimped on, then fill the crimp with solder to ensure a conductive connection as well as a good mechanical connection. Heavy duty truck dealers can supply the proper cables and do the crimping.

Battery clamp. Unless there is no other option, NEVER USE THESE! If you do, replace them at your earliest opportunity with a crimp type clamp.

Unless you have the necessary crimping tools and assortment of various lugs and clamps, the easy solution is to purchase pre-made battery cables. They come in various lengths and are different for positive and negative applications.

IN SUMMARY

The keys to successful battery utilization are:

- Buy a bigger battery than you need.
- Keep it charged up with a trickle charger
- Keep the water level up
- Make sure ALL of the cable and terminal connections are clean and properly sized
- Mount your battery securely and protect the terminals from contact with foreign objects
- Maintain the charging system

Happy Boating