



Really Bad Batteries Cause Really Mysterious Problems

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I just returned to my boat after a long time away from it and now I have problems with several of my instruments. The radar and the fish finder have "wavy" displays. The GPS and the weather fax don't work at all. How can so many things be wrong at the same time? I suspected a power supply problem, so I checked the voltage; it's 13.5 volts

You are right to question so many things going wrong at the same time. Except in the case of a sinking, a fire or a lightning strike, I don't believe in multiple failures at the same time.

Checking the power is a good idea, but you aren't done checking it yet. If your battery charger maintains the voltage that is too high for a long time, your batteries will lose all their water, and even be damaged if the water is maintained. I suspect that the "wavy" displays of your radar and fish finder are due to excessive "ripple" on the power supply.

"Ripple" is natural output of a battery charger. It is caused by the fact that the input power of the battery charger is AC, alternating current. 120-volt alternating current is called that because it alternates between positive 170 volts and negative 170 volts, 60 times per second. The average usable voltage is 120 volts. During a significant portion of the time the voltage is too low to be useful to a battery charger. During these short periods of no useful input power, the battery charger doesn't put out any power. During these periods the batteries have to supply power, even though they are being charged.

If your batteries are boiled dry, or are otherwise very badly damaged, they won't be able to provide this smoothing function and your instruments will not have the steady power that you need. Various 12volt devices have drastically different tolerance to "ripple" on the power input. Some loads like light bulbs have no problem with ripple. Other microprocessor-based equipment may "re-boot" many times per second, never really getting started. A very quick check for this problem is simply to turn off your battery charger, and see if the batteries are good enough to operate the equipment. The voltage should stay between 12 and 13 volts and the ripple will be completely eliminated.

Once you have replaced your batteries and paid the bill, you will probably ask, "how do I avoid this in the future?" The answer is simple for avoiding drastic early failures, but more complicated for optimized long lifetime. The simple answer is to keep them fully charged and don't overcharge them. If you are using an old fashion ferro-resonant charger, your only hope is to disconnect all loads (except bilge pumps) and get someone to run the charger when the voltage gets down under around 12.5 volts and charge them until the voltage gets up near 14 volts. This usually boils down to running the charger one day per month. The better answer is to convert the old charger into a boat anchor and get a modern charger.

Some of the old ferro-resonant chargers have simple voltage sensors that turn the charger on at a predetermined voltage and then turn it off when another higher predetermined voltage is reached. Properly adjusted, this kind of a charger is effective at maintaining a battery with no significant loads. These kinds of chargers are almost never

effective at maintaining batteries that are heavily used, because they do not aggressively replace charge and they will cycle continuously, because they don't throttle the charge rate according to the level of the loads. All they can do is turn off and on.

Modern chargers change modes to optimize fast re-charge and to maintain batteries. If you decide to invest in one, consider getting an inverter/charger combination unit. They are far cheaper than a separate inverter plus a charger. They also provide a "transfer" function that automatically switches loads to and from inverter power and other sources of power. If you are one of those people that have VCR at home that always has the display blinking due to a lack of programming, be warned that you MUST take the time to read the manual and properly set up your new charger or inverter/charger. You have to set the proper battery types and check to make sure that the algorithm (and settings) used by the unit results in the unit shifting to a maintenance voltage unit of around 13 volts. Without proper setup some chargers will never switch to maintenance (float) mode due to other loads on the boat that makes the charger believe that the batteries are not yet charged.

Charger problems have even caused some poorly informed battery vendors to consider their warranties invalid if the battery charger is left on. This is an unreasonable position because maintaining batteries in a low state of charge is even more damaging than moderate over charging. One of my clients leaves his battery charger off until he notices the lights getting very dim and then runs the charger for a couple of hours. He is convinced that this is the way to maintain his battery warranty. He and his battery vendor are going to be very unhappy with the short battery lifetime that this will result in. If your battery vendor wants you to leave the charger off, find a new vendor that can provide you with a detailed data sheet that shows the recommended "float" voltage for your batteries, considering the prevailing temperature.

Stephen Sommer is a degreed electrical engineer with extensive experience in electrical, mechanical, refrigeration and air conditioning systems and holds a USCG Masters license. He consults in all areas of yacht systems, which include all the equipment on board yachts beyond a basic hull and motor or sails.

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