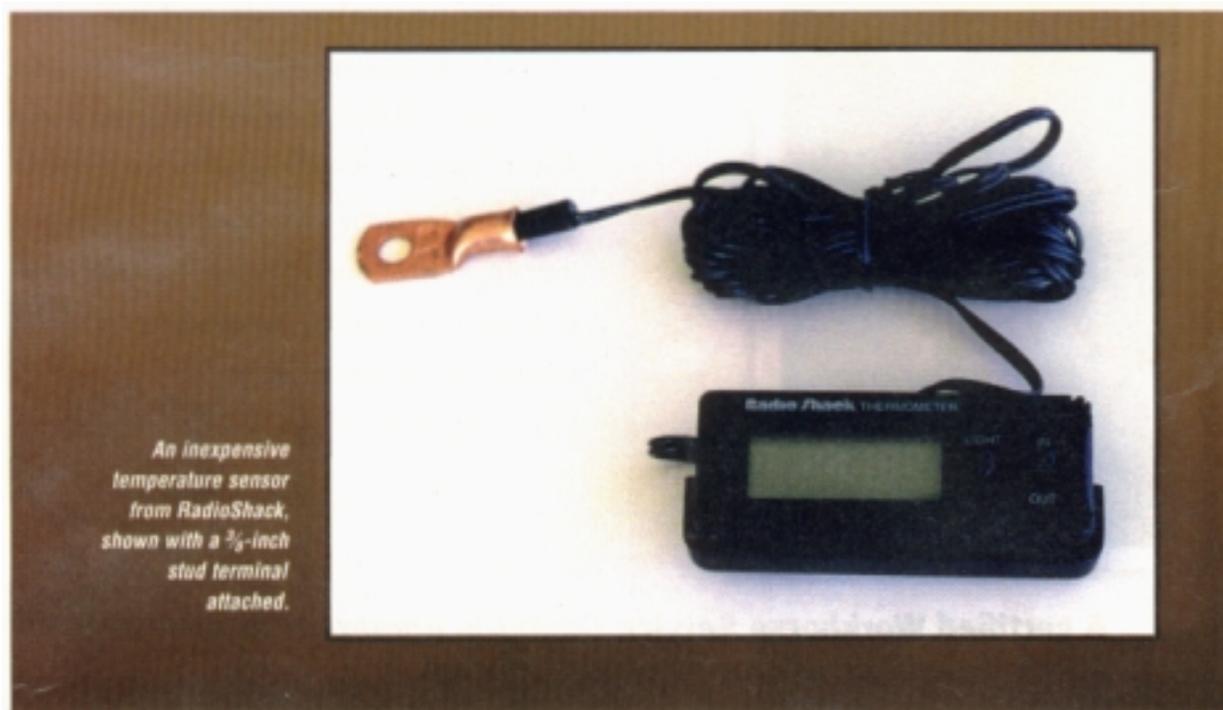


Monitoring Battery Temperature

Using an adapted temperature sensor with your charger can increase the life of your house batteries.

By CAROL MAXWELL & E.S. GURDJIAN, F76350

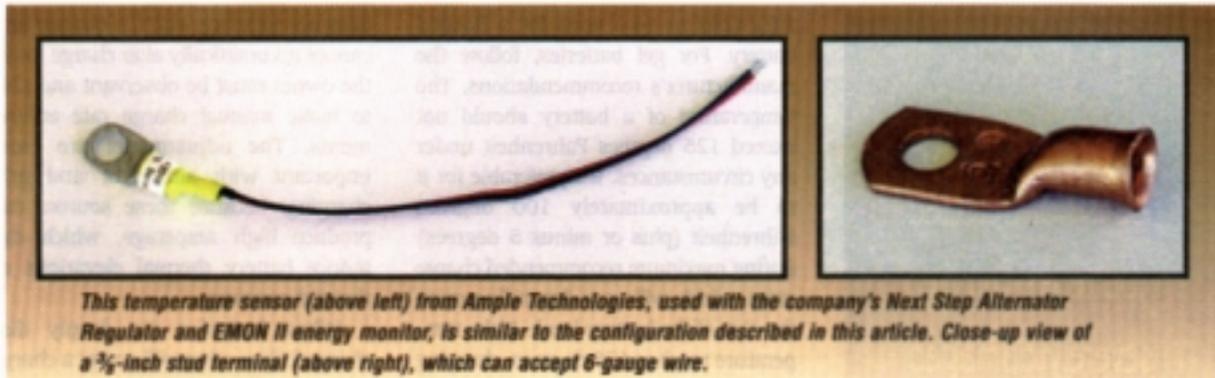


House battery performance continues to be a concern for recreation vehicle owners. As electrical systems become more complex, the chance for battery problems increases.

The simplest electrical systems use a convertor for battery charging. Most of the time, these systems do not have an inverter. As long as an inverter is not present, extreme battery discharge is less likely, except when the coach has been without shore power for a prolonged period of time. Under these circumstances,

convertors often are unable to satisfactorily recharge the batteries. When a convertor is used, the most common problem is battery overcharging while the coach is in storage. Although this does not usually result in a dangerous battery temperature rise, the battery can be over charged enough to increase water consumption and significantly decrease the electrolyte level. When an inverter is also used, the potential for extreme discharging increases, and the potential for significant overcharging is introduced.

Some newer inverter/chargers by Trace Engineering, Heart Interface Inc., and Statpower Technologies Corp. now include temperature sensors that allow automatic temperature-compensated charging. However, many coaches equipped with inverter/chargers utilize units that are capable of temperature-compensated charging but require manual adjustments. Several of the Trace units feature a dial adjustment. The Heart units have either dip switch adjustments or adjustments through an optional "Link" monitor/remote control.



The most common problems associated with battery charging are under charging and overcharging. Undercharging can be minimized by charging to the maximum recommended voltage set points for an adequate time period. As batteries age, their ability to accept a charge changes, and it becomes easier to overcharge them. Two indicators of overcharging are excess water consumption and excess heat during charging. Information pertaining to monitoring water consumption appeared in an article titled "Battery Electrolyte Level Monitor" in the October 1993 issue of FMC. This article describes a monitor that can be made for under \$20. (For a photocopy of this article, send a stamped, self-addressed business-size envelope to Assistant Editor, Clough Pike,

Cincinnati, OH 45244.)

Battery temperature can be monitored by adapting an inexpensive temperature sensor available from RadioShack (part #63-1019, \$15.99). This sensor, or probe, can be used with a charger that features adjustable charge set points or manually controlled temperature regulation to alter charge characteristics. While the sensor may be attached to the battery at various sites, the positive or negative battery post may provide the most reliable readings. We prefer to use the positive post. For a stud post battery, this can be accomplished with a terminal that fits a 3/8-inch stud and can accept a 6-gauge wire.

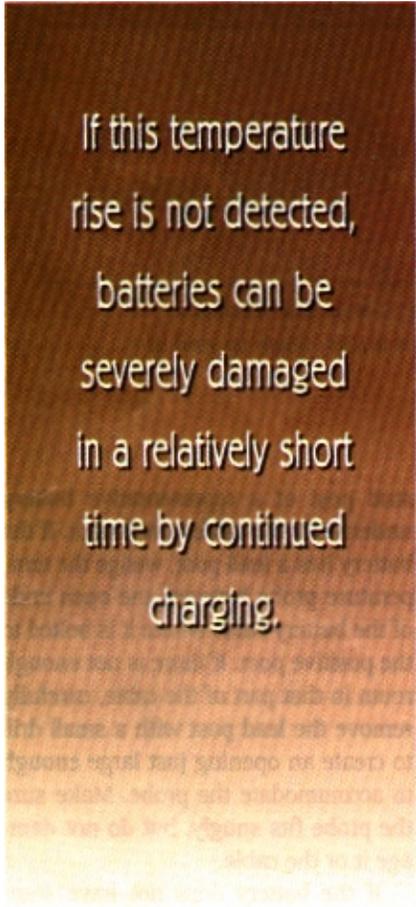
The temperature sensor is inserted into the terminal where the wire is normally attached and is held

in place with a little epoxy. A similar configuration is used by Ample Technology for the temperature sensor component of the Next Step Alternator Regulator and the EMON II energy monitor. If the batteries are all the same age, which is recommended, all will have similar charge characteristics and temperature responses to charging.

Mount the terminal to the positive stud post of a representative battery underneath the cable attachment if the battery has a lead post. Wedge the temperature probe between the open ends of the battery cable where it is bolted to the positive post. If there is not enough room in that part of the cable, carefully remove lead from the cable terminal with a small drill to create an opening just large enough to accommodate the probe. Make sure the probe fits snugly, but do not damage it or the cable.

If the battery does not have standard posts, gently compress the probe between the base of the cable and the top of the battery. Again, make snug contact but be careful not to damage the probe. Mount the sensor display in an appropriate location for your installation, if necessary; the wire between the probe and the display can be lengthened, but all connections should be soldered.

Once the probe is in place, note a base temperature prior to charging. For flooded batteries, the maximum charge rate can be calculated by dividing the amp-hour capacity of the batteries by five. This rate is usually higher for gel batteries, but it's critical to follow the manufacturer's recommendations. When a battery bank used with an inverter is discharged to approximately 50 percent, charge rates often will be between 40 and 120 amps, depending upon the size



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of the battery bank and whether adequate grid voltage is available.

During recharging, note the temperature rise, especially as you begin to reach full-charge voltage. This may be 14.2 volts to 14.6 volts for a flooded battery. For gel batteries, follow the manufacturer's recommendations. The temperature of a battery should not exceed 125 degrees Fahrenheit under any circumstances. It's preferable for it to be approximately 100 degrees Fahrenheit (plus or minus 5 degrees) during maximum recommended charge rates, which will vary depending upon the size of the battery bank. If the temperature reaches 125 degrees, charging should be discontinued until the temperature drops back to approximately 100 degrees. Then, resume charging at a lower charge rate to keep the temperature closer to recommended levels.

Some chargers cause a greater temperature rise at the same amperage than others. Also, as batteries age, they tend to produce more heat, especially when trying to charge to

maximum voltage set points. The temperature rise usually can be diminished by reducing the maximum charge voltage set point. During the life of a battery, an elevated temperature can occur suddenly even while charging to previously adequate parameters. If this temperature rise is not detected, batteries can be severely damaged in a relatively short time by continued charging.

Because this temperature monitor does not interface with the charger and cannot automatically alter charge rates, the owner must be observant and able to make manual charge rate adjustments. The adjustments are most important with alternator and grid charging, because these sources can produce high amperage, which can induce battery thermal elevations or thermal runaway.

When batteries are deeply discharged, they often will accept a charge at maximum rates for a longer period of time before elevated temperatures are noted. When grid voltage is available for a prolonged period, the temperature-compensation setting on the charger may be set to a corresponding level as indicated by the temperature display.

However, when grid voltage is available for limited periods, as when running the AC generator, we have found a faster, yet safe, method of recharging in our application. We leave the charger temperature adjustment at its baseline indication (depending on the model, this may be 60, 70, or 77 degrees). At this maximum allowable setting, we charge until the temperature sensor reads 105 degrees Fahrenheit in a new battery or 110 degrees in a battery that has been in service more than two years. At this point, the charger temperature adjustment is changed to correspond to the temperature reading. In our installation, this technique has produced the fastest charging without causing excess water consumption.

We have been using temperature compensated charging since 1993, and it has doubled the useful life of our house batteries. Although we believe it's better to buy a regulator that can automatically vary charge rates according to temperature and

that can control all charging sources (alternator, solar, wind, and grid charger), this simple temperature sensor will help in adjusting chargers that are not automatically temperature compensated. It also provides a means of monitoring battery temperature in applications in which an automatic temperature-regulated charger is not equipped with its own temperature display.