How can I keep my House Batteries Charged?

By: **Bob Gummersall**

The house battery system is a very key component of any RV because it provides the base motivation for most of our living conveniences. It is especially important for those who do a lot of dry camping or boon docking. Selecting the number and type of battery and then keeping charged is a real challenge. I will not discuss the physics of chargers or the chemistry of batteries, rather the basics in non-technical language. More educated readers will have to understand the reason for my simplifications. I have tried to distill a complex subject into practical layman's terms and descriptions.

House Battery or Batteries, typically called deep-cycle, store 12 vdc (volt direct current) electrical energy in a deep cycle and are designed to allow hundreds of cycles of discharging and recharging without damaging the battery. In contrast, an engine starting battery is designed to give a very short burst of high energy to start the engine and then to be immediately recharged. Capacity of a deep cycle battery is measured in "amp hours" and range from 33 to 200 and weigh 50 to 170 lbs. respectively. Deep cycle battery can cost from $50 to $500. An amp hour is one amp drawn for one hour. 12 vdc batteries can be wired together in parallel to provide more capacity. Two 6 vdc golf cart batteries can be wired in series to provide 12 vdc, then in pairs wired in parallel to provide a large bank of batteries with 450 amp hours or more capacity. Luxury motorhomes can have over 1000 amp hours using four Group 8D batteries. A minimum capacity for an RV is one Group 24 Deep Cycle battery with around 50 amp hours. Multiple battery systems must use exactly the same batteries by brand, type, purchase date and capacity or serious problems will arise. You can not mix and match batteries! The current state of charge is most accurately measured by using a hydrometer, which requires opening each cell and sampling the acid with a bulb powered tube that gauges the specific gravity of this fluid. Care should be taken in performing this task because the sulfuric acid fluid can cause serious injury if splashed or spilled on any body parts. It can also seriously spoil that special shirt or pair of pants that receives a drop or two. A measurement of 1275 is full charged and 1150 or below is discharged. The non-loaded voltage of these two states is 12.75 volts dc and 10.5 volts. A deep cycle battery should never be drawn down below 50% of capacity because such activity shortens it's useful life. Using a volt meter to test charge state is difficult because it requires all loads to be removed from each battery and then waiting at least 30 minutes for each battery to reach its current static charge state. A hydrometer allows you to identify a failed cell immediately and thus allow you to replace batteries before you run into serious problems. Acid fluid level should be checked every two weeks so just before adding any required distilled water, you should take the cell by cell hydrometer reading. Each battery should have exactly the same reading, or the cell(s) that measures low has failed.

12 vdc Loads in an RV draw various amounts of energy (current) and here are some examples. A typical furnace requires 15 amps to operate therefore on very cold nights it can use over 100 amp hours thus completely discharging one Group 27 battery. Several lamps can draw 8 amps or more. The water pump typically consumes 7 amps. Many

RVs have an inverter that converts 12 vdc battery power into 120 vac (volts alternating current) household power so that we can operate TVs, coffee makers, toasters, hair dryers,

microwaves, etc. The operation of household appliances requires lots of energy. For example, a typical microwave requires 100 amps, a hair dryer 95 amps, a toaster 90 amps, and a color TV 10 amps. Using household appliances require lots of energy but fortunately they are typically used for just a few minutes at a time.

Charging Deep-Cycle Batteries is a very complex subject so for those of you experts, excuse my simplifications. The most basic charging system is a "Converter" ($100) that converts 120 vac shore power to typically 13.2 vdc for the 12 vdc systems in the rig. A converter is designed to provide lots of 12 vdc for various systems but is not a good battery charger. All the 12vdc systems in your RV are designed to operate satisfactorily on dc voltages between 10.5 to 15 volts. A converter provides 40 amps or more for these systems, but can only charge batteries at 3 to 5 amps. So if the only charging device you have is a converter, it can take many hours to recharge a depleted battery. The typical alternator on a motorhome or tow rig engine can charge batteries at from 40 amps to 100 amps. However running this engine is not very efficient. More expensive two stage converter/charger ($300) have capacity to provide 30 amps of battery charging. The most expensive three or four stage converter/charger ($600) can provide over 100 amps of charging capability. They are micro-programmed using a smart computer controller that senses the charge state and temperature of the battery bank and adjusts the charge voltage and current to charge the batteries as fast as possible without boiling or damaging them. The charge states are typically called Equalizing (15 vdc), Bulk (14.2 vdc), and Float (13.2 vdc). The latter is a trickle charge rate to maintain charged batteries. Overcharging with too much voltage or current can damage a battery. Inverters ($1000 or more) typically include multi-stage charging in their basic capabilities. When there is no shore or generator power available, they invert battery power to household power. When shore or generator power is available, they switch to being a smart multi-stage charger.

Solar Charging is done with one or more flat solar panels installed on the roof. If the sun is shining, each solar panel typically provides 3 to 5 amps of charging. They work best if they directly face the sun. Most installations on RVs are flat so they are not the most efficient and sacrifice some capacity. Camping in the desert for extended periods many Rvers can adjust the angle of the solar panel to get higher efficiency. The panel would have to actually track the sun's movement to be optimum. This is hardly practical on an RV. Five solar panels can provide up to 25 amps of charging capacity. Many campers report effective use of solar panels even in cloudy environments.

Wind Mills in miniature can be raised above the RV and if there's a good wind can also generate a few amps of charging capability. They are a pain to put up and take down so are most useful when camped in one place for many days.

Generators that operate on gas, propane, or diesel fuel are used when shore power is not available. A typical RV mounted generator has the capacity of 3500 watts or enough capacity to operate a microwave, toaster, hair dryer and color TV at the same time. This ac power also feeds the converter, converter/charger, or inverter/charger to recharge the house batteries. If all you want to do is recharge the house batteries you could use a portable 500 watt generator powering a 40 amp multi-stage charger and run it a few hours per day when the noise does not bother people. Obviously with a 4,000 watt generator and a 100 amp smart charger it will take less time to recharge the house battery system.

Battery Charge State Monitoring can be done with several meter devices ($200+) that are calibrated to the specific battery bank. These computer meters make it possible the read a digital display showing charge state, voltage level, usage, predicted usage time left etc. The controller in these monitors calculate the amount of current being put into the battery bank while charging and taken out during discharging and thus calculate the charge state of the battery. Monitoring systems are usually provided with the better inverters, but can be added to almost any RV battery system.

A summary of house battery systems then says that any RV that will be used primarily with shore power requires only a small capacity house battery like one Group 24 with 80 amp hours. An RV that will be used mostly for boon docking requires much more battery capacity unless you want to turn off everything when the sun goes down and use a catalytic heater or a camp fire to keep warm. Full time desert rats often use solar panels and wind mills to remain totally independent of fossil fuel electrical power while even providing a few hours of TV viewing using a very small inverter. A 40,000 lb. bus conversion that is used to boondock almost exclusively typically use 6 golf cart batteries connected in series/parallel for a total capacity of around 600 amp hours or four Group 8D's with over 1000 amp hours. With this kind of capacity the owners are provided with satellite TV, hair dryer, curling iron, etc. almost like being in a land based home. Luxury motorhomes typically have four Group 4D deep cycle batteries providing over 800 amp hours of capacity. A 10,000 or 15,000 watt generator is used to charge the batteries while running the roof air conditioners to keep everyone cool and the batteries charged. Some of the generators installed in buses have been sound proofed to be very quiet both inside and outside. This is not true of a typical small portable generator that can generate enough noise to be really irritating.

So the answer to the question "How can I keep My House Batteries Charged?" has a different answer for every Rver and every Rving situation. There is no "one" answer. I hope that some of you have found this little composition to be helpful in understanding a very complex subject. I wish you many smiles and safe miles Rving, Bob

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MAIN MENU