

## CHARGING BATTERIES

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To a large extent the reliability and useful life of a battery depends on the quality of the charger process. Battery chargers are often given low priority but chargers are the guardians of the battery. Most cheap battery chargers can do more harm than good. Following are some simple guidelines to follow when charging the different types of batteries that amateur radio operators use.

### Nickel Based Batteries

- The battery should remain cool during charging. Some temperature rise is normal but if the battery temperature is above room temperature after a few hours, it indicates the charger is not working properly. This is particularly a concern with nickel-metal-hydride batteries because they cannot absorb overcharging.
- A smart-fast 2-step charger is the best.
- New, never used nickel-based batteries should have a trickle charge applied for 24-hour prior to use.
- Nickel-cadmium batteries have a memory effect. Memory effect is a condition that causes the battery to hold less charge. The battery gradually loses their maximum energy capacity if they are repeatedly recharged after being only partially discharged. To prevent this effect each battery must periodically be exercised (discharge/charge) to prevent a memory set.
- Fully discharge and recharge a nickel-cadmium battery once per month.
- Nickel-metal-hydride batteries are less prone to memory effect. They should be fully discharged and recharged once every 3 months.
- Nickel-metal-hydride battery chargers require more complex electronics than the nickel-cadmium systems. Different fast and slow charge voltage levels and times are required.
- A nickel-metal-hydride charger can be used to charge nickel-cadmium batteries, but not the other way around.
- Do not leave nickel-based batteries in the charger for more than a few days.
- Nickel-metal-hydrides have a 50% higher self-discharge rate than the nickel-cadmium.
- It takes as long to recharge a nickel-based battery as it does to discharge it.

### Lithium-Ion Batteries

- A Lithium battery does not have the memory problem like nickel-cadmium. They do not need cycling through charging and discharging. However, care must be taken not to overcharge lithium's because they can catch fire.
- Do not over discharge a lithium battery. Most battery chargers will indicate the battery is unserviceable and will no longer charge it. If this happens, you have to use a more conventional trickle charger and get the voltage back up above 2.5volts.
- It takes two times longer to recharge a lithium battery as it does to discharge it.

### Lead Acid – Starting Batteries

- Must be stored in a charged state. A trickle (float) charge should be applied while storing.
- Should be charged right after being used for starting.
- Avoid deep discharging because this can permanently damage the battery.

- Too fast or too high current charging will boil out the water. Explosive hydrogen and oxygen gases are released during the charge cycle.
- It takes about five times longer to recharge a lead acid battery as it does to discharge it.
- The charging rate of the charger should not exceed 20% of the amp hour (AH) capacity of the battery. For a 100 AH battery, use a charger with a capacity of 20A or less.
- Most consumer automotive type battery chargers are bulk chargers and do not have much voltage regulation nor step charging capability.

The same basic rules apply for the AGM and GEL cell type lead acid batteries.

#### AGM – Deep Cycle Batteries

- Recharge right after use.
- A trickle (float) charge should be applied while storing.
- Require a special charging rate as compared to Lead Acid Starting batteries.
- Use a Smart Charger with computer technology that performs 3 step-charging techniques. The 3 steps are: Bulk, Absorption, and Float charging.

#### GEL Cell

- Recharge right after use.
- A trickle (float) charge should be applied while storing.
- Can be damaged by over charging. Use a smart charger.
- Gel cell battery requires a charger designed and/or adjusted for this type of battery. A Smart 3 step charger should be used. Gel cell chargers can usually be used for charging AGM batteries.

To determine your total charge time, a rule of thumb is to take the AH rating of the battery, add 10% to totally top off the battery then divide by the charger rating (amps). Choose the charger that has enough power to complete the job in the time you require.

A good practice is to remove nickel and lithium batteries from HT's and GPS units before storing for even several days. Many HT's and GPS units keep a constant drain on the battery even when turned off. After leaving the lithium battery in an HT for several months, the battery was discharged to a minus reading and the factory charger would not recharge it. The battery was recovered by putting a trickle charger on it as discussed earlier. Four years later that battery is still in use and performing well.

Using the correct charger for your batteries and following some simple rules for each type of battery will protect your investment and extend the life of your batteries.