

A Guide to Battery Maintenance

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A GUIDE TO BATTERY MAINTENANCE

There are three types of batteries currently being used for portable communications: Nickel Cadmium (NiCd), Nickel Metal Hydride (NiMH) and Lithium Ion (Li Ion). For years, NiCd has been the workhorse of rechargeables. It gives the best value for the money, costs less and provides more charge/discharge cycles than its counterparts. But it is heavier, and can demonstrate problems such as memory effect, which reduces charge capacity and cycle life. NiMH and Li Ion are lighter and have higher capacity than NiCd, but each chemistry has its own drawbacks: high costs, short cycle life and limited power capabilities. And, NiMH also has a memory effect.

Naturally, given the lower cost and longer life, NiCd is the battery of choice for most two-way radio operations. When misused, NiCd batteries can become unreliable and “burn out” early, causing communications breakdown and frustration. However, when properly handled, **NiCd batteries do the job dependably and save money.**

It's no great secret. The key to battery success lies in the charging. You can use or abuse your battery, but if you charge (and discharge) it properly, it will serve you well for a long, long time. A maintenance program does not have to be labor intensive or costly.

There is a variety of equipment on the market for battery maintenance -- chargers, conditioners, analyzers, and a new conditioning charger known as an ACTivator. **Chargers** replenish the energy storage capacity of the battery. Three main types are available: the constant-current trickle charge (commonly referred to as “roasters and toasters”); the constant high-current fast charger, which is often self-terminating; and the pulse charger, which combines steady positive current with brief negative currents. Dynamic Electrochemical Waveform, the newest technology on the market, takes pulse charging one step further with an intelligent microchip that reads the chemistry of the battery and responds with very high positive current charging interspersed with variable and brief (microseconds) deep discharging currents to condition the battery as it charges. (for a detailed comparison of charger types, see sidebar)

Conditioners “exercise” the battery by discharging it very deeply -- usually to about 1v/cell. This “cleans” the battery and helps undo the damage of memory effect. **Analyzers** measure the capacity of the battery and sometimes measure changes in capacity. Some analyzers can also determine the cause of a bad battery, i.e. external damage, bad condition or bad cell. Most analyzers discharge the battery fully and then recharge it to measure capacity.

- 1) **Drain your battery before charging** – as much as possible. It sounds simple, but few people actually do it.
 - a) Drain the battery by leaving the radio turned on until the battery can no longer power the radio at all (You can accelerate the process by using the radio). If the situation doesn't permit you to run the battery down before recharging it daily, do it at least once every 7-14 days.
 - b) Don't drop the battery/radio in the charger throughout your shift when it isn't in use. Let it run down a full shift!
- 2) **Terminate charging** – don't leave the battery on a trickle or fast-current charger indefinitely. If your charger is not self-terminating, buy an inexpensive outlet timer. If your charger takes eight hours to charge your battery – have the timer stop at eight hours – don't allow the current to over charge a battery by running all night or weekend.
- 3) **Condition your battery** – NiCd batteries perform best if they are periodically “exercised.” A good conditioner will fully discharge the battery – bringing the voltage down as low as possible (below 1V/cell), far lower than the discharge achieved from running down the radio. This helps to erase any memory-effect. Label the batteries and establish a chart which will remind everyone when a battery is due for conditioning.
- 4) **Invest in a good charger** – many organizations buy the best radios, and then take the basic, inexpensive OEM “trickle chargers” as an afterthought. Likewise, the manufacturers spend their resources making the best radios, then often stick their name on a low-tech, inexpensive charger to bundle with the radio and keep the bid low. The real cost in any durable equipment is O&M- operations and maintenance. An investment in a good charger can bring the long-term costs of your communication system down significantly. A good charger has an intelligent chip to charge your battery only as much as it needs and will terminate when the battery is fully charged. Some form of pulse charging,



rather than constant current, is also preferable. A new generation algorithm for charging is only available in the **ACT**ivators from Advanced Charger Technology (**ACT**). It is worth the investment in doing some research and asking more than one dealer to recommend chargers. A service-oriented dealer should be happy to help you research a number of charger options before making a recommendation.

- 5) **Monitor your batteries** – label all batteries with the date that they are put into service, and keep track of how frequently they are conditioned. A simple chart is sufficient. Look for patterns in problems. Is it possible that battery problems are more prevalent in one department or a certain shift? Can you track quality problems to a particular batch of batteries based on supply date?
- 6) **Format your battery properly the first time** – the life of a battery can be severely shortened in its first day. Follow the manufacturer's directions to fully charge your battery the first time it comes out of the box. If you put it into service prematurely, you have already begun the memory effect problem.
- 7) **Condition your back-up batteries regularly** -- Avoid a crisis of bad back-up batteries by taking a pro-active approach to maintaining them. Do Not leave emergency batteries sitting in non-terminating trickle-chargers or they could fail when you need them most. Again, you can incorporate inexpensive outlet timers to help manage termination and recharging. If possible, use an intelligent conditioning charger like **ACT's** Maintainor, which cycles batteries regularly without user intervention. If that is not an option, rotate the batteries into service regularly, or condition them. At least once a month, batteries which are being charged regularly without being used need to be fully discharged before recharging.

Incorporating these seven simple steps into any battery charging routine will make batteries last longer and reduce memory effect problems. Whether it's a two-way radio, a cellular phone or a lap-top, properly managed rechargeable batteries can eliminate the common headaches of battery failure.