Getting the Most from Your Batteries

Batteries light up our lives—and a whole array of devices. Here's how to choose and use them. **BY BILL HOWARD**

Batteries. Most every gadget is powered by one, if not several, of them. You probably don't pay them much attention, except when they need to be recharged or replaced—which is less frequently than ever thanks to improvements in efficiency. But to get the most out of your batteries, it's important to know about the different battery types and their characteristics, and about proper charging and storage procedures.

A BATTERY MYTH

True or false: If you run a rechargeable battery down only halfway before recharging, sooner or later the battery remembers, and you get only half as much battery life. *Mostly false* nowadays, say most battery experts, with some caveats. Such a *memory effect* did affect older nickel cadmium (NiCd) batteries. But with nickel metal hydride (NiMH) and lithium ion batteries, it's not an issue, or not one that is going to halve battery life.

Some practices will lop off running time. One is leaving a battery always plugged in to a charger. Here's a hypothetical example: If a set of new, fully charged batteries is capable of taking 100 flash pictures in a digital camera, a year from now the constantly charging battery set might be capable of taking perhaps 95 pictures. In comparison, a well-treated one-year-old battery might be capable of taking 98 pictures on a full charge, a couple less than in its prime. No matter how well you treat the rechargeable battery, though, it's unlikely to last more than five years, and will probably give you really good service only for the first three.

POWERING LAPTOPS

As the power needs of notebook computers are greater than those of most portable devices, and notebook portability goes hand-in-hand with battery life, it's important to understand the power capacity of notebook batteries. Notebook battery packs indicate power in *amp-hours* (Ah) or *milliamp-hours* (mAh), but you can't make apples-to-apples comparisons among notebooks because they can operate at different voltages, typically 7.2, 10.8, or 14.4 volts (multiples of 3.6 volts). What matters is their total energy, expressed in *watt-hours* (Wh, the amp-hour rating times the *voltage*). A mainstream notebook battery pack might provide 4.4 Ah (4,400 mAh) at 10.8 volts, or about 47.5 Wh. A notebook battery providing 4.0 Ah at 14.8 volts would produce 59 Wh. The latter battery actually provides about one-third more power, even though its amp-hour rating is 10 percent less. Ultraportables might provide batteries with only 20 Wh of performance, while multimedia notebooks might approach triple digits (though they'll often rate only around 50 Wh because users aren't expected to run these machines away from AC power for long.)

Beware of starter batteries. To shave costs and weight, especially on ultraportables, you may be offered a four-cell battery pack, when the standard is six cells and extended-life batteries would have eight or nine cells. For longer run time with a mainstream laptop, consider a battery that swaps in to the optical drive bay. Usually it's half to two-thirds as powerful as the main battery, and it will often drain before the main battery. If you always leave the bay battery in, after a year of hard use it might be down to half its life, while the main battery will have been called to active duty only a couple times a month on long flights.

MAXIMIZING BATTERY LIFE

If you buy a pack of round-cell NiMH rechargeables, you'll want get an appropriate charger. Higher-capacity batteries call for higher-capacity chargers, unless you don't mind waiting a bit longer. More important, NiMH batteries are sensitive to overcharging and require closer monitoring by the charger; plug NiMH batteries into a charger designed for NiCds and you may overcharge and damage them. Chargers for NiMH and lithium ion batteries monitor battery voltage and temperature to sense when the batteries are charged; they then shut down or provide only a trickle charge.

Rapid chargers that recharge a four-pack of NiMH batteries in as little as 15 minutes have some drawbacks. First, when the green "charged" light glows, the batteries are really at about 80 per-

Know Your Batteries

Here are the most common battery types found in today's gadgets:

Single-use lithium (properly, lithium iron disulfide) batteries are great for digital cameras because they pack in a lot of energy, are lightweight, and don't suffer in the cold.

Prismatic lithium batteries can be shaped to fit inside odd-size cavities. They are used for small laptops, optical-bay batteries, and some music players.

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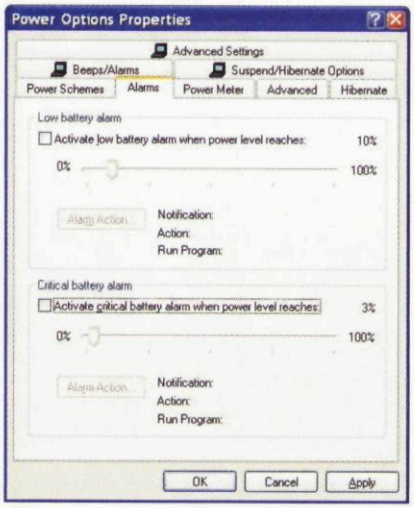
cent capacity, and you'll need another one to two hours to reach full charge. Second, battery makers say rapid chargers are tougher on the internal workings of batteries and may reduce their lifetime. But as Anthony Mazzola of Energizer notes, "You should use the battery rather than other way around." Big deal if your $20 pack of NiMH batteries that theoretically lasts 500 full-charge cycles is good for only 400; it's more important to have the batteries available when you need them.

Once the batteries are fully charged, take them out and set them aside. They won't lose that much of a charge unless you don't use them for a month or two. You can store NiMH and lithium ion batteries without charging them, but remember to put them back in the charger the night before you need them. Cheap chargers may have a timer that shuts off after several hours, which may not accurately gauge the charging process; better ones monitor the battery temperature and voltage, so there's less downside to leaving the battery in the charger.

Batteries should be stored at room temperature. There is no need to keep them refrigerated, and it's even worse to put them in a garage or shed, where they'll be subject to temperature fluctuations. One exception to the benign neglect rule: Lead-acid batteries should be stored fully charged and be protected from freezing, which is more likely to occur if they're not charged; the battery's electrolyte (or liquid) if discharged could freeze in subzero weather and crack the case or its internal plates. For most users, lead-acid means only car and UPS (uninterruptible power supply) batteries. If you've got a car stored for the winter, keep a trickle charger attached.



YOU SHOULD CONDITION your laptop battery several times a year by turning off all power-saver options, then running it all the way down.

HOW LONG WILL THEY LAST?

As a rule of thumb, a NiMH or lithium ion rechargeable battery is good for *about* 500 cycles, meaning a full or nearly full discharge and then a full charge. A half-discharge followed by a recharge counts as about half a cycle. In other words, if you plug and unplug, or dock and undock, your notebook 500 times in six months, the battery isn't going to need replacement.

The highest-power NiMH batteries (2,500 to 2,600 mAh) may last for fewer total cycles than less powerful batteries (2,000 mAh). Some NiCd batteries may be good for 1,000 cycles. The cycle life of a lead-acid battery depends on how often it's allowed to run down. It does not take kindly to full discharges.

Once they're charged, NiMH and lithium ion batteries don't lose too much of their power sitting in a desk drawer. Single-use batteries, especially lithium, are essentially unaffected by sitting for several years.

Some notebook makers, among them Lenovo, recommend a quarterly conditioning, or full discharge, followed by a full recharge. This overcomes any residual memory effect if there is one, and also gets the notebook's power management in sync with the battery. Some notebooks have a conditioning utility that does that automatically (while you're plugged in to AC power, so the whole thing happens overnight). If not, go into your notebook's power management (on most: *Start* | *Control Panel* | *Performance and Maintenance* | *Power Options* | *Properties*). Under the *Power Schemes* tab, choose *Always On;* under *Alarms,* disable any *suspend* or *hibernate* actions invoked by the low-battery alarm and critical-battery alarm. Let the battery run down for two to four hours, then recharge.

If your batteries are suffering from neglect, a couple of charge-discharge cycles may restore them partially.

BEST PRACTICES

For longest life, charge your round-cell batteries on a standard (not rapid) charger and take them out once they're charged. The highest-performance batteries produce more energy per charge but may last fewer cycles. Run your laptop on AC power when possible to avoid using up the finite number of cycles.

Rechargeable batteries are likely to stop working well after three to five years. Recycle spent lithium ion batteries because their innards can be reused, and recycle NiCd and lead-acid batteries because of their toxicity. To find a recycling center, see Rechargeable Battery Recycling Corporation (*rbrc.org*).

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Rechargeable lithium ion battery packs are the type most often used in laptops, cell phones, and camcorders, and are found in many digital cameras.

Most **standard-size round-cell rechargeable batteries** (double-A, triple-A) are nickel metal hydride (NiMH). You'll find them in digital cameras and electronic flashes.

Single-use alkaline batteries in standard sizes are best for devices such as remotes, music players, flashlights, and your kids' toys.