



## Will they work for you?

Rechargeable batteries can save money and resources, but they are best used in certain applications.

### When to Use Rechargeable Batteries

Rechargeable batteries are a good choice for most low-power-use devices such as wireless mice/keyboards, telephone headsets, tape recorders, radios, pagers, cameras, adding machines, walkie-talkies, remote controls and more. They are ideal for these frequently used items.

Batteries will need re-charging every month or two in these and other low-power-use devices.

### When NOT to Use Rechargeable Batteries

#### They should NOT be used for emergency equipment

Because they lose up to 1% of their power capacity per day, NiMHs are **not** good choices for the following:

- Emergency equipment (ie: flashlights, radios, emergency medical devices, etc...)
- Low-power-use devices in difficult-to-access areas (ie: field monitoring devices or ceiling clocks)

At 32 °F rechargeables last 20% less time than at room temperature. Capacity drops sharply below freezing.

### Why Rechargeable Batteries

Purchasing rechargeable batteries saves money, protects the environment, and conserves resources. They can be re-used many times, reducing operating costs and hazardous waste disposal fees. This Fact Sheet provides information about the most commonly available rechargeable battery, nickel-metal-hydride (NiMH). NiMH batteries can be used instead of regular non-rechargeable (alkaline) batteries for many applications.

### Types of Rechargeable Batteries

The most popular and readily available “household type” rechargeable batteries today are Nickel-Metal-Hydride (NiMH). They have advantages over the older rechargeables (Nickel-Cadmium / Ni-Cad) such as:

- Don't contain cadmium, a toxic heavy metal
- Provide a consistent amount of energy after each charge (no decline over time, ie: no “memory” effect)
- Can be recharged up to 1000 times
- Come in AA, AAA, C, D, and 9-volt sizes

“Rechargeable alkalines” are becoming available from some manufacturers and may be an option if NiMH batteries are not working for your application.

### Battery Performance

Rechargeable batteries

- Must be charged before the first use
- Lose charge at a rate of ~1% per day when not being used
- Operate at full charge for longer than alkalines, then lose power quickly once charge is depleted
- Operate at a consistent 1.2 volts, versus alkalines which begin at 1.5 volts and gradually decline
- Do not charge or perform well at temperatures below 32 °F or 0 °C
- Voltage & battery life per charge remain constant until a sharp drop at the end (up to 1000 charges)

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## Charging and Storage for Prolonging Battery Life

**Time to charge may vary.** Older or less expensive chargers are typically less powerful, taking up to 7 hours to charge batteries. More efficient chargers may charge a set of batteries in as little as 15 minutes but may only charge AA and AAA sizes. There is typically no drawback to a short charge time.

**Best Choice Chargers**, also called *Smart Chargers*, have added features to increase the safety, convenience, and performance of your batteries. Look for these features:

- *Automatic Charge Protection*: This feature will automatically stop charging when batteries are full, preventing overheating or overcharging which can compromise battery chemistry and performance.
- *“Trickle Charge”*: This feature senses when a battery is fully charged and automatically initiates “maintenance mode” or “trickle charge”, which charges at approximately the same rate at which NiMHs naturally lose charge. This allows batteries to be stored in the charger between uses.

**Follow these steps when using Rechargeable Batteries.** Actions that can damage battery chemistry and reduce battery life include over-charging or repeatedly using batteries to total discharge (until dead).

- Charge batteries before first use—they arrive uncharged
- Make sure your charger can handle your battery type
- Choose a charger with auto-shutoff and maintenance charging features (ie: a “Smart Charger”)
- Store unused batteries in a “Smart Charger” or at room temperature under dry conditions
- Recharge batteries before they are 100% dead (this “topping off” is not a problem with NiMHs)

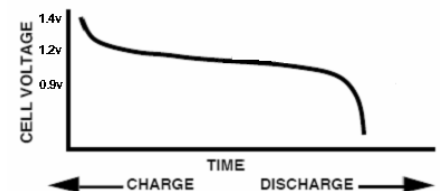
## Troubleshooting

Not charging all the way?

- Gently rub battery ends with a clean pencil eraser or cloth to remove any residue
- Try completely discharging them and completely charging them again
- Try “cycle charging” – 15 mins in the charger, 10 mins out – repeat 4 times followed by a full charge
- For other tips, go to <http://www.energizer.com/products/rechargeables/faqs.aspx> or [http://www.duracell.com/oem/rechargeable/Nickel/nickel\\_metal\\_tech.asp](http://www.duracell.com/oem/rechargeable/Nickel/nickel_metal_tech.asp)

## Power Profile

The power profile of rechargeable batteries is flat at 1.2 volts with a steep power decline at the end (graph, right), compared to alkalines which start at 1.5 volts then gradually decline. Therefore, rechargeables are not appropriate for some medical and other devices where a steep drop in power is unacceptable, where precise reading of remaining battery life is required, or when more than 1.2 volts are required. The power plateau at 1.2 volts may prematurely trigger the low battery indicator on some devices.



## Battery Safety

Never keep any type of battery near keys, coins, or other metal objects. Contact between metal surfaces can cause a short circuit, producing enough heat to burn skin. High heat can result in internal battery pressure caused by excess formation of oxygen or hydrogen gas—in the case of a pressure increase a safety vent in the battery will emit the excess gas, resealing when the pressure is relieved.

## Recycling

All batteries contain hazardous substances including lead, cadmium, mercury, or strong corrosive materials. These will contaminate the environment or cause harm to humans if not disposed of properly.

- Alameda County residents can drop-off batteries at three Household Hazardous Waste Facilities around the County. See [www.household-hazwaste.org](http://www.household-hazwaste.org) for more information.
- Check your local hardware store—many also accept batteries for recycling.
- For other recycling locations near you, see the Recycling Wizard at [www.StopWaste.Org/recycle](http://www.StopWaste.Org/recycle).

StopWaste.Org is the Alameda County Waste Management Authority and Recycling Board operating as one public agency.  
[www.StopWaste.Org](http://www.StopWaste.Org), 1-877-STOPWASTE (786-7927)

This Fact Sheet was adapted with permission from SF Environment, a department of the City and County of San Francisco.