



mobile power systems

The Nerv Centr™ SharePack® is the lightest weight MOTS rechargeable military battery currently in its class, has a small form factor and is compatible with existing kit.



BATTERY BASICS

Primary Batteries vs. Secondary Batteries

This is intended to provide a high level overview of the main differences between Primary (single use) and Secondary (rechargeable) batteries. This summary provides the basic terms as well as differences and advantages between these types of batteries.

PRIMARY (SINGLE USE) BATTERIES

Primary batteries are used daily in devices such as smoke detectors, children's toys, flashlights and more. They are the most efficient packaging for the energy that they store. Since they are only used once and then disposed of, they have lower requirements for storage, durability and smarts. If it breaks, grab another one.

Primary batteries have a lot of advantages, but also a few flaws. Different manufacturers will have different capacities in the same size battery package. Batteries from Company A may have more energy in them than batteries from Company B, even though they are both size AA. Because of this, electronics that use them have a hard time predicting how much longer the battery is going to last. Usually it is very coarse (LOW, MEDIUM, FULL) with no guarantee of accuracy. It is difficult to predict since batteries made by different manufacturers will even perform differently over temperature. You might get 2 hours run time on a device with manufacturer A and only 1.5 hours with manufacturer B. Even worse, they might not work at all, even if the specs on paper are relatively the same.

The main advantage of primary batteries is that they are generally standard sizes (AAA, AA, C, D, CR123, 9V etc.) and are readily available throughout the world. They are also inexpensive.

Millions of these batteries are produced each year. Manufacturers have worked very hard to pull every 1/10th of a cent out of the packaging since there is no value to them in having a more durable package.



BATTERY QUICK FACTS

- *Primary = not rechargeable*
- *More power in smaller packages*
- *Can be bought almost anywhere*
- *Amount of power varies between manufacturers for same size*
- *Disposable*
- *Hard to tell actual power remaining*
- *Usually poor low temperature performance*
- *Inexpensive*



BATTERY QUICK FACTS

- *Secondary = rechargeable*
- *Specific to application*
- *Requires specific charger*
- *Higher initial cost, lower operating cost*
- *Special shipping requirements*
- *Electronics can predict power remaining down to the minute*
- *Typically better low temperature performance*
- *Primary batteries will always be lighter and smaller than equivalent secondary*
- *Requires some maintenance*
- *Degrades as used (cycle life)*

In a military context, the primary batteries advantages are that they are lighter and smaller than their secondary counterparts, and if the battery dies, you can simply grab another one. With advances in lithium technology, the secondary batteries are catching up, but in general the equivalent secondary battery will always be just a little bigger, and just a little heavier, and a little bit harder to get.

SECONDARY (RECHARGEABLE) BATTERIES

Rechargeable batteries are altogether different. They are generally specific to an application and have well defined operating limits. The exception to this is that more and more secondary batteries are becoming standard equipment such as LI-80, LI-145 and BB2590.

Secondary batteries are designed to have a longer lifecycle. Since they are generally more expensive than the primary batteries, the value of the secondary batteries has to increase by reducing the overall lifecycle cost to the customer. These are designed to be more durable, longer lasting and usually have specific connectors on them to make sure you can't plug in incompatible equipment. Because secondary batteries are usually application specific, different batteries put out different voltages, have different amount of stored energy, and take a varying amount of time to recharge. This is to ensure that incompatible equipment cannot be plugged into them. No one wants to turn an expensive radio into a brick because they plugged in the wrong battery.

These batteries also need specific chargers. A customer can spend countless hours figuring out the battery shape, size, energy, connectors and display, only to forget the need for a charger for rechargeable batteries.

Because the secondary battery will likely never be as light as the primary, the value of the secondary battery is increased by adding electronics or otherwise known as Battery Management Systems, BMS for short. These electronics will allow for prediction, sometimes down to the last minute, the amount of time the battery will last, will allow a short circuit without damage to the battery, allow for plugging it in backwards, show icons on a display, connect to battlefield computers and see battery life.

There is a lot of energy stored in these new rechargeable batteries (Lithium Ion). They are classified as dangerous goods, and with good reason. An unproven battery can cause a lot of damage to a transport aircraft or truck if they malfunction. When they begin to burn, they burn quickly. They also produce their own fuels to keep feeding the fire. Because of this transporting them as dangerous goods until they are formally tested and qualified by safety labs is required. Unfortunately, this also makes them difficult and expensive to transport as samples for customers, returns, field trials, etc. This gets even harder if it has to go across oceans or borders. Each country has specific guidelines for transporting unqualified lithium batteries.

Cycle life is a term used with a lot of secondary batteries meaning that they wear out over time. The more performance demanded, the harder it is on the cells and the faster they will degrade. Standard cycle life is 300 to 1000 cycles. For a 300 cycle battery this means is that if they are charged to full and discharged to empty them, at the end of 300 cycles the battery will be left with 80% of the energy storage it had when new.

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