

## Custom Nickel Cadmium

Cornerstone manufactures custom nickel cadmium battery packs and assemblies. Our associated manufacturer's battery design teams uses the latest mechanical and electronic design tools to optimize the reliability, safety and manufacturability of your custom battery packs. This gives you the most cost effective and dependable nickel cadmium battery pack solution for your specific needs.

### Custom Nickel Cadmium Battery Packs & Assemblies

Nickel Cadmium (NiCd) is a well-established chemistry for custom battery packs & assemblies. Although newer battery chemistries have taken the spotlight in recent years, Nickel Cadmium still remains a viable chemistry today.

Nickel Cadmium batteries have several advantages over other battery chemistries in use today. Nickel Cadmiums can take a fast charge, some in as little as 15 minutes and can take a charge at lower temperatures. Maintained properly, Nickel Cadmiums are capable of thousands of cycles. Nickel Cadmiums can sustain heavy loads. Some newer lithium chemistries have comparable fast-charge, hi-rate discharge, and cycle life capabilities as NiCd.

From a price standpoint, Nickel Cadmium is a bargain compared to some newer battery chemistries. In the past, NiCd offered the widest variety of cells and construction methods available. More recently, however, size selection has become somewhat more limited as NiCd batteries have been banned in some regions due to environmental concerns.

Most Nickel Cadmiums for portable application are either spiral wound cylindrical cells or button cells. There are larger plate Nickel Cadmium wet cells used in aircraft and long term stationary applications.

Several kinds of electrodes are used in Nickel Cadmium cells. Sintered, plastic bonded, and foam are the main types. By combining different types of electrodes in a cell, battery pack manufacturers are able to build cells that have unique advantages over other types. For example: Nickel Cadmium cells may be tailored for superior performance at high temperature, high discharge, fast charge, long-term float or trickle charge, or may be made to deliver extra capacity and be economically priced.

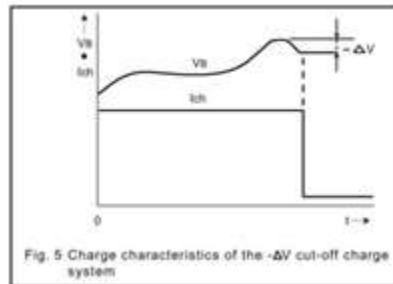
Nickel Cadmium's reputation has suffered over the years from the so-called "memory effect." The term memory effect implies that the battery "remembers" how much energy was required on previous discharges. Simply put, memory effect is a loss of Nickel Cadmium cell performance after relatively few cycles. This is usually caused by crystalline formation on the electrodes of the cell. When the crystals grow, they reduce the surface area of the electrodes, which leads to voltage depression and loss of performance.

The biggest cause of memory effect is overcharge due to the battery being left on charge for an indefinite period of time or being charged before necessary. The best remedy is regular exercise or complete discharge to 1.0 volt/cell. Both cyclic and standby batteries should be fully discharged once a month to maintain optimum performance. If memory effect becomes really bad because of improper maintenance, there are a host of excellent battery analyzer/reconditioners that should be able to repair the damage. If too much time has passed, however, even fancy equipment won't bring your Nickel Cadmium back.

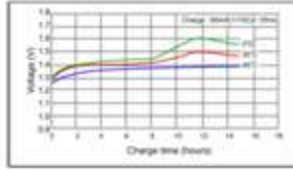
Under normal conditions Nickel Cadmiums prefer a constant current charge. Several cycles may be necessary before a Nickel Cadmium battery reaches its fully rated capacity. Standard Nickel Cadmiums take a 14 hour charge with an input current of 1/10 the battery's capacity or a C/10 (capacity / 10) rate. Special Nickel Cadmiums will take a charge in as little as an hour or less with proper termination. The best termination for Nickel Cadmium is -D V, which means the charge stops after the battery reaches peak

voltage and just starts to drop in voltage as it goes into overcharge. Nickel Cadmiums should be charged in temperatures between 5° C to +45° C.

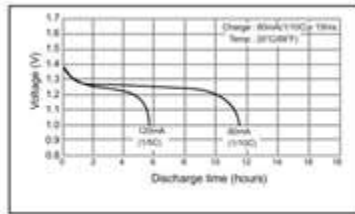
Since around 1990, NiCd cells and batteries have been banned for use in consumer electronics in some regions of the world, particularly in Europe. This is because cadmium is a toxic heavy metal.



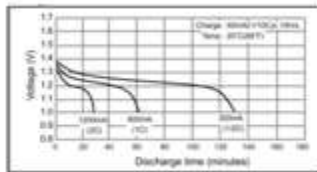
- Cell Voltage: 1.2V (nominal)
- Capacity: 11mAh to 20,000+mAh
- Energy by Weight: 40-60 Watt Hour/Kilogram
- Energy by Volume: Watt Hour/cubic centimeter
- Discharge Characteristics: (recommended drain mA to amperes)
- Cycle Life: 500 to 5000 cycles.
- Self Discharge: 20%/month
- Temperature Range: -40° C to +60° C
- Preferred Charge Methods: Constant Current (-D V fast)
- Sizes: Widest selection of cylindrical and button sizes.
- Applications: Cameras Data terminals, FAX and POS memory, Hobby remote controls, Notebook PCs, Portable phones, Transceivers, Portable printers, Portable TVs, CD and tape players, Security lights, Data terminals, Portable printers, Power tools, Vacuum cleaners, Shavers, Memory back-up, Security systems, Cameras Data terminals, Emergency systems ,Memory back-up, Office equipment, Toys, and Video camcorders.



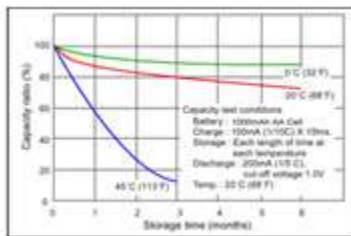
**Charge Characteristics for a Typical 600mAh NiCd AA Cell**



**Low Rate Discharge Characteristics for a Typical 600mAh NiCd AA Cell**



**High Rate Discharge Characteristics for a Typical 600mAh NiCd AA Cell**



**Self Discharge Characteristics for a Typical 1000mAh NiCd AA Cell**