

Hadley RC Club



In the Pits with Mr. Holm

Batteries

There are 3 common types of batteries used in RC vehicles today: NiCd (pronounced Ni-Cad), NiMH (Nickel Metal or its full name Nickel Metal Hydride) and Li-Po (Lithium Polymer). Each type of battery has its advantages and disadvantages.

NiCd	Pros: Cheap Can last 1000 cycles Cons: Low Capacity Can develop "memory"
NiMH	Pros: High Capacities Not as prone to "memory" as Ni-Cd Cons: Can lose 20% of its capacity 24 hours after charging through self-discharge
Li-Po	Pros: High Capacity to Weight Ratio No memory effect Very low self-discharge Cons: Extremely dangerous if not charged correctly. Soft case batteries susceptible to damage Batteries can be permanently damaged if allowed to discharge too low

Because of the dangers of Li-Po batteries, Li-Po batteries cannot be charged at the race without a parent or designated adult supervising. Li-Po's also must be charged in a Lipo Sack which is a fire retardant bag.

Battery Charging

When charging a battery, you should always follow the manufacturer's instructions. Unfortunately most batteries do not come with instructions nor do the manufacturers provide any instructions. This is especially true of NiCd and NiMH batteries. Since LiPo's have specific requirements, we will only discuss the charging of NiCd and NiMH batteries.

When charging NiCd and NiMH batteries, there are two things you need to know: 1. The charge rate which is expressed in Amps and 2. Delta Peak Voltage which is expressed in Millivolts which is frequently abbreviated as mV. You typically do not have to worry about the voltage or number of cells (individual batteries) in a battery pack. The charger will automatically detect this. Some chargers, as a safety measure require you to select this.

Another term you frequently hear is C or C-rate. C is a rate of charge or discharge (Triva: do you know that C stands for coulomb and is named after physicist Charles-Augustin de Coulomb). C is very easy to figure out. It's

just the mAh rating of the battery divided by 1000. So if you have an 1800 mAh battery and you want to charge it at 1C, you charge it at 1.8 Amps.

So getting back to those charger settings, what should you use? I've done a lot of research and came up with these guidelines. For NiCd batteries use a charge rate of 1C to 2C and for NiMH use a rate of 1C to 1.5C. For example if you have an 1800 mAh NiMH battery and you want to charge it at fastest rate, you should the charger to 2.7 Amps ($1800/1000 \times 1.5$).

Almost all chargers have a way to select the charge rate. Select a rate that's within the guidelines, if in doubt, ask someone.

The next setting most chargers have is the delta peak threshold. Delta Peak is used by all chargers to determine when the battery pack is fully charged. Some chargers do not have a setting for this, especially entry level chargers. Those chargers that allow you to set this either have this setting on a per cell rate or for the whole battery pack.

Again, there are guidelines for both types of batteries. For NiCd batteries, a delta peak of 10mV per cell is suggested. For NiMH batteries, use 5mV per cell. If your charger has a setting only for the whole pack, you need to multiply this number by the number of cells. So for example if you have a 6 cell NiMH battery, the setting would be 30mV ($6 \times 5\text{mV}$).

There are a couple of other things you should know about battery charging.

1. NiMH batteries can get hot during charging, this is normal. Some high end NiMH battery manufacturers recommend a final temperature of 125°. NiCd batteries typically don't get hot, but may get warm. Never put a hot battery into a vehicle, a warm battery is OK.
2. Never charge any battery if it's hot. Not only is it dangerous, but will greatly reduce the life cycle of the battery. It's safest to wait until a battery reaches room temperature before recharging.
3. Cut off timers. Most battery chargers have a safety feature that will stop the charge if it hasn't detected a delta peak after a certain amount of time. A battery charged at 1C should full charge in about 1 hour. You need to allow for some extra time as a result of inefficiencies.
4. Many chargers have a setting for the capacity of the battery. This is another safety measure to turn off the charger if the charge cycle goes too long without detecting full.
5. Since both NiCd and NiMH batteries self-discharge, you should charge them as close to race time as practical.
6. Since batteries can take up to an hour to charge, you probably don't have enough time between races to fully charge a battery. Buy enough so you don't have to charge batteries during the races.
7. NiCd batteries should be discharged before recharging to minimize the memory effect. This topic will be covered in more details in the future. NiMH batteries can also benefit from a discharge/charge cycle.
8. It can be helpful to write down the various settings for your batteries if you use more than 1 type of battery.