



## **BATTERY CHARGING GUIDE**

There are three common types of charger:

### **1. Trickle Charger**

These chargers are the most basic type and supply a low power continuous charge to the battery. They are low power because there is no automatic cut off. Typical charge current for AA batteries should be around 120 to 150mA to avoid any overcharging when left on charge for a long period. Unfortunately, some manufacturers allow too higher charge current (>150mA) and this can reduce the life of the cells.

Charging time is calculated as follows: -

E.g.  $\frac{1200\text{mAh cells}}{120\text{mA charging current}}$

= 10 hours x discharge factor of 1.4  
= Total charge time for 4 x 1200mAh cells of 14 hours.

Note: NiMH batteries gradually discharge themselves even without use. Therefore the battery is losing some charge, even whilst charge is being put in. We use a multiplying factor to allow for this discharge during charge time, typically 1.4 for a slow charge, and 1.2 for quicker chargers.

### **2. Timer Controlled Chargers**

These chargers have an automatic pre-set timer which is set according to the capacity of the batteries the charger is intended to charge, and the fast charging current of the charger. When the pre-set time is reached, the charger switches from fast charge to a slow top-up or trickle charge. This trickle charge will keep the battery topped up against the gradual discharge mentioned above. Because there is an automatic switch to trickle charge, the charger can charge the batteries with a more powerful current initially, without the risk of overcharging. Typical fast charging current for a timer controlled charger is 220 – 300mA.

E.g.  $\frac{1800\text{mAh cells}}{\quad}$

240mA charging current

= 7.5 hours x discharge factor of 1.2

= Total charge time for 4 x 1800mAh cells of 9 hours.

The timer would therefore be pre-set at 9 hours, after which time the charge current would automatically switch over to trickle charge.

Problems that can arise with this type of timer charger:

- A. If the cells are not fully discharged before recharging and perhaps require only 4 hours to reach full charge, the timer will still not switch over to trickle charge until 9 hours. Thus allowing for the possibility of some overcharging.
- B. Very often users upgrade the capacity of their batteries, compared to the batteries that were originally supplied with the charger. E.g. The charger in the example above with a charging current of 240mA would need 12 hours to charge 2400mAh batteries. However, this charger would automatically switch to trickle charge after only 9 hours, so the batteries would never become fully charged. This can be critical in high power applications such as digital cameras. The user may only achieve the same performance from the new higher power batteries as from the original batteries because of the limited capabilities of the charger.
- C. If lower capacity batteries are inserted than those originally supplied with the charger, there may be some risk of overcharging as the timer would be set for a longer period of time than actually required.

### 3. Microprocessor Controlled Chargers

Often referred to as “intelligent” chargers these chargers rely on a technology known as “negative delta peak.” The microprocessor monitors each individual battery, effectively measuring its state of charge. The charger automatically switches over to trickle charge when it has determined that the battery has reached full charge. Some manufacturers use a technique whereby 2 or 4 cells have to be charged at one time. This does not allow optimum charge of each cell if one cell has a different charge status from another when charged at the same time. Individual charging circuits are the best types.

Batteries of varying capacities and state of charge / discharge can therefore be put in the charger, safe in the knowledge that the battery will be charged to full capacity with no danger of overcharging. As there is no danger of overcharging much more powerful charging currents can be used, typically 650mA – 4,200mA.

E.g.  $\frac{2400\text{mAh cells}}{1750\text{mA charging current}}$

= 1.25 hours x discharge factor of 1.2

= Total charge time for 4 x 2400mAh cells of 1.65 hours.

The ANSMANN DigiCam Traveller, Energy 8 Universal DigiSpeed 4 and DigiSpeed 4 Ultra -Super Fast Chargers are all examples of Microprocessor Controlled “Intelligent” chargers. All have individual charging circuits to monitor the charging status of each inserted cell.