

## Batteries

(Off load voltages are not the perfect method of judging state of charge but do provide a simple method.)

## Lipos

Minimum voltage: never discharge below (off load) and before charging the battery should have at least:

1 cell = 3.0v

2 cells = 6.0v

3 cells = 9.0 v

4 cells = 12.0v

After charging. Minimum full charge to Maximum full charge:

1 cell = 4.16v to 4.23v

2 cells = 8.32v to 8.45v

3 cells = 12.48v to 12.68v

4 cells = 16.64v to 16.9v

## Nicad

Minimum voltage 1.1v per cell

Max cell voltage (fully charged) = 1.32v per cell

OVERNIGHT: 14-16 hours. C/10 (rated capacity of the batteries divided by 10). Ni-cd batteries can be left on charge at this rate for extended periods (days, even weeks) without damage.

QUICK: 4-6 hours. C/3. Quick charge can eventually degrade the life of the battery.

FAST: 15 minutes or less. 3C. Only specialized chargers for fast charging should be used.

TRICKLE: The Trickle rate replaces the energy that ni-cds lose through shelf life. C/50. The batteries can't be charged up at this rate, only maintained. If you use the Trickle Rate, do so only after the batteries have been fully charged. Preferably at the Overnight rate.

## **Nimh**

Minimum voltage: 1.0 – 1.1 v/cell. (Further discharge may cause permanent damage).

Fully charged 1.35-1.4 /cell (unloaded).

## **Gell Cell**

12.65V is "full"; 12.47V is 75%; 12.24V is 50% 12.06V is 25%; 11.89V is just about zero.

The battery voltage should be kept at or above a 50% state of charge for maximum battery life.

Do not fast charge. Gel cells generally like a steady charge rate of about one tenth of their rated capacity or "C/10". As a general rule of thumb, you should not charge a gel cell at more than 25% of its rated capacity. The optimum charging for a gel cell would be to charge at 25% or C/4 for about 80% of its capacity, then switch to a slower rate, or "float" for the final 20% of capacity, preferably C/10. Keeping a gel cell in a discharged state for extended periods will also diminish its life. Storing in a cool, dry place will maximize shelf life.

## **Lead Acid**

Open circuit:

12.65V is "full"; 12.47V is 75%; 12.24V is 50% 12.06V is 25%; 11.89V is just about zero. (Measure at room temp, 4 – 8 hours rest after charge/discharge.)