

Charging Lithium Polymer (Li-Po) Cells

1. Maximum individual Cell voltage during charge cycle is 4.2 volts per cell.

– **DO NOT EXCEED MAXIMUM-**

For 6 cells: 6 cells X 4.2 volts/cell = 25.2 volts

2. Minimum cell voltage during discharge cycle is 3.0 volts per cell.

– **DO NOT DISCHARGE BELOW MINIMUM-**

For 6 cells: 6 cells X 3.0 volts/cell = 18.0 volts

If a cell is discharged below 3.0 volts, Trickle low charge only at 0.10 C until cell voltage exceeds about 3.2 volts:

For a 2100 mAh pack: 2100 mAh X 0.10 = 210 mAh

3. Maximum charge current for Li-Po cells/packs is 1 C: where C = battery capacity in milliamp hours. –

DO NOT EXCEED-

C = 5000 mAh = 5 amps maximum charge current

4. When charging a multi-cell pack (which is virtually always!) always use a balancer (such as AstroFlights blinky) or a charger, which has an integral balancer. After a number of charge/discharge cycles, cells can go out of balance without the use of a balancing system during charge cycles. A low cell (voltage) will discharge deeper (below 3.0 volts) during use, and not charge up to the maximum (4.2 volts) - - and the other cells in the pack will over charge above 4.2 volts. All this is bad and leads to cell (and pack) failure.

5. Always assure the charger is working properly, and use the correct charging voltage. Li-Po cells or battery packs may ignite if connected to a charger supplying more than 6 volts per cell.

6. Do not install Li-Po cells/packs in a power system that will exceed the rated amperage capacity. Maximum pack manufacturer recommended continuous discharge capacities are usually rated 5C or 10C or 20C; where C equals the battery capacity in milliamp hours (mAh).

For C = 5000 mAh and maximum pack continuous discharge capacity is 10C: 5000mAh X 10 = 50000 mA = 50 amps Burst capacity (greater than maximum continuous) for short duration (usually about 15 seconds, but adhere to mfg specifications) is calculated the same way.

7. After a flight, allow Li-Po packs to cool to ambient temperature prior to charging.

8. Never fast-charge Li-Po cells/packs or any other battery type unattended.

9. Never charge Li-Po cells/packs at any rate unattended.

10. Only charge Li-Po cells/packs with a charger designed specifically for lithium polymer chemistry.

11. Li-Po cells can self-ignite because of unmatched cell capacity or voltage, cell damage, charger failure, incorrect charger settings and other factors. Always store in a fireproof container (Surplus Ammo Boxes and purpose-made battery bunkers work well.)

12. Always charge Li-Po cells or battery packs on a non-flammable surface (metal or ceramic.) Never charge a cell/pack in a model. A hot pack may ignite wood, foam, plastic, etc. Never charge a cell/pack inside a motor vehicle, or in a vehicles engine compartment. Never charge a cell/pack on a wooden workbench, or on any flammable material.
13. If a cell/pack is involved in a crash:
 - a. Remove the cell or battery pack from the model.
 - b. Carefully inspect the cell or battery pack for shorts in the wiring or connections. If in doubt, cut all wires from the cell or battery pack.
 - c. Disassemble the pack.
 - d. Inspect cells for dents, cracks and splits. Dispose of damaged cells (see below).
14. Dispose of cells or battery packs as follows:
 - a. Discharge: with the cell or battery pack in a safe area, connect a moderate resistance across the terminals until the cell or battery pack is discharged.
CAUTION: the cell or battery pack may be hot!
 - b. Discard: -
NiMH: place in regular trash. - NiCd: recycle (cadmium is toxic). - Li-Po: puncture plastic envelope, immerse in salt water for several hours and place in regular trash.
15. Handle all cells or battery packs with care, as they can deliver high currents if shorted. Shorting by a wedding ring, for example, will remove a finger.
16. Always store cells or battery packs in a secure location where they cannot be shorted or handled by children.
17. When constructing a pack, always use only cells of the same capacity (mAh).
18. If batteries are to be stored for periods of greater than 4 weeks at a time, it is necessary to store the batteries in a 50% discharge state. This is irrespective of battery voltage.

How to get to a 50% discharge state?

If you have a watt meter (Astro, Medusa, etc.), you can monitor and discharge to 50% of the pack capacity. For example, after you fully charge a pack, discharge the pack until 50% of the pack capacity is discharged.

If you don't have a watt meter you can follow these general guidelines. With a fully charged pack, fly 1/2 the time you normally fly. For example, if you get 20 minutes of normal flying time, fly 10 minutes to get to "50%" discharge state.