



Taking Performance to New Heights!

PFM Distribution Inc.'s Usage Guide for Apogee High Performance Lithium Polymer Batteries

Failure to follow the following guidelines could result in: Loss of property, injury, or death due to fire or explosion.

Battery discharging, charging, electric motors, spinning propellers, and flying models all have the potential for serious injury to persons and damage to property. In purchasing these products, the user agrees to accept responsibility for all such risks, and not to hold the manufacturer, distributors, or retailers - (including all owners and employees) - responsible for any accident, injury to persons, or damage to property.

CHARGING DO'S:

- **DO** use a charger capable of charging Lithium-Polymer batteries. Some accepted chargers are:
 - Anything manufactured by Schulze or Orbit with a Lithium-Polymer charge cycle.
 - Apache 1-2 or 1-4 cell charger
 - BEL 2-3 cell Lithium-Ion/Polymer charger
 - AstroFlight Model 109
 - Kokam 1-4 cell charger
 - Great Planes Triton
 - Plantraco LPD-400
 - Qualcom 830 Lithium-Ion 2-Cell charger
- **DO** charge in a fire safe box in an area that has non-combustible materials.
- **DO** inspect the cells/pack if a boat/car/aircraft crash or collision has occurred. If malforming has occurred see below for proper disposal of Lithium-Polymer cells. Do not attempt to repair damaged cells.
- **DO** keep a chemical fire extinguisher in the vicinity that Lithium-Polymer cells are being used.
- **DO** check pack polarity and voltage prior to first use. 2-Cell Voltage should be between 7.4 - 7.6, 3-Cell Voltage should be between 11.2 - 11.4. If it's not, please contact us.

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CHARGING DO NOT'S:

- **DO NOT** charge on carpet, cloth, wood, or anything else flammable.
- **DO NOT** charge Lithium-Polymer cells **unattended**. All cells can "vent", no matter the chemistry (Ni-Cad, Ni-Mh, Li-Ion, Li-Poly), however Nickel Cadmium and Metal-Hydride cells come in a metal can, with a venting device. If the cell needs to vent, it can safely do so via a mechanism in the end of the cell. Lithium-Ion/Polymer cells have no vents, and in the event they need to vent the cell is ruptured and a fire can start.
- **DO NOT** charge at over **1C** current. $C = \text{mAh} / 1000$. Example: $850 \text{ mAh} / 1000 = .85\text{A}$ charge rate
- **DO NOT** discharge at over the manufacturers specified rate. Each cell has its own nominal and maximum discharge ratings clearly marked on the pack, and on the individual product pages.
- **DO NOT** discharge lower than 3.0 volts per cell.
- **DO NOT** charge to more than 4.2 volts per cell.
- **DO NOT** crush, pinch, poke, or in any way deform the cell. Lithium-Polymer cells do not have a hard case. Malformation can cause the cell to internally short out, and burst into flame. If a cell is deformed, dispose the pack as per disposal methods below.
- **DO NOT** continue to use any cell that has increased (commonly known as "ballooning") in size. Cells that have a "bloated" appearance have been damaged, and pose a fire hazard. Dispose of the pack as per disposal methods below.
- **DO NOT** allow the cells to exceed 160F degrees. Doing so will reduce the life of the cell, and increase the risk of fire. We have proven that with just one discharge cycle where 200F Degrees was obtained cell capacity was reduced by 20%.
- **DO NOT** assemble cells of unknown capacity. Doing so will cause cell imbalance, and eventually a cell failure (and possibly a fire) could result.
- **DO NOT** store your packs where small children or animals can get to them. Lithium has a sweet smell, which by animals/children could be thought of as candy. Lithium is toxic (death could occur) if ingested.

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Battery Break-in Procedure:

Contrary to popular beliefs that lithium polymer battery packs need no "break-in" period, before you run new Apogee packs continuously at their maximum discharge rate, we recommend you cycle the battery packs at **no more** than 7C for a minimum of 15 cycles down to 3.0V per cell or until the PROPERLY SET Low Voltage Cut-Off (LVC) on your ESC kicks in. All Apogee packs are to be charged at a maximum 1C.

By following this break-in procedure, your batteries will run much cooler when you run them continuously at the maximum discharge rates.

How do I calculate 7C?

If your battery pack capacity is say 1050 mAh with a charge rate of 1.05 A, 7C is simply $7 \times$ Charge Rate or:

$$7 \times 1.05 \text{ A} = 7.35 \text{ A}$$

In this case with the 1050 mAh pack, you should discharge no more than 7.35 A.

How do you cycle an Apogee pack?

If you have a lithium polymer charger (e.g. Triton/Orbit/Schulze) that has a lithium battery discharge cycle, discharge your battery at the 7C rating or lower until the 3.0V per cell reached.

If you don't have a charger with a lithium discharge cycle, you can discharge through your speed controller. Make sure the speed controller LVC is configured properly for the number of cells.

If you have a WattMeter or inductive pickup ammeter, choose the prop/gearing that gets you closes to 7C, and fly normally for 15+ flights to the properly set LVC.

Charge and repeat for 14 or more cycles.

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Disposal Procedure:

- Discharge the cell/pack to 2.5 volts per cell. That would be 5.0 volts for a 2-cell pack and 7.5 volts for a 3-cell pack.
- Find a container that is large enough, once filled with water, to immerse the cell pack under water. Fill the container with water and saturate the water with salt; that is, add enough salt so the salt can no longer dissolve.
- After the pack has been discharged to 2.5V per cell, place the cell or pack into the salt water solution. This will deplete the rest of the energy in the cell/pack. Allow cell/pack to soak for 24 hours.
- Take the cells out of the solution. Check the voltage is 0 volts.
- Discard cell/pack in the trash.

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