



# Safely Charging Lithium Polymer Batteries (LiPos)



University of Minnesota UAV lab

## Key Things to Remember:

- Never Charge a LiPo at too high a rate
- Always use a balancer when charging
- Always pay attention to the instructions
- LiPos are extremely dangerous when mistreated. Treat them well and you may never have a problem
- For more information about any charger, read the manual

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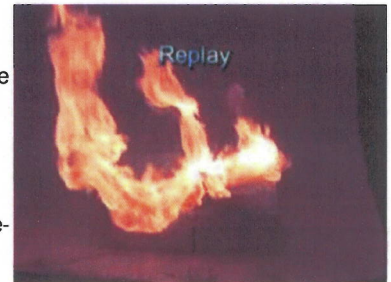
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## Safety

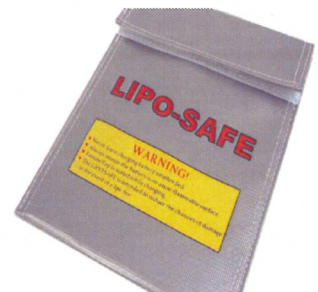
Lithium Polymer batteries are somewhat dangerous since they contain lithium. Following are guidelines relating to safely using them.

- You will not have the equipment to put out a LiPo fire once it starts, thus you must prevent it from starting and also prevent it from lighting other things on fire.
- The first step to this is to always keep the LiPos in a LiPo safe or a LiPo safe bag whenever they are not being used. (When they are charging or in storage)
- The next step to fire prevention is to never charge a LiPo at too high a rate. The way to figure out the safe rate is to divide the capacity in mAh by 1000.
- Another key safety item is to never use a damaged battery. Thus, you shouldn't use a battery that has been in a crash without checking for damage.
- You should never puncture a cell as this will lead to a fire.
- If a LiPo starts to bulge while charging, immediately take it off the charger and if possible put it outside or in a LiPo safe.
- If a LiPo does explode or catch fire, you can throw sand on it to slow the reaction. Alternatively, a class D fire extinguisher (one specialized for putting out metal fires) would put out the battery fire. Any other more common fire extinguisher would put out the fire caused by the battery,

but not the battery itself and would thus be of little use.



A LiPo fire



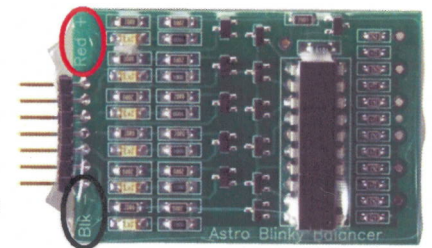
A LiPo safe bag.

## General Charging Instructions

1. Set up the charger with the correct settings (see below)
2. Connect the balancer to the LiPo, making sure that the black wire matches up with (Blk -) or (GND)
3. Connect the LiPo to the charger.
4. Once the charger starts to beep press the same button

that you used to start the charger (normally start/stop). This will stop the beeping.

Note that some chargers ask for the capacity, while others ask for the charge rate. Finding the charge rate is easy, you simply divide the capacity in mAh by 1000.



A balancer with the markings circled

## About Lithium Polymer batteries

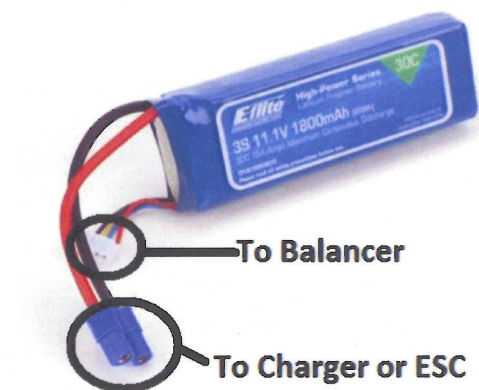
LiPos are a type of battery that is ideal for RC due to their high capacities, high discharge rates, and low weights. These attributes have led to them being the primary type of battery used in most RC hobbies, from planes to boats.

LiPos are composed of separate cells, with most batteries composed of one to six separate cells. Each cell normally has a voltage of about 3.7. Thus, batteries with more cells have more voltage. For example a LiPo with 2 cells would have a normal voltage of 7.4. Cells also have a minimum and maximum voltage, these are 3.2 and

4.2 volts, respectively.

When charging a LiPo, all the cells need to be at about the same voltage, which is why a balancer is needed. A balancer redistributes the charge so that all the cells are at close to the same voltage. This extends the life of the battery and also makes sure that none of the cells are over or undercharged. A balancer also gets its own cord to plug in to coming from the LiPo, since it needs to connect to each cell individually.

Another thing to know about LiPos is the unit used to describe both their maximum



discharge and charge rates. This unit is C as in 1C for the charge rate. C stands for capacity and is derived from just dividing the capacity by 1000.

**“Lithium Polymer batteries are ideal for RC”**

## A helpful table of Minimum, Nominal, and Maximum Voltages

	Minimum Voltage	Nominal Voltage	Minimum Storage Voltage	Maximum Storage Voltage	Maximum Voltage
1 Cell	3.2	3.7	3.8	3.9	4.2
2 Cell	6.4	7.4	7.6	7.8	8.4
3 Cell	9.6	11.1	11.4	11.7	12.6
4 Cell	12.8	14.8	15.2	15.6	16.8
5 Cell	16.0	18.5	19.0	19.5	21.0
6 Cell	19.2	22.2	22.8	23.4	25.2

### LiPo Battery Storage

When storing a LiPo battery for more than a week, you should store it at 3.8 to 3.9 volts per cell (a little more than half charged). This is to extend the life of the batteries.

The **Thunder Power** charger has a feature that will do this automatically. To do this you hold **SEL** and then press it again 4 times to get to a screen that says LiPo/A 123 CHG Option. Here you can change the percentage down to 55 to 60% using the **INC** and **DEC** buttons.

You can exit this screen by holding **SEL** again. Make sure you change this back once you want to charge batteries to their full capacity for flying..

### New Battery Care

When you first get a battery:

- 1) Make a visual inspection of the pack. Checking for any damaged leads, connectors, broken/cracked shrink covering, puffiness or other irregularities.
- 2) Check that none of the cells are below the minimum voltage. If the cells are out of balance use the a balancer to balance the battery. You can also

use the thunder power charger to charge at a very low rate, this will balance the battery as well

- 3) For the first 2-4 discharges no more than 3-5C average discharge to brake in new packs. Also be extremely careful not to over discharge new packs

### Using the Thunder Power Charger (TP610C)

1. Note that this charger also has its own balancer, so make sure you plug in the balancing cable.

2. Press the **select mode** button until you see "LiPo Charge" if needed.

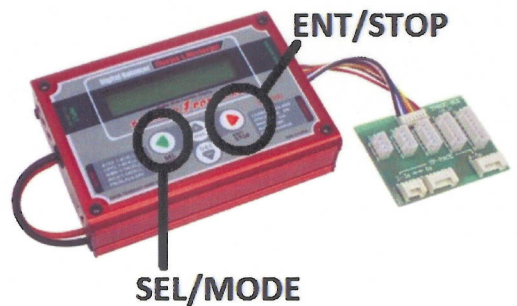
3. Then press **ENT/STOP** and enter the cell count and charge rate (capacity/1000)

4. Hold down **ENT/STOP** to start charging.

5. You can also use this charger to balance by going

into the balance mode by pressing the **SEL/MODE** button repeatedly (three times from charging screen). This also lets you see the voltage for each cell

Note: The Thunder Power chargers also can vary what voltage they charge to. This is discussed further in the storage section.



### Using the Multiplex Charger (M92532)

1. Select the capacity by pressing **START/STOP ENTER** and then using the **DEC** and **INC** and then press **START/STOP Enter** again to enter the voltage

2. Then hold down **START/STOP ENTER** to start charging and then again to stop if desired.



### Using the Triton Charger

1. Press down on the **selector dial** to enter the charge rate by turning the **selector dial** and then again to enter the voltage.
2. To start and or stop charging hold down the **selector dial**.



### Using the Electrify Triton Jr. Charger (GPMM3152)

1. Press **ENTER START** to select the battery capacity and by pressing **INC** and **DEC** then press **ENTER START** again for the voltage.
2. Then hold down **ENTER START** again to start charging.



"LiPo chargers have basically the same controls with a few variations. Once you know how to use one, you should be able to figure out any other one"



**University of  
Minnesota UAV lab**

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