

Safety Guidelines and Technical Rules for use of Lithium Polymer (LiPo) Batteries.

During the past year, the use of LiPo batteries for 'Club' racing has become more popular, as this type of battery technology allows competitors to cope easier with short intervals between races.

Previously, the Electric Sections within the BRCA Electric Board have not allowed the use of LiPo cells at any of their sanctioned events.

At the 1/10th. Touring Car Section AGM in Oct. 2007, this Section decided to allow LiPo cells to be used in a 'Support Class' at their National events for 2008. Obviously with this cell technology being new at BRCA events, there is a lot to Learn.

The BRCA Electric Board have compiled some basic guidelines regarding the safe use of LiPo cells and a set of basic rules to enable the Touring Car Section to have a degree of control on what cells are allowed at their events.

The following guidelines and rules are not a definitive copy 'Set in Stone' and may be subject to amendments as the Racing Season progresses and more information is gathered.

The BRCA Electric Board requires that all competitors that intend using LiPo cells study the following advice and operate strictly within the guidelines below.

A guide to safe use of Li-Po Batteries, from the British Radio Car Association.

Any rechargeable battery that is currently on the market has a risk of explosion, fire, and smoke emission if not handled properly. Despite the stories that have made the press, Lithium (Li-Po) batteries are not fundamentally unsafe, but they need to be treated with a lot more care and respect than NiCd or NiMH cells. Just because a supplier of a Li-Po battery does not label or warn of the dangers of their product does not make that product safe.

The principal risk is fire, which can result from improper charging, crash damage, or shorting the batteries, and this can be difficult to extinguish. Fire occurs due to contact between lithium and oxygen in the air. It does not need any other source of ignition or fuel to start, and burns almost explosively. A lithium battery fire is very hot (several thousand degrees) and is very good at starting additional fires that can result in loss of models, cars and other property. Homes, garages and workshops have also burned.

These warnings can be a little 'scary', and they should be as Li-Poly packs can be very dangerous if not handled correctly. However, please try and keep this information in perspective. Kitchen knives and chip pans can also be very dangerous if not handled properly and there will probably be more injuries caused by scalpels or super glue in eyes than batteries. The following precautions should help you enjoy using Li-Po batteries without having a major incident.

General Precautions

- Only charge Li-Po batteries on a charger specifically design for Li-Po batteries. *Li-Po chargers are available at varying prices, depending upon the features, for the same price as, or lower than, NiMH chargers.*
- Always ensure you use the correct charging voltage for the cell count. This will be 7.4v (2S) for car packs.
- The **maximum** charge rate should be 1C, e.g. 3.2A for a 3200 mah. pack and peak voltage **must not** exceed 8.4v. *For best charging, low charge rates should be used where possible.*
- Double check the charge voltage (or cell count), mah, and current before each charge.
- Never leave charging Li-Po cells unattended (at any charge rate).
- It is best to charge Li-Po cells in an open space on a non-flammable, non-conducting surface (such as a bare cement floor, brick or quarry tile) and away from flammable materials.
- Check your charger for safety. After charging, check the battery with a digital voltmeter, the voltage for a fully charged pack should be between 8.32V to 8.45V.
- Do not charge the battery inside your model, inside your car, on home furniture or wood floor/carpet, or anywhere near flammable material.
- The minimum safe discharge voltage is 5.0V (2.5V per. cell) when under load, or 6.0V (3.0V per. cell when not on load).

- A number of the electronic speed controllers have a Li-Po feature built into their software; make sure that this has been enabled. Otherwise consider fitting a Li-Po cut-off device. Failing that, stop driving when the motor loses power, remove the battery from the car, and recharge it.
- If using a Li-Po receiver pack then you will need to use a 6V regulator, that will supply enough current to power your radio equipment.
- Use connectors that can not be short circuited, or use silicon fuel tube to protect exposed connections. Under no circumstances should the ESC wires be soldered directly to your battery.
- Do not short the battery as it may catch on fire. If you accidentally short a battery, place it in open space and observe the battery for 10 minutes. It may swell up and possibly even catch on fire.
- Have a dry powder fire extinguisher or a bucket of dry sand within reach in case of a fire.
- Cell balancing is a way of ensuring your Li-Po will deliver the maximum performance and capacity over a prolonged period of time, although some manufacturers claim that it is not required with their batteries.
- Li-Po packs are designed for operating temperatures up to 40°C and under no circumstances must they become hotter than 60°C.
- You may need to add weight to your car to balance it and/or reach the minimum legal weight.
- If a pack is involved in a crash or is otherwise damaged, remove the pack from the model and inspect for damage to the pack and the wiring/connections.
- Lithium polymer batteries do not have a hard steel case like a NiMH battery. Instead, a special aluminium foil encloses them. Therefore, they do not vent. If the integrity of the battery is compromised, swelling will occur. If the battery is damaged and the case begins to expand, discontinue use immediately.

2008 Rules for Lithium Polymer (LiPo) Batteries
For use in the Touring Car Pro-Stock Class Only

1. Lithium Polymer (a.k.a. Li-Poly/LiPo) battery packs must have a hard, protective case that completely envelopes the cell(s). The maximum case size is as follows: -
 Length: 139.0mm.
 Width: 47.0mm.
 Height: 25.0mm.
 (Height excludes the mouldings on the bottom of the case that help locate the battery pack in the car).
2. The maximum retail price for the year starting 1st.Jan. 2008 is £80.00.
3. Individual cells used in the construction of the battery shall be rated at 3.7 volts nominal and the pack shall be 2 cells in series.
4. The battery pack shall have leads extending from the case for the positive and negative electrical connections using wire of adequate size to handle discharge rates acceptable to racing applications. Alternatively, the case shall have external connection points for these wires clearly marked positive and negative so the user can apply the lead wires.
5. The case must have the original suppliers label intact, stating the rated voltage and the pack capacity. Maximum capacity is 5,000 mah. The Brand name/logo shall be easily readable.
6. For 2008 there will be a rolling homologation list (as per. motors).
7. All LiPo packs must be charged with a LiPo-capable charger using the industry standard CC/CV (Constant Current/Constant Voltage) charge profile.
8. LiPo batteries may be charged to a maximum of 8.40V +/-0.04V. Overcharging is a serious safety hazard and will not be tolerated.

Please read the guide to safe use of LiPo batteries :- 'Safe use of LiPo Batteries' (above).

The BRCA Electric Board will assist the Touring Car Section in controlling an approved list for LiPo cells. Cells for approval need to comply with the above rules, be available in UK retail outlets and should be sent to :-

Paul Worsley, 23 Prince Rupert Road, Stourport-on-Severn, Worcs. DY13 0AS.

The approved list will be shown in the Touring Car Section of the BRCA website.

During 2008, the approved list is not 'frozen'. Cells will be added to the list on Monday's only.

BRCA Electric Board. 23rd. Jan 2008. (Approval notes added 6th. March 2008)