



# LITHIUM-POLYMER

## SAFETY AND HANDLING INSTRUCTIONS

Lithium-polymer (LiPo) batteries offer a variety of significant advantages over NiCd and NiMH batteries for use in R/C vehicles. It is **extremely important** to have a good understanding of the operating characteristics of LiPo batteries – most importantly how to charge and care for them safely. Always read the specifications printed on the battery's label and in this instruction sheet in their entirety prior to use. Failure to follow these instructions can quickly result in severe, permanent damage to the battery and its surroundings, and even start a **FIRE!**

**WARNING!** LiPo batteries are **ENTIRELY DIFFERENT** from NiCd and NiMH batteries and must be handled differently!! DuraTrax will not be held responsible for any and all incidental damages and bodily harm that may result from improper use of DuraTrax brand lithium-polymer batteries. In purchasing these products, the buyer/user agrees to bear all responsibilities of these risks and not hold DuraTrax and/or its distributors (owners and employees) responsible for any accidents, injury to persons, or property damage. If you do not agree with these conditions, please return the battery to the place of purchase.

Before and after every use of your LiPo battery, inspect the pack carefully to ensure no physical damage such as swelling, cracks in the case, or loose plugs and wires are evident. Such signs can often indicate a dangerous problem exists with the battery that could lead to failure.

### **LIPO BATTERY RATINGS**

LiPo batteries are rated by cell configuration, voltage, capacity and "C" value.

Cell configurations vary widely but can easily be determined by the terminology. "S" means series. "P" means parallel. For a battery that is labeled as 2S, it would contain two LiPo "cells" wired in series. For a 2S2P battery, it would contain four cells in total. Two sets of two cells wired in series and then these two sets wired together in parallel. The more cells you wire in series, the higher pack voltage you will have. The more cells that are wired in parallel, the more capacity you will have.

Voltage is 3.7V per cell nominal. Note: In operation, NEVER let your pack drop below 2.9V per cell. Conversely, when charging, NEVER charge higher than 4.2V per cell. If these guidelines are exceeded, your battery can be damaged.

The "C" rating is the discharge amperage rate that the battery is capable of delivering. Note: This is a "multiplier" of the cell capacity rating, NOT a means for direct comparison. Therefore, the final discharge amperage rating of a battery is capacity times the C rating.

### **CHOOSING THE RIGHT LIPO BATTERY**

Evaluate your application and determine what you think the "average" discharge amperage rate will be during operation.

The below are "guidelines" only. Your application could vary:

- 1/10 Sport RC cars: 15~25 amps average.
- Sport RC boats: 15~25 amps average.
- 1/10 Off road cars: 22~35 amps average.
- Mod Touring cars: 40~55 amps average.
- 1/8 scale cars: 50~65 amps average.
- Fast electric race boats: 45~65 amps average.

By calculating the battery pack ratings, you can determine which battery is right for your application. Important note: Even though your battery can handle more current, for the longest battery life and to keep your batteries operating safely, it is recommended that your "average" discharge amperage NOT exceed more than 60% of the discharge amperage rating. We have found that consistent operation over this spec, will dramatically shorten the lifespan and performance of your battery pack.

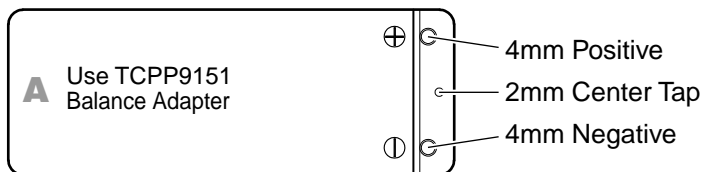
**Example:** A 3200mAh 25C pack will be  $3.2 \times 25 = 80$  amps. Multiply this by 0.6 and you get 48amps. This pack should work very well and have long life for applications of 48amps or below.

**Note:** LiPo batteries DO NOT operate well in temperatures lower than 40°F (45°C).

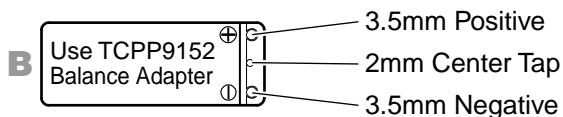
### **CHARGING THE BATTERY**

A LiPo compatible charger which can apply the "constant current/constant voltage" charge technique (cc/cv) and a cell balancer must be used for charging. DuraTrax suggests using the DuraTrax ONYX™ 230 AC/DC Advanced Charger (DTXP4230), and the Team Checkpoint® Pro LiPo Balancer (TCPP9150).

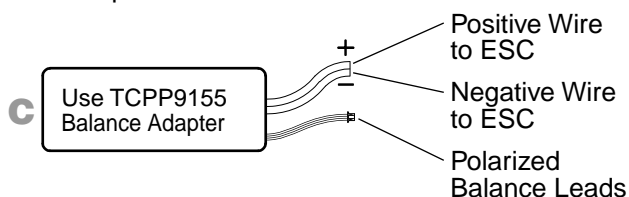
DuraTrax batteries have one of three connector types. Use the following drawings to determine the correct balance adapter to use for your 7.4V pack.



**Drawing “A”** is a larger pack typically used for 1/10 scale kits. It uses 4mm connectors for the positive (red +) and negative (black –) with a 2mm diameter center tap. Use the Team Checkpoint Pro Lipo 2s 4mm balance adapter TCPP9151.



**Drawing “B”** is a smaller pack typically used with micro (approx 1/18) size kits. It uses a 3.5mm connectors for the positive (red +) and negative (black –) with a 2mm diameter center tap. Use the Team Checkpoint Pro Lipo 2s 3.5 mm balance adapter TCPP9152.



**Drawing “C”** is for packs which feature preinstalled power and balance leads. Use the Team Checkpoint Pro Lipo 2s XH balance adapter TCPP9155.

1. Always connect the charger to the balancer first, and then connect the balancer to the battery. Always observe the correct polarity.

2. Set the charger’s output voltage to match the nominal rated voltage of the entire LiPo battery pack, which is 7.4V for your DuraTrax LiPo Stick Pack battery. NEVER set the charger to a voltage which is greater than the nominal voltage rating of the LiPo pack or allow LiPo cells to charge to greater than 4.20V per cell at any time!! Overcharging usually will result in a permanent, catastrophic failure in the LiPo cells. This can result in permanent damage to the battery and its surroundings, and cause personal injury!

3. Set the charger’s output current to NO GREATER than the “1C” rating of the battery. A battery’s “1C” rating equals the amount of current needed to fully charge the battery in one hour. For example, a battery rated at 2500mAh of capacity has a 1C rating of 2500mAh (or 2.5 amps) while a battery rated at 4000mAh of capacity has a 1C rating of 4000mAh (or 4.0 amps) and so on.

4. Place your battery into a fireproof box or LiPo bag. This is “required” at most tracks.

5. Start the charge process.

**IMPORTANT WARNINGS:** Be sure to READ and FOLLOW these important warning statements regarding the charging of LiPo batteries:

- **ABSOLUTELY NEVER** charge LiPo batteries with a NiCd or NiMH charger! ONLY use a charger specifically designed for LiPo batteries which can apply the “constant current / constant voltage” (cc/cv) charge technique.
- **NEVER** attempt to charge a LiPo battery with a charger that is not capable of balance charging UNLESS you use a cell balancer similar to the Team Checkpoint Pro LiPo Balancer! Failure to do so could result in damage to the battery and its surroundings, and cause personal injury.
- **NEVER** apply a trickle charge to LiPo batteries.
- **ALWAYS** provide adequate ventilation around LiPo batteries while charging.
- **NEVER** charge a LiPo battery while it is inside the model. A hot pack could ignite plastic, foam, etc.
- **NEVER** charge LiPo batteries at currents greater than the “1C” rating of the battery (“C” equals the rated capacity of the battery).
- **NEVER** allow LiPo batteries to overheat at any time! Batteries which exceed 140°F [60°C] during charge can and USUALLY WILL become damaged physically and possibly catch FIRE!! If a battery becomes overheated, disconnect it from the charger immediately. Do not reuse it if you suspect it has been damaged in any way.
- **ALWAYS** discontinue charging a LiPo immediately if at any time you witness smoke or see the battery starting to swell. This may cause the battery to rupture and/or leak, and the reaction with air may cause the chemicals to ignite, resulting in fire. Disconnect the battery and leave it in a safe, fireproof location (ideally outside).
- **NEVER** continue to charge LiPo batteries if the charger fails to recognize full charge. Overheating or swelling of the LiPo cells is an indication that a problem exists. The batteries should be disconnected from the charger immediately and placed in a fireproof location!!

## **CONNECTING TO AN ESC & DISCHARGING THE BATTERY**

- **ALWAYS** read your ESC, LiPo Balancer, or Discharger instructions completely before connecting your battery.
- It is **REQUIRED** that you use an ESC which is designed to handle the low voltage cutoff points for LiPo batteries. Discharging LiPo batteries below 2.9V per cell can cause permanent damage and limit the number of times the battery can effectively be used again. Always follow the instructions provided with the ESC for proper operation.
- **ALWAYS** connect the battery’s positive (+) terminal to the red lead from the ESC or Balancer and the battery’s negative terminal (-) to the black lead from the ESC, LiPo Balancer, or Discharger.
- **NEVER** discharge LiPo batteries at currents which exceed the discharge current rating of the battery, as this can often cause a cell to overheat. Do not allow a LiPo cell to exceed 140°F [60°C] during discharge.

## **BATTERIES INVOLVED IN A CRASH**

It is very important to remember that crash damage to LiPo batteries is much more dangerous than with NiCd or NiMH cells. DuraTrax LiPos are enclosed in a protective plastic case to add a layer of protection for the cells in the pack. After a crash, remove the LiPo battery from the model but **DO NOT** immediately place it in a model, pocket, or full size automobile. Instead, inspect it thoroughly by checking for cracks in the case, loose plugs and wires, or any other physical damage. If any physical damage is noticeable, place the battery in a fireproof location and observe it for safety concerns. If possible, leave the battery in the safe location for 24 hours. If no physical damage is apparent, it should not be assumed that no internal damage has occurred. LiPo batteries can often have a delayed chemical reaction. While they may appear to be safe immediately after removing them from the crash, they can suddenly begin to smolder, emit smoke, and catch fire even an hour or more after a crash. For this reason, all LiPos involved in a crash should be placed in a fireproof location and observed for at least 24 hours for safety concerns before they are reused.

## **IN THE EVENT OF A FIRE**

When handling LiPo Batteries, you should “ideally” have a class “D” type fire extinguisher available. At a minimum, a medium size (2 gallon) metal bucket filled with sand will work. A scoop for the sand and fireproof gloves are also highly recommended.

In the event that a LiPo battery begins to smoke, immediately bury the battery in your bucket of sand or use the fire extinguisher. If **SAFELY** possible, move the battery outdoors. If the battery cannot be taken outside, evacuate the building and open all doors to clear the fumes. If needed, call the fire department. Avoid breathing the fumes.

**TIP:** Keep a large zip lock bag filled sand in your pit box. This is handy for when you travel to events. If a battery fails, simply throw the bag onto the battery. As the plastic melts, it will cover the pack with sand.

## **HANDLING, STORAGE & TRANSPORTATION**

- **IMPORTANT! ALWAYS** store LiPo cells/packs in a fireproof container and place in a secure location away from children.
- **NEVER LEAVE** a LiPo battery **UNATTENDED** at **ANY TIME** while being charged or discharged!!!
- **NEVER** put a LiPo pack in the pocket of any clothing!
- **ALWAYS** charge and discharge LiPo batteries in a fireproof location and in a container made of metal (such as an ammunition box), ceramic tile, or a bucket of sand, and provide adequate ventilation around LiPo batteries during charge, discharge, and during storage.
- **NEVER** allow LiPo batteries to be charged or discharged on or near combustible materials, including paper, plastic,

carpets, vinyl, leather, wood, inside an R/C model or full-sized automobile!

- **ALWAYS** have a lithium-approved “Class D type” fire extinguisher or a bucket of sand available at all times.
- **NEVER** allow LiPo batteries to come in contact with water or moisture at any time. If batteries do come in contact with water or moisture, immediately dry the battery with a clean towel.
- **NEVER** store batteries near an open flame or heater.
- **NEVER** allow LiPo batteries to become punctured, especially by metallic objects such as screwdrivers, hobby knives, etc.
- **DO NOT** expose battery packs to direct sunlight for extended periods of time.
- **NEVER** leave LiPo batteries lying loosely anywhere in a full size automobile (in the trunk, backseat, floor, etc.). Never leave them inside the vehicle indefinitely, as temperatures can easily rise far in excess of 120°F and damage the battery. When transporting LiPo batteries, **ALWAYS** store them in a fireproof container.
- For long term storage it is recommended to charge the battery fully, and then discharge them to 50% to 60% of their capacity.
- Store the battery at room temperature in a cool or shaded area, ideally between 40° to 80°F. Temperatures exceeding 170°F for greater than 1 hour may cause damage to the battery and cause a fire.
- **NEVER** allow LiPo batteries to freeze. This will damage the chemistry and reduce performance.
- **ALWAYS** make sure all plugs / connectors on the LiPo battery are covered, to prevent an accidental short.
- **ALWAYS** make sure that metallic objects, such as wristwatches, bracelets, or rings, are removed from your hands when handling LiPo packs. Accidentally touching battery terminals to any such objects could create a short circuit condition and possibly cause severe personal injury.

## **FIRST AID INSTRUCTIONS**

If the battery's outer case is punctured, cracked, or torn, **DO NOT** allow the battery's internal chemicals to get in the eyes or on skin. Wash affected areas with soap and water immediately if they come in contact with the electrolyte. If electrolyte makes contact with the eyes, flush with large amounts of water for 15 minutes and seek medical attention immediately! If a battery leaks electrolyte or gas vapors, do not inhale leaked material. Leave the area and allow the batteries to cool and the vapors to dissipate. Remove spilled liquid with absorbent towels and dispose.

## **DISPOSAL OF LIPO BATTERIES**

Unlike NiCd batteries, LiPo batteries are environmentally friendly. For safety reasons, it's best that LiPo cells be fully

discharged before disposal (however, if a pack or cell is physically damaged, it is NOT recommended to discharge LiPo cells before disposal – see details below). Batteries must be cool before proceeding with disposal instructions.

### To dispose of LiPo cells and packs:

1. If the plastic case is cracked or shows signs that any LiPo cell in the pack has been physically damaged, resulting in a swollen cell or a split or tear in a cell's foil covering, do NOT discharge the battery. Jump to step 5.
2. Place the LiPo battery in a fireproof container or bucket of sand.
3. Connect the battery to a LiPo discharger. Set the discharge cutoff voltage to the lowest possible value. Set the discharge current to a C/10 value, with "C" being the capacity rating of the pack. For example, the "1C" rating for a 1200mAh battery is 1.2A, and that battery's C/10 current value is (1.2A / 10) 0.12A or 120mA. Or, a simple resistive type of discharge load can be used, such as a power resistor or set of light bulbs as long as the discharge current doesn't exceed the C/10 value and cause an overheating condition. For LiPo packs rated at 7.4V and 11.1V, connect a 150 ohm resistor with a power rating of 2 watts (commonly found at Radio Shack) to the pack's positive and negative terminals to safely discharge the battery. It's also possible to discharge

the battery by connecting it to an ESC/motor system and allowing the motor to run indefinitely until no power remains to further cause the system to function.

4. Discharge the battery until its voltage reaches 1.0V per cell or lower. For resistive load type discharges, discharge the battery for up to 24 hours.
5. Submerge the battery into bucket or tub of saltwater. This container should have a lid, but it does not need to be airtight. Prepare a bucket or tub containing 3 to 5 gallons of cold water, and mix in 1/2 cup of salt per gallon of water. Drop the battery into the saltwater. Allow the battery to remain in the tub of saltwater for at least 2 weeks.
6. After 2 weeks in the saltwater the LiPo battery can be removed and disposed of in the normal trash.

For Technical Service and Support on your DuraTrax product, please contact:

**Hobby Services** (217) 398-0007  
3002 N. Apollo Drive, Suite 1  
Champaign, IL 61822

Or e-mail us at [hobbyservices@hobbico.com](mailto:hobbyservices@hobbico.com)  
<http://www.duratrax.com>

## AVAILABLE FROM DURATRAX

### Adapters:

- DTXC2210 Adapter Standard Plug to Mini Plug
- DTXC2211 Adapter Standard Plug to 4mm Male Bullet
- DTXC2212 Adapter Deans® Ultra® Female Plug to 4mm Male Bullet
- DTXC2213 Adapter Traxxas® Female Plug to 4mm Male Bullet

### Chargers:

- DTXP4230  
DuraTrax® Onyx™ 230 Advanced Peak Charger w/LCD



- In addition to NiCd and NiMH chemistries, handles the latest in battery technology — including LiPo, LiIon and LiFe (A123) cells!
- Fast charge current stretches from 0.1 to an incredible 7 amps.
- Includes an easy-to-read, 2x8 reversed LCD with backlight.
- Also features ten battery memories and a built-in cooling fan.

### Charge Leads:

- DTXC2220 Charge Lead 4mm Banana to Standard Plug
- DTXC2221 Charge Lead 4mm Banana to Deans Ultra
- DTXC2222 Charge Lead 4mm Banana to Traxxas
- DTXC2223 Charge Lead 4mm Banana to Mini Plug

- DTXP4170  
DuraTrax® IntelliPeak™ ICE™ DC Competition Charger



- Four-time R/C Car Action "Reader's Choice" award-winner!
- Handles 1-10 NiCd or NiMH cells, and 1-4 lithium-ion (Li-Ion) or lithium-polymer (Li-Po) cells.
- Wide adjustable current ranges for fast-charge (0.1-8.0A) and discharge (0.1-10.0A) are ideal for electric cars, trucks and boats.
- Performs 1-10 cycles (NiCd and NiMH only) — retrieves data for 10 full cycles.

## AVAILABLE FROM CHECKPOINT

- TCP9150 Team Checkpoint Pro Car LiPo Balancer
- TCP9151 Pro LiPo 2S 4mm Balance Adapter
- TCP9152 Pro LiPo 2S 3.5mm Balance Adapter
- TCP9155 Pro LiPo 2S XH Balancer Adapter

