Model Train™ TECHNOLOGY

LiPo Battery & Charger

OPERATIONS MANUAL

Version 1.1a

WARNING

IMPORTANT!!! READ MANUAL in its entirety before use.
Take extra precautions when handling Lithium Polymer (LiPo) batteries, as they require different safety measures compared to NiMH or NiCd batteries!

Failure to follow these instructions can result in severe permanent damage to battery, cause serious personal injury, or lead to a fire.

This LiPO battery is intended to be used with this Model Train Technology G-Controller product only. Any damage caused by misuse or modifications will void your warranty and can cause serious injury.

By purchasing this product, the buyer/user agrees that they have read and understood the safety precautions printed in this document and accepts full responsibilities of these risks. By agreeing, the user/buyer does not hold Model Train Technology LLC responsible for any accidents, injury to persons, or property damage that may occur.

If buyer/user does not agree with these conditions, please return the battery in its original condition immediately.

General Safety Guidelines

1. **NEVER** use a NiCd/NiMH charger to charge LiPo batteries. Only use chargers designed for Lithium Polymer (LiPo) batteries.

2. **NEVER** store LiPo batteries in any location that exceeds 40-80° F (e.g. in a car, garage, or in the sun)

3. **NEVER** leave charging batteries unattended. Keep watch on the charging process & react to any potential problems that may occur.

4. **NEVER** let the battery's positive and negative leads to touch. This can cause the battery to short and lead to a FIRE. If for any reason you need to cut the terminal wires, it will be necessary to cut each wire SEPARATELY, to make sure the wires do NOT touch each other.

5. **ALWAYS** charge batteries in a fireproof container or surface and away from combustible material. Do NOT charge on surfaces that can catch fire – this includes: wood, cloth, carpet, or in the product case.

6. **ALWAYS** inspect the battery to make sure there are no signs of damage, deformity, or swelling before charging. If there are, STOP charging the battery and follow the proper procedure to dispose of the battery.

7. **NEVER** charge a swollen or ballooned or damaged battery (even if swollen upon purchase). Continuing to charge a battery that has begun to swell will result in a fire.

Avoid Over-Discharging LiPo Batteries

Over-discharging—continuing to use a LiPO battery even when it is almost completely drained or below its minimum voltage level—can cause permanent damage to the battery.

The damage caused by this can be INTERNAL battery damage and will not always be visible. However, internal damage can eventually lead to a FIRE when attempting to re-charge it at later times.

**Caution: this problem can be easily and commonly overlooked in because there are no indicators that the battery is at a low voltage and should be removed to be re-charged. Please exercise proper understanding and usage of the battery in your application to prevent safety issues or injuries and to prolong battery life.*

Charging Batteries

Caution – Before Charging

1. ALWAYS visually inspect LiPo battery for any damaged leads, connectors, shrinkwrap, swelling of cells, or other irregularities before charging or using.
2. Do NOT use if you find any of the above issues with your pack.
3. Before installing or changing the connector, check the voltage of the pack using a digital voltmeter (not your charger).
   All new packs ship at approximately 3.80V per cells.
   - 2S pack should read approximately 7.60V
4. Do not attempt to charge any pack if open voltage per cell is less than 3.3V
   - Do not charge a 2-cell pack if below 6.6V

If any damage to the pack or leads is found, or if the voltage is significantly less for your pack than specified above, do NOT attempt to charge or use the pack. Contact Model Train Technology LLC directly as soon as possible.

Charging LiPo Batteries

1. NEVER leave charging batteries unattended. Constantly watch the charging process and react to any potential problems that may occur.

2. ONLY charge batteries in a fireproof surface or container and away from combustible material. Do NOT charge on surfaces that can catch fire – this includes wood, cloth, carpet, or in the application's device.

3. Allow the battery to cool down to ambient temperature before charging.
4. Do NOT charge multiple battery packs in series. Charge each battery pack individually.

   Failure to do so may result in incorrect battery recognition and charging functions.

   Overcharging may occur and result in FIRE.

5. Li-Po/Li-ion/LiFe battery without PCB and/or requires balance charging must use Balance Charge Mode with JST XH balancing connector. Always follow both the battery and charger instructions. Failure to do so may result in FIRE.

6. Use the white JST XH balancing connector for balance charge.

7. When selecting the cell count or voltage for charging purposes, select the cell count and voltage as it appears on the Li-Po battery label. Selecting a cell count or voltage other than the one printed on the label will cause improper charging rates that can lead to FIRE.

8. As a safety precaution, confirm the information printed on the battery is correct.
   - Example: The label on a 2-Cell battery pack in series will read – "7.4V" – You must select 2-Cell for charging.

9. You must check the pack voltage before charging. Do not attempt to charge any pack if open voltage per cell is less than 3.3V. For example:

   - Do not charge a 2-cell pack if below 6.6V

10. In most cases the charger's charging current should not exceed 1C, unless otherwise noted. A higher setting may damage the battery & cause a FIRE.

    C-rating is a standard which defines a battery's operating current based on its capacity. 1C is the current it takes to approximately fully discharge a battery in 1 hour, and is simply defined by dropping the "h" in the pack's capacity (e.g. 1C for a 1000mAh Li-Po battery is 1000mA, or 1A).

11. **Additional Notes:** Some LiPo chargers on the market may contain insufficient or incorrect information regarding the battery packs they are designed for. It is the user's responsibility to assure the charger you purchased is compatible with the battery included with this product.

Discharging Batteries & First Uses

Battery packs should NEVER be over-discharged at any time.

Specifically, over-discharging on the first use will ruin the battery permanently before you get to fully enjoy it.

Be extremely careful not to over-discharge new packs.

Battery Maintenance & Handling

- NEVER disassemble existing LiPo packs to mix with other LiPo cells/packs.
- Do NOT discharge battery to a level below 3V per cell under load. Deep discharge below 3V per cell can deteriorate battery performance. Be sure to set your ESC for the proper cut off voltage (6.0V cut off for 2S packs, 9.0V cut off for 3S packs, etc).

Storage & Transportation

- Fireproof containers such as fireproof Li-po bags are strongly recommended for li-po battery storage and transportation.
- NEVER store batteries near an open flame or heater.
- Do NOT expose battery pack to direct sunlight (heat) for extended periods of time.
- Storing battery at temperature greater than 170°F for extended periods of time (more than 2 hours) can cause damage to battery and a possible fire.
- For long term storage, do NOT store batteries fully charged; it is recommended to fully charge and then discharge it to 50-60% of their capacity before storing.

- Store battery at room temperature between 40 and 80°F for best results.
- When transporting or temporarily storing in a vehicle, temperature range should be greater than 20 °F but no more than 150°F.

Battery Life & Disposal of LiPo Batteries

Rechargeable LiPo batteries do NOT last forever. Batteries that have lost 20% of their initial capacity should be removed from service and disposed of properly.

If at any time you see any physical damage in a LiPo battery such as swollen cell, split, or tear in the cell's foil covering, STOP usage immediately and dispose of battery at a local recycling location.

Proper Disposal Procedure of LiPo Batteries:
Battery disposal guidance varies based on your location. We recommend finding a local recycling location using the locator on Call2recycle.org. For any additional questions, contact your local recycling center for more specific disposal information.

INTRODUCTION

The Model Train Technology™ ***G-Controller™*** Battery Version uses an off-the-shelf "shorty" LiPo battery. We selected this battery for these reasons:

1. Size (It fits into our enclosure)
2. Easy of connection (via 2 banana plugs)
3. High power to size ratio - long endurance
4. Availability
5. Affordability

IF YOU JUMPED TO THIS PART OF THE MANUAL WITHOUT READING THE FIRST 6 PAGES, PLEASE GO BACK AND READ THEM. THIS WILL SAVE YOU HEADACHES LATER.

The LiPo battery has two cells and has a 5000mAh rating. That is 5.0 amps. In our testing this battery ran continuously for 5 days (using power saving mode**). You can recharge the battery approximately 300 times. That means that if you run the ***G-Controller*** with a Signal attached for 12 hours a day two days a week, then charge it at the end 96 hours of use, the battery life will be about 25 years. In other words, with proper use and maintenance the battery will last a long time.

** power saving mode turns off the LEDs after one hour of no detection of a train. The LEDs turn back on automatically when a train passes.

For most people, figuring out how to use the charger may be a new skill. There is a video online that shows all the steps.

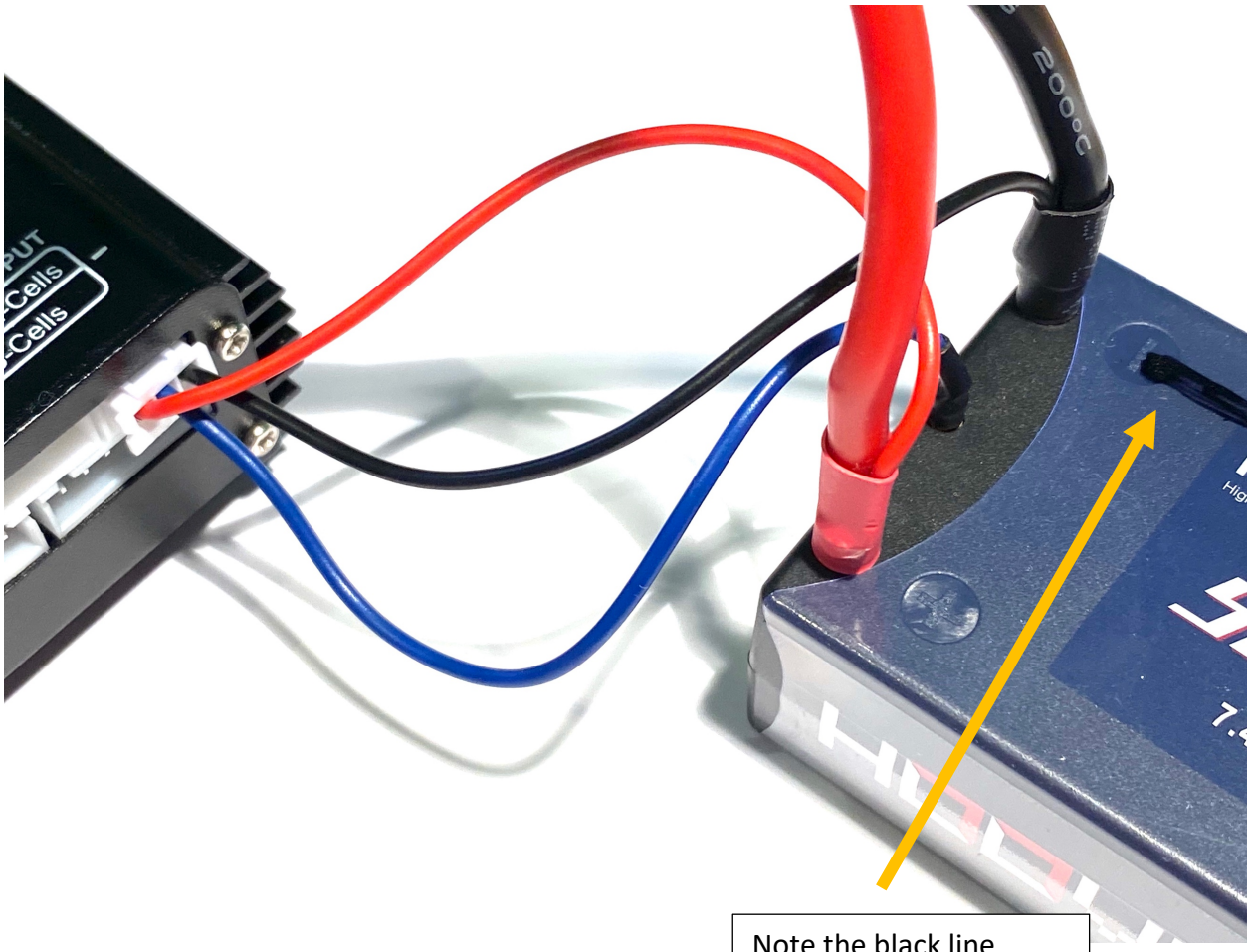
Link to Video: https://youtu.be/gKs8dBdc2oI

- DO NOT RUN THE BATTERY DOWN TO ZERO!
- ALWAYS CHARGE WHEN YOU THINK 96 (4 DAYS) HOURS OF USE HAS PASSED.
- NEVER EVER, EVER LEAVE THE CHARGER/BATTERY UNATTENDED WHEN CHARGING THE BATTERY !!
- DO NOT LEAVE THE BATTERY PLUGGED INTO THE CHARGE AFTER CHARGING IS COMPLETE.

BALANCED CHARGING

To charge the battery always use BALANCED CHARGING. ALWAYS. Balanced charging means that the charger adjusts the charging rate to the battery's two cells so that they charge at the same rate AND the resulting charge is nearly identical in each of the two cells. This assures that neither cell is over charge and that the drain on the cells when in use is also balance. This prolongs battery life, is safer and makes the output more consistent and reliable.

The make Balanced charging work some extra wires must be connected between the charger and the battery (the white JST plug and single blue wire). This is what it should look like when connected:



Note the black line made with a Sharpie to make seeing the polarity more easily.

CHARGING SETUP:

Charging Specifications for 5000mAh Lipo Battery:

SELECT:

1. LiPo Balance Charging
2. Set Amps to 5.0a
3. Set Voltage to 7.4v

FOR A FULL DESCRIPTION VIEW THIS VIDEO:

https://youtu.be/gKs8dBdc2oI

ELECTRONICS AND STATIC ELECTRICITY

The ***MTT PRECISION DETECTOR™ - Trackside*** circuit board and components are exposed when the cover is off. Electricity can be dangerous. Static electricity can cause component failure. Scuffing along a carpet and then touching one of the component connectors can cause a static spark. These components are fairly rugged – some designed for the automotive industry. Just be mindful of the risk. The current on the board will not harm you if the board is powered and operated as per the instructions.

ONE YEAR MANUFACTURER WARRANTY:
We warrant this product to be free from defects in workmanship and materials, under normal residential use and conditions, for a period of one (1) year for the original invoice date. Shipping and handling fees are to be paid for by the customer.

LIMITATION OF LIABILITY

UNDER NO CIRCUMSTANCE SHALL COMPANY OR ITS AFFILIATES, PARTNERS, SUPPLIERS OR LICENSORS BE LIABLE FOR ANY INDIRECT, INCIDENTAL, CONSEQUENCIAL, SPECIAL OR EXEMPLARY DAMAGES ARRISING OUT OF OR IN CONNECTION WITH YOUR USE, OR INABILITY TO USE THE PRODUCT, WHETHER OR NOT THE DAMAGES WERE FORESEEABLE AND WHETHER OR NOT COMPANY WAS ADVISED OF THE POSSIBLITY OF SUCH DAMAGES. WITHOUT LIMITING THE GENERALITY OF THE FOREGOING, COMPANY'S AGGREGATE LIABILITY TO YOU SHALL NOT EXCEED THE AMOUNT OF THE PRODUCT. THE FOREGOING LIMITATION WILL APPLY EVEN IF THE ABOVE STATED REMEDY FAILS OF ITS ESSENTIAL PURPOSE.

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