

# Hobbico®

# LiFe Source™

## LITHIUM IRON PHOSPHATE BATTERY INSTRUCTIONS

LiFe batteries (LiFePO<sub>4</sub> - Lithium Iron Phosphate) have several advantages over LiPo (Lithium Polymer) batteries. Most importantly, LiFe batteries are much safer. LiFe batteries also have a much longer cycle and calendar life, and consist of iron and phosphate which have a much lower environmental impact than the cobalt used in LiPo batteries. It is **important** to have a good understanding of the operating characteristics of LiFe 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!

### 1 WARNING!



LiFe batteries are **ENTIRELY DIFFERENT** from NiCd, NiMH, and LiPo batteries and must be handled differently!! Hobbico will not be held responsible for any and all incidental damages and bodily harm that may result from improper use of Hobbico LiFeSource brand LiFe batteries. In purchasing these products, the buyer/user agrees to bear all responsibilities of these risks and not hold Hobbico 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 LiFe battery, inspect the pack carefully to ensure no physical damage is evident, such as swelling, splitting or torn outer heat shrink wrapper, or loose plugs and wires. Such signs can often indicate a problem exists with the battery that could lead to failure.

### 2 LiFe BATTERY RATINGS

LiFe battery packs are identified by the pack voltage and capacity. A 6.6V 1100mAh LiFe battery has a *NOMINAL* voltage of 6.6 volts and a storage capacity of 1100 milliamp-hours, or 1.1 amp-hours.

LiFe packs are made up of individual cells that are connected together in *SERIES*. Connecting cells in series adds the voltage of all cells to result in a total pack voltage. A 6.6V 1100mAh pack is made up of two 3.3V 1100mAh LiFe cells ( $2 \times 3.3V = 6.6V$ ). This is referred to as a "2S" pack, meaning two cells in series. Each LiFe cell has a *NOMINAL* voltage of 3.3V. A fully charged LiFe cell is 3.6V, and a fully

depleted LiFe cell is 2.5V. Most LiFe chargers and balancing equipment are based using a battery's nominal voltage rating as a parameter.

Battery capacity is measured in mAh (milliamp-hours), being the amount of current that the battery can deliver over a certain time period. The larger the capacity, the longer the run or operating time (assuming the load current doesn't change).

A battery's "C" rating indicates the maximum current the battery can deliver at any given moment, as well as the maximum charge rate for the battery. The "C" value is simply a multiplier of the amp-hour capacity rating of the battery. An 1100mAh LiFe battery has a 1C value of 1.1. An 1800mAh LiFe battery has a 1C value of 1.8, and so on. LiFe batteries are also rated by their maximum discharge capability using the C value. A battery rated as 10C can deliver a maximum current of 10 times the C value of the battery. As an example, an 1100mAh battery with a 10C discharge rating can deliver a maximum current of 11A ( $10 \times C = 10 \times 1.1 = 11A$ ).

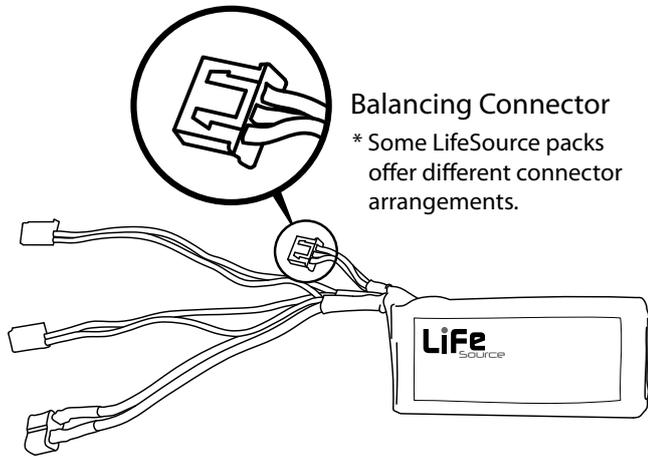
### 3 CHOOSING THE RIGHT LiFe BATTERY

Evaluate your application to determine the "average" discharge amperage rate needed for operation. Choose a LiFe battery which can easily handle the current needs of the application. The current draw of the application can be measured using a multi-meter or meters made specifically for the radio-controlled hobby. When measuring the current, servos should be in operation when a reading is made. Actual current draw will be greater in flight due to increased load on the servos (an on-board data logger can provide accurate servo current draw). Desired flight time and battery weight should also be considering when selecting a battery.

# 4

## CHARGING THE BATTERY

A LiFe compatible charger which can apply the “constant current/constant voltage” charge technique (cc/cv), such as the LifeSource AC/DC Charger (HCAM6375), ElectriFly™ Triton™ EQ (GPMM3155), and ElectriFly Triton2™ EQ (GPMM3156), is required for charging LiFe batteries. All of these chargers have built-in cell balancers.



1. Always observe the correct polarity when connecting the battery to the charger and refer to the instructions that came with the charger. For LifeSource batteries having a balancing connector, attach this lead to the balancing port on the charger.

 2. Set the charger’s output voltage to match the nominal rated voltage of the entire LiFe battery pack. **NEVER** set the charger to a voltage which is greater than the nominal voltage rating of the LiFe pack or allow LiFe cells to charge to greater than 3.6V per cell at any time!! Overcharging usually will result in a permanent, catastrophic failure in the LiFe 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 a “3C” rating of the battery. Using a “1C” rate will help to maximize the lifespan of the LiFe battery. See the section on ratings on page 1 for details.

4. Start the charge process.

# 5

## IMPORTANT WARNINGS!

 Be sure to READ and FOLLOW these important warning statements regarding the charging of LiFe batteries:

■ **NEVER** charge LiFe batteries with a charger not specifically compatible with LiFe batteries! **ONLY** use a charger which can apply the “constant current / constant voltage” (cc/cv) charge technique with LiFe voltage settings. Although a LiPo charger also applies this charge technique, the charger **MUST** be LiFe compatible. **DO NOT** attempt to charge your LiFe battery on a LiPo-only charger.

■ **ALWAYS** charge LiFe batteries in an area with adequate ventilation.

■ **NEVER** charge LiFe batteries at currents greater than the “3C” rating of the battery (“C” equals the rated capacity of the battery).

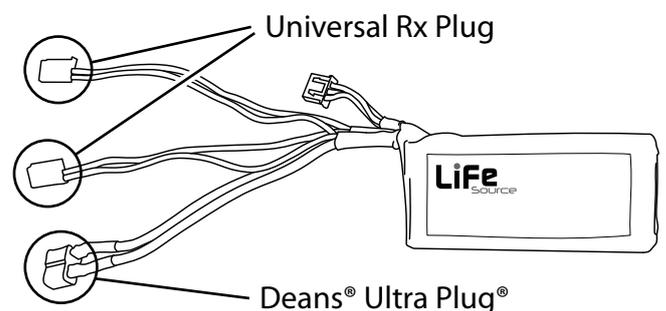
■ **NEVER** allow the temperature of LiFe batteries to exceed 140°F [60°C] at any time. Overheating will cause permanent damage. Do not reuse your LiFe battery if you suspect it has been damaged in any way.

■ **ALWAYS** discontinue charging a LiFe 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 LiFe batteries if the charger fails to recognize full charge. Overheating or swelling of the LiFe cells is an indication that a problem exists. The batteries should be disconnected from the charger immediately and placed in a fireproof location!!

# 6

## CONNECTING AND USING THE BATTERY



■ A voltage regulator might be required to step the LiFe battery voltage down to an acceptable level when used with some receivers. Check with your radio manufacturer for details. Some servos have a maximum input voltage of 4.8V or 6.0V.

■ Three discharge leads are provided on some LifeSource packs. Two are equipped with Universal Rx connectors and the other is a Deans® Ultra Plug®. Dual Universal Rx plugs are provided for models having redundant radio systems. The Deans Ultra Plug is provided for applications drawing more than 10A. No more than 5A should be carried through either Universal Rx plug.

■ The voltage of each LiFe cell in the battery pack should not be drawn below 2.5V. Drawing the voltage below this can cause permanent damage to the pack or make the battery non-recognizable by the charger. A 2-cell LiFe battery with a nominal voltage of 6.6V should not be discharged below 5.0V.

■ **NEVER** discharge LiFe 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 LiFe cell to exceed 140°F [60°C] during discharge.

## 7 BATTERIES INVOLVED IN A CRASH



After a crash, remove the LiFe 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 casing, 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 no physical damage is apparent, it should not be assumed that no internal damage has occurred as LiFe batteries can 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 generate heat even an hour or more after a crash. For this reason, all LiFe batteries involved in a crash should be placed in a fireproof location and observed for at least 24 hours before they are reused or disposed.

## 8 OVERHEATED PACKS

When handling LiFe Batteries, it is recommended to 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 recommended. In the event that a LiFe 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.

## 9 HANDLING, STORAGE & TRANSPORTATION



■ **ALWAYS** store LiFe cells/packs in a fireproof container and place in a secure location away from children.

■ **NEVER** leave a LiFe battery unattended at ANY TIME while being charged or discharged!!!

■ **NEVER** put a LiFe pack in the pocket of any clothing!

■ **ALWAYS** have a lithium-approved “Class D type” fire extinguisher or a bucket of sand available at all times.

■ **NEVER** allow LiFe batteries to come in contact with water or moisture at any time. If batteries do come in contact with water or moisture, immediately dry them with a clean towel.

■ **NEVER** store batteries near an open flame or heater.

■ **NEVER** allow LiFe 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 LiFe batteries laying 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 LiFe batteries, **ALWAYS** store them in a fireproof container.

■ For long term storage (more than 6 months) it is recommended to charge the battery fully, and then discharge it to 60% to 75% of its 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 LiFe batteries to freeze. This will damage the cells and reduce performance.

■ **ALWAYS** make sure all plugs/connectors on the LiFe 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 LiFe packs. Accidentally touching battery terminals to any such objects could create a short circuit condition and possibly cause severe personal injury.

## 10 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.

Unlike NiCd batteries, LiFe batteries are environmentally friendly. For safety reasons, it's best that LiFe cells be fully discharged before disposal (however, if a pack or cell is physically damaged, it is **NOT** recommended to discharge LiFe cells before disposal – see details below). Batteries must be cool before proceeding with disposal instructions.

**To dispose of LiFe cells and packs:**

1. If there are any signs that any LiFe cell in the pack has been physically damaged, resulting in a swollen cell or a split or tear in a cell's covering, do NOT discharge the battery. Jump to step 5.
2. Place the LiFe battery in a fireproof container or bucket of sand.
3. Connect the battery to a 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. 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 (5-10% salt solution). 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 7 to 10 days.
6. After 7-10 days in the saltwater the LiFe battery can be removed. Please recycle the battery at your local battery recycling center. Do not dispose of the battery in the regular trash.

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

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