Turnigy 10XC Charger

User's Guide

01/17/2012

This Turnigy product manufactured in Singapore by LEO Energy Pte Ltd, www.revolectrix.com

Table of Contents

Description

Model: Hobby King Turnigy 10XC, for use with LiPo, Li-Ion, A123, NiCd, NiMH, and Pb battery packs

10s Multi-Chemistry, 10 Amp, 400W model for charging with available high-power balancing, overcharge protection, and automatic charge/discharge to storage (for Li batteries)

Features

- Charges Lithium Polymer, Lithium Ion, A123, NiCd, NiMH, and Pb packs. Charges any brand of pack.
- Supports high-power balance charging of Li or A123 battery packs. Balance charges one 1s to 10s pack, or two 1s to 5s LiPo packs simultaneously. When two packs are connected, the balance connections and pack main discharge wires are wired in series by the charger.
- Equipped with JST PA series times two, 6 position balance connectors which enable the charger to monitor and independently charge each cell to its optimum level (balance charge operation).
- Accepts Turnigy 10XC Adapters for plug-and-play compatibility. Turnigy 10XC Adapters support from 2s to 6s battery packs (all brands) when the charger is running in the charger's default wiring mode; termed "DEFAULT WIRING" in charger options menu. *See section titled "Special Button Operation" later in this user guide for more details on altering WIRING MODE.*
- Also supports customer-selectable, XH mode. JST XH/EH balance connectors and wiring are growing to be the dominant scheme in the industry. Switching to XH mode, the Turnigy 10XC can support existing XH style adapters you may already own. Splice in Turnigy 6 position battery pigtails to the wires on existing adapters and you are good to go!
- Supports non-balanced charge of Li (up to 2s), Ni (up to 28 cells), Pb (up to 24V), A123 (up to 12s).
- Accepts 10-32 VDC input.
- Up to 10A max charge current.
- Maximum 25A input current
- 470W max continuous input and 400W max continuous output at 30V DC input. Charger will achieve rated output to a 10s LiPo using 30V DC input. Increasing input voltage beyond 30V does increase power output, but only if the charger's output voltage exceeds 42V; e.g., when charging 12s non-balanced A123 packs. However, 32V DC input is a maximum rating. It is recommended to utilize input voltage slightly below the absolute maximum.
- Includes 1A proportional integrated balancers
- Power-balance-charge packs through balance connectors in tandem with the main discharge wires of the battery pack(s). Unit does not support balance-connector only charging.
- Compensates for balance wire lengths up to six feet with 1mV accuracy.
- Displays individual cell internal resistance to 0.1milliohm, for estimating pack quality, health, and performance.
- Storage Preset available to charge or discharge Li batteries to appropriate per-cell storage levels; 3.8v (LiPo), 3.0v (A123).
- During discharge to storage, the 10XC incorporates 1A-per-cell (nominal) discharge rate using the charger's integrated balancing circuitry to provide up to 42W (at 10s) discharge power.
- Light-grey, 2 line, 16 character backlit LCD display provides easy readability.
- One button, Charge Optimization can be set for an Accurate 1mV cell balance and (C/20 termination)

or for Faster Charging (less balancing accuracy and C/10 termination) at the 10XC interface.

- Protects your Pb input source from over-discharge by providing an audible warning when input voltage of your Pb battery approaches 50% state of charge.
- Intelligent controller performs extensive checks to prevent damage to packs and power supply. This makes it virtually impossible to damage the charger or the batteries from incorrect connections or wiring; including, but not limited to reverse polarity.
- Input reverse-polarity protection.
- Simple, effective, 2-button interface allows instant access to presets, preset parameters, and starting and stopping charger operations.
- Access pre-defined, named presets by clicking the MODE button.
- Hold the MODE button to access the Main Menu operations: Choose Chg. Amps, Choose Chemistry, Show Help Screen, Exit. Use the charger's Main Menu to alter basic settings of presets on-the-fly.
- Press and hold the START/STOP button to start charger operation or cancel/end a charging session.
- Press and hold MODE button during power up to access Options Menu; choose input amps limit and supply low voltage setting (Power Management feature), alternate between DEFAULT or XH balance wiring schemes, and set quiet charging (no speaker beeps during charging).
- Supports Bi-directional, optional PC which enables charger firmware updates.
- Use available PC software to update charger firmware reliably with the click of your mouse button, and without sending the charger back to the factory. Keep up-to-date with the latest enhancements and bug fixes.
- Works with a wide range of power supplies, even those not rated for high power. Easily changes from moderate current bench supply at home to car battery at the field. Set Input supply amps limit and supply low voltage at the charger interface, to prevent damage to your input source.

Precautions

- Follow all instructions in this manual to assure safe operation.
- **IMPORTANT:** Do not disconnect or connect packs while the charger is charging.
- Always watch LiPo packs while they are charging. Never leave LiPo packs unsupervised during charging.
- See additional warning sheets provided with your battery packs.
- Follow all guidelines for charging, discharging, handling and storing LiPo cells.
- Minor arcing may occur when discharge wires are connected to the charger before charging. This is normal.

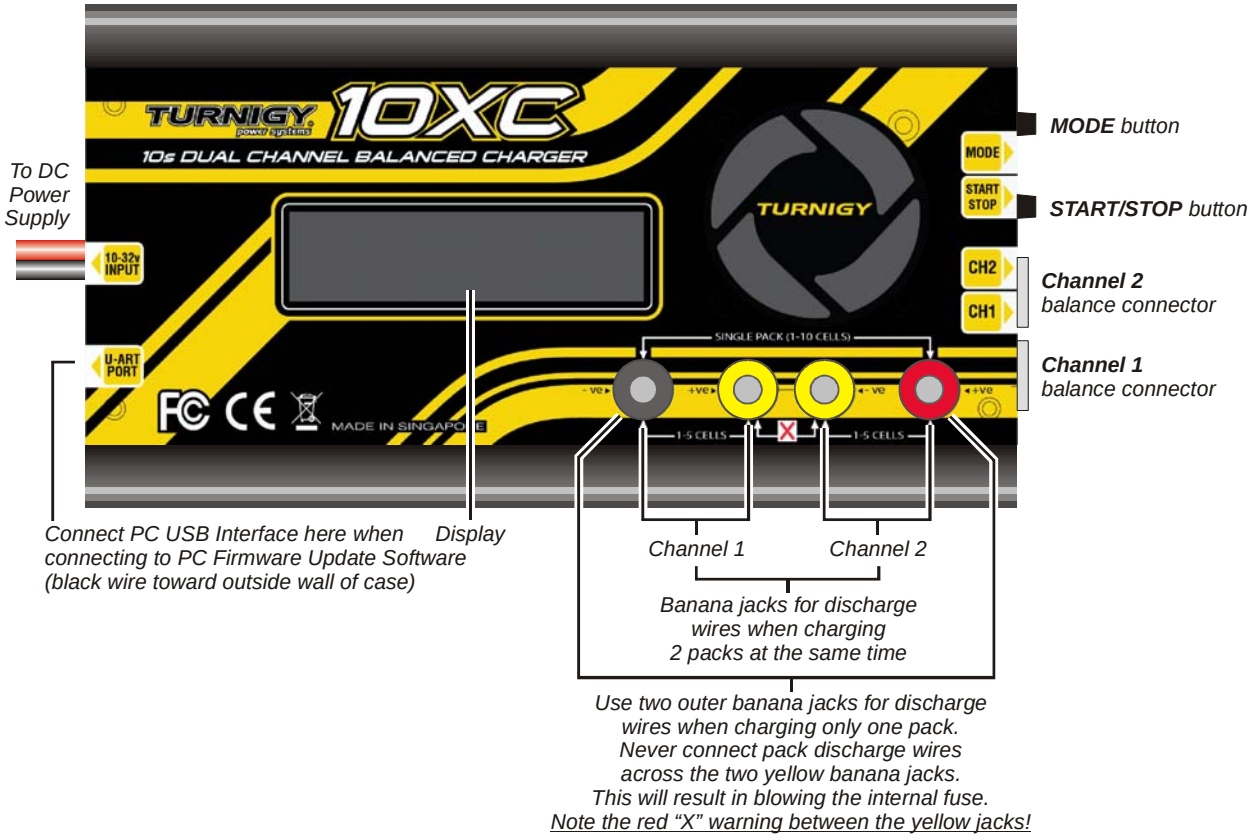
Parts

- ☐ Turnigy 10XC Charger
- ☐ Removable input plier clips (red/black) for connecting the 10XC to a DC power source
- ☐ Optional PC USB Adapter (required for using the Firmware Update Utility Software)
- ☐ Optional: Turnigy 10s Adapters (support all major battery brands)
- ☐ Optional: Turnigy 10s Banana Plug Output Cables (2 pack) – solder the mating end of the connector you use on your battery's discharge wires to these cables

Notes:

You may have already received some of the optional items listed above with your purchase.

Charger terminology



Power and Charging Speed

When one pack is connected to the charger, the pack is initially charged at the selected charge rate (or the maximum charge rate possible). Using Ohm's law, the maximum charge rate (Amps) is derived from the maximum power (Watts) the charger can produce without overheating.

Maximum output power will normally reach approximately 400W when charging a 10s LiPo battery using a 30V DC input power source, and assuming the input source can deliver a maximum of 470W of clean power to the charger input. Maximum power depends on many factors including pack imbalance during charge, input (supply) voltage, output (charge) voltage, DC/DC converter efficiency, which varies between 80% and 95% depending on the relationship of supply voltage-to-charge voltage, ambient temperature, and internal operating temperature. Increasing input voltage beyond 30V does increase power output, but only if the charger's output voltage exceeds 42V; e.g., when charging 12s non-balanced A123 packs. However, 32V DC input is a maximum rating. It is recommended to utilize input voltage slightly below the absolute maximum.

When the pack reaches about 95% capacity, the charger enters balance charge mode. Charge current tapers off, but will remain at 1A or higher until the pack voltage slows the current to 1/20th C (Constant Voltage Mode). When the pack reaches 99% capacity, the charger beeps three times. The pack can be removed to use, or allowed to continue charging until it is 100% full and the charger displays "Charge Complete."

During the entire charge process, the charger power balances the pack using 1A current until all cell voltages are within 1mV of each other. Power balancing is the process of beginning the balancing process early in the charge cycle using high-current shunts to drain excess cell voltage while other cells in the pack have a chance to catch up. Power balancing means the pack tops off faster and the total charge time is greatly reduced. This is possible because the balance circuitry is internal to the charger. Automatic temperature control and an integral fan ensure the charger never exceeds maximum safe operating temperature under any conditions. The result is faster, safer charging.

When charging two packs, the packs are connected in series (the balance connections as well as the main charge wires). In effect, the charger treats the two packs as a single pack. For example, if you connect a 3s pack and a 4s pack, the charger operates on them as one 7s pack. If the pack capacities are different for the two packs connected, the charge rate should be selected based on the lower capacity pack. Initially, the packs are charged at the selected charge rate (or the maximum charge rate possible) until one pack becomes fully charged—however, the charger can handle cell balancing of the two packs completely independently. The second pack continues to charge at a minimum 1A rate until it is full and balanced.

Notice that one of the packs in a simultaneously-charged pair is always topped off at a minimum rate of 1A (dictated by the maximum balance current available). If the packs have the same capacity, and were discharged to about the same level, both packs will charge in less than 30 minutes at 3C. However, if the packs have different capacities, or were discharged to different levels, charging for the pair could take longer than expected. In most instances, by the time the first pack is fully charged, the second pack is already approaching constant voltage charge mode; the battery pack itself is the limiting factor in charge time, not the charger.

> **Example 1:** You are powering an aircraft with two 4s 2100mAh packs connected in series. Because those packs have the same capacity, and were discharged to about the same level during flight, you can expect them to charge in about the same time. It would be appropriate to charge them simultaneously using the Turnigy 10XC Charger.
>
> **Example 2:** You are powering one aircraft with a 3s 500mAh pack, and other aircraft with a 5s 5000mAh pack. If you charge these packs simultaneously using the Turnigy 10XC Charger, it would probably take a long time (the 500mAh pack would become full first, then the charger would switch to its 1A balancing rate to fill up the 5000mAh pack, which could take several hours). In this case, it would be faster to charge these packs separately because the charger can then apply optimum (and substantially different) charge currents to each pack.

In some cases, such as Example 2, it will be faster to charge two packs separately rather than simultaneously. It's up to you to decide, based on what you know about their respective capacities and discharge states.

In Example 2 above, when the 500 mAh pack reaches 99% capacity (the charger beeps three times), it is a simple matter to remove the pack from the charger and continue charging the 5000 mAh pack at a higher charge rate. Here's how:

1. Connect both packs and start charging them using an AUTO or manual rate setting.
2. Watch the fuel level display. When one pack reaches 99% fuel level, stop charging.
3. Disconnect the full pack.
4. If the partially charged pack is connected to Channel 2, move it to Channel 1.
5. Continue charging the partially-charged pack.

About Factory Presets

During all phases of the charge process, the charger will balance all the cells in Channel 1 and Channel 2 together as one big pack, and report the fuel level of two packs being charged as one big pack. The exception to this is if you use one of the Factory containing the words "Dual Channels". In this case, the 10XC will balance all the cells in Channel 1 against each other and all the cells in Channel 2 against each other.

Setting Input Current Limit and Low Voltage

The charger will draw up to 25A to deliver its 10A maximum output current. The high input current is required when the input voltage must be boosted to drive packs having larger numbers of cells in series. Output power is determined by several factors, including battery pack imbalance during charge, input voltage, input current, output voltage, ambient temperature, and the charger's internal temperature.

The charger's DC-to-DC converter is typically 80% to 95% efficient. Highest efficiency occurs when the input voltage is higher than the output voltage needed to charge the connected pack(s). However, the charger cannot tolerate input higher than 32V DC. Supplying input voltage of 30V provides the highest efficiency, coolest operating temperature and fastest charging times, especially when charging packs containing more than five cells in series.

You can also manually limit the charger's input current and adjust the supply low voltage limit so the charger will not draw more power than the supply can provide. If you know your power supply is rated for 3A output, for example, you can limit the charger's input current to 3A. (Be aware that limiting charger input current may increase pack charge times.) If you are using a Pb battery to power the 10XC and you do not want to discharge below a certain voltage, you can set it where you want it. When the charger is powered from a high current source (such as a car battery), you can adjust the current limiting to provide maximum pack charging current. Details for changing these settings are provided in sections "Options Menu Explained" as well as "Limiting charger input current". The Factory Default settings for Input Current Limit and Supply Low Voltage Limit are as follows:

1. Input Supply Current Limit: 25A
2. Input Supply Low Voltage Limit: 11V

Connecting packs to the charger

General information

- When balance charging, both a balance connector and the main discharge wires must be connected to the Turnigy 10XC.
- When performing a non-balance charge on a 2s Li, A123, NiCd, NiMH, or Pb pack, connect only the pack's main discharge wires to the two outer banana jacks on the charger's front panel.
- When charging only one pack, always plug that pack's balance connector into the charger's Channel 1 balance port and always connect the main discharge wires to the charger's outermost banana jacks.
- When charging two packs simultaneously, make sure to correlate each pack's balance connector and pack discharge leads to the same charger Channel. For example, first pack's balance connector in Channel 1 balance port, first pack's discharge leads to Channel 1 banana jacks (the left two jacks). Second pack's balance connector in Channel 2 balance port, second pack's discharge leads to Channel 2 banana jacks (the right two jacks).
- When charging two packs, both packs must have the same chemistry. For example, you can't charge one A123 pack and one LiPo pack at the same time. Never mix chemistries under any circumstances.

> **WARNING:** Failure to comply with the above could result in fire and/or damage not covered by warranty!

- Pack discharge wires are usually not terminated in banana plugs (e.g., they might be terminated in a XT60 connector). For convenience in connecting to the charger, prepare an adapter cable with banana plugs on the charger end and a connector that mates with the pack's discharge connector on the other end.

> **CAUTION:** When using the banana plug adapter cables described above, ALWAYS insert the banana plugs into the charger BEFORE connecting the adapter cable to the pack. Reverse the sequence when disconnecting the pack. This will prevent the live banana plugs from touching each other, which would create a dangerous condition and could seriously damage the pack.

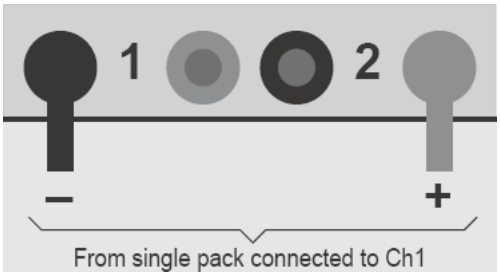
Connecting packs

1. Hobby King offers plug-and-play adapters for charging LiPo packs equipped with balance connectors made by all major manufacturers.

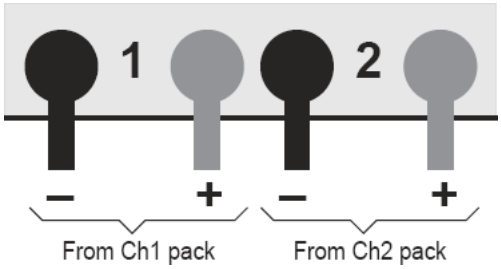
If an adapter isn't available for the pack you want to charge, or if the pack doesn't have a balance connector, the Turnigy 10XC 6 position cable assemblies can be used to make the pack compatible with the Turnigy 10XC Charger.

Note: see also "Balance connector wiring" later in this manual.

2. When charging a single pack, plug the discharge wires into the outermost banana jacks.



3. When charging two packs simultaneously, connect the discharge wires into the banana jacks as shown below.



Applying power to the charger

- *To apply power to the charger:* Connect the charger to a 10V to 32V DC power supply, field battery or car battery. If your bench power supply is equipped with banana jacks for output, you can remove the plier clips from the charger's input cables and plug the cables directly into the power supply jacks.

When the charger is powered up, it displays the following "Welcome" screen:

```
Turnigy 10s
[firmware version]*
```

Press the **MODE button** one time to advance to the "Preset Menu"

```
Preset 1
[chem] [BAL] @ [charge current]*
```

Press the MODE button repeatedly to scroll through and view/select the Turnigy 10XC's 10 presets, one at a time.

*Information in square brackets varies.

Introduction to presets

As shipped from the factory, the charger has ten presets. The presets are displayed in the "Preset Menu" and display in the charger's LCD as follows:

Preset Name/Settings	Description
Preset 1 LiPo BAL @ 1.0A	Designed for a single 1s-10s LiPo battery, balance charged at 1.0 Amps.
P2 Dual Channels LiPo BAL @ 1.0C	Designed for two, 1s-5s LiPo batteries, balance charged at 1.0 Amps.
Preset 3 LiPo BAL @ STORE	Designed to automatically storage charge or discharge LiPo batteries to 3.8v per cell for safe storage. Preset will charge or discharge using 1A internal balance circuits.
Preset 4 LiPo 2sU @ 1.0A	Designed for one 2s LiPo, unbalance charged at 1.0A.
Preset 5 A123 BAL @ 4.6A	Designed for 1s-10s A123 battery, balance charged at 4.6A.
P6 Dual Channels A123 BAL @ 4.6A	Designed for two, 1s-5s A123 batteries, balance charged at 4.6A.
Preset 7 A123 2sU @ 4.6A	Designed for one 2s A123, unbalance charged at 4.6A.

Preset 8 **NiCd 8mV @ 1.0A**	**Designed for 1-26 cell NiCd, non balance charged, peak detection, 8mV fallback at 1.0A.**
Preset 9 **NiMH 5mV @ 1.0A**	**Designed for 1-26 cell NiMH, non balance charged, peak detection, 5mV fallback at 1.0A.**
Preset 10 **LEAD 12V @ 3.0A**	**Designed for 12V Lead Acid Battery, non balance charged at 3.0A.**

When power is applied, the charger always initializes to the last preset used for charging. If you altered the charge settings for a preset at the charger (as described in "Changing a preset," later in this manual), those changes are retained when the charger is disconnected from power, and will be reapplied when the charger is powered up again.

"Selecting a preset" and "Changing a preset," in the next section, provide additional information.

Operating the charger

You operate the charger using the **MODE button** and **START/STOP** button on the right side of the charger. This simple, effective, 2-button interface allows instant access to presets, preset parameters, as well as starting and stopping charger operations.

- **MODE button:** enables you to view/select a preset, change preset parameters and display charging data during charging.
- **START/STOP button:** enables you to start charging after you have selected a preset, and to stop or cancel a charging session at any time. The **START/STOP button** also allows you to toggle back and forth between Accurate and Faster Charge optimizations (applicable to LiPo and A123 battery packs only).

Overview of button operations:

Following is an overview of all possible functions available using these buttons. These functions are listed in the approximate order you might use to traverse the 10XC.

- At start up, **press the MODE button** to access and scroll the Preset Menu and to view/select pre-defined, named presets and their settings, one at a time. A preset is considered "selected" when its name and settings are listed on the charger's LCD.
- At any time prior to starting a charge operation, **press and hold the MODE button** to access the Main Menu options: **`Choose Chg. Amps`**, **`Choose Chemistry`**, **`Show Help Screen`**, **`Exit`**. While watching the scrolling menu options, continue **holding the MODE button**, then, release it only when you see the menu option you want. Now you may use the charger's menu to alter parameters of presets on-the-fly. *Note: Preset parameters are permanently saved the instant they are changed.*
- When inside of Main Menu options, **press the MODE** button to change preset parameters.
- When changes to preset parameters are complete, **press and hold the MODE button** to access the Main Menu again. Then choose **`Exit`** to return to the Preset Menu.
- **Press the START/STOP** button to toggle back and forth between Accurate vs Faster Charge optimization. *This feature available only when a LiPo or A123 balanced preset is selected.*
- **Press and hold the START/STOP button** (for 1 second) to start charger operation or cancel/end a charging session.
- At any time while charge is in progress, **press the MODE button** to view real-time operating

information and charging data.

Special Button Operation:

- **Press and hold MODE button** while applying power to access and scroll the Options menu: **`CHOOSE SPLY AMPS`**, **`LOWS SUPPLY VOLTS`**, **`NODE CONNECTOR`**, **`QUIET CHARGING`**, **`Exit`**. Use the Options Menu to choose input amps limit and supply low voltage setting, alternate between DEFAULT or XH balance wiring schemes, and set quiet charging (no speaker beeps during charging).

Performing Common Tasks:

Selecting a preset

- At start up, **press the MODE button** to access and to scroll the Preset Menu and view/select pre-defined, named presets and their settings, one at a time.

The preset displayed when you stop pressing the **MODE button** is the "selected" preset. Once the preset is selected, you can change the parameters for this preset (see "Changing a preset") or begin charging by **pressing and holding the START/STOP button** (for one second).

Changing a preset

You can change the charge parameters for the currently selected preset to match the characteristics of the pack(s) you are charging.

- At any time prior to starting a charge operation, **press and hold the MODE button** to access the Main Menu options: **`Choose Chg. Amps`**, **`Choose Chemistry`**, **`Show Help Screen`**, **`Exit`**. While watching the scrolling menu options, continue **holding the MODE button**, then, release it only when you see the menu option you want. Now you may use the charger's menu to alter parameters of presets on-the-fly. *Note: Preset parameters are permanently saved the instant they are changed.*

1. Select the preset you want to change (see "Selecting a preset," above).
2. At this point, there are several things you can do:
   - *To change the charge current:*

     a. **Press and hold the MODE button**, then release it when the display changes to this:

```
Choose Chg. Amps
  Hold for More
```

     Note: If you **hold the MODE button** down longer, you'll see **`Choose Chemistry,`** etc (described below)

     When you **release the MODE button**, you'll see the charge current of the selected preset:

```
Choose Chg. Amps
Charge @ [current]
```

     b. Then:

     - **Press the MODE button** about once per second to increase current in 0.1A steps.
     - **Press the MODE button** quickly twice to increase current to the next whole Amp.

- When the maximum current is reached, **press the MODE button** once if you wish to select STORAGE charge mode:
  - **STORE** (to charge or discharge pack to 50% capacity; optimum for long-term storage)

- *To change the chemistry:*

a. **Press and hold the MODE button**, then release it when the display changes to this:

```
Choose Chemistry
  Hold for More
```

Note: If you hold the **MODE button** down longer, you'll see **Show Help Screen**, etc (described below).

When you release the **MODE button**, you'll see the chemistry setting:

```
Choose Chemistry
[chemistry] [BAL] [voltage]
```

b. **Press and release the MODE button** until you see the chemistry you want. Choices are:

Chemistry/Charge Mode	Description
LiPo BAL 4.20V	LiPo Balance Charge to 4.20V per cell
LiPo BAL 4.22V	LiPo Balance Charge to 4.22V per cell
LiPo BAL 4.10V	LiPo Balance Charge to 4.10V per cell
A123 BAL 3.65V	A123 (or LiFe) Balance Charge to 3.65V per cell
NiCd 8mV Fall Bk	NiCd Unbalance Charge, Peak Detect, 8mV Fallback
NiMH 5mV Fall Bk	NiMH Unbalance Charge, Peak Detect, 5mV Fallback
LEAD 6V	Lead Acid Charge to 6V
LEAD 12V	Lead Acid Charge to 12V
LEAD 18V	Lead Acid Charge to 18V
LEAD 24V	Lead Acid Charge to 24V
LiPo 1sU 4.20V	LiPo Unbalance Charge, 1s to 4.20V
LiPo 2sU 8.40V	LiPo Unbalance Charge, 2s to 8.40V
A123 1sU 3.65V	A123 (or LiFe) Unbalance Charge, 1s to 3.65V
A123 2sU 7.30V	A123 (or LiFe) Unbalance Charge, 2s to 7.30V
A123 3sU 10.95V	A123 (or LiFe) Unbalance Charge, 3s to 10.95V
A123 4sU 14.60V	A123 (or LiFe) Unbalance Charge, 4s to 14.60V
A123 5sU 18.25V	A123 (or LiFe) Unbalance Charge, 5s to 18.25V
A123 6sU 21.90V	A123 (or LiFe) Unbalance Charge, 6s to 21.90V
A123 7sU 25.55V	A123 (or LiFe) Unbalance Charge, 7s to 25.55V
A123 8sU 29.20V	A123 (or LiFe) Unbalance Charge, 8s to 29.20V
A123 9sU 32.85V	A123 (or LiFe) Unbalance Charge, 9s to 32.85V
A123 10sU 36.50V	A123 (or LiFe) Unbalance Charge, 10s to 36.50V
A123 11sU 40.15V	A123 (or LiFe) Unbalance Charge, 11s to 40.15V
A123 12sU 43.80V	A123 (or LiFe) Unbalance Charge, 12s to 43.80V

- *To get help using the Turnigy 10XC:* **Press and hold the MODE button**, then release it when the display changes to this:

```
Show Help Screen
  Hold for More
```

Note: If you **hold the MODE button** down longer, you'll see **Exit,** etc (described below)

Press the MODE button repeatedly to scroll the Help Screen information

- *To Exit the Main Menu and return to the Preset Menu:* **Press and hold the MODE button**, then release it when the display changes to this:

```
Exit
Hold for More
```

Note: You **may press and hold the MODE** button from any place within the menu to change menu options or select **Exit**. Remember, any changes you make while in the Main Menu are saved the instant you make the changes. If you **hold the MODE button** down longer, you'll see the previous Main Menu options described above.

or

- *To Quick Start a Charge (Exit the Main Menu and begin charging in one operation if a pack is connected):* **Press and hold the START/STOP button** for one second. Details are provided in the next section.

Charging a pack or packs

1. Before charging, pack(s) must be properly connected to the charger. See "Connecting packs to the charger," earlier in this manual for details. Also, the correct preset must be selected for the packs connected to the charger. See "Selecting a preset", earlier in this manual for details.
2. **Press and hold the START/STOP** button for one second to enter Charging Mode.
3. You will see the following screens in sequence:

```
PLEASE WAIT…
```

```
CHRGING LiPo BAL
 MODE for info.
```

**above screen will vary depending on what preset is being used*

Note: because the 10XC supports automatic storage charge/discharge to 50%, the initial LCD indication may show **DSCHGING** *for up to 10 seconds, even if a charge was initiated. This is normal.*

4. While in Charge Mode, you can take the following actions:
   - *To view pack and operating data:* **Press the MODE button** repeatedly to cycle through the following screens. (These examples assume two packs are being charged using one of the Dual Channel presets; if one pack is being charged, only the top line may appear in some screens.)

```
C 1.00A 00:00:59
Supply=12.2V/ 3A
```

Charge current and charge time.
Supply voltage and input current.

```
[preset name]
[chem] [BAL] @ [charge current]
```

Selected preset.
Preset's charging settings.

```
[chemistry] [BAL] [charge process]
[chemistry] [BAL] [charge process]
```

Chemistry and charge process (Fast Charging, Balance Charging, etc.) in effect for each channel.

```
Ch1 Pack = 15.772V
Ch2 Pack = 15.761V
```

Total pack voltage(s).

`Ch1  42mAh In` `Ch2  40mAh In`	mAh put back into pack(s) during charging.
`1:3.956V 2:3.956V` `3:3.956V 4:3.956V`	Individual cell voltages.* ":" indicates Ch1
screen auto scrolls to show all cells:	
`5=3.966V 6=3.966V` `7=3.966V 8=3.966V`	Individual cell voltages.* "=" indicates Ch2
`1:12.3mΩ 2:13.2` `3:12.1mΩ 4:14.2`	Individual cell internal resistances in milliohms.*† ":" indicates Ch1
screen auto scrolls to show all cells:	
`5=11.8mΩ 6=13.5` `7=12.4mΩ 8=12.6`	Individual cell internal resistances in milliohms.*† "=" indicates Ch2

*Cells are numbered from 1 through n, where 1 is the first cell in the pack connected to Ch1, and n is the last cell in the pack (if only one pack is being charged) or the last cell in the pack connected to Ch2 (if two packs are being charged).

†For the charger to calculate internal resistances, pack must be at less than 80% fuel level at start. Internal resistances will be available for display after about 12 minutes of charging, and will be periodically updated after that.

5. Note, when you **press and hold the START/STOP button** to initiate a charge or storage operation (step 2 above), you are actually starting a charge "session". During a session, the data is logged to the charger's memory, the displayed on the charger's LCD. When the charger is allowed to finish the operation, the LCD will read, e.g., **`LiPo [BAL] DONE`**

- *To end the charge session and clear logged data:* Press the **START/STOP** button for one second. The charger flashes **`CHARGER STOPPED`** then displays the Preset Menu.

  Note: Pack data is lost when you end the charge session, so if you want to see it, cycle through the saved data by **pressing the MODE button** before **pressing and holding the START/STOP** button.

- *To cancel charging at any time:* **Press and hold the START/STOP** button for one second. The charger flashes **`CHARGER STOPPED`** then displays the Preset Menu.

  Note: Pack data is lost when you end the charge session, so if you want to see it, cycle through the saved data by **pressing the MODE button** before **pressing and holding the START/STOP** button.

Options Menu Explained

In addition to the charger's Preset Menu, and Main Menu, there is also an Options Menu available for altering basic charger settings using the charger's interface. The Options Menu is accessed by **pressing and holding the MODE button** *while* you power up the charger.

1. **Press and hold the MODE button** *while* you power up the Turnigy 10XC.
2. **Continue holding the MODE button**; the charger will enter the Options Menu and immediately start to cycle through the following menu items; **`CHOOSE SPLY AMPS`**, **`LOW SUPPLY VOLTS`**, **`NODE CONNECTOR`**, **`QUIET CHARGING`**, **`Exit`**. **Release the MODE button** only when the LCD reads the setting you want to change or **press and hold the MODE button** again to begin cycling through the Options Menu items again. If you accidentally release the MODE button when the LCD reads **`Exit`**, begin again at step 1 above.
3. At this point, there are several things you can do:

- *To change the charger's input supply current (amps) limit (Power Management feature):*

  a. **Press and hold the MODE button**, then release it when the display changes to this:

```
CHOOSE SPLY AMPS
  Hold for More
```

Note: If you hold the **MODE button** down longer, you'll see **`LOW SUPPLY VOLTS,`** etc (described below).

When you release the **MODE button**, you'll see the current supply amps limit setting:

```
CHOOSE SPLY AMPS
Limit @ [current amps setting]
```

  b. **Press and release the MODE button** until you see the current limit setting you want. Choices range from 1A to 25A in 1A increments.

Note: to protect your power supply from overload, make this setting approximately 10% lower than the max current rating of your input supply. Factory Default for this setting is 25A. But realize that reducing the supply current limit below 25A will extend charge times.

- *To change the charger's input supply low voltage limit (Power Management feature):*

  a. **Press and hold the MODE button**, then release it when the display changes to this:

```
LOW SUPPLY VOLTS
  Hold for More
```

Note: If you hold the **MODE button** down longer, you'll see **`NODE CONNECTOR?`**, etc (described below).

When you **release the MODE button**, you'll see the input supply current low voltage limit setting:

```
LOW SUPPLY VOLTS
 Limit @ [volts]
```

  b. **Press and release the MODE button** until you see the input supply low voltage limit setting you want. Choices range from 10V to 28V in 0.1V increments.

Note: Press the button about once per second to select 0.1V increments. Press the button faster to scroll in 1V increments. 10V is the Factory Default setting and is the lowest input voltage for safe operation of the 10XC; however, you may choose to raise this voltage to protect your input supply. For example, you should avoid operating at lower than 11 or 11.5V using a 12V Pb battery as input as over-discharge will severely shorten the life of the input battery.

- *To toggle the charger between DEFAULT and XH balance connector wiring:*

  a. **Press and hold the MODE button**, then release it when the display changes to this:

```
NODE CONNECTOR?
  Hold for More
```

Note: If you hold the **MODE button** down longer, you'll see **`Quiet Charging`**, etc (described below).

When you **release the MODE button**, you'll see the currently selected balance connector wiring

mode:

```
NODE CONNECTOR?
    >[mode]
```

b. **Press and release the MODE button** to toggle operation between **DEFAULT WIRING** or **XH/EH WIRING**

Note: DEFAULT WIRING is the Factory Default mode and provides proper operation when using Turnigy 10XC adapters. XH/EH WIRING mode supports the popular JST XH or EH wiring scheme. See the section "Balance Connector wiring" below for more information about these wiring schemes.

- *To set the charger for QUIET CHARGING:*

a. **Press and hold the MODE button**, then release it when the display changes to this:

```
QUIET CHARGING?
 Hold for More
```

Note: If you hold the **MODE button** down longer, you'll see **Exit**, etc (described below).

When you **release the MODE button**, you'll see the setting for QUIET CHARGING:

```
QUIET CHARGING
    >[Y/N]
```

b. **Press and release the MODE button** to turn QUIET CHARGING OFF or ON.

Note: When QUIET CHARGING is turned ON, the charger will not beep to notify you at 99% charge completion or when the charge is completed. Setting QUIET CHARGING to YES does not disable the speaker during button presses.

- *To Exit the Options Menu and return to the Preset Menu:*

a. **Press and hold the MODE button**, then release it when the display changes to this:

```
      Exit
Hold for More
```

Note: If you hold the **MODE button** down longer, you'll see **CHOOSE SPLY AMPS**, etc (described above).

When you **release the MODE button**, you'll see the Preset Menu:

```
Preset 1
[chem] [BAL] @ [charge current]
```

Note: Remember, any settings you change while in the Options Menu are automatically saved the instant you make the change. You may Exit the menu at any time. You may also simply cycle power to the charger to re-start, in which case the Welcome Screen will appear.

Alternate charging modes

Based on what the charger determines about charging conditions, it may enter one of these charging modes automatically (as indicated in the display):

- In **Low Voltage Restore Mode**, the charger automatically attempts to repair an over-discharged pack. Cells discharged as low as 0.5V may be repaired to as much as 98% of capacity.
- In **Safety Charging Mode**, the charger detects that at least one cell is seriously out of balance, and

automatically lowers charge current to 0.5A.

CAUTION: If the charger's display shows **SAFETY CHARGING** during several attempts at charging, the pack is damaged. Treat damaged packs with caution. Do not charge them on a flammable surface, and do not charge them unattended. Never repeatedly START a charge on a pack that continuously triggers **SAFETY CHARGING**. Fire may result!

If the charger detects a problem, it will stop charging and display a safety code. If this happens:

1. Press the **MODE button** to reset the charger.
2. Reconnect the battery properly.
3. Press the **START/STOP** button to continue charging.

See the "Troubleshooting" section for more information

Using the Firmware Update Utility Software

The Turnigy 10XC Firmware Update Utility Software enables you to update the charger's firmware, and restore Factory Defaults.

Installing the Firmware Update Utility Software

For detailed information on installing the Turnigy 10XC Firmware Update Utility and drivers for the PC USB Interface (sold separately), please visit the Hobby King website.

Launching the Firmware Update Utility Software

Start > All Programs > Hobby King > Turnigy 10XC.

Connecting the charger to your computer

** The Turnigy 10XC Firmware Update Utility is a free download. But to actually connect the charger to the PC and use the application you will require the PC USB Interface. This device also requires the proper driver to support your version of Windows.*

1. If the Firmware Update Utility Software isn't running, launch it now.
2. Now plug the USB plug into your computer. Windows should locate the device and load the driver you just installed.
3. Now power up the charger and plug the 3-pin connector into the jack on the charger's left side. The black wire should be toward the bottom of the charger's panel.
4. With COM port set to "Auto" (Firmware Update Utility program lower left corner) watch the message line just below the program's menu bar.
   - If "Waiting to Start" appears, everything is working properly and you are ready to use the program.
   - If "Checking Com COMx for data" or "No Data from 10XC Charger" doesn't go away, the program can't communicate with the charger. To correct this, unplug the PC interface from the PC and the charger and begin again at Step 1 above. If problem persists, contact Hobby King Technical Support.

Updating charger firmware

When you are ready to update the charger:

1. Be sure the charger is connected to the computer, and is powered up.
2. Disconnect all packs from the charger.
3. In the Firmware Update Utility program window, select the firmware you want to install.
4. Click Update Firmware.
5. Wait—and do nothing—until updating is complete.

> **IMPORTANT:** During firmware downloading, do not disconnect the charger from power, do not disconnect the charger from the computer, and do not exit the Firmware Update Utility Software. If the firmware update is compromised for any reason, disconnect the PC interface from the charger and from the PC, re-boot the computer, cycle power to the charger, then repeat steps 1 – 5 above.

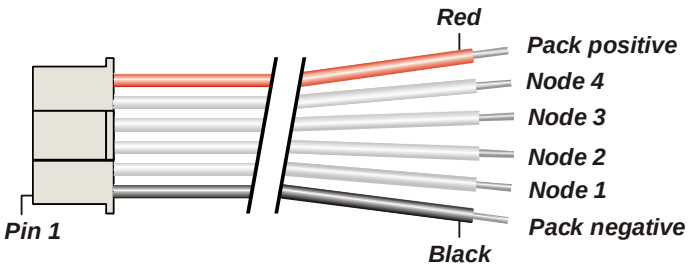
Restoring Factory Defaults

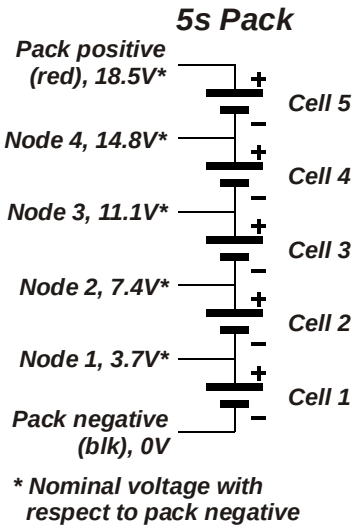
To restore Factory Defaults, click the "Factory Default" button

Balance connector wiring

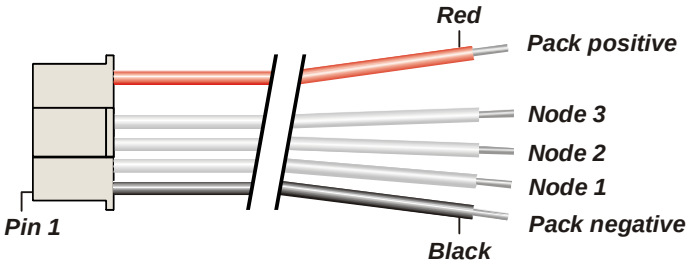
When using DEFAULT WIRING mode (Factory Default Setting)

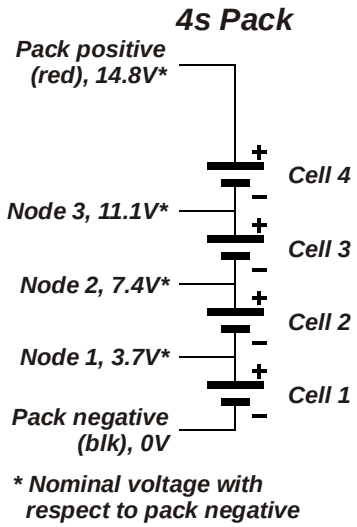
The following diagrams shows how a 6 pin Turnigy 10XC (JST PA series) balance connector must be wired to a 5s, 4s, 3s, 2s, and 1s battery pack when the Turnigy 10XC is set to DEFAULT WIRING mode (Factory default).



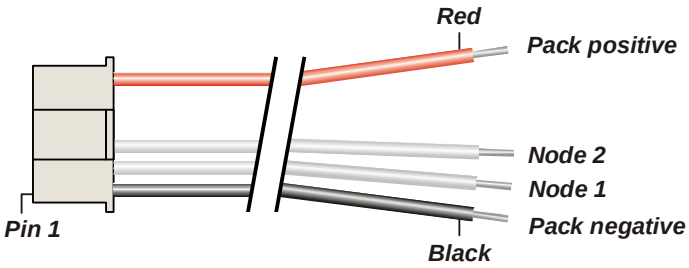


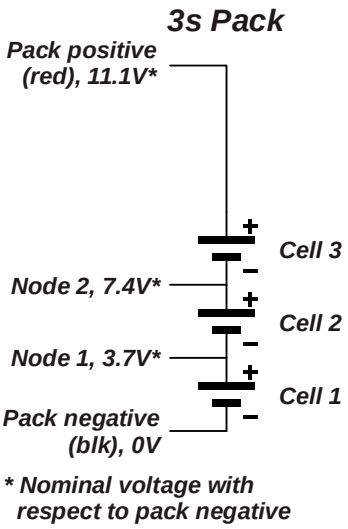
Turnigy 10XC Connector/DEFAULT WIRING Mode





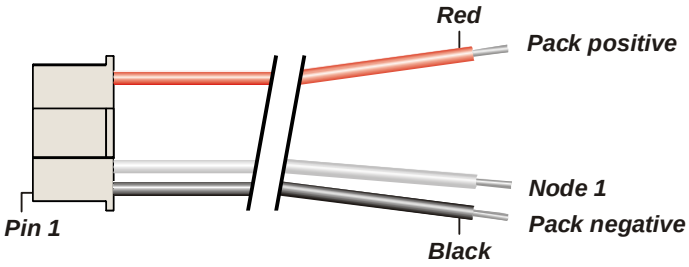
Turnigy 10XC Connector/DEFAULT WIRING Mode

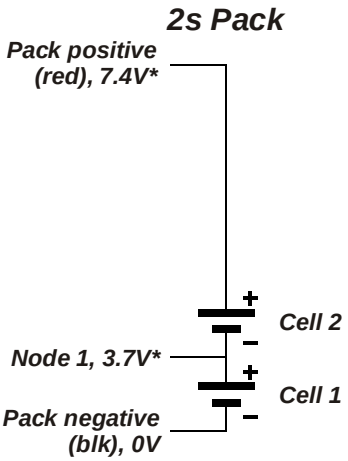




* Nominal voltage with respect to pack negative

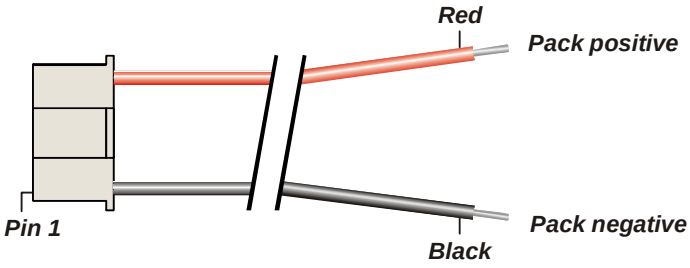
Turnigy 10XC Connector/DEFAULT WIRING Mode

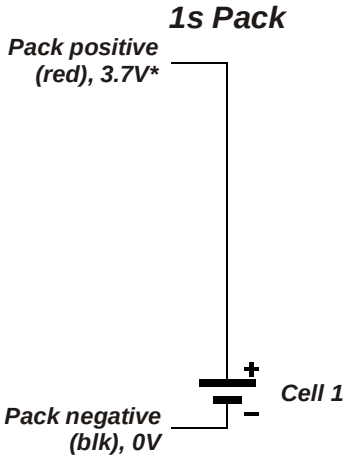




* Nominal voltage with respect to pack negative

Turnigy 10XC Connector/DEFAULT WIRING Mode



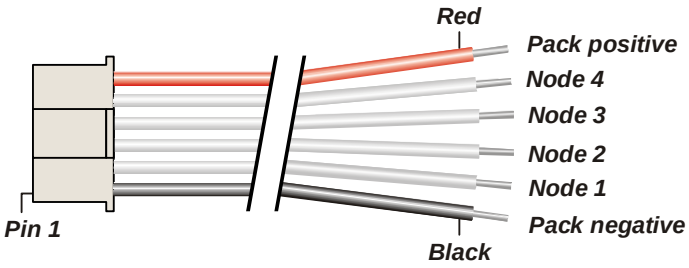


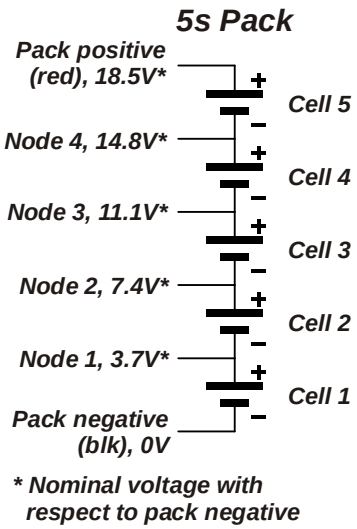
* Nominal voltage with respect to pack negative

NOTE: In the above DEFAULT WIRING scheme, when the battery has fewer than 5 cells, the red wire always connects to Pack positive, and the unused balance wires are left un-connected from the battery. Always remove unused wires from the battery pigtail by gently lifting each pin's locking tab with a hobby knife, and pulling the wire free of the housing.

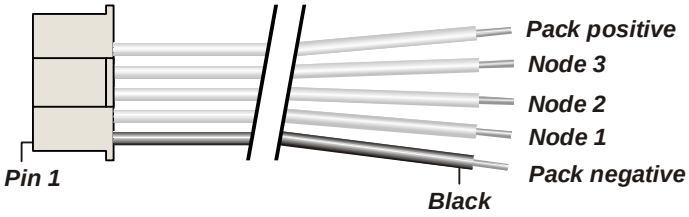
When using XH/EH WIRING mode

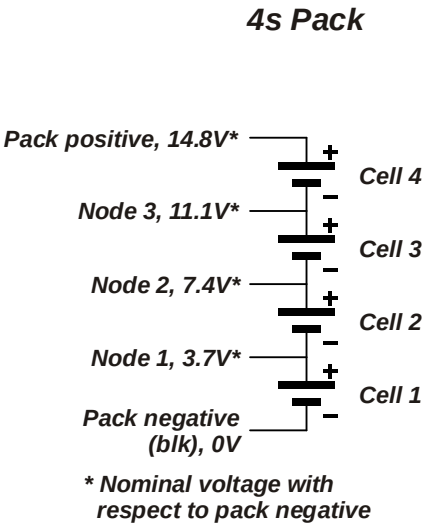
These diagrams show how a 6 pin Turnigy 10XC (JST PA series) balance connector must be wired to a 5s, 4s, 3s, 2s, and 1s battery pack when the Turnigy 10XC is set to XH/EH WIRING mode. You may choose to set the 10XC to XH MODE and splice the 6 position connector to an XH adapter you already own. Use this illustration to guide you.





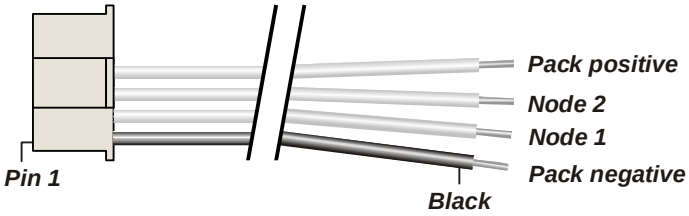
Turnigy 10XC Connector/XH and EH Wiring Mode

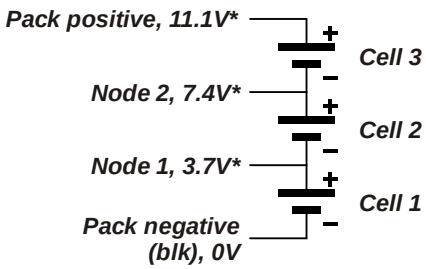




Turnigy 10XC Connector/XH and EH Wiring Mode

3s Pack

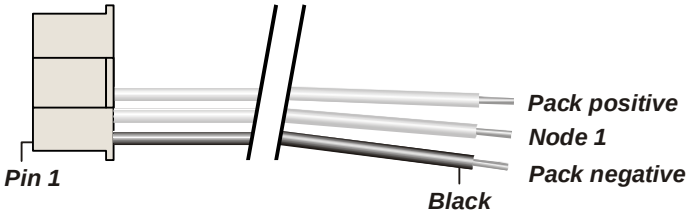


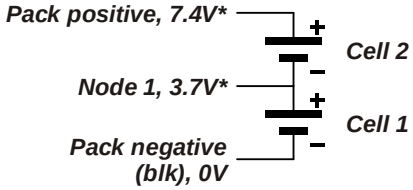


** Nominal voltage with respect to pack negative*

Turnigy 10XC Connector/XH and EH Wiring Mode

2s Pack

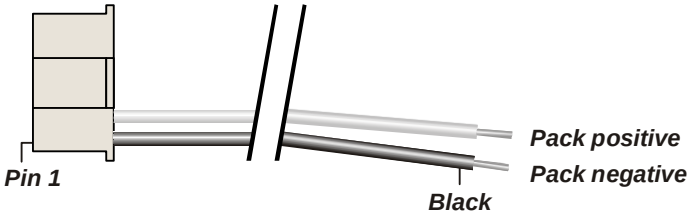


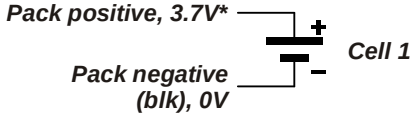


** Nominal voltage with respect to pack negative*

Turnigy 10XC Connector/XH and EH Wiring Mode

1s Pack





** Nominal voltage with respect to pack negative*

NOTE: In the above XH/EH wiring scheme, there are no un-used wires between any of the nodes and/or pack positive like the DEFAULT WIRING scheme. Pack positive continually moves up by one with each additional cell added to the pack. Always remove unused wires from the battery pigtail by gently lifting the pin's locking tab with a hobby knife, and pulling the wire free of the housing.

Specifications

For battery type	Lithium Polymer, Lithium Ion, Lithium Manganese, A123 (LiFEPO4), NiCd, NiMH, Pb packs
Supported Cell Counts	LiPo, LiIon, LiMg – 1s-10s balanced, 1s, 2s unbalanced A123 (LiFEPO4) – 1s-10s balanced, up to 12s unbalanced NiCd – up to 28 cells (non-balanced) NiMH – up to 28 cells (non-balanced) Pb (Lead) – up to 24V
Pack capacity	100mAh to 65Ah (charge time limited to maximum of 12 hours)
Input voltage	10 to 32VDC; low voltage limit selectable from 10V – 28V in 0.5V increments
Input current	Up to 25A; can be limited to 1A to 25A in 0.5A increments
Power conversion	62.5kHz switcher operating at 80% - 95% efficiency
Per-Cell output voltage	LiPo, LiIon, LiMg – 4.10V, 4.20, or 4.22V A123 (LiFEPO4) – 3.65V NiCd – 1.20V NiMH – 1.20V Pb (Lead) – 2V
Output current	100mA - 10A*, reverse polarity protected
Discharge current	1A per cell nominal (42W max) for storage discharging Li
Cont. output current	400W @ +30V DC input
Cell balancing	Resolution 78uV (16 bit) for 1s-10s Li or A123 LiFEPO4) balanced charging
Voltage calibration	calibration is to ± 6 mV
Current calibration	Charge current is factory calibrated on a 4A standard; calibration is to ± 1mA
Measurement accuracy	Voltage resolution: 78 uV (16 bit) Voltage tolerance: ± 6 mV Charge current: ± 1% Capacity added to pack: ±1%
Internal resistance	0.1mohm voltage resolution allows accurate four point internal resistance measurement of each cell
Serial data output	19.2kbps, 8 bits, 1 start bit, 1 stop bit, no parity
Data integrity	Checksum, CRC checking
Cooling fan	Single, 8 CFM, 40mm diameter
Heat Sink	Aluminum case, finned
Output connector	2 x JST PA series, 6 position
LCD	2 line, 16 character, light grey/blue backlit
Size	6.83” x 3.67” x 1.70”
Firmware updates	Customer upgradeable using Firmware Update Utility Software

Footnotes:

** Please note, for safety reasons, available charger current may be limited for certain battery types and/or charging modes, e.g., non-balanced charge of Li*

Quick start for the Turnigy 10XC Charger

Refer to manual for complete operating details.

A. Connect charger to a 12V to 32V (maximum) power source.

B. Connect pack(s) to charger.

- Plug pack's balance connector(s) into channel jack(s) on right side of the charger (use balance connector adapters as needed).
- When charging only one pack, plug pack's balance connector into Ch1. Plug pack's discharge wires into outermost banana jacks on charger's panel.
- When charging two packs: Plug discharge wires from Ch1 pack into banana jack pair #1, and plug discharge wires from Ch2 pack into banana jack pair #2.
- When using an unbalanced preset, connect *only* the pack discharge wires in accordance with bullet points 2 and 3 above.

C. Configure charger:

- *To review selected preset's settings:* **Press MODE button**.
- *To select a different preset:* **Press MODE button** until you see the desired preset's name and settings in display.
- *To change selected preset's settings:* **Press and hold MODE button** to set chemistry and/or charge current. Press and hold to exit.

D. Press **START/STOP** button for one second to begin charging.

E. During charging:

- *To view charge data:* **Press MODE button** repeatedly.
- *To cancel charging at any time:* **Press START/STOP** button for one second.

F. The charger will automatically stop charging, and initiate a series of beeps when charging is complete.

G. To end charging session and return to Preset Menu, **press START/STOP** button for one second.

Troubleshooting

There are 26 ways to improperly connect two packs to a charger! After the **START/STOP** button is pressed, a special battery checking sequence automatically checks every wire before initiating a charge. It is possible to get an unrelated safety code from a simple wiring issue.

Operating errors appear as messages in the display. To determine the problem, look up the description below. Correct the error. If errors continue, contact Hobby King Customer Service.

Code/Message	Problem
Neg. Term. < 0V	Check pack wiring
Supply < 10 Volts	Input supply voltage is too low
Supply > 32 Volts	Input supply voltage is too high
Supply Unstable	Check for a loose supply connection or thin wiring
Ch2 No Add Up	Check pack wiring or dirty connectors
Chg. Overvoltage	Cell is too high
C2 Pack Detected	A pack was detected on channel 2 after starting charge
Series Chargers	Check Pack wiring. Check for 2 chargers on a series pack.
Low Voltage Cell	A cell is too low
Cell < 0.1V	The cell voltage is too low on a cell
Reverse Polarity	Check pack wiring
Node 10 < 0V	Check pack wiring
Ch2 Bad S. Count	Channel 2 couldn't identify the pack. Check for correct node setting.
System Softstart	Check the power supply is big enough. Loose input connections.
2 Pack Con. Err.	Check pack wiring
Ch1 No Add Up	Check pack wiring or dirty connectors
Unbalanced Only	Unbalanced charge detected voltage on the node connector.
Ch1 has no pack	Check pack wiring or dirty connectors
Positive < 0V	Check bananas
Butt Not Pressed	The confirm chemistry mode button was not pressed
Pack Detect CH1	Unbalanced charge detected voltage on the node connector
Pack Detect CH2	Unbalanced charge detected voltage on the node connector
Charge Timeout	The pack is taking too long to charge
Bad Amps Setting	Charger safety check
Amps Not Raising	Check the banana wiring
Bad Fuel Table #	Corrupted preset. Factory restore the charger
Bad Lith Fuel Tb	Corrupted preset. Factory restore the charger
A123 < 2.7V/CELL	Cell low voltage
A123 > 3.8V/CELL	Cell high voltage
Options Corrupt	Factory restore the charger
L.Supply V.Limit	The supply voltage reached the cutoff
No Auto Amps	Auto amps are not allowed in some chemistries
Chem Not Found	Corrupted preset. Factory restore the charger
LIPO < 3.0V/CELL	Cell low voltage
LIPO > 4.2V/CELL	Cell high voltage
Set Amps >= 2A	Lower the amps setting
Bad Banana Tot V	Check the connectors. Clean the connectors.
Preset is Blank	Change presets or factory restore
No Fuel Table	Corrupted preset. Factory restore the charger

…table continued from previous page

Fuel not None	Corrupted preset. Factory restore the charger
Fuel not LiPo	Corrupted preset. Factory restore the charger
Fuel not A123	Corrupted preset. Factory restore the charger
Safety Code #79	CH1CELLS out of range
Safety Code #80	CH2CELLS out of range
Safety Code #81	Bad Pb charge setup
Safety Code #82	Trickle current above 1A
Safety Code #83	Bad starting chemistry
Safety Code #84	Bad Pb set voltage
Safety Code #85	Bad NiCd fallback
Safety Code #86	Bad A123 set voltage
Safety Code #88	CHECKPACK1 cell V out of range
Safety Code #89	CHECKPACK2 cell V out of range
Safety Code #90	Unknown screen number
Safety Code #92	MUX number error
Safety Code #93	Calibration checksum is bad
Safety Code #94	Bad EEPROM write
Safety Code #98	Charger over current
Safety Code #99	Bad mode number
Safety Code #100	Temperature out of range
Safety Code #101	Bad EEPROM preset write
Safety Code #102	Bad chemistry number