

Cellpro 10XP Charger

User's Guide



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08/12/2011

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Description

Model LC10S15ADC-MC, for use with LiPo, Li-Ion, A123, NiCd, NiMH, and Pb battery packs

10s Multi-Chemistry, 15 Amp, 600W model for automatic and manual 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 Cellpro brand (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 Cellpro 10s Adapters for plug-and-play compatibility. Cellpro 10s Adapters support from 2s to 6s battery packs (all brands). For more information on REVO adapters, visit http://www.revlectrix.com/cellpro_adapters.htm
- Backward-compatibility with older Cellpro 4s adapters is assured using the available 6-pin to 5-pin adapter(s) (REVO PN: CP10S-5S/4S-ADP-US) for charging 2s to 4s Cellpro packs having 5-pin balance connectors.
- 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 CP10XP can support existing XH style adapters you may already own. Splice in REVO PN: CPBP6P-10-US 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 15A max charge current.
- Maximum 25A input current
- 720W max continuous input and 605W 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.
- Supports AUTO rate charging (1.0C, 2.0C, and 3.0C charge rate) using Advanced Fuel Gauging technology, or manual set currents of 0.10A – 15A in 0.10A increments.
- Industry's largest 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 CP10XP 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) using the Charge Control Software or at the CP10XP 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, or make the adjustments using the free PC Charge Control Software (CCS).
- 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 FMA or XH balance wiring schemes, and set quiet charging (no speaker beeps during charging).
- Supports Bi-directional, optional PC interface (REVO PN: FUIM2-US or FUIM3-US) which enables extensive charger setup using the CCS. Configure up to 10 custom presets, adjust speaker volume, set LCD contrast and control many other settings.
- CCS automatically checks for software and charger firmware updates in the background. 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.
- 6 different, available Fuel Gauge lookup tables (fuel tables) may be assigned to independent presets to match the characteristics of different Li battery chemistries. This feature only available using the CCS.
- 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 using the Power Management feature. Set Input supply amps limit and supply low voltage settings using the CCS or 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

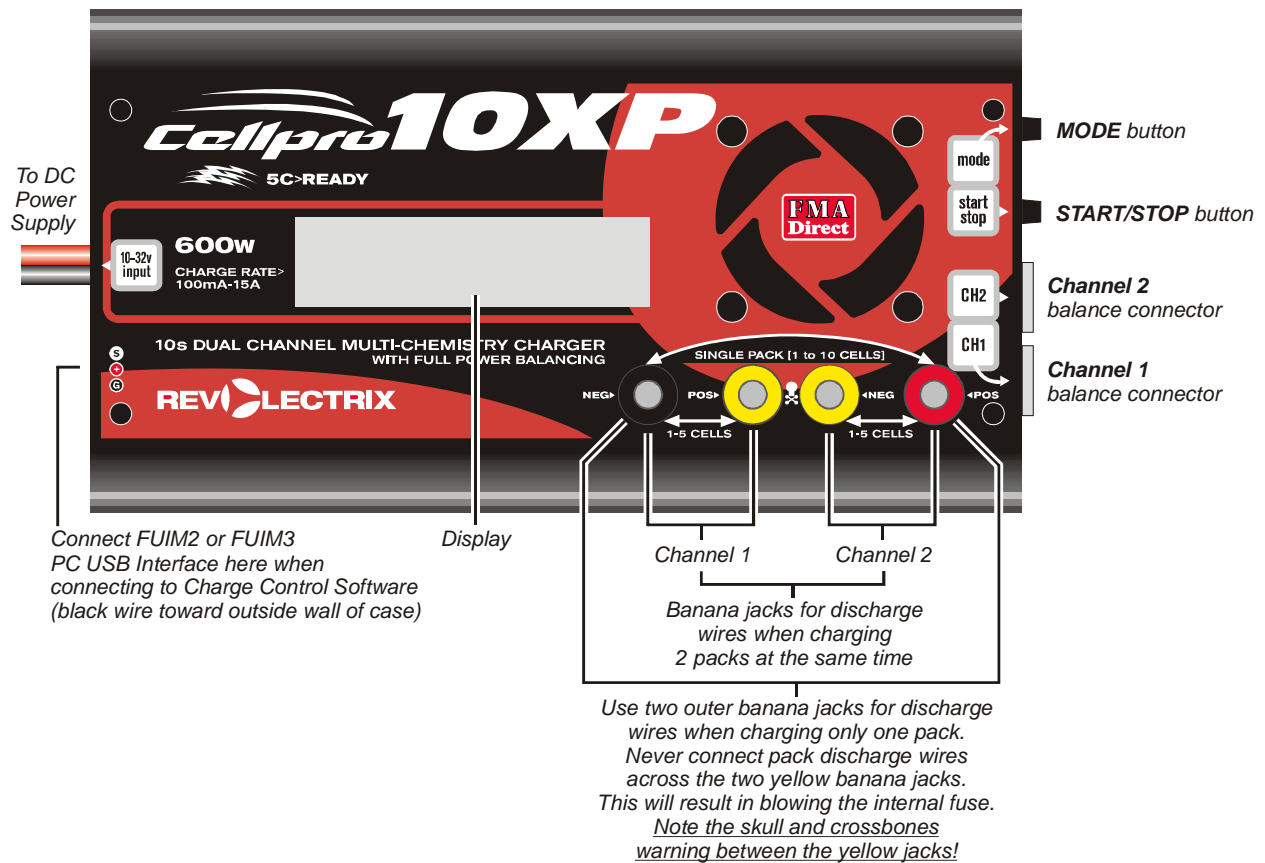
- ☐ Cellpro 10XP Charger
- ☐ Removable input plier clips (red/black) for connecting the CP10XP to a DC power source
- ☐ Optional: FUIM2-US or FUIM3-US PC USB Adapter (required for using the Charge Control Software)
- ☐ Optional: Cellpro 6-pin to 5-pin Adapter(s)
- ☐ Optional: Cellpro 10s Adapters (brands other than REVOLLECTRIX Cellpro)
- ☐ Optional: CP10S-BP12-2PK-US, Cellpro 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 the purchase of a Combo.

Unless otherwise stated, REVOLLECTRIX part numbers found within this manual assume purchase was or will be made within the United States. If ordering from the International website, drop the “-US” from the part number.

Charger terminology



Pack terminology and configurations

REVOLLECTRIX Cellpro branded 5s battery packs



REVOLLECTRIX Cellpro branded 2s, 3s, and 4s battery packs



REVOLECTRIX Cellpro branded 6s-9s battery packs

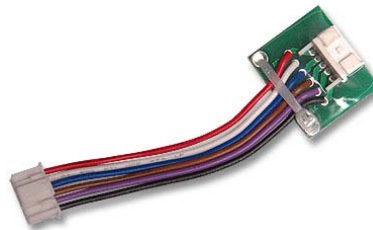
Balance connector,
Cellpro brand
(JST PA series)
6 position



Balance connector,
Cellpro brand
(JST PA series)
5 position

Discharge wires:
Red = Pack positive
Blk = Pack negative

6s-9s REVOLECTRIX packs like
the one shown above require the
5s-to-4s adapter for one of the
balance connectors for inter-
connection to the Cellpro 10XP charger



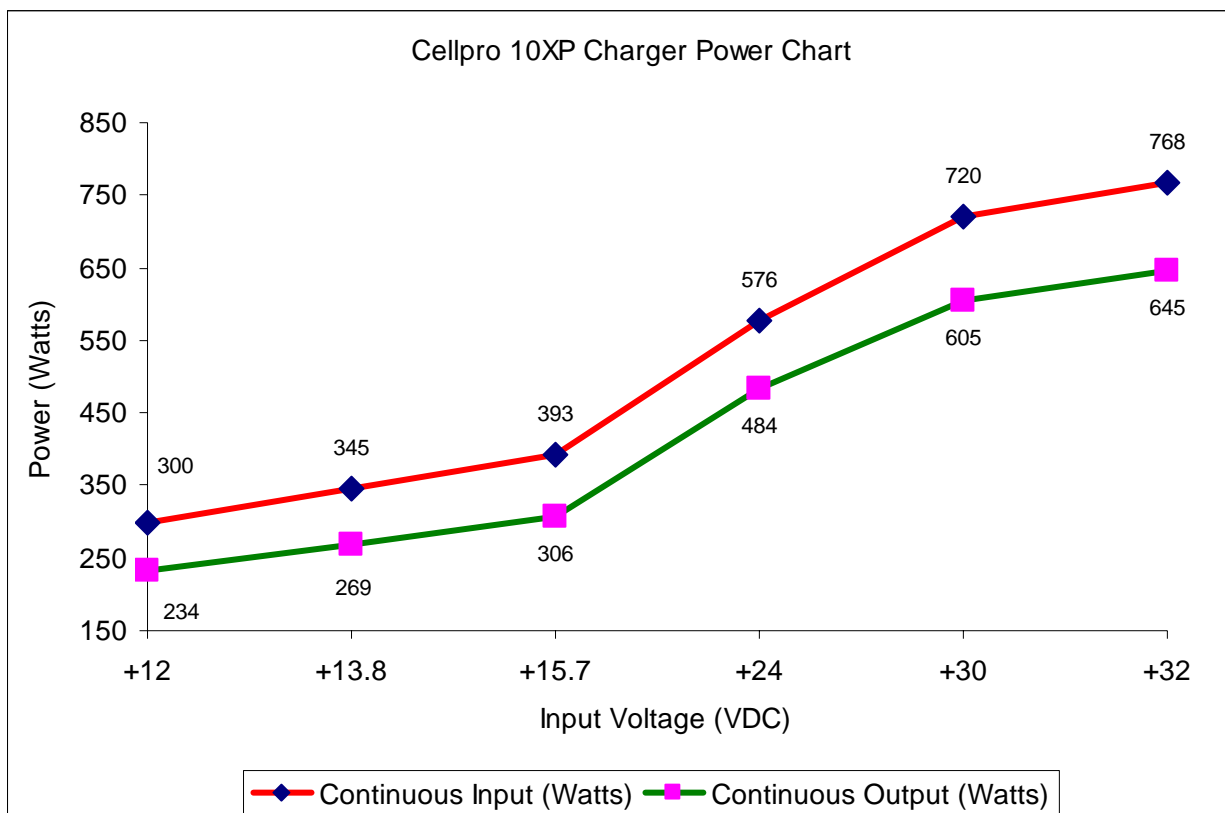
Note: Other brands of batteries will require Cellpro 10XP Adapters. For more information on REVO adapters, visit http://www.revolectrix.com/cellpro_adapters.htm

Understanding the Cellpro 10XP Charger

Auto Charging vs. Manual Current Settings

When balance charging Li batteries, you can set the Cellpro 10XP Charger's charge rate to one of three AUTO modes—1.0C, 2.0C or 3.0C—as appropriate for the pack(s) being charged. When one of these rates is selected, the charger determines the pack's capacity (over time) and automatically sets the correct output current using FMA's advanced Fuel Gauging technology. The accuracy of AUTO charging depends on how well your battery's charge curve matches up with the fuel table being used by the CP10XP. Six different fuel tables are available to support different Li battery chemistries and may be assigned to individual presets using the Charge Control software. Factory presets for LiPo batteries are set up for a generic, 15C battery profile. AUTO charging using the default presets may or may not be accurate for your batteries. The advantage to using AUTO charging is that you do not need to think about or even know the true capacity of your batteries. You can charge different capacity batteries at different times without having to adjust the charge rate setting and the charge will automatically adjust to choose the appropriate charge rate. You just tell the CP10XP how fast you want to charge, and it does the work for you. For safety reasons, AUTO charging current is capped at 6A, regardless of the size of the pack being charged. You can also manually set charge current to any value between 0.1A and 15A in 0.1A increments. Finally, you can select Storage Charge mode which automatically charges or discharges to the appropriate per-cell storage voltage for LiPo or A123 batteries.

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 605W when charging a 10s LiPo battery using a 30V DC input power source, and assuming the input source can deliver a maximum of 720W 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. From the graph, you can see that 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. Since the charger supports a high power balance current of 1A, all other things being equal, the charger still outperforms competing brands. 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 Cellpro 10XP 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 Cellpro 10XP 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 presets (or set up a custom preset) containing the words "Dual Channels". In this case, the CP10XP will balance all the cells in Channel 1 against each other and all the cells in Channel 2 against each other, and report the fuel level of the two packs independently.

Power Management Feature

The charger will draw up to 25A to deliver its 15A 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 CP10XP 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" under "Using the Charge Control Software". The Factory Default settings for the Power Management feature 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 Cellpro 10XP.
- 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.

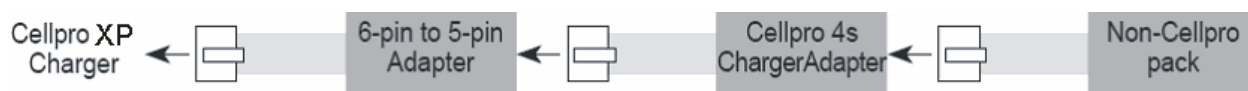
WARNING: Failure to comply with the above could result in fire and/or damage not covered by warranty!

- Pack discharge wires are usually not terminated in banana plugs (e.g., they might be terminated in a Deans 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. Revolatrix sells banana plugs suitable for this purpose as REVO PN: CP10S-BP12-2PK-US, Cellpro 10s Banana Plug Output Cables (2 pack).

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 non-Cellpro packs

Generally, follow the instructions in “Connecting one 1s to 10s Cellpro pack” and “Connecting two 1s to 5s Cellpro packs” below, but your packs may not be equipped with compatible balance connectors. REVOLATRIX offers plug-and-play adapters for charging LiPo packs equipped with balance connectors made by other manufacturers. Check http://www.revolatrix.com/cellpro_adapters.htm for adapter compatibility. The Cellpro 10XP Charger works with all existing Cellpro 4s charger adapters. You must connect a 6-pin to 5-pin Adapter (REVO PN: CP10S-5S/4S-ADP-US) between the charger and the Cellpro 4s charger adapter, as shown here:

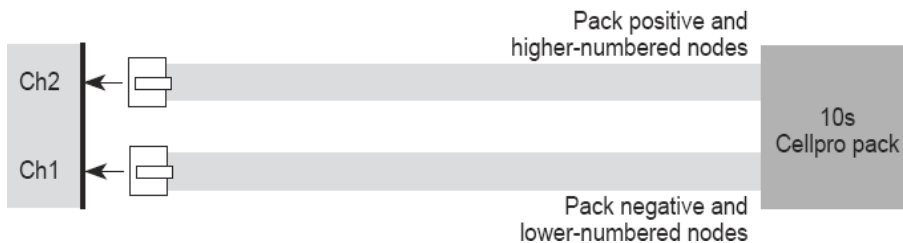
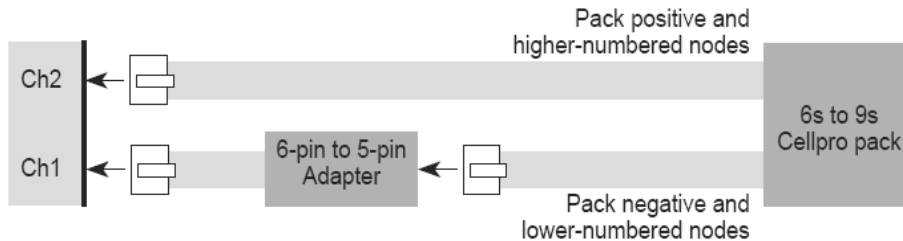
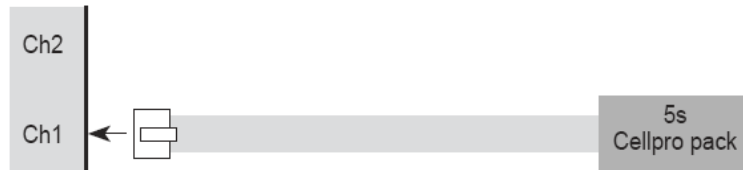
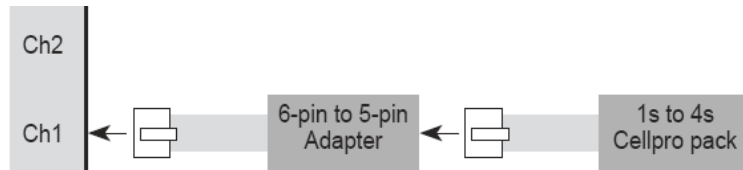


If an adapter isn't available for the pack you want to charge, or if the pack doesn't have a balance connector, the REVOLATRIX PN CPBP7-US (Cellpro battery pigtail 10", 5 position) and/or PN CPBP6P-10 (Cellpro battery pigtail 10", 6 position) cable assemblies can be used to make the pack compatible with the Cellpro 10XP Charger. Instructions for connecting these cable assemblies to your packs are provided in the “Cellpro Pin Lead Connection” document at: http://www.revolatrix.com/support_docs/item_1315.pdf

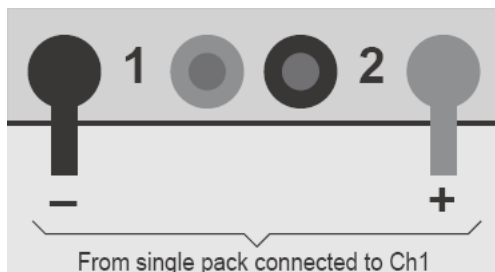
Note: see also “Balance connector wiring” later in this manual.

Connecting one 1s to 10s REVOLLECTRIX Cellpro pack

1. How you connect the Cellpro pack's balance connector(s) to the charger depends on the pack's configuration. Use the photos in the section "Pack terminology and configurations" above, then find the configurations in the diagrams below and connect as shown in that diagram.

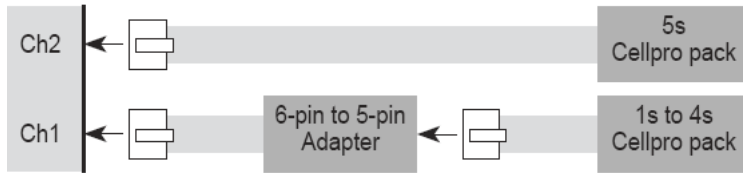
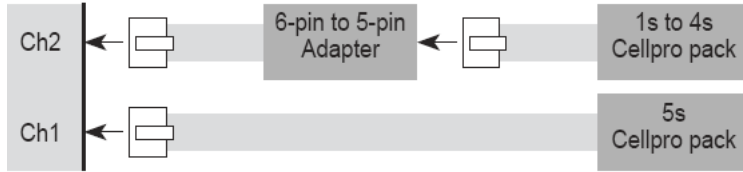
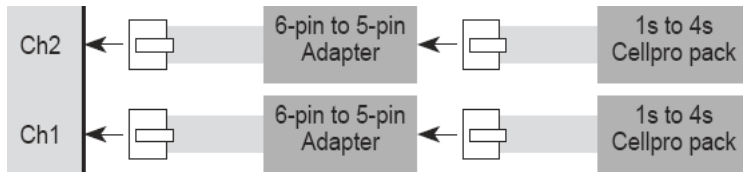


2. When charging a single pack, plug the discharge wires into the outermost banana jacks.

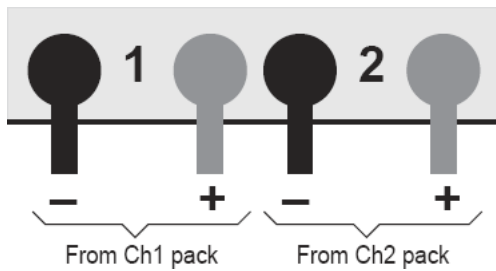


Connecting two 1s to 5s Cellpro packs

1. How you connect the Cellpro packs' balance connectors to the charger depends on the packs' configurations. Use the photos in the section "Pack terminology and configurations" above, then find the configurations in the diagrams below and connect as shown in that diagram.



2. 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:

Cellpro 10XP
[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 Cellpro 10XP'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 @ 1.0C	Designed for a single 1s-10s LiPo battery, balance charged at AUTO 1.0C.
P2 Dual Channels LiPo BAL @ 1.0C	Designed for two, 1s-5s LiPo batteries, balance charged at AUTO 1.0C.
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 using AUTO 1.0C or discharge using 1A internal balance circuits.
Preset 4 LiPo 2sU @ 1.0A	Designed for one 2s LiPo, unbalance charged at 1.0A manual rate setting.
Preset 5 Al23 BAL @ 4.6A	Designed for 1s-10s Al23 battery, balance charged at 4.6A manual rate setting.
P6 Dual Channels Al23 BAL @ 4.6A	Designed for two, 1s-5s Al23 batteries, balance charged at 4.6A manual rate setting.
Preset 7 Al23 2sU @ 4.6A	Designed for one 2s Al23, unbalance charged at 4.6A manual rate setting.
Preset 8 NiCd 8mV @ 1.0A	Designed for 1-26 cell NiCd, non balance charged, peak detection, 8mV fallback at 1.0A manual rate setting.
Preset 9 NiMH 5mV @ 1.0A	Designed for 1-26 cell NiMH, non balance charged, peak detection, 5mV fallback at 1.0A manual rate setting.
Preset 10 LEAD 12V @ 3.0A	Designed for 12V Lead Acid Battery, non balance charged at 3.0A manual rate setting.

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.

Note: If you programmed the charger using the Charge Control Software, different presets may be available. Also, if you have been using the software, you may have given the factory presets different names. Bottom line: if you change settings at the charger, or redefine presets, you probably won't see the factory presets shown above. To revert back to the original factory settings above, initiate a Factory Restore using the CCS, Presets tab.

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 CP10XP.

- 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 (Power Management feature), alternate between FMA 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).

Note: The Charge Control Software enables you define up to ten custom presets. Using the CCS, you can change the names of the Factory Presets, or change any of the available parameters associated with each preset. If you have defined custom presets, you can—at the charger—select any preset. (If you have not defined custom presets, the factory presets are available.)

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:

<p>Choose Chg. Amps Hold for More</p>

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:

<p>Choose Chg. Amps Charge @ [current]</p>
--

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 for each of the following three AUTO charge modes or STORAGE charge mode:
 - ◆ 1.0C (where C = pack’s capacity)
 - ◆ 2.0C
 - ◆ 3.0C

- ◆ **STORE** (to charge or discharge pack to 50% capacity; optimum for long-term storage)
- ◆ (Return to manual charge current settings at 0.1A)

Note: The charger's AUTO charge fuel gauge tables are optimized for Lithium Cobalt batteries. If you are charging Lithium Manganese batteries, AUTO charge modes may not be accurate. Manual current settings are recommended when charging Lithium Manganese batteries. Use the CCS to assign the appropriate fuel gauge table to your presets to improve the accuracy of AUTO charge mode.

■ *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
Al23 BAL 3.65V	Al23 (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
Al23 1sU 3.65V	Al23 (or LiFe) Unbalance Charge, 1s to 3.65V
Al23 2sU 7.30V	Al23 (or LiFe) Unbalance Charge, 2s to 7.30V
Al23 3sU 10.95V	Al23 (or LiFe) Unbalance Charge, 3s to 10.95V
Al23 4sU 14.60V	Al23 (or LiFe) Unbalance Charge, 4s to 14.60V
Al23 5sU 18.25V	Al23 (or LiFe) Unbalance Charge, 5s to 18.25V
Al23 6sU 21.90V	Al23 (or LiFe) Unbalance Charge, 6s to 21.90V
Al23 7sU 25.55V	Al23 (or LiFe) Unbalance Charge, 7s to 25.55V
Al23 8sU 29.20V	Al23 (or LiFe) Unbalance Charge, 8s to 29.20V
Al23 9sU 32.85V	Al23 (or LiFe) Unbalance Charge, 9s to 32.85V
Al23 10sU 36.50V	Al23 (or LiFe) Unbalance Charge, 10s to 36.50V
Al23 11sU 40.15V	Al23 (or LiFe) Unbalance Charge, 11s to 40.15V
Al23 12sU 43.80V	Al23 (or LiFe) Unbalance Charge, 12s to 43.80V

■ *To get help using the Cellpro 10XP:* **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 CP10XP 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.)

<div style="border: 1px solid black; padding: 5px; text-align: center;">C 1.00A 00:00:59 Supply=12.2V/ 3A</div>	Charge current and charge time. Supply voltage and input current.
<div style="border: 1px solid black; padding: 5px;">[preset name] [chem] [BAL] @ [charge current]</div>	Selected preset. Preset's charging settings.
<div style="border: 1px solid black; padding: 5px;">[chemistry] [BAL] [charge process] [chemistry] [BAL] [charge process]</div>	Chemistry and charge process (Fast Charging, Balance Charging, etc.) in effect for each channel.

Ch1 Fuel = 47% Ch2 Fuel = 55%	Results of unique FMA algorithm that determines pack "fuel level." Data is also used to calculate correct C rate during 1/2/3C charging.
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 <i>screen auto scrolls to show all cells:</i>	Individual cell voltages.* ":" indicates Ch1
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 <i>screen auto scrolls to show all cells:</i>	Individual cell internal resistances in milliohms.*† ":" indicates Ch1
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.

- 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 LCD, and to the CCS (if connected to the PC). 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.

Note: In addition to the Options Menu items described below, the CCS allows access to these and other charger options on the Options tab.

1. **Press and hold the MODE button** *while* you power up the Cellpro 10XP.
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:

<p style="text-align: center;">CHOOSE SPLY AMPS Hold for More</p>

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:

<p style="text-align: center;">CHOOSE SPLY AMPS Limit @ [current amps setting]</p>
--

- 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:

<p style="text-align: center;">LOW SUPPLY VOLTS Hold for More</p>

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:

<p style="text-align: center;">LOW SUPPLY VOLTS Limit @ [volts]</p>

- 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 CP10XP; 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 FMA and XH balance (node) 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 **FMA NODE WIRING** or **XH/EH WIRING**

Note: FMA NODE WIRING is the Factory Default mode and provides proper operation when using FMA or REVOLLECTRIX Cellpro branded batteries with JST PA series connectors. 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. This may be accomplished only using the CCS on the Options tab.

■ *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!

- In **Cold Weather Balancing Mode**, unlike previous FMA chargers, the Cellpro 10XP does not support reduced end of charge voltage based on ambient or operating temperature.

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 Charge Control Software

The Cellpro 10XP Charge Control Software (CCS) enables you to define presets, save and load groups of presets, update the charger's firmware, and control various aspects of the charger's options.

Installing the Charge Control Software

For detailed information on installing the Cellpro 10XP CCS, please visit the Cellpro 10XP Product Tabbed page at www.revlectrix.com (from the main chargers page, locate and click the charger's image) then click the "Resources" tab.

Launching the Charge Control Software

1. **Start > All Programs > FMA Direct > Cellpro 10XP.**
2. If your computer is connected to the Internet, after you launch the application, the program will check to see whether a new version is available. If a new version is available, it will automatically download in the background. The next time you launch the application, you will have the option to install the new version or launch the version you already have.
3. If an update to the CCS is available, it may carry with it a newer firmware version. If new firmware is available, a message will appear; click **OK** to close the message window. See "Updating charger firmware," later in this manual, for instructions.

Connecting the charger to your computer

** The Cellpro 10XP CCS is a free download. But to actually connect the charger to the PC and use the application you will require either the FUIM2-US or FUIM3-US PC USB Interface.*

1. Follow all of the install directions on the CCS install page. Do not attempt to connect the FUIM2-US/FUIM3-US to the PC or to the charger until you have successfully installed the product's USB driver. Follow these instructions.
2. If the Charge Control Software isn't running, launch it now.
 - a. Click **Download USB Driver** link at the bottom the CCS window.
 - b. Choose the correct PC interface version (FUIM2-US/FUIM3-US) driver version and run the installer.
 - c. Restart your computer if prompted.
3. Now plug the FUIM2-US/FUIM3-US USB plug into your computer. Windows should locate the device and load the driver you just installed.
4. 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.
5. With COM port set to "Auto" (CCS 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 10XP 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, check the FAQ page at www.revlectrix.com or check the "Support Options" section below.

Monitoring charging operations

- *To monitor cell voltages, total pack voltage and related charging parameters **during charging**:*
Click the **Cells** tab.

- *To monitor cell internal resistances **during charging**:* Click the **Int. Res.** tab.

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

- *To view cell parameter graphs: **View > Graphs**.* In the **Graphs** window:
 - *To view cell volts: **View > Cell Volts**.*
 - *To view pack volts: **View > Pack Volts**.*
 - *To view current: **View > Amps**.*
 - *To view internal resistance: **View > Internal Resistance**.*
 - *To view fuel level: **View > Fuel**.*
 - *To print a graph: **File > Print**.*

NOTE: Depending on the preset selected, not all Graphs will contain data.

Limiting charger input current

The charger will draw up to 25A to deliver its 15A 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. The charger monitors input current from the power supply, and automatically reduces pack charge current if it determines that the power supply can't keep up.

You can also manually limit the charger's input current 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, or slightly lower. This feature prevents damage to power supplies, such as bench supplies, having low to moderate output currents. (Be aware that limiting charger input current may increase pack charge times.) When the charger is powered from a high current source (such as a car battery), you can set manual current limiting to a higher level. Factory default setting for input current limiting is 25A.

Additionally, the input supply low voltage limit can easily be adjusted. The Factory Default setting is 10V which ensures safe operation of the charger. But in some cases you may wish to increase this input voltage limit; e.g., to prevent a 12V Lead Acid input supply battery from being over-discharged. Most Pb batteries will experience greatly reduced life-span if discharged below 11V or 11.5V.

- *To monitor supply voltage:* Click the **Supply** tab.
- *To manually set input current limiting:*
 1. In the **Supply** tab, select the desired maximum current in the **Current Limit** dropdown list.
 2. Click the **Update Charger** button.
- *To manually adjust supply low voltage limiting:*
 1. In the **Supply** tab, select the desired minimum input voltage in the **Supply Low Voltage Limit** dropdown list.
 2. Click the **Update Charger** button.
- *To set the CP10XP to warn you when a 12V or 24V input supply Lead Acid battery is at 50% depth of discharge,* check the **Warn 50% DOD** checkbox.
- *To manually adjust Input Current Limit or Supply Low Voltage Limit at the field without using the Charge Control Software,* see the section "Options Menu Explained" above.

Defining presets

On the Presets tab, you can define and name up to ten charger user presets using the CCS. Each preset consists of a name, a chemistry, a charge current, a Fuel Table (Li chemistry only), and whether or not the preset supports Dual Pack Charging (track balancing and capacity independently on Ch1/Ch2). See "Selecting a preset," earlier in this manual, for instructions on selecting a preset for charging.

Note: Remember that presets can be overridden at the charger. Preset changes made at the charger are retained in the charger until manually changed again, or until a new group of presets is downloaded to the charger. When you connect the charger to the computer and launch the Charge Control Software, the program uploads and displays the presets stored in the charger.

Perform all preset operations in the **Presets** tab.

- *To define a preset:*
 1. In the **Name** field, enter a name (or new name) for the preset.
 2. In the **Chemistry** field, select the chemistry. In addition to basic battery chemistry, “Chemistries” encompass charge voltages, balance options, and manual cell counts when applicable.
 3. In the **Amps** field, select the charge current, either AUTO 1C, 2C, 3C, STORE, or manual set rate.
 4. If this preset will be used to charge two 1s-5s packs simultaneously, you may choose to activate the **Dual Channel** option (this enables the charger to treat Ch1 and Ch2 as completely separate packs for purposes of balancing, fuel gauge readout, and capacity readouts).
- *To download presets to the charger:* Click **Update Charger**. The charger will beep when downloading is complete.
or
To ignore changes and restore the previous presets: Click **Cancel**.
- *To restore the factory settings:* Click **Factory Default**, then click **Update Charger**.
Note: This restores the Factory Default presets, and also resets all charger options listed on the “Options” tab as well as the “Supply” tab to Factory Defaults. Restoring Factory Defaults does not alter the currently-installed Firmware level.

Setting charger options

1. Click the **Options** tab.
2. Set options as desired:
 - **LCD Contrast** sets the contrast of the charger’s LCD. The display will be easier to read in bright conditions when the contrast is high.
 - **Auto Scroll Status Screens** option, when checked, directs the charger to scroll through multiple screens during charging. **Delay** controls how long each screen is displayed.
 - **Speaker Volume** controls the loudness of the charger’s speaker. If you want the charger to confirm when you press the **MODE** button and **START/STOP** button, activate the **Button Clicks ON** option. Deactivate the **Speaker ON** option to mute the charger. Select **Quiet Charging** to prevent the charger from beeping when charger reaches 99% fuel or when charge process complete.
 - **Optimize for Accurate Balance** balances cells to 1mV and C/20 charge termination. The charger can take an additional two to thirty minutes to balance the cells, depending on the state of imbalance present between cells. **Optimize for Faster Charging** reduces balancer accuracy and terminates charge at C/10 to speed up the overall charging time.
3. Click **Update Charger**.
or
If you don’t want to apply the changes, click **Cancel**.

Recording charge data

The Charge Control Software can record charge data for each charging session.

1. Press the **START/STOP** button on the charger to start a session.
2. When prompted, enter a file name. You can enter a file name you previously used, but you must confirm that you want to overwrite older data.

Charge data is stored in a semicolon-delimited format, which can be imported into a spreadsheet for analysis.

Updating charger firmware

1. If your computer is connected to the Internet, after you launch the application, the program will check to see whether a new version is available. If a new version is available, it will automatically download in the background. The next time you launch the application, you will have the option to install the new version or launch the version you already have.
2. If an update to the CCS is available, it may carry with it a newer firmware version. If new firmware is available, a message will appear; click **OK** to close the message window.

When you are ready to update the charger:

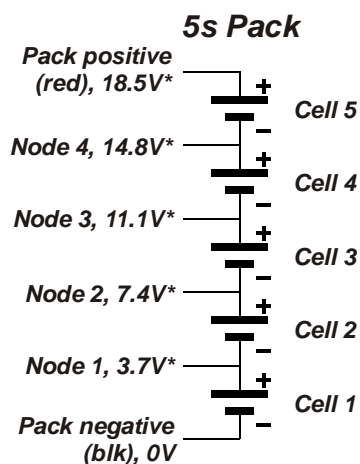
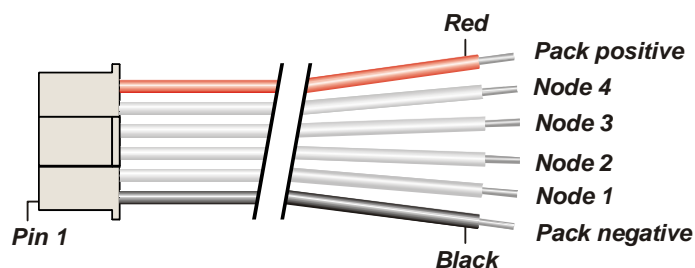
1. Be sure the charger is connected to the computer, and is powered up.
2. Disconnect all packs from the charger.
3. In the Charge Control Software window, switch to the **Firmware** tab.
4. Select the firmware you want to download.
5. Click Update Firmware.
6. Wait—and do nothing—until updating is complete.

IMPORTANT: During firmware downloading, do not disconnect the charger from power, do not disconnect the charger from the computer, and do not exit the Charge Control 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 – 6 above.

Balance connector wiring

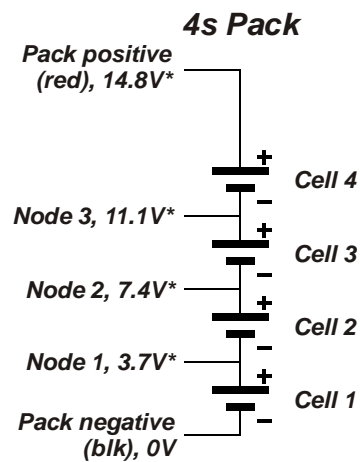
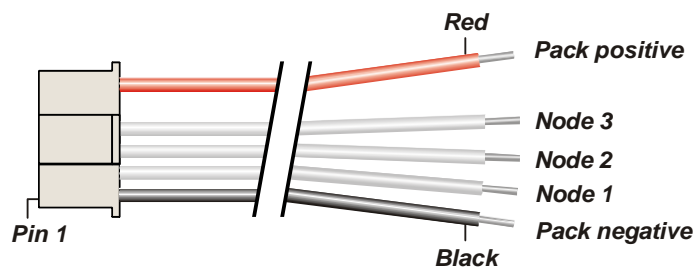
When using FMA WIRING mode (Factory Default Setting)

The following diagrams shows how a 6 pin Cellpro (JST PA series) balance connector (REVO PN CPBP6P-10-US) must be wired to a 5s, 4s, 3s, 2s, and 1s battery pack when the Cellpro 10XP is set to FMA WIRING mode (Factory default).



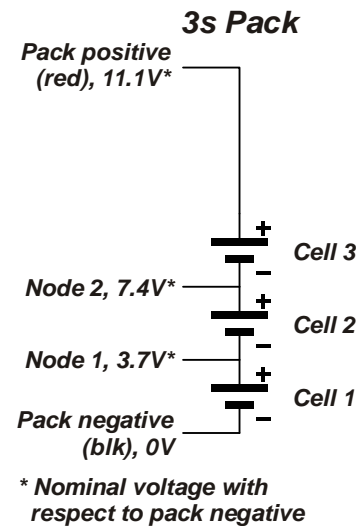
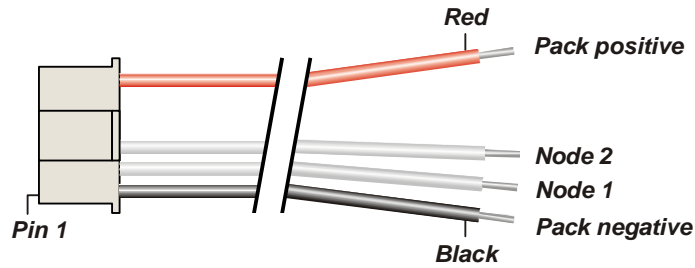
* Nominal voltage with respect to pack negative

FMA Cellpro Connector/FMA Wiring Mode

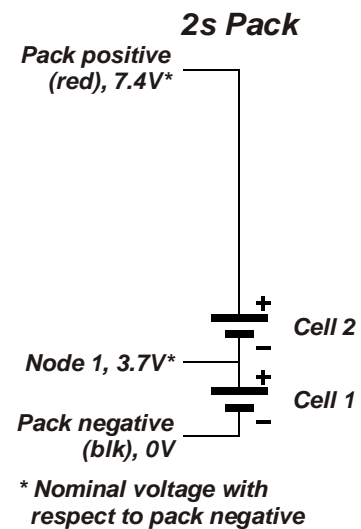
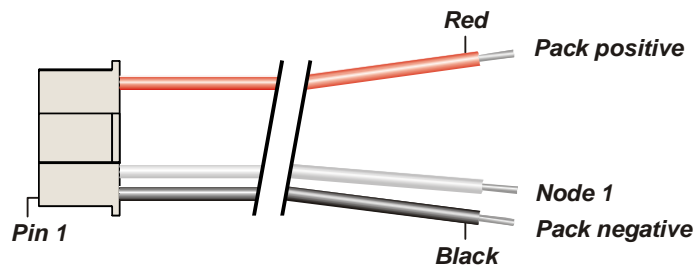


* Nominal voltage with respect to pack negative

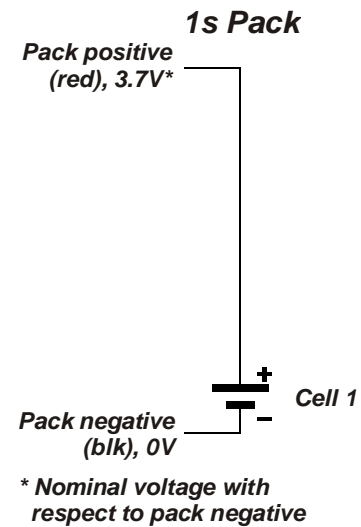
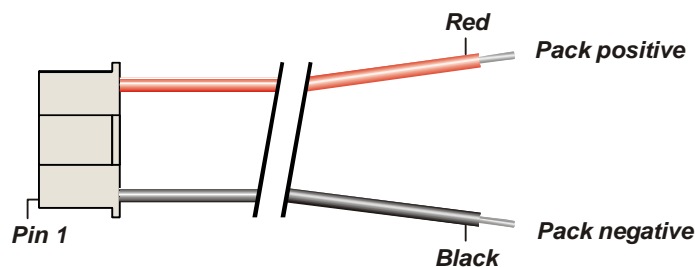
FMA Cellpro Connector/FMA Wiring Mode



FMA Cellpro Connector/FMA Wiring Mode



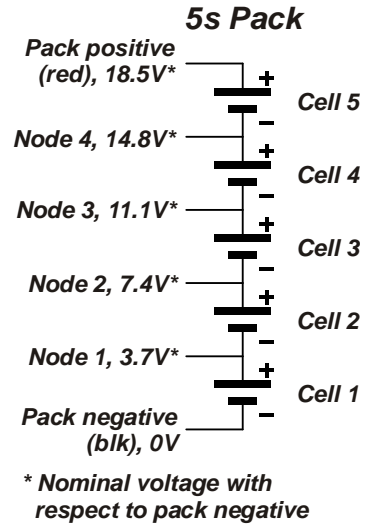
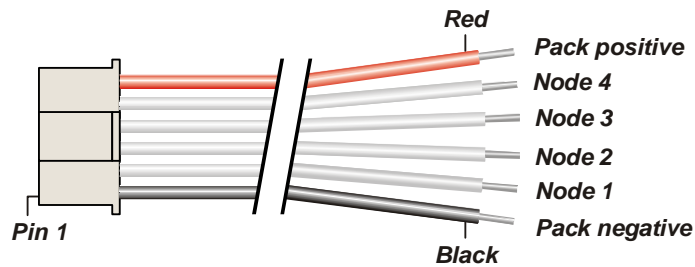
FMA Cellpro Connector/FMA Wiring Mode



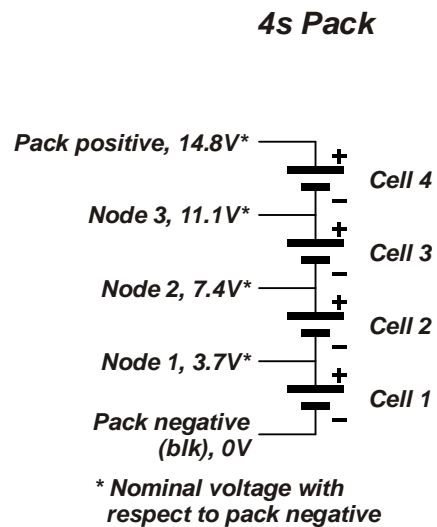
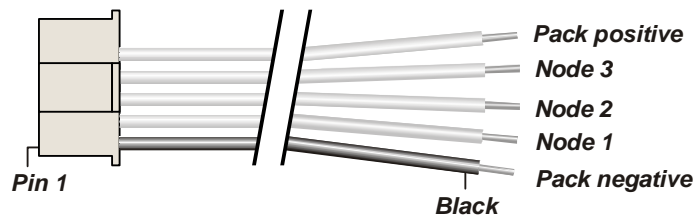
NOTE: In the above FMA wiring scheme, when the battery has fewer than 5 cells, the red wire always connects to Pack positive, and the unused balance (node) wires are left un-connected from the battery. Always remove unused wires from the Cellpro battery pigtail by gently lifting each pin's locking tab 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 Cellpro (JST PA series) balance connector (REVO PN CPBP6P-10-US) must be wired to a 5s, 4s, 3s, 2s, and 1s battery pack when the Cellpro 10XP is set to XH/EH WIRING mode. You may choose to set the CP10XP to XH MODE and splice the CP 6 position to an XH adapter you already own. Use this illustration to guide you.

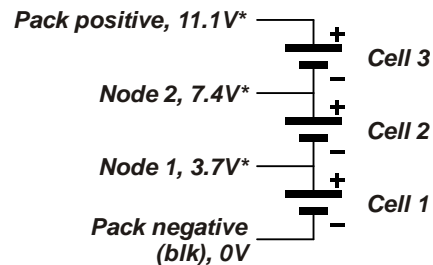
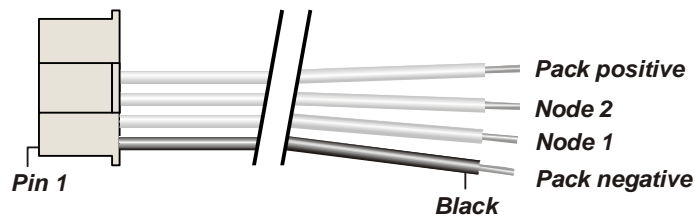


FMA Cellpro Connector/XH and EH Wiring Mode



FMA Cellpro Connector/XH and EH Wiring Mode

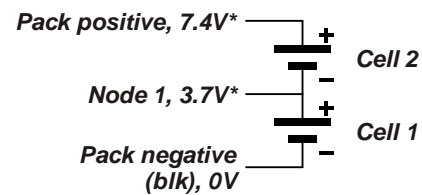
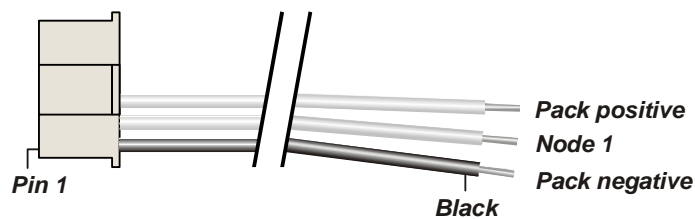
3s Pack



* Nominal voltage with respect to pack negative

FMA Cellpro Connector/XH and EH Wiring Mode

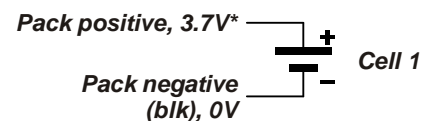
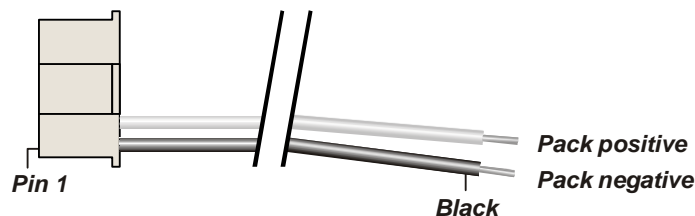
2s Pack



* Nominal voltage with respect to pack negative

FMA Cellpro 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 FMA wiring scheme. Pack positive continually moves up by one with each additional cell added to the pack. Always remove unused wires from the Cellpro battery pigtail by gently lifting the pin's locking tab with a hobby knife, and pulling the wire free of the housing.

Estimating performance factors

If you don't have a way to directly measure your propulsion system's electrical parameters, the Cellpro 10XP Charger enables you to estimate them using before- and after-flight measurements.

Collect data

Charge pack.



When charging is finished, record **Fuel %** and **total pack voltage** (i.e. sum of cell voltages).



Fly plane (or test on the ground). Record **flight time in minutes**.



Connect pack to charger. Record **Fuel %** and **total pack voltage**.

Calculate performance factors

$$\frac{(\text{Fuel \% before flight}) - (\text{Fuel \% after flight})}{100} \times (\text{Pack capacity, Ah}) = \text{Capacity consumed during flight, Ah}$$

$$\frac{(\text{Capacity consumed during flight, Ah}) \times 60}{(\text{Flight time, minutes})} = \text{Average current during flight, A}$$

$$\frac{(\text{Pack voltage before flight, V}) + (\text{Pack voltage after flight, V})}{2} = \text{Average voltage during flight, V}$$

$$(\text{Average voltage during flight, A}) \times (\text{Average current during flight, V}) = \text{Average power during flight, Watts}$$

$$\frac{(\text{Average power during flight, Watts})}{(\text{Model weight, pounds})} = \text{Watts per pound}$$

Evaluate results

- **Average current during flight** gives you a rough idea whether system components—ESC, motor, connectors and wiring—are operating within their current ratings. Keep in mind that peak current during flight may greatly exceed the average current you calculated.
- **Watts per pound** is an approximate indicator of aircraft performance (other factors influencing performance include lift, drag and motor type). Here are some guidelines:
 - 25 to 30 watts per pound: level flight.
 - 40 to 50 watts per pound: take off from smooth surface, climb.
 - 50 to 75 watts per pound: take off from grass, sport aerobatics.
 - 75 to 125 watts per pound: pattern aerobatics.
 - Over 125 watts per pound: 3D.

Specifications

For battery type	Lithium Polymer, Lithium Ion, Lithium Manganese, A123 (LiFePO4), NiCd, NiMH, Pb packs
Supported Cell Counts	LiPo, Lilon, 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 (Power Management feature)
Input current	Up to 25A; can be limited to 1A to 25A in 0.5A increments (Power Management feature)
Power conversion	62.5kHz switcher operating at 80% - 95% efficiency
Per-Cell output voltage	LiPo, Lilon, LiMg – 4.10V, 4.20, or 4.22V A123 (LiFePO4) – 3.65V NiCd – 1.20V NiMH – 1.20V Pb (Lead) – 2V
Output current	100mA - 15A*, reverse polarity protected
Discharge current	1A per cell nominal (42W max) for storage discharging Li
Cont. output current	234W @ +12V DC input; 645W @ +32V DC input
Cell balancing	Resolution 78uV (16 bit) for 1s-10s Li or A123 LiFePO4) balanced charging
Voltage calibration	Cell voltage measurements are factory calibrated to a standard traceable to NIST; calibration is to ± 6 mV
Current calibration	Charge current is factory calibrated on a 4A standard; calibration is to ± 1 mA
Measurement accuracy	Voltage resolution: 78 uV (16 bit) Voltage tolerance: ± 6 mV Charge current: $\pm 1\%$ Capacity added to pack: $\pm 1\%$ Percent capacity ("Fuel"): $\pm 10\%$ (with accurate fuel table defined in preset)
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	"Cellpro" compatible, 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 Charge Control Software (CCS)

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 Cellpro 10XP 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 FMA 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

Support options

For Sales Support on REVOLLECTRIX Brand Products:

Email: sales@revollectrix.com

or phone: (800) 343-2934

For Sales or Technical Support on "Other Brands" in the REVO Store:

Email: brandsupport@revollectrix.com

To request information about a REVOLLECTRIX product you are considering purchasing:

Email: info@revollectrix.com

or phone: (800) 343-2934

Support is also available for any of the following areas:

For technical support on a REVOLLECTRIX product you already own

To request Refunds or Exchanges of merchandise

To request warranty or non-warranty repair work

To request support via email:

Email: support@revollectrix.com

or phone: (301) 668-4280

To initiate a case directly on line for any of the above:

1. Log on to your account at www.store.revollectrix.com
2. Click the "My Account" tab
3. Under Support, click "Contact Support"
4. On the case form, enter a subject which contains the product name, part number, or description
5. Type a message in the message field
6. The fields on the top right of the form are optional
7. Click Submit

A customer representative will contact you via email.

REVOLECTRIX limited warranty

REVOLECTRIX warrants this product to be free of manufacturing defects for the term of one year from the date of purchase. Should any defects covered by this warranty occur, the product shall be repaired or replaced with a unit of equal performance by REVOLECTRIX or an authorized REVOLECTRIX service station. Unit must be returned to the original place of purchase.

Limits and exclusions

This warranty may be enforced only by the original purchaser, who uses this product in its original condition as purchased, in strict accordance with the product's instructions. Units returned for warranty service to a REVOLECTRIX service center will be accepted for service when shipped postpaid, with an assigned Return Merchandise Authorization (RMA) form to the service station designated by REVOLECTRIX. To obtain an RMA, contact REVOLECTRIX. If you purchased the unit directly from REVOLECTRIX, you may also file a case on line at [www.usastore.revolectrix](http://www.usastore.revolectrix.com) (US web store) or www.store.revolectrix.com (International web store) to start the RMA process. If you purchased the product from an authorized distributor or dealer, contact the distributor or dealer for further instructions.

This warranty does not apply to:

- Consequential or incidental losses resulting from the use of this product.
- Damage resulting from accident, misuse, abuse, neglect, electrical surges, reversed polarity on connectors, lightning or other acts of God.
- Damage from failure to follow instructions supplied with the product.
- Damage occurring during shipment of the product either to the customer or from the customer for service (claims must be presented to the carrier).
- Damage resulting from repair, adjustment, or any alteration of the product by anyone other than an authorized REVOLECTRIX technician.
- Installation or removal charges, or damage caused by improper installation or removal.

Call (301) 668-4280 for more information about service and warranty repairs.