REVOLECTRIX™

GT500
Multi Chemistry Charger

MANUAL

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Rev2.2

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About GT500

Description:

- Model GT500 for use with LiPo, LiIon, LiPoHV, LiFePO4 (or A123), NiCd, NiMH, and Pb (Lead Acid) battery packs

Features

- Selectable charge rates range from 25mA to 20A
- Continuous maximum output power rating, 500W @ +24VDC input voltage, 250W @ +12VDC input voltage
- Native support of JST XH balance connectors allows direct connection of 1s-8s LiPo/LiHV Batteries without requiring any adapters. Also supports Revolectrix SPA and MPA Safe Parallel Adapters; the industry's safest methods for parallel charging multiple, same-cell-count packs. These items are peripheral products, available separately or as part of Combo packages, not included as a part of the basic GT500 unit
- Smart Power Management allows customer to select between programmable input power sources. Available settings include power supply input current limit, input low voltage limit, regenerative discharge rate and voltage limit. GT500 stores 1 set-up for Power Supply and 1 set-up for Battery and can be programmed to ask for verification one time on start-up
- GT500 supports charging through the main discharge wires only for certain scenarios (see features tab for full details). For balanced charging, the unit requires balance wires in combination with the discharge wires (charge rate support up to 20A max)
- Initiate charge, discharge, store, monitor, and multiple cycles at the GT500
- The unit comes equipped with basic presets for all battery chemistries currently available as well as 28 EMPTY user preset positions. During the course of operation, any changes that are made at the charger may be named and saved ("SAVE AS") or saved over ("SAVE") to the user presets bank. The process is analogous to opening a document in a PC application, making changes, and then using the "Save" or "Save As" menu options from the PC application to store the unique setup parameters chosen during the course of using the charger for its intended purpose; charging and managing your batteries. Best of all, everything happens at the charger, which makes it ideal for taking it on the road
- 0.1mohm resolution allows accurate four point internal resistance measurement of each cell
- Environmentally friendly, regenerative discharge capability of up to 500W. Unlike traditional methods of discharge, which deplete the output battery's energy in the form of heat across a transistor, regenerative discharge takes most of that energy and puts it back into the input battery. In other words, when you discharge your LiPo for storage, you will be re-charging your Lead Acid input battery. The total amount of power that you can achieve is limited only by the amount of current that your input battery can accept, or 500W, whichever is lower
- GT500 is also equipped with a traditional, 50W internal discharge capability which is non-regenerative
- Large cooling fan
- Massive over-sized internal heat sink
- 12AWG silicon input power cable terminating in an EC-5 female pin connector. A plier clip assembly with EC-5 on one end and red/black plier clips on the other is available as an accessory item

- Massive sendust core toroid capable of 25A continuous input current requirement for maximum output specifications

Other Features

- 2.6", 128 x 64 pixels graphic LCD with white LED backlight
- Embedded PC USB support and free PC Software
- Intuitive Navigation Wheel with inclusive push button SELECT/ENTER, plus a BACK button makes Navigating menus and making selections a joy!
- Sleek and attractive high-impact ABS enclosure for maximum airflow efficiency
- Sturdy Aluminum top panel
- Quick "preset over-ride access" to common charging parameters like setting charge and discharge current and operational modes of charge / discharge / monitor / cycle(s)
- Additional advanced options menu for adjusting in-depth charging parameters and global options at the unit
- Free and reliable firmware updates for the life of the product using the free, downloadable, Windows-based Firmware Update Utility (Application)
- Programmable options allow speaker ON/OFF or volume, selectable completion notification, information scrolling, Logo display duration at power up and Navigation Wheel direction control
- Multiple product cases can be interlocked

Please note: all specifications and features listed above subject to change without notice

Specifications

For Battery types: Lithium Polymer HV (1s to 8s balanced, 1s to 2s unbalanced), Lithium Polymer (1s to 8s balanced, 1s to 2s unbalanced) Lithium Ion (1s to 8s balanced, 1s to 2s unbalanced), Lithium Manganese (1s to 8s balanced, 1s to 2s unbalanced), A123 (LiFePO4) (1s to 8s balanced, 1s to 8s unbalanced), NiCd (1s to 21s), NiMH (1s to 21s), Lead Acid batteries (1s-12s Flooded, Gel, AGM, SLA)

Pack capacity: 50 mAh to 360Ah

Input voltage: 10-32VDC, reverse polarity protected

Input current: 1A to 25A, software limited

Power conversion: Synchronous DC/DC converter, 85% to 93% efficiency depending on output current

Output battery charge current: Adjustable range 25mA to 20A, limited by 25A input current*

Output battery discharge current: Internal discharge 25mA to 8A, 50W max Regenerative discharge 25mA to 20A, 500W max

Continuous max output power: 250W @ +12VDC input, 500W @ +24VDC

Cell balancing: 1s-8s 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 +/- 1mA

Measurement accuracy:
Voltage resolution: 78uV (16 bit)
Voltage tolerance: +/- 6mV
Charge current: +/- 1%
Capacity added to pack: +/- 1%
Percent capacity (“Fuel”): +/- 5% (with accurate fuel table defined for battery being charged)

Interface: USB 2.0 Full Speed (12Mb/s)

Cooling fans: Single, 13 CFM, 50mm diameter

Heat sink: Internal 120W aluminum, thin finned

Output battery connector: Modified JST XH series, 9 position max; accepts 1s-8s balance plugs on batteries

LCD: 2.6", 128 x 64 pixels graphic LCD with white LED backlight

Size: 5.70" x 5.57" x 3.40"

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*

Precautions

- Follow all instructions in this manual to ensure 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.

Smart Power Management

IMPORTANT: To prevent damage to the power source, you must specify the power source's operating characteristics before charging for the first time with a DC power supply, and before charging for the first time from a battery. The GT500 allows you to store up to 6 different power supply profiles (3x DC power supply profiles and 3x Lead Acid battery profiles). After that, load the power supply profile using the **Power Source** option any time you change to a different DC power supply or battery. See Example 1: Configuring Smart Power Management on how to configure Smart Power Management for both a DC power supply and a Lead Acid battery.

Because the GT500 is capable of high power output, it is strongly recommended that you configure Smart Power Management before you use the GT500 for the first time, and select the power source in use any time it is changed.

The GT500 stores six Smart Power Management profiles: three for DC power supplies (PSU1, PSU2, PSU3) and three for Lead Acid batteries (Batt1, Batt2, Batt3). When you first apply power to the GT500, the first thing you do is select the profile that matches the power source you are using. This makes it easy to change the Smart Power Management profile from a DC power supply at home to a Lead Acid battery at the field.

If you don't configure Smart Power Management to match your power source(s), these are the default settings:

	PSU1	PSU2	PSU3	Batt1	Batt2	Batt3
Voltage lower limit	10.0V	15.0V	10.0V	11.0V	22.0V	11.5V
Current upper limit	25A	25A	5A	25A	25A	25A
Regenerative discharge	Not Available	Not Available	Not Available	Enabled	Enabled	Enabled
Regenerative voltage upper limit into Lead Acid battery	Not Available	Not Available	Not Available	14.4V	28.8V	14.4V
Regenerative current upper limit into Lead Acid battery	Not Available	Not Available	Not Available	10A	10A	10A

Regenerative Discharge

Regenerative discharge routes most of the energy from the pack being discharged back into the Lead Acid battery powering the GT500. This feature is only available when the GT500 is powered from a Lead Acid battery. Regenerative discharge supports up to 20A, 500W maximum.

Regenerative discharge

- Enable/disable regenerative discharge at the GT500 via Smart Power Management for the supply battery.

GT500 automatically determines whether it is connected to a Lead Acid battery or a DC power supply. If it detects a power supply, it switches to internal discharge (10mA to 8A, 50W maximum).

Power supplies

GT500 is one of the highest power RC battery maintenance devices available. Running full power, it can deliver 500W to batteries during charge. To achieve this, even on an 8 cell Lithium battery, it must boost the input voltage. This means the GT500 may draw up to 600W from the input power supply.

To take advantage of GT500's full power capability, the power source should be 24V DC (higher voltage does not improve output power), and capable of delivering a minimum of 25A to GT500's input.

If you don't need GT500's full output power, it can operate from much lower power sources. Use the steps outlined in Example 1: Configuring Smart Power Management to configure GT500 to never exceed the maximum capabilities of your input source(s), whether DC power supply or Lead Acid battery.

Important: Unstable power supplies can damage the charger. To help reduce risk to the charger observe the following:

1) When powering more than one Charger/Battery Workstation from the same supply, ensure that all connected chargers are idle (not charging) when connecting the second or third charger. Alternatively, connect all chargers to the supply before the supply is powered up.

2) When powering the Charger/Battery Workstation from an automotive battery (Lead Acid) installed in a vehicle, do not start or stop the vehicle's engine unless the charger is idle, or disconnected from the automotive battery (Lead Acid).

3) When powering any Revolectrix Charger or Battery Workstation using the E-Fuel 1200W/50A power supply:
i) first connect the Power Supply to AC power ***BEFORE*** connecting the charger to the Power Supply.
ii) set the voltage on the Power Supply so it is within the operating range of the Charger or Battery Workstation you will be powering.
iii) wait at least 15 seconds.
iv) then connect the Charger or Battery Workstation to the Power Supply.
v) conversely, disconnect the Charger or Battery Workstation from the Power Supply ***BEFORE*** disconnecting the Power Supply from AC power.

Firmware Update

- The free GT500 PC software gives you the ability to update to the latest firmware via a USB cable. You can download the GT500 PC software at

  http://www.revolectrix.com/downloads.htm

- Refer to the GT500 PC software for firmware update instructions.

Connecting Packs

General info

- When balance charging, both a balance connector and the main discharge wires must be connected.
- When performing a non-balance charge on a LiPo, LiFePO4 (or A123), NiCd, NiMH, or Lead Acid pack, connect only the pack's main discharge wires to the two outer banana jacks of the charger.

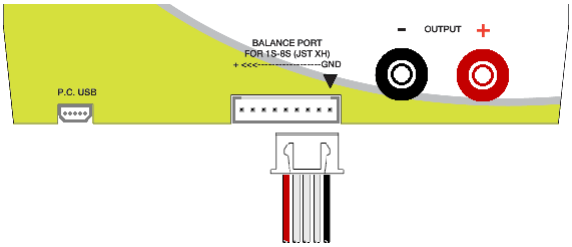
Note: After a charge is initiated, never alter the connections between the charger and the battery packs. Always end the current charge session before making any connection changes. See page 25 for more information about STARTING and STOPPING charge sessions.

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.

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.

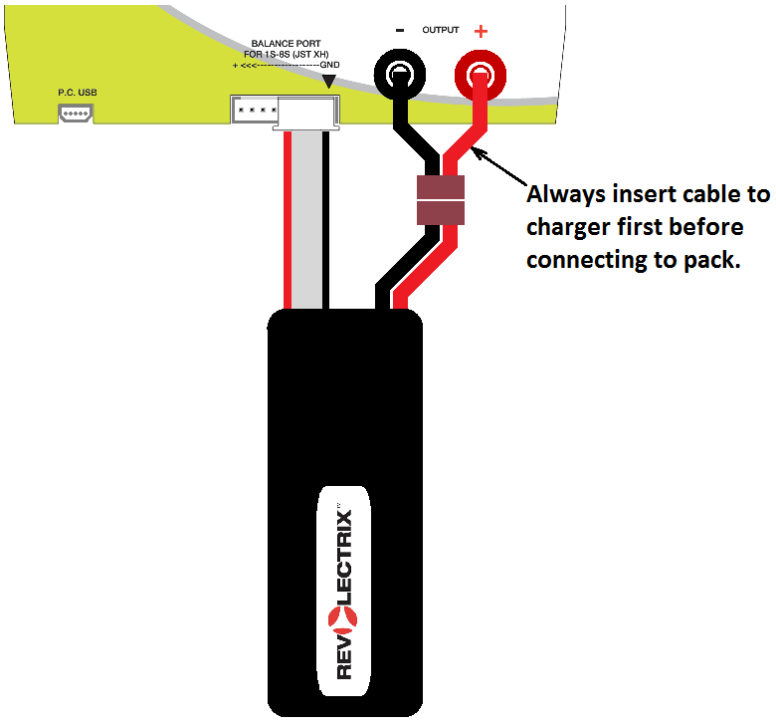
- The GT500 balance port accepts direct connection of a universal JST-XH balance connector up to 9-pins, supporting packs up to 8s. To connect a pack lower than 8s, align the connector to the right as shown. The negative pin of the battery pack balance connector (usually identified by a black wire) must be connected to the ground of the charger balance port (identified by an arrow or "GND") in all cases.



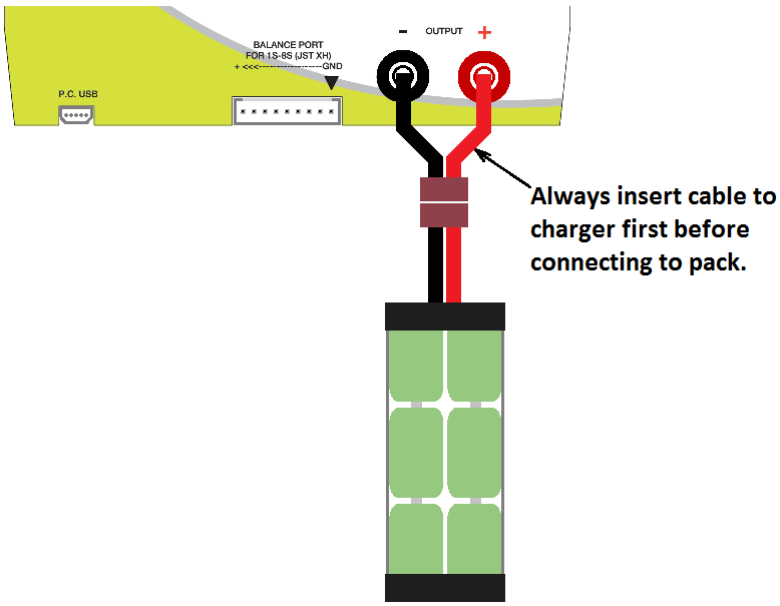
- The GT500 does not support balance-wire-only charging.

Single Pack Balanced LiPo Charge/Discharge

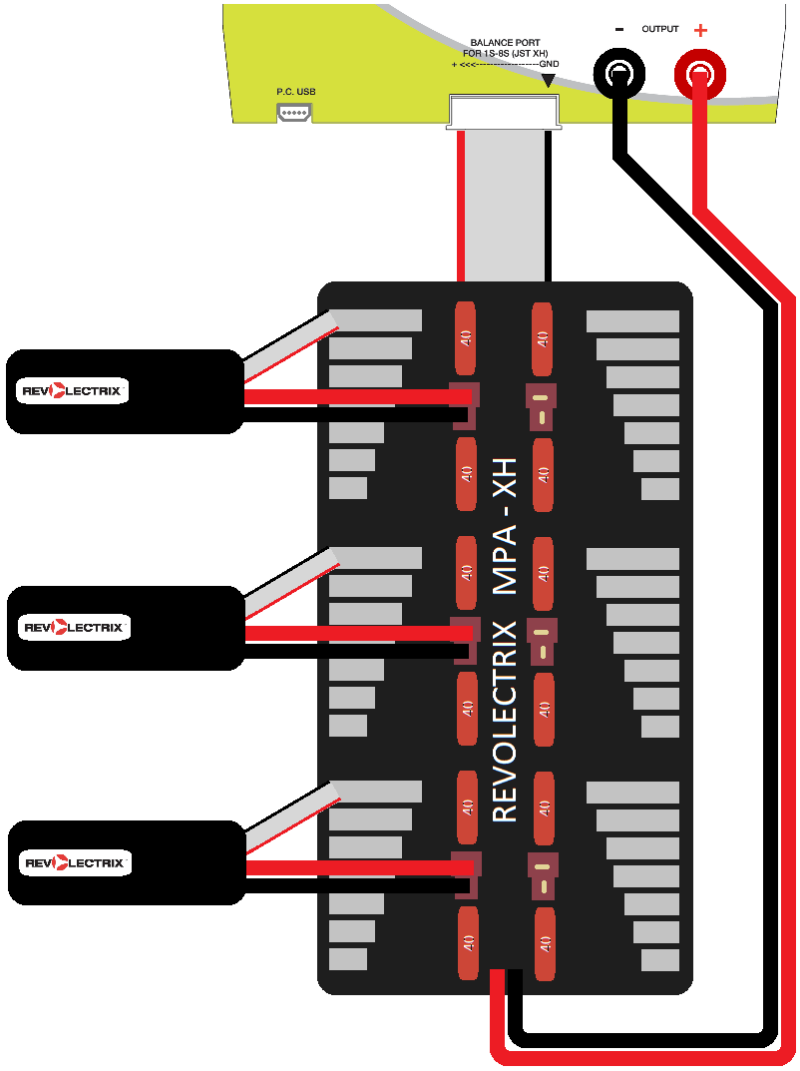
Note: Best practice is to connect balance connector first, then connect discharge wires.



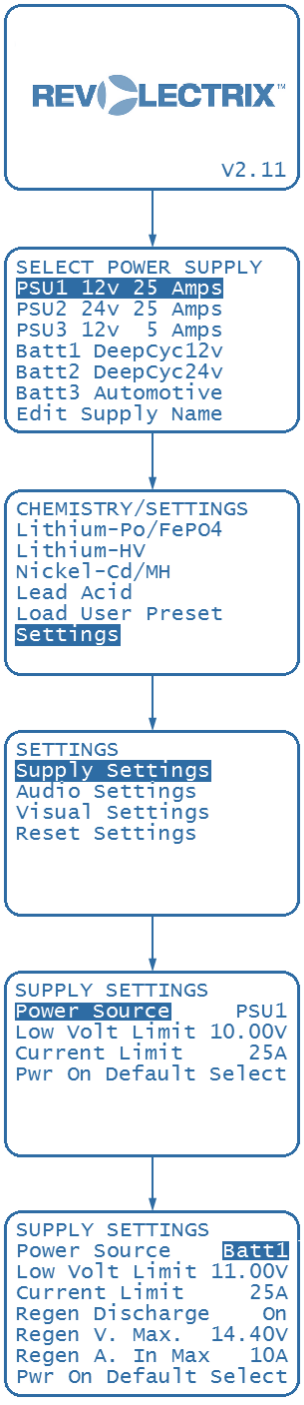
Single Pack Unbalanced Charge/Discharge



Parallel Charge



Example 1: Configuring Smart Power Management



1. This example will show you how to configure a 12V DC power supply and a 12V Lead Acid battery for GT500 for the first time. Although we use a 12V DC power supply in this example, any input source may also be used.
2. Connect GT500 to a 12V DC power supply. The Revolectrix logo screen will be displayed with the firmware version number displayed at the bottom right.
3. If the **Logo Display** option in **CHEMISTRY/SETTINGS -> SETTINGS -> VISUAL SETTINGS** is *ON* (default), the Revolectrix logo will remain displayed until you press any button or scroll the navigation wheel. Press any button to go to the next step.
4. If the **Pwr On Default** option in **CHEMISTRY/SETTINGS -> SETTINGS -> SUPPLY SETTINGS** is *SELECT* (default), the **SELECT POWER SUPPLY** menu appears.

> **Tip:** Once you have configured Smart Power Management, you may wish to rename the input source names. To do this, use the **Edit Supply Name** option in the **SELECT POWER SUPPLY** menu. Refer to Example 3: Saving and Loading a User Preset on how to edit names.

> **Tip:** Use the **Menu Dir Inv** option in **CHEMISTRY/SETTINGS -> SETTINGS -> VISUAL SETTINGS** to change the direction of the highlight movement when you use the navigation wheel. This option only applies to menu navigation.

5. Since Smart Power Management is not set up yet, scroll the navigation wheel to **PSU1 12v 25 Amps** and press **ENTER**.
6. The **CHEMISTRY/SETTINGS** menu should appear next. If this is not the first time you are using the GT500, you may not get the **CHEMISTRY/SETTINGS** menu to appear. In this case, press BACK repeatedly until you reach the **CHEMISTRY/SETTINGS** menu. Then scroll to **Settings** and press **ENTER**.
7. In **SETTINGS** menu, scroll to **Supply Settings** and press **ENTER**.
8. In the **SUPPLY SETTINGS** menu, under the **Power Source** option, you will see the setting is at *PSU1* which is the source you have selected in step 5 above. This shows that PSU1 settings are used by GT500 for power management.
9. The other options in this screen show the settings for PSU1. Refer to Menu Options - Supply Settings on how to set each of the options. If you wish to change them, scroll the navigation wheel to highlight the option you wish to change and press **ENTER**. The highlight will change from the option to the setting and you can use the navigation wheel again to scroll through the settings available. To save the new setting, press **ENTER** or to discard your changes, press **BACK**.
10. Once you are satisfied with PSU1 settings, scroll to the **Power Source** option and press **ENTER** to change the power source.
11. Scroll to *Batt1* and press **ENTER**. The screen will now update to show the settings for Batt1.
12. Once the Batt1 settings have been set, you can redo step 10 and 11 again to configure the other power source settings for all the input sources that you

have. After you have configured all the power source settings, you only need to change the **Power Source** option to select the right input source each time you power up with a different input source. The GT500 will then load the correct settings for Smart Power management.

> **Note:** After you have changed the settings in any of the six input source profiles, remember to use the **Power Source** option to load the Smart Power Management settings for the input source you are currently using.

> **Tip:** If you change input source frequently, you may want to leave the **Pwr On Default** option to *Select* so that each time GT500 is powered up, you will be prompted with the **SELECT POWER SUPPLY** menu to select a power source. Alternatively, if you use one input source most of the time, you can change the **Pwr On Default** option to point to the correct input source. GT500 then defaults to the input source you have chosen without showing the **SELECT POWER SUPPLY** menu. If you chose this method, you can still change the input source via the **CHEMISTRY/SETTINGS -> SETTINGS -> SUPPLY SETTINGS** menu.

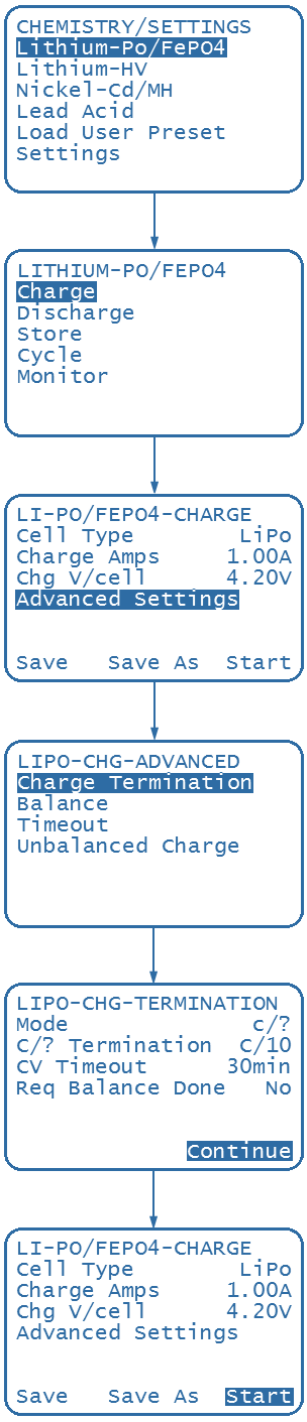
13. Scroll to the **Power Source** option and change the source back to *PSU1*.
14. Press and hold the BACK button to return to the **CHEMISTRY/SETTINGS** menu.

Example 2: Charging a LiPo pack

Tip: The following detailed instructions for charging a LiPo pack will help you learn how to navigate through the charging process. Once you become familiar with GT500 operations, you shouldn't need instructions at all.

IMPORTANT: To prevent damage to the power source, you must specify the power source's operating characteristics before charging for the first time with a DC power supply, and before charging for the first time from a battery. The GT500 allows you to store up to 6 different power supply profiles (3x DC power supply profiles and 3x Lead Acid battery profiles). After that, load the power supply profile using the **Power Source** option any time you change to a different DC power supply or battery.

1. Connect GT500 to a 10–32V DC power supply or 12–28.8V battery. When powered on, the Revolectrix logo screen will display briefly or remain on indefinitely depending on the Logo Display option setting defined in **CHEMISTRY/SETTINGS -> SETTINGS -> VISUAL SETTINGS**. If the logo has not been set to **On**, skip to step 3.
2. Press any button or turn the navigation wheel to exit the Revolectrix logo screen.
3. If the **Pwr On Default** option has not been set to **Select**, skip to step 4. Otherwise, the **SELECT POWER SUPPLY** menu will appear. Then:
   a. Turn the navigation wheel to select one of the power source that matches the power supply you're using.
   b. Press **ENTER**.
4. If you are using GT500 for the first time, the **CHEMISTRY/SETTINGS** menu will appear next.
5. Connect the LiPo pack to GT500:
   a. Connect the balance connector of the LiPo pack to GT500. (See Connecting Packs for details.)
   b. Connect the banana jack cable between the pack/battery and the GT500.
6. In the **CHEMISTRY/SETTINGS** menu:
   a. Use the navigation wheel to scroll to the **Lithium-Po/FePO4** option if it's not already highlighted. This option in general applies to all Lithium battery chemistries available.
   b. Press **ENTER**.
7. In the next screen, the header displays **LITHIUM-PO/FEPO4** to indicate you have selected this chemistry. Use the navigation wheel to scroll to **Charge** mode if it's not already highlighted and press **ENTER**.
8. In the next screen, the header displays **LI-PO/FEPO4-CHARGE** to indicate the battery chemistry and the operating mode you have selected above. The next few lines display the basic settings/options applicable to the LiPo charge operation.



a. The **Cell Type** option allows you to switch between **LiPo** and **LiFePO4** (or A123).

> **Tip:** The **Cell Type** is one of several options where its setting could be adjusted by the user. Option settings are always displayed to the right of the option and pressing **ENTER** changes the highlight from the option to the setting. Once the setting is highlighted, use the navigation wheel to scroll through the available settings and press ENTER again to save the setting. The highlight will go back to the option and the setting will display what you have just selected. While scrolling through a setting, if you decide to discard your changes and leave the setting in its original value, press the **BACK** button. Once a setting has been changed, it is saved to memory. When the charger is disconnected from the power source and then powered up again, the last saved settings will be displayed.

> **Tip:** There are a total of 8 cell types (**LiPo** or LiIon, **LiFEPO4** or A123, **LiHV427**, **LiHV435**, **NiCd**, **NiMH**, **PbSLA** and **PbAGM**) supported in GT500. Each of the cell types have their own settings saved in GT500. Changing the **Cell Type** option will call up its settings and the display will be updated to show the saved settings applicable to that cell type.

b. The **Charge Amps** option allows you to adjust the current for charging the LiPo pack. The allowable range is 25mA to 20A.

c. The **Chg V/cell** option sets the cell end voltage of the LiPo pack.

d. Selecting **Advanced Settings** brings up another set of menus that allows you to adjust more detailed settings applicable for the battery chemistry or operating mode.

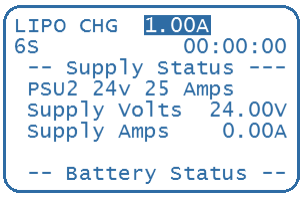
e. The **Save** or **Save As** option allows you to save the settings you have changed to one of 28 available User Presets that you may load at any time. See Example 2: Saving and Loading a User Preset on how to save or load a user preset.

f. **Start** will allow you to start the charge operation.

9. Scroll to **Advanced Settings** and press **ENTER**. The screen now shows a few group of advanced settings available for LiPo Charge.
10. Scroll to **Charge Termination** and Press **ENTER**. You now see all the options applicable for LiPo charge termination.
11. Scroll to the **CV Timeout** option and adjust the setting at **1hr**. Press **ENTER** to save the setting.
12. If you would like to change an advanced setting from another advanced settings group, press **BACK** to see the list and select another group. Otherwise scroll to **Continue** and press **ENTER**. This brings you back to the **LI-PO/FEPO4-CHARGE** menu with **Start** highlighted. Press **ENTER** to start the charge operation.
13. GT500 checks the battery and cell voltages and displays the number of cell count and battery chemistry. If the display matches the pack's chemistry and cell count, press **ENTER** to start charging. If the display does not match the pack's chemistry and cell count, press **BACK** or do nothing – if you do nothing, the screen will time out with a series of error beeps and go back to the previous screen.
14. During the charge operation, use the navigation wheel to scroll through and view the status information. Throughout the charge operation, the battery chemistry, cell count and current setting will be displayed at the top together

with the time status information.

> **Tip:** You can use the **Info Scroll Time** option in **CHEMISTRY/SETTINGS -> SETTINGS -> VISUAL SETTINGS** to auto-scroll through the status information.



15. To change the current setting, press **ENTER**. The current setting you have previously set in the **CHARGE AMPS** option will be highlighted and you can adjust the setting if desired. Press **ENTER** again to set a new charging current or press **BACK** to discard any changes.
16. To stop the operation, press and hold **BACK**. The charger stops charging and **STOP** is displayed at the top right of the screen. Press any button to return to the **LI-PO/FEPO4-CHARGE** screen.
17. If you allow the operation to complete, GT500 will beep several times and the display will show **DONE** at the top right of the screen. Use the navigation wheel to scroll through and review the status information. Press any button to return to the **LI-PO/FEPO4-CHARGE** screen.

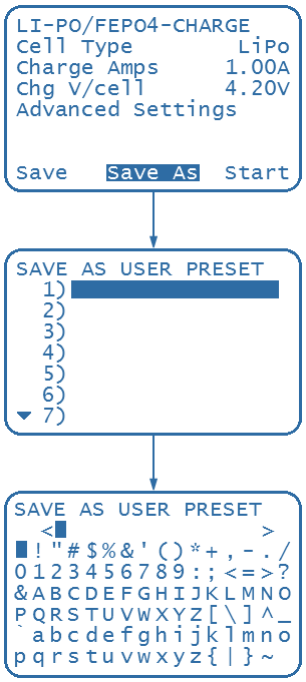
> **Note:** NiMH, NiCd and Lead Acid user presets may switch to trickle charge (depending on how the preset is configured) when charging is complete.

> **Note:** The operation is now complete, but the “session” remains open so you can review the status information. Once you press any button, the status information will be discarded. If you disconnect the pack before ending the session, GT500 will display a “Pack Removed” message. This is a non-critical message, and you can ignore it in this situation.

> **Note:** After a Charge/Discharge/Regenerative Discharge operation is complete, the fan will continue operating for another few minutes to allow the internal temperature to cool down faster.

18. Disconnect the LiPo pack from GT500.

Example 3: Saving and Loading a User Preset



1. After changing settings, you can save them to 1 of 28 available User Presets so that you may recall or load them at another time when you want to use those settings. This example shows you how to save your settings to a blank preset. To save your settings, you must be at a menu that has the **SAVE** and **SAVE AS** options at the bottom of the screen. Follow step 1 to 8 in Example 1: Charging a LiPo Pack to get to a menu with the **SAVE** and **SAVE AS** options.
2. After you have changed your settings, including any advanced settings, scroll to **SAVE AS** and press **ENTER**.

> **Tip:** The difference between **Save** and **Save As** lies in the editing of the user preset name. **Save** recalls the name of the user preset you have selected to write to and you can change none or any characters of the old name if you wish. **Save As** starts with a blank line for you to type in a new name.

3. The **SAVE AS USER PRESET** menu appears for you to select 1 out of 28 user presets. Scroll to the first preset or any blank preset you wish to save to and press **ENTER**.
4. The **SAVE AS USER PRESET** menu is replaced by an editing screen. On the second line below the **SAVE AS USER PRESET** header is a blank line where your user preset name will appear as you type. The first character in the user preset name is highlighted to show that it is ready to be changed. Below the user preset name is a series of character and symbols that you can use for the user preset name. Scroll through the available characters and symbols and press **ENTER** to select that character/symbol. The next character in the user preset name becomes highlighted for you to change.

> **Tip:** Instead of pressing **ENTER**, pressing **BACK** when editing a name highlights the previous character to change. Pressing **ENTER** when the last character in the name is highlighted moves the highlight back to the first character. These shortcuts will help you to edit names faster.

> **Note:** In GT500, Supply names and User Preset names supports up to 16 characters maximum.

5. If you wish to discard the name you have just typed, press and hold **BACK**. Otherwise, if you have finished typing in the user preset name, press and hold **ENTER** to save the name.
6. After saving the user preset, the menu in step 2 above appears. In order to see the name you have just typed, press **BACK** to go to the **LOAD USER PRESET** menu. Alternatively, the **LOAD USER PRESET** menu is accessible via **CHEMISTRY/SETTINGS -> LOAD USER PRESET**.

Note: Notice in step 6 above that pressing **BACK** brings you to the **LOAD USER PRESET** menu instead of the menu where you are presented with one of the operating modes (ie. Charge, Discharge, Store, Cycle or Monitor). This is a characteristic of Revolectrix chargers where the powerful and intuitive features of a User Preset based menu interface may be experienced. In GT500, after loading or saving a preset, the **LOAD USER PRESET** menu becomes the main menu instead of the **CHEMISTRY/SETTINGS** menu. However, you can still access the **CHEMISTRY/SETTINGS** menu by press **BACK** at the **LOAD USER PRESET** menu. The **CHEMISTRY/SETTINGS** menu then becomes the main menu again.

7. At any time, you can load one of your user presets by accessing the **CHEMISTRY/SETTINGS -> LOAD USER PRESET** menu.

Charging tips

General information

- Cells in a pack have different voltages when they are discharged. GT500 balances (equalizes) cell voltages while it is charging the pack. GT500 provides one of the highest available balance current in the industry.
- During charging, cells that charge the fastest are the weakest cells in the pack. At the end of charging, cells with the highest voltage are weakest. This happens because weaker cells have lower capacity, and they charge faster than stronger cells.
- By definition, end-of-life for a LiPo cell is when the cell can only be charged to 80% of its original capacity rating. The number of charge/discharge cycles a cell undergoes before reaching end of life depends on several factors, including cell quality, discharge rate, internal heat generated during use, and other parameters. Cells in an older pack may be more out of balance, but GT500 will still balance them by the end of charge. For this reason, it may take longer to balance older packs. The charger may show FUEL=99% for some time while it is balancing a high capacity (3Ah and up) “veteran” pack that is severely out of balance, but some settings can be configured to stop balancing after a preset time or condition. Often, the last few millivolts of balancing take a very long time and do not significantly improve overall pack charge or performance.

Charging packs

- You can top off packs, or remove them when they are partially charged. There is virtually no way to damage a pack when using GT500. (The only exception to this is if you are using Parallel Adapters and you accidentally connect two packs having different number of cells together in parallel. This is less a function of the GT500 and more about ensuring proper connection of packs to the GT500.)
- If a pack is at 80% or less of its capacity when connected to an auto-detect speed controller, the controller may lower its cut-off voltage. This could over-discharge the pack during the flight. Auto-detect speed controllers should properly set cut-off voltage if packs are charged to at least 90%.
- To save time, stop charging when the pack reaches about 95% of capacity. That last 5% takes the longest.
- Some cells may sag 0.10V within an hour after charging. This is normal as packs age.
- In REVOLECTRIX’s opinion, over-discharging an LiFePO4 (or A123) pack below 2.0V/cell will damage the cells (contrary to some reports). GT500 requires a minimum pack voltage of 1.5V to activate charging. If an LiFePO4 (or A123) pack is below this voltage, do not try to repair the pack by boosting voltage. Even if you manage to repair the pack, it will not have many cycles left and GT500 will reject it for multiple reasons (as indicated by displayed messages).

Internal Resistance

- The **Cell Int. Res.** status information displays each cell internal resistance when balanced charging Lithium packs.
- Viewing individual internal cell resistance enables you to more accurately evaluate pack quality and condition. If all cells show a low internal resistance, that's a good indicator that the pack can be charged and discharged at a higher C rate. Here are two examples:
- A pack rated at 5C and 40–50C discharge may have an internal cell resistance of 2 milliohms. This low resistance allows larger currents into and out of the pack with-out generating excessive heat.
- A pack rated at 2C charge and 20–30C discharge may have 17 to 20 milliohms internal cell resistance. The higher resistance prevents the pack from charging or discharging as quickly, and the larger resistance will generate more heat during those operations.
- A cell poorly matched to the other cells in a pack will show a substantially different internal resistance. Also, a cell with high internal resistance compared to other cells may indicate the cell is weakening, which can degrade overall pack performance.
- Be aware that individual cell resistance will vary during charge. This is normal and results from the different voltages and currents applied to the pack during charging.
- Use the GT500 as a tool, measuring and recording the internal resistance of your packs over time. Look for trends that would indicate the IR of a cell or a pack is increasing over time. This is a good indication that the pack is aging or has internal damage and should be replaced eventually.
- For best results, Lithium packs should be stored at 50% of capacity. Use GT500's **Store Mode** to prepare Lithium packs for storage.

Menu Options

Basic Settings – Charge

Cell Type – specifies the type of cell for that battery chemistry. In Lead Acid packs, the charge end voltage for SLA/Gel cell is fixed at 2.40V/cell and the charge end voltage for AGM cell is fixed at 2.45V/cell.

Charge Amps – sets the charge current. The charge current is used for the constant current portion of the charge.

Chg V/cell – sets the desired cell voltage for Lithium packs. This value can be reduced to under charge a pack, or raised to over charge a pack.

No of Cells – Cells can be auto or fixed. If the cell count is fixed, only packs that verify this count can be charged.

Basic Settings – Discharge

Cell Type – specifies the type of cell for that battery chemistry.

Discharge Amps – sets the discharge current (or regenerative discharge current if the **Regen Discharge** option is **On**).

Disch V/cell – sets when to stop the discharge.

No of Cells – Cells can be auto or fixed. If the cell count is fixed, only packs that verify this count can be discharged.

Basic Settings - Store

Cell Type – specifies the type of cell for that battery chemistry.

Charge Amps – sets the charge current. The charge current is used for the constant current portion of the charge.

Discharge Amps – sets the discharge current (or regenerative discharge current if the **Regen Discharge** option is **On**).

Store V/Cell – specifies the cell voltage to charge/discharge to.

Basic Settings - Cycle

Cell Type – specifies the type of cell for that battery chemistry.

Charge Amps – sets the charge current. The charge current is used for the constant current portion of the charge.

Discharge Amps – sets the discharge current (or regenerative discharge current if the **Regen Discharge** option is **On**).

Chg V/cell – sets the desired cell voltage for Lithium packs. This value can be reduced to under charge a pack, or raised to over charge a pack.

Disch V/cell – sets when to stop the discharge.

No of Cells – Cells can be auto or fixed. If the cell count is fixed, only packs that verify this count can be discharged.

Basic Settings - Monitor

Cell Type – specifies the type of cell for that battery chemistry.

Advanced Settings – Cycle Settings

Cycles – sets the number of charge and discharge cycles.

Cool Down – sets the amount of time for the pack to cool down between charges and discharges.

End Cycle – end cycling with a charge or discharge.

Advanced Settings – Charge Termination

Mode – sets what method is used to terminate a charge. Current C/? is a standard Lithium type termination that stops the charge when current is below a ratio set by the charge current. Typically, termination should be C/10.

C/? Termination – sets what current to terminate at. Typically, Lithium type packs terminate at C/10. However, C/20 will put slightly more capacity into a pack, while C/5 will make the pack finish charge faster (with slightly less capacity).

Man A Setting – allows a precise termination current to be set. When the current drops to the set value, the charge will stop.

CV Timeout – sets the maximum time for the Constant Voltage portion of the charge. A typical timeout value is 30 minutes. Lithium packs that take longer than 30 minutes usually have enough damage that they will never balance out correctly. Once the timeout is reached, the charge ends.

Req Balance Done – keeps the pack charging until all the cells are equal. This makes the pack balance more accurately.

Fallback Volts – sets the amount of voltage (per cell) that voltage fallback termination uses to stop the charge. NiMH batteries need to be set lower than NiCd's.

Advanced Settings – Discharge Termination

Mode – sets what method is used to terminate a discharge.

C/? Termination – sets what current to terminate at.

Man A Setting – allows a precise termination current to be set. When the current drops to the set value, the discharge will stop.

CV Timeout – sets the maximum time for the Constant Voltage portion of the discharge. Once the timeout is reached, the discharge ends.

Advanced Settings – Discharge Profile

Profile – sets how to discharge the pack. Constant Current maintains the set current for the entire discharge. Constant Power maintains constant power for the entire discharge based on the set current and the starting pack voltage.

CC/CV Disch – allows a precise cutoff voltage at the end of the discharge. The discharge set current is maintained until a cell reaches the discharge cutoff voltage. Then the current is reduced until the termination current is reached. This feature is useful for storage mode.

Advanced Settings – Charge Balance

Bal Charge – allows the balancers to balance the cells as they charge.

Balance Start V – sets when to start balancing the cells. Packs that are discharged very low will be very out of balance, but don't really need balancing because of cell capacity variations. A typical value is around 3.7V (10% capacity).

Advanced Settings – Discharge Balance

Bal Discharge – allows the balancers to balance the cells as they discharge. This is useful when packs have damaged cells. It allows all the cells to fully discharge.

Advanced Settings – Charge Timeout

Chg Timeout – limits the amount of time for a pack to charge. This is an important safety feature. Fast charging presets with high currents should have short charge timeout settings.

Chg Cap Limit – limits the capacity going into the pack during a charge. This complements the **Chg Timeout** as an important safety feature. Fast charging presets with high currents should have low **Chg Cap Limit** settings.

Advanced Settings – Discharge Timeout

Disch Timeout – limits the amount of time for a pack discharge. If this timeout is reached, the discharge will stop.

Disch Cap Limit – limits the capacity going out of the pack during a discharge.

Advanced Settings – Trickle Settings

Mode – sets whether to trickle charge after a charge. Also allows GT500 to skip directly to trickle charge. This is only needed for NiCd/NiMH batteries when a fast charge isn't desired. Trickle Charge only can be helpful to increase the life of those batteries.

Trickle Amps – sets the current for the trickle charge mode. Typically, trickle current is set to 1/20 of the capacity of the battery.

Trickle Timeout – sets the time limit for a trickle charge. The ideal time is 24 hours. For NiCd/NiMH, this timeout allows the cells to balance to full charge. The weaker cells will overcharge at a slow enough rate that they are not damaged and the stronger cells will catch up and fully charge.

Advanced Settings – Float Settings

Mode – sets whether to trickle/float charge after a charge.

Float Amps – sets the finishing current for Lead Acid batteries. Finishing is very important for Lead Acid batteries because slightly overcharging the battery removes the sulfides that build up on the plates from a deep discharge.

Float Timeout – sets how long to finish the cells by a slight overcharge for Lead Acid batteries.

Advanced Settings – Unbalanced Charge

Charge Amps – sets the charge current. The charge current is used for the constant current portion of the charge.

Chg V/cell – sets the desired cell voltage for Lithium packs. This value can be reduced to under charge a pack, or raised to over charge a pack.

No of Cells – GT500 only allows 2s Unbalanced Charging. For 1s cells, use Basic Charge.

Advanced Settings – Unbalanced Discharge

Discharge Amps – sets the discharge current (or regenerative discharge current if the **Regen Discharge** option is **On**).

Disch V/cell – sets when to stop the discharge.

No of Cells – allows cells from 2s to 8s to be Unbalanced Discharge. Only packs that verify this count can be discharged.

Settings - Supply Settings

Power Source – specifies the input source for Smart Power Management. The GT500 stores six Smart Power Management profiles: three for DC power supplies (PSU1, PSU2, PSU3) and three for Lead Acid batteries (Batt1, Batt2, Batt3). After changing the settings in any of the six

profiles, remember to use the **Power Source** option to load the correct Smart Power Management profile for the input source you're currently using.

Low Volt Limit – specifies the cutoff voltage. (Cutoff voltage should be about 50% lower than the power supply's nominal output voltage. Example: For a 24V power supply, set the cutoff voltage to 12V. To protect your power supply, charging reduces or stops if the power supply's voltage drops below the value you set here.)

Current Limit – specifies the current limit appropriate for your DC power supply or Lead Acid battery. (Maximum output current capability of Lead Acid batteries varies widely. Generally, a standard flooded Lead Acid car battery might deliver 25A continuously and 50A for short periods. An AGM style might not have any trouble delivering 50A continuously without suffering substantially shortened life. To protect your battery from damage, GT500 will never draw more current than you specify here, but charge current may not reach the preset or manually set value.)

Regen Discharge – enables regenerative discharge mode. (Regenerative discharge puts energy back into a battery power source during pack discharge cycles.)

Regen V. Max – limits the voltage at the power source during regenerative discharge by reducing the regenerative discharge amp when this voltage has been reached or exceeded. It is recommended to check your Lead Acid battery power source specifications to determine the correct maximum voltage to set.

Regen A. In Max – specifies the maximum current flowing *into* the Lead Acid battery power source during regenerative discharge.

Pwr On Default – specifies the default power source each time the charger is powered on. If one of the six power supply profiles is selected, the **SELECT POWER SUPPLY** menu will not appear at startup for you to select a power source. If you would like to have the option to choose a power source each time during startup, leave the **Pwr On Default** option at **Select**.

Settings - Audio Settings

Speaker Volume – sets the loudness (Off, 1 = quietest, Max = loudest).

Finish Beeps – controls how many times the GT500 repeats "beep beep beep" when charging is complete.

Button Beep – enables or disables the speaker "beep" when the **ENTER** or **BACK** button is pressed. This option is not applicable if the **Speaker Volume** option is *Off*.

Settings - Visual Settings

Info Scroll Time – during Charge/Discharge/Regen/Monitor, enables auto-scrolling of battery pack and supply status information and by setting the time delay between different screens (Off = turn off auto-scrolling).

Menu Dir Inv – sets the direction of movement of the highlighted item during menu navigation (Off = scrolls the highlighted item down when the navigation wheel is turned anti-clockwise, On = scrolls the highlighted item down when the navigation wheel is turned clockwise)

Logo Display – controls how long the Revolectrix logo screen remains displayed during each power up. This setting is On by default and the logo screen remains on until a button is pressed or the navigation wheel is turned.

Settings - Reset Settings

Factory Restore – restores all settings to their factory defaults. This option does not reset or change any of the stored User Presets. A prompt will appear to confirm if you wish to proceed with this option.

Delete All Presets – clears all User Presets memory. A prompt will appear to confirm if you wish to proceed with this option.

Delete Preset No – clear a specific User Preset number and leave other User Presets intact. A prompt will appear to confirm if you wish to proceed with this option.

Troubleshooting

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Safety Code/Message	Problem
Cannot Load an Empty Preset	Attempting to load a blank/empty User Preset.
Bad Cell Count Check Wiring	Check the balance connector or adapter.
Check Connections	Check the main discharge connectors.
Mains Lead Reversed	Check the battery pack to charger connections. Battery positive connects to charger red terminal and battery negative connects to charger black terminal.
Maximum Current Exceeded	Check the wiring for a loose connection. Check the supply wiring too.
Battery Voltage Too High	Check the main discharge connectors for a loose connection.
Supply Voltage Above High Voltage Limit	Supply voltage is too high.
Supply Voltage Below Low Voltage Limit	Supply voltage is too low.
Cap. Limit Exceeded	The charge/discharge capacity has reached the **Chg Cap Limit** / **Disch Cap Limit** option setting.
Charge Timeout Exceeded	The charge/discharge time elapsed has reached the **Chg Timeout** / **Disch Timeout** option setting.
Amp. Limit Exceeded	Check the wiring for a loose connection.
Batt & Cell Sum Does Not Add Up Check Wiring	Check the balance connector or adapter.
Supply V Exceed Regen V Max Switching To Internal Disch.	During regenerative discharge, the supply voltage has reached the **Regen V. Max.** option setting.
Temp. Limit Exceeded	High internal temperature warning. Check fan operation.
Pack Below 3.0V Use Regen Disch	The pack voltage is too low.
Cell Volts Diff More Than 150mV Amp Limit to 1A	Safety charge activated due to cell volts range too high.
Supply Amp Limit Reached Chg Amp Reduced	Supply amps has reached or exceeded the Smart Power Management setting.
Low Cell Voltage	The cell voltage is out of range.
High Cell Voltage	The cell voltage is out of range.
DC Supply Detected	Check supply connections. Do not attempt a regenerative discharge into a DC power supply.

Safety Code/Message	Problem
Code Checksum Bad Return Charger To Factory	Code is corrupted.
Calibration Checksum Bad Return Charger To Factory	Calibration data is corrupted.

Support options

For Support on REVOLECTRIX Products:

REVO USA

Email: support@revolectrix.com

or phone: (301) 798 2770

REVO SINGAPORE

Email: support@revolectrix.com

or phone: (65) 6272 1818

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 REVO USA (US web store) or REVO Intl (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) 829-5533 for more information about service and warranty repairs.