TME Xtrema ™

Instruction Manual

(Firmware version 1.3.x rev 4/27/2009)

1. Introduction

Congratulations for purchasing TME's Xtrema Lithium (Li) Charger – Wattmeter. You are now the owner of the most expandable, high end Li charging and monitoring system available. The Xtrema combines the power of a high end Li charger with the versatility of a high end Wattmeter. It also features a very useful temperature probe for monitoring your batteries and motor as well as an over sized LCD display that shows all important data simultaneously. And the Xtrema has an expansion port that allows for future plug in features and FREE lifetime software updates. Our promise to you is to keep the Xtrema current with the latest Lithium advances and charger features. This assures you that Xtrema is a solid value for many years to come. Your unit is fully calibrated and tested during manufacturing and should provide many years of trouble free operation.

Safety while charging is an integral part of the design of the Xtrema and a high priority at TME. Two collective features actively prevent overcharging your battery. They serve as backup to the normal constant voltage termination. The temperature cutoff provides the first level of protection. It is set to shut off your charger if your battery goes over 104°F. This default temperature is easily changeable to accommodate ambient temperature or for a more conservative cutoff. The second method is a safety timer that aborts the charge if it takes longer than 120 minutes. This default time can also be changed to match your charge rate.

With the addition of our Xtrema Balancer and the fully optically isolated Balancer Interface Module, a new level of safety and convenience is achieved with the Xtrema. Cell count is accurately verified and charge per cell is monitored assuring your packs are charged safe and complete with no chance of overcharge.

Most people find that they can easily operate the Xtrema with no manual or with very little information. However we recommend that you take the time to read this manual to discover features, tips, and options that may not be immediately obvious.

For example the **SETUP MENU** allows you to customize your Xtrema's **volts per cell**, **safety timer** and **temperature cutoff**.

The **Volts per cell** setting is particularly important when charging M1 High Power Hypersonic ™ Lithium Ion cells manufactured by A123 Systems since the default is set to charge common lithium polymer cells. You can also change volts per cell to charge your Lithium Polymer batteries to a "storage charge" level for safe long term storage. (NOTE: M1 cells do not require a "storage charge" and can be left charged at any level without degrading performance)

Other interesting features you will discover in setup allows you to tailor the sounds the Xtrema makes from **No Sound** (library mode), **Beep Once**, or the default **Remind Me** (nag me) mode.

Manual Revisions:

By virtue of the expansion port, the Xtrema can be easily updated to incorporate new features. This means that as we add new features, our instruction manual becomes a living document that constantly changes. We ship each Xtrema with a printed QUICK START manual and provide a CD with the latest manual that matches your Xtrema's revision.

In this way we can provide you with the most up to date and complete manual without having to worry about delaying updates because of a surplus of printed manuals. If you do not have a computer to print out your manual you can take it to a friend or nearby library to print it out.

Updates and the latest news on the Xtrema can be located on our special Xtrema web site. Simply go to www.theXtrema.com

Date	Revision	Description
07/24/06	1.0.0	First production release
08/15/06	1.1.x	Added support for m1 cells from A123 Systems
06/12/07	1.2.x	Added support for XtremaLog data output
02/12/08	1.3.x	Added support for Balancer option

In this manual the following conventions are used.

WARNING!

This signifies that the information presented is of concern for safety. Loss of life or property may result if these warnings are not observed. At the very least damage to your batteries or the Xtrema may result if you ignore these warnings.

TIP!

This signifies that the information presented is a tip that will help you obtain extra enjoyment or utility of the Xtrema

Note:

This signifies that the information presented is a note that will help you understand a particular feature of the Xtrema.

2.PRECAUTIONS – ⚠️ 💣 WARNING!

- **DO NOT CHARGE Lithium Polymer / ION batteries unattended. Ever!**

- **USE POLARIZED CONNECTORS on the motor and battery to prevent reversal of leads. Red to (+) and black to (-)** Although we have circuitry to protect the Xtrema, in certain situations serious damage to Motor, speed controller, battery and the Xtrema may result. Make sure that your connectors can handle the maximum amps your motor can draw. The Xtrema can safely measure 50 amps continuous and up to 100 amps for short durations when used as a Wattmeter.

- **DO NOT CHARGE** inside a **vehicle**

- **DO NOT CHARGE** in **direct sunlight**

- **DO NOT CHARGE** when ambient **temperature** is very **HIGH or LOW**.

- **DO NOT CHARGE** when Li battery pack is **hot** or **near flames**

- **DO NOT USE an Automobile battery charger** for the input power source. **Use a regulated 12 to 13.8V DC supply or a 12 Volt Lead Acid battery capable of providing up to 20 amps** when charging at the maximum charge capacity.   Your supply must maintain a minimum of 10.5V to a max of 15V to operate.

- **DO NOT CONNECT MULTIPLE EXTERNAL POWER SUPPLIES, METERS ETC. WITH COMMON GROUNDS.** All three (-) Negative leads on the Xtrema are at slightly different ground potentials. Make sure if you connect external equipment that they are electrically isolated from each other.

- Xtrema CASE may get **HOT** when charging at high current.

- **DO NOT CONNECT the balancer DIRECTLY to the Xtrema Charger without the Balancer Interface Module - BIM in between.** The BIM has opto-isolators needed for both reverse polarity protection and because the expansion port ground is at a different potential than the (-) battery lead. Plugging the balancer direcly into the Xtrema without the BIM will void your warranty
- **DO NOT USE** the balancer with the Xtrema if the 10 pin ribbon cable is loose or frayed. Always check all connections!
- **DO NOT LEAVE** the balancer connected to the battery for long periods after balancing. A tiny amount of power drain is always present.

3. GENERAL OPERATION

The Xtrema's menu system was designed to be simple and intuitive. When you first connect the Xtrema to the input power it will display the welcome screen for a few seconds before going to the main menu. The welcome screen will display the firmware and hardware revision numbers which should correspond to this manual.

When in the main menu a blinking square box is used to draw your attention to the current selection or the choice that is to be made. All operation is via a single joystick that can be slightly moved in four directions. In all cases operation is simple as noted below.

Up ▲ or down ▼ buttons on the joystick select menu or value options Left ◄ goes back to previous selection, right ▶ button accepts option and goes to next step

Note: **Pressing** the joystick button to the Left ◄ while in the Main Menu will force the Xtrema to shut off the display and go into a standby / off state. Momentarily pressing the joystick again in any direction will restart the Xtrema back to normal operation
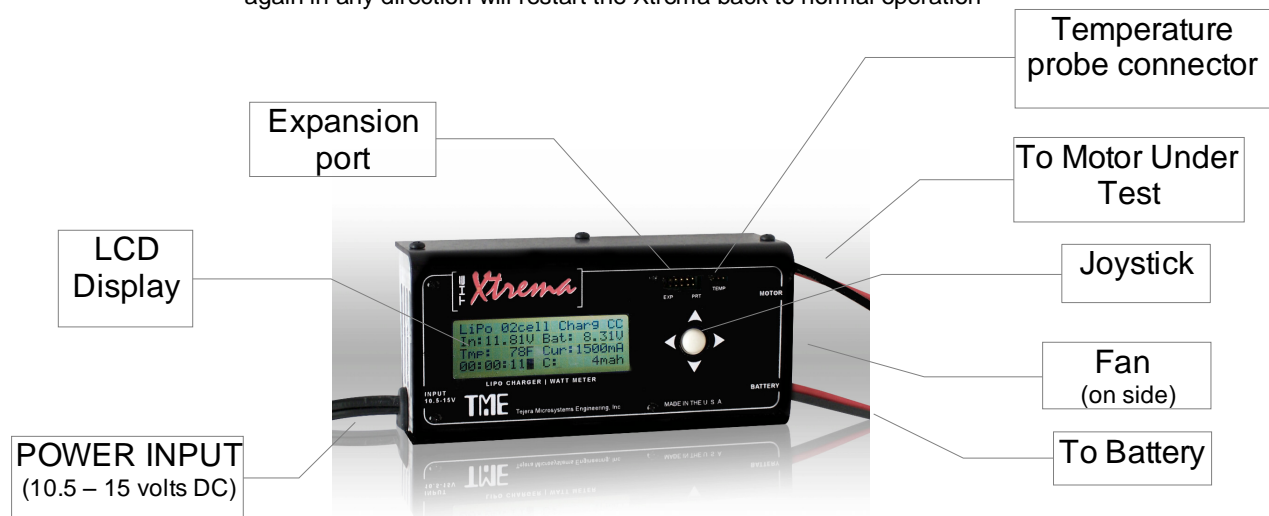
4. CHARGING a Lithium (Li) Battery

Overview - How the charger works

The Xtrema charges lithium batteries using the constant current to constant voltage method (CC/CV) recommended by Lithium battery manufacturers. When you start a charge cycle, the first thing the Xtrema does is test to see if the pack voltage is plausible for the cell count and volts per cell you have selected. It does this during the `TESTING` phase.

If the optional Balancer and Balancer Interface Module are attached then the Xtrema further verifies the cell count by requesting cell count information from the balancer. Based on the voltage the Xtrema actually measures, it can interpret the cell count information as parallel or serial pack configuration automatically. The balancer also provide balance information to the Xtrema which may force an abort during the `TESTING` phase if the cell imbalance exceeds 200mv.

If all is OK, the Xtrema proceeds to increase the battery voltage just enough to maintain the charge current you selected. This is called the constant current phase and is indicated with `"Charge CC"` on the display.

If the optional Balancer and Balancer Interface Module are attached then the Xtrema tests the status of the balancer connectors once per minute to assure the pack remains balanced during the complete charge. If a slight imbalance occurs the constant current is temporarily reduced to less than 175ma so that the balancers can work quickly to bring the cells back into balance.

This constant current phase continues until the voltage eventually climbs to the end value. (Volts per cell multiplied by the cell count, Ex: @ 4.2volts per cell then 8.4V for 2 cell, 12.6V for 3 cell and so on)

At that point the Xtrema enters the constant voltage phase indicated by `"Charge CV"` on the display. Generally a battery is about 80 to 90% charged at this point. During this phase the Xtrema holds the terminating voltage constant. As the battery charges up, it naturally begins to draw less and less current as it "fills up". The Xtrema simply maintains a constant voltage on the battery while watching the current go down. When the charge current drops to 1/10 of the initial charge current, the Xtrema considers the battery fully charged. This is indicated by the word `"COMPLETE"` on the display accompanied by repetitive beeps (unless beeps have been disabled in Setup)

In summary when used with the optional Xtrema Balancer and Balancer Interface Module, the Xtrema features these integrated balancer features:

- Balancer support for up to 4 separate series or parallel packs used as one large pack
- Accurate cell count verification
- Battery balanced checked every minute reducing charge current when needed to hasten balance charge.
- Charger aborts charge if cell to cell or pack to pack imbalance exceeds 200mv
- Charger volts/cell settings transferred to balancer.
- Charge terminates if any cell exceeds selected volts/cell

Note: The Xtrema can charge and balance up to 4 Lithium battery packs (balance connectors) of the same capacity and bring them within balance of each other. To minimize charge times and problems, all packs should be fairly close in voltage before starting. Additionally, these packs should be packs that are normally charged and discharged as a set, so that all cells have the same charge state, age, and capacity. To assure packs are at the same voltage, measure each packs voltage with the Wattmeter or an external voltmeter and test to see that each pack is within 50 mv (.05V) times the number of cells of each other. Ex: 5 cell pack should be within 0.250 V. The Xtrema will attempt to charge balance packs that are as much as 200 mv per cell before aborting. However this type of imbalance will take a very long time to correct especially on larger capacity cells.

TIP! You can charge multiple same size packs (non A123 packs) that were discharged at different times by first bringing the packs close to each other. To do this, first charge them separately to a reduced voltage (between 3.65 to 3.9 volts per cell) using the Xtrema's volts per cell setting. After the individual packs have been charged to a common voltage they may be connected together (series or parallel), change the volts per cell to a normal 4.1 to 4.2 volts per cell, and charged as a single larger pack. In parallel you can balance charge up to four 6s packs!

Perform the following steps IN ORDER

IMPORTANT!
When using the balancer, make sure the Xtrema firmware has been updated to version 1.3.0 or greater.

Connect the Xtrema to charge a battery

- **Connect the red (+) and black (-) Xtrema inputs directly to a 12Volt automobile battery or regulated power supply. Be careful to observe polarity.**

Note: Make sure that the input voltage does not go below 10.5 Volts while charging or the Xtrema will stop the charging process. Also charging will terminate if the voltage is above 15.0 Volts. When either of these conditions occurs the charge will terminate with a BAD INPT message in the upper right status area of the display.

Note: Upon power up you will see the Xtrema welcome screen. This will display the firmware and hardware revision and then beep. You will also notice that the fan will momentarily come on and then shut off performing a power up fan test.

WARNING! DO NOT CONTINUE USING THE CHARGER if you do NOT hear or feel the fan come on during power up. Also if you hear any unusual fan noise such as a bad bearing, please return the unit for service. For long fan life, the fan is designed to only come on during high power charging. The cooling it provides is an integral part of the Xtrema's power to charge large packs.

WARNING! Your charger comes with factory default settings of 4.2 volts per cell. These settings are ideal for obtaining the maximum charge from Lithium Polymer type cells. These settings must be changed to 3.6 volts per cell when charging M1 High Power

Hypersonic ™ Lithium Ion cells manufactured by A123 Systems. **(See** Li Settings **section below before proceeding.)**

- **Connect the Li battery to the connector labeled "BATTERY". CAUTION: Insure that there is nothing connected to the "MOTOR" connector because the battery voltage will be present there regardless of mode.**

Note: When used with the balancer, up to four packs connected in series or parallel via the charger output leads may be balanced charged. The Xtrema will automatically sort out the balancers series or parallel status, confirm the cell count and evaluate the pack to be within min and max voltage.

⚠️ 💣 **WARNING! USE POLARIZED CONNECTORS on the motor and battery to prevent reversal of leads.** Although we have circuitry to protect the Xtrema in case of reverse battery, in certain situations serious damage to Motor, speed controller, battery and the Xtrema may result if polarity is not observed. Therefore please use polarized connectors that match you largest battery connector and use polarized adapters for smaller packs.

- **You may optionally connect the temperature probe to the battery using the hook and loop strap. We recommend always using the temperature probe for maximum safety during charge.**

📌 **TIP! FOR MAXIMUM EFFECTIVENESS** you will want to set the temperature cutoff to a few degrees above the starting pack temperature. The factory default is 104°F. (To do this see the instructions under the SETUP MENU.) For example if the pack temperature is 80°F then you may want to set the temperature cutoff to 85°F. (You can determine the pack temperature by attaching the thermometer to the battery with the supplied hook/loop band and temporarily entering the Wattmeter function,)

Lithium batteries are amazingly efficient during a charge and rarely go up in temperature at all when charging properly.

- **You may optionally connect the cell balancing system consisting of up to two Balance Interface Module and up to four Xtrema balancers that connect to the balancing plug on your battery**.

  -
  -

  -
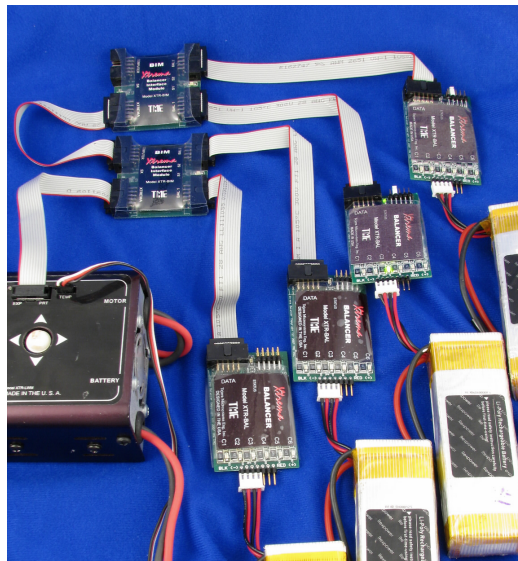
BE SURE TO FOLLOW THESE STEPS IN ORDER

1. Connect BIM at the connector labeled **XTREMA** to the Xtrema charger's expansion port **EXP PRT** with the supplied 10 pin ribbon cable
2. If a second BIM is needed (to support 3 or 4 balancer) connect the connector labeled **XTREMA** on the second BIM to the connector labeled **COMPUTER** on the first BIM with the supplied 10 pin ribbon cable.
3. If your are monitoring the charge with the XtremaLog software, connect the matching end of the optional DATA cable (XTR-232 or XTR-USB) to the free connector marked **COMPUTER** on the BIM and the other end to your computer RS-232 or USB port.
4. Connect the balancer from the connector marked **DATA** on the balancer, to the connector marked **BAL1** or **BAL2** on the BIM with the supplied 10 pin ribbon cable.
5. If a third or fourth balancer is needed connect them to the second BIM as in step 5 however **MAKE SURE** you place a jumper across jumper 2 of the third and fourth balancer for proper operation. **DONT FORGET**. **THIS IS VERY IMPORTANT!**
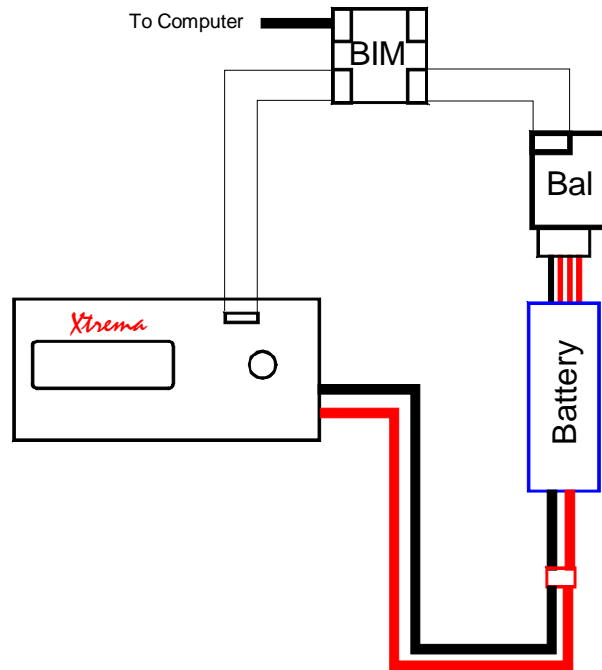
    JUMPER 2 - XTREMA BALANCER PRIMARY/SECONDARY (ON=SECONDARY, OFF=PRIMARY (default)) (Secondary setting shown below.)
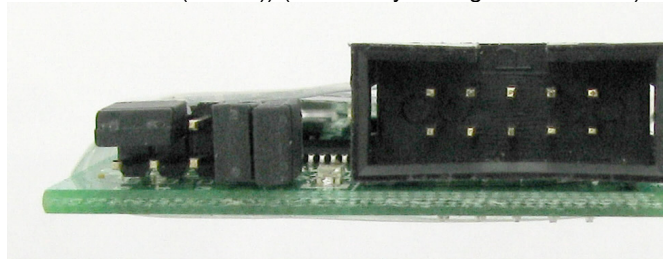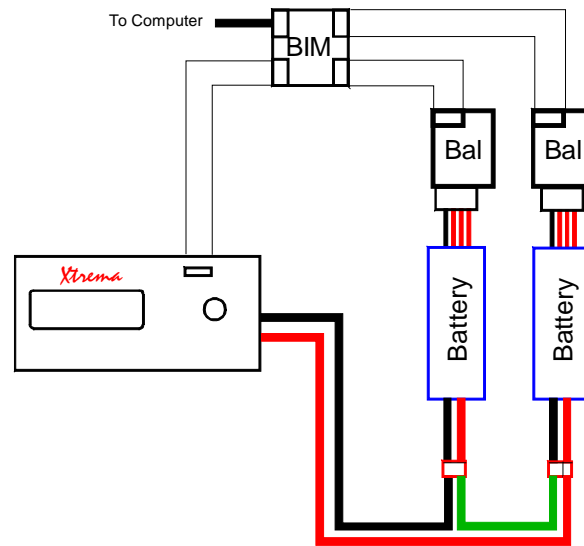

6. **Finally** connect the batteries being charged to the balancers **LAST!** This is very important for proper operation.

Below are some common configurations:

Single battery with balancer
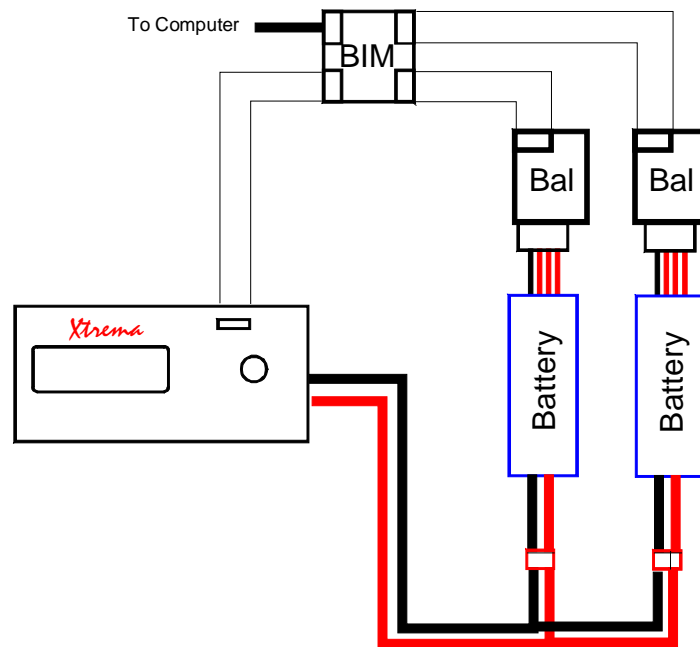
To Computer

BIM

Bal

Xtrema

Battery

Dual series batteries with balancer

To Computer

BIM

Bal   Bal

Xtrema

Battery   Battery

Dual parallel batteries with balancer

To Computer

BIM

Bal   Bal

Xtrema

Battery   Battery

Quad series batteries with balancer
(Connect JUMPER 2 to 3rd and 4th balancer)

To Computer

BIM

BIM

Bal   Bal   Bal   Bal

Xtrema

Battery   Battery   Battery   Battery

Quad parallel batteries with balancer
(Connect JUMPER 2 to 3rd and 4th balancer)

To Computer

BIM

BIM

Bal   Bal   Bal   Bal

Xtrema

Battery   Battery   Battery   Battery
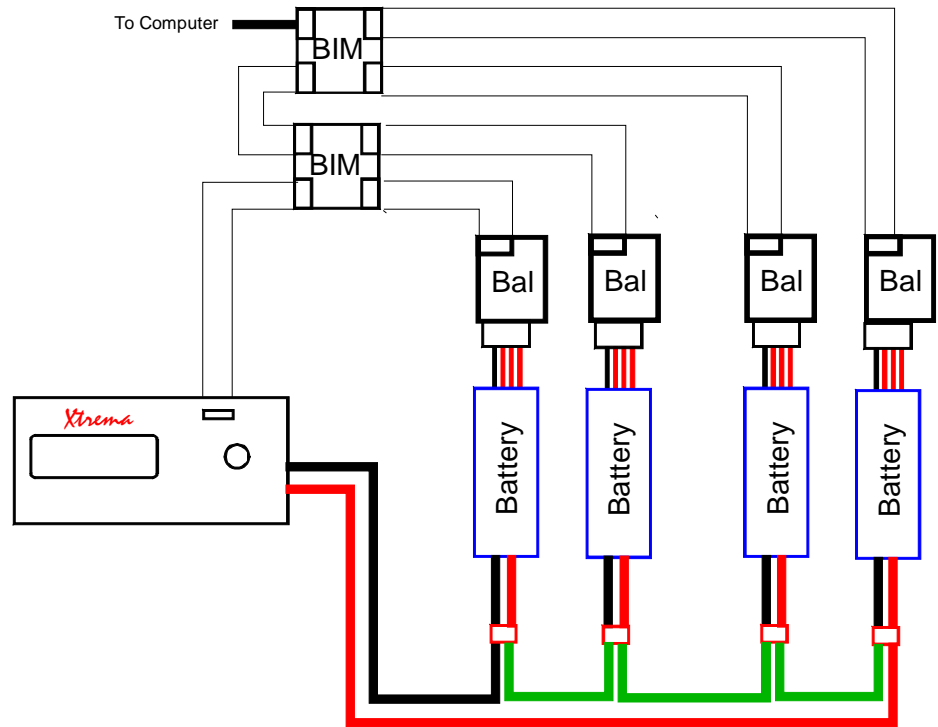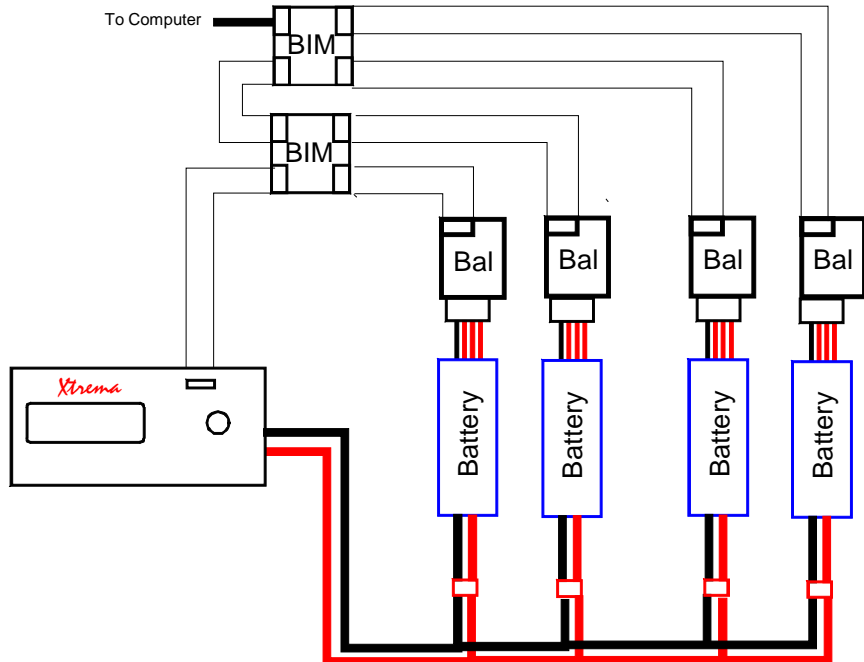
TIP! You may want to extend the abort timer settings if charging batteries that are out of balance. (see SETUP MENU settings in the Xtrema manual.)

TIP! When using multiple balancers with the Xtrema, it is convenient to apply hook and loop tape (Velcro) to the back of the balancer(s) and the BIM(s) and attach them to a small sturdy board. If using only one BIM module you may find it convenient to attach it directly to the side of the charger with the hook and loop tape.

TIP! If you use a 12s pack configured as two series 6s packs you can easily charge them in a dual parallel configuration and reconnect them in series when they are done charging.

Note: The Xtrema, now with the fully integrated balancer, will verify the cell count and program the balancer to match the volts per cell you have selected. If the imbalance is greater than 200 mv the Xtrema will abort the charge. If under 200 mv imbalance, the Xtrema will reduce the charge rate to less than 175 mv while balancing. We call this "Power Balancing". Also, If any cell voltage is above the "volts per cell" setting, the Xtrema will reduce the charge rate to <10 ma while balancing. TIP: You can observe the amount of imbalance at each pack by counting the blinks of the **STATUS** LED of each balancer starting and ending after the 5 second pause with the LED OFF.

WARNING! IMPORTANT NOTE: You must insert JUMPER 2 to the third and forth balancer for proper operation. **THIS IS VERY IMPORTANT SINCE IT MAKES THE EXTRA BALANCERS UNIQUE AND VISIBLE TO THE XTREMA.**

WARNING! IMPORTANT NOTE: 30 minutes after charger and balance cycle has completed the balancer(s) will shut down into a low power state. It is still advisable to remove the batteries from the balancers to prevent draining the battery pack(s). Failure to disconnect the pack(s) for an extended time may result in long term damage to your batteries.

WARNING! The temp probe, abort timer and balancer cannot save a damaged or defective battery cell. If a pack starts to overheat or is persistently out of balance, it is an early sign that the pack has already been damaged or that you have programmed the current too high. Shutting off the Xtrema early (as a result of an overheated or out of balance battery) is designed to greatly minimize the probability of smoking or igniting the battery. **UNDER NO CIRCUMSTANCES** should you rely on these features in lieu of being close by while charging batteries.

NEVER CHARGE Lithium Polymer / ION batteries unattended. Ever!

Set to Li Charge mode

- "Li Charger" should be selected on the display. (If not push the up ▲ or down ▼ buttons on the joystick until it is selected.) Press the joystick to the right ▶ to enter Li Charger mode.

```
        Main Menu:
    o   ◀ Li Charger   ▶
    f       ▼ Wattmeter
    f         ..setup..
```

Select the cell count and milliamps

```
    Slct  ▲ 2          750
    Batt◀   3cell  2000mA▶
    Mem:  ▼ 5         5000
             10        3500
```

- You will see four battery pack configurations that can be customized and remembered by the Xtrema. These can represent four of your most common pack configuration. Use the up ▲ or down ▼ buttons on the joystick to pick the pack you want. If none of them match, pick any one of the four you want to change. In the next step, you will be able to change the values to match your battery. Your setting will be automatically remembered the next time you enter this menu. Press the right ▶ button when you have made your selection.

> **Note:** If at first you do not see any pack like the ones you own, simply pick any one of the batteries. You are ALWAYS given the option to change those settings of the memorized location and the current pack.

```
      Update Memory 02
        ▲
    ◀       3▶cell   2000 mA
        ▼
```

- You now have an opportunity to change the cell count. If the cell count is correct then simply press the right ▶ button to continue. If not, you can change the cell count at this point by using the up ▲ or down ▼ button until the cell count you want is displayed. Notice that holding the button down will rapidly advance through the numbers. When the cell count you want is displayed, press the right ▶ button to continue.

Note: Unlike some other chargers the Xtrema does not require you to know the nominal voltage of your pack. Most people refer to their Li Po batteries by the cell count (series count) the nominal voltage will be calculated and presented to you for verification later. Also note, a 6s pack is considered a 6 cell count pack. A 6s2p is still considered a 6 cell pack for the purpose of this menu.

Note: The memory location will only be updated if you actually proceed to charge the pack so that the next time you go to charge, the Xtrema has remembered the last pack you charged. If you hit the left◄ button at this point you will go back to step 5 and the cell value will revert to the original value.

```
Update Memory 02

3 cell◄ 2000►mA
```

- **You now have an opportunity to change the milliamps. For most Li batteries this is normally set to 1C or basically the milliamp rating of the battery or less. If the milliamp charge rate is correct then simply press the right ▶ button to continue. If not you can change the milliamps at this point by using the up ▲ or down ▼ buttons until the milliamps you want is displayed. Notice that holding the button up or down will rapidly advance through the numbers. When the milliamps you want is displayed press the right ▶ button to continue.**

Note: Unlike some other chargers the Xtrema does not require you to convert from amps to milliamp or vise versa. Your battery packs are marked in milliamp so the Xtrema is set in milliamp reducing the chance of conversion error. The current limitation varies with the cell count as outlined in this table: 1s=8000, 2s=8000, 3s=8000, 4s=8000, 5s=7500, 6s=6500, 7s=5500, 8s=5000, 9s=4500, 10s=4000

⚠️ 💣 **WARNING!** Make sure you set the charge rate to (or below) the recommended milliamps suggested by the manufacturer. EXCEEDING the recommended settings may cause your packs to overheat and produce **smoke** or **fire**. Typically the number of milliamps of charge current is equal to the number of milliamp hours of capacity of the battery. This is also known as charging the battery at 1C. M1 cells and other types of Lithium cells can be charged at a higher rate. An M1 cell at 2300 mah capacity can be charged at up to 10 amps! Therefore, please refer to the battery manufacturers suggested charge rate.

For example: If your battery is labeled as a 2500 mah battery then you typically charge a Lithium polymer battery at a 2500 milliamp rate. You may also charge below that amount however your charge time will increase and the max time in the SETUP MENU may need to be increased from the default of 120 minutes. (See section on SETUP MENU)

Start the Charge

Calculated nominal pack voltage

Selected charge current

Selected cell count

```
11.10V 1200mA 03cell
4.20V/C 104F 120abt
    Are You Sure?
◄NO   CHARGE?   YES►
```

4.2 volts /per cell
(Change in setup menu)

120 minute abort timer
(Change in setup menu)
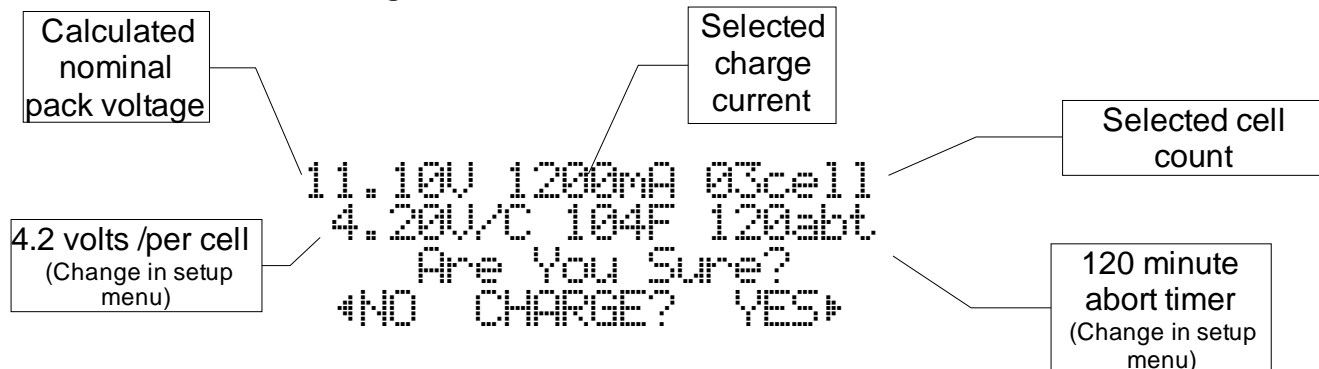
- **The Xtrema will give you one last chance to abort before charging. It will calculate the Li voltage based on cell count and display the charge current that you have selected.**

⚠️💣 **WARNING! DO NOT MISS THIS LAST OPPORTUNITY TO CHECK YOUR SETTINGS. Wrong settings may cause some LI batteries to burst into FLAMES!**

If all is OK, then start the charge by pressing the right ▶ button to continue. You may abort the charge at any time by pressing any key ▲▼ ◀▶. When the charge has terminated, either by a fail mode, user abort, or successful completion, the display will freeze with the terminating values and the STATUS code will appear at the top right of the LCD. You may hit any key ▲▼ ◀▶ to go back to the Update Memory display. You may then start another charge cycle (starting at step 6) or you may press the left◀ button to return to the main menu. In an emergency you may rapidly pull out the battery to stop a charge. However, this is NOT a recommended way to abort the charge.

📝 **Note:** At the beginning of a charge, the Xtrema will quickly test your pack to see if its voltage is plausible with your selection. If it measures a voltage over your terminating voltage (cell count X MAX volts/cell) it will abort and display a HI BAT V message. If it measures a voltage below your minimum voltage (cell count X MIN volts/cell) it will abort and display a LO BAT V message. The chart below indicates valid cell voltages for different types of packs.

Volts/Cell	LiPo	M1
MAX	up to 4.2	3.6
Nominal	3.7	3.3
MIN	3.0	2.0

📝 **Note:** The Xtrema in the screen above shows the pack voltage as well as the milliamps and cell count you have programmed. Up until now you have been programming the Xtrema in cell count because quite frankly most people remember their 5 cell Lithium Polymer battery pack as a *5 cell pack* and not as an **18.5 volt pack**. Adding to the confusion a 5 cell M1 Lithium Ion pack has a nominal voltage of 16.5 volts. Your 5 cell pack will most likely be labeled as an 18.5 or 16.5 volt pack so here is a good chance to double check to make sure you have selected the right cell count.

Three other pieces of information are also shown in this display.

1.) The **volts per cell** (4.2V/C) determine the maximum capacity you put into the battery. The default is 4.2 volts per cell commonly used by Lithium Polymer batteries. This is typically the maximum charge that is recommended by LiPo battery manufacturers. The Xtrema allows you to alter this rate in the **SETUP MENU. It is very important to pay attention to this number since M1 cells must be charged no more than 3.6 volts per cell.** When charging Li Polymer cells, you can make this number smaller to provide a more conservative charge. Charging conservatively prolongs the life of the battery at the expense of reducing the run time per flight by a small percent.

2.) The max **temperature cutoff** (104F) is also shown in this final display before charging. This too can be adjusted in the SETUP MENU. The default is 104°F but this temperature is best adjusted to be only a few degrees above the starting battery temperature.

3.) The **max safety timer** (120abt) is also shown in this final display before charging. The default abort time is 120 minutes but you can and should make this time longer in case you charge your battery at a conservative CURRENT setting. For example charging a 2000 mah battery at 1000 ma will take twice as long to charge than if you were charging it at 2000 ma. This is a very conservative charge rate that should put a minimal stress on the battery while charging however, you may want to consider changing the max safety timer to say 150- 240 minutes to allow the extra charge time.

Note: After the charging has started, if you hit any key to abort the ABORTED! Status will show and the unit will stop charging. Hit any key again to go to menu.

Note: After the charge cycle has ended the Xtrema will beep (if not silenced) to signify the end of charge. The beeping will continue until you hit the joystick button in any direction. This will shut off the beeping but will leave the display intact so that you can observe the terminating values of the recent charge. You may also stop the beeping by simply removing the battery from the charger. The display will show the final result until you push the joystick as described above.

(Remind me beep mode is assumed above)

Note: In order to extend the life of the fan, the Xtrema is programmed to turn the FAN ON only when charging a battery with 50 watts or more power. Therefore you may not hear the fan running when charging small batteries.

Charge Display – During a charge you will see the following display

Number of Cells expected

Power Input Voltage

Temperature probe display. (displays none if disconnected)

Total time since start of charge

ERROR / STATUS (see section 8)

Actual Battery Voltage while charging

Actual Battery Current while charging

Cumulative Charge dumped into cell

```
Li03 cell    Charg CC
In:13.80V Bat:  11.12V
Tmp:   72F Cur:  1200mA
00:30:49  C:    605mah
```
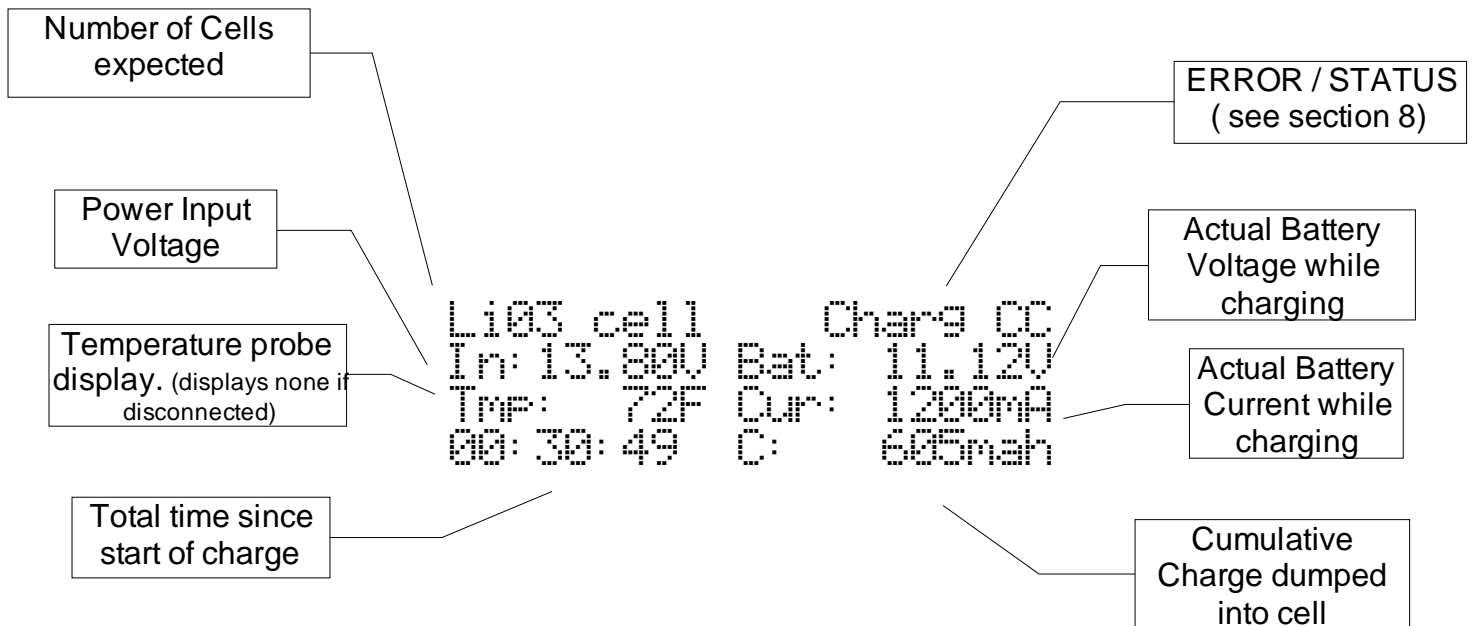
5. Using the Wattmeter

Connect the Xtrema in between battery and motor

Connect the red (+) and black (-) Xtrema directly to a 12Volt automobile battery or regulated power supply. Be careful to observe polarity.
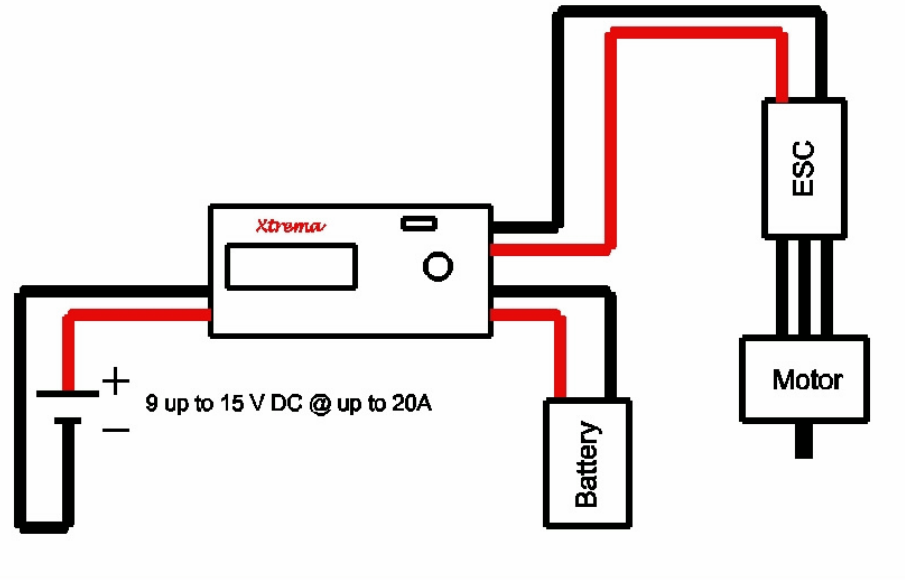
🔖 **TIP!** *The Xtrema can run as with an input voltage as low as 6.5 volts and less than 40ma. of current when used as a wattmeter. Therefore you will find it more convenient to carry a small 9 volt transistor battery and clip onto the terminals when you want to make measurements remotely and you do not want to carry along a 12 volt battery source.*

Connect the Li battery to the connector labeled "**BATTERY**"

Connect your speed controller and motor to the connector labeled "**MOTOR**"

You may optionally connect the temperature probe to the battery, motor or your speed controller using the hook and loop strap for monitoring purposes.

Set to Wattmeter mode

"Wattmeter" should be selected on the display. (If not push the up ▲ or down ▼ buttons on the joystick until it is selected.) Press the joystick to the right ▶ to enter Wattmeter mode.

Calculated Watts		Calculated Horsepower

```
2061.9 Watts 2.76 Hp
 36.80 Volts
 56.03 Amps        83F
◄Exit 00:08:17 More►
```

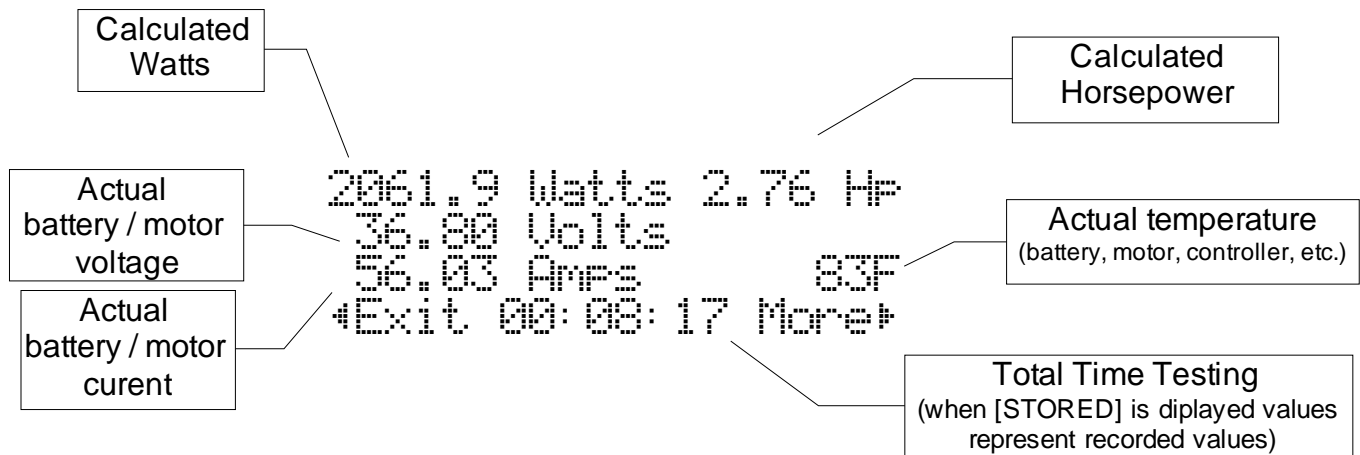**Calculated Watts** → (points to 2061.9 Watts)

Calculated Horsepower → (points to 2.76 Hp)

Actual battery / motor voltage → (points to 36.80 Volts)

Actual temperature (battery, motor, controller, etc.) → (points to 83F)

Actual battery / motor curent → (points to 56.03 Amps)

Total Time Testing (when [STORED] is diplayed values represent recorded values) → (points to 00:08:17)

You are now able to measure Watts, amps, volts, temperature and even horsepower. Pressing the right ► button will allow you to toggle into the **[STORED]** mode which will display peak amps, minimum voltage, max temperature as well as the calculated watts and horsepower.

```
2030.1 Watts 2.72 Hp
 35.38 Volts minimum
 57.88 Amps peak 89F
◄Exit [STORED] More►
```

Press the left ◄ button to return to the main menu.

🖈 **TIP!** For "Volts minimum" to display properly you should connect the battery to the Xtrema before you enter the Wattmeter mode. Otherwise the minimum voltage displayed will be zero 0.00. If you have already entered the Wattmeter mode simply push the joystick ◄ left once then ► right to temporarily go to the main menu and then re enter the Wattmeter mode

Also note that at any time you want to reset the minimum and peak settings you may simply go back to the main menu temporarily as described above.

🖈 **TIP**! When used as a wattmeter the Xtrema can be powered by as little as 6.5 Volts. A 9 volt battery makes a handy and convenient source of power when used at the flight line. Simply clip to the corresponding terminals of the battery.

6. SETUP MENU

The setup menu allows you to customize the internal setting of the Xtrema. You enter the setup menu from the main menu by selecting ..setup.. and pressing the joystick to the ▶ right.

```
      Main Menu:
o        Li Charger
f     ▲  Wattmeter
f   ◀   ..setup..    ▶
```

Upon entering the setup menu you will see three options. The first is Li Setup which allows you to change charger settings such as volts per cell, the safety timer and the temperature cutoff. The second option Beep Options lets you set up how the Xtrema makes sounds. The third option Set Defaults merely restores all the factory default options.

Li Setup

Select LI SETUP from the setup menu and press the joystick to the ▶ right.

Choose one of the following by moving the up ▲ or down ▼ buttons and press the joystick to the ▶ right.

Volts / Cell

This setup menu allows you to change the maximum voltage that the Xtrema stops charging. You can program the Xtrema to charge from 3.6 volts / cell to 4.20 volts / cell. Note that this is a GLOBAL setting meaning that it will affect all of your memorized pack configurations.

Choose the desired voltage by moving the up ▲ or down ▼ buttons and press the joystick to the ▶ right when the displayed value is what you desire. You may abort the change by hitting the joystick ◀ left.

Why change the Volts per cell?

Different Lithium chemistries require charging up to different voltages. You can charge Lithium Polymer packs lower to increase their longevity and for long term storage. The chart and descriptions below can help you select the right volts / cell.

Recommended Volts/Cell	LiPo	M1
Charge	4.0 to 4.2	3.6
Storage	3.7	none

M1 High Power Hypersonic ™ Lithium Ion nano-phosphate cells – 3.60 volts per cell

The 3.6 volt setting is a special setting for M1 High Power Hypersonic ™ Lithium Ion cells manufactured by A123 Systems. When selected, the Xtrema will switch from constant current to constant voltage at 3.6 volts per cell as required by these cells. Also when this setting is selected the battery voltage calculation displayed just before charging (during the "Are you Sure?" window) is based on the nominal 3.3 volts per cell multiplied by the selected cell count. Lastly when 3.6 volts per cell is selected the LO BAT V error message will be triggered when the battery is below 2.0 volts per cell.

Lithium Polymer Cells – 3.65 to 4.2 volts per cell

The factory default setting is 4.20 v/c and this provides you with the maximum capacity of common Lithium Polymer cells. You may change this down to 3.7 volts for what is called a "storage charge" when using lithium polymer cells. This allows you to charge your batteries to approximately 50% full charge and is the factory recommended method for storing LiPo batteries long term. NOTE; M1 cells do not require a storage charge and may be stored at any voltage without loss of performance.

Example: For a 3 cell pack 4.20 volts/cell equates to 3 X 4.2V or 12.60 volts max.
             or For a 3 cell pack 3.70 volts/cell equates to 3 X 3.7V or 11.10 volts max.

The reason for all the in between values is that some manufacturers of Lithium Ion or polymer cells may suggest a more conservative charge voltage. Or you may want to charge the batteries more conservatively to extend their life. You now have the option of charging at 4.15, 4.10, 4.05 or 4.00 volts per cell. The lower in voltage you chose, the earlier the Xtrema will limit charging giving you slightly less capacity per charge. The reason you may want to do this is to extend the cycle life of your batteries.

Choosing 4.15 volts/cell may only reduce the capacity of your charge by about 5 percent but it will extend the useful life of your pack by many cycles.

Note: If you have reduced the volts/cell value and you try to charge batteries previously charged at a higher volts/cell, they will cause the Xtrema to display a HI BAT V error message. Simply discharge the battery below the desired max voltage.

Safety Timer

This setup menu allows you to change the maximum amount of time to allow for charging. The purpose is to abort the charge when a battery is not charged in the amount of time expected. This may occur if a shorted or weak cell prevents the pack voltage from climbing up to the expected voltage.

The default time is set to 120 minutes and this should be sufficient for charging at a 1C rate. (Ex. Charging your 1000 mah battery at 1000 ma. Etc.) If you chose to charge at a lower rate, then you may want to adjust this timer for a longer time period. The timer is adjustable from 0 minutes to 990 minutes in 10 minute increments.)

TIP! Zero 0 minutes effectively disables the charger and may be used in situations where you may want to disarm the Xtrema from charging.

Choose the desired minutes by moving the up ▲ or down ▼ buttons and press the joystick to the ▶ right when the displayed value is what you desire. You may abort the change by hitting the joystick ◀ left.

Temp Cutoff

This setup menu allows you to change the maximum temperature that will abort the charge cycle. This feature is not designed to save your battery since overheating during charge is a sign of a damaged cell. However this feature may prevent reaching battery temperatures resulting in thermal runaway that may cause combustion. Hopefully this may prevent a Lithium battery fire.

Choose the desired temperature by moving the up ▲ or down ▼ buttons and press the joystick to the ▶ right when the displayed value is what you desire. You may abort the change by hitting the joystick ◀ left.

The default temperature is set to 104°F. The temperature is adjustable from 60°F to 130°F. **FOR MAXIMUM EFFECTIVENESS** you will want to set the temperature cutoff to a few degrees above the starting pack temperature. For example if the pack temperature is 80°F then you may want to set the temperature cutoff to 85°F. (You can determine the pack temperature by attaching the thermometer to the battery with the supplied hook/loop band and temporarily entering the Wattmeter function,)

Lithium batteries are amazingly efficient during a charge and rarely go up in temperature at all when charging properly.

⚠️ 💣 WARNING! This feature is not designed to save your batteries. If a pack starts to overheat, it is an early sign that the pack has already been damaged or that you have programmed the current too high. Shutting off the Xtrema early (as a result of an overheated battery) is designed to greatly minimize the probability of smoking or igniting the battery. **UNDER NO CIRCUMSTANCES** should you rely on this feature in lieu of being close by while charging batteries.

NEVER CHARGE Lithium Polymer / ION batteries unattended. Ever!

📌 **TIP!** There are several ways to test the thermometer. The easiest way is to set the cutoff temperature a few degrees above room temperature but under body temperature (98°F). Start the charge as you normally would and grab the temperature probe with your hand. Hold it tightly to transfer your body heat to the probe and make the temperature rise. You should see the temperature display climb while charging. It should abort the charge as soon as the temp display reached the limit you set.

Beep Options

Select Beep Options from the setup menu and press the joystick to the ▶ right.

Choose one of the following by moving the up ▲ or down ▼ buttons and press the joystick to the ▶ right.

Only one of the beep options is selected at a time. The option will automatically go back to the previously selected option. This feature affects sounds that occur at all Status/Error messages except for CHARGE CC and CHARGE CV which have no sounds associated with their states...

No Sound

Select this option if you prefer that the Xtrema make no sounds at all. All Error and Status messages will still be displayed on the LCD screen however they will be silent.

Beep Once

Select this option if you prefer that the Xtrema alert you of problems or completion only once. All Error and Status messages will remain displayed on the LCD screen until you exit the screen.

Remind Me (default)

Select this option if you prefer that the Xtrema alert you of problems or completion only repeating every 15 seconds. All Error and Status messages will remain displayed on the LCD screen until you exit the screen.

Set Defaults

Select Set Defaults from the setup menu and press the joystick to the ▶ right.

This option will instantly set the Xtrema back to the factory default options.

The defaults are:

- **4.20 Volts / cell**
- **120 minute (safety timer abort)**

- **104°F (max temperature abort)**
- **Remind Me (beep mode)**

7. XtremaLog Updating and Data Logging Software

Introduction

The XtremaLog program is a powerful tool that allows you to convert your Xtrema into a charge and power analyzer. Now you can easily keep records of your battery charge cycles or analyze the power output of your power system. It also allows you to update the firmware in your Xtrema to take advantage of the latest features and improvements that TME offers. This program requires that you purchase the optional Xtrema data cable to take advantage of all these features. Updates to this program and the Xtrema are FREE for the life of the product and are available via the Xtrema web site. www.theXtrema.com

In order to capture the data from the Xtrema, it must be updated to **FIRMWARE version 1.2.0 or later.**

If the XtremaLog program fails to run or if your computer does not capture properly, your computer may need Microsoft's NET version 1.1 Framework installed. You can get it at

http://www.microsoft.com/downloads/details.aspx?FamilyID=262d25e3-f589-4842-8157-034d1e7cf3a3&displaylang=en

Connecting to your Xtrema

If you are using the RS232 data cable (XTR-232) connect it to a serial port from your PC to the Xtrema Expansion Port. If you are using a generic RS-232 to USB adapter, insure that you have installed the proper drivers to emulate a standard com port. If you are using our USB adapter (included in part numbers XTR-USB or USB-232) you will need to download and install the drivers located on our Downloads page. http://www.tmenet.com/downloads.htm. Click on "Xtrema USB Cable Driver" link and open the file to install the drivers.

Updating Xtrema Firmware

The update feature allows you to keep your Xtrema's firmware current with the latest features and improvements. To update your Xtrema to the latest release connect the Xtrema to the PC and perform the following tasks.

1. First click on the "**Update**" tab in the XtremaLog program and select the COM PORT that is connected to the Xtrema. Only COM Ports that are available can be checked.

2. Power up your Xtrema and from the main menu shut the Xtrema **OFF** by tapping the joystick to the left once.

3. With the display off, turn the Xtrema back **ON** by pushing and holding the joystick to the left for about 4 seconds.

> If you did this correctly, the Xtrema will simply get stuck waiting for a product update and display "**Loading...**" on the LCD display.. To abort you must remove power.

NOTE: If your Xtrema is completely dead (due to an aborted or bad update) you must re-connect the Xtrema to a 12 Volt source while holding the joystick to the left for at least 4 seconds (push joystick BEFORE connecting power). If already powered up you must first remove power. You will see the Xtrema display show two solid bars going from left to right. This is normal.

4. Click the "**Select Update File**" button on the XtremaLog program and select the file matching the release number you desire. The first time you run this program you will have to search for the folder containing all the files were unzipped to. (NOTE: All firmware releases are available in case you desire to go back to a previous release.)

5. Click the "**Update Xtrema"** button to download the new software into your charger. A progress bar will appear under the button. When the update is completed, a status message will appear below the progress bar.

6. Within a few seconds after the progress bar reaches 100% the Xtrema will automatically restart, beep and you should see the updated version number in the splash screen. Your Xtrema is now updated. If your update fails check your connections or try a different com port and repeat steps 2 – 6

Change log:

Xtrema Firmware:

> 07/24/2006 ver 1.0.0   First production release.
> 08/15/2006 ver 1.1.0b Added m1 charging feature (beta release)
> 08/29/2006 ver 1.1.1   Changed min to abt on "Are You Sure?" window
> 10/11/2006 ver 1.1.2b   Changes to improve production yield caused by op   amp offset. Issues resolved impact false CHCK MOT warning and missed full charge detect on low ma charge setting.
> 10/30/2006 ver 1.1.2   Production release
> 11/07/2006 ver 1.1.3b   Improved current accuracy during CV charge
> 11/10/2006 ver 1.1.4b   Fixed LCD initialization after update
> 11/10/2006 ver 1.1.5b   Fixed abort timer from ending early when set to 260   minutes or greater
> 11/10/2006 ver 1.1.5   Production release
> 01/12/2007 ver 1.2.0b Added feature to output data to PC for data logging. Added test to detect unexpected over current while in CV mode and revert to CC mode
> 06/12/2007 ver 1.2.0 Production release
> 02/05/2008 ver 1.3.8 Added balancer support to charger. Production release

Capturing Data

The capture feature allows you to record data that is output by the Xtrema during a charge cycle or while using the Xtrema as a wattmeter. To use this feature the Xtrema must be connected and powered on. Then perform the following steps in sequence to start the capture.

1. First click on the "**Capture**" tab in the XtremaLog program

2. Click on the green "**Save Capture / Start**" button and enter a file name that will remind you of the specific data you are capturing. Then click the "Save" button

Ex.

        Kokam5s2p-1-27-2007
        AXI4130-16TP6s2p

3. The Xtrema may ask you to "**Please Select a COM PORT**" if you have not done so during your session. Go ahead and select the com port that is connected to the Xtrema. Only COM Ports that are available can be checked. If you select the wrong one you will need to go to the "**Update**" tab to select a new port.

4. XtremaLog is now waiting for data from the Xtrema. You may now proceed to charge a battery or enter the wattmeter to run your power tests. The XtremaLog will automatically detect the mode you are in and display the data you are capturing in real time.

IMPORTANT NOTE: When capturing Wattmeter data DO NOT press the joystick to the right in order to display peak AMPS, min volts etc. on the Xtrema's LCD display. This affects the data output to the computer causing an undesirable gap of missing data in the capture file.

5. When you are done logging, you may click on the "**STOP CAPTURE**" button. The file you opened at the start is automatically saved and closed. Under certain conditions, the capture will automatically stop. Some of those conditions are: charge complete, stopping and starting the Wattmeter, switching from watts to charge.

NOTE: While capturing you are allowed to turn off any of the graphed lines by simply un-checking the box next to the data you no longer want to see. Checking the box reactivates the line. Deselecting a graph line does not affect the capture process. All data is continually captured until the "**STOP CAPTURE**" button is pressed. You may also change the line colors at any time by clicking on the colored box below each check box.

Analyzing your Data

The XtremaLog program allows you to analyze the data you have previously captured. To enter this mode simply click on the "**Analyze**" tab. Note that you can analyze previously captured data while you are actively capturing new data.

Once you have entered the mode you may click on "**Open Base File**" to open and graph your reference file. The XtremaLog program will wait for you to click on the file that you want displayed. Once you have selected the Xtrema data capture file (file type: .xdc) the XtremaLog program will graph the file and allow you to examine the data.

At this point you will have the option to open up a second file to graph and compare against the already opened base file. Simply click on the "**Open Compare File**" button to open the second file. You will need to select the lines you want to compare. (More on this later.)

NOTE: You can make the XtremaLog display the data values at a given point on the time line by simply pointing the mouse to the area on the graph you are interested in. As you are moving the mouse within the plotting area, the points will be displayed in the status bar at the bottom of the tab. The points will be listed with the first letter of the point an then either the letter "B" for Base or "C" for Compare. For example; Amps in the Base file will be displayed as "AB" and amps in the compare file will be "AC". A left click will lock the data point values.. A right click will clear the data point values.

While analyzing the data you are allowed to turn off any of the graphed lines by simply un-checking the

box next to the data you no longer want to see. Checking the box reactivates the line. You also have a "**Select All**" and "**Deselect All**" button that forces all check boxes in that row on or off. You may also change the line colors at any time by clicking on the colored box below each check box.

There are a few points to note when opening up a second file to compare against the base file.

1. The two files should be displaying the same type of data. It is possible to display a charge graph and compare it to a wattmeter graph. This of course, will not make much sense to compare, however, the XtremaLog program allows you to do this if desired.

2. The two files should represent similar time spans. The XtremaLog will scale the time line to best fit the longer of the two files. This makes the file with the smaller time span appear shorter. In extreme cases you may not be able to see much of the shorter file. In this case, to expand the smaller graph you may simply uncheck all the other points in the other graph.

Printing Data

You may print the currently displayed graph by selecting File and then Print from the menu in the top left corner of the window.

8. Specifications

CHARGER SPECIFICATIONS:

# Cells:	1-10 cells
Input Voltage:	10.5V - 15V DC @ up to 20 AMPS
Input Connectors:	Super heavy duty Alligator Clips with 3 ft. cord.
Case Size:	6.25 x 3.25 x 2.25 in. (159 x 83 x 57 mm.)
Weight:	22 oz. (624 grams)
Charger Output Connections:	14 Gauge Fine Strand Silicon Wire
Volts per Cell:	3.60V (m1 cells) - 4.20 volts in .05 volt steps
Charge Rate:	50mA - 8000mA in 50 mA steps (4000mA max @ 10 cells)
Battery Types:	Lithium Ion, Lithium Polymer
Safety Timer:	10 - 990 minutes (120 default)
Fan:	On only when needed for longer life.
Safety Temperature Cutoff:	60°F - 130°F (104°F default)
Display:	4 line X 20 character LCD display
Audible Alarms:	Piezo Speaker alarms15 seconds, beep once or disable

WATTMETER SPECIFICATIONS

Input Supply Voltage:	6.5V - 15V DC < 40 ma
Wattmeter Output Connections:	14 Gauge Fine Strand Silicon Wire
Voltage Measurement:	0 - 60 V, resolution 0.01 V
Current Measurement:	0 - 100 A peak, 50 A continuous, resolution 0.01 A
Power Measurement:	0 - 6000 W, resolution 0.1 W.
Horsepower Measurement:	0 - 8.0 HP resolution .01 HP
Temperature Measurement:	up to 302°F (150°C)

9. ERROR/STATUS MESSAGES

OPEN CKT This error message is displayed if the charge is interrupted by an open circuit to the battery. It is not recommended to stop the Xtrema from charging by disconnecting the battery. Use the abort procedure by hitting any key instead.

MAX TIME This error message is displayed if the Xtrema has been charging longer than the Max Safety time setting of the Safety Timer. The default is set to 120 minutes but this can be modified from 0 to 990 minutes.

MAX TEMP This error message is displayed if the Xtrema's temperature probe has measured greater than than the Max Temp Cutoff setting of the temp cutoff. The default is set to 104°F but can be modified from 60°F to 130°F.

HI BAT V   This error message is displayed if the Xtrema detects during the testing phase prior to charging that the battery to be charged voltage is higher than the cell count multiplied by the Volts per Cell setting in the SETUP MENU. Typically this may indicate that the cell count programmed into the Xtrema is lower than the actual pack. A low volts per cell setting will also cause the same fault.

LO BAT V   This error message is displayed if the Xtrema detects during the testing phase prior to charging that the battery to be charged voltage is lower the cell count multiplied by 3.0 volts per cell. (2.0 Volts per cell for m1 cells) Typically this may indicate that the cell count programmed into the Xtrema is higher than the actual pack.

CHCK BAT   This error message is displayed if the Xtrema detects, during the testing phase prior to charging, that the battery does not appear to be present or is connected backwards. Check your wiring and battery connections other causes may be an open pack.

CHCK MOT   This error message is displayed if the Xtrema detects, during the testing phase prior to charging, battery current going to the motor leads. Make sure your motor is disconnected and restart the charger.

ABORTED!   This error message is displayed if the charge is interrupted by hitting the joystick in any direction while charging. This is the preferred method to stop a charge cycle.

BAD INPT   This error message is displayed if the charge is interrupted by the input voltage (12 volt battery or power supply) has either dropped below 10.5 volts or gone above 15 Volts. The display will indicate the last read voltage to help you determine the problem.

Charg CC   This status message indicates that the charger has completed the initial testing phase and has entered the constant current charging phase. It will continue to remain in this state until the battery voltage has risen to the specified volts per cell setting in the setup menu. This message makes no sound.

Charg CV   This status message indicates that the charger has completed the initial constant current charging phase and has entered the constant voltage charging phase. It will continue to remain in this state until the battery current drops below 1/10 of the initial constant current charge rate. This message makes no sound.

COMPLETE   This status message indicates that the charger has completed the complete charging phase and has successfully charged your battery. It will continue to remain in this state until the joystick button is pushed twice. The first push silences the unit and the second push returns the charger to the selection menu.

BAL ER01   This error message is displayed if the balancer firmware needs to be updated to work properly with the Xtrema Charger/Wattmeter firmware.

BAL ER02   This error message is displayed if a difference of 200mv of imbalance is seen by the charger between multiple packs.

BAL ER03   This error message is displayed if a difference of 200mv of imbalance is seen by the charger between cells.

10.   CHARGER DATA RECORDS

The XtremaLog program stores your captured data on the disk as a **.xdc** file. (Xtrema Data Capture) This file is a (comma separated values) that can be imported into your favorite spreadsheet program for advanced graphing and analysis. In some cases you may need to copy and rename the file to end in **.csv.** The following table describes the fields for the comma separated data. The content field suggests the maximum number of digits and format that can be expected.

Example:

```
C,36.01,Charg CV,13.54,76,F,350,126,0,4,51<cr>
```

Field #	Content	Notes		
1	C	This single character indicates the Xtrema is in Charge mode and marks the beginning of the record.		
2	*vv.vv*	This field represents the voltage of the battery under charge.		
3	*ssssssss*	This field represents the status of the Xtrema. The following ASCII strings are valid and the action to be taken is indicated is noted below:		
		ASCII string	**description**	
		OPEN CKT	**Open circuit abort**	Fault aborted acquisition
		MAX TIME	Maximum time abort	Timer aborted data acquisition
		MAX TEMP	Maximum temperature abort	Temperature aborted data acquisition

Field #	Content	Notes		
		HI BAT V	Hi battery voltage abort	fault aborted data acquisition
		LO BAT V	Low battery voltage abort	Fault aborted data acquisition
		CHCK BAT	No battery or backwards battery abort	Fault aborted data acquisition
		CHCK MOT	Motor current detected abort	Fault aborted data acquisition
		ABORTED!	User aborted	user aborted termination
		BAD INPT	Input power supply voltage too high or low	Fault aborted data acquisition
		Charg CC	Normal Constant Current Charge mode	Valid data record
		Charg CV	Normal Constant Voltage Charge mode	Valid data record
		COMPLETE	Charge complete	Normal termination

Field #	Content	Notes
4	*ii.ii*	This field represents the voltage of the input charger voltage.
5,6	*ttt, f*	These fields represent the temperature as measured by the temperature probe. If no temperature probe is present the ASCII string ' none' will be written in this space. The second field will be an ASCII 'F' character to signify Fahrenheit. Future versions may output an ASCII 'C' to signify Centigrade.
7	*cccc*	This field represents the current of the battery under charge. Represented in milliamp.
8	*mmmm*	This field represents the accumulated current of the battery under charge. Represented in milliamp hours.
9,10,11	*hh,mm,ss*	The first field represents the hours, the next field represents the minutes, the last field represent the seconds.
	<cr>	Carriage return character signifies end of record. ASCII character (hex 0D)

11. WATT METER DATA RECORDS

The XtremaLog program stores your captured data on the disk as a **.xdc** file. (Xtrema Data Capture) This file is a (comma separated values) that can be imported into your favorite spreadsheet program for advanced graphing and analysis. In some cases you may need to copy and rename the file to end in **.csv**. The following table describes the fields for the comma separated data. The content field suggests the maximum number of digits and format that can be expected.

Example:

```
W,84,F,    ,0,          ,12.55,0,0,0,0,1,0<cr>
W,83,F,peak,12.65,minimum,10.23,129.4,0.17, [STORED],0,0,0.0294694444444444<cr>
```

Field #	Content	Notes
1	W	This single character indicates the Xtrema is in Wattmeter mode.
2,3	*ttt,f*	These fields represent the temperature as measured by the temperature probe. If no temperature probe is present the ASCII string ' none' will be written in this space. The second field will be an ASCII 'F' character to signify Fahrenheit. Future versions may output an ASCII 'C' to signify Centigrade.
4	*ssss*	This field represents the state of the displayed data. If blank then normal real time data is being displayed in all other fields. If the field has the string 'peak', then stored data is being displayed in all other fields.
5	*mm.mm*	This field represents the current of the load under test. Represented in Amps
6	*sssssss*	This field represents the state of the displayed data. If blank then normal real time data is being displayed in all other fields. If the has the string 'minimum', then stored data is being displayed in all other fields.
7	*vv.vv*	This field represents the voltage of the battery under test. Represented in VOLTS
8	*wwww.w*	This field represents the calculated wattage of the battery under test. Represented in WATTS

Field #	Content	Notes
9	*hh.hh*	This field represents the calculated HORSEPOWER of the load under test. Represented in HP,
10,11,12	*Hh,mm,ss*	The first field represents the hours, the next field represents the minutes, the last field represent the seconds. The character string '[STORED]' in field #10 means that the wattmeter was interrupted to display the stored values and the hours minutes and seconds were not recorded.
13	*f.fffffffffffff*	This field contains the accumulated amp hours for the point in time of the record.
	<cr>	Carriage return character signifies end of record. ASCII character (hex OD)

12.   Warranty

The Xtrema is warranted to the original purchaser for 3 years from the date of purchase to be free from defects in material and workmanship. During this period Tejera Microsystems Engineering Inc. will repair or replace, at their discretion, the defective unit. Warranty is not transferable and is therefore limited to the original purchaser of the unit, This warranty does not apply to any unit which has been abused, improperly installed, improperly used, used for purposes other than those purposes for which the unit was designed, handled roughly, damaged in shipment, nor to any unit which has been altered or repaired by unauthorized personnel. Under no circumstances will the buyer be entitled to incidental or consequential damages. Warranty coverage also requires proof of purchase date unless ordered direct from the manufacturer. This Limited Warranty gives you specific legal rights; you may also have other rights which vary from state to state.

WARRANTY PROCEDURE:

A minimum charge of $7.00 to cover shipping and handling is required on all returned units after the first 30 days, and should be enclosed with the unit.   Be sure to enclose your Bill of Sale as proof of purchase with the unit. (A legible photocopy is acceptable.) In the event that the work is not covered under the warranty, TME will attempt to contact the owner unless special instructions or a credit card number are received with the unit.

FREE LIFETIME UPDATES:

The Xtrema carries free firmware updates for the life of the product. For your convenience, downloadable updates will be made available online at www.theXtrema.com or www.TMEnet.com . Activate your warranty online to receive product updates and upgrades! Go to: www.TMEnet.com/register A special data cable will be required for your computer to connect to the Xtrema (not included) Alternately you may return the Xtrema to us with $7.00 for return shipping to be updated at no charge.

REPAIRS:

For out of warranty repairs the standard repair fee per unit is up to 50% of the current list price plus $7.00 shipping and handling charges. You may prepay by check, MO, VISA, MASTER CARD or DISCOVERY

ALL RETURNS MUST BE SENT TO: Tejera Microsystems Engineering, Inc., 11705 Boyette Rd #418, Riverview, Florida 33569 carefully pack and ship the unit via the post office, UPS or FED EX, fully insured and prepaid.

The Xtrema Charger/Wattmeter is 100% Designed and made in the USA. The Xtrema Balancer, BIM and associated cables are designed, programmed, packaged and tested in the USA with custom components manufactured for us in China and Taiwan