TRITONEQ™

INTRODUCTION

TritonEQ™ offers all of the specifications and features of the original Triton Jr., and adds a built-in AC power supply, lithium balancing circuit, and a new reversed LCD with adjustable view angle. The range of currents and cell counts make TritonEQ great for smaller sized electric flight applications. But it can still be used in various other applications, such as for Tx and Rx batteries, field batteries, and more. TritonEQ can charge, discharge, and cycle multiple types of rechargeable batteries with high output power. A Quick Reference Guide, plus state-of-the art programming and flowcharts make TritonEQ easy to understand and use. Its very small size and light weight make TritonEQ extremely easy to transport.

It is strongly recommended to completely read this manual before use! Damage resulting from misuse or modification will void your warranty.

WARNING!! Charging lithium-based rechargeable batteries poses a risk of FIRE! NEVER treat lithium-based batteries in the same manner as other battery types. NEVER leave lithium batteries unattended while being charged! ALWAYS charge lithium-based batteries in a fireproof location! Failure to follow all care and handling instructions contained in this manual could result in quick, severe, permanent damage to the batteries and all surroundings!! Follow all safety precautions when using such batteries, as listed on pages 9-12 of this manual!

QUICK REFERENCE GUIDE

1. Connect TritonEQ to the AC or DC input power source. (See page 3 for details)
2. Find the programming flowcharts included in the package.
3. Press BATT TYPE to find the screen which matches your battery type. (See page 5 for details)
4. Connect the proper charge adapter to the “Output” jacks. Connect the battery to the charge lead, observing proper polarity.
5. To charge:
   a. For NiCd and NiMH batteries see page 5.
   b. For lithium based batteries see page 11.
   c. For lead-acid (Pb) batteries see page 12.
6. To discharge:
   a. For NiCd and NiMH batteries see page 7.
   b. For lithium based batteries see page 12.
   c. For lead-acid (Pb) batteries see page 13.
7. For cycling of NiCd and NiMH batteries see page 8.

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SPECIFICATIONS

AC input voltage:	110V 60Hz – 240V 50Hz (detachable AC cord)
DC input:	11-15.0V DC, with large alligator clips
Number of outputs:	one, banana jacks
Battery types, # cells:	1-14 NiCd, NiMH 1-6 LiPo, Li-Ion, or LiFe (3.6, 3.7 or 3.3V cells) 2, 4, 6, 8, 10, 12V Pb (2V per cell)
Fast charge current:	0.1-5.0A (1C maximum for lithiums) 63W max DC, 50W max AC
Fast charge termination:	peak detection NiCd, NiMH cc/cv for Pb and lithiums
Trickle current: (NiCd/MH only)	chg current / 20
Peak sensitivity: (NiCd/MH only)	8mV NiCd, 5mV NiMH
Peak delay at start: (NiCd/MH only)	3 minutes
Fast charge safety timer:	NiCd/NiMH 1.5 hours, lithiums 3 hours, or turn off
Lithium balancing accuracy:	5mV per cell
Lithium balancing connector:	FlightPower and ElectriFly adapters included
Lithium max. node current:	300mA
Discharge current:	0.1-1.0A (5W max)
Discharge cutoff voltage:	NiCd, NiMH 0.1-16.8V LiPo, Li-Ion 3.0V per cell LiFe 2.5V per cell Pb 1.8V per cell
Cycle count: (NiCd, NiMH only)	1-5 cycles
Battery memories:	one
Programming controls:	membrane touchpad, 4 buttons
Display type:	2x16 reversed LCD w/backlight and adjustable angle
Audible indicators:	beeper
Case material:	aluminum and ABS plastic
Safety devices:	solid-state reverse polarity and overload
Case size:	5.9 x 6.0 x 2.3 in [150 x 153 x 58mm]
Weight:	23.8 oz [675g, w/o AC power cord]

SPECIAL FEATURES AND FUNCTIONS

- Includes a tiny, lightweight built-in switching AC power supply
- A new easy to see 2x16 reversed LCD with backlight and 0-45° adjustable view angle
- Built-in balancing for 1-6S LiPo, LI-Ion, or LiFe (A123) cells, with FlightPower and ElectriFly adapters included
- Durable membrane touchpad input controls, and very simple programming menu
- Handles 1- 14 nickel-cadmium (NiCd) or nickel-metal hydride (NiMH) cells, 1-6 lithium-polymer (LiPo), lithium-ion cells (Li-Ion), or lithium ferrite nanophosphate (LiFe) cells, or 2-12V lead-acid batteries (Pb)
- Precision “zero deltaV” peak detection for NiCd and NiMH batteries
- “Constant current / constant voltage” charge method for Pb and lithium based batteries
- 0.1 – 5.0A adjustable charge current
- Automatically sets trickle charge current for NiCd and NiMH batteries
- 0.1 – 1.0A adjustable discharge current
- Adjustable discharge cutoff voltages for NiCd/NiMH
- Cycle NiCd and NiMH batteries one to five times
- Displays input and output volts, peak volts, avg dsch volts, chg and dsch capacity, currents and time, error messages.
- Status screen constantly updates capacity, battery voltage, current, and time during use.
- Audible beeper aids in programming and notifies of function changes.
- Safety features include fast charge safety timer, current overload and reverse polarity protection.
- Small and lightweight, with a rugged aluminum case for long-lasting durability and excellent heat dissipation.

IMPORTANT WARNINGS

Disconnect the battery and remove input power from the charger immediately if the charger or battery become hot!! Allow the charger or battery to cool down before reconnecting.

- **NEVER** attempt to charge incompatible types of rechargeable batteries as permanent damage to the battery and charger could result.
- **NEVER** use automotive type battery chargers to power the charger.
- **NEVER** allow water, moisture or foreign objects into the charger.
- **NEVER** block the air intake holes which could cause the charger to overheat.
- **NEVER** attempt to use batteries with more cells or total voltage than listed in the specifications
- **NEVER** leave the room where a battery is being charged or discharged.

- **NEVER** place the charger or battery on a flammable surface or near a flammable object while in use. Keep away from carpets, cluttered workbenches, etc.
- **NEVER** overcharge batteries as permanent damage could result. Do not use a charge or discharge current rate which exceeds the safe level of the battery. Do not attempt to charge or discharge a battery if it is hot.
- **ALWAYS** disconnect from power source when not in use.
- **ALWAYS** keep out of reach of children.
- **ALWAYS** connect the charge lead to the charger before connecting the battery to the lead. And **ALWAYS** disconnect the battery from the charge lead BEFORE disconnecting the charge lead from the charger. Otherwise, if the ends of the charge lead touch each other while the battery is still connected it will cause a severe and dangerous short-circuit condition.

GLOSSARY OF TERMS

Amps (A): The unit of measure for charge or discharge current.

Milli-amps (mA): A unit of measure for current, being amps (A) multiplied by 1000 and listed as "mA". So 2.5A is the same as 2500mA (2.5 x 1000). Or, to convert mA to amps, divide the mA number by 1000. So 25mA is the same as 0.025A (25 divided by 1000).

Capacity, milli-amp hours (mAh), and amp-hours (Ah): Charge energy stored by a battery is called **capacity**, which is defined as how much current a battery can supply in one hour of time. Most hobby batteries are rated for capacity in **"mAh" or milli-amp hours**. A 650mAh battery can deliver 650mA of current for one hour (650mA x 1hr = 650mAh). A 3200mAh battery can deliver 3200mA (3.2A) of current for one hour (3200mA x 1hr = 3200mAh), etc. Very large batteries, such as lead-acid field batteries, are usually rated in **"Ah" or amp-hours**. A "12V 7A" field battery can deliver 7 amps of current for one hour (7A x 1hr = 7Ah).

"C" rating: Capacity is also referred to as the "C" rating. Some battery suppliers recommend charge and discharge currents based on the battery's "C" rating. A battery's "1C" current value is the same number as the battery's rated capacity number, but noted in mA or amps. A 600mAh battery has a 1C current value of 600mA…a 3C current value of (3 x 600mA) 1800mA. The 1C current value for a 3200mAh battery would be 3200mA (3.2A), etc.

INPUT POWER – CONNECTION, PROTECTIONS AND LIMITATIONS

AC Input: For indoor use, this charger includes a built-in switching AC power supply that delivers power by connecting the included AC power cord to a common 110V AC outlet. This built-in power supply is also compatible with 220V 50Hz sources (220V input power cord not included).

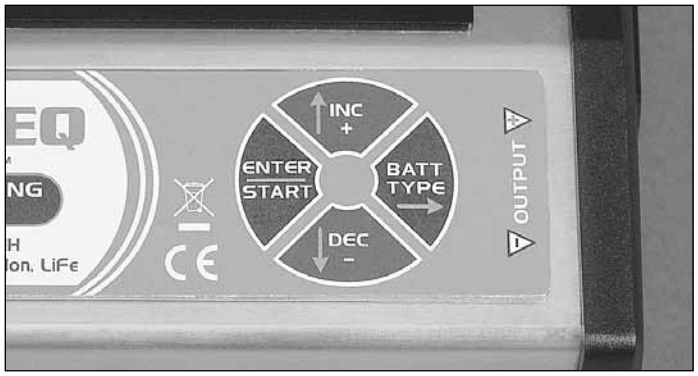
DC Input: This charger can also be powered by a portable 12V DC power source for use at the field. It's best to use a clean DC power source whose output is filtered to remove unwanted electrical noise. Do NOT use an automobile battery charger as a power source. On the left side of the charger, connect the DC power cord's alligator clips directly to the output terminals on the 12V DC power source. Always match polarities (red lead to red "+" terminal, black lead to black "-" terminal). To utilize the charger's **absolute maximum** power capabilities the DC power source must be capable of delivering at least 7.2A while maintaining 11 volts DC.

WARNING! Never accidentally short together the positive (+) and negative (-) DC input connections when connected to 12V DC power. Failure to do so could result in permanent damage to the power source and the charger.

TritonEQ has a maximum overall power rating of 63 watts with DC input, and 50 watts with AC input. If charging a battery with high voltage at high current, or if the input voltage is low, the charger might limit the output current as a result of the charger's maximum power rating. This is normal.

The charger will be on at all times when connected to input power. Disconnect the charger from input power when not in use.

CHARGER CONTROLS AND OUTPUT CONNECTIONS



BATT TYPE button: To change battery type, move to the right through all menus, and to find the data screens.

INC button: To increase values on-screen and move upwards through menus.

DEC button: To decrease values on-screen and move downward through menus.

ENTER/START button: To confirm settings, and to start and manually stop functions.

Lithium Balancing Jack: To connect an adapter for balancing of LiPo batteries. See page 10.

Banana Jacks: Main output for charging, discharging, and cycling.

For best performance it's recommended to use pre-assembled leads to connect batteries to the charger. Always connect the charge lead to the charger FIRST. Then connect the battery to the charge lead. Always match polarities from the battery's lead to the banana jacks (red positive (+) lead to red banana jack, black negative (-) lead to the black banana jack).

WARNING! NEVER allow the positive and negative output connections to touch while a battery is connected to the output. Failure to do so could result in permanent damage to the battery and/or the charger and void your warranty.

Great Planes offers a large variety of charge leads which can be found at most hobby retailers nationwide:

Part Number	Description
GPMM3105	charge lead – banana plug to 2-pin connector
GPMM3148	charge lead – banana plugs to Deans® Ultra® male
GPMM3149	charge lead – banana plugs to Deans® micro
GPMM3200	Balancing lead – 1-6S ElectriFly LiPos
GPMM3201	Balancing lead – 1-6S FlightPower, Thunder Power LiPos
HCAP0101	Futaba J Tx and Rx charge leads, except 9VAP
HCAP0102	Futaba J Tx and Rx charge leads, 9VAP only
HCAP0104	Airtronics/Sanwa Tx and Rx charge leads
HCAP0105	JR/Spektrum Tx and Rx charge leads
HCAP0106	Hitec Tx and Rx charge leads
HCAP0108	Charge leads, banana plugs to alligator clips
HCAP0110	9V-style Tx connector, Futaba-J Rx charge lead
HCAP0310	Banana Plugs (3 pair)
HCAP0320	Heavy Duty Banana Plugs (2 pair)

DETERMINING BATTERY TYPE AND SPECIFICATIONS

IMPORTANT: It is always CRUCIAL to know your battery's exact type, rated voltage and capacity!! To avoid causing permanent damage to your battery, carefully read your battery's label and/or instruction sheet or consult your battery supplier and determine:

1. **Type:** Is the battery a nickel-cadmium (NiCd), nickel-metal hydride (NiMH), lithium-polymer (LiPo), lithium-ion (Li-Ion), lithium ferrite nanophosphate (LiFe), or lead-acid (Pb)?
2. **Rated capacity:** This should be listed on the battery's label in "mAh" ("milli-amp hours"). Capacity is also referred to as the "C" rating. Charge and discharge currents are also expressed as a function of this "C" rating. For example, a 2100mAh battery would have a "1C" charge or discharge current rate of 2100mA or 2.1 amps. This battery's 2C rating would be (2.1 x 2) 4.2 amps, etc.
3. **Rated voltage: NEVER** guess the rated voltage of a lithium battery! If not printed on the battery's outer label, consult your battery supplier or determine pack voltage as follows:
   a. NiMH and NiCd batteries: multiply the total number of cells in the pack by 1.20.
   b. LiPo batteries: multiply the total number of cells in the pack by 3.70.
   c. Li-Ion batteries: multiply the total number of cells in the pack by 3.60.
   d. LiFe batteries (A123): multiply the total number of cells in the pack by 3.30.
   e. Lead-acid (Pb): multiply the total number of cells in the battery by 2.0.

GETTING STARTED – MAIN MENU

All main functions (charge, discharge, cycle) for all battery types are found in the Main Menu. When power is applied, the charger will start at one of the "CHARGE" screens as seen along the top of the Main Menu. More specific details about all settings for all battery types can be found in the included flowcharts.

IMPORTANT: Different parameters exist for each battery type. It's CRUCIAL to use functions in the menu which are marked for your exact battery type!!

To change battery types, press BATT TYPE until the proper battery type is found (moving right across the programming flowchart).

CARE AND HANDLING INSTRUCTIONS FOR NiMH BATTERIES

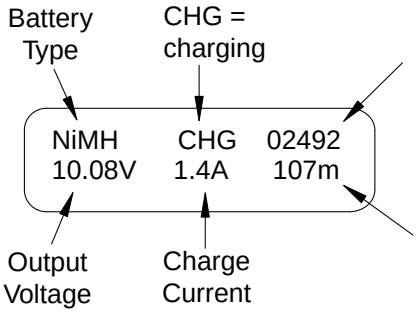
- **NEVER** allow NiMH batteries to overheat, as this could adversely affect their performance or damage the cells. If this happens, disconnect the battery from the charger immediately and allow to cool!
- **NEVER** deep cycle NiMH batteries as permanent damage could result.
- **NEVER** attempt to use the NiCd, Pb, or lithium functions with NiMH batteries.
- Store NiMH packs with some voltage remaining on the cells (refer to battery supplier).

CHARGING NiCd or NiMH BATTERIES

1. In the MAIN MENU, find the "NiCd CHARGE" screen to charge a NiCd battery and skip to step 3.
2. To charge a NiMH battery, press BATT TYPE until the "NiMH CHARGE" screen is found. Press ENTER to confirm this battery type.
3. To change the charge current, press ENTER to cause the value to flash. Press INC or DEC to find the desired charge current (0.1 – 5.0 amps). See the chart on the next page for recommended current settings. Note that "0.1A" is the same as 100mA… "0.8A" is the same as 800mA, etc. Press ENTER, or wait 5 seconds and TritonEQ will automatically confirm this selection.

NiCd and NiMH CHARGE AND DISCHARGE CURRENT CHART			
CHARGE TIPS: Using a current which could fully charge an empty pack in 1 or 2 hours should avoid overheating of the battery. This table shows recommended 1 and 2 hour charge current settings for batteries of different rated capacities. **DISCHARGE TIPS:** More accurate mAh measurements can be achieved when using a current which can discharge the pack in 1 or 2 hours, as shown in the table. Note: The maximum discharge current is 1 amp. And, the maximum power dissipation during discharge is 5 watts, which might cause discharge currents to automatically be limited for packs having high voltage.	Battery Capacity (mAh)	2 Hour Currents	1 Hour Currents
	100-200	0.1A	0.2A
	300-400	0.2A	0.4A
	500-600	0.3A	0.6A
	700-800	0.4A	0.8A
	900-1000	0.5A	1.0A
	1100-1200	0.6A	1.2A
	1300-1400	0.7A	1.4A
	1500-1600	0.8A	1.6A
	1700-1800	0.9A	1.8A
	1900-2000	1.0A	2.0A
	2100-2200	1.1A	2.2A
	2300-2400	1.2A	2.4A
	2500-2600	1.3A	2.6A
	2700-2800	1.4A	2.8A
	2900-3000	1.5A	3.0A
	3100-3300	1.7A	3.3A
	3400-3600	1.8A	3.6A
	3700-4000	1.9A	4.0A
	4100-4300	2.1A	4.3A

4. To **START PEAK CHARGE**, press and hold ENTER for 2 seconds. “BATTERY CHECK, PLEASE WAIT…” will show briefly as TritonEQ evaluates the condition of the battery. If the battery is ready, the charge process will start automatically at which time you’ll see a screen like shown below.



Charge capacity: This is how much capacity (energy, in “mAh”) has been delivered to the pack during charge. For a battery which previously had some charge, this number could be low. For a battery which had little or no charge, this number should be higher (ideally within 10% of the battery’s own mAh rating).

Elapsed charge time: This is the number of minutes the battery has been on charge. For a battery which previously has some charge, this number could be low. For a battery which previously had little charge, this number should be larger.

WARNING! It is normal for NiCd and NiMH batteries to become warm during charge. Disconnect batteries IMMEDIATELY if they become hot at any time! If batteries become overheated, it may be necessary to use a lower charge current in the future. Never attempt to charge batteries at excessive rates, as permanent damage could result.

5. When peak charge is finished, the screen will show “END” and tones will sound for 10 seconds. The charger will automatically go to trickle charge at this time (see the section below for details), but the battery should now be ready for use. Other data measured during charge can be viewed in the DATA VIEW screens, as shown on page 14.

Notes for charging NiCd and NiMH batteries:

- A battery which is approaching- or has reached full charge should become warm to the touch, but never get HOT. If overheated, the battery has likely reached an overcharge condition and should be disconnected from the charger immediately!! Allow the battery to cool before use.
- Lower current means it takes longer to charge, but it's less stressful on the batteries, tends to result in more fully charged batteries, and helps to maximize the battery's lifespan.
- Larger "sub-C" size cells can handle peak charge currents up to 5.0 amps with little heat generation. Smaller "A" and "AA" cells overheat more easily and should be charged at much lower currents. Even smaller "AAA" and "N" cells should be charged at lower rates. Refer to the table on page 6 for recommended charge currents.
- For packs having more than 8 cells, the actual amount of current delivered to the battery might be limited due to the charger's maximum rated output power. This is normal.
- It's a good idea to discharge NiCd batteries before charging on a regular basis, to maintain good operating condition.
- Always recharge NiMH batteries just prior to use.
- The "deltaV" peak detection method is used to charge NiCd and NiMH batteries up to 95-98% full charge. A trickle charge current will automatically be delivered to the battery after peak charge ends. This trickle charge is designed to help the battery safely reach 100% full charge. Trickle charge is applied only after an individual peak charge (not after discharge or cycle), and will remain on until the pack is disconnected. The trickle current value is fixed at a rate being the regular charge current setting divided by 20. A fast charge current of 1.0A will result in a trickle current setting of (1000mA / 20) 50mA. A fast charge current of 600mA will result in a trickle current of (600 / 20) 30mA, etc.
- Charge can be stopped manually by pressing ENTER, or disconnecting the pack.
- A backup safety timer will also automatically stop charge if peak has not been detected in 1.5 hours. This timer can be shut off in the DATA VIEW menu. See page 14.

DISCHARGING NiCd or NiMH BATTERIES

1. To discharge a NiCd battery, first find the "NiCd CHARGE" screen. Then press 🡻 to find the "NiCd DISCHARGE" screen and skip to step 3.
2. To discharge a NiMH battery, first find the "NiMH CHARGE" screen. Then press 🡻 to find the "NiMH DISCHARGE" screen.
3. Two values can be adjusted in the discharge screen. Press the ENTER button until either the discharge current value or discharge cutoff voltage value starts to flash.

   a. For current, press INC or DEC to change this value (0.1 – 1.0 amps). See the chart on page 6 for recommended discharge current settings. Note that "0.4A" is the same as 400mA…"0.9A" is the same as 900mA, etc.

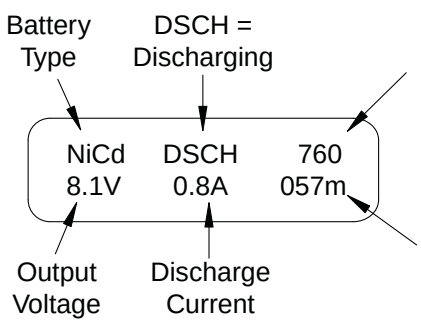
   b. For cutoff voltage - the voltage of the entire pack (not per cell) where discharge will end – press INC or DEC to find the desired cutoff point. NiCd and NiMH cell manufacturers recommend discharging batteries down to 1.0-1.1V per cell. See the chart at right to determine the discharge cutoff point for your battery. Once set, press ENTER, or wait 5 seconds and TritonEQ will automatically confirm both settings.

4. To **START DISCHARGE**, press and hold ENTER for 2 seconds. "BATTERY CHECK, PLEASE WAIT…" will show briefly as TritonEQ evaluates the condition of the battery. If the battery is ready, discharge will start automatically at which time you'll see a screen like shown below.

DISCHARGE CUTOFF SETTINGS - NiCd & NiMH

# cells in the pack	Rated Pack Voltage	*Cutoff Voltage
1	1.2	1.1
2	2.4	2.2
3	3.6	3.3
4	4.8	4.4
5	6.0	5.5
6	7.2	6.6
7	8.4	7.7
8	9.6	8.8
9	10.8	9.9
10	12.0	11.0
11	13.2	12.1
12	14.4	13.2
13	15.6	14.3
14	16.8	15.4

*Cutoff volts based on 1.1V/cell for NiCd/NiMH



Discharge capacity: This is how much capacity (energy, in "mAh") has been delivered from the pack during discharge. For a battery which previously had little charge, this number could be low. For a battery which previously had been fully charged, this number should be high (ideally within 10% of the battery's own mAh rating).

Elapsed discharge time: This is the number of minutes the battery has been on discharge. For a battery which previously had little charge, this number should be low. For a battery which previously had been fully charged, this number should be larger.

5. When discharge is finished, the screen above will show “END” and tones will sound for 10 seconds. The battery can now be re-charged, or disconnected from TritonEQ. Other data measured during discharge can be viewed in the DATA VIEW screens, as shown on page 14.

Notes about discharging NiCd and NiMH batteries:

- Some transmitters might contain a diode in their charge circuit which could prevent the battery from being discharged through the radio’s charge jack. Here, a “No battery” error will show. It’s best to remove the battery from the Tx and connect it directly to TritonEQ for discharging. (see page 4 for a list of adapters).
- For more accurate discharge readings, it’s better to use a current which can discharge the pack in 1 or 2 hours.
- The maximum discharge current is 1 amp. Maximum power dissipation during discharge is 5 watts, which might cause discharge currents to automatically be limited for packs having high voltage.
- Sub-C and some “A” size cells are often used for high current/power applications such as driving electric motors (not for radio system uses). These applications typically result in cells being discharged to voltages below 1.1V per cell. To determine the condition of these cells, it may be desirable to set the discharge cutoff voltage to 0.9V per cell (multiply number of cells in the pack by 0.9). Do NOT attempt to discharge cells to voltages lower than recommended.
- To determine the condition of a battery, compare the final capacity measurement the battery delivered during discharge to the capacity rating listed on the battery’s label. If a battery provides less than 70% of its rated capacity it may need to be replaced. Additional cycles can be attempted to try and revive the battery, but if capacity measurements fail to improve the battery should be replaced.
- Discharge can be stopped manually by pressing ENTER, or disconnecting the pack.

CYCLING NiCd or NiMH BATTERIES

Battery “cycling” is the process of fully charging then discharging a battery to a pre-determined cutoff point (or vise-versa). Cycling is only recommended for NiCd and NiMH batteries, and never for lithium or lead-acid batteries. TritonEQ can perform anywhere from one to five cycles consecutively.

1. First, determine if you want the battery to be discharged first followed by a peak charge (this is sometimes preferred if the battery is used on a regular basis). Or, do you prefer to peak charge the battery first followed by a discharge (sometimes preferred if the battery is new or has not been used for some time)?

2. To cycle a NiCd battery, find the “NiCd CHARGE” screen. Press 🡻 to find either the “NiCd CHG TO DSCH” or “NiCd DSCH TO CHG” screen (depending if you want to charge or discharge first) and skip to step 4.

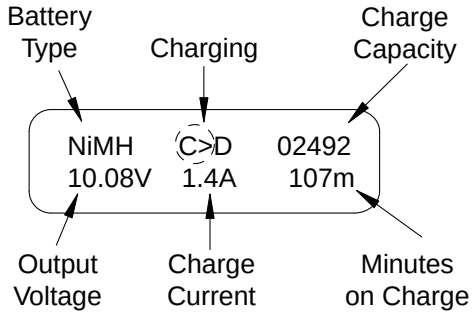
3. To cycle a NiMH battery, find the “NiMH CHARGE” screen. Press 🡻 to find either the “NiMH CHG TO DSCH” or “NiMH DSCH TO CHG” screen (depending if you want to charge or discharge first).

4. To change the value of the charge or discharge current, press ENTER until the appropriate value flashes. **It’s very important to note whether this is the charge (CHG) or discharge (DSCH) current!** Press INC or DEC to adjust the current setting as desired. Press ENTER to select the next current value and adjust it as needed. See the table on page 6 for recommended charge and discharge currents. Press ENTER, or wait 5 seconds and TritonEQ will automatically confirm both settings.

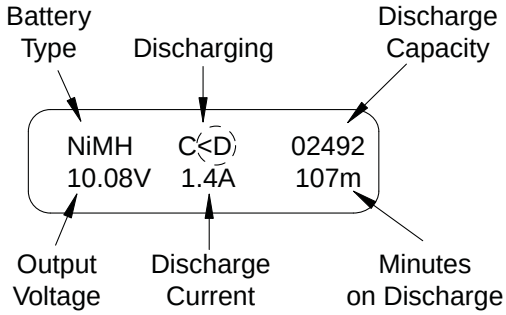
5. Press ENTER until the cycle number “1X” starts to flash. This setting determines how many cycles will be performed consecutively. Press INC or DEC to adjust this setting as desired. Press ENTER, or wait 5 seconds and TritonEQ will automatically confirm this setting.

6. To **START CYCLING**, press and hold ENTER for 2 seconds. “BATTERY CHECK, PLEASE WAIT…” will show briefly, and TritonEQ will start cycling if the battery is in suitable condition, at which time you’ll see a screen like shown on the next page.

CHARGE PORTION OF CYCLE



DISCHARGE PORTION OF CYCLE



7. When all cycling is finished, “END” will show on-screen. Press BATT TYPE to see the DATA VIEW screens for all cycling data (go to page 14). Note that TritonEQ will only show data for the last cycle (not all cycles). If set to cycle 4 times, only data for cycle 4 will be viewable (not for cycles 1, 2, or 3).

Notes for cycling NiCd and NiMH batteries:

- Periodic cycling of NiCd batteries (once per month or two months) can be beneficial in keeping them in good operating condition. Excessive cycling will unnecessarily shorten the lifespan of the battery.
- A short time delay of 3 minutes will occur in-between the charge/discharge functions to allow the battery to cool. This is normal, and cannot be changed.
- During cycle mode, the discharge cutoff voltage for NiCd and NiMH batteries is FIXED (not adjustable) at 0.8V per cell.
- Cell manufacturers note three main benefits of cycling NiCd and NiMH batteries:
  1. Battery maintenance: NiCd batteries benefit the most from regular cycling to help keep them in good operating condition, and is recommended once monthly. NiMH batteries do not require as much cycling. But excessive cycling will unnecessarily shorten the lifespan of the battery.
  2. Determining battery condition: NiCd and NiMH batteries are rated by how much charge energy or “capacity” they can store compared to their rated capacity. A battery that can supply only a small fraction of its rated capacity is likely reaching the end of its useful life and may need to be replaced.
  3. Breaking-in batteries: new NiCd and NiMH batteries may need to be broken-in before they will perform to their specifications. Older batteries which have been unused for an extended length of time may require to be broken-in again to regain their usefulness. Repeated cycling is the best way to revive such batteries.

IMPORTANT CARE AND HANDLING FOR LITHIUM-POLYMER BATTERIES

WARNING!! NEVER ATTEMPT TO CARE FOR LITHIUM-POLYMER (LiPo) OR LITHIUM-ION (Li-Ion) CELLS IN THE SAME WAY AS OTHER BATTERY TYPES! LiPo and Li-Ion cells are much more sensitive and volatile than NiCd, NiMH or lead-acid batteries. Misuse and overcharge can quickly result in LiPo/Ion cells getting hot and/or swelling, which could lead to **VIOLENT EXPLOSION AND/OR FIRE** and serious personal injury and property damage.

- **NEVER** leave the room while charging or discharging lithium batteries!
- **NEVER** place lithium batteries on flammable surfaces during charge.
- **NEVER** attempt to use the NiCd, NiMH, or Pb functions with lithium batteries.
- **NEVER** continue to charge or use LiPo/Ion cells if they start to swell, become overly warm to the touch, or if they do not charge within the specified charging time. Failure to follow this guideline could cause the battery to become hot, and explode or ignite!!
- **NEVER** discharge Li-Ion cells lower than **2.5V per cell**.
- **ALWAYS** have a “class D” fire extinguisher available when handling LiPo batteries.
- LiPo/Ion cells hold charge very well, and should not be trickle charged or cycled.
- LiPo/Ion cells should be charged about once per year at a minimum to prevent over-discharge.
- LiPo/Ion batteries should be stored with about 30%-50% of capacity.
- If LiPo/Ion cells leak fluid, rinse the affected area well with water and seek immediate medical care.

SELECTING LiPo, Li-Ion, or LiFe BATTERY TYPES

TritonEQ can handle lithium-polymer (LiPo), lithium-ion (Li-Ion), and lithium ferrite phosphate (LiFe, such as A123 brand) battery types. While similar in many ways, there are some slight differences amongst these battery types. Setting TritonEQ for the proper lithium type is necessary for safety, and will result in better performance for your packs. Refer to the Lithium Menu flowchart included to set the specific type of lithium battery:

1. Press BATT TYPE until the LiPo CHARGE screen shows.

2. Press ↓ twice to find the “Lithium type” screen.

3. Press ENTER, then either INC or DEC to find the desired lithium type.

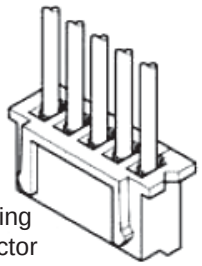
4. Press ENTER, or wait 5 seconds and the new battery type will automatically be confirmed. Once a change in lithium type has been made, all screens and settings relating to lithium batteries will follow the nominal voltage ratings for the battery type selected (as explained on page 5).

BALANCED VS. NON-BALANCED LITHIUM PACKS

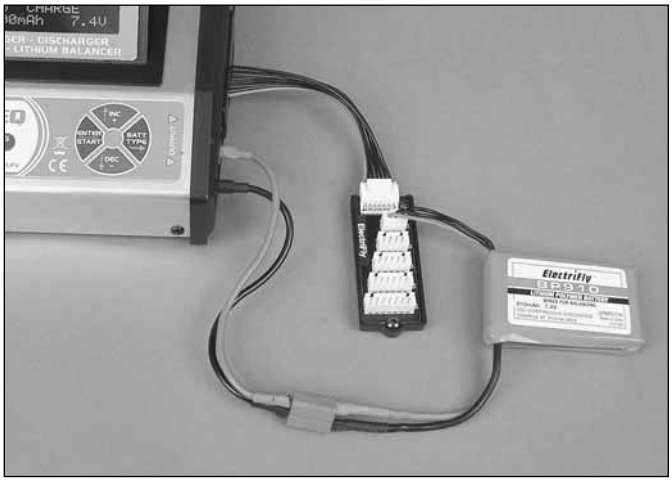
Lithium batteries for R/C are commonly available in two different assembly/wiring configurations: wired for balancing, and non-balanced. It’s important to know which configuration you have before proceeding. Consult your battery supplier if you are unsure if your battery is wired for balancing, if it’s not wired for balancing but has a built-in safety circuit, or neither.

WARNING! It is NOT recommended to charge a LiPo battery which is not wired for balancing, or which does not have a built-in protection circuit! Such types of LiPo batteries have NO means to protect the equipment or the user from damage that could result from an overcharge condition of any single cell in the pack.

Packs wired for BALANCING have a unique connector which has more than two wires going to the pack itself. Each wire is connected to an individual cell inside the pack, by which the charger/discharger monitors the condition of the individual cell and controls whether it should be charged or discharged. Such packs SHOULD be charged with a LiPo charger that is capable of balancing, or with a LiPo charger that is connected to a separate LiPo cell balancer. TritonEQ has a built-in balancing circuit.



Balancing Connector



To balance a LiPo battery during charge or discharge, connect the appropriate adapter to match your battery to the charger’s balancing jack. The red wire will always be on the left (see photo above left). Then connect the battery to the balancing adapter. Lastly, connect the battery’s main power lead to the proper adapter which is already connected to the charger’s banana jacks (note proper polarity, see photo above right).

Note: Anytime a lithium battery is connected to the balancing jack – but NO fast charge is in progress – the charger will attempt to slowly balance the pack by discharging any cells of higher voltage. The LCD will briefly show “SLOW BALANCING” every five seconds during this time. See pages 11 and 12 for details about fast charging and discharging of lithium batteries.

NON-BALANCED packs are wired so the charger can only detect the voltage of the entire pack (not individual cells), so there is only one charge lead. It's highly recommended to ONLY use such types of LiPo packs if they have a built-in charge safety circuit which prevents any single cell in the pack from being overcharged. Simply connect the battery's main power lead to the charger's banana jacks (note proper polarity).

CHARGING LiPo, Li-Ion, or LiFe BATTERIES

WARNING! Always follow the instructions below when charging LiPo/Ion batteries! LiPo/Ion batteries should NEVER get warm or change shape anytime during charge! Disconnect batteries IMMEDIATELY if they become excessively warm or hot or change shape at any time, and refer to the Troubleshooting Guide in the rear of this manual for details. LiPo/Ion cells are much more dangerous than NiCd or NiMH batteries, and pose a significant FIRE HAZARD which can result in causing bodily harm and/ or permanent damage to the cells and the surrounding environment.

1. Find the "LiPo CHARGE" screen (or "Li-Ion CHARGE" or "LiFe CHARGE" screen if you selected either of those lithium types). **IMPORTANT: Two values MUST be set properly in this screen.**

2. Press ENTER to cause the battery capacity value to flash. Then press INC or DEC to find the capacity value that **most closely matches** the capacity rating marked on your lithium battery (noted in "mAh"). TritonEQ will automatically set the proper charge current based on the capacity value entered (see notes section for details).

3. Press ENTER to now cause the voltage value to flash. Press INC or DEC to set this voltage to the **EXACT** nominal voltage rating shown on your pack. Press ENTER to confirm the setting.

WARNING!! NEVER enter a capacity or voltage number that is higher than the value specified for your battery! Failure to follow this warning can cause permanent damage to your battery, charger and surroundings as a result of FIRE!

4. To **START CHARGE**, press and hold ENTER for 2 seconds. "BATTERY CHECK, PLEASE WAIT…" will show briefly, and TritonEQ will start charging if the battery is in suitable condition.

5. When finished charging, the screen will show "END" and tones will sound for 10 seconds. The battery should now be ready for use. TritonEQ will display details about the charge data for your battery, including charge capacity, elapsed charge time, etc. A more complete set of data measured during charge can be viewed in the DATA VIEW screens shown on page 14.

Note: If cells within a pack had been badly out of balance, the charger's backup safety timer might expire before all cells become properly balanced again. If the battery does not seem to have become fully charged after the first charge is complete, attempt to re-charge the pack again.

Notes about charging LiPo, Li-Ion, and LiFe batteries:

- TritonEQ automatically sets the charge current based on the battery's 1C rating. For example, if a capacity of 600mAh is entered TritonEQ will set the charge current at 0.6A (600mA). For a capacity setting of 2500mAh, the charge current will be set to 2.5A (2500mA), etc.
- Lithium based batteries are charged using the "constant current / constant voltage" process (cc/cv). Constant current is delivered during the first part of fast charge. When the battery reaches a pre-set voltage, constant current is no longer delivered, and a constant voltage is applied to the battery. As the battery's voltage becomes equalized to the voltage on the charger's output, charge current will steadily begin to drop. This is normal. When current reaches an approximate value of 1/10C, the charge process will end completely.
- LiPo/Ion batteries do not need trickle charge, and therefore no such function exists.
- For lithium based batteries rated at 11.1V or greater, the actual amount of current delivered to the battery might be reduced due to the charger's maximum power limitation rating. Various circumstances such as battery condition, low input power, etc. can contribute to such a condition. This is normal.
- For safety reasons, fast charge of lithium based batteries will automatically stop if the actual amount of capacity delivered to the battery reaches 110% of the capacity setting entered in point 2.
- A backup safety timer will also automatically stop fast charge if not completed after 3 hours.

DISCHARGING LiPo, Li-Ion, or LiFe BATTERIES

1. At the “LiPo CHARGE” screen (or “Li-Ion CHARGE” or “LiFe CHARGE” screens respectively) press ↓ to find the “LiPo DISCHARGE” screen or similar.
2. Two values can be adjusted in this discharge screen. Press ENTER to cause the discharge current value to flash. Press INC or DEC to change this value.
3. Press ENTER again to cause the discharge cutoff voltage value to flash. Press INC or DEC to adjust this voltage to the proper value. All discharging of the battery will stop when the voltage listed in this screen is reached. Settings for LiPo and Li-Ion batteries are based on 3.0V per cell, so the cutoff settings should be determined as follows:

LiPo and Li-Ion Packs		**LiFe Packs**	
pack size	**cutoff voltage**	**pack size**	**cutoff voltage**
1S	3.0V	1S	2.5V
2S	6.0V	2S	5.0V
3S	9.0V	3S	7.5V
4S	12.0V	4S	10.0V
5S	15.0V	5S	12.5V
6S	18.0V	6S	15.0V

WARNING!! Do not attempt to discharge a LiPo battery below its recommended cutoff voltage. Doing so may cause a failure later when attempting to re-charge the battery, and result in a FIRE!

4. To **START DISCHARGE**, press and hold ENTER for 2 seconds. “BATTERY CHECK, PLEASE WAIT…” will show briefly, and the charger will start discharging if the battery is in suitable condition.

5. When discharge is finished, the screen will show “END” and tones will sound for 10 seconds. The battery can now be re-charged, or disconnected from the charger. TritonEQ will display details about the discharge data for your battery including discharge capacity, discharge time, etc. A more complete set of data measured during discharge can be viewed in the DATA VIEW screens shown on page 14.

Notes about discharging LiPo, Li-Ion, and LiFe batteries:
- For more accurate discharge readings, it’s better to use a current which can discharge the pack in 1 or 2 hours.
- The maximum discharge current is 1 amp. Maximum power dissipation during discharge is 5 watts, which might cause discharge currents to automatically be limited for packs having high voltage.

CARE AND HANDLING FOR LEAD-ACID (Pb) BATTERIES

Do not attempt to care for lead-acid (Pb) batteries in the same way as other battery types! Lead-acid batteries commonly used in R/C hobby field boxes require unique care and handling methods as they contain different characteristics than other battery types.

- Do not attempt to use the NiCd, NiMH, or lithium functions on Pb batteries.
- Do not exceed 14.7V maximum charge voltage for batteries rated at 12V.
- Pb batteries have a self-discharge rate of 5-10%, meaning they hold charge very well. Thus, there is no need to trickle charge Pb batteries. No cycling of Pb batteries is needed.
- Do not leave Pb batteries in the full discharge condition, which could cause the battery to lose its ability to regain full charge.

CHARGING Pb (LEAD-ACID) BATTERIES

1. Press BATT TYPE until the “Pb CHARGE” screen is found.

2. Two values can be adjusted in this screen. Press ENTER to cause the charge current value to flash. Then press INC or DEC to change this value. For common 12V 7Ah lead-acid R/C field batteries, a charge current of 0.5A to 1.0A should safely, fully charge a battery in 7 to 14 hours.

3. Most hobby field batteries have a nominal rated voltage of 12V. Make sure the voltage marked on the battery matches the voltage setting on-screen. To change the voltage, press ENTER until the voltage flashes. Then press INC or DEC to find the proper voltage. Press ENTER to confirm the setting.

4. To **START CHARGE**, press and hold ENTER for 2 seconds. "BATTERY CHECK, PLEASE WAIT…" will show briefly, and TritonEQ will start charging if the battery is in suitable condition.

5. When finished charging the screen will show "END" and tones will sound for 10 seconds. The battery should now be ready for use. TritonEQ will display details about the charge data for your battery, including charge capacity, elapsed charge time, etc. A more complete set of data measured during discharge can be viewed in the DATA VIEW screens shown on page 14.

Notes about charging Pb batteries:
- Lead-acid batteries use the "constant current / constant voltage" method (cc/cv) as explained in the section for lithium batteries. However, different voltage levels are used for evaluating the condition of Pb batteries.
- Lead-acid batteries do not need trickle charge, and therefore no such feature exists.
- Lead-acid batteries have a nominal voltage of 2.0V per cell. For most field batteries, even though you cannot see any individual "cells", there are 6 cells internally. At 2.0V per cell, this makes a total field battery voltage of 12V.
- For lead-acid batteries rated at 12V or greater, the actual amount of current delivered to the battery might be limited due to the charger's maximum rated output power. This is normal, due to various possible circumstances such as the condition of the battery, limitations of the input power source, charge connector/connection, etc.

DISCHARGING Pb BATTERIES

1. At the "Pb CHARGE" screen, press 🡻 to find the "Pb DISCHARGE" screen.

2. Two values can be adjusted on this discharge screen. Press ENTER to cause the discharge current value to flash. Press INC or DEC to change this value.

3. Lead-acid batteries are discharged to 1.8V per cell. Most hobby batteries have a nominal voltage rating of 12 volts – being 6 cells at 2V each. So the proper discharge cutoff voltage for 12V field batteries would be 10.8V (1.8V x 6 cells). Press ENTER to cause the discharge cutoff voltage value to flash. Press INC or DEC to adjust the voltage value as necessary. Press ENTER to confirm the value.

4. To **START DISCHARGE**, press and hold ENTER for 2 seconds. "BATTERY CHECK, PLEASE WAIT.." will show briefly, and TritonEQ will start discharging if the battery is in suitable condition.

5. When discharge is finished, the screen will show "END" and tones will sound for 10 seconds. The battery can now be re-charged, or disconnected from TritonEQ. The charger will display details about the charge data for your battery, including discharge capacity, elapsed time, etc. A more complete set of data measured during discharge can be viewed in the DATA VIEW screens shown on page 14.

Notes about discharging Pb batteries:
- For more accurate discharge readings, it's better to use a current which can discharge the pack in 1 or 2 hours.
- The maximum discharge current is 1 amp. Maximum power dissipation during discharge is 5 watts, which might cause discharge currents to automatically be limited for packs having high voltage.
- The proper discharge cutoff voltage for batteries with a nominal rated voltage of 2V is 1.8V, 4V batteries should be discharged to 3.6V, 6V batteries should be discharged to 5.4V, 8V batteries should be discharged to 7.2V, and 10V batteries should be discharged to 9V.

MISCELLANEOUS FUNCTIONS

Buzzer: Audible tones will sound to identify when a function has started or stopped, when an error occurs, and will sound once for each push of a button to aid in setup. This buzzer cannot be adjusted or turned off.

Memory: When settings are adjusted in the programming, TritonEQ will memorize these settings until changed again manually (even when power is removed from the charger). Note, however, that all measured test data is lost when power is removed from the charger.

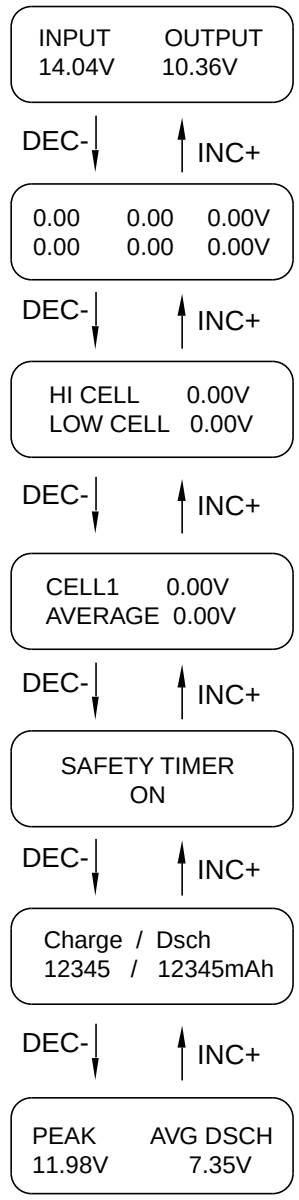
Safety Timer: A backup timer is built-in to protect the charger for safety purposes. If TritonEQ does not properly identify a battery having reached full charge, this timer will automatically stop fast charge to prevent any damage from occurring due to overcharge. The fast charge safety time for NiCd and NiMH batteries is fixed at 1.5 hours (90 minutes), and is 3 hours (180 minutes) for LiPo, Li-Ion, LiFe, and Pb batteries. This function can be turned off (see page 14), but is ONLY recommended if charging NiCd or NiMH batteries at very low currents. Do NOT turn this function off when charging lithium-based batteries.

Peak Delay at Start: The voltage of NiCd and NiMH batteries can be unstable during the very early stages of charge. For this reason, the peak detection circuit is automatically turned off for the first 3 minutes of charge to prevent a premature termination of the charge function. After 3 minutes, the peak detection circuit is automatically turned back on and TritonEQ can accurately detect peak when it actually occurs.

Peak Sensitivity: TritonEQ will automatically stop charging NiCd and NiMH batteries when it detects the battery's voltage has actually dropped **very slightly** just after peak. Identifying this voltage change is called peak sensitivity, which is fixed at 8mV per cell for NiCd batteries, and 5mV per cell for NiMH batteries.

DATA VIEW SCREENS – CHARGE, DISCHARGE AND CYCLE DATA

TritonEQ keeps track of data which can be viewed after any charge, discharge, or cycle function has ended. There are 2 ways to access this menu. While a charge, discharge, or cycle function is in progress, or after any such function has ended, press BATT TYPE to find these DATA VIEW screens shown below. Or, to find this menu BEFORE starting charge, discharge, or cycle, press and hold BATT TYPE for 3 seconds. Re-press BATT TYPE to return to the previous screen.



Press BATT TYPE to return to previous screen.

INPUT: The voltage measured at the charger's input.
OUTPUT: The voltage measured at the charger's output.

This screen shows voltages of individual lithium cells when the balancing function is used. Voltages for cells 1, 2, and 3 are on the top line. Voltages for cells 4, 5, and 6 are on the bottom line.

HI CELL: Shows the highest individual cell voltage measured.
LOW CELL: Shows the lowest individual cell voltage measured.

CELL1: Shows the voltage for cell number 1. Press ENTER to see voltages for other cells in the pack.
AVERAGE: Shows the average of all cells in the pack.

This is a backup safety timer that will automatically shut down the charge process after a certain time if the charger does not recognize that the battery has reached full charge. This timer can be shut off in this screen, which is useful if you wish to slow charge a NiCd or NiMH battery. Leave set to "ON" for lithium batteries! Press "ENTER" to change this setting. This timer will reset to "ON" each time power is removed from the charger.

Charge: The amount of energy (mAh) sent to a battery during a charge period (or charge portion of a cycle). For cycles, only data from the LAST cycle will be shown.
Dsch: The amount of capacity (mAh) drained from the battery during a discharge period (or discharge portion of a cycle). For cycles, only data from the LAST cycle will be shown.

PEAK: The highest or "PEAK" battery voltage measured during charge.
AVE DSCH: The battery's average voltage measured over the course of an entire discharge process is calculated and shown at right.

BATTERY CONDITION: Tracking these voltages over time is helpful for evaluating a battery's overall condition as it ages. Peak and average voltages will decrease as a battery approaches the end of it's lifecycle.

HEAT VENTILATION

Holes are designed in the case to allow hot air to escape to help keep the electronic circuitry cool. This helps to maintain accurate operation and maximize the lifespan of the charger itself. **CAUTION: Do not block the vent holes during operation, as it could cause the charger to overheat and possibly cause permanent damage.**

ERROR INDICATIONS AND SAFETY FEATURES

Solid-state circuitry protects the charger against potential damage which could be caused by short-circuit or reverse polarity conditions. If power is connected backwards to TritonEQ's input, the screen may turn black and no other operation will occur, but it will be protected from damage. Re-check all input connections to make sure it is connected properly.

The following error messages will show on-screen to protect the charger and battery from damage due to improper connection, input voltage, etc. These messages will be accompanied by loud tones on the buzzer. When any message appears, refer to the corresponding problem and solution explanation. Press ENTER to clear the warning.

Error Displayed	**Problem and Solution**
Input voltage	When input voltage is under 11.0V or over 15V.
No battery	When a battery is not detected at the charger's output.
Open circuit	When a battery becomes disconnected while a function is in progress.
Reverse polarity	When a battery is connected to the output in reverse.
Overheating	The temperature inside the charger's case is too high. TritonEQ will pause the current function and show this message. The function will resume automatically after the charger has cooled to an acceptable level.
Time limit over	When the charge safety timer has expired (1.5 hours for NiCd/MH, and 3 hours for LiPo/Ion batteries.
Internal error	When a problem exists within the control circuitry of the charger.
Batt volts too high	When the voltage setting in the charger is too low. It may take up to 5 minutes for this error to show.
Batt volts too low	When the voltage setting in the charger is too high. It may take up to 5 minutes for this error to show.

TROUBLESHOOTING GUIDE

PROBLEM: Display does not work when unit. Check power supply for proper power. Check input connections for proper contact.

PROBLEM: Charger doesn't recognize battery. Make sure battery is not connected backwards. Check for faulty connection or wiring. Perhaps there is a defective cell in the pack, in which case the pack should be replaced.

PROBLEM: Does not automatically stop charge after 1.5 hours for NiCd/MH batteries, or 3 hours for LiPo/Ion batteries. Internal problem might exist. Disconnect battery **IMMEDIATELY** and contact Hobby Services.

PROBLEM: Battery voltage low after charge is completed. Make sure charge current setting isn't too low. Battery might be defective and require replacement. Check to see if the backup safety timer expired before full charge was reached. For lithium batteries, make sure the battery capacity value entered in the programming matches the rated capacity of the battery.

PROBLEM: Will not lock into discharge mode. An improper discharge voltage was entered for the battery. Adjust the battery voltage in the discharge screen to match the number of cells in the pack. Tx might have a diode in charge circuit, in which case it's best to connect the battery to the charger directly (outside of the Tx). Battery might be defective and require replacement. Battery might already be discharged.

PROBLEM: Low mAh readings after discharge. Batteries might not have been fully charged prior to discharge. Batteries might have been old or unused for an extended period of time, which may require additional cycles to see if capacity improves. Battery might be defective and require replacement. Discharge current setting might be too high, and should be lowered. An improper discharge voltage was entered for the battery. Adjust the battery voltage to the proper value for the battery. Battery might already be discharged.

PROBLEM: LCD and/ or controls do not function properly. Input power might be connected backwards, and require re-connection. Input fuse might be blown and require replacement.

*1-YEAR LIMITED WARRANTY – *U.S.A AND CANADA ONLY*

Great Planes warrants this product to be free from defects in materials and workmanship for a period of one (1) years from the date of purchase. During that period, Great Planes will, at its option, repair or replace without service charge any product deemed defective due to those causes. You will be required to provide proof of purchase (invoice or receipt). This warranty does not cover damage caused by abuse, misuse, alteration or accident. If there is damage stemming from these causes within the stated warranty period, Great Planes will, at its option, repair or replace it for a service charge not greater than 50% of its then current retail list price. Be sure to include your daytime telephone number in case we need to contact you about your repair. This warranty gives you specific rights. You may also have other rights, which vary from state to state.

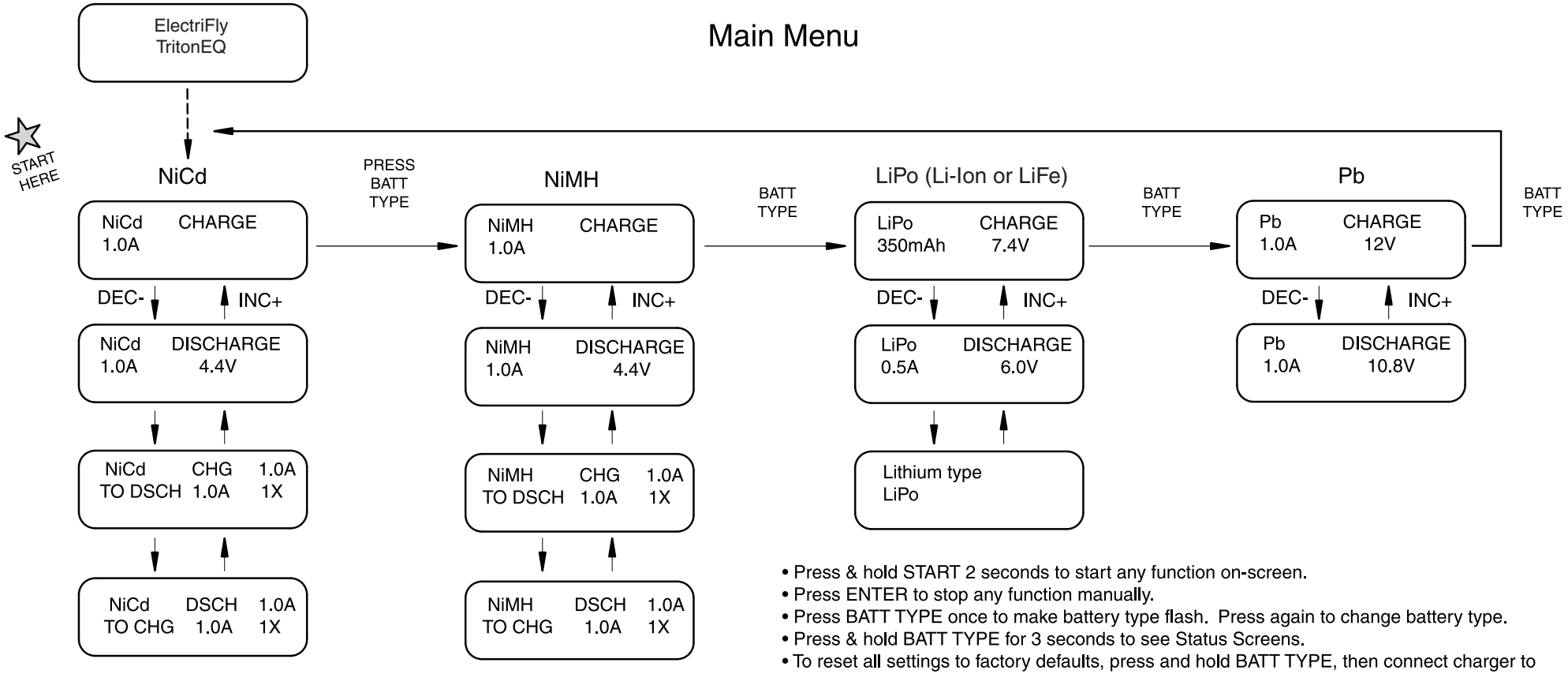
For service on your Great Planes product, warranty or non-warranty, send it post-paid and insured to:

HOBBY SERVICES
3002 N. Apollo Drive, Suite #1
Champaign, Illinois 61822
Tel: 217-398-0007

*For warranty and service information if purchased outside the USA or Canada, see the additional warranty information insert (if applicable) or ask your retailer for more information.

TRITONEQ

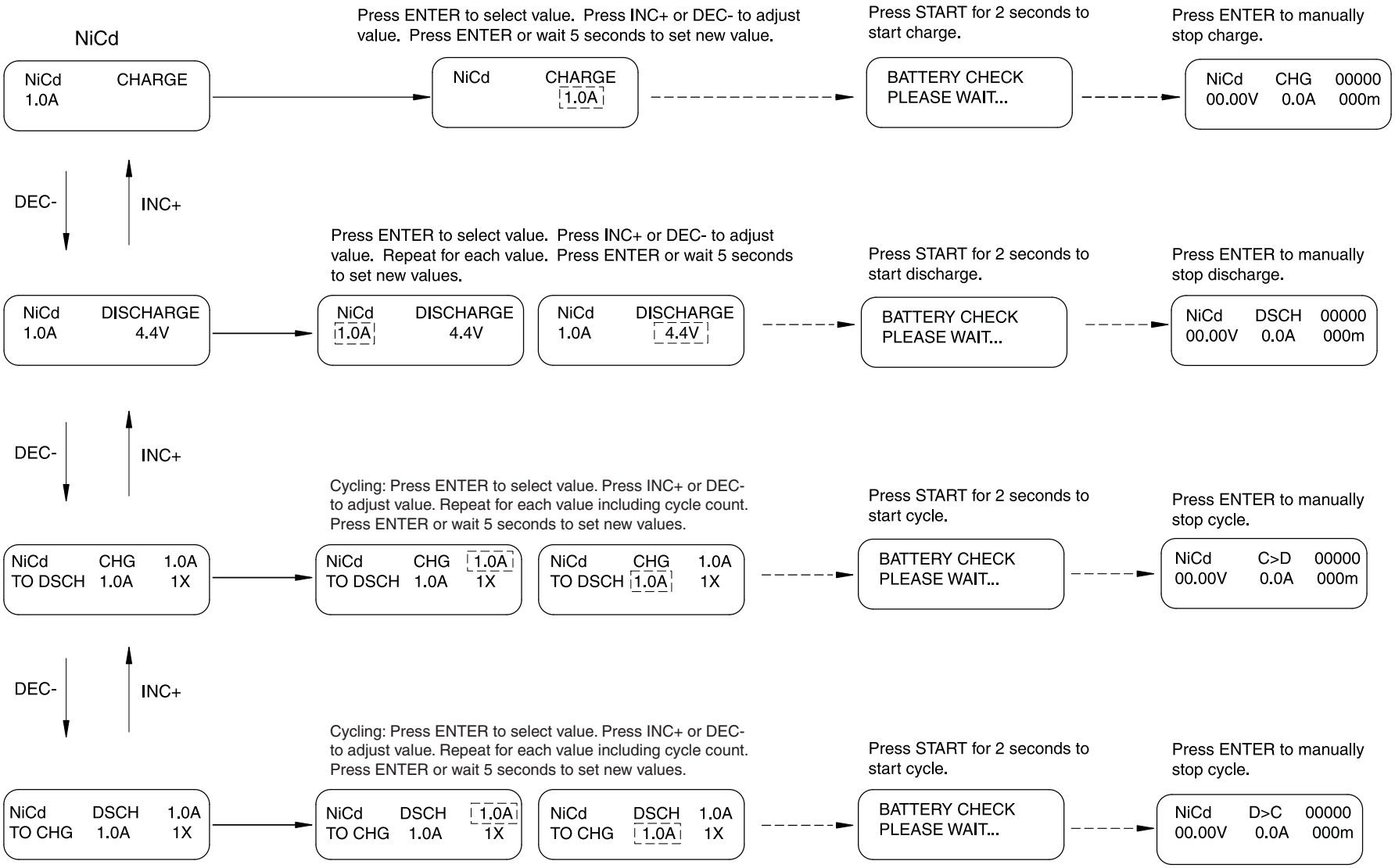
Main Menu



- Press & hold START 2 seconds to start any function on-screen.
- Press ENTER to stop any function manually.
- Press BATT TYPE once to make battery type flash. Press again to change battery type.
- Press & hold BATT TYPE for 3 seconds to see Status Screens.
- To reset all settings to factory defaults, press and hold BATT TYPE, then connect charger to 12V input power.

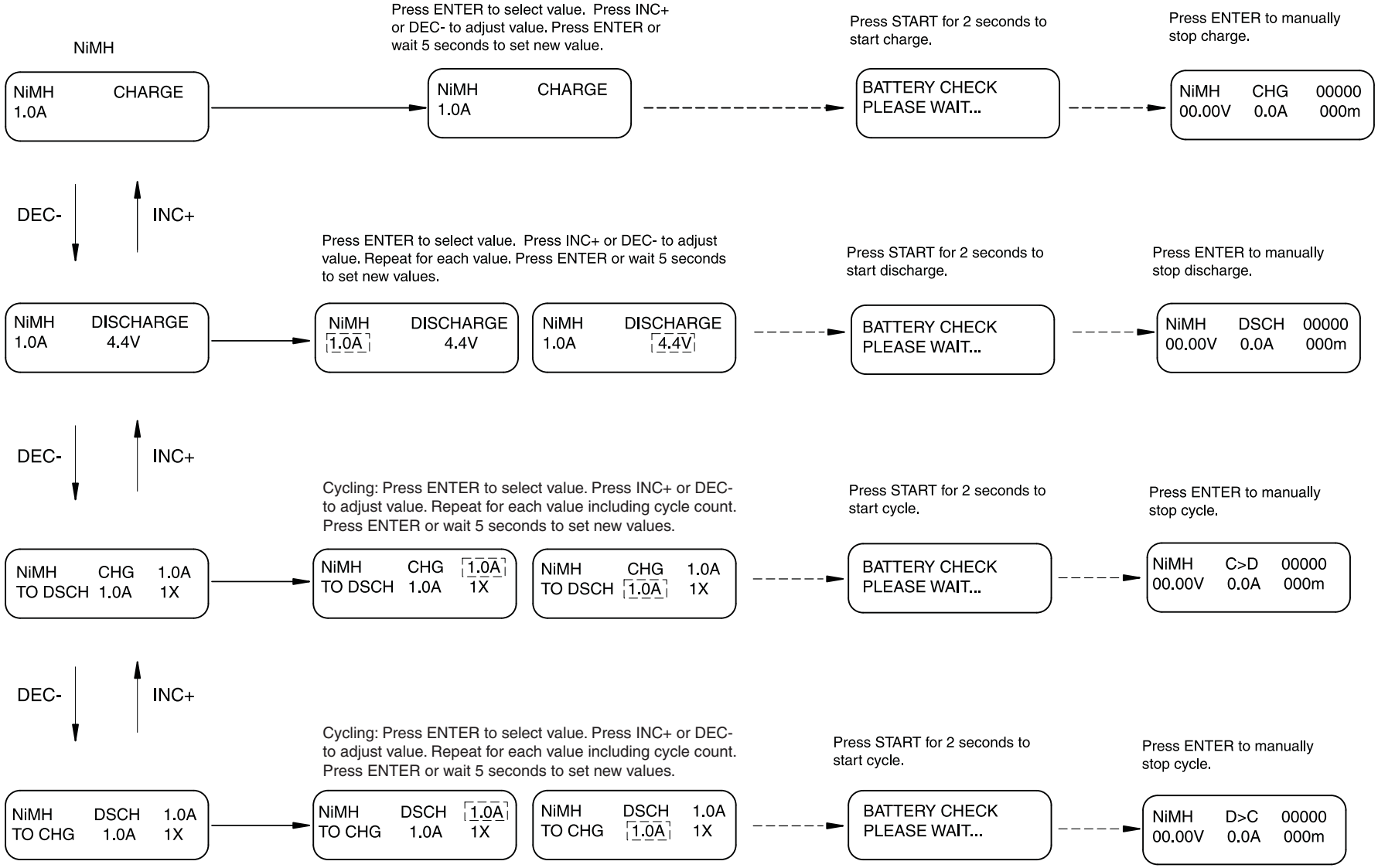
TRITON EQ

NiCd Menu



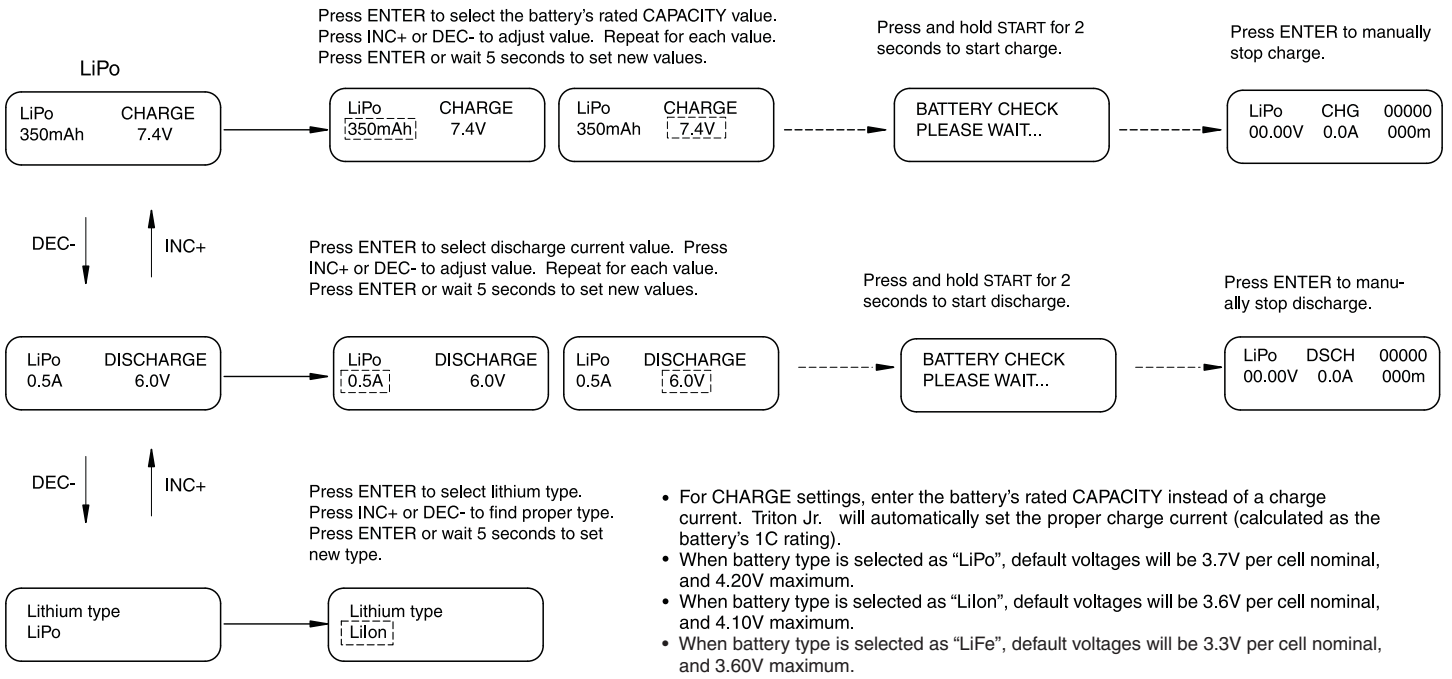
TRITON EQ

NiMH Menu



TRITON EQ

Lithium Menu



- For CHARGE settings, enter the battery's rated CAPACITY instead of a charge current. Triton Jr. will automatically set the proper charge current (calculated as the battery's 1C rating).
- When battery type is selected as "LiPo", default voltages will be 3.7V per cell nominal, and 4.20V maximum.
- When battery type is selected as "LiIon", default voltages will be 3.6V per cell nominal, and 4.10V maximum.
- When battery type is selected as "LiFe", default voltages will be 3.3V per cell nominal, and 3.60V maximum.

Pb Menu