ElectriFly

TRITON

Computerized Charger, Discharger and Cycler

INSTRUCTION MANUAL

QUICK REFERENCE GUIDE

Note: This Quick Reference Guide is a condensed version of only some of the information given in this manual. It is STRONGLY recommended to read this entire manual before operating your Triton charger. Refer to the MAIN MENU page of the included programming flowcharts.

1. Connect Triton to a 12V DC power supply, observing proper polarity.
2. Connect the battery to Triton's output jacks, observing proper polarity.
3. Determine which battery TYPE you have (NiCd, NiMH, Li-Ion/Li-Po, or Pb).
4. Press the BATT TYPE button to find the correct "charge" screen to match your battery type.
5. To charge a battery:
   a. **Note:** See SETUP MENU on page 13 to make sure all misc. charge parameters are properly set.
   b. Determine the appropriate **charge current**. See "Charging Batteries" on page 8 and the "R/C Battery Charge / Discharge Chart," or consult your battery supplier.
   c. Press the round dial then rotate to the appropriate charge current. Re-press dial to confirm setting.
   d. *For Li-Ion/Li-Po and Pb batteries only, rotate the dial to the **rated voltage** of the battery being charged (check battery label). Re-press dial to confirm setting.
   e. Press and hold the dial for 3 seconds to begin charge.
6. To discharge a battery:
   a. Determine the **appropriate discharge current and cutoff voltage**. See "Discharge Current & Cutoff Voltage" on page 11 and the "R/C Battery Charge / Discharge Chart," or consult your battery supplier.
   b. While in the "charge" screen for the appropriate battery type, rotate the dial to the "discharge" screen.
   c. Press the dial then rotate to the appropriate **discharge current**. Re-press dial to confirm setting.
   d. Rotate the dial to set the battery's appropriate **discharge voltage cutoff**. Re-press dial to confirm setting.
   e. Press and hold the dial for 3 seconds to start the discharge process.
7. For cycling functions, see the "Charge-To-Discharge and Discharge-To-Charge" section of this manual.

SPECIFICATIONS

Input Voltage:	10.5 – 15.0V DC
Battery Types, # cells:	1-24 Nickel-Cadmium cells (1.2 – 28.8V NiCd) 1-24 Nickel-Metal Hydride cells (1.2 – 28.8V NiMH) 1-4 Lithium-Ion and Lithium-Polymer cells (3.6 – 14.8V Li-Ion/Li-Po) 3, 6, 12 Lead-Acid cells (6, 12, 24V Pb)
Fast Charge Current:	0.1 – 5.0A linear (2.5A maximum for Li-Ion/Li-Po)
Fast Charge Termination:	"zero deltaV" peak detection for NiCd and NiMH (0ΔV) "constant current / constant voltage" for Pb and Li-Ion/Li-Po (cc/cv) *optional thermal cutoff for all battery types
Trickle Charge Current:	0 – 250mA (n/a for Pb and Li-Ion/Li-Po)
Discharge Current:	0.1 – 3.0A (2.5A maximum for Li-Ion/Li-Po)
Discharge Cutoff Voltage:	0.5 – 1.2V per cell NiCd & NiMH (0.8V/cell fixed during cycle) Pb fixed at 1.8V per cell Li-Ion/Li-Po fixed at 3.0V per cell
Cycle Count:	one to ten cycles (n/a for Pb and Li-Ion/Li-Po)
Battery Memories:	ten battery parameter storage memories
Display Type:	2-line, 32 character LCD
Output Connectors:	banana jacks
Case Size:	6.2 x 4.0 x 2.0 in (157 x 102 x 51mm)
Weight:	16.4 oz. (466g)

* Requires thermal probe – GPMM3151

SPECIAL FEATURES

- Great for tiny park flyers, large scale electrics, Tx and Rx batteries, field batteries, and R/C car batteries!
- Handles 1- 24 NiCd or NiMH cells, 1-4 Lithium-Ion or Lithium-Polymer cells (Li-Ion/Li-Po), or 6, 12, and 24V lead-acid batteries (Pb).
- "Zero deltaV" peak detection with adjustable sensitivity for NiCd and NiMH batteries.
- "Constant current / constant voltage" charge method for Pb and Li-Ion/Li-Po batteries.
- Optional thermal cutoff for fast charge (thermal probe not included).
- 0.1 - 5.0A adjustable charge current (2.5 amps maximum. for Li-Ion/Li-Po).
- Top-off charge feature fully charges NiMHs without overheating.
- 0 - 250mA self-adjusting trickle charge current (NiCd and NiMH only).
- 0.1 - 3.0A adjustable discharge current (2.5A maximum for Li-Ion/Li-Po).
- Adjustable discharge cutoff voltage (fixed for Pb and Li-Ion/Li-Po).
- Charge and discharge currents adjustable in 0.1A (100mA) increments.
- Store parameters for up to 10 batteries in memory.

- Perform 1 to 10 cycles for battery conditioning and evaluation (NiCd and NiMH only).
- Recall data for 10 full cycles on a two-line, 32 character LCD.
- Displays input and output voltage, and memorizes peak and average battery voltages.
- Status screen constantly updates capacity, battery voltage, current, and time during use.
- Adjustable sound cues.
- Warning messages for improper input voltage, poor connections, unsuitable battery condition, reverse polarity on output.
- Safety features include cool-off time delay, maximum NiMH charge input, fast charge safety timer, current overload and reverse polarity protection.
- Built-in cooling fan, for better charge efficiency and extended charger life.

IMPORTANT PRECAUTIONS

- Do NOT attempt to charge incompatible types of rechargeable batteries as permanent damage to the battery and charger could result.
- Do not use automotive type battery chargers to power the charger.
- Do not allow water, moisture or foreign objects into the charger.
- Do not block the air intake holes or the fan vent, which could cause the charger to overheat.
- Do not attempt to use batteries with more cells or total voltage than listed in the specifications.
- Do not leave the charger unattended while charging. **Disconnect the battery and remove input power from charger immediately if the charger becomes hot!!** Allow the charger or battery to cool down before reconnecting.
- Do not place the charger or battery on a flammable surface or near a flammable object while in use. Keep away from carpets, cluttered workbenches, etc.
- Always disconnect from power source when not in use.
- Do not 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.
- Keep out of reach of children.

CARE & HANDLING INSTRUCTIONS FOR NIMH BATTERIES

While similar in appearance to NiCd batteries and having the same 1.2V rating per cell, NiMH cells contain a different chemical makeup which requires different care and handling.

- **Do not to allow NiMH batteries to overheat at any time.** Heat can adversely affect the performance of NiMH batteries. If overheating is observed, disconnect the battery from the charger immediately and allow to cool!

- Do not deep cycle NiMH batteries as permanent damage could result.
- Do not attempt to use Triton's NiCd, Pb, or Li-Ion/Li-Po functions with NiMH batteries.
- NiMH cells do not exhibit the "memory effect" like NiCd cells, so little cycling is needed.
- Store NiMH packs with some voltage remaining on the cells (refer to battery supplier).
- NiMH cells have a self-discharge rate of approximately 20–25% (compared to 15% for NiCd batteries). It is important to recharge NiMH batteries immediately prior to use.

CARE & HANDLING INSTRUCTIONS FOR LITHIUM-ION AND LITHIUM-POLYMER BATTERIES

Never attempt to care for lithium-ion (Li-Ion) or lithium-polymer (Li-Po) cells in the same way as other battery types! Li-Ion and Li-Po cells have characteristics which greatly differ from NiCd, NiMH, or Pb batteries, and thus have different care and handling requirements. Since all "lithium" batteries are not identical, it is important to know exactly which specific lithium type cells you have. While different in physical form, lithium-ion and lithium-polymer batteries do have almost identical operational characteristics and can be cared for the same way. However, do not mistake these cell types for lithium-metal or other lithium hybrids, as different care and handling techniques apply.

- Do not attempt to use Triton's NiCd, NiMH, or Pb functions with Li-Ion or Li-Po batteries.
- **The Li-Ion/Li-Po chemistry is a very volatile mixture. Misuse can quickly result in Li-Ion/Li-Po cells getting hot, exploding, or igniting, which could lead to serious damage or personal injury.**
- Li-Ion/Li-Po cells have an 8% self discharge rate, meaning they can hold charge very well. Thus, there is no need to trickle charge Li-Ion/Li-Po cells.
- Do NOT continue to charge or use Li-Ion/Li-Po cells if they do not recharge within the specified charging time. Failure to follow this guideline could cause the battery to become hot, explode, or ignite.
- Li-Ion/Li-Po cells should be charged about once per year at a minimum to prevent over-discharge.
- Do not discharge Li-Ion/Li-Po cells lower than 3.0V **per cell**.
- Li-Ion/Li-Po cells have no "memory" effect so little cycling is needed.
- Li-Ion/Li-Po batteries should be stored with about 30%–50% of capacity.
- If Li-Ion/Li-Po cells leak fluid, rinse the affected area well with water and seek immediate medical care.
- Do NOT continue to charge or discharge a lithium-polymer battery if it overheats or begins to swell.

WARNING: The Li-Ion/Li-Po chemistry is a very volatile mixture. Misuse and overcharge can quickly result in Li-Ion/Li-Po cells getting hot, which could lead to *violent* explosion and/or fire and serious property damage or personal injury.

It is strongly recommended to only use lithium-ion/lithium-polymer cells which have obtained UL1642 approval to ensure they have been produced in accordance with specific safety criteria. It is also strongly recommended to use UL approved cells which have been assembled with a charge protection circuit built into the pack. Such circuits help to regulate cell operation to make sure they operate within specified current and voltage limits. Batteries not containing a built-in regulative circuit can accidently be overcharged, thus posing significant risk of fire and/or explosion. **Consult your battery supplier if you are unsure if your lithium-ion/lithium-polymer battery has UL1642 approval or includes a built-in protection circuit.**

It is strongly recommended to use the Triton Thermal Probe (GPMM3151) anytime when using a lithium-ion/lithium-polymer battery on the Triton charger. Failure to do so, and failure to properly program Triton to charge lithium-ion/lithium-polymer batteries with proper current and temperature cutoff can result in overcharging the battery. A maximum "temperature cutoff" setting of 100°F (37°C) is recommended.

It is strongly recommended to set Triton's lithium-ion/lithium-polymer charge current at a LOW value for safety purposes. Set Triton's lithium-ion charge current to NO GREATER than 500mA for initial charges. Closely monitor the temperature of the lithium-ion/lithium-polymer cells during charge. **If cells become excessively warm to the touch during charge remove them from the charger immediately,** and reduce the level of charge current for future charges to prevent cells from overheating.

CARE & HANDLING INSTRUCTIONS FOR LEAD-ACID BATTERIES (Pb)

Never 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 Triton's NiCd, NiMH, or Li-Ion/Li-Po 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 trickle charge to Pb batteries.
- Pb batteries do not exhibit the "memory effect" like NiCd cells, and therefore little cycling 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.

INPUT POWER

Triton only accepts DC input power which could come from a power supply or 12V automotive battery. To achieve Triton's maximum potential, the power source must be capable of delivering at least 13 amps of current while maintaining 12 volts DC.

Securely connect the charger's red alligator clip to the positive (+) terminal on the power source, and the black alligator clip to the negative (-) terminal. Triton will display an "Input voltage" error message if the input is below 10.5V or above 15.0V. If this occurs, re-check the input power supply to ensure adequate power is present. It's best to use a clean DC power source whose output is filtered to remove unwanted electrical noise. It's recommended to disconnect the charger from input power when not in use.

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

OUTPUT BATTERY CONNECTIONS

Two banana jacks are located on the right side of the charger for connecting batteries. Securely connect the battery charge lead to these jacks with the positive (+) lead connected to the red jack, and the negative (-) lead to the black jack. It is highly recommended to use pre-assembled charge leads to avoid possible erroneous operation or data as a result of using poor quality connections. "No battery" will be displayed if attempting to start a function without a battery connected to Triton's output. "Open circuit" will be displayed if the battery becomes disconnected while a function is in progress. "Reverse polarity" will be displayed if the battery is connected to Triton's output backwards.

WARNING! Do not short the battery connections, as permanent damage to the battery and/or the charger could result and void your warranty.

CHARGER CONTROLS

Three controls make it extremely easy to scroll through menus and select functions. Under the LCD, the right-hand button marked "BATT TYPE" is typically used to scroll horizontally in the MAIN MENU to set the battery type. The left-hand "MENU" button is typically used to jump between the programming menus. The large dial located on the right side has two modes of operation: rotating the dial in both directions will scroll through menus and adjust parameters quickly and easily, and pressing down on the center of the dial acts as another pushbutton which is often used to select objects on-screen.

MENU STRUCTURE

Triton contains three menus, each with specific functions. Refer to the quick reference flowcharts for these menus included with this manual when programming the charger.

1. The MAIN MENU is where selecting the battery type, charge currents and voltages, discharge currents and voltages, and cycling parameters are found. Adjusting and starting any such function is also performed in this menu. The battery memory storage locations are also in the MAIN MENU where setup parameters for 10 batteries can be stored for easy re-call and charger setup.

2. The SETUP MENU is where many different features that support the charge, discharge, and cycle functions can be found and adjusted. Safety features, time delays, cycle counts, peak detection sensitivity, etc. are some of the adjustable parameters found in this menu.

3. The DATA VIEW MENU is where results of charge and discharge functions are displayed, as well as input, output, peak, and average voltages. This is also where Triton contains and displays data stored in the 10 cycle memories.

MAIN MENU

Note: If an LCD screen which is NOT described in this manual or shown in the included programming flowcharts becomes accessed accidentally, do NOT attempt to adjust any values whatsoever. Simply remove and then re-connect power on Triton's input. If the same problem repeats itself, or if values in any such unlisted screens are adjusted by accident, call Hobby Services for further instructions at (217) 398-0007 before proceeding.

This menu is divided horizontally into five sections. All functions for NiCd batteries are located in the left-most vertical column, followed by functions for NiMH, Pb, and Li-Ion/Li-Po batteries, with the battery memory screens in the right-hand column.

1. BATTERY TYPE: The first and most important step is to **select the proper battery chemistry**. Triton will then automatically adjust all other MAIN and SETUP MENU screens according to which battery type has been selected. When power is applied, Triton will default to the "NiCd charge" screen (top-left of flowchart). Press the BATT TYPE button to scroll horizontally across the MAIN MENU to select the proper battery type; "NiMH charge," "Pb charge," "Li-Ion charge,"(which should be used for Li-Po batteries also), "Battery Memory," or back to "NiCd charge." **IMPORTANT: Different parameters exist for each battery type, so it is important to select the proper battery type.**

2. NiCd AND NiMH FUNCTIONS: When either the "NiCd charge" or "NiMH charge" screen is shown, rotate the dial to scroll vertically through the "discharge," "charge-to-discharge" cycle, "discharge-to-charge" cycle, and back to peak "charge" functions.

3. Pb AND Li-Ion/Li-Po FUNCTIONS: When the "Pb charge" or "Li-Ion charge" screen is shown, rotate the dial to scroll vertically through the full "charge" and "discharge" functions. Cycling functions are not available for Pb or Li-Ion/Li-Po batteries.

4. BATTERY MEMORIES: Triton includes memory locations for storing specific parameters for up to 10 different batteries. When the "Memory (10) NiCd" screen is shown, press the dial briefly to cause the memory number within the parentheses to flash, then rotate the dial to scroll through other battery memory locations. When the desired memory is found, re-press the dial to confirm the selection. Next, rotate the dial to scroll vertically through the following screens for the selected memory: battery type, number of cells, battery capacity, charge current, discharge current, and discharge volts/cell. Adjust any such parameter as needed to match the battery type. When the desired battery memory has been properly adjusted / selected, press MENU and Triton will automatically return to the appropriate "charge" screen for the battery type selected. **Starting** any function cannot be accomplished in the battery memory screens. Triton must be in one of the screens described in points 2 and 3 above to start any function. **Note:** It is not necessary to program batteries into memory. This is merely a convenience if you do not wish to re-configure the charger each time you change batteries.

5. ADJUSTING VALUES: To adjust a value in any screen, briefly press the dial and the adjustable parameter will flash. Rotate the dial to adjust the parameter to the desired value. Re-press the dial to confirm the selection (will stop flashing). If two adjustable parameters show on a single screen, repeatedly press the dial to select the appropriate parameter to be adjusted.

6. STARTING A FUNCTION: To start the function which is displayed on-screen (except while in the "Battery Memory" screens), press and **hold** the dial (do not rotate) for 2 seconds. Triton will perform a brief "Battery Check" to ensure the battery is in suitable condition before proceeding.

Carefully read the following sections for detailed descriptions for all functions within the MAIN MENU. Pressing both the MENU and BATT TYPE buttons simultaneously at any time while in the MAIN MENU will jump to the DATA VIEW MENU.

CHARGING BATTERIES

"NiCd charge" and "NiMH charge:" Triton utilizes the "zero deltaV" peak detection method to charge NiCd and NiMH batteries with linear current. This method can result in a battery safely reaching 95 to 98% full charge, after which time Triton will automatically switch to a gentle trickle charge current. Trickle charge will help the battery safely reach its 100% full charge potential.

Triton will supply trickle charge current to NiCd and NiMH batteries only after an individual peak charge – not after discharge or cycle. Trickle charge rates vary from 0 – 250mA, and are automatically set by Triton (not user adjustable). The trickle charge rate is based on the fast charge current setting and the condition of the battery being charged, and should be as follows:

NiCd Batteries Fast Charge Setting	Trickle Charge Rate
0.1 – 1.0A	0 – 35mA
1.0 – 2.0A	75 – 100mA
2.0 – 3.0A	125 – 150mA
3.0 – 4.0A	175 – 200mA
4.0 – 5.0A	200 – 250mA

NiMH Batteries Fast Charge Setting	Trickle Charge Rate
0.1 – 1.0A	0 – 25mA
1.0 – 3.0A	25 – 50mA
3.0 – 5.0A	50 – 100mA

It's a good idea to properly discharge NiCd batteries before charging. If a NiCd battery is only partially discharged on a regular basis it can develop a so-called "memory effect," where it will only be capable of storing part of its maximum rated capacity. It is difficult to reverse the memory effect and battery replacement is usually necessary. NiMH batteries do not exhibit the memory effect and typically have a high self-discharge rate, so discharging before charging is not necessary.

Sub-C NiCd and NiMH cells used for powering DC motors can withstand peak charge currents up to 5.0 amps with little heat generation. "A" or "AA" cells typically used for radios should not be subjected to such high currents. Many chargers are designed to safely peak charge "A" and "AA" size radio batteries at currents of 2.0 amps or less. Exceeding this rate is not typically recommended. "AAA" and smaller cells (such as "N" size) should be charged at even lower rates to avoid permanent damage from overheating. **Consult your battery supplier for proper charge current information.**

In either the "NiCd charge" or "NiMH charge" screens, press the dial to select the current level, then rotate the dial to adjust this level from 0.1 – 5.0 amps. Re-press the dial to confirm the selection. Low charge currents are more gentle on batteries and tend to result in more accurate, full charges but take longer to fully charge batteries. High charge currents result in much quicker charge times, but are more stressful on batteries and can shorten their overall lifespan. Press and **hold** the dial for 2 seconds to start peak charge. **Note:** When charging NiCd or NiMH packs containing greater than 20 cells, or charging lead-acid batteries rated at 12V or greater, the **actual** amount of current delivered to the battery might not exceed 3.5A. This is normal, and can be attributed to a variety of different circumstances such as the condition of the input power supply, battery being charged, charge connector/connection, etc.

Auto-Mode: If pre-set charge currents are not entered in the menu before attempting to charge a battery, Triton's circuitry will automatically set the appropriate charge current to match the battery. Once the battery is connected and the charge process has been started, Triton will monitor and evaluate the condition of the battery and automatically set a charge current. Because the effectiveness of the auto-mode is dependent on many variables relative to the battery being charged (how much charge currently exists, age and quality of the cells, quality of the charge leads, etc.), Triton will likely produce better results when programmed manually. This, and learning how to specifically care for your batteries will ultimately lead to better performance. Because of their small size (which is directly proportional to their high internal impedance and natural tendency to overheat easily), it is recommended NOT to use the auto-mode for charging small park-flyer type batteries (cells smaller than "AA"). Using the auto-mode for NiCds with a rated capacity of 600-2400mAh, or NiMHs with a rated capacity of 1000-3000mAh is acceptable.

"Pb charge" and "Li-Ion charge:" Triton utilizes the "constant current / constant voltage" method (cc/cv) to fully charge lead-acid, lithium-ion and lithium-polymer batteries. Constant current will be delivered during the initial stages of fast charge. When the voltage of the Li-Ion/Li-Po battery has reached approximately 4.0V per cell, Triton will then change its output to apply a constant-voltage to the battery. Lithium batteries naturally resist charge current as they approach full charge. The constant-voltage application simply allows the battery itself to dictate how much current the charger will deliver for safe, full charges. When current to the battery drops below approx. 100mA, Triton will halt the charge process as the battery will be at full charge.

In the "Pb charge" screen, press then rotate the dial to select and adjust charge current from 0.1 – 5.0 amps. It is also necessary to set the **total** voltage rating of the battery to be charged. Again press the dial to select the voltage level, rotating the dial to set the proper battery voltage of either 6, 12 or 24 volts (see battery label or specifications). Re-press the dial to confirm both settings. Press and **hold** the dial to start the charge process.

In the "Li-Ion charge" screen, press then rotate the dial to select and adjust this charge current from 0.1 – 2.5 amps. It is also necessary to set the total voltage rating for the Li-Ion/Li-Po battery which is to be charged. Press the dial to transfer to the voltage setting, rotating the dial to select the proper battery voltage from 3.6 – 14.8V (see battery label or specs). Re-press the dial to confirm both settings. Press and **hold** the dial to start the charge process.

Having very low self-discharge rates, Pb and Li-Ion/Li-Po batteries do not need trickle charge and therefore no such feature exists. No Auto feature exists for Pb or Li-Ion/Li-Po batteries.

WARNING! Lithium-ion cells are VERY sensitive and volatile. Do NOT attempt to charge Li-Ion/Li-Po cells at excessive currents or temperatures. Failure to do so could result in bodily harm and/or permanent damage to the cells as the lithium-ion chemistry can be very explosive. Lithium-Polymer cells are sensitive as well. Overcharging can cause Li-Po cells to overheat and swell and possibly catch on fire. Disconnect all batteries from the charger IMMEDIATELY if they become very warm to the touch.

THERMAL DETECTION (optional): Pressure builds inside cells as they approach full charge which also results in an increase in the battery's temperature. Monitoring a battery's temperature **in addition** to its voltage can result in the most accurate peak detection method. This feature is optional and requires a thermal probe which is available separately (GPMM3151), but recommended especially when charging NiMH and Li-Ion/Li-Po batteries as they can be very sensitive to heat. Refer to the "Temperature Cut-Off" section in the SETUP MENU (on page 13) for using this feature.

WARNING! It is normal for batteries to become warm during charge or discharge. Disconnect batteries IMMEDIATELY if they become hot at any time! Extra caution must be observed with NiMH batteries as any heating will reduce the lifespan of the battery. In such case, it may be necessary to reduce the fast charge current to lower the possibility of heating. Never attempt to charge batteries at excessive rates, as permanent damage could result.

DISCHARGE CURRENT & CUTOFF VOLTAGE

Triton is capable of discharging batteries at 0.1 – 3.0 amps (2.5A maximum. for Li-Ion/Li-Po), adjustable in 0.1A increments. However, other settings are required for using the discharge function for the different battery types. Do NOT attempt to discharge batteries at rates exceeding recommendations.

The amount of current which can be discharged from a battery is also relative to its physical size. Sub-C size NiCd and NiMH cells can typically provide higher discharge currents than "A," "AA" or "AAA" cells. "AAA" and smaller cells should be subjected to even lower discharge rates. Do NOT attempt to discharge batteries at excessive currents as permanent damage could result. Setting a discharge rate of 0.2-0.3A. will simulate the typical discharge current as seen when used for powering radio transmitters and receiver batteries.

NiCd and NiMH cell manufacturers recommend discharging batteries down to a pre-set voltage level **PER CELL** in the pack, typically being 0.9 volts per cell. This is called the "discharge cutoff voltage". To determine the proper discharge cutoff voltage, multiply the number of cells in the pack by 0.9 and enter this **total** voltage in the "NiCd discharge" or "NiMH discharge" screen. For example, to discharge a 7-cell battery the cutoff voltage would be (7 x 0.9) 6.3 volts. **Note:** When discharging Tx and Rx radio batteries, the discharge cutoff voltage should be set at 1.1 volts per cell. A 4-cell Rx battery would therefore have a discharge cutoff voltage of (1.1 x 4) 4.4 volts. Do NOT attempt to discharge cells to voltages lower than recommended.

"NiCd discharge" and "NiMH discharge:" In either screen, press then rotate the dial to select and adjust this level from 0.1 – 3.0 amps. Next, press the dial to transfer to the discharge voltage setting, rotating the dial to select the proper cutoff voltage for the battery to be discharged, ranging from from 0.4 – 28.9V. Press the dial to confirm the selection. Press and HOLD the dial to start discharge. **Note:** Some transmitters may contain a diode in their charge circuitry which will not allow its internal battery to be discharged. In this case, the Triton charger might not be able to start the discharge process. The best option is to remove the battery from the transmitter and connect it directly to the charger using one of Great Planes' pre-assembled charge leads (see rear of manual for a complete list).

"Pb discharge:" Press then rotate the dial to select and adjust discharge current from 0.1 – 3.0 amps. Press the dial to transfer to the voltage setting, rotating the dial to select the proper cutoff voltage of either 5.4V (for batteries rated at 6.0 volts), 10.8V (for 12.0V batteries), or 21.6V (for 24.0V batteries). Press the dial to confirm the selection. Press and hold the dial to start discharge.

"Li-Ion discharge:" Press then rotate the dial to select and adjust discharge current level from 0.1 – 2.5 amps. It is also necessary to set the discharge cutoff voltage setting. Press the dial to transfer to the voltage setting, rotating the dial to select the proper cutoff voltage of either 3.0V (single cells), 6.0V (2 cells), 9.0V (3 cells), or 12.0V (4 cells). Press the dial to confirm the selection. Press and hold the dial to start discharge.

CHARGE TO DISCHARGE & DISCHARGE-TO-CHARGE CYCLING

Battery "cycling" is the function of subjecting a battery to full charge and full discharge processes in succession. Cycling is available for NiCd and NiMH batteries only, and NOT recommended for Pb or Li-Ion/Li-Po batteries. Cell manufacturers note three main benefits of battery cycling:

A. Battery maintenance: NiCd batteries benefit the most from regular cycling (recommended once monthly) to help reduce the threat of the so-called memory effect. NiMH batteries benefit little from regular cycling as they typically do not suffer from symptoms of memory effect.

B. Determining battery condition: Rechargeable batteries are rated by how much charge "capacity" they can store. A function of how much current a battery can deliver over a given amount of time, capacity is rated in "mAh"or milli-amp hours (large batteries might be rated in "Ah," or amp-hours). If a battery can only supply a small fraction of its rated capacity, it's likely reaching the end of its useful life.

C. Breaking-in a new or unused battery: New batteries often require a short break-in period before they will perform to their rated capacity. Older batteries which have been unused for an extended length of time might require the same treatment to regain their usefulness. Repeated cycling is the best way to revive such batteries.

During charge, Triton will monitor and calculate the amount of capacity or charge energy that is delivered **to** the battery. During discharge, Triton will monitor capacity that was delivered **from** the battery. Discharge capacity measurements can then be compared to the capacity rating specified on the battery itself to determine its overall condition. If a battery provides less than 70% of its rated capacity it may not be safe to use. Additional charge-to-discharge cycles can be attempted to try and revive the battery, but if repeated attempts fail to improve performance the batteries should be replaced.

The "chg-to-dsch" feature charges NiCd or NiMH batteries to peak, then automatically changes to a brief cool-off period, then to discharge mode. This process is often used for evaluating a battery's ability to hold capacity.

The "dsch-to-chg" feature will discharge batteries first, followed by a cool-off period, then by a full peak charge. This method can be used just prior to using the battery in application to ensure the battery is fully charged.

For NiCd and NiMH "Chg to Dsch" and "Dsch to Chg" screens, briefly press then rotate the dial to select the proper charge and discharge currents. **Note:** During cycle mode, the discharge cutoff voltage for either battery type is FIXED at 0.8V per cell. This is not adjustable.

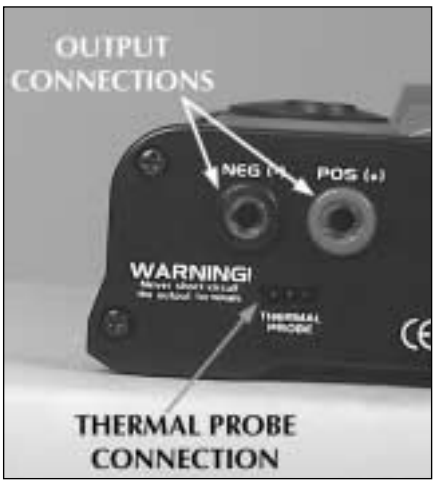
Triton offers the options to set a cool-off time delay between charge and discharge functions, and to cycle a battery up to 10 times in a row. See "Delay Between Charge / Discharge" and "Number of Cycles" in the SETUP MENU (on page 14).

SETUP MENU

Press the MENU pushbutton to access the SETUP MENU, which is divided horizontally into four sections for NiCd, NiMH, Pb, and Li-Ion/Li-Po batteries (changing battery types can ONLY be done through the MAIN MENU). Miscellaneous settings for charge, discharge, and cycling functions are selected in the SETUP MENU. Scrolling through all screens is accomplished by rotating the dial.

1. BUZZER: Sounded at various times during operation to indicate different activities, ten different audible melodies from “Melody 1” to “Melody 10” can be selected by briefly pressing and rotating the dial. Re-press the dial to confirm the selection. “Melody Off” effectively silences the buzzer.

2. SAFETY TIMER: If peak or full charge is not detected, the user-selected safety timer will automatically terminate fast charge to prevent damage to the battery from overcharge. Select a safety time which ranges from "No time limit" to 990 minutes. Recommendations for the safety timer are as follows: **NiMH or NiCd:** batteries having 1000mAh or less – 60 minutes; 1001 to 2000mAh battery – 120 minutes; 2001 to 3000mAh battery – 180 minutes maximum. **Li-Ion/Li-Po:** 60 minutes maximum. **Lead Acid:** 360 minutes maximum. ***Note: These suggested times are just an example based on a charge rate of 1A. Safety timer settings will need to be based on the battery's capacity and the charge rate.*** If charge current is set to a low value, the safety timer can be set to a higher value. If charge current is set to a high value, the safety timer should be set to a shorter value. If this time limit is reached before the battery reaches peak/full charge, “Time limit over” will show on the display and you should NOT assume the battery has reached full charge. It may be necessary to increase this time delay setting to allow the battery to properly reach full charge in the future.



3. TEMPERATURE CUT-OFF: An optional feature, the temperature cut-off is highly recommended for use especially when charging NiMH and Li-Ion/Li-Po batteries. Using this feature requires the purchase of ElectriFly’s Triton Thermal Probe – GPMM3151. Connect the black plug of the thermal probe to the jack on Triton’s right side panel. Slide the white end of the probe onto the battery in parallel with the cells – straddling the area where two cells touch side-by-side. An adjustment screw in the center of the white plug can allow the prongs to be widened or narrowed to **snugly** fit the battery. Ranging from 60–130°F, set the maximum temperature at which Triton should allow batteries to reach during charge. Once a battery reaches this set temperature during charge, Triton will terminate the charge process to protect the battery. Recommended battery temperature settings are as follows: NiCd and NiMH: 125° F; Li-Ion/Li-Po and

Lead Acid – Set for 10° F above room (or field) temperature. **Note:** Failure to make adequate contact between the black tip on the white probe to the battery will prevent this feature from functioning properly. Do not connect the thermal probe to the charger if temperature monitoring will not be used.

The following functions are applicable to NiCd and NiMH batteries only:

4. PEAK DELAY AT START: During the early moments of fast charge a battery's voltage can temporarily be unstable which can cause some peak chargers to prematurely terminate fast charge. Delaying the time at which Triton's peak detection circuitry is activated at the beginning of fast charge can help to avoid this situation. Select a peak delay time, which ranges from 0 to 60 minutes. Typically, a delay of no longer than 3 to 5 minutes is necessary. A delay time of 0 minutes effectively disables this function.

5. NUMBER OF CYCLES: Select from 0 to 10 the number of complete charge-to-discharge cycles the battery should be subjected to in succession. **Note:** All batteries have a "lifecycle" rating, indicating how many cycles a battery can usefully withstand over the course of its life. Periodic cycling of batteries can be beneficial to help keep them in useful condition. Excessive cycling, however, can unnecessarily reduce the useful lifespan of the battery.

6. DELAY BETWEEN CHARGE/DISCHARGE: A battery can often become warm after a charge or discharge period. Triton can insert a user-selected time delay to occur after each charge and discharge period to allow the battery adequate time to cool before being subjected to the next step. Set the charge/discharge delay time, which ranges from 1 to 60 minutes. "DLY" will be displayed any time Triton is in this delay mode.

7. PEAK SENSITIVITY / THRESHOLD: As NiCd and NiMH batteries are being charged their voltage will increase. After their maximum or "peak" charge capacity has been reached the battery's voltage will begin to **decrease**. The point at which Triton will terminate fast charge after peak is called the "peak sensitivity" – sometimes referred to as "threshold." This point can be adjusted by the user, and is set in milli-volts **per cell** in the pack. Using the dial, set the peak sensitivity level. A lower mV sensitivity value can result in **more** precise peak detections, and **higher** mV sensitivity value can result in **less** precise detections. For NiCd batteries, the peak sensitivity ranges from 5mV to 20mV per cell – an initial setting of 10mV is recommended. For NiMH batteries, the peak sensitivity ranges from 3mV to 15mV per cell – an initial setting of 5mV is recommended. Adjust the sensitivity setting as needed to achieve the maximum capacity for the battery.

The following features apply only to NiMH batteries:

8. NiMH MAXIMUM. CHARGE INPUT: This feature sets the maximum charge **capacity** that will be delivered to the battery during charge. NiMHs deteriorate when subjected to excessive heat which can occur if overcharged. If peak charge is not detected by the charger nor has the safety timer expired, this feature will automatically cease fast charge at the user-selected charge input capacity selection. This is also useful when preparing a NiMH battery for long-term storage, as many cell manufacturers recommend to place a partial charge charge on the battery

beforehand. Set the NiMH maximum charge input capacity, which ranges from 0 to 9900mAh. Setting a value of 9900mAh will effectively disable this feature.

9. TOP-OFF CHARGE: When fast charge has terminated the charger will supply the selected amount of "top-off charge" current to help NiMH batteries achieve full charge without overheating. Select the top-off charge rate, from 0 to 1000mA, which should be approximately 7% of the fast charge current setting. For example, if fast charge current is set at 2.5 amps, the top-off charge rate should be set at (2.5A x 0.07) 0.175A or 175mA. If fast charge is 1.0 amps, top-off charge rate should be set at (1.0A x 0.07) 0.70A or 70mA. Triton will automatically terminate the top-off charge after 20 minutes.

DATA VIEW MENU

Triton stores various charge / discharge / cycle data which can be recalled for viewing in the DATA VIEW MENU. This menu can be accessed from the MAIN MENU by pressing the MENU and BATT TYPE buttons simultaneously. Or, this menu can be accessed while Triton is performing a function by pressing only the BATT TYPE button (pressing the MENU button returns the display back to the DATA VIEW MENU). Rotate the dial to scroll through all screens in this menu. All data shown is read-only and cannot be adjusted by the user.

"Input – Output:" The actual voltage being applied to the charger's **input** will be shown on the left, and the voltage measured at its **output** will be shown at right.

"Peak – Average:" The **highest** measured voltage or "peak voltage" recorded during an entire charge period will be shown at left, and the **average** voltage calculated during the entire charge period will be shown at right. Keeping track of both of these measurements every time a battery is charged can help to evaluate its overall condition as the battery ages. Typically, a battery's peak and average voltage levels will gradually decrease as the battery reaches the end of its usefulness.

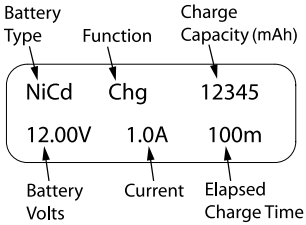
"Chg/Dschg (01):" The amount of capacity delivered **to** the battery during any single charge function will be shown at left, while the capacity delivered **from** the battery during the discharge function will be shown at right (both measured in mAh). This charger stores data for up to 10 cycles. Data for any particular cycle can be retrieved by briefly pressing the dial, causing the cycle number in parentheses to blink. Rotate the dial to select the actual cycle number which is to be displayed. Re-press the dial to confirm the selection.

"Bat. Temperature:" This screen displays the actual temperature of the battery under charge, measured in degrees Fahrenheit (F). An optional feature, it requires the Triton Thermal Probe (GPMM3151) which is available separately. "No sensor" will be displayed if the thermal probe is not connected.

CHARGE / DISCHARGE DISPLAYS

Data pertaining to a function being performed by Triton can be viewed on the LCD while the function is in progress. Data in these screens is active and being updated constantly until the end of the function has been reached. Different screens exist for charge, discharge, charge-to-discharge cycles, and discharge-to-charge cycles.

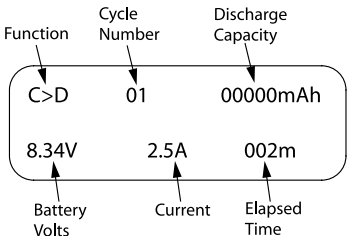
CHARGE DATA: This screen (right) will constantly update and show the battery type in the upper-left, input charge capacity in the upper right (in mAh), and output voltage, charge current, and elapsed charge time (in minutes) along the bottom.



DISCHARGE DATA: This screen (similar to above) will constantly update, showing battery type in the upper-left, discharge capacity upper-right (in mAh), output voltage, discharge current, and elapsed discharge time along the bottom.

CHARGE > DISCHARGE DATA: This screen (right) will show the cycle number top-center, amount of capacity which was discharged FROM the battery top-right (in mAh), output voltage, discharge current, and elapsed discharge time (in minutes) along the bottom.

DISCHARGE > CHARGE DATA: This screen (similar as above) will show the cycle number top-center, amount of capacity – or charge energy – which was delivered TO the battery top-right (in mAh), output voltage, charge current, and peak charge time along the bottom.



Triton allows for the adjustment of current levels WHILE performing a charge, discharge, or cycle function (no need to stop a function and return to another menu). When the LCD is showing any of the displays in this section, briefly press the dial, causing the current value to flash. Then, rotate the dial to the desired current level, and re-press the dial to confirm the new current level. Triton will proceed to complete the function as signaled by the current value changing to show "END." **Note:** For NiMH batteries, when Triton has reached peak charge it will change to "top-off" charge, where the current value on-screen will change to show "TOP." When top-off charge is complete Triton will proceed to show "END."

COOLING FAN

A built-in miniature fan helps to keep all internal components cool during operation. This will help extend the service life of the charger, as well as allow the charger to function more accurately and efficiently. The fan will operate during the following conditions:

A. During discharge.
B. During charge, if the internal temperature exceeds 122°F, if output power exceeds 30W, if output current exceeds 2.5A, or if charging a single cell or packs containing 2 or 3 cells.
C. Anytime the internal temperature exceeds 212°F the charger will stop all charge or discharge functions until the temperature drops below 158°F. The fan will continue to run until the temperature of the charger drops below 113°F.
D. Anytime the fan turns on it will operate until the charge or discharge function is finished unless the internal temperature still exceeds 113°F.

CAUTION: Do not block the vent holes for the cooling fan as an overheating condition could result, possibly causing permanent damage to the charger.

SOLID-STATE CURRENT OVERLOAD & REVERSE POLARITY PROTECTION

The ElectriFly Triton Charger uses solid-state circuitry to protect against potential damage which could be caused by short-circuit or reverse polarity conditions.

REVERSE INPUT POLARITY: If input power to the charger is connected in reverse polarity, the charger will be protected from damage but will not function. Re-check all input connections and the power source to ensure the proper power and polarities are observed.

BATTERY CONDITION PRE-CHECK: Any time a battery is connected to the output the charger will instantly check the condition of the battery and determine if it is suitable for conditioning. In all cases, check the connection between the battery and the charger to ensure a solid physical and electrical connection is made, observing proper polarities at all times.

1. Battery error: If a problem exists with the battery, the display will read "Output battery – connect polarity error." Check the battery for possible problems with its connector or lead. If repeated attempts to use the same battery result in errors, the battery may need to be replaced.

2. Polarity error: If a battery is connected in reverse to the output, the display will show "Output battery – reverse polarity." Re-check the output connections to ensure proper polarities are observed.

OVERHEATING: If Triton's internal temperature exceeds 212°F (100°C) at any time, the charger will automatically pause operations and display "Overheating." This is to protect Triton from damage due to excess heat. Triton will return to normal operation after cooling down to an acceptable level.

TROUBLESHOOTING GUIDE

PROBLEM: Display does not work when unit is connected.
CAUSE AND CURES:
1) Check power supply for improper power.
2) Check input connections for proper contact.

PROBLEM: Charger doesn't recognize battery.
CAUSES AND CURES:
1) Battery may be connected backwards. Connect battery leads properly.
2) Faulty connection or wiring. Correct or replace charge lead.
3) Defective cell in the pack. Replace battery pack or cell.
4) Safety timer and/or temperature cutoff settings too low.

PROBLEM: Does not automatically terminate peak charge after the programmed "safety timer" setting.
CAUSE AND CURES:
Internal problem with Triton Peak Charger. Disconnect battery immediately and contact Hobby Services for further details.

PROBLEM: Battery voltage low after peak charge (below 1.2V per cell).
CAUSES AND CURES:
1) Charge rate setting too low. See "Charging Batteries."
2) Battery connected in reverse. Connect battery leads properly.
3) Defective battery, needs to be replaced.

PROBLEM: Will not lock into discharge mode.
CAUSES AND CURES:
1) Battery connected in reverse. Connect battery leads properly.
2) Cell selector in wrong position. Adjust cell selector to match the number of cells in the pack.
3) Tx has diode in charge circuit. Remove battery and connect directly to Triton Peak Charger, or contact your radio manufacturer for details.
4) Defective cell in pack. Replace battery.
5) Battery already discharged.

PROBLEM: Low mAh/time readings after discharge.
CAUSES AND CURES:
1) Batteries not fully charged prior to discharge. Fully charge batteries prior to discharge.
2) Old or unused batteries. Cycle again to see if capacity improves.
3) Defective battery, needs to be replaced.
4) Discharge rate too high. Change discharge rate to 250mAh for better accuracy.

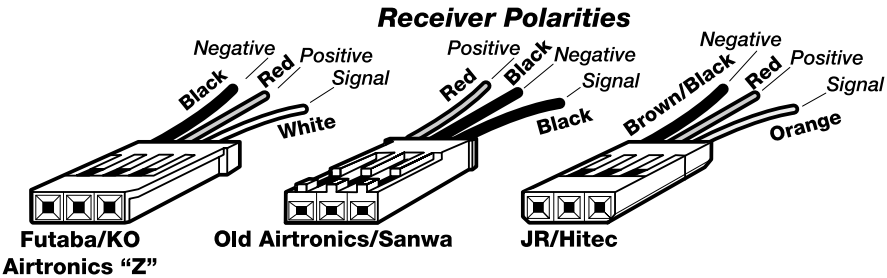
5) Possible internal problem with Triton Peak Charger. Contact Hobby Services for further details

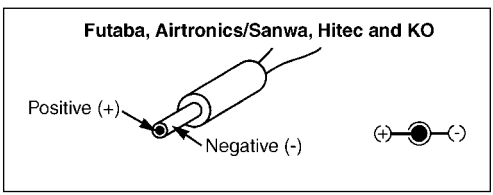
PROBLEM: LEDs and controls do not function properly.
CAUSES AND CURES:
Battery possibly connected backwards. Connect battery leads properly, or contact Hobby Services for further details.

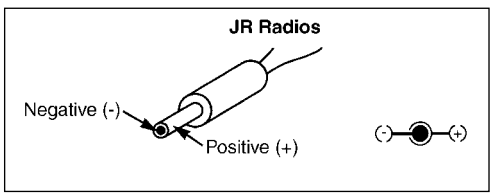
CHARGE LEADS OPTIONAL TRANSMITTER CHARGE ADAPTERS

Great Planes offers a variety of charge leads to match any radio system you may have. These items may be purchased through your local hobby shop.

Part #	**Item Description**
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 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)
GPMM3105	2-PIN/Banana Plug Charge Adapter







1-YEAR LIMITED WARRANTY
**USA 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, IL 61822
(217) 398-0007
www.hobbyservices.com

*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.

CE

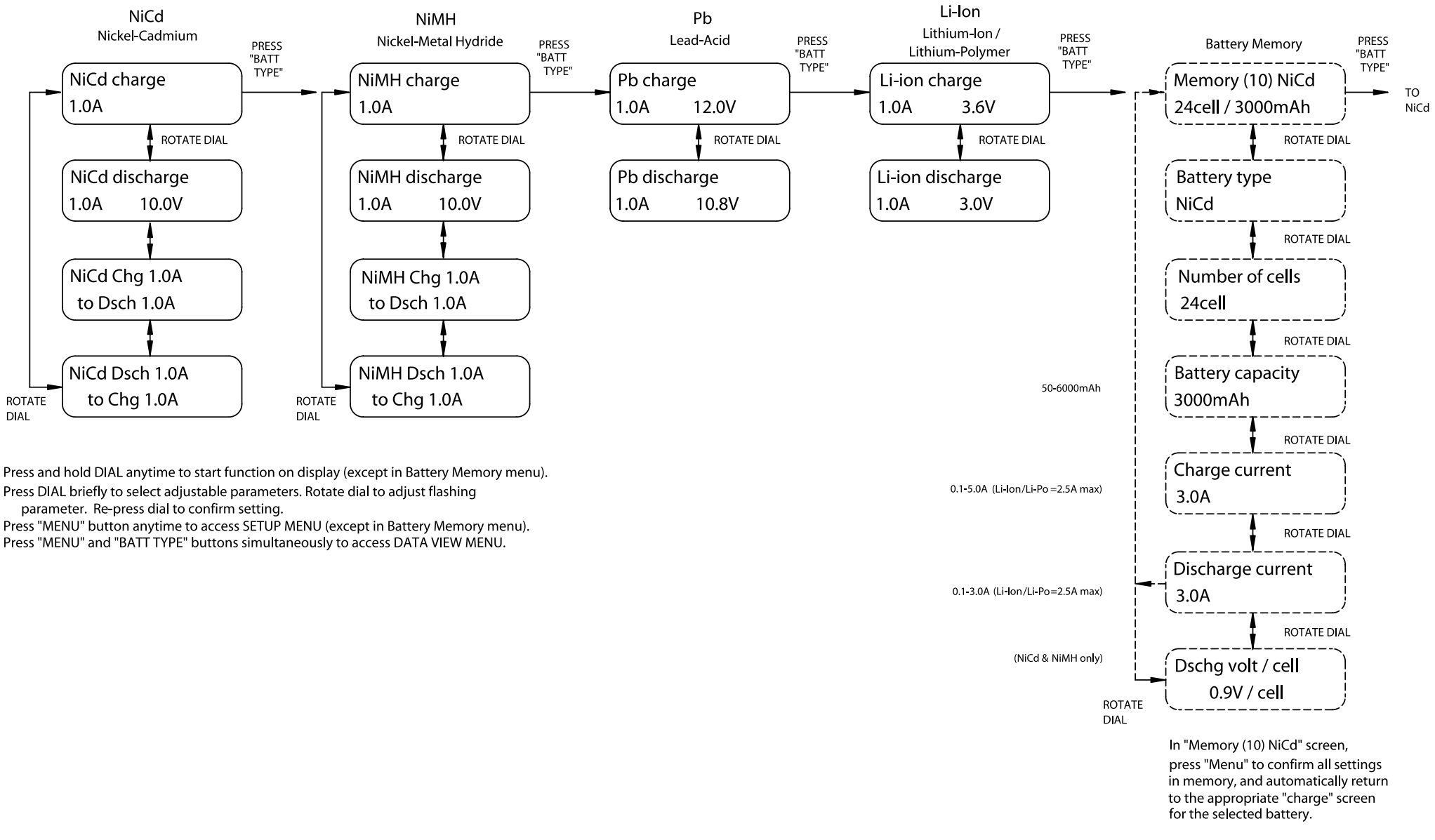
www.greatplanes.com
www.electrifly.com

ElectriFly

TRITON

Programming Flowchart 1

MAIN MENU



Press and hold DIAL anytime to start function on display (except in Battery Memory menu).
Press DIAL briefly to select adjustable parameters. Rotate dial to adjust flashing parameter. Re-press dial to confirm setting.
Press "MENU" button anytime to access SETUP MENU (except in Battery Memory menu).
Press "MENU" and "BATT TYPE" buttons simultaneously to access DATA VIEW MENU.

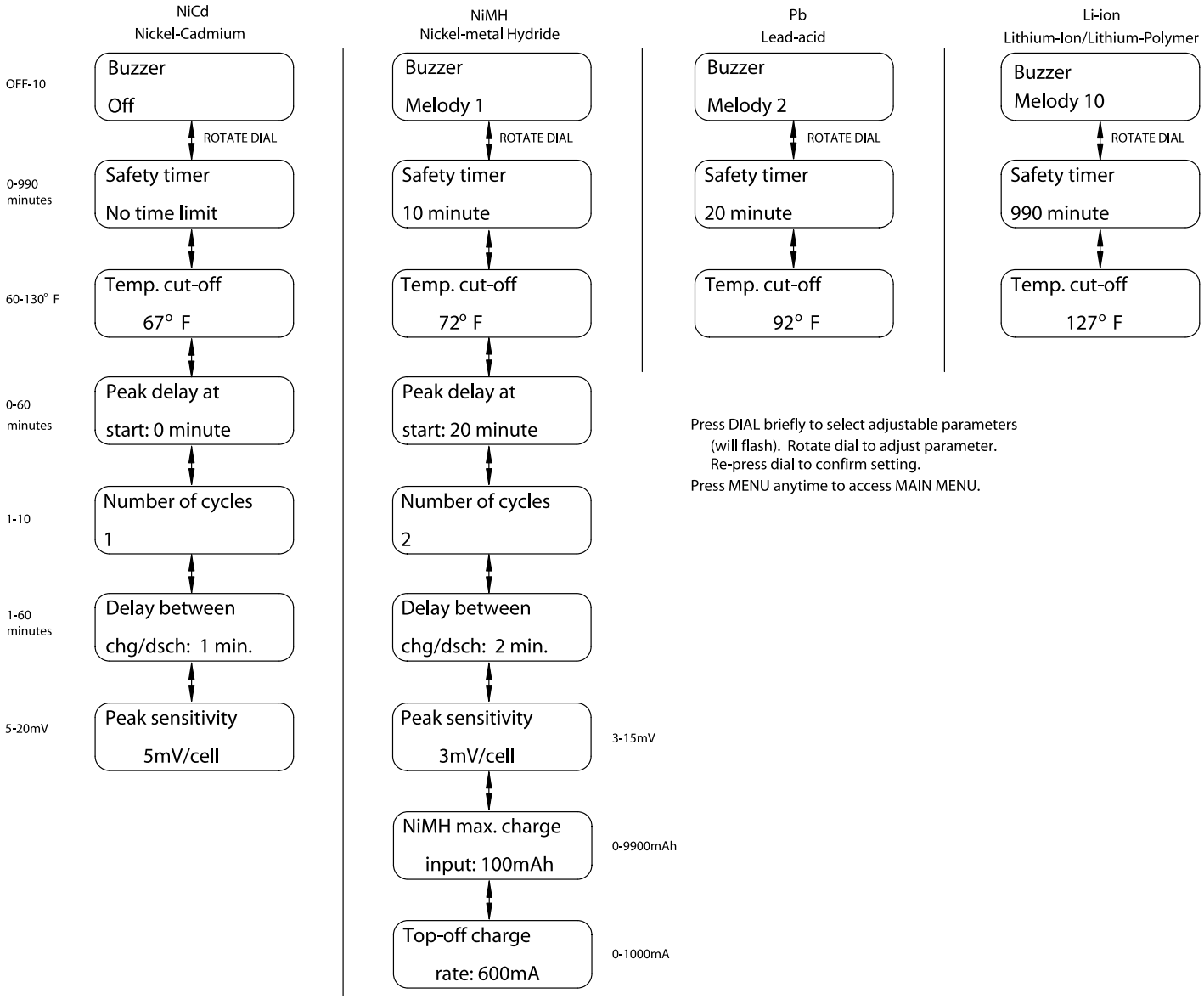
In "Memory (10) NiCd" screen, press "Menu" to confirm all settings in memory, and automatically return to the appropriate "charge" screen for the selected battery.

ElectriFly

TRITON

Programming Flowchart 2

SETUP MENU



Press DIAL briefly to select adjustable parameters (will flash). Rotate dial to adjust parameter. Re-press dial to confirm setting.

Press MENU anytime to access MAIN MENU.

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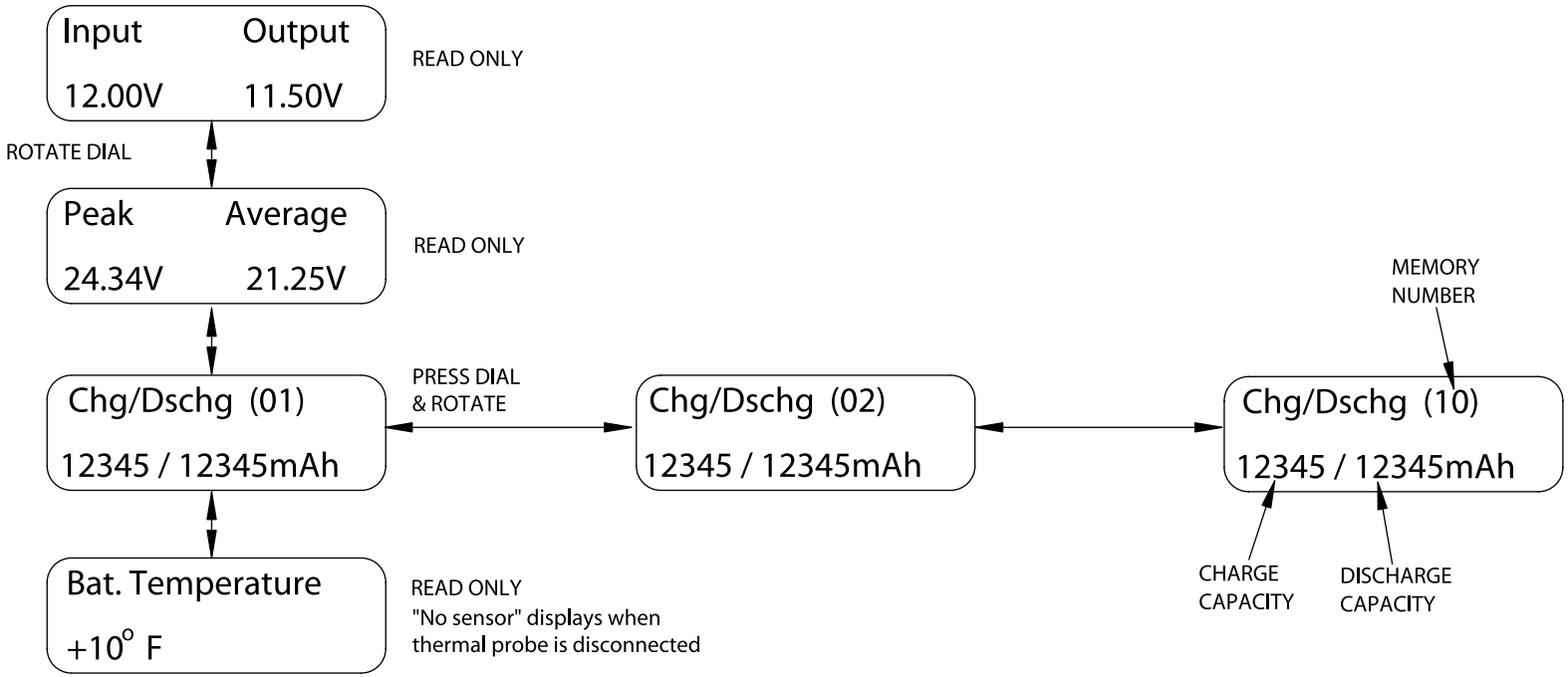
TRITON

Programming Flowchart 3

DATA VIEW MENU



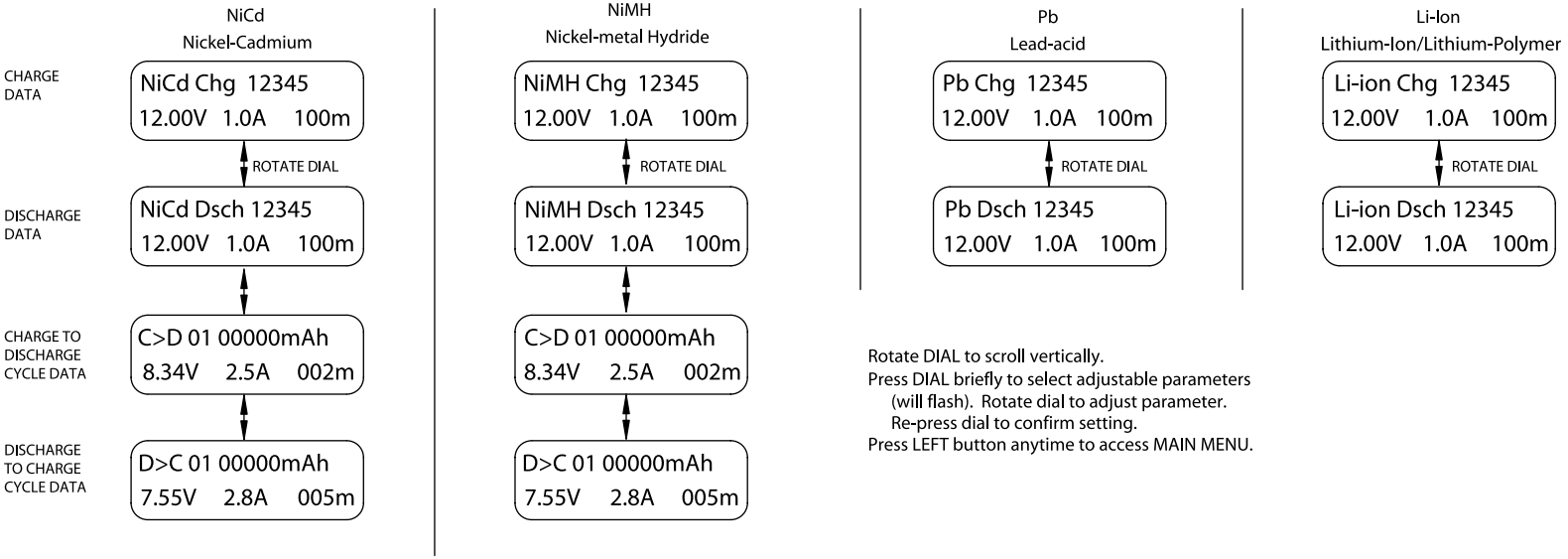
Rotate DIAL to scroll vertically.
Press DIAL, then rotate to scroll horizontally through cycle memory screens.
Press MENU button anytime to access MAIN MENU.

Electrifly

TRITON

Programming Flowchart 4

CHARGE / DISCHARGE DISPLAYS



Rotate DIAL to scroll vertically.
Press DIAL briefly to select adjustable parameters (will flash). Rotate dial to adjust parameter. Re-press dial to confirm setting.
Press LEFT button anytime to access MAIN MENU.

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TRITON

Programming Flowchart 5

ERROR MESSAGES

(Error) Input voltage	When input voltage is under 10.5V or exceeds 15.0V.
(Error) No battery	When a battery is not connected to the charger's output.
(Error) Open circuit	When a battery becomes disconnected during an operation.
(Error) Reverse polarity	When a battery is connected to the output in reverse.
(Error) Time limit over	When the user-selected charge limit has been reached.
(Error) Bat. T too low	When NiMH battery temp. is lower than the user selected value.
Pause Batt.T too high	When battery temp. exceeds the user-selected limit.
Pause Over heating	When the internal temp. of the charger exceeds 212 degrees F.

ElectriFly

TRITON

Operating Characteristics of the Triton Charger

Discharge	(3A Setting)	Charge (5A Setting)	
Voltage (V)	Current (A)	Voltage (V)	Current (A)
1.00	3.00	1.00	1.82
2.00	3.00	2.00	2.00
3.00	3.00	3.00	2.22
4.00	3.00	4.00	2.50
5.00	3.00	5.00	2.86
6.00	3.00	6.00	3.33
7.00	2.86	7.00	4.00
8.00	2.50	8.00	5.00
9.00	2.22	9.00	5.00
10.00	2.00	10.00	5.00
11.00	1.82	11.00	5.00
12.00	1.67	12.00	5.00
13.00	1.54	13.00	5.00
14.00	1.43	14.00	5.00
15.00	1.33	15.00	5.00
16.00	1.25	16.00	5.00
17.00	1.18	17.00	5.00
18.00	1.11	18.00	5.00
19.00	1.05	19.00	4.74
20.00	1.00	20.00	4.50
21.00	0.95	21.00	4.29
22.00	0.91	22.00	4.09
23.00	0.87	23.00	3.91
24.00	0.83	24.00	3.75
25.00	0.80	25.00	3.60
26.00	0.77	26.00	3.46
27.00	0.74	27.00	3.33
28.00	0.71	28.00	3.21
29.00	0.69	29.00	3.10
30.00	0.67	30.00	3.00
31.00	0.65	31.00	2.90
32.00	0.63	32.00	2.81
33.00	0.61	33.00	2.73
34.00	0.59	34.00	2.65
35.00	0.57	35.00	2.57
36.00	0.56	36.00	2.50
37.00	0.54	37.00	2.43
38.00	0.53	38.00	2.37
39.00	0.51	39.00	2.31
40.00	0.50	40.00	2.25

ELECTRIFLY TRITON COMPUTERIZED CHARGER
R/C BATTERY CHARGE/DISCHARGE CHART

BATTERY SPECS			CHARGING					DISCHARGING	
			Break-in charge rate		Standard charge	Quick	Peak Detection	Discharge	Discharge
Type	Size	Capacity	0.1C rate	minutes	rate at 1C	charge rate	Sensitivity	current	cutoff voltage
NiCd	N/AAA	50mAh	0.1A	30	0.1A	0.1A (2C)		C÷5 when checking the battery's ability to hold it's rated capacity. 2C for quick discharges.	0.9 volts per cell
		110mAh	0.1A	66	0.1A	0.2A (2C)			
		150mAh	0.1A	90	0.2A	0.3A (2C)			
		250mAh	0.1A	150	0.3A	0.5A (2C)			
		300mAh	0.1A	180	0.3A	0.6A (2C)			
	AA	500mAh	0.1A	300	0.5A	1.0A (2C)			
		600mAh	0.1A	360	0.6A	1.2A (2C)			
		700mAh	0.1A	420	0.7A	1.4A (2C)			
		800mAh	0.1A	480	0.8A	1.6A (2C)			
	A	1000mAh	0.1A	600	1.0A	2.0A (2C)	8-10mV per cell		
		1100mAh	0.2A	330	1.1A	2.2A (2C)			
		1200mAh	0.2A	360	1.2A	2.4A (2C)			
		1300mAh	0.2A	390	1.3A	2.6A (2C)			
		1400mAh	0.2A	420	1.4A	2.8A (2C)			
	Sub-C	1400mAh	0.2A	420	1.4A	4.2A (3C)			
		1500mAh	0.2A	450	1.5A	4.5A (3C)		(0.2-0.3A when testing Rx and Tx batteries for useful flight time)	(1.1 volts per cell when testing Rx and Tx batteries for useful flight time)
		1800mAh	0.2A	540	1.8A	5.0A			
		1900mAh	0.2A	570	1.9A	5.0A			
		2000mAh	0.2A	600	2.0A	5.0A			
		2400mAh	0.3A	480	2.4A	5.0A			
NiMH	N/AAA	300mAh	0.1A	180	0.3A	0.6A (2C)			
		500mAh	0.1A	300	0.5A	1.0A (2C)			
		600mAh	0.1A	360	0.6A	1.2A (2C)			
		700mAh	0.1A	420	0.7A	1.4A (2C)			
	AA	1200mAh	0.1A	720	1.2A	2.4A (2C)			
		1300mAh	0.1A	780	1.3A	2.6A (2C)			
		1400mAh	0.1A	840	1.4A	2.8A (2C)			
		1500mAh	0.2A	450	1.5A	3.0A (2C)			
		1600mAh	0.2A	480	1.6A	3.2A (2C)	3-5mV per cell	same as above	same as above
	A	1500mAh	0.2A	480	1.6A	3.2A (2C)			
		1700mAh	0.2A	510	1.7A	3.4A (2C)			
		1800mAh	0.2A	540	1.8A	3.6A (2C)			
		1900mAh	0.2A	570	1.9A	3.8A (2C)			
		2000mAh	0.2A	600	2.0A	4.0A (2C)			
	Sub-C	3000mAh	0.3A	600	3.0A	5.0A			
		3300mAh	0.3A	660	3.3A	5.0A			

BATTERY SPECS		CHARGING			DISCHARGING	
		Standard charge rate	Quick charge	Maximum voltage	Discharge	Discharge
Type	Capacity	at 0.3C	rate at 0.7C	per cell	current (C÷5)	cutoff voltage
Lithium-Ion or Lithium-Polymer	600mAh	0.2A	0.4A	4.2 volts	0.1A	3.0 volts per cell
	1200mAh	0.4A	0.8A		0.2A	
	1800mAh	0.6A	1.3A		0.4A	
					C÷5 discharge current to compare battery to manufacturer specs - 2C max. for speed	

BATTERY SPECS		CHARGING			DISCHARGING	
		Standard charge rate	Quick charge	Maximum voltage	Discharge	Discharge
Type	Capacity	at 0.1C	rate at 0.3C	per cell	current (C÷20)	cutoff voltage
Lead-acid	4.5Ah	0.5A	1.5A	2.5 volts	0.3A	1.75 volts per cell
	7Ah	0.7A	2.3A		0.4A	
	10Ah	1.0A	3.3A		0.5A	
					C÷20 discharge current to compare battery to manufacturer specs - 1C max. for speed	

"C" equals the capacity rating of a battery as printed on it's label.

For a 500mAh battery: "1C" = 500mA or 0.5 amps "2C" = 1000mA or 1.0 amps (500x2) "C/5" = 100mA or 0.1 amps (500÷5)
For a 1300mAh battery: "1C" = 1300mA or 1.3 amps "2C" = 2600mA or 2.6 amps (1300x2) "4C" = 5200mA or 5.2 amps (1300x4)

R/C BATTERY CHARGE/DISCHARGE RECOMMENDATIONS

IMPORTANT - Manufacturers rate batteries in terms of "capacity" or "C," which is usually listed in mAh (milli-amp-hours). A battery's capacity or "C" rating should be printed on its label. Charge and discharge currents are expressed as a function of this "C" rating. For example, a 500mAh battery has a "1C" rating of 500mA. To charge this battery at, say, 2C means the charge current should be (500 x 2) 1000mA or 1.0 amps. To discharge this battery at C/5 means the discharge current should be (500 ÷ 5) 100mA. It is important to know your battery's capacity rating, because charge and discharge rates are typically expressed as a function of this "C" value.

NiCd (nickel-cadmium) and NiMH (nickel-metal hydride) batteries:

CHARGING:

1. Slow charge to break-in batteries that are new or have been in storage for some time: set charge current at 0.1C (C x 0.1), and set the "Safety timer" at 960 minutes.
2. Quick charges:
   a. N, AAA, AA and A size cells can safely be charged at charge currents of 2C. A 600mA battery would be charged at (600 x 2) 1200mA or 1.2A.
   b. Most sub-C size cells can safely be charged at 3C.
   c. Lower charge rates are less stressful on cells and will extend service life. Reduce charge current if battery overheats.
   d. Set peak sensitivity to 8-10mV per cell for NiCd batteries, and 3-5mV per cell for NiMH batteries. Reduce peak sensitivity values if battery overheats during charge. **Read through the "Setup Menu" section of Triton's manual completely to properly set all other charge parameters.**

DISCHARGING:

1. Discharge cutoff voltage: Set by multiplying the number of cells in the pack by 0.9. Cutoff for a 7-cell battery would be (7 x 0.9) 6.3 volts.
2. To determine if a battery can deliver its **rated capacity:** Set discharge current at C/5. A 1000mA battery would be discharged at (1000 ÷ 5) 200mA or 0.2A.
3. To determine a **motor/power battery's** ability to provide high currents: Set discharge current to 4C max. A 1200mA battery would be discharged at (1200 x 4) 4800mA or 4.8A. Larger capacity batteries can be discharged at 5.0A maximum.
4. To determine the **useful flight time of Rx and Tx batteries:** Set discharge current to 0.2 or 0.3A, AND set the discharge cutoff voltage to 1.1 multiplied by the number of cells in the pack. For example, a 4-cell Rx pack would be set to (1.1 x 4) 4.4 volts.

FOR LEAD-ACID AND LITHIUM-ION / LITHIUM-POLYMER BATTERIES, ALWAYS CONSULT YOUR BATTERY SUPPLIER FOR EXACT CHARGE AND DISCHARGE SPECIFICATIONS AS PERFORMANCE VARIES BETWEEN CELL MANUFACTURERS!

Pb batteries (lead-acid):

CHARGING - Read Triton's manual to properly set the safety timer in the SETUP MENU:

1. Battery voltage: Set "Pb charge" voltage to match the voltage rating printed on the battery.
2. Slow charge: Set "Pb charge" current at C/10. For a 7Ah (7000mAh) battery, current would be (7000 ÷ 10) 700mA or 0.7A.
3. Fast charge: Set "Pb charge" current at C/3. For a 7Ah battery, this current would be (7000 ÷ 3) 333mA or 2.3 amps.

DISCHARGING:

1. Discharge cutoff voltage: Set "Pb discharge" voltage to 1.75 multiplied by the number of cells in the battery.
2. To determine if a battery can deliver its rated capacity: Set "Pb discharge" current at C÷20. A 7Ah (7000mAh) lead-acid battery would be discharged at (7000 ÷ 20) 350mA or roughly 0.4A.

Lithium-Ion (Li-Ion) and Lithium-Polymer 9Li-Po) batteries

CHARGING - Read Triton's manual to properly set the safety timer in the SETUP MENU:

1. Battery voltage: Set "Li-Ion charge" voltage to be 3.6 multiplied by the number of cells in the battery.
2. Slow charge: Set "Li-Ion charge" current at 0.3C.
3. Quick charge: Set charge current at 0.7C. Some cell brands may allow for a quick charge of up to 1C. ALWAYS consult the cell supplier to confirm what is an acceptable fast charge rate. **NEVER overcharge lithium batteries!!**

DISCHARGING:

1. Discharge cutoff voltage: Set "Li-Ion discharge" voltage to 3.0 multiplied by the number of cells in the battery.
2. To determine if a battery can deliver its rated capacity: Set "Li-Ion discharge" current at C/5 (C÷5).
3. For quick discharges: Set discharge current to no higher than 2C maximum.