

# Operating Manual

**PRODIGY640**  
DC

Professional Balance Charger



**ProtekRC**

**PRODIGY640**  
DC

# Prodigy 640 DC

## Operating Manual

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# 1 Specifications

**Input Voltage:** DC 11.0V – 32.0V

**Charge Current Range:** 0.1 – 40.0A

**Discharge Current Range:** 0.1 – 40.0A

**Charge Power:** Input < 24V:500W / Input > 24V:1000W

**Discharge Power Limit:** Max. 100W

**Energy Transfer Mode:** Max. 1000W

**Balance Tolerance:**  $\pm 0.01V$

**Balance Current:** Max. 1000mA

**NiCd/NiMH Battery Cell Count:** 1 – 16 Cells

**LiPo/LiFe/Li-Ion Cell Count:** 1 – 6 Cells

**Pb Battery Voltage:** 2 – 20V

**Digital Power:** 3 – 24V

**USB Charge Current:** 5V/1A

**Weight:** 1520g

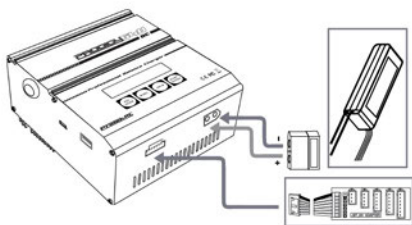
**Dimensions:** 148x167x78mm

## 2 Connection

### Connection Diagram in the Balance Charging/Storage/Discharge Mode

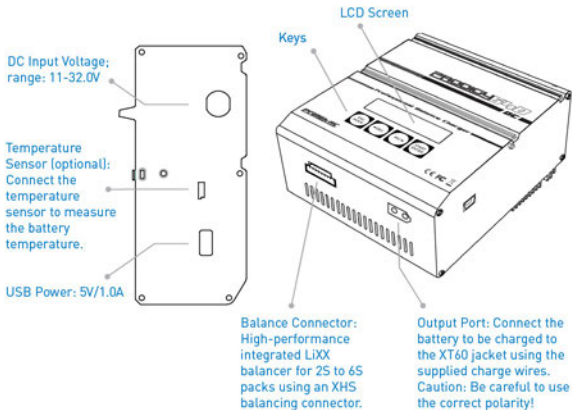
**WARNING:** Read the ENTIRE instruction manual to become familiar with the features of the product before operating.

**WARNING:** Never leave charger unattended, exceed maximum charge rate, charge with non-approved batteries or charge batteries in the wrong mode. Failure to comply may result in excessive heat, fire and or serious injury.



**CAUTION:** Always ensure the battery you are charging meets the specifications of this charger and that the charger settings are correct. Not doing so can result in excessive heat and other related product malfunctions, which can lead to user injury or property damage.

## 3 Exterior



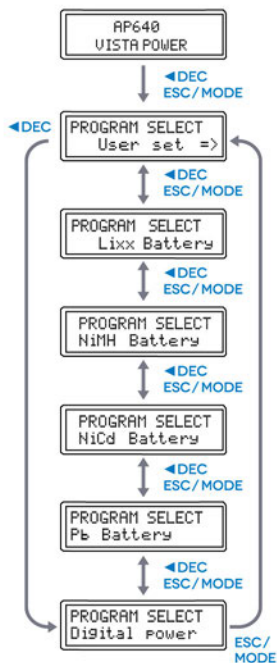
**CAUTION:** Each time you power on the charger make sure the battery is not connected! If a battery is connected when the charger is powered on, damage to the charger and the battery can result!

- 1 Connect charger to power source.
- 2 Make program selections in the charger for correct battery charging.
- 3 Connect balance adapter to charger.
- 4 Connect battery to charger adapter (connect main charging connectors before connecting cell-balancing connectors, when used).
- 5 Connect battery to balance adapter (when used).
- 6 Start battery charging.

## 4 Operating Instructions

### Main Menu

Once you turn on the charger its name will display on the screen for 2 seconds. After the charger finishes its self-check process, you can press the **ESC/MODE** key to enter into the main "Program Select" menus.



**User Set Programming.** Use the **MODE/ESC** key to navigate down the menu and use the **<DEC** key to navigate up. Press the **ENTER/START** key on the desired menu to enter its submenu.

**Lithium battery programming.**

**NiMH battery programming.**

**NiCd battery programming.**

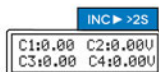
**Pb battery programming.**

**Tunable digital power mode.** You can set the input power to an output power of 3.0V-24.0V DC.

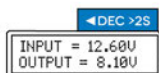
## 5 Data View

You can use the **<DEC** and **INC>** keys to access various information about your battery and charger (this requires the balance plug to be connected):

Before you start the charge or discharge cycle, you can access individual cell voltages and total voltages:

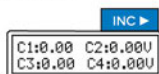


Press the **INC >** key for more than 2 seconds and individual cell voltage will be displayed; hit the **ESC/MODE** to return to previous screen.



Press the **<DEC** key for more than 2 seconds and the input voltage and output voltage will be displayed; hit the **ESC/MODE** to return to previous screen.

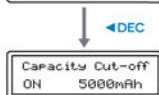
**ATTENTION:** The following data views require the Lithium battery charge or discharge cycle be started.



You can check the individual cell voltages with the balance plug connected.



See what the final voltage has been programmed to.



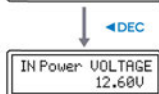
See what the safety capacity has been programmed to.



See what the safety time has been programmed to.

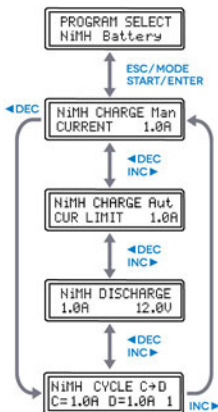


This shows you the internal temperature of the charger. When the temperature sensor is connected you can view the external temperature.



This shows the present voltage of the input power.

## 6 NiMH/NiCd Battery Programming



Once you power on the charger, press the **MODE/ESC** key. This will shift you down to the "Program Select" menus. Navigate with the **ESC/MODE** and **<DEC** keys until you reach your desired NiMH or NiCd battery type (be sure to select the correct battery type!). Then press the **ENTER/START** key.

Use the **<DEC** and **INC** keys to switch through the various battery programming; please refer to the detailed flow chart on the left. When you are ready to alter the parameter value in the programming, press the **ENTER/START** key to make it blink, then change the value with the **<DEC** or **INC** key. The value will be stored by pressing **ENTER/START** key once more. Then press the **ENTER/START** key for more than 2 seconds to start the process.

**Note:** The flow chart example on the left only demonstrates menus for NiMH programming but the processes are the same for NiCd.

**"Charge" Modes (Automatic & Manual):** The default mode is "Aut" (automatic). In "Aut" mode the charger will choose the best amperage charge current for the battery throughout the charge process. Important: Because some batteries

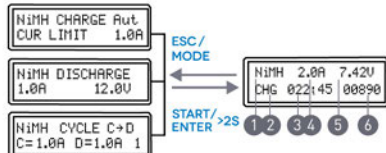
of low impedance and low capacity can cause the processor to "over charge" the battery, you need to set the maximum charge current the charger will charge up to; charging at too high of an amp rate may damage the battery!

**In "Man" (manual) mode, the charger will deliver only the programmed amperage to the battery.**

**"Discharge" Mode:** The discharge current ranges from 0.1A to 40.0A and the final voltage ranges from 0.1 to 24.0V. The final voltage of a NiMH battery is 1.0V/cell, and NiCd is 0.85V/cell. Please refer to what is recommended by the battery manufacturer.

**"Cycle" Mode:** The Prodigy 640 can perform 1-6 cycles of DCHG→CHG or CHG→DCHG continually. You can select this mode to cycle a brand new NiXX battery, for battery maintenance or for long-term storage. Please be careful and set up the parameters correctly or battery damage can occur! After you have selected the correct mode and set up all the parameters correctly, start the process by pressing the **ENTER/START** key for more than 2 seconds.

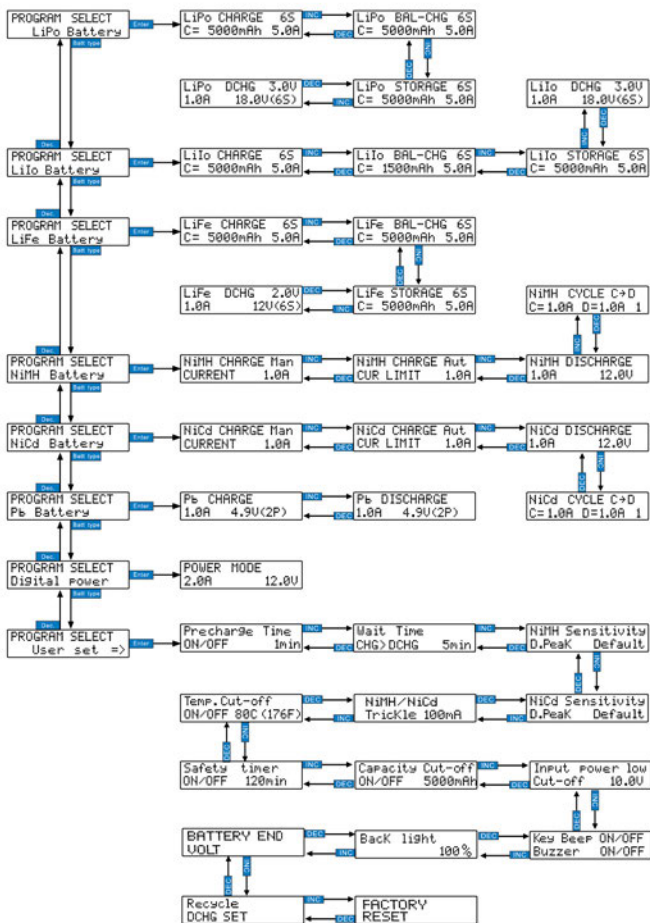
The screen displays the state of the started process. To forcibly stop the process press the **MODE/ESC** key. Description of displays: ① battery type; ② operation mode - CHG=Charge, DSC=Discharge, DCHG→CHG or CHG→D-



CHG=Cycle mode; ③ elapsed time; ④ charge/discharge current of the battery; ⑤ voltage of the battery pack; ⑥ capacity of charge/discharge. You can also view temperatures and  $\Delta V$  continually by pressing the **<DEC** and **INC** keys.



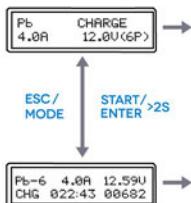
# 7 Programming Guide



## 8 Pb Battery Programming

This is the program for charging a Pb (Lead Acid) battery with a nominal voltage from 2 to 20V. Pb batteries cannot be charged rapidly and they can only receive relatively lower current compared to their capacity; the optimal charge current will be 1/10th of their capacity. Please always follow the instructions supplied by the manufacturer of the battery.

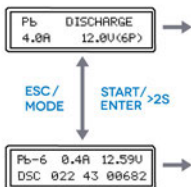
### Charging Pb Battery



The left side of the screen displays the charge current, and can be programmed from 0.1-40A. The right side of the screen displays the voltage, and needs to be matched to the battery being charged. Start the charge process by pressing the **ENTER/START** key for more than 2 seconds.

This screen displays the charging process state. To forcibly stop the charging process, press the **MODE/ESC** key once.

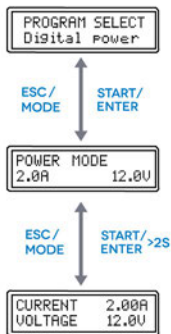
### Discharging Pb Battery



Set the discharge current on the left and final voltage on the right. The discharge current ranges from 0.1-40.0A and the voltage should be matched with the battery being discharged. Start the discharge process by pressing the **ENTER/START** key for more than 2 seconds.

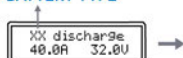
This screen displays the discharging process state.

## 9 Digital Power Programming



In the Digital Power mode, the charger can provide an output power of 3.0V-24V DC for the other electronic equipment. In the "Program Select" menu use the **<DEC** and **<INC >** keys to navigate to the "Digital Power" menu and hit the **START/ENTER**. Press the **START/ENTER** key once more to make the selection blink, then change the value to either "on" or "off" with the **<DEC** and **<INC >** keys. The value will be stored by pressing **START/ENTER** key once more. Then press the **START/ENTER** key for more than 2 seconds to start the process.

### BATTERY TYPE

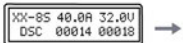


### Energy Transfer

This mode allows the user to take a charged 10-24V Lithium battery and use it as the power supply to charge a dead Pb battery. Note: the batteries are connected to the charger normally; the Lithium battery is connected to the output wires and the Pb connected to the input.



Turn on the "Recycle DCHG Set" in the "User set" menu. Set the initial charge current and voltage to match the Pb battery to be charged. Go back into the "LiXX Battery" programming and select "LiXX DCHG;" be sure to select the correct number of cells!

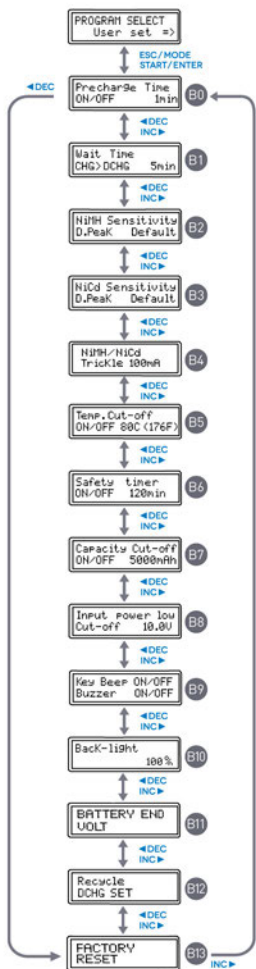


Set the discharge current on the left and the final voltage on the right. The discharge current ranges from 0.1-40A, and voltage should be matched with the battery being discharged. Start the discharge process by pressing **START/ENTER** key for more than 2 seconds.

Press the **<DEC** and **<INC >** keys to switch between "Yes" or "No." Then press **START/ENTER** to confirm the selection.

Press the **START/ENTER** key for more than 2 seconds to start the discharge and transfer the energy to the Pb battery.

# 10 Initial Parameter Setup



**TIP:** Please setup the "User set" menu before operating the charger for the first time.

Once you power on the charger, press the **MODE/ESC** key. This will shift you down to the "Program Select" menu. Press the **MODE/ESC** or **<DEC>** key to navigate left or right in the menus. Find "User Set" then press the **ENTER/START** key to enter into the parameter settings.

At this level, use the **<DEC>** and **INC>** keys to switch between the parameter menus – for navigation help please refer to the detailed flow chart on the left.

When you are ready to alter a parameter value, press the **ENTER/START** key to make it blink, then change the value with the **<DEC>** and **INC>** keys. The value will be stored by pressing the **ENTER/START** key once more.

The charger can accept three types of Lithium batteries: LiPo, Li-Ion and LiFe. Be sure to check your type of battery carefully for proper parameter setup; failure to do so may damage the battery and possibly cause it to explode! (Please refer to Chart A below)

This charger can recognize the cell count of a Lithium battery automatically. But if the battery voltage is lower than the lowest safety voltage, the charger will not start the charge process. Luckily, the charger has a precharge function to restore the battery. You can set the restore time (normally 2 minutes) in the (B0) menu. Once on, the precharge program will start up in the low voltage battery scenario. A higher capacity battery will need more time than a lower capacity battery.

**ATTENTION:** In the normal charge mode, you need to turn off the precharge process. **DO NOT** use this function unless you know the battery status very well. If the battery voltage increase very little, please stop the precharge process immediately or it can cause damage!

When NiMH or NiCd batteries are run through a cycle process, they can become warm. To counter

this, the Prodigy 640 can be programmed with a time delay to occur between each process allowing the battery time to cool down (see the screen **B1**). The value ranges from 1 to 60 minutes. If you are unsure of an adequate time, start with 10 minutes and adjust from there.

**B2** **B3** show the  $\Delta V$  (delta-peak) trigger voltage for automatic charge termination of NiMH and NiCd batteries. The effective value ranges from 5 to 20mV per cell. If  $\Delta V$  is set too high there is a danger of overcharging the battery; if it is set too low, there is a possibility of premature termination. Please refer to the technical specifications of the battery (NiCd: 12mV, NiMH: 7mV).

Tip: If the voltage of the charging battery is lower than 2.5V,  $\Delta V$  may not be perceived, this will cause a danger of discharging the battery. You can connect a temperature sensor or use a charge current above 1C to avoid it.

After the fast charge has been terminated, the charger will automatically supply the trickle function to achieve the full charge without overheating the battery. You can alter the trickle charge value through **B4**.

The 3-pin port on the left side of the charger is a temperature sensor port. You can set the maximum safety temperature, (see screen **B5**) for the unit to shutoff in the event of overheating.

When you start a charge process, the integrated safety timer automatically starts running at the same time. This is programmed to prevent overcharging the battery if it proves to be faulty, or if the termination circuit cannot detect the battery to be full. **B6** shows you this program can be set on or off, and you can set the maximum safety time. The value ranges from 10 to 720 minutes. With the same principle in mind, there is a maximum-capacity-limiting function. See **B7**; the value ranges from 100 to 80,000mAh.

When you use a DC vehicle battery to supply power to the charger, screen **B8** allows you to set a low voltage cutoff to protect your vehicles battery. If the voltage drops below the value you set, the charging operation forcibly terminates.

**B9** allows you to set the audible charger sounds on or off.

**B10** allows you to adjust the brightness of the LCD screen.

**B11** allows you to adjust the end voltage for Lithium and Pb batteries.

**B12** allows you to turn the Energy Transfer mode on and off.

**B13** allows you to reset the charger to the default configurations.

Please refer to the informational **Chart A** below and select the correct parameters for each battery type; failure to do so can result in serious damage or injury!

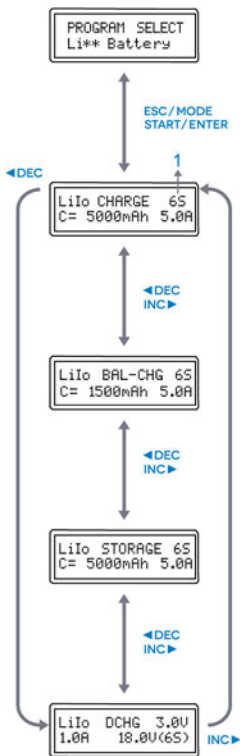
Interm	Types					
	Li-Po	Li-Io	Li-Fe	NiMH	NiCD	Pb
Standard Voltage (V/cell)	3.70	3.60	3.30	1.20	1.20	2.00
Max. Charge Voltage Cutoff Level (V/cell)	4.20	4.10	3.60	1.60	1.60	2.45
Allowable Fast Current	<1C	<1C	<4C	<2C	<2C	<0.4C
Min. Discharge Voltage Cutoff Level (V/cell)	>3.00	>3.00	>2.00	>1.00	>0.85	>1.75

# 11 Warning & Error Messages

The Prodigy 640 is protected against faults and operator errors by the Multi-Protection-System. Faults and Errors are displayed on the LCD screen and they interrupt the active process to protect the unit and the battery.

- |   |   |   |
|---|---|---|
| <div style="border: 1px solid black; padding: 5px; width: fit-content;">REVERSE POLARITY</div>                  | → | The output is connected to a battery with the incorrect polarity.   |
| <div style="border: 1px solid black; padding: 5px; width: fit-content;">CONNECTION BREAK</div>                  | → | This will be displayed if the charger detects an interruption between the battery and the output connection, or if you voluntarily disconnect the charge lead during a charge or discharge cycle. |
| <div style="border: 1px solid black; padding: 5px; width: fit-content;">SHORT ERROR</div>                       | → | There was a short-circuit at the output. Please check the charging leads.   |
| <div style="border: 1px solid black; padding: 5px; width: fit-content;">INPUT VOL ERR</div>                     | → | The voltage of the input power has dropped below the limit.   |
| <div style="border: 1px solid black; padding: 5px; width: fit-content;">BATTERY CHECK<br/>LOW VOLTAGE</div>     | → | The processor detects a lower voltage than what was set in the Lithium programming. Please check the cell count of the battery pack.  |
| <div style="border: 1px solid black; padding: 5px; width: fit-content;">BATTERY CHECK<br/>HIGH VOLTAGE</div>    | → | The processor detects a higher voltage than what was set in the Lithium programming. Please check the cell count of the battery pack.   |
| <div style="border: 1px solid black; padding: 5px; width: fit-content;">BATTERY VOLTAGE<br/>CELL LOW VOL</div>  | → | The voltage of one of the cells in the Lithium battery pack is too low. Please check the voltage of the cells one by one.   |
| <div style="border: 1px solid black; padding: 5px; width: fit-content;">BATTERY VOLTAGE<br/>CELL HIGH VOL</div> | → | The voltage of one of the cells in the Lithium battery pack is too high. Please check the voltage of the cells one by one.  |
| <div style="border: 1px solid black; padding: 5px; width: fit-content;">BATTERY VOL ERR<br/>CELL CONNECT</div>  | → | There is a bad connection at the connector. Please check the connectors and cables carefully.   |
| <div style="border: 1px solid black; padding: 5px; width: fit-content;">TEMP OVER ERR</div>                     | → | The internal temperature of the unit is too high. Please cool down the unit.  |

## 12 Lithium Battery Programming



Once you power on the charger, press the **MODE/ESC** key. This will shift you down to the "Program Select" menus. Navigate with the **ESC/MODE** and **<DEC** keys until you reach your desired Lithium battery type; be sure to select the correct battery type! Then press the **ENTER/START** key to store the value. Press the **ENTER/START** for more than 2 seconds to start the process.

**Charge Mode:** This mode is for a single cell battery or special battery packs without a balance port or cell count. This mode will NOT balance the battery! 1 shows you the cell count number. C shows you the capacity of the battery pack.

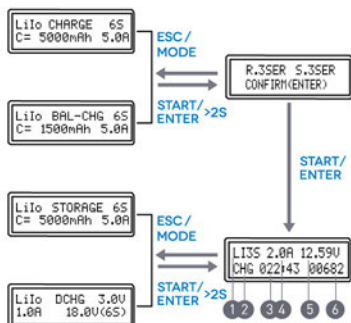
**Note:** The charger will set the charge current according to a rate of 1C automatically when you set the capacity of the battery pack. If you wish to set the current higher you can do so manually (be sure to check the battery manufacturer's specifications to ensure the battery can handle a charge rate higher than 1C!).

**Balance Charging:** This is for 2-6 cell Lithium batteries with a balance plug. The battery balance plug should be connected to the charger's balance port located on the front side of the charger with a suitable connection cable that fits with your battery pack (see the connection diagram for further clarification). In the balance charging mode, the internal processor of the charger will monitor and control the voltage of each cell of the battery pack; this can greatly improve the discharging performance of the battery. The charger uses an optimized calculation to control the tolerance in the range of  $\pm 0.01V$ .

**Storage Mode:** This mode will put the Lithium battery into a storage state and is best for when the battery will not be used for the time being. The charger performs this mode by either charging or discharging the battery until the battery contains around 40% of its power; the final voltage will vary depending on the battery type: Li-Ion: 3.75V, LiPo: 3.85V and LiFe: 3.3V. The charger software is very sophisticated and will know whether the battery needs to be charged or discharged, and will do so automatically as long as the battery balance plug is plugged into the charger's balance port.

**Discharge Mode:** Theoretically, Lithium batteries do not need to discharge, especially a deep-discharge. To ensure the battery discharges evenly, without overly discharging one of the individual cells, connect the balance plug of the battery to the charger; you can set the discharge cut-off voltage to 3.0V-4.0V.

**To Start a Charge/Discharge Cycle:** After you setup the mode menu correctly, press **ENTER/START** key for more than 2 seconds to start the process.



This screen shows the number of cells you set up and what the processor detects. "R" shows the number of cells found by charger and "S" is the number of cells selected by you at the previous menu. If both numbers are identical you can start charging by pressing the **ENTER/START** key. If not, press the **MODE/ESC** key to go back to the previous menu, and then carefully check the number of cells of the battery pack to charge again. If you selected the **AUTO** mode or **Discharge** mode, you can pass over this screen directly.

This screen shows the present situation during a charge process; to stop the charging process press the **MODE/ESC** key once. As you see from the diagram on the left, ① is the cell count, ② is the operating mode - CHG=charging at auto mode, BAL=balance charging, FAS=fast charging, STO=storage mode and DSC=discharging mode - ③ is the elapsed time, ④ is the charge/discharge current, ⑤ is the charge/discharge voltage of the battery and ⑥ is the capacity of the charge/discharge.



## 13 After-Sale Service & Guarantee

Thank you for purchasing the ProTek R/C "Prodigy 640" High Power DC Battery Charger. We will do our best to provide you with comprehensive after sale service and protect your rights and interests.

ProTek R/C guarantees this item to be free of defects in materials and workmanship for one (1) year after original purchase date. The warranty only applies to material or operational defects that are present at the time of purchase; ProTek R/C reserves the right to repair or replace the item. Warranty will not cover items that have been modified, disassembled, or otherwise misused according to the item's instructions. Proof of purchase is required to submit a warranty claim. ProTek R/C is not responsible for bodily injury and/or property damage that may occur from the use of, or caused by, this item.

## 14 Safety Messages

### IMPORTANT:

- 1 Do not cover the charger during use.
- 2 Do not use or store in an environment below 41°F [5°C] or above 122° [50°C].
- 3 Use the charger carefully and do not operate it in a wet or corrosive environment.
- 4 Do not drop, strike, or shake the charger, and do not place heavy items on the charger.
- 5 Never disassemble the charger.
- 6 Keep the charger away from children and pets at all times.
- 7 Never leave a battery in your model while charging
- 8 Never leave power supply, charger or battery unattended during charging
- 9 Never exceed maximum charge rate
- 10 Never charge with incompatible batteries
- 11 Never charge batteries in wrong mode
- 12 Never over discharge a Lithium battery
- 13 Never charge a damaged or swollen battery
- 14 Never charge near or on flammable materials
- 15 Always ensure proper polarity of plugs
- 16 Always balance charge a LiPo battery
- 17 Always use a LiPo charging bag
- 18 Always use a LiPo specific charger to charge a LiPo  
(NiMH or NiCd only chargers WILL NOT WORK!)



**Warning:** This product contains chemicals known to the State of California to cause cancer, birth defects or other reproductive harm.



**THIS PRODUCT IS NOT A TOY! NOT FOR CHILDREN UNDER 14 YEARS.**

For proper operation and to avoid risk of damage and injury, read and follow all instructions before operating this product. Failure to comply may result in excessive heat, fire, property damage and serious injury.

# Compliance Information for the European Union

## Declaration of Conformity



Product(s): ProTek R/C "Prodigy 640" High Power DC Battery Charger  
Item Number(s): PTK-8512

The object of declaration described above is in conformity with the requirements of the specifications listed below, following the provision of the European EMC Directive 2004/108/EC

EN 55014-1:2006  
EN 55014-2:1997+A1:2001  
EN 61000-3-2:2006  
EN 61000-3-3:2008

## Instructions for disposal of WEEE by users in the European Union



This product must not be disposed of with other waste. Instead, it is the user's responsibility to dispose of their waste equipment by handing it over to a designated collections point for the recycling of waste electrical and electronic equipment. The separate collection and recycling of your waste equipment at the time of disposal will help to conserve natural resources and ensure that it is recycled in a manner that protects human health and the environment.

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