Operating Manual

PRODIGY 6.7
QUAD AC/DC

Prodigy 67 Quad AC/DC
Operating Manual

TABLE OF CONTENTS

1 Specifications

AC Input Voltage Range: AC 110V or 220V
DC Input Voltage Range: DC 11.0V – 18.0V
Charge Current Range: 0.1 – 7.0A x4
Discharge Current Range: 0.1 – 2.0A x4
Charge Power: 80W x4
Discharge Power: 10W x4
Balance Current: Max. 500mAh
Energy Transfer Discharge: Max. 320W

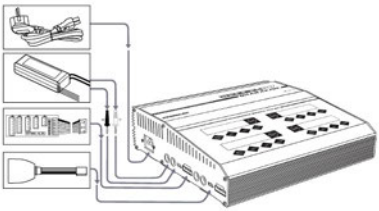
Balance Tolerance: ±0.01V
NiCd/NiMH Battery Cell Count: 1 - 16 Cells
Lithium Battery Cell Count: 1 – 6 Cells
Pb Battery Voltage: 2 – 20V
Digital Power: 3 – 24V
Weight: 1750g
Dimensions: 240x223x67mm

2 Connection

Connection Diagram in the Balance Charging/Storage/Discharge Mode

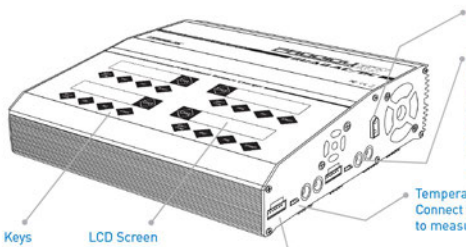
WARNING: Read the ENTIRE instruction manual to become familiar with the features of the product before operating.

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 serious injury.



CAUTION: Always ensure the battery you are charging meets the specifications of this charger and that the charger settings are correct. Failure to do this can result in excessive heat and other related product malfunctions, which can lead to user injury or property damage.

3 Exterior

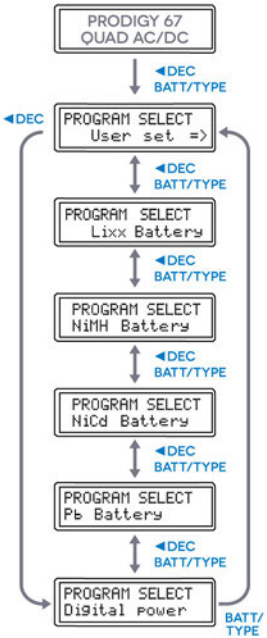


CAUTION: Always power on the charger before connecting a battery to the charger, or damage to the charger and the battery can result.

1 Connect charger to power source.
2 Adjust program selections in the charger as needed for the battery being charged.
3 Connect charge wires and balance adapters to charger.
4 Connect battery to charge wires. Caution: When balance charging, connect the charge wires to the battery before connecting the balance connector.
5 Start battery charging.

4 Operating Instructions

Main Menu
The startup screen shows the charger model for two seconds during the start up/self check process.



Program Select: Press the BATT/TYPE key to cycle down through the program menu or the <DEC key to cycle up through the menu. Press the START key to transfer to the submenu within the chosen program, and press the BATT/TYPE key to exit the submenu.

FROM THE PROGRAM SELECT MENU, CHOOSE:

Lithium Battery Program. This mode is used with LiPo, LiFe and Li-Ion batteries.

NiMH Battery Program. This mode is used with Nickel Metal Hydride batteries.

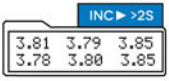
NiCd Battery Program. This mode is used with Nickel Cadmium batteries.

Pb Battery Program. This mode is used with lead acid batteries.

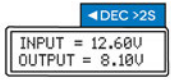
Tunable Digital Power Mode. This mode allows the user to channel the input power from the charger and deliver 3.0V to 24V of output power to various DC devices.

5 Data View

Enter the Lithium Battery mode. Before the charge/discharge process has started, the user can press and hold the INC> or <DEC key for more than two seconds to display the individual cell voltage when the balance plug is connected, as well as the Input Voltage (Power Supply), and Output Voltage (Battery). The user must press the BATT/TYPE key to exit these menus.



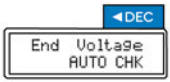
Hold the INC> key for more than two seconds to display the individual cell voltage before the process has been started. Press the BATT/TYPE key to exit.



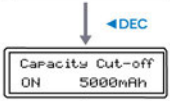
Hold the <DEC key for more than two seconds to display the input and output voltage before the process has been started. Press the BATT/TYPE key to exit.

During a charge or discharge process, pressing the INC> or <DEC keys will display:

The individual voltage of each cell in the battery when using the balance plug.



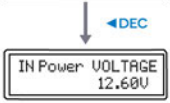
The End Voltage that will be reached at the end of the process.



The user set Capacity Cut Off limit.

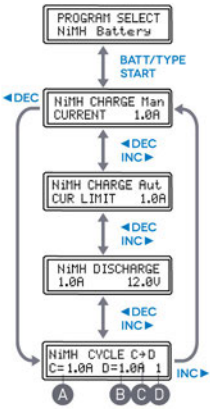
The user set Safety Timer.

The external temperature when a temperature sensor is used. The user can view both the inner/external temperatures when the temperature sensor is connected.



The current Input Power voltage.

6 NiMH/NiCd Battery Programming



Press the BATT/TYPE key while in the screen shown on the left, then press the START key to enter the submenu. The user can switch within the menu to select the mode by pressing the DEC/INC key. Refer to the flow chart at the left. When ready to edit a parameter value in the program, press the START key to make it blink, then change the value using the DEC/INC key. The value will be stored by pressing the START key. Then press and hold the START key for more than two seconds to start the charge process.

NOTE: The NiMH example is shown at the left, but the NiMH and NiCd menus are the same.

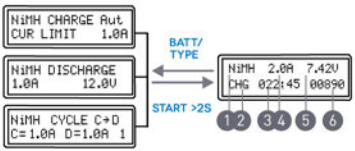
"CHARGE" Mode: The default is "Aut". In "Aut" mode, the user will need to set the upper limit of the charge current to avoid a current level that could damage the battery. The processer may incorrectly identify some batteries with low impedance and low capacity, and may be set to a higher than recommended charge current when in "Aut" charge mode. It is recommended that these batteries be charged in "Man" mode. Manual mode allows the user to select a charge current that is sufficient for the battery type. Switch between modes by pressing the START key for more than one second when the current field is blinking.

- **A** Charge current in the cycle mode
- **B** Discharge current in the cycle mode
- **C** Sequence to cycle
- **D** Number of cycles

"DISCHARGE" Mode: This mode allows the user to select a discharge current range from 0.1A to 2.0A, with a final voltage range of 0.1 to 24V. The final voltage of a NiHM battery is 1.0V per cell, while a NiCd battery is 0.85V per cell. Please refer to the battery manufacturer for recommended low voltage cut off.

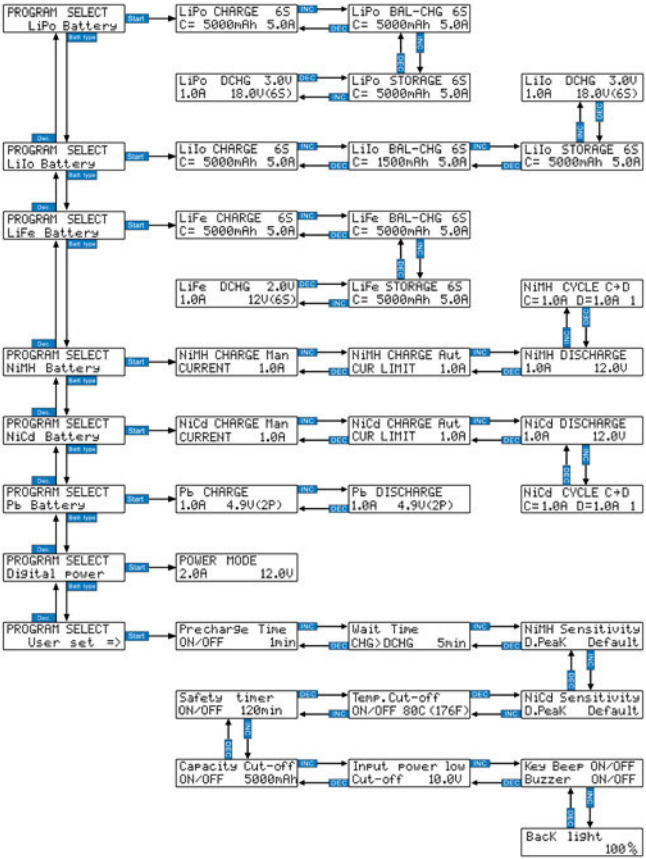
"CYCLE" Mode: This can be set from 1 to 6 cycles of continuous discharge→charge or charge→discharge. This is useful for both new and used Nickel chemistry cells. This parameter must be setup correctly to prevent damaging the cells. Follow the previous charge/discharge menu to set these parameters.

After the modes have been checked, press and hold the START key for more than two seconds.



This screen displays the present state of the process. To stop the process, press the BATT/TYPE key. (1) shows the type of battery; (2) shows the operating mode (CHG=charge, DSC=discharge, DCHG→CHG or CHG→DCHG=cycle mode); (3) shows the elapsed time; (4) shows the charge/discharge current; (5) shows the voltage of the battery; (6) shows capacity of the charge/discharge. The preset parameters, including temperature and ΔV, can be viewed at any time by pressing the DEC/INC keys.

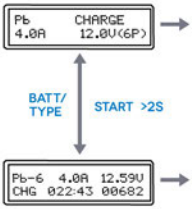
7 Programming Guide



8 Pb Battery Programming

This is programmed for charging Pb batteries with a nominal voltage from 2 to 20V. Pb batteries cannot be charged rapidly. The optimal charge current should be 1/10th of the battery capacity. Please follow the battery manufacturer's instructions when setting up the charge parameters.

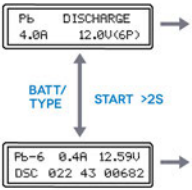
Charging Pb Battery



As shown on the left, the charge current is shown on the left side of the second line, and the voltage of the battery is shown on the right side of the second line. The charge current can be set from 0.1 to 7.0A and should be matched to the battery being charged. Start the charge process by pressing and holding the START key for more than two seconds.

This screen displays the state of the charging process. To force the charge to stop, press the BATT/TYPE key once.

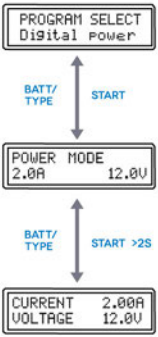
Discharging Pb Battery



Set the discharge current shown on the left side of the second line, and the final voltage on the right side of the second line. The discharge current ranges from 0.1 to 2.0A and the voltage should be matched with the battery being discharged. Start the discharge process by pressing and holding the START key for more than two seconds.

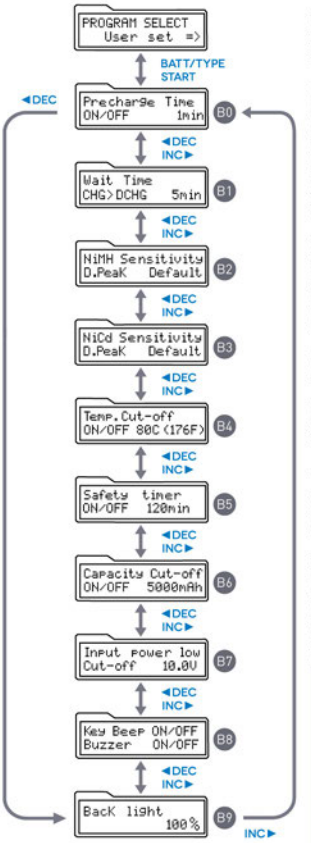
Displays the current state of discharge.

9 Digital Power Programming



In this mode, the charger can provide an output power of DC 3.0V to 24V to power other electronic equipment.

10 Initial Parameter Setup



Verify that the charger parameters have been setup correctly in the "User Set" menu before starting a charge or discharge process.

Press the BATT/TYPE key to cycle through the menu until the "User Set" screen is displayed. Press the START key to enter into the parameter setting menu. The user can then move between the channel menus by pressing the DEC/INC keys. Please refer to the flow chart at the left.

When the user is ready to change the parameter value in the program, press the START key to make it blink, then change the value with the DEC/INC key. The value will be stored by pressing the START key once.

The charger can accept three types of Lithium batteries, LiPo, Li-Ion and LiFe. The user **MUST** verify that the charger is set to match the battery that is going to be charged, or it could cause a fire and/or explosion. (Please refer to Chart A)

This charger can automatically recognize the cell count of a Lithium battery. If the battery voltage is lower than the lowest safety voltage level, the charger will not start the charge process. This is when the user could use the Pre-Charge function to restore the voltage of the battery. The restore time (normally 2 minutes) can be changed in the B0 menu. The higher the battery capacity, the more time it will need.

NOTE: The Pre-Charge function must be turned off when using the normal charge mode. Additionally, **DO NOT** use this function unless the condition of the battery is known to be stable. The user must monitor the battery voltage closely. If the voltage does not increase quickly, stop the Pre-Charge process immediately or it could result in FIRE and ultimately injury and property damage.

When a NiMH or NiCd battery is in a charge/discharge cycle process, the battery may become warm. The charger programming allows the user to set a delay time from 1 to 60 minutes to give the battery time to cool before being subjected to the next process (See screen B1).

B2/B3 shows the delta peak trigger voltage (ΔV) for automatic charge termination of NiMH and NiCd batteries. The effective value ranges from 5 to 20mV per cell. If the ΔV is set too high, there is a risk of overcharging the battery; if it is set too low, there is a possibility the battery will not be fully charged. Please refer to the technical specifications of the battery manufacturer. (NiCd: 12mV, NiMH: 7mV)

NOTE: If the voltage of the charging battery is lower than 2.5V, the ΔV may not be perceived. This will cause a risk of discharge. Use a temperature sensor or set the charge current above 1C to avoid it.

The 3-pin ports on the side of the charger are the temperature sensor ports and are labeled "Temp.". These ports are used with an optional temperature sensor and will read the maximum safety temperature set by the user (see screen B4). The charger will then monitor the battery temperature via the temperature sensor and shut down the process if the value is exceeded.

When a charge process is started, the internal safety timer automatically starts running at the same time. This is programmed to prevent overcharge of the battery if it proves to be faulty or if the termination circuit cannot detect that the battery is full. This program can be on or off (see B5) and the user can set the maximum safety time. This value ranges from 10 to 720 minutes. There is also a maximum capacity limit value, ranging from 100 to 25000mAh (see B6).

When a 12V DC automobile battery is used to supply power for the charger, screen B7 shows the voltage input of the DC battery. If the DC battery voltage drops below the value set by the user, the operation will be terminated to protect the input battery.
Screen B8 is where the user can set the alert and key tones. Screen B9 is where the brightness of the LCD screen is adjusted.

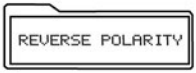
NOTE: Please refer to Chart A below to select the correct values for each battery type. Failure to select the correct settings could result in product malfunction, electrical issues, excessive heat, FIRE and ultimately injury and property damage.

CHART A

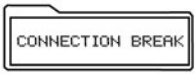
Interm / Types	Li-Po	Li-Io	Li-Fe	NiMH	NiCD	Pb
Standard Voltage (V/cell)	3.70	3.60	3.30	1.20	1.20	2.00
Max. Charge Voltage Cutoff Level (V/cell)	4.20	4.10	3.60	1.60	1.60	2.45
Allowable Fast Current	<1C	<1C	<4C	<2C	<2C	<0.4C
Min. Discharge Voltage Cutoff Level (V/cell)	>3.00	>3.00	>2.00	>1.00	>0.85	>1.75

11 Warning & Error Messages

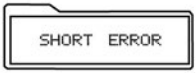
The charger uses a Multi-Protection-System to protect against faults and operator error. Faults/Errors are displayed on the LCD screen and will interrupt the active process to protect the unit and the battery.



Reverse Polarity: The output is connected to a battery with incorrect polarity.



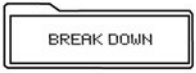
Connection Break: This is displayed when the charger detects a connection interruption between the battery and charge lead, or when the charge lead is disconnected during operation.



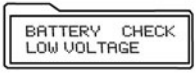
Short Error: There is a short circuit at the charge leads.

Input Vol Err: The voltage of the input power has dropped below the limit.

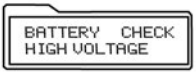
Vol Select Err: The Lithium battery pack voltage was selected incorrectly. Verify the voltage of the battery carefully.



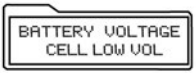
Break Down: There has been a malfunction within the charger circuit.



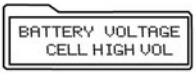
Battery Check Low Voltage: The processor detects the voltage is lower than what is set in the Lithium program. Check the cell count of the battery.



Battery Check High Voltage: The processor detects the voltage is higher than what is set in the Lithium program. Check the cell count of the battery.



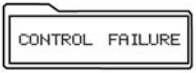
Battery Voltage Cell Low Vol: The voltage of one of the cells in the Lithium battery pack is too low. Check the voltage of each individual cell within the battery pack.



Battery Voltage Cell High Vol: The voltage of one of the cells in the Lithium battery pack is too high. Check the voltage of each individual cell within the battery pack.

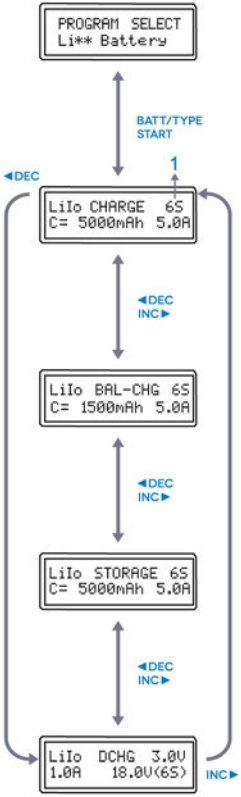
Battery Vol Err Cell Connect: There is a bad connection at the connector. Check the connector and cables carefully.

Temp Over Err: The internal temperature of the charger is too high. Let the charger cool down.



Control Failure: The processor cannot continue to control the feeding current. The unit needs to be repaired.

12 Lithium Battery Programming



Press BATT/TYPE key in the screen on the left until the correct Lithium battery type has been selected, then press START key to enter into the parameter setting menu. The user can switch between the charge modes in the menu using the DEC/INC key. Please refer to the flow chart on the left. To alter the parameter value in the program, press the START key to make it blink, then change the value with the DEC/INC key. The value will be stored by pressing START once. Then press and hold the START key for more than two seconds to start the process.

Charge Mode: Use for an individual battery or a battery pack without a balance port or cell count. 1 shows the cell count. C= shows the capacity of the battery pack.

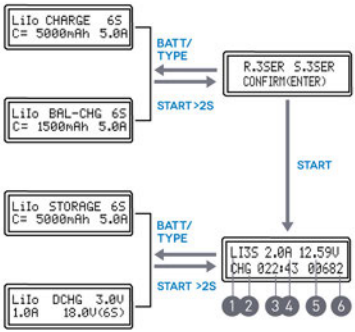
> **NOTE:** The charger will automatically set the charge current at a 1C rate according to the capacity of the battery. If you charge a high rate battery pack you can set the current value a little higher, but do not exceed the battery manufacturer's recommendations.

Balance Charge Mode: Use with 2-6 cell Lithium batteries that have a balance plug. The battery pack being charged should be connected to a balance board that is connected to the port on the side of the charger (see picture B). In this mode the chargers internal processor will monitor and control the voltage of each cell in the battery pack using an optimized calculation to control the voltage range within a tolerance of ±0.01V. This helps to improve the discharge performance of the battery.

Storage Mode: Use to condition batteries for storage. This mode will adjust the battery as needed in order to set the voltage to 40%. The final voltage may differ depending on the type of battery (Li-Ion: 3.75V, LiPo: 3.85V, LiFe: 3.3V). When this mode is selected, the charger will determine if the battery needs to be charged or discharged for storage. If the voltage of the battery at its initial stage is higher that the storage voltage level, the program will discharge the pack; if it is lower the program will charge the pack. In this mode, the user must connect both the primary connector and the balance plug.

Discharge Mode: This is typically not used with Lithium batteries. To avoid an over-discharge condition when using discharge mode, it is recommended that the user set the discharge cut-off voltage to 3.0-4.0V and connect the balance plug of the battery to the charger.

Start the Charge/Discharge Process: After the parameters have been correctly setup in the mode menu, press and hold the START key for more than two seconds to start the process.



This screen shows the number of cells that have been selected, and that the processor detects. "R" shows the number of cells found by the charger and "S" is the number of cells chosen by the user in the previous menu. If both numbers are identical, the process can be started by pressing the START key. If these values are not identical, press the BATT/TYPE key to go back to the previous menu. Carefully verify the number of cells in the battery pack. If the auto or discharge modes have been selected, ignore this screen.

This screen shows the current condition during the charge process. To stop charging, press BATT/TYPE key once. As shown in the image on the left, 1 shows the cell count, 2 shows the operating mode (CHG=charging in auto mode, BAL=balance charging mode, FAS=fast charging mode, STO=storage mode, DSC=discharge mode), 3 shows the elapsed time, 4 shows the charge/discharge current, 5 shows the charge/discharge voltage of the battery, 6 shows the capacity of the charge/discharge.

13 After-Sale Service & Guarantee

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

CE

Product(s): ProTek R/C Prodigy 67 Quad AC Battery Balance Charger
Item Number(s): PTK-8511

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.