

Greenbox[®]

GPX[®] EXTREME



OPERATING INSTRUCTIONS



INTRODUCTION

Thank you for purchasing a GPX Extreme's Greenbox multifunction charger. This charger is equipped with a built-in cell balancer, high-performance microprocessor and specialized software. With these solutions it supports many different types of batteries, has many useful functions and operating modes.

Please read the instruction manual as it contains a lot of important information regarding the operation and use of the device, as well as the safety rules.

Technical specification:

Operating voltage:	DC 11.0~18.0 V AC 100-240V, 50-60Hz
Output power:	Max. charging power 50W Max. discharging power 5W
Charging current:	0.1~5.0A
Discharging current:	0.1~1.0A
Balancing current drain:	300 mAh/cell
NiCD/NiMH cell count:	1~15 cells
Li-Po-Fe-IoN cell count:	1~6 cells
Pb battery voltage:	2~20V
Weight:	580 g
Dimensions:	133 x 87 x 33 mm

SPECIAL FEATURES

Optimized software.

Greenbox chargers feature a special AUTO function which allows automatic selection of the currents during the charging or discharging process. It is particularly useful in the case of lithium batteries where the mismatched parameters can result in overcharging the battery or cause an explosion caused by the user. The software can automatically stop the charging process with a beep signal. All programs in the charger are controlled through reciprocal links in order to ensure maximum safety. All settings can be modified and are freely configurable by the user.

Internal, independent lithium cells balancer.

The Greenbox charger is equipped with independent balancer for lithium cell packs, so it doesn't need to have any external balancers connected for this purpose.

Balancing cell pack during the discharge.

During the process of discharging, Greenbox charger can monitor and balance each cell separately with the aim of the pack. In case of irregularities tension in any of the target cell, the charger will signal an error and automatically stop the discharging process.

Compatible with lithium packs.

The Greenbox charger is fully compatible with many types of Lithium batteries, such as lithium-ion (Li-ion) LiPo (Lithium Polymer) and LiFe (lithium ferric).

FAST and STORAGE charging modes for the lithium cells.

Lithium cell packs can be charged in numerous ways. In addition to the primary charging mode, Greenbox uses two additional modes: FAST, which reduces the charging time of the packet, and second mode called STORAGE- this an additional charge mode is recommended for long term storage of the packet, since it controls the final voltage.

Maximum safety.

Ability to configure the sensitivity of delta-peak voltage is responsible for the automatic shut-off for the nickel cell pack when it's fully charged.

Limit the maximum current auto-charging.

The ability to determine the upper charging limit when charging NiCd or NiMH packs. This feature is useful for packs with low resistance and capacitance charged in AUTO mode.

Capacity limit.

Charging capacity is always calculated as the product of the charging current and charging time. If the charging capacity exceeds a predetermined threshold, then the charging process will automatically stop.

Temperature limiter.

Packet temperature during charging rises due to chemical reactions. If it reaches a predetermined threshold, then the charging process is automatically interrupted. This function is available when the optional temperature sensor is connected (not included in the set).

Input power monitoring.

You can monitor the voltage of the input power supply of the charger in order to protect the DC power source from excessive discharge/load. If the voltage drops below the threshold, the charging process will automatically stop.

Charger's memory.

The charger has a built-in memory of max. 5 packets. It is possible to configure the parameters of charging and discharging for each of them separately. Users can enter data at any time to later select and load directly from the memory of the charger before starting the charging or discharging process.

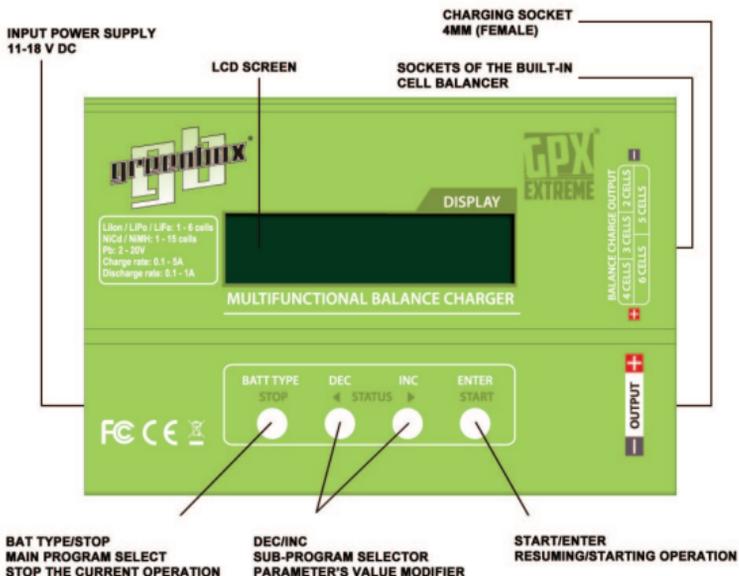
Cyclic charging / discharging.

The charger makes from 1 to 5 consecutive cycles of charge-discharge or discharge-charge to stimulate the packet and align its tensions and in effect restore its original properties.

Process analysis using a PC and USB port.

Greenbox Charger allows you to analyze the characteristics of the packets through the USB port of your PC. Software shows graphs voltage, capacitance, temperature and voltage of each target of lithium packets. This function is available with additional software, which is not included in the kit.

FRONT FACING VIEW



SAFETY WARNINGS

The following warnings and cautions are important because of the safety issues and technical efficiency of the device. Otherwise, charging the packet may damage your charger, the whole packet, and even cause a short circuit or fire.

Never leave the charger unattended while it is running. If you notice any undesirable behavior, stop the operation and use the manual.

Keep the charger away from dust, moisture, heat, rain, sunlight and vibration. Never allow the charger to fall.

The charger is supplied with constant current in the range of 11V - 18V.

Charger and packet should be located on the surface of a high temperature resistant, non-flammable and non-conductive. Never place the charger in a car seat, carpet or similar surface. All flammable materials must be kept away from the charger.

Before charging make sure to choose the appropriate type of packet. If the program is set incorrectly, packet and/or charger could be seriously damaged. It may even lead to fire or explode due to overcharging.

NiCd/NiMh

Voltage: 1,2 V / cell

Available quick-charging current: 1C-2C (depending on the battery type)

Discharging stop voltages: 0,85V per cell for NiCd, 1,0V per cell for NiMh

Li-Ion

Voltage: 3,6 V / cell

Maximum charging voltage: 4,1 V / cell

Available quick-charging current: 1C (or less)

Discharging stop voltage: 2,5V per cell (or higher)

Li-Pol	Voltage: 3,7 V / cell Maximum charging voltage: 4,2V per cell Available quick-charging current: 1C (or less) Discharging stop voltage: 3,0V per cell (or higher)
Li-Fe	Voltage: 3,3 V / cell Maximum charging voltage: 3,6V per cell DAvailable quick-charging current: 4C (or less) Discharging stop voltage: 2,0V per cell (or higher)
Pb	Voltage: 2,0 V / cell Maximum charging voltage: 2,46V per celę Available quick-charging current: 0,4C (or less) Discharging stop voltage: 1,75V per cell (or higher)

In order to avoid short-circuit wires, always connect the charging leads to the charger first, then the packet.
Disconnecting should be made in the reverse order.
Do not simultaneously connect more than one packet to the wire of the charger.

Do not charge or discharge the following packs:

- different cell types (including different manufacturers),
- fully charged or only slightly discharged,
- which are not suitable for re-charging (risk of explosion),
- packets consisting of different charging techniques, other than NiCd, NiMH, LiPo, LiFe, Lilon or gel (Pb, Lead acid),
- faulty or damaged packets,
- with built-in charging circuit and/or protection circuit,

- installed on the device, or packets that are electrically connected to any other device(s),
- in which the manufacturer did not clearly specify that they can be charged with the current provided by the charger

Before charging, please check the following:

Did you select the correct program to charge this type of packet?

Did you select the correct charging or discharging current?

Did you check the voltage packet? Some packets are connected in series. Check before connecting if the output voltage is suitable for the set in the charger.

Did you check all the connections? Are they correct and safe?

Check for poor connections in the circuit.

Never connect the battery pack is the faulty connectors.

CHARGING

During the process of charging, the pack is supplied a predetermined amount of electricity. Charging capacity is calculated by multiplying the charging current and charging time. The maximum permissible charging current depends on the type or parameters of the packet (this information can be read from the housing, packaging or the manufacturer's specifications). It is possible to charge higher currents than the standard only if the packet is checked that they are designed for fast charging. Connect the packet to the appropriate terminals on the charger: red is positive (+) and black is negative (-). Due to the difference between the resistance of cables and connectors, charger often can not read properly packet resistances. For proper operation of the charger, cables are needed to have a sufficiently large cross section (diameter). At the ends of the wire must be given high quality connectors (eg, gold-plated connectors and thick braided copper wires with silicone coating).

Pay attention to the capacity and voltage of the lithium pack. It may consist of cells connected in series or in

parallel. When connected in parallel, packet capacity is a multiple of the amount of target, while the voltage remains the same. Lack of alignment between the objectives of tension in such a configuration may cause a fire or explosion during charging. It is recommended to connect the serial target packet.

DISCHARGING

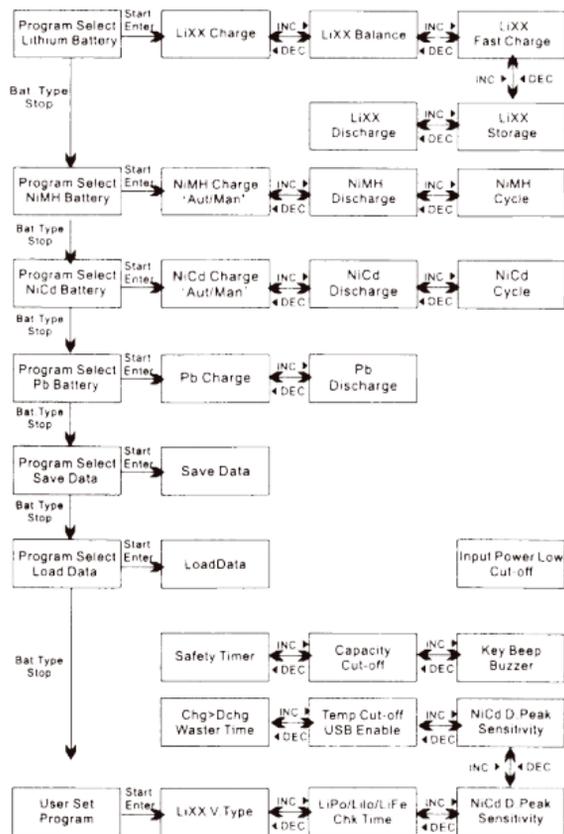
The purpose of discharging the packet is to clear residual electric remains in a packet or decrease its voltage to a certain level. The very same caution should be taken as while the charging process. In order to avoid deep discharge of packets, set the correct target value of the discharge voltage. Lithium packets need not be discharged to a minimum voltage, it leads to rapid loss of cell capacity. Please pay attention to the minimum voltages of the lithium packets in order to protect the them from damage.

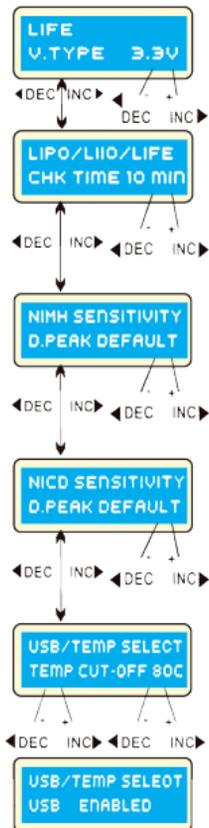
Some packets have a “memory effect”. If a partially discharged pack will begin to recharge before it is completely discharged, it will remember that state and the next time will use only a portion of the capacity. This effect occurs in packets NiCd and NiMH batteries, while in the NiCd it's much greater than in NiMH cells.

Lithium packet prefer partial rather than a full discharge. Avoid periodic full discharge.

Completely new packet has only partial capacity until the execution of 10 or more cycles. The process of charging and discharging the cycling leads to optimize the cell capacity.

CHARGER'S SOFTWARE DIAGRAM





By default, the first time you connect to a power source, the battery charger will work in standard mode settings. The screen will display the information in the following order, and you will be able to change the value of parameters.

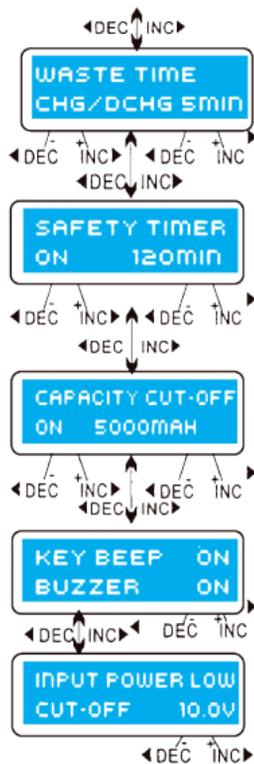
If you want to change a parameter in the charger, press the START/ENTER until the value blinks. Then change the parameter by pressing the INC or DEC button. The changed parameter will be stored after pressing the START/ENTER button.

The screen displays the nominal voltage of the lithium pack. The choices we have are three types of Lithium battery: LiFe (3.3V per cell), Li-Ion (3.6V per cell), and LiPo (3.7V per cell). This information is extremely important, so you should check if you have set the appropriate type of package. If you selected the wrong type of package, charging may lead to fire or explosion. To prevent incorrect settings made by the user, Greenbox charger automatically detects the amount of cells of lithium batteries at the beginning of the process of charging or discharging. However, packages that have been deeply discharged may not be properly recognized. To avoid this error, you can set the time after which the processor will verify the amount of cells. Usually it takes about 15 seconds to find the correct number of cells. However, this time should be extended in the case of packages with a higher capacity. Please note that the process of charging or discharging may end before the set time, if set too long to verify the number of cells. If, moreover, the number of cells was incorrectly diagnosed it may be fatal for the whole pack. In the case of the normal discharge of the packet and correctly diagnosed the number of target is recommended to use the default value.

NiCd and NiMH Sensitivity D.Peak screens present sensitivity setting of so-called Delta-Peak, which automatically occurs at the end of charging NiMH and NiCd packets. Existing values are in the range of from 5 mV to 20 mV per cell. Setting too high value for this parameter can lead to overcharging of the package. However, if it is set to too low value, it will be premature to disable charging and undercharge the packet. Please refer to the technical specification of the packets. The default should be set 12mV for NiCd and 7mV for NiMH.

On the left side of the charger there is a 3-pin port used as both an USB port as well as a temperature sensor. If the screen is indicating a temperature sensor, it can take advantage of such optional temperature monitoring of the packet. However, if the charger has been set to use USB port, you can use the charger as connected to the computer via USB cable. With this connection, you can monitor the charging process using the optional software installed on your PC.

Greenbox charger allows you to set the maximum temperature of the packet in order to protect the it from overheating. The charging process will be terminated automatically when the packet reaches a certain temperature level. This functionality requires the optional temperature sensor that is not included in the kit.



During the cycling process, i.e. charging and discharging, the packet will heat up. Software charger allows you to set time intervals, so that the package could cool down before the next cycle. Gap length is in the range from 1 to 60 min.

Simultaneously with the start of the charging process, an internal safety valve is launched. If an error is detected, the clock stops charging thereby protecting against overcharging. In this case, the charger will not be able to check the charge level of the package, because the resumption of charging requires several additional features. Please read the following description that specifies the time estimate resumed charging.

Capacity Cut-Off is a program for overcharge protection that controls max capacity of the packet. If the Delta-peak protection won't be triggered and the safety timer won't stop the charger, then the charging process will be terminated after reaching a predefined threshold capacity.

Each time when you press any button, you will hear a sound or a short melody indicating the change in the parameter value or the charger state. Sound signals can be turned off in the settings of the charger.

Input power is a function having the task to monitor the voltage of the power adapter. If the voltage is lower than the an earlier set value, the program will terminate charging in order to protect the battery power supply of the charger.

INSTRUCTIONS FOR CALCULATING THE PROPER CHARGING TIME

In order to calculate the charging time of the NiCd or NiMH batteries, divide the capacity of the battery through the charging current, and then divide by 11.9. The result we set as the number of minutes in the internal clock security. If the charger finishes charging process only after a preset time in the clock, the package will be charged at approximately 140% of its capacity.

Examples:

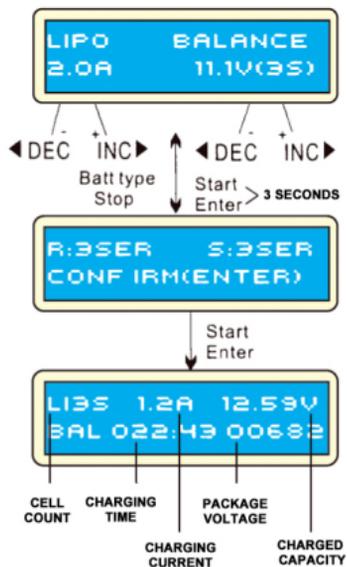
Capacity	Charging current	Timer value
2000mAh	2.0A	$(2000/2.0=1000)/11.9=84\text{min.}$
3300mAh	3.0A	$(3300/3.0=1100)/11.9=92\text{min.}$
1000mAh	1.2A	$(1000/1.2=833)/11.9=70\text{min.}$

CHARGING THE LITHIUM BATTERIES (LiPo,Lilon,LiFe)

This program is designed exclusively for charging or discharging Lithium batteries with a nominal voltage of 3.3V, 3.6V or 3.7V per cell. Different types of packages require different charging techniques. Two basic methods of charging are: a method of constant voltage, and method of constant current. In the second case, remember to properly draw the intensity of which is dependent both on how capacity and packet specifications. The charging voltage is also very important - it should precisely match the voltage of the packet.

If you want to change the parameters, press the START/ENTER (parameter will start blinking), then use the DEC or INC to change the value. Then press START/ENTER to confirm the selected parameter.

On the diagram, the left side of the first line shows the type of the charging packets. In the second line it shows



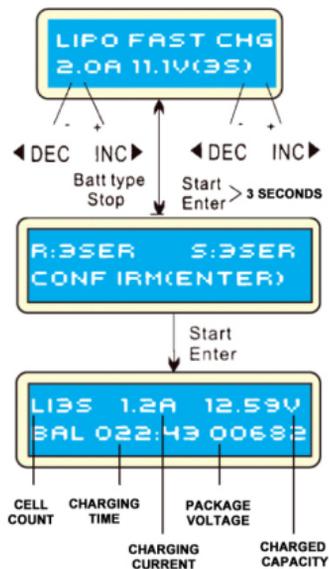
the charging current value selected by the user. After setting the current and voltage press the START/ENTER button and hold it for 3 sec., The process will be started (charging current: 0.1-5.0A, voltage 1-5V)

In the second diagram shows the number of cells detected by the charger. "R" means the amount of detected cells, and the "S" number of cells set at the beginning by the user. If the two values are the same then you should start charging by pressing the START / ENTER. If the quantities are different, press BATT TYPE/STOP to return to the previous menu and re-set the correct number of cells.

The screen will display the actual time of the charging process. To stop the charging process at any time, press BATT TYPE/STOP.

BALANCED MODE LITHIUM BATTERY CHARGING

This mode is designed for charging Lithium batteries using the built-in balancer. In this mode, in addition to the packet connection with the main current connectors, must be connected by a further service connector pack charger (on the right side of the charger). Charging in this mode is different from the normal charging program because the built-in processor monitors the voltage separately for each cell and controls the charging current of each one separately too.

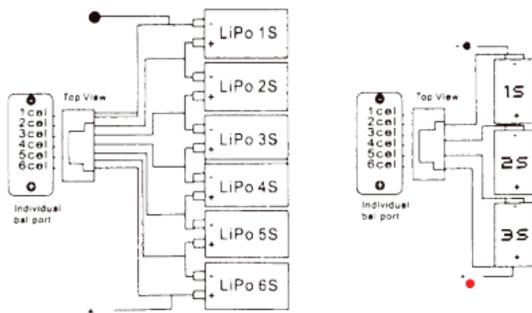


In the diagram, at the left side of the second line, the current charging current is shown on the other hand, and the right side in the same line shows the voltage value. After setting the current and voltage, press START/ENTER and hold it for 3 sec. to begin the process.

This diagram shows the number of cells in the packet, set by the user and detected by the charger. "R" means the amount of detected cells, and the "S" quantity of cells set by the user. If the two values are the same then you should start charging by pressing the START/ENTER. If the values differ, press BATT TYPE/STOP button to return to the previous menu and re-set the correct number of cells.

The screen displays the actual time of the charging process. To stop the charging process at any time, press BATT TYPE/STOP.

CONNECTION DIAGRAM OF INDIVIDUAL CELLS (8-PIN CONNECTION)



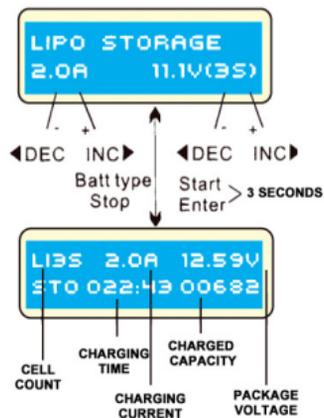
CHARGING LITHIUM PACKET IN „FAST” MODE

During the last stage, the output charging current is reduced. FAST mode manipulates the process of reducing the voltage so the charging process could end up faster. In fact, the charging current is reduced to 1/5 of the output value when the charging time is approaching the last 10%. Capacity of the package after such a charge may be lower in relation to the nominal capacity but the charging time will be reduced accordingly.

In this mode, of course, you can also change the charging current and voltage of the package. Press START/ENTER, then a confirmation tension will be displayed. Then press the START/ENTER button to confirm and start charging. The screen should display the actual status of the charging process in FAST mode. To abort the process, press the BATT TYPE/STOP button once.

CHARGING LITHIUM PACKET IN „STORAGE” MODE

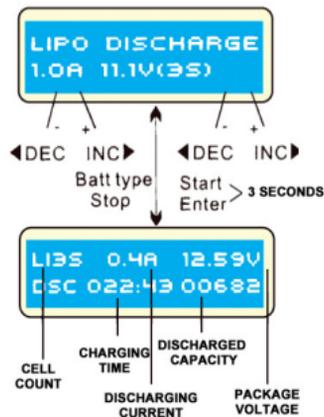
This mode is used for charging or discharging of packets which will not be used for a certain period of time. The STORAGE program is designed to charge or discharge the packet to a specific voltage level, and they are: 3.75V for lithium-ion, 3.85V for LiPo and 3.3V for LiFe. The program will begin the process of discharging the packet if the voltage is higher than the preset storage voltage.



The diagram shows the charging current and the nominal voltage of the packet. Charging or discharging lead pack to achieve the ideal parameters for long-term storage.

This screen shows the current parameters of the package and the current charge level. Single pressing the BATT TYPE/STOP button will stop the charging process.

DISCHARGING OF THE LITHIUM PACKETS



The value of the discharge current on the left can not exceed 1C, and the final voltage on the right side can not be lower than the voltage level that is recommended by the manufacturer to avoid deep discharge. Pressing and holding the START / ENTER more than 3 seconds to start the charging process.

This screen displays the current status of discharging, press the BATT TYPE/STOP button will stop the process.

BALANCING WITH VOLTAGE AND MONITORING THE DISCHARGING PROCESS

The processor monitors the voltage of each cell when the packet is in the STORAGE mode or is discharging. To use this feature, the packet must be additionally connected to the charger via balancer plug. If the voltage on any of the cell is invalid, the charger will show an error on the screen and automatically stop the process. If the packet is damaged or disconnected, to check which cell is damaged, press the INC.

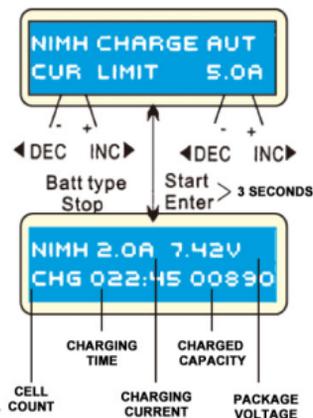
BATTERY VOL ERR
CELL LOW VOL

INC ▶

4.14 4.16 4.09
2.18 0.00 0.00

The processor has detected that the voltage in one of the cells is too low. The fourth cell is damaged (displays 2.18V). Voltage drops to zero when the connection is interrupted.

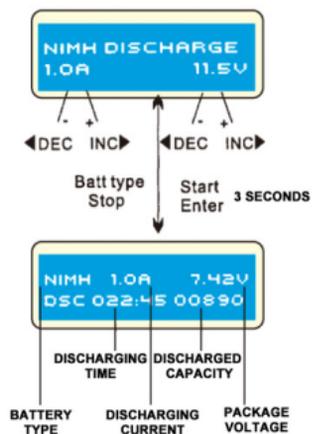
CHARGING NiCd i NiMH PACKETS



This program is used to charge or discharge NiCd and NiMH batteries. When you press the START/ENTER key, parameter flashes. To change the settings, use the INC or DEC to adjust the parameters, and press the START/ENTER to store the new values.

This program is used to charge the packet using the current defined by the user. In AUTO mode, the user should set the upper limit of current to avoid damaging the packet. Some batteries with lower resistance and capacitance can be charged with a higher current in AUTO mode. However, in the manual mode, the packet is always charged with exact current as set by user. If the current field is blinking, you can change the value with INC or DEC. Then the screen displays the current status of the charging process. To stop it, press the BATT TYPE/STOP button. A beep indicates the end of the process.

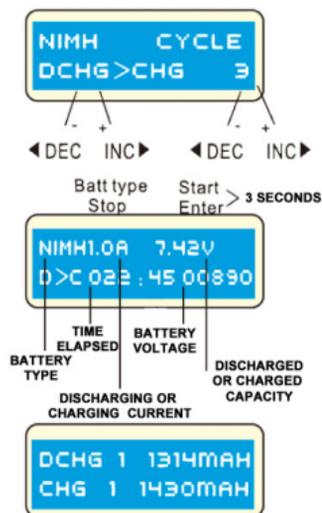
DISCHARGING NiCd i NiMH PACKETS



Set the current of the discharge visible on the left and the final voltage on the right side in the second line of the screen. The discharge current should be in the range of 0.1-1.0A. The final voltage in the range 0.1-25.0V. Press and hold the START / ENTER key for 3 seconds to start the process of discharging.

The screen shows the current state of discharging. To change the current of discharging, press the START / ENTER. Pressing the START / ENTER button will cause the charger to remember the new setting. Press BATT TYPE/STOP to stop the discharging. A beep indicates the end of the process.

CYCLED CHARGE/DISCHARGE AND DISCHARGE/CHARGE OF NiCd AND NiMH PACKETS



Charger Greenbox has the feature of the cycling, or cyclic charging and discharging of the packet. On the left side of the screen, the ability to set the type of the cycle is presented as DCHG>CHG for discharging and charging and CHG>DCHG, for charging and discharging, along with the number of cycles. With this feature you can even the packet levels, refresh it, or form. In settings you can set the time interval of the cooling period between successive processes. The number of cycles should be in the range of 1-5.

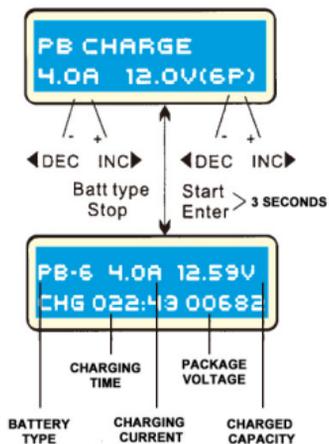
Press the button once BATT TYPE / STOP to stop the cycle. To change the current value, press the START / ENTER. A beep signals the end of the process.

After completion of the cycling it is possible to check the charge and discharge capacity of the package. Press the INC or DEC can check the details for each of the cycles.

CHARGING THE Pb (Lead-Acid) PACKET

This program is designed to charge only Pb maintenance free batteries (gel batteries) with a nominal voltage of 2V to 20V. Pb accumulators are characterized by completely different parameters with respect to the NiCd and NiMH batteries. They can provide a low current relatively to the capacity. The same restrictions apply to charging. Therefore, they should be charged with current of not more than 1/10 of their capacity. Pb batteries are not suitable for fast charging. Please always follow the above recommendations and the manufacturer's instructions.

CHARGING Pb ACCUMULATORS

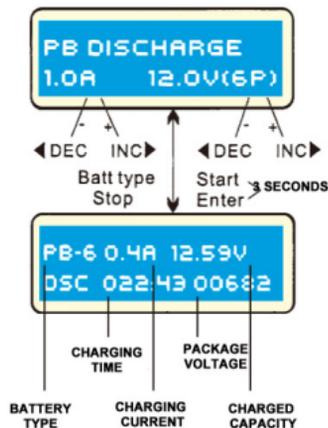


To change the value, press the START / ENTER when the parameter starts blinking, change it using the INC or DEC. To save the setting into the charger, press the START/ENTER button.

On this screen, you can set (left) charging current and the nominal voltage (right). The charging current should be in the range of 0.1-5.0A and voltage should be suitable for the charged battery. In order to start charging hold for 3 seconds the START / ENTER.

This screen shows the current charging status. At any time you can change the current value by pressing the START / ENTER. Once you press it, the charger will remember the new setting. Pressing BATT TYPE / STOP button will stop the charging process.

DISCHARGING Pb ACCUMULATORS

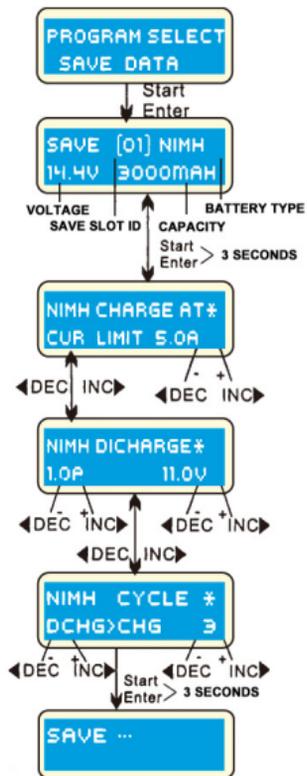


On this screen (left) discharge current and nominal voltage (right). The discharge current should be in the range from 0.1 to 5.0A and voltage should be suitable for the discharged battery. To start discharging hold for 3 seconds the START / ENTER.

This screen shows the current status of the discharge. At any time you can change the current value by pressing the START / ENTER. Once you press it, the charger will remember the new setting. Pressing BATT TYPE / STOP button will stop the discharging process.

SAVING THE SOFTWARE SETTINGS

In order to facilitate its use, the Greenbox charger has the ability to read and write individual settings performed by the user. The charger can store settings for up to 5 different packages. Settings can be triggered from memory charger before starting the charging process or discharging without having to re-enter all parameters.



Parameter settings shown on this screen does not affect the charging or discharging. They show only the specification of the packet. Examples of saving settings for NiMH pack with a capacity of 3000 mAh and 12 cells.

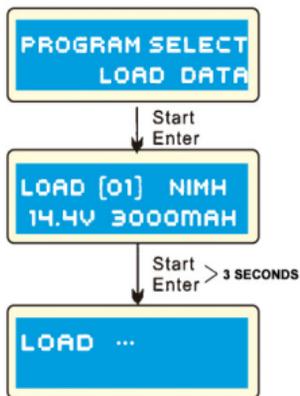
Set the charging current for charging or manual mode limit for the AUTO mode. To change the charging mode simultaneously press the INC or DEC.

Field to set the discharge current and final voltage.

Setting sequence of charging or discharging, and the number of cycles.

Saving the settings.

LOADING SAVED SETTINGS/PROGRAMS



Loading feature is used to read the settings defined by the user and stored in the memory of the charger. In order to load the saved program, press the START / ENTER, and when the parameter flashes select the appropriate number using the INC or DEC. At the end of the hold for 3 seconds the START / ENTER.

Select the number of data set to load. Selected data appear on the screen.

Loading the settings.

ADDITIONAL INFORMATION DISPLAYED DURING OPERATION

Charger Greenbox has several additional features that allow you to preview additional packet or process parameters during charging / discharging. After pressing the DEC shows an additional settings. After pressing the INC you can monitor the voltage of each cell in the package when it is connected to the charger via the balancer cable.



The first screen (End Voltage) shows the voltage terminal, which will be achieved when the charging process completes.

Limitation of capacitance.

The time limit.

3-pin port mode is set to the USB mode.

If you connect a temperature sensor, the screen displays information about the temperature on the surface of packet.

The current power supply of the charger.

When a packet is connected to the charger with the balancer connector, you can check the voltage of each cell in the pack. This function can display the voltage up to 6 cells.

WARNING AND ERROR MESSAGES

Greenbox charger has a number of security features and monitoring the work of the charger. In the event of an error, the message appears on the LCD screen and the charger beeps a sound signal.

REVERSE POLARITY

Reverse polarity.

CONNECTION BREAK

Error in the connection between the charger and the packet.

SHORT ERR

There was a short circuit (short-circuit the positive terminal to the negative).

INPUT VOL ERR

Incorrect input voltage.

VOL SELECT ERR

The voltage setting for the battery is invalid.

BREAK DOWN

The charger stopped working properly. Contact a service center.

BATTERY CHECK
LOW VOLTAGE

The voltage of the package is lower than that which has been set by the user.
Check the number of cells of packet.

BATTERY CHECK
HIGH VOLTAGE

The voltage of the package is higher than that which has been set by the user. Check the number of cells of packet.

BATTERY VOLTAGE
CELL LOW VOL

One of the cell voltage is too low. Check the voltage of each cell.

BATTERY VOLTAGE
CELL HIGH VOL

One of the cell voltage is too high. Check the voltage of each cell.

BATTERY VOLTERR
CELL CONNECT

Incorrect connection of the balancer plug. Carefully check the current connector and wires of the balancer.

TEMP OVER ERR

Temperature is too high. Let the pack and charger to cool down.

CONTROL FAILURE

The charger can not control the charging current of unknown cause. Contact a service center.

WARRANTY AND SERVICE

GPX Greenbox product is covered by a 12 month manufacturer's warranty. In case of problems with the charger, please contact the shop where the product was purchased, showing a valid proof of purchase.

This warranty does not apply in case of improper use or handling of the charger, such as the improper use, charging unsupported battery types, polarity confusion, self-interference in electronic equipment, gross negligence or dirt, wet, bringing to a short circuit, overcharging a packet due to incorrect parameters loading, mechanical damage, improper storage, and others are not due to fault of the manufacturer.

Moreover, the Guarantor shall not be liable for any loss or damage caused as a result of use of the product.



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