HITEC X2 ULTIMA

X2 Ultima Multi-Chemistry, High-Output, Dual-Charger System
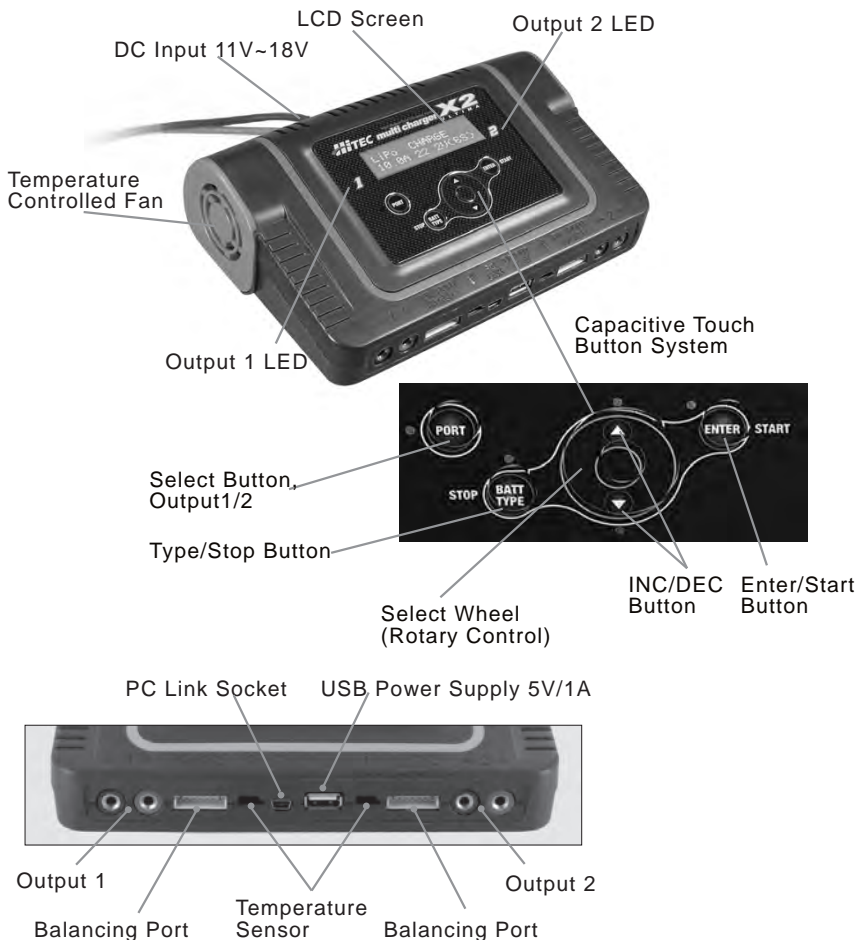

Instruction Manual

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INTRODUCTION

Congratulations on your choice of the X2 Ultima digital intelligent charger from Hitec RCD. You are now the owner of a professional charger/ discharger with battery management and integral balancer.

LCD Screen

Output 2 LED

DC Input 11V~18V

Temperature Controlled Fan

Output 1 LED

Capacitive Touch Button System

Select Button, Output1/2

Type/Stop Button

INC/DEC Button

Enter/Start Button

Select Wheel (Rotary Control)

PC Link Socket

USB Power Supply 5V/1A

Output 1

Output 2

Balancing Port

Temperature Sensor

Balancing Port

INTRODUCTION

Please read this entire operating manual before using this product, as it covers a wide range of information on operation and safety.

The unit is simple to use, but the operation of a sophisticated automatic charger/discharger such as the X2 Ultima does require some knowledge on the part of the user. These operating instructions are designed to ensure that you quickly become familiar with its functions.

It is therefore important that you read the Instruction Manual, Warning and Safety Notes thoroughly before you attempt to use your new automatic charger for the first time. We hope you have many years of pleasure and success with your new battery charger.

The X2 Ultima employs the circuit that features dual output power of 200 watts each. Total output power is 400 watts. Each output can charge or discharge up to 18 cells of NiCd/NiMH or 6 series of Lithium batteries with a maximum current of 10 amps. The X2 Ultima has an individual cell voltage balancer, so it does not require a separate balancer when charging Lithium batteries (LiPo/Li-Ion/LiFe) for voltage balancing.

Reliable/durable capacitive touch systems are used for charger controls. With no moving parts to wear out, the wear and tear issues which plague conventional switches are inherently eliminated. Additionally, because the capacitive touch buttons are mounted behind solid substrates, user and environmental abuse are not a concern.

The three capacitive touch buttons and the 'Select Wheel' are multi-function charger controls, as indicated by the printed legends. The 'Select Wheel' has three functions:

1. Rotate to the right: This action changes the functions of the charger or increases the value of the charger's parameters.

2. Rotate to the left: This action changes the functions of the charger or decreases the value of the charger's parameters.

3. Holding the + or - button down produces a continuous change. Holding the button down for a long period accelerates the rate of change.

The fan cooling system is smart and efficient. The fan speed is controlled by an internal temperature sensor.

Please BE SURE to read these instructions and Warning and Safety Notes before you use the charger for the first time.
It can be dangerous to mishandle batteries and battery chargers, as there is always a risk of batteries catching fire and exploding.

Set contents

1. X2 Ultima Multi-Charger
2. One XH Adaptor and One HP/PQ Adaptor
3. Alligator Clip Charging Cable
4. Tamiya Charging Cable
5. RX Charging Cable
6. Multiplex Charging Cable
7. 18 AWG Wire Charging Cable – 2 pieces
8. Plug-in Battery Clamps

Contents subject to change without notice

Special features

Optimized operating software
The X2 Ultima features the AUTO function that sets the feeding current during the charging or discharging process . It can prevent overcharging which may lead to an explosion due to the user's fault, especially with Lithium batteries. It can disconnect the circuit automatically and alarm once, detecting any malfunction. All the programs of this product are controlled through two- way linkage and communication, to achieve maximum safety and minimize trouble. All the settings can be configured by the user!

Internal independent lithium battery balancer
The X2 Ultima employs an individual-cell voltage balancer. It isn't necessary to connect an external balancer for balance charging.

Balancing individual cells during battery discharging
During the process of discharging, the X2 Ultima can monitor and balance each cell of the battery individually. If the voltage of any single one cell is abnormal, an error message will be indicated and the process will be ended automatically.

SPECIAL FEATURES

Adaptable to various types of Lithium batteries
The X2 Ultima is adaptable to various types of Lithium batteries, such as Li-Ion, LiPo and the new LiFe series of batteries.

Fast and storage mode of Lithium batteries
The purpose of charging Lithium batteries varies. The 'fast' charge mode reduces the duration of charging. The 'store' mode can control the final voltage of your battery, so as to store for a long time and protect the life of the battery.

Maximum safety
Delta-peak sensitivity: The automatic charge termination program is based on the principle of the Delta-peak voltage detection. When the battery's voltage exceeds the threshold, the process will be terminated automatically.

Automatic charging current limit
You can manually set the maximum charge rate for charging your NiCd or NiMH batteries. It will auto-detect when the batteries are fully charged and shut off, even with low impedance NiMH packs.

Capacity limit
The charging capacity is calculated as the charging current multiplied by time. If the charging capacity exceeds the limit, the process will be terminated automatically when you set the maximum value.

Temperature threshold
The battery's internal chemical reaction will cause the temperature of the battery to rise. If the temperature limit is reached, the process will be terminated. This function is available by connecting the temperature probe which is included in this package.

Processing time limit
You can also limit the maximum process time to avoid any possible defect.

Data store/load
For the user's convenience, the charger can store a maximum of 10 different battery data. You can program both the charge and discharge parameters to suit your specific batteries. This data can be called back at any time you need and the process can be executed without resetting the program.

Cyclic charging/discharging
1 to 5 cyclic and continuous processes of charge>discharge or discharge>charge is operable for battery refreshing and balancing to stimulate the battery's activity.

SPECIAL FEATURES

PC- based analysis using USB Communication (for output 1 only)
The X2 Ultima is fitted with a mini USB port on the front side of the case. A USB wire can be connected to this socket in order to link the charger to a PC. The "Charger Monitor" program screen enables you to view graphs of charge and discharge curves with a capacity, voltage, temperature and ampere display. Each individual curve can be individually suppressed or superimposed to allow a visual comparison of the data.

PC-based analysis using USB
Communication
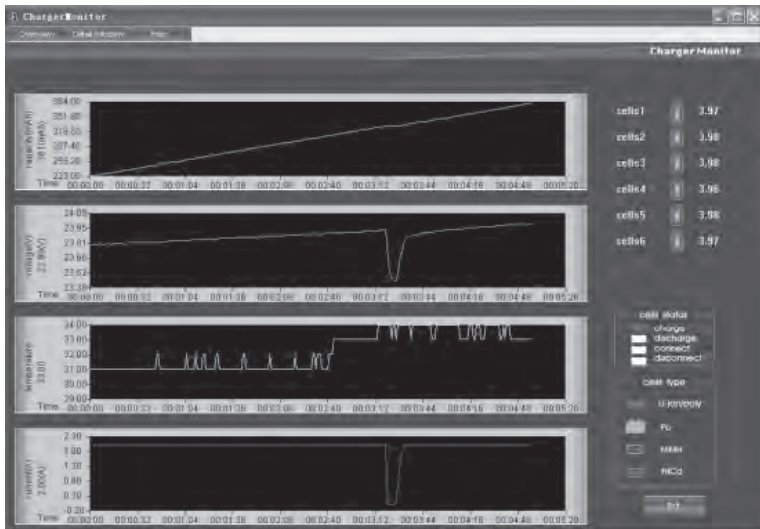
Software is available for download at **www.hitecrcd.com**.

USB Power Supply
The USB power supply can provide 5V, 1A continuous current. You can power your mobile phone, digital camera or even your I-Pod via the USB power supply.

WARNING AND SAFETY NOTES

These warning and safety notes are particularly important. Please follow the instructions for maximum safety; otherwise the charger and the battery can be damaged or at worst, cause a fire.

❗ Never leave the charger unattended when it is connected to its power supply. If any malfunction is found, TERMINATE THE PROCESS AT ONCE and refer to the operation manual.

❗ Keep the charger well away from dust, damp, rain, heat, direct sunshine and vibration. Never drop it.

❗ The allowable input voltage is 11~18V DC.

❗ This charger and the battery should be put on a heat-resistant, non-flammable or non-conductive surface. Never place them on a car seat, carpet or similar material. Keep all flammable, volatile materials away from the operating area.

❗ Make sure you know the specifications of the battery to be charged or discharged to ensure it meets the requirements of this charger. If the program is set up incorrectly, the battery and charger may be damaged .Overcharging can cause a fire or explosion. This warranty is not valid for any damage or subsequent damage arising as a result of a misuse or failure to observe the procedures outlined in this manual.

Standard Battery Parameters

	LiPo	LiIon	LiFe	NiCd	MiMH	Pb
Nominal Voltage	3.7V/cell	3.6V/cell	3.3V/cell	1.2V/cell	1.2V/cell	2.0V/cell
Max Charge Voltage	4.2V/cell	4.1V/cell	3.6V/cell	1.5V/cell	1.5V/cell	2.46V/cell
Storage Voltage	3.8V/cell	3.7V/cell	3.3V/cell	n/a	n/a	n/a
Allowable Fast Charge	$\leqq$1C	$\leqq$1C	$\leqq$4C	1C-2C	1C-2C	$\leqq$0.4C
Min. Discharge Voltage	$\geqq$3.0V/cell	$\geqq$2.5V/cell	$\geqq$2.0V/cell	$\geqq$0.85V/cell	$\geqq$1.0V/cell	$\geqq$1.75V/cell

Be very careful to choose the correct voltage for different types of batteries; otherwise you may cause damage to the batteries. Incorrect settings could cause the cells to catch fire or explode.

WARNING AND SAFETY NOTES

❶ Never attempt to charge or discharge the following types of batteries:
- A battery pack which consists of different types of cells (including different manufacturers)
- A battery that is already fully charged or just slightly discharged
- Non-rechargeable batteries (pose an explosion hazard)
- Batteries that require a different charge technique from NiCd, NiMH, LiPo or gel cell (Pb, Lead acid)
- A faulty or damaged battery
- A battery fitted with an integral charge circuit or a protection circuit
- Batteries installed in a device or which are electrically linked to other components
- Batteries that are not expressly stated by the manufacturer to be suitable for the currents the charger delivers during the charge process

❶ Please bear in mind the following points before commencing charging:
- Did you select the appropriate program suitable for the type of battery you are charging?
- Did you set up adequate current for charging or discharging?
- Have you checked the battery voltage? Lithium battery packs can be wired in parallel and in series, i.e. a 2-cell pack can be 3.7V (in parallel) or 7.4V (in series)
- Have you checked that all connections are firm and secure?
- Make sure there are no intermittent contacts at any point in the circuit.

❶ Charging

During the charge process, a specific quantity of electrical energy is fed into the battery. The charge quantity is calculated by multiplying charge current by charge time. The maximum permissible charge current varies depending on the battery type or its performance and can be found in the information by the battery manufacturer. Only batteries that are expressly stated to be capable of quick-charge are allowed to be charged at rates higher than the standard charge current.

Connect the battery to the terminal of the charger. Red is positive and black is negative. Due to the difference between the resistance of the cable and the connector, the charger can not detect resistance of the battery pack. The charge lead should be of an adequate conductor cross-section and high quality connectors (normally gold- plated) should be fitted to both ends.

When pertaining to charging methods, recommended charging current and charging time, always refer to the manual by the battery manufacturer. Lithium

batteries, in particular, should be charged according to the charging instructions provided by the manufacturer.

Do not attempt to disassemble the battery pack arbitrarily.

Please note that lithium battery packs can be wired in parallel and in series. In the parallel connection, the battery's capacity is calculated by multiplying the single battery's capacity by the number of cells when total voltage stays the same. The voltage's imbalance may cause a fire or explosion. Lithium batteries are recommended to charge in series.

❗ Discharging

The main purpose of discharging is to remove the residual capacity of the battery, or to reduce the battery's voltage to a defined level. The same attention should be paid to the discharging process as charging. The final discharge voltage should be set up correctly to avoid deep-discharging. Lithium batteries cannot be discharged to lower than the minimum voltage or it will cause a rapid loss of capacity or total failure. Generally, Lithium batteries do not need to be discharged. Please pay attention to the minimum voltage of a Lithium battery to protect the battery life.

Some rechargeable batteries have a "memory effect." If they are partly used and recharged before the whole charge is accomplished, they remember this and will only use that part of their capacity next time. This is called "memory effect." It is said that NiCd and NiMH batteries suffer from "memory effect." NiCd has more "memory effect" than NiMH.

It is recommended that Lithium batteries be discharged partially rather than fully. Frequent full discharging should be avoided if possible. Instead, charge the battery more often or use a battery of larger capacity. Full capacity cannot be reached until it has been subject to 10 or more charge cycles. The cyclic process of charge and discharge will optimize the capacity of the battery pack.

PROGRAM FLOW CHART

```
                            LiPo
                            V.Type 3.7V
                            DEC INC
                            Enter           INC   Back-light    INC   Input Power Low  INC   Key Beep  ON  INC   Capacity  Cut off
                                            DEC   100%          DEC   Cut-Off  10.0V   DEC   Buzzer    ON  DEC   ON       5000mAH
USER SET      Start         LiLo
PROGRAM       Enter         V.Type 3.6V
                                                                                                              DEC INC
                            Enter
                            DEC INC                                                                    Safety Time
                                                                                                      ON      180min
                            LiFe
                            V.Type 3.3V

                            INC DEC                                                                    DEC INC

                    LiPo/LiIo/LiFe  INC  NiMH Sensitivity  INC  NiCd Sensitivity  INC  Temp  CUT-OFF  INC  Haste Time       INC  NiMH/NiCd/Pb
                    CHK Time  10min  DEC  D.Peak Default    DEC  D.Peak Default    DEC  ON      80C     DEC  CHG>DCHG 1min    DEC  Trickle 50mA

PROGRAM SELECT  Start  LiPo CHARGE      LiPo BALANCE   INC  LiPo FAST CHG   INC  LiPo STORAGE   INC  LiPo DISCHARGE
LiPo BATT       Enter  0.1A  3.7V(1S)   0.1A 7.4V(2S)  DEC  0.1A  3.7V(1S)  DEC  0.1A  3.7V(1S) DEC  0.1A  3.0V(1S)

PROGRAM SELECT  Start  LiIo CHARGE      LiIo BALANCE   INC  LiIo FAST CHG   INC  LiIo STORAGE   INC  LiIo DISCHARGE
LiIo BATT       Enter  0.1A  3.6V(1S)   0.1A 7.2V(2S)  DEC  0.1A  3.6V(1S)  DEC  0.1A  3.6V(1S) DEC  0.1A  3.0V(1S)

PROGRAM SELECT  Start  LiFe CHARGE      LiFe BALANCE   INC  LiFe FAST CHG   INC  LiFe STORAGE   INC  LiFe DISCHARGE
LiFe BATT       Enter  0.1A  3.3V(1S)   0.1A 6.6V(2S)  DEC  0.1A  3.3V(1S)  DEC  0.1A  3.3V(1S) DEC  0.1A  2.0V(1S)

                    NiMH CHARGE  Man
                    CURRENT    0.1A
PROGRAM SELECT  Start  Start/Enter  INC+DEC   INC  NiMH DISCHARGE  INC  NiMH CYCLE
NiMH BATT       Enter  INC+DEC  Start/Enter  DEC  0.2A    0.1V     DEC  DCHG>CHG  1
                    NiMH CHARGE  Aut
                    CUR LIMIT  0.6A

                    NiCd CHARGE  Man
                    CURRENT    0.1A
PROGRAM SELECT  Start  Start/Enter  INC+DEC   INC  NiCd DISCHARGE  INC  NiCd CYCLE
NiCd BATT       Enter  INC+DEC  Start/Enter  DEC  0.2A    0.1V     DEC  DCHG>CHG  1
                    NiCd CHARGE  Aut
                    CUR LIMIT  0.1A

PROGRAM SELECT  Start  LOAD [01] LiPo   Start 2 Sec.  LOAD…    OK
LOAD DATA       Enter  1.0V  5000mAH    Enter

PROGRAM SELECT  Start  SAVE [ 1 ] LiPo  Start 2 Sec.  LiPo CHARGE *   Start 2 Sec.  SAVE…    OK
SAVE DATA       Enter  3.7V  5000mAH    Enter         0.1A 3.7V(1S)   Enter

PROGRAM SELECT  Start  PB CHARGE       INC  PB DISCHARGE
Pb BATT         Enter  0.1A  2.0V(1P)  DEC  0.1A  2.0V(1P)
```

LITHIUM POLYMER BALANCE CHARGE PROGRAM CONNECTION DIAGRAM

CONNECTING THE CHARGER

The X2 Ultima comes with 4mm male bullet connectors attached to the power INPUT cables. These cables attach directly to most high-quality AC-DC power supply units, such as eFUEL model PSU30A (15V, 30A). Also included are large terminal clips with matching 4mm female bullet connectors which can attach directly to 12V car batteries. It is critically important that you use either a fully-charged 13.8 car battery or a high quality AC-DC power supply in the range of 11V to18V DC output, with a minimum current rating of 30A to insure reliable performance.

4mm Bullet
Connectors
plugging
to eFUEL power
supply

Using a terminal
clip attached to
a car battery

CONNECTING THE BATTERY

Important !!! Before connecting a battery, it is absolutely essential to check that you have set the parameters correctly. If the settings are incorrect, the battery may be damaged and could possibly burst into flames or explode. To avoid short circuits between the banana plugs, always connect the charge leads to the charger first then to the battery. Reverse the sequence when disconnecting the pack.

LITHIUM POLYMER BALANCE CHARGE PROGRAM CONNECTION DIAGRAM

Balance socket:
The balance wire attached to the battery must be connected to the charger's balancing port. Take care to maintain correct polarity!
(See wiring diagram below)
This diagram shows the correct way to connect your battery to the X2 Ultima while charging in the balance charge program mode only.

⚠ WARNING:

Failure to connect as shown in this diagram will damage this charger.

To avoid short circuits between the charge lead, always connect the charge cable to the charger first then connect the battery. Reverse the sequence when disconnecting.

Initial parameter set up (user's set up):

The X2 Ultima will be operated with the default value of the essential user settings when it is connected to a 12V battery for the first time. The screen displays the following information in sequence and the user can change the value of the parameter on each screen. When you are willing to alter the parameter value in the program, press the **start/enter** key to make it blink, then change the value with the **Inc> or <Dec** key. The value will be stored by pressing the **start/enter** key once.

```
USER SET
    PROGRAM->
```

User set up starting screen.

INC ▶

```
LiFe
V.Type   3.3V
```

◀DEC INC▶

This screen displays the nominal voltage of a Lithium battery. There are three kinds of Lithium batteries: LiFe(3.3V), Li-Ion(3.6V) or LiPo (3.7V). It is very important to check the battery carefully and set it up correctly. If the correct value of the battery is not assigned, an explosion may occur during the charge process.

◀DEC INC ▶

```
LiPo/LiIo/LiFe
CHK Time 10min
```

The X2 Ultima recognizes the cell count of a Lithium battery automatically at the beginning of the charge or discharge process to avoid an erroneous setting by the user. However, a deeply discharged battery can be incorrectly perceived. To prevent this error, you can set the time term to verify the cell count by the processor. Normally, 10 minutes is enough time to perceive the cell count correctly. For a larger capacity battery, you may extend the time term. If you set the time term too long for a smaller capacity battery, the charge or discharge process can be finished within the time term even with an erroneous cell count. This may cause a fatal result. If the processor recognizes the cell count incorrectly at the beginning of the charge or discharge process, you may extend the time. Otherwise, you should use the default value.

◀DEC INC▶

```
NIMH Sensitivity
D.Peak    Default
```

◀DEC INC▶

Termination of NiMH and NiCd battery. The effective value ranges from 5 ~ 20mV per cell. If the trigger voltage is set higher, there is a danger of overcharging the battery. If it is set lower, there is a possibility of premature termination. Please refer to the technical specification of the battery. (NiCd default: 12mV, NiMH default: 7mV).

```
NICD Sensitivity
D.Peak    Default
```

◀DEC INC▶

13

◄DEC │ INC►

```
Temp. Cut-off
  ON        80C
```
／－＋＼ │ ／－＋＼
◄DEC INC► │ ◄DEC INC►
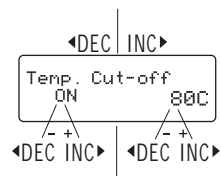
An optional feature uses the temperature probe contacting the surface of the battery. The temperature cut-off can be on or off. If it is on, set the maximum temperature at which the charger should allow the battery to reach during charge. Once a battery reaches this temperature during the charge, the process will be terminated to protect the battery.

```
Weste Time
CHG/DCHG    5MM
```
／－＋＼ │ ／－＋＼
◄DEC INC► │ ◄DEC INC►
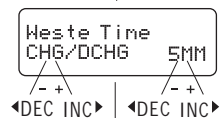
A battery on the cyclic process of charge and discharge can often become warm after the charge or discharge period. The program can insert a time delay after each charge and discharge process to allow the battery adequate time to cool down before continuing to the next process. The value ranges from 1 to 60 minutes.

```
NiMH/Nicd/Pd
Trickle  100mA
```
／－＋＼
◄DEC │ INC►
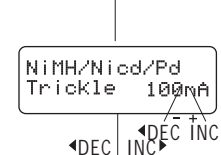
You can set the trickle charge mode to on or off. If it is on, the charger will automatically supply the trickle charge current to achieve a full charge without overheating the battery after the fast charge has been terminated.

```
Sefety time
  ON      120min
```
／－＋＼ │ ／－＋＼
◄DEC INC► │ ◄DEC INC►
◄DEC │ INC►
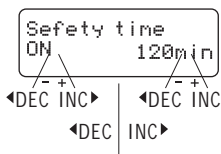
When you start a charge process, the integral safety timer automatically starts running at the same time. This is programmed to prevent overcharging of the battery if it proves to be faulty or if the termination circuit cannot detect the battery in full. The value for the safety timer should be generous enough to allow a full charge of the battery.

```
Copacity Cut-Cff
  ON      500mAh
```
／－＋＼ │ ／－＋＼
◄DEC INC► │ ◄DEC INC►
◄DEC │ INC►
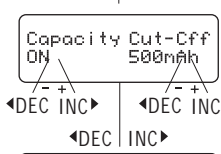
This program sets the maximum charge capacity that will be supplied to the battery during charging. If the delta-peak voltage is not detected or if the safety timer expires for any reason, this feature will automatically stop the process at the selected capacity value.

```
Key Beep    ON
Buzzer      ON
```
／－＋＼
◄DEC INC►
◄DEC │ INC►

The beep sounds every time a button is pressed to confirm your action. The beep or melody sounds at various times during operation to alert you to different mode changes. These audible sounds can be turned on or off.

```
Input power low
Cut-Off   10.0V
```
／－＋＼
◄DEC INC►
◄DEC │ INC►
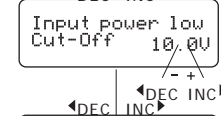
This program monitors the voltage of the input battery. If the voltage drops below the set value, the operation will be forcibly terminated to protect the input battery.

```
Back-light
         100%
```
／－＋＼
◄DEC INC►
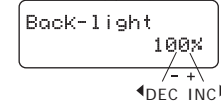
You can adjust the brightness of the charger's LCD screen.

Lithium battery (Li-Ion/LiPo/LiFe) program

These programs are only suitable for charging and discharging Lithium batteries with a nominal voltage of 3.3V, 3.6V and 3.7V per cell. These batteries need to adopt a different charge technique termed constant current (CC) and a constant voltage (CV) method. The charge current varies according to the battery capacity and performance.

The Lithium battery is charged at a constant current until it reaches the final charge voltage of 4.2 V per cell (B). After this point, the voltage is kept at a constant level, and the residual charge takes the form of a declining current curve (C) until the cut-off point (D) is reached. Charge current = C/10. At this point, the battery can be disconnected from the charger and is ready for use.
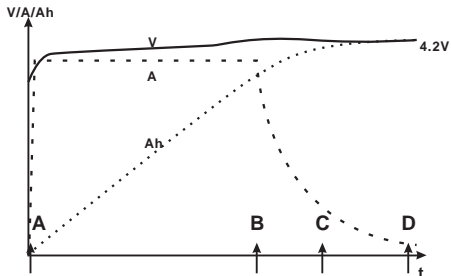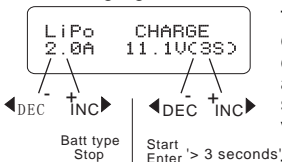

The final voltage of the charge process is also very important. It should be precisely matched with the charged voltage of the battery: 4.2V for LiPo, 4.1V for Li-Ion, and 3.6V for LiFe. The charge current and nominal voltage cell count must always be correct for the battery to be charged.

When you want to alter the parameter value in the program, press the **start/enter** key to make it blink and then change the value with the **Inc>** or **<Dec** key. The value will be stored by pressing the **start/enter** key once.

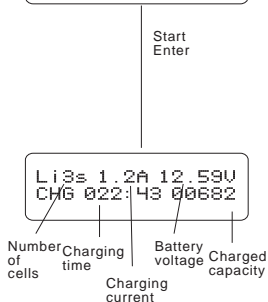## *Charging Lithium battery in the charge mode*

This charging mode is for charging Li-Po/Li-Ion/LiFe batteries without a balance lead.

```
LiPo    CHARGE
2.0A  11.1V(3S)
```
◀DEC ⁺INC▶   ◀DEC ⁺INC▶

Batt type | Start
Stop | Enter '> 3 seconds'

The left side of the first line shows the type of battery you choose. The value on the left of the second line of the charger is the current user set up. After setting the current and voltage, press the **Start/Enter** key for more than 3 seconds to start the process (charge current: 0.1-10.0A, voltage: 3.7-22.2V).

```
R:3SER   S:3SER
CONFIRM(ENTER)
```

Start
Enter

This displays the number of cells you set up and the processor detects. "R" shows the number of cells detected by the charger and "S" is the number of cells set by you at the previous screen. If both numbers are identical, you can start charging by pressing the **Start/Enter** button. If not, press the **Batt Type/Stop** button to go back to the previous screen. Carefully check the number of cells of the battery pack before proceeding.

```
Li3s 1.2A 12.59V
CHG 022:43 00682
```

Number of cells | Charging time | Battery voltage | Charged capacity
Charging current

This screen shows the real-time status during the charge process. Press the **Batt Type/Stop** key once to stop the charge process.

16

Charging Lithium battery in the balance mode

This function is for balancing the voltage of Lithium-polymer battery cells while charging. In the balance mode, the battery needs to have a balance lead to connect to the individual balance port of the charger. You also need to connect the battery's power lead to the output of the charger. Charging in this mode is different from the normal modes, because the built-in processor monitors voltage of individual cells and controls the input current fed into each cell to ensure each cell has equal voltage.

```
LiPo    BALANCE
2.0A   11.1V(3S)
```

◄DEC ⁻ ⁺ INC►   ◄DEC ⁻ ⁺ INC►

Batt type / Stop   Start Enter '> 3 seconds'

The left side of the first line shows the type of battery you choose. The value on the left of the second line of the charger is the current user set up. After setting the current and voltage, press the **Start/Enter** key for more than 3 seconds to start the process (charge current: 0.1-10.0A, voltage: 3.7-22.2V).

```
R: 3SER    S: 3SER
CONFIRM(ENTER)
```

Start Enter

This displays the number of cells you set up and the processor detects. "R" shows the number of cells detected by the charger and "S" is the number of cells set by you at the previous screen. If both numbers are identical, you can start charging by pressing the **Start/Enter** button. If not, press the **Batt Type/Stop** button to go back to the previous screen. Carefully check the number of cells of the battery pack before proceeding.
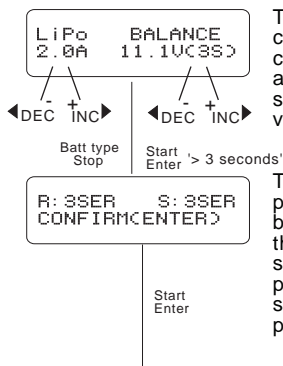
```
Li3s 1.2A 12.59V
BAL 022:43 00682
```

Number of cells / Charging time / Charging current / Battery voltage / Charged capacity

This screen shows the real-time status during the charge process. Press the **Batt Type/Stop** key once to stop the charge process.

Charging Lithium battery in the fast charge mode

The charging current gets smaller as the process nears the end term of the Lithium battery charging process. To finish the charging process earlier, this program eliminates certain terms of the CV process. Actually, the charging current will go to 1/5 from the initial value to end the process while the normal charging goes to 1/10 during the CV term. The charging capacity may be a bit smaller than normal charging but the process time will be reduced.

```
LiPo FAST CHG
2.0A 11.1V(3S)
```

- +
◄DEC INC►   ◄DEC INC►

Batt type   Start
Stop   Enter> 3 seconds
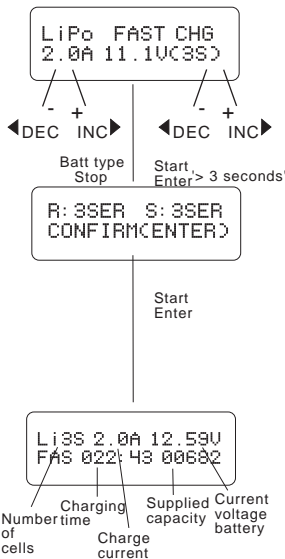
The value on the left side of the second lines sets the charge current. The value on the right side of the second line sets the battery pack's voltage. After setting the current and voltage, press the **Start/Enter** for more than 3 seconds to start the process.

```
R:3SER S:3SER
CONFIRM(ENTER)
```

Start
Enter

This displays the number of cells you set up and the processor detects. "R" shows the number of cells detected by the charger and "S" is the number of cells set by you at the previous screen. If both numbers are identical, you can start charging by pressing the **Start/Enter** button. If not, press the **Batt Type/Stop** button to go back to the previous screen. Carefully check the number of cells of the battery pack before proceeding.

```
Li3S 2.0A 12.59V
FAS 022:43 00682
```

Number of cells
Charging time
Charge current
Supplied capacity
Current voltage battery

This screen shows the real-time status during the charge process. Press the **Batt Type/Stop** key once to stop the charge process.

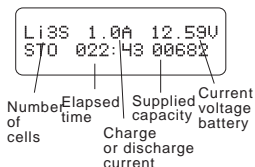### *Charging Lithium battery in the storage mode*

This is for charging or discharging a Lithium battery not to be used immediately. The program will determine whether to charge or discharge the battery to the certain voltage depending on the voltage of the battery at its initial stage. Different voltages exist for each type of battery: 3.75V for Li-Ion, 3.85V for LiPo and 3.3V for LiFe per cell. If the voltage of the battery at its initial stage is over the voltage level for storage, the program will start to discharge.

```
LiPo  STORAGE
1.0A    11.1V(3S)
```
- +   - +
◀DEC INC▶ ◀DEC INC▶
Batt type   Start
Stop   Enter '> 3 seconds'
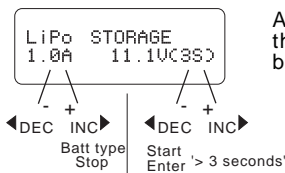
At this screen, you can set up the current and voltage of the battery pack. Charging and discharging will make the batteries come to the voltage level of the "storage" mode.
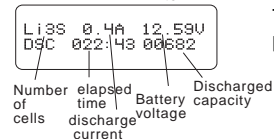
```
Li3S 1.0A 12.59V
STO 022:43 00682
```
Number of cells | Elapsed time | Supplied capacity | Current voltage battery
Charge or discharge current

This screen shows the real-time status charging. Press the **Batt Type/Stop** key once to stop the charge process.

Discharging of Lithium battery

```
LiPo    DISCHARGE
1.0A   11.1V(3S)
```
- +   - +
◀DEC INC▶ ◀DEC INC▶
Batt type   Start
Stop   Enter > 3 seconds'
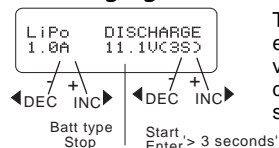
The value of the discharge current on the left can not exceed 1C, and the value on the right can not be under the voltage recommended by the manufacturer to avoid deep discharging. Press the **Start/Enter** key for more than 3 seconds to start discharging.

```
Li3S  0.4A  12.59V
DSC  022:43 00682
```
Number of cells | elapsed time | Battery voltage | Discharged capacity
discharge current

This shows the real-time status of discharging, you can press the **Batt Type/Stop** key to stop discharging.

CHARGING NICD/NIMH BATTERY IN THE CHARGE MODE

Voltage balancing and monitoring in the discharge process

The processor monitors the voltage of each cell in the battery packs during the "storage" and "discharging" process. If the voltage of any cell is abnormal, the X2 Ultima will show an error message and forcibly terminate the program. So if there is battery damage or a disconnection, you can see the error message and press the **Inc** button to know which cell is damaged.

```
BATTERY VOL ERR
  CELL  LOW VOL
```

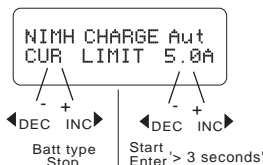This screen shows that the processor detects the voltage of one cell is too low.

INC ▶

```
4.14  4.16  4.09
2.18  0.00  0.00
```
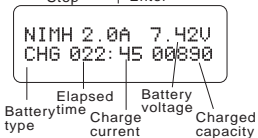
This screen shows that the 4th cell was damaged. The value of voltage may be zero if a disconnection occurs.

Charging NiCd/NiMH battery in the charge mode

This program charges the battery using the current you set up. In the "auto" mode, you should set up the upper limit of the charge current to avoid damage caused by excessive feed current. Some batteries of low resistance and capacity can lead to higher current in the "auto" charging mode. But in the manual mode, it will charge with the current you set. You can make it blink in the current field and press the **Inc** and **Dec** button simultaneously to swap between Auto and Manual Mode. NOTE: Allowable fast charge current: 1C-2C

```
NIMH CHARGE Aut
CUR LIMIT  5.0A
```

◄DEC INC▶   ◄DEC INC▶

Batt type   Start
  Stop   Enter > 3 seconds'

This program is for charging NiCd/NiMH batteries associated with RC model applications. You can press the **Start/Enter** key to make it blink and then the **Inc** or **Dec** button to change the parameter value. Press the **Start/Enter** key to store the value.

```
NIMH 2.0A  7.42V
CHG 022:45 00890
```

Battery Elapsed Battery
type   time   voltage
      Charge   Charged
      current   capacity

This screen shows the real-time status. Press the **Batt Type/Stop** key to end the program. A sound will emit to indicate the end of the program.

Discharge of NiCd/NiMH battery

```
NIMH DISCHARGE
1.0A        11.5V
```

- +   - +
◀DEC INC▶ ◀DEC INC▶

Batt type   Start '> 3 seconds'
Stop   Enter
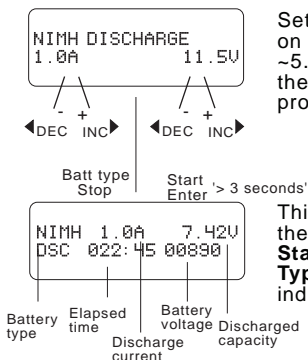
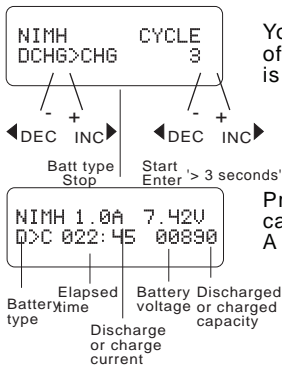Set the discharge current on the left and the final voltage on the right. The range of the discharge current is 0.1 ~5.0A; the range of the final voltage is 0.1~25.0V. Press the **Start/Enter** key for more than 3 seconds to start the program.

```
NIMH 1.0A   7.42V
DSC 022:45 00890
```

Battery   Elapsed   Battery
type   time   voltage Discharged
          Discharge   capacity
          current

This screen indicates the discharging state. You can press the **Start/Enter** key to alter the discharge current. Press the **Start/Enter** key again to store the value. Press the **Batt Type/Stop** key to stop discharging. A sound will emit to indicate the end of discharging.

Charge/discharge and discharge/charge cycle of NiCd/NiMH battery

```
NIMH     CYCLE
DCHG>CHG     3
```

- +   - +
◀DEC INC▶ ◀DEC INC▶

Batt type   Start '> 3 seconds'
Stop   Enter

You can set the sequence on the left and the number of cycles on the right. The range of the cycle number is 1-5.

```
NIMH 1.0A 7.42V
D>C 022:45  00890
```

Battery   Elapsed   Battery   Discharged
type   time   voltage   or charged
          Discharge   capacity
          or charge
          current

Press the **Batt Type/Stop** key to stop the program, You can press the **Start/Enter** key to alter the charge current. A sound will emit to indicate the end of the program.
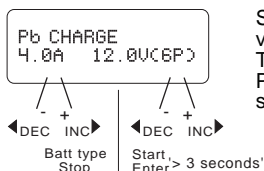
```
DCHG 1 1314mAh
CHG  1 1430mAh
```

When it approaches the end, you can see the capacity of the battery being charged or discharged. You can press the **Inc** or **Dec** key to display the result of each cycle.
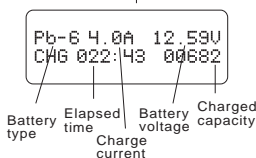
CHARGING PB (LEAD-ACID) BATTERY IN THE CHARGE MODE

Charging Pb (lead-acid) battery in the charge mode

This program is only suitable for charging a Pb（lead-acid）battery with nominal voltage from 2 ~ 24V. The Pb（lead-acid）battery is completely different from the NiCd/NiMH batteries. These batteries deliver lower current in comparison to their capacity. The same restriction applies to the charging process. Consequently, the optimum charge current can only be 1/10 of the capacity. The Pb battery can not be used for fast-charging.Always follow the instructions provided by the battery manufacturer. Due to the chemistry characteristic of a Pb battery, the cut-off point may be difficult to detect. We recommend using the CAPACITY CUT-OFF feature to protect the battery. You can press the **Start/Enter** key to make it blink and alter the value of the parameters using the **INC** or **DEC** key, then press the **Start/Enter** key to store the value.

```
Pb CHARGE
4.0A   12.0V(6P)
```
- + ◀DEC INC▶   - + ◀DEC INC▶

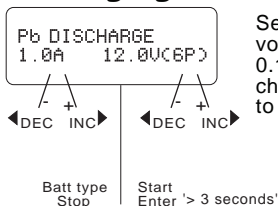Batt type / Stop   Start , Enter > 3 seconds'

Set up the charge current on the left and the nominal voltage on the right. The range of current is 0.1-10.0A. The voltage should match the battery being charged. Press the **Start/Enter** key for more than 3 seconds to start charging.

```
Pb-6 4.0A  12.59V
CHG 022:43 00682
```
Battery type / Elapsed time / Charge current / Battery voltage / Charged capacity

This screen displays the real-time discharging status. Press the **Start/Enter** key to alter the discharge current. Press the **Start/Enter** key again to store the parameter value you set. Press the **Batt Type/Stop** key to end the program.

Discharging of the Pb battery

```
Pb DISCHARGE
1.0A   12.0V(6P)
```
- + ◀DEC INC▶   - + ◀DEC INC▶

Batt type / Stop   Start Enter '> 3 seconds'

Set up the discharge current on the left and the nominal voltage on the right. The range of discharge current is 0.1-5.0A. The voltage should match the battery being charged. Press the **Start/Enter** key for more than 3 seconds to start charging.

```
Pb-6 0.4A  12.59V
DSC  022:43 00682
```
Battery type / Elapsed time / Discharge current / Battery voltage / Discharged capacity
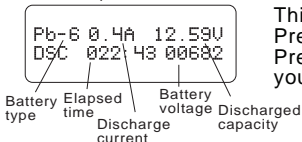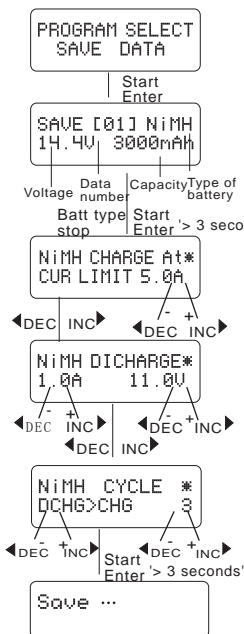
This screen displays the real-time discharging status. Press the **Start/Enter** key to alter the discharge current. Press the **Start/Enter** key again to store the parameter value you set. Press the **Batt Type/Stop** key to end the program.

Storage data program

For your convenience, the X2 Ultima has a data storage and load program. It can store the data of ten batteries, representing the respective specifications of each battery. You can call back the data when charging or discharging without re-setting the program. Press the **Start/Enter** key to make it blink, and use the **Inc** or **Dec** to set up the parameter.

```
┌─────────────────┐
│ PROGRAM SELECT  │
│   SAVE  DATA    │
└─────────────────┘
```

Start
Enter

```
┌─────────────────┐
│ SAVE [01] NiMH  │
│ 14.4V  3000mAh  │
└─────────────────┘
```

Voltage | Data number | Capacity | Type of battery

Batt type stop | Start Enter '> 3 seconds'

Setting of the parameter in the screen will not affect the charge and discharge process. It simply presents the specification of the battery. The example screen shows a NiMH battery pack, including 12 cells, with a capacity of 3000mAh.

```
┌─────────────────┐
│ NiMH CHARGE At* │
│ CUR LIMIT 5.0A  │
└─────────────────┘
```

◀DEC│INC▶   ◀DEC INC▶
           -   +

Set up the charge current in the "manual" mode, or the current limit in the "auto" mode. Press the **Inc** and **Dec** key simultaneously to make the current field blink to switch the charge mode.

```
┌─────────────────┐
│ NiMH DICHARGE*  │
│ 1.0A    11.0V   │
└─────────────────┘
```

◀DEC INC▶   ◀DEC INC▶
  -   +   -   +
    ◀DEC│INC▶

Set up the discharge current and the final voltage.

```
┌─────────────────┐
│ NiMH  CYCLE  *  │
│ DCHG>CHG     3  │
└─────────────────┘
```

◀DEC INC▶ Start   ◀DEC INC▶
  -   + Enter '> 3 seconds' -   +

Set up the charge/discharge sequence and cycle number.

```
┌─────────────────┐
│ Save ...        │
│                 │
└─────────────────┘
```

Save the data.

Load data program

This program loads the data stored at the "save data" program. Press the **Start/Enter** key to make the data field blink and press the **INC** or **DEC** for more than 3 seconds to load the data.

```
PROGRAM  SELECT
     LOAD  DATA
```

| Start
| Enter

```
LOAD [01]   NiMH
 14.4V    3000mAh
```

Choose the data number you want to call back. The data you want to call back will be displayed.

| Start
| Enter '> 3 seconds'

```
Load  ···
```

Load the data.

Various information in the program

You can acquire a variety of information on the LCD screen during the charging and discharging process. If you press the **Dec** key, the charger will display the user's setting. While the battery's balance lead is connected to the charger, you can press the **Inc** key to monitor the voltage of each cell.

```
End Voltage
       12.6V(3S)
```
The final voltage when the program ends.

```
Capacity  Cut-Off
ON      5000mAh
```
Capacity cut-off function is turned on and the setting value of capacity is displayed.

```
Safety   Time
ON      200min
```
Safety timer is turned on and the duration of time in minutes is displayed.

```
Temp    Cut-Off
OFF        80c
```
Temperature cut-off function is turned off.

```
Ext. Temp   26C
```
The external temperature is displayed when the temperature probe is used.

```
IN Power Voltage
12.56V
```
Present input voltage is displayed.

```
C1:4.12 C2:4.09V
C3:4.09 C4:4.10V
```
The battery is connected with the balance lead, so you can check the voltage of each cell in the battery pack.

WARNING AND ERROR MESSAGE

The X2 Ultima incorporates various protective and monitoring functions to verify functionality and the state of its electronics. In the case of an error, the screen displays the cause of the error with an audible sound.

| REVERSE POLARITY | Incorrect polarity connected. |

| CONNECTION BREAK | Battery connection interrupted. |

| SHORT ERR | Short-circuit of the output termination. |

| INPUT VOL ERR | Wrong input voltage. |

| VOL SELECT ERR | Selection of the battery pack voltage is incorrect. |

| BREAK DOWN | Charger has malfunctioned for some reason. Seek professional advice. |

| BATTERY CHECK
LOW VOLTAGE | Voltage is lower than which is set. Please check the number of cells in the battery pack. |

| BATTERY CHECK
HIGH VOLTAGE | Voltage is higher than which is set. Please check the number of cells in the battery pack. |

| BATTERY VOLTAGE
CELL LOW VOL | Voltage of one cell in the battery pack is too low, please check the voltage of each cell. |

| BATTERY VOLTAGE
CELL HIGH VOL | Voltage of one cell in the battery pack is too high; please check the voltage of each cell. |

| BATTERY VOL ERR
CELL CONNECT | Wrong connection of the connector detected; please check the connector and cable. |

| TEMP OVER ERR | Internal temperature of the unit is too high. Cool down the unit. |

| CONTROL FAILURE | The processor cannot control the feeding current, please repair it. |

RECOMMENDED ACCESSORIES

Temperature
Sensor Cable

EH Adaptor

XH Adaptor

TP/FP Adaptor

HP/PQ Adaptor

Tamiya Charging
Cable

Alligator Clip
Charging Cable

JST/BEC Charging
Cable

Futaba RX
Charging Cable

CONFORMITY DECLARATION

The X2 Ultima satisfies all relevant and mandatory EC directives and FCC Part 15 Subpart B: 2008.

For EC directives:
The product has been tested to meet the following technical standards:

Test Standards	Title	Result
EN 55014-1:2006	Electromagnetic compatibility-Requirements for household appliances, electric tools and Similar apparatus - Part 1: Emission	Conform
EN55014-2:1997+A1:2001	Electromagnetic compatibility-Requirements for household appliances, electric tools and Similar apparatus - Part 2: Immunity-Product family standard	Conform
EN61000-6-1(2007)	Electromagnetic compatibility (EMC) -- Part 6-1: Generic standards - Immunity for residential, commercial and light-industrial environments	Conform
EN61000-6-3(2007)	Electromagnetic compatibility (EMC) – Part 6-3: Generic standards -Emission standard for residential,commercial and light-industrial environments.	Conform

This symbol means that you must dispose of electrical equipment seperately from general household waste when such equipment reaches the end of its useful life. Take your charger to your local waste collection point or recycling center. This applies to all countries of the European Union, and to other European countries with a separate waste collection system.

MAXIMUM CIRCUIT POWER CHART

Maximum circuit power chart (Output 1 & 2)

The actual amount of charge current feeding to the battery is automatically limited to 200 watts each, so as not to exceed the charger's maximum rated charging power. The maximum discharge power is approximately 25 watts. The discharge current delivered to the charger is limited by the charger's internal thermal sensor for maximum discharge current. If the internal temperature goes over 80° Celsius, the charger will be cut off and the "TEMP OVER ERR" will show on the LCD. In this case, please decrease the discharge current. Please refer to the following chart for the maximum charging/discharging current.

Maximum Circuit Power Chart

Battery Type	No. of Cells	Rated Voltage(V)	Max Charge Voltage(V)	Charge Current (A) Charging Power 200W	Discharge Current (A) Discharging Power 25W
NiCd/NiM	2	2.4	3.0	10.0	5.0
	3	3.6	4.5	10.0	5.0
	4	4.8	6.0	10.0	4.2
	5	6.0	7.5	10.0	3.3
	6	7.2	9.0	10.0	2.8
	7	8.4	10.5	10.0	2.4
	8	9.6	12.0	10.0	2.1
	9	10.8	13.5	10.0	1.9
	10	12.0	15.0	10.0	1.7
	11	13.2	16.5	10.0	1.5
	12	14.4	18.0	10.0	1.4
	13	15.6	19.5	10.0	1.3
	14	16.8	21.0	10.0	1.2
	15	18.0	22.5	10.0	1.1
	16	19.2	24.0	10.0	1.0
	17	20.4	25.5	9.8	1.0
	18	21.6	27.0	9.2	0.9
LiPo	1S	3.7	4.2	10.0	5.0
	2S	7.4	8.4	10.0	3.0
	3S	11.1	12.6	10.0	2.0
	4S	14.8	16.8	10.0	1.5
	5S	18.5	21.0	10.0	1.2
	6S	22.2	25.2	9.0	1.0
LiIon	1S	3.6	4.1	10.0	5.0
	2S	7.2	8.2	10.0	3.0
	3S	10.8	12.3	10.0	2.0
	4S	14.4	16.4	10.0	1.5
	5S	18.0	20.5	10.0	1.2
	6S	21.6	24.6	9.3	1.0

MAXIMUM CIRCUIT POWER CHART

Battery Type	No. of Cells	Rated Voltage(V)	Max Charge Voltage(V)	Charge Current (A) Charging Power 200W	Discharge Current (A) Discharging Power 25W
LiFe	1S	3.3	3.6	10.0	5.0
	2S	6.6	7.2	10.0	3.5
	3S	9.9	10.8	10.0	2.3
	4S	13.2	14.4	10.0	1.7
	5S	16.5	18.0	10.0	1.4
	6S	19.8	21.6	10.0	1.2
Pb		6.0	7.4	10.0	3.4
		8.0	9.8	10.0	2.5
		10.0	12.3	10.0	2.0
		12.0	14.8	10.0	1.7
		14.0	17.2	10.0	1.5
		16.0	19.7	10.0	1.3
		18.0	22.1	10.0	1.1
		20.0	24.6	10.0	1.0
		22.0	27.1	9.1	0.9
		24.0	29.5	8.3	0.8

Specification

Operating voltage range	DC 11.0~18.0 Volt
Circuit power	Max. Charge power 2x200Watts Max. Discharge power 2x25Watts
Charge current range	0.1~10.0A
Discharge current range	0.1~5.0A
Current drain for balancing Li-Po/Ion/Fe	200mA/cell
Li-Ion/Fe/Polymer cell count	1~6cells
NiCd/NiMH battery cell count	1~18cells
Pb battery voltage	2V~24V
Net weight	727g
Dimension	200x135x57mm

Liability exclusion

This charger is designed and approved exclusively for use with the types of batteries stated in this instruction manual. Hitec RCD accepts no liability of any kind if the charger is used for any purpose other than that stated. We are unable to ensure that you follow the instructions supplied with the charger and we have no control over the methods you employ for using, operating and maintaining the device. For these reasons, we are obliged to deny all liability for loss, damage or costs which are incurred due to the incompetent or incorrect use and operation of our products, or which are connected with such operation in any way. Unless otherwise prescribed by law, our obligation to pay compensation, regardless of the legal argument employed, is limited to the invoice value of those Hitec RCD products which were immediately and directly involved in the event in which the damage occurred.

Commonly used terms

Final charge voltage: the voltage at which the battery's charge limit (capacity limit) is reached. The charge process switches from a high current to a low maintenance rate (trickle charge) at this point. From this point on, further high current charging would cause over-heating and eventual terminal damage to the pack.

Final discharge voltage: the voltage at which the battery's discharge limit is reached. The chemical composition of the battery determines the level of this voltage. Below this voltage, the battery enters the deep-discharge zone. In this condition, individual cells within the pack may become polarized in reverse causing permanent damage.

A, mA: unit of measurement relating to the charge or dis-charge current.
1000 mA = 1 A (A=Ampere,mA=Milliampere)

Ah, mAh: unit of measurement for the capacity of a battery (Amperes x time unit; h = hour). If a pack is charged for one hour at a current of 2 A, it has been fed 2 Ah of energy. It receives the same quantity of charge (2 Ah) if it is charged for 4 hours at 0.5 A, or 15 minutes (=1/4 h) at 8 A.

'C'-rating: capacity is also referred to as the 'C' rating. Some battery suppliers recommend charge and discharge currents based on the battery 'C' rating. A battery's '1C' current is the same number as the battery's rated capacity number, but noted in mA or amps. A 600mAh battery has a 1C current value of 600mA, and a 3C current value of (3 x 600mA) 1800mA or 1.8A. The 1C current value for a 3200mAh battery would be 3200mA (3.2A).

Nominal voltage(V): the nominal voltage of the battery pack can be determined as follows
- NiCd or NiMH: multiply the total number of cells in the pack by 1.2. A 8-cell pack will have a nominal voltage of 9.6 volts (8x1.2).
- LiPo: multiply the total number of cells in the pack by 3.7. A 3-cell LiPo wired in series will have a nominal voltage of 11.1 volts (3x3.7).
- Li-Ion: multiply the total number of cells in the pack by 3.6. A 2-cell Li-Ion wired in series will have a nominal voltage of 7.2 volts (2x3.6).
- LiFe: multiply the total number of cells in the pack by 3.3. A 4-cell LiFe wired in series will have a nominal voltage of 13.2 volts (4x3.3).

If the nominal voltage of the battery is not printed on the battery's label, consult your battery manufacturer or supplier. Do not guess the rated voltage of a battery.

Warranty and service
We guarantee this product to be free of manufacturing and assembly defects for a period of two years from the date-of-purchase. The warranty only applies to material or operational defects which are present at the time of purchase. During that period, we will repair or replace, free of service charge, products deemed defective due to those causes. You will be required to produce proof-of-purchase (i.e. invoice or receipt). This warranty is not valid for any damage or subsequent damage arising as a result of misuse, modification or as a result of failure to observe the procedures outlined in this manual.

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