AC/DC

AC/DC INPUT, PROFESSIONAL
BALANCE CHARGER/DISCHARGER

multi charger X1 AC PLUS

INSTRUCTION MANUAL

Li-Po	Li-Fe	Li-ION	Ni-CD	Ni-MH	PB
1-6 cell	1-6 cell	1-6 cell	1-15 cell	1-15 cell	2-20 V

Table of Contents

Introduction

Congratulations on your choice of the Hitec X1 charger from Hitec RCD USA. The Hitec X1 is a high-performance, microprocessor controlled charger/discharger with battery management capabilities that are suitable for use with most popular battery types. The X1 also features integrated balancing for six-cell, Lithium-Polymer (LiPo), Lithium-Ferrite (LiFe) and Lithium-Ion (Li-Ion) batteries.

Please read this entire operating manual before using the X1 Charger. If you are unsure of its proper operation after reading the manual, please seek advice from an experienced hobbyist or someone familiar with proper battery charging procedures.

Warning

THE CHARGING AND DISCHARGING OF RC HOBBY BATTERIES CAN BE DANGEROUS. FAILURE TO FOLLOW THESE EXPLICIT WARNINGS CAN RESULT IN PROPERTY DAMAGE AND/OR LOSS OF LIFE.

⚠ NEVER LEAVE YOUR CHARGER UNATTENDED WHILE IN OPERATION.

⚠ NEVER CHARGE ON OR AROUND COMBUSTIBLE MATERIALS.

⚠ NEVER CHARGE A DAMAGED BATTERY PACK.

⚠ LOW COST, NO-NAME BATTERY PACKS POSE THE MOST DANGER. WE RECOMMEND YOU ONLY USE BATTERY PACKS THAT ARE SOLD AND WARRANTIED BY A REPUTABLE COMPANY.

⚠ IT IS HIGHLY RECOMMENDED THAT YOU UTILIZE A SAFETY DEVICE SUCH AS A STEEL CASE OR LIPO SACK™ WHILE CHARGING LITHIUM CHEMISTRY BATTERIES.

⚠ IT IS HIGHLY RECOMMENDED THAT YOU KEEP AN OPERABLE "CLASS A" FIRE EXTINGUISHER IN THE CHARGING AREA.

FAILURE TO FOLLOW THESE WARNINGS CAN BE CONSIDERED NEGLIGENCE BY THE OPERATOR AND MAY NEGATE ANY CLAIMS FOR DAMAGES INCURRED.

Hitec RCD USA will not be held responsible for any damages or injuries that may occur by persons who fail to follow these warnings or who fail to properly follow the instructions in this manual.

Warnings and Safety Notes


Warning


Tip

Warning: Be sure to read this section for your own safety.

Caution: Be sure to read this section to prevent accidents and damage to your charger.


Note


Caution

Tip: This section will help you maximize the performance of your charger.

Note: This section will provide more detailed explanations.

These warnings and safety notes are of the utmost importance. You must follow these instructions for maximum safety. Failure to do so can damage the charger and the battery; and in the worst cases, may cause a fire.


Warning

NEVER LEAVE THE CHARGER UNATTENDED WHEN IT IS CONNECTED TO ITS POWER SOURCE. IF ANY MALFUNCTION IS FOUND, TERMINATE THE PROCESS AT ONCE AND REFER TO THE OPERATION MANUAL.

⚠ The allowable DC input voltage is 11-18V DC.

⚠ The allowable AC input voltage is 100-240V AC.

⚠ Keep the charger away from dust, damp, rain, heat, direct sunlight and excessive vibration.

⚠ If the charger is dropped or suffers any type of impact, it should be inspected by an authorized service station before using it again.

⚠ This charger and the battery should be put on a heat-resistant, non-flammable and non-conductive surface.

⚠ Never place a charger on a car seat, carpet or similar surface. 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 can be damaged.

⚠ Fire or explosion can occur due to overcharging.

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

Warnings and Safety Notes

⚠ Never attempt to charge or discharge the following types of batteries:

- A battery fitted with an integral charge circuit or a protection circuit
- A battery pack which consists of different types of cells (including different manufacturer's cells)
- A battery that is already fully charged or just slightly discharged and non-rechargeable batteries (these pose an explosion hazard)
- A faulty or damaged battery
- 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

PLEASE BEAR IN MIND THE FOLLOWING POINTS BEFORE YOU COMMENCE CHARGING:

- Did you select the appropriate program suitable for the type of battery you are charging?
- Did you set up the 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.

Standard Battery Parameters

	LiPo	LiIon	LiFe	NiCd	NiMH	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
Min. Discharge Voltage	3.0-3.3V/cell	2.9-3.2V/cell	2.6-2.9V/cell	0.1-1.1V/cell	0.1-1.1V/cell	1.8V/cell

Warning

WHEN ADJUSTING YOUR X1 CHARGING PARAMETERS, BE SURE YOU SELECT THE PROPER BATTERY TYPE AND CELL VOLTAGE FOR THE TYPE OF CELL YOU ARE CHARGING. CHARGING BATTERIES WITH THE WRONG SETTINGS MAY CAUSE THE CELLS TO BURST, CATCH FIRE OR EXPLODE.

Charging

Before charging your batteries, it is critical that you determine the maximum allowable charge rate for your batteries. The X1 is capable of charging at high rates that may not be suitable or safe for your particular batteries. For example, Lithium cells are typically safe to charge at 1C, or the total mAh÷1000. A 1200mAh battery would have a 1C charge rate of 1.2 amps. A 4200mAh battery would have a 1C charge rate of 4.2 amps. Some manufacturers are offering Lithium cells that can be charged at greater than 1C but this should ALWAYS be verified before charging a Lithium battery at rates higher than 1C. Voltage is just as critical as the charging amperage rate and this is determined by the number of cells in series, or "S". For example, a 3S LiPo is rated at 11.1 volts ("S" multiplied by a single LiPo cell with a nominal voltage of 3.7 volts DC. 3 cells x 3.7 volts each equals 11.1 volts DC).

Connect the battery's main leads to the charger output: red is positive and black is negative. Keep in mind that the gauge or thickness of your charging leads from the X1 to your battery must be of an acceptable current rating to handle the applied charge current. For maximum safety and charging effectiveness, always match or exceed the main battery lead rating when assembling or selecting your charging leads. If you charge a battery at a high current rate (amperage) with a charging lead not rated for the chosen amperage, the wire could get hot, catch fire, short out and/or potentially destroy your battery and the charger. When in doubt, always use a higher gauge wire (lower AWG number). It is common to see charging leads constructed of 14AWG, 16AWG or 18AWG wire.

Warnings and Safety Notes

Always refer to recommendations from your battery manufacturer for your specific battery type and size before initiating a charge or discharge process.

Do not attempt to disassemble or modify Lithium or Lead-Acid battery packs.

Discharging

The X1 discharging functions are for two specific purposes:

- Refreshing the capacity of a Nickel-based battery that has lost capacity over time (NiMH or NiCd).
- Reducing the voltage of a Lithium battery for safe storage.

Warning

LITHIUM CHEMISTRY BATTERY PACKS SHOULD ONLY BE DISCHARGED TO THEIR MINIMUM SAFE VOLTAGE, NO LOWER. DEEP DISCHARGING A LITHIUM CELL WILL DO PERMANENT DAMAGE. REFER TO THE STANDARD BATTERY PARAMETERS TABLE ON PAGE 6 OF THIS MANUAL FOR MINIMUM DISCHARGE VOLTAGES.

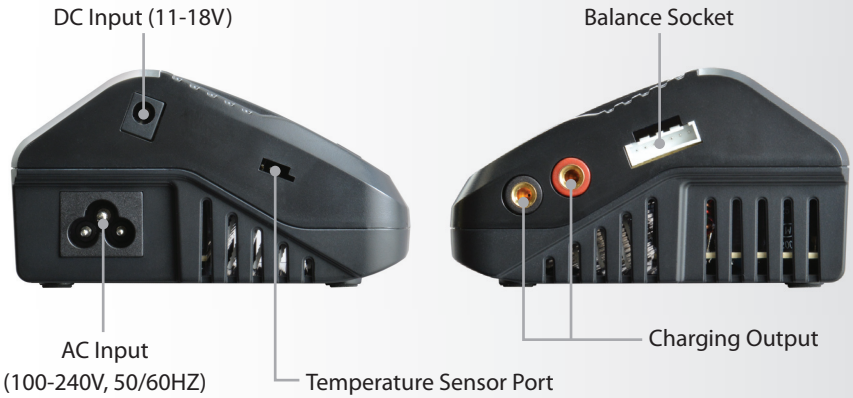
LiPo Charge/Discharge Cycling

Lithium batteries are known to reach full capacity after a break-in period of about 10 charge/discharge cycles. We do not recommend you use the X1 charger to do this, normal use and recharging will achieve the same results. If you wish to perform a Lithium break-in on the bench with the X1, discharging to minimum acceptable voltages and performing a balance charge at 1C maximum rate is recommended. If you choose to break in your Lithium batteries under normal use, charging at only 1C for the first ten cycles will help ensure full performance and service life from your Lithium cells.

Charger Layout

1. Hitec X1 AC Plus Charger
2. AC Power Cord
3. DC Power Cord
4. 18AWG Wire Charging Cable
5. Balancing Board Cable
6. Universal Balancing Board

Charger Layout



Specifications

AC Input	100 - 240 Volts
DC Input	11-18 Volts
Charge Circuit Power	50 Watts
Charge Current Range	0.1 - 1.0 Amps
Discharge Current Range	5 Watts
Discharge Current Power	0.1-1.0 Amps
Current Drain for Balancing LiPo	300mA per cell
NiCd/NiMH Battery Cell Count	1-15 Cells
LiPo/LiFe/Lilon Cell Count	1-6 Cells
Pb Battery Voltage	2-20V
Net Weight	15 oz.

Features

Optimized Operating Software
The X1 "auto" feature sets the charge and discharge current for you automatically, preventing overcharging which can damage your battery. In the event of an error, the X1 instantly disconnects the circuit and sounds an alarm. This feature can be set by the user and controlled through the two-way link for maximum safety.

Internal Independent Lithium Battery Balancer
The X1 features a built-in cell voltage balancer so you don't need to fuss with external balancers while charging.

Balancing Individual Cells During Discharging
The X1 also monitors and balances each cell in the pack individually while discharging. If the voltage of any single cell is abnormal, the X1 will display an error message and the process will end automatically.

Adaptable to various types of lithium batteries
The X1 will charge and discharge a variety of Lithium batteries, such as Li-ion, LiPo and the new LiFe series of batteries.

Fast and Storage Mode of Lithium Batteries
The X1 features two styles of charging. "Fast" charge reduces the charge duration while "Store" controls the final voltage of your battery, to optimize your packs for long term storage and maximum lifespan.

Maximum Safety
Our delta-peak voltage detection program ends the charge cycle whenever a battery's voltage exceeds the set threshold.

Automatic Charging Current Limit
Charging current can be set by the user when charging NiCd or NiMH batteries. The 'AUTO' charging mode, however, is recommended when charging NiMH batteries with low impedance and capacity.

Capacity and Temperature Limits
The charge process will terminate if either the charging capacity or battery temperature exceeds the limit set by the user. The temperature function requires an optional temperature probe, which is not included with the X1.

Features

Processing Time Limit
Protect your battery by setting a maximum time limit for charging and discharging.

Input Power Monitoring
The X1's input voltage is monitored to protect the battery from becoming damaged. The process ends automatically if it drops below the limit.

Data Store/Load
A maximum of five setting profiles can be stored for your convenience. The X1 will store the data pertaining to a program's settings and you can call up data at anytime.

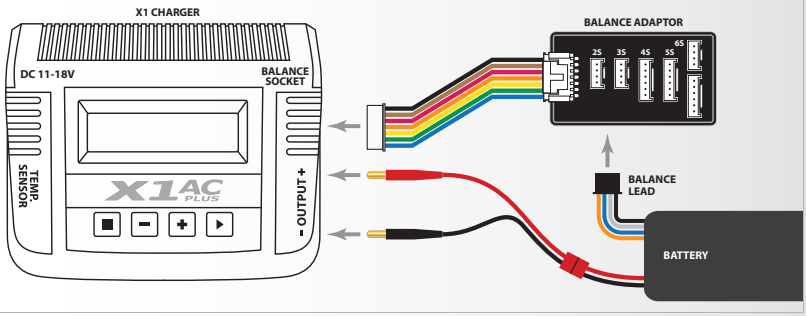
Cyclic Charging/Discharging
A battery can be cycled 1 to 5 times consecutively. This process is good for refreshing and balancing your battery.

Charger/Battery Connections

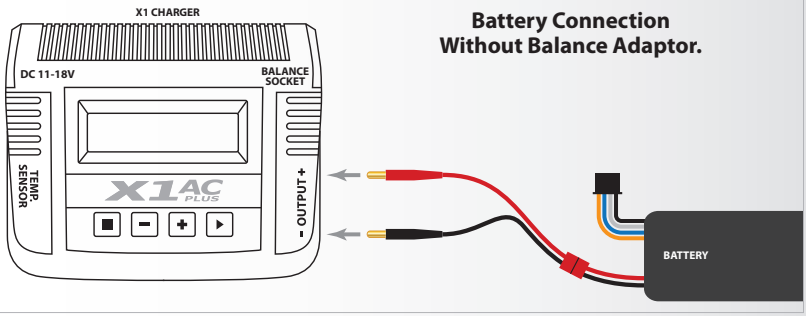
Warning

TO AVOID SHORT CIRCUITS, ALWAYS CONNECT THE CHARGE LEADS TO THE CHARGER FIRST, AND THEN TO THE BATTERY. REVERSE THE SEQUENCE WHEN DISCONNECTING THE PACK.

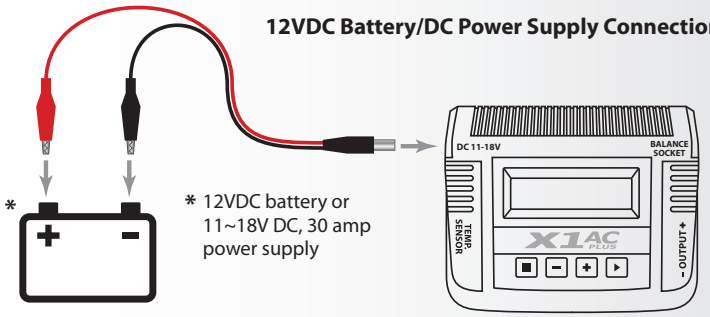
Battery Connection With Balance Adaptor.



Battery Connection Without Balance Adaptor.



12VDC Battery/DC Power Supply Connection.



Lithium

This program is only suitable for charging/discharging Lithium (LiPo/LiIon/LiFe) batteries.

Charge Modes

The X1 offers the following lithium charge modes: Charge, Balance Charge, Fast Charge, Storage and Discharge.

Warning **BEFORE SELECTING A CHARGE MODE, IT IS CRITICAL THAT YOU SELECT THE CORRECT TYPE OF LITHIUM BATTERY TO BE CHARGED. FAILURE TO DO SO CAN RESULT IN DAMAGE TO THE BATTERY AND POSSIBLE EXPLOSION.**

Selecting a Lithium Battery Type

From the "USER SET PROGRAM->" screen, press the ► button once to advance to the "V.Type" screen. The default setting is "LiPo 3.7V".

Press the ► button once and the voltage value will begin flashing. Use the ✚ or ━ buttons to choose from the following options: "LiPo 3.7V", "LiIo 3.6V" or "LiFe 3.3V". Once you have selected the correct battery type, press the ► button to save your settings.

Lithium Charge Mode

Warning **BEFORE YOU BEGIN CHARGING YOUR BATTERY, MAKE SURE YOU HAVE READ AND UNDERSTAND ALL OF THE WARNINGS AND SEFETY INFORMATION CONTAINED ON PAGES 4-7.**

Note **IN THE CHARGE MODE, LITHIUM BATTERIES CAN BE CHARGED WITHOUT THE USE OF A BALANCE ADAPTOR. A BALANCE ADAPTER CAN BE USED, BUT IT IS NOT REQUIRED. BALANCE CHARGE MODE IS RECOMMENDED FOR ANY BATTERY WITH A BALANCE LEAD.**

See page 12 for the appropriate charging connections setup for this operation.

First, select the correct battery type by following the instructions above. Once you have set the correct battery type, press the ■ button once to return to the "USER SET PROGRAM->" screen. Press the ■ button to enter the "PROGRAM SELECT" screen. On this screen you should see the type of battery you have selected.

Lithium Charge Mode (cont.)

Press the ▶ button once to enter the "CHARGE" screen. Press the ▶ button again and the amp rate value will begin flashing. Use the ✚ or ━ buttons to adjust the value to the desired rate. Follow the instructions provided with your battery when setting the amp rate.

Press the ▶ button again and the voltage value will begin flashing. Use the ✚ or ━ buttons to adjust the value to the desired rate. The voltage and cell count should match the values listed on the battery label.

Choosing "AUTO" for the voltage/cell count setting will allow the X1 to automatically determine these settings. If you choose the "AUTO" setting be sure to confirm that the correct cell count is displayed once charging begins.

You are now ready to begin charging. Press and hold the ▶ button until you see "BATTERY CHECK WAIT..." followed by the "CONFIRM/CANCEL" screen.

This screen displays the number of cells you set up as "R" and the number of cells detected by the processor as "S". If both numbers are identical, you may press and hold the ▶ button to confirm and begin charging. If these numbers do not match, press the ■ button to return to the previous screen to carefully check the number of cells of the battery pack before proceeding.

Once charging has commenced, the charger will display the following real-time information: Battery type/cell count, charging current, battery voltage, charging time and charged capactiy.

Caution **DURING CHARGING, THE BATTERY SHOULD BE PLACED INSIDE A FIREPROOF/RETARDANT BAG AND ON A FIRE PROOF SURFACE, AWAY FROM OTHER COMBUSTIBLE OBJECTS.**

If you are using a balance adapter, during charging you may press the ✚ button to view the voltage of each individual cell.

Once the battery is fully charged the screen will read "FULL" and the charger will emit a chiming sound. Press the ■ button to stop charging. You may press the ■ button at any time during the charging process to stop charging.

Lithium Balance Charge Mode

This function is for balancing the voltage of individual Lithium-polymer battery cells while charging. In order to use the Balance Mode, the battery must have a balance lead. Charging in this mode is different from the normal modes because the built-in processor monitors the voltage of each individual cell and controls the input current fed into each cell in order to equalize the voltage. Use of a balance adaptor with any battery that has a balance lead will improve the performance and lifespan of your battery.

Warning **BEFORE YOU BEGIN CHARGING YOUR BATTERY, MAKE SURE YOU HAVE READ AND UNDERSTAND ALL OF THE WARNINGS AND SEFETY INFORMATION CONTAINED ON PAGES 4-7.**

See page 12 for the appropriate charging connections setup for this operation.

First, select the correct battery type by following the instructions on page 13. Once you have set the correct battery type, press the ■ button once to return to the "USER SET PROGRAM->" screen. Press the ■ button again to enter the

"PROGRAM SELECT" screen. On this screen you should see the type of battery you have selected.

Press the ► button once to enter the "CHARGE" screen. Now use the ✚ or ━ buttons to change the charge mode to "BALANCE". Press the ► button again and the amp rate value will begin flashing. Use the ✚ or ━ buttons to adjust the value to the desired rate. Follow the instructions provided with your battery when setting the amp rate.

Press the ► button again and the voltage value will begin flashing. Use the ✚ or ━ buttons to adjust the value to the desired rate. The voltage and cell count should match the values listed on the battery label.

You are now ready to begin charging. Press and hold the ► button until you see "BATTERY CHECK WAIT..." followed by the "CONFIRM/CANCEL" screen.

This screen displays the number of cells you set up as "R" and the number of cells detected by the processor as "S". If both numbers are identical, you may press the ► button to confirm and begin charging. If these numbers do not match, press the ■ button to return to the previous screen to carefully check the number of cells of the battery pack before proceeding.

Lithium Balance Charge Mode (cont.)

Once charging has commenced, the charger will display the following real-time information: Battery type/cell count, charging current, battery voltage, charging time and charged capactiy.

Caution **DURING CHARGING, THE BATTERY SHOULD BE PLACED INSIDE A FIRE PROOF/RETARDANT BAG AND ON A FIRE PROOF SURFACE, AWAY FROM OTHER COMBUSTIBLE OBJECTS.**

During charging you may press the ✚ button to view the voltage of each individual cell.

Once the battery is fully charged the screen will read "FULL" and the charger will emit a chiming sound. Press the ■ button to stop charging. You may press the ■ button at any time during the charging process to stop charging.

Lithium Fast Charge Mode

Charging in Fast Charge Mode allows for a shorter charge time and will result in a slightly reduced charging capacity. To achieve maximum charge capacity, we recommend you use the Lithium Balance Charge Mode. If a fast charge is necessary, select the fast charge mode and follow the same charging instructions as for the Lithium Charge Mode or Lithium Balance Charge Mode.

Warning **BEFORE YOU BEGIN CHARGING YOUR BATTERY, MAKE SURE YOU HAVE READ AND UNDERSTAND ALL OF THE WARNINGS AND SEFETY INFORMATION CONTAINED ON PAGES 4-7.**

Note **IN THE FAST CHARGE MODE, LITHIUM BATTERIES CAN BE CHARGED WITHOUT THE USE OF A BALANCE ADAPTOR. A BALANCE ADAPTOR CAN BE USED, BUT IT IS NOT REQUIRED. BALANCE CHARGE MODE IS RECOMMENDED FOR ANY BATTERY WITH A BALANCE LEAD.**

See page 12 for the appropriate charging connections setup for this operation.

Lithium Fast Charge Mode (cont.)

First, select the correct battery type by following the instructions on page 13. Once you have set the correct battery type, press the ■ button once to return to the "USER SET PROGRAM->" screen. Press the ■ button again to enter the

"PROGRAM SELECT" screen. On this screen you should see the type of battery you have selected.

Press the ► button once to enter the "CHARGE" screen. Now use the ✚ or ━ buttons to change the charge mode to FAST CHG. Press the ► button again and the amp rate value will begin flashing. Use the ✚ or ━ buttons to adjust the value to the desired rate. Follow the instructions provided with your battery when setting the amp rate.

Press the ► button again and the voltage value will begin flashing. Use the ✚ or ━ buttons to adjust the value to the desired rate. The voltage and cell count should match the values listed on the battery label.

You are now ready to begin charging. Press and hold the ► button until you see "BATTERY CHECK WAIT..." followed by the "CONFIRM/CANCEL" screen.

This screen displays the number of cells you set up as "R" and the number of cells detected by the processor as "S". If both numbers are identical, you may press and hold the ► button to confirm and begin charging. If these numbers do not match, press the ■ button to return to the previous screen to carefully check the number of cells of the battery pack before proceeding.

Once charging has commenced, the charger will display the following real-time information: Battery type/cell count, charging current, battery voltage, charging time and charged capactiy.

Caution

DURING CHARGING, THE BATTERY SHOULD BE PLACED INSIDE A FIRE PROOF/RETARDANT BAG AND ON A FIRE PROOF SURFACE, AWAY FROM OTHER COMBUSTIBLE OBJECTS.

If you are using a balance adapter, you may press the ✚ button to view the voltage of each individual cell.

Once the battery is fully charged the screen will read "FULL" and the charger will emit a chiming sound. Press the ■ button to stop charging. You may press the ■ button at any time during the charging process to stop charging.

Lithium Storage Mode

This function is for charging/discharging batteries that will not be used immediately. The program is designed for charging/discharging batteries up-to or down-to safe storage levels. The program will automatically begin to discharge if the current state of the battery exceeds the voltage level for storage.

Warning **BEFORE YOU BEGIN CHARGING/DISCHARGING YOUR BATTERY, MAKE SURE YOU HAVE READ AND UNDERSTAND ALL OF THE WARNINGS AND SEFETY INFORMATION CONTAINED ON PAGES XX-XX.**

Note **IN STORAGE MODE, LITHIUM BATTERIES CAN BE CHARGED WITH OR WITHOUT THE USE OF A BALANCE ADAPTOR. USE OF A BALANCE ADAPTOR IS RECOMMENCED WHENEVER POSSIBLE.**

See page 12 for the appropriate charging connections setup for this operation.

First, select the correct battery type by following the instructions on page 13. Once you have set the correct battery type, press the ■ button once to return to the "USER SET PROGRAM->" screen. Press the ■ button again to enter the

"PROGRAM SELECT" screen. On this screen you should see the type of battery you have selected.

Press the ► button once to enter the "CHARGE" screen. Now use the ✚ or ━ buttons to change from "CHARGE" mode to "STORAGE". Press the ► button again and the amp rate value will begin flashing. Use the ✚ or ━ buttons to adjust the value to the desired rate. Follow the instructions provided with your battery when setting the amp rate.

Press the ► button again and the voltage value will begin flashing. Use the ✚ or ━ buttons to adjust the value to the desired rate. The voltage and cell count should match the values listed on the battery label.

Press and hold the ► button and charging will begin.

Once charging has commenced, the charger will display the following real-time information: Battery type/cell count, charging current, battery voltage, charging time and charged capactiy.

Lithium Storage Mode (cont.)

Caution **DURING CHARGING/DISCHARGING, THE BATTERY SHOULD BE PLACED INSIDE A FIRE PROOF/RETARDANT BAG AND ON A FIRE PROOF SURFACE, AWAY FROM OTHER COMBUSTIBLE OBJECTS.**

If you are using a balance adapter, you may press the ✚ button to view the voltage of each individual cell.

Once the battery is fully charged the screen will read "FULL" and the charger will emit a chiming sound. Press the ■ button to stop charging. You may press the ■ button at any time during the charging process to stop charging.

Lithium Discharge Mode

If you plan to discharge your battery to reach safe storage levels we strongly recommend that you use Storage Mode. In very few instances should discharging become necessary with LiPo batteries. One such instance may include preparing a battery for disposal, in which case the battery should not be completely discharged. Be sure to follow the discharging instructions provided by the battery manufacturer. **Over-discharging a battery can severly damage the battery and may cause a fire or explosion.**

Warning **DISCHARGING LITHIUM CHEMISTRY BATTERIES CAN CAUSE PERMANENT DAMAGE TO THE BATTERY AND IT IS NOT RECOMMENDED FOR ANYTHING OTHER THAN THE DISPOSAL OF THE BATTERY. IF YOU CHOOSE TO DISCHARGE YOUR LITHIUM BATTERIES, MAKE SURE TO PAY CLOSE ATTENTION TO THE MINIMUM VOLTAGE SETTING. IF YOU WANT TO STORE YOUR BATTERY FOR A LONG PERIOD OF TIME YOU SHOULD UTILIZE THE STORAGE MODE CHARGE PROGRAM AS THIS IS THE SAFEST METHOD OF STORING YOUR LITHIUM CHEMISTRY BATTERIES.**

Note **IN DISCHARGE MODE, LITHIUM BATTERIES CAN BE DISCHARGED WITH OR WITHOUT THE USE OF A BALANCE ADAPTOR. THE USE OF A BALANCE ADAPTOR IS RECOMMENDED FOR DISCHARGING ANY BATTERY THAT HAS A BALANCE LEAD.**

Lithium Discharge Mode (cont.)

See page 12 for the appropriate charging connections setup for this operation.

First, select the correct battery type by following the instructions on page 13. Once you have set the correct battery type, press the ■ button once to return to the "USER SET PROGRAM->" screen. Press the ■ button again to enter the

"PROGRAM SELECT" screen. On this screen you should see the type of battery you have selected.

Press the ► button once to enter the "CHARGE" screen. Now use the ✚ or ━ buttons to change from "CHARGE" mode to "DISCHARGE". Press the ► button again and the amp rate value will begin flashing. Use the ✚ or ━ buttons to adjust the value to the desired rate. Follow the instructions provided with your battery when setting the amp rate.

Press the ► button again and the voltage value will begin flashing. Use the ✚ or ━ buttons to adjust the value to the desired rate. The voltage and cell count should match the values listed on the battery label.

Press and hold the ► button and discharging will begin.

Once discharging has commenced, the charger will display the following real-time information: Battery type/cell count, discharging current, battery voltage, discharging time and discharged capactiy.

Caution

DURING CHARGING/DISCHARGING, THE BATTERY SHOULD BE PLACED INSIDE A FIRE PROOF/RETARDANT BAG AND ON A FIRE PROOF SURFACE, AWAY FROM OTHER COMBUSTIBLE OBJECTS.

If you are using a balance adapter, you may press the ✚ button to view the voltage of each individual cell.

Once discharging is complete, the X1 charger will emit a chiming sound. Press the ■ button at any time to stop discharging.

NiCd/NiMH

This program is only suitable for charging/discharging NiCD/NiMH batteries.

Charge Modes

The X1 offers the following NiCd/NiMH charge modes: Charge, Discharge and Cycle.

Warning **BEFORE SELECTING A CHARGE MODE, IT IS CRITICAL THAT YOU SELECT THE CORRECT TYPE OF BATTERY TO BE CHARGED. FAILURE TO DO SO CAN RESULT IN DAMAGE TO THE BATTERY.**

Selecting the Battery Type

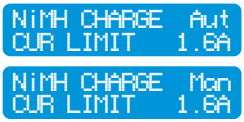
After you power on the X1, press the ■ button repeatedly until you reach the appropriate progam for the battery type you wish to charge. For this example we have chosen the "NiMH BATT" program. Now press the ► button to enter the desired program.

NiCD/NiMH Charge Mode

Warning **BEFORE YOU BEGIN CHARGING YOUR BATTERY, MAKE SURE YOU HAVE READ AND UNDERSTAND ALL OF THE WARNINGS AND SEFETY INFORMATION CONTAINED ON PAGES XX-XX.**

After selecting the correct battery type, if the screen does not read "CHARGE", use the ✚ or ━ buttons to change it to the "CHARGE" mode.

Press the ► button and the amp rate value will begin flashing. Use the ✚ or ━ buttons to adjust the value to the desired rate. Follow the instructions provided with your battery when setting the amp rate.



The charge rate can be set to "Aut" (automatic) or "Man" (manual). If you choose" Man", the charge rate will remain the same throughout the entire charge cycle. If you choose "Aut", the X1 will determine the appropriate charge rate. In the "Aut" function you should set the upper limit of the charge current to avoid damage by an excessive charge rate. To choose between the "Aut and Man" function, press and hold the ✚ and ━ buttons simultaneously while the amp rate is flashing. Release both buttons once the screen displays the desired setting.

NiCd/NiMH Charge Mode (cont.)

Press and hold the ▶ button to begin charging.

Once charging has commenced, the charger will display the following real-time information: Battery type, charging current, battery voltage, charging time and charged capactiy.

Once the battery is fully charged the screen will read "FULL" and the charger will emit a chiming sound. Press the ■ button to stop charging. You may press the ■ button at any time during the charging process to stop charging.

NiCd/NiMH Discharge Mode

Warning

BEFORE YOU BEGIN DISCHARGING YOUR BATTERY, MAKE SURE YOU HAVE READ AND UNDERSTAND ALL OF THE WARNINGS AND SEFETY INFORMATION CONTAINED ON PAGES 4-7.

After selecting the correct battery type (see pg 21), use the ✚ or ━ buttons to select to the "DISCHARGE" mode.

Press the ▶ button and the amp rate value will begin flashing. Use the ✚ or ━ buttons to adjust the value to the desired rate. Follow the instructions provided with your battery when setting the amp rate.

Press the ▶ button again and the voltage cutoff will begin to flash. Use the ✚ or ━ buttons to adjust the value to the desired rate. Follow the instructions provided with your battery when setting the voltage cutoff. The X1 will stop discharging when the battery has reached the preset voltage cutoff.

Press and hold the ▶ button to begin discharging. Once discharging has commenced, the charger will display the following real-time information: Battery type, discharging current, battery voltage, discharging time and discharged capactiy.

When discharging is complete the X1 will chime.

NiCd/NiMH Cycle Mode

The X1 makes cycling of NiCd/NiMH batteries easy. The process of discharging and recharging (cycling) can be achieved automatically with one simple step and will improve the performance of NiCd/NiMH batteries. We strongly recommend cycling any battery that has been discharged and then stored for a preiod of time. This will increase battery life and improve performance.

Warning **BEFORE YOU BEGIN CYCLING YOUR BATTERY, MAKE SURE YOU HAVE READ AND UNDERSTAND ALL OF THE WARNINGS AND SEFETY INFORMATION CONTAINED ON PAGES 4-7.**

For cycling, the X1 uses the charge/discharge amperage and voltage settings entered in charge mode (see pages 21-22).

After selecting the correct battery type (see pg. 21), use the ✚ or ━ buttons to select to the "CYCLE" mode.

The Cycle Mode gives you two cycling options: "DCHG>CHG" or "CHG>DCHG". The "DCHG>CHG" option will first discharged the battery and then charge the battery. The "CHG>DCHG" option will first charge the battery and then discharge the battery. If this screen does not currently show the cycling option you desire, press the ► button once and this setting will begin flashing. Use the ✚ or ━ buttons to change this setting.

Pressing the ► button again will cause the # of cycles option to begin flashing. Use the ✚ or ━ buttons to change this to the number of cycles you want the X1 to run. The X1 can cycle the battery a maximum of 5 times consecutively.

Press and hold the ► button and cycling will begin.

Once cycling has commenced, the charger will display the following real-time information: Battery type, charging/discharging current, battery voltage, charging time and charged capactiy. You will also see "D>C" or "C>D". This will indicate which cycling order you have chozen. Either "D" or "C" will be flashing. This flashing indicates which part of the cycle is currently being executed.

Once the cycling process is complete, the X1 will display the charge/discharge capacity for each cycle. Using the ✚ or ━ buttons, you can scroll through this data for each cycle.

Pb (Lead-Acid)

This program is only suitable for charging Pb (lead-acid) batteries with nominal voltages of 2 to 20V. A Pb (lead-acid) battery is significantly different from NiCd/NiMH batteries. Pb batteries can only deliver current lower 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. A Pb battery cannot be used for fast charging, so please follow the instructions provided by the battery manufacturer.

Pb Charge Modes

The X1 offers the following NiCD/NiMH charge modes: Charge and Discharge.

Warning **BEFORE SELECTING A CHARGE MODE, IT IS CRITICAL THAT YOU SELECT THE CORRECT TYPE OF BATTERY TO BE CHARGED. FAILURE TO DO SO CAN RESULT IN DAMAGE TO THE BATTERY.**

Selecting the Battery Type

After you power on the X1, press the ■ button repeatedly until you reach the "Pb BATT" progam. Now press the ► button to enter the program.

Pb Charge Mode

Warning **BEFORE YOU BEGIN CHARGING YOUR BATTERY, MAKE SURE YOU HAVE READ AND UNDERSTAND ALL OF THE WARNINGS AND SEFETY INFORMATION CONTAINED ON PAGES 4-7.**

After selecting the correct battery type, if the screen does not read "CHARGE", use the ✚ or ━ buttons to change it to the "CHARGE" mode.

Press the ► button and the amp rate value will begin flashing. Use the ✚ or ━ buttons to adjust the value to the desired rate. The amp rate should be set to 1/10 of capacity. The example shows the appropriate amp rate setting for a 7Ah battery. Follow the instructions provided with your battery when setting the amp rate.

Press the ► button again and the voltage rate value will begin flashing. Use the ✚ or ━ buttons to set the voltage and number of cells.

Pb Charge Mode (cont.)

Press and hold the ▶ button and charging will begin.

Once charging has commenced, the charger will display the following real-time information: Battery type, charging current, battery voltage, charging time and charged capactiy.

When charging is complete the X1 will chime.

Pb Disharge Mode

After selecting the correct battery type (see pg. 24), if the screen does not read "DISCHARGE", use the ✚ or ━ buttons to change it to the "DISCHARGE" mode.

Press the ▶ button and the amp rate value will begin flashing. Use the ✚ or ━ buttons to adjust the value to the desired rate. The amp rate should be set to 1/10 of capacity. The example shows the appropriate amp rate setting for a 7Ah battery. Follow the instructions provided with your battery when setting the amp rate.

Press the ▶ button again and the voltage rate value will begin flashing. Use the ✚ or ━ buttons to set the voltage and number of cells.

Press and hold the ▶ button and discharging will begin.

Once discharging has commenced, the charger will display the following real-time information: Battery type, discharging current, battery voltage, discharging time and discharged capactiy.

When discharging is complete the X1 will chime.

Save/Load Data Programs

The Save Data and Load Data programs make it easy to store and load charge and discharge profiles for up to 5 batteries. Data can be saved for each battery type and each charge mode available with the X1. This allows you to call back data for each battery when charging or discharging without having to set up the program over again. You can also edit settings for each saved battery.

Save Data Program

Press the ■ button repeatedly until you reach the "SAVE DATA" program. Press the ► button to enter the program. When you enter the program, the profile number will be flashing. Use the ✚ or ━ buttons to choose which profile (1-5) you wish to edit.

Press the ► button again and the battery type will begin flashing. Use the ✚ or ━ buttons to choose a battery type.

Press the ► button again and the voltage rate value will begin flashing. Use the ✚ or ━ buttons to set the voltage rate. This should match the voltage listed on the battery label.

Press the ► button again and the battery capacity will begin flashing. Use the ✚ or ━ buttons to set the battery capacity. This should match the battery capacity listed on the battery label.

Press and hold the ► button and you will be taken to the "CHARGE" screen. Use the ✚ or ━ buttons to choose from the available charge modes.

Press and hold the ► button and the amp rate value will begin flashing. Use the ✚ or ━ buttons to set the amp rate.

* If this profile is for a NiMH/NiCD battery, simply press and hold the ► button and the profile will be saved. If this profile is for a LiPo battery continue to the next step. See the end of this section for instructions regarding the Manual and Automatic Modes available with charging NiMH/NiCD batteries.

Save Data Program (cont.)

Press the ► button again and the voltage rate value will begin flashing. Use the ✚ or ━ buttons to set the voltage rate and cell count. The cell count will change automatically as you change the voltage. The voltage and cell count should match the battery label.

Press and hold the ► button and this profile will be saved.

Load Data Program

Press the ■ button repeatedly until you reach the "LOAD DATA" program. Press the ► button to enter the program. When you enter the program, the profile number will be flashing. Use the ✚ or ━ buttons to choose which profile (1-5) you wish to load.

Press and hold the ► button and the profile will be loaded.

Overview

Press the ■ button repeatedly until you reach the "USER SET PROGRAM->" screen.

Battery Type
Press the ▶ button once to advance to the "V.Type" screen. This screen will allow you to choose the type of lithium battery you wish to charge. Instructions for setting the battery type can be found on pg. 13.

Each time you press the ✚ button you will advance to the next setting. Pressing the ━ button will take you back to the previous selection.

Battery Check Timer
Press the ✚ button once to advance to the "CHK Time" screen. This screen will allow you to delay the voltage error message in the case of a highly discharged battery.

NiMH Sensitivity
Press the ✚ button once to advance to the "NiMH Sensitvity" screen. This screen will allow you to adjust the cutoff voltage of the automatic charge termination of NiMH batteries.

NiCd Sensitivity
Press the ✚ button once to advance to the "NiCD Sensitvity" screen. This screen will allow you to adjust the cutoff voltage of the automatic charge termination of NiCD batteries.

USB Temperatre Cut-off
Press the ✚ button once to advance to the "Temp Cut-off" screen. This screen will allow you set the battery temperature at which the charging process will be terminated. This feature requires an optional temperature probe that is not supplied with the X1.

Waste Time
Press the ✚ button once to advance to the "Waste Time" screen. This screen will allow you set the time delay between charge>discharge cycles, allowing time for the battery to cool.

Overview (cont.)

Safety Timer
Press the ✚ button once to advance to the "Safety Timer" screen. This screen will allow you to set the maximum charge time in order to prevent accidental overcharging.

Capacity Cut-off
Press the ✚ button once to advance to the "Capacity Cut-off" screen. This screen will allow you to set the maximum charge capacity in order to prevent accidental overcharging.

Key Beep & Buzzer
Press the ✚ button once to advance to the "Key Beep Buzzer" screen. This screen will allow you to control the sound options on the X1.

Input Power Cut-off
Press the ✚ button once to advance to the "Input Power Cut-off" screen. This screen will allow you to set the minimum input voltage cut-off in order to protect the input source.

Battery Check Timer

The X1 recognizes the cell count of the Lithium battery automatically at the beginning of the charge or discharge process to avoid an erroneous setting by the user. In the case of a highly discharged battery, the X1 may initially misread the cell count. By setting the Battery Check Timer, the user can delay the voltage error message, allowing the X1 enough time to determine the correct cell count. Normally, 10 minutes is enough time to perceive the cell count correctly. For a battery of larger capacity, you may extend the time term. However, if you set it too long for a battery of smaller capacity, the charge or discharge process can be finished within the time term with an erroneous cell count. This can 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.

See pg. 28 for instructions on accessing the "CHK Time" screen.

Battery Check Timer (cont.)

Press the ▶ button once to and the timer value will begin flashing. Use the ✚ or ━ buttons to change the timer value. The timer can be set between 5 and 60 min. We strongly recommend that the timer be set to 10 minutes or less.

Press ▶ to set the Battery Check Timer.

NiMH Sensitivity

NiMH Sensitivity shows the cutoff voltage for the automatic charge termination of a NiMH battery. The effective setting ranges from 5 to 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 specifications of the battery (NiMH default: 7mV).

See pg. 28 for instructions on accessing the "NiMH Sensitvity" screen.

Press the ▶ button once and the voltage value will begin flashing. Use the ✚ or ━ buttons to change the voltage value. The voltage can be set between 5mV and 20mV.

Press ▶ to set the voltage.

NiMH Sensitivity

NiCd Sensitivity shows the cutoff voltage for the automatic charge termination of a NiCd battery. The effective setting ranges from 5 to 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 specifications of the battery (NiCd default: 12mV).

See pg. 28 for instructions on accessing the "NiCd Sensitvity" screen.

Press the ▶ button once and the voltage value will begin flashing. Use the ✚ or ━ buttons to change the voltage value. The voltage can be set between 5mV and 20mV.

Press ▶ to set the voltage.

USB Temperatre Cut-off

The Temperature Cut-off is turned on or off with the use of the optional temperature probe by contacting the surface of the battery. If it is on, set the maximum temperature that the charger should allow the battery to reach during charging. Once the battery reaches this temperature, the process will be terminated to prevent damage to the battery.

See pg. 28 for instructions on accessing the "Temp Cut-off" screen.

Press the ▶ button once and "Temp Cut-off" will begin flashing. Use the ✚ or ━ buttons to toggle between Temp Cut-off and USB Enable.

While "Temp Cut-off" is flashing, the ▶ button again and the temperature value will begin flashing. Use the ✚ or ━ buttons to change the temperature value. This value can be set between 20ºC and 80ºC.

Press ▶ to set the Temperature Cut-off.

Waste Time

During the charge>discharge or discharge>charge cycle, batteries increase in temperature. The Waste Time program allows the user to specify the time delay between cycles, allowing time for the battery to cool.

See pg. 28 for instructions on accessing the "Waste Time" screen.

Press the ▶ button once and the timer value will begin flashing. Use the ✚ or ━ buttons to adjust the timer value. The timer can be set to 0 to 60 minutes.

Press ▶ to set the Waste Timer.

Safety Timer

When the charge process starts, the integrated safety timer starts to run simultaneously. If an error occurs or the termination circuit cannot detect whether the battery is fully charged or not, the X1 is programmed to prevent overcharging and will terminate the charging process.

Safety Timer Calculation
When charging NiCd or NiMH batteries, divide the capacity by the current, then divide the result by 11.9. Set this number of minutes as the setting for the safety timer setting. If the charger stops at this time threshold, about 140% of the capacity will have been fed into the battery.

See pg. 28 for instructions on accessing the "Safety Timer" screen.

Press the ▶ button once and "ON" will begin flashing. Use the ✚ or ━ buttons to turn the timer off. We strongly recommend that you leave the Safety Timer on.

Press ▶ to set the Safety Timer.

Capacity Cut-off

This program provides a maximum capacity protection function. If the Delta-peak voltage can not be detected or the Safety Timer times out, the charge process will stop automatically when the battery reaches the user-set maximum charge capacity in order to prevent accidental overcharging.

See pg. 28 for instructions on accessing the "NiCd Sensitvity" screen.

Press the ▶ button once and "ON" will begin flashing. Use the ✚ or ━ buttons to turn the Safety Timer off. Press the ▶ button again and the mAH value will begin flashing. Use the ✚ or ━ buttons to change the mAHvalue. This can be set between 10mAH and 50,000mAH.

Press ▶ to save these settings.

Key Beep & Buzzer

A beep sounds to confirm the user's operation every time a button is pressed. The buzzer or melody sounds at various times during an operation to confirm a different mode change. These functions can be switched on or off.

See pg. 28 for instructions on accessing the "Key Beep" and "Buzzer" screen.

Press the ▶ button once and (Key Beep) "ON" will begin flashing. Use the ✚ or ━ buttons to turn "Keep Beep" off. Press the ▶ button once and (Buzzer) "ON" will begin flashing. Use the ✚ or ━ buttons to turn "Buzzer" off.

Input Power Cut-off

This function monitors the voltage of the input source used to power the charger. If the voltage drops below the user setting, the program will end forcibly to protect the input source.

See pg. 28 for instructions on accessing the "Input Power Cut-off" screen.

Press the ▶ button once and the voltage value will begin flashing. Use the ✚ or ━ buttons to change the voltage.

Press ▶ to set the voltage.

Warnings and Error Messages

Reverse Polarity
The battery/charger connections (red/black) are reversed.

Connection Break
The battery connection has been diconnected.

Short Circuit
There is a short circuit in one of the leads or plugs. If no short is found in one of the leads or plugs you may have a faulty battery, which should not be charged any further.

Input Voltage Error
The input voltage is incorrect. The X1 is can draw power from a 100 to 240AC outlet or from an 11-18V DC power source.

Input Selection Error
The voltage of the battery pack has been selected incorrectly.

Break Down
The charger has malfunctioned. Contact Customer Service at 858.748.1767 or at service@hitecrcd.com.

Battery Check - Low Voltage
The charging voltage is lower than what was input.

Battery Check - High Voltage
The charging voltage is higher than what was input.

Battery Voltage - Low Cell Voltage
Voltage of one cell in the battery pack is too low. Check the voltage of each cell.

Battery Voltage - Low Cell Voltage
The voltage of one cell in the battery pack is too high. Check the voltage of each cell.

Battery Voltage - Cell Connection Error
No balance adaptor is detected while charging in balance mode.

Warnings and Error Messages (cont.)

Over Temperature Error
The internal temperature of the charger is too high. Allow the charger to cool down.

Control Failure
The charger has malfunctioned. Contact Customer Service at 858.748.1767 or at service@hitecrcd.com.

Warranty and Service

LIABILITY EXCLUSION

This charger is designed and approved exclusively for use with the types of batteries stated in this Instruction Manual. Hitec RCD, USA 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 this reason, we are obliged to deny all liability for loss, damage or costs which are incurred due to any misuse or operation of our products. Unless otherwise prescribed by law, our obligation to pay compensation, regardless of the legal argument employed, is limited to the invoice value of Hitec RCD, USA products which were immediately and directly involved in the event in which the damage occurred.

ONE YEAR LIMITED WARRANTY

For a period of one year from the date of purchase, HITEC RCD USA, INC. shall REPAIR OR REPLACE, at our option, defective equipment covered by this warranty. Otherwise, the purchaser and/or consumer is responsible for any charges for the repair or replacement of the charger. This warranty does not cover cosmetic damages and damages due to acts of God, accident, misuse, abuse, negligence, improper installation, or damages caused by alterations by unauthorized persons or entities. This warranty only applies to the original purchaser of this product and for products purchased and used in the United States of America, Canada and Mexico. Plastic cases are not covered by this warranty.

THIS WARRANTY IS IN LIEU OF ANY AND ALL OTHER WARRANTIES, WHETHER FOR MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE AND WHETHER EXPRESS OR IMPLIED. REPAIR OR REPLACEMENT AS PROVIDED UNDER THIS WARRANTY IS THE EXCLUSIVE REMEDY. HITEC RCD, INC. SHALL NOT BE LIABLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES FOR BREACH OF ANY EXPRESS OR IMPLIED WARRANTY RELATING TO THIS PRODUCT, EXCEPT TO THE EXTENT PROHIBITED BY APPLICABLE LAW. ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE ON THIS PRODUCT IS LIMITED TO THE DURATION OF THIS WARRANTY, REPAIR AND SERVICE.

SERVICE AND REPAIR INFORMATION

To have your Hitec charger serviced:

1. Visit the Hitec website at **www.hitecrcd.com** and download the service request form (under Support section).
2. Fill out the service request form completely and include a copy of your original receipt showing the purchase date.
3. Package your product in its original packaging or use a suspension-type packaging (foam peanuts or crumpled newspaper). Hitec RCD shall not be responsible for goods damaged in transit.
4. Ship prepaid (COD or postage-due returns will not be accepted) via a traceable common courier (UPS, insured parcel post, FedEx, etc.) to:

Hitec RCD USA, Inc., Customer Service Center, 12115 Paine St., Poway CA 92064

www.hitecrcd.com

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