



**Model NDX40 Series  
Automatic Battery Charger**

**User's Manual**

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**For Sales, Support and Service  
phone: 407-331-4793  
fax: 407-331-4708**

**website: [www.xenotronix.com](http://www.xenotronix.com)  
email: [information@xenotronix.com](mailto:information@xenotronix.com)**

Xenotronix/TLI, Inc.  
2541 Tracy Road  
Toledo, Ohio 43619  
Phone: 419-666-6982  
Fax: 419-666-6534

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Seller warrants that its products ("Product(s)") will meet the specifications set forth in its catalog from time to time, unless the Buyer is notified otherwise prior to delivery. Seller will, without charge, repair or provide a replacement for any of the Products which prove to be defective in materials or workmanship within one (1) year from the date of shipment ("Warranty Period").

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## TABLE OF CONTENTS

### Model NDX40 Automatic Battery Charger – User’s Manual

Important Safety Instructions . . . . .	1
Introduction . . . . .	2
Operating Instructions . . . . .	2-4
Custom Units Note . . . . .	4
Maintenance Instructions . . . . .	4
Battery Charger Specifications . . . . .	5
Dimensions . . . . .	6

## IMPORTANT SAFETY INSTRUCTIONS

**SAVE THESE INSTRUCTIONS** - This manual contains important safety and operating instructions for Model HPX30 Battery Chargers. Before using the battery charger, please read all instructions and cautionary markings on the battery charger, the battery, and the product using the battery.

**CAUTION** - To reduce the risk of electric shock:

- Do not expose unit to rain or moisture - use indoors only.
- Do not remove cover. There are no user serviceable parts inside. Refer service to qualified service personnel.
- Connect the battery charger directly to a grounding receptacle. An adaptor should not be used with this unit. This unit is equipped with a power cord having an equipment grounding conductor and a grounding plug (3-prong). The plug must be plugged into an outlet that has been properly installed and grounded in accordance with all local and national codes and ordinances.
- Disconnect charger from AC power and battery before attempting any maintenance or cleaning. Turning off controls may not reduce this risk.

## WARNING

- Do not attempt to recharge non-rechargeable batteries. Charge only nickel-cadmium or nickel-metal-hydride rechargeable batteries. Attempting to charge other types of batteries may result in personal injury and battery damage.
- The enclosure will become hot during the charge cycle - DO NOT TOUCH!
- Connect or disconnect the output connectors only when the unit is disconnected from AC power or arcing and burning may result (due to the possible presence of explosive gases).

**DANGER** - Never alter power cord or plug provided. If it will not fit the outlet, replace the power cord with one having the correct plug or have a proper outlet installed by an electrician. Improper connection will result in the risk of an electric shock or fire.

Make sure cords are located so that they will not be stepped on, tripped over, or otherwise subjected to damage or stress. Do not operate this unit with a damaged cord or plug - replace them immediately. To reduce the risk of damage to electric plug, pull by plug rather than cord when disconnecting unit.

Do not operate charger if it has received a sharp blow, been dropped, or otherwise damaged in any way. Do not disassemble charger; incorrect reassembly will result in the risk of an electric shock or fire. Refer service to qualified service personnel.

Recharge batteries in well ventilated areas to prevent build-up of explosive gases.

Allow space around unit and adequate air circulation to reduce internal heat buildup. Do not operate in a small, enclosed space.

## INTRODUCTION

The Model NDX40 is designed with the best interests of your battery in mind. It is a high reliability battery charger designed for recharging Nickel-Cadmium (NiCd) and Nickel-Metal-Hydrate (NiMH) batteries. It can charge from 1 to 12 cells at currents from 500 mA to 2500 mA. Accurate detection of fully charged batteries is accomplished using negative-delta-V sensing with 12.5-bit resolution, digital filtering, currentless voltage sensing, and a nominal  $-0.5\%$  (with respect to top level) negative-delta-V detection level. To prevent the false detection of negative-delta-V, the sensing circuit is inhibited at the beginning of the charge cycle. The back-up timer is matched to four charging rates: 2C (45 min), 1C (1.5 hr), 0.5C (3 hr), and 0.25C (6 hr).



An optional temperature sensor can be used to detect when the battery temperature falls outside of the safe range of 0 °C and 50 °C. Outside the set temperature range, float charge takes place and the back-up timer is paused. A built-in hysteresis (offset) prevents rapid on/off cycling. When the battery temperature returns to a safe range, the charger resumes where it left off. This option is recommended for the quicker 2C and 1C charge rates to minimize the effects of overcharging.

When charging is complete, the charger will enter a float charge mode where a lower current is pulsed to avoid cell degradation due to dendritic (crystalline) growths.

This unit incorporates protection against open circuit batteries, during which time outputs are switched off and timing is reset.

There is a single yellow LED indicator that comes on solid during charge and flashes when the battery is charged and ready for use.

Equipped with a thick aluminum heat-sinking chassis to ensure field reliability and performance, the NDX40 is designed to withstand rugged applications. An IEC-60320 input module and switchable input power are provided to enable the maximum flexibility. The standard output cable is three feet long and has a barrel plug connector. An optional four-conductor cable with a thermistor is offered for wiring to a custom connector – the included temperature sensor must be built into the battery pack. We also offer an optional temperature probe on a secondary cable that can be added to monitor the external battery pack temperature.

## OPERATING INSTRUCTIONS

Before using this battery charger, make sure that it is compatible with your battery. Refer to the battery charger, the specifications in this manual, and your battery documentation.

If batteries are hot or cold, allow them to adjust to room temperature before attempting to charge them.

The standard output cable is black SPT-1 zipcord (parallel cord), size 18 AWG, 2-conductor, 3-feet long and has a molded on barrel plug connector with a molded strain relief. The output connector has a 5.5 mm (0.22") O.D. and a 2.5 mm (0.10") I.D. The outer sleeve is negative and the center contact is positive. Your battery pack or charging stand should have a power jack to match the barrel plug polarity.

When using the optional temperature probe, either insert it into the cell pack or press it against the external surface of the cell pack.

When using the optional 4-wire output cable with thermistor, attach the red output lead to the positive battery terminal and attach the black output lead to the negative battery terminal. The thermistor must be attached directly to the battery case for it to adequately detect the actual battery temperature. The green and white leads may be attached to the thermistor in any order. The thermistor will terminate the high rate charge, and switch into the float charge mode, whenever the battery temperature falls out of the safe charging temperature range of 10 to 50 °C. Typical reasons for an out of range battery temperature are charging a battery in a too hot or too cold environment, trying to charge too small a battery for the charger, or the failure of the  $-\Delta V$  circuit to detect a charged battery.

**CAUTION:** This charger is not reverse protected. Make sure the battery connector is properly wired or damage to the battery and charger may result when the charger is plugged in.

The input voltage setting is displayed on the back of the charger. If this setting must be changed, make sure the power cord is disconnected while operating the switch. Operating the switch while the power is applied may cause damage to the switch or charger. Plug the power cord into a properly grounded outlet that supplies the correct input power. The charger should now be on and charging the battery. If the indicator is not lit, unplug the charger and make sure the battery is properly connected to the charger. If there is still a problem, check the AC input fuse and replace as necessary.

This battery charger is fully automatic. The charger starts out in the CHARGE mode. The yellow indicator will be on continuously. In this mode, a high rate constant current will be delivered to the battery. When the battery is fully charged, the  $-\Delta V$  circuit will detect a drop in voltage as the battery begins to be overcharged, and the charger will switch into the READY mode. The indicator will begin to flash indicating the battery is fully charged and ready for use. In READY mode, a pulsed current will float the battery to maintain charge. If the  $-\Delta V$  circuit fails to detect a drop in voltage the backup timer will still switch the charger into the READY mode. When attempting to charge a dead battery pack (less than about 1 volt) the charger will initially start out in the READY mode. When the battery voltage rises, the charger will switch into the CHARGE mode. If the

charger does not switch into CHARGE mode, this indicates that your battery is probably damaged. You can attempt to recover the battery by leaving your battery attached to the charger. Eventually, the charger may switch into CHARGE mode. Damaged batteries may be partially recovered.

Note: During READY mode, the indicator will flash at different rates depending on the charge rate.

Note: With power on and no battery attached, the indicator will periodically flash and the open-circuit voltage will be approximately 20 to 22 volts. This is part of the battery detect feature. When a battery is connected, its relatively low voltage will be detected and the charge cycle will be started. When the battery is disconnected, the high open-circuit voltage will be detected and the charger will be reset.

For more detailed information, refer to the Application Notes for the NDX40, which can be downloaded from our website.

## **CUSTOM UNITS NOTE**

Xenotronix/TLI can make custom units, or modify our existing units, to exactly match your charging needs. Call our sales department for technical information and pricing.

Following are *some* of the modifications we can perform:

- Set charge current to match your battery capacity
- Change timers and charge rates
- Provide custom cables and connectors
- Private labeling

## **MAINTENANCE INSTRUCTIONS**

**FUSE REPLACEMENT** - The AC input module contains the main fuse and a spare fuse. Detach the power cord. Use a flat head screwdriver or a coin to pry open the fuse drawer or holder. Replace the blown fuse with the spare. You can use the old fuse to push out the spare fuse. Now is a good time to install a new spare fuse. Replace fuses only with the same type (as indicated in this manual) and value (as indicated on the charger).

**CLEANING** - Unplug the charger and disconnect the battery before attempting any cleaning. If it becomes necessary to clean the enclosure, wipe the enclosure exterior with a damp cloth. If necessary, use a mild detergent. Do not use an abrasive cleanser or spray cleaners directly onto the charger. Do not immerse unit in water.

## BATTERY CHARGER SPECIFICATIONS

General Conditions: 25 °C (77 °F)

Quick Charge Rate	2C (C/5)	1C (C/1)	.5C (C/2)	.25C (C/4)
Minimum Charge Current	0.5 A / 500 mA	0.5 A / 500 mA	0.5 A / 500 mA	0.5 A / 500 mA
Maximum Charge Current	2.5 A / 2500 mA	2.5 A / 2500 mA	2.5 A / 2500 mA	2.5 A / 2500 mA
Float Charge Rate (avg.)	0.05C (C/20)	0.025C (C/40)	0.0125C (C/80)	0.01C (C/100)
Peak Float Charge Current	$0.27 * I_{chg}$	$0.27 * I_{chg}$	$0.27 * I_{chg}$	$1.7 * I_{chg}$
Battery Capacity (mAh)	250 to 1250	500 to 2500	1000 to 5000	5000 to 10000
Normal Recharge Time (approx.)	35 min.	1 hr., 10 min.	2 hr., 30 min.	5 hr., 35 min.
Back-up Timer (approx.)	45 min.	1 hr., 30 min.	3 hr.	6 hr.
-ΔV Inhibit (approx.)	1.5 min.	3 min.	6 min.	12 min.
-ΔV Detection Level	Nominal -0.5% with respect to top level			
Number of Cells	1 to 10 (for 11 & 12 cell applications, consult factory)			
Battery Chemistry	Rechargeable Nickel-Cadmium (NiCd) and Rechargeable Nickel-Metal-Hydride (NiMH)			
Open-Circuit Voltage	About 20 to 22 volts			
Input Rating	115 or 230 VAC ± 10%, 50 – 60 Hz, 0.70 A (RMS)			
Line / Load Regulation	± 2% maximum			
Ambient Operating Temperature	15 to 35 °C (59 to 90 °F)			
Ambient Storage Temperature	-40 to 80 °C (-40 to 176 °F)			
Dimensions	W 5.5" (14 cm) x D 3.5" (8.9 cm) x H 2.9" (7.3 cm)			
Weight	About 4 lbs (1.8 kg) with standard output cable			

## DIMENSIONS

