

MILLENNIUM

BATTERY MANAGEMENT



OPERATION MANUAL

WELCOME TO THE NEW MILLENNIUM

The Novak Millennium is a complete battery management system designed to get the most performance out of your batteries. With its large, easy-to-read display, the Millennium gives you vital information that is easy to comprehend.

The Millennium is equipped with **Reverse Pulse Mode** for all Ni-Cd cells, **Linear Mode** for Ni-Cd & Sub-C size Ni-MH cells, and **Ni-MH Mode** for smaller Ni-MH cells. All three modes are user-adjustable, including the charge rate, delta-peak value, reverse pulse duration, and trickle charge rate (*even button and alarm tones*).

SPECIFICATIONS	
Case Size	4.00" x 4.38" x 2.33" (10.16 x 11.13 x 5.92 cm)
Weight	13.94 ounces (395 grams)
Input Voltage (Power Source)	12-15 volts DC
Charging Modes	Linear (Ni-Cd) • Reverse Pulse (Ni-Cd) • Ni-MH
Charging Capability	4-8 cells (1.2 VDC/cell)
Ni-Cd Charge Rate (Linear & Reverse Pulse)	0.5-7.0 amps (adjustable)
Trickle Charge Rate (after linear peak)	0.1-0.4 amp (adjustable)
Reverse Pulse Duration	5-20 milliseconds
Ni-MH Charge Rate	0.5-1.5 amps (adjustable)
Circuit Protection	Input RVP, Output RVP & Short-Circuits, Shorted Batteries, Thermal Overload

IMPORTANT PRECAUTIONS

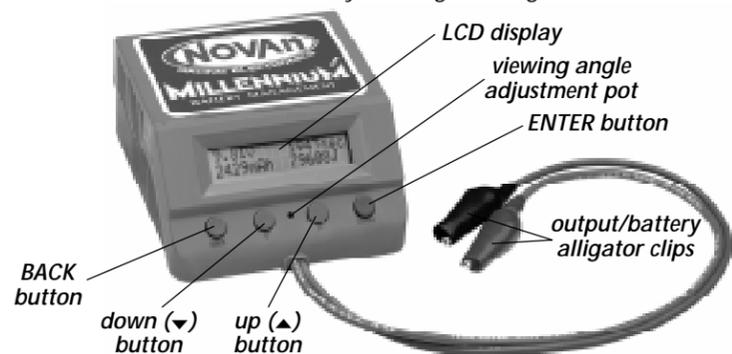
The following precautions will help to prevent possible damage to the Millennium, the battery pack, or the input power source.

- **Charge only nickel-cadmium or nickel-metal hydride*** rechargeable battery packs—Damage will occur from charging of any other type of batteries (*lead-acid, lithium-ion, gel cells, etc.*). ***Ni-MH Mode is not intended for sub-C cells.**
- **Never allow water, moisture, or other foreign materials to enter Millennium.**
- **Do not use automobile battery chargers to power the Millennium**—False peaks can occur, and excessive voltage spikes can damage the Millennium.
- **Do not obstruct the air intake on the bottom of the Millennium**—This will cause overheating and thermal shut down. *Be careful if putting Millennium on a pit towel.*
- **Do not charge batteries with fewer than 4 or more than 8 cells**—connected in series.
- **Do not charge battery packs connected in parallel**—Batteries will be damaged.
- **Enhanced-voltage ("zapped") batteries may not charge properly**—Cells may be damaged. Consult the battery matching company for charging recommendations.
- **Excessive charging current can damage batteries**—Maximum charging rates for nickel-cadmium and nickel-metal hydride can be obtained from battery maker.
- **Never exceed 15 volts DC input power source to power the Millennium.**
- **Gases from a lead-acid battery may ignite** if sparks occur when connecting or disconnecting the Millennium's alligator clips—Using a lead-acid battery as a power source may generate hydrogen gas and should only be used in a well ventilated area. Avoid open flames and sparks which may ignite battery gases.

PLEASE FOLLOW ALL INSTRUCTIONS CAREFULLY

MILLENNIUM CONTROLS & DISPLAY

Your Millennium is designed to be very easy to operate and understand. On the angled front panel of the Millennium you will find everything you need to be in total control of your battery management. The Millennium's main advantage is its large LCD with electronically-adjustable viewing angle. This LCD gives you easy to follow prompts, and guides you through all of the Millennium's adjustments and controls. *The sections of this manual are the same as the LCD screens you will go through on the Millennium.*



The viewing angle adjustment pot lets you adjust the Millennium's LCD contrast with a flat blade screwdriver for different positions and lighting.

The **down (▼)** and **up (▲)** buttons navigate you through the **SELECT MENU** screens, and are used to modify various parameters. The **ENTER** button is used to make selections from the **SELECT MENU** screens, enter a value for the various parameters, or begin charging. The **BACK** button returns you to the previous screen once past the **SELECT MENU** screens.

INPUT POWER SOURCE VOLTAGE

As a general rule, the input power source voltage should be 1.5 volts DC above the peak-voltage of the battery pack being charged.

Example 1: (6 cell Ni-Cd pack peak-voltage≈10.5 volts) + (1.5 volts) = 12 voltsDC

Example 2: (8 cell transmitter pack peak-voltage≈13.5 volts) + (1.5 volts) = 15 voltsDC

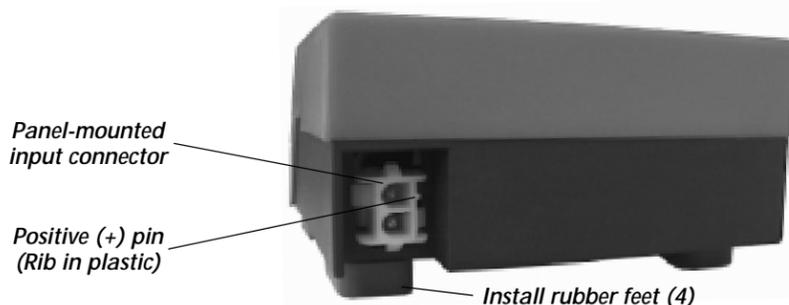
Remember that older battery packs peak at higher voltages.

If your power supply's output voltage does not adjust high enough to peak the battery pack as described above, 8 cell packs can be charged as two, 4 cell packs.

INPUT POWER SOURCE CONNECTION

The Millennium's input power connection can be found in the lower corner of the back panel of the case. The supplied power harness has a matching connector attached to it, and will plug directly to the panel-mounted connector on the back of the Millennium case.

When looking at the panel-mounted connector on the back of the case, **the lower pin is negative (-), and upper pin is the positive (+) connection and is marked with a raised rib in the plastic connector** as shown below.



Acceptable Input Power Sources: DC power supply or lead-acid battery

**Output current of power source should meet/exceed desired charge rate.*

***Connect input power harness to lead-acid battery before connecting harness to Millennium.*

If the Millennium will be used with a power supply, cut the wires of the input power harness included with the Millennium to the desired length and secure them to the output terminal screws of the power supply.

If your power supply has post-style output terminals, or if you will be running the Millennium from a lead-acid battery, you can solder the included alligator clips to the input power harness. Solder the red alligator clip to the wire that goes to the Millennium's positive (+) upper pin (*ribbed*). Solder the black alligator clip to the wire from the negative (-) lower pin.

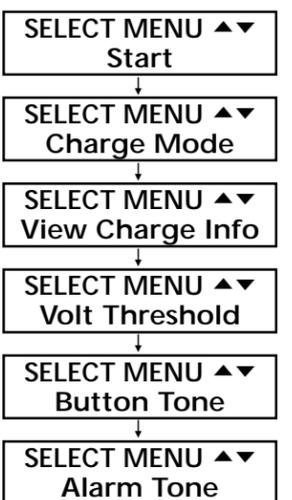
MAIN SELECTION MENUS

SELECT MENU ▲▼
Start

The first level of navigation in the Millennium's software is the **SELECT MENU** option screens. The loop of first level option screens is shown here→ In each of the **SELECT MENU** screens (and **CHARGE MODE** screens), the top line of the LCD displays your present location in the software (**SELECT MENU** or **CHARGE MODE**), and shows **up (▲)** and **down (▼)** arrows to prompt you to use one of these keys to continue navigation.

The bottom line of the LCD displays one of the software options. You can go to the second level of the Millennium's software by simply pushing the **ENTER** button at any of the option screens.

The **Start** option begins the charge process. The other options take you to the next software level where you can change various parameters.



ALARM & BUTTON TONES

SELECT MENU ▲▼
Alarm Tone

From the initial **Start** screen, push the **up (▲)** button once to go to the **Alarm Tone** option screen, once more to go to the **Button Tone** screen.

To adjust the tones, push the **ENTER** button from either option screen to go into the **Set Alarm Tone** or **Set Button Tone** adjustment screens. You can now use the **down (▼)** and **up (▲)** buttons to change the tone.

When finished, press **ENTER** to return to the option screens.

VOLT THRESHOLD SETTING

SELECT MENU ▲▼
Volt Threshold

From the **Start** screen, push the **up (▲)** button three times to go to the **Volt Threshold** option screen, or once more from the **Button Tone** screen.

The Volt Threshold value entered is the drop in millivolts that the Millennium looks for to determine that the battery pack has peaked. This is adjustable from 4 to 20 mV/cell (*refer to Tips & Rec. Settings Section*).

To adjust, push the **ENTER** button from the **Volt Threshold** option screen. You can now use the **down (▼)** and **up (▲)** buttons to change the value.

DETAILED CHARGE HISTORY

SELECT MENU ▲▼
View Charge Info

From the *Start* screen, push the up (▲) button four times to go to the *View Charge Info* option screen, or once more from the *Volt Threshold* screen. Remember that these screens are on a loop, and you can go either direction to get back to a desired option screen.

The *View Charge Info* option gives you detailed information about the last battery pack that was charged. This information can prove helpful in comparing battery packs, and also tracking the performance of your packs. To view the charge history, push the **ENTER** button from the *View Charge Info* option screen. If the Millennium has never been used, or it has been reset to factory defaults, all values will be zero.

The display shows the battery's peak voltage, the time in seconds to charge the pack, the battery pack's capacity in milliamp hours, and the pack's energy measured in joules. The calculations used are:

9.95V	1653sec
2185mAh	81316J

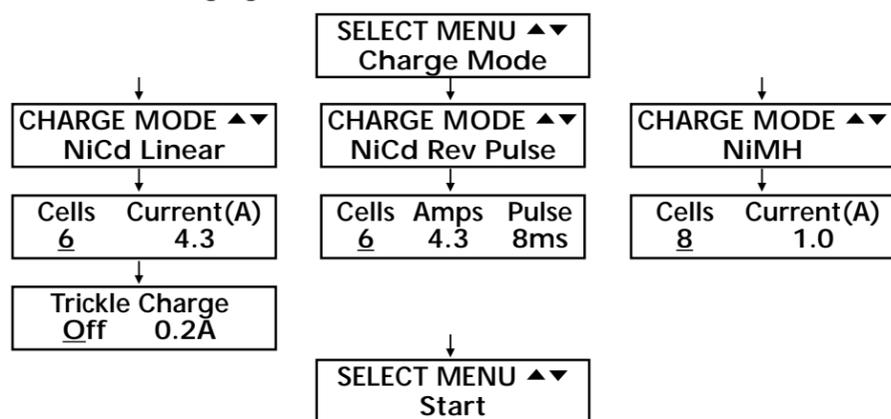
Capacity (mAh) = {Charge Current (milliamps)} x {Charge Time (hours)}
Energy (J) = {Charge Current} x {Charge Time} x {Average Charge Voltage}

CHARGE MODE SELECTION

SELECT MENU ▲▼
Charge Mode

From the *Start* screen, push the down (▼) button once, or the up (▲) button five times to go to the *Charge Mode* option screen.

Push the **ENTER** button from the *Charge Mode* option screen. You can now use the down (▼) and up (▲) buttons to change the Millennium's method of charging. The choices are as follows:



Push **ENTER** when the desired charge method screen is visible.

After entering into this charge parameter adjustment level of the software, the screen will indicate that you can change the value of the active parameter by underlining the value. Use the down (▼) and up (▲) buttons to adjust the parameter. Press **ENTER** to activate the next parameter on the screen, and again use the down (▼) and up (▲) buttons to adjust.

In each charge mode (Linear, Reverse Pulse, and Ni-MH), you can adjust the number of cells in the battery pack (4-8), and the charge current (amps).

Ni-Cd Linear Charging Mode

This method is a linear charge with adjustable current between 0.5 and 7.0 amps, and has an adjustable trickle charge (0.1-0.4 amp) option that follows the peak of the charge and can be turned on or off.

In the *Linear* charge mode, pressing **ENTER** after adjusting the charge current will bring up the trickle charge option. Use the down (▼) or up (▲) button to change trickle charge from on to off. Press **ENTER** again to activate the trickle charge current, and again use the down (▼) and up (▲) buttons to adjust. Press **ENTER** when finished. You will automatically jump to the *Start* option screen to begin charging—Press **ENTER** to start.

Ni-Cd Reverse Pulse Charging Mode

This method is also a linear charge with adjustable current between 0.5 and 7.0 amps, however this method uses a short pulse of discharge or "Reverse Pulse" once per second for an adjustable duration of 5 to 20 milliseconds. There is no trickle charge option with this charge method.

In the *Reverse Pulse* charge mode, after you adjust the number of cells and charge current just as in the Linear mode above, pressing **ENTER** will activate the *Pulse* parameter. Use the down (▼) or up (▲) buttons to adjust the pulse duration. Press **ENTER** when finished to jump to the *Start* option screen to begin charging—Press **ENTER** to start charging.

Ni-MH Charging Mode (See 'Recommended Settings' for Sub-C Ni-MH cells)

This method is a linear charge for small (A & AA cells) Ni-MH batteries. Charge current is adjustable from 0.5 and 1.5A.

In this mode, adjust the number of cells using the down (▼) or up (▲) buttons, press **ENTER**, then adjust the charge current. Press **ENTER** when finished adjusting the charge current to jump to the *Start* option screen to begin charging—Press **ENTER** to start charging.

THE CHARGING PROCESS

After starting charge, the battery and connections are analyzed. If needed, the Millennium will attempt to condition the battery with a low-level trickle charge to bring up individual cell voltages so that successful charging can occur without reversing a cell. **To stop charge, push BACK button.**

During the charge, the LCD cycles through three screens of charge information, including: {charge time & pack voltage}, {# of cells & delta-peak value}, and {charge mode, charge current, charge time, & pack voltage}.

At the end of charge, the Millennium will cycle between the charge history screen and a *Charge Complete* screen accompanied by an audible alert.

RECOMMENDED SETTINGS (Ni-CD & Ni-MH)

DISCHARGING

Ni-Cd To maintain capacity, discharge every charge cycle with 30 ohm/10 watt resistor across terminals. Remove when resistor cools to room temp.

Ni-MH Do not deep-discharge (No discharge trays, resistors, or light bulbs).

LINEAR CHARGING MODE

Ni-Cd Charge at 3.5-4.5 amps for Sub-C & D cells, and 0.5-1.0 amp for AA's. Battery makers specify the charge current at no more than 2.5 times the capacity (2.5 x 2000mAh = 5.0A) & twice capacity for D cells.

Ni-MH Charge Sub-C Ni-MH cells at 4.0-5.5 amps and trickle charge OFF.

REVERSE-PULSE CHARGING MODE

Ni-Cd A rev. pulse duration of 12ms will help enhance run times & increase average discharge voltage by lowering battery's internal resistance. Use 5-9ms for small (A & AA) cells & 10-20ms for large (Sub-C & D) cells.

Ni-MH Not recommended.

Ni-MH CHARGING MODE

Ni-Cd Not recommended.

Ni-MH Charge cells smaller than Sub-C size at 0.5-0.8 amp. Not recommended for Sub-C and larger cells

RE-PEAKING

Ni-Cd Wait a short time after the initial charge to allow individual cells to equalize, then re-peak the pack to bring all cells up together.

Ni-MH Not recommended. Use Ni-MH cells immediately after initial charge.

VOLTAGE THRESHOLD

Ni-Cd Set delta-peak (Volt Threshold) to 12 mV/cell for Linear charging, and 14-18 mV/cell for Reverse Pulse. Too-high of a delta value will overheat batteries and decrease the battery life.

Ni-MH Set delta-peak to 4 mV/cell (Millennium V.1.20/newer) to avoid overheating.

Millenniums with no version # at start-up, set delta-peak to 8 mV/cell (min).

TROUBLE-SHOOTING GUIDE

This section lists the messages that may appear on the Millennium's display, and the probable causes and solutions. If you are unable to solve your problem, check our website or call our Customer Service Department.

Condition . . . In Progress	<ul style="list-style-type: none"> Battery voltage too low to begin charge process. One or more cells shorted. Number of cells set too high. Output leads/alligator clips are shorted.
Battery Not Connected	<ul style="list-style-type: none"> Battery pack connected backwards. Charging attempted with no battery connected. Charging attempted with no power source. Battery pack has open cell or bad connection—Check battery pack and cells.
Battery Not Connected & Press Any Button To Continue	<ul style="list-style-type: none"> Input power source disconnected while charging. Battery disconnected while charging. Battery voltage close to power source voltage—Increase input power source voltage. Output leads un-shortened during conditioning.
Outputs Shorted & Press Any Button To Continue	<ul style="list-style-type: none"> Output leads un-shortened during conditioning, then re-shortened—Check output leads for short. Output leads shorted during charging—Check output leads for short.
Battery Failure	<ul style="list-style-type: none"> Number of cells set too high. After conditioning, battery voltage still too low to begin charge process—Try new battery.
Charger Shutoff Due to Overheat	<ul style="list-style-type: none"> Internal temperature above 203°F—Check intake grill for blockage. Will go to <i>Start</i> screen when cool.
Set Alarm Tone - ▼ +	<ul style="list-style-type: none"> No Alarm or Button tone is heard—Alarm or Button tone is set too low. Increase tone setting.

***To reset all factory defaults and settings, hold down the **BACK** button during the Millennium's start-up screen until "Factory Settings Restored" is displayed.

CUSTOMER SERVICE & REPAIRS

NOVAK ELECTRONICS, INC.
18910 Teller Avenue
Irvine, CA 92612

(949) 833-8873
FAX (949) 833-1631
www.teamnovak.com

Monday-Thursday: 8:00am-5:00pm (PST) • Friday: 8:00am-4:00pm (closed every other Fri.)

Before sending Millennium for service, review *Trouble-Shooting Guide & Instructions*. Refer to enclosed **CHARGER SERVICE CARD** for complete service/return procedures.

- Hobby dealers/distributors are NOT authorized to replace product thought to be defective.
- If a hobby dealer returns your Millennium for service, submit a completed **CHARGER SERVICE CARD** to the dealer and make sure it is included with the Millennium. Service cards can be obtained by downloading from our website or call our customer service.
- Novak Electronics does not make any electronic components (resistors, etc.) available for sale.
- To provide the most efficient service possible to our customers, it is not our policy to contact customers by phone or mail.

PRODUCT WARRANTY

Novak Electronics, Inc. guarantees the Millennium to be free from defects in materials and workmanship for a period of 120 days from original date of purchase (verified by dated, itemized sales receipt). Warranty does not cover incorrect installation, components worn by use or excessive force, exceeding the recommended input voltage, damage resulting from charging more than the recommended number of cells, or from improper connection or charging of receiver battery packs or enhanced-voltage batteries, any splices to the output wires, damage from disassembling the case, tampering with the internal electronics, allowing water, moisture, or any other foreign materials to enter charger or get onto the PC board. In no case shall our liability exceed the product's original cost or cover the cost of batteries damaged while charging. We reserve the right to modify the provisions stated in this warranty without notice.

Because Novak Electronics, Inc. has no control over connection and use of this product, no liability may be assumed nor will be accepted for damage resulting from the use of this product. Every Millennium is thoroughly tested before leaving our facility, and is therefore considered operational. By the act of connecting/operating this product, the user accepts all resulting liability.

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