# OPERATING INSTRUCTIONS

# RHINO™
## DIGITAL PEAK-DETECTION CHARGER

Part #4470

NOVAK ELECTRONICS, INC. *RACING TEAM*

# INTRODUCING THE RHINO

The Rhino charger is a rugged and compact, constant current charger designed to charge 4 to 8 cell nickel-cadmium battery packs from a 10 to 15 volt DC power source.

The Rhino features digital peak-detection circuitry with automatic shut-off. Charge currents from 0.5 up to 10 amps allow you to fine-tune the charging. Output jacks let you connect an external voltmeter to monitor both the battery pack voltage and the charging current. A Start/Stop button also allows you to interrupt and continue the charge cycle at any time.

Inside the Rhino charger, a cooling fan keeps things cool when the going gets tough, while a serviceable air filter keeps the dirt out. For safety, the Rhino charger is equipped with Solid State RVP™ and thermal overload protection.

| SPECIFICATIONS | |
|---|---|
| Charging Capacity | 4 to 8 cells |
| Peak Detection | 10 bit digital |
| Charging Rate | 0.5 to 10 amps/adjustable (±10%) |
| Power Source Input | 10 to 15 volts DC |
| Lock-Out Time | 100 seconds |
| Reverse Voltage Protection | Solid State RVP™ (Input and Output) |
| Overload Protection | Thermal |
| Size (Width x Depth x Height) | 4.75" x 3.75" x 2.50" |
| Input Connector (Source) | Alligator Clips (6 foot) |
| Output Connector (Battery) | Alligator Clips (12 inch) |

## *NOTHING CHARGES LIKE A RHINO!™*

# IMPORTANT PRECAUTIONS

*The following precautions will help to prevent possible damage to the charger, battery pack, and the input power source.*

• Charge only nickel-cadmium rechargeable batteries packs.

• Never allow water, moisture, or other foreign materials to enter the charger.

• Automobile battery chargers should not be used to power the charger. False peaks can occur, and excessive voltage spikes can damage the charger.

• Do not obstruct or cover the fan grill on the top of the charger, as this will cause it to overheat and shut down. Clean the air filter periodically to avoid overheating.

• Do not charge battery packs with less than 4 or more than 8 cells connected in series.

• Nickel-cadmium batteries can be damaged if the charging current used is too high. Maximum charging rates can be obtained from the battery manufacturer.

• Never use an input power source which exceeds 15 volts DC to power the charger.

• Using a lead-acid battery as a power source may generate hydrogen gas and should only be used in a well ventilated area. Poor ventilation can cause build up of gases from the lead-acid battery, and may ignite if sparks occur when connecting or disconnecting the charger's alligator clips. Avoid open flames and sparks which may ignite battery gases.

• Do not allow the Rhino's output leads to come in contact with your automobile's chassis when using a 12-volt automobile battery as a power source.

***PLEASE FOLLOW ALL INSTRUCTIONS CAREFULLY***

# SELECTING A CHARGE RATE

The following table shows typical charging rates for popular cells used for battery packs in the remote control industry. While higher charging rates will peak your cells sooner, use of excessive charging rates may damage your batteries.

| BATTERY PACK TYPE | CHARGING RATE |
|---|---|
| SCRC cells | 3.0 to 6.0 amps |
| SCE, P-170, and P-180 cells | 2.0 to 3.5 amps |
| SCR cells (except Panasonic) | 3.0 to 6.0 amps |
| Receiver Battery Pack* (50 mAh) | 0.5 amp |
| Transmitter Battery Pack* (AA) | 0.5 to 1.5 amps |

*\*Charging at higher currents than listed may result in battery pack damage.*

# POWER SUPPLY VOLTAGE

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

*Example: (8 cell transmitter pack peak-voltage\* = 13.5 volts) + (1.5 volts) = 15 volts DC (Max.)*
  *\*Older battery packs will peak at higher voltages–Do not exceed 15 volts DC input voltage*
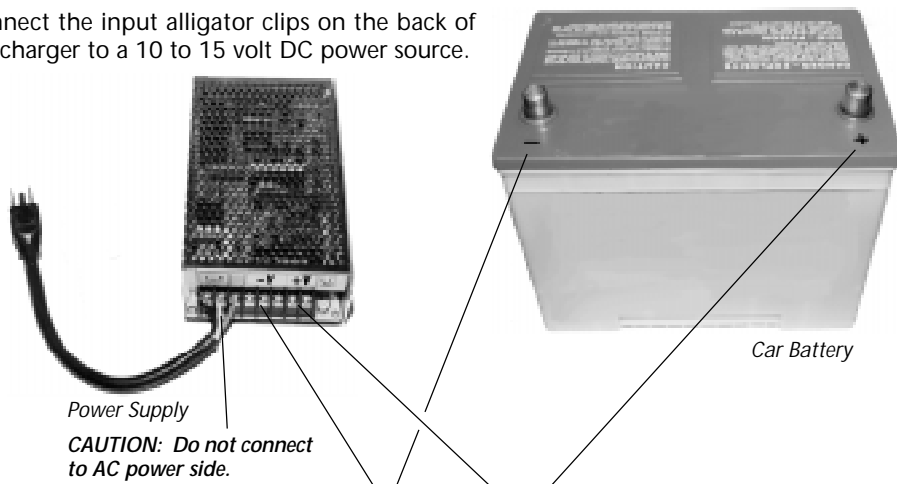
# RHINO QUICK SET-UP

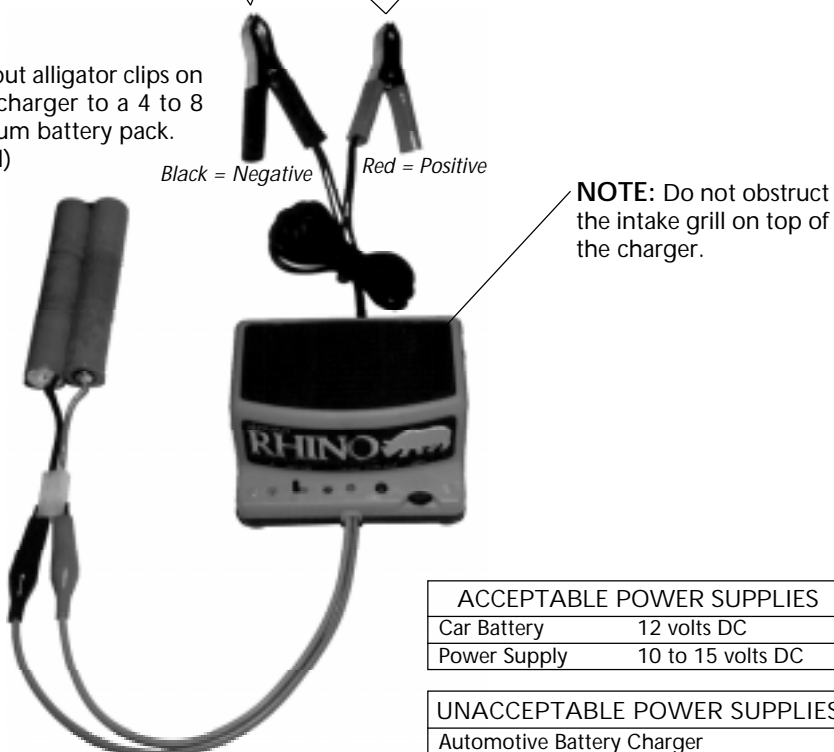*Refer to the back page for more information.*

## STEP 1

• Connect the input alligator clips on the back of the charger to a 10 to 15 volt DC power source.

*Car Battery*

*Power Supply*
*CAUTION: Do not connect to AC power side.*

## STEP 2

• Connect the output alligator clips on the front of the charger to a 4 to 8 cell nickel-cadmium battery pack. (1.2 volts DC/cell)

*Black = Negative*   *Red = Positive*

**NOTE:** Do not obstruct the intake grill on top of the charger.

| ACCEPTABLE POWER SUPPLIES | |
|---|---|
| Car Battery | 12 volts DC |
| Power Supply | 10 to 15 volts DC |

| UNACCEPTABLE POWER SUPPLIES |
|---|
| Automotive Battery Charger |

## STEP 3

• Adjust the charger to the desired charge current by rotating the **AMPS** dial with your thumb.

## STEP 4

• Press and hold the **START/STOP** button until the red LED is illuminated. The Rhino is charging! When the red LED goes out, the battery pack is charged.

# RHINO™
## DIGITAL PEAK-DETECTION CHARGER

***Visit us at:***
***www.teamnovak.com***

NOVAK ELECTRONICS, INC. *RACING TEAM*

# DETAILED INFORMATION

## RHINO OPERATION

### TO START CHARGING

1. Connect Rhino as in illustration on front of instructions.
2. Adjust charging current as described in the CHARGE CURRENT section below.
3. Press and hold the START/STOP button until LED is lit.

Once the Rhino starts charging, there is a **100 second lock-out time**, during which the charger ignores voltage peaks and will not shut off. *Be careful how many times you repeak the battery pack, as the pack voltage will continue to drop during the lock-out and may damage the battery pack.* After the lock-out time, the Rhino's peak detection circuitry is active. When the battery voltage peaks and begins to drop, the charger will shut off and the LED will go out. At this time, the batteries will be warm to the touch, and are fully charged and ready to run.

**STOPPING A CHARGING RHINO** has never been easier, just push the **START/STOP** button. At any time, you can interrupt the charging sequence and then start back up again when you are ready to continue. *Each time you stop the charger, the 100 second lock-out time is reset to zero and will be activated when you restart charging.*

## CHARGE CURRENT

The Rhino can charge at a minimum current of 0.5 amp up to a maximum of 10 amps. Adjust the charging current by turning the current adjust dial, "**AMPS**", with your thumb to line up the number of the desired charge rate with the pointer below the dial. (Refer to photo on front)

### ADJUST CHARGING CURRENT USING A VOLTMETER

With an external voltmeter, you can accurately adjust the Rhino's charging current and monitor the voltage of the battery pack during the charge cycle.

1. Set the Rhino's slide switch to '**A**' for Amps.
2. Set the voltmeter to the 200 mV range (or the lowest voltage range available).
3. Insert the RED (Positive) voltmeter probe into the red (**+**) output jack on the left side of the slide switch, and insert the BLACK (Negative) probe into the black (**-**) output jack on the right side of the slide switch.
4. The charging current is equal to the mV reading on the voltmeter divided by 10. Example: 30.0 mV on the volt meter indicates a charge rate of 3.00 amps. Charging current can only be measured while charging.

## PACK VOLTAGE

### MONITOR BATTERY PACK VOLTAGE USING A VOLTMETER

1. Set the charger slide switch to '**V**' for Volts.
2. Set the voltmeter to the 20 V range.
3. Insert voltmeter probes as in step 3 of the CHARGE CURRENT section.
4. The battery pack voltage is equal to that displayed on the voltmeter.

## COOLING FAN

The Rhino has a **built-in cooling fan** that automatically runs during charging. When the charger is charging the fan will run, and when the Rhino comes to a stop the fan will also stop. The fan will stop at the completion of charge, or whenever you interrupt the charge cycle. When you can no longer hear the Rhino's fan running you know that your battery pack has finished charging.

### SERVICING THE AIR FILTER

1. **Remove the outer fan grill with a small flat blade screwdriver.** Insert screwdriver into the two slots at back edge of grill and gently pry plastic forward while lifting grill upward at the same time. Refer to photo below.
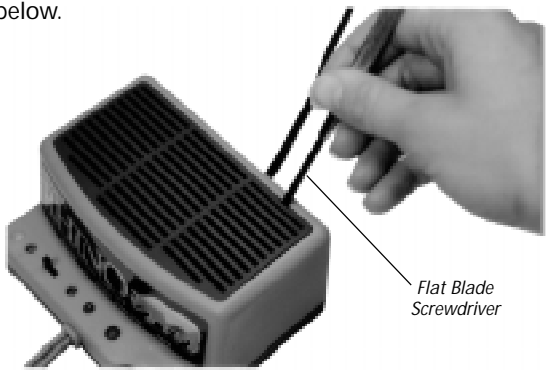

*Flat Blade Screwdriver*

2. **Remove foam air filter.**
3. **Clean filter with mild soap and water.** Thoroughly dry the filter before replacing. Replacement air filters are also available in Novak Kit #5650.
4. **Replace air filter and outer fan grill.** Insert the curved front edge of the fan grill into the slots in the case, then snap the back edge of the fan grill down into place.

## BATTERY TIPS

### GETTING THE MOST OUT OF YOUR BATTERIES

Getting the most run time and the longest life from your batteries requires more than just charging at the correct current. Proper care is a must for your battery packs.

### REPEAK FOR MAXIMUM CAPACITY

When the battery pack voltage peaks at the end of the charge and begins to drop, one or more cells are fully charged and have started to 'self-discharge'. The energy that is put into the cell after it has peaked results in the dissipation of heat. You may notice when the battery pack peaks, that some of the cells get warmer than others. This is because the charge times differ slightly from cell to cell.

A good way to reduce the problem of some cells having a more complete charge than others, is to repeak the battery pack after about 30 minutes. This allows the cells that have over-charged to discharge down to the level of the remaining cells in the pack. Repeaking after the cells have equalized with each other brings all the cells up together for maximum capacity. It is best to time this process so that you are able to run immediately after repeaking, this will minimize the 'self-discharging' of the batteries.

### DISCHARGE FOR EXTENDED RUN TIME AND LONG LIFE

When you are done for the day, you should fully discharge your battery packs to prepare them for the next time you use them. Storing and then recharging a partially charged battery pack will result in decreased performance from your batteries, and will also reduce the number of effective charge cycles you will get from your batteries.

The simplest method to discharge your batteries is to put a 30 ohm/10 watt resistor across the battery terminals **as shown below**. As the pack discharges, some of the cells will become reversed (the cell voltage becomes negative) and will charge backwards. Charging a cell backwards at high rates will damage the cell. However, the current drawn through a 30 ohm resistor is low enough for the cell to tolerate without damage. Connect the resistor to the battery until the resistor cools to room temperature. This may take several hours. Remove the resistor from the battery at this time. *Damage to the battery pack can also occur if the resistor remains attached to the pack for a time period longer than 24 hours.*

*Discharging Battery Pack*


30Ω / 10W Resistor
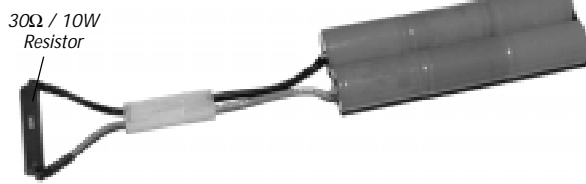
• *Always discharge your battery packs after using them to get the maximum performance and longest battery life.*

### PRODUCT WARRANTY


★ 120 DAY WARRANTY

Novak Electronics, Inc. guarantees the Rhino charger to be free from defects in materials or workmanship for a period of 120 days from the original date of purchase (verified by dated, itemized sales receipt). This warranty does not cover components worn by use, damage due to using an input voltage higher than 15 volts DC, damage due to charging more than 8 or fewer than 4 cells, damage to battery packs resulting from improper connection or charging of a receiver battery pack, any splices to the input or output wires, component damaged from excessive force when pressing the **START/STOP** button or over-rotating the **AMPS** dial, disassembling the case *(other than the intake grill)*, tampering with the internal electronics, allowing water, moisture, or any other foreign material to enter charger or get onto the PC board, or allowing any exposed wire to short-circuit.

In no case shall our liability exceed product's original cost. We reserve the right to modify the provisions stated in this warranty without notice.

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

### CUSTOMER SERVICE

### CUSTOMER SERVICE HOURS (PST)

Monday-Thursday:   8:00am-5:00pm
Friday: 8:00am-4pm *(closed every other Friday)*
(949) 833-8873 • FAX (949) 833-1631

## TROUBLE-SHOOTING GUIDE

This section describes typical charger problems, causes, and solutions. If you are unable to solve the problem, call our Customer Service Department for assistance.

### Charger Stops Before Battery Pack Is Fully Charged

• Input power supply is unstable. Connect the charger input to a 12 volt DC automobile battery to check.
• The battery pack has one or more bad cells in it. Try charging different battery packs. Monitor the battery pack voltage while charging. If the voltage starts to drop before the charger shuts off, the charger is operating normally.
• The charging current is too high. If charging current is too high for the battery pack, it will heat up prematurely and cause the voltage to drop, shutting off the charger. Reduce the charge current.
• The charging current was lowered while charging after the lockout time expired. Press the STOP/START button to restart the charge cycle.
• Poor connection to the input power source or battery pack. Check, clean, and tighten all connections.
• Charger has over-heated and has thermally shut down. (See Below)

### Charger Stops And Will Not Restart
*Thermal Shut-Down has occurred*
• Air filter clogged or something blocking fan grill. Clean filter or clear the air path.
• The internal cooling fan is not running. Fan should run whenever the charger is operating. Check fan grill for obstruction. Fan may need replacing.
• Charger input voltage too high or charge current set too high. Reduce input voltage to 1.5 volts DC above the peak-voltage of the battery pack being charged or reduce charging current. This more commonly happens when charging 4 cell packs at too high of a current.

### Charger Will Not Start
• Charger has thermally shut down and is cooling off. Charger can be restarted after a few minutes when the proper operating temperature has been reached.
• Battery pack voltage is too low. Connect the charger to the battery pack and wait a few minutes before starting the charger.
• Press and hold the START/STOP button until the LED glows evenly. Pushing the button rapidly does not allow the circuitry to stabilize.
• Bad connection in charging circuit. Check input and output connections. Try charging a different battery pack.

### Charger Stays On but Battery Pack Does Not Charge
• Input voltage too low. Input voltage to the charger should be at 1.5 volts DC above the peak-voltage of the battery pack being charged.
• Charge current set too low. Increase current.

### Charge Current Will Not Adjust Properly
• Input voltage too low. The input voltage to the charger should be 1.5 volts DC above the peak-voltage of the battery pack being charged.

### Charger Starts By Itself and Will Not Shut-Off
• Internal damage. Return for service.

## SERVICE PROCEDURES

Before sending your Rhino charger in for service, review the Trouble-Shooting Guide and Instructions. The charger may appear to need service when other problems exist in the system.

*PLEASE NOTE:* Chargers that operate normally when received will be charged a minimum service fee and return shipping costs.

*WHAT TO SEND:* Fill out all of the requested information on the enclosed *CHARGER SERVICE CARD* and return it with your charger. Service cards can also be downloaded from our website at **www.teamnovak.com.**

*WARRANTY WORK:* For warranty service work, you *MUST CLAIM WARRANTY* on the *CHARGER SERVICE CARD* and include a valid, dated, cash register receipt, or an invoice from previous service work. If any warranty provisions have been voided there will be a service charge.

*SERVICE COSTS:* Customer is responsible for service costs (parts, labor and shipping/handling charges). chargers are returned UPS/COD CASH ONLY. See *CHARGER SERVICE CARD* for other payment and shipping options.

*ADDITIONAL NOTES:*
• Hobby dealers/distributors are not authorized to replace chargers thought to be defective.
• If a hobby dealer sends your charger for service, submit a completed *CHARGER SERVICE CARD* to the dealer and make sure it is sent with the charger.
• Novak Electronics, Inc. does not make any electronic components (transistors, 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.

*FOR SERVICE, SEND CHARGERS TO:*
NOVAK ELECTRONICS, INC.
Attn: Service Department
18910 Teller Avenue,
Irvine, CA. 92612  USA


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