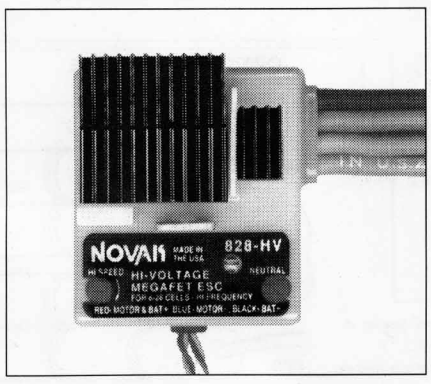
828-HV



HIGH–VOLTAGE MEGAFET
ELECTRONIC SPEED CONTROL

INSTRUCTION MANUAL

NOVAK ELECTRONICS, INC. RACING TEAM

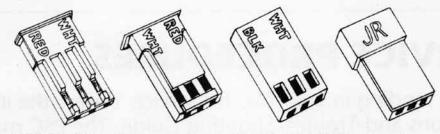
PRECAUTIONS

ESC= Electronic Speed Control

- **ALWAYS USE HEAT SINKS.** The 828-HV may overheat and cause damage if all three heat sinks are not used.
- **DISCONNECT THE BATTERIES.** Always disconnect the battery pack from the ESC when not in use. Nickel-cadmium batteries can discharge at extremely high current and may explode if they are accidentally short-circuited.
- **TURN ON YOUR TRANSMITTER FIRST.** Always turn on the transmitter first so that you have control of the radio before you connect the ESC.
- **CHECK THE SPECIFICATIONS.** Never use less than 8 cells or more than 28 cells. When using more than 13 cells, always remove the red input wire and use an external receiver battery pack. Using more than 13 cells reduces the life of the motor. Novak Electronics is not responsible for damage to the motor or battery under any circumstance.
- **NO WATER!** Never allow water, moisture or any other foreign material on the PC board.
- **INSULATE.** Always insulate exposed wires with heat shrink tubing to prevent accidental short-circuits.

1 CHANGING THE INPUT HARNESS

Included with the 828-HV is the exclusive Novak Input Plug System™ to convert the Futaba J type input harness to be compatible with the Airtronics, KO, Kyosho, and JR radio systems. Refer to Figures 1 through 3 to change the input plug.



AIRTRONICS (A) KO KYOSHO (KYO) JR

FIGURE 1 With a small flat-head screwdriver, press down each of the three metal prongs until the wires are easily removed. Remove wires.

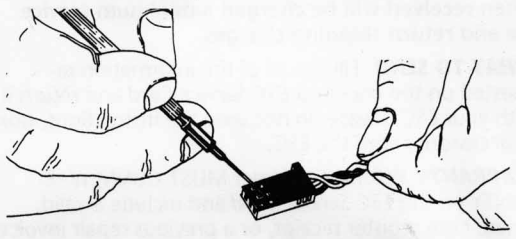


FIGURE 2 With the screwdriver, carefully lift up each of the metal locking tabs to the angle shown.

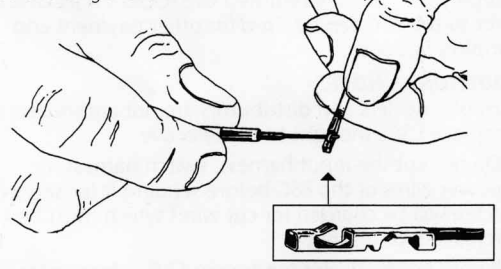
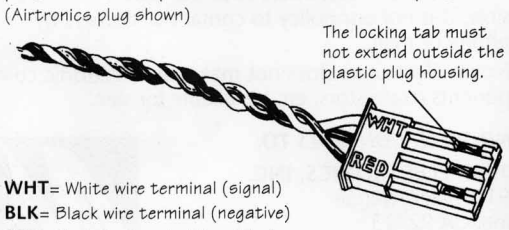


FIGURE 3 Insert each wire pin into the correct plug slot. Each pin should "click" into the plug. (Airtronics plug shown)



WHT= White wire terminal (signal)
BLK= Black wire terminal (negative)
RED= Red wire terminal (positive)

CAUTION! Improper installation of these wires may cause damage to the receiver, servo and/or ESC.

ABOUT THE 828-HV

The 828-HV MEGAFET Electronic Speed Control (ESC) is designed for high voltage and high current applications. The 828-HV delivers smooth proportional throttle control and braking when using 8 to 28 cells.

828-HV features include:

- Thermal overload protection.
- Low on-resistance MEGAFET transistors.
- High surge-current capability.
- High frequency pulse width modulation for maximum efficiency and smooth acceleration.
- Battery regenerative braking.
- Battery eliminator circuit (BEC) for up to 13 cells.
- Heavy duty 14 gauge silicone power wires.

R/C Applications (8-28 cells): Drag Cars, Electric Boats, Truck Pulls, Electric Airplanes, and Monster Trucks.

2 HEAT SINK INSTALLATION

Not using the three required heat sinks may cause the 828-HV to overheat, which will damage the ESC and void the warranty.

1. Each large heat sink mounts on the six in-line transistors, and the small heat sink mounts on the offset transistor (refer to HOOK-UP DIAGRAM on back page).
2. Place the ESC on a flat surface and press the heat sinks onto the metal tabs of the transistors until they are secure. The heat sinks are designed for a tight fit for optimum heat transfer, and may be difficult to press onto the transistors.

   NOTE: Be careful not to use too much force when installing the heat sinks so that you do not damage any of the components under the MOSFETs. **Never use a vise to install the heat sinks!**
3. If the small heat sink fits loosely on the offset transistor, carefully bend the two tabs of the heat sink closer together with a pair of pliers until the fit is secure.
4. Metal must not come between the large heats sinks and the small heat sink because they will short circuit and cause serious damage to the ESC (warranty will be void).
5. Heat sinks will get hot while running. Do not touch hot heat sinks–they may cause burns.
6. Do NOT glue the heat sinks onto the transistors.

3 MOUNTING INSTRUCTIONS

1. Mount the 828-HV to the chassis with the included mounting tape. Mounting the ESC to achieve maximum airflow through the heat sinks is very important for maximum performance.
2. Mount the On/Off switch in a convenient place with double-sided sticky tape.

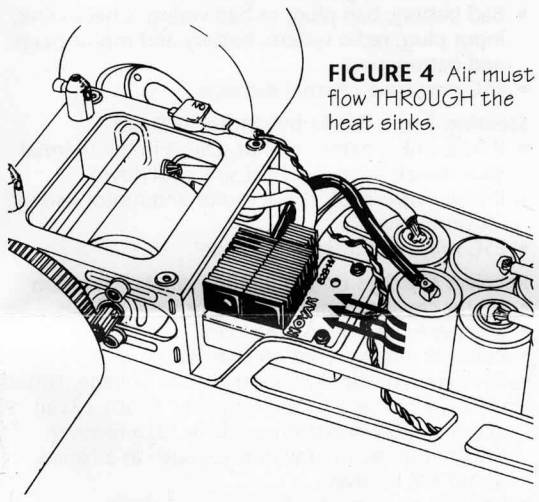


FIGURE 4 Air must flow THROUGH the heat sinks.

3. If your radio is on the 75 MHz band and your model has a metal or graphite chassis, do not mount the receiver or antenna on the chassis. Mounting the receiver on the chassis may decrease the range of your radio by as much as 50%. Always mount the receiver and antenna as high in the car as possible.
4. To decrease the chances of radio interference, mount the receiver and antenna at least two inches away from the motor, servo, and power wires.
5. Always mount the antenna as close to the receiver as possible.
6. DO NOT allow the heat sinks to touch any metal components of the model–such as the chassis, solder joints, or motor.
7. Do not drape any wire or plastic parts over the heat sinks–they may melt when the heat sinks get hot.

828-HV

► Specifications

Case Size	1.80" L x 1.62" W x 0.62" H
Weight[1]	2.51 oz.
ON Resistance	0.0018Ω
PWM Frequency	2500 Hz (nominal)
Rated Current[2]	up to 500 amps
Peak Current[3]	up to 1200 amps
Braking Current	50 amps
Voltage Input[4]	8-28 cells (1.2 V/cell)
Current Efficiency	over 99%
Input Plug Length	12 in.
Power Plugs	Deans plugs included
BEC	5 volts, 0.5 amps
Wire Size	14 gauge
Part No.	1520

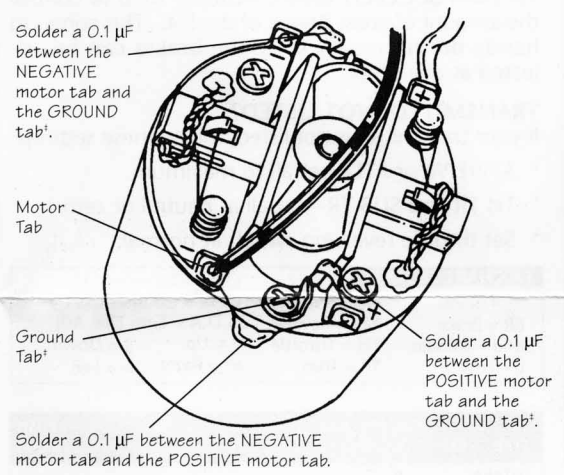
[1] Without heat sinks. Heat sinks=0.5 oz.
[2] Transistor's current rating at 25° C junction temperature.
[3] Based on a 2 msec peak at 2% duty cycle (transistors only).
[4] An external receiver battery pack must be used for more than 13 cells.

4 HOOKING UP THE 828-HV

1. MOTOR CAPACITORS
Motors generate radio noise which can interfere with your receiver and cause radio interference problems. Three 0.1µF capacitors MUST be installed on EVERY motor. Extra 0.1µF capacitors are available in Novak kit #5620. Solder capacitors between:

- POSITIVE (+) motor tab and NEGATIVE (-) motor tab
- POSITIVE (+) motor tab and GROUND motor tab‡
- NEGATIVE (-) motor tab and GROUND motor tab‡

FIGURE 5 Proper motor capacitor installation.



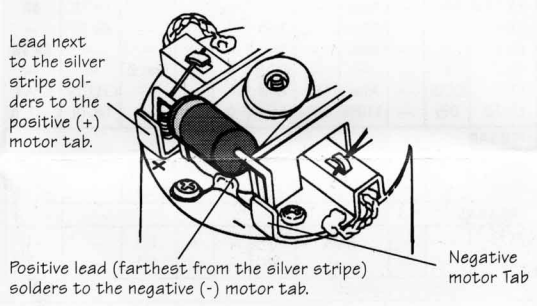
‡Solder to the can of the motor if it does not have ground tabs.

2. SCHOTTKY DIODE
Schottky diodes provide smoother braking and increase the efficiency of the speed control and motor. To install the Schottky diode:

- Solder the lead of the Schottky diode that is closest to the silver stripe on the body of the diode to the POSITIVE (+) motor tab.
- Solder the other lead of the Schottky diode to the NEGATIVE (-) motor tab.

If the diode is installed backwards, it will crack. Cracked diodes should be replaced. Always use Schottky diodes rated at 45 volts, 8 amps, and 0.4 forward voltage drop. Extra Schottky diodes are available in Novak kit #5640.

FIGURE 6 Proper Schottky diode installation.



3. INPUT HARNESS
After the proper input plug has been installed (STEP 1), plug the ESC input harness into the throttle channel (CH 2) of the receiver.

If more than one servo is used, an external receiver battery pack must be used (STEP 5).

4. BATTERY PACK
The 828-HV is designed to be used with 8 to 28 cells only. Warranty is void if fewer than 8 cells or more than 28 cells are used.

If more than one battery pack is used, they must be connected in SERIES (such as two 7 cell packs to give a total of 14 cells in series). Refer to HOOK-UP DIAGRAM on back page.

5. POWER WIRES
Use the included Deans Ultra plug to connect the ESC to the battery pack (refer to HOOK-UP DIAGRAM on back page). Always install the female plug on the battery pack to prevent accidental short-circuits. Insulate all exposed wires with heat shrink tubing. To minimize power loss, keep wires as short as possible.

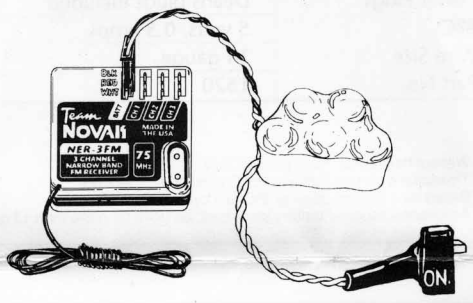
5 USING MORE THAN 13 CELLS

An external receiver battery MUST be used to power the radio system if more than 13 cells are used in the main battery pack.

The 828-HV has a built-in BEC to provide power for the receiver and servo for an input voltage between 8 and 13 cells. When more than 13 cells are used, the BEC's voltage regulator will overheat and shut down, causing loss of radio and damage the ESC.

When using an external receiver battery, always disconnect the red wire of the input harness. Plug the 5 or 6 cell external receiver battery pack into the battery terminal of the receiver.

FIGURE 7 *When using more than 13 cells, always use an external receiver battery pack.*



6 TRANSMITTER ADJUSTMENTS

Adjusting your transmitter's throttle channel is probably the most critical step for proper ESC set-up. The basic transmitter throttle adjustments are:

ATV, EPA or ATL—High ATV/EPA controls the amount of throw from neutral to full throttle. Low ATV/EPA/ATL controls the amount of throw from neutral to full brake (PUSH BRAKE).

EXP or EXPO—Controls the linearity of the throttle channel. Set to zero or middle setting.

SUB TRIM—Usually used to center a servo. Set to zero or middle setting.

TH TRIM or COAST BRAKE—Usually used to control the amount of coast brakes of the ESC. This comes in handy during racing since the brakes can be adjusted at any time.

TRANSMITTER NOT LISTED?
If your transmitter is not listed, follow these settings:

- ATV/EPA, or ATL—set all to maximum.
- TH TR and SUB TR—set all at neutral or zero.
- Set throttle reversing switch at normal.

TX CHART LEGEND

— = None	Nor = Normal	CW = Clockwise ↻
BR = Brake	Rev = Reverse	CCW = Counter CW ↺
Mid = Middle	TH = Throttle	G.D.A.= Grip Dial Adj.
L = Low	TR = Trim	⇑ = Up ⇓ = Down
		⇒ = Right ⇐ = Left

TX TYPE	TH EXP	ATL	ATV or EPA Hi	ATV or EPA Low	TH TR	SUB TR	REV SW	MECH ADJ	COAST BRAKE	PUSH BRAKE
FUTABA										
*T2PKA**	—	—	10	6	-5	—	⇒	Pos 2	CH2 TR	ATV-L
T3PG	0	—	10	—	-5	—	Nor	Pos 2	BR TR	BR Lim
T2P	—	—	—	—	-5	—	Rev	1/3	—	—
T2PB	—	—	—	—	-5	—	Rev	Mid	—	—
*T2PD**	—	5	10	10	L-5	0	Rev	1/3	ATL	ATL
*T2PBKA**	—	—	10	10	L-5	—	Rev	Mid	—	ATV-L
T2NCS	—	—	—	—	⇓	—	—	—	—	—
T2NBR	—	—	—	—	⇓	—	Rev	⇓	—	—
T3PB	0	10	10	10	N	0	Rev	1/3	TH TR	ATL
AIRTRONICS										
CL-3P	0%	—	100%	<60	Mid	—	Nor	—	TH TR	EPA-L
*XL-2P**	—	—	Max	Max	Mid	—	Nor	—	TH TR	EPA-L
*CS-2P**	Nor	—	CW	CW	Mid	—	Nor	—	TH TR	EPA-L
VT-2P	—	—	—	—	L	—	⇐	⇓	—	—
JR PROPO										
BEAT 2	—	—	10	10	Mid	—	Nor	—	TH TR	EPA-L
PCM	—	—	—	—	CCW	—	Nor	3:1	—	—
R-756	0%	Max	110%	50%	Mid	0	Nor	—	TH TR	G. D. A.
KO PROPO										
EX-I	Min	—	Max	—	Mid	—	⇐	—	CH2 TR	—
EX-I FM	Min	—	Max	—	0	—	⇑	—	TH TR	BR
EX-II	—	—	Max	—	Mid	—	⇑	—	BR TR	—
EX-5	—	—	Max	—	Mid	—	⇒	—	—	BR TR
EX-7	—	—	—	—	CCW	—	⇓	Pos B	—	—
EX-9	CCW	—	Max	Max	Mid	—	⇐	—	CH2 TR	EPA-L
EX-10	0%	—	110%	50%	Mid	0	Nor	—	TH TR	G. D. A.
PULSAR										
*2000**	—	—	—	—	⇐	—	Nor	1/3	—	—
2001	—	—	+	0	⇐	—	Nor	1/3	—	EPA-L
TRAXXAS										
2025	—	—	Max		0	—	⇒	1/3	—	—
2201	—	—	—		0	—	⇒	1/3	—	—

** Set-up sheets are available.*

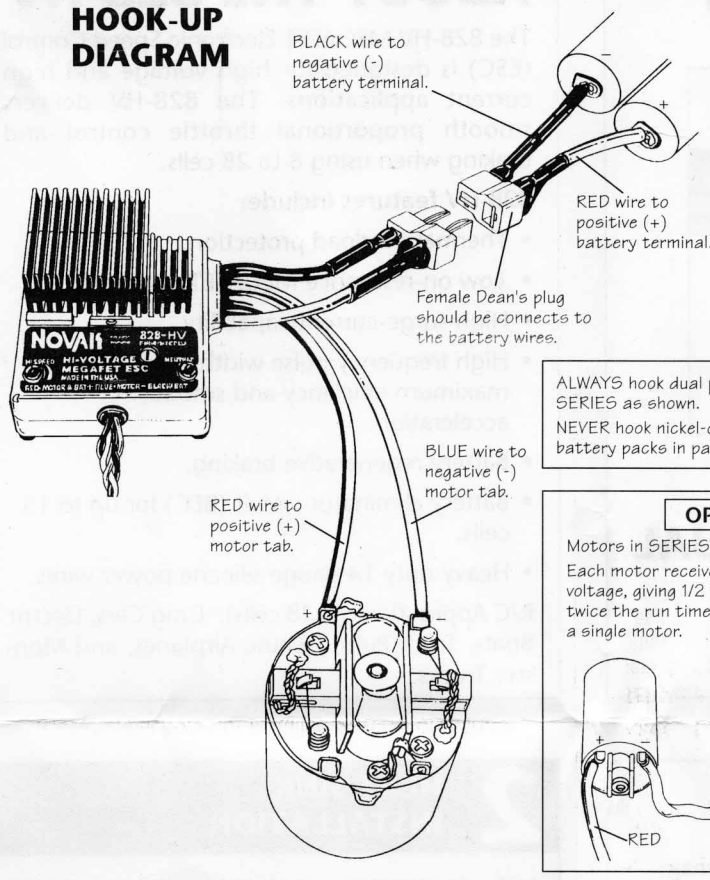
PRODUCT WARRANTY

Novak Electronics, Inc. guarantees the 828-HV speed control to be free from defects in materials or workmanship for a period of 90 days from the original date of purchase (verified by a sales receipt). This warranty does not cover damage due to incorrect installation, components worn by use, application of reverse input voltage, not using heat sinks, not removing the red input harness when using an external receiver battery pack, not using an external receiver battery pack when using more than 13 cells, using less than 8 cells or more than 28 cells, cross connection, not properly installing three 0.1µF (50V) capacitors on the motor, any splices to the input harness or switch harness, tampering, pot damage, allowing water, moisture, or any foreign material on the ESC's PC board, incorrect installation of an alternate input plug plastic, or allowing any exposed wires to short-circuit.

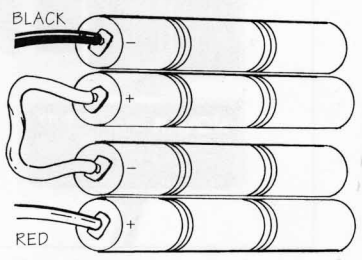
In no case shall our liability exceed product's original cost. We reserve the right to modify the provisions of this warranty without notice.

Because Novak Electronics, Inc. has no control over the installation and use of the ESC, no liability may be assumed nor will liability be accepted for any damage resulting from using this product. Every ESC is thoroughly tested and cycled before leaving our facility and is, therefore, considered operational. By the act of installing or operating this speed control, the user accepts all resulting liability.

► 828-HV HOOK-UP DIAGRAM



OPTIONAL MULTIPLE BATTERY HOOK-UP

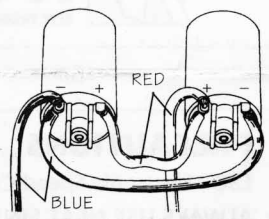


ALWAYS hook dual packs in SERIES as shown.
NEVER hook nickel-cadmium battery packs in parallel.

OPTIONAL DUAL MOTOR HOOK-UP

Motors in SERIES
Each motor receives 1/2 the pack voltage, giving 1/2 the power and twice the run time as compared to a single motor.

Motors in PARALLEL
Each motor receives the full pack voltage, giving twice the power and 1/2 the run time as compared to a single motor.



7 SPEED CONTROL ADJUSTMENTS

For proper operation, your transmitter MUST be adjusted (STEP 6) before the speed control's HI SPEED and NEUTRAL pots are adjusted.

When adjusting the HI SPEED and NEUTRAL settings, DO NOT force the pots past their stops– this can cause board and/or component damage.

1. DISCONNECT THE MOTOR. Plug the 828-HV into the fully charged 8 to 28 cell battery pack.
2. Turn on the transmitter and speed control.
3. Rotate the NEUTRAL pot on the speed control until the red LED turns on (FIGURE 8).
4. Hold the transmitter at 90% throttle and rotate the HI SPEED pot on the speed control until the green LED turns on (FIGURE 9).
5. Connect the motor and check for proper operation. Hold the transmitter at 100% throttle and make sure that the motor runs and the green LED stays on.
6. Use the coast brake adjustment on the transmitter to dial in more or less brake. If there is no coast brake adjustment, rotate the ESC's NEUTRAL pot a few degrees counter-clockwise (↺) for desired coast brake and re-adjust the HI SPEED pot.

   When adjusting Push Brakes on the transmitter, a blinking green LED on the ESC indicates full brakes– do not go past this setting.

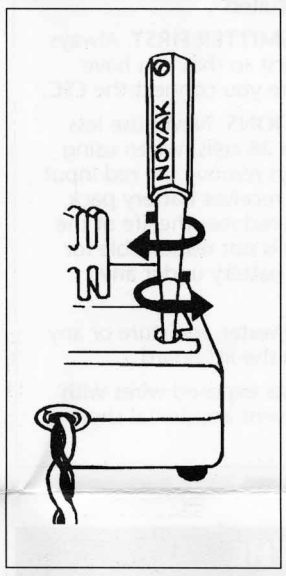


FIGURE 8 *Rotate the NEUTRAL pot on the speed control until the red LED turns on.*

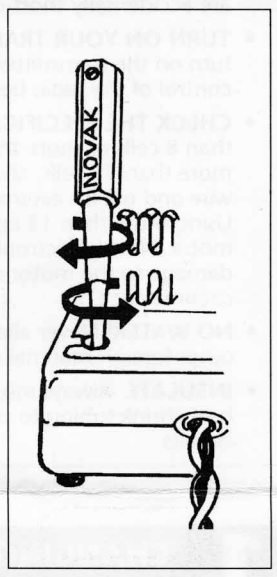


FIGURE 9 *Hold the transmitter at 90% throttle and rotate the HI SPEED pot on the speed control until the green LED turns on.*

TROUBLE-SHOOTING GUIDE

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

Motor & Steering Servo are Dead
- Bad battery, bad plug, or bad wiring. Check wires, input plug, radio system, battery and motor plugs, and battery pack.
- ESC may have internal damage†.

Steering Servo Works but Motor is Dead
- If heat sink is extremely hot, ESC is in the thermal shut-down mode. Let heat sink cool down.
- If heat sink is cool, check motor and motor wiring for problems.
- ESC may have internal damage†.

Receiver Glitches or Stutters During Acceleration
- Motor capacitors not installed or have broken.
- Receiver mounted too close to ESC.
- Receiver mounted flat on chassis.
- Receiver is dropping out due to low voltage. Either use (1) a Novak Stutter Stopper (# 5450); (2) an external receiver battery pack, or (3) a receiver designed to be used with ESCs, such as a Novak AM or FM receiver.
- Bad power plug, check wiring and plugs.

Model Runs Slowly or Has Slow Acceleration
- Bad plug(s), bad battery, or bad motor.
- Incorrect transmitter or ESC settings. Set-Up again.
- Schottky diode installed backwards, check polarity.

ESC is Melted or Burnt/ESC Runs with Switch Off
- Internal damage†.

Brakes Fade
- External Schottky diode broken or not installed on motor.

Motor Runs Backwards
- Motor wired backwards.
- Battery pack wired backwards (will damage speed control and void warranty).

† ESC has internal damage, see SERVICE PROCEDURES section.

The Novak 828-HV is designed and manufactured in the U.S.A.
Input Plug System™ is a trademark of Novak Electronics, Inc.
Printed in the USA 12/93 • No. IM-1520-2

SERVICE PROCEDURES

Before sending in your ESC for service, review the instructions and Trouble-Shooting Guide. The ESC may appear to have failed when other problems exist in the system—such as a defective transmitter, receiver, servo, battery, motor, or incorrect adjustments/installation.

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

WHAT TO SEND Fill out all of the information requested on the enclosed ***ESC Service Card*** and return it with your ESC. Please do not send the instructions, box, or accessories with the ESC.

WARRANTY WORK Customer MUST CLAIM WARRANTY on the ***ESC Service Card*** and include a valid, dated, cash register receipt, or a previous repair invoice with the ESC. If any warranty provisions have been voided there will be a service charge.

SERVICE COSTS Customer assumes responsibility for service costs (parts, labor, and shipping/handling charges). All ESCs are returned UPS/COD CASH ONLY. Refer to the ***ESC Service Card*** for other payment and shipping options.

ADDITIONAL NOTES:
- Hobby dealers and distributors are not authorized to replace ESCs thought to be defective.
- Do not cut the input harness, switch harness, or power wires of the ESC before sending it for service. A fee will be charged for cut wires which must be replaced for testing.
- If your hobby dealer sends your ESC in for service, be sure to submit a completed ***ESC Service Card*** to your dealer and make sure it is sent with your ESC.
- To provide our customers with the fastest service possible, it is not our policy to contact customers by phone or mail.
- Novak Electronics does not make any electronic components (transistors, etc.) available for sale.

SEND SPEED CONTROLS TO:
NOVAK ELECTRONICS, INC.
18910 Teller Avenue
Irvine, CA 92715

CUSTOMER SERVICE HOURS (PST)
Monday-Friday: 8:00am-4:00pm
(714) 833-8873 • FAX (714) 833-1631