

OPERATING INSTRUCTIONS

TEMPEST HYPERFET II PRO

Part #1760



NOVAK
ELECTRONICS, INC. RACING TEAM



INTRODUCING THE TEMPEST

The Novak Tempest Pro combines the power of HYPERFET II transistors with full-digital micro-computer control to give you the smoothest, fastest, and coolest speed control the racing industry has to offer. Team driver or not!

The Tempest Pro features Novak's exclusive Polar Drive Technology™ that gives increased power with operating temperatures cool enough that heat sinks are not needed. This means smoother throttle response along with quicker acceleration, increased radio system range, and longer run times than conventional ESC's (Electronic Speed Controls). All this and the ability to run the hottest modified motors. SIX HYPERFET II drive transistors and new Super-Flex 12™ wire give demanding racers the lowest voltage drop and highest current rating in the industry, while THREE more HYPERFET II's supply the braking circuit with more power than any other racing speed control.

Other features include the original One-Touch Set-Up™, Radio Priority & Digital Anti-Glitch Circuitry™, the Novak Input Plug System™, CLC II™ current limiter with 'OFF' position, ultra-light case design, and a heavy-duty BEC with the power to handle today's high power servos.

SPECIFICATIONS

Input Voltage	4-10 cells (1.2 volts DC/cell)
Case Width	2.04 inches [51.82 mm]
Case Depth	1.35 inches [34.29 mm]
Case Height	0.73 inch [18.54 mm]
Weight (w/o heat sinks)	2.46 ounces [69.74 g]
On-Resistance @ Transistors	1.167mΩ
Rated Current	420 amps
Braking Current	210 amps
BEC Voltage	6.0 volts DC
BEC Current	5.0 amps
Wire Size (Battery/Motor)	12 gauge (Super-Flex 12™)
Wire Length (Battery/Motor)	9 inches [228 mm]
Signal Harness Length	8 inches [203 mm]
Transistor Type	HYPERFET II™
Current Limiter Range	20 to 80 amps / OFF
PWM Frequency	2500 hertz (fixed)
Part Number	1760

TEMPEST ACCESSORIES

MOTOR CAPACITORS

To prevent radio interference problems, you must have three 0.1µF capacitors properly installed on every motor. Included with the Tempest Pro speed control are three 0.1µF (50V) capacitors for one motor. Additional 0.1µF (50V) capacitors are available in Novak kit #5620. Refer to Step 3 for motor capacitor installation instructions.

SCHOTTKY DIODES

The Tempest Pro uses an external Schottky diode. For optimum performance, we suggest installing the Schottky diode on the motor. One Schottky diode is included with the Tempest and must be installed as described in Step 3.

If using a low turn modified motor, it may be necessary to use two Schottky diodes on the motor. Install the second Schottky diode as shown in Step 3. Additional Schottky diodes are available in Novak kit #5640.

HEAT SINKS

Heat sinks are not required with the Tempest. However, if transistors get excessively hot during operation, the added cooling provided by heat sinks will result in a slight increase in efficiency. An optional Heat Sink Set is available as Novak kit #5407. Heat sinks are recommended for multi-motor/heavy load applications and set-ups with limited air circulation.

PRECAUTIONS

- READ INSTRUCTIONS CAREFULLY BEFORE USING!
- WATER & ELECTRONICS DON'T MIX! Do not operate model in or around water. Never allow water, moisture, or other foreign materials to get inside the ESC.
- 4 to 10 CELLS ONLY Never use more than 10 cells (12 volts DC) in the main battery pack.
- MOTOR CAPACITORS REQUIRED Three 0.1µF (50V) ceramic capacitors must be properly installed on every motor to prevent radio interference.
- NO REVERSE VOLTAGE! Reverse battery polarity can damage speed control—Disconnect battery immediately.
- DON'T LET TRANSISTOR TABS TOUCH Never allow the two transistor tab banks to touch each other or any exposed metal, as this will create a short circuit and damage the speed control.
- DISCONNECT THE BATTERIES Always disconnect the battery pack from the speed control when not in use.
- TRANSMITTER ON FIRST Always turn on the power of your transmitter first so that you will have control of the radio equipment when you turn on the speed control.
- DON'T LET INPUT WIRES TOUCH! Never allow the input harness' black and red wires touch each other while the ESC is on, as this will create a short circuit and damage the ESC.
- INSULATE WIRES Always insulate exposed wiring with heat shrink tubing to prevent short circuits.

RADIO INTERFERENCE

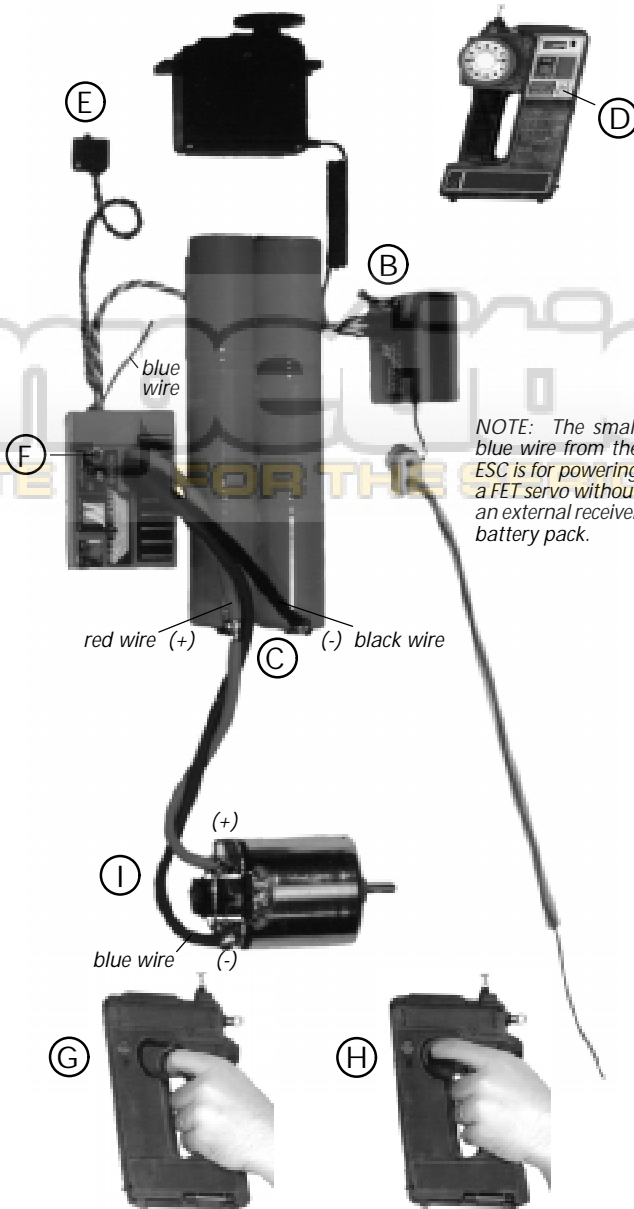
The high frequency switching operation of electronic speed controls can generate radio interference. Here are some common causes of radio interference problems:

- CAPACITORS NOT INSTALLED ON MOTOR Electric motors generate radio noise that can interfere with the receiver. To prevent radio problems, every motor must have three 0.1µF (50V) ceramic capacitors installed on it. Refer to Step 3 on back page for proper installation.
- RECEIVER/ANTENNA INCORRECTLY MOUNTED The receiver and antenna should be mounted as far from the motor, power wires, battery, and servo as possible, as these components all emit radio noise. On graphite or aluminum, place receiver on edge with the crystal and antenna as far above the chassis as possible. Mount the antenna close to receiver and trail any excess wire off the top of antenna. *Do not cut or coil excess wire!*
- MOTOR BRUSHES WORN As motor brushes continue to wear, excessive motor noise will be generated. To avoid radio interference, worn motor brushes should be replaced. The motor commutator may also need to be cleaned or trued and can be machined to help the motor run more efficiently.

TEMPEST QUICK SET-UP FOR DETAILED INFORMATION REFER TO STEPS 1 THRU 5

- INSTALL SPEED CONTROL**
Use double-sided tape to mount ESC in model where the power wires are neatly routed away from the receiver and antenna. For more details refer to Step 2 on back.
- CONNECT SPEED CONTROL TO RECEIVER**
Plug the ESC input signal harness into the throttle channel of receiver. Make sure the proper plug plastic is installed on ESC signal harness. Refer to Step 1 for changing plug.
- CONNECT SPEED CONTROL TO BATTERY**
Solder the BLACK wire of ESC to *negative* of a completely charged 4 to 10 cell battery pack (1.2 volts DC/cell). Strip a short section of insulation off the RED wire of ESC where it will attach to battery *positive*. Solder stripped section of RED wire to battery *positive*.
- TURN ON TRANSMITTER POWER**
Refer to Step 4 on back for transmitter adjustments.
- TURN ON SPEED CONTROL**
Slide ON/OFF switch to *ON* position.
- PRESS AND HOLD SPEED CONTROL SET BUTTON**
With transmitter throttle in *neutral* position, press and hold SET button until status LED *turns solid red*, then release.
- PULL THROTTLE TO FULL-ON POSITION**
Hold until status LED *turns solid green*.
- PUSH THROTTLE TO FULL-BRAKE POSITION**
Hold until status LED *blinks green*, then return throttle to *neutral* position. LED will then turn solid red indicating proper programming and throttle is in neutral position.
- CONNECT SPEED CONTROL TO MOTOR**
Turn off speed control and then transmitter. Solder the BLUE wire of ESC to motor *negative*. Solder the end of the RED wire of ESC to motor *positive*.
- STORM THE TRACK & WIN!**
Turn on transmitter and then speed control.

You are now prepared to experience the smoothest motor control, lowest voltage drop, and highest current rating available in racing speed controls!



NOTE: The small blue wire from the ESC is for powering a FET servo without an external receiver battery pack.

DETAILED INFORMATION

STEP 1 CHANGING THE INPUT PLUG

Included with the Tempest Pro is the Novak Input Plug System™ to convert the Futaba J style signal harness to be compatible with Airtronics, KO, Kyosho, JR, and Hitec radios. Refer to Figures 1 through 3 to convert plug.

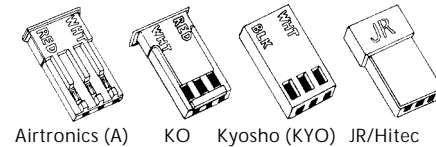


FIGURE 1 With a small standard screwdriver, press on each of the three metal prongs until the wires are easy to remove. Remove wires.

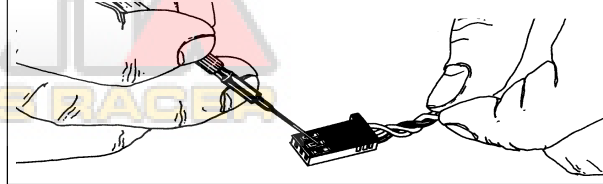


FIGURE 2 With the screwdriver, carefully lift up each of the metal locking tabs to the angle shown.

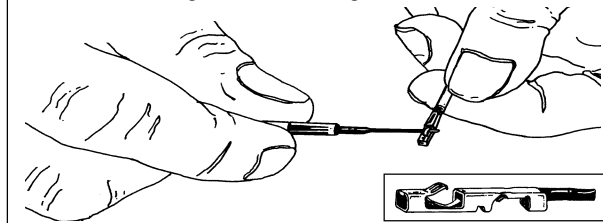
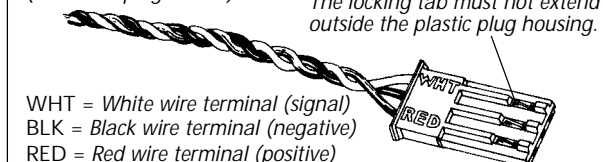


FIGURE 3 Insert each pin into the correct plug slot. Each pin should "click" into place. (Airtronics plug shown)



CAUTION Improper installation or shortening of these wires may cause damage to the receiver, servo, and speed control.



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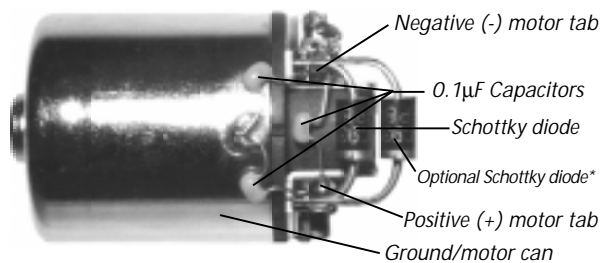
STEP 2 MOUNTING INSTRUCTIONS

1. DETERMINE BEST ESC MOUNTING LOCATION
The ESC should be positioned away from the receiver and antenna as shown in Quick Set-Up photo on front page. Choose a mounting position that will keep the power wires as short as possible without obstructing movement of the suspension or the motor pod. Remember, even though heat sinks are not required, cooler operating temperatures mean higher efficiency. So choose a mounting position that allows maximum airflow through the transistor tabs.
2. INSTALL SPEED CONTROL
Use the included double-sided tape to mount the ESC.
3. INSTALL ON/OFF SWITCH
Determine a convenient place to mount the switch where it will be easy to get to. Mount the switch using a piece of double-sided tape or with a screw through the hole in the base of the switch housing.
4. INSTALL RECEIVER
Mount the receiver as far from the motor, power wires, battery, and servo as possible. These components all emit radio noise when the throttle is being applied. On graphite or aluminum, place the receiver on edge with the crystal and antenna as far above the chassis as possible. Mount the antenna close to the receiver and trail any excess wire off the top of the antenna tube.

STEP 3 HOOK-UP INSTRUCTIONS

Refer to Quick Set-Up photo on front

1. INSTALL MOTOR CAPACITORS
Electric motors generate radio noise that can interfere with your receiver and cause radio problems. Included in the accessory kit with the speed control are three 0.1µF (50V) non-polarized, ceramic capacitors. These capacitors must be installed on every motor to help reduce the noise generated by the motor and also to prevent possible damage to the speed control. Extra 0.1µF capacitors are available in Novak kit #5620. Solder 0.1µF (50V) capacitors between:
 - POSITIVE (+) motor tab & NEGATIVE (-) motor tab.
 - POSITIVE (+) motor tab & GROUND tab*.
 - NEGATIVE (-) motor tab & GROUND tab*.**If your motor does not have a ground tab, solder the capacitor leads to the can of the motor as shown below.*



*A second Schottky diode may be needed if using a low turn modified motor.

2. INSTALL SCHOTTKY DIODE
Solder the lead CLOSEST to the silver stripe on the body of the Schottky diode to the POSITIVE (+) motor tab. Solder the lead OPPOSITE the silver stripe on the body of the Schottky to the NEGATIVE (-) motor tab. *If installed backwards, a Schottky diode will be destroyed. The body of a bad diode will normally crack open. Replace only with Schottky diodes that have a minimum rating of 35 volts/8 amps. Schottky diodes are available in Novak kit #5640.*
3. CONNECT SPEED CONTROL TO THE RECEIVER
After the proper input plug plastic has been installed to match the receiver (Refer to Step 1), plug the speed control into the THROTTLE CHANNEL of the receiver.
4. CONNECT SPEED CONTROL TO THE BATTERY PACK
Cut the BLACK wire of speed control to the desired length and strip about 1/4" of insulation off the end. Solder to the negative side of a completely charged 4 to 10 cell battery pack (1.2 volts DC/cell).
Strip a short section of insulation (1/4"-3/8") from the middle section of the RED wire of speed control where it will attach to positive of battery pack. Solder the stripped section of RED wire to positive of battery pack.
5. CONNECT SPEED CONTROL TO THE MOTOR
Cut the BLUE wire of speed control to the desired length and strip about 1/4" of insulation off the end. Solder to the negative tab of the motor.
Cut the RED wire of speed control (after battery pack connection) to desired length and strip about 1/4" of insulation off the end. Solder to positive tab of motor.
TIP: Twisting the BLUE & RED motor wires one or two times around each other as they go to motor can help reduce any radio noise that may be emitted from the power wires.
6. USING PLUGS FOR BATTERY & MOTOR CONNECTION
High-quality/low-resistance connector plugs, such as Dean's Ultra Plugs, can also be used to connect the motor and battery pack. While these connectors make component changes quick and easy, the connection will never have the low resistance of a good solder joint. Be sure to use connectors that can not be connected backwards, as this will damage the speed control.
It is good practice to use a female connector on the main battery pack to keep the pack from shorting if the connector touches a conductive surface.
If you plan to use connector plugs for the battery pack and the motor, use a male connector on the speed control wires going to the battery pack and a female connector on the wires going to the motor. By doing this, you will avoid plugging the battery pack into the motor output of the speed control by mistake.

STEP 4 TRANSMITTER ADJUSTMENTS

For proper ESC operation adjust transmitter as follows:

1. Set HIGH ATV or EPA to maximum setting.
[Amount of throw at full throttle]
2. Set LOW ATV, EPA, or ATL to maximum.
[Amount of throw at full brakes]
[Reduce this after programming to reduce amount of brakes]
3. Set EXPONENTIAL to zero.
[Throttle channel linearity]
4. Set THROTTLE CHANNEL TRIM to middle setting.
[Adjusts neutral position/Increases or decreases coast brakes]
5. Set CHANNEL REVERSING SWITCH to either position.
6. Set MECHANICAL THROW ADJUSTMENT to position with 2/3 throttle and 1/3 brake throw.
[Adjusts pistol-grip transmitter's throttle trigger throw]

STEP 5 SPEED CONTROL PROGRAMMING

Before beginning this step, the speed control should be connected to the receiver and to a charged 4 to 10 cell battery pack, and the transmitter should be adjusted.

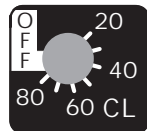
1. TURN ON THE TRANSMITTER.
2. TURN ON THE SPEED CONTROL
Slide the ON/OFF switch to the ON position.
3. PRESS AND HOLD SPEED CONTROL'S SET BUTTON
With the transmitter throttle in the neutral position, press and hold the SET button on the speed control until the status LED turns solid red.
4. RELEASE SPEED CONTROL'S SET BUTTON
5. PULL TRANSMITTER THROTTLE TO FULL-ON POSITION
Hold it there until the status LED turns solid green.
NOTE: The motor will not run during programming even if it is connected to the speed control.
6. PUSH TRANSMITTER THROTTLE TO FULL-BRAKE
Hold it there until the status LED blinks green.
7. RETURN TRANSMITTER THROTTLE TO NEUTRAL
The status LED will turn solid red, indicating that the throttle is in the neutral position and also that proper programming has been completed.

If transmitter settings are changed during programming, it will be necessary to complete the programming sequence once again. If you experience problems during programming, turn off the speed control and repeat programming.

STEP 6 ADJUSTING THE CURRENT LIMITER

The Tempest Pro ESC is equipped with CLC II current limiting circuitry. The current limiter pot controls the maximum amount of current going to the motor upon acceleration.

CLC II can be used to prevent excessive amp draw which wastes energy and overheats the batteries and motor. And, for slippery tracks, CLC II can be used as traction control.



The Tempest's CLC II is smooth and efficient. The "OFF" position bypasses the current limiter for maximum punch. Setting CLC II is simple, just turn the knob to the desired maximum amp draw. Before adjusting, set up the car similar to how it will be when racing. Use practice time at the track to set the current limiter to match track conditions.

- TO REDUCE WASTED ENERGY We recommend starting at a high level and adjusting downward to suit the track conditions. The recommended setting is just above the point where the CLC II starts reducing the acceleration of the motor.
- TO CONTROL TRACTION ON SLIPPERY TRACKS We recommend starting at the lowest setting and adjusting upward. The recommended setting is just below the point where the car is difficult to control during acceleration.
- FOR MAXIMUM PUNCH Turn the knob to the "OFF" position and punch the throttle!

RECEIVER BATTERY PACK

The Tempest Pro should not require an external receiver battery pack for most racing situations. The built-in Radio-Priority Circuitry™ provides complete control of the steering servo even after the main battery pack has 'dumped' and can no longer provide the power required to operate the motor. However, applications using 4-cell set-ups, multiple high-powered servos, and main battery packs with 8 or more cells require the use of an external receiver battery pack to prevent overloading or underpowering of the ESC's voltage regulator. *Failure to use an external receiver battery pack in these applications will damage the voltage regulator and void the product warranty.*

1. Plug the external 5 cell nickel cadmium receiver battery pack into the battery slot of the receiver.
2. Leave the speed control's ON/OFF switch in the OFF position. This switch is not used with this configuration.
3. Use the ON/OFF switch on the external receiver battery pack to turn the system power on and off.

Note: If using a FET servo with an external receiver battery pack, the separate power wire from the servo must be connected to the red (positive) servo wire. For this application do not use the blue wire from the ESC.

TROUBLE-SHOOTING GUIDE

ESC Will Not Program Properly

- Too little transmitter throw—Increase ATV/EPA setting.
- Make sure ESC is plugged into the throttle channel of receiver. Check throttle channel operation with a servo.
- ESC SET button not held long enough—Press and hold SET button until status LED turns solid red.

Steering Channel Works But Motor Will Not Run

[Status LED is solid RED at all throttle positions]

- No signal from receiver—Make sure speed control is plugged into throttle channel of receiver. Check throttle channel operation with a servo. Check the wiring color sequence of receiver harness.

Steering Channel Works But Motor Will Not Run

[Status LED is RED at neutral / GREEN at full throttle]

- Check motor connections. Check motor and brushes.
- Steering Channel Works But Motor Will Not Run
 - Not programmed—Repeat programming.

- Check wiring and connections—Check operation of system without speed control.

Receiver Glitches/Throttle Stutters During Acceleration

- Motor capacitors broken or missing—Refer to Step 3.
- Receiver or antenna too close to speed control, power wires, battery, or motor—Refer to Step 2.

- Bad connections—Check wiring and connectors.

- Excessive current to motor—Use a milder motor or a smaller pinion gear.

ESC Is Melted Or Burnt/ESC Runs With Switch Off

- Internal damage—Refer to Service Procedures.

**For more help call our Customer Service Department.*

SERVICE PROCEDURES

Before sending in your Tempest Pro for service, review the Trouble-Shooting guide and the instructions. The ESC may appear to have failed when other problems exist.

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

WHAT TO SEND: Fill out all of the information requested on the enclosed ESC SERVICE CARD and return it with your speed control.

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

SERVICE COSTS: Customer is responsible for all service costs (parts, labor, and shipping/handling charges). Speed controls are returned by UPS/COD CASH ONLY. See ESC SERVICE CARD for other payment and shipping options.

ADDITIONAL NOTES:

- Hobby dealers/distributors are not authorized to replace speed controls thought to be defective.
- If a hobby dealer sends your speed control for service, submit a completed ESC SERVICE CARD to the dealer and make sure it is sent with the speed control.
- To provide the most efficient service possible to our customers, it is not our policy to contact customers by phone or mail.
- Novak Electronics, Inc. does not make any electronic components (transistors, resistors, etc.) available for sale.

PRODUCT WARRANTY

Novak Electronics, Inc. guarantees the Tempest Pro to be free from defects in materials or workmanship for a period of 90 days from original date of purchase (verified by dated, itemized sales receipt). Warranty does not cover incorrect installation, components worn by use, damage from using less than 4 or more than 10 cells (1.2 volts DC/cell) input voltage, short-circuiting heat sinks, cross-connection of battery/motor, reverse voltage application, damage resulting from thermal overload, damage from incorrect use of an external receiver battery pack, damage from incorrect installation of FET servo or receiver battery pack, damage from excessive force while installing heat sinks, not installing three 0.1µF (50V) capacitors and a Schottky diode on motor, splices to input or switch harnesses, damage from excessive force when using SET button or current limiter or from disassembling case, tampering with internal electronics, allowing water, moisture, or any other foreign material to enter ESC or get onto PC board, incorrect installation of alternate input plug plastic, allowing exposed wiring to short-circuit, or any damage caused by a crash.

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

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

CUSTOMER SERVICE

CUSTOMER SERVICE HOURS (PST)

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

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Printed in the U.S.A. 3/96 • #IM-1760-2

The following is a product addendum for the Tempest Pro Electronic Speed Control, which has been renamed, the Tempest Max.



PRODUCT ADDENDUM

Updated 6/97 #AD-1760-1

THE ROCK-SOLID TEMPEST, JUST GOT BETTER!

The Tempest Pro electronic speed control is now stuffed full of the most powerful transistors available anywhere, the new HYPERFET III. These tough transistors drop the On-Resistance down to an all-time low at 0.00067 Ω . and crank out an amazing 480 amps of Drive Current Rating. With a built-in Schottky Diode and a 3.0 amp, 5.7 volt BEC with overload protection the Tempest's already rock-solid performance and reliability just got better!

Along with the best components, we've also built-in Brake Light Circuitry for realistic appearance of your car or truck with our optional Brake Light Accessory Kit (part #5655).

Always on the cutting-edge of racing technology, Novak wants the Tempest Pro to keep your performance at its best.

FIRST IN TECHNOLOGY, FIRST AT THE FINISH LINE!

The following is an addendum for the Tempest Max Electronic Speed Control, and updates the CLC II current limiting circuitry.

OPERATING INSTRUCTIONS ADDENDUM

The Tempest Pro includes Novak's CLC II current limiting circuitry. This provides the ability to control the maximum amount of current going to the motor upon acceleration by adjusting the current limiter pot.

The instruction manual describes the use of a plastic knob to adjust the current limiter pot. In this version the knob has been removed and a plastic adjustment screwdriver* has been included to adjust the pot. All other content of the current limiting instructions (Step 6) remain unchanged.

Caution! Forcing the pot past its stop point can cause internal speed control damage and void the warranty

* This screwdriver can also be used as a One-Touch Tool to press down the "SET" button.