OPERATING INSTRUCTIONS

CycloneC2 & CycloneTC2

The **CycloneC2** & **CycloneTC2** touring edition are all-digital, microprocessor-based ESC's *(Electronic Speed Controls)* using advanced components and the best HYPERFET III transistors available, to deliver the highest performance with compact size and light weight. Each have three user-selectable throttle profiles and the ability to store a fourth custom profile created by the optional ***Pit Wizard*** *(#1035/older Pit Wizards requires adaptor #5710)*, giving you extreme flexibility.

Novak's original One-Touch Set-Up™ button now performs double duty as a ***Combination One-Touch/ON-OFF switch***.

Constant Force Braking provides more effective braking at lower motor RPMs, while a minimum brake adjustment pot lets you set initial braking from 0-75%.

Novak's ***Polar Drive Circuitry*** gives you increased power and reduced operating temperatures. This means even smoother throttle response, increased radio system range, quicker acceleration, and longer run times.

Other features include ***Low-Resistance Solder Posts*** *(minimal voltage drop & high current handling)* for quick and easy wire replacement and positioning, heavy-duty BEC for high power servos, ***Digital Anti-Glitch Circuitry***™, and ***Radio Priority Circuitry***™ to maintain steering control after battery dumps.

SPECIFICATIONS

Input Voltage	4-7 cells (1.2 volts DC/cell)	
Case Width	1.69 inches [4.29 cm]	
Case Depth	1.11 inches [2.81 cm]	
Case Height	0.76 inch [1.93 cm]	
Weight (w/o heat sinks)	1.33 ounces [37.70 g]	
On-Resistance *@ Transistors*	0.00049 Ω	*@ 25°C transistor junction temp.*
Rated Current	480 amps	
Braking Current	160 amps	
BEC Voltage	6.0 volts DC	
BEC Current	3.0 amps	
Wire Length (Battery/Motor)	9 inches [22.8 cm]	
Signal Harness (replaceable)	9 inches [20.3 cm]	
Minimum Brake Range	0 to 75 % Full Brake	
Minimum Drive (% Full Drive)	2.0-6.0-4.0 (TC2: 2.0-3.0-5.0)	
Deadband (% Full Throttle)	5.0-5.0-5.0 (TC2: 5.0-3.0-3.0)	
Drive Frequency (kHz)	15.6-5.86-7.8 (TC2: 15.6-11.7-7.8)	
Brake Frequency (kHz)	3.9-3.9-5.86 (TC2: 3.9-5.86-11.7)	

STEP 1
CHANGING THE INPUT HARNESS

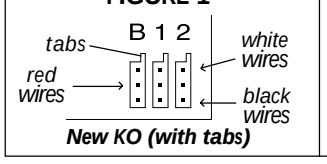
The CycloneC2 & CycloneTC2 ESCs come with the industry standard connector on a user-replaceable input harness. This connector works with all major radio brands. However, with some older style receivers the sequence of the wires in the plastic connector needs to be changed. ***This is an important step, because the electronics inside the receiver may be damaged if the sequence is incorrect.*** Changing the wiring is easily accomplished as described below.

JR • Hitec • Futaba • New KO • Airtronics Z

If your receiver is a JR, Hitec, Futaba, new KO, or an Airtronics Z *(blue case)* you do not need to change the sequence of the ESC's input harness wires. New KO cases have tabs on the input harness openings as in Figure 1.

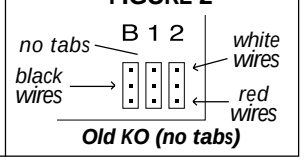
- Insert one end of the input harness into receiver with the ***BLACK wire toward the outside edge*** of receiver case.
- Insert opposite end of input harness into ESC with the ***WHITE wire toward the 'WHT' marking*** on the case label.

FIGURE 1



New KO (with tabs)

FIGURE 2



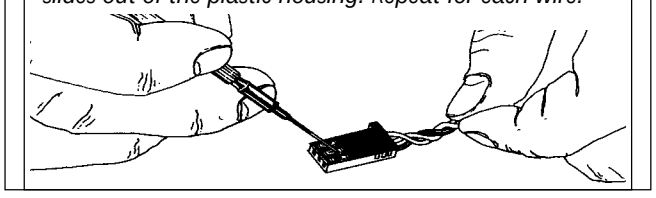
Old KO (no tabs)

Old-style KO • Old-style Sanwa/Airtronics

If your receiver is an older KO or Sanwa/Airtronics, you must change the sequence of the ESC's input harness wires. Old Sanwa/Airtronics cases are black in color. Old KO cases do not have the tab openings (See Figure 2).

- Insert one end of input harness into ESC with the ***WHITE wire toward the 'WHT' marking*** on the case label.
- ***Interchange the red and black wires*** in the plug plastic at the opposite end of input harness as in Figure 3 below.
- Insert modified end of the harness into the receiver with the ***RED wire toward the outside edge*** of receiver case.

FIGURE 3 *With a small standard screwdriver, gently lift the plastic prong until the wire and metal socket easily slides out of the plastic housing. Repeat for each wire.*



STEP 2
MOUNTING INSTRUCTIONS

1. DETERMINE BEST ESC MOUNTING LOCATION

Speed control should be positioned away from the receiver and antenna as shown in set-up photo *(back page)*. Choose a mounting position that will keep power wires away from the receiver and antenna, and will provide maximum airflow through transistor tabs or heat sinks to allow for proper cooling.

REMEMBER: Choose a mounting position where it will be easy to get to the combination One-Touch/ ON-OFF switch on the top of the speed control. You will need to get to this to turn the ESC on and off.

2. INSTALL THE SPEED CONTROL

Use the included double-sided tape to mount ESC.

3. INSTALL THE RECEIVER AND ANTENNA

Mount receiver as far from ESC, motor, power wires, battery, and servo as possible. These components all emit radio noise when the throttle is being applied. On graphite or aluminum, it may help to 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 mast*.

**Cutting or coiling excess wire will reduce radio range.*

PRECAUTIONS

- **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 7 CELLS ONLY** Never use more than 7 cells (8.4 volts DC) in the main battery pack.
- **SCHOTTKY DIODE RECOMMENDED** An external Shottky diode should be properly installed on every motor to further reduce radio interference and obtain the best performance and efficiency from your CycloneC2 or CycloneTC2.
- **POWER CAPACITOR REQUIRED** The external power capacitor must be used with your CycloneC2 or CycloneTC2. ***Failure to use Power Capacitor will damage speed control!***
- **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. The short circuit will damage the ESC.
- **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 GET BURNT!** Transistor tabs can get hot, so be careful. If transistor tabs get extremely hot use optional heat sinks.
- **INSULATE WIRES** Always insulate exposed wiring with heat shrink tubing to prevent short circuits.

ACCESSORIES

SCHOTTKY DIODES

The C2 & TC2s have internal Schottky diodes. An external diode is also included and should be used for optimum ESC, braking, and motor performance. ***Refer to Step 3***
Additional Schottky diodes are available in Novak kit #5640.

HEAT SINKS

Heat sinks are not required with the C2 or TC2, however the added cooling will increase the ESC's efficiency. An optional Heat Sink Set is available as Novak kit #5407. Heat sinks are recommended for heavy load applications and set-ups with limited air circulation, or whenever ESC gets excessively hot.

POWER CAPACITORS

An external power capacitor is included, and **MUST BE USED** to maintain cool and smooth operation. ***Refer to Step 3***
Replacement Power Capacitor is available in Novak kit #5675.

SOLDER POST WIRE SETS

Replacement C2 & TC2 solder post wire sets are available in Novak kit #5537 and includes two 9" pieces of each color power wire.

INPUT SIGNAL HARNESS

The user-replaceable input signal harness is available in both short *(4.5")* and long *(9.0")* lengths to fit different applications. *4.5" harness in Novak kit #5315, and 9.0" harness in kit #5320.*

PIT WIZARD-To-C2/TC2 ADAPTOR HARNESS

To connect to the C2 & TC2's new DataLink connector, older Pit Wizards *(or ESC Profile Software)* require the ***Pit Wizard-To-C2/ TC2 Adapter Harness*** available in Novak kit #5710.

STEP 3
HOOK-UP INSTRUCTIONS

Refer to Set-Up photo on back

1. MOTOR CAPACITORS

The CycloneC2 and TC2 have motor capacitors installed inside the speed control. ***Capacitors are not required on motor***.

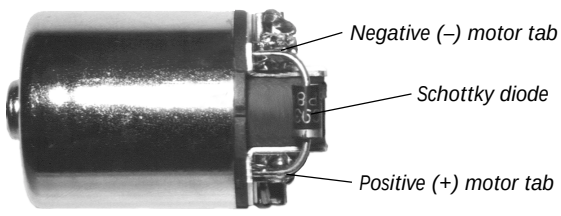
Note: Many other ESCs still require that these capacitors be installed on every motor to help reduce radio noise.

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.

FIGURE 4 *(Extra Schottky diodes available in Novak kit #5640)*

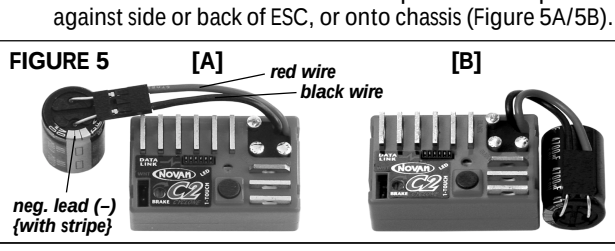


3. INSTALL POWER CAPACITOR

WHY POWER CAPACITOR IS NEEDED: ***The power capacitor drops the ESC's operating temperature by 10-15°F, and dissipates noise & voltage spikes from the ESC's high switching speed. You MUST use Novak capacitors. Other capacitors with similar ratings will not provide the same protection. We have done extensive research to find capacitors with the very best Quality Factors.***

- Determine best place to mount Power Capacitor. If mounting capacitor standing on end, bend capacitor's leads flat along top of capacitor (Figure 5A).
  If mounting capacitor laying down, bend capacitor's leads flat along top of capacitor, then down over the side of the capacitor (Figure 5B).
- Cut capacitor's leads so that both leads will be equally held by PowerCap Harness. Insulate the exposed leads of the capacitor with the included vinyl tubing.
- Attach PowerCap Harness to the leads of the capacitor. Insert ***negative lead (–)*** *{marked with stripe}* into the opening leading to the ***BLACK*** wire. Insert ***positive lead (+)*** *{unmarked}* into the opening leading to the ***RED*** wire.
- Use the included double-sided tape to hold capacitor against side or back of ESC, or onto chassis (Figure 5A/5B).

FIGURE 5 **[A]** **[B]**



STEP 3
HOOK-UP INSTRUCTIONS *(Cont.)*

4. CONNECT SPEED CONTROL TO THE RECEIVER

Configure input harness wires and connect ESC to the **THROTTLE CHANNEL** of receiver as described in Step 1.

5. CONNECT SPEED CONTROL TO THE BATTERY PACK

Cut the **BLACK** wire to the desired length and strip about 1/8"-1/4" of insulation off each end. Solder to the ***negative*** side of a completely charged 4 to 7 cell battery pack and the other end to the ***BLK*** solder post.

Cut the **RED** wire to desired length *(to go from ESC to battery positive to motor)* and strip about 1/8"-1/4" of insulation off each end. Strip a short section of insulation (1/4"-3/8") from the middle section of the **RED** wire where it will attach to ***positive*** of battery pack. Solder the stripped section of **RED** wire to ***positive*** of battery pack and one end to the ***RED*** solder post.

IMPORTANT NOTE: DO NOT OVERHEAT POSTS ***Prolonged or excessive heating of the solder post or the solder joint on top of the solder post will result in the post desoldering from PCB and short-circuiting inside ESC.***

6. CONNECT SPEED CONTROL TO THE MOTOR

Solder the free end of the **RED** wire to ***positive*** motor tab. Cut the **BLUE** wire to desired length and strip about 1/8"-1/4" of insulation off each end. Solder to the ***negative*** tab of the motor and to the ***BLUE*** solder post.

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.*

7. 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. *Note--while connectors make component changes quick and easy, they will never have as little resistance as a good solder joint.*

Use connectors that can not be connected backwards!

It is good practice to use female connectors on battery packs to avoid shorting the connector and the battery.

If using connectors for both battery and motor:

Use a male connector on the ESC wires going to the battery and a female connector on the wires going to the motor *(Shown here in Figure 6)*. ***This will help prevent you from cross connecting the battery and motor outputs of speed control, and causing internal damage.***

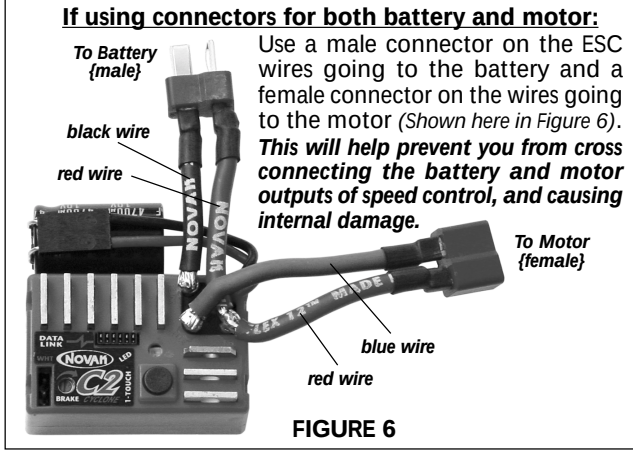
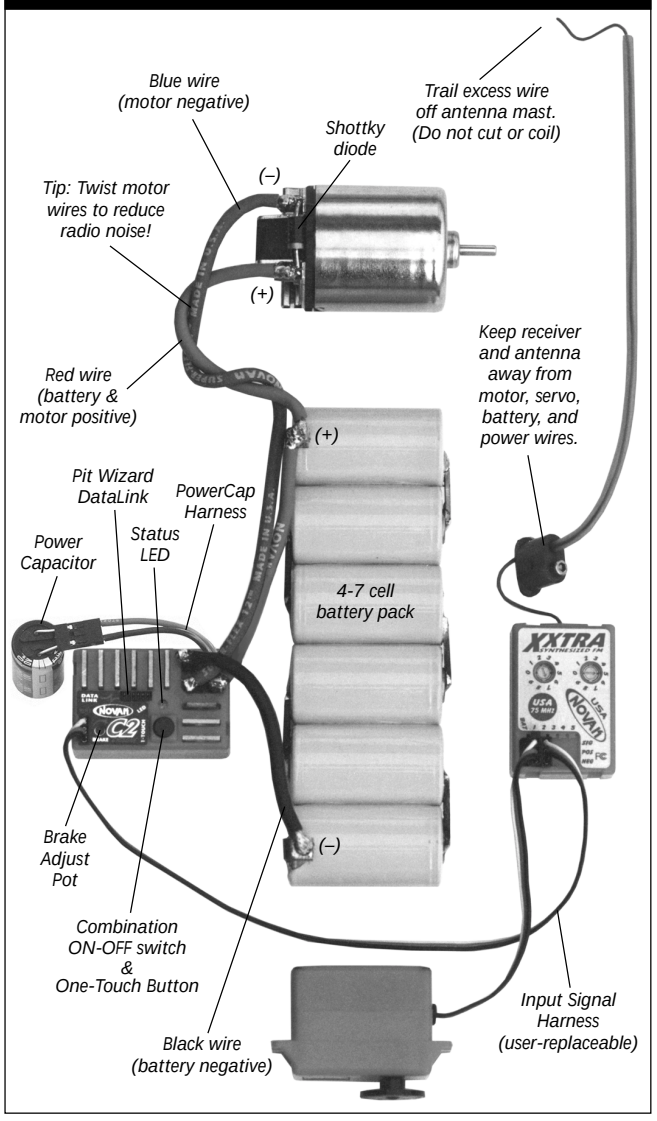


FIGURE 6

SET-UP PHOTO



STEP 4
TRANSMITTER ADJUSTMENTS

For proper ESC operation adjust transmitter as follows:

1. Set **HIGH ATV** or **EPA** to **maximum** setting.
   [Controls amount of throw from neutral to full throttle]
2. Set **LOW ATV**, **EPA**, or **ATL** to **maximum** setting.
   [Controls amount of throw from neutral to full brakes]
   [Reduce this after programming to reduce amount of brakes]
3. Set **EXPONENTIAL** to **zero**.
   [Controls the linearity of the throttle channel]
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 **ELECTRONIC TRIGGER THROW ADJUSTMENT** to **70% throttle** and **30% brake** throw (or 7:3).
   [Adjusts pistol-grip transmitter's throttle trigger throw]
7. Set **MECHANICAL TRIGGER 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 7 cell battery pack, and the transmitter should be adjusted.

1. **CONNECT THE BATTERY**
2. **TURN ON TRANSMITTER THEN THE SPEED CONTROL**
   Press and release the ***One-Touch/ON-OFF*** button.
   Note: Status LED may or may not come on if ESC and transmitter nuetral positions are not the same.
   NOTE: To turn the ESC on & off, just press and release the button as you would the numbers on a touch-tone phone or keyboard––just a quick/momentary press of the button.
3. **PRESS & HOLD ESC'S ONE-TOUCH/ON-OFF BUTTON**
   With the transmitter throttle in the neutral position, press and hold the ***One-Touch/ON-OFF*** button on the speed control until the status **LED** ***turns solid red***.
4. **RELEASE ESC'S ONE-TOUCH/ON-OFF BUTTON**
5. **PULL THROTTLE TO FULL-FORWARD 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 THROTTLE TO FULL-BRAKE POSITION**
   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.

The speed control is programmed and ready to race!

If transmitter settings are changed, it will be necessary to complete the programming sequence once again.

If you experience any problems during programming, turn off the speed control and repeat programming.

NOVAK ELECTRONICS, INC.
18910 Teller Avenue
Irvine, CA 92612
www.teamnovak.com

STEP 6
THROTTLE PROFILE SELECTION

The CycloneC2 and CycloneTC2 allow you to choose between three user-selectable throttle profiles that are programmed at the factory. This chart gives the specifics of each profile:

Profile	Description (**default)	Dead Band %	Drive Frequency kHz	Minimum Drive %	Brake Frequency kHz	Dr.Brake Toggle	
1	**Modified	5.0	15.60	2.0	3.90	OFF	C2
2	Stock	5.0	5.86	6.0	3.90	OFF	C2
3	Drag Brake	5.0	7.80	4.0	5.86	ON	C2
1	**World Cup	5.0	15.60	2.0	3.90	OFF	TC2
2	High Traction	3.0	11.70	3.0	5.86	OFF	TC2
3	Touring Stock	3.0	7.80	5.0	11.70	OFF	TC2

Experiment with each profile to determine which works best for you!

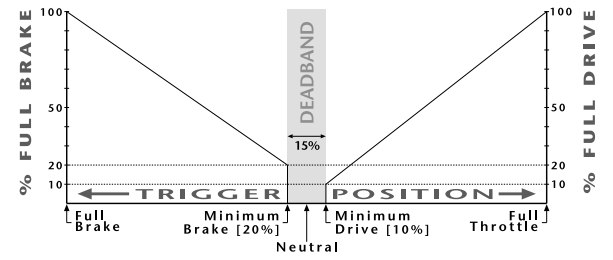
1. **TURN ON THE TRANSMITTER**
2. **TURN ON THE SPEED CONTROL**
3. **PRESS & HOLD ESC'S *ONE-TOUCH/ON-OFF* BUTTON** until the status **LED *turns solid green***. The LED will first turn red, then a few seconds later it will turn green.
4. **RELEASE *ONE-TOUCH/ON-OFF* BUTTON** and then the status ***LED will begin to blink red***. The number of times the LED blinks indicates the profile number selected.
5. **PRESS & RELEASE *ONE-TOUCH/ON-OFF* BUTTON TO SELECT** Each press will change to the next consecutive profile number. *NOTE: After profile #3, the sequence begins again at profile #1.*
6. If *ONE-TOUCH/ON-OFF* button is not pushed for five seconds, the **ESC LOADS THE SELECTED PROFILE INTO MEMORY**, and the status **LED *turns solid red***, indicating that the speed control has exited the profile selection mode and is in neutral.

CUSTOM FOURTH PROFILE

*Both speed controls can store a custom fourth profile that is created with the optional programming device, the **Pit Wizard** (#1035). Once a custom profile has been created and downloaded into the ESC, there will be four profiles to choose from. The Pit Wizard comes with complete details on creating your own custom profiles and gives you the ability to modify the following parameters: Neutral Postion, Full Throttle Position, Full Brake Position, Dead Band Value, Drag Brake Value, Drag Brake Frequency*, Drive PWM Frequency*, Minimum Drive Value, Brake PWM Frequency*, and the Drag Brake Toggle.*

**Adjustable from 122-23,400 Hz*

Illustration below shows graphical display of adjustable parameters



STEP 7
MINIMUM BRAKE ADJUSTMENT

The ***BRAKE*** pot on the CycloneC2 and CycloneTC2 allows you to adjust the percentage of total braking power applied with the initial trigger movement in the brake direction. Refer to above illustration for indication of Minimum Brake Value.

- Turning ***BRAKE*** pot clockwise, increases amount of minimum braking up to a maximum of 75% of the total brake force.
- Turning ***BRAKE*** pot all the way counter-clockwise, sets the amount of minimum braking at the lowest value of 0.39%, or 1/256th *(one step)* of the total brake force.

RECEIVER BATTERY PACK

The CycloneC2 and CycloneTC2 speed controls should not require an external receiver battery pack for most racing situations. The built-in Radio-Priority Circuity™ provides complete control of the steering servos even after the main battery pack has 'dumped' and can no longer provide the power required to turn the motor. However, applications with multiple high-power servos, and some 4-cell set-ups may require an external receiver battery pack to prevent overloading or underpowering of the speed control's voltage regulator.

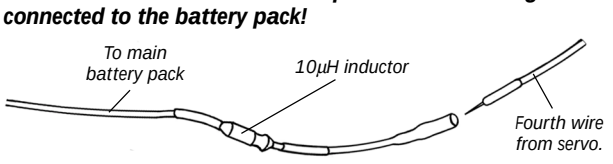
1. Remove the red wire from the speed control's input signal harness as described in Figure 3. Either end of the red wire can be removed from the harness. ***Insulate the exposed end of the wire/metal socket that you remove from the plug plastic.***
2. Plug the external 5 cell (1.2V/cell) receiver battery pack into the battery slot of the receiver.
3. Use the **ON-OFF** switch on the external receiver battery pack to turn the receiver's power on and off.
4. Use the speed control's **ONE-TOUCH/ON-OFF** button to turn the speed control's power on and off.

FET SERVO CONNECTION

The CycloneC2 and CycloneTC2 speed controls are not wired for connecting a FET servo. The fourth wire from the servo must be wired directly to the main battery pack.

Be sure to install the 10µH inductor (supplied with servo) in series with the FET servo's fourth wire as shown below.

Remember that the servo will be powered ON as long as it is connected to the battery pack!



TROUBLE-SHOOTING GUIDE

This section describes possible speed control problems, causes, and solutions.

Steering Channel Works But Motor Will Not Run

- Check motor connections. Check motor and brushes.
- Make sure input signal harness is plugged into the throttle channel of receiver and the speed control. Check throttle channel operation with a servo. Check wiring color sequence of receiver signal harness.
- Possible internal damage—Refer to Service Procedures.

Receiver Glitches/Throttle Stutters During Acceleration

- Receiver or antenna too close to speed control, power wires, battery, or motor—Refer to Step 2.
- Bad connections—Check wiring and connectors.
- Motor brushes worn—Replace brushes.
- Excessive current to motor—Use a milder motor or a smaller pinion gear.
- External Power Capacitor damaged/not installed—Refer to Step 3/replace Power Capacitor *(possible internal damage)*.

Motor and Steering Servo Do Not Work

- Check wires, receiver signal harness wiring and color sequence, radio system, crystals, battery and motor connectors, and battery pack.
- Possible internal damage—Refer to Service Procedures.

Model Runs Slowly / Slow Acceleration

- Check motor and battery connectors—Replace if needed.
- Bad battery or motor—Check operation with another.
- Incorrect transmitter or speed control adjustment—Refer to Steps 4 and 5.
- External Power Capacitor damaged/not installed—Refer to Step 3/replace Power Capacitor *(possible internal damage)*.
- Optional external Schottky diode installed backwards or damaged—Refer to Step 3.

Motor Runs Backwards

- Motor wired backwards—Check wiring and reverse.
- Backwards motor timing—Reverse motor end bell.

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 your CycloneC2/CycloneTC2 for service, review the Trouble-Shooting guide and instructions. The ESC may appear to have failed when other problems exist.

After reviewing the instructions, if you feel that your ESC requires service, please obtain the most current product service options and pricing by one of the following methods:

WEBSITE: We have an abundance of information available for all levels of speed controls, and all of our products. Print a copy of the ***PRODUCT SERVICE FORM*** from the SERVICE section of the website. Fill out the needed information on this form and return it with the Novak product that requires servicing.

PHONE/FAX/E-MAIL: If you do not have access to the internet, contact our customer service department by phone, fax, or e-mail as listed in the CUSTOMER SERVICE section below, and they will supply you with current service options and send you a ***PRODUCT SERVICE FORM***.

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

ADDITIONAL NOTES:

- Hobby dealers or distributors are not authorized to replace Novak products thought to be defective.
- If a hobby dealer returns your speed control for service, submit a completed ***PRODUCT SERVICE FORM*** to the dealer and make sure it is included with the speed control.
- Novak Electronics, Inc. does not make any electronic components (transistors, resistors, etc.) available for sale.

PRODUCT WARRANTY

120 DAY WARRANTY

The CycloneC2/CycloneTC2 is guaranteed to be free from defects in materials or 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, damage from using fewer than 4 or more than 7 cells *(1.2 volts DC/cell)* input voltage, short-circuiting heat sinks, cross-connection of battery/motor, overheating & desoldering solder posts, reverse voltage application, damage resulting from thermal overload, damage from incorrect installation of FET servo or receiver battery pack, damage from excessive force while installing heat sinks, not installing or incorret installation of a Novak power capacitor on the ESC, splices to input harness, damage from excessive force when using the One-Touch/ON-OFF button or BRAKE pot or from disassembling case, tampering with internal electronics, allowing water, moisture, or any other foreign material to enter ESC or get onto the PC board, incorrect installation/wiring of input plug plastic, allowing exposed wiring or solder posts to short-circuit, or any damage caused by a crash, flooding, or act of God.

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 the connection and use of the speed control, 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-Thursday: 8:00am-5:00pm
Friday: 8:00am-4:00pm *(closed every other Fri.)*

(949) 833-8873 • FAX (949) 833-1631

e-mail: cs@teamnovak.com

All Novak speed controls are designed and manufactured in the U.S.A.

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