HAVOC PRO CUSTOM PROGRAMMING

PLEASE NOTE: ***This page contains optional Advanced Programming items!*** ***No further adjustments are required.***
(But don't worry, you can always reset factory defaults by performing the One-Touch programming again, so go ahead & experiment—that's why the programming is in there, right?)

HAVOC PRO ESC SOFTWARE FLOW CHART

The Havoc Pro ESC features nine parameters that can be adjusted. Refer to below flowchart and settings at right.

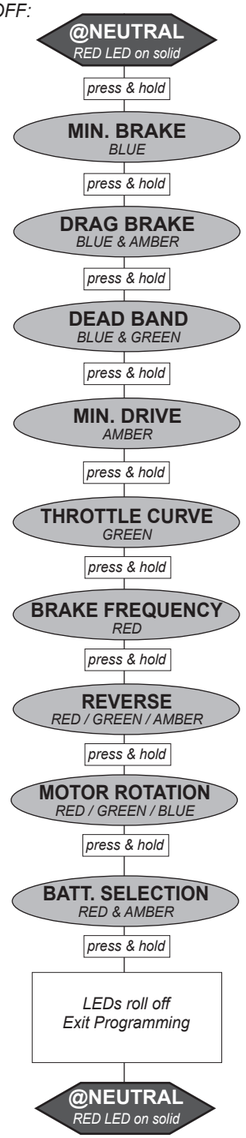
DEFAULT SETTINGS ARE IN BOLD IN TABLES

TO CHANGE PARAMETER SETTINGS:

Transmitter can be either ON or OFF:

1. **IF TRANSMITTER IS OFF, DISCONNECT ESC FROM RECEIVER**
   Remove input signal harness from the receiver to avoid radio interference.
2. **CONNECT ESC TO A CHARGED BATTERY PACK**
3. **SLIDE ESC's ON/OFF SWITCH TO 'ON' POSITION**
4. **WITH ESC AT NEUTRAL PRESS & HOLD ESC'S SET BUTTON**
   Release ESC's SET button once LED is at desired setting.
   To skip a parameter, continue to press and hold ESC's SET button to the desired parameter.
5. **SELECT PARAMETER VALUE**
   LED flashes to indicate active setting (refer to tables at right). Quick press & release SET button to select desired setting.
6. **PRESS & HOLD SET BUTTON TO STORE SELECTION**
   When SET button is pressed and held for about 1 second, the ***new selection is stored*** in ESC's memory—*The 4 status LEDs will scroll across to indicate ESC is exiting programming and ESC returns to neutral.*

Note: there is no time constraint during selection process of custom parameters.



Parameter	Default	Custom
Minimum Brake	9%	
Drag Brake	9%	
Dead Band	5%	
Minimum Drive	1%	
Throttle Curve	Expo-1	
Brake Freq.	3 KHz	
Reverse	OFF	
Motor Rotation	CCW ↺	
Battery Type Selection	Li-Po	

RESTORING FACTORY DEFAULTS:

Every time you perform the One-Touch Set-Up, the ESC is defaulted to the factory default parameter settings.

THROTTLE PARAMETER SETTINGS *(Defaults in Bold)*

1. MINIMUM BRAKE SETTINGS (10) *BLUE LED*

Amount of braking applied with first pulse of transmitter throttle information.
>>Raising this setting starts the braking at a stronger/higher level.

Setting (# of flashes)	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
Minimum Brake (%):	0	3	6	**9**	12	15	18	20	25	30

2. DRAG BRAKE SETTINGS (10) *BLUE & AMBER LEDs*

Amount of braking applied while transmitter is at neutral. 'Coast' brakes.
>>Raising this setting makes the motor slow down more, without pushing the transmitter's trigger into the brake/reverse direction.

Setting (# of flashes)	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
Drag Brake (%):	0	3	6	**9**	12	15	18	20	25	30

3. DEAD BAND SETTINGS (5) *BLUE & GREEN LEDs*

Space between Minimum Brake & Minimum Drive, with neutral in middle.
>>Raising this setting will increase the 'free play', or distance your trigger must move before forward drive or braking will begin.

Setting (# of flashes)	*1*	*2*	*3*	*4*	*5*
Dead Band (%):	2	3	4	**5**	6

4. MINIMUM DRIVE SETTINGS (5) *AMBER LED*

Amount of forward drive applied with first pulse of transmitter information.
>>Raising this setting makes the motor start at a stronger/higher level so it takes off more aggressively from neutral.

Setting (# of flashes)	*1*	*2*	*3*	*4*	*5*
Minimum Drive (%):	**1**	2	5	8	12

5. THROTTLE CURVE SELECTION (3) *GREEN LED*

>>Changing this setting changes the throttle response and ease of driveability.

Setting (# of flashes)	*1*	*2*	*3*
Throttle Curve:	Linear	**Expo-1**	Expo-2

6. BRAKE FREQUENCY (7) *RED LED*

>>Raising this setting makes the brake response smoother and more controllable.

Setting (# of flashes)	*1*	*2*	*3*	*4*	*5*	*6*	*7*
Brake Frequency (KHz):	1	2	**3**	4	5	7.5	8

7. REVERSE (2) *RED, GREEN & AMBER LEDs*

>>Changing this setting activates/deactivates reverse direction.

Setting (# of flashes)	*1*	*2*
Reverse (On/Off):	**Off (FWD/BRK)**	On (FWD/BRK/REV)

8. MOTOR ROTATION (2) *RED, GREEN & BLUE LEDs*

>>Changing this setting changes direction of motor rotation.

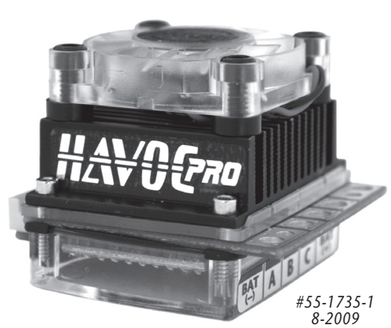
Setting (# of flashes)	*1*	*2*
Motor Rotation (CCW/CW):	**CCW ↺**	CW ↻

9. BATTERY TYPE SELECTION (3) *RED & AMBER LEDs*

>>Changing this setting changes the battery pack that is selected and provides the needed cut-off voltage for Li-Po and Li-Fe packs.

Setting (# of flashes)	*1*	*2*	*3*
Battery Selection	Ni-Cd/Ni-MH	**Li-Po (6.25V)**	Li-Fe (4.75V)

HAVOC PRO ESC BASIC SET-UP GUIDE



#55-1735-1
8-2009

MORE HAVOC FOR YOUR BUCK

Novak's Havoc Pro Brushless ESC – a name synonymous with affordability and reliability – is perfect for a wide range of racing. The Havoc Pro tops the list in the Havoc line because of its unmatched speed, economical price and advanced compatibility: The Havoc Pro is compatible with the entire Novak 540-sized brushless motor line and any ROAR-approved 540-sized sensored brushless motor, all the way down to 3.5-turns. Additionally, the Havoc Pro is compatible with Li-Po, Li-Fe and Ni-MH battery packs.

To benefit from all of the technical features of the Havoc Pro, PLEASE READ ALL INSTRUCTIONS BEFORE OPERATION

PRECAUTIONS

WATER & ELECTRONICS DON'T MIX!
Allowing water, moisture or other foreign materials to get inside ESC will void warranty.

MUST BE 14 YEARS OR OLDER TO OPERATE
This product is not a toy and is not intended for use by children under 14 years of age without the strict supervision of an adult.

DO NOT FREE REV OR OPERATE WITHOUT LOAD
This includes running the motor without a pinion or holding the car in the air and running the motor at or close to full power. Free revving will void the warranty!

NO SCHOTTKY DIODE!
Schottky diodes are never used with reversible ESCs, including brushless.
Do not use Schottky diodes with Havoc Pro ESC!

DISCONNECT BATTERIES WHEN NOT IN USE
Always disconnect batteries from ESC to avoid short circuits and possible fire hazard.

2S LI-PO/LI-FE OR 4 TO 6 NI-MH CELLS ONLY
If using Li-Po or Li-Fe batteries, use a 2-cell (2S) pack for the vehicle's main battery & be sure the Cut-Off programming option is turned ON (refer to page 4).
If using Ni-Cd or Ni-MH batteries, NEVER use more than 6 cells (1.2VDC/cell) in the vehicle's main battery pack, and disable Li-Po Cut-Off.

NOVAK BRUSHLESS MOTORS ONLY
The Havoc Pro is designed for use with sensor-based Novak Brushless Motors. You may replace with Novak sensored motors down to 3.5T.

NO REVERSE VOLTAGE!
Reverse battery polarity can damage ESC & void warranty. Disconnect battery immediately if a reverse connection occurs.

POWER TRANS-CAP MODULE REQUIRED
An external Power Capacitor Module is installed and MUST be used with your ESC. Failure to use Power Capacitor will result in higher ESC operating temperatures & possible thermal shut-down.

TRANSMITTER ON FIRST
Always turn on the power of the transmitter first so that you will have control of the vehicle when you turn it on.

GOOD QUALITY LI-PO BATTERIES SUGGESTED
Using Li-Po batteries that cannot supply the amount of current required by this system will result in possible battery pack, ESC & motor damage, and will void the warranty. It is recommended to use a 25C or higher rating.

GOOD QUALITY RADIO SYSTEM SUGGESTED
With the higher performance of brushless systems, undesirable radio system noise may occur when used with lower quality radio systems (like some RTR radios).

DO NOT BUNDLE POWER & SIGNAL WIRES TOGETHER
RF noise in the power wires can adversely effect radio system performance.

INSULATE WIRES
Always insulate exposed wiring with heat shrink tubing or electrical tape to prevent short circuits, which can damage ESC.

NO CA GLUE
Exposure to CA glue or its fumes can cause damage to internal components of the speed control and result in premature failure.

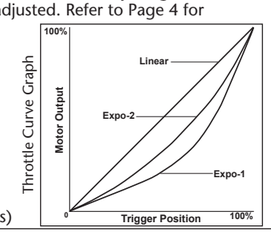
SPECIFICATIONS

Input Voltage	2S Li-Po, 2S Li-Fe or 4-6 Ni-MH cells (1.2 volts DC/cell)
ESC Footprint	1.16"x1.49" [29.5x37.8mm]
ESC Weight (w/o wires)	1.36 ounce [38.5 grams]
B.E.C. Voltage/Current	6.0 volts DC/3.0 amps
Voltage Cut-Off	6.25V (Li-Po), 4.75V (Li-Fe)
Power Wire (Battery/Motor)	14G Super-Flex Silicone
On-Resistance	0.00040 @25°C trans.temp.
Rated Current (per phase)	540A [Fwd & Rev.] @25°C trans.temp.
Motor Limit	3.5-turn Novak 540-size brushless motor

FULLY PROGRAMMABLE INTERFACE

The Novak's Havoc Pro Brushless ESC includes a Fully Programmable Interface. Nine parameters can be adjusted. Refer to Page 4 for Customization Instructions.

- Minimum Brake (10 settings)
- Drag Brake (10 settings)
- Dead Band (5 settings)
- Minimum Drive (5 settings)
- Throttle Curve (3 settings)
- Brake Frequency (7 settings)
- Reverse (2 settings)
- Motor Rotation (2 settings)
- Battery Type Selection (3 settings)



ACCESSORIES

RACING POWER TRANS-CAP MODULE [#5679]
The factory-installed Racing Power Trans-Cap Module MUST BE USED for proper operation.
Note: We recommend using Novak Power Trans-Caps only. We've done extensive testing & research to find components with the very best quality factors—other capacitors will not provide equal protection.

SUPER-FLEX SILICONE 14G WIRE [#5508]
Includes 2 each of 9" Red, Black, Blue, Yellow, & Orange Wire

INPUT SIGNAL HARNESSES [#5315/#5320]
Available in either short (#5315, 4.5") or long (#5320, 9.0") lengths.

3.5MM LOW-LOSS POWER CONNECTOR [#5731]
Low-Loss connectors generate dozens of wiring routing and installation options.

HIGH-VOLUME COOLING FANS [#5648/#5652]
Replacement 30x30x6mm Cooling Fan for Havoc Pro. Includes a plug for easy plug-in to Havoc Pro. Item #5652 is a 2-pack.

REMOTE POWER PROGRAMMING SWITCH [#5602]
Combination Power ON/OFF Switch & One-Touch Programming Button.

PRODUCT WARRANTY

The Havoc Pro Brushless ESC is guaranteed 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)*. Warranty does not cover incorrect installation, components worn by use, damage to case or exposed circuit boards, damage from using more than 6 cells *(1.2 volts DC/cell)* or more than 2 Li-Po/Li-Fe cells input voltage, damage resulting from using Li-Po/Li-Fe batteries without Smart-Stop circuitry active, damage from cross-phase connection, using insufficient Li-Po/Li-Fe batteries that cannot supply the amount of current required by this system, cross-connection of battery/motor power wires, overheating solder tabs, reverse voltage application, improper use or installation of external BEC, damage resulting from thermal overload or short-circuiting motor, damage from incorrect installation of FET servo or receiver battery pack, not using or incorrect installation of a power capacitor on the ESC or from using a damaged power capacitor, damage due to free revving motor, damage due to using a non-Novak motor, a non-sensored motor or a motor lower than 3.5 turns, using a damaged Trans-Cap module, using a Schottky diode, splices to input, ON/OFF switch, or sensor harnesses, damage from excessive force when using the One-Touch/SET button 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 tabs to short-circuit, or any damage caused by a crash, flooding or natural disaster.

Because Novak has no control over the connection & use of the speed control or other related electronics, no liability may be assumed nor will be accepted for any damage resulting from the use of this product. Every Novak speed control & motor is thoroughly tested & cycled before leaving our facility and is, therefore, considered operational. *By the act of connecting/operating speed control, user accepts all resulting liability.* In no case shall our liability exceed the product's original cost. We reserve the right to modify warranty provisions without notice. This product is not intended for use by children under 14 years of age without the strict supervision of an adult. Use of this product in an uncontrolled manner may result in physical damage or injuries—take extra care when operating any remote control vehicle. Designed by Novak Electronics, Inc. in Irvine, CA and assembled with globally sourced components.

STEP 1–CONNECT INPUT HARNESS

The Havoc Pro has a user-replaceable input harness with the industry-standard receiver connector on it & ***works with all major radio brand's new receivers*** [*Refer to Figure 1 to see how to connect the included user-replaceable input harness to Novak's XXtra Synthesized FM Receiver: 75 Mhz (#S2675N)].* However, some very old receivers must have the wiring sequence in the plastic 3-pin JST connector housing changed on the receiver end. ***This is important, as the receiver & servo electronics may be damaged if the sequence is incorrect.***

For instructions on changing the wiring sequence for older receivers, visit the Novak Web site (www.teamnovak.com).

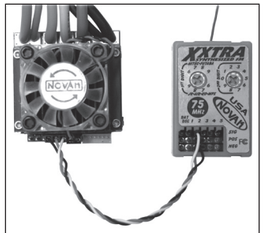


FIGURE 1

User-replaceable input harness plugged into the Novak's XXtra Synthesized FM Receiver: 75 Mhz.

STEP 2–MOUNT ESC

Mount the speed control so that the power wires are as far away from other electronics as possible. Make sure that the speed control or the power wires will not interfere with any moving parts in the vehicle. Select a location that has good cooling and allows airflow through heat sinks.

If the ESC gets air flow, it <u>will</u> run cooler; and that means it will be more efficient!

1. MOUNT SPEED CONTROL IN VEHICLE

Use the included double-sided tape to mount the speed control in vehicle *(do not use glue). Avoid contact with side walls or other chassis components to avoid vibration damage.* ***Be sure receiver & antenna are mounted as far from ESC, power wires, battery, & servo as possible--these components all emit RF noise when throttle is applied. On graphite or aluminum chassis vehicles, it may help to place receiver on edge with crystal & antenna as far above chassis as possible.***

Note: Mount antenna as close to receiver as possible – trail any excess wire off top of antenna mast (cutting or coiling excess antenna wire will reduce radio range).

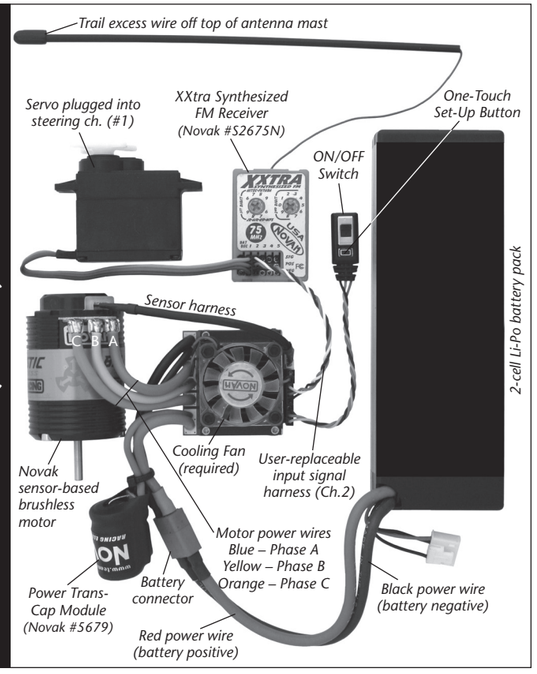
2. SECURE POWER TRANS-CAP MODULE TO CHASSIS

Use the included double-sided tape to mount Power Trans-Cap Module to the vehicle's chassis. *Module can also be tie-wrapped along the power wires–This requires less space on the chassis and provides good isolation from vibration.*

3. INSTALL ON/OFF SWITCH

Using the included double-sided tape, mount the switch where it will be easy to access–Be sure to select a position where it will not get damaged or get switched OFF during a crash or roll-over.

HAVOC PRO SET-UP PHOTO (FIGURE 2)



STEP 3– WIRE SPEED CONTROL TO MOTOR (REFER TO FIG. 2)

The Havoc Pro ESC is compatible with all Novak 540-sized brushless sensored motors. It is not compatible with brushed or sensorless brushless motors.

1. CHECK FOR PROPER GEARING

Neither the brushless motor (with sintered rotor) nor the ESC should be hotter than 160°F after a 5 min. run. If either temperature is higher, the gearing should be lowered until both the ESC and the motor are under this temperature. The cooler the ESC runs, the better the performance of the system.

Motor Turns	Touring Car	2wd Buggy	2wd Truck	4wd Buggy	1/12-Scale	Oval
3.5	10.5	Not Rec.	Not Rec.	Not Rec.	1.1"/28mm	1.2"/31mm
6.5	7.5	10	11.5	10	1.4"/35mm	1.5"/38mm
10.5	5.5	8	9.5	8	2"/51mm	2.6"/66mm
13.5	4.5	7	8.5	7	2.3"/58mm	2.9"/73.5mm
17.5	3.75	6	7.5	6	2.56"/65mm	3.23"/82mm

2. SOLDER MOTOR POWER PHASE WIRES TO MOTOR

If you purchased a Havoc Pro Brushless System, your motor is factory-wired to a Ballistic Brushless Motor. Skip to STEP 4.

A. Cut the ESC's ***BLUE, YELLOW & ORANGE*** silicone motor power wires to the desired length, and strip 1/8-1/4" of insulation from the end of each wire. Tightly twist the exposed strands of wire.

B. Place the ESC's ***BLUE Phase 'A'*** motor wire onto ***motor's 'A' solder tab*** & solder. Use a soldering iron to apply heat to exposed wire; begin adding solder to tip of soldering iron & to wire. Add just enough solder to form a clean & continuous joint from the plated area of the solder tab up onto the wire. Use side cutters to trim remaining (now soldered) wire extending beyond the solder tab (about 1/16" above PCB).

IMPORTANT NOTE: **DO NOT OVERHEAT SOLDER TABS**
Prolonged/excessive heating of solder tabs (motor or ESC) will damage PCB.

C. Solder the ESC's ***YELLOW Phase 'B'*** motor wire to the ***motor's 'B' solder tab*** as described in Step 2B above.

D. Solder the ESC's ***ORANGE Phase 'C'*** motor wire to the motor's ***'C' solder tab*** as described in Step 2B above.

Note: Make sure no wire strands have strayed to an adjacent solder tab, this will result in short-circuiting & severe ESC damage, which will void the warranty.

3. CONNECT MOTOR SENSOR HARNESS TO ESC

Insert the 6-pin connector on the end of the motor's sensor wires into ESC's sensor harness socket–the connector is keyed and will only go in, in one direction.

BRUSHLESS MOTOR PRECAUTIONS

POWER TRANS-CAP MODULE REQUIRED

The factory-installed Power Trans-Cap Module MUST be used with brushless motors. ***If Power Trans-Cap Module becomes dented or damaged, ESC failure can occur–replace immediately (Novak kit #5679). Longer Power Capacitor wires will decrease performance.***

DO NOT USE SCHOTTKY DIODES

Schottky diodes must NOT be used with reversible ESCs. Schottky diode usage <u>will</u> damage the ESC & void warranty.

MOTOR CAPACITORS NOT NEEDED

Novak brushless motors do not require external motor capacitors.

STEP 4– WIRE SPEED CONTROL TO BATTERY (REFER TO FIG. 2)

To connect the Havoc Pro to the battery pack using connectors, we suggest low-loss, high power connectors like Novak's Power Connectors (Novak #5731) or Dean's Ultra.

- Use polarized connectors. *Reverse voltage will damage ESC & void warranty.*
- Use a female connector on battery packs to avoid shorting.

1. INSTALL BATTERY CONNECTOR

A. Cut the ***RED & BLACK*** silicone battery power wire to the desired length, and strip 1/8"–3/16" of insulation from the end of each wire. Tightly twist and tin the ends of the exposed wire with solder.

B. Solder the ESC's ***RED (+)*** battery wire to the connector's ***POSITIVE (+)*** contact.

C. Solder the ESC's ***BLACK (–)*** battery wire to the connector's ***NEGATIVE (–)*** contact.

D. Cover the exposed solder joints with heat shrink tubing to prevent possible short circuits.

2. CONNECT ESC TO BATTERY PACK

Connect the speed control's battery connector to a fully charged 2S Li-Po, 2S Li-Fe or 4-6 Ni-MH cells *(1.2 VDC/cell)* battery pack.

NOTE: If using Ni-MH, the Li-Po Cut-Off Circuitry must be deactivated. If using Li-Fe batteries, the cut-off voltage must be changed. Refer to page 4 for further customizing options.

STEP 5–TRANSMITTER ADJUSTMENTS

For proper ESC operation, adjust transmitter as follows:

A. Set **HIGH ATV** or **EPA** to **maximum** setting.
[amount of throw at full throttle]

B. Set **LOW ATV, EPA** or **ATL** to **maximum** setting.
[amount of throw at full brakes]

C. Set **EXPONENTIAL** to **zero** setting. *[throttle channel linearity]*

D. Set **THROTTLE CHANNEL REV. SWITCH** to either position.

E. Set **THROTTLE CHANNEL TRIM** to **middle** setting.
[adjusts neutral position/increases or decreases coast brakes]

F. Set **ELECTRONIC TRIGGER THROW ADJUSTMENT** to **70% throttle** and **30% brake** throw (or 7:3) for ***Forward & Brake only Profiles***, and **50% throttle** and **50% brake** throw (or 5:5) for ***Profiles with reverse***.
[adjusts trigger throw electronic/digital pistol-grip transmitters]

G. Set **MECHANICAL TRIGGER THROW ADJUSTMENT** *(if radio has it)* to position with **2/3 throttle** and **1/3 brake** throw for ***Forward & Brake only Profiles***, and position with **1/2 throttle** and **1/2 brake** throw for ***Profiles with Reverse.***
[adjusts trigger throw on mechanical/analog pistol-grip transmitters]

•NOT ALL TRANSMITTERS HAVE THESE ADJUSTMENTS•

STEP 6–ONE-TOUCH PROGRAMMING

With ESC connected to (at least) a receiver & a charged battery pack:

1. TURN ON THE TRANSMITTER'S POWER

2. <u>PRESS & HOLD</u> ESC'S ONE-TOUCH/PROGRAMMING BUTTON
Note: The Havoc Pro's One-Touch/Programming button is combined with the ON/OFF switch on the Remote Power Programming Switch harness.

3. TURN ON THE SPEED CONTROL'S POWER
With transmitter throttle at neutral, and still **pressing the One-Touch button**, slide the ESC's **ON/OFF switch** to ***ON position.***

4. CONTINUE HOLDING BUTTON <u>UNTIL RED LED COMES ON</u>

5. RELEASE ONE-TOUCH BUTTON <u>AS SOON AS LED TURNS RED</u>

6. PULL TRANSMITTER THROTTLE TO FULL-ON POSITION
Hold it there until the **green status LED** ***<u>turns solid green</u>***.
Note: Motor will not run during programming even if connected.

7. PUSH TRANSMITTER THROTTLE TO FULL-BRAKES
Hold it there until the **green status LED** ***<u>blinks green</u>***.

8. RETURN TRANSMITTER THROTTLE TO NEUTRAL
Red status LED will ***<u>turn solid red</u>***, indicating that speed control is at neutral and that proper programming has been completed.

NOTE: If transmitter settings are changed, One-Touch Programming must be repeated. If you experience any problems, turn off ESC & repeat One-Touch. Whenever One-Touch set-up is performed, ESC automatically reverts to factory default settings.

USING A RECEIVER BATTERY PACK

If you are planning to use an external receiver battery pack to power the electronics you need to do the following:

1. Plug the external 5 cell (1.2VDC/cell) receiver battery pack into the battery slot of the receiver.
2. To turn the vehicle ON, switch the receiver pack ON. Then, turn the ESC's switch ON, then OFF to allow the ESC to be powered by an external source.
3. To turn the vehicle OFF, turn the receiver pack's switch OFF.

ALTERNATIVE METHOD

1. Plug the external 5 cell (1.2 VDC/Cell) receiver battery pack into the battery slot of the receiver.
2. Unplug the ESC's red wire from the input harness going to the receiver. Insulate the red wire to keep it from shorting.
3. To turn the vehicle ON, switch the receiver pack ON. Then, turn the ESC's switch ON.
4. To turn the vehicle OFF, turn the ESC's switch OFF. Then, turn the receiver pack's switch OFF.

www.teamnovak.com

TROUBLE-SHOOTING GUIDE

Steering Channel Works But Motor Will Not Run

- ***Red status LED blinking when throttle is applied.*** Check motor sensor harness connection at ESC (make sure all metal sockets are fully inserted into the connector's plastic housing)—check for damaged wires.
- ***Red status LED on solid & Green LED blinking.*** Check input signal harness & motor sensor harness connections at ESC. Check input signal harness wiring sequence & connection at throttle channel of receiver. Check throttle channel operation with servo.
- ***Blue & Green status LEDs both blinking.*** Possible ESC shut-down due to locked rotor detection—return throttle to neutral position to regain motor control—check vehicle's drive train for free operation.
- ***Blue & Red status LEDs blinking.*** Possible ESC thermal shut-down—Check gear ratio & free operation of drive train for possible overloading/ESC is being severely over-loaded—allow system to cool & return throttle to neutral position to regain motor control. ***LEDs will continue to blink until system is cooled down.***
- ***Blue & Amber status LEDs blinking.*** Possible motor thermal shut-down—Check gear ratio & free operation of drive train for possible overloading/motor is being over-loaded—allow system to cool & return throttle to neutral position to regain motor control. ***LEDs will continue to blink until system is cooled down.***
- ***Blue & Green (Locked Rotor Detection), Blue & Red (ESC Thermal Shut-Down), or Blue & Amber (Motor Thermal Shut-Down) status LEDs blinking.*** ESC may have shut-down & ESC's neutral point is too far off to sense that transmitter throttle has been returned to neutral *(see Steps 5 & 6).*
- ***Red & Green status LEDs toggling.*** Li-Po/Li-Fe Safety Cut-Off voltage reached. Remove and charge / replace battery pack.
- Possible receiver damage—Check operation with a different receiver.
- Possible internal damage—Refer to Service Procedures.

Receiver Glitches/Throttle Stutters During Acceleration

- Receiver or antenna too close to ESC, power wires, battery, or motor.
- Bad connections—Check wiring, connectors, & sensor harness.
- External Power Trans-Cap Module damaged/not installed—Replace with *Novak #5679.*

Motor and Steering Servo Do Not Work

- Check wires, receiver signal harness wiring & color sequence, radio system, crystals, battery/motor connectors, & battery pack.
- Possible receiver damage—Check operation with a different receiver.
- Possible internal damage—Refer to Service Procedures.

Speed Control Runs Excessively Hot

- Gear ratio too low—Increase gear ratio and check Power Trans-Cap Module *(see Step 3).*

Model Runs Slowly/Slow Acceleration

- Gear ratio too high—Reduce gear ratio *(see Step 3).*
- Check battery connectors—Replace if needed *(see Step 4).*
- Incorrect transmitter/ESC adjustment *(see Steps 5 & 6).*
- External Power Trans Cap Module damaged/not installed—Replace with #5679.

ESC Is Melted Or Burnt/ESC Runs With Switch Off

- Internal damage—Refer to Service Procedures.

Check Novak's Web site for additional information.

SERVICE PROCEDURES

Before sending your speed control or brushless motor system in for service, review **Trouble-Shooting Guide** and all instructions. System may appear to have failed when other problems exist.

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

WEB SITE: Print a copy of the *PRODUCT SERVICE FORM* from the *CUSTOMER SERVICE* section of the Web site. Fill out the needed information on this form and return it with the Novak product that requires servicing.

PHONE/FAX: If you do not have access to the internet, please contact our customer service department by phone or fax as listed below.

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

•ESCs returned without a serial number will not be serviced under warranty•

ADDITIONAL NOTES:

- Units that operate normally will have a service charge.
- Dealers/distributors are not authorized to replace Novak products thought to be defective.
- If a hobby dealer returns your brushless system for service, submit a completed *PRODUCT SERVICE FORM* to the dealer and make sure it is included with the product.
- Novak does not make any internal electronic components available for sale.

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