

MOTOR HALL SENSOR TEST

The Hall Sensor Test diagnostic feature in this ESC allows you to easily check the sensors in the brushless motor connected to it to determine if they are operating normally. This will help you pinpoint the cause of problems in your system, and hopefully reduce the down time and expenses associated with sending your product in for service when you can resolve the issue yourself.

To access this feature, simply follow these steps:

1. Follow the steps in the 'CUSTOM PROGRAMMING OPTIONS' section to access the Hall Sensor Test option via the ESC's SET button.
2. Slowly rotate the motor's output/pinion shaft. If motor is installed in a vehicle, slowly rotate the drive train so that the motor also rotates.
3. The status LEDs on the speed control should cycle through illuminating the BLUE, YELLOW, and RED status LEDs.

If the BLUE, YELLOW, and RED LEDs light up one after another as the motor's shaft is rotated, the Hall Sensors in the motor are operating normally.

If any one of the BLUE, YELLOW, or RED status LEDs do not light while rotating the motor's shaft, there is a either a problem with the Sensor Harness Cable (or its connections either at the motor end or the ESC end) or with the actual Hall Effect Sensors in the motor's timing section.

If your motor has a user-replaceable double-ended sensor harness, replace it with another one to determine if this is the problem. If, after replacing the harness, all 3 of the LEDs still do not light up, it would appear that one of the motor's sensors has been damaged--replace the timing section of your motor, or if your motor is not user-rebuildable, send it in the manufacturer for the appropriate service.

VOLTAGE CUT-OFF CIRCUITRY

This speed control features Novak's Smart-Stop Voltage Cut-Off Circuitry built-in, and when used properly will allow you to safely use LiPo and LiFe type batteries, without letting the cells drop below their critical safety voltage during operation.

The default setting in the speed control is that the Voltage Cut-Off is turned ON and is set to LiPo. If you are using NiMH or NiCd cells, you will need to switch the Voltage Cut-Off feature OFF. If you are using LiFe cells, you will need to switch the Voltage Cut-Off feature to the LiFe battery setting.

Note: Whenever the speed control's One-Touch Programming is performed, this setting will revert to the LiPo default setting.

DO NOT USE LiPo/LiFe BATTERIES WITH VOLTAGE CUT-OFF TURNED OFF

TEMPERATURE MONITORING

This ESC has a built-in diagnostic temperature monitoring feature that lets you quickly check the ESC's operating temperature at any time.

While connected to a battery and powered ON, simply tap the ESC's SET button and one of the on-board LED lights will flash 4 times to indicate the operating temperature of the speed control.

WHITE flashing LED = normal operating temp--under 135°F (57°C).

BLUE flashing LED = medium operating temp--136-147°F (58-64°C).

YELLOW flashing LED = hot operating temp--148-167°F (65-75°C).

GREEN flashing LED = hotter operating temp--168-194°F (76-90°C).

RED flashing LED = hottest operating temp--195-215°F (91-102°C).

You are now pushing the ESC extremely hard and should be very careful to avoid overheating and possible thermal shut-down.

All LEDs flashing = DANGEROUS operating temp--216-239°F (103-115°C).

Your ESC is now about to thermally shut-down.

Reduce the pinion size/check drive train to avoid ESC overheating that could result in potential damage.

EXTERNAL BEC CONNECTION

To use a Non-Novak BEC with this ESC, please follow the BEC manufacturer's instructions. Remove the RED wire from the plug plastic on the ESC's receiver input signal harness, and leave the ESC's ON/OFF switch in the 'ON' position at all times.

When using a Novak BEC with this ESC, the internal & external BECs operate at the same internal voltage, and therefore can be combined together for increased BEC power (2A internal + 5A external = 7A). Simply connect the Novak BEC's main power input leads (heavier gauge silicone wires) to the ESC's Positive & Negative battery solder tabs (RED to Positive, BLACK to Negative). Plug the BEC's receiver power output lead into any open channel of your receiver. Both the ESC ON/OFF switch AND the BEC ON/OFF switch will remain in the 'ON' position at all times. You will disconnect the battery from the speed control to turn the power OFF.

If you notice any problems or cutting-out with the combined BECs, remove RED wire from the receiver harness and power the electronics from the external BEC only.

TROUBLE-SHOOTING GUIDE

Steering Channel Works But Motor Will Not Run

- Possible receiver damage—Check operation with a different receiver.
- Possible internal damage—Refer to 'SERVICE PROCEDURES' section.
- Check motor or motor connections.
- Check ESC is plugged into receiver's throttle channel. Check signal harness wire sequence.

Receiver Glitches/Throttle Stutters During Acceleration

- Receiver or antenna too close to ESC, power wires, battery, or motor.
- Bad motor sensors, sensor harness, or connections—Check wiring, sensor harness, & connections, perform hall sensor test (Refer to 'MOTOR HALL SENSOR TEST' section).
- Low voltage to receiver—Try Novak Glitch Buster (#5626) on receiver to retain power.
- PowerCap damaged/missing—Replace PowerCap/Trans-Cap Module.
- Battery pack damaged or weak—Try a different battery pack.
- Motor magnet weak or overheated—Replace rotor (Refer to motor manufacturer's website).
- Excessive current to motor—Use a milder motor or a smaller pinion gear.
- Untidy wires or signal and power wired bundled together. Input harness and servo wires should be bundled separately. Power wires should be as short as possible.

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.

Motor Runs Backward

- Reverse motor rotation direction—Refer to 'CUSTOM PROGRAMMING OPTIONS' section.
- Improper One-Touch set up—Refer to 'ONE-TOUCH PROGRAMMING' section.

Speed Control Runs Excessively Hot

- Gear ratio too low—Increase gear ratio/Reduce pinion (refer to 'PROPER GEAR SELECTION').
- Motor is damaged—Try a different motor.

Model Runs Slowly/Slow Acceleration

- Gear ratio too high—Reduce gear ratio/Increase pinion (refer to 'PROPER GEAR SELECTION').
- Check battery & connectors—Check battery pack & connectors. Replace if needed.
- Incorrect transmitter/ESC adjustment—Refer to 'TRANSMITTER ADJUSTMENTS'.
- PowerCap damaged/missing—Replace PowerCap or Power Trans-Cap Module.

ESC Is Melted Or Burnt/ESC Runs With Switch Off

- Internal damage—Refer to Service Procedures.

No Power to the BEC

- Check power wire connections to your battery, ESC and BEC unit.
- Check BEC input harness is plugged into receiver & ESC's red wire is removed from harness.
- Be sure that the BEC unit switch is turned ON.

ERROR/LED CODES

- Blue status LED on solid at neutral—Minimum Brake is set to value greater than 0%.
- Yellow status LED on solid at neutral—Drag Brake is set to value greater than 0%.
- Red & Green status LEDs on solid—Check input signal harness connections at ESC and receiver. Check input signal harness wiring sequence—Refer to STEP 3.
- Red status LED on solid & Green LED blinking—Check motor sensor harness connection. Possible internal motor damage.
- Blue & Green status LEDs both blinking. Misfire shut-down—return throttle to neutral position to regain motor control—check 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 & Yellow status LEDs blinking. Possible Motor thermal shut-down—Check gear ratio & free operation of drive train for possible overloading/Motor 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 & Green (Misfire Detection), Blue & Red (ESC Thermal Shut-Down), or Blue & Yellow (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 (Refer to 'ONE-TOUCH' & 'TRANSMITTER ADJUSTMENTS').
- Green & White status LEDs blinking. RPM safety limit reached & physical limit of motor bearings being reached/Possible over-rev condition. Increase gear ratio or reduce pinion.
- Red & Green status LEDs toggling. LiPo/LiFe Cut-Off voltage reached. Recharge battery.

SERVICE PROCEDURES

Before sending your product in for service, review the **Trouble-Shooting Guide**. Product may appear to have failed when other problems exist. After reviewing instructions, if you feel that you require service, obtain the most current service options & pricing as follows:

WEB: Print out the **PRODUCT SERVICE FORM** from CUSTOMER SERVICE section of the web site. Fill out required information on form and return it with the product requiring service.

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

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

TRADE-IN PROGRAM: Novak offers a trade-in program for non-warranty items toward current and discontinued products. You can replace, exchange, or upgrade Novak products as listed within the trade-in program. Complete a Non-Warranty Service Form to be eligible.

ADDITIONAL NOTES:

- Dealers/distributors aren't authorized to replace products thought to be defective.
- If a hobby dealer returns your product for service, submit a completed **PRODUCT SERVICE FORM** to the dealer and make sure it is included with product.
- Novak Electronics, Inc. does not make any internal electronic components (transistors, resistors, etc.) available for sale.

FIELD GUIDE

#55-1832P-1

•For CRAWLER ESCs with ROCK BOOST•

10-2011

This Brushless Electronic Speed Control (ESC) is factory loaded with programmable features. While this may seem overwhelming at first glance, this *Field Guide* is designed to keep you out on the rocks to use as a quick-reference and help walk you through the programming of all of the speed control's features.

Take the time to thoroughly read through this programming guide before attempting to make any programming adjustments so you fully understand the different ESC parameters, and how they can be used to fine tune your ESC's feel and performance. Most importantly, enjoy all of the technical benefits and features the ESC has to offer.

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ONE-TOUCH PROGRAMMING

With the ESC connected to (at least) a charged battery pack, the receiver, and the brushless motor's sensor harness:

1. TURN ON THE TRANSMITTER'S POWER
2. PRESS & HOLD ESC'S ONE-TOUCH/SET BUTTON
3. TURN ON THE SPEED CONTROL'S POWER

With transmitter throttle at neutral, and still pressing the SET button, slide the ESC's ON/OFF switch to ON position.

4. CONTINUE HOLDING SET BUTTON UNTIL RED LED COMES ON
5. RELEASE SET BUTTON AS SOON AS RED LED TURNS ON
6. PULL TRANSMITTER THROTTLE TO FULL-ON POSITION

Hold it there until the green status LED turns solid green.

Note: Motor will not run during programming even if connected.

7. PUSH TRANSMITTER THROTTLE TO FULL-BRAKE/REVERSE
- Hold it there until the green status LED blinks green.

8. RETURN TRANSMITTER THROTTLE TO NEUTRAL

The red status LED will turn solid red, indicating that the ESC is at neutral and that proper programming has been completed. Blue & yellow LEDs will also be on indicating Minimum Brake (blue) & Drag Brake (yellow) settings are at levels above 0%.

If transmitter settings are changed, the One-Touch Programming must be repeated. If you experience any problems, turn off ESC and repeat One-Touch.

NOTE: Whenever the One-Touch Programming set-up is performed, the speed control will automatically revert back to the factory-default settings.

TRANSMITTER ADJUSTMENTS

Transmitter adjustments may not be required to properly complete the One-Touch programming of the speed control. However, should you have any problems completing the ONE-TOUCH PROGRAMMING, adjust the settings on your transmitter as listed below, then repeat the ONE-TOUCH PROGRAMMING as described above.

THROTTLE CHANNEL ADJUSTMENTS

- A. Set HIGH ATV or EPA to 100%. [amount of throw at full throttle]
- B. Set LOW ATV, EPA, or ATL to 100%. [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)—best for racing ESCs. Set to 50% throttle and 50% brake for full time use with reverse to get the best performance in reverse.

[adjusts trigger throw on electronic/digital pistol-grip transmitters]

- G. Set MECHANICAL TRIGGER THROW ADJUSTMENT to position with 2/3 throttle and 1/3 brake throw.

[adjusts trigger throw on mechanical/analog pistol-grip transmitters]

•NOT ALL TRANSMITTERS HAVE ALL OF THESE ADJUSTMENTS•

ESC PARAMETERS

The following parameters are adjustable to help fine-tune the feel and response of the speed control to your liking:

1. Rock Boost (1 of 2)..... OFF/ON
2. Standard Drag Brake--Settings 1-5 (1 of 5)..... 0-100%
Power Hill/Hold Brake--Settings 6-10 (1 of 5) 40-90%
3. Minimum Drive (1 of 10) 0-15%
4. Dead Band (1 of 5) 2-8%
5. Throttle Curve (1 of 2) Linear/Exponential
6. Brake Frequency (1 of 10) 1.67-13.7KHz
7. Brake End Point (1 of 10) 10-100%
8. Drive Frequency (1 of 2) 7-16KHz
9. Motor Rotation (1 of 2) CCW/CW
10. Voltage Cut-Off (1 of 3) OFF-LiPo-LiFe

PROPER GEAR SELECTION

Motor operating temperature is the ONLY way to properly set vehicle gearing

The Motor and Speed Control should not exceed **160°F MAX** at any time during run!

Change the gearing to avoid overheating!

DO NOT FREE-REV MOTOR!

Free-running your brushless motor in a no-load condition can cause rotor failure & ESC transistor damage that will not be covered by the product's warranty.

Because of the potential danger of overheating and ESC/motor damage and failure, **you must start with VERY small pinion sizes** and check the speed control and motor operating temperatures at multiple times throughout the initial runs after installation. This is the only way to ensure that you are not causing excessive heating.

If ESC & motor temperatures remain low & stable, you can slowly increase the pinion size while again monitoring the temperatures to determine the safe gearing for your vehicle, motor, and climate/track conditions. Because these variables can change or be modified, **you MUST continually monitor ESC & motor temperatures** to protect your electronics from damage.

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. 2.4GHz radio systems are the best to use. FM radio systems are acceptable, as long as the system is high quality. **AM radio systems are not recommended.**



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CUSTOM PROGRAMMING OPTIONS -- ADVANCED

ESC SOFTWARE FLOW CHART

This speed control features many parameters that can be customized to fine-tune the ESC's feel & response to your liking.

The flow chart below and the adjustment steps to the right describe the different parameters and how they effect the ESC.

One-Touch Programming must be completed before customization of parameters, as all ESC parameters are defaulted back to the factory settings whenever the One-Touch Programming is performed.

DEFAULT SETTINGS FOR THE ESC PARAMETERS ARE LISTED IN BOLD IN THE TABLES TO THE RIGHT

TO CHANGE PARAMETER SETTINGS:

1. CONNECT THE ESC TO A CHARGED BATTERY PACK, RECEIVER, AND MOTOR'S SENSOR HARNESS.

2. TURN ON TRANSMITTER.

2.SLIDE THE ESC'S ON/OFF SWITCH TO 'ON' POSITION

3. WITH ESC AT NEUTRAL, PRESS & HOLD SET BUTTON

Release ESC's SET button once LEDs are lit for the desired setting.

To skip a parameter, continue to press & hold SET button until desired parameter is reached.

4. SELECT PARAMETER VALUE

LED flashes to indicate active setting (refer to tables at right). Quick press & release SET button to select desired setting.

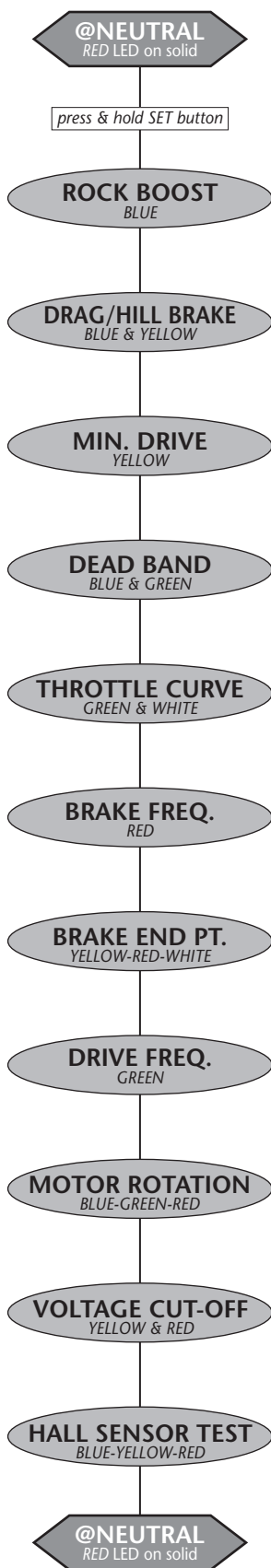
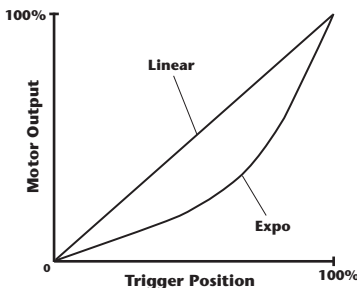
5. PRESS & HOLD SET BUTTON TO STORE NEW SELECTION

When SET button is pressed and held for about 1 second, the new selection is stored in ESC's memory—Status LEDs will scroll across to indicate ESC is exiting programming & ESC returns to neutral.

There is no time constraint during selection of custom parameters.

THROTTLE CURVES

This ESC features both linear and exponential throttle curves. The 'Expo' curve provides a more controllable bottom end response as shown below.



continue holding ESC's SET button to skip steps here

ROCK BOOST

#1 ROCK BOOST SETTINGS (1 of 2) **BLUE LED**

>> Changing this setting activates or deactivates ESC's Rock Boost.

When OFF, ESC's throttle response is set up for low speed rock crawling only. When ON, ESC has low speed rock crawling throttle response, then when transmitter is held at full throttle, Rock Boost engages & ESC electronically advances the motor timing for increased top speeds.

Note: White LED will be ON when ESC is at neutral if this setting is turned ON.

Setting (# of flashes)	1	2
Reverse:	OFF	ON

DRAG/HILL BRAKE

#2 DRAG/HILL BRAKE SETTINGS (1 of 10) **BLUE & YELLOW LEDs**

Amount of braking being applied while transmitter is at neutral. AKA 'hold' brakes.

>> Settings 1-5 are Standard Drag Brake settings--less aggressive braking for rock racing (setting #1 applies no braking while trigger is at neutral). Settings 6-10 are Power Hill Brake settings (ESC applies power to motor to 'hold' its position)--very strong rock crawling Hill/Hold braking.

Note: Yellow LED will be ON when ESC is at neutral if this setting is above 0%.

Note: Default is setting #5 for Axial® Wraith™ edition Timbuk2 ESC.

Setting (# of flashes)	1	2	3	4	5*	6	7	8	9	10
Drag Brake (%):	0	40	60	95	100	40	65	70	80	90

MINIMUM DRIVE

#3 MINIMUM DRIVE SETTINGS (1 of 10) **YELLOW LED**

Amount of forward drive applied with first pulse of transmitter throttle information sent.

>> Increasing this setting starts the forward drive at a stronger level.

This is useful to compensate for heavier vehicles to minimize the amount of trigger throw required before effective drive is applied.

Setting (# of flashes)	1	2	3	4	5	6	7	8	9	10
Minimum Drive (%):	0	1	2	3	4	6	8	10	12	15

DEAD BAND

#4 DEAD BAND SETTINGS (1 of 5) **BLUE & GREEN LEDs**

The space between Minimum Brake and Minimum Drive, with Neutral in the middle.

>> Increasing this setting increases amount of 'free play', or distance the transmitter's trigger must move before forward drive or braking begins.

This is useful for triggers that don't center accurately or have worn pots.

Setting (# of flashes)	1	2	3	4	5
Dead Band (%):	2	3	4	5	8

THROTTLE CURVE

#5 THROTTLE CURVE SELECTION (1 of 2) **GREEN & WHITE LEDs**

How the ESC's throttle (forward drive) responds to the transmitter's trigger input.

>> Changing this setting changes how the throttle responds to your transmitter's trigger movement.

The 'Expo' throttle curve gives a less responsive, or more forgiving (easier to handle) low-end acceleration.

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

BRAKE FREQUENCY

#6 BRAKE FREQUENCY SELECTION (1 of 10) **RED LED**

How the ESC's braking response feels with respect to the transmitter's trigger input.

>> Increasing the Brake Frequency makes the brake response feel smoother and more controllable.

Setting (# of flashes)	1	2	3	4	5	6	7	8	9	10
Brake Freq. (KHz):	1.67	2	2.25	2.5	3	3.5	4.5	5.75	10	13.7

BRAKE END POINT

#7 BRAKE END PT. SELECTION (1 of 10) **YELLOW-RED-WHITE LEDs**

The percentage of the ESC's braking power that can be attained as well as the transmitter trigger throw required to reach that power.

>> Decreasing this setting reduces the maximum braking power and the usable distance of the transmitter's brake trigger throw.

Setting (# of flashes)	1	2	3	4	5	6	7	8	9	10
Brake End Pt. (%):	10	20	30	40	50	60	70	80	90	100

DRIVE FREQUENCY

#8 DRIVE FREQUENCY SELECTION (1 of 10) **GREEN LED**

How the ESC's throttle response feels with respect to the transmitter's trigger input.

>> Increasing the Drive Frequency makes the throttle response feel smoother and more controllable.

Setting (# of flashes)	1	2	3	4	5	6	7	8	9	10
Drive Freq. (KHz):	16	15.2	13.8	13	12	11	10	9.5	8	7

Note: The Drive Frequency parameter is not available for adjustment when the 'Expo' Throttle Curve option has been selected.

MOTOR ROTATION

#9 MOTOR ROTATION SELECTION (1 of 2) **BLUE-GREEN-RED LEDs**

>> Changing this setting changes the rotation direction of the motor's output/pinion shaft.

Counter-clockwise rotation is standard in most vehicles.

Note: The Axial® Wraith™ edition Timbuk2 ESC comes with this parameter set to **CLOCKWISE** (setting #2) as the default. Newer Novak Ballistic Crawler motors come timed to 0° mechanical timing and the Rock Boost performs equally well in both directions of rotation. Older Ballistic Crawler motors should have the motor's mechanical timing adjusted to 0°. Do this by aligning the sensor harness connector opening of the Ballistic motor's back bearing cap directly in-line with the center (Phase B) solder tab.

Setting (# of flashes)	1	2
Rotation Direction:	CCW ↺	CW ↻

VOLTAGE CUT-OFF

#10 VOLTAGE CUT-OFF SELECTION (1 of 3) **YELLOW & RED LEDs**

>> Changing this setting enables or disables the ESC's built-in Smart Stop cut-off circuitry, and also sets the voltage cut-off point based on what type of battery is being used for the vehicle's main battery pack.

DO NOT USE LiPo/LiFe BATTERIES WITH THE ESC'S VOLTAGE CUT-OFF CIRCUITRY TURNED OFF

Setting (# of flashes)	1	2	3
Voltage Cut-Off Type:	OFF (NiMH/NiCd)	LiPo	LiFe

HALL SENSOR TEST

#11 MOTOR SENSOR TEST **BLUE-YELLOW-RED LEDs**

>> This is a diagnostic feature that allows you to easily check the functionality of your brushless motor's hall effect sensors & sensor harness and its connections at the speed control and motor. Once activated, slowly rotate the motor's output/pinion shaft and the appropriate LED will light up if a signal is received for its sensor in the motor. Refer to 'MOTOR HALL SENSOR TEST' section.

Motor Hall Sensor	A	B	C
LED Color:	BLUE	YELLOW	RED

RESTORING FACTORY DEFAULTS

Every time the speed control's One-Touch Programming is performed, the ESC will automatically revert back to the factory default settings.

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