

## MOTOR HALL SENSOR TEST

The Hall Sensor Test diagnostic feature in GTB 2 allows you to easily check the sensors in the brushless motor connected to the ESC 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 this source of the problem. If, after replacing the harness, all three of the LEDs still do not light up, it would appear that one of the sensors inside the motor 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

The GTB 2 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

The GTB 2 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 to avoid overheating speed control that could result in potential damage.

## 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.
- Make sure ESC is plugged into the throttle channel of receiver. Check wiring color sequence of receiver signal harness (Refer to STEP 1).

### 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 capacitor on receiver to help retain power during high current draw situations (Novak accessory #5626).
- Power Trans-Cap Module damaged/missing—Replace Power 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'.
- Power Trans-Cap Module damaged/missing—Replace 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 that the input harness from the BEC is plugged into the receiver correctly and the red wire from the ESC's input harness is removed.
- 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 1.
- Red status LED on solid & Green LED blinking—Check motor sensor harness connection. Possible internal motor damage.
- 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 overloaded—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 (Locked Rotor Detection), Blue & Red (ESC Thermal Shut-Down), or Blue & Yellow (Motor Thermal Shut-Down) status LEDs blinking. ESC may have shutdown & 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.
- White status LED blinking. ESC timing is turned ON. ESC is operating normal.
- Red & Green status LEDs toggling. LiPo/LiFe Safety Cut-Off voltage reached. Remove and charge/replace battery pack.

Check Novak's web site for additional information.

## GTB 2 TRACK GUIDE

#55-1709P-1 Rev.2

2-2011



The GTB 2 Racing Brushless ESC (Novak part number #1709) is factory loaded with a dozen programmable features. While this may seem overwhelming at first glance, this **GTB 2 Track Guide** was designed to keep with you at the track 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 operation to 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 GTB 2 ESC has to offer. Visit our web site for the most up to date information and to learn more about other Novak products and services.

## ESC PARAMETERS

1. Minimum Brake (1 of 10) .....0-30%
2. Drag Brake (1 of 10) .....0-30%
3. Minimum Drive (1 or 10) .....0-15%
4. Dead Band (1 of 5) .....2-8%
5. Throttle Curve (1 of 2) .....Linear/Exponential
6. Brake Curve (1 of 2) .....Linear/Exponential
7. Brake Frequency (1 of 10) .....1.67-13.7 KHz
8. Brake End Point (1 of 10) .....10-100%
9. Drive Frequency (1 of 10) .....7-16 KHz
10. Reverse .....OFF/ON
11. Motor Rotation .....CCW/CW
12. Voltage Cut-Off .....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.

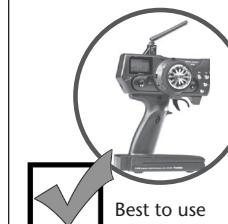
Because of the potential danger of overheating and ESC/motor damage and failure, **you must start with VERY small pinion sizes** and check the speed control and motor operating temperatures at multiple times throughout the initial runs after installation. This is the only way to ensure that you are not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

### 2.4 GHz



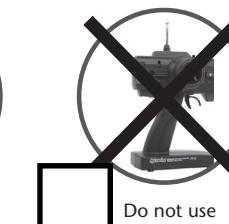
Best to use

### FM



OK to use

### AM



Do not use

# CUSTOM PROGRAMMING OPTIONS -- ADVANCED

## GTB 2 ESC SOFTWARE FLOW CHART

The GTB 2 ESC features a dozen 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.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.

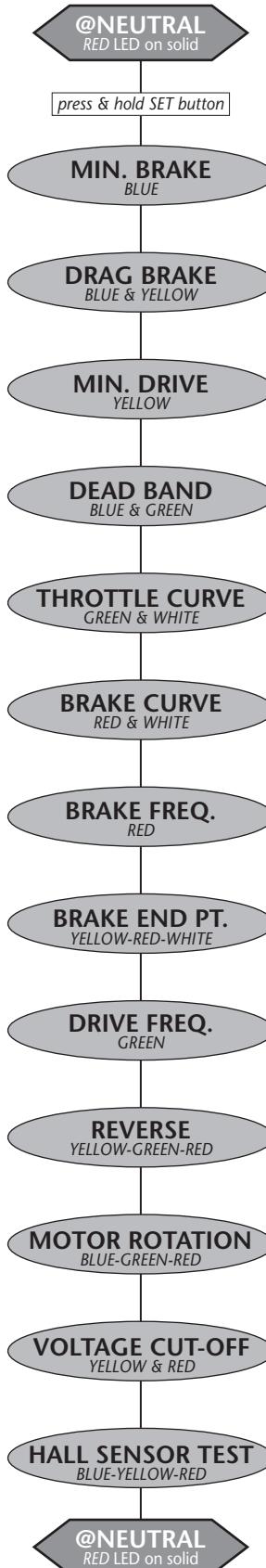
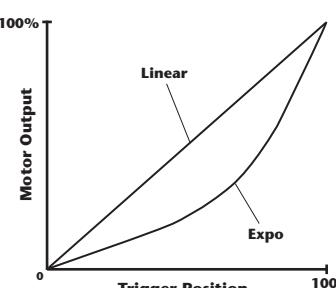
5.PRESS & HOLD SET BUTTON TO STORE NEW SELECTION

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 AND BRAKE CURVES

The GTB 2 features both linear and exponential throttle & brake curves. The 'Expo' curves provide a more controllable bottom end response.



## MINIMUM BRAKE

### #1 MINIMUM BRAKE SETTINGS (1 of 10) BLUE LED

Amount of braking applied with the first pulse of transmitter throttle information sent.

>> Increasing this setting starts the braking at a stronger/higher level. This is useful to compensate for heavier vehicles to minimize the amount of trigger throw required before effective braking is applied.

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

| Setting (# of flashes) | 1 | 2 | 3        | 4 | 5  | 6  | 7  | 8  | 9  | 10 |
|------------------------|---|---|----------|---|----|----|----|----|----|----|
| Minimum Brake (%):     | 0 | 3 | <b>6</b> | 9 | 12 | 15 | 18 | 21 | 24 | 30 |

## BRAKE CURVE

### #6 BRAKE CURVE SELECTION (1 of 2) RED & WHITE LEDs

How the ESC's brakes respond to the transmitter's trigger input.

>> Changing this setting changes how the brakes respond to your transmitter's trigger movement. The 'Expo' curve gives a less responsive, or more forgiving low-end braking.

| Setting (# of flashes) | 1      | 2    |
|------------------------|--------|------|
| Brake Curve:           | Linear | Expo |

## DRAG BRAKE

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

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

>> Increasing this setting makes the motor slow down more without pushing the transmitter's trigger into the brake/reverse direction.

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

| Setting (# of flashes) | 1 | 2 | 3        | 4 | 5  | 6  | 7  | 8  | 9  | 10 |
|------------------------|---|---|----------|---|----|----|----|----|----|----|
| Drag Brake (%):        | 0 | 3 | <b>6</b> | 9 | 12 | 15 | 18 | 21 | 24 | 30 |

## 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/higher 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 (%):     | <b>0</b> | 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 transmitter triggers that don't center accurately or have worn pots.

| Setting (# of flashes) | 1 | 2 | 3 | 4        | 5 |
|------------------------|---|---|---|----------|---|
| Dead Band (%):         | 2 | 3 | 4 | <b>5</b> | 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' curve gives a less responsive, or more forgiving low-end acceleration.

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

## REVERSE

### #10 REVERSE SELECTION (1 of 2) YELLOW-GREEN-RED LEDs

>> Changing this setting activates or deactivates the speed control's motor reversing functionality. When OFF, the ESC has forward and brakes only. When ON, the ESC has forward with brakes, then reverse with a second push of trigger after braking to a slow speed.

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

## MOTOR ROTATION

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

>> Changing this setting changes the rotational direction of the motor's output/pinion shaft. Counter-clockwise rotation is the standard in most remote control vehicles. For optimal motor performance, use counter-clockwise rotation instead of reversing the transmitter's throttle channel throw.

| Setting (# of flashes) | 1     | 2    |
|------------------------|-------|------|
| Rotation Direction:    | CCW ↗ | CW ↘ |

## VOLTAGE CUT-OFF

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

>> Changing this setting enables or disables the speed control's built-in Smart Stop cut-off circuitry, and also sets the voltage cut-off point based on what type of batteries are being used in 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) | <b>LiPo</b> | LiFe |

## HALL SENSOR TEST

### #13 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.**

**GTB2**  
[www.teamnovak.com](http://www.teamnovak.com)