

VOLTAGE CUT-OFF CIRCUITRY

When active (see *Track Guide* to turn ON/OFF), the built-in Novak Smart-Stop Voltage Cut-Off Circuitry lets you safely use 1-2S Lithium Polymer (LiPo) or Lithium Iron Phosphate (LiFe) battery packs by cutting off the speed control's throttle output when the critical safety voltages are reached.

The circuitry monitors the pack voltage and automatically selects a 1S or 2S cut-off voltage value [3.125/6.25V (1S/2S) LiPo; 2.375/4.75V (1S/2S) LiFe]. When the ESC detects that the critical safety voltage value will soon be reached, it begins interrupting, or "blipping," the throttle output as an early warning that the voltage is getting low and the throttle output will soon be completely shut off.

When the critical voltage is reached, the throttle output to the motor gets completely shut down to keep the voltage from dropping further (Red & Green LEDs will alternately flash & you still have steering control).

Re-charge battery after Smart-Stop circuitry shuts off throttle

Even though the pack's voltage will rise (after a short resting period) to a level high enough to run motor again, this is not good for LiPo or LiFe batteries.

Reaching critical safety voltage too many times can damage the cells.

DO NOT CONTINUE TO RUN VEHICLE AFTER THE SMART-STOP HAS SHUT DOWN THE THROTTLE OUTPUT THE FIRST TIME.

When the ESC is switched ON, the Yellow & Red LEDs will flash together 2 times to indicate LiPo/LiFe Cut-Off is ACTIVE.

With the Voltage Cut-Off turned ON & using NiCd or NiMH cells, the circuitry will shut off the ESC's throttle output very early into the run, due to the different characteristics of these batteries. Change the ESC's Cut-Off Circuitry mode to OFF to use these batteries.

See CUSTOM PROGRAMMING OPTIONS on Track Guide to properly adjust this setting.

WIRING AND COOLING FAN

This section shows the polarity of the GTB 2 ESC's output pins. The included receiver harness (Novak #5309) has a 2mm mini plug on the end that is plugged into the ESC and a standard JST plug on the receiver end. The included ON/OFF switch (Novak #5602) has a standard JST plug on it. Before connecting, note the wiring sequence of the installed harness connectors as shown here.

The GTB 2 ESC's heat sink is designed to accept a 25x25mm cooling fan, and comes with nylon 4-40x5/8" screws to secure it. To install, simply center the fan on the ESC and push the nylon screws down into the cross cuts of the heat sink. If using metal screws, thread them into the heat sink. Install the fan's power connector onto the fan output pins on the ESC--note polarity as shown below.

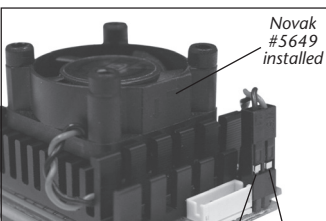


FIGURE 3

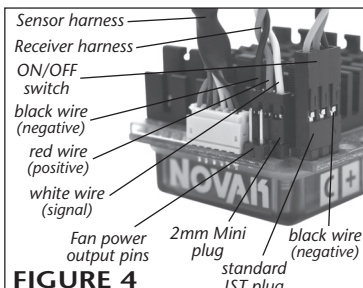


FIGURE 4

OPTIONAL RECEIVER PACK USAGE

If you are planning to use an external receiver battery pack with the GTB 2 ESC 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 vehicle OFF, turn ESC's switch OFF, then turn receiver pack's switch OFF.

SERVICE PROCEDURES

Before sending your speed control in for service, review the **Trouble-Shooting Guide** (in *Track Guide*). The ESC may appear to have failed when other problems exist. After reviewing instructions, if you feel that your ESC 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.

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 •

TRADE-IN PROGRAM: For non-warranty work, Novak offers a trade-in program for current and discontinued products. You can replace, exchange or upgrade any Novak speed control to any available speed control listed within the trade-in program. You must 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.

CONTACT INFORMATION:

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PRODUCT WARRANTY

The GTB 2 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 LiPo/LiFe cells input voltage, damage resulting from using LiPo/LiFe batteries without Smart-Stop voltage cut-off circuitry active, using insufficient LiPo/LiFe 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, damage due to free revving motor, damage due to using a non-Novak motor or a non-sensored motor, not using or incorrect installation of a Power Trans-Cap Module on the ESC or from using a damaged Power 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. Melted speed controls or motors are not covered by the warranty.

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.

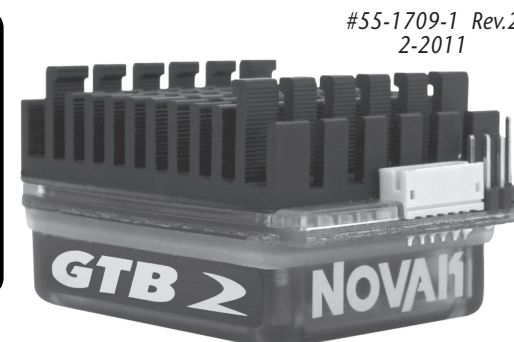
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GTB 2 Brushless ESC, NovaBrakes, Thermal Overload Protection, Hall Sensor Test, Smart Braking II, Polar Drive Technology, Radio Priority Circuitry, & One-Touch Set-Up are all trademarks of Novak Electronics, Inc.

BASIC SET-UP GUIDE -- GTB 2 ESC

• See "Track Guide" sheet for Proper Gearing, and Custom Programming •

NOVAK



GTB 2



The GTB 2 Brushless ESC (#1709) includes Novak's exclusive NovaBrakes™, on-board temperature monitoring & motor hall sensor test diagnostic tools, Thermal Overload Protection, and has no electronic motor timing to comply with all zero-timing Sportsman spec racing series.

The GTB 2 ESC is loaded with over a dozen adjustable parameters, has complete on-board programming, is compatible with all 540 & 550-size Novak brushless motors, is sensor-based, sports a cross-cut heat sink, and includes everything necessary for racing, including a cooling fan & Power Trans-Cap Module.



For informative product videos, visit the Team Novak Channel on YouTube®.

To benefit from all of the technical features of the GTB 2, PLEASE READ ALL INSTRUCTIONS BEFORE OPERATION

ACCESSORIES

PLUG-IN INPUT SIGNAL HARNESS (MINI-JST) [Novak kits #5304 & #5309] Includes input signal harness with 2mm Mini plug on ESC end for use with GTB 2. 4.5" in Novak kit #5304, and 9" in Novak kit #5309.

BRUSHLESS MOTOR CONNECTOR WIRE SET [Novak kit #5332] Flexible 14GA wire with gold-plated connectors for low-resistance connections.

BRUSHLESS SENSOR HARNESSES [Novak kit #5351-#5353] Shielded sensor harness protects sensor wires and provides multiple installation options. 4"/100mm (Novak #5351), 6"/150mm (Novak #5352), & 9"/230mm (Novak #5353).

LOW-PROFILE HEAT SINK [Novak kit #55431] For GTB 2/Kinetic/Havoc Pro SC ESCs with 8.5T or higher motor. Includes thermal gap pad.

SMART BOOST 1-CELL LiPo STEP-UP MODULE [Novak kit #5474] Supplies full 6V/3A to receiver & servo for optimal performance. Built-in LiPo voltage cut-off circuitry. Recommended for 1S (or 4-cell NiMH) racing and 2.4GHz radio systems.

SUPER-FLEX SILICONE 14GA WIRE SET [Novak kit #5508] Two each of 9" length black, red, blue, yellow, and orange 14GA wire.

SUPER-FLEX SILICONE 12GA WIRE SET [Novak kit #5512] Two each of 3 ft. length black, red and blue 12GA wire. Optional wire set is perfect for low-resistance connections.

REMOTE POWER PROGRAMMING SWITCH [Novak kit #5602] Includes ON/OFF Power Switch and One-Touch Programming Button harness.

25x25x10mm COOLING FANS [Novak kits #5649 & #5653] Cooling fans fit heat sink perfectly & has the GTB 2 ESC's 2mm Mini power plug for easy connection. Single fan in Novak kit #5649, and 2-pack of fans in Novak kit #5653.

LIGHTWEIGHT POWER TRANS-CAP MODULE [Novak kit #5678] Replacement Lightweight Power Trans-Cap Module provides improved efficiency and lowers operating temperatures. It is compatible with 2S LiPo and 4-6 cell NiMH.

POWER CONNECTORS—3.5mm & 4mm [Novak kit #5731 & #5741] Low-Loss connectors generate dozens of wiring routing and installation options.

LEAD-FREE SILVER SOLDER [Novak kit #5831-#5833] Novak solder contains 3% Silver for high-conductivity and is available in three sizes. 6g in Novak kit #5831, 15g in Novak kit #5832, and 100g in Novak kit #5833.

MOUNTING TAPE 25x35mm [Novak kit #5840 & #5841] Includes cushioned, double-sided tape to secure electronics in vehicles. 10 pieces in Novak kit #5840, and 100 pieces in Novak kit #5841.

HEAT SHRINK TUBING [Novak kit #5850 & #5851] Novak heat shrink tubing is 6" long and available in six sizes: 1/16" - 3/8". 6 piece assortment in Novak kit #5850, and 24 piece assortment in Novak kit #5851.

SPECIFICATIONS

Input Voltage.....	1-2S LiPo/LiFe cells, 4-6 NiMH cells
ESC Footprint.....	1.16"x1.47"x0.97" (29.5x37.3x24.6mm)
ESC Weight (w/o wires).....	1.29 ounce (36.6 grams)
540 Motor Limit.....	3.5-turn sensor-based brushless
550 Motor Limit.....	4.5-turn sensor-based brushless
B.E.C. Voltage/Current (built-in).....	6.0 volts DC / 3 amps
Power Wire (Battery/Motor).....	14G Super-Flex Silicone
On-Resistance.....	0.00040 ohm per phase @25°C trans.temp.
Status LEDs.....	5
Thermal Overload Protection.....	Yes

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.

SENSOR-BASED BRUSHLESS MOTORS ONLY

The GTB 2 is designed for use with sensor-based Novak Brushless Motors. You may replace with Novak sensed motors down to 3.5T (540-size) or 4.5T (550-size).

NO SCHOTTKY DIODES!

Schottky diodes are never to be used with brushless ESCs. Do not use Schottky diodes with GTB 2 ESC!

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!

1-2S LiPo/LiFe OR 4-6 NiMH CELLS ONLY

If using LiPo or LiFe batteries, NEVER use more than a 2 cell (2S) pack for the vehicle's main battery & be sure the Voltage Cut-Off option is turned ON (refer to *Track Guide*). If using NiCd or NiMH batteries, NEVER use more than 6 cells (1.2VDC/cell) in the vehicle's main battery pack, and disable Voltage Cut-Off Circuitry (refer to *Track Guide*).

DISCONNECT BATTERIES WHEN NOT IN USE

Always disconnect batteries from ESC to avoid short circuits and possible fire hazard.

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 2S Power Trans-Cap module is installed on ESC & MUST be used at all times. Failure to use a Novak Power Trans-Cap module with the proper cell rating will result in higher ESC temperatures & possible thermal shut-down or damage.

GOOD QUALITY LiPo/LiFe BATTERIES SUGGESTED

Using LiPo/LiFe 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.

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 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 system use is best.** An FM system is acceptable, as long as it is high quality. AM systems are NOT recommended.

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 the ESC.

NO CA GLUE

Exposure to CA glue or its fumes can cause damage to internal components of the ESC and result in premature failure.

www.teamnovak.com

STEP 1-CONNECT INPUT HARNESS

The GTB 2 ESC has a user-replaceable input harness with a 2mm mini plug on the ESC end of it and the industry-standard connector on the receiver end of it. **The GTB 2 ESC works with all major radio brand's new receivers** [Refer to Figure 1 to see how to connect the included user-replaceable input harness]. However, some very old receivers must have the wiring sequence in the plastic 3-pin JST connector housing changed on the receiver end.

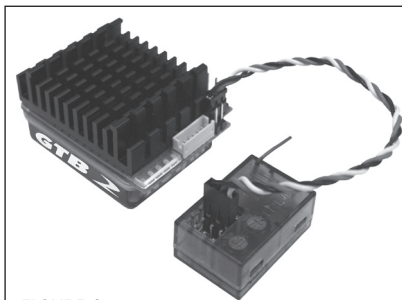


FIGURE 1
Input harness plugged into Ch. 2 of the receiver.

NOTE: 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).

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 speed control gets air flow, it will 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 included double-sided tape, or a tie-wrap, to mount Power Trans-Cap Module to the vehicle's chassis or shock tower. 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

Use the included double-sided tape, and 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.

4. SECURE POWER WIRES

To avoid vibration damage, tie wrap the power wires together or to a point on the vehicle.

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.**



STEP 3-WIRE ESC TO MOTOR

The GTB 2 is compatible with all Novak 540 and 550-sized brushless sensed motors. It is not compatible with brushed or sensorless brushless motors.

1. INSTALL PINION GEAR

Tighten pinion's set screw on flat of motor shaft. Align pinion & spur gears.

2. ADJUST MOTOR FOR PROPER GEAR MESH

A. Adjust the motor position for proper free play. You **NEED** a small amount of play between the pinion gear and the spur gear (about the thickness of a piece of paper)--**check the free play at several positions around the spur gear to ensure a proper mesh (just in case the gears are out of round).**

MAKE SURE THE PINION/SPUR GEAR MESH IS NOT TOO TIGHT!

If gear mesh is too tight, motor shaft breakage can occur.

B. Tighten motor mounting screws--Avoid using excessive force that could break screws or strip the threaded holes in motor.

3. CHECK FOR PROPER GEARING

The brushless motor & ESC should NOT be hotter than 160°F after a 5 minute run. Lower the gearing until both ESC & motor are under this temperature. The cooler the ESC runs, the better the performance of the system.

****Check out our NovaGear App, available on the Apple™ iTunes Store, for help selecting the proper starting points for gearing in your brushless motor applications****

4. SOLDER MOTOR POWER PHASE WIRES TO MOTOR

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 and tin with solder.

B. Place the **BLUE Phase 'A'** motor wire onto motor's 'A' solder tab & solder. Use soldering iron to apply heat to exposed wire; begin adding solder to tip of iron & to wire. Add just enough solder to form a clean & continuous joint from the plated area of solder tab up onto the wire.

C. Solder the ESC's **YELLOW Phase 'B'** motor wire to the motor's 'B' solder tab.

D. Solder the ESC's **ORANGE Phase 'C'** motor wire to the motor's 'C' solder tab.

IMPORTANT NOTE: DO NOT OVERHEAT SOLDER TABS

Prolonged/excessive heating of solder tabs (motor or ESC) will damage PCB. **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.**

5. CONNECT MOTOR SENSOR HARNESS TO ESC

Insert the 6-pin connector of the motor's sensor harness into ESC's sensor harness socket--connector is keyed and only inserts in one direction. Novak offers Shielded Brushless Sensor Harnesses in three lengths: 4"/100mm (Novak #5351), 6"/150mm (Novak #5352) & 9"/230mm (Novak #5353).

BRUSHLESS MOTOR PRECAUTIONS

FACTORY-INSTALLED 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 #5678). Longer wires will decrease performance.

DO NOT USE SCHOTTKY DIODES

Schottky diodes **MUST NOT** be used with reversible ESCs. Schottky diode usage **will** damage the ESC & void warranty.

MOTOR CAPACITORS NOT NEEDED

Novak brushless motors do not require external motor capacitors.

STEP 4-WIRE ESC TO BATTERY

To connect the GTB 2 to the main battery pack using connectors, we suggest low-loss high power connectors like Dean's Ultra Plug.

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

1. INSTALL BATTERY CONNECTOR

- 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.
- Solder the ESC's **RED (+)** battery wire to the connector's **POSITIVE (+)** contact.
- Solder the ESC's **BLACK (-)** battery wire to the connector's **NEGATIVE (-)** contact.
- 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 1-2S LiPo, 1-2S LiFe cells, or 4-6 NiMH cells (1.2 VDC/cell) battery pack.

NOTE: If using NiMH or LiFe batteries, the Voltage Cut-Off Circuitry must be programmed for the appropriate battery type (refer to GTB 2 Track Guide).

STEP 5-ONE-TOUCH PROGRAMMING

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

- TURN ON THE TRANSMITTER'S POWER**
- PRESS & HOLD ESC'S ONE-TOUCH/SET BUTTON**
- TURN ON THE SPEED CONTROL'S POWER**
- CONTINUE HOLDING SET BUTTON UNTIL RED LED COMES ON**
- RELEASE SET BUTTON AS SOON AS LED TURNS RED**
- 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.

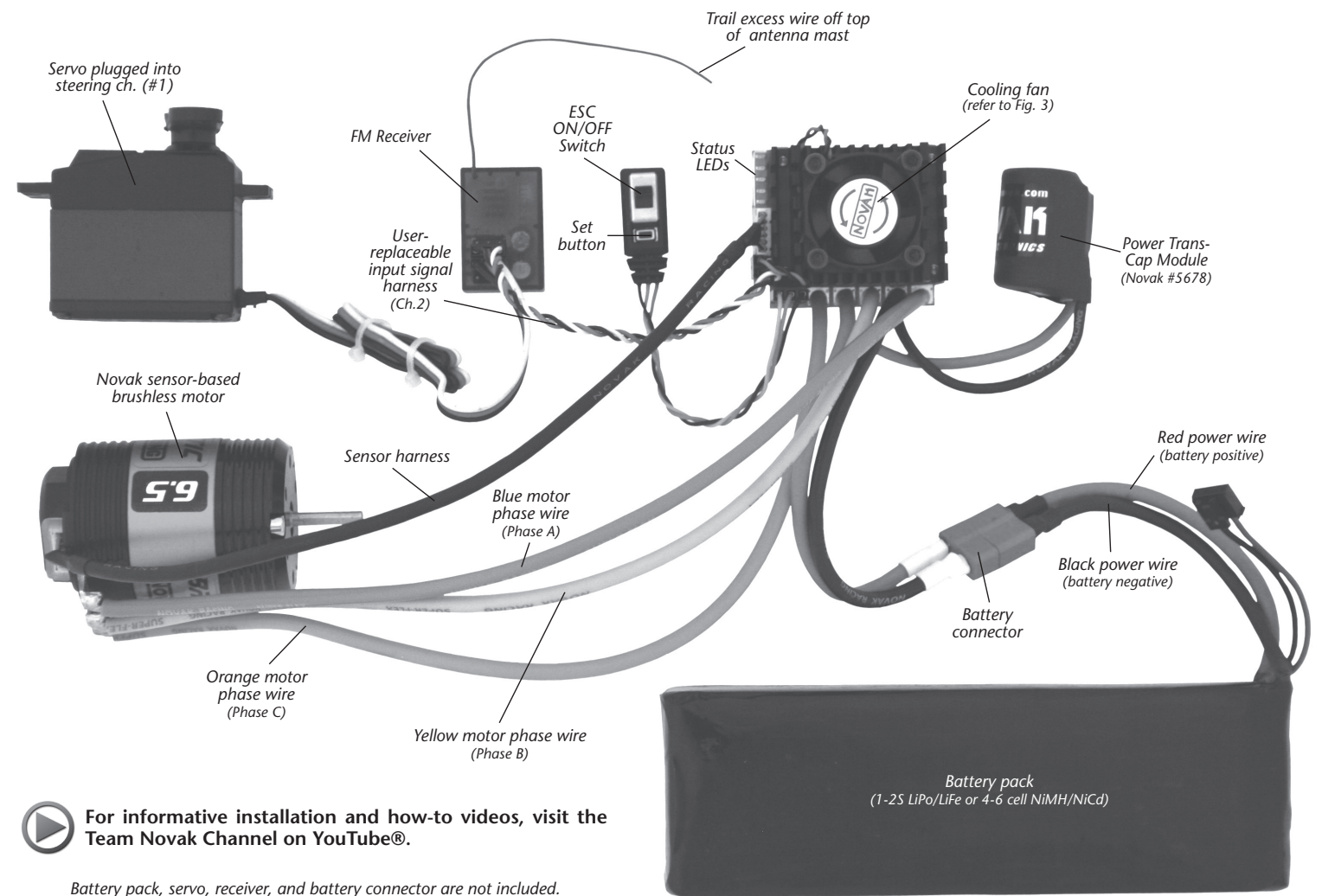
- PUSH TRANSMITTER THROTTLE TO FULL-BRAKE/REVERSE**
- RETURN TRANSMITTER THROTTLE TO NEUTRAL**

The red status LED will **turn solid red**, indicating that speed control 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.

GTB 2 SET-UP PHOTO (FIGURE 2)



For informative installation and how-to videos, visit the Team Novak Channel on YouTube®.

Battery pack, servo, receiver, and battery connector are not included.

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