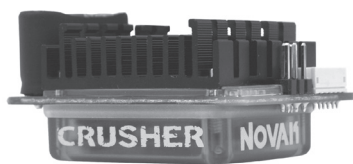


# BASIC SET-UP GUIDE ----- CRUSHER

• Download "CRUSHER FIELD GUIDE (Simple Tuner)" from website for Proper Gearing & Custom Programming •

NOVAK



CRUSHER NOVAK

#55-1834-1 Rev.1  
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## SPECIFICATIONS

Input Voltage .....	2-4S LiPo cells ( <i>External BEC required for 3-4S operation</i> )
Motor Compatibility .....	Sensor-based brushless ( <i>Novak Crawler for Crawler Mode</i> )
Motor Limit (2S).....	6.5T 540-size ( <i>13.5T Crawler</i> ); 4.5T 550-size; 4600 Kv (4-pole)
Motor Limit (3S).....	13.5T 540-size ( <i>18.5T Crawler</i> ); 6.5T 550-size; 3500 Kv (4-pole)
Motor Limit (4S).....	13.5T 540-size ( <i>18.5T Crawler</i> ); 550-size/4-pole not recomm.
ESC Footprint & Height.....	1.16" x 1.47" x 0.96"H ( <i>29.5 x 37.3 x 24.4mm</i> )
ESC Weight ( <i>w/o wires</i> ).....	1.42 ounce ( <i>40.4 grams</i> )
B.E.C. Voltage/Current.....	6.0 volts DC / 5.0 amps
Power Wire ( <i>Battery/Motor</i> ) .....	14G Super-Flex Silicone
On-Resistance .....	0.0004ohm per phase @25°C <i>trans.temp.</i>

The Crusher Brushless ESC includes both Sport Driving and Rock Crawling Modes, 2S-4S operation, RPM Boost Timing to electronically advance the motor timing at full-throttle for explosive top speeds, Novak's Simple-Tuner onboard programming, Novak's exclusive X-Drive, and is compatible with 540-size (standard/Novak Crawling), 550-size, and 4-pole sensor-based brushless motors.

• Please Read All Instructions Carefully Before Operation •

## MULTI PROFILE ESC

The Crusher ESC is equipped with four throttle profiles (3 standard and 1 crawling). Each profile has been designed to suit various needs and are 100% customizable using the Crusher's Simple Tuner firmware.

- **PROFILE 1: Basher (default)** - standard modes of operation w/reverse
- **PROFILE 2: Racer** - Defaults set with no reverse and no timing for "blinky" mode racing. Great starting profile for club/spec racing.
- **PROFILE 3: Timing Test**- Preset with mild timing level, low power brakes and no reverse. Great profile to start with safe timing level.
- **PROFILE 4: Crawling (auto-detect)**- Rock crawling features enabled with used with a Novak Rock Crawling brushless motor only (0 deg. mech. timed)- power hill/hold brakes, instant reverse, & Rock Boost™!

To change or customize the throttle profile, download either the Standard or Crawling Crusher Field Guide (with Simple Tuner) from the DOWNLOADS section of the Novak website ([www.teamnovak.com/downloads](http://www.teamnovak.com/downloads)). There is also a single-page Crusher Throttle Profile Cheat Sheet that can be downloaded.

## PRODUCT WARRANTY

This Brushless ESC is guaranteed to be free from defects in materials or workmanship for a period of 120 days from original purchase date (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 4 LiPo cells input voltage, damage from using motors with too few of turns for the battery being used, damage resulting from using LiPo batteries without Smart-Stop voltage cut-off circuitry active, using insufficient LiPo batteries that cannot supply the amperage 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, incorrect installation of a PowerCap or Power Trans-Cap Module on ESC or operating ESC with a damaged PowerCap, 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 connection & use of ESC 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 ESC & motor is thoroughly tested & cycled before leaving our facility and is, therefore, considered operational. By the act of connecting/operating ESC, 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. Melted ESCs/motors are not covered by the warranty.

Designed by Novak R/C, Inc. in California and assembled with globally sourced components.  
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## 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

Strict adult supervision is required for use by children under 14 years of age.

### SENSOR-BASED BRUSHLESS MOTORS ONLY

Designed for use with 540 & 550-size sensor-based Novak brushless motors.

**For optimal Crawler Mode performance, earlier Novak Ballistic Crawler motors MUST have the mechanical motor timing set to 0°**—Loosen bearing cap & adjust timing to where the sensor harness connector is directly in-line with the center (*Phase B*) solder tab.

### 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!

### 2-4S LiPo CELLS ONLY-Ext. BEC recommended w/Heavy Servo Loading

NEVER exceed 4S LiPo packs (*with the proper turn/kv motors only!*)—Be sure Voltage Cut-Off option is turned ON (*refer to Field Guide*). For NiCd/NiMH, disable Voltage Cut-Off circuitry.

### GOOD QUALITY RADIO & LiPo BATTERIES SUGGESTED

Undesirable radio noise may occur when using lower quality radio systems. **2.4GHz radio system use is best**; high quality FM system is acceptable; AM systems are NOT recommended. LiPo's that can't supply the required amperage can damage electronics & voids warranty.

### UNPLUG BATTERY WHEN NOT IN USE & SWITCH ESC OFF

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

### ALWAYS SWITCH OFF ESC BEFORE CONNECTING BATTERY

If battery is connected with ESC switch in ON position, serious damage can occur.

### DO NOT BUNDLE POWER & SIGNAL WIRES TOGETHER

RF noise in the power wires can adversely effect radio system performance.

### DISCONNECT MOTOR BEFORE BINDING or ONE-TOUCH

Motor may receive full throttle signal if connected to ESC & damage or injury can occur.

### TRANSMITTER ON FIRST

Turn on transmitter power first so you will have control of vehicle when you turn it on.

### INSULATE WIRES & NO REVERSE VOLTAGE!

Insulate exposed wiring with heat shrink tubing or electrical tape to prevent short circuits, & never reverse connect the battery—ESC damage will occur & void warranty.

### POWERCAP REQUIRED/GLITCH BUSTER SUGGESTED

On-Board PowerCaps are installed on ESC & MUST be used at all times to avoid high ESC temperatures & possible damage. Use of a Glitch Buster helps with heavy BEC loading.

### NO CA GLUE

CA glue or fumes can damage internal components of ESC & cause premature failure.

## ACCESSORIES

### PLUG-IN INPUT SIGNAL HARNESS (JST-JST) [Novak kits #5315 & #5320]

Input signal harness with JST connector on both ends--4.5" (#5315), 9" (#5320).

### 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--4" (#5351), 6" (#5352), 9" (#5353).

### 3A HIGH-VOLTAGE UNIVERSAL BEC (2-7S) [Novak kit #5463]

Supplies 6.0V / 3A of power to receiver & servo for extra performance under heavy loads.

### SUPER-FLEX SILICONE 14GA WIRE SET [Novak kit #5508]

Two each of 9" length black, red, blue, yellow, and orange 14GA wire.

### ESC POWER SWITCH HARNESS [Novak kit #5600]

Includes replacement ON/OFF Power Switch with stripped & tinned wire harness.

### GLITCH BUSTER CAPACITOR [Novak kit #5626]

**\*HIGHLY RECOMMENDED\***

Supplies reserve power to receiver during spikes of heavy servo load to avoid drop-out.

### 25x25x10mm COOLING FANS [Novak kits #5647 & #5651]

Cooling fans with JST power plug. Single fan (#5647), 2-pack of fans (#5651).

### 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, #5832, #5836]

3% Silver solder for high-conductivity--6gr (#5831), 15gr (#5832), HD 25gr (#5836).

### MOUNTING TAPE 25x35mm [Novak kit #5840 & #5841]

Cushioned, double-sided tape for mounting electronics--10pc (#5840), 100pc (#5841).

### HEAT SHRINK TUBING [Novak kit #5850 & #5851]

6" long heat shrink tubing in six sizes: 1/16" - 3/8"--6pc kit (#5850), 24pc kit (#5851).

## EXTERNAL BEC CONNECTION

To install Novak BEC (*Novak #5463 recommended*):

1. Connect BEC's main power input leads (*heavier gauge silicone wires*) to ESC's Positive & Negative battery solder tabs (*RED to Pos, BLACK to Neg*).
2. Plug the BEC's receiver power output lead into any open channel of your receiver.
3. Remove the RED wire from the plug plastic on the ESC's receiver input signal harness--Insulate removed wire to avoid short circuits, as it is "live".
4. Turn ON the BEC's power switch, then turn ON the ESC's power switch.

To turn the system's power OFF, turn off the ESC's power switch then turn off BEC.

To install a non-Novak BEC, follow manufacturer's instructions.

## STEP 1-MOUNT ESC

Mount the ESC so the power wires are as far away from other electronics as possible, and they will not interfere with the vehicle's moving parts. Select a location with good airflow for cooling the ESC for efficient operation.

### 1. MOUNT SPEED CONTROL IN VEHICLE

Use the included double-sided tape to mount ESC in vehicle (*do not use glue*). Avoid contact with side walls or chassis components to avoid vibration damage. Be sure receiver & antenna are mounted as far from ESC, power wires, battery, and servo as possible--These components all emit RF noise.

Note: Mount antenna as close to receiver as possible--trail excess wire off top of antenna mast (cutting/coiling excess wire reduces radio range--2.4GHz too).

### 2. INSTALL ON/OFF SWITCH

Use included double-sided tape or a screw to mount switch that will be easy to access--select a place where it will not get damaged/switched OFF in a crash.

### 3. SECURE POWER WIRES TO AVOID DAMAGE

Use the included tie-wraps to secure the ESC's power wires together or to a point on the vehicle to avoid possible damage to wires & solder joints.

## STEP 2-CONNECT MOTOR/BATTERY

### MOTOR CONNECTION

#### 1. SELECT PROPER MOTOR FOR OPTIMUM PERFORMANCE

The ESC's Crawler Mode ONLY works with Novak Ballistic Crawler brushless motors set to 0° mechanical timing (Sensor harness opening of back bearing cap should be directly inline with Phase B solder tab). The ESC's Standard Modes (Profiles 1-3) work best with Novak brushless motors set to 30° mechanical timing.

#### 2. INSTALL PINION GEAR & ADJUST MOTOR FOR PROPER GEAR MESH

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

- You NEED a small amount of play between the pinion & spur gear (about thickness of a piece of paper)--check free play at several points around spur gear to ensure a proper mesh (Make sure gear mesh is NOT TOO TIGHT).
- Tighten motor mounting screws--Avoid using excessive force that could break screws or strip the threaded holes in motor.

#### 3. CHECK FOR PROPER GEARING DURING INITIAL RUNS

The brushless motor & ESC should NOT be hotter than 160°F after a 5 minute run--Lower the gearing (& check drive train for problems) if temps are higher.

#### 4. CONNECT ESC'S MOTOR POWER PHASE WIRES TO MOTOR

- Solder the speed control's Phase 'A' silicone motor power wire to the motor's Phase "A" solder tab.
- Solder the ESC's Phase 'B' motor wire to the motor's Phase "B" solder tab.
- Solder the ESC's Phase 'C' motor wire to the motor's Phase "C" solder tab.

#### 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.

### BATTERY CONNECTION

#### 1. CONNECT ESC'S BATTERY CONNECTOR TO BATTERY PACK

Solder the ESC's RED & BLACK battery power wires to a battery connector, and connect ESC to a fully charged battery pack.

Use low-loss high power connectors like Novak Power Connector.

- Use polarized connectors. Reverse voltage will damage ESC & void warranty.
- Use a female connector on battery packs to avoid shorting of exposed contacts.
- Insulate all exposed wiring connections to avoid shorting.

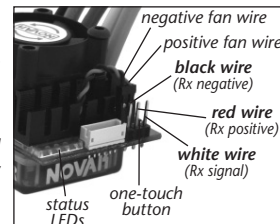
Voltage Cut-Off Circuitry must be turned OFF if using NiMH/NiCd batteries. External BEC is Recommended for 3-4S Usage with High-Power Servos!

## STEP 3-CONNECT RECEIVER

### RECEIVER CONNECTION

The ESC has a user-replaceable input signal harness with the industry-standard JST connector on both ends of it.

ESC works with all major brand's new receivers (very old receivers need wiring sequence changed in plastic plug on receiver end--Damage may occur if sequence is incorrect). For instructions on changing the wiring sequences, visit our web site.



#### 1. CONNECT RECEIVER HARNESS TO Rx PINS ON ESC

Insert the JST connector of receiver input harness onto the receiver harness 3-pin header on the ESC. White wire goes on the left side pin as shown above.

#### 2. CONNECT RECEIVER HARNESS TO RECEIVER

Insert 3-pin connector of receiver harness into Ch.2 (throttle) slot of receiver.

#### 3. INSTALL 25mm COOLING FAN ON ESC (OPTIONAL)

Press fan screws through 2 of the holes along one edge of the fan and into the 1st gap of ESC heat sink fins. Plug fan connector onto ESC's fan pins--note polarity.

#### 4. CONNECT GLITCH BUSTER CAPACITOR TO RECEIVER (OPTIONAL)

The Glitch Buster helps provide reserve power when using the built-in BEC with power hungry servos. Insert JST connector into any open slot of receiver--note polarity.

## STEP 4-ONE-TOUCH SET-UP

With at least 2 of the Motor Power Wires disconnected & ESC connected to a charged battery pack, the receiver, & the motor's sensor harness:

- WITH THE ESC OFF, TURN ON THE TRANSMITTER'S POWER
- PRESS & HOLD ESC'S ONE-TOUCH/SET BUTTON
- TURN ON THE SPEED CONTROL'S POWER

With transmitter at neutral (still pressing SET button), slide ESC's 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 green status LED turns solid green. (Motor won't run during programming).

#### 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 speed control is at neutral and that proper programming has been completed.

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

NOTE: ESC will NOT revert back to factory-default settings when the One-Touch Set-Up is performed. Refer to the 'Data Reset' feature in the CRUSHER FIELD GUIDE-Simple Tuner (available at [www.teamnovak.com/downloads](http://www.teamnovak.com/downloads))

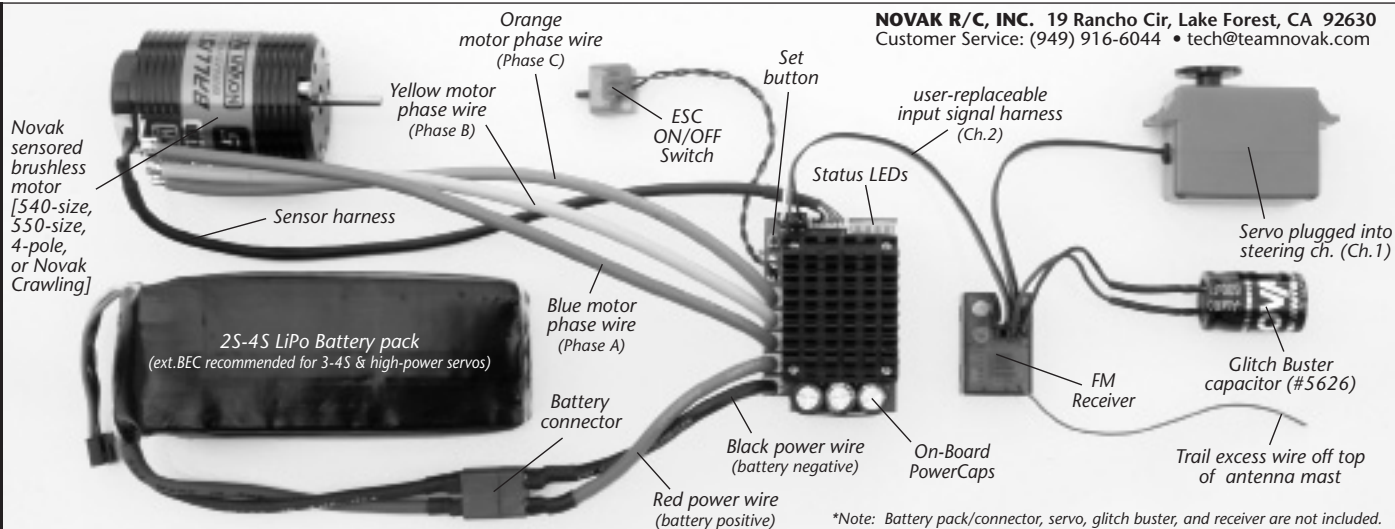
## TRANSMITTER ADJUSTMENTS

Transmitter adjustments may not be required to properly complete the One-Touch programming. If you have any problems with the programming, adjust your transmitter settings as listed below and repeat ONE-TOUCH PROGRAMMING.

### THROTTLE CHANNEL ADJUSTMENTS

- Set HIGH ATV or EPA to 100%. [amount of throw at full throttle]
  - Set LOW ATV, EPA, or ATL to 100%. [amount of throw at full brakes]
  - Set EXPONENTIAL to zero setting. [throttle channel linearity]
  - Set THROTTLE CHANNEL REVERSING SWITCH to either position.
  - Set THROTTLE CHANNEL TRIM to middle. [adjusts neutral position]
  - Set ELECTRONIC TRIGGER THROW to 70% throttle/30% brake (or 7:3)--best for racing. Set to 50%/50% for full time use with reverse for best performance.
  - Set MECHANICAL TRIGGER THROW to 2/3 throttle and 1/3 brake throw position.
- NOT ALL TRANSMITTERS HAVE ALL OF THESE ADJUSTMENTS•

SET-UP PHOTO



\*Note: Battery pack/connector, servo, glitch buster, and receiver are not included.

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