



## User Manual

### RC Electric Parts' Electric Speed Controller (ESC) for Brushless Motors

Thank you for using RC Electric Parts' ESC designed to meet your hobbies needs. As you'll find the ESC's settings are programmable with lots of features. If you have any issues with your product feel free to contact us at [RCElectricParts@gmail.com](mailto:RCElectricParts@gmail.com) and we'd be happy to help you!

## 01 Main Features

- The ESC uses a powerful high-performance microcontroller processor which supports programmable settings to meet the user's needs.
- Supports high RPM motors
- Maintains a desired constant RPM
- Designed to reduce interference
- Starting speed can be set
- Throttle response is very quick, stable, and linear.
- Designed for fixed wing airplanes and helicopters.
- Low-voltage values can be set.
- Integrated SBEC provides high current efficiently with little heat loss
- Abnormal input voltage protection, low voltage protection, and cut's power when lost signal

- Overheat protection: Output power will reduce to half power when temperature reaches 100° C (212° F) and return to full power when temperature is under 100° C
- Safety Protection: ESC will not power motor unless the throttle stick is in the minimum throttle position
- ESC can be programmed via the transmitter on startup or using a programming card (Sold separately)
- ESC beeps motor during startup to confirm number of battery cells for power input.
- RC Electric Parts has intellectual property on the product and can be updated and upgraded. The product can also be made to customers' specifications.

## 02 Product Specifications

Model	Continuous Current	Burst Current (10 sec)	BEC	BEC Type	LiPo Cells	Ni-MH Cells	SIZE (mm)	Weight
30A ESC	30A	40A	5V / 3A	UBEC	2 - 4S	5 - 12S	53 x 25 x 11	33g
40A ESC	40A	60A	5V / 3A	UBEC	2 - 4S	5 - 12S	66 x 27 x 13	44g
60A ESC	60A	80A	5.5V / 4A	UBEC	2 - 4S	5 - 12S	68 x 36 x 20	68g

\*Size and weight are for reference only and may slightly vary

**BEC:** Means there is a regulator that steps down the input battery voltage to power the receiver and everything that plugs into the receiver. SBEC & UBEC are a type of BEC.

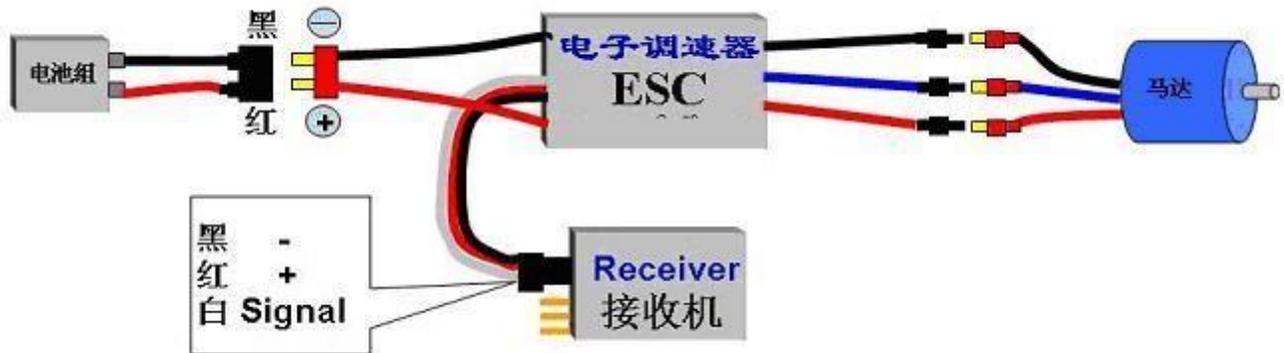
**UBEC:** Switching power regulator, very efficient, and produces minimal heat.

**SBEC:** Linear power regulator, most common in ESCs, not as efficient, and produces a lot of heat

**OPTO:** No BEC is provided and a separate BEC is required to power the receiver

## 03 Wiring Diagram

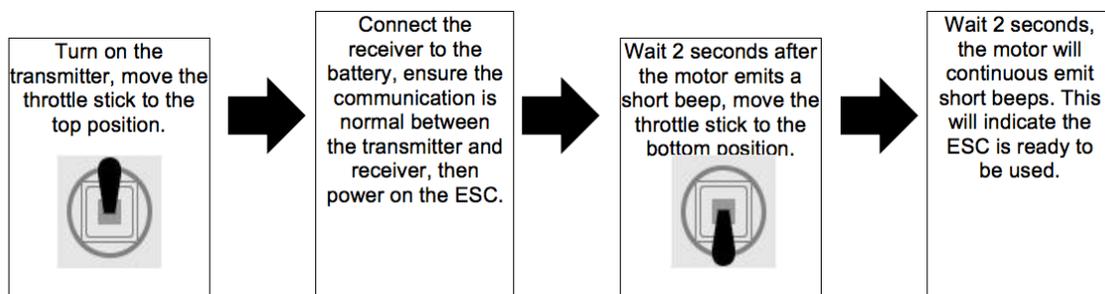
\*Please ensure all solder joints are insulated with heat shrink where necessary.



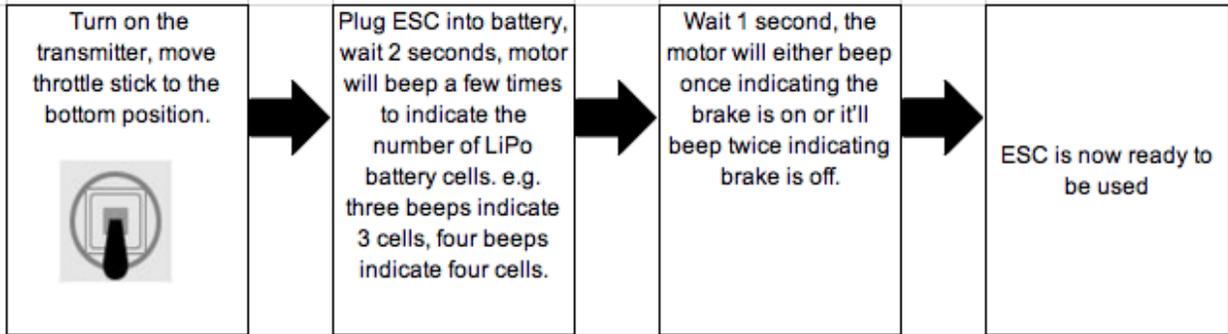
## 04 First Time Use

When using the ESC for the first time or switching transmitters a “Throttle Range Calibration” procedure will need to be done. This will set the minimum and maximum throttle range for the ESC and will ensure a stable linear throttle response.

### 1. Throttle Range calibration

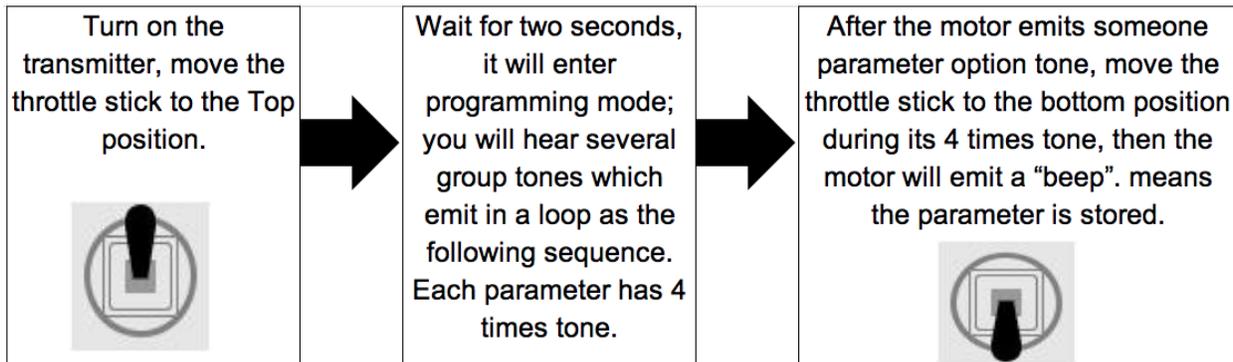


### 2. Normal start-up



## 05 Programming Instructions

\* The ESC can be programmed using the transmitter or an RC Electric parts Programming Card (Sold Separately). Both methods work but using a programming card is easier.



### Settings / Parameters Table

\*The motor will need to be connected in order for the ESC to make the beeps.

- A = one short beep ( - )
- B = three continuing beeps ( - - - )
- C = gradual changing sound + beep ( ~ - )
- D = low beep ( ∨ )
- E = long beep ( — )
- = pause

Parameter	Settings	Tone Sequence
1	Throttle Range Calibration	A - A - A - A
2	Brake	B - B - B - B

3	Battery Type	NiMH / NiCad Battery	C - C - C - C
4		LiPo / Li-ion	D - D - D - D
5	Low Voltage Protection ("For LiPo / Li-ion" or " for NiMH / NiCad Battery")	Low (2.8V or 50%)	E - E - E - E
6		Med (3.0V or 65%)	AA - AA - AA - AA
7		High (3.2V or 75%)	BB - BB - BB - BB
8	Reset to factory default settings		CC - CC - CC - CC
9	Timing	Automatic	DD - DD - DD - DD
10		Low (7 - 22°)	EE - EE - EE - EE
11		High (22 - 30°)	AAA - AAA - AAA - AAA
12	Motor Start-up Speed	Very Smooth (1.5 sec)	BBB - BBB - BBB - BBB
13		Smooth (1 sec)	CCC - CCC - CCC - CCC
14		Accelerated Start-up (0 sec)	DDD - DDD - DDD - DDD
15	Helicopter Mode	Off	EEE - EEE - EEE - EEE
16		Helicopter Mode 1	AAAA - AAAA - AAAA - AAAA
17		Helicopter Mode 2	BBBB - BBBB - BBBB - BBBB
18	Motor Rotation Direction		CCCC - CCCC - CCCC - CCCC
19	PWM Frequency	8K	DDDD - DDDD - DDDD - DDDD
20		16K	EEEE - EEEE - EEEE - EEEE
21	Low Voltage Protection Mode	Reduce Power	AD - AD - AD - AD
22		Hard Cutoff	AE - AE - AE - AE

## 1. Programming the ESC using the transmitter

There are five different types of tones symbolized by a letter e.g. "A", "B", etc. Once you enter the ESCs programming mode, the ESC will consecutively go through the programmable settings starting with parameter #1 through parameter #22 and will not repeat. To recycle through the parameters, repower the ESC. To determine which parameter the ESC is currently selecting, listen to the tone sequence. When the parameter is selected you can activate it by moving throttle to the zero-throttle position. You can alternatively check out our programming videos (May not be available yet).

### An Example on how to turn the brake on/off

Turn on the transmitter and move the throttle to the full throttle position. Powerup the ESC and wait a couple of seconds. The ESC may make a short beep. Wait for the ESC to make "A – A – A – A" set of tones which is four short beeps. This indicates that IF the throttle stick was moved the zero-throttle position it would do a throttle range calibration. However, this isn't the desired setting to be changed. The brake setting is parameter #2 which means to change the setting we'll need to wait for the second set of tones to complete. So, we'll wait a couple more seconds until the ESC makes a "B –

B – B – B” set of tones which is four sets of three continuing beeps. Once it has finished making the tones move the throttle to the zero-throttle position. If the brake was off before it’ll turn the brake on and if the brake was on before it’ll turn it off. Wait for the ESC to beep which confirms that the ESC has saved the new settings. Now unplug the ESC and it’ll be ready for use. If other settings are desired to be changed simply repeat the procedure for each setting individually.

## 2. Programming the ESC using the programming card

To program the ESC using the programming card is simple.

# 06 Programmable Settings

**1. Throttle Range Calibration:** See “1. Throttle Range Calibration” under “04 First Time Use”

### 2. Brake: On / Off

**On:** The propeller will stop immediately when the throttle stick is moved to the neutral position.

**Off:** The propeller will be able to freely spin when the throttle stick is moved to the neutral position.

### 3. Battery type LiPo / Li-ion or NiMH / NiCad

**NiMH / NiCad:** Set protection point for NiCad / NiMH battery type.

\*Note: The selection of NiMH / NiCad battery will make the ESC automatically set the cutoff voltage at 65% (Factory default). The cutoff voltage can be modified through the low voltage parameter. When the NiMH / NiCad battery connects to the ESC, the ESC will read its initial voltage. The voltage will be used as a reference value for the cutoff voltage. E.g. 65% of the initial voltage.

**LiPo / Li-ion:** Set protection point for LiPo / Li-Ion battery type and detect number of cells automatically in the battery pack. Cutoff voltage will be based on the set cutoff voltage parameter and can be modified through the cutoff voltage parameter.

**4. Battery protection: Low (2.8V or 50%) / Medium (3.0V or 65%) / High (3.2V or 75%)**

**Ni-xx (NiMH / NiCad) battery pack:** Set the cutoff voltage 50% (Low) / 65% (Medium) / 75% (High) of the initial voltage (The voltage the ESC reads when the battery pack is plugged in).

**Li-xx (LiPo / Li-Ion) battery pack:** Set the cutoff voltage per cell 2.8V (Low) / 3.0V (Middle) / 3.2v (High). E.g. A 4s battery cutoff voltage will be 11.2V for Low, 12.0V as Medium, and 12.8V as High.

### 5. Recover to factory default setting.

*Factory default settings are as follows:*

Settings	Default Parameter
Brake	Off
Type of Battery	LiPo / Li-Ion Battery
Low Voltage Protection	Medium / 3.0V / 65%
Timing	Automatic
Start-up	Smooth
Helicopter Mode	Off
Motor Rotation Direction	Normal
PWM Frequency	8kHz
Protection Mode for Low Voltage	Reduce Power

### 5. Timing: Automatic / Low / High

**Automatic:** The ESC will detect the most suitable motor timing automatically.

**Low (7 – 22 degrees):** Suitable for most inrunner motors.

**High (22 – 30 degrees):** Suitable for most outrunner motors.

\*Note: Under most cases, the Automatic setting is suitable for all motors. However, in order to increase efficiency, we recommend using low timing for 2 poles (generally inrunner motors) and using high timing for 6 and more poles (generally outrunner motors). We

recommend using the recommended timing for the motor or “Automatic” setting when uncertain.

## **6. Start-up: Very Smooth / Smooth / Accelerated Startup**

**Very Smooth:** 1.5 second linear throttle lag response time between starting the motor and full motor speed. This setting can prevent a gearbox from stripping under instantaneous load. This setting is recommended for geared motors or slow startups

**Smooth:** 1 second linear throttle lag response time between starting the motor and full motor speed. This setting is recommended for geared motors or slower startups.

**Accelerated Startup:** Zero throttle lag response time between starting the motor and full motor speed. This setting is recommended for direct drive motors and zero delay startups.

## **7. Helicopter Modes: Off / Mode 1 / Mode 2**

**Off:** Turns off Helicopter Mode.

**Helicopter Mode 1:** Delays throttle response time between zero-throttle position and full throttle position by 5 seconds.

**Helicopter Mode 2:** Delays throttle response time between zero-throttle position and full throttle position by 15 seconds.

\*Note: This mode is slightly different than the Start-up mode. It'll only delay the throttle lag response time when the throttle is in the zero-throttle position for a few seconds and then the throttle stick is immediately moved to the full throttle position. Otherwise the throttle will respond normally based on the programmed “Start-up” parameter. If the Helicopter Mode is turned on the “Brake” setting will be reset to “Off” and the “Protection Mode for Low Voltage” setting will be reset to “Reduce Power”.

## **8. Motor Rotation Direction: Clockwise / Counterclockwise**

\*Note: The motor rotation direction can be reversed by swapping any two of the three bullet plug connections. However, if you've soldered the connection between the ESC and Motor you can alternatively program the ESC to reverse the motor direction.

## **9. PWM Frequency: 8kHz / 16kHz**

**8kHz:** Is the PWM Frequency for a motor with 2 poles, usually an inrunner motor. However, the 16 kHz frequency can provide more power but will also cause more Electromagnetic Interference (EMI). Therefore, the default setting is 8kHz.

**16kHz:** Is the PWM frequency for a motor with more than 2 poles, usually an outrunner motor.

## 10. Protection Mode for Low Voltage: Reduce Power / Hard Cutoff

**Reduce Power:** The ESC will reduce the motors output power when the set “Low Voltage Protection” mode is reached to protect the battery from over discharging but still giving enough power to return the ESC. This parameter is recommended.

**Hard Cutoff:** The ESC will completely shut off the motors output power when the set “Low Voltage Protection” mode is reached to protect the battery from over discharging.

## 07 ESC Protections

### Start-up Protection

If the motor fails to startup normally in two seconds after push the throttle to start the ESC will cut off the motor. The throttle shall be reset to commence a restart. Possible reasons: there is a disconnection or poor contact in wiring between the ESC and motor. The propeller is stemmed by other objects. The speed reduction gear is badly blocked.

### Overheat Protection

When the working temperature in the ESC is higher than 100°C, the ESC will reduce the output power automatically to commence protection, but will reduce the output power to 40% of full power to reserve some power for motor and avoid crash landing instead of turning off all output power. The ESC will recover to max power as the temperature falls.

### Loss of Throttle Signal Protection

The ESC will reduce the output power to motor when the ESC detect that there are 2 seconds' lost of throttle signals. If there another 2 seconds' lost of throttle signals, the ESC will cut off motor automatically. If the throttle signals recover during the Throttle Signal reduction of output power of motor, the ESC will recover control of throttle at once. In this method, in the case of momentary lost of signals (within 2 seconds), the ESC Loss Protection will not commence the protection of throttle. Only when the control signals have been lost for a long time, the ESC will

commence protection. However, the ESC will reduce the output power gradually instead of cutting off output power immediately so that the players will have certain period to rescue the machine. It has both safety and practicability

### Low Voltage Protection

- The warning tone: The warning tone is set as audible sound to help users judge abnormal condition after turn on the power. 1. Fail to enter working mode after turn on the power: the routine of throttle has not been set yet. 2. Continuing beeps: the pull rod of throttle is not in the lowest position. 3. There is a short pause after a beep: the ESC can not detect normal throttle signals from receiver. 4. There is a pause of one second after a beep: the voltage of battery pack is out of acceptable limit (once the battery is connected, the ESC will carry out a self-checking and check the voltage of battery.)

## 08 Attention

Please pay attention to the following safety information when using.

- Never disassemble any electro components in the ESC by yourself, or permanent damages or lost of information will occur.
- Check the setting of receiver. Do not install propeller or small driving gear on motor if you haven't confirm that the setting of receiver is correct when test the ESC and motor for the first time.
- Do not use cracked or broken battery pack.
- Do not use battery pack easily get overheat.
- Do not use short-cut battery.
- Do not use cable insulation material against standards.
- Do not use cable connector against standards.
- The number of battery or servo system shall not exceed the rules for ESC.
- The voltage of battery shall not exceed the scope of working voltage of ESC.
- Pay attention to the polarities of battery. Wrong polarities will damage the ESC.
- Be sure that the ESC will not use in manned craft or other manned machines.
- Do not place the ESC in moist or over exposure.
- Do not take out battery when the motor is working, for the generated large peak current will damage the ESC.
- Do not pack anything outside the ESC. Install the ESC in places with good ventilation and heat dissipation as far as possible.