

User Manual Series Brushless Speed Controller

Thank you for purchasing this HOBBYWING product! Brushless power systems can be very dangerous. Any improper use may cause personal injury and damage to the product and related devices. We strongly recommend reading through this user manual before use. Because we have no control over the use, installation, or maintenance of this product, no liability may be assumed for any damages or losses resulting from the use of the product. We do not assume responsibility for any losses caused by unauthorized modifications to our product. Besides, we have the right to modify our product design, appearance, features and usage requirements without notification. We, HOBBYWING, are only responsible for our product cost and nothing else as result of using our product.

01 Warnings

- ◆ Read through the manuals of all power devices and aircraft and ensure the power configuration is rational before using this unit.
- ◆ Ensure all wires and connections are well insulated before connecting the ESC to related devices, as short circuit will damage your ESC. Ensure all devices are well connected, in order to prevent poor connections that may cause your aircraft to lose control or other unpredictable issues like damage to the device. If necessary, please use a soldering iron with enough power to solder all input/output wires and connectors.
- ◆ Never get the motor locked up during high-speed rotation, otherwise the ESC may get destroyed and may also get your motor damaged. (Note: move the throttle stick to the bottom position or disconnect the battery immediately if the motor really gets locked up.)
- ◆ Never use this unit in the extremely hot weather or continue to use it when it gets really hot. Because high temperature will activate the ESC thermal protection or even damage your ESC.
- ◆ Always disconnect and remove batteries after use, as the ESC will continue to consume current if it's still connected to batteries. Long-time contact will cause batteries to completely discharge and result in damage to batteries or/and ESC. This will not be covered under warranty.

02 Features

- ESC which features a high performance 32-bit ARM M0 microprocessor (with a running frequency of up to 96MHz) is compatible with various brushless motors.
- DEO (Driving Efficiency Optimization) Technology greatly improves throttle response & driving efficiency and reduces ESC temperature.
- Separate programming cable for connecting ESC to a LED program box and allows users to program the ESC anytime, anywhere. (For detailed info, please refer to the user manual of HOBBYWING LED program box.)
- Normal/Reverse brake modes (esp. reverse brake mode) can effectively shorten the landing distance for the aircraft.
- Search mode can help users find the aircraft by the alarm beeps after the aircraft falls into the complex environment.
- Multiple protection features like start-up, ESC thermal, capacitor thermal, over-current, over-load, abnormal input voltage and throttle signal loss effectively prolong the service life of the ESC.

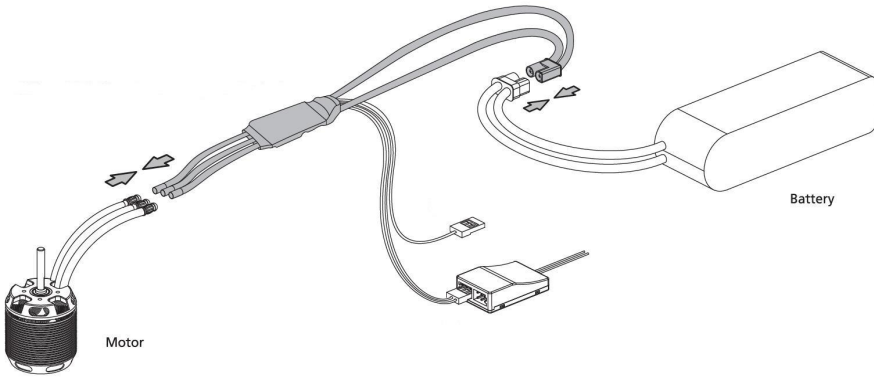
03 Specifications

Model (Regular)	Cont. Current	Peak Current	Input Voltage	BEC Output	Weight	Size (L*W*H)
Skywalker 15A V2	15A	30A	2-3S LiPo	5V @ 2A (Linear-mode)	10g	38*17*5mm
Skywalker 20A V2	20A	40A	2-3S LiPo	5V @ 3A (Linear-mode)	20g	45*23*8mm
Skywalker 30A V2	30A	50A	3-4S LiPo	5V @ 5A (Switch-mode)	33g	60*25*8mm
Skywalker 40A V2	40A	60A	3-4S LiPo	5V @ 5A (Switch-mode)	36g	60*25*8mm
Skywalker 50A V2	50A	70A	3-4S LiPo	5V @ 5A (Switch-mode)	36g	60*25*8mm
Skywalker 50A-6S V2	50A	70A	3-6S LiPo	5V @ 6A (Switch-mode)	68g	73*30*12mm
Skywalker 60A V2	60A	80A	3-6S LiPo	5V @ 7A (Switch-mode)	68g	73*30*12mm
Skywalker 80A V2	80A	100A	3-6S LiPo	5V @ 7A (Switch-mode)	79g	85*36*9mm
Skywalker 100A V2	100A	120A	3-6S LiPo	5V @ 7A (Switch-mode)	92g	85*36*9mm

04 User Guide

Attention! The default throttle range of this ESC is from 1100µs to 1940µs (Futaba's standard); users need to calibrate the throttle range when they start to use a new SKYWALKER brushless ESC or another transmitter.

I. Connections



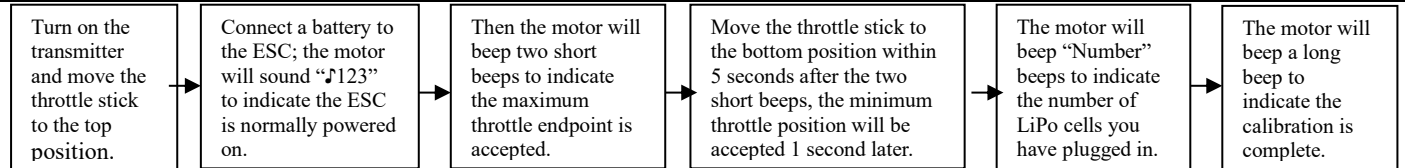
Signal cable description:

Throttle Signal Cable (White/Red/Black Tri-color Cable): plug it into the TH channel on the receiver or flight controller. The White wire is for transmitting throttle signals, the Red & Black wires are BEC output wires.

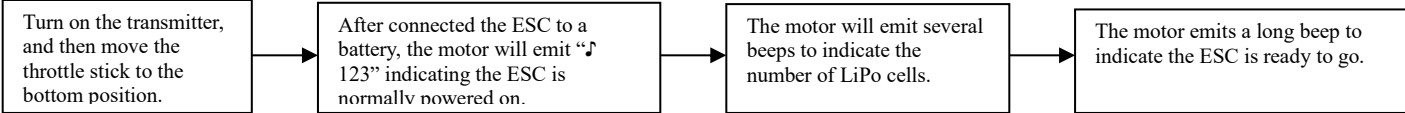
Reverse Brake Signal Wire (Yellow Wire): it must be plugged into any vacant channel on the receiver (when using the Reverse Brake mode) to control the ON/OFF of the Reverse Brake function.

Programming Cable (Yellow Cable): connect it to a LED program box if users want to program the ESC.

II. ESC/Radio Calibration



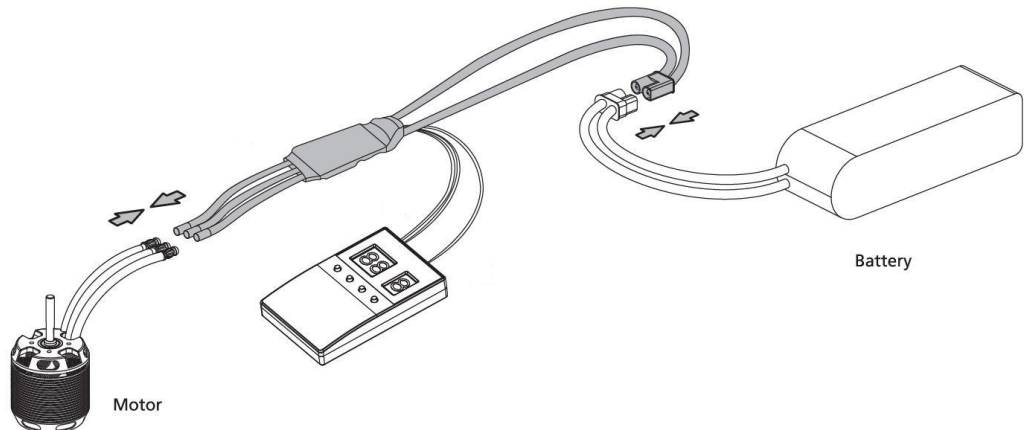
III. Normal Start-up Process



05 ESC Programming

I. Program your ESC with a LED Program Box

Wiring :



1). Plug the programming cable (on your ESC) into the programming port on the LED program box.

Note: Need plug the throttle signal cable into the power port on the LED program box and the programming wire (yellow wire) into the programming port on the LED program box.

2). (With a battery connected to your ESC), after connected a LED program box to the ESC, you need to disconnect the battery first and then reconnect it to the ESC to enter the programming mode, check and set parameters.

The portable program box is an optional accessory applicable for field use. Its friendly interface makes the ESC programming easy and quick. Connect a battery to your ESC after connecting a LED program box to the ESC, all programmable items will show up a few seconds later. You can select the item you want to program and the setting you want to choose via "ITEM" & "VALUE" buttons on the program box, and then press the "OK" button to save all new settings to your ESC.

Attention! You need to power your ESC off and then on after adjusting parameters. Otherwise, new parameters won't take effect.

II. Program your ESC with the Transmitter

It consists of 4 steps: Enter the programming → Select parameter items → Select parameter values → Exit the programming

I. Enter the Programming

Turn on the transmitter, move the throttle stick to the top position, and connect a battery to the ESC, 2 seconds later, the motor will beep "B-B-" first, then emit 56712 5 seconds later to indicate that you are in the ESC programming mode.



II. Select Parameter Items

After entering the programming, you'll hear the following 12 kinds of beeps circularly. Move the throttle stick to the bottom position within 3 seconds after you hear some kind of beeps, you'll enter the corresponding parameter item.

1. "B-"	Brake Type	(1 Short B)	7. "B——B-B-"	Timing	(1 Long B & 2 Short Bs)
2. "B-B-"	Brake Force	(2 Short Bs)	8. "B——B-B-B-"	Active Freewheeling	(1 Long B & 3 Short Bs)
3. "B-B-B-"	Voltage Cutoff Type	(3 Short Bs)	9. "B——B-B-B-B-"	Search Mode	(1 Long B & 4 Short Bs)
4. "B-B-B-B-"	LiPo Cells	(4 Short Bs)	10. "B——B——"	Factory Reset	(2 Long Bs)
5. "B——"	Cutoff Voltage	(1 Long B)	11. "B——B——B-"	Exit	(2 Long Bs & 1 Short B)
6. "B——B-"	Start-up Mode	(1 Long B & 1 Short B)			

Note: A long "B——" equals to 5 short "B-", so a long "B——" and a short "B-" represent the 6th item in "Select Parameter Items".



III. Select Parameter Values

The motor will beep different kinds of beeps circularly, move the throttle stick to the top position after you hear some kind of beeps will get you to the corresponding parameter value, then you'll hear the motor emit "1515" to indicate the value is saved, then get back to "Select Parameter Items" and continue to select other parameter items that you want to adjust.

Items	Values (Bs)	1 B-	2 B-B-	3 B-B-B-	4 B-B-B-B-	5 B--
1	Brake Type	Disabled	Normal	Reverse	Linear Reverse	
2	Brake Force	Low	Medium	High		
3	Voltage Cutoff Type	Soft	Hard			
4	LiPo Cells	Auto Calc.	2S	3S		
			3S	4S	5S	6S
5	Cutoff Voltage	Disabled	Low	Medium	High	
6	Start-up Mode	Normal	Soft	Very Soft		
7	Timing	Low	Medium	High		
8	Active Freewheeling	On	Off			
9	Search Mode	Off	5min	10min	15min	



VI. Exit the Programming

Move the throttle stick to the bottom position within 3 seconds after you hear "Two long and One short beeps" (emitting from the motor) can get you exit the programming mode. The motor beeps "Number" beeps to indicate the number of LiPo cells you have plugged in, and then a long beep to indicate the power system is ready to go.

06 Programmable Items

Items	Values	1	2	3	4	5
1	Brake Type	*Disabled	Normal	Reverse	Linear Reverse	
2	Brake Force	*Low	Medium	High		
3	Voltage Cutoff Type	*Soft	Hard			
4	LiPo Cells	*Auto Calc.	2S	3S		
			3S	4S	5S	6S
5	Cutoff Voltage	Disabled	Low	*Medium	High	
6	Start-up Mode	*Normal	Soft	Very Soft		
7	Timing	Low	*Medium	High		
8	Active Freewheeling	*On	Off			
9	Search Mode	*Off	5min	10min	15min	

Note: Those values marked with * in the form below are the factory default settings.

1. Brake Type

1.1 Normal Brake

After selected this option, the brake function will be activated when you move the throttle stick to the bottom position. In this mode, the brake amount equals to the brake force you've preset.

1.2 Reverse Brake

After selected this option, the Reverse Brake signal wire (its signal range must be the same as the throttle range) must be plugged into any vacant channel on the receiver, and you can control the motor direction via that channel. The channel range of 0-50% is the default motor direction, and the channel range of 50% to 100% will cause the motor to spin counterclockwise. The channel stick should be within the channel range of 0-50% (0 would be better) when the first time you power on the ESC. After the Reverse function is activated, the motor will stop first and then spin in the reversed direction and then increase to the speed corresponding to the throttle input. Either signal loss, no matter reverse brake signal loss or throttle signal loss during the flight, can cause the throttle signal loss protection to be activated.

1.3 Linear Reverse Brake

After selected this option, the Reverse Brake signal wire must be plugged into any vacant channel on the receiver, and you can control the motor direction via that channel. This channel should be set to a linear switch (usually a knob on the transmitter). Turn the linear channel switch to activate the reverse function. The speed of the motor is controlled by the linear channel switch. When reversed, the initial throttle value is started at 10%, and the throttle stroke of the linear switch is cured to 1.34ms-1.79ms. The channel stick should be at 0% throttle position when the first time you power on the ESC. Either signal loss, no matter reverse brake signal loss or throttle signal loss during the flight, can cause the throttle signal loss protection to be activated.

2. Brake Force

This item is only effect in the "Normal brake" mode, The higher the level, the stronger the braking effect, where the low/medium/high corresponds to the braking force: 60%/90%/100%

3. Voltage Cutoff Type

3.1 Soft Cutoff

After selected this option, the ESC will gradually reduce the output to 60% of the full power in 3 seconds after the low-voltage cutoff protection is activated.

3.2 Hard Cutoff

After selected this option, the ESC will immediately cut off the output when the low-voltage cutoff protection is activated.

4. LiPo Cells

The ESC will automatically calculate the number of LiPo cells you have plugged in as per the "3.7V/Cell" rule if "Auto Calc." is selected, or you can set this item manually.

Note: 15A, 20A can only select the following parameters: automatic calculation, 2S,3S.

5. Cutoff Voltage

If set off, the low-voltage protection function is disabled. In addition, the protection voltage value of the low-voltage protection function corresponding to the low/medium/three modes is about 2.8V/ section, 3.0V/ section and 3.4V/ section. This value is the voltage of a single battery, multiplied by the number of lithium batteries automatically identified by the electronic governor or the number of lithium batteries manually set, which is the protection voltage value of the battery. (For example, if the low voltage protection threshold of 3 lithium batteries is medium, the protection voltage of the batteries is 3X3.0=9.0V)

6. Start-up Mode

This is used to adjust the throttle response time of ESC acceleration from 0% to 100%. Normal/Soft/Very Soft correspond to approximately 200ms/500ms/800ms respectively

7. Timing

Can adjust the drive motor timing value. The low / Medium and high are respectively: 5°/15°/25°.

8. Active Freewheeling (DEO)

This item is adjustable between "Enabled" and "Disabled", and it is enabled by default. With it enabled, you can have better throttle linearity or smoother throttle response.

9. Search Mode

After selected this option, ESC will drive the motor chirping prompt when the throttle is keep 0% and continues to the set time.

07 Troubleshooting & Multiple Protections

Troubleshooting

Troubles	Warning Tones	Causes	Solutions
The ESC didn't work after it was powered on while the motor kept beeping.	"BB, BB, BB....."	The input voltage was beyond the operating voltage range of the ESC.	Adjust the power-on voltage and ensure it's in the operating voltage range of the ESC.
The ESC didn't work after it was powered on while the motor kept beeping.	"B-, B-, B-, B-....."	The ESC didn't receive any throttle signal from the receiver.	Check if the transmitter and receiver are well bound, if any poor connection exists between the ESC and receiver.
The ESC didn't work after it was powered on while the motor kept beeping.	"B, B, B, B....."	The throttle stick has not been moved to the bottom position.	Move the throttle stick to the bottom position and calibrate the throttle range.
The ESC didn't work after the throttle calibration while the motor kept beeping.	"B, B, B, B....."	The throttle range you set was too narrow.	Re-calibrate the throttle range.
The ESC output suddenly reduced to 50% during the flight, the motor kept beeping after the flight completed but the battery was still connected to the ESC.	"BB, BB, BB....."	The ESC thermal protection has been activated	Improve the heat dissipating condition (i.e. add a cooling fan) or reduce the ESC load.
The ESC output suddenly reduced to 50% during the flight, the motor kept beeping after the flight completed but the battery was still connected to the ESC.	"BBB, BBB, BBB....."	The low-voltage cutoff protection has been activated.	Change another pack; lower down the cutoff voltage or disable the LVC protection (we do not recommend this).

Multiple Protections

1. Start-up Protection:

The ESC will monitor the motor speed during the start-up process. When the speed stops increasing or the speed increase is not stable, the ESC will take it as a start-up failure. At that time, if the throttle amount is less than 15%, the ESC will try to restart automatically; if it is larger than 20%, you need to move the throttle stick back to the bottom position first and then restart the ESC. (Possible causes of this problem: poor connection/ disconnection between the ESC and motor wires, propellers are blocked, etc.)

2. ESC Thermal Protection:

The ESC will gradually reduce the output but won't cut it off when the ESC temperature goes above 120°C. For ensuring the motor can still get some power and won't cause crashes, so the maximum reduction is about 60% of the full power. (Here we are describing the ESC's reaction in soft cutoff mode, while if in hard cutoff mode; it will immediately cut off the power.)

3. Throttle Signal Loss Protection:

When the ESC detects loss of signal for over 0.25 second, it will cut off the output immediately to avoid an even greater loss which may be caused by the continuous high-speed rotation of propellers or rotor blades. The ESC will resume the corresponding output after normal signals are received.

4. Overload Protection:

The ESC will cut off the power/output or automatically restart itself when the load suddenly increases to a very high value. (Possible cause to sudden load increase is that propellers are blocked.)

5. Low Voltage protection:

When the battery voltage is lower than the cutoff voltage set by the ESC, the ESC will trigger the low-voltage protection. If the battery voltage is set to soft cutoff, the battery voltage will be reduced to a maximum of 60% of the full power. When set to hard cutoff, the output is cutoff immediately. After the throttle returns to 0%, the ESC will drive the motor to sound the alarm.

6. Abnormal voltage input protection:

When the battery voltage is not within the input voltage range supported by the ESC, the ESC will trigger the Abnormal input voltage protection, ESC will drive the motor to sound the alarm.