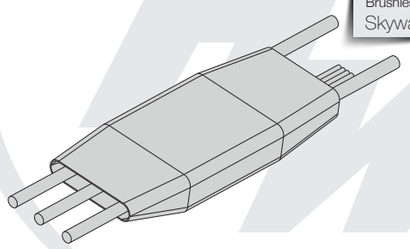
HOBBYWING®

USER MANUAL

SKYWALKER

Brushless Electronic Speed Controller

Skywalker V2



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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 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.

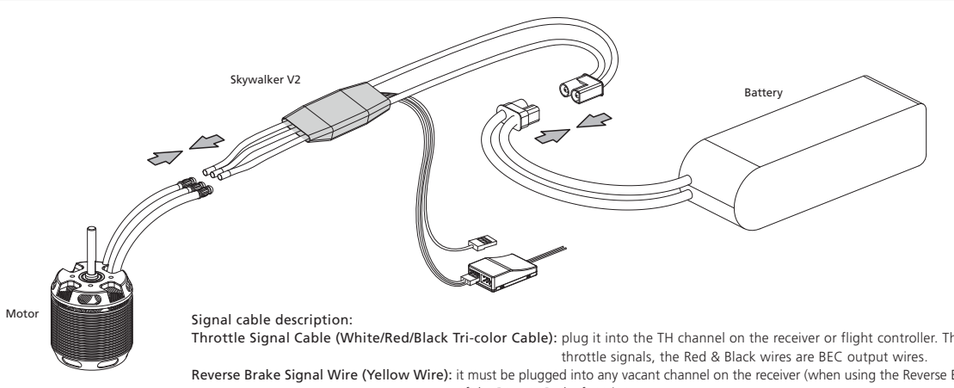
03 Specifications

Model (Regular)	Cont. Current	Peak Current	Input Voltage	BEC Output	Weight	Size (L x W x H)
Skywalker 40A V2	40A	60A	3-4S LiPo	5V @ 5A (Switch-mode)	36g	60 x 25 x 8mm
Skywalker 50A V2	50A	70A	3-4S LiPo	5V @ 5A (Switch-mode)	36g	60 x 25 x 8mm
Skywalker 80A V2	80A	100A	3-6S LiPo	5V @ 7A (Switch-mode)	79g	85 x 36 x 9mm
Skywalker 100A V2	100A	120A	3-6S LiPo	5V @ 7A (Switch-mode)	92g	85 x 36 x 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.

1 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.

2 ESC/Radio Calibration

Turn on the transmitter and move the throttle stick to the top position. → Connect a battery to the ESC; the motor will sound "♪123" to indicate the ESC is normally powered on. → Then the motor will beep two short beeps to indicate the maximum throttle endpoint is accepted. → Move the throttle stick to the bottom position within 5 seconds after the two short beeps, the minimum throttle position will be accepted 1 second later. → The motor will beep "Number" beeps to indicate the number of LiPo cells you have plugged in. → The motor will beep a long beep to indicate the calibration is complete.

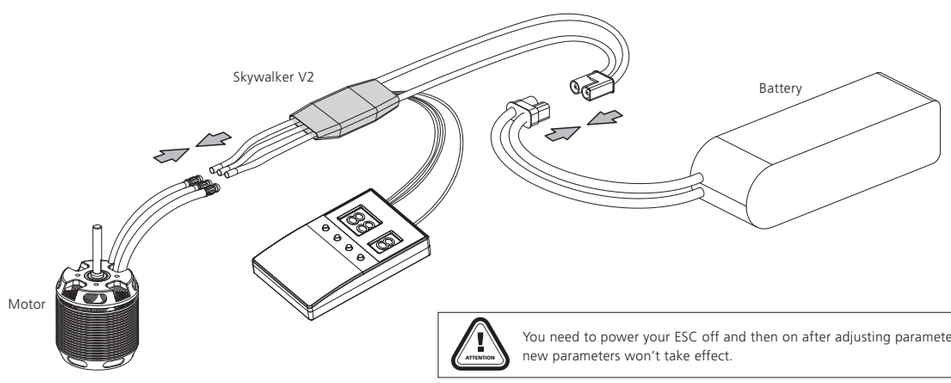
3 Normal Start-up Process

Turn on the transmitter, and then move the throttle stick to the bottom position. → After connected the ESC to a battery, the motor will emit "♪123" indicating the ESC is normally powered on. → The motor will emit several beeps to indicate the number of LiPo cells. → The motor emits a long beep to indicate the ESC is ready to go.

05 ESC Programming

1 Program your ESC with a LED Program Box

1. Wiring:



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

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.

2 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 567$\dot{1}\dot{2}$ 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)
2	"B-B-"	Brake Force	(2 Short Bs)
3	"B-B-B-"	Voltage Cutoff Type	(3 Short Bs)
4	"B-B-B-B-"	LiPo Cells	(4 Short Bs)
5	"B——"	Cutoff Voltage	(1 Long B)
6	"B——B-"	Start-up Mode	(1 Long B & 1 Short B)
7	"B——B-B-"	Timing	(1 Long B & 2 Short Bs)
8	"B——B-B-B-"	Active Freewheeling	(1 Long B & 3 Short Bs)
9	"B——B-B-B-B-"	Search Mode	(1 Long B & 4 Short Bs)
10	"B——B——"	Factory Reset	(2 Long Bs)
11	"B——B——B-"	Exit	(2 Long Bs & 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 " $\dot{1}5\dot{1}5$ " 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.	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	Acitve 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.	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 to 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 to 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.
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

1 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).

2 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℃. 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.

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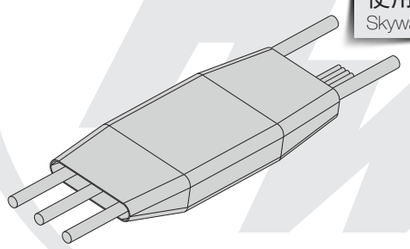
SKYWALKER

空模无刷电子调速器使用说明书

Skywalker V2



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感谢您购买本产品！无刷动力系统功率强大，错误的使用可能导致人身伤害和设备损坏，为此的我们强烈建议您在使用设备前仔细阅读本说明书，并严格遵守规定的操作程序。我们不承担因使用本产品或擅自对产品进行改造所引起的任何责任，包括但不限于对附带损失或间接损失的赔偿责任。我们有权在不经通知的情况下变更产品设计、外观、性能及使用要求。

01 注意事项

- 使用此电调前，请认真查看各动力设备以及飞行器说明书，确保动力搭配合理，避免因错误的动力搭配导致电机超载，最终损坏电调。
- 电调装入飞行器后，使用飞行器前，请确保所有电线和连接部件绝缘良好，短路将会毁坏电调。请务必仔细连接好各部件，若需对电调的输入输出线、插头做相关焊接时，为保证焊接牢靠，请使用足够功率的焊接设备进行焊接。若连接不良，您可能不能正常控制飞行器，或出现设备损坏等其他不可预知的情况。
- 电调使用过程中，请勿将电机堵转，否则将会毁坏电调并且可能导致电机损坏。如因特殊原因导致电机堵转，请立刻将油门归零，或者拔掉电池。
- 勿使电调置于高温环境中或者由于电调自身发热导致温度过高的情况下使用或继续使用，高温将会触发电调温度保护，严重时将毁坏电调。
- 使用完毕后，切记断开电池与电调的连接。如电池未断开，电调有可能会误驱动电机转动，造成不可预知的危险，若长时间连接电池，电池最终会被完全放电，进而导致电池或电调出现故障。

02 产品特色

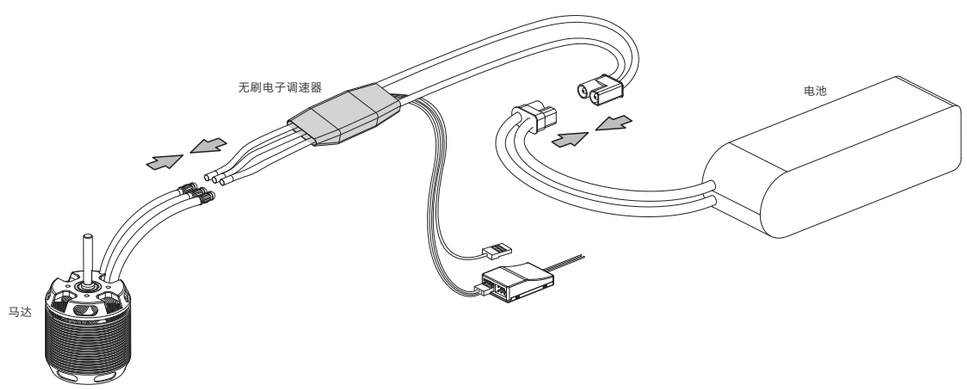
- 采用32位控制核心，运行频率高达96MHz，兼容多种无刷电机。
- 采用同步整流驱动效率优化技术（DEO---Driving Efficiency Optimization），油门响应更快更线性，驱动效率更高，电调温度更低。
- 具备独立参数编程线，用于连接LED参数设定盒进行参数设定，LED参数设定盒具有简单直观的界面，便于您随时随地修改各项参数。（详见LED参数设定盒说明书）
- 具有普通刹车，反推刹车多种刹车模式。尤其是反推刹车，可有效缩短飞机降落距离。
- 具有寻机模式，飞行器掉入复杂环境后，可以凭电机鸣叫提示寻找飞行器。
- 具有启动保护、堵转保护、温度保护、低压保护、油门信号丢失保护、输入电压异常保护等多重保护功能，有效延长电调使用寿命。

03 产品规格

低压型号	持续电流	瞬时电流	输入电压	BEC	重 量	尺寸（长x宽x高）
Skywalker 40A V2	40A	60A	3-4节锂电池	开关稳压BEC，5V @ 5A	36g	60 x 25 x 8mm
Skywalker 50A V2	50A	70A	3-4节锂电池	开关稳压BEC，5V @ 5A	36g	60 x 25 x 8mm
Skywalker 80A V2	80A	100A	3-6节锂电池	开关稳压BEC，5V @ 7A	79g	85 x 36 x 9mm
Skywalker 100A V2	100A	120A	3-6节锂电池	开关稳压BEC，5V @ 7A	92g	85 x 36 x 9mm

04 使用向导

1 接线示意图



信号线说明：

油门信号线（白、红、黑）：插入接收机油门通道或飞控油门通道，其中白线用于传送油门信号，而红线和黑线为BEC的输出线。

反推刹车信号线（黄）：使用反转刹车时，必须将该信号线接入到遥控器的其他空闲通道上，使用该通道来控制反转刹车功能的开启与关闭。

编程线（黄）：连接LED编程设置盒进行参数设置。

电调的油门行程出厂默认值为1100μs—1940μs（Futaba标准）,当首次使用电调或者更换其他遥控器使用时，均应重新设定油门行程。

2 油门行程校准操作方法

开启遥控器，将油门打到最高点 → 电调接上电池，马达鸣叫“♪123”提示音，表示上电正常 → 随后马达发出“哔-哔-”双短鸣音，表示油门最高点校准成功 → 5秒钟之内将油门摇杆推到最低，等待1秒，油门最低点校准成功 → 马达发出N声短鸣音“哔-”，表示锂电节数 → 马达发出一声长鸣音“哔——”，表示系统准备就绪，可随时起飞

3 正常开机过程

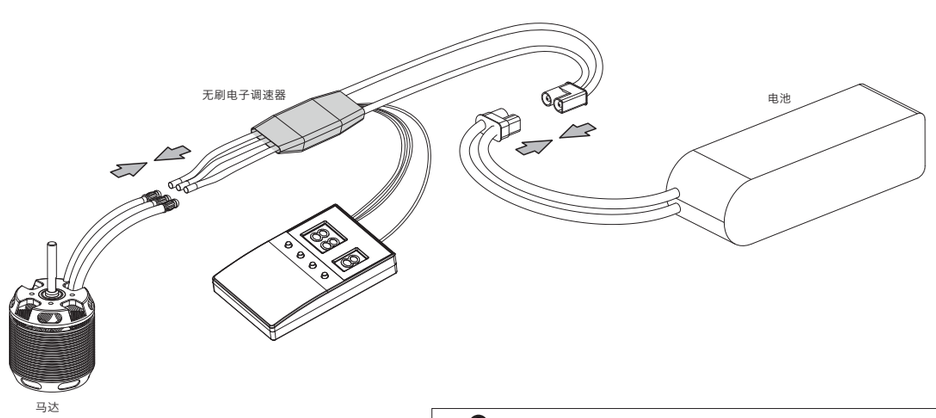
开启遥控器，将油门摇杆打到最低点 → 电调接上电池，鸣叫“♪123” 提示音，表示上电正常 → 马达发出N声短鸣音“哔-”，表示锂电节数 → 马达发出一声长鸣音“哔——”，表示系统准备就绪，随时可以起飞

05 参数设定方法

电调参数设定方法有两种：

1 通过LED参数设定盒进行参数设定（详见LED参数设定盒说明书）

1．接线示意图：



1）将电调编程线（黄色）连接至LED参数设定盒编程线接入口。

2）电调上电（已通电的需断开电源重新上电），电调进入参数设置模式，读取、设定电调参数。

在将黄色信号线插入LED参数设定盒编程线接入口的同时，也需要将油门信号线插入LED参数设定盒供电口，否则将无法设定电调参数。

2．参数设定方法：

1）电调和LED参数设置盒连接后，给电调接上电源，数秒后该电调的各项参数即可显示出来。

2）选择LED参数设置盒上的“ITEM”键可选择编程项目；

3）选择“VALUE”按键设置该编程项目下的参数值；

4）按“OK”键保存新参数到电调内部。

更改任意参数设定值后，电调均需重新上电，新的参数设定值才可生效。

2 通过遥控器进行参数设定

参数设定方法：

使用遥控器油门摇杆设定参数分为四个步骤：

进入编程→选择参数项目→选择该参数项目下的参数值→退出

一、进入编程模式

开启遥控器，将油门打到最高，电调接上电池，等待2秒，鸣叫“哔-哔-”提示音，再等待5秒，会鸣叫“ 567$\dot{1}\dot{2}$ ”特殊提示音,表示已经进入编程模式。

二、选择参数项目

进入编程设定后，会听到12种鸣叫音，按如下顺序循环鸣叫，在鸣叫某个提示音后，3秒内将油门打到最低，则进入该设定项。

1	“哔”	刹车类型	（1短音）
2	“哔-哔-”	刹车力度	（2短音）
3	“哔-哔-哔-”	低压保护模式	（3短音）
4	“哔-哔-哔-哔-”	锂电池节数	（4短音）
5	“哔——”	低压保护阈值	（1长音）
6	“哔——哔-”	启动模式	（1长1短音）
7	“哔——哔-哔-”	进角	（1长2短音）
8	“哔——哔-哔-哔-”	同步整流	（1长3短音）
9	“哔——哔-哔-哔-哔-”	寻机模式	（1长4短音）
10	“哔——哔——”	回复出厂默认值	（2长音）
11	“哔——哔——哔-”	退出	（2长1短音）

注：一长音“哔——”相当于5声短音“哔-”，所以在第二步“选择设定项”中，一长一短“哔——哔-”表示第6选项。

三、选择参数值

马达会循环鸣叫，在鸣叫某个提示音后将油门摇杆打到最高点，则选择该提示音所对应的参数值，接着鸣叫特殊提示音“ $\dot{1}\dot{5}\dot{1}\dot{5}$ ”，表示该参数值已被保存。退回第二步选择参数项目，再选择其它参数项目。

参数项目 \ 参数值（提示音）		1 “哔”	2 “哔，哔”	3 “哔，哔，哔”	4 “哔，哔，哔，哔”	5 “哔--”
1	刹车类型	*无刹车	普通刹车	反推刹车	线性反推刹车	
2	刹车力度	*低	中	高		
3	低压保护模式	*软关断	硬关断			
4	锂电节数	*自动计算	3节	4节	5节	6节
5	低压保护阀值	关闭	低	*中	高	
6	启动模式	*普通	柔和	超柔和		
7	进角	低	*中	高		
8	同步整流	*开	关			
9	寻机模式	关	5分钟	10分钟	15分钟	

四、退出设定

当电机鸣叫出11.“哔——哔——哔-”（即第11个设定项）2长1短音后，3秒内将油门打到最低点，则退出设定。马达发出N声短鸣音“哔-”，表示锂电节数，随后马达发出一声长鸣音“哔——”，表示系统准备就绪。

06 可编程参数

1 可编程参数项目

参数项目 \ 参数值		1	2	3	4	5
1	刹车类型	*无刹车	普通刹车	反推刹车	线性反推刹车	
2	刹车力度	*低	中	高		
3	低压保护模式	*软关断	硬关断			
4	锂电节数	*自动计算	3节	4节	5节	6节
5	低压保护阀值	关闭	低	*中	高	
6	启动模式	*普通	柔和	超柔和		
7	进角	低	*中	高		
8	同步整流	*开	关			
9	寻机模式	*关	5分钟	10分钟	15分钟	

带*的为出厂默认时的设置。

2 可编程参数说明

1. 刹车类型：

1）普通刹车：油门归零以后，触发刹车，刹车力度为设定的刹车力度；

2）反推刹车：开启反推刹车功能后，须将反推刹车信号线（信号范围和油门行程一致）插入到接收机的一个空闲通道上，通过该通道控制电机正反转，通道行程0-50%为电机默认设置转向，通道行程50%-100%触发电机反转。初次上电该通道摇杆所处位置建议为该通道行程0-50%范围内（最好为0），否则有可能会出现推动油门后电机先正转后反转得情况。触发反转时，电机先刹停，再反转加速至油门摇杆输出的油门量。

3）线性反推刹车：开启此功能以后，须将反推刹车信号线插入到接收机的一个空闲通道上，该通道需设置为线性开关（一般为遥控器上的旋钮），推动该线性开关启动油门反推。启动时反推油门大小为10%，此后反推油门大小由该线性开关控制。线性反推刹车油门行程固化为1.34-1.79ms。电调上电时改通道需和油门通道一样保持在0%油门位置。该通道和油门通道中任何一个丢失信号，均会触发油门信号丢失保护。

2. 刹车力度：

设置的刹车力度越大，螺旋桨由旋转到停止的时间越短；该功能仅在普通刹车模式下有效，其中低/中/高分别对应刹车力度：60% /90% /100%.

3. 低压保护模式：

软关断：触发低压保护后输出功率将逐渐降低为总功率的60%；

硬关断：立即断开输出。

4. 锂电节数：

选择自动计算，将按单节电池3.7V计算电池节数，也可手动设置电池节数。

5. 低压保护阈值：

设置关闭则低电压保护功能关闭，另外低/中/高三种模式对应的低电压保护功能的保护电压值为约2.8V/节 / 3.0V/节和3.4V/节；该值为单节电池的电压，与电子调速器自动识别的锂电节数或手动设置的锂电节数相乘，即为电池的保护电压值。（例：3节锂电池，低压保护阈值为中，则电池的保护电压为：3x3.0=9.0V）

6. 启动模式：

普通：推动油门摇杆以后电机会立即启动并快速达到相应的油门值(加速率为200ms)；

柔和：推动油门摇杆以后电机会先缓慢启动然后再快速达到相应的油门值（加速率为500ms）；

超柔和：推动油门摇杆以后电机会先缓慢启动然后再快速达到相应的油门值（加速率为800ms）；

7. 进角：

可以调节驱动电机的进角值。其中低中高分别为：5°/15°/25°。

8. 同步整流：

固定为开启，开启同步整流将带来更好的油门线性。

9. 寻机模式：

开启以后，油门为0%的情况下，持续保持至设定的时间后，电调将驱动电机鸣叫。

07 故障及保护功能说明

1 故障处理

故障描述	提示音	说 明	解决办法
电调通电以后不工作，鸣叫报警。	“哔哔，哔哔，哔哔，…...”	输入的电压不在电调的工作电压之内。	调节通电电压至电调的工作电压范围内。
电调通电以后不工作，鸣叫报警。	“哔，-，哔，-，哔，-，……”	油门信号丢失。	接入油门信号。
电调通电以后不工作，鸣叫报警。	“哔，哔，哔，……”	油门摇杆没有归零。	油门摇杆归零，进行油门行程校准。
进行油门行程校准后，电调不工作，鸣叫报警。	“哔，哔，哔，……”	所设定油门总行程过窄（电调设计时，要求油门总行程不得小于三格油门）,本次行程设定无效。	重新进行油门行程校准。
飞行过程中电调输出功率突然下降至60%，停止飞行后不断电情况下，鸣叫报警。	“哔哔，哔哔，哔哔，……”	触发电调温度保护。	改善散热； 降低电调负载。
飞行过程中电调输出功率突然下降至60%，停止飞行后不断电情况下，鸣叫报警。	“哔哔哔，哔哔哔，哔哔哔，……”	触发电调低压保护。	更换电池； 降低低压保护阈值。

2 保护功能说明

1. 启动保护：

启动过程中，电调会检测电机转速，当转速出现停止上升或者转速提升不稳定的情况，则判断启动失败，若此时油门小于15%，电调会自动尝试重新启动；若此时油门大于20%，需将油门归零后重新启动。（出现这种情况的原因可能有：电调和马达连线接触不良或有个别输出线断开、螺旋桨被其他物体阻挡、减速齿卡死等）

2. 油门信号丢失保护：

当电调检测到油门遥控信号丢失0.25秒以上即立即关闭输出，以免因螺旋桨继续高速转动而造成更大的损失。信号恢复后，电调也随即恢复相应的功率输出。

3. 堵转保护：

当负载突然变得极大时，电调会切断动力并自动重启动。（出现负载急剧增大的原因通常是螺旋桨堵转）

4. 温度保护：

当电调工作温度超过 120 摄氏度时，电调会逐渐降低输出功率进行保护，但不会将输出功率全部关闭，最多只降到全功率的60%，以保证马达仍有动力，避免因动力不足而摔机。油门归零以后，电调会驱动电机鸣叫报警提示。

5. 低压保护：

当电池电压降低至电调低压保护阈值设定的电压以下时，电调会逐渐降低输出功率进行保护，但不会将输出功率全部关闭，最多只降到全功率的60%，以保证马达仍有动力，避免因动力不足而摔机。油门归零以后，电调会驱动电机鸣叫报警提示。

6. 上电电压异常保护：

当接入的电池电压不在电调支持的输入电压范围内时，会触发电调接入电压异常保护，电调会驱动电机鸣叫报警提示。