

# 无刷电子调速器说明书

感谢您购买中特威天鹰系列无刷电子调速器。为了安全起见，我们强烈建议您在使用之前仔细阅读本使用手册。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。

## 注意事项

- 使用此产品的时候，时刻牢记安全第一。
- 马达连接好电池和电调的情况下，有可能意外启动而造成伤害，请谨慎连接。
- 连接电池前，如果需要对飞机或者直升机进行近距离操作，请先不安装螺旋桨或者断开小齿轮。
- 请遵守当地所有关于遥控飞行器的法律法规。
- 请勿在人群上面或者附近飞行。

## 主要特性

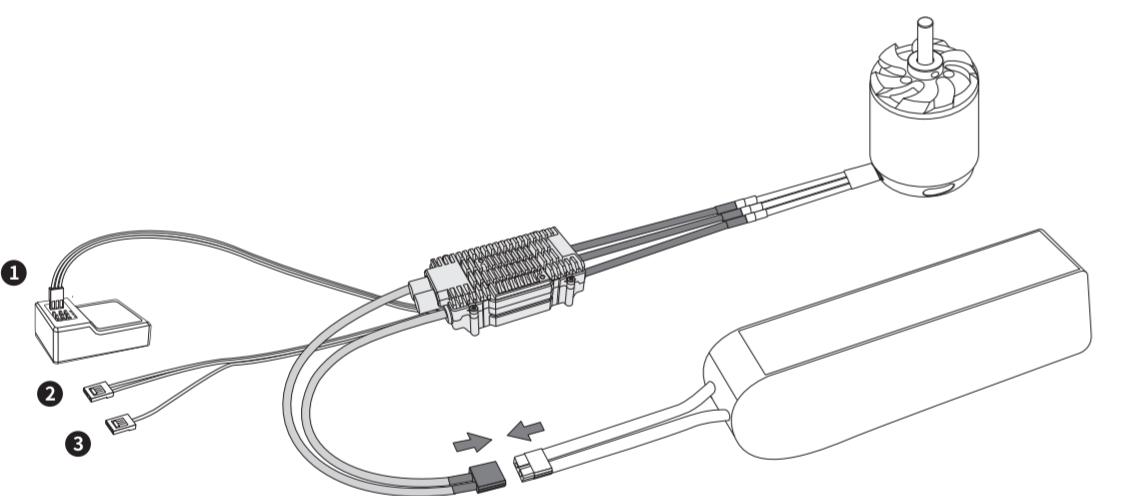
1. 采用高性能32位处理器，运算频率高达170MHz，运算能力极强，运行速度更快。
2. 采用新一代制作工艺的功率输出元件(MOSFET)，低发热，瞬间承受电流大，可靠性高。
3. 自检功能：电调上电后会对电源短路，电机是否缺相，油门归零问题，电压范围进行自检。
4. 单侧面开孔以及独特的吸风道设计，极大地增强了电调散热性能。
5. 具有两种飞行模式：固定翼模式和直升机模式。
6. 具有直升机定速功能，定速感度可调，易于操作。
7. 具有熄火降落反悔时间选择功能，在设定的时间内可人工中断熄火降落过程并快速重启电机，避免因操控失误而坠机。
8. 电调有独立的编程接口，可用LCD编程卡或蓝牙模块为电调进行参数设定。
9. 具有数据回传功能，可实时发送数据：电流、电压、温度、转速、油门、电调状态，手机App或LCD编程卡上可实时查看以上数据。
10. 支持蓝牙无线调参，通过手机(苹果&安卓)APP可进行参数设置，升级电调软件，查看数据记录等操作。
11. 多重保护：上电电压异常保护，启动保护，温度保护，油门信号丢失保护，过负荷保护，低压保护，过流保护。

## 产品规格

型号	编号	持续电流 峰值电流 (A)	电池节数	重量(g)	BEC输出	尺寸(mm) (长*宽*高)	编程方式
Skyhawk 65A SBEC	4065211	65A / 80A	3-6S Lipo	55	6V, 7.4V, 8.4V adjustable / 10A	60*34*22	LCD编程卡G2/安卓&苹果APP
Skyhawk 125A SBEC	4125211	125A / 140A	3-8S Lipo	171	6V, 7.4V, 8.4V adjustable / 10A	87*40*32	LCD编程卡G2/安卓&苹果APP
Skyhawk 155A SBEC	4155211	155A / 170A	3-8S Lipo	171	6V, 7.4V, 8.4V adjustable / 10A	87*40*32	LCD编程卡G2/安卓&苹果APP
Skyhawk 130A HV SBEC	4130311	130A / 150A	6-14S Lipo	236	6V, 7.4V, 8.4V adjustable / 10A	95*50*36	LCD编程卡G2/安卓&苹果APP
Skyhawk 160A HV SBEC	4160311	160A / 180A	6-14S Lipo	236	6V, 7.4V, 8.4V adjustable / 10A	95*50*36	LCD编程卡G2/安卓&苹果APP
Skyhawk 300A HV OPTO	4300411	300A / 320A	6-14S Lipo	461	None	118*59*47	LCD编程卡G2/安卓&苹果APP

①注：电调的重量和尺寸不含风扇在内

## 连接线示意图



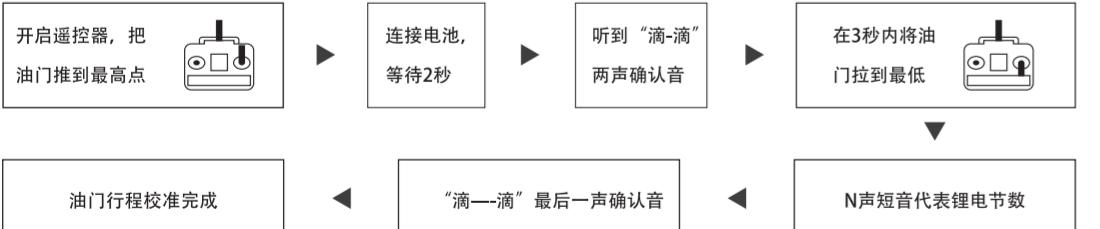
① 油门信号线（黑、红、白）：插入接收机油门通道，其中白线用于传递油门信号，而红线和黑线为电压输出线和地线。

② BEC输出线（黑、红）：插入接收机电池专用通道或其它任意空闲通道。

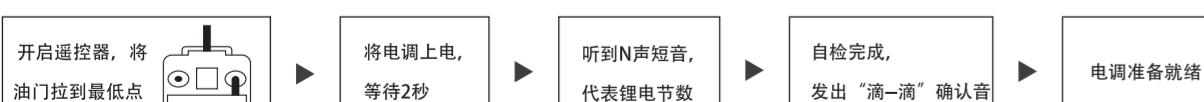
③ RPM信号线（黄）：插入无副翼系统转速输入通道。

## 首次使用电调并设置油门行程

温馨提示：在首次使用本电调或更换其他遥控器使用时，请务必先重新设定油门行程。



## 电调的正常启动程序



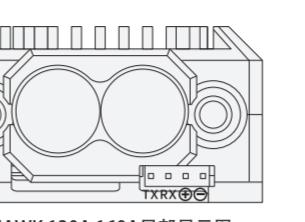
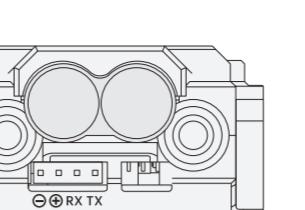
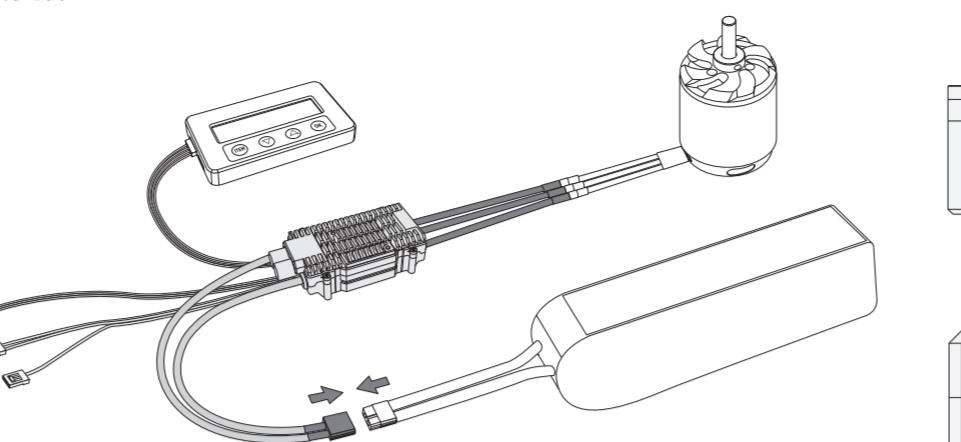
## 参数设定与电调运行数据查看方法

本电调可进行参数设定，以满足不同的飞行需求。

本电调可通过LCD编程卡和手机APP查看电调的实时数据：包括电流、电压、电调温度、油门、电调状态码等。

## 1. 使用LCD编程卡调参及查看实时数据(LCD编程卡需另购)

### A:接线示意图

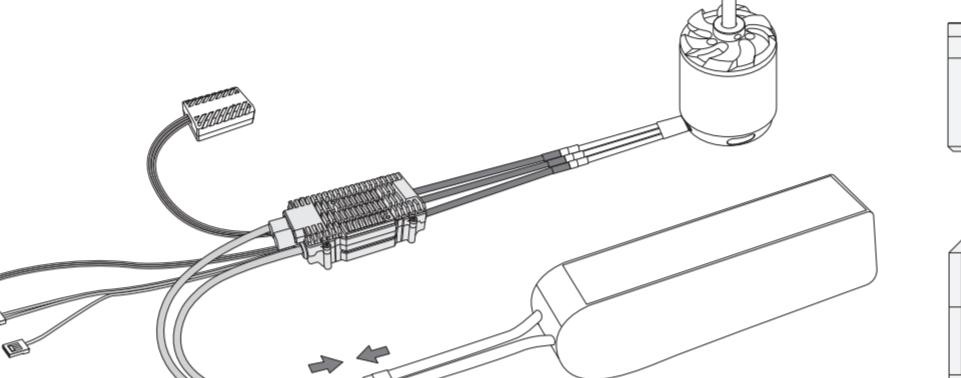


### B:操作步骤

1. 根据上面接线示意图将电调与LCD编程卡和电池正确连接。  
(用编程卡连接线连接编程卡与电调时可根据刻字区分正负极位置，红线对应正极，黑线对应负极进行连接。)
2. 正确连接好后，LCD编程卡首先会自动进入实时数据界面，此时可查看电调实时数据。  
(显示实时数据信息有电压/电流/油门/转速/温度等)
3. 再按“ITEM”或“OK”键，即可进入参数设置界面。  
(按“ITEM”代表循环切换编程项，按“▼”代表向下切换某编程项的参数值，按“△”代表向上切换某编程项的参数值，按“OK”键代表保存并发送当前所选的参数值到电调。)
4. 每次更改完参数后，需要重新上电，新更改的参数才会生效。

## 2. 使用手机APP调参及查看实时数据(蓝牙模块需另购)

### A:接线示意图



### B:操作步骤

1. 根据上面接线示意图连接电调与蓝牙模块，并将电调连接电池。  
(蓝牙模块的红线对应正极，黑线对应负极进行连接。)
2. 下载并安装好中特威航模手机APP，打开APP并且连接到蓝牙，然后即可进行参数设置及实时数据的查看。
3. 每次更改完参数后，需要重新上电，新更改的参数才会生效。

## 可编程参数项及说明

### 1. 可编程参数项及对应可编程设定值

1 制动类型	*普通刹车，反推刹车
2 制动力度	*0, 0-100%
3 进角	*15° 0-30°
4 正反转	*CW, CCW
5 SR功能	ON, *OFF
6 电池节数	*自动 / 3S, 4S, 6S / 3S, 4S, 6S, 8S / 6S, 8S, 10S, 12S, 14S
7 低电压保护点	关闭, 2.5V, *3.0V, 3.2V, 3.4V, 3.6V, 3.8V
8 低电压保护方式	*降低功率，立即断开
9 BEC	6.0V, *7.4V, 8.4V
10 加速度	1, *2, 3, 4
11 启动力度	低, *中, 高
12 飞行模式	*固定翼, 直升机
13 定速参数P	*4 1-10
14 定速参数I	*3 1-10
15 遥控回传	*1 实时数据, 2 SBUS

①带\*的为出厂默认设置

### 2. 可编程项目说明

#### 1 制动类型

1.2 普通刹车：设置该功能时，油门遥感归零后，电调将按照设置的刹车力度使电机停转，默认设置为普通刹车。

▲ 警告：此功能只能在50%油门以下才有效，且只允许在飞机降落至地面使用，否则有可能引起电调烧毁！

#### 2 制动力度

设定普通刹车功能下油门归零以后，电机停转的速度，数值越大，电机刹车的力度就越强，电机从旋转到停止的时间也越短。0%-100%可调（步长为：1%），默认设置为0%  
(该功能仅在普通刹车模式下有效)

#### 3 进角

调节电调驱动电机的进角，0° - 30° 可调，默认设置为15°。

#### 4 正反转

设置电机转向，连接好电机与电调以后，默认电机为正转，则设置为反转后电机将反转，若默认电机为反转，则设置为反转后电机将正转，默认设置为正转。

#### 5 SR功能

可使电调工作效率更高，更节能，续航时间更长，默认设置为关闭。

#### 6 锂电节数

可自动计算，也可手动设置电池节数，选择自动计算，将按单节3.8V计算电池节数。使用LiPo或者LiHV电池若出现电调自检过程鸣叫电池错误，可调节此项纠正检测，默认设置为自动。

#### 7 低电压保护点

支持2.5V/3.0V/3.2V/3.4V/3.6V/3.8V 6档可调。该值为单节电池的电压值，若您使用的是6节锂电池，那最终的保护电压即为设置的值X6，默认设置为3.0V。

#### 8 低电压保护方式

降低功率：当达到预设的低电压保护阈值时，电调减少输出功率至70%，默认设置为降低功率。

立即断开：当达到预设的低电压保护阈值时，电调立即关断输出功率。

#### 9 BEC

设置电调内置BEC电压，6.0V/7.4V/8.4V三挡可调，默认设置为7.4V。

## 10 加速度

1, 2, 3, 4四档可调，数值越大加速度越柔和，默认设置为2。

## 11 启动力度

调整电机启动启动时的启动力度，设置越高启动力度越大，低/中/高档三档可调，默认设置为中档。

## 12 飞行模式

固定翼模式：适用于固定翼飞机及多旋翼飞机，该模式下油门高于5%（包含5%）才启动电机，油门响应迅速。

直升机模式：适用于使用本电调进行定速飞行的直升机飞机，该模式下油门高于40%（包含40%）才启动电机，电机以柔慢方式启动，完成缓启动后转速稳定进入定速运行状态。每次从其它模式调整至该模式时需要做一次转速标定，才可以正常运行定速功能，以后保持在该模式下就不需要反复做转速标定了，默认设置为固定翼模式。

## 13 定速参数P

控制电调在维持定速过程中补转的程度，数值越大，出现转速不足或转速过高时回归目标转速的程度就越大，该功能需要配合定速感度I设置，1到10档可调，默认设置为4档。

## 14 定速参数I

当转速低于或超过设置的过预期值时，电调会进行转速补偿。该参数用于调整补转的程度大小。参数过大将造成补转过度，参数过小将引起补转不足，1到10档可调，默认设置为3档。

## 15 遥控回传

Real Time Data, SBUS2. 默认设置为Real Time Data。

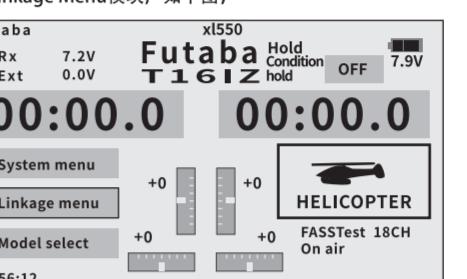
设置Real Time Data可在LCD编程卡和手机APP显示电调实时数据。

设置SBUS2则可在遥控器显示电调实时数据（遥控器需要支持SBUS2协议）。

下面以FUTABA遥控器为例演示如何在遥控器上显示实时功能：

① 连接好电调和电池以及接收机后，开启遥控器。

按Linkage Menu模块，如下图：



② 然后选择Sensor模块，如下图：



Linkage menu x1550 Hold 7.9V 1/2

Servo momtr Model select Model type

Servo reverse End point Servo speed

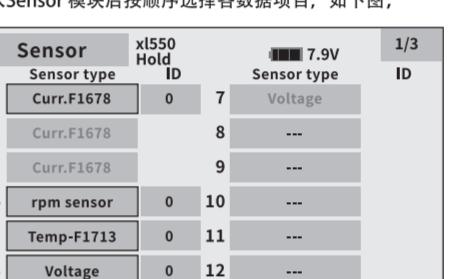
Sub-trim Function Fail safe

System type Trim setting Throttle cut

Idle down Swash ring Stick alarm

Timer Function name Sensor

③ 退出后进入Telemetry界面把选择好的数据项目加上去即可显示，如下图：



④ 退出后进入Telemetry界面把选择好的数据项目加上去即可显示，如下图：



Telemetry x1550 Hold 7.9V 1/3

1 Cru.F1678 Current

5 Temp.F1713 Temperature

Thank you for purchasing ZTW Skyhawk Brushless Electronic Speed Controller (ESC). We strongly recommend reading this manual carefully before using this product for the sake of safety. ZTW 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.

### Important Warnings

- Always place safety as priority when you use the product.
- An electric motor that is connection with battery pack and ESC may start unexpectedly and cause serious danger. Always treat a powered system with respect.
- Always remove the propeller or disengage the pinion gear before the battery connected if you need to working on a plane or helicopter at short range.
- Please observe all local laws regarding the flying of remote control aircraft.
- Never fly over or near crowds.

### Key Features

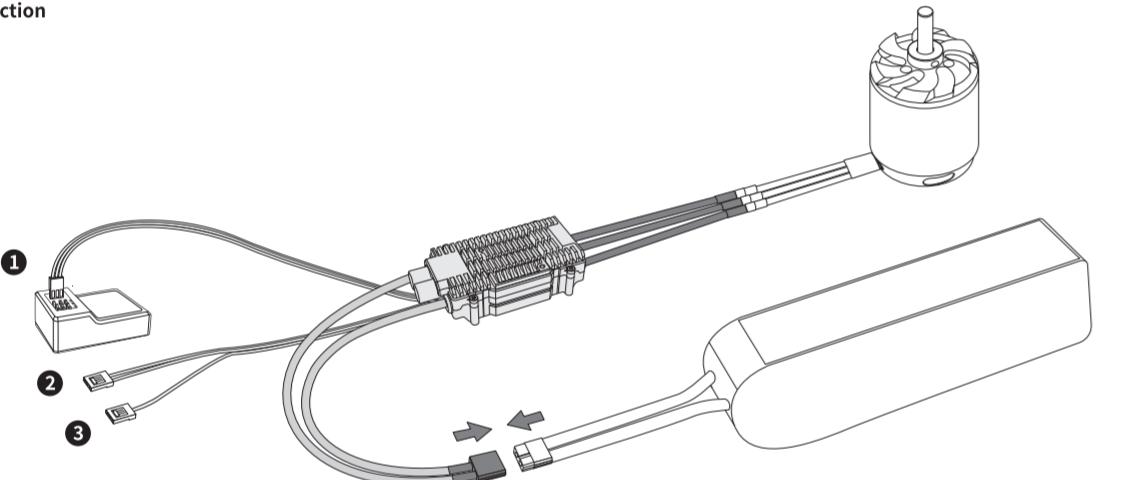
- Adopting high performance 32 bit microprocessor with a running frequency of 170MHz, supported much stronger computing ability and faster running speed.
- Adopting new generation craft on the MOSFET, low heat generation, large instantly withstand current, and high reliability.
- Self-check function: after the ESC powered on, it will automatically check if have the power short circuit, motor lose phase, throttle is not at zero position problem, and voltage range.
- The special ESC case design and the unique fan guard structure greatly enhance the ESC heat dissipation performance.
- There are two flight modes: fixed-wing mode and helicopter mode.
- Equipped with the helicopter speed-control function, the speed sensitivity is adjustable and easy to operate.
- Equipped with the time selection function for stall landing, it can be manually adjustable within the time set to avoid a crash due to handling errors.
- The ESC has a separate programming interface to connect with LCD programming card or Bluetooth module for programming.
- Supporting data returning function: current, voltage, temperature, RPM, throttle and ESC status code.
- Bluetooth module supported, change the parameter settings, software upgrading, data recording and the operation can be completed via the mobile phone (Apple and Android) APP.
- Multiple protections: abnormal power-on voltage protection, start up protection, temperature protection, throttle signal loss protection, over load protection, low voltage protection, over current protection

### Product Specifications

Type	PN# Model	Cont. Current Burst Current	Input Voltage	Weight (g)	BEC Output	Size (mm)	Programming Way
Skyhawk 65A SBEC	4065211	65A/80A	3-6S LiPo	55	6V,7.4V,8.4V adjustable /10A	60*34*22	LCD Program Card G2/ Android&IOS APP
Skyhawk 125A SBEC	4125211	125A/140A	3-8S LiPo	171	6V,7.4V,8.4V adjustable /10A	87*40*32	LCD Program Card G2/ Android&IOS APP
Skyhawk 155A SBEC	4155211	155A/170A	3-8S LiPo	171	6V,7.4V,8.4V adjustable /10A	87*40*32	LCD Program Card G2/ Android&IOS APP
Skyhawk 130A HV SBEC	4130311	130A/150A	6-14S LiPo	236	6V,7.4V,8.4V adjustable /10A	95*50*36	LCD Program Card G2/ Android&IOS APP
Skyhawk 160A HV SBEC	4160311	160A/180A	6-14S LiPo	236	6V,7.4V,8.4V adjustable /10A	95*50*36	LCD Program Card G2/ Android&IOS APP
Skyhawk 300A HV OPTO	4300411	300A/320A	6-14S LiPo	461	None	118*59*47	LCD Program Card G2/ Android&IOS APP

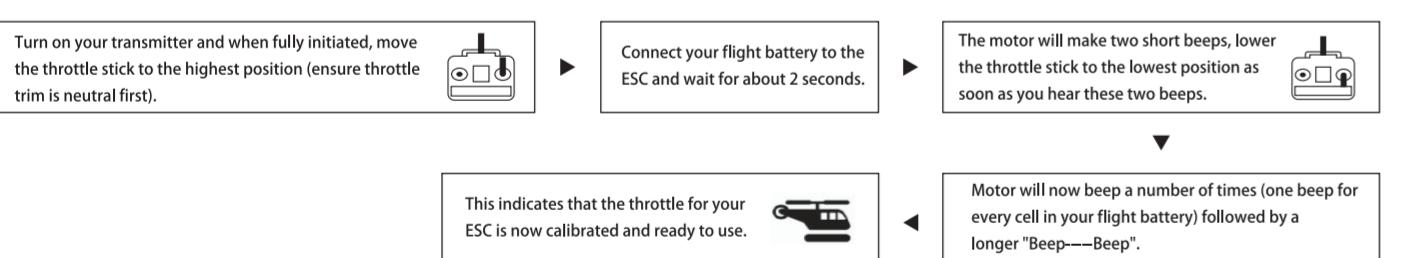
① Remark: The ESC weight and size spec. include fan.

### Wires Connection

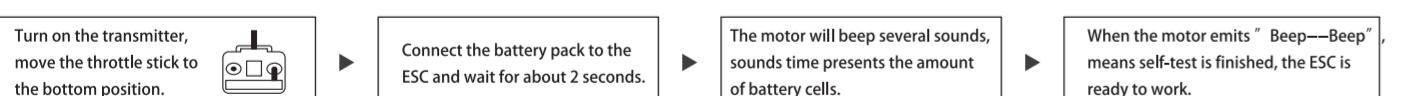


- ① Throttle signal wire (Black,Red,White): Plug into the receiver throttle channel, the white wire is transmitter the throttle signal, the red wire and black wire is the BEC voltage output wire and ground wire.  
 ② BEC output wire(Black,Red): Plug into the receiver battery dedicated channel or any available channel.  
 ③ RPM signal wire (Yellow): Plug into the speed input channel.

### Throttle Calibration



### Normal Startup Procedure

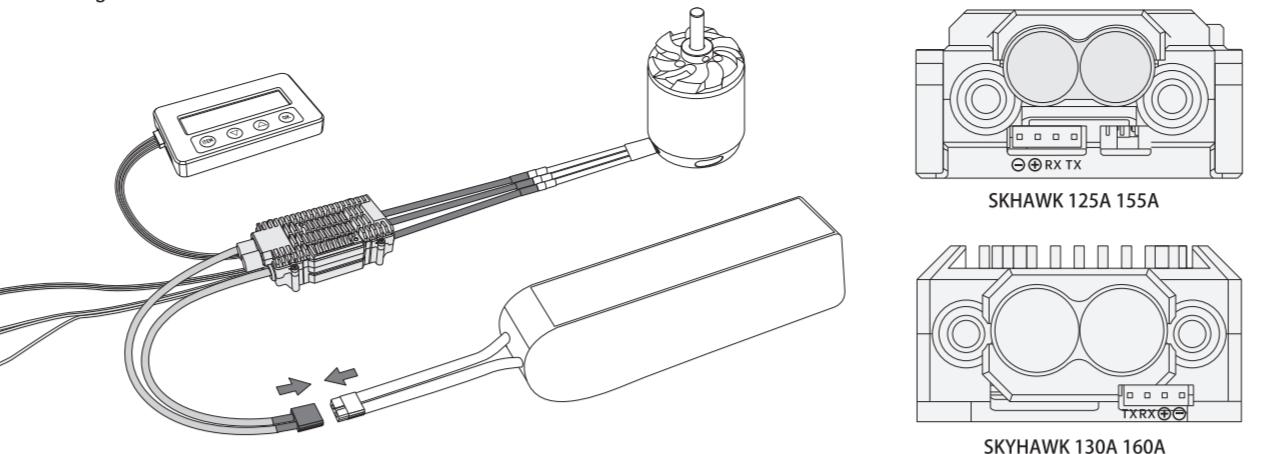


### Parameter setting and the way to check the ESC real time data

The ESC parameters can be programmed to meet different flight needs. The ESC real time data like current, voltage, ESC temperature, throttle, and ESC status code can be checked by LCD program card or Mobile phone APP.

### 1. Using LCD program card to set the ESC parameters (need to purchase LCD program card separately)

#### A. Wire connection diagram

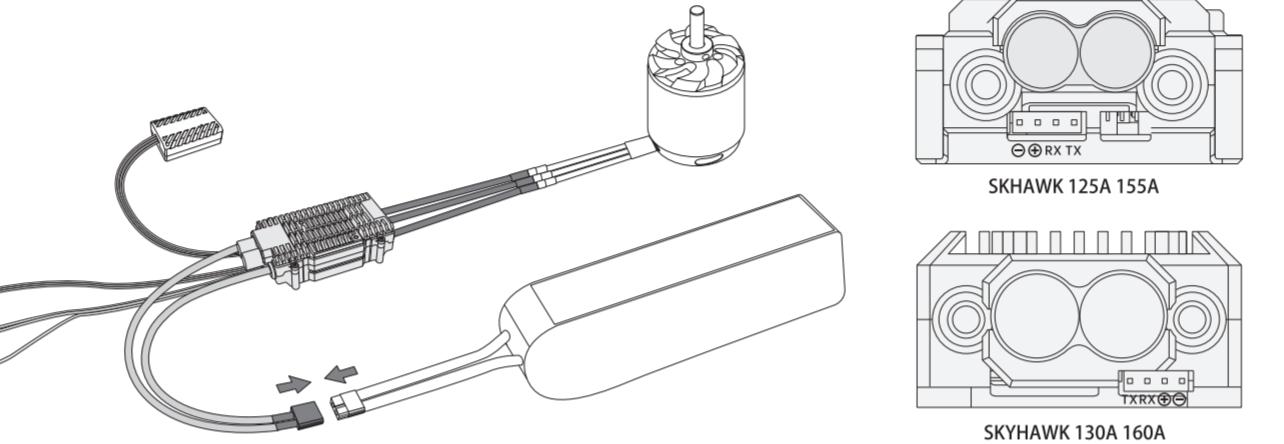


#### B: Operating steps

- Connect the ESC to LCD program card and battery correctly base on above wire connection diagram. (the LCD program card connecting wire:Red wire corresponds to the "+" and Black wire correspond to the "-" position, pay attention to the "+" "-" lettering on the LCD and ESC)
- After connected well, LCD program card turns on and will go to the real time data interface first. (Real time data includes: voltage/current/throttle/RPM/temperature and so on)
- Then press ITEM " orOK " button, it goes to the parameters setting interface. (In parameters setting interface, press ITEM " to change the programmable items, press "Δor " button to choose the item parameters, and press "OK" to save settings.)
- After set the new ESC parameters, need to re-power the ESC again, then the new set parameters will take effect.

### 2. Using Mobile phone APP to set the ESC parameters and view real time data (need to purchase the Bluetooth module separately)

#### A. Wire connection diagram



#### B: Operating steps

- Connect the ESC to the Bluetooth module and battery correctly base on above wire connection diagram. (Blue tooth module Red wire corresponds to "+" and Black wire corresponds to "-", pay attention to the "+" and "-" lettering on the ESC)
- Download and install ZTW APP well, open APP and connect it with Bluetooth, then you can start to set the ESC parameters and check the real time data by APP.
- After set the new ESC parameters, need to re-power the ESC, then the new set parameters will take effect.

### Programmable parameters items and instructions

#### 1. Programmable parameter items and corresponds programmable set values

1 Brake Type	*Normal, Reverse
2 Brake Force	*% 0-100%
3 Timing	*15° 0-30°
4 Motor Rotation	*CW, CCW
5 SR Function	ON, *OFF
6 Battery Cells	*Auto / 3S, 4S, 6S / 3S, 4S, 6S, 8S / 6S , 8S, 10S, 12S, 14S
7 Low Voltage Cutoff Threshold	OFF, 2.5V, 3.0V, 3.2V, 3.4V, 3.6V, 3.8V
8 Low Voltage Cutoff Type	*Reduce Power, Cutoff Power
9 BEC	6.0V,7.4V, 8.4V
10 Acceleration	1, *2, 3, 4
11 Start-up Power	Low, *Middle, High
12 Flight Mode	*Fixed Wing, Helicopter
13 Governor Parameter P	*4 1-10
14 Governor Parameter I	*3 1-10
15 Telemetry	*1 Real Time Data, 2 SBUS

① The options marked with "\*" are the factory default setting.

② Remark: When using gyro for the speed calibration, the Flight Mode need to choose Fixed Wing, and the Acceleration need to choose 4.

#### 2. Programmable parameter project description

##### 1 Brake Type

- 1.1 Normal Brake: When "Normal Brake" is turned on, after the throttle trigger return to zero position, it will make the motor stop running according to the parameter of brake force set, default setting is Normal brake.

- 1.2 Reverse Brake: Plug the 3Pin signal wire into the throttle channel, and plug the 1Pin signal wire into any 2-stage switch channel of the receiver, then turn on the transmitter 2-stage switch. The Reverse Brake function is turned on now, you can change the forward and reverse directions of the motor by flipping the 2-stage switch of the transmitter.

⚠ Warning: This function can only be effective when the throttle is below 50%, and it is only allowed to be used.

##### 2 Brake Force

- After throttle trigger is pulled to zero position, the higher value means the stronger brake force, and it will take shorter time to make the motor from running to standstill.0%-100% adjustable, 1% as 1 step, default setting is 0%. (This function only valid under normal brake mode.)

##### 3 Timing

Adjust the angle of the motor electrically, 0° -30° adjustable, default setting is 15° .

##### 4 Motor Rotation

Clockwise and counter-clockwise direction is adjustable from the ESC, default setting is CW.

##### 5 SR Function

The synchronous rectification function makes the ESC with higher driving efficiency and more energy-saving, and support longer flight time, default setting is off.

##### 6 Battery Cells

The number of battery cells can be set by calculated automatically and set manually. If select Auto-calculation (calculated base on 3.8V each cell). If battery cells errors occurs with motor beeps, like used LiPo or LiHV batteries, then you can set manually, default setting is auto.

##### 7 Low Voltage Cutoff Threshold

22.5V/3.0V/3.2V/3.4V/3.6V/3.8V adjustable, the voltage means each cell voltage. For example if you used 6 cells Lipo battery, then the low voltage threshold value is 6x set voltage value, default setting is 3.0V.

##### 8 Low Voltage Cutoff Type

Reduce Power:When the voltage drops to the set low-voltage protection threshold, the ESC will reduce power to 70%.

Cutoff Power:When the voltage drops to the set low-voltage protection threshold, the ESC will cut off the power immediately.

default setting is reduce power.

##### 9 BEC

The ESC is built in BEC with 6.0V/7.4V/8.4V adjustable, default setting is 7.4V.

##### 10 Acceleration

1,2,3,4 adjustable, the higher value means more soft acceleration, default setting is 2.

##### 11 Start Up Power

Low/Middle/High adjustable, set high means stronger start up force, default setting is Middle

### 12 Flight Mode

Fixed-wing mode:suitable for fixed-wing and multi-rotary aircraft,in this mode, the throttle has to be more than 5%(include 5%) to start the motor and the throttle responds is rapid. Helicopter mode:suitable for fixed speed flight helicopter aircraft, the throttle in this mode has to be more than 40%(include 40%) before starting the motor, the motor starts in a ultra smooth manner,after the completion of slow start speed into the fixed speed operating state, default setting is Fixed-wing mode.

#### 13 Governor Parameter P

Control the degree of rotation while maintaining at fixed speed. The higher the value, the greater the degree of regression target speed when the speed is insufficient. Whereas, when the speed is too high, the function needs to be combined with the fixed speed sensitivity I setting. 1 to 10 adjustable, default setting is 4.

#### 14 Governor Parameter I

When the speed falls below, or exceeds the value set, the speed is compensated by the ESC. This parameter is used to resize the degree of rotation. Too large parameters will cause excessive make-up, too small parameters will cause insufficient replacement.1 to 10 adjustable, default setting is 3.

#### 15 Telemetry

Real Time Data, SBUS2, default setting is Real Time Data.

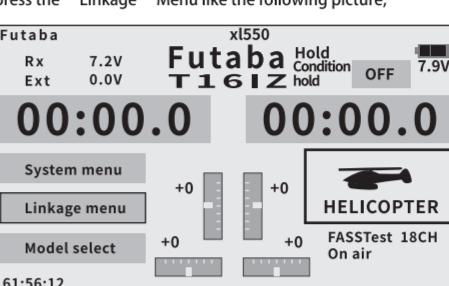
If set Real Time Data means you can have the real time data on the LCD program card and mobile phone app.

If set SBUS2 means you can have the real time data on the transmitter.

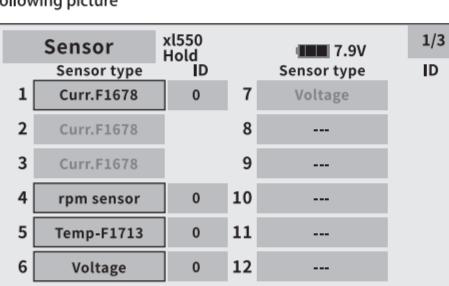
Let's take FUTABA remote control (SBUS2 protocol) as an example, to show you how to set the (Telemetry)real time data return function.

① Connected the ESC with battery and receiver well, then turn on the transmitter,

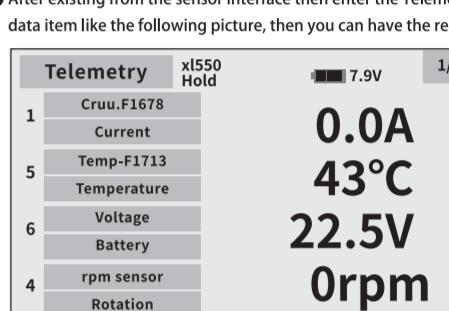
② Select and press "Sensor" like the following picture;



③ After entered the sensor interface, select each data item in sequence like the following picture



④ After exiting from the sensor interface then enter the Telemetry interface, add the selected data item like the following picture,



### The Fixed Speed Function Settings

#### 1. Fixed speed description

By speed calibration, the motor speed-throttle value corresponding curve is established. The throttle value is set to a fixed value on the remote control, the output of the throttle value corresponds to the speed, and the motor load changes to maintain the same speed.

Note: The manufacturer default setting is fixed-wing mode, if set to the helicopter mode, then you need to do the speed calibration for the first time, and the ESC will store the motor speed-throttle value corresponding curve after the speed calibration.

#### 2. Speed calibration process

① When using gyro for the speed calibration, the Flight Mode need to choose Fixed Wing, and the Acceleration need to choose 4.

#### 3. Speed calibration

① Need to do the throttle calibration first before the speed calibration (if already done, just skip this step).