ZTW SKKHAWK Series Brushless Electronic Speed Controller User Manual

ZTW® Technology Co.,Ltd.

SKYHAWK

Series Brushless Electronic Speed Controller User Manual

Series ESC User Manual

Contents

Series Brushless Electronic Speed Controller

Thank you for purchasing ZTW Skyhawk Brushless Electronic Speed Controller (ESC). We strongly recommend reading this manua carefully before using ths 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 thatis 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 alllocal laws regarding the flying of remote control aircraft.
- Neveriy over or near crowds.

Key Features

1. Adopting high performance 32 bit microprocessor with a running frequency of 170MHz, supported much stronger computing ability and faster running speed.
2. Adopting new generation craft on the MOSFET, low heat generation, large instantly withstand current, and high reliability.
3. 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.
4. The special ESC case design and the unique fan guard structure greatly enhance the ESC heat dissipation performance.
5. There are two flight modes: fixed-wing mode and helicopter mode.
6. Equipped with the helicopter speed-control function, the speed sensitivity is adjustable and easy to operate.
7. 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 erors.
8. The ESC has a separate programming interface to connect with LCD programming card or Bluetooth module

for programming.

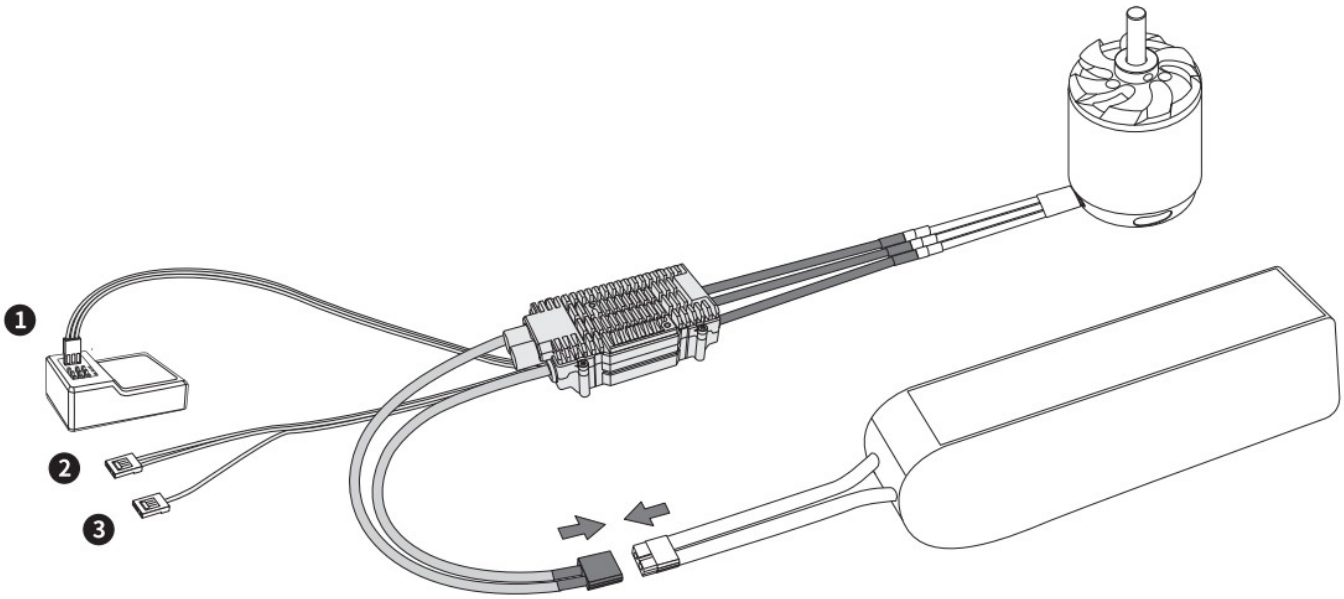
9. Supporting data returning function: current, voltage, temperature, RPM, throttle and ESC status code.
10. Bluetooth module supported, change the parameter settings, software upgrading, data recording and the operation can be completed via the mobile phone (Apple and Android) APP.
11. Multiple protections: 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	sim (mm)	Programming Way
Skyhawk 65A SBEC	4065211	65A/80A	3-65LiP0	55	6V,7.4V,8.4V adjustable /10A	60*34*22	LCD Program Card G2/ Android&IOS APP
Skyhawk 125A SBEC	4125211	125A/140A	3-8SLiPo	171	6V,7.4V,84Vadjustable /10A	874032	LCD Program Card G2/ Android&IOS APP
Skyhawk 155A SBEC	4155211	155A/170A	3-8SLiPo	171	6V,7.4V,84Vadjustable /10A	87*40*32	LCD Program Card G2/ Android&IOS APP
Skyhawk 130A HVSBEC	4130311	130A/150A	6-145LiPo	236	6V,7.4V,84Vadjustable /10A	95*50″36	LCD Program Card G2/ Android&IOS APP
Skyhawk 160A HVSBEC	4160311	160A/180A	6-14SLiPo	236	6V,7.4V,84Vadjustable /I0A	95%50*36	LCD Program Card G2/ Android&IOS APP
Skyhawk 300A HVOPTO	4300411	300A/320A	6-14SLiPo	461	None	11845947	LCD Program Card G2/ Android&IOS APP

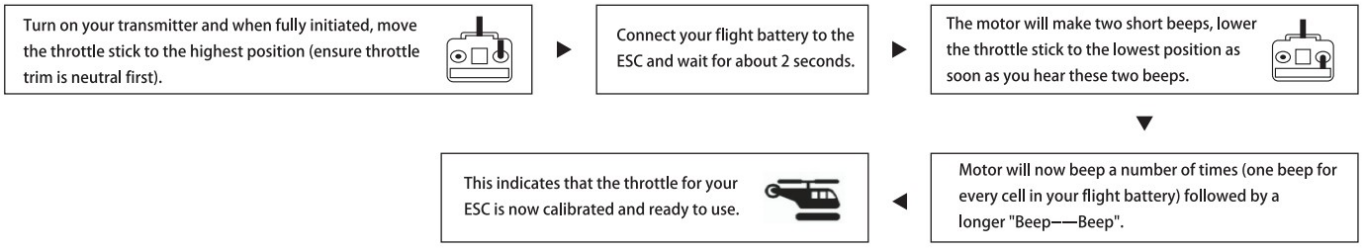
Remark: The ESC weight and size spec. include fan.

Wires Connection

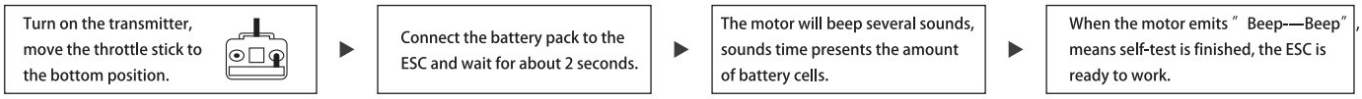


1. Throttle signal wire (Black Red, White: Plug into the receiver throttle channel, the white wire i transmitter the throttle signal, the red wire and black wire is the BEC voltage output wire and ground wire.
2. BEC output wire(Black Red): Plug into the receiver battery dedicated channel or any available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

Throttle Calibration



Normal Startup Procedure



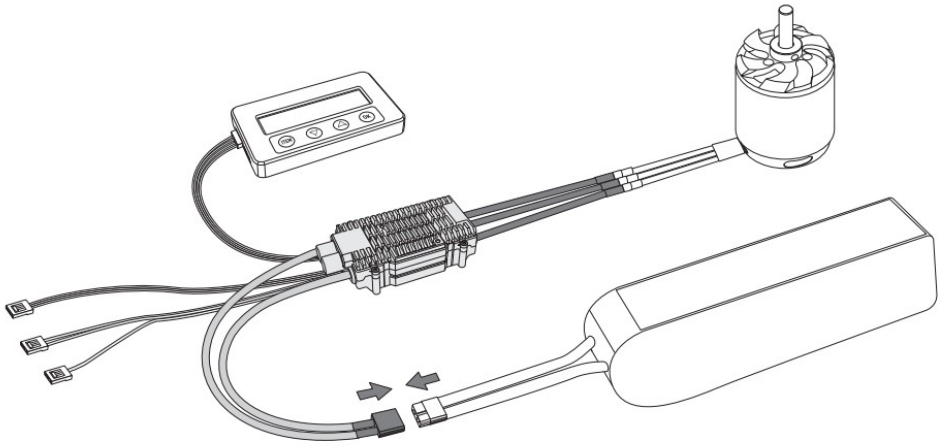
Parameter setting and the way to check the ESC real time data

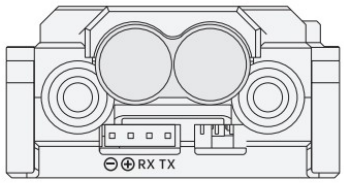
'The ESC parameters can be programmed to meet different flight needs.

'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.

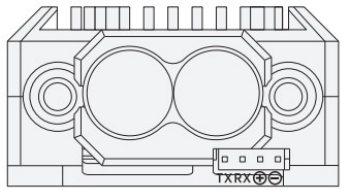
1. Using LCD program card to set the ESC parameters (need to purchase LCD program card separately)

A. Wire connection diagram





SKHAWK 125A 155A

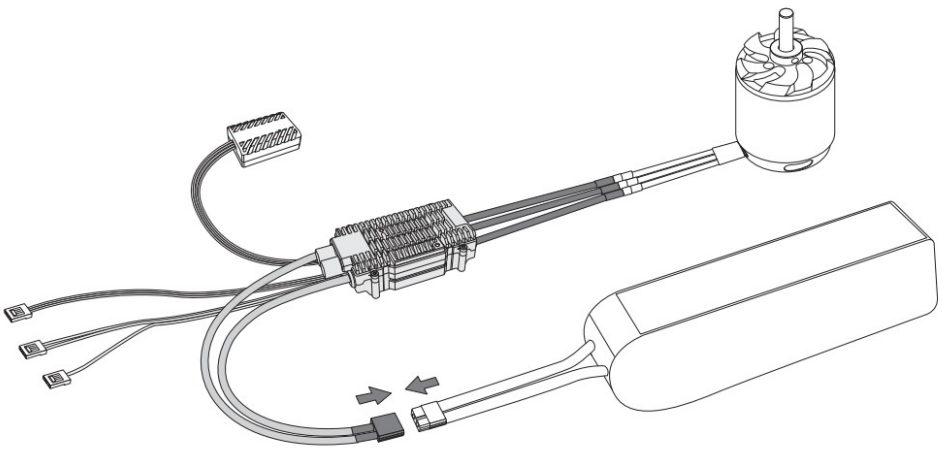


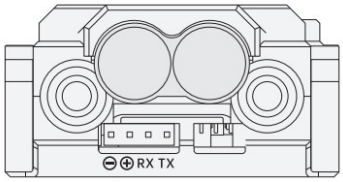
SKYHAWK 130A 160A

B: Operating steps

1. 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 tothe “~” position, pay attentiontothe “+ ” lettering on the LCD and ESC)
2. 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 50 on)
3. Thenpress ITEM * oK button, it goes to the parameters setting interface. (In parameters setting interface, press [TEM * to change the programmable items, presy * “ok” button to choose the item parameters, and press “OK” to save settings.)
4. After set the new ESC parameters, need to re-power the ESC again, then the new set parameters willtake effect.

2. Using Mobile phone APP to set the ESC parameters and view real time data (need to pu ase the Bluetooth module separately)
A. Wire connection diagram





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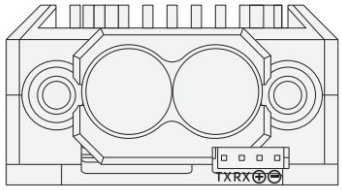


SKYHAWK 130A 160A

B: Operating steps

1. Connect the ESC to the Bluetooth module and battery correctly base on above wire connection diagram. (Blue tooth module Red wire correspondsto *+* and Black wire corresponds to * “, payattentiontothe “+ and ” – ‘ lettering on the ESC)
2. 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.

3. After set the new ESC parameters, need to re-power the ESC, then the new set parameters willtake effect.

Programmable parameters items and instructions

1. Programmable parameter items and corresponds programmable set values

1 Brake Type	*Normal, Reverse
2 Brake Force	*0% 0 -100%
3 Timing	*15 0-30′
4 Motor Rotation	*CW, CCW
5 SR Function	ON, *OFF
6 Battery Cells	*Auto /35, 45, 65 /35, 45, 65, 85/6S, 8S, 10S, 125, 145
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

The options marked with “* ” are the factory default setting

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 standstill0%-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 s 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 LiFe 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 settingis 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 s builtin BEC with 6.0V/7.4V/8.4V adjustable, default setting is 7.4V.

10. **Accelerat**

    1,234 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 mannerafter 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 to0 high, the function needs to be combined with the fixed speed sensitivity setting. 1 to 10 adjustable, default settingis 4.

14. **Governor Parameter**

    When the speed fails 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, t00 small parameters will cause insufficient replacement.1 to 10 adjustable, default setting is 3.

15. **Telemetry**

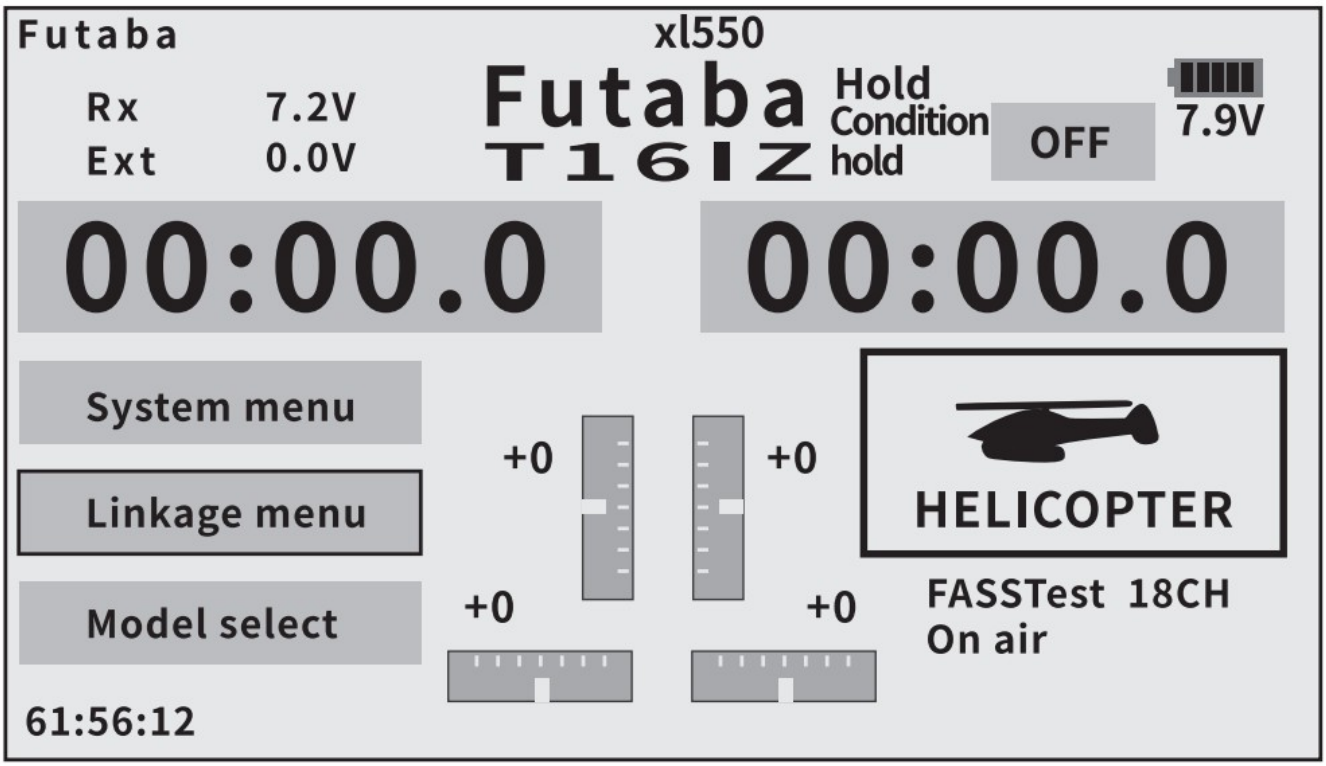
    Real Time Data, SBUS2, default setting is Real Time Data.

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

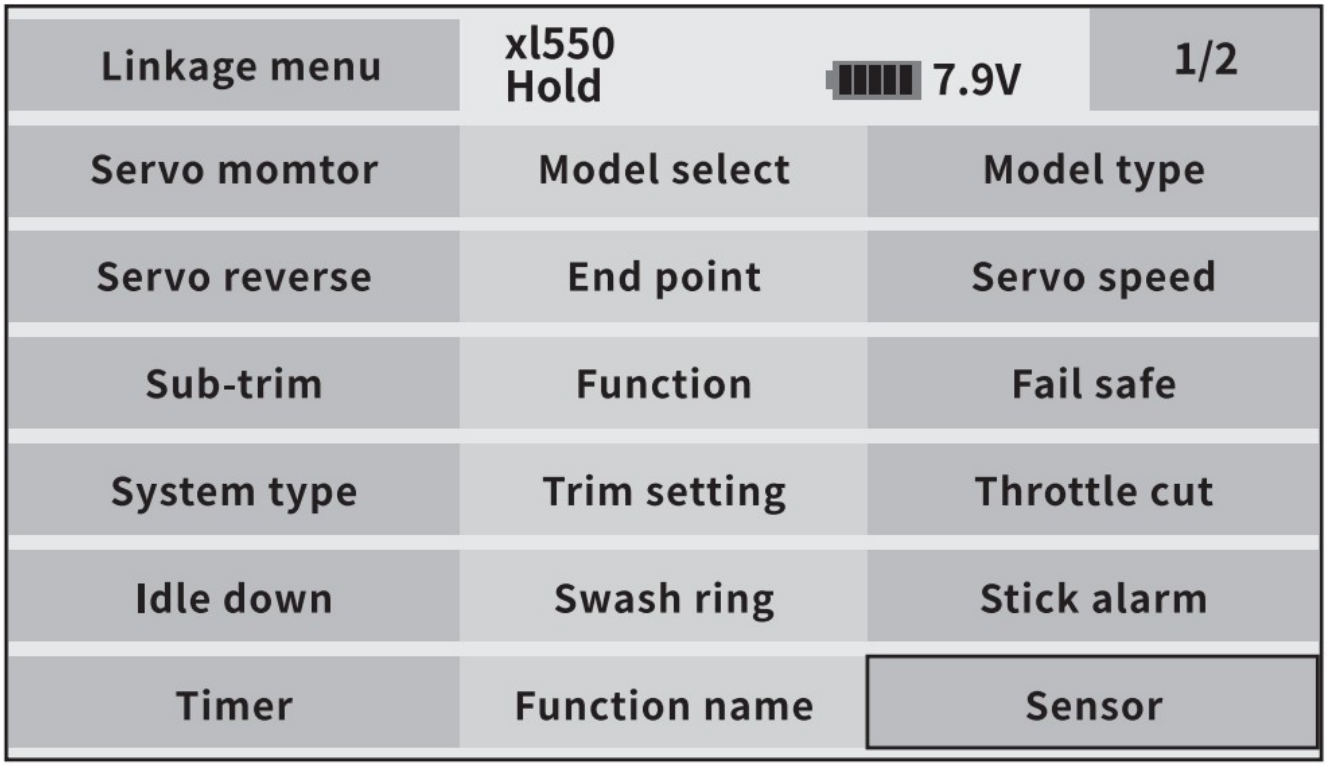
If set SBUS2 means you can have the real time data on the transmitter.

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

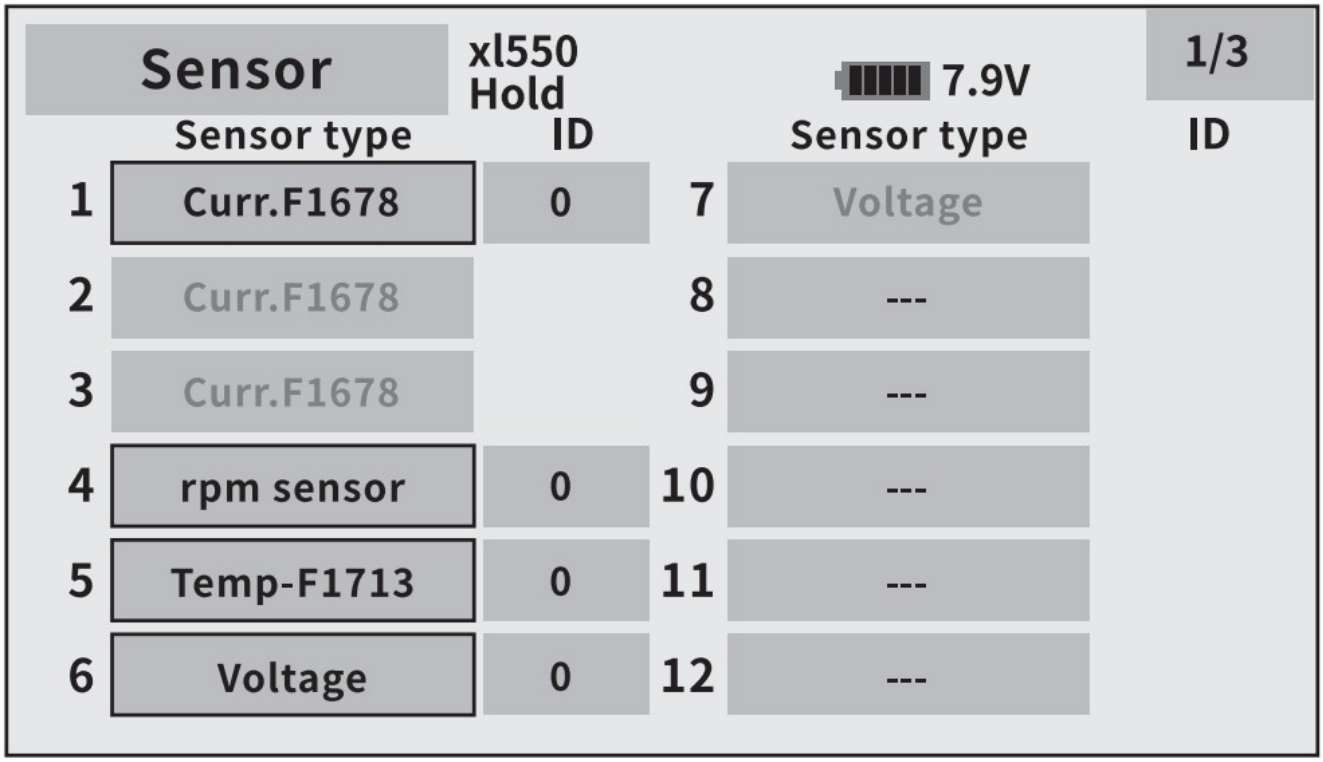
1. Connected the ESC with batery and receiver well, then turn on the transmitter, pressthe “Linkage” Menu like the following picture;



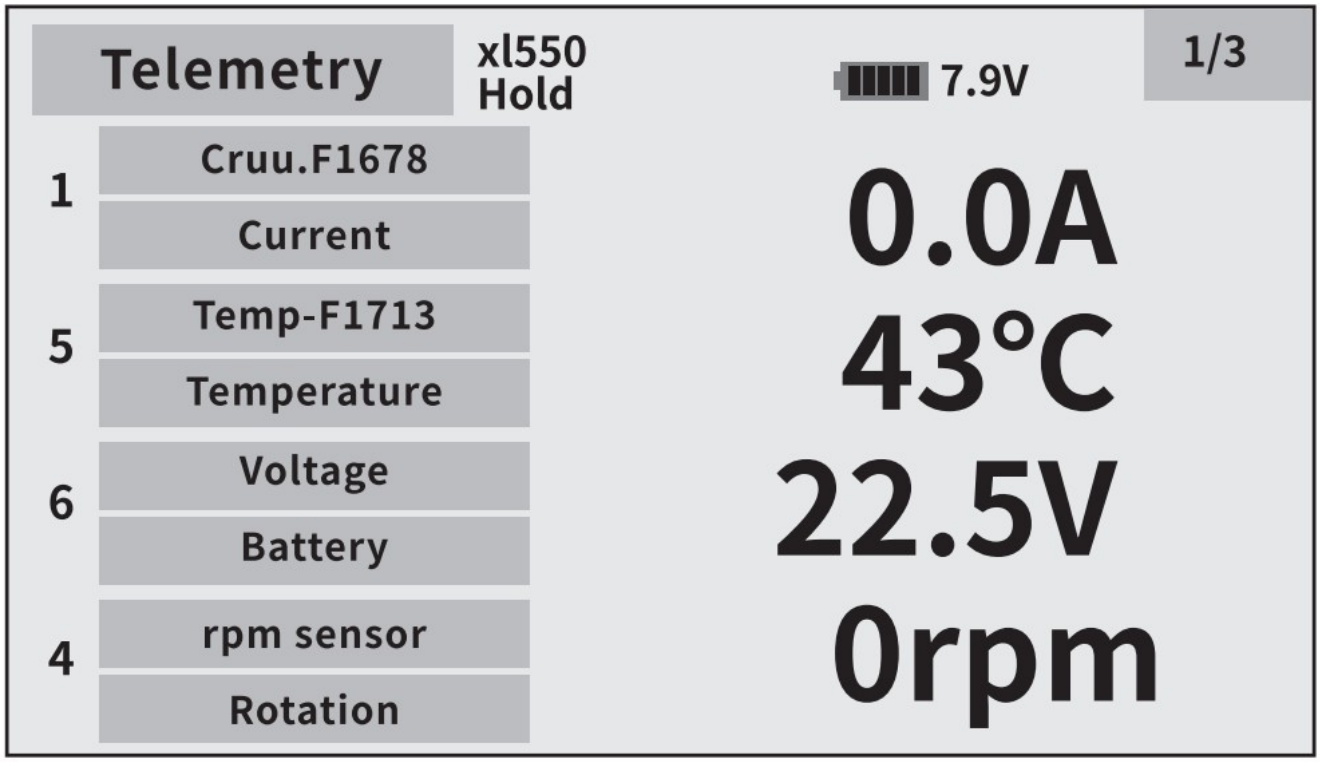
2. Selectand press “Sensor” like the following picture;



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



4. After existing from the sensor interface then enter the Telemetry interface, add the selected data item like the following picture, then you can have the real time data on the transmitter.



The Fixed Speed Function Settings

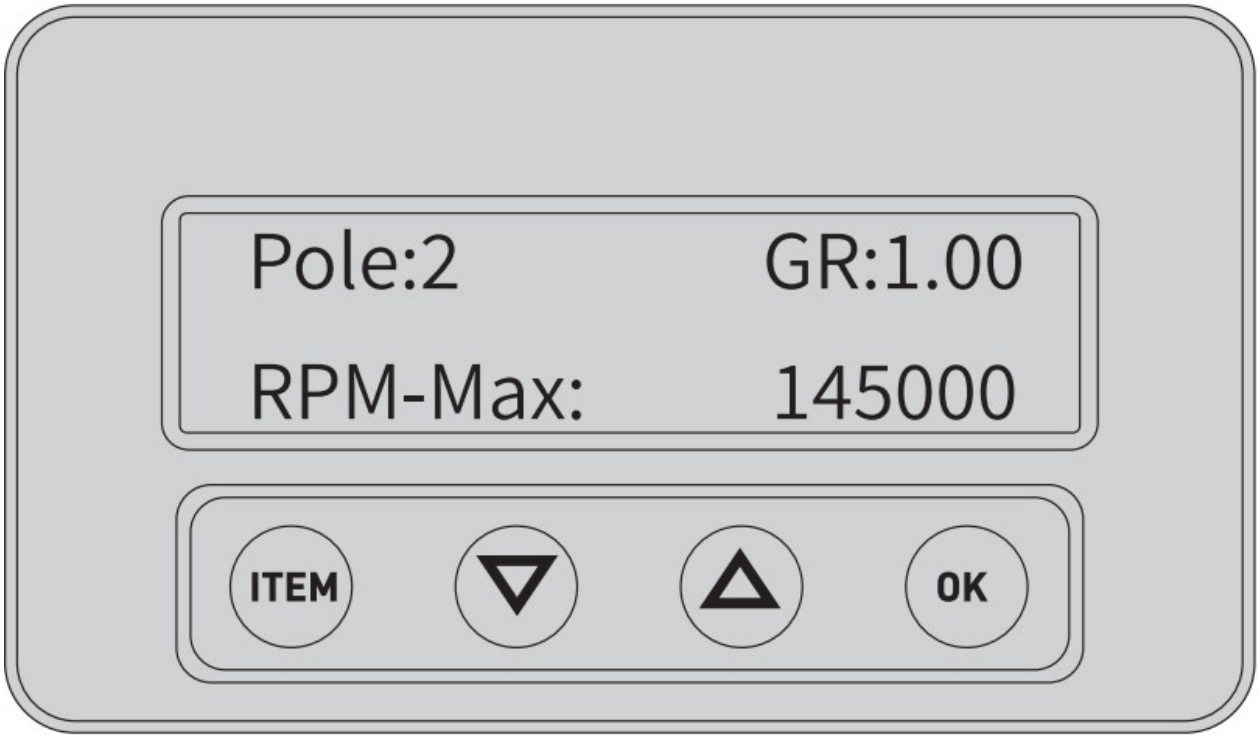
1. Fixed speed description

   By speed calibration, the motor speed-throttle value corresponding curve s established. The throttle value i 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 manufacture default setting is Fixed-wing mode, if et to the helicopter mode, then you need to do the speed calibration for the first time, and the ESC wil stores the motor speedthrottle value corresponding curve after the speed calibration.

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

2. Speed calibration process
    1. Need to do the throttle calibration first before the speed calibration (if already done, just skip this step).
    2. Make sure the main rotor pitch is at 0 degrees.
    3. Pullthe throttle stick to the minimum position, waiting for the esc self-check process.
    4. Push the throttle to 50%, the rotor of the helicopter wil start to slowly accelerate (the main rotor pitch is zero degrees, the helicopter will not lft ff) and wait for the acceleration to complete, When the rotor speed i stable, push the throttle sick to the minimal position.
    5. Speed calibration isfinished.
3. How to calculate the main rotor RPM at 100% throttle
    1. Connect the LCD program card o Bluetooth after the speed calibration is completed tofind the records as shown:



    The values in the figure s just a example, depending on the actual display values. This valueis the maximum electrical speed that the motor can achieve at 100% throttle.

    2. For example, if motor have 10 poles, using 13 motor teeth with main teeth of 120T, the gear ratio is around 9.23.

    And Formula;

    100% throttle speed of the main rotor=MAX RPM = (motor poles +2)+ gear ratio

    Then the main rotor 100% throttle speed is 145000-+(10+2)-(12 + 13) is around 3410 RPM

    If the main rotor during 3D flight requires to be maintained at 2500 rpm, the fixed speed throttle needs to be set at 2500-+ 3410 to get about 0.8. At 0.8, e throttle value needs to be setat 80%.

    3. You can set motor poles and the gear ratio (GR) on a LCD program card to get the speed of the main rotor at 100% throttle.
        1. Connect the ESC to:a LCD program card after the speed is calibrated, and then enter the interface as shown above.
        2. press “OK” toselect options related to “motor poles” , press “OK” toselect gear ratio (GR) by, then press “OK” will show the speed of the main rotor at 100% throttle.

Protection Function

1. **Abnormal power-on voltage protection :** The ESC enters a protective state once the input voltage detected is not n the operating voltage, Prompting LED light to flash.
2. **Start-up protection:** If the motor fails to start normally within 2 seconds after pushing the throttle to start, the ESC will cut off the output power, and you need to make the throttle calibration again, then ESC can be restarted. Possible reasons: disconnection or poor connection between ESC and motor, the propeller or motor is blocked by other objects, the gearbox is damaged, etc.
3. **Over-heat protection:** When the temperature of the ESC is over about 110°C, the ESC will automatically reduce the output power for protection, but wil not fully shut down the power, reduce itt0 70% of the full power at most to ensure the motor has enough power to avoid crashes.
4. **Throttle signal loss protection:** The ESC will reduce the output power if throttle signal is lost for 1 second, will cut off output to the motor f the throttle signal islost over 2 seconds. If the: throttle signal restored during power down, the ESC willimmediately restored throttle control. In this way, the ESC will not protect when the signal loss less than 2 seconds, only when the signal lost s over 2 seconds or longer time. And the ESC will reduce the output power gradually instead of cutting off it immediately, so the player has enough of time to save the plane, taking into account safety and practicality.
5. **Over load protection:** The ESC will cut off power or restart automatically when the load increased a lot suddenly, possible reason is the motor blocked. “
6. **Low voltage protection:** When the operating voltage of the ESC have exceeded the protection voltage set, power will be gradually reduced for safety, but will not be turned off, These willstill be up o 50% of power, to ensure that the motor has the power to land,
7. **Over-current protection:** When the peak current exceeds the specified value, the ESC will immediately cut off the output power, and then restart to restore the power. If the current exceeds the specified value again, the output power will be completely cut off. Possible reason s overload, burnt motor and so on.
8. **Break Protection:** If there is a break in the connection between the motor and ESC. Check the motor is fully connected,check connectors or solder joints are as they should be.

Explanations for Warning Tones

Throbles:	Wairings Tones
1.Throttle signal loss	“Beep-Beep~” (every two seconds)
2Temperature protection	“Beep Beep-Beep Beep–” (every two seconds)
3.Low voltage protection	“Beep Beep Beep–Beep Beep Beep—” (every two seconds)
4The throttle value Is not at 0% throttle	“Beep-Beep-” (every 200 millseconds)
5.The voltage Is not within the range	“DoRaMI-DoRaMI-” (every 200 milliseconds)

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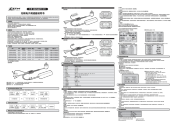
Documents / Resources

	ZTW SKKHAWK Series Brushless Electronic Speed Controller [pdf] User Manual 160A HV SBEC 14S, SKKHAWK Series Brushless Electronic Speed Controller, Brushless Electronic Speed Controller, Electronic Speed Controller, Speed Controller