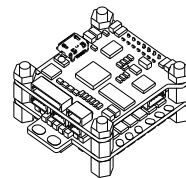




Thank you for purchasing our product. Any Improper operation may cause personal injury damage to the product and related equipments. This high power system for RC model can be dangerous, we strongly recommend reading the user manual carefully and completely. We will not assume any responsibility for any losses caused by unauthorized modifications to our product. We have the right to change the design, appearance, performance and usage requirements of the product without notice.

### 01 Main features

- EFM8BB21F16G MCU, pipelined 8-bit C8051 core with 50 MHz maximum operating frequency.
- Dedicated high frequency driver, makes the start more smooth. ESC maximum speed is limited to 500k eRPM.
- Two layers tower structure between 4in1 ESC and FC using quick pin connection. Dual ways signal transmission makes the flight more stable
- Exposed pads for Battery and Motor wires, fast welding without additional disassembly, makes the installation faster and more convenient.
- F3 flight controller, supports PPM, PWM and SBUS remote control / receiving mode.
- FC integrated OSD, also integrated 5V/1A, 12V/500mA for Image transmitter, camera, buzzer, LED and other peripheral devices; provided several silicone cables for connectors on FC, and will give you an unprecedented experience for installation;
- Connect computer via USB on the flight controller, then can upgrade ESC software directly or adjusted the ESC settings directly;
- Built-in current meter, OSD directly display the real-time current without any additional connection;
- BLHeli-S firmware is the next generation code, following the base BLHeli code. It designed for superior performance in multirotors, and uses hardware generated motor pwm for smooth throttle response and silent operation.
- Supports features to prevent sync loss. There are tuneable parameters that can make the code run well even in the most demanding situations, although default settings will work excellently in normal operating environments.
- The code supports regular 1-2ms pulse width input, as well as Oneshot125, Oneshot42 and Multishot. The input signal is automatically detected by the ESC upon power up.
- Supports Dshot150, Dshot300 and Dshot600. Dshot is digital signal, anti-interference ability is stronger, and do not need throttle calibration.



\*图片仅供参考，产品以实物为准

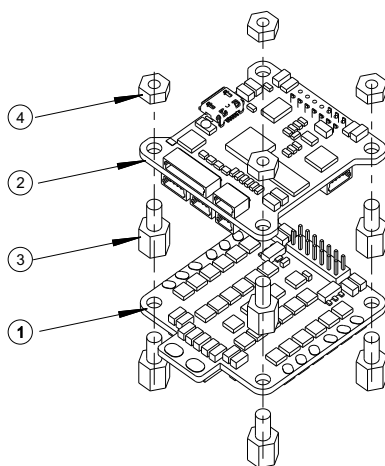
### 02 Specifications

Model	Manufacture Model	Con. Current	Burst Current (10S)	BEC	LiPo cells	Weight	Size (For reference)	Typical Applications (For reference)
Raptor S-Tower-20A	W4-FW020004-SX	20A	30A	No	2-4S	20g	41.5x36x19.6mm	130-330 Multi
Raptor S-Tower-30A	W4-FW030004-SX	30A	40A	No	2-4S	20g	41.5x36x19.6mm	170-450 Multi

\*Raptor S-Tower is using the A-H-15 BLHeli-S firmware; Please contact Flycolor for more information.

### 03 Part list / Install Dimensions

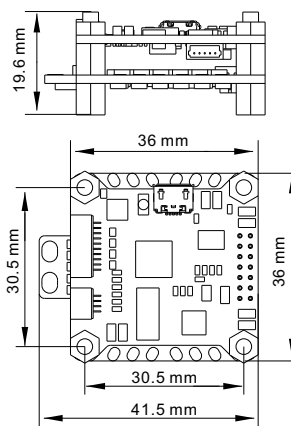
Item	Description	Qty.
1	Raptor BLS 4in1 ESC	1
2	Flight Controller	1
3	Nylon spacer M3*6+6	8
4	Nylon Nut M3	8
5	Nylon screw M3*10 (Not shown in figure)	4



For quick plug, Flight Controller additionally provide :  
 one 10p cable (10-pin SH1.0 terminal) for PWM or PPM connectors;  
 one 3p cable (4-pin SH1.0 terminal)for SBUS connector;  
 one 5p cable (5-pin SH1.0 terminal)for LED and Buzzer;  
 three 4p cables(4-pin SH1.0 ) for different brand Image Transmitters.  
 two 3p cables (3-pin SH1.0 )for different brand Cameras;

Attention: For these quick plug cables, please confirm the wire sequences on your devices' connector are corresponding with the Flight controller's before connecting. If the terminals are not fit your devices ,please make a modified connection to fit.

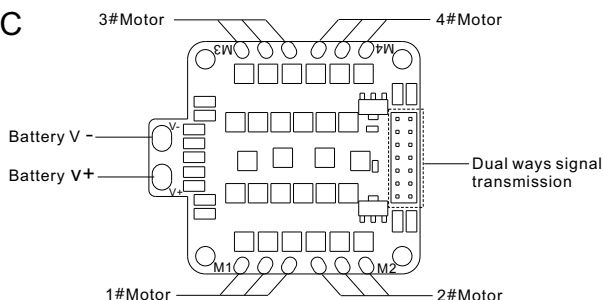
#### Install Dimensions



\*All pictures are for reference only

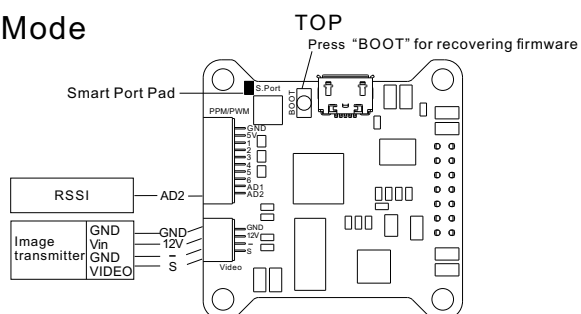
### 04 Wiring diagram of ESC and FC receiving mode

#### ESC

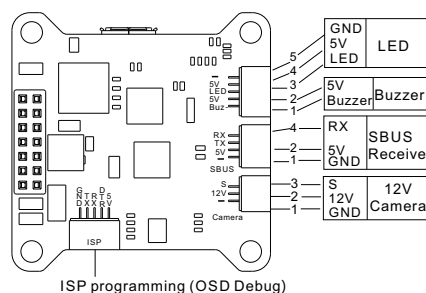


- All welding requires good welding technology, short circuit between the element or the wire should be avoided at any time.
- Please ensure all solder joints are insulated with heat shrink where necessary.
- Please double-check the polarity is correct before power up.

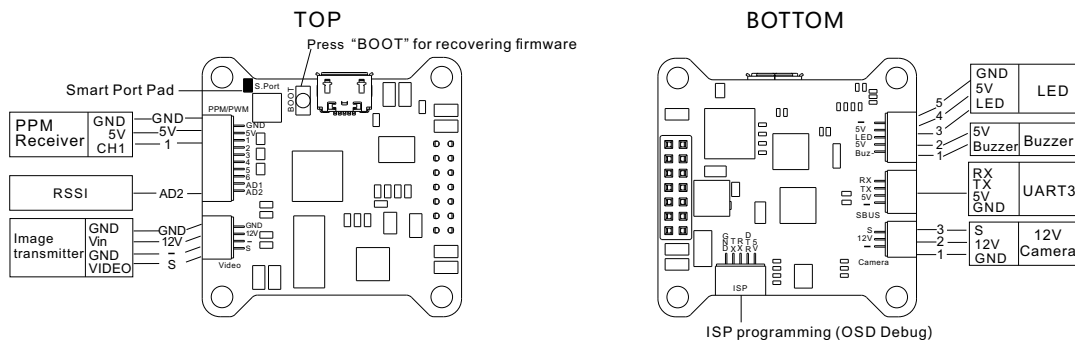
#### SBUS Mode



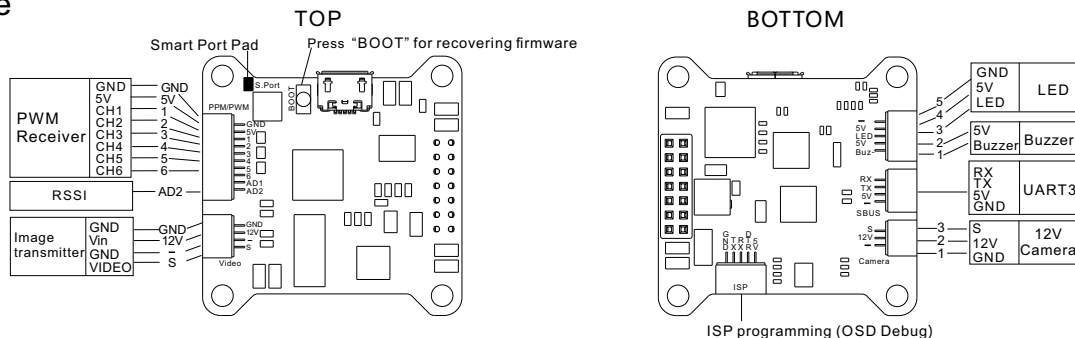
#### BOTTOM



## PPM Mode



## PWM Mode



## 05 ESC Programming parameter

Programming parameters below can be accessed from the configuration software (BLHeliSuite):

- 1. Startup power:**  
Startup power can be set to relative values from 0.031 to 1.5. This is the maximum power that is allowed during startup. Actual applied power depends on throttle input, and can be lower, but the minimum level is a quarter of the maximum level. Startup power also affects bidirectional operation, as the parameter is used to limit the power applied during direction reversal. For low rpms, the maximum power to the motor is limited, in order to facilitate detection of low BEMF voltages. The maximum power allowed can be set via the startup power parameter.
- 2. Commutation timing:**  
Commutation timing can be set to low/mediumlow/medium/mediumhigh/high, that correspond to 0°/7.5°/15°/22.5°/30° timing advance. Typically a medium setting will work fine, but if the motor stutters it can be beneficial to change timing. Some motors with high inductance can have a very long commutation demagnetization time. This can result in motor stop or stutter upon quick throttle increase, particularly when running at a low rpm. Setting timing to high will allow more time for demagnetization, and often helps.
- 3. Demag compensation:**  
Demag compensation is a feature to protect from motor stalls caused by long winding demagnetization time after commutation. The typical symptom is motor stop or stutter upon quick throttle increase, particularly when running at a low rpm. As mentioned above, setting high commutation timing normally helps, but at the cost of efficiency. Generally, a higher value of the compensation parameter gives better protection. If demag compensation is set too high, maximum power can be somewhat reduced.
- 4. Direction:**  
Rotation direction can be set to fwd/rev/bidirectional fwd/bidirectional rev. In bidirectional mode, center throttle is zero and above is fwd rotation and below is reverse rotation. When bidirectional operation is selected, programming by TX is disabled.
- 5. Beep strength:**  
Sets the strength of beeps under normal operation.
- 6. Beacon strength:**  
Sets the strength of beeps when beeping beacon beeps. The ESC will start beeping beacon beeps if the throttle signal has been zero for a given time. Note that setting a high beacon strength can cause hot motors or ESCs!
- 7. Beacon delay:**  
Beacon delay sets the delay before beacon beeping starts.
- 8. Programming by TX:** If disabled, throttle calibration is disabled. Please notice that throttle stick can calibrate throttle range only, and can not programming parameter via throttle stick.
- 9. Min throttle, max throttle and center throttle:**  
These settings set the throttle range of the ESC. Center throttle is only used for bidirectional operation. The values given for these settings are for a normal 1000us to 2000us input signal, and for the other input signals, the values must be scaled.
- 10. Thermal protection:**  
Thermal protection can be enabled or disabled. And the temperature threshold can be programmed between 80°C and 140°C (from rev16.3). The ESC measures temperature within the MCU and limits motor power if the temperature is too high. Motor power is limited in four steps:
  - If the temperature is above threshold, motor power is limited to 75%.
  - If the temperature is above threshold 5°C, motor power is limited to 50%.
  - If the temperature is above threshold 10°C, motor power is limited to 25%.
  - If the temperature is above threshold 15°C, motor power is limited to 0%.
- 11. Low RPM power protect:**  
Power limiting for low RPMs can be enabled or disabled. Disabling it can be necessary in order to achieve full power on some low kV motors running on a low supply voltage. However, disabling it increases the risk of sync loss, with the possibility of toasting motor or ESC.
- 12. Brake on stop:**  
Brake on stop can be enabled or disabled. When enabled, brake will be applied when throttle is zero. For nonzero throttle, this setting has no effect.

## 06 Attention

- User need to calibrate the throttle range when starting to use a new ESC or another transmitter. When the input signal is Dshot, throttle calibration is disabled
- BLHeli-S open-source firmware, when some abnormality occurs in ESC driving the motor or need the motor to reach a higher RPM, user can try to change the timing.
- Observe polarity at all times. Check and double check before applying power.
  - Power off before unplugging, plugging in or making any connections.
- 5V, 12V supply is for low-current use only (5V 1A MAX, 12V 500mA MAX).
- Do everything you can to prevent vibrations.
  - Keep magnets away from the Flight Controller.
  - Please contact Flycolor sales or technical support for more information.

## User Manual Multi-Rotor Brushless ESC