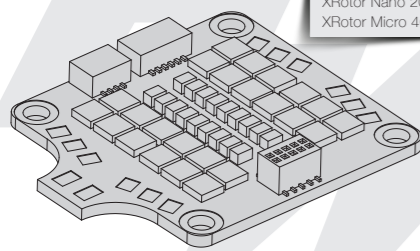


01 Introduction

X-Rotor USER MANUAL
Multi-Rotor
 Brushless Electronic Speed Controller
 XRotor Nano 20A 4in1 BLHeli-S DShot600
 XRotor Micro 40A 4in1 BLHeli-S DShot600



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 damage or losses resulting from the use of the product. We do not assume responsibility for any losses caused by unauthorized modifications to our product. We, HOBBYWING, are only responsible for our product cost and nothing else as result of using our product.

02 Warnings

- Read through the manuals of all power devices and aircraft and ensure the power configuration is rational before using this unit, as incorrect configuration may cause the ESC to overload and be damaged.
- Ensure all wires and connections must be well insulated before connecting the ESC to related devices, as short circuit will damage your ESC. And ensure all devices are well connected, (please use a soldering iron with enough power to solder all input/output wires and connectors if necessary,) as poor connection may cause your aircraft to lose control or other unpredictable issues such as damage to the device.
- Do not use this unit in the extremely hot weather or continue to use it when it gets really hot (around 105°C/221°F). Because high temperature will cause the ESC to work abnormally or even damage it.
- Users must always disconnect the batteries after use as the current on the ESC is consuming continuously if it's connected to the batteries (even if the ESC is turned off). The battery will completely be discharged and may result in damage to the battery or ESC when it is connected for a long period of time. This will not be covered under warranty.
- The open source ESC can only be flashed with the corresponding firmware (not any other firmware) when flashing firmware, otherwise it may cause the ESC to stop working and even damage the chip inside.

03 Features

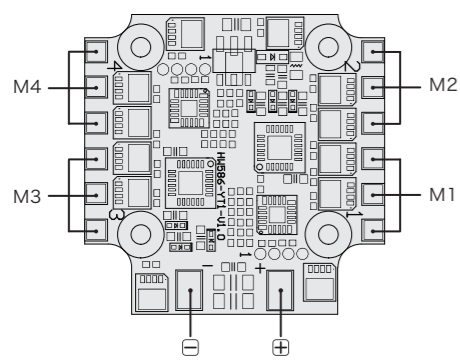
- Compact design for easy installation and neat wiring.
- Amp/Volt monitoring port allows flight controller to monitor the voltage & amperage in real time (on condition that the FC supports the function).
- EMF88B2 chip with an operating frequency of 48MHz for great performance.
- BLHeli-S open source program supports firmware update or ESC programming via throttle signal wire and all the functions of BLHeli-S.
- Damped light mode for rapider motor response.
- Regular PWM throttle mode, OneShot125 throttle mode, OneShot42 throttle mode, and MultiShot throttle mode are supported.
- Dshot150/300/600 digital throttle mode is supported.
- ESC supports a throttle signal of up to 621Hz in regular throttle mode and is compatible with various flight controllers.

04 Specifications

Model	Cont. Current	Peak Current	BEC	LiPo	Weight	Size	Mounting Hole
XRotor Micro 40A 4in1 BLHeli-S DShot600	40A	50A	5V @ 1.5A	2-5S LiPo	10g	42.6x36x4mm	30.5x30.5mm
XRotor Nano 20A 4in1 BLHeli-S DShot600	20A	30A	No	2-4S LiPo	6g	32x31.9x5.8mm	20x20mm

05 User Guide

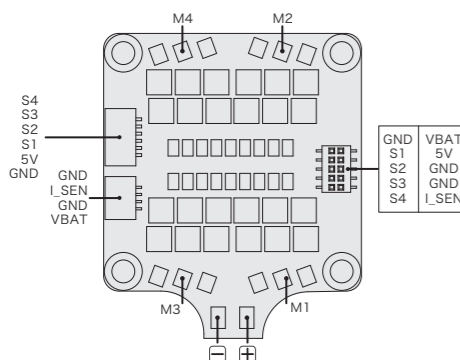
1 XRotor Nano 20A 4in1 BLHeli-S DShot600 Definitions for Different Ports



Please ensure that the capacitor included in the product box is also soldered onto the ESC when soldering ESC input wires.

- S1/S2/S3/S4: they are throttle signal input ports; port S1 is for ESC M1, S2 is for M2, S3 is for M3 and S4 is for M4.
- →: the "→" on the board are soldering points for connecting the power wire; and the "+-" next to S1, S2, S3 and S4 are pins for connecting the flight controller.

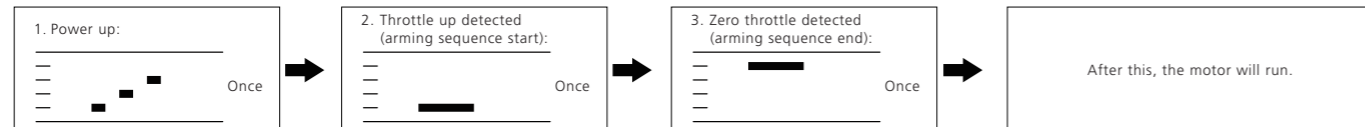
2 XRotor Micro 40A 4in1 BLHeli-S DShot600 Definitions for Different Ports



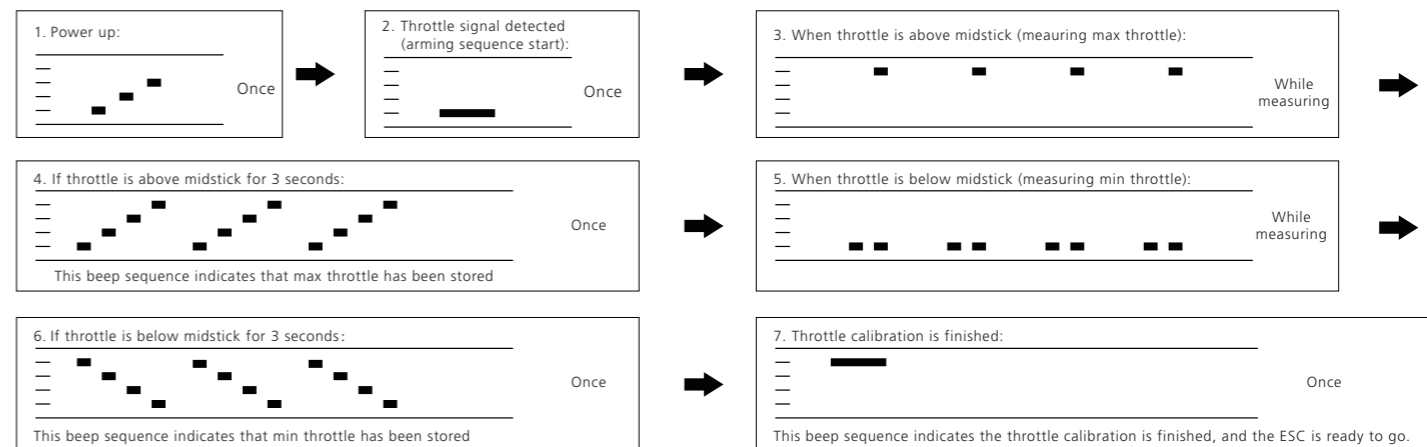
Users only need to connect the throttle control wire, 5V power wire and ground wire of the ESC to the corresponding ports (on peripheral devices like receiver) when a single ESC needs to be programmed. We strongly recommend soldering the capacitor (included in the product box) onto the ESC when using a 5S LiPo pack. (Note: users can solder the capacitor first, and then the Red & Black output wires.)

- S1-S4: Throttle Signal Input Ports. Port S1 is for ESC M1, S2 is for M2, S3 is for M3, and S4 is for M4.
- 5V: 5V Power Port
- GND: Ground Wire
- I_SEN: Amp monitoring port with the amperage of 30.2mA/A is to connect to the Amp monitoring port on flight controller.
- VBAT: Battery Volt monitoring port with the battery voltage is to connect to the Battery Volt monitoring port on flight controller.

3 Normal Start-up Process



4 Throttle Range Calibration



This is an extremely powerful brushless motor system. We strongly recommend removing your propellers for your own safety and the safety of those around you before performing calibration and programming functions with this system.

06 Programmable Items

Function	1	2	3	4	5	6	7	8	9	10	11	12	13
1 Startup power**	0.031	0.047	0.063	0.094	0.125	0.188	0.25	0.38	0.50	0.75	1.00	1.25	1.50
2 Temperature Protection	Off	80	90	100	110	120	130	140					
3 Low RPM Power Protect	Off	On											
4 Motor Direction	Normal	Reversed	Bidirectional	Bidirectional Rev.	High								
5 Demag Compensation	Off	Low	High										
6 Motor Timing	Low	MediumLow	Medium	MediumHigh	High								
7 PPM Min Throttle	1100-1692	1148											
8 PPM Max Throttle	1288-2020	1832											
9 PPM Center Throttle	1152-1828	1488											
10 Brake On Stop	Off	On											
11 Beep Strength	Off	2-255	40										
12 Beacon Strength	1-255	80											
13 Beacon Delay	1-10minutes	Infinite	10minutes										

(Those "gray background and black text" options are the factory default settings.)

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. A lower startup power parameter will give lower maximum power for low rpms (this is implemented from rev16.1).

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. Demag compensation is an alternative way of combating the issue. First of all, it detects when a demag situation occurs.

- In this situation, there is no info on motor timing, and commutation proceeds blindly with a predicted timing.
- In addition to this, motor power is cut off some time before the next commutation. A metric is calculated that indicates how severe the demag situation is. The more severe the situation, the more power is cut off.

When demag compensation is set to off, power is never cut. When setting it to low or high, power is cut. For a high setting, power is cut more aggressively. 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.

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 (programmable threshold implemented from rev16.3). The programmable threshold is primarily meant as a support for hardware manufacturers to use, as different hardwares can have different tolerances on the max temperatures of the various components used.

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.

07 Others

BLHeli official website: <https://github.com/bitdump/BLHeli>

BLHeliSuite download: <https://www.mediafire.com/folder/dx6kfaasyo24l/BLHeliSuite>

Firmware: A-H-25 Rev: 16.6