Version change history

Date	Updater	Version	Remark
2023-09-07	Makerbase	V1.00	Document creation.

MKSESC BL45A V1.0 Manual

Part 1 Product Introduction

1.1 Product introduction

MKSESC BL45A is a brushless ESC based on the BLHeli open source ESC program.Low-cost and small size. Use the latest EFM8BB21F16G high-speed control chip. It can start smoothly and respond quickly. Support BLHeli-S and the new DShot150/300/600. Digital throttle, strong anti-interference ability, rapid response, suitable for DIY aircraft models and traversing aircraft.
机。

1.2 Features

1. The latest EFM8BB21F16G high-speed control chip starts smoothly and responds quickly.
2. Integrated RGB multi-color bright LED night flight lights, making night flying more cool.
3. Supports BLHEIi-S/DSHot150/300/600 digital throttle with strong anti-interference ability and rapid response.
4. Supports high KV motor to start quickly and fly violently.
5. Less noise and smoother throttle response.
6. Using 3-ounce copper-thick high-quality PCB, large current and small control signals are layered to enhance anti-interference capabilities.
7. The gold plating process on the PCB surface effectively improves the ESC's current resistance and heat dissipation capabilities.
8. Damped Light mode and regenerative braking function make the motor deceleration more sensitive, effective and more precise.

1.3 Product parameters

MKSESC BL45A V1.0 	
MCU	EFM8BB21F16G-C
Driver chip	FD6288Q
Input voltage	Support 2-6S input
Output current	Continuous current 45A, peak value 55A/10S
Supporting agreement	dshot125/300/600,oneshot125
Weight	About 6.6g
Size	28.7mm x13.9mm x 1.6mm

Part 2 Hardware Preparation

2.1 Schematic

The schematic diagram and other project files of MKSESC BL45A V1.0 can be downloaded through github.

2.2 Interface Description

Part 2 Update firmware and adjust parameters

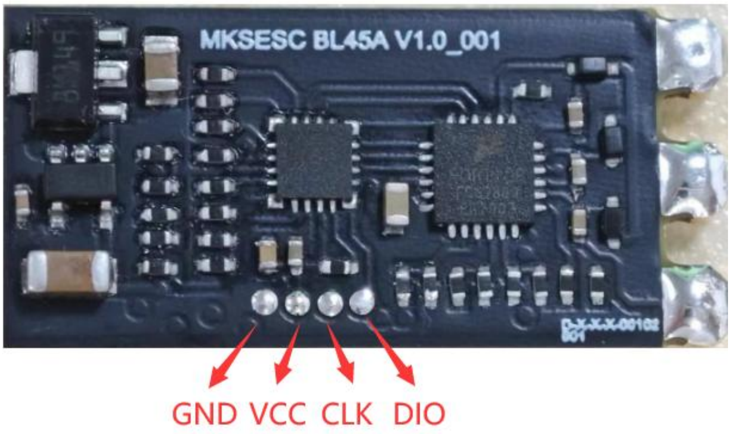
This article introduces the use of Arduino UNO to update firmware and adjust parameters.
准备工具：
1、Arduino UNO
2、BLHeliSuite 16.7.14.9.0.3（Includes all firmware and assistant software）
3、MKSESC BL45A V1.0

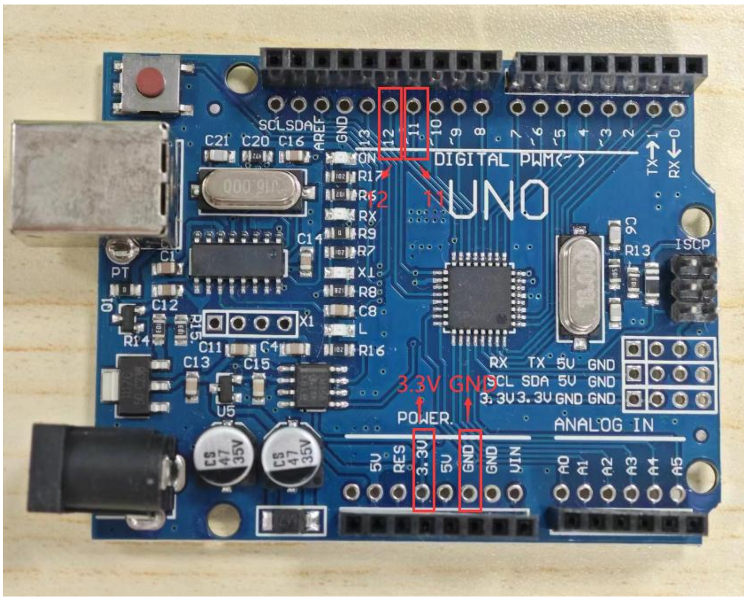
1.4 Hardware connection

1. The connection relationship between Arduino UNO and MKSESC BL45A is as follows

	MKSESC BL45A V1.0	Aduino UNO
1	VCC	3.3V
2	GND	GND
3	CLK	11
4	DIO	12

Connect Arduino UNO and MKSESC BL45A V1.0 according to the above connection relationship.

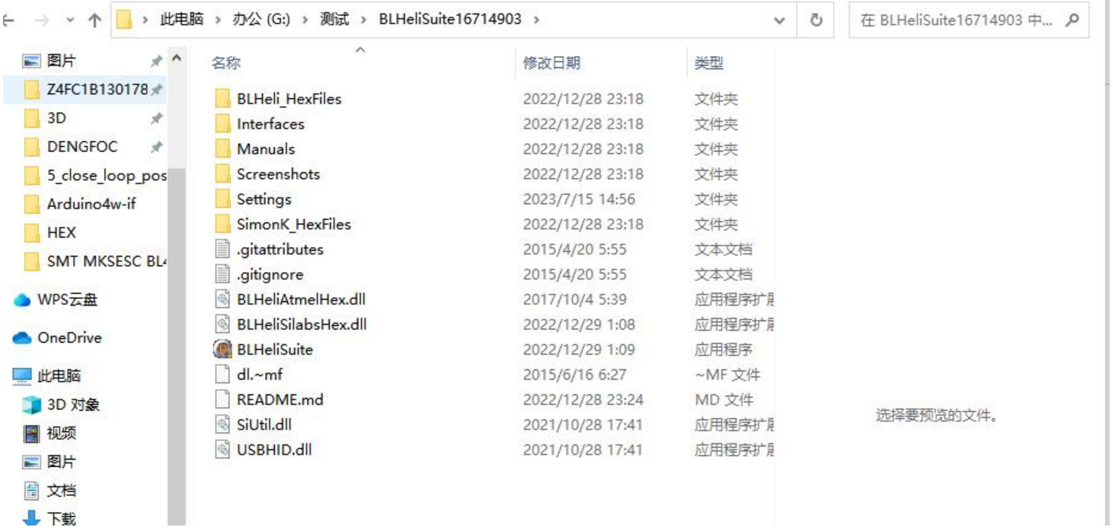




1.4 BLHeliSuite program preparation

1. Download link:https://drive.google.com/drive/folders/1Y1bUMnRRolmMD_lezL0FYd3aMBrNzCig

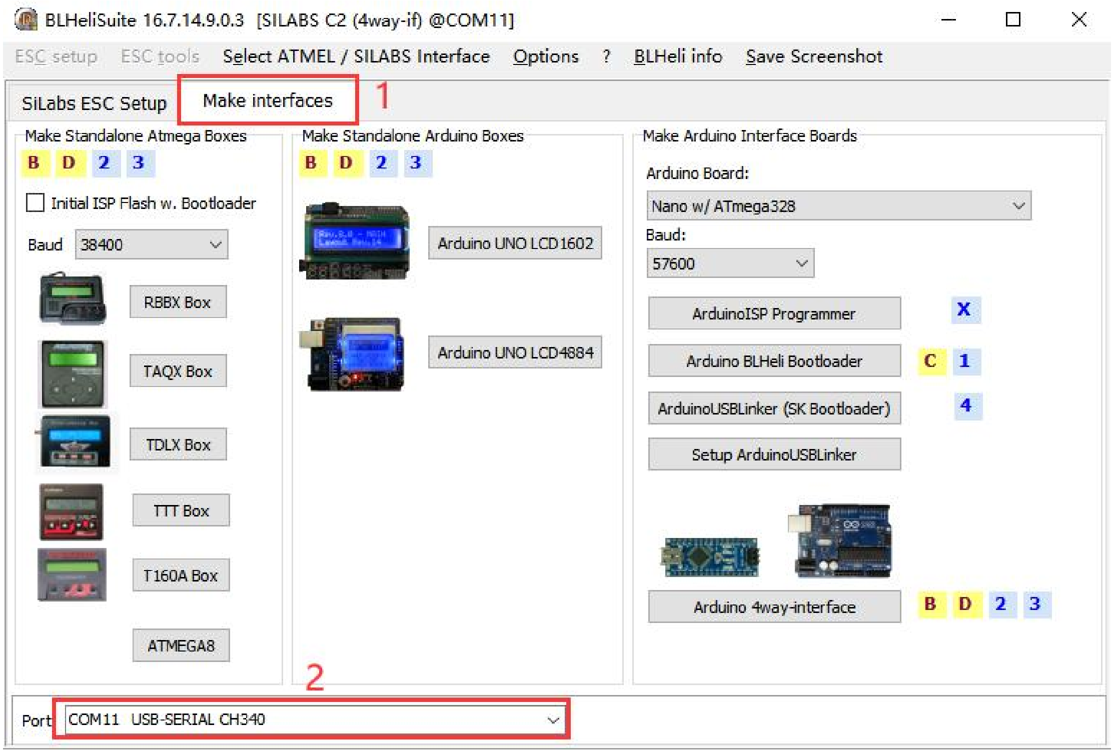
2. Open the BLHeliSuite installation directory, as shown in the figure below.



名称	修改日期	类型
BLHeli_HexFiles	2022/12/28 23:18	文件夹
Interfaces	2022/12/28 23:18	文件夹
Manuals	2022/12/28 23:18	文件夹
Screenshots	2022/12/28 23:18	文件夹
Settings	2023/7/15 14:56	文件夹
SimonK_HexFiles	2022/12/28 23:18	文件夹
.gitattributes	2015/4/20 5:55	文本文档
.gitignore	2015/4/20 5:55	文本文档
BLHeliAtmelHex.dll	2017/10/4 5:39	应用程序扩
BLHeliSilabsHex.dll	2022/12/29 1:08	应用程序扩
BLHeliSuite	2022/12/29 1:09	应用程序
dl.~mf	2015/6/16 6:27	~MF 文件
README.md	2022/12/28 23:24	MD 文件
SiUtil.dll	2021/10/28 17:41	应用程序扩
USBHID.dll	2021/10/28 17:41	应用程序扩

选择要预览的文件。

3. Open BLHeliSuit, first click Make interfaces, and then select the port, as shown in Figures 1 and 2 below.



BLHeliSuite 16.7.14.9.0.3 [SILABS C2 (4way-if) @COM11]

Initial ISP Flash w. Bootloader: □

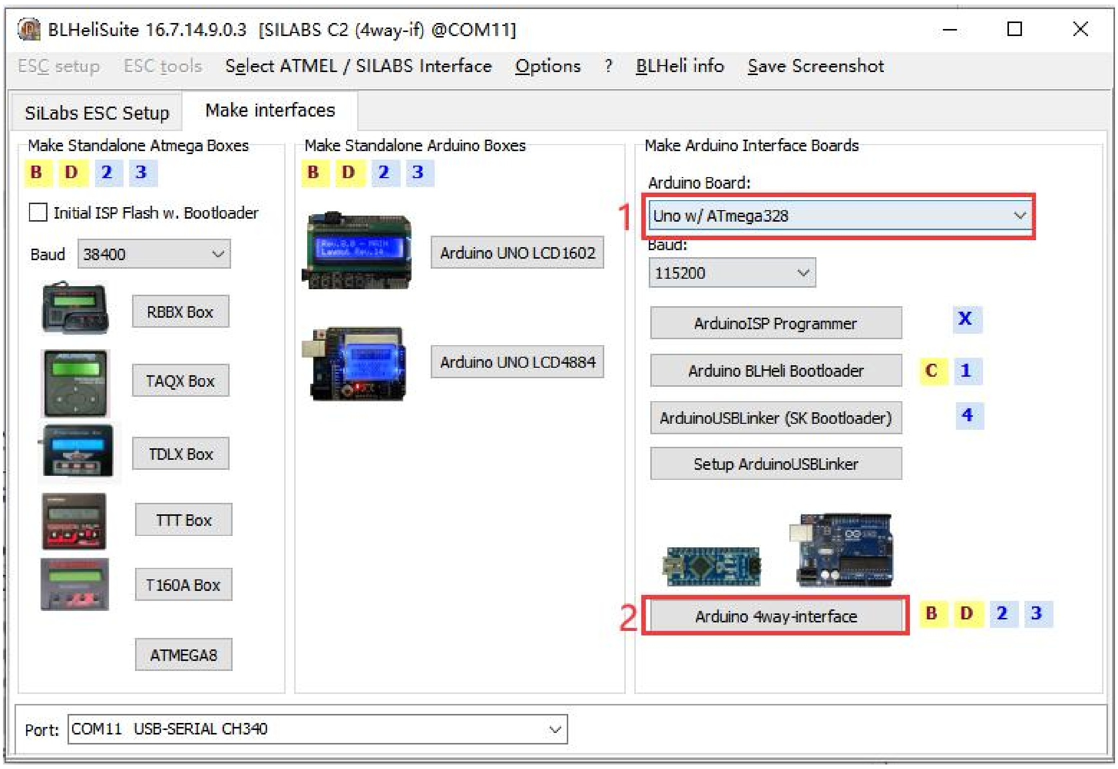
Baud: 38400

Arduino Board: Nano w/ ATmega328

Baud: 57600

Port: COM11 USB-SERIAL CH340

4. Open BLHeliSuit, first click Make interfaces, and then select the port, as shown in Figures 1 and 2 below.



BLHeliSuite 16.7.14.9.0.3 [SILABS C2 (4way-if) @COM11]

Initial ISP Flash w. Bootloader: □

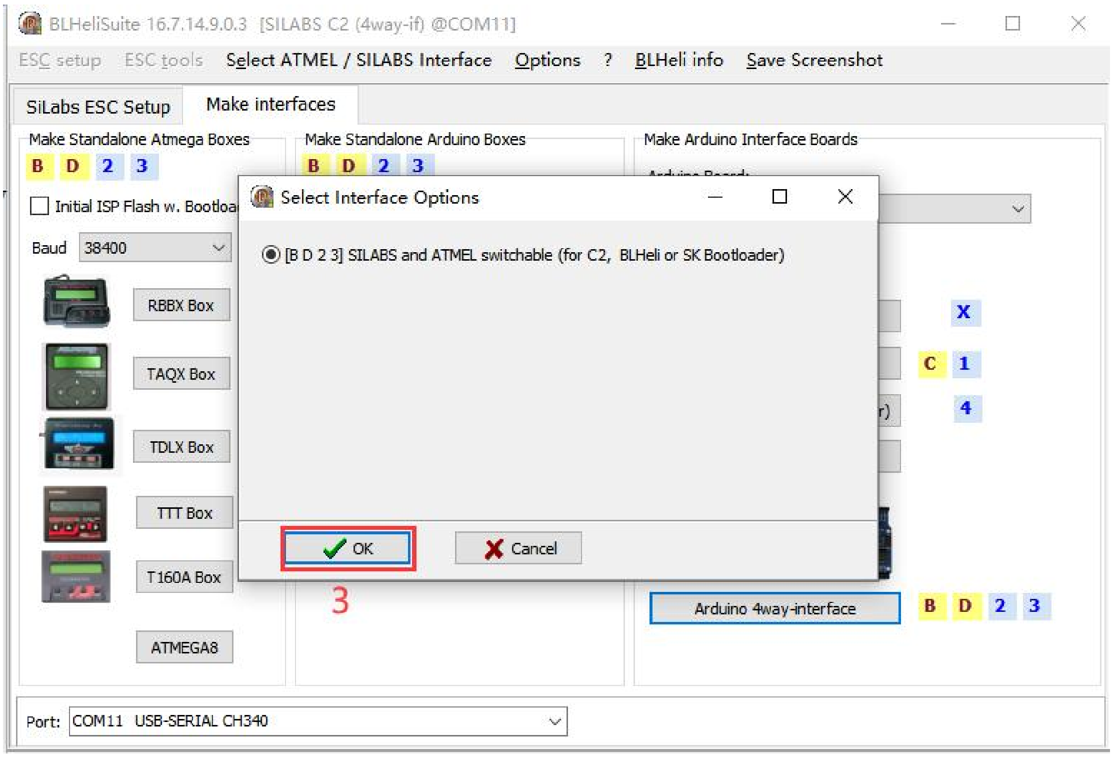
Baud: 38400

Arduino Board: Uno w/ ATmega328

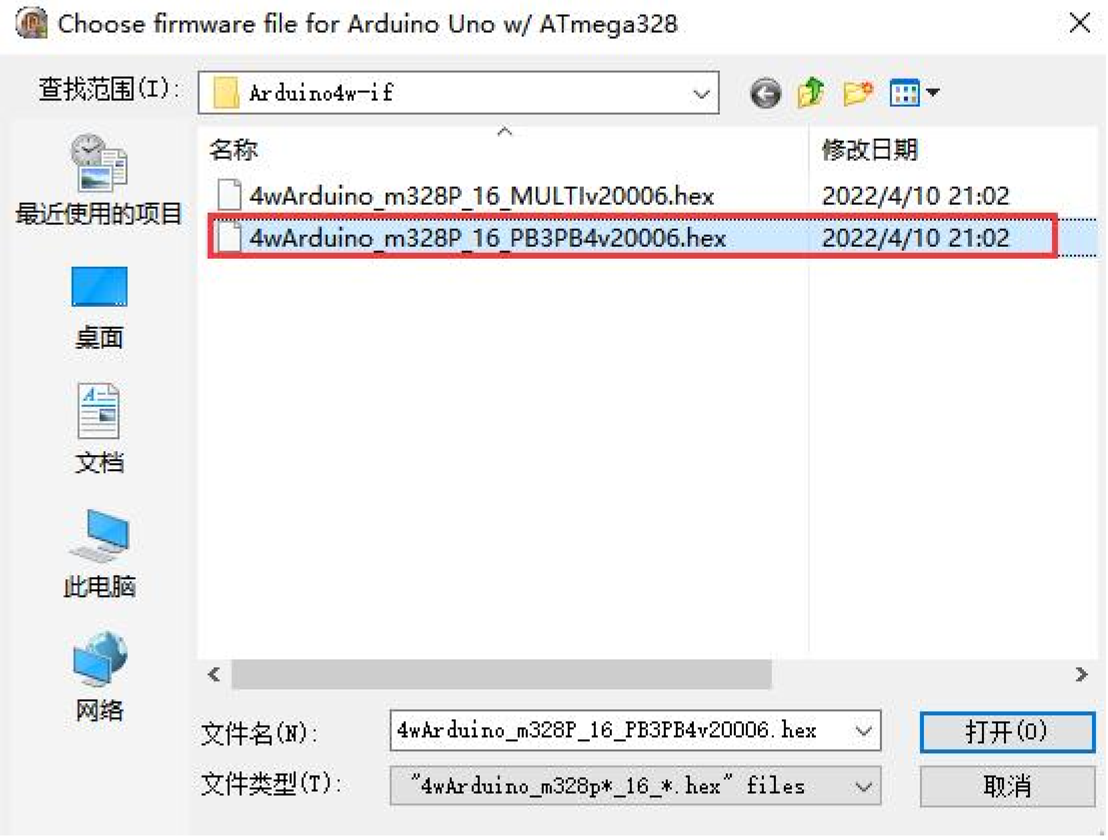
Baud: 115200

Port: COM11 USB-SERIAL CH340

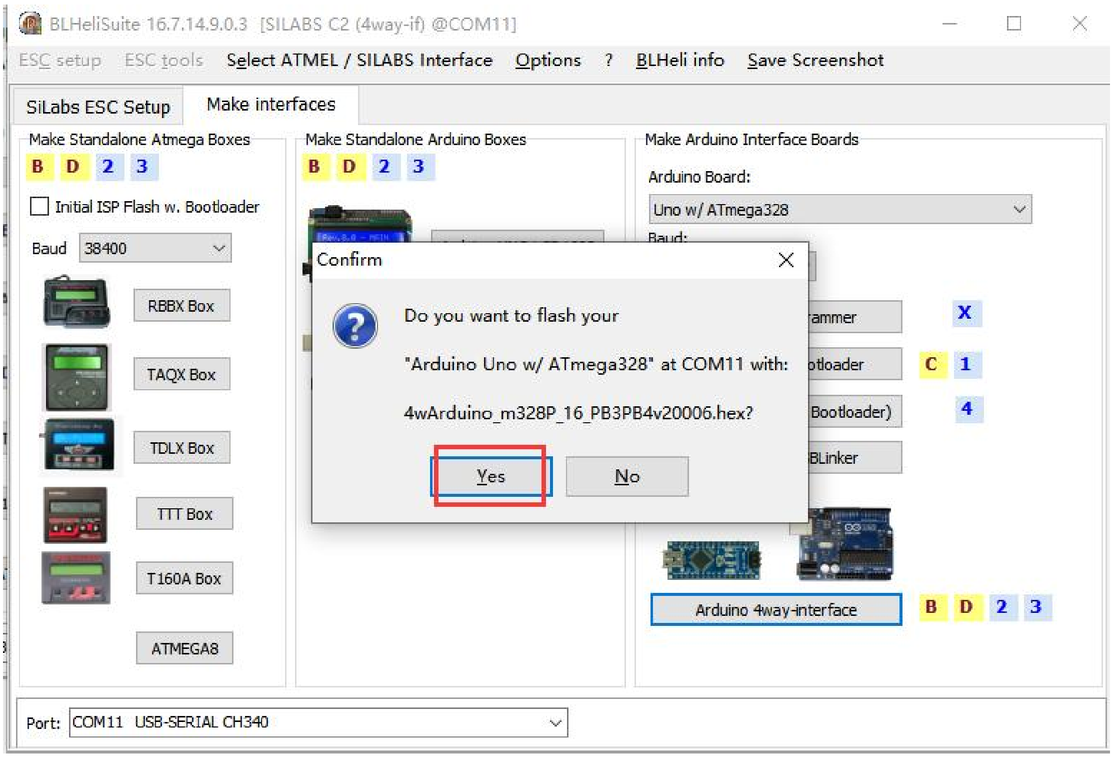
Click OK.


BLHeliSuite 16.7.14.9.0.3 [SILABS C2 (4way-if) @COM11]
ESC setup
ESC tools
Select ATMEL / SILABS Interface
Options
?
BLHeli info
Save Screenshot
SiLabs ESC Setup
Make interfaces
Make Standalone Atmega Boxes
Make Standalone Arduino Boxes
Make Arduino Interface Boards
Initial ISP Flash w. Bootloa
Baud 38400
RBBX Box
TAQX Box
TDLX Box
TTT Box
T160A Box
ATMEGA8
Select Interface Options
● [B D 2 3] SILABS and ATMEL switchable (for C2, BLHeli or SK Bootloader)
OK
Cancel
3
Arduino 4way-interface
B D 2 3
X
C 1
4
Port: COM11 USB-SERIAL CH340

Choose 4wArduino_m328P_16_PB3PB4v20006.hex.


Choose firmware file for Arduino Uno w/ ATmega328
查找范围(I):
Arduino4w-if
名称
修改日期
4wArduino_m328P_16_MULTIv20006.hex
2022/4/10 21:02
4wArduino_m328P_16_PB3PB4v20006.hex
2022/4/10 21:02
最近使用的项目
桌面
文档
此电脑
网络
文件名(N):
4wArduino_m328P_16_PB3PB4v20006.hex
文件类型(T):
"4wArduino_m328p*_16_*.hex" files
打开(O)
取消

Click Yes.

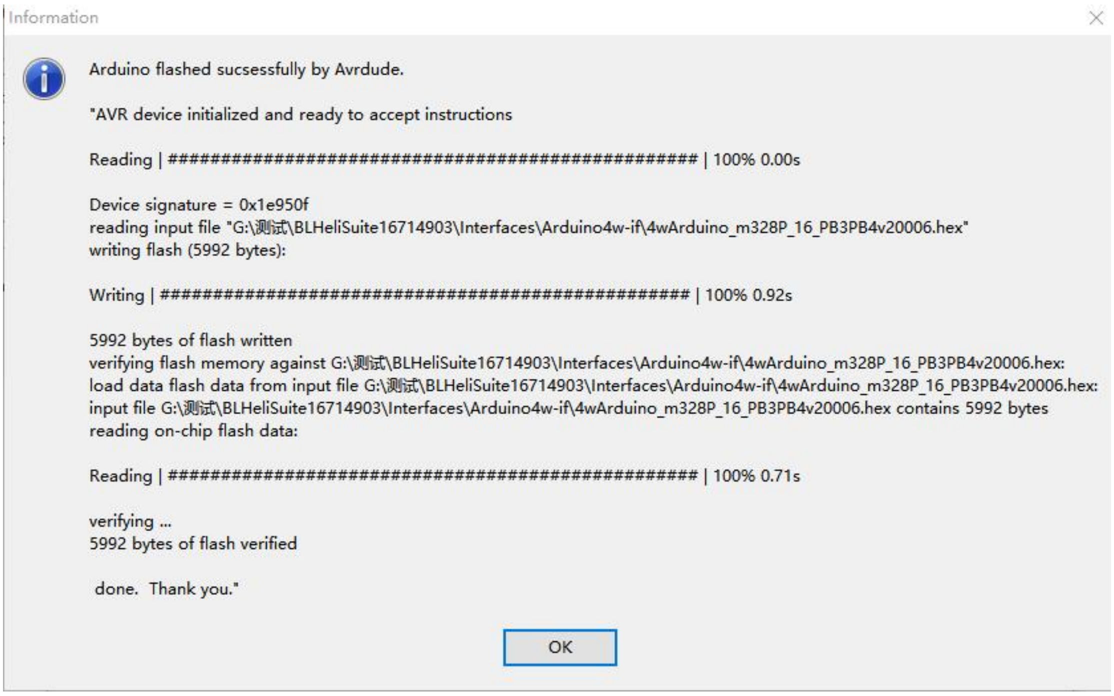


Do you want to flash your

"Arduino Uno w/ ATmega328" at COM11 with:

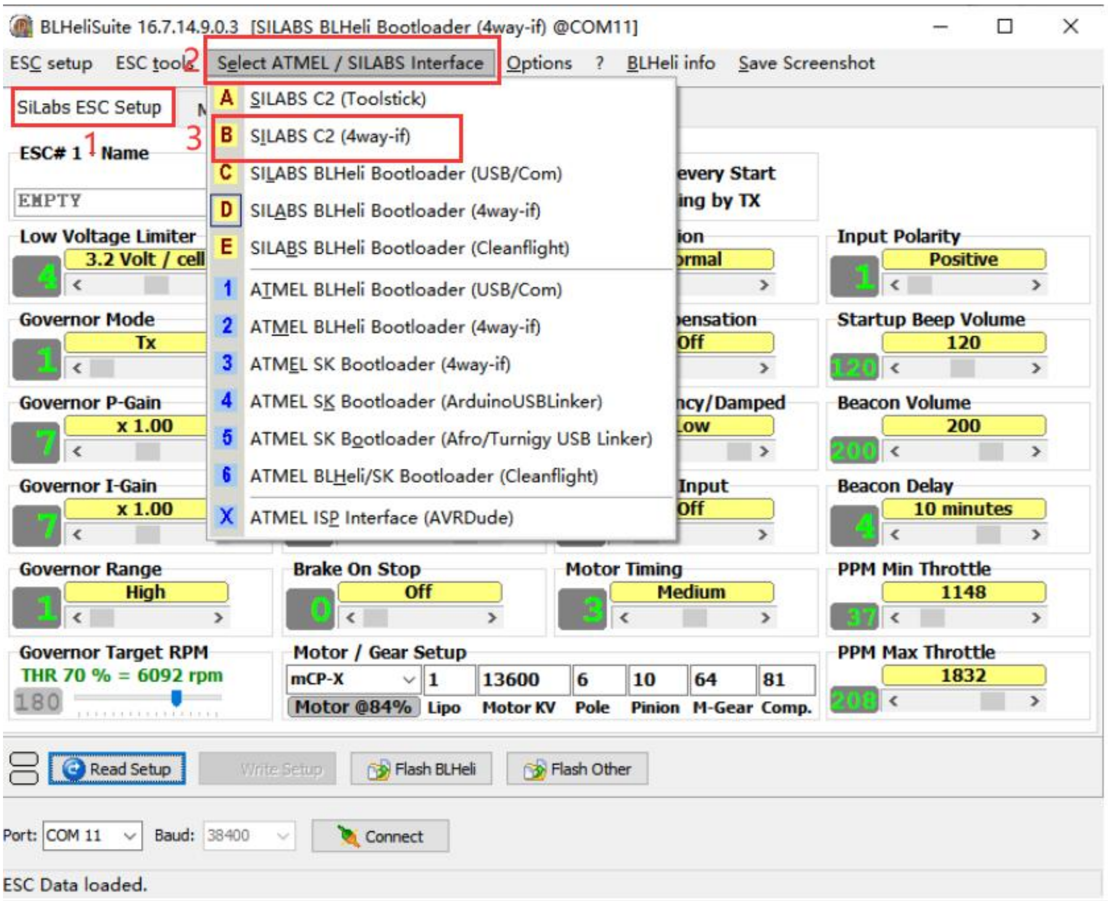
4wArduino_m328P_16_PB3PB4v20006.hex?

After completion, it will be displayed as shown below, click OK.



```
Arduino flashed sucsessfully by Avrdude.

"AVR device initialized and ready to accept instructions

Reading | ################################################## | 100% 0.00s

Device signature = 0x1e950f
reading input file "G:\测试\BLHeliSuite16714903\Interfaces\Arduino4w-if\4wArduino_m328P_16_PB3PB4v20006.hex"
writing flash (5992 bytes):

Writing | ################################################## | 100% 0.92s

5992 bytes of flash written
verifying flash memory against G:\测试\BLHeliSuite16714903\Interfaces\Arduino4w-if\4wArduino_m328P_16_PB3PB4v20006.hex:
load data flash data from input file G:\测试\BLHeliSuite16714903\Interfaces\Arduino4w-if\4wArduino_m328P_16_PB3PB4v20006.hex:
input file G:\测试\BLHeliSuite16714903\Interfaces\Arduino4w-if\4wArduino_m328P_16_PB3PB4v20006.hex contains 5992 bytes
reading on-chip flash data:

Reading | ################################################## | 100% 0.71s

verifying ...
5992 bytes of flash verified

 done.  Thank you."
```

5. Click Silabs ESC Setup and select "SILABS C2 (4way-if)" in Select ATMEL/SILABS interface, as shown in Figures 1, 2, and 3 below.


BLHeliSuite 16.7.14.9.0.3 [SILABS BLHeli Bootloader (4way-if) @COM11]
ESC setup
ESC tools
Select ATMEL / SILABS Interface
Options
?
BLHeli info
Save Screenshot
SiLabs ESC Setup
1
2
3
A SILABS C2 (Toolstick)
B SILABS C2 (4way-if)
C SILABS BLHeli Bootloader (USB/Com)
D SILABS BLHeli Bootloader (4way-if)
E SILABS BLHeli Bootloader (Cleanflight)
1 ATMEL BLHeli Bootloader (USB/Com)
2 ATMEL BLHeli Bootloader (4way-if)
3 ATMEL SK Bootloader (4way-if)
4 ATMEL SK Bootloader (ArduinoUSBLinker)
5 ATMEL SK Bootloader (Afro/Turnigy USB Linker)
6 ATMEL BLHeli/SK Bootloader (Cleanflight)
X ATMEL ISP Interface (AVRDude)
Read Setup
Write Setup
Flash BLHeli
Flash Other
Connect

ESC# 1 Name: EMPTY

Low Voltage Limiter: 4 — 3.2 Volt / cell

Governor Mode: 1 — Tx

Governor P-Gain: 7 — x 1.00

Governor I-Gain: 7 — x 1.00

Governor Range: 1 — High

Governor Target RPM: THR 70 % = 6092 rpm — 180

Brake On Stop: 0 — Off

Motor / Gear Setup: mCP-X, 1 Lipo, 13600 Motor KV, 6 Pole, 10 Pinion, 64 M-Gear, 81 Comp., Motor @84%

Motor Timing: 3 — Medium

…every Start …ing by TX

…ion: …rmal

…ensation: Off

…ncy/Damped: Low

…Input: Off

Input Polarity: 1 — Positive

Startup Beep Volume: 120 — 120

Beacon Volume: 200 — 200

Beacon Delay: 4 — 10 minutes

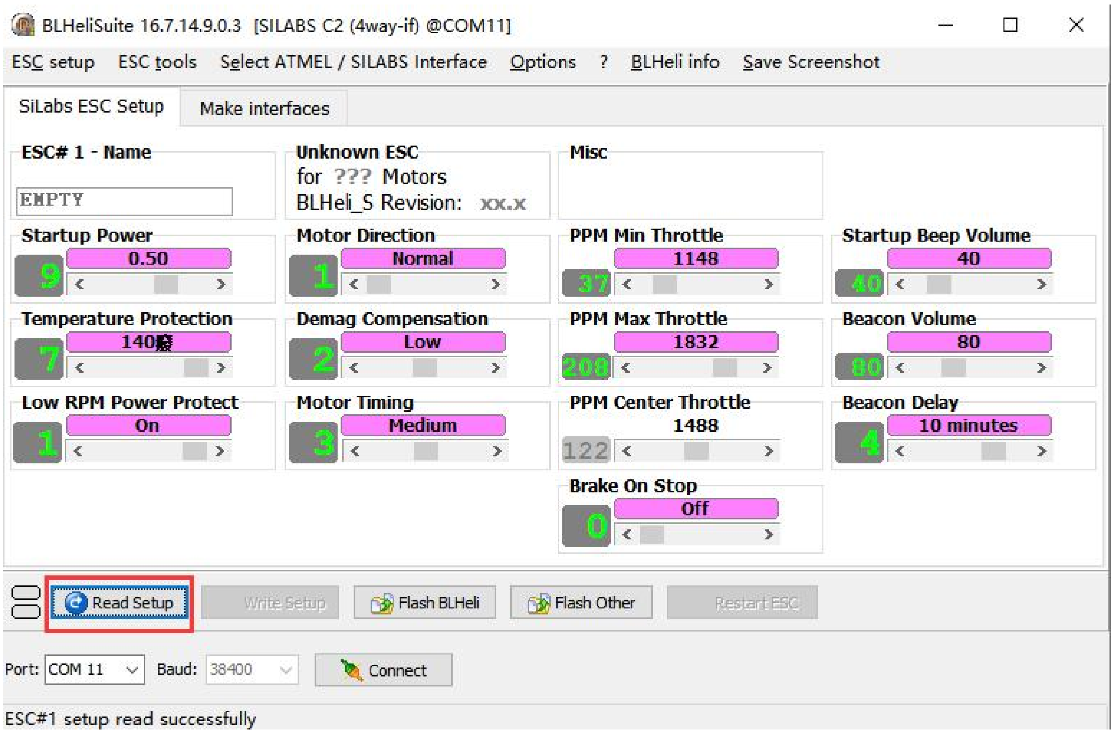
PPM Min Throttle: 37 — 1148

PPM Max Throttle: 208 — 1832

Port: COM 11 Baud: 38400

ESC Data loaded.

Click Read Setup to read the ESC parameters.



ESC# 1 - Name: EMPTY

Unknown ESC for ??? Motors BLHeli_S Revision: xx.x

Misc

Startup Power: 9 — 0.50

Motor Direction: 1 — Normal

PPM Min Throttle: 37 — 1148

Startup Beep Volume: 40 — 40

Temperature Protection: 7 — 140鑻

Demag Compensation: 2 — Low

PPM Max Throttle: 208 — 1832

Beacon Volume: 80 — 80

Low RPM Power Protect: 1 — On

Motor Timing: 3 — Medium

PPM Center Throttle: 122 — 1488

Beacon Delay: 4 — 10 minutes

Brake On Stop: 0 — Off

Port: COM 11 Baud: 38400

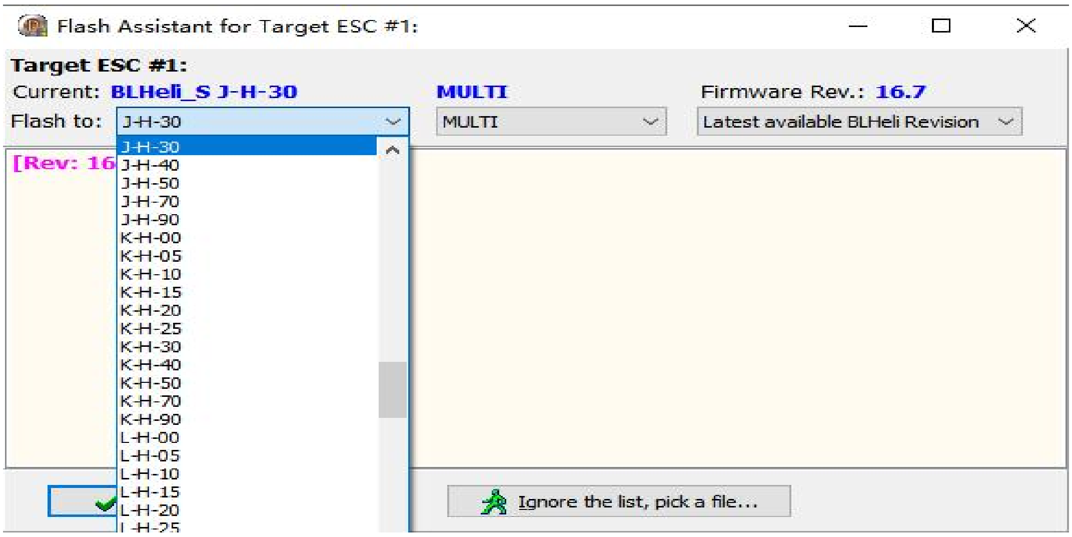
ESC#1 setup read successfully

6.Click Flash BLHeli to burn the firmware. Here we use the J-H-30 firmware. After selecting the firmware, click OK.

The first letter indicates the MCU pin (J for EFM8BB21F16G-C);

The second letter is L or H (L represents 24MHz MCU, H represents 48MHz MCU);

The last two numbers represent the FET's switching dead time. The unit is 20.4ns. Some field effect transistor drivers have adaptive field effect transistor dead time control. For these MOS transistors, 00 is used to represent the field effect transistor switching dead time.



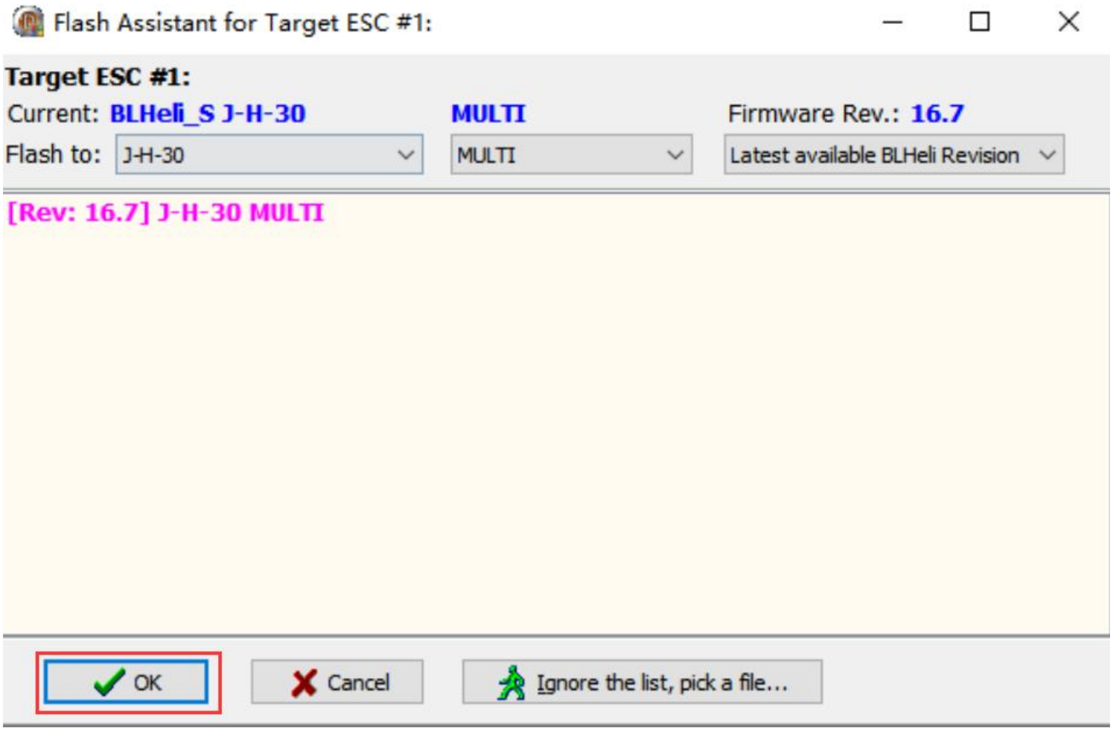
Flash Assistant for Target ESC #1:

Target ESC #1:

Current: BLHeli_S J-H-30 MULTI Firmware Rev.: 16.7

Flash to: J-H-30 MULTI Latest available BLHeli Revision

[Rev: 16



Flash Assistant for Target ESC #1:

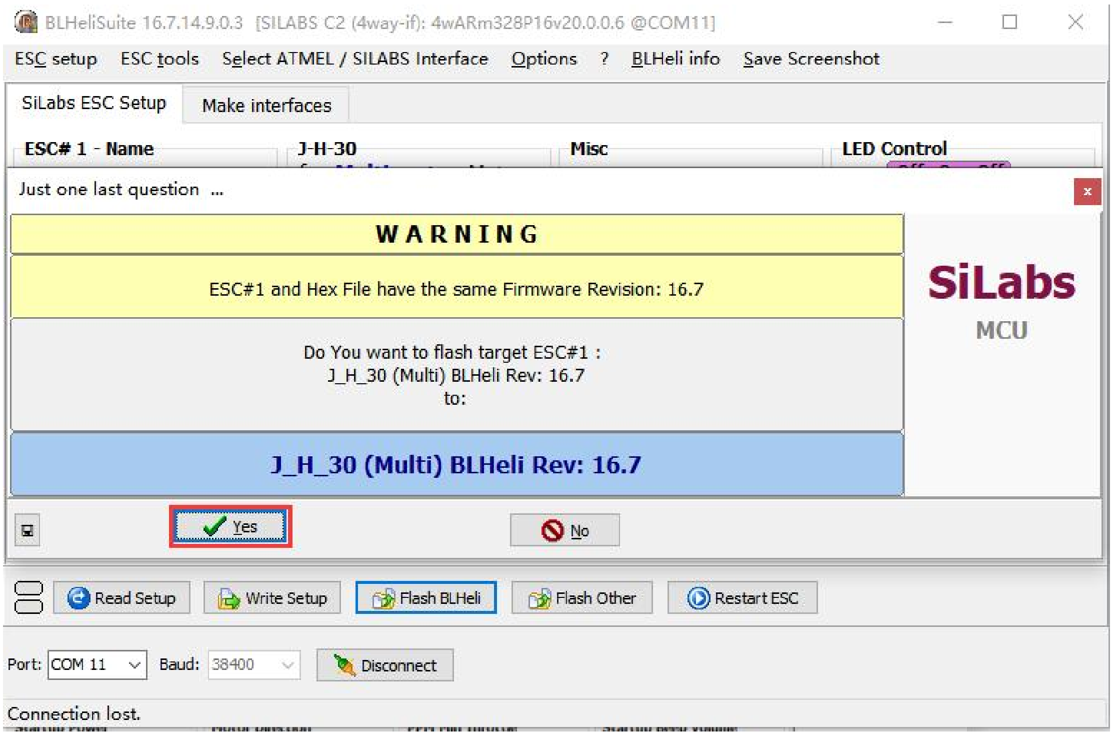
Target ESC #1:

Current: BLHeli_S J-H-30 MULTI Firmware Rev.: 16.7

Flash to: J-H-30 MULTI Latest available BLHeli Revision

[Rev: 16.7] J-H-30 MULTI

Then click Yes in the picture and wait for the firmware burning to complete.



Just one last question ...

WARNING

ESC#1 and Hex File have the same Firmware Revision: 16.7

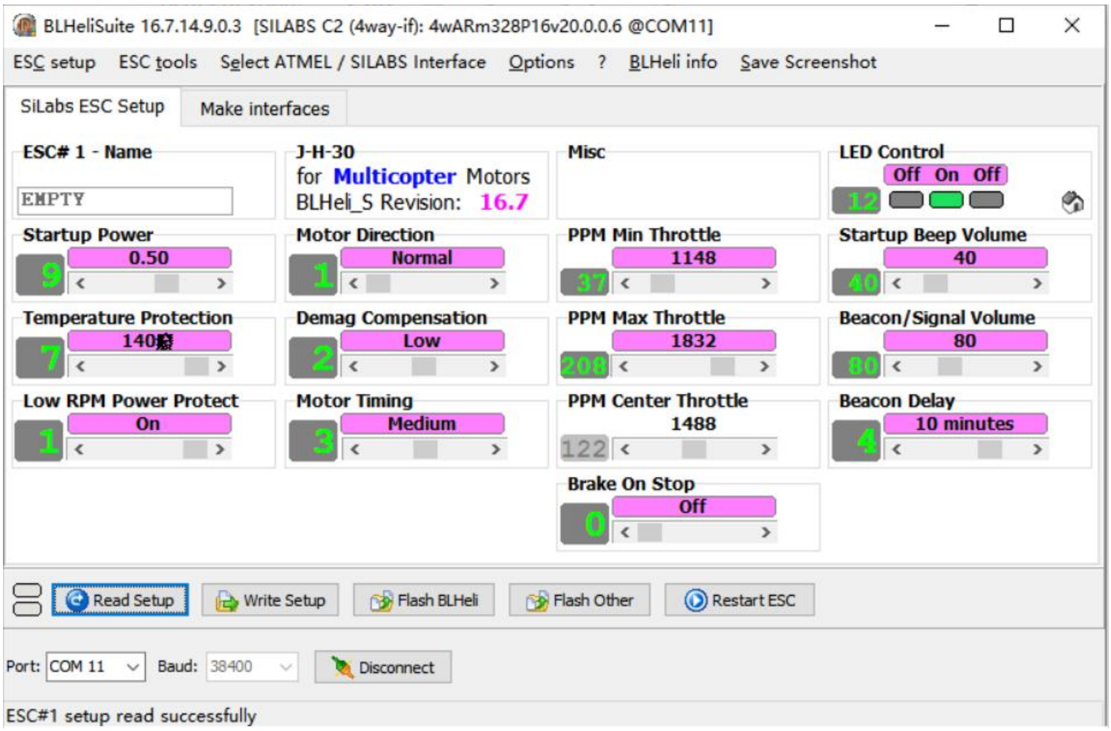
Do You want to flash target ESC#1 :
J_H_30 (Multi) BLHeli Rev: 16.7
to:

J_H_30 (Multi) BLHeli Rev: 16.7

Port: COM 11 Baud: 38400

Connection lost.

6. After the firmware burning is completed, the user can change the parameters as needed, as shown in the figure below.



ESC# 1 - Name: EMPTY

J-H-30
for Multicopter Motors
BLHeli_S Revision: 16.7

Misc

LED Control: Off On Off (12)

Startup Power: 0.50 (9)

Motor Direction: Normal (1)

PPM Min Throttle: 1148 (37)

Startup Beep Volume: 40 (40)

Temperature Protection: 140度 (7)

Demag Compensation: Low (2)

PPM Max Throttle: 1832 (208)

Beacon/Signal Volume: 80 (80)

Low RPM Power Protect: On (1)

Motor Timing: Medium (3)

PPM Center Throttle: 1488 (122)

Beacon Delay: 10 minutes (4)

Brake On Stop: Off (0)

Port: COM 11 Baud: 38400

ESC#1 setup read successfully

ESC parameter description

Parameter	Description
Startup power	The maximum power allowed at startup, the actual power depends on the throttle input.
Temperature protection	The temperature protection threshold can be set to 80℃ -140℃.
Low RPM power protect	Disabling ensures low KV motors achieve full power when running at low voltage. However, disabling it will increase the risk of synchronization loss, leading to motor burnout.
Motor direction	In the two-way mode, the midpoint of the throttle is the zero point, above the midpoint is forward rotation, and below the midpoint is reverse rotation.
Demag compensation	Prevent the motor from stalling due to long demagnetization time after motor commutation. The higher the compensation value, the better the protection. But if the compensation value is too high, the maximum power will be reduced.
Motor timing	Usually, setting the timing angle to medium is suitable for most motors, but if the motor does not run smoothly, you can try changing the timing angle.
PPM Min throttle PPM max throttle PPM center throttle	Set the throttle stroke amount of the ESC. Neutral throttle is only used in two-way mode. Under normal circumstances, the throttle signal value is between 1000us-2000us. For other numerical input signals, corresponding proportions need to be
Brake on stop	In the power-on state, there is a braking function when the throttle is zero. If the throttle does not have a zero point, this setting is invalid
Led Control	RGB multi-color bright LED setup
Startup Beep Volume	Set the beep volume during normal operation.
Beacon/Signal Volume	Set the beacon volume. If the time of zero throttle signal exceeds a set time, the ESC control motor will sound an alarm. To facilitate the recovery of lost aircraft.
Beacon delay	Set the delay before the beacon starts emitting.

1.5 Basic testing

1.Open the following program with Arduino.

```
#include <Servo.h>
Servo myservo1;//
int Max=2000;       //pwm at maximum speed
int Min=1000;       //pwm at mINIimum speed
int pos=Min;        //Initial speed assignment
int sign=0;            //Flag bit, used to switch whether the speed
increases or decreases
void setup() {
    myservo1.attach(9);  //The pwm output port is port 9
    myservo1.write(Max); //Output the defined maximum pwm value, and
simulate the remote control throttle to the maximum
    delay(5000);         //Waiting for the motor to set the maximum value,
and it will make a beeping sound.
    myservo1.write(Min); //Output the defined minimum pwm value, and
simulate the remote control throttle to the minimum
    delay(5000);         //Waiting for the motor to set the minimum value,
it will make a beeping sound.
    Serial.begin(9600);
}
void loop()     //The motor speed changes from small to large and then to
small, repeating the cycle. The pwm value will be output from the serial
port.
{
    delay(10);
    if(sign==0)              //Let the speed gradually increase to half
of the maximum speed
{
    Serial.println(pos);
    myservo1.write(pos);   //Output pwm to port 9
    pos++;
    if(pos==(Max+Min)/2)
    sign=1;
}
    if(sign==1)              //Let the speed gradually decrease until
the motor stops rotating
{
    Serial.println(pos);
    myservo1.write(pos);   //Output pwm to port 9
    pos--;
    if(pos==Min)
    sign=0;
}
}
```

2.After the program is uploaded，the motor will make a beeping sound，and then the motor will first accelerate to the maximum，and then the speed will gradually decrease until the motor stops rotating，and the cycle will repeat.

At this point，the MKSESC BL45A V1.0 firmware update and use is completed.