SpeedyBee®

F405 AIO

User Manual

V1

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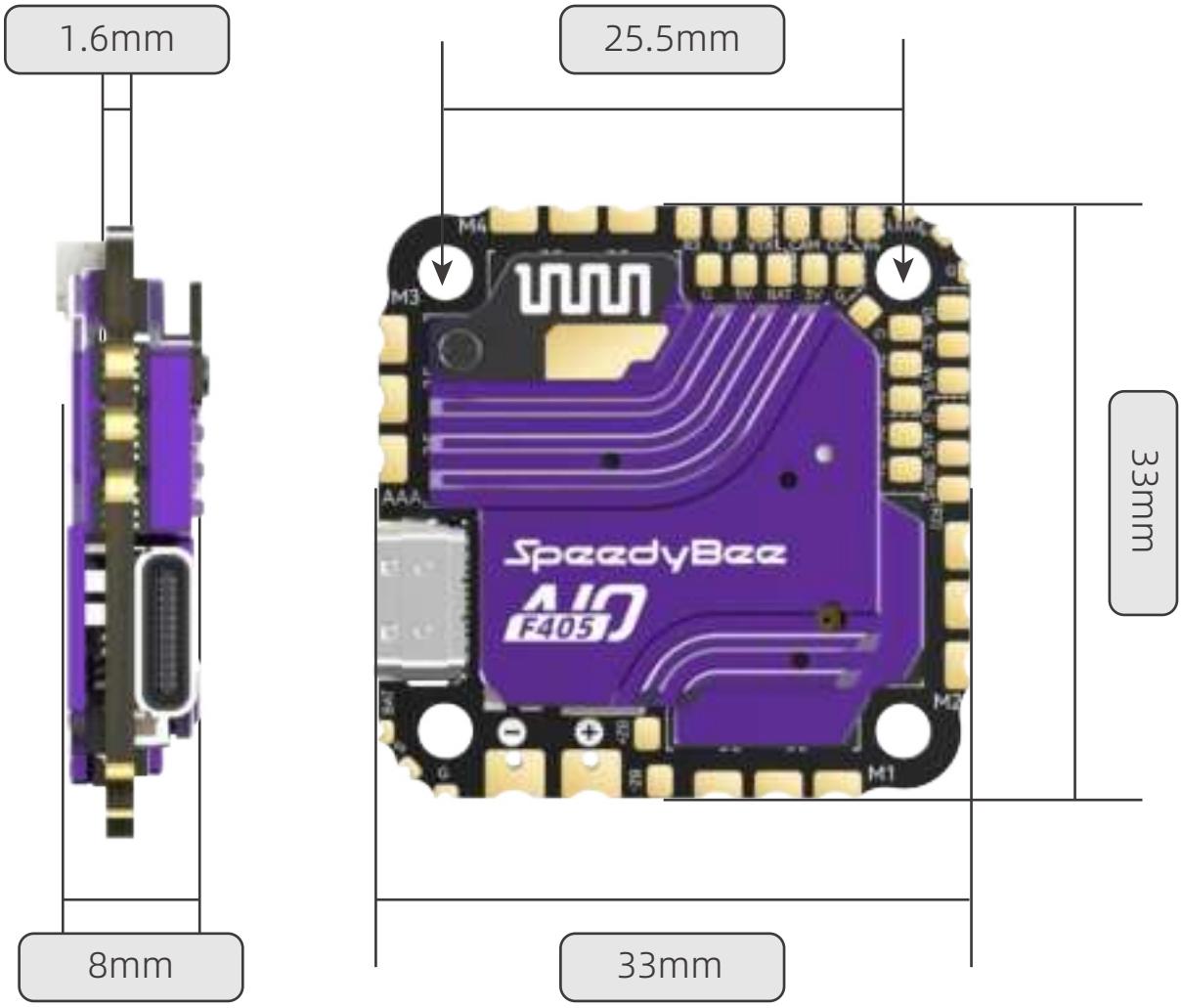
Part 1 - Overview

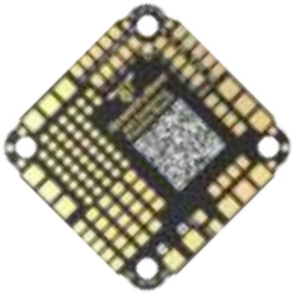
Specs Overview 1.1

Product Name	SpeedyBee F405 AIO
Bluetooth Tuning	Supported
Firmware Update via App	Supported
Power Input	3-6S
Mounting	25.5x25.5mm
Dimensions	33.0mm (L) x 33.0mm (W) x 8mm (H)
Weight	13.6g (with CNC)

1.2 Dimensions



SpeedyBee F405 AIO x 1



Soldering Practice Board x 1

DJI Air Unit 6pin*80mm
Connection Cable x 1

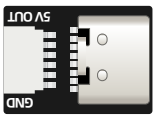
35V 470uF
Electrolytic Capacitor x 1

M2 * 6.6mm Silicone
Dampening Sleeves x4

M2 Silicone Dampening Ring x 5

M2 Nylon Hex Nut x 5

XT30 Power Cable
(Length: 7cm)x 1



Type-C Extension Module x 1

Power Expansion Boardx 1

BEC x 1

Black Heat Shrink Tube for
Type-C Extension Module x 1

4-pin * 80mm Cable for Type-C
Extension Module x1

User Manual x 1

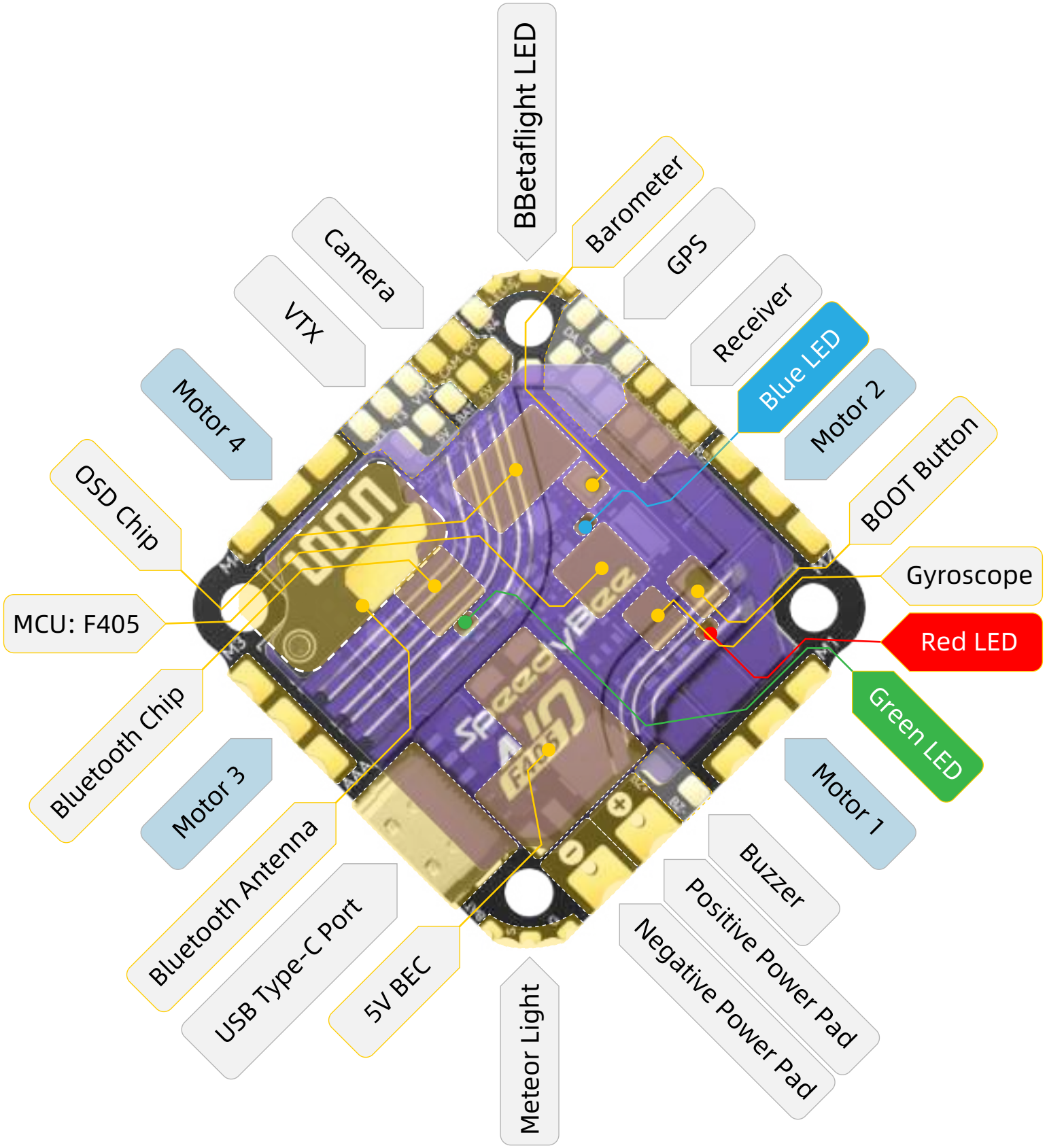
M2*20mm Screws for F405 AIO
& VTX Installation x 4

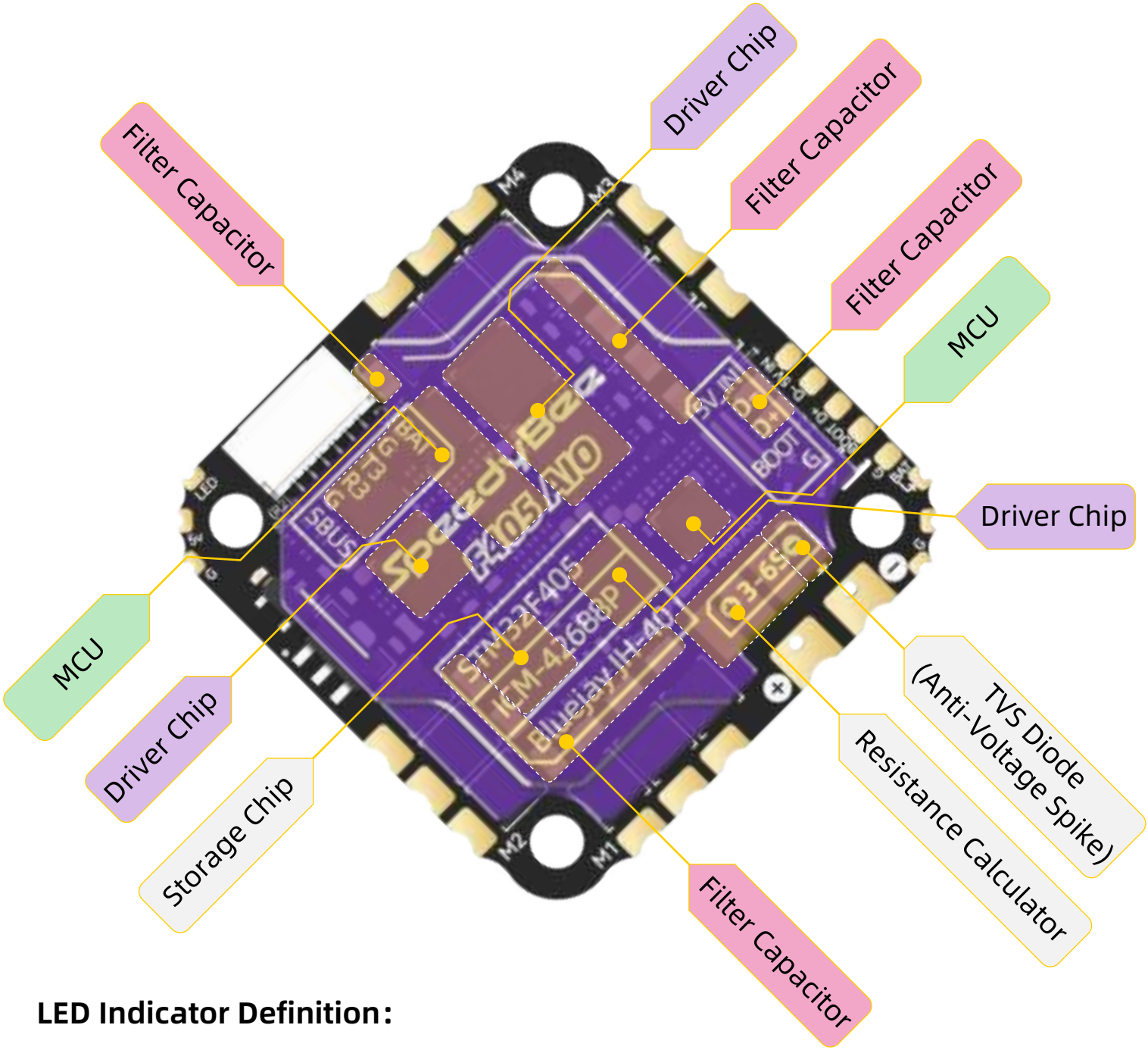
M2*12mm Screws for
F405 AIO Installation x4

Transparent Heat Shrink Tube
for External BEC x 1

6-pin * 30mm Cable for
External BEC x1

Capacitor Heat Shrink Tube x 2


BBetaflight LED
Barometer
GPS
Receiver
Blue LED
Motor 2
BOOT Button
Gyroscope
Red LED
Green LED
Motor 1
Buzzer
Positive Power Pad
Negative Power Pad
Meteor Light
5V BEC
USB Type-C Port
Bluetooth Antenna
Motor 3
Bluetooth Chip
MCU: F405
OSD Chip
Motor 4
VTX
Camera



LED Indicator Definition:

Red LED - Flight controller power indicator. Solid Red after powering up.
Green LED - Bluetooth status indicator. Solid Green indicates Bluetooth is connected.
Blue LED - Flight controller status indicator, controlled by the flight controller firmware.

BOOT Button:

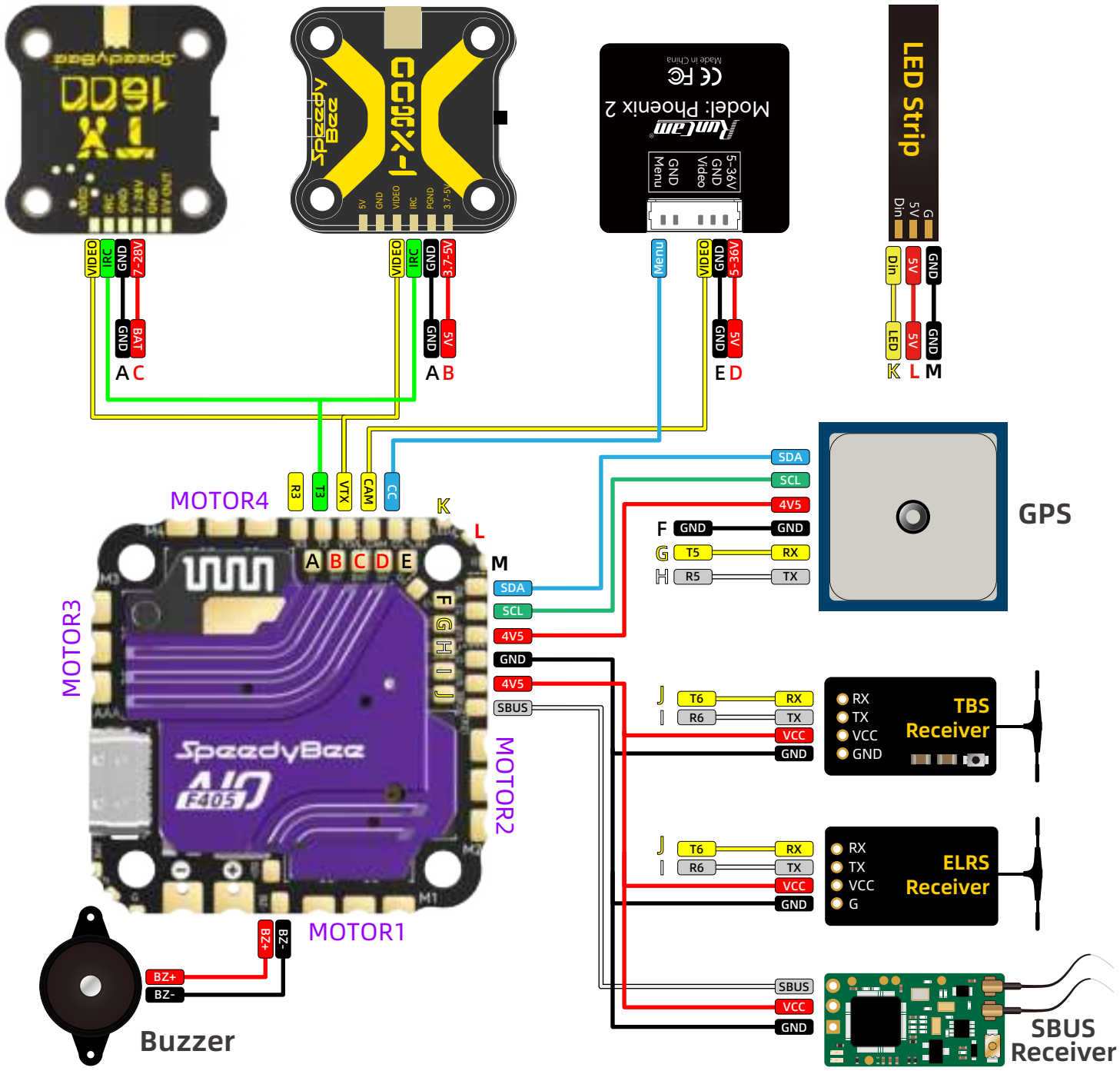
If the flight controller gets bricked and can't power up, please follow these steps to re-flash firmware for it:

① Hold the BOOT button (the only button on the flight controller) and power it on. The flight controller will enter DFU mode.
② Open the SpeedyBee App, go to the firmware flashing page, and follow the prompts to re-flash the firmware.

When the Meteor Light pad is connected to an LED strip, long press the BOOT button to toggle the LED strip on/off. When the LED strip is on, short press the BOOT button to switch LED colors.

Part 2 - Flight Controller

Peripheral Connection 2.1

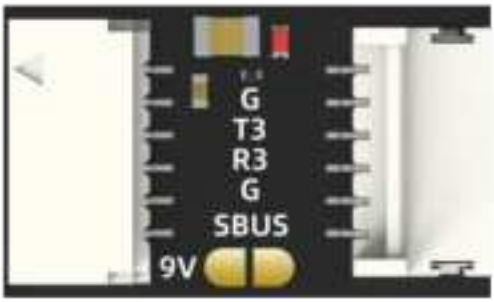


Included Accessories: Soldering Practice Board and External 5/9V BEC

Soldering Practice Board

The included soldering practice board has the same pad layout as the F405 AIO. It is recommended to scan the QR code to watch the soldering tutorial and practice on the board before performing the actual soldering.

External BEC

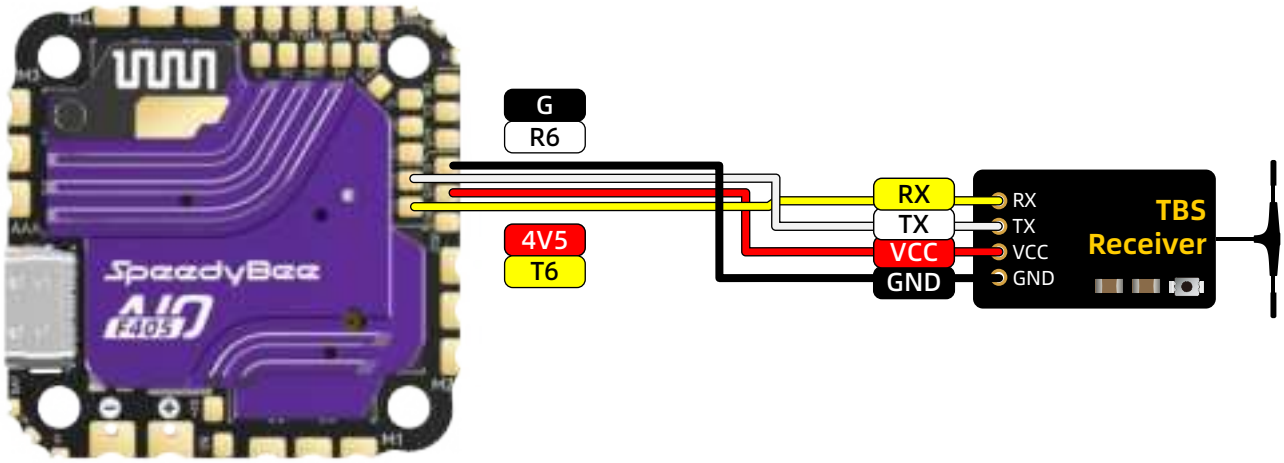


Default Output: 5V Optional output: 9V

The external BEC can be used to power peripherals such as a 9V VTX or 5V Meteor LED strips. By default, it outputs 5V, and by short-circuiting the two pads, it will output 9V.

TBS Receiver Connection and Settings:

Identifier	Configuration/MSP	Serial Rx	Telemetry Output	Sensor Input	Peripherals
USB VCP	115200		Disabled AUTO	Disabled AUTO	Disabled AUTO
UART1	115200		Disabled AUTO	Disabled AUTO	Disabled AUTO
UART2	115200		Disabled AUTO	Disabled AUTO	Disabled AUTO
UART3	115200		Disabled AUTO	Disabled AUTO	Disabled AUTO
UART4	115200		Disabled AUTO	Disabled AUTO	Disabled AUTO
UART5	115200		Disabled AUTO	Disabled AUTO	Disabled AUTO
UART6	115200		Disabled AUTO	Disabled AUTO	Disabled AUTO

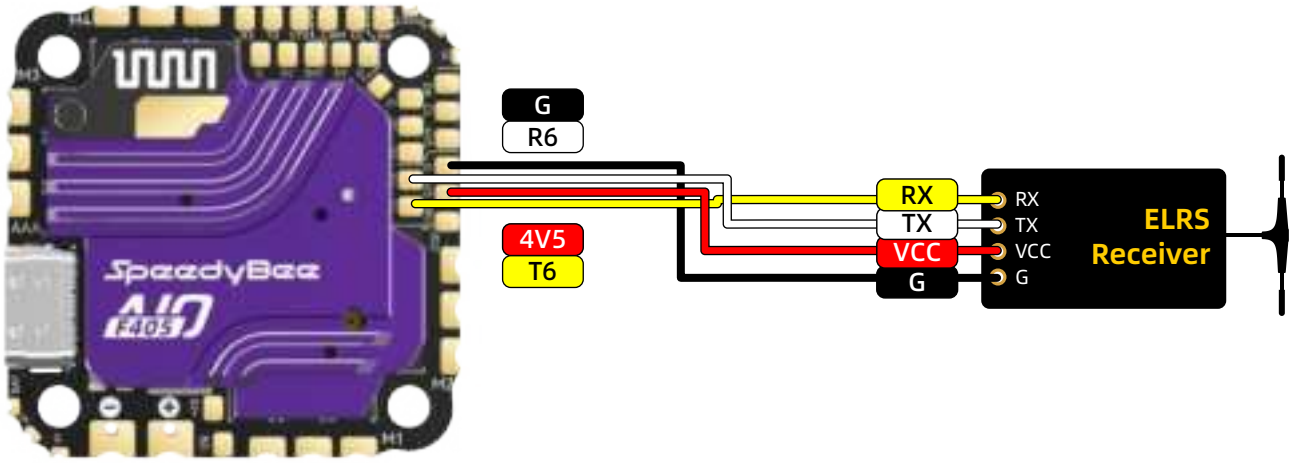


Setting Steps

1.Enable the UART6 serial receiver port on the Ports tab.
2.Set the receiver protocol to CRSF on the Receiver tab.

ELRS Receiver Connection and Settings:

Identifier	Configuration/MSP	Serial Rx	Telemetry Output	Sensor Input	Peripherals
USB VCP	115200		Disabled AUTO	Disabled AUTO	Disabled AUTO
UART1	115200		Disabled AUTO	Disabled AUTO	Disabled AUTO
UART2	115200		Disabled AUTO	Disabled AUTO	Disabled AUTO
UART3	115200		Disabled AUTO	Disabled AUTO	Disabled AUTO
UART4	115200		Disabled AUTO	Disabled AUTO	Disabled AUTO
UART5	115200		Disabled AUTO	Disabled AUTO	Disabled AUTO
UART6	115200		Disabled AUTO	Disabled AUTO	Disabled AUTO

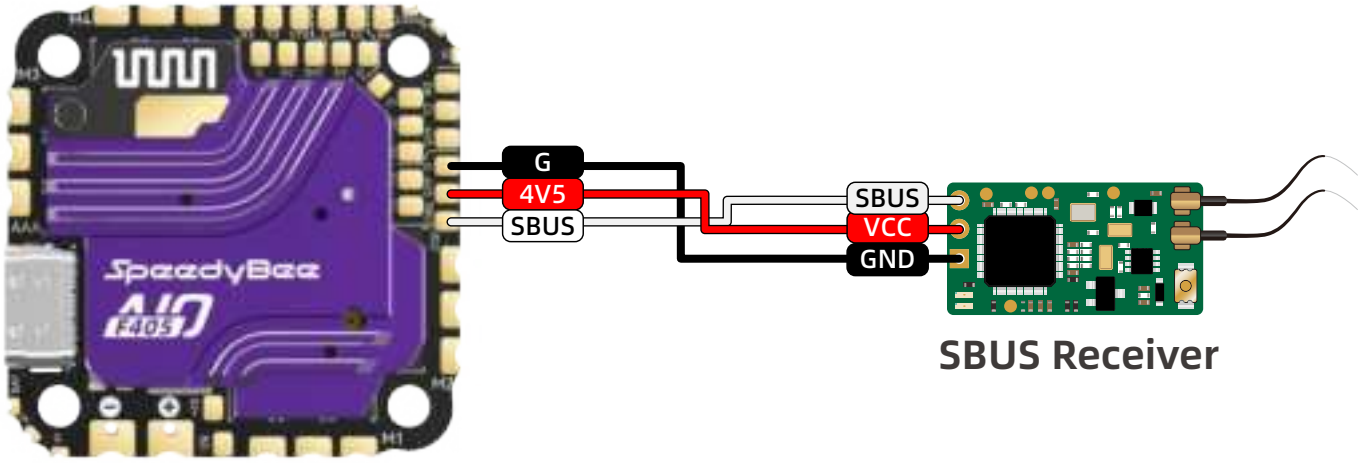


Setting Steps

1. Enable the UART6 serial receiver port on the Ports tab.
2. Set the receiver protocol to CRSF on the Receiver tab.

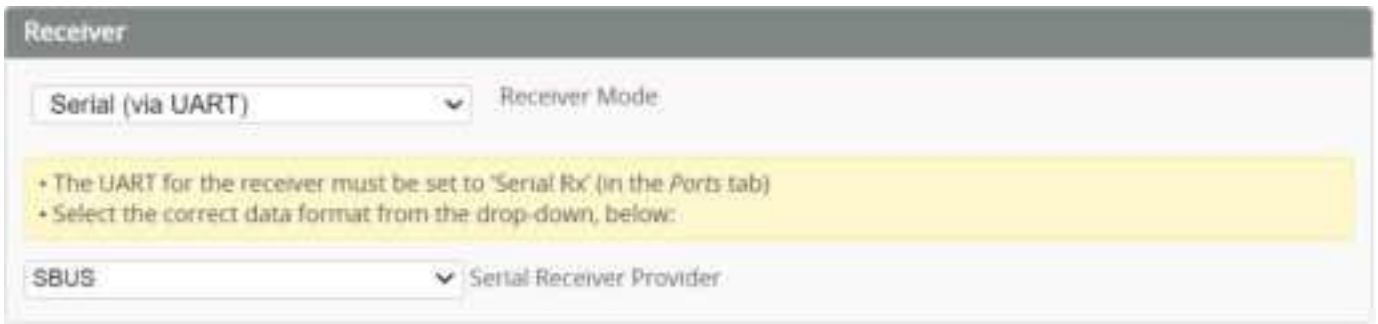
SBUS Receiver Connection and Settings:

Identifier	Configuration/MSP	Serial Rx	Telemetry Output	Sensor Input	Peripherals
USB VCP	115200		Disabled AUTO	Disabled AUTO	Disabled AUTO
UART1	115200		Disabled AUTO	Disabled AUTO	Disabled AUTO
UART2	115200		Disabled AUTO	Disabled AUTO	Disabled AUTO
UART3	115200		Disabled AUTO	Disabled AUTO	Disabled AUTO
UART4	115200		Disabled AUTO	Disabled AUTO	Disabled AUTO
UART5	115200		Disabled AUTO	Disabled AUTO	Disabled AUTO
UART6	115200		Disabled AUTO	Disabled AUTO	Disabled AUTO



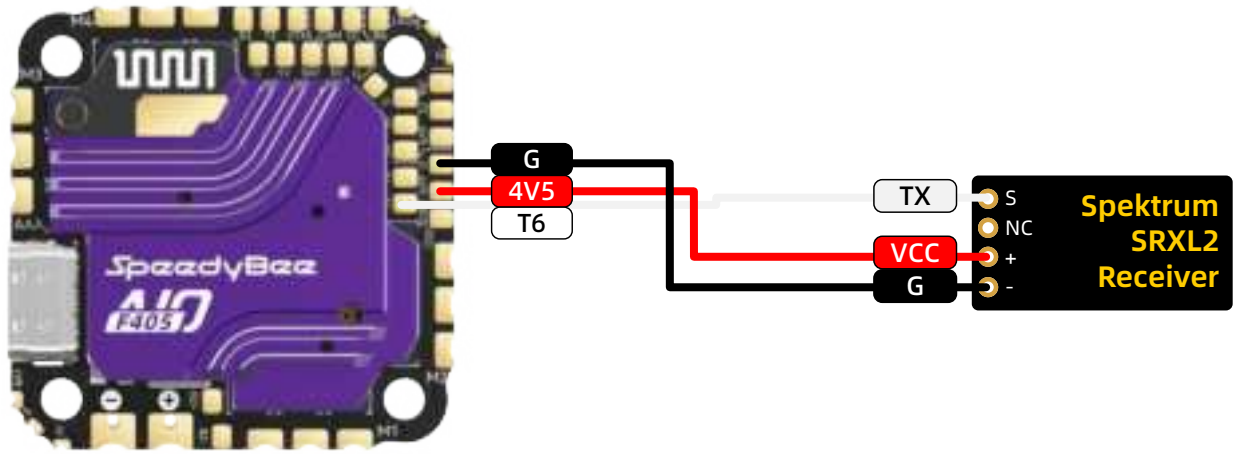
Setting Steps

1. Enable the UART2 serial receiver port on the Ports tab.
2. Set the receiver protocol to SBUS on the Receiver tab.



Spektrum SRXL2 Receiver Connection and Settings:

Identifier	Configuration/MSP	Serial Rx	Telemetry Output	Sensor Input	Peripherals
USB VCP	115200		Disabled AUTO	Disabled AUTO	Disabled AUTO
UART1	115200		Disabled AUTO	Disabled AUTO	Disabled AUTO
UART2	115200		Disabled AUTO	Disabled AUTO	Disabled AUTO
UART3	115200		Disabled AUTO	Disabled AUTO	Disabled AUTO
UART4	115200		Disabled AUTO	Disabled AUTO	Disabled AUTO
UART5	115200		Disabled AUTO	Disabled AUTO	Disabled AUTO
UART6	115200		Disabled AUTO	Disabled AUTO	Disabled AUTO



Setting Steps

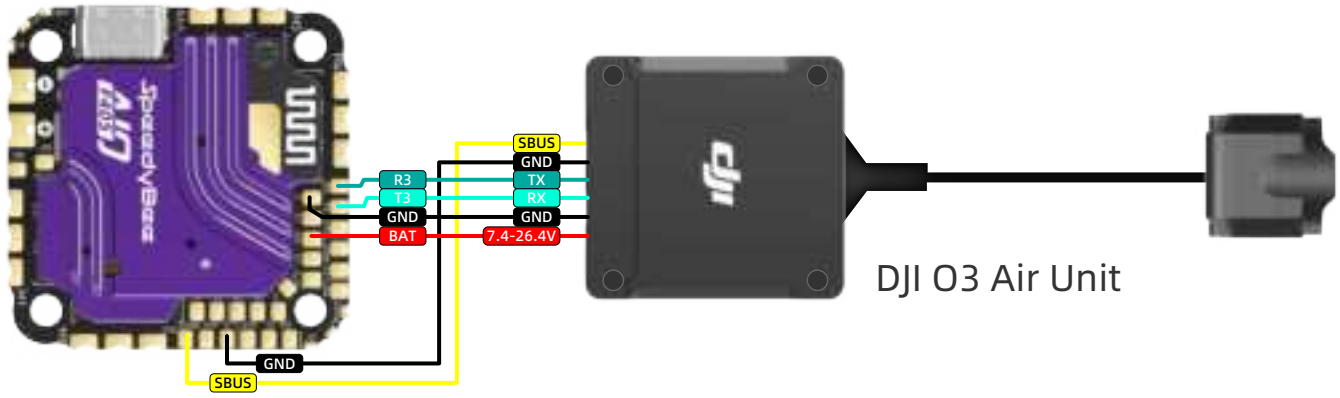
1. Enable the UART6 serial receiver port on the Ports tab.
2. Set the receiver protocol to SPEKTRUM SRXL2 on the Receiver tab.

HD VTX Connection and Settings:

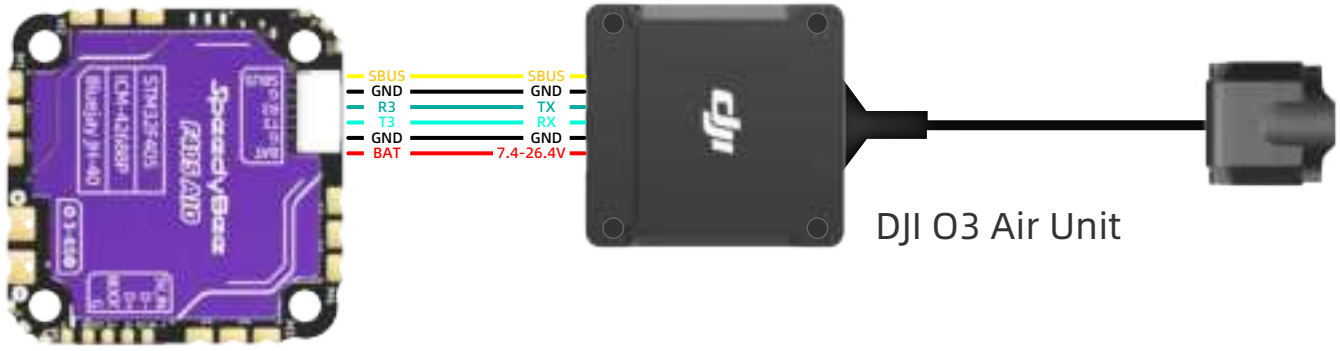
Identifier	Configuration/MSP	Serial Rx	Telemetry Output	Sensor Input	Peripherals
USB VCP	115200		Disabled AUTO	Disabled AUTO	Disabled AUTO
UART1	115200		Disabled AUTO	Disabled AUTO	Disabled AUTO
UART2	115200		Disabled AUTO	Disabled AUTO	Disabled AUTO
UART3	115200		Disabled AUTO	Disabled AUTO	VTX(MSP+D AUTO
UART4	115200		Disabled AUTO	Disabled AUTO	Disabled AUTO
UART5	115200		Disabled AUTO	Disabled AUTO	Disabled AUTO
UART6	115200		Disabled AUTO	Disabled AUTO	Disabled AUTO

If you are using an external receiver, please do not enable the settings for the Serial Digital Receiver on UART2, as this may conflict with your external receiver, clear your port settings, and prevent the receiver from functioning properly.

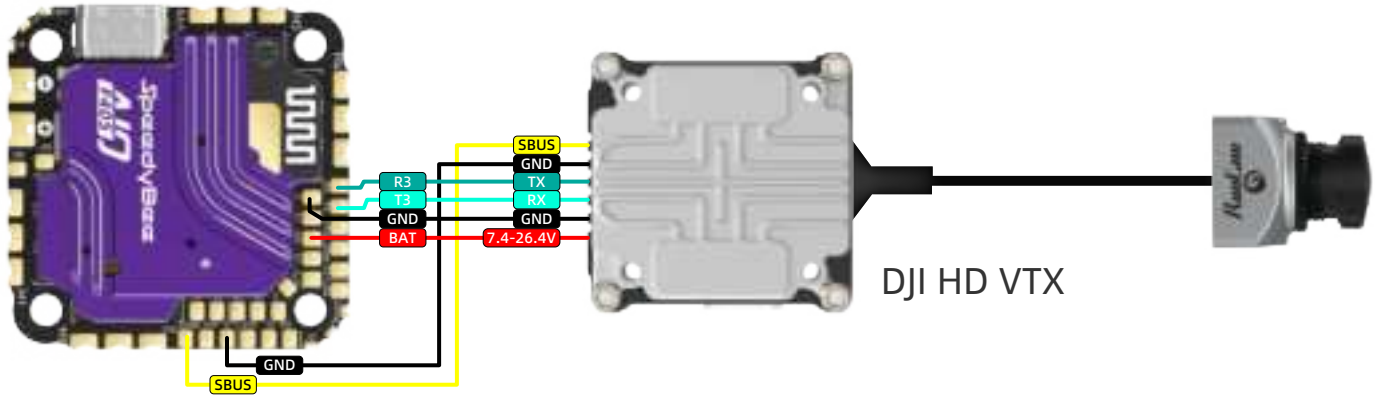
DJI O3 Air Unit Solder Connection



DJI O3 Air Unit Cable Plug Connection

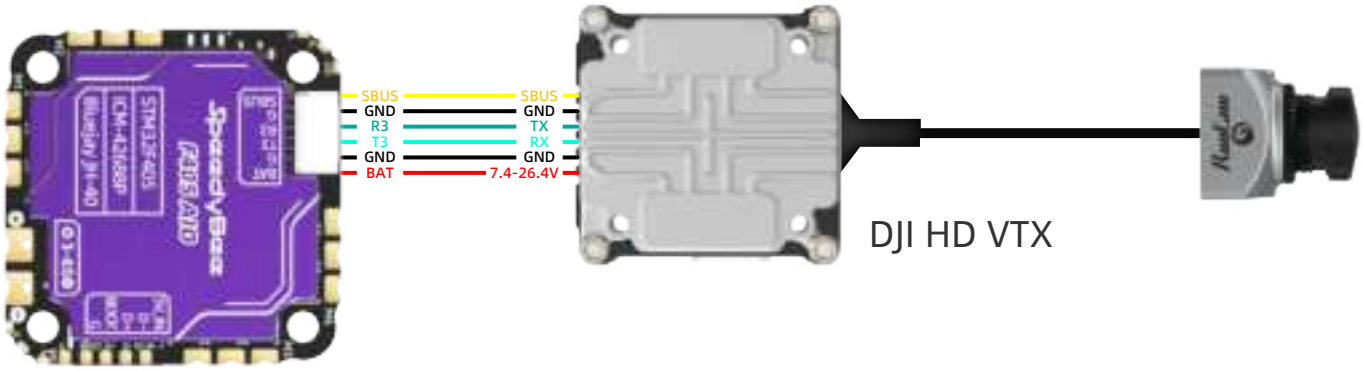


DJI HD VTX Solder Connection



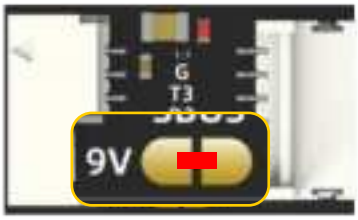
HD VTX Connection and Settings:

DJI HD VTX Cable Plug Connection

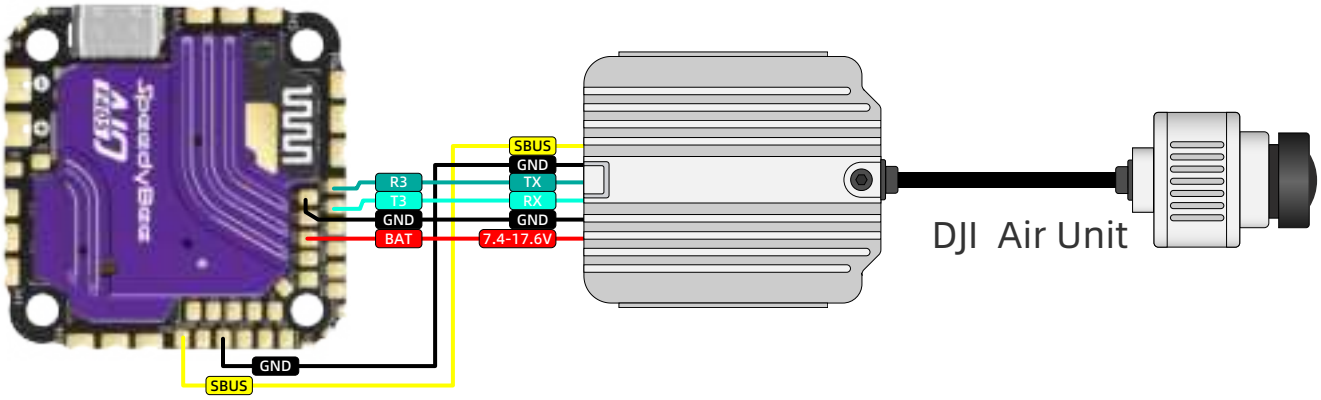


Warning!

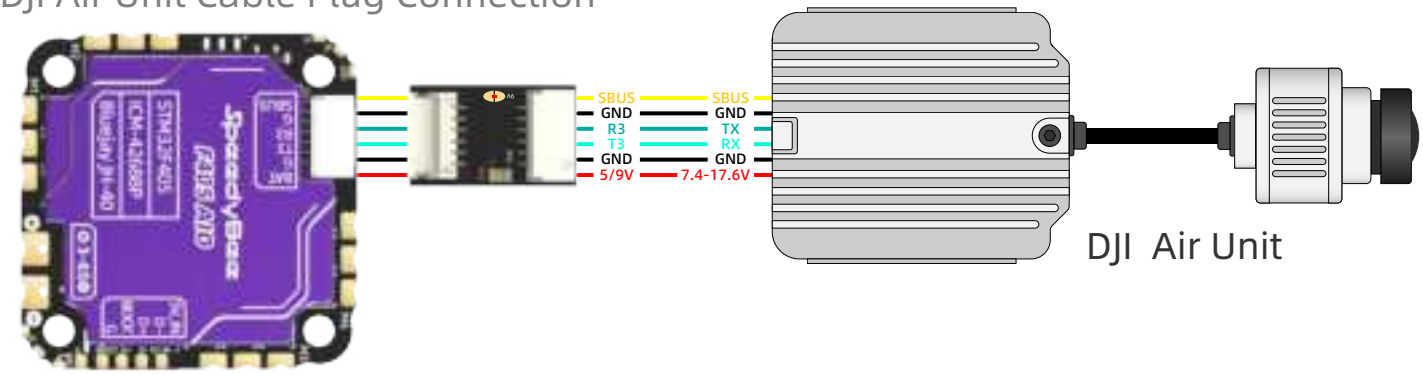
The DJI Air Unit only supports 3-4S batteries. Do not connect directly to a 6S battery, as it could damage the DJI Air Unit. Please use the included external BEC and set it to 9V output (by short-circuiting the two pads) before connecting to the DJI Air Unit.



DJI Air Unit Solder Connection



DJI Air Unit Cable Plug Connection



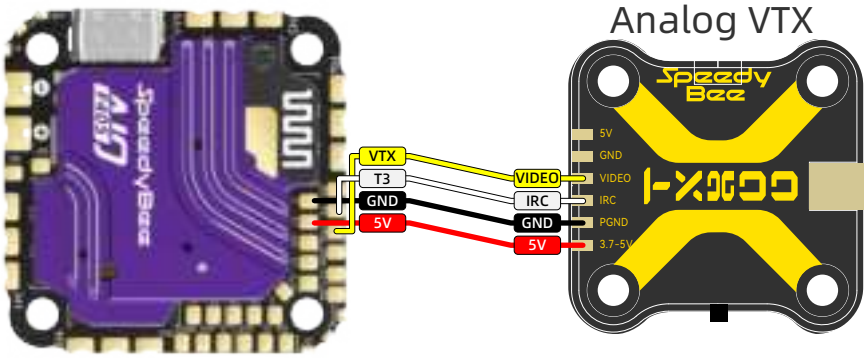
Analog VTX Connection and Settings:

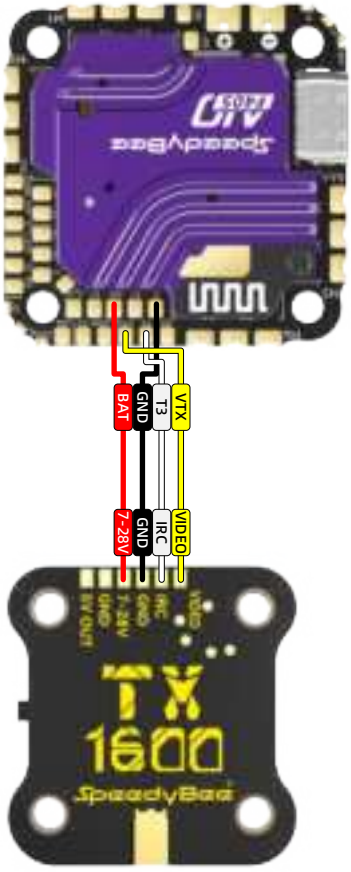
Identifier	Configuration/MSP	Serial Rx	Telemetry Output	Sensor Input	Peripherals
USB VCP	115200		Disabled AUTO	Disabled AUTO	Disabled AUTO
UART1	115200		Disabled AUTO	Disabled AUTO	Disabled AUTO
UART2	115200		Disabled AUTO	Disabled AUTO	Disabled AUTO
UART3	115200		Disabled AUTO	Disabled AUTO	VXT(IRC Tr AUTO
UART4	115200		Disabled AUTO	Disabled AUTO	Disabled AUTO
UART5	115200		Disabled AUTO	Disabled AUTO	Disabled AUTO
UART6	115200		Disabled AUTO	Disabled AUTO	Disabled AUTO

Note: Leaving CLI tab or pressing Disconnect will **automatically** send "**exit**"to the board.
With the latest firmware this will make the controller **restart** and unsaved changes will be **lost**.
Warning: Some commands in CLI can result in arbitrary signals being sent on the motor output pins.
This can cause motors to spin up if a battery is is connected. Therefore it is highly recommended to make sure that **no battery is connected before entering**

```
Entering CLI Mode, type 'exit' to return, or 'help'
#
#Building AutoComplete Cache ... Done!
#
# set osd_displayport_device = MAX7456
osd_displayport_device set to MAX7456
```

Analog VTX





Analog VTX

Setting Steps

1. Set UART6 Peripheral to “IRCTramp” and save.
2. In the CLI page, enter the following commands:
   set osd_displayport_device = MAX7456
   save
3. In the OSD tab, set the video format to PAL or NTSC (depending on the camera protocol).

Active OSD Profile

Current: OSD Profile 1

Video Format

○ Auto ◉ PAL ○ NTSC ○ HD

Video Format

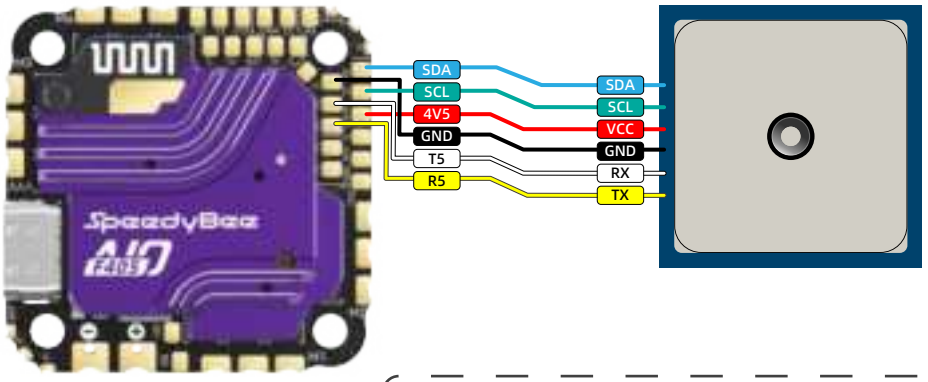
○ Auto ○ PAL ◉ NTSC ○ HD

Units

○ Imperial ◉ Metric ○ British

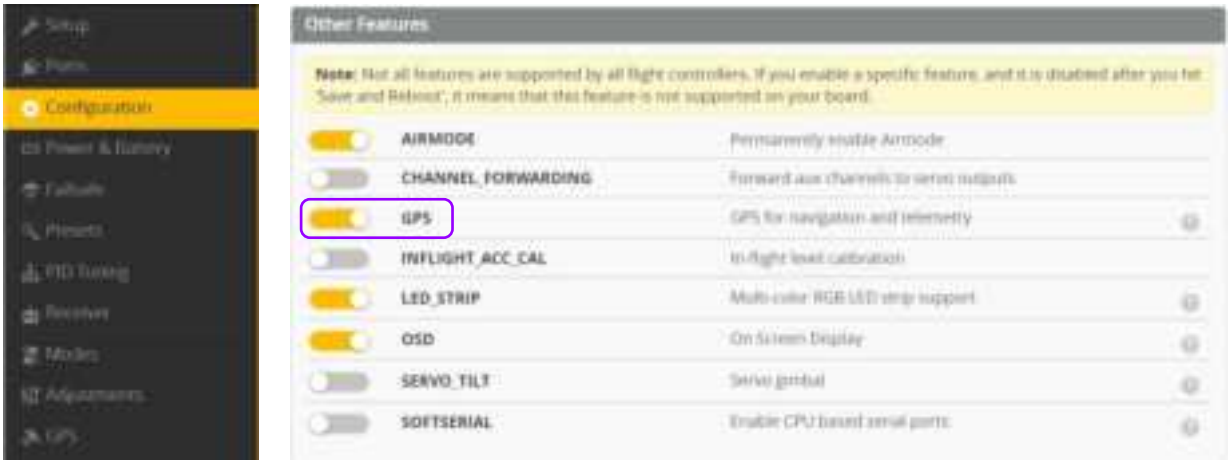
GPS Connection and Settings:

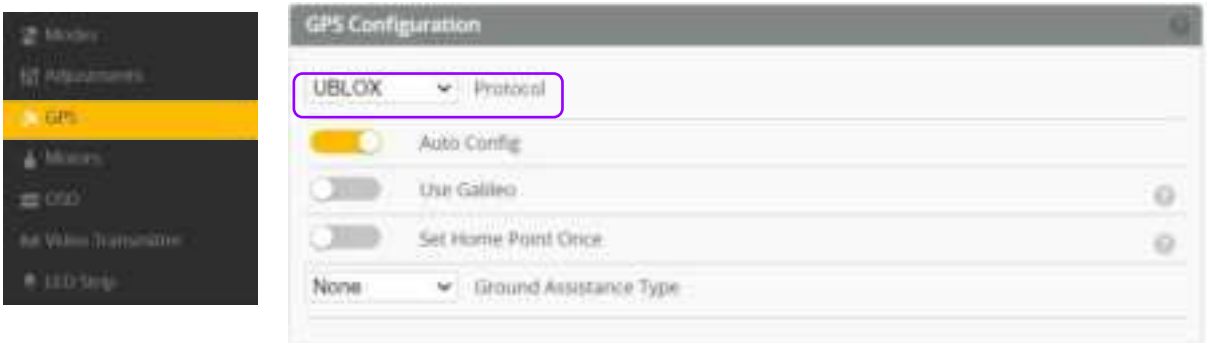
Identifier	Configuration/MSP	Serial Rx	Telemetry Output	Sensor Input	Peripherals
USB VCP	115200		Disabled AUTO	Disabled AUTO	Disabled AUTO
UART1	115200		Disabled AUTO	Disabled AUTO	Disabled AUTO
UART2	115200		Disabled AUTO	Disabled AUTO	Disabled AUTO
UART3	115200		Disabled AUTO	Disabled AUTO	Disabled AUTO
UART4	115200		Disabled AUTO	Disabled AUTO	Disabled AUTO
UART5	115200		Disabled AUTO	GPS AUTO	Disabled AUTO
UART6	115200		Disabled AUTO	Disabled AUTO	Disabled AUTO



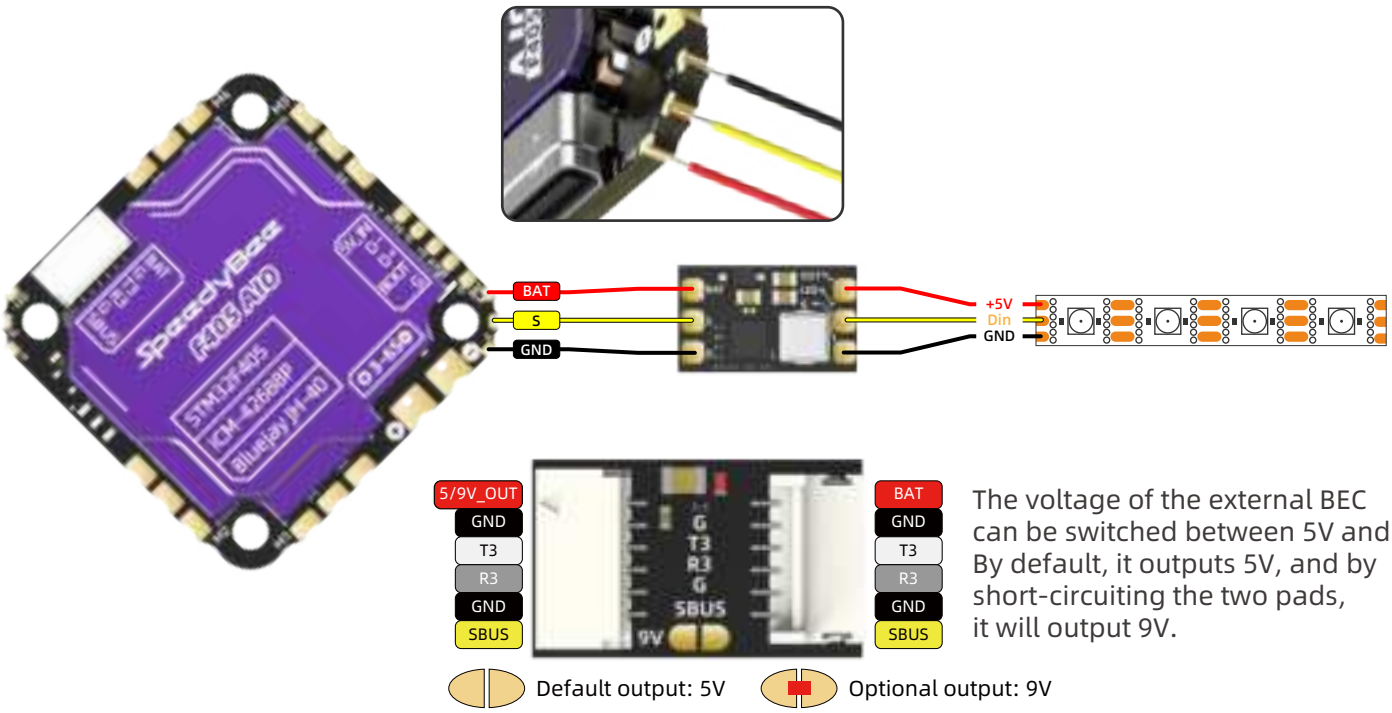
Setting Steps

1. Set UART5 Sensor Input to“GPS”on the Ports tab.
2. Enable GPS on the Configuration tab.
3. Select protocol based on the GPS used.





Meteor LED Strip Connection:



The voltage of the external BEC can be switched between 5V and 9V. By default, it outputs 5V, and by short-circuiting the two pads, it will output 9V.

Meteor LED Function Instructions:

The F405 AIO supports Meteor LED function, allowing multiple LED effects and status indicators. Users can customize the LED effects via the SpeedyBee App.

Operation Steps:

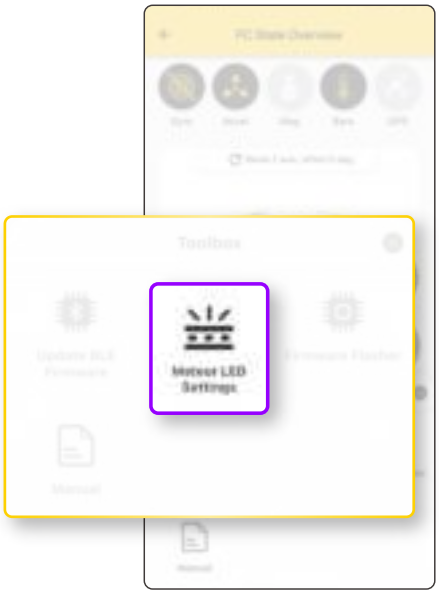
1. Connect to the F405 AIO via the SpeedyBee App.

2. Go to the “Toolbox” at the bottom right corner of the App interface and select “Meteor LED Settings” to start customizing.
Additionally, the F405 AIO supports remote control for the Meteor LED (LED LOW channel needs to be enabled in the mode setting).

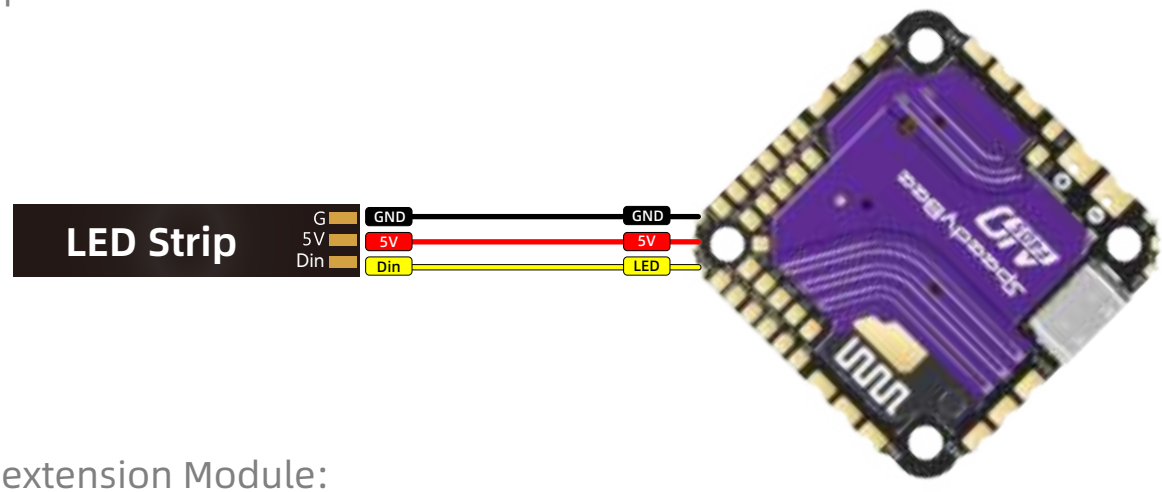
Operation Methods:

1. Switch Control:
Set the channel corresponding to the "LED LOW" mode to the high position to turn off the meteor light strip; conversely, setting it to the low position will turn it on.

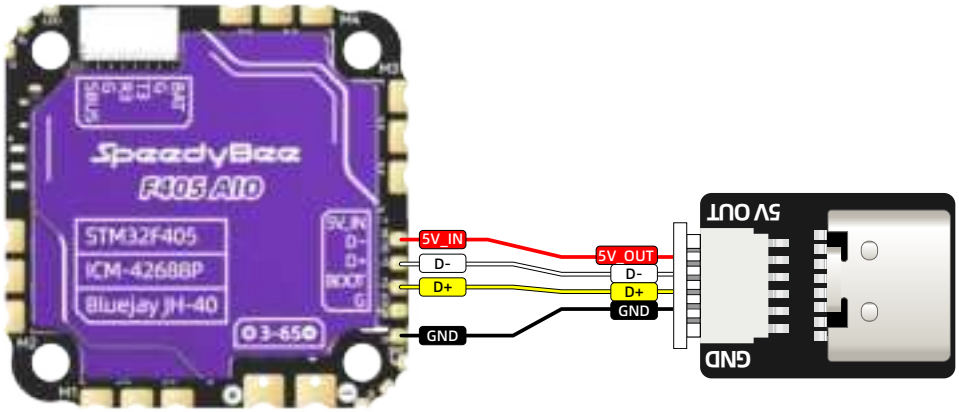
2. Effect Switching:
Quickly toggle the channel corresponding to the "LED LOW" mode once to switch the Meteor LED effects.



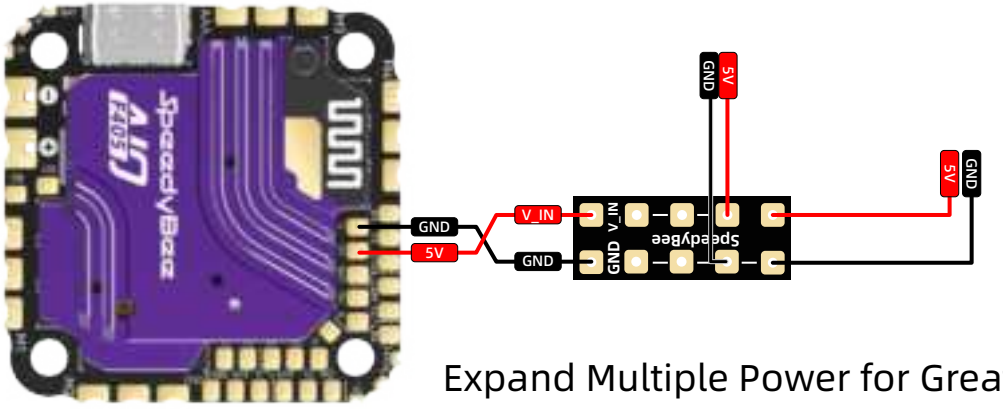
LED Strip Connection:



Type-C extension Module:



Power Expansion Board:



Expand Multiple Power for Greater DIY Flexibility

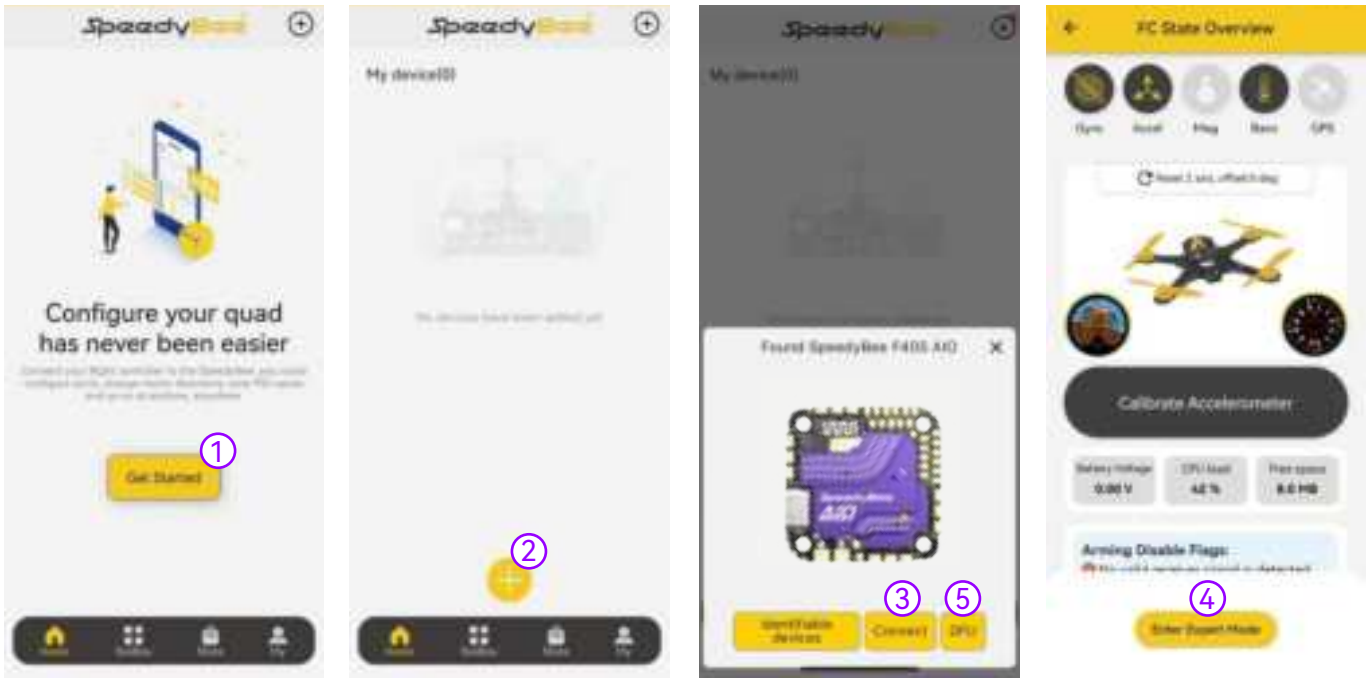
The power expansion board can convert 1 power source into 4, eliminating the hassle of soldering multiple wires to the same pad and allowing for easy connection of more power devices, such as receivers, LED strips, VTX, GPS, cameras, ect.

1.Install with the front facing up:

2.Install with the front facing up and rotated 45°counterclockwise:

3.Install with the back facing up:

4.Install with the back facing up and rotated 45°clockwise:

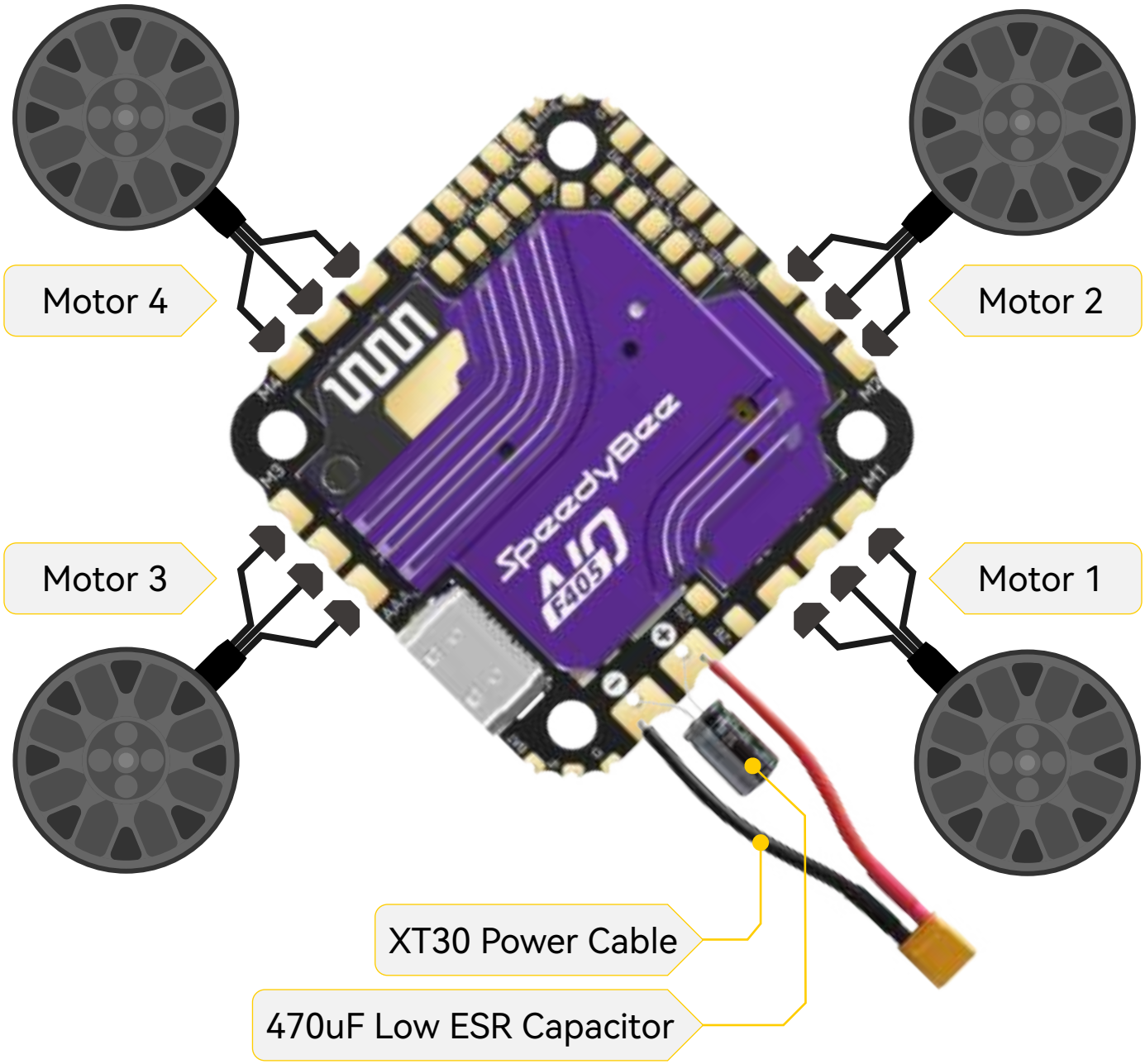


⑤ If it is inconvenient to press the BOOT button during installation, you can use the DFU function via APP to wirelessly trigger the flight controller to enter recovery mode.

How to Use Wireless DFU Function:

Part 3: ESC (Electronic Speed Controller)

Connecting Motors and Power Wires 3.1



- **Tip**: To protect the AIO flight controller from voltage spikes when powering on, it is strongly recommended to use the included 470uF low ESR capacitor.

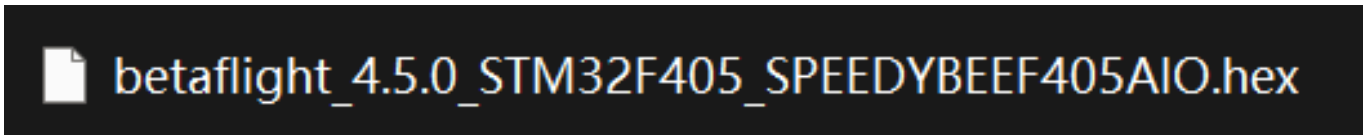
Part 4: Firmware Flashing

Flashing the Flight Controller Firmware 4.1

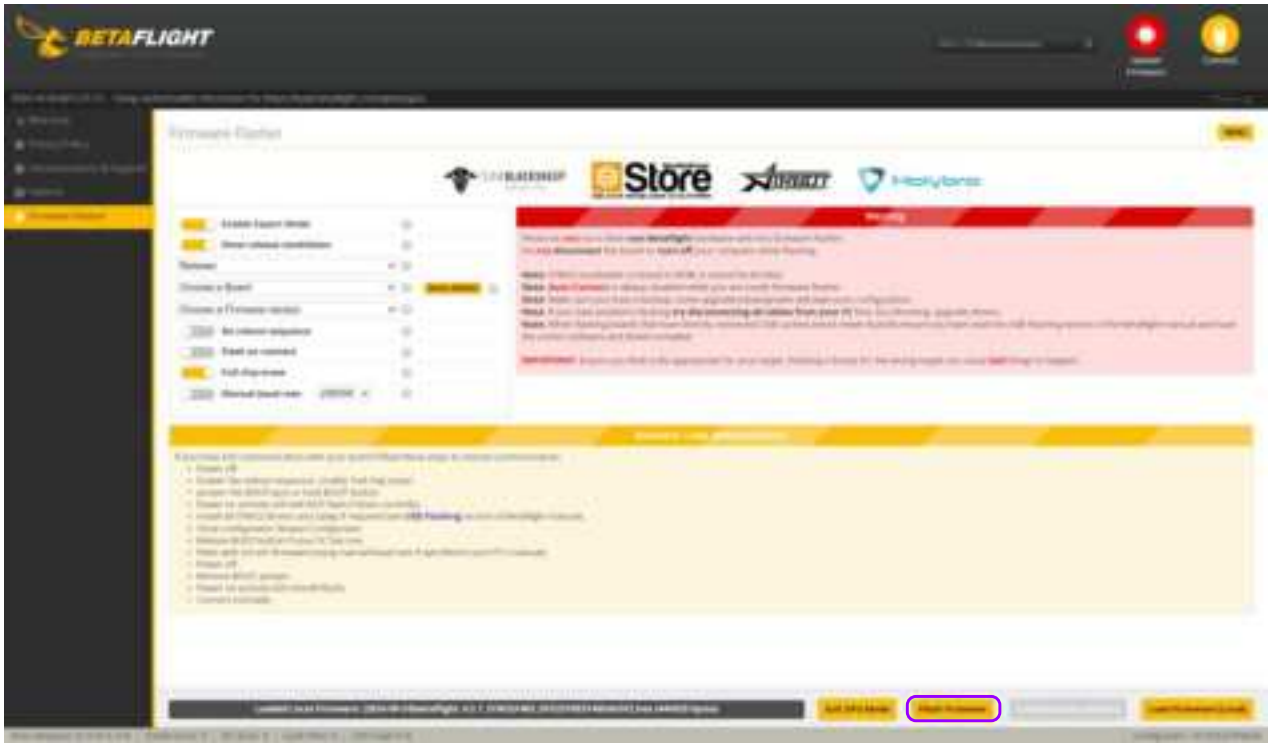
1. After entering DFU mode, click the “Update Firmware” button.

2. Click “Load Firmware (Local)” at the bottom right corner.

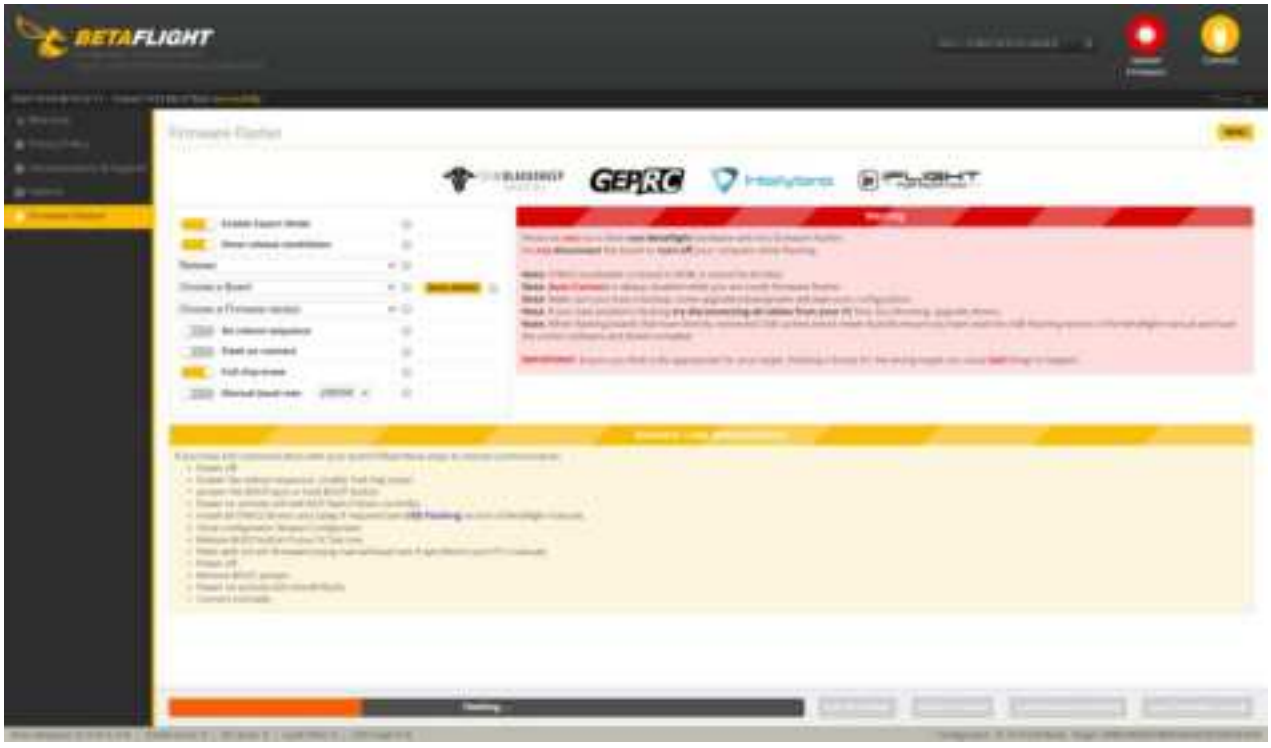
3. Choose the appropriate firmware.



4. Click “Flash Firmware”



5. Wait until the firmware flashing is complete.

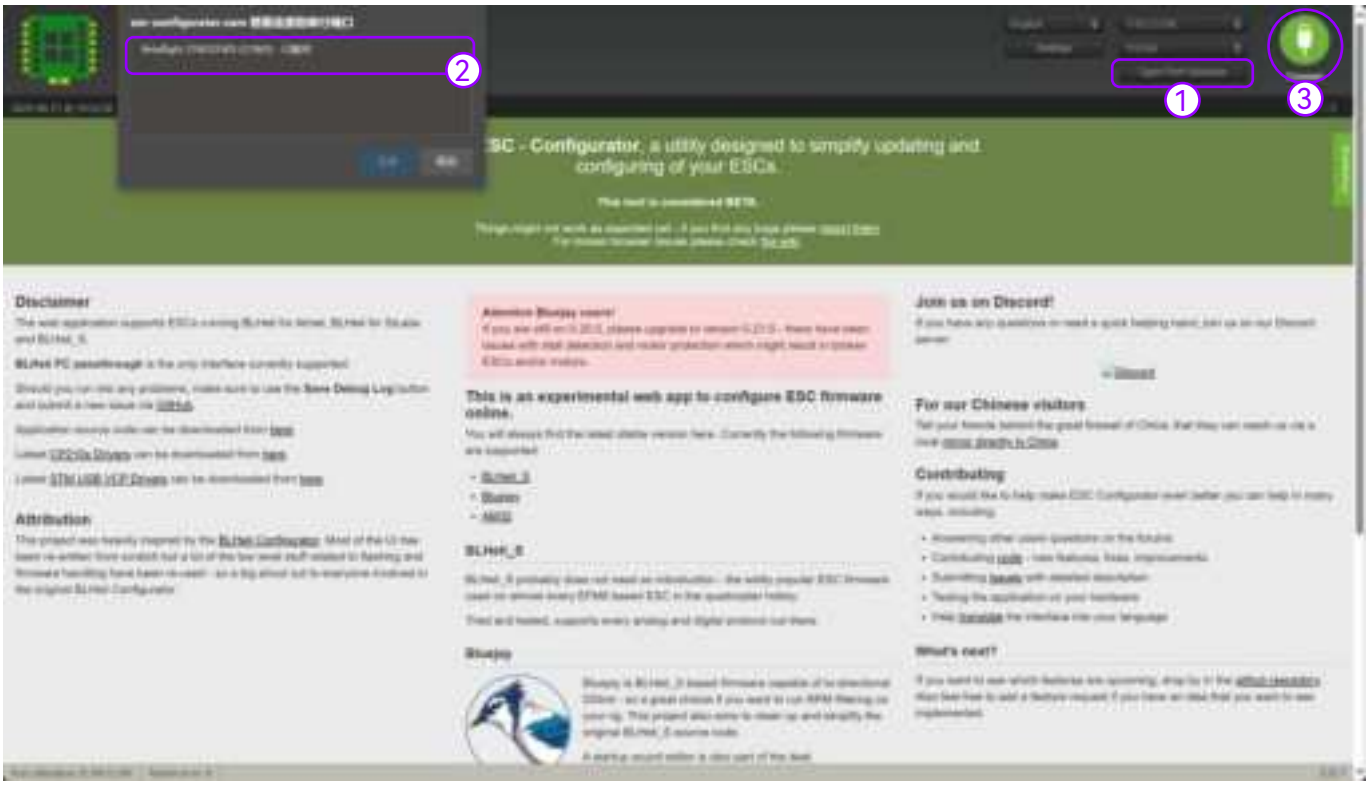


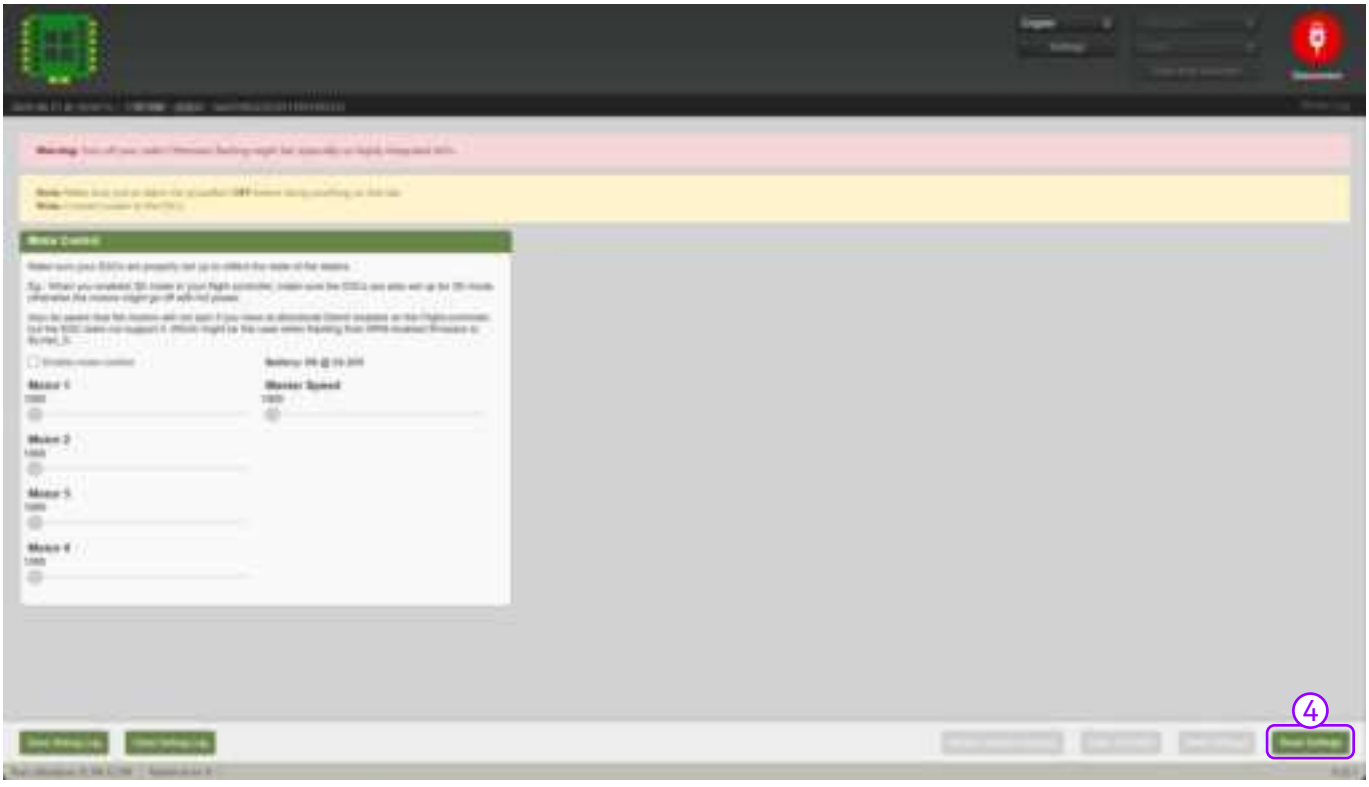
■ The ESC supports flashing with either BLHeli_S or BlueJay firmware.

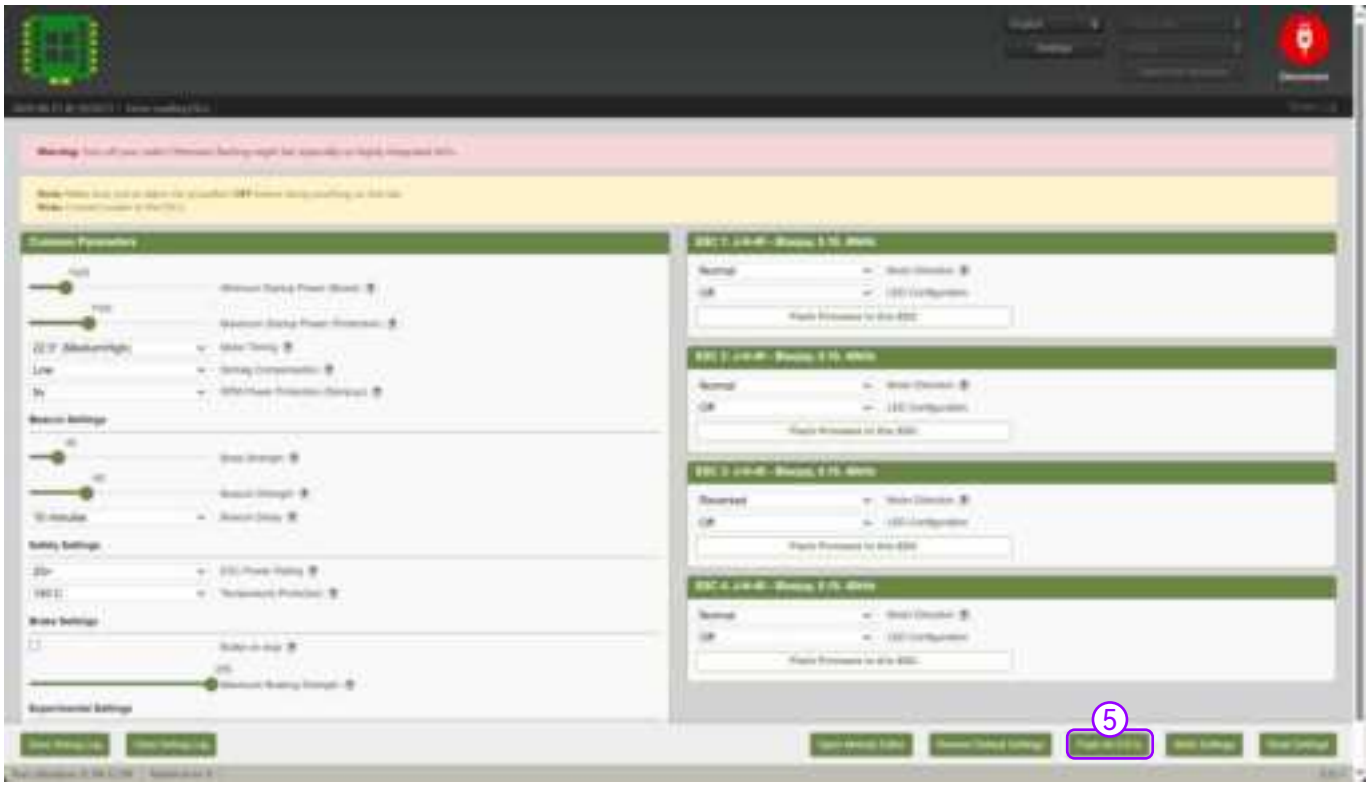
The process is as follows:

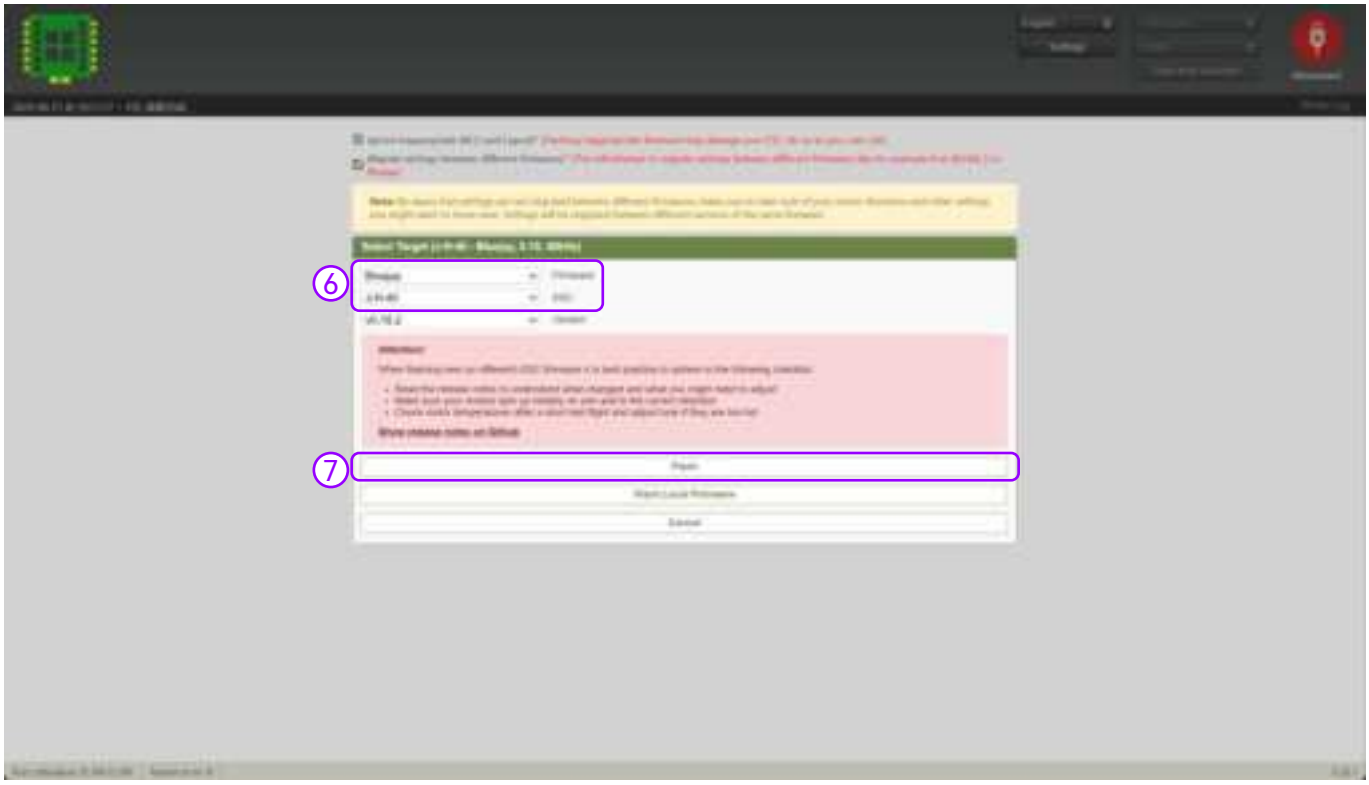
1. Power the AIO with a battery.
2. Connect the AIO to the computer via a USB cable.
3. Go to the following link to flash the firmware: https://esc-configurator.com/

*Note: Set the ESC type to 'J-H-40'.






5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Flight Controller

Product Name	SpeedyBee F405 AIO
MCU	STM32F405
Gyro	ICM-42688P
USB Port Type	Type-C
Barometer	SPA06-003
OSD	Supported
Bluetooth BLE	Supported, Bluetooth speed enhancement - 2.0
Wireless Flight Controller Firmware Update	Supported (no need to press physical BOOT button)
Wireless Download & Black Box Analysis	Not supported
DJI Air Unit Connection Method	Supports both 6-pin direct insertion and soldering
6-pin DJI Sky Port Direct Insertion	Supported, can directly connect to DJI O3/RunCam Link /Caddx Vista without changing wire order
Flash (for BlackBox)	8MB
Betaflight CC Pads (Camera Parameter Adjustment)	Supported
Input Voltage	3S-6S LiPo battery
4V5 Output	Two 4V5 outputs; total current 1A
5V BEC Output	Three 5V outputs; total current 2A; shared with 4V5
9V BEC Output	None (comes with an external BEC module, can switch between 5V and 9V); total current output 2A
MOTOR	M1-M4
UART	4 full-function serial ports （UART3,UART4,UART5,UART6+SBUS[R2]）
ESC Telemetry	None
I2C	Supported
LED Pads	Supported, used to control WS2812 LED lights
Buzzer Pads	Supported, BZ+ and BZ- pads
BOOT Button	Supported, press and hold the BOOT button while powering on to enter DFU mode for firmware recovery
RSSI Pads	None
SmartPort	Not supported

Flight Controller

Supported Flight Controller Firmware	BetaFlight(Default), INAV
Firmware Target Name	SPEEDYBEE F405AIO
Mounting	25.5 x 25.5mm, 2mm hole diameter
Dimensions	33.0mm (length) x 33.0mm (width) x 8mm (height)
Weight	13.6g (including CNC)

ESC

Product Name	SpeedyBee F405 AIO
Input Voltage	3-6S LiPo battery
Continuous Current	40A
Burst Current	45A (10s)
ESC Protocol	Supports DSHOT600/300; other protocols may cause severe errors, please use with caution.
Output Voltage	VBAT battery voltage (used to power the flight controller)
Current Sensor	Supported (Scale = 254, Offset = 0)
Firmware	Bluejay JH-40 48kHz