SpeedyBee F405 WING MINI

User Manual V1.2

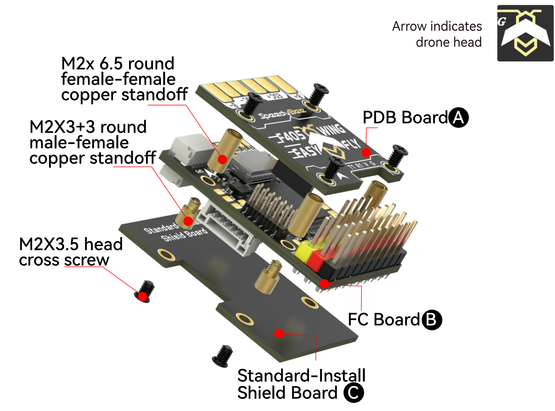
SpeedyBee APP | Installation | Facebook

Specification Overview

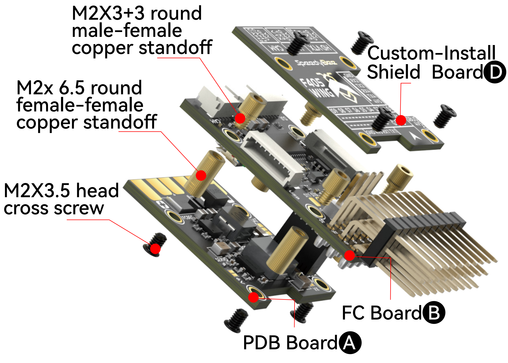
Product Name	SpeedyBee F405 WING MINI
PDB Board	SpeedyBee F405 WING MINI PDB Board
FC Board	SpeedyBee F405 WING MINI FC Board
Shield Board	SpeedyBee F405 WING MINI Custom-Install Shield Board SpeedyBee F405 WING MINI Standard-Install Shield Board
Wireless USB Extender	SpeedyBee F405 WING MINI USB Extender
Wireless Configuration	Bluetooth BLE/WIFI(AP)/WIFI(STA)
FC Firmware	INAV
Power Input	2-6S
Dimension	37(L) x 26(W) x 14(H) mm
Weight	19g （Wireless USB Extender included）

Part1-OverView

⬢ Standard-Install Shield Board
Installation standard Flight Controller orientation



⬢ Custom-Install Shield Board
Installation inverted Flight Controller

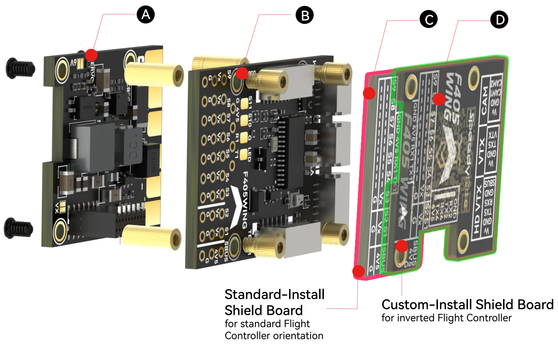


⬢ Assembly Instructions

1.Assemble Ⓐ(PDB Board) and Ⓑ(FC Board), align pins, insert, and secure with screws and bolts.

2.For standard Flight Controller orientation, assemble Ⓒ(Standard-Install Shield Board).

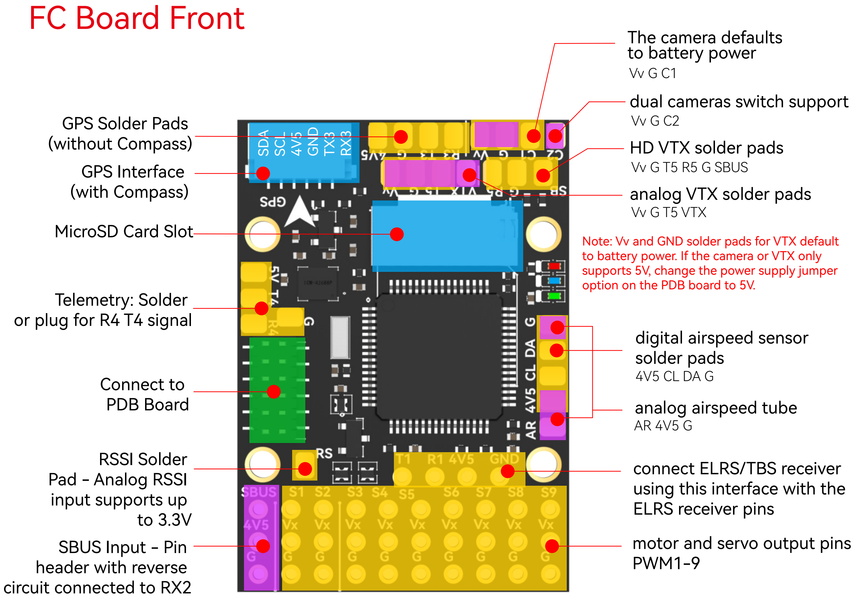
3.For inverted Flight Controller, assemble Ⓓ(Custom-Install Shield Board).



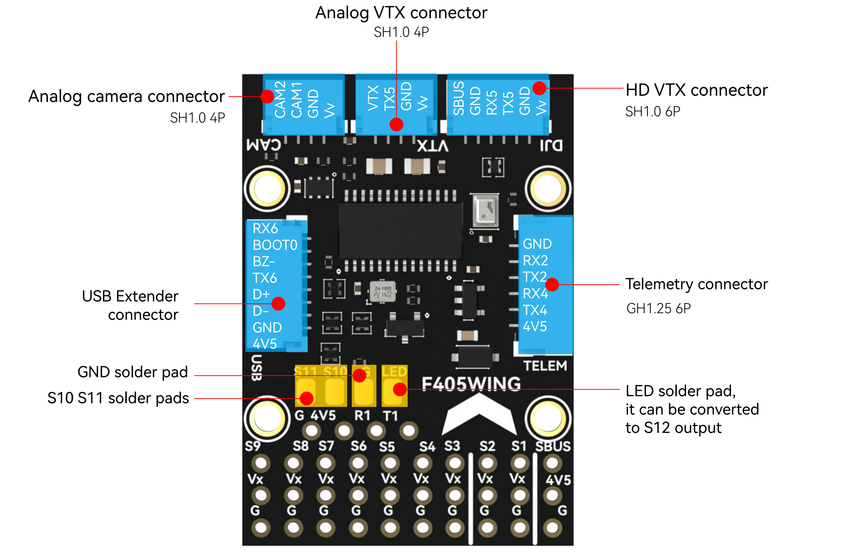
Part2-Hardware Description

Layout

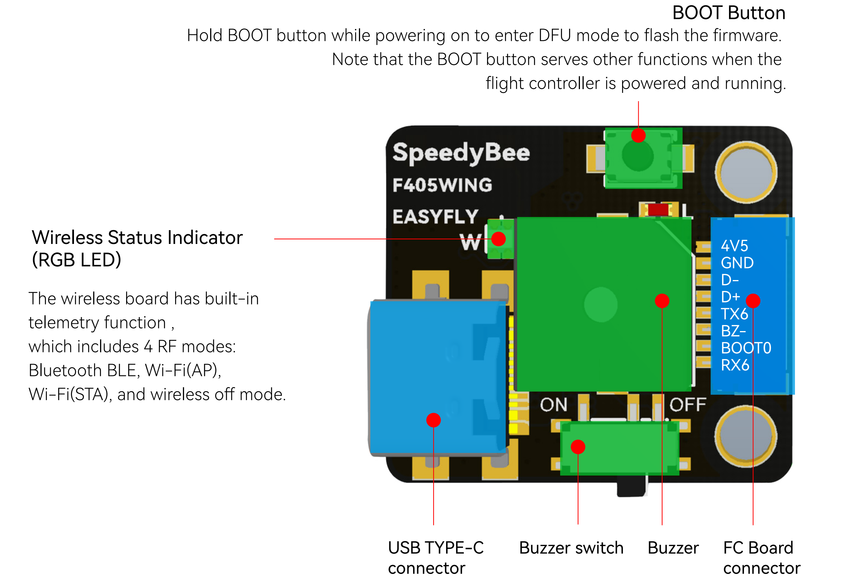
FC Board Front



FC Board Back



USB Extender Front



Green Slow Flash: Bluetooth BLE not connected
Solid Green: Bluetooth BLE connected

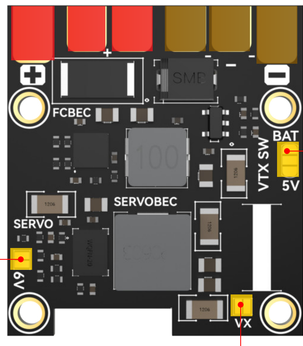
White Slow Flash: Wi-Fi (AP) not connected
Solid White: Wi-Fi (AP) connected

Purple Slow Flash: Wi-Fi (STA) not connected
Solid Purple: Wi-Fi (STA) connected

RGB LED off: Wireless off.

Press BOOT button for 6 seconds to switch between 4 wireless modes. When the yellow LED flashes rapidly and the device automatically restarts, the switch is successful.

PDB Board Back



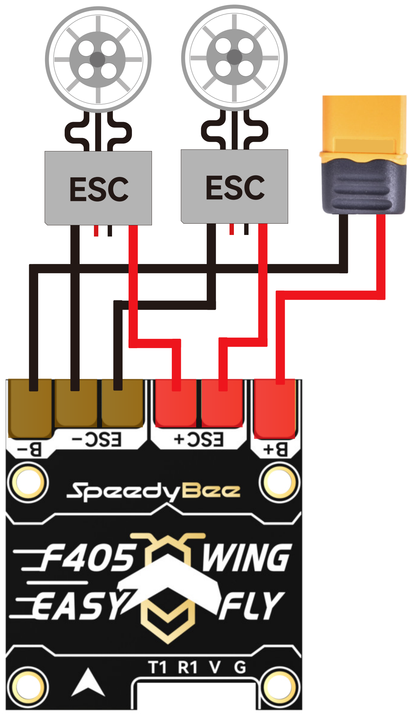
Servo BEC
Voltage Jumper
- Default 5V Output
- 6V Output

VTX Power Supply Jumper
- Default battery voltage output
- 5V Output

Selecting the 6V BEC voltage for servo will raise Vv's 5V output to 6V. When using battery voltage output, ensure that the VTX supports a wide voltage range of 7-26V to prevent damage.

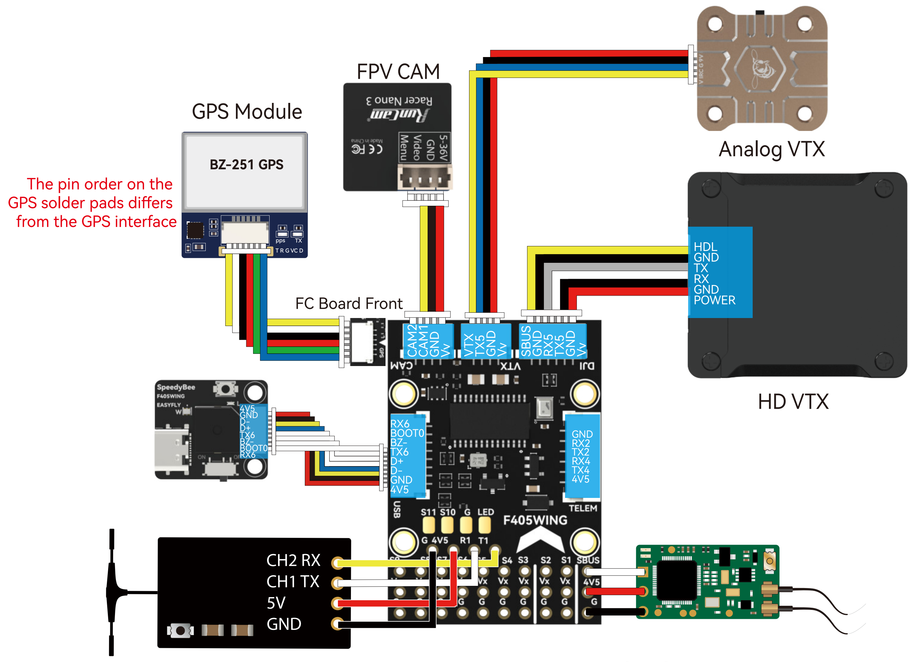
Servo BEC Power
Supply Jumper
- Default servo BEC power supply
- ESC BEC power supply

PDB Board Front



Peripheral Connection on FC Board

Method 1, Plug and Play

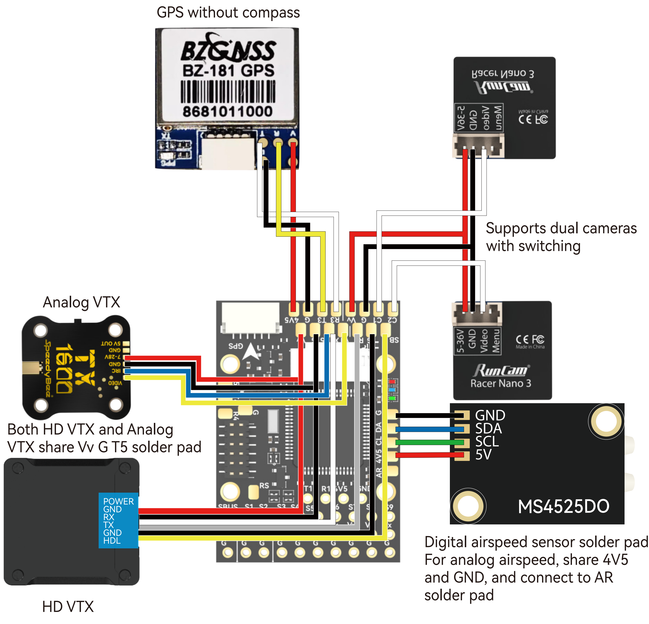


ELRS/TBS receiver
Use a 4-pin Dupont female header on the FC Board front.

SBUS/PPM receiver
Use a 3-pin Dupont female header on the FC Board front.

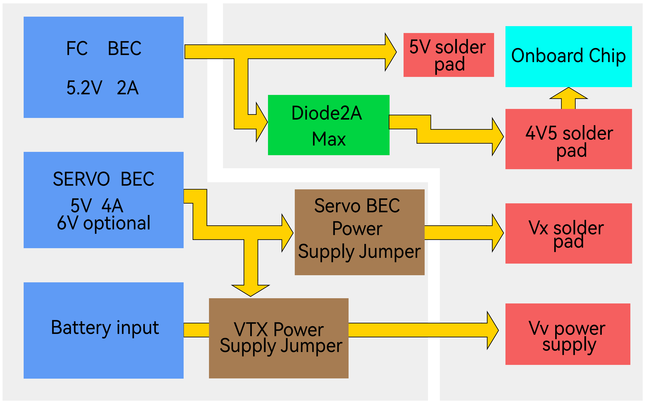
Method 2, Soldering

FC Front



Power Supply

The layout for the F405 WING MINI is as follows



1，FC BEC default output is 5.2V, supplied in two routes:

• The first route is directly supplied to the 5V solder pads.

• The second route is supplied through a diode to the onboard chip and the 4V5 solder pads.
Please note that FC BEC can provide 2A continuous current and 3A peak current. The onboard chip requires power ≤ 1A, GPS and receiver ≤ 0.1A, and wireless controller ≤ 0.1A. If connecting high-power telemetry or VTX to the 5V solder pads, ensure the operating current is ≤ 0.8A.

2，The VTX power supply interface (Vv) can be set to two power ways: direct battery power or internal BEC 5V (shared with 5V4A Servo BEC).

• Factory setting is battery power, where Vv interface voltage is the same as the battery voltage.
Please note: Ensure the voltage of VTX and camera power supply matches the battery voltage, if not, damage may occur.

• By using **VTX Power Supply Jumper**, you can switch to 5V power supply. In this case, the Vv interface voltage will be 5V (if you choose this method, ensure the servo and VTX current are sufficient).
Please note: When Servo BEC Voltage Jumper is switched to 6V, the Vv interface voltage also switches to 6V.

3，Servo power supply (Vx pin header) defaults to being powered by Servo BEC at 5V. When Servo BEC is switched to 6V via **Servo BEC Voltage Jumper**, the voltage at the Vx pin header also switches to 6V.
Please note that if the ESC supports BEC output, do not connect the BEC red wire to the Vx pin header. Otherwise, it may damage the ESC or Servo BEC.

Alternatively, you can directly power it using the ESC's BEC, but you need to disconnect **Servo BEC Power Supply Jumper**. In this way, the power supply for the Vx pin header comes from an ESC's BEC.

4，Power supply recommendations:

• When using a digital VTX with a wide voltage input, you can use the default battery voltage for Vv.

• When using an analog VTX powered by 5V, you can switch Vv power supply voltage to Servo BEC's 5V supply. In this case, you can install up to four 9g servos to avoid insufficient current.

• When using aircraft with 64 or 70 EDF Jets, Servo BEC power supply may not be sufficient for servos and landing gear. You can disconnect **Servo BEC Power Supply Jumper** and directly use the ESC's BEC to power the devices.

Part 3 - Firmware Upgrade

Firmware Upgrade

SpeedyBee F405 WING MINI does not support wireless firmware flashing. Please update the firmware using a computer by following these steps:

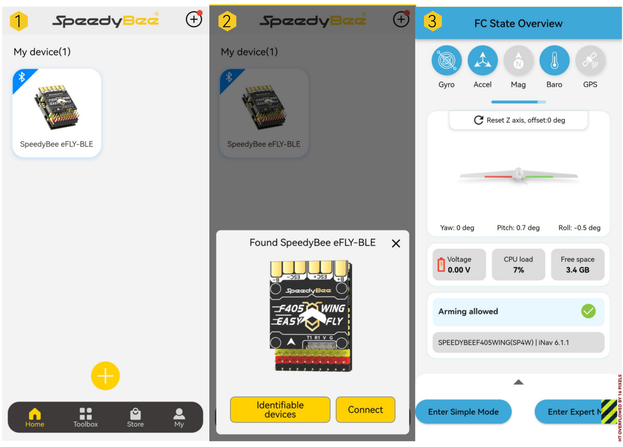
①Press and hold the BOOT button while connecting the FC to your computer via a USB cable.

②Open the INAV Configurator on your computer and navigate to the "Firmware Flasher" page. Select the flight controller target as "SPEEDYBEEF405WING" and proceed with flashing the firmware.

APP Connection

Connecting INAV firmware to SpeedyBee APP

Check the color of the Wireless Status Indicator. If it is Green Slow Flash, open the SpeedyBee App and follow the steps to connect to the corresponding product.



Part4-Specifications

SpeedyBee F405 WING MINI FC board

Product Name	SpeedyBee F405 WING MINI FC board
MCU	STM32F405, 168MHz, 1MB Flash
IMU(Gyro&Accelerometer)	ICM-42688-P
Barometer	SPL06-001
OSD Chip	AT7456E
Blackbox	MicroSD Card Slot
UART	6 sets (UART1, UART2, UART3, UART4, UART5, UART6 - Dedicated for Wireless board Telemetry connection)
I2C	1x
ADC	4x
PWM	12x (9x pin headers + 2x solder pads + 1x "LED" pad)
ELRS/CRSF Receiver	Supported, connected to UART1
SBUS	Built-in inverter for SBUS input (UART2-RX)
LED	3x LEDs for FC STATUS (Blue, Green) and 3.3V indicator (Red)
Analog RSSI	Supported, Named as "RS"
Dual Analog Camera Switching	Default to Camera1 Video Input (C1). Switch between C1 and C2 using INAV Modes/USER. Both cameras should have the same video format, either PAL or NTSC.
Supported FC Firmware	INAV: SpeedyBeeF405WING (default)
Weight	5.6g

SpeedyBee F405 WING MINI PDB board

Product Name	SpeedyBee F405 WING MINI PDB board
Input voltage range	7~36V (2~6S LiPo)
Battery Voltage Sensor	Connect to FC board VBAT, 1K:10K
Battery Current Sensor	80A continuous, 150A peak Connect to FC board Current
TVS Protective diode	Yes
FC BEC output	Output 5.2V +/- 0.1V DC Continuous current 2 Amps, 3A Peak
VTX & Camera power supply	The VTX power interface Vv offers two power supply options: direct battery voltage or integrated BEC 5V,By default, it is set to battery voltage (Ensure the VTX and camera input voltage range is compatible) Switching to 5V power supply is possible via pad jumper.
Servo BEC output	Output 5V +/- 0.1V DC Continuous current 4 Amps, 5A Peak Voltage adjustable, 5V Default, 6V via jumper
Weight	5.5g

SpeedyBee F405 WING MINI Wireless USB Extender

Product Name	SpeedyBee F405 WING MINI Wireless USB Extender
Wireless Configuration (long press BOOT button for 6 seconds to switch modes) INAV:Please make sure the MSP switch on UART 6 is turned on and set to a baud rate of 115200 ArduPilot:Please make sure the Serial 6 is set to baud rate 115200 and protocol Mavlink2	BLE mode, connect to Speedybee APP
	Wi-Fi (Access Point)mode, able to connect to Speedybee APP, WiFi: Speedybee eFLY-WIFI Password: 88888888
	Wireless off mode
USB Port Type	Type-C
Buzzer	5V Active Buzzer
Weight	3.2g

Part5-pin mapping

⬢ INAV mapping

UART			
USB		USB	
TX1 RX1	5V tolerant I/O	UART1	ELRS/TBS receiver
TX2 RX2 SBUS	5V tolerant I/O	SBUS pad	SBUS receiver, SBUS pad = RX2 with inverter
		TX2	SmartPort Open "Configuration" tab, scroll to "Other Features",enable "CPU based serial ports", save and reboot. In "Ports" tab, select "SOFTSERIAL2", set telemetry to "SmartPort", save and reboot.
TX3 RX3	5V tolerant I/O	UART3	GPS
TX4 RX4	5V tolerant I/O	UART4	USER
TX5 RX5	5V tolerant I/O	UART5	DJI OSD/VTX
TX6 RX6	5V tolerant I/O	UART6	Onboard wireless controller

PWM		TIMER	INAV Plane	INAV MultiRotor
S1	5V tolerant I/O	TIM4_CH2	Motor	Motor
S2	5V tolerant I/O	TIM4_CH1	Motor	Motor
S3	5V tolerant I/O	TIM3_CH3	Servo	Motor
S4	5V tolerant I/O	TIM3_CH4	Servo	Motor
S5	5V tolerant I/O	TIM8_CH3	Servo	Motor
S6	5V tolerant I/O	TIM8_CH4	Servo	Motor
S7	5V tolerant I/O	TIM8_CH2N	Servo	Servo
S8	5V tolerant I/O	TIM2_CH1	Servo	Servo
S9	5V tolerant I/O	TIM2_CH3	Servo	Servo
S10	5V tolerant I/O	TIM2_CH4	Servo	Servo
S11	5V tolerant I/O	TIM12_CH2	Servo	Servo
LED	5V tolerant I/O	TIM1_CH1	WS2812LED	WS2812LED
	Open "Configuration" tab, scroll to "Other Features", enable "Multi-color RGB LED strip support", save and reboot. In "Led Strip" tab of INAV GUI, configure LED colors and behaviors , then save.			

ADC			
VBAT	1K:10K divider builtin 0~30V	VBAT ADC ADC_CHANNEL_1	voltage scale 1100
CURR	0~3.3V	CURRENT_METER ADC ADC_CHANNEL_2	Current scale 195
AIRSPD	10K:10K divider builtin 0~6.6V	AIRSPEED ADC ADC_CHANNEL_3	Analog Airspeed
RSSI	0~3.3V	RSSI ADC ADC_CHANNEL_4	Analog RSSI

I2C			
I2C1	5V tolerant I/O	onboard Barometer	SPL06-001
		Compass	QMC5883 / HMC5883 / MAG3110 / LIS3MDL
		Digital Airspeed sensor	MS4525
		OLED	0.96″

Part6-Standard settings

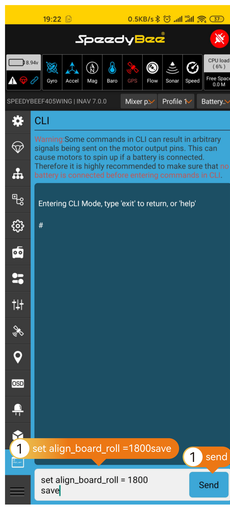
- FC Inverted Settings
- Hardware Installation

According to the diagram in Part 1, if you choose to install the FC in the standard Flight Controller orientation, you can use the default parameters.
If you choose to install the FC inverted (with the PDB board facing the ground and the Custom-Install Shield Board facing the sky), you will need to make the following settings.

1 INAV Settings

① On the CLI page, enter the following commands in the input box:
set align_board_roll = 1800
save

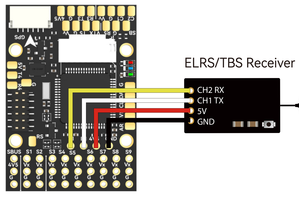
②Click "Send," and the FC will save the parameters and restart.



Receiver Settings

- ELRS/TBS Receiver

Hardware Connection：
Solder the receiver using a 4-pin Dupont single-head cable, then plug the Dupont cable into the corresponding pin header.

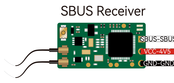


INAV Settings

Detectable with default settings.

SBUS Receiver

Hardware Connection:
Use a 3-pin Dupont male-to-male cable and plug it into the SBUS input pin header.

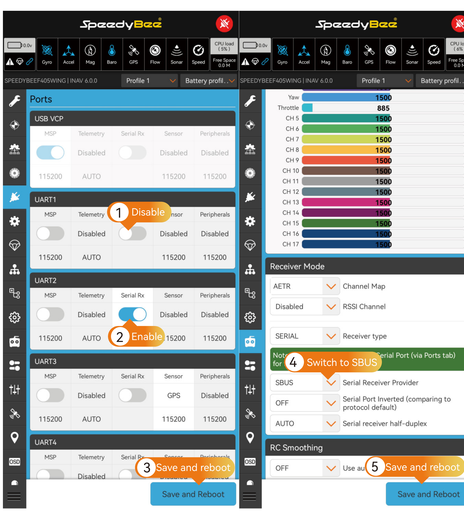


1 INAV Settings

①In the Ports tab, disable Serial RX for UART1, enable Serial RX for UART2, then save and reboot.

②Switch the CRSF protocol to SBUS in the Receiver tab, then save and reboot.

INAV Settings

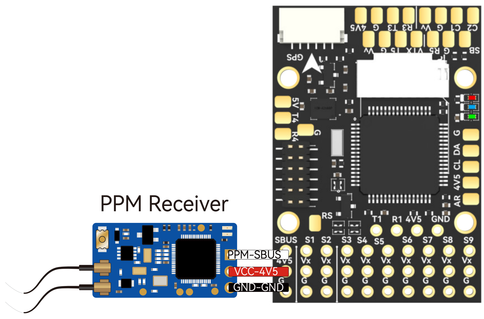


PPM Receiver:

Hardware Connection:

Use a 3-pin Dupont male-to-male cable and plug it into the SBUS input pin header.

PPM receivers only supported in INAV 3.x and below.



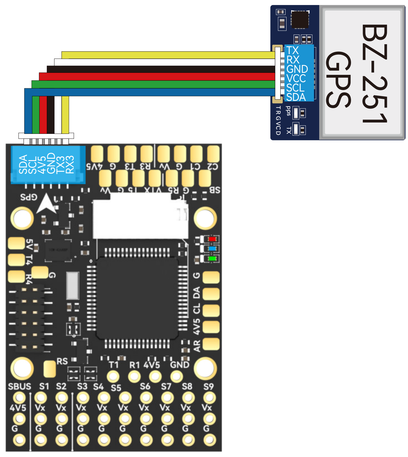
INAV Settings

INAV does not support

GPS Settings

Hardware Connection:

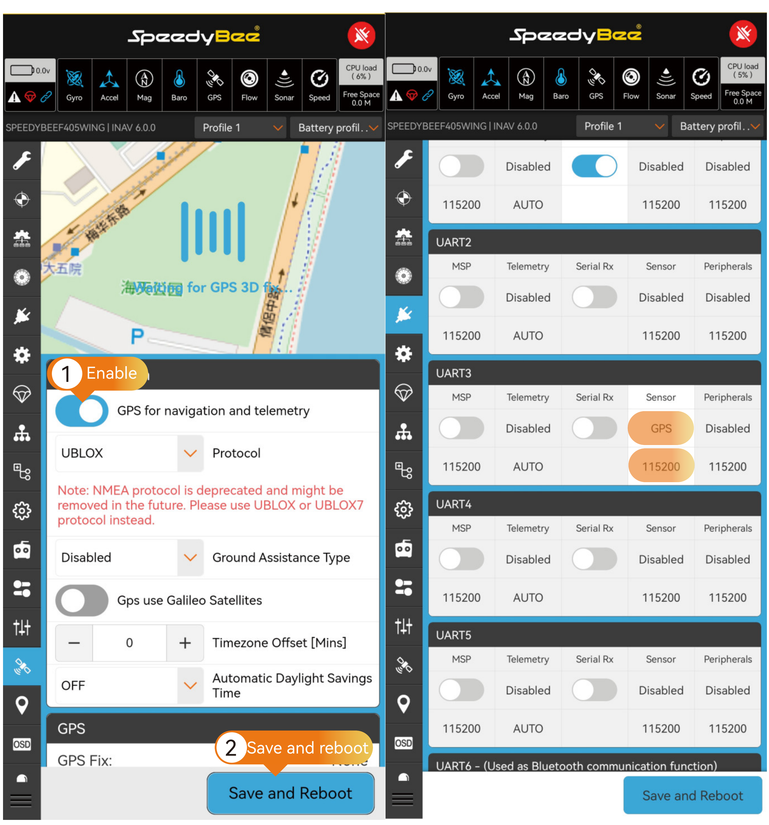
Rearrange the pre-crimped JST SH1.0 cables of the GPS Module Cable according to the GPS module's pin layout. Insert them into the 6-pin JST SH1.0 housing. The BZ-251 GPS module is recommended.



INAV Settings

In the GPS tab, enable GPS for navigation and telemetry, then save and reboot. If not using a UBLOX module, refer to the specifications of the corresponding module and select the appropriate baud rate and protocol.

INAV Settings



Compass (Magnetometer)Settings

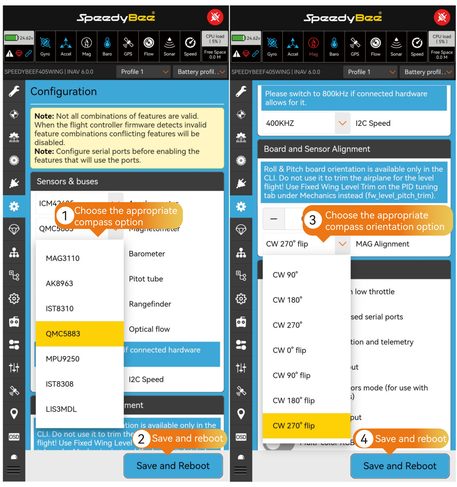
Hardware Connection:

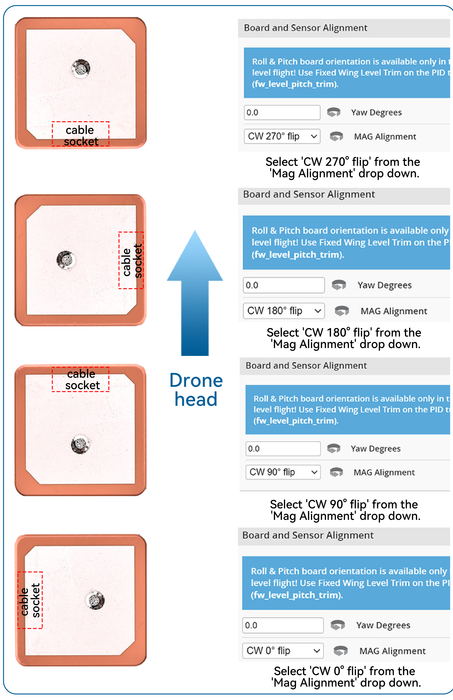
Use the recommended BZ-251 GPS module with an integrated QMC5883 compass. Install the GPS module away from the power supply lines, Motors, ESCs, and hatch magnets to avoid electromagnetic interference.Confirm the signal lines are connected as SDA to SDA, SCL to SCL.

INAV Settings

In the Configuration tab, select the appropriate compass option based on the compass model, then save and reboot. Adjust the compass orientation according to the specifications defined in the GPS module's documentation, then save and reboot.

INAV Settings

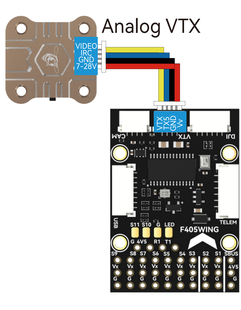




Analog VTX Settings

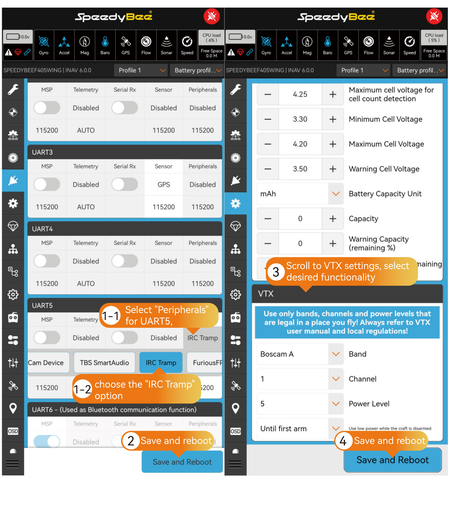
Hardware Connection:

Connect the SpeedyBee TX ULTRA analog VTX with the VTX cable



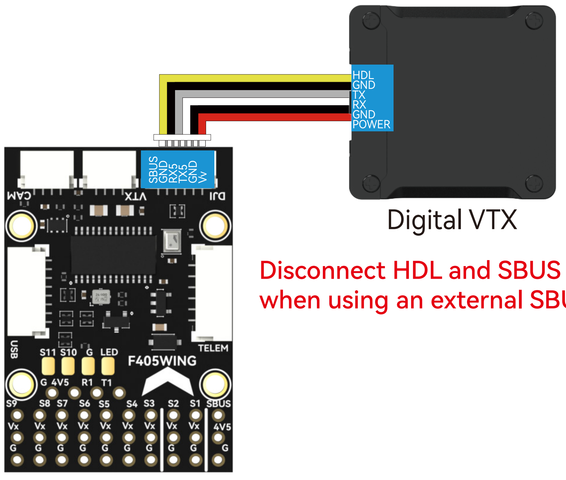
Note: Please adjust the VTX BEC power supply to 5V when using the TX800.

INAV Settings



Digital VTX Settings

Hardware Connection:
Use a Digital VTX cable to connect to the Digital VTX.



Disconnect HDL and SBUS signals when using an external SBUS receiver.

❶ INAV Settings

①In the Ports tab, select "Peripherals" for UART5 and choose the "MSP DisplayPort" option, then save and reboot.

②In the OSD tab, scroll down to the "Video Format" option and select the appropriate option based on the following guidelines.

③Save and reboot.

INAV Settings



For DJI O3, DJI Air Unit V1 paired with DJI Goggles 2, RunCam Link paired with DJI Goggles 2 , Caddx Vista paired with DJI Goggles 2.

For other digital VTX devices, consult the table below for parameter settings:

FPV goggles/VRX	Air unit	Ports tab		OSD tab
		UART	Peripherals	Video Format
DJI G2	DJI O3	UART5	MSP DisplayPort	BF43COMPAT
	DJI Air Unit V1	UART5		
	RunCam Link/Caddx Vista	UART5		
DJI V2	DJI O3	UART5	MSP DisplayPort	BF43COMPAT
	DJI Air Unit V1	UART5	DJI FPV VTX	/
	RunCam Link/Caddx Vista	UART5		/
Caddx WS Avatar	Caddx WS Avatar	UART5	MSP DisplayPort	AVATAR
HDzero	HDzero	UART5	MSP DisplayPort	HDZERO

Wireless board with FC settings

Hardware Connection:

Check the alignment and secure fastening of the pin headers and sockets between the wireless board and the flight controller.

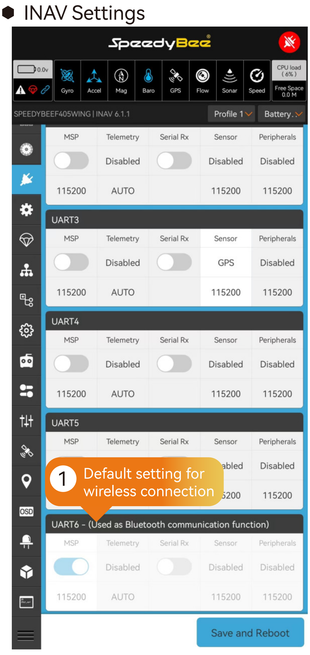
For INAV firmware, switch the wireless mode to BLE mode, indicated by a slow flashing green wireless status indicator.

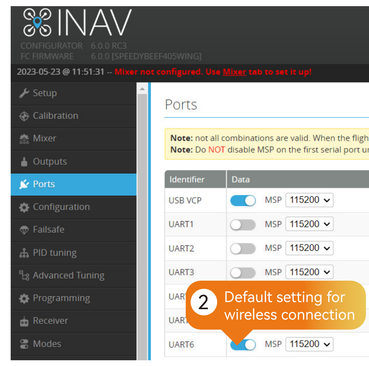
For ArduPilot firmware, switch the wireless mode to WiFi mode, indicated by a slow flashing white wireless status indicator.

1 INAV Settings

Default parameters enable direct connection. If wireless connection fails and the battery indicator light shows flowing lights, please check this setting.

INAV Settings



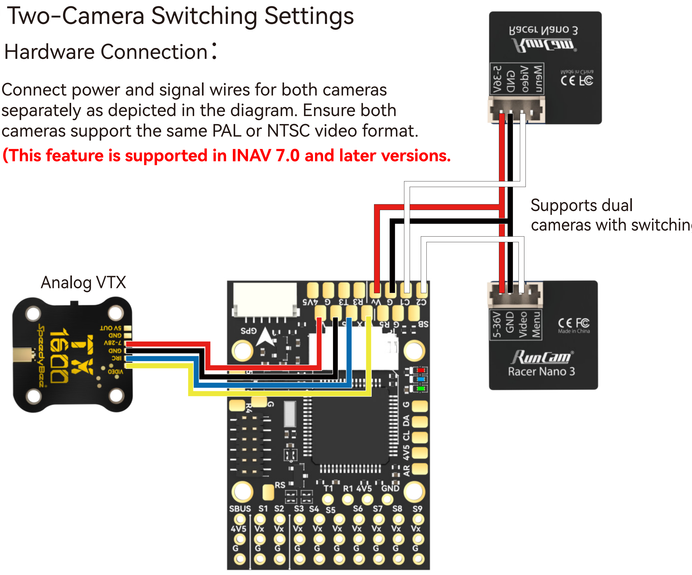


Two-Camera Switching Settings

Hardware Connection:

Connect power and signal wires for both cameras separately as depicted in the diagram. Ensure both cameras support the same PAL or NTSC video format.

(This feature is supported in INAV 7.0 and later versions.



1 INAV Settings

①Go to "Mode" tab, select "USER1", and press "Add Range".

②Choose camera switch control channel, adjust blue bar for range (white for Camera 1, blue for Camera 2).

③Click "Save".

