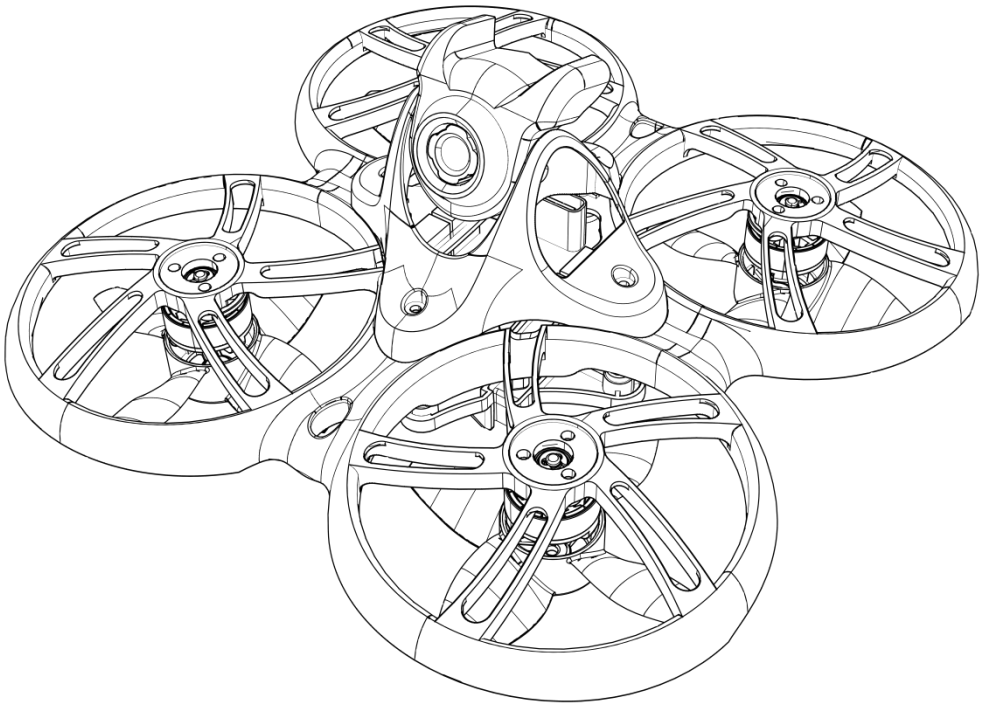
Tiny Hawk III PLUS



Thanks for purchasing the Tinyhawk III Plus.
Please follow the instruction manual to assemble and configure your Tinyhawk III Plus.

Design in California, Made in China

Disclaimer:

1. Please read this disclaimer carefully before using this product.
2. By using this product, you indicate your agreement with this disclaimer and confirm that you have read this product carefully.
3. This product is not suitable for individuals under 18 years old. It is strongly recommended that children under 18 years old be supervised by adults.
4. Please read the user manual and warnings carefully.
5. Before each flight, ensure the battery is fully charged, power connections are secure, and do not fly around crowds, children, animals, or objects.
6. Our Tinyhawk III Plus comes equipped with an open-source flight controller and electronic speed controller to meet the needs of FPV enthusiasts upgrading their quadcopters.
7. EMAX is not responsible for any direct or indirect damages or injuries resulting from the use of this product.

Important Notes:

1. Please assemble and operate this product correctly according to the instructions.
2. Fly in a safe area away from crowds.
3. Do not use this product in strong electromagnetic environments.
4. Do not use this product in adverse conditions such as wind, rain, lightning, snow, etc.
5. Do not use this product if you have physical or mental illnesses, dizziness, fatigue, or if you are under the influence of alcohol or drugs.
6. Do not modify or use unauthorized EMAX parts and accessories.

Support:
For updates or technical support, please visit the emax-usa.com or emaxmodel.com website.

Tinyhawk III Plus(HD)	
Wheelbase	76mm
Maximum appearance size	LxWxH=105x105x45mm
Weight	35.5g (without battery)
Motor	TH0802 II-15000KV
propeller	Avan TH Turtlemode-2
Main control board	STM32F411 (100MHz) main control Integrated 4-in-1-6A-8 bit electrical regulation, input voltage 1-2S On board ELRS (2.4G) receiver (SPI communication)
Camera	HDZERO Nano Lite Camera
Image transmission	HDZero whoop Lite 0/25mW/200mW
Battery	1S HV 650mAh
Tinyhawk III Plus （Analog）	
Wheelbase	76mm
Maximum appearance size	LxWxH=105x105x45mm
Weight	32.5g (without battery)
Motor	TH0802 II 15000KV
propeller	Avan TH Turtlemode-2
Main control board	STM32F411 (100MHz) main control Integrated 4-in-1-6A-8 bit electrical regulation, input voltage 1-2S On board ELRS (2.4G) receiver (SPI communication)
Camera	RunCam Nano 6
Image transmission	32-bit 40CH open source image transmission Power: 0/25mW/100mW/400mW
Battery	1S HV 650mAh

Tinyhawk III Plus -BNF(the product list for the HD version)

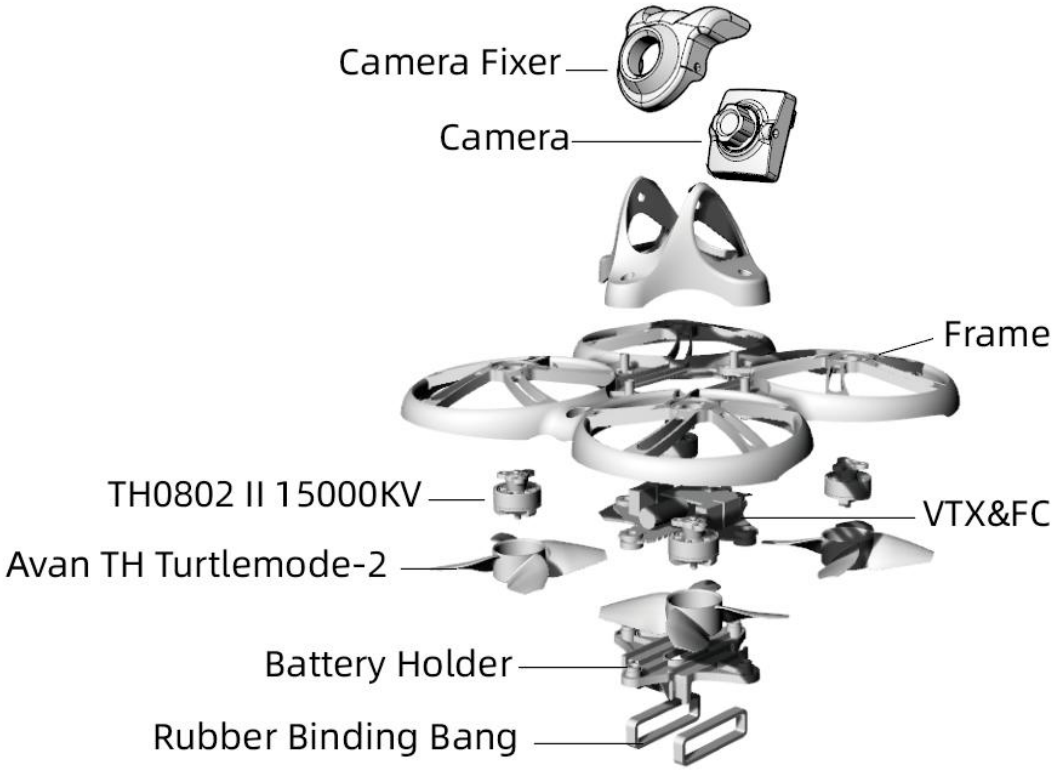
1.Tinyhawk III Plus .....×1
2.EMAX 1s HV 650mAh .....×1
3. Charger .....×1
4. Propellers..... ×4 (2xCW, 2xCCW)
5. Accessory Pack .....×1

Tinyhawk III Plus -BNF the product list for the analog version:

1.Tinyhawk III Plus .....×1
2.EMAX 1s HV 650mAh .....×1
3.Charger .....×1
4. Propellers ..... ×4 (2xCW, 2xCCW)
5. Accessory Pack .....×1

1.Tinyhawk III Plus

1.1Tinyhawk III Plus



1.2 Tinyhawk III Plus Propellers

The Tinyhawk III Plus Plus propellers come in two rotational directions: clockwise (CW) and counterclockwise (CCW). When purchasing a set of propellers, please buy 2 propellers with a clockwise rotation and 2 propellers with a counterclockwise rotation. The propellers rotate along the blunt edge of the propeller. When installing propellers, follow the correct direction of the propeller as shown in the diagram below.

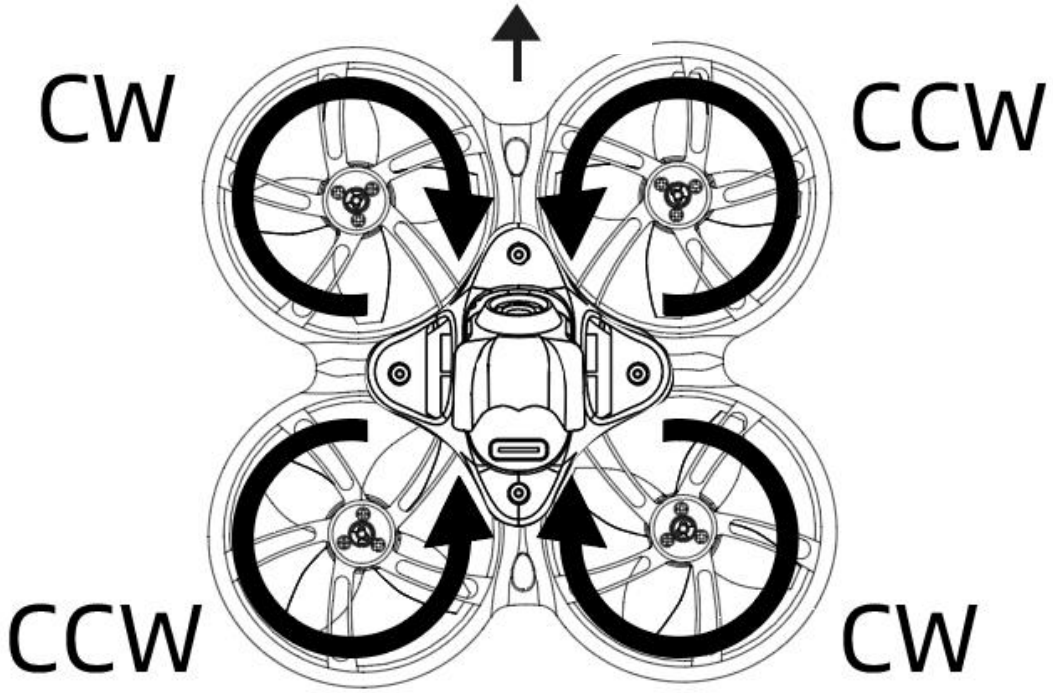
1. **Propeller Installation**

   Align the 3 protrusions on the propeller with the 3 protrusions on the motor. Support the motor from behind and press the propeller blades with your hand until they are flush with the motor shaft.

   Note: Incorrect propeller installation can result in the Tinyhawk III Plus not flying properly and being uncontrollable. Please carefully confirm the correct propeller direction. If the motor's back isn't supported, it might lead to frame breakage. Be cautious and mindful of safety while installing propellers.

2. **Propeller Removal**

Use a small tool (such as a 1.5mm hex wrench or a small screwdriver) to press against the metal at the bottom of the motor and the Tinyhawk III Plus. Hold the propeller blades with your fingers and press until the propeller pops off the motor. Note: Propellers only need to be removed when replacing them with new ones. Exercise caution and ensure safety when removing propellers and using tools.



1.3 Tinyhawk III Plus Camera

The Tinyhawk III Plus camera comes in two versions:

(1) HD version camera, model is RunCam HDZERO Nano Lite;

(2) Analog version camera, model is RUCAM Nano 6.

Note: For more detailed instructions on using the camera, refer to the RunCam HDZERO Nano Lite manual and the RUCAM Nano 6 manual.

1.4 Tinyhawk III Plus Video Transmission

The Tinyhawk III Plus camera comes in two versions:

(1) HD version HDZero Whoop Lite, paired with the HD version camera.

(2) 32-bit Open Source Analog VTX, paired with the analog version camera..

1.4.1 High-Definition Digital Video Transmission (HDZero Whoop Lite)

Model of the high-definition digital video transmission: HDZero Whoop Lite;
Note: For more detailed usage instructions, please refer to the HDZero Whoop Lite manual.

1.4.2 EMAX 32-bit Analog Video Transmission

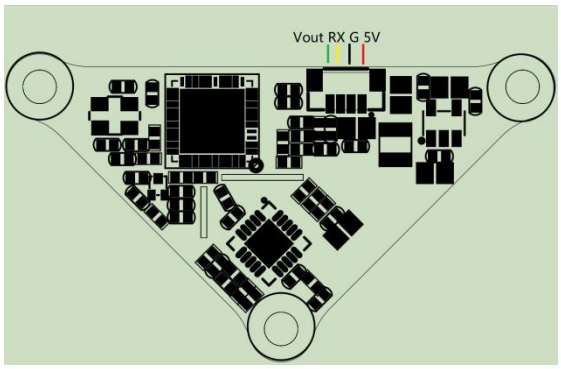
The specific parameters for the 32-bit analog video transmission are as follows:

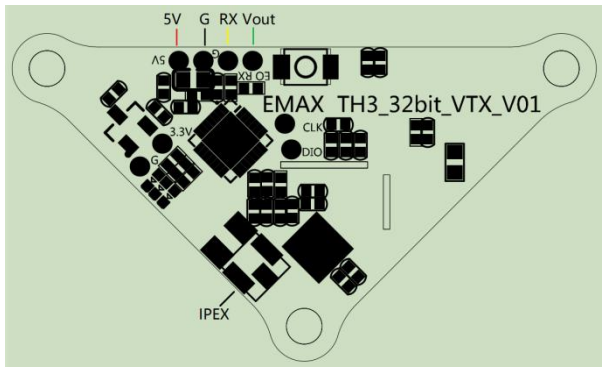
Frequency: 5.8GHz 40

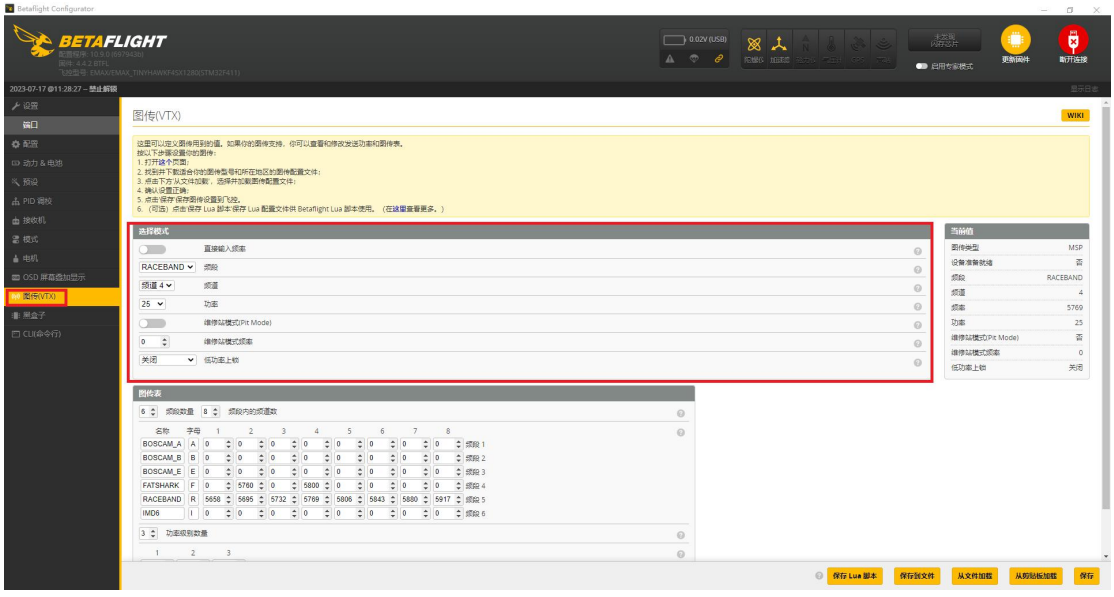
channels; RF Power: 0/25mW/100mW/400mW;

Power Input: 5V;

Others: Supports Smartaudio protocol, firmware updates for VTX through flight controller.







1.5 Changing Video Transmitter Settings

The default video transmitter settings for the Tinyhawk III Plus are R:4:25mW. If you wish to make changes, follow these steps:

Open the Betaflight Configurator software.Locate the video transmitter settings section and make adjustments to the desired frequency, channel, power level, and low power lock, if needed.Once you've made your desired changes, click on the "Save" button.After saving the changes, restart the

Tinyhawk III Plus . The new settings will be in effect.

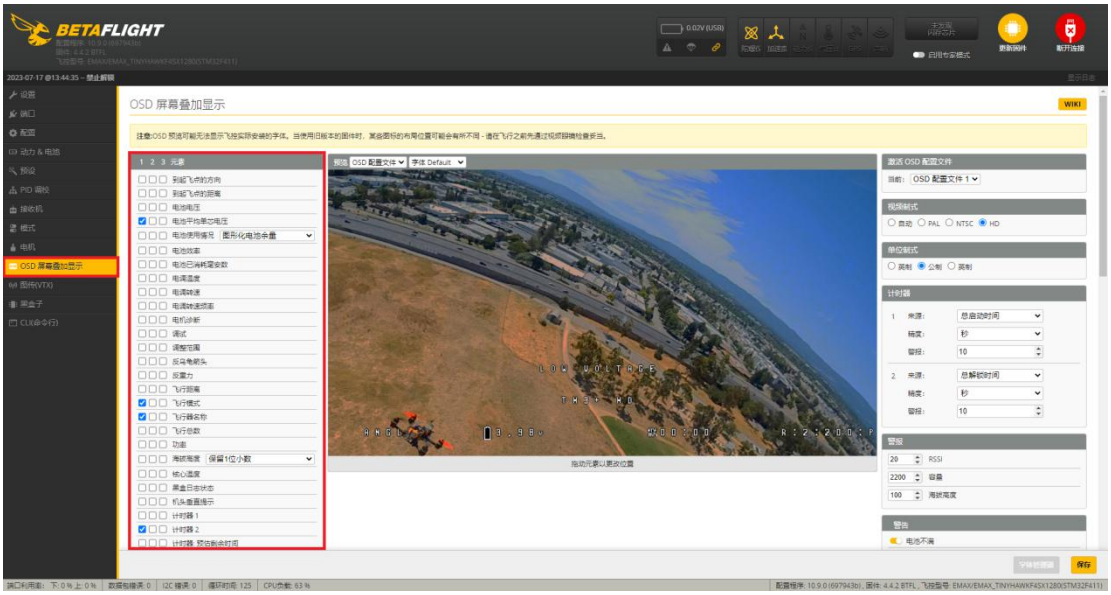
Note: The procedure for changing video transmitter settings is the same for both the HD version and the analog version. The low power lock feature ensures that the video transmitter operates at a lower power until the drone is armed. After arming, it operates at the set power level

1.6 Changing OSD Settings

(1) Changing OSD Settings Using Betaflight Configurator Software

The OSD settings of the Tinyhawk III Plus are pre-configured at the factory. If you wish to make changes, follow the steps below:

In the Betaflight Configurator software, locate the OSD screen overlay option. Then, customize the character display settings according to your preferences for viewing on your video goggles. Finally, click the "Save" button. After restarting, the changes will take effect. This process is the same for both the HD version and the analog version.



(2) Changing VTX Settings through Betaflight OSD

The Tinyhawk III Plus comes equipped with SmartAudio, which is pre-configured. The SmartAudio for the analog video transmitter is on UART2 TX, and for the digital video transmitter, it's on UART1. Power on the Tinyhawk III Plus , video goggles, and remote control.

Follow the on-screen prompts to enter the main setup menu. With the throttle stick centered, yaw stick to the left, and pitch stick up (THROTTLE MID + YAW LEFT + PITCH UP), you'll enter the OSD parameter adjustment menu.

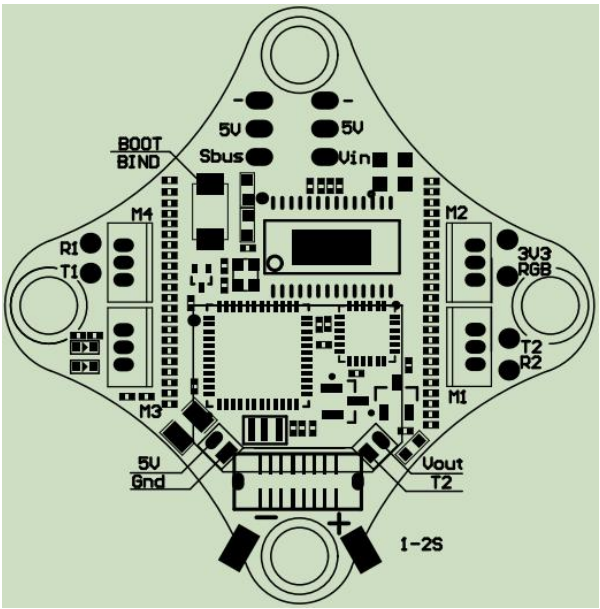
In the menu interface, use pitch (up/down) to navigate and select menu options. Move the cursor to "FEATURES" and use the roll (left/right) stick to proceed to the next menu. Use the pitch stick to move the cursor to "VTX SA" and then pull the roll stick to the right to enter the VTX configuration menu.

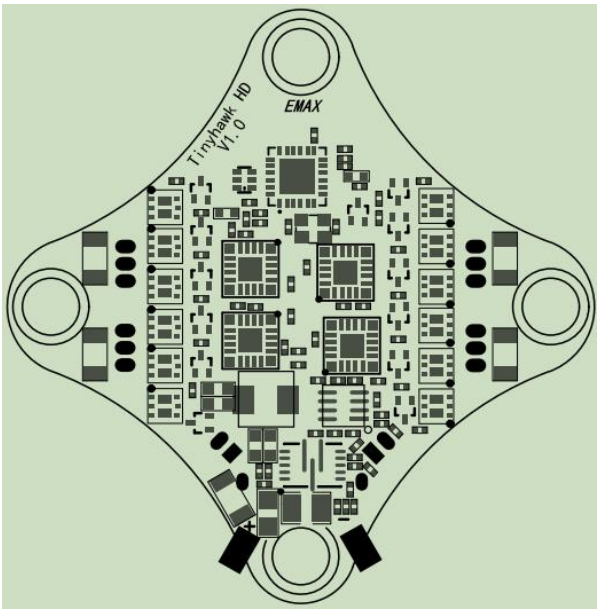
Within the VTX SA menu, you can configure BAND, CHANNEL, and POWER. Move the pitch stick to navigate the cursor up and down to select the desired VTX options. Once the parameters are set, move the cursor to "SET" and then rotate the stick to the right to enter "SET" and select "YES." Rotate the stick to the right again to save the settings.

In the VTX SA menu, move the cursor to "CONFIG" to enter the submenu. Move the cursor to "PIT FMODE" and pull the roll stick to the right to turn off the VTX power.

2.Tinyhawk III Plus- AIO

2.1Tinyhawk III Plus-AIO



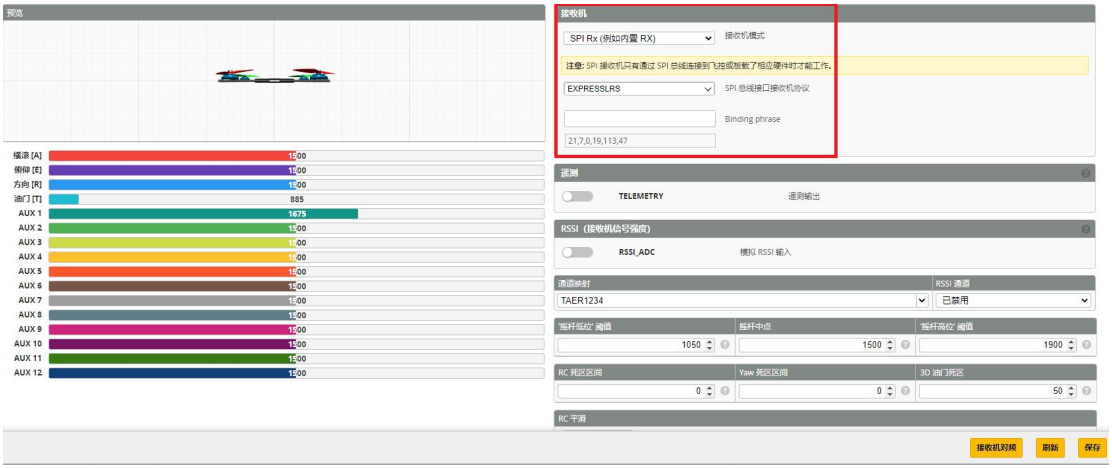


The Tinyhawk III Plus Plus-AIO is an integrated system that includes an ELRS (2.4G) receiver, 6A BlHeliSuite electronic speed controller, and an F411 flight controller.

2.2 Tinyhawk III Plus Receiver

2.2.1 EMAX ELRS (2.4G) Receiver Specifications

The Tinyhawk III Plus 's receiver is an onboard ELRS (2.4G) receiver. The RF module used is SX1280, employing SPI communication. It features a ceramic antenna (with a gain of 3dB) and operates within the frequency range of 2400-2480MHz. The receiver protocol used is CRSF, and its protocol version is ELRS V3.0.



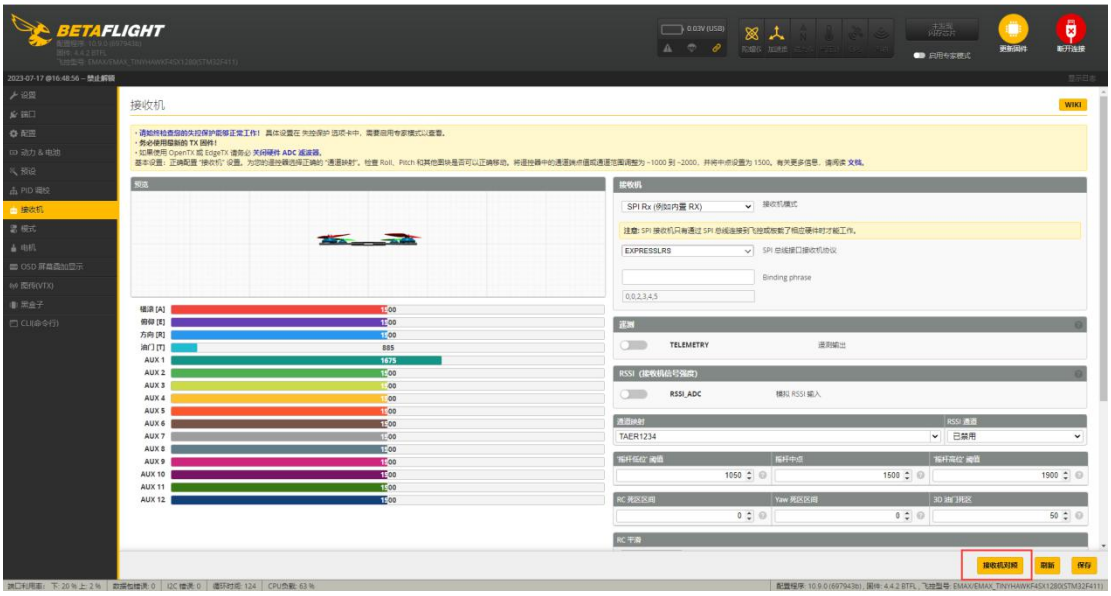
2.2.2 Binding Tinyhawk III Plus with Remote Control

Binding, also known as pairing, is the process of connecting the receiver and the remote control. One receiver can be bound to one remote control, while one remote control can be bound to multiple receivers.

Note: The binding between the remote control and the receiver doesn't need to be repeated unless you replace either of the components.

(1) You can put the receiver into binding mode using the Betaflight Configurator. In the CLI tab, type the following command: bind_rx, then press Enter. The receiver will enter binding mode.

(2) Alternatively, you can also access the Betaflight Configurator, go to the Receiver section, and click on the "Bind" button. This action will put the receiver into binding mode.



2.2.3 Changing Flight Controller Binding Key

When altering the flight controller's binding key using the Betaflight Configurator software, follow these steps: Input the following commands into the command line within the Betaflight Configurator (using 0, 1, 2, 3, 4, 5 as example keys):

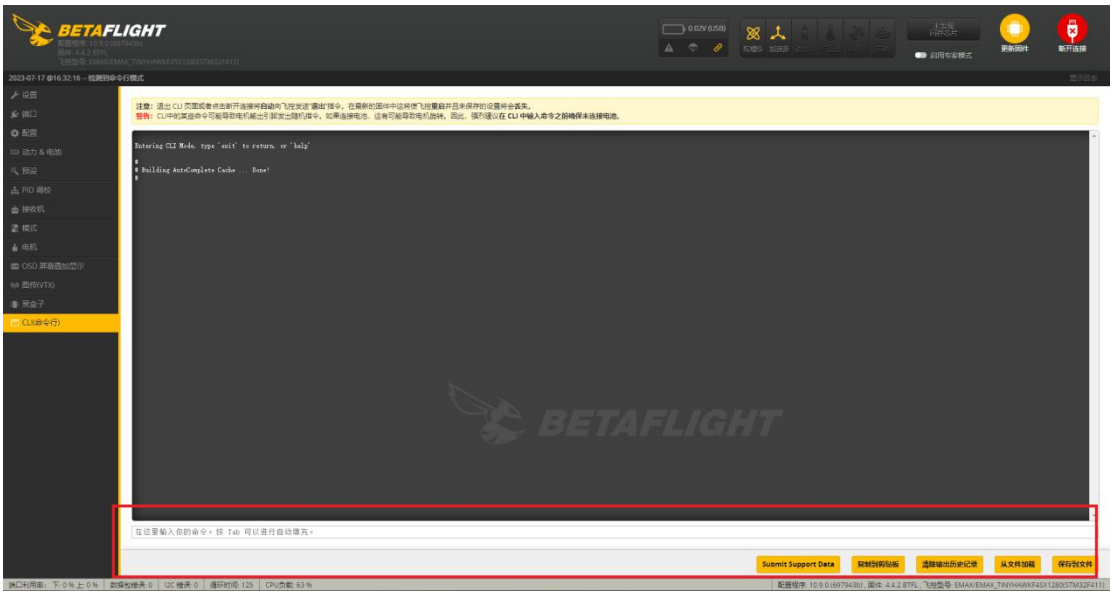
set expresslrs_uid = 0,1,2,3,4,5

Save

Press Enter.

Wait for the flight controller to restart and access the Betaflight Configurator.

This will confirm the successful modification of the binding key.



2.3 Tinyhawk III Plus Electronic Speed Controllers (ESCs)

The Tinyhawk III Plus features built-in 4-in-1 8-bit 6A electronic speed controllers (ESCs).

The maximum peak current is 6.7A.

The MCU is EFM8BB21F16G. I

nput voltage range is 1-2S.

The ESC firmware is JESC_SH90_48_2_3.HEX.

Supported signal protocols include: D-Shot150, D-Shot300, D-Shot600, Multishot, OneShot125, PWM.

2.4 Tinyhawk III Plus Flight Controller

The MCU is STM32F411CEU6 (100MHz).

The MPU is either ICM20689 or ICM42688 (connected via SPI).

It supports OSD (AT7456E).

Power input ranges from 1-2S.

It supports BB sound and programmable RGB.

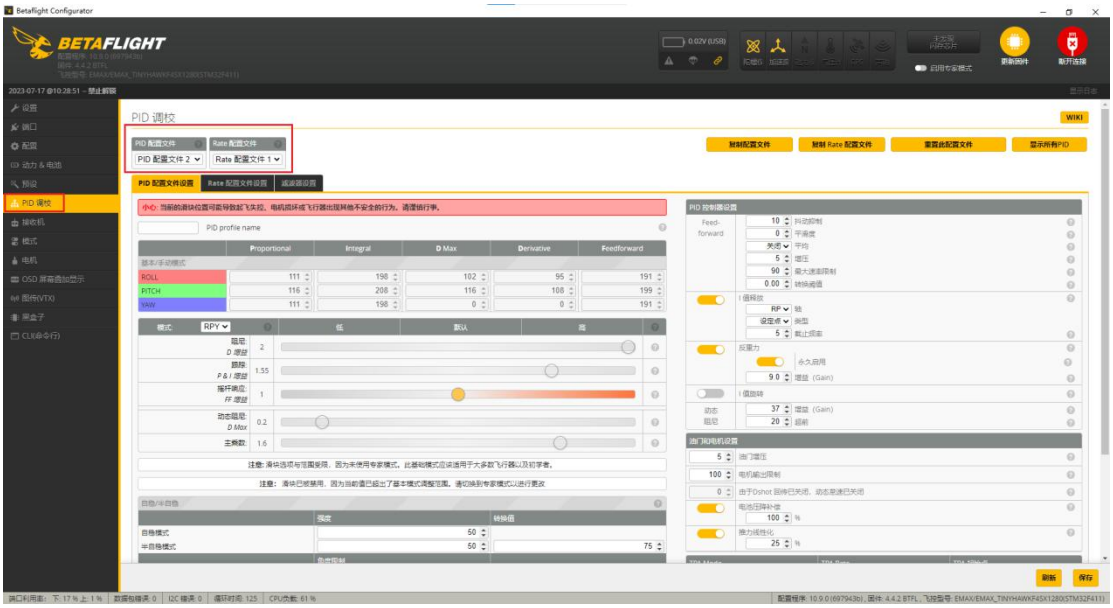
There are 2 UART ports (UART1/UART2). Onboard 5V/2.5A BEC and 3.3V/300mA BEC. The firmware is EMAX_TINYHAWKF4SX1280.

2.5 Introduction to PID Profiles

PID configuration profile 1 is tailored and optimized for the Tinyhawk III Plus using the provided Emax 1s HV 650mAh battery. It's designed for both indoor and outdoor flying control, offering the ultimate flight control experience. This profile is specifically designed for optimal indoor flight control using the Emax 1s HV 650mAh battery.

Profile 2 is a more advanced rate configuration profile, tailored for enthusiasts who prefer acrobatic flying. These profiles can be easily switched within the Betaflight OSD menu.

These configurations have undergone meticulous professional tuning. EMAX strongly recommends against making arbitrary changes to these values.



2.6 Flashing Firmware to the Flight Controller

To flash firmware to the flight controller, follow these steps:

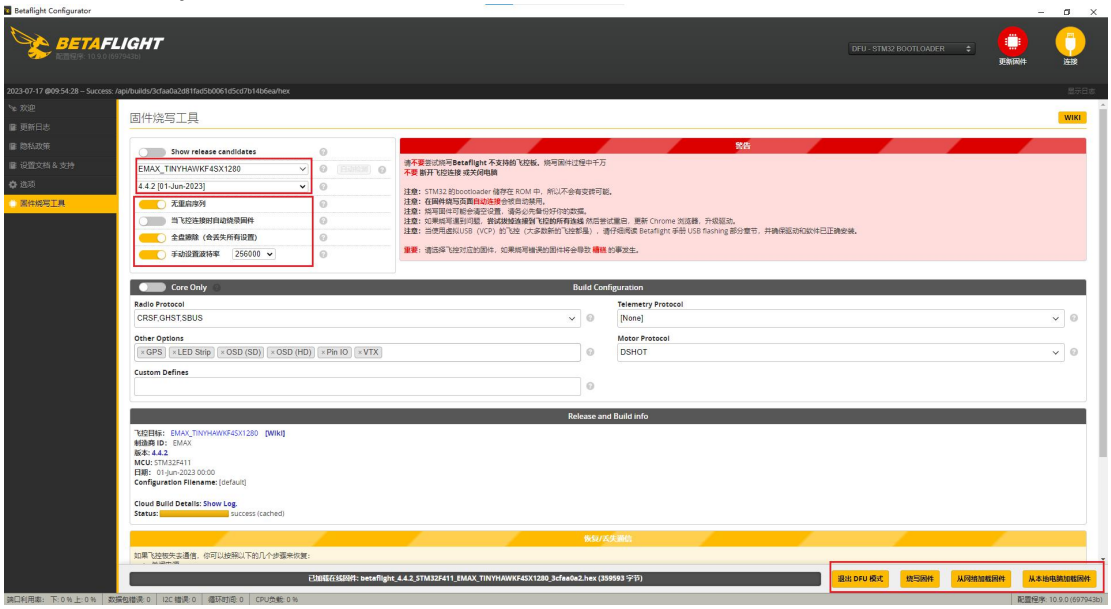
Locate the Boot button on the flight controller's mainboard.Press and hold the Boot button.While holding the Boot button, connect the flight controller to your computer using a Type-C cable. This will put the flight controller into DFU (Device Firmware Upgrade) mode. Once in DFU mode, proceed to update the

firmware. If you encounter issues entering DFU mode, check the data cable and ensure that the necessary drivers are installed on your computer.

1.Choose EMAX_TINYHAWKF4SX1280 version 4.4.2 as the firmware and manually select the baud rate of 256000 from the dropdown menu.

2.Select either "Load Firmware Online" or "Load Firmware Local" based on your preference, and wait for the download to complete.

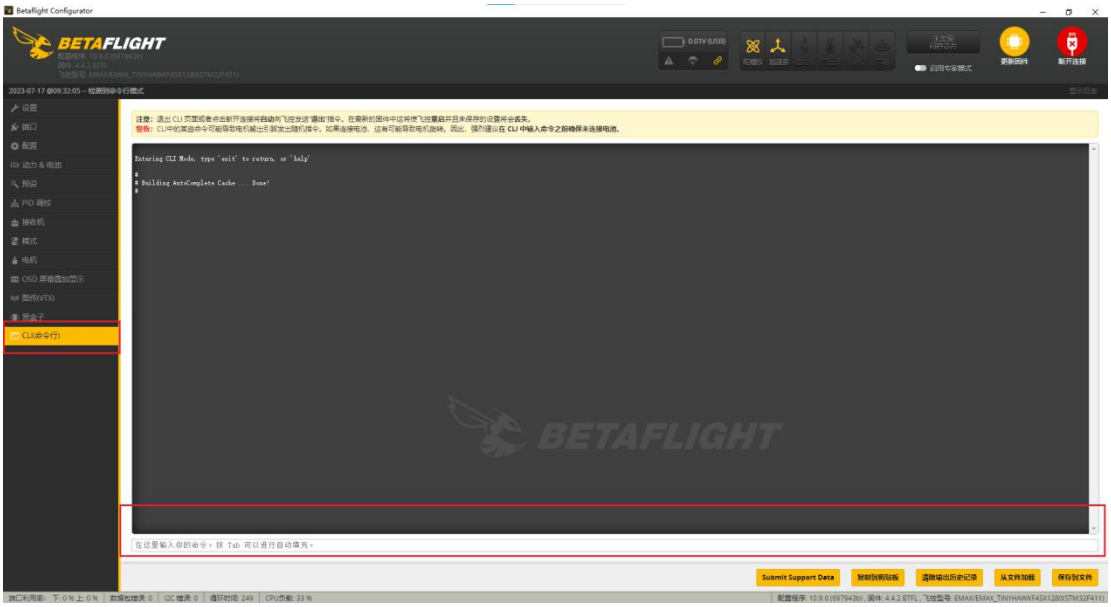
3. Finally, click "Flash Firmware" and wait a few



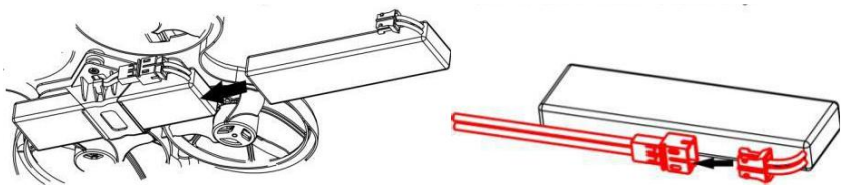
2.7 Flashing Configuration Parameters to the Flight Controller

Download the latest CLI Dump file from https://emax-usa.com/.Open the CLI Dump file in a text editor and copy all the text.Paste the copied settings into the command bar of the Betaflight Configurator and press Enter.

Once completed, reconnect to the Betaflight Configurator, and the Tinyhawk III Plus will have its default settings restored.



Disclaimer: The Tinyhawk III Plus has been fine-tuned to its optimal state. Altering PID settings may impact flight time, overall speed, aircraft control, and even result in motor overheating. We do not recommend modifying any PID settings or upgrading firmware to a new version for the Tinyhawk III Plus .



3. Flying the Tinyhawk III Plus

Before flying upon startup, please ensure you've familiarized yourself with flight controls. Fly cautiously and operate in open and controlled areas.

Start by powering on the remote control and video goggles, ensuring the goggles are on the correct video channel. Turn on the Tinyhawk III Plus by sliding the battery into the battery tray and connecting the power. Once the battery is in place, set the Tinyhawk III Plus on a level, stable surface to allow for calibration.

Calibration takes a few seconds, and after that, the Tinyhawk III Plus is ready to fly. With a fully charged battery, it can fly for about 4 minutes. When the battery voltage drops to 3.2V, land the Tinyhawk III Plus promptly. Continuing to fly beyond this point can severely damage your battery, an action that EMAX does not recommend.

3.1 UNLOCK

Unlocking refers to setting the Tinyhawk III Plus in a flight-ready state. When the Tinyhawk III Plus is first powered on, the propellers won't spin until it's unlocked.

(1) Start by lowering the throttle stick to the bottom position to control the aircraft. Wait for the red light on the flight controller to stop blinking and the blue light to stay solid, indicating that the aircraft calibration is complete and it's ready.

(2) Then, toggle the unlock switch on the remote controller to unlock.

(3) When the Tinyhawk III Plus is successfully unlocked, you will see the propellers start spinning.

Note: In case of collisions, immediately stop flying the Tinyhawk III Plus. Failing to do so can damage the aircraft. Before handling the Tinyhawk III Plus, ensure that the toggle switch is in the locked position.

3.2 Flight Modes

The Tinyhawk III Plus has three flight modes:

1. Simple Mode (Stabilized Mode ARM): This is a basic flight control mode where the maximum angle of the Tinyhawk III Plus is limited during flight to help restrict speed and make flying easier. In this mode, the aircraft's control is attitude-based. Pitch and roll inputs from the transmitter control the pitch and roll angles of the aircraft. For instance, a 20-degree roll input on the stick translates to a 20-degree roll angle for the Tinyhawk III Plus .
2. .Intermediate Mode (Horizon Mode): This mode has a higher angle limit for faster flight. Attitude control remains the same. The only difference is that at the endpoints of pitch and roll stick inputs, the aircraft will flip in that direction.
3. Advanced Mode (Acro Mode): This mode gives you full control over the aircraft. There are no angle limits anymore, and control is rate-based. This means that control inputs from the sticks set a rotation rate around the respective axis.

Straight Flight

To learn how to pilot the Tinyhawk III Plus , start by flying it within line of sight (without wearing video goggles). Power on the Tinyhawk III Plus and place it in a safe and open area. Start the Tinyhawk III Plus and use the left stick to raise the throttle to hover. Begin by attempting to maintain a stable altitude. Control the throttle pitch with your thumbs to control the elevation of the aircraft, allowing the Tinyhawk III Plus to fly smoothly. It takes practice to become proficient, so repetition is necessary to achieve mastery.

3.3 Advanced Flying - First-Person View (FPV) Flight

Once you have a certain level of operational proficiency in flying, you can try flying using video goggles (FPV goggles). Make sure that the Tinyhawk III Plus and the video goggles are on the same VTX channel. Choose a spacious and safe location. Apply the experience gained from regular flight of the Tinyhawk III Plus to your operation. Use controlled throttle to maintain a slow and level flight, making it easier to learn FPV flying. As you gain more flying experience, you will be able to maneuver the Tinyhawk III Plus in the air like driving a car.

The video goggles display information (OSD) from the Tinyhawk III Plus camera's image feed. The OSD shows essential details such as flight time and battery voltage. Always keep an eye on these numbers during flight to gauge the remaining battery voltage. The Tinyhawk III Plus can fly for a maximum of 4 minutes. Land the Tinyhawk III Plus when the battery reaches 3.2V. It is not

recommended to let the battery voltage drop below 3.2V, as this can damage the battery.

Warning: Maintain controlled altitude while flying, avoid making sudden stick movements, as it can make the aircraft difficult to control. Do not let the battery voltage drop below 3.2V. If you lose sight of the aircraft, activate the motors to produce a beeping sound to help locate the Tinyhawk III Plus!

Warning:

Thank you for purchasing our product! Have a great time flying!
Warning: Please be aware of your surroundings. This product is not suitable for individuals under the age of 18. It contains small parts, so please keep it out of reach of children to avoid accidental swallowing.