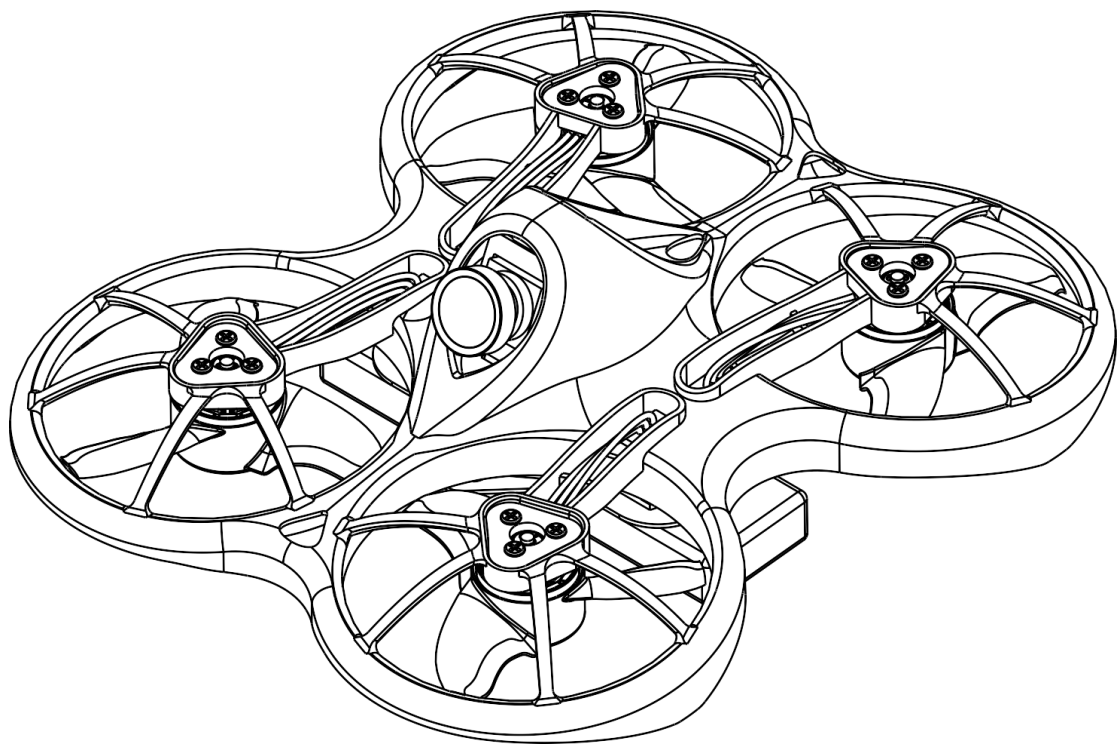Thanks for purchasing the Tinyhawk. Designed in California, assembled in China.

Disclaimer

Please read the disclaimer carefully before using this product. By using this product, you hereby agree to this disclaimer and signify that you have read them carefully and completely. This product is not suitable for people under the age of 18. Adult supervision is highly recommended for kids under the age of 18.

Our Tinyhawk features open-source flight controller and Electronic Speed Controllers to meet the FPV enthusiasts' need to upgrade their quad.

Please read the instruction manual and warnings carefully. Before every flight, make sure the battery is fully charged and power connections are secure. DO NOT fly around crowds, children, animals or objects. EMAX ACCEPTS NO LIABILITY FOR DAMAGE(S) OR INJURIES INCURRED DIRECTLY OR INDIRECTLY FROM THE USE OF THIS PRODUCT.

Precautions

Please follow the instructions to assemble and to operate this product in a proper way.

Pilots do not use this product if you have physical or mental illness, dizziness, fatigued, or use while under the influence of alcohol or drugs.

Please fly in a safe area away from people

Do not modify or use other parts and accessories not approved for the use of EMAX.

Do not use this product in harsh environments (such as winds, rain, lightning, snow, etc.).

 Do not use this product in a strong electromagnetic environment.

Support

Please visit **emax-usa.com** or **emaxmodel.com** for any updates or support needs.

Table of Contents

Product specification

Tinyhawk	Parameter
Diagonal wheelbase (without paddles)	75mm
Maximum size of the aircraft (without antenna, cable tie)	125mm
Aircraft weight (without battery)	27.5g
Motor	TH08025 15000KV
Propeller	Avan Tinyhawk propeller 40x23x3
Main Flight Controller	F4（MATEKF411 firmware） 4 in one 3A ESC EMAX Tiny receiver（Compatible with Frasky remote control D8 mode）
Camera	600TVL CMOS camera
Transmitter	25mW Adjustable frequency 37CH
Battery	1 Cell 450 mAh HV lipo battery
Radio	
Maximum appearance size	181×213×80(mm)
weight (without battery)	211g
Number of channels	6 Channels
Transmission frequency	2.4GHz ISM Band（2400MHz~2483.5MHz）
Output Power	22dbm
Modulation	GFSK
battery	1 cell 18650 lipo battery
Goggle	
Maximum appearance size	140×153×90(mm)
weight (without battery)	398g
Resolution	480×272
battery	1 cell 18650 lipo battery

emax-usa.com

Product list

1. Tinyhawk × 1
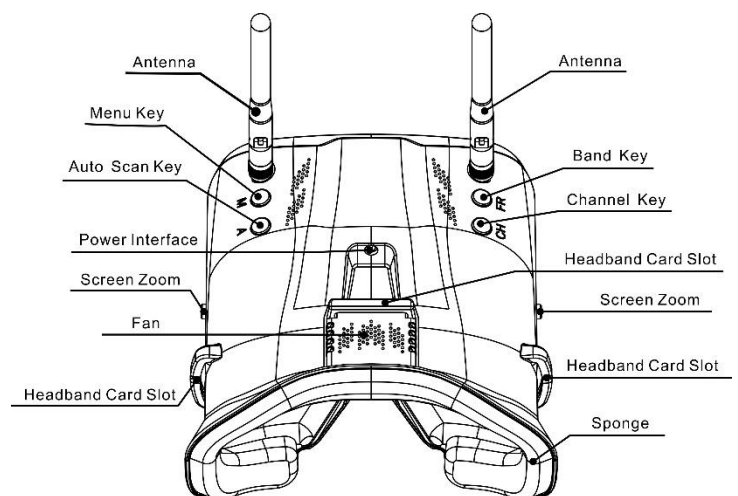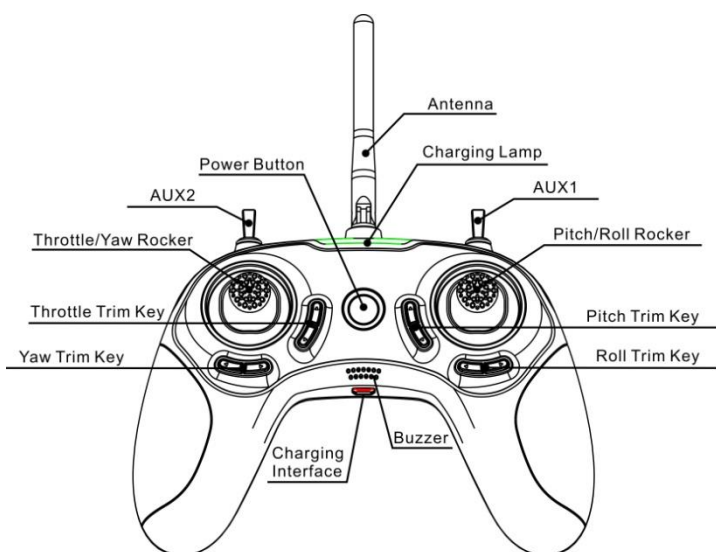2. Radio × 1
3. Goggle × 1
4. Instruction manual × 1
5. Battery × 1
6. Charger × 1
7. Gaggle battery case × 1
8. Extra Propeller Set (2x CW, 2x CCW)
9. Screwdriver x 1

Tinyhawk Structure
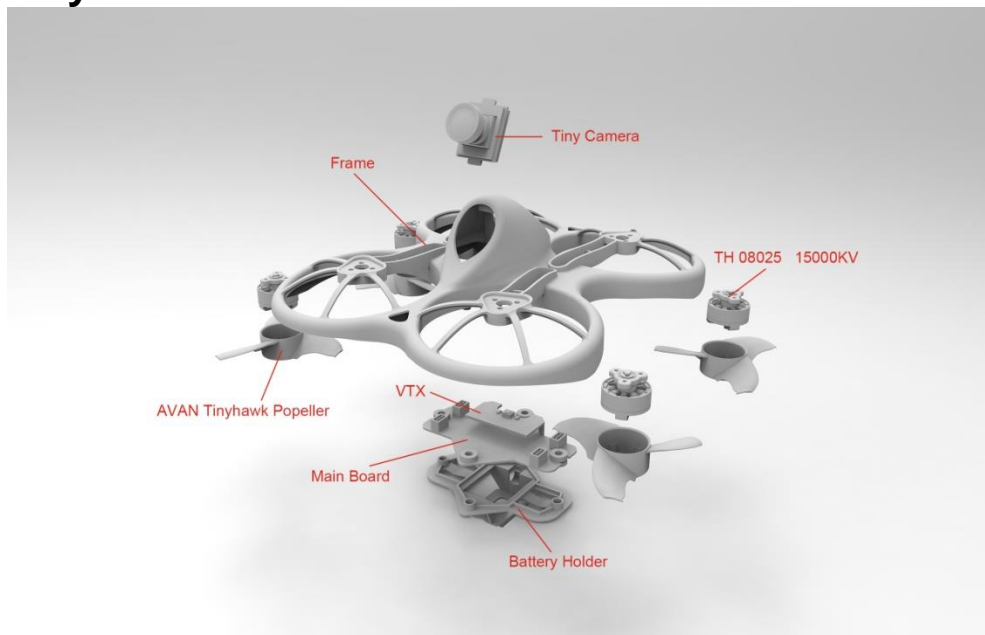

Radio and Goggle Diagram

Radio

Battery and Charging

This is a 6 channel 2.4 GHz radio, The radio is powered with an 18650 battery. The radio comes with the battery installed; however if a reinstall is needed make sure the negative side is on the side touching the spring of the radio. The radio can be charged with a micro usb cable attached right below the speaker and power button.
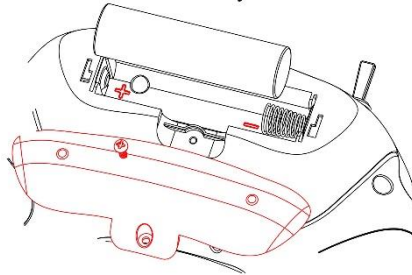
Installation of battery   Charge
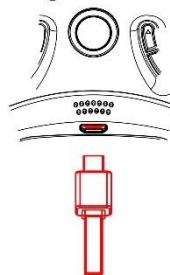
Operation
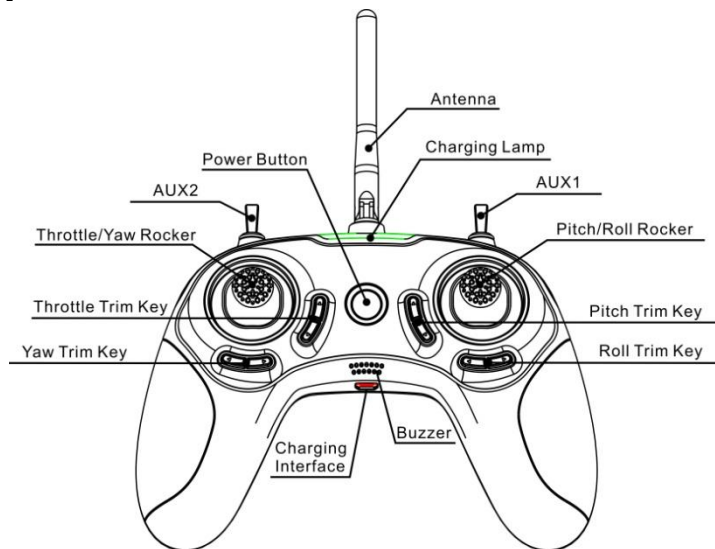
Power

Power on and off by holding the power button for 2 seconds. The center light will turn green when on.

Binding

The radio comes already bound to tinyhawk in the ready to fly kit. If binding is necessary follow these steps:

1. Put tinyhawk into binding mode by pressing and holding the bind button while powering on tinyhawk. A green light will power on tinyhawk flight controller indicating in bind mode.
2. Put the radio into bind mode by first powering on the radio and then press and hold both the throttle trim down and pitch trim down buttons for 2 seconds until a red light turns on next to the green light around the power button. Release the buttons and the red and green lights will flash indicating the radio is in binding mode.

3. Monitor the tinyhawk flight controller; a red light will flash on the board indicating when binding has been completed.
4. Take the radio out of binding mode by pressing and holding the throttle trim down and pitch trim down buttons for 2 seconds until the red lights turn off.
5. Unplug tinyhawk battery to power it down to take it out of binding mode.
6. Tinyhawk and radio will not be bound.

Trim

There are trim buttons for each axis on each gimbal. Each trim adjustment will beep the radio and a longer beep will sound for center trim. Adjust roll and pitch trim when hovering to achieve a stable hover with no gimbal input.

Gimbal Calibration

The radio comes pre-calibrated; however, recalibrating can help troubleshoot some problems.

1. With the radio off, pull the right gimbal to the lower right corner and then power on.
2. Release the right gimbal to its center position and red lights will flash around the power button indicating in calibration mode.
3. Use the right gimbal and pitch forward to the maximum pitch forward point then press the respective trim button (pitch positive trim) setting the maximum point for the pitch axis.
4. Repeat for the right gimbal most minimum position and press the respective trim button (pitch negative trim) to set the minum.
5. Repeat step 3 and 4 for each axis on both gimbals.
6. Press and hold both throttle trim buttons and both pitch trim buttons for 2 seconds to exit calibration mode.
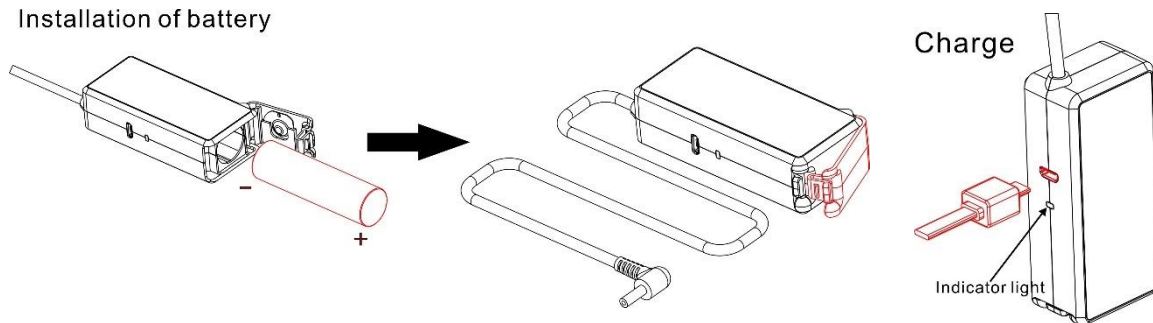
Goggles
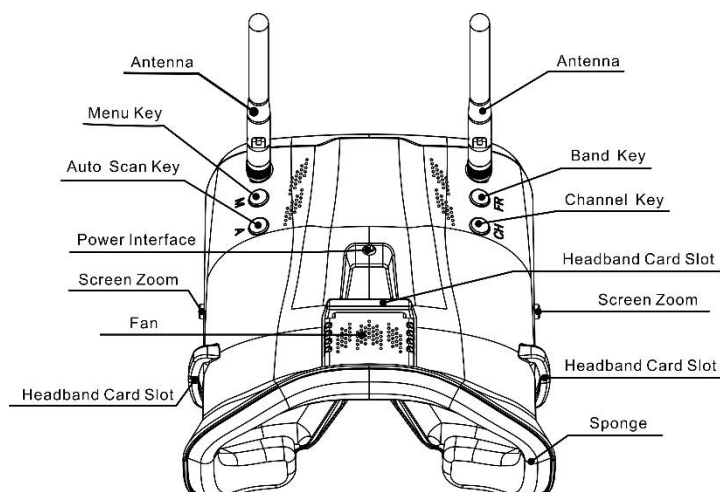
Battery and Charging

The battery cartridge comes preinstalled with a 18650 battery. If a battery reinstall is required please use caution making sure to install with the correct polarity. The battery can be charged in the cartridge with a micro USB cable. When the battery is

charging the indicator light is green. The indicator light will turn red when charging is complete.

Installation of battery   Charge   Indicator light

Assembly

Minimal assembly is required for proper operation of the goggles. Follow the steps below.

1. Attach the two supplied antennas by screwing them on to the SMA connection point.
2. Place the battery cartridge in the sleeve on the backside of the head strap.
3. Feed the power lead through the loop on the top side of the head strap and plug in the power lead to the port on the goggles. This will power the goggles.
4. Please remove antennas and power lead when traveling/storing the goggles.

Operation

Power

Power on the goggles by plugging in the power lead from the battery cartridge. Power off by unplugging the power lead from the battery cartridge.

Video Channel Selection

There are 2 buttons (CH and FR) that can manually select the correct channel and frequency band. The table below shows the channel and frequency band map with the respective frequency number. This is the recommended way to change channels to the correct frequency on tinyhawk. The CH button will cycle through the channel number (1-8) while the FR button will cycle through the frequency band (A,B,E,F,R,H). The frequency band and channel number will be shown in the upper right corner of the screen when cycling through channels.

Tip: Make sure tinyhawk is powered on. When cycling through channels it will be easier to spot the correct one with the video feed from tinyhawk.

FR \ CH	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8	
A	5865	5845	5825	5805	5785	5765	5745	5725	MHz
B	5733	5752	5771	5790	5809	5828	5847	5866	MHz
E	5705	5685	5665	—	5885	5905	—	—	MHz
F	5740	5760	5780	5800	5820	5840	5860	5880	MHz
R	5658	5695	5732	5769	5806	5843	5880	5917	MHz

Caution: Make sure the goggles are on the correct channel that tinyhawk is on. The current selected band and channel of tinyhawk is shown in the lower right corner of the screen.

Video Channel Auto Scanning

There is a scanning function on the goggles to aid in finding which channel tinyhawk is on. First power on tinyhawk then press the "A" button to start the auto scan mode. This mode will cycle through all channels and select the channel with the best video reception. The frequency band and channel number will be shown in the upper right corner of the screen when cycling through channels.

Caution: If using this feature with multiple tinyhawks (or other drones with a vtx) powered on, autoscan may select the wrong drones channel. We recommend manually selecting the correct channel to prevent mismatch errors.

Screen Adjustments

The menu button ("M") will bring up a menu where you can adjust brightness, contrast, saturation, and language. To cycle through menu options, press the menu button again. With the current selection highlighted, adjustments can be made pressing the "FR" button to increment and "CH" to decrement. The menu will close automatically after 3 seconds if no input was detected.
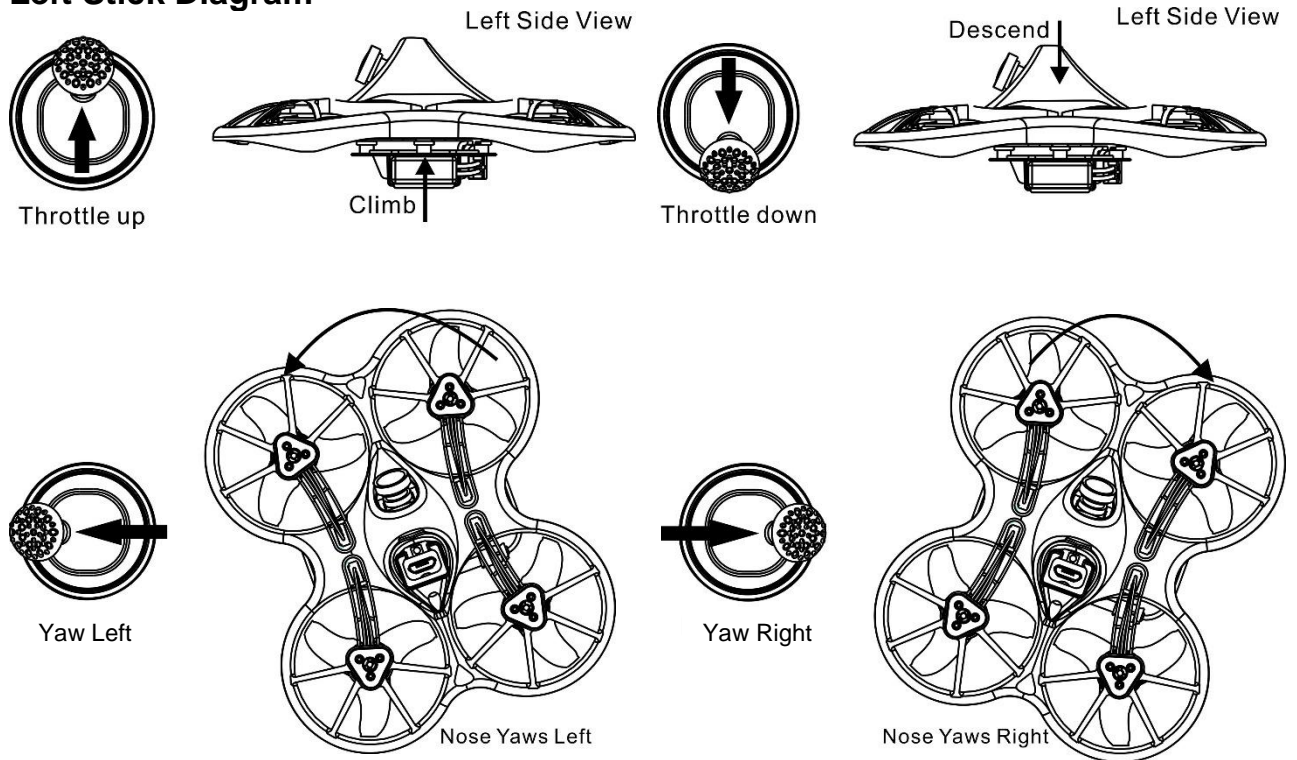
Flight

Always use caution when flying and operate in an open and controllable area. Please learn the flight controls first before powering on the aircraft to fly.

Radio Stick Controls

The left stick controls throttle and yaw direction of tinyhawk. The right stick controls pitch and roll of the aircraft.

Left Stick Diagram

Left Side View

Throttle up   Climb

Descend   Left Side View

Throttle down

Yaw Left   Nose Yaws Left

Yaw Right   Nose Yaws Right

Right Stick Diagram

Left Side View

Pitch Down   Forward

Left Side View

Pitch Up   Backward

Rear View

Roll Left   Left

Rear View

Roll Right   Right
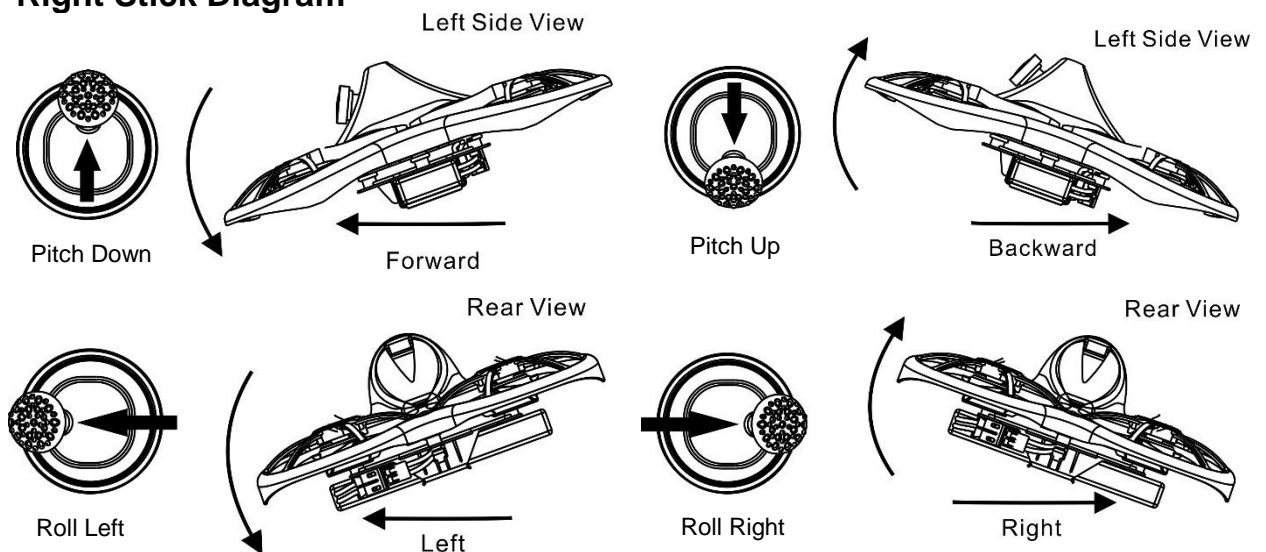
Fly Tinyhawk

Start by powering on your Radio and Goggles. Tinyhawk comes already bound to your radio and on the right video channel matched with your goggles. Power on tinyhawk by sliding the battery into the battery tray and 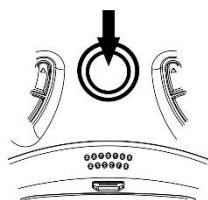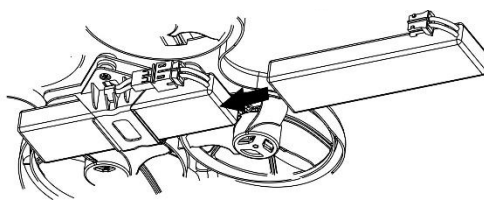plugging it in. Once the battery is plugged in, set tinyhawk on a stable surface so it can calibrate. Calibration takes a few seconds then tinyhawk is ready to fly. Tinyhawk can fly for 4 minutes on a fully charged battery. Land tinyhawk when the battery reaches 3.2v; flying any longer can severely damage your battery and is not recommended.
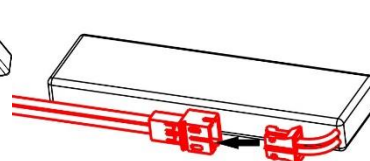
1. Turn on Transmitter   2. Install Battery   3. Connect Battery

Arming

Arming refers to setting tinyhawk to a fly ready state. When tinyhawk is powered on first it will not spin up the propellers until it is armed. Arm the aircraft by first moving throttle to the bottom position. Then move the left switch of the radio to its 3rd position upwards. You will see the propellers spinning when tinyhawk is successfully armed.
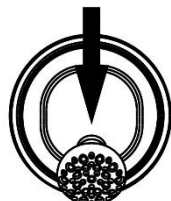
1. Throttle down   2. Switch to Arm Position
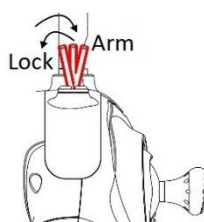
In the event of a crash always disarm immediately. Failure to disarm in a timely manner can damage tinyhawk.

Always disarm tinyhawk before handling it. Disarm tinyhawk by setting the arm switch to its 1st position (bottom).

Flying Modes

The right switch on the radio controls the different flight modes of tinyhawk. There are 3 modes: easy, intermediate, and advance. The switch in its first position downward is easy mode, second position is intermediate, and third position is advanced.

emax-usa.com
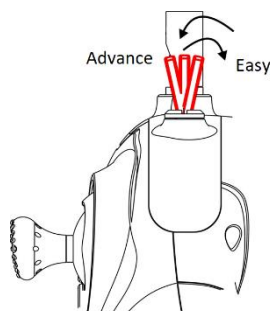
Easy Mode: This is easy flight control where the maximum angle of tinyhawk is limited in flight to help limit speed and make flying easier. In this mode control of the aircraft is attitude based. Input from the right gimbal with pitch and roll controls the pitch and roll angle of the aircraft. For example 20 degrees of tilt on roll of the gimbal will translate to 20 degrees of roll tilt on tinyhawk.

Intermediate Mode: This mode has a higher angle limit for higher speed flying with the same attitude control. The only difference is at the end of the gimbal for pitch and roll, it will cause the aircraft to flip in that direction.

Advance Mode: This mode gives you full control of the aircraft. There is no more angle limit and control is rate based. This means control input from the gimbal sets a rotation rate on said axis.

Line of Sight Flying
To learn how to fly tinyhawk start by flying it line of sight (no goggles yet). Power on tinyhawk and set it down in a cleared room. Arm tinyhawk then throttle up using the left stick to a hover position. Work on maintaining a constant altitude. Pitch and roll tinyhawk with the right thumb stick and yaw tinyhawk with the left thumb stick.

First Person View (FPV) Flying
Make sure tinyhawk and the goggles are on the same vtx channel and that you have a clear area to fly around in. Apply the same principals learned when flying tinyhawk line of sight except now work on flying in a forward direction while maintaining a controlled constant altitude. It is easier to learn flying FPV by always moving in a forward direction so always apply a slight amount of pitch using your right thumb stick. You can steer tinyhawk like a car using yaw on the left thumb stick.

There is an on screen display (OSD) overlaying the video feed from the camera of tinyhawk. The OSD displays important information such as flight time and battery voltage. Pay attention to these numbers during flight to know how much battery life is left. Tinyhawk can fly for a maximum of 4 minutes. When the battery reaches 3.2v, land tinyhawk. Drawing the battery below 3.2v is not suggested and can damage the battery.

Tips: Work on maintaining a controlled altitude flight to begin while driving tinyhawk with pitch and yaw. Do not let the battery go lower than 3.2v. The arm switch activates a beeper when set in the 2nd position (middle); this is useful when looking for tinyhawk.

Tinyhawk

Propeller Direction and Mounting

There are 2 spinning directions for tinyhawk propellers, Clockwise (CW) and Counter-Clockwise (CCW). When Buying a set of propellers, 2 CW and 2 CCW will be given. The blunt leading edge indicates the direction the propeller is suppose to rotate as compared to the sharp trailing edge. When mounting propellers please make sure the correct orientation shown in the diagram below.
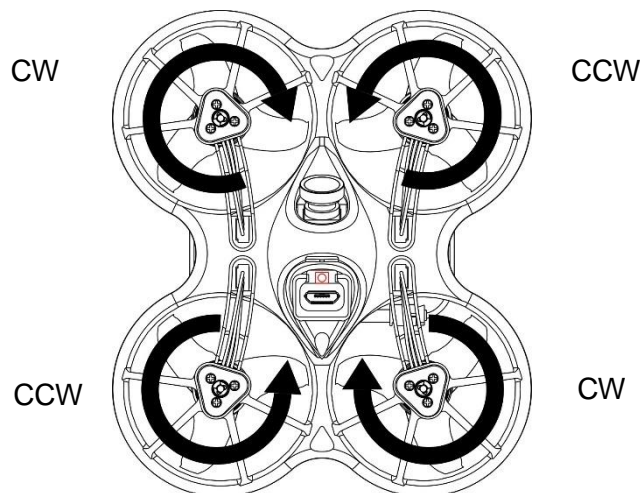
Caution: Failure to mount the propellers in the correct orientation will cause tinyhawk to not fly correctly and with no control. Please double check for the correct orientation.

1. Line up the 3 struts of the propeller with the 3 struts on the motor bell.
2. Press on the propeller while supporting the backside of the motor with our fingers.
3. Press on until the motor shaft is flush with the propeller.

Caution: Failure to support the motor sufficiently can cause the frame to break. Use caution when pressing the propellers on.

Propeller Dismount

Use caution when dismounting the propellers. Only do so if completely necessary to change to a new propeller.

1. Use a small tool (such as a 1.5mm hex wrench or the small screwdriver provided) to press on the metal on the bottom of the motor and tinyhawk.
2. Press on the blades of the propeller with your fingers until the propellers pop off the motor.

Caution: Failure to support the motor sufficiently can cause the frame to break. Use caution when pressing the propellers off.
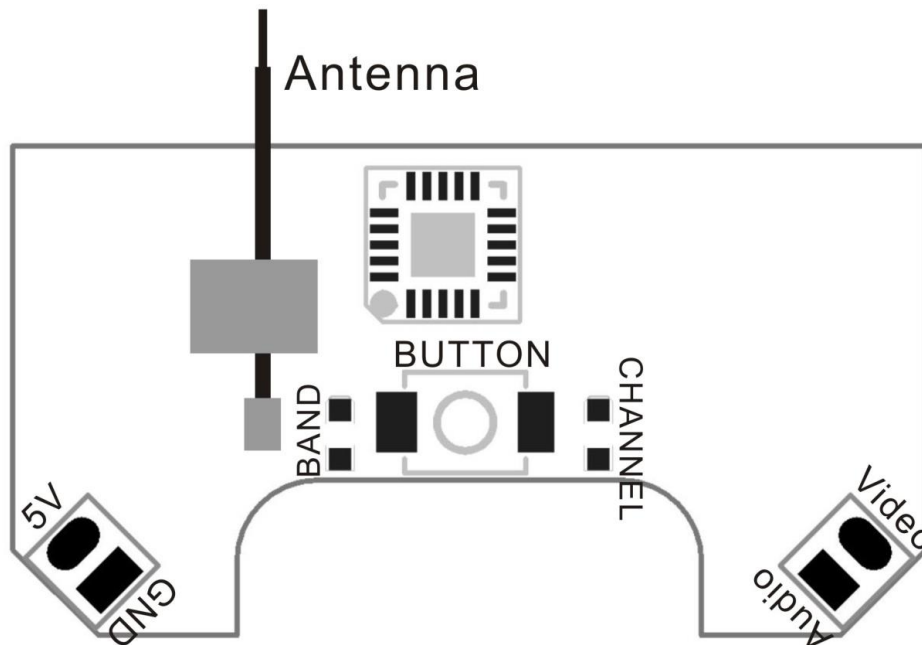
emax-usa.com

Tinyhawk VTX Settings

Vtx Schematic and Button Diagram

VTX Channel Settings with the Button

1. Normal display

All LEDs on the VTX are normally off until the button is pressed. To check band and channel status click the button once quickly, and LED starts to indicate frequency band and frequency channel. First indicate the frequency band and then indicate the frequency channel. After all 2 rounds of LED display cycles, all LED will be off.

2. Menu Entry / Exit

(1)Press the button and hold for 5s to enter the menu. After entering the menu, BAND LED lights up.

(2)Press the button and hold for 5s again to save parameters and exit the menu. After saving and exiting the menu, all LED goes out.

3. Band and Channel parameter change

After entering menu, short click button to switch frequency group band(b)/frequency channel (C),and the LED of the corresponding menu is lit.

4.Enter/Exit Parameters

(1) After choosing menu, press the button and hold for 2s to enter parameter option. And the corresponding LED flash.

Notice: When SmartAudio function is on, if the video receiver can't display image such as showing only snow image, that is because flight controller set the VTX frequency to an illegal one. While battery is connected you can press vtx button to adjust the frequency to the legal one to display an image and after wards you can set the frequency to legal one in OSD menu.

emax-usa.com

Button Menu Diagram
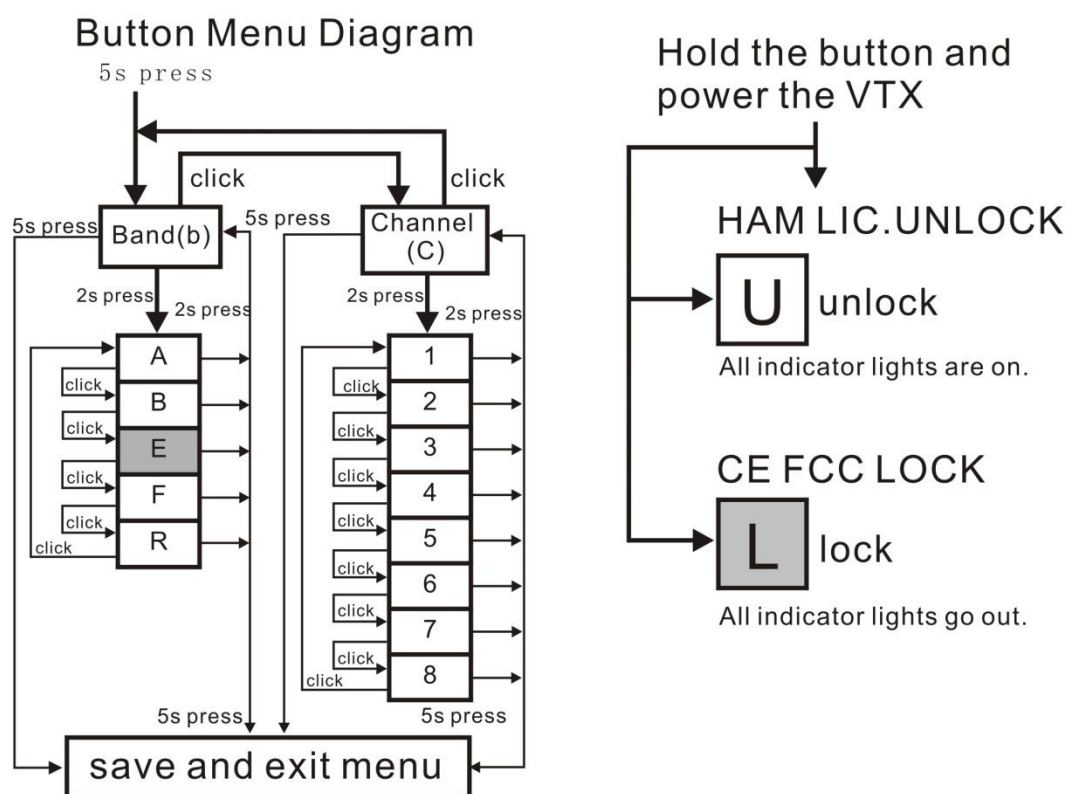
CE and FCC unlicensed user chart

FR \ CH	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8	
A	5865	5845	5825	5805	5785	5765	5745	—	MHz
B	5733	5752	5771	5790	5809	5828	5847	5866	MHz
E	—	—	—	—	—	—	—	—	MHZ
F	5740	5760	5780	5800	5820	5840	5860	—	MHz
R	—	—	—	5769	5806	5843	—	—	MHz

Unlocked FCC HAM licensed user chart

FR \ CH	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8	
A	5865	5845	5825	5805	5785	5765	5745	5725	MHz
B	5733	5752	5771	5790	5809	5828	5847	5866	MHz
E	5705	5685	5665	—	5885	5905	—	—	MHz
F	5740	5760	5780	5800	5820	5840	5860	5880	MHz
R	5658	5695	5732	5769	5806	5843	5880	5917	MHz

* From the factory this video transmitter is designed to operate within CE and FCC unlicensed users specifications. To use the unlocked features of this VTX the user is required to have a HAM radio license or prior consent from the FCC.By purchasing this equipment, the user is agreeing that they understand these responsibilities and will operate the equipment legally. Emax cannot be held responsible for your actions if you purchase and/or use this product in violation of your government's regulations.

Changing VTX setting via Betaflight OSD

Tinyhawk is equipped with SmartAudio and is already configured with stock settings. The SmartAudio line is operated on UART 2 TX.

1. Power on Tinyhawk, goggles, and Controller.

2. Follow the tips on screen to enter the main settings menu: THROTTLE MID+ YAW LEFT+ PITCH UP to enter OSD parameter adjustment menu. as shown in Figure 2.

3. In the menu interface, switching PITCH up/down to choose menu option. Move the cursor to "FEATURES" and stir Roll stick right to enter next menu. Using PITCH stick to move cursor to "VTX SA", as shown in Figure 3.Then pull ROLL stick right to enter VTX configuration menu, as shown in Figure 4.
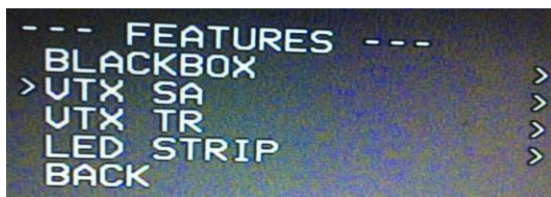

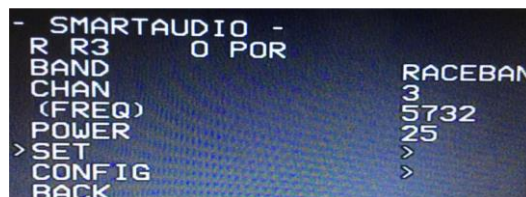Figure 1

Figure 1

Figure 3

Figure 5

4. In the menu of VTX SA, we can configure the BAND, CHAN and POWER. Pulling the PITCH stick to move cursor up and down to choose VTX options that need setting. While pulling ROLL stick left and right to change the corresponding parameters.Once the parameters is set, moving the cursor to "SET", then turn ROLL stick right to enter "SET" and choose "YES" and turn ROLL stick right to save setting parameters, as shown in Figure 5.
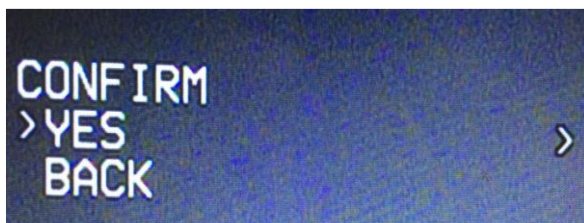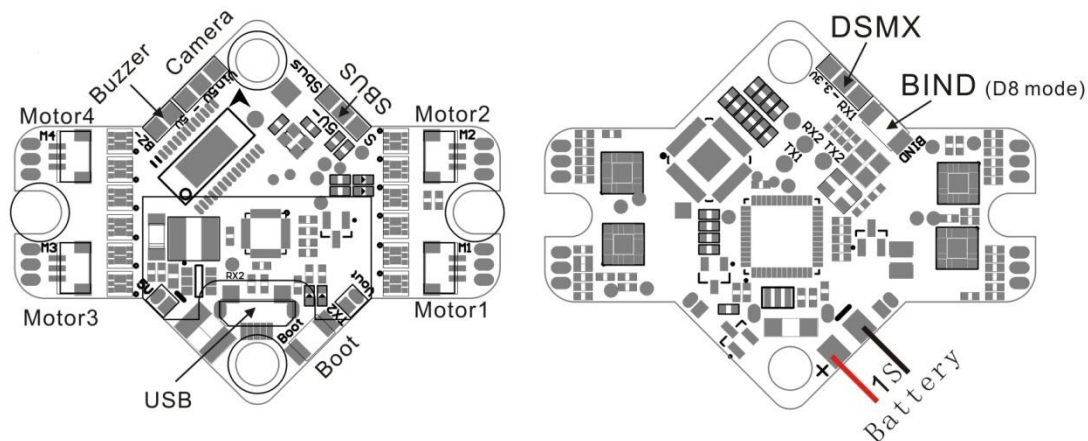

Figure 6

emax-usa.com

Tinyhawk All-in-One Flight Controller

Tinyhawk's main electronic board is shown above. This board contains a F4 flight controller with all 4 esc's and an 8CH receiver.

Emax Tiny Receiver

Number of Channels: Up to 8CH using SBUS

Compatibility: FrSky D8 mode

Binding Procedure

Binding is the process of uniquely associating a particular receiver to a transmitter module. A transmitter

module can be bound to multiple receivers (not to be used simultaneously). A receiver can only be bound to one transmitter module.

1.Hold the bind button while powering on the receiver. When the GREEN LED is on, it means the receiver is in BIND MODE

2.Turn on the transmitter, make sure it is set to D8 mode, and then set it into bind status. When the RED LED of the receiver starts flashing, it means bind successful.

3.Turn on the transmitter again, the GREEN LED receiver will be on, it means the receiver is receiving data from transmitter. Transmitter bind with receiver no need repetitive operation, unless you change either receiver or transmitter.

Emax Tinyhawk Flight Controller (FC)

This flight controller has a F4 MCU with a MPU6000 gyro. Tinyhawk flight controller comes pre-programmed and properly tuned for optimal flight. The flight controller is programmed with Betaflight 3.5.0. For a full tune and configuration setting file (CLI dump file) please visit https://emax-usa.com/ for the CLI dump file.

Stock Flight Controller Settings

Tinyhawk is configured to take a channel map of the AETR1234 convention. That is the channel map is in the respective order: throttle, aileron, elevator, rudder, AUX 1, and AUX 2. The arm switch on tinyhawk is set on AUX 2 and armed with the highest value. The middle stage of AUX 2 activates the beeper. AUX 1 is configured for a 3 stage switch to select flight modes: Angle, Horizon, and Acro activating in an increasing order. The stock radio controller is already configured to these settings. If

configuring a new radio please configure your radio as described above or change these settings in Betaflight Configurator.

PID profiles: PID profile 1 is tuned and optimized for Tinyhawk for ultimate control of flight indoors and outdoors. Please do not change these values.

Rate Profiles: Profile 1 is designed for optimal indoor flight control. Profile 2 is similar to profile 1 with a bit more sensitivity to allow rolls and flips flying in doors. Profile 3 is a more sensitive rate profile tuned for people who like to fly "pincher" style. These profiles can easily be switched in Betaflight OSD menu.

Adjusting Software Settings (Betaflight Configurator)
Betaflight Configurator can be used to changed programmed settings on Tinyhawk and to flash new firmware if desired. Betaflight Configurator and flight controller firmware can be downloaded at https://github.com/betaflight/. The hardware target for Tinyhawk Flight Controller is MatekF411.

DISCLAIMER: We do not suggest changing any PID settings on Tinyhawk or upgrading the firmware to new versions. Tinyhawk comes stock with an optimal tune for superior flight performance. Changing this can affect flight time, overall speed, control of the aircraft, and excessive heat within the motors.

### Reprogramming Tinyhawk Flight Controller
1. Put the Flight Controller in DFU mode by pressing the BIND button while plugging in the micro USB cable to a computer.
2. Select MATEKF411 as the target and then select the firmware (3.5.0). Select Manual Baud Rate with 256000 in the drop down menu
3. Select Load Firmware(Online) to download the firmware
4. Select Flash Firmware to program the flight controller
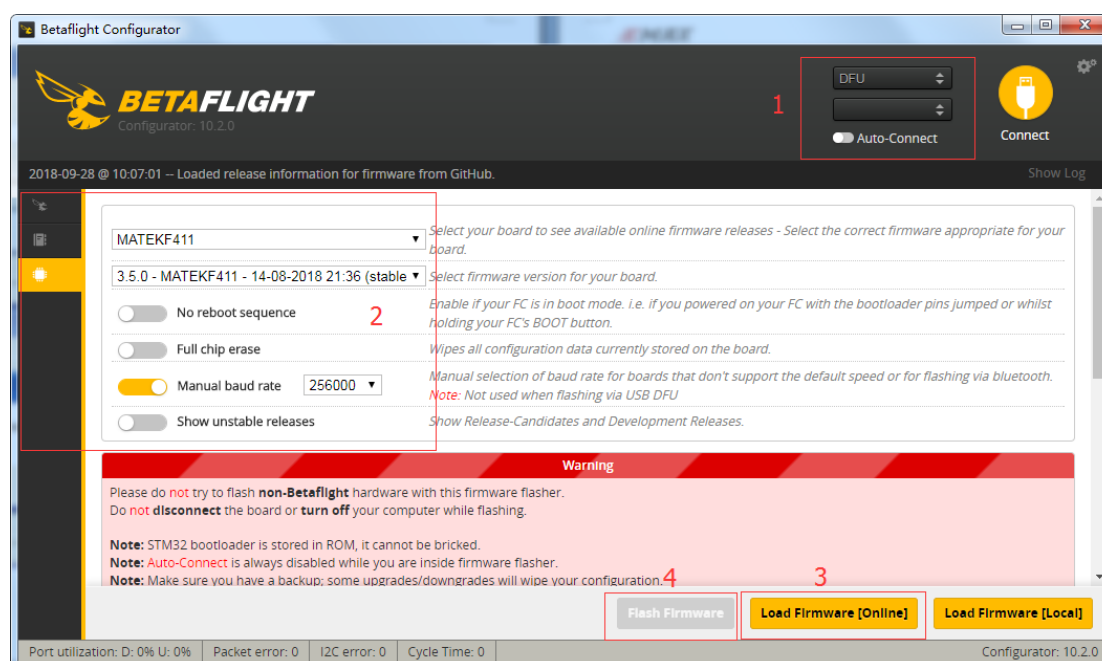
Set the Correct Settings
Download the latest CLI Dump File from https://emax-usa.com/
Connect Tinyhawk to Betaflight configurator and select the CLI tab

Open the CLI Dump File in a text editor and copy all the text.
Paste the settings into the command bar and press enter
Tinyhawk will reconnect to Betaflight when completed
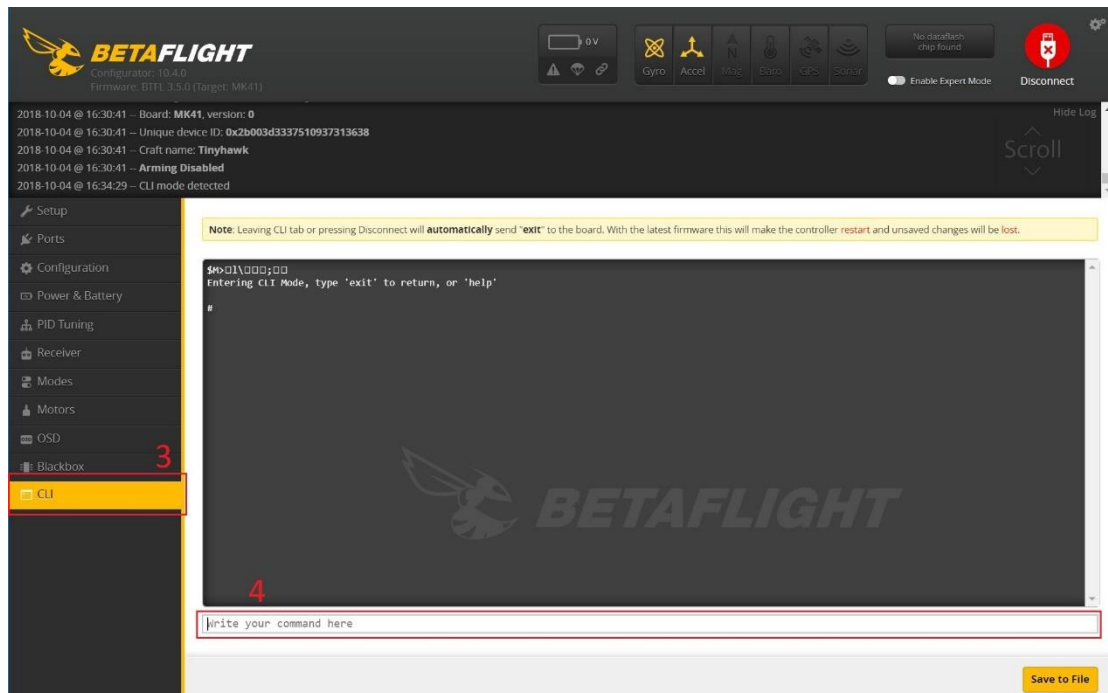
Thank you for purchasing our product! Enjoy Flying Tinyhawk.

⚠️ **Warning：**

Please pay attention to your surroundings. Not

Recommended for persons under 18 years of age.

emax-usa.com