

T1Pro User Manual V1.0

2016.07.20 Revision

For Firmware Version V3.30 or above

& Adjusting-parameter software Version V1.40 or above

Please strictly follow these steps to mount and use this product, as well as to install adjusting-parameter software on your computer or phone.

Thank you for purchasing TopXGun product. There are web pages of T1Pro at our website www.topxgun.com, which is updated regularly. You can obtain product information, technical updates and manual corrections. TopXGun recommends you to download and use the newest user manual. The information contained in this manual is subject to change without notice.

This manual is only for basic assembly and configuration; you can obtain more details and advanced instructions when using adjusting-parameter software, if you find the information on software and user manual are not consistent, adjusting-parameter software shall prevail.

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Introduction

Disclaimer & Warning

Please read this disclaimer carefully before using the product. By using this product, you hereby agree to this disclaimer and signify that you have read them fully.

THIS PRODUCT IS NOT SUITABLE FOR PEOPLE UNDER THE AGE OF 18.

This product is an autopilot system designed for serious multi-rotor aircraft. It can provide user with fabulous flight experience when the system is powered normally and the connection is correct. When setting parameters or updating firmware, we strongly recommend users to remove all propellers, and make sure all connections are good. Keep the aircraft away from people, dangerous objects and fragile objects. TopXGun accepts no liability for damage or injuries incurred directly or indirectly from the use of this product in the following conditions:

- 1.Failure to follow the guidance of the manual to assemble or operate.
- 2.Damage or injuries incurred when users are drunk, taking drugs, fatigue and any other conditions no matter physically or mentally that could impair your ability.
- 3.Damage or injuries caused by subjective intentional operations.
- 4.Malfunctions caused by refit or replacement with non-TopXGun accessories and parts.
- 5.Damage or injuries caused by mis-operation or subjective mis-judgment.
- 6.Damage or injuries caused by mechanical failures due to erosion, aging.
- 7.Damage or injuries caused by knowingly flying the aircraft in abnormal condition.
- 8.Damage or injuries caused by using in bad weather, such as typhoon, hail, fog etc.
- 9.Damage or injuries caused by flying in the following situations such as the aircraft in magnetic interference area, radio interference area, government regulated no-fly zones.
- 10.Damage or injuries caused by operating aircraft in condition of low visibility or blocked eyesight.
- 11.Damage or injuries caused by infringement such as any data, audio or video material recorded by the use of aircraft.
- 12.Other losses that are not covered by the scope of TopXGun liability.

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Certifications

This product is approved with quality standards such as FCC, CE and RoHS.

Introduction

Product introduction

T1Pro is a mature flight control system for commercial and industrial multi-rotor platform, it has below features:



- Support 9 types of multi-rotor platform
- Higher performance external IMU
- Double redundant system with double GPS
- Power management module with high voltage (2S-12S)
- It has black box function, the longest record time of flight data can be 32 hours totally.
- Two basic control modes: Attitude Mode and GPS Mode
- Support One-Key Go Home, Fail safe and Go Home, Low Voltage Protection
- Designed with built-in vibration absorption, no extra mount frame or vibration absorption pad is required
- Support S.Bus receiver, PPM receiver and PWM receiver
- Support up to 128 waypoints(it needs to buy one set of wireless digital radio separately)

In the Box






Warranty card×1, Main controller×1, PMU(HV)×1, External IMU module X1, GPS/Compass×1, LIU×1, OSD×1, GPS Bracket×1, Servo Cable×8, Micro-USB×1, AV cable×1, 3M Adhesive Tape.

Symbol Description

Universal symbol

Symbol	Significance	Description
	Attention	This mark represents potential risk, if ignore it, may result in equipment damage, loss of data or other unpredictable consequences.
	Instruction	Starting with this mark is the additional information of the body , the emphasis and supplement on the body.

LED Symbol

Symbol	Description
 (N)	It means yellow LED indicator flashes N times ;
{   } (N)	It means yellow and purple LED indicator flash N times ;
 (∞)	It means yellow LED indicator continuously flashes ;
 (N)	It means yellow LED indicator is continuously on for N seconds.

1 Installation & Test

1.1 Hardware installation

Step1. Confirm multi-rotor type, forward direction and rotation direction of the motor/propeller.

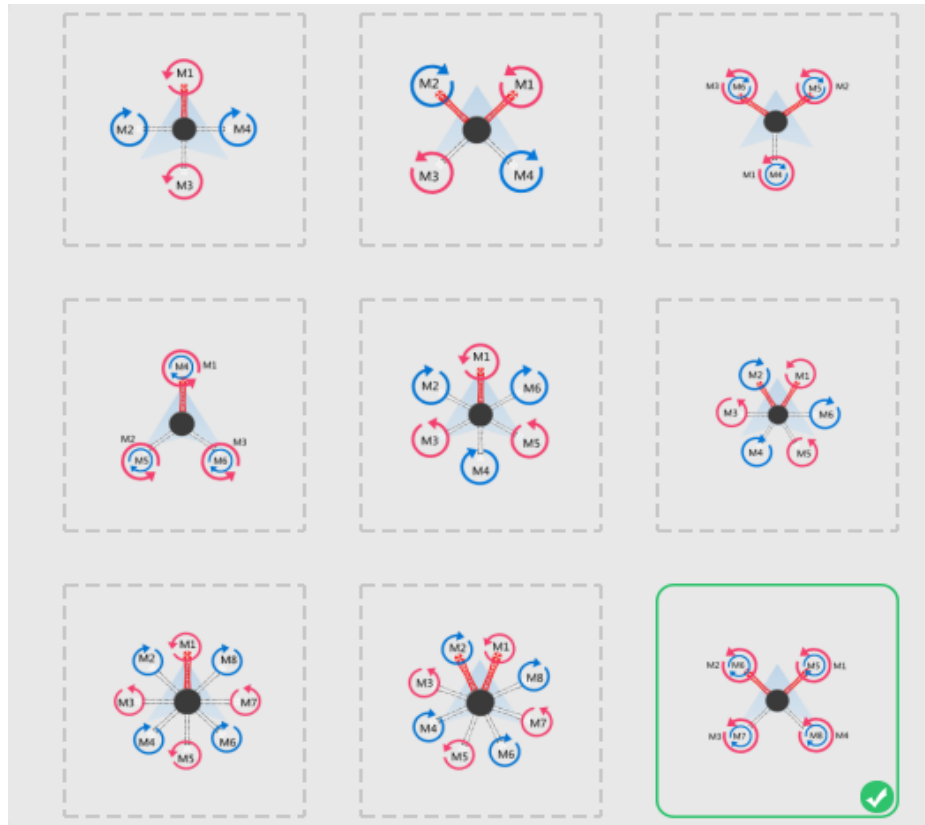


Figure 1-1 Confirm multi-rotor type

Step2. Install the controller unit, connect every part.

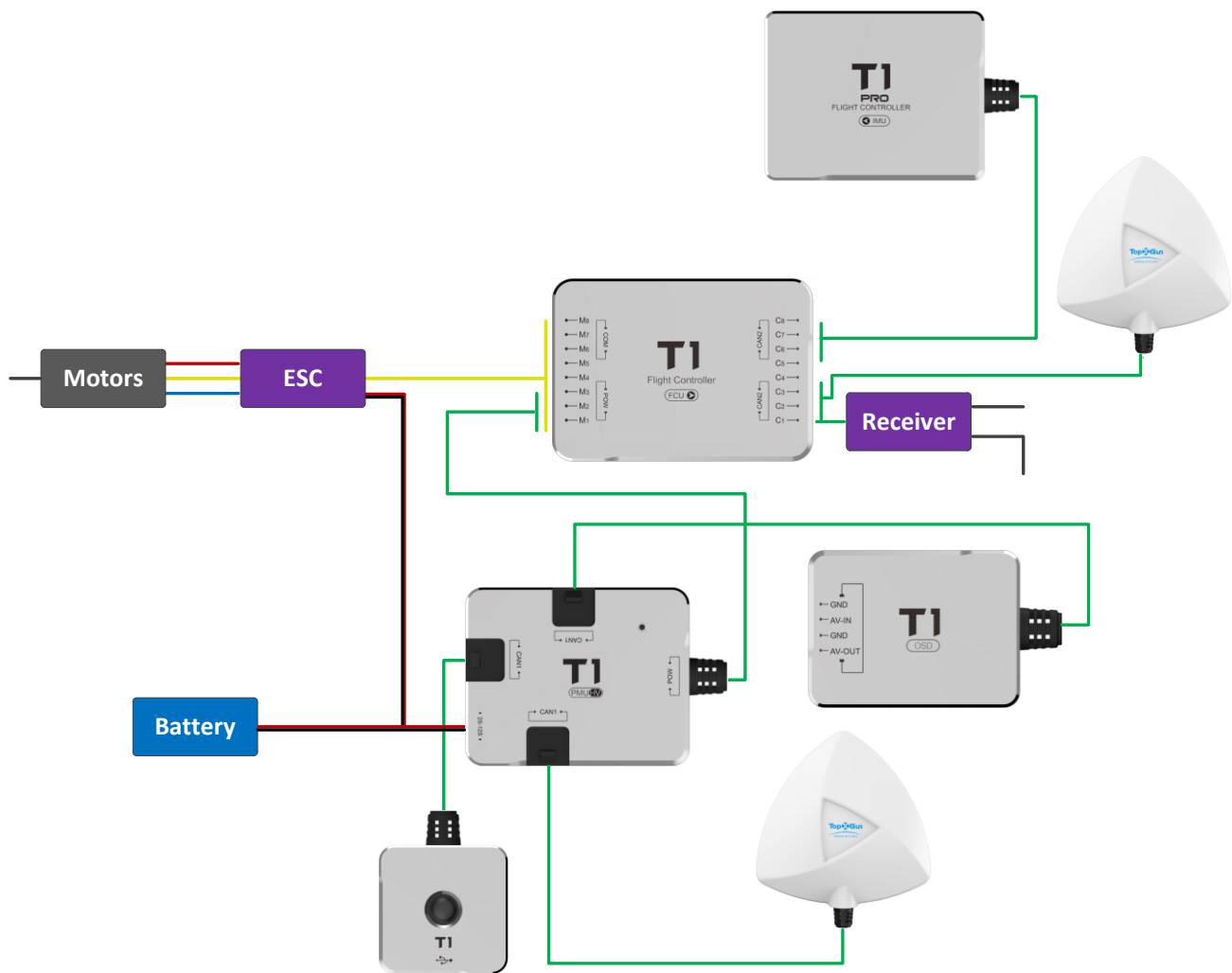


Figure 1-2 Connection diagram of the main controller

Installation specification

● FCU installation

The TopXGun logo should be facing the sky, with the orientation arrow pointing directly to the nose direction, please mount it on a central place in board center of aircraft.

port connection

- Connection of ESC: Connect M1 ~ M8 to ESC, T1Pro supports up to eight motors at most (ESC signal wire is down and earth wire is up)
- Connection of receiver: SBus and PPM receiver can be connected directly to C1. PWM receiver should be connected to C1 ~ C8 on flight controller. The receiver should have at least six channels for realizing built-in advanced functions of flight controller.(Recommended to use servo cable of flight controller included to connect flight controller and the receiver.)

If you have matched DTU (data transmission unit), please connect it to COM port on MC, it is recommended that you completed fixation after wiring.

● External IMU module installation

When installing, The T1Pro IMU logo should be facing the sky, with the orientation arrow pointing directly to the nose direction, To maximize the best flight experience, please mount it on a central place in board

center of aircraft and connect to any port of FCU with CAN2 logo.

● PMU(HV) module installation

Please do not mount it on any other electronic device, choose a ventilated place for cooling. Make sure the three CAN ports are convenient for connecting during installation.



Three ports of PMU module have same definition

● GPS/COMPASS module installation

T1Pro have GPS/Compass module and redundant GPS/Compass module.

When installing, The top side with TopXGun logo should be facing up, with the orientation arrow pointing directly to the nose direction, mount it on the bracket horizontally. Connect it to any one of the CAN ports of PMU.

It is recommended to use bracket included in package, otherwise, please make sure it is nonmagnetic.



GPS/Compass module and redundant GPS/Compass module all have built-in magnetic compass which is magnetic sensitive equipment and please pay attention to keep it away from the motor, ESC, power battery and etc when install and use.

● LIU module installation

Mount in a good place to make sure the LIU is visible during flying, connect it to any one of the CAN ports of PMU with the enclosed 3M adhesive tape.

● OSD module installation

Installation position requirements

Mount it on an appropriate place in board center of aircraft; make sure it's a ventilated place for cooling. Connect it to any one of the CAN ports of PMU.

Port illustration

Connect AV-IN to camera's AV, GND above AV-IN to ground electrode of camera; connect AV-OUT to AV input port of image transmitter, GND above AV-OUT to ground electrode of image transmitter.

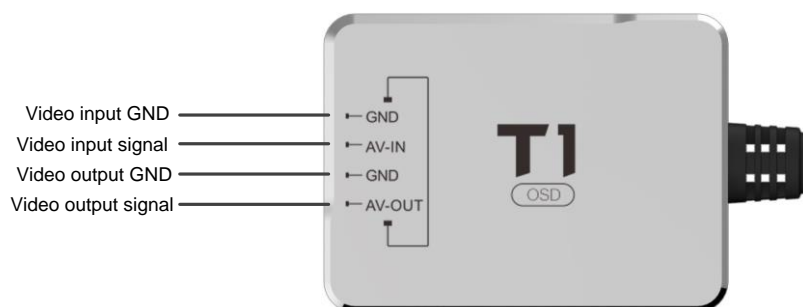


Figure 1-3 OSD installation



When using the module, no power can be supplied to the steering gear/worm through the receiver, otherwise the data of OSD may lost.

1.2 Installation and test for adjusting-parameter software

Preparation before installation and configuration

T1Pro flight controller supports PC, Mobile phone to adjust parameters

- If you do the configuration on phone, you only have to install phone app and buy bluetooth module, no need to install any driver.
- If you do the configuration on PC, it must meet below demands
 - support windows system Windows XP/7/8/10
 - PC has connected to the Internet.
 - Install latest adjusting-parameter software (It may need to install driver)

Install and test steps

Here follows the instruction of parameter setting steps, taking the settings of adjusting-parameter software as example. You can see details of setting method according to the inner specification of adjusting-parameter software.

Step1. Use USB cable to connect flight controller and PC.

PC will automatically detect flight control and connect it.



When using a USB to connect flight controller and PC, there should be power given to flight controller.

Step2. Choose the type of aircraft, as shown in Figure 1-4.

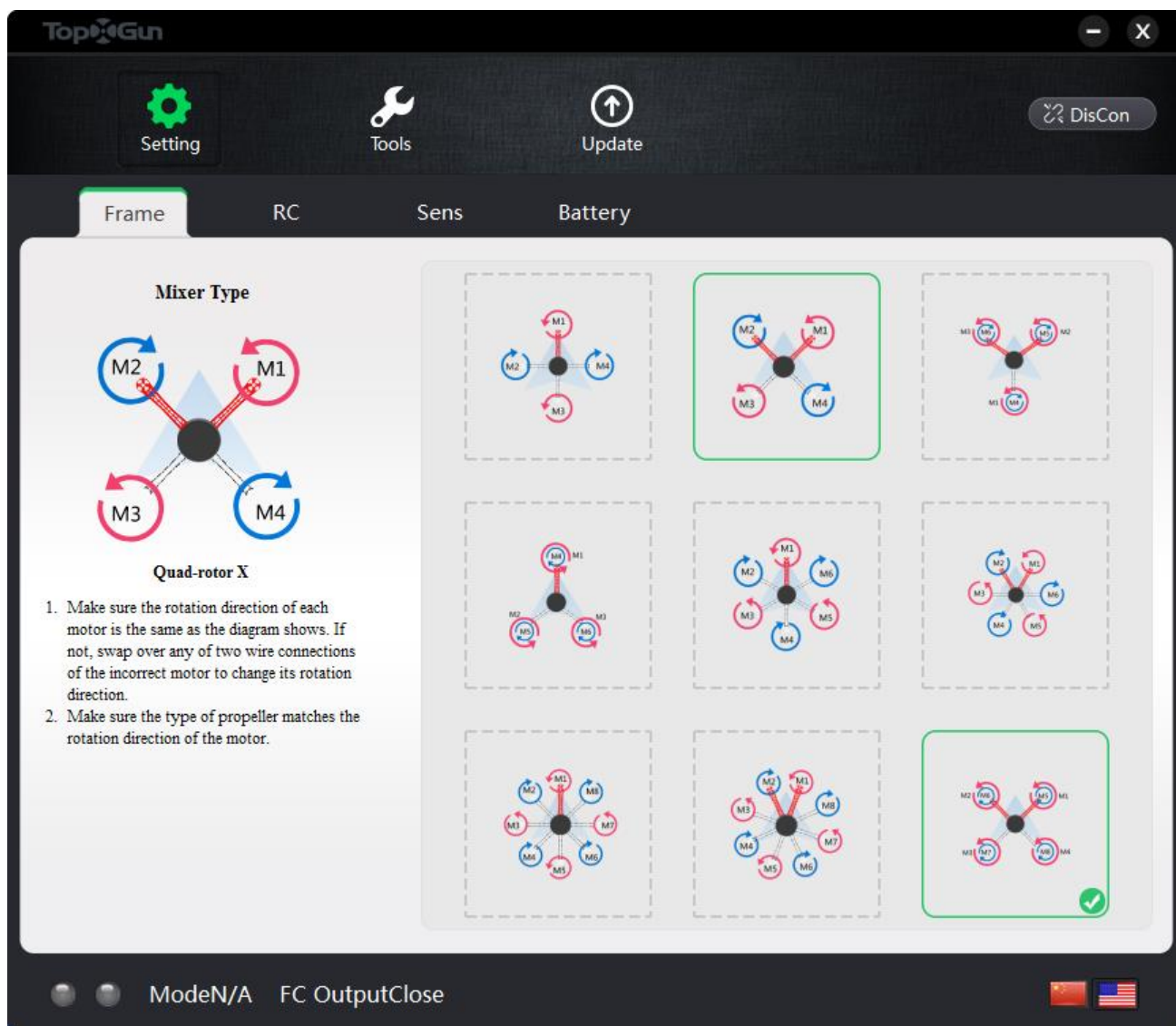


Figure 1-4 Set the type of aircraft



- (1) The direction of the red arrow indicates rotating clockwise (view from the top).
- (2) The direction of the blue arrow indicates rotating anticlockwise (view from the top).
- (3) To coaxial propellers: red propeller is at Top; blue propeller is at Bottom.

Step3. Choose the type of receiver and calibrate it

1. Choose the type of receiver you have.
2. Setup a new fixed wing model on transmitter, choose a three position switch for CH5, choose a two position or three position switch for CH6.
3. Click the "START CALIBRATION" button, and move the stick of channel 1 to 4, the switch of 5 to 6, throughout their complete range several times, then click the "FINISH CALIBRATION" button.



Remote control only unlock after the correct calibration, please check the channel direction is correct or not:

- turn the aileron stick to right, the roll cursor slides to right;

- turn the rudder to right, the yaw cursor slides to right;
- pull backward the elevator stick, the pitch cursor slides to right;
- Push forward the throttle stick, the throttle cursor slides to right;

4. Switch CH5 mode switch, CH6 return switch , check if the position on software matches with the control mode, whether return mapping is normal.



If the receiver type is not S.Bus, you need to do as follow:

1. Set the End Point of CH5 to 30% ~ 70%

2. Set the rudder angle in the range of normal mode.

You can verify the Fail-Safe setting by shutting down the transmitter, the control mode will automatically jump to red 'Fail-Safe' area.

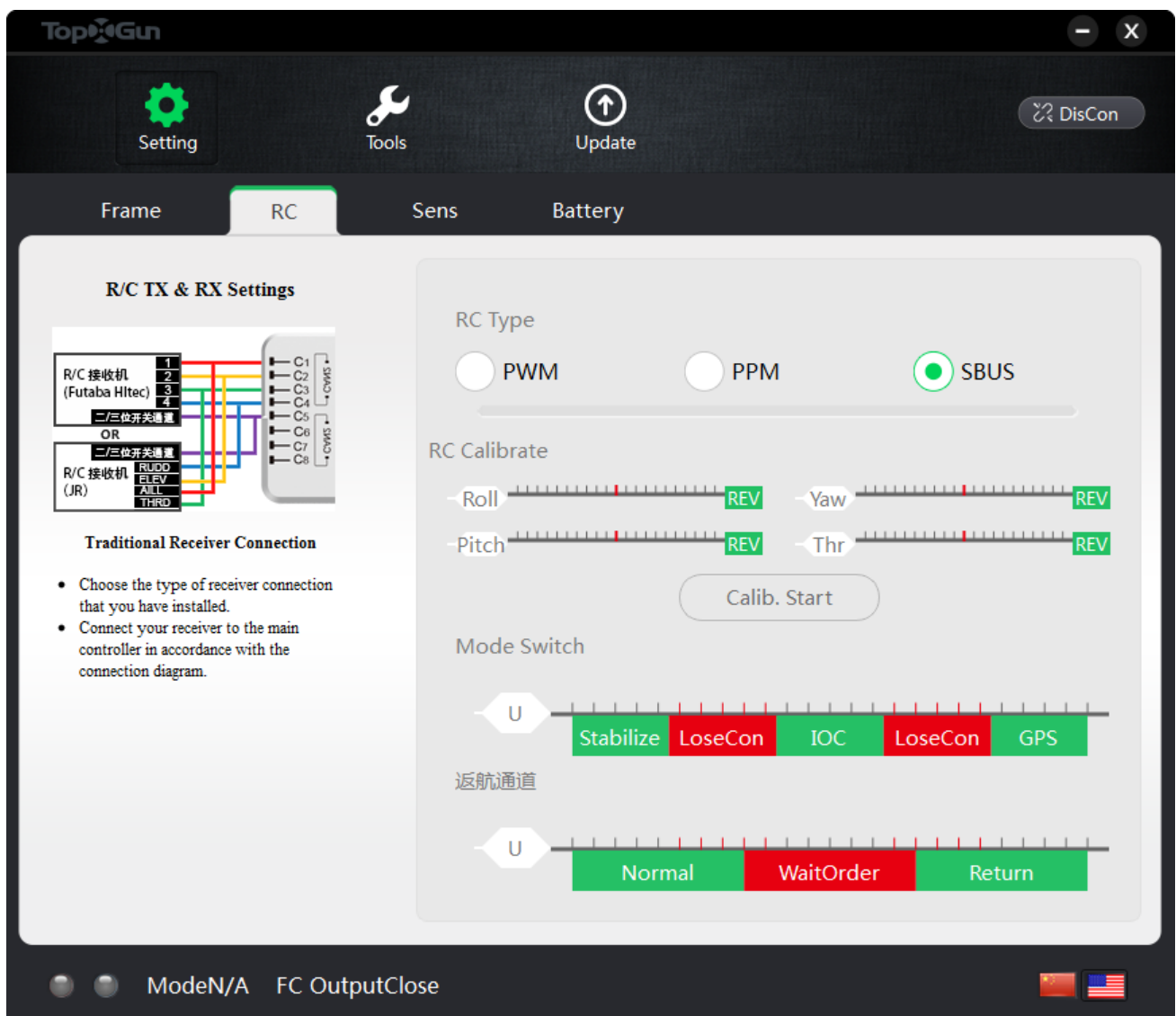


Figure 1-5 Remote control/Receiver channel setting

Step4. Gain setting, , as shown in Figure 1-6.

1. Choose the axle base of aircraft which you are using , T1Pro flight controller will be set parameters

- automatically according to aircraft wheelbase in order to get better flight experience
2. You can adjust adjust the sensitivity according to the instruction of adjusting-parameter software.
 3. You can obtain the best sensitivity of flight by the process of ‘ test flight and readjusting’

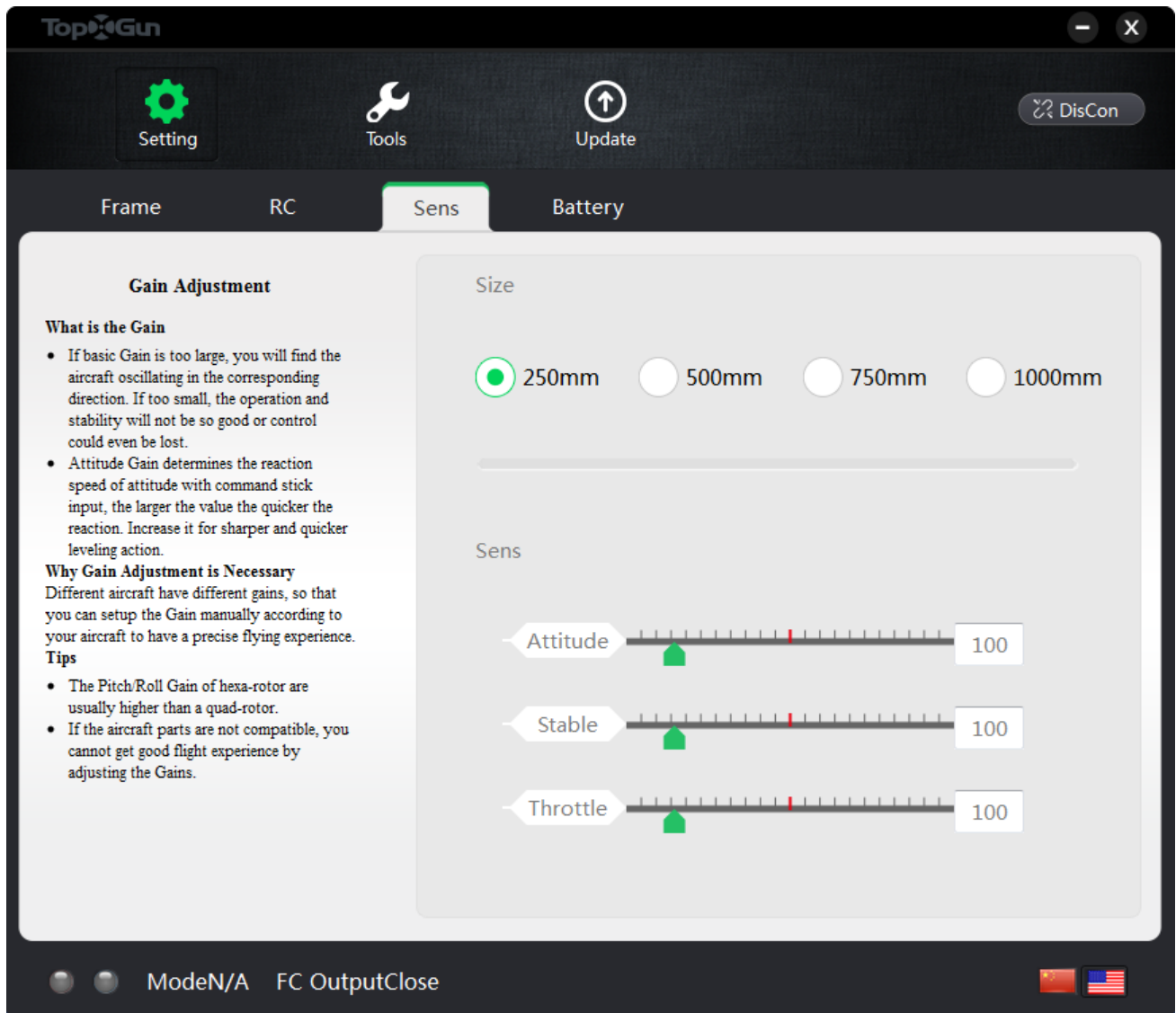


Figure 1-6 Gain setting

Step5. Low-voltage protection setting, as shown in Figure 1-7.

- If you do not want to use this function, you can turn it off, then the aircraft will only alarm with LED blinking when the battery is low. The first level protection has yellow LED blinking, the second level protection has red LED blinking.



- If the low-voltage protection is turned on, the aircraft will return automatically during first level protection, during second level protection the aircraft will land automatically.

No matter the auto-return or land in stand point, you can switch CH5 mode twice to terminate low-voltage protection at any time .

If the low-voltage protection is triggered, you are unable to switch to any kind of flight mode except for attitude mode and returning mode and landing mode.

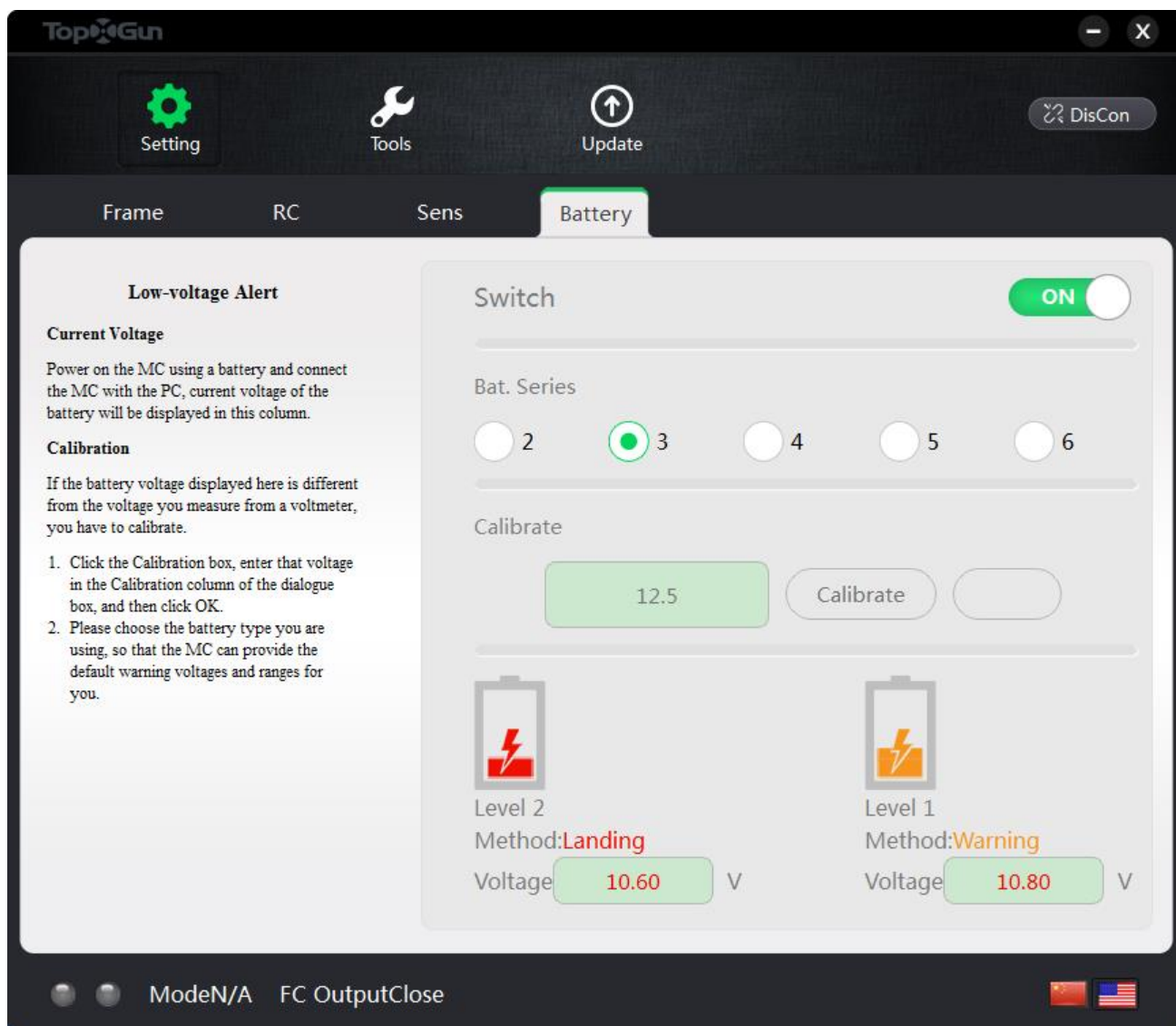


Figure 1-7 Low-voltage protection setting

1.3 Unlock and lock

T1Pro has only one way to unlock the aircraft, follow the figure 1 to unlock no matter whether you are using Japan TX or US TX, and follow the figure 2 to lock the aircraft. The aircraft will automatically lock after landing with the throttle stick maintaining minimum for 3 seconds.



After ESC has calibrated by T1Pro flight controller, the motor will turn on according to the order when you unlock the drone. When there is run-up of NO. 1 motor, all will turn on at the same time after you push the throttle.

The idle speed of DJI series ESC is higher. There is no idle speed of motor when your use its recommended idle speed. It can be solved when you shift it to the higher idle speed in motor idle interface



figure 1 unlock



figure 2 lock

1.4 ESC and compass calibration

ESC and compass can be calibrated by the switch combination of CH5 on the remote control.



If you adopt the method of separate power supply for motor and flight controller, you need to cut the power for motor first, the power for flight controller later, when you want to do calibration and repower it. After this, power can be provided for flight controller at first, motor later.

ESC and compass can be calibrated by flipping stick, you may refer to Figure 1-8 and Figure 1-9 for calibrating.

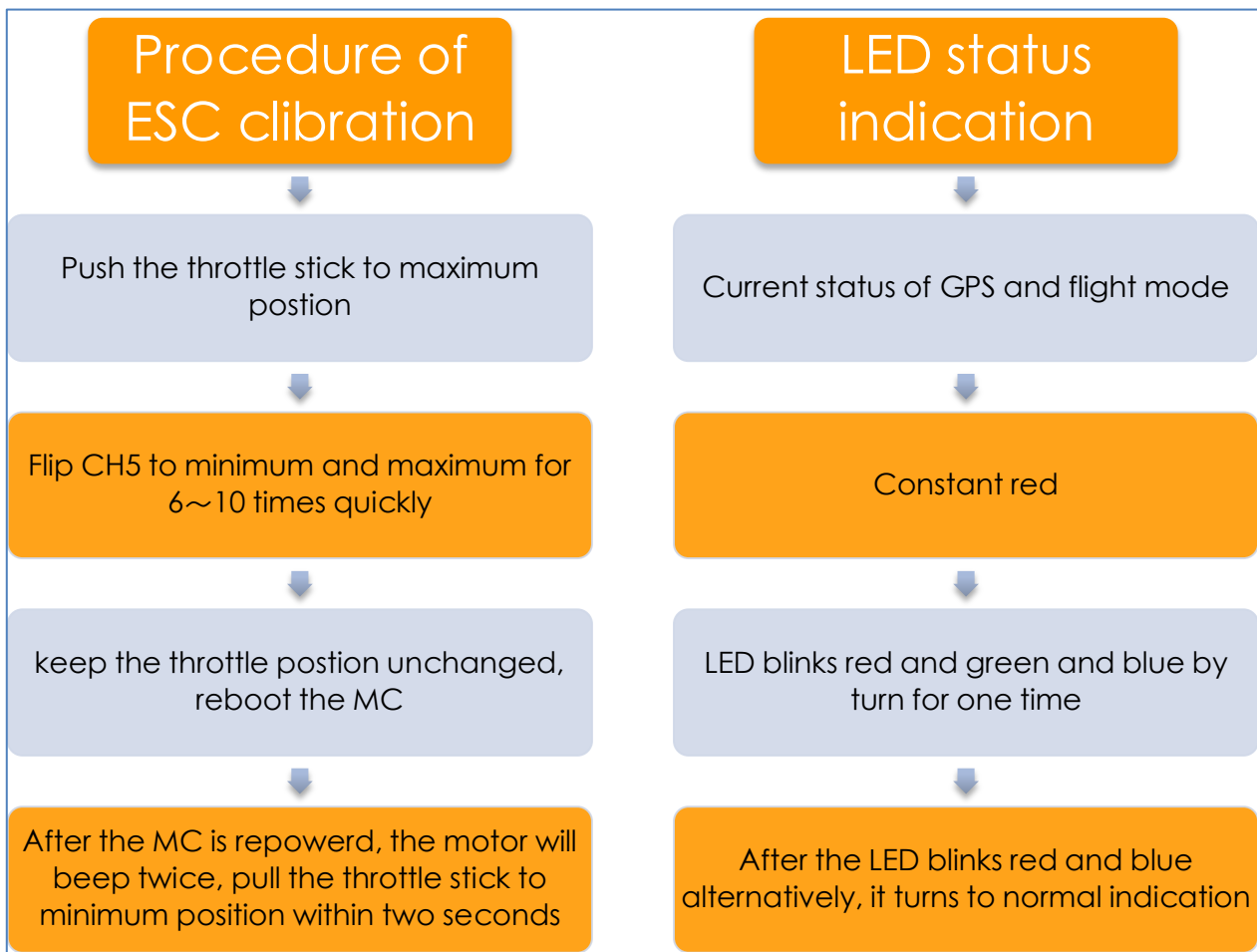


Figure 1-8 Procedure of T1Pro ESC calibration

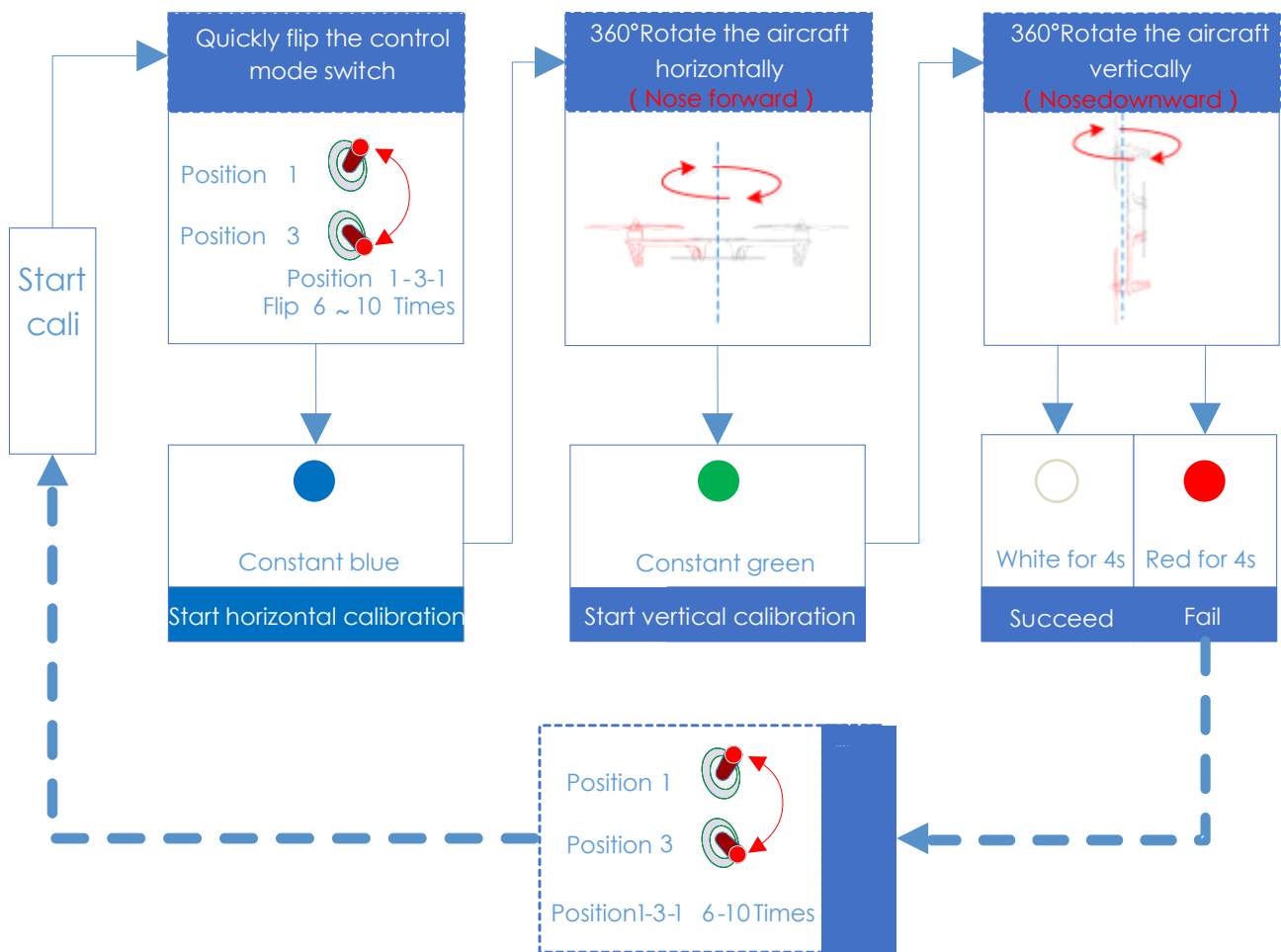


Figure 1-9 Procedure of compass calibration

1.5 Horizontal Calibration

For the first time before a test flight, put the plane on level ground and make it perform toe-out locking action for 10 seconds. When the blue and green indicator of LIU is flashing alternately, you can loosen remote controller. After about 10 seconds, there is only LIU blue indicators flashing, then 15 seconds later, LIU is normal, which shows that the calibration is successful. Calibration process takes about 25 seconds altogether. If the drone still on one side during the flight attitude mode, you are suggested to do horizontal calibration once again.

2Fly test instructions










2.1Flight mode and corresponding responding

















Channel CH5 can be two position switch or three position switch. When set to two position switch ,top and bottom position correspond to attitude mode and GPS mode; When set to three position switch, bottom-middle-top position correspond to attitude mode and intelligent direction mode and GPS mode. Attitude mode and GPS mode are used most generally for common flight. The response relationship between the remote controller and the action of aircraft is shown in table 2.1.

Table 2.1 Control mode instruction



Control mode	Stick operation	Respond of aircraft	Remark
Attitude mode	Roll/Pitch	Tilt angle of roll and pitch is proportional to their stick range	
	Yaw	The yaw speed corresponds to yaw stick range	
	Throttle	The average output of motor corresponds to current throttle value, and throttle output has the maximum privilege	
GPS mode	Roll/Pitch	Tilt angle of roll and pitch is proportional to their stick range, but the speed of level flight is limited below maximum speed (10m/s)	
	Yaw	The yaw speed corresponds to yaw stick range	
	Throttle	Aircraft maintains the attitude when the throttle is in mid position, the up/down range of throttle correspond to up/down speed	

2.2LED indicator descriptions

Normal flight indication: blinks status of GPS firstly, then blinks status of flight mode			
Indication	LED status	Instruction	Remark
GPS status	 (1) (2)	GPS unavailable	 (2) Less than 7 satellites are available,  (1) More than 7 satellites are available, but the quality is no good
		GPS available	
Fly mode		Attitude mode, with no roll input or pitch input	
	 (2)	Attitude mode, with roll input or pitch input	
		GPS mode, with no roll input or pitch input	
	 (2)	GPS mode, with roll input or pitch input	
		Automatic pilot mode	This LED blinks during automatic pilot mode or automatic return mode

Special status indication: these indication have higher priority than normal Flight indication			
Indication	LED status	Instruction	Remark
Initialized state	{   } (10)	Hardware initialized, compass has been corrected by "zeroing"	
Sensor state	 (∞)	Abnormal data of IMU or barometer	Reboot the MC
	{   } (∞)	Abnormal data of compass	Check if there is magnetic disturbance, or realign the magnetic compass.
Receiver state	{   } (∞)	Receiver signal lost	
Voltage state	 (∞)	First level low-voltage alert	
	 (∞)	Second level low-voltage alert	
Home point record	 (10)	Record home point	Record home point when the GPS is available for positioning for the first time; Record home point every time when the motor is starting .
Waypoint state	 (5)	Arrive at the destination	
Function state indication: indicate function operation state			
Indication	LED status	Instruction	Remark
Compass calibration		During process of calibrating in the xy axis	
		During process of Calibrating in the z axis	
	 (4)	Compass calibration successful	
		Compass calibration failed	
ESC calibration		The sign of ESC calibration has been stored, continue to complete calibration after reboot	

(1)  (N) means LED blinks yellow N times ;

(2) { } (N) means LED blinks yellow and purple alternatively N times ;



(3)  (∞) means LED continuously blinks ;

(4)  (N) means LED is continuously on for N seconds.

2.3 Firmware Update



It is need to confirm that you have download the latest adjusting-parameter software and connected to the Internet before update the firmware.

Step1. Click 'update' button and enter into the interface of firmware update. The system will indicate if there is module need to be updated as shown in Figure 2-1.

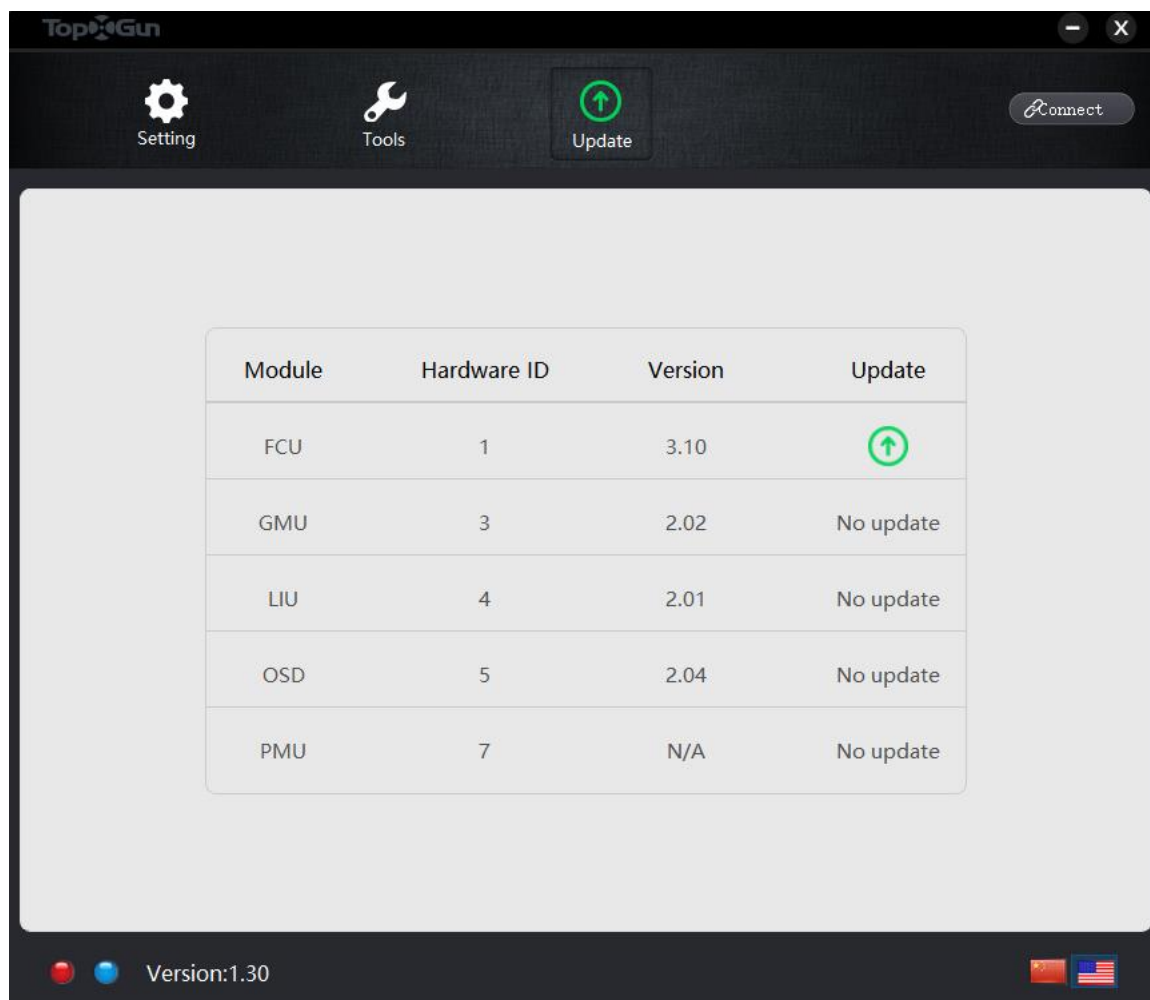



Figure 2-1 Firmware Update 1

Step2. Click '

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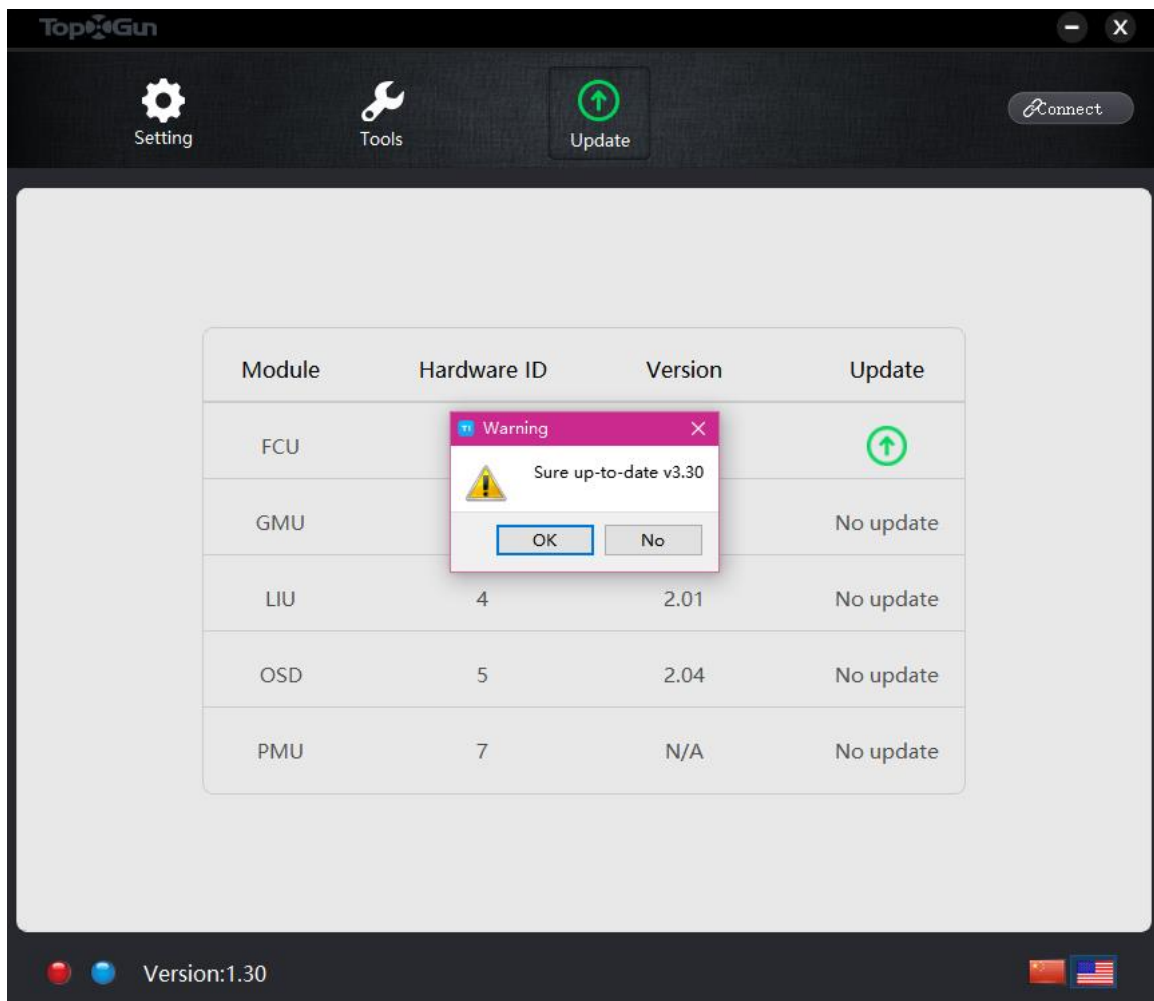


Figure 2-2 Firmware Update 2

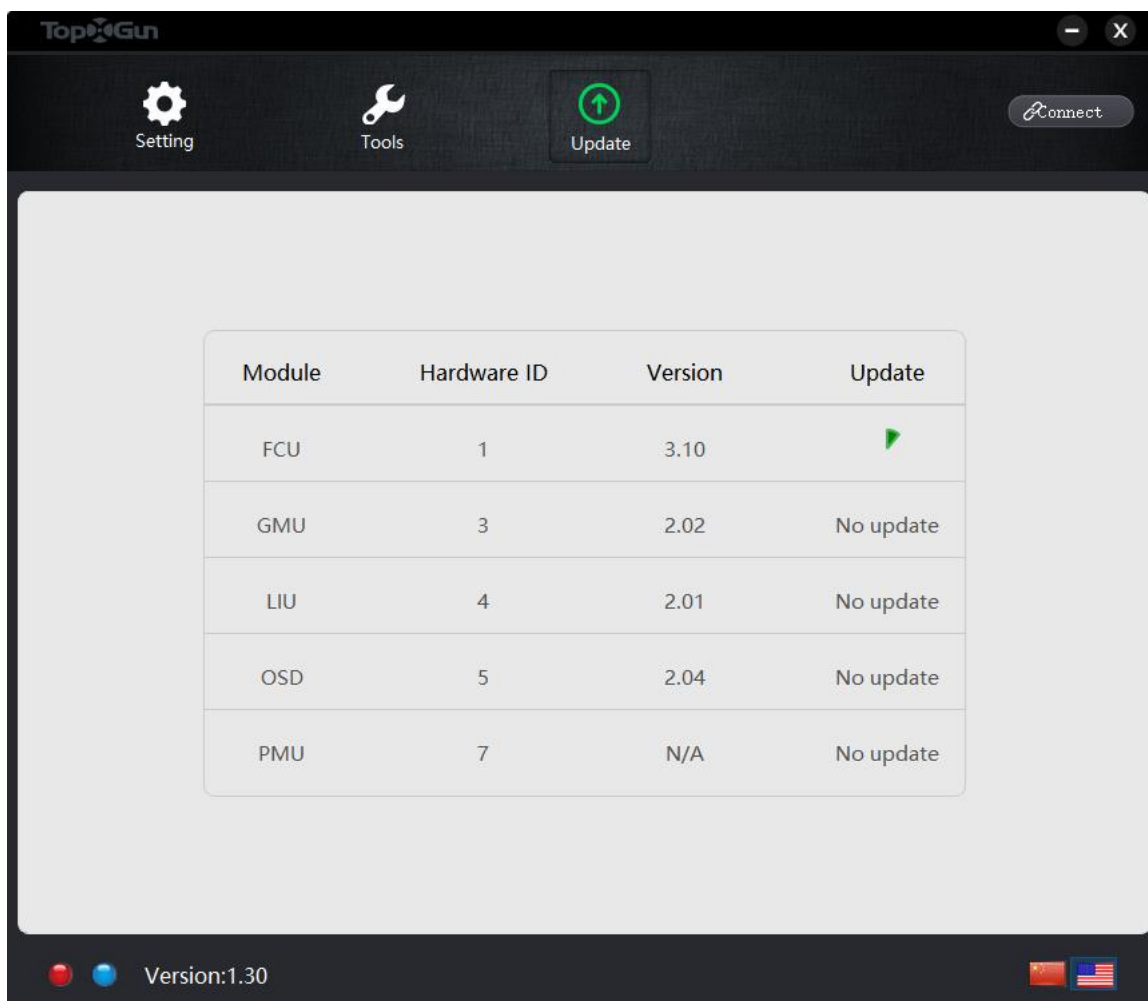


Figure 2-3 Firmware Update 3

Step3.After the update is finished, 'No available update' displayed in the column of 'Update', it means the current firmware is the latest one as shown in Figure 2-4.

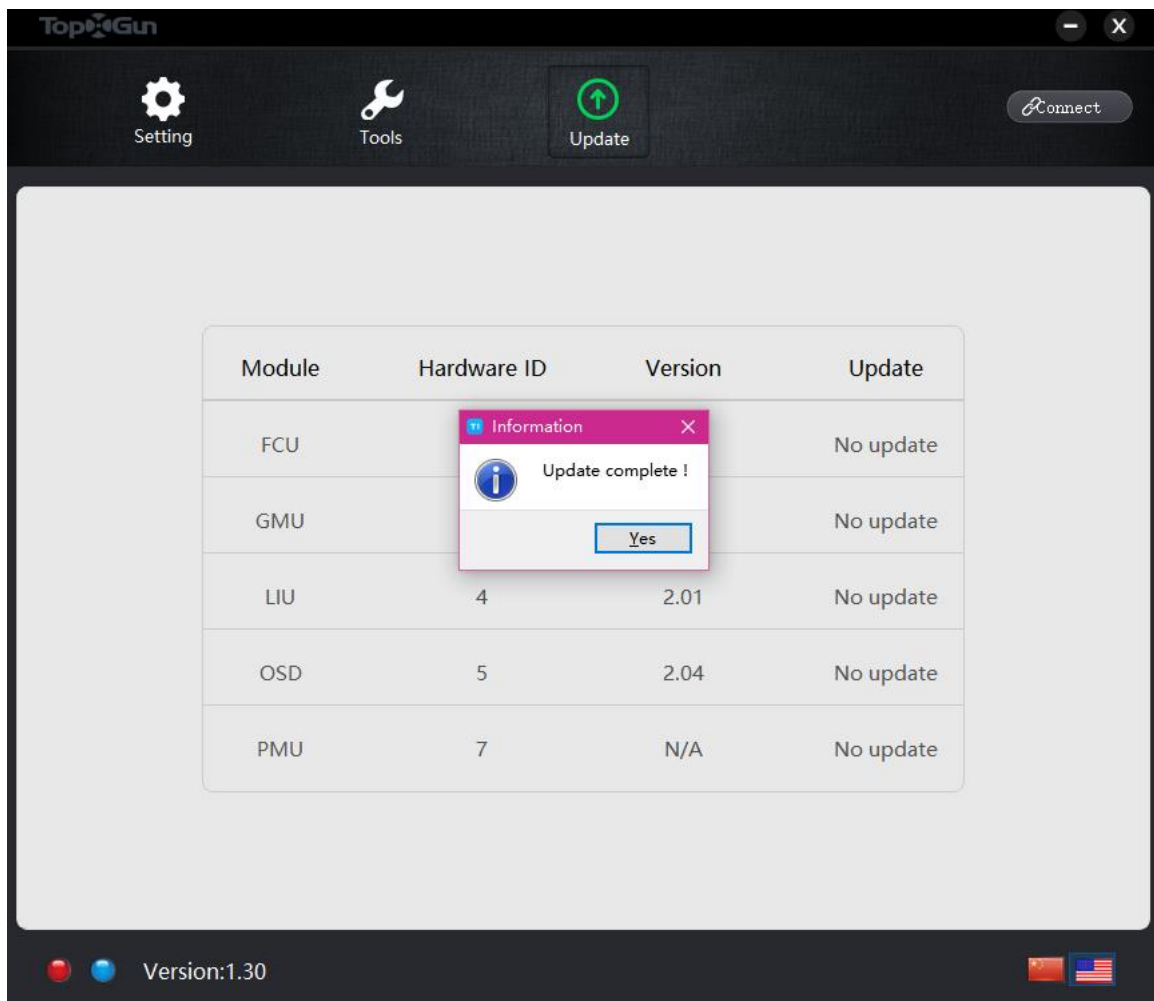


Figure 2-4 Firmware Update 4

When updated FCU version 3.00 and its previous version to version 3.10, the version NO. will be indicate error on the first connection. After the update is successful, the firmware version 3.10 will be shown.



When you reconnect after disconnect USB, firmware version number will display an error. Now you need to connect the computer to upgrade the firmware again. After the update is successful, the firmware version 3.10 will be shown again. After the reconnect the firmware version is displayed correctly.

2.4 First test flight

Double check the items by following steps before flight, ensure safe flight.

Check before flight

Please check the following content to avoid the accident.



- Check the nose direction,
- Check MC installation direction,
- Make sure each motor rotating direction is matched
- Make sure the connection between every part is solid.

Power on and Check

Inspection steps is following. For LED status indicators meaning, please refer to 'LED indicator descriptions'.

Step1. Please switch on the remote control at first, then power on multi-rotor.



After MC powered on, avoid shaking the aircraft before {   } (10) finishes, otherwise it may lead to poor flight attitude.

Step2. Observe the LED status, wait until the GPS status is normal, then move on to the next step.

Step3. Flip the CH5 stick to top and bottom quickly for several times, make sure the LED indication corresponds with position of mode setting.

Low-altitude test flight

Step1. Put aircraft in about 5 meters distance at least from the hand and wait for flight control system works normal (red flashing into green flashing).

Step2. Pull the left and right stick to the lower right corner in attitude mode, the motor unlocked and starts from No.1 by turn. If the amount of throttle lever in the process of take turns to start more than 20%, all the motors will immediately start.



Step3. After the motors start, apply the throttle to 30% slowly, and then try to push your sticks in Roll, Pitch and Yaw to feel if your multi-rotor moves to the corresponding direction. If ok, all sticks (except throttle stick) return to center, continue to push the throttle until the aircraft takes off.

Step4. Do every channel operation below 2 meters height , if responding is ok, you can explore the best performance by yourself.

3 Advanced Functions

3.1 One-Key Go Home

You can realize “One-Key Go Home” in any kind of mode when the aircraft is in air and GPS signal is ok.

After the function of “One-Key Go Home” is triggered, the aircraft will maintain current height and heading direction, then fly to overhead point of home point in a straight line, and the LED will turn to  (1)  (2); After the aircraft arrives at overhead point of home point, it will hover for five seconds, then lands vertically, the speed of landing will be adjusted according to current height of the aircraft; after landing, the flight controller will confirm if the landing is completed, the motors will be locked after confirmation, then the landing is over.





- When the aircraft is returning to overhead point of home point, you are able to adjust the heading direction of aircraft, but unable to adjust the position of aircraft
- When the aircraft is landing from overhead point of home point, you can operate channel roll, pitch and yaw.

3.2 Intelligent direction

Intelligent direction is also named ‘no nose mode’. You can put CH5 switch from the attitude mode to middle grade which means enter into the intelligent direction of the attitude mode (with no fixed high point), or put CH5 switch from the GPS mode to middle grade which means enter into the intelligent direction of the GPS mode (with fixed high point). Then after each time of unblocking, the current nose direction will be recorded as intelligent direction. No matter how the change of nose direction during flight, all round directions of remove control pitching and rolling will be taken as nose direction of unblocking.



3.3 Fail safe and Go Home

If the receiver you are using is S.Bus, there is no need to set Fail-Safe; if you are using PWM or PPM receiver, you need to set CH5 to Fail-Safe area (you can verify by shutting down the transmitter, refer to “RC setting” for more information)

LED will turn to {   } (∞) After the transmitter signal is lost, the aircraft will return to overhead point of home point and land, finally lock (refer to chapter “One-Key Go Home” for more information). If the transmitter signal is resumed, the aircraft will quit “Go Home” mode, then switch to the flight mode CH5 is corresponding with currently.

3.4 Low Voltage Protection

You can set trigger threshold of low-voltage protection in assistant software. This value is measured when the aircraft is loaded, so when the low-voltage protection is trigger, you can find the actual value is higher than trigger value you set after the aircraft landed.

There are two levels of low voltage protection, the first level protection has LED warning( (∞)), during second level protection the aircraft will land automatically with LED warning( (∞)), then lock after landed.



You can switch to attitude mode to quit protection after automatic landing of low-voltage protection executed.