

# YS-X6 Multi-Rotor Autopilot

User Manual

V1.0



[www.zerouav.net](http://www.zerouav.net)

## **YS-X6 Profile**

YS-X6 autopilot is a tremendous flight system for multi-rotors Supporting Android/Apple IOS and PC system and providing excellent auto-navigation, target lock, self-leveling and position/altitude holding. It is designed for both professional and hobby applications in commercial and industrial platform, can be installed easily in various common aircraft types from Quad-rotor to Octo-rotor(Including common Customize Motor Mixer) and supports most common third-party commercial ESCs. YS-X6 adopts ARM+FPGA classic structure, integrates high-precision sensor elements, applies advanced temperature compensation arithmetic and industrial attitude arithmetic, 400MHz refresh frequency as well, to make the system more stable, efficient and reliable.

## **Warning and Declaimer**

1. The manual contains information about installation, debugging, and how to use the product. Please read it thoroughly before using the product.
2. Zero UAV (Beijing) Intelligence Technology Co. Ltd. assumes no liability for damage(s) or injuries incurred directly or indirectly from the use of it.
3. Please keep far away from the crowd, children and property when using the product.
4. When any of the following events or incidents has taken place, we will not offer any warranty and service:
  - (1) The product has been repaired, modified, or any parts of the product have been substituted or replaced by anyone not expressly authorized by Zero UAV.
  - (2) The warranty card, the serial number of the hardware and the flight data or any of these items is lost.
  - (3) Damaged caused by use's faults such as attempting wiring not in accordance with the manual, which may cause short circuit.

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## Safety Instructions

For safety reason, please pay serious attention to following items:

1. Please remove all propellers during configuration and setup.
2. The side marked "IMU" of the IMU faces up. The arrow points to the aircraft head.
3. Make sure switch on the RC transmitter first then power on multi-rotor before takeoff! Power off multi-rotor first, then switch off RC transmitter after landing. Pay special attention to it when using the S-BUS or self-adaptive feature of the autopilot.
4. Throttle calibration, manual rudder position, realtime rudder position, channels setup must be accurate.
5. GPS+COMPASS is sensitive to magnetic interference, should be far away from any electronic devices. The arrowhead points to the aircraft head.
6. Please enable F/S function of RC transmitter before takeoff.
7. Do not fly in GPS mode when the signal is not good (red light blinks) or the "GPS Velx (cm)" & "GPS Vely (cm)" in GCS is more than 15cm/s.
8. The Gimbal Servo can be supplied power from any ESC, but if ESC has no BEC output, please add extra power but not use the power supplied from Autopilot.
9. In auto Go Home mode, the two ways can stop motors : Make throttle stick under 10%; Click "Diabie Engine" in "Control" of GCS. The above two ways can not stop motors when in other Flight Mode.
10. The low voltage Alert is NOT fun. You should land your multi-rotor ASAP when the Alert remind you to prevent your multi-rotor from crash or any other harmful consequences.
11. Please don't takeoff when the "Vibrate state" in GCS displays a high value.
12. Must check the "Course Angle" and "Magnetic Declin" value in GCS are correct after compass magnetic calibration.
13. Must check the "Attitude Angle" and "Static Angle" in GCS are correct before

takeoff.

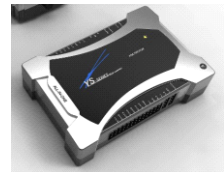
14. Please pay special attention to the wire connection of GPS/COMPASS , IMU and MC. Wrong wire connection will result in short-circuit and may smoke your devices.
15. Anti-plug Design is NOT fun, please don't try.
16. In some strong magnetic field, if "Course Angle" value displays different from real rotational angle, please recalibrate the compass magnetic before takeoff.
17. The RC receiver is enabled in default, please check your RC transmitter before takeoff.

## In Box

■ Hardware □ Software (Need Download)

### ■ Main Controller(MC) X1

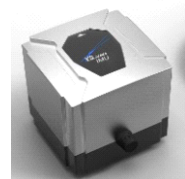
The MC communicates with IMU, GPS/Compass and other external electronic devices to carry out autopilot functionality. Update firmware from PC R232 serial port.



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### ■ IMU X1 (Inertial measurement unit)

It is for sensing the attitude.



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### ■ WIFI X1 (Data link can be added to extent range)

It is used to communicate ground station and autopilot, or connect to hot spot of phone/tablet.



YS-GCS record real time flight state through WIFI module.

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■GPS/Compass X1

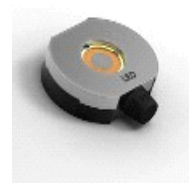
The GPS/Compass module is for sensing the position and Direction.



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■LED Indicator X1

The LED indicates current flight states.



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■GPS BracketX1

GPS/Compass is sensitive to magnetic interference, please use this bracket to mount GPS module.

■3-PIN Servo Cable X8

Used to connect MC to RC Receiver.

■R232 Serial port to 3-PIN Servo Cable X1

It is for connecting PC to MC and update firmware.

■3M Double-side adhesive tape

Used to fix components on multi-rotor's frame

■Warranty Information Card X1

It provides Product Serial No., Purchase Date. Please fill out related information and return back to Zero UAV for registering your product warranty.

- ☐GS Software for Android System
- ☐GS Software for Apple IOS System
- ☐GS Software for PC Windows XP/7/SP3 system
- ☐Firmware Program on PC.
- ☐Firmware for updating or upgrading.

## IMU

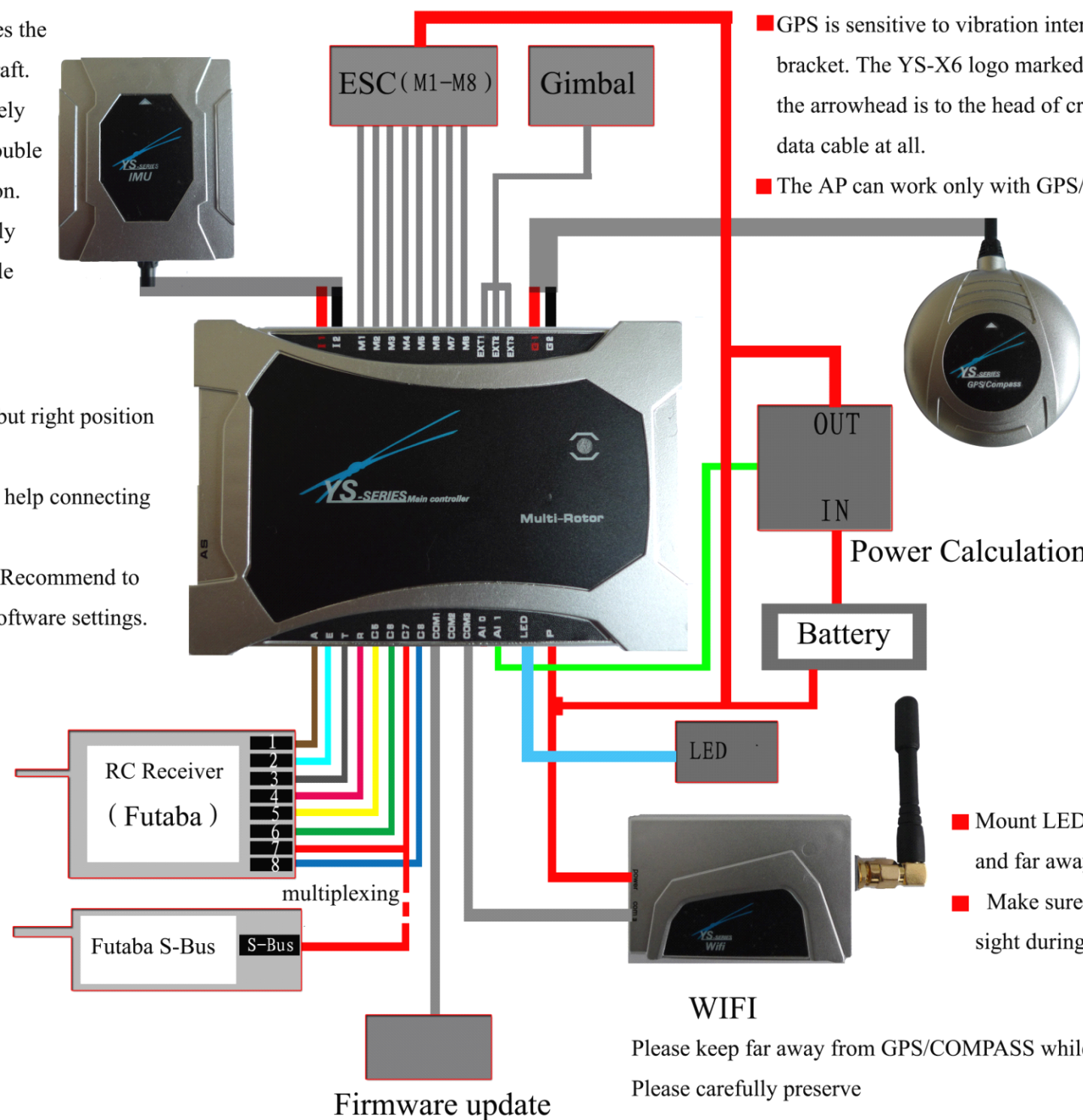
- The IMU is best positioned near the Multi-Rotor's center of gravity, where vibration is relatively low.
- Orient the IMU such that the arrow marked on the printed surface of the IMU faces the sky, the arrowhead is to the head of craft.
- The sides of the IMU should be precisely parallel to the multi rotor body. Use double-sided foam tape for secured installation.
- IMU Module is precise, please carefully preserved. DO not extend the data cable at will.

## Autopilot Box

- No direction request on AP mounting but right position to avoid using ESC extending cables.
- Make sure all interfaces are exposed, to help connecting easily and upgrading firmware.
- Once the position of AP is confirmed. Recommend to firm AP after completing wiring and software settings.

## RC Receiver

- This is only connection example, please set aileron/elevator/throttle/direction/ actuator control channel on your RC Tx ready first.
- Select two 3-way switches as the switch of controlling modes, and then connect the receivers to the right channels of AP.



## GPS Compass

- GPS Compass is sensitive to magnetic interference, should be far away from any electronic devices. Please use our GPS bracket to mount GPS module.
- GPS is sensitive to vibration interference, please firm the GPS bracket. The YS-X6 logo marked on GPS should face the sky, the arrowhead is to the head of craft. Please DO NOT extend data cable at all.
- The AP can work only with GPS/Compass connected.

## Power Calculation

## LED

- Mount LED at the right position and far away from GPS.
- Make sure the light can be in sight during flight.

## WIFI

Please keep far away from GPS/COMPASS while mounting.  
Please carefully preserve

**Note:**

The power supply range of MC (Autopilot) and WIFI is 3s~6s(Power remains a little), namely 10.8V~25.5V, MC provides 5.7V power to RC receiver automatically, no need to add any out-built power module. After correct connection and powering it, the autopilot will complete initialization in few seconds and LED light starts to blink in red for three times continuously, indicating the connection is correct and motivated successfully.

The above "the light blinks in red for three times" is a sign to check whether all hardware are working normally or not, all data connection is based on this. After powering if no "the light blinks in red for three times", please contact Zero UAV (Beijing) Intelligence Technology Co. Ltd. or its distributors directly. Otherwise, please check the assembly carefully referring to the above illustration.

**Attention: Any wrong connection of IMU or GPS may result in burning out the devices.**

When ESC and motor work, they will produce serious magnetic interference, so GPS and magnetic sensor must be installed by nonferrous to keep far away from motor and ESC (especially the 8-axis multi-rotor), and the arrow is towards aircraft nose. Otherwise, the aircraft will fly circling around and can not correctly hover.



## **Power management module & Speed sensor**

### **(1) Power Management module**

When YS-X6 autopilot is access to power module, user can directly observe the present discharge current and battery consumption in "data " page of GCS .If make use of this function, user must connect the autopilot to power module firstly, push the throttle stick to the bottom, then power the autopilot. After that, AP will zero gyro automatically, and start to output the current value (ampere A) and power consumption(MAH) according to the detection of power module.

### **(2) Speed Sensor**

When using SBUS, after emptying CH8、A、E、T、R、CH5 channels, speed sensor can be connected to show the accurate rotation speed of each motor, so user can conveniently observe the efficiency and balance of the multi-rotor. When not using SBUS, the CH8、A、E、T、R、CH5 channels are occupied by receiver plugs, so user can not use the speed sensor.

User can insert the speed sensor plugs which are compatible with YS-X6, into CH8,A,E,T,R,CH5(four-axis connected to CH8,A,E,T) of AP according to the order of M1~M6, connect the other end of detection line on speed sensor to any phase among three-phase power line on each corresponding M1~M6 motor, and weld firmly.

In "settings" of GCS, fill in the motor magnet quantity ( the pulse value produced by motor when rotating a pad), namely user can observe the current rotation speed of 4 or 6 motors on "data" interface. The update frequency of rotation speed is 5HZ, namely the rotation speed is detected and displays once 200ms.

## **Data Link extension**

User can purchase XB-PRO900 data link on selection to extend the control distance, making the GCS and mobile control avoid WIFI distance limit. For

XB-PRO900 data link, the transmission power is 100 mW and frequency 900 MHZ, communication distance measured actually is not less than 2 ~ 3 km (open areas). The physical port of XB-PRO900 data link is RS232, and the communication baud rate is 115200 BPS.

A pair of XB-PRO900 contains two data links, one is on set-top, another one is on the ground, encapsulations are consistent and interchangeable.

### **(1) Data link connection on Craft**

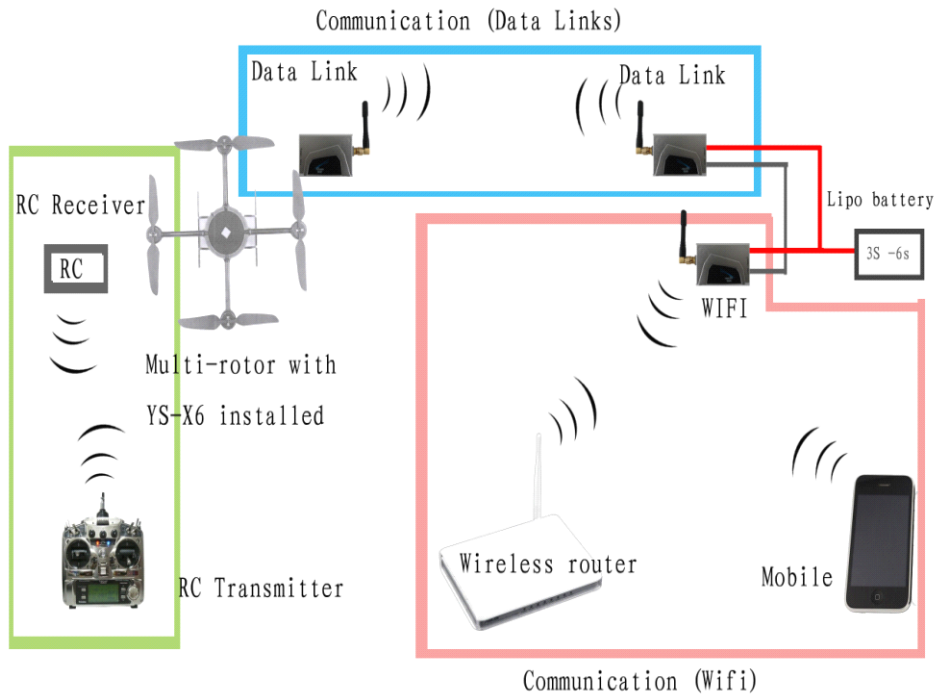
Take WIFI module off from multi-rotor, and install the data link to the aircraft with reference to the connection method of WIFI module, and connect the data link to COM3 on AP .



Data link connection on Craft

### **(2) Data link connection on the ground**

Connect WIFI module taken off from the craft to another data link on the ground(using the connecting lines with data link), to supply power with wireless routers on the ground together. Namely the parts on the ground are: the ground station, WIFI module, wireless router .



Data link and WIFI both are powered by 3 S ~ 6 S lithium battery (same as main board of AP), the power line is red-black color line, red is positive and black is negative.

## Joystick Connection

After purchasing the joystick, users can use it to control the aircraft in GPS mode. When data link is unconnected, joystick control distance depends on WIFI distance. When using XB-PRO900 data link, the control distance of joystick depends on the communication distance of data link.

Joystick contains two parts: joystick and joystick WIFI. (Note: different from the communication WIFI above, not in common)

## (1) Joystick Connection



The joystick connection is quite simple, just need to connect joystick WIFI to joystick according to the illustration above, and power it in a convenient place , joystick can work automatically .

**Notice:** joystick and WIFI both are powered by 3 S ~ 6 S lithium battery (the same as AP main board ), the power cord is red-black color line, red is positive and black is negative.

The signal lines connecting joystick and joystick WIFI, are three-color dupont line.

## (2) Joystick Instructions

1. In GPS auto-hovering mode(CH5,position3), can use joystick to control the aircraft. After power the joystick, joystick operation equals to the cross operation on mobile remote control interface. To avoid the confliction with mobile cross operation, turn off the mobile remote control in mobile GCS to cancel the round circle on the cross.

2. When RC is off, the round circles on RC cross interface in mobile GS will display once automatically. At this time can't use the joystick, otherwise it equals there are two cross operations at the same time. If now need to use joystick, select "menu" and click on " RC off" in mobile GCS, when the round circle on RC cross interface disappears ,enable and use the joystick.

## **Software (GCS) Installation**

Please download YS-GCS from our website, install it to your Android (Phone or Tablet), Apple (Iphone or Ipad) or PC.

### **To Android:**

Download YS-GCS to mobile and running it once in file manager can complete the installation.

### **TO Apple** (IOS 5.0/5.0.1/5.1/5.1.1 ):

Please make sure jailbreak before installation

First, make sure your Iphone is connected to network.

1. Get into "Settings" find your wireless network in "WLAN" , remember the "IP Address" of your Iphone.
2. Select "Never" in "Auto-lock" of "General"
3. Download WinSCP and install it to PC, then restart PC.
4. Open WinSCP: fill in "same IP Address from your Iphone" to "Host Name", fill in "root" to "User Name", select "SCP" in "file protocol", click "log in" at the bottom, your Iphone can be connected then.

Notice: If it can not be connected, you need to restart Iphone and install openssh.

5. After connecting Iphone successfully, Open the "WinSCP", you can see your Iphone file directory (Including "root" directory) is showing at the right side.
6. Find YSwifi.app and copy it to " Applications" file in "root" directory.
7. Change the property of 'YSwifi.app" to same showing as below., then you can

see the YSwifi Icon is on your Iphone desk.

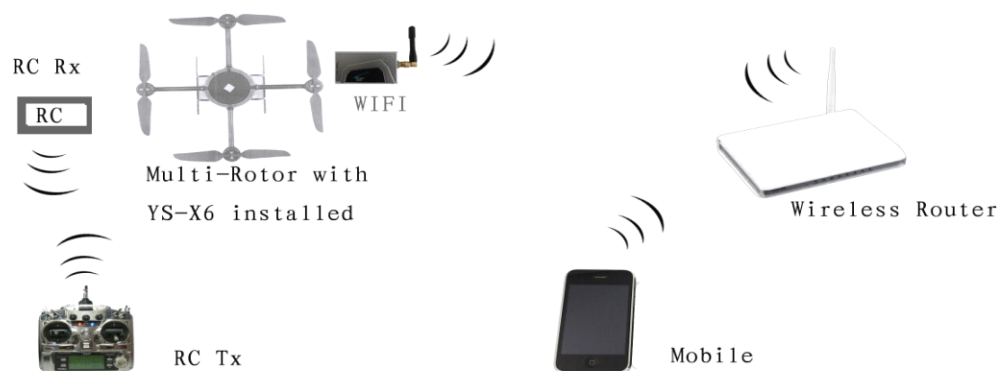


## TO PC:

Running YS-X6 Icon once can complete the installation.

## Software (GCS) Communication

### WIFI Communication



Communicate the AP to ground station through WIFI

### Way1:

1. Build up a wireless network through a Router (Recommendation)

WIFI Module has been set in default to search and connect wireless network named "YS-X6 **Serial no.**" example:YS-X6-10200 and password is 82890430. MUST use **WPA2-PSK AES** encryption method.

2. After the above wireless network was built successfully, open WLAN in your phone/tablet and connect it to the same network name with router, wireless network is built up now.

3. Then power on the autopilot and router, if the values in "Data" of 'GCS' are walking, means WIFI is communicated with Autopilot successfully.

When using Hotspot by Mobile, it can be connected only with IP Address 192.168.1.X. , otherwise please add a router to connect.

For example: If Mobile IP is:192.168.0.1,the Hotpoint function can not work.

**Tips:** Default User Name:YS-X6-Serial No., password: 82890430

### **Way2:**

Build up wireless network through the hotspot of Phone/Tablet.

It requires the phone or tablet must have hotspot function.

## **Firmware Upgrade**

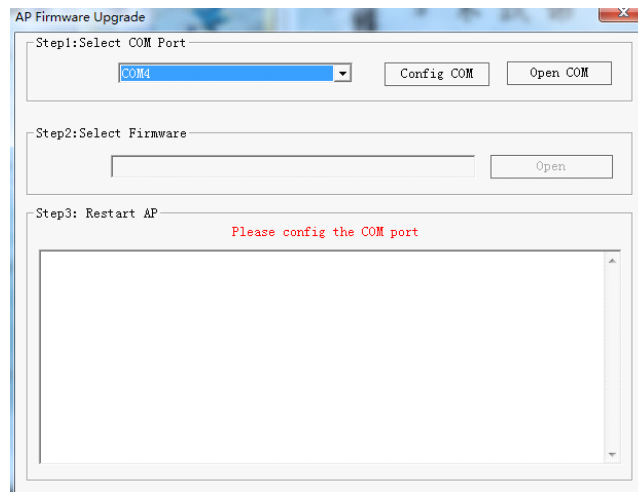
YS-X6 provides simple firmware upgrade ways, before upgrading firmware please download the firmware from Zero UAV official website.

Cable: Plug one end of USB Serial Line to USB port on computer, and the other end to COM1 on autopilot.

Operation steps:

**Step1:** Autopilot can not be powered. Connect 3 pin connector to the COM1 port of the autopilot and 9 pin connector (DB9) to PC serial port.

Do not enable autopilot power, if enabled please shut down. Enable the private programme for upgrade "AP Firmware Upgrade", click on "Upgrade", the software will open the interface as below.



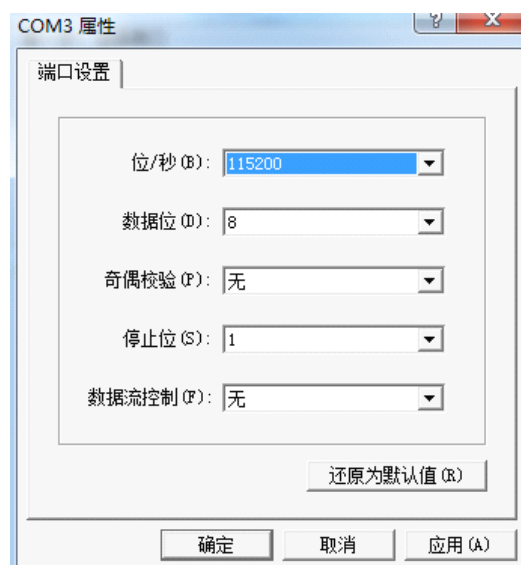
**Step2:** Select COM port used for upgrade(you can single click on with right mouse button "my computer"->"attribute"->device manager"->"port"(COM/LPT)to find if you do not know which COM to use),click on "Config COM", then setup its property to be:

Baud rate: 115200

Data bite: 8

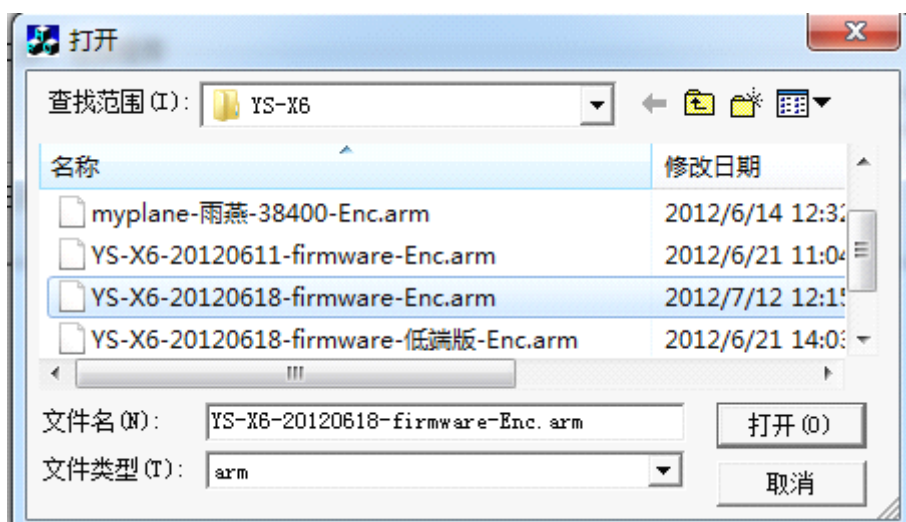
Parity: None

Stop bit: 1 after setting click on "Open COM"

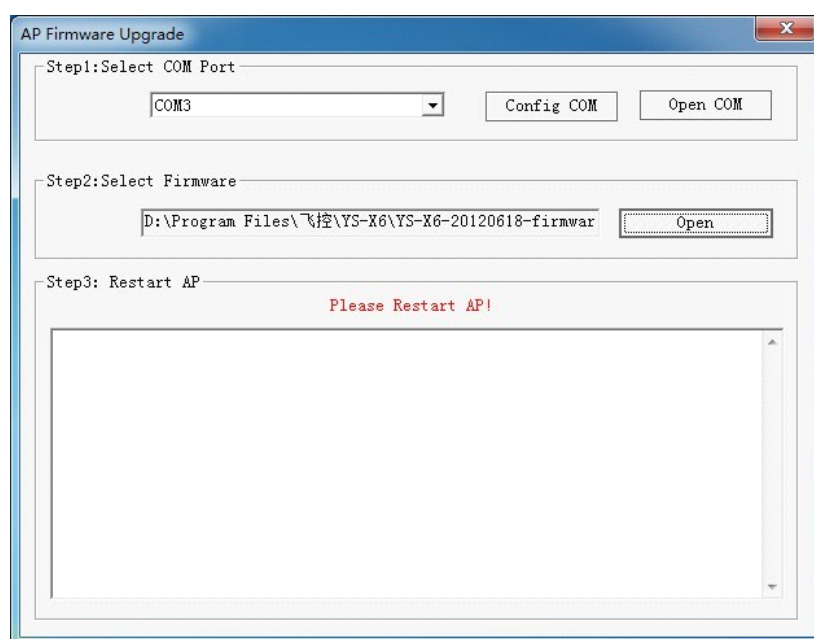


**Step3:** Select a ".arm" file offered by Zero UAV to upgrade.





**Step4:** Power the autopilot, upgrade can be completed automatically. When it says in red words "Upgraded, please close the window.", then autopilot can be powered off.



**Attention:**

- 1 If all settings are finished, if repower on the autopilot the software doesn't operate the upgrade, please shut down the software and reinsert the serial port.
- 2 If the below warning is showing,



Please download the firmware and operate above steps again.

## Flight data

During flight, all the realtime flight data will be saved automatically to the root directory of mobile in "hj" folder named "T+ runtime" The flight tracking file for Apple is saved to the folder: /private/var/mobile/documents/yswifi, When any problem happened, you can send it back to the factory if need. This file is one important warranty information, please preserve it carefully.

## RC Transmitter Settings

Please read this introduction thoroughly, because all fight control mode is based on using Channel 5 and Channel 6 on the RC Transmitter. Both channels must be set to 3-position switches which is for switching Manual mode/Attitude mode/GPS attitude mode. Users can check the working state of the switches in the "Flight Mode" on GCS Interface. Please familiarize with the following switch position:

CH5		CH6
		It works only when CH5 at position 3
Position 1 Manual Mode	Red light blinks for 3 times	Position 1 Auto Hover mode
Position 2	Blue light blinks	Position 2

Attitude Mode	twice	Auto Navigation mode
Position 3 GPS Attitude Mode	Green light blinks once	Position 3 Auto Go Home mode
Remarks  1. CH6 is available only when CH5 is at position 3. 2. Quit from any mode in CH 6, need to switch CH5 from position 3 to other positions.  Example: If you want to fly in Auto Navigation mode, switch CH5 to position 3 first, then switch CH6 to position 2. If you want quit from Auto Navigation mode, need to switch CH5 from position 3 to position 1 or position 2.		

### **CH5 position**

**Position 1.** Manual Mode: control the aircraft by manually.

**Position 2.** Attitude Mode (Stabilization & position hold): User can control the aircraft manually, but altitude holding is decided automatically by the autopilot through barometer sensor. Switch CH5 to position 2 before takeoff. Push THR stick to climb up, pull back to make it go down, keep THR stick in the middle to hold altitude.

**Position 3.** GPS Attitude Mode (Auto Mode), please check below " CH6 Position".

### **CH6 Position**( It works only when CH5 is at position 3)

**Position 1.** Auto Hover mode

The aircraft will hold position & altitude automatically in this mode. Pushing/Pulling Elevator stick or moving the Aileron stick left/right to make the craft move up/down or left/right. After releasing the sticks, the craft will hover there automatically.

**Position 2.** Auto Navigation mode (Waypoints)

Please make sure the waypoints have been uploaded successfully before switch to this position, other your aircraft may fly away even lost.(Please check "Waypoints Fly" for more details)

### **Position 3.** Auto Go Home mode

Auto Go Home mode

1. "Auto Go Home" for standard version: after the aircraft reaching "Home location", need to control the aircraft manually and switch CH5 to position 2 to stop motors.

"Auto Go Home" for Professional version: your aircraft will land automatically when reaching "Home location" and make throttle under 10% can stop motors immediately.

Please check "Home location" in GCS page.

#### **Tips:**

1. When any accident unexpected happen, please switch CH5 back to position 1 (Manual mode), prevent your craft from flying away.
2. Setup "Auto Go Home" as Fail-Safe of RC Transmitter, we recommend users to setup throttle stick 30% above when go home, because the motors will stop when throttle stick is under 10%.

## **Ground Control Software (GCS)**

### **Buttons**

No.	Buttons	Functions
1	Control	Default interface to control the aircraft
2	Data	Real time flight data
3	Map	Real time map or saved map
4	Settings	Setup various states
5	Parameters	Adjust various Attitudes
6	Cross	General control the flight

	Interface	
7	Round Circle in Cross	A button to control the flight
8	The Cross	A track to control the flight to Climb up/ Go down/rotate
9	Enable "Control"	Click it enter into controlling by phone
10	Magnetic data	Used to check the magnetic compass calibration successful or not
11	IP Searching	Functions Reserved
12	Quit	Quit from the GCS

### **Control**

Enter into controlling by phone with switching the RC Transmitter to Auto Hover mode(CH5=position 3, CH6=position 1) , and then click " Enable Control" in GCS.

### **Control Methods:**

1. When no any press on the 'Cross", the aircraft will Auto-hover with position and altitude hold.
2. Press down and hold the middle round circle, moving your finger to left/right/front/back or to any direction, the craft will perform same like when operating the aileron and elevator stick of RC Transmitter. (Your phone will vibrate once when start to press down the round circle)
3. Touch any point on the Cross ( No pressing down the middle round circle), up point is "climb up", down point is "go down", left point is "change the flight direction to left and then go to left, right point is " change the flight direction to right and then go to right".

The distance from the touching point to the middle round circle is farther means the flight speed is faster, the closer the slower flight speed.

4. When wifi signal is lost, the autopilot will enable RC Receiver automatically, you can use RC Transmitter to control the aircraft. When wifi signal recovers,

autopilot will disable RC Receiver and Enable "Control" automatically.

### Operations on cross interface:

"Control" Enabled	Operation methods	Aircraft Reactions
Middle Round Circle Area	Red circle means unlocated, Green circle means located	No reaction
How to Auto Hover	No touch any area or button	Auto Hover
Duiring flight	1 Press down and hold the circle, drag up or down 2 Press down and hold the circle, drag up or down 3 Press down and hold the circle, and drag left top, left bottom, right top, right bottom etc.	1 Move to front or back 2 move left or right 3 Move left top, left bottom, right top, right bottom etc.
Climb up/Go down/Rotate	Touch any point within the range of the Cross: 1 Right Top 2 Right Bottom 3 Left 4 Right Notes: (1) The distance to the round circle means the flight speed. The farther ,the faster. (2) Press=moving, release=stop moving (3) Release=position hold immediately	1 Climb up 2 Go down 3 Rotate to left 4 Rotate to right
WIFI signal lost duiring flight	1. When flying in Auto Navigation( waypoints) , no need do any operation. 2. When flying in other modes, make your aircraft "Go Home and Landing" after 10 seconds.	1. Auto Navigation 2. Go Home and Landing
Reget WIFI signal	Quit from GPS Attitude Mode	

### Data

Get into the data interface by touching the button "Data", shown as below:



### **GPS Satellites:**

It shows how many satellites were researched and reached.

### **GPS Velx(cm)**

### **GPS Vely(cm):**

GPS velocity. It displays a value below 10 when the aircraft is static.

### **Xekf Velx**

### **Xekf Vely**

### **Xekf Veld:**

The velocity after Kalman filtering. It displays a value between 0-20 and increase constantly. When the velocity exceeds normal range, LED will be in solid white, suggest you land the aircraft urgently.

### **Attitude Angle:**

Display real time attitude duiring flight.

### **Static Angle:**

Display real attitude of the static aircraft. Static Angle can work only with no any vibration, used to check whether the aircraft is in all good conditions before takeoff.

### **Target Point:**

You can fill the waypoints number which you want the aircraft fly to.

### **Flight Mode:**

It displays the craft states: Zero Gyro, Manual, Auto Hover, Auto Navigation, Auto Go Home and Land, setup status.

**Flight Altitude:**

Barometer altitude of the craft, unit is meter.

**Course Angle:**

Course Angle means the directions which the crafthead points to. Due North=0 degree, clockwise direction is positive, counterclockwise direction is negative. For example: Due East=+90 degree, Due West=-90 degree, Due South=+180 degree or -180 degree.

Notice: It works only when in GPS mode and flying in Auto Modes, it will not work when in Manual mode or Attitude mode.

**AP Volt:**

Autopilot voltage

**GPS Lat**

**GPS Lng**

GPS longitude and latitude.

**Manual Servo Position**

**Rudder    Aileron**

**Elevator    Throttle**

Please check more details in "RC Transmitter Settings".

**Vibrate State:**

Vibrations from IMU.

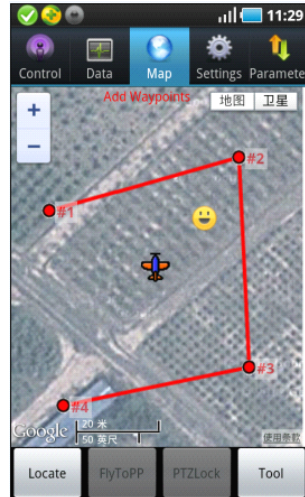
1-3 means your aircraft is in good condition.

3-10 means it is workable but not good.

10 above , it displays in red color, means vibration exceeds limits.

**Map**





+: Zoom in

-:Zoom out

Map: map mode.

Satellite:

satellite mode

**Tips:**

1. The map which you used last time was saved in default, when you open it next time, it shows up the saved map.

2. You can research new maps by connecting network again.

## **Locate**

### **Locate Plane :**

After the GPS was located, click this button can find where your aircraft locates.

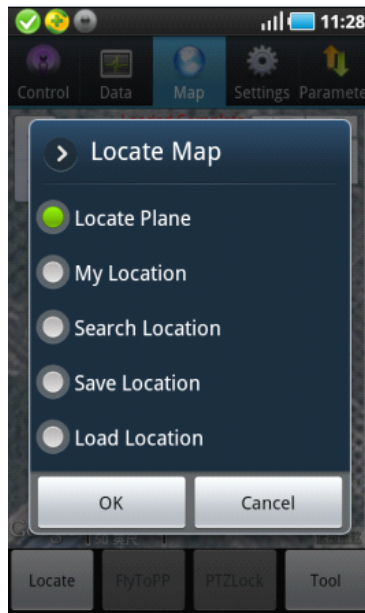
### **My Location:**

Phone/Tablet position. The GPS of Phone/Tablet need to be enabled.

**Search Location:** (Search the position where you want to check)

**Save Location :** (Save the current position on map)

**Load Location:** (Load the saved position on map)



## Fly ToPP

Please check "Fly To Point Fly" page.

## PTZ Lock:

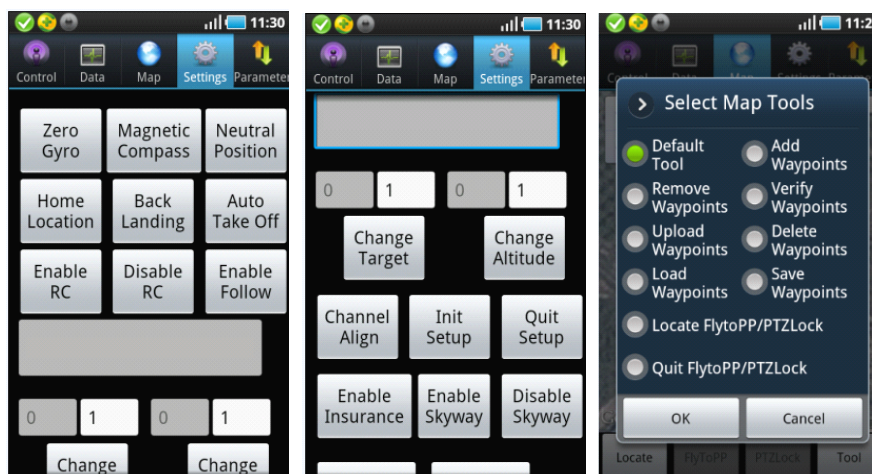
Please check "Target Lock Fly" page.

## Tool

Click it enter editing waypoints, please check "Waypoints Fly" Page.

Locate FlytoPP/PTZLock: Move Map center to operation area.

## Settings



## Notice:

All operations in settings are vitally important, please operate seriously.

## Zero Gyro

1. When the craft is static on the ground and the value difference between Attitude Angle and Static Angle is more than 5, please go this Operation.
2. After performing this operation, the flight state will be "Zero Gyro", please wait patiently, the flight mode will change to "Manual".
3. After Zero Gyro, if the Attitude Angle and Static Angle is in same value, means "Zero Gyro" is Successful.

Key tips: Absolutely prohibit to Zero Gyro duiring flight, it can be operated only When no any vibration.

### **Magnetic Compass**

Click it enter into "Magnetic Compass" Calibration.

### **Neutral Position**

It's used to capture Neutral Position after flight and Transmitter adjustments, please operate it by manually in no wind.

Notes: When capture neutral position, please move all sticks to middle position.

### **Home Location**

It's used to change new home position.

### **Back Landing**

Auto Go Home and Landing. After the aircraft reaches home location, the craft can be controlled manually.

Notice: The motors can be stopped only by clicking " Disable Engines".

### **Auto Take Off**

Take off fully automatically, please check 'Auto Take Off' Page.

### **Enable RC**

### **Disable RC**

We suggest you to enable or disable RC only when need to Auto take off.

### **Enable Follow**

This function can be used only when you phone has GPS hardware and got 4 above GPS satellites, and in GPS Attitude mode.

After enabled Follow Me, the aircraft will fly automatically following mobile GPS location.

### **Change Target**

In Auto Navigation mode, fill in the new waypoint number which you will fly to.

#### **Attention:**

Fill in a number which is in the range of uploaded waypoints number.

### **Change Altitude**

In waypoints mode, it's used to set flight altitude, put in altitude needed here. Example: filling in 10 means setting flight altitude as 10 meters.

### **Channel Align**

Please confirm to align the channel without any electric power connected. Example: When moving Throttle stick as Minimum-Maximum-Minimum, if GCS data displays as below: Manual Throttle is 7 when Throttle stick is at the Minimum position and 9 when at the Maximum position, that means Channel Align is completed successfully.

#### **Special Attention**

Please don't configure propeller when power first time, only power the autopilot and need to calibrate Channel Align first.

Operation as blow:

Select "Channel Align" in Settings, push/pull Elevator sticks of RC Transmitter to the Maximum/Minimum, move Aileron sticks of RC Transmitter to the leftmost/rightmost within 5 seconds. After 5 seconds, autopilot will complete collecting data automatically. User can observe whether the data shown in GCS can match with real manual operation when was moving the sticks.

Example:

1. When pulling Throttle stick to the Minimum, the "Throttle" showing in GCS displays 7; Pushing to the Maximum, it displays 90.
2. When moving Aileron stick to the leftmost, the "Aileron" showing in GCS

displays 40; to the rightmost, it displays 40.

3. When moving Rudder stick to the leftmost, the "Rudder" showing in GCS displays 40, to the rightmost, it displays 40.

4. When pushing Elevator stick to the Maximum, the "Elevator" showing in GCS displays 40, pulling to the Minimum, it displays 40.

They displays "Neutral Position" without any movement.

Please make sure the Throttle stick is at the Minimum position before take off, and flight mode/CH5 must be in Manual. Otherwise it's extremely possible to result in Injures or Damages caused by rotors rotates suddenly after connecting power. (It takes FUTABA as standard example with no any reversed-directions set. If use WFLY RC Transmitter, it requests to reverse directions, please make sure the value displays in "Data" of Rudder/Aileron/Elevator/Throttle in GCS can match with real operation when moving each stick from the Minimum to Maximum, otherwise need to reverse directions of RC Transmitter channel.)

### **Init Setup**

It's used to align channels or complete parameters of craft. After clicking this button, flight state will display "Settings". After getting into settings, the control channels for each motor on craft is directly connecting to throttle channel of RC Transmitter and no any mix control output, it is equal to like a Y-line of "one to many", it's convenient for users to set strikes for all rotors at the same time.

### **Quit Setup**

After completing Throttle channel calibration and all parameters filled, click this button to exit from settings.

### **Enable Skyway**

The craft can be switched to Auto-navigation mode only after set CH6 to Auto-navigation and then click this button "Enable Skyway" to open the waypoints first.

### **Parameters**

Please do NOT change the parameters of Roll/Pitch/THR/Rotate PID.



### Cell Num

The autopilot can calculate the low voltage alert according to the Cell Number filled in by users. When the mobile vibrates once each 2 seconds, it means the power is getting low and remind user to note. When the mobile vibrates once each 1 second, it means the power is getting very low and request the craft to land at once.

### Ctrl Type

Complete default number 2.

1. Attitude mode, fit to adjust parameters/dynamic flight.
2. Acceleration mode, fit to static flight.

### Magnetic Declin

Fill in local magnetic declination, deflection to West is Positive/to East is negative ( most regions in China are deflecting to West).

Example: Magnetic declination is 6 degree 30' West, namely 6.5 degree, then fill in 6.5.

Please refer to the below website about magnetic declination

<http://www.ngdc.noaa.gov/geomagmodels/struts/calcDeclinat>

### Aircraft Type

Fill in mix control type, please refer to Appendix 2.

### PTZ Roll Sensitivity

### **PTZ Pitch Sensitivity**

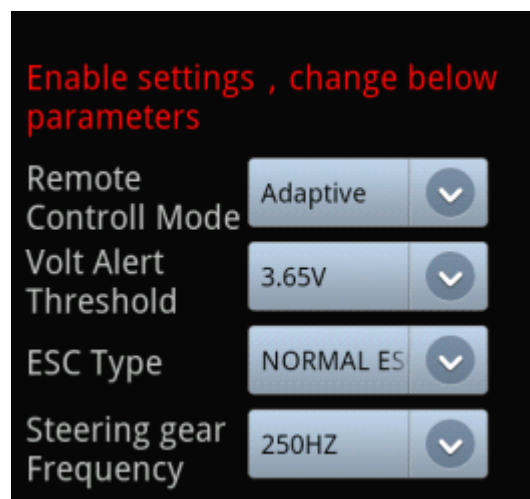
It's used to adjust the compensation angle of PTZ. If user feel the compensation angle is small, can fill in bigger number, on the contrary fill in smaller number (Note: can fill in negative value)

### **Max Speed**

Set flight speed.

The four parameters shown as below need to be filled in when use first time.

Please get into the "settings" to put in the four parameters and upload it to the Autopilot first, it can be allowed to fly only after getting the parameters by clicking the button "Get".



### **Remote Control Mode**

Can select the options according to the RC Transmitter which is been using.

Adaptive: the autopilot can select the remote control mode automatically according to the RC Transmitter which is been using.

Normal: Normal FUTABA Receiver, autopilot CH1 connects to receiver CH1, autopilot CH2 connects to receiver CH2.

S-BUS: Only connect autopilot CH7 to the receiver S-BUS port

JR Satellites ; the current firmware does not support JR Satellites temporarily, but later firmware will support.

### **Volt Alert Threshold**

Fill in the alert voltage of each battery which is been using, need user to fill in after measuring by self. Usually fill in 3.65

### **ESC Type**

Fill in the ESC type which is been using.

Note: Fault filling of Normal ESC and XA ESC will result that the propellers go out of control after power connected.

### **Steering gear Frequency**

Input the correct value according to your servo type: 50HZ for Analog Servo, 250HZ and 330HZ for Digital Servo.

## **Customized Parameters**

Customized parameters can be set up by yourself, users can customize the proportion coefficient of pitch, toll and turning to apply in the multi-rotor body with irregular configuration.

Customized throttle parameters:all of them must be 100, wrong setting will result in immediate rotating after powering, which is very dangerous .

Customized waypoints flight parameters:to make the aircraft rotate to right, the speed changing method of correspondent motor should be decreased to -100, and increase to 100.

Customized pitch parameters: to make the aircraft head be downward, the speed changing method of correspondent motor should be decreased to -100, and increase to 100.

Customized toll parameters : to make the aircraft roll to right, the speed changing method of correspondent motor should be decreased to -100, and increase to 100.

e.g:the flight parameters setting of QuadX is as following:



	THR (%)	COURSE (%)	PITCH (%)	ROLL (%)
M1	100	100	-100	-100
M2	100	-100	-100	100
M3	100	100	100	100
M4	100	-100	100	-100
M5	100	0	0	0
M6	100	0	0	0
M7	100	0	0	0
M8	100	0	0	0

First please fill in “customized parameters” in “setting” of GCS, after confirmation, (**attention:the wrong settings will result in immediate rotation with high speed after powering on or the aircraft type is changed to 10,so strongly suggest you to take off all of the propellers to ensure your absolute safety!**) change the aircraft type to 10, and then power on the autopilot again after getting the correct confirmation, push the throttle in the minimum position to make the motor rotate in slow speed, and check whether the control method is consist with settings, after all finished the aircraft can fly.

## Arm/Disarm motors and Failsafe

### Enable Motors Protection

Any time after landing or before take-off, only if it is manual mode and the throttle stick is at the bottom position, the motors can be locked up completely after 5 seconds; After locked up, motors won't rotate even if push the throttle stick. The insurance only can be enabled through “enable insurance” on mobile or through motor arming.

### Disarm motor

Only in manual mode and without holding altitude, the motors stop rotating with pulling the throttle stick back to the bottom. Other time, if pull back the throttle stick to the bottom, the motors won't stop rotating but only decrease altitude.

Whenever need to stop the motors urgently, below ways can help:

- (1) Switch CH5 to position 1, namely in manual mode but without holding altitude, what's more the throttle stick must be in the minimum.
- (2) when mobile selects "RC off", click on "motor off " on mobile RC interface; Or enable the receiver "RC on", according to the method (1);
- (3) After auto-returning home and landing on the ground, click on "motor off" on mobile RC cross interface and confirm; Or enable the transmitter, according to method (1);
- (4) After landing on the ground in holding altitude or GPS mode, press the cross downward continuously, namely the throttle stick or RC throttle stick controlling landing is on the bottom position all the time, motor will stop rotating slowly till shut down completely and locked up.

### **Wifi Signal Lost**

- (1) When receiver is enabled, if the WiFi signal loses more than 1 second, then control the aircraft by transmitter;
- (2) When user select "receiver off " (RC off), all of the operations by transmitter are unavailable, controlling is managed as follows:
  - A. In " waypoints flight " mode, the flight will not be influenced if the wifi signal loses, and aircraft will go back to the first waypoint to hover after finishing waypoints flight, then you need to judge whether wifi signal has recovered, if the signal unrecoverable, then manage as following;
  - B. When it's not " waypoints flight " mode or aircraft hovers in the first waypoint after finishing waypoints flight, please wait 10 seconds if the wifi signal loses, and continue to operate if recovers; If there is no signal 10 seconds later, then enable the temporary returning & landing function; if the signal recovers again, then stop returning home instead of hovering. Hovering can receive mobile phone cross control and " returning & landing", "waypoints on", " motor off" switch control. Continue to return home and land if the signal is not recovered again.

## RC Signal Lost

Users must refer to the instruction of remote control transmitter to correctly set up F/S, and set CH5 to position 3, CH6 to position 1, throttle stick to the middle position (installation guide has tips). If enable F/S for any reason in "RC on" status, the autopilot will be switched to auto-hovering status (continue flight path for 3 seconds in auto-waypoints mode, wait for 3 seconds and start to return home if the signal can't recover after 3 seconds).

## Phone Control

### (1) Phone Cross Control

During flight, when remote control is switched to "Auto-hover" or "GPS mode", the craft shall get into auto-hover. Meanwhile click GCS on mobile → "enable control/disable control" to enable or disable the control operation.

Mobile remote control operation ways as below:

	Transmitter Interface Operation Ways	Craft Status
RC ON		
Circle area	Red: Not located; Green: located.	Keep still
Position Hold	DO NOT touch any area	Position hold.
Operation	1. Press the circle and move up/down 2. Press the circle and move left/right 3. Press the circle and move left top, left bottom, right tip, etc.	1. Move back and front 2. Move left and right 3. Move lefttop, leftbottom, etc
Climb/ Decline/Rotate	Click the circle and move in the range of the red cross: 1. Top 2. Bottom	1. Climb 2. Decline 3. Rotate to the left 4. Rotate to the right

	3.Left 4.Right Note (1) The distance to the red dot means the flight speed. The farther ,the faster. (2) Press=moving,release=stop moving (3) Release=position hold immediately (4) The Maximum speed is 2.5 m/s	
--	--	--

1. When no any press on the "Cross", the aircraft will Auto-hover with position and altitude hold.

2.Press down and hold the middle round circle, moving your finger to left/right/front/back or to any direction, the craft will perform same like when operating the aileron and elevator stick of RC Transmitter. (Your phone will vibrate once when start to press down the round circle)

3. Touch any point on the Cross ( No pressing down the middle round circle), up point is "climb up", down point is "go down", left point is "change the flight direction to left and then go to left, right point is " change the flight direction to right and then go to right".

The distance from the touching point to the middle round circle is farther means the flight speed is faster, the closer the slower flight speed.

When wifi signal is lost, the autopilot will enable RC Receiver automatically, you can use RC Transmitter to control the aircraft. When wifi signal recovers, autopilot will disable RC Receiver and Enable "Control" automatically.

**Notice:** In "Settings" of GCS , there is "change altitude" there, when in automatic mode and the throttle stick is in the middle position, you can put in target altitude directly (unit: meter) and confirm, then the craft will go up or down to

the preset altitude.

## (2) Phone attitude mode

User can enable phone attitude control mode in phone remote control mode, click on "enable attitude" the transmitter interface will be changed to a blue cross, which indicates mobile attitude control mode has been enabled.

**Notice:** keep the phone flat before enabling attitude mode, otherwise the craft will fly to the direction where the phone tilt to.

Phone attitude operation methods:

Enable attitude	Transmitter Interface Operation Ways	Craft Status
Circle Status	Red:unlock Green:lock	-
Hover Operation	Keep the mobile phone flat and no click	Hover
Flight Operation	1 Mobile phone tilt to front/back 2 Mobile phone tilt to left/right 3 Mobile phone tilt to upleft/downleft/upright/downright	1 front/back 2 left/right 3 upleft/downleft/upright/downright move
Climb/Descend/Auto-rotate	1 click on right above the circle (inside the cross) 2 click on under the circle (inside the cross) 3 click on the left of the circle (inside the cross) 4 click on the right of the circle (inside the cross)	1 Climb 2 Descend 3 Left rotation 4 Right rotation

	<p>Note:</p> <p>(1)The further click point from the circle the quicker craft moves</p> <p>(2)Pressing time equals craft moving time.</p>	
--	--	--

Note: The control mode can be switched between phone cross control and phone attitude control.

## Trial Flight

Check before Takeoff:

Please make sure your Multi-rotor has been assembled correctly.

Please make sure you have setup all parameters correctly.

Please make sure you have align the transmitter channels.

Please make sure CH5&CH6 are in correct setup, and setup Failsafe already.

Please make sure ESC stroke was calibrated.

**Any one of the situations as below may result in serious accidents.**

- ▶ The motors rotate reversely.
- ▶ The propellers are assembled in wrong way.
- ▶ The IMU is assembled in wrong way.
- ▶ The components are assembled in wrong way.

**Special attention:**

Switch on the RC Transmitter first and then the receiver. Power on AP first then connect motive power for Multi-rotor.

Please adjust the attitude sensibility and trial fly in Auto-hovering mode in empty & weak-wind space

Please check whether the hj file has been saved to the mobile successfully (Only if power the autopilot, hj file can be formed after the data connected.

## Fly Test

Step1: Make sure adequate power to the RC Transmitter/Autopilot and all components.

Step2: Check all the connections to make sure everything is in good condition.

Step3: Turn on RC Transmitter first, then start the Multi-Rotor craft.

Step4: Make sure that the flight mode can be changed normally through flipping the transmitter switches and checking it.

Step5: Get into Auto-hovering mode. Move the sticks to check the movements of Elevator/Roll/Course Angle whether are all correct. If not, please get back to parameter settings to revise it.

Step6: Move the Throttle stick slowly to make all motors start work, then make your Multi-rotor aircraft take off slowly.

## Before Flight

### Magnetic Compass Calibration

Ferromagnetic substances placed on multicopter or around its working environment will affect the reading of earth magnetic for digital compass, it also reduces the accuracy of the multi rotor control, or even reads incorrect heading. Calibration will eliminate such influences, and ensure MC system performs well in a non-ideal magnetic environment. **The result will display immediately after calibration but will not be saved to the autopilot.**

When to calibrate it?

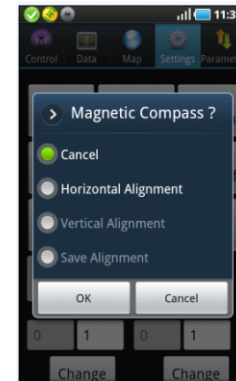
1. The first time you install YS-X6 on aircraft.
2. When the multi rotor mechanical setup is changed.
  - A. If the GPS/Compass module is re-positioned.
  - B. If electronic devices are added/removed/re-positioned (Main Controller, servos, batteries, etc).
  - C. When the mechanical structure of the aircraft is changed.

3. If the flight direction appears to be drifting (meaning the aircraft doesn't "fly straight").

## Calibration Steps

### Step 1 Calibration in horizontal:

Enter Calibration by elect "Horizontal Alignment" from "Magnetic Compass" in GCS and click "OK" to send the command to autopilot. After it says "Success" meaning the autopilot received the command of Horizontal Alignment, can start the Calibration. Rotate your aircraft along with the horizontal surface, ask a helper to monitor the attitude angle changing in "Data" and try best to keep Pitch and Roll value smaller than 3 (you can also check the blinking light which is connecting with autopilot, constantly light on means attitude is good, if attitude is too big the light will turn off ). After completing 2-3 laps horizontal rotation, then go to the next step;



**Step 2** Calibration in vertical: Select "Vertical Alignment" from "Magnetic Compass" in GCS and click "OK" to send the command to autopilot. After it says "Success" meaning the autopilot received the command of Vertical Alignment, ask a helper to monitor the attitude angle changing in "Data" and try best to keep Pitch and Roll value smaller than 3 (you can also check the blinking light which is connecting with autopilot, constantly light on means attitude is good, if attitude is too big the light will turn off ). Then hold your Multi-rotor vertically and rotate it along with its vertical axis, after completing 2-3 laps vertical rotation, then go to the next step;

**Step 3** After you finished the calibration, the GCS will go to "Control" interface automatically, two round circles will show whether the calibration was successful or not:

If two round circles show up in the "Control" interface (one blue circle one red circle), calibration succeeds, can exit ;

If no circle or only one circle shows up in the "Control" interface, the calibration



has failed. Enter calibration by selecting "Horizontal Assignment" and then re-start from step 1 for re-calibration.

Successful Calibration Image:



## During Flight

### (1) Motor Arming

Unlock throttle: Move rod as V shaped when the throttle is in the bottom. After that push throttle stick to enable the motor in 5 seconds, and the motor insurance will be locked up automatically exceeding 5 seconds.

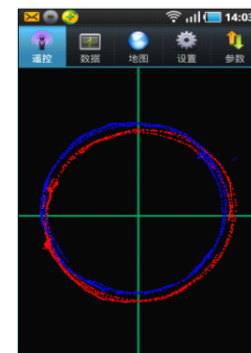
Rod moving: Rudder in the left- most position, elevator in the bottom, aileron in the right-most position, throttle in the bottom. For the right or left throttle, user need to judge by self that the motor arming direction is 八 or V shape.

After moving rod as V shaped, motor will not be enabled automatically, user need to push the throttle stick to the minimum position to enable the motor after moving rod.



### (2) Vibrating and Shaking

During flight, user need observe the "vibrate state" and "shake state" in "data" page to judge the shaking status of IMU. In stable flight, it is normal when the "vibrate state" and "shake state" range from 0~9, the smaller the



number the smaller the shaking, the number will directly affect flying quality.

Vibrating coefficient:the maximum acceleration of alternate motion(vibrate) in up&down/left&right/back&forth three directions.

Shaking coefficients:the maximum angular velocity of rotary movement around X/Y/Z three axes.

### **(3) Manual servo position and real servo position**

Manual servo position

After channel calibration on transmitter,when user put the stick in the middle position, the value of rudder, elevator and aileron in "manual servo position" of GCS should be small (no more than 2) . If user already adjusted the trim and the manual servo position is not near the center, need to click on "Neutral Position" in "settings" to make the autopilot record the correct stick center position.

Real servo position

Real servo position is the relation of differential rotation speed outputted by motor to keep aircraft stable during flight. Example: when clockwise and anticlockwise propellers lose balance(suppose clockwise motor is not leveling, the reaction torque generated by it is smaller than that generated by anticlockwise motor), when in level flight and heading unchangeable, the real servo position will keep stable with left 5~7. With the same pulse width output, the reaction torque generated by clockwise motor is smaller than that generated by anticlockwise in the same rotation speed, which lead aircraft rotate to the right, autopilot will output levorotation torque automatically, namely the differential make the clockwise rotation speed faster and anticlockwise slower. In this condition, aircraft can fly normally and do not need hover any more, but the power consumption and temperature of clockwise motor are higher than the anticlockwise motor's.

So, it is suggested that user need to precisely detect the balance and level symmetry of motor and propeller to get a more stable flight. Until level flight and hovering, the rudder of real servo position is smaller.

## **(4) Auto-takeoff and Auto-landing**

### **A. Semi-auto takeoff**

When get 5 or more GPS satellites locks, switch CH5 to position 3 and CH6 to position 1, namely the flight status is "auto-hovering", then push the throttle stick after moving rod in V shaped, when throttle stick is more than half, aircraft will be powered on and take off automatically, hovering 3 meters about from the ground and getting into auto-hovering status.

**Notice:** aircraft can take off full-automatically only if the aircraft has completed semi-automatic takeoff and succeed.

**Step 1** Wait until get 5 or more GPS satellites lockes, put the THR in the minimum or in the middle position, switch CH5 to GPS mode (the third position), CH6 to the first position.

**Step 2** Click on "enable insurance", or move rods as V shaped to make the throttle unlocked, then continue the next step within 5 seconds.

**Step 3** Click on "auto-takeoff ", the aircraft will be powered on and take off slowly, hovering in the height of 2~3 meters from ground.

**Step 4** If the throttle is in the minimum in auto-takeoff mode, if you want to control the flight altitude, you must move the THR to the middle position.

**Notice:** if there are any accidents during take-off you can switch to manual mode by transmitter to control the craft .

### **B. Auto-returning home and Auto-landing**

Autopilot will set the returning home position automatically when GPS has locked or aircraft takes off in manual/auto mode.

In GPS mode, when switch CH6 to position 3 or select "auto-return home & landing" in the mobile phone and meanwhile click on "OK", AP will enable auto-returning home & landing after 3 seconds; and the motor will auto-fly to 20 meters if the altitude is less than 20 meters, when aircraft returns the throttle servo doesn't work, the autopilot will descent to the ground automatically when reaching the start position and can interferes the landing position; After

enabling "auto-returning", it can't prevent autopilot from returning and auto-landing if switching CH6 back to "auto-hovering "and "auto-navigation", unless switch CH5 to manual position(position1/2) and then back to holding position to continue hovering.

Notes: Click on "motor off" -> "OK" to shut down the motor.

### **(5)Click & Fly to point**

**MODE :** in GPS auto-hover mode

First, click any point on the map and it can appear a yellow smile there.

Second, click on "FlyToPP" button in Map page (the button will get grey if no click beyond a few seconds, then need to click on the map again and the yellow smile will appear ), the yellow round smile will change to purple star smile. The operation of flying to the next position is same as above.

### **(6)Target Lock**

**MODE:** in GPS auto-hover mode

First, it will appear a yellow smile while clicking any point on the map;

Second, click "PTZLock" button in map page. After yellow round smile changing to purple star smile, the head of aircraft will face the locking point;

Third,user can operate on mobile phone remote control interface or by transmitter.

**Remark1:** When left aileron outputs in RC interface, the aircraft will hover clockwise around the target point. When the right aileron outputs, it will hover anti-clockwise.

**Remark2:** Pushing the stick can decrease the hovering radius and drag the stick can increase the hovering radius.

**Remark3:** After selecting " Quit FlytoPP/PTZ Lock" in "Select Map Tools", the elevator operation and aileron operation will be normal.

### **(7) Waypoints Flying**

#### **Step1:**

Click "tools"-> " Design waypoints'. One click on the map can get one waypoint,

get all waypoints one by one. Click "Default Tool" to complete the waypoints design.

### **Step2:**

After the waypoints drawing is completed, click "Upload Waypoints" to the Autopilot. To confirm a successful upload by checking whether each waypoint has been changed to blue or get into "Target Point" and check whether the number displays there is same with uploaded waypoints, if not you need to upload again. If any waypoint is not changed to blue, please also upload again.

### **Step3:**

Click "Remove Waypoints" to recover the blue waypoints to red, then select "Verify waypoint" from "Tool", download uploaded waypoints to ground station for comparing, if all waypoints are blue, that means the uploaded waypoints is same with that in GCS and waypoints checking succeed. Otherwise need to upload waypoints again.

### **Step4:**

After switching CH5 to position 3 and CH6 to Auto-navigation, autopilot will get into Auto-waypoints Mode and go to waypoint 1 & hold position. Fill in "Change Target" with number 2 and upload it, the autopilot will fly to waypoint 2、3、4...and fly back to waypoint 1 and hover there after finished all waypoints.

**Notice:** If waypoints are uploaded incorrectly, the aircraft will fly away automatically when switching to auto-navigation.

## **(8) Follow Me**

This function can be used after GPS is enabled and meanwhile GPS gets no less than 7 satellites locks showing on "data"page of GCS. In GPS hover mode, all the sticks on transmitter are in the middle position, user can click on "enable follow" in "setting"page, the craft can fly following the mobile phone GPS position and lock the nose direction.

If to exit this function, just click on "disable follow" on "setting" page.

## (9) Carefree

In GPS hover mode, "Carefree" can be used. Click on "enable course locked" button in "setting" page, autopilot can record the current orientation of craft nose. Then users can adjust the orientation of craft nose with rudder; when user operate the left/right aileron and sticks on transmitter, the autopilot will fly to the orientation as same as the orientation when the course is locked, not the current orientation of craft nose. To quit "carefree", click on "disable course locked" button.

## Troubleshooting

1	Craft flying to all directions	Check whether the Magnetic Compass Calibration is correct.
2	Altitude is changed	Vibration exceed limit, please try to reduce the vibration from rotors and balance the propellers.
3	in stabilization mode , Craft flips over after taking off	1. Check whether ESC wire connection and MC wire connection are correct. 2. Check whether IMU is mounted at right position and direction is correct or not.
4	No WIFI signal on the Tablet/Mobile	1. Check any wires get loosen. 2. Exceed WIFI communication range. 3. Tablet/Mobile is in low power. 4. Enable Control and try to analog control the craft, check whether LED light blinks regularly, if not please check the communication among autopilot, phone and WIFI 5. Whether set the SSID as YS-X6-X( Serial number).

		6. Whether router IP is :192.168.1.1
5	Altitude changes too much	Vibration exceed limit.
6	Craft is not stable after position hold.	Shake exceed limit.
7	Drifting much in the GPS position hold	Check whether the LED light blinks for one time one loop, or you may not "Capture centural"
8	Can not control the craft in stabilization mode	Not hold the position, still not start to calculate attitude

## Appendix

### Appendix1: Port Description

MC		
CH1	A ileron	For roll control (left/right)
CH2	E levator	For pitch control (front/back)
CH3	T hrottle	For throttle control Or to gimbal roll servo
CH4	Rudder	F or rudder control Or to gimbal pitch servo
CH5	Manual/Auto Mode Switch	
CH6	Auto-mode Switch	
CH7	For S-BUS	
CH8		
COM1	PC connection for configuration and upgrades.	firmware
COM2		
COM3	Connect	WIFI module
AI0		
AI1	Connect Power Calculate Module	
LED	Connect LED Indicator	
IMU1	To power	
IMU2	To data	
M1	M otor 1	
M2	M otor 2	
M3	M otor 3	
M4	M otor 4	
M5	M otor 5	

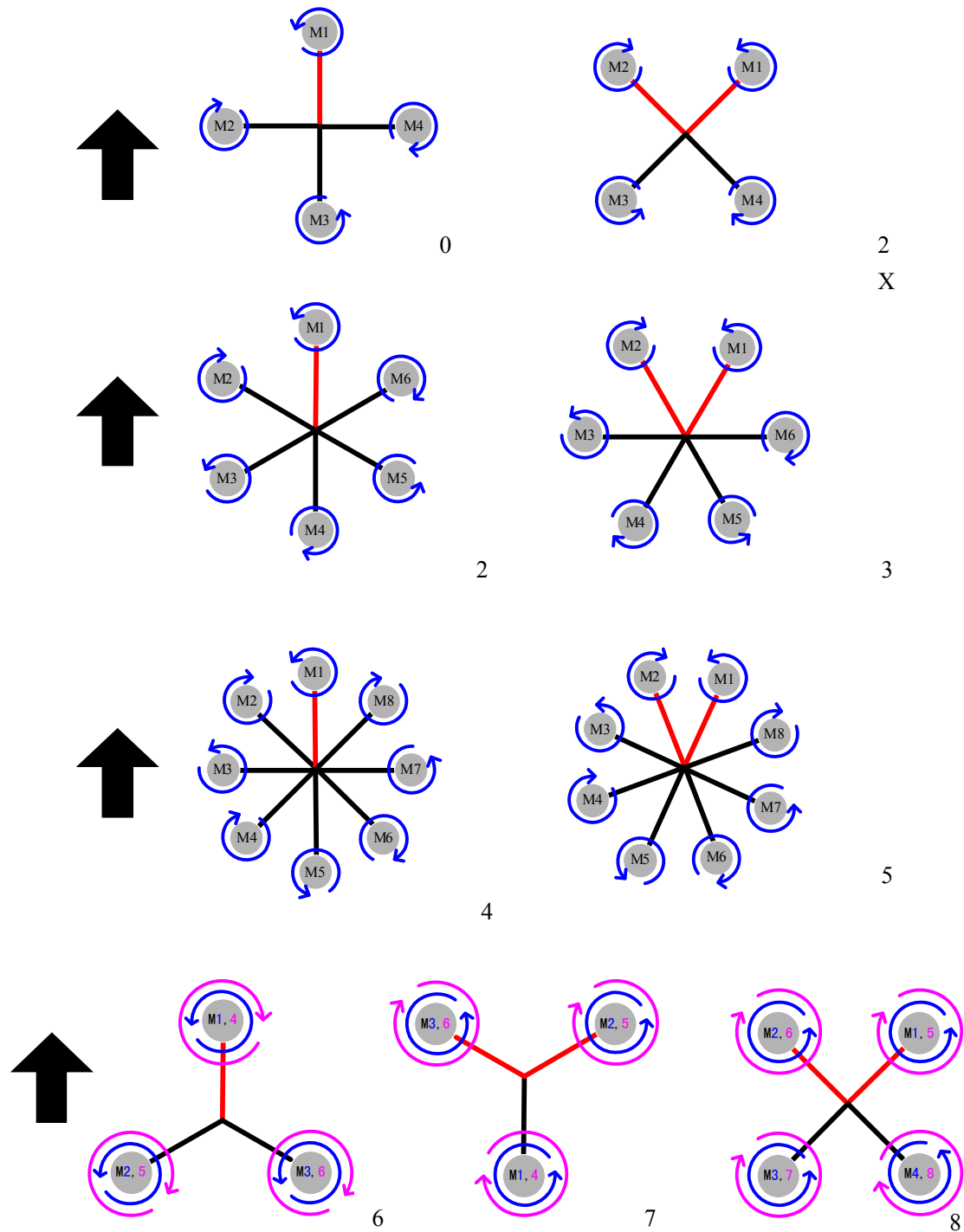
M6	M otor 6
M7	M otor 7
M8	M otor 8
EXT1	Gimbal roll servo
EXT2	Gimbal pitch servo
EXT3	
GPS1	To power
GPS2	To data

## **Appendix 2 : Multi-Rotor Supported**

To coaxial propellers: Blue propeller is at Top; Red propeller is at Bottom.

Otherwise all propellers are at top. The arrow means the aircraft head. Fill in "Aircraft Type" in the parameter settings with the below numbers.





### Appendix 3 : Light Description

GPS unlocated, red light blinks for 3 times one loop.

GPS located (5 satellites), red light blinks for 2 times one loop.

GPS located (6 satellites), red light blinks for one time one loop.

When located GPS satellites is more than 7, the red light be solid all the time.

When GPS Speed value from Kalman filtering is too large, the LED will be solid white, need to land aircraft urgently.

Altitude hold in the Stabilization mode: Blue light blinks for one time one loop means the users is operating; Blue light blinks for two times one loop means Altitude hold.

In the GPS mode, Green light blinks for one time one loop means the user is operating; Green light blinks for two time one loop means Auto-over and position hold.

Low voltage alert: Yellow light blinks for 3 times one loop;

Low voltage alert urgently: Yellow light blinks constantly.

## **Else**

### **(1) Motor Twitching and Fault**

The PWM signal output in hardware state of YS-X6 Autopilot ESC adopts FPGA(Field Programmable Gate Array ), which is a reliable device to output signal. The signal will not stop outputting even if the processor freezes when powering autopilot. Generally, except for connection line loss and contraction undesirable, motor twitch and stalled fault are mainly relevant to the matching of motor,ESC and propeller, commonly it is the motor out-of step that lead to the phenomenon of switching and stalling. When YS-X6 select the ordinary ESC, PWM output are as following:

High electrical level output: 3.3 V

Internal operation frequency: 250 HZ, namely 4 ms a caculation cycle

Pulse width output frequency: 400 HZ, or 2.5 ms a pulse width

Pulse width range: 1000 us ~ 2000us

Pulse width changing speed: a caculation cycle (4 ms), pulse width adjustment is no more than 60 us, namely great changes adjustment of pulse width are limited to 60 us each calculation cycle, to reach the final pulse width via accumulating many periodic adjustment.

Users are suggested to consult ESC and motor manufacturer to select the

matching auxiliary equipment, ruling out the possibility of stalled or twitching. To protect you and other people, please don't be careless any time, aircraft will not safe in dangerous area or over the crowd.

## **(2) Aircraft Shaking Adjustment**

**First**, the deviation of installation direction or vibration or shaking will delay IMU test. So user need to check IMU installation, vibration and shaking coefficient, and reduce them within 10 (the smaller the better) with various kinds of Suspension means;

**Second**, the attitude adjustment of multi-rotor are based on motor speed adjustment, so the servo sensitivity will directly affect the accuracy of attitude adjustment. User need to adjust the matching of weight and pitch propeller once more, to make motor keep enough speed and generate enough servo effect. Since the aircraft seeking high efficient configuration, the flight stability decline is inevitable, user only can select appropriate balance between the flight efficiency and stability;

**Third**, the symmetry of multi-rotor has significant effect on flight stability. In the third quarter of Chapter 9 "real servo position", user can estimate the symmetry of motor and propeller in level flight. If fail to adjust the symmetry, user must spend more energy in motor frame and dynamic configuration;

**Fourth**, if the three steps above are finished, user can click on "roll sensitivity", "pitch sensitivity" to adjust the value in "parameters setting", namely set the reversing dynamics of AP; And adjust "motion compensation", namely set the reversing stabilization of AP to do a certain kind of adjustment.

**"Roll sensitivity", "Pitch sensitivity"** have been set correction value of velocity error, 60 is default, the bigger the sensitivity the quicker the correction, namely the touchness is more flexible. But too big touchness will lead high-frequency vibrating, so need to decrease the sensitivity value for high-speed craft.

**"Motion compensation"** is set for the shaking correction of low-speed craft,

80 is default. Without the compensation, since the servo effect is too small, when user take the sticks on transmitter in the middle position, the craft will rock few to be stable slowly. User can gradually increase the "motion compensation" parameters to get the best effect of not rocking when the sticks are in the middle. But for the high-speed craft, the value should be decreased, or the craft will vibrate highly-frequency. The minimum value of the parameter is 0 and maximum is 255.

## Contact

### **Zero UAV (Beijing) Intelligence Technology Co. Ltd.**

TEL 0086-10-57250711

FAX 0086-10-82890430-8078

### **Sales**

Email: [sales\\_zerouav@yeah.net](mailto:sales_zerouav@yeah.net)

Skype: sales.zerouav

MSN: [sales\\_zerouav@hotmail.com](mailto:sales_zerouav@hotmail.com)

### **Technical Support**

Email: [support\\_zerouav@yeah.net](mailto:support_zerouav@yeah.net)

Skype: support.zerouav

MSN: support\_zerouav@hotmail.com

### **Complaints**

Email: [zerouav@yeah.net](mailto:zerouav@yeah.net)

Address: Room 106 Building 64 Block 2B, Xi'erqi Lingxiu New Silicon Valley,  
Haidian District, Beijing, China

Post Code : 100085