YS-X6 Multi-Rotor Autopilot

Quick Start Guide

V1.0

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, applys advanced temperature compensation arithmetic and industrial attitude arithmetic, 400MHz refresh frequency as well, to make the system more stable, efficient and realiable.
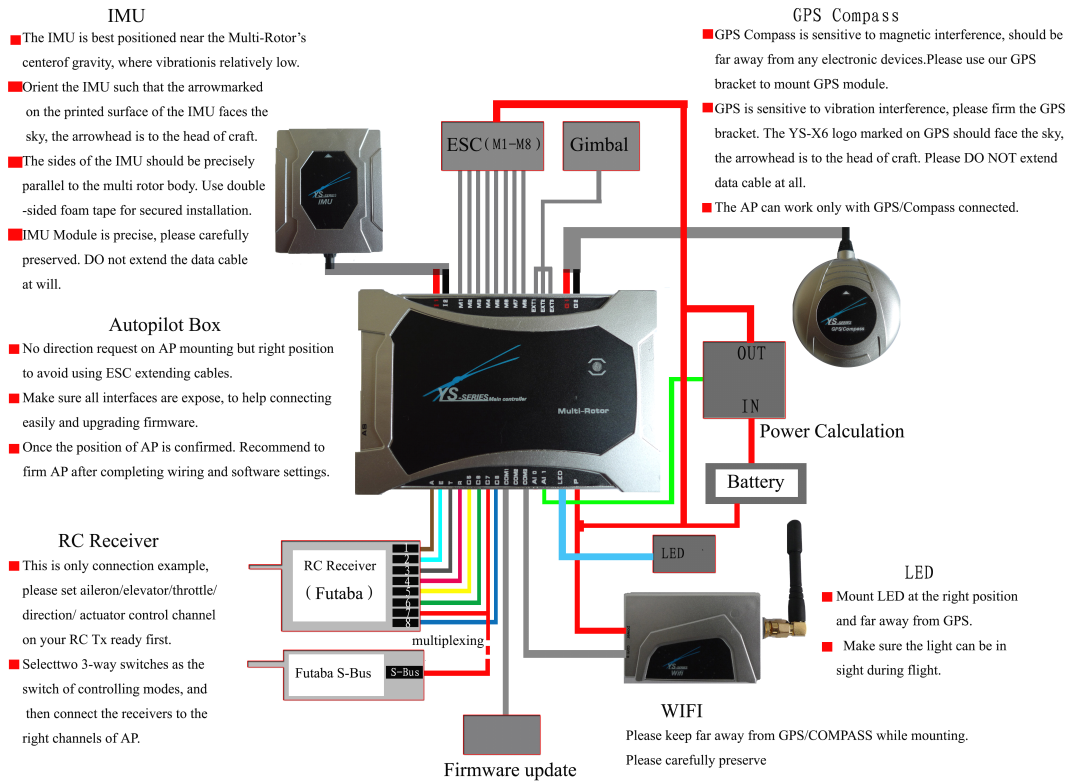
Warning and Declaimer

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 this product.

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 placed, 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 user's faults such as attempting wiring not in accordance with the manual, which may cause short circuit or damage(s).

Contents

1 Assembly

IMU
- The IMU is best positioned near the Multi-Rotor's centerof gravity, where vibrationis relatively low.
- Orient the IMU such that the arrowmarked 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 expose, 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.
- Selecttwo 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.

ESC(M1-M8) Gimbal

OUT
IN
Power Calculation

Battery

LED

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

RC Receiver（Futaba）

multiplexing

Futaba S-Bus S-Bus

Firmware update

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.

2 WIFI Communication
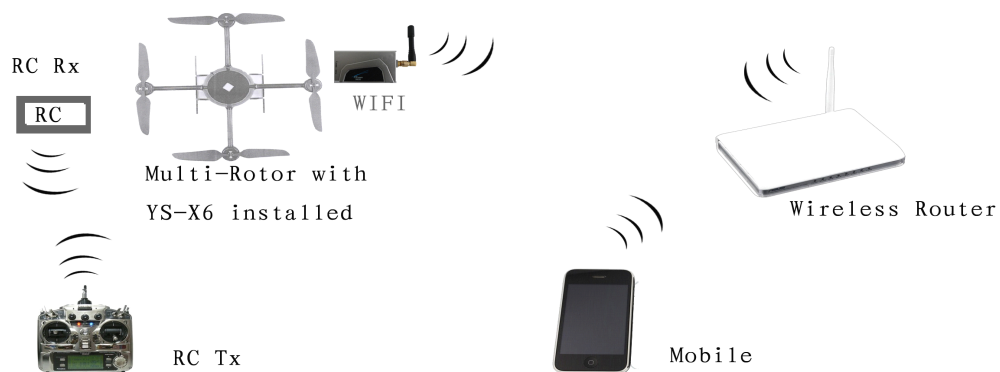
Step1: Download YS-GCS. It must be installed to the Mobile memory card. Android system can be installed automatically via running file installation once in the file manager. Apple system can be installed after APP jailbreak, please refer to" Apple Installation Instructions".

Step2: Use wireless router to build AP. Set SSID of the router as"YS-X6-Serial No." (Note: The letters must be in Capital), password is 82890430, and use encryption method WPA2-PSK AES. Router IP must be 192.168.1.1 (The mobile with hotspot function can be also instead of router, but must make sure the mobile can set up SSID and password, in same way IP should be: 192.168.1.1)

Step3: Open WLAN on mobile/tablet to connect to router. (All the flight data shall be saved to YShj in mobile after connecting Wifi data, the YShj file can be replayed through one kind of tool of computer).

Only same SSID: YS-X6-Serial No. Password: 82890430

3 Before trial flight

After all communication start to work, please go to the below steps for parameters setup or calibrations. (If any communication setup failed, please refer to the above two steps carefully again.)

(1)Transmitter Channels Calibration;

(2)Check CH5 & CH6, set up F/S (Failsafe);

(3)ESC Stroke Calibration;

(4)Set up aircraft types and parameters. Fill in local magnetic declination
(West is positive, East is negative);

(5)Check the configuration direction of IMU & GPS

After completing the above steps well, you can go to test the fly manually.

(Please refer to the below website for magnetic declination)

Link reference:

http:// magnetic-declination.com/

http://www.ngdc.noaa.gov/geomagmodels/struts/calcDeclination

The transmitter is used in fix-wing mode, no need any mix-control. Any channel can't be reversed on FUTABA Transmitter, channels on Jr and WFLY transmitters need be reversed. For other branch transmitters, after calibrating the channels, check whether the practical servo operation is the same as "manual servo position" showing on GCS when operating the servo,if same is correct and if not same need to set reversed channel on transmitter.

4 Magnetic Compass Calibration

Ferromagnetic substances placed on multi-rotor 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 multirotor 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:

(1) If two round circles show up in the "Control" interface (one blue circle one

red circle), calibration succeeds, can exit ;

(2) If no circle or only one circle shows up in the "Control" interface, the

calibration has failed. Enter calibration by selecting " Horizontal Asignment"

and then re-start from step 1for re-calibration.

Successful Calibration Image:
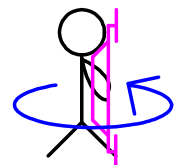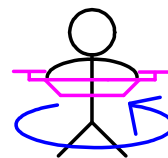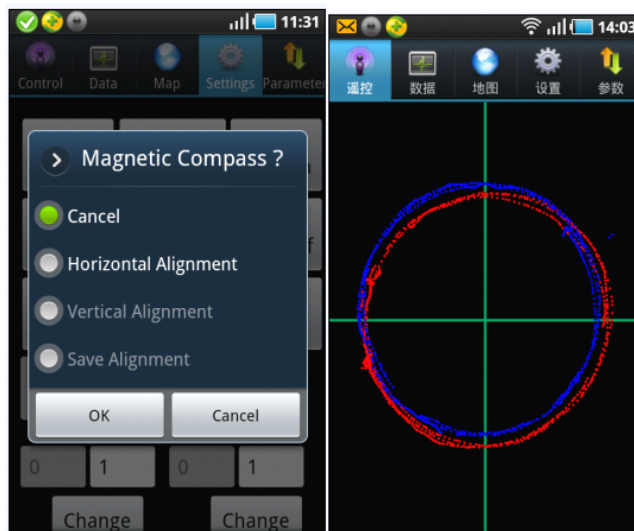
5 Flight Control Mode

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 Attitude Mode	Blue light blinks twice	Position 2 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.		

Notice:

The switch of RC receiver is button which showing "Receiver off" or "Receiver on" in GCS, used to turn off/on the RC receiver on craft, namely any operation is useless for aircraft if receiver displays "RC off ", which equals there is no RC receiver on the craft. It is not suggested to close the receiver (RC off) if user isn't familiar with the system.

Mobile RC Status means whether the cross operation is enabled or not in the mobile RC interface, enable the GC software and click on" RC on", there is a "round circle" showing on the "cross", indicating "Mobile RC status"has been enabled. Select " RC off", there is no round circle on the cross, indicating "Mobile RC status" has been off.

6 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.

direct to the aircraft head
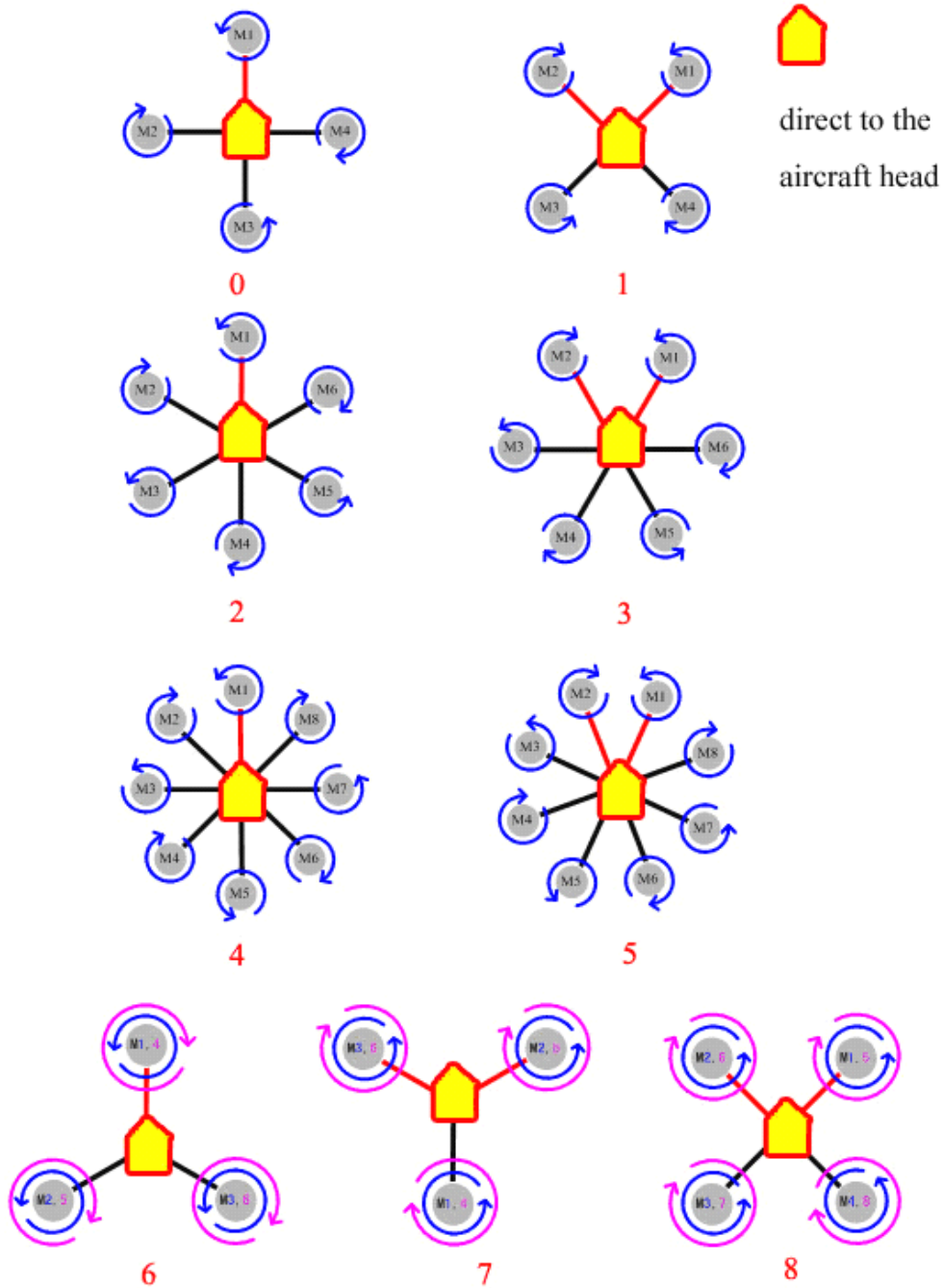
7 Customized Parameters

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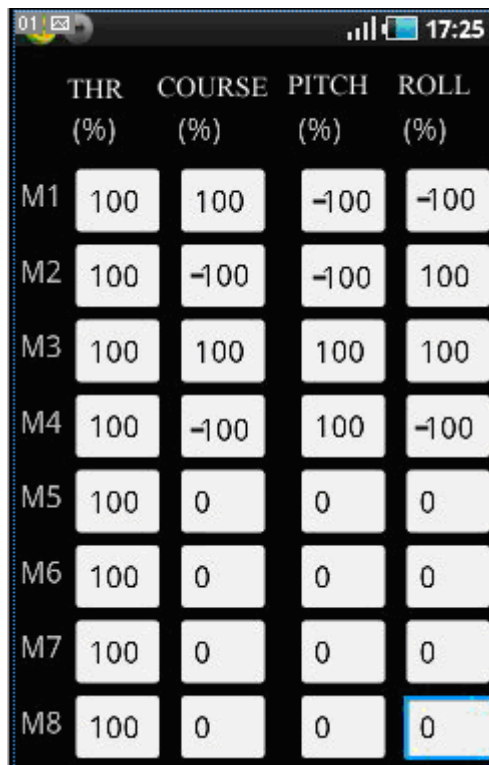
Customized throttle parameters:all of them must be 100, wrong setting will result in immediate rotating after powering, which is very dangerous .

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.

8 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.

9 Phone Control

(1) Phone Cross Control

During flight, when remote control is switched to "Auto-hover" of " 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:

RC ON	Transmitter Interface Operation Ways	Craft Status
Circle area	Red: Not loacated; 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/Rota te	Click the circle and move in the range of the red cross: 1.Top 2.Bottom 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、Climb 2、Decline 3、Rotate to the left 4、Rotate to the right

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 3Mobile phone tilt to upleft/downleft/upright/downright	1front/back 2left/right 3upleft/downleft/ upright/downr ight 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) Note: (1)The further click point from the circle the quicker craft moves (2)Pressing time equals craft moving time.	1 Climb 2 Descend 3 Left rotation 4 Right rotation

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

10 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 axises.

（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

minitrim 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

Steps

Step1: On map page click on "tool"->"add waypoints", to generate the waypoints, one click on the map can get one waypoint, get all the waypoints one by one. Click "save waypoints" to finish the flight course.

Step2: After finishing the flight course, you can save it to file and   directly download next time, click on "upload waypoints" to send the path data to the AP. Check if every waypoint change to blue which indicates the upload is successful(orange is unsuccessful), and in "data" page check whether the QTY of the waypoints in the "target point"are the same with the QTY of uploading,if not ,re-upload them one more time. Any waypoint that is not changed to blue, can be re-uploaded.

Step3: Click "remove waypoints", the blue waypoint will change to red, then select "Verify waypoint" from "Tool", download flight waypoints to ground station for comparing, if all waypoints are blue which showing the saved

waypoints in RC are coincident with GS waypoints and waypoints detection is correct . If not, need to reupload waypoints.

Step4: AP shall get into auto-waypoints mode while putting Channel5 of RC to auto-positions, Channel6 to auto-navigation bar. Arriving to first point to hover, set number 2 in "change target" of setting interface and upload, then beginning waypoints flying according to the order of 2,3,4…… even finish all waypoints and go back to first point to hover.

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.

10 Parameter Setup

Default Parameters

Origin Default parameters is as below from Quad-rotor X type, almost all crafts can fly well with the default parameters.
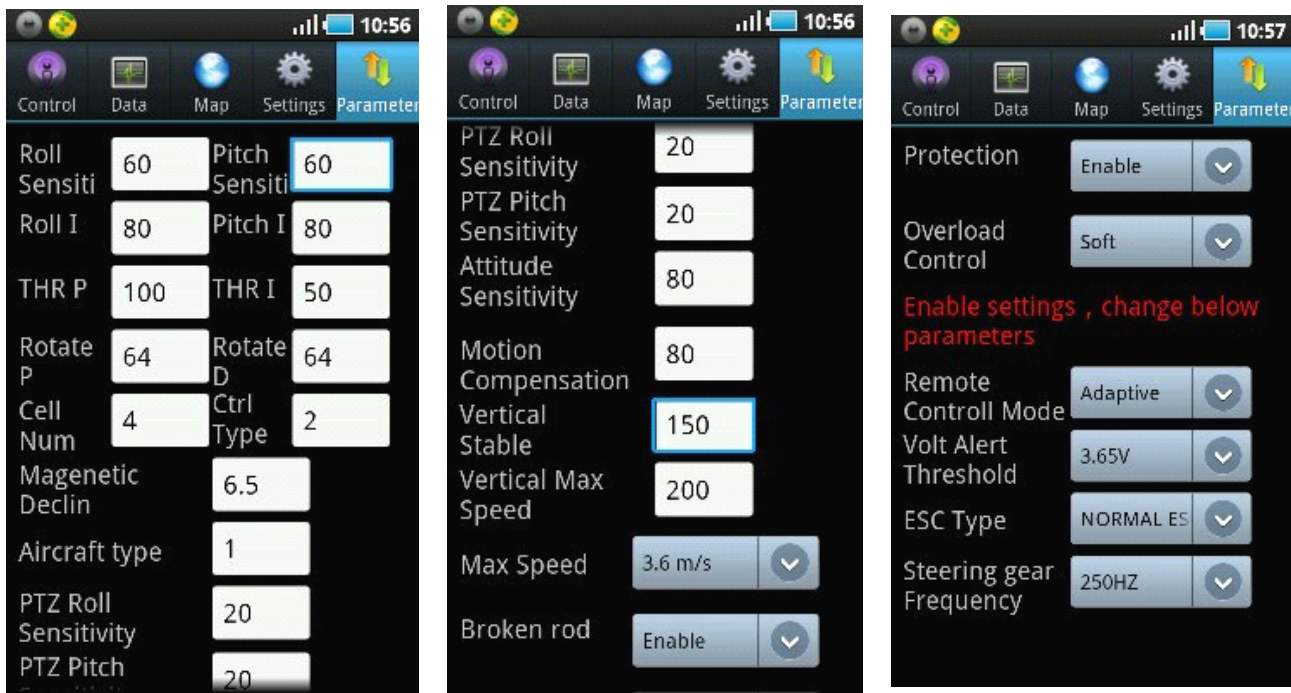
"PTZ Roll Sensitivity" & "PTZ Pitch Sensitivity" can directly affect the touchiness off the throttle in manual mode and the value can be changed, but NO recommendation on changing "Roll I/Pitch I/ THR P/THR I/Rotate P/Rotate D.

The meanings of other parameters are as below:

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.

Complete default number 2.
1. Attitude mode, fit to adjust parameters/dynamic flight.
2. Acceleration mode, fit to static flight.
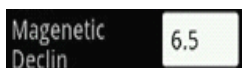
Magnetic declination

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

http://magnetic-declination.com/

Aircraft type 1

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

PTZ Roll Sensitivity 20

PTZ Pitch Sensitivity 20

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)

Attitude Sensitivity 80

It is the revised coefficient of inclined angle generated by aircraft resisting the external force.The bigger the number the more sensitive to the external force, the default number is 80, suitable to most of crafts.

Vertical Max Speed 200

In GPS mode, the maximum default speed of up & down (unit :cm/s) is 200,namely 2 meters/ second, the maximum number which can be set is 255.

Motion Compensation 80

The default value is 80 suitable to most of aircrafts, increase the shaking compensation number to get a more stable flight if the aircraft is shaking heavily. But it will result in high-frequency vibrating if the number is too big. Setup range :0~255.

Vertical Stable 150

It is useful only in manual mode and with no holding altitude, to increase the

touchiness off the throttle in manual mode, the default value is 150. The air pressure has big influence on motor stability when the number is big. If the air pressure is not stable in windy days, too big number will affect the touchiness off the throttle in manual mode and with no holding altitude.

Max Speed   3.6 m/s
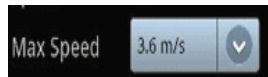
Setup: maximum flight speed.

Broken rod   Enable
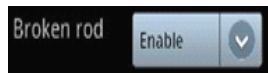
Setup: whether to use motor arming to release throttle protection.

Protection   Enable

Setup: whether to enable the throttle protection.

The 4 parameters below need to be filled in when use the parameters for first time, when filling the values must make sure the throttle stick is in the bottom; if click on "enter setting " in "settings",you can update the parameters when "setting status" displays in "data" interface. Then click on "send" and "get". After confirmation of correct uploading,click on "exit setting" in "settings", AP can be enabled.

Remote Controll Mode   Adaptive
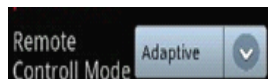
User select the options according to current RC mode, the setting must be right!

Self-adaptive: AP select the options according to the using RC Tx.

Normal: Normal FUTABA Receiver, AP CH1 connect Receiver CH1, AP CH2 connect Receiver CH2.

S-BUS: Only connect AP CH7 to the Receiver S-BUS port

Volt Alert Threshold   3.65V

Voltage initial warning number

Fill in the warning voltage which each battery is been using, user can fill after measuring by self. Usually fill in 3.65.
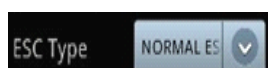
ESC Type   NORMAL ES

ESC Type

Filling value according to the ESC type which user is using.

Note: Wrong filling between Normal ESC and XA ESC will cause the propeller out of control after being powered on.
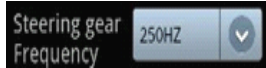
Rudder output Frequency

Filling value according to the Rudder which is being using, 50HZ is Analog Servo, 250HZ is Digital Servo.

11 Power management module
& Speed sensor

（1）Power Management Podule

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.

12 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 .
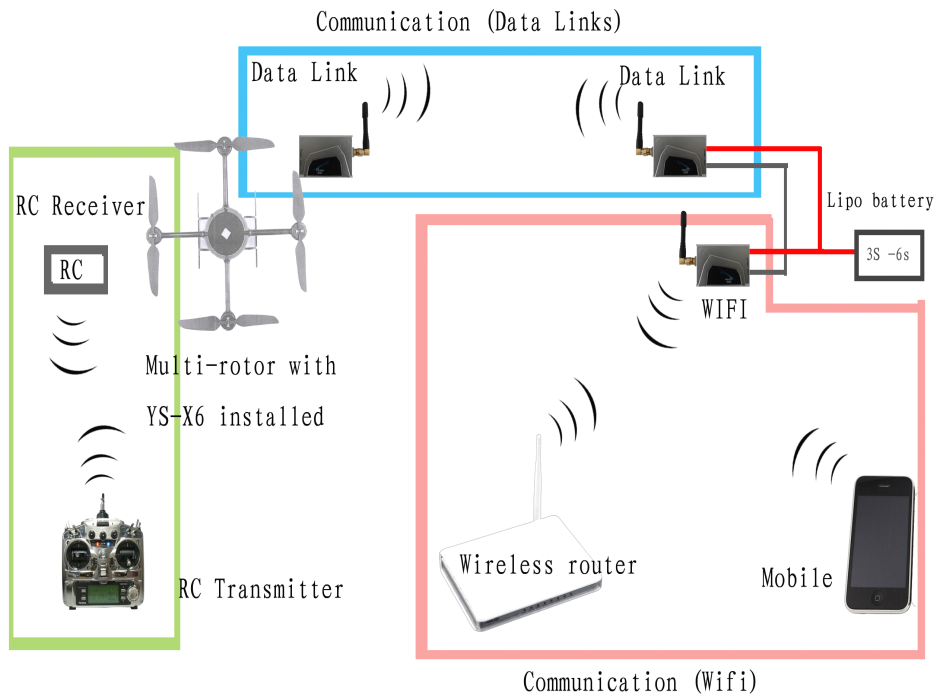
Data link and WIFI both are powered by 3 S ~ 6 S lithium battery (same as main board of AP), the power line is red-black color line, red is positive and black is negative.

13 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 inllustration 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.

14 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 "toll 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.

"Toll 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.

15 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.
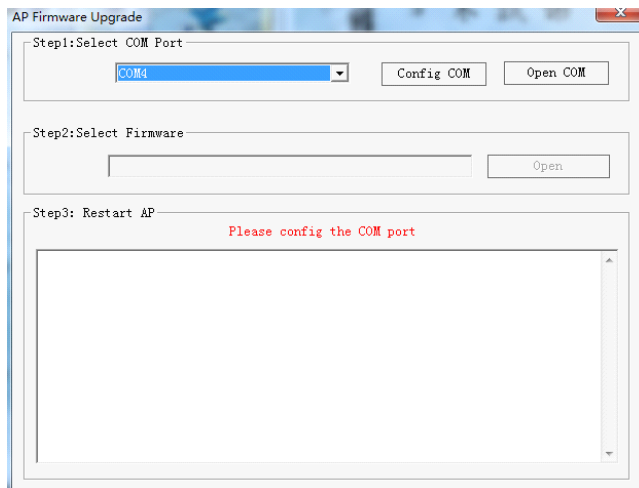
Step2: Select COM port used for upgrade(you can single click on with right mouse button "my computer"->"attribute"->device manager"-> "port"(COM/LPT)to find if you do not know which COM to use),click on "Config COM"， then setup its property to be:
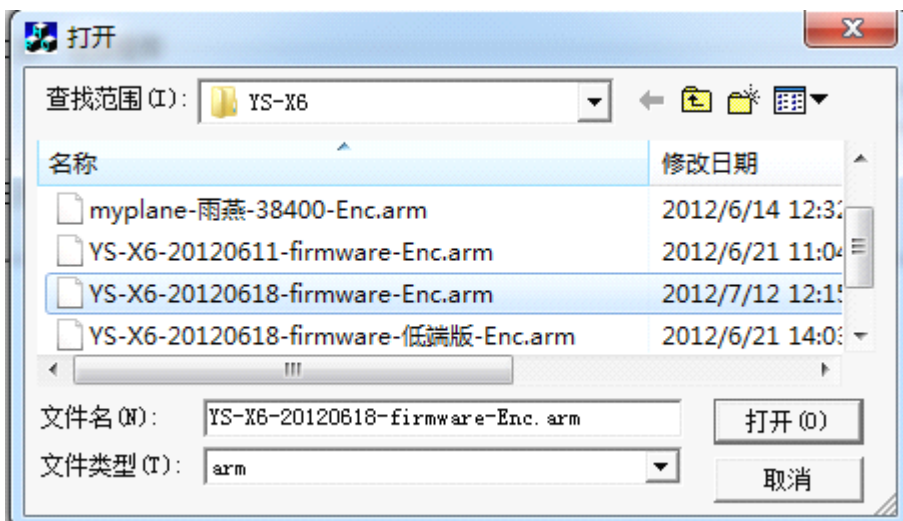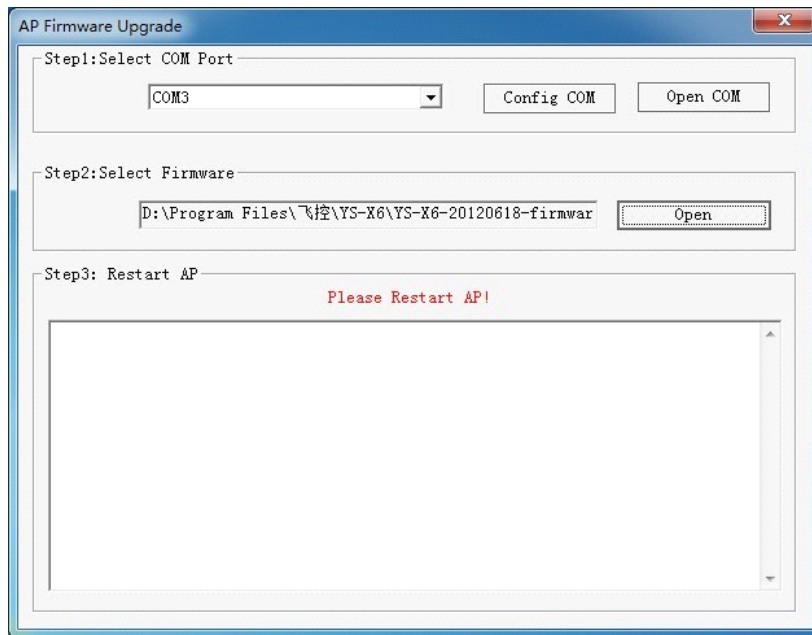
Baud rate: 115200

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.

Appendix：LED Status

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

GPS located (5 satellites), red light blinks twice one loop;

GPS located (6 satellites), red light blinks once one loop;

When located GPS satellites is more than 7, the red light will 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: If blue light blinks once one loop, means the users is operating; Blue light blinks twice one loop means Altitude hold;

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

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