Shark X8 Multi Rotor Flight Controller

User Manual

20.03.2014

Thank you for purchasing this product. Please strictly follow the instruction for the installation and operation of your aircraft.

DISCLAIMER

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

THIS PRODUCT IS STRICTLY FOR PERSON AT AGE OF 18 AND ABOVE

SHARK X8 is an autopilot system specially designed for multi-rotor aircraft, the system provides excellent self-leveling, attitude holding, and accurate position holding, make it the best choice for the aerial videography, FPV, and entertainment. Under normal circumstances, the power system (battery, motors) can provide excellent flying experience, and achieve great performance.

Despite our effort to optimize the system with all safety measures, but we strongly advise user to remove all propellers while calibrating and configuring the system with power connection attached. Keep the aircraft away from people, animal, flammable and fragile substance during any configuration, firmware upgrading, parameter set up.

Our company is not liable for any damage(s) or injuries incurred directly or indirectly from the use of the product in the following conditions:

1. Damage(s) or injuries incurred when user(s) are taking alcohol, drug, drug anesthesia, dizziness, fatigue, nausea and any other condition no matter physically or mentally that could impair the user(s) ability.
2. Damage(s) or injuries caused by subjective intentional operations.
3. Failure to follow the guidance of the user manual/instruction during installation and operation.
4. Malfunction/failure caused due to alteration/refit, replacement with part(s) that not provide by our company.
5. Damage(s) or injuries caused by operational errors or subjective misjudgment.
6. Damage(s) or injuries caused by wear and tear, corrosion, or aging and any other mechanical damage(s).
7. Damage(s) or injuries cause by continue flying aircraft when the low voltage alarm is triggered.
8. Damage(s) or injuries caused by intentionally flying the aircraft in known abnormal condition(s) (such as water, oil, solid particles etc. that will cause the aircraft flying dangerously or incomplete assembly, such as missing parts, damaged/defect parts).
9. Damage(s) or injuries caused by flying the aircraft at magnetic/radio interference area, any government regulated non-flying zone, the user/pilot facing strong sunlight that affect the visibility, blocked sight, poor eyesight and any other condition that not suitable for flying.
10. Damage(s) or injuries caused by flying under inclement weather, such as rain, lightning, windy, snowing and hail or any adverse weather condition.

11. Damage(s) or injuries caused by when the aircraft is encounter following situation: collision, overturning, fire, explosion, lightning, storm, tornado, storm, flood, tsunami, subsidence, ice trap, cliff collapse, avalanche, hail, mudslides, landslides, earthquakes and so on.
12. Damage(s) or injuries caused by infringement such as any data, audio or images obtained by using the aircraft.
13. Damages(s) or injuries caused by misuse of battery protection circuit, battery, charger, and radio transmission and control system.
14. Other losses that are not covered by the scope of our company.

Function Overview

Flight Control System Overview
1. All-In-One design integrated 3-axis gyroscopes, 3-axis accelerometer and barometer
2. Support up to maximum 8 rotors outputs
3. 3 flight control modes, 5 intelligent function (attitude, altitude, GPS, Return-To-Home, AOC)
4. GPS provide high accuracy position hold and wind resistance and auto flight function
5. Precise altitude control function provides good wind resistance
6. Failsafe RTH, Position Hold, effectively enhances flight safety and reduces the probability of crashing
7. Low voltage protection, Low voltage auto-landing significantly extend the battery life
8. Automatic Orientation Control (AOC), forward direction does not move along with nose direction
9. Perform remote calibration and start flying without connecting to the computer
10. Connecting assistant software via USB, plug and play that no driver is required.
11. Flight data recording and playback, longer flight data can be stored with larger-capacity micro SD card
12. Online firmware update
13. One key system recovery
14. Flight limits function, it restrict the aircraft’s flying height and distance.

SYSTEM SPECIFICATION

Items	Description
Power Input	7-20V
Power Output	5V/2A
Support ESC output	8 point PWM (ESC) 400HZ refresh frequency
Max Tilt Angle	30°
Hovering Accuracy (GPS Mode)	+/-2 M
Wind Resistance	<8m/s, 25km/h
Recommend Transmitter	PCM or 2.4g with a minimum 6 channels
Operating Temperature	-10°C～ 50°C （14F～122F）

Shark X8 CONTROL MODES

	Normal Mode	Attitude Mode	GPS Mode
Transmitter Commend	Linear Control		
Rudder Angular Velocity	Max 100°/s		
Stick Command (Tilt\Roll)	Stick center position keep for 0 The maximum tilt angel corresponds to stick ~30°		Stick center position automatically Lock, Maximum flying speed > 4m/s
Throttle	Direct control motor speed	Throttle lock at Altitude mode, Ascending if center position great than centerline. Descending if the center position less than center line	
Position Lock	No	No	Yes
Elevation Speed	No Limit	Max 5m/s	
F/S Return-To-Home	Support	Support	Support
Flight Speed	No Limit	No Limit	Max 5m/s

QUICK INSTALLATION

1. Refer SYSTEM ASSEMBLY AND CONNECTION chapter to connect all equipment and parts (FC, ESC, MOTOR, GPS).
2. Refer AIRCRAFT TYPE (MOTOR MIXER) chapter for the motor, propellers installation and orientation.
3. Refer TRANSMITTER chapter for the proper connection of transmitter and receiver.
4. TRANSMITTER CALIBRATION to check all channel are moving toward the correct direction.

QUICK START GUIDE

Once the transmitter is being calibrated please follows the steps below to begin flying the aircraft

1. Switch on the transmitter first, then connect the battery and power on the multi-rotor aircraft with the **propellers removed**.
2. Place the aircraft stationary on a flat ground, and wait for the self-check to be completed.
3. Observe the LED conditions to identify the autopilot system working status.
4. Switch control mode on your transmitter to Normal Mode, Arm the motor by using Combination Stick Commands (CSC)
5. Push throttle to 30%, monitor whether the motor rotation is being controlled.
5. Adjust the Yaw, Roll and Pitch, and observe whether the motor acting correspondingly
6. Use hand to wobble the aircraft, observe the changes on the output of each motor.
7. Proceed to low flying testing is the aircraft corresponding to the transmitter stick command.

If the yellow LED light flash after the self-check, will indicate the transmitter enter calibration mode, meanwhile check the if the throttle stick is at 0, or reverse the throttle, re-power back the aircraft.

LED STATUS

GREEN LED indicate the control mode

YELLOW LED indicate the autopilot system status

RED LED indicate the GPS signal strength and low voltage alarm

LED Blink Sequence GREEN->YELLOW->RED

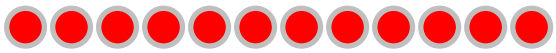
GREEN LED Description

NO	Normal Mode
	Attitude Mode
	GPS Mode
	AOC Forward Direction
	Return-To-Home

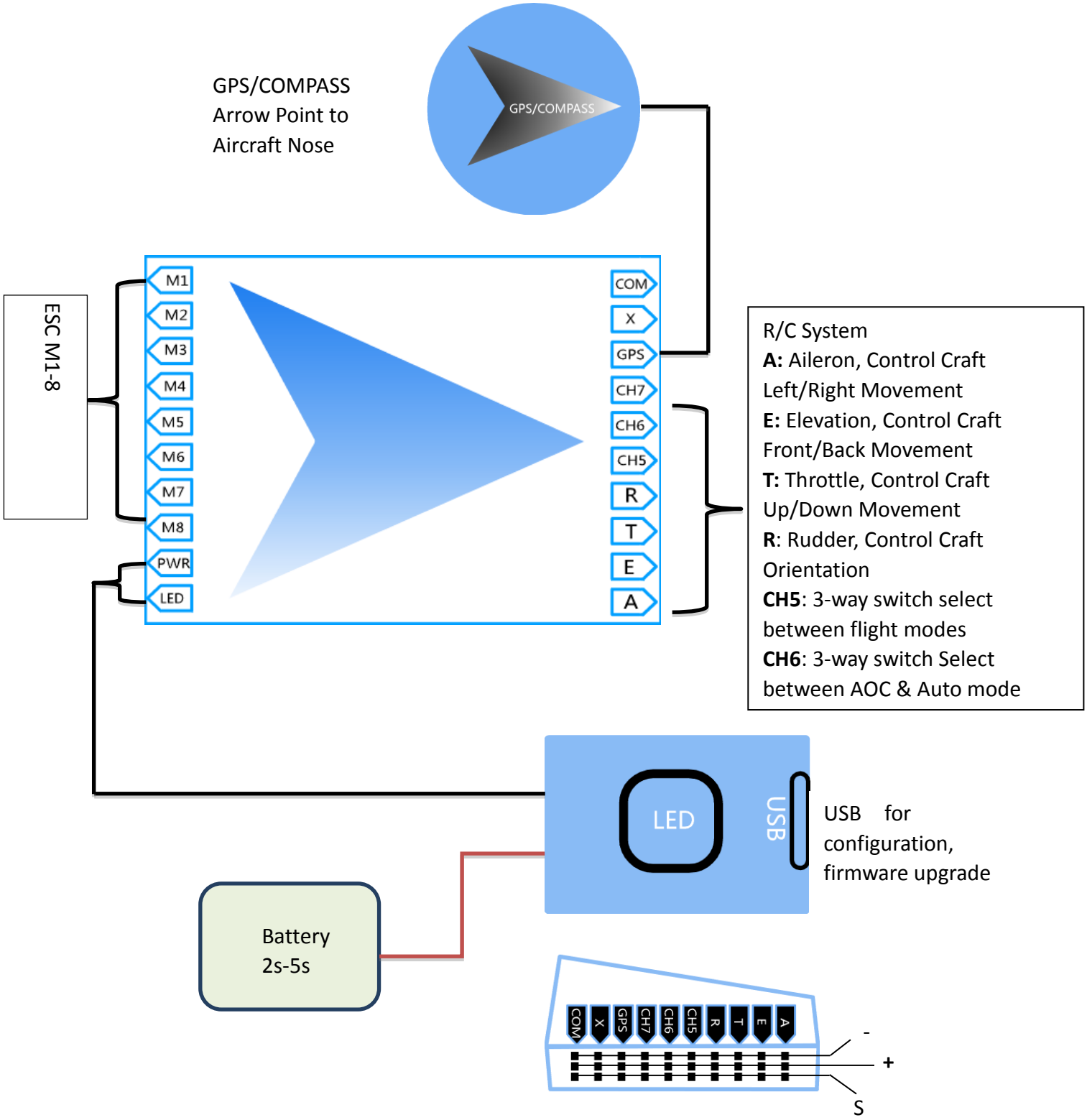
YELLOW OR BLUE LED Description

	Altitude not lock, throttle stick not at center
	Position not lock, yaw and roll stick not at center
 。。。 。。。。。。。 Intermittent flashes	Throttle stick not at 0, it only appear during switching on.

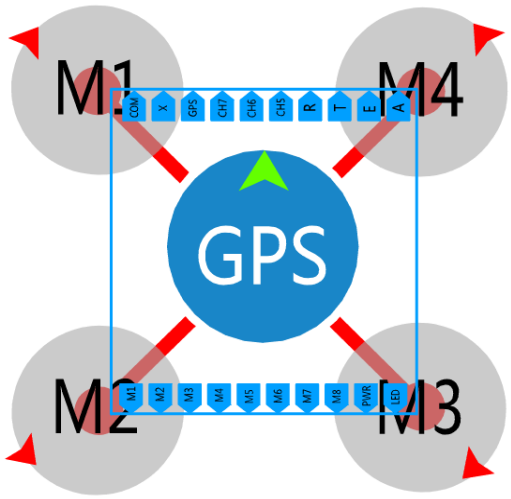
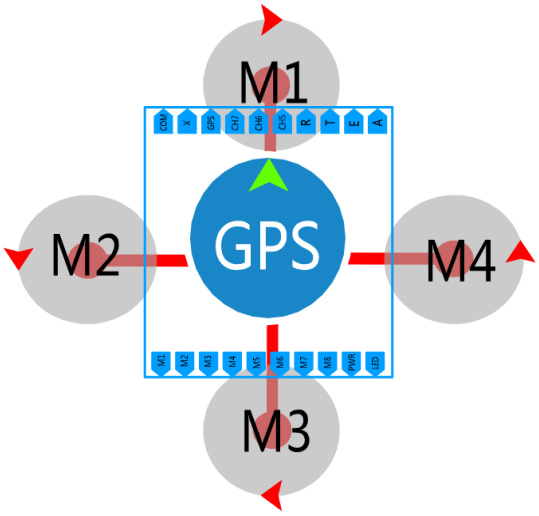
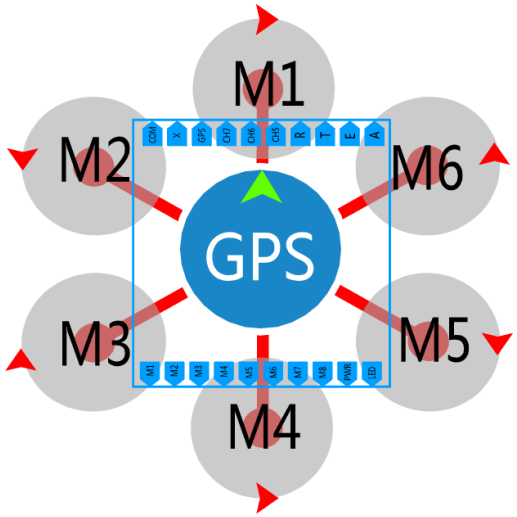
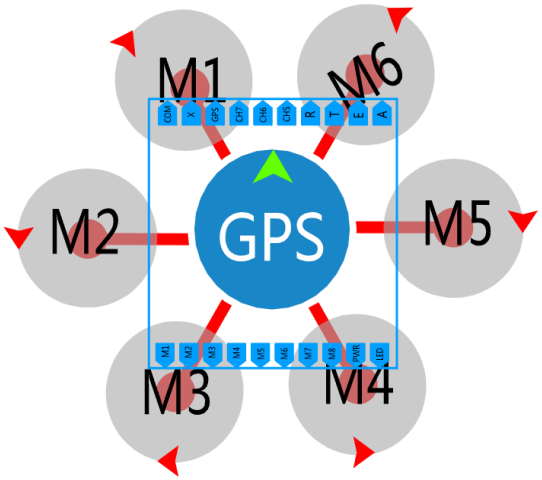
RED LED Description

GPS No Signal	
GPS Worst Signal (GPS Satellite Detected <5)	
GPS Bad Signal (GPS Satellite Detected =5	
GPS Good Signal (GPS Satelite Detected =6)	
GPS Best Signal (GPS Satelite Detected >6)	No Flash
Low Voltage Alarm	
Voltage lower than Landing Voltage (Below Low Voltage Alarm)	

SYSTEM ASSEMBLY AND CONNECTION



AIRCRAFT TYPES (MOTOR MIXER)

	
Quad-rotor X	**Quad-rotor I**
	
Hexa-rotor I	**Hexa-rotor V**

Inconsistent installation will cause the aircraft unable to fly

1. Flight Controller (FC) Orientation Arrow must point to the aircraft nose direction
2. GPS Orientation Arrow must point to the same direction as the FC
3. The side with the receiver installed is the aircraft nose.

CONNECTING TO ASSISTANT SOFTWARE

Properly connect receiver, ESC, BEC module, GPS, flight controller, ensure all propellers are removed. Power on the aircraft, connect USB cable between BEC module and computer, wait for the computer to identify the device, once the device has been identified, a removable disk icon will be appeared in the computer.

If the micro SD card is removed, the flight controller can not to communicate with computer

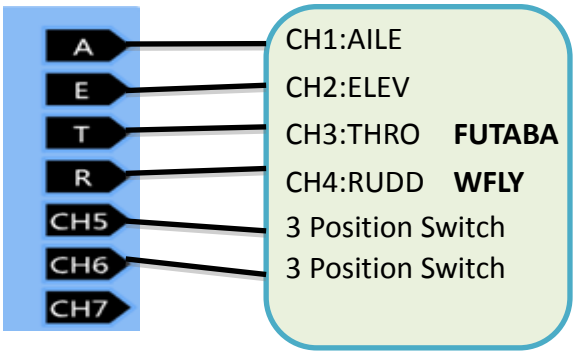
*Suggest using lower capacity SD card

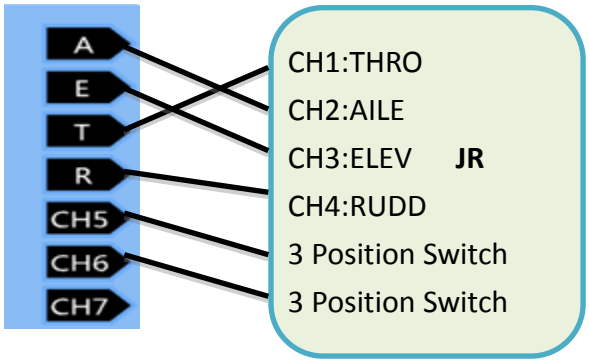
Must ensure the micro SD card is correctly inserted, in order to connect to PC or normal operation of the flight controller

TRANSMITTER

The flight controller can be connected with most commonly used R/C transmitters with receiver, please turn off all mixing output before the connection. Ensure there are at least two 3 position switches are available on the transmitter (CH5,CH6 shall be left unconnected, must connect to the switches), and all channels can be set to reverse.

Futaba/JR transmitter connection, for other transmitter can also refer to the connection shown below





When connecting* **Futaba *transmitter, reverse on all channels must turn off*

SWITCH FLIGHT MODES

Once CH5 is being connected to 3 position switch channel on the transmitter, user is able to switch between Attitude, Altitude, GPS

Once CH6 is being connected to 3-position switch channel on the transmitter, user is able to switch between one key return home or AOC mode.

CH5, CH6 Switch Position and Flight Mode Selection.

Channel	CH6:-A	CH6:-B	CH6:-C	
CH5:-A	Attitude	Attitude + AOC	Attitude	Flight Mode
CH5:-B	Altitude	Altitude + AOC	Altitude	Flight Mode
CH5:-C	GPS	GPS + AOC	GPS + RTH	Flight Mode

CALIBRATE R/C TRANSMITTER

When receiver is being connected, it requires calibrating the transmitter channel throw and center point.

Calibration steps as followed (All channels must be set to 0 during calibration)

1. **Turn on transmitter, push throttle to Max, all other sticks at center**
2. **Power on aircraft (receiver), wait for the yellow LED flashes**
3. **During the bule LED flashing, pull throttle to 0**
4. **Wait for the system to enter normal status**

If unable to enter calibration mode, push throttle to reserves direction and repeat.

Once entered calibration mode, the yellow LED flash intermittently, now pull the throttle to 0, all other sticks must be at center

If the throttle sticks already at minimum and still unable to enter calibration mode, please check whether the receiver is connected properly or throttle set to reserve.

ATTITUDE MODE

At attitude mode, the aircraft will level at its attitude, transmitter corresponds with aircraft attitude, move stick up, the aircraft move forward, aircraft automatically level if stick at center.

ALTITUDE LOCK MODE

Aircraft will maintain level from ground, and keep altitude holding at altitude lock mode, when throttle stick at center point. Aircraft will ascend when the throttle sticks above center, descend when the throttle sticks below center.

GPS MODE

GPS mode make the flight much easier for the user, when all sticks at the center point, the aircraft will automatically locked at current position and hovering accurately in the air, it provides good wind resistant with windy condition.

At this mode the stick corresponding with speed, max speed about 4m/s
Must ensure autopilot system collects enough satellite signals, otherwise aircraft flight will not be able to hover
By observing the RED LED to confirm the satellite signal condition, refer to *LED DESCRIPTION*

ONE KEY RETURN HOME

The aircraft will ascend to the predefined height once the ONE KEY RETURN HOME is selected, and adjust the aircraft orientation to let the tail point to the take off point. Hovering in the air for while then rapidly return to the top of the take off point, after few second the aircraft will land on the take off point.
To use ONE KEY RETURN HOME, refer toCH5, CH6 Switch Position and Flight Mode Selection.

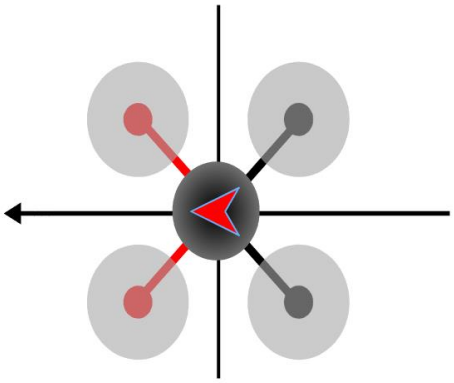
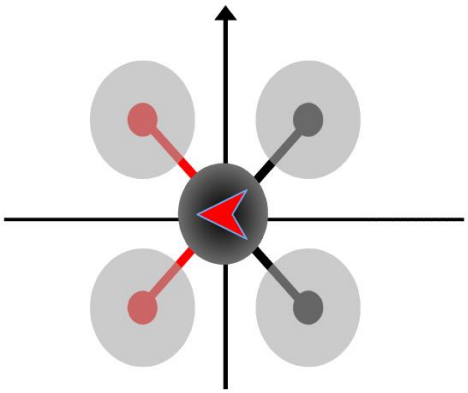
When use ONE KEY RETURN HOME, must ensure the auto pilot system has collected enough satelite signal, otherwise the aircraft will not to fly, all sticks must be at center position when excute ONE KEY RETURN HOME.

CH6 can be used to intervent the ONE KEY RETURN HOME process, but not suggest to perform this action, as this may cause the aircraft crash during the high speed flight.

AUTOMATIC ORIENTATION CONTROL (AOC)

AOC mode can be turned on via CH6; with AOC the aircraft forward direction has nothing to do with the nose direction.

How to switch on; refer to Switch flight Modes chapter.

AOC off, push elevator stick	AOC on, push elevator stick
Black arrow point to the actual flight direction	
	
Fly towards aircraft nose direction	Fly toward direction of locked course

When AOC is switched on, the flight controller will record the current nose direction as forward direction.

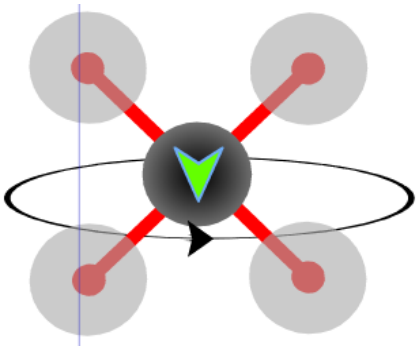
ELECTRONIC COMPASS

Flight controller calculate the aircraft flying course by detecting the magnetic field, environment/condition changes may cause the magnetic field change, the electric compass must be calibrated in any one of the following circumstances. Otherwise serious consequences may occur such as a crash.

a) Initial use, after the aircraft has been assembled
b) Aircraft rotating during hovering (Toilet bow effect)
c) Change to new airframe, or change installation position.

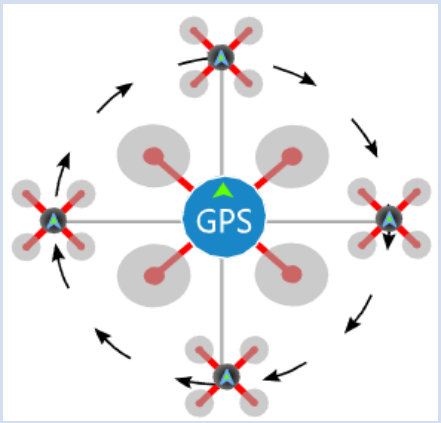
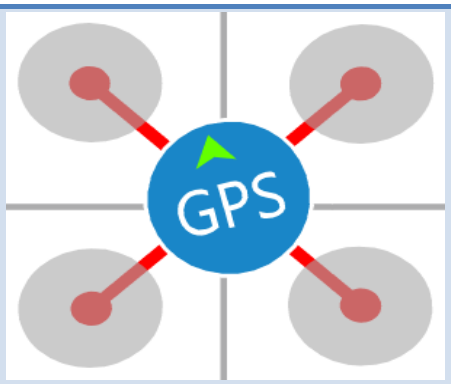
CALIBRATION

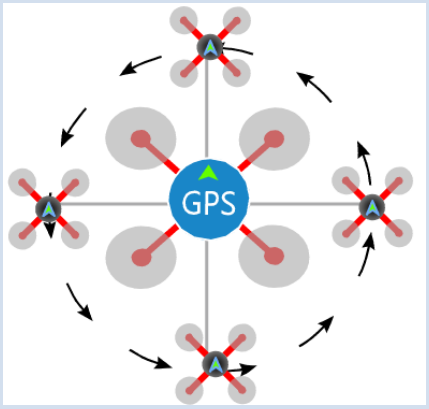
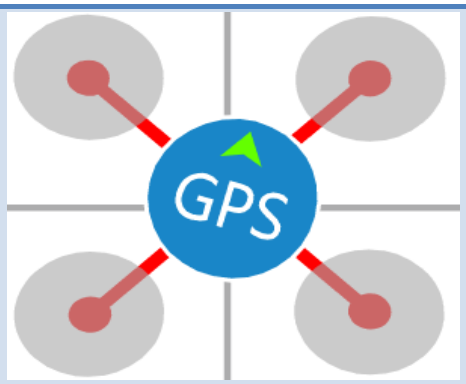
1. Switch on transmitter, push the throttle stick to 0, and power on the auto pilot system.
2. Quickly switch the control mode switch (CH5) till the GREEN LED is flashing.
3. Hold multi-rotor horizontally and rotate it around the gravitational force line (About 360°) till the GREEN LED change to constant green.
4. Hold multi-rotor vertically and rotate it (nose point downwards) around the gravitational force line (About 360°) till the LED turn off. Meaning calibration is completed.

	
Hold horizontally, rotate the multi-rotor Till the GREEN LED change to constant green	Hold vertically, rotate the multi-rotor till the GRREN LED turn off.
LED status during horizontal calibration 	
LED status during vertical calibration 	

Multi-rotor Rotating Problem During Hovering

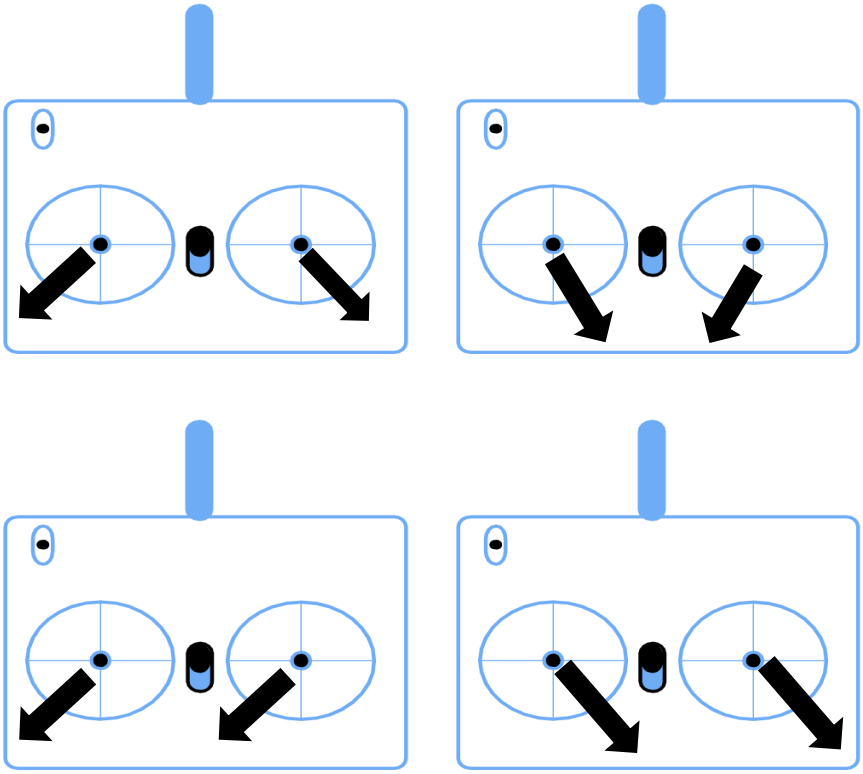
If you have done the compass calibration and there is rotating problem, please re-calibrate the compass.
If the problem persistent, please reinstall the GPS as the instruction below

Rotating Clockwise	Rotate GPS counter clockwise for certain angle (0-30°)
	

Rotating counter clockwise	Rotate GPS clockwise for certain angle (0-30°)
	

START/STOP the MOTORS

Push throttle up will not start the motor, push the throttle down will not stop the motor either, motor will only start or stop unless one of the follow sticks combination command (CSC) is executed.



If the flying direction is oppsite of the stick direction, please set to revers in the transmitter setting.

*If the motor fail to start after the above action has been done, Please recalibrate R/C transmitter CALIBRATING R/C TRANSMITTER

LOW VALTAGE PROTECTIONG

There are two levels of low voltage protection available to use, low voltage alarm and low voltage landing. Correctly use the low voltage protection will effective extend the battery life.

LOW VOLTAGE ALARM

When the low voltage alarm trigged, RED LED light begin flashing, automatically move up the throttle from the end point, please prepare for the multi-rotor to land to prevent any crash!

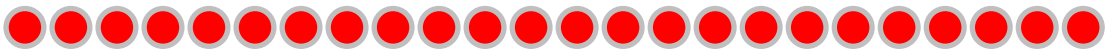
LED flashing sequence during alarm stage

Value of alrm voltage can be set via assistant sofware.

LOW VOLTAGE LANDING

When battery level below the low voltage landing alarm, the multi-rotor will automatically landed from the its currently position.

After enter the low voltage landing, the RED LED will flash constantly



THIS FUNCTION DOSE NOT WORK ON NORMAL MODE.
THIS FUNCTION DOSE NOT WORK ONONE KEY RTH MODE

Set auto-landing voltage to 0V, can switch off the low voltage landing.
When the system enter the automatic landing process, the throttle stick will not be able to control the aircraft altitude. In order to regain control of the aircraft, switch it to NORMAL MODE during this stage.

FAILSAFE

The auto pilot system provides complete failsafe protection functions, which effectively avoid the lost or crash of multi-rotor aircraft. User can choose auto-landing or position hold when the failsafe switch is turned on. The movement in failsafe mode can be chosen via the assistant software. Default value is define as Return to Home.

SET FAILSAFE ON TRANSMITTER

1. Set the throttle through the failsafe protection to minimal
2. Set the pitch, roll, direction channel failsafe protection to 0%
3. Set mode switch to GPS mode

POSITION HOLD

If you do not choose auto return to home, the aircraft will enter position hold mode when failsafe is activated. Once regain the control signal, the system will pass the control to the user.

RETURN TO HOME

The multi-rotor aircraft will perform the following action after entering the RETURN TO HOME mode

a) If the current altitude is less than the preset level, the aircraft will automatically rise to the preset altitude
b) Automatically adjust the aircraft flying direction, make the tail point to the take off point.
c) Fly to take off point straight
d) Hovering on top of the take off point before landing

During the course of return to home, even the control signal is regained, user will not able to control the auto pilot system

User can switch to attitude mode, to end auto return to home and regain the control of aircraft.

TAKE OFF POINT (RETURN POINT)

a) The system automatically records the current take off point as the return point

b) To ensure the safety of flight, collect enough GPS satellites signal before takeoff.