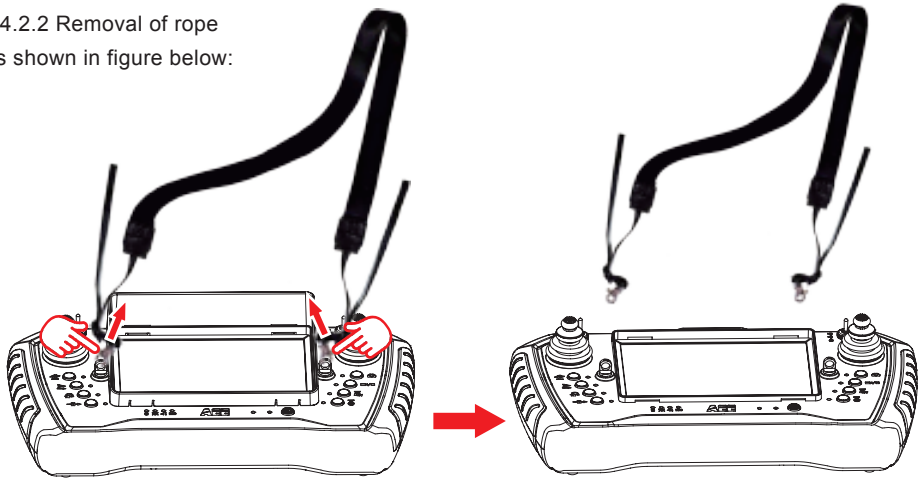
1.4.2.2 Removal of rope

As shown in figure below:



2. Aircraft

2.1 Overview of aircraft

The Mach6 aircraft mainly consists of flight control system, communication system, locating system, power system and intelligent flight battery. The functions of all parts will be introduced in details in this chapter.

2.2 Flight mode

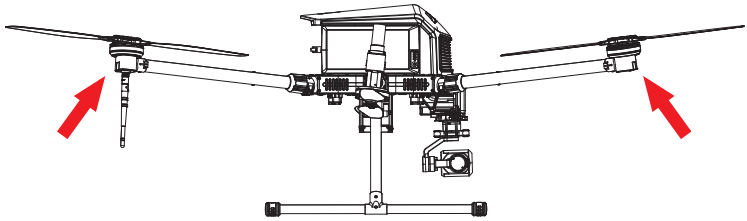
High Velocity Mode: This mode is the same as the POS HOLD Mode(GPS), the max horizontal flight speed is increased, and the max speed 75.5ft/s.

POS HOLD Mode: The drone can suspend based on its sensor and its suspension level and position depend on the satellite locating quality. It is recommended to enter this mode in general operation.Max speed 59.1ft/s.

ATTI mode: Please use this mode with caution, for the drone can maintain the height but fail to maintain the horizontal position in this mode and it may have drifting. This mode does not apply to a beginner.

2.3 Navigation and Status Lights

The drone includes nose LED indicator and drone status indicator. As shown in figure below:



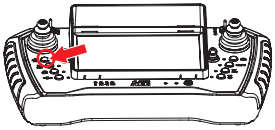
The nose LED indicator shows the nose direction of drone and the white light will be normally on after the drone is started. The tail LED indicator shows the current status of flight control system. Please refer to the status of flight control system represented by flickering modes.

Introduction to drone status indicators

Normal status	
Power-on self-test	During power-on self-test, the tail LED will flicker alternatively in red, yellow, purple and green; it will become red when self-test is passed
High Velocity Mode	When GPS signal is sufficiently acquired, the Tail LED will be Green. If GPS signal is not sufficient the LED will be Red.
POS HOLD Mode	When GPS signal is sufficiently acquired, the Tail LED will be Green. If GPS signal is not sufficient the LED will be Red.
ATTI mode	The tail LED is normally on in red.
Return flight	The tail light flickers alternatively between purple and green.
Upgrade firmware	The blue light flickers quickly during upgrade.
Compass calibration:	Slow flickering from yellow light to green light. When satellite signal is received and locked, the green light will be normally on; otherwise, the red light will be normally on.
Accelerator calibration:	Calibration mode is entered when blue light is on; the blue light flickers during calibration; when calibration is done, the blue light is normally on; the green light will be normally on when level calibration is done.
Warning and fault	
Battery level alarm	Battery level alarm
Battery level alarm	Battery level alarm
Drone and remote control signal is lost	Drone and remote control signal is lost

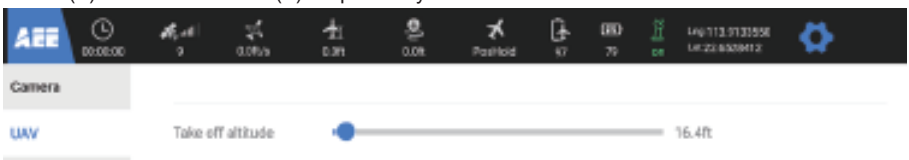
2.4 Auto takeoff/landing

The MACH6 drone supports one-key takeoff and landing. Press “One-key takeoff/landing” button and enter “ ” to set the takeoff height.



Steps of use.

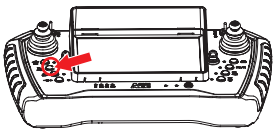
1. Enter “ ” in the main interface of remote control and set the takeoff height in “UAV setting interface – Takeoff height”. The default takeoff height is 16.4041995(ft); the min. and max. takeoff height are 16.4041995(ft) and 393.7007874(ft) respectively.



2. Once height setting is done, short press “One-button takeoff/landing” button of remote control, the main interface of remote control will pop up the dialogue box of “Are you sure to enter one-button takeoff?”; the drone will unlock vertical takeoff and suspend at the designated height.
3. Short press again and the main interface of remote control will pop up dialogue box of “Are you sure to land?”; the drone will land vertically and lock the propellers automatically.

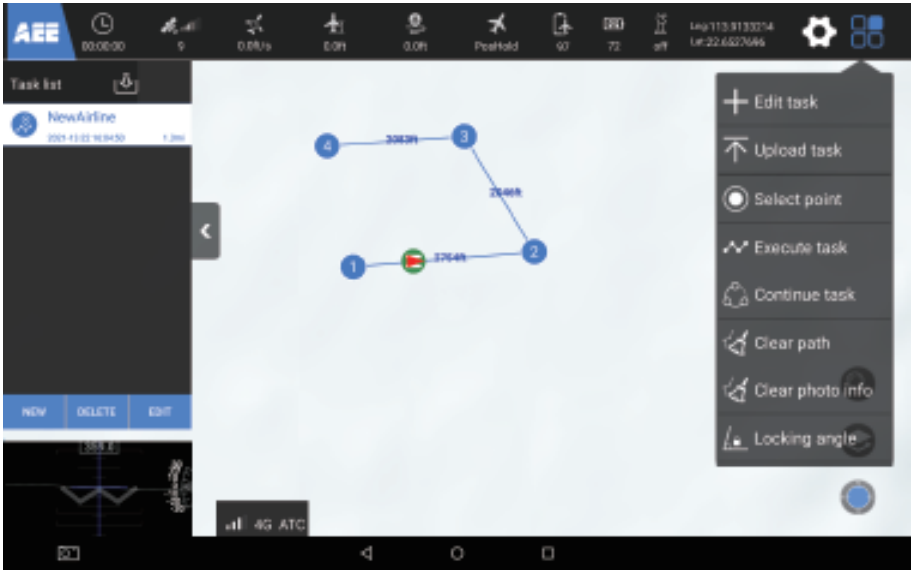
2.5 One-button route

The MACH6 drone supports one-button auto route mission. Press “One-button route” on remote control or enter the map to set “ ” “Edit route” “Execute route”.

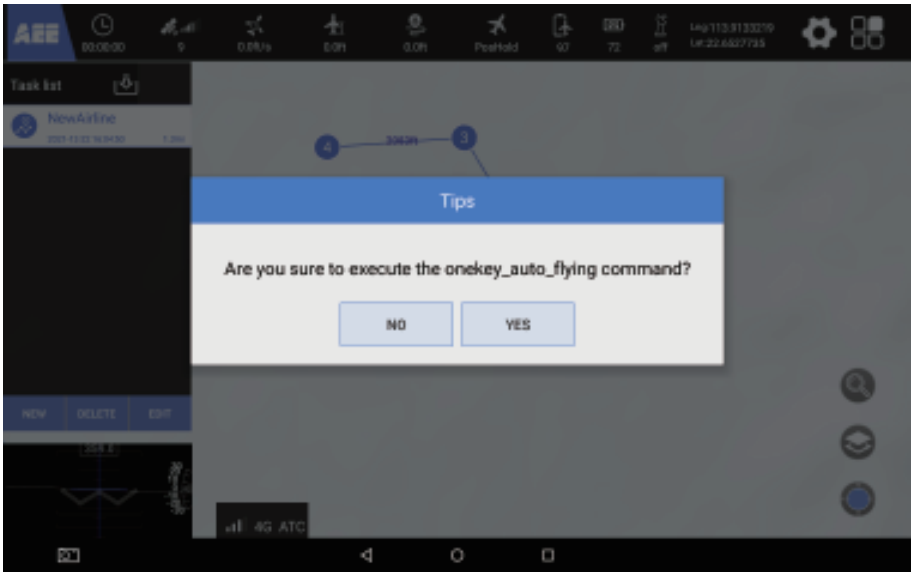


Steps of use:

1. Firstly, edit a route mission and upload it to the drone. Please refer to “5.9 Route mission”.



2. When upload is done, short press “One-button route” on remote control, or enter map and press “Execute route” in “Edit route”, the main interface of remote control will pop up dialogue box “Are you sure to execute route?”, the drone will unlock automatically and execute the route mission. Once the mission is completed, the drone will return, land and lock the propellers automatically.



2.6 Auto return

The Mach 6 supports Return to Hom (RTH) function. The Home Point is defined point at which the GPS signal is acquired. When the communication signal is lost between the remote and the drone, RTH is initiated automatically. The Mach 6 supports 4 RTH modes, one button return, low battery alert return, mission completion return, and control signal loss return.

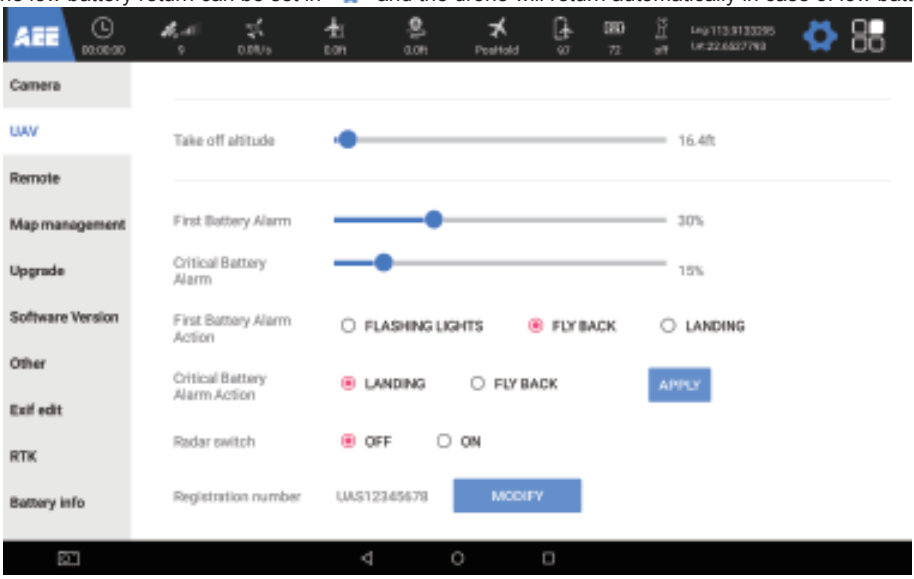
2.6.1 One-button return

Press “One-button return” key on remote control to trigger one-button return. The user may use one-button return function when the drone is beyond the visible range and the nose direction is unknown. Return height: When drone height is lower than 49 ft, the drone will firstly climb to the height of 49ft and then start returning. When drone height is over 49ft, the drone will return directly at the current height. During return, the drone’s flight mode will become “return”; meanwhile, the tail green light and purple light will flicker alternatively. The user can quit the return mode through “Flight mode switch” on the remote control, to control the drone again.

Note: 1. It is recommended to enter the middle position (POS HOLD Mode) after flight mode is switched.
2. If the switch is pulled to down position (ATTI Mode), pay close attention to the drone to avoid safety accident.

2.6.2 Low battery return (auto calculation function will be further added)

The low battery return can be set in “ ” and the drone will return automatically in case of low battery.



As the default setting, the return when the first-level alarm is triggered, or the drone will land when the second-level alarm is triggered. This function can be changed through user setting, and the drone will have corresponding actions after 3-5s when reaching the set alarm threshold of battery level. The user can stop the first-level alarm action through mode switch to control the drone again. However, if the first-level alarm is stopped, the set action will not be executed; instead, remote control will have prompt and buzzing and the tail light of drone will flicker slowly in red. The second-level alarm action is compulsory and cannot be stopped, but the user can control the flying of drone to land at safe place.

Note: 1. Make sure to inspect the battery level prior to takeoff, to make sure the drone can finish the mission. In case of low battery, please replace the battery in time to make sure the drone can land safely.
2. When it prompts “First-level alarm of battery level” while the drone is flying within visible range, please return and land the drone in time.
3. While the drone is flying beyond the visible range, pay close attention to the battery level and return in advance in case of low battery, to make sure the drone can return and land safely, and avoid over discharging of battery for further use.

2.6.3 Mission completion auto return
Upon finishing execution of all route missions, the drone will return to HOME point (takeoff point) automatically.

2.6.4 Control failure return
When the drone is disconnected from remote control for 3s, the drone will return automatically. If signal is reconnected during return, the user can switch the mode (switch to middle position (POS HOLD Mode) to stop the return mode. When the drone’s return is stopped, it will suspend at the local place, and the user may press “One-button return” to make the drone return.

2.7 Radar avoidance function
The drone is fitted with millimeter wave radar obstacle-avoidance function at front side, to prevent damage of drone due to obstacles when it flies forwards.
Note: The radar is fitted at the front end of drone only. There’s no radar at the left, right and rear side.

2.7.1 Distance setting and prompt information are as follows:
Stop forward flight: Distance limit: 0~32.8ft; when obstacle occurs within distance of 32.8ft, the drone will stop forward flight, but it can fly to the left, right and back or climb. If obstacles are detected at the left or right side, the drone can fly backwards or climb only.

Distance prompt information:
The color includes green, yellow and red; the indicator will become red when obstacle occurs within 32.8ft, become yellow when obstacle occurs within 33ft and 65.6ft, or become green when obstacle occurs within 131ft; meanwhile, the drone will decelerate, in order to stop within distance of 32.8ft during high-speed flying forwards.

The prompt area is divided into 3 areas: When observed from the front side, the detection angle 112° is divided into 3 small areas which are about 37° respectively; the prompt area will show corresponding colors and distances when obstacles occur at different distance in the corresponding area. Note: The data will show the min. distance only.

Dead zone of detection:
The current dead zone of radar detection is about 5.25ft, and no distance prompt will be provided if distance is less than 5.25ft;

Schematic Diagram for Distance Data and Color Area of Radar

When obstacle (pay attention to dead zone) occurs within distance of 6.5616798(ft) at front of drone, the takeoff will be locked and the interface of remote control will prompt obstacle within 6.5616798(ft);
Not: 1. The radar function is enabled in “POS HOLD Mode” only; in this flight mode, the user may enable or disable the radar.
2. The radar will be disabled automatically in “ATTI Mode” and the user should use the drone with caution in this mode.

2.8 RTK
2.8.1 System composition
Drone, remote control and RTK base station

2.8.2 Use process
Put the three components, i.e. drone, remote control and RTK base station, at the open and unblocked outdoor space, turn on them respectively and check their working status.

2.8.3 Drone
Once the drone is started, the general satellite and high-accuracy satellite locating and searching function will work simultaneously; when satellite is located and locked, the tail light of drone will become green; the flight control system will compare the satellite searching quality and effect, and have auto switching between GPS- general mode and RTK high-accuracy locating mode; the status light at drone end has no prompt, and the locating status and mode can be viewed from the remote control;

Remote control
The remote control should clearly indicate the information, such as satellite locating mode, status and satellite quantity. The details are as follow:
GPS mode (general):
a. Mode display: GPS logo is marked at the upper left corner of current satellite icon;
b. Locating status: The icon, letter and figure will become grey when it is not located, or become green when it is located.
c. Satellite quantity: Maintain the existing display mode and have real-time display of satellite quantity.

RTK mode (high accuracy):
a. Mode display: The RTK-R (real-time RTK) and RTK-N (network RTK) are marked at the upper left corner of current satellite icon.
b. Locating status: The icon, letter and figure will become grey when it is not located, or become blue when it is located.
c. Satellite quantity: Maintain the existing display mode and have real-time display of satellite quantity.

2.8.4 Schematic diagram for icon position of remote control is as follows:

2.9 Point selection flight

Select the flight point in map setting. For details, please refer to “5.9.7 Point selection operation”.

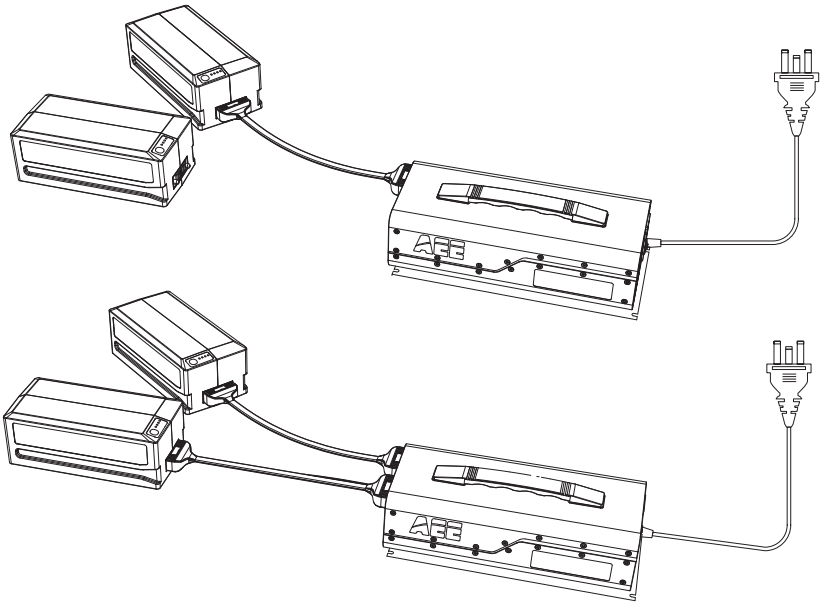
Note: The fly height must be set properly while using this function.

3. Intelligent Battery

3.1 Introduction

As an intelligent battery that is designed specifically for MACH6, the battery has self-heating function to get adapted to cold places. With good judgment strategy, the battery can monitor the local and total status, prompt and handle the faults. The intelligent battery must be charged by the specific charger provided by AEE.

The charger has six jacks, which can charge six batteries at the same time. (**Note:** Two charging cables are included as standard)



Note: Make sure to fully charge the intelligent battery before use.

3.2 Functions

1. Battery level display: The battery has battery level indicator to show its current battery level.
2. Balanced charge protection: It can balance the voltage of internal battery cell automatically, in order to protect the battery.
3. Overcharge protection: The battery will stop charge automatically for overcharge may damage the battery severely.

4. Power-off protection: When battery is turned on, but no electrical device is connected, the battery will enter power-off (shutdown) status within 5min, in order to maintain its battery level.
5. Communication: The real-time battery information can be viewed in the setting of remote control, such as battery voltage, current, battery level and charging times.

Note: Please read the Manual, disclaimer and rules on battery surface carefully and follow them strictly before use; otherwise, the consequences caused therefrom should be undertaken by the user.

3.3 Use of intelligent battery

3.3.1 Intelligent battery on/off

Intelligent battery on: firstly short press the on/off button once when intelligent battery is off and then long press it for over 2s, to turn on the battery. When battery is on, the power indicator will be on in turns and the green indicator will be normally on. The power indicator shows current battery level.

Intelligent battery off: firstly short press the on/off button once when intelligent battery is off and then long press it for over 2s, to turn off the battery. When intelligent battery is off, the power indicator will be off in turns.

3.4 View battery level

Short press the on/off button once to view the current battery level when intelligent battery is off.

3.4.1 The power indicator can display the battery level during charging/discharging. The definition of indicator is as follows:

“ ■ ” LED indicator is normally on “ ▩ ” Indicates that the LED light flashes slowly “ ▥ ” Indicates that the LED light flashes quickly

Slow flashing: once every 1 second, fast flashing: once every 0.5 second. The charging status is flashing in the form of a marquee									
Discharge state					charging				
LED1	LED2	LED3	LED4	instruct	LED1	LED2	LED3	LED4	instruct
■	■	■	■	80~100%	■	■	■	■	99~100%
■	■	■		60~80%	■	■	■	▩	80~99%
■	■			40~60%	■	■	▩	▩	60~80%
■				20~40%	■	▩	▩	▩	40~60%
▩				Less than 20%	▩	▩	▩	▩	Less than 20~40%
▥	▥	▥	▥	Abnormal battery	▥	▥	▥	▥	Abnormal battery

3.4.2 Charging

1. Connect AC power to AC power supply.
2. Connect intelligent battery and charger when intelligent battery is on or off.
3. Under charging status, the battery level indicator of intelligent battery will flicker circularly and indicate the current battery level.
4. The intelligent battery is fully charged when all battery indicators are off. Please disconnect the intelligent battery from charger and unplug the charger plug, to complete the charging.
5. The intelligent battery, which is hot after completion of flight, must be cooled to room temperature before being charged.

Note: Make sure the intelligent battery is off before pushing it in or out from the drone. Do NOT insert or unplug the battery when the battery is on.

3.4.3 The indicator definition during charging is as follows:

“ ■ ” LED indicator is normally on “ ▩ ” Indicates that the LED light flashes slowly “ ▥ ” Indicates that the LED light flashes quickly

Battery Level Indicator				
LED1	LED2	LED3	LED4	Current Battery Level
▩	▩	▩	▩	Less than 20~40%
■	▩	▩	▩	40~60%
■	■	▩	▩	60~80%
■	■	■	▩	80~99%
■	■	■	■	99~100%

3.4.3.1 Details of charging completion:
Once charging is done, the LED indicator of charger will turn green from red. Please disconnect the charger from battery according to the following sequence, to avoid short circuit due to accidental contact between positive and negative pole.
1. Firstly, turn off the charger and remove the plug of external power wire;
2. Unplug the charging wire on battery;

Note: 1. The intelligent battery must be charged by the specific charger provided by AEE; otherwise, the consequences should not be undertaken by AEE.
2. In order to avoid short circuit caused by accidental contact of anode and cathode charging connector, battery damage or other safety accidents, it is strictly prohibited to remove charging from the charger before turning off the power switch. It is recommended to charge the battery in fire-proof place and take proper protection measures; it is forbidden to charge the battery indoors.

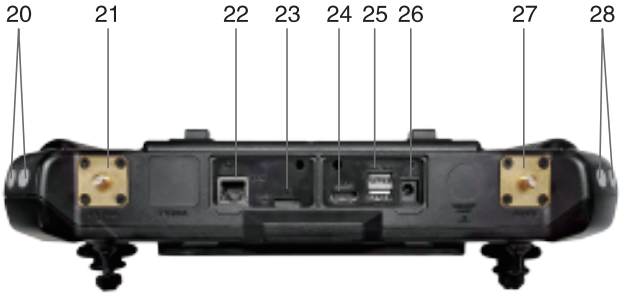
3.4.4 Charging protection indicator

3.4.5 Notes of using intelligent battery
1. Do not remove or reassemble the battery.
2. Do not short circuit the battery or connect it in reverse electrode.
3. Do not use near heat sources.
4. Do not put the battery into water or wet it.
5. Do not charge near fire or under direct sunlight.
6. Do not crush or throw it.
7. Do not use the battery under the condition of serious damage or deformation.
8. No reverse charging or over discharging (otherwise, it may cause battery bulging, leakage, cell breakdown, even explosion, etc.)
9. It is forbidden to open or disassemble the battery.
10. Waste batteries should be recycled for environmental protection.

3.4.6 Maintenance & transport of intelligent battery
1. If the battery is not used for a long time, it is recommended to take out the battery and place it separately and charge and discharge it every 3 months. First, discharge the battery to 3.75V, then fill it to 4.2V, and finally put it to 3.85V to store the cell (single chip) to maintain the battery performance and extend the service life of the battery.
2. For safety concern, the battery should be discharged in advance during transport. Discharge the single piece to 3.75V~3.8V.

4. Illustration and Functional Introduction of Remote Control and Drone Parts

4.1 Illustration and functional introduction of remote control parts and drone parts。 As shown below:
Model of remote control: Y12

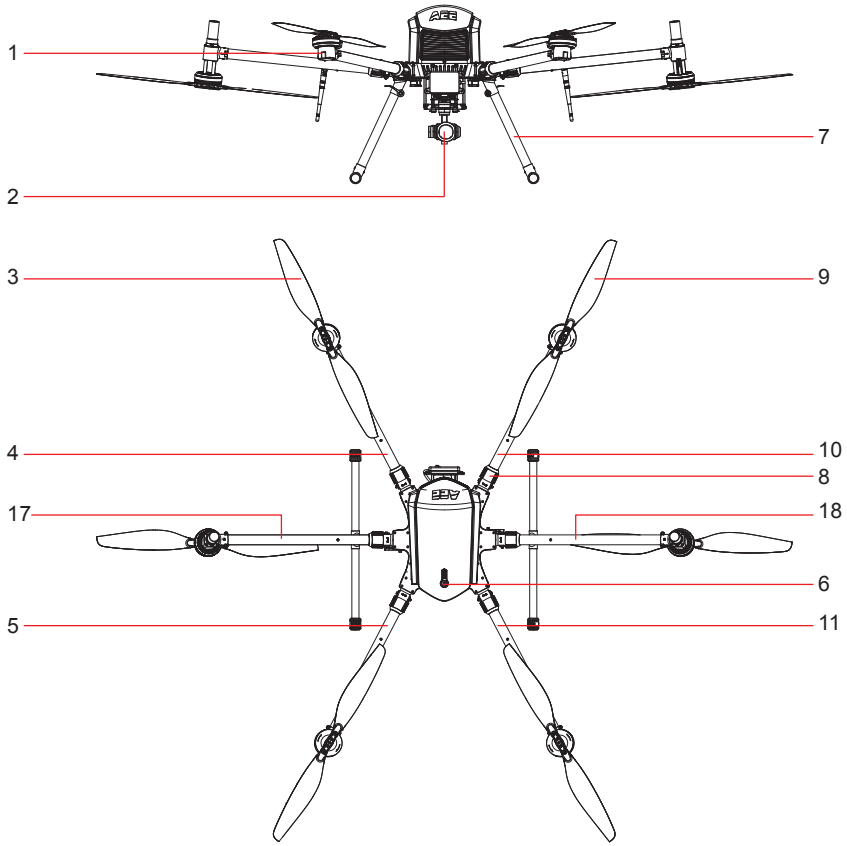


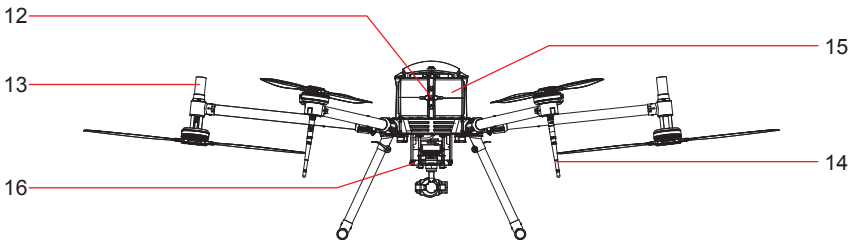
No.	Category	Type	Qty.	Brief description
1	Flight mode switch	Three-speed toggle type	1	UP：High Velocity Mode Middle: POS HOLD Mode (GPS) Down: ATTI Mode
2	Left joystick	Universal joystick	1	Control the throttle and the heading
3	One button take-off/landing	Push-button	1	One button take-off/landing
4	One button route	Push-button	1	After setting the route, one button controls the drone to fly according to the route.
5	One button return	Push-button	1	When the drone has a normal flight, one button controls it to make autonomous return.
6	Route suspended/resumed	Push-button	1	Press the button to suspend the route, and then press it again to resume the route
7	Switch camera mode	Toggle type	1	Top level: Lock the lens Low level: lens back to center Mid level: Camera follow
8	Right joystick	Universal joystick	1	Control the flight forward & backward and to left & right
9	Camera button	Push-button	1	Short press to start airborne photo taking
10	Video button	Push-button	1	Short press to start/stop airborne video
11	Payload key	Push-button	1	Payload power on/off
12	Navigate light button	Push-button	1	Navigation light on/off
13	Power button	Push-button	1	Short press once, long press for 3S to turn on/off the power, and a prompt sound will be given when the power is started successfully。 Forced off: Short press once, and then long press it for 5~10s
14	Button response indicator	LED light	8	It indicates whether the corresponding button works
15	System indicator	LED light	1	If the system works properly, the LED light will flash.
16	Communication failure light	LED light	1	If the communication between the remote control and the drone is interrupted, the light will be red.
17	Battery alarm light	LED light	1	When the battery is low, the light will be red.
18	Charging indicator	LED light	1	The light will be red during battery charging while the light will be blue when the battery is fully charged
19	Power button response indicator	LED light	1	It indicates whether the corresponding button works
20	Zoom control button	Push-button	2	Mark "+" for zooming in images, mark "-" for zooming out images
21	Digital video transmission antenna interface	/	1	Digital HD video antenna

22	Net port	/	1	Network cable interface
23	SD insertion port	/	1	SD card slot
24	HDMI	/	1	HD image transmission interface
25	USB	/	2	Software upgrade interface and external device
26	DCIN	/	1	Charger interface
27	Radio antenna interface	/	1	Radio antenna
28	Pitching control of the gimbal	Push-button	2	Control the gimbal pitching, up means nose-up and down means nose-down
29	Reservation function button	L1/R1	2	Up: reservation function Down: reservation function
30	Gimbal course control	Push-button	1	Gimbal course key (30) + gimbal pitch key (28), left for top, right for bottom
31	Payload up control	Push-button	1	Control the payload tilt
32	Payload down control	Push-button	1	Control the payload bay

4.2 Illustration of drone parts

As shown in figure below:





【1】Motor
【2】Gimbal
【3】Positive propeller
【4】Foldable arm L
【5】Foldable arm L
【6】Power switch
【7】Landing gear
【8】Lock
【9】Counter propeller
【10】Foldable arm R
【11】Foldable arm R
【12】Battery lock
【13】RTK
【14】Antenna
【15】Battery
【16】Mount interface
【17】Foldable arm L
【18】Foldable arm R

5. Remote Control

5.1 Operation of remote control

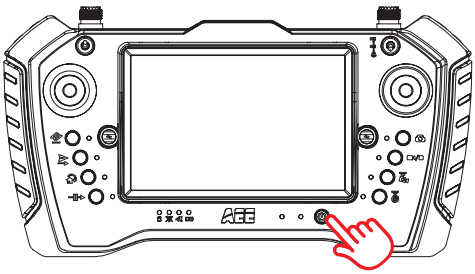
Operation mode of remote control

5.2 Remote control on/off

The Y12 remote control has a built-in high-performance large-capacity battery (5,600 mAh), which can work continuously for three hours. The current battery level can be checked through the remote control indicator. Turn on the remote control according to the following steps:

1. Short press once to view the battery level. If battery level is low, please charge the remote control.
2. Short press and then long press for 3s to turn on the remote control. When remote control is turned on, the buzzer will have “Di – Di– Di– Di– Di” sound from low to high level, and the 8 LED indicators will be on in turns.
3. After use of the drone, short press twice and the screen of remote control will pop up dialogue box “power off, restart” for selection. For any special condition, short press and then long press for 5~10s to turn off by force.

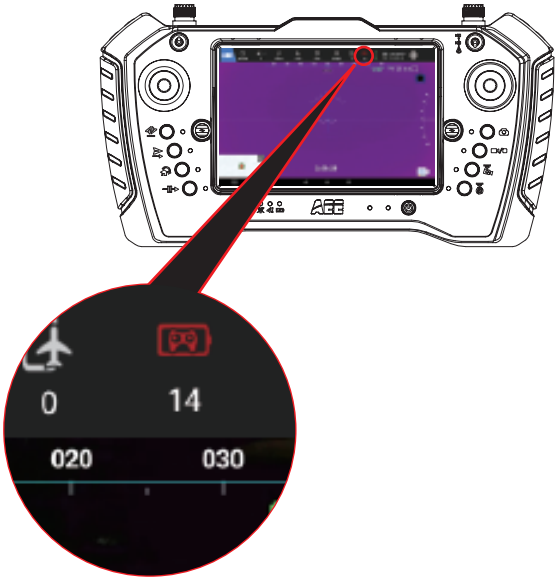
The operation above is as shown below:



5.3 Battery level of remote control

5.3.1 Low battery alarm of remote control

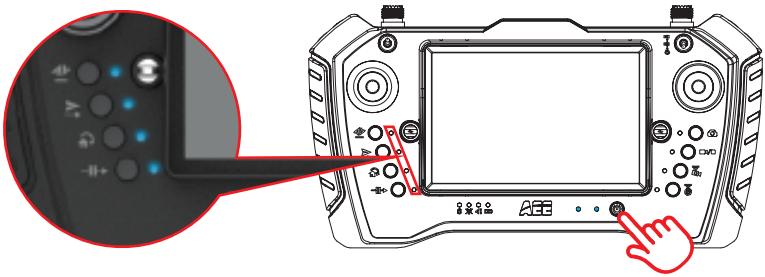
Low battery alarm of remote control Y12			
Low battery alarm (15%)	Beep...beep...beep... (continuous)	Remote control prompts " remote control low battery "	The battery level icon of remote control on main screen becomes red from white



5.3.2 Check the battery voltage of remote control

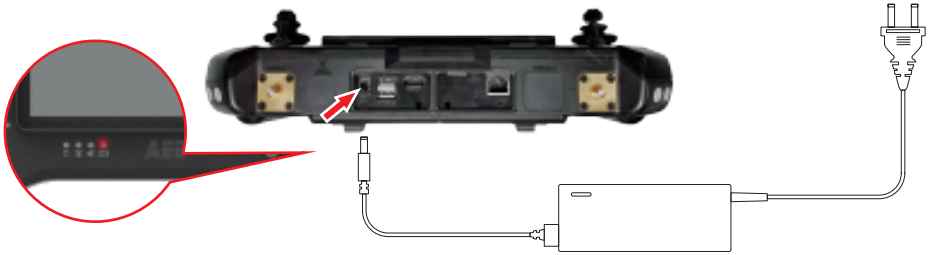
Power detection before starting: short press the power button of the remote control, and the state on the left shows the current power of the remote control, as shown in the following table:

Battery level of Y12 remote control	Status light display (blue light)
Power ≥75%	Four status lights are on
50% ≤ Power <75%	Three status lights are on
25%≤ Power＜50%	Two status lights are on
Power＜25%	One status light is on



5.3.3 Remote control charging

The user can charge the remote control with a standard charger. Charging is as shown below:

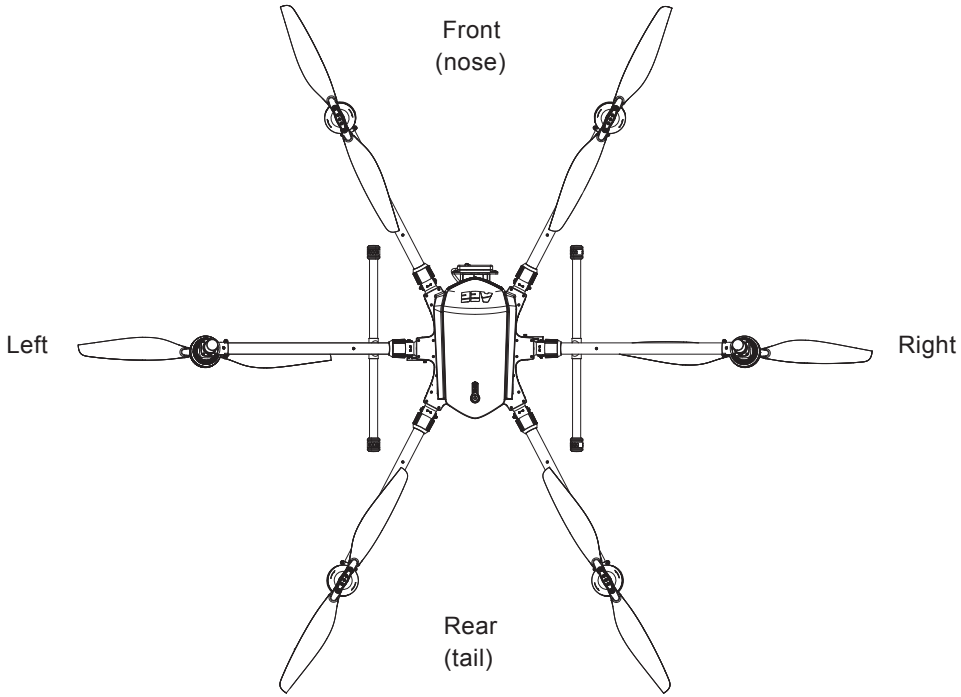


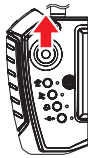
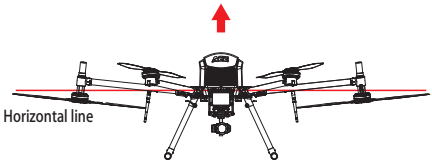
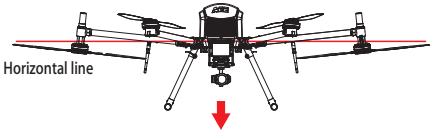
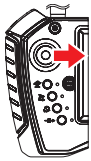
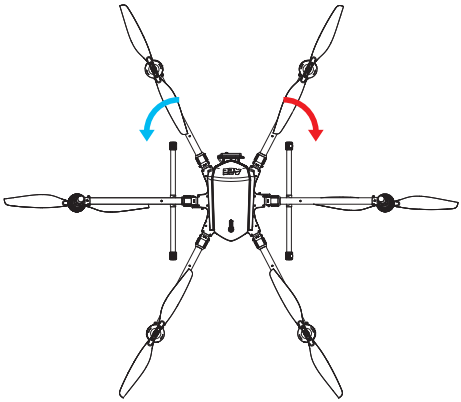
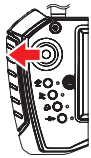
Charging indicator	Charging status
Red light	Charging...
Blue light	Charging completed

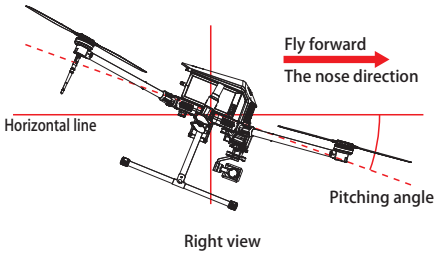
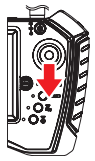
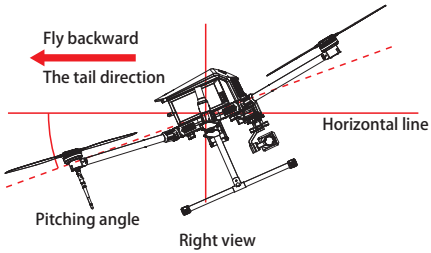
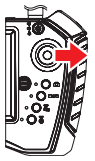
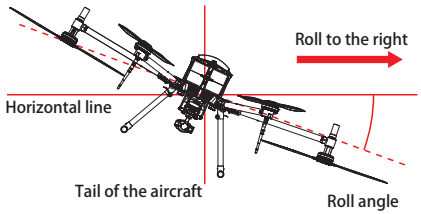
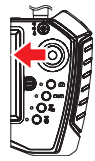
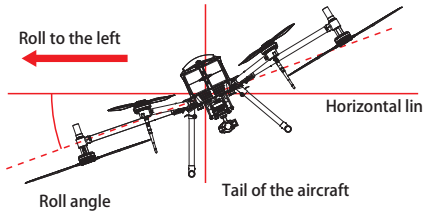
5.4 Drone operation

Operation definition

As shown below:



Joystick	Drone attitude	Illustration
Left joystick centered	Altitude and heading remain unchanged When the left joystick is centered, the altitude and heading of the aircraft remain unchanged	
 Left joystick forward, right joystick in situ	Upward When the motor speed increases, the propeller speed becomes faster; the bigger the joystick's amplitude is, the faster the climbing speed will be.	
Left joystick backward, right joystick in situ	Downward When the motor speed decreases, the propeller speed becomes slower; the bigger the joystick's amplitude is, the faster the landing speed will be.	
 Left joystick to right, right joystick in situ	Turn the nose right (Clockwise rotation)	
 Left joystick to left, right joystick in situ	Turn the nose left (Anticlockwise rotation)	

 Right joystick centered	Right joystick centered. When the number of GPS satellites is ⩾ 6, the position of the aircraft remains unchanged. When the number of GPS satellites is <6, the aircraft position needs to be manually controlled. The tail light is kept on in green after the satellite positioning	
 Right joystick forward, left joystick in situ	Fly forward The nose is downward, and the drone tilts forward and flies in the direction of the nose. At this point, push the throttle forward a little to adjust the flight altitude to make the drone fly horizontally	
 Right joystick backward, left joystick in situ	Fly backward The tail is downward, and the drone tilts backward and flies in the direction of the tail. At this point, push the throttle forward a little to adjust the flight altitude to make the drone fly horizontally	
 Right joystick to right, left joystick in situ	Fly to the right The drone tilts to the right and flies to the right.	
 Right joystick to left, left joystick in situ	Fly to the left The drone tilts to the left and flies to the left.