

LOVOL heavy industry Co., Ltd

**LOVOL**



# User Manual

LOVOL HEAVY INDUSTRY CO.,LTD.

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## 1. Disclaimer and Warning

LOVOL products are NOT toys and not suitable for children under the age of 18. Adults should keep the product out of the reach of children and DO NOT operate this drone in the presence of children. The operator must have some flight experience. People who DO NOT have any experience are not being suggested flying. Flying after the training of LOVOL is recommended.

DO NOT drop, launch, fire or project any dangerous payload on or at any buildings, persons or animals, or which could cause personal injury or property damage. DO NOT use the products for any reason other than general personal use. DO NOT use it for any illegal or inappropriate purpose (such as spying, military operations, or unauthorized investigations). DO NOT use this product to violate the right of privacy and private property of others.

LOVOL product is a multicopter flying platform intended for agriculture applications in farmland, woodland, orchards, etc. It offers easy flight when in good working order. DO NOT use it to do other functions, if you change parts of LOVOL drone, we are not responsible.

The information in this document affects your safety and your legal rights and responsibilities. Read this entire document carefully to ensure proper configuration before use. Failure to read and follow the instructions and warnings in this document may result in product loss, serious injury to you, or damage to your drone. By using the products, you hereby signify that you have read this disclaimer carefully and that understand and agree to abide by the terms and conditions herein. You agree that you are solely responsible for your own conduct while using the products, and for any consequences thereof. You agree to use the products only for purpose that are proper and in accordance with all applicable laws, rules and regulations LOVOL has made and may make available.

LOVOL accepts no liability for damage, injury or any legal responsibility incurred directly or indirectly from the use of the products if users DO NOT obey the instructions and warnings. The user shall observe safe and lawful practices including, but not limited to, those set forth in these safety guidelines.

LOVOL is a trademark of SHANDONG LOVOL HEAVY INDUSTRY CO., LTD. (abbreviated as "LOVOL") and its affiliated companies. Names of products, brands, etc., appearing in this document are trademarks or registered of their respective owner companies.

LOVOL reserves the right to update this disclaimer.

## **2. Using This Manual**

### **2.1 Before You Begin**

Check all of the included parts listed on the table in the box and read the operating manual. Make sure you fully understand the functionality of each individual part, the flight condition requirements, the key contingency warning functions/systems, and all government regulations before each flight. If you have any question or problems during the assembly, maintenance or use of this product, please contact LOVOL or LOVOL authorized dealer.

### **2.2 Before Flight**

Pre-flight checklist (refer to individual Pre-flight checklist):

- a. Remote controller and drone batteries are fully charged;
- b. Every part is in good condition;
- c. Propellers are in good condition and been unfolded. Frame arms are unfolded and the screws are firmly tightened;
- d. There is nothing obstructing the motors. You can test the motors on the ground to see if they are running in right direction;
- e. Spraying system is without any blockage and works properly;
- f. Calibrate Compass (GPS) and accelerometer (IMU) before first flight, after long way transportation/crash/big vibration, and calibrate GPS again at new flight location 5km away.

### **2.3 Pesticide Usage**

- a. Pesticides are poisonous and can pose serious risks to human safety. Use them in strict accordance with their specifications;
- b. Residue on the equipment caused by splashes or spills when pouring and mixing the pesticide can irritate your skin. Be sure to clean the drone after mixing;
- c. Use clean water to mix the pesticide to avoid blocking the strainer. Clear any blockages before using the drone;
- d. Wear protective clothing to prevent direct body contact with the pesticide. Always rinse your hands and skin after handling pesticides. Clean the drone and remote controller after applying the pesticide;
- e. Effective use of pesticides relies on pesticide density, spray rate, spray distance, drone speed, wind speed and wind direction. Consider all factors when using pesticides, but NEVER compromise the safety of people, animals and the environment in doing so;
- f. DO NOT contaminate rivers and sources of drinking water.

### **2.4 Operation**

- a. Stay away from the rotating propellers and motors;
- b. The takeoff weight must not exceed Max. takeoff weight;
- c. Maintain line of sight of your drone at all times;
- d. NEVER stop the motors mid-flight;
- e. DO NOT answer incoming calls during flight. DO NOT fly under the influence of alcohols or drugs;
- f. In the instance of a Low Battery Warning, land the drone at a safe location;
- g. During the Return-to-Home procedure, if there is obstacle on the way, switch "SA" top and manually control drone avoid it with RC;
- h. Always keep your hands on the remote controller so long as the motor is still

spinning. Turning on remote controller before powering on the drone. Power off the drone before turning off the remote controller after landing.

## 2.5 Maintenance and Upkeep

- DO NOT use aged, chipped or broken propellers;
- Remove or empty the spray tank during transportation or when not in use to avoid damaging the landing gear;
- Recommended storage temperature (empty spray tank): between -20°C and 40°C;
- Clean the drone immediately with clean water after spraying;
- Inspect the drone every 100 flights or after flying for over 20 hours;
- DO NOT over-charge or dis-charge the batteries;
- For more maintenance guidelines, refer to the following document.

## 2.6 Environment

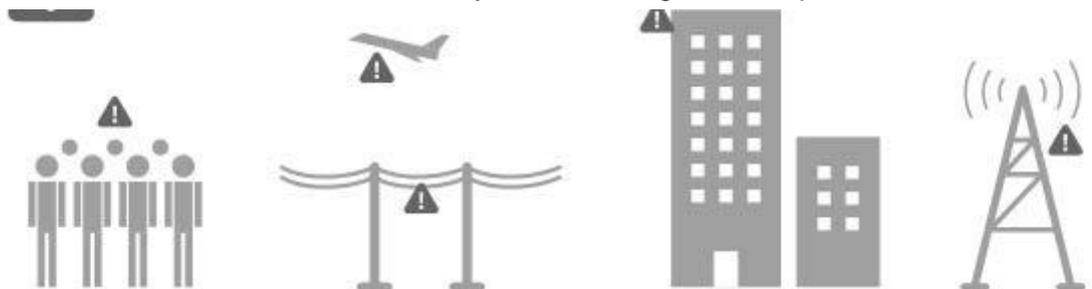
- Always fly at locations that are clear of crowds, cars, building and other obstacles;
- Be very careful when flying over 2,000 m above sea level;
- Fly in moderate weather conditions with temperatures between 0° to 40° C.

## 2.7 Observe Local Laws and Regulations

- DO NOT fly in the No Fly Zones, must comply with local laws and regulations;
- Fly in open areas and control flight height below 50 m, maintain lines of sight;
- Calibrate GPS before flight and fly with strong GPS signal;



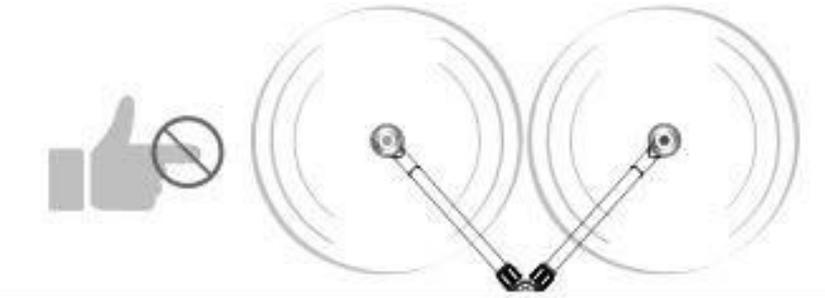
- Avoid flying over or near obstacles, crowds, high voltage power lines, airports, mines or bodies of water. DO NOT fly near strong electromagnetic sources such as power lines and base stations as it may affect on magnetic compass;



- DO NOT fly in adverse weather conditions such as rain (precipitation rate exceeding 25mm in 12 hours), wind speeds exceeding 8m/s, fog, snow, and lightning;



- f. Stay away from working propellers and motors, otherwise it may cause serious injuries to people and property.



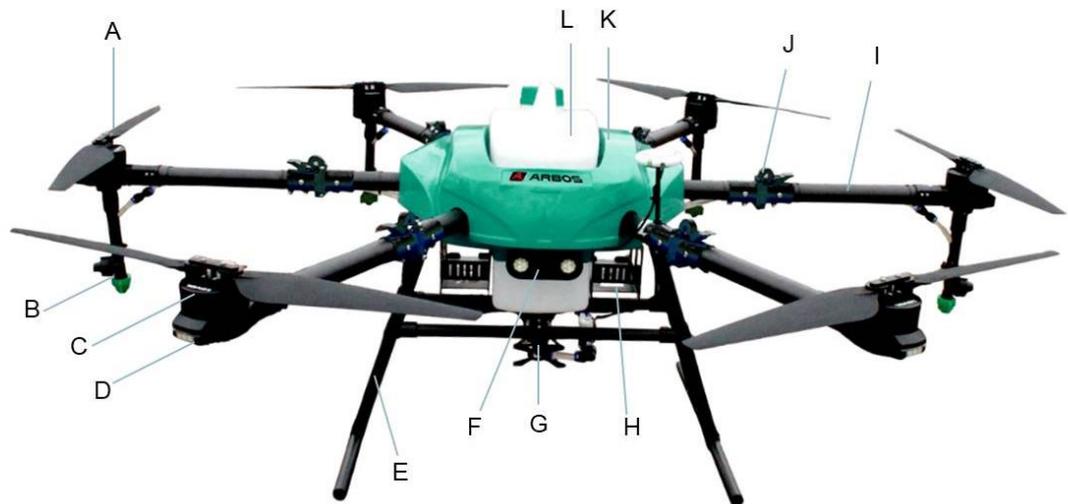
### 3. Product description

#### 3.1 Sprayer drone

##### 3.1.1 Profile

- a) The LOVOL drone is a battery-powered multirotor drone designed for agricultural applications in variety of environments and terrains, including terraces, fields, forests and orchards. It is dust-proof, water-proof and made of anti-corrosive materials;
- b) The drones also include industry-leading flight control system and three operation modes: attitude, GPS and AB point, can spray in various terrain;
- c) The remote controller features a range of controls for navigation, flight and spraying. While the drone does all the hard work in the fields, you keep full control over it in the palm of your hands.

##### 3.1.2 Drone Body



- |                         |                            |
|-------------------------|----------------------------|
| A. Propeller            | G. Water pump              |
| B. Motor                | H. Helmet                  |
| C. Motor mount (Gray)   | I. Drone arm               |
| D. High pressure nozzle | J. Middle connecting joint |
| E. Landing gear         | K. Battery                 |
| F. Fixe camera          | L. Chemical tank           |

### 3.2 Remote Controller

#### 3.2.1 Profile

- a) Remote controller is Datalink 32 (or update remote controller VD32) and the maximum transmission distance is 1.5 km;
- b) The drone remote control system operates at 2.4 GHz- 2.483 GHz. The remote controller features a number of spraying system control functions to help complete operations;
- c) Remote controller has inner datalink, can work with autonomous flying APP perfectly. All data has been set up in advance before delivery, please DO NOT change any data of RC. We are not responsible for the results because of changing the remote controller data.

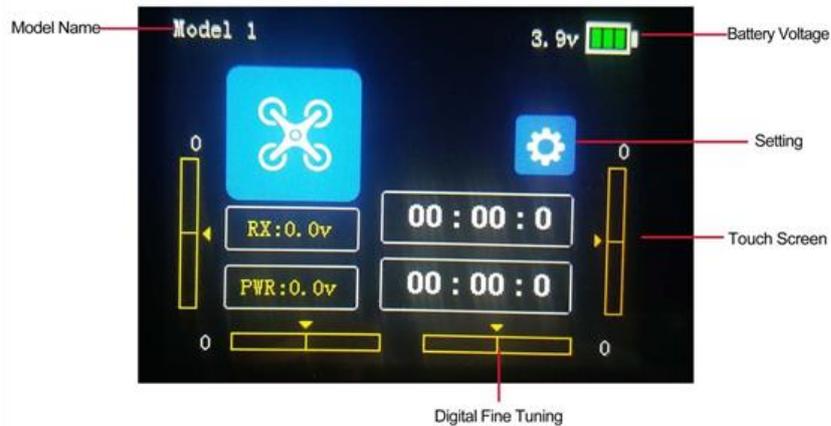
#### 3.2.2 Introduction of buttons and switches of RC



| Key | Up         | Middle                | Down           |
|-----|------------|-----------------------|----------------|
| SA  | Normal     | Return to break point | RTH            |
| SB  | Close pump | No function           | Open pump      |
| SC  | ATT mode   | Manual job mode       | AB job mode    |
| SD  | Normal     | Record A point        | Record B point |



- S2: Pressed down: open electrostatic centrifugal nozzles  
 Pressed up: close electrostatic centrifugal nozzles
- S5: Night job indicator switch



 Note: DO NOT change remote controller settings.

### 3.2.3 Battery charging of RC

It can be charged with normal charger of phone. Connect to the 2A-5V to charge.

Battery working parameters:

- a. Built-in High Capacity Battery: 3.7V 4400mAh Lipo Battery;
- b. Working Current: 270mA;
- c. Duration: 10 hours;
- d. Charging Port: Micro USB port charging;
- e. Charging time: 2-3 hours.

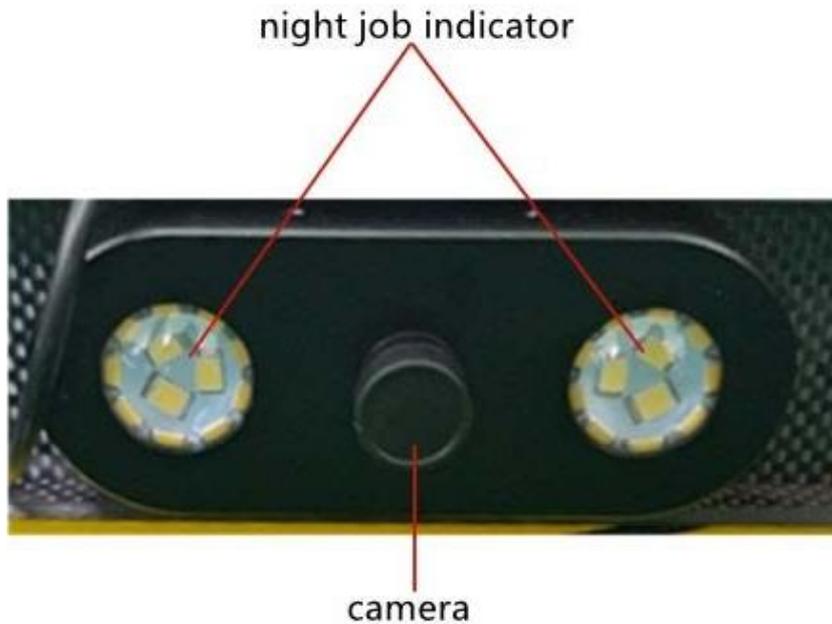


### 3.3 Integrated night job indicator + FPV

(1) Profile

FPV is used to observe the situations ahead of the drone in real time, configured with 8W/120 degree wide-angle night job indicator. Maximum transmission distance is 1.5 km (without obstacles).

(2) Overview

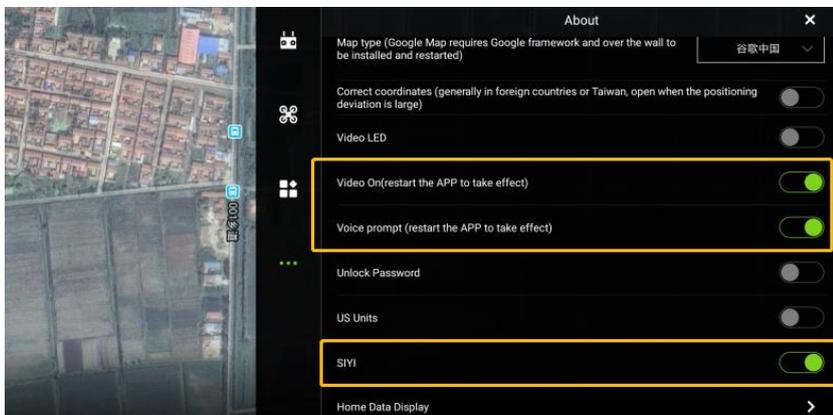


(3) Use

- a) Connect phone with RC via OTG cable;



- b) Open and close the camera and night job indicator via APP. Turn on Video LED / Video on / SIYI;



When the camera is turned on, the image will be transferred to the APP widget window in real time. Tap to switch between the Map View and the Camera View.



- c) The night job indicator also can be turn on and off by press S5 on remote controller.

### 3.4 Optional Accessory

#### 3.4.1 Terrain following radar

##### (1) Profile

The terrain following radar module uses millimeter-wave radar technology. Through the uninterrupted scanning of the radar, the drone can sense the terrain changes in

the flight direction, and adjust the flight altitude according to the terrain and crop height in time to realize the imitation flight to ensure uniform spraying during flight. The radar module has stable detection performance and good environmental applicability. It has strong anti-interference ability, is not affected by light, and has a long detection range. It has all-weather all-day characteristics.

(2) Features

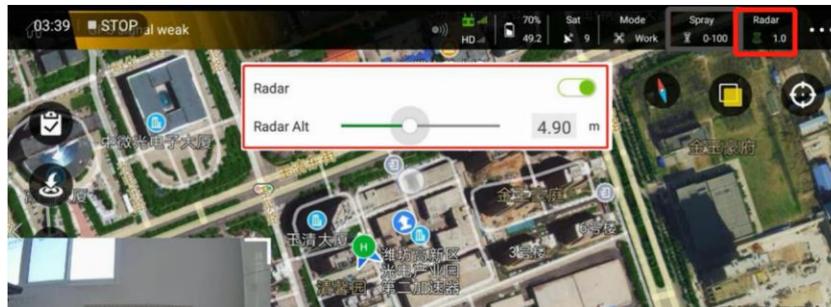
- a) Strong penetrability (including fog, smoke, dust, light rain) is not affected by light;
- b) Strong anti-interference ability, good environmental applicability;
- c) Stable performance, detection distance 15m;
- d) Power saving, total power It consumes only 1.5W;
- e) It works all day and all day;
- f) It is small in size and light in weight.

(3) Overview

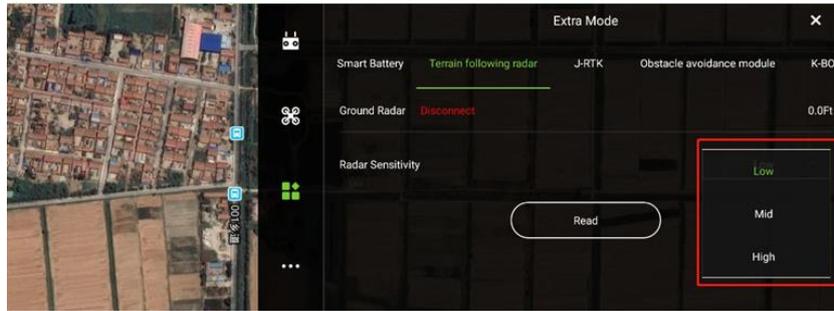


(4) Use

- a) Turn on & turn off the terrain follow radar by APP. Set the Radar work Altitude from 0 to 10 meters;



- b) You can select the terrain following sensitivity according to the different working scenes:
  - Low sensitivity: Suitable for high-crop crops (such as sorghum, corn, etc.), gentle and gentle, limiting the rate of decline. It can prevent the high drop and twitch caused by the high pole falling down and the high pole unevenness;
  - Medium sensitivity: Suitable for most scenes and non-high crops (such as rice, wheat, soybeans, etc.). Imitation speed is moderate and response is moderate;
  - High sensitivity: It is suitable for demonstration effects, as well as some non-job entertainment occasions, which are imitation, fast, and fast.

**NOTE:**

- Please turn off the radar when you spray high crops higher than 4 m and fruit trees. It will be dangerous because the crops will cover the ground, the radar will sense the crops height, it will make the drone flying very unstable, can cause crash if you DO NOT turn off it;
- Terrain following radar does not work in GPS mode;
- In bad weather, such as heavy rain, heavy rain, typhoon, strong wind (wind speed above 8m/s), thunderstorms, hail, foggy weather, etc., the radar-assisted altitude function may be invalid;
- The radar-assisted fixed-height function may fail under conditions where the terrain change speed exceeds the maximum vertical maneuverability of the drone;
- Larger height differences (bigger than 1 m in normal operating environments, such as ditches or ponds around, sparse fruit trees or shrubs above, terraces).
- The speed of the drone is too fast (greater than 5 m/s);
- Surface of the object whose inclination exceeds the following values: 15° (drone speed 1 m/s), 6° (drone speed 3 m/s), 3° (flying speed 5 m/s);
- If the distance between the drone and the surface being measured exceeds the set height (1.5–10 m), the radar-assisted altitude function may be disabled;
- Ensure that the pitch and roll angle of the drone attitude does not exceed 20°;
- Always pay attention to the relative height of the drone and the surface being measured;
- Use radar-assisted elevation modules in accordance with local radio regulations and legal regulations.

**3.4.2 Obstacle avoidance radar****(1) Profile**

The obstacle avoidance radar module is mainly used to measure the relative distance between the drone and the obstacle in front of the flight, so as to effectively avoid obstacles. The obstacle avoidance radar adopts 24GHz radar technology, which can work around the clock in strong light, high temperature, fog, dust, wind and night. The sensitivity is high, the detection distance is long, the signal transmission is fast and stable, and the cable can be detected more than 1cm. Wires, small trees of 10cm trunks, 1.7m tall people and 15cm poles provide excellent obstacle avoidance for high-speed drones, making them ideal for plant protection drones operating in outdoor complex environments.

(2) Features

- d) High sensitivity;
- e) Detection distance is far;
- f) Signal transmission is fast;
- g) Signal transmission is stable;
- h) All-weather work;
- i) Environmental adaptability.

(3) Overview

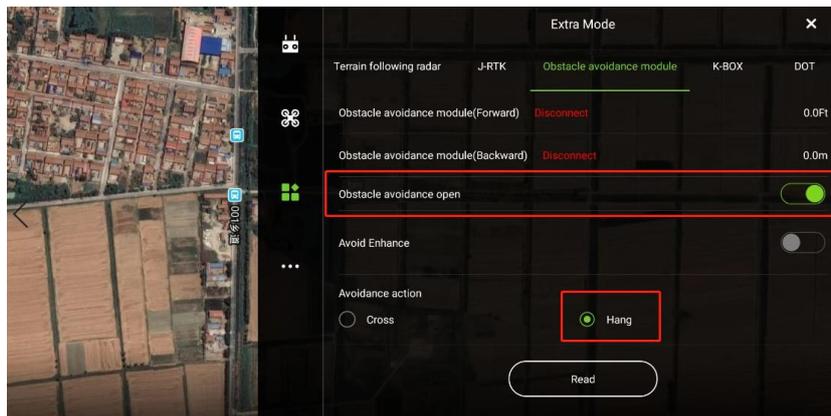


Installing position



(4) Use

Open APP, turn on Obstacle avoidance function. Select “Hang” in Avoidance action.

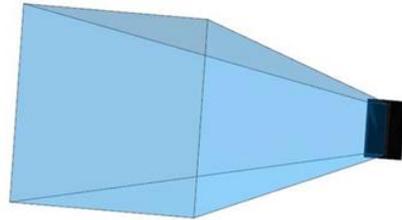


**Obstacle avoidance radar operation warning!**

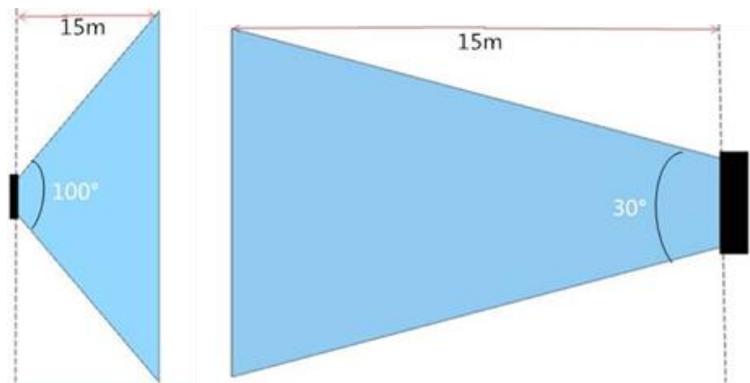
- Please keep the control of the drone throughout, and DO NOT rely solely on the information provided by the APP. The obstacle avoidance radar function will not be available in certain flight modes or flight environments. When the obstacle does not meet the radar detection conditions, the obstacle avoidance function may fail. Please ensure that the line of sight is good, relying on the naked eye observation or the camera to return the image observation in real time, reasonably judge the flight situation, and avoid obstacles in time;

➤ Detection range:

Radar module detection range: 100° in the horizontal direction and 30° in the vertical direction. If an obstacle is outside the detection range, the drone cannot sense the obstacle and should fly with caution. When the drone is working in any mode, it must be observed in real time to prevent the drone from entering the radar detection blind zone to avoid collision.



Radar detection area



Horizontal direction

Vertical direction

- Range of direction: (Outside the effective range, the obstacle perception function may be malfunctioning or invalid)
  - Target obstacle diameter  $\geq$  1CM cable-stayed wire: 2 ~ 10m;
  - Target obstacle diameter  $\geq$  15CM utility pole: 2 ~ 15m;
  - Small tree with a target obstacle diameter  $\geq$ 10CM (trunk diameter): 2~15m.
- The objects within 2m is not considered as an obstacle by the radar, and the avoidance function cannot be realized. If obstacle suddenly enter the detection range within 3 meters, the drone may not be able to stop and cause obstacle avoidance failure;
- In the manual operation mode, AB point mode, and automatic operation mode, please confirm that the obstacle-avoidance radar on the APP remains open. Otherwise, the obstacle avoidance function is turned off;
- If the drone's pitch angle exceeds 20°, it may affect the obstacle avoidance effect. Please fly with caution;
- Obstacle avoidance radars are suitable for use in flat farm environments and cannot be used in environments with significant drops. It is recommended that the flight speed be  $\leq$ 3.5m/s on slopes with an inclination of  $>10^\circ$  . Otherwise, the operation may be stuck;
- The radar module is more precise and should not be crushed or collided;
- The radar sensitivity may be reduced when multiple drone are working at close range;
- Please fly with caution.

### 3.5 Battery & BB Buzzer

#### 3.5.1 Battery for sprayer drone:

| Battery type      | Qty   | Applicable models | Battery Voltage |
|-------------------|-------|-------------------|-----------------|
| 6S 17000mAh li-po | 2 pcs | LJ10L-606         | 44.4V           |



**NOTE:**

- After you receive the batteries, please check if the appearance of the battery is intact and whether there is a bulge problem. Before charging or storage new battery, please use BB buzzer to test the voltage of each battery. Make sure each battery cell voltage is between 3.75V to 3.9V. The maximum and minimum voltage of battery cells does not exceed 0.2V. If the above phenomenon occurs, please DO NOT use this battery and give us feedback in time;
- Fully charged battery before use them;
- In addition, storage the battery voltage (adjust battery voltage to 3.85V) if DO NOT use battery more than 3 days.

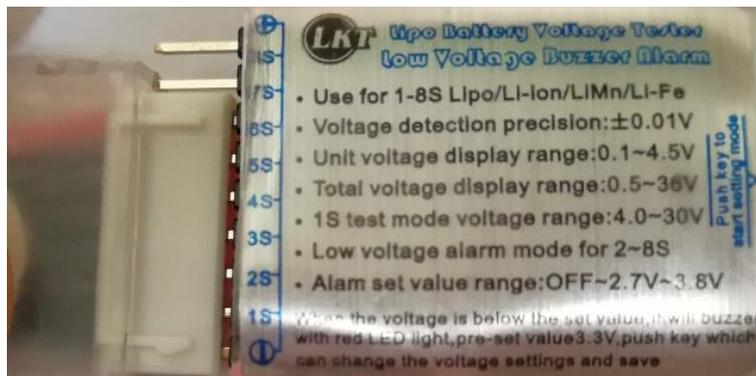
#### 3.5.2 BB Buzzer (For LJ10L-606)

(1) Profile

Battery buzzer is a small and light useful tool, detecting low voltage on individual cells and total voltage. Please use it check the individual and whole battery voltage before takeoff, and keep it connected to the batteries during whole flight process. If the individual cell voltage difference is more than 0.2V, please don't use the battery any more. If the battery total voltage is lower than 22.2V(6S battery), please full charge it to 25.2V(6S battery) before use.

(2) Use

- a) Connect to battery. For 6S battery: from 1S to 6S, black wire to 1S;



- b) Low voltage setting: Push the small button on side face until to 3.6V or 3.7V. Default low voltage setting is 3.6V per cell, we have set it before delivery;  
Recommend alarming protection voltage:  
6S 17000mah battery: 3.30V
- c) Please connect BB buzzer to batteries during the whole flight. A loud alarm will sound if any individual cell drops to 3.6V, then please return the drone and land in safe location, if it is too far away please land the drone in a safe location ASAP.

### 3.6 Charger

| Charger type        | Applicable model |
|---------------------|------------------|
| 1200W 8-way charger | LJ10L-606        |
| 1200W 2-way charger | LJ16L-606        |

#### 3.6.1 Eight-way charger (For LJ10L-606)

##### (1) Overview



##### (2) Battery



- A. Power switch
- B. Power source socket
- C. Positive and negative pole wire socket
- D. Balanced charger socket
- E. Balanced charger plug
- F. Balanced charger connector

- G. Positive and negative pole wire plug
- H. Negative pole wire connector (black)
- I. Positive pole wire connector (red)
- J. Battery positive pole connector (red)
- K. Battery negative pole connector (black)
- L. Battery balanced charger connector

##### (3) Use

- a) Connect power source plug with B, then connect the power source connector with power source. (Please buy an adapter in local market if the plug is not suitable). Connect D with E, connect C with G, then connect the wires on the opposite side and connect other wires according to the same way. Turn on A;

- b) Set the Current as “15A”, set the Type as “LiPo”, set the mode as “Charge”;



- c) Connect L with F (6S pin), then connect K with H, connect J with I, then connect the battery on the opposite side and connect other batteries according to the same way;
- d) Long press “Start/Stop” button to start charging. The batteries fully charged voltage is 25.2V;
- e) During the charging, the battery being charged shows that the indicator light is always red; when fully charged, the indicator light is always green; while the battery waiting for charging, the indicator light blinks green;
- f) Conclusion: the charger can connect to 8 pcs batteries at the same time, charge 2 by 2 in 30 minutes (the charging sequence number: ①⑤-②⑥-③⑦-④⑧). After full charged, it will stop charging automatically, has nanny function, can be used for charging at night.



Note:

- Never select the “LiHV” item to charge the battery;
- Select the suitable charging current according to different batteries, DO NOT charge the small battery using the large current. Please select small charging current if the charging time is enough. The recommendation parameters as below:

| Maximum charging current | Battery type |
|--------------------------|--------------|
| 15A                      | 17000mah     |

- DO NOT use this charger to charge the small battery (such as 3500mah battery);
- Please note that it is strictly forbidden to connect the battery when the charger is powered off. When the battery is fully charged, if you need to turn off the charger, be sure to disconnect the charger from the battery. Otherwise, it will seriously damage the battery!

### 3.6.2 Smart battery 12S-22AH Double-way charger(For LJ16L-606)

Smart battery 12S-22AH

#### (1) Overview

This product is a 12S-22AH self-balancing intelligent battery pack designed for agriculture sprayer drones with data record management function. The SPower intelligent management system developed and designed to provide users with application and security services;

(2) Main parameters of the product

| Serial | Project               | Parameter           |
|--------|-----------------------|---------------------|
| 1      | Standard              | 44.4V (12S)         |
| 2      | Nominal capacity      | 22000mAH            |
| 3      | Charging voltage      | 50.4V (4.2V/Cell)   |
| 4      | Charging over current | TYP.30A             |
| 5      | Working temperature   | 0℃—60℃              |
| 6      | Storage temperature   | -10℃—35℃            |
| 7      | Battery pack weight   | TYP.6.1Kg           |
| 8      | Physical dimension    | 173.0*111.4*244.8mm |

(3) Product features and description

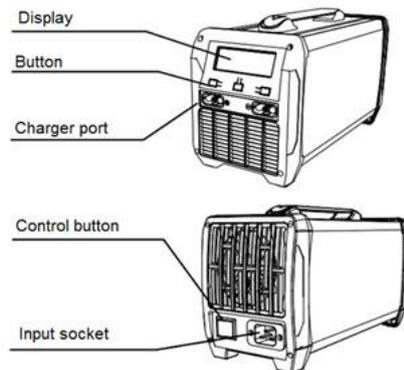
| Features   | Functional description  |       |       |          |                 |                 |   |   |   |   |        |   |   |   |   |         |   |   |   |   |         |   |   |   |   |         |   |   |   |   |         |   |   |   |   |         |   |   |   |   |         |   |   |   |   |          |
|--|---|-------|-------|----------|-----------------|-----------------|---|---|---|---|--------|---|---|---|---|---------|---|---|---|---|---------|---|---|---|---|---------|---|---|---|---|---------|---|---|---|---|---------|---|---|---|---|---------|---|---|---|---|----------|
| <b>Power on &amp; off</b>  | <p>Power on and off by pressing keys to control battery power display and communication:</p> <p>(1)Power on: When the battery is off, press the button shortly, led to indicate the power. When the light is not off, press and hold the button for more than 2 seconds. The battery indicator lights up from left to right;</p> <p>(2)Power off: Shortly press the button, the 4 led all flash. Then press the button for more than 2 seconds, the led indicator will be completely off from right to left. Power off.</p>   |       |       |          |                 |                 |   |   |   |   |        |   |   |   |   |         |   |   |   |   |         |   |   |   |   |         |   |   |   |   |         |   |   |   |   |         |   |   |   |   |         |   |   |   |   |          |
|  | <p>1. This product is designed with 4 led lights, 8 levels (solid on /flashing) to indicate power (capacity type);</p> <p>2. In the off state, short press the button, the LED indicates the current power, and it goes off after 2S;</p> <p>3. Power off state, charge and discharge can automatically wake up and display power, and LED cycle indicates charge or discharge status.</p>  |       |       |          |                 |                 |   |   |   |   |        |   |   |   |   |         |   |   |   |   |         |   |   |   |   |         |   |   |   |   |         |   |   |   |   |         |   |   |   |   |         |   |   |   |   |          |
| Battery indicator  |   |       |       |          |                 |                 |   |   |   |   |        |   |   |   |   |         |   |   |   |   |         |   |   |   |   |         |   |   |   |   |         |   |   |   |   |         |   |   |   |   |         |   |   |   |   |          |
| <b>Smart battery capacity indicator</b>  | <table border="1" style="width: 100%; text-align: center;"> <thead> <tr> <th>LED1</th> <th>LED 2</th> <th>LED3</th> <th>LED4</th> <th>Current battery</th> </tr> </thead> <tbody> <tr> <td>⊖</td> <td>○</td> <td>○</td> <td>○</td> <td>0%~20%</td> </tr> <tr> <td>●</td> <td>○</td> <td>○</td> <td>○</td> <td>13%~25%</td> </tr> <tr> <td>●</td> <td>⊖</td> <td>○</td> <td>○</td> <td>26%~37%</td> </tr> <tr> <td>●</td> <td>●</td> <td>○</td> <td>○</td> <td>38%~50%</td> </tr> <tr> <td>●</td> <td>●</td> <td>⊖</td> <td>○</td> <td>51%~62%</td> </tr> <tr> <td>●</td> <td>●</td> <td>●</td> <td>○</td> <td>63%~75%</td> </tr> <tr> <td>●</td> <td>●</td> <td>●</td> <td>⊖</td> <td>76%~87%</td> </tr> <tr> <td>●</td> <td>●</td> <td>●</td> <td>●</td> <td>88%~100%</td> </tr> </tbody> </table> | LED1  | LED 2 | LED3     | LED4            | Current battery | ⊖ | ○ | ○ | ○ | 0%~20% | ● | ○ | ○ | ○ | 13%~25% | ● | ⊖ | ○ | ○ | 26%~37% | ● | ● | ○ | ○ | 38%~50% | ● | ● | ⊖ | ○ | 51%~62% | ● | ● | ● | ○ | 63%~75% | ● | ● | ● | ⊖ | 76%~87% | ● | ● | ● | ● | 88%~100% |
|  | LED1  | LED 2 | LED3  | LED4     | Current battery |                 |   |   |   |   |        |   |   |   |   |         |   |   |   |   |         |   |   |   |   |         |   |   |   |   |         |   |   |   |   |         |   |   |   |   |         |   |   |   |   |          |
|  | ⊖   | ○     | ○     | ○        | 0%~20%          |                 |   |   |   |   |        |   |   |   |   |         |   |   |   |   |         |   |   |   |   |         |   |   |   |   |         |   |   |   |   |         |   |   |   |   |         |   |   |   |   |          |
|  | ●   | ○     | ○     | ○        | 13%~25%         |                 |   |   |   |   |        |   |   |   |   |         |   |   |   |   |         |   |   |   |   |         |   |   |   |   |         |   |   |   |   |         |   |   |   |   |         |   |   |   |   |          |
|  | ●   | ⊖     | ○     | ○        | 26%~37%         |                 |   |   |   |   |        |   |   |   |   |         |   |   |   |   |         |   |   |   |   |         |   |   |   |   |         |   |   |   |   |         |   |   |   |   |         |   |   |   |   |          |
|  | ●   | ●     | ○     | ○        | 38%~50%         |                 |   |   |   |   |        |   |   |   |   |         |   |   |   |   |         |   |   |   |   |         |   |   |   |   |         |   |   |   |   |         |   |   |   |   |         |   |   |   |   |          |
|  | ●   | ●     | ⊖     | ○        | 51%~62%         |                 |   |   |   |   |        |   |   |   |   |         |   |   |   |   |         |   |   |   |   |         |   |   |   |   |         |   |   |   |   |         |   |   |   |   |         |   |   |   |   |          |
|  | ●   | ●     | ●     | ○        | 63%~75%         |                 |   |   |   |   |        |   |   |   |   |         |   |   |   |   |         |   |   |   |   |         |   |   |   |   |         |   |   |   |   |         |   |   |   |   |         |   |   |   |   |          |
| ●  | ●   | ●     | ⊖     | 76%~87%  |                 |                 |   |   |   |   |        |   |   |   |   |         |   |   |   |   |         |   |   |   |   |         |   |   |   |   |         |   |   |   |   |         |   |   |   |   |         |   |   |   |   |          |
| ●  | ●   | ●     | ●     | 88%~100% |                 |                 |   |   |   |   |        |   |   |   |   |         |   |   |   |   |         |   |   |   |   |         |   |   |   |   |         |   |   |   |   |         |   |   |   |   |         |   |   |   |   |          |
| <p>Note: ● indicates constant light; ⊖ indicates flashing state; ○ indicates power off</p> |   |       |       |          |                 |                 |   |   |   |   |        |   |   |   |   |         |   |   |   |   |         |   |   |   |   |         |   |   |   |   |         |   |   |   |   |         |   |   |   |   |         |   |   |   |   |          |
| <b>Battery life prompt</b>   | <p>When the battery usage cycle reaches 300 times, the led indicator of the battery indicator changes from green to red to indicate the battery level, prompting battery life has been reached, users should use it with caution.</p>   |       |       |          |                 |                 |   |   |   |   |        |   |   |   |   |         |   |   |   |   |         |   |   |   |   |         |   |   |   |   |         |   |   |   |   |         |   |   |   |   |         |   |   |   |   |          |

|   |   |             |             |             |                  |                               |
|---|---|-------------|-------------|-------------|------------------|-------------------------------|
| <b>Smart alarm</b>  | 1. Use the buzzer and led to make an alarm prompt;  |             |             |             |                  |                               |
|   | <b>Battery alarm indication</b>   |             |             |             |                  |                               |
|   | <b>LED1</b>   | <b>LED2</b> | <b>LED3</b> | <b>LED4</b> | <b>Indicator</b> | <b>Alarm type</b>             |
|   | ○   | ◉           | ○           | ○           | flashing         | Overcharge alarm              |
|   | ◉   | ◉           | ○           | ○           | flashing         | Charge over temperature alarm |
|   | ○   | ○           | ◉           | ○           | flashing         | Charge over current alarm     |
| Note: ◉ means flashing; ○ means extinguished  |   |             |             |             |                  |                               |
| 2. Alarm description:   |   |             |             |             |                  |                               |
| <p>(1) Overcharge alarm : When the voltage reaches 4.35V, the buzzer will drop alarm and the corresponding LED will flash; until the voltage is lower than 4.30V, the alarm will be released;</p> <p>(2) Charge over-temperature alarm: When the temperature reaches 75 ° C, the buzzer will drop alarm and the corresponding LED will flash; if the temperature is lower than 65° C or the charging is completed, the alarm will be cancelled;</p> <p>(3) Charging overcurrent alarm: the current reaches 30A, the buzzer drips off after 10 seconds, and the corresponding LED flashes; if the charging current is less than 10A, the LED alarm is cancelled.</p> |   |             |             |             |                  |                               |
| <b>Smart storage</b>  | <p>1. When the battery is not used for a long time, the battery will automatically start the intelligent storage function and discharge to the storage voltage;</p> <p>2. Turn-on conditions: the unit voltage is &gt; 3.90V, and the shutdown time is not used &gt; 4 days;</p> <p>3. Ending conditions: minimum unit voltage <math>\leq</math> 3.85V or start or charge and discharge operation;</p> <p>4. During the self-discharge process, 4 LEDs flash slowly, and automatically shut down after reaching the end condition.</p>  |             |             |             |                  |                               |
| <b>Auto sleep function</b>  | <p>1. When the battery is turned on and not in use, it will automatically hibernate and shut down after 3 minutes when the battery voltage is high, and automatically hibernate and shut down after 1 minute when the battery is low to save battery power;</p> <p>2. When the communication is not connected, the minimum unit voltage is <math>\geq</math>3.75V, and it will be shut down after 3min; the minimum unit voltage is &lt;3.75V, and it will be shut down after 1min;</p> <p>3. When the communication is connected, the minimum unit voltage &gt; 3.55V will not automatically shut down; when the minimum battery voltage is <math>\leq</math> 3.55V, it will automatically shut down after 1min.</p> |             |             |             |                  |                               |
| <b>Software upgrade</b>   | This product is designed with software upgrade function, which can be connected to the computer through the usb port for software upgrade and update.   |             |             |             |                  |                               |

## Intelligent Two-way UAV Charger

### (1) Introduction

Intelligent two-way UAV charger is a product for rapid charging of UAV Li-ion battery with the maximum charging power of 1200W\*2. This product uses independent power supply design. The internal circuit is highly intelligent, integrated and modular. High-precision data monitoring and optimal charging algorithm are used to achieve efficient and safe charging and delay battery aging. This product is easy to be operated by one click without setting. The whole charging screen is clear and intuitive. The charging state is displayed digitally to intuitively know the charger and battery state. This product is one of the best choices for plant protection UAV.



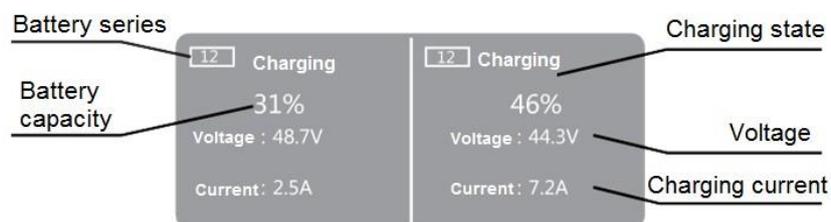
### (2) Parameters

- a) Input voltage: AC 100V-240V;
- b) Max. charging power: 1200W\*2;
- c) Display mode: LCD;
- d) Number of battery series supported: 12S.13S.14S;
- e) Weight: Approx. 5.50kg;
- f) Dimensions: 340mm\*195mm\*145mm.

### (3) Operation

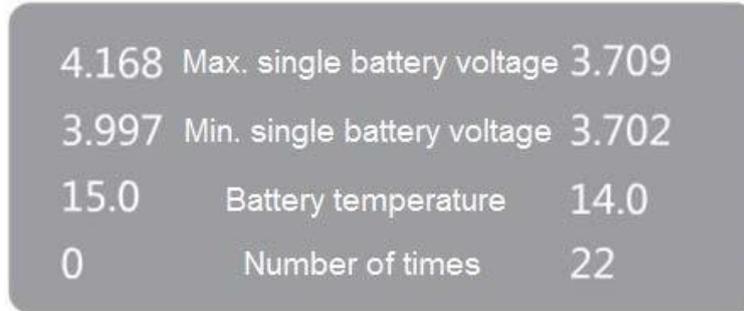
- a) Turn on the AC power supply and make sure that the input wire is plugged tightly. The rear switch is set to position 0 (OFF), at this time, the charger does not work. Turn the rear switch to position 1 to start the charger;
- b) Put the battery into the charger port. After the battery is automatically turned on, the charger will automatically recognize the battery type and then automatically start the charging. At this time, the charger is in the charging state. The LCD will display the current charging state, battery capacity, number of battery series, voltage and charging current. The fan will rotate at the same time until the charging state is displayed at 100%;

#### Charging Home Screen



- c) In the normal charging process, short press the Mid-Mode Selection button to enter the sub-screen, and then automatically go back to the home screen after 5 sec;

**Charging Sub-Screen**



- d) In the charging process, short press the switch button under the corresponding charging line of the screen to stop charging and long press this button again to start charging. In case of any error, it can be removed when the abnormal conditions are eliminated;

**Stop Screen**



- e) Long press the Mid-mode Selection button to enter the power setting screen, where the charging power can be set high and low by using the left and right switch buttons;

**Power Setting Screen**



- f) Optional Accessories \*To be ordered separately



1. Type of rechargeable battery: Li-ion polymer battery.
2. Number of battery series supported: 12S/13S/14S.
3. Number of plug-in batteries: 4 (max) .
4. Charging mode: Intelligent charging, one at a time, charging in turns.
5. Channel state indicator: Green LED.
6. Display mode: LED.

**Safety Tips:**

For maximum safety, please strictly follow the following information, otherwise the charger and battery may be damaged or even cause fire.

- a) Do not use the charger unattended. If there is any function error, please immediately stop the charging and consult the manual for the cause.
- b) Please ensure that the charger is away from dust, humidity, rain and high temperature. Avoid direct sunlight, strong vibration or impact on the charger.
- c) The charger supports AC input voltage of AC100-240V. If the generator is used for outdoor power supply, please ensure that the generator can provide stable voltage and sufficient power. Large voltage change will cause damage to the charger.
- d) Please place the charger on the heat-resistant, nonflammable and insulated surfaces. Do not put it on the car seat, carpet or other similar places. Please make sure that flammable and explosive objects are far away from the charging area.
- e) Please do not charge with the following types of batteries Different models of battery pack (Incl. different manufacturers); Non-rechargeable battery; Battery with special requirements for charging technology; Damaged or defective battery; Battery with built-in combined or protective circuit; Battery installed in other devices or connected to other components; Rechargeable battery not confirmed by the manufacturer whether it is suitable for the current of this charger.
- \* Only the battery specified by the charger manufacturer can be used for charging.
- f) The charger is suitable for those aged 14 and above. Those with behavioral and mental disorders or those without experience must be supervised or guided.
- g) If the power cord is damaged, please return it to the manufacturer or supplier for replacement; if you replace it by yourself, please use the one with enough power and make sure it is tightly plugged into the socket in order to avoid accident.
- h) Please strictly follow the instructions to use the product.

**Disclaimer:**

The design of this charger is only applicable to the battery listed in this manual. If the user uses the charger for other purposes than those specified in the manual, the company will not take any responsibility. As we are unable to know whether you have carefully read the manual before use, nor how you use and store the product, we refuse to bear any damage or loss caused by or related to improper use. In case of direct or indirect loss caused by our products within the scope of laws, we will compensate subject to the invoice amount for the products.

**(4) Matters needing attention**

- a) Please use the plant protection drone special charger to charge and keep away from the high temperature environment;
- b) Please recharge the battery after use to avoid over-discharge and damage the battery for a long time;
- c) When the battery is stored for a long time, due to the self-discharge characteristics of the battery itself, in order to prevent over-discharge damage, the battery should be periodically checked (recommended every 3 months) to make the single-segment voltage in 3.8v-3.9v optimal storage state (temperature An environment of  $20 \pm 5$  ° C and a humidity of  $65 \pm 20\%$  rh);

- d) In the course of use, if the battery is found to be deformed or smelly, it is forbidden to use;
- e) Under no circumstances should the battery be put into water or fire;
- f) It is forbidden to squeeze, collide, puncture, disassemble or short-circuit the battery to avoid unnecessary losses.

### 3.6.3 Battery voltage storage

#### (1) Eight-way charger

- a) Connect the power source and batteries with the charger, turn on the charger, set the Current as the same with that when charging, set the Type as “LiPo”. Set the mode as “Storage”. Long press “Start/Stop” button to start discharging;
- b) During the discharging, if the battery voltage of per cell is lower than 3.85V, the charger will charge the battery to 3.85V, if it is higher than 3.85V, the charger will discharge the battery to 3.85V.

#### (2) Dual-channel smart charger

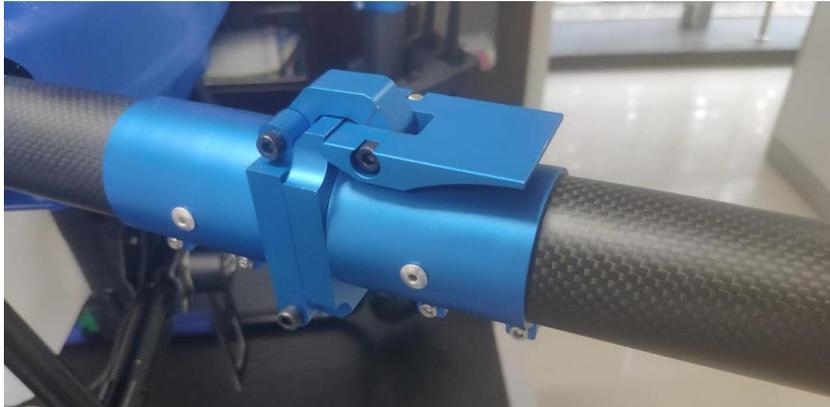
The dual-channel smart charger has the function of intelligently maintaining the storage voltage, should just connect the battery to the charger.

## 4. Use LOVOL sprayer drone

### 4.1 Preparation before taking off

#### 4.1.1 Power on sequence

- (1) Turn on remote controller;
- (2) Unfold the arms, fix the folding joints;



- (3) Connecting batteries of drone: Insert plug from right to left;



Note: Make sure that the battery connections are in the correct order, otherwise the circuit may be short-circuited and damage the drone.

- (4) Drone self-inspection is about 10s (LED light blinks red, green and yellow in cycle).

#### 4.1.2 Power off sequence

- (1) Disconnect batteries of drone: Insert plug from left to right;



Note: Make sure that the battery disconnections are in the correct order, otherwise the circuit may be short-circuited and damage the drone.

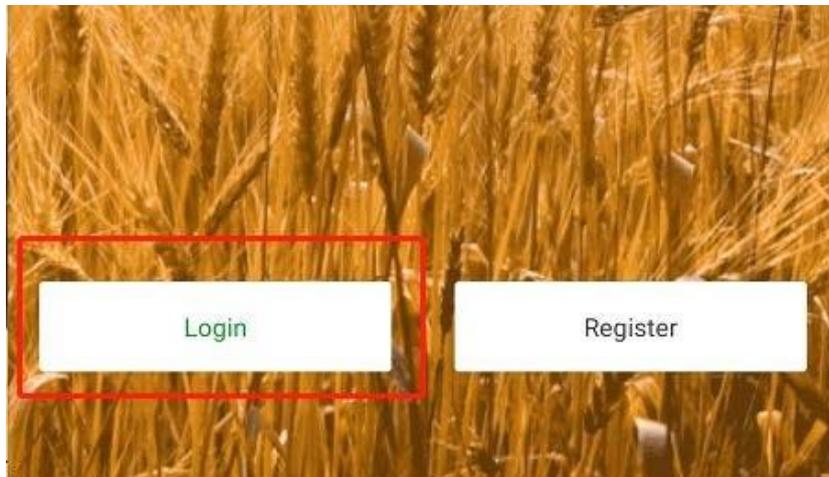
- (2) Turn off remote controller;

#### 4.1.3 Install APP software & connect

- (1) Download and Install App. Scan the QR code to install App or ask from your sale manager;



- (2) Download and install App on Android phone or tablet. The phone must have OTG function, and keep it open, otherwise cannot be connected;
- (3) Login
  - a) Open APP, click "Login";



- b) Please log in to the app with the account assigned by our company.  
Account: 8648566XXXX  
Password: lovoltech



## Login

Phone/Username

8648566xxxx

Password

lovoltech



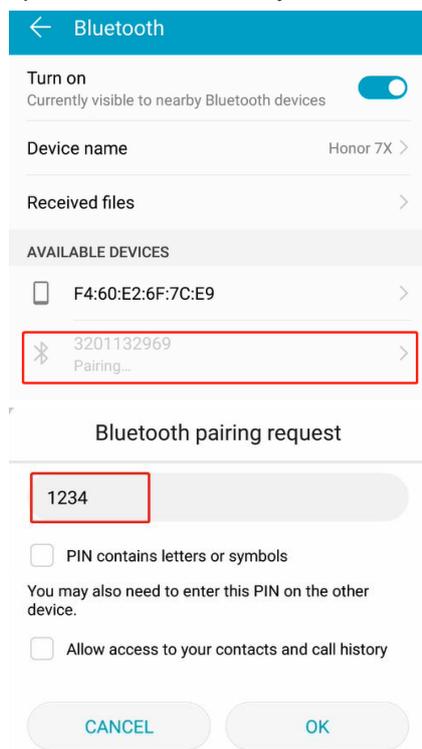
Login

(4) Connect phone with remote controller

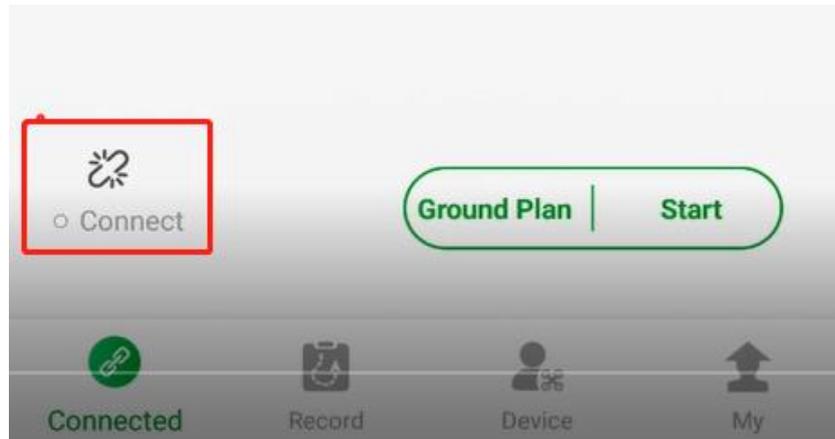
a) Please check the Device number of your remote controller in the back of it;



b) Turn on "Bluetooth" function. Search for the device number of remote controller equipment. Connect it by Bluetooth. Input Bluetooth pairing code 1234;



c) Turn on APP. Click “Connect”;



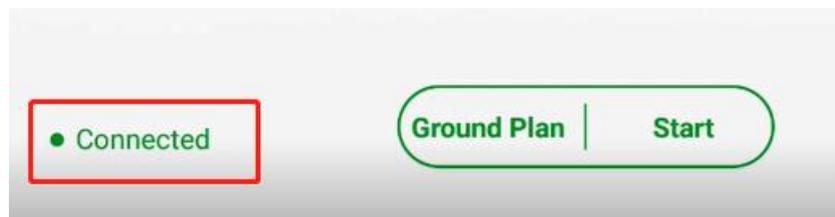
d) Select “Bluetooth”. Click “OK”;



e) Select the device number of remote controller;



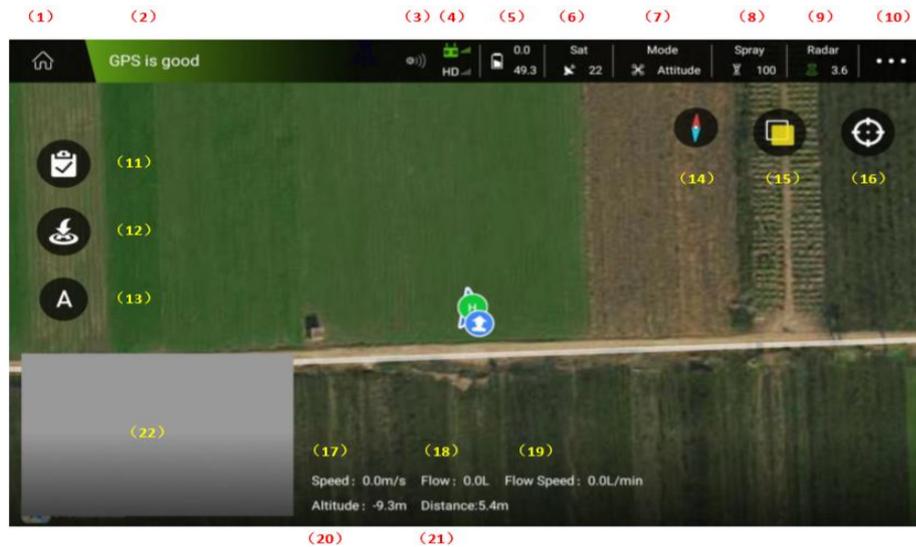
f) Connected;



g) App connection completed. Click “Start”, enter into the UI.

#### 4.1.4 APP Introduction.

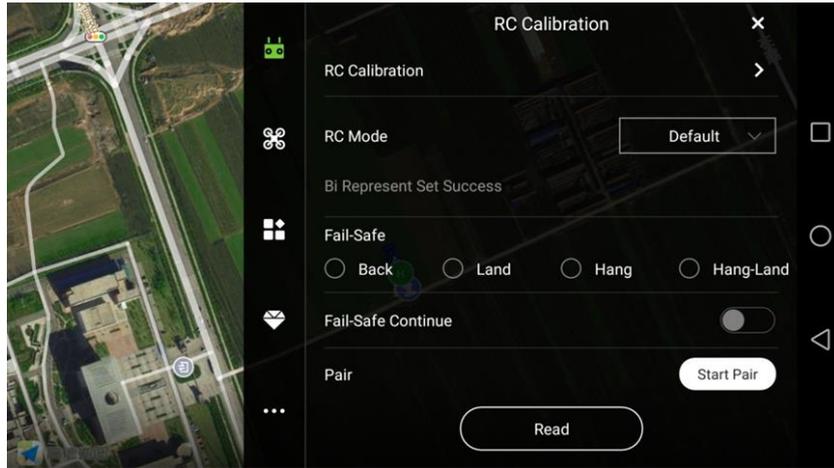
##### (1) Main interface introduction



- |  |                                    |
|--|------------------------------------|
| (1) Back to home page  | (11) Task list                     |
| (2) Status Bar   | (12) Automatic Return              |
| (3) Obstacle radar indication  | (13) Mode switching                |
| (4) RC & Image Transmitter indication                                  | (14) Map direction change          |
| (5) Battery percentage & Voltage                                       | (15) Map type change               |
| (6) GPS quantity   | (16) Drone/Operator position       |
| (7) Flight mode indication   | (17) Flight speed                  |
| (8) Water pump mode indication<br>(Click to switch and adjust)         | (18) Used dosage                   |
| (9) Terrain following radar indication<br>(Click to switch and adjust) | (19) Flow rate                     |
| (10) Menu  | (20) Flight height                 |
|  | (21) Distance between drone and RC |
|  | (22) FPV                           |

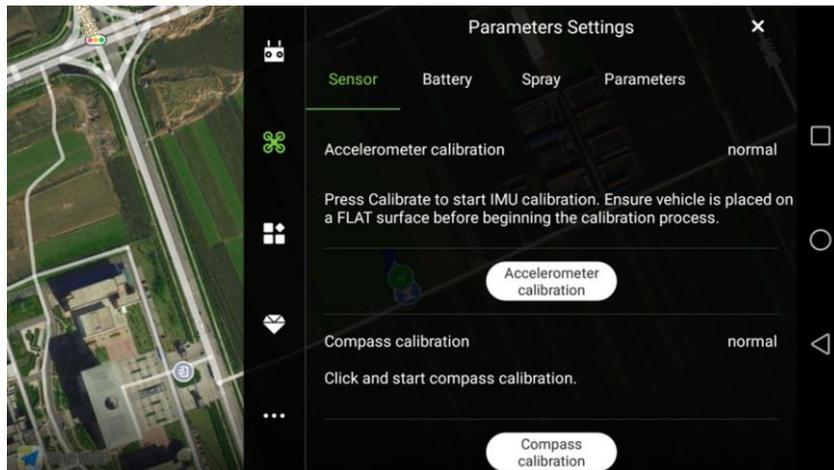
**⚠ Warning:** Please power on the drone, remote controller, and connect APP with remote controller before changing any parameter in APP. Click "Read" first to fill data, and click "Save" then.

(2) RC Calibration interface



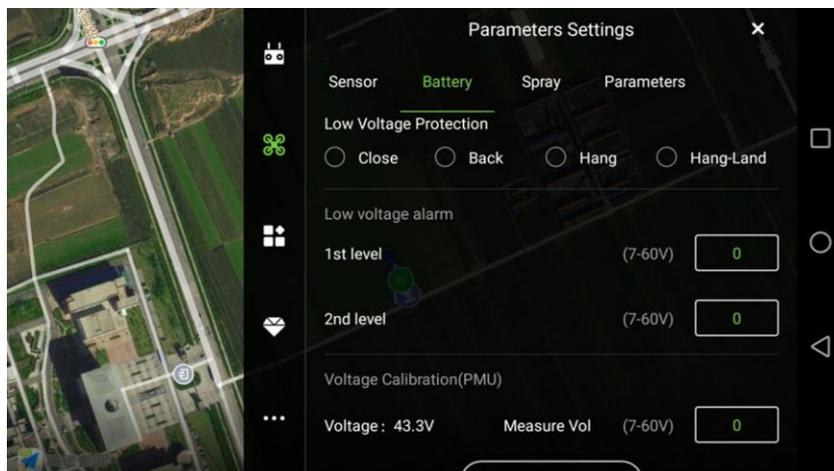
- a) RC calibration: Calibrating RC sticks;
- b) RC mode: (DEFAULT) Not modify;
- c) Fail-Safe protection: Return;
- d) Fail-Safe continue: Off;
- e) Receiver frequency: Not modify.

(3) Sensor interface



This interface indicates the status of compass and IMU calibration.

(4) Battery interface



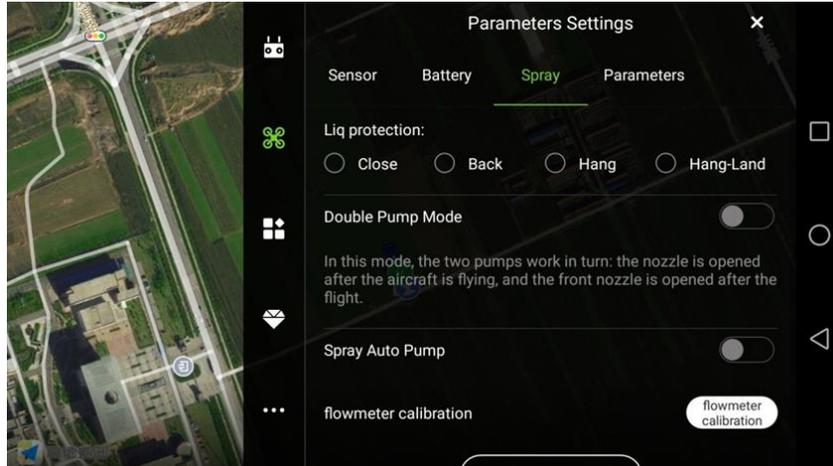
- a) Low voltage protection (2<sup>nd</sup> level of low voltage alarm): Off;
- b) Low voltage alarm setting

|     |          | 1 <sup>st</sup> level | 2 <sup>nd</sup> level | Model     |
|-----|----------|-----------------------|-----------------------|-----------|
| 6S  | 17000mAh | 20.5V                 | 20V                   | LJ10L-606 |
| 12S | 23000mAh | 44V                   | 43V                   | LJ16L-606 |

c) Voltage calibration: Fill correct voltage in Measure Vol to save.

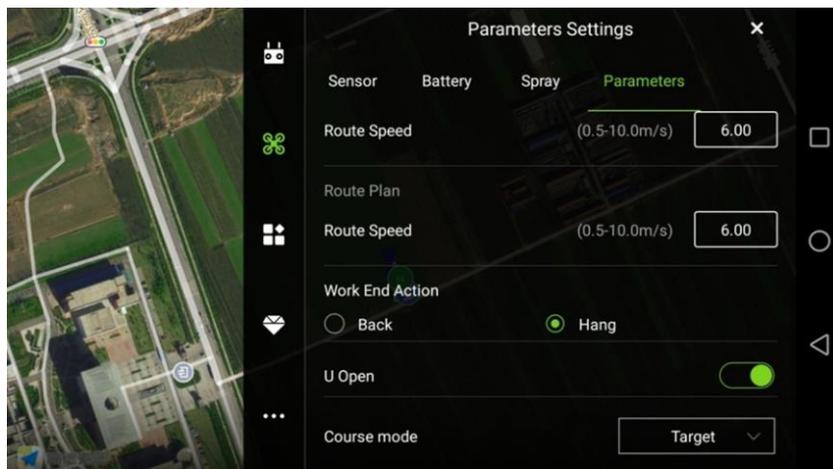
**⚠️** Note: Be ready to return the drone at 1<sup>st</sup> level low voltage alarm; Immediately return and land the drone at 2<sup>nd</sup> level low voltage alarm.

(5) Spray setting interface



- a) Liq protection: Hang (If return, pay attention to flying height);
- b) Double pump mode: (Off) Not modify;
- c) Spray Auto pump: On;
- d) Flow meter calibration: Suggested to calibrate before the first flight. Click “Flow meter calibration”, enter how much water capacity you fill in the tank (5 liters at least), and click “Start”. Calibration finished with water running out.

(6) Parameters interface



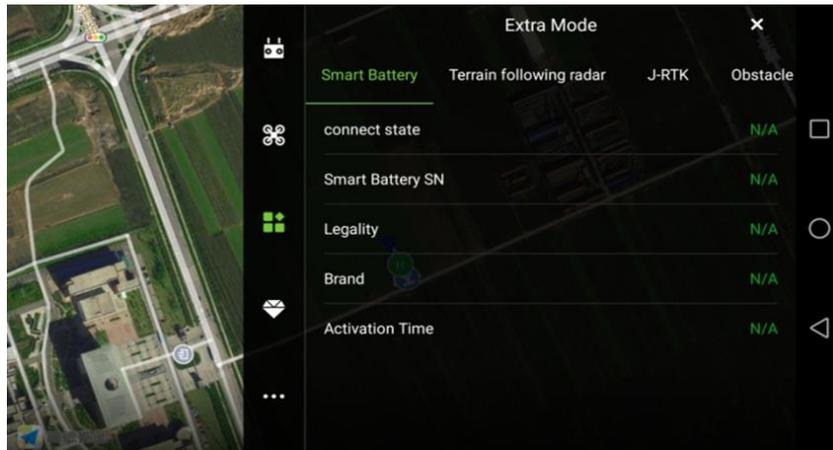
You could modify flying speed, spraying width and U-turn mode in this interface. (Suggest not to modify any default parameters).

- a) Area spraying finished: Hang;
- b) U-turn: Open;
- c) Course Mode:

Select “Target” for drones with Obstacle avoid radar and FPV functions.

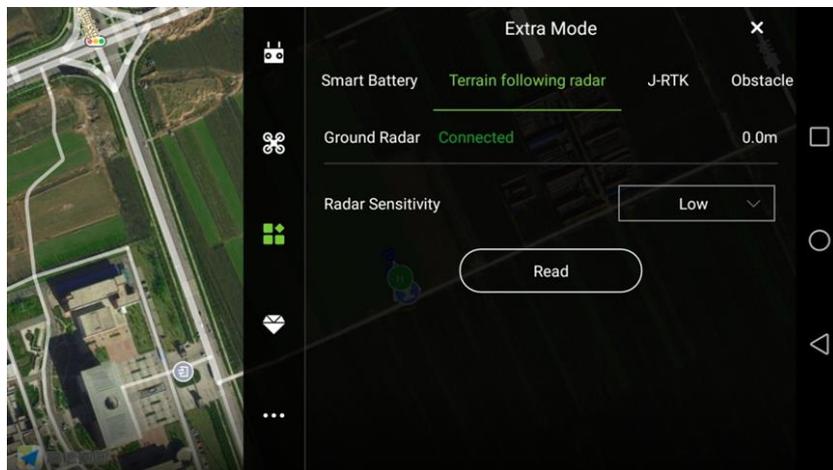
**⚠️** Note: Select “Manual” only for 10-606/16-606/ models. Others select “Target”.

(7) Smart Battery interface



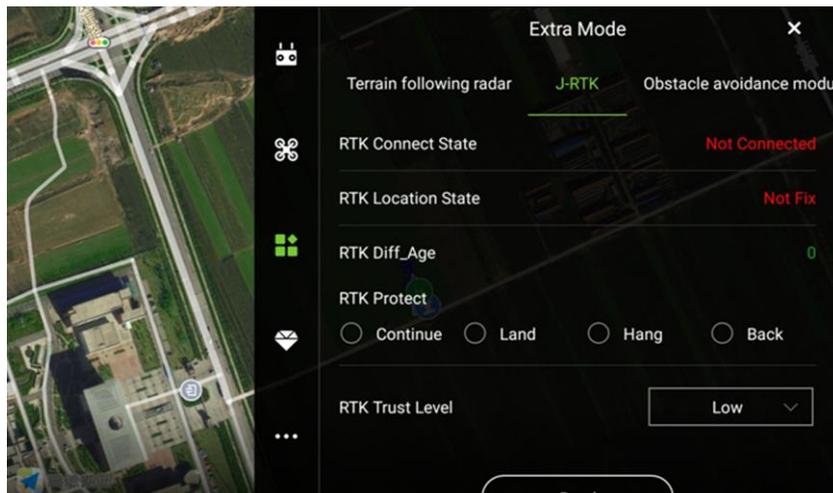
It's only for Smart Battery users.

(8) Terrain following radar



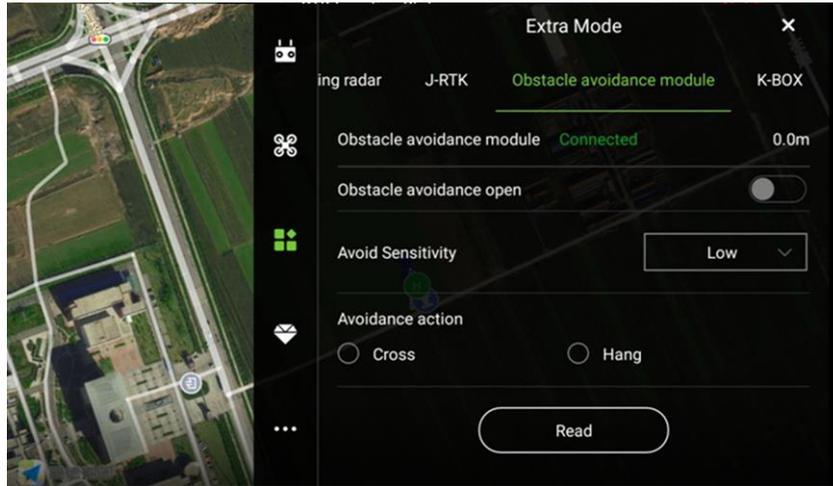
- a) Indicating radar detected height;
- b) Radar sensitivity: Mid. (Could be adjusted per to request).

(9) J-RTK



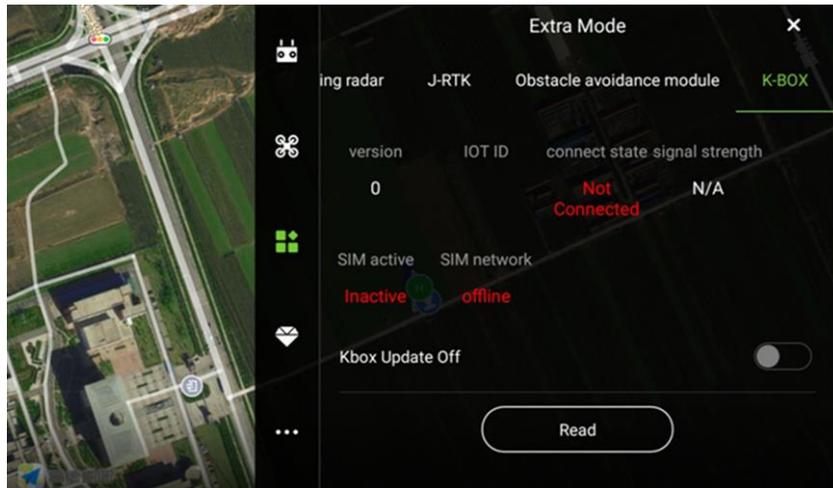
It's only for J-RTK users.

(10)Obstacle avoidance module



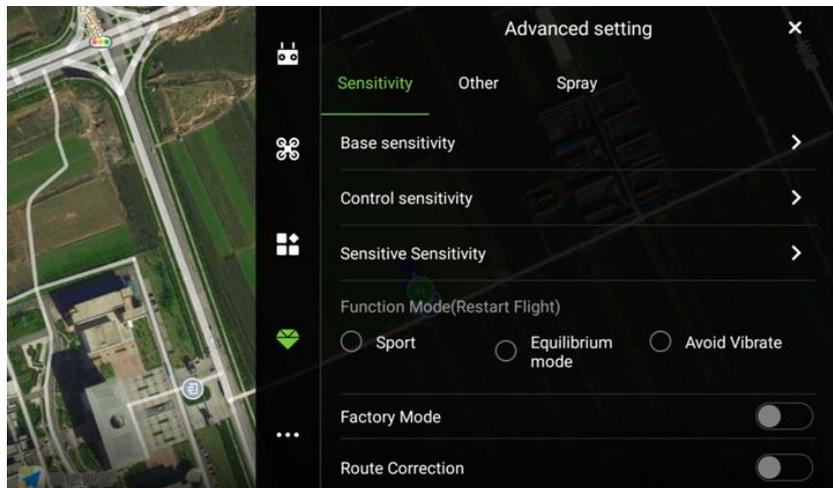
- a) Indicating radar detected distance;
- b) Obstacle avoidance status: On/Off;
- c) Avoid sensitivity: Mid. (Could be adjusted per to request);
- d) Avoidance action: Hang.

(11)K-BOX



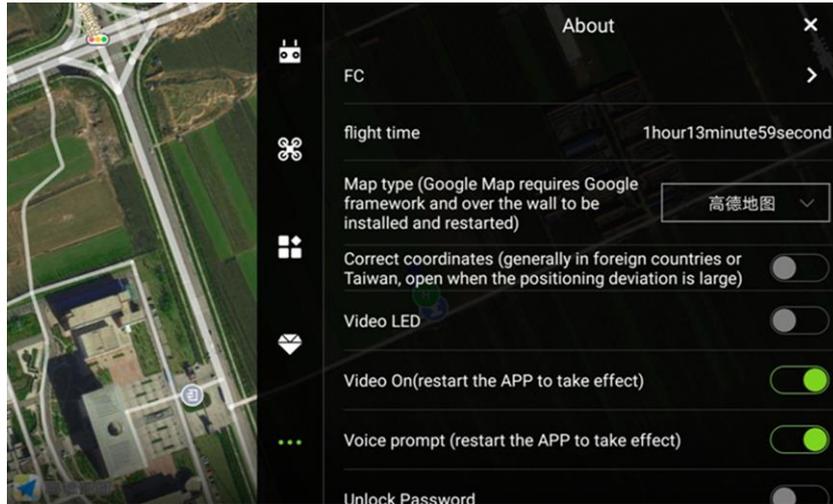
It's only for Smart Battery users.

(12)Advanced Setting

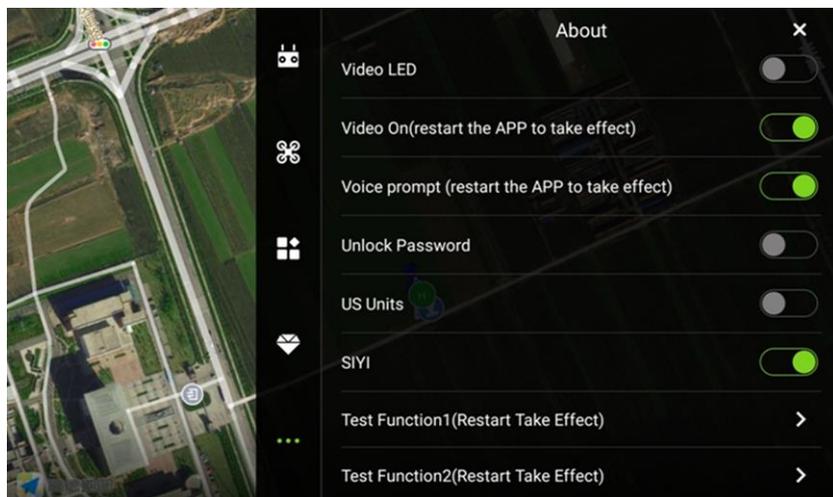


**⚠️** Notice: Parameters in this interface are drone properties. Non-professionals DO NOT modify, otherwise may cause abnormal status or even crash.

(13)About



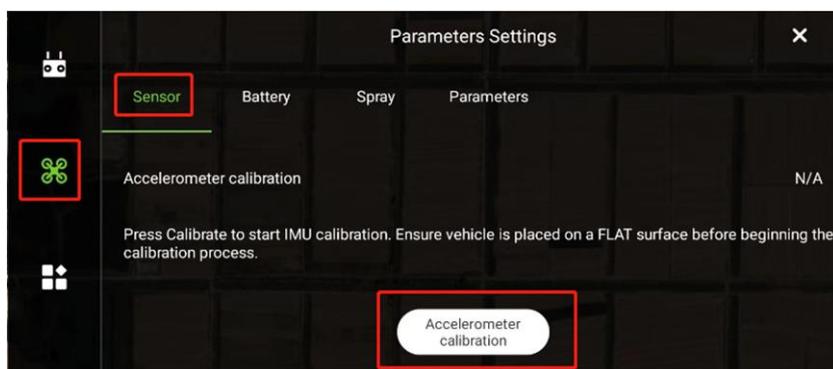
- a) Map type: Gaode Map or Google China for China domestic areas; Google Map for other countries;
- b) Correct coordinates: On/Off. (Default as off, open when positions offset);



- c) Image transmitter, Voice Prompt and SIYI are open as default;
- d) US units status can be chosen per to request.

**4.1.5 IMU Calibration**

Calibrate “ACCELEROMETER” for the first time when received drone, after long way transportation/crash or when it warns “please calibrate ACCELEROMETER”.



Calibration process:

Put the drone on a flat ground, turn on remote controller, power on drone, connect App to remote controller, make sure App is connected. Click “Accelerometer

calibration” to start calibration, after 3 to 5 seconds to complete the calibration. DO NOT move the drone during whole calibration process. In the calibration process, LED light blinks red, green and yellow alternatively. When it changed to solid green for more than 3 seconds means calibrate successfully, it displays “calibration is successful”.

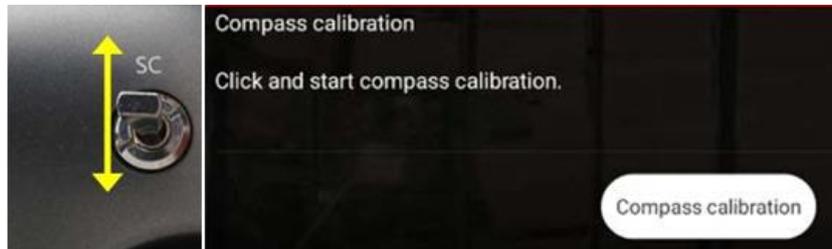
 Note: please don't move the drone during whole calibration process.

#### 4.1.6 GPS Calibration (Compass calibration)

When you got the drone(s), please calibrate COMPASS (GPS) at first. When move to another field 5km away, please calibrate GPS again. After crash, please calibrate GPS before fly again.

Calibration process:

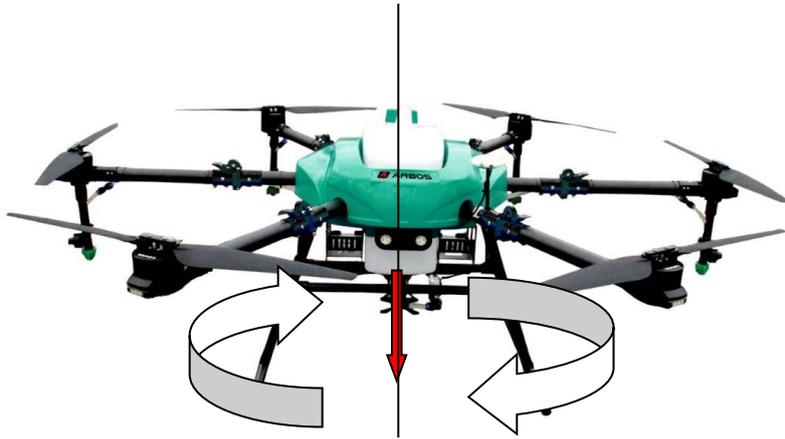
- (1) Put the drone on a flat ground, turn on the remote controller, power on the drone;
- (2) Waiting for the drone self-check, after the self-check finished, continuously and quickly toggle switch SC stick 5-10 times from top to bottom until the indicator light turns constant yellow; Or you can start calibrating by click “Compass calibration” on APP;



- (3) Rotate the drone clockwise and horizontally about 360 degrees until the indicator light turns constant green;



- (4) Put the drone head vertically downward (LED indicator upward), then rotate the drone clockwise about 360 degrees until the indicator light blinks red and yellow and green alternatively, the calibration finished.



**⚠️ Note:** If the indicator light turns red all the time after the calibration, it indicates the calibration failed and needs re-calibration. If the calibration failed many times, move the drone to another place and try again. During the calibration process please keep keys, phone, strong magnetic goods away from the drone.

**⚠️ Warning!**

Please note the following conditions to try to protect GPS from damage. If the GPS module is magnetized by the external environment, a large positioning error or magnetic compass interference will occur.

- (1) The drone is in a storage state, and there should be no metal or electronic equipment within 10 meters away from strong magnetic interference;
- (2) When doing GPS calibration, please remove all metal or electronic products from the operator, such as mobile phones, tablets, metal tools, keys, etc;
- (3) When performing drone repair or maintenance, do not keep the GPS module of the drone close to the computer or mobile phone for a long time. Do not place your phone or tablet on the drone. Do not leave used tools such as screwdrivers, pliers, etc. on the drone.

## 4.2 Manual flight

### 4.2.1 Introduction to flight mode

- Attitude mode (ATT Mode)
  - (1) Only in the attitude mode, the motor can be unlocked. In other modes, it cannot be unlocked. You need to switch to other modes after the attitude unlocks and takes off;
  - (2) In the attitude mode, the terrain following radar does not work, and the terrain following function cannot be used;
  - (3) In the attitude mode, the fixed height and the fixed point are automatically switched according to the search satellite state. When there is no GPS or the GPS signal is not good, the altitude is set high, and when the GPS signal is good, the fixed-point flight can be determined.
  
- Manual job mode
  - (1) In this mode, you cannot unlock and takeoff. You need to unlock the takeoff mode in the attitude mode and cut into this mode;
  - (2) In this mode, the water pump switch is controlled by the remote control switch;

- (3) In this mode, the terrain following radar function needs to be used after setting by the APP. The remote control can temporarily control the altitude, and the height will automatically revert to the height of the previous APP setting after the remote throttle is back middle.

- AB job mode

- (1) The AB point record must be recorded in the manual mode and cannot be recorded in the attitude mode, otherwise the AB job cannot be used;
- (2) In this mode, the pump is automatically turned on and the pump control mode can be debugged via the APP;
- (3) In this mode, the terrain following radar is automatically turned on, and the operation can be turned off by the APP setting, and the remote controller can temporarily control the altitude, and the height will automatically revert to the height of the previous APP setting after the remote throttle is back middle.

#### 4.2.2 Manual job mode

- (1) Power on
  - a) Step 1: Turn on remote controller;
  - b) Step 2: Plug in battery (batteries) in correct order.
- (2) Takeoff
  - a) Please unlock motors and takeoff in ATT Mode;
  - b) Unlock. Push two sticks to bottom as shown below until motors start running at the same time, then release back to central position. The motor will keep idle running speed;



- c) Slowly push up the left stick, the drone takes off slowly. When drone rises to the altitude which you want, release the stick back to middle position. The drone will be hovering in the air;



- d) After takeoff, toggle SC stick to middle - Manual job Mode.

(3) Left and right stick Operation instruction as below table. (Mode 2 by default)



| RC (Mode 2) | Drone (● indicates the head) | Remarks   |
|-------------|------------------------------|---|
|             |                              | Vertical movement of the left stick controls the drone's elevation. Push up to ascend and press down to descend. The more the stick is pushed away from the central position, the faster the drone will change elevation.   |
|             |                              | Horizontal movement of the left stick controls the drone's heading (yaw). Move left to rotate the drone anticlockwise and move right to rotate the drone clockwise. The drone will hover in place if the stick is in the central position. The more the stick is pushed away from the central position, the faster the drone will rotate. |
|             |                              | Vertical movement of the right stick controls the drone's pitch. Push up to fly forwards and press down to fly backwards. The drone will hover in place if the stick is in the central position. Move the stick further for a larger pitch angle and faster flight.   |
|             |                              | Horizontal movement of the right stick controls the drone's roll. Move the stick left to fly left and right to fly right. The drone will hover in place if the stick is in the central position. Move the stick further for a larger roll angle and faster flight.  |

(4) Turn on spray system (Pump + Nozzle)

High pressure nozzle:

Turn on pump - Toggle switch SB stick to bottom position.

(5) Operation Resumption in Manual job mode

- a) The drone has intelligent memory. After refill and change batteries, the drone can resume operation;
- b) The drone will keep hovering automatically and record break point when pesticide is exhaust in Manual job mode. At this time, the left and right sticks of the remote controller are invalid;
- c) Turn off spraying system;
- d) Toggle switch SC to ATT mode. The left and right sticks of the remote controller resume normal control;
- e) Toggle SA stick to bottom to return drone automatically, refill tank;
- f) Takeoff. Toggle SA to middle position, drone will back to break point automatically. After arriving break point, toggle switch SA to top position, continue spray work.

**4.2.3 AB job mode**

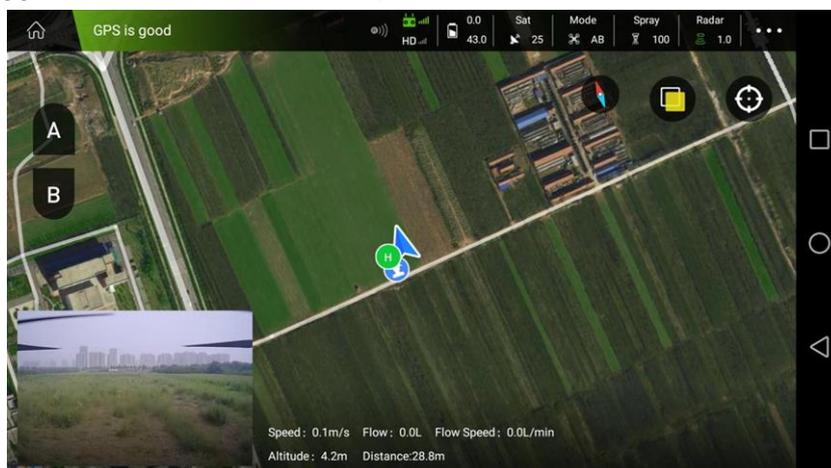
 Warning:

- a) Obstacle Avoidance function open: works in any flight mode;
- b) Terrain Following Function Open: doesn't work in ATT mode;
- c) The pump automatically turns on and off during A B operation and route operation

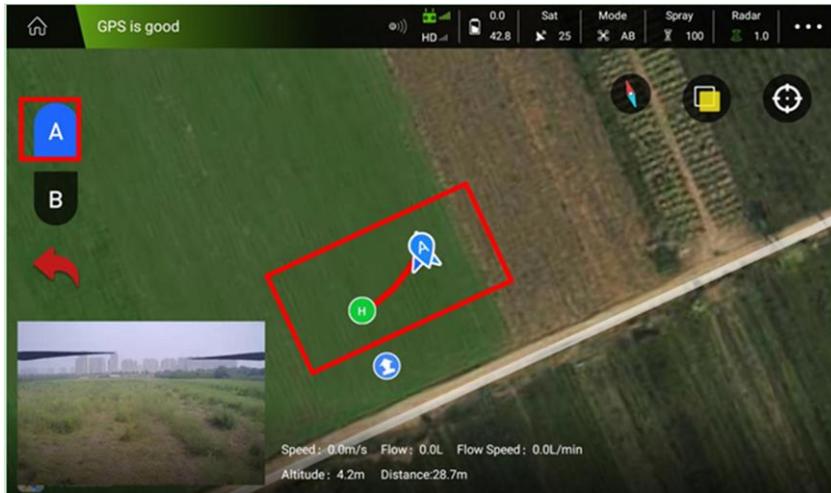
- (1) Hold or toggle switch SC to middle - Manual job mode
- (2) Clear A&B point: before takeoff, quickly toggle switch SD stick 5 to 10 times from top to bottom until the LED light flash Red – Green – Yellow three times



- (3) Takeoff in ATT mode and fly the drone
- (4) Toggle SC stick to bottom – AB job mode.



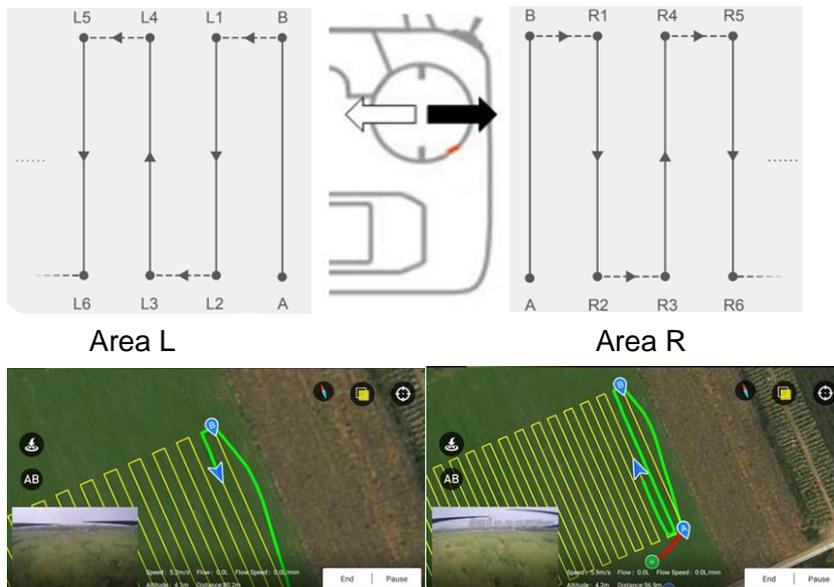
- (5) Mark Point A: Operate the drone to fly to point A. Toggle switch SD to middle position. The LED light flash yellow 2 seconds



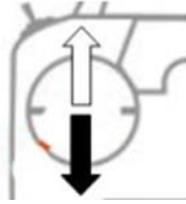
- (6) Mark Point B: Operate the drone to fly to point B. Toggle switch SD to bottom position. The LED light flash green 2 seconds



- (7) Move the right stick left or right (must to the end) to choose the spray direction Area L or Area R until the drone start moving to left or right. Then release it. The drone will fly autonomously at a constant speed and spray width following Area L/R

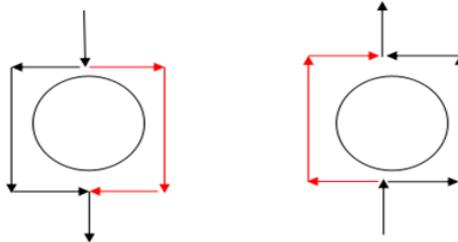


- a) During the AB job operation, the flying height can be adjusted by vertically moving left stick;

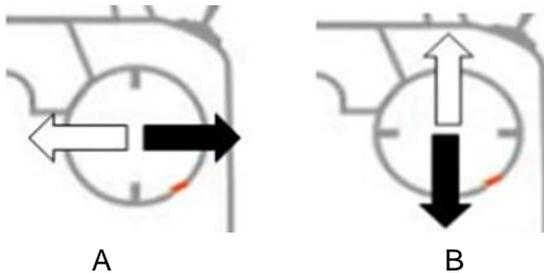


- b) During the AB job point operation, toggle switch SC to ATT mode to exit the A&B point mode.

(8) Avoid obstacles during the AB job point operation



When the drone flies in front of the obstacle, promptly move the right stick to left or right and hold like below picture A until the drone move to the edge of the obstacle. Then move right stick vertically and hold it like picture B to move the drone crossing obstacles then release right stick to middle position. The drone will move back to the normal route and continue spraying working automatically.



(9) Operation Resumption in AB job Mode

- a) Applicable conditions: Low chemical protection & Battery low voltage warning

1. Low chemical protection:

The low chemical protection default setting is Hovering in APP. The drone will keep hovering automatically and record break point when pesticide is exhaust. Toggle switch SC to ATT mode to exit the A&B point mode.



2. Low voltage warning:

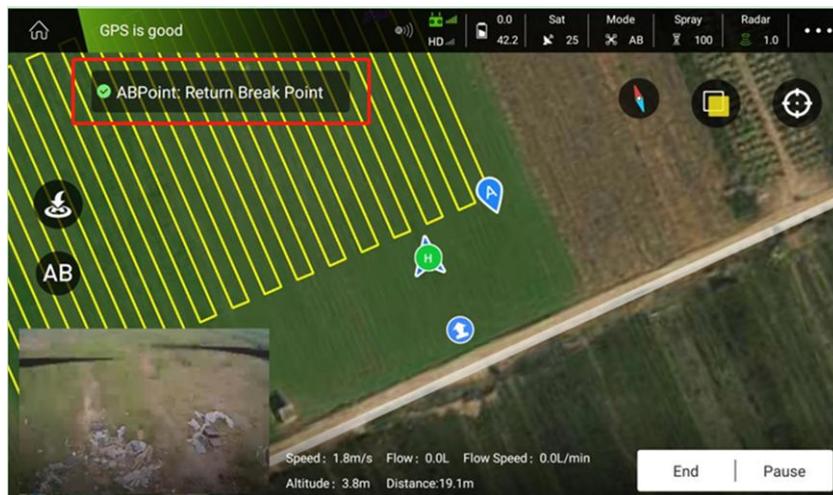
When the buzzer sounds a low voltage alarm or the voltage is in second warning level, Toggle switch SC to ATT mode to exit A&B point mode, the drone will hover automatically and record break point.



b) Operation

Toggle SA stick to bottom position. The drone will rise to Back Altitude – 5 meters by default setting, then return to the takeoff point and land automatically. Back Altitude can be adjusted in App.

After the drone landing, promptly refill pesticide or replace full charged batteries. Toggle SA stick to top – normal flight, takeoff in ATT mode, toggle SC stick to bottom – AB job mode, the drone will fly back the recorded break point, turn on nozzle, the drone will continue AB job spraying work automatically.



#### 4.2.4 Landing

(1) Manually landing via remote controller

- a) Please land the drone in ATT Mode
- b) Pull the left stick down slowly below middle position and hold. The drone will land slowly by itself. Remember DO NOT to pull down directly to the lowest position, otherwise, the drone will lose power and fall



- c) After the drone land, pull the left stick downward to the lowest position. Motor stop running



 Urgent lock (Caution).

When drone will damage people or property in emergency, you can lock the drone directly, and all motors will stop running and drone will fall off.



(2) RTH – One key return and landing

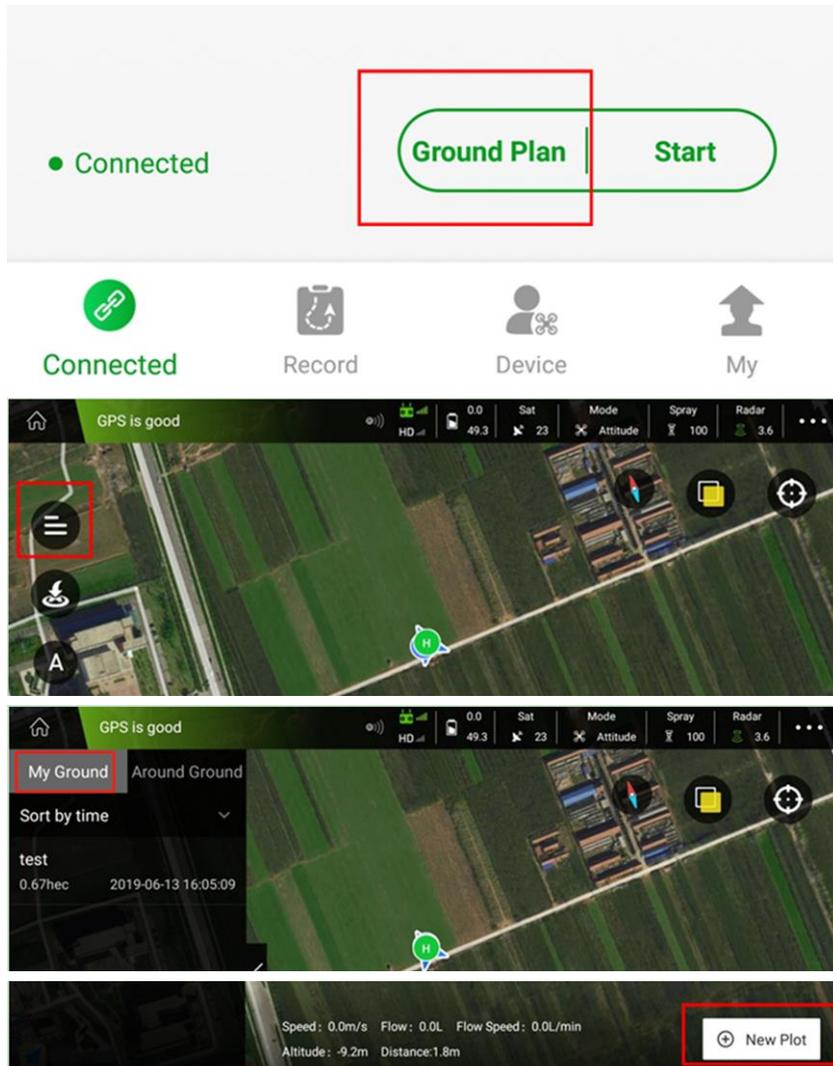
Toggle switch SA stick - RTH key to bottom position. The drone will rise to Back Altitude – 5 meters by default setting, then return to the takeoff point and landing automatically.

### 4.3 Route Operation Mode

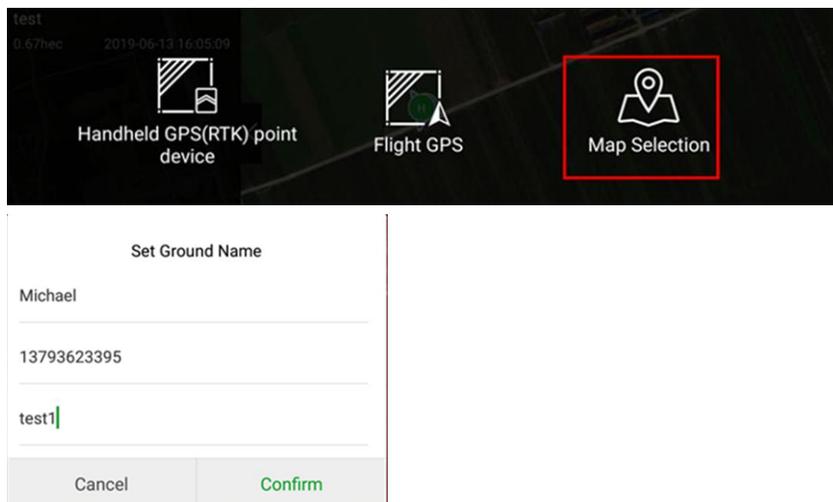
#### 4.3.1 Ground Plan

(1) Method 1:Map selection

a) Click “Ground Plan”, enter the APP, click the left main menu  --choose “my Ground”, then click the bottom right corner “New Plot”. Please as following picture shows



b) Choose and click “Map Selection”--input ground name, such as “test1”--confirm



- c) Please select the point on the map where you want to spray the field. Such as point 1, click on the map, click “Boundary point”, then the App will remind you “Add boundary point successfully”. Repeat the above operation and add point 2, point 3, point 4.....Up to 1,000 points can be added



1. Added point can be adjusted and clear

--Adjustment: Such as point 5, you click point 5. The App will display “Boundary point adjustment”, you can move up/down/left/right to adjust, then click “confirm” is OK

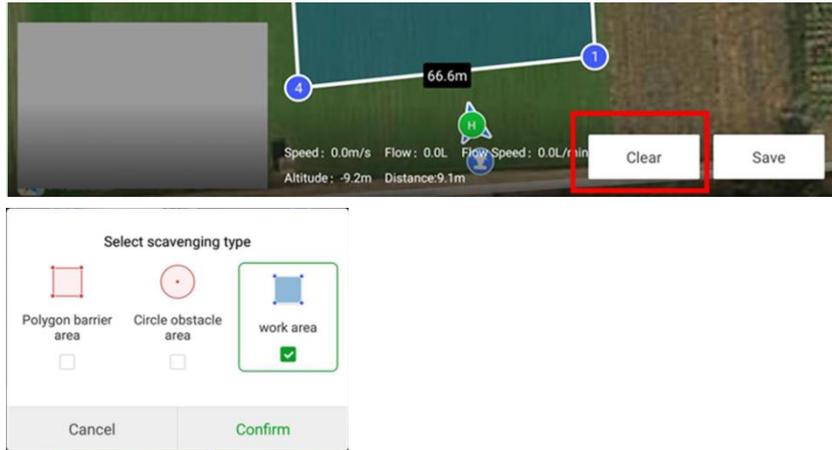
--Clear: Such as point 5 is added, if you want to delete it, you click top right corner



is ok



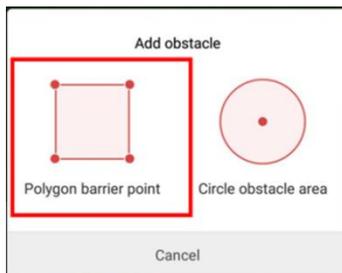
- Click the “clear”, you can delete the all obstacle area or work area. Click “work area” will delete all the points



- Add polygon obstacle area
  - Click “Obstacle point”



- Click “polygon barrier point”--choose the obstacle site on the map



- click “RBI”, display the red obstacle point



4. Repeat the above operation, until draw the whole obstacle shape

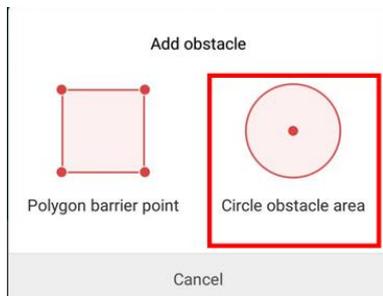


5. Last click “confirm” is saved



e) Add the circle obstacle area

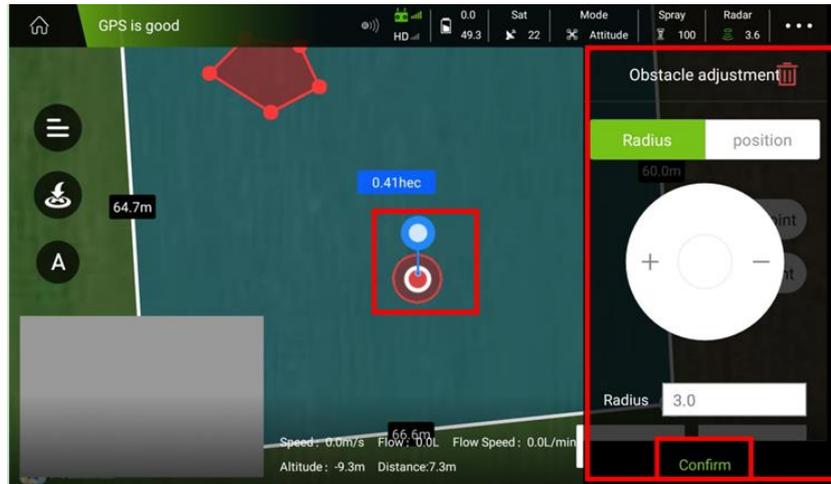
1. Click “circle obstacle area”



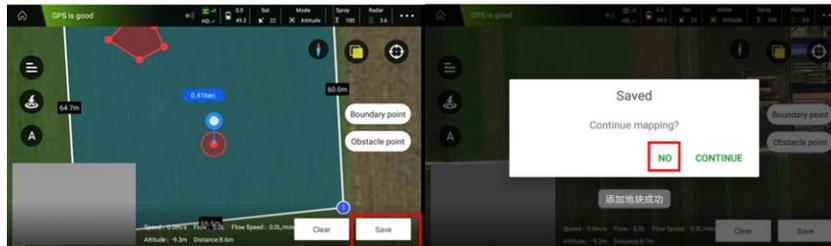
2. Select the obstacle site on the map--click “RBI”



- Click the red point, display “obstacle adjustment”, can adjust the “radius” and “position”. Last Click “confirm” will be saved. Click  will delete the obstacle point

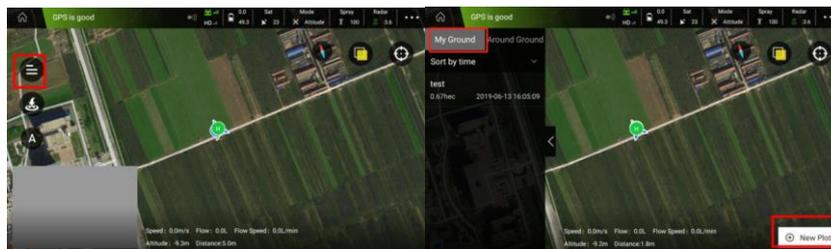


- Click “Save” will finish and save the ground plan. You won’t amend the ground again

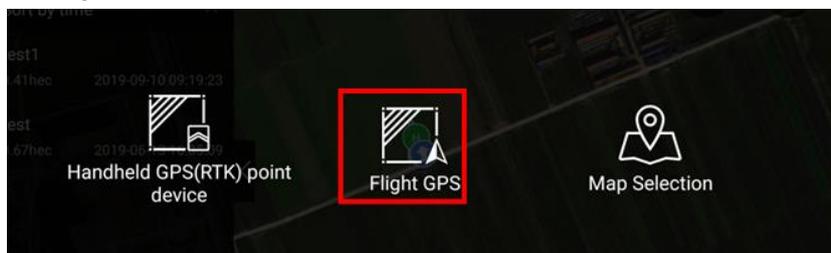


(2) Method 2:Flight GPS

- Click the icon “”. Click “My Ground”, Click “New Plot”



- Click “Flight GPS”



c) Set Ground Name and Confirm

Set Ground Name

Michael

---

13793623395

---

123

---

Cancel
Confirm

d) In ATT mode, control the drone to takeoff

e) Please remote control the drone to fly to the needed spraying area boundary point and hover, Click “Border” or “Obstacle” to add the boundary point, following steps please refer to the “Map Selection”

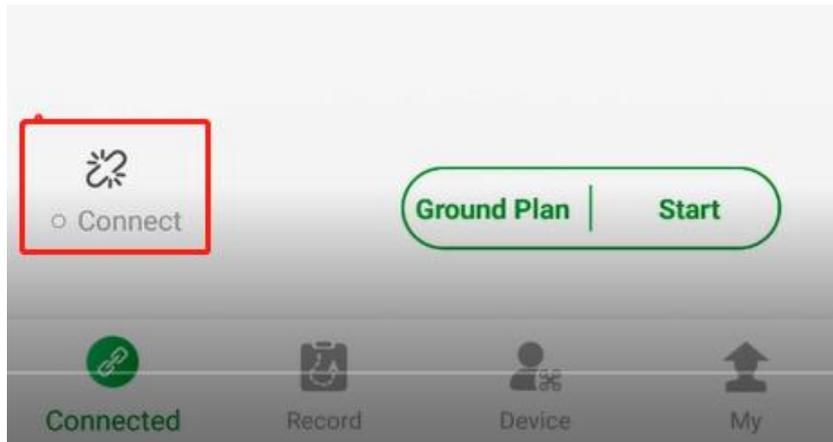


(3) Method 3: Handheld GPS point device (Optional part)

a) Connect Handheld GPS point device with phone. Turn on APP



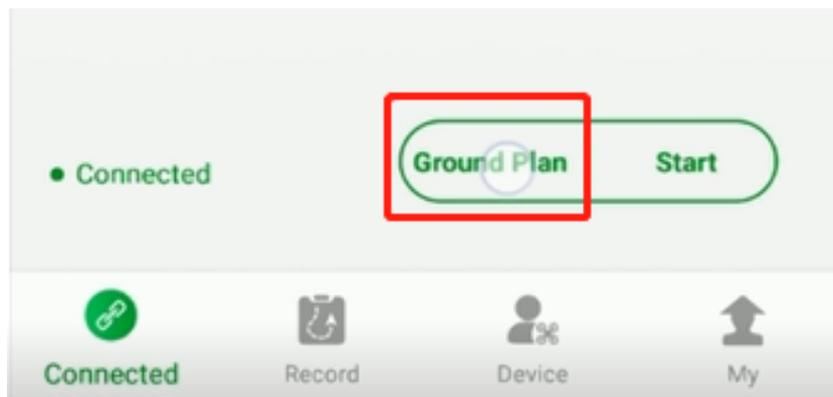
b) Click “Connect”



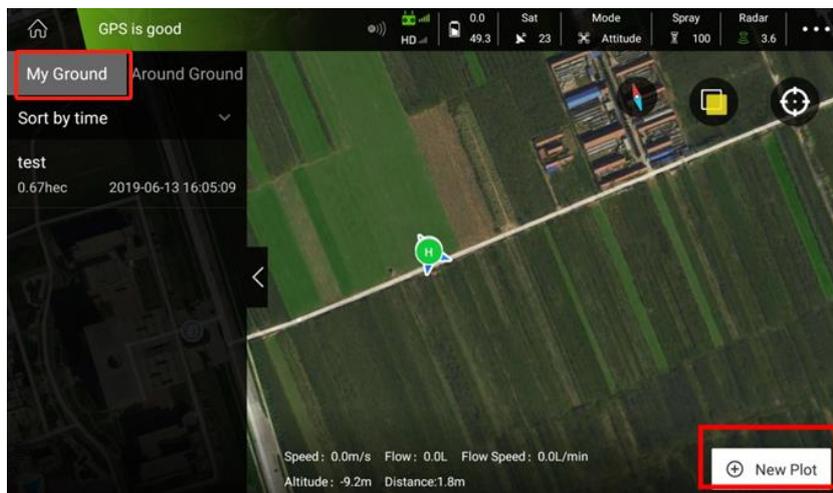
c) Select “打点器” or “Handheld GPS point device”



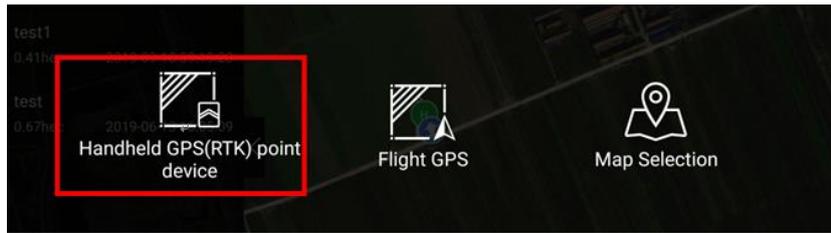
d) Click “Ground Plan”



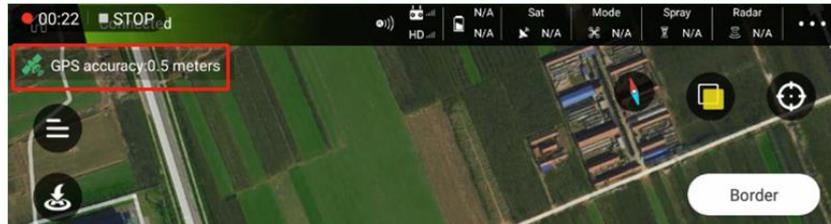
e) Click “My Ground”, Click “New Plot”



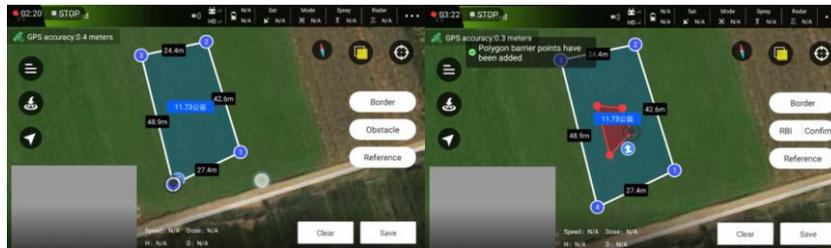
f) Click “Handheld GPS point device”



g) Select the points when the GPS accuracy  $\leq 0.5m$



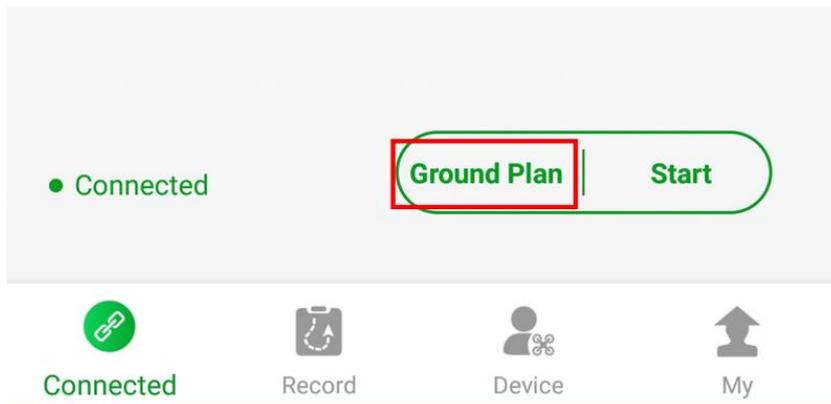
h) The operator holds the mobile phone and the GPS device and walk to the needed area, click “Border” or “Obstacle” to add the boundary point, following steps please refer to the “Map Selection”



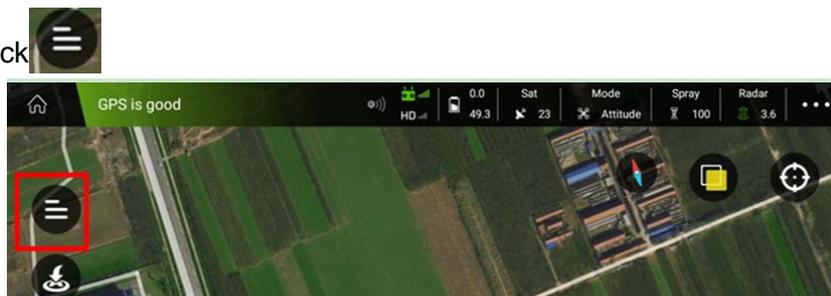
### 4.3.2 APP route operation begins

(1) Task Assignment

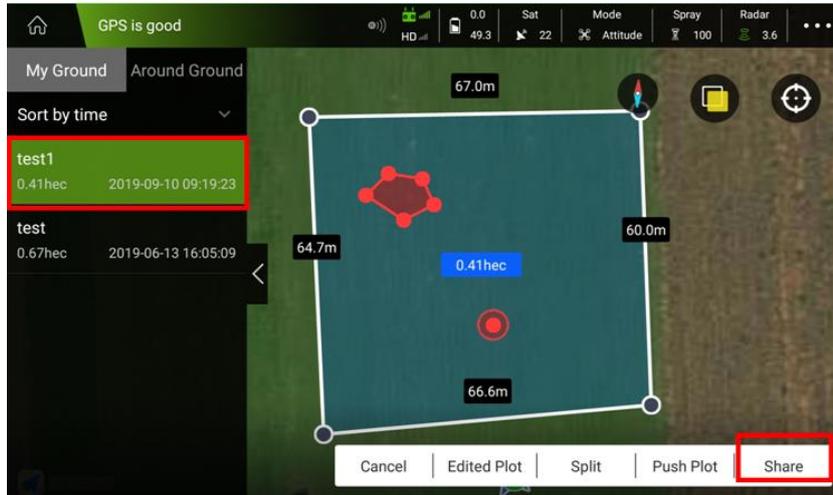
a) Click “Ground Plan”



b) Click



- c) Click “My Ground”, select the plot to be sprayed. For example “ test 1” in below picture. Then click “Share”



- d) Name the Task Name. For example “Task 1” in the picture below

**Share**

1. After clicking OK, the task will appear in the list of tasks that perform the job.  
2. If the land is assigned to a third party, please enter the account name of the third party below.

Please enter the account name (you do not need to

Crop Type

 **DO NOT** input account name

Crop Type

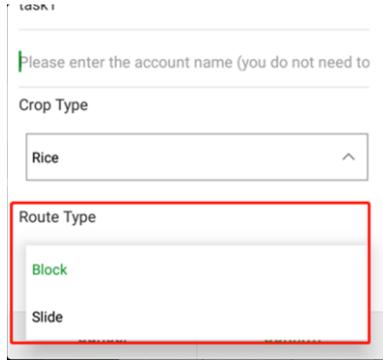
Route Type

- e) Select “Crop Type”

Crop Type

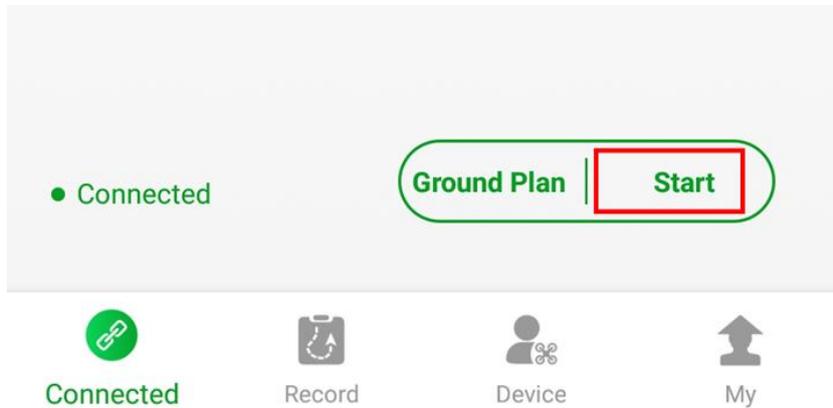
Route Type

- f) Route Type. Select “Block” by default. Then click “Confirm”. Share the task successfully

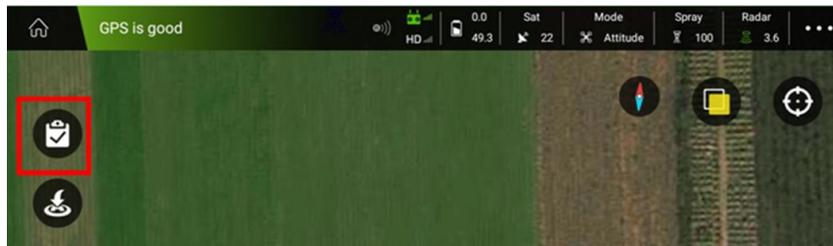


- (2) Perform route operations

- a) Click , back homepage. Click “Start”



- b) Click , open the Job list

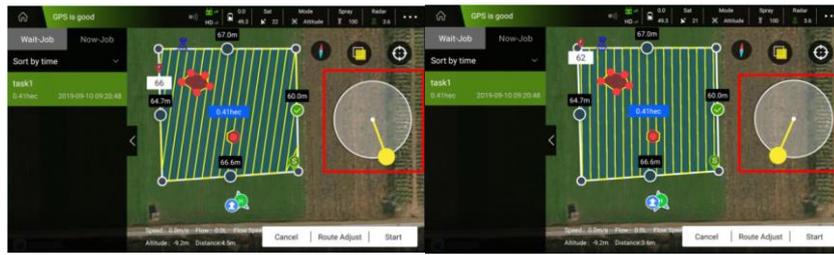


- c) Click “Wait-Job”, find the task named “task1” just shared from “Test 1” ground. Click it



d) Adjust fly route

1. Click , can adjust the direction of the route



2. Click "Route Adjust"



3. Click "Spacing", adjust spray width. It is recommended to keep the default settings:

Recommended spray width setting for each model

LJ 10L-606 4m / LJ 16L-606 5m



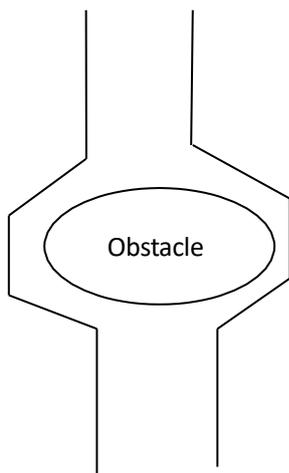
4. Click "Indentation", adjust the indentation distance between the plot and the edge



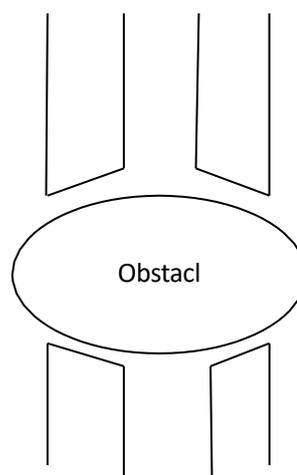
- Click “Obstacle boundary distance”, adjust the indentation distance of the obstacle boundary



- Click “Route Type”, choose how to automatically bypass obstacles. It is recommended to keep the default settings – Cross



Cross



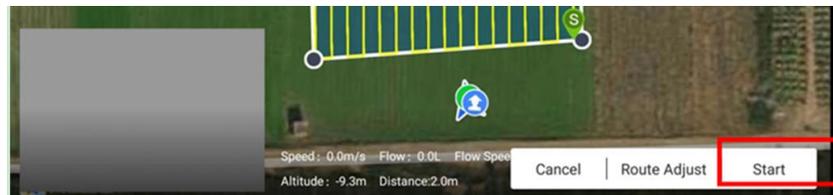
Turn

7. Click "Route setting", fine-tuning the planned plot location

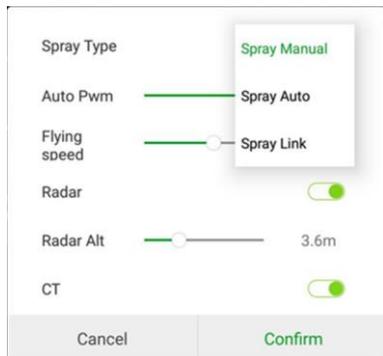


e) Start flying

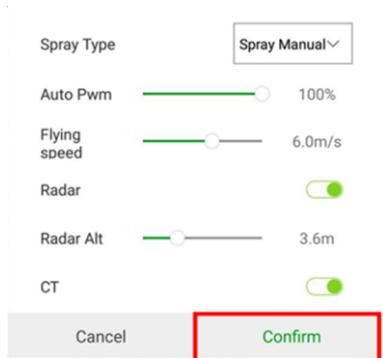
1. Click "Start"



2. Confirm again and adjust the flying parameters



3. After confirm the flying parameters, click "Confirm"

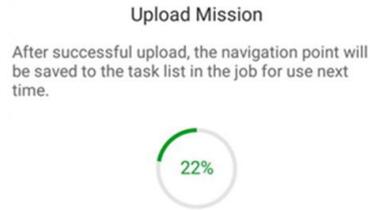


CT off (U off)

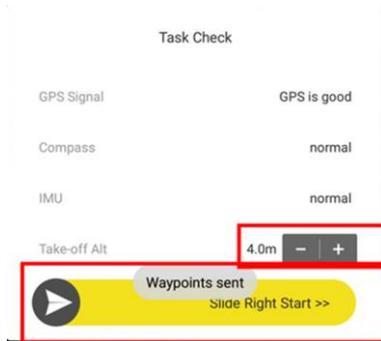


CT on (U on)

4. Upload Mission



5. Set Take – off Altitude. Note: The takeoff height must be higher than the crop height. Then Slide Right to Start



6. The drone will takeoff and fly to the start point automatically. Turn on Nozzle switch by pressing “S2” on RC



**⚠️** If your drone is not equipped with a terrain following radar, or if you turn off the terrain following radar function, the drone will automatically fly at the altitude set by the takeoff altitude. If your drone is equipped with a terrain-following radar and is turned on and sets the Radar Altitude, the drone will automatically adjust the altitude to the radar set height and work after taking off.





7. After drone arrive the start point, the water pump will turn on automatic. Start spraying. The route the drone passes will be displayed in green color



8. The drone will automatically bypass the marked obstacles



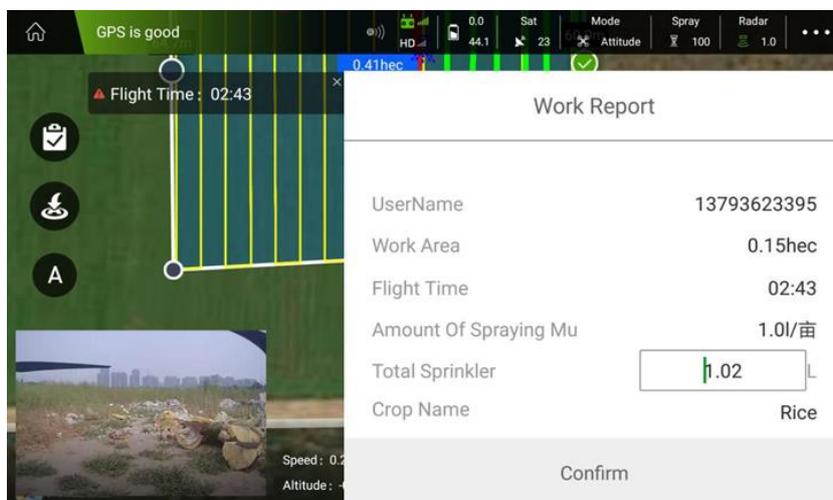
- When the liquid in the medicine box is used up, the liquid breaking alarm will be displayed. The drone will automatically stop the spray job and will remain hover by default. Record the location of the breakpoint



- Return and land the drone by click  in APP, or toggle SA stick on RC or manually operating by RC

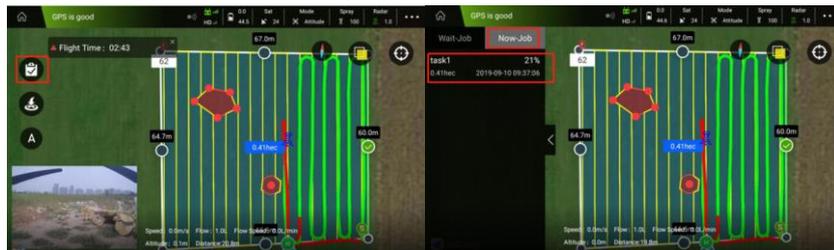


- Click "Confirm"





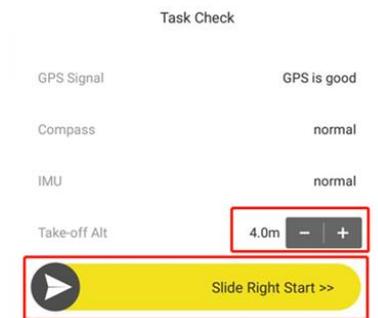
12. Fill the liquid again and replace the batteries if necessary. Click , select "Now Job" list. Call up the ongoing task "task1"



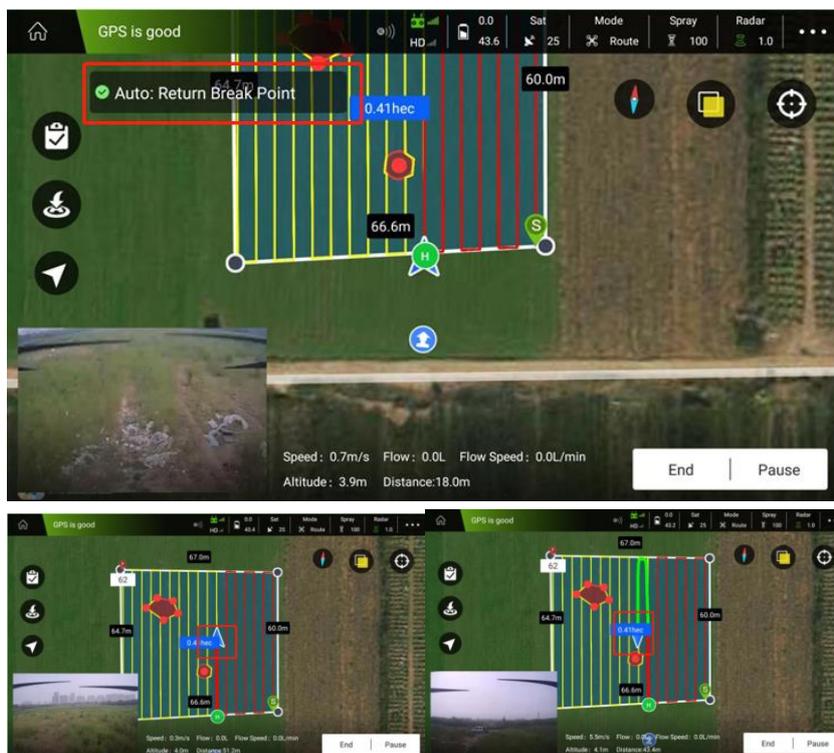
13. Click "start", confirm the flying and spray parameters again, click "confirm"



14. Set Take – off Altitude. Then Slide Right to Start



15. Drone will takeoff and fly back to the recorded break point automatically. Then spraying operation will continue from the break point automatically



16. At the end of the job, please click "End" or "Pause" to end the spray job

## 5. Maintenance and Upkeep

To ensure flight safety and optimal performance, performing comprehensive and regular maintenance is recommended. This manual is intended to help users maintain their drone as well as possible and maximize reliability. Please note that the most effective way to extend the longevity of your drone is to inspect your drone before and after each flight to check for lodged objects and damaged parts and arrange repair if necessary

We recommend conducting a pro flight checklist each time you use the drone as outlined below.

### Post-Flight Checklist

- (1) Cleaning drone after finish spraying
  - a) Clean the drone immediately after finish spraying. Keep the drone away from sand and water, and wipe them down if they've been exposed to sand or water  
Please note: Use a soft brush or wet/dry towel to clean the drone. DO NOT rinse the drone with liquids.
  - b) Batteries: Check that the connectors between the batteries and drone are dry. Dry the drone and batteries with a towel before storage.
  - c) FPV camera and terrain following radar: Check that the camera and terrain following radar are dry.
  - d) Drone arms: Ensure that the arms and folding joints are dry before unlocking and folding. In cases where small objects like sand become lodged in the connector or arm, use a compressed air duster to remove these objects.
  - e) Remote controller: Ensure the remote controller are clean. Check that each stick, switch and button are working properly. In cases where small objects like sand become lodged in the stick or switch, use a compressed air duster to remove these objects.
  - f) Clean spray system; Fill the spray tank with clean water, open pump to spray water through nozzle until the tank is empty. Avoid residual pesticide blockage and damage to the spray system.
  - g) Clean spreader system; clean the residue inside the spreader tank and spreader. Using dry compressed air and a clean soft dry towel is recommended. DO NOT rinse with liquids.
- (2) Checking for worn and loose parts
  - a) Motors: Detach the propellers and start the motors. Listen carefully to see if there is any abnormal noise, please replace the motors.
  - b) Propellers: Check that the propellers have no crack, replace new propellers if damaged. Check the propeller base screws are tightened.
  - c) Screws: Check all the screws on the drone are tightened.
  - d) Ensure that the folding joint can be connected/disconnected smoothly.
  - e) Check the following parts for signs of wearing: wires, hoses, propellers, landing legs and motors. If these parts seem worn or damaged, please replace them.

## 6. Updating Apps and Firmware

Make sure you are using the latest firmware and App when flying LOVOL Series drone.

## 7. LED Status description

| Indication of Flying Mode                                   | Status Indicator   |  | Priority Level |
|---|--|--|----------------|
| Attitude(ATT-STA, ATT-ALT)                                  | green indicator blinks once                              |    | Low            |
| Manual Job mode (angle, speed)                              | green indicator blinks twice                             |    | Low            |
| Function mode (During AB job or APP routing job.)           | green indicator blinks three times                       |    | Low            |
| Self-driving mode (ground station control, return-to-home ) | green indicator blinks quickly                           |    | Medium         |
| Indication of GPS   | Status Indicator   |  | Priority Level |
| Disconnection of GPS or GPS didn't receive the satellite    | red indicator blinks three times                         |    | Low            |
| Poor GPS signal   | red indicator blinks twice                               |    | Low            |
| Ordinary GPS signal   | red indicator blinks once                                |    | Low            |
| Strong GPS signal   | No blink of red indicator                                |  | Low            |
| RTK positioning   | yellow indicator blinks once                             |    | /              |
| Indication of Low Voltage Alarm                             | Status Indicator   |  | Priority Level |
| Level one alarm   | yellow indicator blinks three times                      |    | Low            |
| Level two alarm   | yellow indicator blinks quickly                          |    | High           |
| Indication double-faced of calibration                      | Status Indicator   |  | Priority Level |
| Horizontal calibration                                      | Yellow indicator is solid on                             |   | Medium         |
| Vertical calibration  | Green indicator is solid on                              |  | Medium         |
| Calibration failure   | Red indicator is solid on                                |  | Medium         |
| Calibration success   | Alternating blink among red, green and yellow indicators |  | /              |
| Indication of accelerometer Calibration                     | Status Indicator   |  | Priority Level |
| Being calibrated  | Alternating blink among red, green and yellow indicators |  | Medium         |
| Calibration success   | The green indicator is solid on                          |  | Medium         |
| Calibration failure   | Red indicator is solid on                                |  | Medium         |
| Indication of Abnormal status                               | Status Indicator   |  | Priority Level |
| Lost control of remote controller                           | Quick blink of red indicator                             |  | High           |
| Compass is disturbed/ abnormal                              | Alternating indicators blink between green and yellow    |  | High           |
| GPS loses the signal  | Alternating blink between green and red indicators       |  | High           |
| IMU vibration is too fierce/ abnormal                       | Alternating blink between red and yellow indicators      |  | High           |
| Indication of other Status                                  | Status Indicator   |  | Priority Level |
| Initialization of power on                                  | Alternating blink among red, green and yellow indicators |  | High           |
| Unlock  | Alternating blink among red, green and yellow indicators |  | High           |
| Unlock failure  | Red indicator is normally on                             |  | High           |

## 8. Basic Maintenance

### 8.1 Spraying system

- (1) If the nozzle can't spray normally, please inspect if there is air inside of the hose, release air from nozzle, pump can solve the problem.
- (2) Inspect the tank & pump inlet/outlet if stuck.
- (3) Inspect if pump ESC is burned. If ESC signal cable is connected incorrect pump will have beep sound.

### 8.2 Drone flight is not stable

- (1) Inspect all the spare parts are in good condition and connected well, all the screws are fastened.
- (2) Calibrate IMU.
- (3) Remote controller warn "Please relink".
- (4) Inspect the remote controller receiver is red light or green light. If it is red light, please relink it as maintenance manual.

### 8.3 Remote Controller can't unlock

- (1) Ensure all the sticks are in correct position.
- (2) Calibrate IMU.
- (3) Calibrate remote controller sticks.
- (4) Inspect remote controller settings if changed carelessly: RC channel and Reverse.

### 8.4 Remote Controller warn "throttle not idle"

Pull throttle stick to bottom.

### 8.5 GPS Calibration Failure

- (1) Ensure there is no magnetic influence in the environment.
- (2) Move SC stick fast and continuously until LED turns correct color.
- (3) Change place and calibrate again.

### 8.6 App Disconnected

- (1) Ensure using Android cellphone/tablet with OTG function and OTG in turned on.
- (2) Inspect the USB cable and OTG cable connections are correct.
- (3) Change cellphone/tablet and try again.

### 8.7 Replacement & Calibrations After Crash

- (1) Inspect the motor running direction, if wrong change any 2 of the 3 ESC signal wires until the running is correct.
- (2) If the motor/pump have beep sound, inspect the ESC of them if burned or disconnected or connected in wrong order. Change any 2 of the 3 wires connection order until there is no beep sound.
- (3) If changed ESC or motor, calibrate ESC (FOC power system no need calibrate ESC).
- (4) Calibrate IMU and GPS before fly again.

### 8.8 Digital Fence

There is a red circle, the drone can only fly within it. Default height is 30m, radius is 300m. If you want to fly far need change the settings on Assistant.

**Technical support**

Please contact LOVOL service to get technical support

After sale service Email: [ag\\_service@global.lovol.com](mailto:ag_service@global.lovol.com)



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