Portable C-UAV Equipment

DT-650

User Manual
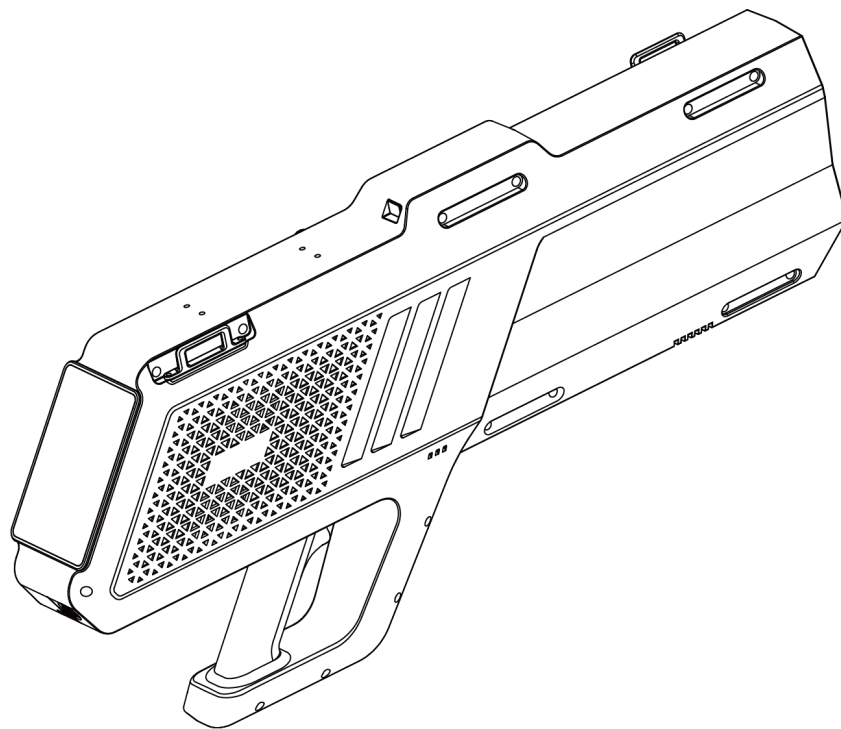
Contents

1 Product Overview

DT-650 Portable Counter-UAV Equipment (hereinafter referred to as "DT-650") is an integrated counter-UAV product based on Software Defined Radio (SDR) technology, which can conduct 360-degree detection, identification, and positioning of UAVs in the surrounding airspace for a long time. After discovering suspicious targets, the equipment interferes through its unique SDR technology, forcing the UAV to hover, return, or make an emergency landing based on its own safety strategy.

DT-650 can simultaneously detect and interfere single or multiple UAVs, and can be used as an effective supplement to large-scale fixed counter-UAV systems, applied to urban counter-terrorism, no-fly zone protection of important facilities such as military-control zones, airports, ports, prisons, etc., and also applied as a single soldier's equipment for security of major events, prevention of leakage of confidentiality at law enforcement scenes, and counter-smuggling activities in the border defense areas.

DT-650 has big detection and interference range, full interference frequency band, which can comprehensively interfere with UAVs' navigation signals, remote control signals, and image transmission signals. The interference frequency band covers communication, navigation, and 5G frequency bands, forming a powerful countermeasure on various illegal UAVs. DT-650 has low power consumption and can operate continuously for long periods of time. External integrated design makes it easy for individual soldiers to carry; Internal modular design with high reliability makes it easy to maintain.
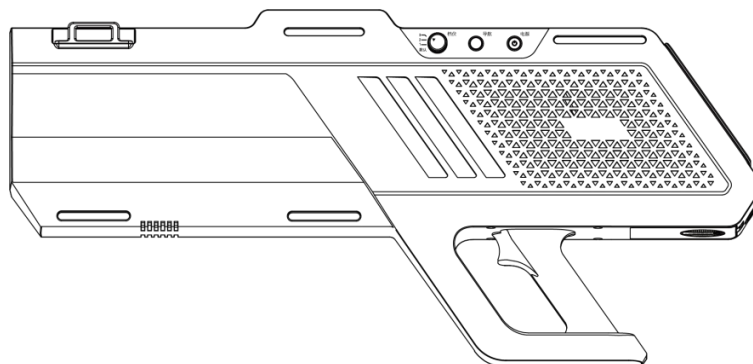
2 Structure and Operating Principles

2.1 Structure

DT-650 Portable Counter-UAV Equipment consists of the body, touchscreen, battery compartment and so on.
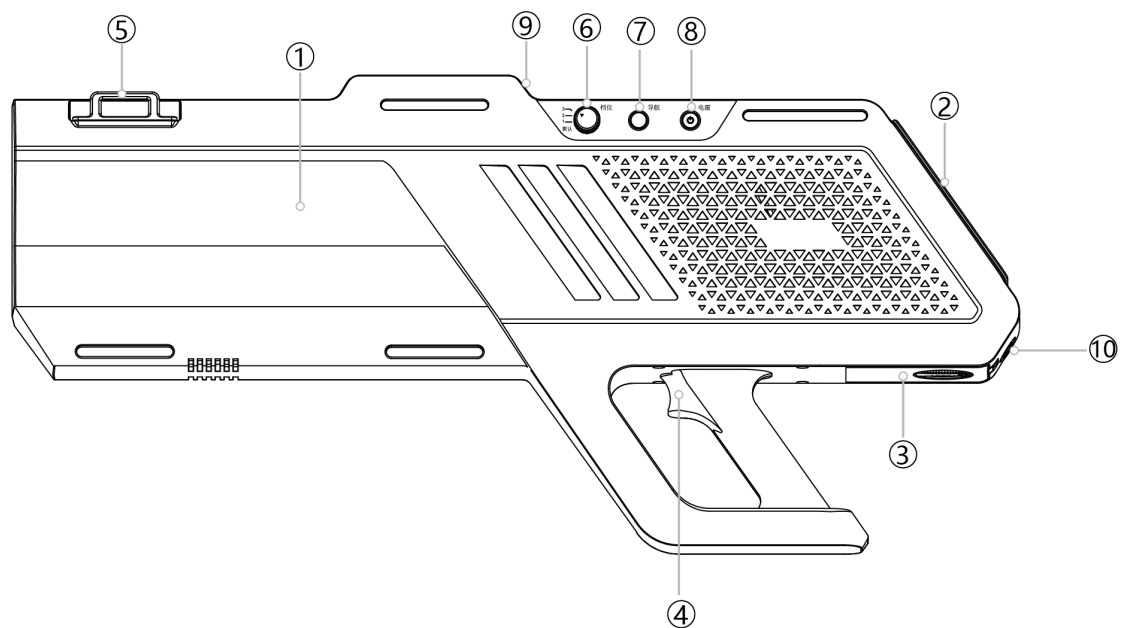
① Body

② Touchscreen

③ Battery compartment

④ Interference trigger

⑤ Strap hook

⑥ Mode knob (twisting the knob to align different gears to select different interference modes):

1) Default Gear

Full-band selection

2) Gear 1

Customized gear 1, factory default selected 840MHz~930MHz, 1430MHz~1444MHz, 2400MHz~2500MHz, 5725MHz~5875MHz, which is suitable for most of the conventional UAV jamming.

3) Gear 2 (5G band)

Customized gear 2, factory default selected 2515MHz~2675MHz, 3400MHz~3600MHz, applicable to 5G band jamming.

4) Gear 3 (communication jamming band)

Customized gear 3, 840MHz~930MHz, 1430MHz~1444MHz, 2400MHz~2500MHz, 2515MHz~2675MHz, 3400MHz~3600MHz, 5725MHz~5875MHz are selected as the jamming bands by factory default.

⑦ Navigation interference switch: pressing the button to select the 1550MHz~1620MHz band, pressing again to pop up and uncheck.

⑧ Power switch: long press for about 2 seconds to turn on, long press again for about 2 seconds to turn off.

⑨ Data port

⑩ Charging port to connect to the DC side of the adapter.

2.2 Operating Principles

Portable Counter-UAV Equipment is a Software Defined Radio (SDR) technology-based Counter-UAV product integrated functions of detection and countermeasure, which can detect UAVs in the surrounding airspace for a long period of time, and interfere the targets through its unique SDR technology, forcing the UAV to hover, return, or make an emergency landing based on its own safety strategy.

Portable Counter-UAV Equipment using radio passive detection technology, through the omni-directional broadband antenna for a long time, to

continuously receive the radio signals less than or equal to 6GHz of surrounding airspace. With constantly monitoring of the 4 bands of signals that civilian UAVs commonly used in the 840MHz ~ 930MHz, 1430MHz ~ 1444MHz, 2400MHz ~ 2500MHz, 5725MHz ~ 5875MHz, the equipment can identify and determine the UAVs according to their spectral characteristics.

3 Technical Parameters

(1) Frequency bands of detection:

    ①   840MHz～930MHz;

    ②   1430MHz～1444MHz;

    ③   2400MHz～2500MHz;

    ④   5725MHz～5875MHz;

(2) Frequency bands of interference:

    ①   840MHz～930MHz;

    ②   1430MHz～1444MHz;

    ③   1550MHz～1620MHz;

    ④   2400MHz～2500MHz;

    ⑤   5725MHz～5875MHz;

    ⑥   2515MHz～2675MHz;

    ⑦   3400MHz～3600MHz;

(3) ※Detection distance: not less than 2.5 kilometers

(4) ※Detection horizontal coverage angle: 360°

(5) ※Detection directional accuracy: Tolerance less than 20°

(6) Interference distance: not less than 2 kilometers (Test model is DJI Phantom 4, interference communication ratio 10:1)

(7) ※Interference azimuth covering: not less than 30°

(8) Standby duty time: not less than 6 hours

(9) Single battery continuous operating time: not less than 40 minutes

(10) Power supply: lithium-ion batteries (two standard configurations, one for use and one for backup)

(11) Total weight: not more than 4.5 kilograms

(12) Body size: 705mm (±10mm) *100mm (±10mm) *322mm (±10mm)

(13) Working temperature: -30℃~45℃

(14) Protection level: IP54

(15) Power adjustment: supports high and low power adjustment

(16) Frequency bands switching: support jamming band switching
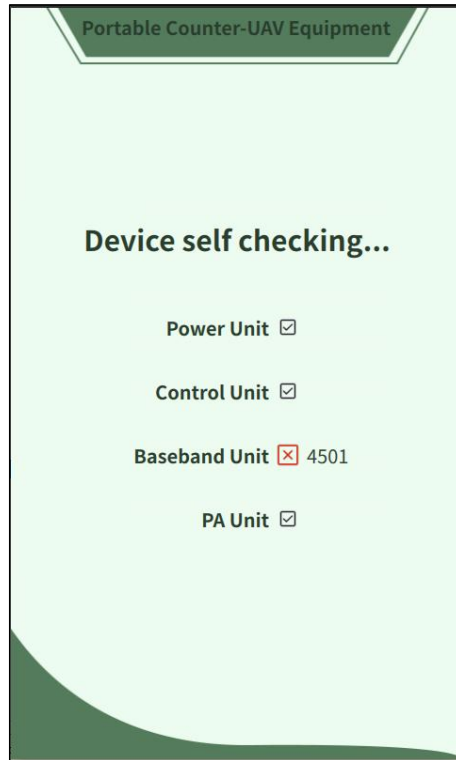
※ Test model: DJI Phantom 4, with clear aerial vision.

4 How to Use

4.1 Functions

4.1.1 Power on and self-check

After powering on, the interface displays "self-checking", and enters the main

interface after the self-check is completed. When any of the power supply unit, main control unit, baseband unit, amplifier unit in a fork "X" that is the

self-check error (with error code).

Possible error codes and meanings:

- 4003: Battery not inserted or faulty
- 4101: Touchscreen malfunction
- 4201: USB pathway malfunction
- 4301: Temperature sensor malfunction
- 4401: Compass malfunction
- 4501: Baseband unit malfunction
- 4601: Amplifier unit failure

4.1.2 Power Display

The remaining battery power of the equipment is displayed on the right side of the status bar at the top of the main interface. When the remaining battery power is less than or equal to 10%, an alarm icon flashes in the power icon and the system automatically pops up a low-battery alarm prompt.
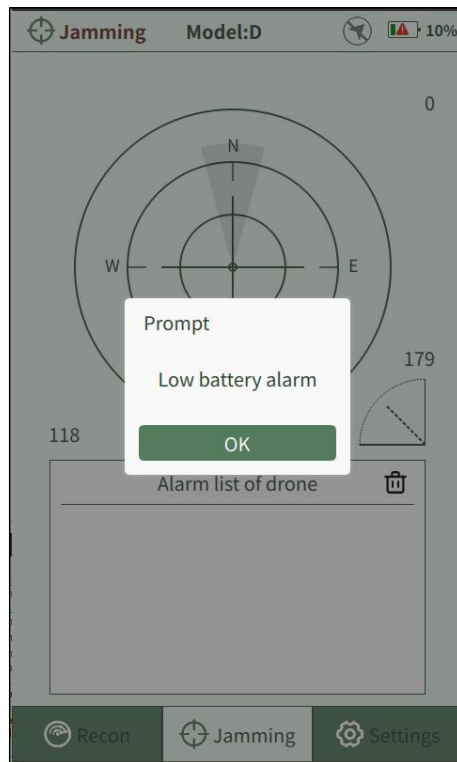
4.1.3　Target Reconnaissance

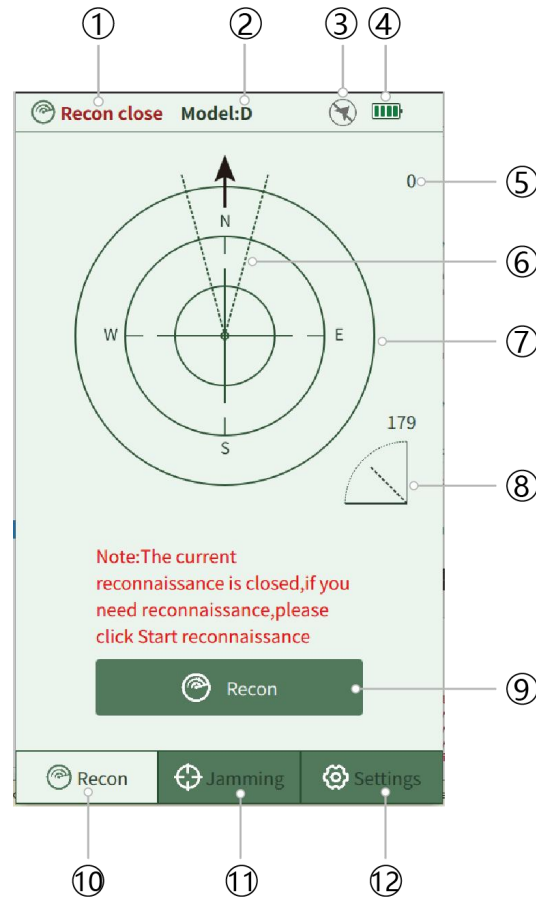After the system completes the self-check, it enters the main interface, as shown in the following figure:

① Indicates the current working status of the equipment, displaying "Reconnaissance close" indicates that the equipment is currently in the state of reconnaissance close, displaying "Reconnaissance" indicates that the equipment is currently in the state of reconnaissance (the default state of the equipment is "Reconnaissance close"), displaying "Jamming" indicates that the equipment is currently in the state of jamming;

② Displays the current gear (gear of jamming band configuration);

③ Displays whether the equipment has selected the navigation jamming band;

④ The current remaining battery power (25% per cell);

⑤　Shows the clockwise angle of the equipment to the north;

⑥　The arrow on the compass indicates the direction of the head end of the equipment, and the area surrounded by two dotted lines is the effective jamming area;

⑦　The equipment supports an electronic compass, indicating the horizontal position of the equipment in relation to the UAV;

⑧　Indicates the equipment and the UAV's pitch angle;

⑨　Starts reconnaissance button, clicks to enter the reconnaissance state;

⑩　Clicks to enter the reconnaissance window;

⑪　Jamming button, clicks to turn on jamming;

⑫　System settings button, clicks to enter the system settings interface.

4.1.4 Reconnaissance Alerts

The equipment beeps when it detects a UAV target, and the UAV target is displayed in the UAV alert list. Red font indicates a UAV that is currently present within the reconnaissance range, and black font indicates a UAV that has left the reconnaissance range.
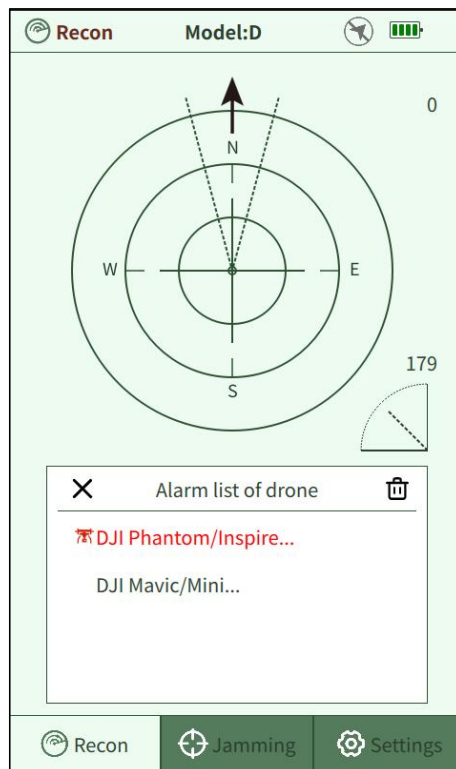
- The UAV alarm list shows the current alarm information, click "🗑" to clear the alarm list record, while the historical alarm record is still retained.

4.1.5 Target Tracking

The equipment supports UAV target tracking, users manually tap the UAV target (red font) in the UAV alert list to start tracking.

During the tracking user turns the equipment horizontally left/right according to the arrow pointing to the upper left/right corner of the compass to find the UAV orientation, as shown in the figure below. At the same time there is a beep sound to indicate that the tracking direction is correct if the horizontal angle between the equipment and the UAV is getting smaller and smaller, the sound will become more and more urgent. When the effective jamming area (dashed

sector) on the compass appears UAV target blinking indicates that the target has been tracked.
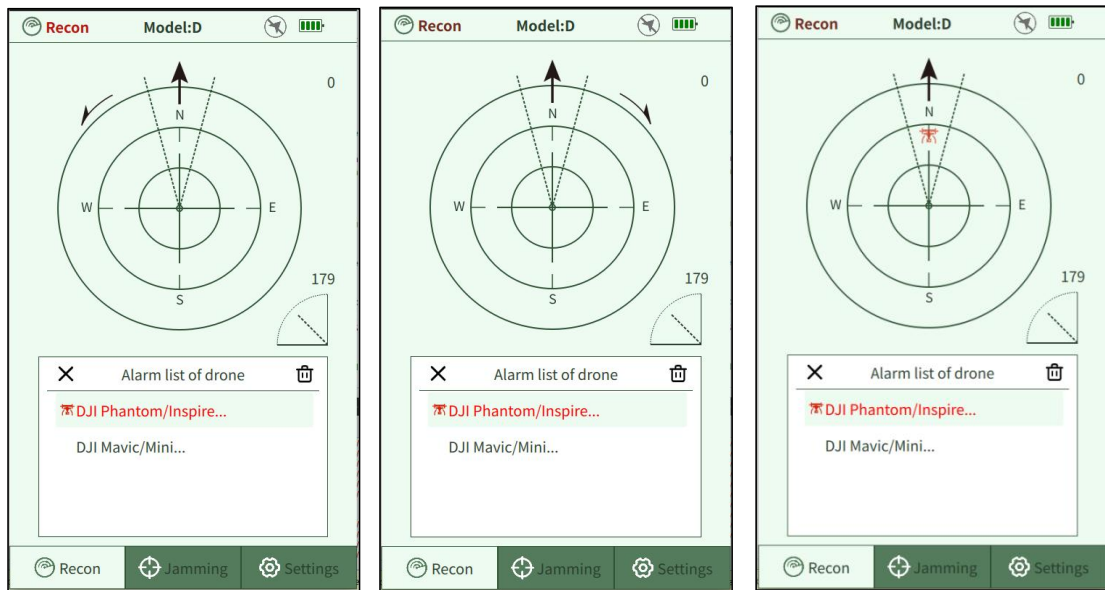
4.1.6 Target Jamming

After tracking the UAV, the operator presses the jamming trigger or clicks the jamming button on the screen, the equipment starts jamming the target UAV, while there is a continuous beeping sound to indicate that the jamming is in progress.

4.1.7 Jamming Band Switching

(1) Switch to communication jamming band: Twist the mode knob to Gear 3;

(2) Switch to the band of navigation-jamming-only: Twist the mode knob to the default gear, cancel all the bands selected under "Enable/Disable" in the band setting, and then press the navigation jamming switch;

(3) Switch to full-frequency jamming band: Twist the mode knob to Gear 3 and press the navigation jamming switch;

(4) Switch to 5G jamming band: Twist the mode knob to Gear 2.

*The above corresponding frequency bands are set at the factory, and users can set them by themselves according to actual needs.

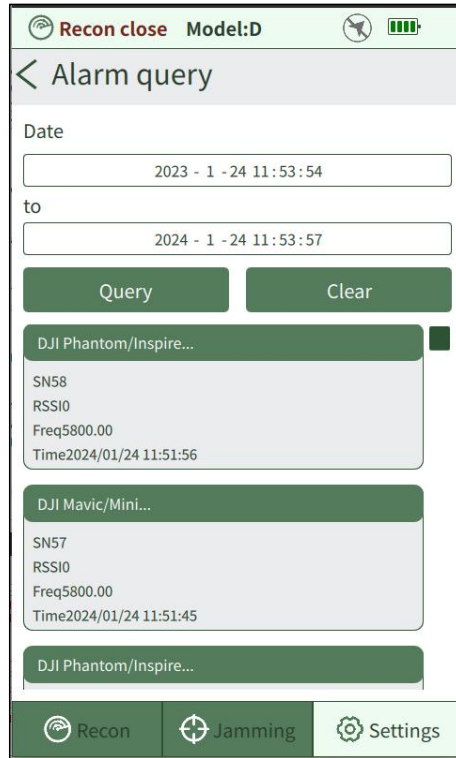## 4.1.8 Jamming Band Settings

From the main interface, click the System Settings button to enter the Band Settings window, where you can customize the jamming band and set the high/low transmit power.
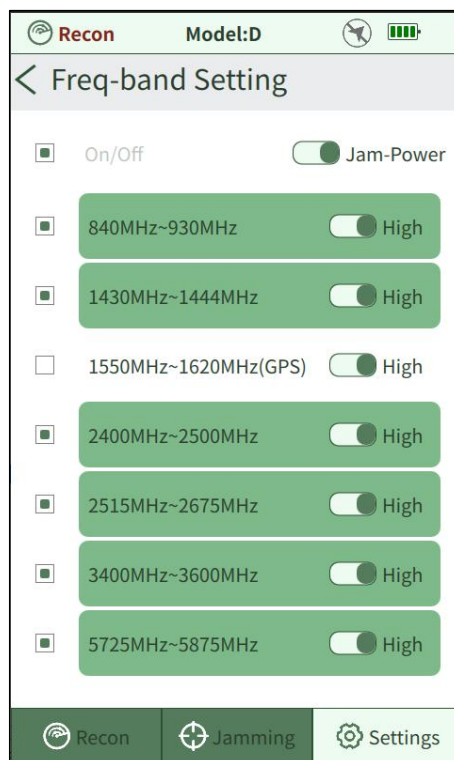
4.1.9 Alarm Query

From the main interface, click the System Settings button to enter the Alarms Query window, where you can query the alarm records for all time periods.

4.1.10 General Settings

Click the System Settings button from the main interface to enter the General Settings window, which has the function of setting the system time manually. You can also set the maximum continuous jamming time from 30 seconds to 120 seconds, with a default of 90 seconds.
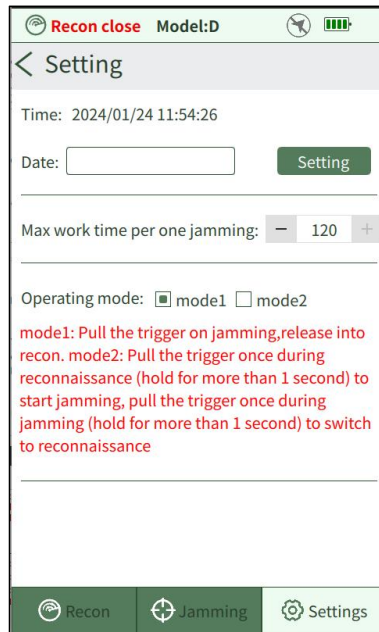
4.1.11 Compass Calibration

From the main interface, click on the System Settings button to enter the Compass Calibration window, click on the "Start Calibration", the user holds the equipment along the inverted figure of eight (∞) trajectory swing equipment, until the interface prompts the calibration is complete.
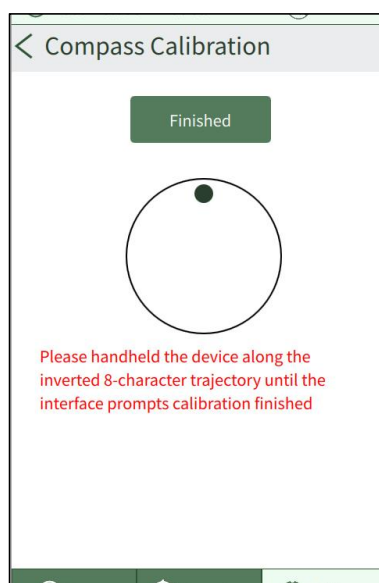
4.1.12 System Logs

Click the System Settings button from the main interface to enter the System Logs window, which displays the user's operation log.

4.1.13 About

From the main interface, click the System Settings button to enter the About window, which displays the product name and other information about the equipment, click the "Factory Reset" button to restore the factory settings.
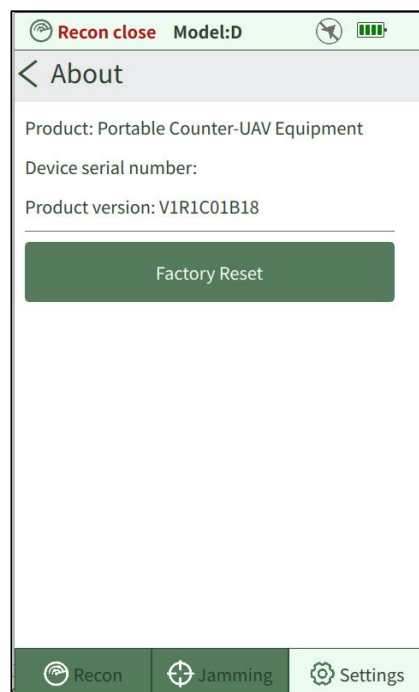
4. 2 Practical Operations

Dangerous:

- Do not use this equipment in explosive environments, such as those where flammable liquids, gases or dust are present!

- This equipment has a built-in lithium battery, to ensure safety, do not place the equipment in fire or water. Otherwise, it may cause overheating, fire, short circuit or explosion.

- It is strictly prohibited to place the equipment squarely on the human body when the equipment is turned on to jamming!

Caution:

- Do not use beyond the working temperature range.

- Stay alert and pay attention to the surrounding environment when operating.

- Do not use the equipment under lightning, complex electromagnetic environment, so as not to affect the state of use of the unit.

- If the equipment has not been used for a long time, please test all functions before use.

4. 2. 1 Power On
Press the power switch for about 2 seconds to turn on the power.

4. 2. 2 Jamming Band Setting
Twist the mode knob to the desired gear.

4. 2. 3 Reconnaissance
Hold the equipment in your hand or place the equipment on a horizontal

surface, and observe whether the main interface UAV alarm list displays UAV alarm messages.

4. 2. 4 Tracking

According to the arrow pointing at the upper left/right corner of the main interface compass, turn the equipment horizontally left/right, or search for the UAV through the buzzer sound, when the UAV target blinks in the effective jamming zone (dashed sector) on the main interface compass indicates that the target has been tracked.

4. 2. 5 Jamming

Press and hold the jamming trigger to start jamming, or you can tap the jamming button on the screen to start jamming.

5 Maintenance

5. 1 General Maintenance

1. Clean the surface of the equipment every three months with a dust-free cloth to remove dust, grease and other dirt left on its surface;

2. When the equipment is not in use, it should be charged to full once a month;

3. The equipment should be kept away from strong magnetic fields, high voltage lines.

5. 2 Battery Installation & Replacement

1. When replacing the battery, turn the battery compartment cover switch to the unlocked position and pull open the battery compartment cover.

2. After installing new batteries into the battery compartment, close the battery compartment cover and turn the battery compartment cover switch

to the locked position.

5.3 Battery Charge

1. After confirming that the battery is installed, plug the DC adapter connector into the charging port of the equipment and then turn on the power to charge the battery.

2. The power switch flashes blue during charging, and when it is full, the blue is always on.

3. It takes about 2.5 hours to fully charge the battery.

4. Key Notes:

(1) In order to maintain the activity of the battery, the battery needs to be fully charged every one month.

(2) The charging temperature should be kept at 0℃~40℃.

(3) Please check whether the battery power is sufficient and whether the battery status is normal before you are about to carry out jamming activities after a long time of non-use.

Warning:

● If there is any stuck when plugging and unplugging cables and batteries, do not force the operation to avoid damage.

● Due to the battery safety characteristics, low temperature -30℃ or below and high temperature 45℃ or above may not be able to power on, need to return to room temperature then charging to activate.

● In order to maintain lithium-ion activity and battery performance, the equipment should be charged every other month, each time full.

6 Common Faults Analysis and Troubleshooting

The common faults and troubleshooting methods are listed in Table 1. If there are other faults, please cut off the power immediately and contact our company's maintenance personnel as soon as possible.

Table 1 Common faults and troubleshooting methods

No.	Faults	Troubleshooting	Remarks
1	Unable to power on	Please plug in the adapter to power on, if still cannot power on please contact the manufacturer	Non-faulty
2	Cannot jam the UAV	1. Please check whether the jamming band settings are selected correctly; 2. Please make sure whether there is obvious cover in the surrounding environment; 3. Check whether the battery power is enough; 4. Please turn off the equipment, wait for a period of time, then restart and try again, if it is charging, please disconnect the adapter.	Non-faulty
3	Cannot start jamming by pressing the trigger	Click the main interface jamming button in case of emergency, then contact the manufacturer	Non-faulty
4	Cannot reconnoiter the UAV	1. Please make sure that the surrounding environment is not obviously obscured; 2. Actually, there is no UAV	Non-faulty

		flying in the surrounding area; 3. If there is a UAV, please turn off the equipment, wait for a period of time, restart and try again.	
5	Unable to charge	1. Check whether the adapter is functioning properly; 2. Check whether the battery temperature exceeds 0℃ ~40℃ temperature range; 3. Drain the power of the equipment to less than 60% before charging; 4. Check if the battery is installed properly.	Non-faulty
6	Compass direction is not correct	Enter the System Settings interface to calibrate the compass	Non-faulty

7 Maintenance Cycle

When the product is in normal operation, one month is a maintenance and repair cycle.

8 Transportation and Storage

8.1 Transportation Precautions

Packed products can be loaded on cars, trains, ships or airplanes and transported by road, railroad, water or air. The transportation process should meet the following requirements:

(1) It is not allowed to be shipped in the same vehicle with flammable,

explosive and corrosive articles;

(2) There should be rain, dust, sun, impact and fall prevention measures during transportation;

(3) Transportation boxes should be stacked smoothly and neatly, not super-high and overweight, and stacked no more than 4 layers;

(4) If damage is found during shipment and transportation, the relevant departments should be notified in time to deal with it.

8. 2 Storage Precautions

8. 2. 1 Inspection Content of The Storage Period
(1) Check the number of products and completeness;

(2) Check the overall appearance and screen of the product, and report any problems promptly;

(3) When the product is not used during the storage period, the product should be fully charged once every month.

8. 2. 2 Inspection Cycle for Storage Period
The inspection cycle for the storage period is one month.

8. 2. 3 Requirements for Storage Warehouse
(1) The temperature of the storage warehouse should be kept within the range of 5℃~35℃, and the relative humidity should be below 70%;

(2) The floor should be wood, tile, terrazzo, or asphalt, if it is a cement floor, a moisture-proof layer should be added under the cement;

(3) All facilities and items stored in the warehouse should be kept clean and tidy, and all kinds of harmful gases and corrosive chemicals are not allowed;

(4) The warehouse should have good lighting, ventilation, dust-proof facilities, and its building should have good shockproof, fireproof insulation, heat preservation, as well as drainage and other facilities;

(5) There should be no strong electromagnetic field in and around the warehouse.

8. 2. 4 Requirements for Storage

(1) The products should be neatly stacked, stacking no more than 4 layers;

(2) It is prohibited to put corrosive and explosive items into the product storage;

(3) The products should be placed on crossties 30 centimeters above the ground and more than 1 meter away from the wall to maintain air circulation;

(4) The products should be kept away from strong magnetic field and high voltage line.