



Product Manual

RTK Navigation and Positioning

RTK-01-Kit

深圳市瑞杰创新科技有限公司

Extreme Power Technology Co., Limited

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II Revision History

版本	描述信息	发行日期
V1.0	Initial Release	2025-10-28

III Product Usage Precautions

Thank you for choosing products from Ruijie Innovation! To ensure the safe and stable operation of the device and fully utilize its high-precision positioning performance, please read this manual thoroughly before use and strictly follow the operating procedures.

1. Safety Warnings

- Do not set up the device in thunderstorms or environments with strong electromagnetic interference (e.g., near high-voltage electricity, large radio transmission sites) to avoid equipment damage or personal safety risks.
- The base station must be set up on stable ground, and the tripod must be fully locked to prevent the device from tipping over and being damaged. When connecting the rover station to the flight controller, operate with power off to avoid short circuits that may burn the interface.
- Do not disassemble or modify the device casing or internal circuits without authorization; otherwise, the product warranty will be invalidated, and safety issues such as equipment malfunctions or short circuits may occur.

2. Liability Statement

- Our company only assumes warranty responsibility for quality issues of the device itself (the warranty period is subject to the product certificate). We shall not be liable for losses caused by the following situations:
 - ✧ Improper operation not in accordance with the manual or unauthorized modification of the device;
 - ✧ Equipment damage caused by force majeure (e.g., earthquakes, lightning strikes, floods);
 - ✧ Indirect losses caused by equipment failures (e.g., operation delays, data loss).

3. Manual Copyright and Updates

- The copyright of this manual belongs to Shenzhen Ruijie Innovation Technology Co., Ltd. No one may reprint, modify, or quote any part of this manual in any form without written permission. To meet market demands, this product will be improved and upgraded irregularly, and our company reserves the right to modify this manual without prior notice.

1. Product Overview

The RTK-01-Kit is a four-system multi-frequency RTK positioning system integrated with a high-performance data transmission link. It can receive and process differential data in real time, and finally output centimeter-level 3D positioning accuracy. This effectively solves the problem of insufficient positioning accuracy of ordinary GPS and provides a stable and reliable positioning solution for high-precision operation scenarios.

1. Core Advantages

- **High Precision:** Supports four satellite systems (Beidou, GPS, GLONASS, Galileo) and multi-frequency signal reception, achieving centimeter-level positioning accuracy.
- **Low Power Consumption:** Adopts a low-power chip solution with strong battery life, suitable for scenarios such as UAVs and portable devices.
- **Small Size:** Modular design with a compact size, easy to integrate into carriers such as UAVs, surveying equipment, agricultural machinery, and robots.
- **Anti-Interference:** Equipped with anti-electromagnetic interference capability, it can stably receive GNSS signals in complex environments (subject to meeting the setup environment requirements).

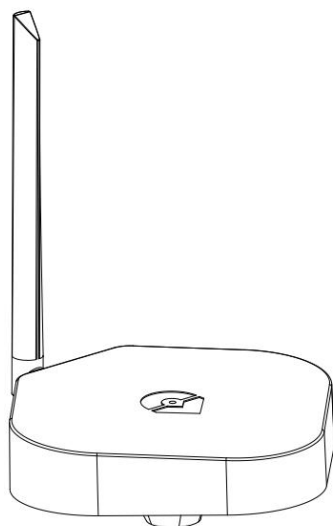
2. Application Fields

- **UAVs:** Precision hovering, route planning, plant protection operations, aerial survey modeling.
- **Surveying and Mapping:** Topographic surveying, engineering setting out, boundary surveying.
- **Agriculture:** Autonomous driving of agricultural machinery, variable-rate fertilization/seeding.
- **Robots:** Indoor-outdoor integrated positioning, autonomous navigation.

2. Package Contents

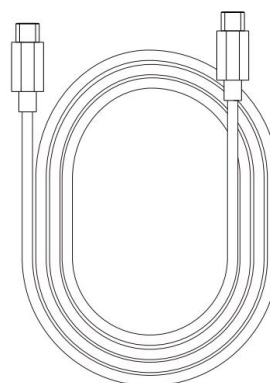
RTK-01-B Base Station

×1



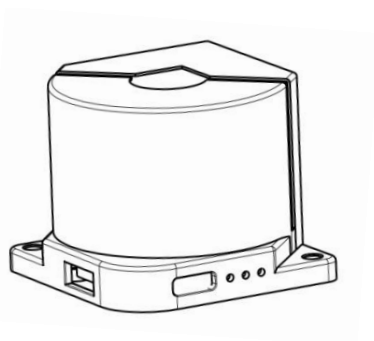
Type C Cable

×1

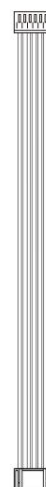


RTK-01-R Rover Station

×1



GH1.25-6P Double-Ended Reverse Cable×1



3. Base Station User Guide

The base station is the "differential signal transmitter" of the RTK system. Its installation location and environment directly affect the positioning accuracy. Please strictly follow the steps below for operation:

1. Preparation Before Setup

- Check Device Status: Ensure the base station casing is undamaged, interfaces are not loose, and the Type C cable is not broken.
- Select Setup Location: Prioritize open and unobstructed areas (e.g., building rooftops, open playgrounds) and avoid the following areas:
 - 1) Obstacles: No trees, buildings, billboards, or other obstructions within a 15° range around the antenna (to prevent GNSS signal absorption).
 - 2) Interference Sources: Keep a distance of $\geq 200\text{m}$ from high-power radio transmission sources (TV stations, microwave stations, radar stations) and $\geq 50\text{m}$ from high-voltage transmission lines (to avoid electromagnetic field interference).
 - 3) Special Environments: Avoid large areas of water (e.g., lakes, ponds) and metal reflectors (e.g., iron houses, walls) (to reduce the multipath effect and avoid positioning deviations caused by signal reflection).

2. Setup Steps

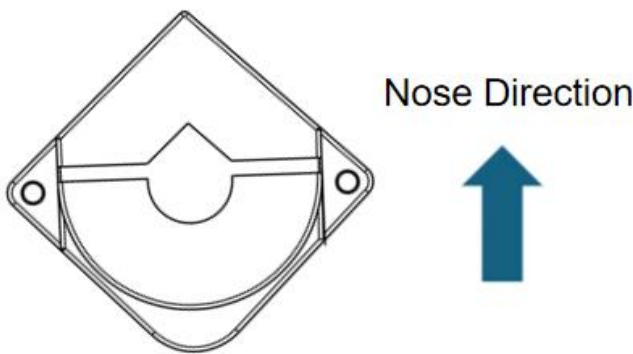
- 1) Unfold the Tripod: Stretch the three legs of the tripod to an appropriate length (recommended height: 1.5-2m for easy signal reception), and tighten the locking knobs of each leg clockwise to ensure the tripod is stable and does not shake.
- 2) Place the Base Station: Place the RTK-01-B base station horizontally on the platform at the top of the tripod. Use the tripod's spirit level (if available) or a mobile phone level app to assist in leveling, ensuring the base station is in a horizontal state.
- 3) Fix and Power On: Fix the base station on the platform to prevent displacement. Connect the Type C cable—one end to the Type C interface of the base station, and the other end to a power supply device (e.g., power bank, DC power supply, voltage: 5V).
- 4) Confirm Signal Status: Wait for 2 minutes. If the PPS light of the base station flashes, it indicates that the GNSS signal has been successfully locked, and you can proceed with the subsequent rover station configuration (after the base station is locked, do not move the tripod or the base station; otherwise, you need to wait for signal re-locking).

4. Rover Station Usage

The RTK-01-R rover station is used in conjunction with a flight controller and supports two firmware solutions: ArduPilot (matched with Mission Planner ground station) and PX4 (matched with QGroundControl ground station). The operation procedures for different scenarios are detailed below:

1. General Preparation Steps

- **Power-Off Operation:** Ensure the flight controller is powered off to avoid short circuits when connecting cables.
- **Cable Connection:** Use the included GH1.25-6P double-ended reverse cable. Insert one end into the GH1.25 interface of the rover station, and the other end into the dedicated GPS interface of the flight controller (please check the flight controller interface label to avoid incorrect insertion).
- **Confirm Connection:** Check that the cable plugs are not loose and the pins are not bent to ensure normal signal transmission.
- **Compass Direction Confirmation:** Ensure the geomagnetic direction of the rover station is consistent with the nose direction of the flight controller.

Compass Direction Parameter		
Model		RTK-01-R
		
Compass Model		QMC5883
Flight Controller Firmware	ArduPilot	Yaw 315°
	PX4	Roll 180°, Yaw 45°

2. Scenario 1: Matched with ArduPilot Firmware (Mission Planner Ground Station)

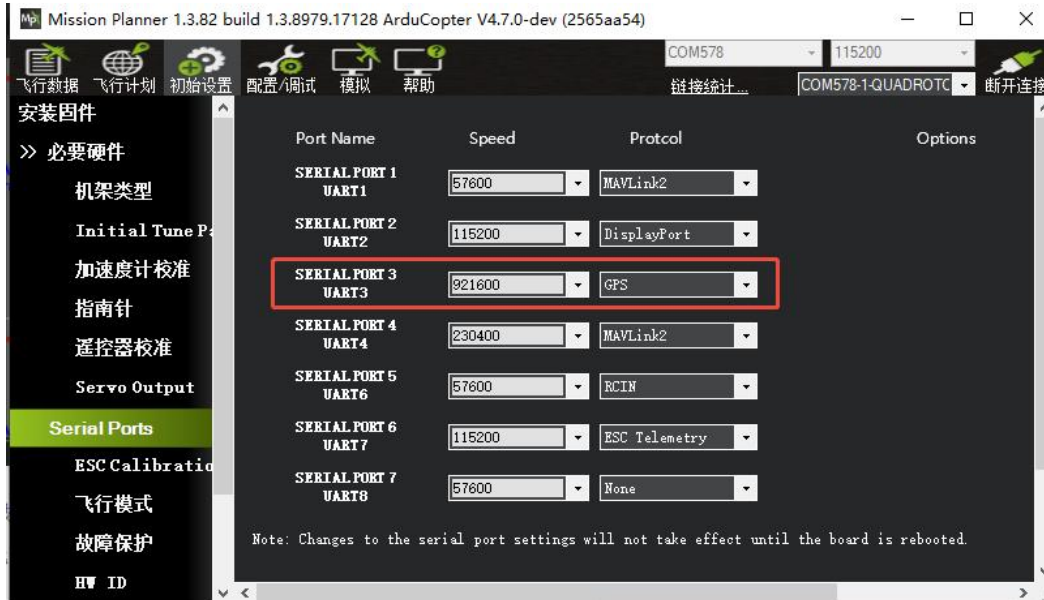
- Ground Station Connection and GPS Status Check
 - 1) Launch the Software: Open the Mission Planner ground station (it is recommended to use the latest version).
 - 2) Port and Baud Rate Configuration:
 - ① Click the "Port Selection" drop-down box at the top of the ground station and select the COM port corresponding to the flight controller (you can check it through "Device Manager - Ports" on the computer).
 - ② Fixedly select "115200" for the baud rate; click the "Connect" button. If the connection is successful, the data on the main interface of the ground station will continuously change with the attitude of the flight controller.
 - ③ Initial GPS Status: When the rover station is not connected, the main interface of the ground station will display "No GPS"; after successful connection, the positioning status (e.g., "3D Fix") will be displayed gradually.



- GPS Serial Port Configuration
 - 1) Enter the Configuration Interface: Click“初始设置”on the left side of the ground station.→“Serial Ports”（串口设置）；
 - 2) Select the GPS Interface: In the“Serial Ports” list, find the dedicated GPS interface of the flight controller (e.g., "SERIAL PORT3 UART 3", which depends on the flight controller model and is usually labeled "GPS" or "UART3").
 - 3) Set Parameters:
 - ① “Speed”（波特率）: Select “921600”（must be consistent with the rover

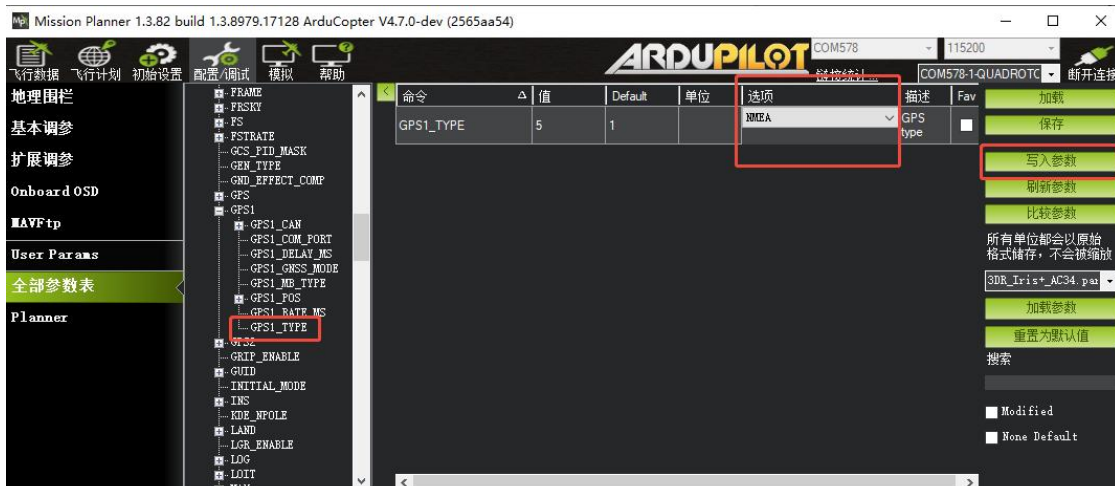
station's baud rate) ;

② “Protocol” (协议) : Select “GPS” (specify this interface for GPS signal transmission)

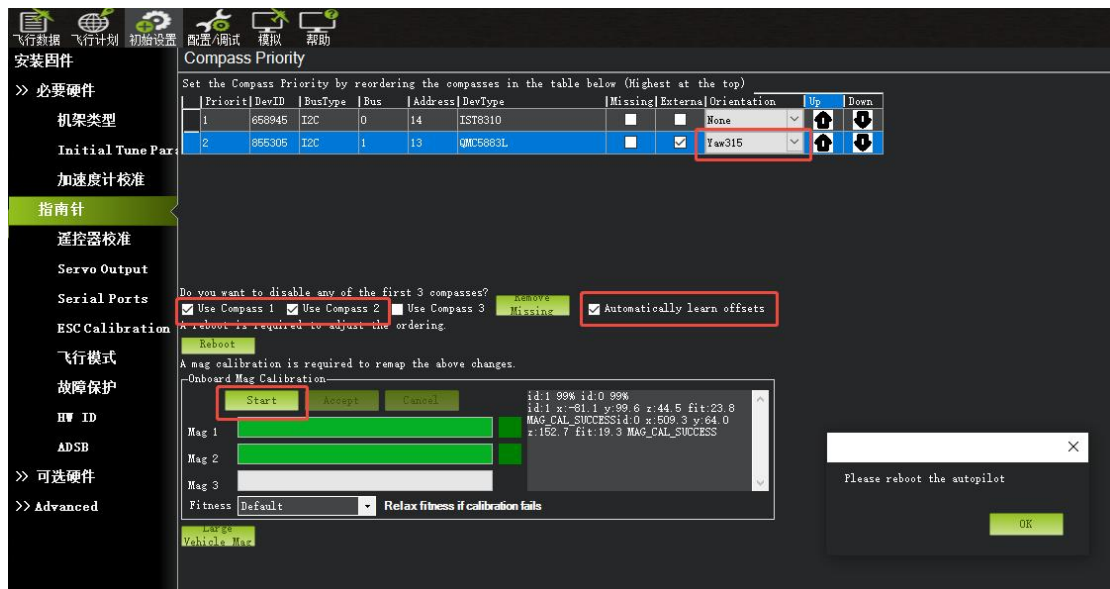


● GPS Protocol Configuration

- 1) Enter the Parameter List: Click "Configuration/Debug" → "Full Parameter List" on the left side of the ground station.
- 2) Search for Parameters: Enter "GPS1_TYPE" in the search box to find the parameter (used to set the rover station protocol).
- 3) Select the Protocol: Click the drop-down box on the right of "GPS1_TYPE" and select "NMEA" (must be consistent with the rover station protocol).
- 4) Write Parameters: Click the "Write Parameters" button and wait for the parameters to be saved successfully (the interface prompts "Parameters written successfully").

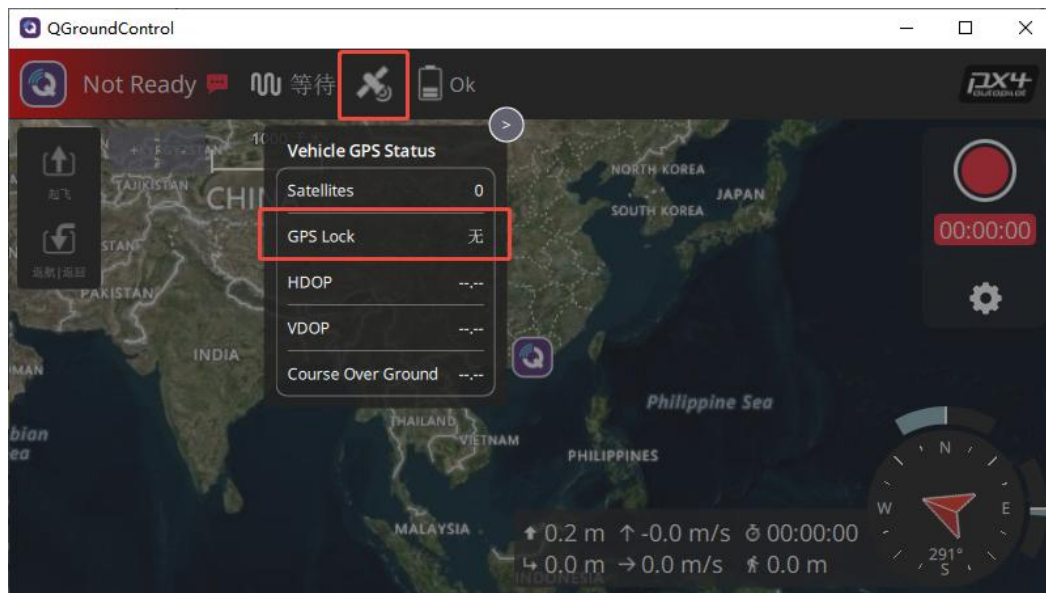


- Geomagnetic Calibration and Final Confirmation
 - 1) Reboot the Flight Controller: Disconnect the ground station connection, turn off the flight controller power, and then power it on again to ensure the serial port and protocol configurations take effect.
 - 2) Geomagnetic Calibration (Mandatory Step to Avoid Compass Interference):
 - ① Enter the Calibration Interface: Click "Initial Setup" → "Compass".
 - ② Select External Compass: In the "Compass Priority" list, set "QMC5883L" (the rover station's built-in compass) to the 2nd position (the 1st position is the flight controller's built-in compass).
 - ③ Check Settings: Check "Automatically learn offsets", "Use Compass 1" (enable the flight controller's built-in compass), and "Use Compass 2" (enable the rover station's external compass).
 - ④ Start Calibration: Click the "Start" button, hold the UAV and slowly draw a "figure-eight" arc or rotate it 360° around the axis horizontally and vertically at a constant speed (ensure the UAV is unobstructed and away from metal objects) until the progress bar reaches 100%.
 - ⑤ Confirm Calibration Result: After successful calibration, the interface will prompt "MAG_CAL_SUCCESS", and "Orientation" in the "QMC5883L" column will display "Yaw315". Reboot the flight controller to make the calibration take effect.
 - ⑥ Final Status Check: Reconnect the ground station; the main interface should display "GPS: 3D Fix", indicating that the rover station is configured successfully and ready for use.

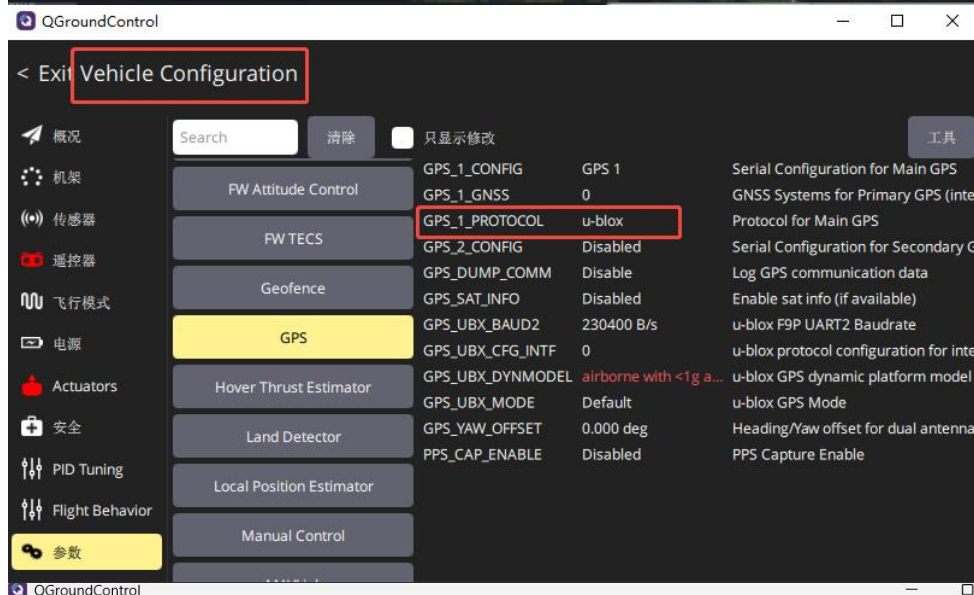
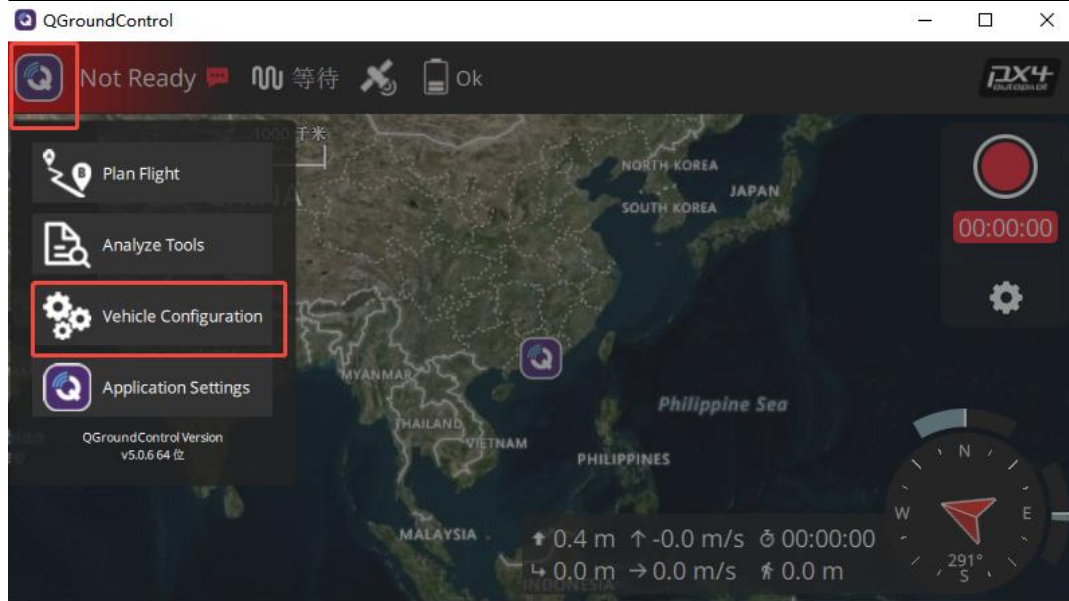


3. Scenario 2: Matched with PX4 Firmware (QGroundControl Ground Station)

- Ground Station Connection and GPS Status Check
 - 1) Launch the Software: Open the QGroundControl ground station (it is recommended to use the latest version).
 - 2) Connect the Flight Controller: Connect the flight controller to the computer using a USB cable; the ground station will automatically recognize the flight controller ("PX4" is displayed at the top of the interface).
 - 3) Initial GPS Status: Before configuration, "Vehicle GPS Status" on the main interface of the ground station will display "GPS Lock: None"; after successful configuration, "GPS Lock" will display the GPS positioning status, number of satellites, and HDOP value.



- GPS Protocol Configuration
 - 1) Enter the Parameter Interface: Click "Vehicle Configuration" → "Parameters" at the top of the ground station; enter "GPS" in the search box to filter out GPS-related parameters.
 - 2) Set Protocol Parameters: Find "GPS_1_PROTOCOL" (Main GPS Protocol), click the drop-down box on the right, and select the default protocol of the rover station.
 - 3) Save and Reboot: Click the "Save" button; the interface prompts "Vehicle reboot required after change" (the flight controller needs to be rebooted after modification). Disconnect the flight controller power and then power it on again.

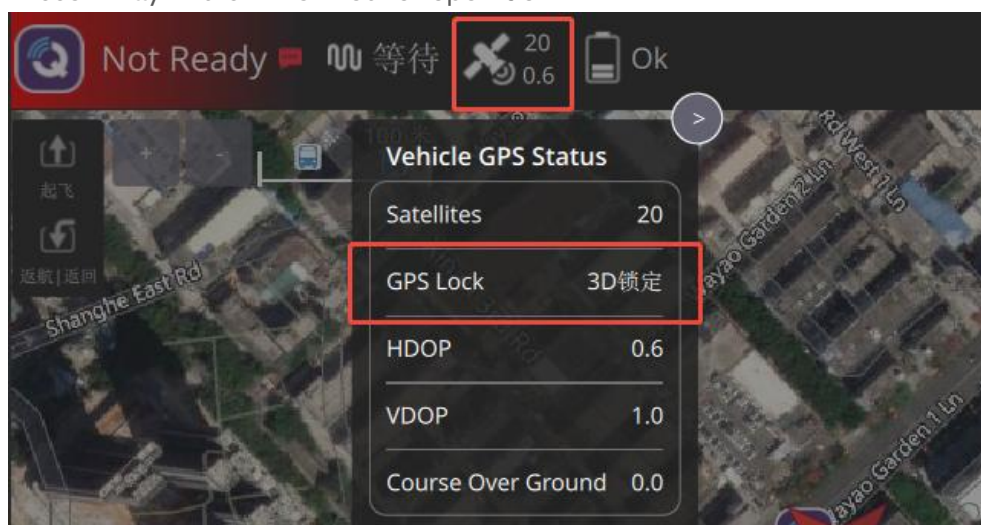


- Final Status Confirmation

After rebooting the flight controller, reconnect the ground station. "Vehicle GPS Status" on the main interface should display:

- ✧ "GPS Lock: Yes";
- ✧ Number of satellites ≥ 8 ;
- ✧ HDOP ≤ 1.5 , VDOP (Vertical Dilution of Precision) ≤ 2.0 .

If the above conditions are met, it indicates that the rover station is configured successfully and can be used for operations.



5. Contact Us

If you encounter unsolvable problems during product use, or need technical support or after-sales consultation, you can contact us through the following methods:

- Address: Room B309, Donglian Building, Chuangye 2nd Road, Xin'an Street, Bao'an District, Shenzhen
- Phone: +86 13714999515 (Mr. Zhang)
- Website: www.eppinno.com
- Email: vince@eppinno.com

FCC warning statements:

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Caution: Any changes or modifications to this device not explicitly approved by manufacturer could void your authority to operate this equipment.

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

The device has been evaluated to meet general RF exposure requirement This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment.

This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.