Hi-Target

Surveying the World,Mapping the Future

V700S SLAM RTK

User Manual

Revision of the manual

Revision date	Revision Level	Explanations
May 2025	1.0	V700S SLAM RTK product manual V1.0
September 2025	1.1	Added Use and Precautions chapters based on version 1.0

Preface

Instruction

Welcome to the Hi-Target V700S SLAM RTK. This introduction describes how to use this product.

Experience Requirement

To help you use the Hi-Target series' products better, we suggest you carefully read the instructions.

If you are unfamiliar with the products, please refer to http://www.hi-target.com.cn/

Tips for Safe Use

Notice: The contents here are special operations and need your special attention. Please read them carefully.

The contents here are very important. The wrong operation may damage the machine, lose data, break the system and endanger your safety.

Exclusions

Before using the product, please read these operating instructions carefully: they will help you to use it better. Hi-Target Surveying Instrument Co., Ltd will assume no responsibility if you fail to operate the product according to the instructions or operate it wrongly due to misunderstanding the instructions.

Hi-Target is committed to constantly perfecting product functions and performance, improving service quality and we reserve the right to change these operating instructions without notice.

We have checked the contents of the instructions the software and hardware, without eliminating the possibility of error. The pictures in the operating instructions are for reference only. In the case of non-conformity with products, the products shall prevail.

Technology and Service

If you have any technical issues, please refer to Hi-Target's technology department for help

Relevant Information

You can obtain this introduction by:

1. Purchasing Hi-Target products: you will find this manual in the instrument container to guide you on operating the instrument.

2. Logging onto the Hi-Target official website, download the electronic version introduction at Download center → Partners → Partner center.

Advice

If you have any comments and suggestions for this product, please email info@hi-target.com.cn. Your feedback will help us to improve the product and service.

Contents

Chapter 1

Overview

This chapter contains:

- Introduction

- Product features

- Use and precautions

1.1 Introduction

V700S SLAM RTK is a high-integration, high-precision medium-range handheld 3D real-world reconstruction device that supports real-time preview and data collection. It features a high-performance laser head, camera module, GNSS positioning board, antenna, MEMS sensor, long-lasting battery, and multiple communication modules. The device comes with an easy-to-use APP, making it quick to get started with measurements.

1.2 Product features

● Real-time RTK fusion function, no post-processing;

● Real-time RTK measurement function;

● Strong endurance.

1.3 Use and precautions

The V700S SLAM RTK is designed to be resistant to both chemicals and impact, but precision instruments require careful use and maintenance and care should be taken.

Notice: This equipment complies with radiation exposure limits set forth for a controlled environment. This equipment should be installed and operated with a minimum distance of 1m between the radiator and your body. This transmitter must not be co-located or operated in conjunction with any other antenna or transmitter.

We recommend that a distance of 0.31m or more be maintained between this device and people during operation. Operations closer than this distance is not recommended.

The product shall not be permanently installed outdoors because protection against water and dust is not guaranteed Please bring back to indoors in rainy weather.

This device needs a license from the national regulatory authority before use.

The receiver must be within the specified temperature range when it is used and stored. For detailed requirements, please refer to Chapter 3: Technical specification.

Notice: 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.

(2) this device must accept any interference received, including interference that may cause undesired operation.

Notice: The user manual for LE-LAN devices shall contain instructions related to the restrictions mentioned in the above sections, namely that:

i. the device for operation in the band 5150–5250 MHz is only for indoor use to reduce the potential for harmful interference to co-channel mobile satellite systems;

ii. for devices with detachable antenna(s), the maximum antenna gain permitted for devices in the bands 5250-5350 MHz and 5470-5725 MHz shall be such that the equipment still complies with the e.i.r.p. limit;

iii. for devices with detachable antenna(s), the maximum antenna gain permitted for devices in the band 5725-5850 MHz shall be such that the equipment still complies with the e.i.r.p. limits as appropriate; and

iv. where applicable, antenna type(s), antenna models(s), and worst-case tilt angle(s) necessary to remain compliant with the e.i.r.p. elevation mask requirement set forth in section 6.2.2.3 shall be clearly indicated.

Notice: The device has requirements for authorization of use exist in the Union on putting into service.

The max. recommended charging ambient temperature is 25°C by manufacturer.

The max. recommended discharging ambient temperature is 45°C by manufacturer.

To ensure the continuous tracking observation of the satellite and quality of the satellite signal, the space above the station should be as wide as possible, with no obstacles above the 15° elevation angle. To reduce the interference of various electromagnetic waves on the GNSS satellite signal,

there should be no strong electromagnetic interference within a range of about 200 meters around the station, such as TV towers, microwave stations, and high-voltage transmission lines. To avoid or reduce the occurrence of multipath effects, the station should be away f.rom terrain and features with strong reflectors, such as high-rise buildings, water, etc.

Chapter 2

Product Introduction

This chapter contains:

- Appearance

- Basic functions

- Software operation

- Data processing

2.1 Appearance

The appearance of this product is mainly divided into two parts: the main engine and the battery bar.

Schematic diagram in three dimensions

1-Host   2-Battery bar

2.1.1 Structure
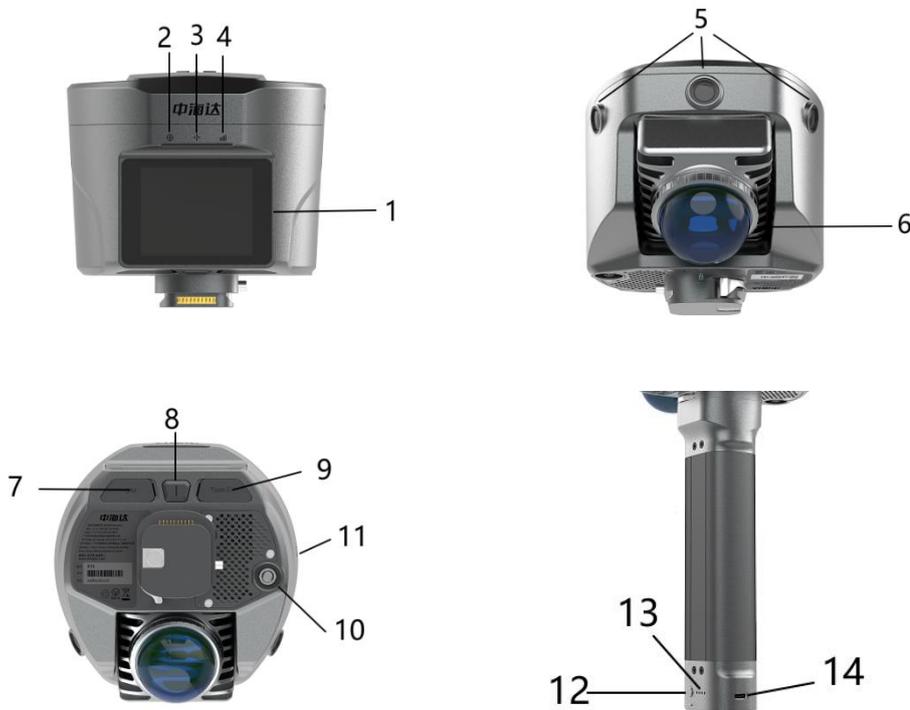
1-Screen 2-Mode light 3-Precision light/Track light 4-Signal light 5-Camera 6-LiDar 7-SIM card interface 8-

Power button 9-Type-C interface 10-External antenna interface 11-NFC

12-Battery bar button 13-Power display 14-Battery bar charging interface

- Camera component: Obtain the left, front and right view photo data for point cloud coloring.

- Accuracy warning light: used for preliminary evaluation of user operation accuracy.

- Power switch button: the function of turning on and off the host.

- External antenna interface: used for external radio antenna.

- NFC interface: used to control the App to quickly establish a connection with the host through NFC.

- Battery bar charging port: used for battery bar charging.

- Battery bar power button: the initial display of the remaining battery power.

- External SIM card interface: used for external SIM card, providing network data traffic.

- Type-C data copy interface: used for data copy, including point cloud data download and firmware copy upgrade.

> **Notice:** When you do not need to plug or unplug the SIM card and Type-C data cable temporarily, please cover it to achieve the purpose of waterproof and dustproof.

2.2 Basic functions of the equipment

2.2.1 Battery installation

1. Place the main engine on a stable plane, open the battery lock lever and press the safety button;

2. Insert the battery along the guide slot into the bottom of the device and ensure that it is inserted in place;

3. Press the locking lever to lock the battery and complete the installation.

> ⚠ **Notice:** The battery needs to be locked before it starts working. Failure to lock the battery may cause the device to fall or abnormal power consumption.

2.2.2 Battery disassembly

1. Place the device on a stable plane, do not disassemble in the air; lock the battery pull rod open, press the safety button;

2. Push the battery out along the guide slot and separate it from the main head;

3. After the battery and the main head are completely separated, turn back the locking lever to complete the disassembly.

Notice: The battery cannot be removed in the air. The customer shall bear the damage caused by the equipment removed in the air.

2.2.3 Key function

Function	Key operation	Device status
Starting up	Short press 1 second	The three lights are green and on. When the lock star and signal light switch from green to off, the device enters standby mode.
Shut down	Hold down for 6 seconds	The device is in standby mode. Long press for 6 seconds, the precision and signal indicator lights will be yellow. Release the button, and the indicator light will be off to indicate that the shutdown is complete.

2.2.4 LED indicator function

Type of LED lamp	Indicate status	Meaning
Mode light	Green	The device is in RTK mode
	Blue	The device is in SLAM mode
Precision lights	Red	The representative accuracy is not available, and the accuracy is greater than 10cm error
	Yellow	The representative accuracy is generally 6-10cm error
	Green	The representative accuracy is good, and the accuracy is within the error range of 5cm
	Off	The representative has not started the collection/work
Signal lamp	Green	The green light flashes when receiving the

		difference
	Off	No differential received

2.2.5 Data copies

Use the accompanying USB data cable to connect to the COMPUTER's USB3.0 interface when the device is off. Enter the static disk that the COMPUTER can normally recognize, and select the corresponding project file to copy.

2.2.6 Battery charging

Use the matching adapter in the kit to charge. The battery LED indicator is flashing to indicate that it is charging. The charging time is about 2 hours. The charging process indicator indicates the current power.

Notice: Battery charging is recommended to charge a single battery or charge the device when it is off. Otherwise, the charging may not be completed.

2.2.7 Firmware upgrade

1. Use the accompanying USB cable to connect to the COMPUTER's USB port when the device is off. The computer can normally identify the update disk symbol, copy the upgraded firmware package to the update disk symbol, and restart the host to complete the upgrade.

update (I:)

936 MB 可用，共 952 MB

2. Configure remote firmware upgrade via a remote server. Remote firmware upgrade is automatically recognized and selected by the host during startup.

> **Notice:** 1. Do not force power off during the upgrade process. If forced power off, the instrument may be damaged and abnormal.
>
> 2. Do not upgrade the firmware when the battery level is lower than 15%

2.2.8 Precautions for use

1. SLAM RTK is a precision mapping device, which may be damaged by falling or external collision, resulting in abnormal operation or inaccurate precision.

2. To ensure that SLAM RTK is enabled, do not block the radar and camera field of view, otherwise it may lead to map building failure or accuracy decline.

3. Using the base of SLAM RTK can effectively ensure the initialization accuracy of the equipment; uneven ground will cause the equipment to shake, which may lead to the failure of initialization or increase the thickness of map building.

4. When using the equipment, try to avoid rapid rotation or large shaking of the equipment. Large shaking may lead to failure of map building or decrease of map accuracy.

5. The waterproof level of SLAM RTK is IP54, so do not use it in the environment that exceeds this protection level. It is recommended to clean the equipment with a soft dry cloth or built-in cleaning cloth. Keep the radar and lens parts clean and do not touch them directly with your hands.

6. Do not cover the heat dissipation area during use. If the heat dissipation area is seriously blocked, the heat dissipation efficiency will be greatly reduced and the device will automatically shut down.

2.3 APP software operation

Hi-Survey is a handheld software designed to work with Hi-Target SLAM RTK products. After connecting the device, users can view various information, switch between different working modes, and download specific data. From the user's perspective, the software aims to provide more precise measurements, more user-friendly operations, and a wider range of functions to support diverse measurement tasks.

2.3.1 Precautions for operation

1. When connecting the device with the software of this product, if the handheld device is disconnected from the host during the operation process due to environmental or other factors, you can wait for the handheld device to automatically reconnect or manually connect. After reconnection, the trajectory before the disconnection and the point cloud collected after the recovery will be restored. The data will be stored in the host throughout the process.

2. When initializing, the device should be oriented towards buildings and other features, avoid moving vehicles and crowds, and open fields; ensure that the LiDar is not blocked, and avoid a group of people surrounding the device.

3. If there are people accompanying during the collection process, please let them follow behind the collector, and it is not recommended to stand side by side.

4. Avoid violent rotation of the measuring rod (body) or violent shaking, and keep stable movement during the collection process; after placing it steadily, click the collection 1-2s later.

5. When entering or leaving a room, open the door in advance, turn your back and move slowly.

6. Please take the stairs to go up and down the floor. Taking the elevator may lead to the failure of building map. When going up and down the stairs, avoid sticking to the wall.

7. In the corridor, the equipment should be tilted forward appropriately to align the laser with the end of the corridor to avoid drift in the forward direction.

8. If the main power quantity reaches or falls below 5% during the operation, the current task will be forcibly terminated and data will be saved automatically.

9. Before operation, please check whether the battery bar is installed in place and whether the safety bolt is locked. Check whether the radar is dirty. If so, wipe it clean.

10. Before operation, the measurement route should be planned according to the survey area, and the power of the equipment and the power of the hand book should be checked to avoid missing or insufficient power and need to be reworked.

11. Check whether the camera and laser head functions are normal before operation.

12. If the measurement area is an indoor scene, open all doors first if conditions permit.

13. If vehicles pass through the collection process, the equipment can be turned away from the moving object and then collected after the moving object passes through.

14. When turning, increase the radius of the turn to avoid sharp turns and avoid sticking to the inside of the bend.

15. When collecting points at the corner of the wall, do not let the LiDar "face the wall", which will block the whole view. It is recommended to face away from the corner of the wall.

16. When collecting, it is recommended to release the device steadily and click the collection after 1~2s to avoid collection errors caused by delay.

17. In scenarios where GNSS is limited or without a signal, such as under eaves, behind buildings, or indoors, repeated initializations should be conducted if possible. First, conduct SLAM modeling in areas with stable GNSS coverage, focusing on the target to be measured. Once the environmental map is complete, slowly advance towards the target point. When reaching the target point, the laser head should move beyond the previously scanned area to ensure accuracy. (Similar to RTK observations, having more satellites can improve positioning accuracy).

2.3.2 Installation environment

Operating environment: Hi-Survey software needs to run on the accompanying handheld device, tablet, or other devices, which may cause compatibility issues such as crashes. You can copy the APK file (APK stands for Android Package) directly to the handheld device or tablet for installation, or install it using a third-party mobile assistant on your computer.

Uninstall: Long press the Hi-Survey software to the top of the screen for uninstallation. The screen will pop up a window asking "Do you want to uninstall the software?" Click OK to uninstall the software.

Chapter 3

## Equipment

This chapter contains:

- Device connection

- Base

- Rover

- Additional function

- Static collection

- Device information

- Data debugging

- Device check

3.1 Device connection

The controller can connect to the receiver via Bluetooth, network, WiFi, or NMEA universal devices (Bluetooth). Additionally, the Handbook can be set to have built-in GPS and a demo mode. To connect, open the Hi-Survey software, click on the [Device Connection] option in the upper right corner of the device menu, then enter the [Device Connection] interface. Choose the connection method; it is recommended to use WiFi to connect to the host. Click [Connect], select the device you want to connect to (using the 'Device SN number'), and enter the WiFi password for the device. Enter the default password 12345678, and after entering the password, click [Confirm] to complete the connection.

If you choose the connection method as 'Bluetooth,' both the receiver and the handheld device must have their Bluetooth functions enabled. Click 'Connect' in the lower right corner to enter the Bluetooth connection interface. Click 'Search Devices' to find the device you want to connect to, select the instrument number of the receiver from the list, and a Bluetooth pairing dialog box will appear. Click 'Pair.' Once the Bluetooth pairing is successful, connect to the receiver. If you cannot find the device, click [Search Devices] below to search for the receiver again. After finding the corresponding instrument number, select the device and proceed with the connection.
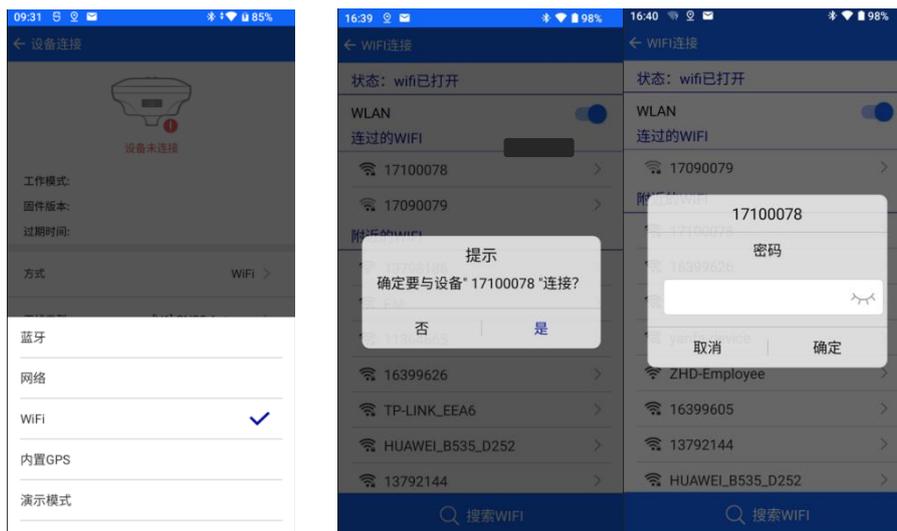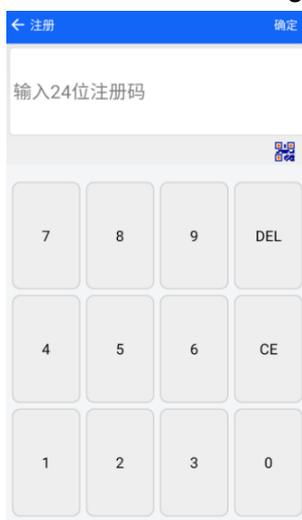
Connect the device via WiFi

3.2 Register

Register the receiver, connect the GNSS receiver, and input the receiver registration code or scan the QR code of the receiver (please ask the relevant business personnel of Hi-Target for the registration code or QR code. The registration code of the receiver with 7-bit fuselage number is 21 bits, and the registration code of the receiver with 8-bit fuselage number is 24 bits).

Host registration

3.2 NFC connection

It is easy for you to use the NFC-enabled handbook to scan the NFC tag of the receiver with NFC function, so as to connect the target device.

After the host is successfully connected, the device connection interface displays the basic information of the host, including working mode, firmware version, expiration time, host number, and automatically adapted antenna type. The connection button shows disconnect.

In the software setting interface, you can select NFC connection mode as "Bluetooth first" or "WiFi first". The default connection mode is Bluetooth.

3.3 Base

Setting the reference station mainly sets the working parameters of the reference station, including the coordinate of the reference station, the data link of the reference station and other parameters.

3.3.1 Template

You can save all the parameters set by the reference station as a template, and then you can directly load the parameter template from the station setting template.

Long press to select the template, you can move or delete the template data.

[New] Click to enter the manual setting interface, you can configure the station parameters and save the new template.

[Load] Click on any template to jump to the manual site setting interface and load the site setting parameters of the template.

[Share] After logging in to the joint operation, click the share button to generate a 4-digit extraction code. Within half an hour, other operators can obtain the current station setting parameters based on the extraction code.

[Access] After logging in to the joint operation, click the access button and enter the 4-digit extraction code to obtain the station setting template corresponding to the extraction code.

3.3.2 Set manually

You can select different data links to set the host.

[Save] Enter the template name to save the current parameters as a template.

[Generate] Generate the current parameter setting ▦ as a QR code.

[Share] After logging in to the joint operation, click the share button to generate a 4-digit extraction code. Within half an hour, other operators can obtain the current station setting parameters based on the extraction code.

[Access] After logging in to the joint operation, click the access button and enter the 4-digit extraction code to obtain the station setting parameters corresponding to the extraction code.

3.3.3 Station location

Set the coordinates of the reference station to the latitude and longitude in the WGS-84 coordinate system (Note: The H in the reference station coordinates represents the ellipsoidal height. Since the main board requires the elevation height based on its internal model, you need to first obtain the elevation anomaly value of the elevation model at that location. This means setting the reference station with GNSS in a measurable state. Therefore, when setting the base station and it prompts 'No elevation anomaly value obtained!', the current receiver's output solution status is unsolvable).

1. Set by average

Generally, when setting up the reference station, you can collect a relatively accurate WGS-84 coordinate by smoothing the ground where the station is set up, so as to set up the station (Note: setting up the station at any position does not mean inputting any coordinates. It is necessary to set up the station after smoothing for many times, and the more smoothing times, the higher the reliability).

[Number of smoothing] After selecting "smooth station", the number of smoothing input box is displayed. The average value is calculated by single-point positioning, and the number of smoothing is set to 5 by default. In the new version, the information of each smoothing is no longer displayed.

[Point name] Name of the ground reference point where the reference station is set.

[Target height] Input the instrument height and instrument height type of the reference station.

2. Set by point

At known points, you can check "Known point setting", and input the local plane coordinates of the known point, or click the "point library" button on the right to obtain it from the point library.

[Ground point] The ground reference point for setting the reference station can be set manually or obtained through the "point library".

[Point library] Used to extract points from the coordinate library to the current interface (all point library buttons have similar functions).

Base station data link

Used to set the communication mode and parameters between the reference station and the mobile station, including "built-in radio" and "built-in network".

3, Internal radio

When the base station uses the built-in radio function: set the data link as built-in radio, set the channel, radio protocol and power.

[Power] There are three options: high, medium and low.

[Frequency Table] Entering the frequency table interface can obtain the optimal channel and set the frequency of a certain channel.

"Refresh": If the current search results are not the best channel, you can change the starting channel to continue a new round of search.

"Modify": Click on the frequency of a channel to modify the frequency value of the channel within the specified range.

"Save": After the modification of the frequency table, you must click "Save". The page prompts "Save the frequency table successfully" to complete the modification of the frequency table.

"Restore default value": Click OK to restore the frequency table to the default value.

Notice: 1. iRTK2/iRTK3 series (non-satel station) has no frequency table option;

2. The receiver of the iRTK platform and previous platforms (non-satel radio) can enter the ordinary frequency table interface and obtain the optimal channel and frequency table;

3. As long as the receiver with built-in Satel radio is available, it can enter another frequency table option interface to read and modify the radio protocol and channel;

4. A10 There is no frequency table option for radio stations other than XDL/ADL and satel;

5. The protocol selects Satel to set the radio FEC function;

6. When connecting to a host that does not support frequency point editing, you can

view the frequency point but cannot edit it.

4, Internal GSM

When the reference station uses the built-in network function: set the data link to the built-in network, set the server/IP/port, and set the packet type (packet number group number, reference station body number).

"Server/IP": Select the server, manually input the IP and port number, or click "Select" to display the list of server addresses. You can select the required server from the list. At present, Hi-Target has multiple network servers and server ports for you to use, and you can choose the server and port by yourself.

Read the

Table 3.1 List of Hi-Target network servers

Server IP/domain name	Server port	Where the server is located
202.96.185.34	9000/8800 8000/7000	Guangzhou
121.33.218.242	9000/8000	Guangzhou
60.205.82.126	9000	Chihiro

"Group type": There are two types: group number and reference station fuselage number.

"Group number and group number": 7 digits and 3 digits respectively. The group number should be less than 255, and the reference station and mobile station need to be set in the same way to work properly.

"Base station body number": The software automatically fills in the base station body number; when synchronizing the mobile station, you need to select the base station body number mode and input the same base station body number.

When the server is set to CORS mode, the base station logs into the server in CORS mode. You only need to enter the IP address and port number. The source node, username, and password are automatically set to the device ID and zhdgps, respectively, and cannot be changed. When setting up the mobile station, the username should be an 8-digit number (it is recommended to use the

device ID as the username for login), but it must not be the same as the base station's username. All other settings are the same as those for the base station.

3.4 Rover

Setting the mobile station mainly sets the working parameters of the mobile station, including the data link of the mobile station and other parameters. The setting of the mobile station is similar to that of the reference station, but the input information is different.

3.4.1 Template

You can save all the parameters set by the mobile station as a profile template, or you can load the parameters directly from the setting template.

3.4.2 Set manually

The method for manually setting up a mobile station is the same as setting up a base station. When setting up a mobile station, you can also choose to obtain configuration parameters by scanning a QR code. Typically, when using this method, the configuration parameter QR code is generated when setting up the reference station. After sharing the QR code, users at the mobile station can directly scan it to quickly obtain the parameters set for the base station and set up the station using these parameters, without the need for manual input.

3.4.3 Rover station data link

Used to set the communication mode and parameters between the mobile station and the base station, including "built-in radio", "built-in network", and "handbook differential".

Mobile stations use the "built-in radio" function: set the data link as a built-in radio, modify the radio channel, radio protocol, air baud rate. The radio channel must be consistent with the base station.

Mobile stations use the "Built-in network" function: The data link selects the built-in network, and you can click "Advanced options" to set other parameters such as network type.
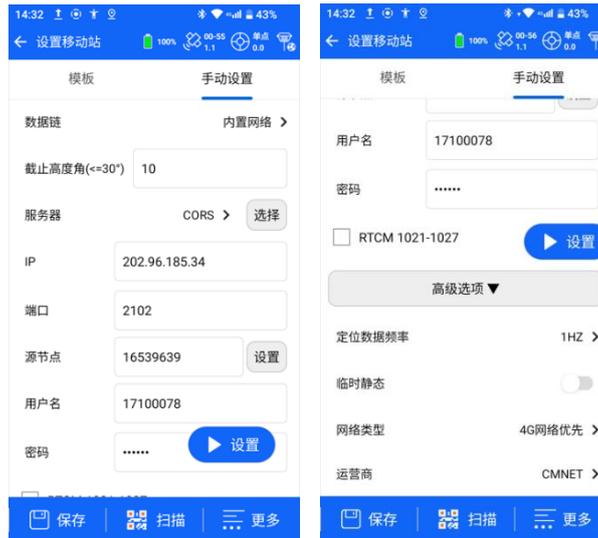
"Server": includes ZHD, CORS and TCP/IP. If you use Hi-Target server, use ZHD; if you access the CORS network, select CORS.

"IP": manually enter the server IP and port number, or click "Select" to extract it. You can select the required server from the list.

"Group type": Select group number, group number or reference station body number.

"Group number and group number": 7 digits and 3 digits respectively. The group number should be less than 255, and the reference station and mobile station need to be set in the same way to work properly.

"Operator": Enter "CMNET" when using GPRS; enter "card, card" when using CDMA.

"Connect to CORS": Select CORS on the network and enter the IP address and port number of CORS.

Click the server, select CORS mode, click the "Settings" button on the right side of the source node column, and pop up the "CORS connection parameters" interface. Click [Get source node] to obtain the CORS source list, select "source node", input "user name" and "password", and select the differential message format.

Notice: In the CORS connection interface, there is a CORS node with RTCM correction. Check the RTCM1021-RTCM1027 option below, and then compare the actual coordinates given by the user with the output coordinates to ensure that the correction is correct.

[Open] You can invoke an existing CORS source node file (.txt).

[Save] Generate the source node file (.txt) of the current CORS source node and save it in the ZHD folder.

[OK] Complete the Settings and return to the previous screen.

The mobile station uses the "logbook difference" function: in the mobile station setting interface, select the data link as "logbook difference", and select the server, set IP, port, packet number, group number and other parameters, click "set" to complete the station setting.

> **Notice:** 1. When the data link mode is "built-in network", the APN parameter set by the operator is the parameter of the host SIM card;
>
> 2. When the data link mode is "handbook difference", the APN is set to the APN parameter of the handbook system. In the case that the manual is not connected to WiFi, the manual must install a SIM card to set the APN, otherwise a prompt will be displayed;
>
> 3. For details on APN parameter setting in the manual system, refer to Manual and Application → APN parameter setting.
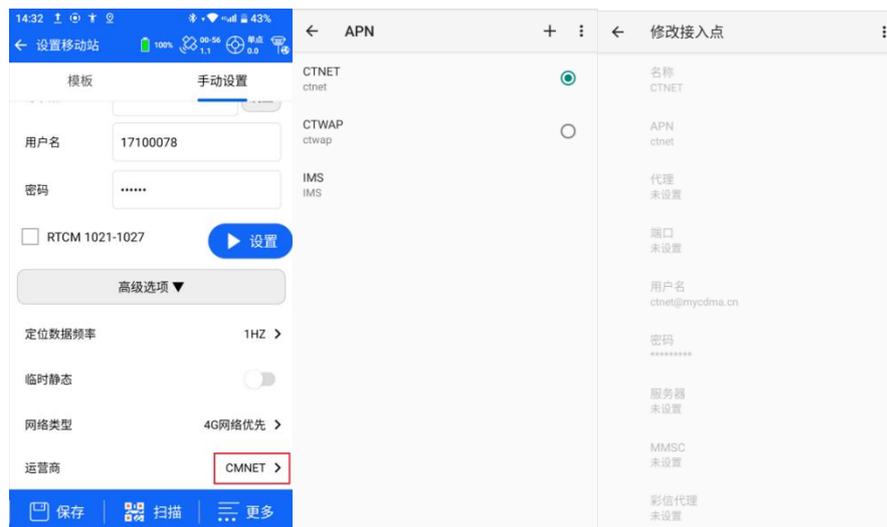
Other options for rover

Set the positioning data frequency, GNSS cutoff Angle, PPK and source node.

"Cut-off altitude Angle": The cut-off Angle of the GNSS receiving satellite, which can be adjusted between 0 and 30 degrees.

"Positioning Data Frequency": After setting the output position data of positioning data frequency in the "Other" interface, in the detailed measurement interface, if you select the option to automatically collect data by time and check the synchronization of positioning data output, it will automatically synchronize with the positioning data frequency. For example, if the positioning data frequency is 2Hz, the data will be transmitted every 0.5 seconds.

"PPK": After "PPK" is enabled in [Mobile station], the receiver synchronization starts temporary static collection. In [Fragment measurement], click the floating collection button to perform PPK collection operation and record the RSP file. The file name of the file is consistent with that of the ongoing static collection.

"Setting": Generally, click after all the mobile station parameters are set. A prompt box will pop up after clicking. If the setting is successful, check whether the mobile station host can normally receive the differential signal. If the setting fails, check whether the parameters are set incorrectly and click several times repeatedly.

Notice: If PPK is enabled when setting up the mobile station, a PPK correction prompt box will be displayed when exporting the coordinate point in [Data Export] → [Coordinate Point] or [Data Processing].
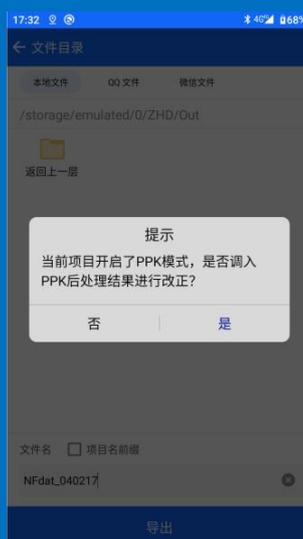
3.5 Additional function

The receiver auxiliary functions include: module information, registration information, satellite tracking switch, receiver setting, service authorization information, restoration system, firmware upgrade, network diagnosis, and base station differential data forwarding (only supported by devices that display base station logbook differential).

3.5.1 Module information

View the type and status information of the communication module, as well as the firmware version number. This view of the module information is only supported for some models.

"Radio Module Type": Displays the type information of the main radio module.

"Radio firmware version": Displays the firmware version of the main radio module.

"Network Module Type": Displays the type information of the current network module.

"IMU Module Type": Displays the type information of the IMU module on the host.

"IMU firmware version": Displays the firmware version of the IMU module on the host.

3.5.2 Registration

Under the registration information interface, view the QR code, registration code and expiration time of the instrument registration information.

3.5.3 Satellite tracking switch

Enter "Satellite Tracking Switch" to select whether the satellite system is on or off. When the satellite system is turned off, it will not be displayed in the star map.

[Note]: All satellite systems will be opened when static recording begins.

3.5.4 Receiver setup

Set the receiver's static RINEX record, firmware upgrade prompt, remote connection, voice selection, voice volume, breakpoint continuation, LiDar module echo number, LiDar module frame rate and other functions.

"Static RINEX record": If checked, Rinex format data will be recorded synchronously when static

data is collected (current firmware version does not support this feature).

"Firmware upgrade prompt": When enabled, a prompt is displayed when there is firmware that can be upgraded.

"Voice selection": Switches voice announcements (none/default/customized (in English mode)).

"Voice volume": The volume of the host voice can be set.

"Continued measurement at breakpoint": After being enabled, the mobile station can maintain a PPP fixed state for 5min even if it loses differential data.

3.5.5 Service authorization information

Displays the current receiver version type and its corresponding function permissions.
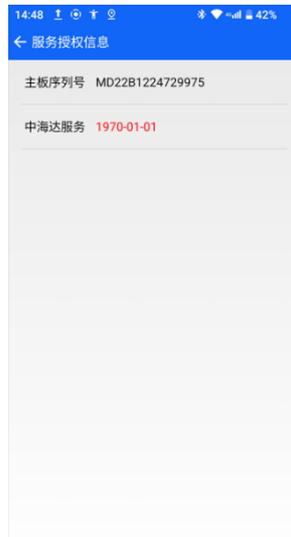
3.5.6 Restore the system

When you are connected to a host, you can restore the firmware upgrade series to its original state.

3.5.7 Firmware upgrade

When the WiFi connection is active, you can upgrade the firmware of the host and motherboard. The same BRD file can be used for upgrading the motherboard; however, if an incorrect BRD file is imported, the host will display a failure message during the upgrade process. This feature is currently supported on hosts such as iRTK2, V90, and A12 (the standard version does not support this feature).

3.5.8 Network diagnosis

This function checks whether the network module and SIM card are functioning properly, the strength of the network signal, whether ✔ they are registered ✘ to the network, ✔ whether dialing is successful, and whether a successful connection to the server has been established. It indicates that this step is normal; it indicates that this step is abnormal; it indicates that this process has not been checked (default state). This feature is currently supported only by the iRTK5 series host.

3.5.9 Data forwarding

This function can forward the differential data of the base station to other devices within the same LAN, so that other devices can set up the differential mobile station to obtain the differential. When connecting to a host that supports the differential base station handbook, this entry is displayed.

1. Environmental preparation

- Multiple handbooks need to be connected to the same LAN;

- The logbook 1 is connected to a host that supports the base station logbook differential data link;

- The remaining handbooks connect to the host that supports the mobile station handbook differential data link.

2. operating process

- Enter the "Base station differential data forwarding" interface in Handbook 1, set the station parameters, and open the switch to set the host as the base station differential CORS, and switch the interface to display the current IP address of the hand book and the forwarding port.

- Set the host of the mobile station's logbook to the mobile station's logbook differential CORS. Enter the IP port displayed on the "Base Station Differential Data Forwarding" interface, the source node input the base station SN number or RTCM32, and enter the user name and password (the default password is zhdgps) to obtain the forwarded differential data and achieve fixation.

3.6 Static collection

3.6.1 Static collection Settings

In RTK working mode, if static acquisition is required at the same time, you can click the static acquisition menu to enter the temporary static acquisition Settings, input the sampling interval, file name, pole height and cutoff height Angle; you can view GDOP, file size, start time and record time.

After clicking the "Start" button, the recording starts.

If the current connected receiver is in the A10/V60/iRTK2 series or iRTK5 series, you can set the 'Timed Collection' time and select the 'Pure Static' option. After selecting the 'Pure Static' option, the 'Timed Collection' function will be enabled. Once the specified collection duration is reached, the collection will stop, and the receiver will automatically turn off. To select the 'Pure Static' option, you must first set the receiver to either a reference station or a mobile station. After unselecting, the pure static collection will stop.

Notice: The limit of the quantity height (antenna height) should not be greater than 65m, otherwise it will lead to the inconsistency between the antenna height displayed by HGO. The software will fail to prompt when you input the quantity height exceeding 65m; the limit of the zenith height should not be greater than 30 degrees.

3.6.2 Static file management

You can view the static files in the current receiver and perform related operations.

[Refresh] Refresh the current file list interface.

[Delete] Long press a record to delete the selected static data, support multiple files for deletion.

[Format] Format static data, the data is not recoverable.

When connecting to a WiFi network, the receiver supports FTP downloads of static files to the local storage of the device. Long-pressing a static file will bring up a file selection mode (multiple files can be selected). After a successful download, the software will prompt you with the file download and save path. If the user is not connected to WiFi, clicking the download button will result in a message stating that 'only WiFi connections support downloading from the host to the local device'.

3.7 Device information

The device information interface displays the device information, module information and service authorization information of the current connected host.

The host device information includes: SN number, firmware version, data version, expiration time, working mode;

Module information includes: radio module type, radio firmware version, network module type, IMU module type, IMU firmware version;

Service authorization information: motherboard serial number, Hi-Target service expiration time and other content.

3.8 Data debugging

It is mainly used to debug data and detect GPRS signal strength. The received debugging data can be saved as a file.

[Hex] Selects and displays in hexadecimal format.

[Refresh] Select and refresh output.

[Save] Save the output data.

[New line] Select, send new line. In general, you must select the command before sending it.

[Send] Enter the command above and click the "send" command.

Horizontal sensor data output is added in demo mode and built-in GPS mode.

3.9 Device check

Device check is the latest function of this software, that is, to check whether the coordinate point meets the specified accuracy.

Under the main interface of the device, click the [Device Check] icon to enter the device check interface. Users can fill in or select the corresponding coordinate points from the known points, and the software will display the corresponding NEZ. Then, click the 'Start Check' button, and the software will process the data, displaying it in a list at the bottom of the interface. The displayed content includes: Point Name N, Difference N, E, Difference E, Z, Difference Z. After the device check is successful, the software will prompt with a message saying "The current device meets the check requirements."

Chapter 4

Measure

This chapter contains:

- Detail survey

- Tilt measurement

- SLAM-RTK mode

- SLAM image measurement mode

- SLAM

- Download of job data

- Device check

- Data processing

4.1 Detail survey

Click the [Fragment Measurement] button on the main menu of the measurement page to enter the fragment measurement interface. The text interface and graphic interface can be switched by clicking the [Text] / [Graphic] button.
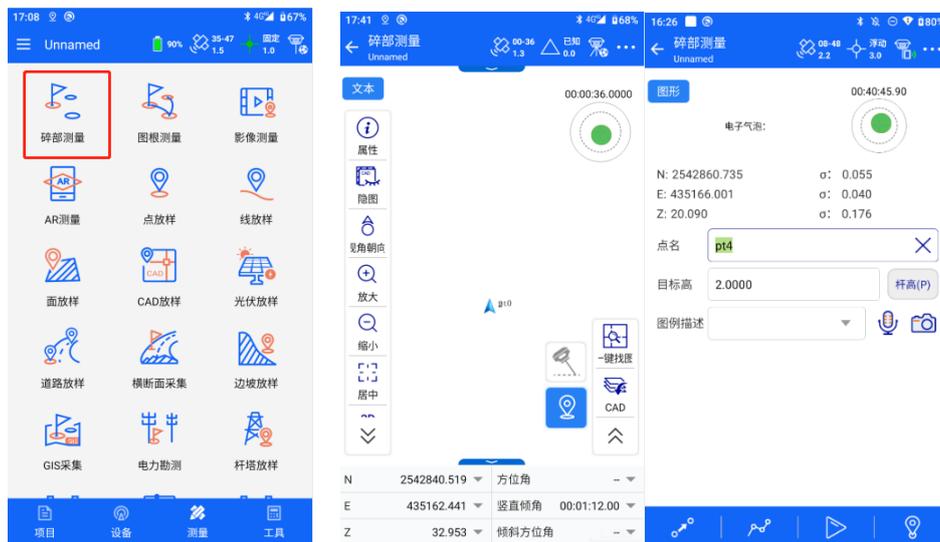

All tool buttons can be configured to display or hide in [Measurement Configuration] -> [Display] -> "Tool Configuration".

4.1.1 Manual collection

In most cases, upon reaching the measurement location, the system determines whether to proceed with data collection based on the measurement ![icon]coordinates and their accuracy, as well as the solution status displayed on the interface. In RTK fixed solutions, when you click 'manual collection,' the software first performs an accuracy check (the accuracy settings are detailed in 'Measurement Configuration' → 'Data'). If the accuracy does not meet the requirements, the software will provide a prompt.

Before the data collection is complete, a detailed interface for saving coordinate point information will appear, allowing you to check the reliability of the points. The software automatically accumulates the points based on their global point numbers, and the prefix of the point name reflects the historical usage. You can directly enter the 'target height' or click 'pole height' to configure the target height and antenna type in detail. In the 'legend description' section, you can input annotation information or select common annotation types. Additionally, you can set the distance in the collection confirmation box.
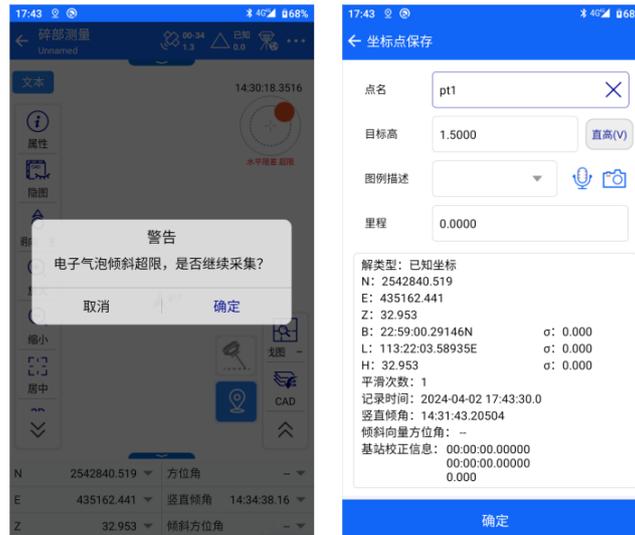
4.1.2 Automatic acquisition

Click the automatic ▷ acquisition button to enter the automatic acquisition settings interface. Select the automatic acquisition mode, including time interval, planar interval (change in N or E direction), oblique distance interval, and electronic bubble centering. Enter the prefix, number, and annotation information for the point. After clicking [OK], the software will enter the automatic acquisition mode. During the automatic acquisition process, accuracy checks will be performed (the accuracy ▮▮ settings are detailed in 'Measurement Configuration' → 'Data'). If the accuracy requirements are met, the software will automatically acquire and prompt you to save the point. If the accuracy requirements are not met, no prompts will be given until the accuracy is satisfied, at which point the software will continue to acquire and prompt you to save the point. Click to end the automatic acquisition.
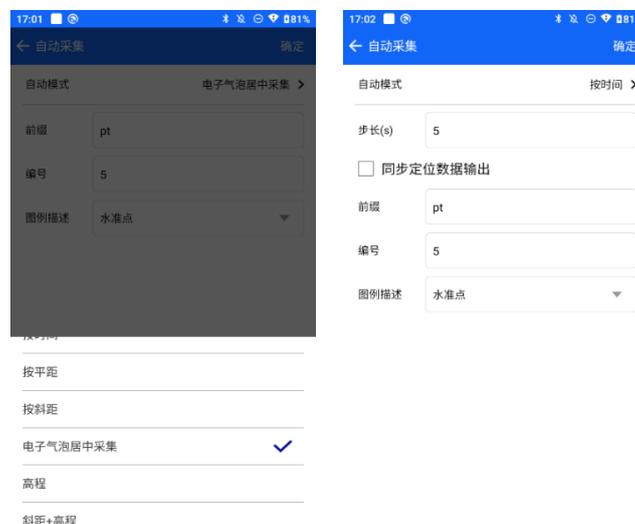
When the automatic acquisition mode is selected as "time", the step length (s) can be set, and the

acquisition will be automatically carried out according to the set time interval.

When the automatic acquisition mode is selected as "by flat distance", the step length value can be set, and the acquisition will be automatically carried out according to the flat distance step length value.

When the automatic acquisition mode is selected as "acquisition according to the slope distance", the step length value can be set, and the acquisition will be automatically acquired according to the slope distance step length value.

When the automatic acquisition mode is selected as "electronic bubble centering", you can "straighten and collect, and leave after collecting", without manual intervention. Click [Configuration] - [Data] - [Electronic Bubble Configuration] in the upper right corner of the page to set the bubble accuracy.

When the data quality is poor (the type of solution, the accuracy of coordinates, and the centering of bubbles do not meet the requirements), the automatic collection will be suspended, and specific red font prompts will be given according to the current unsatisfactory conditions.

4.1.3 Average collection

Average collection is a simple method to enhance measurement accuracy. According to error theory, errors can occur in any direction. Therefore, with a sufficient number of observations, random errors will cancel each other out (though this is only theoretical; in practice, more smoothing does not necessarily mean higher accuracy). After entering the smoothing interface and clicking start, the software begins to plot coordinates and display the current position. During the smoothing process, the software automatically analyzes the data quality, calculates the standard deviation (median error), and displays it.

Smooth acquisition supports both text and graphical displays. Once the smooth acquisition has reached a certain number of times, you can remove specific points from the smooth acquisition list in the text mode interface to improve accuracy by not including these points in the smoothing process (long press the smooth acquisition item to see the 'Delete' toolbar). The software will automatically recalculate the smoothness. In the graphical display interface, clicking on a point from the smooth acquisition will show its coordinates.

The calculated median error is theoretically the same as the measured median error; however, due to the smoothing process being a small sample collection, the estimated median error may be less than the actual measurement error.

Before performing smooth data collection, you can configure the smoothing settings by clicking on [Configuration] in the upper right corner of the collection interface. This allows you to set the smoothing method, type of solution, number of smoothings, and smoothing accuracy. Each time you exit the software, the solution type for smooth data collection will be set to fixed. During smooth data collection, no further configurations can be made. If the current solution type does not match the set one, the software will display a red alert stating "Data solution status does not meet the requirements, smooth paused." In this case, you need to reset the solution type. If the smoothness accuracy is not met or the configuration exceeds the limit, the software will display a warning "Data quality is poor, smooth paused." In this case, you need to reconfigure the smoothness accuracy.
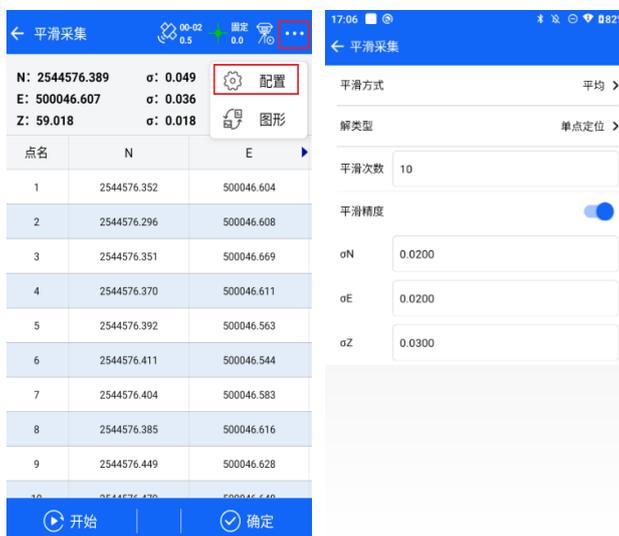
4.1.4 PPK collection

PPK (GPS dynamic acquisition post-processing differential) technology is the earliest GPS dynamic differential technology, also known as stop and go.

The mobile station uses the PPK acquisition function. After filling in the parameters of the mobile station, expand the advanced options below the station setting interface and open the "PPK" switch. Click the setting to set the station. The mobile station starts recording static data, enters the graphic acquisition interface for detailed measurement, and clicks the floating collection button to enter the PPK acquisition interface.

Enter the corresponding point name, target height and legend description at the measurement position, select the number of times to be smoothed (generally recommended more than 200 times), and click [Start marking] to collect.

When the set number of smooth times is reached or click [End Mark], the software will automatically save the coordinate points.

Each PPK collection will correspond to the recording of a PPK file record, which can be viewed and deleted in the PPK file management module.

Notice: The data and marking information of the PPK function of the mobile station are recorded in the Rinex folder of the host in Rinex format, and the Rinex file should be used for calculation during post-processing. For the relevant operations of PPK post-processing, please refer to the "HGO V2.0.0 Software User Manual".

4.2 General Measurement

4.2.1 Tilt measurement

After connecting the host to Hi-Survey measurement software, open the "tilt measurement" switch in the measurement interface or [Measurement Configuration] -- [Data] interface. Click the tilt measurement switch in the measurement interface or the tilt measurement icon in the top message bar to trigger the initialization pop-up window. Perform the initialization of tilt measurement according to the prompt in the pop-up window.

According to the prompt of the initialization pop-up window, shake the RTK host back and forth (frequency is 1 second) for heading initialization;
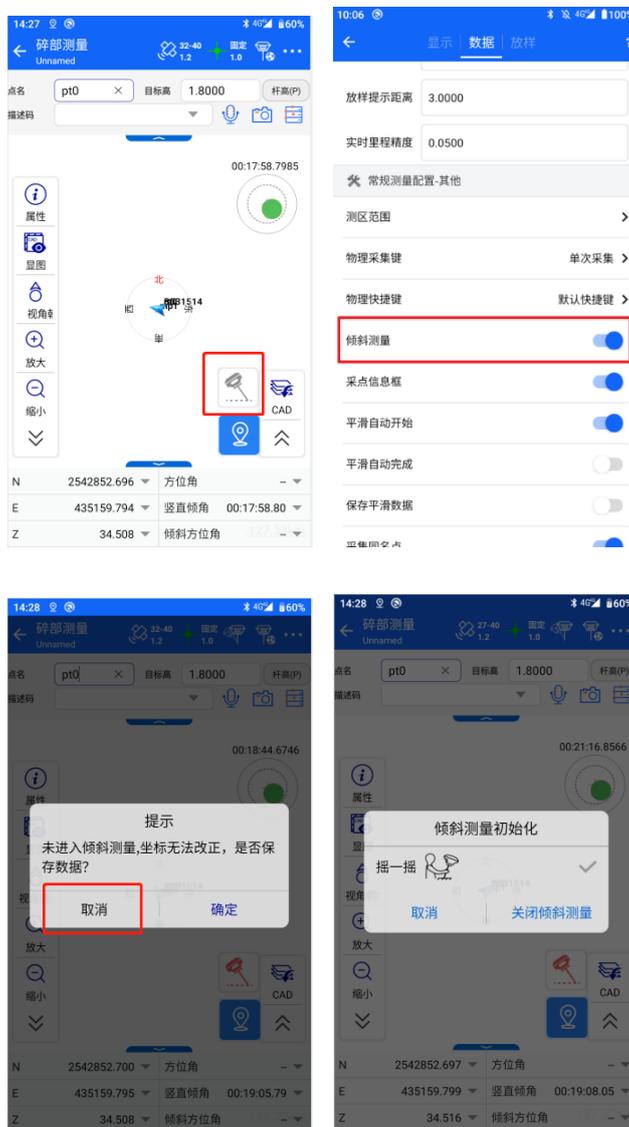
When all the initialization items are checked, the host voice announces "enter tilt measurement", and

the tilt measurement icon is lit. After the tilt measurement initialization is completed, the host can perform the tilt measurement operation.

Notice: 1. After the tilt measurement is enabled, the uncorrected tilt measurement must be initialized before it can be used. Otherwise, the user will be prompted to perform initialization operation.

2. After the uncorrected tilt measurement is turned on, click the icon of tilt measurement in the lower right corner of the interface to select the off tilt measurement.

3. Start the tilt measurement and enable the tilt measurement mode. The bottom box can view the tilt azimuth and the page that has not been corrected for tilt.

4. After entering the uncorrected tilt measurement, when the electronic bubble switch is turned on, the vertical tilt Angle is displayed above the electronic bubble, and when the electronic bubble switch is turned off, the vertical tilt Angle is displayed in the bottom box.

4.2.2 SLAM-RTK mode

Click SLAM on the left toolbar, select SLAM-RTK mode, and complete the initialization according to the software prompts. Then enter SLAM-RTK mode. The state of SLAM is switched to SLAM solution state, and the coordinates are displayed as SLAM trajectory coordinates.
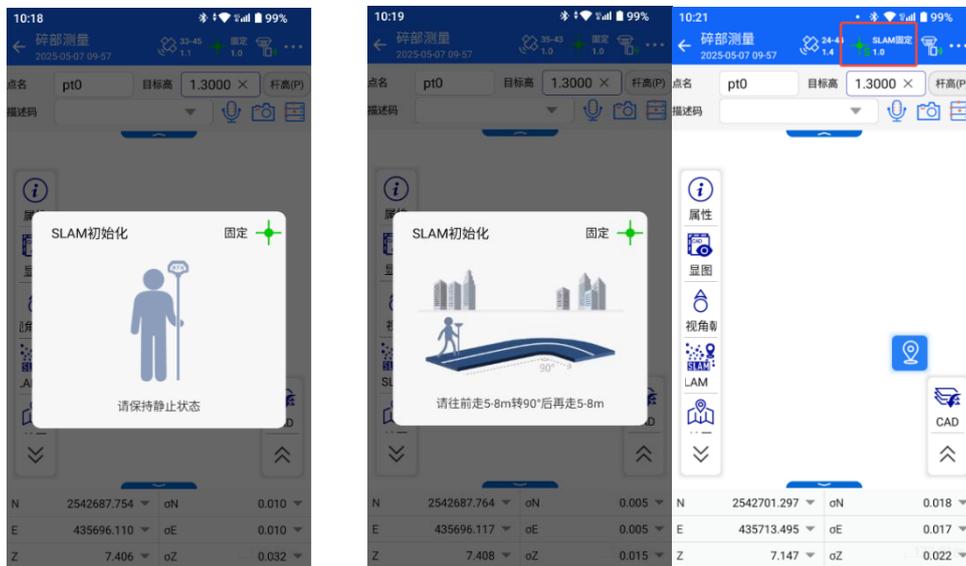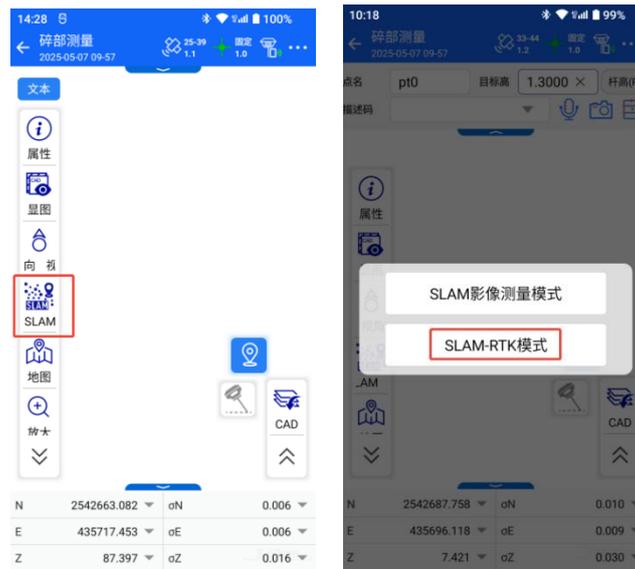
4.2.3 SLAM image measurement mode

Click on the SLAM icon in the toolbar, select the SLAM image measurement mode, and navigate to the puncture point interface. Follow the software prompts to complete the initialization. After initialization, switch to the SLAM solution state, where the coordinates will display as SLAM trajectory coordinates. Click the 'Shooting' button to take a single photo. Move the pointer to select the desired puncture point position, click 'OK', then move the pointer again to select another position on the same plane as the puncture point. Click 'Save' to calculate and save the coordinates of the puncture point. Once saved, click the 'Point Library' button to view the point data and coordinate library.
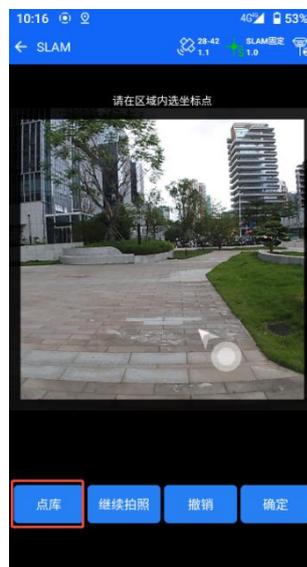
Notice: If you have entered SLAM-RTK mode, you can directly enter SLAM image measurement mode without initialization again.

1. SLAM image measurement precautions:

- The location of the puncture point should not be at the edge of the image, because the image is distorted, and the distortion in the edge part is larger, which will affect the accuracy.

- In the 5-10s near the moment of taking a photo, there should be no dynamic objects, such as pedestrians and vehicles, between the camera and the real location of the puncture point. Otherwise, there will be a point cloud of dynamic objects in the map construction, resulting in the puncture point hitting dynamic objects. (Avoid multiple values in the direction of depth search).

- Please do not choose objects with low reflectivity, transparency or light absorption where the puncture point is located. Common objects such as glass, liquid, smooth water surface, mirror and asphalt ground.

- If the puncture point is far away, it is best to stay for about 5s first, so that the LiDar can fully scan the object of the required puncture point before taking a photo of the puncture point. Otherwise, the puncture point object is too sparse, which will affect the puncture point accuracy.

- Auxiliary points should be selected on the side that is more continuous in depth.

- Sufficient initialization can improve the accuracy of image measurement.

4.3 SLAM

After connecting to a host supporting SLAM function by WiFi, you can enter the function interface to create 3d point cloud data of tasks scanning nearby objects, and display or operate the point cloud data.

4.3.1 Task management

After entering the SLAM function, a list of point cloud data tasks will be displayed. Click "Start", input the task information and click "OK". The task is created successfully, and then jump to the scanning point cloud interface. Click the shooting button to start scanning the point cloud data of ground objects.
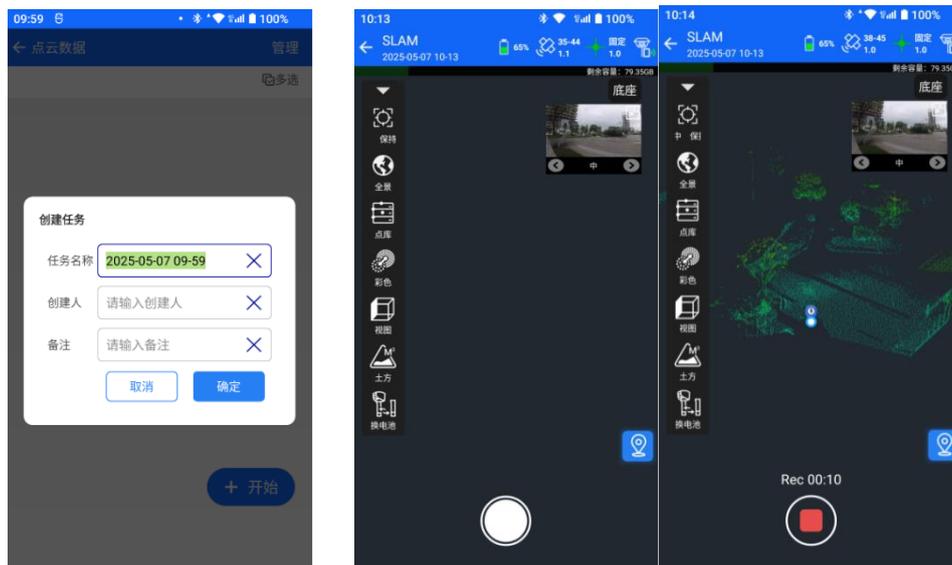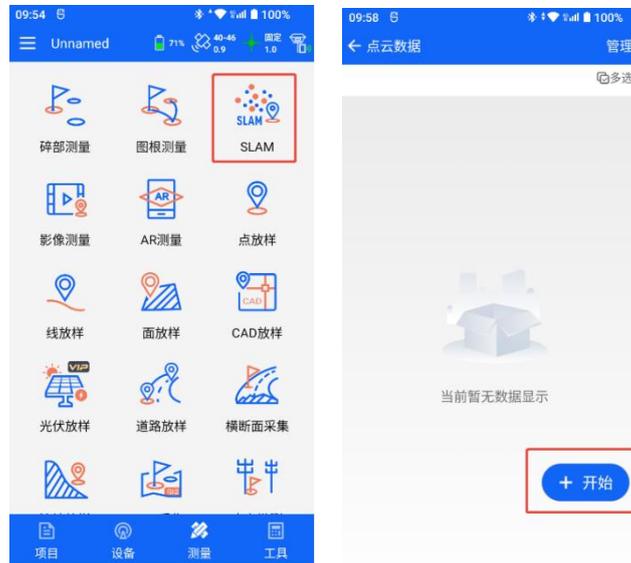

The small window in the upper right corner displays the front camera of the host by default. Click the bottom switch button to switch the three camera images on the left, middle and right of the host. When clicking the small window image, the camera image can be exchanged with the point cloud data display image. There is also a shrink button in the upper right corner of the small window, which can hide or unfold the small window.

[Height configuration] The height configuration entrance is above the small window, or you can click the collection button to configure.
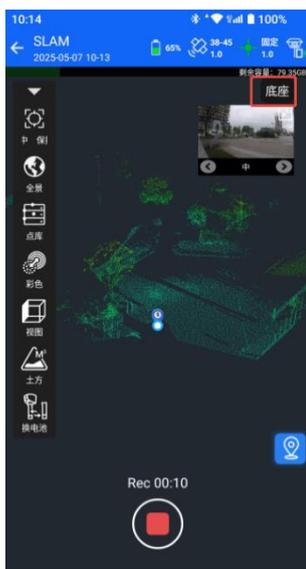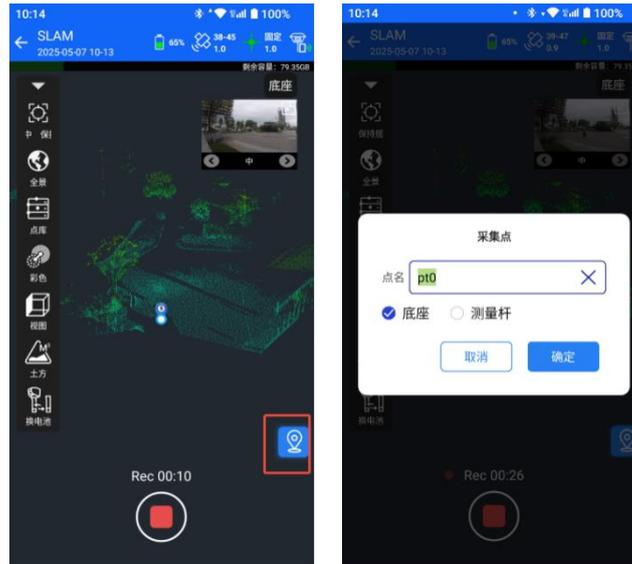
The left toolbar contains the following functions:

[Center/free] When switching to center, swipe the screen with your finger to rotate the point cloud data with the current position as the fixed point; when switching to free, swipe the screen with two fingers to move the point cloud data as a whole, and swipe the screen with one finger to rotate the point cloud data.

[Panoramic] Zoom the point cloud data to display all of it on the screen, centered on the current position.

[Point library] Click to jump to the SLAM point library of the point data.

[Color] Click the color button to select different point cloud display modes, including color, elevation, and intensity.
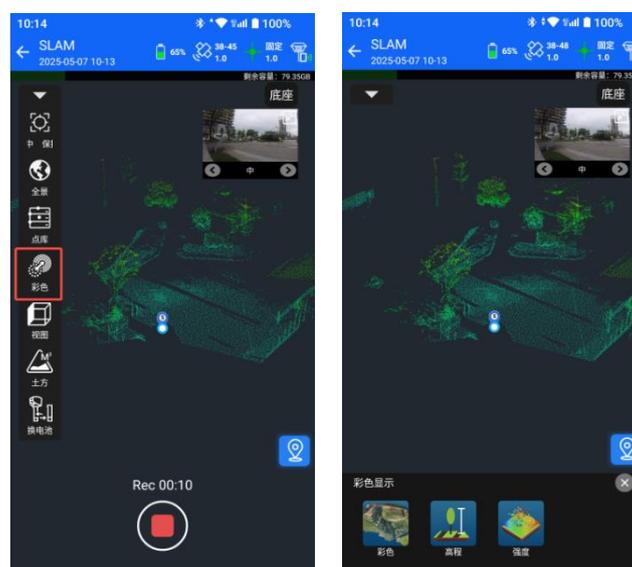
[View] Click the view button to select different view directions to display point cloud data, including front view, top view and left view. (Note: The view takes the laser scanning direction of the host as the positive direction)
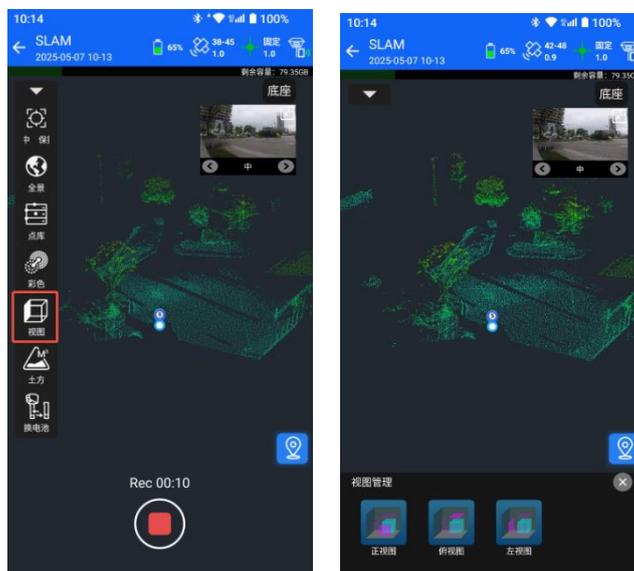
After clicking the 'Scan' button to finish the scanning, click the 'Earthwork' button. Click 'Confirm' to start the earthwork calculation. Once the relevant buttons for earthwork calculation are displayed, click the 'Select Range' button to display a movable pointer. Move the pointer to select the vertices of the earthwork range and click the 'Select Point' button to confirm the selection. After selecting the range, slide the elevation slider on the right to adjust the lowest point (which will serve as the reference elevation surface for the earthwork calculation). Then, click 'Calculation Results' to switch to the calculation result interface, where you can export the results.
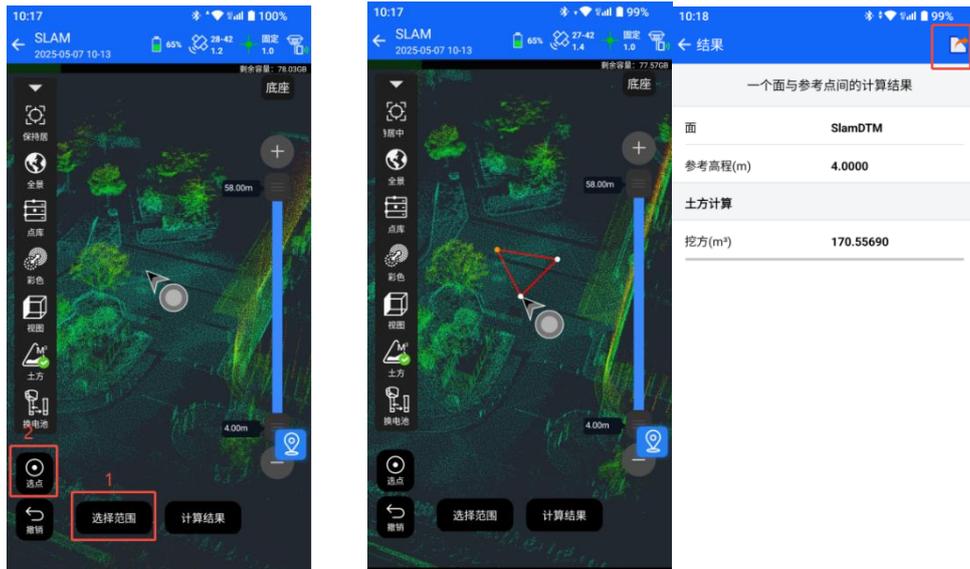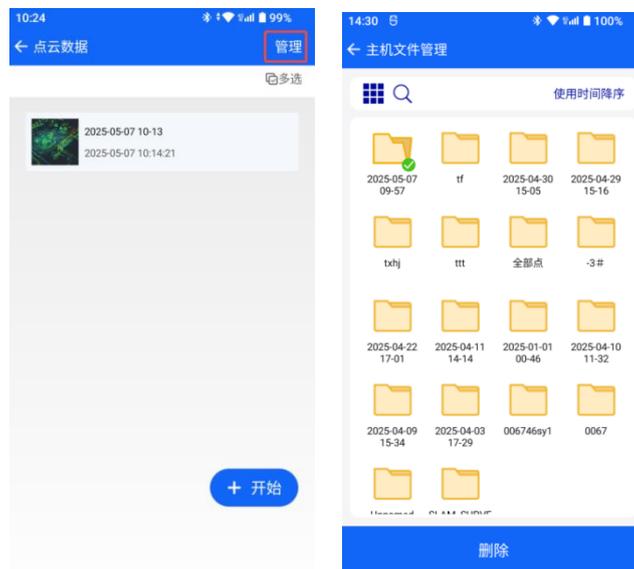
[Replace battery] Click the replace battery button, click OK, and complete the battery replacement within 30s countdown.
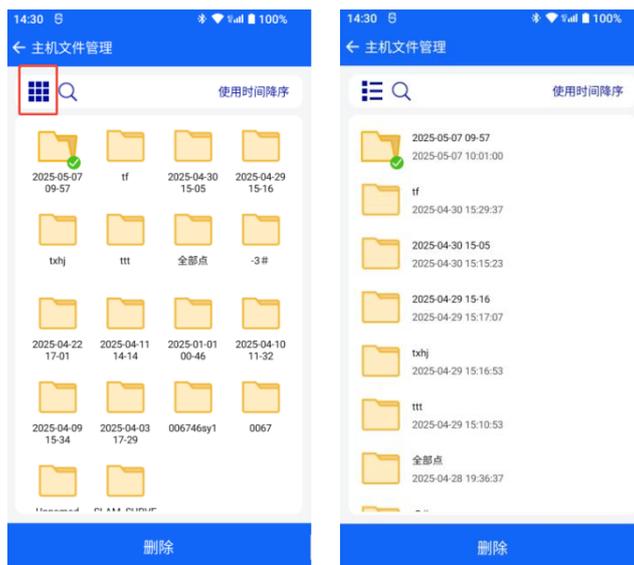
4.3.2 Project management

After the host creates a task in the project, it will be uploaded to the host. Click the "Management" button in the upper right corner of the task list interface to enter the host project management interface for viewing.

[Display mode] Click to switch the display mode of project information.

The software displays projects in descending order of usage time by default. When users click the sort button, a pop-up window appears offering options to sort by name ascending, descending, usage time ascending, or descending. Users can select their preferred sorting method from this window to organize the projects.
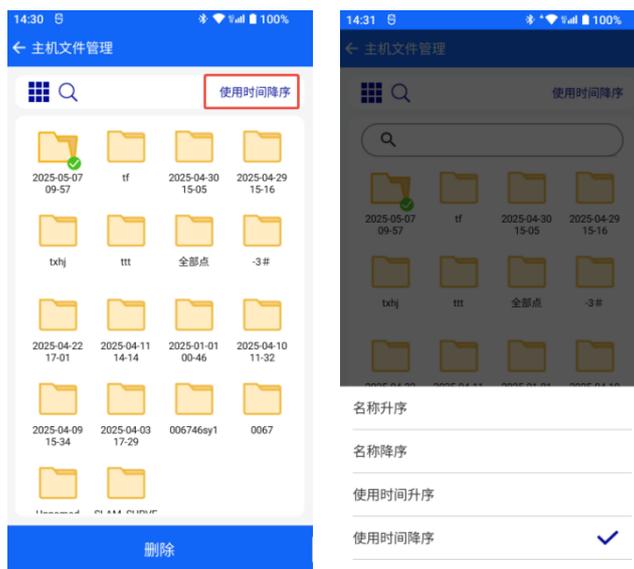
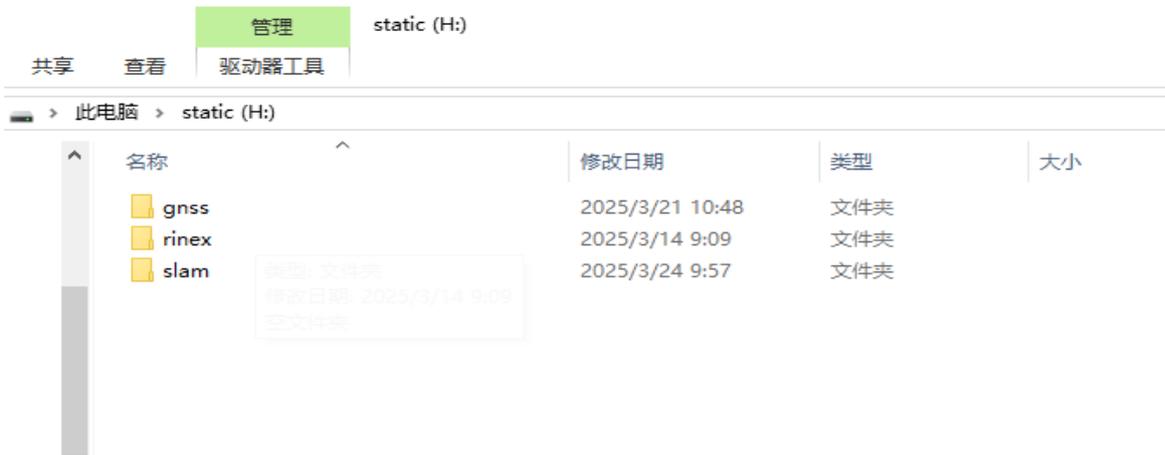[Search] Click to enter keywords to perform a fuzzy search of project names.

4.4 Download job data

Use the accompanying USB data cable to connect to the computer's USB3.0 interface when the device is off. Enter the static disk symbol recognized by the computer, enter the slam folder and select the corresponding project file for copying.
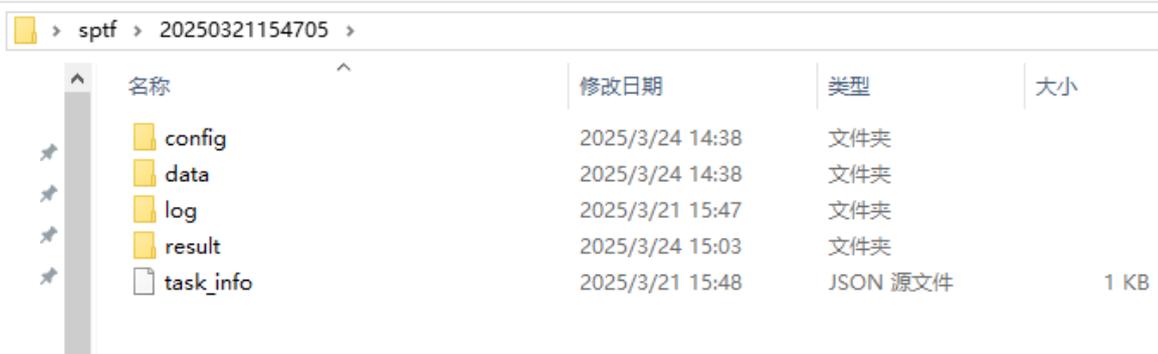
Among them, the slam file is the real-time data of SLAM RTK product. The data folder in the task folder of each project contains the original data of camera, board card, IMU, LiDar and motor, the result folder is the result data and trajectory data of real-time point cloud maintenance, and point_data.csv is the coordinate data collected during the operation process.

The project file supports the post-processing software Hi-LiDar of Hi-Target.
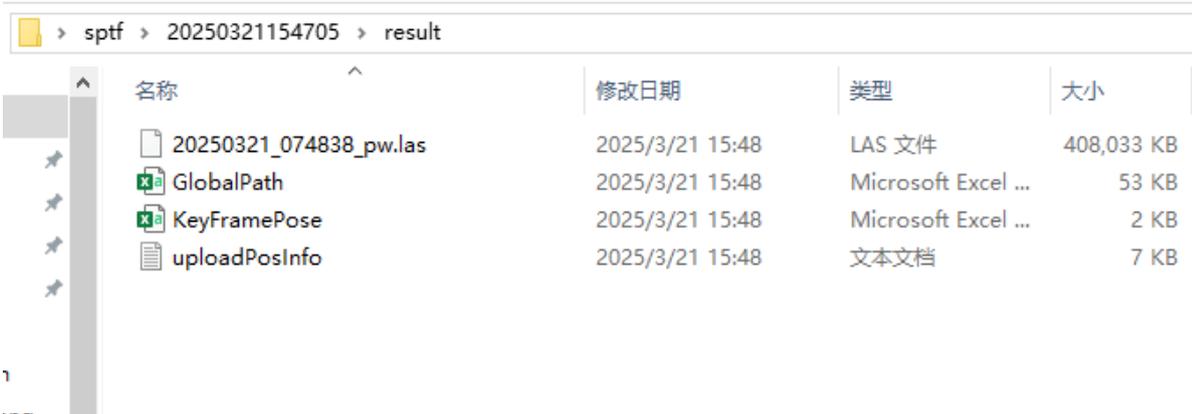
update (H:)
0.99 GB 可用，共 0.99 GB

static (I:)
27.7 GB 可用，共 425 GB

管理
共享　查看　驱动器工具
static (H:)

> 此电脑 > static (H:)

名称	修改日期	类型	大小
gnss	2025/3/21 10:48	文件夹	
rinex	2025/3/14 9:09	文件夹	
slam	2025/3/24 9:57	文件夹	

20250321154705

共享　查看

> sptf > 20250321154705 >

名称	修改日期	类型	大小
config	2025/3/24 14:38	文件夹	
data	2025/3/24 14:38	文件夹	
log	2025/3/21 15:47	文件夹	
result	2025/3/24 15:03	文件夹	
task_info	2025/3/21 15:48	JSON 源文件	1 KB

result

共享　查看

> sptf > 20250321154705 > result

| 名称	修改日期	类型	大小
20250321_074838_pw.las	2025/3/21 15:48	LAS 文件	408,033 KB
GlobalPath	2025/3/21 15:48	Microsoft Excel ...	53 KB
KeyFramePose	2025/3/21 15:48	Microsoft Excel ...	2 KB
uploadPosInfo	2025/3/21 15:48	文本文档	7 KB

SLAM RTK product data path

4.5 Data processing

This product can be processed by Hi-LiDar post-processing software to optimize the collected point cloud data. The specific steps are as follows:

4.5.1 New construction

1. Click file/New project, fill in the project name and select the original data directory file;

2. The original data does not need additional processing, and can be directly imported into one-click calculation;

3. Select the data directory to the root directory of the original data.
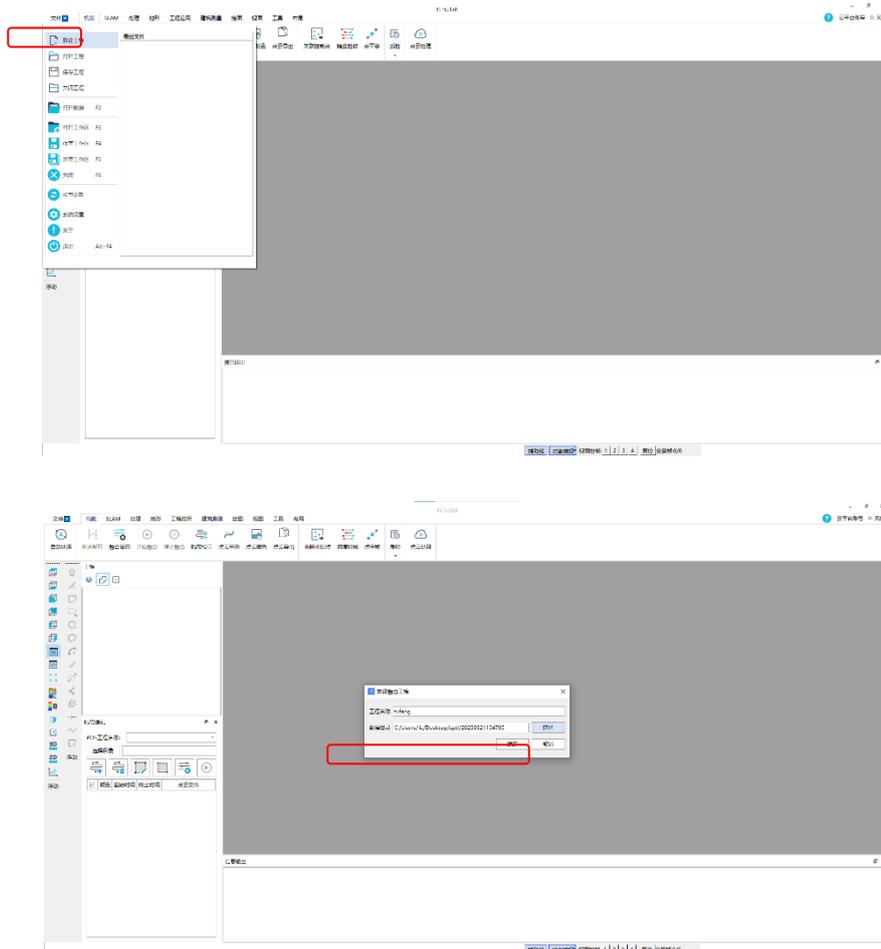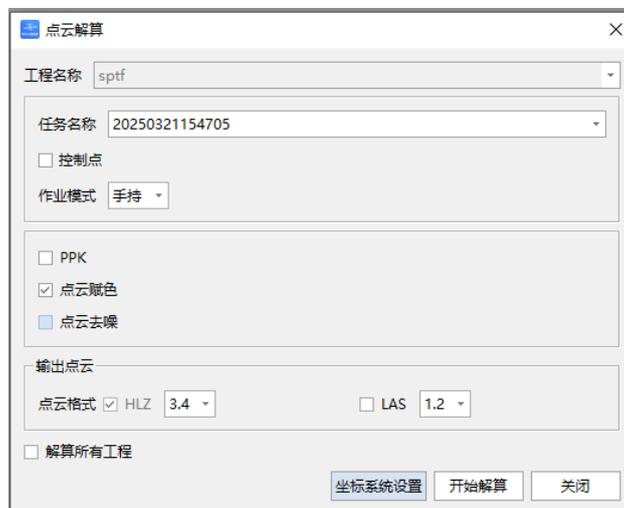

new construction

4.5.2 Configure the coordinate system

Click [Coordinate System Configuration] in [Point Cloud Calculation], select the coordinate system parameter file in the directory to set the coordinate system parameters. Click OK
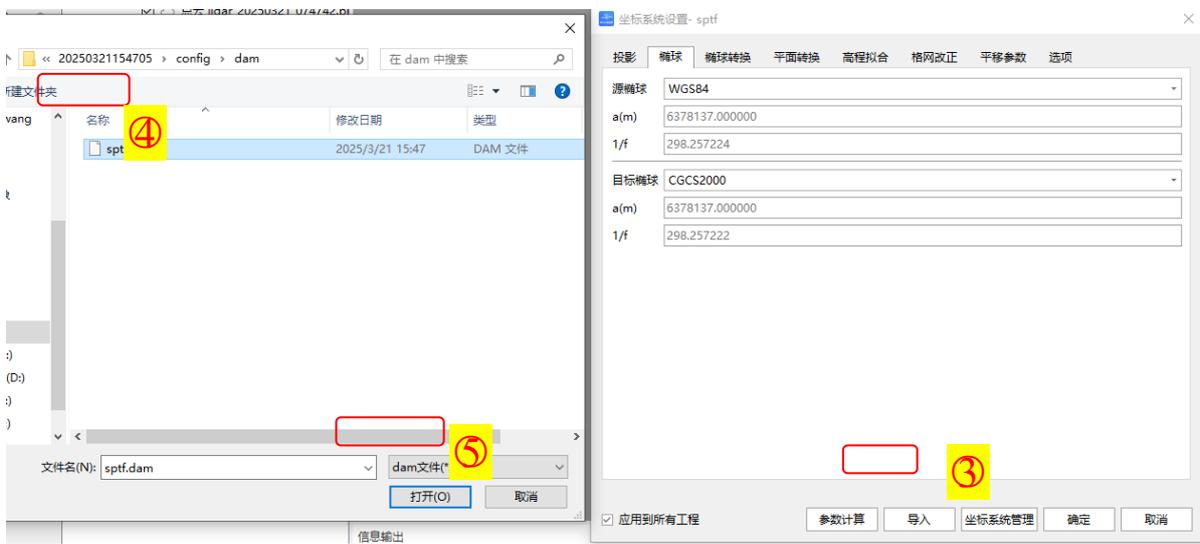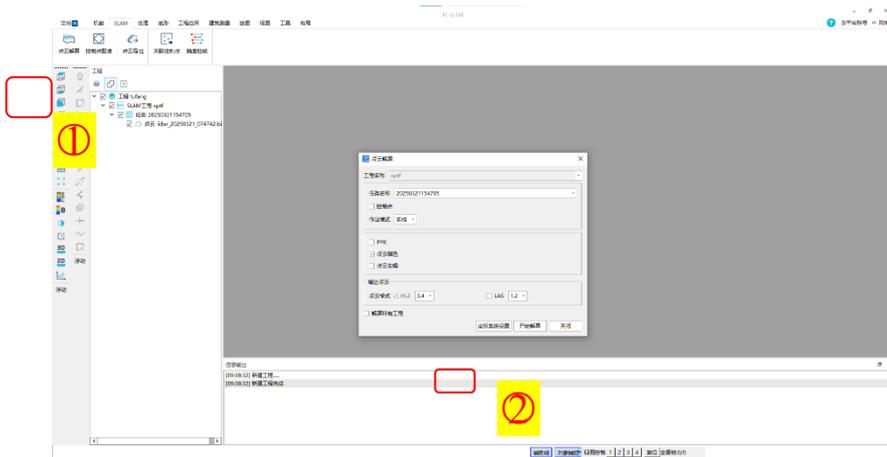
Configure the coordinate system

4.5.3 Point cloud solution

Set the operation mode, point cloud format, click the solution, and wait for the successful data processing;

Control point setting: Add control points to improve the trajectory accuracy and obtain the results of absolute coordinate system.

PPK setting: the position is corrected by PPK post-processing technology, and the point cloud of the relative coordinate system is converted into the absolute coordinate system;

Coloring of point cloud: the point cloud data and image are aligned to obtain real colors and then attached to the point cloud;

Point cloud denoising: remove the noise of point cloud anomalies, retain the real geometric features, and improve the accuracy and reliability of point cloud;

Output point cloud: supports output of multiple point cloud formats;

Solve all projects: support one-click solve multiple projects;

4.5.4 Calculation of cutting and filling

Click [Terrain] [Earthwork Calculation] in the menu bar, select the calculation range, enter the base elevation and grid size, and click calculate.
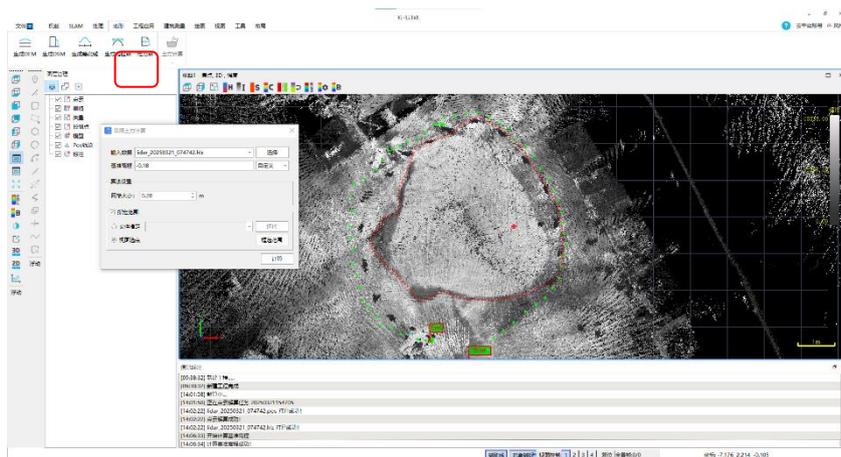
Preview of calculation results and export of reports;