SLAM-RTK User Guidance – V700S

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Version 1.0

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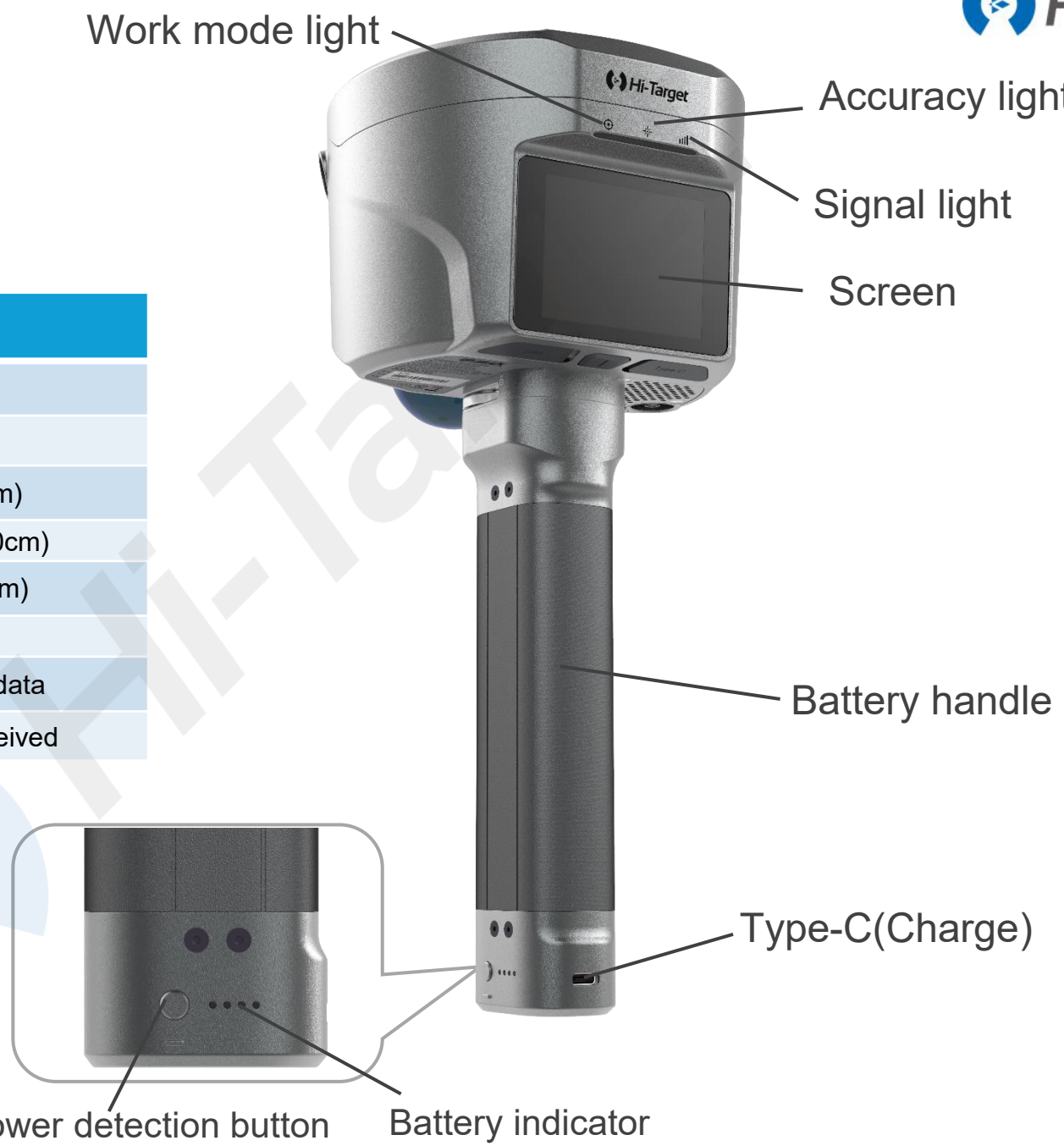
Introduction

V700S SLAM RTK represents Hi-Target's next-generation engineering surveying system, combining SLAM technology, GNSS antennas, high-precision IMU, multi-sensor global shutter cameras, and advanced chip integration. Its groundbreaking Laser Reverse Positioning technology ensures 5cm accuracy even after satellite signal loss, revolutionizing traditional RTK operations for faster, more efficient surveying.

V700S design embodies Hi-Target's years of technical expertise and industry application experience in high-precision satellite navigation. It offers SLAM-image survey, SLAM-RTK survey, on-site volume calculation based on point cloud data, 3D scanning, visualized accuracy display, unified indoor and outdoor coordinate framework, and point cloud output with geographic coordinates. From field data collection to final output, it provides a comprehensive end-to-end solution, making it a highly efficient and versatile engineering surveying system.

Introduction

Light Type	Status	Description
Work mode light	Green	RTK Mode
	Blue	SLAM Mode
Accuracy light	Red	Accuracy bad(≥10cm)
	Yellow	Accuracy normal(6~10cm)
	Green	Accuracy good(< 5cm)
	off	Not working
Signal light	Green	Receiving differential data
	off	No differential data received



Introduction

Technical parameters

Feature	V700S
Number of channels	1408
Satellite tracking	BDS、 GPS、 GLONASS、 GALILEO、 QZSS、 IRNSS、 SBAS、L-BAND
Data storage	Built-in 512GB ROM, supports automatic cyclic storage of static data and las data
RTK positioning accuracy[1]	H: ± (8+1×10^{-6}D) mm V: ± (15+1×10^{-6}D)mm
Static positioning accuracy[1]	H: ± (2.5+0.5×10^{-6}D) mm V: ± (5+0.5×10^{-6}D) mm
Tilt measurement accuracy[1]	8mm+0.3mm/°tilt

[1] The values obtained under the Hi-Target standard test field, accuracy fluctuations may occur in some scenarios.
[2] Battery life is related to the working environment, working temperature and battery life.

Feature	V700S
SLAM-image survey[1]	Multiple points can be measured on a single photo，5cm@15m
SLAM-RTK survey[1]	After the loss of satellite signal, it can still guarantee the accuracy of 5cm for a period of time.
Camera	3 HD color camera
Laser ranging	40m @10% reflectivity 70m @80% reflectivity
Laser point frequency	200,000 points/second
Angle of field	Horizontal Angle ≥ 160°, vertical Angle: 59°
Battery life[2]	RTK mode: > 10 hours SLAM mode: > 5 hours
Weight	≤ 1.68kg (including battery)
Waterproof and dustproof	IP64

Package List

Item	PCS
V700S GNSS Receiver	1
Battery	1
Qpad X9 Tablet	1
Radio Antenna	1
Survey Pole 2.2m	1
Power Adapter	1
USB Data Cable	2
Double-socket tablet mount	1
Tablet Bracket	1
Tablet Mount	1
Fixing Screw	1
Control Point Benchmark	1
Survey Benchmark	1
Rover Plastic Case	1
Certificate Of Quality	1
Warranty Card	1
Plastic Case PVC Label (Hi-Target)	1
Envelope	1
Hi-Survey software	1
Hi-LiDAR software(Optional)	1

Technical Terminology Explanation

1.SLAM

SLAM (Simultaneous Localization and Mapping) is a technique that utilizes sensors such as cameras, LiDAR, and high-precision inertial navigation systems to determine its own position (localization) in real-time while simultaneously constructing an environmental map (mapping).

2.Point Cloud

A spatial point dataset acquired through scanning, where each point contains information such as three-dimensional coordinates and laser reflection intensity.

3.Real-time Point Cloud

Refers to the device's ability to acquire, process, and display point cloud data in real-time, enabling simultaneous processing and visualization of point cloud data acquisition.

4.Loop Closure

The SLAM system detects loops (i.e., returning to previously traversed locations) and performs loop closure correction to rectify accumulated pose errors, thereby improving the consistency and accuracy of the map.

Technical Terminology Explanation

5. Absolute Coordinates

Absolute coordinates refer to a coordinate system that describes positions using a fixed reference point. In this system, any position can be uniquely determined by a set of fixed numerical values, which are measured relative to a fixed reference point (usually the origin of the coordinate system).

6. Relative Coordinates

Relative coordinates are a coordinate system that is defined relative to a certain reference point (initial position) or reference frame. It is often used to describe the relative position and orientation of an object in space. The reference point for relative coordinates is variable and can be the current position or any designated position.

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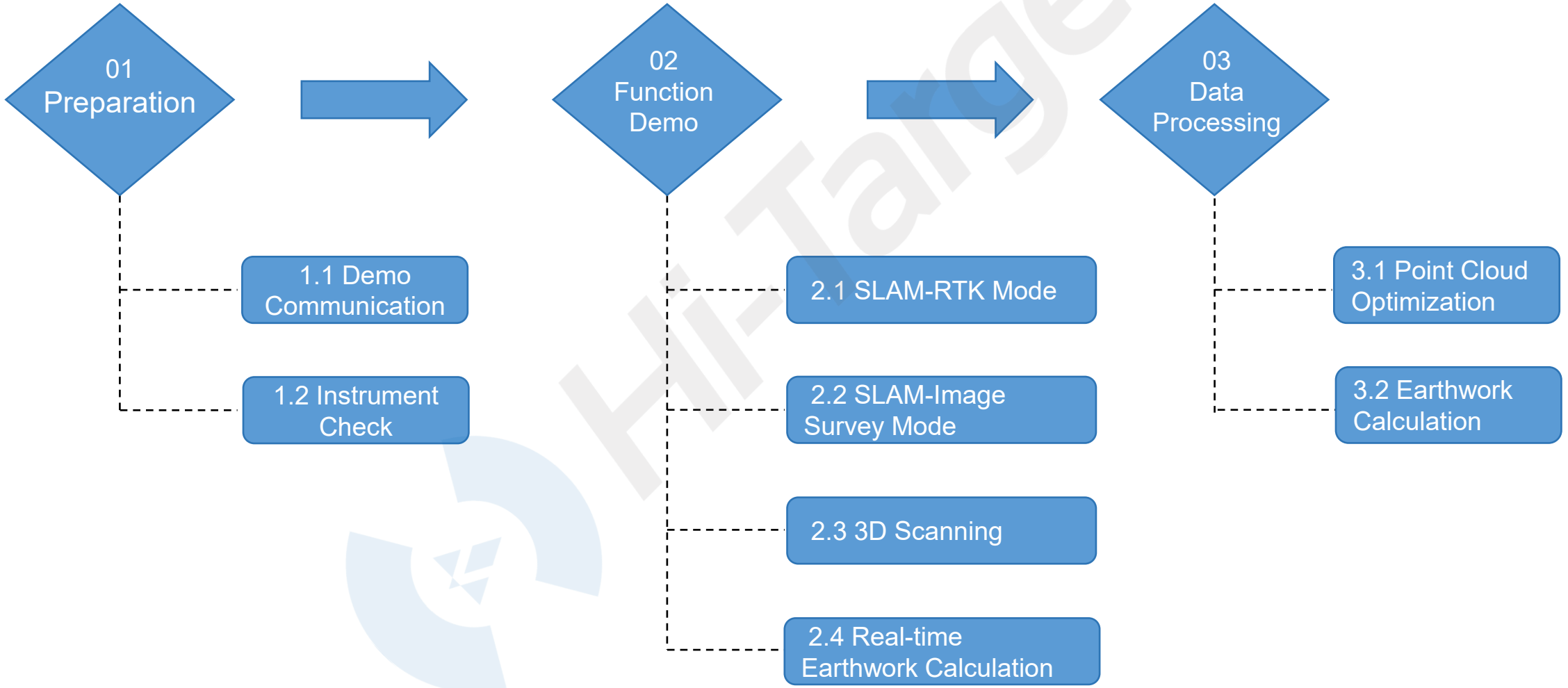
Key Features Guidance

- SLAM-RTK Mode
- SLAM-Image Survey Mode
- 3D Scanning
- Earthwork calculation

Demo Process



Preparation

Demo communication:

- Confirm the demonstration time and location with the customer in advance.
- Communicate to understand the customer's common work scenarios and determine the demonstration plan in advance based on the customer's work scenarios.
- Communicate to understand the customer's focused performance indicators and functional parameters, and determine the verification method for the results.
- Communicate to understand the control point situation within the demonstration area.

Preparation

Instrument Check:

- **Completeness Check:** Verify the completeness of the equipment and accessories against the product configuration list. Inspect for any damage. Check the laser scanner and camera lenses for dirt or obstructions. Clean them thoroughly if necessary. (Otherwise, it will affect imaging results)
- **Software/Firmware Version:** Check the software and firmware versions of the device. The V700S standard package includes the iHand55 controller, controlled by **Hi-survey** software. The software version should be **V3.4.0 or above**, and the firmware version should be **V1.0.0 or above**.
- **Authorization and Services:** Verify the device registration code.
- **Device Battery and Memory Capacity:** Check the battery levels of the host device and the data collector. Ensure that the memory capacity meets the collection requirements.
- **Device Testing:** Power on the device and perform a functional test before the demonstration.

Attention: The V700S Lidar module is equipped with a transparent protective cover. When using SLAM functions, the protective cover needs to be removed. When not in use, the protective cover should be installed to prevent the lidar from being bumped or scratched.

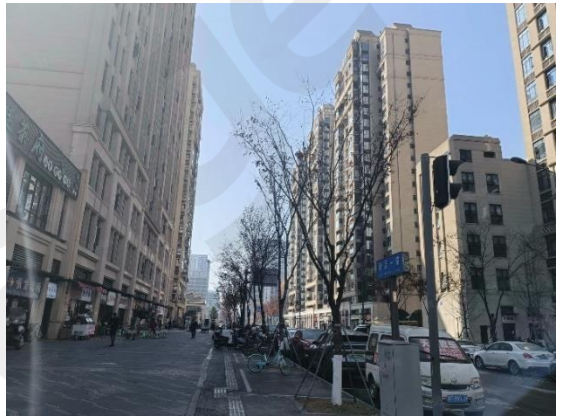
SLAM-RTK Mode

SLAM-RTK mode

The SLAM-RTK Mode is developed based on Hi-Target's innovative Laser Reverse Positioning Technology. It fuses laser odometry information with point cloud data to calculate the current measurement point's coordinates. Even after satellite signal loss, it can maintain 5cm accuracy in a short time.

Functional Characteristics:

- Deep fusion of GNSS and SLAM technologies ensures sustained 5cm accuracy in a short time even after GNSS signal loss.
- In complex environments with severe obstructions, the integrated GNSS and SLAM positioning technology enables real-time validation of RTK positioning results, effectively eliminate the problem of large coordinate errors.
- Establishes a unified indoor and outdoor coordinate framework based on RTK positioning, directly outputting point cloud data with georeferenced coordinates.



High-density built-up areas

Elevated bridge obstructions

Obstructed canopy forest areas

SLAM-RTK Mode

Step 1 Equipment Installation

① Install the V700S battery and lock it with a clip;

② Connect the center rod and the mounting Tablet Bracket;

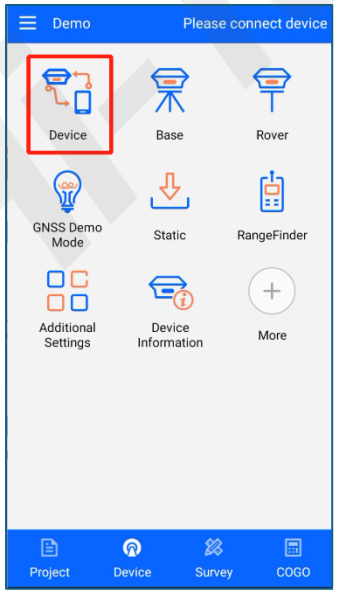
Step 2 RTK Initialization, Get ‘Fixed’ solution

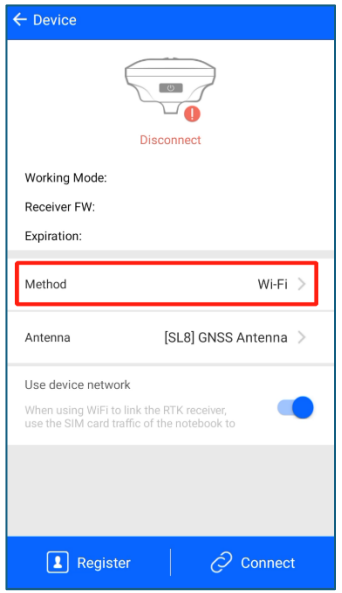
① Using **WiFi** to connect the V700S, create a new project, and set coordinate system;

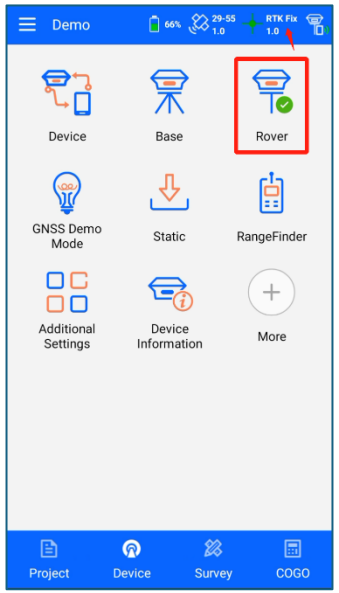
② Setting **Rover Mode** and get ‘Fixed’ solution;

Attention:

- The battery handle should be installed firmly to prevent the device from falling and damaging the laser
- Imaging and SLAM functions require the tablet and device to be connected via WiFi







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SLAM-RTK Mode

Step 3 SLAM-RTK Initialization

Click **"Detail Survey",** then click **"SLAM"** icon from the left toolbar and select **"SLAM-RTK Mode"** to initialize.

The initialization process consists of two stages:

① **SLAM Initialization:** Maintain the device stationary for 3-5 seconds, avoiding significant movements, until the initialization is complete.

Note:

- ***Orient the device towards feature-rich objects such as buildings, and avoid pointing it towards moving vehicles, crowds, or open spaces.***
- ***Ensure that the LiDAR sensor is not obstructed, and avoid surrounding the device with a group of people.***

② **Accuracy Optimization:** After getting RTK fixed solution, follow an "L" or "Z" shaped trajectory, moving forward 5-8 meters before turning 90 degrees and continuing for another 5-8 meters. **(To ensure accuracy, the initialization time and walking distance should be as long as possible.)**

Note:

- ***Avoid walking in a straight line. The longer the walking distance, the better the initialization results.***
- ***Choose a relatively open and unobstructed environment to ensure reliable GNSS accuracy during initialization.***

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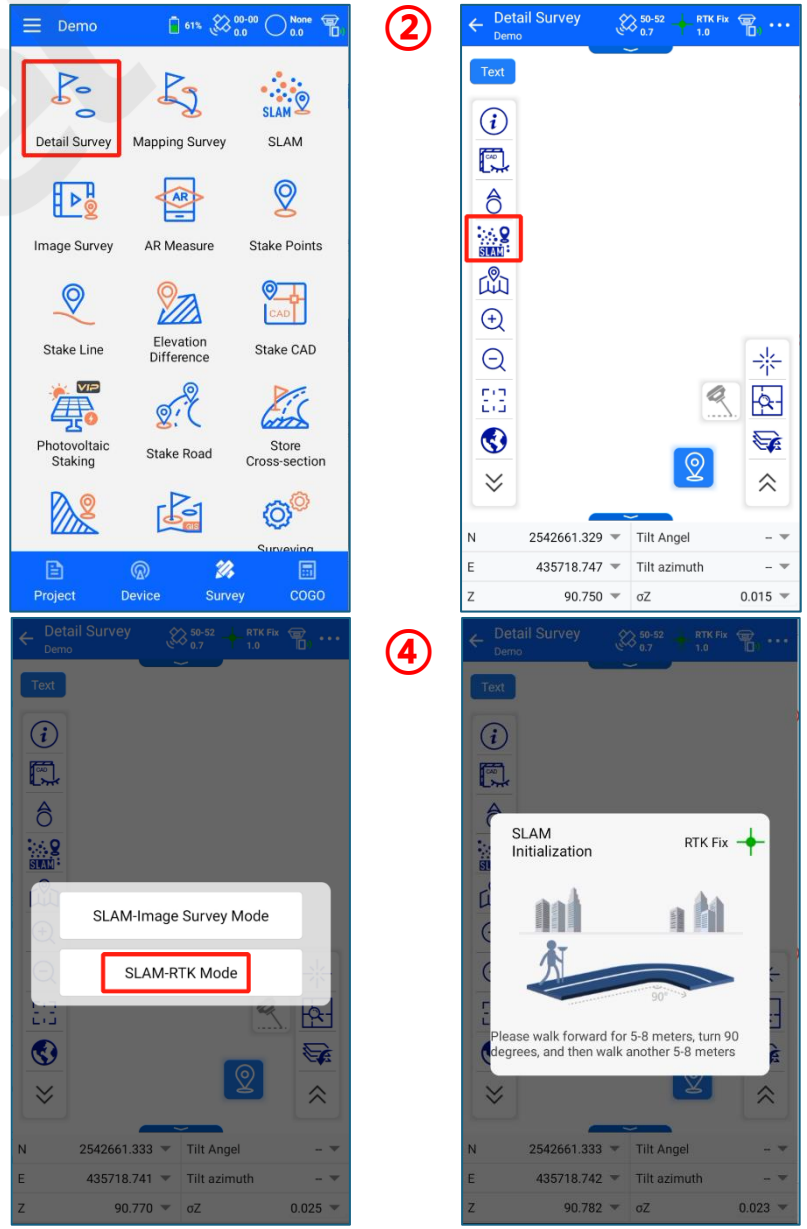
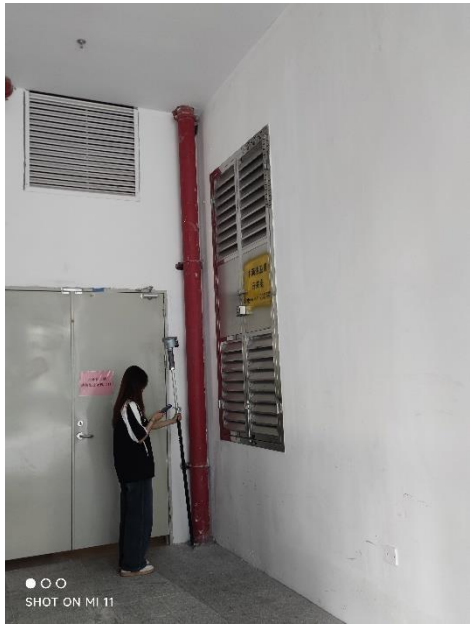


SLAM-RTK Mode

Step 4 Measurement in GNSS-Denied or Weak Signal Areas

① After initialization, measurement can proceed in GNSS-denied or weak signal areas, with the data acquisition process consistent with conventional measurement methods.

② In SLAM-RTK mode, the software's solution status will display 'SLAM Fix' solution after GNSS signal limitation.



Note:

- *When conducting demonstrations with personnel present, ensure they follow behind the data collector, and avoid walking alongside.*
- ***Prevent abrupt rotations or severe shaking of the center pole**; maintain smooth and steady movement during data collection.*
- *After stabilizing the pole for data acquisition, allow 1-2 seconds of stillness before capturing the point.*
- *When vehicles or pedestrians pass nearby, turn your back towards the moving objects and resume data collection after they have passed.*
- *When capturing points at wall corners, **avoid facing the LiDAR towards walls**, as it will obstruct the entire field of view; it is recommended to face away from the corner.*
- *When entering or exiting rooms, open doors in advance, turn your back, and proceed slowly.*
- *Use stairs for inter-floor movement; elevators may lead to mapping failures. When using stairs, avoid close contact with walls.*
- *In corridors, tilt the device slightly forward to aim the laser towards the corridor's end, preventing drift in the direction of travel.*

SLAM-RTK Mode

Step 5 Data Export

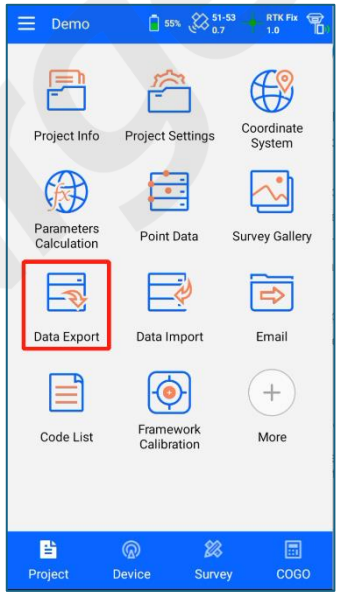
The measurement results from the SLAM-RTK mode are in the form of coordinate points. By default, the exported results are stored in the **/ZHD/Out** folder within the tablet's internal memory.

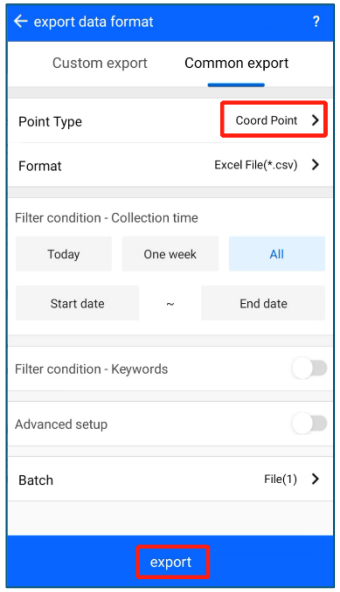
① On the main interface of the software, click 'Data Export'.

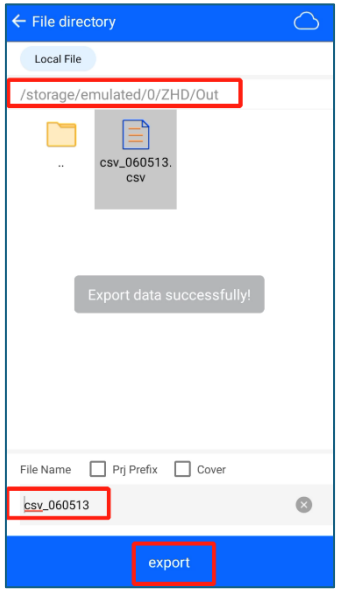
② Choose 'Common Export', set 'Point Type' to 'Coordinate Points', select the desired format based on your requirements, and then click 'Export'.

③ Enter a file name for the exported data, and click 'Export' to successfully export the data.

④ Connect the handheld device to the computer using a data cable. Locate the exported file in the tablet's shared storage under the /ZHD/Out folder and copy it to the tablet device.







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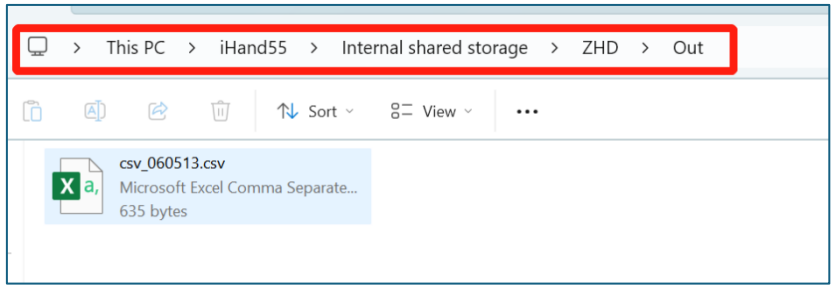

Note:

- For simple coordinate comparison during demonstrations, direct comparison within the point data is sufficient, eliminating the need to export measurement result files.
- For exporting measurement results, it is recommended to use the Excel file (*.csv) format, which includes comprehensive data information.

SLAM-RTK Mode

Step 6 Accuracy Verification

① In outdoor areas with available GNSS signals, direct comparison of RTK positioning coordinates can be performed for accuracy verification.

② In areas with weak GNSS signals, such as corners or partially obstructed locations, where RTK can achieve a fixed solution, direct comparison of RTK positioning coordinates can be used for accuracy verification.

③ In indoor areas without GNSS signals, accuracy can be verified by performing multiple initialization and repeated measurements of the same location, then comparing the coordinate deviations between the repeated measurements.

④ In scenarios with control points, direct comparison of coordinate deviations with the control point coordinates can be used for accuracy verification.

Note:

When using control points for accuracy verification, ensure that the control point coordinates and the current instrument coordinates are in the same coordinate system.

SLAM-Image Survey Mode

SLAM-Image Survey Mode

SLAM-Image Survey Mode represents a new generation of non-contact measurement technology developed by Hi-Target. Building upon the foundation of previous image measurement techniques, this mode integrates SLAM technology to enable real-time acquisition of multiple point coordinates from a single photograph, significantly enhancing accuracy and efficiency.

Functional characteristics:

- Real-time acquisition of comprehensive geo-information and instant accuracy alerts through laser point cloud data and image data, providing intuitive, efficient, and convenient operation.
- The new mode of non-contact measurement greatly improves the range of operation. It can be measured in basements, under bridges, across rivers and ditches, and in enclosed areas, so that the operation is efficient and safe;
- Based on Android high-performance laser point cloud and image processing technology, only a photo is needed to obtain the coordinates of multiple points in real time by controller software. **The working distance is 15m, the accuracy is better than 5cm**, and the working efficiency is improved by 10 times.

SLAM-Image Survey Mode

Steps 1 - SLAM Initialization:

Click **"Detail Survey"**, then click **"SLAM"** icon from the left toolbar and select **"SLAM-Image Survey Mode"** to initialize.

The initialization process consists of two stages:

① **SLAM Initialization:** Maintain the device stationary for 3-5 seconds, avoiding significant movements, until the initialization is complete.

Note:

- ***Orient the device towards feature-rich objects such as buildings, and avoid pointing it towards moving vehicles, crowds, or open spaces.***
- ***Ensure that the LiDAR sensor is not obstructed, and avoid surrounding the device with a group of people.***

② **Accuracy Optimization:** After getting RTK fixed solution, follow an "L" or "Z" shaped trajectory, moving forward 5-8 meters before turning 90 degrees and continuing for another 5-8 meters. **(To ensure accuracy, the initialization time and walking distance should be as long as possible.)**

Note:

- ***Avoid walking in a straight line. The longer the walking distance, the better the initialization results.***
- ***Choose a relatively open and unobstructed environment to ensure reliable GNSS accuracy during initialization.***

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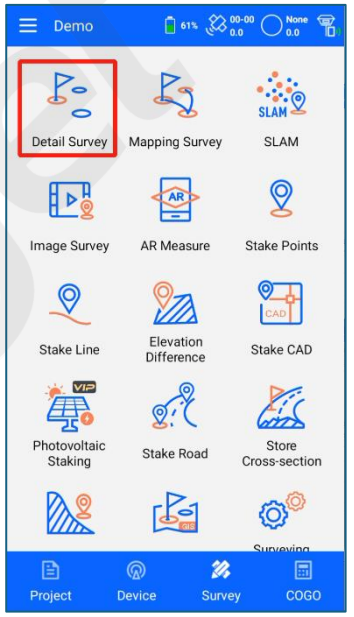

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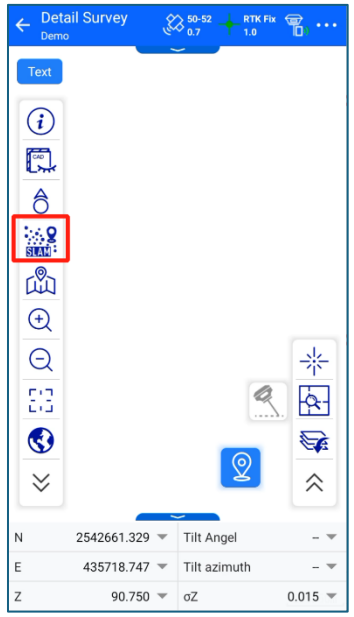

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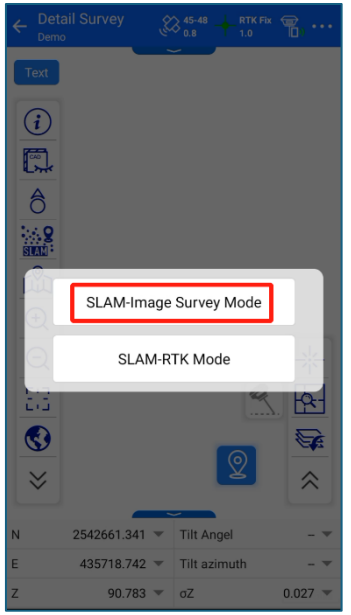

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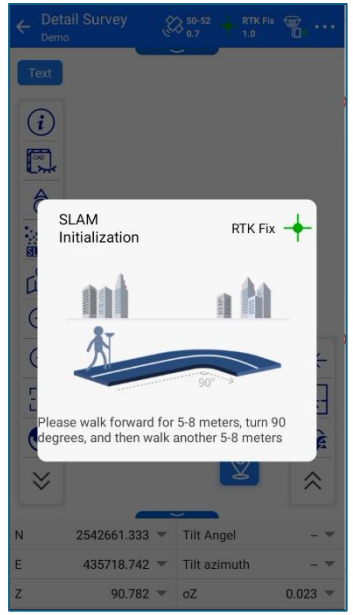


SLAM-Image Survey Mode

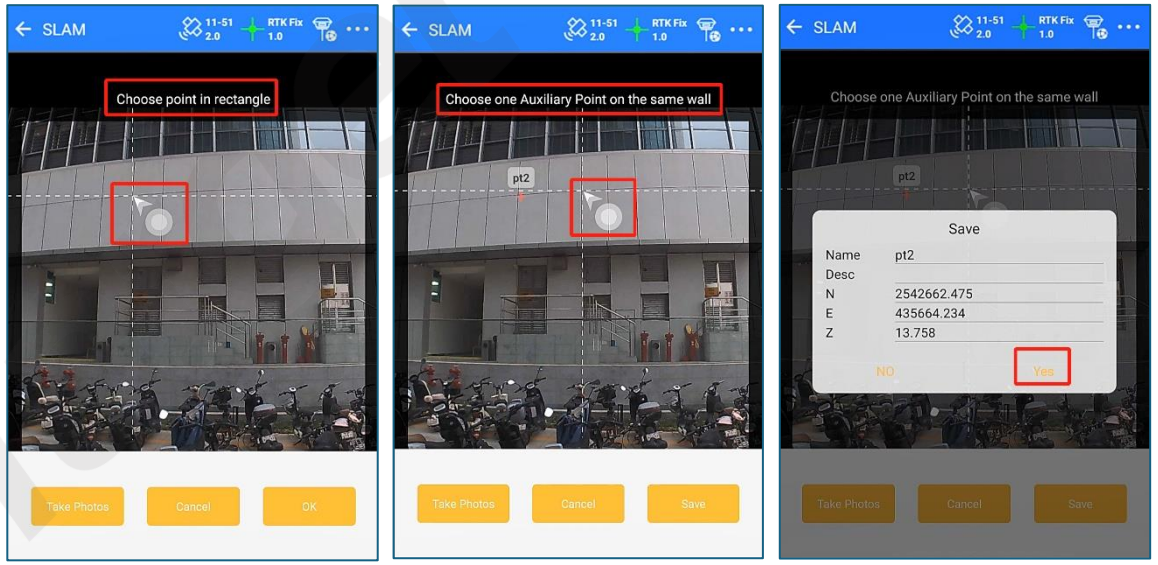
Step 2 – Take photos and extract point coordinates from photo.

① Capture an image of the target subject using the integrated RTK camera. Ensure the shooting distance is **within 10 meters** for optimal accuracy;

② Drag the cursor to select the feature point (measurement point) to be measured.;

③ Select an auxiliary point *(The auxiliary point must be on the same plane as the measurement point)*

④ Save the calculated coordinates.



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Note:

- During SLAM image measurement, *avoid abrupt rotations or severe shaking of the center pole*, it may result in failure or low accuracy.
- *Do not select these points at the edge of the image*, as image exhibit distortion, particularly at the edges, which can affect point accuracy;
- Within 5-10 seconds of capturing an image, ensure no dynamic objects, such as pedestrians or vehicles, pass between the device and the actual location. Their presence can introduce dynamic object point clouds into the map, causing measurement points to be placed on these dynamic objects, thus affecting accuracy.
- *Avoid selecting measurement points on objects with low reflectivity, transparency, or high absorption*. Common examples include glass, liquids, smooth water surfaces, mirrors, and asphalt surfaces.
- *For optimal measurement results, select objects with rich features. Prior to capturing an image, allow the laser to fully scan the object for 5-10 seconds*.

SLAM-Image Survey Mode

Step 3 - Data Export

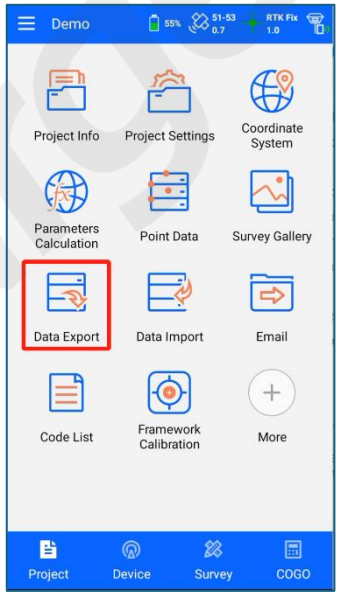
The measurement results from the SLAM-RTK mode are in the form of coordinate points. By default, the exported results are stored in the **/ZHD/Out** folder within the tablet's internal memory.

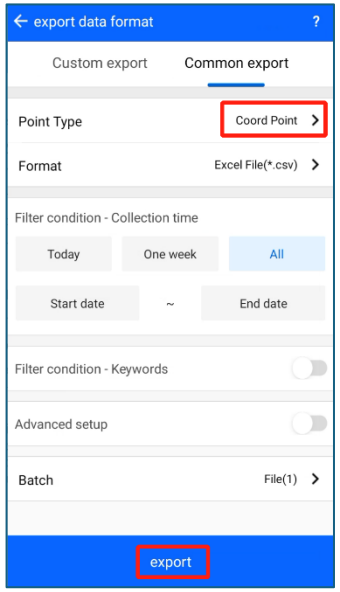
① On the main interface of the software, click 'Data Export'.

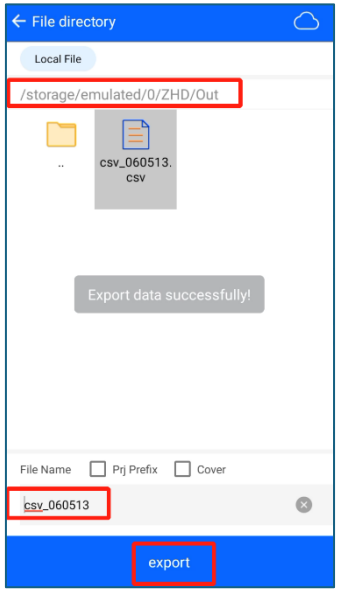
② Choose 'Common Export', set 'Point Type' to 'Coordinate Points', select the desired format based on your requirements, and then click 'Export'.

③ Enter a file name for the exported data, and click 'Export' to successfully export the data.

④ Connect the handheld device to the computer using a data cable. Locate the exported file in the tablet's shared storage under the /ZHD/Out folder and copy it to the tablet device.







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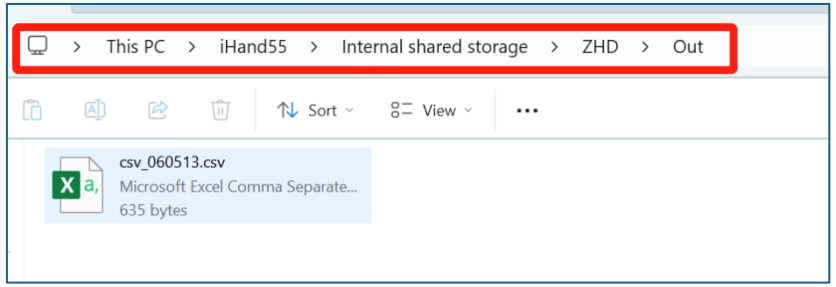


Note:

- For simple coordinate comparison during demonstrations, direct comparison within the point data is sufficient, eliminating the need to export measurement result files.
- For exporting measurement results, it is recommended to use the Excel file (*.csv) format, which includes comprehensive data information.

SLAM-RTK Mode

Step 4 - Accuracy Verification

① In outdoor areas with available GNSS signals, direct comparison of RTK positioning coordinates can be performed for accuracy verification.

② In areas with weak GNSS signals, such as corners or partially obstructed locations, where RTK can achieve a fixed solution, direct comparison of RTK positioning coordinates can be used for accuracy verification.

③ In scenarios with control points, direct comparison of coordinate deviations with the control point coordinates can be used for accuracy verification.

Note:

When using control points for accuracy verification, ensure that the control point coordinates and the current instrument coordinates are in the same coordinate system.

3D Scanning

3D scanning introduction

The V700S integrates a MID360 laser scanner, global shutter camera, and high-precision inertial navigation system (INS), enabling 3D scanning operations in small-scale environments. Equipped with a high-performance, built-in 3D reconstruction algorithm, the V700S achieves real-time mapping during data acquisition. It generates high-precision, high-definition 3D point cloud data and offers adaptive spatial data capture capabilities for both indoor and outdoor scenarios.

MID360 laser scanner

The MID360 Laser Scanner is a hybrid solid-state LiDAR characterized by its 360° omnidirectional scanning, high-precision point cloud output, lightweight design, and strong environmental adaptability.

Global shutter camera

The key feature of a global shutter camera is that all pixels are exposed simultaneously, which eliminates motion distortion and provides high synchronization, making it suitable for high-speed imaging.

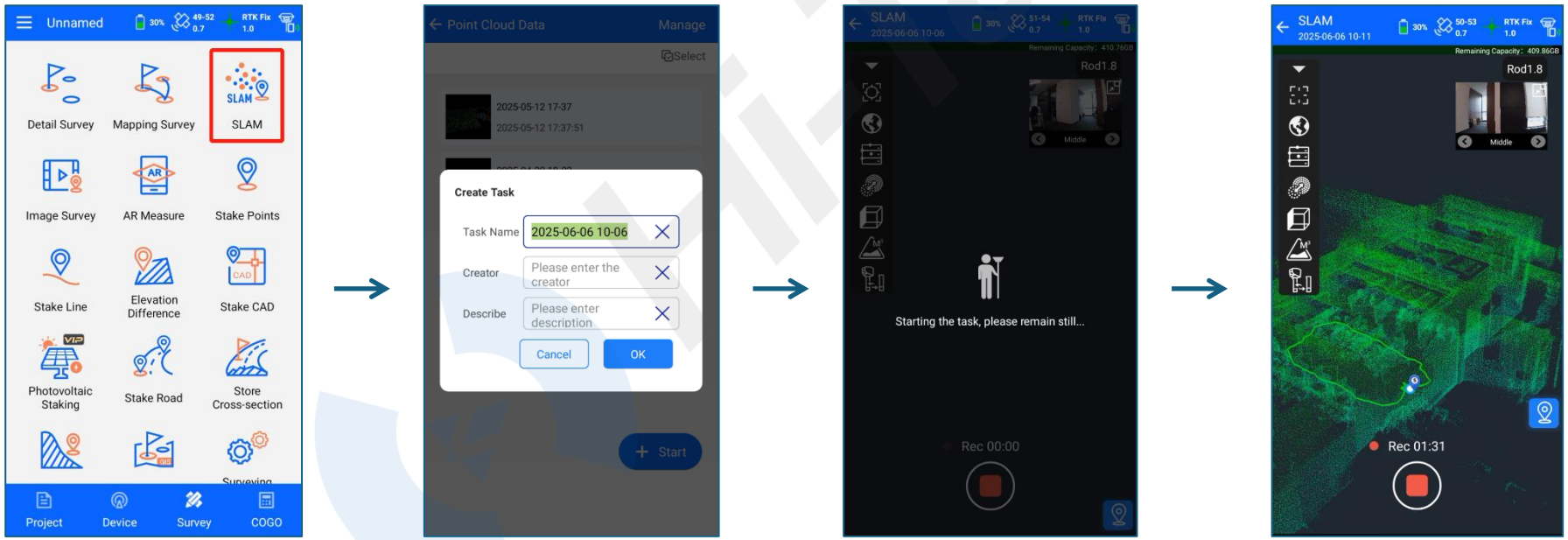
3D Scanning

Step 1 Equipment installation and RTK initialization

- The equipment installation and RTK initialization steps for 3D scanning are exactly the same as those for SLAM image measurement mode. The 3D scanning can be performed either by hand-held operation or by mounting the device on a survey pole. In pure indoor environments where GNSS signals are unavailable, RTK initialization is not required. In such cases, the point cloud output will be in a relative coordinate system.

Step 2 SLAM initialization and scanning

① In the survey interface, click SLAM, enter a task name to create a task, and **keep the device stationary** for initialization;

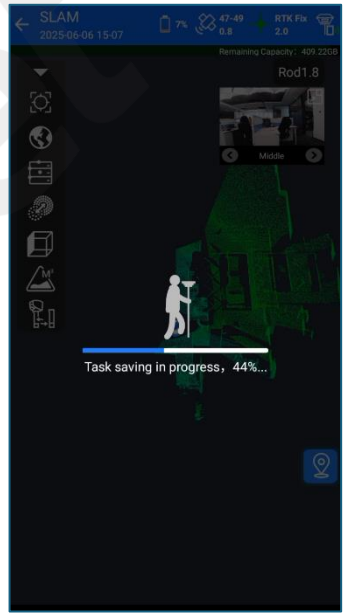


- Maintain device stability and immobility during initialization until completion
- Ensure the laser is directed towards feature-rich scenes, such as buildings, irregular rocks, etc., during initialization.
- **Avoid moving objects or obstructions within the laser's field of view during the initialization process.**

3D Scanning

② Users can initiate scanning upon the point cloud display on the interface. Data acquisition ceases upon the 'Stop' command and is subsequently stored on the host system.

③ Once scan data is saved, users can review result details from multiple angles within the Hi-survey software interface.



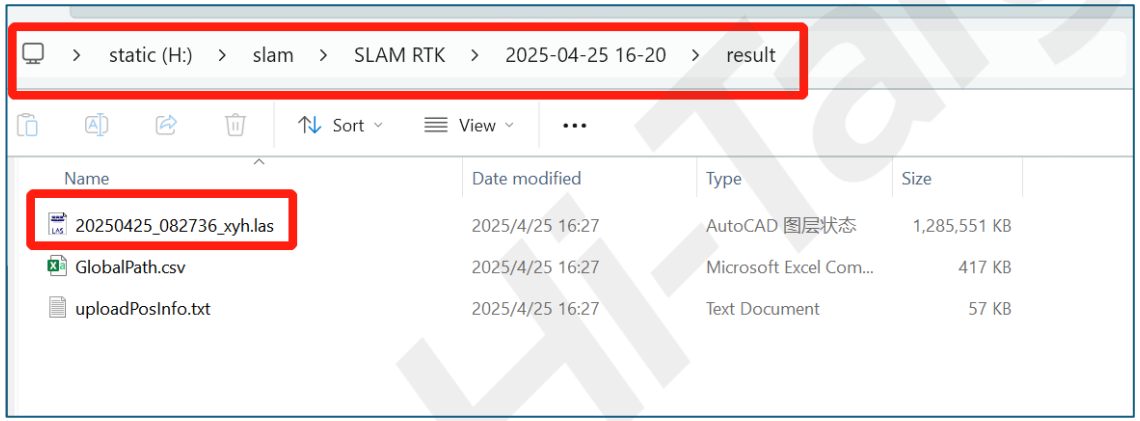
Precautions:

- When conducting demonstrations with personnel present, ensure they follow behind the data acquisition operator, and avoid parallel movement;
- **Minimize scanning of highly reflective objects** such as glass curtain walls and vehicle windows to reduce noise in point cloud data;
- If operating in indoor or GNSS-denied environments, external control points are required for point cloud coordinate system transformation;
- In indoor environments, ensure all doors are open prior to scanning. **When moving between rooms, proceed slowly with your back facing the entrance.** For multi-floor operations, use staircases as elevators may lead to mapping failures. When navigating stairs, avoid close proximity to walls. When turning corners, use a wide turning radius and avoid sharp turns or hugging the inner curve;
- When scanning corridors, tilt the device slightly forward to align the laser with the corridor's end, preventing forward drift;
- For optimal performance, the V700S should be used within a 25m range. **Suitable scanning scenarios include small volume stockpiles and low-rise buildings**. For larger range scenarios and GNSS-denied environments, small loop scanning is recommended.

3D Scanning

Step 3 Data Output

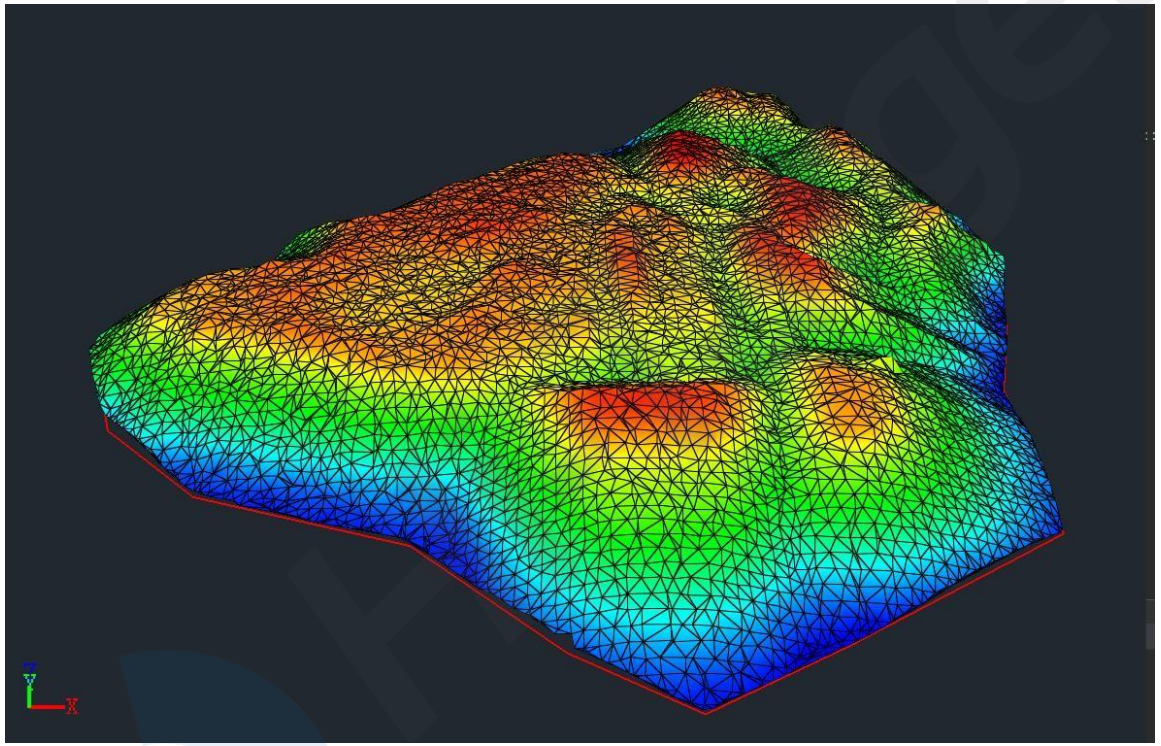
- Point cloud data acquired by the V700S 3D scanner is stored on the V700S host's "static" drive. To retrieve the data, connect the host via data cable and copy the files from the corresponding folder.



Note:

- The static disk becomes inaccessible when the device registration code expires.
- The static disk operates in read-only mode. Direct data deletion from the disk is prohibited. Data file management must be performed using the Hi-survey software.

Earthwork volume calculation



V700S provides real-time acquisition of rich 3D geospatial data and utilizes high-performance Android-based laser point cloud processing technology for instant volume calculation, offering simplicity and convenience.

Earthwork volume calculation

Step 1: 3D Scanning

- The V700S earthwork calculation relies on real-time acquired, high-precision point cloud data. Therefore, 3D scanning is required to obtain point cloud data prior to calculation. The specific steps are consistent with the previous 3D Scanning.

Step 2: Earthwork Volume Calculation

① Upon completion of the scan, save the task. Then, select "Earthwork" from the left toolbar and click "OK" to initiate the volume calculation;

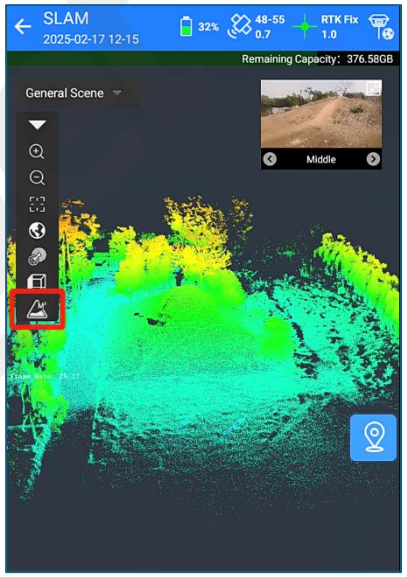
② Define the area of interest by selecting a boundary line on the point cloud;

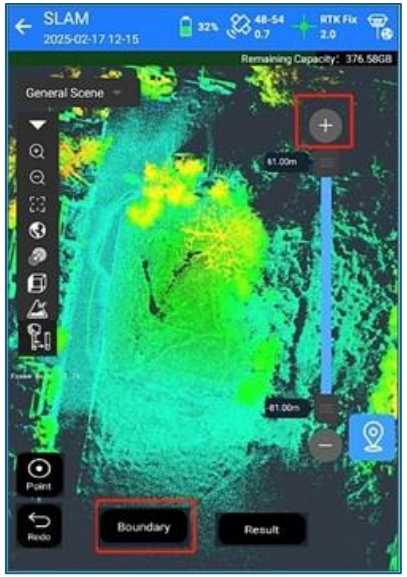
③ Refine the point cloud data by clipping extraneous points using the elevation slider on the right side;

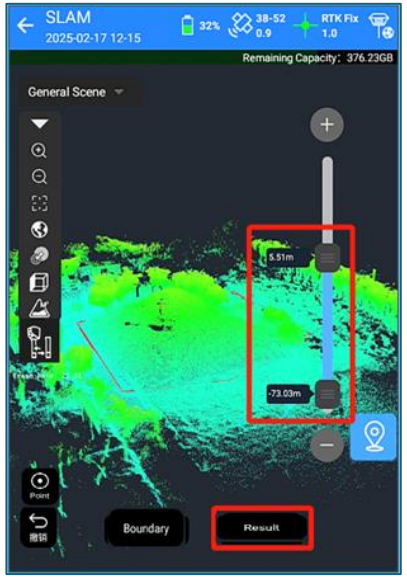
④ Calculate and obtain the earthwork volume results.

Note:

- To ensure accurate calculation results, avoid obstructions such as vegetation or structures that may interfere with data collection.
- Please note that the current version does not support re-opening and re-calculating scanned point cloud data directly on the tablet device.







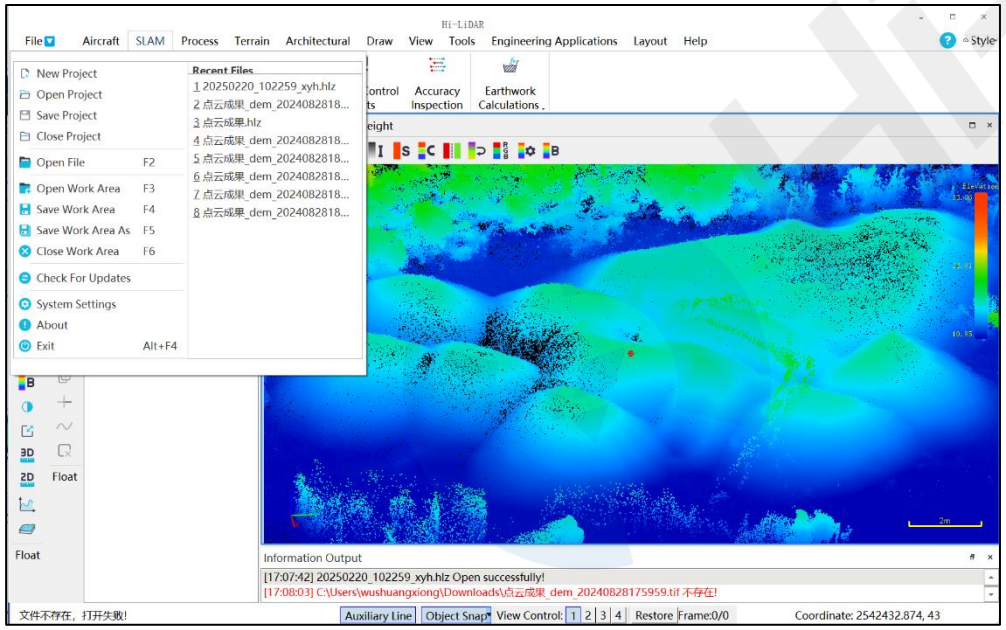
Data processing

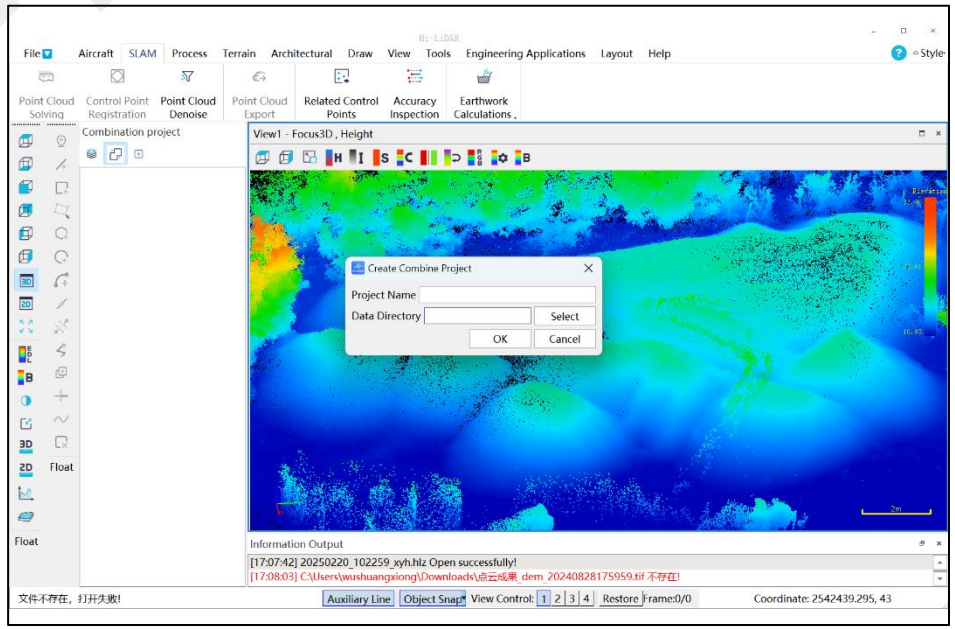
Point Cloud Optimization (Post-Processing)

The V700S optional Hi-LiDAR post-processing software, which supports optimized processing of captured point cloud data. The following steps outline the procedure for point cloud optimization:

Step 1: Create New Project

- select 'File' > 'New Project', and then enter the project name and the directory containing the raw data.
- The raw data can be imported directly for single-step computation without any preprocessing.
- Specify the root directory of the raw data as the data directory.

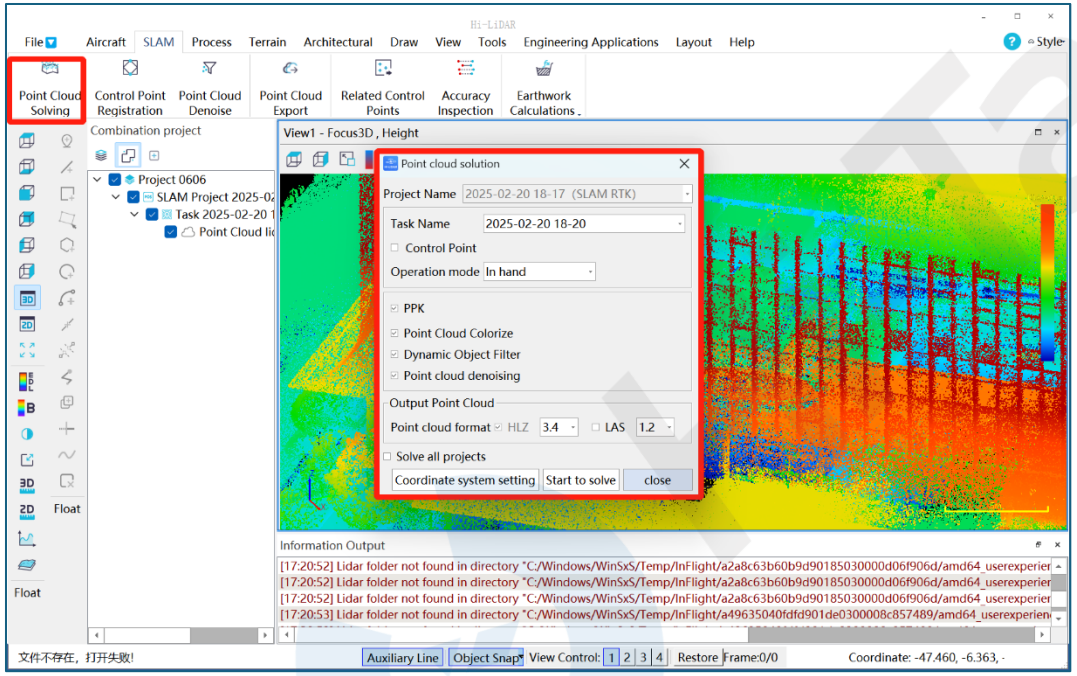


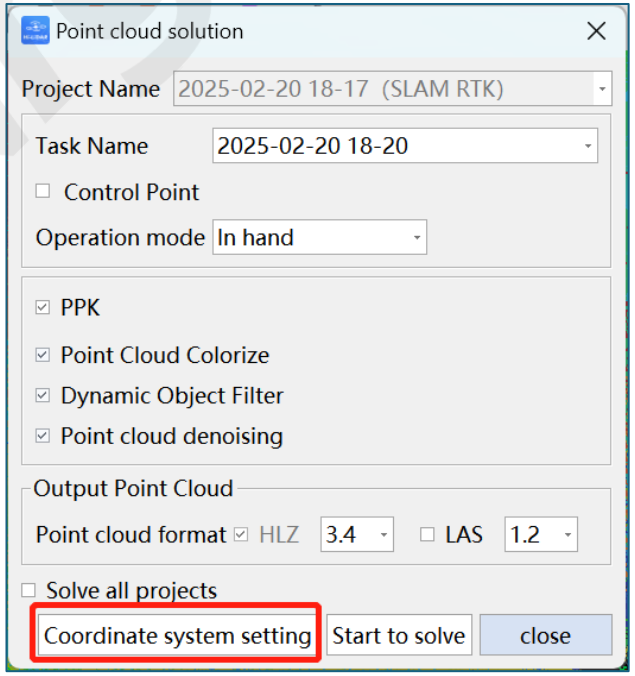


Data processing

Step 2: Coordinate System Configuration

- Click "Coordinate System Settings" to configure coordinate system parameters.

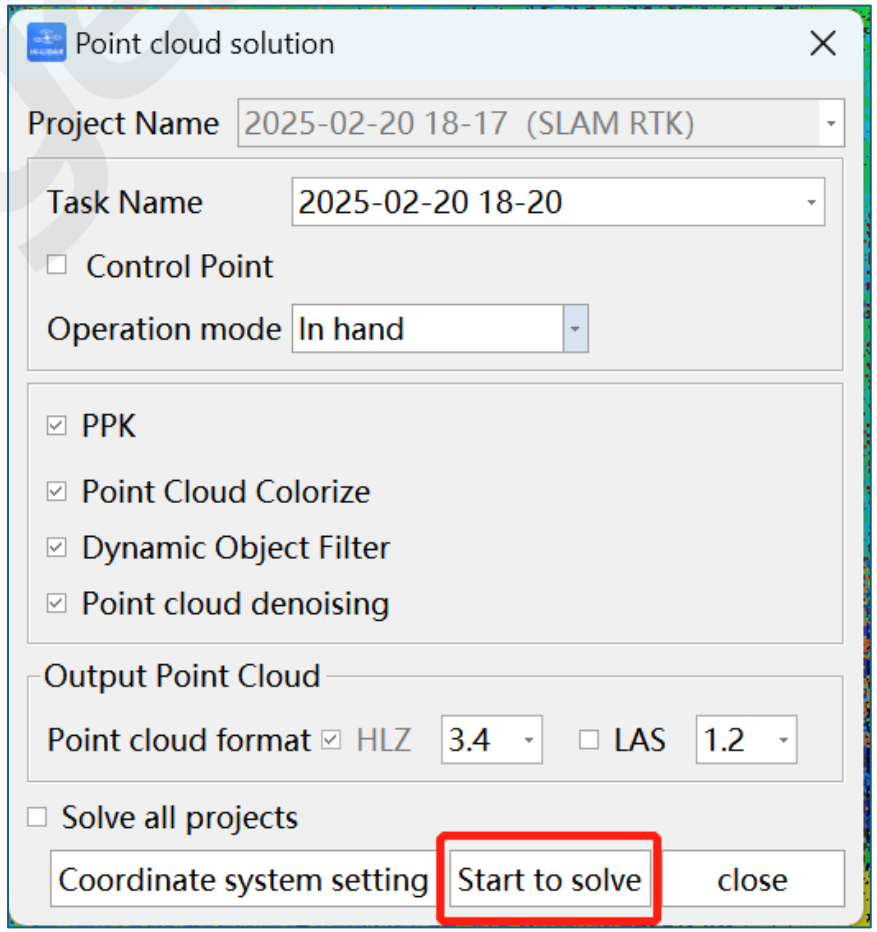




Data processing

Step 3: Point cloud processing and analysis

- Configure the working mode and point cloud format, then click ‘Compute’.
- **Control Point**: Addition of control point setup functionality to enhance trajectory accuracy and generate results in an absolute coordinate system.
- **PPK**: Implementation of PPK post-processing techniques to refine position and orientation data, transforming relative coordinate system point clouds into absolute coordinates.
- **Point Cloud Colorize**: Integration of point cloud data and image registration to achieve realistic color mapping onto point clouds.
- **Dynamic Object Filter:** Remove moving objects from point clouds, such as people or cars in motion.
- **Point cloud denoising**: Implementation of algorithms to remove anomalous noise points, preserving true geometric features and improving point cloud accuracy and reliability.
- **Output Point Cloud**: Support for exporting point clouds in various industry-standard formats.
- **Solve all projects**: Capability to process multiple projects simultaneously with a single click.



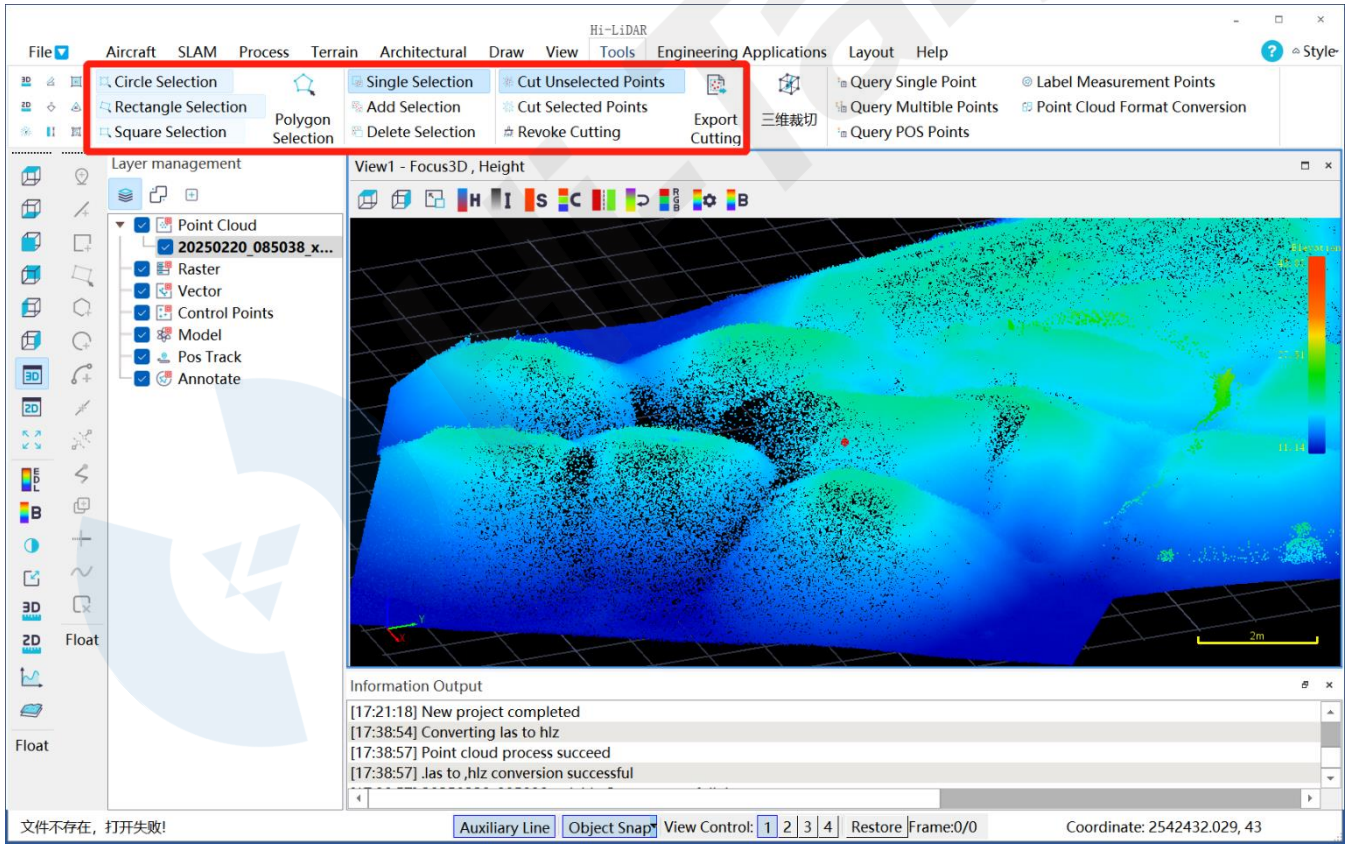
Data processing

Earthwork Calculation (Post-Processing)

The V700S optional Hi-LiDAR post-processing software, which supports post-processing earthwork calculations. The detailed steps are as follows:

Step 1: Point Cloud Clipping

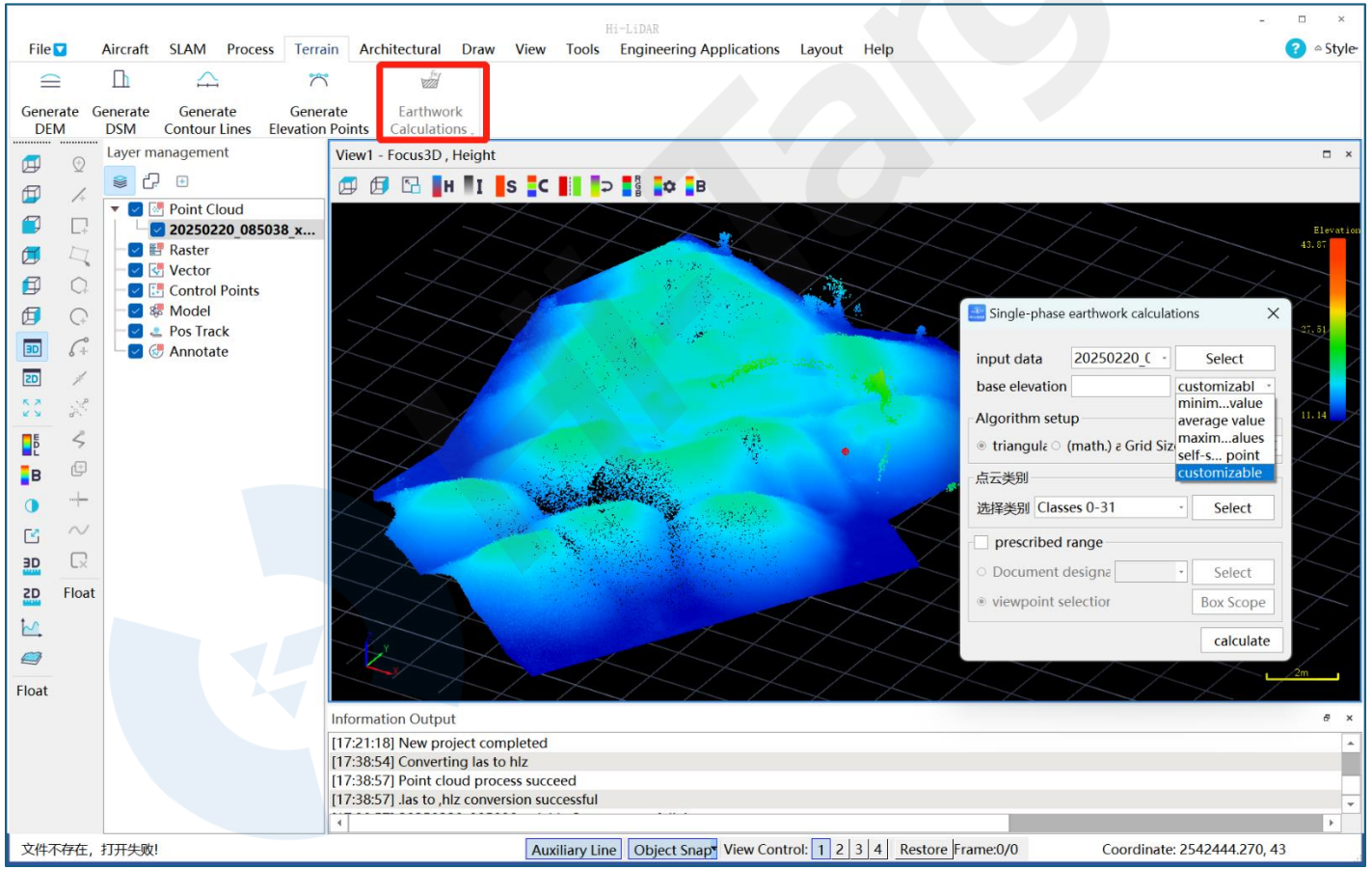
After the point cloud processing is completed, navigate to the “Tools” menu in the menu bar and start the point cloud clipping.



Data processing

Step 2: Earthwork Calculation

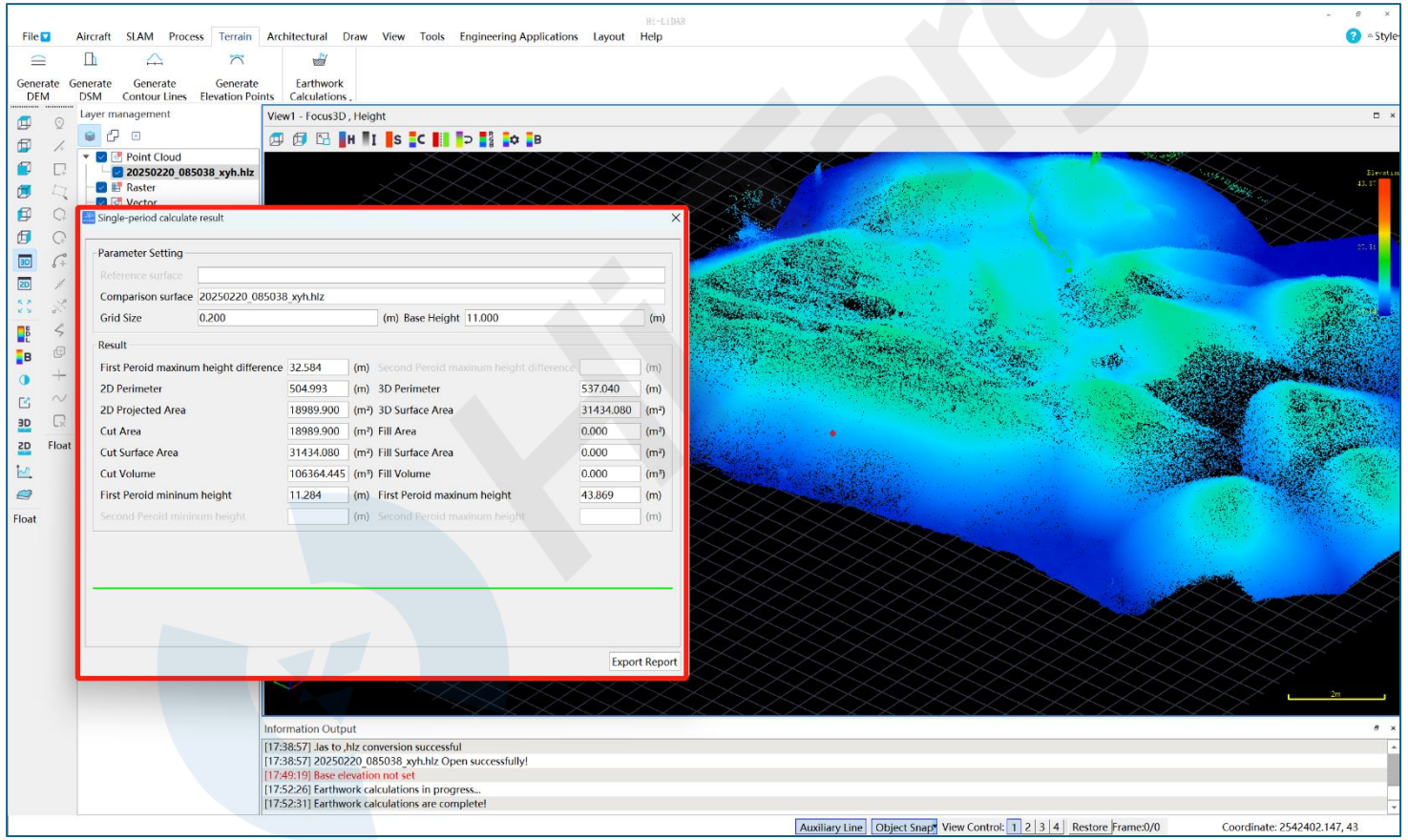
After point cloud clipping, select Terrain / Earthwork Calculation (Single / Multi-Period), set the base elevation and grid size, and calculate.



Data processing

Step 3: Export report

Preview calculation results, export report.



3

Q&A

Q&A

1. What is the product positioning of V700S?

The V700S is Hi-Target's innovative, next-generation engineering surveying system. It integrates GNSS positioning, LiDAR, a global shutter camera, and a high-precision inertial navigation module. The system innovatively fuses high-precision RTK and laser SLAM, leveraging multi-layered complementarity to significantly enhance positioning accuracy and system reliability, and expand system usability in complex environments. It is a differentiated, high-end, professional RTK product, and also a cost-effective SLAM product.

2. What are the differences and advantages between SLAM-RTK and conventional RTK products on the market?

- Leverages laser reverse technology, enabling precise measurements in environments with limited or no GNSS signals;
- Employs SLAM imaging technology for non-contact measurement, providing "what you see is what you measure" capability;
- Functions as a standard SLAM product, offering high integration, extended battery life, and simplified operation (scene adaptability, control point elimination, loop closure elimination, consistent indoor/outdoor coordinate framework);
- Facilitates quick on-site stockpile volume measurements, eliminating the need for post-processing;
- Utilizes GNSS+SLAM fusion algorithms to eliminate "fly points" and ensure data accuracy;
- Maintains all standard RTK functionalities.

Q&A

3. What is the use of initializing the SLAM-RTK mode and SLAM-image survey mode of the V700S? What should I pay attention to during use?

The initialization process for SLAM-RTK and SLAM-Image survey mode consists of two key steps:

◆ Static Initialization

Purpose: To initialize the system's pose and build the initial map, guaranteeing subsequent positioning and mapping accuracy.

Usage Guidelines:

1. **Maintain device stillness for 3-5 seconds, avoiding significant movement**, until initialization is complete.
2. **Orient the device towards feature-rich objects such as buildings, avoiding moving vehicles, crowds, and open spaces**.
3. **Ensure the LiDAR sensor is unobstructed** and avoid surrounding the device with personnel.

◆ Move a distance

Purpose: To complete the initial alignment of the local coordinate system with the absolute coordinate system, ensuring the accuracy of SLAM-RTK and SLAM Image survey.

Usage Guidelines:

1. After RTK fixed, **it is recommended to traverse an L or Z-shaped path, moving 5-8 meters in each of the two perpendicular directions, avoiding straight lines.**
2. A longer travel distance during initialization results in better initialization performance; insufficient initialization may lead to decreased accuracy.
3. Select **open, unobstructed scenes** for initialization to ensure reliable GNSS accuracy during the process.

Q&A

4. Why V700S need to be initialized during 3D scanning? What are the precautions?

This process is necessary to calibrate the internal sensors and ensure the accuracy of SLAM-based measurements. Initialization can be performed by simply holding the device stationary as prompted during startup, eliminating the need for complex procedures or lengthy waiting periods.

Precautions:

1. Ensure the device is held steady and stable during the initialization process;
2. The Lidar should be directed towards a **feature-rich environment**, such as buildings or trees, to facilitate accurate sensor calibration;
3. Ensure the laser's path is free from moving objects or obstructions that may interfere with feature recognition;
4. **Avoid scanning highly reflective objects**, such as glass curtain walls or vehicle windows, as they can introduce excessive noise into the resulting point cloud.

Q&A

5. How long does a single battery last for the V700S? How many batteries does it come with?

- The V700S is powered by lithium battery, and the operation life of SLAM mode is better than 5 hours, and the operation life of RTK mode is better than 10 hours;
- The V700S product is standard with 1 battery;

6. How much storage space does V700S have?

V700S features 512GB of internal storage, supporting automatic circular storage of static and LAS data. In practical testing, the V700S generates approximately 6GB of point cloud data in 10 minutes and 33GB in 1 hour, which fully meets operational requirements.

Q&A

7. What should we consider when using the V700S product in SLAM-RTK mode?

- During demonstrations with accompanying personnel, ensure they follow behind the data collector, avoiding side-by-side positioning to minimize interference;
- **Avoid abrupt rotations or violent shaking of the pole**. Maintain steady and smooth movements during data collection for optimal results. When taking a shot, hold the pole steady for 1-2 seconds before clicking collect;
- When vehicles or pedestrians are nearby, turn your back to the moving objects until they have passed to minimize interference. Then, resume data collection;
- When collecting data near wall corners, **avoid positioning the LiDAR facing directly into the wall**, as this will obstruct the field of view. It is recommended to position the LiDAR facing away from the wall;
- Open doors in advance when entering or exiting rooms, and move slowly with your back facing the doorway to ensure consistent data capture;
- Use stairs when transitioning between floors. Elevator use may lead to mapping failures. When using stairs, avoid close proximity to walls;
- In corridors, tilt the device slightly forward, aligning the LiDAR with the corridor's end to minimize drift in the direction of travel.

Q&A

8. What should we consider when using the V700S product in SLAM-image survey mode?

- **Maintain a photography distance of no more than 10 meters**. Exceeding this distance can significantly compromise measurement accuracy;
- During SLAM image survey, **refrain from sudden rotations or excessive shaking of the measurement rod**. Such actions can lead to measurement failures or reduced accuracy;
- **Position measurement points away from image edges**. Image distortion is more pronounced at the edges, which can negatively impact point accuracy;
- Within 5-10 seconds before and during photography, **ensure no dynamic objects (e.g., pedestrians, vehicles) pass between the device and the actual measurement location**. Presence of such objects can introduce erroneous point cloud data, affecting accuracy;
- **Avoid selecting measurement points on objects with low reflectivity, transparency, or high light absorption**. Examples include glass, liquids, smooth water surfaces, mirrors, and asphalt;
- **For optimal measurement results, select objects with rich features. Allow the laser to scan the object thoroughly (5-10 seconds) before capturing images;**
- Utilize auxiliary points to enhance measurement point accuracy and prevent misselection at object edges. **Auxiliary points and measurement points must lie on a depth-continuous plane.**

Q&A

9. What should we consider when using the V700S product in 3D scanning mode?

- **Avoid abrupt rotations or excessive shaking of the measurement rod** during SLAM image measurement. Such movements can lead to measurement failures or reduced accuracy;
- **Reduce the scanning of highly reflective surfaces**, such as glass curtain walls or vehicle windows, as they introduce significant noise into the point cloud output;
- In indoor environments lacking GNSS signals, the point cloud coordinate system requires transformation using external control points;
- When scanning indoor scenes, ensure all doors are open and move in and **out of rooms with backward-facing movements at a slow pace**; Utilize staircases for floor transitions, as elevator use may result in mapping failures; Avoid close proximity to walls when ascending or descending stairs; Increase the turning radius during turns to prevent sharp turns and avoid hugging the inner curve of bends;
- In corridor environments, slightly tilt the device forward to align the laser with the corridor's end, minimizing forward drift;
- The V700s product performs optimally within a 25-meter measurement range. Recommended scanning scenarios include **small-volume stockpiles and low-rise buildings**. For larger measurement ranges and GNSS-denied environments, employ small loop scanning patterns..

Q&A

10. What should we consider when using the V700S product in 3D scanning mode?

The V700S enables direct volume calculation within the Hi-Survey software. Users can interactively select the desired volume calculation area from the real-time point cloud and input design elevations to obtain immediate results. The V700S also supports volume calculation using the Hi-LiDAR point cloud post-processing software.

Note:

- To ensure accurate volume calculation results, it is crucial to avoid areas with dense vegetation or structural obstructions that may obscure the ground surface;
- Currently, the V700S does not support re-opening and processing scanned point clouds on the tablet.

11. What scenarios are V700S products suitable for 3D scanning? Can it be used for facade measurement?

The V700S integrates the MID360 laser scanner, offering an effective measurement range of 40 meters. It is best suited for small-scale, localized 3D scanning applications, maximizing operational efficiency. It can also be utilized for building facade scanning of structures with limited height. For scanning taller buildings, it is recommended to use equipment with a longer measurement range, such as the Hi-Target professional SLAM product LS1.

Hi-Target

THANK YOU

To be the Global Leader in
Geospatial Solutions