Cygnus Lite User Manual

Manual Revision

SatLab GEOSOLUTIONS AB

Revision Date	Revision Level	Description
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Cygnus Lite

User Manual

Preface

Introduction

Welcome to the SatLab Cygnus Lite. This introduction describes how to use this product.

Experience requirement

To help you use the SatLab products better, SatLab suggests that you read the instructions carefully. If you are unfamiliar with the product, please refer to https://www.satlab.com.se/

Tips for safe use

Notice: These are special operations and need your special attention. Please read them carefully.

Warning: The contents here are very important as the wrong operation may damage the machine. This can lead to the loss of data, or break the system and endanger your safety.

Exclusions

Before using the product, please read these operating instructions carefully, as they will help you to use it better. GeoSolution i Göteborg AB assumes no responsibility if you fail to operate the product according to the instructions or operate it wrongly because you have misunderstood them.

SatLab is committed to constantly perfecting the product's functions and performance, improving its service quality and reserves the right to change these operating instructions without notice.

We have checked the contents of the instructions and software and hardware but please note the possibility of deviation. The pictures in the operating instructions are for reference only and the actual products may vary from them.

Technology and service

If you have any technical issues, please call the SatLab technology department for help, and we will answer your question.

Relevant information

You can obtain this introduction by:
Purchasing SatLab products: this manual is found in the instrument container and will help you to operate the instrument.

Logging on to the SatLab official website and downloading the electronic version of this introduction from Partner Center: http://members.SatLab.com.cn/

Advice

If you have any suggestions for this product, please email us: sales@SatLab.com.cn. Your feedback information will help us to improve our product and service.

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Chapter 1

Overview

This chapter contains:

- Software Introduction

- Cygnus Lite Device Introduction

1. Overview

1.1 Cygnus Lite Device Introduction

1.1.1 Cygnus Lite Packing List

Figure 1-1 Cygnus Lite Packing List

Notice: Please use this product's standard charger to charge the receiver. We will not be responsible for any accidents that occur during the charging process or any damage to the instrument if you use other chargers instead.

1.1.2 Cygnus Lite Device Introduction

Figure 2-2 Cygnus Lite

- **LiDAR Sensor:** Mainstream DJI Livox MiD360 Sensor, with 200,000 pts/s.
- **2*12MP Cameras:** Dual 12MP HD Camera for vivid colorization of point cloud.
- **Handle Battery:** Quick lock & release battery supports max 90min scanning.
- **Power Button:** All-in-one button for battery indication and power on & off.
- **GNSS Antenna:** Built-in multi constellation & frequency high-precision GNSS chipset.
- **TF Card Slot:** Hot-swapping TF Card supports maximum 1TB storage.
- **MagSafe Ring:** MagSafe ring to attach mobile device easily as going with the scan.
- **GCP Benchmark:** Ground Control Point benchmark for known points collection.

Notice:

1. The measurement accuracy, reliability, and initialization time depend on various factors, including environment complexity, lighting conditions, scanning speed and feature richness. The data is derived under normal conditions.
2. Irregular operations such as rapid rotation and high-intensity vibration may affect the localization and mapping accuracy of the SLAM system. It is recommended to maintain steady movement for optimal results.
3. The battery operating time is related to the operating environment, operating temperature, and battery life. Using the device in low or high-temperature environments may affect battery performance.
4. Large open spaces or environments with few features may reduce the performance of the SLAM system. It is advisable to use the system in scenarios with sufficient features.

1.2 Software Introduction

SatPoint is a mobile app used with SatLab's innovative handheld lidar product - Cygnus Lite, including IOS and Android versions. The software provides functions such as device connection, firmware upgrade, and full-process visual scanning operations. Users can interactively view real-time reconstructed true-color three-dimensional space point clouds, fully displaying rich information such as acquisition status, storage, power, RTK status, and network, to avoid missed and wrong picks during scanning operations. The software interface is simple and interactive, you can get started directly with no basic knowledge.

Figure 3-3 Software interface

Chapter 2

Data Collection Process

This chapter contains:

- Connecting the Device

- Data Collection

2. Data Collection Process

2.1 Connecting the Device

1. Enter the main interface of the App.
2. Click "Device Connection" to the mobile phone settings interface -> Look for it in WLAN "SatLab-" wireless network, connected to this network.

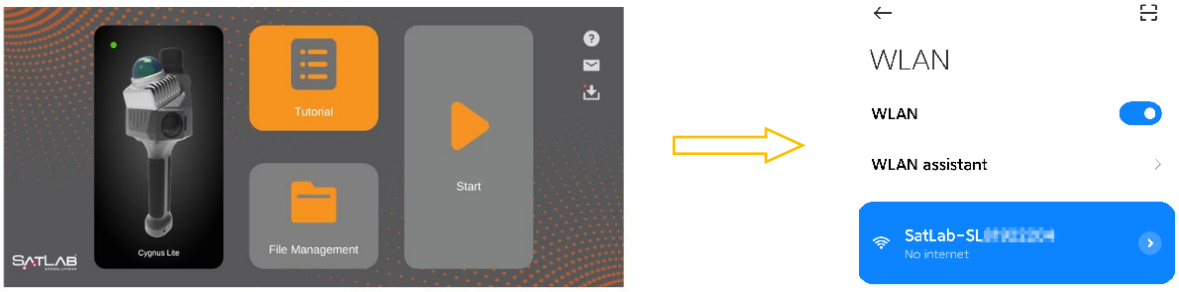


Figure 2-1 Device Connection

Note: When WiFi won't connect, check and try:

1. When clicking to connect to a wireless network, select a connective option that can make it durable, such as "Trust this WIFI" and "Don't disconnect".
2. Turn off network proxy or traffic-interception software, such as VPN (if enabled).
3. Turn off advanced WLAN settings such as "Dual WIFI acceleration", "Intelligent selection of the best WLAN", "Data network acceleration", "Automatic switching of data networks", etc. (if turned on).
4. If none of the above operations solve the problem, you can try turning off the SIM card mobile network on your phone and then reconnecting it.

2.2 Data Collection

2.2.1 Enter the operation interface

On the main interface of the software, click "Start" to enter the project interface.

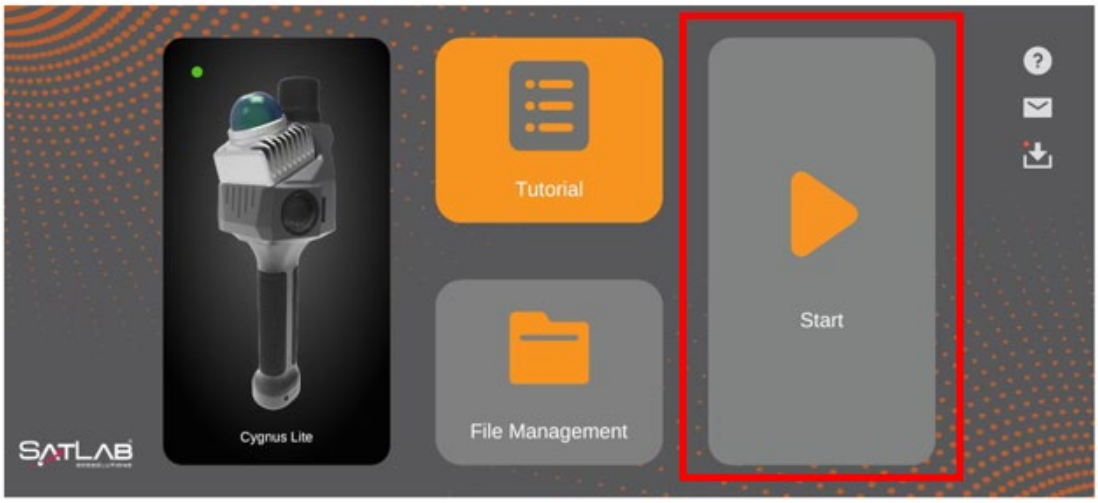
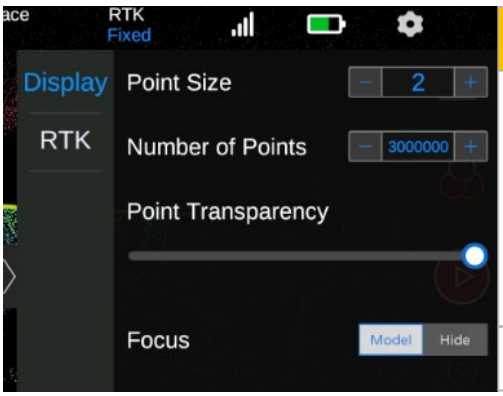


Figure 2-2 SatPoint App interface

2.2.2 Parameter settings

1. Click the "Settings" button to set the point cloud display, RTK, etc.



	Parameter	Parameter description
Display	Point Size	Point cloud render size, ranging from 1-10
	Number of Points	The maximum number of point cloud renders in a scene, up to million
	Point Transparency	Point cloud transparency settings
	Focus	Controls the visibility and suppression of the model at the focal point of the 3D scene
RTK	RTK switch	Button to control RTK switch (RTK account can be entered according to needs, NTRIP mode account is supported)

Figure 2-3 Parameter settings

2. You can enable RTK and connect to a network CORS account to support NTRIP network CORS access. The use of the RTK module can greatly improve the accuracy of data acquisition, and it is recommended to enable this function.

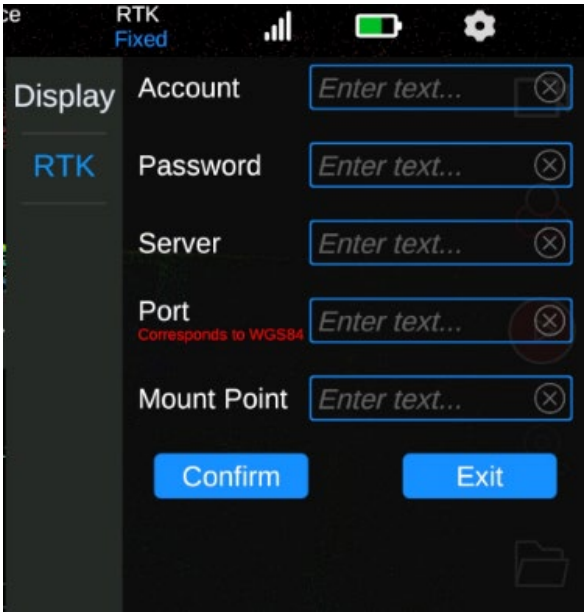


Figure 2-4 RTK Connection

2.2.3 Create a new project

When the device status is “Ready“, click the “Start” button to start the project. At this time, the "New Project" window will pop up, enter the project name and click "Confirm".

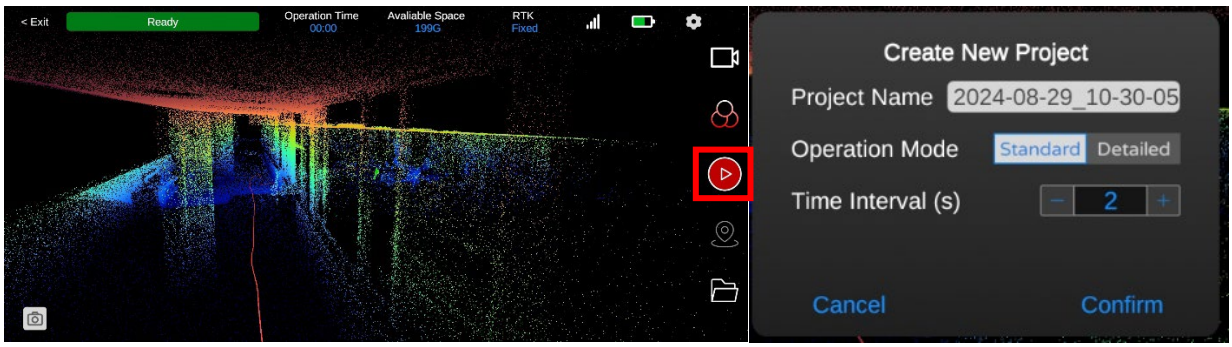


Figure 2-5 New project

2.2.4 Data collection

Keep the device stationary to complete initialization, and when the device status shows "Recording", the scan project can be performed.

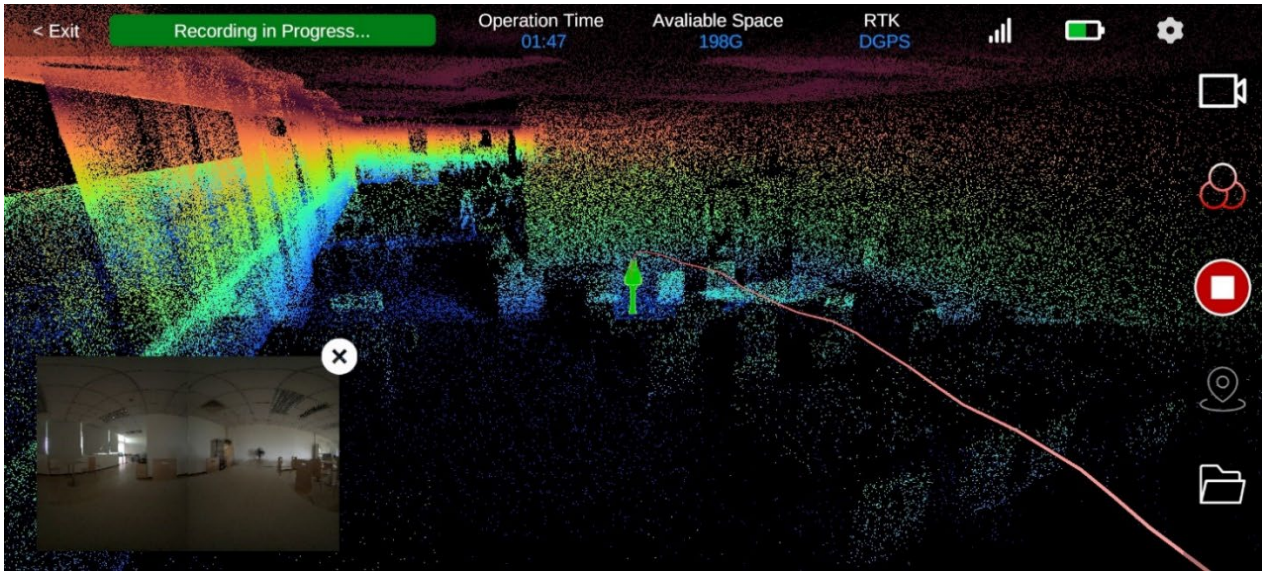


Figure 2-6 Data collection

The software displays the reconstructed 3D space point cloud information and collection trajectory in real time, you can manually view the 3D true color point cloud in space.

Introducing status bar related situations:

1. Exit: Return message main interface.
2. Status: Presentation of current state.
3. Operation time: Prompt the working time of the current project.
4. Available Space: The remaining space on the device memory card.
5. RTK state: RTK Equipment status.
6. Signal: Device signal status.
7. Electricity: Equipped with electricity amount indicator.
8. Configuration: Project parameter settings, click to set relevant parameters.
9. Maneuvering model: Roaming mode switching, including free roaming and third-person modes.
10. Point printing model: Switch the display mode of point cloud in the 3D scene, including three modes: color point cloud, intensity coloring and elevation gradient.
11. Start/End: Control the start and end of the project.
12. Control point management: Add, delete, and overwrite control points in the operation area. Control points can enhance the overall calculation accuracy of the data collected by the operation.
13. File management: Jump to the file management page, where you can manage, delete, and view local/mobile project data.
14. Photo information: View the photos currently taken by the device.
15. Three-dimensional scene: The device analyzes and displays the collected point cloud in real time. You can manually zoom in/out/translate the three-dimensional scene to view the point cloud details.

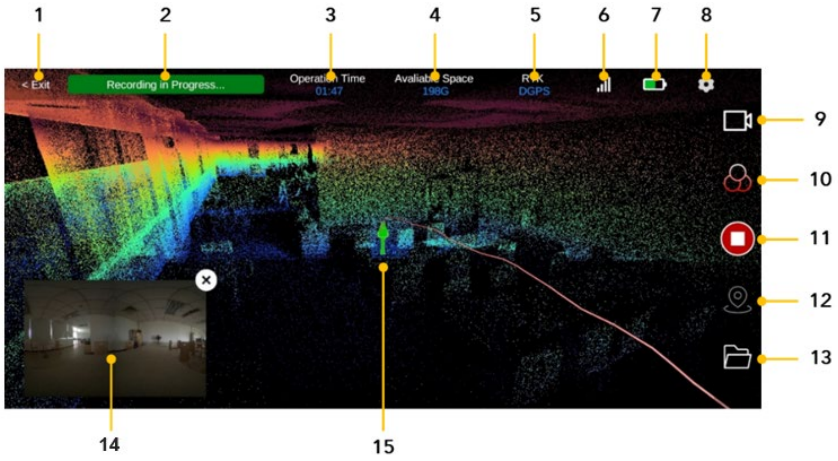


Figure 2-7 Introducing status bar

2.2.5 Add control points

When the work area cannot be connected to the network CORS account, in order to obtain the laser point cloud data that is referenced to the real geographical location, the control point location can be added during the scanning process. Click the "Control Point Management" button on the right side of the software to add a new control point or overwrite/delete an existing control point.

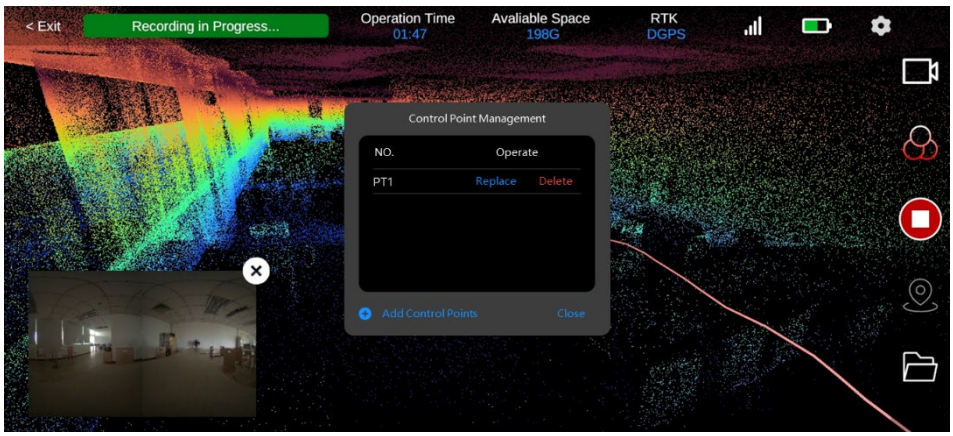


Figure 2-8 Add control points

Scanning tips:

1. Once you start scanning, keep your device steady and move at a slightly slower speed.
2. If you find that the color point cloud on the mobile phone is slow to update, you can stand still and wait until the color point cloud display on the mobile phone is dense before continuing to move (it takes a certain amount of time for the device to color the point cloud).
3. In order to better record the pipeline at the top of the building or the ground of the site, the equipment can be re-scanned again by changing the angle up or down.
4. If you want to record a complete object, you can scan it around the object to better record its outer contours.

5. If you need to record the part with information (signboards, posters, large screens, etc.), it is recommended to stand still for 1~2 seconds to scan it to improve the efficiency of object coloring.

Better color results:

In order to obtain the local high-definition effect, it is recommended to stand at the position where the high-definition data needs to be obtained for 1~2s when scanning, so that the picture is clearer.

Prevent data degradation:

1. In a narrow space or a single structure scenario, there is a small probability of degradation in scanning, which is manifested in the fact that the "device point" on the screen quickly moves away from the actual position at an abnormal speed.
2. In order to avoid this phenomenon, when entering the above scenario, please orient the radar towards a place with rich structures and a long detection distance, and try to avoid the rotational movement of the radar in such a space. Or start the recording of new data, and manually splice the two pieces of data during post-processing.

Avoid people:

1. When scanning, keep the device appropriately away from your body to avoid scanning yourself into the artwork.
2. If the data will be used or analyzed, it is recommended to avoid having others present during the scanning process. This is to prevent the operator or any bystanders from being inadvertently captured in the data, which could affect the data quality.

2.2.6 End the Project

1. When the data collection is complete, click the "End" button to end the collection task.
2. When the data is successfully saved, you can click the "Start" button to continue the next acquisition task, or click the "Exit" button at the top of the software to return to the main interface of the software.

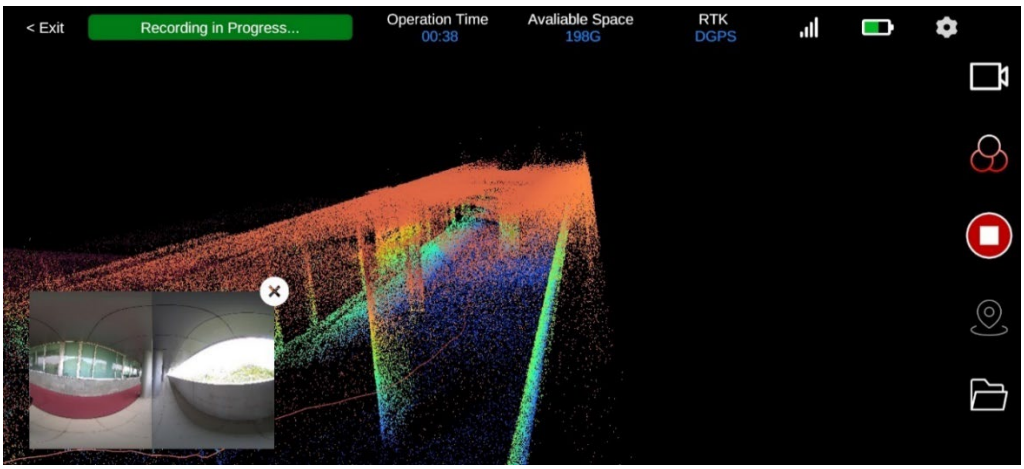


Figure 2-9 End the Project

2.3 Data export and processing

When the device is powered off, take out the SD card and put it into the card reader. Plug the card reader into the computer, copy the corresponding project file to the local computer, and use the point cloud post-processing software "SatPoint" to analyze and generate high-precision point cloud data.

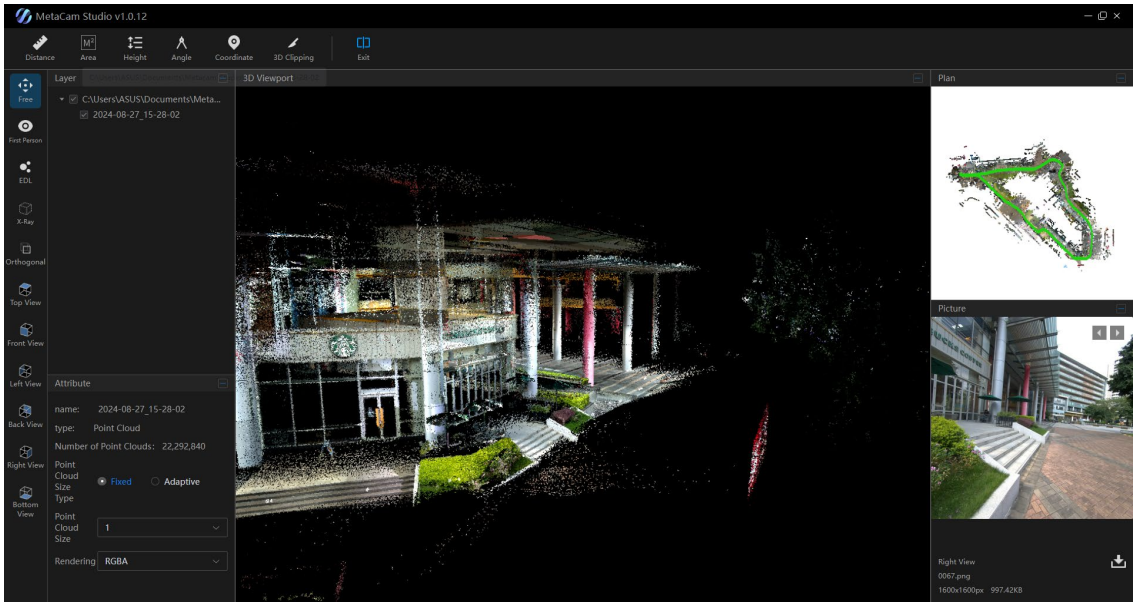


Figure 2-10 SatPoint software interface

Chapter 3

Review Data

This chapter contains:

- File Management

- Download the Project

- Data Review

3. Review Data

3.1 File Management

Click "File Management" on the main interface of the software to enter the file management page. Supports the management of device files and local files.

Figure 3-1 SatPoint App interface

When the device is connected to the app, the device files will be displayed, and the device files can be sorted, deleted, and downloaded.

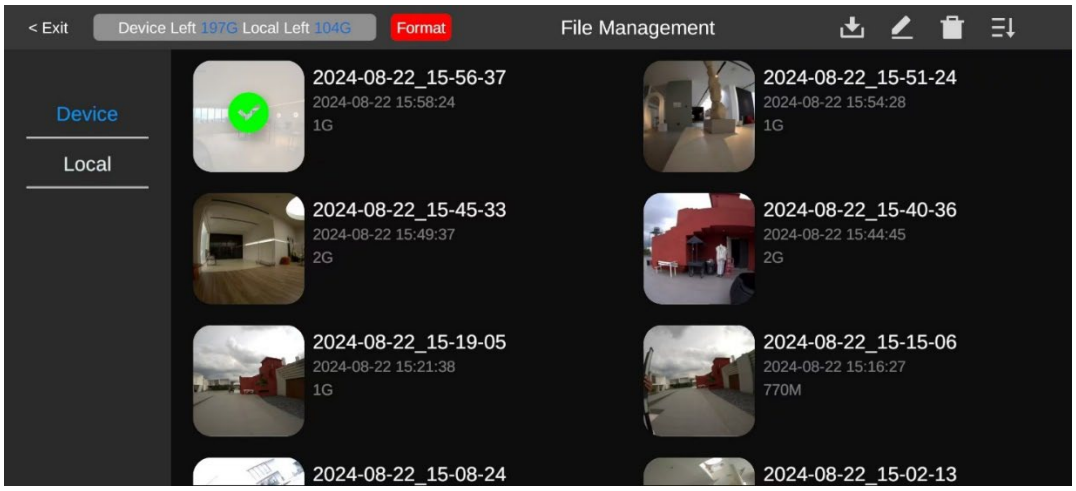


Figure 3-2 File Management

3.2 Download the Project Data

Long press to download the current project data. After the download is completed, the corresponding record will be generated in "Local File Management".

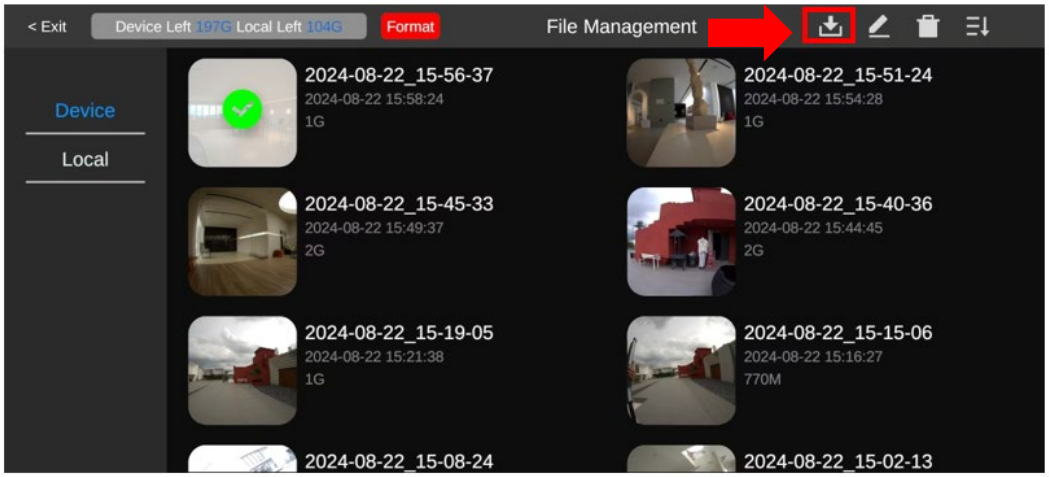


Figure 3-3 Download data

3.3 Data Review

Switch to “File Management” and click the corresponding project.

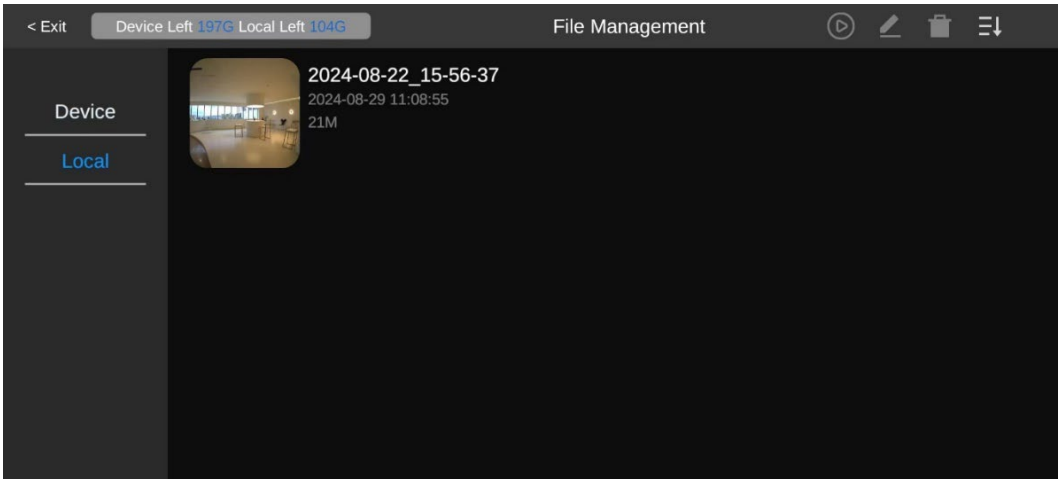


Figure 3-4 Data review

In the "Data Replay" interface, you can rotate/zoom and pan the point cloud.

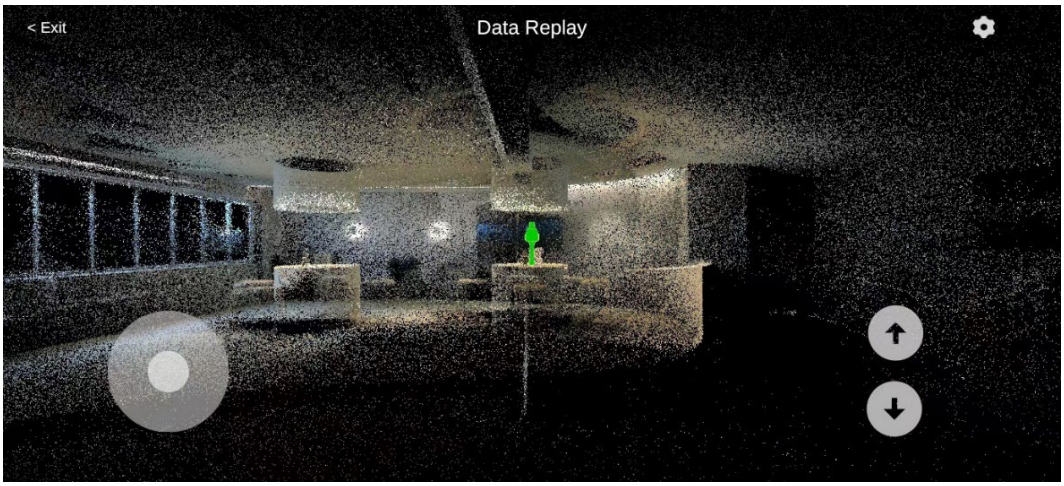


Figure 3-5 Review point cloud data

Chapter 4

Desktop Processing Software

This chapter contains:

- Hardware and software requirements
- Software Installation, Upgrade and Uninstallation
- Software License
- Software Data Processing
- Download and process data
- Software Window Description
- Viewport Control Toolbar
- Tools Menu

4. Desktop Processing Software

SatPoint software is an internal processing tool software for SatLab handheld 3D laser scanner series products. The software provides functions such as original data analysis, 3D point cloud viewing and measurement analysis, and is compatible with SatLab handheld laser radar products. It can completely cover the entire process of data collection-data parsing-data analysis, and fully support the application of 3D laser point cloud.

4.1 Hardware and software requirements

To ensure smooth software operation, the recommended configuration is as follows:

CPU	Intel® Core™ i7-1070CH@2.90 GHz (or AMD processor with equivalent performance)
Graphics	GeForce RTX2060 4GB
Memory	32GB
Storage	64GB or more of available hard disk space
Operating system	Windows 11 Series

4.2 Software Installation, Upgrade and Uninstallation

4.2.1 Software Installation

After obtaining the software installer, double-click to run the installer. Click "Next" step by step on the software installation interface. The installation can be completed quickly, and all installation settings can use the default settings.

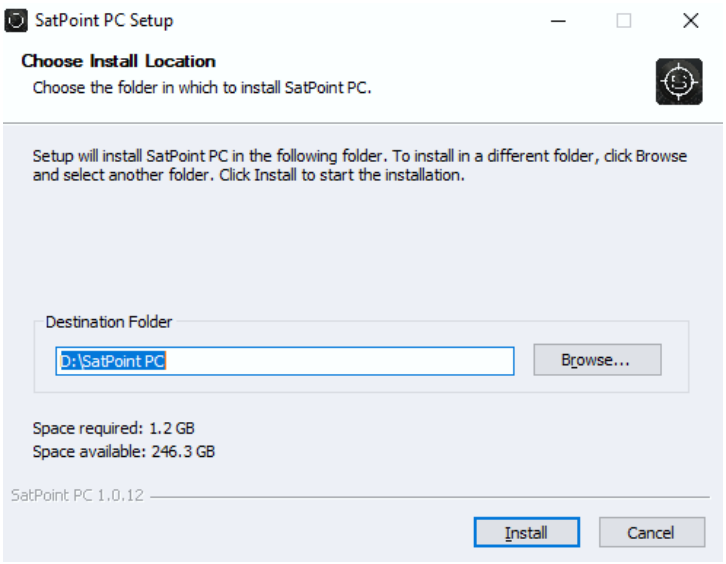


Figure 4-1 SatPoint PC Setup

4.2.2 Software Upgrade

When a new version of the software is available, a pop-up window will appear to prompt you

to upgrade. Click the "Update Now" button to update the software.

4.2.3 Software Uninstallation

In Windows, browse to the directory where the software installer is located and double-click “Uninstall SatPoint Cloud PC.exe” to uninstall the software.

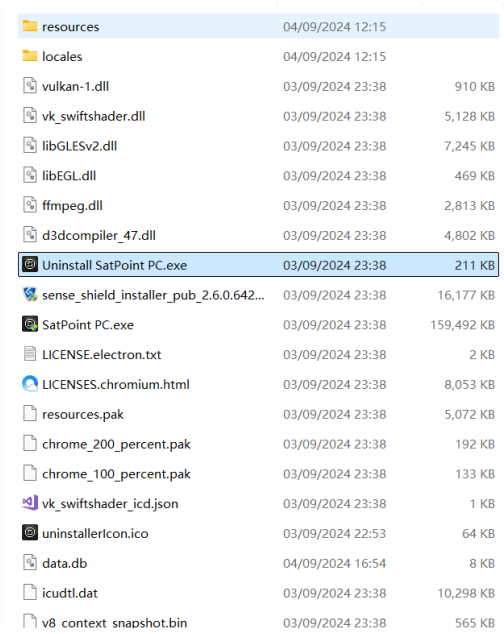


Figure 4-2 Uninstall SatPoint PC

In the uninstallation interface, click "Uninstall" to enter the software uninstallation process.

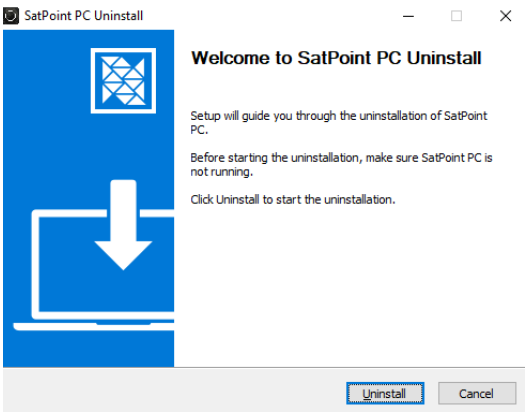


Figure 4-3 uninstallation process

Software uninstallation progress:

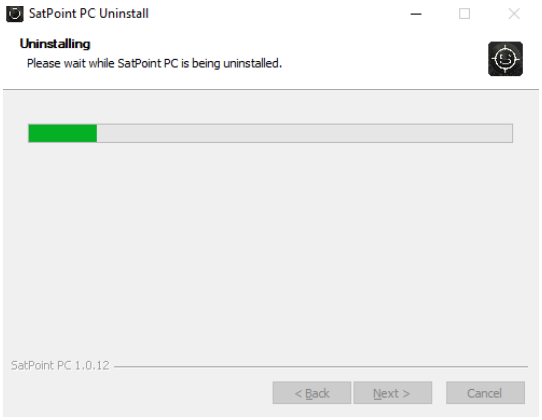


Figure 4-4 uninstalling

Click the "Finish" button to complete the software uninstallation.

4.3 Software License

The software uses a "hardware lock" to authorize the software functions. Please obtain the "hardware dongle" and install it before authorization. Install the encryption driver.

4.3.1 Obtaining a "Hardware Dongle"

The device is purchased with a software dongle.

4.3.2 Driver Installation

After the software is installed, the encryption driver installation interface will pop up. You can also click the"sense_shield_installer_pub_2.6.0.64252.exe" program in the software installation interface to install the encryption driver.

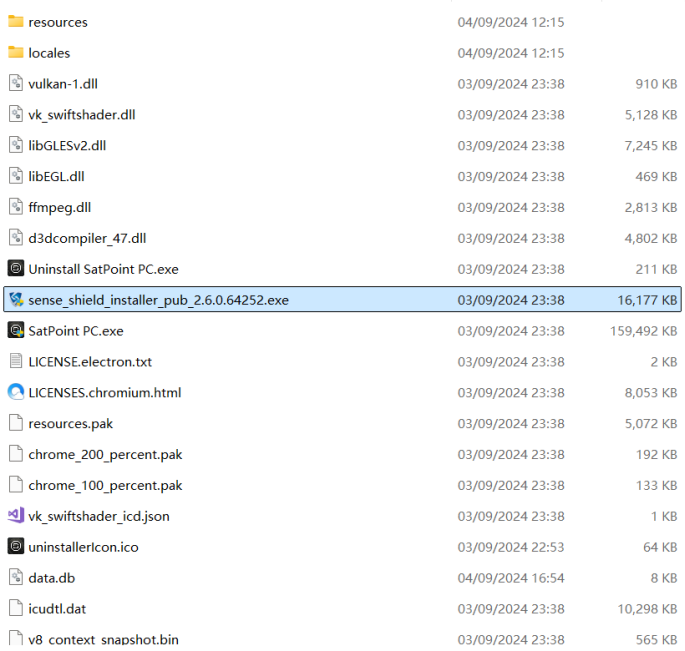


Figure 4-5 Encryption driver

Click "Install" on the driver installation interface and wait for a while to complete the driver installation.

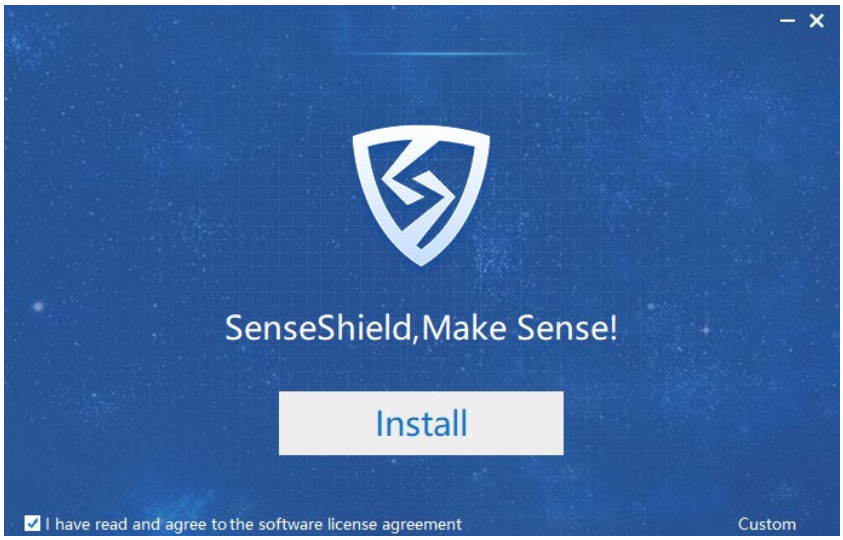


Figure 4-6 Install SenseShield

4.3.3 Software Authorization

Insert the "hardware dongle" encryption program into the computer, open the driver Virbox user tool interface, You can view the software authorization information in the “Dongle”-"Local Dongle".

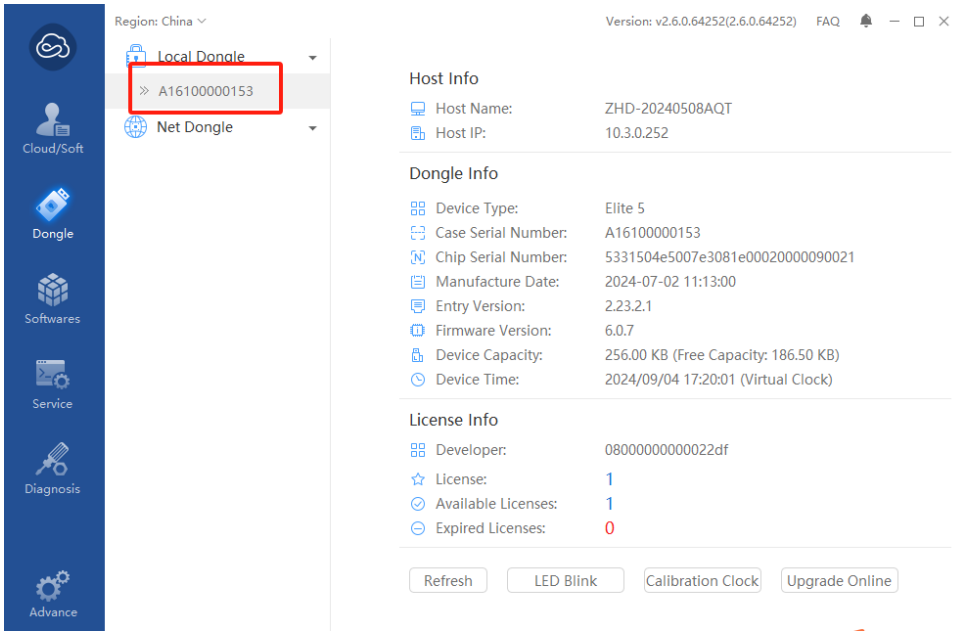


Figure 4-7 Virbox interface

4.4 Software Data Processing

Remove the storage card of the scanner data, insert it into the card reader, connect it to the computer to read the data, and convert the original data into 2024-03-26_xxx Copy and paste a copy to your local computer.

Open the Point Cloud Manager software, select the file copied to the computer, and click “Confirm” to start data processing.

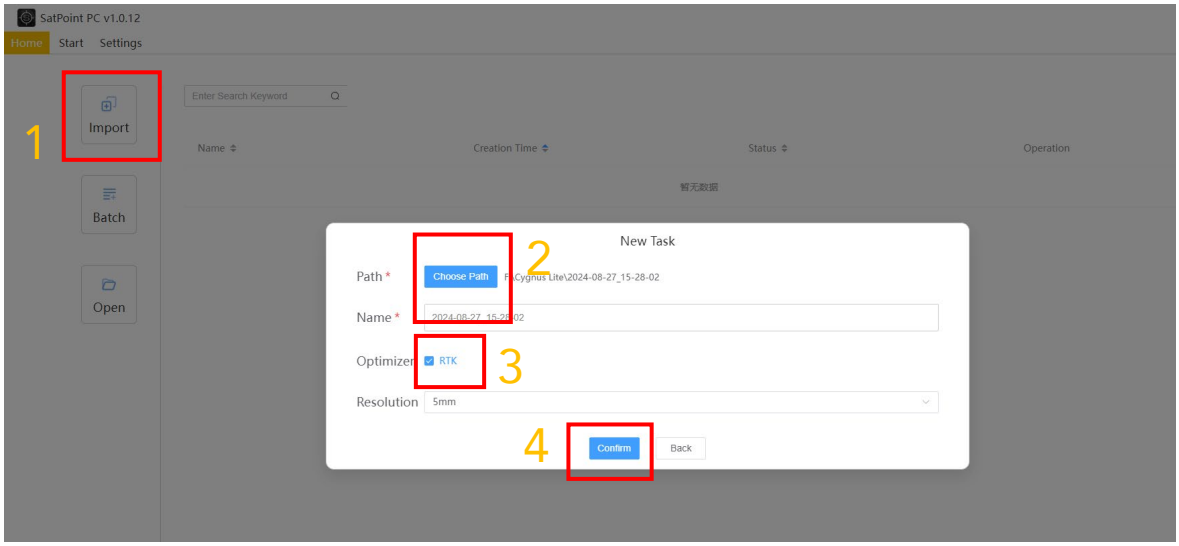


Figure 4-8 New Task

You can also perform batch import tasks. Select the batch import function on the right side and synchronize the file paths of the tasks to be executed for import.

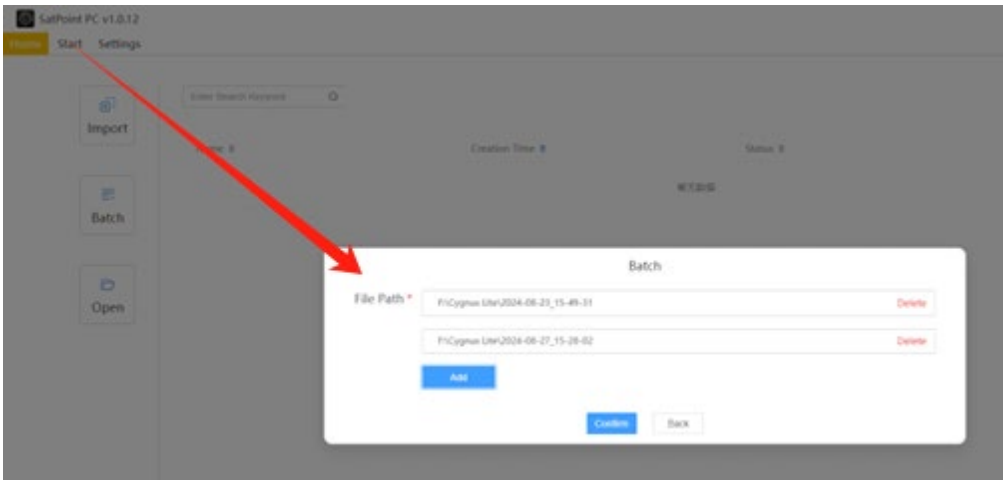


Figure 4-9 Import the task file path

4.5 Download and process data

After the data is successfully imported, click Start Processing, and the status will synchronously display the current data processing status. After the point cloud is processed, it will be displayed. Select open on the right side of the task bar to view the processing effect of the point cloud.

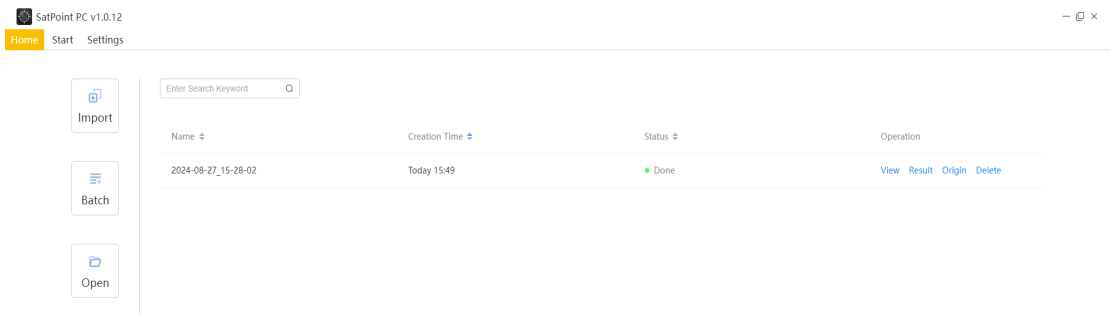


Figure 4-10 process data interface

Open the completed task and adjust the point cloud effect according to actual needs in the toolbar on the left. Show floor plans and photos taken.

Figure 4-11 Floor plans and photos

4.6 Software Window Description

4.6.1 Layer Window

The point cloud files or data loaded in the 3D viewport are displayed in the form of a directory tree, making it convenient for users to operate these files or data.

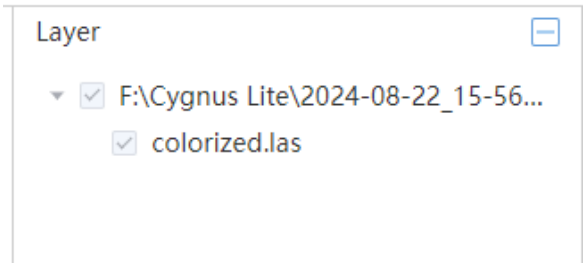


Figure 4-12 Layer Window

4.6.2 Layer Show/Hide

Click the small box in front of the layer to change the visibility of the layer. When the layer is in the "checked" state, the data of the layer is displayed in the 3D scene.

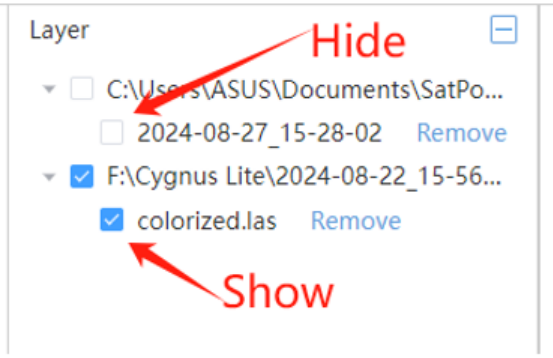


Figure 4-13 Layer Show/Hide

4.6.3 Removing a layer

Click the "Remove" option behind the layer to remove the current layer.

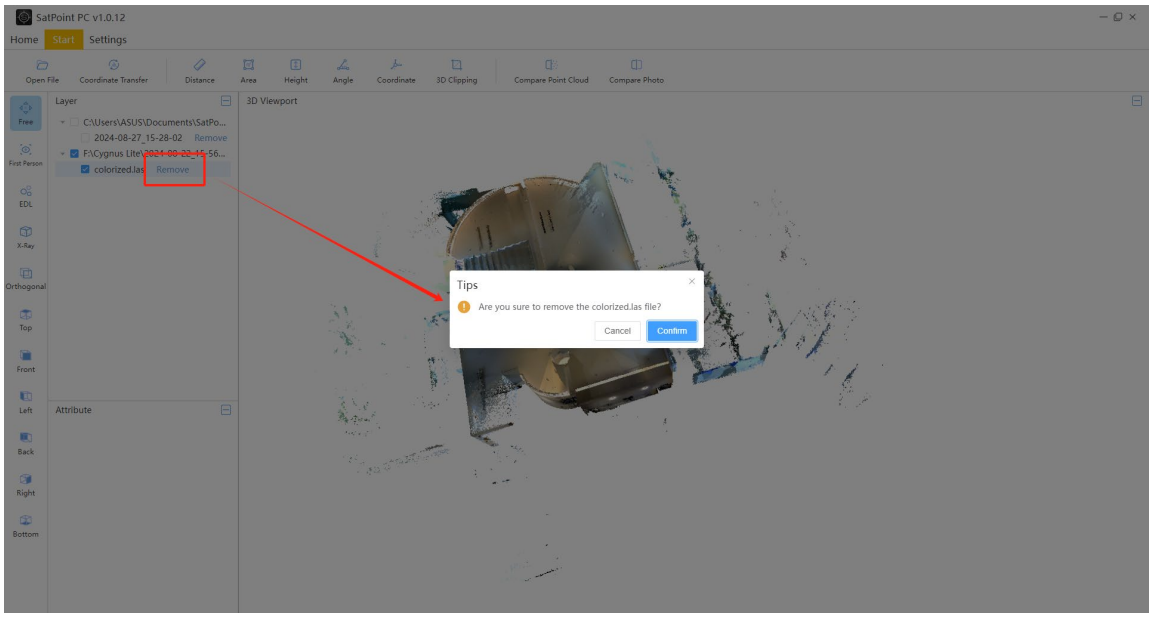


Figure 4-14 Remove layer

4.6.4 Layer Renaming

Select the layer to be operated, right-click and click "Rename".

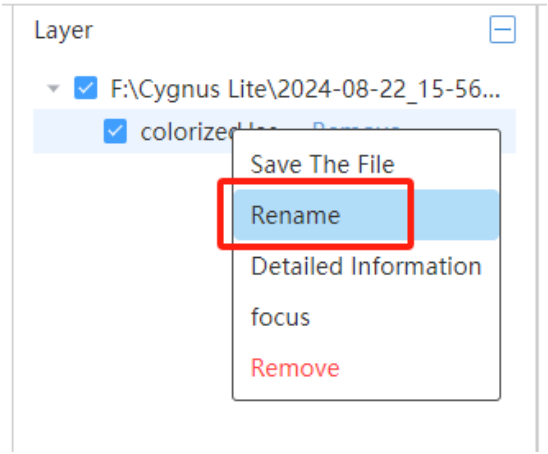


Figure 4-15 Layer rename

Enter a new name in the pop-up window and click the "Confirm" button to rename.

4.6.5 Properties Window

Displays detailed property information of the file or data selected in the layer window, and allows interactively changing related properties of the layer.

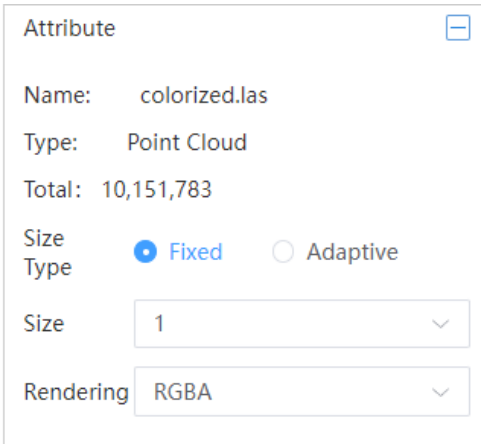


Figure 4-16 Attribute

Point Cloud Properties Window:

Selecting the point cloud layer in the layer window will display the detailed attribute information of the point cloud and allow you to change the attributes of the point cloud.

Figure 4-17 Point Cloud Properties Window

The detailed description of each parameter is as follows:

- Name: the name of the point cloud.
- Type: The type of file or data, displayed as "point cloud".
- Total: Displays the point quantity information of the current point cloud file.
- Size Type: Controls the display size of the point cloud in the scene. When "Fixed" is selected, you can adjust the size in the "Point Cloud Size" parameter. The display size of the entire point cloud; when the "Adaptive" option is selected, the point cloud automatically calculates the size of the point cloud.
- Size: controls the display size of the point cloud in the scene.
- Rendering: Set the rendering mode of the point cloud. The default is "True Color", you can choose to switch to "Elevation" or "Intensity" rendering model.

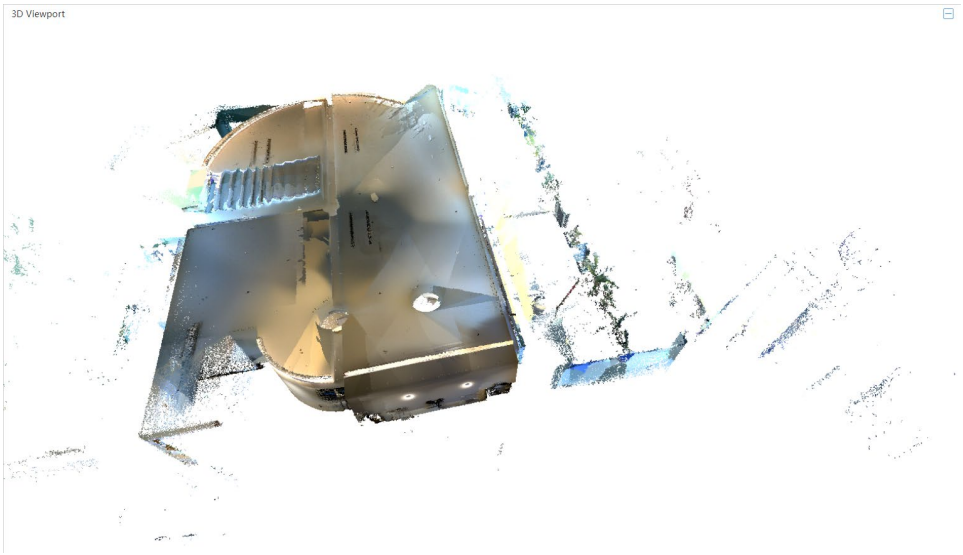


Figure 4-18 True Color Mode

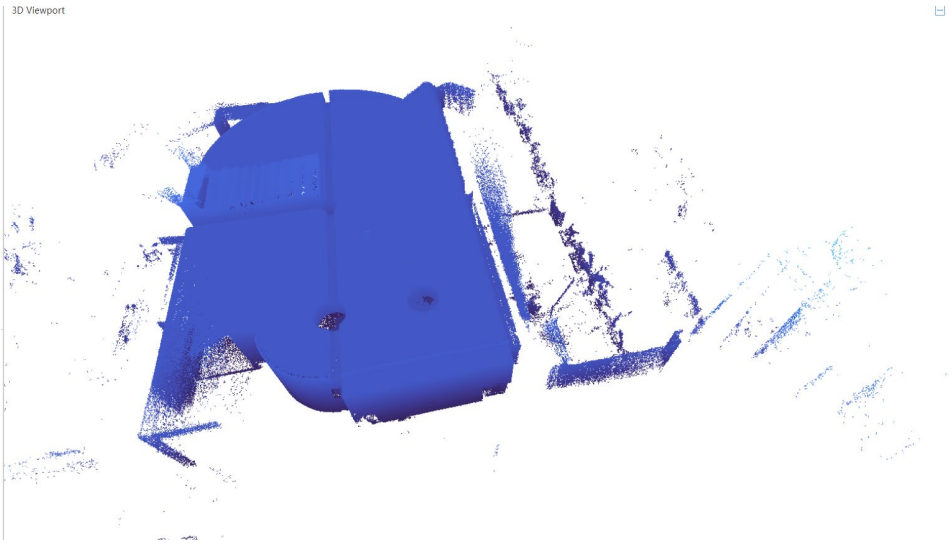


Figure 4-19 Elevation Mode

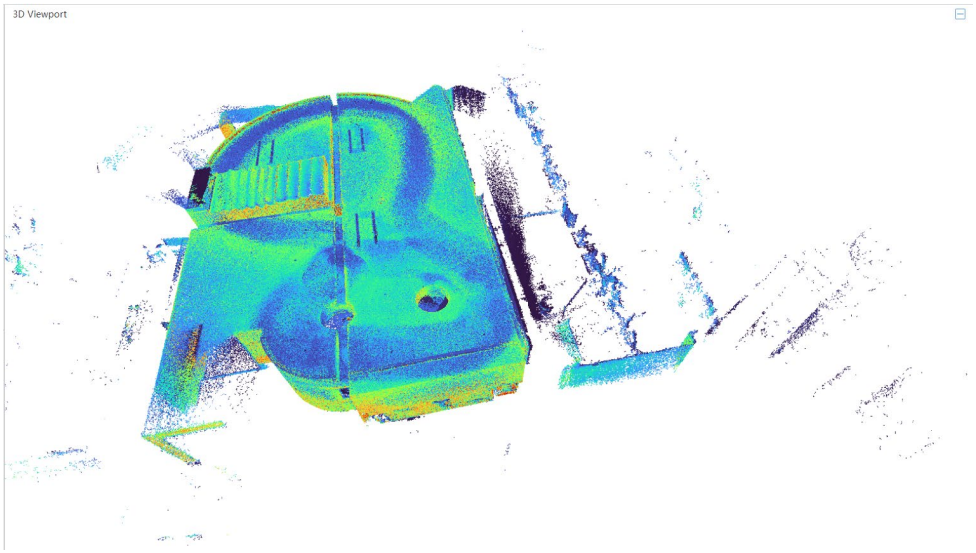


Figure 4-20 Intensity Mode

Measurement Properties window:

Select the "Measurement" layer in the layer window, and information related to the measurement results will be displayed, and the relevant results can also be copied.

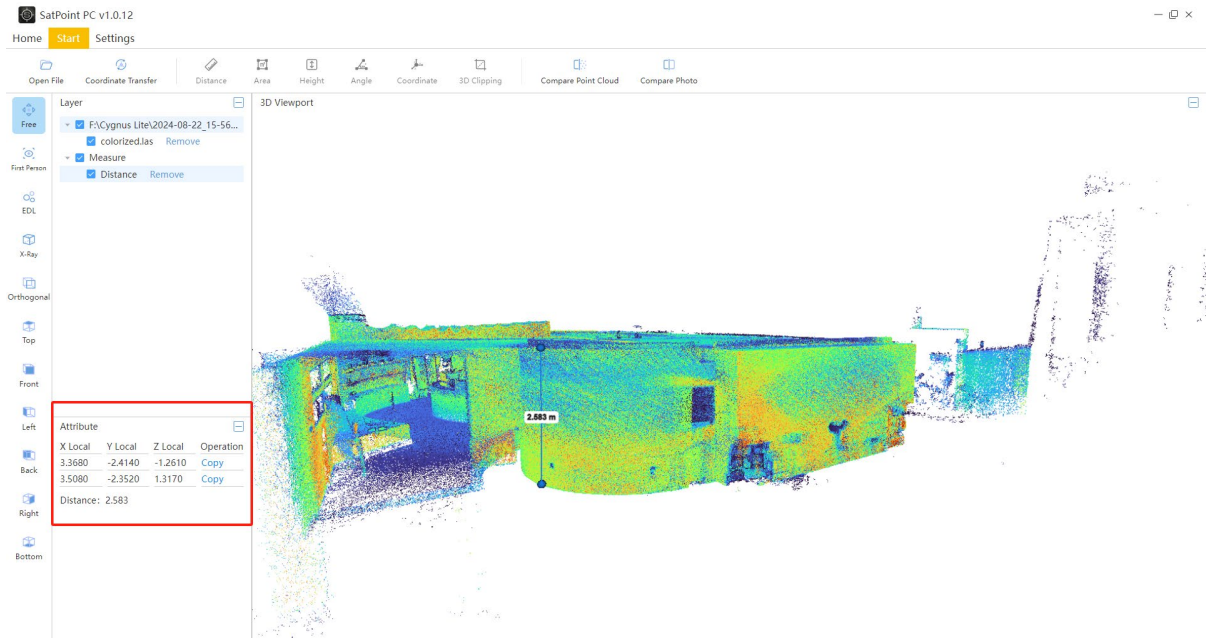


Figure 4-21 Measurement Properties

4.6.6 3D Viewport

The 3D viewport is the main window for point cloud display and supports 3D display of point clouds.

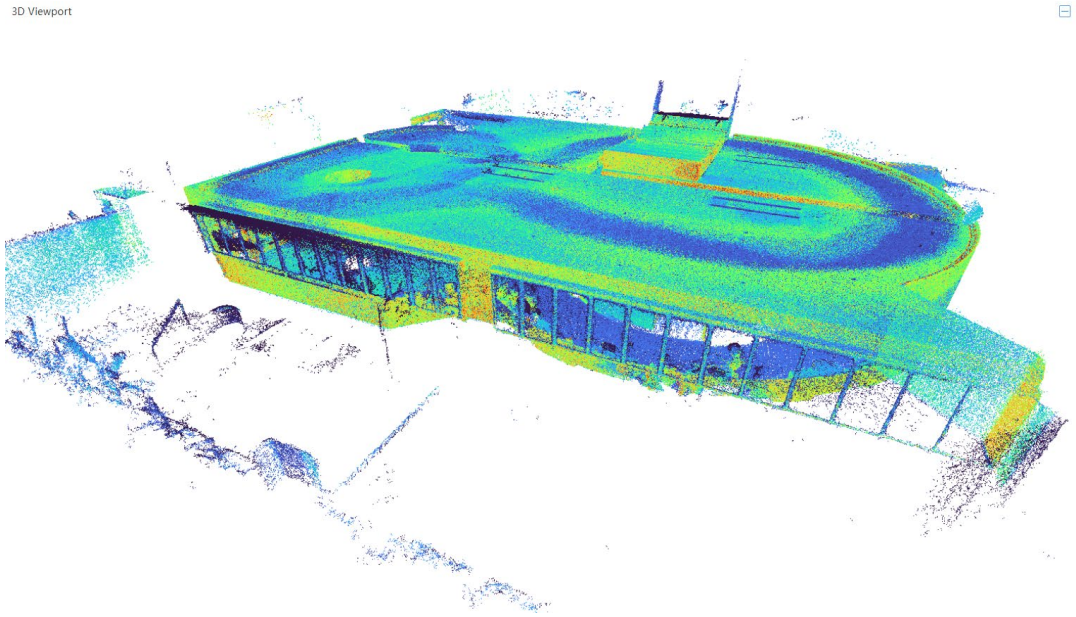


Figure 4-22 3D viewport

The logic of the mouse control viewport operation is as follows:

- Translate: hold down the left mouse button and drag to translate the 3D viewport;
- Rotate: hold down the right mouse button and drag to rotate the 3D viewport;

- Zoom the viewport: scroll the mouse wheel to zoom the scene, and the zoom center is the mouse pick-up point.
- Note: You can also control the display of the 3D viewport through the "Viewport Control Toolbar", see the "Viewport Control Toolbar" section for details.

4.7 Viewport Control Toolbar

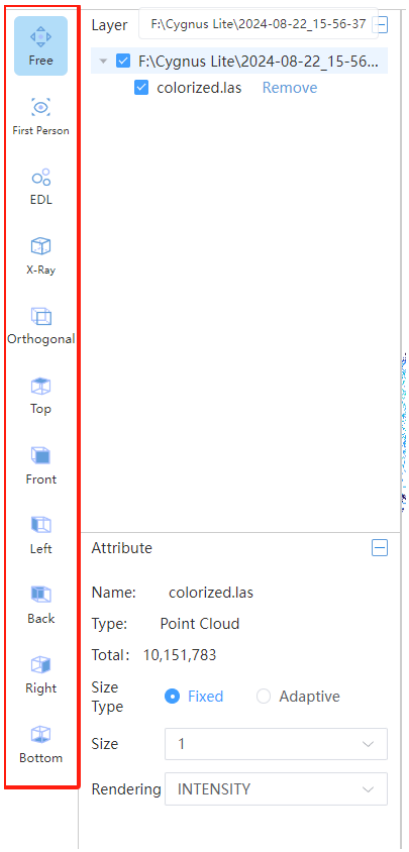


Figure 4-23 Viewport Control Toolbar

4.7.1 Free View/First Person

- Free view: Use the mouse to control the browsing of the point cloud in the 3D viewport, such as translation, zooming and rotation.
- First Person: The browsing of the point cloud in the 3D viewport can be controlled by the keyboard.

W: Forward	S: Backward	A: Left
D: Right	Q: Down	E: Up

4.7.2 Orthographic/Perspective Views

The default mode is perspective. Click “Ortho” to switch to Ortho mode.

Figure 4-24 Perspective Mode

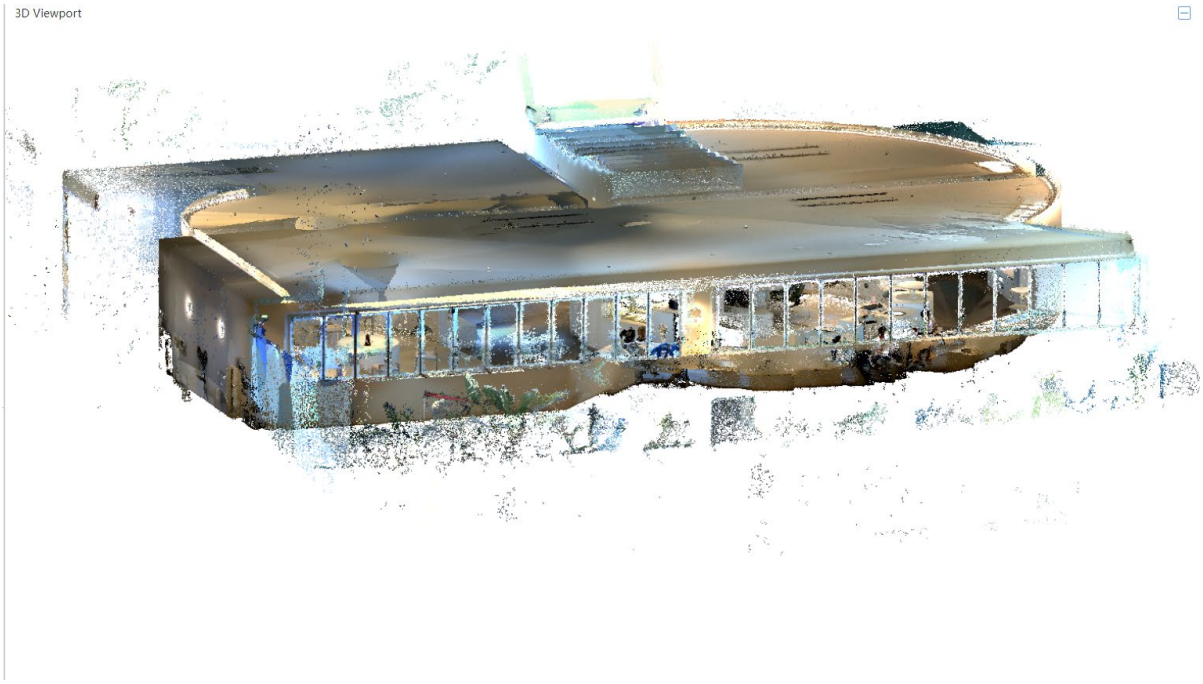


Figure 4-25 Ortho Mode

4.7.3 EDL effect

Visual enhancement technology, by simulating lighting effects to enhance the depth and contour clarity of the point cloud, making the details of the model more prominent.

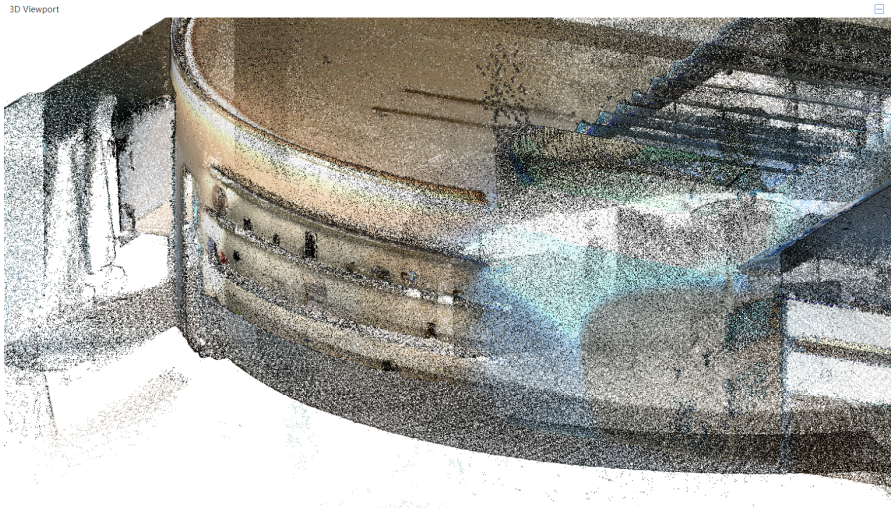


Figure 4-26 Enable EDL

Figure 4-27 EDL is not enabled

4.7.4 Transmitted light effect

Simulates X-ray transmission effect, making it easier to view the internal structure of the model.

4.7.5 Top view/front view/left view/right view/bottom view/back view

You can control the camera to view the point cloud in the 3D viewport from different perspectives.

4.8 Tools Menu

The tool menu provides common measurement functions as well as height profile, 3D cropping, point cloud comparison and photo comparison functions.

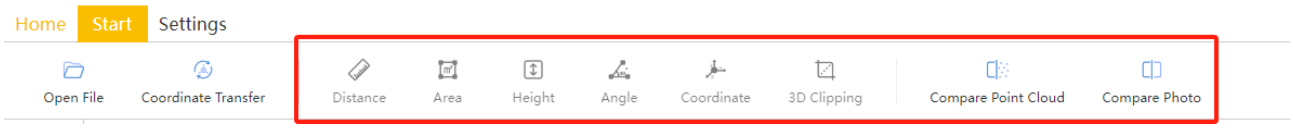


Figure 4-28 Tools Menu

4.8.1 Distance measurement

Click the "Distance (measurement)" button to activate the distance measurement function; click on different points in the scene to measure the distance between two points.

4.8.2 Area measurement

Click the "Area (measurement)" button to activate the area measurement function; click on different points in the scene to measure the area of the polygon.

4.8.3 Height measurement

Click the "Height (measurement)" button to activate the height measurement function; the height information between two points can be measured.

4.8.4 Angle measurement

Click the "Angle (measurement)" button to activate the angle measurement function; click on different points in the scene to measure the angle between two sides.

4.8.5 Position measurement

Click the "Position (measurement)" button to activate the position measurement function; click on a point in the point cloud in the scene, and the mouse will pick up to display the position information of the point.

4.8.6 Height profile

Click "Height profile" to operate the point cloud to obtain the profile information.

4.8.7 Stereo cropping

Click "Stereo cropping" to crop the point cloud data.

4.8.8 Compare point clouds

The compare point cloud function provides users with an efficient way to make intuitive comparisons between point cloud data. By synchronizing the point cloud views in two windows, users can find differences and similarities between different data sets.

The operation process is as follows:

1. **Data loading**

The user first loads the point cloud data to be compared in two independent view windows. This data can be data that has been previously loaded into the layer window, or directly imported from an external file.

2. **View synchronization**

After activating the view lock function, the rotation, translation or zoom operation of the point cloud in one window will be automatically copied in the point cloud view of the other window for synchronous viewing.

3. Independent operation

If a point cloud needs to be viewed in more detail, the view lock can be unlocked and the view of one window can be operated independently without affecting the display status of the other window.

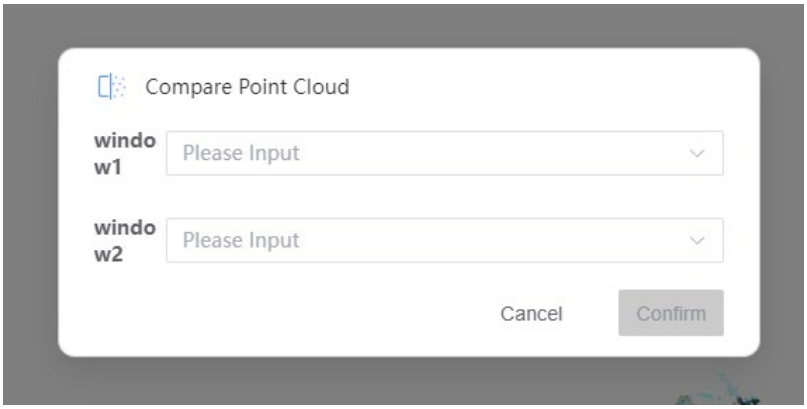


Figure 4-29 Compare Point Cloud

4.8.9 Comparison Photos

The Compare Photos feature allows users to conduct in-depth comparative analysis between 3D models, floor plans and site photos. The functions greatly enrich the user's toolbox in model analysis, field reproduction and data verification.

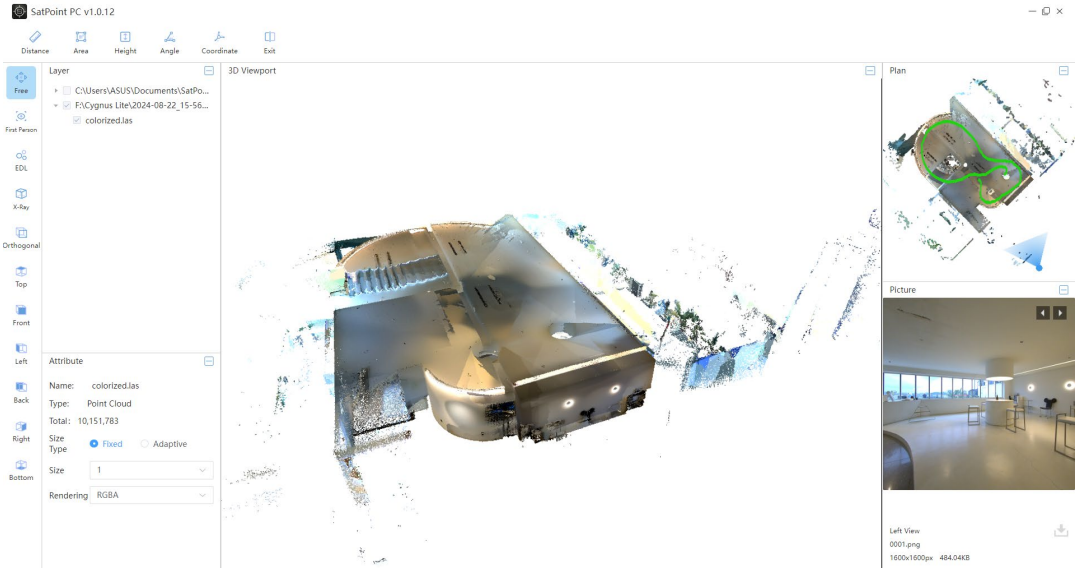


Figure 4-30 Comparison Photos

Chapter 5

Maintenance of Handheld Laser Radar Equipment

This chapter contains:

- Battery & Charger

- Precautions

- Technical Specification

5. Maintenance of Handheld Laser Radar Equipment

Do not disassemble or modify the handheld laser radar equipment without authorization.

Handheld laser radar equipment has been calibrated and debugged before leaving the factory. It is prohibited to disassemble or modify the handheld laser radar equipment without authorization. The user shall bear the losses caused by unauthorized modification of the handheld laser radar equipment. If you need to design or modify the handheld laser radar equipment for installation, please contact SatLab' s Technical Support.

5.1 Battery & Charger

1. Battery: Cygnus Lite has two 3150mAh /14.4V batteries.

Notice: If the battery needs to be stored for a long time, charge it to approximately 70% capacity before placing it back in its original packaging. Store the packaged battery in a dry environment with moderate temperature. It is recommended to perform a charge-discharge cycle on the battery every 3 months. If you do not have the necessary conditions for charging and discharging, take out the battery after 3 months, charge it to about 70% capacity, and then return it to storage.

2. Charger:

For charging, please use the dedicated charger provided with the Cygnus Lite.

After inserting the charger into the TYPE-C port of the charging slot, the power indicator light on the handle will light up, indicating that the battery is connected to the charger. At the same time, you can press the power button on the handle to check the remaining battery power. When charging, you can check the charging progress by observing the number of indicator lights on the battery.

Figure 5-1 Cable and Charger

5.2 Precautions

1. Please store the handheld laser radar device in a room temperature, dry and ventilated place to avoid excessive humidity causing the lens to fog up. The recommended storage environment temperature is between -20°C and 60°C. If the lens fogs up, the water vapor will dissipate automatically after the handheld laser radar device is turned on and heated up for a period of time.

2. Avoid storing the handheld laser radar device in places with strong vibrations or near strong magnetic fields.

3. Avoid suddenly bringing the device directly from a cold place to a warm place to prevent moisture condensation.

4. Do not expose the handheld laser radar device to direct sunlight for a long time.

5. Do not scratch the lens or the lens surface coating with your hands or hard objects.

6. Pay attention to the cleanliness and dryness of the handheld laser radar device interface.

7. When cleaning the lens, please use a soft and dry-cleaning cloth to wipe the surface. Please do not use a cleaner containing organic solvents such as thinners or gasoline to clean the lens.

8. Do not use an unstable power supply or a power supply that exceeds the voltage range that the handheld laser radar device can withstand.

9. Do not start or shut down the handheld laser radar device frequently. Please wait for more than 60 seconds between continuous power on and off, otherwise it will affect the life of the movement.

10. The handheld laser radar device is a precision device. Please place it in the transport box during the turnover transportation.

5.3 Technical Specification

PHYSICAL & ELECTRICAL	
Weight	1.0 kg (Include battery)
Size	297 * 103 * 104 (Include battery) ; 133 * 104 * 103 (Mainframe)
Battery	3150mAh * 2 (Maximum 90 minutes working for each battery)
Input	14.4 V
Charging	Type-C, PD-30 W (Average1.5hr charging time for each battery)
LiDAR & IMAGING	
Camera	12 MP * 2
Camera FOV	360 * 270°
Laser Class	1
LiDAR FOV	360 * 59°
Point Measurement Rate	200,000 pts/sec
Frequency	10hz
Range	0.1 ~ 40 m @ 10%; 0.1 ~ 70 m @ 80%
SYSTEM PERFORMANCE	
RTK Performance	0.8 cm + 1 ppm (H); 1.5 cm + 1 ppm (V)
Processing	Real-time processing / Post processing
Range Noise	±1 cm
Accuracy Indoor	±2.5 cm
Precision Indoor	±1 cm
ENVIRONMENTAL	
Robustness	Designed for indoor and outdoor use
Temperature	Operating: -20 ~ +55°C ; Storage: -20 ~ +60°C
Ingress Protection	IP54
DATA TRANSFER	
Format	.las
Detachable Storage	TF Card, 256GB, max 1TB extendable.
Data Transfer	Wireless and USB 3.0
Desktop Software	SatPoint PC, GreenValley LiDAR360MLS Optional