



T150 3D Terrestrial Laser Scanner

User Manual



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Before operating this product, please read this User Manual carefully. Familiarity with the instructions and procedures described herein will help ensure safe and efficient operation of the product. EPiC LiDAR shall not be liable for any loss, damage, or consequences resulting from improper operation of the product, failure to follow the instructions contained in this User Manual, or misunderstanding of the information provided herein.

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Every effort has been made to ensure the accuracy and consistency of the information contained in this manual with the corresponding hardware and software. However, discrepancies may occasionally occur. Illustrations, screenshots, and images in this manual are provided for reference purposes only. In the event of any inconsistency between the manual and the actual product, the actual product shall prevail.

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Safety Information

DANGER!

Indicates an imminently hazardous situation which, if not avoided, will result in serious injury. DANGER statements are intended to draw attention to critical operating procedures or conditions. Do not proceed with any operation until all stated conditions have been fully understood and satisfied.

WARNING!

Indicates a potentially hazardous situation which, if not avoided, could result in serious injury, or permanent damage to equipment. WARNING statements are intended to highlight risks associated with operation, maintenance, or handling procedures. Do not proceed until all specified conditions have been fully understood and met.

CAUTION!

Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury, equipment damage. CAUTION statements are used to emphasize safe operating practices and proper handling procedures. Ensure all specified conditions have been satisfied before proceeding.

NOTICE!

Indicates important information related to product operation. Failure to follow a NOTICE may result in equipment malfunction, reduced performance, or loss of data, but does not involve personal injury. Read and understand all NOTICE statements before performing the relevant operation.

NOTE!

Provides supplementary information, recommendations, or helpful tips regarding product operation, configuration, or maintenance. NOTE statements are not safety-related and are intended solely to improve user understanding and operational efficiency. They may appear before or after the relevant text.

Chapter 1 Product Introduction

T150 Terrestrial Laser Scanner is a survey-grade 3D laser scanning system independently developed by EPiC LiDAR Tech Co., Ltd. Utilizing advanced laser scanning technology, T150 enables rapid and accurate acquisition of three-dimensional geometric data in complex environments. It generates high-density point clouds and is suitable for a wide range of professional applications, including building surveying, cultural heritage documentation, engineering inspection, and topographic mapping.

Designed for objects and environments within a measurement range of 0.5 m to 150 m, T150 operates in conjunction with the EPiC Capture software platform, providing an integrated workflow for scanner control, system status monitoring, point cloud data storage, and preliminary data processing. This streamlined solution delivers an optimal balance of operational efficiency, data quality, and ease of use.

This User Manual describes the safe operation, system components, software functions, data acquisition and processing procedures, as well as maintenance requirements of the T150 Terrestrial Laser Scanner (hereinafter referred to as the "Scanner"). The manual serves as an essential reference for the proper operation and maintenance of the scanner. Users are strongly advised to read this manual carefully before operating the Scanner.

1.1 Product Structure

The physical appearance of the Scanner is shown in Figures 1-1 and 1-2.



Figure 1-1 Front View



Figure 1-2 Side View

1.2 Technical Specifications

1.2.1 Key Features

- ① Laser ranging;
- ② Full 360° horizontal panoramic scanning;
- ③ Region of Interest (ROI) scanning;
- ④ Panoramic image acquisition and point cloud colorization;
- ⑤ Real-time multi-station point cloud registration;
- ⑥ Gigabit Ethernet and Wi-Fi connectivity for data transfer and remote operation;
- ⑦ One-touch data acquisition;
- ⑧ Dual-media storage with internal SSD and removable USB storage;
- ⑨ Tilt compensation;
- ⑩ GNSS Positioning;
- ⑪ Environmental parameter monitoring (temperature, humidity, and barometric pressure);

1.2.2 System Parameters

1) General

Weight	3.3kg (Battery Included)
Dimension	216mm×168mm×105mm
Power Consumption	50W
Operating Temp.	-20~+50°C
Storage Temp.	-30~+60°C
IP Rating	IP54
Laser Product Classification	Class I
Wavelength	1550nm
FoV	Vertical 300° (-60~+90°) / Horizontal 360°
Scan Speed	100 Lines/sec

Maximum Pulse Repetition Rate	1.2MHz
-------------------------------	--------

Table 1-1 General

2) Ranging

Max.Range	0.5~150m
Precision (1 σ)	$\leq 1.5\text{mm}@50\text{m}$; $\leq 2.5\text{mm}@100\text{m}$
3D Accuracy	$\leq 2\text{mm}@50\text{m}$; $\leq 3\text{mm}@100\text{m}$

Table 1-2 Ranging

3) Internal Camera

Unit	2
Resolution	4000×3000
Effective Resolution of Panoramic Image	$\geq 100\text{ MP}$
High Dynamic Range (HDR)	Exposure Bracketing (3X, 5X)

Table 1-3 Camera

4) Power

Battery Weight	235g/pc
Type	Rechargeable Li-Ion Battery
Operating Temp.	-20~+50°C
Capacity	3300mAh/pc
Other	Hot-swappable, Air and Rail Transport Compliant

Table 1-4 Battery

5) Control

Data Storage	Internal SSD: 1TB; External USB Drive: 256GB
Scanner Control	Wireless, Wired, and Button

Table 1-5 Control

6) Interface

Communication	Gigabit Ethernet
Power	17 ~ 33V DC/ 5A
Integration & Development	Supported

Table 1-6 Interface

7) Others

Tilt-compensation	$\pm 5^\circ$
Environmental Sensor	Temperature, Humidity, Barometric Pressure
Inertial Navigation System	MEMS IMU
GNSS Signal Tracking	BDS, GPS, GLONASS, Galileo, QZSS, SBAS supported
Tripod	Carbon Fiber Tripod
Inverted Mode	Supported

Table 1-7 Others

Chapter 2 Safety Information

2.1 Intended Use

Scanner is designed exclusively for the acquisition of three-dimensional spatial data in indoor and outdoor static surveying environments. Any use beyond the scope specified in this User Manual is considered improper and is strictly prohibited, including but not limited to unauthorized surveying activities, hazardous environment exploration, or other unlawful applications.

2.2 Improper Use

The following actions constitute improper use and may result in equipment damage, data loss, or personal injury. Such actions are strictly prohibited:

- Operating Scanner in environments with explosive atmospheres, flammable materials, strong electromagnetic interference, excessive temperatures, high humidity, or corrosive conditions.
- Disassembling, modifying, or tampering with internal components, hardware assemblies, or firmware without authorization.
- Using non-approved accessories, including tripods, batteries, chargers.
- Touching, obstructing, or forcibly rotating moving parts or optical components while Scanner is in operation.
- Subjecting Scanner to impact, shock, vibration, or dropping it from height.
- Exposing Scanner to seawater, wastewater, or other corrosive liquids.
- Improper battery handling, including short-circuiting, overcharging, overheating, or storing batteries outside the specified environmental conditions.

2.3 Operator Requirements

Operators of Scanner shall meet the following requirements:

- Have received appropriate training and be familiar with the contents of this User Manual, including operating procedures, safety requirements, and basic troubleshooting methods.
- Be capable of independently transporting, setting up, and operating Scanner

safely.

- Never operate Scanner while under the influence of alcohol, medication, fatigue, or any condition that may impair judgment or concentration.
- Immediately stop operation and disconnect the power supply if abnormal behavior is detected. Contact authorized service personnel for assistance. Unauthorized repair or maintenance is prohibited.

2.4 General Safety Instructions

Before operating Scanner, carefully read and comply with the following safety instructions to ensure safe operation and prevent equipment damage or personal injury:

- Hardware troubleshooting, maintenance, and repairs shall only be performed by personnel authorized by EPiC LiDAR.
- Before each use, inspect Scanner, accessories, and interfaces for signs of damage, looseness, or abnormal conditions. Do not operate the equipment if any defect is detected.
- Set up Scanner on a stable and solid surface whenever possible. Concrete or other rigid surfaces are recommended. When operating on soft or unstable ground, use tripod spikes, weights, or other stabilization measures to prevent movement or tipping.
- Ensure the tripod is fully deployed, properly secured, and stable before mounting Scanner.
- Do not touch rotating components, optical windows, or interface connectors while Scanner is operating.
- After use, power off Scanner, remove the battery packs, and store the equipment in its protective case.
- Maintain a safe distance from pedestrians, vehicles, and moving machinery during operation to minimize the risk of accidental collision.
- Comply with all applicable site safety regulations. When working near power facilities, transportation infrastructure, or other controlled areas, obtain all required permits and approvals before commencing work.

2.5 Laser Safety

WARNING!

Laser Radiation Hazard. Scanner contains a Class 1 laser device. Avoid direct and prolonged exposure to the laser beam.

Observe the following laser safety instructions at all times during operation:

- Never look directly into the laser aperture while Scanner is operating.
- Avoid prolonged exposure of the eyes or sensitive skin areas to the laser beam.
- Ensure that no personnel are directly exposed to the laser beam within the work area. Where necessary, use barriers or other protective measures to restrict access.
- Do not modify program settings or attempt to alter laser emission parameters. Unauthorized modifications may compromise laser safety and measurement performance.
- Do not point cameras, smartphones, or other imaging devices directly at Scanner while the laser is active, as permanent damage to image sensors may occur.

2.6 Electrical Safety

When operating Scanner with an external power supply, observe the following precautions:

- Use only the power adapter and cables supplied or approved by EPiC LiDAR.
- Ensure that the input voltage complies with the specified operating range of 17 ~ 33V DC/5A. Incorrect voltage may result in equipment damage or malfunction.
- If overheating, smoke, unusual odor, or other abnormal conditions are observed at the cables or connectors, immediately disconnect the power supply, discontinue operation and contact customer service.
- Prevent Scanner, power cables, and connectors from coming into contact with water or other conductive liquids.
- When Scanner will not be used for an extended period, disconnect the external power supply, remove the batteries, and store all cables properly to prevent deterioration or damage.

2.7 Battery Safety

WARNING!

Scanner uses lithium-ion batteries. Improper handling may result in leakage, fire, or explosion, causing equipment damage, personal injury, or property damage. Follow all battery safety instructions before use.

Battery Safety Instructions:

- Use only the lithium-ion batteries and battery chargers supplied or approved by EPiC LiDAR.
- Inspect batteries before use. Do not use batteries that show signs of swelling, leakage, physical damage, excessive heat, or other abnormalities.
- Charge batteries only in a cool, dry, and well-ventilated environment. Avoid direct sunlight, excessive heat, or high humidity during charging.
- Do not overcharge or over-discharge batteries. Disconnect the charger after charging is complete and replace batteries promptly when low battery warnings are displayed.
- Replace batteries when the remaining charge falls below 15%. To maintain uninterrupted operation, remove one battery and install a fully charged replacement. Confirm normal battery recognition before replacing the second battery.
- During transportation or storage, remove batteries from Scanner and place them in the designated battery compartments within the carrying case to prevent crushing, impact, or short circuits.
- Dispose of used batteries in accordance with local environmental regulations. Do not incinerate, disassemble, or discard batteries as general waste.
- For long-term storage, maintain battery charge levels between 30% and 70% and store batteries in a cool, dry environment.

Battery Charger Safety Instructions

- Use only the battery charger supplied or approved by EPiC LiDAR.
- Battery charging shall be continuously supervised. If supervision cannot be maintained, stop charging and disconnect the power supply.
- Before use, inspect the charger, cables, and connectors for signs of damage,

looseness, or corrosion.

- Connect the charger only to a properly rated power outlet and keep it away from water or damp environments.
- Place the charger on a stable, well-ventilated surface during operation. Do not cover the charger or expose it to excessive heat or direct sunlight.
- The charger supports simultaneous charging of up to four batteries. If abnormal heating, smoke, unusual odor, battery swelling, or other abnormalities occur, immediately disconnect the power supply and stop charging.
- Disconnect the charger from the power source after charging is complete and store the charger and cables properly.
- When not in use, disconnect the charger from the power outlet to prevent unnecessary power consumption and component aging.

2.8 Mechanical Safety

Observe the following mechanical safety precautions during setup, operation, and transportation:

- Ensure that Scanner is securely mounted to the tripod and that all locking mechanisms are properly engaged before operation.
- Do not touch moving or rotating components while Scanner is operating.
- When relocating Scanner over short distances in the field, keep Scanner securely mounted on the tripod and transport the assembly by holding the tripod body with both hands. Never lift or carry the system by the instrument housing alone.
- Protect optical windows, mirrors, and other precision optical components from impact, scratching, or contact with hard objects.
- The tripod features a four-section telescopic design with a center extension column. Adjust height gradually and ensure that each section is securely locked before use.
- Position the tripod on a stable surface. When operating on uneven or sloped terrain, adjust and secure the tripod to maintain a stable setup and minimize the risk of tipping.
- Scanner shall remain under supervision throughout the scanning process to prevent accidental contact by pedestrians, vehicles, or machinery.

2.9 Transportation and Storage Safety

Observe the following precautions when transporting Scanner:

- Transport Scanner in the designated protective case. Use the original protective case whenever possible and ensure that all components are securely fixed in place.
- Remove batteries from Scanner before transportation and store them in the designated battery compartments within the protective case.
- Protect Scanner from severe shock, impact, crushing, vibration, or dropping during transportation to prevent damage to the scanner's internal components and optical lenses.
- When transporting Scanner by road, rail, sea, or air, use appropriate shock-absorbing packaging materials. The original protective case together with protective cushioning materials is recommended.
- Scanner batteries are lithium-ion batteries rated at 3300 mAh (47.52 Wh) per battery. Transportation of lithium-ion batteries shall comply with all applicable local and international transportation regulations.

Observe the following precautions when storing Scanner:

- Remove batteries from Scanner before storage and store them separately.
- Store Scanner and accessories in the designated protective case together with appropriate desiccant materials to reduce moisture accumulation.
- Store all components, including Scanner, batteries, charger, cables, and removable USB drive, in a clean and dry environment with a relative humidity not exceeding 60% and a storage temperature between -10°C and +30°C. Avoid environments subject to vibration, direct sunlight, excessive heat, high humidity, or corrosive substances.
- Inspect Scanner and batteries periodically during long-term storage. Recharge batteries approximately every three months to maintain a charge level of about 70%.
- Store the carrying case in a stable, dry, and well-ventilated location away from flammable materials and sources of strong electromagnetic interference.
- Do not store Scanner together with sharp, heavy, or abrasive objects that may cause physical damage.

Chapter 3 Hardware Components

T150 Terrestrial Laser Scanner System consists of the scanner unit, control tablet, batteries, GNSS module, removable USB storage device, tripod, and other accessories. This chapter provides an overview of each system component, including its function, physical appearance, and the procedures required for system assembly and setup prior to operation.

No.	Item	QTY
1	Scanner	1set
2	Battery	4pcs
3	Batter Charger	1pcs
4	Tripod	1pcs
5	GNSS Antenna	1pcs
6	Tablet	1set
7	Tablet Charger	1pcs
8	Wire Cable	1pcs
9	Power Cable	1pcs
10	USB Flash Driver	1pcs
11	Dongle	1pcs
12	Cleaning Kit	1set
13	Product Manual	1pcs
14	Inspection Report	1pcs
15	Warranty Card	1pcs
16	Desiccant	2pcs

No.	Item	QTY
17	Packing List	1pcs

Table 3-1 Configuration List

Scanner packing list:

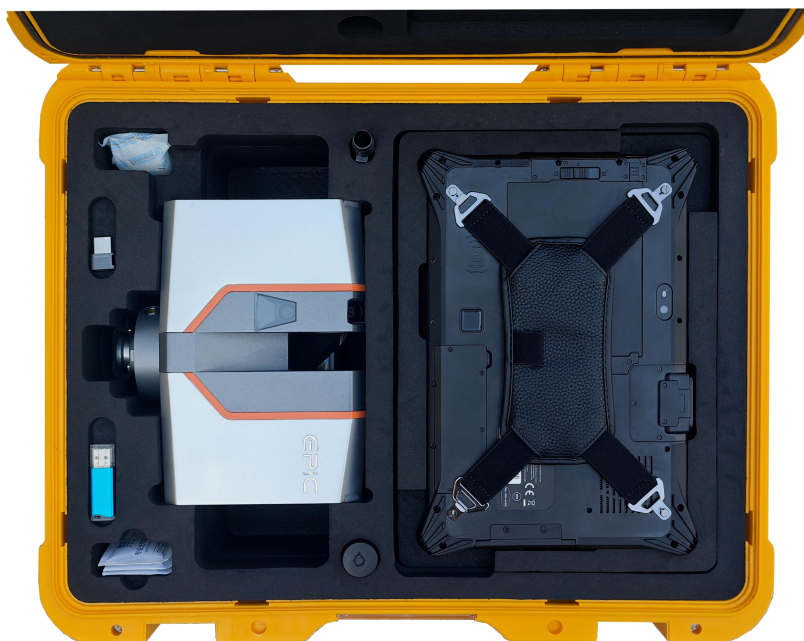


Figure 3-1 Scanner Package



Figure 3-2 Scanner Package

3.1 Scanner Unit

Scanner Unit is the core component of the system. It integrates the laser measurement module, imaging module, scan control module, and communication interfaces into a single compact platform.

Scanner Unit is responsible for laser emission, point cloud data acquisition, image capture, system control, and data storage, providing the foundation for efficient and reliable reality capture workflows.



Figure 3-3 T150 Scanner

1) Dimension

T150 Scanner Dimension: 216mm×168mm×105mm;

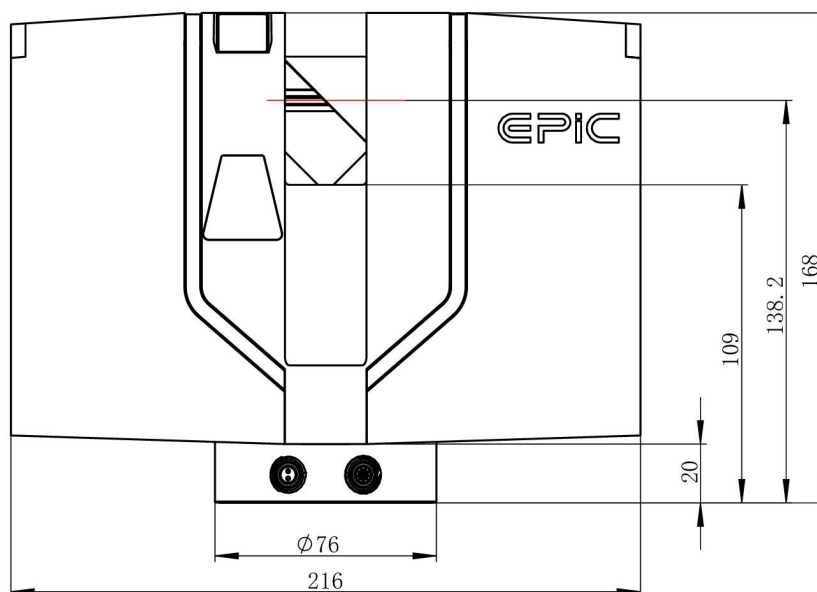


Figure 3-4 Front View Dimensions

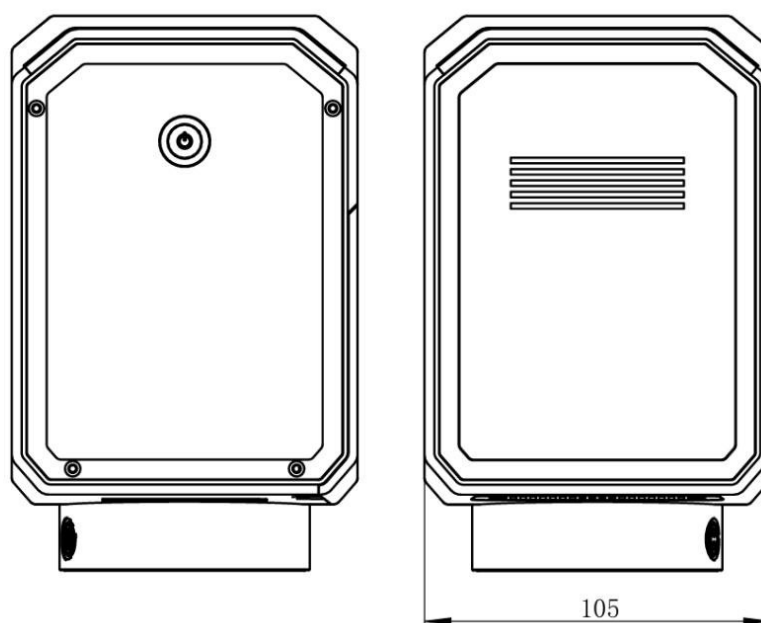


Figure 3-5 Side View Dimensions

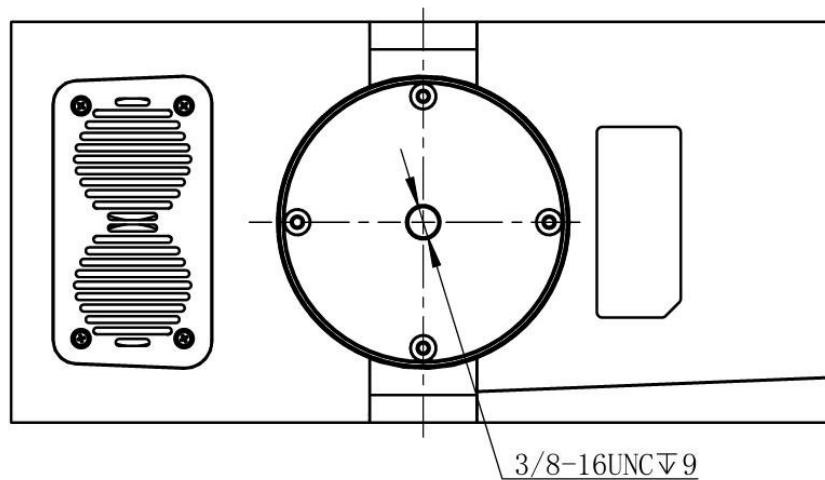


Figure 3-6 Bottom View Dimensions

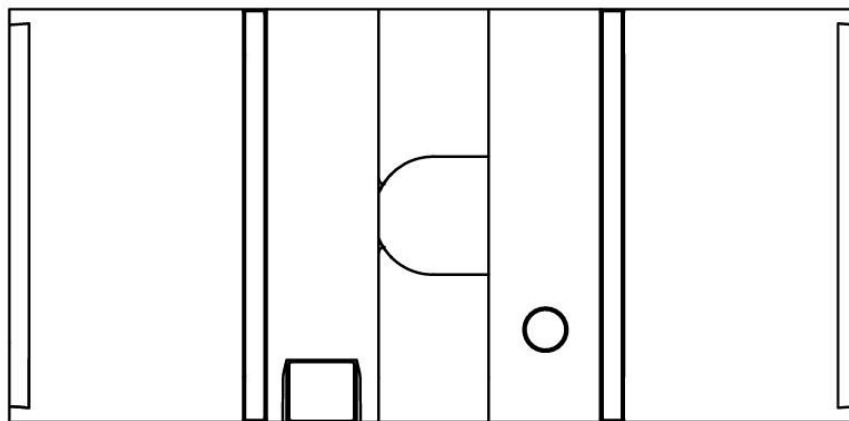


Figure 3-7 Top View

- 2) **Status Indicators:** Scanner is equipped with status indicators that provide visual feedback on the operating condition of the system. Different indicator colors represent different operating states. The status indicators are located on the top of Scanner, as shown in Figure 3-8.



Figure 3-8 Status Indicators

Power On	Alternating Red and Blue
System Ready	Solid Blue
Data Acquisition in Progress	Flashing Blue
Data Acquisition Completed	Solid Blue
Power Off	Solid Blue
System Error	Solid Red
Firmware Update in Progress	Flashing Red (Slow)
Firmware Update Completed	Off (Updated Successfully)
	Solid Red (Update Failed)

Table 3-2 Indicator Status Definitions

- 3) The battery compartment and removable USB storage slot are located behind the rear protective cover of Scanner. Open the cover to access the battery bays and USB storage slot, as shown in Figure 3-9.



Figure 3-9 Battery Compartment

NOTICE!

Installation Notice! Ensure that the removable USB storage device is fully inserted and securely seated before operation. Improper installation may result in data storage failures or data loss. When installing batteries, verify the correct polarity and orientation before insertion. The battery bays are equipped with locking mechanisms to secure the batteries in place. Forcing batteries into the compartment in the wrong orientation may damage the electrical connectors.

- 4) The GNSS antenna connector is located on the top of Scanner and is used to connect the GNSS antenna for positioning and georeferencing functions, as shown in Figure 3-10.

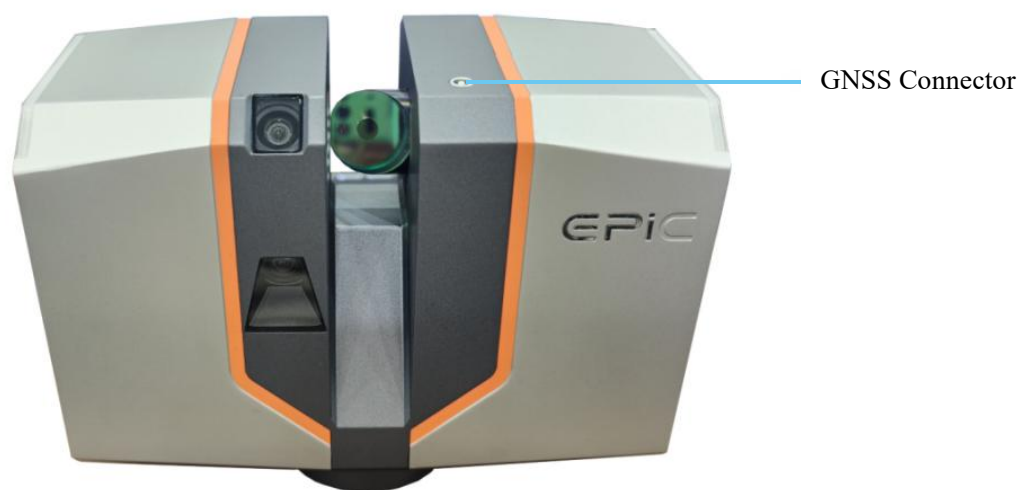


Figure 3-10 GNSS Antenna Connector

NOTICE !

Ensure that the GNSS antenna is securely connected before operation. Improper installation may result in unstable GNSS reception and reduced positioning performance.

- 5) The power connector and Ethernet port are located on the front side of the base. They are used for connecting an external power supply and a wired network connection, respectively, as shown in Figure 3-11.

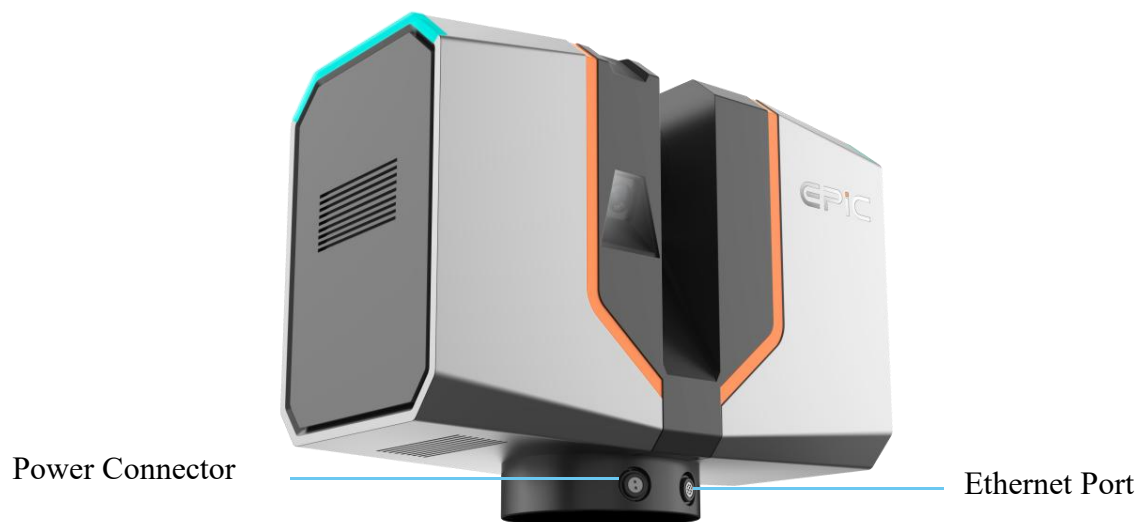


Figure 3-11 Power Connector and Ethernet Port

CAUTION!

Connection Notice ! Before connecting or disconnecting the power cable, ensure that Scanner is powered off while power is applied may result in connector damage, electrical short circuits, or equipment malfunction.

- 6) The power button is located on the side of Scanner. Press and hold the power button for approximately three seconds to power on or power off the system, as shown in Figure 3-12.



Figure 3-12 Power Button

NOTICE!

After pressing the power button to start Scanner, wait until the status indicator changes to a steady state before proceeding with further operations. To power off Scanner, press and hold the power button for approximately three seconds. When the status indicator turns off, the shutdown process is complete. Do not disconnect the power supply or remove batteries during startup or shutdown, as this may result in data loss or system corruption.

3.2 Control Tablet

Scanner is supplied with a dedicated control tablet running the EPiC Capture field software. It enables functions such as remote scanner control, parameter configuration, and data preview. The tablet features a hot-swappable or field-replaceable rear battery to extend operating runtime.

The standard specifications for the control tablet are as follows::

Operating System	Windows 10 Pro
Processor	12th Gen Intel (R) Core (TM) i5-1235U 1.30GHZ
Storage Capacity	128GB
System Memory (RAM)	16GB
Display Adapter	Inter (R) Iris (R) Xe Graphics

Table 3-3 Control Tablet Specifications



Figure 3-13 Tablet Front View



Figure 3-14 Tablet Rear View

3.3 Scanner Battery

Scanner is powered by dedicated lithium-ion batteries supplied with the system. Each single battery has a capacity of 3300 mAh / 47.52 Wh. A paired set of two batteries provides an operating runtime of approximately 2 hours.

Scanner is equipped with two battery slots. It is recommended that both batteries be installed during operation to maximize runtime. The system supports hot-swappable

battery replacement, allowing batteries to be exchanged while the device is in operation. The replacement procedure is as follows: remove one of the two installed batteries, replace it with a fully charged battery, and once the battery status is correctly recognized by the system, remove and replace the second battery in the same manner.

The front and rear sides of the battery are shown in the figure below. The front side displays key information such as model and capacity. The rear side is equipped with a battery level display button and LED indicators, as shown in Figure 3-16.

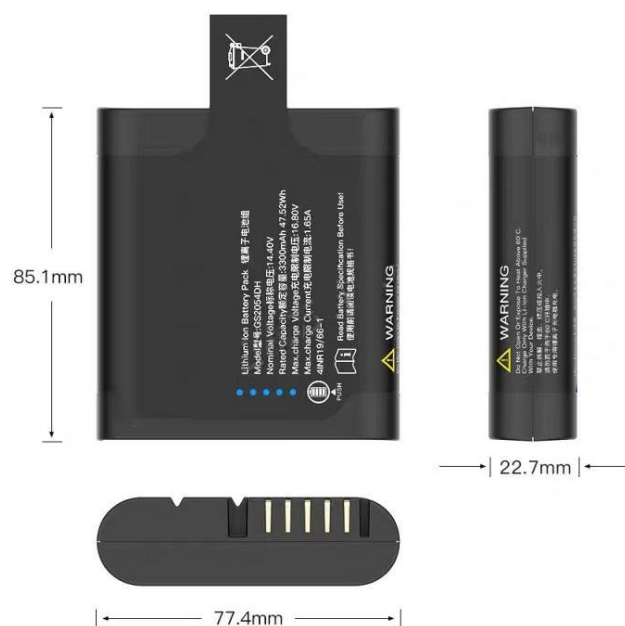


Figure 3-15 Battery



Figure 3-16 Button

NOTE!

The rear side of the lithium-ion battery features a power indicator button. Pressing this button activates the integrated LED indicators to display the current state of charge. Five illuminated LEDs indicate a charge level of $\geq 80\%$; four LEDs indicate 60%–80%; three LEDs indicate 40%–60%; two LEDs indicate 20%–40%; and one LED indicates 0%–20%, in which case the battery should be replaced promptly. The battery is 3C,CB,CE,FCC,UKCA, KC,PSE,RCM certified and complies with transport regulations, allowing it to be safely carried on high-speed trains and commercial flights.

WARNING!

Do not short-circuit, puncture, or incinerate the battery under any circumstances, as this may result in leakage, overheating, fire, or explosion. If any abnormal conditions occur during operation—such as excessive heat generation or swelling—the battery must be immediately taken out of service and replaced.

3.4 USB Drive

Scanner is equipped with a 256GB USB drive, which is used to store raw point cloud data, images, and other files captured during scanning, as shown in Figure 3-17.



Figure 3-17 USB Drive

NOTICE!

During scanning, ensure that the USB drive is securely inserted into the designated port on the scanner. Poor physical contact may lead to data storage failure. Handle and store the USB flash drive with care to avoid loss, damage, or virus infection. Back up the data regularly to prevent data loss.

The file system of the USB drive must be formatted to exFAT. If the flash drive cannot be recognized, check whether the file system meets this requirement, or reformat the drive (ensure all data is backed up before formatting).

3.5 Software Dongle

Scanner comes with a software dongle, as shown in Figure 3-18. The pre-processing software is copy-protected and requires the dongle to be connected for authorization and normal operation.



Figure 3-18 Dongle

3.6 GNSS

GNSS (Global Navigation Satellite System) is a collective term for global satellite positioning systems. T150 supports multi-constellation positioning using BDS, GPS, GLONASS, Galileo, QZSS, and SBAS, as shown in Figure 3-19.

During scanning operations, the GNSS module automatically acquires absolute geographic coordinates for each scan position. This enables global registration and georeferencing of multi-station point cloud data without the need for extensive ground control point deployment, significantly improving field productivity. The acquired positioning information also allows point cloud data to be directly referenced to national or local coordinate systems, facilitating seamless integration with GIS, CAD, and other geospatial datasets. This capability supports a wide range of applications, including topographic surveying, engineering surveying, infrastructure documentation, and smart city projects.



Figure 3-19 GNSS

3.7 Battery Charger

The battery charger supplied with T150 supports simultaneous charging of up to four batteries and is designed to provide efficient battery charging for extended field operations. The charger is shown in Figure 3-20.



Figure 3-20 Battery Charger

The charger is equipped with four charging slots, each with an individual charging status indicator.

Charging Indicator Status

- Flashing Green: Battery charging in progress
- Solid Green: Battery fully charged

CAUTION!

Ensure batteries are properly inserted and connected. Operate the charger in a well-ventilated area and avoid direct sunlight, excessive heat, moisture, or obstruction during charging.

3.8 Ethernet Cable and Power Cable

The supplied Ethernet cable can be used to establish a wired connection between the control tablet and T150. Compared with a wireless connection, a wired connection provides greater stability and is recommended for long-distance operation or environments with wireless signal interference.

Connect one end of the Ethernet cable to the Ethernet port on T150 and the other end to the Ethernet port on the control tablet. Once securely connected, communication is established automatically without additional configuration, as shown in Figure 3-21.



Figure 3-21 Ethernet Cable

To support system integration and custom applications, T150 is supplied with a power cable for connection to an external power source. External power operation is recommended for long-duration or fixed-location scanning projects, as shown in Figure 3-22.



Figure 3-22 Power Cable

CAUTION!

Use a 17–33 V DC / 5 A power source. Avoid cable damage or excessive pulling to prevent equipment damage, short circuits, or electrical hazards.

When batteries are installed and an external power source is connected, T150 automatically switches to external power operation. The power status icon changes from “” to “”, as shown in Figure 3-23. If the external power source is disconnected or depleted, T150 automatically switches back to battery power.

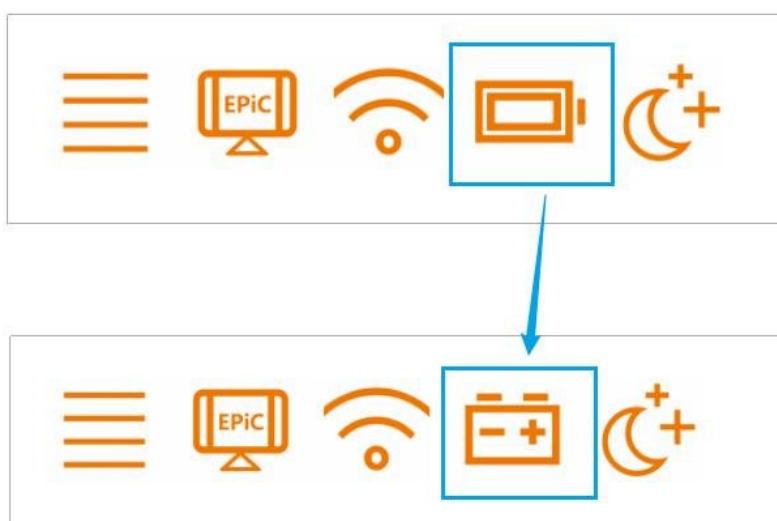


Figure 3-23 External Power Status Icon

3.9 Tripod

T150 is supplied with a dedicated tripod featuring a four-section telescopic carbon-fiber design. The tripod provides stable support for Scanner during operation and can be fitted with tripod spikes when required for improved stability on soft or uneven terrain. With a maximum operating height of 1.59 m, the tripod helps minimize vibration and movement, ensuring reliable instrument stability and optimal data quality during scanning operations. The tripod structure is shown in Figure 3-24.



Figure 3-24 Tripod

Leg Material	Carbon Fiber	Weight	1.4kg
Loading Capacity	20kg	Maximum Height	1.59m
Height Without Center Column Extension	1.3m	Minimum Height	0.39m
Folded Length	0.545m	Number of Sections	4
Maximum Tube Diameter	28.3mm	Minimum Tube Diameter	18.4mm

Table 3-4 Tripod Specifications

Chapter 4 Control Software

Instructions

4.1 Control Interface

Launch the E Pic Capture field software and establish a connection with the instrument as described in Section 6.2.3, "Connecting to the Scanner." Once successfully connected, the main user interface will appear as shown in Figure 4-1.

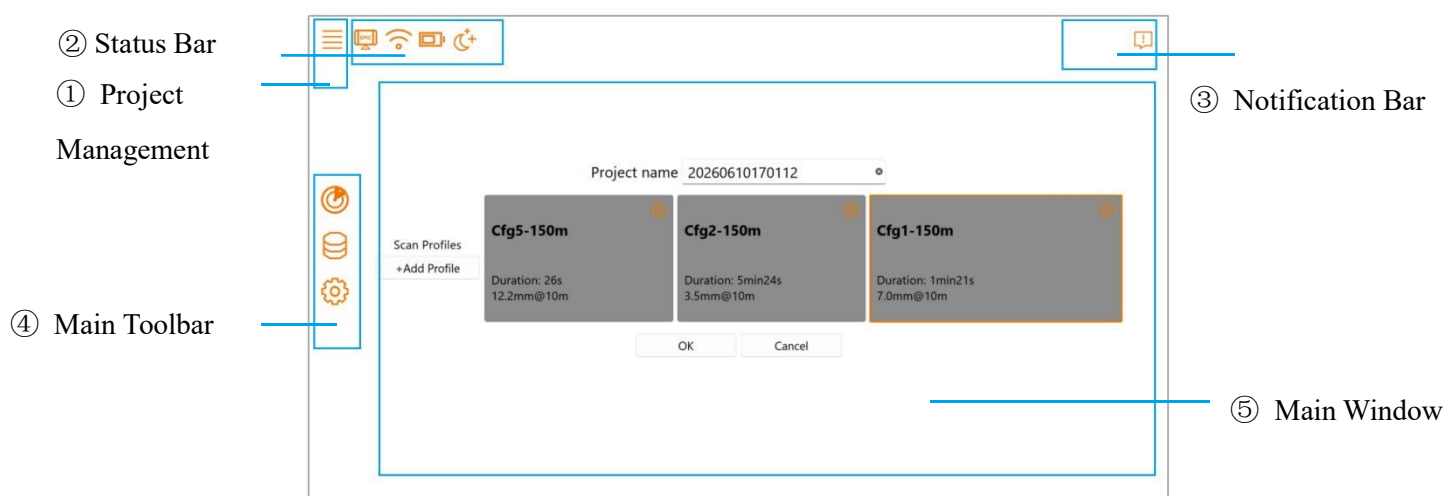


Figure 4-1 Control Interface Overview

- ① Project Management: Used for managing projects and devices.
- ② Status Bar: Displays the current status of the instrument and system components.
- ③ Notification Bar: The designated area where prompt windows and system alerts pop up.
- ④ Main Toolbar: Allows toggling between the Scanning Interface, Point Cloud Viewer, and System Settings.
- ⑤ Main Window: The primary display area for software functionalities and data visualization.

4.2 Project Management

Tap the **【Project Management】** to expand the main menu, as shown in Figure 4-2.

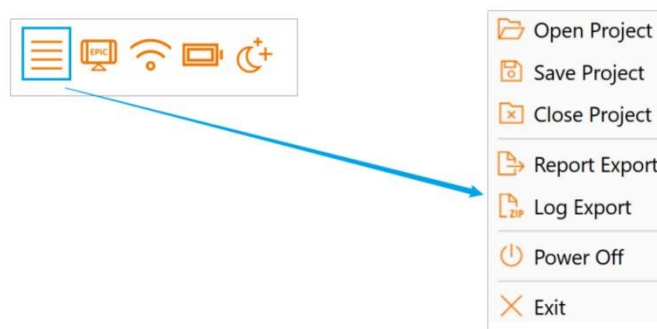


Figure 4-2 Project Management Menu

① **Open Project:** Open an existing project for review, editing, or additional scanning, as shown in Figure 4-3. Real-time projects are stored locally on the control tablet. Projects cannot be accessed from a different control device.

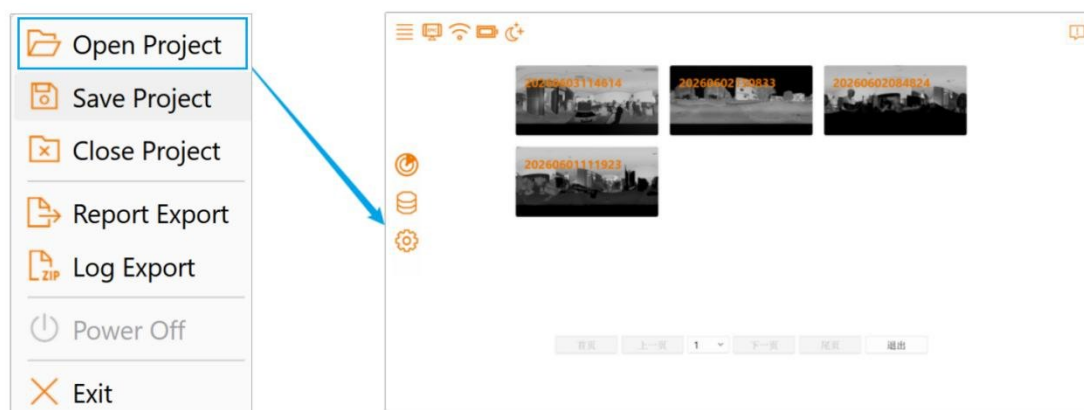


Figure 4-3 Project Management

- ② **Save Project:** Save the current project.
- ③ **Close Project:** Close the current project.
- ④ **Report Export:** Export the real-time registration report.
- ⑤ **Log Export:** Export system and scanning logs for troubleshooting and technical support purposes.
- ⑥ **Power Off:** Shut down Scanner.
- ⑦ **Exit:** Exit the software.

4.3 Status Bar

Tap the **【Status Bar】** to open the Device Status window, as shown in Figure 4-4.

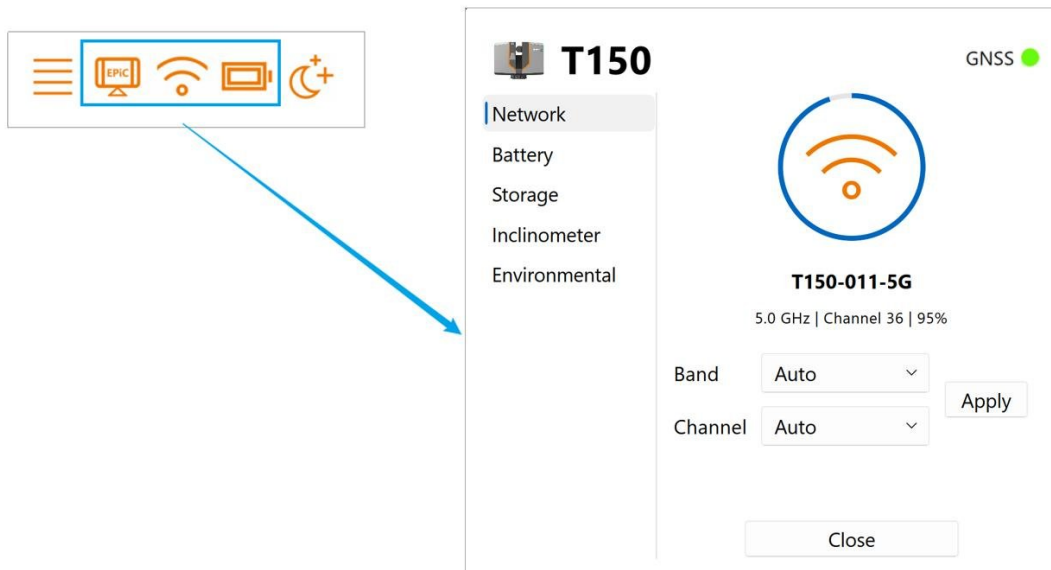


Figure 4-4 Status Bar Menu

1) Network:

① GNSS: When a GNSS antenna is connected and sufficient satellite signals are available in an open-sky environment, the GNSS indicator changes from red to green, indicating that GNSS positioning is available.

② WiFi: The default Wi-Fi configuration is 5 GHz, Channel 36. When signal strength falls below 70%, a "Signal Unstable" warning is displayed.

NOTE!

① The 2.4 GHz band provides wider coverage and better obstacle penetration but offers lower data throughput and is more susceptible to interference. The 5 GHz band provides higher bandwidth, faster data transfer rates, and reduced interference, but with shorter effective range.

② Lower channel groups (36, 40, 44, 48) generally provide longer coverage distances, while higher channel groups (149, 153, 157) offer improved interference resistance.

- 2) Battery: Displays the remaining charge level and cycle count for each installed battery.
- 3) Storage: Displays the total and available capacity of both the USB storage device and internal SSD. The storage location can be selected by the user. By default, scan data is saved simultaneously to both storage devices.
- 4) Clinometer: Displays the real-time pitch and roll angles of Scanner.;
- 5) Environmental : Records real-time atmospheric pressure, temperature, and humidity measurements.

4.4 Theme Switching

Tap **Theme Switch** to switch from Night Mode to Day Mode. Tap the button again to return to Night Mode, as shown in Figure 4-5.

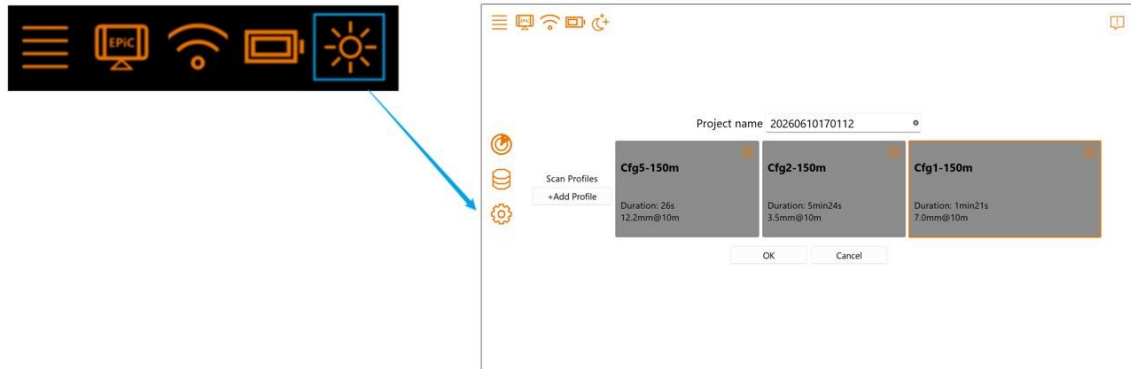


Figure 4-5 Theme Switching

4.5 Notification Bar

The Notification Bar displays system messages and status information, including:

- Device connection and disconnection status
- Scan progress and acquisition status
- USB storage and battery alerts
- Registration progress
- Registration results
- Other system notifications

4.6 Scan Interface

The main window displays the Scan Settings interface by default. Alternatively, tap

Scan Interface button to return to the scan interface.

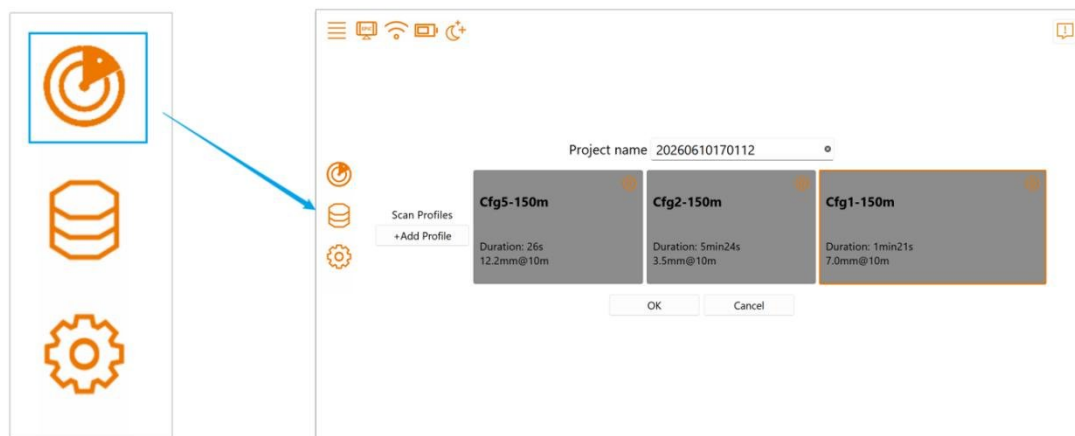


Figure 4-6 Scan Interface

4.6.1 Project Name

The default project name is generated from the current date and time. Users may modify the project name as required. Project names support Chinese characters, English characters, numbers, and special characters.

4.6.2 Scan Configuration

The Scan Configuration panel provides three predefined scan profiles: Cfg1, Cfg2, and Cfg3. Existing profiles can be modified by tapping the Settings button “”, or a new profile can be created by selecting **【Add Configuration】**, as shown in Figure 4-7.

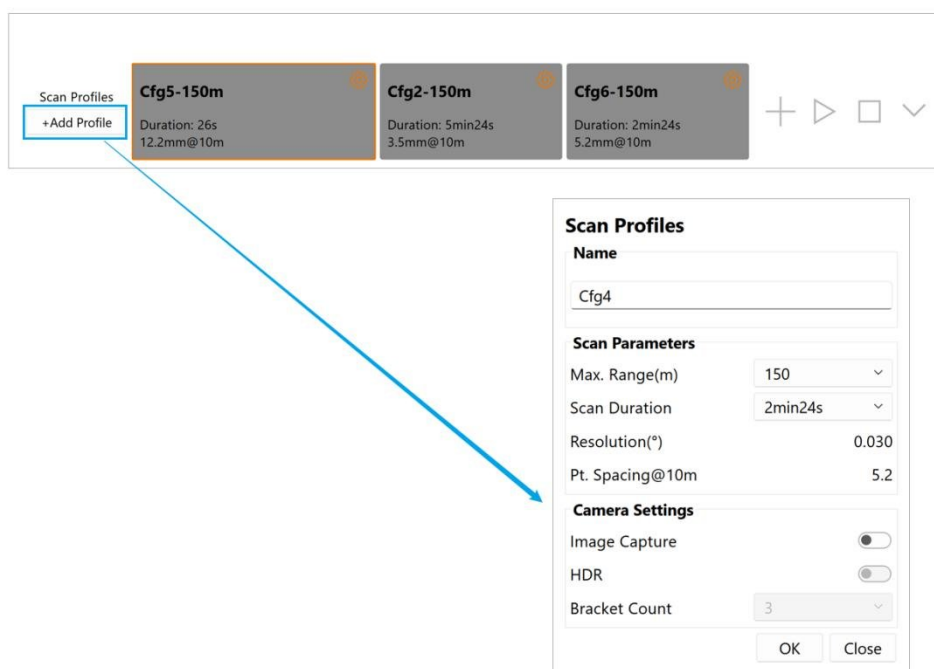


Figure 4-7 Scan Configuration

- ① **Name:** The default name is Cfg4. Users may assign a custom name.
- ② **Max Range:** Select 30 m, 60 m, or 150 m according to the approximate distance to the target area.
- ③ **Scan Duration:** When the scan duration is adjusted, the displayed “Resolution” and “Point Spacing @10m” are updated accordingly. Select an appropriate scan duration based on the required data density and project requirements.
- ④ **Image Capture:** Enable or disable image capture.
- ⑤ **HDR:** Enable or disable High Dynamic Range (HDR) imaging.
- ⑥ **Bracket Count:** Select 3 or 5 exposure levels according to scene conditions.

NOTICE!

HDR is available only when Image Capture is enabled.

Bracket Count is available only when HDR is enabled.

Enabling HDR or increasing the Bracket Count increases image acquisition time.

NOTE!

Resolution is the angular spacing between adjacent laser measurements. Smaller values produce higher point density. Point Spacing@10m is the distance between adjacent laser points on a surface located 10 m from the scanner phase center. Smaller values produce higher point density.

NOTE!

HDR (High Dynamic Range) improves image quality in scenes with high brightness contrast.

NOTICE!**HDR 3x vs HDS 5x**

HDR imaging combines multiple images captured at different exposure levels to increase dynamic range. Higher exposure counts provide improved brightness coverage but require additional acquisition and processing time.

HDR (3 Exposures): Captures three images at different exposure levels (underexposed, normal, and overexposed) and combines them into a single image. This mode effectively preserves highlight and shadow detail while maintaining fast acquisition speed. It is recommended for general indoor, outdoor, and moderately backbit environments.

HDR (5 Exposures): Captures five images at different exposure levels, providing a wider dynamic range for challenging lighting conditions. This mode is recommended for high-contrast scenes such as direct sunlight, strong back lighting, sunsets, or environments with extreme brightness variation. While additional shadow and highlight detail can be recovered, image acquisition and processing require more time, and image noise may be more noticeable in low-light areas.

4.6.3 Control Panel

Select a configured “Scan Profile” to perform scan operations using the control panel on the right side of the interface, including scan start, stop, and pause functions.

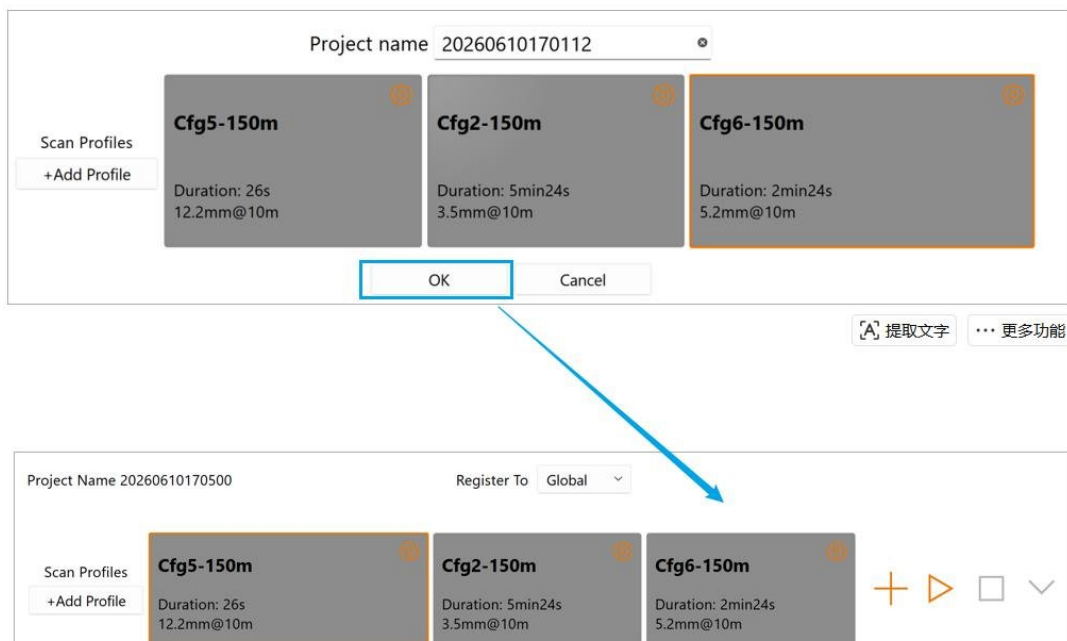


Figure 4-8 Control Panel

1) Registration Reference

Starting from the second scan position within a project, the registration reference can be set to “Previous Scan Position” or “Global Registration”. The default setting is “Previous Scan Position”.

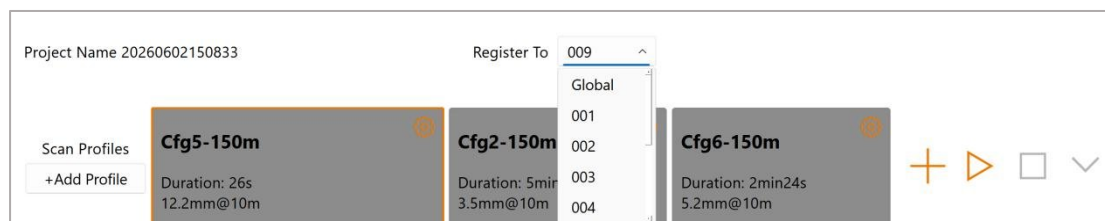


Figure 4-9 Registration Reference

2) Scan Control Buttons

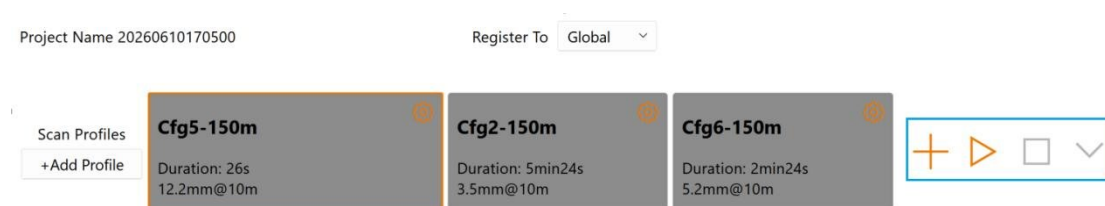


Figure 4-10 Scan Control Buttons

- ①  New Project: Create a new project.
- ②  Start Scan
- ③  Stop Scan
- ④  ROI Scan: Perform a quick scan to generate a real-time grayscale preview.

Tap **【ROI】**, then select the start and end positions on the screen to define the scan area. Choose a desired scan profile and perform a high-resolution scan only within the selected region, as shown in Figure 4-11.

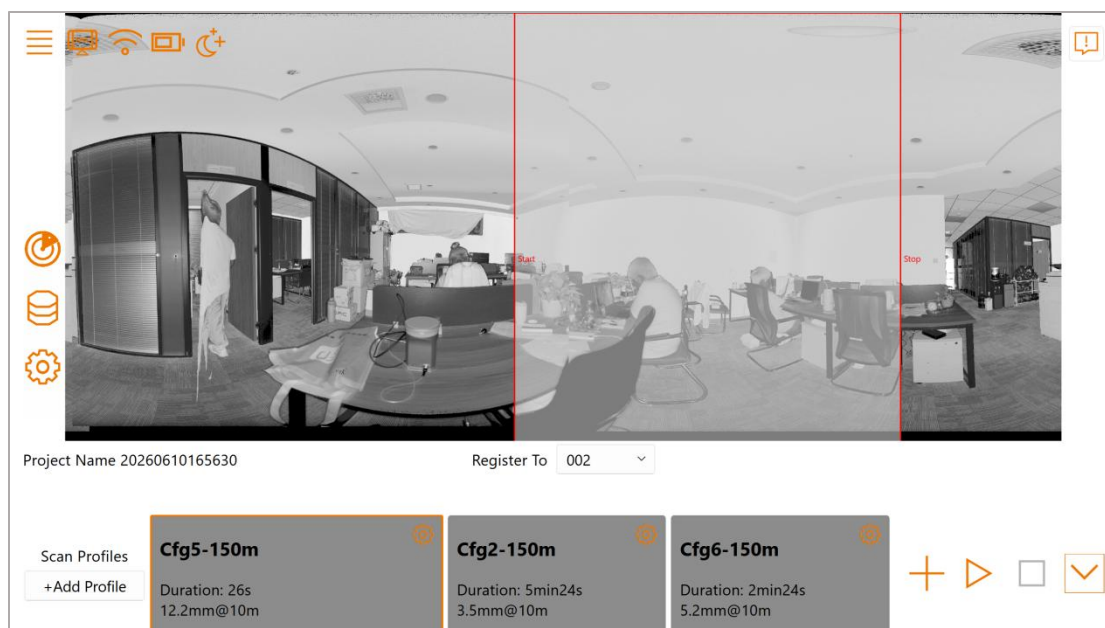


Figure 4-11 ROI

4.7 Browsing Interface

Tap the “Viewer” button to switch to the Browsing interface. This interface allows users to view the real-time generated point cloud and the current registration results, as shown in Figure 4-12.

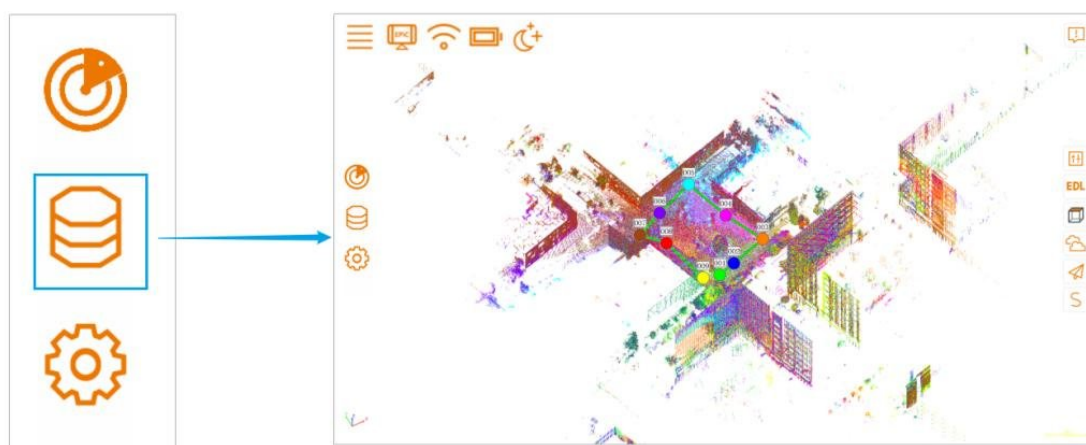


Figure 4-12 Point Cloud Viewer Interface

4.7.1 Registration Tools

After completing a scan at a station, the system will automatically register it with the previous station (except for the first station of a project). If automatic registration fails or the registration relationship needs to be modified, the “Registration Tools” can be used for adjustment.

The toolbar at the top of the screen is the “Registration Toolbar”. It supports manual registration, modification of registration relationships, resetting registration relationships, and re-registration operations, as shown in Figure 4-13.

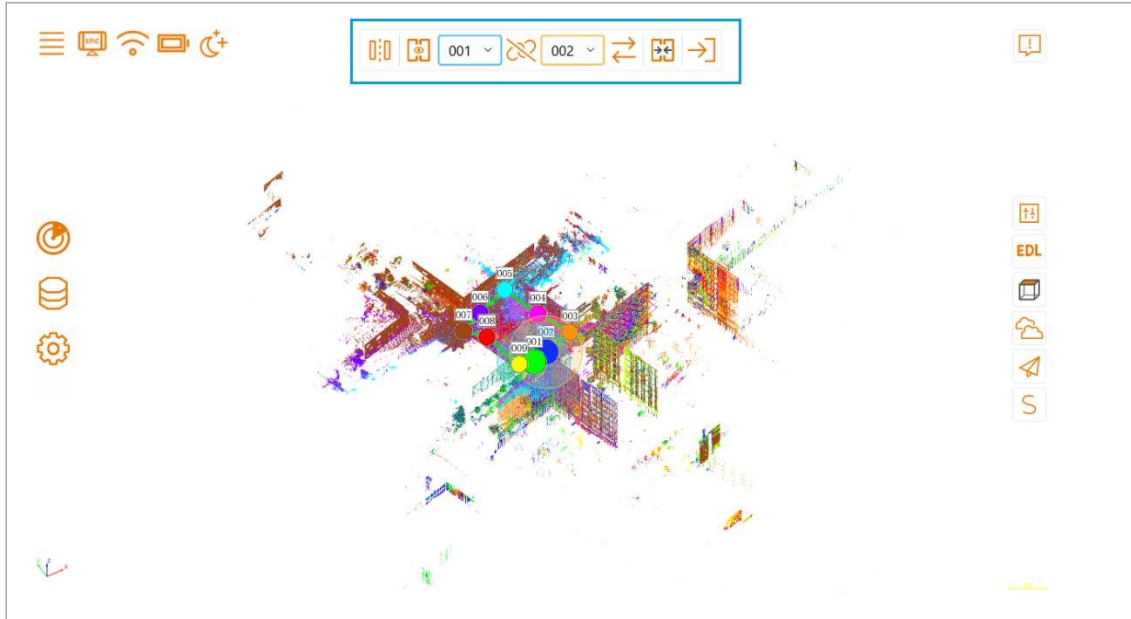


Figure 4-13 Registration Tools

- ①  Reference Scan & Moving Scan: Select the “Reference Scan” and “Moving Scan”. Tap the central “Disconnect  ”to break the current registration link. The button will then change to “Connect  ”, which can be clicked to re-establish the registration link.
- ②  Swap Scans: Invert the designations of the current "Reference Scan" and "Moving Scan".
- ③  Register: Start the registration process between the selected “Reference Scan” and “Moving Scan”.
- ④ Tap  to open “Pick-point Alignment” interface. Select corresponding points within this interface to perform manual cloud-to-cloud registration. The button then changes to “Point Cloud View  ”, to toggle back to the standard point cloud display interface, as shown in Figure 4-14.

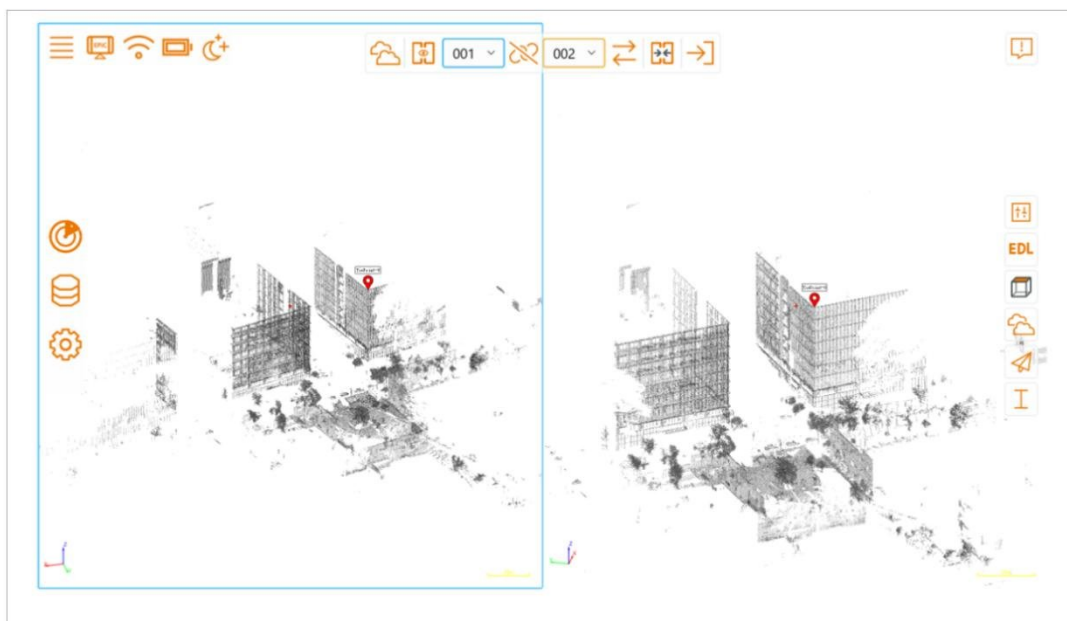


Figure 4-14 Manual Registration

- ⑤  Exit: Close the registration tool

4.7.2 Station Setting

Select any scan station on the display interface. Click the station to open the “display menu”, as shown in Figure 4-15.

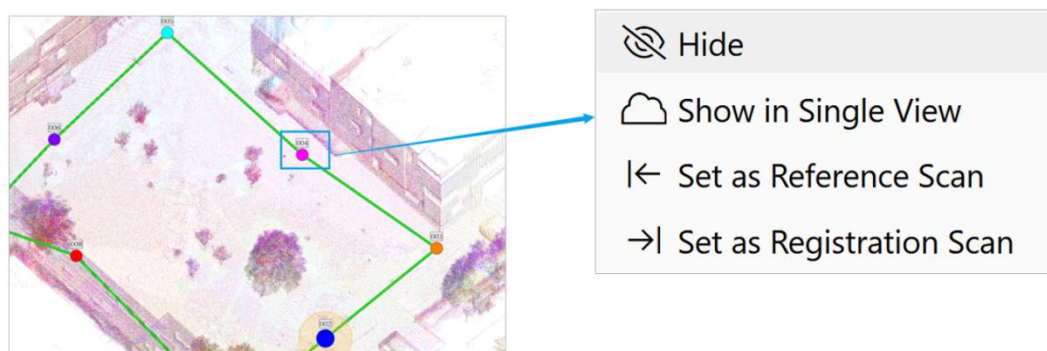


Figure 4-15 Display Menu

- ① Hide: Hide the point cloud of the selected scan station. The option then changes to “Show”. Tap again to re-display the station point cloud.
- ② Show in Single View: Display only the point cloud of the current scan station. Use the “Switch” button at the top to toggle between scan stations, as shown in Figure 4-16.

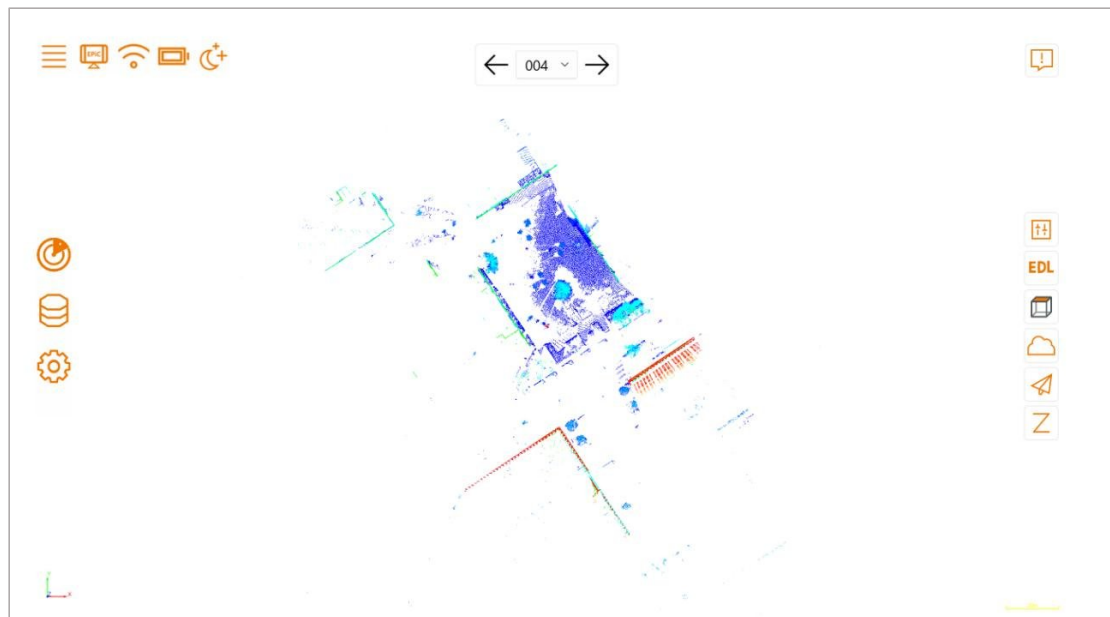


Figure 4-16 Single Station View

- ③ Select Reference Scan: Set the current scan station as the reference scan.
- ④ Select Moving Scan: Set the current scan station as the registration scan.

4.7.3 Registration Link Line

Tap the “Registration Link Line” to open the edit menu, as shown in Figure 4-17.

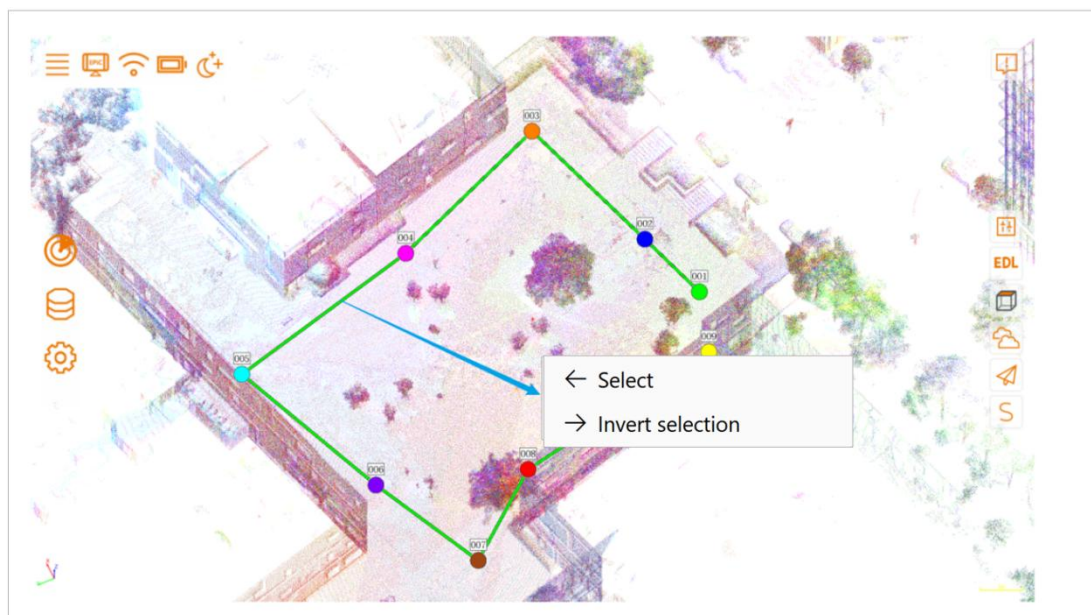


Figure 4-17 Switch Stations

- ① Edit Link: Edit the registration relation between the two connected scan positions.
- ② Invert Link Direction: Swaps the “Reference” and “Moving” roles between

the two linked scan positions.

4.7.4 Display Toolbar

The Display Toolbar is positioned on the right side of the interface to facilitate the adjustment of point cloud rendering modes, point sizes, and basic measurements, as shown in Figure 4-18.

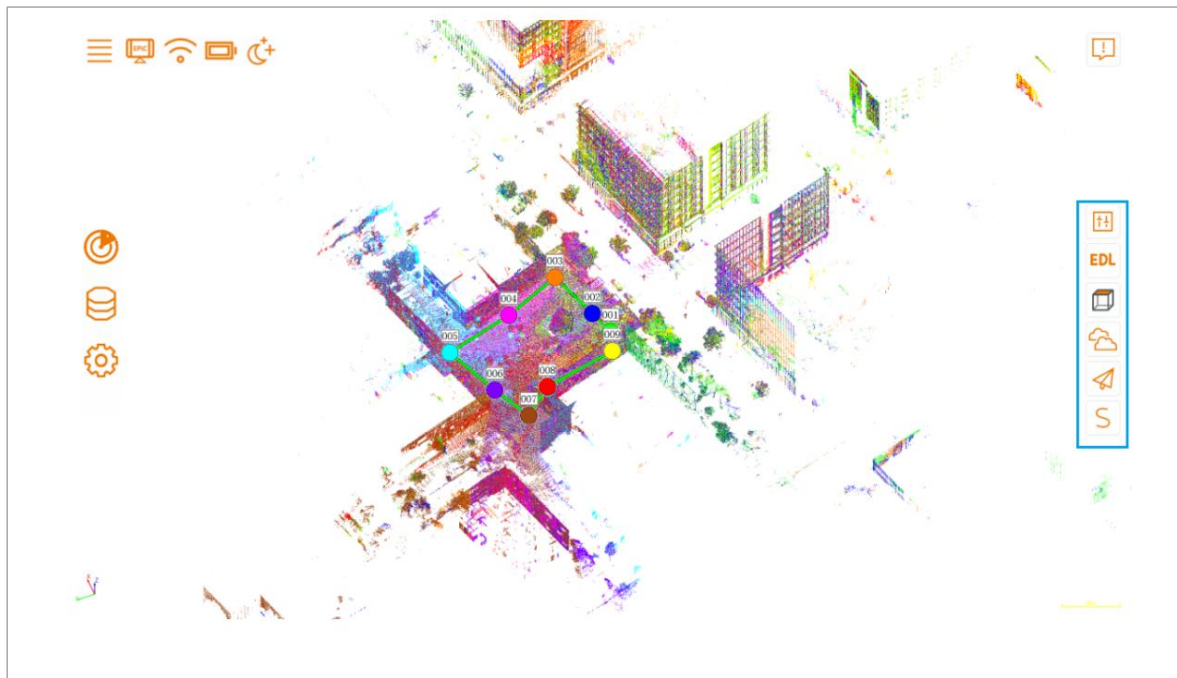


Figure 4-18 Display Toolbar

- 1) The elevation filter restricts the visualization of the real-time point cloud based on specified height values. Adjustment is available via the “+” and “-” buttons, or by directly dragging the blue slider handles to redefine the bounding range.

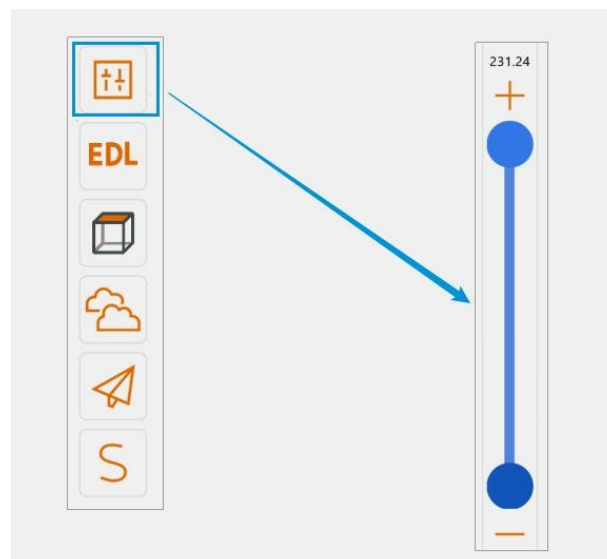


Figure 4-19 Elevation Filter

2) EDL Display

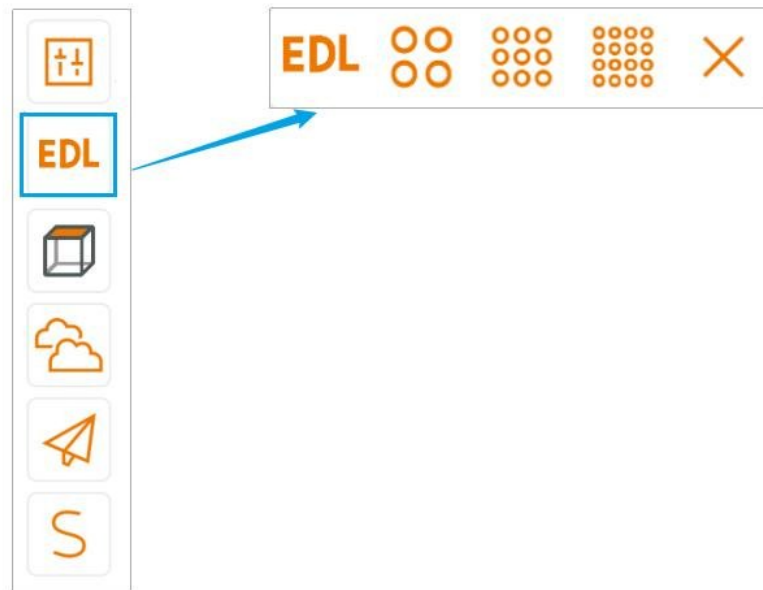


Figure 4-20 EDL

- ①  **EDL Display:** A single tap enables Eye-Dome Lighting (EDL) rendering; a subsequent tap disables the effect.
- ②  **Point Size:** The default value is 2, with options configurable to 2, 4, or 6.

NOTE!

Eye-Dome Lighting(EDL) is a non-photo realistic shading technique designed to enhance depth perception in 3D point clouds. When activated, a virtual lighting algorithm automatically accentuates contours, surface roughness, and fine details. This significantly improves the distinctness of structural features such as surface undulations, perforations, steps, and edges.

3) Point Cloud View

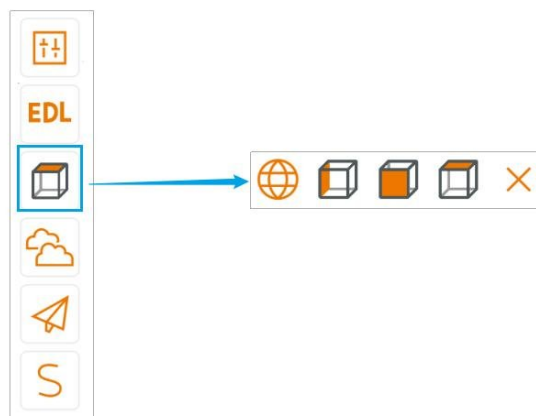


Figure 4-21 View Control

- ①  Zoom Extents: Automatically adjusts the view to encompass the entire dataset.
- ②  Side View: Switches the viewer workspace to the left elevation view.
- ③  Front View: Switches the viewer workspace to the front elevation view.
- ④  Top View: Switches the viewer workspace to the top-down plan view.

4) Point Cloud Display



Figure 4-22 Point Cloud Display

- ①  Load Point Cloud;
- ②  Unload Point Cloud;
- ③  Single-station Display: Visualizes the point cloud of a single selected

scan position. Toggle controls at the top enable switching between different stations.

- ④  **Multi-station Display** : Visualizes the registration point cloud data from multiple scan positions simultaneously.

5) Measurement Tool

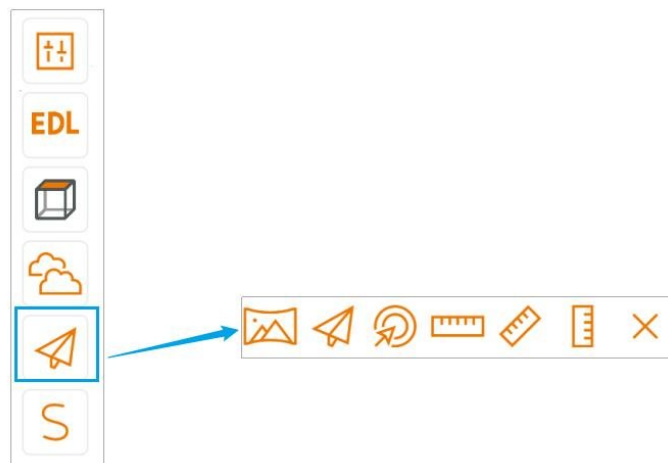


Figure 4-23 Measurement Tool

- ①  **First-Person View**: Switch the viewing perspective to first-person mode.
- ②  **Fly-Through Mode**: Switches the navigation mode to a third-person perspective for interactive fly-through inspection.
- ③  **Point Query**: Select a point in the viewing window to obtain information such as relative coordinates and reflectance intensity.
- ④  **2D Measurement**: Measure the projected 2D distance. This value does not represent the actual 3D spatial distance.
- ⑤  **3D Measurement**: Measure the true distance in 3D space.
- ⑥  **Height Measurement**: Measure the vertical height difference.

6) Rendering Modes

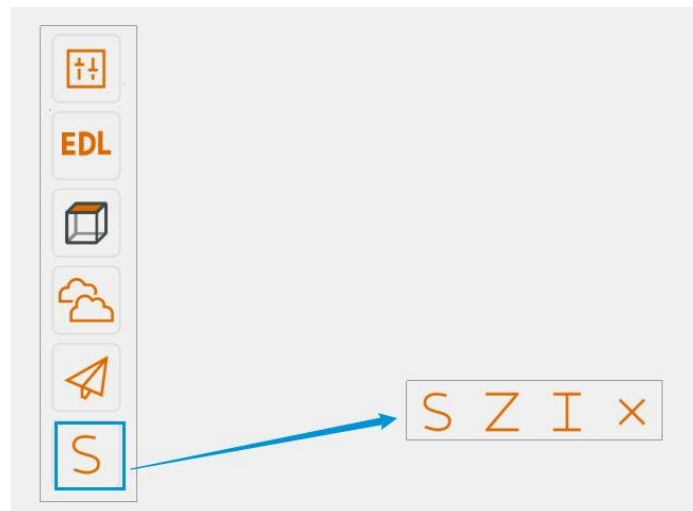


Figure 4-24 Rendering Modes

- ①  Monochrome Rendering: Each scan station is displayed in a different solid color. This is the default rendering mode.
- ②  Elevation Rendering: Render the point cloud according to elevation, with colors ranging from blue to red.
- ③  Intensity Rendering: Render the point cloud according to the reflectance intensity of the scanned objects.

4.8 Settings Interface

Tap the “Settings” button opens the settings interface, which provides access to display configurations, system preferences, and device version information, as shown in Figure 4-25.

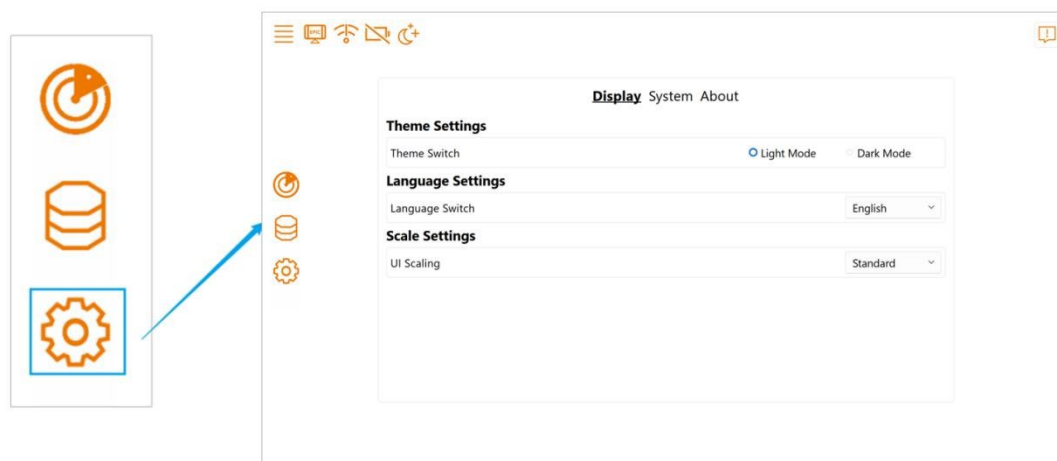


Figure 4-25 Settings

4.8.1 Display Settings

- 1) Theme Selection: Switch between Day Mode and Night Mode, corresponding to white and black backgrounds, respectively. The default setting is Night Mode.
- 2) Language Settings: The standard software version supports Simplified Chinese and English.
- 3) UI Scaling: Adjusts the interface scale with the following options: Minimal, Small, Standard, Large, and Maximal.

4.8.2 System Settings

Display **System** About

Project Settings

Project Directory C:/EPiC/EPiC Capture/EPIC Data 

Auto-Registration Settings

Environment Type	Outdoor ▾
Max. Station Distance	▾ 40.00 ▴
Max. Height Difference	▾ 3.00 ▴
Subsampling Distance(m)	▾ 0.50 ▴
Curvature Filter Threshold	▾ 0.0010 ▴

Auto-Apply

Auto-Registration Result	☒
Tie Point Registration Result	☒

Figure 4-26 System Settings

- 1) **Project Directory:** Real-time processing projects are saved locally on the control tablet. The default automatic save location for projects can be configured here.
- 2) **Auto-Registration Settings:** Parameters for automated registration can be optimized based on the actual operational environment. In the event of an automatic registration failure, adjusting these parameters allows for a re-attempt of the automated alignment process.

NOTICE!

Maximum Station Spacing: The maximum distance between two stations. If stations are close, use a smaller value. Estimate based on actual conditions. Smaller values result in faster registration.

Maximum Elevation Difference: The maximum height difference between two stations. If the elevation difference is small, use a smaller value. Estimate based on actual conditions. Smaller values result in faster registration.

Subsampling Distance: Point cloud down-sampling before registration. For small scenes (e.g., indoor environments), use 0.1–0.3 m. For outdoor scenes, use 0.3–0.5 m.

Curvature Filter: Removes noise points based on surface curvature. Smaller values remove more non-planar points. Typical values range from 0.001 to 0.01. If there are few planar surfaces in the scene, a value of 0.1 is recommended.

- 3) **Automatic Registration Result:** Apply the automatic registration result. Upon completion, the coordinate system of the Moving Station is transformed into the

coordinate system of the Reference Station.

- 4) Tie Point Registration Result: Apply the corresponding point registration result.

Upon completion, the coordinate system of the Moving Station is transformed into the coordinate system of the Reference Station.

4.8.3 System Information

Display System **About**

Software

Software Name	EPiC Capture
Software Version	1.0.3 20260527
Server Version	
Client Version	1.00.006 20260522

Scanner

Scanner type	
Scanner S/N	

Company

Company Name	EPiC LiDAR Tech Co., Ltd
Website	https://www.epiclidar.cn

Figure 4-27 About

- 1) Software: View the software version, server version, and client version.
- 2) Scanner: View the connected scanner type and device serial number (S/N).
- 3) Company: Display information about the device manufacturer.

Chapter 5 Data Acquisition Preparation

This chapter covers all preparatory procedures required prior to field data acquisition. It includes checklists for equipment verification, site reconnaissance, scan station deployment, and station setup guidelines. These workflows are designed to ensure seamless scanning operations, guarantee point cloud data integrity and accuracy compliance, and mitigate operational risks or data rework.

5.1 Equipment preparation

Prior to initiating data acquisition, a rigorous item-by-item inspection of the entire operational equipment configuration must be performed. Ensure that all devices are intact, fully charged, and complete with all standard accessories, and that all measurement instrumentation holds a valid calibration status. Defective or uncalibrated equipment is strictly prohibited from field deployment. The mandatory inspection checklist is detailed below:

1) Scanner main unit

Inspect the scanner main unit housing to ensure it is free from physical damage, including impact marks, cracks, water ingress, excessive wear, or deformation. Verify that the optical lens protection cover/window is perfectly clean and transparent, free of dust, fingerprints, water stains, or scratches. If cleaning is required, wipe gently using a designated lint-free lens cloth; do not touch the optical surface directly with bare hands. Perform a power-on self-test (POST) to verify that the internal operating system, laser emission, data reception, and data storage systems initialize correctly without any error messages or warning pop-ups. Verify that the available onboard or removable storage media has sufficient capacity to accommodate the entire scheduled scanning project. Conclude the inspection by executing a verification test scan to ensure the complete data acquisition workflow functions flawlessly.

2) Battery

Inspect the genuine internal scanner batteries. Ensure all batteries are fully charged prior to field deployment; each individual battery must maintain a capacity of over

80%. Test battery insertion and extraction beforehand to verify solid contact mechanics and eliminate any potential for intermittent power failure due to a loose fit. For extended outdoor or large-scale project areas, the system must be equipped with a dedicated external power pack and compatible heavy-duty power cables. Verify that the external power pack has sufficient charge, cables show no structural insulation damage, and all locking connectors provide stable engagement to facilitate uninterrupted power supply. Simultaneously check the physical condition of all batteries to ensure there is no swelling, leakage, or abnormal thermal behavior. Defective, degraded, or aged batteries are strictly prohibited from operations to prevent unexpected mid-scan power losses that cause data corruption, data loss, or abrupt system shutdowns.

3) Tripod

Use only the designated system tripod supplied with the scanner. Inspect the tripod legs to ensure smooth extension and retraction. Verify that all locking clamps and knobs are fully functional, free of stripped threads, and tighten securely without slippage. Ensure that the tripod feet/spikes are intact, stable, and free from severe wear or detachment. Deploy the tripod to evaluate its structural stability; verify that all height-locking notches or mechanisms engage correctly and that there is no residual wobbling, settling, or axial drift once locked. Before mounting the scanner, thoroughly clean the tripod top plate / head interface to ensure the mounting surface is pristine and level. This guarantees a rigid and secure coupling of the scanner unit (or tribrach), eliminating instrument vibration or micro-displacements during scanning operations which would otherwise degrade point cloud accuracy.

4) RTK / Total Station (Control Survey Equipment)

If absolute coordinate acquisition, site calibration, or multi-station registration and positioning are required, an RTK receiver or total station must be prepared in advance. Inspect the instrument main unit, range pole, prism, data cables, and batteries to ensure the complete accessory kit is intact and present. Power on the instrument to verify that the power-on self-test (POST) initializes correctly without any system error messages. Complete instrument calibration, tribrach leveling, and centering adjustments prior to field deployment. Verify that the RTK network subscription is valid, the differential correction signal is stable, and a reliable fixed solution is

achieved. Ensure that the total station's horizontal angle, vertical angle, and EDM (Electronic Distance Measurement) accuracy comply with required tolerances to enable precise execution of station coordinate acquisition, target positioning, and control point verification tasks.

5.2 Site Inspection

Prior to deploying instruments to the project site, a comprehensive site assessment must be conducted to screen for all potential active interference factors, clearly defining the scanning boundaries and localized risk areas. This field evaluation establishes the operational baseline for subsequent scan station deployment and sensor parameter configuration, thereby safeguarding overall point cloud data quality.

1) Scan Location and Ground Conditions

Clear all debris, temporary obstructions, loose soil, gravel, and standing water within the operational area to ensure an unobstructed field of view (FOV) and eliminate potential data occlusions. Inspect the immediate terrain and ground stability; prioritize flat, solid, and non-settling surfaces for scan station setups. Explicitly avoid potholes, steep slopes, soft mud, and water-logged areas to prevent tripod instability, instrument tilting, or micro-displacements during scanning. Concurrently, review the complete operational layout to identify target structures, topography, and critical geometric features, ensuring no data gaps or missing coverage zones.

2) Ambient Light and Weather Conditions

Evaluate onsite ambient lighting profiles. Avoid data capture in scenarios characterized by direct, intense sunlight, localized back lighting, or extreme high-contrast scenes, as harsh lighting can degrade HDR colorization (causing overexposure/blown-out highlights) and introduce additional range noise into the laser data, while excessive shadows can lead to critical detail loss in dark areas. For outdoor operations, prioritize overcast conditions or low-light intervals, or implement shading countermeasures during peak sunlight hours. Closely monitor meteorological limits. Scanning operations are strictly prohibited during high winds, heavy precipitation, dense fog, or sandstorms to protect the optical windows and internal components from dust or moisture ingress. Furthermore, these adverse conditions

induce atmospheric turbulence and attenuate visibility, resulting in fragmented point clouds and geometric accuracy distortion.

3) Identification of Interference Sources

Screen the site for dynamic operational interference. Prior to initializing the scanner, clear all moving pedestrians and vehicles from the active scanning envelope and temporarily halt nearby construction or machinery operations; this eliminates dynamic occlusions along the sensor's line-of-sight and prevents the generation of moving artifacts (ghosting noise). Identify challenging target materials, such as highly reflective (specular) surfaces (e.g., glass, polished metal fascia, mirrored components, or wet pavements) and low-reflectivity (highly absorptive) materials (e.g., dark matte finishes or unlit confined cavities). Document these zones during the walk-through to adaptively adjust laser pulse repetition rates (PRR), sensitivity thresholds, or to enable multi-exposure HDR capture, ensuring optimal data integrity. Additionally, mitigate Electromagnetic Interference (EMI) by maintaining safe operating distances from power transformers and high-voltage gear to ensure uninterrupted scanner system stability.

5.3 Scan Station Setup Guidelines

Select optimal scan positions based on the intended target geometry. To guarantee data quality and instrument safety, adhere strictly to the following principles during station deployment:

1) Stability Principle

- Ensure the tripod or mounting assembly is completely stable to prevent data drift or registration errors induced by vibrations, wind loads, or accidental human contact.
- Prioritize solid, level surfaces (e.g., concrete). For soft ground conditions, secure the setup using tripod spikes (foot plates) or stabilization weights.

2) Data Quality Control

- Maintain a scan overlap of $\geq 30\%$ between adjacent scan stations, increasing to $\geq 50\%$ in geometrically complex environments.

- Inspect point cloud integrity immediately post-scan using the real-time preview interface; execute supplementary scans if data voids (occlusions) or excessive noise are identified.
- Schedule operations during off-peak hours with minimal pedestrian and vehicular traffic to mitigate excessive dynamic artifacts (ghosting noise).

3) Field of View (FOV) Optimization

- Position scan stations to maximize coverage of the target area's primary geometric features and minimize occlusions (e.g., avoid obstructions from trees or adjacent structures).
- Minimize interference within the line-of-sight caused by highly absorptive or highly reflective materials (e.g., dense atmospheric haze, glass curtain walls).

4) Scan Station Density Control

- Plan scan station spacing adaptively based on target accuracy requirements and scene complexity to prevent insufficient overlap (resulting in data voids) or excessive data redundancy (which reduces operational efficiency).
- Increase scan station density in complex environments and utilize artificial targets (e.g., registration spheres, planar targets) to facilitate multi-station registration and alignment.

5) Safety and Regulatory Compliance

- Adhere strictly to site-specific safety regulations and protocols (e.g., obtain formal permits/approvals when operating near power utilities or active traffic zones).
- Do not deploy scan stations in hazardous environments or high-risk areas (e.g., cliff edges, landslide-prone zones).

5.4 Scan Route Planning

5.4.1 General Planning Principles

- ① Sequential and Continuous Station Deployment: Position scan stations

sequentially along the physical alignment of the operational area. Prioritize S-shaped or linear traversal paths to minimize instrument backtracking and transport. Maintain a point cloud overlap rate of $\geq 30\%$ between adjacent scan stations; increase this overlap threshold to $\geq 50\%$ for complex structures and narrow corridors.

- ② **Supplementary Stationing for Blind Spots:** Deploy localized infill stations at positions prone to line-of-sight occlusion such as wall corners, behind structural columns, beneath eaves, and within enclosed spaces—to eliminate point cloud data voids.
- ③ **Control Point Deployment:** For large-scale industrial facilities or topographic surveying applications, deploy target-fitted control points at critical vertices as well as the start and end boundaries of the survey area to facilitate global coordinate unification.
- ④ **Interference Avoidance:** Route traversal paths away from high-traffic vehicular and pedestrian thoroughfares, large specular glass facades, standing water zones, and the immediate vicinity of high-voltage overhead cables.

5.4.2 Recommended Scan Configurations by Scenario

1) Scenario 1: Single Isolated Building

Deployment: Deploy scan stations sequentially along a linear loop-traversal path around the exterior facade of the building to establish a closed-loop scan trajectory. For structures with elevated heights, extend the standoff distance of the scan stations radially outward to avoid vertical facade occlusions and minimize perspective blind spots. Maintain a scan station spacing of 8m to 30m, uniformly distributing scan positions along the long axes of the building to guarantee sufficient cloud-to-cloud overlap. Dedicated supplementary scan stations must be explicitly deployed at each of the four structural corners of the building to capture occlusion-prone geometric features such as wall vertices, columns, and structural eaves.

Deployment: Interior environments are highly prone to geometric occlusions and require frequent spatial transitions; therefore, supplementary scan stations must be explicitly deployed at critical environmental junctions and interior portals.

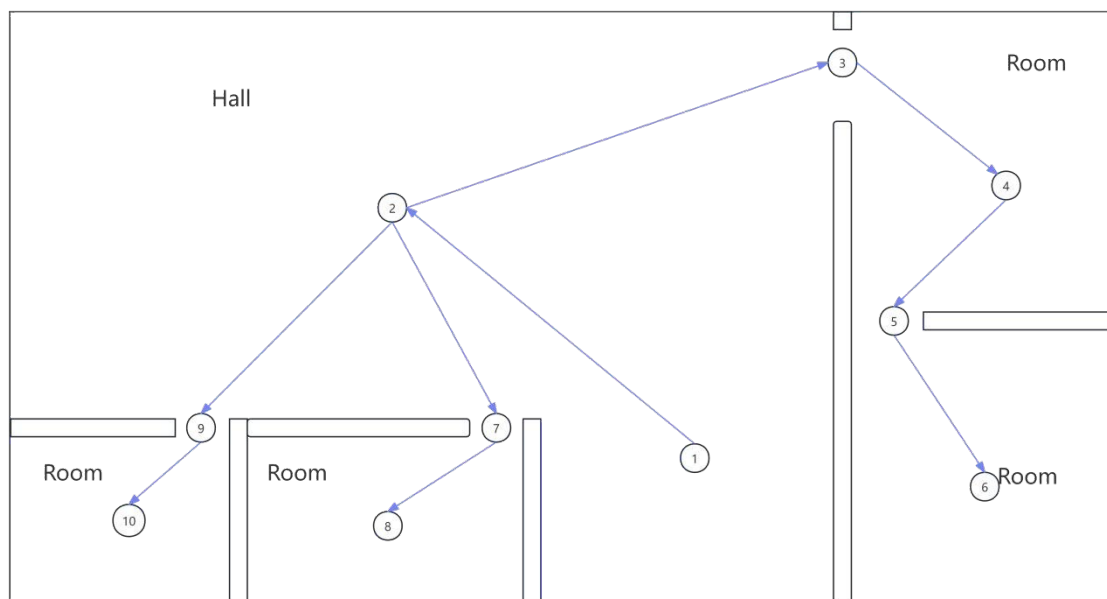


Figure 5-2 Indoor Scan Configuration Planning

4) Scenario 4: Indoor-to-Outdoor Scanning

Deployment: Complete data capture requires interleaved scan station setups covering both interior and exterior zones. Dedicated transitional scan stations must be positioned at all environmental thresholds and entrance/exit portals.

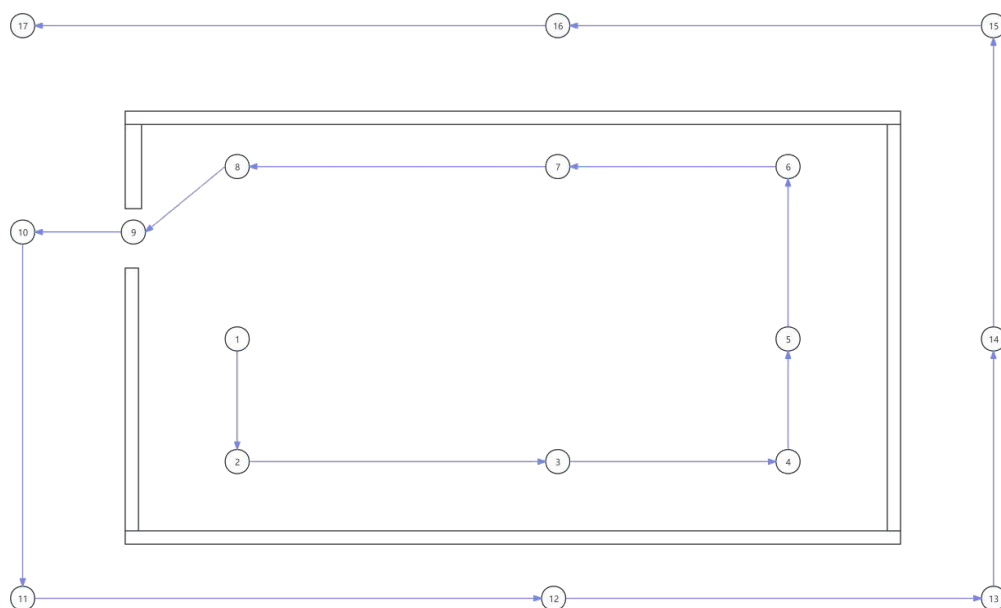


Figure 5-3 Indoor/Outdoor Scan Route Planning

5) Scenario 5: Narrow and Long Tunnels / Corridors (Sequential Progressive Stationing)

Deployment: Advance scan stations progressively along the center line of the tunnel or corridor. Maintain a station spacing of 8m to 15m along linear segments. At curved geometries or bends, increase station density locally to eliminate inner-bore scanning blind spots. If the tunnel cross-section is significantly wide, the station-to-station baseline distance may be adaptively extended.

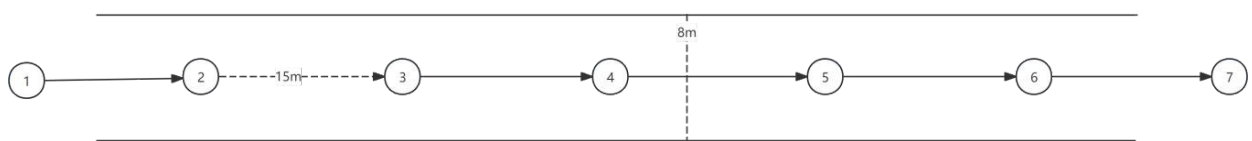


Figure 5-4 Tunnel Scan Configuration Planning

Chapter 6 Scanner Mounting, Dismounting, and Data Acquisition

Operating Workflow: After conducting a comprehensive site assessment, define the scanning route and proceed to the initial position of the path for scan station setup, then mount and assemble the instrument in accordance with standard technical specifications. Once the scanner has completed its boot-up sequence, use the control software on the accompanying tablet PC to connect to the instrument, configure the scan parameters, and initiate data acquisition along the predefined path. Verify the generated real-time point cloud to evaluate the overall coverage and data quality results.

WARNING!

Prior to executing any operations on the hardware equipment or the control software, it is mandatory to read and thoroughly understand the complete contents of Chapter 3 (System Hardware Configuration) and Chapter 4 (Control Software Description) in their entirety.

6.1 Instrument Assembly and Setup

6.1.1 Setting Up the Tripod

The accompanying tripod is a 4-section telescopic tripod featuring an integrated central elevating column, as shown in Figure 6-1. It can extend to a maximum height of 1.59 m, allowing height adjustment based on operator ergonomics and preferences. During deployment, ensure the tripod is substantially level and structurally stable to guarantee that the scanner remains free from vibrations or shaking during operation, and is fully safeguarded against accidental impacts from pedestrians or vehicles. Adhere to the following principles when setting up the tripod:

- ① Select flat, solid ground to deploy the tripod. Extend and distribute the three tripod legs evenly to ensure firm contact with the ground surface;
- ② Adjust the tripod height according to operational requirements: loosen the locking knobs on each leg section, extend or retract the tripod legs to the desired height, and then securely tighten the locking knobs to ensure that each individual

section is rigidly locked in place;

- ③ Check the levelness of the tripod. Visually inspect and adjust the legs to ensure that the tripod top plate is perfectly horizontal;
- ④ On soft or loose ground conditions, force the tripod spikes firmly into the substrate or add stabilization counterweights to the tripod base to enhance structural stability, preventing the assembly from tilting or toppling over.

WARNING!

After setting up the tripod, verify its stability repeatedly. Any looseness in the tripod assembly can cause the instrument to fall, leading to severe equipment damage and personal injury.



Figure 6-1 Tripod

6.1.2 Mounting the Scanner Main Unit

Place the scanner main unit onto the tripod top plate. Secure the scanner using the integrated quick-release coupling latch on the tripod head to ensure a rigid, shake-free connection between the main unit and the tripod, as shown in Figure 6-2.



Figure 6-2 Mounting the main unit

6.1.3 Battery Installation

Open the battery compartment cover at the rear of the device and insert a fully charged battery into the battery slot, ensuring that the battery orientation is correct, as shown in Figure 6-3.

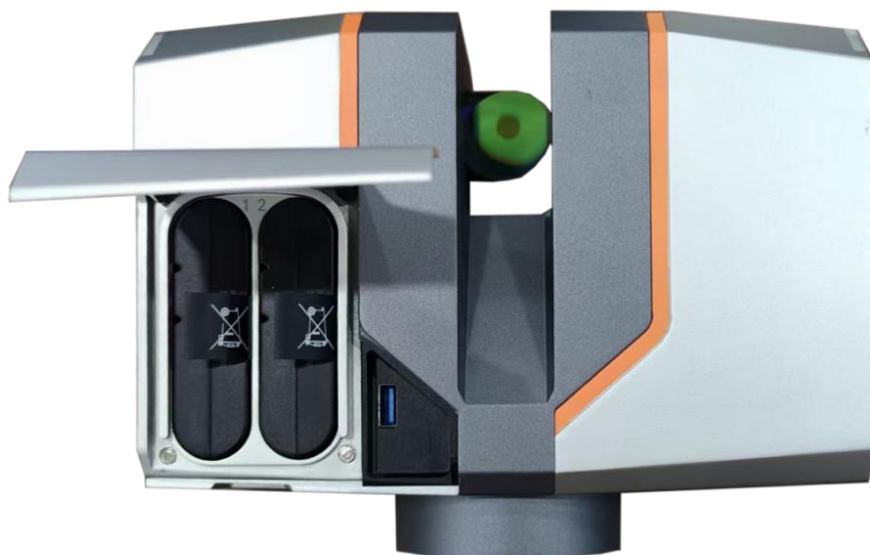


Figure 6-3 Battery Installation

NOTE!

It is highly recommended to install two fully charged batteries simultaneously to extend the system operating time. Once the batteries are inserted, their capacity can be monitored via the control software to confirm proper installation and electrical contact.

6.1.4 USB Flash Drive Installation

The scanner is equipped with a 256 GB USB flash drive dedicated to storing the acquired raw point cloud data, panoramic images, and other project files. The USB flash drive is pre-installed inside the scanner main unit by default and can be extracted for data copying, transfer, or backup, as shown in Figure 6-4.

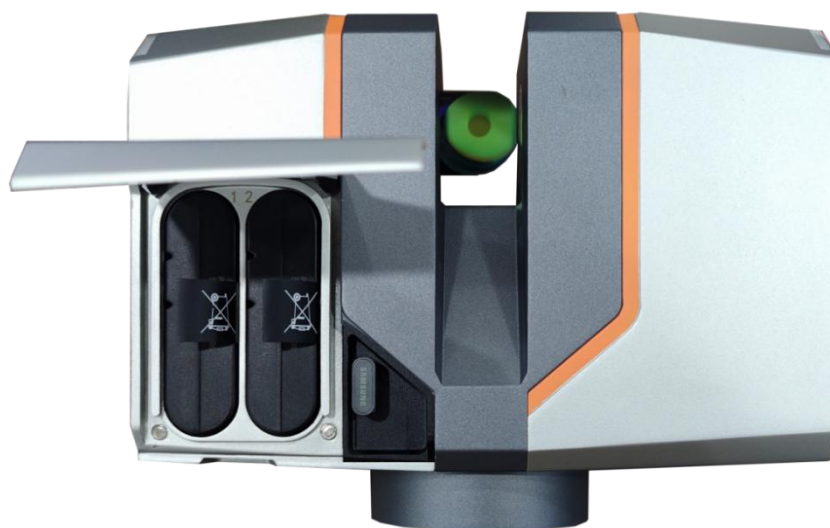


Figure 6-4 USB Flash Drive Installation

NOTICE!

- ① Prior to initializing each scan session, you must verify that the USB flash drive is correctly inserted and recognized by the control software; otherwise, scan data cannot be saved, resulting in a failed operation;
- ② Always re-insert the USB flash drive into the instrument immediately after copying or transferring data to prevent misplacement.

6.1.5 GNSS Connectivity

If the point cloud data requires absolute geo-referenced coordinates and the data acquisition scenario is outdoors, an external GNSS receiver can be mounted to

acquire absolute positioning data. The installation interface is located on top of the instrument, as shown in Figure 6-5.



Figure 6-5 GNSS Installation

6.2 Instrument Connectivity

6.2.1 Instrument Power-On

Press and hold the power button on the side of the device for 3 seconds to initiate the boot-up sequence. The scanner will execute a rotation reset (initialization calibration), and the status LED indicator on top of the instrument will turn solid purple, indicating a successful system startup.

6.2.2 Tablet PC Power-On

Press the power button on the control tablet PC, wait for the tablet to boot up, and enter the operating system interface. Locate the E Pic Capture control software icon



and tap to open the application. The user interface shown in Figure 6-2 will appear, indicating readiness to establish a connection with the scanner.

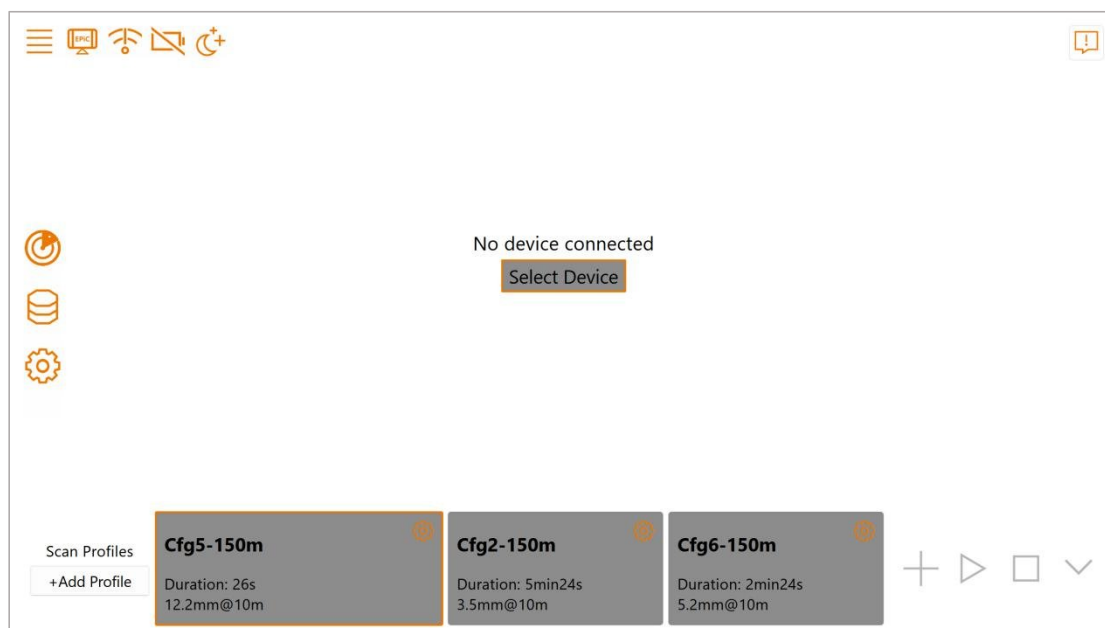


Figure 6-1 The Tablet PC

NOTE!

To use alternative control devices (e.g., a personal laptop) to connect to the scanner, copy the E Pic Capture installation package from the USB flash drive and execute the installation setup.

6.2.3 Connecting to the Scanner

Ensure that the tablet PC's Wi-Fi interface remains enabled. Tap [Select Device to Connect], and select the corresponding device serial number from the populated list to establish a connection. The device serial number can be verified on the transport case or the scanner main unit itself. For example, the Wi-Fi SSID for Unit No. 6 is "T150-006-5G", and the initial default security key is "12345678". Enter the Wi-Fi password for the initial pairing; subsequent connections will reconnect automatically.

NOTE!

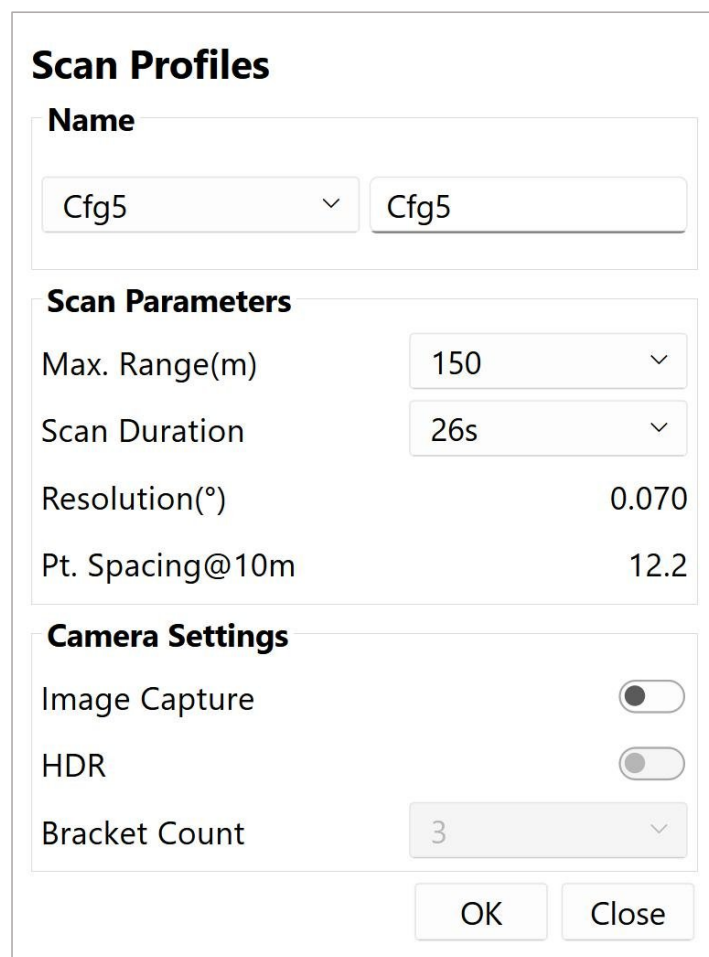
Upon a successful device connection, a "Device Connected Successfully!" notification will appear in the right-side status panel. The Wi-Fi icon will switch to an active connection state, the battery icon will display the current charge level, the main window will transition to the project creation wizard, and the instrument status LED indicator will turn solid blue.

6.3 Data Acquisition

6.3.1 Scan Parameter Configuration

Configure the following parameters sequentially: ①Scan Distance; ②Scan Duration; ③Camera On/Off; ④HDR On/Off; ⑤Number of Exposures (3/5).

For detailed parameter configurations, refer to Section "4.6.2 Scan Configuration".



The image shows a 'Scan Profiles' configuration window. It has a title bar 'Scan Profiles'. Below the title bar is a 'Name' section with a dropdown menu showing 'Cfg5' and a text input field also containing 'Cfg5'. Below this is a 'Scan Parameters' section with four rows: 'Max. Range(m)' with a dropdown set to '150', 'Scan Duration' with a dropdown set to '26s', 'Resolution(°)' with a value of '0.070', and 'Pt. Spacing@10m' with a value of '12.2'. Below the 'Scan Parameters' section is a 'Camera Settings' section with three rows: 'Image Capture' with a toggle switch turned on, 'HDR' with a toggle switch turned off, and 'Bracket Count' with a dropdown set to '3'. At the bottom right of the window are two buttons: 'OK' and 'Close'.

Scan Profiles	
Name	
Cfg5	Cfg5
Scan Parameters	
Max. Range(m)	150
Scan Duration	26s
Resolution(°)	0.070
Pt. Spacing@10m	12.2
Camera Settings	
Image Capture	☒
HDR	☐
Bracket Count	3
OK Close	

Figure 6-2 Configuration Profile

6.3.2 Single Station Scanning

Tap the highlighted Start button at the bottom right of the control software. The device will initiate point cloud data acquisition, and the main interface will display a real-time grayscale intensity image. Once the point cloud acquisition progress bar concludes, the camera acquisition sequence will begin (if the camera is enabled). The single station scan is complete when the imagery progress bar concludes.

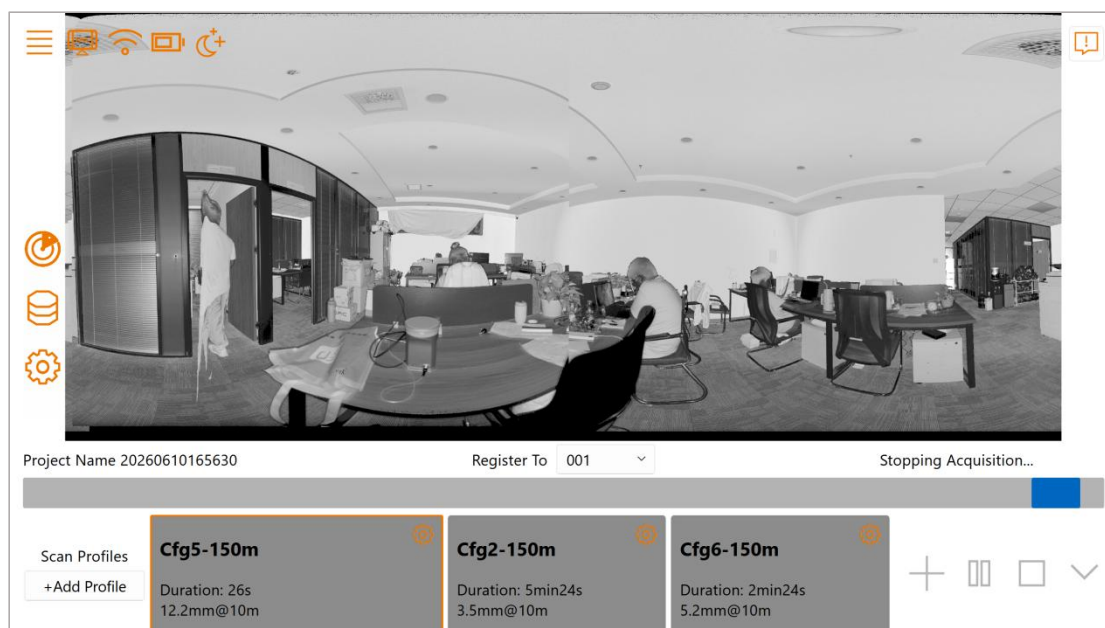


Figure 6-3 Single Station Scanning

Post-scan, if there are critical target areas within the scene that require high-density data capture, define a Region of Interest (ROI) in accordance with Section "4.6.3 Control Bar" and apply an extended-duration profile to execute the localized ROI data scan.

6.3.3 Station Transition

Upon completion of a single station scan, maintain the software connection to the device and transition to the next scheduled station along the planned route. The instrument does not need to be powered down during this transition. Firmly grip the tripod assembly with both hands to ensure stable transport, and remain highly vigilant of passing vehicles and pedestrians to prevent collisions.

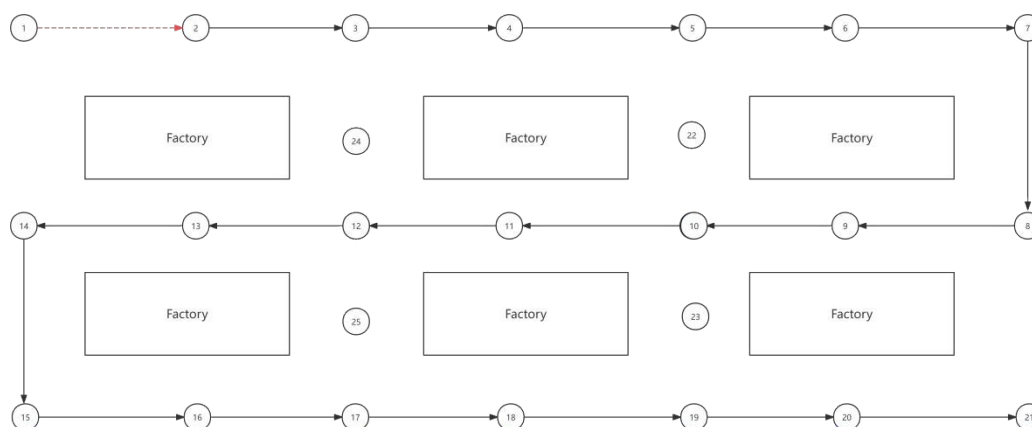


Figure 6-4 Station Transition

Relocate and deploy the tripod at the target position, then execute another scan session via the control software to complete data capture for that station. Once the scan concludes, the system will automatically initiate targetless registration/alignment. The operator may immediately proceed to relocate to the subsequent station, as the physical transport process will not interrupt or degrade the background automatic registration progress or its final alignment accuracy.

6.3.4 Registration

Commencing from the second station of the project, the system will automatically execute cloud-to-cloud registration upon scan completion. The final registration and alignment results can be evaluated in the point cloud viewer interface.

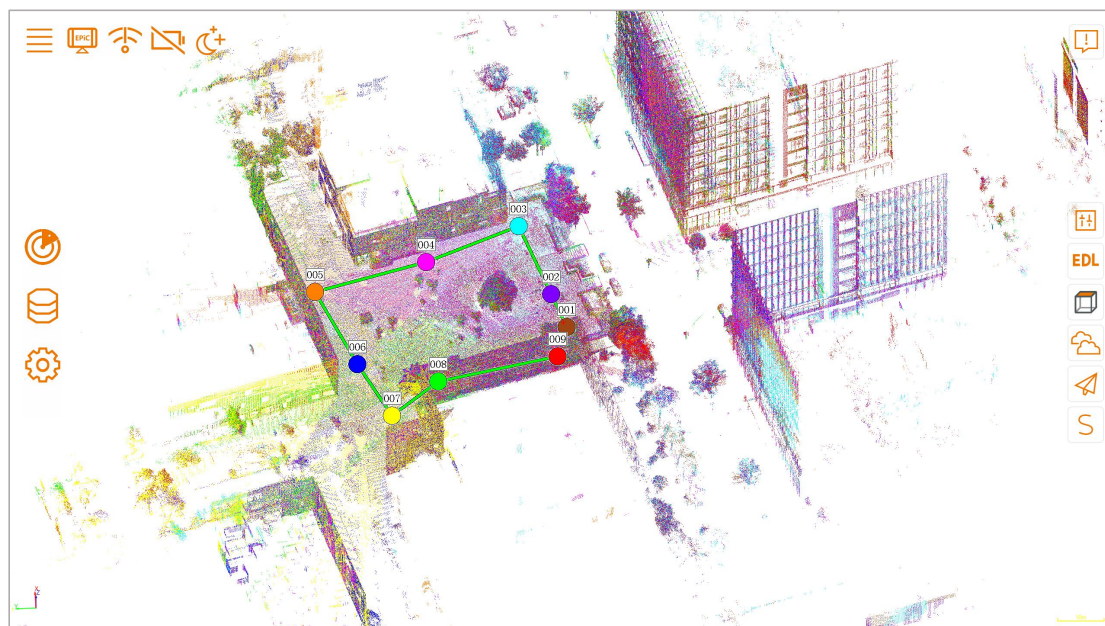


图 6-5 Multiple Scanning Station Registration

If the automatic registration fails, the following corrective measures can be implemented:

- ① Adjust the automatic registration constraints and parameters via [Settings] → [System] → [Automatic Registration Settings]. After modifying the parameters, tap [Automatic Registration] to re-execute the automated alignment sequence;



Figure 6-7 Automatic Registration Settings

② Tap [Manual Registration by Point Selection] on the registration toolbar to perform manual point-matching registration.

6.3.5 Acquired Data Verified

Upon completion of field scanning operations, a comprehensive inspection of the acquired data must be performed immediately to ensure project data integrity and technical validity. The operational sequence is as follows:

- ① Extract the data storage USB flash drive from the scanner unit and insert it securely into the control tablet or data processing workstation;
- ② Open the data management software and cross-check all station data associated with the surveyed project, focus inspection strictly on the following items:
 - Whether all data file structures are complete, showing zero omissions, data loss, or structural corruption;
 - Whether the point cloud data records load correctly without generating empty files or unreadable system exceptions; If data omissions, file corruption, or insufficient point cloud density in critical zones are detected, isolate and diagnose the root cause (e.g., unexpected mid-scan power loss, storage media errors, line-of-sight occlusions, or excessive standoff distance). Based on actual site conditions, execute supplementary scans immediately to ensure the final deliverable fulfills all downstream post-processing and geometric analysis requirements.

6.4 Instrument Dismounting

6.4.1 Battery Removal

- ① Power off the instrument: Press and hold the power button or tap the [Shut Down] button within the control software to turn off the instrument. Verify that the entire system has executed a complete shutdown sequence and is fully powered off;
- ② Detach the GNSS antenna;
- ③ Open the compartment cover at the rear of the device and extract the internal battery;

6.4.2 Dismounting the Main Unit

When dismantling the main unit, securely hold the scanner main body and rotate the quick-release coupling latch counter-clockwise. Once the latch is fully loosened, lift the main unit vertically upward to remove it from the tripod head;

6.4.3 Packing the Instrument

Place the main unit and all auxiliary components back into the transport case sequentially, and verify that the complete system inventory is present and intact.

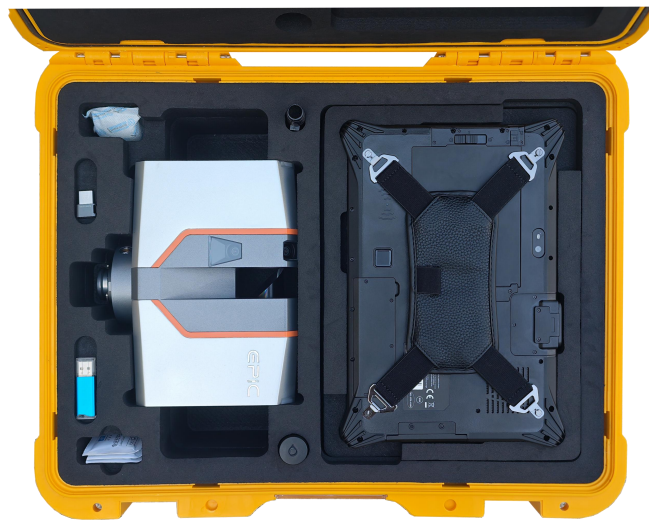


Figure 6-6 Packing the Instrument



Figure 6-7 Packing the Instrument

Chapter 7 Common Questions

7.1 Pop-up Notifications

message content	Trigger Condition	Fault Diagnosis	Solution
Device Connected!	Successful device connection	—	—
Device Disconnected!	Device connection interrupted	Scanner powered off; network interface on the control unit was switched	Check instrument power status; verify network connectivity
Project Name Empty!	Start scan clicked, but no project name entered	Missing project designation	Enter a valid format for the project name
Failed to Create Project Directory!	Unsuccessful project initialization	Default storage directory does not exist; alternative directory can be configured	Verify whether the storage location path is correct
Critical Wi-Fi Signal, Unable to Acquire Data	Exceptionally weak Wi-Fi signal strength	Standoff distance to the instrument is too large; signal occlusion or RF interference	Move closer to the instrument; switch to a wired Ethernet connection
Weak Wi-Fi Signal, Risk of Data Loss During Scan	Degraded Wi-Fi signal strength	Standoff distance to the instrument is too large; signal occlusion or RF interference	Move closer to the instrument; switch to a wired Ethernet connection
No USB Flash Drive Detected	USB drive mount failure	USB flash drive not installed; USB media corrupted	Insert an intact USB flash drive; switch to internal/external SSD storage
Insufficient USB Storage Space	Inadequate USB capacity	—	Purge/backup data on the USB drive; switch to SSD storage
No SSD Detected	SSD mount failure	—	Contact RIEGL Technical Support; do not attempt unauthorized repairs
Insufficient SSD Storage Space	Inadequate SSD capacity	—	Purge/clean data within the SSD; switch to USB storage
Critical Battery Level!	Battery capacity dropped below 15%	—	Replace the battery pack immediately

message content	Trigger Condition	Fault Diagnosis	Solution
Battery Capacity Insufficient for Current Scan Profile	Low remaining charge coupled with an extended-duration scan configuration	—	Replace the battery pack
Failed to Save Point Cloud: [Error Message]	Incomplete real-time point cloud transmission upon scan completion	Power source or network interface cut off during active transmission	Real-time preview point cloud is incomplete, but raw data within the USB drive or internal SSD remains unaffected
Point Cloud Data Received	Real-time point cloud streaming completed	—	—
Report Exported to: [Path]	Registration report exported successfully	—	—
Storage Location Modified	Default storage path updated	—	—
Failed to Modify Storage Location	Default storage path update failed	Target directory path is invalid	Verify the target storage path destination
USB Flash Drive Ejected	USB drive unmounted and safely removed	—	—
Camera 1 Error!	Camera 1 hardware anomaly detected	—	Contact RIEGL Technical Support; do not attempt unauthorized repairs
Camera 2 Error!	Camera 2 hardware anomaly detected	—	Contact RIEGL Technical Support; do not attempt unauthorized repairs
Dual Camera Error!	Dual camera subsystem anomaly detected	—	Contact RIEGL Technical Support; do not attempt unauthorized repairs
Failed to Retrieve Camera Information!	Internal camera communication anomaly	—	Contact RIEGL Technical Support; do not attempt unauthorized repairs
Log File Exported to: [Path]	System log file export completed	—	—
Are you sure you want to exit?	User tapped [Exit] / [Quit]	—	—
Are you sure you want to shut down?	User tapped [Shut Down]	—	—
Display scaling	UI scaling ratio	—	—

message content	Trigger Condition	Fault Diagnosis	Solution
changes require a system reboot. Reboot now?	modified		
Language changes require a system reboot. Reboot now?	System display language configured	—	—

Figure 7-1 Pop-up Notifications and Error Messages

7.2 Troubleshooting and Solution

This section compiles high-frequency operational faults and categorizes self-diagnostic troubleshooting procedures based on operational scenarios. The troubleshooting logic follows a sequence of simple external checks prior to internal hardware diagnostic inspection. Most fundamental faults can be resolved rapidly via on-site user operations. If the fault persists after executing all self-diagnostic procedures, contact RIEGL Technical Support immediately. Do not attempt unauthorized disassembly of the instrument housing, power supply mainboard, wireless modules, or other core components to avoid compounding equipment damage.

1) Scanner Fails to Boot Up

- ① The battery pack is not installed or is defective. Replace the battery or connect an external power supply to attempt system boot-up;
- ② Poor electrical contact of the power button. Press and hold the button repeatedly to test functionality;
- ③ Internal power supply mainboard failure (the system remains completely unresponsive to both battery replacement and external power supply). The instrument must be returned to the factory for power module service.

2) Wi-Fi Connection Failure or Intermittent Disconnection

- ① Excessive standoff distance between the instrument and the control unit, or signal attenuation caused by intervening walls or metallic obstructions. Reduce the baseline distance, remove the obstructions, and re-establish the connection;
- ② Environmental RF interference sources are present. Switch to a direct wired Ethernet connection;

③ The control unit is connected to an alternative Wi-Fi access point. Disconnect from other networks and ensure the connection is maintained exclusively with the scanner's WLAN hotspot;

④ The Ethernet IP subnet configuration on the control unit has been modified. Reconfigure the network adapter to obtain an IP address automatically (DHCP/Auto-IP);

⑤ Poor contact of the scanner Wi-Fi antenna or internal wireless module failure. Utilize a direct wired Ethernet connection to ensure stable data transmission as a temporary workaround prior to hardware servicing.

3) USB Flash Drive Unrecognized

① A non-compliant USB drive is installed. Verify whether the matching, original manufacturer-supplied USB drive is being used;

② The USB flash drive is corrupted. Replace it with a new USB drive; note that the file system format must be exFAT;

③ The USB drive is not fully seated in the slot. Re-insert the USB drive and ensure the interface latching mechanism is completely engaged;

④ Surface oxidation or contaminants on the instrument's USB interface contacts. Clean the interface metallic contacts gently using a lint-free wipe;

⑤ If the interface fails to recognize a compliant USB drive, an internal USB hardware fault is indicated. The instrument must be returned to the factory for repair.

4) Camera Subsystem Failure

① The camera failed to capture imagery upon point cloud acquisition completion. Verify if the image acquisition toggle was disabled within the scan profile configurations;

② Acquired imagery is blurry or exhibits distinct artifacts/spots. Inspect the camera lens for dust, smudges, or physical scratches;

③ Loose ribbon cable connection or hardware degradation within the dual-camera subsystem. Reboot the instrument to reset the internal hardware communication bus. If repeated initialization attempts fail, return the instrument to the factory for repair.

5) Incomplete Grayscale Intensity Image

- ① Unstable instrument data connection during the active scan session. Verify the current Wi-Fi or wired Ethernet connectivity status;
- ② Pedestrians or vehicles loitered within or traversed the scene during scanning, causing line-of-sight occlusions in the point cloud. Position scan stations as far away from high-traffic zones as possible;
- ③ High-specular reflective surfaces (such as mirrors or glass facades) encountered, resulting in zero or insufficient valid data returns. Extend the standoff distance from highly reflective surfaces accordingly;
- ④ The optical path is obstructed by fingerprints, dust, or condensation on the instrument protection glass/lens. Clean the optical surfaces using a soft, lint-free lens wipe;
- ⑤ Co-channel interference present within the 2.4 GHz wireless spectrum (e.g., from two-way radios or external routers). Modify the scanner's Wi-Fi frequency band selection or switch to a wired Ethernet transmission path;
- ⑥ hardware failure of the laser receiver module, characterized by a persistent and total absence of intensity data across specific azimuth sectors or the entire field of view. If the fault persists after verifying optical cleanliness, power stability, and communication integrity, the receiver module must be returned to the factory for replacement.

6) Automatic Registration Failure

- ① Insufficient geometric overlap between adjacent scan stations (minimum requirement $\geq 30\%$, increasing to $\geq 50\%$ in complex environments), resulting in an inadequate count of corresponding tie points. Adjacent stations must share at least 3 distinct, non-collinear geometric features;
- ② The instrument was powered off during station transition, causing an interruption in IMU (inertial measurement unit) data tracking. Execute manual registration by point selection;
- ③ Dynamic occlusions from pedestrians or vehicles during data acquisition masked corresponding features across adjacent stations. Re-acquire point cloud data for the occluded sectors;
- ③ Software registration constraints and algorithm parameters do not match the physical characteristics of the scene. Adjust the parameters and re-execute the automatic alignment sequence.

Chapter 8 Maintenance

Recommendations

Following prolonged operation of the scanner in harsh environments, components exposed to the exterior atmosphere may experience fatigue degradation or failure, potentially compromising instrument functionality and performance. Regular inspection and maintenance routines must be executed to safeguard nominal system operation.

Furthermore, periodic inspections should focus primarily on the items listed below:

Category	Item	Interval	Method	Checklist	Solution
Visual / Maint.	Structural Exterior	Annually	Visual	Deformation, cracks, or physical damage	Contact provider
	Fasteners	Annually	Tool / Visual	External & base mounts: loose, corroded, missing	Replace (same spec)
	Connectors	Semi-annually	Visual	Loose couplings, corrosion, or degradation	Contact provider
	Cables	Semi-annually	Visual	Aging or wear (check connectors/feedthroughs)	Contact provider
	Battery	Quarterly	Functional	Power delivery and runtime performance	Contact provider
	Tripod	Quarterly	Tool / Visual	Loose hardware, corrosion, or missing parts	Replace (same spec)
	Tablet PC	Quarterly	Functional	OS boot-up and nominal operation	Contact provider
	Optical Window	Quarterly	Visual	Window cracks, damage, internal moisture/dust	Contact provider
Power-On Test	Desiccant	Quarterly	Extract / Visual	Color saturation shift to pink	Replace cartridge
	Azimuth Drive	Quarterly	Visual / Audio	Smooth horizontal rotation; zero abnormal noise	Contact provider

Chapter 9 Contact Information and After-Sales Support

Thank you for your continued trust and support in EPiC LiDAR Tech Co., Ltd. products. Should you encounter any product anomalies during operation, please notify us promptly. We will make every effort to rectify these issues to ensure our products fully align with your professional requirements. To help us provide you with superior service in the future, please contact us by phone or email if you encounter any difficulties or have valuable suggestions while utilizing this documentation.

Company Address: Room 302, Area B, Building 21, West District, CEC Information Harbor, No. 27 Yangqiaohu Avenue, Jiangxia District, Wuhan City, Hubei Province

Company Phone: 027-87959978

Company Website: www.epiclidar.cn

FCC Caution.

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

- (1) This device may not cause harmful interference, and
- (2) this device must accept any interference received, including interference that may cause undesired operation.

Any Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

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

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

FCC Radiation Exposure Statement:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20 cm between the radiator & your body.