

# **LiMobile M2 Lite Mobile Laser Scanning system**

## **User Guide**



## Reading instructions

Dear user:

Thank you for using the LiMobile M2 Lite mobile laser scanning system. We are pleased to provide you with vehicle-mounted mobile measurement data collection and processing services. GreenValley International (GVI) is committed to continuously improving our products. We welcome your valuable comments and suggestions on our hardware equipment, processing software, training and documentation materials. You can contact us at [info@lidar360.com](mailto:info@lidar360.com). Sincerely thank you.

### ▷ Related services and technical support

Related services and technical support: [www.greenvalleyintl.com](http://www.greenvalleyintl.com)

Inquiry hotline: +1 (510) 345-2899

Contact email: [info@greenvalleyintl.com](mailto:info@greenvalleyintl.com)

### ▷ Disclaimer

This manual contains important safety instructions to guide you to safely install and operate this product, so please read this user manual carefully before using this product.

Users need to use and maintain the device in accordance with the requirements. If the instrument's lifespan is affected by improper operation or maintenance by the customer, GVI will not bear the relevant responsibility, and all repair services will be charged at standard rates.

If the instrument is damaged by the logistics company during transportation, GVI will not bear the relevant responsibility.

During use, in order to avoid damage to the equipment and violation of the warranty terms, please do not disassemble the equipment at will. If the product fails, it must be repaired by qualified maintenance personnel authorized by GVI, GVI will not bear all relevant responsibilities if the instrument is damaged due to self-assembly or self-disassembly operations without the support of GVI. Users need to use the original battery and accessories of LiMobile M2 Lite. If users use non-dedicated batteries or chargers, it may cause accidents such as unstable voltage, explosion and combustion of the equipment system. Once used, GVI will not bear the relevant responsibilities and the warranty qualification will be invalid.

The user manual of LiMobile M2 Lite vehicle-mounted mobile laser scanning system will be updated in real time as product technology evolves. The content of this document is subject to modification without further notice. The latest version can be downloaded from the official website of GVI or contact our technical support staff to obtain it.

### ▷ Product logo and trademark

The product model and production serial number are marked on the device label. The production serial number is the unique identification number of the device. Please provide this number accurately when contacting our technical support personnel.

GreenValley International® and LiMobile® are registered trademarks of GVI. Other product names, company names and brand names mentioned in this document may be the trademark property of their holders.

### ▷ Copyright and trademark

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# Safety Instructions

## 1.1 Overview

The following instructions clearly define the responsibilities of the product owner and the actual user of the equipment, as well as how to prevent and avoid dangerous operations. For user safety considerations, the product owner and the actual user of the equipment must read this manual carefully and follow the operating specifications in the manual before use.

### ► About Warning Information

| Type                                                                                                 | Description                                                                                                                                                             |
|------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  <b>Danger</b>      | Indicates a potentially hazardous situation which, if not avoided, will result in death or serious injury.                                                              |
|  <b>Warning</b>     | Indicates a potentially hazardous situation or situation caused by improper operation which, if not avoided, may result in death or serious injury.                     |
|  <b>Carefulness</b> | Indicates a potentially hazardous situation or situation caused by improper operation which, if not avoided, may result in minor or moderate injury.                    |
| <i>Attention</i>                                                                                     | Indicates a potentially hazardous situation or situation caused by improper operation which, if not avoided, may result in economic loss and damage to the environment. |
| ★                                                                                                    | Indicates that special precautions are required in actual use so that the equipment can be used correctly and effectively.                                              |

## 1.2 Responsibilities

|                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Equipment Manufacturer</b>                  | GVI assumes quality responsibility for the equipment and original accessories provided under the conditions of user specification use.                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Personnel Responsible for the Equipment</b> | <ul style="list-style-type: none"> <li>• Understand the safety instructions and operating methods in the user manual</li> <li>• Ensure that the equipment is operated in accordance with the relevant instructions in the user manual</li> <li>• If there is a safety problem with the equipment, please stop operating the system immediately and notify the technical support personnel of GVI.</li> <li>• Ensure that the national laws, regulations and operating conditions regarding the operation of this equipment are followed</li> </ul> |

## 1.3 Usage Environment Restrictions

|                                                                                                    |                                                                                                                                                                                                      |
|----------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  <b>Danger</b>  | Suitable for use in environments suitable for permanent human habitation. Not suitable for use in corrosive or explosive environments.                                                               |
|  <b>Warning</b> | Do not work in hazardous areas, near electrical installations or similar areas.                                                                                                                      |
|  <b>Warning</b> | The device has an IP65 protection rating, which protects it from prolonged exposure to moisture. The device is intended for use in dry environments only and should not be used in harsh conditions. |

## 1.4 Laser Safety

|                                                                                                    |                                                                                                                                                                                                                                                                             |
|----------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Description of Laser Type</b>                                                                   | According to the international standard IEC 60825-1:2014, the laser used in this device is a Class 1 laser product and does not require personal protective equipment. The risk of eye damage is low if the device is used and operated in accordance with the user manual. |
|  <b>Warning</b> | Do not open the laser instrument housing.                                                                                                                                                                                                                                   |

|                                                                                                  |                                                     |
|--------------------------------------------------------------------------------------------------|-----------------------------------------------------|
|  <b>Warning</b> | Do not operate an obviously damaged instrument.     |
|  <b>Warning</b> | Do not point the emitter aperture at the human eye. |

## 1.5 Battery and Cable Safety

|                                                                                                        |                                                                                                                                                                                                                                                                              |
|--------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  <b>Warning</b>       | Please use the specific charger provided to charge the battery.                                                                                                                                                                                                              |
|  <b>Warning</b>       | It is recommended to use the provided AC/DC power solution and battery charger to power the device.                                                                                                                                                                          |
|  <b>Warning</b>       | It is strictly forbidden to expose the battery to any liquid, do not immerse the battery in water or wet it. Never use the battery in rain or humid environment.                                                                                                             |
|  <b>Warning</b>       | The internal battery may decompose upon contact with water, causing the battery to spontaneously combust or even explode.                                                                                                                                                    |
|  <b>Warning</b>       | Do not disassemble, puncture, impact, knock, short-circuit, or incinerate the battery, and do not use damaged batteries.                                                                                                                                                     |
|  <b>Warning</b>       | Do not use the battery in a strong static or magnetic field environment. Otherwise, the battery protection board will fail, causing serious malfunctions of the LiDAR device.                                                                                                |
|  <b>Warning</b>       | <p>The instrument and accessories should not be disposed of with household waste. They should be properly disposed of in accordance with the regulations implemented in your country.</p>  |
|  <b>Warning</b>     | Do not short-circuit the positive and negative poles of the battery with wires or other metal objects.                                                                                                                                                                       |
|  <b>Warning</b>     | If any electrolyte leaks from a damaged battery, avoid skin contact and direct inhalation of the gas.                                                                                                                                                                        |
|  <b>Warning</b>     | If the skin or eyes come into direct contact with the electrolyte leaking from the battery, wash it thoroughly with clean water and contact a doctor immediately.                                                                                                            |
|  <b>Warning</b>     | Do not modify the cables.                                                                                                                                                                                                                                                    |
|  <b>Carefulness</b> | Do not unplug the battery when the battery power is turned on, otherwise the power interface may be damaged.                                                                                                                                                                 |
|  <b>Carefulness</b> | If there is dirt on the battery interface, clean it with a dry cloth. Otherwise, it will cause poor contact, resulting in energy loss or failure to charge.                                                                                                                  |
| <b>Attention</b>                                                                                       | Pay attention to the operating specifications when installing the equipment and do not damage the cable interface.                                                                                                                                                           |

## 1.6 General Operational Safety

|                                                                                                    |                                                                                                                                                       |
|----------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
|  <b>Danger</b>  | Please obey traffic rules. The speed of the car should not exceed 80 km/h. The recommended maximum speed is 60 km/h.                                  |
|  <b>Warning</b> | Turn off the vehicle engine during the installation of the equipment.                                                                                 |
|  <b>Warning</b> | The driver should remember that the equipment will add extra height to the vehicle, so the total height of the vehicle should be carefully monitored. |
|  <b>Warning</b> | It is recommended that another person besides the driver is responsible for operating the system during the collection to prevent traffic accidents.  |

|                                                                                                      |                                                                                                                                                                                         |
|------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  <b>Warning</b>     | Avoid using this device in snow, rain, fog, thunderstorms, or strong sunlight.                                                                                                          |
|  <b>Warning</b>     | Pay attention to the operating temperature of the device.                                                                                                                               |
|  <b>Warning</b>     | To avoid the risk of suffocation, keep plastic foil, bags and bubble wrap away from infants and children.                                                                               |
|  <b>Warning</b>     | Do not use the device if it has obvious noise, alarm or is damaged, and contact the manufacturer's technicians for repair in time. Forced use may cause permanent damage to the device. |
|  <b>Warning</b>     | Do not attempt to repair damaged parts of the device without authorization.                                                                                                             |
|  <b>Carefulness</b> | Do not open the device without authorization.                                                                                                                                           |
|  <b>Carefulness</b> | Install the device carefully to avoid the risk of being hit or pinched.                                                                                                                 |
| <b>Attention</b>                                                                                     | Perform safety tests on the device installation regularly, especially before and after the device is used for important tasks.                                                          |

## 1.7 Electromagnetic compatibility

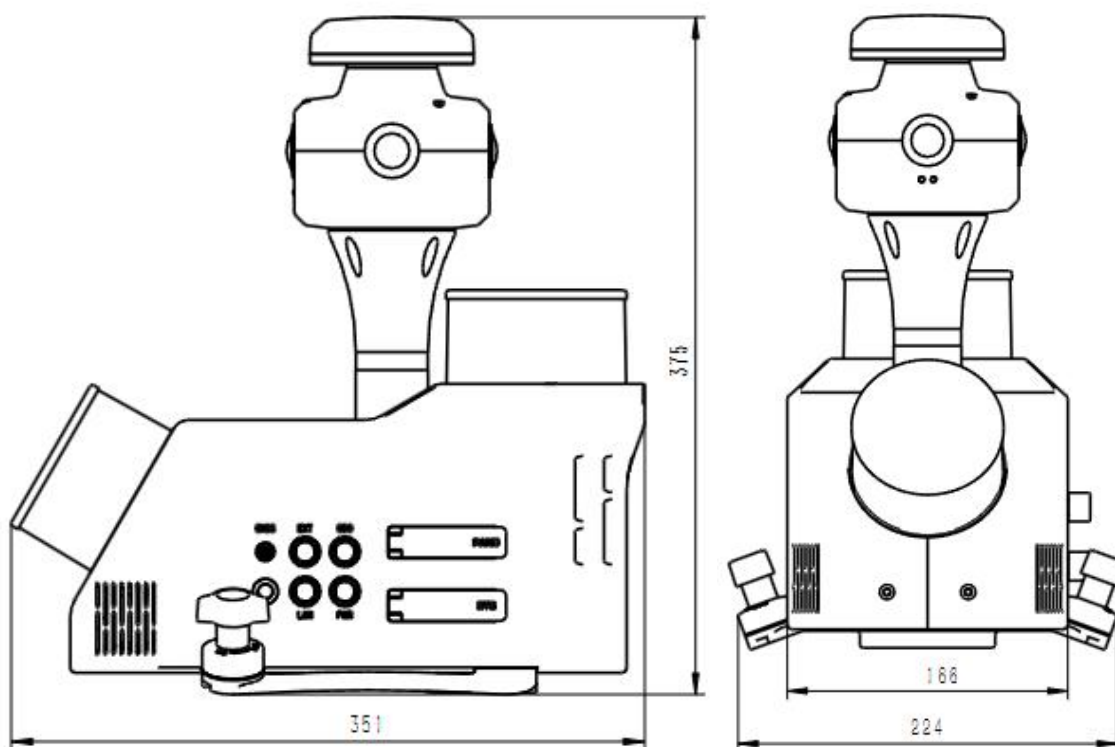
|                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|--------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  <b>Warning</b>       | <p>Although the device is manufactured in strict accordance with relevant regulations and standards, the possibility of interference with other equipment or effects on people and animals cannot be completely ruled out.</p> <ul style="list-style-type: none"> <li>• Do not use the device for operation near gas stations, chemical facilities, and other explosive and hazardous places.</li> <li>• Do not use the device for operation near medical equipment.</li> <li>• Users can take appropriate measures according to the situation.</li> </ul> |
|  <b>Carefulness</b> | Please use original factory accessories for operation. If you use other PC, two-way radio communication equipment or other electronic equipment accessories, please pay attention to the electromagnetic compatibility information provided by the manufacturer.                                                                                                                                                                                                                                                                                           |
|  <b>Carefulness</b> | Two-way radio communication equipment or diesel generators, it cannot be ruled out that the equipment may be interfered with in the electromagnetic environment. The measurement results should be verified for reliability.                                                                                                                                                                                                                                                                                                                               |
|  <b>Carefulness</b> | If the device is only connected to one of the two ports of the cable and the other end is left bare, it may emit excessive electromagnetic radiation. Therefore, when using the device, the connectors at both ends of the cable should be connected.                                                                                                                                                                                                                                                                                                      |

## 2 Product Introduction

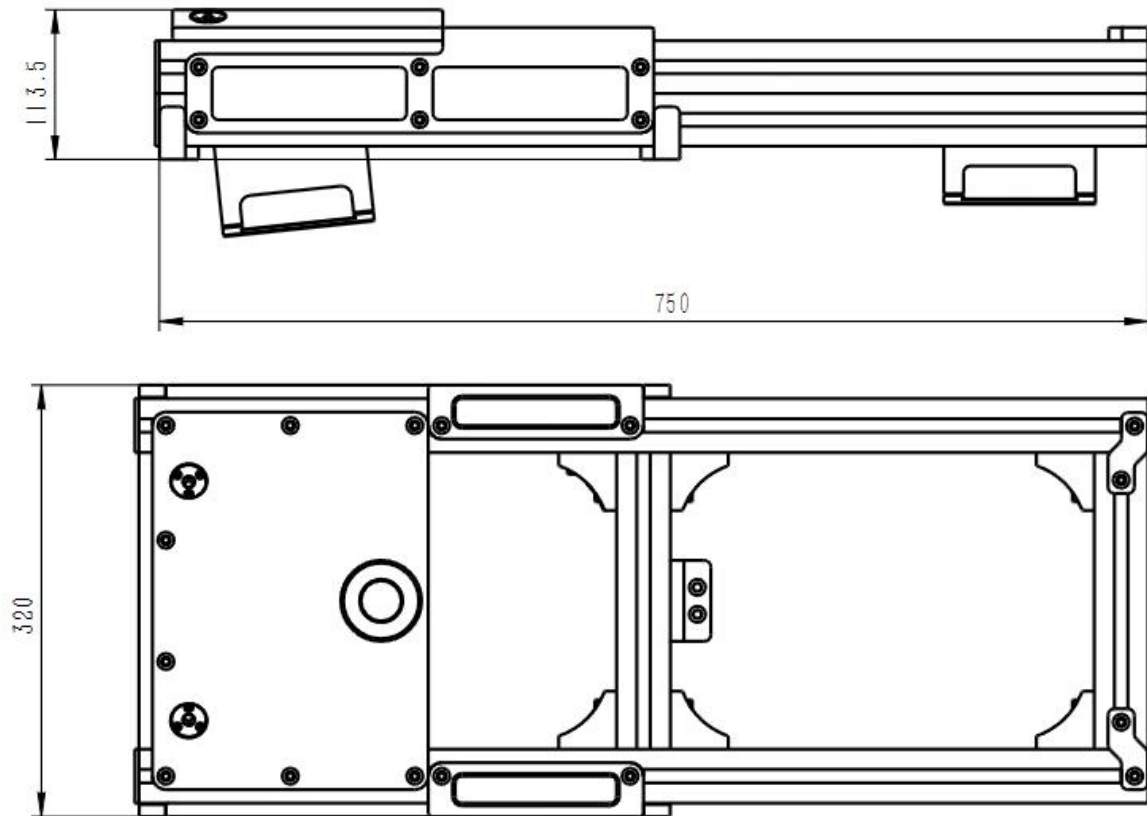
LiMobile M2 Lite is a lightweight, high-value mobile laser scanning system independently developed by GreenValley International. Weighing only 6kg, the system is designed for rapid deployment and flexible field operations. It integrates a 300 m long-range mapping LiDAR, a horizontally mounted SLAM LiDAR, and a in-house developed 30 MP high-definition panoramic camera, with optional Distance Measurement Instrument (DMI) support available. Through advanced multi-sensor fusion technology, the system maintains high-precision mapping performance even in GNSS-denied environments. Combined with the LiDAR360MLS processing platform, LiMobile M2 Lite delivers a complete end-to-end workflow for professional geospatial data acquisition and production. The system is ideally suited for applications including urban asset inventory, roadway infrastructure management, intelligent transportation, and urban forestry surveys.

### 2.1 Equipment Structure Diagram

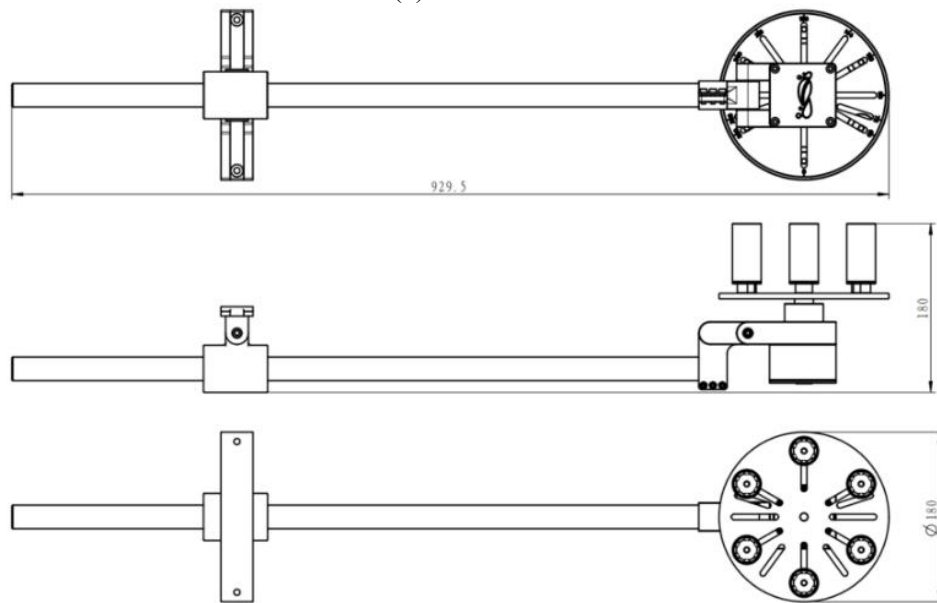
As shown in the figure below, the structure diagrams of the main unit, panoramic camera , and DMI (optional) are provided (dimensions are in millimeters).



(1)Sensor Unit

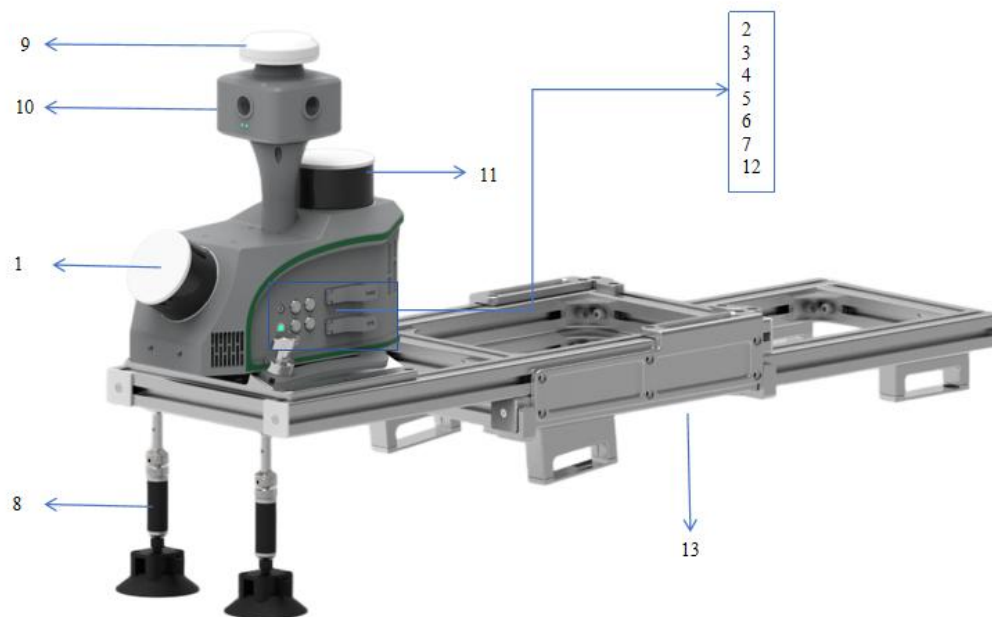


(2) Roof Rack



(3) DMI

## 2.2 Device Description



|                                |
|--------------------------------|
| 1.LiDAR                        |
| 2.EXT: Extended Debugging Port |
| 3.ODO: DMI Sensor Port         |
| 4.GNSS: Backup Antenna Port    |
| 5.Device Power Indicator       |
| 6.LAN: Ethernet Port           |
| 7.POW: Power Cable Port        |
| 8.Support Structure Component  |
| 9.Antenna                      |
| 10.Panoramic Camera            |
| 11.SLAM LiDAR                  |
| 12.System Disk Interface       |
| 13.Roof Rack                   |

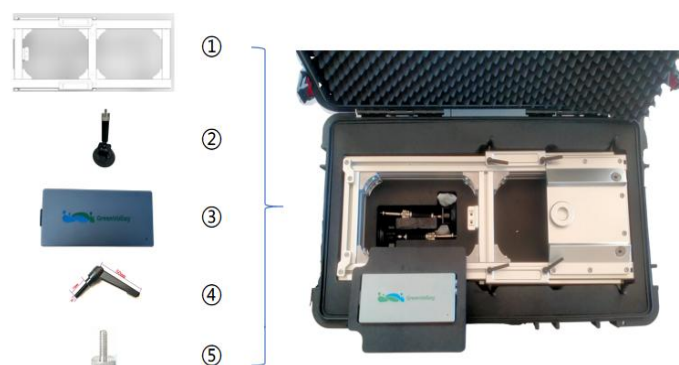
## 2.3 Device List

### 2.3.1 Sensor Unit Case



| No. | Items                      | Quantity |
|-----|----------------------------|----------|
| 1   | Tablet                     | 1        |
| 2   | Tablet Charger             | 1        |
| 3   | Type-C to Ethernet Adapter | 1        |
| 4   | RJ45 Ethernet Cable        | 1        |
| 5   | LEMO Ethernet Cable        | 1        |
| 6   | External Power Cable       | 1        |
| 7   | LiDAR Protector Cover      | 2        |
| 8   | CFE Card Reader            | 1        |
| 9   | Cleaning Set               | 1        |
| 10  | Hook and Loop Fastener     | 1        |
| 11  | CFE Card Set (2 Disks)     | 1        |
| 12  | Sensor Unit                | 1        |
| 13  | Sensor Unit Rain Cover     | 1        |
| 14  | Dust Removal Tool Kit      | 1        |
| 15  | Three-prong Power Cable    | 1        |
| 16  | Tool Kit                   | 1        |
| 17  | High-Vis Reflective Vest   | 1        |
| 18  | International Plug Adapter | 1        |

### 2.3.2 Roof Rack Case



| No. | Items                                                            | Quantity |
|-----|------------------------------------------------------------------|----------|
| 1   | Roof Rack                                                        | 1        |
| 2   | Support Structure Component                                      | 2        |
| 3   | Power Adapter                                                    | 1        |
| 4   | L-shaped spare bolt                                              | 4        |
| 5   | 304 Stainless Steel Knurled Thumb Screw / Manual Adjustment Bolt | 4        |

### 2.3.3 Battery Accessory Case ( Optional )



| No. | Items           | Quantity |
|-----|-----------------|----------|
| 1   | Wi-Fi Antenna   | 2        |
| 2   | Battery Box     | 1        |
| 3   | Tool Kit        | 1        |
| 4   | Battery Charger | 3        |

### 2.3.4 DMI Case (Optional)



| No. | Items                     | Quantity |
|-----|---------------------------|----------|
| 1   | Socket Gripper            | 6        |
| 2   | Vernier Caliper           | 1        |
| 3   | Magnetic Fixing Component | 1        |
| 4   | DMI Main Component        | 1        |

|    |                          |    |
|----|--------------------------|----|
| 5  | Suction Cup              | 2  |
| 6  | Adjustable Wrench        | 1  |
| 7  | DMI Storage Bag          | 1  |
| 8  | DMI Protection Rope      | 1  |
| 9  | Socket Fixing Screw      | 12 |
| 10 | Suction Cup Fixing Screw | 4  |

## 2.4 Technical Specifications

### 2.4.1 System Parameters

| Performance Indicator             | Parameter        |
|-----------------------------------|------------------|
| Dimensions                        | 351×224×375 mm   |
| Roof Rack Dimensions              | 750×320×113.5 mm |
| DMI Dimensions                    | 929.5×180×180 mm |
| Weight                            | 6 kg             |
| Roof Rack Weight                  | 13 kg            |
| DMI Weight                        | 4.8 kg           |
| Battery(Optional)                 | 6000 mAh×6       |
| Operating Time                    | ≥ 6 h            |
| Storage                           | 1 TB×2           |
| System Control                    | Tablet           |
| Interface Connection              | Wi-Fi/Ethernet   |
| Operating Temperature             | -10 °C ~ 50 °C   |
| Storage Temperature               | -30 °C ~ 60 °C   |
| Power Supply Input Voltage        | 24 V-DC          |
| Power Consumption (Typical)       | 60 W             |
| Power Consumption (Max.)          | 110 W            |
| Raw Point Cloud Format            | *.pcap           |
| Raw Panoramic Camera Image Format | *.lipgr          |

### 2.4.2 Mapping LiDAR Parameters

| Performance Indicator    | Parameter                    |
|--------------------------|------------------------------|
| Detection Range          | 0.5 ~ 300 m                  |
| Scanning Frequency       | 20 Hz                        |
| FOV (Vertical)           | 40.3° ( -20.8°~ +19.5°)      |
| FOV (Horizontal)         | 360°                         |
| Range Accuracy           | ± 1 cm                       |
| Laser Class              | Class 1 (Eye-safe)           |
| Scan Rate: Single Return | Dual Return: 1,280,000 pts/s |

### 2.4.3 SLAM LiDAR Parameters

| Performance Indicator    | Parameter                    |
|--------------------------|------------------------------|
| Detection Range          | 0.05 ~ 120 m                 |
| Scanning Frequency       | 20 Hz                        |
| FOV (Vertical)           | 31° (-16° to +15° )          |
| FOV (Horizontal)         | 360°                         |
| Range Accuracy           | ± 2 cm                       |
| Laser Class              | Class 1 (Eye-safe)           |
| Scan Rate: Single Return | Dual Return: 1,280,000 pts/s |

### 2.4.4 Integrated Navigation Parameters

| Performance Indicator        | Parameter                                                             |
|------------------------------|-----------------------------------------------------------------------|
| GNSS Systems:                | GPS; GLONASS; GALILEO; BEIDOU; QZSS; SBAS                             |
| IMU Update Frequency         | 100 Hz                                                                |
| Roll/Pitch Accuracy (RMS 1σ) | Horizontal: 0.01 m<br>Vertical: 0.02 m                                |
|                              | Roll/Pitch Accuracy (RMS 1σ) 0.01°<br>Heading Accuracy (RMS 1σ) 0.04° |

### 2.4.5 Panoramic Camera Parameters

| Performance Indicator             | Parameter        |
|-----------------------------------|------------------|
| Pixel                             | 3000 W (1200W*4) |
| Maximum Stable Capture Frame Rate | 10 FPS           |
| Resolution                        | 7680*3840        |
| Sensor Type                       | CMOS             |
| Power Consumption                 | Maximum 14 W     |
| Trigger Mode                      | Time Trigger     |

### 2.4.6 Wi-Fi Parameters

| Performance Indicator         | Parameter                          |
|-------------------------------|------------------------------------|
| Current Frequency Band        | 2.4~2.4835GHz、5.15~5.85GHz         |
| Communication Standard        | IEEE 802.11 a/b/g/n/ac/ax, CSMA/CA |
| Security Type                 | WPA2-PSK (Encryption Mode)         |
| Effective Connection Distance | 5 m                                |
| Wi-Fi SSID:                   | LiMobile_XXXX                      |
| Default Password              | greenvallley                       |

### 2.4.7 Tablet Parameters

| Performance Indicator | Parameter    |
|-----------------------|--------------|
| Resolution            | 1920*1200    |
| Screen Size           | 11 inches    |
| Network Type          | 5 GB + Wi-Fi |
| Storage Capacity      | 128 GB       |
| RAM                   | 8 GB         |

★ Notes:

1. Our company reserves the right to update the manual content at any time to reflect the latest product information. The hardware specifications and detailed technical parameters of the LiMobile M2 Lite equipment are subject to the actual product and packing list.
2. For more detailed parameters of the laser and camera sensors, please refer to the information released by the original equipment manufacturer.

## 3 Equipment Requirements

### 3.1 Equipment Cleaning

|                                                                                                                                                                                            |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The equipment should be cleaned regularly (3-5 days) using a cleaning kit.                                                                                                                 |
| Before starting the cleaning operation, ensure that the scanning system is turned off and the power is turned off.                                                                         |
| Never touch the camera lens or the lidar protective glass directly with your hands.                                                                                                        |
| Must wash your hands before cleaning to prevent stains on your hands from getting on the lens cleaning cloth or wiping paper.                                                              |
| Choose a place with less dust and use a mini clean air blower to blow away dust on the laser head, camera lens, and device body.                                                           |
| Do not use air from the pneumatic system to clean the lens, as it contains a trace of oil. Use the provided professional lens cleaning air blower to clean the lens.                       |
| Use the brush end of the lens end to remove dust from the laser head, camera lens, and gaps.                                                                                               |
| Please only use a dedicated lens cleaning cloth or lens cleaning wipes to gently wipe the LiDAR protective glass. Wipe in a circular motion from the inside out, avoiding excessive force. |
| Do not use alcohol or other corrosive liquids to wipe the device to avoid damage to the device.                                                                                            |
| A soft cloth can be used to clean the device housing and tablet screen.                                                                                                                    |

### 3.2 Equipment Transportation

|                                                                                                                                                                                                                                                                                                                                               |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| During transportation and use, the device should be handled with care to avoid soiling and scratching its surface. Staff should not sit on the device and packaging box.                                                                                                                                                                      |
| The instrument is a precision instrument. Avoid violent impacts during transportation and handling to avoid damage to the optical components in the instrument or deviation from the direction.                                                                                                                                               |
| When transporting this device in the field, ensure that the product is placed in the original equipment box.                                                                                                                                                                                                                                  |
| Do not transport this product in a road vehicle in a scattered manner, as it may be subjected to shock and vibration.                                                                                                                                                                                                                         |
| For products that do not have an equipment box to be placed, use equivalent packaging and affix labels such as "precision instrument", "handle with care", and "fragile" on the outside of the box to avoid damage to the equipment.                                                                                                          |
| If the equipment is carried and transported by staff, avoid damage due to improper handling. The staff should be informed that the equipment is a precision instrument and should be handled with care. It must be placed carefully when carrying the equipment in a car, and the equipment must not be subject to shock without supervision. |
| If the device is transported by express delivery, the device box needs to be additionally shockproof (such as filling with shock-absorbing cotton or foam), and a small amount of insurance should be purchased and marked as fragile.                                                                                                        |
| The battery should be discharged to the storage level when transporting, and the battery must be properly protected during transportation to avoid collision, extrusion or puncture.                                                                                                                                                          |
| Before taking the battery on the flight, ensure that it is discharged to less than 5% power.                                                                                                                                                                                                                                                  |

### 3.3 Equipment Storage

|                                                                                                                                                                                                                                                                                                                                                                                     |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The storage temperature range for the device is -10°C-50°C. Please store it according to the temperature range.                                                                                                                                                                                                                                                                     |
| Before storage, ensure that all power is turned off, and store the device and accessories neatly in the original device box. Do not stack them.                                                                                                                                                                                                                                     |
| Please place the device in a clean, ventilated and dry place to avoid condensation inside the components causing short circuits and damaging the instrument when it is turned on for use.                                                                                                                                                                                           |
| When the device is transferred from a cold environment to a warm environment, water vapor may condense on the components of the device. To avoid this, place the device in a sealed plastic bag before transferring it. Wait until the temperature of the device is basically the same as the outside temperature and the condensation has played out before turning on the device. |
| If the device is installed on a vehicle and stored outdoors, cover the device with a protective cover when not in use to prevent dust and water accumulation on the lens.                                                                                                                                                                                                           |

|                                                                                                                                                                                                                                                                                                                                                    |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Batteries should be stored in a well-ventilated, dry and cool place, and avoid storage or display in direct sunlight or places exposed to rain. High temperature will damage battery performance; high humidity may cause gradual corrosion of the battery surface; exposure to rain can reduce resistance, and may cause self-discharge and rust. |
| Batteries that have been soaked or dampened must be dried before storage and use.                                                                                                                                                                                                                                                                  |
| Please avoid keeping the tablet in a low-power state for extended periods. It is necessary to charge the tablet regularly.                                                                                                                                                                                                                         |
| Do not stack batteries randomly to avoid short circuits and damage.                                                                                                                                                                                                                                                                                |
| Do not store batteries for a long time after they are completely discharged to avoid over-discharge of the batteries, causing damage to the battery cells and making them unusable. Please discharge the batteries to 40%-65% for storage to extend the battery life.                                                                              |
| It is not recommended to store the batteries for a long time when fully charged, as this may cause sudden discharge of the batteries, thereby damaging the batteries.                                                                                                                                                                              |
| Recharge and discharge the batteries every 3 months or so to keep the batteries active.                                                                                                                                                                                                                                                            |
| Please ensure that the battery is charged using the matching battery charger provided with the equipment. Do not use any other charger arbitrarily.                                                                                                                                                                                                |
| If the battery cannot be charged (e.g., the light does not flash during charging), press and hold the button for 10 seconds to initiate charging. After charging is complete, press and hold the button for another 10 seconds.                                                                                                                    |
| For additional detailed precautions regarding the battery, please refer to Attachment 1: "B60 Battery Safety Usage Guidelines".                                                                                                                                                                                                                    |
| If the optional battery pack is installed, do not leave the battery inside the battery compartment for extended periods when the device is not in use. Prolonged storage may cause the battery to become over-discharged, preventing it from powering on. To maintain optimal battery performance, periodically charge and discharge the battery.  |

### 3.4 Collection Environment Requirements

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| For the sake of car driving safety, it is not recommended to use the equipment in weather conditions such as rain, snow or fog. In addition, under such weather conditions, the point cloud data will also have more noise.                                                                                                                                                                                                                                                                                      |
| It is not recommended to use it frequently in strong winds, dusty environments, or other similar conditions which will affect the service life of the equipment and cause the point cloud data to have more noise.                                                                                                                                                                                                                                                                                               |
| It is forbidden to expose or use the equipment in extreme temperatures. The ambient temperature must not exceed the operating temperature range of the equipment.                                                                                                                                                                                                                                                                                                                                                |
| Due to the changes in temperature and air pressure during air transportation, the rapid increase in temperature after unpacking may cause condensation on certain components inside the equipment. Water inside the components may cause short circuits and damage the instrument when it is turned on. Therefore, when the equipment is transferred from a cold environment to a warm environment, it is recommended to leave the equipment for 24 hours in a place with constant temperature and air pressure. |
| Daytime data collection should avoid periods when the light is too weak.                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| When collecting in the city center, the rush hours in the morning and evening should be avoided to improve collection efficiency. In good weather conditions, it is recommended to select the following time period: 09:00-17:00. Due to different seasons, time zones or latitudes, the above time can be flexibly adjusted according to actual conditions.                                                                                                                                                     |
| Drive in as open an area as possible and stay away from trees, buildings, high-voltage transmission lines and other places with complex electromagnetic environments.                                                                                                                                                                                                                                                                                                                                            |
| If you need to use the device for a long time or in special conditions such as high humidity, please consult our technical support personnel for relevant precautions. Our company will not assume equipment warranty responsibility if the instrument fails when used in special environments.                                                                                                                                                                                                                  |
| For optimal image quality, a data acquisition speed of no more than <b>60 km/h</b> is recommended. Higher speeds may result in image blur. If image quality is not a priority and only point cloud data is required, the system supports data acquisition at speeds of up to 80 km/h.                                                                                                                                                                                                                            |

### 3.5 Collection Preparation

|                                                                                                                                                                                                                                                                                                |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Please check carefully whether the accessories are complete according to Chapter 2.3 or the packing list of the shipment.                                                                                                                                                                      |
| Check whether the battery is sufficient for the collection task.                                                                                                                                                                                                                               |
| Check whether the tablet computer power meets the collection task requirements.                                                                                                                                                                                                                |
| When working in a large area, it is necessary to plan the work area in advance for block collection to reduce the amount of data generated in a single operation. It is best to have two blocks of overlap between blocks.                                                                     |
| According to Attachment 2: "LiMobile M2 Lite_Data Size Calculator ", please check the remaining storage capacity of the device's hard drive and perform data cleanup in a timely manner.                                                                                                       |
| If the project requires continuous collection work, it is recommended to format the collection disk every 10-15 days. Before formatting, you need to back up the data to avoid data loss. For detailed steps on disk formatting, please refer to Attachment 3: "Disk Formatting Instructions". |
| Please plan a reasonable route with reference to the street view map and conduct on-site surveys when necessary.                                                                                                                                                                               |
| Please check the height limit.                                                                                                                                                                                                                                                                 |
| According to the project engineering requirements, confirm that control points that meet the accuracy are arranged during data collection.                                                                                                                                                     |
| Ensure that the base station is set up before data collection.                                                                                                                                                                                                                                 |

### 3.6 Equipment Installation

|                                                                                                                                                                                                                             |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Check that the connections between the luggage rack crossbar, the roof rack, and the car are stable, and ensure that the bayonet or screw is tightened.                                                                     |
| Check whether there are cracks on the roof rack and the luggage rack crossbar.                                                                                                                                              |
| After pulling out the roof rack, ensure that the knob is tightened.                                                                                                                                                         |
| Check whether the screws between the device body and the roof rack are tightened.                                                                                                                                           |
| Check whether the device body has no obvious damage.                                                                                                                                                                        |
| Check whether the antenna and the antenna support bracket are stably connected.                                                                                                                                             |
| Check whether the cable is connected and plugged in normally, and check whether the cable has no obvious damage.                                                                                                            |
| Check whether there are foreign objects blocking the interfaces of each connector and whether the pins are deformed.                                                                                                        |
| Before the device is powered on, check whether the acquisition disk is correctly inserted and the buckle is fastened.                                                                                                       |
| Check whether the battery box is turned on normally.                                                                                                                                                                        |
| After the device is powered on, check whether the device indicator light is on.                                                                                                                                             |
| Check whether the surface of the laser glass is clean and dust-free. If there is dust, please use the cleaning kit to clean it in time.                                                                                     |
| Please avoid placing the battery box and battery in a sealed trunk during data acquisition. It is recommended to place them on the back seat of the vehicle.                                                                |
| If any rotating part of the equipment becomes difficult to turn, do not force it to rotate. If the equipment malfunctions, do not continue using it under such conditions, as this may worsen the damage to the instrument. |

### 3.7 Collection Operation

|                                                                                                                                                                                                                                                                                                                                                           |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| A base station must be set up before data collection.                                                                                                                                                                                                                                                                                                     |
| The device needs to be initialized in an open area with good GPS signal.                                                                                                                                                                                                                                                                                  |
| The data collection duration must be greater than 10 minutes.                                                                                                                                                                                                                                                                                             |
| Make sure that the inertial navigation system is initialized with more than 20 satellites and PDOP is less than 2.                                                                                                                                                                                                                                        |
| After the device is powered on, please ensure first that the tablet is successfully connected to the device's Wi-Fi first.                                                                                                                                                                                                                                |
| After turning on the device, please follow the status prompts on the APP interface to ensure that the sensor is connected normally.                                                                                                                                                                                                                       |
| Check whether the sensor acquisition parameters are correct (enabled configuration, installation angle, camera acquisition frame rate, etc.).                                                                                                                                                                                                             |
| During the device power-on period, it is forbidden to unplug or plug in the data acquisition disk.                                                                                                                                                                                                                                                        |
| Before the engineering data is collected, the inertial navigation system needs to be aligned. The inertial navigation system alignment process needs to be stationary for 3 minutes, and then accelerate and decelerate twice, turn around, and then accelerate and decelerate again. This process is to ensure data quality, please follow it carefully. |
| After the engineering data collection is completed, the inertial navigation system still needs to be calibrated to ensure data quality.                                                                                                                                                                                                                   |
| Reversing is prohibited during the collection process.                                                                                                                                                                                                                                                                                                    |
| Try to drive at a constant speed throughout, maintaining a speed of 40 km/h, and without exceeding 60 km/h.                                                                                                                                                                                                                                               |
| Minimize stops during the drive.                                                                                                                                                                                                                                                                                                                          |
| Sudden braking is prohibited, avoid abrupt stops or movements.                                                                                                                                                                                                                                                                                            |
| Avoid accelerating too quickly; when speeding up, do so gently and gradually.                                                                                                                                                                                                                                                                             |
| When approaching an intersection, pay attention to the traffic lights. If the light is yellow, it is acceptable to reduce speed until the light turns green. Try to avoid stopping and waiting for the red light.                                                                                                                                         |
| When driving on straight sections, maintain a constant speed and avoid frequently steering to change lanes.                                                                                                                                                                                                                                               |
| Avoid driving alongside other vehicles. Choose to overtake or slow down to allow the other vehicle to pass, thus preventing obstruction of the scanned area.                                                                                                                                                                                              |
| When passing through tunnels, do so quickly and smoothly.                                                                                                                                                                                                                                                                                                 |
| After the collection is completed, please make sure to click the shutdown button on the APP interface first, and then disconnect the power supply after the device is shut down. Do not turn off the power directly, as this abnormal operation will cause data loss.                                                                                     |
| During the device power-on period, it is forbidden to plug and unplug the connecting cables.                                                                                                                                                                                                                                                              |
| When replacing batteries during the acquisition process, replace them one by one. Do not unplug multiple batteries at the same time.                                                                                                                                                                                                                      |
| During the collection process, closely monitor the data refresh in the APP and any changes in parameters. If any abnormality occurs, promptly stop the collection and perform an inspection.                                                                                                                                                              |
| Do not use the device if it has obvious noise, alarm sound or is damaged, and contact the manufacturer's technicians for repair in time. Forced use may cause permanent damage to the device.                                                                                                                                                             |
| Do not attempt to repair damaged parts of the device without authorization.                                                                                                                                                                                                                                                                               |
| Please do not upgrade the tablet's operating system.                                                                                                                                                                                                                                                                                                      |
| SLAM Optimization Notice: For areas requiring SLAM optimization, it is recommended to maintain a vehicle speed below 40 km/h to ensure optimal positioning accuracy and mapping performance.                                                                                                                                                              |

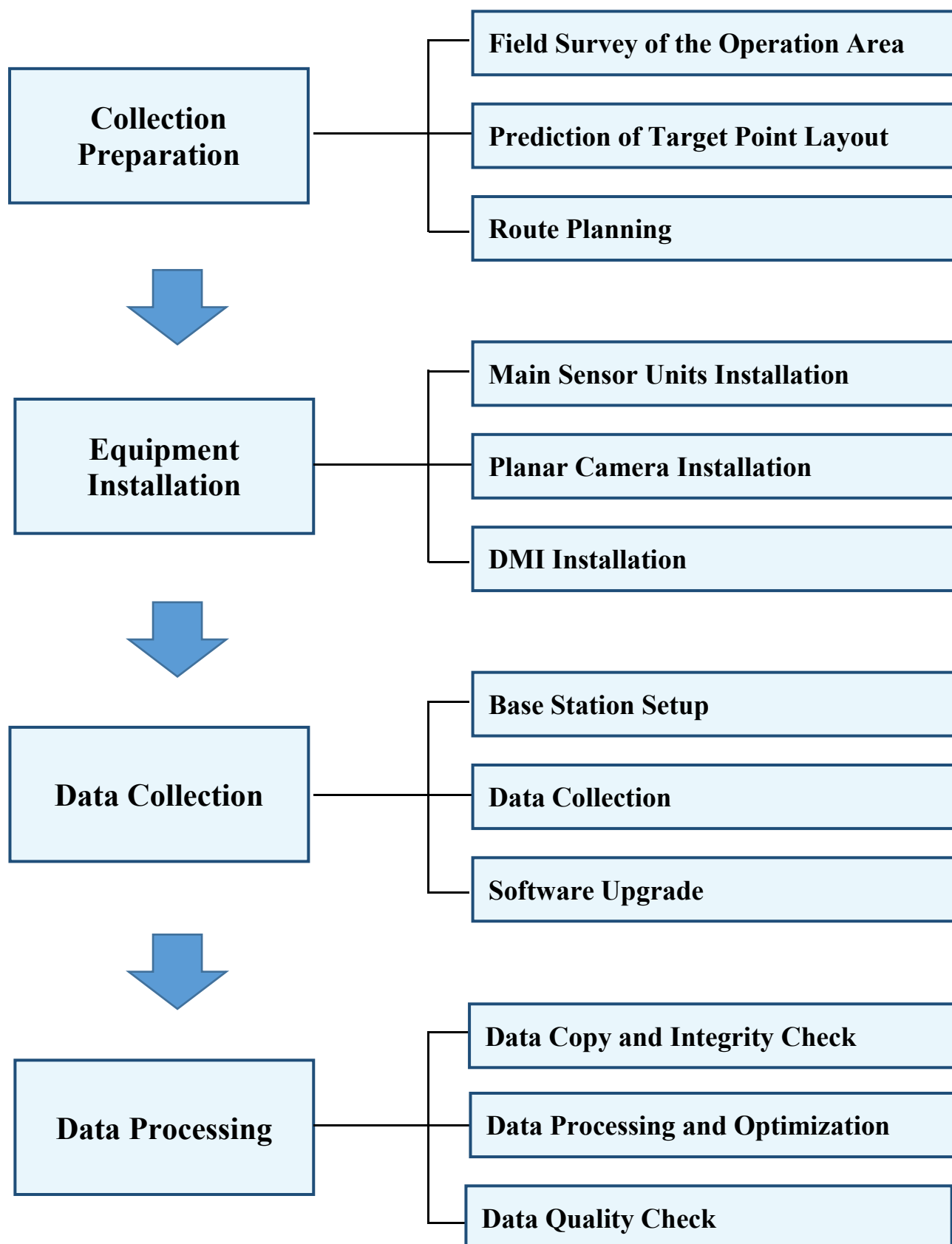
### 3.8 Collection Completion

|                                                                                                                                                                                                          |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| When disassembling and assembling the device, make sure that the contents of the packing list are complete.                                                                                              |
| After the day's collection task is completed, check whether the equipment is intact. Check whether the structural screws and plug-in interfaces are loose. Check whether the cables are damaged.         |
| If there are damaged parts, discontinue the collection operation to avoid further damage to the equipment. Contact our technical staff for troubleshooting and repair operations.                        |
| Please use the data copy tool to check the data integrity and back up the data in time.                                                                                                                  |
| Before cleaning the disk, make sure that the data has been backed up and is available.                                                                                                                   |
| Do not delete the original factory files stored on the disk, and do not modify the drive letter.                                                                                                         |
| Please keep the equipment properly. It is recommended to cover the laser head with a laser protective cover or put the device back into the equipment box for storage after the collection is completed. |

### 3.9 Maintenance

|                                                                                                                                                                                                                                                                                                                                                                                             |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Regularly check and maintain the equipment, including its appearance and other components.                                                                                                                                                                                                                                                                                                  |
| When the equipment structure is loose or disassembled, the equipment parameters should be recalibrated.                                                                                                                                                                                                                                                                                     |
| Product calibration must be performed by the after-sales department of GVI, and it is recommended to calibrate the equipment every 12 months. Users can collect calibration field data for feedback, and our technical support will update the calibration file parameters. For detailed steps, please refer to Attachment 4: "Equipment Calibration Field Data Collection Specifications". |
| If there are any problems with the equipment, please contact our technical support personnel in time for processing.                                                                                                                                                                                                                                                                        |
| Users are prohibited from disassembling the equipment by themselves. If you encounter any problems during this process, please contact our technical support personnel in time and inform the details truthfully.                                                                                                                                                                           |

## 4 Overall Description of the Mobile Laser Scanning System Workflow



## 5 Collection preparation work

### 5.1 Field Survey of the Operation Area

Investigate the actual traffic conditions of the road section to be measured (including but not limited to objective traffic congestion, vehicle speed limits, whether both main and auxiliary roads can be collected, traffic restrictions, etc.).

Determine the scanning range and object (clearly define the number of kilometers of roads to be scanned by the equipment, the types of roads, and the number of lanes on the driving route).

Mark on the map for corresponding prompts (such as driving route direction, turns, connections, etc.).

Find a relatively suitable location for setting up base stations and plan a certain number of target point locations.

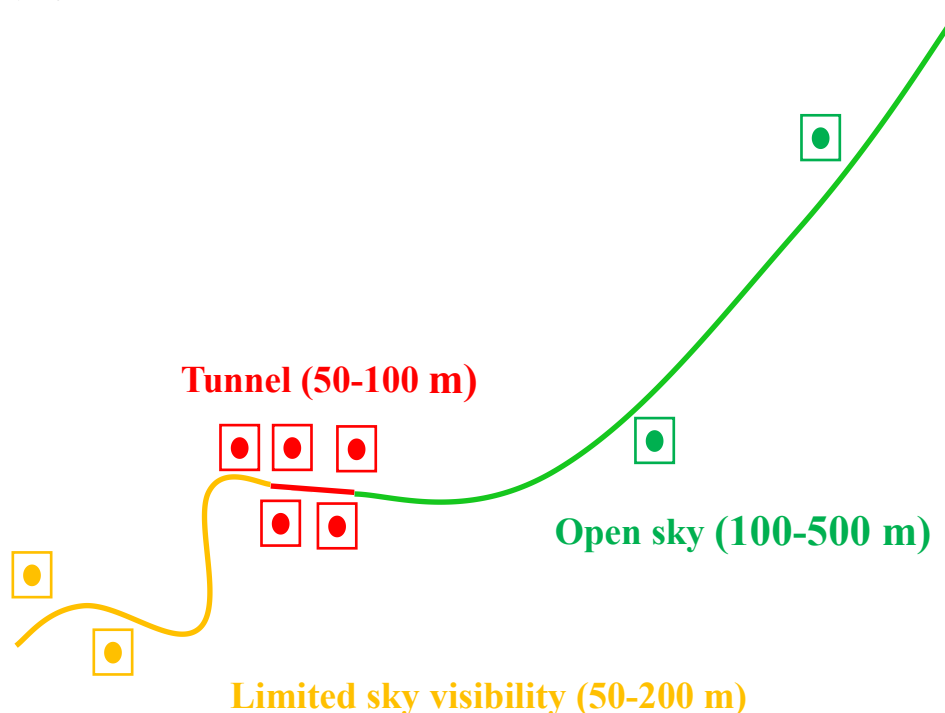
### 5.2 Prediction of target point layout

1. Purpose: To correct the positioning error of the equipment and reduce the impact of cumulative errors on the measurement results, thereby improving the accuracy of the data results. This is an indispensable step in the operation.

2. Target point type: (1) Road marking corner point; (2) High reflective paint point; (3) Checkerboard target point.

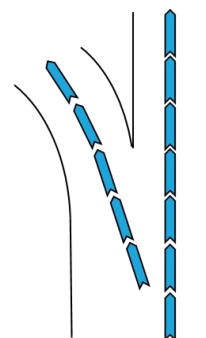
3. Layout specification: as shown in the figure below. Target points should be appropriately increased in places where there are dense trees on both sides of the road, under bridges and tunnels, etc., which may cause satellite signal loss.

4. Surveying instruments: RTK, total station.

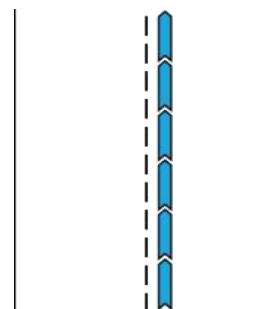


## 5.3 Route Planning

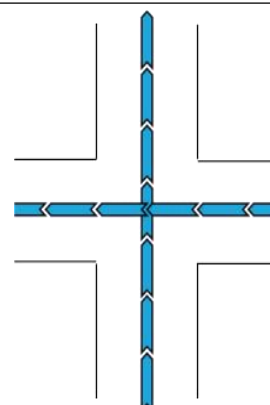
During the collection process, the entire road must be captured (including turning lanes), with no missing sections.



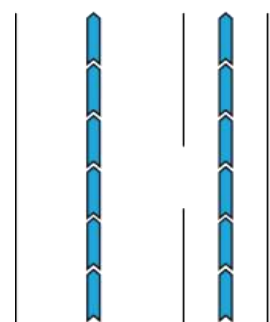
The road data should be collected by driving along the centerline of the road.



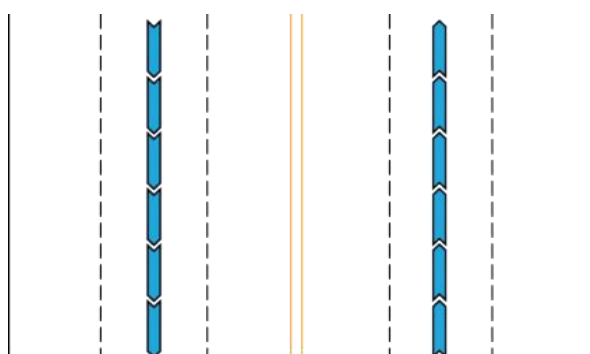
Long, straight sections should be prioritized, avoiding frequent turns or loops. Lane changes should also be minimized. When turning, try to minimize the turn radius.



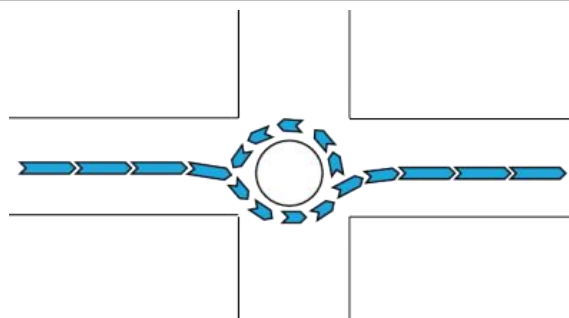
When there are main and auxiliary roads, prioritize collecting data from the main road. For expressways, elevated roads, and ring roads, auxiliary lanes must be collected. Main and auxiliary roads should be collected separately and not mixed. Roads connecting main and auxiliary roads do not need to be collected.



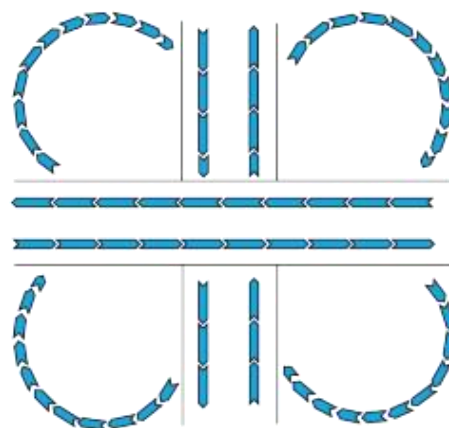
Bidirectional roads must be collected in both directions. For a bidirectional three-lane road, the center lane should be used. For a bidirectional four-lane road, both directions should be collected by passing through twice to capture enough laser point clouds. For a bidirectional six-lane road or more, multiple passes in both directions are needed to ensure sufficient data collection.



When collecting data from a roundabout, the entire roundabout must be enclosed. The vehicle needs to drive along the innermost lane of the roundabout to capture the actual shape of the roundabout.



Interchanges are more complex, so to ensure road connectivity, every ramp of the interchange must be fully collected. The collection method is as follows: first, collect data along the main line of the interchange, then separately collect each ramp.



If there is a median or a green belt separating the lanes, for bidirectional two-lane roads, both directions must be collected by passing through once in each direction.

## 6 Device Installation

### 6.1 Main Sensor Unit Installation

#### 6.1.1 Roof Rack and Luggage Rack Crossbar Installation

1. Place the roof rack upside down on the ground and place the luggage rack crossbar in the positioning slot underneath it.

★ Notes:

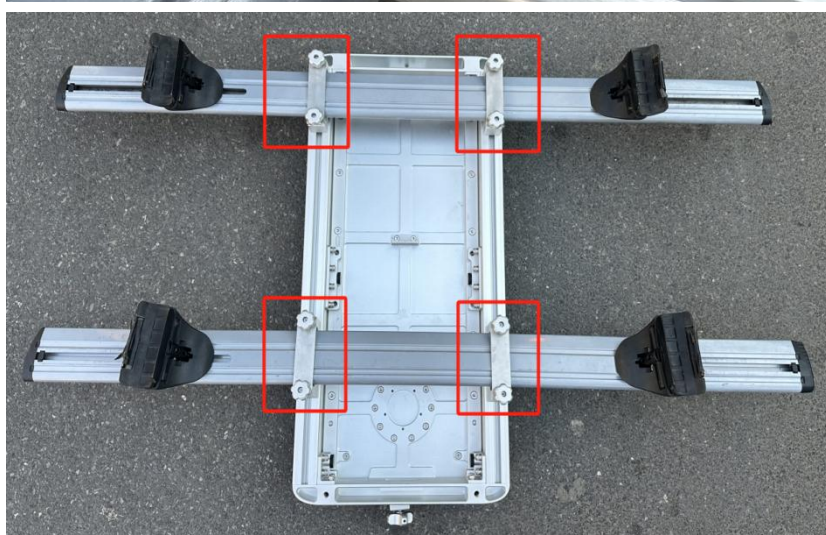
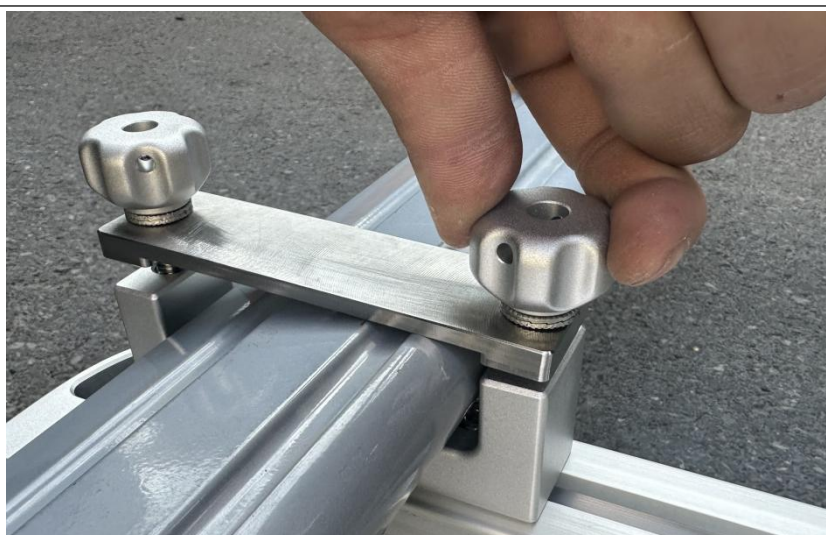
1. The roof rack crossbars are not included in the delivery. Users need to prepare them by referring to Attachment 4: "Vehicle and Luggage Rack Crossbar Selection Guide".
2. Position the roof rack as centrally as possible on the luggage rack crossbar.



2. Manually tighten the fixing screws on the positioning slot at the bottom of the roof rack to secure the luggage rack crossbar to the roof rack.

★ Notes:

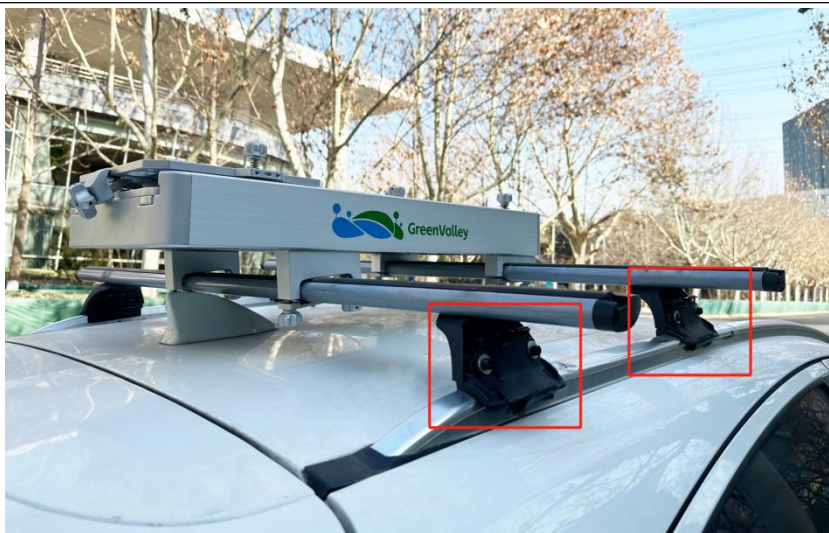
The positions of the four mounting brackets are adjustable. For longer vehicles, reposition the mounting brackets as needed to accommodate the vehicle length.



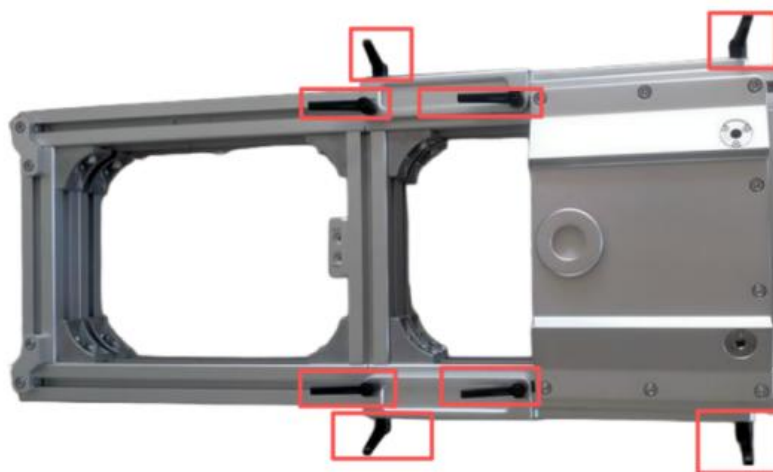
3. Place the luggage rack crossbar and roof rack on the vehicle roof, and use an Allen wrench to tighten the four mounting clamps on the luggage rack crossbar.

★ Notes:

1. Install the equipment towards the rear of the vehicle to minimize obstruction.
2. The distance between the positioning slots of the roof rack can be adjusted based on the vehicle model.
3. When disassembling the roof rack, there is no need to remove the roof rack crossbars. Simply unscrew the fixing screws of the roof rack.



4. Rotate the L-shaped bolts counterclockwise to loosen all eight bolts, then pull out the sliding support bracket. Once the bracket is fully extended, rotate the L-shaped bolts clockwise to tighten and secure it in place.



5. Fully extend the quick-release bracket, then tighten the bolts to secure it in place.



## 6.1.2 Support Structure Component Installation

1. Align the support structure with the holes under the roof rack and tighten the top fixing knob.
2. Rotate the black knob at the bottom to lower the suction cup of the support structure until it touches the vehicle body.
3. Rotate the light gray knob in the middle to the top of the black knob to secure it.



4. As shown in the diagram, turn the switch on the suction cup to the locked position.



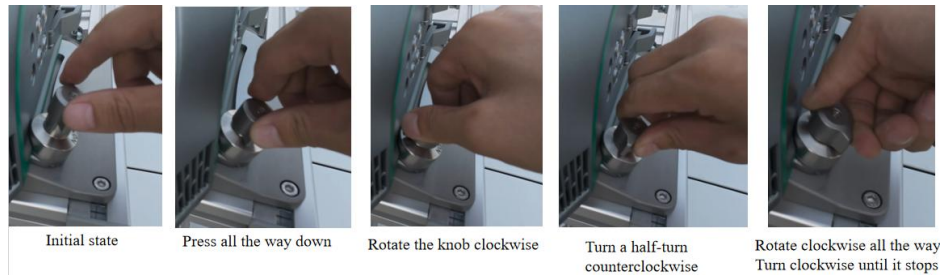
### 6.1.3 Main Sensor Unit Installation

1. Slide the main unit in the direction of the arrow until it reaches the stop position on the quick-release bracket, as shown in the figure.



2. Press and hold the buttons on both sides, then rotate the knob clockwise. When the knob can no longer be turned, rotate it counterclockwise by half a turn, then continue tightening it clockwise until you hear a distinct "click," indicating that the mechanism is fully locked.

**Important:** The half-turn counterclockwise step is required and must not be omitted. If this procedure is unclear, refer to the operation video for a detailed demonstration of this step.



★ Notes:

- 1.Shake the luggage rack crossbar, roof rack, and sensor unit firmly to ensure stability.
- 2.The device is calibrated before leaving the factory. Minor scratches may occur during installation and use, which is normal and will not affect performance.

## 6.2 Cable Connection

1. Plug the power cable and network cable into their corresponding ports on the device. Match each cable to its port according to the labels on the cables.





2. Power on the device after connecting the cables, and check the status of the LED indicators.



★ Note:

1.Ensure to distinguish between the network cable ports at both ends to prevent equipment damage due to incorrect plugging.

2.All LED indicators turning green indicates a normal status. Specifically, the adapter LED will first light up solid green and then change to slow flashing green. The main device unit will maintain a solid green light after powering on. For the panoramic camera, a green light indicates synchronization, while a red light indicates out-of-sync status or a connection error.

3.CAUTION: Pay close attention to the orientation of the power and network cables. Since the connectors on the device end and the adapter end are different, the correct insertion direction has been clearly labeled on the cables.



### 6.3 Battery Installation (Optional)

1. As shown in the diagram, insert the battery into the battery compartment.

★ Notes:

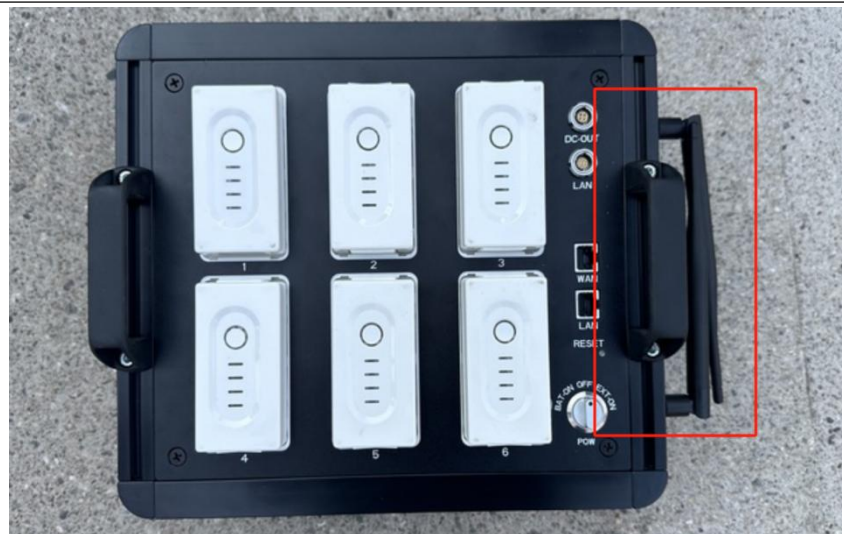
1. Ensure the battery is installed in the correct direction as shown in the diagram. Reverse insertion is prohibited.
2. Press down on the battery to check if it is securely installed.
3. To remove the battery, press the top buckle inward and pull it out simultaneously.



2. Manually screw the two Wi-Fi antennas onto the right side of the battery compartment.



3. To reduce the risk of breakage from external force, bend the antennas inward.



4. Cable Connection



## 6.4 DMI Installation (Optional)

### 6.4.1 Preparatory Work

1. Use tools to remove the screw protective cap on the right rear wheel hub of the data collection vehicle.



### 6.4.2 Socket Installation

1. Appropriately loosen the screw at the front end of the socket, and push the end of the internal claw of the socket to align with the end of the outer wall of the socket.



2. Tighten the internal claw of the socket around the hub screw, use a tool to tighten the front screw of the socket until the entire socket assembly fits snugly against the hub screw.



★ Note: When the resistance of the screw increases, users can reverse the screw half a turn before continuing to tighten. During the tightening process, keep your hands steady to ensure that the outer wall of the socket and the hub are always in snug contact.



3. Repeat the above steps to complete the installation of all sockets.



4. Check if all sockets are installed flush. Use a vernier caliper to measure them. The depth difference between any sockets should not exceed 1 mm. If any socket is not flush, use an adjustable wrench to adjust it until it meets the requirement.

Note: The vernier caliper must be zeroed before use.



### 6.4.3 Main Component of the DMI Installation

1. Align the holes of the chuck with the screw holes at the top of the socket. Once aligned, use the socket fixing screws to secure them together.

☆ Note:

1.The chuck has a scale on the top. It is recommended to first install it using the socket fixing screw at the "0" hole position. This makes it convenient for the user to align the remaining holes according to the number of bolts on the vehicle wheel hub being measured.

2.The screws can be initially fastened loosely. Once the position is properly adjusted, tighten them in sequence.



### 6.4.4 Magnetic Fixing Component Installation

1.Pass the socket of the magnetic fixing component through the DMI cable and conduit in sequence.



2.As shown in the diagram, move the magnetic fixing component to a suitable position and attach it to the vehicle body.

Note:

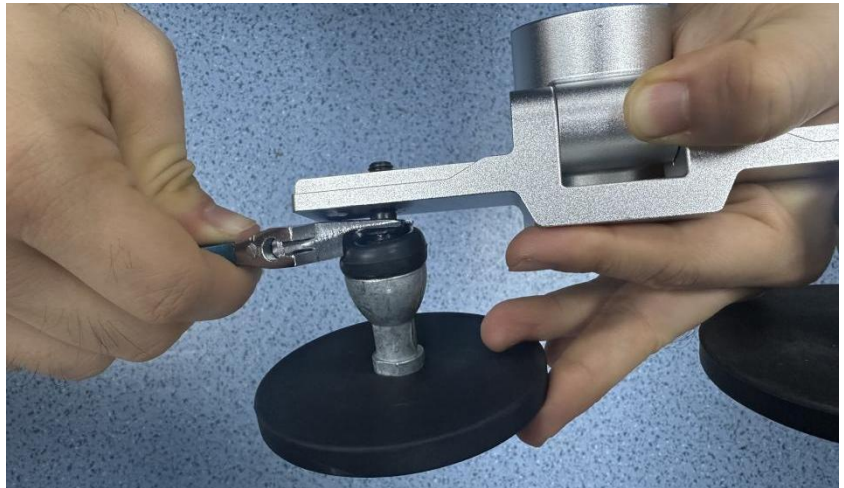
1. To ensure a more secure installation, please clean dust from the vehicle body surface before installation.

2. During installation, ensure the DMI is perpendicular to the ground to prevent damage caused by uneven force.

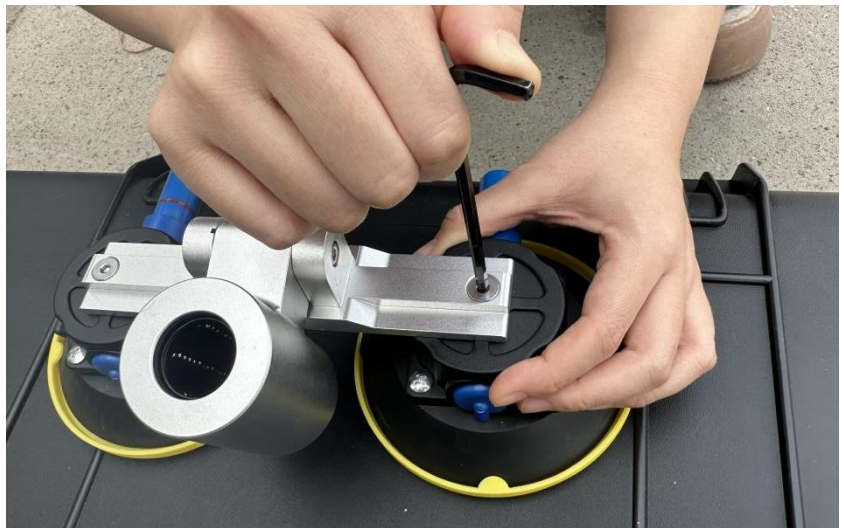


### 6.4.5 Magnetic Fixing Component Installation (Optional)

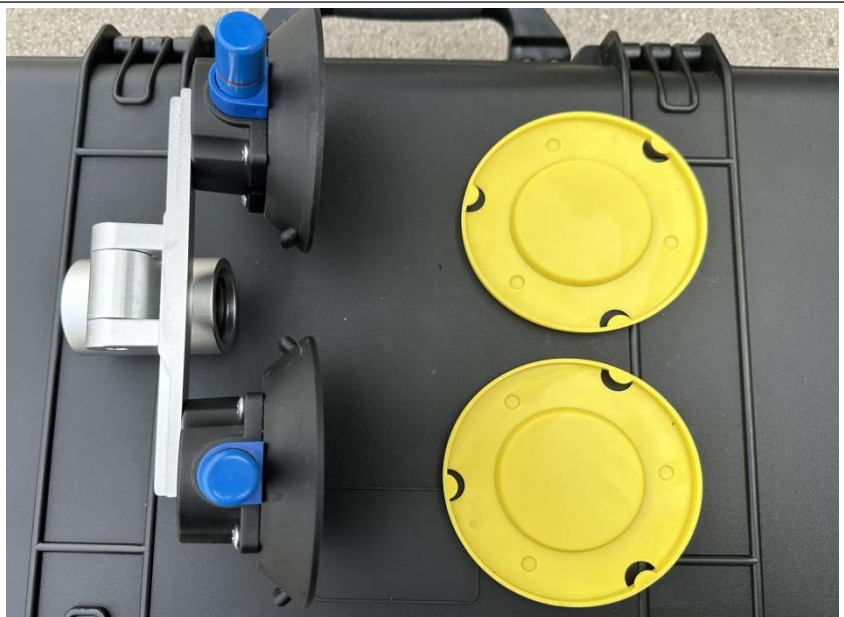
1. Use an adjustable wrench to remove the magnetic fixing component.



2. Align the screw holes of the suction cup with the holes on both sides of the fastener. Once aligned, use the suction cup fixing screws to secure them one by one.



3. After tightening the screws, remove the yellow protective cover from the bottom of the suction cup.



4. Thread the DMI cable and cable conduit through the socket of the fastener.



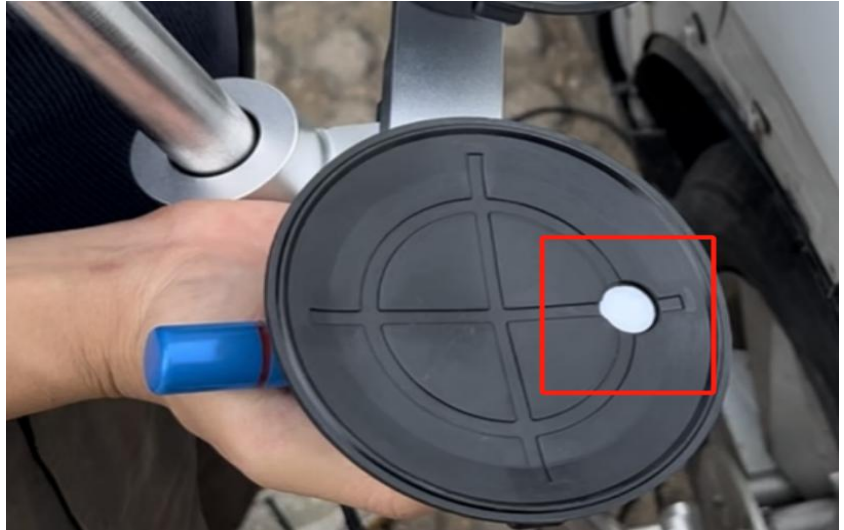
5. Move the suction cup fastener to a suitable position so that the wire harness is vertical to the ground, and adjust the position of the suction cup so that the air valve faces upward.



6. Press firmly on the suction cup, continuously pressing down on the blue piston until the suction cup is fully attached.



☆ Note: Please remove the white cotton pad before pressing the blue piston.



#### 6.4.6 Safety Rope Connection

1. Fix both ends of the safety rope to the DMI and the vehicle respectively to prevent the sensor from accidentally falling off and causing danger during vehicle movement.



#### 6.4.7 Cable Connection

1. Insert the DMI cable into the ODO port on the side of the device main body.



#### 6.4.8 Parameter Measurement

1. When collecting and processing the DMI sensor data, it is necessary to add the lever arm value  $x$  of the wheel speed sensor and the wheel circumference. Therefore, users need to measure these after installation.

DMI Option

?

×

Lever Arm X :

0.000

m

Wheel Circumference:

0.000

m

Ticks Per Wheel Revolution:

4000

Add To Favorite

Open Favorite

OK

Cancel

Sensor Parameter

×

Navigation

Panorama

Enable ☐ DMI

DMI Location ☒ Left ☐ Right

Wheel Size  cm

Lever Arm Offset  m

Speed Warning  km/h

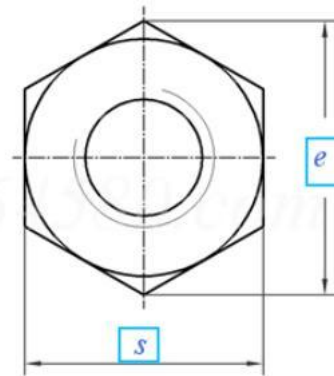
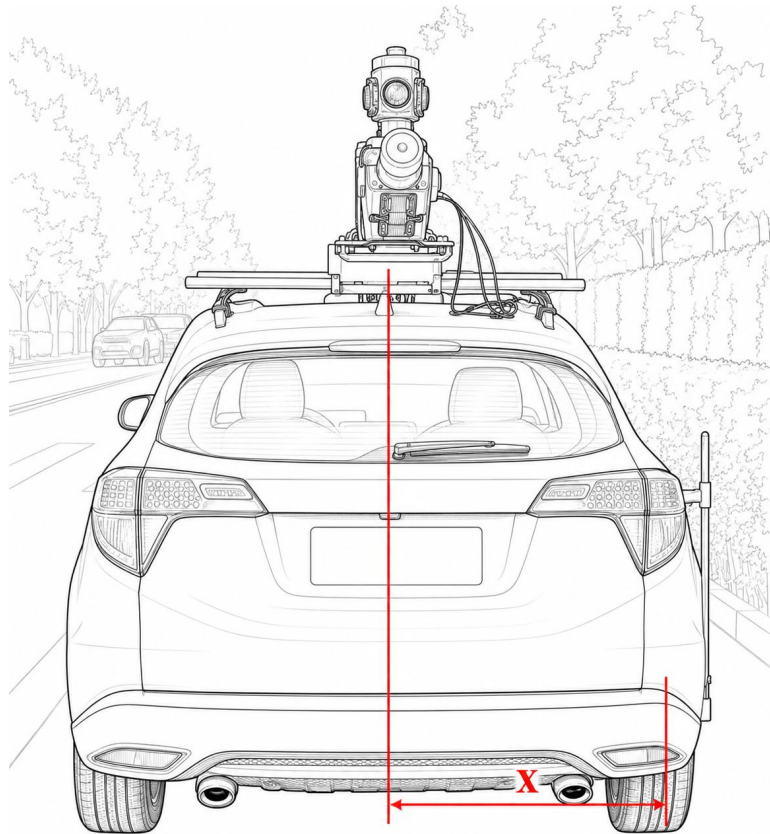
OK

Reset

☆ Notes:

1.As shown in the figure, the lever arm value  $x$  is the horizontal distance between the center position of the device and the center position of the wheel.

2.The wheel speed sensors provided by our company are currently all external, and users must install them locally by themselves. To ensure successful installation of the wheel speed sensor, users need to provide the specific model of the vehicle or the accurate size of the wheel hub nuts before purchasing.



## 7 Field Data Collection

### 7.1 Base Station Setup

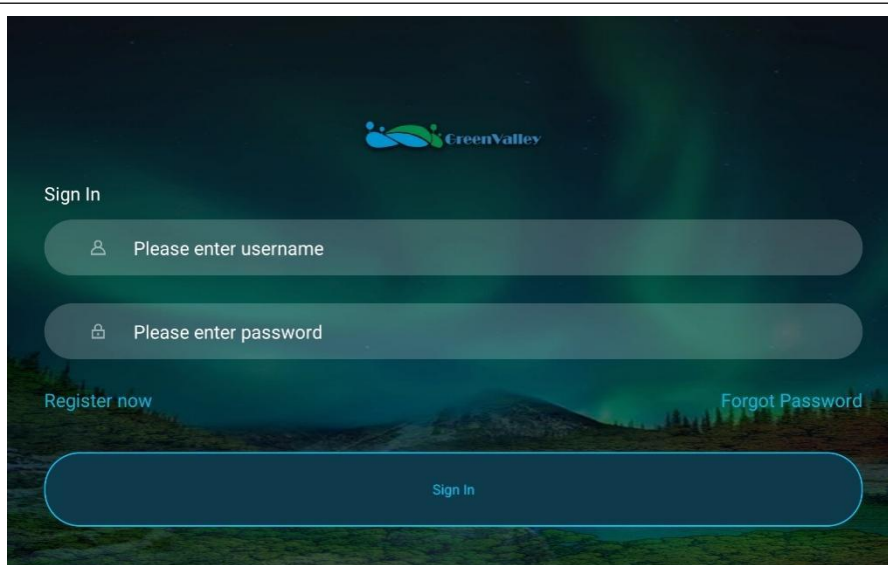
Before data collection, users need to plan and set up the base station location appropriately. If using our LiBase equipment, specific operations can be found in the "LiBase Quick Guide" and "LiSurvey User Manual."

☆ Note:

1. To ensure data accuracy, plan the base station location reasonably. The base station setup range should not exceed 20 km.
2. The base station setup time must fully cover the data collection time, with an additional 15 minutes before and after.
3. Multi-base station data trajectory resolution requires assistance from third-party software.

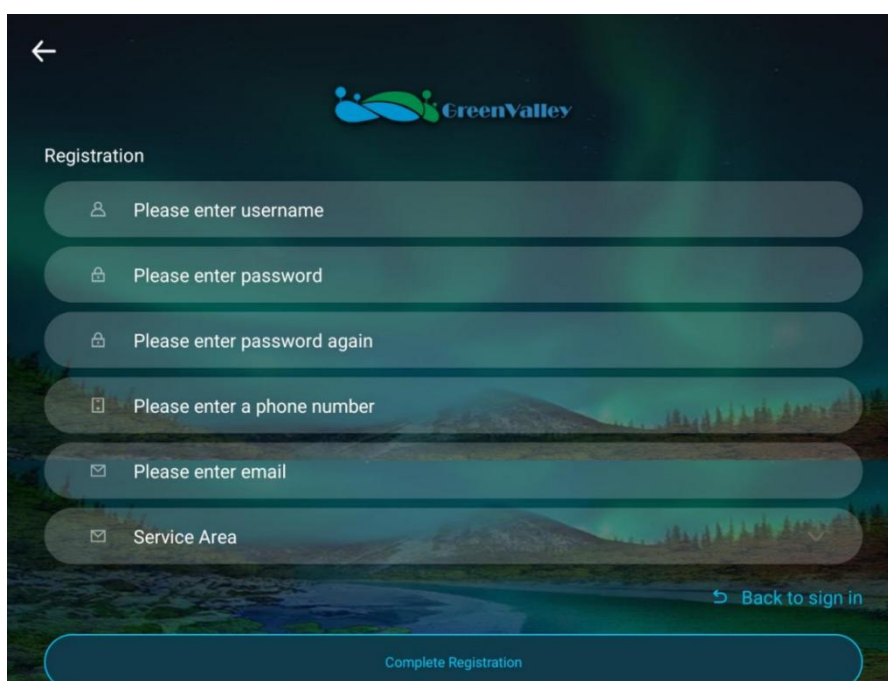
### 7.2 User Registration and Sign In

1. The LiMobile M2 Lite device requires signin to the GreenValley account. Connect the tablet to the internet. After opening the APP, the Sign In interface will appear. Click the **Register now** button to proceed to the Registration page.



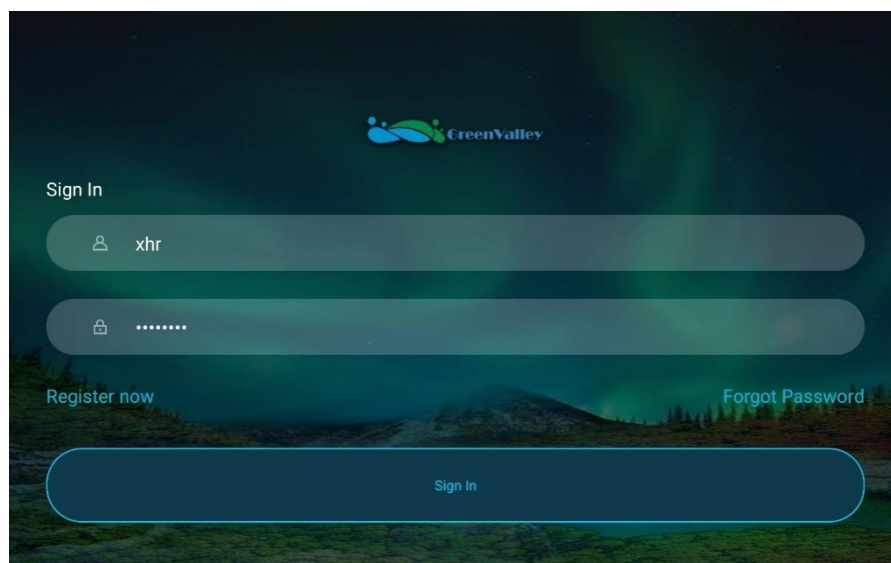
The Sign In interface features the GreenValley logo at the top. Below it, the text "Sign In" is displayed. There are two input fields: "Please enter username" and "Please enter password". At the bottom, there is a "Sign In" button. Links for "Register now" and "Forgot Password" are located on the left and right sides respectively.

2. After filling in the information, click the **Complete Registration** button, and the app will automatically return to the Sign In interface.

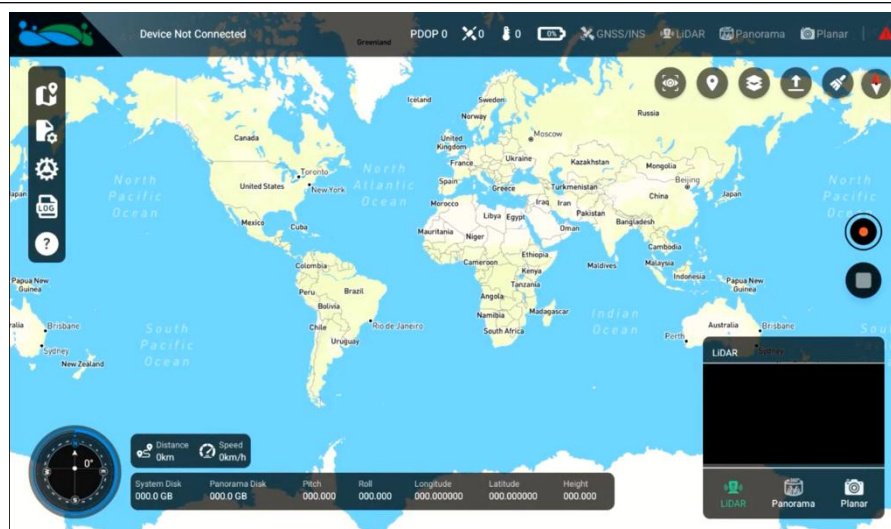


The Registration interface features the GreenValley logo at the top. Below it, the text "Registration" is displayed. There are six input fields: "Please enter username", "Please enter password", "Please enter password again", "Please enter a phone number", "Please enter email", and "Service Area". At the bottom, there is a "Complete Registration" button. A "Back to sign in" link is located on the right side.

3. Enter the username and password, then click the **Sign In** button to complete the login.



4. After successful login, the app will redirect to the **Device Not Connected** interface, indicating a successful login.



## 7.3 Power on the Device

### 7.3.1 Battery Power Supply

1. Rotate the power switch POW on the battery box to the **BAT-ON** position, and the green indicator light will illuminate.



### 7.3.2 External Power Supply

The device also supports external power supply mode. If using external power, it is recommended to use an AC voltage of 110 V~220 V outdoor power source (with a power rating of 1000W or higher).

1. Connect the device battery box and the outdoor power source as shown in the diagram.



2. Secure the cable by fastening the lock downward.



3. Turn on the outdoor power source and rotate the power switch POW on the battery box to the EXT-ON position.



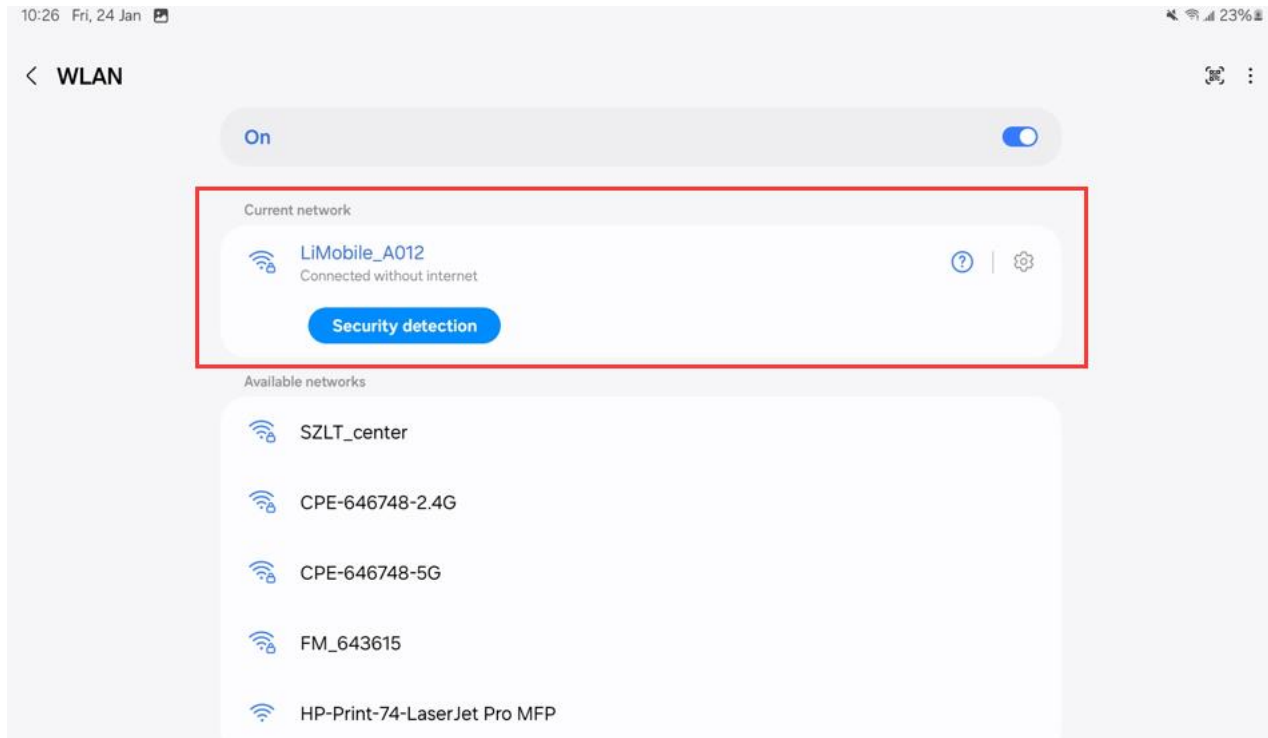
## 7.4 Device Connection

### 7.4.1 Wi-Fi Connection

Search for the Wi-Fi name: LiMobileM2\_XXXX on the mobile device.

Enter the default Wi-Fi password: greenvally.

☆ Note: "XXXX" refers to the last four digits of the device's serial number (SN).



### 7.4.2 Wired Connection

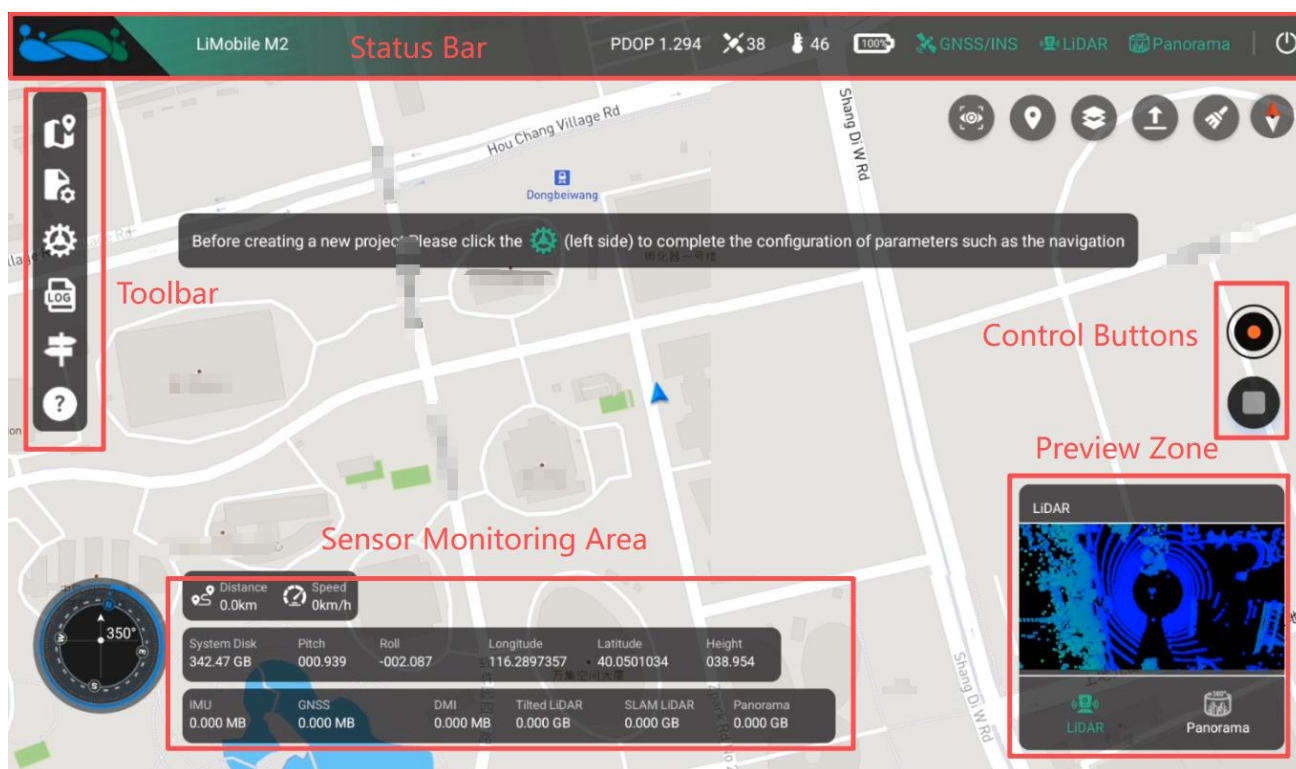
1. Use an adapter to connect one end of a RJ45 Ethernet cable to the mobile device's Ethernet port.



2. Connect the other end of the RJ45 Ethernet cable to the battery box's Ethernet port Or Adapter's Ethernet port



## 7.5 APP Interface Overview

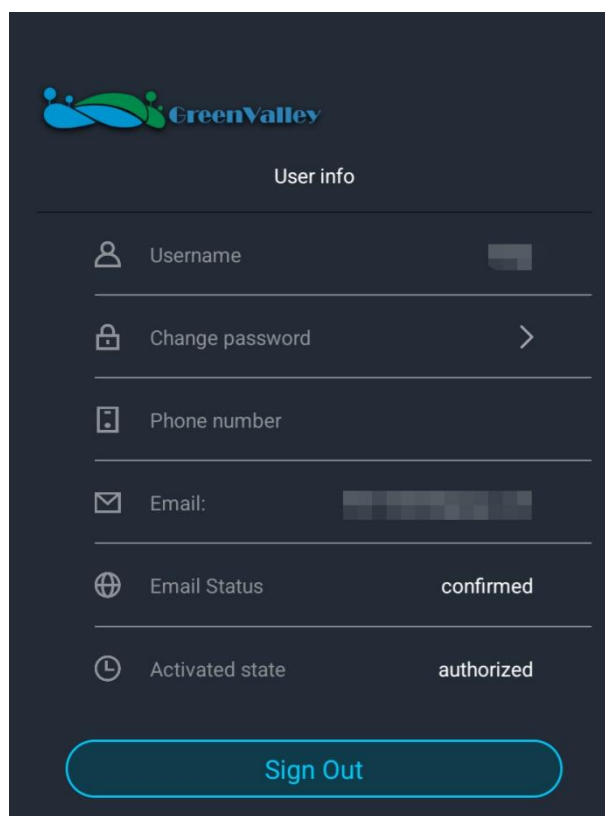


## 7.5.1 Top Device Status Bar

### 1. Account Management Button

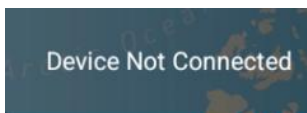


User Management Interface: Users can view GreenValley account information, activated status, and perform operations such as **Sign Out**.

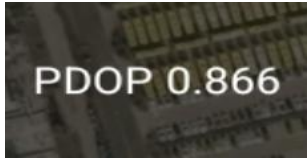
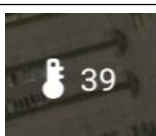


The screenshot shows the 'User info' section of the GreenValley application. It includes fields for Username, Change password, Phone number, and Email. The Email Status is 'confirmed' and the Activated state is 'authorized'. A prominent 'Sign Out' button is at the bottom.

## 2. Device Connection Status

|                                                                                   |                                              |
|-----------------------------------------------------------------------------------|----------------------------------------------|
|  | Tablet disconnected from the device.         |
|  | Tablet successfully connected to the device. |

## 3. Device Status Information

|                                                                                     |                                                                                                                                                                                                                                                                                                 |
|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|    | PDOP Value: Generally, a value less than 2 indicates good signal quality, suitable for data collection.                                                                                                                                                                                         |
|    | Satellite Count: Displays the number of satellites tracked by the device.                                                                                                                                                                                                                       |
|    | Device Temperature: Displays the internal temperature of the device.                                                                                                                                                                                                                            |
|   | Battery Level: Displays the remaining battery level of the device. A red warning icon appears when the battery level is below 20%.                                                                                                                                                              |
|  | <p>Sensor Connection Status (IMU, LiDAR, Panoramic Camera, Planar Camera).</p> <p>Green: Sensor is synchronized and ready for collection.</p> <p>Yellow: Sensor is activated but not synchronized.</p> <p>Red: Sensor is connected but not activated.</p> <p>Gray: Sensor is not connected.</p> |

## 4. Device Power Button

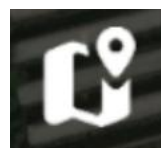


Power Button



Disabled when the device is not connected.

## 7.5.2 Left Toolbar

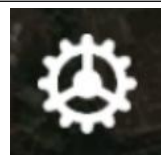
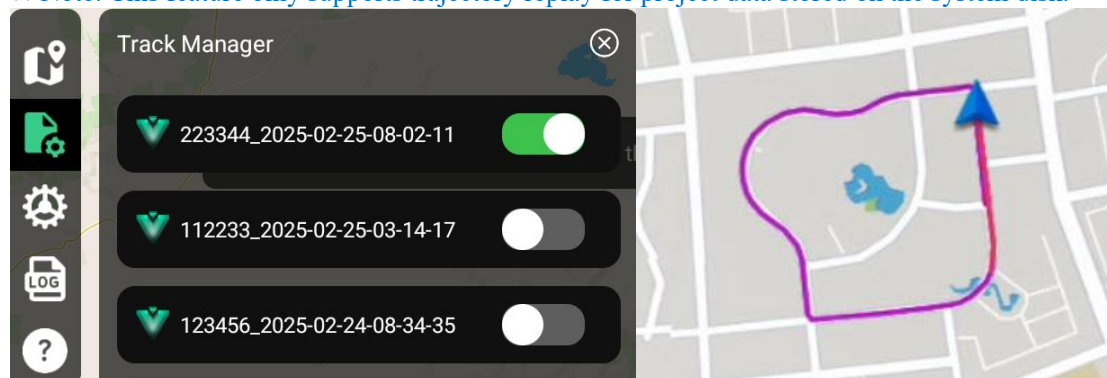


Offline Map Download Button: Refer to Section 7.7.1 for detailed steps.



Track Management Button: Users can replay trajectory files from historical projects. Swipe the trajectory slider to the right, and the corresponding trajectory (purple) will be automatically replayed on the map.

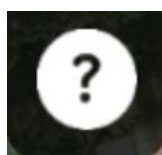
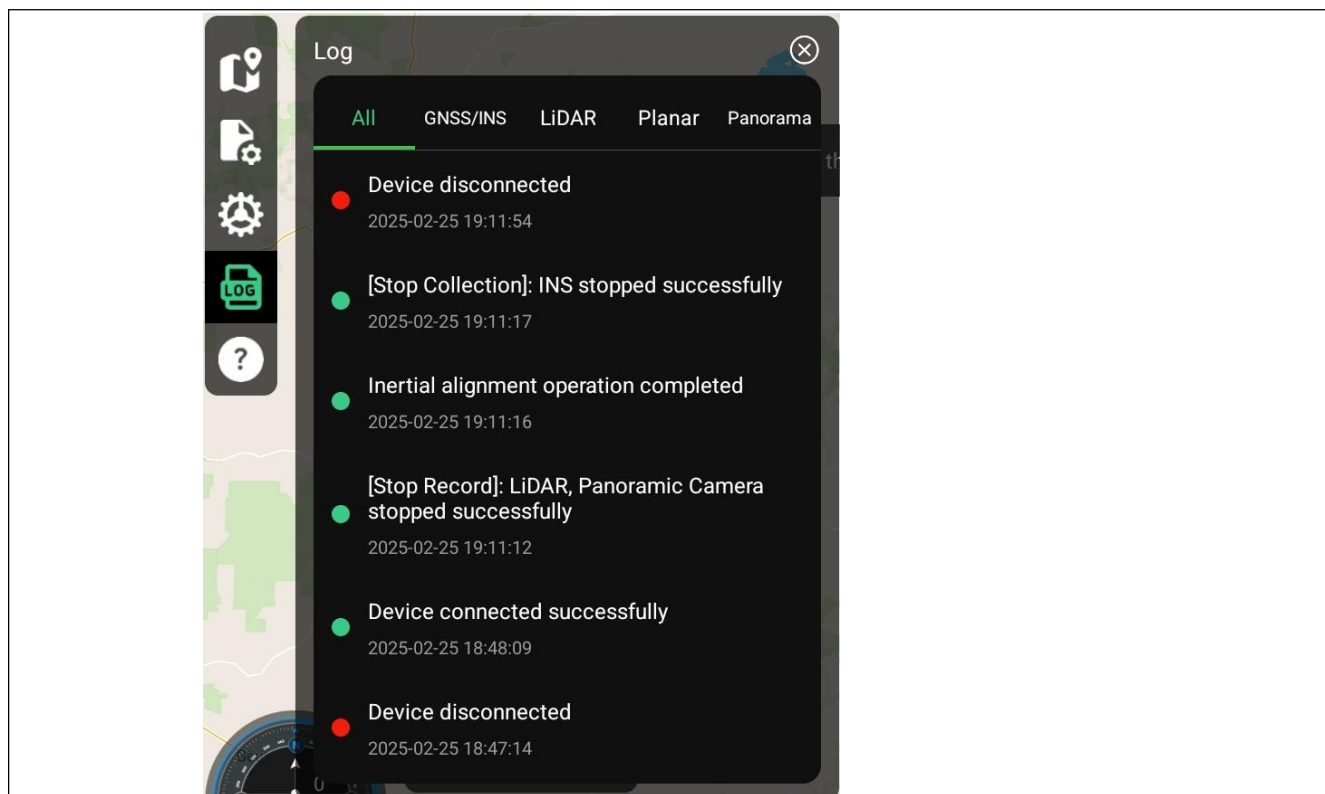
☆ Note: This feature only supports trajectory replay for project data stored on the system disk.



Configuration Button: Refer to Sections 7.6.2 for detailed settings.



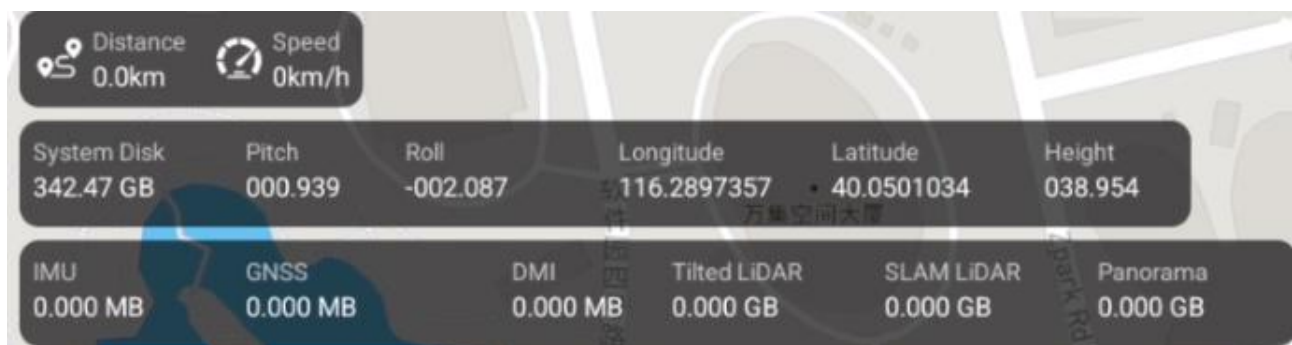
Log Button: Users can view real-time operation logs. The app supports voice alerts for important reminders.



About buttons: Users can quickly view the device calibration file information, system version information, APP version information, and frequently asked questions.

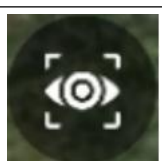
### 7.5.3 Bottom Information Panel

Displays information such as Distance, Speed, available disk space (yellow warning if below 10%, red warning if below 3%), Pitch, Roll, Heading, Latitude, Longitude, and Height.

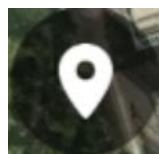


### 7.5.4 Main Interface

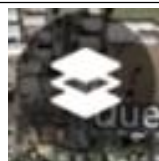
#### 1. Map Function Buttons



Follow Button: Click to rotate the map according to the driving direction.

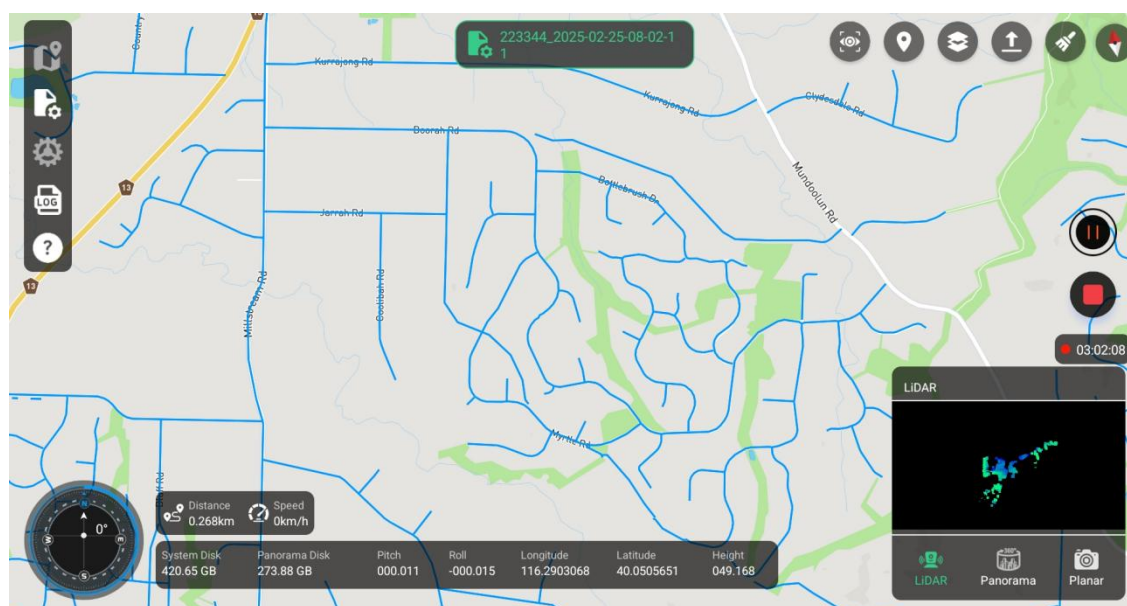
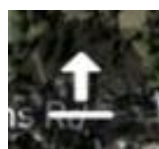


Location Button: Click to jump to the current device location on the map.

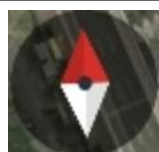


Map Switch Button: Click to switch between satellite and navigation maps.

Trajectory Upload Button: Click to upload planned trajectory files (.kml/.kmz/.ovkml/.ovkmz/\*.txt) from the tablet. The planned trajectory (blue) will appear on the map.

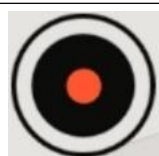


Trajectory Clear Button: Click to remove all trajectories from the map, including real-time, uploaded, and replayed trajectories.

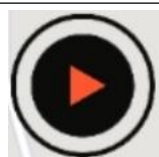


Pointer Button: Click to reset the map orientation to north.

## 2. Collection Operation Buttons



New Project Button



Start Data Recording Button

|                                                                                   |                             |
|-----------------------------------------------------------------------------------|-----------------------------|
|  | Pause Data Recording Button |
|  | Stop Data Recording Button  |
|  | Project Collection Time     |

### 3. Data Preview Window

|                                                                                     |                                                                                                                                                                       |
|-------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|   | Single-frame Point Cloud Preview: Click the thumbnail to enlarge. Displays data from both LiDARs.                                                                     |
|  | Panoramic Image Preview: Click the thumbnail to enlarge. Camera 1-4 correspond to the side cameras (starting from Camera 0, counterclockwise when viewed from above). |

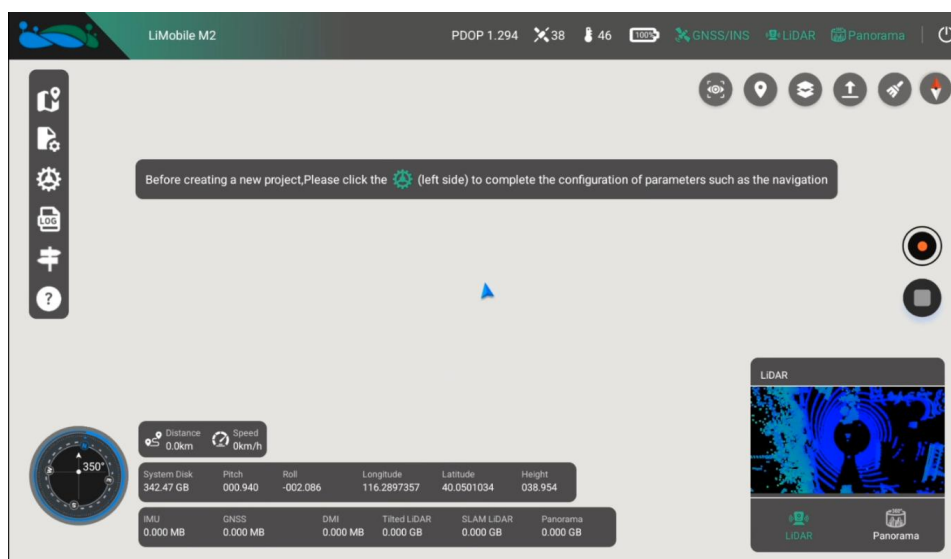
### 4. User Prompt

Before creating a new project, please click the  (left side) to complete the configuration of parameters such as the navigation

## 7.6 Quick Data Collection

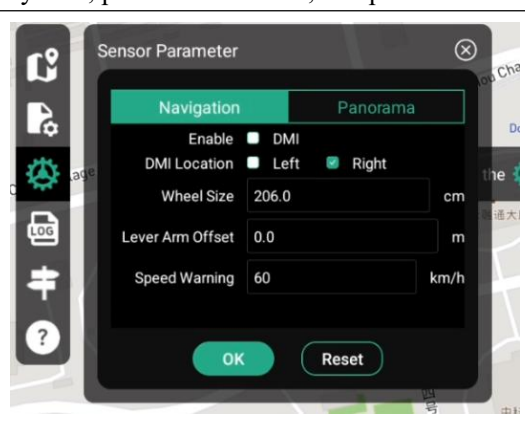
### 7.6.1 Device Initialization

After powering on the device, establish communication between the device and the tablet. When the device connection status in the top-right corner turns green, the device is successfully connected. The device will automatically initialize after powering on, requiring no user intervention. Wait until all sensor status indicators turn green before starting data collection.



### 7.6.2 Sensor Parameter Settings

After device initialization, click the Settings button in the toolbar to configure parameters for the navigation system, panoramic camera, and planar camera.



The screenshot shows the 'Sensor Parameter' dialog box with the 'Navigation' tab selected. It contains the following settings:

- Enable:** ☒ DMI
- DMI Location:** ☐ Left ☒ Right
- Wheel Size:** 206.0 cm
- Lever Arm Offset:** 0.0 m
- Speed Warning:** 60 km/h

Buttons for 'OK' and 'Reset' are at the bottom.

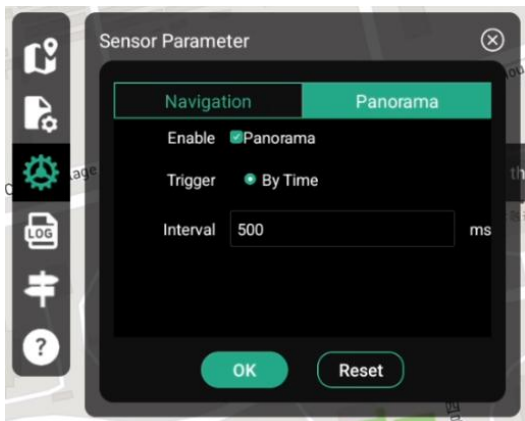
#### Navigation

**DMI Enable Settings:** The device will record data only after it is enabled.

**DMI Location:** For determining the DMI's mounting position relative to the vehicle body.

**Wheel Size:** Used to calculate driving distance.

**Lever Arm Offset:** For processing wheel speed sensor data.



**Panorama**

**Panorama Enable Settings:** the device will record data only after it is enabled.

**Trigger Mode:** supports By Time trigger modes.

1. By Time

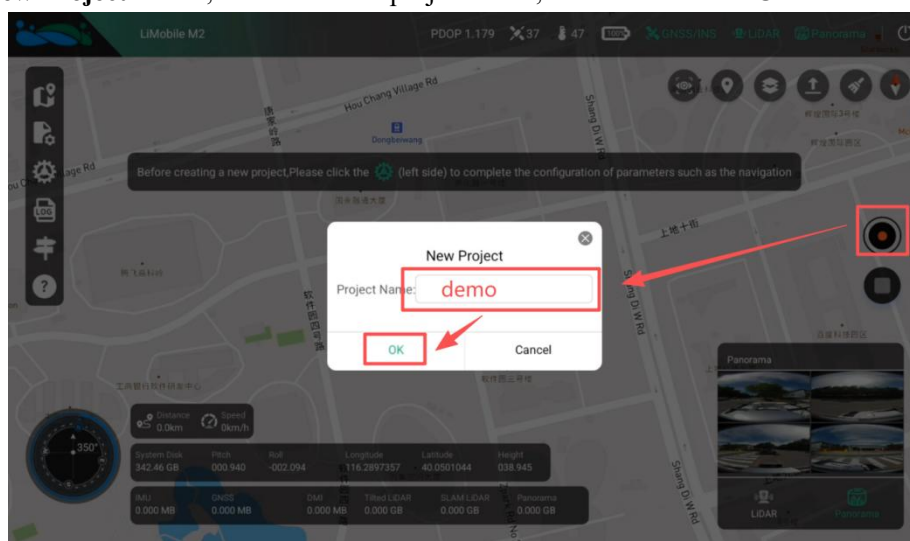
Frame Rate: default parameter 200-30000 ms.

☆ Notes:

1. After settings are complete, click the "OK" button to make the parameters effective.
2. The "Reset" button will restore all sensor parameters to factory defaults.

### 7.6.3 New Project

Click the **New Project** button, enter a custom project name, and then click the **OK** button.



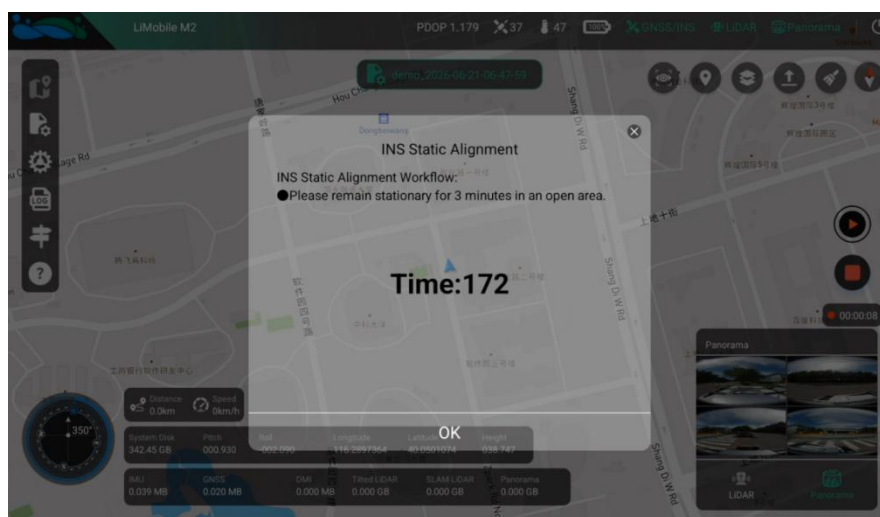
☆ Notes:

1. The name of the newly created project should not contain special characters.
2. The final project name is: User-defined name\_UTC time.

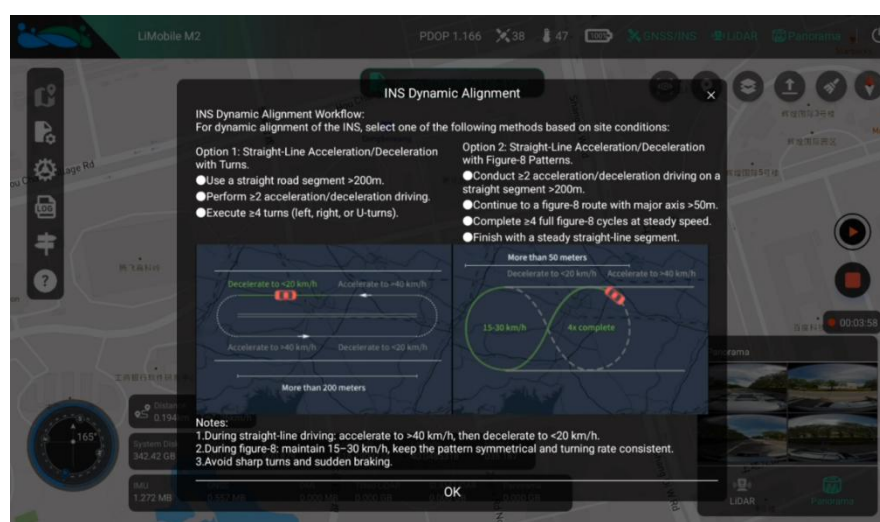
### 7.6.4 IMU Alignment

After creating a new project, the IMU Alignment pop-up window will automatically pop up on the interface. The IMU Alignment operation is divided into two steps: Static Alignment and Dynamic Alignment.

**Static Alignment:** Please remain still for 3 minutes in an open area. The user needs to wait for the countdown to end and click the OK button.

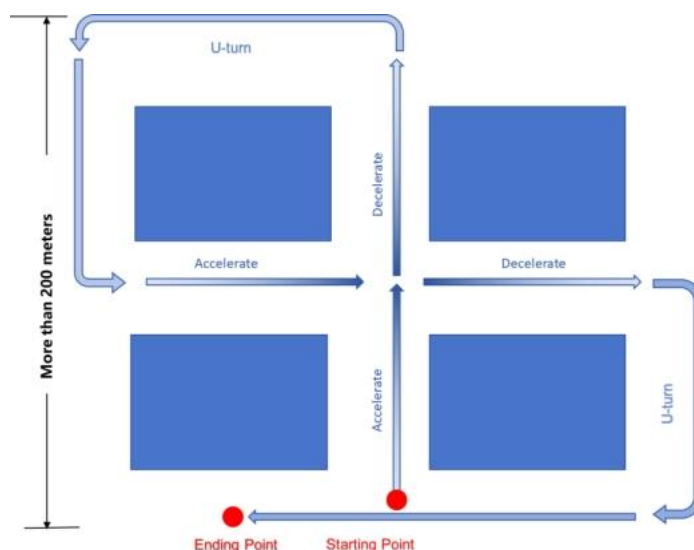


**Dynamic Alignment:** The user needs to follow the diagram and first accelerate forward to 40 km/h and decelerate to 10 km/h, and then turn around. Then accelerate forward to 40 km/h, decelerate to 10 km/h, and turn around again. Finally, repeat the above acceleration, deceleration, and U-turn operations. Click the OK button when finished.



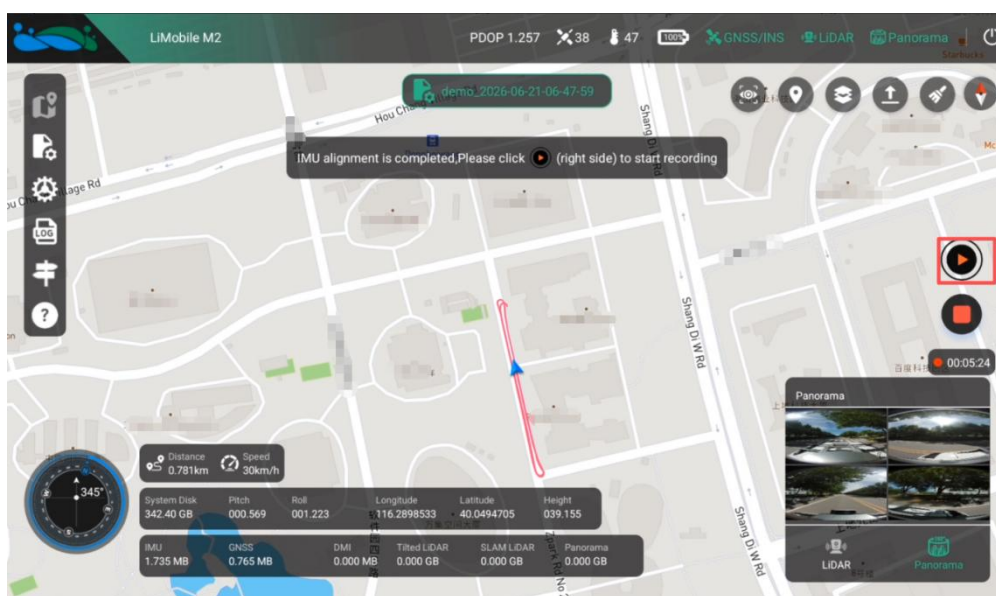
#### ☆ Notes:

1. If the INS alignment operation is not carried out, there will be a high risk that some data cannot be processed.
2. If users are under tight schedules and need to shorten the waiting time for the static alignment step, the manual provides other alignment criteria, that is, when the PDOP value is below 2 and the number of satellites is above 15, and this state remains stable for 30 seconds, dynamic alignment can be carried out.
3. If the user's acquisition environment permits, it is recommended to conduct the dynamic alignment operation as shown in the following figure.

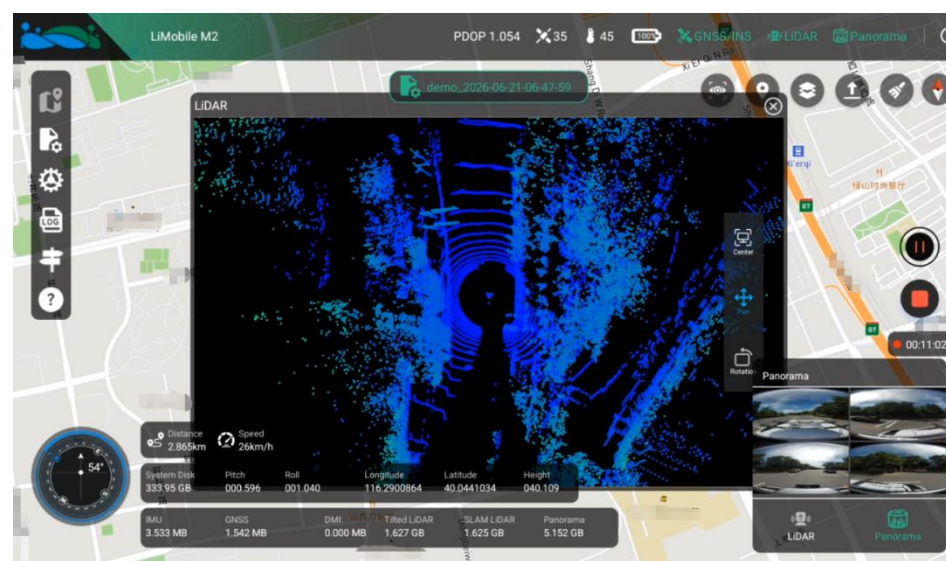
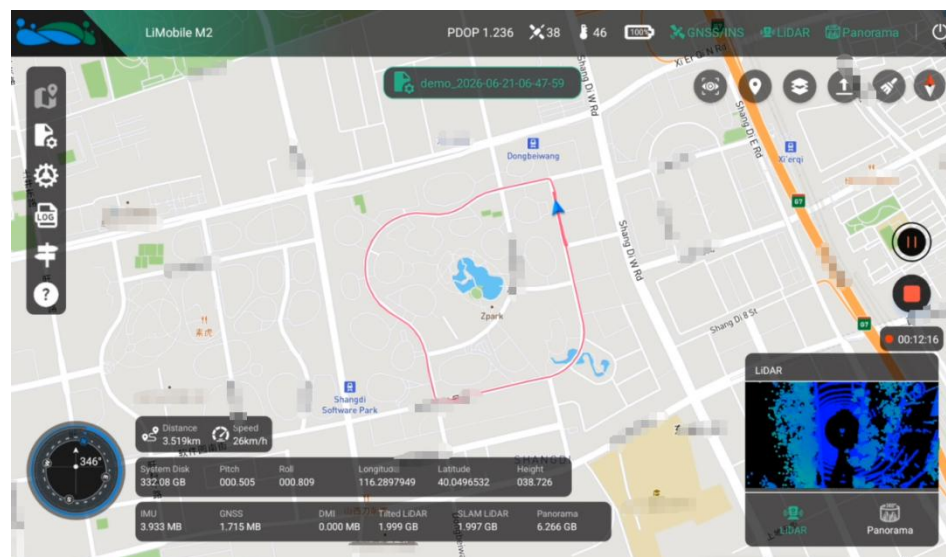
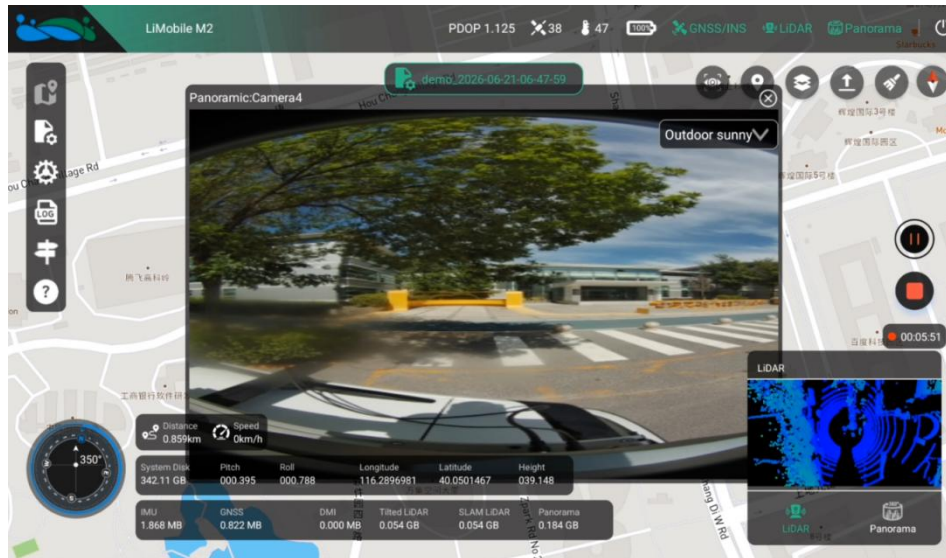


### 7.6.5 Start Data Recording

According to the prompt at the top of the main interface, click the Start Recording button, and the device will begin recording sensor data.

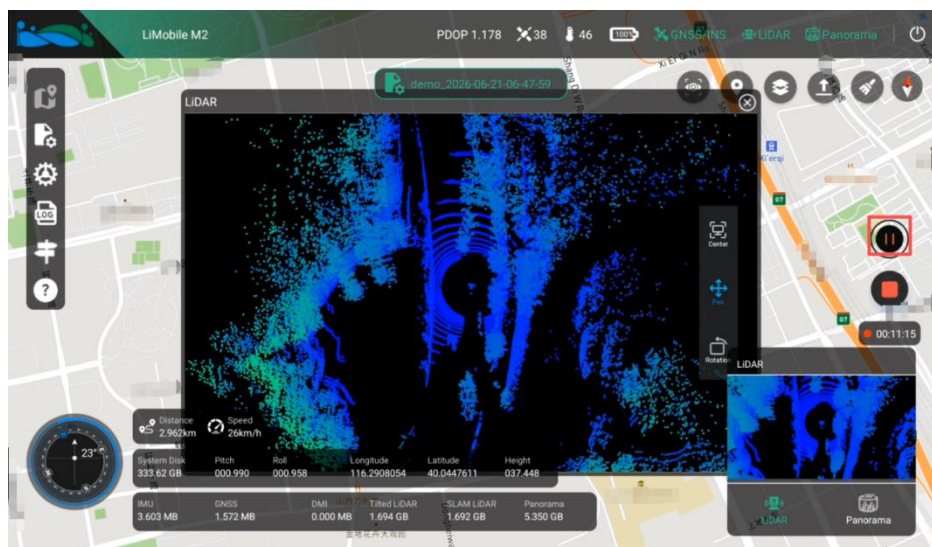


Users can view the driving route of the equipment in real time on the map, and can also view the collected single-frame point cloud data and image data in real time.



☆ Notes:

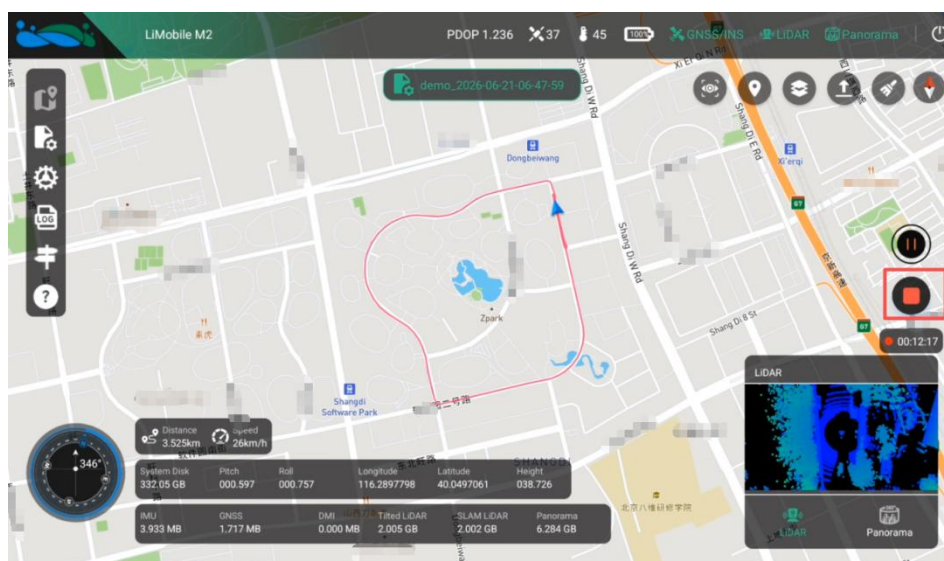
1. When users encounter situations such as the need to transfer the work area or traffic jams during data collection, they can click the "Pause Recording" button to pause data recording.



2. After the pause of data recording ends, users can click the "Start Recording" button again to obtain data.

### 7.6.6 Stop Data Recording

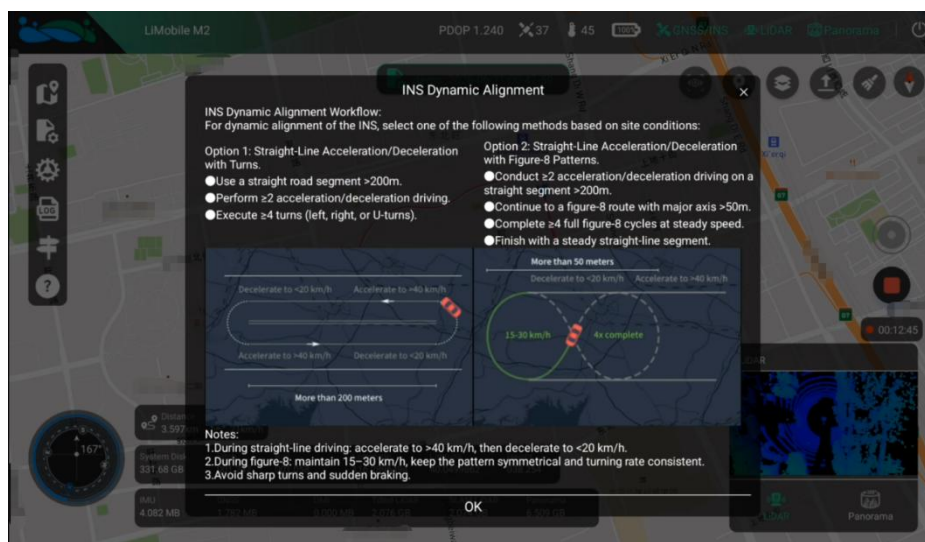
After the collection is completed, click the "Stop Recording" button.



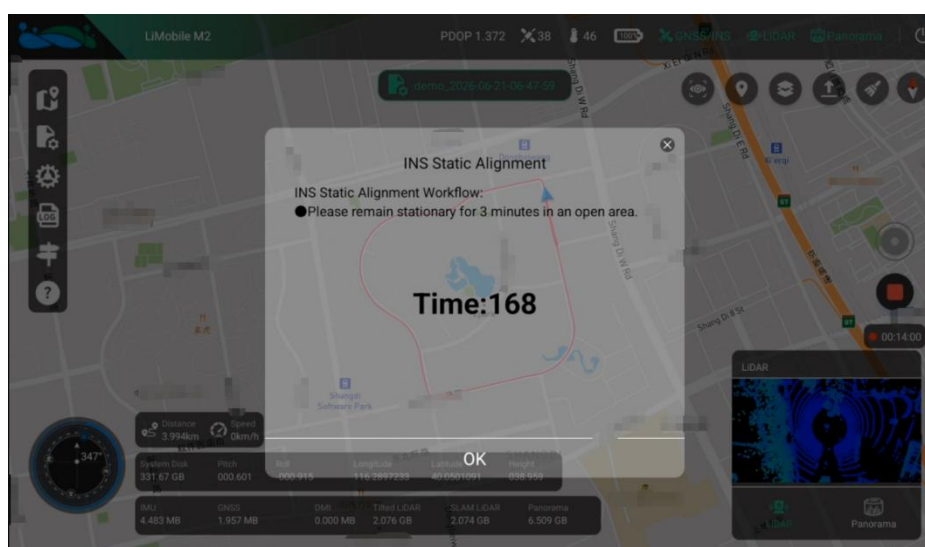
### 7.6.7 IMU Alignment and Close Project

After stopping data recording, the interface will automatically pop up the INS Alignment window. The INS alignment operation consists of two steps: Dynamic Alignment and Static Alignment.

**Dynamic Alignment:** The user needs to follow the diagram and first accelerate forward to 40 km/h and decelerate to 10 km/h, and then turn around. Then accelerate forward to 40 km/h, decelerate to 10 km/h, and turn around again. Finally, repeat the above acceleration, deceleration, and U-turn operations. Click the OK button when finished.

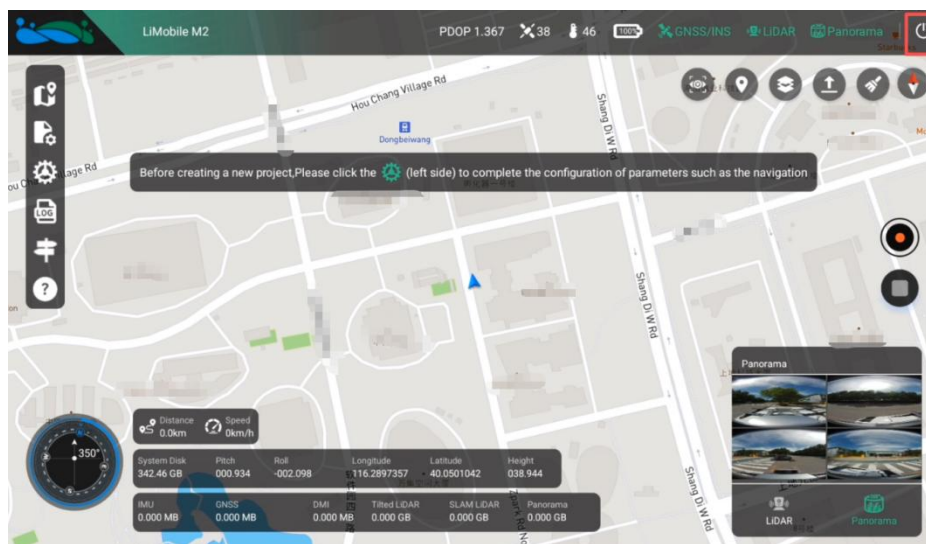


Static Alignment: Remain stationary in an open area for 3 minutes. Wait for the countdown to end, then click the Confirm button to finish the current project.



## 7.6.8 Device Shutdown

After completing all data collection tasks, click the power button in the upper right corner to shut down the device.



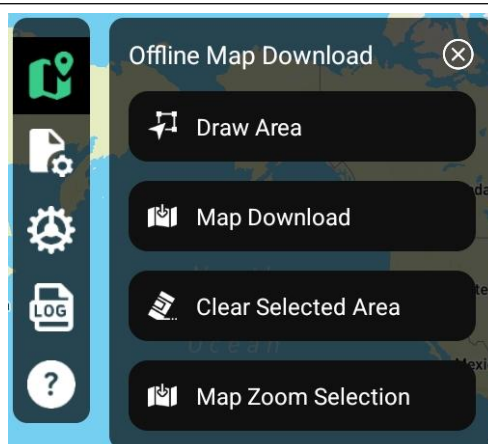
☆ Notes:

1. Please wait patiently for 30 seconds (the time required for the equipment system to be completely shut down). Do not perform any operations until the interface shows that the equipment connection is disconnected, and then turn off the equipment power.
2. Please cut off the power in advance before plugging or unplugging the disk.

## 7.7 Other Operational Instructions

### 7.7.1 Offline Map Download

1. Connect the tablet to an internet-enabled network and click the offline map download function button on the left to bring up the function menu.



2. Click the **Map Zoom Selection** button to set the map level range.

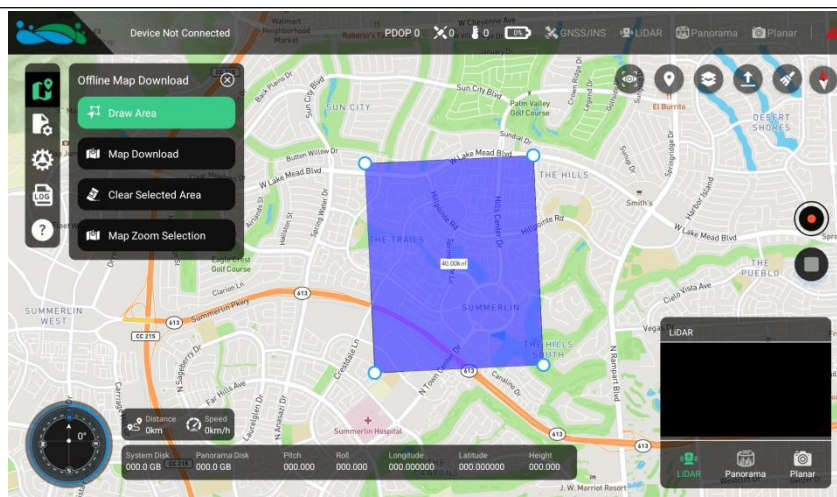
#### Map Zoom Selection

Minimum download zoom level:

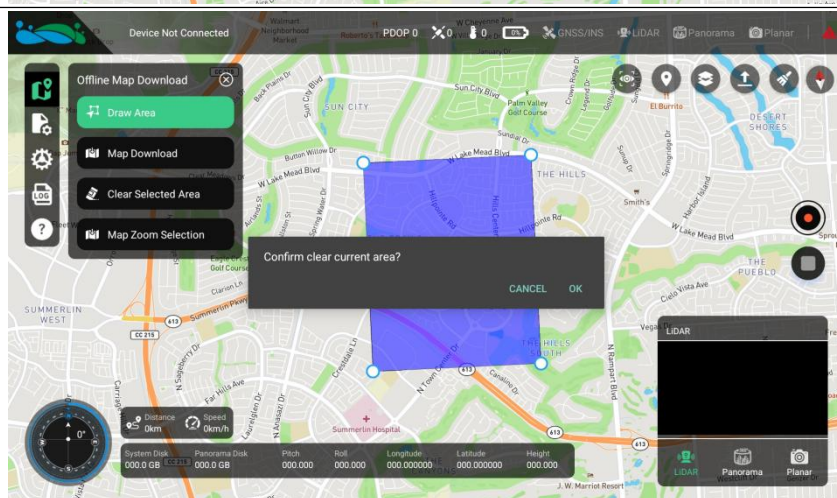
Maximum download zoom level:

CANCEL OK

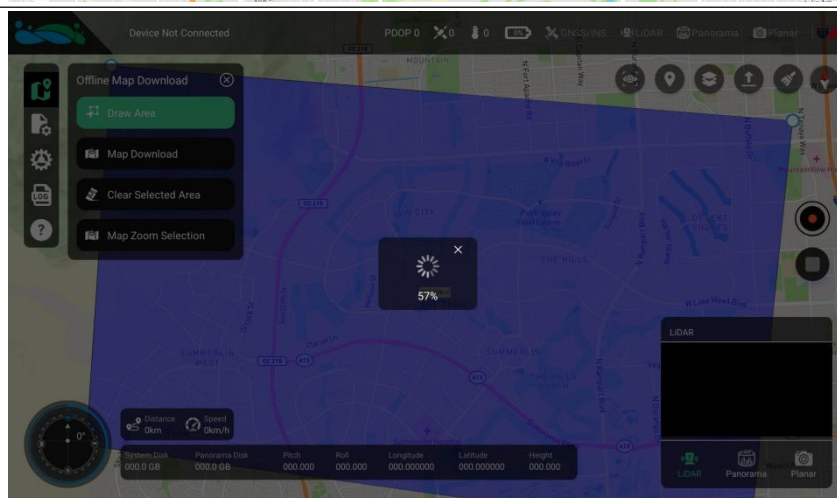
3. Click the **Draw Area** button to delineate the download area.



4. If the selected area is incorrect, click the **Clear Selected Area** button and redraw the download area.



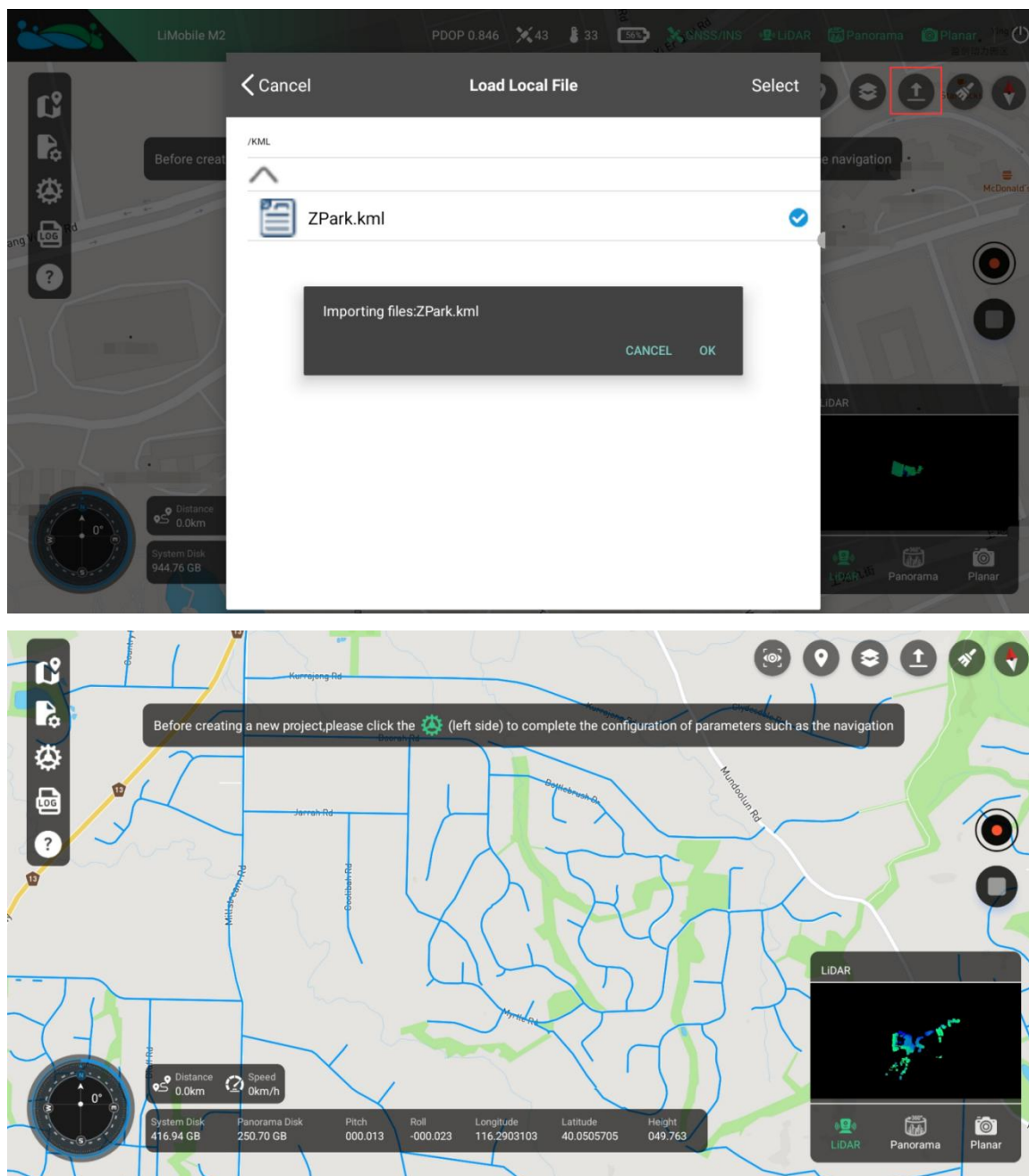
5. Click the **Map Download** button to complete the map download.



## 7.7.2 Route Planning

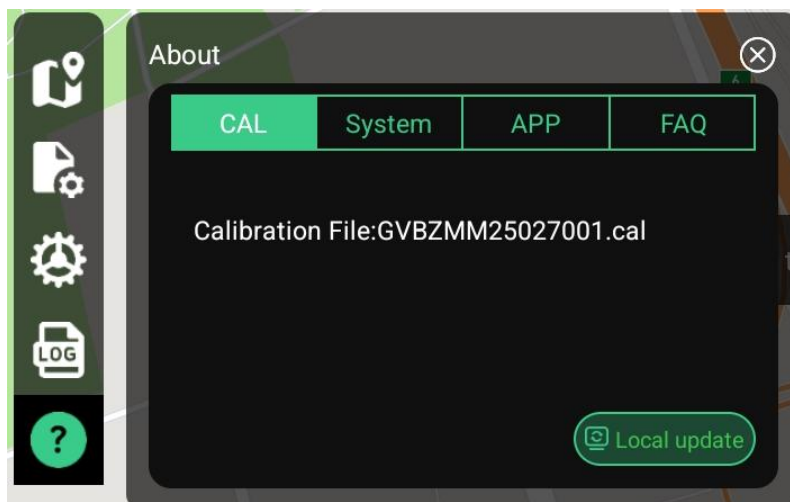
1. Users need to generate a collection planning route file in advance using online mapping software such as Google Earth or professional GIS software like ArcGIS, QGIS, or LiDAR360MLS (the software supports formats such as \*.kml, \*.kmz, \*.ovkml, \*.ovkmz, \*.txt, etc.), and import the generated file into the tablet.

2. Click the trajectory upload button in the upper right corner of the main interface, select the trajectory file to be imported, and the trajectory (in blue) will be displayed on the map interface.



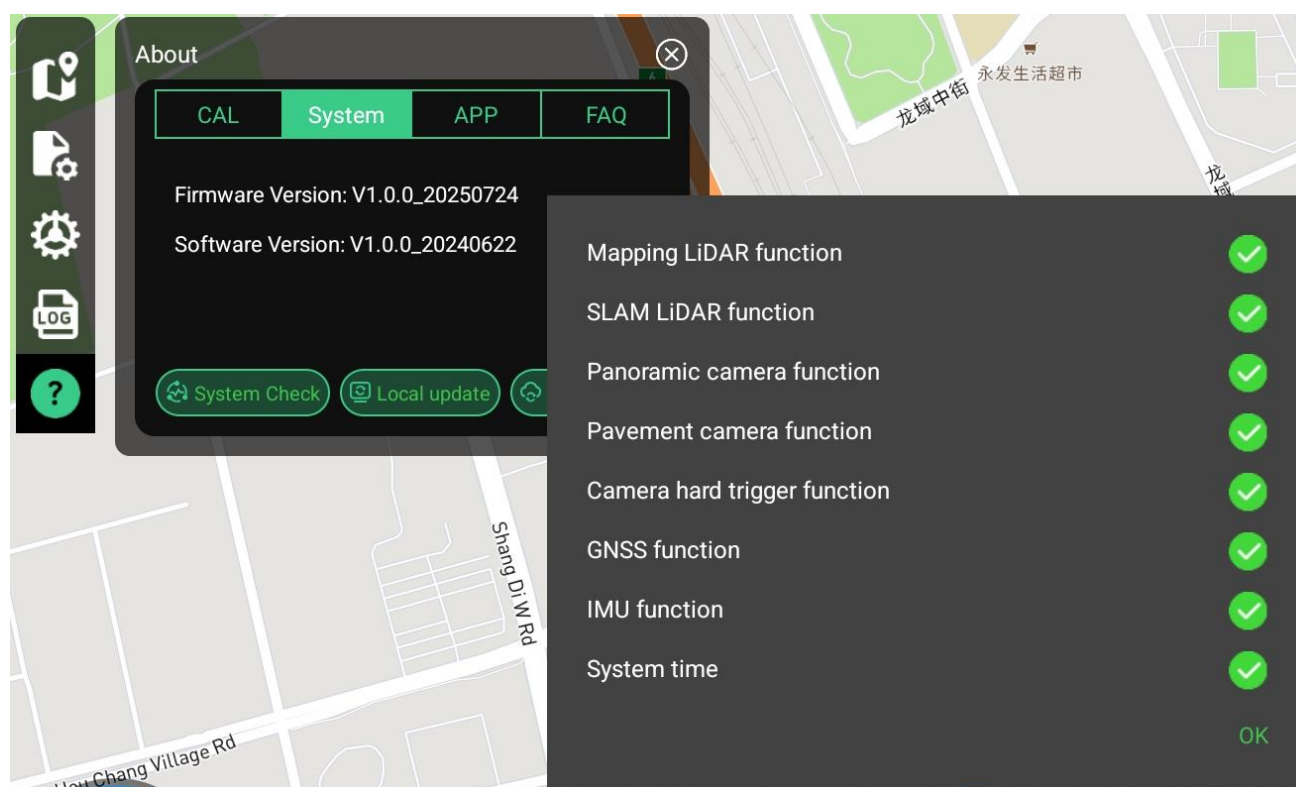
### 7.7.3 Calibration File Update

1. Users need to save the new calibration file (SN.cal) in the LiMobileSystem->Cal directory under the root directory of the M2\_SYS disk and insert the disk into the device.
2. Open the APP and connect to the device, then click the **About** button in the left toolbar, switch to the **CAL** interface, and then click the **Local update** button. The system will automatically recognize the calibration files in the specified path and complete the update.



### 7.7.4 System Check

The APP supports a system check function, which users can utilize to inspect the equipment during data collection.

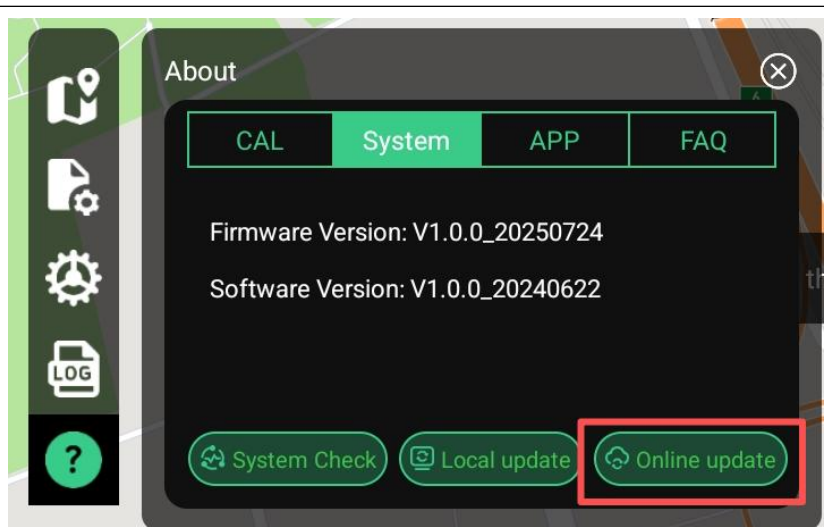


### 7.7.5 Firmware and Software Version Update

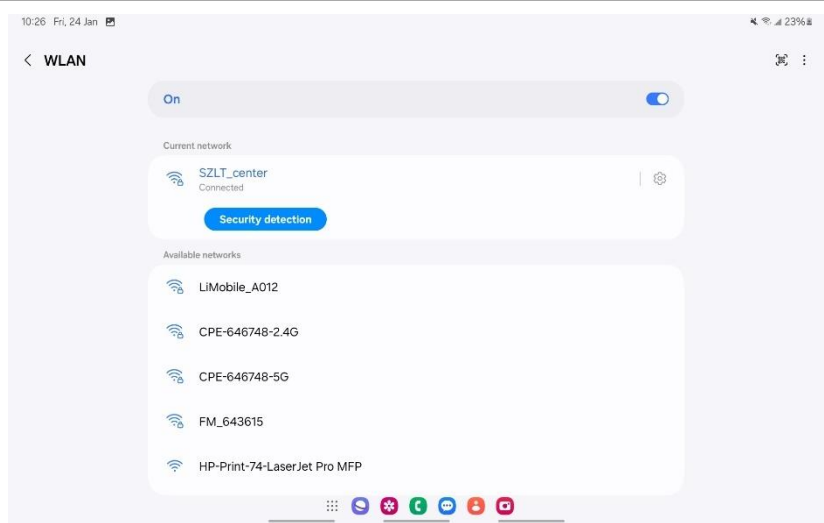
The device software and firmware will be packaged into a comprehensive update package for version updates. The device supports both local and online update modes, allowing users to choose flexibly.

## • Online Update

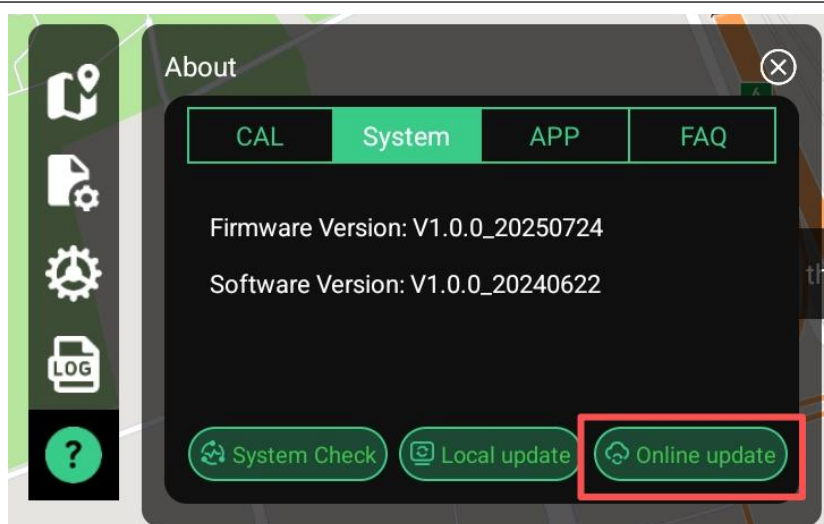
1. Open the APP and connect to the device, then click the **About** button and switch to the **System** interface. Check the current firmware version information of the device, and then click the **Online update** button. The tablet will then jump to the network switching interface.

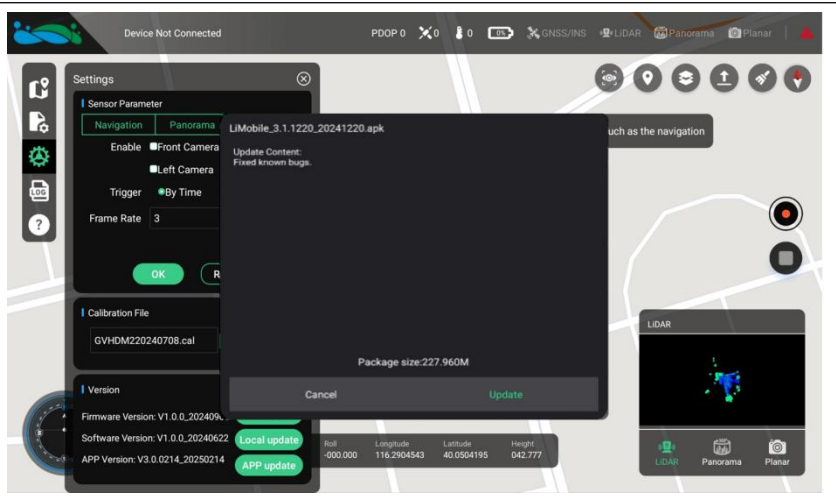
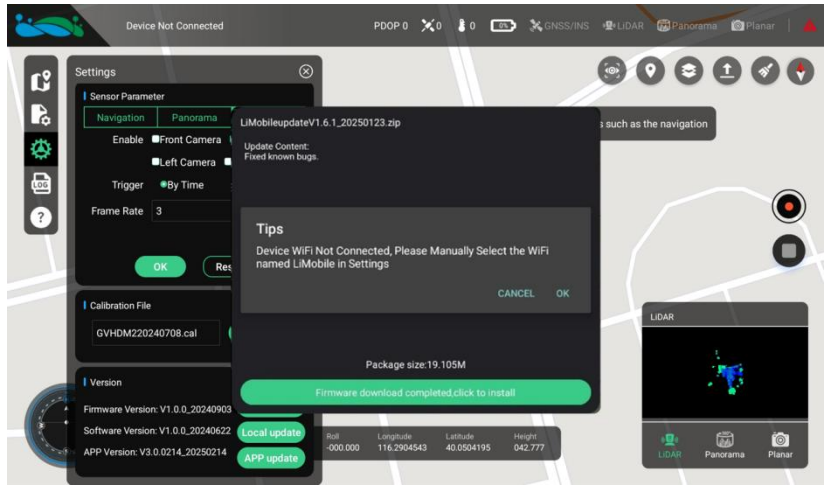
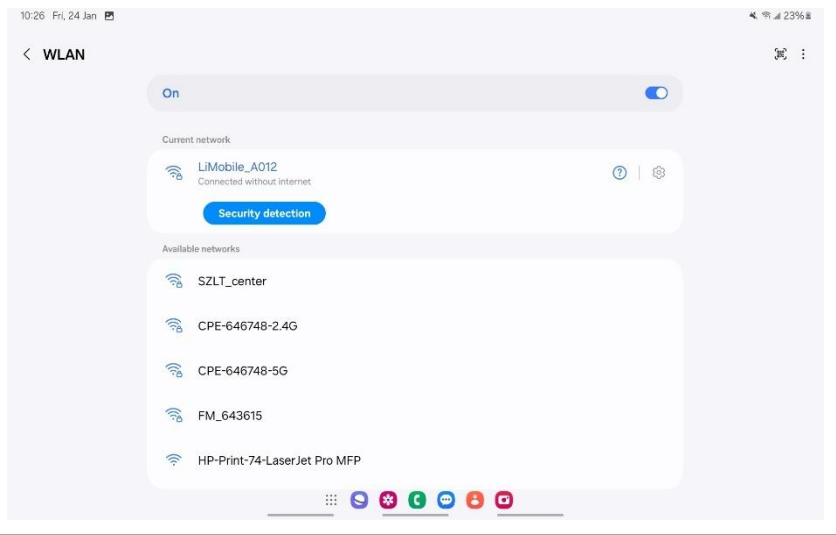


2. Users need to be connected to a network with Internet access.

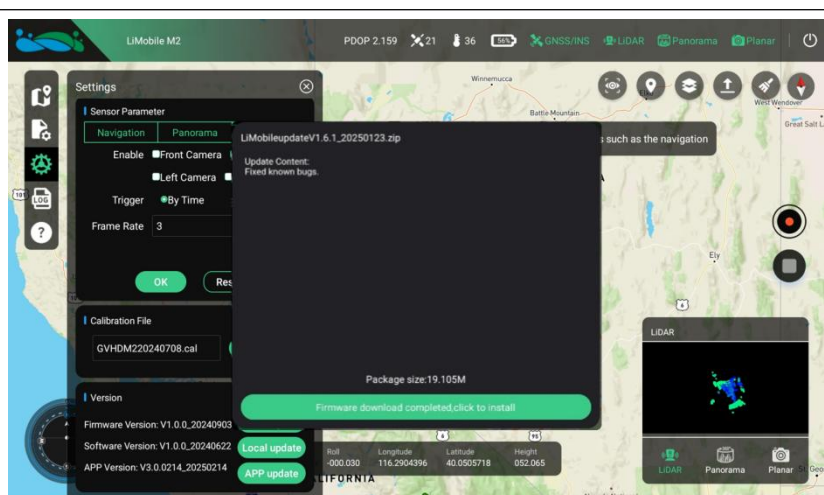


3. Switch back to the APP interface, click the **Online update** button again, the update dialog box will pop up, and click the **Update** button to download the comprehensive update package of firmware and software.



|                                                                                                                                                         |                                                                                      |
|---------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
|                                                                                                                                                         |    |
| <p>4. After the download is complete, click <b>Firmware download complete</b>, click to <b>install</b> button, and then click the <b>OK</b> button.</p> |   |
| <p>5. Follow the prompts to switch networks.</p>                                                                                                        |  |

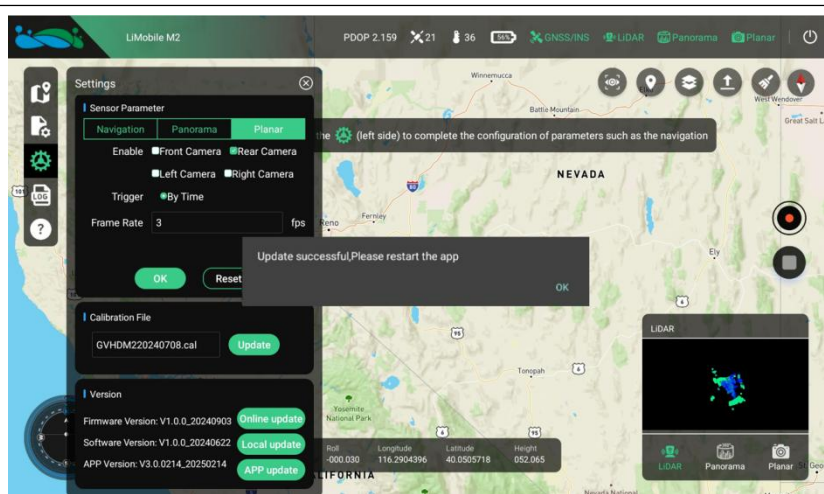
6. Switch back to the APP interface, click the **Firmware download completion**, click to **install** button again.



7. After the update is successful, click the **OK** button and restart the APP.

☆ Note:

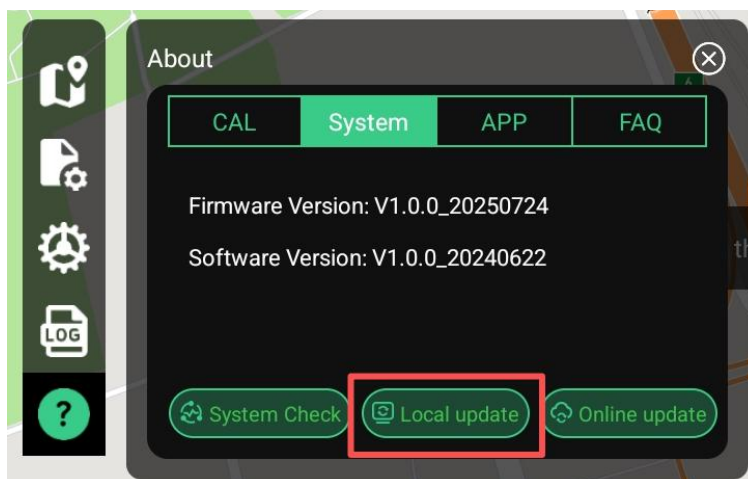
1. After the firmware and software update, the device will automatically shut down. Please power on the device again.
2. Restart the device and open the app to check the version number in the configuration interface to confirm the update was successful.



#### ● Local Update



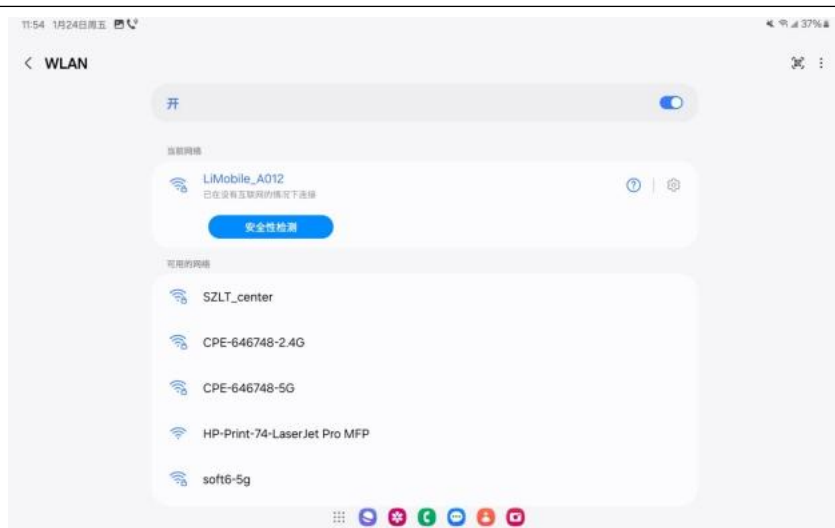
1. Scan the QR code, or enter <https://licloud.greenvalleyintl.com/api/v1/software/185/package> in the browser to download the comprehensive update package for firmware and software.
2. Users need to place the update package in the LiMobileSystem folder in the root directory of the M2\_SYS disk and insert the disk into the device.
3. Open the APP and connect to the device, click the **Local update** button on the **System** interface. The system will automatically start the update and will shut down automatically when completed, and the APP will prompt to restart.



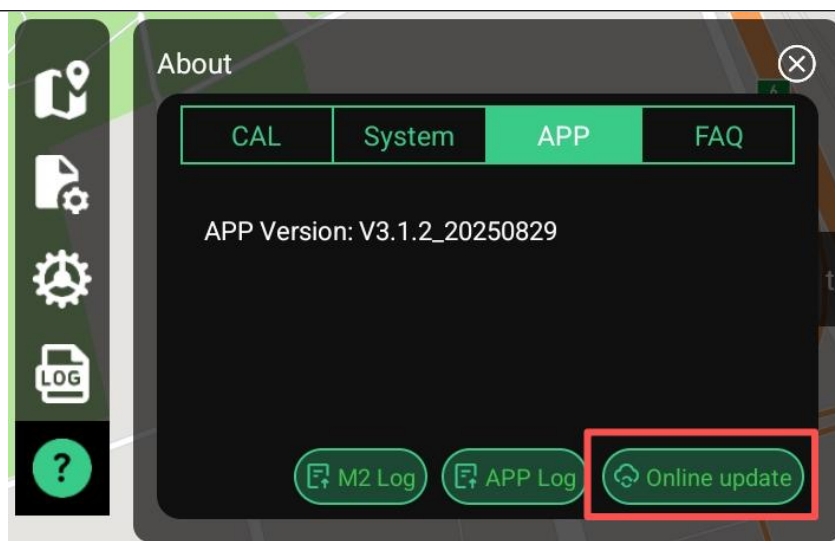
4. After waiting ten seconds, turn off the power and power on again. After waiting for about a minute and a half, the user starts the device again and opens the APP to check whether the version number of the configuration interface has been updated successfully.

### 7.7.6 GreenValley APP Update

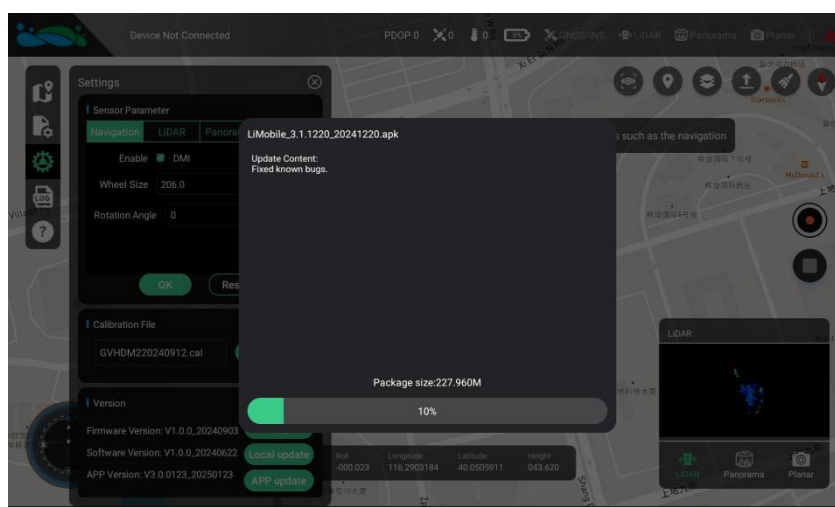
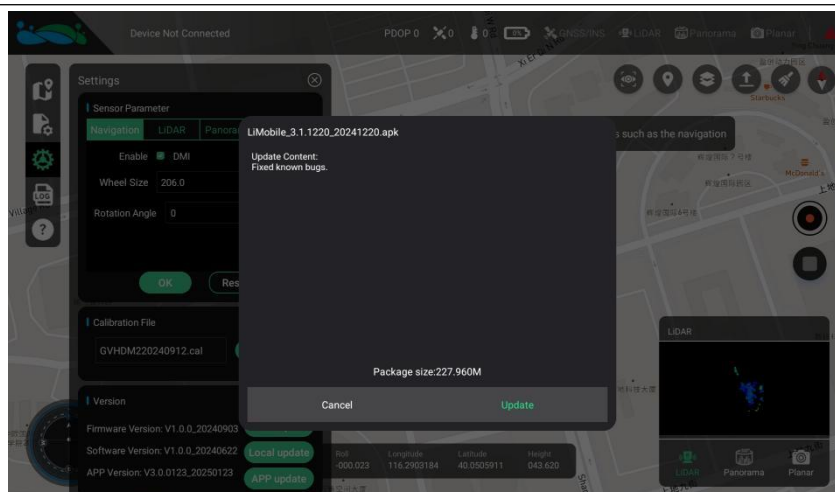
1.Users need to be connected to a network with Internet access.



2.Open the APP and connect to the device, then click the **APP** button in the **About** interface. The user can view update information in the pop-up window.



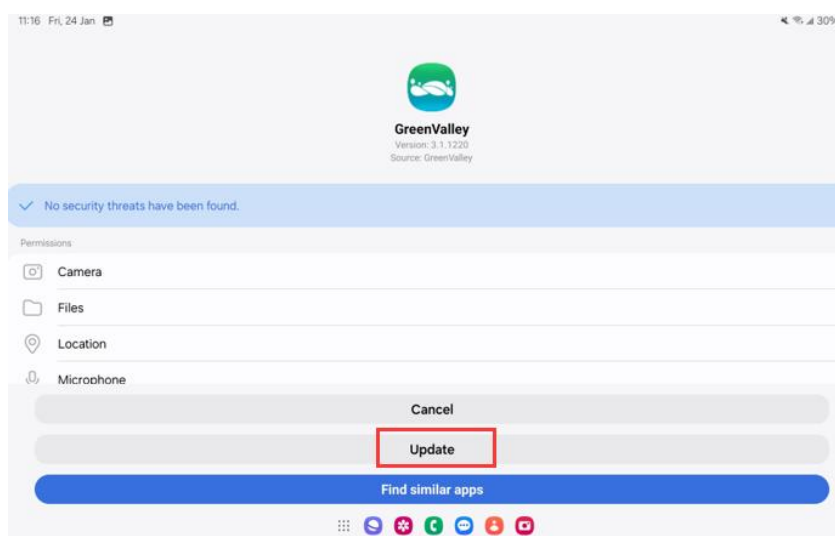
3. Click the **Online update** button, and the software will automatically begin updating.



4. After the progress bar is complete, the following interface will appear. Click the **Update** button to proceed.

☆ Notes:

1. Uninstallation is required before installation.
2. The installation package name is LiMobile\_3.x.xxxx\_xxxxxxxx.apk.
3. Users should use the shipped tablet for APP upgrade installation. Our company will not be responsible for any collection issues caused by changing the collection mobile device.
4. After the APP is successfully installed, the first time it is launched, application permission prompts will appear. Users need to enable application permissions on the tablet.



---

### 7.7.7 Log Upload

If an abnormality occurs during data collection, click the **About** button and switch to the **APP** interface to send the logs back to our technical personnel for issue diagnosis. For detailed operation steps, please refer to Appendix 6: "Steps for Uploading Collection Logs".

## 8 Data Processing

### 8.1 Preparation

#### 8.1.1 Hardware Preparation

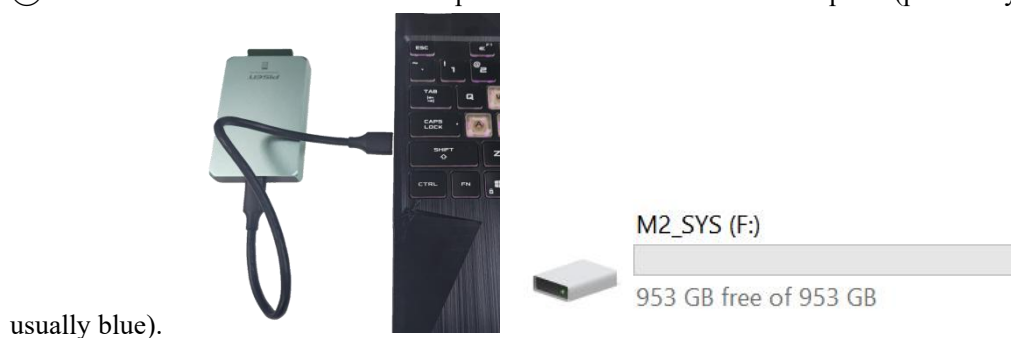
The LiMobile M2 Lite is equipped with two 1 TB data storage disks: **M2\_SYS**.

- **M2\_SYS Disk:** Stores mobile station data, raw point cloud data, raw panoramic camera data, calibration files, system parameters, logs, etc.

During LiMobile M2 Lite data collection, The project folder name is the custom project name entered during data collection in the APP, followed by the UTC time.

Before copying data and performing raw data quality check, connect the hardware as follows to allow the computer to recognize the M2\_SYS disk:

- ① Insert both disks into the card reader.
- ② Connect the data cable at the **DATA** port of the card reader to the computer (preferably to a USB 3.0 port,



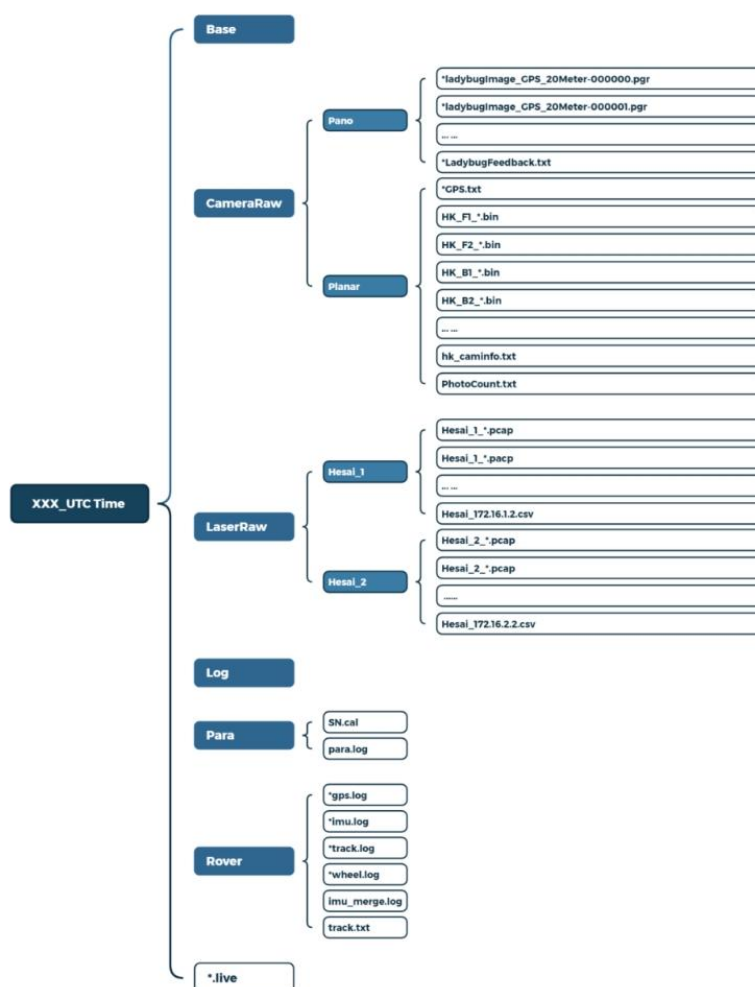
| M2_SYS (H:) >  |                   |             |      |  |
|----------------|-------------------|-------------|------|--|
| Name           | Date modified     | Type        | Size |  |
| data           | 2/14/2025 2:07 PM | File folder |      |  |
| LiMobilesystem | 3/27/2023 6:13 PM | File folder |      |  |
| log            | 2/14/2025 2:31 PM | File folder |      |  |

#### ☆ Notes:

1. Ensure the correct orientation when inserting the disks.
2. Do not rename the project folder before completing data copying and merging to avoid errors.
3. Safely eject the disks from the computer after data copying to prevent damage.
4. Connect the card reader to a power source for stable data transfer.
5. Avoid processing raw data directly on the storage disks to prevent damage.
6. Copy the data twice: one copy for processing and one for archiving.
7. The charger plug is not included in the delivery; users must prepare it themselves.
8. After each data copy, promptly check the remaining disk space and clear the data as needed. Additionally, users should regularly and timely perform disk formatting operations. For specific steps, please refer to Attachment 3: "Disk Formatting Instructions".

#### 8.1.2 Data Structure Overview

The complete data structure of LiMobile M2 Lite is shown in the figure below.



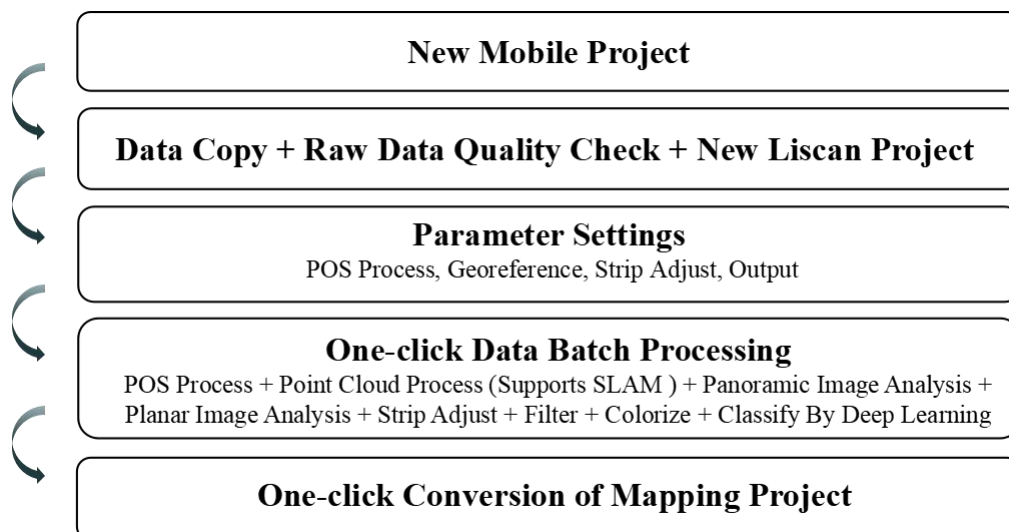
The LiMobile M2 Lite project folder contains six folders and a \*.live file:

- **Base:** Empty by default. Users can manually copy base station data files here. The LiDAR360MLS software will automatically recognize them during preprocessing.
- **CameraRaw:** Stores image data collected by the cameras. Contains two subfolders:
  - **Pano:** Stores raw panoramic camera data (\*.lipgr) and trigger feedback files.
  - **Planar:** Stores raw planar camera data (\*.bin), trigger feedback files, camera files, and photo count files (PhotoCount.txt). (The current Planar folder is empty.)
- **LaserRaw:** Stores raw point cloud data (.pcap) and internal parameter files (.csv). Contains two subfolders:
  - **Hesai\_1:** Stores raw point cloud data from the tilted LiDAR, mainly for mapping.
  - **Hesai\_2:** Stores raw point cloud data from the horizontal LiDAR, mainly for SLAM trajectory optimization.
- **Log:** Stores device and sensor logs, data check files (dataCheck.txt), and valid trajectory truncation files (LiDeviceCheck.ini). Send this folder to technical support if data collection issues arise.
- **Para:** Stores calibration files (SN.cal) and sensor parameter logs (para.log).
- **Rover:** Stores mobile station data, including:
  - \* gps.log: GNSS data.
  - \* imu.log: IMU data.
  - \* track.log: Real-time GNSS data with latitude, longitude, and elevation.

- \* wheel.log: DMI data.
- imu\_merge.log: Merged mobile station file from gps.log and imu.log, automatically recognized by LiDAR360MLS.
- track.txt: Used for trajectory replay in the APP.
- \*.live file: Records device sensor models, calibration parameters, and file paths for quick new project.

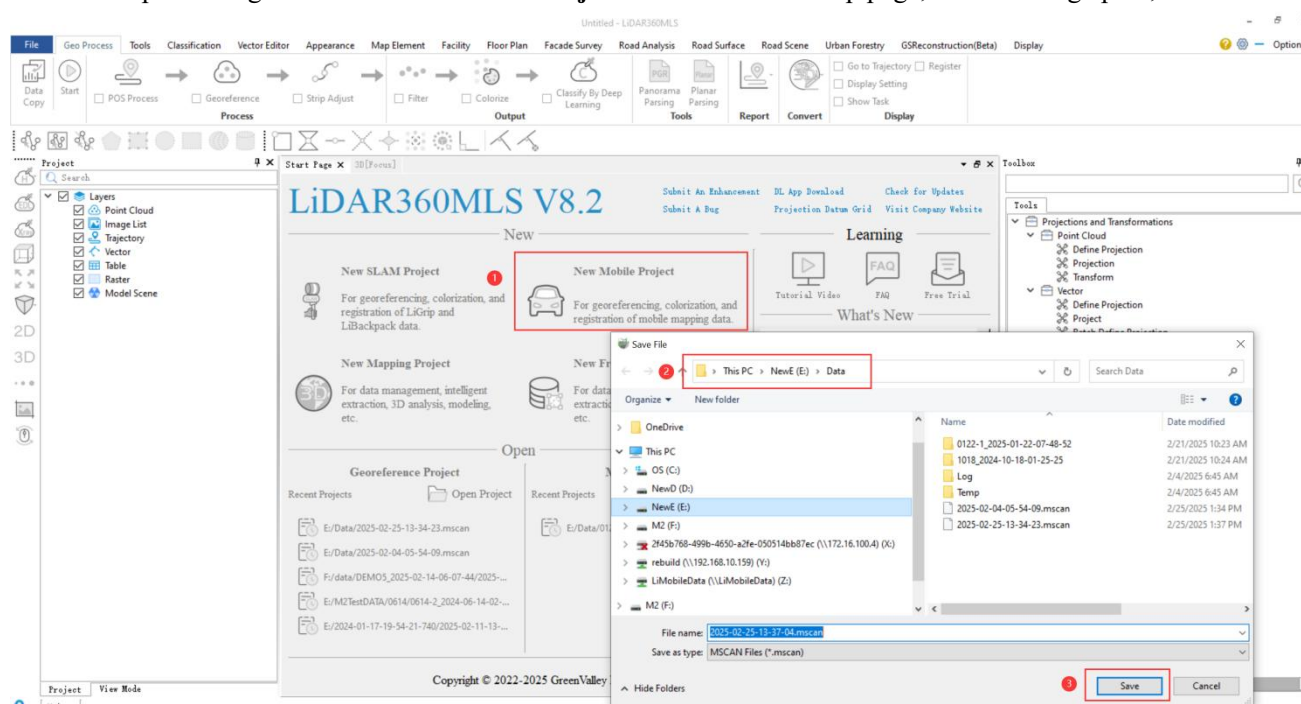
## 8.2 Data Processing and Output

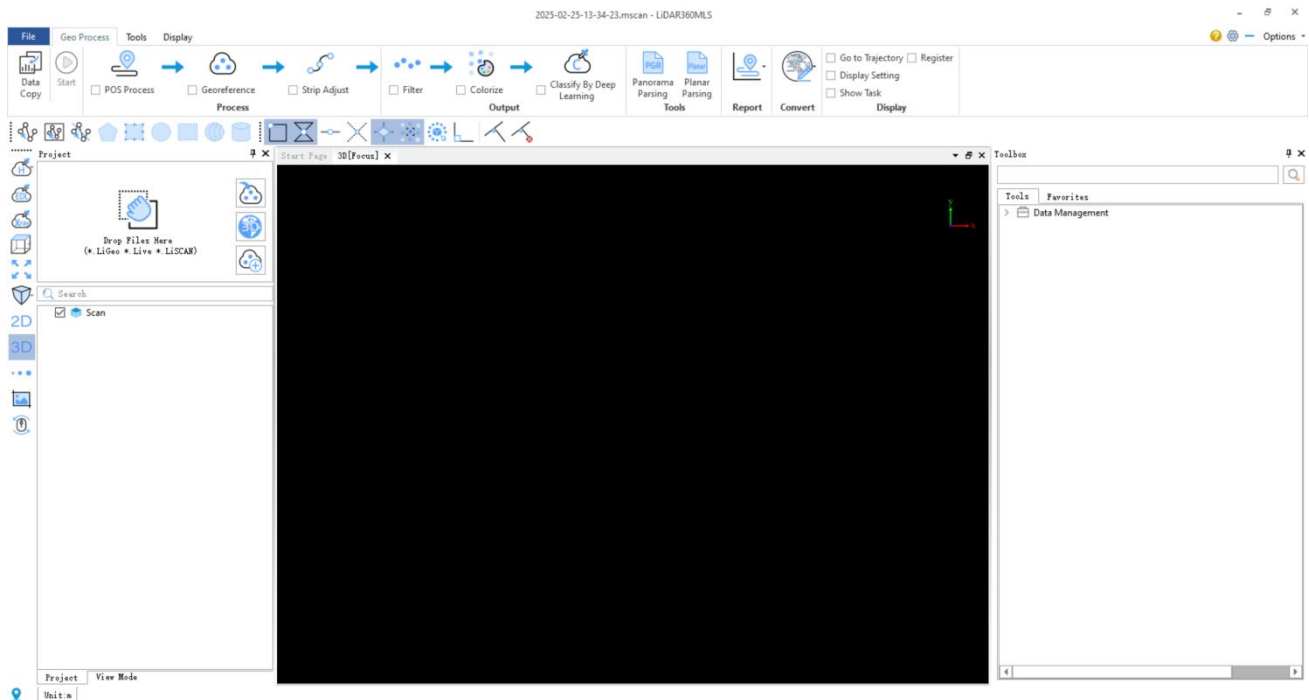
This section provides a quick guide for data processing. For detailed parameter settings, refer to the LiDAR360MLS User Guide.



### 8.2.1 New Mobile Project

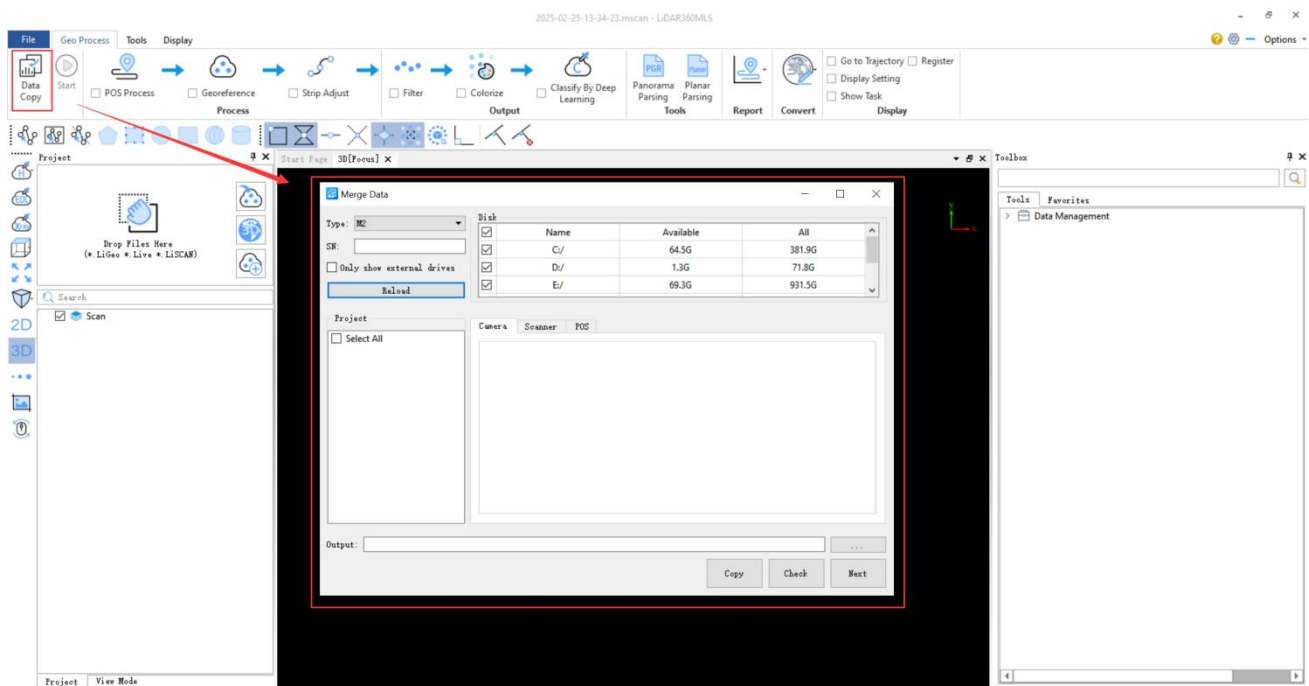
To improve data manageability and enable batch processing, create a mobile processing project (\*.mscan) before data processing. Click the **New Mobile Project** button on the startup page, set the storage path, and save.





## 8.2.2 Data Copy and Quality Check

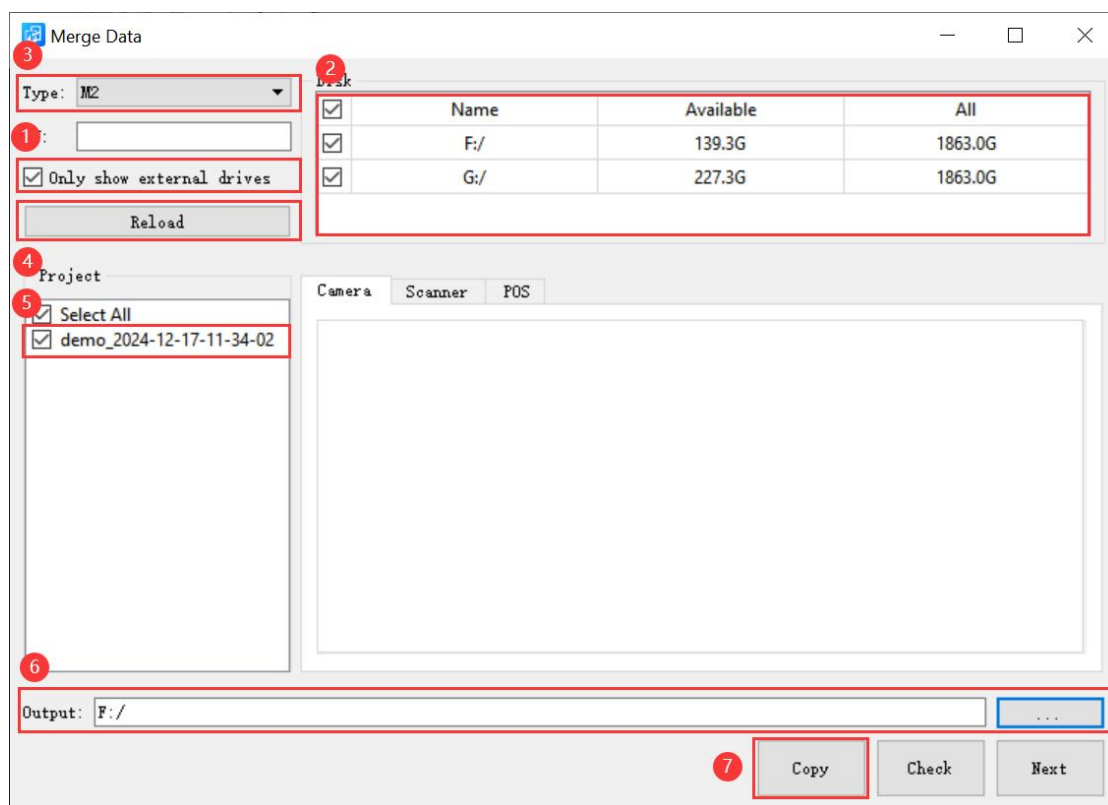
1. Click the **Data Copy** button in the top-left corner of the software interface to open the **Merge Data** dialog.



2. Follow these steps:

- (1) Check **Only show external drives**.
- (2) Select the disk drive corresponding to the device.
- (3) Choose the device type.
- (4) Click **Reload**.
- (5) Select the data to copy.
- (6) Set the output storage path.

(7) Click **Copy**.



3. After the copying process is completed, the software will generate a **Raw Data Quality Report** and save it in the corresponding project path. The report will also automatically pop up in the browser. If the data status is abnormal, please re-collect the data promptly.

demo\_2024-12-17-11-34-02 > RawDataReport

| Name                                                                                                         | Date modified     | Type                | Size |
|--------------------------------------------------------------------------------------------------------------|-------------------|---------------------|------|
|  2024-12-17-11-34-02.html | 2/12/2025 6:24 PM | Chrome HTML Docu... | 6 KB |

## Raw Data Quality Report

2025.02.11



### 1. Project Summary:

| Project Name             | Collect Time (s) |
|--------------------------|------------------|
| demo_2025-01-24-03-46-25 | 120.089          |

### 2. Camera Statistics:

| Camera    | Number of Images | Number of Triggers | Deviation  |
|-----------|------------------|--------------------|------------|
| Planar_F1 | 217              | 218                | 1          |
| Planar_F2 | 217              | 218                | 1          |
| Planar_B1 | 0                | 0                  | Unreadable |
| Planar_B2 | 0                | 0                  | Unreadable |
| Panorama  | 318              | 318                | 0          |

### 3. Scanner Statistics:

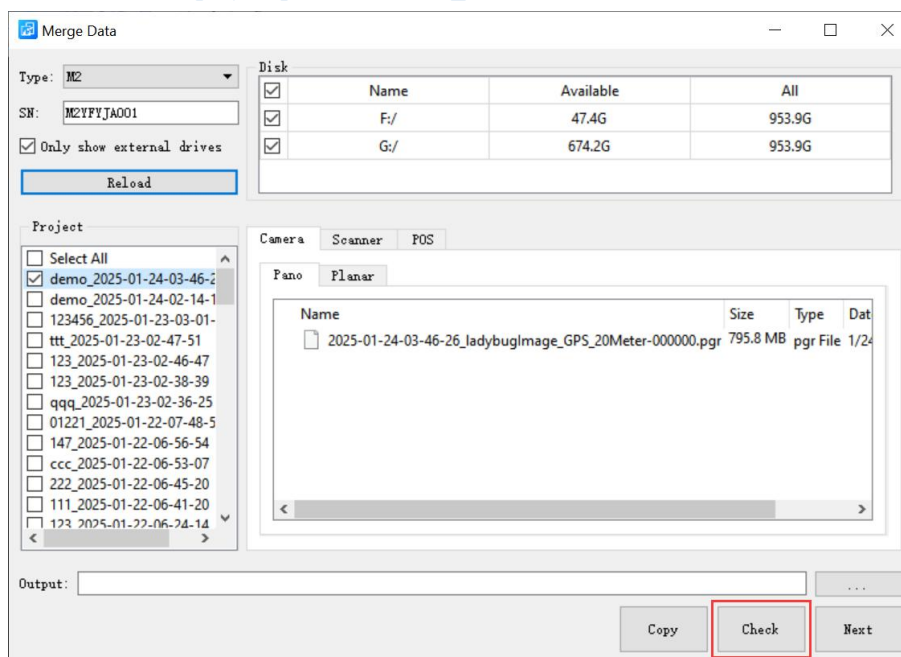
| Scanner  | LIDAR File                                                                        | Start Time (UTC)    | Stop Time (UTC)     | Status |
|----------|-----------------------------------------------------------------------------------|---------------------|---------------------|--------|
| Scanner1 | F:/test/demo/demo_2025-01-24-03-46-25/LaserRaw/Hesai_1_2025-01-24-03-46-51-0.pcap | 2025-01-24 03:46:51 | 2025-01-24 03:48:04 | pass   |
| Scanner2 | F:/test/demo/demo_2025-01-24-03-46-25/LaserRaw/Hesai_2_2025-01-24-03-46-51-0.pcap | 2025-01-24 03:46:51 | 2025-01-24 03:48:04 | pass   |

### 4. IMU Statistics:

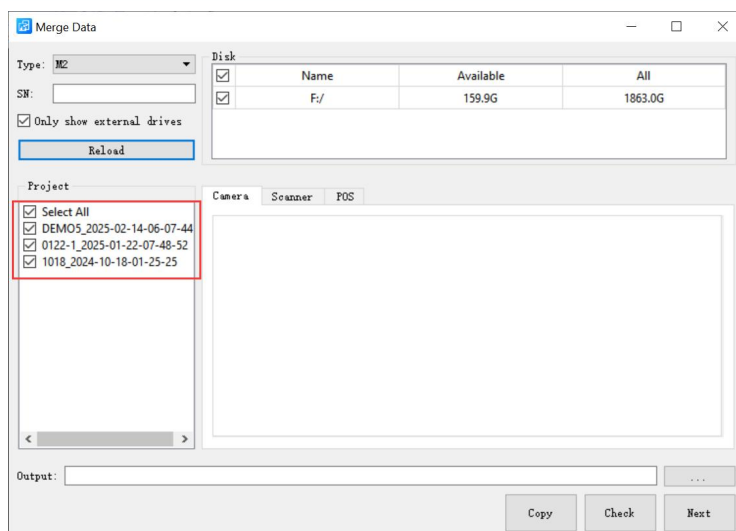
| IMU File                                                  | Status |
|-----------------------------------------------------------|--------|
| F:/test/demo/demo_2025-01-24-03-46-25/Rover/imu_merge.log | pass   |

### ☆ Notes:

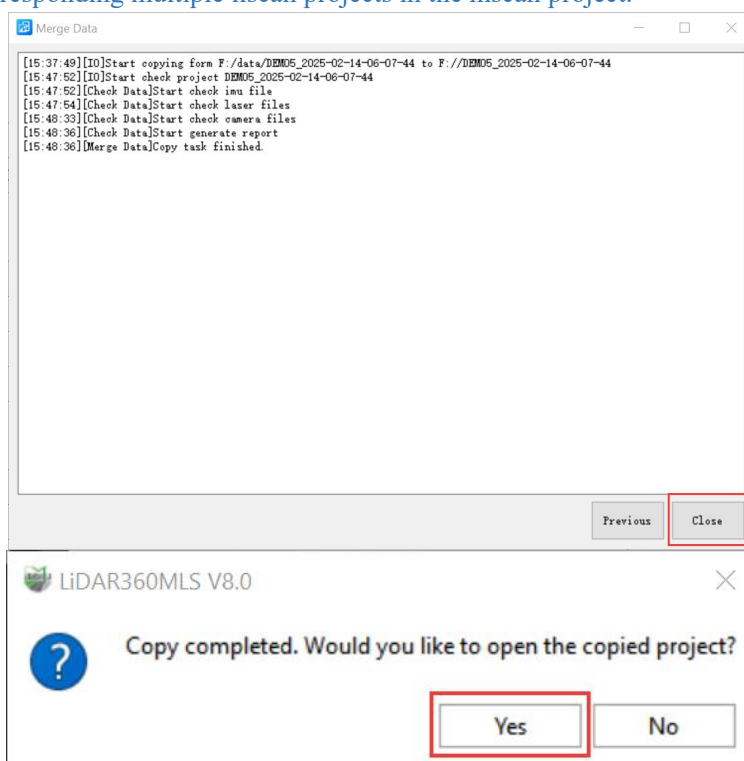
- The data copying function also supports raw data quality checks without actually copying the data. The raw data quality report will be saved in the project path on the M2\_SYS disk.



- This function supports batch processing of data. Simply select multiple projects simultaneously at this step.



3. After the copying process is completed, clicking the **Close** button will bring up a dialog box. Clicking the **Yes** button will generate corresponding multiple liscan projects in the mscan project.

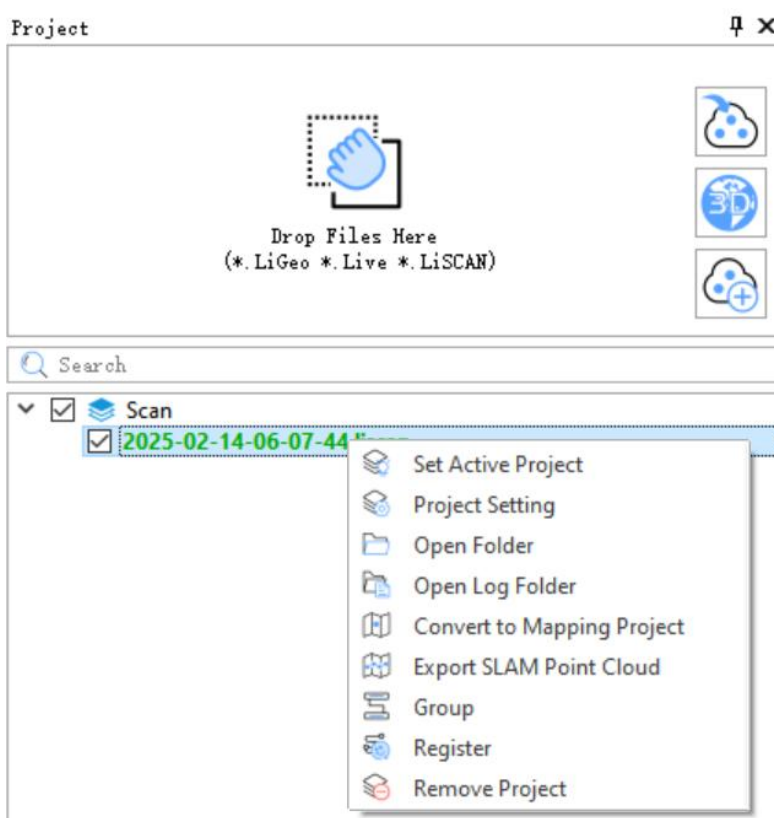


4. If the data copying function is not used, the software also provides multiple ways to create new liscan projects, including dragging and dropping \*.live files, importing \*.live files, adding existing data files, and creating based on calibration files. Users can choose the appropriate method according to their data situation.



### 8.2.3 Parameter Settings

Before setting the parameters for the process steps on the right side of the interface, users need to activate the target project. In the directory tree of the project window, right-click on the \*.liscan project name that requires parameter settings, and then click the **Set Active Project** button in the dropdown menu. The name of the project will be highlighted.



## POS Process

Setting

**Scan Name:**2025-02-14-06-07-44

POS Process
Georeference
Strip Adjust
Output

Process Mode

External Input

LiNav

Remote File

2025-02-14-06-07-44/Rover/imu\_merge.log
...

IMU File

2025-02-14-06-07-44/Rover/imu\_merge.log
...

☐ Use DMI

DMI Setting

Base Station Mode

NovAtel

RINEX

RTCM3/GVRTCM3

F:/DEMO5\_2025-02-14-06-07-44/Base/robi044q00.25i
F:/DEMO5\_2025-02-14-06-07-44/Base/robi044q00.25i

+

-

Location Mode:

From Header

Average

Manual

Select from Favorites

☒ Repair Traj Jump

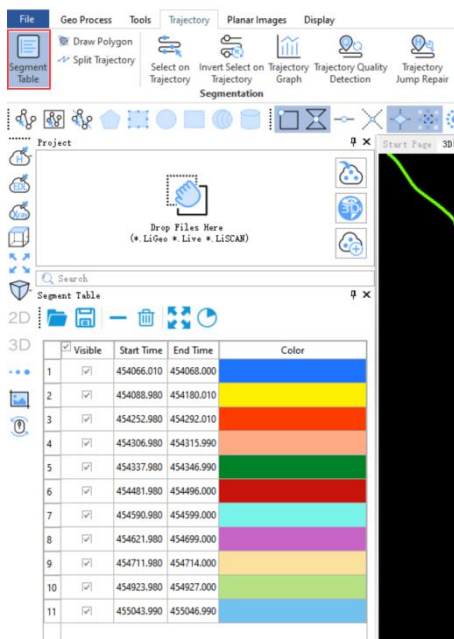
Default

Apply To All

OK

1. The software will automatically recognize the mobile station file and IMU file.
2. If a DMI is used, check the **Use DMI** option and click the **DMI Setting** button to set the parameters.
3. Add the base station file.
4. Select the **Location Mode**. The software supports two modes: automatic parsing from the data header and manual mode.
5. Repair Traj Jumps: Used to detect and repair trajectory segments with horizontal/elevation jumps. If unchecked, the software will only detect jump segments during the POS process step.

☆ **Note:** Users can view jump segments by clicking the trajectory segment table in the trajectory menu bar.



## Georeference

Setting


**Scan Name: 2025-02-14-06-07-44**

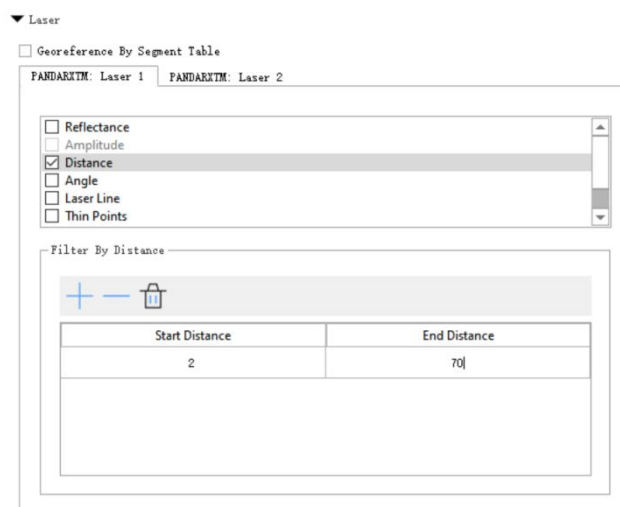
POS Process   Georeference   Strip Adjust   Output

Output Coordinate System: WGS 84 / UTM zone 56S

- ▶ Laser
- ▶ Camera Setting
- ▶ Advance Setting

1. Output Coordinate System: Set the target coordinate system for the POS file imported or generated in the previous step. By default, the WGS 84 / UTM 6-degree zone coordinate system where the data was collected is recommended. Click the button on the right to edit.

2. Laser: Users need to set distance filtering parameters for both lasers separately. The starting distance is used to filter out the vehicle's shadow, and it is recommended to set it to 2.



▼ Laser

☐ Georeference By Segment Table

PANDARXTM: Laser 1    PANDARXTM: Laser 2

☐ Reflectance  
☐ Amplitude  
☒ Distance  
☐ Angle

Filter By Distance

+   —   

| Start Distance | End Distance |
|----------------|--------------|
| 2              | 70]          |

### 3. Camera Setting: Use the default parameters.

Planar Camera Settings: The software will automatically recognize the image folder and camera file. Check **Analyzing Planar** to enable the software to automatically parse planar camera data during the Georeference step.

▼ Camera Setting

☒ Analyzing Panorama    ☒ Analyzing Planar

MV-GC: Camera 3    MV-GC: Camera 4    Ladybug5plus: Camera 9

Calibration

Image Folder: EMO5\_2025-02-14-06-07-44/CameraRaw/Planar/ ...

Camera Event: 4-06-07-44/CameraRaw/Planar/hk\_caminfo.txt ...

Panoramic Camera Settings: Check **Analyzing Panoramic** to enable the software to parse panoramic images in parallel during the Georeference step. The original \*.pgr format panoramic image data will be converted to \*.jpg format, and a panoramic camera file (ladybug\_caminfo.txt) will be generated for functions such as point cloud and panoramic image overlay display and colorization.

▼ Camera Setting

☒ Analyzing Panorama
☒ Analyzing Planar

MV-GC: Camera 3
MV-GC: Camera 4
Ladybug5plus: Camera 9

Calibration

Image Folder:
./DEMOS\_2025-02-14-06-07-44/CameraRaw/Pano
...

Camera Event:
...

Thinning By Distance:
0.200
m

Resolution:
8192\*4096

4. Advanced Settings: Used for SLAM process. The default parameters are recommended.

▼ Advance Setting

☒ SLAM

Spline Knot Interval:
0.05

Loop Fitness Score:
0.30

Feature Filter Size:
0.200
m

Max Segment Length:
10.000
m

Loop Search Radius:
20.000
m

Horizontal Laser Setting

Option

*(Note: Not recommended to set.)*

#### ☆ Notes:

1. Usage scenario: Vehicle mounted SLAM point cloud calculation is used to assist in the calculation of point clouds for integrated navigation. In response to the problem of insufficient accuracy in integrated navigation calculation caused by GNSS signal obstruction environments such as urban canyons, dense tree lined roads, and underground parking lots, SLAM and integrated navigation pose fusion algorithm are adopted to optimize the pose calculation accuracy in satellite signal obstruction environments, thereby improving the accuracy of point cloud calculation. It should be noted that SLAM only optimizes the trajectory segments selected by the user and automatically detects low-quality trajectory segments after trajectory calculation. Users can add or delete other low-quality trajectory segments based on this.

2. Attention: The accuracy of SLAM is greatly affected by environmental features. In environments with sparse features or a large number of dynamic targets, it is easy to encounter problems such as pose estimation drift or error accumulation. Therefore, it is recommended to avoid selecting certain open scenes (such as highways, elevated bridges, etc.) for calculation. If the engineering collection scene is completely open, it is not recommended to check the SLAM option, otherwise it may reduce the accuracy of point cloud calculation. The SLAM algorithm has a high demand for computing resources, especially in large-scale environments where real-time mapping and localization have a high computational complexity, which may affect the solution speed.

#### Strip Adjust

1. The default parameter settings can be used.

Setting ✕

Scan Name: 2025-02-14-06-07-44

POS Process Georeference Strip Adjust Output

▼ Trajectory Split

Min Length Of Segment: 25.0 m

Max Length Of Segment: 60.000 m

▼ Registration

Max Correspondence Distance: 2.000 m

Voxel Size: 0.100 m

Min Distance From Ground To Trajectory: 0.500 m

Overlap Threshold: 20 %

Number of Threads: 4

▼ Trajectory Optimization

Time Interval: 1 s

Max Correction Of Orientation: 1.0 °

Max Correction Of Position: 2.000 m

2. Checking the GCP option allows control points to participate in Strip Adjust. Users need to click the Edit button to edit the control points.

▼ GCP

☐ GCP

Edit

3. The user can import \*.xml track files and customize settings to define fixed segments for flight strip splicing.

▼ Fix Segments

...

## Output

1. Filtering: Users can optionally enable **Noise Filter** and **Smooth Filter**. It is recommended to use the default parameters.

▼ Filter

☐ Noise Filter

Radius: 0.200 m

N Sigma: 1.00

☐ Smooth Filter

Radius: 0.200 m

2. Colorize: Supports user-defined addition of mask files (refer to [Appendix 7 "Mask File Creation Tutorial"](#)) or selection of a preset mask radius mode. It offers two color assignment modes: Color by Time and Color by Distance, with the Color by Time mode being recommended. The feature also supports Blend and Optimize Sky-coloured Points functions.

▼ Colorize

☐ Mask Path:

☒ Mask Radius: 7.000 m

Camera Option: Panorama

Mode: Color by Time ☐ Use Depth Map

☐ Blend ☐ Optimize Sky-coloured Points

Image Span: 1.000 m

3. Classify By Deep Learning: Select the GV\_Road\_MLS mode. Supports both CPU and GPU processing types.

When using GPU for computation, it is not recommended to set the batch size too large.

#### ▼ Classify By Deep Learning

Model:

Process Type: ☒ CPU ☐ GPU

Batch Size:

▼ Advance Setting

Block Length:  m

Buffer:  m

Classify Mapping:

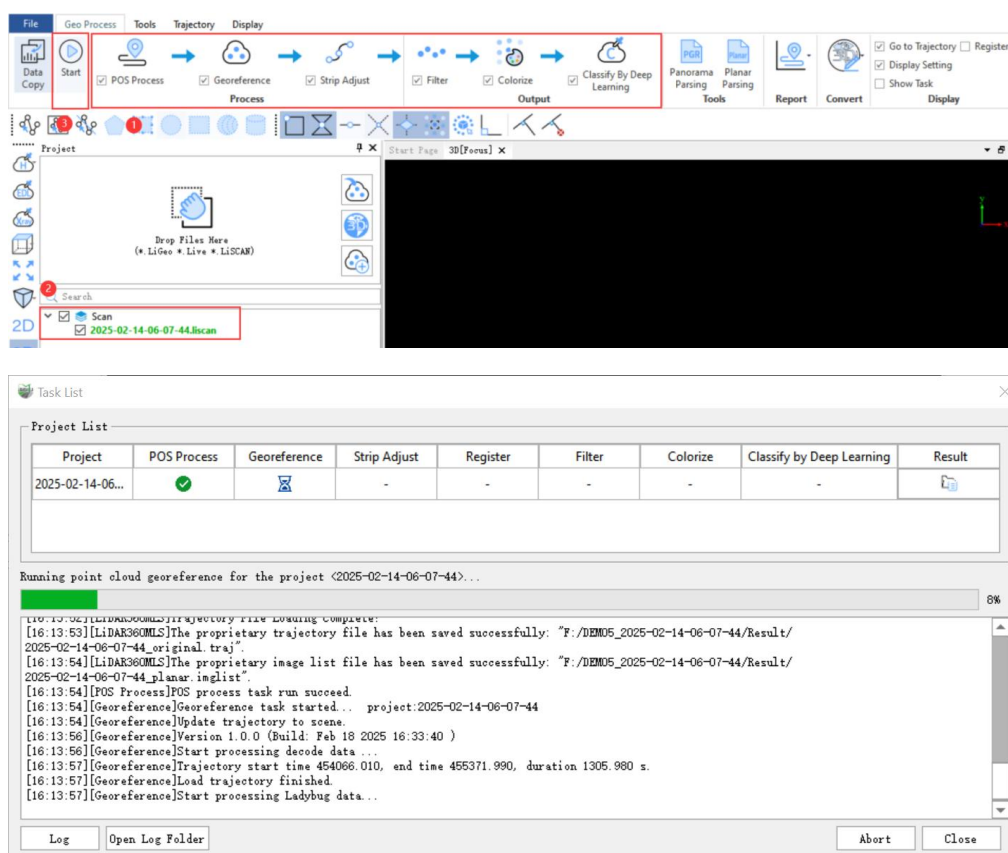
☒ Ground Point Optimize

*(Note: Pre-trained models are trained on data in meters. If the dataset is in other units, it needs to be re-projected accordingly.)*

## 8.2.4 One-Click Batch Data Processing

The specific steps are as follows:

- (1) In the directory tree on the left side of the interface, check the \*.liscan projects that need to be processed.
- (2) Select the processing steps to be performed.
- (3) Click the **Start** button. The software interface will automatically pop up the **Batch Processing - Project List** window and begin executing the selected processing steps. Users can click the right side of the pop-up window to view the result data.



The software supports the following processing steps for one-click batch data processing:

**POS Process:** Post-processes the original POS file to obtain high-precision POS data. This step will automatically perform a base station check. If users import external POS data, this step can be skipped.

**Georeference:** Processes the original point cloud data to obtain a high-precision point cloud with real geographic coordinates. This step also analyses planar image data and panoramic image data simultaneously. SLAM process can also be performed in this step.

**Strip Adjust:** Supports internal adjustment of point cloud revisit areas for single-project data; supports adjustment for multiple projects to reduce stratification errors in revisit areas; and supports the participation of control points in the adjustment.

★ Notes:

1. This step will regenerate point cloud, trajectory, and image data.



2. Strip alignment has two modes: **Single** and **Multi**.

**Single:** Each liscan project performs internal strip adjusting operations separately.

**Multi:** Not only each liscan project performs internal strip adjusting operations separately, but also strip adjusting operations are performed between liscan projects.



**Filter:** Used to filter noise in the point cloud and thin the point cloud.

**Colorize:** Assigns color information to the point cloud based on the point cloud and images.

**Classify By Deep Learning:** Uses deep learning methods to classify point cloud data. (This feature is not included as a complimentary function with the purchase of the device. If needed, please contact our company for additional purchase authorization.)

★ Notes:

1. Prior to point cloud process, it is necessary to generate a trajectory first. Therefore, the Georeference button will only be activated after the POS Process is checked; once Georeference is checked, the Strip Adjust and subsequent buttons will be activated.

2. After point cloud process, if the camera images have not been parsed, the Colorize step cannot be selected.

3. If only the point cloud needs to be obtained, select POS Process and Georeference will be sufficient.

4. The data collected in GNSS signal obstructed environments such as urban canyons and dense tree lined roads may exhibit layering. If better quality point cloud data is needed, it is recommended to check the option of Strip

Adjust. However, this step is slow and should be carefully checked.

5. It is not recommended to check the option of 'Strip Adjust' for data collected in open areas.

6. The filtering option can be used to denoise and thin point clouds, but this step is time-consuming and should be carefully checked.

7. To obtain colored point cloud output, you need to check the Colorize step.

8. The Optimize sky-colored points option is time-consuming and is only supported for color assignment based on panoramic images.

9. To obtain point cloud with classification information, you need to check the Classify by Deep Learning.

10. If any issues or anomalies arise during data process, please click to open the log folder, and send the log files along with screenshots of the software's abnormal behavior to our technical support team, providing as detailed a description of the operating steps as possible.

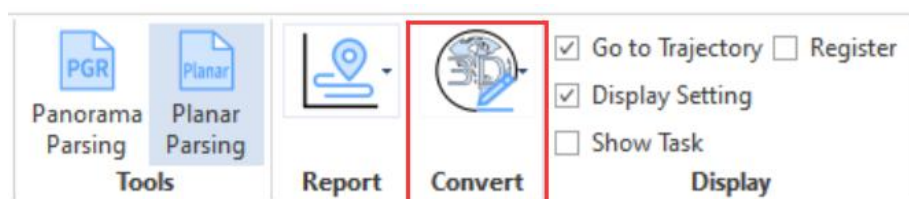
### 8.2.4 Convert to Mapping Project

LiDAR360MLS software supports two modes for converting mobile projects into mapping projects: Convert to Mapping Project and Organize into Mapping Project.

**Convert to Mapping Project:** Convert the single activated \*.liscan project into a mapping project to facilitate subsequent data post-processing operations.

1. Activate the \*.liscan project that needs to be converted into a mapping project.

2. In the Convert panel, click the dropdown arrow next to the button icon, and then click the Convert to Mapping Project button. The software will automatically switch to the mapping project interface.



**Organize into Mapping Project:** Converts multiple \*.liscan projects into a mapping project simultaneously.

1. In the Convert panel, click the dropdown arrow next to the button icon, and then click the Organize into Mapping Project button.



2. **Reorganize Project** dialog box will appear, allowing users to configure parameters. Please select at least two sets of liscan projects that need to be converted and set the output path.

3. Click the **OK** button, and the software will switch to the mapping project interface.

 Reorganize Project

| <input checked="" type="checkbox"/> Select | File Name                      |
|--------------------------------------------|--------------------------------|
| <input checked="" type="checkbox"/>        | 2024-04-17-07-26-57-512.liscan |
| <input checked="" type="checkbox"/>        | 2024-02-04-03-32-22-254.liscan |

Output path: G:/0716/02\_2023-11-03-07-28-58-278\_A001test2/

OK Cancel

## 9 Appendix

Attachment 1 "Attachment 5 B60 Battery Safety Usage Guidelines"

Attachment 2 "LiMobile M2 Lite\_Data Size Calculator"

Attachment 3 "Disk Formatting Instructions"

Attachment 4 "Calibration Field Data Collection Tutorial"

Attachment 5 "Vehicle and Luggage Rack Crossbar Selection Guide"

Attachment 6 "Steps for Uploading Collection Logs"

Attachment 7 "Mask File Creation Tutorial"