FEIMA ROBOTICS

SLAM2000

(Handheld Lidar Scanner)

⚠ Warning

- **Operators should always pay attention to the surrounding environment when collecting data to avoid safety accidents caused by distraction.**
- **SLAM2000 is not explosion-proof, and should not be used near gas stations or in dangerous areas such as mines, pits, septic tanks, etc. where flammable and explosive gases such as methane, natural gas.**
- **Avoid fire, property damage and personal injury by using batteries, charging and storing them in accordance with the guidelines in the Product Manual for this type of equipment.**

SLAM2000 Introduction

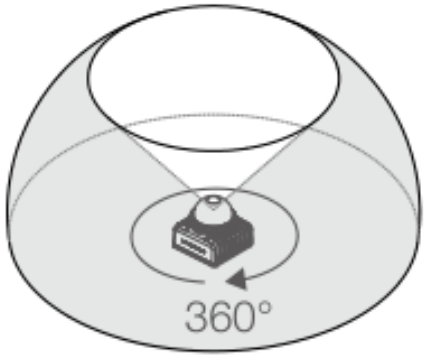
SLAM2000 Introduction

SLAM2000 is a high precision handheld LiDAR scanner innovatively developed by Feima Robotics. The device has a panoramic laser field of view, integrated vision camera and fugitive color camera, replaceable Li-ion battery handle, built-in high-precision inertial guidance chip and high-performance computing unit, real-time high-precision data acquisition to support real-time mapping. SLAM2000 can be expanded with external RTK, backpack, power supply, tripod and other devices. It is widely used in a variety of scenarios such as confined space, square volume mapping, emergency rescue, and real-time navigation.

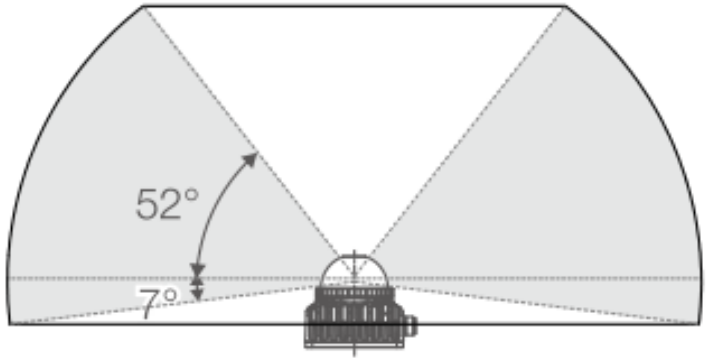
SLAM2000 Introduction

Panoramic laser field of view

The use of hemispherical non-repeating scanning laser, integrated 360-degree rotating head, can form a panoramic laser field of view angle, to ensure all-round, multi-angle data acquisition, to achieve "what you see, what you see is what you get," the high-efficiency scene data conversion.



水平



垂直

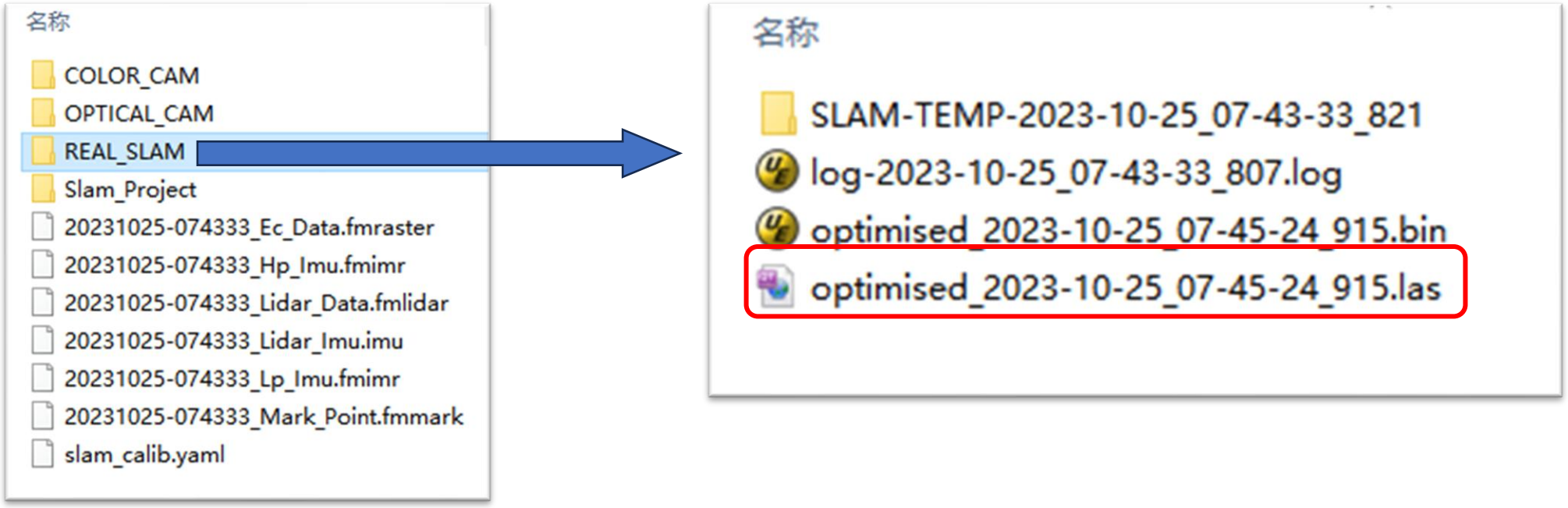
SLAM2000 Introduction

High-Accuracy Surveying and Mapping

Built-in high-precision IMU can effectively control the cumulative error, high-precision laser calibration algorithm to further enhance the laser sensor accuracy, industry-grade SLAM algorithm to realize high-precision mapping.

Real Time Mapping

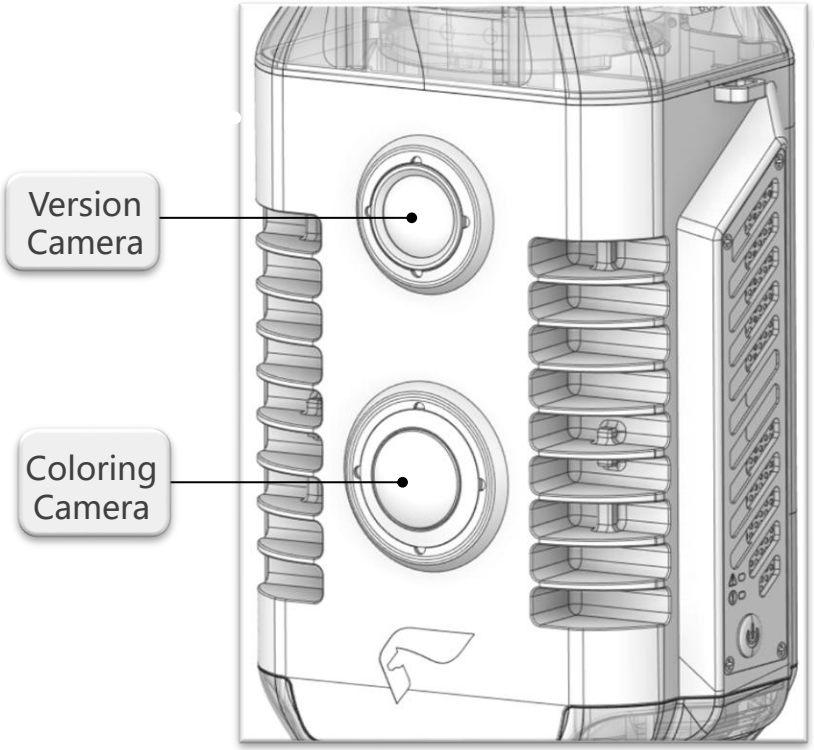
Real-time map construction is available, i.e., map construction is carried out in the process of data collection, and the resultant data is output directly after the completion of data collection, which is suitable for application scenarios requiring timeliness of results, such as emergency rescue and real-time mapping.



SLAM2000 Introduction

Vision Camera

The 1/2.3-inch CMOS sensor with 12-megapixel resolution vision camera can acquire and run vision SLAM algorithms to provide matching feature points for weakly structured texture environments, avoiding errors due to structural repetition and matching errors, and improving the scene applicability of the device. The vision camera can also be used as a high-resolution detail camera to acquire high-definition images of localized scenes.



Coloring Camera

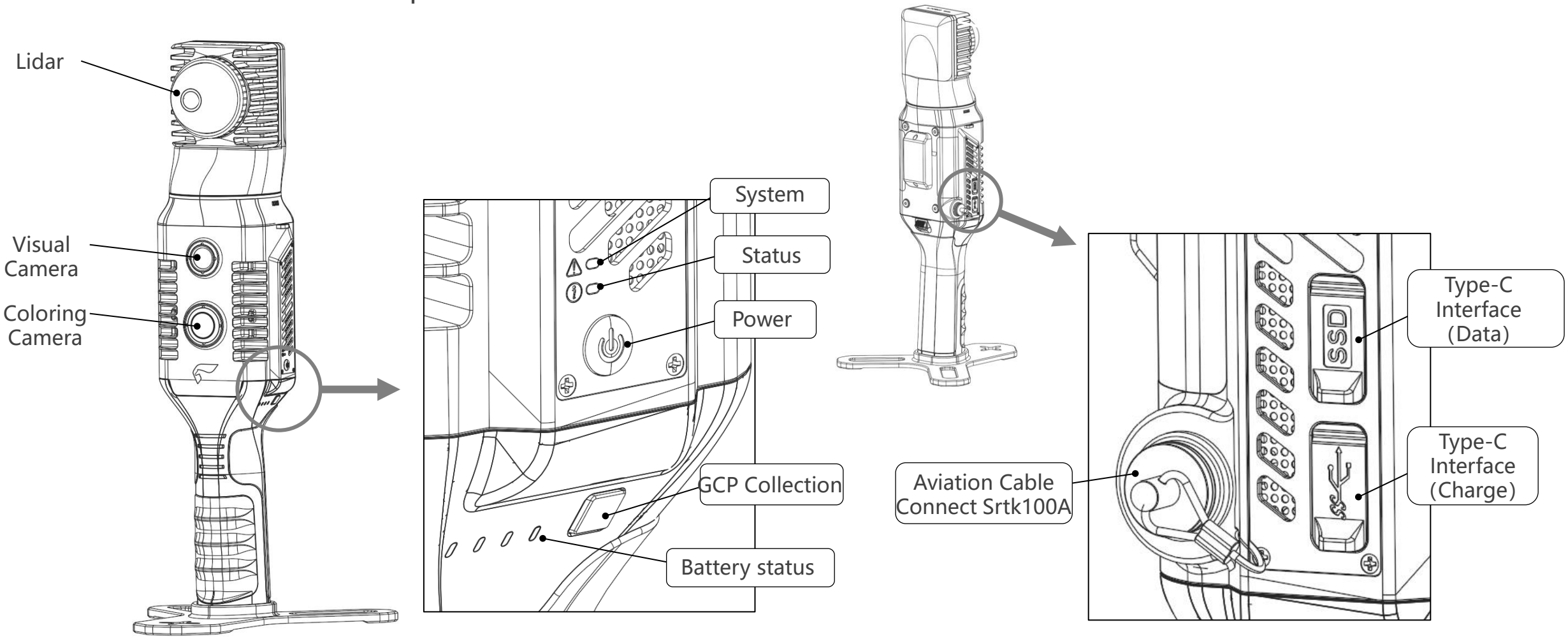
1/2.3-inch CMOS sensor, 12-megapixel resolution, 210° field of view angle, which can obtain a larger range and higher resolution of the ground texture information. The color assignment algorithm is optimized for mapping scenes, and the color point cloud is clearer and more detailed.

Rich Extension

SLAM2000 has a wealth of external expansion, support for handheld, backpack, static station mode, and support for external power supply, RTK, network module, etc., to meet the needs of users for more applications.

Component Description

The scanner is mainly composed of the main body, battery handle, laser sensor, camera sensor and other components. The body contains a rotating head, control components and other equipment, can be either hand-held for data collection, or carry S-PACK200 backpack for data operations.



SLAM2000 Parameters

Component	Name	Parameter
Total	Model	SLAM2000
	Weight	925g (Body)1450g (With handle, With base)
	Size	L×W×H (Body)94.5 mm×84.6 mm×219mm
		L×W×H (With handle, With base)170 mm×173.8 mm×364.5 mm
	Power Consumption	20W(Typical)
	Input Voltage	20V
	Storage Space	512GB SSD
	Operating Temperature	-20°C ~ +50°C
	Storage Temperature	-40°C ~ +70°C
	Operating Humidity	< 95%
	Protection Class	IP54
	Laser Field of View	Panoramic 360°
	Working Mode	Mobile, Station
Laser Part	Laser Wavelength	905nm
	Eye Safety Level	Class 1
	Range(@100klx)	40m@10% reflectivity70m@80%reflectivity
	FOV	360°Horizontal，-7~52°Vertical
	Random error in ranging (1σ)	⩽2cm(@10M)
	Angular random error (1σ)	⩽0.15°
	Point Frequency	200kpts/s
	Echo	Single Echo (First or Strongest Echo)
	Point Cloud Frame Rate	10Hz（Typical）
Color Camera	Pixel	12 Million
	Field of view (diagonal)	210°
Vision Camera	Pixel	12 Million
	Field of view (diagonal)	100°
Interaction	Type-C 1	SSD Memory Data Copy
	Type-C 2	Charge + Extended Functions
	Aviation Plug	Interacts with S-RTK100A, Power Supply
	WiFi	Supply
Li-Ion Battery	Model	SP30
	Charging Interface	Type-C3
	Input Voltage	5-20V
	Output Voltage	10.8V
	Battery Capacity	3000mAh
	Standard	GB31241-2014S
	Weight	About 400g
	Dimension	Length×Width×Height85 mm×60 mm×144.5 mm
	Endurance	95min (Separately Powered SLAM2000)

Software packages

Software packages

SLAM GO

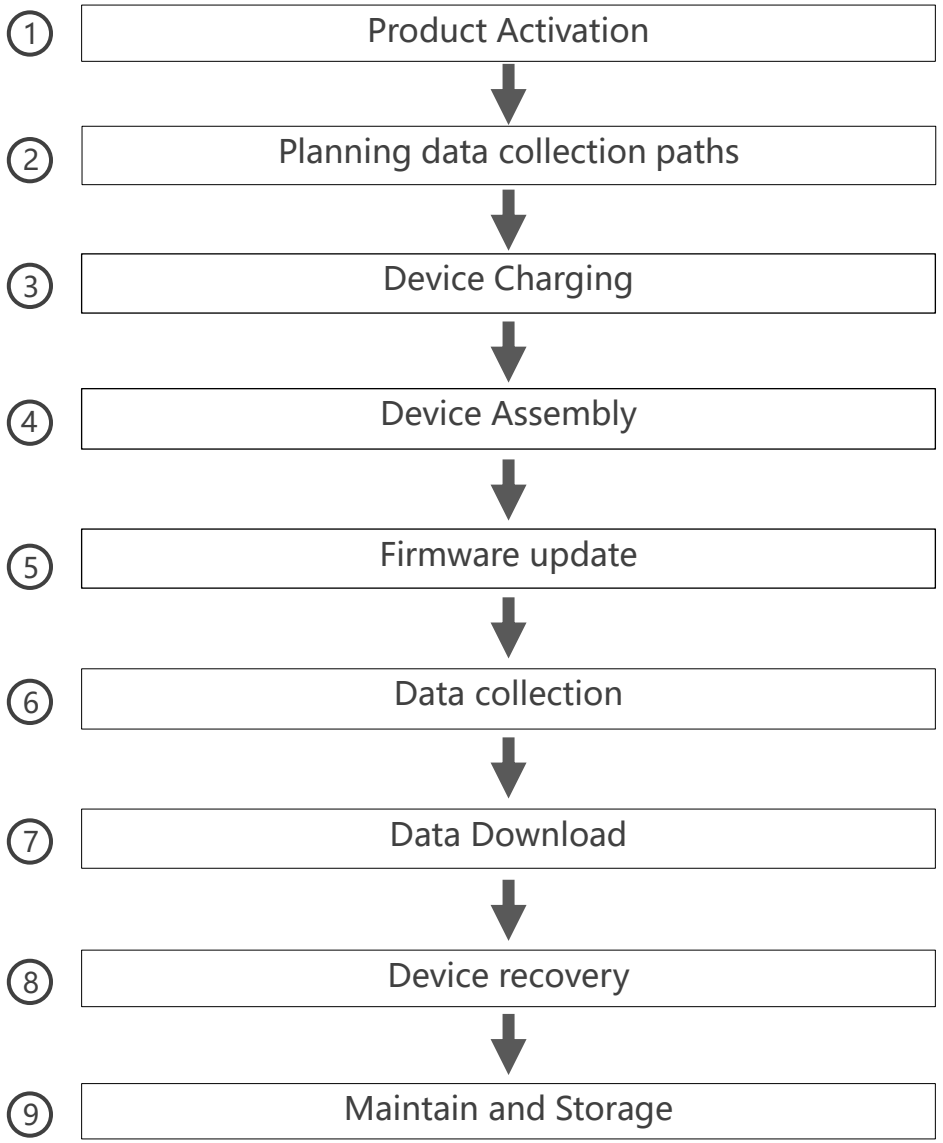
SLAM GO is a mobile phone APP for SLAM2000, which connects to SLAM2000 device through mobile phone, and can be used for project management, real-time point cloud match display, image preview, firmware upgrade and other operations; it supports Android 8.0 and above systems.

SLAM GO POST

SLAM GO POST is the PC software accompanying SLAM2000. The software allows post-processing of SLAM100 acquisition data, production of high-precision and high-detail colour point clouds, production of local panoramas, point cloud browsing and optimisation; SLAM GO POST software supports Windows 10 (64-bit) and above.

Operation

Operation


1
Product Activation
2
Planning data collection paths
3
Device Charging
4
Device Assembly
5
Firmware update
6
Data collection
7
Data Download
8
Device recovery
9
Maintain and Storage

Assembly

The case can accommodate both SLAM2000 and S-RTK100 with an extension antenna.

Assembled Battery Handle

When installing the handle, first align the slide rail under the fuselage with the slot above the handle and then push it in, after installing it in place, you can hear the "click" sound, check that the release button at the back of the handle is fully rebounded, and that the joints between the fuselage and the handle have been aligned and are firm and not loosened.

After the installation is completed, you need to make sure that the [Release Button] has been fully ejected and that the handle is tightly fitted to the body without loosening.

Assembly base

When installing the base, please lock the hand screws tightly, it is recommended to install the base every time you use it, it is easy to place and protect the device.

Assembly complete

SLAM2000 +S-RTK100

When using S-RTK100A with SLAM2000 for field data collection operations, you need to prepare all the necessary equipment in advance.

Number	Device
1	SLAM2000 scanner body set
2	SLAM2000 Battery Handle Quantity on Demand
3	S-RTK100 device body
4	S-RTK100 Quick Release Bracket
5	S-RTK100 Quick Release Bracket Mounting Screws × 4
6	Screw tool
7	Aviation cable × 1
8	Mobile power (rechargeable battery) on demand
9	Charging power cord Type-C interface
10	TF memory card (for S-RTK100)
11	Nano-SIM card (for S-RTK100)
12	**Card Removal Pin (for mobile phone)**

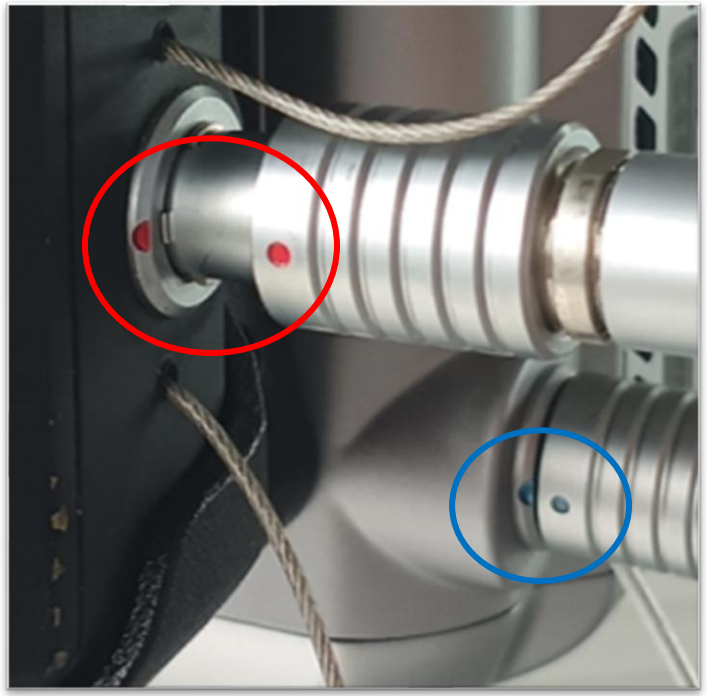
SIM card and memory card need to be installed in advance to use S-RTK100A.

SLAM2000 +S-RTK100

Align the S-RTK100 bracket with the pre-drilled screw holes and secure the S-RTK100 bracket using the 4 screws (M2.5 x 6) included in the box.

Insert the S-RTK100 into the bracket from top to bottom and hear a "click" sound to check that the S-RTK100 fits tightly and securely into the bracket.

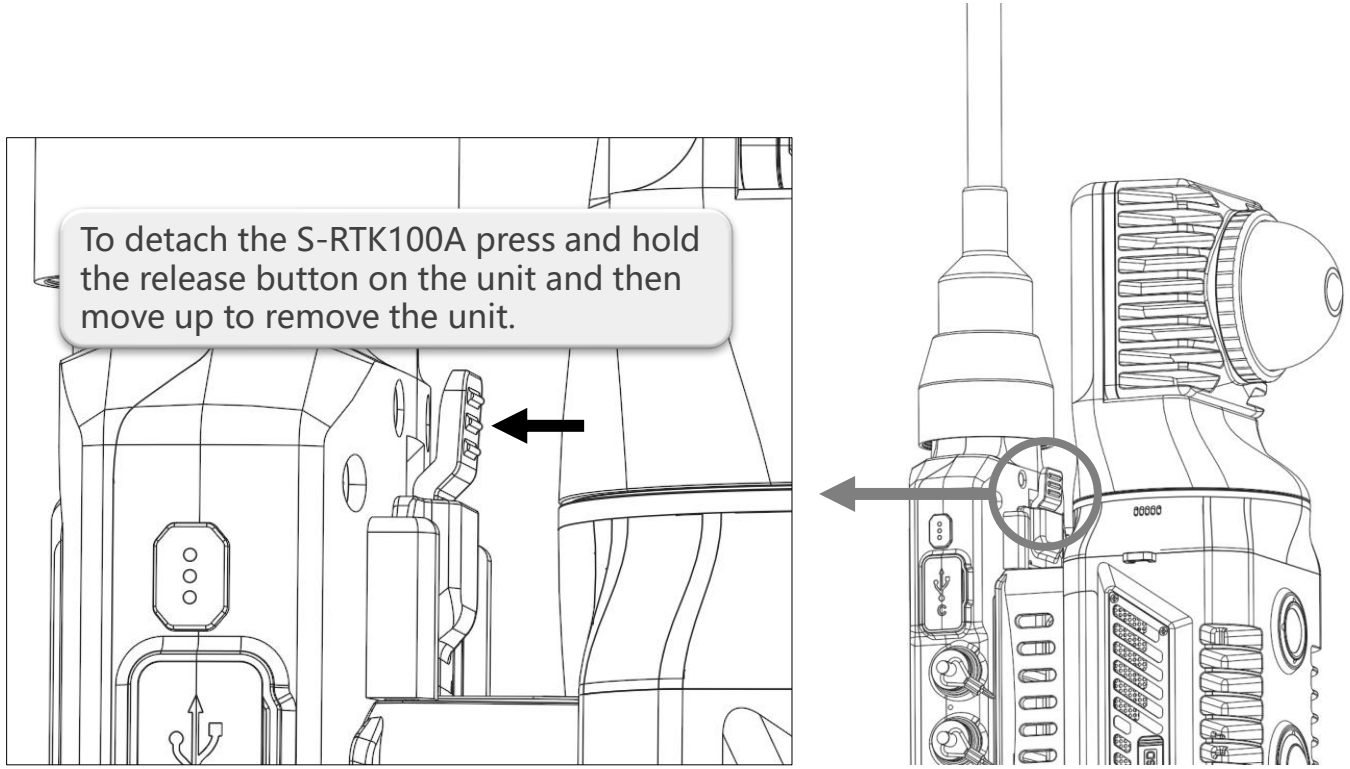
Connect SLAM2000 with Srtk100A By Aviation Cable.
Note that the two ends of the aviation plug cable have anti-reverse plugging design and red and blue markings, reverse can not be inserted, when inserted, note that the red/blue dot marking of the aviation plug cable port and the red/blue dot marking of the aviation plug port of the device are aligned with the red/blue dot marking of the aviation plug port before inserting it.

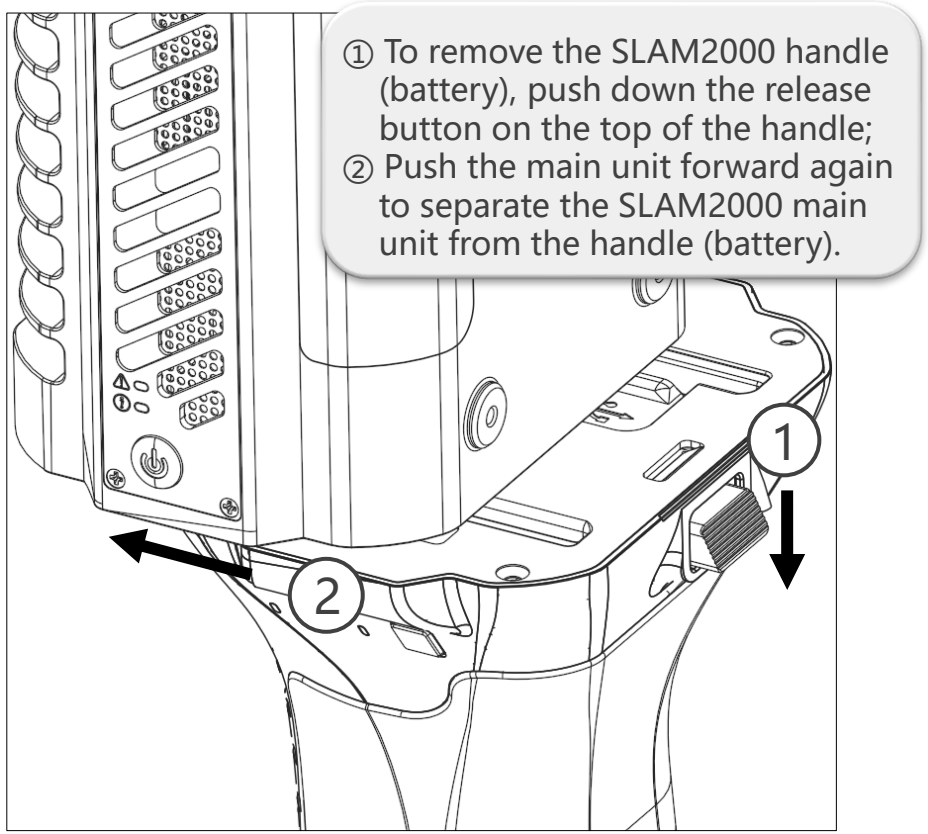


Assembly of devices

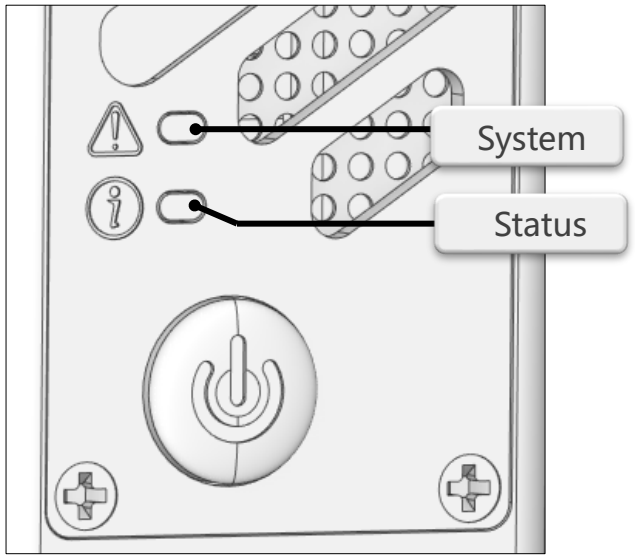
SLAM2000+S-RTK100 assemble complete.

Device recovery



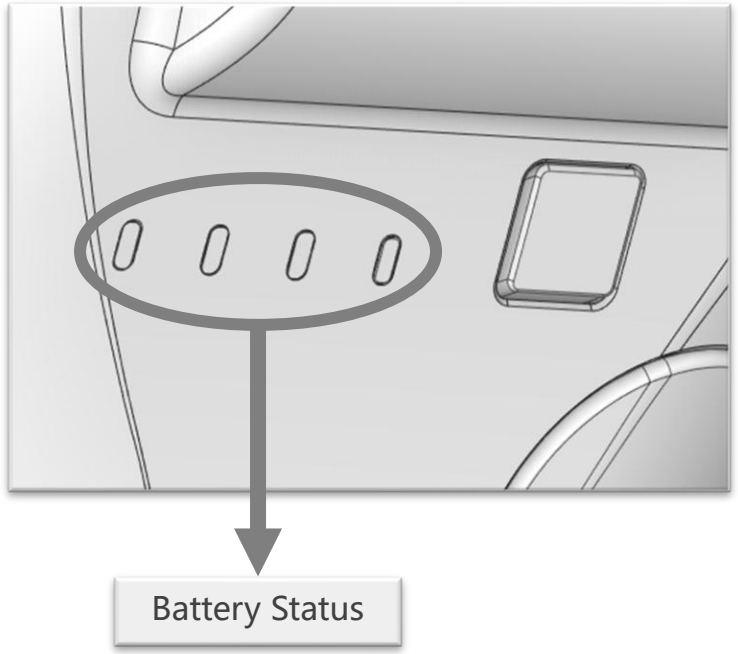


Indicator



LED	Display	Meaning
System Indicator	White light on	System firmware upgrading
	Red light flashing	System not ready
	Blue light always on	System ready
Status Indicator	White light flashing fast	MCU firmware upgrading
	Red light on	Device is initialising, not ready
	Green light on	Device ready
	Green light flashing	Data Collecting
Buzzer	Switch on	One beep
	Switch on	One beep
	Switch on	1 beep every 10 seconds
	Ultra Low Battery	1 beep every second
	Mark Point Information Collection	Point information collection successful.
	Start Collection	One beep
	Stop Collection	One beep

指示灯说明

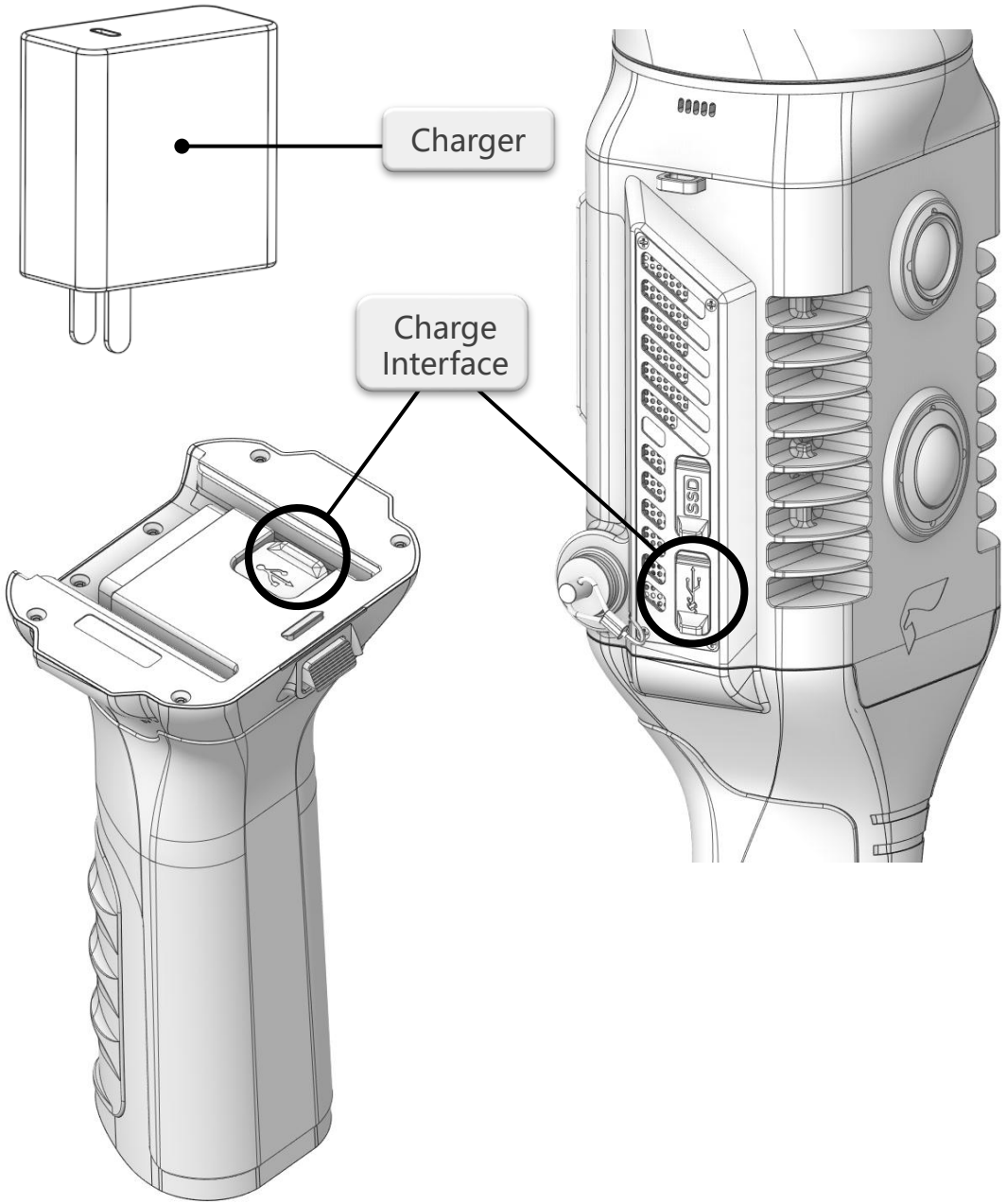


Description: The LED will light up for 6 seconds when you press the key to check the power level, the first 3 seconds will show the power level, the last 3 seconds will show the power level if the battery is normal, otherwise it will show the protection status.

SLAM2000电池LED指示灯状态表					
Status		LED1	LED2	LED3	LED4
Discharge protection status	Undervoltage	Flash(5Hz)	Slow Flash(1Hz)	Out	Out
	Discharge Low Temperature	Flash(5Hz)	Out	Slow Flash(1Hz)	Out
	Discharge Over Temperature	Flash(5Hz)	Out	Out	Slow Flash(1Hz)
	Discharge Overcurrent	Flash(5Hz)	Slow Flash(1Hz)	Slow Flash(1Hz)	Out
	Discharge Short Circuit	Flash(5Hz)	Slow Flash(1Hz)	Slow Flash(1Hz)	Slow Flash(1Hz)
Charge protection status	Overvoltage	Slow Flash(1Hz)	Out	Out	Flash(5Hz)
	Charging Low Temperature	Out	Slow Flash(1Hz)	Out	Flash(5Hz)
	Charging Over Temperature	Out	Out	Slow Flash(1Hz)	Flash(5Hz)
	Charging Overcurrent	Slow Flash(1Hz)	Slow Flash(1Hz)	Out	Flash(5Hz)
Battery level indication	0%~12%	Slow Flash(1Hz)	Out	Out	Out
	13%~24%	Always On	Out	Out	Out
	25%~37%	Always On	Slow Flash(1Hz)	Out	Out
	38%~49%	Always On	Always On	Out	Out
	50%~62%	Always On	Always On	Slow Flash(1Hz)	Out
	63%~74%	Always On	Always On	Always On	Out
	75%~87%	Always On	Always On	Always On	Slow Flash(1Hz)
	88%~100%	Always On	Always On	Always On	Always On
Battery level indication	0%~24%	LED1->LED4 Streaming Lamp Display			
	25%~49%	Always On	LED2->LED4 Streaming Lamp Display		
	50%~74%	Always On	Always On	LED3->LED4 Streaming Lamp Display	
	>=75%	Always On	Always On	Always On	Slow Flash(1Hz)
	Full	Always On	Always On	Always On	Always On
Update status		Slow Flash(1Hz)	Slow Flash(1Hz)	Slow Flash(1Hz)	Slow Flash(1Hz)

Battery Charge

Charger Specification
Input: AC 100-240 V ~50/60 Hz , 1.8A
Output: DC 5V—3A or 9V—3A or12V—3A
or15V—3A or 20V—3.25A



The SLAM2000 battery can be charged by connecting the charger to the battery via a Type-C cable.

Mode 1: The charger connects directly to the Type-C port on the SLAM2000 battery grip for charging.
Mode 2: When the handle is mounted to the SLAM2000 body, the charger is connected to the Type-C port on the underside of the body for charging.

SLAM2000 scanner handle internal integrated 3000mAh replaceable lithium battery, safer and more reliable. Working voltage 10.8V, each battery single continuous working time of about 95min (separate power supply SLAM2000). Battery in normal maintenance under normal use conditions, charge and discharge cycle times ≥ 300 times.

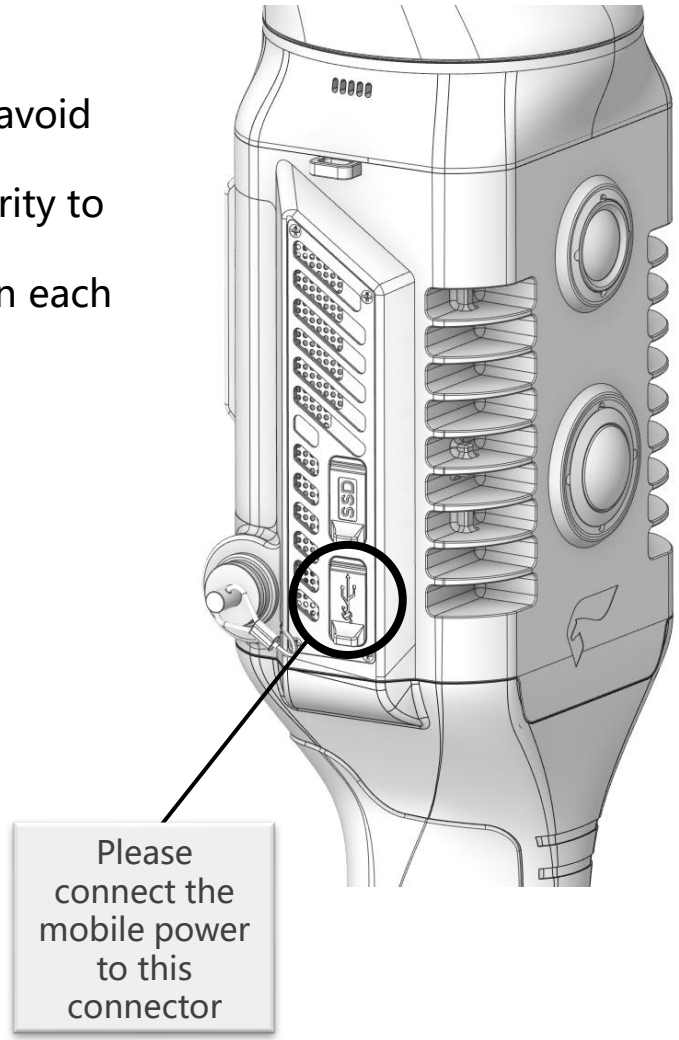
External Power Supply

A mobile power supply (rechargeable battery) can be connected to the SLAM2000 interface via a TYPE-C power cable.

- Confirm the interface voltage according to the manual of the mobile power supply to avoid wrong connection;
- When both internal and external power supplies are available, the device will give priority to the external power supply (20V);
- Data acquisition will not be interrupted when the power supplies are switched between each other.

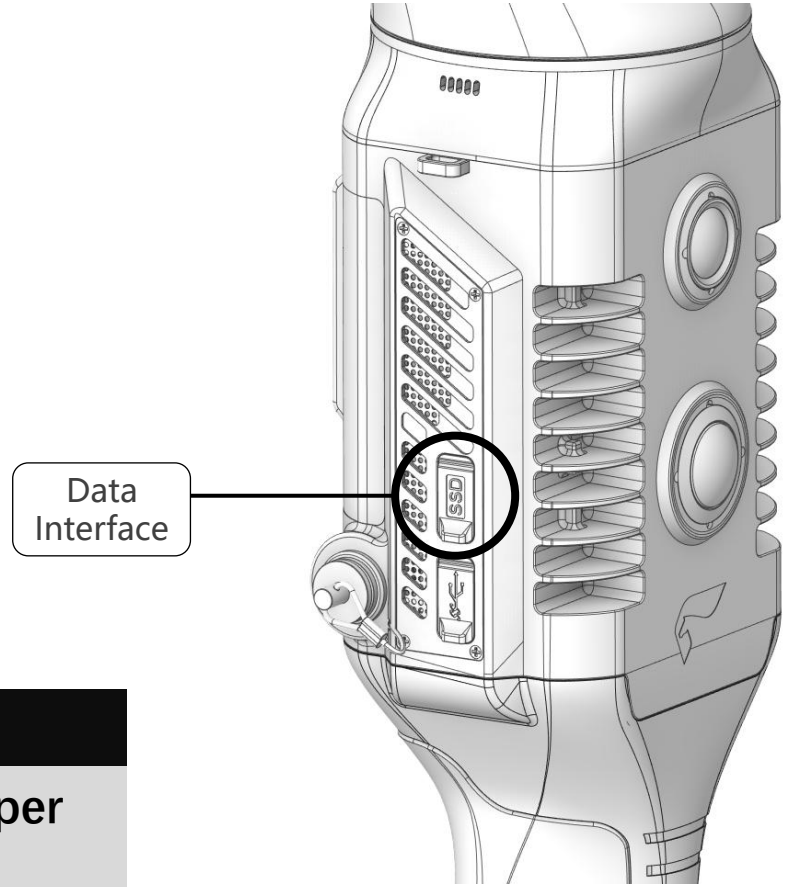
Tips:

- The power requirement of the power bank should not be less than 40W (20V 2A).
- External power supply requires its own TYPE-C power cable.



Data Storage

SLAM2000 use the internal SSD memorize， the storage space is 512GB，connect to PC via cable for data transfer.



Notice!

- **There are two Type-C ports on the side of SLAM2000, the upper one is for data and the lower one is for charging.**

Device Activation

The scanner needs to register a Feima account and activate the device before use, see the "SLAM GO" section for details on the address to obtain the software and the registration and activation process.

SLAM2000 Data Collection

Data Collection

Device power on
Long press the scanner ON key for 3 seconds, the laser head starts to rotate for self-test, waiting.....

- System Indicator【Blue Light On】
- Status Indicator【Green Light On】
- Laser head stops rotating

At this point, the device starts up successfully and is in standby mode.

Notice!

- Hold the scanner steadily and keep the laser head upright when the device is switched on.
- Place the scanner on a safe, stable table or flat surface.

Connect SLAM GO APP

It is recommended to connect to SLAM GO APP after the device is normally switched on. After the device is connected, you can understand the working status of the device and get the latest firmware to upgrade the device in time on your mobile phone.

Please refer to the "SLAM GO" section for more details.

Start Collection

The scanner needs to be initialization in a static position before starting data acquisition. Positioning requirements for the distance from the object to be measured > 0.4 metres and should not be too far away, the static phase needs to be at least 60 seconds before the start of the motion acquisition, static can not be held in the hands of the scanner, it must be placed smoothly on the ground or tabletop and other fixed surfaces in a safe.

Short press the scanner on the key, the status indicator will first change to [green flashing], at this time the device is initialization, the time is 60 seconds (mobile phone APP will show the countdown to read the seconds), the laser head will not rotate during the calibration phase, after 60 seconds the status indicator will change to [green flashing], the laser head will start to rotate and data acquisition. Static position, such as placing the position of a slight inclination but can ensure that the scanner is static also meets the static requirements.

Static Initialization 60s

Tips:

- Keep the scanner in front of your body during data collection, in the same direction as you walk, with the laser head facing up.

Data Collectiom

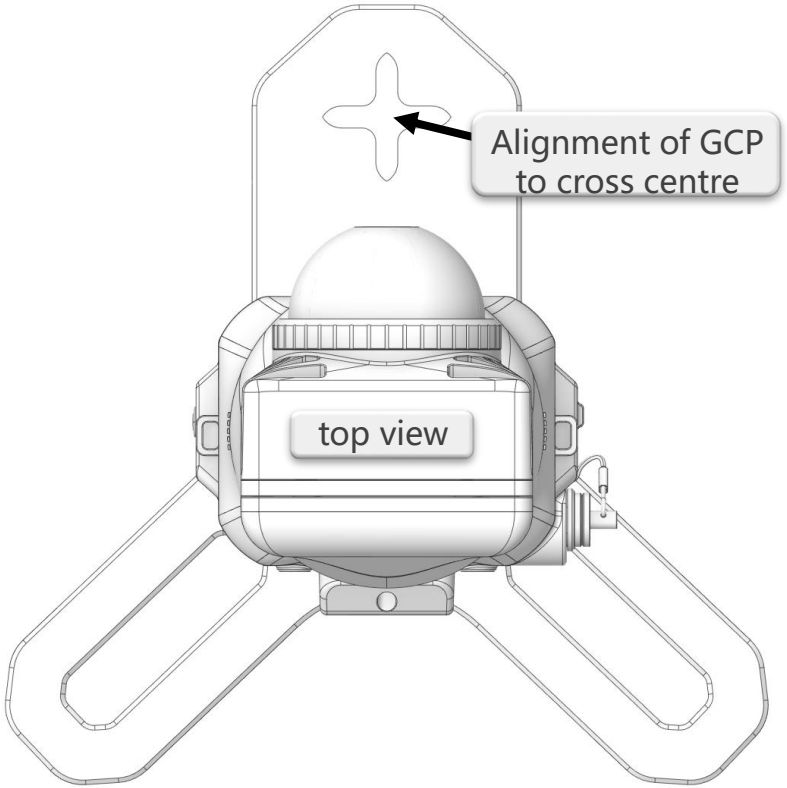
① Need to initial for 60 seconds before collection

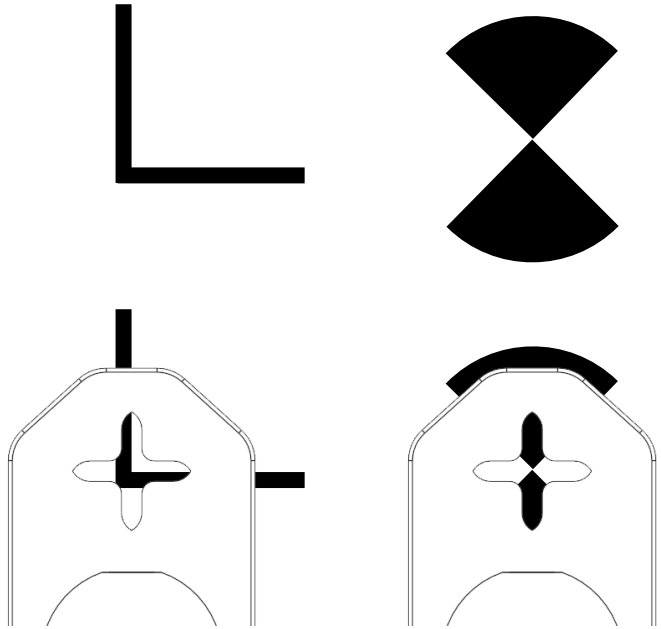
② Wait for the initialisation countdown to finish

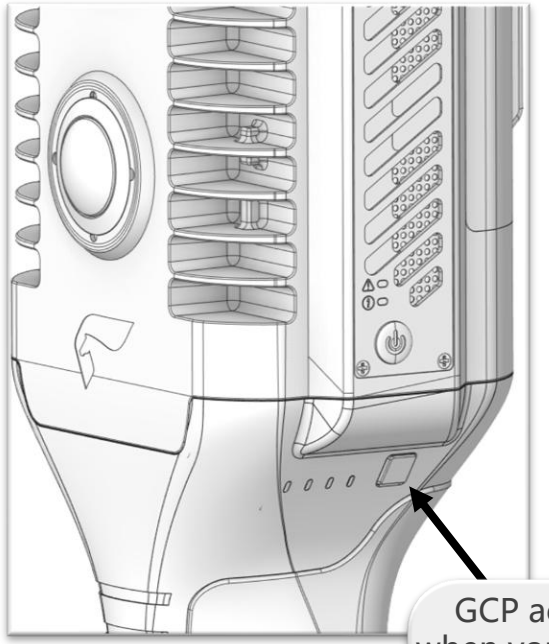
③ Initialisation before data acquisition

GCP Collection

When you need to collect GCP, please align the cross centre of the base of the device to the GCP first, then press the GCP collection key briefly, and then you will hear a "beep" sound after the GCP collection is successful, you don't need to wait for the collection of GCP, and you can continue to collect data after collecting the current point information.

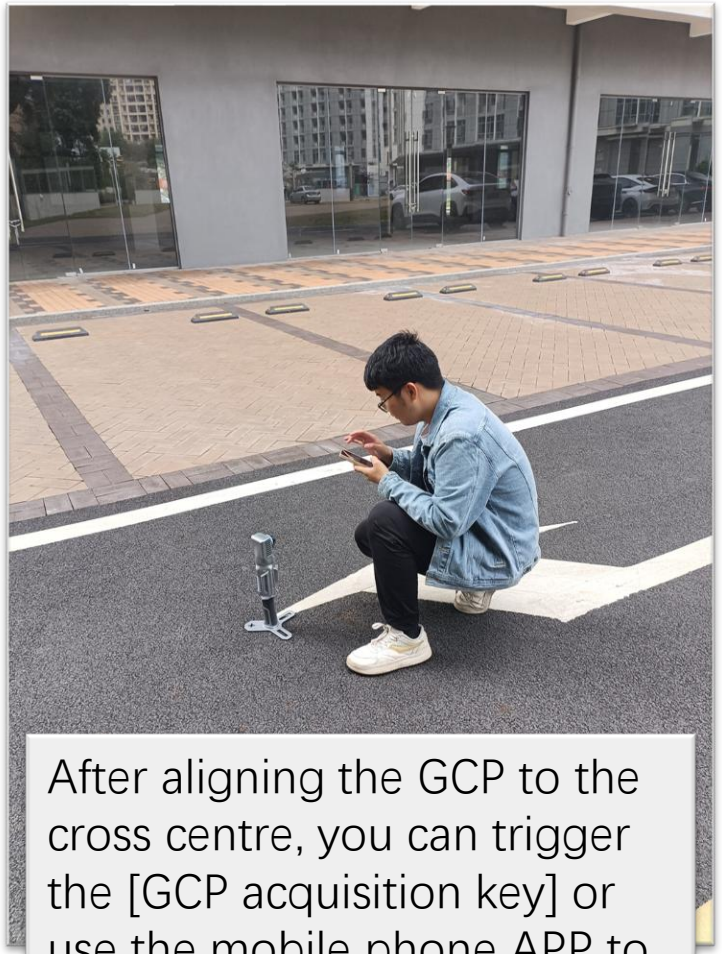




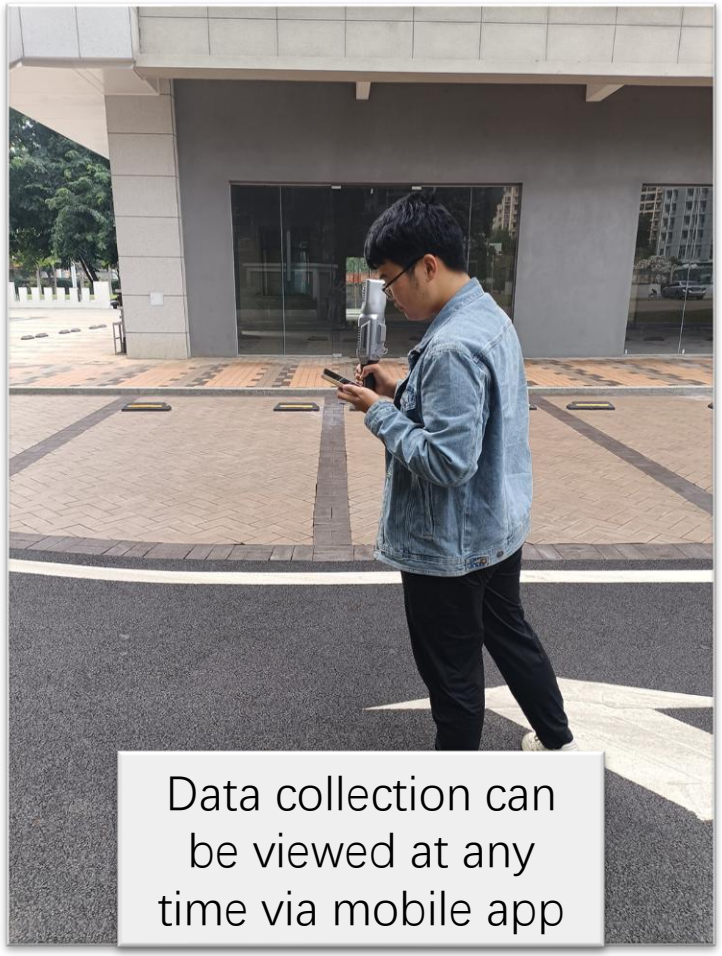


GCP Collection

Locate the GCP that needs to be collected.

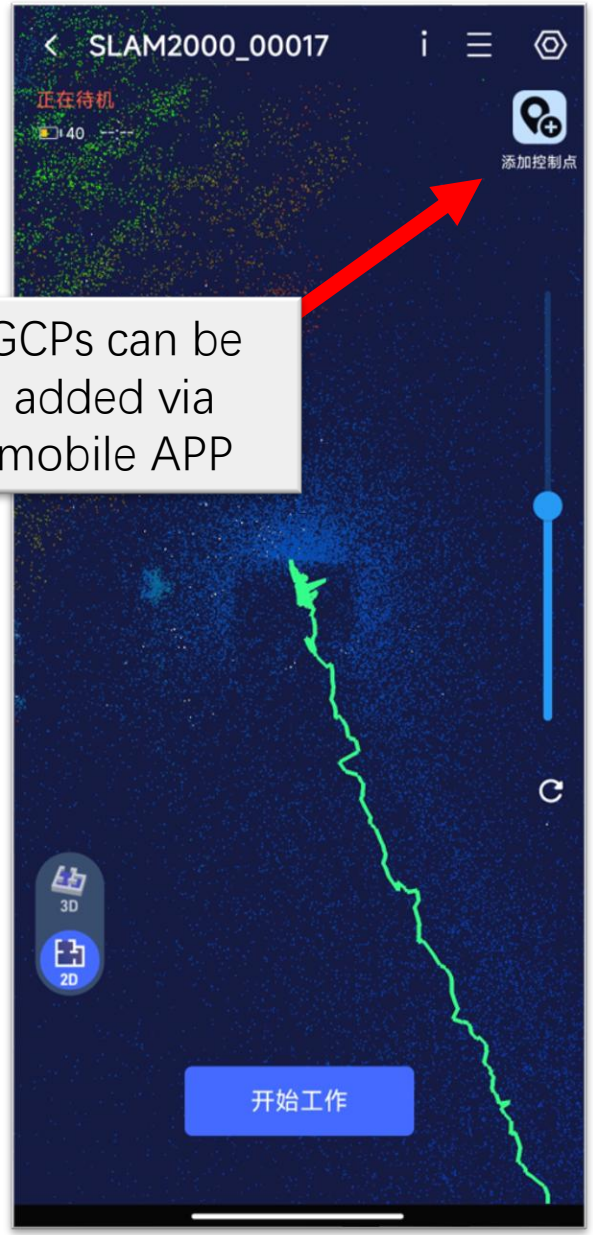


After aligning the GCP to the cross centre, you can trigger the [GCP acquisition key] or use the mobile phone APP to acquire the GCP.

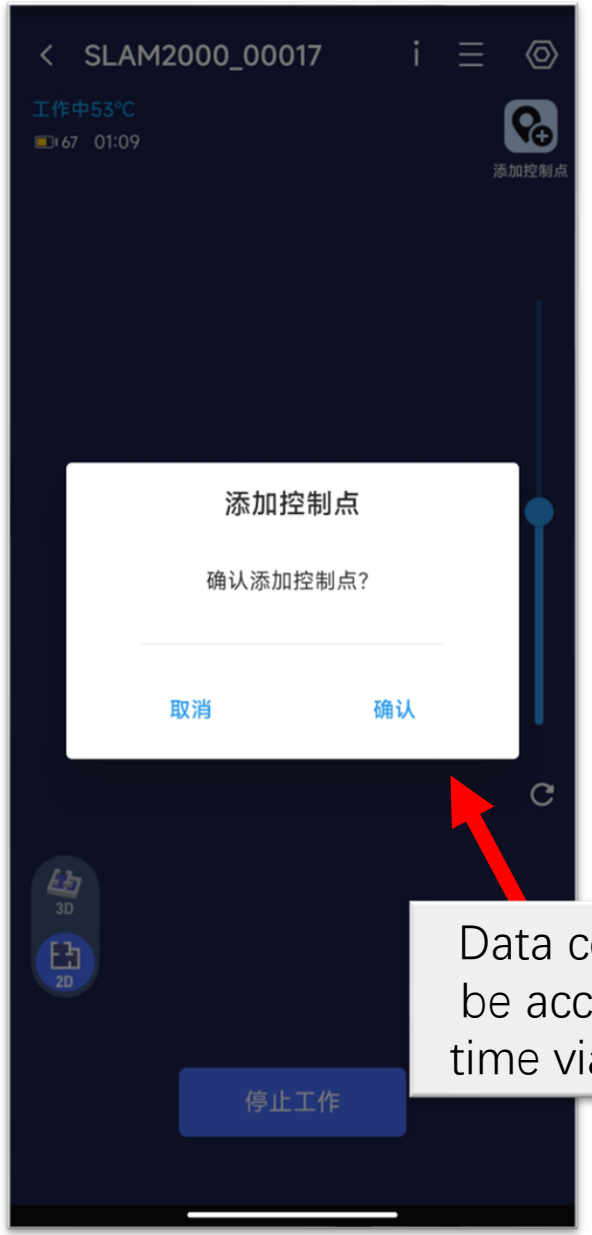


Data collection can be viewed at any time via mobile app

GCP Collection



GCPs can be added via mobile APP



Data collection can be accessed at any time via mobile app

End Collection

Short press the scanner [On/Off key] in the data acquisition state to end the data acquisition, the status indicator restores the [green light is always on] standby state, and the laser head stops rotating;

If you want to get the results of "real-time mapping" of the device, please wait for the device to finish this "real-time mapping" before the device is switched off or before the next acquisition, and the waiting time is about 1/25 of the time of this acquisition.
Example: If the collection time is 25 minutes, you need to wait for 1 minute after stopping the collection. At the end, you can hear the buzzer "beep".

Turn Off

Press and hold the scanner ON/OFF key to turn off the device, and wait until the system indicator and status indicator are all off, at which time the device is turned off.

Data Check

After the data acquisition is completed, you can turn off the scanner, use the data cable to connect SLAM2000 and PC, find the folder named "SN_XXXXX" and copy it to the backup directory; The system will automatically generate this folder after each data collection, and the order of data collection can be identified according to the size of the folder name tail number.

Problem Analysis

When there is a problem with the collected data, please pack and compress the folder named "LOG" in the scanner's memory card and submit it to Feima's after-sales department for analysis.

SLAM2000+S-RTK100A Collection

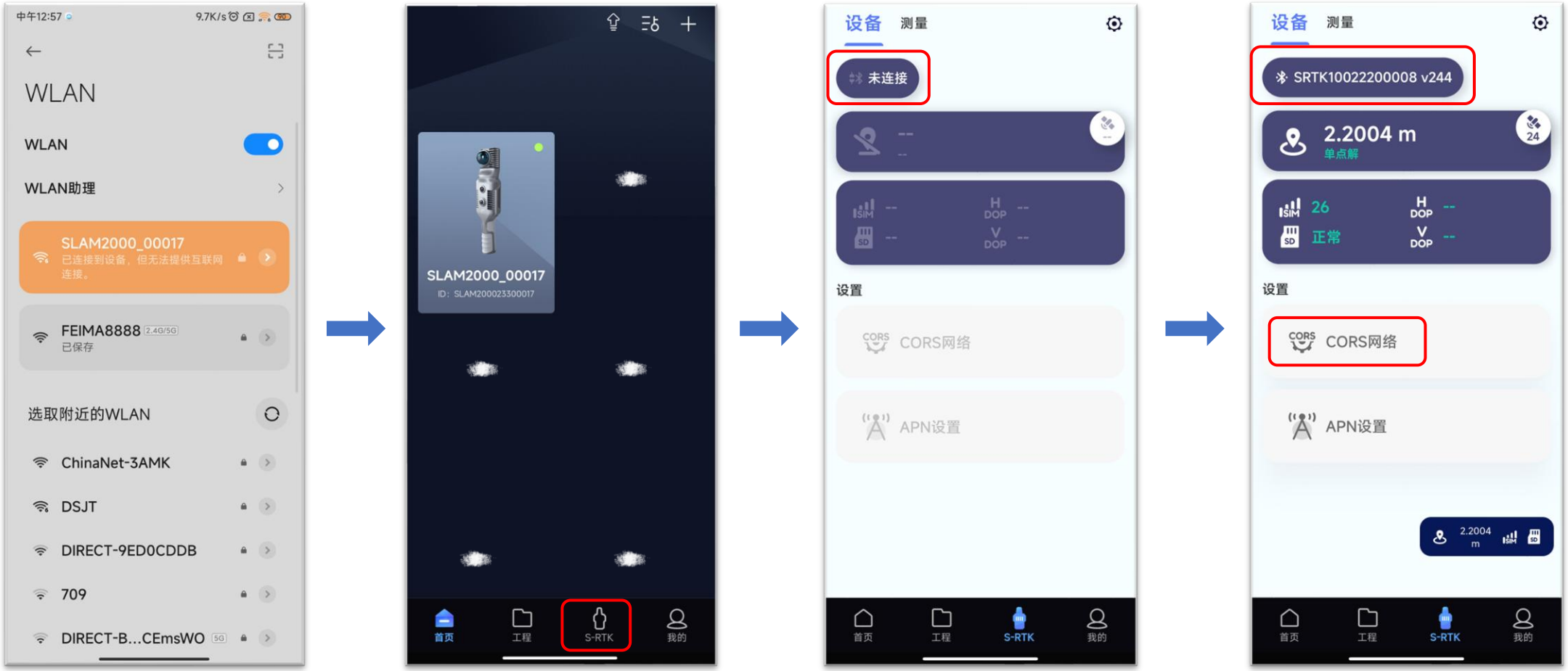
SLAM2000+S-RTK100A Collection

After the equipment is assembled and the SLAM2000 is switched on, the S-RTK100A will also be powered up and switched on at the same time, if it is the first time to use the S-RTK100 some related preparations are needed before.

(If your S-RTK100A has been successfully configured previously, you can skip the next two pages.)

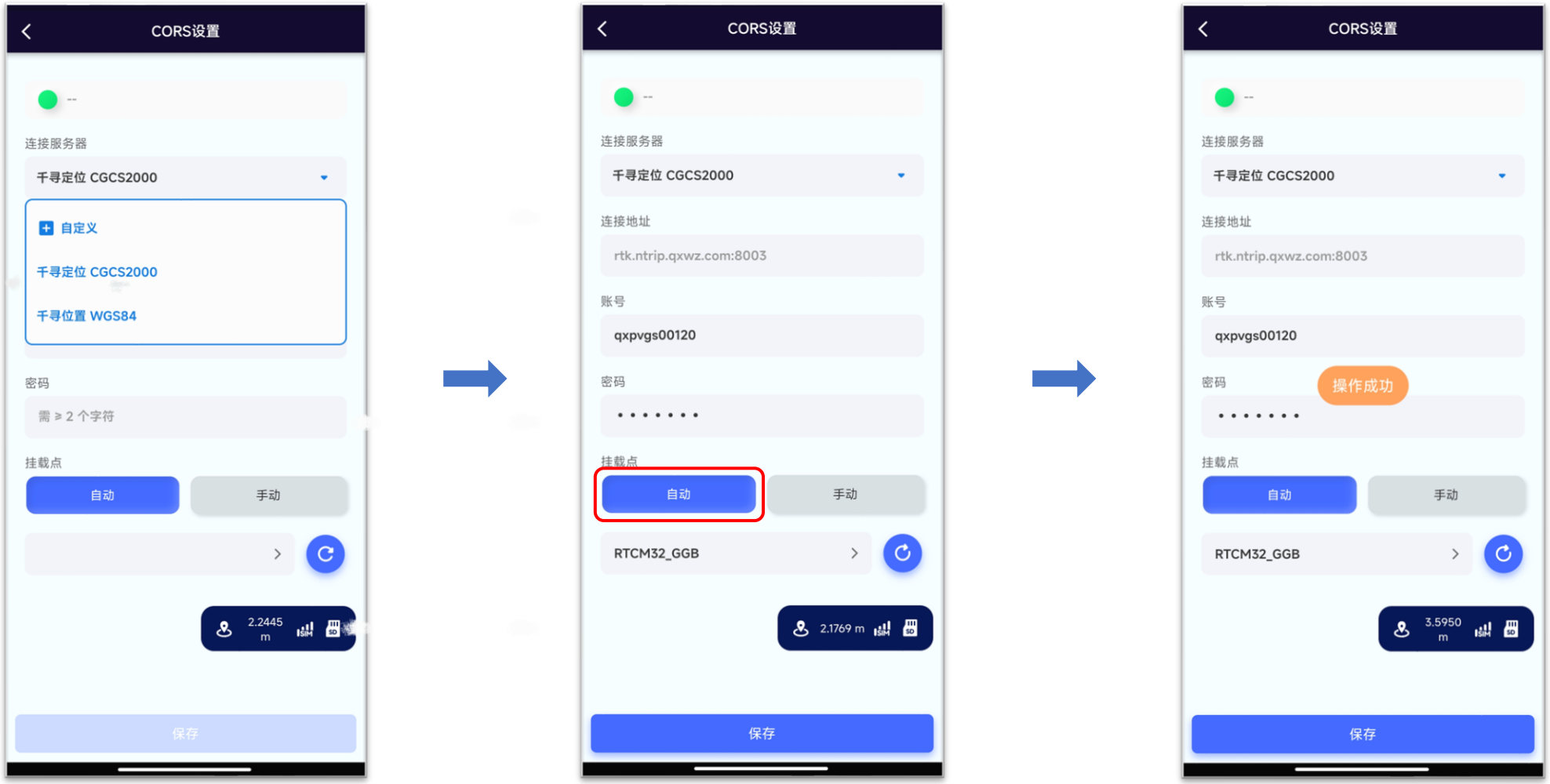
SLAM2000+S-RTK100A Collection

Open SLAM GO APP software on mobile phone, connect SLAM2000 via WiFi, click "S-RTK" button at the bottom of the mobile phone to enter S-RTK100A operation page, first open Bluetooth on mobile phone, and then click "Not Connected" at the top right. "At this time, the mobile phone will automatically search for S-RTK100A devices and connect.



SLAM2000+S-RTK100A Collection

On the CORS setting page, select the coordinate system and fill in the Chance account and password, then S-RTK100A can be used normally after successful connection.



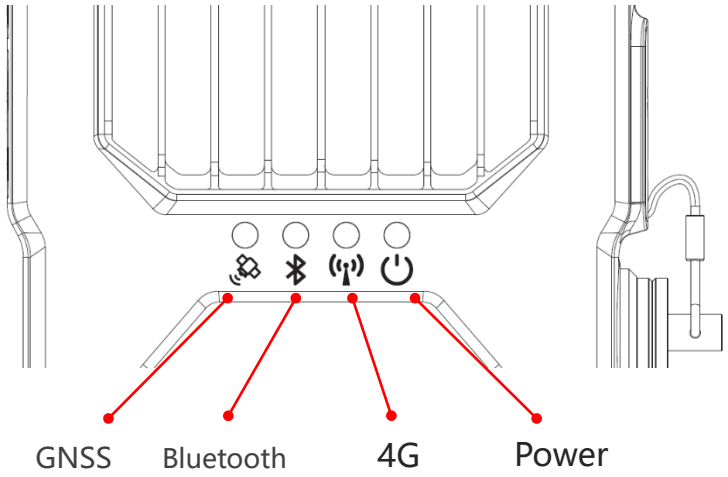
SLAM2000+S-RTK100A Collection

When the device is assembled and configured, the SLAM2000 will be switched on, and the S-RTK100 will be powered on at the same time. After the S-RTK100 is switched on, it is necessary to carry out the time auto-calibration and star search, and it is necessary to wait for a few seconds to a few minutes at this stage (the waiting time is related to the strength of the GNSS signal). After getting the fixed solution, it is recommended to wait for about 20 seconds to stabilise the signal.

- Try to choose a location with open and high ground when static.
- Keep the backpack antennae as vertical and skyward as possible.

SLAM2000+S-RTK100A Collection

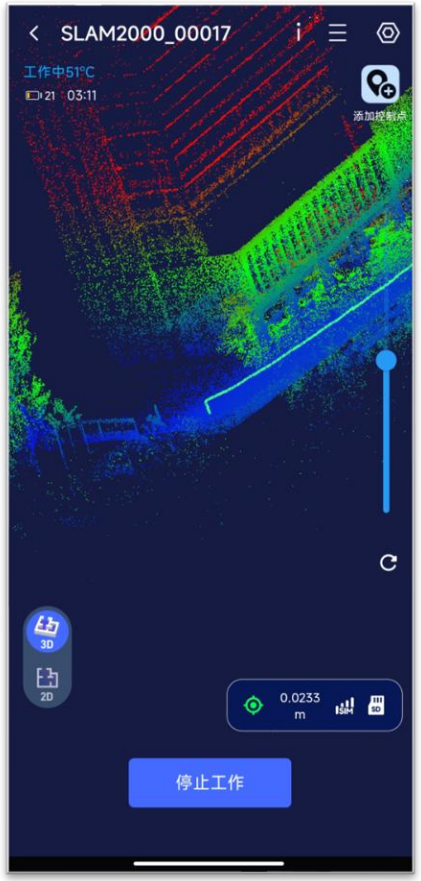
Judge the working status of the device according to the S-RTK100A indicator.



Indicator light	Function	Device status	Indicator light status			
			Red	Green	Blue	Yellow
GNSS	Positioning	Search satellites	Flsah			
		Single point positioning	Alway on			
		Pseudo range Positioning				Flash
		Floating point positioning		Flash		
		Fixed positioning		Flash		
		Static Station Mode			Always on	
		Positioning system is initializing	Flash			
Bluetooth	Bluetooth	Bluetooth preperation	Flash			
		Initialization successful, Bluetooth disconnected status	Always on			
		Bluetooth connection successfully		Always on		
4G	Communication	The data is not ready	Flash			
		SIM card read successfully		Flash		
		Connect to 4G network		ALways on		
		Differential data available		Flash		
		No SIM card or unrecognized			Flash	
Power	Power	Without MicroSD card installed	Flash			
		USB access	Always on			
		The system is working properly		Flash		
		MicroSD card data write error			Always on	

SLAM2000+S-RTK100A Collection

The SLAM2000+S-RTK100A solution also requires a 60-second initialization before acquiring data, and the acquisition operation can be carried out normally after the reading seconds are over.



SLAM2000+S-PACK200 (Backpack)

Special Notice

Special Notice!

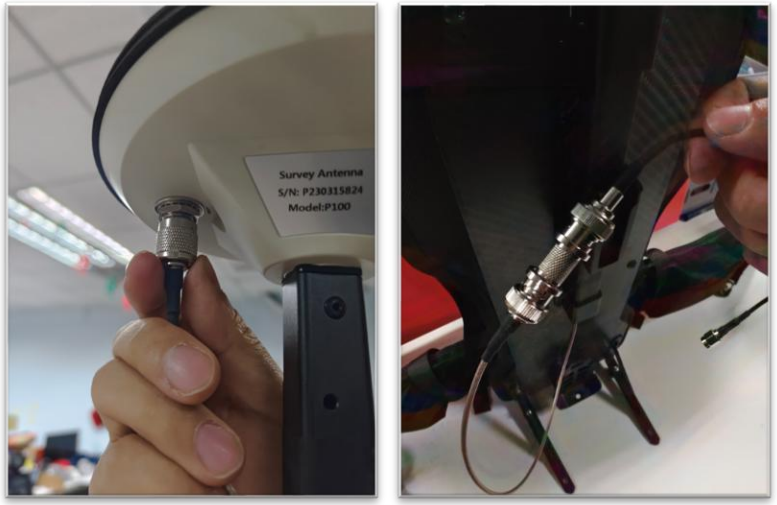
SLAM2000 scanner belongs to the precision equipment, when assembled with the backpack need to pay special attention to the position of the backpack, in the conditions allow the backpack should be placed horizontally as far as possible, or placed at a large angle against the wall.

Due to the change in centre of gravity when the scanner is installed, the backpack can easily tip forward when placed vertically causing damage to the equipment!

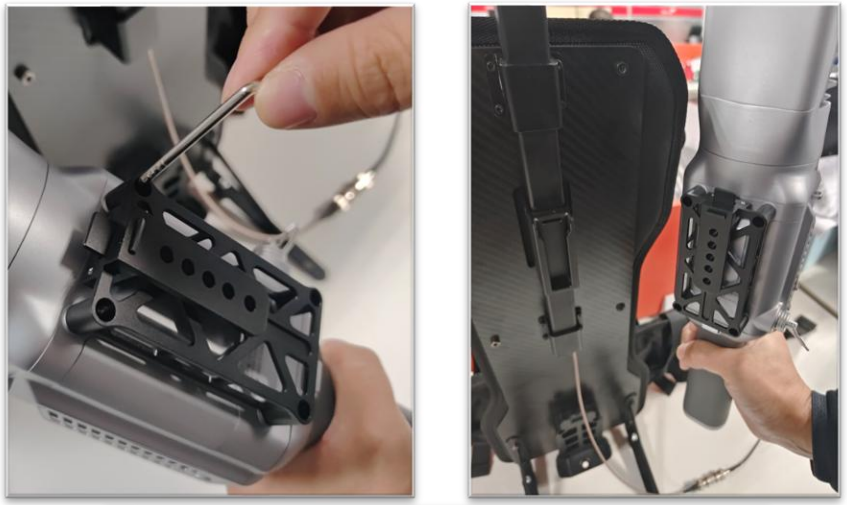
Prevent equipment dumping!!!

S-PACK200 Assemble

Install GNSS Antenna



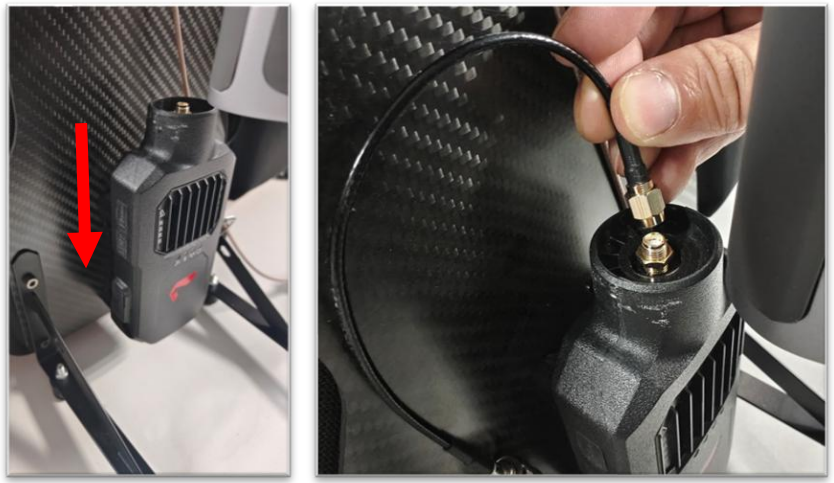
Connect Feeder



Install SLAM2000 bracket

Install SLAM2000 to backpack

Please insert SD card and SIM card in advance



Install S-RTK100A and connect the feeder

S-PACK200 Assemble

Connect the aviation plug cable, pay attention to the direction of the plug

Assemble complete

S-PACK200 Collection

The SLAM2000 + S-PACK200 + S-RTK100A combination operates in the same way as the SLAM2000 + S-RTK100A. The S-PACK200 can be used more flexibly in a wide range of scenarios, and the side pockets can carry a number of mobile power sources to extend the range.

SLAM2000+S-PACK200 Assemble

SLAM2000+S-PACK200+S-RTK100 Assemble

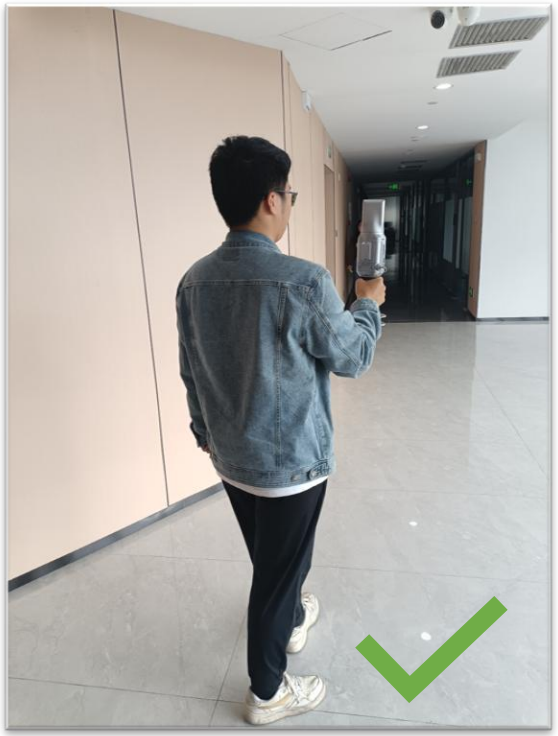
Others Notice

Notice

- It is recommended that the user press the ON/OFF key briefly to put the scanner into standby mode after completing a single data acquisition, after which the user can press the ON/OFF key briefly again to start the next data acquisition.
- In principle, it is not required to take a closed-loop path, but in order to guarantee the data accuracy, it is recommended that the user take a complete closed-loop route as far as possible under the circumstances.
- Please be careful when removing the scanner from the case and protect the rotating laser head (precision part).
- Do not touch the laser emission area protector with hands.
- Do not touch the camera lens with your hands.
- The laser head is not allowed to be downward during data acquisition.
- Please try to keep the scanner moving smoothly during data collection and avoid violent shaking.
- Before using the device, please make sure that the battery handle has been installed in place without loosening, and that the safety catch is in place.
- During the use of the equipment, please pay attention to the light to avoid damage to the laser due to bumping or violent vibration.
- Single data collection time should be more than 60 seconds.
- In order to ensure data security and data processing ease of use it is recommended that the single data acquisition time is controlled within 25 minutes.
- Keep the distance between the scanner and the object to be measured > 0.4m, avoid the laser head close distance (<0.4m) to the wall turn.
- Try to avoid moving pedestrians in front of the laser head.
- Avoid unnecessary large turns in place.
- Data acquisition needs to be continuous and ensure a certain degree of overlap.

Notice

Scanner has a fellow traveller or vehicle in front of it



Roofs will block the satellite signal of S-RTK100A

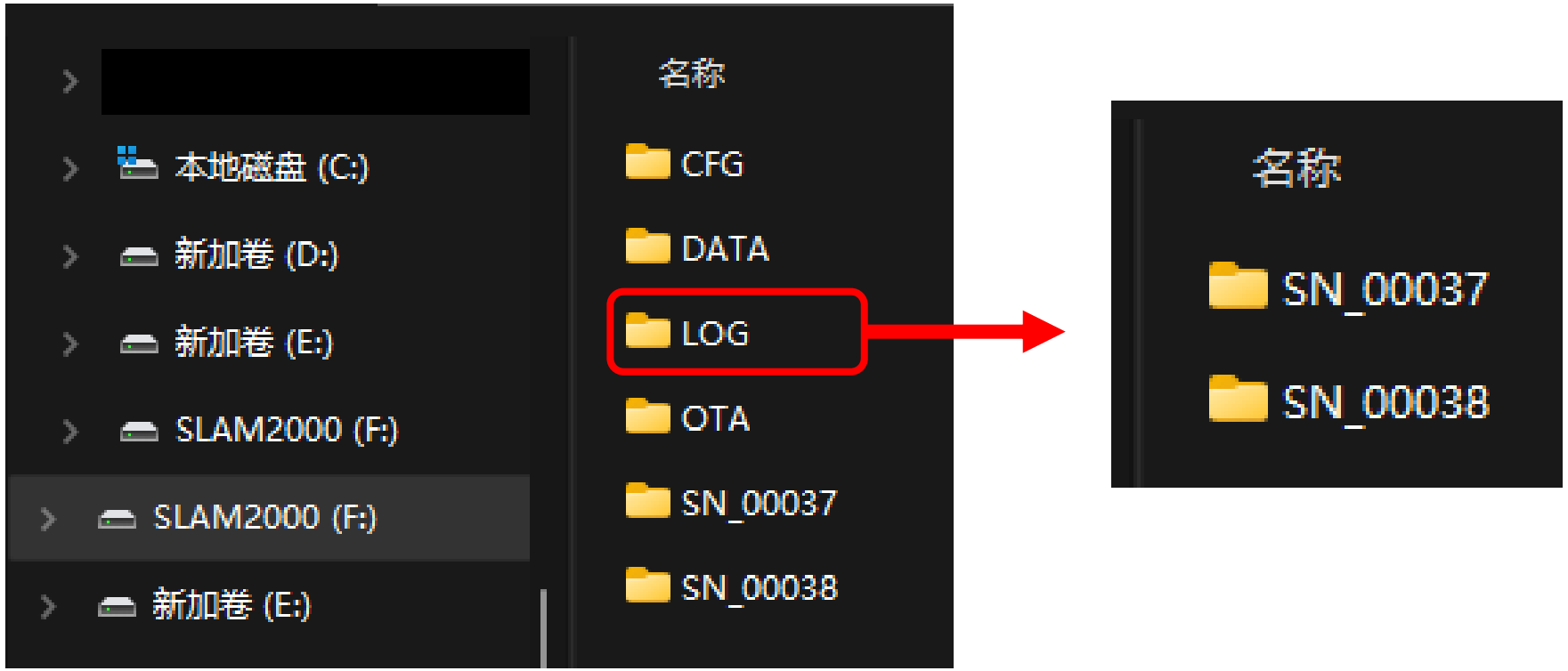
Insufficient clearance from the wall

Notice

Note that the scanner is placed in a pass-through position on both sides for a few seconds at door crossings and turns to allow for better front-to-back matching of the point cloud to reduce cumulative errors.

Device Log

If the SLAM2000 malfunctions or reports an error, you can send the log data and the set of acquisition results data to Feima after-sales service for further assistance.



Maintenance&Storage

Clean

Notice!

- When cleaning the laser head protector and the camera lens, you can use a clean air blower or a soft, dry, soft-bristled brush or a special cleaning cloth to wipe the surface, do not use alkaline cleaners for cleaning, and be careful not to be scratched by hard objects on the lens glass.

Storage Requirement

- Keep away from magnetic fields;
- Protection from falling;
- Protection from crushing;
- Keep away from humid environments;

If the device is not used for a long time, please store SLAM2000 in a safe, dry and ventilated place that avoids direct sunlight, the storage environment requires a relative humidity of less than 40%, and a temperature of -20℃~60℃ to avoid excessive humidity in the environment that causes the device to produce condensation, and the recommended storage temperature is 5~28℃.

THANKS

深圳飞马机器人股份有限公司

www.feimarobotics.com