

### **RobotSLAM User Manual**



#### Contents



### **1.Getting to know RobotSLAM**

#### 1.1 Unboxing



ID	Part Name	Quantity
А	Handheld (include handheld grip and target base)	1
В	GNSS antenna&cable (for built in GNSS module)	1
С	Smartphone Holder	1
D	Shoulder strap	1
E	Main cable	1
F	Battery compartment	1
G	Rechargeable battery	2
Н	Battery charger&cable	1
I	Ethernet cable	1
J	USB flash drive	1



к	External TF card	1
L	SD card reader	1
М	Cleaning cloth	1
N	Hand-carry case	1
0	Panorama camera (optional)	1
Р	Fill-in light	1

#### **1.2 Technical Specifications**

Specification	Parameter		
Principle	mechanical rotation		
Models	RobotSLAM RobotSLAM Plus		
Laser sensor	16-line 32-line		
System accuracy	1cm (highest)		
Laser safety class	CLA	SS 1	
Measuring range	0.05 ~ 120 m		
FOV(horizontal)	360°x285°		
Angle resolution(H.)	0.18° (10 Hz)		
Angle resolution(V.)	2° 1°		
Scanning frequency	5Hz/10 Hz		
Scan Rate	320,000points/sec 640,000point/sec		
	Built in storage: 512G SSD		
Storage	Camera built in storage: 128G TF		
	External TF card: standard 128G (support extend to 512G)		
Weight(only handheld)	1.9	2 kg	



Induration time	Single battery≥2h, two batteries≥4h
Environment	-20°C $\sim$ 65°C (working) /-40°C $\sim$ 85°C (storage)
Data acquisition time to data processing	1:2

### 2. Device details

#### Device interface display



ID	Port Name	Functions	descriptions
1	Start/Stop scanning button	Start/Stop scanning	the button is to control the device to start scanning or stop scanning; if RTK function works, the button color is blue, if not, the button color is purple;
2	Ground control point marking button	press once to record the current ground control point location	place the device on the ground control point marks, and press the button shortly one time to record the GCP location
3	Main cable point	DC 12V ~ 16.8 V	please use the standard battery
4	GNSS antenna port	OOS signal	please use the standard GNSS antenna
5	Nano SIM card slot	SIM card	Able to access CORS via N
6	External TF card slot	TF card	insert the external TF card

#### LED screen display



ID	Item	Content	Description
1	GNSS solution		number of locked satellites/numbers of
L	status		searched satellites
		Storing	Recording
2	Data recording	Unstore	Stop recording
	status	Cam data download	Camera data is downloading, please wait
		No gnss	No GNSS signal
3	RTK Positioning	Single	there is GNSS signal, but don't reach differential solution; <b>Solution</b> : please check the RTK account settings, if RTK settings is correct, the satellite signal is weak;
	status	Float	Not fix, the accuracy is between meter and centimeter
		Fixed	$1{\sim}3$ cm positioning accuracy
4	Collection tie	h: m: s	Collected time



F	Notwork access	atl	SIM card loaded
5	5 Network access	*all	No SIM card
	6 External storage	×C	Not detected TF card
6			TF card detected
		If there is O on the left of the TF card sign	External storage works

#### 2.1 device connection



Internet cable connection



Internet cable connection—it is used to download the data, one end connect to the device, the other end connect to the computer;

**Power button-**it is designed to power on the lidar system;

- 1. insert one or two batteries to the **battery compartment**;
- 2. connect one end of the **main cable** to the laser scanner, the other



end to the battery compartment;

#### Install the GNSS antenna

Push the GNSS antenna base plate to the slot, and insert the antenna cable to the port;



**Notes:** It is better to remove the GNSS antenna carefully, not to rotate the antenna cable;

#### Install the panorama camera (it is an optional part)



Press the lock button with left hand, and push the camera to the camera slot with right hand; the same method to uninstall the camera. **Notes**: Please remove the panorama camera carefully, not to hurt the laser scanner in front.



#### 2.2 Data capture

1. Connect the battery and the main cable with the battery compartment;



2. Press the power button and LED light is on;



Press power button

LED light ON

3. Long Press the camera power button, and the camera is on;





long press the camera power button Camera ON

4. Go to the start point, put the instrument on the ground(flat ground);



Press the start recording button, the scanner starts scanning



The camera will start recording too at the same time or after a few seconds



 After starting the scan, please keep the instrument in one place without moving for 1 minute or so, and then get up and start scanning;







Initialization time(1minute)

Scanning

Finalization time(1minute)

6.when finishing the scan, keep the instrument in the same place without moving for 1 minute too, and then press the start recording button again to stop the scan.



Notes: 1. When initializing, don't move the instrument;

2.Keep the instrument in front of the operator in scanning process.



# 3.Data download and RTK function settings

#### 3.1 Data download

Connect the LiDAR system with the computer via a network cable:





Input <u>\\192.168.0.30</u> in your computer

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2023/6/27 15:24 文件夹

SCANNER



Copy out the data folder, all the information is in the same folder.

#### 3.2 RTK settings

Before using RTK function, please insert a SIM card first,



SIM card slot

Method 1- Set RTK with the RobotSLAM engine software-in the computer



	CONNECT	
Mobile CORS	O Qian	kun FindCM
IP Address:	Port:	0002
Mount Point:		-
User Account:		
User Password		
LOSIN	CHECK STATE	LOGOUT

Method 2-using the mobile phone APP-RobotSLAM Palm

- Connect the device wifi to the android system mobile phone; the password is 12345678;
- 2. Run software RobotSLAM Palm and make sure connect the device already;



3. Set the RTK information, and if next time, you want login a new RTK information, please log out the old one, and then input the new information.





#### 3.3 Control the RobotSLAM via Palm software

Click the arrow button to enter the interface to control the device,



Click to start/stop the scan

#### 3.4 Activate the device

Please get the activation code from the factory, and connect the mobile phone WIFI, and then input the code to activate it;



### 4.Data processing

#### 4.1 Computer configuration

Computer	Minimum	Recommended	
Operating	Windows10/Windows11 64-bit		
system			
Graphics	CTV 2060/RV6600M or above (	NVIDIA sories recommended )	
card	GIA-SUGU/KAOOUUM OF ADOVE ( NVIDIA Series recommended )		
CPU	Intel i7-11800H/AMD R7-5800H or	Intel i7-12700H/AMD R7-6800H or	
	above	above	
Internal	16GB or above	32GB or above	
Memory			
SSD	1TB or above	2T or above	

#### 4.2 RobotSLAM Engine software installation



"English(US) or English(UK)"; click "下一步(Next)"; set the installation path,



#### 4.3 Apply a software license

1. send the factory your machine code to apply a license file:



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2.click "BROWSE" to import the license file and click ACTIVATE;

#### 4.4 Data processing in RobotSLAM Engine

1<sup>st</sup> , Double click to run RobotSLAM Engine software

 $2^{\text{nd}}$  , Open SLAM Manager, click" CHANGE" to load the project folder;







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 $3^{\rm rd}$  , if the scanning time is less than 20 minutes, directly click <code>``Run Bag file''</code>

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 $4^{\rm th}$  , wait for the processing, when the processing bar reach 100%, and show "Finish refining trajectory", the processing finish.



5<sup>th</sup>, **Export point cloud** by clicking the following icon:

Vehicle Type:		Handheid	
Invironment		Universe	
Arectory Path:	E/290426/0426-291/	20230426134606	CHANGE
	Generate	O Replay	
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 $6^{\text{th}}\text{,}$  and then click <code>``OK''</code> to export point cloud.

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TIME	XSOURCE	YSOURCE	ZSOURCE	XTARG



#### 4.5 Export colorized point cloud

If the data also collect video with the panorama camera, check "Colorize Smooth Pointcloud" or "Colorize Origin Pointcloud" to export the point cloud, and then click OK.

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#### 4.6 Export Absolute Coordinates

1. If marks GCPs in the scanning process





Marking GCPs on the ground

If some Ground Control Points are marked and get the coordinates file for the GCPs, please check" Transform Point Cloud" and "Use GCP points" to receive absolute coordinates;

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#### 2.If RTK access to CORS network during scanning process

If RTK function works and the GNSS solution is Fixed most of the time, before process, please check "Use GNSS Factor",

Vehicle Type:		Handheid	
Environment:		Universe	).
Directory Path:	E//52heoji/2023(	1705083142-9Froot	CHANGE
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RTK Threshold/r	nt: 0.03	Use GNSS Factor	Use Loop Detection

And when export point cloud, please check the followings:

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					OK	CANCEL

### 5.Battery

RobotSLAM includes two batteries, one battery can work 2hours, two batteries totally can work about 4hours.





Battery charging

Battery LDE display (remaining power display)



### 6.Usage Guidelines

This chapter will talk about guidelines for how to use RobotSLAM to receive desirable surveying results.

As we know, SLAM can work both indoors and outdoors, and don't reply on the satellite signals to do the scanning and get 3D point cloud. But it doesn't mean we can scan randomly to get the results. And there are some rules need to take care.

#### 6.1 Walking Speed

1. The scanning speed is normally walking speed;

2. Don't shake the device violently during the process. When turning, turn around slowly, especially for indoor environment or stairs scanning.



#### 6.2 Loop closure

It is necessary that the operator should start scanning and end scanning in the same position to close the loop. Because there are cumulative errors in the SLAM scanning, and the loop works well to eliminate the error.



Outdoor small scene route planning



Outdoor large scene route planning

#### 6.3 indoor scanning

- 1. For indoor environment scanning, please open all doors in advance;
- 2. Plan walking route in advance;
- 3. Avoid walking people as much as possible;





Open the door before start scanning

FCC Caution:

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

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

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.

If this equipment does cause harmful interference to radio or television reception,

which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.

- Increase the separation between the equipment and receiver.

- Connect the equipment into an outlet on a circuit different

from that to which the receiver is connected.

-- Consult the dealer or an experienced radio/TV technician for help.

The device has been evaluated to meet general RF exposure requirement. The device can be used in portable exposure condition without restriction.

#### Specific Absorption Rate (SAR) information:

This device meets the government's requirements for exposure to radio waves. The guidelines are based on standards that were developed by independent scientific organizations through periodic and thorough evaluation of scientific studies. The standards include a substantial safety margin designed to assure the safety of all persons regardless of age or health. FCC RF Exposure Information and Statement the SAR limit of USA (FCC) is 1.6 W/kg averaged over one gram of tissue. Device types: This device has also been tested against this SAR limit. This device was tested for typical body-worn operations with the back of the This device kept 0mm from the body. To maintain compliance with FCC RF exposure requirements, use accessories that maintain an 0mm separation distance between the user's body and the back of This device. The use of belt clips, holsters and similar accessories should not contain metallic components in its assembly. The use of accessories that do not satisfy these requirements may not comply with FCC RF exposure requirements, and should be avoided.